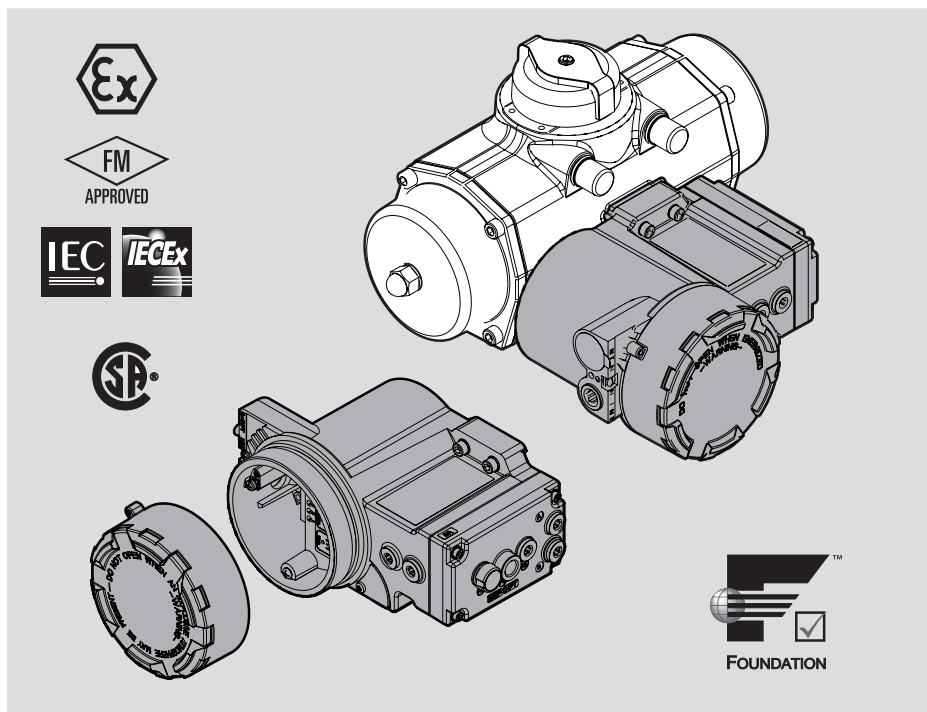


# Bettis Q-Series Control Module

## QC54 FOUNDATION Fieldbus™



## 1 Applicable modules

QC54 - FOUNDATION Fieldbus™

- Weather Proof
- Non-incendive/Non-Sparking/FISCO ic
- Intrinsically safe/FISCO

### Note:

These variations can be equipped with one or two pilot valves:

- \* One pilot valve is default and suitable for normal operation of double acting or spring return actuators.
- \* Two pilot valves are required for Fail in Last Position function on double acting actuators.

The enclosures have a IP66 or NEMA 4X, ingress protected rating.

## 2 Before starting

- \* Actuator must be isolated both pneumatically and electrically before any (dis)assembly is begun.
- \* Hazards related to the control of external processes under measurement, are beyond the scope of the content described in this document.
- \* Installation, adjustment, putting into service, use, assembly, disassembly and maintenance of the control module must be done by qualified personnel.
- \* Do not install, operate, or maintain a Q series control module without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance.
- \* To avoid personal injury or property damage, it is important to carefully read, understand, and follow all of the contents of this manual, including all safety cautions and warnings.
- \* Be sure that the actuator is correctly mounted before connecting air supply and electrical wiring (see Installation & Operation Manual Bettis Q-Series Valve Actuator, DOC.IOM.BQ.E)
- \* Check the module label for the right execution (see figure 2.2)
- \* Check the type of actuator: single or double acting (see figure 2.2).
- \* For mechanical installation of the module see installation instruction leaflet DOC.QC4.MTI.1, as shipped with the module.
- \* If you have any questions regarding these instructions, contact your Emerson sales office before proceeding as shipped with the module.

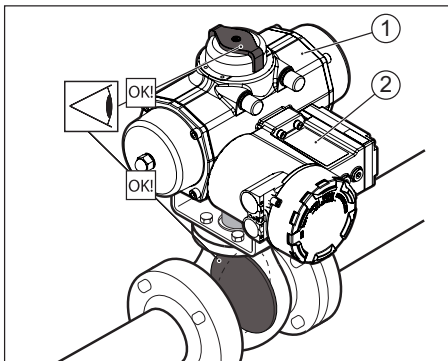


Fig. 2.1 Check proper mounting before connecting air supply and electrical wiring.

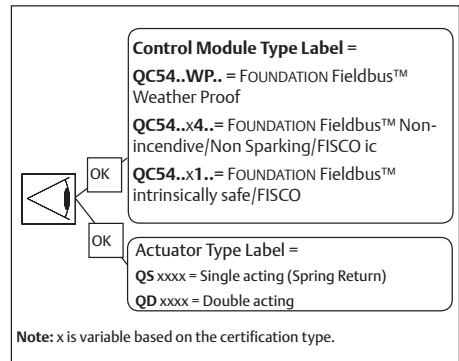


Fig. 2.2 Identification

## 2.1 Mechanical alignment and mounting of the control module

The control module is equipped with an alignment-edge on top of the module. This allows easy alignment and mounting of the control module on to the actuator housing.

### Procedure: (see figure 2.3)

1. First take care that both mating faces from the actuator and control module are clean and free of dirt.
2. Check if the module has the required function
3. Remove the transparent film from the control module.
4. Ensure seals are placed correctly.
5. Level the screws with the surface.
6. Place the alignment-edge (1) of the control module at the top of the pneumatic interface.
7. Flip the module down taking care that the IPT Probe (2) on the actuator fits in the mating hole on the control module and loosely place the screws.
8. Tighten screws according force in sequence.

