Installation, Operation & Maintenance Manual DOC.IOM.Q.E Rev. C April 2017

# **FieldQ Valve Actuator**





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# A Before you start

- FieldQ Series actuators must be isolated both pneumatically and electrically before (dis) assembly.
- It is not permitted to connect a pressure vessel with unreduced media to the FieldQ Series pneumatic actuator.
- FieldQ Series actuators must not be connected to an air supply greater than 8 bar g or 120 psig
- This manual does not provide instructions for installations in hazardous areas.
- Installation, adjustment, putting into service, use, assembly, disassembly and maintenance of the pneumatic actuator must be done by qualified personnel.

# A1 Orientation (see fig. A1)

The FieldQ Series actuator is an integrated concept for the automation of quarter turn valves, dampers or other quarter turn applications. It can consists of three basic parts:

- 1. Pneumatic actuator
- 2. Pneumatic Module or NAMUR Plate
- 3. Control Module



Fig A1 Orientation

# A2 Installation, operation and maintenance reference documents

Before mounting, installing, commissioning or (dis)assembling the actuator consult the following documents:

- All chapters of this manual and
- Installation Guide of the supplied Control Module.
- For installation in hazardous area's: The applicable section of the Installation Guide, as
- shipped with the Control Module.
- For Control Modules with bus communication there may be an additional Reference Manual with more detailed information.

(available from www.emerson.com/fieldq).

# A3 Operating medium

- Air or inert gasses:
- Filtered to 50 micron (5 micron for QC54).
- Check the Installation Guide as shipped with the module for the applicable air quality.
- Maximum pressure, 8 bar g / 120 psig
- Dew point 10 K below operating temperature.
- For subzero applications take appropriate measures.



Fig A2 When needed, use Filter/Regulators with correct filter specification.

# A4 Product integrity

 Assembly or disassembly is only allowed for replacing seals and guide bands (soft parts).

# A5 Hazardous areas

Improper installation in a hazardous area can cause an explosion.

- Assembly, disassembly and maintenance must be done in safe area's without a potential explosion hazard.
- For information about installation in a hazardous area, refer to the appropriate sections of the Installation Guide, as shipped with the control module.
- A6

# Warning ; Moving parts

Applying pressure to the actuator or Applying a control signal to the Control Module, may cause the actuator/valve assembly to operate.

# A7 Prevent moisture entering the actuator

Condensation or moisture that enters the actuator or the Control Module can damage these components and can result in failures. Therefore:

- Try not to mount the actuator with the conduit openings or the air entries, pointing upward.
- Ensure integrity of gaskets and o-rings.
- Install drip loops in conduit or cable. When needed use Filter/Regulators with correct filter specification.
- Seal all conduit openings whether used or not.



Fig A3 Install drip loops and use Filter/Regulators with correct filter specification.

# A8 Warehouse storage

- FieldQ Series Actuators and Control Modules should be stored in a clean, dry warehouse, free from excessive vibration and rapid temperature changes.
- Actuators should not be stored on any floor surface.

# A9 On site storage

- FieldQ Series Actuators and Control Modules should be stored in a clean, dry warehouse, free from excessive vibration and rapid temperature changes.
- Ensure all actuator covers are in place and securely fastened.
- Replace plastic conduit plugs with appropriate pipe plugs.

Failure to follow proper storage guidelines will void warranty.

# A10 Lifting instructions

• Use lifting equipement as required by national or local legislation.

#### Table A1 Weight of Actuators with control modules

control modules						
ACTUATOR	Double	Spring	Double	Spring		
ACTUATOR	acting	Return	acting	Return		
TYPE	in	kg.	in Ib			
Q40	3.9	4.5	8.6	9.9		
Q65	4.5	5.7	9.9	12.6		
Q100	5.2	6.7	11.5	14.8		
Q150	6.9	9	15.2	19.8		
Q200	7.9	11.2	17.4	24.7		
Q350	12.5	19	27.6	41.9		
Q600	21.5	29.7	47.4	65.5		
Q950	28.5	40.7	62.8	89.7		
Q1600	44.8	67.9	98.8	149.7		

- It is strongly recommended to use lifting straps to lift the actuator/valve assembly.
- If an actuator/valve assembly should be lifted, it is strongly recommended to connect the lifting straps in such way that the actuator and valve is supported.

# 1 Introduction

# 1.1 Orientation (see fig. 1.1)

The FieldQ Series actuator is an integrated concept for the automation of quarter turn valves, dampers or other quarter turn applications.



