

FLOWBUS®

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Operating & Maintenance Instructions

EPA-SERIES | PNEUMATIC ACTUATORS

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Due to continuous development of our product data is subject to change or modify without prior notice.

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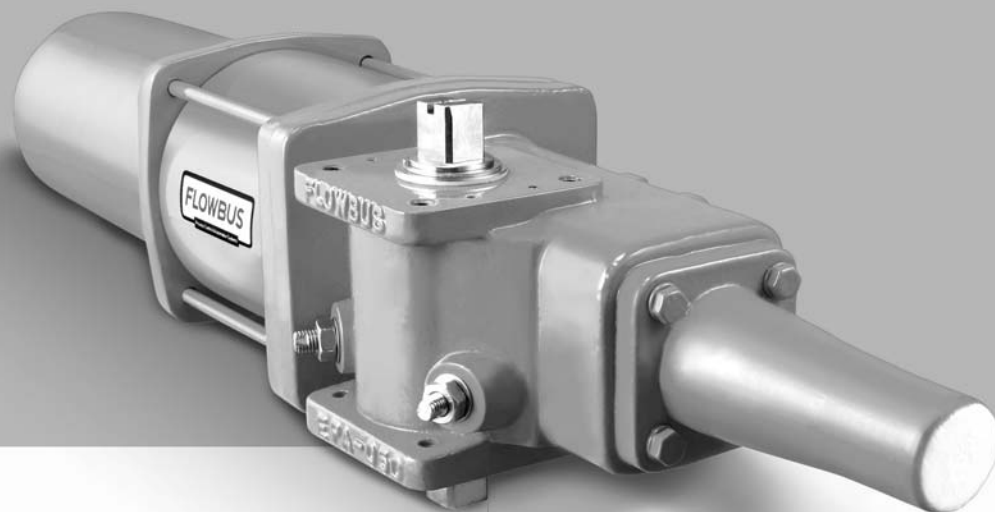
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The following procedures cover the maintenance and inspection of Flowbus EPA-Series actuators. All work should be undertaken by a competent, trained technician, using the correct tools and equipment, and following good working practice. Where procedures in this manual conflict with local legislation, statutory provisions or plant safe working practices, all differences should be reviewed and resolved by authorized representatives of the customer and Flowbus.

1.1 General Information

Service Interval

The normal recommended service interval for the EPA-Series actuators is every three years. To maintain the normal recommended service interval, operating conditions should be as follows.

- The air supply should not exceed the maximum operating pressure indicated in the technical data.
- The operating temperature should be between -20°C and 80°C
- The air supply clean, dry instrument air
- All operating and maintenance instructions should be followed.

CAUTION The normal service interval cannot be guaranteed if these conditions are not followed.

Regular actuator inspection should be carried out according to the customer's maintenance regime.

Preparation for Work

Confirm all electrical and pneumatic power supplies have been isolated and removed from the actuator before commencing any work.

Also remove any piping or ancillary equipment that may interfere with or reduce access to the actuator modules that are to be worked on.

WARNING EPA-Series actuators should be earthed during installation to meet local plant and national safety requirements.

Correct Equipment

To prevent damage a commercial seal removing tool or a small screwdriver with sharp corners rounded off should be used to remove seals from seal grooves.

All pipe threads should be sealed using a non-hardening thread sealant.

CAUTION Care should be taken to follow all instructions supplied by the sealants manufacturer.

Work Area

Flowbus recommends that where possible actuator disassembly should be performed in a clean area on a workbench.

Introduction 01

1.2 Safety Information

General Information

Flowbus products are inherently safe.

DANGER Before any work commences, all procedures should be reviewed with care to prevent severe actuator damage or fatal injury to personnel. Particular care should be paid to any safety text ; e.g. Warnings, Cautions & Dangers.

DANGER Any work instructions or procedures provided by Flowbus should not be replaced or altered to the customer's safety instructions or work procedures. Where procedures in this manual conflict with local legislation, statutory provisions or plant safe working practices, all differences should be reviewed and resolved by authorized representatives of the customer and Flowbus

DANGER Do not attempt to remove the pistons from the actuator body by using air pressure when the end caps have been removed.