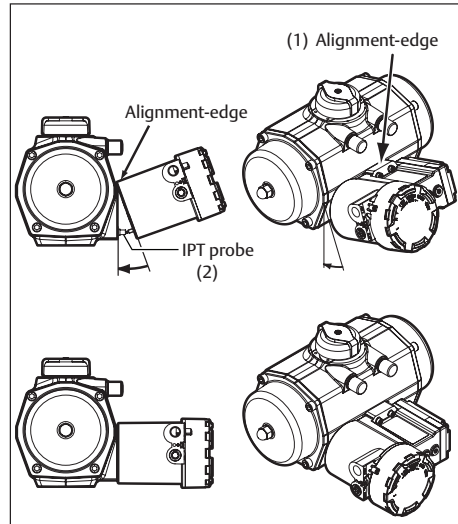


Fig. 2.3 Alignment and mounting of control module to actuator

### Tightening moments

The Control Module should be fastened by using an Allen key and applying the following tightening moments:

- Allen Key No 5: 6.1 to 6.6 Nm  
(54 - 58.4 In.lbs)

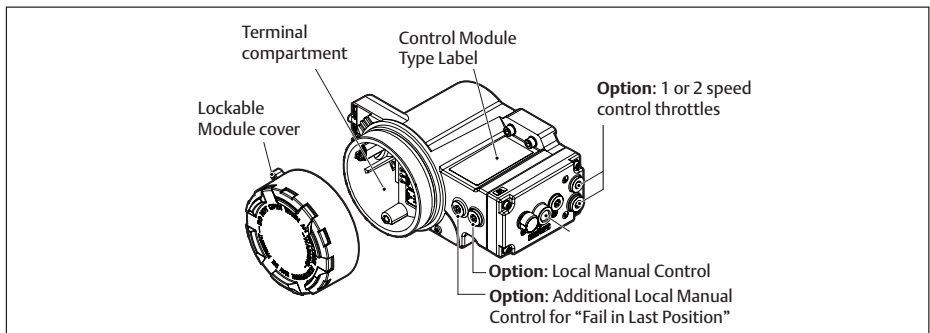


Fig. 2.4 Control module overview

### 3 Pneumatic connections



#### IMPORTANT

- 1 The actuator/valve combination can move after connecting the air supply.
  - 2 Ensure that the QC54 control modules are mounted properly to the actuator to achieve good functioning and the required ingress protection, before connecting the air supply.
  - 3 Check that the maximum supply pressure  $P_{max} = 8\text{bar}/116\text{Psi}$
  - 4 Be sure that the minimum required supply pressure for the application is available at the actuator.
  - 5 Take appropriate measures to prevent condensation or moisture to entering the actuator or the control module. Condensation or moisture can damage these components and can result in failures.
  - 6 The exhaust ports Ra and Rb on the module (see figure 3.1) are shipped from the factory with transport protection.
- \* If ingress protection IP66 or NEMA 4X is required, appropriate connections must be used in exhaust ports Ra & Rb.

#### 3.1 Operating media :

- \* Air or inert gasses.
- \* Air filtered at 5 micron.
- \* Dew point 10 K below operating temperature.
- \* For subzero applications take appropriate measures.

#### 3.2 Single acting (spring return) or Double acting actuator :

- 1 Remove the transport sticker from the air supply (Ps).
- 2 Connect air supply to port (Ps).

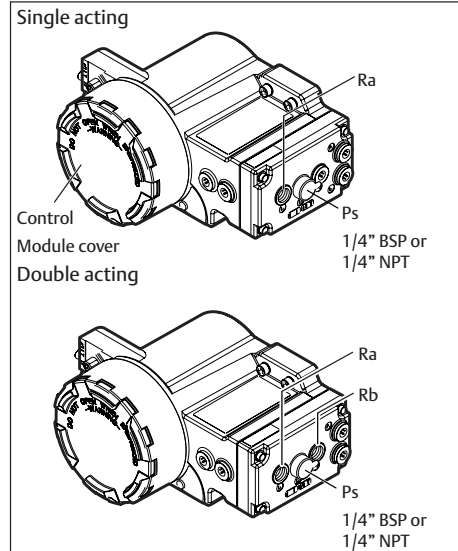


Fig. 3.1 Pneumatic connections

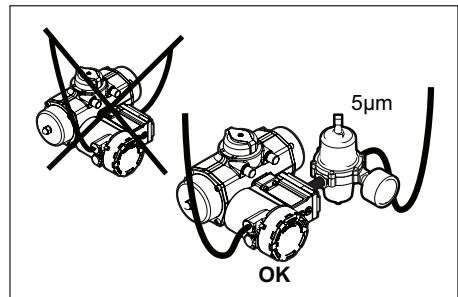


Fig. 3.2 Install drip loops

## 4 Electric Connections

Table 4.1 Electrical data QC54 - FF

|                                   |  |
|-----------------------------------|--|
| Voltage range *                   | 9~32V  |
| Maximum current                   | 18 mA  |
| Reverse polarity protection       | Unit is not polarity sensitive.  |
| Required external protection      | Restrict the power supply current to <600mA.                                     |
| <b>Environmental conditions :</b> |  |
| Temperature *                     | -20°C to +50°C<br>(-4°F to +122°F)   |
| Humidity                          | 0 to 85% at 25°C(+77°F)<br>derate to 50% above 40°C<br>(104°F) (non-condensing). |
| Altitude                          | Operating full power available<br>up to 2000 meter (6000 feet).                  |
| Use                               | In- and outdoor.   |

\* The current restricted power supply meets NEC Class 2, as described by the National Electrical Code® (ANSI/NFPA 70 (NEC®))

\* In case the Control module is used in Hazardous locations, check the chapters 10, 11 or 12 for detailed instructions.

