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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 Quartz series valve monitors. The Quartz is designed to provide position feedback indication of on/off automated valves.

Note
The selection and use of the Quartz 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 Quartz. If you are uncertain about the use of this device, or its suitability for your intended use, please contact StoneL for assistance.

1.2 Title plate markings
The Quartz 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 49 for specific product markings.

1.3 CE markings
The Quartz by StoneL meets the requirements of European Directives and has been marked according to the directive.

1.4 Recycling and disposal
Most of the Quartz parts can be recycled if sorted according to material. In addition, separate recycling and disposal instructions are available from us. A Quartz 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 Quartz 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**

**Materials of construction**

- **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) typical
- **Enclosure protection**: Type 4, 4X, 6 and IP67

**Unit weights**

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>Short</th>
<th>Medium</th>
<th>Tall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum cover</td>
<td>1.27 kg / 2.80 lb</td>
<td>1.55 kg / 3.42 lb</td>
<td>1.75 kg / 3.85 lb</td>
</tr>
<tr>
<td>Clear cover</td>
<td>1.20 kg / 2.64 lb</td>
<td>1.27 kg / 2.79 lb</td>
<td>1.39 kg / 3.06 lb</td>
</tr>
<tr>
<td>Stainless steel cover</td>
<td>3.84 kg / 6.25 lb</td>
<td>3.00 kg / 6.80 lb</td>
<td>3.50 kg / 7.70 lb</td>
</tr>
</tbody>
</table>

**Unit dimensions for Output option “S” - Short visual indicator**

(Consult factory for cover sizes on specific models)

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>Short</th>
<th>Medium</th>
<th>Tall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short cover</td>
<td>Unit height</td>
<td>Cover removal clearance</td>
<td></td>
</tr>
<tr>
<td>Medium cover</td>
<td>Unit height</td>
<td>Cover removal clearance</td>
<td></td>
</tr>
<tr>
<td>Tall cover</td>
<td>Unit height</td>
<td>Cover removal clearance</td>
<td></td>
</tr>
</tbody>
</table>

**Unit dimensions for Output option “N” - Extended visual indicator**

(Consult factory for cover sizes on specific models)

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>Short</th>
<th>Medium</th>
<th>Tall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short cover</td>
<td>Unit height</td>
<td>Cover removal clearance</td>
<td></td>
</tr>
<tr>
<td>Medium cover</td>
<td>Unit height</td>
<td>Cover removal clearance</td>
<td></td>
</tr>
<tr>
<td>Tall cover</td>
<td>Unit height</td>
<td>Cover removal clearance</td>
<td></td>
</tr>
</tbody>
</table>

**Environmental conditions**

- **Location**: Indoor and outdoor
- **Maximum altitude**: 5000 m
- **Maximum humidity**: 90%
- **Pollution degree**: 4

**Ratings and approvals**

- See page 49 for StoneL’s official website

*Only models listed in StoneL’s official website are approved per specific rating.*

*Functional Safety (SIL) approvals for specific models and Quartz SIL safety manual also available on StoneL’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

Quartz certified dimensional drawing can be found under the download tab at www.stoneL.com/en/products/Quartz
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 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 StoneL.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 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 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

Fig. 2.3 short visual indicator assembly figure

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 Stonel.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 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.
3 Maintenance, repair and installation

3.1 Maintenance and repair

Maintenance or repair of StoneL Quartz equipment must only be done by StoneL 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 StoneL 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 Quartz 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 until it stops on the surface of the base not to exceed 10 ft. lbs (13.5 Nm). 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)

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>QN33, QX33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Configuration</strong></td>
</tr>
<tr>
<td>Wire terminals for one or two solenoids</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
</tr>
<tr>
<td><strong>Maximum current</strong></td>
</tr>
<tr>
<td>Continuous 0.1 amp @ 125 VAC/VDC</td>
</tr>
<tr>
<td><strong>Minimum on current</strong></td>
</tr>
<tr>
<td><strong>Voltage range</strong></td>
</tr>
<tr>
<td><strong>Maximum voltage drop</strong></td>
</tr>
<tr>
<td><strong>Leakage current</strong></td>
</tr>
<tr>
<td><strong>LED indication</strong></td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
</tr>
<tr>
<td><strong>Operating life</strong></td>
</tr>
<tr>
<td><strong>Warranty</strong></td>
</tr>
<tr>
<td>Sensor module Five years</td>
</tr>
</tbody>
</table>

**Wiring diagram**

**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.

**Bench test procedure**

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

**WARNING**

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

**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**
QN35_, QX35_

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
</tr>
<tr>
<td>(2) Normally open (NO) sensors</td>
</tr>
<tr>
<td>Wire terminals for one or two solenoids</td>
</tr>
<tr>
<td>Maximum current</td>
</tr>
<tr>
<td>Inrush 1.0 amp @ 125 VAC/VDC</td>
</tr>
<tr>
<td>Continuous 0.1 amp @ 125 VAC/VDC</td>
</tr>
<tr>
<td>Minimum on current</td>
</tr>
<tr>
<td>0.5 mA (VAC/VDC)</td>
</tr>
<tr>
<td>Voltage range</td>
</tr>
<tr>
<td>20 - 250 VAC 50/60 Hz, 3 - 250 VDC</td>
</tr>
<tr>
<td>Maximum voltage drop</td>
</tr>
<tr>
<td>6.5 volts @ 10 mA</td>
</tr>
<tr>
<td>7.2 volts @ 100 mA</td>
</tr>
<tr>
<td>Leakage current</td>
</tr>
<tr>
<td>AC circuits 0.25 mA</td>
</tr>
<tr>
<td>DC circuits 0.15 mA</td>
</tr>
<tr>
<td>LED indication</td>
</tr>
<tr>
<td>Bottom sensor: red</td>
</tr>
<tr>
<td>Top sensor: green</td>
</tr>
<tr>
<td>Temperature range</td>
</tr>
<tr>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>Operating life</td>
</tr>
<tr>
<td>Unlimited</td>
</tr>
</tbody>
</table>

**Warranty**

- All mechanical parts: Two years
- Sensor module: Five years

---

**Wiring diagram**

Models with 3 conduit entries have an additional 2-pole terminal block for second solenoid termination.

**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.

**Bench test procedure**

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

---

**WARNING**

- Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.
- To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.
4.1 Inductive proximity sensors

4.1.3 SST solid state proximity sensors (X)

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

Wiring diagrams

2 SST sensors (QN2X, QX2X)

4 SST sensors (QN2X, QX2X)

6 SST sensors (QN6X, QX6X)

Unit has 2 vertically mounted 12-pole terminal blocks.

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).
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 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.

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

Fig. 1 cam set for normally open sensor function
Fig. 2 cam set for normally closed sensor function
### 4.1 Inductive proximity sensors

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

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>3- Wire NPN sinking sensor QN_E, QX_E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3- Wire PNP sourcing sensor QN_F, QX_F</td>
</tr>
</tbody>
</table>

#### 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

#### Wiring diagrams

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

![Wiring diagram for 3-wire sensors](image)

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

![Wiring diagram for 3-wire sensors](image)

#### Bench test procedure

Connect a load resistor of 3K Ω to 10K Ω 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.

