Easytork Rack & Pinion Actuator IOM

General

Always refer to the most up-to-date IOM on www.easytork.com

Storage

The Easytork Rack & Pinion Actuator (“ERPA”) is a high-quality product and as such must be handled, transported and stored with care. Prior to storage, inspect the actuator for shipping damage. Keep the actuators in their original packing boxes during storage. It is recommended to keep the actuators in a clean and dry environment until ready for use. Store the actuators indoors to protect them from humidity and dust.

Operating Conditions

Lubricants

The actuator comes lubricated with grease from the factory and does not require re-lubrication under normal operating conditions. Recommended actuator lubricants for standard working conditions:

- Kluber Unigear LA02
- Esso(Exxon)Beacon EP2
- Fina Marson EP L2
- Shell Alvania EP2
- Mobilux Ep2

Air Supply

Instrument Air:
Clean instrument air is to be used. The operating medium is to be filtered to 30 micron particle size or less. Always consult with a representative of ERPA for suitability and recommended practice.

Other Media:
Non inert gases cannot be used and will void Easytork’s warranty. Pure oxygen, hydrogen, and combustible natural gas must not be used.

Corrosive gas cannot be used.

Piping connected to the actuator or accessories should be fitted according to recommended instrumentation piping practice. Prior to connection, make sure that all lines have no loops and are free of water, oil, or other contaminants that may be trapped in the pipes. Pipes must be flushed with air to clean the passages. Where sealants have been used for threaded connections, care must be taken to avoid excess material from being forced into the actuator ports.

Supply Pressure

The supply pressures for the ERPA are as follows:

2-8 bar (30-116 psi).

When sizing an actuator to the available air supply, make sure you have adequate power in the actuator to allow the valve to complete its operation and leave enough power for safety margin.

Temperature

It is essential to use an air dryer for the air supply to avoid any moisture in sub-zero Celsius temperatures.

Humidity and Corrosion

The ERPA operates on double acting principle in both double acting or fail-safe functions, therefore the ERPA will not create a vacuum effect and pull air from the environment into the actuator.

Speed Regulator

Slower operation of the actuator is possible, without significant torque output reduction, by external fitting of flow regulator valves.

Faster operation can be achieved under certain conditions by fitting quick exhaust valves.

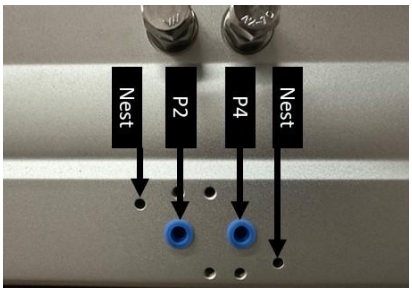
Explosive Zones

For actuators installed in potentially explosive zones, make sure that the internal parts of the actuator cannot come into contact with the external atmosphere.

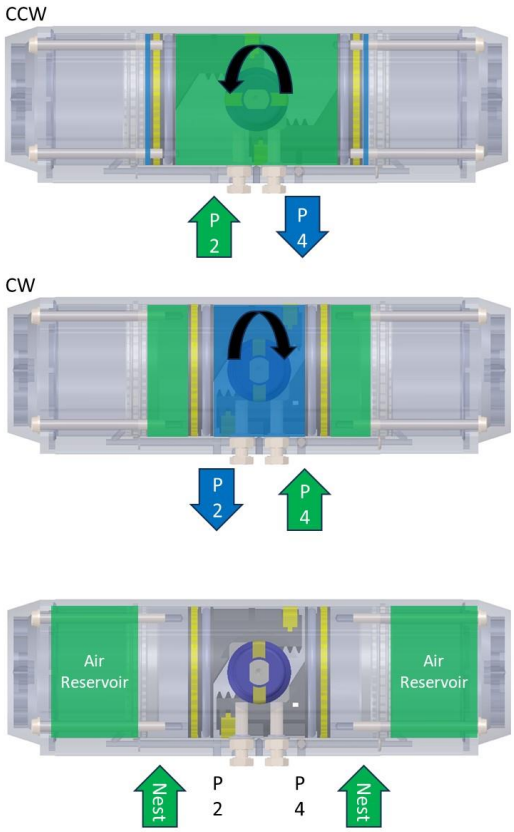
Principle of Operation

The Easytork Rack & Pinion Actuator is a pneumatic quarter-turn rack & pinion actuator.