### ⚠ WARNING

\* Do not put the Control module and the Pneumatic module in direct contact with magnetic material. This can cause damage or malfunction of the position feedback.

\* If the Control Module is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

\* If required, mount earth wire (1) between top (2) and bottom (3) ring of earth wire connection (see figure 4.1).

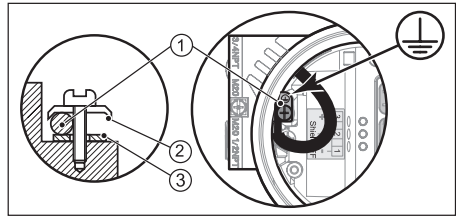


Fig. 4.1 Earth wire connections

#### 4.1 Procedure

1. Remove control module cover (see figure 4.2)
2. Guide the cable(s) through the electrical entry(ies).
  - Use and mount cable glands as required by national or local legislation.
  - When IP65/NEMA4X ingress protection is required, the electrical entries must be fitted with glands rated IP65/NEMA4X or higher.
  - Apply minimum thread counts:  
For NPT, at least 5 full threads  
For Metric, at least 8 full threads for Group A/B and 5 full threads of Group C/D
3. Connect the FOUNDATION Fieldbus™ signal to the applicable terminals (see figure 4.3).
  - For 7/8" or M12 quick connector pinout, see figure 4.3 and 4.4.
  - For hazardous area connections, see the wiring instructions in 11.5 and 11.6.
4. Mount the function module cover to the housing (see figure 4.2) or continue with chapter 5. Take care that the cover seal is in place to comply to dust and water tightness according to IP66/NEMA4X.

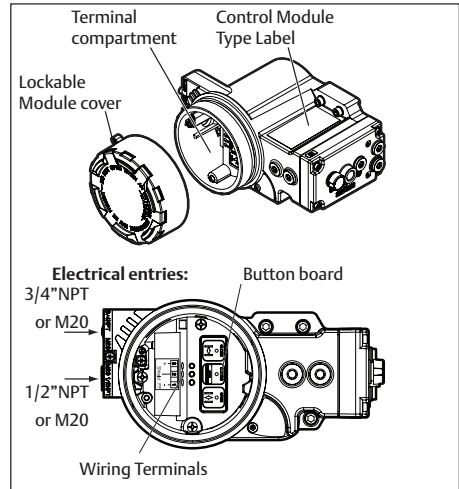


Fig. 4.2 Installing wiring

#### 4.2 FOUNDATION Fieldbus installation and wiring guidelines

Please check [www.fieldbus.org](http://www.fieldbus.org) for various application guides like installation and wiring guidelines.

Table 4.2 Wiring dimensions

| Wire type   | Dimensions                                 |
|-------------|--|
| Cable range | 0.33 to 2.5mm <sup>2</sup> or 22 to 12 AWG |

Table 4.3 Tools

| Tool               | Dimensions             |
|--------------------|------------------------|
| Cover lock screw   | Allen key 2mm          |
| Tool for terminals | Screw driver 0.6 x 3.5 |

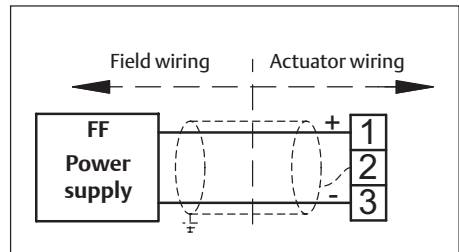


Fig. 4.3 Terminal connections

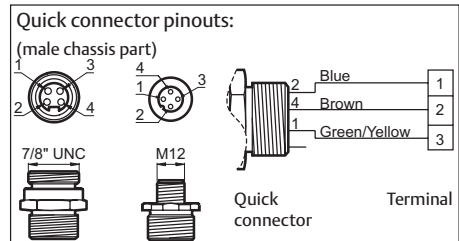


Fig. 4.4 Quick connector pinouts

## 5 Initial setup

### 5.1 Initialization procedure

Initialization sets automatically the switch points for the position feedback of the actuator (see §5.2). Additionally, initialization checks if the actuator and control module configuration match. This procedure will detect the action type (Fail-Open, Fail-Close or Fail in last position) and generate an alert if there is a configuration issue.

This process is done automatically, by the module, however, the user must start it and the unit must be wired according chapter 4.

Digital communication is not required but power supply is necessary (9V to 32V DC).

The initialization process can be started in one of two ways:

1. Initialization using the local buttons (see §5.2).
2. Initialization using a bus command (see **Reference manual QC54, DOC.RM.BQC54.E**)

### 5.2 Initialization using local buttons

Before starting the initialization procedure, make sure the device is in "Out of Service" (OOS). By default, the device is shipped with the OOS setting.

To set the device to OOS either use the FF system or a 475 communication tool.

- 1 Press the Status/Auto-Initialization button for 3 seconds or hold until the LED starts flashing.
- 2 Press the Status/Auto-Initialization button for 1 second and the LED starts blinking
- 3 Actuator will cycle 2 or 3 times.
- 4 At the end of the routine the Status LED switches to constant on, meaning the initialization was successful.

#### Remark:

- If the button board does not work, see §5.3.1.
- If the Status LED is flashing, the auto initialization routine has failed, see §5.3.2.
- If the read out in the PLC or DCS is reversed or readjustment of the exact positions is needed, or
- If it is not possible to finish the auto-initialization routine, the limit switch points can be set, by the bus. In both cases, see **Reference manual QC54, DOC.RM.BQC54.E**, chapter 3.4

#### ⚠ WARNING

- \* During the initialization routine the actuator / valve combination will cycle several times.
- \* Before initialization check whether the actuator and valve have the same "Open" and "Closed" positions.
- \* Ensure that the valve stroke is not obstructed before the initialization routine is started.