Fig 1.1 Introduction

- 1. Pneumatic actuator
- 2. Visual Position Indication
- 3. Stroke adjustment bolts
- 4. Control Module

- 5. Entries for optional manual control
- 6. Exhausts
- 7. Supply air entry
- 8. Entries for optional speed control

# 2 Installation

# 2.1 Before you start

In case of an air or electrical failure, it is important to know the behavior of the actuator. Before mounting the actuator on a valve consult the following paragraph's.

# 2.2 Failure modes

# 2.2.1 Valve rotation

Valves are normally manufactured so that:

- the valve is closed after a clock wise rotation (viewed from above).



Fig. 2.2.1

- the valve is open after a counter clock wise rotation (viewed from above).





# 2.2.2 Position after a failure

The position of the actuator after a failure depends on the:

- Operating principles (see §2.3)
- Assembly code (see §2.4)
- Kind of failure

# Table 2.1 Position after a failure

Principle of operation	Assembly code :	Kind of failure :	Position :
		Pressure	not defined
	( cw )	Signal	Closed
Double		Supply voltage	Closed
actuator		Pressure	not defined
		Signal	Open
		Supply voltage	Open
Single	*	Pressure	Closed
acting	(cw)	Signal	Closed
actuator		Supply voltage	Closed
(Spring		Pressure	Open
Keturn)		Signal	Open
		Supply voltage	Open

# Table 2.2Position after a failure with a Double<br/>acting module with Fail-In-Last-<br/>Position function

Principle of operation	Assembly code :	Kind of failure :	Position :
	<b>*</b> .	Pressure	not defined
		Signal	not defined
Double		Supply voltage	Closed
actuator		Pressure	not defined
		Signal	not defined
		Supply voltage	Open

# 2.3 Operating principle

2.3.1 Double acting actuators

IMPORTANT

The operating principle, as explained here, is applicable for actuators with assembly code CW (direct acting).

- The outward stroke will move the valve to the "Open" position.
- The inward stroke will move the valve to the "Closed" position.

For assembly codes CC the operating principle is reversed (reverse acting):



Fig. 2.3.1



Fig. 2.3.2

See paragraph 2.4 for more information about actuator assembly codes

- \* Electric control signals can be connected in the Control Module (QC; see documentation supplied with the Control Module). The Control Module is equipped with a pilot valve which controls a 5/2 spool valve.
- <sup>6</sup> Connect air supply to air inlet (Ps).

# **Outward stroke**

- 1 Send control signal "Open" to the Control Module.
- 2 Pilot valve 1 will be activated and the 5/2 spool valve will pressurize the central air chamber.
- 3 The piston will move outwards to the "Open" position.
- 4 The Control Module indicates the "Open" position and activates feedback signal "Open".

# Inward stroke

- 1 Send control signal "Close" to the Control Module.
- 2 Pilot valve 1 will be deactivated and the 5/2 spool valve will pressurize the end cap air chambers.
- 3 The piston will move inwards to the "Closed" position.
- 4 The Control Module indicates the "Closed" position and activates feedback signal "Closed".

# **Optional controls:**

LMC Local Manual Control SCSpeed Control throttles



# IMPORTANT:

In case of an electric control signal failure, the actuator will move to its "Closed" position.



# IMPORTANT

The operating principle, as explained here, is applicable for actuators with assembly code CW (direct acting).

- The outward stroke will move the valve to the "Open" position.
- The inward stroke will move the valve to the "Closed" position.

For assembly codes CC the operating principle is reversed (reverse acting):



Fig. 2.3.3



Fig. 2.3.4

See paragraph 2.4 for more information about actuator assembly codes

- \* Electric control signals can be connected in the Control Module (QC; see documentation supplied with the Control Module). The Control Module is equipped with a pilot valve which controls a 5/2 spool valve.
- \* Connect air supply to air inlet (Ps).

# **Outward stroke**

- 1 Send control signal "Open" to the Control Module to activate Pilot valve 1 and de-activate Pilot valve 2.
- 2 The 5/2 spool valve will pressurize the central air chamber.
- 3 The piston will move outwards to the "Open" position.
- 4 The Control Module indicates the "Open" position and activates feedback signal "Open".

# Inward stroke

- 1 Send control signal "Close" to the Control Module to activate Pilot valve 2 and de-activate Pilot valve 1.
- 2 The 5/2 spool valve will pressurize the end cap air chambers.
- 3 The piston will move inwards to the "Closed" position.
- 4 The Control Module indicates the "Closed" position and activates feedback signal "Closed".

# **Optional controls:**

LMC Local Manual Control SCSpeed Control throttles

# 2.3.2 Single acting (spring return) actuators

# IMPORTANT

The operating principle, as explained here, is applicable for actuators with assembly code CW (direct acting).

- The outward stroke will move the valve to the "Open" position.
- The inward stroke will move the valve to the "Closed" position.

