ACTREG

POWER IN AUTOMATION

SY-N SERIES
SCOTCH YOKE ACTUATOR

Installation and Operating Manual

CE

Ex II 2 G D

ISO 9001

BUREAU VERITAS Certification

Safety Integrity Level SIL 3

IEC 61508 / IEC 61511

INDEX

1. INTRODUCTION

This manual provides the users all the necessary information for the correct manipulation and operation the SY-N series scotch yoke actuator. Also provides the maintenance procedures and the safety warnings to prevent accidents and actuator malfunctioning.

2. STANDARDS AND REGULATIONS

Actuators destined for European member states have been designed, built and tested according to the Quality Control System, in compliance with the EN ISO 9001:2015 standard and with the following regulations/directive.

- 2006/42/EC: European Machinery Directive
- 2014/68/EU: Pressure Equipment Directive (PED)
- 2014/34/EU: Directive for safety equipment and systems to be used in potentially explosive atmospheres (ATEX)
- 2014/30/UE: Electromagnetic Compatibility Directive
- EN ISO 12100: Machinery Safety Directive
- EN 60079-14: Explosive atmospheres - Part 14: Electrical installations design, selection and erection
- ISO 80079-36: Non-electrical equipment for explosive atmospheres - Basic method and requirements
- EN 1127–1: Explosive atmospheres – Explosion prevention and protection
- ISO 80079-37: Non-electrical equipment for explosive atmospheres - non-electrical type of protection construction safety "c", control of ignition sources "b", liquid immersion "k"
- UNI EN ISO 7010: Safety Signals
- EN13445: Unfired Pressure Vessels

3. General Information

This manual is produced to enable the user to install, operate and maintain the actuator. It is compulsory to read and follow the instructions to manipulate the actuators.

Maintenance and operation must be carried out in accordance with the National Legislation and Statutory Provisions relating to the safe use of this equipment, applicable to the site of installation. The operators must read all the recommendations to know how to manipulate actuators properly and safety. Operators must always wear appropriate Personal Protection Devices (PPDs) in line with the existing plant regulations.

⚠ Improper use can damage the equipment or cause dangerous situations for health and safety. Actreg declines any responsibility for damage to people and/ or objects resulting from the use of the equipment for applications different from those described in the present manual.

3.1 Working Conditions and Applications

The Ambient Temperature:
Standard actuator:-40°C~80°C
High temperature actuator:-20°C ~-120°C

Operating Pressure:
Pneumatic actuator: 3~8 Bar(The pressure of different models is different, refer to the technical parameters on the nameplate)
Hydraulic manual: 60~150 Bar

Operating Media:

Pneumatic actuator: dry and clean compressed air
Hydraulic manual:Hydraulic oil with viscosity not greater than 40CST should be used in areas with low ambient temperature

Products are available for Ball Valves,Butterfly Valves,Plug Valves,Air Valves and all the 90° rotation valves,widely applicable to the chemical industr,food & beverage,metallurgy,offshore platform,pharmaceyticals, energy,paper, textile and other industries.

3.2 Technical Date

Output Torque:
Double Acting:1034~116673Nm
Spring Return and torques:437~54709Nm

4. Model Reference, Labels and Nameplates

4.1 Model Reference

SY01 – NF14 – 450 – SR - 3 - FC – L – HW

Actuator type:
SY01: Pneumatic

Flange Connection:
F14 up to F48

Cylinder Size:
200 up to 1000 (SY01)

Acting type:
SR: Spring Return
DA: Double Acting

Spring number (only for SR):
1 / 2/ 3 / 4

Optional features:
HW: Handwheel Override
HY: Hydraulic Override

Temperature Operating Range:

High (H):	- 20 / 120°C
Standard:	- 20 / 80°C
Low (L):	- 40 / 80°C

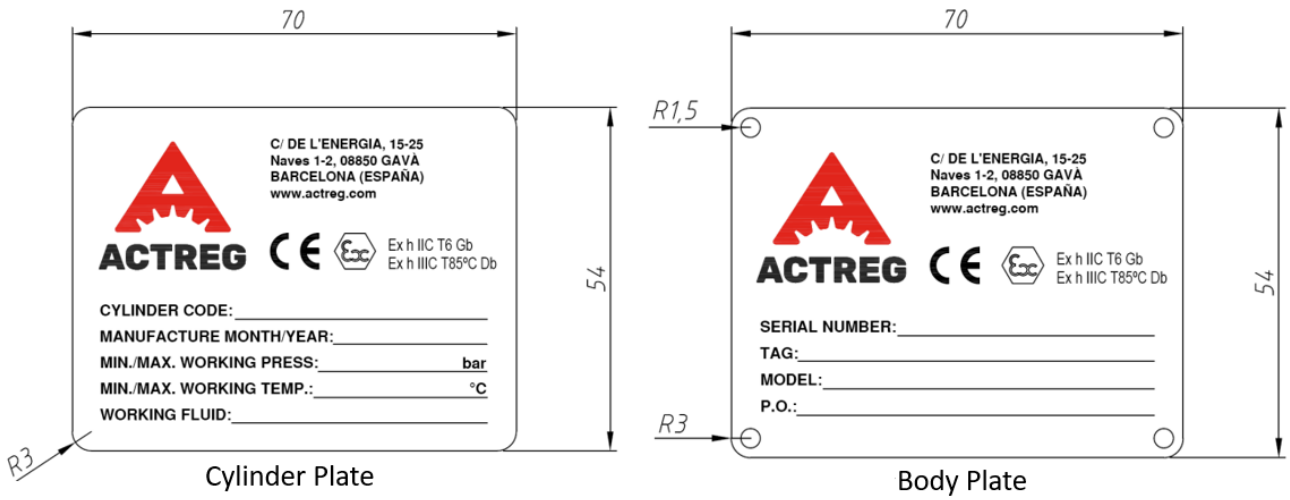
Fail Position (only for SR):
FC: Fail position CLOSE
FO: Fail position OPEN

4.2 Labels

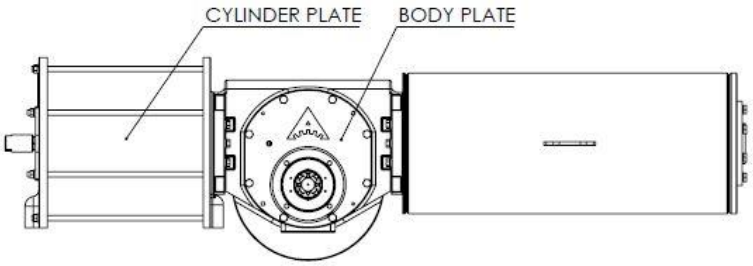
Label for SY01 Actuator :

4.3 NAMEPLATES

Name Plates for the Actuator Cylinder and Body with the necessary info to identify them:



Nameplate position:



5. OPERATING LIMITS

The operating medium of the actuator is Gas. For best possible service life and trouble-free operation, according to ISO 8573-1, Actreg recommends quality class 5.4.4 for indoor operating, and 5.3.4 for outdoor operating. This means 40µm filter, dew point +3°C for indoor operation or -20°C for outdoor operating and oil concentration 5.0mg oil/m³.