Table 5.1 Status LED indications

| Status               | Status LED action       |
|----------------------|-------------------------|
| OK (init successful) | Constant on             |
| Initializing         | Blinking (see fig. 5.1) |
| Init error           | Flashing (see fig. 5.1) |
| Init default         | Flashing (see fig. 5.1) |
| Identification       | Flashing for 300 sec.   |

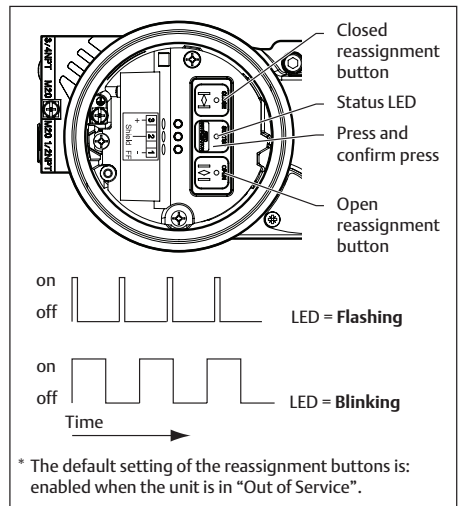


Fig. 5.1 Reassignment buttons  
(located behind front cover of module).

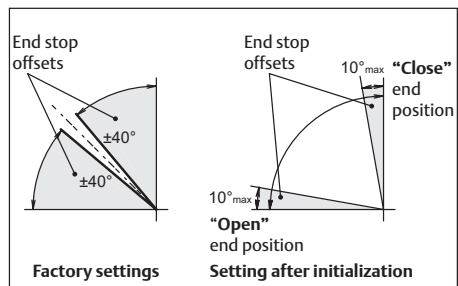


Fig. 5.2 Feedback characteristic

### 5.3 Troubleshooting

#### 5.3.1 “Factory default settings”, using the button board.

To set the control module to its factory default settings, do the following:

1. Power must be connected according chapter 4 and the Status LED is either on or flashing.
2. Disconnect the power.
3. Press both reassignment (OPEN and CLOSE) buttons.
4. Reconnect power.
5. Status LED goes on.
6. Release the reassignment (OPEN and CLOSE) buttons.
7. Observe that the Status LED indicates that the unit is in its “Init Default” state (Flashing, see §5.2)

#### 5.3.2 If auto initialization procedure has failed (Status LED is flashing)

1. Check supply pressure
2. Check Actuator assembly code (see **Installation & Operation Manual Bettis Q-Series Valve Actuator, DOC.IOM.Q.E**)
3. Repeat the initialization procedure.
4. When the actuator does not move within 10 seconds, the auto initialization will fail.
5. To solve this either;
  - Perform the “default setting” procedure (see §5.3.1) and repeat the initialization procedure (see §5.2), or
  - Set the limit switch points individually by the bus see **Reference manual QC54, DOC.RM.BQC54.E** chapter 3.4.

## 6 Check functioning

To perform a function test, please see chapter 3 of **Reference manual QC54, DOC.RM.BQC54.E**.

- After checking the functioning mount the control module cover to the housing (see figure 3.1).

## 7 Maintenance

The Bettis Q-Series control modules are designed to operate without maintenance.

For any further maintenance to the actuator see **Installation & Operation Manual Bettis Q-Series Valve Actuator, DOC.IOM.Q.E** or contact your local Bettis Q-Series representative.

For any further maintenance to the control module see **Maintenance Manual, DOC.MM.BQC54.E** or contact your local Bettis Q-Series representative.

Installation, adjustment, putting into service, use, assembly, disassembly, maintenance and repair of the control module must be done by qualified personnel.

### ▲ WARNING

- Substitution of components may impair suitability of the equipment

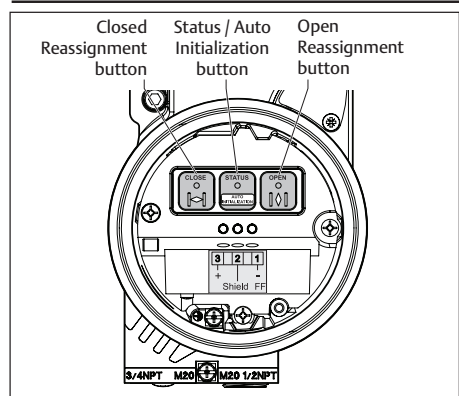


Fig. 5.3 Button board functionality

Table 2 Button board functionality (see fig. 5.3)

| Action                     | Reassignment buttons  |
|----------------------------|---|
| Initialize                 | Press and confirm press the “Status/Auto-Initialization” button.  |
| Set to factory default     | Push both reassignment buttons and hold while powering up. Release buttons when Status LED is solid.                              |
| Switch point re-adjustment | A new switch point can be set by pressing and confirm press the corresponding “Open” or “Closed” button (actuator wil not cycle). |



## 8 Optional Controls

### 8.1 Manual Control options

(see figure 8.1)

For commissioning, emergency or maintenance purposes, the Bettis Q-Series can be supplied with one or two Manual Control options. These can operate the spool valve(s) inside the module and as such operate the actuator, when there is air pressure available, but no control signal or power supply.

#### 8.1.1 Mounting Manual Control

1. To add a Manual Control, remove the plug(s) in front of the module and turn in the Manual Control.
  - For normal operation the module should be fitted with one Manual Control.
  - For Double Acting with a Fail-in-Last-Position function, two Manual Control can be fitted.

