Quartz® by StoneL
Valve monitor series QC/QG/QN/QX
Installation, Maintenance and Operating instructions
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Read these instructions first!
These instructions provide information about safe handling and operation of the limit switch. If you require additional assistance, please contact the manufacturer or manufacturer’s representative. Addresses and phone numbers are printed on the back cover.

**Save these instructions.**

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All trademarks are property of their respective owners.
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5 Model/Type code

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6 Regulatory, specific conditions of use, and product marking

7 Appendix

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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 51 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
- -55° C to 80° C (-67° F to 176° F) QC series only

**Enclosure protection**
- Type 4, 4X, 6 and IP66 / IP67

**Unit weights**

<table>
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<tr>
<th>Cover Type</th>
<th>Short</th>
<th>Medium</th>
<th>Tall</th>
</tr>
</thead>
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<tr>
<td>Aluminum cover</td>
<td>1.27 kg</td>
<td>1.55 kg</td>
<td>1.75 kg</td>
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<tr>
<td>Clear cover</td>
<td>1.20 kg</td>
<td>1.27 kg</td>
<td>1.39 kg</td>
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<tr>
<td>Stainless steel cover</td>
<td>3.84 kg</td>
<td>3.00 kg</td>
<td>3.50 kg</td>
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**Unit dimensions for Output option “S” - Short visual indicator**

(Consult factory for cover sizes on specific models)

<table>
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<tr>
<th>Cover Type</th>
<th>Unit height</th>
<th>Cover removal clearance</th>
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<tr>
<td>Short cover</td>
<td>102 mm [4.00 in]</td>
<td>143 mm [5.62 in]</td>
</tr>
<tr>
<td>Medium cover</td>
<td>123 mm [4.86 in]</td>
<td>184 mm [7.24 in]</td>
</tr>
<tr>
<td>Tall cover</td>
<td>155 mm [6.10 in]</td>
<td>241 mm [9.48 in]</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>Unit height</th>
<th>Cover removal clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short cover</td>
<td>127 mm [5.03 in]</td>
<td>143 mm [5.62 in]</td>
</tr>
<tr>
<td>Medium cover</td>
<td>148 mm [5.86 in]</td>
<td>184 mm [7.24 in]</td>
</tr>
<tr>
<td>Tall cover</td>
<td>186 mm [7.10 in]</td>
<td>241 mm [9.48 in]</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 51 or StoneL’s official website

* Only models listed on 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 ¾" 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.
### 2.3 Typical Quartz with short visual indicator assembly figure

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

### 2.4 Instructions for mounting with short visual indicator

Special notes:  
- Mounting of the Quartz requires a StoneL mounting kit specific to the actuator the Quartz is to be mounted to.  
- It is recommended that thread lubricant or anti-seize be used on the mounting kit fasteners (Items B, I and J) prior to assembly.  
- In high cycle or high vibration applications, blue Loctite® may be used on the mounting kit fasteners in place of lubricant or anti-seize.  
- The instructions below are for a typical mounting application. Refer to 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 ⅜" 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 a minimum of ¼ turn after cover engages o-ring. Do not use any tool to tighten the cover.

Field wiring

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

4.1 Inductive proximity sensors

4.1.1 Dual module SST sensors (33)

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<td>Sensor module</td>
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**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.
### 4.1 Inductive proximity sensors

#### 4.1.2 Dual module SST sensors (35)

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<td>QC35, QN35, QX35</td>
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<table>
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<td>Temperature range</td>
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<tr>
<td>Operating life</td>
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<tr>
<td>Warranty</td>
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#### Wiring diagram

![Wiring diagram](image)

- SOL 1 (1)
- SOL 2 (2)
- SOL PWR 1 (3)
- SOL PWR 2 (4)
- TOP SW NO (5)
- TOP SW C (6)
- BTM SW NO (7)
- BTM SW C (8)

- 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).

---

**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

4.1.3 SST solid state proximity sensors (X)

### Applicable models
Quartz with 2-wire inductive solid state QN_X_, QX_X_

### Specifications
- **Configuration**: (2) SST solid state sensors
- **Operation**: NO/NC (cam selectable)
- **Maximum current**
  - Inrush: 1.0 amp @ 125 VAC/VDC
  - Continuous: 0.1 amp @ 125 VAC/VDC
- **Minimum on current**: 0.5 mA (VAC/VDC)
- **Voltage range**: 24 - 125 VAC 50/60 Hz; 8 - 125 VDC
- **Maximum voltage drop**
  - Continuous: 0.1 amp @ 125 VAC/VDC
  - 6.5 volts @ 10 mA
  - 7.5 volts @ 100 mA
- **Leakage current**
  - AC circuits: 0.25 mA
  - DC circuits: 0.15 mA
- **LED indication**
  - Bottom sensor: red
  - Top sensor: green
- **Temperature range**: -40° to 80° C
- **Operating life**: Unlimited

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

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

### Wiring diagrams
- **2 SST sensors (QN2X, QX2X)**
- **4 SST sensors (QN2X, QX2X)**
- **6 SST sensors (QN6X, QX6X)**

### WARNING
Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.
4.1.3 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
### Applicable models

<table>
<thead>
<tr>
<th>3-Wire NPN sinking sensor</th>
<th>QN_E_</th>
<th>QX_E_</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-Wire PNP sourcing sensor</td>
<td>QN_F_</td>
<td>QX_F_</td>
</tr>
</tbody>
</table>

### Specifications

<table>
<thead>
<tr>
<th>Configuration</th>
<th>2-wire DC solid state sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>NO/NC (cam selectable)</td>
</tr>
<tr>
<td>Maximum current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Voltage range</td>
<td>10-30 VDC</td>
</tr>
<tr>
<td>Maximum voltage drop</td>
<td>&lt;2.0 VDC</td>
</tr>
<tr>
<td>Current consumption</td>
<td>&lt;15 mA</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>Two years</td>
</tr>
</tbody>
</table>

### Wiring diagrams

#### (2) 3-wire sensors (QN2E_, QN2F_, QX2E_, QX2F_)

#### (4) 3-wire sensors (QN4E_, QN4F_, QX4E_, QX4F_)

---

**WARNING**

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

**Bench test procedure**

Connect a load resistor of 3K 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.
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 ½°.

**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.
4.2 Intrinsically safe inductive proximity switches

4.2.1 Dual module NAMUR sensors (44)

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>QN44, QX44</th>
</tr>
</thead>
</table>

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>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>
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<tr>
<td>Operating life</td>
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Warranty

<table>
<thead>
<tr>
<th>All mechanical parts</th>
<th>Two years</th>
</tr>
</thead>
<tbody>
<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.

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.

