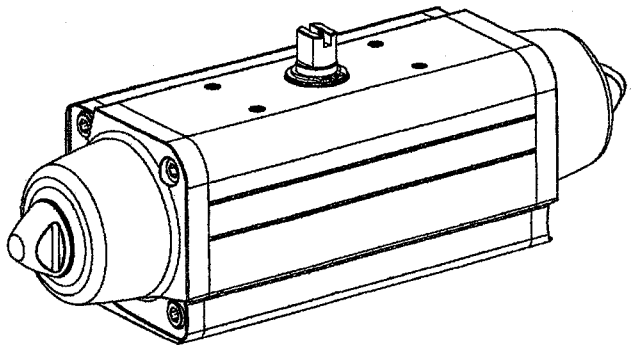
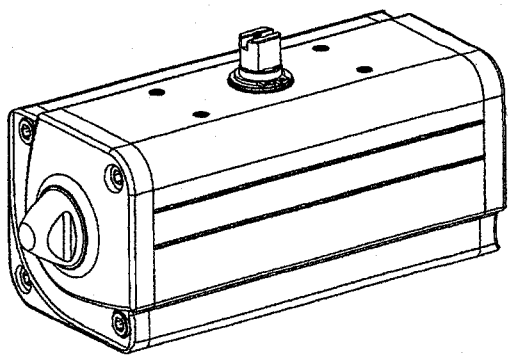
INSTRUCTION MANUAL
Scotch – Yoke
Part turn pneumatic actuator
GD15 - GD1920 GS15 – GS960

CONTENTS





Tomoe Valve Ltd will be free to change all the specifications and data included in this manual at any time , so as to improve the quality and the performance of its products.

1) General features

The G Series actuator range represents a wide range of part turn pneumatic actuators for valve remote control.The actuators are available in Double Acting "GD" and Spring Return "GS" versions.

- The principle of the actuator application is to open and close the connected valve, without the manual operation with lever or hand wheel, by means of an electric-pneumatic connection on remote control.

- Scotch – Yoke is a mechanical system that transforms the linear force into a rotary torque.

This system provides a long working life and best performance with the minimum energy consumption.

- The G Series Scotch-Yoke system with its oblique grooves produces a torque curve with the highest torque at the start opening operation in order to overcome the valve breakaway torque.

The maintenance should be done by trained personnel only.

This instruction manual contains important information regarding the G Series Scotch-Yoke pneumatic actuator operation, installation, maintenance and storage.
Please read carefully before installation and keep it in a safe place for further reference.

2) Working conditions

a) **Construction.**
Standard G S eries actuators are suitable for indoor and outdoor installation. The laser marking on the actuator body gives the actuator technical characteristics: type, size, operating maximum pressure, output torque, operating max temperature, flange connection, serial manufacture number (see drawing pag.4).

b) **Motive energy**
The operating media should be dry and filtered compressed air not necessarily lubricated or inert gases compatible with internal actuator parts and lubricants. The filtration must grant a maximum particle size not exceeded 30µm. The air lubricant must be compatible with the internal parts. The operating media should have its dew point not less than –20°C (-4°F) in normal condition, or at least the dew point should be 10°C below the ambient temperature.

c) **Supply operating media pressure.**
The maximum supply pressure is 8,4 bar (120 psig)
Nominal supply pressure is 5,6 bar (80 psig), working pressure range from 2,5 bar (36 psig) up to 8,4 bar (120 psig).

d) **Operating temperature.**
Actuator standard working temperature range form –20°C (-4°F) to 80°C (176°F)
For low and high temperature versions please contact Tomoe Valve Ltd.

e) **Operating drive rotation.**
The part turn actuator rotation angle is nominally 90°. The G Series actuator provides a stroke of 92° rotation, from –1° to 91° , with standard stroke adjustment of –10°.

f) **Cycle time.**
The cycle time is dependent on different operating and installation factors such as the supply pressure, the flow capacity, the connection pipe size, the solenoid valve performance, the valve torque and characteristics, and environmental temperature conditions.

G Series Actuator open/close cycle times (sec.).

SIZE COD	Open	Close	Cycle		SIZE COD	Open	Close	Cycle
GD15	0,04	0,04	0,08		GS15	0,11	0,13	0,24
GD30	0,06	0,07	0,13		GS30	0,23	0,27	0,50
GD60	0,10	0,11	0,21		GS53	0,41	0,48	0,89
GD106	0,20	0,21	0,41		GS90	0,60	0,70	1,30
GD180	0,32	0,31	0,63		GS120	0,79	0,92	1,71
GD240	0,41	0,40	0,81		GS180	1,29	1,41	2,7
GD360	0,60	0,58	1,18		GS240	1,8	1,9	3,7
GD480	0,78	0,76	1,54		GS480	1,5	1,6	3,1
GD960	1,50	1,60	3,10		GS960	2,9	3,4	6,3
GD1920	3,1	2,9	6,0					

The above time table is referred to a standard actuator working cycle at the following tests conditions:

Ambient temperature: 18°C – 25°C
Motive energy operating medium: compressed air at 5,6 bar
Nominal cycle: 90° in both directions
Load: free
GD actuators operate with solenoid valve 5/2 ISO 1-2. While the GS actuators with solenoid valve 3/2.
Time tested with Electronic Timer device.

NOTE: different working condition such as air pressure, piping connection, filters or solenoid valves, could change the timing of the operations.

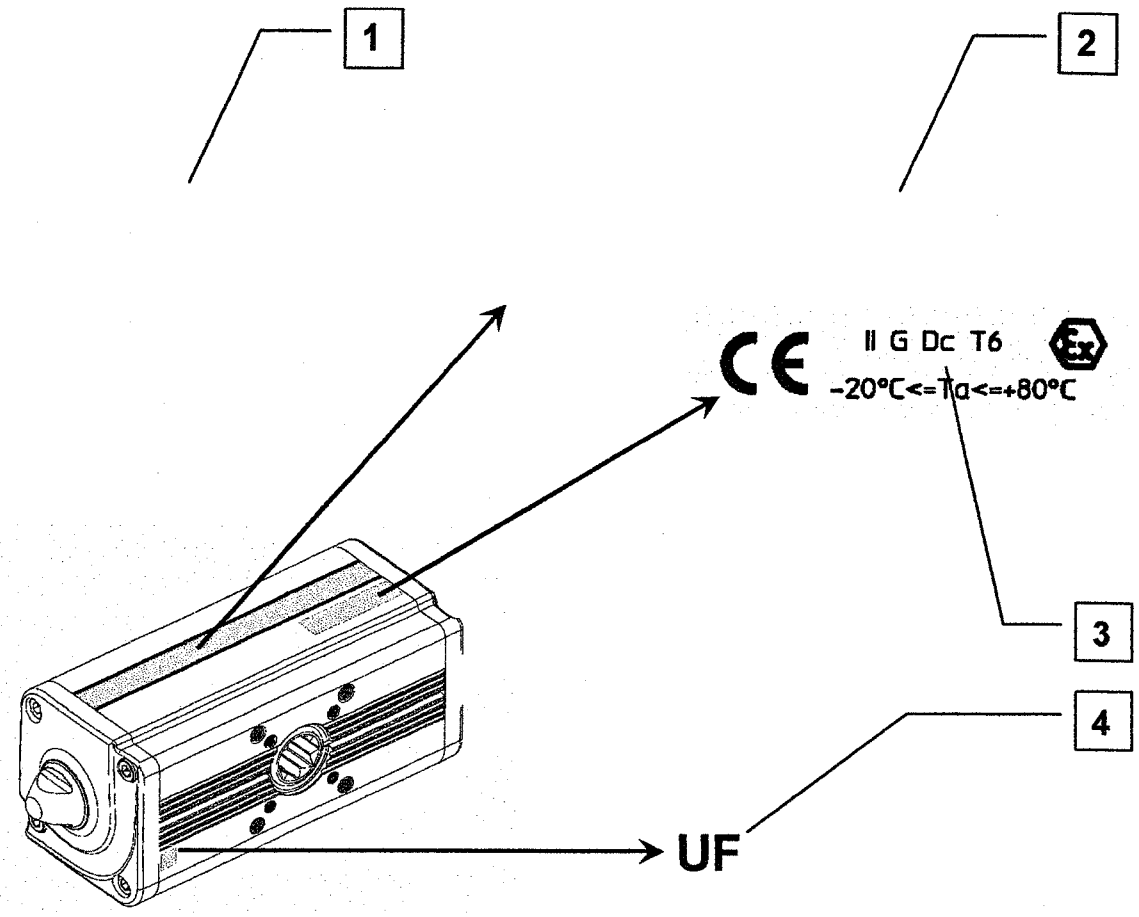
g) **Lubrication.**
The actuators are factory lubricated for the standard working condition life.
During maintenance and reassembling Actautech recommends to use KLUBER ISOFLEX TOPAS NB52, or equivalents.