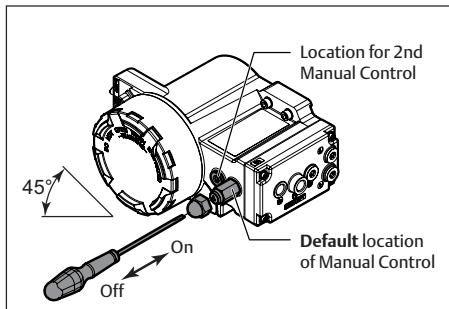


Fig. 8.1 Local Manual Control options

#### 8.1.2 Manual Control operation

1. The Manual Control has a “Push & Lock” function:
  - To operate the Manual Control, use a screw driver, push to activate and release to de-activate the pilot valves.
  - If required turn it 45°, to lock it in position and keep the actuator in its operated state.
2. In case of a Fail in Last Position configuration with two manual controls:
  - The manual control on the right side (default location) will pressurize the central air chamber and cause the actuator to rotate counter clock wise. For reverse acting Bettis Q-Series actuators (Assembly code CC) the actuator will rotate clockwise.
  - The manual control on the left side (Location for 2nd Manual Control) will pressurize the end cap air chambers and cause the actuator to rotate clock wise. For reverse acting Bettis Q-Series actuators (Assembly code CC) the actuator will rotate counter clock wise.
  - In order to operate one of the manual control, be sure the opposite manual control is de-activated and unlocked.

## 8.2 Speed control option

(see figure 8.2). The Bettis Q-Series can be supplied with a Speed Control option. One throttle is required for Spring Return actuators and up to two for Double Acting actuators.

The speed control throttle controls the air flow in and out of an air chamber and as such limits the speed of the “Opening” and “Closing” stroke simultaneously

### 8.2.1 Mounting Speed Control throttle(s):

1. Remove the plug(s) at the side of the module and turn in the throttle (2).
2. Spring Return actuators: Use the top entry only.
3. Double acting actuators: Use both bottom and top entries.
  - For standard actuators, the top entry will throttle the closing stroke.
  - For standard actuators, the bottom entry will throttle the opening stroke.
  - For reverse acting actuators, the opposite strokes will be throttled.

### 8.2.2 Adjusting Speed Control throttle(s):

1. Remove the nut cap (1).
2. Clockwise rotation of the adjustment screw reduces the speed.
3. Counter clockwise rotation of the adjustment screw increases the speed.
4. Replace the nut cap.

## 9 Related Information

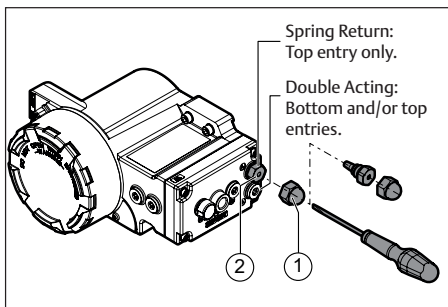


Fig. 8.2 Speed control operation

## 9.1 FOUNDATION Fieldbus installation and wiring guidelines

Please check [www.fieldbus.org](http://www.fieldbus.org) for various application guides like installation and wiring guidelines.

## 9.2 Other Related Information

Other documents containing information related to the Bettis Q-Series module include:

|                |  |
|----------------|--|
| 1.604.12       | FOUNDATION Fieldbus Control Module data sheet                                  |
| DOC.RM.BQC54.E | Reference Manual for Bettis Q-Series with FOUNDATION Fieldbus Function module. |
| DOC.IOM.Q.E    | Installation Operation & Maintenance Manual.                                   |

These documents are available, in multiple languages, for download from

[www.emerson.com/bettis](http://www.emerson.com/bettis)

## 9.3 Device driver

The following DD drivers can be downloaded from [www.emerson.com/bettis](http://www.emerson.com/bettis):

|                                    |                           |
|------------------------------------|---------------------------|
| For general use                    | Q-Series DD Rev. 4        |
| For use in combination with DeltaV | Q-Series DD Rev. 4 DeltaV |

## 9.4 Applied IECEx standards


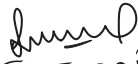
The following standards are applied:

- For Bettis Q-Series Control Module **QC54...P4...**,  
IEC 60079-0 Ed. 6.0 :2011  
IEC 60079-15 Ed. 4.0 :2010  
IEC 60079-31 Ed. 2.0 :2013
- For Bettis Q-Series Control Module **QC54...P1...**,  
IEC 60079-0 Ed. 6.0 :2011  
IEC 60079-11 Ed. 6.0 :2011  
IEC 60079-26 Ed. 3.0 :2014

## 9.5 RoHS Directive

This product is only intended for use in large scale fixed installation excluded from the scope of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2).