Air Connection



Port **2** and **4** are NAMUR standards. Pressure entering port 4 rotates the actuator clockwise, and pressure entering port 2 rotates the actuator counter-clockwise. The **Nest** ports interface the air reservoir.



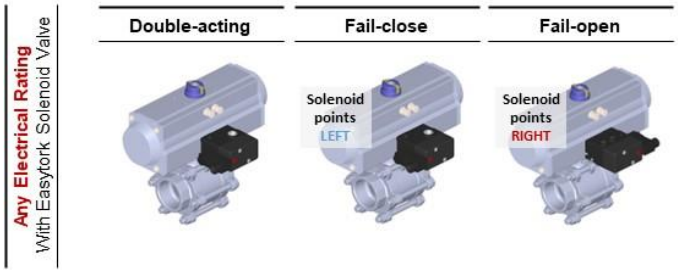
Two direct airlines to ERPA (double-acting)
Users can directly pipe two airlines to the actuator, respectively P2 and P4. However, the two Nest holes should be plugged to prevent foreign environment from getting into the actuator.

Double-Acting or Fail-Safe Installation and Operation

Easytork Solenoid Valve

Air flow video

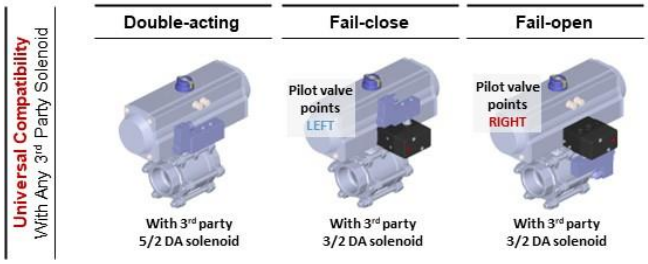
https://vimeo.com/901995131



Third-Party Solenoid Valve

Air flow video

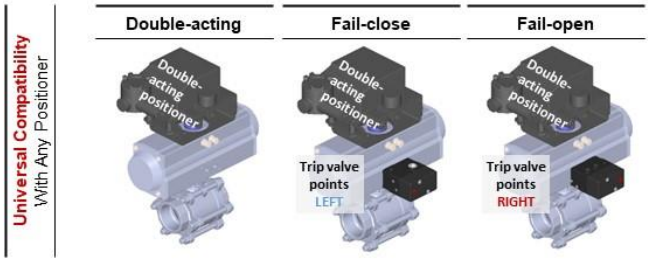
https://vimeo.com/902384423



Third-Party Positioner

Air flow video

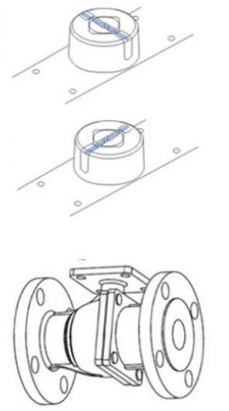
https://vimeo.com/903057177



Installation – ERPA to Valve

ERPA to Valve

Caution: Ensure the drive shaft (60) and position indicator (19) accurately reflect the orientation of the controlling mechanism of the valve (i.e. ball or disc in a ball valve or butterfly valve respectively).



ISO 5211 or DIN3337

ERPA actuators are in accordance with ISO5211 (or DIN3337) international standards.

The following ISO 5211 standard table shows the maximum torque transmittable for each flange connection and the preferred square head.

