

Pneumatic actuators

Fig.540 : Air/Air

Fig.541 : Air/Spring



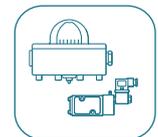
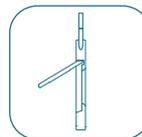
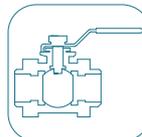
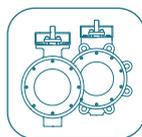
Introduction

This instruction manual contains important information regarding the installation, operation, maintenance and storage for Coreline pneumatic actuators. For errors resulting from improper installation, the manufacturer or Distributer can not be held responsible. Please read these instructions carefully and save them for future reference. Other information can be found in our latest product catalogue from our website - www.coreline.dk .

Requirements for the maintenance staff

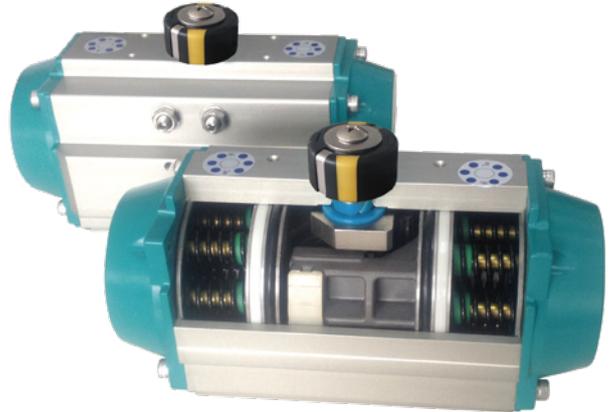
The staff assigned to assembly, operating and maintenance tasks, should be qualified to carry out such jobs and in any circumstance, ensure personal safety.

www.coreline.dk



Specifications

Coreline Fig.540/541 Aluminum pneumatic actuator is a 90° Air/Air or Air/Spring rack and pinion system, which has been designed for the actuation of all type of 1/4 turn equipments. The Fig.540/541 pneumatic actuators have been designed and tested to obtain the highest cycling life and the most reliable performance with minimum maintenance and service. Mounting specifications of our pneumatic actuators follow international standards. CE approval and ATEX certification provide guarantee for safety and reliability. Many sizes minimize air consumption and unit cost.



Mounting details: Bottom - ISO5211-DIN3335; Top - VDI/VDE3845

Air supply pressure: 2.5bar~8bar

Air connection: NAMUR. G1/8" for size 32(Air/Air); G1/4" for size 40-210; G1/2" for size 240-400

Operating media: Dry or lubricated air, non-corrosive gas in accordance with ISO8573 Part 1, Class5

Caution: The operating media must have a dew point equal -20°C or at least 10°C below the ambient temperature. The max article size must not exceed 30 µm.

Operating temperature:

-15°C (5°F) ~+80°C (176°F): Standard (NBR O-ring)

-40°C (-40°F)~+80°C (176°F): Low temperature (Silicone O-ring)

-15°C (5°F)~+150°C (302°F) : High temperature (FPM O-ring)

Caution: For low and high temperature service, special grease is required. Please contact Coreline for each application. High and low temperature will vary the output torque of the actuator.

Travel adjustment:Adjustable +4°/-4° by 0° and 90° position

Lubrication: Pre-lubricated for life of actuator on assembly under normal operating conditions

The standard lubricant is suitable for use from -15°C (-5°F) to +80°C (+176°F). For low (LT) and high (HT) temperature service, where special grease is required please contact Coreline.



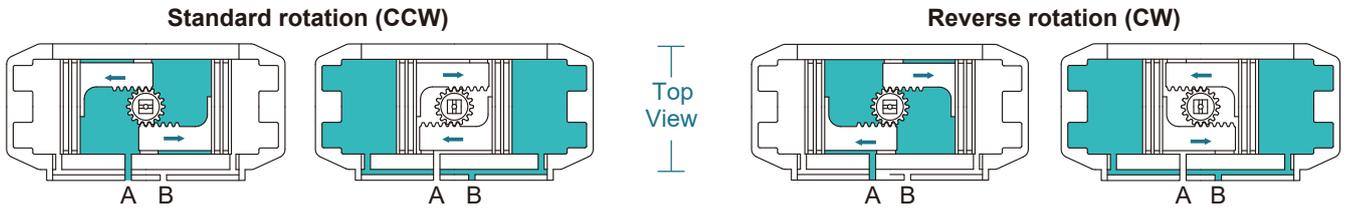
SIL3

ATEX, CE and SIL3 approval for Coreline pneumatic actuators.