For assembly code CC the operating principle is reversed (reverse acting):



Fig. 2.3.5



Fig. 2.3.6

See paragraph 2.4 for more information about actuator assembly codes

- \* Electric control signals can be connected in the Control Module (QC; see documentation supplied with the Control Module). The Control Module is equipped with a pilot valve controls a 3/2 spool valve.
- \* Connect air supply to air inlet (Ps).

#### **Outward stroke**

- 1 Send control signal "Open" to the Control Module.
- 2 Pilot valve 1 will be activated and the 3/2 spool valve will pressurize the central air chamber.
- 3 The piston will move outwards to the "Open" position
- 4 The Control Module indicates the "Open" position and activates feedback signal "Open".

#### Inward stroke

- 1 Send control signal "Close" to the Control Module.
- 2 Pilot valve 1 will be deactivated and the 3/2 spool valve will vent the central air chamber
- 3 The springs will move the pistons inwards to the "Closed" position
- 4 The Control Module indicates the "Closed" position and activates feedback signal "Closed".

# **Optional controls:**

LMC Local Manual Control SCSpeed Control throttles





# 2.3.3 Position feedback

#### FieldQ Series patented, position sensing system

The FieldQ Series actuator (1) has a patented, contactless position sensing system. This system consists of a position probe (2) which is rides on a special curve (4) in the pinion bottom.

The curve is shaped in such a way that the position probe moves linearly and proportionally to the rotation of the actuator pinion.

The linear movement of the position probe is used, inside the control module (3) to operated the limit switches.



WARNING:

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

# Installation of the FieldQ Series modules

For installation instructions of the modules see chapter 4.

#### Installation Guides - Control modules

Each Control Module is shipped with an Installation Guide, which contains more information on the pneumatic and electrical installation and operation of the Module. Additionally, these Installation Guides can be downloaded from.emerson.com/fieldq

#### 2.4 Actuator assembly codes

#### 2.4.1 Double acting assembly codes







Pilot valve not operated in Control Module В =

All views are from above. Pistons are shown in inner position

End cap air chambers (2) pressurized



# 2.4.2 Single acting (Spring Return) assembly codes





- A = **Pilot valve operated** in Control Module
- **B** = **Pilot valve not operated** in Control Module

All views are from above. Pistons are shown in inner position

Central air chamber (1) pressurized
Spring stroke (2)

CC

С

#### 2.5 **Valve Installation**

# WARNING!

Ŵ Actuator must be isolated both pneumatically and electrically before (dis) assembly. Before mounting or (dis)assembling the actuator consult the relevant sections of this manual.

Remove handle nut, handle, lock washer, etc. from valve if required.



Fig. 2.5.1



Fig. 2.5.2

# CAUTION!

Be sure that the insert is mounted at 90° or 45°.

It is possible to mount the insert turned 22.5°. This way the valve will not open or close the right way.



Fig. 2.5.3



# CAUTION!

- Before mounting the actuator on the valve be sure that both the actuator and the valve have the same position.
- When mounting do not hit with hammer on pinion top.



Fig. 2.5.4



Fig. 2.5.5



# **IMPORTANT!**

- When mounting the actuator across the pipeline, the NAMUR slot at the pinion top is turned 90° and does not reflect the position of the valve blade.
- When mounting NAMUR (VDI/VDE3845) switch boxes or positioners take care that these devices can be and will be set to reflect the actual limit positions.

# 2.6 Recommended tubing sizes

Actuator Model no.	Runs up to 1.2 mtr / 4 ft.	Runs over 1.2 mtr. / 4 ft.
Q-40, 65	6 mm / 1/4"	6 mm / 1/4"
Q-100, 150, 200, 350	6 mm / 1/4"	8 mm ~ 5/16"
600, 950, Q1600	8 mm / 1/4"	10 mm ~ 3/8"

# 2.7 Air consumption per stroke at atmospheric pressure

Air chamber	Model								
- at 1 atm (litres)	Q40	Q65	Q100	Q150	Q200	Q350	Q600	Q950	Q1600
Central air chamber	0.16	0.33	0.35	0.84	0.8	1.8	2.9	4.7	7.3
End cap air chambers	0.22	0.36	0.49	0.78	1	1.9	3.1	4.9	8.0
						``````````````````````````````````````	·		
			- at 1 atr	n (cu./in.)					
Central air chamber	10	20	21	51	49	110	177	287	445
End cap air chambers	13	22	30	48	61	116	189	299	488

# 3 Mechanical stroke adjustment



Fig. 3.1



Fig. 3.2



Fig. 3.3

The factory setting of the stroke is  $90^{\circ \pm 0.5^{\circ}}$ 

If required the stroke can be adjusted by means of two stroke adjustment bolts.

