NUTORK Actuators & Valves
INSTALLATION, MAINTENANCE AND OPERATING INSTRUCTION MANUAL

FOR NUTORK ACTUATOR Model/Type:
- NKD-032~NKD270
- Double Acting "D" and Spring Return "S"
- 0°→90° Stroke

CONTENT

1) GENERAL

This instruction manual contains important information regarding the installation, maintenance and storage for NUTORK rack and pinion pneumatic actuators. Please read these instructions carefully and save them for future reference. It is important that only properly trained personnel disassemble/assemble the actuator.

2) WARNING

Do not operate the actuator using inflammable oxidizing, corrosive, explosive and unstable gases or liquids. For actuators installed in potentially explosive zones, make sure that the internal parts of the actuator can not come into contact with the external atmosphere.
· It is important that the actuator should only be used within pressure limits indicated in our technical specification..
· Operating the actuator over pressure limits will damage internal parts as well as cause damage to the housing.
· Operating the actuator over temperature limits will damage internal and external components (disassembly of spring return actuator may cause dangerous).
· Operating the actuator in corrosive environments with incorrect protection may damage the internal and external parts.
· Do not disassemble individual spring cartridges. Disassembly may result in personal injury. For further information contact NUTORK.
· Isolate all air lines and make sure that actuator air connection is vented before installation or servicing of the actuator.
· Do not remove end caps or disassemble the actuator while the actuator is pressurized.
· Before installing onto a valve make sure that the rotation of the valve and the actuator are the same and that the position indicator rotation is also correct.
· If the actuator is incorporated in a system or used within safely devices or circuits, the customer shall en that the national and local safely laws and regulations are observed.

3) WORKING CONDITIONS AND TECHNICAL DATA

· Operating media:
Dry or lubricated air or inert /non-corrosive gases provided they are compatible with internal actuator parts and lubricant. The operating media must have a dew point equal to -20℃(14℉) or at least 10℃ below the ambient temperature. The maximum particle size must not exceed 30um.
· Supply pressure:
The maximum supply pressure is 8 bar (116PSI), 7 bar (101.5PSI) for Pt800.
Generally for Double Acting and Spring Return actuator the supply pressure is: from 2.5 bar (36PSI) minimum to 8 bar (116PSI) maximum.
· Operating Temperature:
Standard product form -20℃(-4℉) to +80℃(+176℉).
Low temperature actuator with silicone O rings from -40℃(-40℉) to +80℃(+176℉).
High temperature actuator with FPM O rings from -15℃(-5℉) to +150℃(+300℉).
Caution: For low and high temperature service special grease is required. Please contact NUTORK for each application. High and low temperature will vary the output torque of the actuator.
· Operating Time:
See Technical Data sheet,
Caution: The operating speeds depend on several factors such as: supply pressure/supply capacity (i.e.: Pipe diameter/low capacity or pneumatic accessory), valve type, valve torque and characteristics, safety factor is to be applied, frequency of operation and temperature.
· Stroke:
The stroke for NUTORK actuator is as following (See technical date):
Standard construction: 90° rotation with stroke adjustment at 0°or 90°+/-5°.
Type 120° stroke: 120° rotation with stroke adjustment at 0°or 120°+/-5°.
Type 180° stroke: 180° rotation with stroke adjustment at 0°or 180°+/-5°.
· Lubrication:
The actuators are factory lubricated for the life of the actuator in normal working conditions.
The standard lubricant is suitable for use from -20℃(-4℉) to +80℃(+176℉). For low (LT) and high (HT) temperature service, where special grease are required please contact NUTORK.
Recommended NUTORK actuator lubricants for standard working conditions.
1.Kluber Unigear LA02, 2.Esso (Exxon) Beacon EP2, 3.Fina Marson EPL2, 4.Shell Alvania EP2, 5.Mobilux EP2
· Construction:
Two piston rack and pinion actuator design, suitable for indoor or outdoor installations.
· Protection and Corrosion resistance:
Ensure actuators are supplied with corrosion protections for normal environments. For severe duties select the protection required for corrosion protection. See technical data sheet before installing actuators.
· Actuator designation and Marking:
The actuator type, size, operating pressure, output torque, direction of rotation, orientation of the failure mode, operating temperature and drive type are determined by actuator designation.