Warning

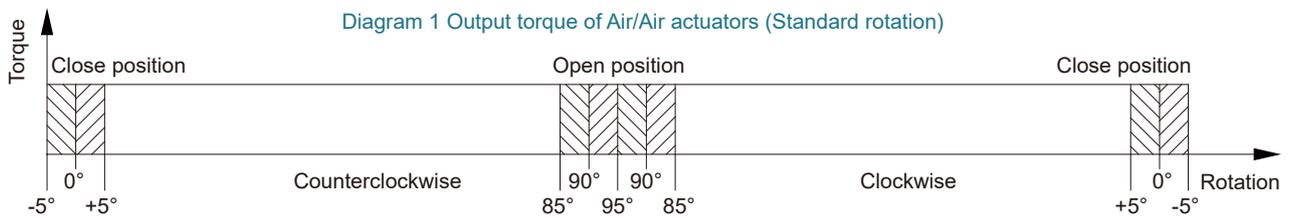
- Make sure only qualified person can carry out the mounting, assembly and disassembly of the actuators.
- Never use the adjust screw when there is pressure towards it.
- Do not remove end caps or disassemble the actuator while the actuator is pressurised.
- Before installing onto a valve, make sure that the rotation of the valve and the actuator are the same and that the position indicator orientation is also correct.
- If the actuator is incorporated in a system or used within safety devices or circuits, the customer shall ensure that the national and local safety laws/rugulations are observed.
- Do not operate the actuator using inflammable, oxidising, corrosive, explosive and unstable gases or liquids. For actuators installed in potentially explosive zones, make sure that the internal parts of the actuator cannot come into contact with the external atmosphere.
- It is important that the actuator should only be used within pressure limits indicated in our technical specifications.
- 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 componets (disassembly of Air/Spring actuator may become dangerous).
- Operating the actuator in corrosive environments with incorrect protection may damage the internal and external parts.
- Special attention and precautions should be observed of the stored energy contained in the Air/Spring pneumatic actuators. Do not disassemble individual spring cartridges to avoid injury. For further information contact Coreline.

Principle of Air/Air actuators



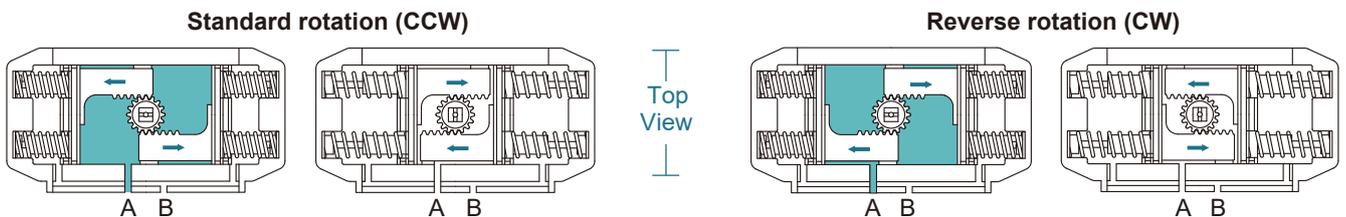
Air to Port A forces the pistons outwards, causing the pinion to turn counterclockwise while the air is being exhausted from Port B.
 Air to Port B forces the pistons inwards, causing the pinion to turn clockwise while the air is being exhausted from Port A.

Air to Port A forces the pistons outwards, causing the pinion to turn clockwise while the air is being exhausted from Port B.
 Air to Port B forces the pistons inwards, causing the pinion to turn counterclockwise while the air is being exhausted from Port A.