h) **Internal wear protection**
The cylinder is lapped to obtain a surface with fine roughness and is protected with 20µn technical oxidation. The pistons slide supports are in P.T.F.E. only, no rubber in contact. The use of steel bearings on the Scotch-Yoke system ensures no play and low friction during operation

i) **External protection**
The G Series standard actuators are suitable for indoor and outdoor installation. The aluminium body is external protected form corrosion and wear with 20 µm technical oxidation. The cast aluminium end caps are polyester painted. Driving shaft and caps screws are in stainless steel.
For aggressive atmosphere and severe environmental condition select the required protection from the external finishes shown in our catalogue or contact directly our technical department.

I) Marking and classification

All G Series actuator bodies are laser-marked with the Manufacturer name and address, the actuator Type code including the Series and Size, and its range of Pressure and Temperatures working conditions and limits.

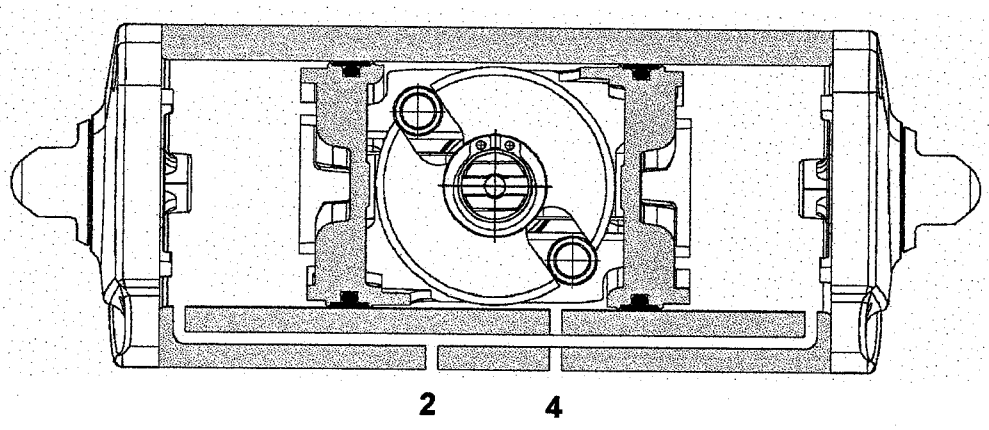


CAPTION

1 Logo and Address of the Manufacturer or Distributor according with the E.U.
2 Actuator Range Code including the Series "GD" the Torque Size "106" and Flange Size F05-F07
3 Product Classification and Zone Classification according with the ATEX Directive 94/9/EC
4 Production date code.

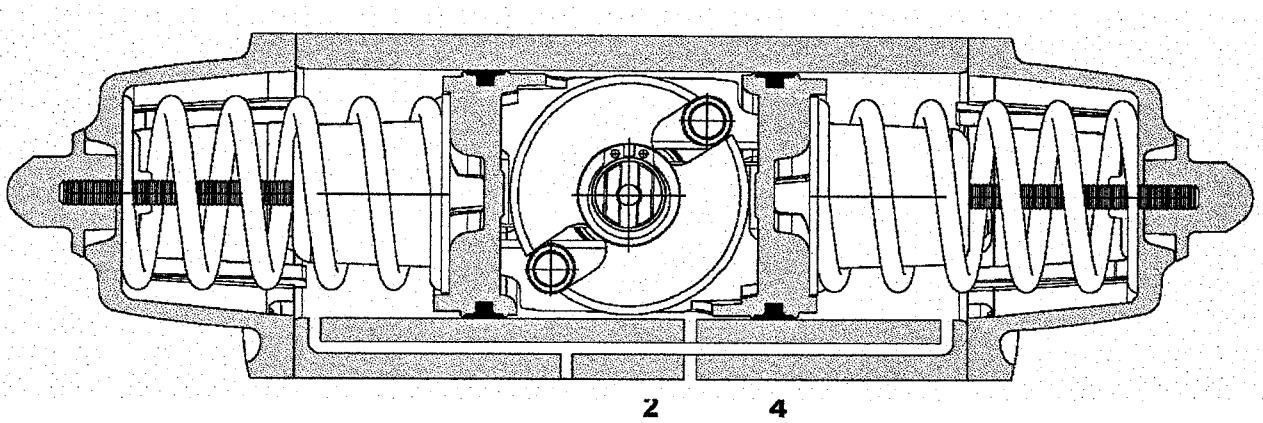
3) Operation and rotation direction

Double Acting.
The pistons of standard GD actuators are mounted as shown below. This provides the highest torque at the valve start opening for valve clockwise to close. The pistons are then in their outermost position and the end travel stops can be fine adjusted.



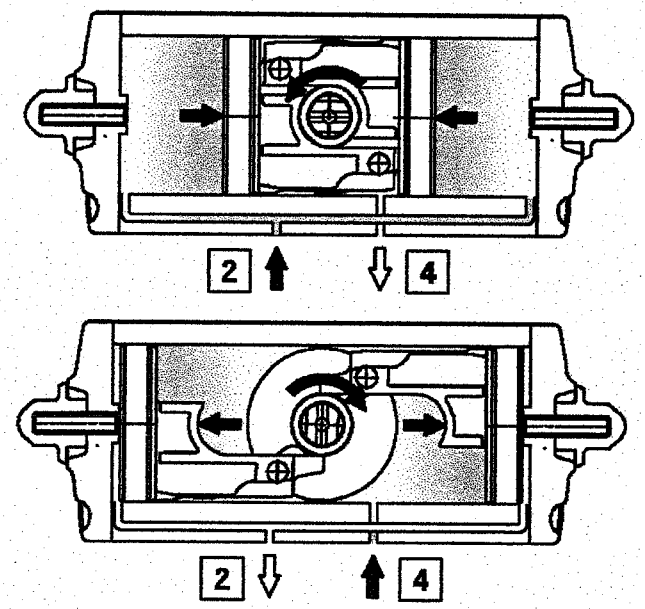
The port 2 is in connection with the cylinder side chambers, supplying the pressurised air in port 2 the standard Double Acting actuator drive shaft rotates counter clockwise to open , while the port 4 is in connection with the intermediate chamber and when pressurised the drive shaft rotates clockwise to close.

Single Acting, Spring Return fail to Close.
The pistons of standard GS actuators are mounted as shown below. Although spring force is diminished, the geometry of the mechanism provides a greater torque at the end of the spring stroke. When the actuator is in the valve open position, and the springs are fully compressed, the end of travel stops can be fine adjusted.
Caution. In order to avoid suction of dust or dirt inside of the actuator chambers during the spring action, install a filter on the port 2.

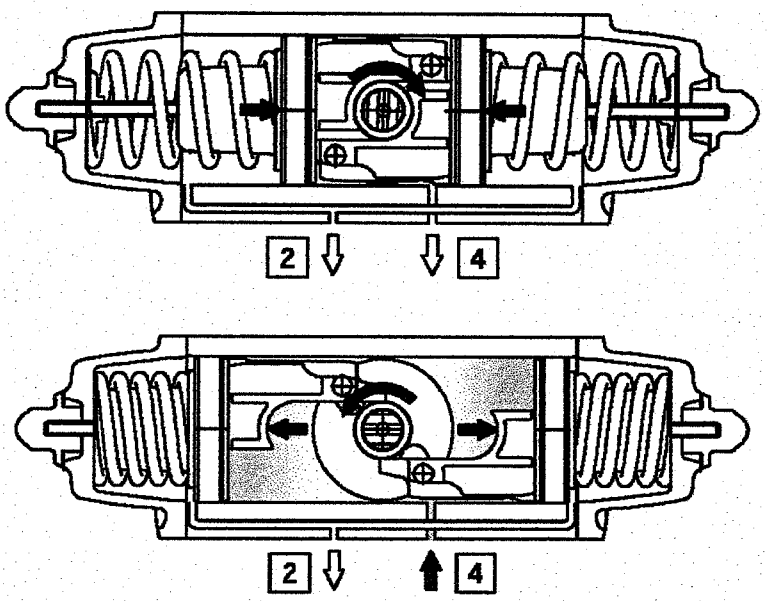


The port 4 is in connection with the intermediate chamber and when pressurised the drive shaft rotate counter clockwise to open.