Quality Class	Solid Particles		Water		Oil
	Particle size (µm)	Max. concentration (mg/m³)	Max. press. dew point (°C)	Quantity (g/m³)	Max. concentration (mg/m³)
1	0.1	0.1	-70	0,003	0.01
2	1	1	-40	0,11	0.1
3	5	5	-20	0,88	1.0
4	15	8	+3	6	5.0
5	40	10	+7	7,8	25
6	-	-	+10	9,4	-

Actuators are factory lubricated for the lifetime in normal working conditions and do not require any further lubrication.

Recommended tightening torque (Class A2/A4 bolts) Coef. friction 0.3								
Thread size	Torque for A2-70	Torque for A4-70	Thread size	Torque for A2-70	Torque for A4-70	Thread size	Torque for A2-70	Torque for A4-70
M5	6,1 Nm	8 Nm	M12	88 Nm	117 Nm	M20	439 Nm	586 Nm
M6	10,4 Nm	13,9 Nm	M14	141Nm	188 Nm	M22	582 Nm	776 Nm
M8	25,5 Nm	33,9 Nm	M16	218 Nm	291 Nm	M24	724 Nm	966 Nm
M10	51 Nm	69 Nm	M18	380 Nm	411 Nm	M27	-	-

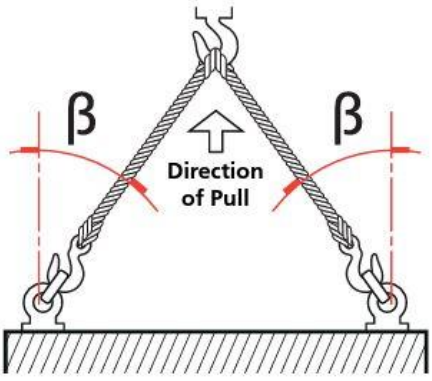
⚠ Do not use the equipment outside its operating limits. Verify operating limits on the labels or nameplates of the actuator.

6. LIFTING AND HANDLING

The actuators that weigh above 25 kg are supplied with lugs to lift them. Only certified operators can lift the actuators with cranes or other lifting devices.

6.1 LIFTING INSTRUCTIONS

- The lifting device and the sling must be suitable rated for the actuator weight and dimensions.
- Do not use damaged slings.
- The sling must not be shortened with knots or bolts or any other makeshift device.
- For lifting purposes, use only suitable lifting tools.
- Do not drill holes, weld eye bolts or add any other type of lifting device on the actuator external surface.
- Do not lift the actuator and valve combination with the actuator lugs.
- Every assembly must be estimated separately for safe and correct lifting.
- Avoid pulls or abrupt movements during lifting. Avoid pushing the load.
- During lifting operations, do not handle the sling and/or the actuator.
- The actuator must be horizontal and the load balanced.
- The angle β must be between 0° and 45° as shown below.



⚠ Prior to lifting the actuator, make sure is not electrically or pneumatically connected.

7. SAFETY AND PRECAUTIONS

Before installing the equipment make sure you have read all the possible risks and the actuator is suitable for the intended application. It is recommended that only trained and experienced operators shall install this kind of equipment, always using the proper PPE required on every working environment.

7.1 PRECAUTIONS

- During the installation and commissioning or the disassembly assure the actuator cannot be operated remotely. Prior to starting, remove pneumatic supply, vent the pressure vessels and remove electrical power.

- The actuator must be correctly fitted on the valve or the mounting kit, assure all the mounting parts are tightened before connecting any electrical power or air supply.

- All the fittings must be properly sealed to avoid the pressurized fluid ejection during the operation.

- Do not disassemble the actuator in case of malfunctioning. Follow instructions in the present manual and contact Actreg to know how to proceed.

- Take care of the surface of the actuator, this can reach very high or very low temperatures if the valve is working with hot or cold fluids. Also take care with the environmental temperatures and the elements exposed to the sun light directly can increase the surface temperatures. To avoid the accidents, it is recommended to use protective gloves.
  In the presence of dust, equipment surface temperature must not exceed 2/3 of the ignition temperature of the dust. Dust ignition temperature is reduced by 75 °C if a 5 mm thick coating builds up. Keep equipment surfaces clean by planning regular cleaning maintenance using a suitable wet anti-static cloth.

- Operators should wear ear protections if the noise is higher than 85 dB during the operation.

- Foresee periodic maintenance procedure to verify tightening.

8. INSTALLATION ON VALVE

Before proceeding, read and understand the *Safety and Precautions* information. Also, prior to performing any operations check the operating drawings and TAG numbers.

8.1 PRELIMINARY ACTIONS

- Verify the ATEX classification of the actuator is compatible with the plant zoning.
- Check the mounting drawings to ensure the position of the actuator with the valve and the pipeline.
- Ensure all fasteners are adequately tightened, to avoid loosening during operation, considering vibrations induced by the dynamics of the pipeline. Also ensure tubing runs are adequately fastened and supported to avoid leaks from any gas connections.

8.2 INSTRUCTIONS

The actuator assembly on valve can be performed by:

- Mounting directly using the actuator housing flange with threaded holes.
- Using a mounting bracket and a coupling adapter between the actuator and the valve.

The assembly position of the actuator must be in accordance with the actuator design, plant requirements and the valve model. To assemble the actuator on the valve, proceed as follows:

- Verify the coupling dimensions of the valve flange and stem; they must meet the actuator coupling dimensions.
- Actuator is supplied in the failure position (for single-acting). Set the valve in the right position per the actuator fail position. Check the position of the actuator by means of the position indicator on the center body or on the limit switch box (if present).
- Clean the coupling flange of the valve and remove anything that might prevent adherence to the actuator flange. Grease shall be completely removed.
- Inspect, clean and apply grease on the coupling hole (valve side of coupling joint).
- Lubricate the valve stem with oil or grease, to facilitate assembling.
- Lift the actuator according to instructions reported in *Lifting and Handling.*
- If possible, place the valve stem in a vertical position to facilitate assembling.
- If the assembly is done using an adapter and coupling joint, assemble the coupling joint onto the valve stem before proceeding with the assembly of the actuator.
- Do no exert any force while lowering the actuator onto the valve.

- Fix the actuator to the valve by means of threaded connections (bolts, stud bolts and nuts).
- Tighten bolts or nuts of the connecting stud bolts to the correct torque, in accordance with the size and material characteristics of the bolts installed by the customer.
- Support the actuator until fully installed and fixing bolts are correctly tightened.
- Check for possible damage to the paint-work and repair is necessary, according to painting specification.

Installation must be performed by qualified personnel.

⚠	Do not pressurize the actuator / valve adapter.

