

# Stonel™ Quartz™

Valve monitor series  
QC/QG/QN/QX

Installation, maintenance and  
operating instructions



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## Read these instructions first!

These instructions provide information about safe handling and operation of the limit switch. If you require additional assistance, please contact the manufacturer or manufacturer's representative. Addresses and phone numbers are printed on the back cover.

### Save these instructions.

Subject to change without notice.

All trademarks are property of their respective owners.

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# 1 General

## 1.1 Introduction

This manual incorporates the Installation, Maintenance and Operation (IMO) instructions for the Stonel™ Quartz™ series valve monitors. The product is designed to provide position feedback indication of on/off automated valves.

### Note

The selection and use of this product in a specific application requires close consideration of detailed aspects. Due to the nature of the product, this manual cannot cover all the likely situations that may occur when installing, using, or servicing the product. If you are uncertain about the use of this device, or its suitability for your intended use, please contact the factory for assistance.

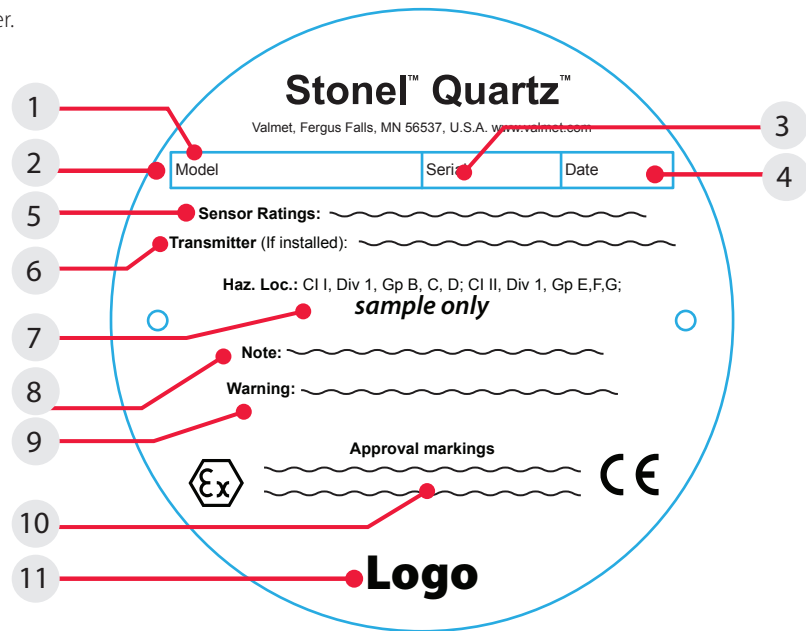
## 1.2 Title plate markings

The product has an identification plate attached to the cover.

1. Identification plate markings
2. Model
3. Serial number
4. Date
5. Sensor rating
6. Transmitter rating (if installed)
7. Protection class information\*
8. Note
9. Warning
10. Approval markings\*
11. Logo

### Note

\* See page 48 for specific product markings.



## 1.3 CE markings

Stonel Quartz meets the requirements of European Directives and has been marked according to the directive.

## 1.4 Recycling and disposal

Most of the product parts can be recycled if sorted according to material. In addition, separate recycling and disposal instructions are available from us. This product can also be returned to us for recycling and disposal for a fee.

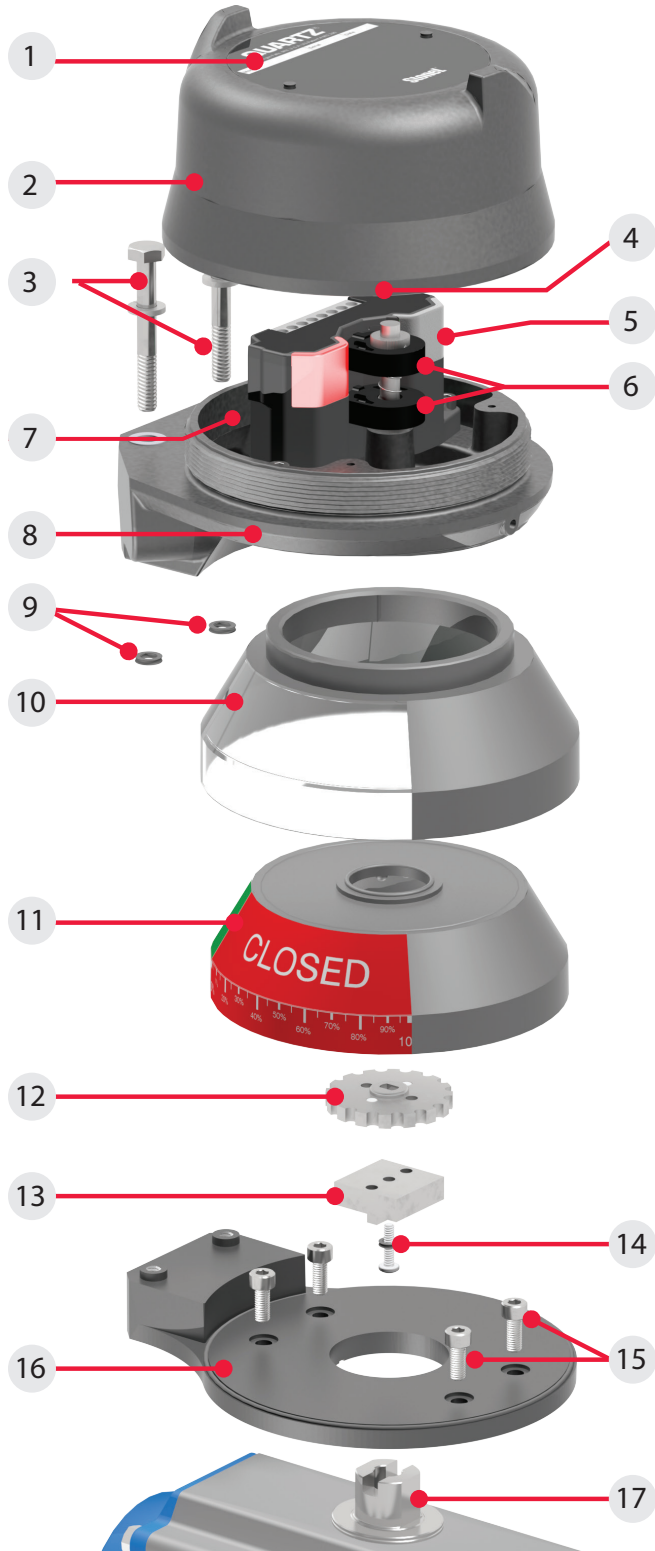
## 1.5 Safety precautions

Do not exceed the permitted values! Exceeding the permitted values marked on the product may cause damage to the switch and to equipment attached to the switch and could lead to uncontrolled pressure release in the worst case. Damage to the equipment and personal injury may result.

To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed when in operation.

### 1.6 Assembly drawing

- 1. Title plate
- 2. Cover
- 3. Thru-bolt mounting bolt
- 4. Cover lock (*cast cover model only*)
- 5. Function
- 6. Cams
- 7. Internal ground lug
- 8. Housing
- 9. Thru-bolt retaining o-rings
- 10. Visual indicator cover
- 11. Visual indicator drum
- 12. Coupler spacer
- 13. Drive block
- 14. Drive block retaining screw
- 15. Mounting plate retaining screws
- 16. Extended visual indicator mounting plate
- 17. Actuator shaft



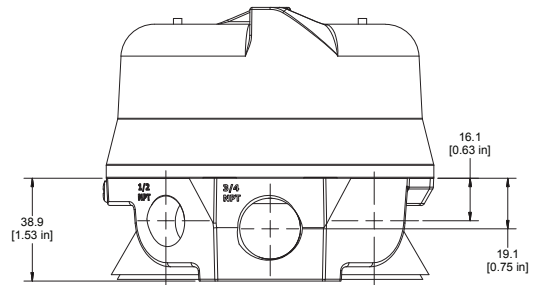
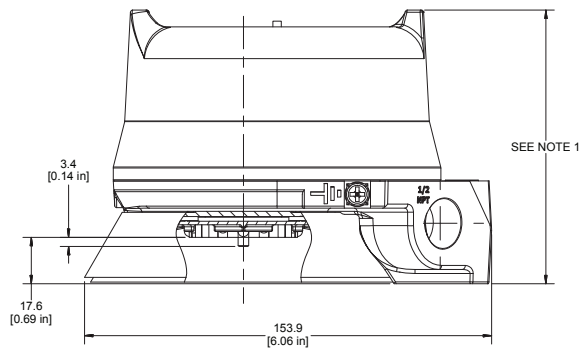
### 1.7 Specifications for all models

See page 10 for function specific details.

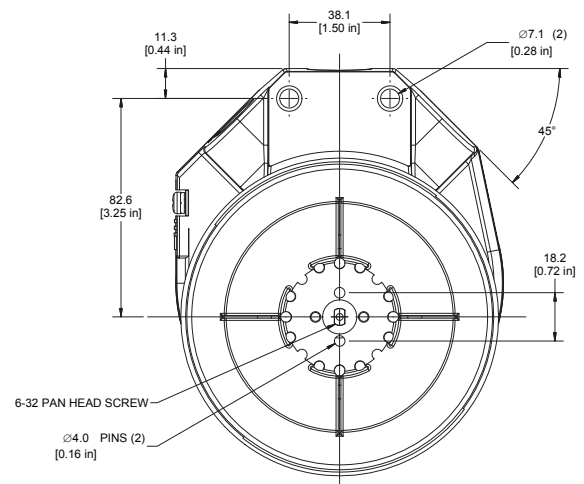
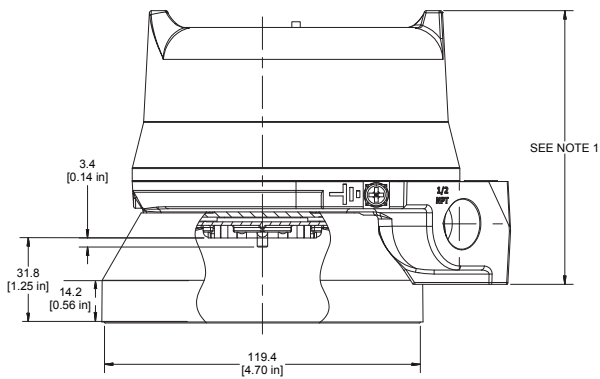
| Specifications   |   |                   |
|--|---|-------------------|
| <b>Materials of construction</b>   |   |                   |
| Housing & cover  | Epoxy-coated anodized marine grade aluminum or CF3M stainless steel   |                   |
| Clear cover & indicator  | Lexan® polycarbonate  |                   |
| Elastomer seals  | Buna-N; optional EPDM   |                   |
| Drive shaft  | Stainless steel   |                   |
| Drive bushing  | Bronze, oil impregnated   |                   |
| Fasteners  | Stainless steel   |                   |
| Operating temperature range  | -40° C to 80° C (-40° F to 176° F) <i>typical</i><br>-55° C to 80° C (-67° F to 176° F) <i>QC series only</i> |                   |
| <b>Enclosure protection</b>  | Type 4, 4X, 6 and IP66 / IP67   |                   |
| <b>Unit weights</b>  |   |                   |
| Aluminum cover   | Short   | 1.27 kg / 2.80 lb |
|  | Medium  | 1.55 kg / 3.42 lb |
|  | Tall  | 1.75 kg / 2.85 lb |
| Clear cover  | Short   | 1.20 kg / 2.64 lb |
|  | Medium  | 1.27 kg / 2.79 lb |
|  | Tall  | 1.39 kg / 3.06 lb |
| Stainless steel cover  | Short   | 3.84 kg / 6.25 lb |
|  | Medium  | 3.00 kg / 6.80 lb |
|  | Tall  | 3.50 kg / 7.70 lb |
| <b>Unit dimensions for Output option "S" - Short visual indicator</b><br>(Consult factory for cover sizes on specific models)      |   |                   |
| Short cover  | Unit height   | 102 mm [4.00 in]  |
|  | Cover removal clearance   | 143 mm [5.62 in]  |
| Medium cover   | Unit height   | 123 mm [4.86 in]  |
|  | Cover removal clearance   | 184 mm [7.24 in]  |
| Tall cover   | Unit height   | 155 mm [6.10 in]  |
|  | Cover removal clearance   | 241 mm [9.48 in]  |
| <b>Unit dimensions for Output option "N" - Extended visual indicator</b><br>(Consult factory for cover sizes on specific models)   |   |                   |
| Short cover  | Unit height   | 127 mm [5.03 in]  |
|  | Cover removal clearance   | 143 mm [5.62 in]  |
| Medium cover   | Unit height   | 148 mm [5.86 in]  |
|  | Cover removal clearance   | 184 mm [7.24 in]  |
| Tall cover   | Unit height   | 186 mm [7.10 in]  |
|  | Cover removal clearance   | 241 mm [9.48 in]  |
| <b>Environmental conditions</b>  |   |                   |
| Location   | Indoor and outdoor  |                   |
| Maximum altitude   | 5000 m  |                   |
| Maximum humidity   | 90%   |                   |
| Pollution degree   | 4   |                   |
| <b>Ratings and approvals*</b>  | See page 48 or manufacturer's official website  |                   |
| * Only models listed on on manufacturer's official website are approved per specific rating.                                       |   |                   |
| * Functional Safety (SIL) approvals for specific models and Quartz SIL safety manual available on manufacturer's official website. |   |                   |

## 1.8 Dimensions

### Output option "S" - Short visual indicator



### Output option "N" - Extended visual indicator



#### Note 1

Cover height varies based on model number.

Short cover = 102 mm [4.0 in]  
Dual module and 2-switch models use short covers.

Medium cover = 123.4 mm [4.86 in]  
Transmitter only units

Tall cover = 155.4 mm [6.12 in]  
Four switch models and transmitter with switch models

The certified dimensional drawing for this product can be found on manufacturer's website.

## 2 Assembly and mounting

### 2.1 Typical Quartz with extended visual indicator assembly figure

- A. Quartz unit
- B. Thru-bolt mounting bolts (2)
- C. Cover lock (*cast cover model only*)
- D. External ground lug (Internal ground lug provided)
- E. Indicator cover setscrew
- F. Coupler spacer
- G. Thru-bolt retaining o-rings
- H. Drive block
- I. Drive block retaining screw
- J. Mounting plate retaining screws (4)
- K. Extended visual indicator mounting plate

### 2.2 Instructions for mounting with extended visual indicator

#### Special notes:

- Mounting of the product requires a Stonel mounting kit specific to the actuator the product is to be mounted to.
- It is recommended that thread lubricant or anti-seize be used on the mounting kit fasteners (Items B, I and J) prior to assembly.
- In high cycle or high vibration applications, blue Loctite® may be used on the mounting kit fasteners in place of lubricant or anti-seize.
- The instructions below are for a typical mounting application. Refer to <https://stonel.mountingkitsonline.com/> for kit specific layout drawings.

#### Steps

This unit and mounting kit are supplied separately. From the shipping container, ensure items A and F are present. From the mounting kit, ensure items B, G, H, I, J and K are present.

1. Locate the extended visual indicator mounting plate (Item K) and place on the actuator. Using an M4 allen wrench, fasten with the four mounting plate retaining screws (Item J). Torque screws to 25 to 30 in.lbs (2.8 to 3.4 Nm).
2. Loosen indicator cover setscrew (Item E) with an M2 allen wrench and rotate indicator cover to desired viewing angle and retighten setscrew.
3. Remove indicator drum screw from Quartz unit.
4. Rotate indicator drum to desired position. (OPEN or CLOSED appearing through indicator window.)
5. Attached drive block (Item H) to the coupler spacer (Item F) with the provided drive block retaining screw (Item I).
6. Place Quartz unit onto the extended visual indicator mounting plate, ensuring the drive block tabs engage the slot in the actuator shaft.
7. Slide Thru-bolt mounting bolts (Item B) with washers into housing and fit Thru-bolt retaining o-rings (Item G) over bolts to retain Thru-bolt mounting bolts in the housing.
8. With an  $\frac{7}{16}$ " socket, tighten down with the Thru-bolt mounting bolts. Torque bolts to 15 to 20 in.lbs (1.7 to 2.3 Nm).
9. Operate actuator to full open and full closed positions and check for proper alignment between switch and actuator. Eccentricity of shaft must not be greater than 0.254 mm [0.1 in] from centerline.
10. Fine-tune the visual indicator cover by repeating steps 2 as needed.
11. Follow additional Touch & Tune instructions found in section 4 related to the specific model being installed.

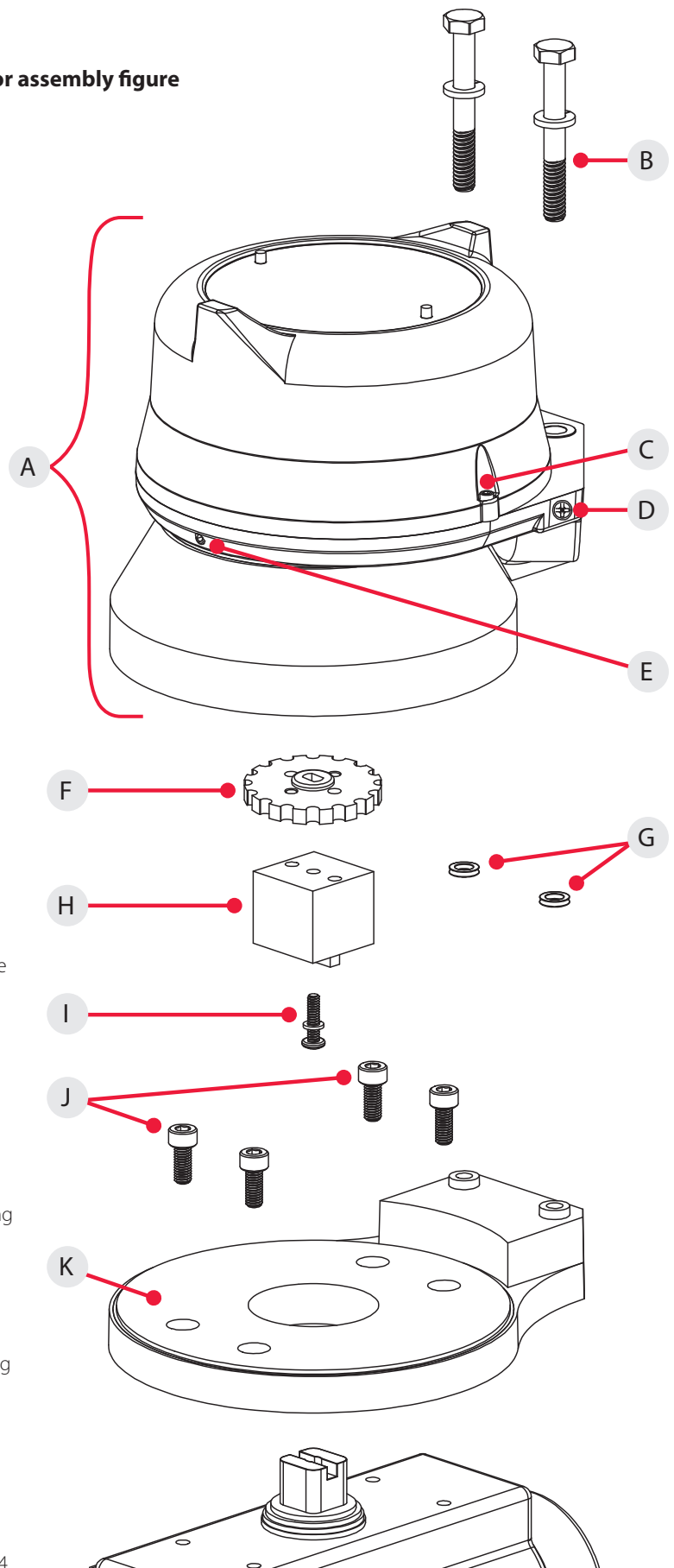


Fig. 2.1 extended visual indicator assembly figure

### 2.3 Typical Quartz with short visual indicator assembly figure

- A. Quartz unit
- B. Thru-bolt mounting bolts (2)
- C. Cover lock (*cast cover model only*)
- D. External ground lug (Internal ground lug provided)
- E. Indicator cover setscrew
- F. Coupler spacer
- G. Thru-bolt retaining o-rings
- H. Drive block
- I. Drive block retaining screw
- J. Mounting plate retaining screws (2)
- K. Mounting plate

### 2.4 Instructions for mounting with short visual indicator

#### Special notes:

- Mounting of the Quartz requires a Stonel mounting kit specific to the actuator the Quartz is to be mounted to.
- It is recommended that thread lubricant or anti-seize be used on the mounting kit fasteners (Items B, I and J) prior to assembly.
- In high cycle or high vibration applications, blue Loctite® may be used on the mounting kit fasteners in place of lubricant or anti-seize.
- The instructions below are for a typical mounting application. Refer to <https://stonel.mountingkitsonline.com/> for kit specific layout drawings.

#### Steps

Quartz unit and mounting kit are supplied separately. From Quartz shipping container, ensure items A and F are present. From the mounting kit, ensure items B, G, H, I, J and K are present.

1. Locate the mounting plate (Item K) and place on the actuator. Using the provided mounting plate retaining screws (Item J), fasten the mounting plate to the actuator.
2. Loosen indicator cover setscrew (Item E) with an M2 allen wrench and rotate indicator cover to desired viewing angle and retighten setscrew.
3. Remove indicator drum screw from Quartz unit.
4. Rotate indicator drum to desired position. (OPEN or CLOSED appearing through indicator window.)
5. Attached drive block (Item H) to the coupler spacer (Item F) with the provided drive block retaining screw (Item I).
6. Place Quartz unit onto the mounting plate, ensuring the drive block tabs engage the slot in the actuator shaft.
7. Slide Thru-bolt mounting bolts (Item B) with washers into housing and fit Thru-bolt retaining o-rings (Item G) over bolts to retain Thru-bolt mounting bolts in the housing.
8. With an  $\frac{3}{16}$ " socket, tighten down with the Thru-bolt mounting bolts. Torque bolts to 15 to 20 in.lbs (1.7 to 2.3 Nm).
9. Operate actuator to full open and full closed positions and check for proper alignment between switch and actuator. Eccentricity of shaft must not be greater than 0.254 mm [0.1 in] from centerline.
10. Fine-tune the visual indicator cover by repeating steps 2 as needed.
11. Follow additional Touch & Tune instructions found in section 4 related to the specific model being installed.

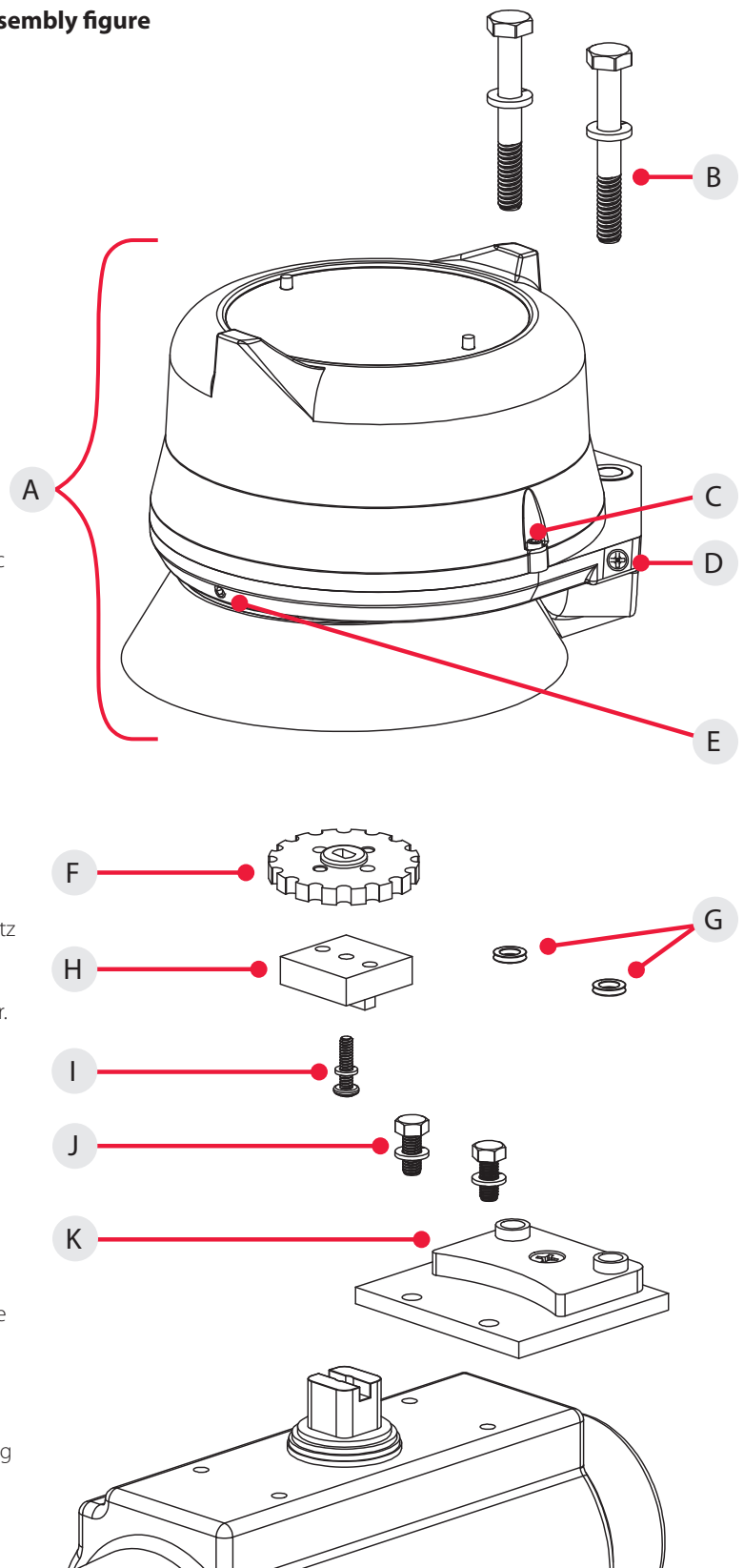


Fig. 2.3 short visual indicator assembly figure





## 3 Maintenance, repair and installation


### 3.1 Maintenance and repair


Maintenance or repair of this equipment must only be done by the factory or by qualified personnel that are knowledgeable about the installation of electromechanical equipment in hazardous areas. All parts needed for repairs or maintenance must be purchased through a factory authorized distributor to maintain warranty and to ensure the safety and compliance of the equipment. No routine maintenance of Stonel Quartz units is required.

### 3.2 Installation

 **Caution:** To maintain safety, only power supplies that provide Double/Reinforced insulation, such as those with PELV/SELV outputs, shall be used. (As applicable)

 **Attention:** If the unit is used in a manner not specified by Stonel, the protection provided by it may be impaired.

 **Attention:** If required, the housing can be grounded to earth potential by either the internal or external ground lug. (See Assembly drawing 1.6 Item 7 on page 5, Figure 2.1 Item D on page 7, and Figure 2.3 Item D on page 8)

 **Attention:** In order to maintain enclosure type and IP ratings, cover shall be tightened by hand a minimum of ¼ turn after cover engages o-ring. Do not use any tool to tighten the cover.

#### Field wiring

- It is the responsibility of the installer, or end user, to install this product in accordance with the National Electrical Code (NFPA 70) or any other national or regional code defining proper practices.
- This product comes shipped with conduit covers in an effort to protect the internal components from debris during shipment and handling. It is the responsibility of the receiving and/or installing personnel to provide appropriate permanent sealing devices to prevent the intrusion of debris or moisture when stored or installed outdoors.

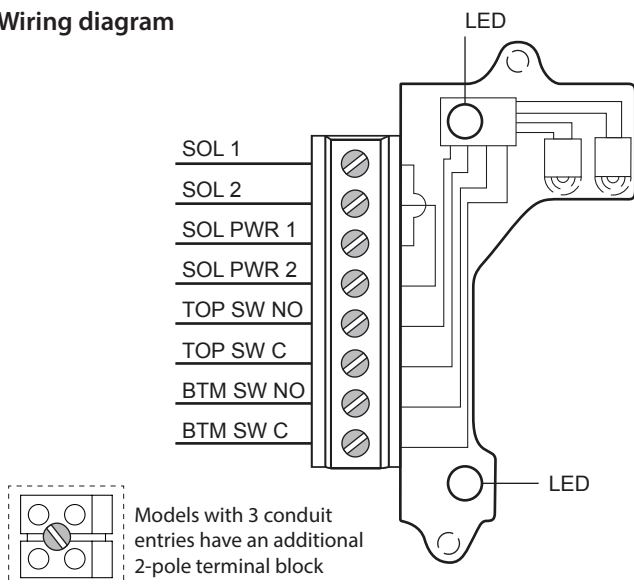
# 4 Function specific details

## 4.1 Inductive proximity sensors

### 4.1.1 Dual module SST sensors (33)

| Applicable models    |  |
|----------------------|--|
| QN33_, QX33_         |  |
| Specifications       |  |
| Configuration        | (2) SST solid state sensors<br>Wire terminals for one or two solenoids |
| Operation            | NO/NC (cam selectable)   |
| Maximum current      | Inrush 1.0 amp @ 125 VAC/VDC<br>Continuous 0.1 amp @ 125 VAC/VDC       |
| Minimum on current   | 2 mA (VAC/VDC)   |
| Voltage range        | 24 - 125 VAC 50/60 Hz; 8 - 125 VDC                                     |
| Maximum voltage drop | 6.5 volts @ 10 mA<br>7.5 volts @ 100 mA                                |
| Leakage current      | AC circuits 0.25 mA<br>DC circuits 0.15 mA                             |
| LED indication       | Bottom sensor: red<br>Top sensor: green                                |
| Temperature range    | -40° to 80° C  |
| Operating life       | Unlimited  |
| Warranty             |  |
| All mechanical parts | Two years  |
| Sensor module        | Five years   |

### Wiring diagram



**WARNING**

Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.

### Bench test procedure

Use Stonel Light Read Tester. Or use a 24 VDC or 120 VAC power supply with series load resistor (2kΩ - 6kΩ).

### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

#### For normally open function (Fig. 1)

1. With the valve in the closed position and if the valve turns counterclockwise to open, set both cams so that the metal activation strips are 180° from each other with the bottom cam set in the middle of the sensor target.
2. Lift the bottom cam and turn counterclockwise until the red LED goes out then clockwise again until the red LED is lit. (Reverse the direction of the cam if the valve opens clockwise.)
3. Move the valve to the opposite position (open), push down on the top cam and rotate counterclockwise until the green LED is lit. (Reverse the direction of the cam if the valve opens clockwise.)

For the normally open operation, both LEDs will be off during the actuation period. If the optional green CLOSED visual indicator is used, the colors would be reversed in steps 1 and 2.

#### For normally closed function (Fig. 2)

1. With the valve in the closed position, set both cams so that the metal activation strips are aligned with each other and set in the middle of the sensor targets.
2. If the valve turns counterclockwise to open, pull up on the bottom cam and rotate clockwise until the red LED goes out. (If the valve turns clockwise to open, rotate bottom cam counterclockwise until it goes out.)
3. Operate the valve to the opposite position (open). Push down on the top cam. If the green LED is off, rotate top cam clockwise until it is lit. When the green LED is lit, turn cam counterclockwise until the green LED goes off.

For the normally closed operation, both the red and green LEDs will be illuminated during the actuation period. The red LED is off in the closed position and the green LED is off in the open position. If the optional green CLOSED visual indicator is used the colors would be reversed in steps 1 and 2.