Double Acting operation cycle (GD Type).



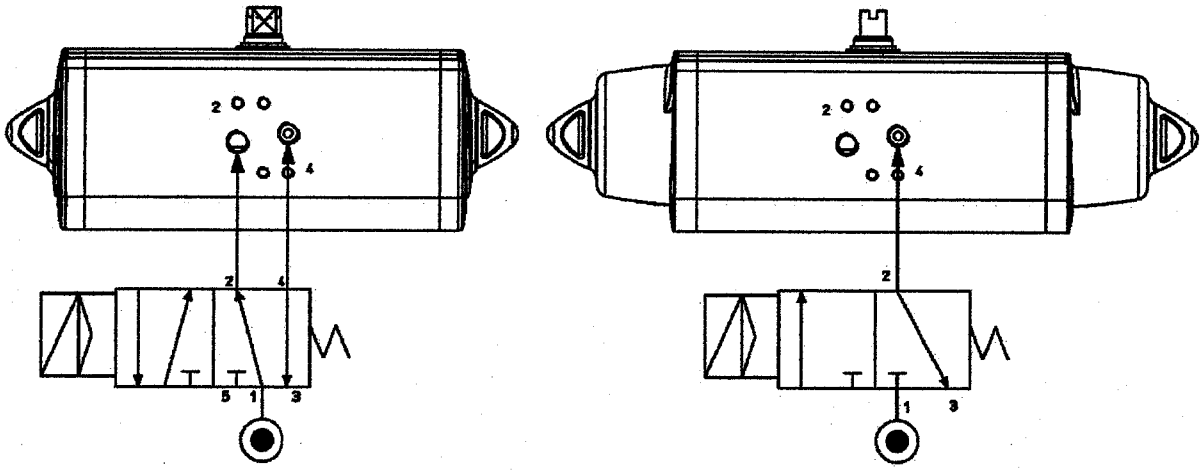
Simple Acting Spring Return fail to close operation cycle (GS Type).



Important.
Special Double Acting version for flow dosing and Spring Return fail to open actuators with different piston positions have different rotation to close and to open: please follow their special instructions.

Actuator operation functionality remote control should be done by means of direct solenoid valve connection to the actuator standard interface VDE/VDI 3845 NAMUR, or by means of pipes screwed on the ports marked with the numbers 2 and 4 and connected to a separate control cabinet.

Fig 3,1 – Typical air connection schema .



A) Rotation direction.
In accordance with the international standard ISO 5599-2 the actuator air ports connection position, location, orientation and form shall be clearly identified and market with the numerate 2 and 4.
Standard Double Acting and Simple Acting Spring Return actuators shall be Clockwise (CW) direction to valve Close, and Counter Clockwise (CCW) direction to valve Open.

4) Safety notice

- The actuator should be used within the pressure mentioned limits only, operating the actuator over the pressure limit will damage the internal actuator parts.
- Operating the actuator over or under the temperature limits will damage the internal and external parts.
- Operating the actuator in corrosive environments without the required external protection will damage the actuator.
- Before installation, service or maintenance verify that the actuator is not pressurised, disconnect the air lines and make sure that the air ports are vented
- Do not remove the end caps while the actuator is installed in the line, or while the actuator is under pressure.
- Do not disassemble the caps end spring cartridge, this operation should be done by Actuatech trained personnel only, this operation could causes personal injury.
- Before mounting the actuator onto the valve make sure that the valve rotation is according with the actuator operating rotation, and the upper shaft slot orientation is also correct.
- Before installing the actuated valve do cycling test for a wile to ensure the correct mechanical mounting and actuator/valve operations.
- The actuator installation shall be done according to and in observance with the local and national laws regulation.

- **Tomoe Valve Ltd can not be responsible for any damage to people, animals or other due to improper use of the product.**

5) Installation instruction.

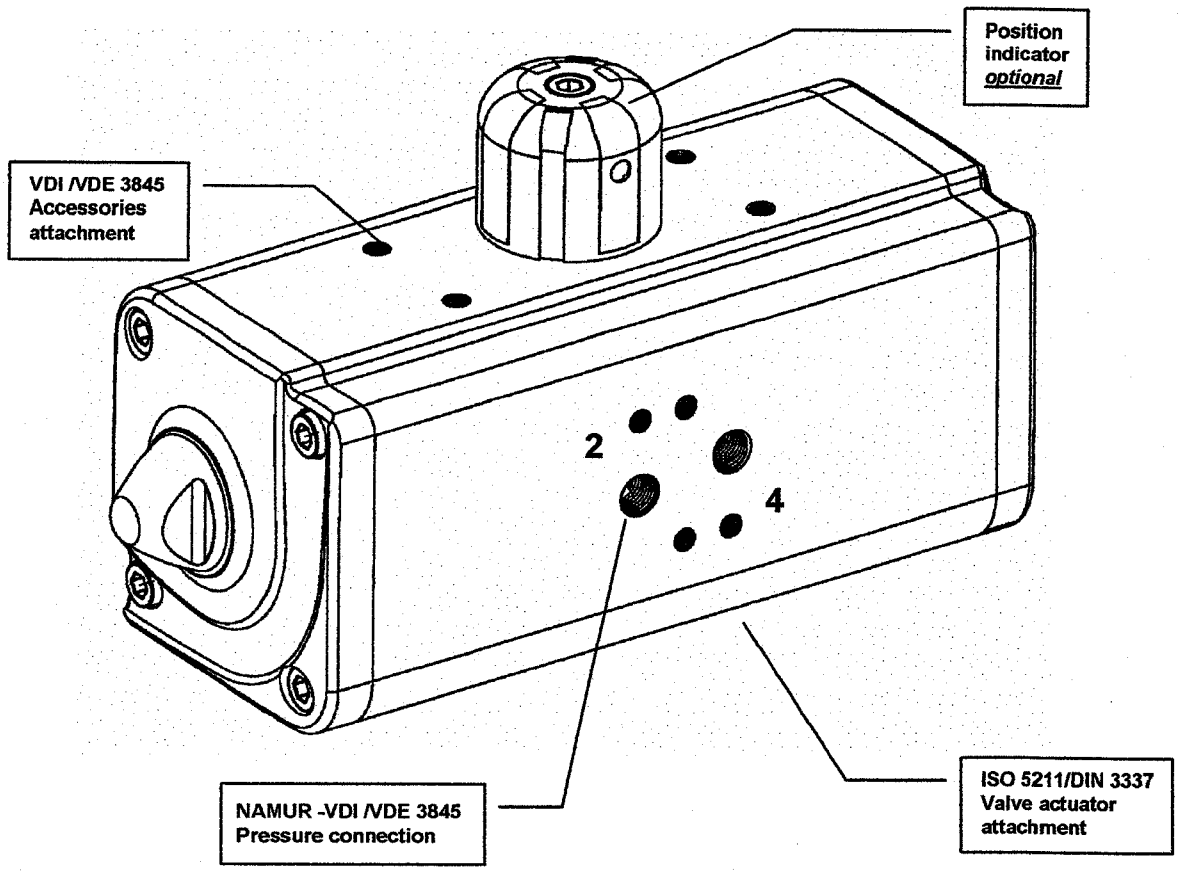
The principle of the actuator application is to open and close the connected part turn valve installed in a plant, without the manual operation, by remote control by means of an electric-pneumatic connection.

