Service Manual
VCIOM-16909-EN Rev. 0
October 2021

Bettis RTS Checklist and Maintenance

Electric Actuators

BETTIS™

EMERSON™

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Section 1: Checklists

1.1 Commissioning (Functional Safety After IEC 61508/61511)

Manufacturer	
Manufacturer	
Address	

General	
Date	
Device Name/Type	
Serial Number Actuator	
Serial Number Control Unit	
Safety Function	

Commissioning			
	Yes	**No**	**Comments**
Are all warning signs and labels clearly readable?	☐	☐	
Is the operating manual fort he actuator/control unit present?	☐	☐	
Is the equipment correctly assembled?	☐	☐	
Is the wiring of the control unit and the actuator correct?	☐	☐	
Are all protective features correctly wired and sized?	☐	☐	
Connection wiring correct?	☐	☐	
Are the screwed cable glands correctly adjusted and in proper conditions?	☐	☐	
Is the travel and torque switch adjusted?	☐	☐	
Have the commissioning and basic settings been done according to operating manual?	☐	☐	
Safety functions verified with Proof Test?	☐	☐	

Inspector 1:	Inspector 2:	Inspector 3:	Inspector 4:

1.2 Proof Test Checklist 1 (Functional Safety After IEC 61508/61511)

Actuator	Tag Number	
	Type	
	Serial Number	

		Comments
General Condition		
Corrosion		
Mechanical Damage		
Oil Leakage		
Presence of Water		
Presence of Dust		
Condition	Reporting unit	
	Terminal compartment	
	Control unit	
	Cable routing	
	Other	
Running Check	End position	
	Running noise	
	Manual operation	

Decision			
Clearance	☐	Comment:	
Repair	☐		
Maintenance	☐		
Clearance not possible	☐		
Date:		Inspector:	

1.3 Proof Test Checklist 2 (Functional Safety After IEC 61508/61511)

Actuator	Tag Number	
	Type	
	Serial Number	

Test	☐ Safe Open
	☐ Safe Close

	Yes	No
Travel to start position	☐	☐
Travel command given?	☐	☐
Was the safety function triggered?	☐	☐
Running Check: Running Noise	☐	☐
Running Check: End position correct?	☐	☐
Error message correctly displayed?	☐	☐
Error message correctly stored in device history?	☐	☐
End Safety function	☐	☐

Decision			
Clearance	☐	Comment:	
Repair	☐		
Maintenance	☐		
Clearance not possible	☐		
Date:		Inspector:	

1.4 PVST Checklist (Functional Safety After IEC 61508/61511)

Actuator	Tag Number	
	Type	
	Serial Number	

Safety Function	☐ PVST

Test			
		Yes	**No**
Was the function performed?		☐	☐
Did malfunctions occur?		☐	☐
Running check	End position	☐	☐
	Running Noise	☐	☐
	Manual operation	☐	☐

Decision			
Clearance	☐	Comment:	
Repair	☐		
Maintenance	☐		
Clearance not possible	☐		
Date:		Inspector:	

Section 2: Maintenance

⚠ CAUTION

This CAUTION only applies for FQ actuators (Fail-Safe Actuators). Maintenance work on open actuators may only be conducted if these are de-energized. Re-energizing during maintenance is strictly prohibited. Work on the electrical system or equipment must be carried out only in accordance with electrical regulations by a qualified electrician or by specially instructed personnel under the control and supervision of a qualified electrician.

⚠ CAUTION

This CAUTION only applies for FQ actuators (Fail-Safe Actuators). When the actuator is de-energized, the actuator will return to the fail-safe position. If this is not the case, inspect the shaft valve for a mechanical jam condition. This condition might increase the torque requirement and increase stroke time. To avoid this condition, it is recommended to perform routine checks of the fail-safe function, check the operating time and smoothness of the running in fail-safe operation at least every 3 months.

⚠ CAUTION

This CAUTION only applies for FQ actuators (Fail-Safe Actuators). The actuator has a pre-stressed coil spring or disk spring assembly, when undoing the flange mounting bolts, the spring force against the valve can cause the actuator to turn abruptly or become loose from the valve. Improper disassembly may lead to both damage to the actuator as well as serious injuries! If maintenance work is needed requiring the actuator to be disassembled, contact Emerson regarding detailed instructions and/or special purpose tools for relaxing the spring assembly.