## EU Declaration of Conformity

|  |   |  |
|--|---|--|
|   | <p>Legal representative entity for the European Union:<br/>Emerson Process Management, Valve Automation<br/>Asveldweg 11, 7556 BR Hengelo Netherlands</p>   | <p>ROC nr. 11090<br/>Rev. 2</p>              |
| <p><b>FieldQ</b></p>   |   |  |
| <p><b>EU DECLARATION OF CONFORMITY</b><br/>Issued in accordance with the<br/><b>EMC Directive 2014/30/EU, Appendix 1</b><br/><b>ATEX Directive 2014/34/EU</b></p>  |   |  |
| <p>We hereby declare, that the products specified below meet the basic health and safety requirements of the above mentioned European Directives.</p>  |   |  |
| <p>Product description:<br/>Serial number:<br/>Year of Construction:<br/>Manufacturer:</p>   | <p><b>QC54 Foundation Fieldbus Control module</b><br/>Each Control module has an identifiable serial number<br/>Each Control module has an identifiable Year of Construction<br/>Emerson Machinery Equipment (Shenzhen) Co. Ltd.<br/>Bao Heng Technology Industry Park Phase 2, North<br/>Hong Lang 2nd Road District 68, Bao'an District,<br/>518101 Shenzhen, China</p> |  |
| <p><b>EMC Directive 2014/30/EU</b></p>   |   |  |
| <p><b>Types:</b></p>   | <p><b>QC54...</b></p>   |  |
| <p>Applicable standards:</p>   | <p>IEC61326-1 : 2012</p>  | <p>NAMUR Recommendations : NE21: 2015</p>    |
| <p><b>ATEX Directive 2014/34/EU</b></p>  |   |  |
| <p><b>Types:</b></p>   | <p><b>QC54...P4...</b></p>  |  |
| <p>ATEX Certificate No.:</p>   | <p>DEKRA 16ATEX0064X</p>  |  |
| <p>Marking:</p>  | <p>Ⓔ II 3 G Ex nA IIC T4 Gc Ta = -20°C ... +50°C<br/>Ⓔ II 2 D Ex tb IIIC T80°C Db</p>   |  |
| <p>Applicable standards:</p>   | <p>EN 60079-0 : 2012 + A11</p>  | <p>EN 60079-15 : 2010 EN 60079-31 : 2014</p> |
| <p><b>Types:</b></p>   | <p><b>QC54...P1...</b></p>  |  |
| <p>ATEX Certificate No.:</p>   | <p>DEKRA 16ATEX0064X</p>  |  |
| <p>Marking:</p>  | <p>Ⓔ II 1 G Ex ia IIC T4 Ga<br/>Ⓔ II 1 D Ex ia IIIC T80°C Da<br/>Ta = -20°C ... +50°C</p>   |  |
| <p>Applicable standards:</p>   | <p>EN 60079-0 : 2012 + A11 EN 60079-11 : 2012</p>   |  |
| <p>Notified body:</p>  | <p>DEKRA Certification B.V., Notified body no : 0344<br/>Meander 1051, 6825 MJ Arnhem, The Netherlands</p>  |  |
| <p>Signed: <br/>Name: S. Ooi<br/>Position: Vice President, Global Marketing &amp; Pneumatic/Hydraulic SBU<br/>Emerson, Actuation Technologies</p> |   |  |
| <p>Date: 2016-11-25<br/>Place: Houston TX, U.S.A.</p>  |   |  |

## 10 Installation instructions for Non Incendive or Non sparking

### 10.1 Product marking

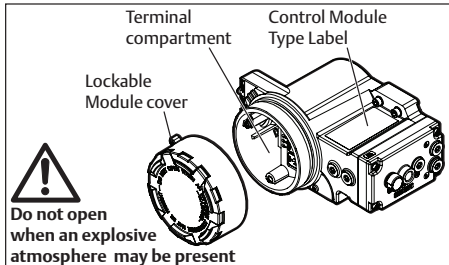


Fig. 10.1 Product marking

#### IECEX Hazardous or Classified Location

Certificate : IECEx DEK 16.0032X  
Non sparking  
Ex nA IIC T4 Gc  
Ex tb IIIC T80°C Db

#### ATEX Hazardous or Classified Location



Certificate : DEKRA 16ATEX0064 X  
Non sparking  
Ex II 3 G Ex nA IIC T4 Gc  
Ex II 2D Ex tb IIIC T80°C Db

#### FM Hazardous or Classified Location

Non Incendive, Class I, II, III, Division 2,  
Groups ABCDEFG, T4,  
Class 1, Zone 2 Group IIC T4

#### CSA Hazardous or Classified Location

Certificate : CSA 17CA70167494X  
Class I, Division 2, Groups A, B, C and D, T4;  
Class II, Division 1, Group E, F and G, T80°C;  
Class III, Division 1, T80°C  
Ex nA IIC T4 Gc  
Ex tb IIIC T80°C Db

#### Ambient temperature:

T4 @ Ta = -20°C...+50°C IP66/Nema 4X

### 10.2 ATEX/IECEX Intended use

- The Control Module QC54..P4.. of the Bettis Q-Series pneumatic actuator is a Group II category 3 equipment with protection level Gc (IECEX).
- The Bettis Q-Series pneumatic actuators is a Group II category 2 equipment.
- Both are intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours, mists or by air/dusts are likely to occur.
- Therefore the assembly may be used in hazardous area classified Zones 2 (Gasses) and/ or 21, 22 (Dust).

### 10.3 Safety instructions

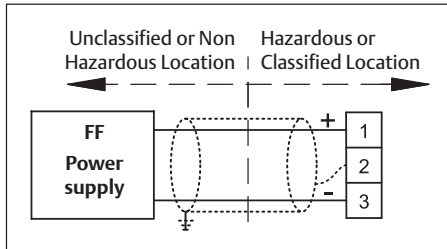
#### WARNING

- Personal injury or property damage caused by fire or explosion may occur if the module is opened in any area which contains a potentially explosive atmosphere or has been classified as hazardous.
- Do not open when module is energized.
- Prevent any kind ignition during installation, adjustment, putting into service and use.
- Assembly, disassembly and maintenance must be done in safe area's without a potential explosion hazard.
- Installation, adjustment, putting into service, use, assembly, disassembly and maintenance or repair, shall be carried out in accordance with the applicable code of practice by suitably-trained personnel.
- Provisions must be made to prevent the rated supply voltage being exceeded by more than 40%.
- Potential electrostatic charging hazard, clean only with a damp cloth - danger of propagating discharge.
- The apparatus shall be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust is avoided.
- Precaution shall be taken to avoid danger of ignition due to electrostatic charges on the marking plate of the enclosure.
- Substitution of electronics cartridge, switch cartridge, pilot valve cartridge, pneumatic cartridge, enclosure and seals must be with parts from Emerson else the suitability for Division 2 will be impaired.