The normal sizing of actuators for wet service requires a 20%-30% safety margin over the valve breakaway torque. Plant design, chemical and physical flow characteristics and environmental condition could increase the safety factor to apply to actuator sizing.

Before performing any installation operation, verify the actuator and valve conditions according to the safety notice above described.
Moreover the utmost clearness is required during valve installation of the air supply connection to the actuator. All the connection parts such as reductions, joints, plates, brackets and equipment must be clean and dirty free.
Before assembling the actuator onto the valve make sure that both items are correctly oriented, depending upon which direction of rotation is required.

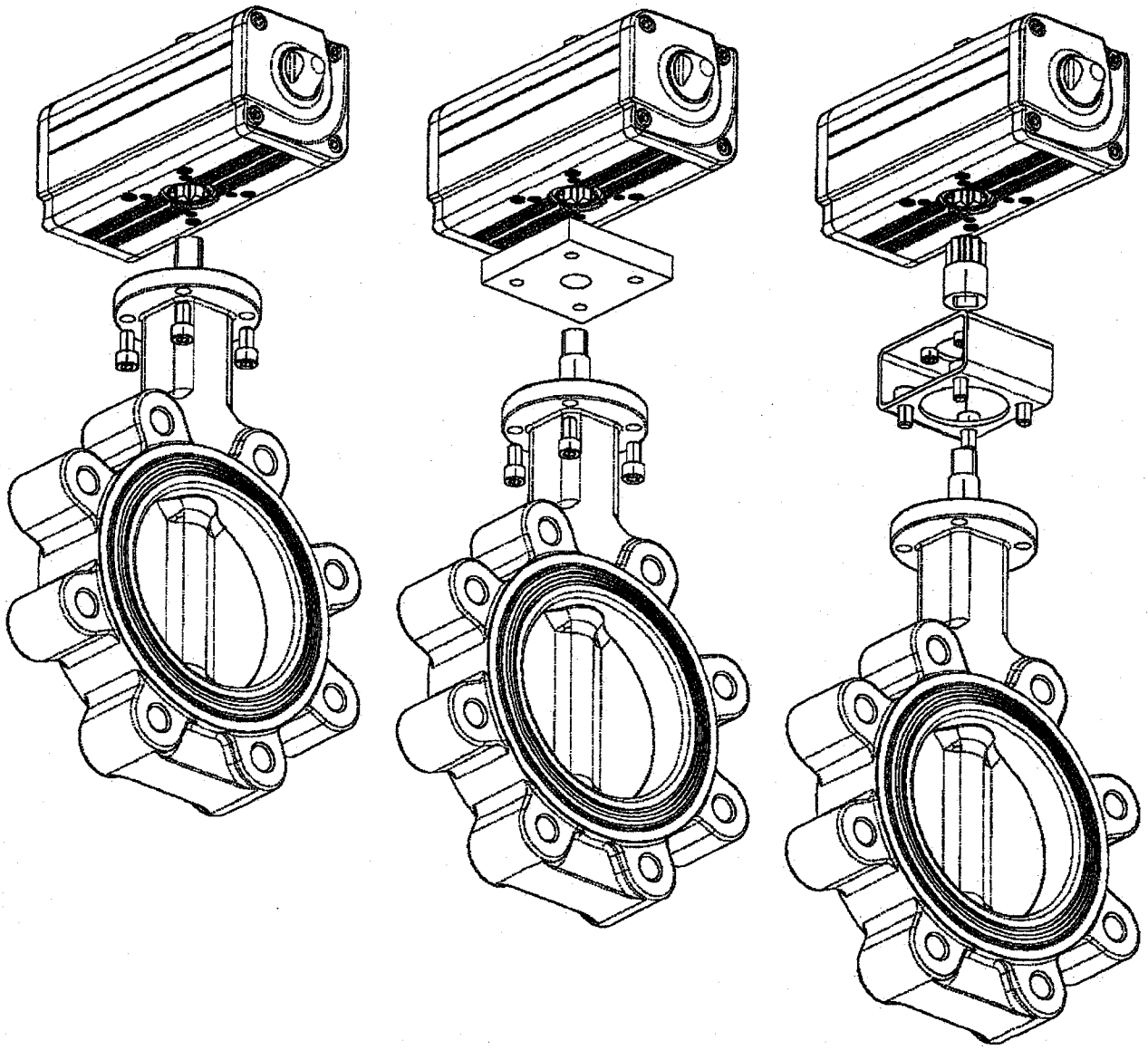
- Before starting the actuator installation, should be done a visual actuator control to verify its physical condition after transportation and storage.
- Control trough the shaft slot or caps the actuator position
- Read carefully the Actuatech instruction sheet included in the cardboard box
- Read the actuator limits and performances marked on the actuator body to verify its suitability
- Remove the protection label stickers from the ports

Fig 5,1 - Actuator control.



- Before fitting the actuator on the valve, clean the valve and the actuator from the dust and dirt.
- Verify the valve position, close or open, and the rotation direction.
- Verify the actuator position and rotation according with the valve requirement and operation, especially for Spring Return installation Fail to Close or Fail to Open.
- Spring Return Fail to Close actuators are always supplied in the close position.
- While Spring Return Fail to Open are always supplied in the open position.

Fig 5,2 – Valve/Actuator assembly: (A) direct-mount (B) plate-mount (C) bracket-mount.



A **B** **C**

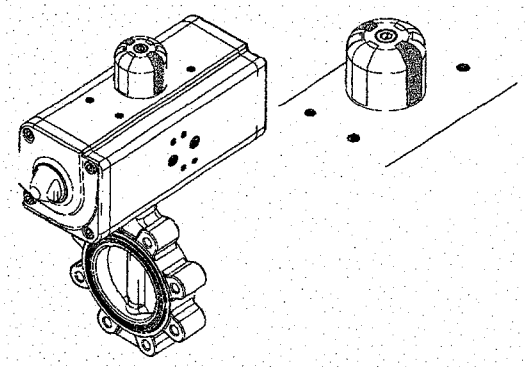
A) Direct mounting.
Valve actuator direct mounting is the best solution to avoid play between valve stem and actuator drive shaft. For a direct mounting you should have the same standard flange connection on valve and actuator, as well as the valve stem dimensions that fit perfectly with the actuator drive. Before installation please verify that the actuator and valve flange ISO connections are the same size; verify that the valve stem size and shape is suitable for direct mounting, if necessary use a drive reduction.
Fit the valve stem into the actuator drive shaft connection, and bolt together the two ISO flanges.

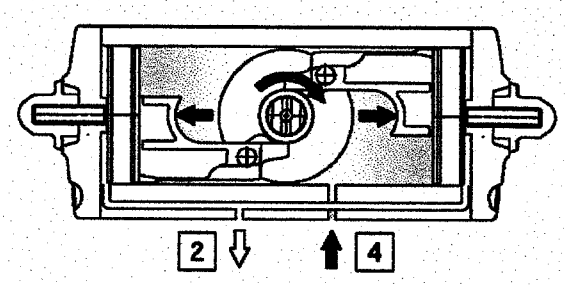
B) Mounting plate connection.
In case direct mounting is not possible because of differences in actuator/valve flanges or drives sizes, mounting plate adapters with suitable flanges dimensions allows an easy connection leaving a sufficient space for the valve/actuator drive adapter.

C) Bracket & Joint connection.
Wherever for technical reason the plant installation requires a distance between actuator and valve, or the valve flange and/or stem are not standard, and in any case, where the valve/actuator connection could not be possible, a bracket and joint is the right answer. The Bracket is a steel bridge that allows to connect the valve with is own flange connection in one side and with the suitable actuator connection onto the opposite side, leaving a space in between for a steel joint connection. The joint allows a drive connection between the actuator and the valve stem, indispensable in case of stem key and square head drives.
Chose the suitable flange bracket and joint connections to fix the actuator onto the valve without any play.
The G Series actuator with its draining channels system on the flange connection pattern is especially designed for valve direct mounting. This system allows any possible flow coming from the valve stem to drop away, whereas with a valve/actuator direct mounting damage could occur to the actuator.

