Bettis Q-Series Control Module

QC54 FOUNDATION™ Fieldbus
1 Applicable modules

QC54 - FOUNDATION Fieldbus™ Weather Proof

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.
* Installation, adjustment, putting into service, use, assembly, disassembly and maintenance of the control module must be done by qualified personnel.
* 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.BQC4.MTI.1, 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 onto 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 (see fig 5; nr.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.

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

Fig 2.3 Alignment and mounting of control module to actuator
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 \( P_{\text{max}} = 8\text{bar}/116\text{Psi} \)
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 50 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).
4 Electric Connections

Table 4.1 Electrical data QC54 - FF

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

* 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.
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 control drawings as indicated in chapter 4.2
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.

4.2 FOUNDATION Fieldbus installation and wiring guidelines

Please check www.fieldbus.org for various application guides like installation and wiring guidelines.

Table 4.2 Wiring dimensions

<table>
<thead>
<tr>
<th>Wire type</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid wire</td>
<td>2.5mm² max.</td>
</tr>
<tr>
<td>Stranded wire</td>
<td>0.2-3.3mm² or 24-12 AWG</td>
</tr>
</tbody>
</table>

Table 4.3 Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover lock screw</td>
<td>Allen key 2mm</td>
</tr>
<tr>
<td>Tool for terminals</td>
<td>Screw driver 0.6 x 3.5</td>
</tr>
</tbody>
</table>
5 Initial setup

5.1 Initialization procedure

Initialization sets automatically the switch points for the position feedback of the actuator (see fig. 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.QC54.E)

5.2 Initialization using local buttons

1. Press and confirm press the “Status/Auto-Initialization” button
2. Status LED will blink.
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.QC54.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

<table>
<thead>
<tr>
<th>Status</th>
<th>Status LED action</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK (init successful)</td>
<td>Constant on</td>
</tr>
<tr>
<td>Initializing</td>
<td>Blinking (see fig. 5.1)</td>
</tr>
<tr>
<td>Init error</td>
<td>Flashing (see fig. 5.1)</td>
</tr>
<tr>
<td>Init default</td>
<td>Flashing (see fig. 5.1)</td>
</tr>
<tr>
<td>Identification</td>
<td>Flashing for 300 sec.</td>
</tr>
</tbody>
</table>

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 buttons.
4. Reconnect power.
5. Status LED goes on.
6. Release the reassignment 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.BQ.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.QC54.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.BQ.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.

Table 2 Button board functionality (see fig. 5.3)

<table>
<thead>
<tr>
<th>Action</th>
<th>Reassignment buttons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initialize</td>
<td>Press and confirm press the &quot;Status/Auto-Initialization&quot; button.</td>
</tr>
<tr>
<td>Set to factory default</td>
<td>Push both reassignment buttons and hold while powering up. Release buttons when Status LED is solid.</td>
</tr>
<tr>
<td>Switch point re-adjustment</td>
<td>A new switch point can be set by pressing and confirm press the corresponding &quot;Open&quot; or &quot;Closed&quot; button (actuator wil not cycle).</td>
</tr>
</tbody>
</table>
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 pilot 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.

8.1.2 Manual Control operation

1 The Manual Control has a “Push & Lock” function:

- To operate the Manual Control, use a screwdriver, push to activate and release to deactivate 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 clock wise.

- 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 deactivated and unlocked.

3 It is possible to rotate the screw multiple cycles. The unit will than toggle every 90° between “locked” (1) and “unlocked” (0).
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 (1).
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 (2).
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

9.1 FOUNDATION Fieldbus installation and wiring guidelines

Please check 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:

BQ 1.604.12 FOUNDATION Fieldbus Control Module data sheet


These documents are available, in multiple languages, for download from www.emersonprocess.com/bettis

9.3 Device driver

The following DD drivers can be downloaded from www.emersonprocess.com/bettis:

<table>
<thead>
<tr>
<th>For general use</th>
<th>Q-Series DD Rev. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>For use in combination with DeltaV</td>
<td>Q-Series DD Rev. 4 DeltaV</td>
</tr>
</tbody>
</table>

Fig. 8.2 Speed control operation
EC Declaration of Conformity

Legal Representative Entity for the European Union: Emerson Process Management, Valve Automation
Asveldweg 11, 7556 BR Hengelo Netherlands

EC DECLARATION OF CONFORMITY
Issued in accordance with the

- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC, Appendix 1

We hereby declare, that the products specified below meet the basic health and safety requirements of the above mentioned European Directives.

<table>
<thead>
<tr>
<th>Product description</th>
<th>QC54 FieldQ Control module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial number:</td>
<td>Each Control module has an identifiable serial number</td>
</tr>
<tr>
<td>Year of Construction:</td>
<td>Each Control module has an identifiable Year of Construction</td>
</tr>
</tbody>
</table>

EMC Directive

Types: QC54...


Signed: _____________________________
Name: S. Ooi
Position: Vice President, Rack & Pinion SBU & Global Marcom
Emerson Process Management, Valve Automation Group
Date: 2015-10-05
Place: Houston TX, U.S.A.

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