Important Information

Where the following procedures contain critical safety information this is highlighted with the following text :

DANGER This is the signal word used to indicate an imminently hazardous situation that, if not avoid, will result in death or severe injury. This signal word is to be limited to the most extreme situations

WARNING This is the signal word used to indicate a potentially hazardous situation which, if not avoid, could result in death or severe injury.

CAUTION This is the signal word used to indicate a potentially hazardous situation which, if not avoid, could result in moderate or minor injury. It may also be used to alert against unsafe practices.

1.3 Maintenance

The following checks should be made as part of a regular preventative maintenance schedule. The period between checks will depend on the frequency of operation and service conditions.

1. Ensure the actuator operates smoothly and in the required cycle time.
2. Check the supply pressure of the operating media is in the required range.
If necessary, tighten piping fittings
3. Visually inspect the actuator and ancillary equipment for signs of physical damage or corrosion.

4. Check all pneumatic connections for leaks. If necessary, tighten piping fittings.
5. Visually inspect the actuator painting condition to avoid continuing corrosion.
If necessary, paint damaged areas. Contact Flowbus for approved painting specifications.

Service Tools

1. Spare Kits (Section 7)
2. Flowbus Painting Specification

1.4 Lubrication

CAUTION Alternative lubricants should not be used without prior written approval of Flowbus, This is to ensure that the lubricants used are compatible with the actuator materials and suitable for use over the actuators working range.

Lubrication Position

- | | | |
|------------------|--------------------|-----------------------|
| 1. Cylinder Body | 2. Piston Seal | 3. Drive Shaft Seals |
| 4. Yoke | 5. Top Cover Seals | 6. Bottom Cover Seals |

Grease Specification

Manufacturer : SK Corporation / Product : Grease / Color : Ivory
Model : ZIC Royal Grease EP 0, 1, 2

Additional grease is required in the following conditions

1. Moisture found inside pipeline (Water ingress and/or condensation)
2. Frequency of operation - Over 100,000 cycle times per year
- Less than 3 cycle times per year
3. Over 80° ambient temperature