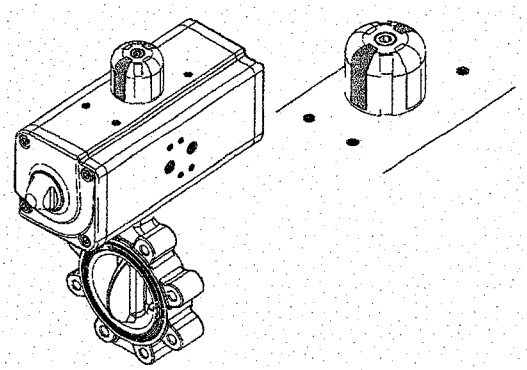
Fig 5,3 Actuator/Valve rotation control and mounting.

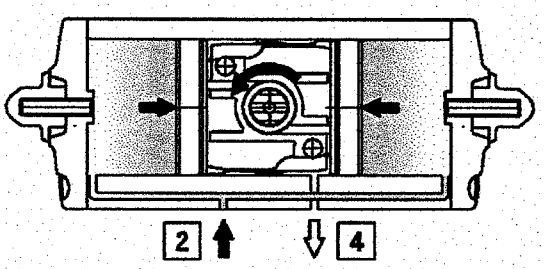
Type : GD (Valve closed)



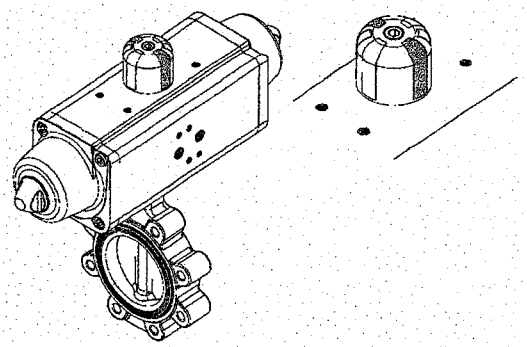


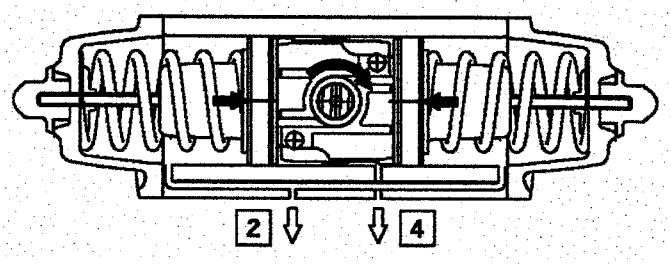
Type : GD (Valve open)



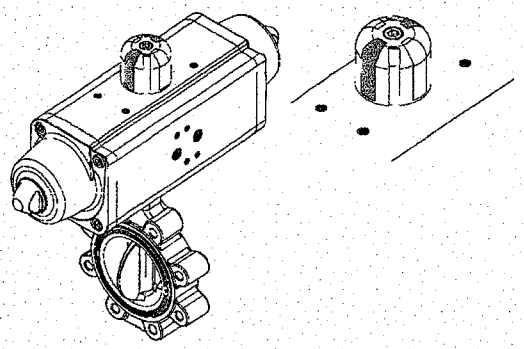


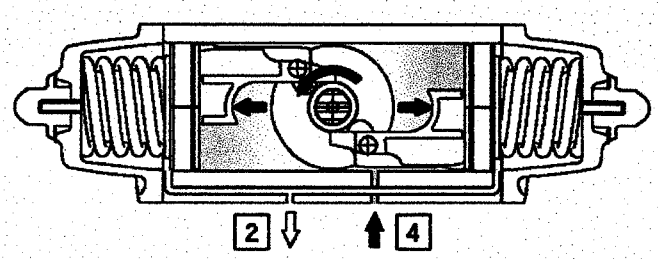
Type : GS (Valve closed)





Type : GS (Valve open)





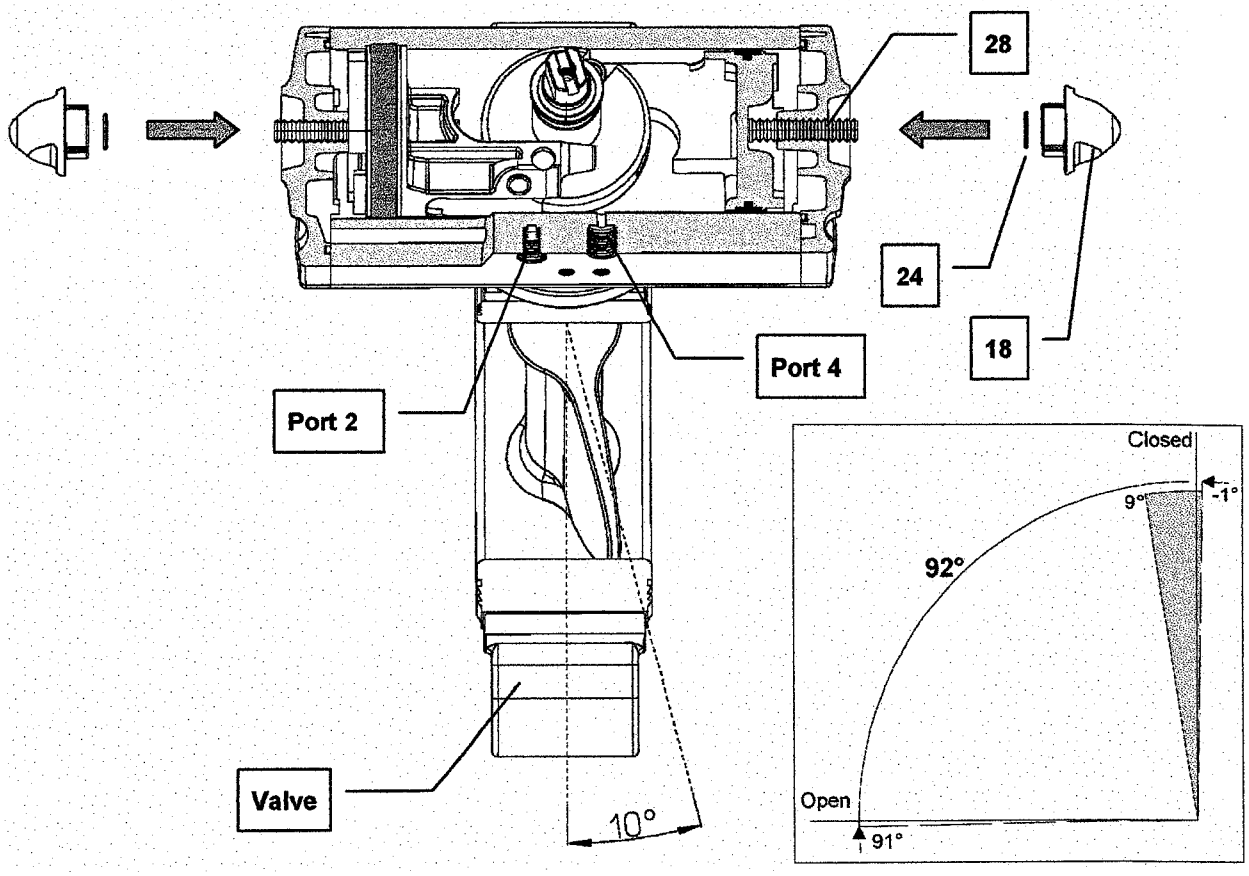
Stroke adjustment.
Both actuator versions, Double Acting and Spring Return, are provided as standard with 10° stroke adjustment.

a) GD Double Acting stroke adjustment instruction.

Close adjustment from 0° to +10°

The stroke adjustment on the actuator mounted on the valve should be done with the valve free of any flow pressure or friction impediments.In addition the actuator shall be disconnected from the air supply and equipment.
This operation should be done with the valve/actuator held firmly in the pipe line or in a vice.

- Supply the air pressure to port 2 to open the valve, and to position the actuator pistons inward.
- Remove the cap nuts (part N° 18) and its O-ring (part N° 24).
- Screw in clockwise direction the screw adjustment (part N° 28) in one actuator side only.
- Supply the air pressure to port 4 to close the valve and to position the pistons outward and against the adjustment screw, and check the valve close position.
- In case the valve position is not correct, repeat the operation from the beginning.
- In opposite situation, if, with the air supply in the port 4, the valve is not sufficiently closed, unscrew counter clockwise the adjustment screw (part N° 28) backward until the required position has been found.
- Obtained the correct valve position, and with the air pressure to the port 4, screw the other adjustment screw up to piston pressing, in this way both adjustment screws are working to stop the pistons simultaneously.
- Tightly screw the cap nuts (part N° 18) with its sealing O-ring (part N° 24) on the end caps to hold the adjustment screws in desired position.
- The actuator is now ready to operate correctly.