9. REMOVAL FROM VALVE

The end user is in charge of removing the actuator from the valve.

⚠	Removal shall be performed only by qualified staff, wearing/using appropriate PPDs.

⚠	Do not remove the actuator if the valve is blocked in the intermediate position.

To disassemble the actuator from the valve, proceed as follows:

- Cut off electrical power supply.
- Cut off pneumatic supply.
- Release any pressure from the control group.
- Remove the supply pipes from the actuator.
- Remove control and signal lines from electric components (if any).
- Sling the actuator in the line with the instructions given in *Lifting and Handling.*
- Unscrew bolts or nuts from the stud bolts fixing the actuator to the valve.
- Lift and remove the actuator from the valve.

10. OPERATION

The following instructions must be followed and integrated into End User safety program when installing and using Actreg products. Read and save all instructions prior to installing, operating and servicing this product.

Follow all warnings, cautions and instructions marked on and supplied with the product. Install equipment as specified in Actreg installation instructions and as per applicable local and national codes of practice. Connect all products to the proper pipeline gas sources.

When replacement parts are required, ensure that the qualified service technician uses only replacement parts specified by Actreg.

Substitutions will invalidate any hazardous area certification and may result in fire, electrical shock, other hazards or improper operation.

10.1 INSTALLATION TUBE AND FITTING

10.1.1 The installation environment should be avoided in high temperature,low temperature,high moisture and corrosive place， otherwise appropriate protection should be carried out.

10.1.2 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 slaps or teakage,please screw the interface till no teakage.

10.1.3 The conduit size of electrical accessories:
The different pneumatic actuators have different air inlet sizes,from NPT3/8" to NPT2",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:

Air inlet size table:

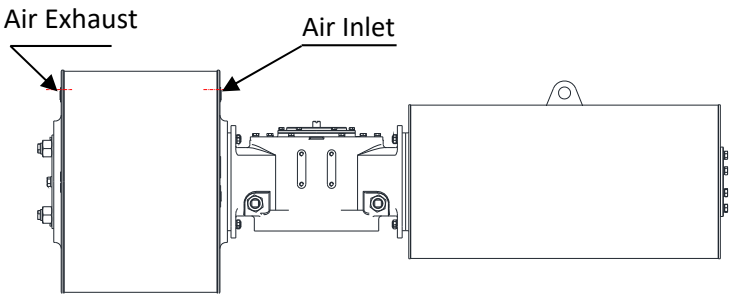
Actuator	200	250	300	350	400	450
Air Inlet	NPT3/8”	NPT1/2"	NPT1/2”	NPT1/2”	NPT3/4”	NPT3/4”
Actuator	500	600	700	800	900	1000
Air Inlet	NPT3/4”	NPT3/4”	NPT1”	NPT1-1/2”	NPT1-1/2”	NPT2”

10.1.4 When it is hoped to open or close the valve at high speed, the main gas path should be equipped with a larger diameter copper pipe or stainless steel pipe.

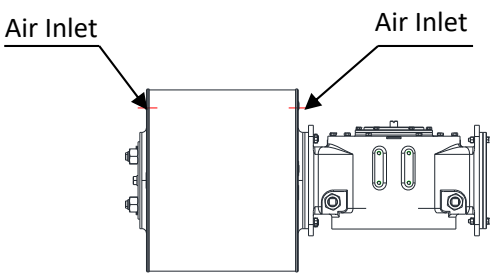
10.1.5 The operating medium is filtered dry air. Dehumidification is required when the dew point is below -15°C.

10.1.6 Pneumatic(hydraulic) actuator air(oil) inlet position indication.

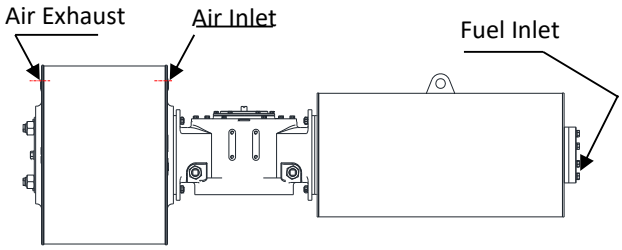
Single acting pneumatic actuator



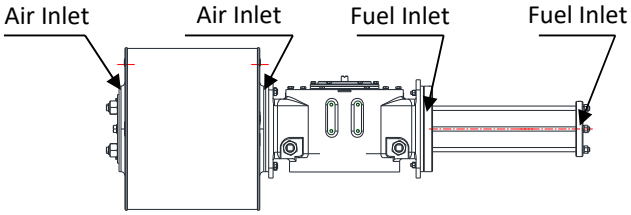
Double acting pneumatic actuator



Single action with manual hydraulic intake, oil port position



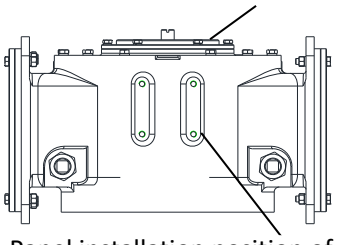
Double action with manual hydraulic intake, oil port position



10.1.7 Dimensions and positions of accessories installation.

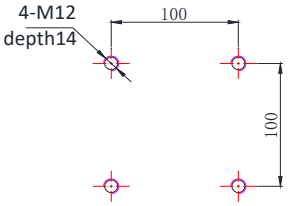
Electrical accessories are installed on the box and cover of the drive module, as shown in the following figure

Limit switch, positioner mounting position

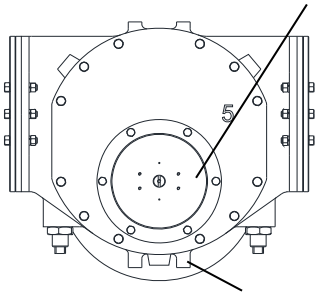


Panel installation position of solenoid valve, air control valve and pressure reducing valve

Panel mounting dimensions of solenoid valve, air control valve and pressure reducing valve modules

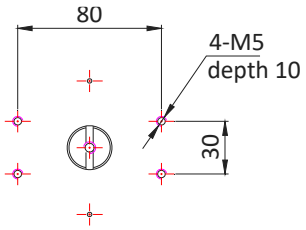


Limit switch, positioner mounting position



Panel installation position of solenoid valve, air control valve and pressure reducing valve module

Installation dimensions of limit switch and positioner



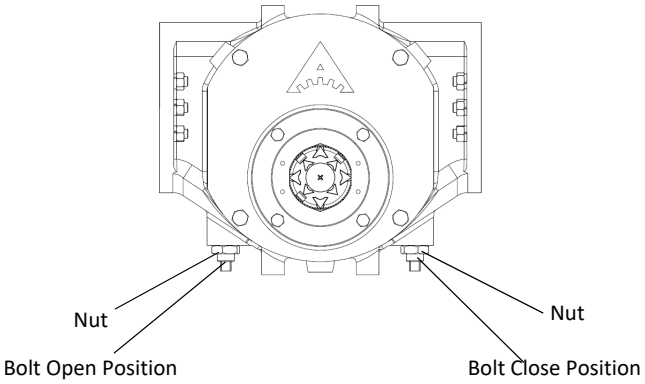
10.2 Adjustment of Valve On/Off Position