# 3.1 Adjusting the "Open" position

- 1. Connect supply pressure and control wiring according the instructions shipped with the Control Module.
- 2. Remove the nut caps (A).
- 3. Loosen nuts (B). See table 3.1.

Repeat next steps 4 to 8 until desired setting is achieved:

- 4. Send the actuator/valve assembly to the "Open" position (see instructions shipped with the Control Module).
- 5. Check whether the position of the valve is correct. The position indication knob (C) indicates the valve position

If the position is not correct, proceed with the following steps:

- 6. Send the actuator/valve assembly to the "Closed" (opposite) position (see instructions shipped with the Control Module).
- 7. Turn the limit stop bolts (see table 3.1): Turning in reduces the stroke: Turning out increase the stroke:
- 8. Send the actuator/valve assembly to the "Open" position (see instructions shipped with the Control Module).
- 9. Check whether the position of the valve is correct.

When the "Open" position is correct proceed with adjusting the "Closed" Position.

# 3.2 Adjusting the "Closed" position

- 1. Execute steps 4 to 8 of §3.1 but now for the "Closed" position.
- 2. Mount the nut caps (A).



Fig. 3.1.2

A stustor Cito	Angular	Tools		
Actuator Size	displacement	Nut	Bolt	
Q40	3.0 °	W10 mm	SD1.2 mm	
Q65	3.6 °	W13 mm	SD1.2 mm	
Q100	2.7 °	W13 mm	SD1.2 mm	
Q150	2.7 °	W17 mm	SD1.5 mm	
Q200	2.3 °	W17 mm	SD1.5 mm	
Q350	2.7 °	W19 mm	SD1.5 mm	
Q600	2.7 °	W24 mm	W10 mm	
Q950	2.5 °	W24 mm	W10 mm	
Q1600	2.7 °	W30 mm	W10 mm	

W = Wrench

SD = Screwdriver

# 3.3 Adjusting the end position with no electrical wiring connected.

If the Control Module is equipped with the optional Pneumatic Manual Override (A), only supply pressure needs to be connected to cycle the actuator. For more information on how to use the "Pneumatic Manual Override" see chapter 6.

# **REMARK:**

In case of air leakage over the limit stop bolts, turn the lock nut of the limit stop bolts tighter, until leakage stops.

# 4 Removing and mounting of the FieldQ Series Modules



Fig. 4.1



# WARNING

FieldQ Series actuators must be isolated both pneumatically and electrically before (dis)assembly.

The Pneumatic Module (1) is placed between the Control module (2), and the housing (3) of the actuator. It controls the air going in and out the actuator. The actuator can be equipped with a NAMUR plate (6) for direct solenoid mounting.



Fig. 4.2

# 4.1 Removing the FieldQ modules

- 1 To prevent warping of the modules and damage the threads:
  - First loosen the all screws 1/4 to 1/2 turns.
  - The screws can now be removed completly.
- 2 Prevent damage to the position probe (5) to guarantee accurate position feedback.

# 4.2 Mounting the FieldQ modules

- 1 Take care that the following mating surfaces are clean.
  - Between the actuator housing and the
  - Pneumatic Module (or NAMUR plate).
- Between the Pneumatic Module and the Control Module.
- 2 To align the position probe (5) properly to the Control Module:
  - First mount the Pneumatic Module.
  - Then mount the Control Module.

3 Press the O-rings (8) and seals (4, 7 & 9) firmly their mating grooves to keep them in place during mounting.

- 4 Prevent damage to the position probe (5) to
- guarantee accurate position feedback.
- 5 When fastening the module turn each screw two to three turns at a time, in sequence, to assure an air tight connection.

# 4.3 Tightning moments

The Control Module and Pneumatic module should be fastened by using the allen keys as indicated and applying the following tightning moments:

- Phillips head size 2, 1.8 to 2.2 Nm
- Allen Key No 5: (16 19.5 In.lbs)
   Allen Key No 5: 6.1 to 6.6 Nm (54 - 58.4 In.lbs)

# 4.4 Connecting air supply

To connect air supply see the Installation Guide shipped with the control module.

# TIP

Grease the O-rings and seals before mounting. This makes them sticky and prevents that these O-rings and seals fall away during mounting.

# 5 Speed control option

# WARNING FieldQ Serie

FieldQ Series actuators must be isolated both pneumatically and electrically before any (dis)assembly is begun.

The FieldQ 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

# 5.1 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.

# 5.2 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.



Figure 5.1 Speed Control option

6

# Manual Control option Manual control Manual control Nut cover Location for 2nd Manual Control Manual Control Default location of Manual Control

Fig. 6. 1 Local Manual Control option

# Manual Control option



# WARNING

FieldQ Series actuators must be isolated both pneumatically and electrically before (dis)assembly.