Bench test procedure

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

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

4.2 Intrinsically safe inductive proximity switches

4.2.2 Dual module NAMUR sensors (45)

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>QC45_, QN45_, QX45_</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Specifications</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>(2) NAMUR sensors (EN 60947-5-6) Wire terminals for one or two solenoids</td>
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<tr>
<td>Voltage range</td>
<td>5 - 25 VDC</td>
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<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°C to 80°C (-40°F to 176°F) typical -55°C to 80°C (-67°F to 176°F) QC series only</td>
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<tr>
<td>Operating life</td>
<td>Unlimited</td>
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</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.


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.
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.

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

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

Fig. 1 cam set for counterclockwise rotation
Fig. 2 cam set for clockwise rotation
4.2 Intrinsically safe inductive proximity switches

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

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

### Specifications

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<th>Configuration</th>
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</tr>
</thead>
<tbody>
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<td>Operation</td>
<td>NO/NC (cam selectable)</td>
</tr>
<tr>
<td>Current ratings</td>
<td>Target present: Current &lt; 1.0 mA</td>
</tr>
<tr>
<td></td>
<td>Target absent: Current &gt; 3.0 mA</td>
</tr>
<tr>
<td>Voltage range</td>
<td>5 - 25 VDC</td>
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<tr>
<td>Operating life</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Warranty</td>
<td>Two years</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)**

```
TOP SW +
TOP SW -
BTM SW +
BTM SW -
```

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

```
TOP SW +
TOP SW -
2nd SW +
2nd SW -
3rd SW +
3rd SW -
BTM SW +
BTM SW -
```

**Bench test procedure**

Use StoneL Light Read Tester or use a 24 VDC power supply and an ammeter. 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 1/2°.

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

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

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

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

---

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


STOP
4.2 Intrinsically safe inductive proximity switches

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

Applicable models
(QN_B_, QX_B_)

Specifications

<table>
<thead>
<tr>
<th>Configuration</th>
<th>NO/NC (cam selectable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>Current present</td>
</tr>
<tr>
<td></td>
<td>Current absent</td>
</tr>
<tr>
<td>Voltage range</td>
<td>5 - 25 VDC</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-25° to 80° C</td>
</tr>
<tr>
<td>Operating life</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Warranty</td>
<td>Two years</td>
</tr>
</tbody>
</table>

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

Wiring diagrams
2 NAMUR NO sensors (QN2B, QX2B)

![Wiring Diagram]

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

![Caution]


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

Valve closed to open in counterclockwise rotation (Fig. 1)
1. With the valve in the closed position, set the bottom cam so that it is centered on the bottom sensor and the top cam is 90° from the bottom cam. Connect power supply and ammeter to the bottom switch.
2. Rotate bottom cam counterclockwise until the ammeter reads > 3 mA, then rotate clockwise until the ammeter reads < 1 mA. Tighten set screw.
3. Move valve to the open position. Connect power supply and ammeter to the top switch. Rotate top cam clockwise until the ammeter reads > 3 mA then counterclockwise until the ammeter reads < 1 mA. Tighten set screw.

Valve closed to open in clockwise rotation (Fig. 2)
1. With the valve in the closed position, set the bottom cam so that it is centered on the bottom sensor and the top cam is 90° from the bottom cam. Connect power supply and ammeter to the bottom switch.
2. Rotate bottom cam counterclockwise until the ammeter reads > 3 mA, then rotate clockwise until the ammeter reads < 1 mA. Tighten set screw.
3. Move valve to the open position. Connect power supply and ammeter to the top switch. Rotate top cam clockwise until the ammeter reads > 3 mA then counterclockwise until the ammeter reads < 1 mA. Tighten set screw.
4.2 Intrinsically safe inductive proximity switches

4.2.5 P+F NAMUR sensors NJ2-V3-N (N)

**Applicable models**
(QN_N, QX_N)

**Specifications**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>NO/NC (cam selectable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current ratings</td>
<td>Target present</td>
</tr>
<tr>
<td>Voltage range</td>
<td>5 - 25 VDC</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-25° to 80° C</td>
</tr>
<tr>
<td>Operating life</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Warranty</td>
<td>Two years</td>
</tr>
</tbody>
</table>

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

**Wiring diagrams**

2 NAMUR sensors (QN2N, QX2N)

![Diagram 1: Wiring diagram for 2 NAMUR sensors (QN2N, QX2N)](Diagram1)

4 NAMUR sensors (QN4N, QX4N)

![Diagram 2: Wiring diagram for 4 NAMUR sensors (QN4N, QX4N)](Diagram2)

**Bench test procedure**

Use StoneL Light Read Tester or use a 24 VDC power supply and an ammeter. 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 1/2°.

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>(QN2P_, QX2P_, QN2L_, QX2L_, QN4P_, QX4P_, QN4L_, QX4L_)</td>
</tr>
</tbody>
</table>

### Specifications

- **Configuration**: SPST (NO)
- **Contact material**: Ruthenium
- **Electrical ratings**: 0.15 amp @ 125 VAC 50/60 Hz; 30 VDC
- **Maximum voltage drop**: No LED (P)
  - 0.1 volts @ 10 mA
  - 0.5 volts @ 100 mA
  - 3.5 volts @ 10 mA
  - 6.5 volts @ 100 mA
- **Temperature range**: -40° to 80° C
- **Operating life**: 5 million cycles
- **Seal**: Hermetically sealed reed switches
- **Warranty**: Two years

### Wiring diagrams

#### 2 SPST switches

1. **TOP NO**
2. **TOP C**
3. **BTM C**
4. **BTM NO**

- **top switch**
- **bottom switch**

#### 4 SPST switches

1. **TOP NO**
2. **TOP C**
3. **2nd C**
4. **2nd NO**
5. **3rd C**
6. **3rd NO**
7. **BTM C**
8. **BTM NO**

- **top switch**
- **second switch**
- **third switch**
- **bottom switch**

### Touch & Tune switch setting

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

### Bench test procedure

Test 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.

### 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_ , QX2G_ , QN2S_ , QX2G_ , QN4G_ , QX4G_ , QN4H_ , QX4H_ , QN4S_ , QX4S_ )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Configuration</strong></td>
</tr>
<tr>
<td><strong>Electrical ratings</strong></td>
</tr>
<tr>
<td>&quot;G&quot; sensors</td>
</tr>
<tr>
<td>&quot;S&quot; sensors</td>
</tr>
<tr>
<td>&quot;H&quot; sensors*</td>
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<tr>
<td>Maximum voltage drop</td>
</tr>
<tr>
<td>Contact material</td>
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<td>Temperature range</td>
</tr>
<tr>
<td>Operating life</td>
</tr>
<tr>
<td>Seal</td>
</tr>
<tr>
<td>Warranty</td>
</tr>
</tbody>
</table>

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

**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.

**Wiring diagrams**

2 SPDT switches

```
<table>
<thead>
<tr>
<th></th>
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</tbody>
</table>
```

Note: 4 SPDT models have (2) 12 pole terminal block (12 spares)
4.3 Reed type proximity switches

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

### Applicable models

QN_J

### Specifications

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

### Wiring diagrams

#### 2 SPST switches (QN2J_)

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

#### 4 SPST switches (QN4J_)

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

#### Touch & Tune switch setting

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

#### Bench test procedure

Test sensors with a standard Ohm meter.