The stroke adjustment is available from 80° to 100°The way of stroke adjustment:

Loosened 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

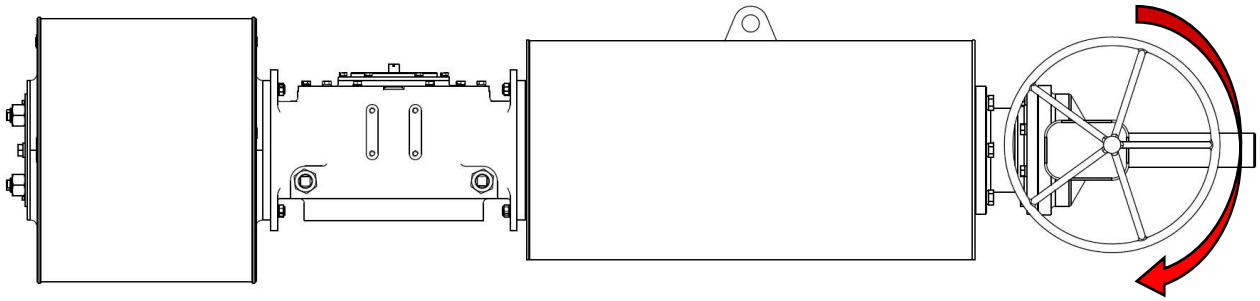
b Screw out the close direction stroke bolt, close position increased, screw in the close direction stroke bolt, close position decreased



⚠ Please note to tighten the bolt nut after adjusting the appropriate on/off position

10.3 TRAVEL REGULATION 0-100%

The actuator can be modified to achieve a 100% full travel regulation. The limitation is only for one stroke direction, from 0% to the percentage that the client needs to open or close the valve. The regulation system is a screw with a bevel gear and a hand wheel to operate it.



⚠ Ensure the actuator is not pressurized before start to manipulate the adjusting screws.

10.4 AUTO OPERATION WAY

On/off control pneumatic 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 opens when solenoid valve de-energized (Failure Open Type)

Modulating Control Pneumatic Actuated Valve:

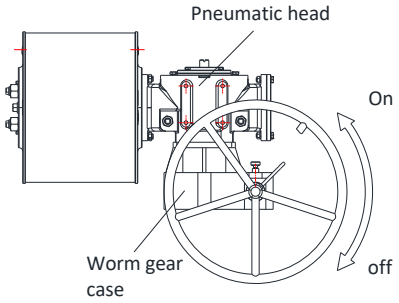
A) To the positioner 4 ~ 20mA electrical signal (electric-gas positioner), the valve according to the size of different currents to achieve 0 ~ 90 degrees of opening adjustment;

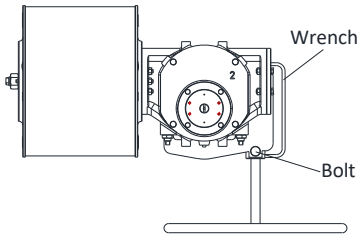
B) To the positioner 0.02 ~ 0.1MPa gas signal (gas-gas positioner), the valve according to the size of different air pressure to achieve 0 ~ 90 degrees of opening adjustment

10.5 MANUAL OPERATION WAY

10.5.1 Double acting pneumatic head clutch manual operation

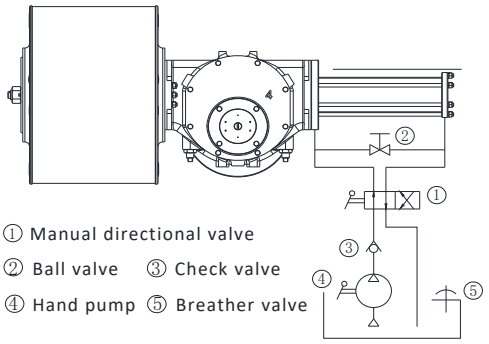
The clutch manual is installed between the pneumatic head and the valve (as shown on the right).The pneumatic head should be in the reset state during manual operation; One hand pulls out the latch on the worm gear box, while the other hand turns the wrench counterclockwise to loosen the latch after the worm gear in the worm gear box engages, and ensures that the latch enters the eccentric sleeve before manual operation of the valve; Turn the worm gear box hand wheel valve clockwise closes, turn the worm gear box hand wheel valve counterclockwise opens. After manual operation of the valve, the need to automatically operate the valve must first pull out the latch on the worm gear box, while the other hand clockwise turn the crank handle to make the worm gear in the worm gear box to release the latch, ensure that the latch into the eccentric sleeve.

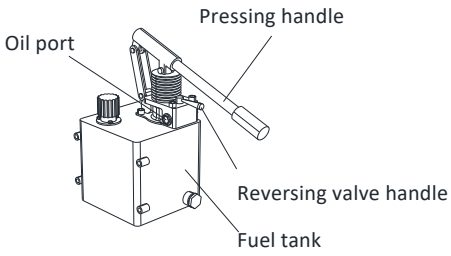




10.5.2 Double acting pneumatic head hydraulic manual operation

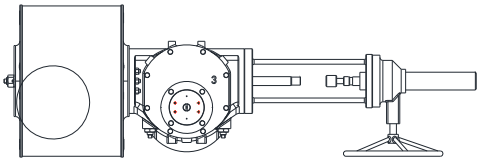
During manual operation, the pneumatic head should be in the reset state, while the ball valve 2 is closed, the oil inlet/discharge of the manual hydraulic cylinder is controlled by operating the manual reversing valve 1, and the manual pump is operated to realize the manual opening and closing of the valve. If the reversing valve handle is left, the hand pump is connected to the left oil port; If the reversing valve handle is to the right, the hand pump is connected to the right oil port (such as the shape diagram of the double-acting hydraulic hand pump on the lower right side).When switching to automatic mode, open the ball valve 2.





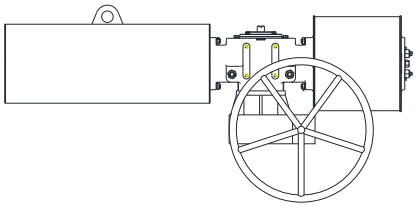
10.5.3 Double acting pneumatic head bevel gear screw manual operation

The pneumatic head should be in the reset state during manual operation; The handwheel turns counterclockwise to open the valve; The hand wheel turns clockwise and the valve closes. When switching to automatic mode, the lead screw must be returned first.



