Integrated Control modules

QC40 with AS-Interface digital bus communication.

Features

- **ASI digital communication.**
- **Up to 62 devices per segment for ASI-3 protocol**
- **Basic actuator functions for:**
  - Spring return applications, or
  - Double acting applications or,
  - Double acting Fail in Last Position applications.
- **Suitable for all Bettis actuator sizes both single and double acting actuators.**
- **Available as "Weather Proof" for indoors or outdoors use and "Non-Arcing/Non-Incendive" for areas with a potential explosion hazard.**
  - The robust aluminum alloy enclosure (IP66 / NEMA4X rated), protects the IPT system, pneumatic components, the feedback switches and terminals and makes it suitable for indoor and outdoor use.
  - The Explosion Proof version is available with ATEX / IECEx Ex d approval for use in Zone 2, 21 and 22 and/or FM Explosion proof approval for use in Class I, Division 2.
- **Operates with exchangeable position feedback switches.**
- **Non-Intrusive switch point adjustment of the feedback switches. Allows to adjust switch points without opening the Control Module.**
- **LED indicators for Fail, Power, Open and Close position.**
- **Lockable Control Module cover.**
- **All the control and feedback connections can be wired through one single entry to the Control Module.**
- **One larger entry (3/4"NPT) is available for larger multi-core cables on imperial units.**
- **Modular functionality for easy update towards present and future bus systems.**

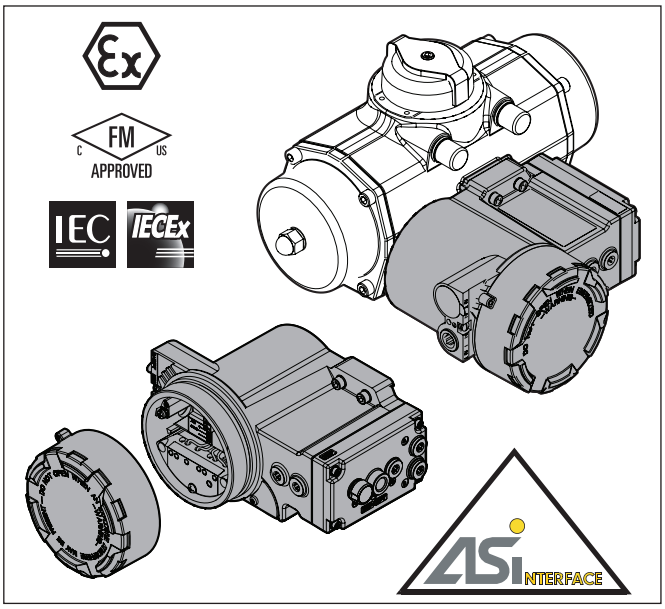


Fig. 1. Control module QC40 with ASI digital communication.

Description:

This Bettis Control Module offers an integrated concept for valve automation. Its compact and robust construction incorporates basic control and feedback functionality and communicates through the ASI 3, 2, 1 protocol.

Construction

All electrical and pneumatic control components are located inside one module housing making it a compact and robust construction incorporating basic control and feedback functionality and is suitable for indoor and outdoor use.
The Control Module is mounted at the side of the basic actuator housing. Inside, wiring terminals are available for connecting the AS-Interface signals. Two cable entries are available.
One pneumatic connection is available to feed the control module. The pilot valves inside the control module are used to send the actuator to its open or closed position.
These modules are available with ATEX, IECEx or Inmetro certification for use in Zone 2, 21, and 22, and additionally FM certified for use in Class I, Division 2.