Minimum of 3.5 volts required for proper switch operation.

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>
<tbody>
<tr>
<td>Specifications</td>
<td>Configuration</td>
</tr>
<tr>
<td></td>
<td>Electrical rating</td>
</tr>
<tr>
<td></td>
<td>Maximum voltage drop</td>
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<tr>
<td></td>
<td>Contact material</td>
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<tr>
<td></td>
<td>Temperature range</td>
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<tr>
<td></td>
<td>Operating life</td>
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<tr>
<td></td>
<td>Seal</td>
</tr>
<tr>
<td></td>
<td>Warranty</td>
</tr>
</tbody>
</table>

Wiring diagrams

2 SPDT switches (QN2M_)

4 SPDT switches (QN4M_)

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.

Bench test procedure
Test sensors with a standard Ohm meter.

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>
</tr>
</thead>
<tbody>
<tr>
<td>QC2V_, QG2V_, QX2V_, QC4V_, QG4V_, QX4V_, QG6V_, QX6V_</td>
</tr>
</tbody>
</table>

**Specifications**
- **Electrical ratings**
  - 10.0 amp @ 125/250 VAC 50/60 Hz
  - 0.5 amp @ 125 VDC
- **Temperature range**
  - -40°C to 80°C (-40°F to 176°F) typical
  - -55°C to 80°C (-67°F to 176°F) QC series only
- **Operating life**
  - 400,000 cycles
- **Warranty**
  - Two years

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

<table>
<thead>
<tr>
<th>Applicable models for gold contacts (W)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC2W_, QG2W_, QX2W_, QC4W_, QG4W_, QX4W_, QG6W_, QX6W_</td>
</tr>
</tbody>
</table>

**Specifications**
- **Electrical ratings**
  - 1.0 amp @ 125 VAC 50/60 Hz
  - 0.5 amp @ 30 VDC
- **Temperature range**
  - -40°C to 80°C (-40°F to 176°F) typical
  - -55°C to 80°C (-67°F to 176°F) QC series only
- **Operating life**
  - 100,000 cycles
- **Warranty**
  - Two years

**Recommended for use in 24 VDC computer input applications**

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

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

Wiring diagrams
2 SPDT switches (QC2V_, QC2W_, QG2V_, QG2W_, QX2V_, QX2W_)

![Wiring diagram]

- 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 (QC4V_, QGCW_, 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)

Applicable models
QG14_, QX14_

Specifications

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<tr>
<th>Electrical ratings</th>
<th>4.5 amp @ 125/250 VAC, 50/60 Hz; 24 to 125 VDC</th>
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<tbody>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
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<tr>
<td>Operating life</td>
<td>250,000 (VAC), 100,000 (VDC) cycles</td>
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<tr>
<td>Warranty</td>
<td>Two years</td>
</tr>
</tbody>
</table>

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

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.
4.5 Valve communication terminals (VCT)

4.5.1 VCT with DeviceNet™ communication (92)

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>QN92_, QX92_</th>
</tr>
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### Specifications

<table>
<thead>
<tr>
<th>Communication protocol</th>
<th>DeviceNet™</th>
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<tbody>
<tr>
<td>Configuration</td>
<td>(2) Discrete Inputs (sensors) (2) Discrete Outputs (solenoids) (1) 4-20 mA auxiliary analog input, 10-bit resolution</td>
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<tr>
<td>Voltage</td>
<td>24 VDC via DeviceNet™ network (11 – 25 VDC)</td>
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<tr>
<td>Output voltage</td>
<td>24 VDC</td>
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<tr>
<td>Quiescent current</td>
<td>32 mA @ 24 VDC, 48 mA @ 11 VDC</td>
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<td>Maximum output current</td>
<td>160 mA, both outputs combined</td>
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<tr>
<td>Maximum output power</td>
<td>4 watts, both outputs combined</td>
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<td>Default address</td>
<td>63 (software assigned)</td>
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<td>Default baud rate</td>
<td>125K (software selectable 125K, 250K or 500K baud)</td>
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<td>Messaging</td>
<td>Polling, cyclic and change of state</td>
</tr>
<tr>
<td>DeviceNet™ type</td>
<td>100</td>
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</tbody>
</table>

### Bit mapping

- **Inputs (3 bytes)**
  - Byte 0, bit 0 = red LED
  - Byte 0, bit 1 = green LED
  - Byte 0, bit 7 = fault bit
  - Byte 1, bits 8-15 = analog input
  - Byte 2, bits 16-23 = analog input

- **Outputs (1 byte)**
  - Byte 0, bit 0 = OUT 1
  - Byte 0, bit 1 = OUT 2
  - Byte 0, bit 4 = not used

### Warranty

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

---

**Bench test procedure**

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

**Touch & Tune switch setting**

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

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

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

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

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

---

**Caution:**

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

---

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

---

**Caution:**

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

---

**Warning:**

To avoid damaging the module when performing the position switch calibration procedure, apply 24 VDC across V+ and V-. Use the LEDs to determine when switches are made. You cannot do this procedure with an ohmmeter. No series load resistor is required when attaching a 24 VDC power supply for switch setting.
4.5.1  VCT with DeviceNet™ communication (92) continued

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

Quartz with DeviceNet™ Fault Bit (input byte 0, bit 7)
1. The Fault indication will set to a 1 when input byte 0, bits 0 and 1 are set to 1 at the same time.
2. When input byte 0, bits 0 and 1 are both set to 1, this would indicate that the valve is both open and closed at the same time. This would be an abnormal or Fault condition.
4.5 Valve communication terminals (VCT)

4.5.2 VCT with Foundation Fieldbus communication (93)

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>QN93_, QX93_</th>
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<table>
<thead>
<tr>
<th>Specifications</th>
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<td>Communication protocol</td>
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<tr>
<td>Configuration</td>
</tr>
<tr>
<td>Function blocks</td>
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<tr>
<td>Voltage</td>
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<tr>
<td>Output voltage</td>
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<td>Quiescent current</td>
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<td>Channel 3 (DO1)</td>
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<td>Channel 4 (DO2)</td>
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<thead>
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<th>Special channel assignments</th>
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<td>Channel 8 (DO1)</td>
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<td>Channel 9 (DO2)</td>
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<th>Valve control single block mode</th>
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<td>Channel 10 (DO1)</td>
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<th>READBACK_D values</th>
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<tr>
<td>0 = None</td>
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<tr>
<td>1 = Discrete Input 1 is true</td>
</tr>
<tr>
<td>2 = Discrete Input 2 is true</td>
</tr>
<tr>
<td>3 = Both Discrete Inputs 1&amp;2 are true</td>
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</table>

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

---

### Wiring diagram

*Piezo valves not supplied with unit

---

**WARNING**

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

---

**Bench test procedure**

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

---

**Caution:** To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.
4.5.2 VCT with Foundation Fieldbus communication (93) continued

Touch & Tune switch setting
All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 ½°.