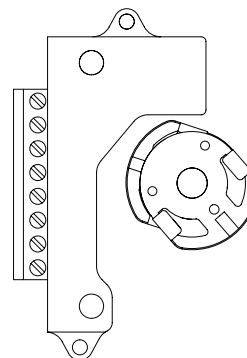


Fig. 1 cam set for normally open sensor function

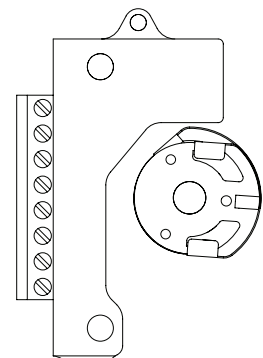


Fig. 2 cam set for normally closed sensor function

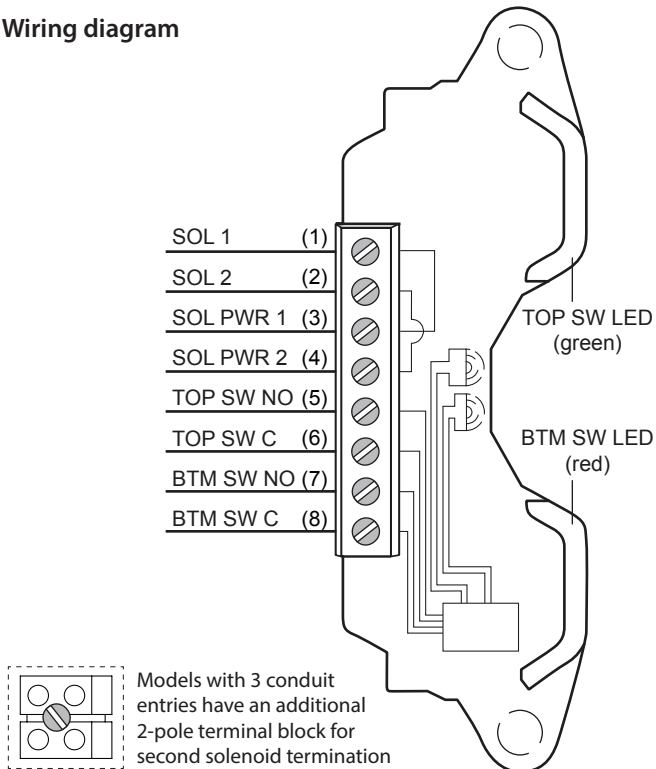
**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

## 4.1 Inductive proximity sensors

### 4.1.2 Dual module SST sensors (35)

| Applicable models    |   |
|----------------------|---|
| QC35_, QN35_, QX35_  |   |
| Specifications       |   |
| Configuration        | (2) Normally open (NO) sensors<br>Wire terminals for one or two solenoids                                     |
| Maximum current      | Inrush 1.0 amp @ 125 VAC/VDC<br>Continuous 0.1 amp @ 125 VAC/VDC  |
| Minimum on current   | 0.5 mA (VAC/VDC)  |
| Voltage range        | 20 - 250 VAC 50/60 Hz; 8 - 250 VDC  |
| Maximum voltage drop | 6.5 volts @ 10 mA<br>7.2 volts @ 100 mA   |
| Leakage current      | AC circuits 0.25 mA<br>DC circuits 0.15 mA  |
| LED indication       | Bottom sensor: red<br>Top sensor: green   |
| Temperature range    | -40° C to 80° C (-40° F to 176° F) <i>typical</i><br>-55° C to 80° C (-67° F to 176° F) <i>QC series only</i> |
| Operating life       | Unlimited   |
| Warranty             |   |
| All mechanical parts | Two years   |
| Sensor module        | Five years  |

### Wiring diagram



### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensor module. The magnet in the cam will be centered on the sensor when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is  $4\frac{1}{2}^\circ$ .

#### Valve closed to open in counterclockwise rotation (Fig. 1)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar rotating so that the magnet is centered on the bottom sensor and the top cam is  $90^\circ$  from the bottom cam. Top cam is adjusted by pushing down and rotating.
2. At this time the red LED will be lit and green LED out.
3. Move valve counterclockwise to the open position. Green LED will be lit and red LED will be out. Cam adjustments are now completed.

#### Valve closed to open in clockwise rotation (Fig. 2)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar rotating so that the magnet is centered on the bottom sensor and the top cam is  $90^\circ$  from the bottom cam. Top cam is adjusted by pushing down and rotating.
2. At this time the red LED will be lit and green LED out.
3. Move valve clockwise to the open position. Green LED will be lit and red LED will be out. Cam adjustments are now completed.

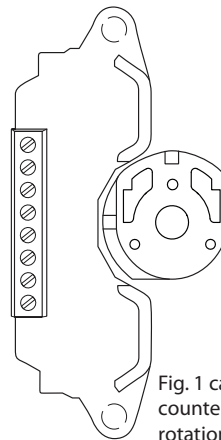


Fig. 1 cam set for counterclockwise rotation

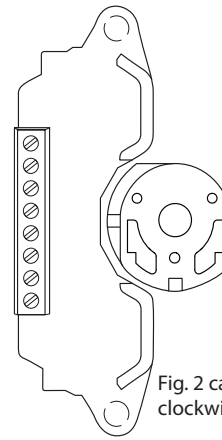


Fig. 2 cam set for clockwise rotation



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

### WARNING

Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.

### Bench test procedure

Use Stonel Light Read Tester. Or use a 24 VDC or 120 VAC power supply with series load resistor (2k $\Omega$  - 6k $\Omega$ ).

## 4.1 Inductive proximity sensors

### 4.1.3 SST solid state proximity sensors (X)

| Applicable models                                     |  |
|---|--|
| Quartz with 2-wire inductive solid state QN_X_, QX_X_ |  |
| Specifications  |  |
| Configuration   | (2) SST solid state sensors                                      |
| Operation   | NO/NC (cam selectable)   |
| Maximum current                                       | Inrush 1.0 amp @ 125 VAC/VDC<br>Continuous 0.1 amp @ 125 VAC/VDC |
| Minimum on current                                    | 0.5 mA (VAC/VDC)   |
| Voltage range   | 24 - 125 VAC 50/60 Hz; 8 - 125 VDC                               |
| Maximum voltage drop                                  | 6.5 volts @ 10 mA<br>7.5 volts @ 100 mA                          |
| Leakage current                                       | AC circuits 0.25 mA<br>DC circuits 0.15 mA                       |
| LED indication  | Bottom sensor: red<br>Top sensor: green                          |
| Temperature range                                     | -40° to 80° C  |
| Operating life  | Unlimited  |
| Warranty  |  |
| All mechanical parts                                  | Two years  |
| Sensor module   | Five years   |

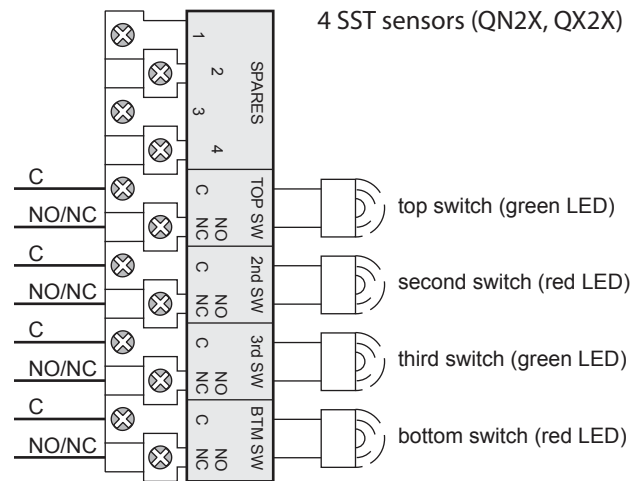
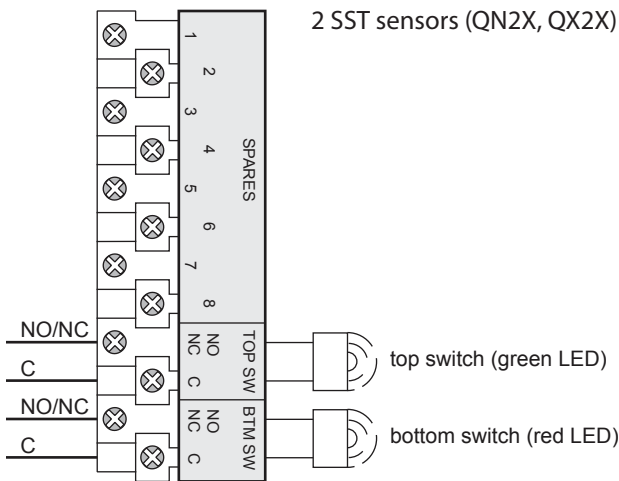
**WARNING**

Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.

#### Bench test procedure

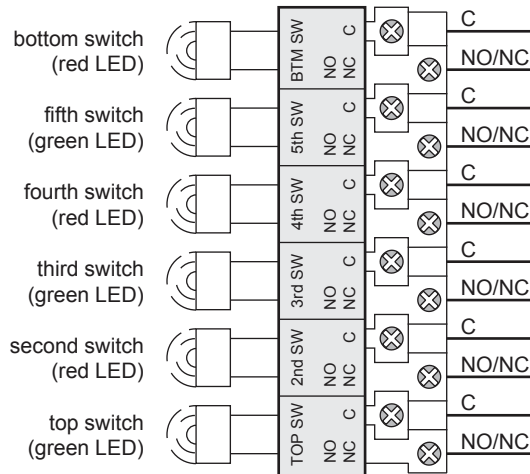
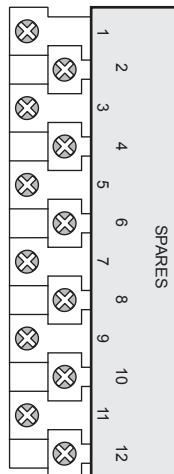
Use Stonel Light Read Tester. Or use a 24 VDC or 120 VAC power supply with series load resistor (2kΩ - 6kΩ).

#### Wiring diagrams



#### 6 SST sensors (QN6X, QX6X)

Unit has 2 vertically mounted 12-pole terminal blocks



### 4.1.3 SST solid state proximity sensors (X) continued

#### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is  $4\frac{1}{2}^\circ$ .

#### For normally open function (Fig. 1)

1. With the valve in the closed position and if the valve turns counterclockwise to open, set both cams so that the metal activation strips are  $180^\circ$  from each other with the bottom cam set in the middle of the sensor target.
2. Lift the bottom cam and turn counterclockwise until the red LED goes out then clockwise again until the red LED is lit. (Reverse the direction of the cam if the valve opens clockwise.)
3. Move the valve to the opposite position (open), push down on the top cam and rotate counterclockwise until the green LED is lit. (Reverse the direction of the cam if the valve opens clockwise.)

For the normally open operation, both LEDs will be off during the actuation period. If the optional green CLOSED visual indicator is used, the colors would be reversed in steps 1 and 2.

#### For normally closed function (Fig. 2)

1. With the valve in the closed position, set both cams so that the metal activation strips are aligned with each other and set in the middle of the sensor targets.
2. If the valve turns counterclockwise to open, pull up on the bottom cam and rotate clockwise until the red LED goes out. (If the valve turns clockwise to open, rotate bottom cam counterclockwise until it goes out.)
3. Operate the valve to the opposite position (open). Push down on the top cam. If the green LED is off, rotate top cam clockwise until it is lit. When the green LED is lit, turn cam counterclockwise until the green LED goes off.

For the normally closed operation, both the red and green LEDs will be illuminated during the actuation period. The red LED is off in the closed position and the green LED is off in the open position. If the optional green CLOSED visual indicator is used the colors would be reversed in steps 1 and 2.

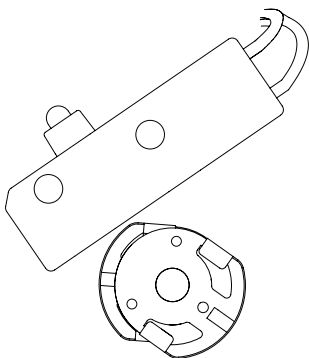


Fig. 1 cam set for normally open sensor function

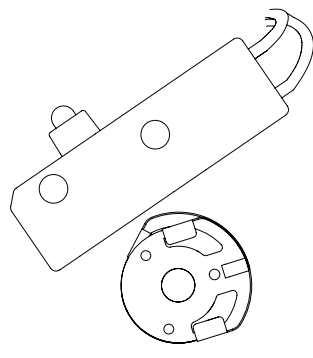



Fig. 2 cam set for normally closed sensor function



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

## 4.1 Inductive proximity sensors

### 4.1.4 P+F 3-wire solid state proximity sensors (E, F)

| Applicable models                        |                                   |
|--|-----------------------------------|
| 3- Wire NPN sinking sensor QN_E_, QX_E_  |                                   |
| 3- Wire PNP sourcing sensor QN_F_, QX_F_ |                                   |
| Specifications                           |                                   |
| Configuration                            | (2) 3-wire DC solid state sensors |
| Operation                                | NO/NC (cam selectable)            |
| Maximum current                          | 100 mA                            |
| Voltage range                            | 10-30 VDC                         |
| Maximum voltage drop                     | <2.0 VDC                          |
| Current consumption                      | <15 mA                            |
| Temperature range                        | -40° to 80° C                     |
| Operating life                           | Unlimited                         |
| Warranty                                 |                                   |
| Two years                                |                                   |

**WARNING**

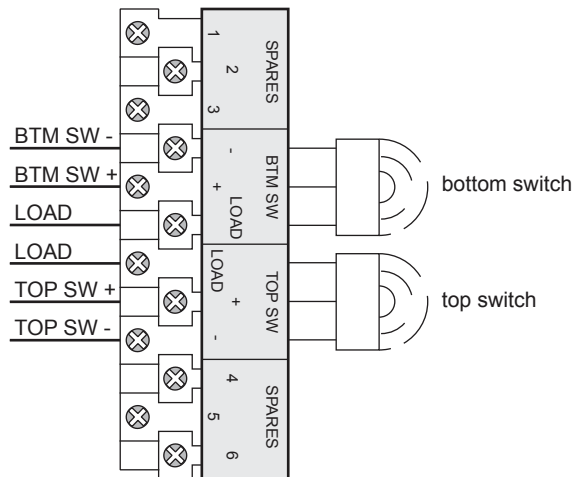
Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.

#### Bench test procedure

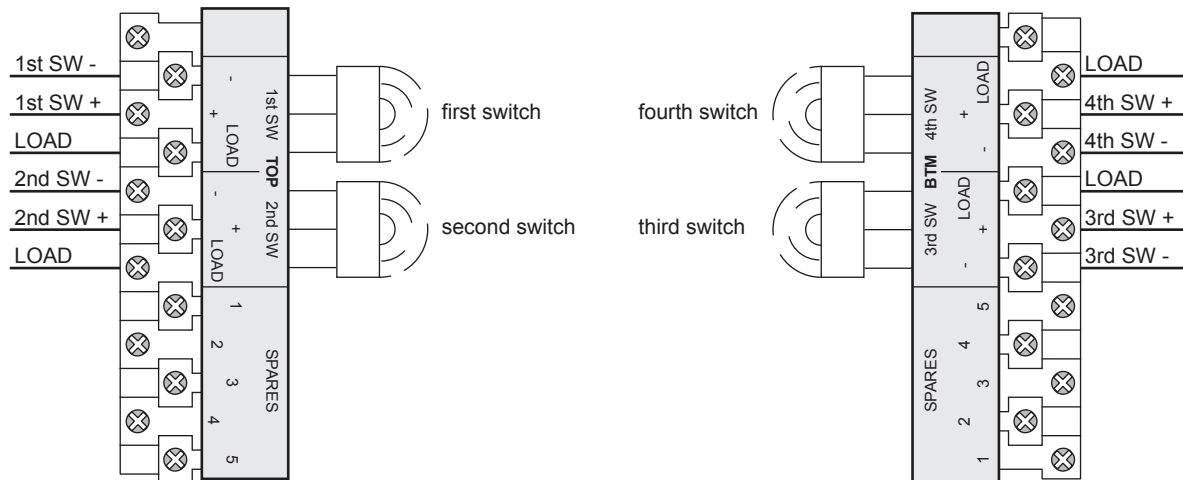
Connect a load resistor of 3K  $\Omega$  to 10K  $\Omega$  across a switch's load and (+) terminals (QN2E, QX2E), or a switch's load and (-) terminals (QN2F, QX2F). Using a 24 VDC power source, connect the power source (+) lead to a switch's (+) terminal and the power source (-) lead to a switch's (-) terminal. Connect a voltmeter across the load resistor. Apply 24 VDC. With cam activation strip in front of sensor target, the voltmeter will read >20 VDC. Activation strip away from sensor target voltmeter will read 0 VDC.

#### Wiring diagrams

(2) 3-wire sensors (QN2E\_, QN2F\_, QX2E\_, QX2F\_)



(4) 3-wire sensors (QN4E\_, QN4F\_, QX4E\_, QX4F\_)



#### 4.1.4 P+F 3-wire solid state proximity sensors (E, F) continued

##### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is  $4\frac{1}{2}^\circ$ .

##### For normally open function (Fig. 1)

1. With the valve in the closed position and if the valve turns counterclockwise to open, set both cams so that the metal activation strips are  $180^\circ$  from each other with the bottom cam set in the middle of the sensor target. Connect test equipment to bottom switch as per Bench Test Procedure.
2. Lift the bottom cam and turn counterclockwise until the voltmeter reads 0 VDC then clockwise again until the voltmeter just reads  $>20$  VDC. (Reverse the direction of the cam if the valve opens clockwise.)
3. Move the valve to the opposite position (open), connect test equipment to top switch. Push down on the top cam and rotate counterclockwise until the voltmeter just reads  $>20$  VDC. (Reverse the direction of the cam if the valve opens clockwise.)

For the normally open operation, both sensors will be off during the actuation period.

##### For normally closed function (Fig. 2)

1. With the valve in the closed position, set both cams so that the metal activation strips are aligned with each other and set in the middle of the sensor targets. Connect test equipment to bottom switch as per Bench Test Procedure.
2. If the valve turns counterclockwise to open, pull up on the bottom cam and rotate clockwise until the voltmeter just reads 0 VDC. (If the valve turns clockwise to open, rotate bottom cam counterclockwise until the voltmeter reads 0 VDC)
3. Operate the valve to the opposite position (open). Connect test equipment to top switch. Push down on the top cam. If the voltmeter reads 0 VDC, rotate top cam clockwise until it reads  $>20$  VDC. With the voltmeter reading  $>20$  VDC rotate cam counterclockwise until the voltmeter just reads 0 VDC.

For the normally closed operation, both sensors will be activated during the actuation period.

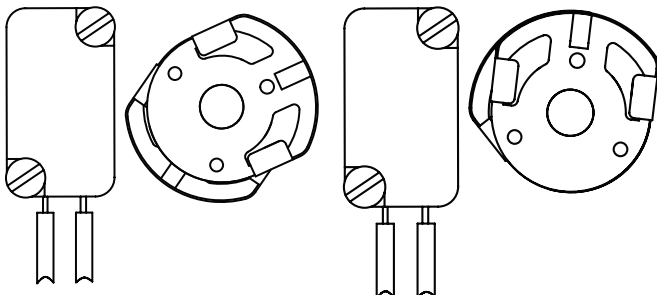


Fig. 1 cam set for normally open sensor function

Fig. 2 cam set for normally closed sensor function



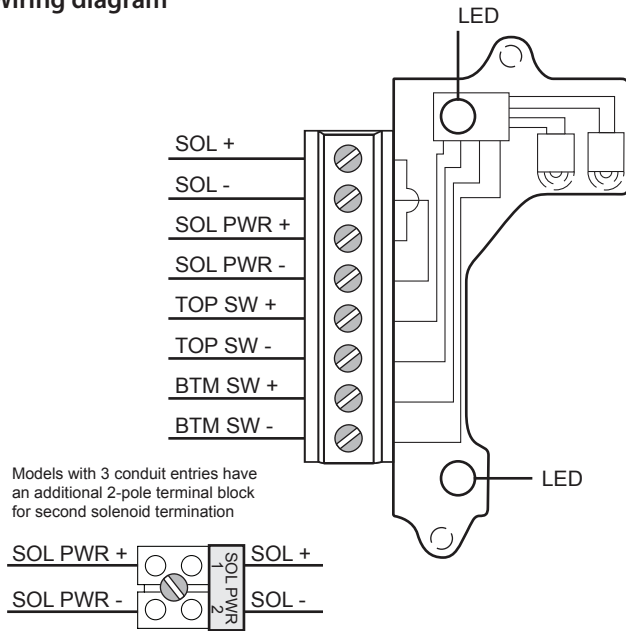
**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

## 4.2 Intrinsically safe inductive proximity switches

### 4.2.1 Dual module NAMUR sensors (44)

| Applicable models  |  |
|--|--|
| QN44_, QX44_   |  |
| Specifications   |  |
| Configuration  | (2) NAMUR sensors (EN 60947-5-6)<br>Wire terminals for one or two solenoids              |
| Operation  | NO/NC (cam selectable)   |
| Voltage range  | 5 -25 VDC  |
| Current ratings  | Target present Current < 1.0 mA (LED = OFF)<br>Target absent Current > 3.0 mA (LED = ON) |
| LED indication   | Bottom sensor: green<br>Top sensor: red  |
| Temperature range  | -40° to 80° C  |
| Operating life   | Unlimited  |
| Warranty   |  |
| All mechanical parts   | Two years  |
| Sensor module  | Five years   |
| <i>Use with intrinsically safe repeater barrier. NAMUR sensors conform to EN 60947-5-6 standard.</i> |  |

### Wiring diagram



### Bench test procedure

Use Stonel Light Read Tester or use a 24 VDC power supply. No series load resistor required.

**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.



Reference controlled installation drawing #105193 for proper intrinsic safety installation details. Find document in the Appendix on page 51.

### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

#### Valve closed to open in counterclockwise rotation (Fig. 1)

1. With the valve in the closed position, set the bottom cam so that the metal activation strip is centered on the bottom sensor target and the top cam is 180° from the bottom cam.
2. Lift up bottom cam and rotate counterclockwise until the green LED is lit and remains lit when the cam is released, then rotate clockwise until the green LED goes off and remains out when the cam is released.
3. Move valve to the open position. Push down top cam and rotate counterclockwise until the red LED goes off. Release cam.

#### Valve closed to open in clockwise rotation (Fig. 2)

1. With the valve in the closed position, set the bottom cam so that the metal activation strip is centered on the bottom sensor target and the top cam is 180° from the bottom cam.
2. Lift up bottom cam and rotate clockwise until the green LED is lit and remains lit when the cam is released, then rotate counterclockwise until the green LED goes off and remains out when the cam is released.
3. Move valve to the open position. Push down top cam and rotate clockwise until the red LED goes off. Release cam.

#### Notes:

1. With the valve in the closed position, the red LED is lit and the bottom sensor is active (i.e. drawing less than 1.0 mA of current), while the top sensor is inactive (i.e.. drawing greater than 3.0 mA of current).
2. When the valve is in the open position, the green LED is lit and the top sensor is active while the bottom sensor is inactive.
3. During valve transition from closed to open or open to closed both LEDs will be lit and neither sensor will be active.

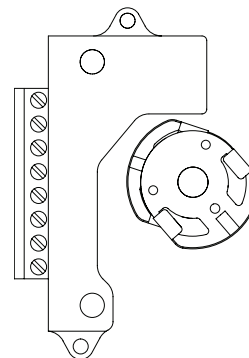


Fig. 1 cam set for normally open sensor function

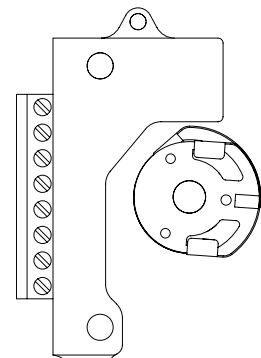


Fig. 2 cam set for normally closed sensor function

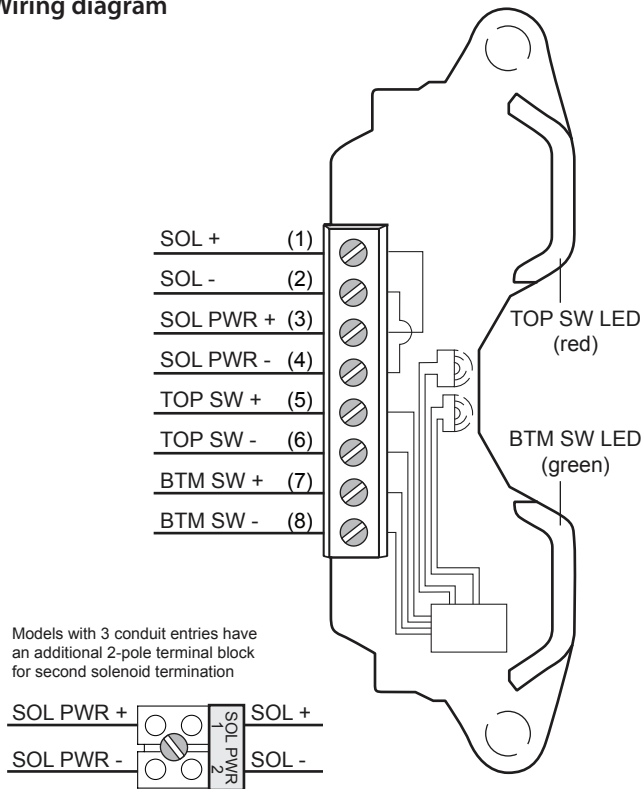


## 4.2 Intrinsically safe inductive proximity switches

### 4.2.2 Dual module NAMUR sensors (45)


| Applicable models  |   |
|--|---|
| QC45_, QN45_, QX45_  |   |
| Specifications   |   |
| Configuration  | (2) NAMUR sensors (EN 60947-5-6)<br>Wire terminals for one or two solenoids                                   |
| Voltage range  | 5 - 25 VDC  |
| Current ratings  | Target present    Current < 1.0 mA (LED = OFF)<br>Target absent    Current > 3.0 mA (LED = ON)                |
| LED indication   | Bottom sensor: green<br>Top sensor: red   |
| Temperature range  | -40° C to 80° C (-40° F to 176° F) <i>typical</i><br>-55° C to 80° C (-67° F to 176° F) <i>QC series only</i> |
| Operating life   | Unlimited   |
| Warranty   |   |
| All mechanical parts   | Two years   |
| Sensor module  | Five years  |
| <i>Use with intrinsically safe repeater barrier. NAMUR sensors conform to EN 60947-5-6 standard.</i> |   |

### Wiring diagram



### Bench test procedure

Use Stonel Light Read Tester or use a 24 VDC power supply. No series load resistor required.



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.



Reference controlled installation drawing #105193 for proper intrinsic safety installation details. Find document in the Appendix on page 51.

### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensor module. The magnet in the cam will be centered on the sensor when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

#### Valve closed to open in counterclockwise rotation (Fig. 1)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar rotating so that the magnet is centered on the bottom sensor and the top cam is 90° from the bottom cam.
2. At this time the red LED will be lit and green LED out.
3. Move valve counterclockwise to the open position. Green LED will be lit and red LED will be out. If the red LED is lit, push down top cam and rotate until magnet in the top cam is centered on the top sensor and the red LED goes out. Cam adjustments are now completed.

#### Valve closed to open in clockwise rotation (Fig. 2)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar rotating so that the magnet is centered on the bottom sensor and the top cam is 90° from the bottom cam.
2. At this time the red LED will be lit and green LED out.
3. Move valve clockwise to the open position. Green LED will be lit and red LED will be out. If the red LED is lit, push down top cam and rotate until magnet in the top cam is centered on the top sensor and the red LED goes out. Cam adjustments are now completed.

### Notes

1. With the valve in the closed position, the red LED is lit and the bottom sensor is active (i.e. drawing less than 1.0 mA of current), while the top sensor is inactive (i.e. drawing greater than 3.0 mA of current).
2. When the valve is in the open position, the green LED is lit and the top sensor is active while the bottom sensor is inactive.
3. During valve transition from closed to open or open to closed both LEDs will be lit and neither sensor will be active.

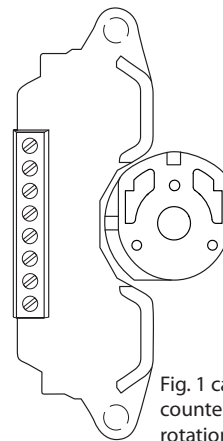


Fig. 1 cam set for counterclockwise rotation

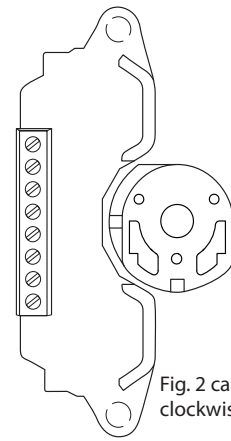


Fig. 2 cam set for clockwise rotation

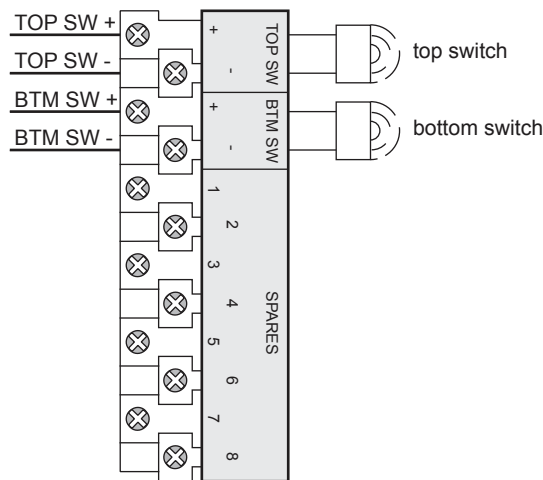
## 4.2 Intrinsically safe inductive proximity switches

### 4.2.3 P+F NAMUR sensors NJ2-12GK-SN (A)

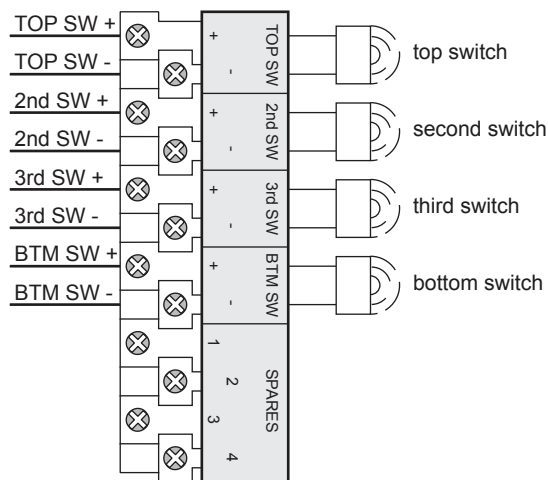
| Applicable models  |                                  |                  |
|--|----------------------------------|------------------|
| QN_A_, QX_A_   |                                  |                  |
| Specifications   |                                  |                  |
| Configuration  | (2) NAMUR sensors (EN 60947-5-6) |                  |
| Operation  | NO/NC (cam selectable)           |                  |
| Current ratings  | Target present                   | Current < 1.0 mA |
|  | Target absent                    | Current > 3.0 mA |
| Voltage range  | 5 - 25 VDC                       |                  |
| Temperature range  | -40° to 80° C                    |                  |
| Operating life   | Unlimited                        |                  |
| <b>Warranty</b>  | Two years                        |                  |
| <i>Use with intrinsically safe repeater barrier. NAMUR sensors conform to EN 60947-5-6 standard.</i> |                                  |                  |

#### Wiring diagrams

##### 2 NAMUR sensors (QX2A, QN2A)



##### 4 NAMUR sensors (QX4A, QN4A)



#### Bench test procedure

Use Stonel Light Read Tester or use a 24 VDC power supply and an ammeter. No series load resistor required.

**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.



Reference controlled installation drawing #105193 for proper intrinsic safety installation details. Find document in the Appendix on page 51.

#### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

##### Valve closed to open in counterclockwise rotation (Fig. 1)

1. With the valve in the closed position, set the bottom cam so that the metal activation strip is centered on the bottom sensor target and the top cam is 90° from the bottom cam. Connect power supply and ammeter to the bottom switch.
2. Lift up bottom cam and rotate counterclockwise until the ammeter reads > 3 mA, then rotate clockwise until the ammeter reads < 1 mA. Release the cam.
3. Move valve to the open position. Connect power supply and ammeter to the top switch. Push down top cam and rotate clockwise until the ammeter reads > 3 mA then counterclockwise until the ammeter reads < 1 mA. Release cam.

##### Valve closed to open in clockwise rotation (Fig. 2)

1. With the valve in the closed position, set the top cam so that the metal activation strip is centered on the bottom sensor target and the bottom cam is 90° from the top cam. Connect power supply and ammeter to the top switch.
2. Push down top cam and rotate clockwise until the ammeter reads > 3 mA, then rotate counterclockwise until the ammeter reads < 1 mA. Release the cam.
3. Move valve to the open position. Connect power supply and ammeter to the bottom switch. Lift up bottom cam and rotate clockwise until the ammeter reads > 3 mA, then rotate counterclockwise until the ammeter reads < 1 mA. Release the cam.

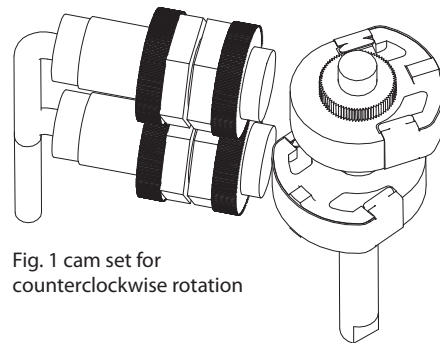


Fig. 1 cam set for counterclockwise rotation

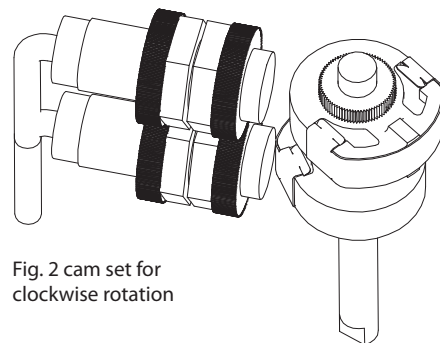


Fig. 2 cam set for clockwise rotation

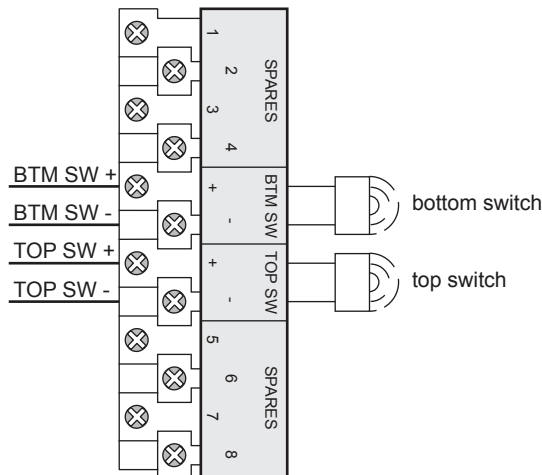
## 4.2 Intrinsically safe inductive proximity switches

### 4.2.4 P+F NAMUR sensors NJ5-30GK-S1N (B)

| Applicable models  |                                     |                  |
|--|-------------------------------------|------------------|
| (QN_B_, QX_B_)   |                                     |                  |
| Specifications   |                                     |                  |
| Configuration  | (2) NAMUR NO sensors (EN 60947-5-6) |                  |
| Operation  | NO/NC (cam selectable)              |                  |
| Current ratings  | Target present                      | Current > 3.0 mA |
|  | Target absent                       | Current < 1.0 mA |
| Voltage range  | 5 - 25 VDC                          |                  |
| Temperature range  | -25° to 80° C                       |                  |
| Operating life   | Unlimited                           |                  |
| <b>Warranty</b>  | Two years                           |                  |
| <i>Use with intrinsically safe repeater barrier. NAMUR sensors conform to EN 60947-5-6 standard.</i> |                                     |                  |

### Wiring diagrams

#### 2 NAMUR NO sensors (QN2B, QX2B)



### Bench test procedure

Use Stonel Light Read Tester or use a 24 VDC power supply and an ammeter. No series load resistor required.



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.



Reference controlled installation drawing #105193 for proper intrinsic safety installation details. Find document in the Appendix on page 51.

### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensors. The edge of the metal cam will be approximately at the center of the sensor when activation occurs.

#### Valve closed to open in counterclockwise rotation (Fig. 1)

1. With the valve in the closed position, loosen the set screw on the bottom and top cams with an M3 allen wrench and set the bottom cam so that it is centered on the bottom sensor and the top cam is 90° clockwise from the bottom cam. Connect power supply and ammeter to the BTM SW +/- terminals.
2. Rotate bottom cam counterclockwise until the ammeter reads < 1 mA, then rotate clockwise until the ammeter reads > 3 mA. Tighten set screw to 15 to 20 in.lbs (1.7 to 2.3 Nm).
3. Move valve to the open position. Connect power supply and ammeter to the TOP SW +/- terminals. Rotate top cam clockwise until the ammeter reads < 1 mA then counterclockwise until the ammeter reads > 3mA. Tighten set screw to 15 to 20 in.lbs (1.7 to 2.3 Nm).

#### Valve closed to open in clockwise rotation (Fig. 2)

1. With the valve in the closed position, loosen the set screw on the bottom and top cams with an M3 allen wrench and set the bottom cam so that it is centered on the bottom sensor and the top cam is 90° counterclockwise from the bottom cam. Connect power supply and ammeter to the BTM SW +/- terminals.
2. Rotate bottom cam clockwise until the ammeter reads < 1 mA, then rotate counterclockwise until the ammeter reads > 3 mA. Tighten set screw to 15 to 20 in.lbs (1.7 to 2.3 Nm).
3. Move valve to the open position. Connect power supply and ammeter to the TOP SW +/- terminals. Rotate top cam counterclockwise until the ammeter reads < 1 mA then clockwise until the ammeter reads > 3mA. Tighten set screw to 15 to 20 in.lbs (1.7 to 2.3 Nm). Disconnect power supply and ammeter from the top sensor.

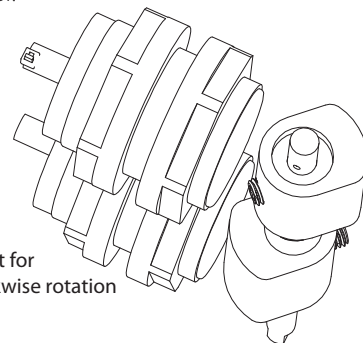


Fig. 1 cam set for counterclockwise rotation

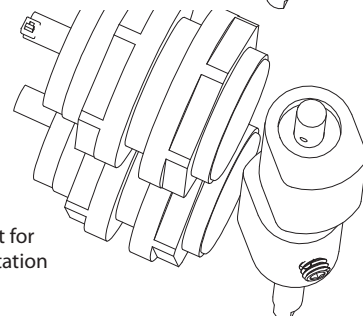


Fig. 2 cam set for clockwise rotation

**4.2 Intrinsically safe inductive proximity switches**

**4.2.5 Reserved**

|                          |           |
|--------------------------|-----------|
| <b>Applicable models</b> |           |
|                          |           |
| <b>Specifications</b>    |           |
|                          |           |
|                          |           |
|                          |           |
|                          |           |
| <b>Warranty</b>          | Two years |

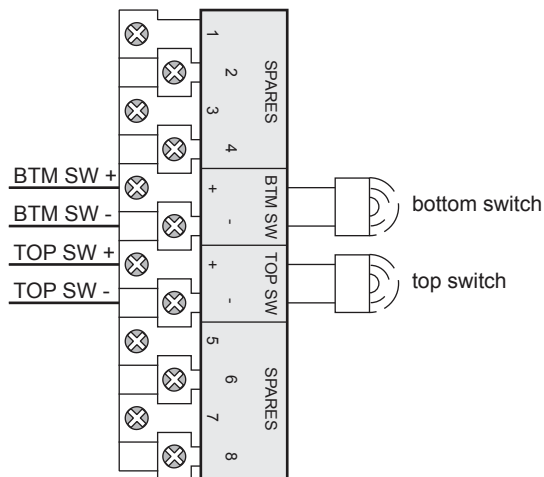
## 4.2 Intrinsically safe inductive proximity switches

### 4.2.6 P+F NAMUR sensors NJ2-V3-N (N)

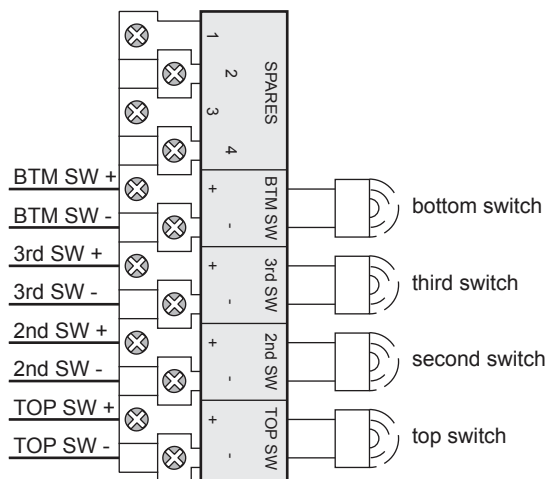
| Applicable models  |                                  |                              |
|--|----------------------------------|------------------------------|
| (QN_N_, QX_N_)   |                                  |                              |
| Specifications   |                                  |                              |
| Configuration  | (2) NAMUR sensors (EN 60947-5-6) |                              |
| Operation  | NO/NC (cam selectable)           |                              |
| Current ratings  | Target present                   | Current < 1.0 mA (LED = OFF) |
|  | Target absent                    | Current > 3.0 mA (LED = ON)  |
| Voltage range  | 5 - 25 VDC                       |                              |
| Temperature range  | -25° to 80° C                    |                              |
| Operating life   | Unlimited                        |                              |
| <b>Warranty</b>  | Two years                        |                              |
| <i>Use with intrinsically safe repeater barrier. NAMUR sensors conform to EN 60947-5-6 standard.</i> |                                  |                              |

### Wiring diagrams

#### 2 NAMUR sensors (QN2N, QX2N)



#### 4 NAMUR sensors (QN4N, QX4N)



### Bench test procedure

Use Stonel Light Read Tester or use a 24 VDC power supply and an ammeter. No series load resistor required.



Reference controlled installation drawing #105193 for proper intrinsic safety installation details. Find document in the Appendix on page 51.

### Touch & Tune switch setting

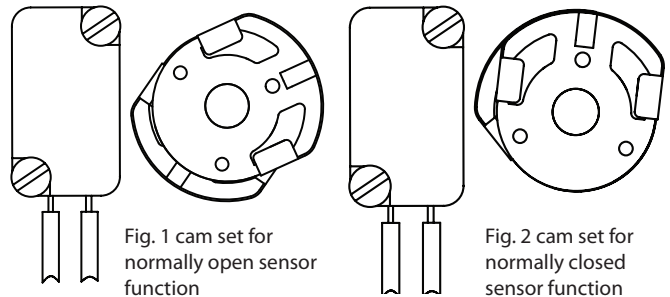
All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

#### Valve closed to open in counterclockwise rotation (Fig. 1)

1. With the valve in the closed position, set the bottom cam so that the metal activation strip is centered on the bottom sensor target and the top cam is 180° from the bottom cam. Connect power supply and ammeter to the bottom switch.
2. Lift up bottom cam and rotate counterclockwise until the ammeter reads > 3 mA, then rotate clockwise until the ammeter reads < 1 mA. Release the cam.
3. Move valve to the open position. Connect power supply and ammeter to the top switch. Push down top cam and rotate counterclockwise until the ammeter reads < 1 mA. Release cam.

#### Valve closed to open in clockwise rotation (Fig. 2)

1. With the valve in the closed position, set the bottom cam so that the metal activation strip is centered on the bottom sensor target and the top cam is 180° from the bottom cam. Connect power supply and ammeter to the bottom switch.
2. Lift up bottom cam and rotate clockwise until the ammeter reads > 3 mA, then rotate counterclockwise until the ammeter reads < 1 mA. Release the cam.
3. Move valve to the open position. Connect power supply and ammeter to the top switch. Push down top cam and rotate counterclockwise until the ammeter reads < 1 mA. Release cam.



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

### 4.3 Reed type proximity switches

#### 4.3.1 SPST Maxx-Guard proximity sensors (L, P)

| Applicable models  |                                     |                    |
|--|-------------------------------------|--------------------|
| (QN2P_, QX2P_, QN2L_, QX2L_, QN4P_, QX4P_, QN4L_, QX4L_) |                                     |                    |
| Specifications   |                                     |                    |
| Configuration  | SPST (NO)                           |                    |
| Contact material   | Ruthenium                           |                    |
| Electrical ratings                                       | 0.15 amp @ 125 VAC 50/60 Hz; 30 VDC |                    |
| Maximum voltage drop                                     | No LED (P)                          | 0.1 volts @ 10 mA  |
|  |                                     | 0.5 volts @ 100 mA |
|  | With LED (L)                        | 3.5 volts @ 10 mA  |
|  |                                     | 6.5 volts @ 100 mA |
| Temperature range  | -40° to 80° C                       |                    |
| Operating life   | 5 million cycles                    |                    |
| Seal   | Hermetically sealed reed switches   |                    |
| Warranty   | Two years                           |                    |

**WARNING**

Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.

#### Bench test procedure

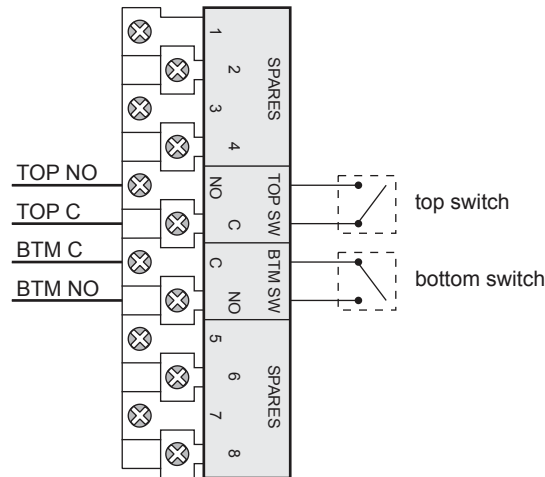
Test LED units with 9 volt battery and series load resistor between 150 and 1000 ohms - ½ watt. Ohm meter will not work. (Light Read tester available from Stonel or Stonel distributor.)  
Minimum of 3.5 volts required for proper switch operation.

#### Touch & Tune switch setting

- Lift bottom cam and rotate until sensor is activated. (White highlight will be next to sensor.) Release cam and be sure it slides fully onto spline.
- Operate actuator to opposite position, push down on top cam and repeat process.

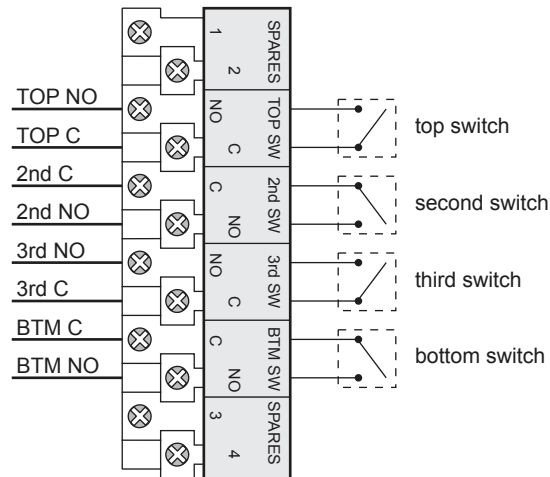
#### Wiring diagrams

##### 2 SPST switches



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

##### 4 SPST switches



### 4.3 Reed type proximity switches

#### 4.3.2 SPDT Maxx-Guard proximity sensors (G, H, S; OLD STYLE)

| Applicable models  |   |   |
|--|---|---|
| (QN2G_, QX2G_, QN2H_, QX2H_, QN2S_, QX2S_, QN4G_, QX4G_, QN4H_, QX4H_, QN4S_, QX4S_)           |   |   |
| Specifications   |   |   |
| Configuration  | SPDT  |   |
| Electrical ratings   |   |   |
| "G" sensors  | 0.20 amp @ 120 VAC 50/60 Hz; 0.30 amp @ 24 VDC                |   |
| "S" sensors  | 0.10 amp @ 120 VAC 50/60 Hz; 0.10 amp @ 24 VDC                |   |
| "H" sensors*   | Vmax-240 volts; Imax-3 amps<br>Wmax-100 watts; Wmin-2.0 watts |   |
| Maximum voltage drop   | No LED  | 0.1 volts @ 10 mA<br>0.5 volts @ 100 mA |
|  | With LED  | 3.5 volts @ 10 mA<br>6.5 volts @ 100 mA |
|  |   |   |
| Contact material   | Rhodium ("G" and "S" sensors)<br>Tungsten (H sensor)*         |   |
| Temperature range  | -40° to 80° C   |   |
| Operating life   | 5 million cycles  |   |
| Seal   | Hermetically sealed reed switches                             |   |
| <b>Warranty</b>  | Two years   |   |
| <small>* Not recommended for electrical circuits operating at less than 20 mA @ 24 VDC</small> |   |   |

**WARNING**

Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.

#### Bench test procedure

Test LED units with 9 volt battery and series load resistor between 150 and 1000 ohms - ½ watt. Ohm meter will not work. (Light Read tester available from Stonel or Stonel distributor.)

Minimum of 3.5 volts required for proper switch operation.

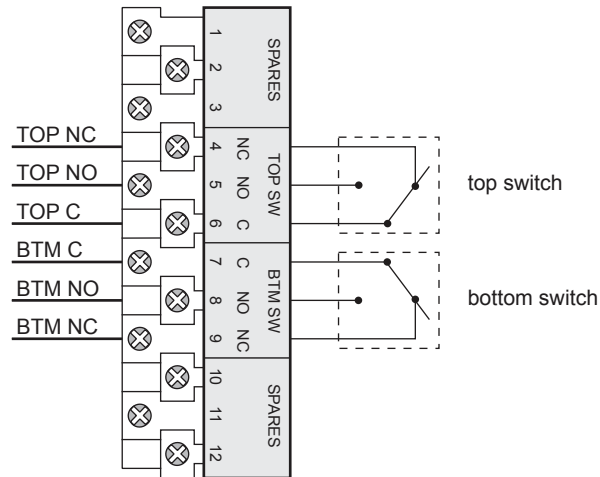
#### Touch & Tune switch setting

- Lift bottom cam and rotate until sensor is activated. (White highlight will be next to sensor.) Release cam and be sure it slides fully onto spline.
- Operate actuator to opposite position, push down on top cam and repeat process.

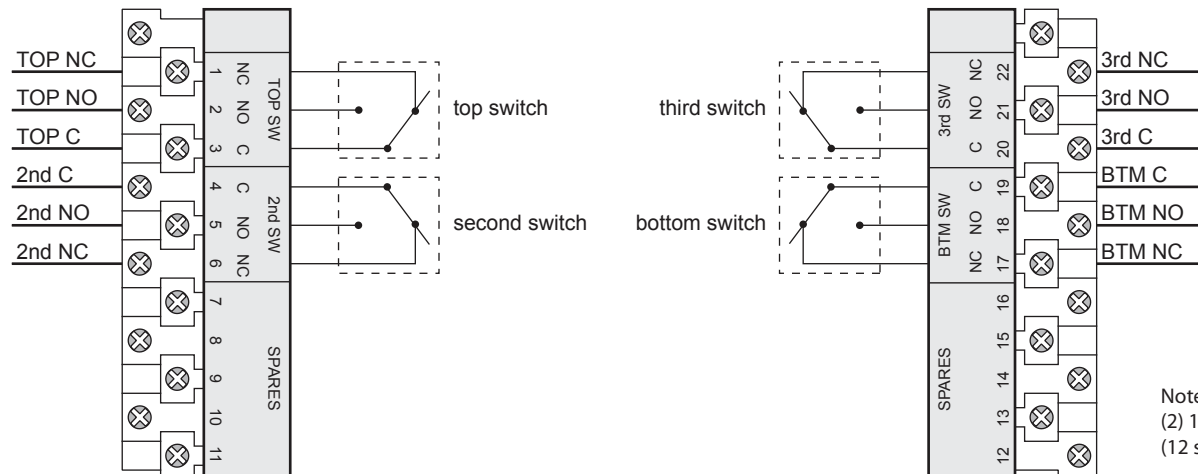
**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

#### Wiring diagrams

##### 2 SPDT switches



##### 4 SPDT switches



Note: 4 SPDT models have (2) 12 pole terminal block (12 spares)

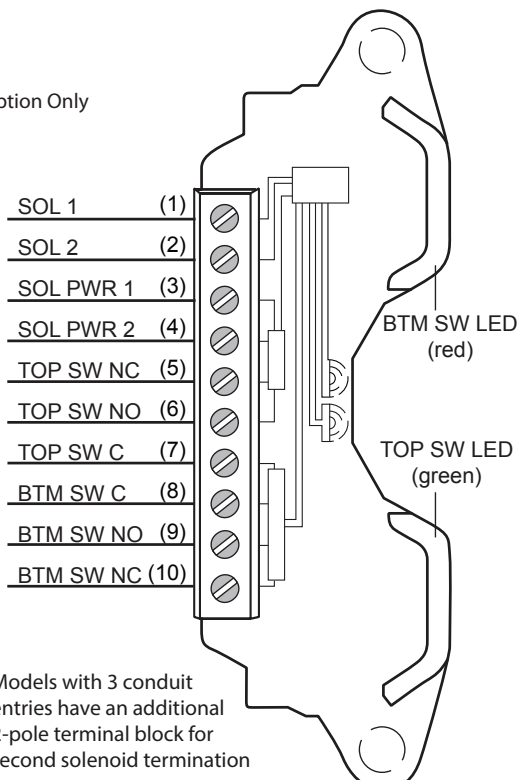
### 4.3 Reed type proximity switches

#### 4.3.3 SPDT Maxx-Guard dual module (G, H, S; NEW STYLE)

| Applicable models                          |   |   |
|--|---|---|
| (QN2G_, QX2G_, QN2H_, QX2H_, QN2S_, QX2S_) |   |   |
| Specifications                             |   |   |
| Configuration                              | SPDT  |   |
| Electrical ratings                         |   |   |
| "G" sensors                                | 0.20 amp @ 120 VAC 50/60 Hz; 0.30 amp @ 24 VDC                |   |
| "S" sensors                                | 0.10 amp @ 120 VAC 50/60 Hz; 0.10 amp @ 24 VDC                |   |
| "H" sensors*                               | Vmax-240 volts; Imax-3 amps<br>Wmax-100 watts; Wmin-2.0 watts |   |
| Maximum voltage drop                       | No LED  | 0.1 volts @ 10 mA<br>0.5 volts @ 100 mA |
|  | With LED  | 3.5 volts @ 10 mA<br>6.5 volts @ 100 mA |
| Contact material                           | Rhodium ("G" and "S" sensors)<br>Tungsten (H sensor)*         |   |
| Temperature range                          | -40° to 80° C   |   |
| Operating life                             | 5 million cycles  |   |
| Seal                                       | Hermetically sealed reed switches                             |   |
| <b>Warranty</b>                            | Two years   |   |

\* Not recommended for electrical circuits operating at less than 20 mA @ 24 VDC

Note: LEDs "S" Option Only



**WARNING**

Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.

#### Bench test procedure

For G and H sensor options use an Ohmmeter. For S sensor option use Stonel Light Read Tester or use a 24 VDC or 120 VAC power supply with series load resistor (2kΩ - 6kΩ). An Ohmmeter cannot be used with the S sensor option.

#### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensor module. The magnet in the cam will be centered on the sensor module when activation occurs. When the cam is released ensure it slides fully onto the splined collar. One spline tooth setting is 4 1/2°.

#### Valve closed to open in counterclockwise rotation (Fig. 1)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar and rotating so that the magnet is centered on the module.
2. Connect Ohmmeter between BTM SW C and BTM SW NO. When the bottom sensor is triggered there will be continuity.
3. Release the cam and ensure it slides fully onto the splined collar.
4. Move valve counterclockwise to the open position. Set the top cam by pushing down the cam off the splined collar and rotating so that the magnet is centered on the module.
5. Connect Ohmmeter between TOP SW C and TOP SW NO. When the top sensor is triggered there will be continuity. (For S sensor models when power is applied the green LED will be lit).
6. Release the cam and ensure it slides fully onto the splined collar. Cam adjustments are now completed.

#### Valve closed to open in clockwise rotation (Fig. 2)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar and rotating so that the magnet is centered on the module.
2. Connect Ohmmeter between BTM SW C and BTM SW NO. When the bottom sensor is triggered there will be continuity. (For S sensor models when power is applied the red LED will be lit).
3. Release the cam and ensure it slides fully onto the splined collar.
4. Move valve clockwise to the open position. Set the top cam by pushing down the cam off the splined collar and rotating so that the magnet is centered on the module.
5. Connect Ohmmeter between TOP SW C and TOP SW NO. When the top sensor is triggered there will be continuity. (For S sensor models when power is applied the green LED will be lit).
6. Release the cam and ensure it slides fully onto the splined collar. Cam adjustments are now completed.

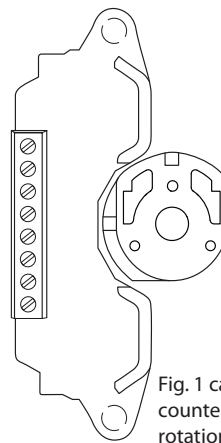


Fig. 1 cam set for counterclockwise rotation

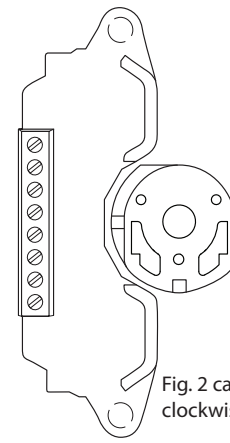


Fig. 2 cam set for clockwise rotation

**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.



### 4.3 Reed type proximity switches

#### 4.3.4 Intrinsically safe models with SPST Maxx-Guard proximity sensors (J)

| Applicable models    |   |
|----------------------|---|
| QN_J                 |   |
| Specifications       |   |
| Configuration        | SPST (NO)                               |
| Electrical rating    | 0.1 amp @ 10-30 VDC                     |
| Maximum voltage drop | 0.1 volts @ 10 mA<br>0.5 volts @ 100 mA |
| Contact material     | Ruthenium                               |
| Temperature range    | -40° to 80° C                           |
| Operating life       | 5 million cycles                        |
| Seal                 | Hermetically sealed reed switches       |
| Warranty             | Two years                               |



Reference controlled installation drawing #105193 for proper intrinsic safety installation details. Find document in the Appendix on page 51.

#### Touch & Tune switch setting

1. Lift bottom cam and rotate until sensor is activated. (White highlight will be next to sensor.) Release cam and be sure it slides fully onto spline.
2. Operate actuator to opposite position, push down on top cam and repeat process.

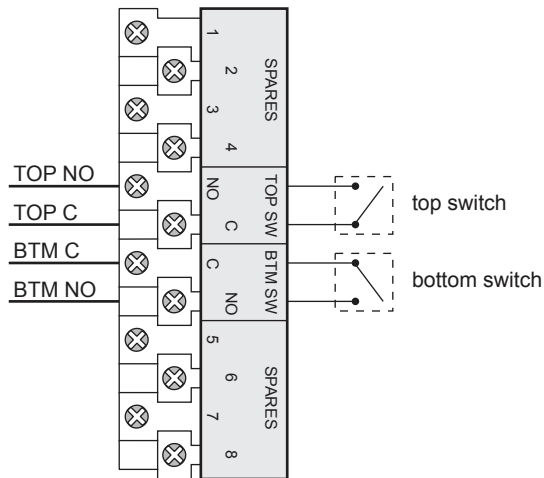
#### Bench test procedure

Test sensors with a standard Ohm meter.

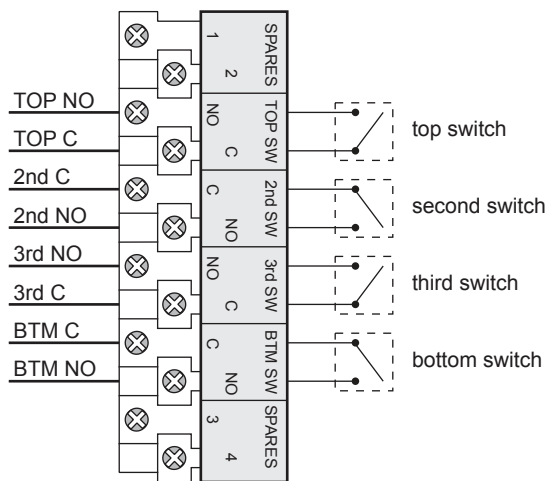
Minimum of 3.5 volts required for proper switch operation.

#### Wiring diagrams

##### 2 SPST switches (QN2J\_)



##### 4 SPST switches (QN4J\_)



### 4.3 Reed type proximity switches

#### 4.3.5 Intrinsically safe models with SPDT Maxx-Guard proximity sensors (M; OLD STYLE)

| Applicable models    |   |
|----------------------|---|
| QN_M                 |   |
| Specifications       |   |
| Configuration        | SPDT; passive (intrinsically safe)      |
| Electrical rating    | 0.1 amp @ 10-30 VDC                     |
| Maximum voltage drop | 0.1 volts @ 10 mA<br>0.5 volts @ 100 mA |
| Contact material     | Rhodium                                 |
| Temperature range    | -40° to 80° C                           |
| Operating life       | 5 million cycles                        |
| Seal                 | Hermetically sealed reed switches       |
| Warranty             |   |
| Two years            |   |



Reference controlled installation drawing #105193 for proper intrinsic safety installation details. Find document in the Appendix on page 57.

#### Touch & Tune switch setting

1. Lift bottom cam and rotate until sensor is activated. (White highlight will be next to sensor.) Release cam and be sure it slides fully onto spline.
2. Operate actuator to opposite position, push down on top cam and repeat process.

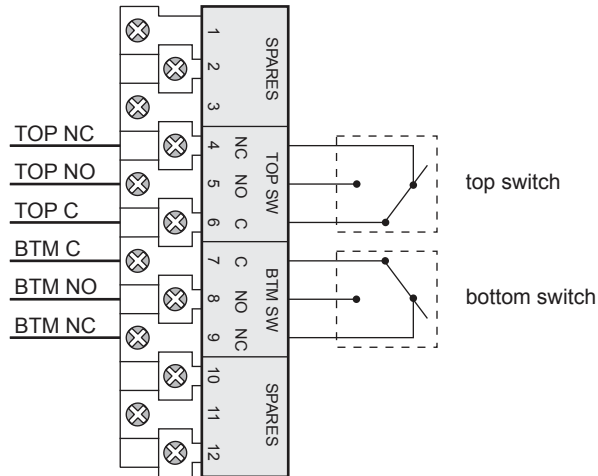
#### Bench test procedure

Test sensors with a standard Ohm meter.