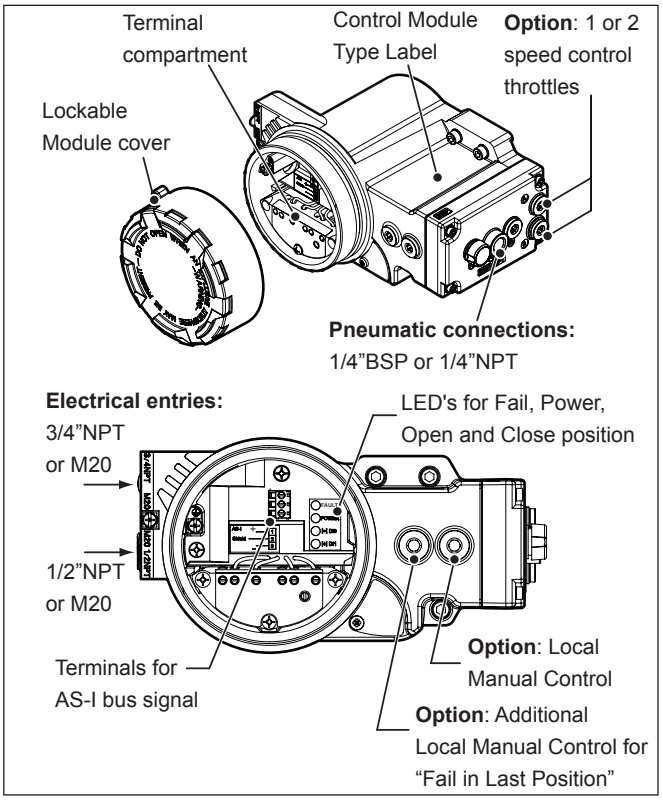


Fig. 2. Control module overview

General specifications:

Material housing:	Aluminium alloy
Operating media:	Air or inert gasses, filtered at 50µm
Pneumatic entry:	Metric units: G1/4" Imperial units: 1/4”NPT
Electrical connections :	Internal terminal strip for bus signal Internal and external earth connection Optional quick connectors: 7/8" or M12 connector (see page 9)
Cable entries:	Metric units: 2x M20x1.5 Imperial units: 1/2” and 3/4"NPT
Enclosure:	Rated IP66 - NEMA4X
Switch points:	Factory set at 15° before each end of travel (open and closed position).
- Adjustable range:	Between -3° to 15° and +75° to +93° of the end position.
Finish:	Chromated with polyurethane based coating.
Temperature range:	G-Type switch: -30°C to +60°C (-22°F to +140°F) N-Type switch: -25°C to +60°C (-13°F to +140°F)

Dimensions:

Metric:	See data sheet BQ1.603.08
Imperial/UNC:	See data sheet BQ1.603.09
DIN 3337:	See data sheet BQ1.603.10

Electrical safety requirements:

Use:	In- and outdoor.
Altitude:	Operating full power available up to 2000 meter (6000 feet).
Maximum relative: humidity	80% for temperatures up to 31°C (87.8°F) decreasing linearly to 50% relative humidity at 40°C (104°F).
Mains supply: fluctuation	Up to ±10% of nominal voltage
Over voltage category:	II
Pollution degree:	2 (3 when the cover remains closed)

Communication Protocol:

Protocol:		AS-Interface
Number of devices:		31 for ASI-1 protocol 62 for ASI-2 protocol
Current	Minimum:	34 mA at 26.5V and 25°C
	Maximum:	140 mA at 26.5V and 25°C
	Nominal:	101 mA at 26.5V and 25°C to 60°C
	Protection:	Short circuit detection
ASI-Profile V3.0:		S-6.A.E (other profiles optional)

Table 1 - Factory settings:

Factory address	00	EID1	7
E/A-Code	6	EID2	E
E/A-Code	A	Parameter	00

Q-Series data bits		Functions	
	Type	DI’s	DO’s
D0	Bi-directional	Feedback “Closed”	Pilot Valve 2 Control
D1	Bi-directional	Feedback “Open”	Pilot Valve 1 Control
D2	Bi-directional	Not used	
D3	Bi-directional	Not used	

LED indicators for Open and Close position, Status, and Power.

- The Open and Close LED identify the position of the automated valve. These LED's are also useful for setting the switch points more accurately.
- Status feedback is provided according to the ASI standard For more detailed information on LED indications, see Installation Guide : DOC.IG.BQC40.1
- The power LED indicates if the AS-I cartridge is powered or not.