**WARNING**

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

---

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

---

![Fig. 1 cam set for normally open sensor function](image1)
![Fig. 2 cam set for normally closed sensor function](image2)
4.2 Intrinsically safe inductive proximity switches

4.2.1 Dual module NAMUR sensors (44)

**Applicable models**
QN44, QX44

**Specifications**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>(2) NAMUR sensors (EN 60947-5-5) Wire terminals for one or two solenoids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>NO/NC (cam selectable)</td>
</tr>
<tr>
<td>Voltage range</td>
<td>5 -25 VDC</td>
</tr>
<tr>
<td>Current ratings</td>
<td>Target present Current &lt; 1.0 mA (LED = OFF) Target absent Current &gt; 3.0 mA (LED = ON)</td>
</tr>
<tr>
<td>LED indication</td>
<td>Bottom sensor: green Top sensor: red</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>Operating life</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Warranty</td>
<td>All mechanical parts Two years</td>
</tr>
<tr>
<td>Sensor module</td>
<td>Five years</td>
</tr>
</tbody>
</table>

Use with intrinsically safe repeater barrier. NAMUR sensors conform to EN 60947-5-6 standard.

**Wire diagram**

Models with 3 conduit entries have an additional 2-pole terminal block for second solenoid termination.

**Bench test procedure**

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

**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 ½°.

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.

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.

**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.


**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

4.2.2 Dual module NAMUR sensors (45)

**Applicable models**
QN45_, QX45_

**Specifications**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>(2) NAMUR sensors (EN 60947-5-6) Wire terminals for one or two solenoids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage range</td>
<td>5 - 25 VDC</td>
</tr>
<tr>
<td>Current ratings</td>
<td>Target present: Current &lt; 1.0 mA (LED = OFF) Target absent: Current &gt; 3.0 mA (LED = ON)</td>
</tr>
<tr>
<td>LED indication</td>
<td>Bottom sensor: green Top sensor: red</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>Operating life</td>
<td>Unlimited</td>
</tr>
</tbody>
</table>

**Warranty**

- All mechanical parts: Two years
- Sensor module: Five years

Use with intrinsically safe repeater barrier. NAMUR sensors conform to EN 60947-5-6 standard.

**Wiring diagram**

**Bench test procedure**

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

**Reference controlled installation drawing**


**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

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

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>QN_A_, QX_A_</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
</tr>
<tr>
<td>Operation</td>
</tr>
<tr>
<td>Current ratings</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Voltage range</td>
</tr>
<tr>
<td>Temperature range</td>
</tr>
<tr>
<td>Operating life</td>
</tr>
<tr>
<td>Warranty</td>
</tr>
</tbody>
</table>

Use with intrinsically safe repeater barrier. NAMUR sensors conform to EN 60947-5-6 standard.

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.


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 top 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 bottom switch. Push down top cam and rotate clockwise until the ammeter reads > 3 mA then counterclockwise until the ammeter reads < 1 mA. Release the 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 NJ2-V3-N (N)

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>(QN_N, QX_N)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
</tr>
<tr>
<td>Operation</td>
</tr>
<tr>
<td>Current ratings</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Voltage range</td>
</tr>
<tr>
<td>Temperature range</td>
</tr>
<tr>
<td>Operating life</td>
</tr>
<tr>
<td>Warranty</td>
</tr>
</tbody>
</table>

Use with intrinsically safe repeater barrier. NAMUR sensors conform to EN 60947-5-6 standard.

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.

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.
4.3 Reed type proximity switches

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

### Specifications

<table>
<thead>
<tr>
<th>Configuration</th>
<th>SPST (NO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact material</td>
<td>Ruthenium</td>
</tr>
<tr>
<td>Electrical ratings</td>
<td>0.15 amp @ 125 VAC 50/60 Hz; 30 VDC</td>
</tr>
<tr>
<td>Maximum voltage drop</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No LED (P)</td>
</tr>
<tr>
<td></td>
<td>With LED (L)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>Operating life</td>
<td>5 million cycles</td>
</tr>
<tr>
<td>Seal</td>
<td>Hermetically sealed reed switches</td>
</tr>
<tr>
<td>Warranty</td>
<td>Two years</td>
</tr>
</tbody>
</table>

### Wiring diagrams

#### 2 SPST switches

```
  TOP NO 3 4 5 6 7 8 9 10
  TOP C   
  BTM C   
  BTM NO  
```

#### 4 SPST switches

```
  TOP NO 3 4 5 6 7 8 9 10
  TOP C  
  2nd C  
  2nd NO 
  3rd NO 
  3rd C  
  BTM C  
  BTM NO 
```

---

**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**

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.

---

**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

4.3.2 SPDT Maxx-Guard proximity sensors (G, H, S)

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>(QN2S_, QXG_, QN2H_, QN2S_, QX2S_, QN4G_, QX4G_, QN4H_, QX4H_, QN4S_, QX4S_)</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Configuration</th>
<th>SPDT</th>
</tr>
</thead>
</table>

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**: 0.50 volts @ 10 mA; 5.0 volts @ 100 mA

- **Maximum voltage drop**
  - No LED: 0.1 volts @ 10 mA; 0.5 volts @ 100 mA
  - With LED: 3.5 volts @ 10 mA; 6.5 volts @ 100 mA

- **Contact material**: Rhodium ("G" and "S" sensors)
  - Tungsten ("H" sensor)*

- **Temperature range**: -40° to 80° C
- **Operating life**: 5 million cycles
- **Seal**: Hermetically sealed reed switches
- **Warranty**: Two years

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

### Wiring diagrams

#### 2 SPDT switches

```
TOP NC
TOP NO
TOP C
BTM C
BTM NO
BTM NC
```

#### 4 SPDT switches

```
TOP NC
TOP NO
TOP C
2nd C
2nd NO
2nd NC
```

```
3rd C
3rd NO
3rd NC
```

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

**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**

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.

**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

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

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


**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.

**Light read sensors**

Test LED units with 9 volt battery and load between 150 and 1000 ohms - 1/2 watt. Ohm meter will not work. DO NOT test without load. (Maxx-Guard Light Read tester available from StoneL or StoneL distributor.)

Minimum of 3.5 volts required for proper switch operation.

**Notes**

1. The QN_J series devices are approved under the Entity Concept as Intrinsically Safe for Class I, Division 1, Groups A, B, C, & D, Class II, Division 1, Groups E, F, & G, and Class III, Division 1 Hazardous (Classified) locations. Under the Entity Concept the parameters for the QN_J and devices are \( V_{max} = 30V \), \( I_{max} = 100 \text{ mA} \), \( C_i = 66nF \), \( L_i = 0.80mH \). In order to have an approved loop the associated apparatus (barriers) must be FMRC approved under the Entity Concept with the following parameters: \( V_o = 40V \), \( I_{sc} = 100 \text{ mA} \). The control drawing for the associated apparatus will specify the allowed connected inductance and capacitance.
2. Installation of the solenoid and its associated barrier must be in accordance with the respective control drawings supplied by the respective manufacturers. This equipment must be approved by Factory Mutual Research Corporation as Intrinsically Safe for Class I, Division 1 Hazardous (Classified) locations.