4) OPERATING FUNCTION AND DIRECTION OF ROTATION

The actuator is a pneumatic device for remote actuation of valves. The operation (0°-90°, 0°-120°or 0°-180° rotation) may be connected by different methods.
· Namur direct mounting of solenoid valves (5/2 for double acting, 3/2 for spring return) to pressure connections 2 and 4.
· Screwed connection (to pressure connections 2 and 4) with air lines from separate control cabinet. The standard rotation is clockwise to close, counter-clockwise rotation is obtained when port 2 is pressurized. For actuator marked LF the rotation is counter-clockwise to close, clockwise rotation is obtained when port 2 is pressurized,

5) ACTUATOR INSTALLATION INSTRUCTIONS

The NUTORK actuator is pneumatic device for the remote operation of industrial valves. The NUTORK actuator will operate through 90°, the option is available for 120° or 180° of rotation permitting the opening and closing of many types of 1/4 turn valves.
All the necessary technical information to install the actuator correctly and safely onto a valve i.e. Dimensions, Output torque, Air volume, Stroke Adjustment, Operating Temperature, Direction of Rotation and Weight is stated clearly on the Actuator label, in the catalogue and technical data sheets. Please read this technical information carefully before proceeding with the actuator installation.

5.1) Important Safety Notice:

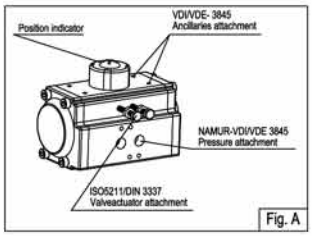
· The actuator must not be pressurized at any time during installation as injury may result.
· The utmost cleanliness is required during air supply connection to the actuator i.e. the connecting pipe thread, fittings and seals must be clean and dirt-free.
· When fitting accessories onto the actuator assemble them in such a way that the top of the drive shaft is easily accessible should manual operation of the actuator be required.
· Before fitting onto the valve make sure that the actuators / valves are correctly orientated, depending upon which direction if rotation is required.

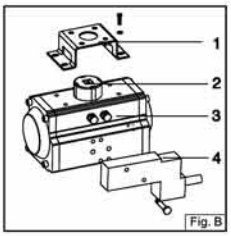
5.2) Controls and connections. Figure A:

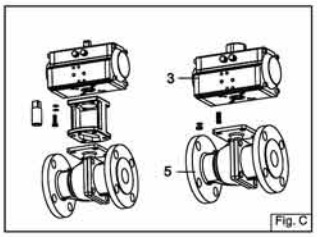
5.3) Assembly of accessories: Solenoid valves and Switchboxes Figure B:

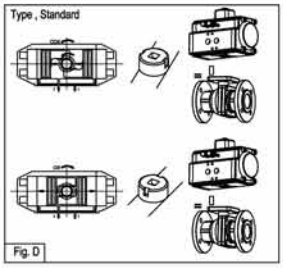
· Solenoid valve mounting:
Before mounting a solenoid valve ensure that the actuator is in its normal position (closed position), pistons together.
· For standard assembly and rotation (Clockwise to close): the groove on the indicator 2 must be diagonal to the longitudinal axis of the actuator in the closed position.
Fit the solenoid valve 4 onto the actuator 3 using the screws provided.
· Switchbox mounting:
Fit the switchbox and bracket 1 onto the actuator 3, using four screws provided.

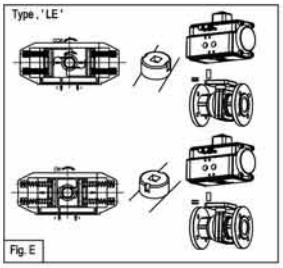
5.4) Assembly of Valve Figure C:
Before proceeding with the assembly of a valve onto an actuator be sure that the actuator operates in the desired direction of rotation and both actuators/valves are correctly orientated.
Important: When using a spring return actuator for a fail safe operation, ensure that when air or electricity failure occurs the direction of rotation is correct for your application.
Fit the valve 5 onto the actuator 3. Ensure that the actuator is normal position (closed position).
There are two types of valve assembly onto the actuator:
- Direct-mounting: Fit the square of the valve 5 directly into the square of the actuator 3 and bolt together through the valve ISO pad.
- Bracket- mounting: Mounting with a bracket 6 and coupling 7, the bracket is bolted to the actuators / valve to join them together and the coupling is used to connect the output drive to the valve stem (max tightening torque see the table).
5.4.1) Mounting alternatives:
5.4.2) Valve mounting with Actuator Type STANDARD (Clockwise to close) Figure D
5.4.3) Valve mounting with Actuator Type LF(Clockwise to open) Figure E