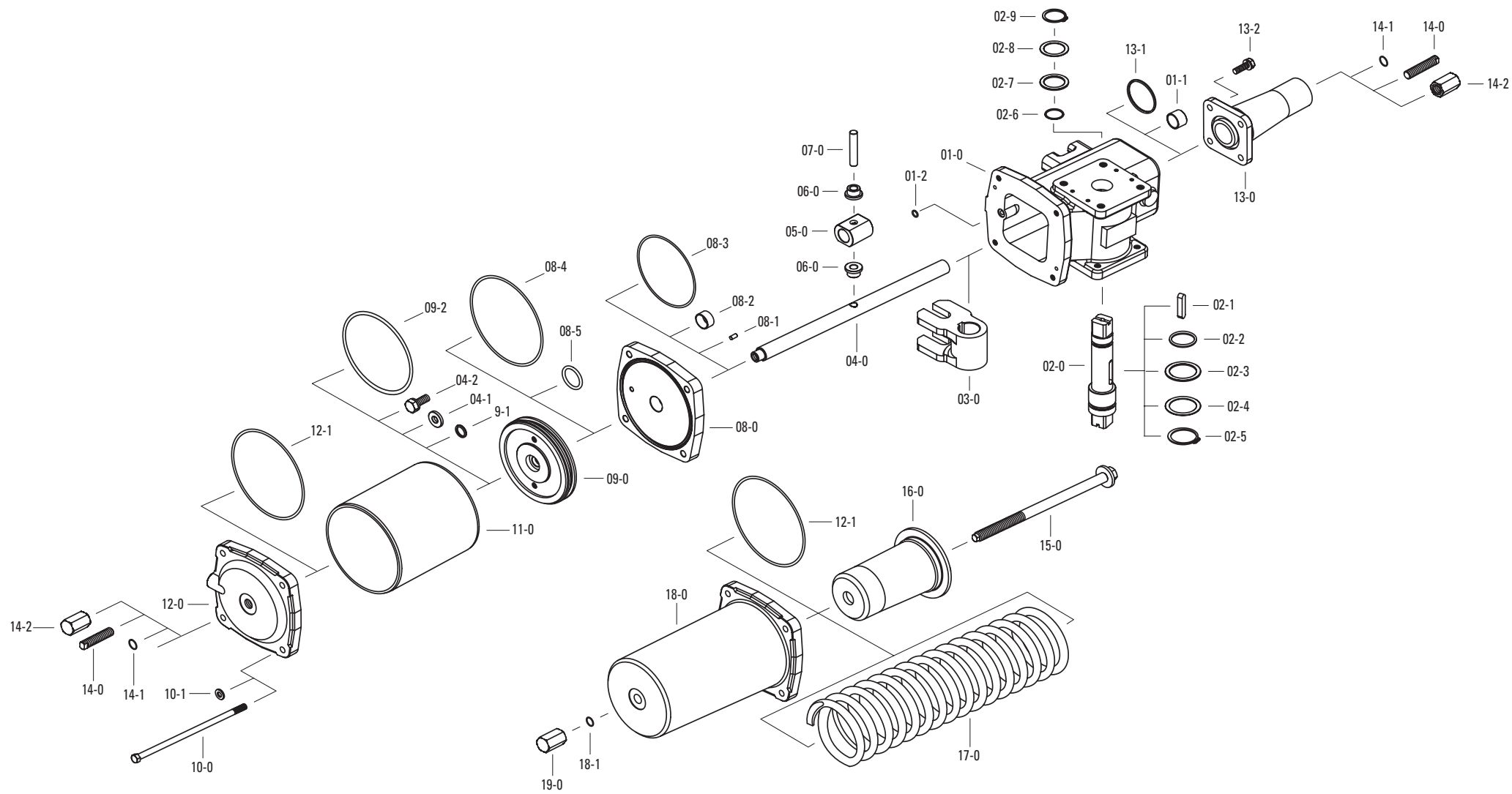
CAUTION This is the standard grease specification for Flowbus EPA-Series actuators. If an alternative was supplied to customer requirements for special service applications, this will be noted in the job specific documentation. This is available on request.

1.5 Required Tools

- | | | |
|----------------|--------------------------|--------------------------|
| Allen key set | Air Impact wrench | Rubber or leather mallet |
| Small Hammer | Adjustable monkey wrench | L-Screwdrivers |
| Snap Ring Clip | Oblate Spanner Set | Impact end wrench set |
| Impact socket | | |

CAUTION All tools/hexagons are metric standard.

1.6 Expanded view of EPA-Series



Parts List

Part No.	Description	Material	Q'TY	Remarks
1-0	Housing	A536 Gr.65	1	-
1-1	Piston Rod Bushing	ASTM B 427	1	-
1-2	Housing Seal	BUNA-N	1	-
2-0	Drive Shaft	AISI 1045	1	-
2-1	Key	AISI 1045	1	-
2-2	Bottom Seal	BUNA-N	1	-
2-3	Bottom Washer A	TP-601	1	-
2-4	Bottom Washer B	AISI 304	1	-
2-5	Snap Ring	ASTM A 686	1	-
2-6	Top Seal	BUNA-N	1	-
2-7	Top Washer A	TP-601	1	-
2-8	Top Washer B	AISI 304	1	-
2-9	Snap Ring	ASTM A 686	1	-
3-0	Yoke	AISI 1045	1	-
4-0	Piston Rod	AISI 4140	1	-
4-1	Piston Rod Washer	AISI 1045	1	-
4-2	Bolt & S/Washer	AISI 4135	1	10.9T
5-0	Yoke Block	AISI 1045	1	-
6-0	Sliding Block	A295 51100	2	-
7-0	Yoke Pin	AISI 4120	1	-
8-0	Top Cover	A36	1	-
8-1	Dowel Pin	AISI 1045	2	Heat Treatment
8-2	Piston Rod Bushing	ASTM B 427	1	-
8-3	Housing Seal	BUNA-N	1	-
8-4	Top Seal	BUNA-N	1	-
8-5	Top Cover Inner Seal	BUNA-N	1/2	-
9-0	Piston	A283 Gr.D	1	-
9-1	Piston Inner Seal	BUNA-N	1	-
9-2	Piston Seal	BUNA-N	1	-
10-0	Tie Rod Bolt	AISI 1045	4	8.8T
10-1	S/Washer	AISI 1045	4	8.8T
11-0	Cylinder Tube	A53	1	-
12-0	Bottom Cover	A536 Gr.65	1	-
12-1	Bottom Seal	BUNA-N	2	-
13-0	End Cover	A536 Gr.65	1	-
13-1	Seal	BUNA-N	1	-
13-2	Bolt & S/Washer	AISI 4135	4	10.9T
14-0	Adjust Bolt	AISI 4135	1/2	-
14-1	Seal	BUNA-N	1/2	-
14-2	Adjust Cap	A36	1/2	-
15-0	Spring Rod	AISI 1045	1	-
16-0	Retainer	A536 Gr.65	1	-
17-0	Spring	AISI 5160	1	-
18-0	Spring Cover	A536 Gr.65	1	-
18-1	Seal	BUNA-N	1	-
19-0	Hex Cap Nut	A36	1	-