#### 10.4 CSA safety instructions

- The equipment may be used in zones 2 with flammable gases and vapours with apparatus groups IIA, IIB & IIC and with temperature classes T1, T2, T3, T4.
- The equipment may be used in zones 21 & 22 with flammable dusts, fibres and flyings in groups IIIA, IIB and IIC, with a layer auto-ignition temperature of not less than 75 K above the maximum surface temperature marked in the dust coding.
- There are no special checking or maintenance conditions other than a periodic check.
- With regard to explosion safety, it is not necessary to check for correct operation.
- If the equipment is likely to come into contact with aggressive substances, e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected thus ensuring that the type of protection is not compromised.

#### 10.5 Wiring instructions QC54 Non Incendive / Non Sparking Control Modules



#### Warning

- \* Explosion hazard. Do not disconnect equipment when a flammable or combustible atmosphere is present.
- \* Use installation wiring connections with admitted maximum operating temperature of at least 20 °C (68°F) higher than maximum ambient.

| Electrical Input:            |  |
|------------------------------|--|
| Voltage range                | 9–32V  |
| Current                      | 18 mA maximum                                |
| Cable range:                 |  |
| Solid wire                   | 2.5mm <sup>2</sup> max                       |
| Stranded wire                | 0.33 - 2.5mm <sup>2</sup> or 22 - 12 AWG     |
| Protection:                  |  |
| Reverse polarity             | Unit is not polarity sensitive.              |
| Required external Protection | Restrict the power supply current to <600mA. |

- \* The current restricted power supply meets NEC Class 2, as described by the National Electrical Code® (ANSI/NFPA 70 (NEC®))

## 11 Intrinsically safe installation instructions

### 11.1 Product marking

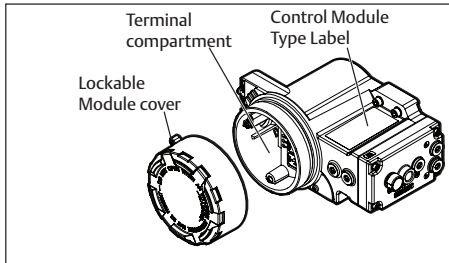


Fig 11.1 Product marking

#### IECEx Hazardous or Classified Location

- Certificate : IECEx DEK 16.0032X
- Intrinsically safe
  - Ex ia IIC T4 Ga
  - Ex ia IIIC T80°C Da

#### ATEX Hazardous or Classified Location



- Certificate : DEKRA 16ATEX0064 X
- Intrinsically safe
  - Ex II 1 G Ex ia IIC T4 Ga
  - Ex II 1 D Ex ia IIIC T80°C Da

#### FM Hazardous or Classified Location

- Intrinsically safe, Class I, II, III Div.1, Groups ABCDEFG, T4
- Class 1, Zone 0, AEx ia IIC T4 Ga
- Zone 20 AEx ia IIIC T80C Da

#### CSA Hazardous of Classified location

- Certificate : CSA 17CA70167494X
- Intrinsically safe
  - Class I, Division 1, Groups A, B, C and D T4;
  - Class I, Division 2, Groups A, B, C and D, T4;
  - Class II, Division 1, Group E, F and G, T80°C;
  - Class III, Division 1, T80°C
  - Ex ia IIC T4 Ga
  - Ex ia IIIC T80°C Da
  - Ex ic IIC T4 Gc

#### Ambient temperature:

T4 @ Ta = -20°C...+50°C IP66

### 11.2 ATEX / IECEx Intended use

The Control Module QC54..P1.. of the Bettis Q-Series pneumatic actuator is a Group II category 1 (ATEX) equipment with protection level Ga (IECEx) and intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours, mists or by air/dusts are likely to occur.

The Bettis Q-Series pneumatic actuators is a Group II category 2 equipment and intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours, mists or by air/dusts are likely to occur.

Therefore it may be used in hazardous area classified Zones 1, 2 (Gasses) and/or 21, 22 (Dust).

### 11.3 Safety instructions

#### ⚠ WARNING

- Personal injury or property damage caused by fire or explosion may occur if the module is opened in any area which contains a potentially explosive atmosphere or has been classified as hazardous.
- The material for the Control Module housing is an aluminium alloy. When the unit is used in a potentiality explosive atmosphere, requiring EPL Ga, the unit must be installed in such a way, that even in the event of rare incidents, an ignition source due to impact or friction between the enclosure and iron/steel is prevented.
- For applications in explosive atmospheres caused by air/dust mixtures and where equipment with EPL Da is required, the surface temperature has been determined for a dust layer with a thickness of 5 mm maximum.
- Potential electrostatic charging hazard, clean only with a damp cloth - danger of propagating discharge.
- The apparatus shall be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust is avoided.
- Precaution shall be taken to avoid danger of ignition due to electrostatic charges on the marking plate of the enclosure.
- Substitution of electronics cartridge, switch cartridge, pilot valve cartridge, pneumatic cartridge, enclosure and seals must be with parts from Emerson else the suitability for Division 2 will be impaired.

#### 11.4 CSA Safety instructions

- The equipment may be used in zones 0, 1 and 2 with flammable gases and vapours with apparatus groups IIA, IIB & IIC and with temperature classes T1, T2, T3, T4.
- The equipment may be used in zones 20, 21 & 22 with flammable dusts, fibres and flyings in groups IIIA, IIIB and IIIC, with a layer auto-ignition temperature of not less than 75 K above the maximum surface temperature marked in the dust coding.
- Installation, adjustment, putting into service, use, assembly, disassembly and maintenance or repair, shall be carried out in accordance with the applicable code of practice by suitably-trained personnel.
- There are no special checking or maintenance conditions other than a periodic check.
- With regard to explosion safety, it is not necessary to check for correct operation.
- If the equipment is likely to come into contact with aggressive substances, e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected thus ensuring that the type of protection is not compromised.