⚠ CAUTION

For explosionproof actuators, it is necessary before opening the cover to wait a certain time after switching off, see explosion protection sticker (Figure 1). Following times are specified for the actuators (it applies for all RTS actuators).

- CM32: 5 min.
- CM64: 10 min.

Figure 1 Explosion Protection Sticker

Actuators are ready for use after installation. By default, the actuator is delivered filled with oil.
On-going monitoring:

- Beware of increased running noise. During long downtime periods, operate the actuator at least every 3 months.
- For actuators with output types A, B and C according to DIN 3210-A, B1, B2 and C according to DIN ISO 5210, re-lubricate at least every 6 months on existing grease fittings (see Section 3.3).

Actuators are designed for installation in any position. Therefore, the main body is not equipped with a level indication or a drain plug. The replacement of the lubricant from the main body must be performed via the handwheel.

Every approx. 10,000 to 20,000 hours (about 5 years, see Section 3), depending on the workload, you must:

- Change oil, and
- Replace seals

Check all roller bearings and the worm-wheel assembly and replace if necessary.
Check our lubricants table for recommended oils and greases (see Section 3).

Check the cable glands at regular intervals (annually) for tightness of the cables and retighten if necessary.

If the visual inspection (eg. dust or water penetration) indicates that the effectiveness of the sealing elements of the cable entry has suffered damage or aging, such elements have to be replaced preferably by using the original spare parts from the manufacturer of the equipment or through cable entries of comparable quality as well as the same ex- or IP protection class. If screws need to be replaced, it is preferable to use original replacement parts. The tensile strength of the screws must be at least 400 N/mm^2.

Section 3: Lubricant Recommendation and Requirements

3.1 Main Body: -40 °C to +60 °C

Operating oil:	European: DIN 51 517-CLP-HC American: Schaeffer #167 ISO 68

i.e. fully synthetic high-performance gear oils based on poly-alpha-olefins (PAO)

Viscosity class:	68 ISO VG
Pourpoint:	< -54 °C (according DIN ISO 3016)
Lubricant requirement CM32:	200 - 250 ml
Lubricant requirement CM64:	300 - 350 ml

3.2 Output Type A and Spindle Drives (Linear Actuators) -40 °C to +60 °C

Operating grease:	European: DIN 51825-K(P) R -40 American: AMSOIL Artic

i.e. water repellent complex grease on Al-soap base with high resistance to acids and alkalis

Penetration 0.1 mm:	310 - 340
Dropping point:	about 260 °C
NLGI No.:	1

acid-free, little or not water-reactive

3.3 Basic Lubricant Service Interval

⚠ CAUTION

The service interval for RTS CM Compact Series actuators is ten years from the shipping date, Emerson. However, the functionality and service life of the lubricants depends on the operating conditions. Reduction factors have to be taken into consideration if applicable.

Table 1. Lubrication Utilization

Operating Condition(s)	Definition	Reduction Factor (Multiplier)
Duty Time (DT)	(Total engine running time)	-
Extremely high DT	Over 1,250 hours/year	0.5
High DT	Over 500 hours/year	0.7
Extremely low DT	Less than 0.5 hours/year	0.8
Ambient temperature	(Permanent or long-term)	-
Extremely changeable	Between -10 °C and +50 °C	0.5
Extremely high	Over +50 °C	0.7
Extremely low	Below -25 °C	0.9
Output speed	(On main shaft of actuator)	-
High speed	Over 80 rpm	0.8
Utilization	(Relative to rated power)	-
Very high	Over 90%	0.8
High	Between 80 to 90%	0.9

Application example:
Extremely low DT + extremely low ambient temperature + high speed + 87% utilization
> 0.8 * 0.9 * 0.8 * 0.9 = 0.51 reduction factor
(Lubrication maintenance interval) 10 years * 0.51 = 5.1 years (62 months).

⚠ CAUTION

This calculated maintenance interval applies neither to the maintenance of output type A (threaded bushing) units nor to the maintenance of linear and spindle drive units. These units must be periodically lubricated (at least every 6 months) via the grease nipples (see Section 3).

During maintenance of our actuators, remove and replace old grease with new one.
Mixing of different lubricant types is NOT permitted.
Quantities needed for lubricant service are listed in Section 3.

3.4 Lubricant Points FQ

The table values given apply to re-lubrication in accordance with the re-lubrication intervals in the operating instructions. After re-lubrication has been carried out, 2-3 full strokes must be performed. If torque switch-off occur, the grease nipples must be removed, and the strokes repeated.