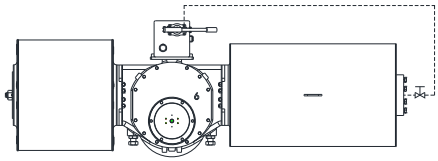
10.5.4 Single acting pneumatic head clutch manual operation

The clutch manual is installed between the pneumatic head and the valve (as shown on the right). The pneumatic head should be in the reset state during manual operation; Clutch engagement and disengagement refer to 5.2.1; Turn the worm gear box hand wheel valve clockwise closes, turn the worm gear box hand wheel valve counterclockwise opens. When switching to automatic mode, remove the clutch first.

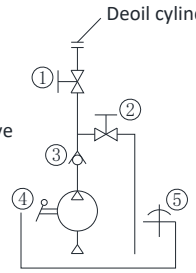


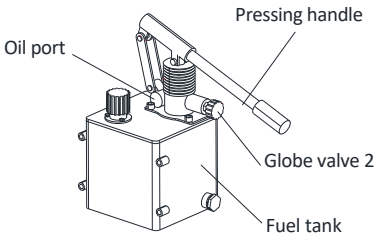
10.5.5 Single-acting pneumatic head hydraulic manual operation

The pneumatic head should be in the reset state during manual operation; Control the hand pump pressurization and cylinder return by operating the stop valve 2. The following is the hydraulic schematic diagram, and the lower right side is the outline diagram of the single-acting manual pump. Turn hand wheel clockwise to close stop valve 2. Open stop valves 1 and 2 when switching to automatic mode.



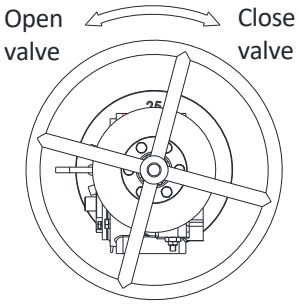
① Globe valve 1
② Globe valve 2 ③ Check valve
④ Hand pump ⑤ Breather valve

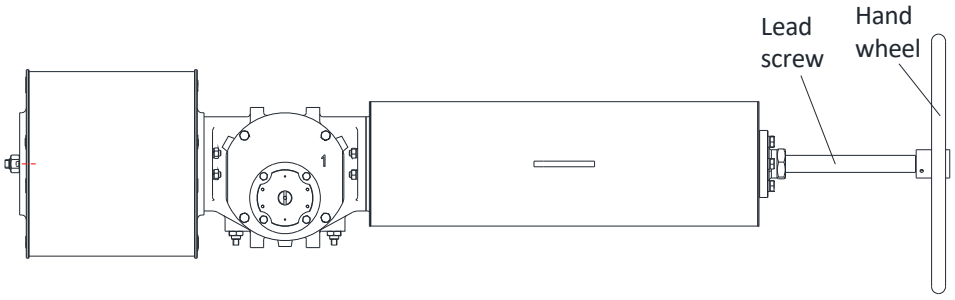




10.5.6 Single-acting pneumatic head screw manual operation

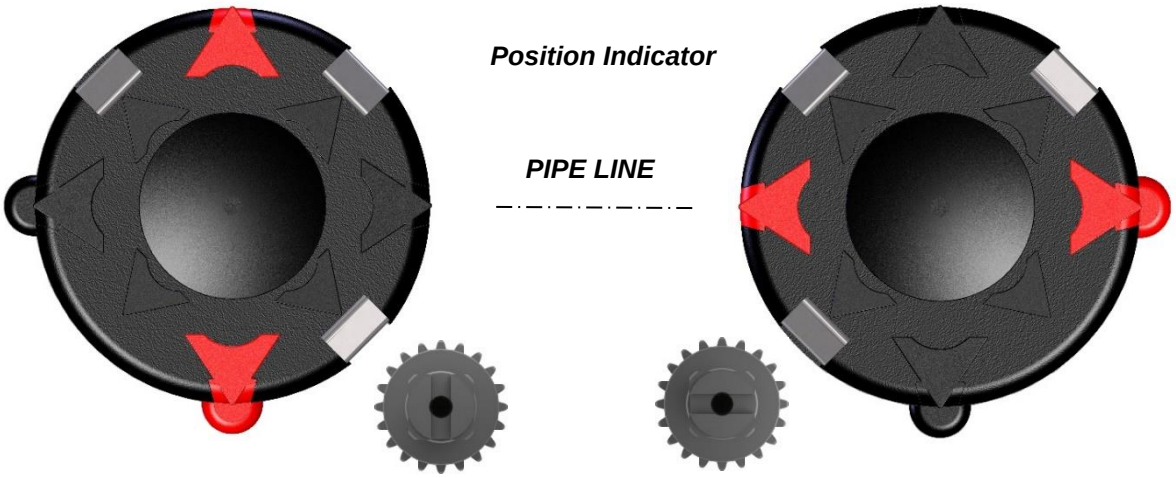
The pneumatic head should be in the reset state during manual operation; Turn the hand wheel counterclockwise to open the valve, turn the hand wheel clockwise to close the valve (as shown below). When switching to automatic mode, the lead screw must be returned first.





10.6 ACTUATOR POSITION INFORMATION AND TRANSMITTING

The standard actuator has a visual position indicator on the top of the actuator. This position indicator has different colour arrows to indicate if the valve is closed or open, and the way to know this information is explained below:

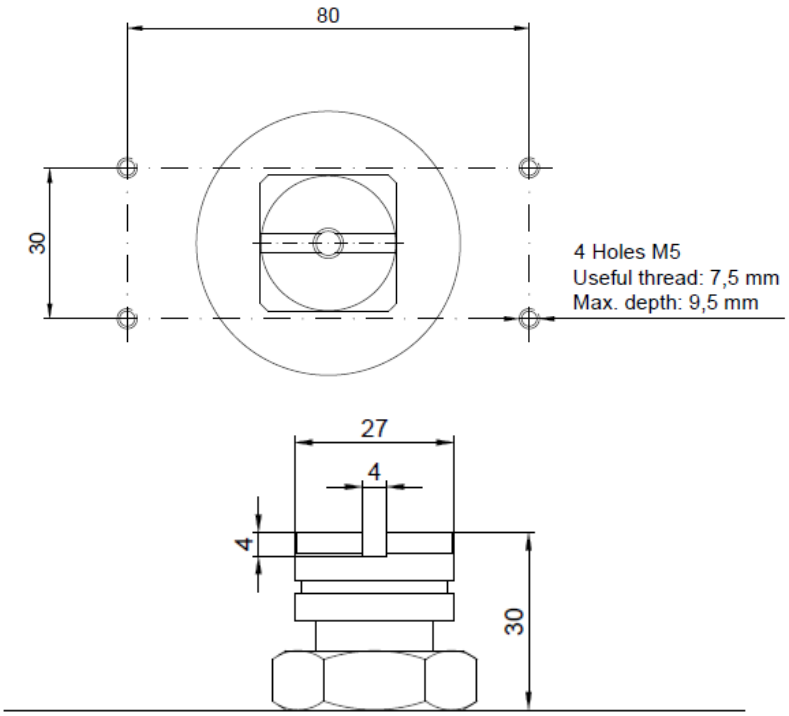


⚠ The position indicator must be in accordance with the pipe line orientation.

