

NUTORK[®]

Actuators & Controls



NSF Series Pneumatic & Hydraulic Actuators

Installation & Operation
Instruction Manual



NUTORK CORPORATION

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1. Summarize

The instruction manual for NSF series scotch yoke pneumatic & hydraulic actuators for all models of NSF14, NSF16, NSF25, NSF30, NSF35, NSF40, NSF48, NSF60.

2. Working Conditions & Application

The Ambient Temperature :

Standard actuator: -20°C to +80°C

Low temperature actuator: -40°C to +80°C

High temperature actuator: -20°C to +120°C

Operating Pressure:

Pneumatic actuator: 3~7 Bar

Hydraulic actuator: 60~150 Bar

Operating Media:

Pneumatic actuator: dry and clean compressed air

Hydraulic actuator: hydraulic Oil with viscosity within 40CST, or low temperature hydraulic oil in low-temperature area.

NSF series actuators is available for Ball Valves, Butterfly Valves, Plug Valves, Air Valves and all the 900 rotation valves, widely applicable to the chemical industry, food & beverage, metallurgy, offshore platform, pharmaceuticals, energy, paper, textile and other industries.

3. Technical Data

Output Torque:

Double Acting: 830~226,400Nm

Spring Return end torques: 307~71753Nm

4. Installation, Tube & Fitting

4-1: The installation environment should be avoided in high temperature, low temperature, high moisture and corrosive place.

4-2: The conduit is usually use brass and stainless steel pipe , try to avoid vibration, it's easy to make the tubes slapped, damaged, otherwise it will cause to leakage. It's necessary to take action when violent vibration. For it may vibration or impact during transportation , check the interface of all tubes before using the products, if there are any slap or leakage, please screw the interface till no leakage.

4-3: The conduit size of electrical accessories:

The different pneumatic actuators have different air inlet sizes, from 3/8" to 2", users should choose the tube size according to specific requirement. The air inlet is sized by different pneumatic actuator size. Detailed sizes please refer to the following table:

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4-4: Air inlet size table:

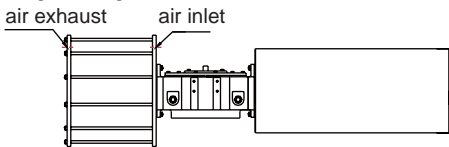
Actuator Size	200	250	300	350	400	450	500
Air inlet size	3/8"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"
Actuator Size	550	600	700	800	900	1000	1100
Air inlet size	3/4"	1"	1"	1 1/2"	2"	2"	2"

4-5: The quick operation actuator must use more bigger size air tube. Choose the same size brass, stainless steel or flexible metallic tube from compressor or air reservoir to actuator tubes.

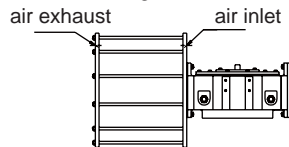
4-6: Operating media is filtered dry air, dew point over -15°C must use dryer.

4-7: Pneumatic & Hydraulic Actuator Air (Oil) Inlet Position Indication.

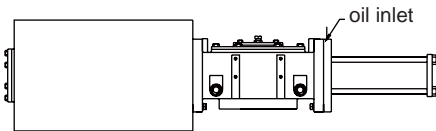
Single Acting Pneumatic Actuator



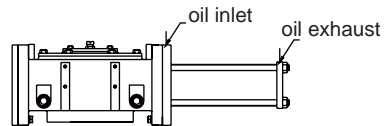
Double Acting Pneumatic Actuator



Single Acting Hydraulic Actuator

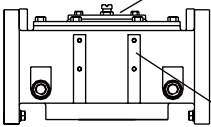


Double Acting Hydraulic Actuator



4-8: Dimensions and Positions of Accessories Installation

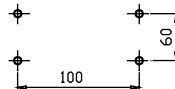
Switchbox, E/P positioner



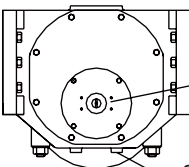
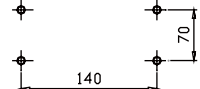
Solenoid Valve, Air-Valve, Relief valve Installation Position