Flange		Preferred Sq. Head (1)	
Flange	Max Flange torque (NM)	Size	Max transmissible torque (NM)
F03	32	9mm	32
F04	63	11mm	63
F05	125	14mm	125
F07	250	17mm	250
F10	500	22mm	500
F12	1,000	27mm	1,000
F14	2,000	36mm	2,000
F16	4,000	46mm	4,000

Note (1): Maximum transmissible torque figures are based on a maximum allowable torsional stress of 280 MPa for the driven component.

Caution: Do not exceed the maximum torque transmittable for specified flange patterns. Exceeding the maximum torque transmittable may damage the actuator body or drive insert.

ERPA Selection

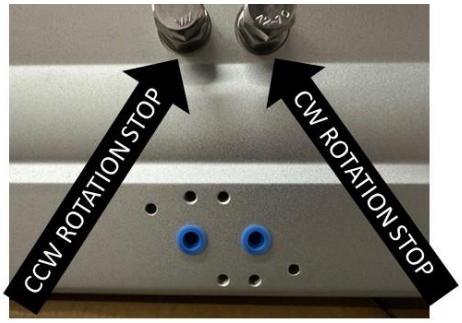
The suggested safety factor for the double-acting and fail-safe version in normal working conditions is 15-20%. The actuator is designed to continuously operate no less than 15% of specified air pressure.

The ERPA can only be used to fail-safe close position a high-performance butterfly valve when the high-performance butterfly valve seat retainer is downstream. The ERPA can only be used to fail-safe open position a high-performance butterfly valve when the high-performance butterfly valve seat retainer is upstream. All other setups cannot be used and will void Easytork's warranty.

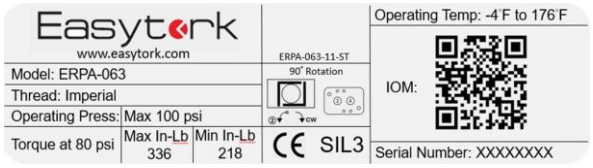
Travel Adjustment

The actuator is factory-adjusted to produce 90° rotation. Actuator rotation is designed to be restricted by the stopper bolt and nut set. The adjustment of +/- 5° (is standard) in the travel limits per each stopper bolt.

Caution: Ensure proper sealing before operation.



Identification and Marking



Maintenance

Maintenance is limited to the replacement of seals when wear affects actuator performance. Seal life will vary according to application, conditions of cycle frequency, temperature, condition of air supply, etc.

PART N°	UNIT Q.TY	PART DESCRIPTION
01	1	OCTI–CAM(Stop arrangement)
02	2	STOP CAP SCREW
03	2	WASHER
04	2	NUT(Stop screw)
05*	2	BEARING(Piston back)
06*	1	BEARING(Pinion top)
07*	1	BEARING(Pinion bottom)
08*	2	THRUST BEARING(Pinion)
09*	2	PLUG
10	1	THRUS WASHER(Pinion)
11*	2	*O*RING(Stop screw)
13	8/12/16(A)	CAP SCREW(End cap)
14*	2	*O*RINB(End cap)
15*	2	BEARING(Piston head)
16*	2	*O*RING(Piston)
18	1	SPRING CLIP(Pinion)
19	1	POSITION INDICATOR
20*	1	*O*RING(Pinion bottom)
21*	1	*O*RING(Pinion top)
30	1	END CAP(right)
31	1	END CAP(left)
39	1	CAP SCREW(Indicator)
40	2	PISTON
41	1	ACTUATOR IDENTIFICATION LABEL
50	1	BODY
60	1	DRIVE SHAFT

Disassembly

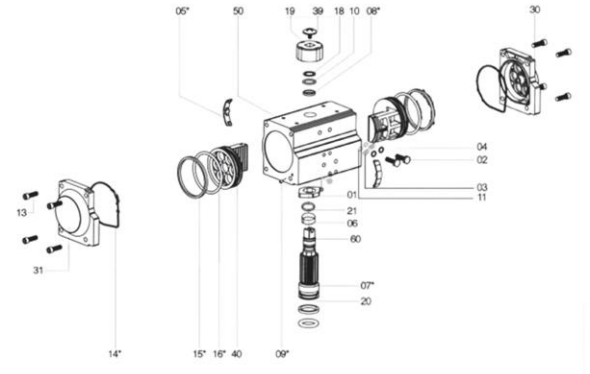
General

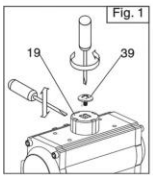
Note: Easytork's warranty and liability of the ERPA are voided with the disassembly of the product.