Spare Parts List

Part No.	Description	Material	Q'TY	Remarks
1-2	Housing Seal	BUNA-N	1	-
2-2	Bottom Seal	BUNA-N	1	-
2-5	Snap Ring	ASTM A 686	1	-
2-6	Top Seal	BUNA-N	1	-
2-7	Top Washer A	TP-601	1	-
2-9	Snap Ring	ASTM A 686	1	-
8-3	Housing Seal	BUNA-N	1	-
8-4	Top Seal	BUNA-N	1	-
8-5	Top Cover Inner Seal	BUNA-N	1/2	-
9-1	Piston Inner Seal	BUNA-N	1	-
9-2	Piston Seal	BUNA-N	1	-
12-1	Bottom Seal	BUNA-N	2	-
13-1	Seal	BUNA-N	1	-
14-1	Seal	BUNA-N	1/2	-
18-1	Seal	BUNA-N	1	-

2.1 Actuator Mounting to Valve

The dimensions of the mounting holes and bolts comply with ISO5211. The holes are ISO Metric Coarse on metric models. (UNC coarse for imperial models.) The valve stem should be concentric to the actuator drive. Mounting kits should be designed to ensure concentricity of the valve stem, coupling and pinion drive.

CAUTION Ensure the mounting kit coupling for the drive shaft moves smoothly in the actuator drive.