The bracket dimension for solenoid valve, air valve, air set

NSF14-NSF25



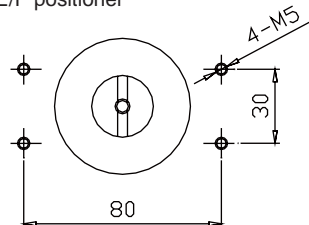
NSF30-NSF60



Switchbox, E/P positioner

Solenoid Valve, Air-valve, Relief valve Installation Position

The top mounting pad of switchbox & E/P positioner



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5. Operation

5-1. Auto-Operation

On/Off Control Pneumatic (Hydraulic) Actuated Valve:

- A) The valve open when solenoid valve energized (Failure Close Type)
- B) The valve close when solenoid valve de-energized (Failure Close Type)
- C) The valve close when solenoid valve energized (Failure Open Type)
- D) The valve open when solenoid valve de-energized (Failure Open Type)

Modulating Control Pneumatic (Hydraulic) Actuated Valve:

To give 4-20mA DC signal to Electro-Pneumatic positioner (or 0.02-0.1MPa to Pneumatic – Pneumatic positioner) the valve position can be proportional controlled by the input signal.

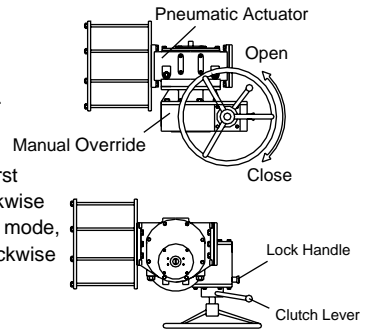
5-2. Manual Operation Way

5-2-1) Double Acting Pneumatic & Hydraulic Actuator

5-2-1-1) Declutchable Wormgear Manual Override

The declutchable wormgear manual override is used for all double acting pneumatic actuators, (refer right side figure 1).

To release the air or oil firstly, How to operate the declutchable manual override, To engage manual operation. First pull out the lock handle, then rotate the clutch lever in anti-clockwise direction until engagement takes place. To return the automatic mode, first pull out the lock handle, then rotate The clutch lever in clockwise direction until engagement takes place.



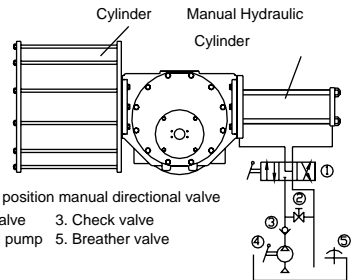
(Figure 1)

5-2-1-2) Hydraulic Manual Override

The hydraulic manual override is used for all double acting pneumatic actuators, (refer right side figure 2).

To release the air or oil firstly, and close the stop valve (2), by way of 4 port 3 position manual directional valve(1) control oil in & out, manual open & close valve by operation manual pump(4).

After manual operation, set the handle of 4 port 3 position manual directional valve(1) to the middle position when it change to auto-operation way.



1. 4 port 3 position manual directional valve
2. Stop valve
3. Check valve
4. Manual pump
5. Breather valve

(Figure 2)

5-2-2. Single Acting Pneumatic or hydraulic Actuator

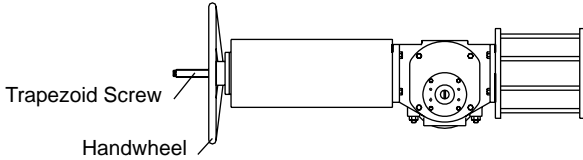
5-2-2-1) Jackscrew Operator

The jackscrew operator only available in NSF14XXX & NSF16XXX single acting actuator which is side mounted operator. turning the handwheel, control the valve position by screwing in & out the trapezoid screw in spring case. For the valve, turn handwheel

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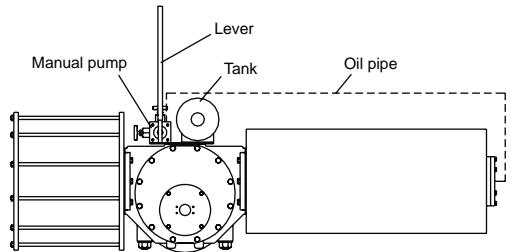
clockwise to open, counter-clockwise to close.