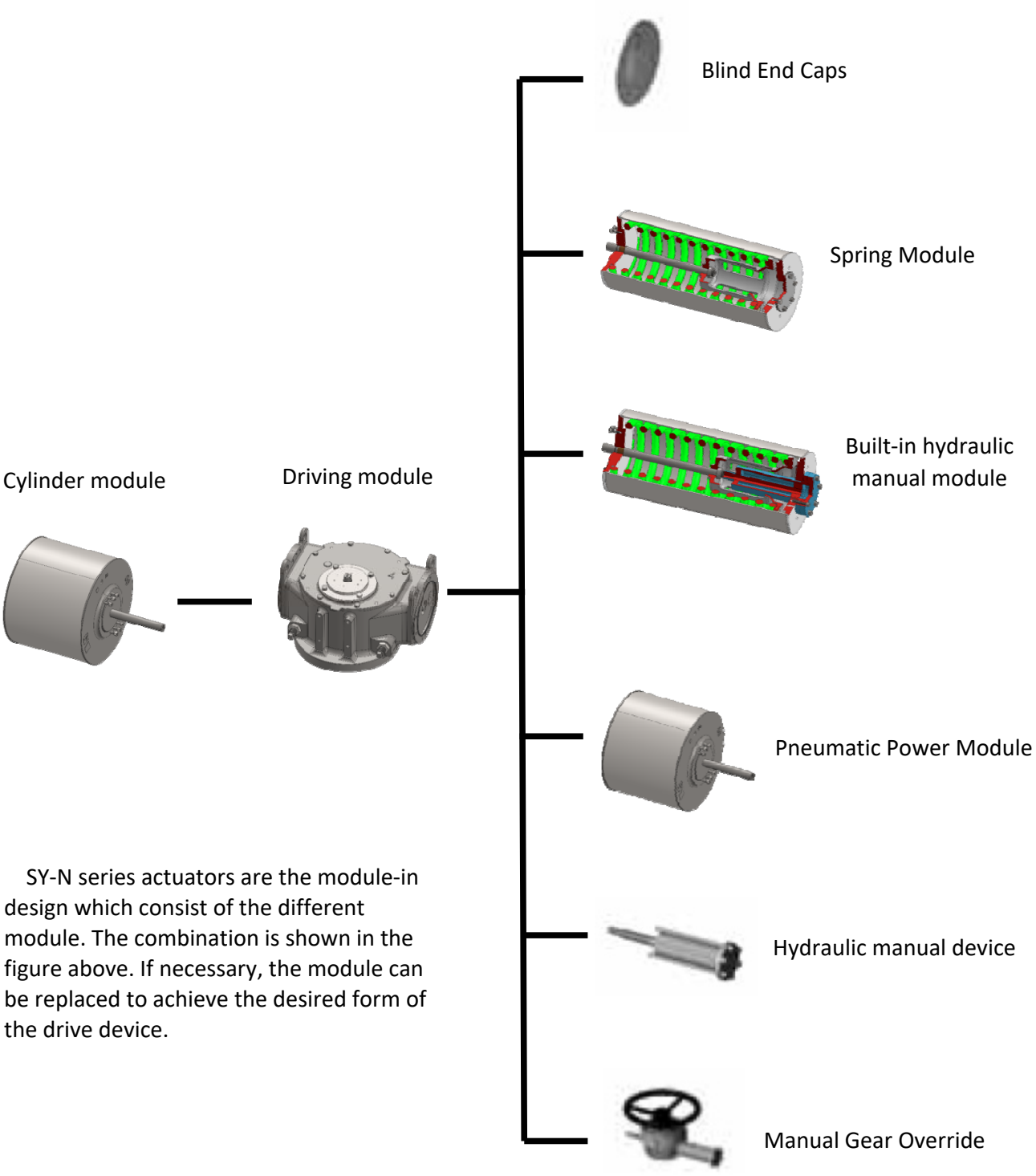
The position indicator also has a different design (as standard for high performance actuators), that is much clearer to know the valve position.

The colours per standard for the two different positions are green and red, this can be changed per customer requirements.

If the actuator is going to be mounted with limit switch boxes, inductive sensors, positioners or other position transmitters, the mounting interface for the attachments of ancillaries according to EN 15714-3.