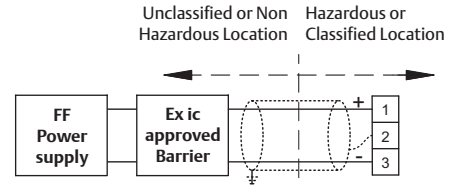
#### 11.5 Dielectric strength

Control Module QC54 complies to the dielectric strength requirement according IEC 60079-11

**Table 11.1 Wiring dimensions**

| Wire type   | Dimensions                                 |
|-------------|--|
| Cable range | 0.33 to 2.5mm <sup>2</sup> or 22 to 12 AWG |

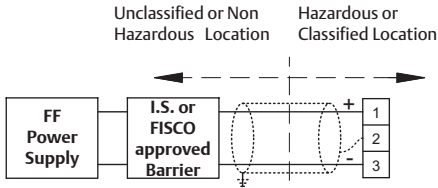
#### 11.6 Wiring instructions QC54 - Protection level "ic"



#### Important

\* Cable may be disconnected without gas clearance

### 11.7 Wiring instructions QC54 - Intrinsically safe Control Modules



| QC54 Intrinsically Safe Entity Parameters |     |       |      |      |      |
|---|-----|-------|------|------|------|
| Circuit                                   | Ui  | Ii    | Pi   | Ci   | Li   |
| Ex ia                                     | 30V | 380mA | 1.5W | 5 nF | 10μH |
| Ex ic                                     | 30V | -/-   | -/-  | 5 nF | 10μH |

| Notes: |  | FM  | ATEX / IECEx  |
|--------|--|---|---|
| 1      | Installation must be in accordance with:                           | National Electrical Code and ANSI/ISA RP12.06.01  | The national wiring practices of the country of use   |
| 2      | Before operation:  | The control module must be mounted according chapters 2, 3 and 11   |   |
| 3      | Barriers:  | Must be FM/CSA Approved and installed in an enclosure that meets the requirements of ANSI/ ISA S82.01/CEC part1 and installed per manufacturer's installation instructions. | Must be certified by a Certified/European Notified body and installed per manufacturer's installation instructions. |
|        |  | Control equipment connected to the barrier must not use or generate more than 250Vrms or Vdc.   |   |
| 4      | Intrinsically safe equipment                                       | Must be FM Approved   | Only ATEX/IECEx Approved  |
| 5      | Barrier I.S. Entity Parameters must meet the following conditions: | $I_o \leq I_i$<br>$L_o \geq L_i + \text{Cable}$   | $P_o \leq P_i$  |
| 6      | Resistance between intrinsically safe ground and earth ground      | Less than one ohm   |   |
| 7      | For FISCO  | Follow the instructions as per chapter 12   |   |
| 8      | Hand-held communicator or multiplexer                              | Must be FM approved with entity parameters and installed per the manufacturer's control drawings.   | Must be ATEX/IECEx approved with entity parameters and installed per the manufacturer's control drawings.           |



## 12 FISCO Concept

The QC54 module is suitable for use in a FISCO system in accordance with IEC 60079-11 : 2012 for use in Zone 1 and 2 locations.

### 12.1 Fieldbus Intrinsically Safe Concept

The FISCO Concept allows the interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination.

The criterion for such interconnection is that the voltage ( $U_i$  or  $V_{max}$ ), the current ( $I_i$  or  $I_{max}$ ), and the power ( $P_i$ ), which intrinsically safe field devices can receive and remain intrinsically safe, considering faults, must be equal to or greater than the voltage ( $U_o$ ,  $V_{oc}$ ), the current ( $I_o$ ,  $I_{sc}$ ) and the power ( $P_o$ ) levels which can be delivered by the associated power supply device considering faults and applicable safety factors. In addition, the maximum unprotected capacitance ( $C_i$ ) and inductance ( $L_i$ ) of each apparatus (other than the terminators) connected to the Fieldbus must be less than or equal to 5 nF and 10  $\mu$ H respectively.

In each I.S. Fieldbus segment only one active device, normally the associated apparatus, is allowed to provide the necessary energy for the Fieldbus system. The voltage ( $U_o$  or  $V_{oc}$ ) of the associated apparatus, used to supply the bus, has to be limited to the range of 14VDC to 24VDC.

All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except to a leakage current of 50  $\mu$ A for each connected device. Separately powered equipment needs a galvanic isolation to insure that the intrinsically safe Fieldbus circuit remains passive.

### 12.2 Cable parameters

The cable used to interconnect the devices needs to comply with the following parameters:

|  |            |  |
|--|------------|--|
| Loop resistance $R_c$ :  | 15 ... 150 | Ohm/Km   |
| Inductance per unit length $L_c$ :   | 0.4...1    | mH/km  |
| Capacitance per unit length $C_c$ :  | 80 ...200  | nF/km  |
| $C_c = C_c \text{ line/line} + 0.5 C_c \text{ line/screen}$ , if both lines are floating or      |            |  |
| $C_c = C_c \text{ line/line} + C_c \text{ line/screen}$ , if the screen is connected to one line |            |  |
| Length of spur Cable:  | max. 60    | m  |
| Length of trunk cable:   | max. 1     | Km   |
| Length of splice:  | max. 1     | m (T-box must only contain terminal connections with no energy storage capability) |

When the cable complies with IEC 60079-11, no further consideration of cable parameters is necessary. The cable parameters may be determined in accordance with Annex C of IEC 60079-14.

### 12.3 Terminators

At both ends of the trunk cable, an approved line terminator with the following parameters is suitable:

- R = 90 ...102Ohm
- C = 0 ...2.2  $\mu$ F

**Note:** IEC 61158-2 requires an operational capacitance value of 0,8  $\mu$ F to 1,2  $\mu$ F.

The number of passive devices connected to the bus segment is not limited due to I.S. reasons. If the above rules respected, up to a total length of 1000m (sum of trunk cable and all spur cables), the inductance and capacitance of the cable will not impair the intrinsic safety of the installation.





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