After manual operation, screw out the trapezoid screw when it change to auto-operation way, to ensure the auto-operation smoothly realized. Avoid to screw out integral trapezoid screw, the valve open & close position will be influenced if the screwing is not in place.

5-2-2-2) Hydraulic Manual Override

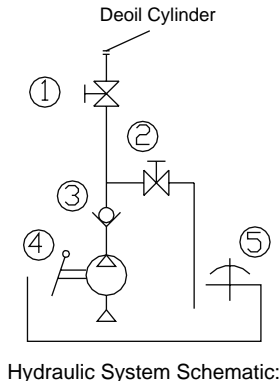
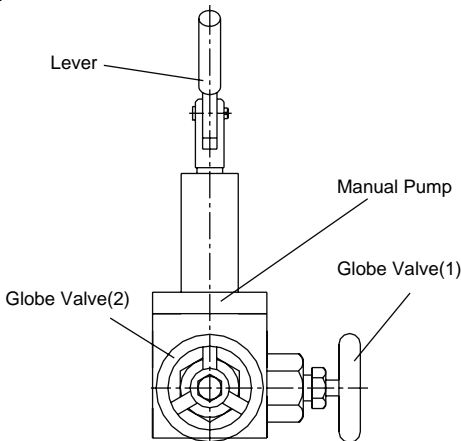
The hydraulic manual override is used for NSF25XXX ~ NSF60XXX. The hydraulic manual override is an integral device which consists of manual pump, tank, globe valve, check valve and other parts, easy to operate and maintain. The major parts as follows:



The Operation of Hydraulic Manual Override::

- a). Close globe valve(1), open globe valve (2);
- b). Inject oil to the oil cylinder by operating manual pump through lever handle, piston of oil cylinder press the spring to open valve.
- c). Close globe valve(2).
- d). When close the valve, Open the globe valve (1) & (2)

After manual operation, open globe valve(1) & (2), at the meantime when it change to auto-operation way.



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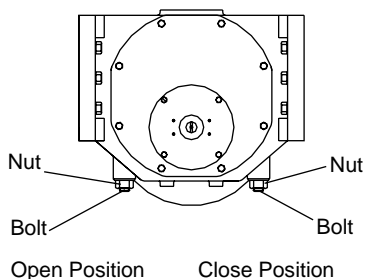
6. Stroke Adjustment

The stroke adjustment is available from 80° to 100°

The way of stroke adjustment:

Loosend the stroke nut firstly,

- a. Screw out the open direction stroke bolt, open position increased, screw in the open direction stroke bolt, open position decreased,
- b. Screw out the close direction stroke bolt, close position increased, screw in the close direction stroke bolt, close position decreased,