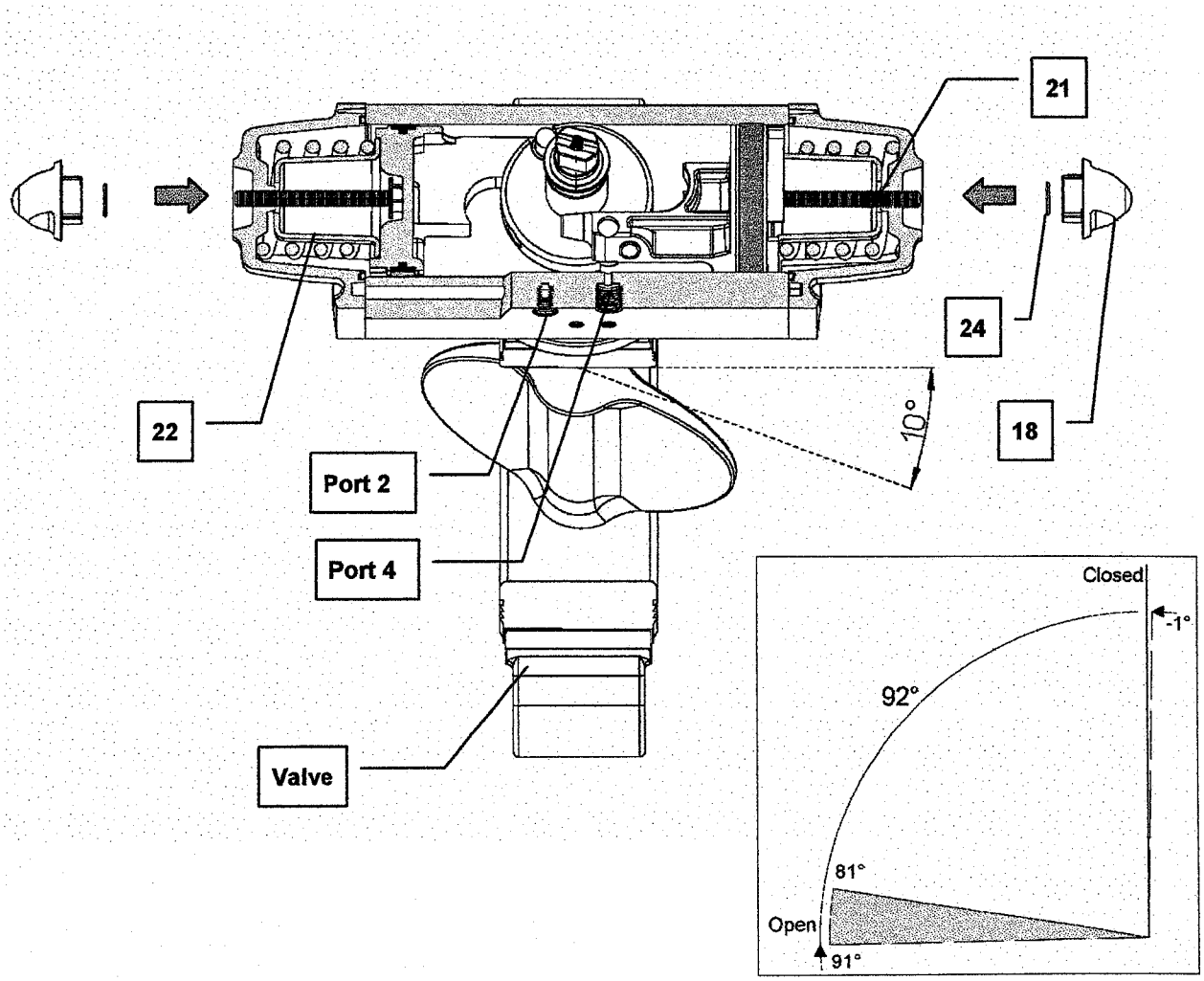
G Series standard stroke adjustment is max 10° , special longer screws are available on request.

a) GS Single Acting Spring Return Fail to Close stroke adjustment instruction.

Open adjustment from 80° to 90°

The stroke adjustment on the actuator mounted on the valve should be done with the valve free of any flow pressure or friction impediments, the actuator shall be disconnected from air supply and equipment.
This operation should be done with the valve/actuator held firmly in the pipe line or in a vice.

- Remove the cap nuts (part N° 18) and its O-ring (part N° 24).
- Screw, clockwise direction, the screw adjustment (part N° 21) in one actuator side only.
- Supply air pressure to port 4, and due to the air pressure action the pistons moves to the outward position up to the limits determined by the adjustment screw on the piston head,
- check the valve open position, if is not enough repeat the operation from the beginning.
- In opposite case, valve to much open, with the air supply to the port 4, move the adjustment screw inward, clockwise.
- Without pressurised air supply, tighten the cap nuts (part N° 18) with its sealing O-ring (part N° 24) on the end caps to hold the adjustment screws in desired position.
- In this condition the actuator is ready to work correctly.

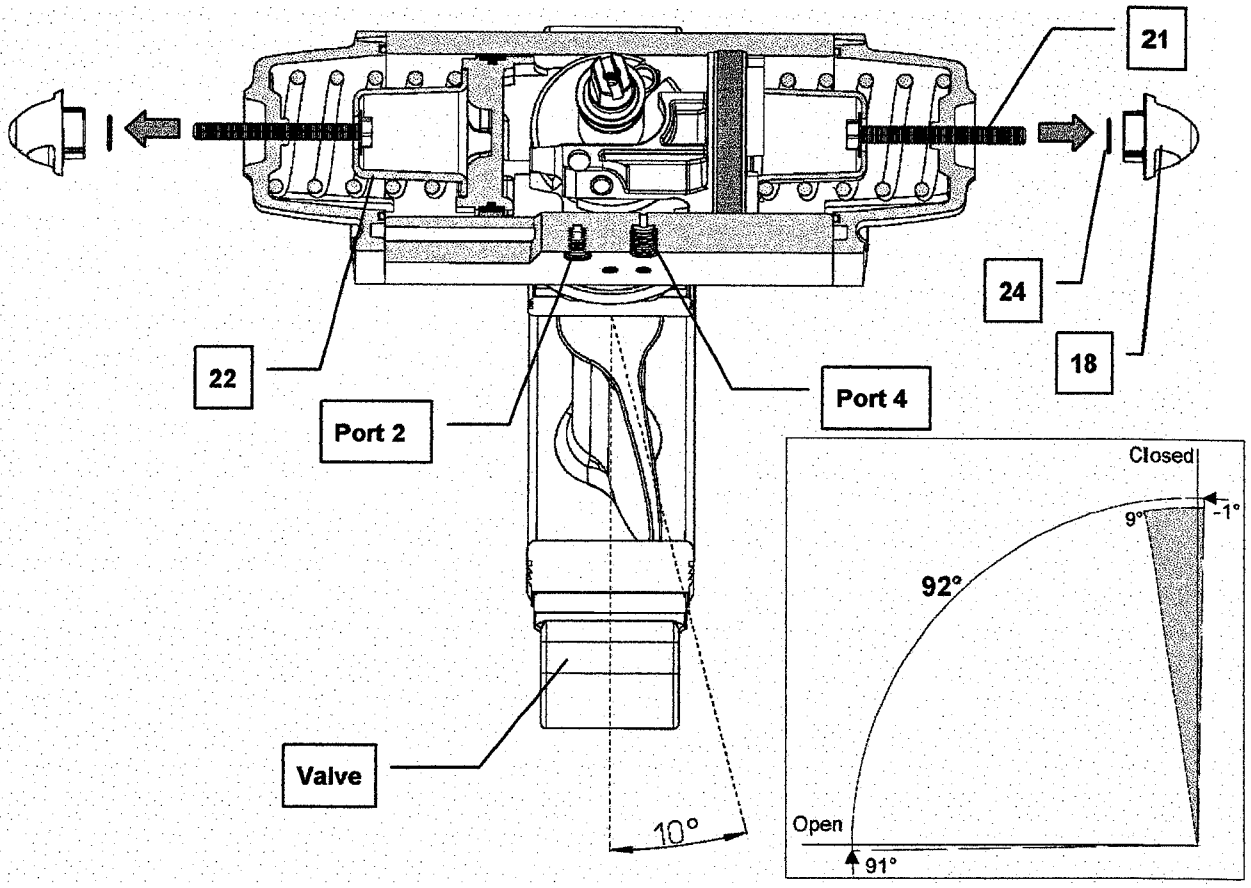


G Series standard stroke adjustment is max 10°, special longer screws are available on request.