NOTE:
Lubricant can leak out of the lubrication points.

After that, the grease fittings should be installed.

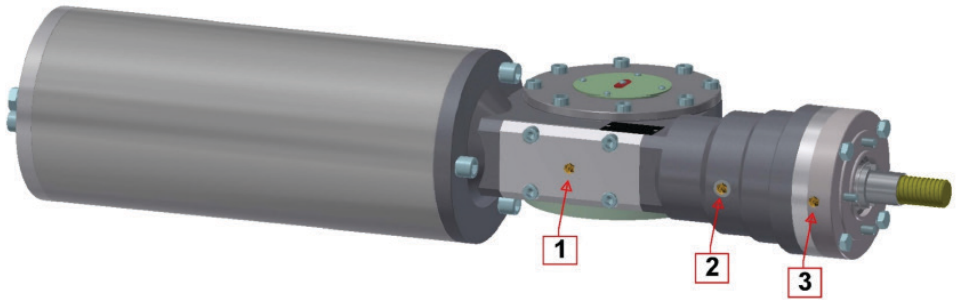
At initial assembly or upon complete disassembly of the spindle nut is filled, all gears and bearings pocketed filling. All moving parts as well as internal surfaces are coated to cover them.

- Lubricant quantity according to expenditure.
- Lubricant specification according to the operating instructions depending on the temperature range.

Table 2. Fuses on the Logic Board

Type	Lubrication Point (Quantity)		
	1 Main Gear (cm^3)	2 Bearing Spindle Drive (cm^3)	3 Intermediate Gear (cm^3)
FQ03	8	-	-
FQ06	18	-	-
FQ10	20	42	-
FQ20	20	68	29
FQ30	20	90	59
FQ50	20	80	90

Figure 2 Lubrication points



Section 4: Manual Actuator Operation Under Maintenance

4.1 Manual Operation

The manual operation is only possible if the actuator is delivered with the optional handwheel. This option allows an adjustment of the valve in de-energized state.

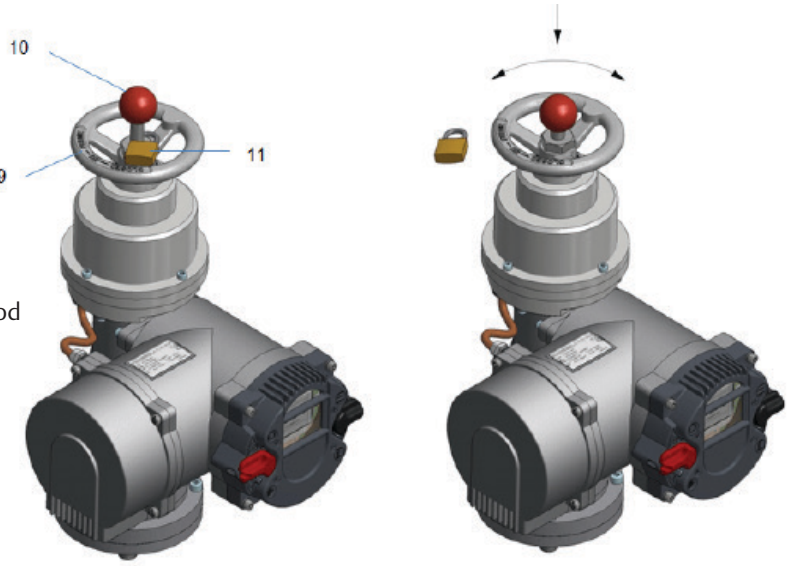
⚠ CAUTION

- By activating the manual drive, the fail-safe function is disabled.
- By activating the manual drive, the electrical function of the drive is disabled.
  In normal operation, the handwheel (9) has no effect, it rotates idly by.

NOTE:

The manual mode can be activated only when the drive is in the fail-safe position.