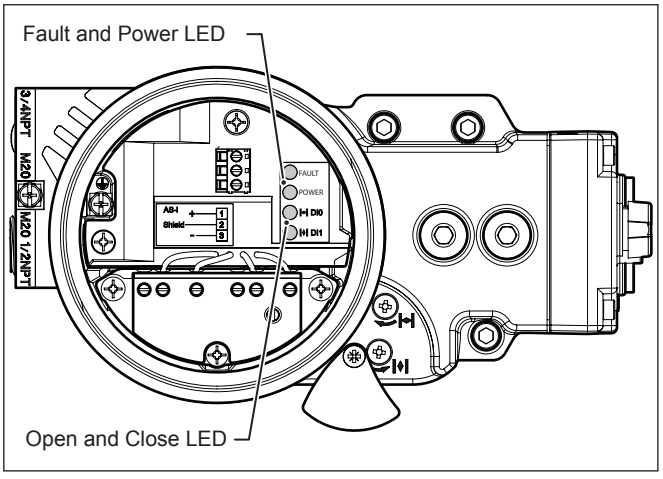


Fig. 3. LED indicators

Pneumatic control

Pneumatic control variations

The Control Module contains all the necessary pneumatic components to control the actuator and control the incoming and outgoing airflow. Pneumatically the modules are available for three applications:

1 Spring return or
2 Double acting or
3 Double Acting - "Fail-in-Last-Position".

To achieve these functions, each Control Module can be fitted with one or two pilot valves depending on the required functionality:

1 One pilot valve is default and suitable for normal operation of double acting or spring return actuators
2 Two pilot valves are required to achieve a "Fail-in-Last-Position" functionality on double acting actuators.

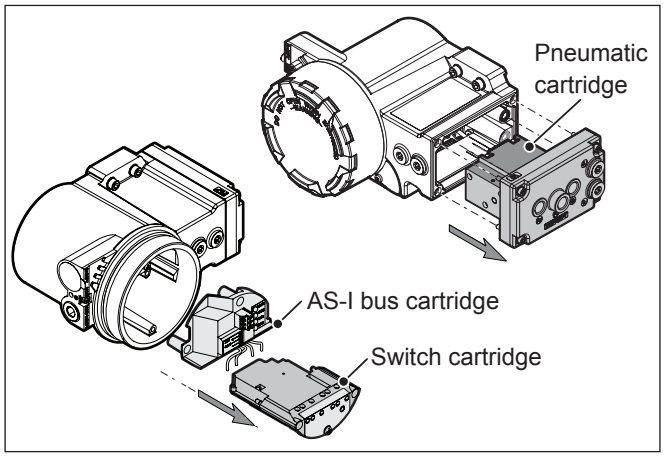


Fig. 4. Pilot valve and pneumatic cartridge

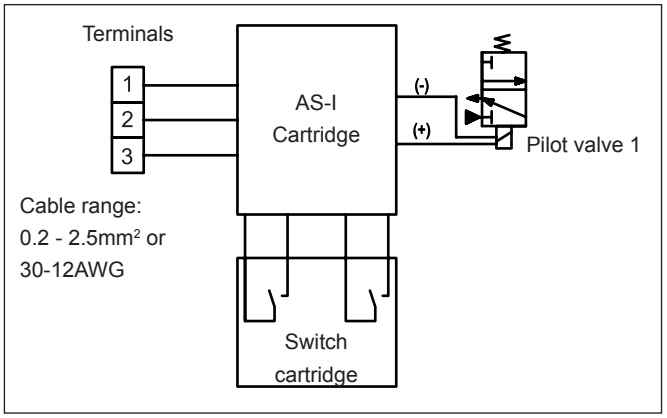


Fig. 5. One pilot valve and wiring connections for standard Double Acting or Spring Return applications

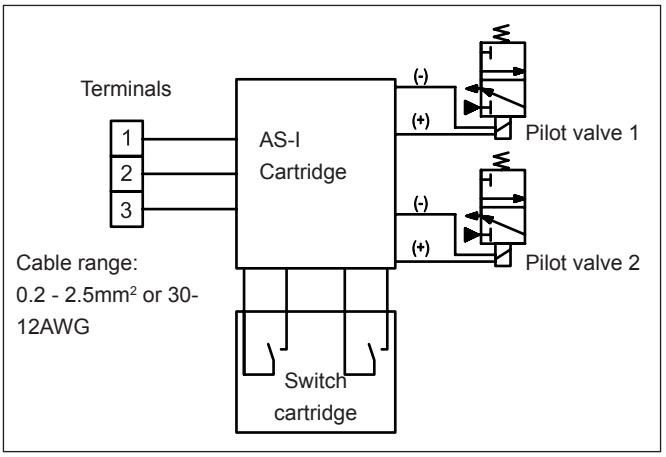


Fig. 6. Two pilot valves and wiring connections for Double Acting "Fail in Last Position" applications