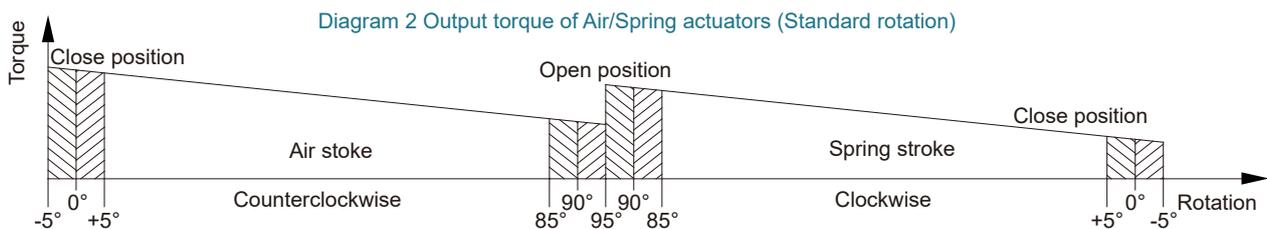
With reference to diagram 1, it can be noticed that the Air/Air pneumatic actuator has constant torque over the whole stroke.

Principle of Air/Spring actuators



Air to port A forces the pistons outwards, causing the springs to compress. The pinion turns counterclockwise while air is being exhausted from port B.
 Loss of air pressure on port A, the stored energy in the springs forces the pistons inwards. The pinion turns clockwise while air is being exhausted from port A.

Air to port B forces the pistons outwards, causing the springs to compress. The pinion turns counterclockwise while air is being exhausted from port B.
 Loss of air pressure on port B, the stored energy in the springs forces the pistons inwards. The pinion turns clockwise while air is being exhausted from port A.



With reference to diagram 2, we can see that the output torque of Air/Spring actuator is not constant but decreasing. This is because of the acting of springs that, when compressed during air stroke, counteract the piston movement and accumulate energy which will be available in a decreasing way during the rotation inversion.

Assembly of actuator / valve

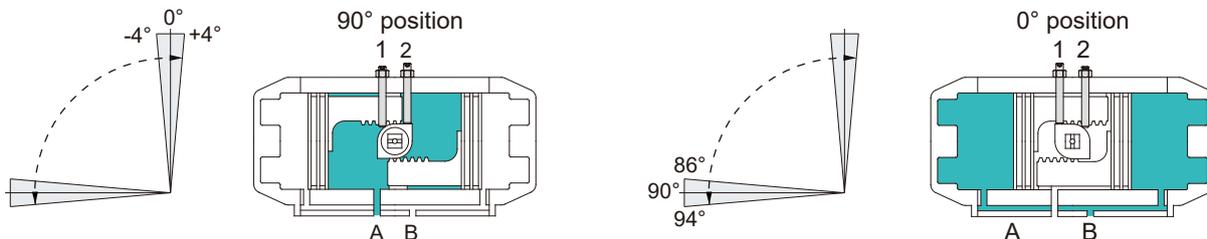
Pneumatic actuators are fitted with a double square "star" pattern drive shaft and a mounting bolt pattern conforming to ISO5211 Standards. This allows the actuator to be fitted to valves in increments of 90°, allowing mounting alignment either inline or across the line of the pipe work, enabling the most efficient use of space without the position affecting the actuators basic operation.

- Determine the desired operation of assembly for Air/Spring valves:
Normally closed NC, or Normally open NO.
- Make sure the supply air pressure is minimum same or higher than used by the calculation for sizing the actuator.
- Make sure that the rotation direction and the position indicator are in the correct position.
- Ensure the mounting screws are proportionally fastened with correct torque.
- Fit the stem of the valve directly into the square of the actuator. Use an additional adaptor if needed.
- Bolt the valve and actuator together through the valve ISO pad. Make sure the force is proportionally distributed in circle.
- When using a Air/Spring actuator for fail safe operation, ensure that when air or electricity failure occurs, the direction of rotation is correct for your application.
- Ensure temperature is not higher than max. limit of actuator.
- Ensure supply air quality is accordance with ISO8573 Part 1, Class 5 with the maximum particle size not exceeding 30µm.
- **IMPORTANT:** When using a Air/Spring actuator for a fail safe operation, ensure that when air or electricity failure occurs, the direction of rotation is correct for your application.



End stop adjustment

Each pneumatic actuator has been pressure tested and adjusted from factory. Normally users do not need to make adjustments and testing. Connected with the valve, if the valve open or closed position needs to be adjusted, there are two adjustment screws upper the end of the cylinder, 0° and 90° position can be adjusted to ± 4°.