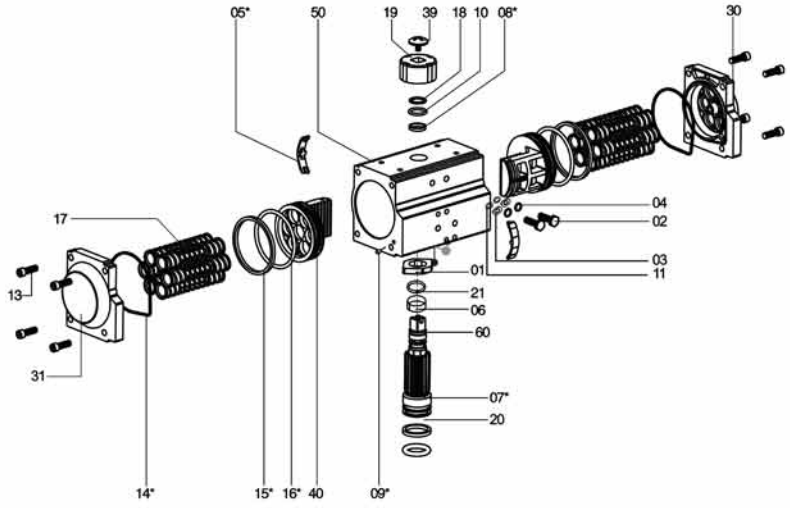








6) MAINTENANCE INSTRUCTION
With the information given below, NUTORK provides the end user with all the required information necessory for maintenance. Under normal operating conditions the actuator requires only periodic observation to ensure proper adjustment.
Rebuilding of NUTORK actuator is allowed only to the personnel of NUTORK or to personnel which are properly instructed. By contravention the guarantees expires!
Spare kits for maintenance are available to replace all seals and bearings.
6.1) Drawing with itemized com ponents and recommended spare parts.

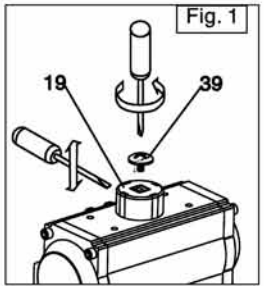


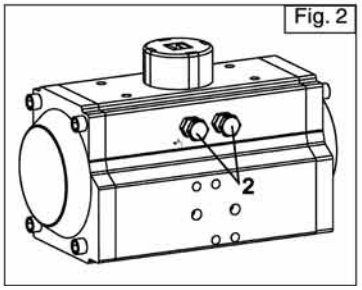
Part No.	Qty	Part Description	Part No.	Unit Qty	Part Description
1	1	Stroke Cam (Stop arrangement)	15	2	Piston Bearing
2	2	Stroke Bolt	16	2	Piston O-Ring
3	2	Washer	17	min.5/ max.12	Spring (Cartridge)
4	2	Nut(Stop Screw)	18	1	Spring Clip (Pinion)
5	2	Piston Guide	19	1	Position Indicator
6	1	Trust Bearing (Pinion Top)	20	1	O Ring (Pinion Bottom)
7	1	Thrust Bearing (Pinion Bottom)	21	1	O Ring (Pinion Top)
8	2	Thrust Bearing(Pinion)	30	1	End Cap (Right)
9	2	Plug	31	1	End Cap (Left)
10	1	Thrust Washer(Pinion)	39	1	Cap Screw (Indicator)
11	2	O Ring(Stop Screw)	40	2	Piston
13	8	Cap Screw (End Cap)	50	1	Body
14	2	O Ring(End Cap)	60	1	Drive Shaft

6.2) Disassembly
When disassembly of actuator is required for maintenance, firstly remove the actuator from the valve. Before performing and disassembly operations it is important to verity that the actuator is not pressurized. Always use caution and double check that the ports 2 and 4 are vented and are free from any accessory and/or device. When the actuator is a spring return unit, make sure that the actuator is in the failed position before disassembly.