2.2 Maximum Operating Pressure (M.O.P)

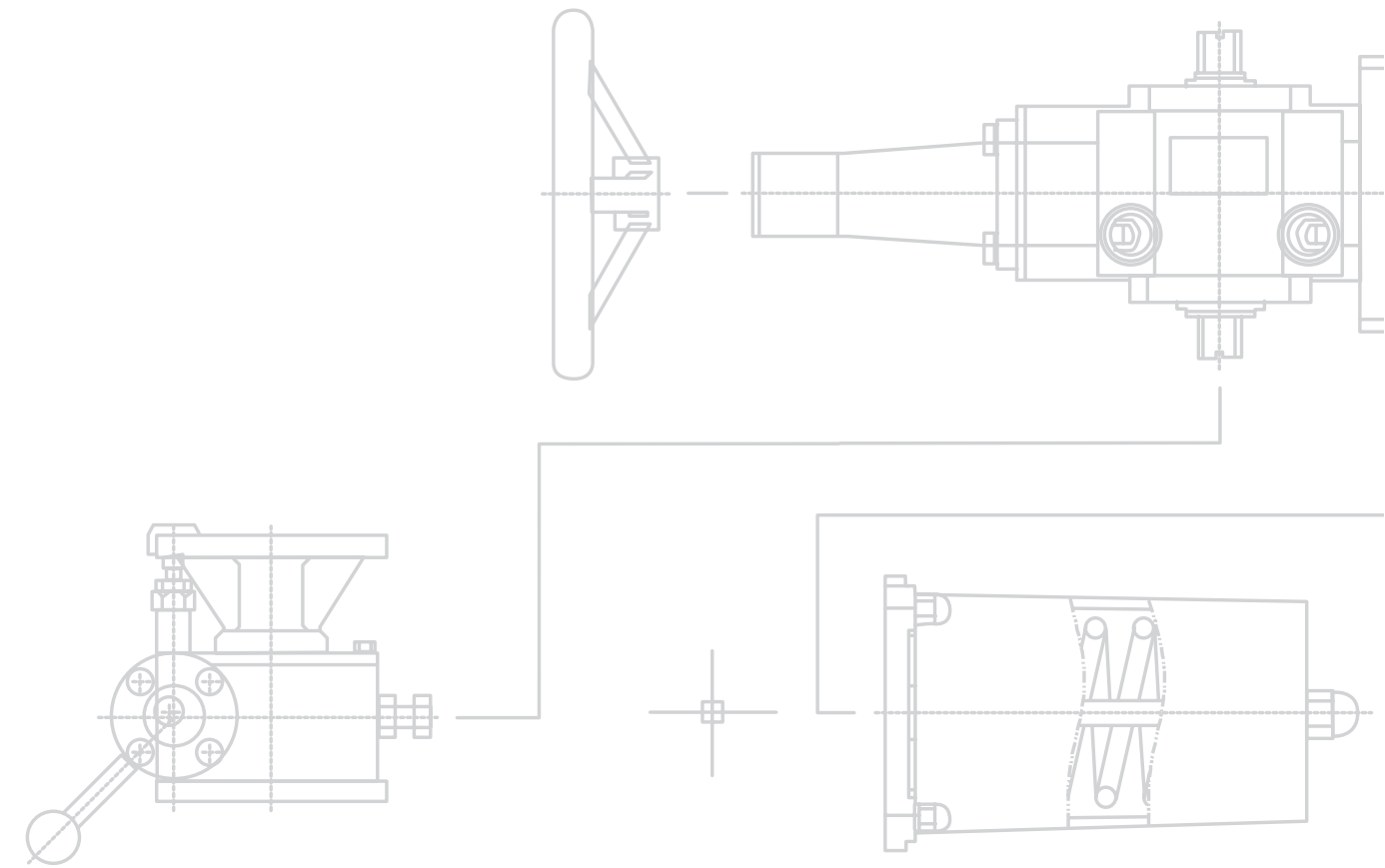
The operating supply pressure should not exceed maximum rated operating pressure indicated on the actuator label.

2.3 Operating Air Supply

The air supply should be clean, dry and lubricated.

CAUTION Before using an alternative air supply not of instrument quality, please consult Flowbus.

For the cylinder seal replacement, follow the below actuator disassembly and reassembly procedures (4-Actuator Disassembly, 5-Actuator Reassembly) if any leakage found during maintenance.



Actuator Disassembly

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4.1 General Information

The actuator should be fully vented and decontaminated before work commences. Ensure that all connections are removed from the actuator. All power supplies should be removed before work commences.

DANGER Before work commences, ensure that explosive and/or noxious gas or liquid are fully vented from the actuator and confirm using appropriate measuring equipment.

DANGER Do not remove the Spring Module while the spring is compressed.

WARNING Where actuators are equipped with a spring cartridge mounted manual override or stroke adjuster, ensure any air or electrical supplies are removed or isolated and the manual override set to the auto position.

4.2 Pneumatic Power Module Disassembly

CAUTION Review the instructions and warnings in section 4.1 before proceeding with Pneumatic Cylinder Disassembly

WARNING Ensure the air supply is isolated and any remaining pressure is vented before disassembly of the actuator.

DANGER Care should be taken to avoid the air supply into the cylinder when the piston has been removed. This may cause severe equipment damage or fatal injury to personnel.