For commissioning, emergency or maintenance purposes, the FieldQ 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.

# 6.1 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.

# 6.2 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 FieldQ 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 FieldQ 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.
- 3 It is possible to rotate the screw multiple cycles. The unit will than toggle every 90° between "locked" (1) and "unlocked" (0).

# 7 Trouble shooting FieldQ Series

# 7.1 Mechanical problems

Problem	Possible error	Solution	Where to find
Feedback position and actual	Actuator and valve are	Remove actuator from valve.	Chapter 1 and 2 of
position are not the same.	mounted 90° rotated in	Check assembly code of	DOC.IOM.BQ.E
Valve is in "Closed" position,	relation to each other.	actuator. Put both valve and	
actuator is in "Open"		actuator in "Closed" position.	
position and will not move		Mount actuator on valve.	
anymore.			
Valve does not reach the	Limit stop screws are not	Readjust the limit stop screws	Chapter 3 of DOC.IOM.BQ.E
completely "Closed" or	set correctly.		Chapter 2, §2.5 of
"Open" position.	Insert is not mounted	Mount the insert in the right	DOC.IOM.BO. E
	properly	position. Remark: Rotate insert	
		for one cam = 22.5°	
	Pressure to low	Apply pressure as per sizing	Data sheets DA =
	Sizing is wrong	Check valve torque data with	BQ1.602.01.
		actuator torque data	SR = BQ1.602.02 or
			BQ1.602.03
Actuator rotates, valve does	No coupling between	Install a coupling between	Chapter 2 of DOC.IOM.BQ.E
not.	actuator shaft and valve	actuator shaft and valve	
	spindle.	spindle.	

# 7.2 Pneumatic problems

Problem	Possible error	Solution	Where to find
Actuator does not react to	There is no supply	Supply the right pressure to	See supplied
electrical control signal.	pressure at the actuator.	the actuator.	documentation of the
			Control Module.
	Supply pressure is	Connect supply pressure to	See supplied
	connected to one to the	port "Ps".	documentation of the
	exhausts.		Control Module.
Actuator does not react good	There is sufficient	Take care the supply air tubing	See chapter 2, §2.6 of
to electrical control signal.	supply air pressure but	has the right dimensions.	DOC.IOM.BQ.E
	insufficient supply air		
	capacity.		
	Control Module is not	Mount the "Control Module"	See chapter 4, of
	mounted properly.	in the right way to the	DOC.IOM.BQ.E
		"Pneumatic Control Module".	
	Speed control (if present)	Turn the speed control more	See chapter 5 of
	blocks air flow.	open.	DOC.IOM.BQ.E
		Select 1 size larger actuator	
	Manual override	Unlock manual override on the	See chapter 6 of
	(if present) on the Control	Control Module.	DOC.IOM.BQ.E
	Module is locke		
Double acting actuator	Control module has	Replace pneumatic cartridge	See DOC.QC4.PNC.1
will only move to "open"	wrong pneumatic	for version suitable for double	
position.	cartridge.	acting actuators.	

# 7.3 Electrical problems

Problem	Possible error	Solution	Where to find
Actuator does not react	Control wiring, Power supply	Connect all wiring in the right	See documentation
to control signals	wiring or feedback wiring are	way.	shipped with the Control
	not right connected.		Module. (DOC.IG.BQCxx)
	The power supply voltage is	Connect the right power	See documentation
	not the same as the voltage	supply voltage.	shipped with the Control
	of the applicable Control		Module. (DOC.IG.BQCxx)
	Module.		
Actuator does not react	Initialization was not	Execute the initialization	See documentation
consistent.	completed in the right way.	procedure or set feedback	shipped with the Control
		signal manuall	Module. (DOC.IG.BQCxx)
	Sizing is wrong	Re size the actuator to the	Data sheets
		valve	DA = BQ1.602.01.
			SR = BQ1.602.02 or
			BQ1.602.03
There are problems with	The wiring of the feedback	Connect the feedback wiring	See documentation
position feedback after	signals may be switched.	in the right way.	shipped with the Control
sending the actuator			Module. (DOC.IG.BQCxx)
to either the "Open" or			
"Closed" position.			

# 8 Maintenance

# CAUTION:

Actuator must be isolated both pneumatically and electrically before any (dis)assembly is begun. Before mounting or (dis)assembling the actuator consult the relevant sections of this manual.

# IMPORTANT

Under the European Pressure Equipment Directive, conversion of actuators may only be performed by companies or personnel, authorized by Emerson.

# 8.1 General

All FieldQ Series actuators are supplied with sufficient lubrication for their normal working life. If required, recommended lubrication for all standard actuators is a Castrol LMX, FINA Cera WR2 or equivalent. Periodic checks should be performed to make certain that all fasteners remain tight.