Close adjustment from 0° to +10°

The stroke adjustment on the actuator mounted on the valve should be done with the valve free of any flow pressure or friction impediments, the actuator must be disconnected from air supply and equipment.
This operation should be done with the valve/actuator well held in the pipe line or in a vice.

- Remove the cap nuts (part N° 18) and its O-ring (part N° 24).
- Supply the air pressure to port 4 to open the valve, and position the actuator pistons outward.
- Unscrew, counter clockwise direction, both screws (part N° 21) .
- Stop to supply air pressure to port 4, and due to the spring action the pistons moves to the inward position up to the limits determinate to the adjustment screws on the spring caps (part N° 22), ***Attention**
- Check the valve close position, if is over closed repeat the operation from the beginning until the desired valve closure position is achieved.
- In opposite case, with the valve to much open, with the air supply to the port 4, move both adjustment screws inward, clockwise.
- Without pressurised air supply, tighten the cap nuts (part N° 18) with its sealing O-ring (part N° 24) on the end caps to hold the adjustment screws in desired position.
- In this condition the actuator is ready to work correctly.



***Attention.** The Spring Return close adjustment is not a mechanical stop that acts against the pistons travel or the shaft rotation, but the screws limits the spring travel and the pistons without any force standstills. In this condition the shaft is not stopped and theoretically could be moved to the total closing position.
G Series standard stroke adjustment is max 10° , special longer screws are available on request.

This adjustment table represents the average drive variation angle **α** for each full turn of the adjustment screw **β**.
For each 1° of drive variation **α** 1 the adjustment screw is to be rotated as **β** 1.

*The below table data is referred to the standard stroke adjustment only (10°).
For longer screw adjustment please contact our Sales Department.

ACTUATOR SIZE	ADJUSTMENT SCREW ROTATION ANGLE	SHAFT VARIATION ANGLE AFTER ADJUSTMENT	ADJUSTMENT SCREW ROTATION ANGLE	SHAFT VARIATION ANGLE AFTER ADJUSTMENT
	β	**α**	**β** 1	**α** 1
GD15	360°	3°34'	120°	1°
GD30	360°	2°54'	120°	1°
GS15	360°	3°7'	120°	1°
GD60	360°	2°18'	144°	1°
GS30	360°	2°26'	144°	1°
GD106	360°	1°55'	180°	1°
GS53	360°	2°	180°	1°
GD180	360°	2°14'	144°	1°
GS90	360°	2°14'	144°	1°
GD240	360°	2°	180°	1°
GS120	360°	1°54'	180°	1°
GD360	360°	1°45'	216°	1°
GS180	360°	1°40'	216°	1°
GD480	360°	1°49'	180°	1°
GS240	360°	1°54'	180°	1°
GD960	360°	1°28'	270°	1°
GS480	360°	1°57'	180°	1°
GD1920	360°	1°28'	270°	1°
GS960	360°	1°33'	216°	1°

6) Maintenance

G Series actuators are designed, manufactured and pre-lubricated for long working life without maintenance. Its construction and materials allows to maintain the actuator performance more over 500.000 cycles, depending on the operationally and environmental condition.

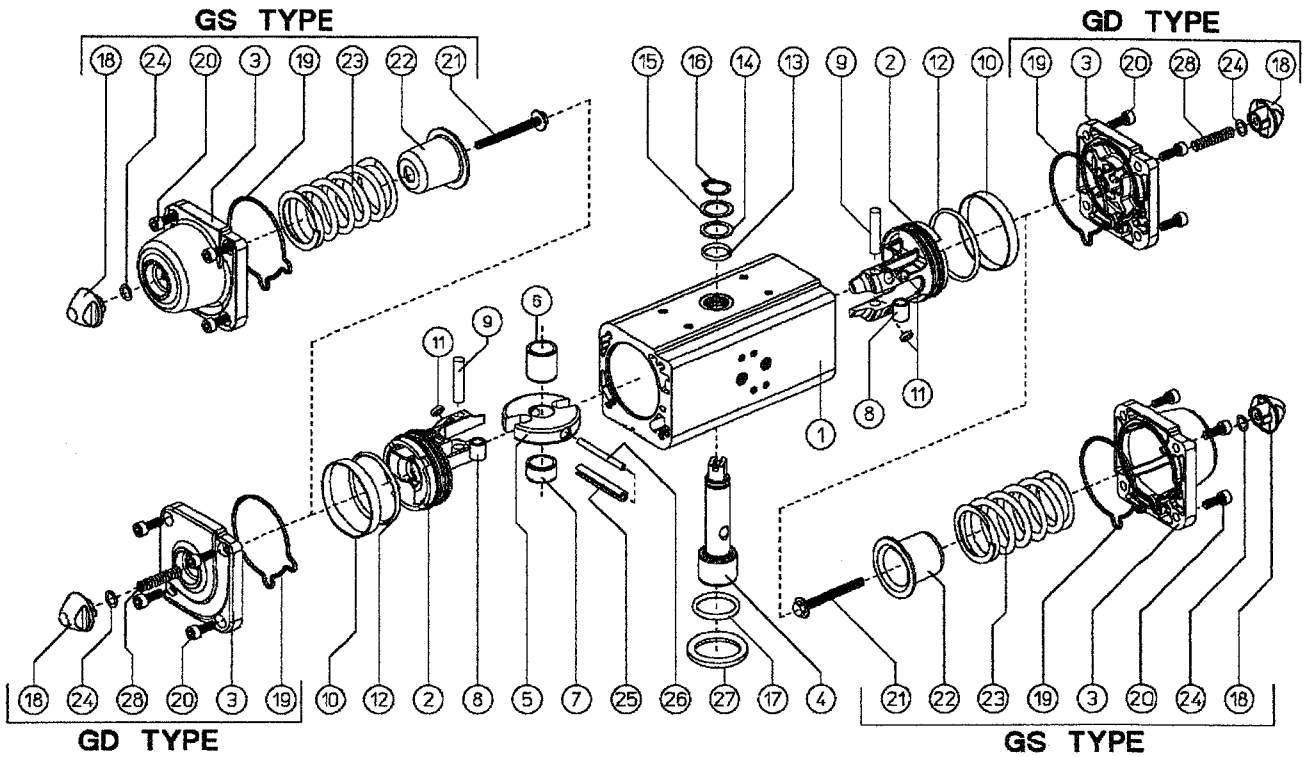
Under normal operating condition the actuator will require periodic observation to ensure proper adjustment only. Actuator Endurance tests done in the factory, under standard working conditions, shows that the expectation of medium sized actuator life is over 1.000.000 cycles.

Should it be necessary to replace its pistons sealing, this operations must be done by trained people with proper tools, we recommend to return the actuator to Tomoe Valve Ltd, where the actuator will be overhauled and than tested for a correct replacement.

On request Tomoe Valve Ltd will be willing to provide its sealing Kits.

!!! Tomoe Valve Ltd declines any responsibility for the products repaired by third parties

Fig 6,1 Actuator components and material list.