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

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

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>QN96_, QX96_</th>
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**Specifications**

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<tr>
<th>Configuration</th>
<th>(2) Discrete sensor Inputs</th>
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<tr>
<td></td>
<td>(2) Auxiliary Discrete Inputs</td>
</tr>
<tr>
<td></td>
<td>(2) Outputs (solenoids)</td>
</tr>
<tr>
<td>Voltage</td>
<td>26.5 - 31.6 VDC (AS-i 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>160 mA, both outputs combined</td>
</tr>
<tr>
<td>Maximum output power</td>
<td>4 watts, both outputs combined</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>ID/IO codes</td>
<td>ID = F; IO = 4; ID1 = F; ID2 = E (S-4.F.E.)</td>
</tr>
<tr>
<td>Default address</td>
<td>00</td>
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**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 = OUT 2</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 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.

**Wiring diagram**

- **ASI +**
- **ASI -**
- **Aux IN +**
- **Aux IN1 -**
- **Aux IN2 -**
- **3 wire RTN**
- **OUT2 +**
- **OUT2 -**
- **OUT1 +**
- **OUT1 -**
- **Solenoid valve**
- **LED**

**WARNING**

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

**Bench test procedure**

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

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

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

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

Applicable models
QN96_, QX96_

Specifications

<table>
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<th>AS-Interface</th>
</tr>
</thead>
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<td>(2) Discrete sensor Inputs</td>
</tr>
<tr>
<td></td>
<td>(2) Auxiliary Discrete Inputs</td>
</tr>
<tr>
<td></td>
<td>(2) Outputs (solenoids)</td>
</tr>
<tr>
<td>Voltage</td>
<td>26.5 - 31.6 VDC (AS-i Voltage)</td>
</tr>
<tr>
<td>Output voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Quiescent current</td>
<td>15 mA</td>
</tr>
<tr>
<td>Maximum output current</td>
<td>160 mA, both outputs combined</td>
</tr>
<tr>
<td>Maximum output power</td>
<td>4 watts, both outputs combined</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C</td>
</tr>
<tr>
<td>ID/IO codes</td>
<td>ID = F; IO = 4; ID1 = F; ID2 = E (S-4.F.E.)</td>
</tr>
<tr>
<td>Default address</td>
<td>00</td>
</tr>
<tr>
<td>Bit assignment</td>
<td>Inputs Outputs</td>
</tr>
<tr>
<td>Bit 1 = Aux Input 1</td>
<td>Bit 1 = not used</td>
</tr>
<tr>
<td>Bit 2 = Aux input 2</td>
<td>Bit 2 = not used</td>
</tr>
<tr>
<td>Bit 3 = green LED</td>
<td>Bit 3 = OUT 1</td>
</tr>
<tr>
<td>Bit 4 = red LED</td>
<td>Bit 4 = OUT 2</td>
</tr>
</tbody>
</table>

Warranty

| All mechanical parts   | Two years |
| Sensor module          | Five years |

Wiring diagram

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

WARNING

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

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

Bench test procedure

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

Touch & Tune switch setting

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

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

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

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

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

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

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

**Applicable models**

| QN97_ | QX97_ |

**Specifications**

<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&lt;br&gt;(2) Auxiliary Discrete Inputs&lt;br&gt;(1) Output (solenoid)</td>
</tr>
<tr>
<td>Voltage</td>
<td>26.5 - 31.6 VDC (AS-i 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 80° C (-40° to 176° 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>
<tr>
<td>Bit assignment</td>
<td>Inputs</td>
</tr>
<tr>
<td>Bit 1 = Aux input 1</td>
<td>Bit 1 = not used</td>
</tr>
<tr>
<td>Bit 2 = Aux input 2</td>
<td>Bit 2 = not used</td>
</tr>
<tr>
<td>Bit 3 = green LED</td>
<td>Bit 3 = OUT 1</td>
</tr>
<tr>
<td>Bit 4 = red LED</td>
<td>Bit 4 = not available</td>
</tr>
</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 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 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 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 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.

**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.

**WARNING**

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

---

**Wiring diagram**

---

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

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

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<tr>
<th>Applicable models</th>
<th>QN97_, QX97_</th>
</tr>
</thead>
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<td>Specifications</td>
<td>Communication protocol AS-Interface with extended addressing</td>
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<tr>
<td>Configuration</td>
<td>(2) Discrete sensor Inputs</td>
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<tr>
<td></td>
<td>(2) Auxiliary Discrete Inputs</td>
</tr>
<tr>
<td></td>
<td>(1) Output (solenoid)</td>
</tr>
<tr>
<td>Voltage</td>
<td>26.5 - 31.6 VDC (ASI Voltage)</td>
</tr>
<tr>
<td>Output voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Quiescent current</td>
<td>15 mA</td>
</tr>
<tr>
<td>Maximum output current</td>
<td>160 mA</td>
</tr>
<tr>
<td>Maximum output power</td>
<td>4 watts</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 80° C (-40° to 176° 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>
<tr>
<td>Bit assignment</td>
<td>Inputs</td>
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<tr>
<td></td>
<td>Outputs</td>
</tr>
<tr>
<td></td>
<td>Bit 1 = Aux input 1</td>
</tr>
<tr>
<td></td>
<td>Bit 1 = not used</td>
</tr>
<tr>
<td></td>
<td>Bit 2 = Aux input 2</td>
</tr>
<tr>
<td></td>
<td>Bit 2 = not used</td>
</tr>
<tr>
<td></td>
<td>Bit 3 = green LED</td>
</tr>
<tr>
<td></td>
<td>Bit 3 = OUT 1</td>
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<tr>
<td></td>
<td>Bit 4 = red LED</td>
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<tr>
<td></td>
<td>Bit 4 = not available</td>
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<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 diagram

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

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

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

**Touch & Tune switch setting**
All adjustments assume you are looking down on the top of the sensor module. The magnet in the cam will be centered on the sensor when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 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 prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed within operation.
4.6 Position transmitters and potentiometers

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

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<td><strong>Applicable models</strong></td>
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<td>Standard potentiometer QN5, QX5</td>
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<tr>
<td>High performance potentiometer QN7, QX7</td>
</tr>
<tr>
<td><strong>Output</strong></td>
</tr>
<tr>
<td><strong>Voltage range</strong></td>
</tr>
<tr>
<td><strong>Recommended voltage</strong></td>
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<tr>
<td><strong>Maximum load</strong></td>
</tr>
<tr>
<td><strong>Span</strong></td>
</tr>
<tr>
<td><strong>Maximum linearity error</strong></td>
</tr>
<tr>
<td>Standard potentiometer (5) + 0.85°</td>
</tr>
<tr>
<td>High performance potentiometer (7) + 0.35°</td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
</tr>
<tr>
<td><strong>Warranty</strong></td>
</tr>
</tbody>
</table>