Depending upon the conditions under which the actuator must work such as extended duty, or abnormal operating conditions, periodic replacement of internal seals is recommended. Repair kits containing all necessary seals and instructions can be obtained through authorized FieldQ Series distributors.

# 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)

# 8.2 Single acting / Spring Return actuators

On spring return actuators, the springs can be replaced.



SPRINGS SHOULD ALWAYS BE REPLACED IN COMPLETE SETS.

Spring kits are available through authorized FieldQ Series distributors.

# 8.3 FieldQ Series recommended spare parts

All soft seals, bearings, and nonreusable parts are included in the FieldQ Series recommended spare parts kit.

The spare parts kit is identical for both the double acting and the spring return models. For the spring return models we recommend a set of spare springs for each different model in addition to the recommended spare parts kit. Keep in mind that, when necessary, springs are to be replaced in complete sets. The following spare parts kits are available:

1 Repair kit for FieldQ Series actuator and all modules, available per actuator size.

2 Module seals kit, suitable for all module variations.

# 8.4 Position tracking device kits

The position tracking device takes care of the mechanical part of the feedback signal. In case the position tracking device malfunctions, spares are available. Position tracking device kits are available per actuators size and contain all necessary seals and lubricants. They can be obtained through authorized FieldQ Series distributors.

# 8.5 Conversion kits

When the action of an actuator needs to be changed from spring return to double acting or visa versa, conversion kits can be utilized. Two kinds of conversion kits are available:

- 1 Single acting (spring return) Conversion kits, to make a spring return actuator.
- 2 Double acting Conversion kits, to make a double acting actuator.

# 8.6 High Temp and Low Temp Conversion kits

For the FieldQ actuators with the NAMUR plate, special conversion kits are available to make the FieldQ suitable for High temperature or Low temperature applications. There are no "High temp" or "Low temp" conversion kits available for FieldQ actuators with modules.

# 9 Disassembly

# 9.1 Before starting



9.1.1

# 







# 9.1.1

**Caution**! Never disassemble a valve that is under pressure!

**Caution**! Ball valves and plug valves can trap pressurized media in the cavity. Isolate the piping system in which the actuator valve assembly is mounted and relieve any pressure on the valve.



Prevent damage to the position probe (A) to guarantee accurate position feedback.

Removing end caps all types QD and QS 40 to QS 350

# 

9.2.1

9.2



9.2.2



9.2.1

Be careful not to damage the endcap (A) and B-port (B) O-rings.

# 9.2.2 | 9.2.3

**Caution**! If the actuator is a "spring return" model, uniformly loosen all endcaps screws, 1/4 - 1/2 turns at a time, in sequence, to relieve pre-load of the springs.

On all actuators with springs use caution when removing endcaps.

9.2.3

9.3

# 

Removing end caps type QS 600 to 1600

9.3.1





#### 9.3.1

Be careful not to damage the endcap (A) and B-port (B) O-rings.

**Caution**! If the actuator is a "spring return" model, loosen endcap screws in sequence as shown, 1/4 - 1/2 turns at a time, to relieve preload of the springs.



On all actuators with springs use caution when removing endcaps.

# S \* 0<sub>00</sub>

#### Removing limit stop bolts, pistons and pinion assembly. 9.4

9.4.1



9.4.2



# 9.4.1 Remove limit stop bolts.

# 9.4.2

Remove the two pistons by using an adaptor fitted in a vice.

Place the actuator on top of the adaptor R (either the square end or the insert shape end). Turn the complete actuator and the pistons will come out.

# 9.4.3





Remove spring clip from pinion top and remove pinion.

For removing the circlip, circlip pliers are required.









# 9.4.4

Remove spring clip form upper pinion part and remove upper pinion part through bore of housing



For removing the circlip, circlip pliers are required.

# 9.4.5

Removing the insert requires an extraction tool. Please contact your local FieldQ Series representative for more information about this extraction tool.

9.4.5

# 10 Reassembly

# 10.1 Reassembly guide band and pinion assembly







Before reassembly check the requested assembly code (see chapter 2.7).

10.1.1 Apply grease to the parts as per table 10.1 and figure 10.1.1

# Table 10.1 Grease instructions

Part	Section of part	Amount of grease		
O-rings				
1	Completely	Light film		
	Housing			
2	Piston bore Light film			
3	Top pinion bore Light film			
4	Bottom pinion bore	Light film		
	Pistons			
5	O-ring & guideband	Fully greased		
	groove			
6	Outer side of legs	Light film		
7	Coorteeth	Half the teeth depth		
/		full with grease		
	Pinion			
8	Bottom O-ring groove Fully greased			
9	Top O-ring groove Light film			
10	Coartaath	Half the teeth depth		
10		full with grease		
	Upper pinion p	oart		
11	Outer diameter	Fully greased		
12	Inner diameter	Light film		
Housing guideband				
13	Inner diameter	Light film		
Piston Guidebands				
14	Completely	Light film		



#### Important:

Do not grease the middle part of the piston bore (15) and the outer diameter of the housing guideband.