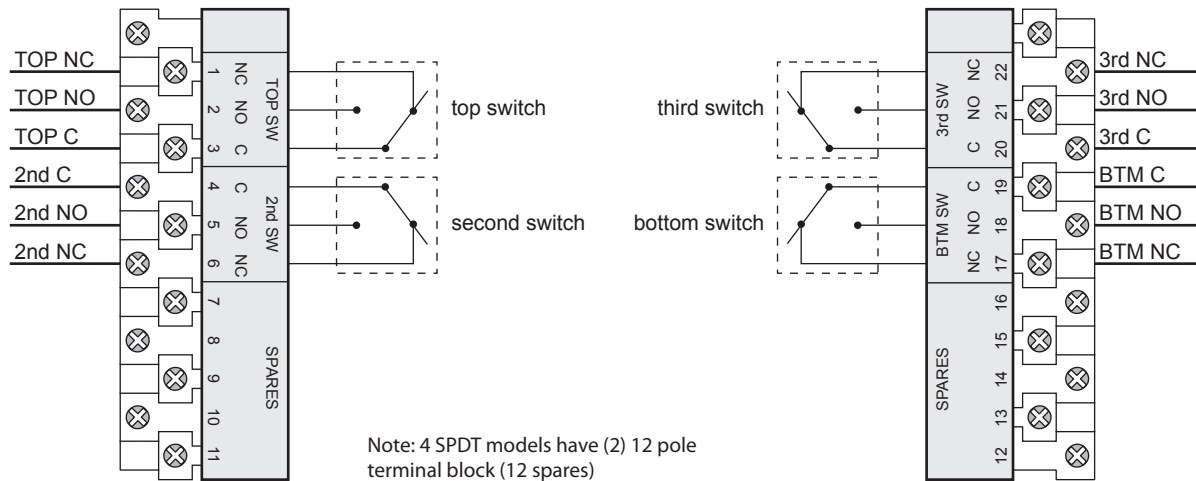
Minimum of 3.5 volts required for proper switch operation.

#### Wiring diagrams

##### 2 SPDT switches (QN2M\_)



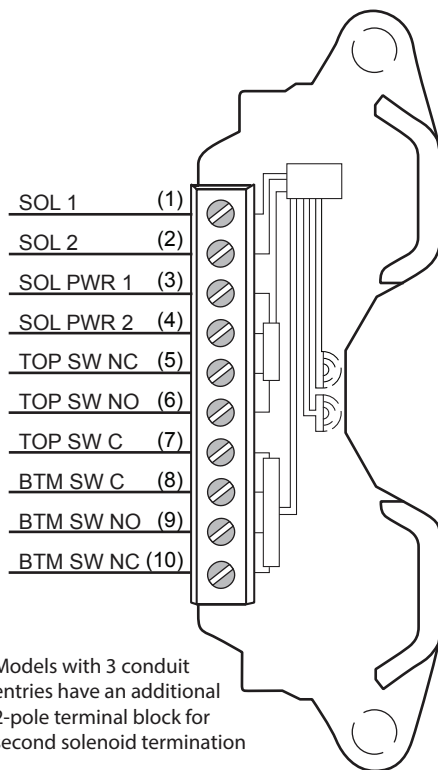
##### 4 SPDT switches (QN4M\_)



### 4.3 Reed type proximity switches

#### 4.3.6 Intrinsically safe models with SPDT Maxx-Guard dual module (M; NEW STYLE)

| Applicable models    |   |
|----------------------|---|
| QN2M_, QX2M_         |   |
| Specifications       |   |
| Configuration        | SPDT; passive (intrinsically safe)      |
| Electrical rating    | 0.1 amp @ 10-30 VDC                     |
| Maximum voltage drop | 0.1 volts @ 10 mA<br>0.5 volts @ 100 mA |
| Contact material     | Rhodium                                 |
| Temperature range    | -40° to 80° C                           |
| Operating life       | 5 million cycles                        |
| Seal                 | Hermetically sealed reed switches       |
| Warranty             | Two years                               |



#### WARNING

Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.

#### Bench test procedure

Use an Ohmmeter to verify sensor functionality.

#### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensor module. The magnet in the cam will be centered on the sensor module when activation occurs. When the cam is released ensure it slides fully onto the splined collar. One spline tooth setting is 4 1/2°.

#### Valve closed to open in counterclockwise rotation (Fig. 1)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar and rotating so that the magnet is centered on the module.
2. Connect Ohmmeter between BTM SW C and BTM SW NO. When the bottom sensor is triggered there will be continuity.
3. Release the cam and ensure it slides fully onto the splined collar.
4. Move valve counterclockwise to the open position. Set the top cam by pushing down the cam off the splined collar and rotating so that the magnet is centered on the module.
5. Connect Ohmmeter between TOP SW C and TOP SW NO. When the top sensor is triggered there will be continuity.
6. Release the cam and ensure it slides fully onto the splined collar. Cam adjustments are now completed.

#### Valve closed to open in clockwise rotation (Fig. 2)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar and rotating so that the magnet is centered on the module.
2. Connect Ohmmeter between BTM SW C and BTM SW NO. When the bottom sensor is triggered there will be continuity.
3. Release the cam and ensure it slides fully onto the splined collar.
4. Move valve clockwise to the open position. Set the top cam by pushing down the cam off the splined collar and rotating so that the magnet is centered on the module.
5. Connect Ohmmeter between TOP SW C and TOP SW NO. When the top sensor is triggered there will be continuity.
6. Release the cam and ensure it slides fully onto the splined collar. Cam adjustments are now completed.

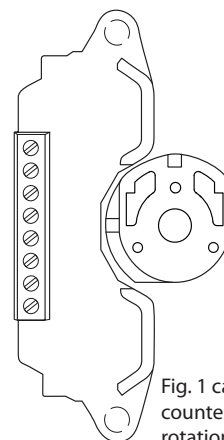


Fig. 1 cam set for counterclockwise rotation

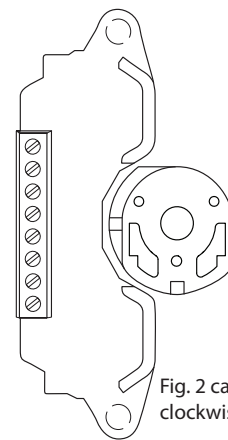


Fig. 2 cam set for clockwise rotation



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

## 4.4 Mechanical micro switches

### 4.4.1 Silver contacts (V) and gold contacts (W)

| Applicable models for silver contacts (V)*   |   |
|--|---|
| QC2V_, QG2V_, QX2V_, QC4V_, QG4V_, QX4V_, QG6V_, QX6V_                                 |   |
| Specifications   |   |
| Electrical ratings   | 10.0 amp @ 125/250 VAC 50/60 Hz<br>0.5 amp @ 125 VDC  |
| Temperature range  | -40° C to 80° C (-40° F to 176° F) <i>typical</i><br>-55° C to 80° C (-67° F to 176° F) <i>QC series only</i> |
| Operating life   | 400,000 cycles  |
| <b>Warranty</b>  | Two years   |
| <i>* Not recommended for electrical circuits operating at less than 20 mA @ 24 VDC</i> |   |
| Applicable models for gold contacts (W)**  |   |
| QC2W_, QG2W_, QX2W_, QC4W_, QG4W_, QX4W_, QG6W_, QX6W_                                 |   |
| Specifications   |   |
| Electrical ratings   | 1.0 amp @ 125 VAC 50/60 Hz<br>0.5 amp @ 30 VDC  |
| Temperature range  | -40° C to 80° C (-40° F to 176° F) <i>typical</i><br>-55° C to 80° C (-67° F to 176° F) <i>QC series only</i> |
| Operating life   | 100,000 cycles  |
| <b>Warranty</b>  | Two years   |
| <i>** Recommended for use in 24 VDC computer input applications</i>                    |   |

### Touch & Tune switch setting

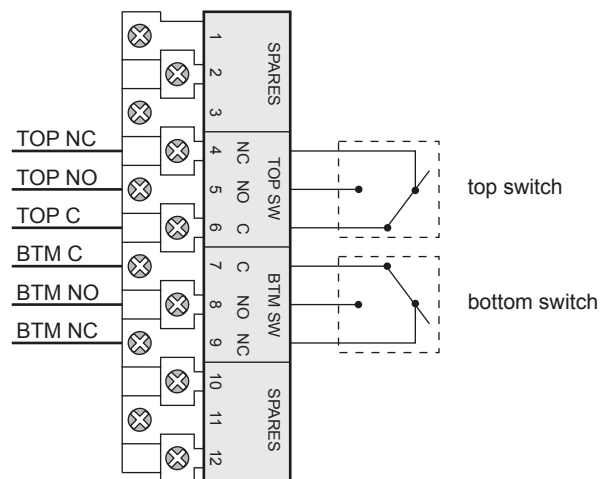
1. Lift bottom cam and rotate until sensor is activated. Release cam and be sure it slides fully onto spline.
2. Operate actuator to opposite position, push down on top cam and repeat process.



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

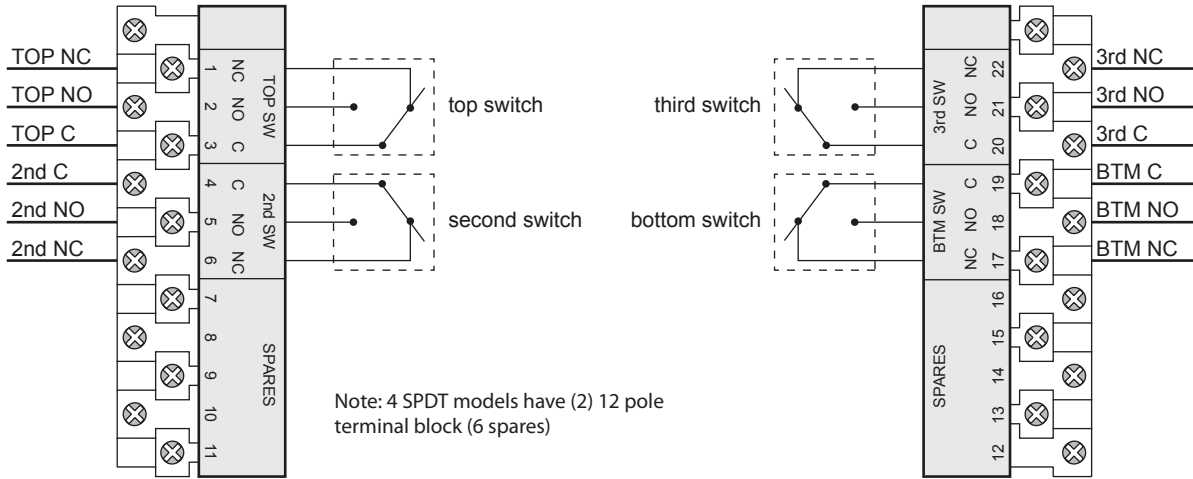
### Wiring diagrams

2 SPDT switches (QC2V\_, QC2W\_, QG2V\_, QG2W\_, QX2V\_, QX2W\_)

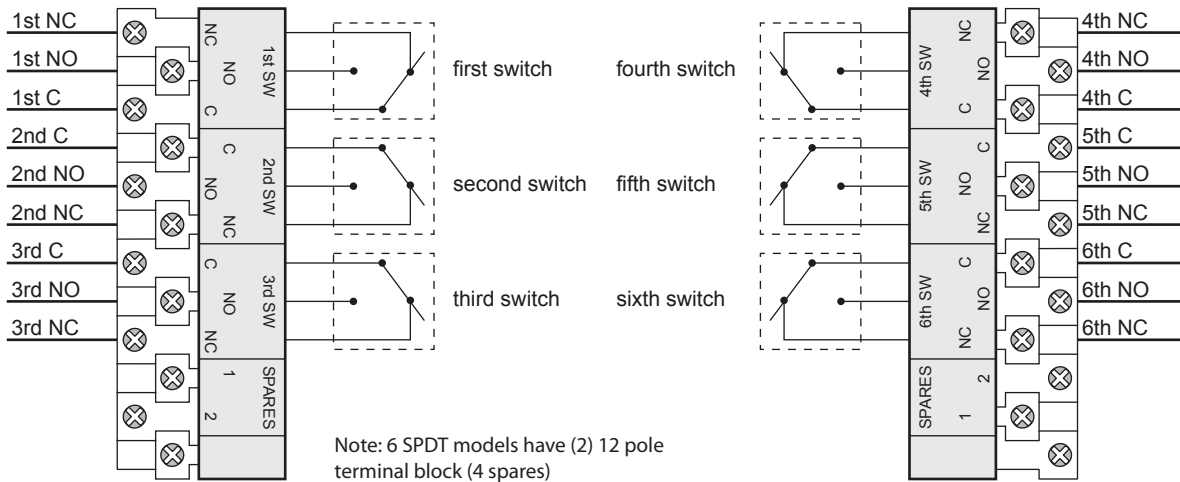


### 4.4.1 Silver contacts (V) and gold contacts (W) continued

4 SPDT switches (QC4V\_, QGCW\_, QG4V\_, QG4W\_, QX4V\_, QX4W\_)



6 SPDT switches (QG6V\_, QG6W\_, QX6V\_, QX6W\_)



## 4.4 Mechanical micro switches

### 4.4.2 DPDT switches (14)

|  |   |
|--|---|
| <b>Applicable models</b>   |   |
| QG14_, QX14_   |   |
| <b>Specifications</b>  |   |
| Electrical ratings   | 4.5 amp @ 125/250 VAC 50/60 Hz; 24 to 125 VDC |
| Temperature range  | -40° to 80° C                                 |
| Operating life   | 250,000 (VAC), 100,000 (VDC) cycles           |
| <b>Warranty</b>  | Two years                                     |
| <i>Not recommended for electrical circuits operating at less than 20 mA @ 24 VDC</i> |   |

#### Touch & Tune switch setting

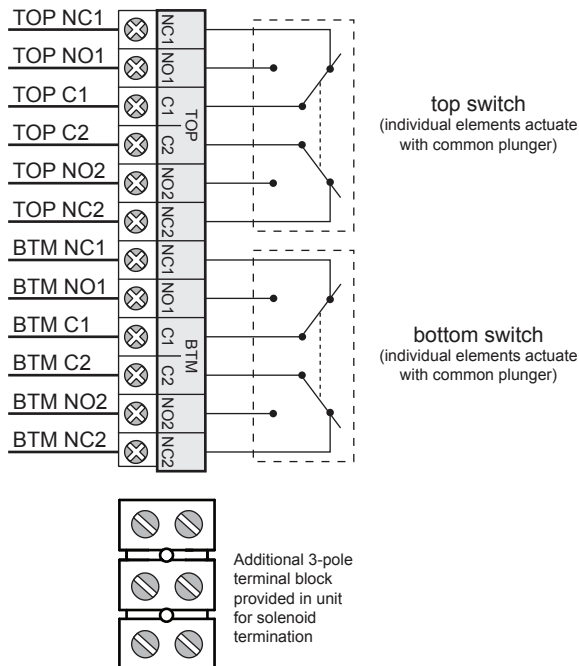
1. Lift bottom cam and rotate until sensor is activated. Release cam and be sure it slides fully onto spline.
2. Operate actuator to opposite position, push down on top cam and repeat process.



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

#### Wiring diagram

2 DPDT switches (QG14\_, QX14\_)

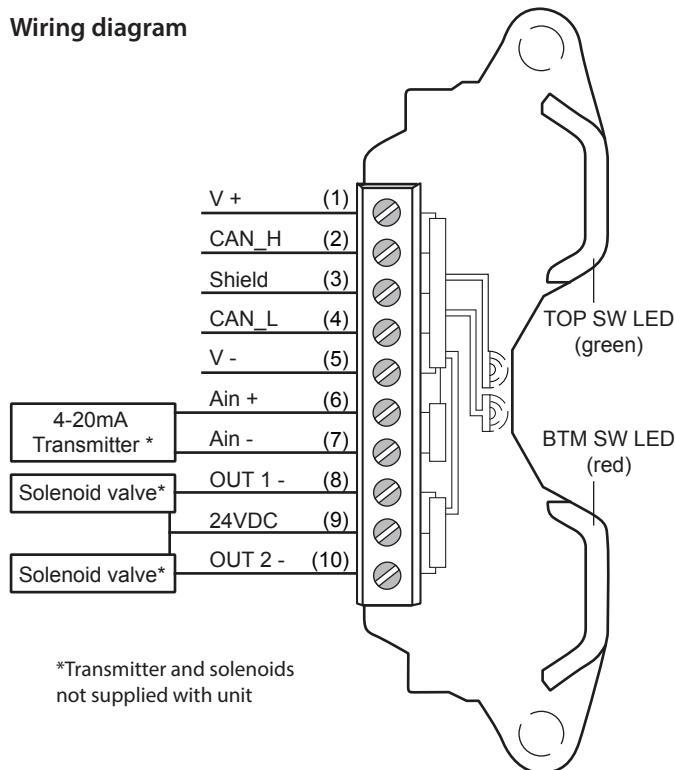


## 4.5 Valve communication terminals (VCT)

### 4.5.1 VCT with DeviceNet™ communication (92)

| Applicable models                 |   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
|-----------------------------------|---|------------------|------------------|-------------------------|-----------------------|---------------------------|-----------------------|---------------------------|----------------------|----------------------------------|--------------------------|-----------------------------------|--------------------------|
| QN92_, QX92_                      |   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Specifications                    |   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Communication protocol            | DeviceNet™  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Configuration                     | (2) Discrete Inputs (sensors)<br>(2) Discrete Outputs (solenoids)<br>(1) 4-20 mA auxiliary analog input, 10-bit resolution<br>no additional power source required   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Voltage                           | 24 VDC via DeviceNet™ network (11 - 25 VDC)   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Output voltage                    | 24 VDC  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Quiescent current                 | 32 mA @ 24 VDC, 48 mA @ 11 VDC  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Maximum output current            | 160 mA, both outputs combined   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Maximum output power              | 4 watts, both outputs combined  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Default address                   | 63 (software assigned)  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Default baud rate                 | 125K (software selectable 125K, 250K or 500K baud)  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Messaging                         | Polling, cyclic and change of state   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| DeviceNet™ type                   | 100   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Bit mapping                       | <table border="0"> <tr> <td>Inputs (3 bytes)</td> <td>Outputs (1 byte)</td> </tr> <tr> <td>Byte 0, bit 0 = red LED</td> <td>Byte 0, bit 0 = OUT 1</td> </tr> <tr> <td>Byte 0, bit 1 = green LED</td> <td>Byte 0, bit 1 = OUT 2</td> </tr> <tr> <td>Byte 0, bit 7 = fault bit</td> <td>Byte 0, bit 2 = Wink</td> </tr> <tr> <td>Byte 1, bits 8-15 = analog input</td> <td>Byte 0, bit 3 = not used</td> </tr> <tr> <td>Byte 2, bits 16-23 = analog input</td> <td>Byte 0, bit 4 = not used</td> </tr> </table> | Inputs (3 bytes) | Outputs (1 byte) | Byte 0, bit 0 = red LED | Byte 0, bit 0 = OUT 1 | Byte 0, bit 1 = green LED | Byte 0, bit 1 = OUT 2 | Byte 0, bit 7 = fault bit | Byte 0, bit 2 = Wink | Byte 1, bits 8-15 = analog input | Byte 0, bit 3 = not used | Byte 2, bits 16-23 = analog input | Byte 0, bit 4 = not used |
| Inputs (3 bytes)                  | Outputs (1 byte)  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Byte 0, bit 0 = red LED           | Byte 0, bit 0 = OUT 1   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Byte 0, bit 1 = green LED         | Byte 0, bit 1 = OUT 2   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Byte 0, bit 7 = fault bit         | Byte 0, bit 2 = Wink  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Byte 1, bits 8-15 = analog input  | Byte 0, bit 3 = not used  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Byte 2, bits 16-23 = analog input | Byte 0, bit 4 = not used  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Warranty                          |   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| All mechanical parts              | Two years   |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |
| Sensor module                     | Five years  |                  |                  |                         |                       |                           |                       |                           |                      |                                  |                          |                                   |                          |

### Wiring diagram



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

**WARNING**  
Do not apply external power to output terminals as this will damage the module.

**Attention:** Any external auxiliary device connected to the VCT module shall be ground isolated.

### Bench test procedure

To bench test DeviceNet™ module: Use 24 VDC power supply across V + and V -. No series resistor needed. To test communication, a functioning DeviceNet™ network is required.

### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensor module. The magnet in the cam will be centered on the sensor when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

### Valve closed to open in counterclockwise rotation (Fig. 1)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar rotating so that the magnet is centered on the bottom sensor and the top cam is 90° from the bottom cam. Top cam is adjusted by pushing down and rotating.
2. At this time the red LED will be lit and green LED out.
3. Move valve counterclockwise to the open position. Green LED will be lit and red LED will be out. Cam adjustments are now completed.

### Valve closed to open in clockwise rotation (Fig. 2)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar rotating so that the magnet is centered on the bottom sensor and the top cam is 90° from the bottom cam. Top cam is adjusted by pushing down and rotating.
2. At this time the red LED will be lit and green LED out.
3. Move valve clockwise to the open position. Green LED will be lit and red LED will be out. Cam adjustments are now completed.

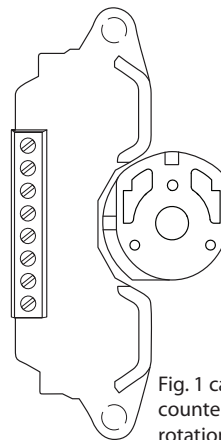


Fig. 1 cam set for counterclockwise rotation

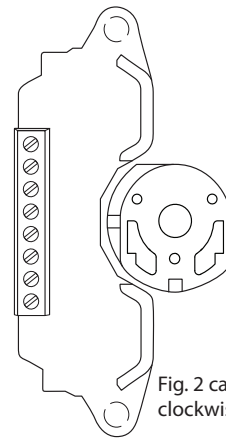


Fig. 2 cam set for clockwise rotation

**Caution:** To avoid damaging the module when performing the position switch calibration procedure, apply 24 VDC across V + and V -. Use the LEDs to determine when switches are made. You cannot do this procedure with an ohmmeter. No series load resistor is required when attaching a 24 VDC power supply for switch setting.

### 4.5.1 VCT with DeviceNet™ communication (92) continued

#### DeviceNet™ Wink feature

The Wink feature provides the capability of setting the CLOSED and OPEN LEDs to simultaneously flash or wink at a 2 Hz rate. This feature aids in physically locating the unit on the network.

1. DeviceNet™ communications are required in order to set the Wink feature. The unit must be addressed and correctly configured to be recognized by the control system.
2. Set byte 0, bit 2 to 1 in the desired unit. Once the correct unit has been physically located on the network, indicated by the winking of the CLOSED and OPEN LEDs, set byte 0 bit 2 back to 0. Performing this function will not change the closed and open sensor setpoints.

#### Quartz with DeviceNet™ Fault Bit (input byte 0, bit 7)

1. The Fault indication will set to a 1 when input byte 0, bits 0 and 1 are set to 1 at the same time.
2. When input byte 0, bits 0 and 1 are both set to 1, this would indicate that the valve is both open and closed at the same time. This would be an abnormal or Fault condition.

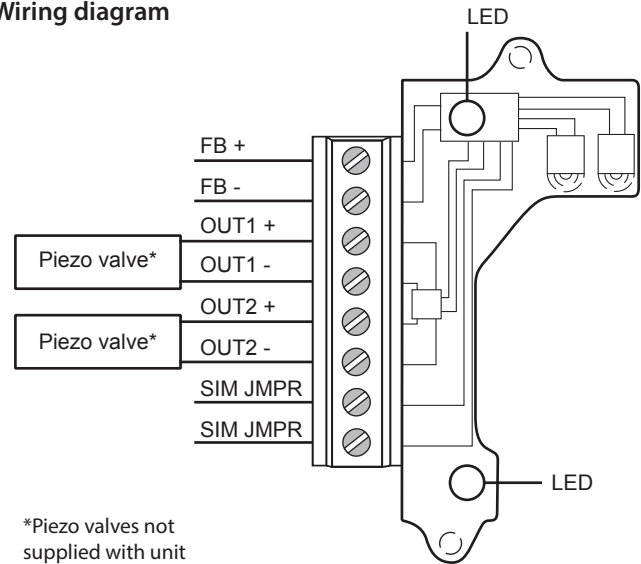


## 4.5 Valve communication terminals (VCT)

### 4.5.2 VCT with Foundation Fieldbus communication (93)

| Applicable models               |  |
|---------------------------------|--|
| QN93_, QX93_                    |  |
| Specifications                  |  |
| Communication protocol          | Foundation Fieldbus (H1)   |
| Configuration                   | (2) Discrete Inputs, DI (open and closed)<br>(2) Discrete Outputs, DO (solenoids)<br>Multiple DI/DO blocks or modified output block for bus-powered discrete devices that operate at the ultra low power such as piezo solenoid valves and relays. Limited to 2.0 mA @ 6.5 VDC |
| Function blocks                 | 2 DI; 2 DO   |
| Voltage                         | 9 - 32 VDC (bus voltage)   |
| Output voltage                  | 6.5 VDC  |
| Quiescent current               | 16 mA  |
| Maximum output voltage          | 2.0 mA @ 6.5 VDC   |
| Current draw                    | 16 mA  |
| Standard channel assignments    |  |
| Channel 1 (DI1)                 | Discrete Input 1 (red LED) 1 = true; 0 = false   |
| Channel 2 (DI2)                 | Discrete Input 2 (green LED) 1 = true; 0 = false   |
| Channel 3 (DO1)                 | Discrete Output 1 (OUT 1) 1 = true; 0 = false  |
| Channel 4 (DO2)                 | Discrete Output 2 (OUT 2) 1 = true; 0 = false  |
| Special channel assignments     |  |
| Channel 8 (DO1)                 | Discrete Output 1 (OUT 1) with state report from Discrete Input 1 (READBACK_D)   |
| Channel 9 (DO2)                 | Discrete Output 2 (OUT 2) with state report from Discrete Input 2 (READBACK_D)   |
| Valve control single block mode |  |
| Channel 10 (DO1)                | Discrete Output 1 (OUT 1) will state report Discrete Inputs 1&2 (READBACK_D)   |
| READBACK_D values               | 0 = None<br>1 = Discrete Input 1 is true<br>2 = Discrete Input 2 is true<br>3 = Both Discrete Inputs 1&2 are true  |
| Warranty                        |  |
| All mechanical parts            | Two years  |
| Sensor module                   | Five years   |

### Wiring diagram



\*Piezo valves not supplied with unit

### WARNING

Do not apply external power to output terminals as this will damage the module.

### Bench test procedure

To bench test Foundation Fieldbus module: Use 9 - 32 VDC power supply across FB + and FB -. No series load resistor needed. To test communication, a functioning Foundation Fieldbus network is required.



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

## 4.5.2 VCT with Foundation Fieldbus communication (93) continued

### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is  $4\frac{1}{2}^\circ$ .

#### For normally open function (Fig. 1)

1. With the valve in the closed position and if the valve turns counterclockwise to open, set both cams so that the metal activation strips are  $180^\circ$  from each other with the bottom cam set in the middle of the sensor target.
2. Lift the bottom cam and turn counterclockwise until the red LED goes out then clockwise again until the red LED is lit. (Reverse the direction of the cam if the valve opens clockwise.)
3. Move the valve to the opposite position (open), push down on the top cam and rotate counterclockwise until the green LED is lit. (Reverse the direction of the cam if the valve opens clockwise.)

For the normally open operation, both LEDs will be off during the actuation period. If the optional green CLOSED visual indicator is used, the colors would be reversed in steps 1 and 2.

#### For normally closed function (Fig. 2)

1. With the valve in the closed position, set both cams so that the metal activation strips are aligned with each other and set in the middle of the sensor targets.
2. If the valve turns counterclockwise to open, pull up on the bottom cam and rotate clockwise until the red LED goes out. (If the valve turns clockwise to open, rotate bottom cam counterclockwise until it goes out.)
3. Operate the valve to the opposite position (open). Push down on the top cam. If the green LED is off, rotate top cam clockwise until it is lit. When the green LED is lit, turn cam counterclockwise until the green LED goes off.

For the normally closed operation, both the red and green LEDs will be illuminated during the actuation period. The red LED is off in the closed position and the green LED is off in the open position. If the optional green CLOSED visual indicator is used the colors would be reversed in steps 1 and 2.

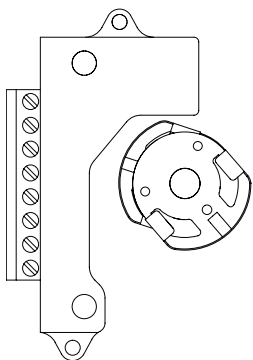


Fig. 1 cam set for normally open sensor function

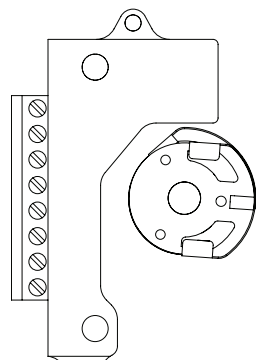


Fig. 2 cam set for normally closed sensor function



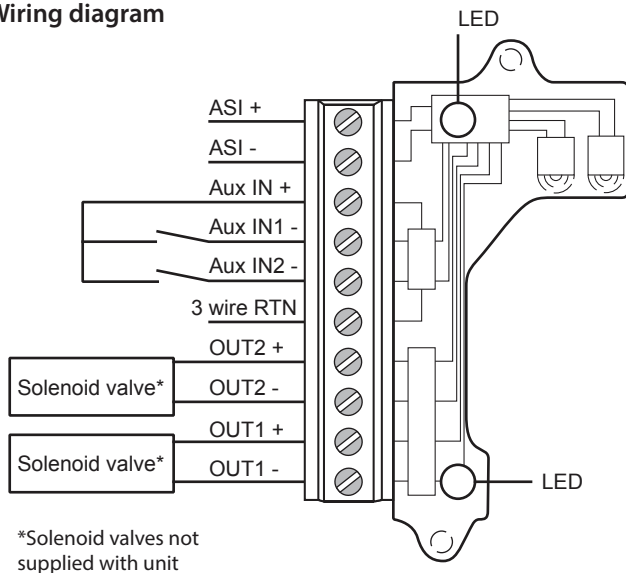
**Caution:** To avoid damaging the module when performing the position switch calibration procedure, apply 9 - 32 VDC across FB + and FB -. Use the LEDs to determine when switches are made. You cannot do this procedure with an ohmmeter. No series load resistor is required when attaching a 24 VDC power supply for switch setting.

## 4.5 Valve communication terminals (VCT)

### 4.5.3 VCT with AS- Interface communication (96 OLD STYLE)

| Applicable models      |   |        |         |                     |                  |                     |                  |                   |               |                 |               |
|------------------------|---|--------|---------|---------------------|------------------|---------------------|------------------|-------------------|---------------|-----------------|---------------|
| QN96_, QX96_           |   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Specifications         |   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Communication protocol | AS- Interface   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Configuration          | (2) Discrete sensor Inputs<br>(2) Auxiliary Discrete Inputs<br>(2) Outputs (solenoids)  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Voltage                | 26.5 - 31.6 VDC (AS-i Voltage)  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Output voltage         | 24 VDC  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Quiescent current      | 21 mA   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Maximum output current | 160 mA, both outputs combined   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Maximum output power   | 4 watts, both outputs combined  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Temperature range      | -40° to 80° C   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| ID/IO codes            | ID = F; IO = 4; ID1 = F; ID2 = E (S-4.FE.)  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Default address        | 00  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Bit assignment         | <table border="0"> <tr> <td>Inputs</td> <td>Outputs</td> </tr> <tr> <td>Bit 1 = Aux Input 1</td> <td>Bit 1 = not used</td> </tr> <tr> <td>Bit 2 = Aux input 2</td> <td>Bit 2 = not used</td> </tr> <tr> <td>Bit 3 = green LED</td> <td>Bit 3 = OUT 1</td> </tr> <tr> <td>Bit 4 = red LED</td> <td>Bit 4 = OUT 2</td> </tr> </table> | Inputs | Outputs | Bit 1 = Aux Input 1 | Bit 1 = not used | Bit 2 = Aux input 2 | Bit 2 = not used | Bit 3 = green LED | Bit 3 = OUT 1 | Bit 4 = red LED | Bit 4 = OUT 2 |
| Inputs                 | Outputs   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Bit 1 = Aux Input 1    | Bit 1 = not used  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Bit 2 = Aux input 2    | Bit 2 = not used  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Bit 3 = green LED      | Bit 3 = OUT 1   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Bit 4 = red LED        | Bit 4 = OUT 2   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Warranty               |   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| All mechanical parts   | Two years   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Sensor module          | Five years  |        |         |                     |                  |                     |                  |                   |               |                 |               |

### Wiring diagram



#### WARNING

Do not apply external power to output terminals as this will damage the module.