Wiring diagrams

**Transmitter only**

**Transmitter with SPST switches**

**Transmitter with SPDT switches**

**Transmitter with solid state switches**


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)**

![Diagram of transmitter with (33) VCT's](image1)

**Transmitter with (35) VCT’s (Q\_5T, Q\_7T)**

![Diagram of transmitter with (35) VCT's](image2)

**Transmitter with (44) VCT’s (Q\_54, Q\_74)**

![Diagram of transmitter with (44) VCT's](image3)

**Transmitter with (45) VCT’s (Q\_5R, Q\_7R)**

![Diagram of transmitter with (45) VCT's](image4)
4.6.1 4 to 20 mA position transmitters with and without switches (Type 5, 7) continued

**Position transmitter calibration**

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

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

**Electrical schematic**

**Load curve**

**Touch & Tune switch setting**

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

QN53, QX53, QN73, QX73 see page 10
QN5T, QX5T, QN7T, QX7T see page 11
QN5X, QX5X, QN7X, QX7X see page 12
QN5E, QX5E, QN5F, QX5F, QN7E, QX7E, QN7F, QX7F see page 14
QN54, QX54, QN74, QX74 see page 16
QN5R, QX5R, QN7R, QX7R see page 17
QN5A, QX5A, QN7A, QX7A see page 18
QN5N, QX5N, QN7N, QX7N see page 20
QN5L, QX5L, QN5P, QX5P, QN7L, QX7L, QN7P, QX7P, QN7T, QX7T see page 21
QN5G, QX5G, QN5H, QX5H, QN5S, QX5S, QN7G, QX7G, QN7H, QX7H, QN7J, QX7J see page 23
QN5M, QX5M, QN7M, QX7M see page 24
QX5V, QX5W, QX7V, QX7W see page 25
### 4.6 Position transmitters and potentiometers

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

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<th>Applicable models</th>
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</thead>
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<td>Standard potentiometer QNB, QXB</td>
</tr>
<tr>
<td>High performance potentiometer QNC, QXC</td>
</tr>
</tbody>
</table>

#### Specifications

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

#### Wiring diagrams

- **Potentiometer only**

- **Potentiometer with SPDT switches**

- **Potentiometer with SPST switches**

- **Potentiometer with solid state switches**

---

**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 set screw. 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 see page 13
- QNB7, QXB7, QNC7, QXC7 see page 11
- QNBX, QXBX, QNCX, QXCX see page 12
- QNBE, QXBE, QNBF, QXB, QNCEF, QXCEF, QNCF, QXCF see page 14
- QNB4, QXB4, QNC4, QXC4 see page 16
- QNBR, QXBR, QNCR, QXCR see page 17
- QNBA, QXBA, QNCA, QXCA see page 18
- QNBN, QXBN, QNBN, QXCN see page 20
- QNBL, QXBL, QNB8, QXB8, QNBC, QXCL, QCCL, QCCL, QCCL, QCCL, QCCL see page 21
- QNBG, QXBG, QNBB, QXBB, QNB8, QXBS, QNC, QXCG, QNCH, QXC, QNCS, QCSC see page 22
- QNB, QXBJ, QNCJ, QCCL see page 23
- QNBM, QXB, QNCM, QCXM see page 24
- QXBV, QXBV, QXCW, QCX see page 25
4.6 Position transmitters and potentiometers

4.6.3 Digital position transmitter (Type T_)

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>QNT_, QXT_</th>
</tr>
</thead>
</table>

### Specifications

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

### Wiring diagrams

**Transmitter only (Q_TO)**

#### Setup Instructions:
- Operate actuator to 4 mA position and touch SET 4 mA for 2 seconds.
- Operate actuator to 20 mA position and touch SET 20 mA for 2 seconds.

### LED status indications

<table>
<thead>
<tr>
<th>Green LED state</th>
<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>Solid on</td>
<td>4.0 mA</td>
<td>Valve at closed calibrated position</td>
<td></td>
</tr>
<tr>
<td>Solid on</td>
<td>Off</td>
<td>20.0 mA</td>
<td>Valve at open calibrated position</td>
<td></td>
</tr>
<tr>
<td>4 short flashes every 3 sec (- - - -)</td>
<td>Off</td>
<td>3.5 mA</td>
<td>Attempted calibration span greater than 320°</td>
<td>Perform calibration within maximum span (≤320°)</td>
</tr>
<tr>
<td>Off</td>
<td>4 short flashes every 3 sec (- - - -)</td>
<td>3.5 mA</td>
<td>Attempted calibration span less than 35°</td>
<td>Perform calibration within minimum span (≥35°)</td>
</tr>
<tr>
<td>Off</td>
<td>2 short flashes every 3 sec (- -)</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>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>1 long and 1 short flashes every 3 sec (--- -)</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>1 long and 2 short flashes every 3 sec (--- - -)</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

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 20
QNTG, QXTG, QNTH, QXTH, QNTS, QXTS see page 22
QNTM, QXTM see page 24

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 Expeditors

4.7.2 With mechanical switches (8V, 8W)

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>QXBV_, QXBW_</td>
</tr>
</tbody>
</table>

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

**Expeditor with SPDT mechanical switches with gold contacts (QXBW_)**
- **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**

**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>Feature</th>
<th>Details</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>
</tbody>
</table>

| Warranty                     | - Two years                                  |

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

**Intermediate switch**

![Diagram of intermediate switch setting]

**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°.

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)

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>QN82_, QX82_</th>
</tr>
</thead>
</table>

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>
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<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>
<tr>
<td>Warranty</td>
<td>Two years</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

**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.

**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

4.7.5 With Foundation Fieldbus communication (83)

**Intermediate switch specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable models</td>
<td>QN83_, QX83_</td>
</tr>
<tr>
<td>Intermediate switch settings</td>
<td></td>
</tr>
<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 switch</td>
</tr>
<tr>
<td>Warranty</td>
<td>Two years</td>
</tr>
</tbody>
</table>

**Intermediate switch setting**

At full close 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 4.5°.

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 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.