![Wiring diagrams](#)

**STOP**

1. Touch & Tune setting instructions
2. Wiring diagrams
3. Notes
### 4.3 Reed type proximity switches

#### 4.3.4 Intrinsically safe models with SPDT Maxx-Guard proximity sensors (M)

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>QN_M</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>SPDT, passive (intrinsically safe)</td>
</tr>
<tr>
<td>Electrical rating</td>
<td>0.1 amp @ 10-30 VDC</td>
</tr>
<tr>
<td>Maximum voltage drop</td>
<td>0.1 volts @ 10 mA, 0.5 volts @ 100 mA</td>
</tr>
<tr>
<td>Contact material</td>
<td>Rhodium</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>Operating life</td>
<td>5 million cycles</td>
</tr>
<tr>
<td>Seal</td>
<td>Hermetically sealed reed switches</td>
</tr>
<tr>
<td>Warranty</td>
<td>Two years</td>
</tr>
</tbody>
</table>

#### Wiring diagrams

**2 SPDT switches (QN2M_)

![Wiring diagram for 2 SPDT switches](image)

**4 SPDT switches (QN4M_)

![Wiring diagram for 4 SPDT switches](image)

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

#### 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.

#### Light read sensors

Test LED units with a 9 volt battery and load between 150 and 1000 ohms - ½ watt. Ohm meter will not work. DO NOT test without load. (Maxx-Guard Light Read tester available from StoneL or StoneL distributor.) Minimum of 3.5 volts required for proper switch operation.

4.4 Mechanical micro switches

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

<table>
<thead>
<tr>
<th>Applicable models for silver contacts (V)*</th>
<th>(QG2V_, QX2V_, QG4V_, QX4V_, QG6V_, QX6V_)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifications</td>
<td><strong>Electrical ratings</strong> 10.0 amp @ 125/250 VAC 50/60 Hz  0.5 amp @ 125 VDC</td>
</tr>
<tr>
<td></td>
<td><strong>Temperature range</strong> -40° to 80° C</td>
</tr>
<tr>
<td></td>
<td><strong>Operating life</strong> 400,000 cycles</td>
</tr>
<tr>
<td></td>
<td><strong>Warranty</strong> Two years</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Applicable models for gold contacts (W)**</th>
<th>(QG2W_, QX2W_, QG4W_, QX4W_, QG6W_, QX6W_)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifications</td>
<td><strong>Electrical ratings</strong> 1.0 amp @ 125 VAC 50/60 Hz  0.5 amp @ 30 VDC</td>
</tr>
<tr>
<td></td>
<td><strong>Temperature range</strong> -40° to 80° C</td>
</tr>
<tr>
<td></td>
<td><strong>Operating life</strong> 100,000 cycles</td>
</tr>
<tr>
<td></td>
<td><strong>Warranty</strong> Two years</td>
</tr>
</tbody>
</table>

**Recommended for use in 24 VDC computer input applications

Wiring diagrams

2 SPDT switches (QG2_, QG2W_, QX2V_, QX2W_)

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

4 SPDT switches (QG4V_, QG4W_, QX4V_, QX4W_)

6 SPDT switches (QG6V_, QG6W_, QX6V_, QX6W_)

Note: 4 SPDT models have (2) 12 pole terminal block (6 spares)

Note: 6 SPDT models have (2) 12 pole terminal block (4 spares)
4.4 Mechanical micro switches

4.4.2 DPDT switches (14)

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>QG14_, QX14_</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical ratings</td>
</tr>
<tr>
<td>Temperature range</td>
</tr>
<tr>
<td>Operating life</td>
</tr>
<tr>
<td>Warranty</td>
</tr>
<tr>
<td>Not recommended for electrical circuits operating at less than 20 mA @ 24 VDC</td>
</tr>
</tbody>
</table>

Wiring diagram

2 DPDT switches (QG14_, QX14_)

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.

Additional 3-pole terminal block provided in unit for solenoid termination.

Top switch (individual elements actuate with common plunger)

Bottom switch (individual elements actuate with common plunger)
4.5 Valve communication terminals (VCT)

4.5.1 VCT with DeviceNet™ communication (92)

**Applicable models**
- QN92_, QX92_

**Specifications**

<table>
<thead>
<tr>
<th>Communication protocol</th>
<th>DeviceNet™</th>
</tr>
</thead>
</table>

**Configuration**
- (2) Discrete Inputs (sensors)
- (2) Discrete Outputs (solenoids)
- (1) 4-20 mA auxiliary analog input, 10-bit resolution
- no additional power source required

**Voltage**
- 24 VDC via DeviceNet™ network

**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>
<thead>
<tr>
<th>Inputs (3 bytes)</th>
<th>Outputs (1 byte)</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

**Warranty**
- All mechanical parts: Two years
- Sensor module: Five years

---

**Wiring diagram**

- V + (1)
- CAN_H (2)
- Shield (3)
- CAN_L (4)
- V - (5)
- Ain + (6)
- Ain - (7)
- OUT 1 - (8)
- 24VDC (9)
- OUT 2 - (10)

- **TOP SW LED (green)**
- **BTM SW LED (red)**

*Transmitter and solenoids not supplied with unit

---

**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 ½°.

**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.

---

**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.
4.5.1 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)

<table>
<thead>
<tr>
<th><strong>Applicable models</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>QN93_, QX93_</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Specifications</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication protocol</strong></td>
</tr>
<tr>
<td><strong>Configuration</strong></td>
</tr>
<tr>
<td><strong>Function blocks</strong></td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
</tr>
<tr>
<td><strong>Output voltage</strong></td>
</tr>
<tr>
<td><strong>Quiescent current</strong></td>
</tr>
<tr>
<td><strong>Maximum output voltage</strong></td>
</tr>
<tr>
<td><strong>Current draw</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Standard channel assignments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 1 (DI1)</td>
</tr>
<tr>
<td>Channel 2 (DI2)</td>
</tr>
<tr>
<td>Channel 3 (DO1)</td>
</tr>
<tr>
<td>Channel 4 (DO2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Special channel assignments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 8 (DO1)</td>
</tr>
<tr>
<td>Channel 9 (DO2)</td>
</tr>
</tbody>
</table>

**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 |
| 1 = Discrete Input 1 is true |
| 2 = Discrete Input 2 is true |
| 3 = Both Discrete Inputs 1&2 are true |

<table>
<thead>
<tr>
<th><strong>Warranty</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>All mechanical parts</td>
</tr>
<tr>
<td>Sensor module</td>
</tr>
</tbody>
</table>

**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.

**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.
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.
4.5 Valve communication terminals (VCT)

4.5.3 VCT with AS-Interface communication (96)

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>QN96_, QX96_</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication protocol AS-Interface</td>
</tr>
<tr>
<td>Configuration (2) Discrete sensor Inputs (2) Auxiliary Discrete Inputs (2) Outputs (solenoids)</td>
</tr>
<tr>
<td>Voltage 24 - 30 VDC (AS+ Voltage)</td>
</tr>
<tr>
<td>Output voltage 24 VDC</td>
</tr>
<tr>
<td>Quiescent current 21 mA</td>
</tr>
<tr>
<td>Maximum output current 160 mA, both outputs combined</td>
</tr>
<tr>
<td>Maximum output power 4 watts, both outputs combined</td>
</tr>
<tr>
<td>Temperature range -40° to 80° C</td>
</tr>
<tr>
<td>ID/IO codes ID = F; IO = 4; ID1 = F; ID2 = E (S-4.F.E.)</td>
</tr>
<tr>
<td>Default address 00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bit assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs Outputs</td>
</tr>
<tr>
<td>Bit 1 = Aux Input 1 Bit 1 = not used</td>
</tr>
<tr>
<td>Bit 2 = Aux input 2 Bit 2 = not used</td>
</tr>
<tr>
<td>Bit 3 = green LED Bit 3 = OUT 1</td>
</tr>
<tr>
<td>Bit 4 = red LED Bit 4 = OUT 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td>All mechanical parts Two years</td>
</tr>
<tr>
<td>Sensor module Five years</td>
</tr>
</tbody>
</table>

**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 counterclockwise 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.