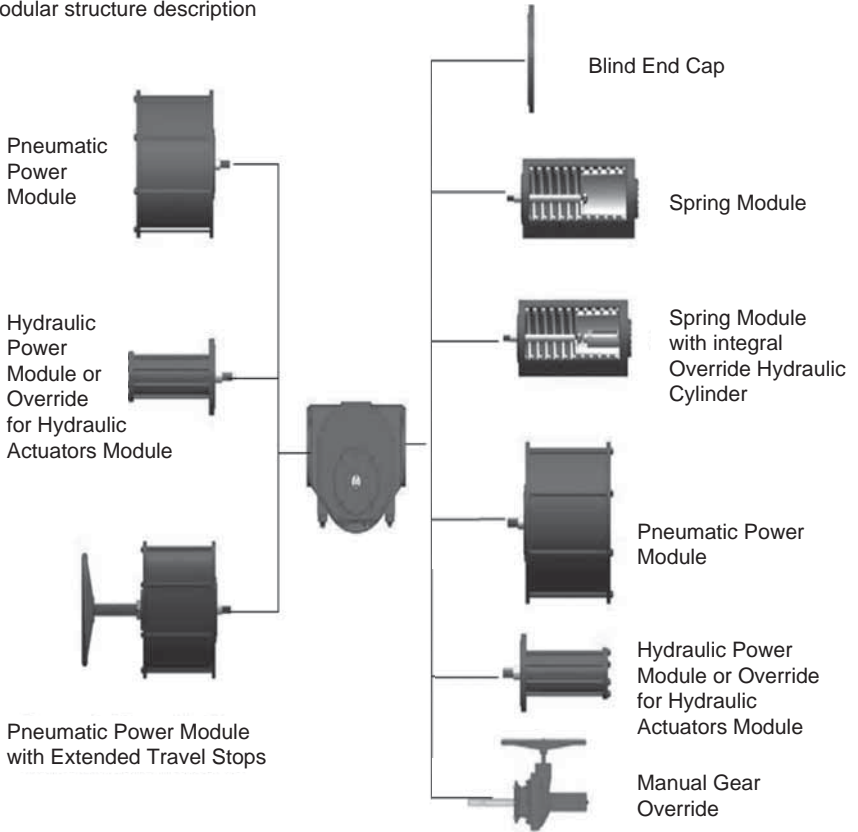


Note: Please note to tighten the bolt nut after adjusting the appropriate on/off position.

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7. Modular structure description

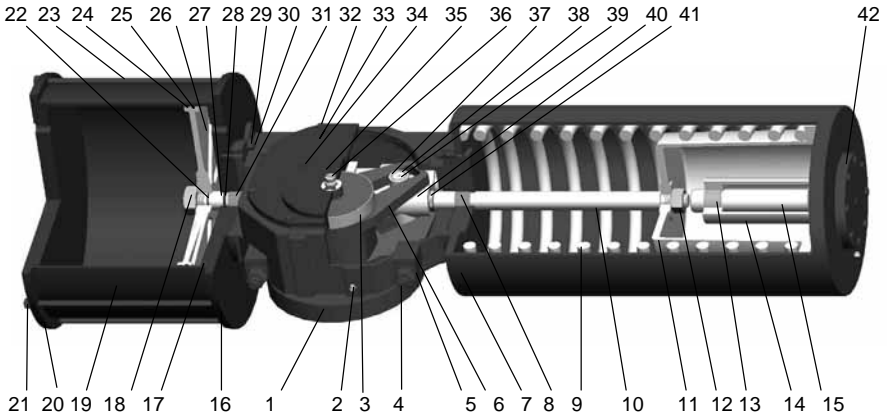


NSF series actuators is the module-in design which consist of the different module. The different function is available in the different combination.

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8. Assembly Drawing & Part List Assembly Drawing

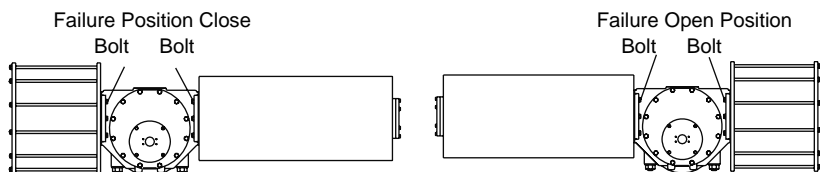


Part List

No.	Name	Material	No.	Name	Material
1	Body	Ductile Iron	22	O-Ring	NBR
2	Vent Valve	Carbon Steel	23	Screw	Alloy Steel
3	Sliding Bearing	Metal + TFE	24	Guide Ring	PTFE
4	Adjust Stud	Alloy Steel	25	O-Ring	NBR
5	Nut	2H	26	Piston	Ductile Iron
6	Yoke	Carbon Steel	27	Center Bar	Alloy Steel
7	Spring Case	Carbon Steel	28	O-Ring	NBR
8	Sliding Bearing	Metal + TFE	29	Stud	Alloy Steel
9	Spring	Alloy Steel	30	Nut	2H
10	Tension rod	Alloy Steel	31	Sliding Bearing	Metal + TFE
11	Spring Seat	Carbon Steel	32	Bolt	Carbon Steel
12	Nut	2H	33	Body Cap	Ductile Iron
13	Sliding Bearing	Metal + TFE	34	Bolt	Carbon Steel
14	Hydraulic Cylinder	Carbon Steel	35	Cover	Ductile Iron
15	Hydraulic Piston	Carbon Steel	36	Drive Shaft	Alloy Steel
16	Adapter	Ductile Iron	37	Roller	Alloy Steel
17	O-Ring	NBR	38	Sliding Bearing	Metal + TFE
18	Nut	2H	39	Pin	Alloy Steel
19	Cylinder	Carbon Steel	40	Guide Block	Ductile Iron
20	End Cap	Ductile Iron	41	Nut	Carbon Steel
21	Nut	2H	42	Cover Plate	Carbon Steel