### Bench test procedure

To bench test AS-Interface module: Use 24 VDC power supply across ASI + and ASI -. No series resistor needed. To test communication, a functioning AS-Interface network is required.



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

#### For normally open function (Fig. 1)

1. With the valve in the closed position and if the valve turns counterclockwise to open, set both cams so that the metal activation strips are 180° from each other with the bottom cam set in the middle of the sensor target.
2. Lift the bottom cam and turn counterclockwise until the red LED goes out then clockwise again until the red LED is lit. (Reverse the direction of the cam if the valve opens clockwise.)
3. Move the valve to the opposite position (open), push down on the top cam and rotate counterclockwise until the green LED is lit. (Reverse the direction of the cam if the valve opens clockwise.)

For the normally open operation, both LEDs will be off during the actuation period. If the optional green CLOSED visual indicator is used, the colors would be reversed in steps 1 and 2.

#### For normally closed function (Fig. 2)

1. With the valve in the closed position, set both cams so that the metal activation strips are aligned with each other and set in the middle of the sensor targets.
2. If the valve turns counterclockwise to open, pull up on the bottom cam and rotate clockwise until the red LED goes out. (If the valve turns clockwise to open, rotate bottom cam counterclockwise until it goes out.)
3. Operate the valve to the opposite position (open). Push down on the top cam. If the green LED is off, rotate top cam clockwise until it is lit. When the green LED is lit, turn cam counterclockwise until the green LED goes off.

For the normally closed operation, both the red and green LEDs will be illuminated during the actuation period. The red LED is off in the closed position and the green LED is off in the open position. If the optional green CLOSED visual indicator is used the colors would be reversed in steps 1 and 2.

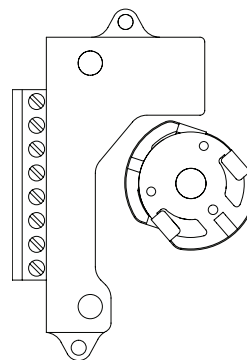


Fig. 1 cam set for normally open sensor function

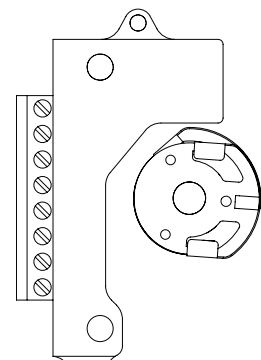


Fig. 2 cam set for normally closed sensor function



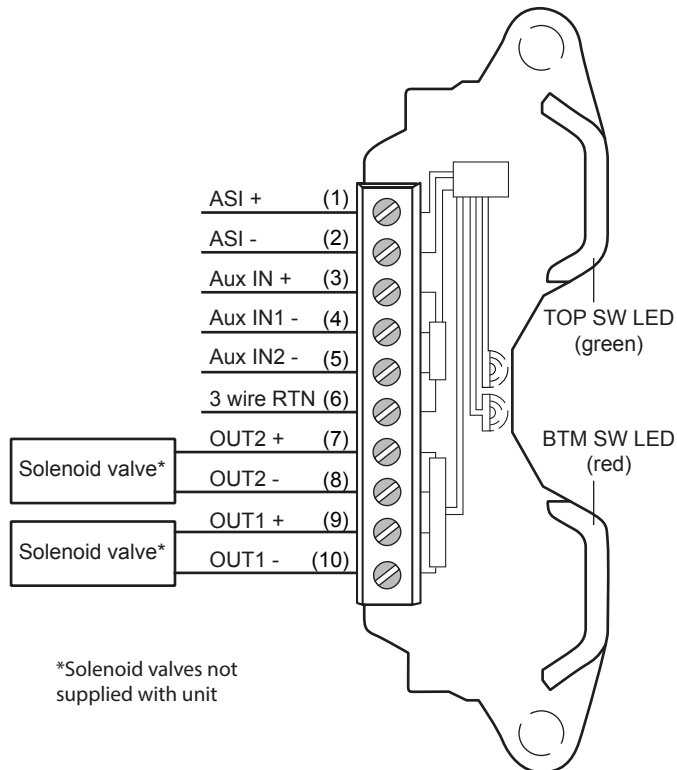
**Caution:** To avoid damaging the module when performing the position switch calibration procedure, apply 24 - 30 VDC across ASI + and ASI -. Use the LEDs to determine when switches are made. You cannot do this procedure with an ohmmeter. No series load resistor is required when attaching a 24 VDC power supply for switch setting.

## 4.5 Valve communication terminals (VCT)

### 4.5.4 VCT with AS- Interface communication (96 NEW STYLE)

| Applicable models      |   |        |         |                     |                  |                     |                  |                   |               |                 |               |
|------------------------|---|--------|---------|---------------------|------------------|---------------------|------------------|-------------------|---------------|-----------------|---------------|
| QN96_, QX96_           |   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Specifications         |   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Communication protocol | AS- Interface   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Configuration          | (2) Discrete sensor Inputs<br>(2) Auxiliary Discrete Inputs<br>(2) Outputs (solenoids)  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Voltage                | 26.5 - 31.6 VDC (AS-i Voltage)  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Output voltage         | 24 VDC  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Quiescent current      | 15 mA   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Maximum output current | 160 mA, both outputs combined   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Maximum output power   | 4 watts, both outputs combined  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Temperature range      | -40° to 80° C   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| ID/IO codes            | ID = F; IO = 4; ID1 = F; ID2 = E (S-4.F.E.)   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Default address        | 00  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Bit assignment         | <table border="0"> <tr> <td>Inputs</td> <td>Outputs</td> </tr> <tr> <td>Bit 1 = Aux Input 1</td> <td>Bit 1 = not used</td> </tr> <tr> <td>Bit 2 = Aux input 2</td> <td>Bit 2 = not used</td> </tr> <tr> <td>Bit 3 = green LED</td> <td>Bit 3 = OUT 1</td> </tr> <tr> <td>Bit 4 = red LED</td> <td>Bit 4 = OUT 2</td> </tr> </table> | Inputs | Outputs | Bit 1 = Aux Input 1 | Bit 1 = not used | Bit 2 = Aux input 2 | Bit 2 = not used | Bit 3 = green LED | Bit 3 = OUT 1 | Bit 4 = red LED | Bit 4 = OUT 2 |
| Inputs                 | Outputs   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Bit 1 = Aux Input 1    | Bit 1 = not used  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Bit 2 = Aux input 2    | Bit 2 = not used  |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Bit 3 = green LED      | Bit 3 = OUT 1   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Bit 4 = red LED        | Bit 4 = OUT 2   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Warranty               |   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| All mechanical parts   | Two years   |        |         |                     |                  |                     |                  |                   |               |                 |               |
| Sensor module          | Five years  |        |         |                     |                  |                     |                  |                   |               |                 |               |

### Wiring diagram



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

### WARNING

Do not apply external power to output terminals as this will damage the module.



**Attention:** Any external auxiliary device connected to the VCT module shall be ground isolated.

### Bench test procedure

To bench test AS-Interface module: Use 24 VDC power supply across ASI + and ASI -. No series resistor needed. To test communication, a functioning AS-Interface network is required.

### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensor module. The magnet in the cam will be centered on the sensor when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

### Valve closed to open in counterclockwise rotation (Fig. 1)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar rotating so that the magnet is centered on the bottom sensor and the top cam is 90° from the bottom cam. Top cam is adjusted by pushing down and rotating.
2. At this time the red LED will be lit and green LED out.
3. Move valve counterclockwise to the open position. Green LED will be lit and red LED will be out. Cam adjustments are now completed.

### Valve closed to open in clockwise rotation (Fig. 2)

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar rotating so that the magnet is centered on the bottom sensor and the top cam is 90° from the bottom cam. Top cam is adjusted by pushing down and rotating.
2. At this time the red LED will be lit and green LED out.
3. Move valve clockwise to the open position. Green LED will be lit and red LED will be out. Cam adjustments are now completed.

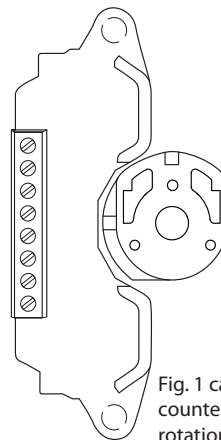


Fig. 1 cam set for counterclockwise rotation

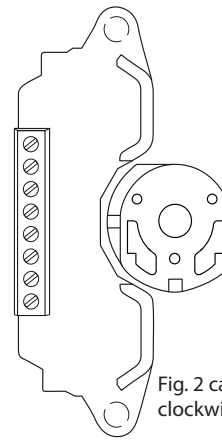


Fig. 2 cam set for clockwise rotation



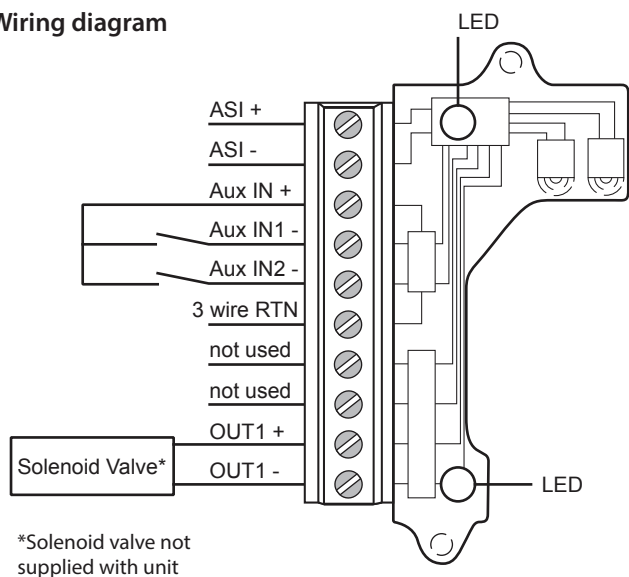
**Caution:** To avoid damaging the module when performing the position switch calibration procedure, apply 24 - 30 VDC across V + and V -. Use the LEDs to determine when switches are made. You cannot do this procedure with an ohmmeter. No series load resistor is required when attaching a 24 VDC power supply for switch setting.

### 4.5 Valve communication terminals (VCT)

#### 4.5.5 VCT with AS-Interface communication and extended addressing (97 OLD STYLE)

| Applicable models      |   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
|------------------------|---|--------|---------|---------------------|------------------|---------------------|------------------|-------------------|---------------|-----------------|-----------------------|
| QN97_, QX97_           |   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Specifications         |   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Communication protocol | AS- Interface with extended addressing  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Configuration          | (2) Discrete sensor Inputs<br>(2) Auxiliary Discrete Inputs<br>(1) Output (solenoid)  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Voltage                | 26.5 - 31.6 VDC (AS-i Voltage)  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Output voltage         | 24 VDC  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Quiescent current      | 21 mA   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Maximum output current | 100 mA  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Maximum output power   | 2.4 watts   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Temperature range      | -40° to 80° C (-40° to 176° F)  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| ID/IO codes            | ID = A; IO = 4; ID1 = 7; ID2 = E (S-4.A.E.)   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Default address        | 0A  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Bit assignment         | <table border="0"> <tr> <td>Inputs</td> <td>Outputs</td> </tr> <tr> <td>Bit 1 = Aux input 1</td> <td>Bit 1 = not used</td> </tr> <tr> <td>Bit 2 = Aux input 2</td> <td>Bit 2 = not used</td> </tr> <tr> <td>Bit 3 = green LED</td> <td>Bit 3 = OUT 1</td> </tr> <tr> <td>Bit 4 = red LED</td> <td>Bit 4 = not available</td> </tr> </table> | Inputs | Outputs | Bit 1 = Aux input 1 | Bit 1 = not used | Bit 2 = Aux input 2 | Bit 2 = not used | Bit 3 = green LED | Bit 3 = OUT 1 | Bit 4 = red LED | Bit 4 = not available |
| Inputs                 | Outputs   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Bit 1 = Aux input 1    | Bit 1 = not used  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Bit 2 = Aux input 2    | Bit 2 = not used  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Bit 3 = green LED      | Bit 3 = OUT 1   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Bit 4 = red LED        | Bit 4 = not available   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Warranty               |   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| All mechanical parts   | Two years   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Sensor module          | Five years  |        |         |                     |                  |                     |                  |                   |               |                 |                       |

#### Wiring diagram



**WARNING**  
Do not apply external power to output terminals as this will damage the module.

#### Bench test procedure

To bench test AS-Interface module: Use 24 VDC power supply across ASI + and ASI -. No series resistor needed. To test communication, a functioning AS-Interface network is required.

**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

#### Touch & Tune switch setting

All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released he sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

#### For normally open function (Fig. 1)

1. With the valve in the closed position and if the valve turns counterclockwise to open, set both cams so that the metal activation strips are 180° from each other with the bottom cam set in the middle of the sensor target.
2. Lift the bottom cam and turn counterclockwise until the red LED goes out then clockwise again until the red LED is lit. (Reverse the direction of the cam if the valve opens clockwise.)
3. Move the valve to the opposite position (open), push down on the top cam and rotate counterclockwise until the green LED is lit. (Reverse the direction of the cam if the valve opens clockwise.)

For the normally open operation, both LEDs will be off during the actuation period. If the optional green CLOSED visual indicator is used, the colors would be reversed in steps 1 and 2.

#### For normally closed function (Fig. 2)

1. With the valve in the closed position, set both cams so that the metal activation strips are aligned with each other and set in the middle of the sensor targets.
2. If the valve turns counterclockwise to open, pull up on the bottom cam and rotate clockwise until the red LED goes out. (If the valve turns clockwise to open, rotate bottom cam counterclockwise until it goes out.)
3. Operate the valve to the opposite position (open). Push down on the top cam. If the green LED is off, rotate top cam clockwise until it is lit. When the green LED is lit, turn cam counterclockwise until the green LED goes off.

For the normally closed operation, both the red and green LEDs will be illuminated during the actuation period. The red LED is off in the closed position and the green LED is off in the open position. If the optional green CLOSED visual indicator is used the colors would be reversed in steps 1 and 2.

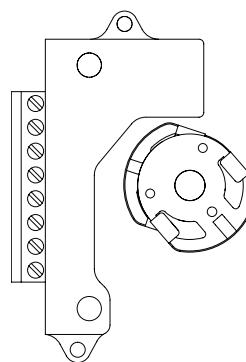


Fig. 1 cam set for normally open sensor function

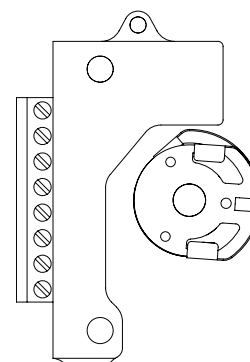


Fig. 2 cam set for normally closed sensor function

**Caution:** To avoid damaging the module when performing the position switch calibration procedure, apply 24 - 30 VDC across ASI + and ASI -. Use the LEDs to determine when switches are made. You cannot do this procedure with an ohmmeter. No series load resistor is required when attaching a 24 VDC power supply for switch setting.

**4.5 Valve communication terminals (VCT)**

**4.5.6 VCT with AS-Interface communication and extended addressing (97 NEW STYLE)**

| Applicable models      |   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
|------------------------|---|--------|---------|---------------------|------------------|---------------------|------------------|-------------------|---------------|-----------------|-----------------------|
| QN97_, QX97_           |   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Specifications         |   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Communication protocol | AS- Interface with extended addressing  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Configuration          | (2) Discrete sensor Inputs<br>(2) Auxiliary Discrete Inputs<br>(1) Output (solenoid)  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Voltage                | 26.5 - 31.6 VDC (AS-i Voltage)  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Output voltage         | 24 VDC  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Quiescent current      | 15 mA   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Maximum output current | 160 mA  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Maximum output power   | 4 watts   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Temperature range      | -40° to 80° C (-40° to 176° F)  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| ID/IO codes            | ID = A; IO = 4; ID1 = 7; ID2 = E (S-4.A.E.)   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Default address        | 0A  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Bit assignment         | <table border="0"> <tr> <td>Inputs</td> <td>Outputs</td> </tr> <tr> <td>Bit 1 = Aux input 1</td> <td>Bit 1 = not used</td> </tr> <tr> <td>Bit 2 = Aux input 2</td> <td>Bit 2 = not used</td> </tr> <tr> <td>Bit 3 = green LED</td> <td>Bit 3 = OUT 1</td> </tr> <tr> <td>Bit 4 = red LED</td> <td>Bit 4 = not available</td> </tr> </table> | Inputs | Outputs | Bit 1 = Aux input 1 | Bit 1 = not used | Bit 2 = Aux input 2 | Bit 2 = not used | Bit 3 = green LED | Bit 3 = OUT 1 | Bit 4 = red LED | Bit 4 = not available |
| Inputs                 | Outputs   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Bit 1 = Aux input 1    | Bit 1 = not used  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Bit 2 = Aux input 2    | Bit 2 = not used  |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Bit 3 = green LED      | Bit 3 = OUT 1   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Bit 4 = red LED        | Bit 4 = not available   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Warranty               |   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| All mechanical parts   | Two years   |        |         |                     |                  |                     |                  |                   |               |                 |                       |
| Sensor module          | Five years  |        |         |                     |                  |                     |                  |                   |               |                 |                       |

**WARNING**

Do not apply external power to output terminals as this will damage the module.

**Attention:** Any external auxiliary device connected to the VCT module shall be ground isolated.

**Bench test procedure**

To bench test AS-Interface module: Use 24 VDC power supply across ASI + and ASI -. No series resistor needed. To test communication, a functioning AS-Interface network is required.

**Touch & Tune switch setting**

All adjustments assume you are looking down on the top of the sensor module. The magnet in the cam will be centered on the sensor when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

**Valve closed to open in counterclockwise rotation (Fig. 1)**

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar rotating so that the magnet is centered on the bottom sensor and the top cam is 90° from the bottom cam. Top cam is adjusted by pushing down and rotating.
2. At this time the red LED will be lit and green LED out.
3. Move valve counterclockwise to the open position. Green LED will be lit and red LED will be out. Cam adjustments are now completed.

**Valve closed to open in clockwise rotation (Fig. 2)**

1. With the valve in the closed position, set the bottom cam by lifting up off the splined collar rotating so that the magnet is centered on the bottom sensor and the top cam is 90° from the bottom cam. Top cam is adjusted by pushing down and rotating.
2. At this time the red LED will be lit and green LED out.
3. Move valve clockwise to the open position. Green LED will be lit and red LED will be out. Cam adjustments are now completed.

**Wiring diagram**

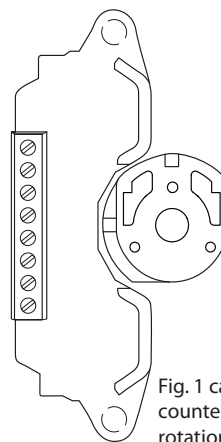
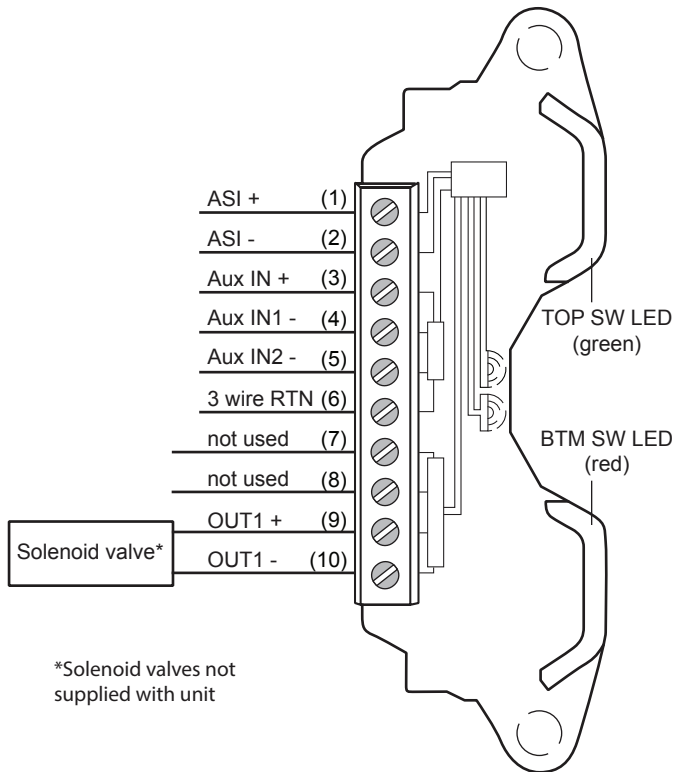


Fig. 1 cam set for counterclockwise rotation

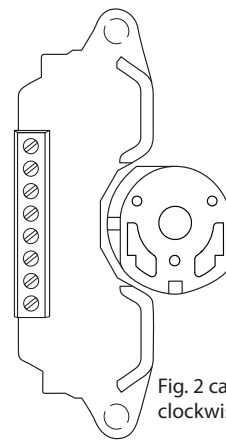


Fig. 2 cam set for clockwise rotation

**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

**Caution:** To avoid damaging the module when performing the position switch calibration procedure, apply 24 - 30 VDC across V + and V -. Use the LEDs to determine when switches are made. You cannot do this procedure with an ohmmeter. No series load resistor is required when attaching a 24 VDC power supply for switch setting.

## 4.6 Position transmitters and potentiometers

### 4.6.1 4 to 20 mA position transmitters with and without switches (Type 5\_, 7\_)

| Applicable models                         |  |
|---|--|
| Standard potentiometer QN5_, QX5_         |  |
| High performance potentiometer QN7_, QX7_ |  |
| Specifications                            |  |
| Output                                    | 2-wire 4-20 mA   |
| Voltage range                             | 10 - 40 VDC  |
| Recommended voltage                       | 24 VDC, 50 mA minimum  |
| Maximum load                              | 700 ohm @ 24 VDC (see load curve)  |
| Span                                      | Adjustable from 35° to 270°  |
| Maximum linearity error                   | Standard potentiometer (5) $\pm 0.85^\circ$<br>High performance potentiometer (7) $\pm 0.35^\circ$ |
| Temperature range                         | -40° to 80° C  |
| Warranty                                  |  |
| Two years                                 |  |



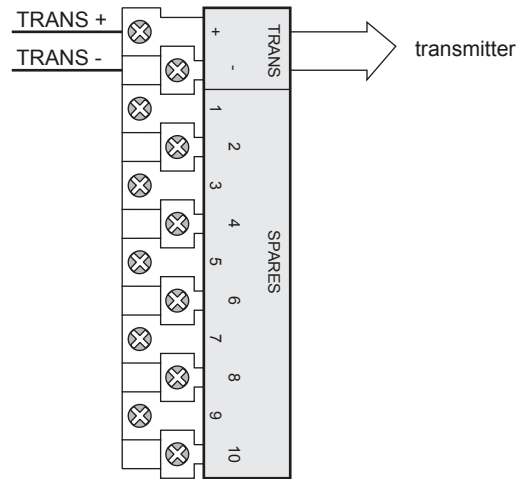
Reference controlled installation drawing #105193 for proper intrinsic safety installation details. Find document in the Appendix on page 51.



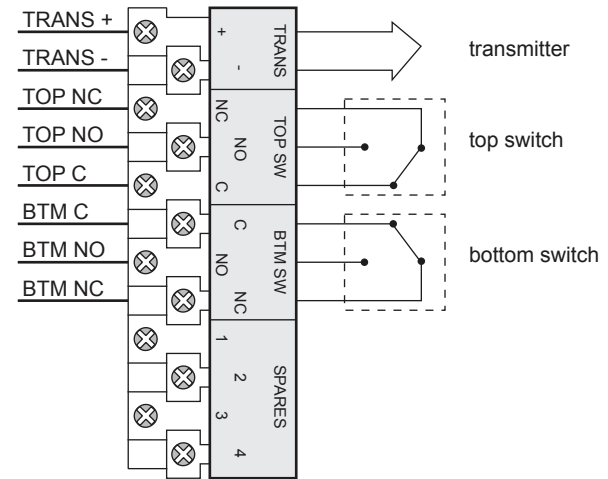
**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

### Wiring diagrams

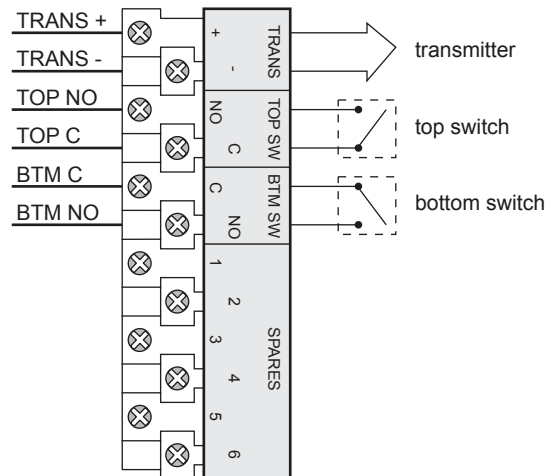
#### Transmitter only



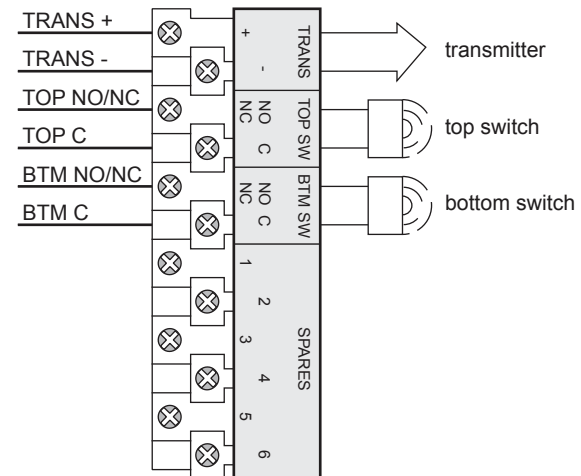
#### Transmitter with SPDT switches



#### Transmitter with SPST switches

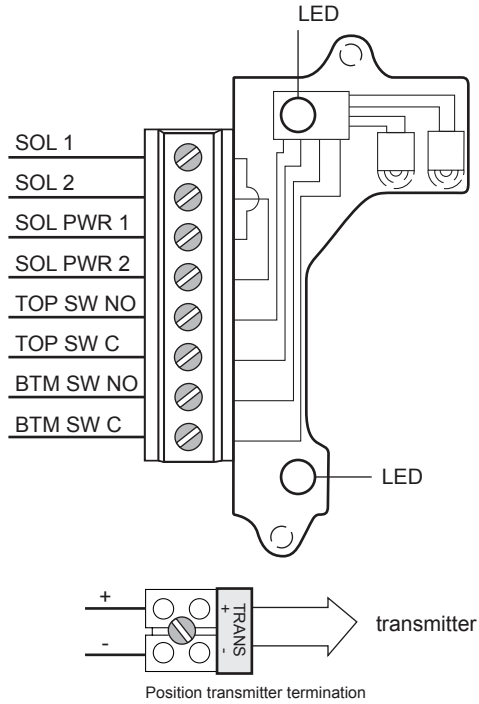


#### Transmitter with solid state switches

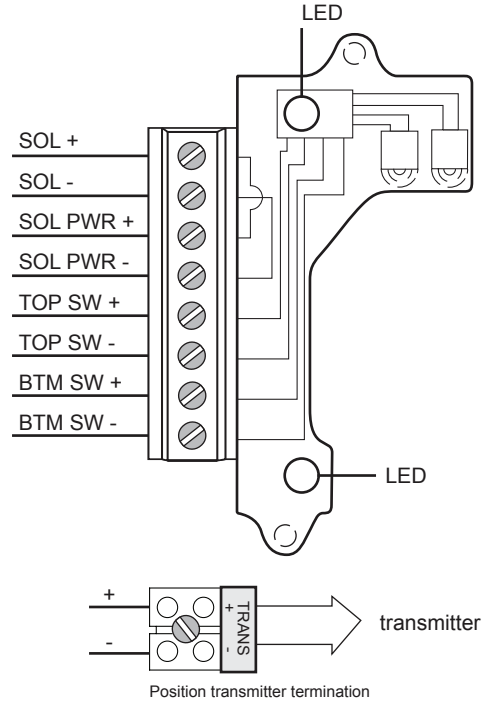


4.6.1 4 to 20 mA position transmitters with and without switches (Type 5\_, 7\_) continued

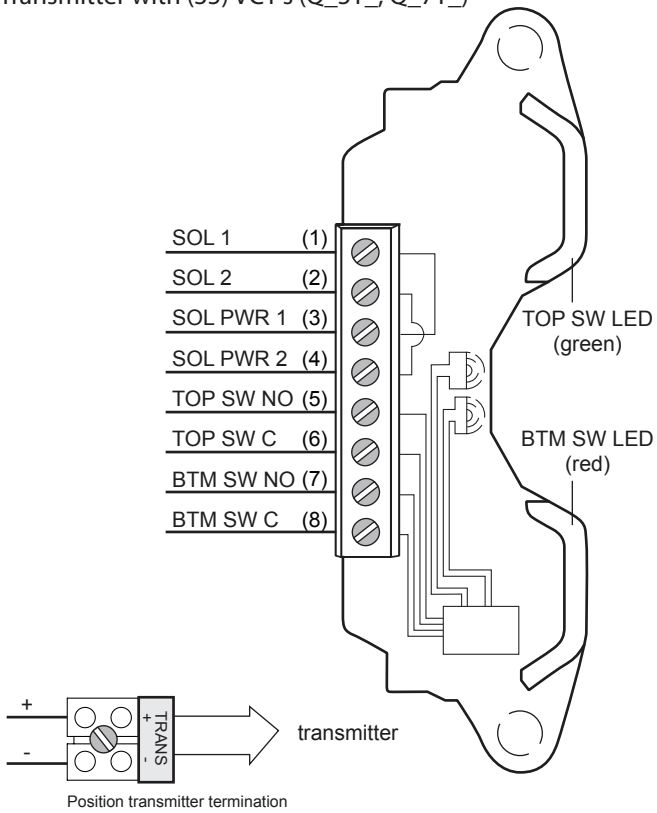
Transmitter with (33) VCT's (Q\_53\_, Q\_73\_)



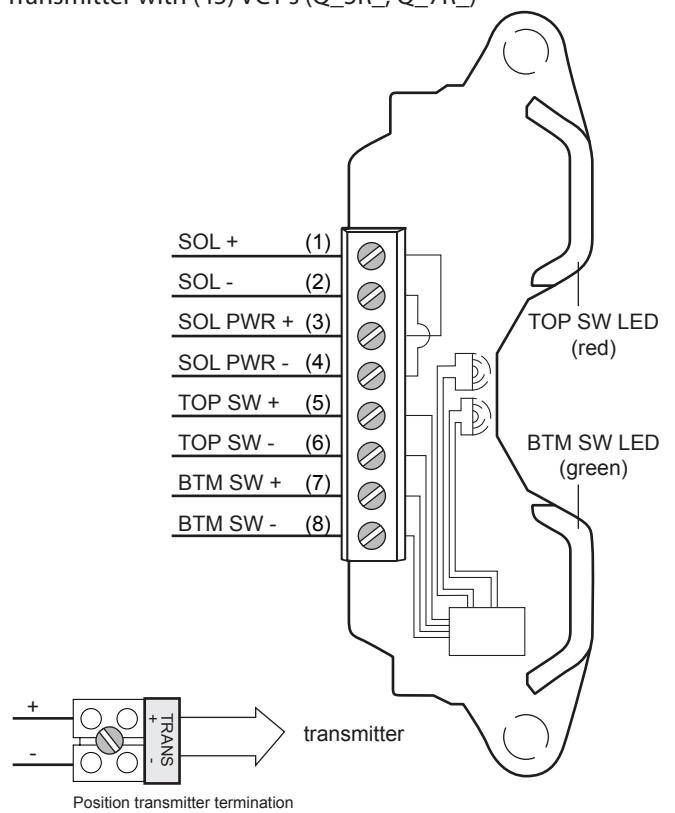
Transmitter with (44) VCT's (Q\_54\_, Q\_74\_)



Transmitter with (35) VCT's (Q\_5T\_, Q\_7T\_)



Transmitter with (45) VCT's (Q\_5R\_, Q\_7R\_)



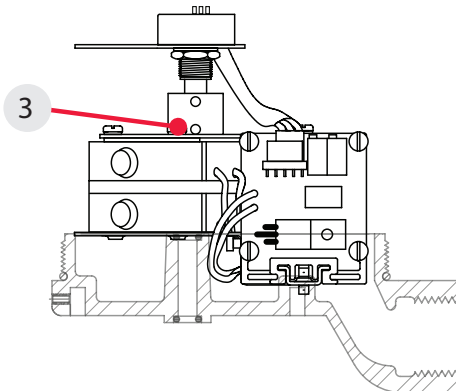
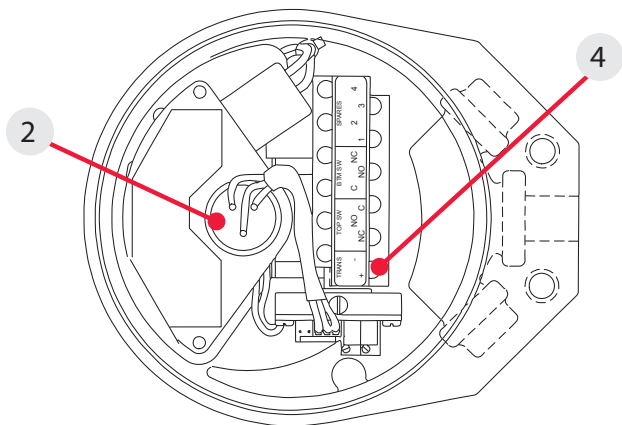
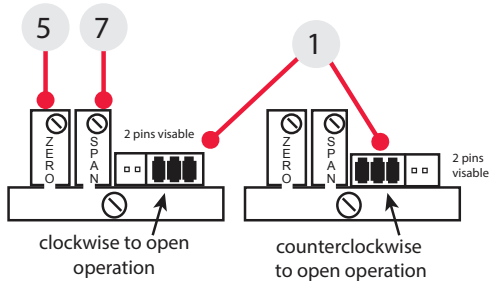


4.6.1 4 to 20 mA position transmitters with and without switches (Type 5\_, 7\_) continued

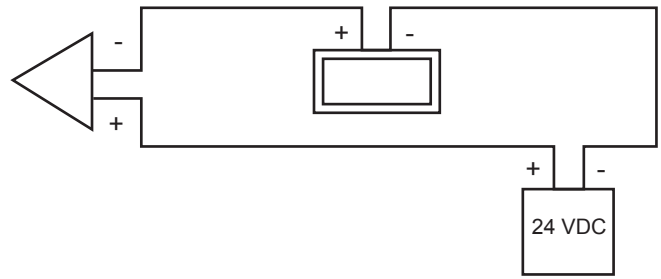
**Position transmitter calibration**

1. Connect the plug as shown for either clockwise or counterclockwise to open operation (as viewed from top).
2. Operate actuator to desired zero position. With power disconnected, connect an ohmmeter across the terminals located on top of the potentiometer. For counterclockwise rotation, connect to the terminals with the black lead and white lead. For clockwise rotation, connect the ohmmeter to the terminals with the red lead and white lead.
3. Loosen bottom set screw and rotate coupling until the ohmmeter reads between 400 - 600 ohms. Retighten setscrew. Verify the ohmmeter still reads between 400 - 600 ohms.
4. Disconnect the ohmmeter and connect DC power to the positive (+) and negative (-) terminals (see electrical schematic).
5. Adjust the screw on the zero trimpot for a 4 mA output.
6. Operate actuator to the desired 100% position.
7. Adjust the screw on the span trimpot for a 20 mA output. Zero and span adjustments are non interactive.