**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.

**WARNING**

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

**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 and extended addressing (97)

**Applicable models**

QN97_, QX97_

**Specifications**

<table>
<thead>
<tr>
<th>Communication protocol</th>
<th>AS-Interface with extended addressing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>(2) Discrete sensor Inputs</td>
</tr>
<tr>
<td></td>
<td>(2) Auxiliary Discrete Inputs</td>
</tr>
<tr>
<td></td>
<td>(1) Output (solenoid)</td>
</tr>
<tr>
<td>Voltage</td>
<td>24 - 30 VDC (AS+ Voltage)</td>
</tr>
<tr>
<td>Output voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Quiescent current</td>
<td>21 mA</td>
</tr>
<tr>
<td>Maximum output current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Maximum output power</td>
<td>2.4 watts</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 82° C. (-40° to 180° F)</td>
</tr>
<tr>
<td>ID/IO codes</td>
<td>ID = A; IO = 4; ID1 = 7; ID2 = E (S-4.A.E.)</td>
</tr>
<tr>
<td>Default address</td>
<td>0A</td>
</tr>
</tbody>
</table>

**Bit assignment**

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<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 used</td>
</tr>
</tbody>
</table>

**Warranty**

All mechanical parts  Two years
Sensor module  Five years

**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 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.

**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.

**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.
4.6 Position transmitters and potentiometers

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

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard potentiometer QN5_, QX5_</td>
</tr>
<tr>
<td>High performance potentiometer QN7_, QX7_</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
</tr>
<tr>
<td>2-wire 4-20 mA</td>
</tr>
<tr>
<td>Voltage range</td>
</tr>
<tr>
<td>10 - 40 VDC</td>
</tr>
<tr>
<td>Recommended voltage</td>
</tr>
<tr>
<td>24 VDC, 50 mA minimum</td>
</tr>
<tr>
<td>Maximum load</td>
</tr>
<tr>
<td>700 ohm @ 24 VDC (see load curve)</td>
</tr>
<tr>
<td>Span</td>
</tr>
<tr>
<td>Adjustable from 35° to 270°</td>
</tr>
<tr>
<td>Maximum linearity error</td>
</tr>
<tr>
<td>Standard potentiometer (5) ± 0.85°</td>
</tr>
<tr>
<td>High performance potentiometer (7) ± 0.35°</td>
</tr>
<tr>
<td>Temperature range</td>
</tr>
<tr>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>Warranty</td>
</tr>
<tr>
<td>Two years</td>
</tr>
</tbody>
</table>

Wiring diagrams

Transmitter only

```
+ 1 2 3 4 5 6 7 8 9 10
| + \------+\------+
|       |      |
| 1 2 3 | 4 5 6 |
|       |      |
|       |      |
| 1 2 3 | 4 5 6 |

Transmitter with SPST switches

```

Transmitter with SPDT switches

```
+ 1 2 3 4 5 6 7 8 9 10
| + \------\------+
|       |      |
|       |      |
|       |      |

Transmitter with solid state switches

```
+ 1 2 3 4 5 6 7 8 9 10
| + \------\------+
|       |      |
|       |      |
|       |      |


Caution: To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.
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 (35) VCT’s (Q_5T_, Q_7T_)

Transmitter with (44) VCT’s (Q_54_, Q_74_)

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**

<table>
<thead>
<tr>
<th>Load curve</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Load curve diagram" /></td>
</tr>
</tbody>
</table>

**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, QX74, QX74 see page 16
- QN5R, QX5R, QN7R, QX7R see page 17
- QN5A, QX5A, QN7A, QX7A see page 18
- QN5N, QX5N, QN7N, QX7N see page 19
- QN5L, QX5L, QN5P, QX5P, QN7L, QX7L, QN7P, QX7P see page 20
- QN5G, QX5G, QN5H, QX5H, QN5S, QX5S, QN7G, QX7G, QN7H, QX7H, QN7S, QX7S see page 21
- QN5J, QX5J, QN7J, QX7J see page 22
- QN5M, QX5M, QN7M, QX7M see page 23
- QX5V, QX5W, QX7V, QX7W see page 24
4.6 Position transmitters and potentiometers

4.6.2 Potentiometer with and without switches (Type B_, C_)

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard potentiometer QNB_, QXB_</td>
</tr>
<tr>
<td>High performance potentiometer QNC_, QXC_</td>
</tr>
</tbody>
</table>

### Specifications

<table>
<thead>
<tr>
<th></th>
<th>Standard potentiometer (B)</th>
<th>High performance potentiometer (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>0-10K ohm ± 5%</td>
<td>0-10K ohm ± 0.1%</td>
</tr>
<tr>
<td>Linearity</td>
<td>± 0.25%</td>
<td>± 0.10%</td>
</tr>
<tr>
<td>Power rating</td>
<td>0.5 watt @ 80° C</td>
<td></td>
</tr>
<tr>
<td>Cycle life</td>
<td>2 million shaft rotations</td>
<td>50 million shaft rotations</td>
</tr>
<tr>
<td>Vibration tolerance</td>
<td>acceptable</td>
<td>outstanding</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
<td></td>
</tr>
<tr>
<td>Warranty</td>
<td>Two years</td>
<td></td>
</tr>
</tbody>
</table>

### Wiring diagrams

**Potentiometer only**

```
1
2
3
```

```
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

**Potentiometer with SPST switches**

```
1
2
3
TOP NO
TOP C
BTM NO
BTM C
```

```
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

**Potentiometer with SPDT switches**

```
1
2
3
TOP NC
TOP NO
TOP C
BTM C
BTM NC
```

```
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

**Potentiometer with solid state switches**

```
1
2
3
TOP +
TOP -
BTM +
BTM -
```

```
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

---


**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.
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 ± 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 (page 13)
- QNB7, QXB7, QNC7, QXC7 (page 11)
- QNBX, QXBX, QNCX, QXCX (page 12)
- QNB6, QXB6, QNC6, QXC6, QNB, QXB, QNC, QXC see page 14
- QNB4, QXB4, QNC4, QXC4 (page 16)
- QNB9, QXB9, QNC9, QXC9 see page 17
- QNBA, QXBA, QNCA, QXCA (page 18)
- QNBN, QXBN, QNCN, QXCN (page 19)
- QNBL, QXBL, QNBP, QXP, QNCL, QXCL, QNPC, QXCP see page 20
- QNBG, QXBG, QNBH, QXBH, QNBS, QXBS, QNCG, QXCG, QNCH, QXCH, QNCS, QXCS see page 21
- QNB, QXB, QNC, QXC see page 22
- QNB, QXB, QNC, QXC see page 23
- QXBV, QXBW, QXCV, QXCW see page 24
4.6 Position transmitters and potentiometers