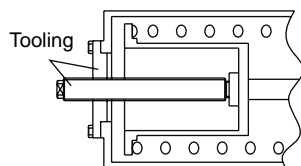
9. Module Replacement

9-1 Spring return, pneumatic actuator from failure close position to failure open position



Replacement Steps (refer to assembly drawings and parts list)

- 1) Loosen the spring end cap bolts, remove the spring cover 42
- 2) Withstand Spring rod with special tooling(see the right picture)
- 3) Loosen the bolts on the top cover 34, remove the top cover 35
- 4) Loosen the bolts on the body cap 32, remove the body cap 33
- 5) Anti-clockwise rotating nut 41, Spin out it from the guide block 40, while unscrewed it from the spring center bar
- 6) Loosen the bolts connect the spring module and body, remove the spring module
- 7) Anti-clockwise rotating the nut connect the cylinder center bar in guide block, screw out from the guide block, while unscrewed from the cylinder center bar
- 8) Loosen the bolts connect the pneumatic power module and body, remove the pneumatic power module
- 9) Encase the pneumatic power module at one end of the body ever encase spring module, nut 41 to connect cylinder center bar with the guide block 40, rotating nut 41 in place
- 10) Bolt to connect pneumatic power module with body and tighten the bolts
- 11) Encase the spring module at one end of the body ever encase the pneumatic power module, nut 41 to connect spring case center bar with the guide block 40, rotating nut 41 in place
- 12) Mount the body cap on body, installed the bolt connect the body cap and body, tighten the bolts
- 13) Mount the cover on body cap, installed the bolt connect the cover and body cap, tighten the bolts.
- 14) Screw out the trapezoidal screw in the tooling of spring end cap, to separate it from the spring seat in the spring case, loosen the bolts which installed the tooling on spring end, remove the tooling.
- 15) Installed the spring end cap, screw and tighten bolts connect body cap and cover
- 16) Supply or cut off air to the actuator to check whether the drive can move smoothly



9-2 Spring return, pneumatic actuator from failure open position to failure close position The same method as failure close position to failure open position.

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9-3. Change double acting type to single acting type

Replacement Steps (refer to assembly drawings and parts list)

- 1) Withstand Spring rod with special tooling
- 2) Loosen the bolt which connect blind plate and body, remove the blind plate
- 3) Loosen the bolt 34 on the cover, remove the cover 35
- 4) Loosen the bolt 32 on body cap, remove the body cap 33
- 5) Encase the spring module at one end of the body ever encase pneumatic power module, nut 41 to connect spring case center bar with the guide block 40, rotating nut 41 in place
- 6) Screw out the trapezoidal screw in the tooling of spring end cap, to separate it from the spring seat in the spring case, loosen the bolts which installed the tooling on spring end, remove the tooling
- 7) Assemble the spring end cap, then screw and tighten the bolt connecting the spring cylinder cover and spring cylinder;
- 8) Assemble the body on the cylinder, then screw and tighten the bolt connecting the body cap and the body;
- 9) Assemble the top cover on the body cap, then screw and tighten the bolt connecting the body cap and the top cover.
- 10) Supply air to the actuator, and actuated it for 4~5 times to check if it works smoothly.