When driving shaft turns Counterclockwise:
Loosen the locknut and turn the end position adjust screw 2 inwards/outwards until the desired position is reached.
Secure the position by tightening the locknut.

When driving shaft turns Clockwise:
Loosen the locknut and turn the end position adjust screw 1 inwards/outwards until the desired position is reached.
Secure the position by tightening the locknut.

Control and connections , Fig.A.

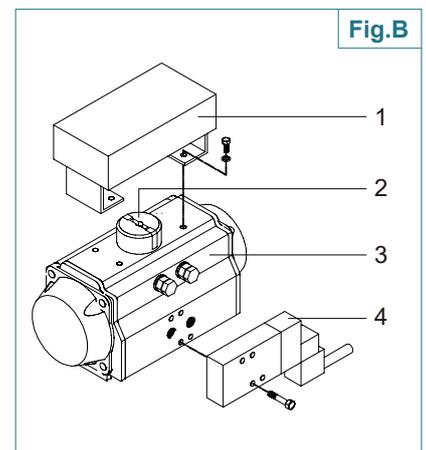
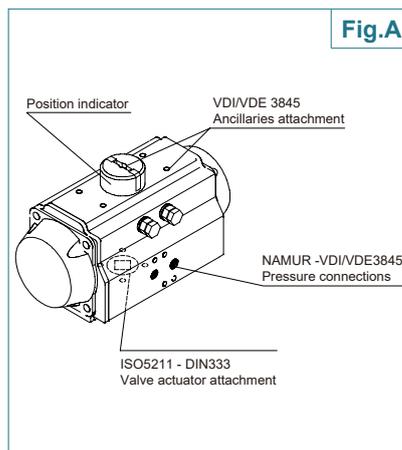
Assembly of accessories , Fig.B.

Solenoid valve mounting:

Fit the solenoid valve (4) onto the actuator (3) using the screws provided.

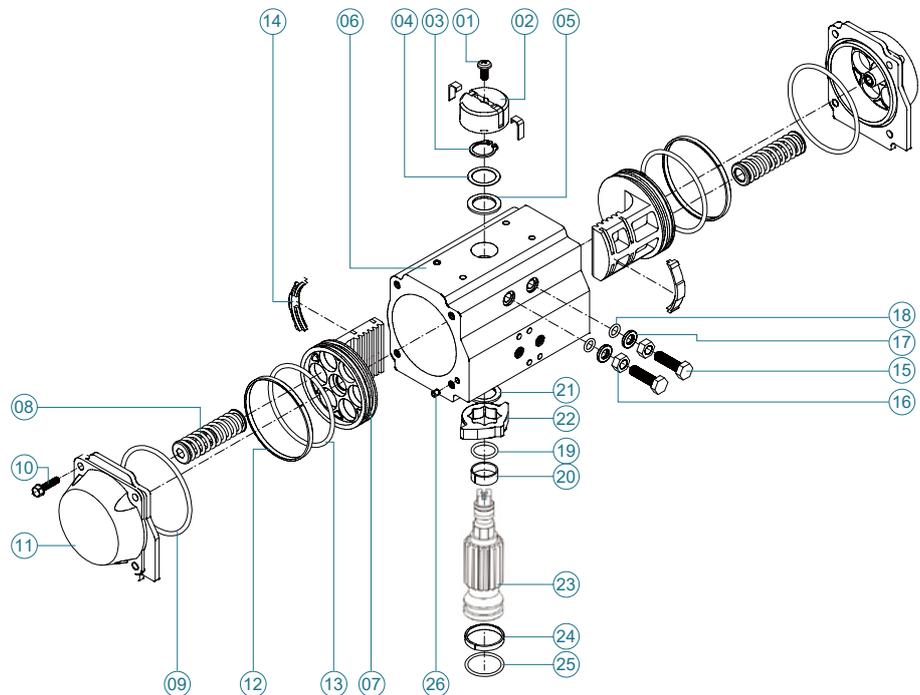
Position switch box mounting:

Ensure pneumatic valve is in desired position and the actuator indicator is correctly mounted. Ensure the position switch box indicator is in the same position as actuator indicator. Mount position switch box (1) onto actuator (3), ensure Namur shaft is correctly placed into pinion top of actuator(2).