Pneumatic components

The pneumatic components inside the module consist out of one or two pilot valves and a 3/2 spool valve or 5/2 bistable spool valve. The spool valves are pneumatically operated by the pilot valves.
To assure trouble-free operation, the spool valves are equipped with big ports. This enables a large air flow and makes it less sensitive for contamination of the internals. The large air flow also fast cycle times and enables it to be utilized for the entire Bettis Q-Series actuator range.

Internal corrosion protection:

The spring return models have standard a built in “Breather” function. During the spring stroke, the exhaust air from the center chamber (A-Port) is first fed to the spring chamber (B-port) preventing air from outside from being sucked into the spring chamber. This reduces the possibility of internal corrosion and maximizes the actuators’ working life.

Pneumatic options

Speed Control

The QC40 control module 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.

Silencers and vents

The exhaust ports Ra and Rb on the module are shipped from the factory with transport protection.
The module can be equipped with either silencers or vents.

Manual Control

For commissioning, emergency or maintenance purposes, the QC40 control module can be supplied with Manual Control options. These options can operate the actuator when there is air pressure available, but no control signal or power supply.

- 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.

Maximum Flow Rates of Q-Series Modules

The maximum flow rates depends mainly on the flow rates of the Bettis Q-Series modules. You can use K_v 0.33 (m^3/h) or C_v value of 0.38 (US gall/min 1 Psi) for approximate operating speed calculations.