1. Disconnect pneumatic and electric supplies.
 2. Remove the adjust bolt (14-0), the O-ring (14-1), the adjust cap (14-2) from the bottom cover (12-0).
 3. Remove the spring washer (10-1) from the tie rods (10-0) fitting to the cylinder tube (11-0) and the bottom cover (12-0).
 4. Remove the bottom cover (12-0) from the cylinder tube (11-0)
 5. Remove the tie rods (10-0) from the top cover (8-0).
 6. Remove the cylinder tube (11-0) from the top cover (8-0).
- WARNING** While removing the bottom cover care should be taken to avoid the piston o-ring damaged.
7. Remove the hexagon bolts (4-2) and the piston washer (4-1) fitting the piston rod (4-0) and the piston (9-0)
 8. Remove the piston (9-0) from the piston rod (4-0)
 9. Remove the hexagon bolts & the spring washer (8-5) fitting the housing (1-0) and the top cover (8-0).

10. Remove the housing (1-0) from the top cover (8-0)
11. Remove the hexagon bolts & the spring washer (8-5) fitting the housing (1-0) and the end cover (13-0).
12. Remove the end cover (13-0) from the housing (1-0).

4.3 Drive Module Disassembly

CAUTION Review the instructions and warnings in section 4.1 before proceeding with housing disassembly.

DANGER Ensure the air supply is isolated, any remaining pressure is vented and the spring tension is released before disassembly of the actuator.

1. Disconnect pneumatic and electric supplies.
2. Remove the snap rings (2-5, 2-9) from the housing (1-0) which is fitting the housing (1-0) and the drive shaft (2-0).
3. Remove the top washer "A&B"± (2-7, 2-8) and the bottom washer "A&B"± (2-3, 2-4) from the drive shaft (2-0).
4. Remove the yoke pin (7-0) which is fitting the yoke (3-0) and the piston rod (4-0).
5. Remove the tie rods (4-0) from the yoke (3-0).
6. Remove the drive shaft (2-0) from the yoke (3-0).
7. Remove the yoke (3-0) from the housing (1-0).
8. Remove the sliding block (6-0) from the yoke (3-0).
9. Remove the key (2-1) from the drive shaft (2-0).
10. Remove the top seal (2-6) and the bottom seal (2-2) from the drive shaft (2-0).
11. Remove the seal (13-1) from the end cover (13-0).

4.4 Spring Module Disassembly

1. Remove the spring module from the housing (1-0).
2. Follow the pneumatic power module and drive module disassembly procedures.

DANGER Spring module disassembly should only be performed by a competent, trained technician, using the correct tools and equipment in a clean air on a workbench otherwise severe equipment damage or fatal injury to personnel may cause.

DANGER Ensure the air supply is isolated, any remaining pressure is vented and the spring tension is released before disassembly of the actuator.

DANGER Do not disassemble a spring unit.

CAUTION For Spring Module disassembly, consult with Flowbus.

Actuator Reassembly

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5.1 General Information

DANGER Only new seals and gaskets should be used, when reassembling the actuator. Ensure these items are within their manufacturers recommend shelf life.

DANGER On inspection, any damaged or worn parts should be replaced.

1. Remove all old seals and gaskets.
2. All parts should be cleaned to remove dirt and other foreign material prior to inspection
3. All parts should be thoroughly inspected for excessive wear, stress cracking, galling and pitting. Attention should be directed to threads and sealing surfaces subjected to sliding or rotating motion. The sealing surfaces of the cylinder must be free of deep scratches, pitting, corrosion and blistering or flaking of the coating.

DANGER Any parts found to be damaged or worn should be replaced.

4. Before installation, all moving parts and the internal cylinder body should be coated with a film of lubricant.

DANGER The recommended lubricant for all parts and seals is detailed in section 1.4.

5. All the seal groove should be lubricated.
6. The assembly procedure is the reverse action of the disassembly procedure.
7. Reconnect pneumatic and electric supplies.

WARNING Operating pressure should not exceed maximum rated operating pressure indicated on the actuator label. Operating pressure should be checked using a calibrated gauge and in the event of an unregulated supply, a pressure regulator should be used.