A) Removal of position indicator (Part No.19), figure 01:
· Remove cap screw (39) if fitted.
· Lift position indicator (19) off shaft, it may be necessary to pry gently with a screwdriver.

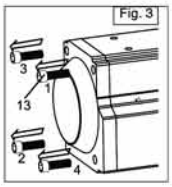
B) Removal of stop cap screw (Part No.02), figure 02:
· Remove both stop cap screws together with nut (04) and washer (03).
· Remove stop screw O-rings(11) and discard if replacing all soft parts.

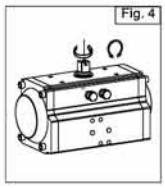




C) End Caps disassembly (Part No.30), figure 03:

· Remove cap screw (End cap 13) in the sequence shown in the figure 03. Caution: when disassembling a spring return actuator, the end cap (30) should be loose after unscrewing end cap bolts (13) 4-5 turns. If there is still force on the end cap after 4-5 turns of the end cap bolts, this may indicate a damaged spring cartridge and any further disassembly should be discontinued. Further disassembly of the end caps may result in injury. Return actuator to NUTORK for further maintenance.
· For spring return actuators always remove spring cartridge.
· Remove end cap O-rings (14) and discard if replacing all soft components.





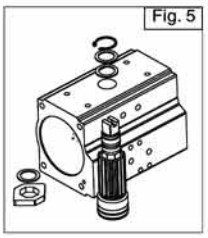
D) Pistons disassembly (Part No.40), figure 04:

· Holding the body (50) in a vice or similar device, rotate the drive shaft (60) until the pistons (40) are released.
Caution: Air pressure should not be used to remove the pistons from the body.
· Remove piston O-ring (16) using a small screwdriver; remove the piston guides(05) and piston bearings(15). Discard piston guides and bearings when replacing all soft components.

E) Piston shaft disassembling (Part No.60), figure 05:

· Remove spring clip (18) carefully, using nap-ring pliers, remove external thrust bearing (06) and thrust washer (10).
· Apply downward force to top of drive shaft (60) until it is partially out of the bottom of the body when it is possible to remove the stroke cam (01) and internal thrust bearing (08), then push the pinion (60) completely out of the bottom of the body, if pinion does not remove freely gently tap the top of the shaft with a plastic mallet.
· Remove top and bottom pinion bearings (06) and (07) and top and bottom pinion O-rings (20) and (21).
· Discard bearings (06) and (07), internal and external thrust washer (08) and O-rings (20) and (21) if replacing all soft components.

When all components are disassembled, those not being replaced should be properly cleaned and inspected for wear prior to being greased and re-assembled.

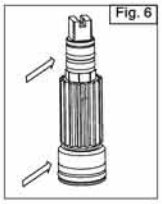


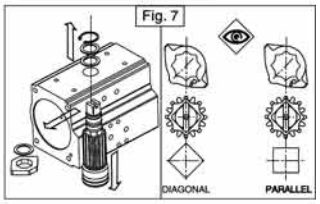
6.3) Assembly:

Prior to assembly, ensure all components are perfectly clean and free from damage.

A) Drive shaft assembly (Part No.60), figures 06 and 07;

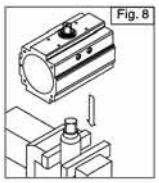
· Install top and bottom pinion bearings (06) and (07) and top and bottom pinion O-rings(20) and (21) onto the shaft.
· Grease the outside surface of the drive shaft on top and bottom as shown in figure 05.
· Insert partially the drive shaft (60) in the body (50), install stroke cam (01) in the correct position as shown in figure 07 related to the bottom and top of the drive shaft and the rotation of the actuator when energized and install internal thrust bearing (08). Insert completely the drive shaft in the body.
· Fit external thrust bearing (08), thrust washer (10) and then external circlip (18) using snap ring pliers.