Actuator part list

Part No	QTY	PART DESCRIPTION
01	1	Cap screw
02	1	Position indicator
03	1	Spring clip
04	1	Thrust washer
05	1	Thrust bearing
06	1	Body
07	2	Piston
08	0-12	Spring
09	2	O-ring (end cap)
10	8	Cap screw (end cap)
11	2	End cap
12	2	Bearing (piston head)
13	2	O-ring (pinion)
14	2	Wear band
15	2	Travel adjustment screw
16	2	Nut (stop screw)
17	2	Washer (stop screw)
18	2	O-ring (stop screw)
19	1	O-ring (pinion top)
20	1	Bearing (Piston top)
21	1	Thrust bearing (pinion top)
22	1	OCTI-CAM
23	1	Drive shaft
24	1	Bearing (pinion bottom)
25	1	O-ring (pinion bottom)
26	2	Plug



Disassembly of the actuator

- Before performing any disassembly operations, it is important to verify that the actuator is not pressurized.
- Remove the actuator from the valve when maintenance is needed.
- When the actuator is a Air/Spring unit, make sure that the actuator is in the “fire safe” position before disassembling.
- Always use caution and double check that the air ports are vented and are free from any accessories and/or devices.

A. Removal of position indicator (Part No.02), Fig.01:

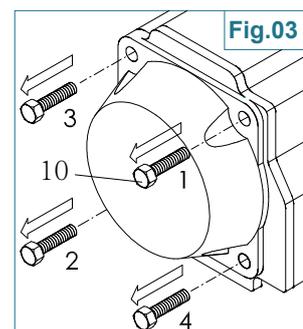
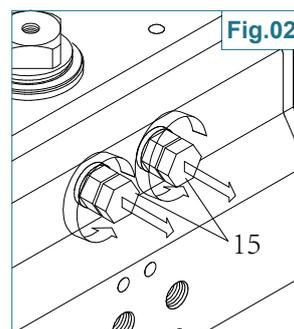
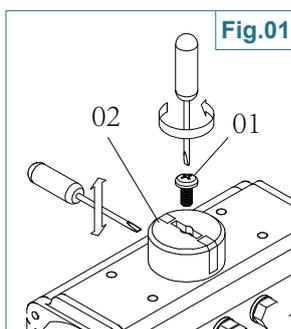
- Remove cap screw (01) if fitted.
- Lift position indicator (02) off from shaft, it may be necessary to pry gently with a screwdriver.

B. Removal of travel adjustment screws (Part No.15), Fig.02:

- Remove both travel adjustment screws together with the nut (16) and washer (17).
- Remove stop screw O-rings (18) and discard if replacing all soft parts.

C. End caps disassembly (Part No.11), Fig.03:

- Remove cap screw (10) in the sequence shown in the Fig.03.
- When disassembling a Air/Spring actuator, the end cap should be loose after unscrewing end cap bolts (10) 4-5 turns. The spring cartridge should always be removed. **Caution:** If there is still force on the end cap after 4-5 turns of the cap bolts, this may indicate a damaged spring cartridge. Therefore any further disassembly should be discontinued in case of any injuries. Please return the actuator to Coreline for further maintenance.
- Remove end cap O-rings (09) and discard if replacing all soft componts.



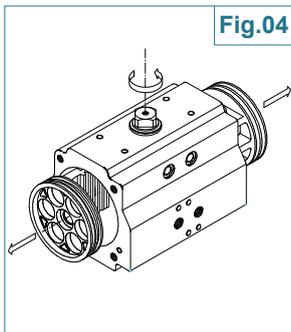


Fig.04

D.Pistons disassembly (Part No.07), Fig.04:

- Holding the body (06) in a vice or similar device, rotate the drive shaft (23) until the pistons (07) are released. **Caution:** Air pressure should not be used to remove the pistons from the body.
- Remove piston O-rings (13) by using a small screwdriver; remove the piston back (14) and piston head bearings (12). Discard bearings when replacing all soft parts.

E.Pinion shaft disassembly (Part No.23), Fig.05:

- Remove spring clip (03) carefully, using nap-ring pliers, remove external thrust bearing (05) and thrust washer (04).
- Apply downward force to top of pinion (23) until it is partially out of the bottom of the body when it is possible to remove the octi-cam (22) and internal thrust bearing (05), then push the pinion (23) 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 (20) and (24) and top and pinion bottom O-rings (25) and pinion top O-rings(19). Discard bearings (20) and (24), internal and external thrust washer (05) and O-rings (25) and (19) 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.