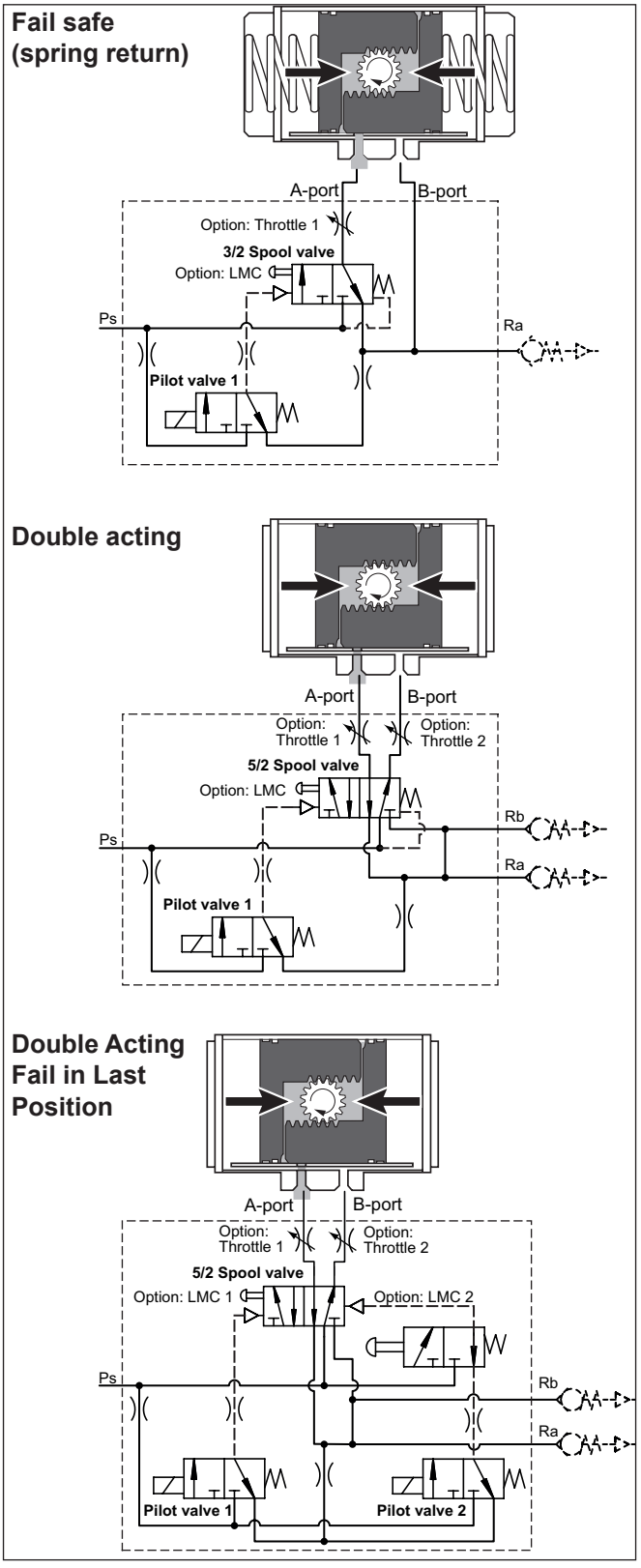


Fig. 7. Pneumatic operation

Position feedback

Switch cartridges

The position feedback is achieved by switch cartridges in the module. These cartridges contain switching elements which sense the open or closed position and are pre wired to the AS-I cartridge (see fig 5 and 6). These easily exchangeable switch cartridges are available with mechanical or proximity switching elements.

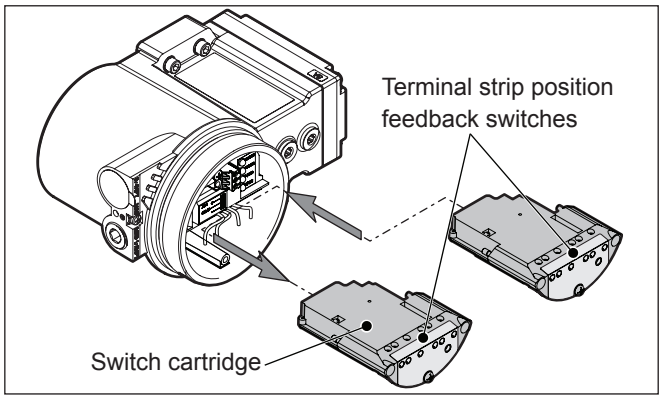


Fig. 8. Switch cartridges

Mechanical switches

Table 2: Mechanical switches

Specification	Description
Option code	G (gold contacts)
Type	Mechanical
Contacts	NO and NC
Temperature range	-30°C to +60°C / -22°F to +140°F For use in hazardous areas, see table 7

2-Wire Proximity switches

Table 4: 2-wire NAMUR proximity switches

Specification	Description
Option code	N
Type	2-wire inductive, normally closed
Temperature range	-25°C to +60°C / -13°F to +140°F For use in hazardous areas, see table 7
Compliant to	DIN EN 60947-5-6 (NAMUR)

Note:

1. The switch cartridge is internal powered by AS-i cartridge, external power/wire for switch signal is not required.
2. For applications below -20°C (-4°F), the base actuator must be equipped with Low temperature seals.

Non-Intrusive switch point adjustment

If required the switches can be adjusted without opening the module. This, so called, Non-Intrusive switch adjustment is located at the front of the module behind a locable (1) shield (2). Two adjustment screws are available for adjusting the Closed (3) and Open (4) position indication.