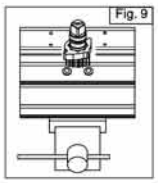


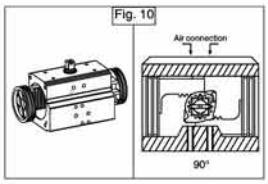


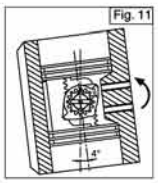
B) Pistons assembly(part No.40), figure 08, 09, 10 and 11;

· Install piston O-rings(16), the piston guide (05) and piston bearings(15);
· Grease the internal surface of the body (50) and the piston (40) rack teeth.
· Hold the body (50) in a horizontal position by inserting the top of the shaft into a vice or the bottom of the shaft connection into a male drive fitted in a vice as shown in figure 08.
· Ensure that the stroke cam is in the right position as shown in figure 09.
· For standard rotation assembly (clockwise to close) rotate the body (50) about 40-45° counter-clockwise form bottom view or clockwise from top view depending on which way the shaft has been linked as shown in figure 10.
· Press the two pistons (40) simultaneously inside the body (50) until the pistons are engaged and rotate the body clockwise from bottom view or counter clockwise from top view until the stroke is completed.
· Ensure that when the pistons are inserted that they both mesh at the same time. Check fully closed and open position as shown in figure 11.



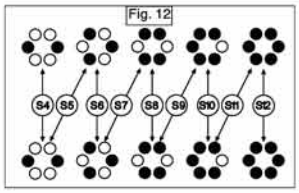


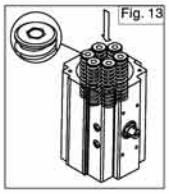




C) Spring set assembly(only for spring return actuator), figure 12 and 13.

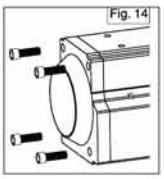
Before proceeding to he end caps assembly put the actuator in vertical position and proceed as below described first on one side and then on the other side of the actuator.
· Insert the proper quantity of spring cartridges of the internal spring set according to the pattern shown in figure 12 (referring to the total number of springs). Individual springs should be inserted as shown in figure 13.
· Then proceed in the same way for the other side.

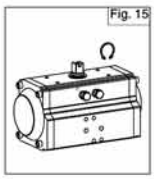




D) End cap (part 30 and 31), figure 14.

· Fit end cap O-ring seal (14) into the groove in the end cap, on both end caps.
· Fit end cap onto the body (50), verifying that the O-ring remains in the groove.
· Insert all the cap screw (13) and tighten each only partially. Complete tightening by following the sequence indicated in figure 14.





E) Assembly of stop cap screw (Part 02) and stroke adjustment, figure 15.

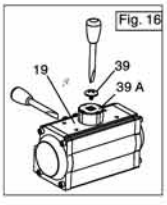
· Insert on both the stop cap screw (02), the nut (04), the washer (03), and the O-ring.
· Fit the stop cap screw (02) in the body.

Stroke adjustment for standard rotation actuator (Clockwise to close):

· 0°(close) position stroke adjustment with actuator in close position, screw or unscrew the right (from top view) stop cap screw (02) until the desired stop position is achieved. Then tighten the stop adjustment nut (04) to lock it in place.
· 90°(open) position stroke adjustment with actuator in open position, screw or unscrew the left (from top view) stop cap screw (02) until the desired stop position is achieved. Then tighten the stop adjustment nut (04) and lock it in place.

F) Assembly of position indicator (Parts No 19, 39), figure 16:

· Fit position indicator (19) on the shaft verifying that it indicates the correct actuator position.
· Then fit cap screw (39) where fitted.



7) STORAGE INSTRUCTIONS

If the actuators are not for immediate use, the following precaution must be taken for storage:

· Store in a dry environment and ambient temperature.
· It is recommended that the actuator be stored in its original box.
· Do not remove the plastic plugs on air supply ports.

NUTORK®

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:

	**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. PTFE, Polyester, Nickel , Ceramic and Epoxy coated are available on request.
	**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.
	**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.
	**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. 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.
	**NTQ electric actuator, CE approval(IP67 & EExdIIBT4 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 & EExdIIBT4 enclosure.
	**The fully range accessories(Limit Switchbox, Solenoid Valve, Declutchable Manual Override, Air Filter regulator, E/P Positioner ---etc).**
	**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

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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