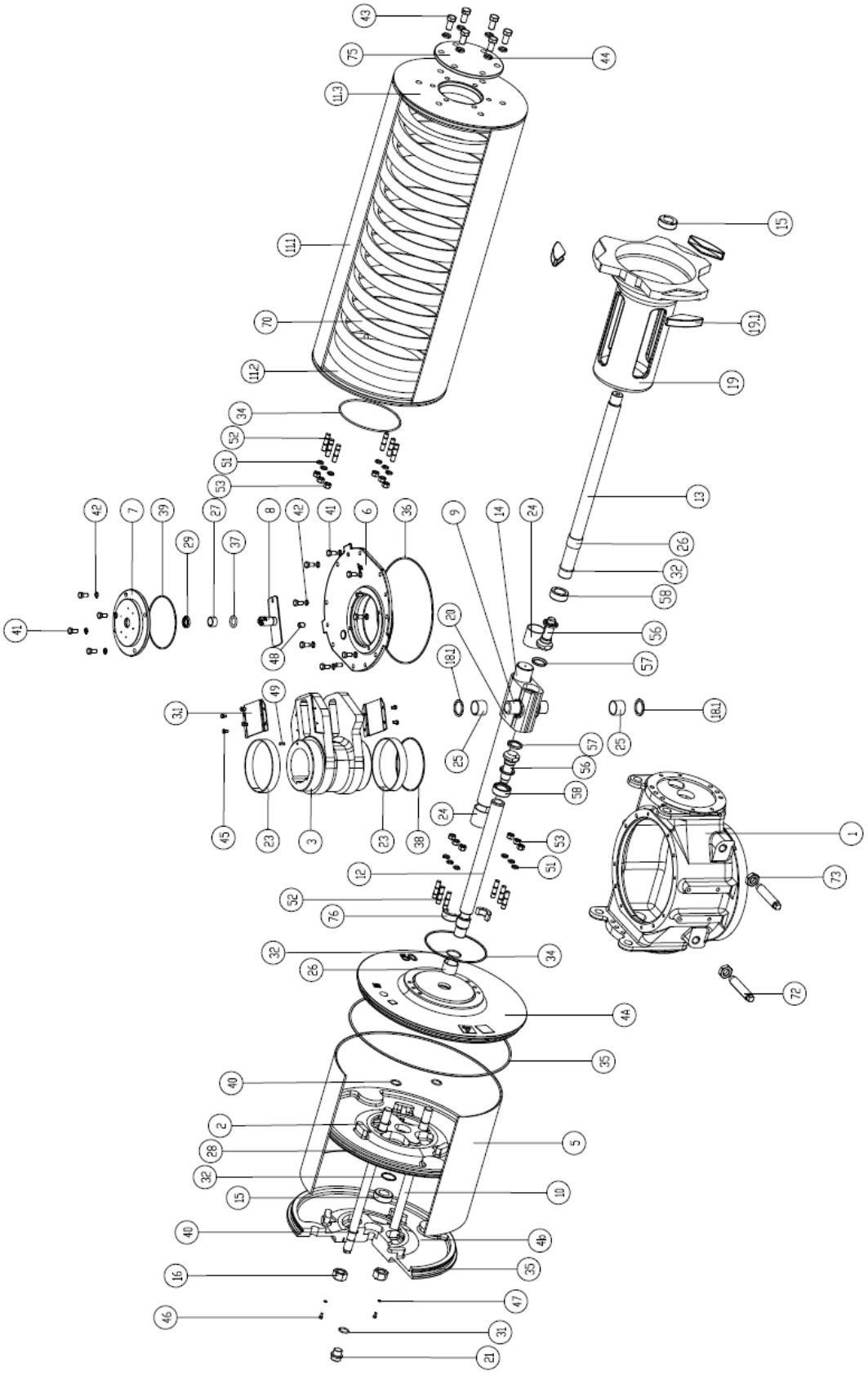


11. MODULE DESIGN INSTRUCTION



SY-N series actuators are the module-in design which consist of the different module. The combination is shown in the figure above. If necessary, the module can be replaced to achieve the desired form of the drive device.

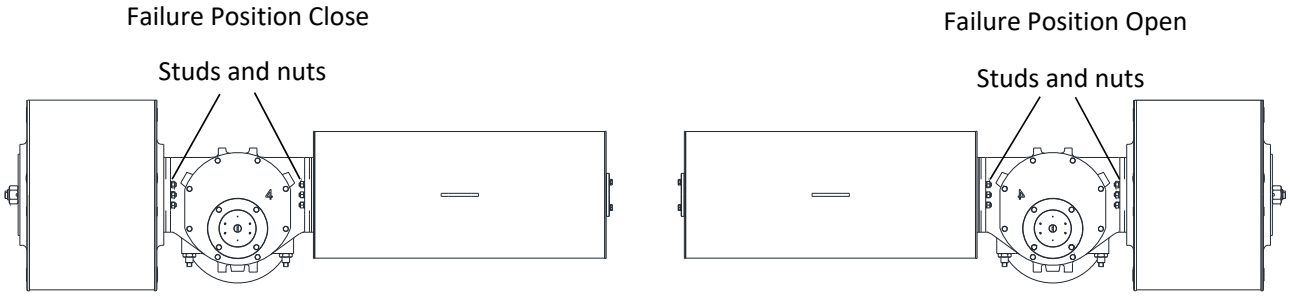
12. ASSEMBLY DRAWING AND PART LIST



1	Body	6	Body Cover	11.3	End Cap	19	Spring Seat	26	Lubricated Bearing for Stem	35	O-ring Cap Cylinder	42	Spring Washer	49	Pin	70	Spring		
2	Piston	7	Cap Stem	12	Body Air Stem	19.1	Pad	27	Lubricated Bearing for Driver	36	O-ring Body Cover	43	Bolt	51	Spring Washer	72	Leveling Screw		
3	Yoke	8	Stem Driver	13	SR Body Shaft	20	Guide Block	28	O-ring Piston	37	O-ring Driver	44	Spring Washer	52	Stud	73	Hex Nut		
3.1	Yoke Cover	9	Pin Yoke	14	Guide	21	Plug	29	Seal Driver	38	O-ring Yoke	45	Bolt	53	Hex Nut	75	SR Cap		
4a	Body Air Cylinder	10	Cylinder Guide	15	Round Nut	23	Lubricated Bearing for Yoke	31	O-ring Plug	39	O-ring Cap Stem	46	Bolt	56	Joint	76	Half Ring		
4b	Cap Cylinder	11.1	Body SR Cylinder	16	Hex Nut	24	Lubricated Bearing for Guide	32	O-ring Piston	40	O-ring Cylinder Guide	47	Spring Washer	57	Joint Seat				
5	Body Air Cylinder	11.2	Guide Cap	18.1	Washer	25	Lubricated Bearing for Pin	34	O-ring Body Side	41	Bolt	48	Pin	58	Lock Nut				

13. MODULE REPLACEMENT

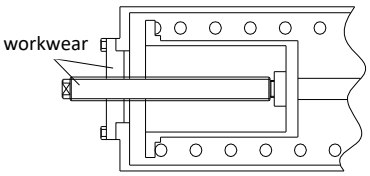
13.1 Spring return, pneumatic actuator from failure close position to failure open position



Operation Steps (refer to assembly drawings and parts list)

1. -Loosen the bolt on the cover of the spring cartridge 43 and remove the cover of the spring cartridge 75

2. -Hold the spring tie rod 13 with special tooling (See figure 9.1.1)



9.1.1

3. -Loosen the bolt on the shaft cover 41 and remove the shaft cover 7

4. -Loosen the bolts on the cover 41 and remove the cover 6

5. -Turn the lock nut 58 on the side of the spring module counterclockwise to unscrew it from the guide block 20

6. -Loosen the nut connecting the spring module to the housing and remove the spring module

7. -Turn the lock nut 58 on the cylinder module side counterclockwise to unscrew it from the guide block 20

8. -Loosen the nut connecting the cylinder module to the housing and remove the spring module

9. -Put the cylinder module into one end of the box where the spring module was originally installed, connect the movable joint 56 connected to the piston rod with the guide block 20 with the lock nut 58, and lock the nut tightly; Note that the movable joint can swing slightly

10. -Connect the cylinder module to the box with studs and nuts, and tighten the studs and nuts

11. -Put the spring module into one end of the box where the cylinder module was originally installed, connect the movable joint 56 connected to the spring tie rod with the guide block 20 with the lock nut 58, and lock the nut tightly; Note that the movable joint can swing slightly

12. -Install the box cover 6 on the box, install the bolts 41 connecting the box cover and box, and tighten them

13. -Install shaft cover 7 on box cover 6, install bolts 41 connecting box cover and top cover and tighten

14. -Screw out the screw in the tool on the end cover of the spring barrel to make it open some distance from the end of the spring tie rod; (You can first aerate the cylinder and pull the spring cylinder), then loosen the bolt on the spring end cap to install the tool, and remove the tool

15. -Install spring cylinder cover 75, install bolt 43 and tighten

16. -Aerate/deaerate the cylinder to make the driving device operate 4 to 5 times to check whether the operation is smooth

13.2 The spring-return pneumatic head changes from a faulty air opening valve to a faulty air closing valve in the same way that it changes from a faulty air closing valve to a faulty air opening valve

13.3 Double acting pneumatic head becomes spring return pneumatic

head Operation Steps (refer to assembly drawings and parts list)