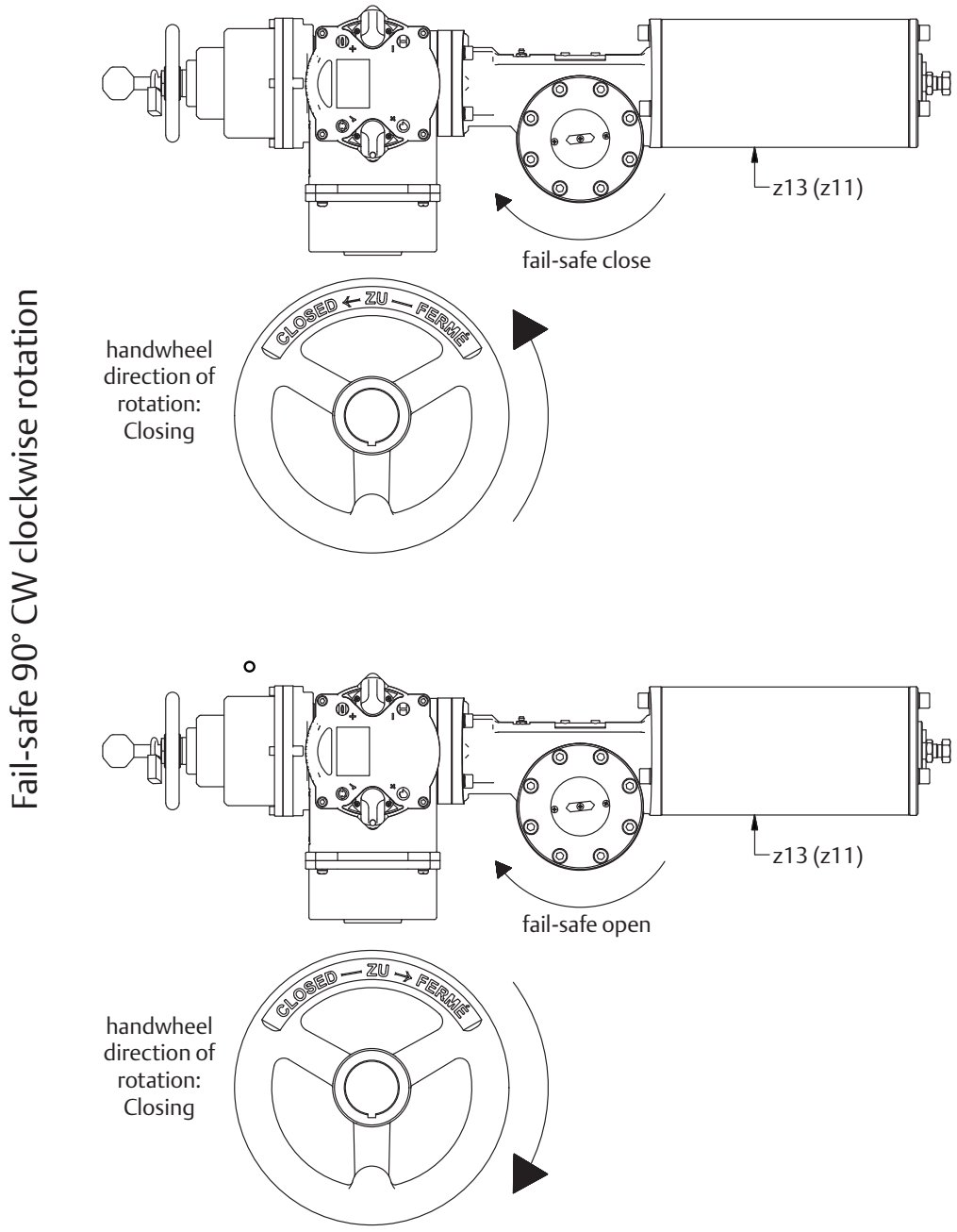
Figure 3 Manual handwheel operation



9. Handwheel
10. Coupling Rod
11. Padlock

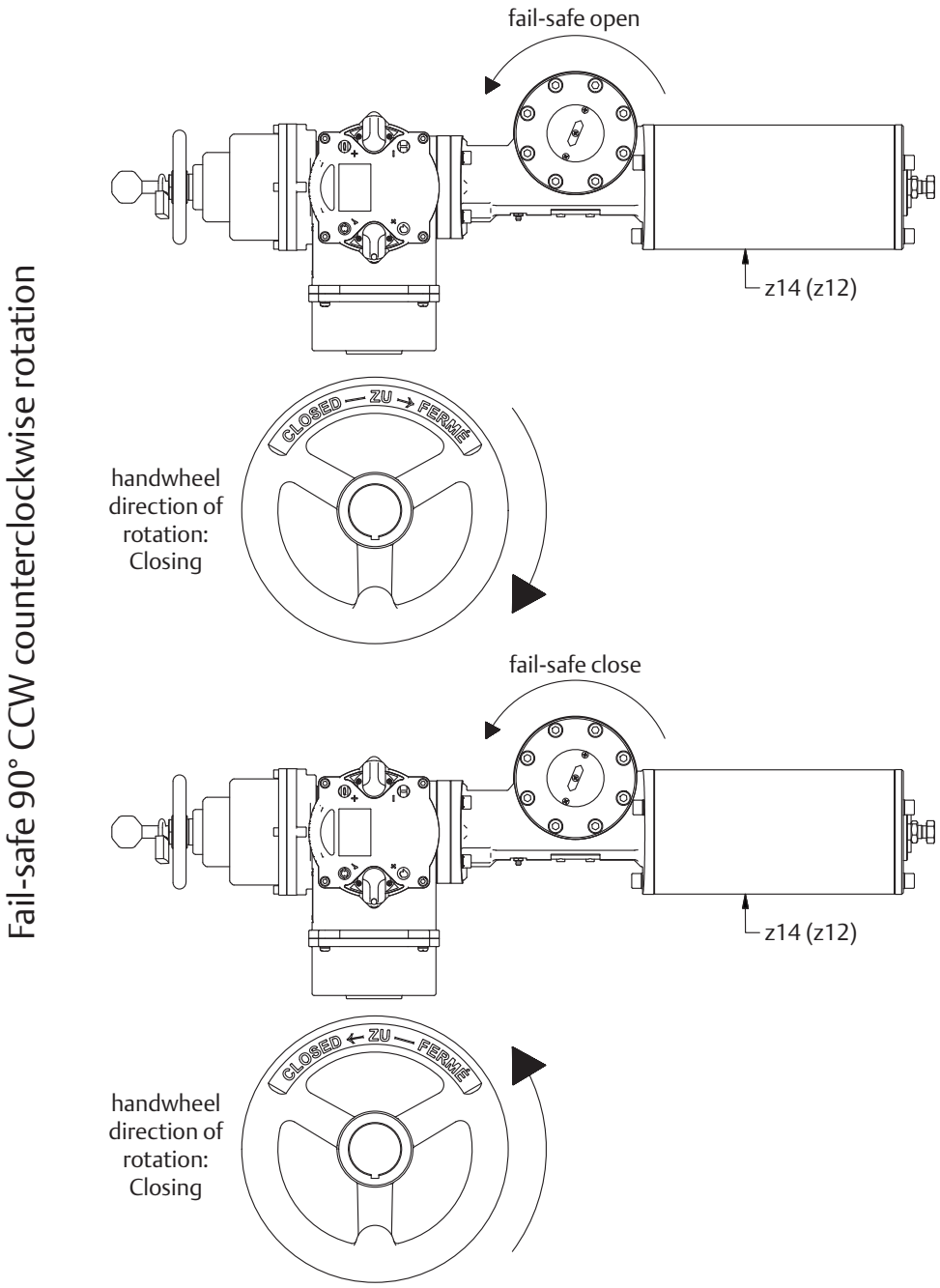
4.1.1 Direction of rotation of handwheel for closing the valve, Fail-safe direction "CW"

Figure 4 Rotation of direction for fail-safe direction "CW"



4.1.2 Direction of rotation of handwheel for closing the valve, Fail-safe direction "CCW"

Figure 5 Rotation of direction for fail-safe direction "CCW"



4.1.3 Activate Manual Operation

To activate manual mode:

- The padlock has to be removed.
- The coupling rod has to be pushed all the way into the actuator.

For easier clutch engagement, move the handwheel easily back and forth. Through the engagement, the actuator is automatically electrically disabled and the display shows "manual operation".

4.1.4 Deactivate Manual Operation

To exit the manual mode and enable the actuator again for the automatic mode:

- The actuator has to be driven to the fail-safe position by the handwheel.
- The coupling rod be pulled up to the stop of the actuator.
- The coupling rod again secured with the padlock.

4.1.5 Required Force on the Handwheel

Table 3 shows the maximum force applied to the handwheel for the different actuator sizes.

Table 3.

Type	Max. handwheel torque (Nm)		Handwheel diameter (mm)
	In fail-safe direction	Counter fail-safe direction	
FQ03	4	8.5	140
FQ06	4	14.5	140
FQ10	8	32	200
FQ20	8	28.5	200
FQ30	8	31	200
FQ50	8	32	200

The force on the handwheel was calculated for one-handed operation. With two-hand operation, the value per hand is halved. The maximum force may be exceeded by 20% in manual mode.

The direction of rotation and the maximal handwheel torque are written on the handwheel label, as shown on Figure 6.

Figure 6 Handwheel label

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