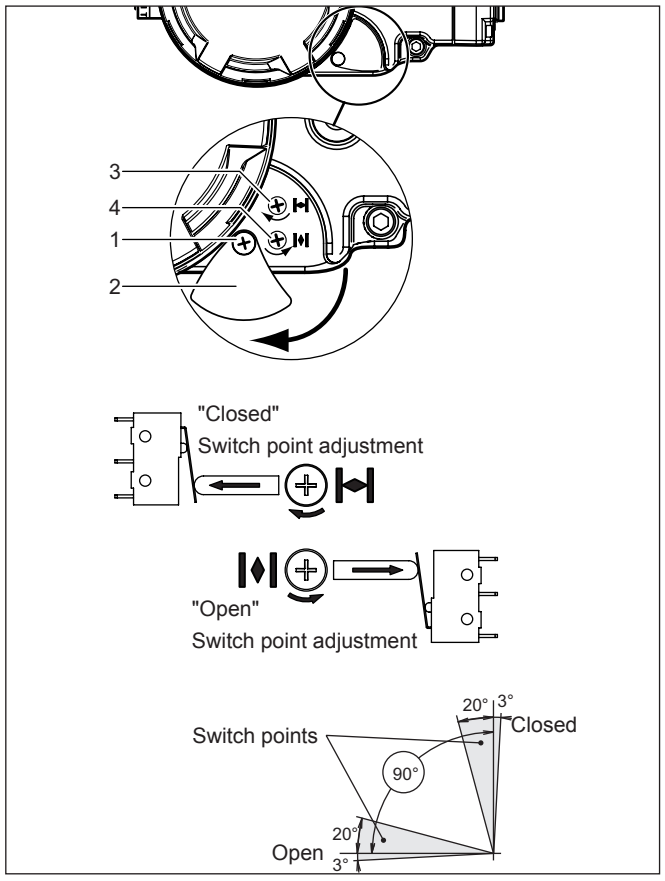


Fig. 9. Non-Intrusive switch point adjustment

Important:

- The above "Closed" and "Open" marked adjustment screws will adjust the valve's "Closed" or "Open" switch point, if the valve closes after a Clock Wise (CW) rotation.
- If the valve closes after a Counter Clock Wise (CCW) rotation, the "Closed" marked adjustment screw will adjust the "Open" switch point. Similar, the "Open" marked adjustment screw will adjust the "Closed" switch point.

Control Module Options

Local Manual Control

Description

For commissioning, emergency or maintenance purposes, the QC40 control module 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.

Notes:

- One Local Manual Control is required for normal operation of Double acting or Spring return actuators.
- For Double acting actuator with a Fail-in-last position function, a second Local Manual Control can be mounted.
- These options can be ordered together with the Control Module or as a kit to be mounted later.
- For option ordering codes, see page 7

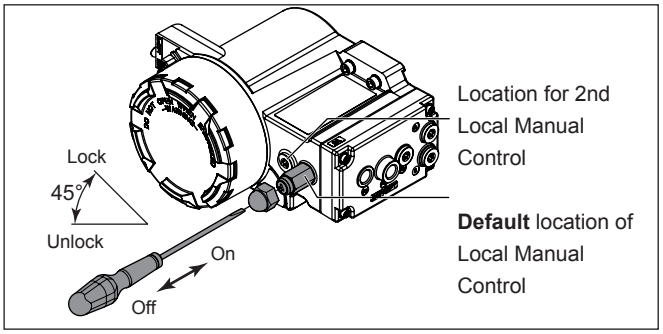


Fig. 10. Local Manual Control option

Speed Control

Description

The QC40 control module 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. This throttle consists of :

1 Nut cover
2 Main throttle with set screw.

Note:

- For Spring Return actuators with one speed control throttle, it is not possible to set both the stroke cycle times to an equal time.
- Four Double Acting actuators it is possible to mount two speed control throttles.
- The actual stroke cycle times depend on the actual load on the actuator during the different strokes.

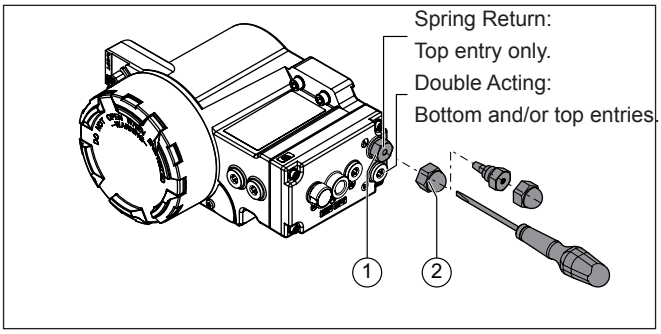


Fig. 11. Speed control options

Hazardous area executions

Control Module QC40 with AS-I bus communication is available with optional Non-Incendive/Non Sparking (NI) approvals as listed below:

IECEx
Certificate No.: Pending

Non-Sparking
Ex nA IIC T4 Gc
Ex tb IIIC T80°C Db

ATEX
Certificate No.: Pending

Non-Sparking

CE

Ex II 3 G Ex nA IIC T4 Gc
Ex II 2 D Ex tb IIIC T80°C Db

FM
Certificate No.: Pending

Non Incendive
- Class I, II, III, Division 2, Groups ABCDEFG, T4,
- Class 1, Zone 2 AEX nA IIC T4 Gc

Ambient temperature:
T4 @ Ta = -25°C...+60°C IP66/Nema 4X or below FM marking

Note:
This product is only intended for use in large-scale fixed installations 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).