1. -Hold the spring tie rod with special tooling (See figure 9.1.1)

2. -Loosen the bolts connecting the box end plate to the box, and remove the box end plate

3. -Loosen the bolt on the shaft cover 41 and remove the shaft cover 7

4. -Loosen the bolts on the cover 41 and remove the cover 6

5. -Put the spring module into one side of the end plate of the original box, connect the movable joint 56 connected to the piston rod with the guide block 20 with the locking nut 58, and lock the nut tightly; Note that the movable joint can swing slightly

6. -Stud and nut Connect the spring module to the box and tighten the stud and nut

7. -Screw out the screw in the tool on the end cover of the spring barrel to make it open some distance from the end of the spring tie rod; (You can first aerate the cylinder and pull the spring cylinder), then loosen the bolt on the spring end cap to install the tool, and remove the tool

8. -Install spring cylinder cover 75, install bolt 43 and tighten

9. -Install the box cover 6 on the box, install the bolts 41 connecting the box cover and box, and tighten them

10. -Install shaft cover 7 on box cover 6, install bolts 41 connecting box cover and top cover and tighten

11. -Aerate/deaerate the cylinder to make the driving device operate 4 to 5 times to check whether the operation is smooth

13.4 The spring return pneumatic head becomes a double acting pneumatic

head Operation Steps (refer to assembly drawings and parts list)

1. -Loosen the bolt on the spring cartridge cover 43 and remove the spring cartridge cover 75

2. -Use special tooling to support the spring rod (See figure 9.1.1)

3. -Loosen the bolt on the shaft cover 41 and remove the shaft cover 7

4. -Loosen the bolts on the cover 41 and remove the cover 6

5. -Turn the lock nut 58 on the side of the spring module counterclockwise to unscrew it from the guide block 20

6. -Loosen the nut connecting the spring module to the housing and remove the spring module

7. -Connect the box end plate to the box with studs and nuts, and tighten the studs and nuts

8. -Install the box cover 6 on the box, install the bolts 41 connecting the box cover and box, and tighten them

9. -Install shaft cover 7 on box cover 6, install bolts 41 connecting box cover and top cover and tighten

10. -Air is injected from the two air intakes of the cylinder to make the drive device operate 4 to 5 times to check whether the action is smooth

13.5 Install the screw handwheel mechanism on the spring

module Operation Steps (refer to assembly drawings and parts list)

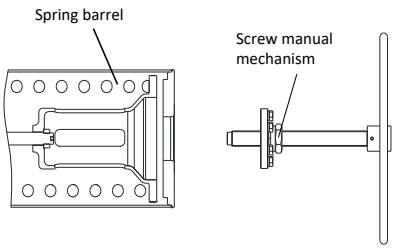
1. -Loosen the bolt on the spring cartridge cover 43 and remove the spring cartridge cover 75

2. -Turn the handwheel and back it to the outside

3. -Install the screw manual mechanism on the end face of the spring barrel

4. -Screw and tighten the bolt connecting the screw hand mechanism to the spring barrel

5. -Turn the hand wheel of the screw manual mechanism to open and close the valve, and check the side manual mechanism for flexibility 2 to 3 times



9.5.1

13.6 A hydraulic manual mechanism is installed on the spring

module Operation Steps (refer to assembly drawings and parts list)

1. -Loosen the bolt on the spring cartridge cover 43 and remove the spring cartridge cover 75

2. -Install the O-ring at the root of the hydraulic cylinder flange (See figure 9.6.1)

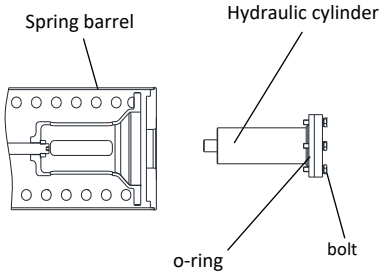
3. -Load the hydraulic cylinder into the spring base

4. -Screw and tighten the bolt connecting the spring cylinder to the hydraulic cylinder

5. -Refer to the drawings in 5.2.5, install the hydraulic hand pump on the box, and tighten the connection bolts

6. -The manual pump is connected to the hydraulic cylinder with stainless steel pipe and high pressure joint

7. -Add an appropriate amount of hydraulic oil to the oil tank of the manual pump, use the handle to operate the manual pump to fill the oil into the hydraulic cylinder, make the drive device run to the working position, check whether each part of the oil leakage and whether the manual is normal



9.6.1

14. DISMANTLING AND DISPOSAL

The first step is to ensure that there is no longer any pressure on any part of the team. Waste fats and oils will be managed in accordance with local legislation.

- When disassembling the actuator, it is essential to correctly separate the components that make it up according to the type of material.
- Components of a metallic nature such as iron, aluminium or scrap will be disposed of for recovery if possible.
- Eliminate components such as rubber, PVC, resins, etc. separately in accordance with the current regulations of the territory in which the cutting is carried out.
- Electric components are to be separately disposed of on specialized disposal sites.

15. MAINTENANCE

- First confirm that the air pressure is normal
- The solenoid valve is powered on, whether the output gas is switched, and the electrical circuit should be checked if it cannot be switched
- If the solenoid valve is powered on and the output gas can be switched, the pneumatic head should be removed from the valve and the pneumatic head and valve should be checked separately
- When checking the pneumatic head, the pneumatic head should be ventilated first to check whether the operation of the pneumatic head is normal and whether there is gas leakage in each part
- If there is air leakage, replace the seal ring

16. STORAGE

Actreg actuators have been fully tested before leaving the factory. All actuators must be examined upon delivery to ensure that they have not suffered any damage during transport. Inform the supplier immediately if there is any damage.

In order to keep the actuator in good conditions until installation, at least the following measures are recommended:

- Check presence and assembling of dust plugs.
  Keep the actuator on shipping boxes or pallet until installation, never put the actuator directly on the ground.
- Protect the valve coupling area (adapter flange and coupling joint) with rust preventive oil.
- Protect against weather action, covering the actuators with appropriate polyethylene sheets.
- Check the actuator condition every 6 months and verify the above protection measures remain in place.

17. LONG TERM STORAGE

If long term storage is necessary, further operations must be carried out to maintain the actuator in a good working condition:

- Replace the plastic plugs with metal plugs.
- Stroke the actuator every 12 months:
  - Cycle the actuator (using filtered, dehydrated air) to the working pressure, never exceed 8 bar.
  - Cycle the actuator with all the existing controls (i.e., two complete strokes – one open, one closed) at least 5 times.
  - Cycle the actuator fitted with the mechanical manual override for 4 complete strokes.
- Disconnect the pneumatic and electric (if present) supply from the actuator, and carefully close all the threaded connections of the actuator.
- Remove electrical components covers (if present) to ensure control terminals are clean and free from oxidation and humidity. Reassemble the covers.
- In case of storage for over 12 months prior to installation, it is recommended to operate the actuator to verify correct operation.

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