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

4.7.6   With AS-Interface communication (86)

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

**Intermediate switch specifications**

See also AS-Interface module specifications and adjustment procedures on page 32

<table>
<thead>
<tr>
<th>Electrical ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10 amp @ 125 VAC 50/60 Hz</td>
</tr>
<tr>
<td>3.5 volts @ 10 mA</td>
</tr>
<tr>
<td>6.5 volts @ 100 mA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40° to 80° C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating life</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 million cycles</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Seal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hermetically sealed reed switch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two years</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**

*Soleno ids not supplied with unit

**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.

**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 ½°.

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.
5 Model/Type code

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

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

5.3 QNabcdef
   a = 2A, 4A, 5A, 7A, 2B, 2E, 4E, 5E, 7E, 2F, 4F, 5F, 7F, 2G, 4G, 5G, 7G,
   2H, 4H, 5H, 7H, 8H, 2I, 4I, 5I, 7I, 2J, 4J, 5J, 7L,
   2M, 4M, 5M, 7M, 2N, 4N, 5N, 6N, 7N, 5O, 7O, 2R, 4R, 5R, 7R, 92, 93, 94,
   2S, 4S, 5S, 7S, 5T, 7T, 2V, 4V, 5V, 6V, 7V, 8V, 2W, 4W, 5W, 7W, 8W,
   4X, 6X, 8Y, 14, 33, 35, 44, 45, 53, 54, 73, 74, 82, 83, 84, 86, 87,
   92, 93, 94, 96, 97, 98, B3, C3, B4, C4, BA, CA, BE, CE, BF, CG, BH,
   CH, BJ, CJ, BL, CL, BM, CM, CN, BO, CO, BP, BR, CS, BS, CT, TA, TE,
   TF, TG, TH, TM, TN, TO, TR, TS, TT
   c = 02, 03, 05, 06
   d = S, N, H
   e = A, C, D, G, N, R, S, T, U, V, W, X, 1, 2, 3, 4, 5, 0
   f = A or M

5.4 QXabcdef
   a = 2A, 4A, 5A, 7A, 2B, 2E, 4E, 5E, 7E, 2F, 4F, 5F, 7F, 2G, 4G, 5G, 7G,
   2H, 4H, 5H, 7H, 8H, 2I, 4I, 5I, 7I, 2J, 4J, 5J, 7L,
   2M, 4M, 5M, 7M, 2N, 4N, 5N, 6N, 7N, 5O, 7O, 2R, 4R, 5R, 7R, 92, 93, 94,
   2S, 4S, 5S, 7S, 5T, 7T, 2V, 4V, 5V, 6V, 7V, 8V, 2W, 4W, 5W, 7W, 8W,
   4X, 6X, 8Y, 14, 33, 35, 44, 45, 53, 54, 73, 74, 82, 83, 84, 86, 87,
   92, 93, 94, 96, 97, 98, B3, C3, B4, C4, BA, CA, BE, CE, BF, CG, BH,
   CH, BJ, CJ, BL, CL, BM, CM, CN, BO, CO, BP, BR, CS, BS, BT, TA, TE,
   TF, TG, TH, TM, TN, TO, TR, TS, TT
   b = B, E, F, G, J, L, M, N, R, S, T, V, W
   c = 02, 03, 05, 06
   d = S, N, H
   e = A, C, D, G, N, R, S, T, U, V, W, X, 1, 2, 3, 4, 5, 0
   f = A or M
6 Regulatory, specific conditions of use, and product marking

DECLARATION OF CONFORMITY

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 QC 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>QN Series</td>
<td>EU Type Examination Certificate FM10ATEX0039X&lt;br&gt;ATEX 2014/34/EU&lt;br&gt;EN 60079-0:2012+A11:2013, EN 60079-11:2012&lt;br&gt;EMC 2014/30/EU&lt;br&gt;EN 60947-6-2:2007/A1:2012</td>
<td><img src="image" alt="2809 ATEX II 1 G Ex ia IIC T6…T1 Ga" /></td>
</tr>
<tr>
<td>QX Series</td>
<td>EU Type Examination Certificate FM08ATEX0008X&lt;br&gt;ATEX 2014/34/EU&lt;br&gt;EN 60079-0:2012+A11:2013, EN 60079-1:2014&lt;br&gt;EMC 2014/30/EU&lt;br&gt;EN 60947-6-2:2007/A1:2012</td>
<td><img src="image" alt="2809 ATEX II 2 G c Ex db IIC T6…T5 Gb" /></td>
</tr>
<tr>
<td>QC Series</td>
<td>IECEx Certificate of Conformity IECEx FMG 11.0001X&lt;br&gt;IEC 60079-0:2011, IEC 60079-1:2014</td>
<td>Ex db IIC T6…T5 Gb</td>
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<tr>
<td>QC Series</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ATEX Notified Bodies for EU Type Examination Certificates:
- FM Approvals Europe Ltd., Dublin, Ireland (Notified Body Number 2809)

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 2809)
    - QAR GB/FME/QAR11.0003..............FM Approvals (Notified Body Number 2809)

- Vanha Porvoontie 229, FIN-01380 Vantaa, Finland
  - Product Serial Number Designation = V******
  - Quality Assurance Certificates:
    - ISO 9001:2015............................DNV (Notified Body Number 2460)
    - QAN DNV-2006-OSL-ATEX-0260Q........DNV (Notified Body Number 2460)
    - QAR NO/DNV/QAR09.0008............DNV (Notified Body Number 2460)

- 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 2460)
    - QAN DNV-2006-OSL-ATEX-0260Q........DNV (Notified Body Number 2460)
    - QAR NO/DNV/QAR09.0008............DNV (Notified Body Number 2460)

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

Fergus Falls, 09th August 2019

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, QX and QC 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 +60°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 T4…T1 Ga Ta = -25°C to +80°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 T4…T1 Ga Ta = -25°C to +61°C</td>
</tr>
</tbody>
</table>

- NOTE: See also FM08ATEX0008X for Series QN, QX and QC with Type of Protection “d”. See also Control Drawing 105193 for “Ex ia” installation.

#### For QX and QC 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 +80°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 = -40°C to +69°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 +57°C</td>
</tr>
</tbody>
</table>

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

#### For QX and QC 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 = -45°C to +80°C</td>
</tr>
<tr>
<td>2. Consult the manufacturer if dimensional information on the flameproof joints is necessary.</td>
<td>Ex db IIC T6 Gb Ta = -40°C to +57°C</td>
</tr>
</tbody>
</table>

105414revC

StoneL publication 105406revC
### 6 Regulatory, specific conditions of use, and product marking continued

#### For QN, QX and QC Series – IECEx FMG 19.0016X

<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>Ex ia IIC T4...T1 Ga Ta = -25°C to +80°C Ex ia IIC T4...T1 Ga Ta = -25°C to +68°C Ex ia IIC T4...T1 Ga Ta = -40°C to +80°C Ex ia IIC T4...T1 Ga Ta = -40°C to +74°C Ex ia IIC T4...T1 Ga Ta = -40°C to +61°C Ex ia IIC T4...T1 Ga Ta = -35°C to +40°C Ex ia IIC T4...T1 Ga Ta = -35°C to +74°C Ex ia IIC T4...T1 Ga Ta = -35°C to +61°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>Ex ia IIC T5 Ga Ta = -55°C to +80°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>Ex ia IIC T5 Ga Ta = -40°C to +69°C Ex ia IIC T5 Ga Ta = -40°C to +64°C Ex ia IIC T5 Ga Ta = -40°C to +46°C Ex ia IIC T5 Ga Ta = -35°C to +34°C Ex ia IIC T5 Ga Ta = -25°C to +68°C Ex ia IIC T5 Ga Ta = -25°C to +61°C Ex ia IIC T5 Ga Ta = -25°C to +40°C Ex ia IIC T5 Ga Ta = -25°C to +25°C Ex ia IIC T5 Ga Ta = -25°C to +64°C</td>
</tr>
</tbody>
</table>