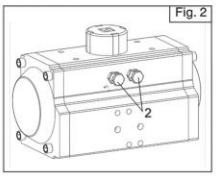
Before performing any disassembly operation, read all the warnings and safety instructions in this booklet.

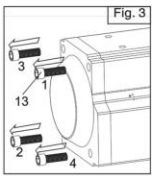
Do not attempt to disassemble the actuator while it is still connected to the valve or any ancillary. Verify that the actuator is not pressurized. Work in a clean area, free of dust, debris, grease, corrosives and moisture. For security and comfort, do the repairs on a table with a vice.

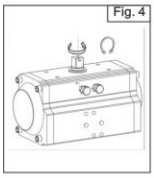
A) Remove position indicator (Part No.19), Fig. 1:
- Remove cap screw (39 and 39A) if fitted
- Lift position indicator (19) off the shaft, it may be necessary to pry gently with a screwdriver.

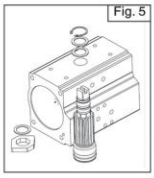


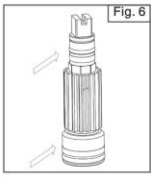


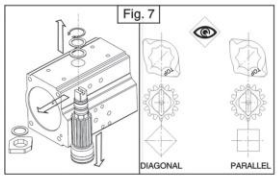


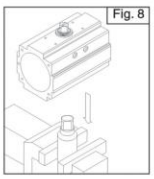


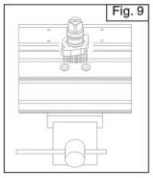


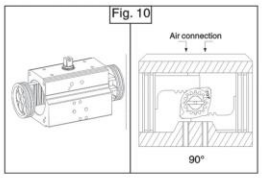


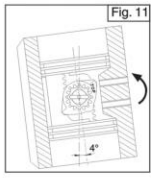


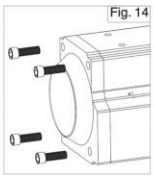


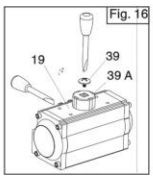












B) Removal of stop cap screws (Part No. 02), Fig. 2:
- Remove both stop cap screws together with nut (04) and washer (03).
- Remove stop screw O-rings (11) and discard if replacing all soft parts.

C) End caps disassembly (Part No .30) Fig. 03:
- Remove the cap screw (End cap 13) in the sequence shown in Fig. 03. Note, ERPA has no spring-return actuator-related risks.
- Remove end cap O-rings (14) and discard if replacing all soft components.

D) Pistons disassembly (Part No.40), Fig. 4:
- 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' rings (16) using a small screwdriver. Remove the piston back (05) and piston head (15) bearings. Discard bearings when replacing all soft components.

E) Shaft disassembly (Part No 60), Fig. 5:
- Remove the spring clip (18) carefully, using snap-ring pliers, and remove the external thrust bearing (08) and thrust washer (10).
- Apply downward force to the top of the drive shaft (60) until it is partially out of the bottom of the body when it is possible to remove the octi-cam (01) and internal thrust bearing (08), then push the pinion (60) completely out of the bottom of the body. If the 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 before being greased and reassembled.

Assembly

General

Before assembly, ensure all components are perfectly clean and free from damage. Please see the “Lubricants” section for recommended lubricants.