9-4. Transform the spring return type to double acting type actuator

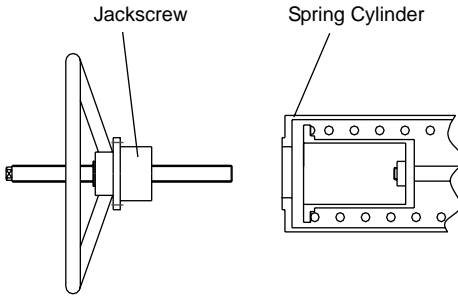
Steps: (Please refer to the assembly chart and parts table)

- 1) Loose the bolt on the spring end cap, and take the spring end cap 42;
- 2) Withstand the spring piston rod with the special tool;
- 3) Loose the bolt 34 on the top cover, and take the top cover 35;
- 4) Loose the bolt 32 on the body cap, and take the body cap 33;
- 5) Rotate the bolt 41 in counter- clockwise direction and back out it from the guide block 40, then take it from the piston rod.
- 6) Loose the bolt connecting spring module and the body and remove the spring module.
- 7) Assemble the blind plate on the body where spring module is assembled, then screw and tighten the bolt connecting blind plate and body;
- 8) Assemble the body cap on the body, then screw and tighten the bolt connecting the body cap and body;
- 9) Assemble the top cover on the body cap, then screw and tighten the bolt connecting the body cap and top cover ;
- 10) Supply air to the 2 air ports on the spring module of actuator, and actuate it for 4~5 times to check if it works smoothly;

9-5. Assemble the Jackscrew on the spring module

Steps:

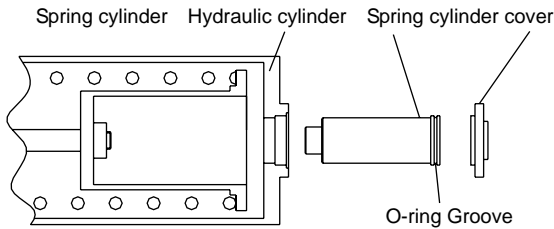
- 1) Loosen the bolt on the spring end cap and take the spring end cap 42;
- 2) Assemble the Jackscrew on the side of spring cylinder
- 3) Screw and tighten the bolt connecting the Jackscrew and spring cylinder;
- 4) Rotate the hand wheel on the Jackscrew and open/ close the valve for 2~3 times to check if the manual override works flexible;



9-6. Assemble the hydraulic manual override mechanism on the spring module

Steps:

- 1) Loosen the bolt on the spring end cap and take the spring end cap 42;
- 2) Put the O-ring and Stop collar in to the O-ring of hydraulic cylinder;
- 3) Assemble the hydraulic cylinder into the spring cylinder;
- 4) Put the O-ring into the spigot of spring cylinder side;
- 5) Assemble the spring cylinder cover on the spring cylinder;
- 6) Screw and tighten the bolt connecting spring cylinder cover and the spring cylinder;
- 7) Please refer to the figure 5-2-1, assemble the manual pump on the body cap, then screw and tighten the bolt.
- 8) Connect the stainless tube, high pressure fitting and the hydraulic cylinder;
- 9) Add some hydraulic oil into the tank of the manual pump, then power oil to the hydraulic cylinder through operating the lever on the manual pump. Make the driving mechanism run to the full open position, and check if there is leakage and if the manual override works well;



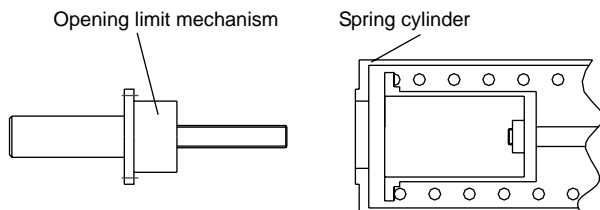
9-7. Assemble the opening limit mechanism on the spring module

Steps:

- 1) Loosen the bolt on the spring end cap and take the spring end cap 42
- 2) Assemble the Jackscrew on the spring cylinder side
- 3) Screw and tighten the bolt connecting the opening limit mechanism and spring cylinder;

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10. Attention

- 10-1. When the spring return type actuator with the Jacscrew enters into the auto-operation mode after manual operation, the trapezoid screw must be back out to the proper position;
- 10-2. When the spring return type actuator with the Jacscrew enters into the auto-operation mode after manual operation, the 2 globe valves on the manual pump must be opened;
- 10-3. When the double acting type actuator with the gear mechanism enters into the auto-operation mode after manual operation, the hand lever must be set to the auto position;
- 10-4. Don't rotate the hand wheel and or lever if the manual override is not needed;
- 10-5. To confirm if the air pressure is normal before operation;
- 10-6. The operation medium should be filtered dry, clean air and hydraulic oil;

11. Maintenance

- 11-1. First, to confirm if the air pressure is normal;
- 11-2. If the solenoid valve is energized and the supplied air can be shifted. If yea, please check the electric circuit;
- 11-3. If the solenoid valve is energized and the supplied air can be shifted, please take the actuator from the valve and check the actuator and valve separately.
- 11-4. When checking the actuator, please supply air to the actuator firstly and check if the actuator works normally and if there is leakage;
- 11-5. If there is leakage, please change the seal.