5.2 Actuator Testing

Work Procedures

1. Apply supply pressure and check for any external leakage at all joints and fittings.
2. Operate the actuator 5 times at the maximum supply pressure specified on the actuator label.
3. Apply normal operating pressure to input / output port of actuator.
4. Conduct leakage test as follow;

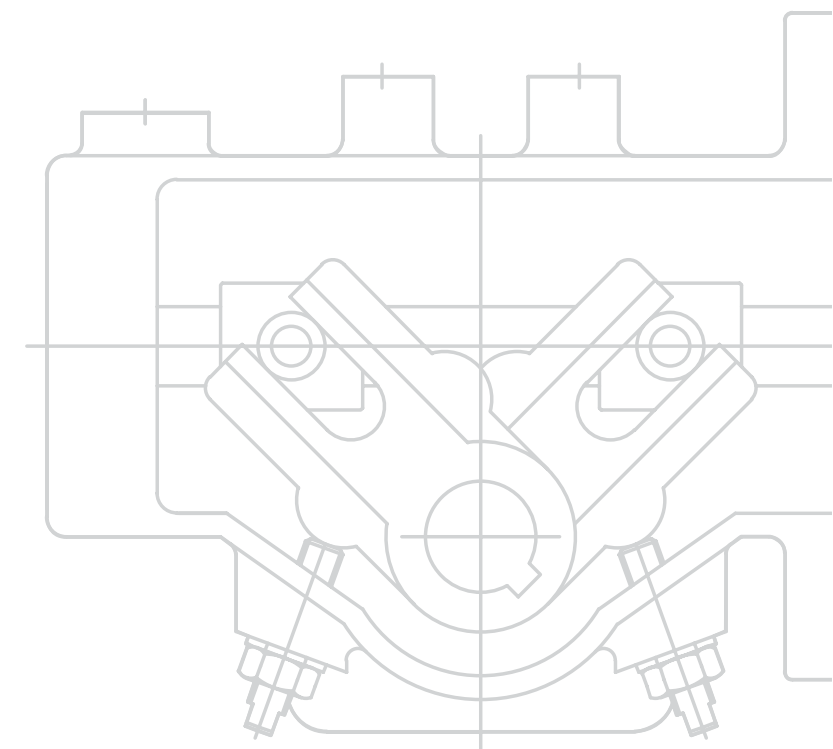
WARNING Both the input and output ports should be tested by pressurizing each port in turn and applying the test procedure.

CAUTION Leaks should be tested by applying a leak detector medium to the outside of the part or joint being tested, while the actuator is pressurized.

- 4.1. Check for leakage at the piston seal of the pneumatic power module.
- 4.2. Check for leakage at the end cover.
- 4.3. If leaks are detected, remove the air supply.

5. Once actuator is repaired, repeat the leakage test.

6. Repeat the test for the other port.



Troubleshooting Guide

In the event of reduced actuator performance, the followings are provided to assist in troubleshooting. Reference to ancillaries or equipment not supplied should be ignored.

6.1 Irregular movement

1. Ensure the air supply is constant with no pressure fluctuations.
2. Disassemble and check all components are correctly lubricated.
3. Visually check for worn or damaged parts and replace if necessary.
4. Check valve operation and consult the valve manufacturer if required.

6.2 Incomplete stroke

1. Check travel stops are set correctly and adjust if required
2. Remove any hard grease and re-lubricate
3. Check that the cylinder is free of obstructions or dirt
4. Check valve operation and consult the valve manufacturer if required.

6.3 Insufficient power

1. Check that the supply pressure is above the minimum actuator working pressure.
2. Ensure that the actuator provides sufficient torque to operate the valve at the air supply pressure provided.
3. Inspect any ancillary controls and replace if required.
Refer to component manufacturer's documentation if necessary.
4. Inspect the air supply line for damage, leaks or blockages. If necessary, clean or replace.
5. Inspect the exhaust port, and silencers if fitted, for blockages. Clean or replace as required.
6. Ensure speed controls are correctly set if fitted.
7. Inspect the piston and rod seals for excessive wear or damage. Remove and replace if required.
8. Check valve operation and ensure it is suitable for operation by the actuator.
Contact the valve manufacturer if required.