Take care that half the gear depth is full with grease.



10.1.2

- 1. Mount the upper pinion part (A),
- 2. Mount the stroke adjustment cam (B) and housing guide band (C).
- Keep the stroke adjustment cam in position while mounting the pinion.
- The two circlips have one side with bevelled edges (E) which must go DOWN onto the thrust washer, the square edge side (F) must face UPWARDS.

10.1.2





# 10.1.3

Mount the pinion.

- For fastening the circlips, circlip pliers are required.
- Use limit stop screws (3) as a reference to position limit stop cam (1) and pinion (2) as shown. See indication dot in the Pinion top slot. Views are from above.
- The position of the pinion and the limit stop cam, as shown, is the position where the pistons are in the inward position (see next paragraph).

# 10.2 Reassemble the pistons



10.2.1



10.2.2



#### 10.2.1 / 10.2.2

- 1 Check required assembly code.
- 2 Apply a light film of grease to the bore of the housing.
- 3 Ensure that O-rings (1) and guide bands (2) are kept in place during assembly.
- 4 Align the pinion so that the teeth on the pinion will "pickup" the pistons rack teeth when turning the top of the pinion:
  - clockwise (CW) for assembly code CW or
  - counter clockwise (CCW) for assembly code CC
- Turn the pinion gently to guide the guide band into the housing, taking care not to damage the guide band.

# 10.2.3

- Ensure that smooth movement and 90 degree operation can occur without moving the pistons out of the actuator body.
- Ensure that the slot on the pinion top is: - exactly perpendicular (code CW) or
  - in line (code CC) with the actuators centre line.
- If not, turn the pistons outward until they disengage from the pinion. Shift one tooth of the pinion, reassemble and check again.



#### 10.3.1



#### 10.3.1

When replacing springs in a spring return actuator, ensure that the springs are replaced in their identical position in the spring pack from where they were removed. Before assembling the springs and endcaps, make sure that the pistons are inwards.



10.3.2



# 10.3.3

Ensure that endcap O-rings (1) and airport O-rings (2) are in place on both sides.



Put some grease on the air port O-rings (2), so they and stay in place while mounting.

# 10.4 Reassembly end caps single acting actuators QS 600 to QS 1600



10.4.1



10.4.2

# 10.4.1

When replacing springs in a spring return actuator, ensure that the springs are replaced in their identical position in the endcap from where they were removed.

Before assembling the springs and endcaps, make sure that the pistons are inwards.

#### 10.4.2

Ensure that endcap O-rings (a) and airport O-rings (b) are in place on both sides.

Engage the bolts with the tapped holes in the actuator body by forcing down slightly on the cap. Tighten each bolt in small and equal turns.

end-cap boils						
Actuator Cap Bolt			Tightening Torque			
		Hexagon	Nm		in.lb	
туре	Size	Key size	max.	min.	max.	min.
40	M5	4mm	1,7	1,3	15	11
65	M6	5 mm	3,2	2,7	28	24
100	M6	5mm	3,2	2,7	28	24
200	M8	6mm	7,1	5,2	63	46
350	M10	8mm	14	11,2	124	99
600	M12	10mm	44,2	25	391	222
950	M12	10mm	44,2	25,1	391	222
1600	M14	12mm	70,6	39,6	624	350

# Table 10.3Tightening torque FieldQ Series<br/>end-cap bolts

# 10.5 Mounting and setting of limit stops



10.5.1



#### 10.5.2



# Setting of limit stops

# **Closed position**

- 1 Move actuator to the "Closed" position<sup>(1)</sup>.
- 2 Turn the "Closed" limit stop screw in until it blocks.
- 3 Move actuator to the "Open" position<sup>(1</sup>.
- 4 Turn the "Closed" limit stop screw in as shown in table 2.5.2

#### **Open position**

- 1 Repeat the steps 1 to 4 as described for the "Closed" position but now for the "Open" position.
- <sup>(1</sup> Apply pressure to port A or B

#### REMARK

This procedure does not apply for setting the exact end positions of a "FieldQ Series mounted on a valve".

To set the end positions of a FieldQ Series mounted on a valve, do as described above, check the valve position and adjust where necessary.