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NUTORK CORP. manufactures a wide range of pneumatic actuators, electric actuators and the accessories of pneumatic actuator (limit switchbox, solenoid valve, manual override ---etc.) for quarter turn valves

Nutork Corp. supply the following product range:

	<p>NK series rack & pinion type (CE-ATEX certified and PED compliant) 14 models, the output torque from 9Nm(80in.lbs) to 3,920Nm(34,660in.lbs) at 6 bar air supply. ISO5211/DIN3337 for valve connection, VDI/VDE 3845(Namur) standard connection for solenoid valve and shaft top end(limit switchbox or E/P positioner), +/-5 degree stroke adjustment. 25~30um standard hard anodized treatment on actuator body and over 120um epoxy coated on end caps which meet ASTM B117 qualification(salt spread test over 1,000 hours and no corrosion.</p> <p>PTFE, Polyester, Nickel , Ceramic and Epoxy coated are available on request.</p>
	<p>NSF series scotch yoke type pneumatic and hydraulic actuators (CE-ATEX certified and PED compliant) The output torque from 1.660Nm(14,690in.lbs) to 226,200Nm (2,001,870in.lbs) at 6 bar air supply. Anti-corrosion painting on outer body and cylinder as standard. VDI/VDE 3845(Namur) standard connection for shaft top end(limit switchbox or E/P positioner), +/-10 degree stroke adjustment. ISO5211 standard for valve connection. PTFE coated on inner cylinder surface. Hydraulic manual override is available for big size actuator.</p>
	<p>NTE series electric actuator, CE approval 10 models and the output torque from 18Nm(159in.lbs) to 2,000Nm(17,700in.lbs), compact design, die-casting aluminum alloy housing, alloy steel with heat treatment gear driving unit, integral wormgear & drive shaft, 30% duty rating, detachable crank handle, ISO5211(option), IP68 enclosure.</p>
	<p>NTEII series electric actuator, CE approval Dual Power: 12~ 24 VAC/DC or 85~265VAC/VDC , Module-in design & encapsulated control pack 10 models and the output torque from 18Nm(159in.lbs) to 2,000Nm(17,700in.lbs), compact design, die-casting aluminum alloy housing, alloy steel with heat treatment gear driving unit, integral wormgear & drive shaft, 30% duty rating, detachable crank handle, ISO5211(option), IP68 enclosure.</p> <p>Option Functions: 1. Integral Local Control Unit. 2. Infrared non-intrusive calibration 3. LCD display(2 lines, 15 character) 4. Electronic over-torque protection 5. Electronic limitation at open & close position and the others.</p>
	<p>NTQ electric actuator, CE approval(IP67 & EExdIIIBT4 enclosure) 10 models, the output torque from 100Nm(885in.lbs) to 3,000Nm(26,550in.lbs), de-clutchable manual override, 2xSPDT each for open & close, torque switch: 1xSPDT each for open & close. space heater, self-lock, IP67 & EExdIIIBT4 enclosure.</p>
	<p>The fully range accessories(Limit Switchbox, Solenoid Valve, Dec clutchable Manual Override, Air Filter regulator, E/P Positioner ---etc).</p>
	<p>Dual Plate Check Valve: Retainerless Type Metal Seat Valve Size : DN40-DN1000/150LB DN40-DN600/ 300LB DN40-DN300/ 600LB-2500LB Full Liner Rubber seat Valve Size : DN40-DN2000/ 125-150LB</p>

As we continue to grow and become a major supplier to the industry. NUTORK CORP. will add the necessary people, inventory and new product to set us apart from the rest of the pack!

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