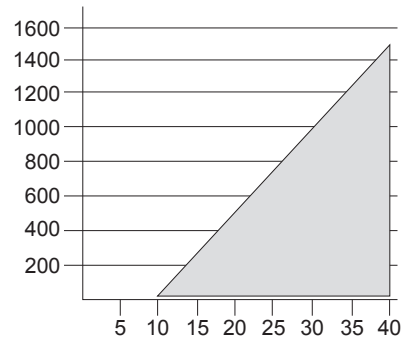
Note: Plug must be at one end of connector or the other



**Electrical schematic**



**Load curve**



**Touch & Tune switch setting**

Refer to appropriate installation and adjusting instructions for bench testing and switch setting procedures for Quartz units with position transmitter and switches

- QN53, QX53, QN73, QX73 see page 10
- QN5T, QX5T, QN7T, QX7T see page 11
- QN5X, QX5X, QN7X, QX7X see page 12
- QN5E, QX5E, QN5F, QX5F, QN7E, QX7E, QN7F, QX7F see page 14
- QN54, QX54, QN74, QX74 see page 16
- QN5R, QX5R, QN7R, QX7R see page 17
- QN5A, QX5A, QN7A, QX7A see page 18
- QN5N, QX5N, QN7N, QX7N see page 21
- QN5L, QX5L, QN5P, QX5P, QN7L, QX7L, QN7P, QX7P, see page 22
- QN5G, QX5G, QN5H, QX5H, QN5S, QX5S, QN7G, QX7G, QN7H, QX7H, QN7S, QX7S see page 23
- QN5J, QX5J, QN7J, QX7J see page 25
- QN5M, QX5M, QN7M, QX7M see page 27
- QX5V, QX5W, QX7V, QX7W see page 28

## 4.6 Position transmitters and potentiometers

### 4.6.2 Potentiometer with and without switches (Type B\_, C\_)

| Applicable models  |   |
|--|---|
| Standard potentiometer QNB_, QXB_<br>High performance potentiometer QNC_, QXC_ |   |
| Specifications   |   |
| Output   | Standard potentiometer (B) 0-10K ohm $\pm$ 5%<br>High performance potentiometer (C) 0-10K ohm $\pm$ 0.1%              |
| Linearity  | Standard potentiometer (B) $\pm$ 0.25%<br>High performance potentiometer (C) $\pm$ 0.10%                              |
| Power rating   | 0.5 watt @ 80° C  |
| Cycle life   | Standard potentiometer (B) 2 million shaft rotations<br>High performance potentiometer (C) 50 million shaft rotations |
| Vibration tolerance  | Standard potentiometer (B) acceptable<br>High performance potentiometer (C) outstanding                               |
| Temperature range  | -40° to 80° C   |
| Warranty   |   |
| Two years  |   |



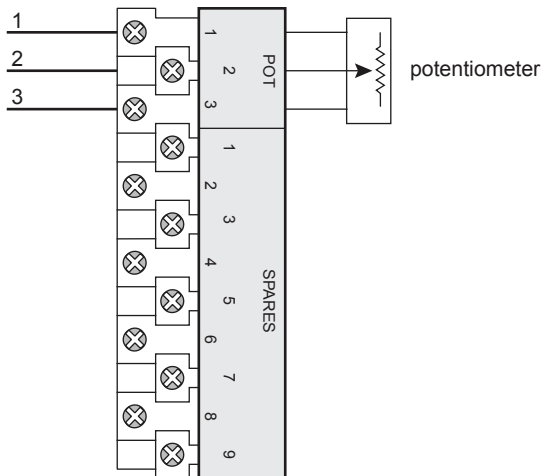
Reference controlled installation drawing #105193 for proper intrinsic safety installation details. Find document in the Appendix on page 51.



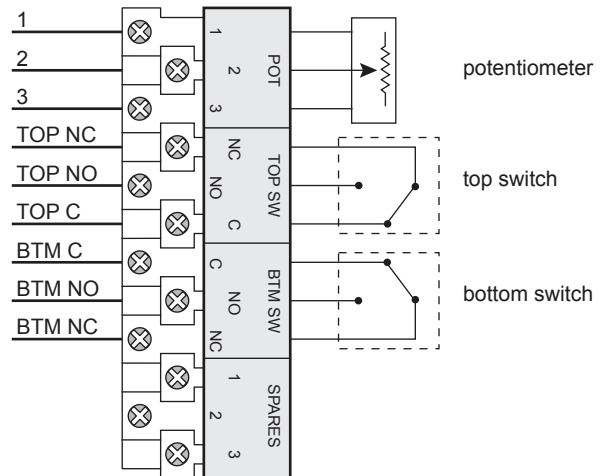
**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

### Wiring diagrams

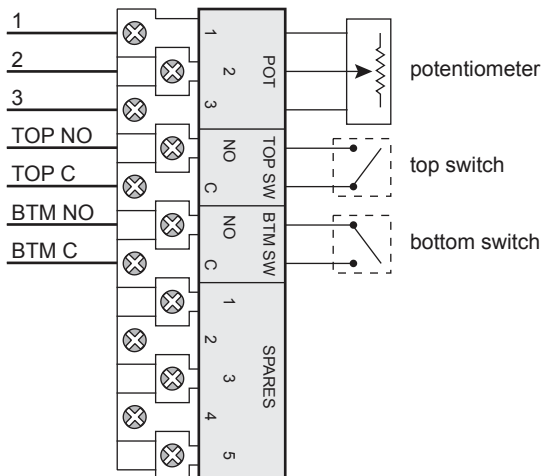
Potentiometer only



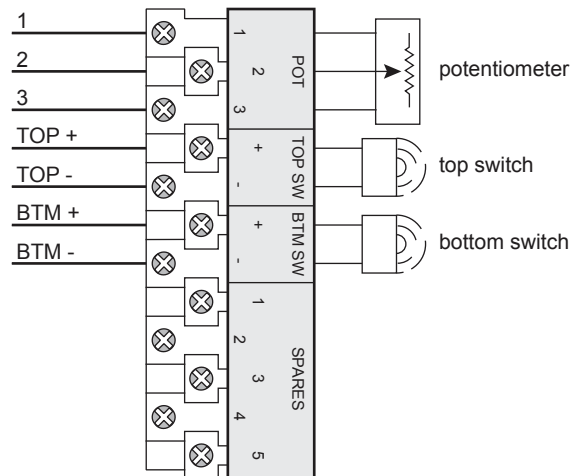
Potentiometer with SPDT switches



Potentiometer with SPST switches

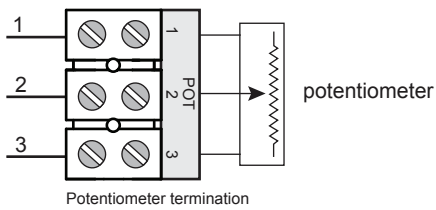
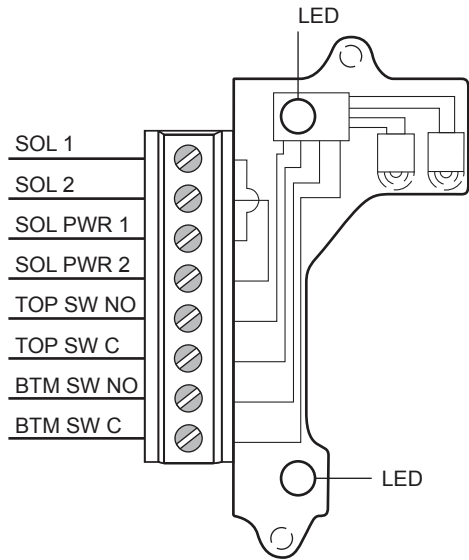


Potentiometer with solid state switches

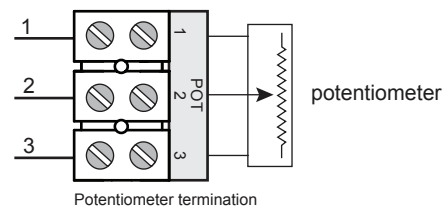
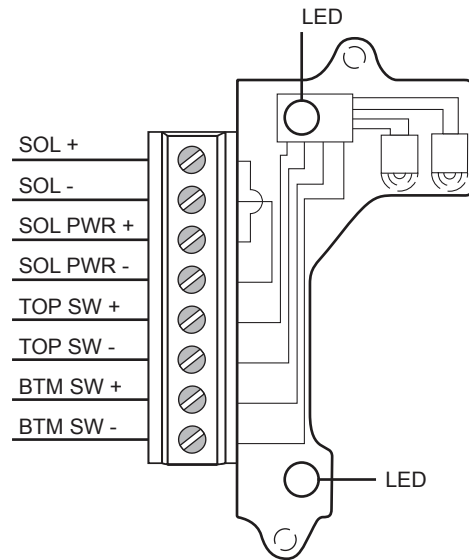


4.6.2 Potentiometer with and without switches (Type B\_, C\_) continued

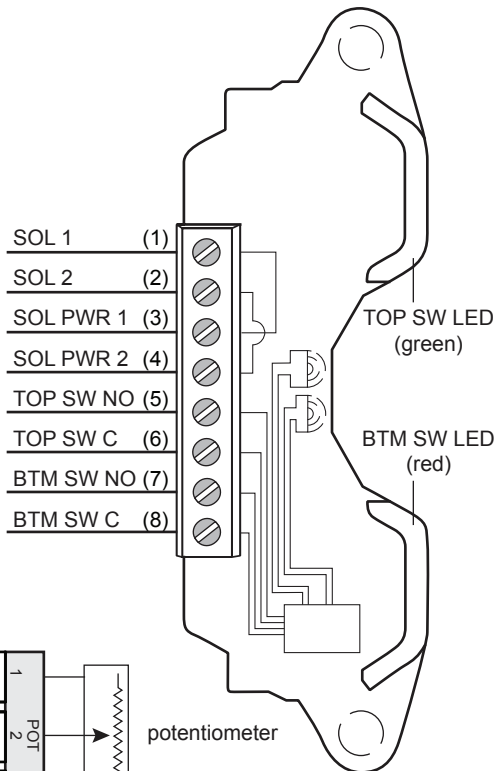
Potentiometer with (33) VCT's (Q\_B3\_, Q\_C3\_)



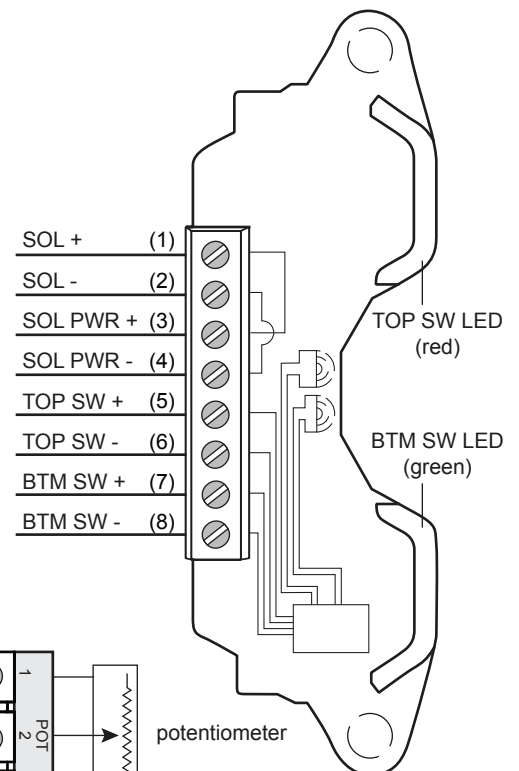
Potentiometer with (44) VCT's (Q\_B4\_, Q\_C4\_)



Potentiometer with (35) VCT's (Q\_BT\_, Q\_CT\_)



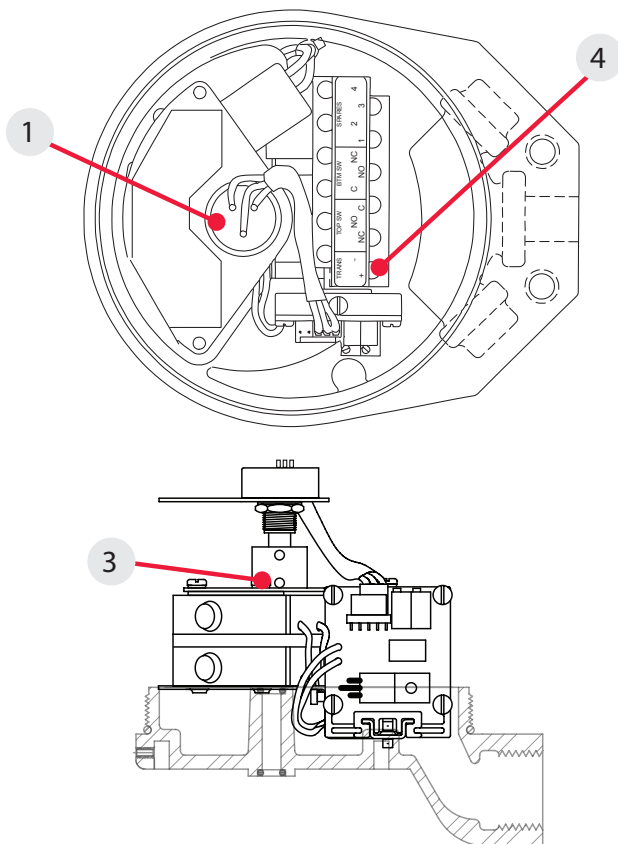
Potentiometer with (45) VCT's (Q\_BR\_, Q\_CR\_)



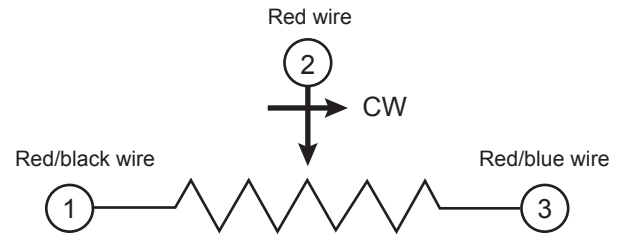
## 4.6.2 Potentiometer with and without switches (Type B\_, C\_) continued

### Potentiometer calibration

1. Operate actuator to desired zero position. With power disconnected, connect an ohmmeter across the terminals located on top or side of the potentiometer. Refer to electrical schematic. For counterclockwise rotation (Ohm value to increase), connect to the terminals with the red lead and red/black lead. For clockwise rotation, connect the ohmmeter to the terminals with the red lead and red/blue lead.
2. Loosen bottom set screw and rotate coupling until the ohmmeter reads < 10 ohms. Retighten setscrew. Verify the ohmmeter still reads < 10 ohms.
3. Operate actuator to the desired 100% position (assuming 90° rotation) and verify ohmmeter reads 2.7K ohms  $\pm$  10%.
4. Remove all test equipment and place unit in service.



### Electrical schematic



### Touch & Tune switch setting

Refer to appropriate installation and adjusting instructions for bench testing and switch setting procedures for Quartz units with position transmitter and switches

QNB3, QXB3, QNC3, QXC3 see page 10

QNB4, QXB4, QNC4, QXC4 see page 16

QNB5, QXB5, QNC5, QXC5 see page 17

QNB6, QXB6, QNC6, QXC6 see page 18

QNB7, QXB7, QNC7, QXC7 see page 19

QNB8, QXB8, QNC8, QXC8 see page 20

QNB9, QXB9, QNC9, QXC9 see page 21

QNB10, QXB10, QNC10, QXC10 see page 22

QNB11, QXB11, QNC11, QXC11 see page 23

QNB12, QXB12, QNC12, QXC12 see page 24

QNB13, QXB13, QNC13, QXC13 see page 25

QNB14, QXB14, QNC14, QXC14 see page 26

QNB15, QXB15, QNC15, QXC15 see page 27

QNB16, QXB16, QNC16, QXC16 see page 28

## 4.6 Position transmitters and potentiometers

### 4.6.3 Digital position transmitter (Type T\_)

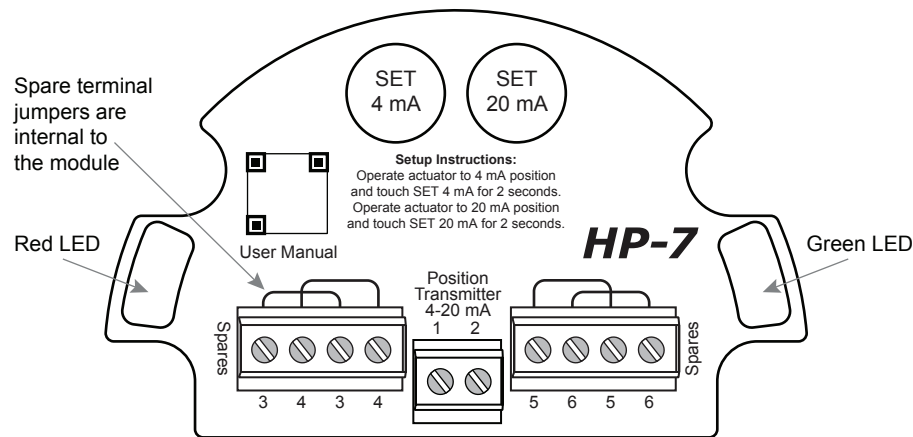
| Applicable models             |  |
|-------------------------------|--|
| QNT_, QXT_                    |  |
| Specifications                |  |
| Output                        | 4-20 mA proportional to valve position   |
| Input voltage                 | 10-40 VDC                                |
| Span range                    | 35° to 320° rotation                     |
| Max resistance load           | 683 ohms @ 24 VDC                        |
| Valid loop current            | 3.8 mA - 20.5 mA (NAMUR NE 43 compliant) |
| Refresh rate                  | 5 ms                                     |
| Resolution                    | 0.02% FS                                 |
| Linearity error               | +/- 0.35% FS                             |
| Hysteresis                    | Negligible                               |
| Thermal drift                 | +/- 0.01% FS/C°                          |
| Terminal block specifications |  |
| Recommended torque            | 4.42 in.lbs (0.5 Nm)                     |
| Conductor strip length        | 0.22 - 0.25 in (5.5-6.5 mm)              |
| Maximum wire size             | 30-12 AWG (0.5-2.5 mm <sup>2</sup> )     |
| Wire type                     | stranded or solid                        |
| Cycle life                    | Unlimited                                |
| Temperature range             | -40° to 80° C                            |
| Warranty                      |  |
| Five years                    |  |



Reference controlled installation drawing #105193 for proper intrinsic safety installation details. Find document in the Appendix on page 51.

## Wiring diagrams

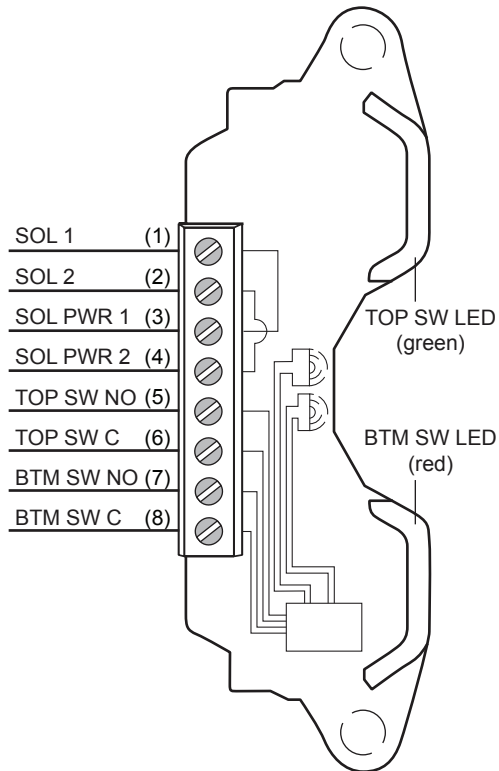
### Transmitter only (Q\_TO)



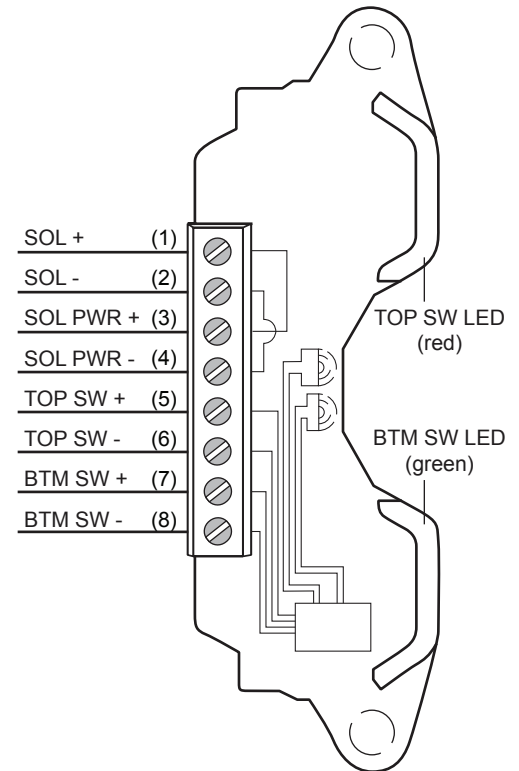
| LED status indications              |  |              |  |   |  |
|-------------------------------------|--|--------------|--|---|--|
| Green LED state                     | Red LED state                                  | Loop current | Possible cause   | Recommended action  |  |
| Off                                 | Solid on                                       | 4.0 mA       | Valve at closed calibrated position                          |   |  |
| Solid on                            | Off  | 20.0 mA      | Valve at open calibrated position                            |   |  |
| 4 short flashes every 3 sec (- - -) | Off  | 3.5 mA       | Attempted calibration span greater than 320°                 | Perform calibration within maximum span ( $\leq 320^\circ$ )  |  |
| Off                                 | 4 short flashes every 3 sec (- - -)            | 3.5 mA       | Attempted calibration span less than 35°                     | Perform calibration within minimum span ( $\geq 35^\circ$ )   |  |
| Off                                 | 2 short flashes every 3 sec (- -)              | 3.4 mA       | Triggering magnet not detected                               | Ensure triggering magnet is properly installed  |  |
| Undefined                           | Undefined                                      | 3.37 mA      | Unit micro-controller may have stopped                       | Power cycle sensor. If problem persists, replace sensor module  |  |
| Off                                 | 1 long and 1 short flashes every 3 sec (— -)   | 3.3 mA       | Loop error: sensor is unable to reach required current level | 1) Loop voltage is too low, increase voltage<br>2) Loop resistance is too high, decrease loop resistance or increase loop voltage |  |
| Off                                 | 1 long and 2 short flashes every 3 sec (— - -) | 3.2 mA       | Internal sensor error  | Power cycle sensor. If problem persists, replace sensor module  |  |

### 4.6.3 Digital position transmitter (Type T\_) continued

Digital transmitter with (35) VCT's (Q\_TT\_)



Digital transmitter with (45) VCT's (Q\_TR\_)



**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.

#### Bench test and calibration procedure

1. Connect 24 VDC+ to terminal 1 and connect 24 VDC- to terminal 2.
2. Operate actuator to the closed position.
3. Press and hold SET 4 mA push button until Red LED is lit (2 second). Release button.
4. Operate actuator to the open position.
5. Press and hold SET 20 mA push button until Green LED is lit (2 second). Release button.
6. Setpoints are retained even after power is removed.

#### Touch & Tune switch setting

Refer to appropriate installation and adjusting instructions for bench testing and switch setting procedures for Quartz units with digital transmitter and switches

QNTT, QXTT see page 11

QNTE, QXTE, QNTF, QXTF page 14

QNTR, QXTR see page 17

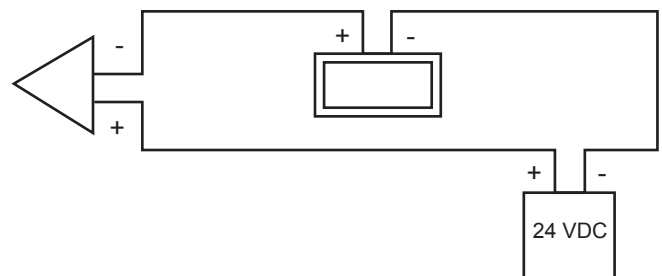
QNTA, QXTA see page 18

QNTN, QXTN see page 21

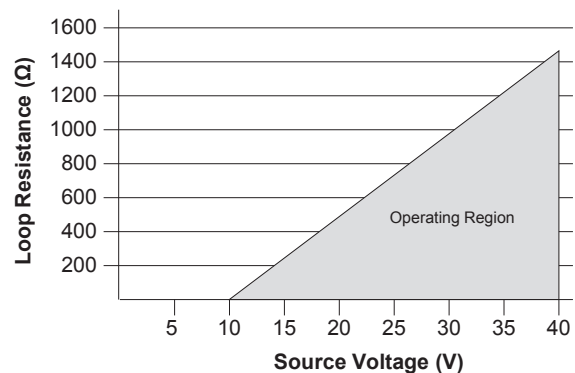
QNTG, QXTG, QNTH, QXTH, QNTS, QXTS see page 23

QNTM, QXTM see page 27

#### Electrical schematic



#### Load curve



## 5 Model/Type code

### 5.1 QCabcdef

a = 2W, 4W, 2V, 4V, 35, 45  
 b = B, E, J, L, N, R, S, T, V, K  
 c = 03, 06  
 d = S, N, H  
 e = A, C, D, G, N, R, S, T, U, V, W, X, 1, 2, 3, 4, 5, 0  
 f = A or M

### 5.2 QGabcdef

a = 2W, 4W, 6W, 2V, 4V, 6V, 14  
 b = A, C, P  
 c = 02, 03, 05, 06  
 d = S, N, H  
 e = A, C, D, G, N, R, S, T, U, V, W, X, 1, 2, 3, 4, 5, 0  
 f = A or M

### 5.3 QNabcdef

a = 2A, 4A, 5A, 7A, 2B, 2C, 2E, 4E, 5E, 7E, 2F, 4F, 5F, 7F, 2G, 4G, 5G, 7G,  
 2H, 4H, 5H, 7H, 2J, 4J, 5J, 7J, 2L, 4L, 5L, 7L,  
 2M, 4M, 5M, 7M, 2N, 4N, 5N, 6N, 7N, 5O, 7O, 2P, 4P, 5P, 7P, 5R, 7R,  
 2S, 4S, 5S, 7S, 5T, 7T, 4X, 6X, 33, 35, 44, 45  
 92, 93, 96, 97,  
 BA, CA, BE, CE, BF, CF, BG, CG, BH, CH, BJ, CJ, BL, CL, BM,  
 CM, BN, CN, BO, CO, BP, CP, BR, CR, BS, CS, BT, CT,  
 TA, TE, TF, TG, TH, TM, TN, TO, TR, TS, TT  
 b = A, B, C, D, E, F, G, H, J, L, M, N, P, Q, R, S, T, U, V, W, Y, Z, K, CD, CR, CZ, CT, CA, CK, CQ, CN  
 c = 02, 03, 05, 06  
 d = S, N, H  
 e = A, C, D, G, N, R, S, T, U, V, W, X, 1, 2, 3, 4, 5, 0  
 f = A or M

### 5.4 QXabcdef

a = 2A, 4A, 5A, 7A, 2B, 2C, 2E, 4E, 5E, 7E, 2F, 4F, 5F, 7F, 2G, 4G, 5G, 7G,  
 2H, 4H, 5H, 7H, 2J, 4J, 5J, 7J, 2L, 4L, 5L, 7L,  
 2M, 4M, 5M, 7M, 2N, 4N, 5N, 6N, 7N, 5O, 7O, 2P, 4P, 5P, 7P, 5R, 7R,  
 2S, 4S, 5S, 7S, 5T, 7T, 2V, 4V, 5V, 6V, 7V, 2W, 4W, 5W, 6W, 7W,  
 4X, 6X, 14, 33, 35, 44, 45  
 92, 93, 94, 96, 97, BA, CA, BE, CE, BF, CF, BG, CG,  
 BH, CH, BJ, CJ, BL, CL, BM, CM, BN, CN, BO, CO, BP, CP, BR, CR,  
 BS, CS, BT, CT, BV, CV, BW, CW  
 TA, TE, TF, TG, TH, TM, TN, TO, TR, TS, TT  
 b = B, E, F, G, J, L, M, N, R, S, T, V, W, K, CR, CT, CK, CN  
 c = 02, 03, 05, 06  
 d = S, N, H  
 e = A, C, D, G, N, R, S, T, U, V, W, X, 1, 2, 3, 4, 5, 0  
 f = A or M

## 6 Regulatory, specific conditions of use, and product marking



### DECLARATION OF CONFORMITY (105414revH)

**Manufacturer:**

Valmet Flow Control Inc. (MN)  
26271 US Highway 59  
Fergus Falls, Minnesota 56537 USA

**Products:**

Quartz QN Series – Valve Position Monitors and Valve Communication Terminals  
Quartz QX Series – Valve Position Monitors and Valve Communication Terminals  
Quartz QC Series – Valve Position Monitors and Valve Communication Terminals  
Quartz QG Series – Valve Position Monitors and Valve Communication Terminals

| Model - Type  | Certificates / Directives / Standards   | Marking  |
|---|---|--|
| QN Series<br>QX Series<br>QC Series                         | EU Type Examination Certificate FM10ATEX0039X<br><u>ATEX 2014/34/EU</u> : EN IEC 60079-0:2018, EN 60079-11:2012<br><u>EMC 2014/30/EU</u> : EN 60947-5-2:2007/A1:2012  |  2809 or 2460<br>ATEX II 1 G Ex ia IIC T6...T1 Ga   |
| QX Series<br>QC Series*<br>* = Not for Dust Protection "tb" | EU Type Examination Certificate FM08ATEX0008X<br><u>ATEX 2014/34/EU</u> : EN IEC 60079-0:2018, EN 60079-1:2014, EN 60079-31:2014, EN ISO 80079-36:2016+COR1:2019, EN ISO 80079-37:2016<br><u>EMC 2014/30/EU</u> : EN 60947-5-2:2007/A1:2012 |  2809 or 2460<br>ATEX II 2 G Ex db h IIC T6...T5 Gb<br>ATEX II 2 D Ex tb h IIC T85°C or T100°C Db |
| QX Series<br>QC Series*<br>* = Not for Dust Protection "tb" | IECEX Certificate of Conformity IECEX FMG 11.0001X<br>IEC 60079-0:2017, IEC 60079-1:2014, IEC 60079-31:2022   | Ex db IIC T6...T5 Gb<br>Ex tb IIC T85°C or T100°C Db   |
| QN Series<br>QX Series<br>QC Series                         | IECEX Certificate of Conformity IECEX FMG 19.0016X<br>IEC 60079-0:2017, IEC 60079-11:2011   | Ex ia IIC T6...T1 Ga   |
| QN Series<br>QX Series<br>QG Series<br>QC Series            | <u>EMC 2014/30/EU</u><br>EN 60947-5-2:2007/A1:2012  |   |

**Manufacturing Locations:**

26271 US Hwy 59, Fergus Falls, Minnesota 56537 USA  
Product Serial Number Designation = A\*\*\*\*\*  
ATEX Notified Body - FM Approvals Europe Ltd., Dublin, Ireland (Notified Body Number 2809)

Vanha Porvoontie 229, FIN-01380 Vantaa, Finland  
Product Serial Number Designation = V\*\*\*\*\*  
ATEX Notified Body - DNV Product Assurance AS, Norway (Notified Body Number 2460)

No.1022, Fenghua Road, Economic & Technology Development Zone, Jiaxing City, Zhejiang Province, China  
Product Serial Number Designation = J\*\*\*\*\*  
ATEX Notified Body - DNV Product Assurance AS, Norway (Notified Body Number 2460)

We declare under our sole responsibility that the products, as described, are in conformity with the listed standards and directives.