#### For QX and QC Series – FM17US0048X / FM17CA0026X

<table>
<thead>
<tr>
<th>Specific Conditions of Use - Notes</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Consult the manufacturer if dimensional information on the flameproof joints is necessary.</td>
<td>XP / I / I / BCD DIP / I-III / I / EFG NI / I-I-III / 2 / ABCDEFG I / I / AEx db IIC T5 Gb I / I / / IIC / T5 Gc</td>
</tr>
</tbody>
</table>

#### For QN and QC 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 is constructed from plastic. To prevent the risk of electrostatic sparking the plastic surface should only be cleaned only with a damp cloth.</td>
<td>NI / I-II-III / 2 / ABCDEFG iS / I, II, III / 1 / ADBCDEFG – 105193 CI I / Zone 0 / AEx ia IIC T6...T1 Ga CI I / Zone 0 / Ex ia IIC T6...T1 Ga</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><em>See Approval Certificates for applicable models / type codes.</em></td>
</tr>
</tbody>
</table>

NOTE: See also Control Drawing 105193 for “IS” installation.
### Installation Notes (Class I, II, III; Division 1; Groups A, B, C, D, E, F, G):

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

1. Voc or Vt < Vmax, Isc or It < Imax, Ca > Ci + Ccable, La > Li + Lcable.
2. Dust-Tight conduit seal must be used when installed in Class II and Class III environments.
3. Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
4. Installation should be in accordance with ANSI/ISA RPA12.6 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70).
5. The configuration of associated apparatus for each sensor wiring pair must be FMRC Approved.
6. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
7. To maintain intrinsic safety, wiring associated with each sensor must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
8. Switches 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.

### Installation Notes (Ex ia IIC T4):

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

1. Voc or Vt < Ui, Isc or It < li, 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.
QNT*, QXT*

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

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

Entity Parameters: $U_i = 30 \text{V}$; $I_i = 100 \text{mA}$; $P_i = 0.75 \text{W}$; $C_i = 3 \text{nF}$; $L_i = 0 \text{H}$.

Solenoid Connection Terminals: $U_i = 30 \text{V}$; $I_i = 120 \text{mA}$

1. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus when the following is true: $V_o, V_t$ or $U_o < U_i$ (Vmax); $I_s, I_t$ or $I_o < I_i$ (Imax); $C_a > C_i + C_{cable}$; $L_a > L_i + L_{cable}$.
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 RPA12.06.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANS/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. Associated apparatus manufacturer’s installation drawing must be followed when installing this equipment.
6. 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.
7. Conduit Grounding – Upon installation verify electrical continuity between conduit and ground terminal.
8. Resistance between Intrinsically Safe Ground and earth ground must be less than one ohm.

INSTALLATION NOTES (Ex ia IIC T5/T6):

Entity Parameters: $U_i = 30 \text{V}$; $I_i = 100 \text{mA}$; $P_i = 0.75 \text{W}$; $C_i = 3 \text{nF}$; $L_i = 0 \text{H}$.

Solenoid Connection Terminals: $U_i = 30 \text{V}$; $I_i = 120 \text{mA}$

1. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus when the following is true: $V_o, V_t$ or $U_o < U_i$; $I_s, I_t$ or $I_o < I_i$; $C_a > C_i + C_{cable}$; $L_a > L_i + L_{cable}$.
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 Vrms or Vdc.
4. Installation should be in accordance with appropriate local code or practice.
5. The configuration of associated apparatus for each sensor/solenoid wiring pair must be approved.
6. Associated apparatus manufacturer’s installation drawing must be followed when installing this equipment.
7. To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
8. Conduit Grounding – Upon installation verify electrical continuity between conduit and ground terminal.
9. Resistance between Intrinsically Safe Ground and earth ground must be less than one ohm.
Controlled Installation Drawings continued

QNB*, QXB*, QNC*, QXC*

NOTE:
1) IF * IS "J", ALSO SEE SHEET 4.
2) IF * IS "M", ALSO SEE SHEET 5.
3) IF * IS "4" OR "R", ALSO SEE SHEET 6.
4) IF * IS "A", ALSO SEE SHEET 8.

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

Entity Parameters:

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

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

INSTALLATION NOTES (Ex ia II C T5/T6):

Entity Parameters:

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

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

NOTE:
1) IF * IS "J", ALSO SEE SHEET 4.
2) IF * IS "M", ALSO SEE SHEET 5.
3) IF * IS "4" OR "R", ALSO SEE SHEET 6.
4) IF * IS "A", ALSO SEE SHEET 8.
**NOTE:**
1) IF * IS "5" OR "7", ALSO SEE SHEET 1.
2) IF * IS "B" OR "C", ALSO SEE SHEET 3.

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

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

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

**INSTALLATION NOTES:**
If Q_7J or Q_5J (Ex ia IIC T4)
else (Ex ia IIC T6):

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

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

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

**Entity Parameters:**
- $V_{mx} = 30$ V; $I_{mx} = 100$ mA; $C_i = 66$ nF; $L_i = 0.80$ mH; $P_i = 2.0$ W
- If $V_{oc} < V_{mx}$, $I_{sc} < I_{mx}$, $C_a > C_i + C_{cable}$, $L_a > L_i + L_{cable}$
- Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
- 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).
- The configuration of associated apparatus for each sensor wiring pair must be FMRC Approved.
- Assicated apparatus manufacturer’s installation drawing must be followed when installing this equipment.
- To maintain intrinsic safety, wiring associated with each sensor must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
- Sensors and/or transmitter are optional based on model number. (If more than 2 sensors, follow instructions above for each sensor.)
- Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
- Substitution of components may impair hazardous location safety.