4.6.3 Digital position transmitter (Type T_)

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Output</strong></td>
</tr>
<tr>
<td>4-20 mA proportional to valve position</td>
</tr>
<tr>
<td><strong>Input voltage</strong></td>
</tr>
<tr>
<td>10-40 VDC</td>
</tr>
<tr>
<td><strong>Span range</strong></td>
</tr>
<tr>
<td>35° to 320° rotation</td>
</tr>
<tr>
<td><strong>Max resistance load</strong></td>
</tr>
<tr>
<td>683 ohms @ 24 VDC</td>
</tr>
<tr>
<td><strong>Valid loop current</strong></td>
</tr>
<tr>
<td>3.8 mA - 20.5 mA (NAMUR NE 43 compliant)</td>
</tr>
<tr>
<td><strong>Refresh rate</strong></td>
</tr>
<tr>
<td>5 ms</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
</tr>
<tr>
<td>0.02% FS</td>
</tr>
<tr>
<td><strong>Linearity error</strong></td>
</tr>
<tr>
<td>+/- 0.35% FS</td>
</tr>
<tr>
<td><strong>Hysteresis</strong></td>
</tr>
<tr>
<td>Negligible</td>
</tr>
<tr>
<td><strong>Thermal drift</strong></td>
</tr>
<tr>
<td>+/- 0.01% FS/C°C</td>
</tr>
<tr>
<td><strong>Terminal block specifications</strong></td>
</tr>
<tr>
<td><strong>Recommended torque</strong></td>
</tr>
<tr>
<td>4.42 in.lbs (0.5 Nm)</td>
</tr>
<tr>
<td><strong>Conductor strip length</strong></td>
</tr>
<tr>
<td>0.22 - 0.25 in (5.5-6.5 mm)</td>
</tr>
<tr>
<td><strong>Maximum wire size</strong></td>
</tr>
<tr>
<td>30-12 AWG (0.5-2.5 mm²)</td>
</tr>
<tr>
<td><strong>Wire type</strong></td>
</tr>
<tr>
<td>Stranded or solid</td>
</tr>
<tr>
<td><strong>Cycle life</strong></td>
</tr>
<tr>
<td>Unlimited</td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
</tr>
<tr>
<td>-40° to 80° C</td>
</tr>
<tr>
<td><strong>Cycle life</strong></td>
</tr>
<tr>
<td>Unlimited</td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
</tr>
<tr>
<td>-40° to 80° C</td>
</tr>
<tr>
<td><strong>Warranty</strong></td>
</tr>
<tr>
<td>Five years</td>
</tr>
</tbody>
</table>

Wiring diagrams

Transmitter only (Q_TO)


LED status indications

<table>
<thead>
<tr>
<th>Red LED state</th>
<th>Loop current</th>
<th>Possible cause</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>4.0 mA</td>
<td>Valve at closed calibrated position</td>
<td></td>
</tr>
<tr>
<td>Solid on</td>
<td>20.0 mA</td>
<td>Valve at open calibrated position</td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td>3.5 mA</td>
<td>Attempted calibration span greater than 320°</td>
<td>Perform calibration within maximum span (&lt;320°)</td>
</tr>
<tr>
<td>Off</td>
<td>3.5 mA</td>
<td>Attempted calibration span less than 35°</td>
<td>Perform calibration within minimum span (&gt;35°)</td>
</tr>
<tr>
<td>Off</td>
<td>3.4 mA</td>
<td>Triggering magnet not detected</td>
<td>Ensure triggering magnet is properly installed</td>
</tr>
<tr>
<td>Undefined</td>
<td>3.37 mA</td>
<td>Unit micro-controller may have stopped</td>
<td>Power cycle sensor. If problem persists, replace sensor module</td>
</tr>
<tr>
<td>Off</td>
<td>3.3 mA</td>
<td>Loop error: sensor is unable to reach required current level</td>
<td>1) Loop voltage is too low, increase voltage 2) Loop resistance is too high, decrease loop resistance or increase loop voltage</td>
</tr>
<tr>
<td>Off</td>
<td>3.2 mA</td>
<td>Internal sensor error</td>
<td>Power cycle sensor. If problem persists, replace sensor module</td>
</tr>
</tbody>
</table>
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 see page 14
QNTR, QXTR see page 17
QNTA, QXTA see page 18
QNTN, QXTN see page 19
QNTG, QXTG, QNTH, QXTH, QNTS, QXTS see page 21
QNTM, QXTM see page 23

Electrical schematic

Load curve
4.7 Expeditors

4.7.1 Operation sequences

Fill control operation sequence (Fig. 1)

1. Fill
   - Low level indicated
   - Controller energizes primary solenoid
   - Actuator/valve opens
   - Open switch activates

2. Top off
   - Intermediate high level indicated
   - Controller de-energizes primary solenoid and controller
     energizes secondary solenoid
   - Actuator/valve closes
   - Intermediate switch activates
   - Secondary solenoid energizes
   - Actuator/valve stops at pre-set intermediate position

3. Full
   - Full level indicated
   - Controller de-energizes secondary solenoid
   - Actuator/valve closes
   - Closed switch activates

Emergency shut down (ESD) operation sequence (Fig. 2)

1. Partial close
   - Controller de-energizes primary solenoid (test mode set in
     controller) and controller energizes secondary solenoid
   - Actuator/valve closes
   - Intermediate switch activates
   - Secondary solenoid energizes
   - Actuator/valve stops in partially closed position.

2. Return to full open
   - Controller energizes primary solenoid
   - Actuator/valve opens
   - Open switch activates
   - Controller de-energizes secondary solenoid (test mode is de-
     activated)

Fill control operation sequence (Fig. 3)

1. Open
   - Controller energizes primary solenoid
   - Actuator/valve opens
   - Open switch activates

2. Rapid to gradual close
   - Controller de-energizes primary solenoid and controller
     energizes secondary solenoid
   - Actuator/valve closes
   - “Intermediate” switch activates
   - Secondary solenoid energizes
   - Actuator/valve decelerates at preset intermediate position

3. Full close
   - Controller de-energizes primary solenoid and controller
     energizes secondary solenoid
   - Actuator/valve closes
   - Intermediate switch activates
   - Secondary solenoid energizes
   - Actuator/valve decelerates at preset intermediate position
4.7 Expositors

4.7.2 With mechanical switches (8V, 8W)

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>QX8V_, QX8W_</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expeditor with SPDT mechanical switches with silver contacts (QX8V_)*</td>
<td>Electrical ratings: 10.0 amp @ 125/250 VAC 50/60 Hz, 0.5 amp @ 125 VDC</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>Operating life</td>
<td>400,000 cycles</td>
</tr>
<tr>
<td>Warranty</td>
<td>Two years</td>
</tr>
<tr>
<td>* Not recommended for electrical circuits operating at less than 20 mA @ 24 VDC</td>
<td></td>
</tr>
</tbody>
</table>

| Expeditor with SPDT mechanical switches with gold contacts (QX8W_)** | Electrical ratings: 1.0 amp @ 125 VAC 50/60 Hz, 0.5 amp @ 30 VDC |
| Temperature range | -40° to 80° C |
| Operating life | 100,000 cycles |
| Warranty | Two years |
| ** Recommended for use in 24 VDC computer input applications |

**Wiring diagram**

Intermediate switch setting

At full closed position lift top cam and rotate in clockwise direction past 0° to desired degree setting for intermediate switch to be energized. After setting is made, run actuator to full open position. De-energize primary solenoid and observe valve position after intermediate switch is activated and secondary solenoid is energized. Readjust top cam if necessary to increase or decrease angle of valve when intermediate switch is activated.