Wiring and Quick Connectors

AS-I Bus terminal wiring

The QC40 module can be connected to the system by hard wiring the module to the terminals The QC40 Module can optionally be equipped with prewired quick connectors. Two versions are available: 7/8" or M12 (male chassis part).

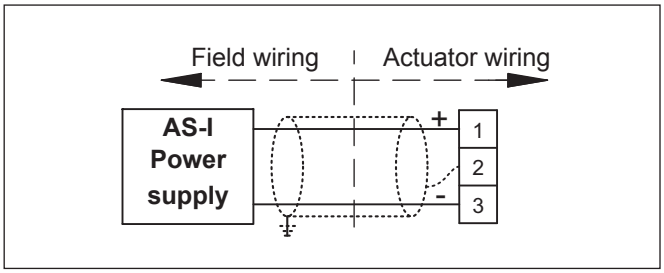
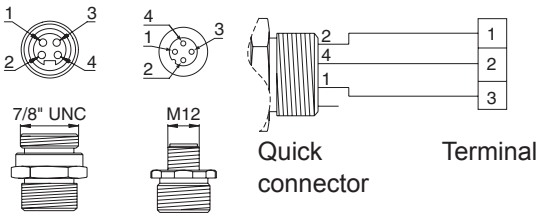


Fig 12. QC40 AS-I module wiring

Quick connector pinouts:
(male chassis part)



Note:
Terminal 2 may be used for shield.

Fig 13. QC40 AS-I module quick connector pinouts

Wiring for hazardous areas

Detailed safe area, Intrinsically safe or Non-Incendive/ Non-Sparking wiring instructions, will be shipped with the product, see Installation Guide : DOC.IG.BQC40.1

Quick connectors

Quick connectors, as shown are excluded for non-Incendive or non-sparking use in hazardous area's classified as Zone 2 or 22 or Cl I, II, III, Div. 2.

Wiring dimensions

Solid wire: 2.5mm^2 max.
Stranded wire: 0.2-3.3mm^2 or 24-12 AWG

Current

Minimum: 34 mA at 26.5V and 25°C
Maximum: 140 mA at 26.5V and 25°C
Nominal: 101 mA at 26.5V and 25°C to 60°C
Protection: Short circuit detection.

Metric Control Module Configuration:

QC40 with ASI digital bus communication.

QC40 • M WP G S K 1 • 0040 I NS 0 IP 0 0

- QC40 — Control module
- M — Conduit connections
- WP — Protection method
- G — Control module options
- S — Action
- K — Future Expansions
- 1 — Language
- 0040 — IPT Device size actuator
- I — Mounting Options
- NS — Speed control
- 0 — Manual Control
- IP — Pneumatic exhaust
- 0 — Top electrical entry
- 0 — Bottom electrical entry

Control module	
QC40	Control module with AS-I communication
•	
Connections	
M	Metric - Conduits: 2x M20 x 1.5 Pneumatic entry 1/4"BSP
Protection method (note 1)	
WP	Weatherproof IP66 / NEMA4X
P4	Non-Incendive / Non Arcing
Control module options	
G	Mechanical switch (Gold Plated)
N	2-wire prox. switch (NAMUR)
Action	
S	Single acting actuator
D	Double acting actuator
F	Double acting actuator - Fail-In-Last-Position
Future Expansions Code	
K	Standard
Language Code	
1	English
•	
IPT Device size for actuator:	
0040	Q40 actuator
0065	Q65 actuator
0100	Q100 actuator
0150	Q150 actuator
0200	Q200 actuator
0350	Q350 actuator
0600	Q600 actuator
0950	Q950 actuator
1600	Q1600 actuator
0000	No IPT probe
0000	No IPT probe