Fergus Falls, 1<sup>st</sup> July 2024



Bryan Beckman, Quality Manager  
Authorized Person of the Manufacturer



**6 Regulatory, specific conditions of use, and product marking continued**

**SPECIFIC CONDITIONS OF USE / MARKING**

| <b>For QN, QX and QC Series -- FM10ATEX0039X</b>   |   |
|--|---|
| <b>Specific Conditions of Use - Notes</b>  | <b>Marking</b>  |
| <p>1. Parts of the enclosure are non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions which might cause a build up of electrostatic charge on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.</p> <p>2. When installed within a EPL Ga location, the aluminum alloy enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.</p> <p>3. Using the box provided on the nameplate, the user shall permanently mark the Type of Protection chosen for the specific installation. Once the Type of Protection has been marked it shall not be changed.</p> <p>NOTE: See also FM08ATEX0008X for Series QN, QX and QC with Type of Protection "d". See also Control Drawing 105193 for "Ex ia" installation.</p> | <p>ATEX II 1 G Ex ia IIC T4...T1 Ga Ta = -25°C to +80°C<br/>                 ATEX II 1 G Ex ia IIC T4...T1 Ga Ta = -25°C to +68°C<br/>                 ATEX II 1 G Ex ia IIC T4...T1 Ga Ta = -25°C to +53°C<br/>                 ATEX II 1 G Ex ia IIC T4...T1 Ga Ta = -40°C to +80°C<br/>                 ATEX II 1 G Ex ia IIC T4...T1 Ga Ta = -40°C to +74°C<br/>                 ATEX II 1 G Ex ia IIC T4...T1 Ga Ta = -40°C to +61°C<br/>                 ATEX II 1 G Ex ia IIC T4...T1 Ga Ta = -25°C to +74°C<br/>                 ATEX II 1 G Ex ia IIC T4...T1 Ga Ta = -25°C to +61°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -55°C to +80°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -40°C to +80°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -40°C to +69°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -40°C to +64°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -40°C to +46°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -40°C to +34°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -25°C to +68°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -25°C to +61°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -25°C to +40°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -25°C to +25°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -25°C to +69°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -25°C to +64°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -25°C to +46°C<br/>                 ATEX II 1 G Ex ia IIC T5 Ga Ta = -25°C to +34°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -55°C to +65°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -40°C to +65°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -40°C to +57°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -40°C to +52°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -40°C to +34°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -40°C to +22°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -25°C to +56°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -25°C to +49°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -25°C to +28°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -25°C to +13°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -25°C to +57°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -25°C to +52°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -25°C to +34°C<br/>                 ATEX II 1 G Ex ia IIC T6 Ga Ta = -25°C to +22°C</p> |

| <b>For QX and QC Series -- FM08ATEX0008X</b>   |  |
|--|--|
| <b>Specific Conditions of Use - Notes</b>  | <b>Marking</b>   |
| <p>1. To minimize the risk of electrostatic sparking, the equipment shall be cleaned only with a damp cloth.</p> <p>2. Using the box provided on the nameplate, the user shall permanently mark the Type of Protection chosen for the specific installation. Once the Type of Protection has been marked it shall not be changed.</p> <p>3. Consult the manufacturer if dimensional information on the flameproof joints is necessary.</p> <p>NOTE: See also FM10ATEX0039X for Series QX and QC with Type of Protection "I".</p> | <p>ATEX II 2 G Ex db h IIC T5 Gb Ta = -55°C to +80°C<br/>                 ATEX II 2 G Ex db h IIC T5 Gb Ta = -40°C to +80°C<br/>                 ATEX II 2 G Ex db h IIC T6 Gb Ta = -40°C to +65°C<br/>                 ATEX II 2 G Ex db h IIC T5 Gb Ta = -25°C to +80°C<br/>                 ATEX II 2 G Ex db h IIC T6 Gb Ta = -25°C to +65°C<br/>                 ATEX II 2 G Ex db h IIC T6 Gb Ta = -25°C to +70°C<br/>                 ATEX II 2 D Ex tb h IIIC T100°C Db Ta = -40°C to +80°C<br/>                 ATEX II 2 D Ex tb h IIIC T100°C Db Ta = -25°C to +80°C<br/>                 ATEX II 2 D Ex tb h IIIC T85°C Db Ta = -25°C to +70°C</p> |

| <b>For QX and QC Series -- IECEx FMG 11.0001X</b>   |  |
|---|--|
| <b>Specific Conditions of Use - Notes</b>   | <b>Marking</b>   |
| <p>1. To minimize the risk of electrostatic sparking, the equipment shall be cleaned only with a damp cloth.</p> <p>2. Consult the manufacturer if dimensional information on the flameproof joints is necessary.</p> | <p>Ex db IIC T5 Gb Ta = -55°C to +80°C<br/>                 Ex db IIC T5 Gb Ta = -40°C to +80°C<br/>                 Ex db IIC T6 Gb Ta = -40°C to +65°C<br/>                 Ex db IIC T5 Gb Ta = -25°C to +80°C<br/>                 Ex db IIC T6 Gb Ta = -25°C to +65°C<br/>                 Ex db IIC T6 Gb Ta = -25°C to +70°C<br/>                 Ex tb IIIC T100°C Db Ta = -40°C to +80°C<br/>                 Ex tb IIIC T100°C Db Ta = -25°C to +80°C<br/>                 Ex tb IIIC T85°C Db Ta = -25°C to +70°C</p> |

## 6 Regulatory, specific conditions of use, and product marking continued

| For QN, QX and QC Series – IECEx FMG 19.0016X  |   |
|--|---|
| Specific Conditions of Use - Notes   | Marking   |
| <p>1. Parts of the enclosure are non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions which might cause a build up of electrostatic charge on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.</p> <p>2. When installed within a EPL Ga location, the aluminum alloy enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.</p> <p>3. Using the box provided on the nameplate, the user shall permanently mark the Type of Protection chosen for the specific installation. Once the Type of Protection has been marked it shall not be changed.</p> | <p>Ex ia IIC T4...T1 Ga Ta = -25°C to +80°C<br/> Ex ia IIC T4...T1 Ga Ta = -25°C to +68°C<br/> Ex ia IIC T4...T1 Ga Ta = -25°C to +53°C<br/> Ex ia IIC T4...T1 Ga Ta = -40°C to +80°C<br/> Ex ia IIC T4...T1 Ga Ta = -40°C to +74°C<br/> Ex ia IIC T4...T1 Ga Ta = -40°C to +61°C<br/> Ex ia IIC T4...T1 Ga Ta = -25°C to +74°C<br/> Ex ia IIC T4...T1 Ga Ta = -25°C to +61°C<br/> Ex ia IIC T5 Ga Ta = -55°C to +80°C<br/> Ex ia IIC T5 Ga Ta = -40°C to +80°C<br/> Ex ia IIC T5 Ga Ta = -40°C to +69°C<br/> Ex ia IIC T5 Ga Ta = -40°C to +64°C<br/> Ex ia IIC T5 Ga Ta = -40°C to +46°C<br/> Ex ia IIC T5 Ga Ta = -40°C to +34°C<br/> Ex ia IIC T5 Ga Ta = -25°C to +68°C<br/> Ex ia IIC T5 Ga Ta = -25°C to +61°C<br/> Ex ia IIC T5 Ga Ta = -25°C to +40°C<br/> Ex ia IIC T5 Ga Ta = -25°C to +25°C<br/> Ex ia IIC T5 Ga Ta = -25°C to +69°C<br/> Ex ia IIC T5 Ga Ta = -25°C to +64°C<br/> Ex ia IIC T5 Ga Ta = -25°C to +46°C<br/> Ex ia IIC T5 Ga Ta = -25°C to +34°C<br/> Ex ia IIC T6 Ga Ta = -55°C to +65°C<br/> Ex ia IIC T6 Ga Ta = -40°C to +65°C<br/> Ex ia IIC T6 Ga Ta = -40°C to +57°C<br/> Ex ia IIC T6 Ga Ta = -40°C to +52°C<br/> Ex ia IIC T6 Ga Ta = -40°C to +34°C<br/> Ex ia IIC T6 Ga Ta = -40°C to +22°C<br/> Ex ia IIC T6 Ga Ta = -25°C to +56°C<br/> Ex ia IIC T6 Ga Ta = -25°C to +49°C<br/> Ex ia IIC T6 Ga Ta = -25°C to +28°C<br/> Ex ia IIC T6 Ga Ta = -25°C to +13°C<br/> Ex ia IIC T6 Ga Ta = -25°C to +57°C<br/> Ex ia IIC T6 Ga Ta = -25°C to +52°C<br/> Ex ia IIC T6 Ga Ta = -25°C to +34°C<br/> Ex ia IIC T6 Ga Ta = -25°C to +22°C</p> |

| For QX and QC Series – FM17US0048X / FM17CA0026X   |   |
|--|---|
| Specific Conditions of Use - Notes   | Marking   |
| <p>1. Consult the manufacturer if dimensional information on the flameproof joints is necessary.</p> | <p>XP / I / 1 / BCD<br/> DIP / II-III / 1 / EFG<br/> NI / I-II-III / 2 / ABCDEFG<br/> I / 1 / AEx db IIC T5 Gb<br/> 21 / AEx tb IIIC T85°C or T100°C Db<br/> Ex tb IIIC T100°C Db;<br/> I / 2 / IIC / T5 Gc</p> <p>*See Approval Certificates for applicable models / type codes.</p> |

| For QN and QC Series – FM17US0129X / FM17CA0072X   |  |
|--|--|
| Specific Conditions of Use - Notes   | Marking  |
| <p>1. Parts of the enclosure is constructed from plastic. To prevent the risk of electrostatic sparking the plastic surface should only be cleaned only with a damp cloth.</p> <p>2. The apparatus enclosure may contain aluminum which is considered to constitute a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction.</p> <p>NOTE: See also Control Drawing 105193 for "IS" installation.</p> | <p>NI / I-II-III / 2 / ABCDEFG<br/> I / 2 / IIC / T5 Gc<br/> IS / I, II, III / 1 / ADBCEFG – 105193<br/> CI I / Zone 0 / AEx ia IIC T6...T1 Ga<br/> CI I / Zone 0 / Ex ia IIC T6...T1 Ga</p> <p>*See Approval Certificates for applicable models / type codes.</p> |

# 7 Appendix

## 7.1 Controlled installation drawings

**HAZARDOUS (CLASSIFIED) LOCATION**

4-20mA TRANSMITTER (+) (-)

Stone Enclosure

NON-HAZARDOUS (SAFE AREA) LOCATION

Control Equipment

Separate Shields

Intrinsic Safety Barrier (Associated Apparatus)

Intrinsically Safe Ground

**INSTALLATION NOTES (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):**

**Entity Parameters:** Vmax = 30 V; Imax = 100 mA; Ci = 66 nF; Li = 0 H; Pi = 0.75 W

- Voc or Vt < Vmax, Isc or It < Ii, Ca > Ci + Ccable, La > Li + Lcable.
- Dust-tight conduit seal must be used when installed in Class II and Class III environments.
- Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
- Installation should be in accordance with ANSI/ISA RPA12.6 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70).
- The configuration of associated apparatus for each sensor wiring pair must be FMRC Approved.
- Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
- To maintain intrinsic safety, wiring associated with each sensor must be run in separate cables or separate shields and/or transmitter are optional based on model number. (if more than 2 switches, follow instructions above for each switch.)
- Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
- Substitution of components may impair hazardous location safety.

**INSTALLATION NOTES (Ex:ia IIC T4):**

**Entity Parameters:** Ui = 30 V; Ii = 100 mA; Ci = 66 nF; Li = 0 H; Pi = 0.75 W

- Voc or Vt < Ui, Isc or It < Ii, Ca > Ci + Ccable, La > Li + Lcable.
- Dust-tight conduit seal must be used when installed in Zone 20, Zone 21, and Zone 22 environments or where Ingress Protection of IP67 is required.
- Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
- Installation should be in accordance with appropriate local code or practice.
- The configuration of associated apparatus for each sensor wiring pair or solenoid wiring pair must be approved.
- Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
- To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
- Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
- Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
- Substitution of components may impair hazardous location safety.

**INSTALLATION NOTES (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):**

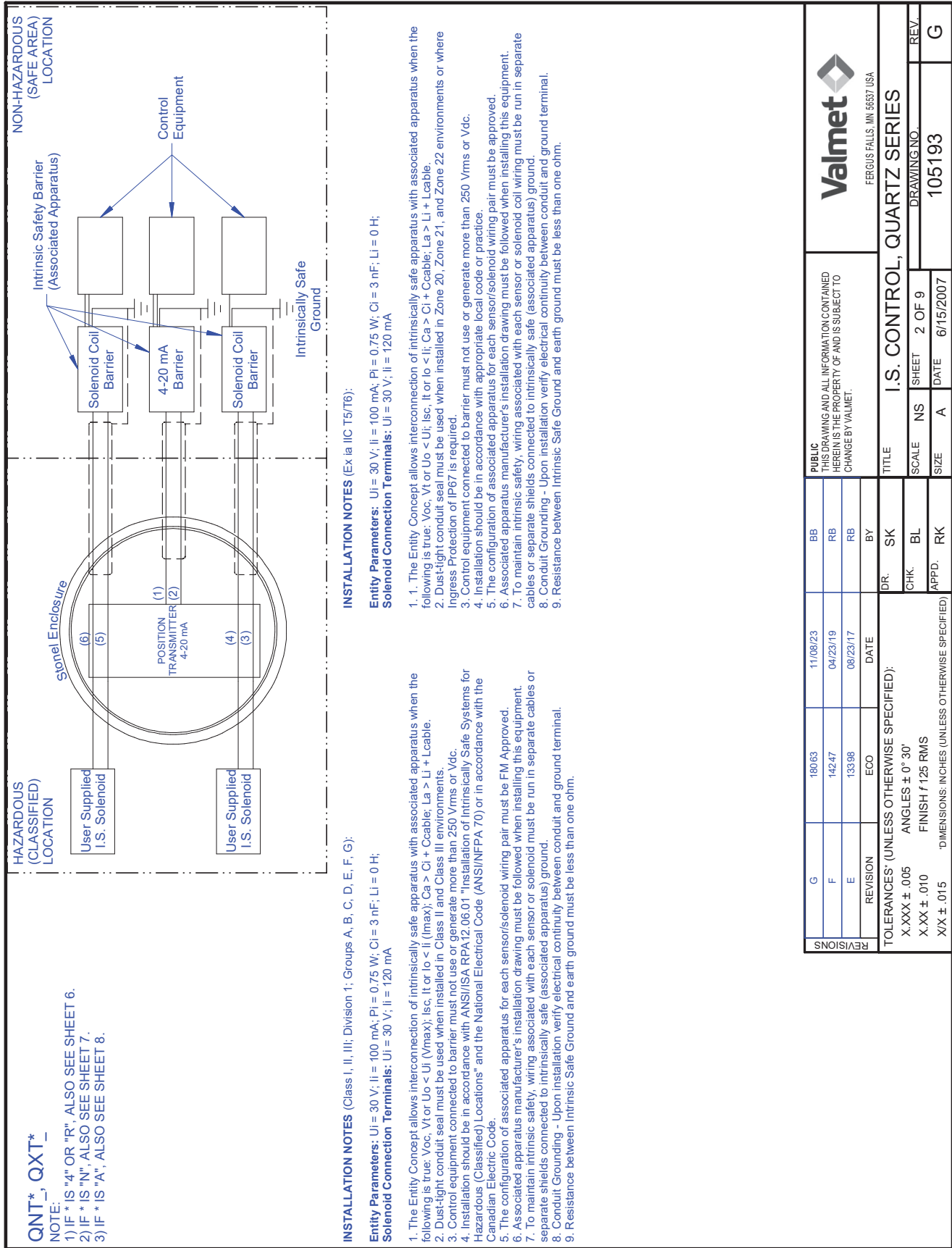
**Entity Parameters:** Vmax = 30 V; Imax = 100 mA; Ci = 66 nF; Li = 0 H; Pi = 0.75 W

- Voc or Vt < Vmax, Isc or It < Ii, Ca > Ci + Ccable, La > Li + Lcable.
- Dust-tight conduit seal must be used when installed in Class II and Class III environments.
- Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
- Installation should be in accordance with ANSI/ISA RPA12.6 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70).
- The configuration of associated apparatus for each sensor wiring pair must be FMRC Approved.
- Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
- To maintain intrinsic safety, wiring associated with each sensor must be run in separate cables or separate shields and/or transmitter are optional based on model number. (if more than 2 switches, follow instructions above for each switch.)
- Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
- Substitution of components may impair hazardous location safety.

| REVISIONS   | NO.   | DESCRIPTION | DATE     | BY | CHK. | APPD. |
|---|-------|-------------|----------|----|------|-------|
| G   | 18063 |             | 11/08/23 | BB |      |       |
| F   | 14247 |             | 04/23/19 | RB |      |       |
| E   | 13398 |             | 08/23/17 | RB |      |       |
| REVISION  |       |             |          |    |      |       |
| ECO   |       |             |          |    |      |       |
| TOLERANCES* (UNLESS OTHERWISE SPECIFIED):                     |       |             |          |    |      |       |
| X.XXX ± .005 ANGLES ± 0° 30'                                  |       |             |          |    |      |       |
| X.XX ± .010 FINISH f 125 RMS                                  |       |             |          |    |      |       |
| X/X ± .015 *DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED) |       |             |          |    |      |       |

|   |  |
|---|--|
| <b>Valmet</b><br>FERGUS FALLS, MN 56537 USA | PUBLIC<br>THIS DRAWING AND ALL INFORMATION CONTAINED<br>HEREIN IS THE PROPERTY OF AND IS SUBJECT TO<br>CHANGE BY VALMET. |
| TITLE<br><b>I.S. CONTROL, QUARTZ SERIES</b> | DRAWING NO.<br><b>105193</b>   |
| SCALE<br>NS                                 | SHEET<br>1 OF 9  |
| SIZE<br>A                                   | DATE<br>6/15/2007  |
| REV.  | G  |

7.1 Controlled installation drawings continued



**QNT\*, QXT\***  
NOTE: \_ , \_

- 1) IF \* IS "4" OR "R", ALSO SEE SHEET 6.
- 2) IF \* IS "N", ALSO SEE SHEET 7.
- 3) IF \* IS "A", ALSO SEE SHEET 8.

**INSTALLATION NOTES** (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):

**Entity Parameters:** U<sub>i</sub> = 30 V; I<sub>i</sub> = 100 mA; P<sub>i</sub> = 0.75 W; C<sub>i</sub> = 3 nF; L<sub>i</sub> = 0 H;  
**Solenoid Connection Terminals:** U<sub>i</sub> = 30 V; I<sub>i</sub> = 120 mA

1. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus when the following is true: Voc, Vi or Uo < Ui; Vmax; Isc, It or Io < Ii; Cca > Ci + Ccable; La > Li + Lcable.
2. Dust-tight conduit seal must be used when installed in Class II and Class III environments.
3. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
4. Installation should be in accordance with ANSI/ISA RPA12.06.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70) or in accordance with the Canadian Electric Code.
5. The configuration of associated apparatus for each sensor/solenoid wiring pair must be FM Approved.
6. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
7. To maintain intrinsic safety, wiring associated with each sensor or solenoid must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
8. Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
9. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.

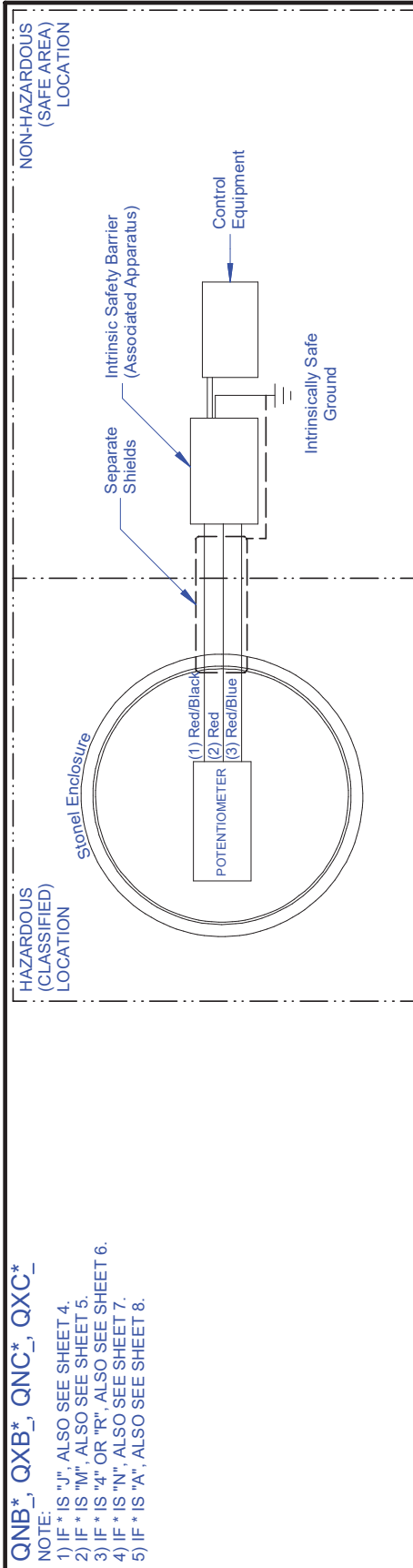
**INSTALLATION NOTES** (Ex ia IIC T5/T6):

**Entity Parameters:** U<sub>i</sub> = 30 V; I<sub>i</sub> = 100 mA; P<sub>i</sub> = 0.75 W; C<sub>i</sub> = 3 nF; L<sub>i</sub> = 0 H;  
**Solenoid Connection Terminals:** U<sub>i</sub> = 30 V; I<sub>i</sub> = 120 mA

1. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus when the following is true: Voc, Vi or Uo < Ui; Vmax; Isc, It or Io < Ii; Cca > Ci + Ccable; La > Li + Lcable.
2. Dust-tight conduit seal must be used when installed in Zone 20, Zone 21, and Zone 22 environments or where Ingress Protection of IP67 is required.
3. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
4. Installation should be in accordance with appropriate local code or practice.
5. The configuration of associated apparatus for each sensor/solenoid wiring pair must be approved.
6. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
7. To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
8. Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
9. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.

|  |          |        |          |                             |  |                                      |
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|  | F        | 142.47 | 04/23/19 | RB                          |  |                                      |
|  | E        | 133.98 | 08/23/17 | RB                          |  |                                      |
|  | REVISION | ECO    | DATE     | BY                          |  |                                      |
| TOLERANCES: (UNLESS OTHERWISE SPECIFIED):                  |          |        |          |                             |  |                                      |
| X.XXX ± .005 ANGLES ± 0° 30'                               |          |        |          |                             |  |                                      |
| X.XX ± .010 FINISH f 125 RMS                               |          |        |          |                             |  |                                      |
| X/X ± .015 DIMENSIONS: INCHES (UNLESS OTHERWISE SPECIFIED) |          |        |          |                             |  |                                      |
| TITLE  |          |        |          | I.S. CONTROL, QUARTZ SERIES |  |                                      |
| DR.  |          |        |          | SK                          |  |                                      |
| CHK.   |          |        |          | BL                          |  |                                      |
| APPD.  |          |        |          | RK                          |  |                                      |
| SCALE  |          | NS     |          | SHEET                       |  | REV.                                 |
| SIZE   |          | A      |          | 2 OF 9                      |  | G                                    |
|  |          |        |          | DRAWING NO.                 |  | 105193                               |
|  |          |        |          | DATE                        |  | 6/15/2007                            |

7.1 Controlled installation drawings continued



**QNB\*, QXB\*, QNC\*, QXC\*, QNX\***  
 NOTE:  
 1) IF \* IS "J", ALSO SEE SHEET 4.  
 2) IF \* IS "M", ALSO SEE SHEET 5.  
 3) IF \* IS "4" OR "R", ALSO SEE SHEET 6.  
 4) IF \* IS "N", ALSO SEE SHEET 7.  
 5) IF \* IS "A", ALSO SEE SHEET 8.

**INSTALLATION NOTES (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):**


**Entity Parameters:** Vmax = 26 V; Imax = 14 mA; Ci = 0 F; Li = 0 H; Pi = 50 mW

1. Voc or Vt < Vmax, Isc or It < Ica, Ca > Ci + Ccable, La > Li + Lcable.
2. Dust-tight conduit seal must be used when installed in Class II and Class III environments.
3. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
4. Installation should be in accordance with ANSI/ISA RPA12.6 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70).
5. The configuration of associated apparatus for each sensor wiring pair must be FMRC Approved.
6. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
7. To maintain intrinsic safety, wiring associated with each sensor must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
8. Switches and/or potentiometer are optional based on model number. (if more than 2 switches, follow instructions above for each switch.)
9. Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
10. Substitution of components may impair hazardous location safety.