**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°.

1. At full open position depress middle cam and rotate until switch is activated. Release cam and be sure it slides fully onto spline.
2. At full closed position lift bottom cam and rotate until switch is activated. Release cam and be sure it slides fully onto spline.

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

4.7.3 With Maxx-Guard proximity sensors (8Y)

**Applicable models**

QN8Y, QX8Y

**Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical ratings</td>
<td>0.10 amp @ 125 VAC 50/60 Hz</td>
</tr>
<tr>
<td>Maximum voltage drop</td>
<td>3.5 volts @ 10 mA</td>
</tr>
<tr>
<td></td>
<td>6.5 volts @ 100 mA</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>Operating life</td>
<td>5 million cycles</td>
</tr>
<tr>
<td>Seal</td>
<td>Hermetically sealed reed switches</td>
</tr>
<tr>
<td>Warranty</td>
<td>Two years</td>
</tr>
</tbody>
</table>

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

**Intermediate switch setting**

At full closed position lift top cam and rotate in clockwise direction past 0° to desired degree setting for intermediate switch to be energized. After setting is made, run actuator to full open position. De-energize primary solenoid and observe valve position after intermediate switch is activated and secondary solenoid is energized. Readjust top cam if necessary to increase or decrease angle of valve when intermediate switch is activated.

**Wiring diagram**

- **Primary 1**
- **Primary 2**
- **Second 3**
- **Second 4**
- **Closed C**
- **Closed NC**
- **Open C**
- **Open NO**
- **Open NC**
- **Intermediate C**
- **Intermediate NO**

*Solenois not supplied with unit*

**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°.

1. At full open position depress middle cam and rotate until sensor is activated. (White highlights will overlap and green LED will light if power is applied.) Release cam and be sure it slides fully onto spline.
2. At full closed position lift bottom cam and rotate until sensor is activated. (White highlights will overlap and red LED will light if power is applied.) Release cam and be sure it slides fully onto spline.

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

#### 4.7.4 With DeviceNet™ communication (82)

**Applicable models**

QN82_, QX82_

**Intermediate switch specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical ratings</td>
<td>0.10 amp @ 125 VAC 50/60 Hz</td>
</tr>
<tr>
<td>Maximum voltage drop</td>
<td>3.5 volts @ 10 mA, 6.5 volts @ 100 mA</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>Operating life</td>
<td>5 million cycles</td>
</tr>
<tr>
<td>Seal</td>
<td>Hermetically sealed reed switch</td>
</tr>
</tbody>
</table>

**Warranty**

Two years

---

**Intermediate switch setting**

At full closed position lift top cam and rotate in clockwise direction past 0° to desired degree setting for intermediate switch to be energized. After setting is made, run actuator to full open position. De-energize primary solenoid and observe valve position after intermediate switch is activated and secondary solenoid is energized. Readjust top cam if necessary to increase or decrease angle of valve when intermediate switch is activated.

---

**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 $4\frac{1}{2}°$.

1. At full open position depress middle cam and rotate until sensor is activated. (White highlights will overlap and green LED will light if power is applied.) Release cam and be sure it slides fully onto spline.

2. At full closed position lift bottom cam and rotate until sensor is activated. (White highlights will overlap and red LED will light if power is applied.) Release cam and be sure it slides fully onto spline.

---

**WARNING**

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

---

**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.

---

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

---

**Wiring diagram**

*Solenoids not supplied with unit*
4.7 Expeditors

4.7.5 With Foundation Fieldbus communication (83)

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>QN83_, QX83_</th>
</tr>
</thead>
</table>

**Intermediate switch specifications**

Applicable models

QN83_, QX83_

Intermediate switch specifications

See also Foundation Fieldbus module specifications and adjustment procedures on page 30

- **Electrical ratings**: 0.10 amp @ 125 VAC 50/60 Hz
- **Maximum voltage drop**: 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 switch
- **Warranty**: Two years

**Intermediate switch setting**

At full closed position lift top cam and rotate in clockwise direction past 0° to desired degree setting for intermediate switch to be energized. After setting is made, run actuator to full OPEN position. De-energize primary solenoid and observe valve position after intermediate switch is activated and secondary solenoid is energized. Readjust top cam if necessary to increase or decrease angle of valve when intermediate switch is activated.

**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.

**WARNING**

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

**Caution:**

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

**Wiring diagram**

*Solenoids not supplied with unit

**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°.

1. At full open position depress middle cam and rotate until sensor is activated. (White highlights will overlap and green LED will light if power is applied) Release cam and be sure it slides fully onto spline.

2. At full closed position lift bottom cam and rotate until sensor is activated. (White highlights will overlap and red LED will light if power is applied) Release cam and be sure it slides fully onto spline.
4.7 Expeditors

4.7.6 With AS-Interface communication (86)

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>QN86, QX86</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intermediate switch specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>See also AS-Interface module specifications and adjustment procedures on page 32</td>
</tr>
<tr>
<td>Electrical ratings</td>
</tr>
<tr>
<td>Maximum voltage drop</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
</tr>
<tr>
<td>Operating life</td>
</tr>
<tr>
<td>Seal</td>
</tr>
<tr>
<td>Warranty</td>
</tr>
</tbody>
</table>

Intermediate switch setting
At full closed position lift top cam and rotate in clockwise direction past 0° to desired degree setting for intermediate switch to be energized. After setting is made, run actuator to full open position. De-energize primary solenoid and observe valve position after intermediate switch is activated and secondary solenoid is energized. Readjust top cam if necessary to increase or decrease angle of valve when intermediate switch is activated.

Wiring diagram

*Solenoïds not supplied with unit

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

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°.

1. At full open position depress middle cam and rotate until sensor is activated. (White highlights will overlap and green LED will light if power is applied) Release cam and be sure it slides fully onto spline.
2. At full closed position lift bottom cam and rotate until sensor is activated. (White highlights will overlap and red LED will light if power is applied) Release cam and be sure it slides fully onto spline.