Fable 3.1 Angular	Displacment & Tools
-------------------	---------------------

Actuator	Angular	Tools	
Size	displacement	Nut	Bolt
Q40	3.0 °	W10 mm	SD1.2 mm
Q65	3.6 °	W13 mm	SD1.2 mm
Q100	2.7 °	W13 mm	SD1.2 mm
Q150	2.7 °	W17 mm	SD1.5 mm
Q200	2.3 °	W17 mm	SD1.5 mm
Q350	2.7 °	W19 mm	SD1.5 mm
Q600	2.7 °	W24 mm	W10 mm
Q950	2.5 °	W24 mm	W10 mm
Q1600	2.7 °	W30 mm	W10 mm

W = Wrench

SD = Screwdriver

10.5.3

# 10.6 Final assembly and airtightness test



10.6.1



10.6.2



# 10.6.1

Plug the IPT device hole (1) with a M12x1.5 plug. Apply pressure (max. 8 barg / 116 PSI) to ports (2) and (3). Use some soapsuds at the indicated points.



Applying pressure to the actuator will cause the actuator/valve assembly to operate.

In case of leakage around :

- 1 The limit stop bolts (and/or the spring-packagebolt at spring return models):
  - Turn the lock nut of the bolts tighter, until leakage stops.
- 2 The endcaps:
  - Disassemble the endcaps, replace O-rings and reassemble the endcaps.
- 3 The pinion top or bottom and A- or B-port:
  - Disassemble the complete actuator, replace O-rings and reassemble the actuator.

# 10.6.2

Take care that the position probe and the mounting hole is clean. Apply Castrol CLS grease to the tip (1) to ensure proper functioning.

# 10.6.3

Check the position of the inner part of the position indication knob. When mounted to the pinion top, the projection of the inner part will fit in the groove on the pinion top.

To disassemble the inner part, press as shown.



# 11 FieldQ Series Parts

# 11.1 Exploded view FieldQ Series (base actuator)





# 11.2 Bill Of Material

Pos.	Qty.	Description	Note
1	1	Body	
2	2	Washer	1
3	1	Circlip	1
4	1	Circlip	1
5	1	Indicator insert	
6	1	Indicator knob	
7	1	Indicator arrow	
8	1	Screw	
9	1	Guide band (housing)	1
10	2	Piston	
11	2	O-ring	1
12	2	Guide band (piston)	1
13	8	End cap screws	
14	2	End cap QD	
15	2	O-ring	1
17	4	Nut cover	
18	4	Nut	
19	4	Washer	1
20	4	O-ring	1
21	2	Limit stop screw	
23	1	O-ring	1
29	1	O-ring seal IPT port	1

Pos.	Qty.	Description	Note
32	3	Screw	
33	1	NAMUR plate	
34	1	O-ring	
35	1	O-ring	
36	1	O-ring	
37	1	Pinion	
38	2	Bearing ring	1
39	2	O-ring	1
40	1	Insert	
41	2	O-ring	1
42	1	Limitstop cam	
43	1	Upper pinion part	
44	2	Springpack bolt (QS)	
45	2	Washer	
46	2	Spring retainer	
47	2	Outer spring	
48	2	Middle spring	
49	2	Inner spring	
50	2	End cap QS	
51	2	O-ring	1
52	1	Center plate	2

#### Notes

1. Included in repair kits.
 2. Options



# 11.3 Exploded view FieldQ Series (Control module)

maintenance manuals as available for each control module from www.emerson.com/fieldq.

Pos.	Qty.	Description
1	1	Module Housing
2	1	Pilot valve Cartridge
3	1	Switch cartridge
4	1	Cover
5	1	Cover seal
6	1	Cover lock screw
7	1	Blind plug
8	1	Pneumatic compartment cover
9	1	Pneumatic compartment cover seal
10	1	Module to Actuator O-ring seal (1
11	1	Module to Actuator O-ring seal (1
12	3	Module fastening screws and washers
13	1	Pneumatic cartridge
14	1	Pneumatic cartridge seal
15	1	Shield switch adjustment screws
16	1	Manual control (option)
17	2	Manual control blind plug (default)
18	1/2	Silencer (1x SR, 2x DA)
19	0/1	Exhaust blind plug (0x DA, 1x SR)
20	2	Speed control blind plug
22	1	IPT device
23	1	O-ring seal IPT port (1

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No. 9 Gul Road #01-02 Singapore 629361 T +65 6777 8211 F +65 6268 0028

No. 1 Lai Yuan Road Wuqing Development Area Tianjin 301700 P. R. China T +86 22 8212 3300 F +86 22 8212 3308 P. O. Box 17033 Dubai United Arab Emirates T +971 4 811 8100 F +971 4 886 5465

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#### EUROPE

Berenyi u. 72- 100 Videoton Industry Park Building #230 Székesfehérvár 8000 Hungary T +36 22 53 09 50 F +36 22 54 37 00

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