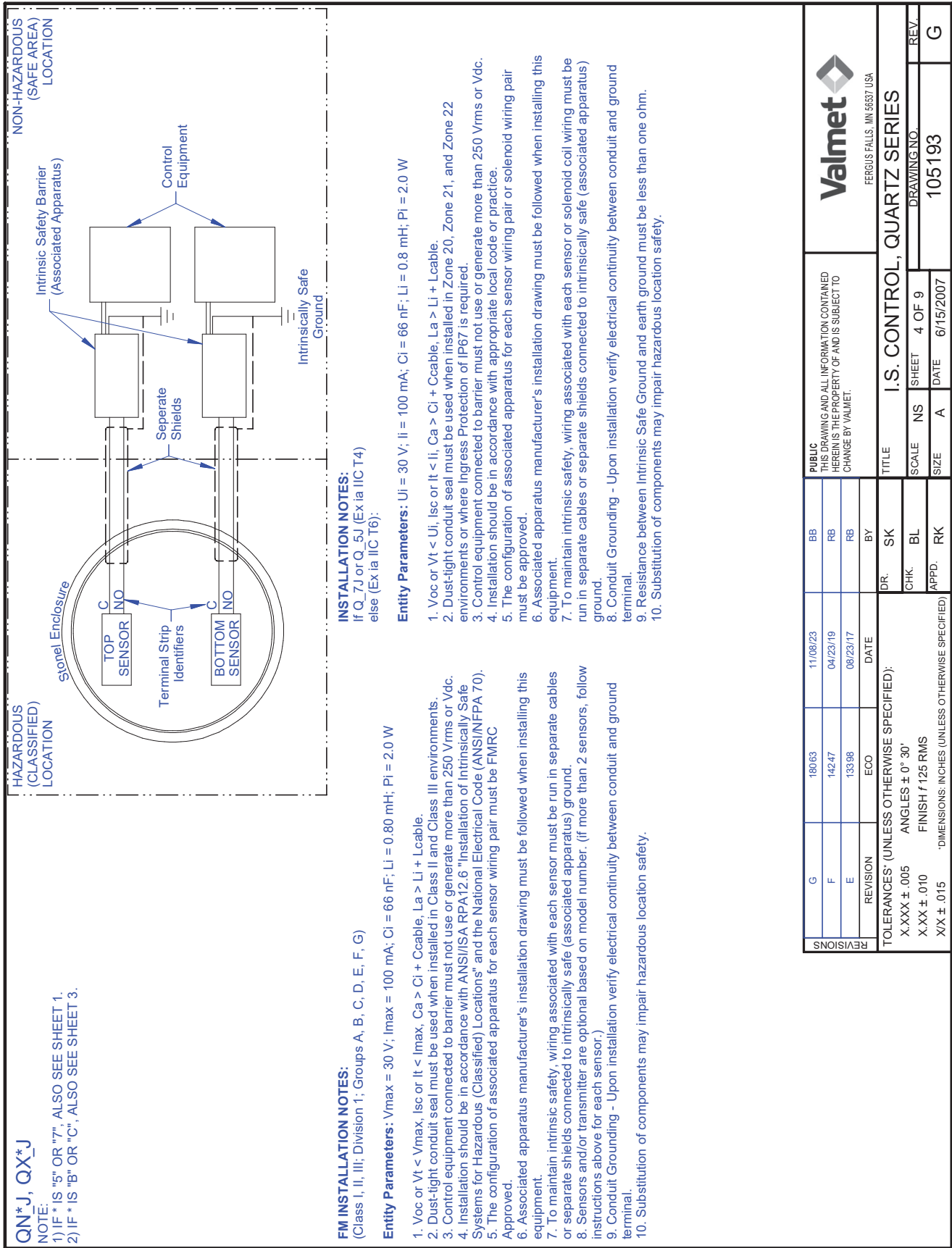
**INSTALLATION NOTES (Ex ia IIC T5/T6):**

**Entity Parameters:** Ui = 26 V; Ii = 14 mA; Ci = 0 F; Li = 0 H; Pi = 50 mW

1. Voc or Vt < Ui, Isc or It < Ii, Ca > Ci + Ccable, La > Li + Lcable.
2. Dust-tight conduit seal must be used when installed in Zone 20, Zone 21, and Zone 22 environments or where Ingress Protection of IP67 is required.
3. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
4. Installation should be in accordance with appropriate local code or practice.
5. The configuration of associated apparatus for each sensor wiring pair or solenoid wiring pair must be approved.
6. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
7. To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
8. Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
9. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
10. Substitution of components may impair hazardous location safety.

|   |       |  |       |          |    |   |       |          |    |   |       |          |    |          |     |      |    |   |  |
|---|-------|--|-------|----------|----|---|-------|----------|----|---|-------|----------|----|----------|-----|------|----|---|--|
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| REVISIONS<br><table border="1"> <tr> <td>G</td> <td>18063</td> <td>11/08/23</td> <td>BB</td> </tr> <tr> <td>F</td> <td>14247</td> <td>04/23/19</td> <td>RB</td> </tr> <tr> <td>E</td> <td>13398</td> <td>08/23/17</td> <td>RB</td> </tr> <tr> <td>REVISION</td> <td>ECO</td> <td>DATE</td> <td>BY</td> </tr> </table> |       | G  | 18063 | 11/08/23 | BB | F | 14247 | 04/23/19 | RB | E | 13398 | 08/23/17 | RB | REVISION | ECO | DATE | BY | TITLE<br><b>I.S. CONTROL, QUARTZ SERIES</b> |  |
| G   | 18063 | 11/08/23   | BB    |          |    |   |       |          |    |   |       |          |    |          |     |      |    |   |  |
| F   | 14247 | 04/23/19   | RB    |          |    |   |       |          |    |   |       |          |    |          |     |      |    |   |  |
| E   | 13398 | 08/23/17   | RB    |          |    |   |       |          |    |   |       |          |    |          |     |      |    |   |  |
| REVISION  | ECO   | DATE   | BY    |          |    |   |       |          |    |   |       |          |    |          |     |      |    |   |  |
| TOLERANCES: (UNLESS OTHERWISE SPECIFIED):<br>X.XXX ± .005 ANGLES ± 0° 30'<br>X.XX ± .010 FINISH f 125 RMS<br>X/X ± .015 DIMENSIONS: INCHES (UNLESS OTHERWISE SPECIFIED)   |       | SCALE NS SHEET 3 OF 9<br>DATE 6/15/2007  |       |          |    |   |       |          |    |   |       |          |    |          |     |      |    |   |  |
| DR. SK<br>CHK. BL<br>APPD. RK   |       | DRAWING NO.<br><b>105193</b>   |       |          |    |   |       |          |    |   |       |          |    |          |     |      |    |   |  |
| REV.  |       | REV.   |       |          |    |   |       |          |    |   |       |          |    |          |     |      |    |   |  |

7.1 Controlled installation drawings continued



**QN\*J, QX\*J**

- NOTE:  
 1) IF \* IS "5" OR "7", ALSO SEE SHEET 1.  
 2) IF \* IS "B" OR "C", ALSO SEE SHEET 3.

**FM INSTALLATION NOTES:**

(Class I, II, III; Division 1; Groups A, B, C, D, E, F, G)

**Entity Parameters:** Vmax = 30 V; Imax = 100 mA; Ci = 66 nF; Li = 0.80 mH; Pi = 2.0 W

- Voc or Vt < Vmax, Isc or It < Imax, Ca > Ci + Ccable, La > Li + Lcable.
- Dust-tight conduit seal must be used when installed in Class II and Class III environments.
- Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
- Installation should be in accordance with ANSI/ISA RPA 12.6 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70).
- The configuration of associated apparatus for each sensor wiring pair must be FMRC Approved.
- Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
- To maintain intrinsic safety, wiring associated with each sensor must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
- Sensors and/or transmitter are optional based on model number. (if more than 2 sensors, follow instructions above for each sensor.)
- Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
- Substitution of components may impair hazardous location safety.

**INSTALLATION NOTES:**

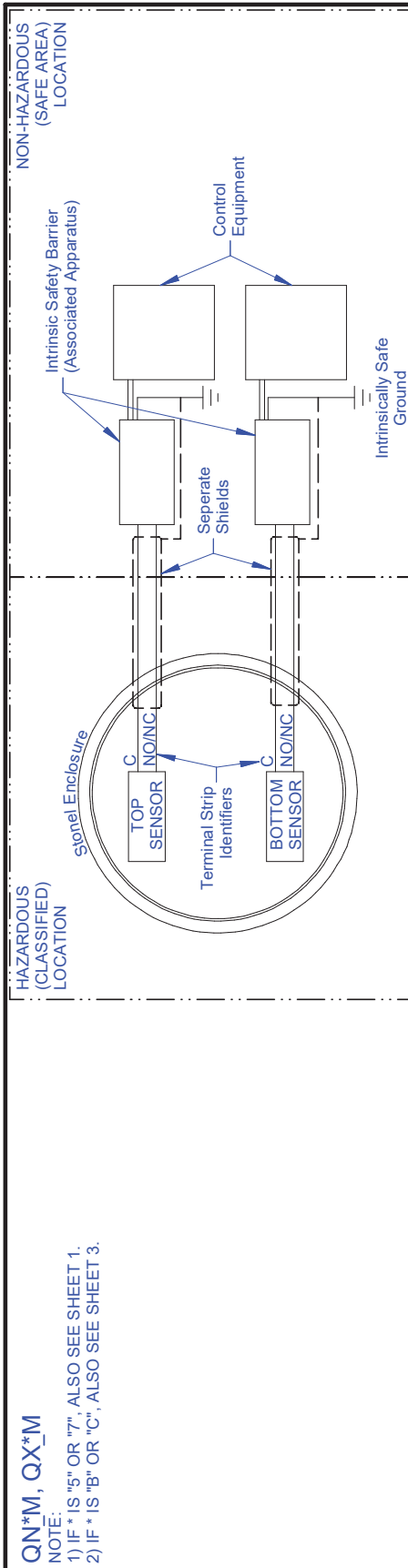
If Q\_7J or Q\_5J (Ex ia IIC T4) else (Ex ia IIC T6):

**Entity Parameters:** Uj = 30 V; Ij = 100 mA; Ci = 66 nF; Li = 0.8 mH; Pi = 2.0 W

- Voc or Vt < Uj, Isc or It < Ij, Ca > Ci + Ccable, La > Li + Lcable.
- Dust-tight conduit seal must be used when installed in Zone 20, Zone 21, and Zone 22 environments or where Ingress Protection of IP67 is required.
- Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
- Installation should be in accordance with appropriate local code or practice.
- The configuration of associated apparatus for each sensor wiring pair or solenoid wiring pair must be approved.
- Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
- To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
- Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
- Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
- Substitution of components may impair hazardous location safety.

|   |   |       |          |     |  |                                      |
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|   | F   | 14247 | 04/23/19 | RB  |  |                                      |
|   | E   | 13398 | 08/23/17 | RB  |  |                                      |
|   | REVISION  | ECO   | DATE     | BY  |  |                                      |
| TOLERANCES: (UNLESS OTHERWISE SPECIFIED): |   |       |          | DR. | TITLE  |                                      |
| X.XXX ± .005                              | ANGLES ± 0° 30'                                 |       | CHK.     | SK  | I.S. CONTROL, QUARTZ SERIES  |                                      |
| X.XX ± .010                               | FINISH f 125 RMS                                |       | APPD.    | BL  | SCALE  | NS                                   |
| X/X ± .015                                | DIMENSIONS: INCHES (UNLESS OTHERWISE SPECIFIED) |       |          | RK  | SIZE   | A                                    |
|   |   |       |          |     | SHEET  | 4 OF 9                               |
|   |   |       |          |     | DATE   | 6/15/2007                            |
|   |   |       |          |     | DRAWING NO.  | 105193                               |
|   |   |       |          |     | REV.   | G                                    |

7.1 Controlled installation drawings continued



**QN\*M, QX\*M**

NOTE:

- 1) IF \* IS "5" OR "7", ALSO SEE SHEET 1.
- 2) IF \* IS "B" OR "C", ALSO SEE SHEET 3.

**FM INSTALLATION NOTES:**

(Class I, II, III; Division 1; Groups A, B, C, D, E, F, G)

**Entity Parameters:** Vmax = 30 V; Imax = 100 mA; Ci = 66 nF; Li = 0.80 mH; Pi = 2.0 W

1. Voc or Vt < Vmax, Isc or It < Imax, Ca > Ci + Ccable, La > Li + Lcable.
2. Dust-tight conduit seal must be used when installed in Class II and Class III environments.
3. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
4. Installation should be in accordance with ANSI/ISA RPA12.6 "Installation of Intrinsically Safe Systems for Hazardous(Classified) Locations" and the National Electrical Code (ANSI/NFPA 70).
5. The configuration of associated apparatus for each sensor wiring pair must be FMRC Approved.
6. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
7. To maintain intrinsic safety, wiring associated with each sensor must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
8. Sensors and/or transmitter are optional based on model number. (if more than 2 sensors, follow instructions above for each sensor.)
9. Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
10. Substitution of components may impair hazardous location safety.

**INSTALLATION NOTES:**

If Q\_7M or Q\_5M (Ex ia IIC T4) else (Ex ia IIC T6):

**Entity Parameters:** Ui = 30 V; Ii = 100 mA; Ci = 66 nF; Li = 0.8 mH; Pi = 2.0 W

1. Voc or Vt < Ui, Isc or It < Ii, Ca > Ci + Ccable, La > Li + Lcable.
2. Dust-tight conduit seal must be used when installed in Zone 20, Zone 21, and Zone 22 environments or where Ingress Protection of IP67 is required.
3. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
4. Installation should be in accordance with appropriate local code or practice.
5. The configuration of associated apparatus for each sensor wiring pair or solenoid wiring pair must be approved.
6. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
7. To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
8. Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
9. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
10. Substitution of components may impair hazardous location safety.

|  |          |                                      |                |
|--|----------|--------------------------------------|----------------|
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| BB   | 11/08/23 | TITLE I.S. CONTROL, QUARTZ SERIES    |                |
| RB   | 04/23/19 | SCALE NS                             | SHEET 5 OF 9   |
| RB   | 08/23/17 | SIZE A                               | DATE 6/15/2007 |
| BY   |          | DRAWING NO. 105193                   |                |
| DR. SK   |          | REV. G                               |                |
| CHK. BL  |          |                                      |                |
| APPD. RK   |          |                                      |                |
| TOLERANCES* (UNLESS OTHERWISE SPECIFIED):  |          |                                      |                |
| X.XXX ± .005 ANGLES ± 0° 30'   |          |                                      |                |
| X.XX ± .010 FINISH F125 RMS  |          |                                      |                |
| X/X ± .015 *DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED)  |          |                                      |                |

7.1 Controlled installation drawings continued

**QN44, QX44, QC45, QN45, QX45, QN\*4, QX\*4, QN\*R, QX\*R**

NOTE:

- 1) IF \* IS "5" OR "7", ALSO SEE SHEET 1.
- 2) IF \* IS "T", ALSO SEE SHEET 2.
- 3) IF \* IS "B" OR "C", ALSO SEE SHEET 3.

**INSTALLATION NOTES** (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):

**Entity Parameters:**  
**QN44, QX44 Sensors:** Ui = 22 V; Ii (Imax) = 120 mA; Ci = 98 nF; Li = 0.8 mH; Pi = 2.0 W  
**QC45, QN45; QX45 Sensors:** Ui = 22 V; Ii (Imax) = 120 mA; Ci = 3 nF; Li = 0 H; Pi = 0.4 W  
**Solenoid Connection Terminals:** Ui = 30V, Ii = 120mA

1. Uo < Ui (Vmax); Io < Ii (Imax); Ca > Ci + Ccable, La > Li + Lcable.  
 2. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.  
 3. Installation should be in accordance with ANSI/ISA RPA12.6.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70) or in accordance with the Canadian Electric Code.  
 4. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.  
 5. To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground. Each Sensor and Solenoid coil shall be wired as separate intrinsically safe circuits.  
 6. Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.  
 7. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.  
 8. Parts of the enclosure are non-conducting and may generate an ignition-capable level or electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charge on non-conducting surfaces. Additionally, cleaning of the equipment should only be done with a damp cloth.  
 9. Substitution of components may impair hazardous location safety.

**INSTALLATION NOTES** (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):

**Entity Parameters:**  
**QN44; QX44 Sensors:** Ui = 22 V; Ii = 120 mA; Ci = 98 nF; Li = 0.8 mH; Pi = 2.0 W  
**QC45, QN45; QX45 Sensors:** Ui = 22 V; Ii = 120 mA; Ci = 3 nF; Li = 0 H; Pi = 0.4 W  
**Solenoid Connection Terminals:** Ui = 30V, Ii = 120mA

1. Voc or Vi < Ui, Isc or Ii < Ii, Ca > Ci + Ccable, La > Li + Lcable.  
 2. Dust-tight conduit seal must be used when installed in Zone 20, Zone 21, and Zone 22 environments or where Ingress Protection of IP67 is required.  
 3. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.  
 4. Installation should be in accordance with appropriate local code or practice.  
 5. The configuration of associated apparatus for each sensor wiring pair or solenoid wiring pair must be approved.  
 6. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.  
 7. To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.  
 8. Conduit Grounding - Upon installation, verify electrical continuity between conduit and ground terminal.  
 9. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.  
 10. Substitution of components may impair hazardous location safety.

|          |       |          |    |  |
|----------|-------|----------|----|--|
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| F        | 14247 | 04/23/19 | RB | THIS DRAWING AND ALL INFORMATION CONTAINED HEREIN IS THE PROPERTY OF AND IS SUBJECT TO CHANGE BY VALMET. |
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| REVISION | ECO   | DATE     | BY |  |

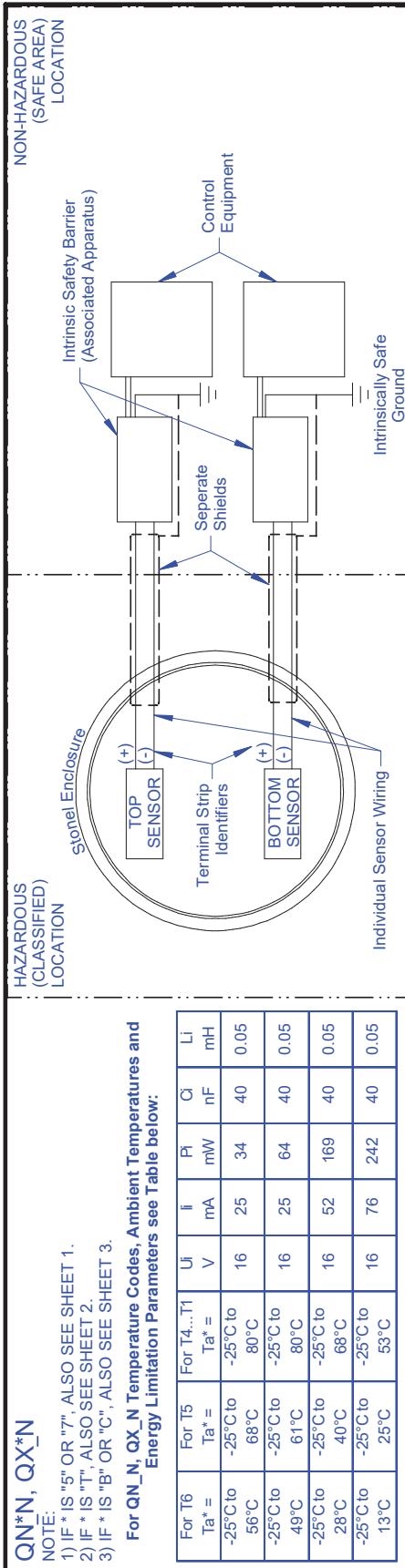
|   |   |
|---|---|
| TOLERANCES: (UNLESS OTHERWISE SPECIFIED): |   |
| X.XXX ± .005                              | ANGLES ± 0° 30'                                 |
| X.XX ± .010                               | FINISH F 125 RMS                                |
| X/X ± .015                                | DIMENSIONS: INCHES (UNLESS OTHERWISE SPECIFIED) |

|                                    |    |                            |           |
|------------------------------------|----|----------------------------|-----------|
| <b>Valmet</b>                      |    | FERGUS FALLS, MN 56537 USA |           |
| <b>I.S. CONTROL, QUARTZ SERIES</b> |    | DRAWING NO.                |           |
| SCALE                              | NS | SHEET                      | 6 OF 9    |
| SIZE                               | A  | DATE                       | 6/15/2007 |
| APPD.                              | RK | DRAWING NO.                | 105193    |
| CHK.                               | BL | REV.                       | G         |



7.1 Controlled installation drawings continued



**QNN, QXN**

NOTE:  
 1) IF \* IS "5" OR "7", ALSO SEE SHEET 1.  
 2) IF \* IS "T", ALSO SEE SHEET 2.  
 3) IF \* IS "B" OR "C", ALSO SEE SHEET 3.

**For QN, QX, N Temperature Codes, Ambient Temperatures and Energy Limitation Parameters see Table below:**

| For T6        | For T5        | For T4...T1   | Uj | Ij | Pj  | Qj | Lj   |
|---------------|---------------|---------------|----|----|-----|----|------|
| Ta* =         | Ta* =         | Ta* =         | V  | mA | mW  | nF | mH   |
| -25°C to 56°C | -25°C to 68°C | -25°C to 80°C | 16 | 25 | 34  | 40 | 0.05 |
| -25°C to 49°C | -25°C to 61°C | -25°C to 80°C | 16 | 25 | 64  | 40 | 0.05 |
| -25°C to 28°C | -25°C to 40°C | -25°C to 68°C | 16 | 52 | 169 | 40 | 0.05 |
| -25°C to 13°C | -25°C to 25°C | -25°C to 53°C | 16 | 76 | 242 | 40 | 0.05 |

**INSTALLATION NOTES (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):**

- Uo < Uj (Vmax); Io < Ij (Imax); Ca > Ci + Ccable, La > Li + Lcable.
- Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
- Installation should be in accordance with ANSI/ISA RPA12.6.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70) or in accordance with the Canadian Electric Code.
- Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
- To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground. Each Sensor and Solenoid coil shall be wired as separate intrinsically safe circuits.
- Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
- Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
- Parts of the enclosure are non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charge on non-conducting surfaces. Additionally, cleaning of the equipment should only be done with a damp cloth.
- Substitution of components may impair hazardous location safety.

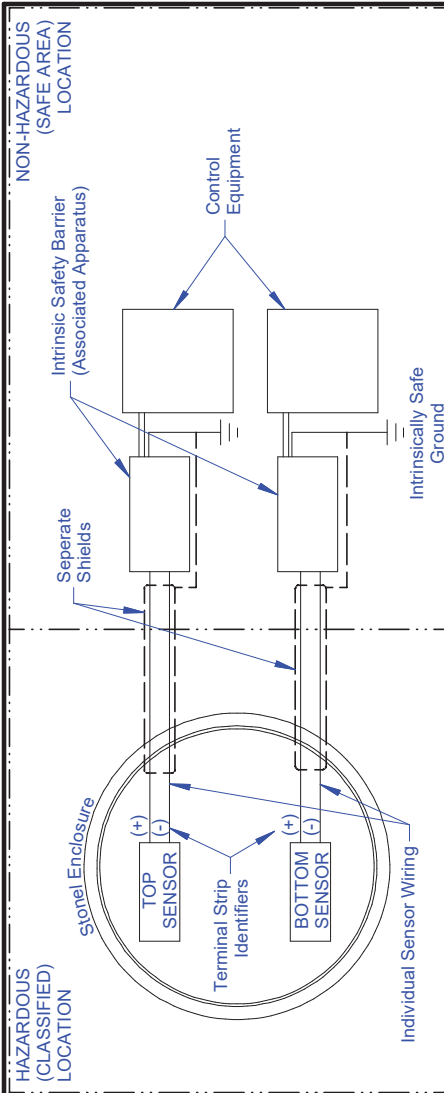
**INSTALLATION NOTES**

If Q\_7N or Q\_5N (Ex Ia IIC T4...T1 Ta\*) else (Ex Ia IIC T6...T1 Ta\*):

- Voc or Vt < Ui, Isc or It < Ii, Ca > Ci + Ccable, La > Li + Lcable.
- Dust-tight conduit seal must be used when installed in Zone 20, Zone 21, and Zone 22 environments or where Ingress Protection of IP67 is required.
- Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
- Installation should be in accordance with appropriate local code or practice.
- The configuration of associated apparatus for each sensor wiring pair or solenoid wiring pair must be approved.
- Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
- To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
- Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
- Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
- Substitution of components may impair hazardous location safety.

|          |       |          |          |  |  |   |                                |  |
|----------|-------|----------|----------|--|--|---|--------------------------------|--|
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| F        | 14247 | 04/23/19 | RB       | TITLE I.S. CONTROL, QUARTZ SERIES<br>SCALE NS SHEET 7 OF 9<br>DRAWING NO. 105193<br>DATE 6/15/2007<br>REV. G |  |   |                                |  |
| E        | 13398 | 08/23/17 | RB       |  |  |   |                                |  |
| REVISION |       | ECO      | DATE     | BY   | DR.  | TOLERANCES (UNLESS OTHERWISE SPECIFIED):<br>X.XXX ± .005 ANGLES ± 0° 30'<br>X.XX ± .010 FINISH f 125 RMS<br>XX ± .015 DIMENSIONS: INCHES (UNLESS OTHERWISE SPECIFIED) |                                |  |
| SK       |       | BL       | CHK.     | APPD.  | RK   |   |                                |  |
| RK       |       | APPD.    | RK       | APPD.  | RK   |   |                                |  |

7.1 Controlled installation drawings continued



**QN\*A, QX\*A**

- NOTE:  
 1) IF \* IS "F" OR "T", ALSO SEE SHEET 1.  
 2) IF \* IS "T", ALSO SEE SHEET 2.  
 3) IF \* IS "B" OR "C", ALSO SEE SHEET 3.

For QN\_A, QX\_A Temperature Codes, Ambient Temperatures and Energy Limitation Parameters see Table below:


| For T6        | For T5        | For T4...T1   | Uj | Ii | Pi  | Ci | Li   |
|---------------|---------------|---------------|----|----|-----|----|------|
| Ta* =         | Ta* =         | Ta* =         | V  | mA | mW  | nF | mH   |
| -40°C to 57°C | -40°C to 69°C | -40°C to 80°C | 16 | 25 | 34  | 50 | 0.15 |
| -40°C to 52°C | -40°C to 64°C | -40°C to 80°C | 16 | 25 | 64  | 50 | 0.15 |
| -40°C to 34°C | -40°C to 46°C | -40°C to 74°C | 16 | 52 | 169 | 50 | 0.15 |
| -40°C to 22°C | -40°C to 34°C | -40°C to 61°C | 16 | 76 | 242 | 50 | 0.15 |

**INSTALLATION NOTES** (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):

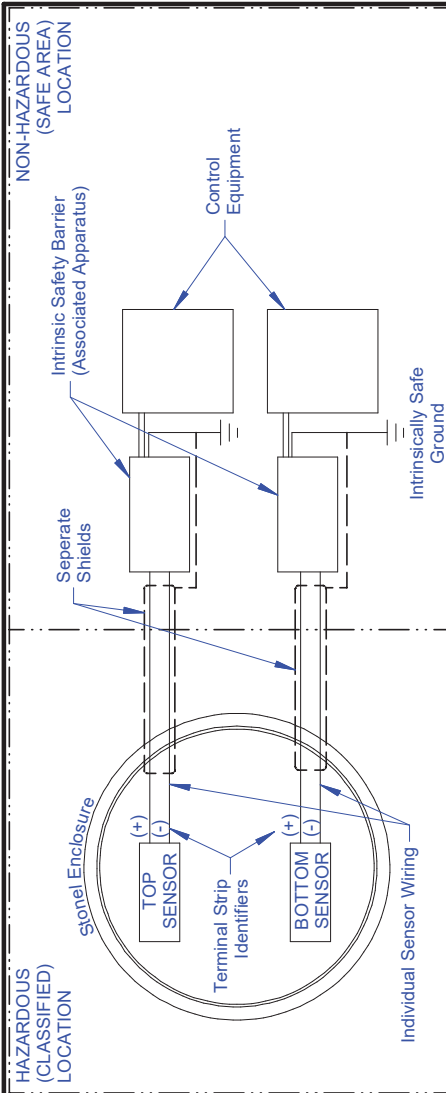
- Uo < Uj (Vmax); Io < Ii (Imax); Ca > Ci + Ccable, La > Li + Lcable.
- Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
- Installation should be in accordance with ANSI/ISA RPA12.6.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70) or in accordance with the Canadian Electric Code.
- Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
- To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground. Each Sensor and Solenoid coil shall be wired as separate intrinsically safe circuits.
- Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
- Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
- Parts of the enclosure are non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charge on non-conducting surfaces. Additionally, cleaning of the equipment should only be done with a damp cloth.
- Substitution of components may impair hazardous location safety.

**INSTALLATION NOTES:**

- If Q\_7A or Q\_5A (Ex ia IIC T4...T1 Ta\*)  
 else (Ex ia IIC T6...T1 Ta\*)
- Voc or Vt < Uj, Isc or It < Ii, Ca > Ci + Ccable, La > Li + Lcable.
  - Dust-tight conduit seal must be used when installed in Zone 20, Zone 21, and Zone 22 environments or where Ingress Protection of IP67 is required.
  - Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
  - Installation should be in accordance with appropriate local code or practice.
  - The configuration of associated apparatus for each sensor wiring pair or solenoid wiring pair must be approved.
  - Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
  - To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
  - Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
  - Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
  - Substitution of components may impair hazardous location safety.

|  <p>FERGUS FALLS, MN 56537 USA</p>  |          | <p><b>I.S. CONTROL, QUARTZ SERIES</b></p> |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |
|--|----------|---|------|----|---|----------|----|---|----------|----|---|----------|----|-----|--|----|---------------|--|
| <p>PUBLIC THIS DRAWING AND ALL INFORMATION CONTAINED HEREIN IS THE PROPERTY OF AND IS SUBJECT TO CHANGE BY VALMET.</p>   |          | <p>DRAWING NO. 105193</p>                 |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |
| <p>DR. SK</p>  |          | <p>SHEET 8 OF 9</p>                       |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |
| <p>CHK. BL</p>   |          | <p>DATE 6/15/2007</p>                     |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |
| <p>APPD. RK</p>  |          | <p>REV. G</p>                             |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |
| <p>TOLERANCES: (UNLESS OTHERWISE SPECIFIED):<br/>                 X.XXX ± .005 ANGLES ± 0° 30'<br/>                 X.XX ± .010 FINISH F125 RMS<br/>                 X/XX ± .015 DIMENSIONS: INCHES (UNLESS OTHERWISE SPECIFIED)</p>   |          | <p>SCALE NS</p>                           |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |
| <p>REVISIONS</p> <table border="1"> <tr> <th>REV</th> <th>DATE</th> <th>BY</th> </tr> <tr> <td>G</td> <td>11/08/23</td> <td>BB</td> </tr> <tr> <td>F</td> <td>04/23/19</td> <td>RB</td> </tr> <tr> <td>E</td> <td>08/23/17</td> <td>RB</td> </tr> <tr> <td>ECO</td> <td></td> <td>BY</td> </tr> </table> |          | REV                                       | DATE | BY | G | 11/08/23 | BB | F | 04/23/19 | RB | E | 08/23/17 | RB | ECO |  | BY | <p>SIZE A</p> |  |
| REV  | DATE     | BY  |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |
| G  | 11/08/23 | BB  |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |
| F  | 04/23/19 | RB  |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |
| E  | 08/23/17 | RB  |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |
| ECO  |          | BY  |      |    |   |          |    |   |          |    |   |          |    |     |  |    |               |  |

7.1 Controlled installation drawings continued



**QN\*B, QX\*B**

**For QN\_B, QX\_B Temperature Codes, Ambient Temperatures and Energy Limitation Parameters see Table below:**

| For T6        | For T5        | For T4...T1   | Uj | Ij | Pj  | Cj  | Lj   |
|---------------|---------------|---------------|----|----|-----|-----|------|
| Ta* =         | Ta* =         | Ta* =         | V  | mA | mW  | nF  | mH   |
| -25°C to 57°C | -25°C to 69°C | -25°C to 80°C | 16 | 25 | 34  | 100 | 0.20 |
| -25°C to 52°C | -25°C to 64°C | -25°C to 80°C | 16 | 25 | 64  | 100 | 0.20 |
| -25°C to 34°C | -25°C to 46°C | -25°C to 74°C | 16 | 52 | 169 | 100 | 0.20 |
| -25°C to 22°C | -25°C to 34°C | -25°C to 61°C | 16 | 76 | 242 | 100 | 0.20 |

**INSTALLATION NOTES (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):**

1.  $U_o < U_j$  (Vmax);  $I_o < I_j$  (Imax);  $Ca > Cj + Ccable$ ,  $La > Lj + Lcable$ .
2. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
3. Installation should be in accordance with ANSI/ISA RPA12.6.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70) or in accordance with the Canadian Electric Code.
4. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
5. To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground. Each Sensor and Solenoid coil shall be wired as separate intrinsically safe circuits.
6. Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
7. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
8. Parts of the enclosure are non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charge on non-conducting surfaces. Additionally, cleaning of the equipment should only be done with a damp cloth.
9. Substitution of components may impair hazardous location safety.

**INSTALLATION NOTES (Ex ia IIC T6...T1 Ta\*):**

1.  $V_{oc}$  or  $V_t < U_j$ ,  $I_{sc}$  or  $I_t < I_j$ ,  $Ca > Cj + Ccable$ ,  $La > Lj + Lcable$ .
2. Dust-tight conduit seal must be used when installed in Zone 20, Zone 21, and Zone 22 environments or where Ingress Protection of IP67 is required.
3. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
4. Installation should be in accordance with appropriate local code or practice.
5. The configuration of associated apparatus for each sensor wiring pair or solenoid wiring pair must be approved.
6. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
7. To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
8. Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
9. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
10. Substitution of components may impair hazardous location safety.

|   |       |   |          |  |          |                    |                                      |                |
|---|-------|---|----------|--|----------|--------------------|--------------------------------------|----------------|
| G   |       | 18063   | 11/08/23 | BB   | PUBLIC   |                    | Valmet<br>FERGUS FALLS, MN 56537 USA |                |
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| E   | 13398 | 08/23/17  | RB       |  |          | DRAWING NO. 105193 |                                      |                |
| REVISION                                  |       | ECO   | DATE     | BY   | TITLE    |                    | I.S. CONTROL, QUARTZ SERIES          |                |
| TOLERANCES: (UNLESS OTHERWISE SPECIFIED): |       | X.XXX ± .005                                    |          | DR. SK   | SCALE NS |                    |                                      | SHEET 9 OF 9   |
| X.XX ± .010                               |       | ANGLES ± 0° 30'                                 |          | CHK. BL  | SIZE A   |                    |                                      | DATE 6/15/2007 |
| X/X ± .015                                |       | FINISH f 125 RMS                                |          | APPD. RK   | REV. G   |                    |                                      |                |
|   |       | DIMENSIONS: INCHES (UNLESS OTHERWISE SPECIFIED) |          |  |          |                    |                                      |                |

**7.1    Controlled installation drawings continued**



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