**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.

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

5.1 QGabcdef

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

5.2 QNabcdef

\[ c = 02, 03, 05, 06 \]
\[ d = S, N, H \]
\[ e = A, C, D, G, N, R, S, T, U, V, W, X, 1, 2, 3, 4, 5, 0 \]
\[ f = A \text{ or } M \]

5.3 QXabcdef

\[ b = B, E, F, G, J, L, M, N, R, S, T, V, W \]
\[ c = 02, 03, 05, 06 \]
\[ d = S, N, H \]
\[ e = A, C, D, G, N, R, S, T, U, V, W, X, 1, 2, 3, 4, 5, 0 \]
\[ f = A \text{ or } M \]
6 Regulatory, specific conditions of use, and product marking

DECLARATION OF CONFORMITY

Manufacturer:
Metso Flow Control, USA Inc. dba StoneL
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 QG Series – Valve Position Monitors and Valve Communication Terminals

<table>
<thead>
<tr>
<th>Model - Type</th>
<th>Certificates / Directives / Standards</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>QX Series</td>
<td>IECEx Certificate of Conformity IECEx FMG 11.0001X IEC 60079-0:2011, IEC 60079-1:2014</td>
<td>Ex db IIC T6…T5 Gb</td>
</tr>
</tbody>
</table>

ATEX Notified Bodies for EU Type Examination Certificates:
FM Approvals Ltd. Windsor, Berkshire, UK (Notified Body Number 1725)

Manufacturing Locations:
26271 US Hwy 59, Fergus Falls, Minnesota 56537 USA
Product Serial Number Designation = A******
Quality Assurance Certificates:
ISO 9001:2015…………………………...TUV SUD America Inc.
QAN FM06ATEXQ0013…………………………FM Approvals (Notified Body Number 1725)
QAR GB/FME/QAR11.0003………………….FM Approvals (Notified Body Number 1725)

Vanha Porvoontie 229, FIN-01380 Vantaa, Finland
Product Serial Number Designation = V******
Quality Assurance Certificates:
ISO 9001:2015…………………………...DNV (Notified Body Number 0575)
QAN DNV-2006-OSL-ATEX-0260Q………DNV (Notified Body Number 0575)
QAR NO/DNV/QAR09.0008………………..DNV (Notified Body Number 0575)

261 Meiyue Rd, Waigaoqiao Free Trade Zone, 200131 Shanghai, China
Product Serial Number Designation = S******
Quality Assurance Certificates:
ISO 9001:2015…………………………...DNV (Notified Body Number 0575)
QAN DNV-2006-OSL-ATEX-0260Q………DNV (Notified Body Number 0575)
QAR NO/DNV/QAR09.0008………………..DNV (Notified Body Number 0575)

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

Fergus Falls, 25th June 2018

Bryan Beckman, Quality Manager
Authorized Person of the Manufacturer
### 6 Regulatory, specific conditions of use, and product marking continued

**SPECIFIC CONDITIONS OF USE / MARKING**

#### For QN and QX Series – FM10ATEX0039X

<table>
<thead>
<tr>
<th>Specific Conditions of Use - Notes</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>ATEX II 1 G Ex ia IIC T4…T1 Ga Ta = -25°C to +80°C</td>
</tr>
<tr>
<td>2. When installed within a Zone 0 location, the aluminum alloy enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.</td>
<td>ATEX II 1 G Ex ia IIC T5 Ga Ta = -40°C to +68°C</td>
</tr>
<tr>
<td>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.</td>
<td>ATEX II 1 G Ex ia IIC T5 Ga Ta = -25°C to +61°C</td>
</tr>
</tbody>
</table>

**NOTE:** See also FM08ATEX0008X for Series QX with Type of Protection “d”. See also Control Drawing 105193 for “Ex ia” installation.

### For QX Series – FM08ATEX0008X

<table>
<thead>
<tr>
<th>Specific Conditions of Use - Notes</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To minimize the risk of electrostatic sparking, the equipment shall be cleaned only with a damp cloth.</td>
<td>ATEX II 2 G c Ex db IIC T5 Gb Ta = -40°C to +60°C</td>
</tr>
<tr>
<td>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.</td>
<td>ATEX II 2 G c Ex db IIC T5 Gb Ta = -25°C to +60°C</td>
</tr>
<tr>
<td>3. Consult the manufacturer if dimensional information on the flameproof joints is necessary.</td>
<td>ATEX II 2 G c Ex db IIC T6 Gb Ta = -40°C to +65°C</td>
</tr>
</tbody>
</table>

**NOTE:** See also FM10ATEX0039X for Series QX with Type of Protection “i”.

### For QX Series – IECEx FMG 11.0001X

<table>
<thead>
<tr>
<th>Specific Conditions of Use - Notes</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To minimize the risk of electrostatic sparking, the equipment shall be cleaned only with a damp cloth.</td>
<td>Ex db IIC T5 Gb Ta = -40°C to +60°C</td>
</tr>
<tr>
<td>2. Consult the manufacturer if dimensional information on the flameproof joints is necessary.</td>
<td>Ex db IIC T5 Gb Ta = -25°C to +60°C</td>
</tr>
</tbody>
</table>

### For QX Series – FM17US0048 / FM17CA0026

<table>
<thead>
<tr>
<th>Specific Conditions of Use - Notes</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>None.</td>
<td>*XP / I / 1 / BCD</td>
</tr>
<tr>
<td></td>
<td>*DIP / II / 1 / EFG</td>
</tr>
<tr>
<td></td>
<td>*N I / I / 2 / ABCD</td>
</tr>
<tr>
<td></td>
<td>*S / II / 2 / FG</td>
</tr>
</tbody>
</table>

| | *See Approval Certificates for applicable models / type codes. |

### For QN Series – FM17US0129X / FM17CA0072X

<table>
<thead>
<tr>
<th>Specific Conditions of Use - Notes</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>*N I / I / 2 / ABCD</td>
</tr>
<tr>
<td>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.</td>
<td>*S / II / 2 / FG</td>
</tr>
<tr>
<td></td>
<td>*IS / I, II, III / 1 / ADBCDEFG - 105193</td>
</tr>
</tbody>
</table>

| | *See Approval Certificates for applicable models / type codes. |

105414revB
**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 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 ANSI/ISA RP12.6 "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. Swatches and/or transmitter 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.

**WARNING:**

1. When used in intrinsic safety applications, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.
2. To prevent the risk of electrostatic sparking, the equipment enclosure shall be cleaned only with a damp cloth.

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

**Entity Parameters:** U = 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.

**Special Conditions for Safe Use:**

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 may cause a build up of electrostatic charge on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.
2. When installed within a Zone 0 location, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.

**TOLERANCES (UNLESS OTHERWISE SPECIFIED):**

- X XXX ± .005
- X XX ± .010
- X X ± .015
- ANGLES ± 0° 30'
- FINISH / 125 RMS

**CONFIDENTIAL:**

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**STONE L CORPORATION, FERGUS FALLS, MN U.S.A.**
7.1 Controlled Installation Drawings continued

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

**Entity Parameters:**  
Ui = 30 V; Ii = 100 mA; Pi = 0.75 W; Ci = 3 nF; Li = 0 H;  
Solenoid Connection Terminals: Ui = 30 V; Ii = 120 mA

1. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus when the following is true: Voc, Vt or Uo < Ui (Vmax); Isc, It or Io < Ii (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. Installation should be in accordance with ANSI/ISA RP12.06.01 "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.
4. The configuration of associated apparatus for each sensor/solenoid wiring pair must be FM Approved.
5. To prevent the risk of electrostatic sparking, the equipment enclosure shall be cleaned only with a damp cloth.
6. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.