A) Drive shaft assembly (Part No .60), Fig. 6 and Fig. 7:
- 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 Fig. 6.
- Partially insert the drive shaft (60) in the body (50), install octi-cam (01) in the correct position as shown in Fig. 7 relative to the bottom and top of the drive shaft and the rotation of the actuator, 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), Fig. 8 and Fig. 9, Fig. 10 and Fig. 11:
- Install piston O-rings (16), the Piston skirt (05) and piston head (15) bearings.
- 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 Fig. 08.
- Ensure that the octi-cam is in the right position as shown in Fig. 09.
- For standard rotation assembly (clockwise to close) rotate the body (50) about 40-45 degrees counter-clockwise from the bottom view or clockwise from top view depending on which way the shaft has been linked as shown in Fig. 10.
- Press the two pistons (40) simultaneously inside the body (50) until the pistons are engaged and rotate the body clockwise from the bottom view or counterclockwise from the top view until the stroke is completed.
- Ensure that when the pistons are inserted and both mesh at the same time. Check fully closed and open positions as shown in Fig. 11.

C) End cap (part 30) Fig. 14:
- Lubricate the body.
- Fit end cap O-ring seal (14) into the groove in the end cap, on both end caps.
- Fit end caps onto the body (50), verifying that the O-ring remains in the groove.
- Insert all the cap screws (13) and then tighten.

D) Assembly of stop cap screws (02), and stroke adjustment Fig. 15:
- Install both the stop cap screw (02), the nut (04), the washer (03), and the O-ring (11).
- Fit the stop cap screw (02) in the body.

Stroke adjustment for standard rotation:
- Full clockwise (CW) 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 in place.
- Full counterclockwise (CCW) position stroke adjustment with the actuator in close 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 in place.

E) Assembly of position indicator (Parts No 19, 39 and 39A), Fig. 16:
- Fit position indicator (19) on the shaft verifying that it indicates the correct actuator position.

Actuator Testing

After completing actuator assembly, it is mandatory to follow the testing procedures listed below to ensure that the actuator has been correctly assembled.

Actuator Leak Test

Any leakage across the actuator is not acceptable.

1. Apply the pressure to port 2 and leave port 4 open.
2. Apply a leak-testing soap solution to port 4 and check for leakage.
3. Repeat this by applying pressure to port 4 and check port 2 for leakage.
4. If leakage is observed, disassemble the actuator again and check the seals, surface finish and cleanliness of the internal parts to find the cause of leakage. After doing the repair work, the leakage test must be performed again.

External Leak Test

Install the ESV to ERPA and apply the pressure to port 1, in both open and close positions. Spray leak-testing soap solution on the housing joint (or rinse in the water) to check for bubbles to ensure that no external leakage occurred.

If there is no internal and external leakage, proceed to the rest of the assembly for upper and lower shafts and position indicator.

TWO YEAR OR TWO MILLION CYCLE WARRANTY

Note: Easytork's warranty and liability of the ERPA are voided if there are damages caused by negligence, misuse, improper application, service or operation or lack of service of product.

EASYTORK offers a limited repair or replacement warranty on all EASYTORK Rack & Pinion Actuator (ERPA) Series, Easytork Solenoid Valve (ESV) Series, and Easytork Air Pilot Valve (EPV) Series (the "Products"). Simply stated, if any of Goods fails within two years or two million cycles, whichever comes first, of delivery by Distributor, despite being properly installed, operated in accordance with industry standard operating procedures, and properly serviced and maintained, EASYTORK will repair the product, or at our option replace the unit with another of equivalent material and design in exchange for the defective unit. This warranty only applies to failures due to defective materials, workmanship, or premature wear in the Goods.

Under no circumstances will EASYTORK accept responsibility or be liable for any costs other than to repair or provide a replacement of the defective Goods. EASYTORK shall not have any liability to any customer for the loss of product, loss of profit, loss of use, or any other indirect, incidental, special or consequential damages as a result of this express limited warranty.

Actuator is designed to continuously operate within 15% of specified air pressure in either DA or FS design.

EASYTORK DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER IMPLIED WARRANTY IN CONNECTION WITH THE CUSTOMER'S PURCHASE OF ANY PRODUCT UNDER THIS AGREEMENT.