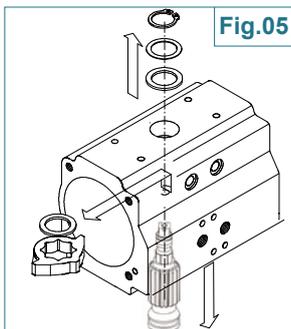


Fig.05

Assembly of actuator

- Prior to assembly, ensure all components are perfectly clean and free from damage. Please make sure that the correct grease is used before assembly.

A.Pinion assembly (part No.23), Fig.06 and 07

- Install top and bottom pinion bearings (20,24) and top and bottom pinion O-rings (19, 25) onto the pinion.
- Grease the outside surface of the pinion on top and bottom as shown in Fig.06.
- Insert partially the pinion (23) into the body (26), install OCTI-cam (22) in the correct position as shown in Fig.07 related to the bottom and top of the pinion, and rotate the actuator when energised and install internal thrust bearing (21).
- Insert completely the pinion (23) into the body (06).
- Fit external thrust bearing (05), thrust washer (04) and then external circlip (03) using snap ring pliers.

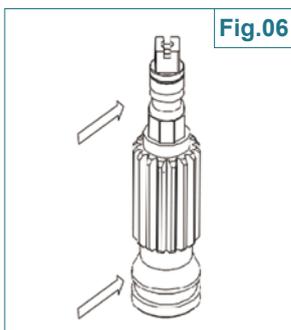


Fig.06

B.Pistons assembly (Part No.07), Fig.08,09,10 and 11:

- Install piston O-rings (13), the piston back (14) and piston head bearings (12).
- Grease the internal surface of the body (06) and the piston (07) rack teeth.
- Hold the body (06) 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.

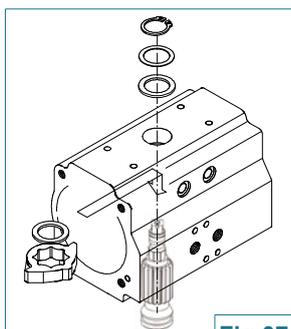


Fig.07

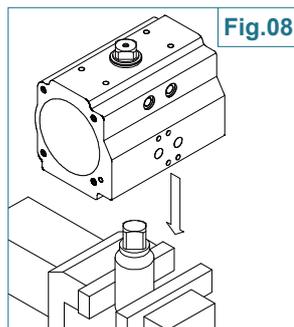
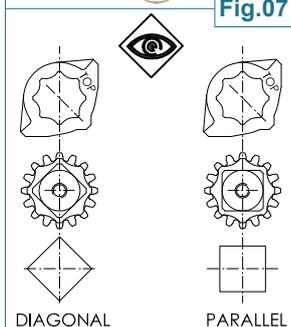


Fig.08

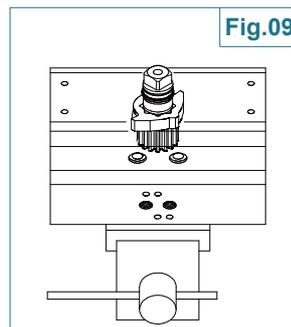


Fig.09

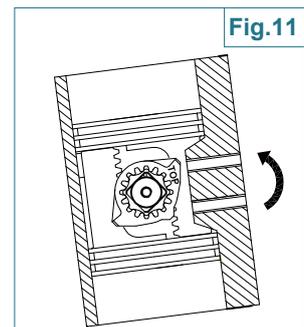


Fig.11

- For standard rotation assembly (Clockwise to close), rotate the body (06) about 0-90° Counterclockwise (from 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(07) simultaneously inside the body (06) until the pistons are engaged, then rotate the body Clockwise (from bottom view) or Counterclockwise (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 positions as shown in Fig.11.
- Fit position indicator (02) on the pinion and ensure that it indicates the correct position, then fix cap screw (01) with a screwdriver.