**Special Conditions of Use:**

1. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus when the following is true: Voc, Vt or Uo < Ui; Isc, It or Io < Ii; Ca > Ci + Ccable; La > Li + Lcable.
2. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
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. Special Conditions for Safe Use:

1. Parts of the enclosure are non-conducting and may generate an ignition-capable level of electrostatic charge under certain conditions. The user should ensure that the equipment is not installed in an area 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.
2. When installed within a Zone 0 location, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.
INSTALLATION NOTES (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):

Entity Parameters: \( V_{\text{max}} = 26 \text{ V} \); \( I_{\text{max}} = 14 \text{ mA} \); \( C_i = 0 \text{ F} \); \( U_i = 0 \text{ H} \); \( P_i = 50 \text{ mW} \)

1. \( V_{\text{oc}} \text{ or } I_{\text{oc}} \text{ or } I_{\text{c}} \text{ or } I_{\text{p}} < V_{\text{max}}, I_{\text{c}} + C_{\text{cable}}, L_{\text{c}} > U_i + L_{\text{cable}} \).
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 V rms or V dc.
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 the 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.

WARNING:
1. When used in intrinsic safety applications, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.
2. To prevent the risk of electrostatic sparking, the equipment enclosure shall be cleaned only with a damp cloth.

INSTALLATION NOTES (Ex ia IIC T5/T6):

Entity Parameters: \( U_i = 26 \text{ V} \); \( I_i = 14 \text{ mA} \); \( C_i = 0 \text{ F} \); \( L_i = 0 \text{ H} \); \( P_i = 50 \text{ mW} \)

1. \( V_{\text{oc}} \text{ or } V_{\text{t}} < U_i, I_{\text{c}} + C_{\text{cable}}, L_{\text{c}} > U_i + L_{\text{cable}} \).
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 V rms or V dc.
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.

Special Conditions for Safe Use:
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.
2. When installed within a Zone 0 location, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.
**Controlled Installation Drawings Continued**

**TOLERANCES (UNLESS OTHERWISE SPECIFIED):**
- X.XXX ± .005
- ANGLES ± 0° 30’
- X.XX ± .010
- FINISH / 125 RMS
- X/X ± .015

**INSTALLATION NOTES:**

**(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 must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
  8. Conduct Grounding - Upon installation verify electrical continuity between conduct 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.

**特例条件**

1. 受電側的保護装置を電気的に非導電で、電場充電のレベルを超える可能性がある電気的静電気放電を防止するために必要。この放電は、防爆環境での静電放電の可能性を最小限に抑えるために、ユーザは電気的に非導電の非金属表面を保護するために、静電気の帯電を防ぐ必要がある。さらに、清掃は湿った布で行う。

2. 当装置は通電する前に、導線の間に絶縁体を設ける必要がある。導線の間に絶縁体をつけることで、防爆環境での静電放電を防ぐ必要がある。この装置は、通電する前に、導線の間に絶縁体をつける必要がある。この装置は、通電する前に、導線の間に絶縁体をつける必要がある。
7.1 Controlled Installation Drawings Continued

**I.S. CONTROL, QUARTZ SERIES**

**FM INSTALLATION NOTES:**

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

**Entity Parameters:**
- $V_{max} = 30$ V
- $I_{max} = 100$ mA
- $C_i = 66$ nF
- $L_i = 0.80$ mH
- $P_i = 2.0$ W

1. $V_{oc} < V_{max}$
2. $I_{isc} < I_{max}$
3. $C_a > C_i + C_{cable}$
4. $L_a > L_i + L_{cable}$

**INSTALLATION NOTES:**

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

**Entity Parameters:**
- $U_i = 30$ V
- $I_i = 100$ mA
- $C_i = 66$ nF
- $L_i = 0.8$ mH
- $P_i = 2.0$ W

1. $V_{oc} < U_i$
2. $I_{isc} < I_i$
3. $C_a > C_i + C_{cable}$
4. $L_a > L_i + L_{cable}$

**Special Conditions for Safe Use:**

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.
2. When installed within a Zone 0 location, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.
7.1 Controlled Installation Drawings continued

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

- Entity Parameters:
  - QN44, QX44 Sensors: $U_i (V_{max}) = 22 \text{ V}; I_i (Imax) = 120 \text{ mA}; C_i = 98 \text{ nF}; L_i = 0.8 \text{ mH}; P_i = 2.0 \text{ W}$
  - QN45, QX45 Sensors: $U_i (V_{max}) = 22 \text{ V}; I_i (Imax) = 120 \text{ mA}; C_i = 3 \text{ nF}; L_i = 0 \text{ H}; P_i = 0.4 \text{ W}$

- Solenoid Connection Terminals: $U_o = 30 \text{ V}, I_o = 120 \text{ mA}$

1. $U_o < U_i (V_{max}); I_o < I_i (Imax); C_o = C_i + C_{cable}, L_o > L_i + L_{cable}$.
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 RPA 14.2.0.1 "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. Conduct 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.

**WARNING:**
1. When used in intrinsic safety applications, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.
2. To prevent the risk of electrostatic sparking, the equipment enclosure shall be cleaned only with a damp cloth.

**Special Conditions for Safe Use:**
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.
2. When installed within a Zone 0 location, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.
### 7.1 Controlled Installation Drawings Continued

#### HAZARDOUS (CLASSIFIED) LOCATION

**Stonel Enclosure**

**Intrinsic Safety Barrier** (Associated Apparatus)

**Top Sensor**

**Bottom Sensor**

**Seperate Shields**

**Intrinsically Safe Ground**

**Tiepoint**

**Control Equipment**

**Location**

**Safe Area**

**Non-Hazardous Location**

---

### INSTALLATION NOTES

(Ex ia IIC T6...T1 Ta*)

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. Each Sensor and Solenoid coil shall be wired as separate intrinsically safe circuits.
8. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
9. Substitution of components may impair hazardous location safety.

### WARNING

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/VSSA RPA12.6.0.1 "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. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
6. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.

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### SPECIAL CONDITIONS FOR SAFE USE

1. When used in intrinsic safety applications, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.
2. To prevent the risk of electrostatic sparking, the equipment enclosure shall be cleaned only with a damp cloth.

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### TOLERANCES (UNLESS OTHERWISE SPECIFIED):**

- X.XXX ± 0.005
- ANGLES ± 0° 30’
- X.XX ± 0.10
- FINISH / 125 RMS
- X.X ± 0.15
QN*A, QX*A

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_A, QX_A Temperature Codes, Ambient Temperatures and Energy Limitation Parameters see table below:

<table>
<thead>
<tr>
<th>For T6, Ta* =</th>
<th>For T5, Ta* =</th>
<th>For T4...T1 Ta* =</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40°C to 57°C</td>
<td>-40°C to 69°C</td>
<td>-40°C to 80°C</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
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<td>25</td>
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<td>50</td>
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<td>50</td>
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<tr>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
</tr>
</tbody>
</table>

INSTALLATION NOTES (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):
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 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 a separate intrinsically safe circuits.
6. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
7. 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.
8. Substitution of components may impair hazardous location safety.

WARNING:
1. When used in intrinsic safety applications, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.
2. To prevent the risk of electrostatic sparking, the equipment enclosure shall be cleaned only with a damp cloth.

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

Special Conditions for Safe Use:
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 only be done with a damp cloth.
2. When installed within a Zone 0 location, the metal enclosure shall be installed in such a manner as to prevent the possibility of sparks resulting from friction or impact.