**INSTALLATION NOTES:**
- If $Q_7M$ or $Q_5M$ (Ex ia IIC T4)
- Else (Ex ia IIC T6):

**Entity Parameters:**
- $U_i = 30$ V; $I_i = 100$ mA; $C_i = 66$ nF; $L_i = 0.80$ mH; $P_i = 2.0$ W
- If $V_{oc} < U_i$, $I_{sc} < I_i$, $C_a > C_i + C_{cable}$, $L_a > L_i + L_{cable}$
- Dust-tight conduit seal must be used when installed in Zone 20, Zone 21, and Zone 22 environments or where Ingress Protection of IP67 is required.
- Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
- Installation should be in accordance with appropriate local code or practice.
- The configuration of associated apparatus for each sensor wiring pair or solenoid wiring pair must be approved.
- Associated apparatus manufacturer’s installation drawing must be followed when installing this equipment.
- To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground.
- Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal.
- Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
- Substitution of components may impair hazardous location safety.
7.1 Controlled Installation Drawings continued

**Installation Notes:**

- **Entity Parameters:**
  - QN44, QC45, QN45, QX44, QX45, QN*, QX*

**Hazards (Classified) Location:**

**Non-Hazardous (Safe Area) Location:**

**Terminal Strip Identifiers:**

**Individual Sensor Wiring:**

**Intrinsically Safe Ground:**

**Intrinsically Safe Barrier (Associated Apparatus):**

**Control Equipment:**

**Terminal Strip:**

**Non-Hazardous Location:**

**Hazardous Location:**

**Installation Notes:**

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

**Restricions:**

This drawing and all information contained herein is the property of and is subject to change by STONEL. Drawing is not to be reproduced or revealed to any other party unless authorized by STONEL.

**Dimensions:**

- Inches (unless otherwise specified)
- Angles ± 0° 30'
- Finish: 125 RMS
- ± 0.005
- ± 0.010
- ± 0.015

**Title:**

I.S. CONTROL, QUARTZ SERIES

**Tolerances:**

- X.XXX ± 0.005
- X.X ± 0.010
- X.X ± 0.015

**Scaling:**

- Sheet 6 of 9

**Revision:**

- 105193
- 08/17 RB13398
- 12/15 RB11363
- 04/19 RB14247

**Drawing Control System:**

STONE L CONTROL US INC, FERGUS FALLS, MN 56537 USA

**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.

**App.:** RK

**Approval Date:** 6/15/2007

**Date:** 08/23/17

**Controlled Installation Drawings continued**
For QN_N, QX_N Temperature Codes, Ambient Temperatures and Energy Limitation Parameters see Table below:

<table>
<thead>
<tr>
<th>Ta* =</th>
<th>U</th>
<th>I</th>
<th>P</th>
<th>C</th>
<th>V</th>
<th>mH</th>
</tr>
</thead>
<tbody>
<tr>
<td>-25°C to 56°C</td>
<td>16</td>
<td>25</td>
<td>34</td>
<td>40</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>-25°C to 61°C</td>
<td>16</td>
<td>25</td>
<td>64</td>
<td>40</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>-25°C to 80°C</td>
<td>16</td>
<td>52</td>
<td>169</td>
<td>40</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>-25°C to 53°C</td>
<td>16</td>
<td>76</td>
<td>242</td>
<td>40</td>
<td>0.05</td>
<td></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 R12.6.01 “Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations” and the National Electrical Code (ANSI/NFPA 70) or in accordance with the Canadian Electric Code.
4. Associated apparatus manufacturer’s installation drawing must be followed when installing this equipment.
5. To maintain intrinsic safety, wiring associated with each sensor or solenoid coil wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground. Each Sensor and Solenoid coil shall be wired as separate intrinsically safe circuits.
6. 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.

INSTALLATION NOTES

If Q_7N or Q_5N (Ex ia IIC T4...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.

For T6 Ta* =

-25°C to -61°C
-25°C to 61°C
-25°C to 80°C
-25°C to 53°C

For T5 Ta* =

-25°C to -61°C
-25°C to 61°C
-25°C to 80°C
-25°C to 53°C

For T4...T1 Ta* =

-25°C to -61°C
-25°C to 61°C
-25°C to 80°C
-25°C to 53°C

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 **TN, TX** Temperature Codes, Ambient Temperatures and Energy Limitation Parameters see Table below:

<table>
<thead>
<tr>
<th>Ta*</th>
<th>U</th>
<th>I</th>
<th>R</th>
<th>C</th>
<th>mH</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40°C to 5°C</td>
<td>16</td>
<td>25</td>
<td>34</td>
<td>50</td>
<td>0.15</td>
</tr>
<tr>
<td>-40°C to 0°C</td>
<td>16</td>
<td>25</td>
<td>64</td>
<td>50</td>
<td>0.15</td>
</tr>
<tr>
<td>-40°C to 6°C</td>
<td>16</td>
<td>25</td>
<td>52</td>
<td>169</td>
<td>50</td>
</tr>
<tr>
<td>-40°C to 12°C</td>
<td>16</td>
<td>76</td>
<td>242</td>
<td>50</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. For **QN_A, QX_A**
   - U < Ui (Vmax); Io < Ii (Imax); Ca > Ci + Ccable, La > Li + Lcable.
   - Control equipment connected to barrier must not use or generate more than 250 Vrms or Vdc.
   - Installation should be in accordance with ANSI/NFPA 70 or in accordance with the Canadian Electric Code.
   - Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
   - Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
   - Parts of the enclosure are non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charge on non-conducting surfaces. Additionally, cleaning of the equipment should only be done with a damp cloth.
   - Substitution of components may impair hazardous location safety.

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. Related 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. 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.
QN\(^*\)B, QX\(^*\)B

For QN_B, QX_B Temperature Codes, Ambient Temperatures and Energy Limitation Parameters see Table below:

<table>
<thead>
<tr>
<th>For T6</th>
<th>For T5</th>
<th>For T4...T1</th>
<th>U</th>
<th>I</th>
<th>R</th>
<th>C</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ta = 57°C</td>
<td>Ta = 69°C</td>
<td>Ta = 80°C</td>
<td>16</td>
<td>25</td>
<td>34</td>
<td>100</td>
<td>0.20</td>
</tr>
<tr>
<td>Ta = 25°C</td>
<td>Ta = 76°C</td>
<td>Ta = 84°C</td>
<td>16</td>
<td>25</td>
<td>64</td>
<td>100</td>
<td>0.20</td>
</tr>
<tr>
<td>Ta = 25°C</td>
<td>Ta = 64°C</td>
<td>Ta = 80°C</td>
<td>16</td>
<td>25</td>
<td>64</td>
<td>100</td>
<td>0.20</td>
</tr>
<tr>
<td>Ta = 34°C</td>
<td>Ta = 64°C</td>
<td>Ta = 80°C</td>
<td>16</td>
<td>52</td>
<td>169</td>
<td>100</td>
<td>0.20</td>
</tr>
<tr>
<td>Ta = 22°C</td>
<td>Ta = 64°C</td>
<td>Ta = 80°C</td>
<td>16</td>
<td>76</td>
<td>242</td>
<td>100</td>
<td>0.20</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 wiring must be run in separate cables or separate shields connected to intrinsically safe (associated apparatus) ground. Each Sensor and Solenoid coil shall be wired as separate intrinsically safe circuits.
6. Conduit Grounding - Upon installation verify electrical continuity between conduit and ground terminal. 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.

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. Resistance between Intrinsic Safe Ground and earth ground must be less than one ohm.
9. Substitution of components may impair hazardous location safety.