C.End cap (Part No.11) and spring cartridge (Part No.08) assembly, Fig.12,13,14:

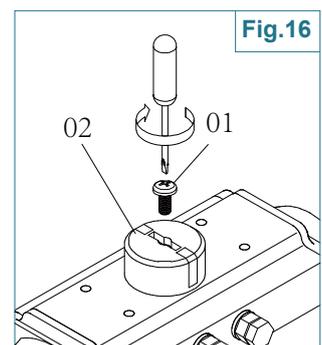
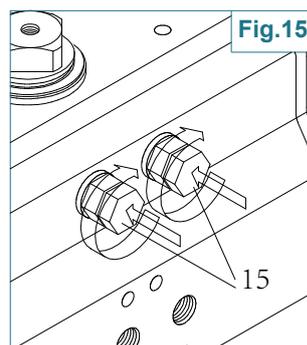
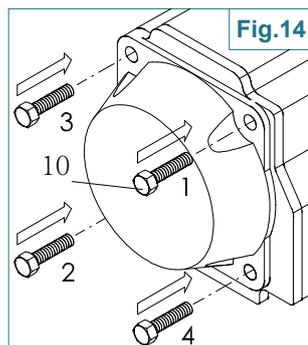
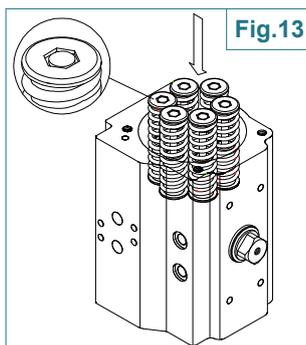
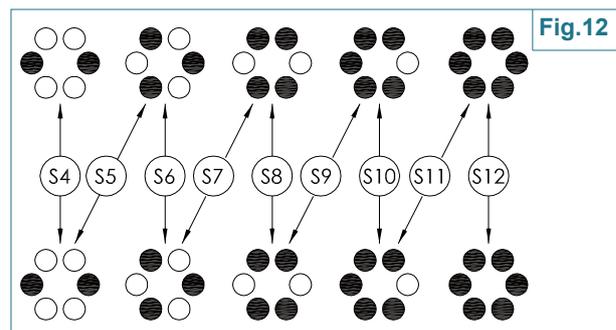
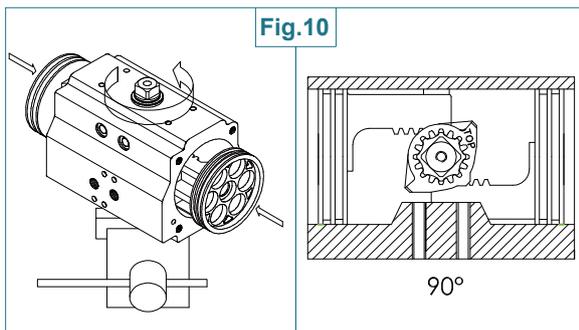
- Lubricate the body(06).
- For Air/Spring actuator, insert the proper quantity of spring cartridge according to the pattern shown in Fig.12 (referring to the total number of springs). Insert spring cartridge (08) as shown in Fig.13.
- Fit end cap O-rings (09) into the groove of both end caps (11).
Note: For some of the sizes the kit will be delivered with O-rings both for the old version (complete round) and the new version (formed O-ring). Use only the O-rings you need for your actuator.
- Fit end caps onto the body (06), ensure that the O-rings remain in the groove.
- Insert all the cap screws (10) and tighten each only partially. complete tightening by following the sequence indicated in Fig.14.

D.Assembly of travel adjustment screws (Part No.15), and stroke adjustment Fig.15:

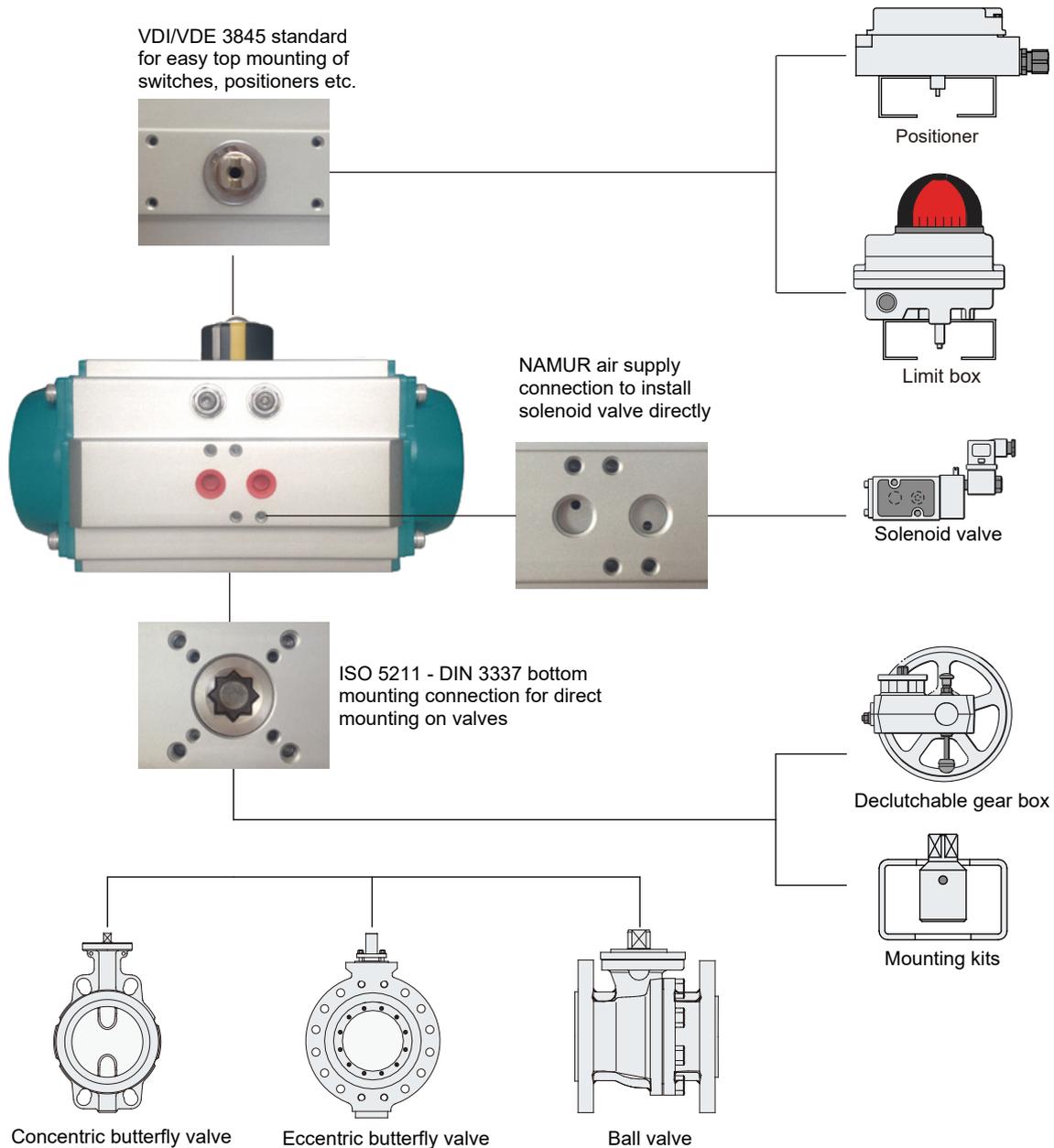
- Insert on both travel adjustment screws (15), the nut (16), the washer (17), and the O-ring in (18).
- Fit both travel adjustment screws (15) in the body. Stroke adjustment for standard rotation actuator (clockwise to close):
 - 0° (close) position stroke adjustment with actuator in close position, screw or unscrew the right (from top view) stop cap screw(15) until the desired stop position is achieved. Then tighten the stop adjustment nut (16) to lock it in place.
 - 90° (open) position stroke adjustment with actuator in open position, screw or unscrew the left (from top view) travel adjustment screw(15) until the desired stop position is achieved. Then tighten the stop adjustment nut (16) and lock it in place.

E.Assembly of position indicator (part No.02 and 01), Fig.16:

- Fit position indicator (02) on the shaft, ensure that it indicates the correct position.
- Fit cap screw (01) with a screwdriver.



Actuator interface for valve automation and mounting standard



Storage

- Ensure the actuator is completely dry and water free.
- Maintain the entrances of air passages by fitting the original or replacement plastic corks.
- Protect from dust, dirt and damage by packing in box or plastic bag.