Mounting Options	
U	Uninstalled
I	Installed/Tested to actuator
Speed control	
NS	No Speed Control
N1	Spring Return (1x throttle)
N2	Double acting (2x throttle)
Manual Control (note 2)	
0	No Manual Control
1	1x "Push&Lock", anodized aluminum
2	2x "Push&Lock", anodized aluminum
Pneumatic exhaust	
IP	IP65/NEMA4 rated exhaust
IN	Non metalic exhaust / Check valve
ZZ	Special exhaust
Top conduit (Glands & Plugs, note 3)	
0	Transport plug
1	Metal blind plug
2	Eurofast (M12)
3	Minifast (7/8”)
Bottom conduit (Glands & Plugs, note 3)	
0	Transport plug
1	Metal blind plug
2	Eurofast (M12)
3	Minifast (7/8”)

Notes:

1. Pending certification, only Weather Proof (WP) versions available.
2. 2x Manual Control are only required incase of Double acting with Fail in Last Position function.
3. Glands & Plugs options are a responsibility of the installer. Appropriate instructions can be found in the Installation Guide DOC.IG.BQC40.1. The Quick Connectors, as listed, are excluded from areas with a potential explosion hazard caused by gasses, dust or fibers. The default location for the Quick Connector is the bottom conduit. 2x quick connectors (top and bottom conduit) for daisy chaining 2 units is not recommended.
4. For applications below -20°C (-4°F), the base actuator must be fitted with Low Temperature seals.
5. No separate pneumatic module required.

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Imperial Control Module Configuration:

QC40 with ASI digital bus communication.

QC40 • U WP G S K 1 • 0040 I NS 0 IP 0 0

- Control module
- Conduit connections
- Protection method
- Control module options
- Action
- Future Expansions
- Language
- IPT Device size actuator
- Mounting Options
- Speed control
- Manual Control
- Pneumatic exhaust
- Top electrical entry
- Bottom electrical entry

Control module	
QC40	Control module with AS-I communication
Connections	
U	Imperial - Conduits: Top: 3/4"NPT; Bottom 1/2"NPT Pneumatic entry 1/4" NPT
Protection method (note 1)	
WP	Weatherproof IP66 / NEMA4X
P4	Non-Incendive / Non Arcing
Control module options	
G	Mechanical switch (Gold Plated)
N	2-wire prox. switch (NAMUR)
Action	
S	Single acting actuator
D	Double acting actuator
F	Double acting actuator - Fail-In-Last-Position
Future Expansions Code	
K	Standard
Language Code	
1	English
•	
IPT Device size for actuator:	
0040	Q40 actuator
0065	Q65 actuator
0100	Q100 actuator
0150	Q150 actuator
0200	Q200 actuator
0350	Q350 actuator
0600	Q600 actuator
0950	Q950 actuator
1600	Q1600 actuator
0000	No IPT probe

Mounting Options	
U	Uninstalled
I	Installed/Tested to actuator
Speed control	
NS	No Speed Control
N1	Spring Return (1x throttle)
N2	Double acting (2x throttle)
Manual Control (note 2)	
0	No Manual Control
1	1x "Push&Lock", anodized aluminum
2	2x "Push&Lock", anodized aluminum
Pneumatic exhaust	
IP	IP65/NEMA4 rated exhaust
IN	Non metalic exhaust / Check valve
ZZ	Special exhaust
Top electrical entry (Glands & Plugs, note 3)	
0	Transport plug
1	Metal blind plug
Bottom electrical entry (Glands & Plugs, note 3)	
0	Transport plug
1	Metal blind plug
2	Eurofast (M12)
3	Minifast (7/8”)

Notes:

1. Pending certification, only Weather Proof (WP) versions available.
2. 2x Manual Control are only required incase of Double acting with Fail in Last Position function.
3. Glands & Plugs options are a responsibility of the installer. Appropriate instructions can be found in the Installation Guide DOC.IG.BQC40.1. The Quick Connectors, as listed, are excluded from areas with a potential explosion hazard caused by gasses, dust or fibers.
   For imperial units only the bottom entry (1/2"NPT) is available with quick connectors.
   2x quick connectors (top and bottom entry) for daisy chaining 2 units, is not recommended.
4. For applications below -20°C (-4°F), the base actuator must be fitted with Low Temperature seals.
5. No separate pneumatic module required.

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