POS.	DENOMINATION	Q.	MATERIALS	STANDARDS
1	Cylinder	1	Aluminium alloy	EN AW 6063 Anodized
2	Piston	2	Aluminium alloy	EN AB 46100
3	Cap	2	Aluminium alloy	EN AB46100 Painted
4	Shaft	1	Stainless steel	AISI 303 - DIN 1.4305
5	Scotch yoke	1	Steel alloy	UNI 90MnVCr8Ku - DIN 1.2842 Ardenered
6	Support bush	1	Acetalitic resin	
7	Shaft support	1	Acetalitic resin	
8	Bush	2	Steel alloy	UNI 110w4Ku - DIN 1.2516
9	Rotative sleeve	2	Steel alloy	UNI 6364A - DIN 6325
10*	Dynamic seal (piston)	2	P.T.F.E. Carbo-Graphite filled	
11*	Piston's support	4	P.T.F.E. Carbo-Graphite filled	
12*	Piston o-ring	2	Nitrilic rubber	
13*	O-ring (upper sealing shaft)	1	Viton	
14	External support ring	1	Aluminium alloy	
15	Washer	1	Stainless steel	UNI 3653 - DIN 471
16	Seeger	1	Stainless steel	UNI 3653 - DIN 471
17*	O-ring (low sealing shaft)	1	Viton	
18	Nut	1	Aluminium alloy	EN AB46100 Painted
19*	Cap o-ring	2	Nitrilic rubber	
20	Screw	8	Stainless steel	AISI 304 - DIN 1.4301
21	Spring loading screw	2	Steel	UNI 3740/65 8G Galvanized
22	Spring cap	2	Steel	DIN 1.0315 Galvanized
23	Spring	2	Steel	DIN 1.7102
24*	O-ring	2	Nitrilic rubber	
25	External elastic pin of the yoke	1	Steel	DIN 1481
26	Internal elastic pin of the yoke	1	Steel	DIN 1481
27	Centering ring	1	Aluminium alloy	DIN AlMgSiPb Anodized
28	Stroke adjustment screw	2	Stainless steel	AISI 304 - DIN 1.4301

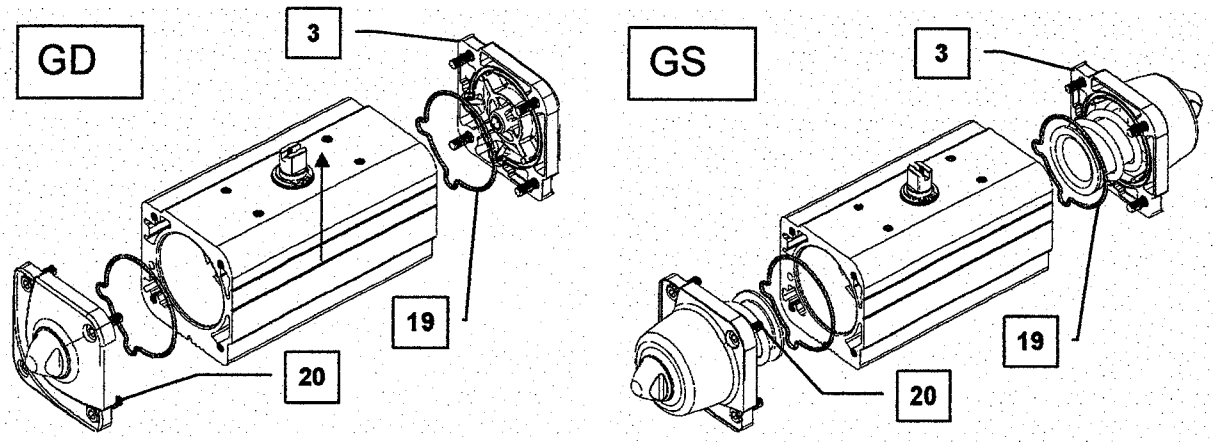
*** Parts included in the spare parts kit.**

Fig 6,2 Spare parts kit code identification for actuator size.

TYPE	KIT CODE
GD15	KGGI0012
GD30	KGGI0014
GS15	
GD60	KGGI0016
GS30	
GD106	KGGI0060
GS53	
GD180	KGGI0019
GS90	
GD240	KGGI0020
GS120	
GD360	KGGI0021
GS180	
GD480	KGGI0022
GS240	
GD960	KGGI0024
GS480	
GD1920	KGGI0026
GS960	

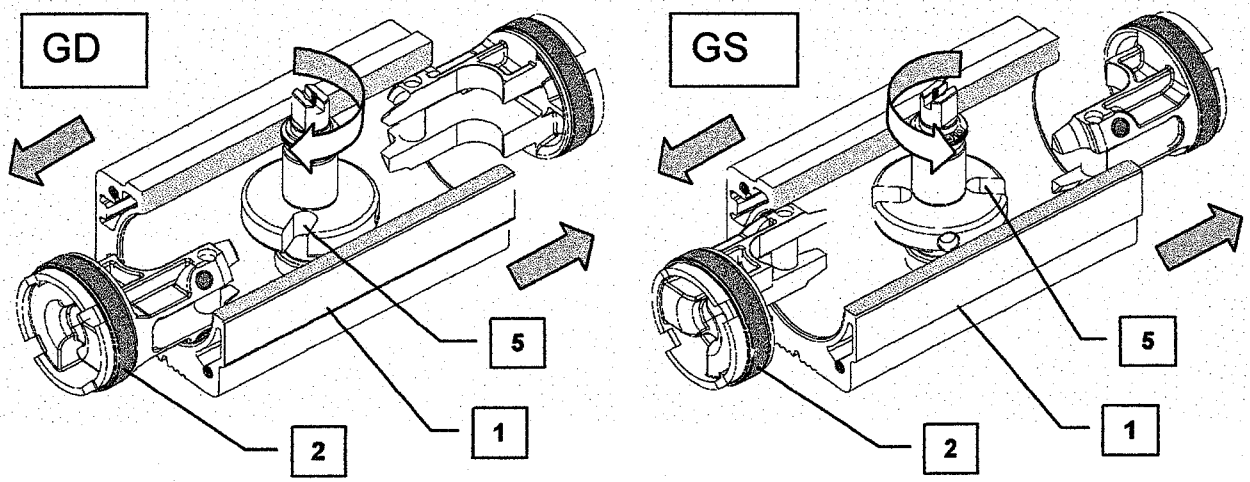
Disassembly.
Actuator disassembly operation must done with the actuator free from any pneumatic and electric connection and dismounted from the valve.
Verify that the actuator is air bag free, and the spring return actuator is completely in its springs rest position.
Check that the air port 2 and 4 are absolutely vented.
Use proper tools only.

A) Loosen the end cap screws (part N° 20) in cross sequence to remove the end caps (part n° 3), in case of force on the screws that means that the actuator is still under air or spring action and the operation should be discontinued until the action is removed. The end caps contain a sealing O-ring (part N° 19) on its seat that should be checked before replacement.

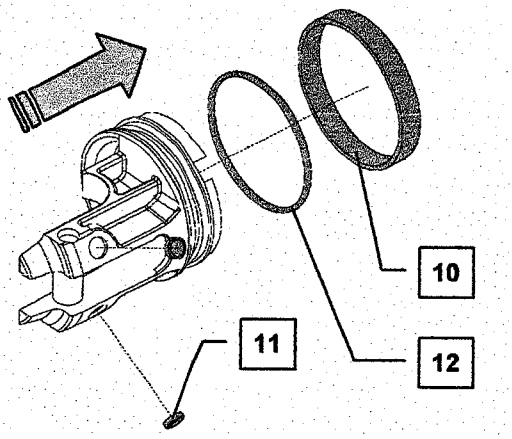


Caution. The Spring Return end cap cartridges (Parts N° 3 + 18+24+19+23+22+21) are a safety device, where the preloaded spring is set to avoid the dangerous spring jumping. Do not release the screw (part N° 21) to remove the spring from its seat, this operation must be done by trained technicians only.

B) Hold the actuator in the vice and rotate the drive shaft until the pistons (part N°2) are released form the scotch-yoke groves (part N° 5), then slip off the pistons from the cylinder (part N°1). Do not use compressed air to remove the pistons from the actuator body, this operation could cause personal injuries.



C) The pistons P.T.F.E. fascia (part N° 10), O-ring (part N° 12) and supports (part N° 11) should be checked before replacement. Do not use sharp tools to cut the fascia and O-ring or remove the supports from the piston as this may cause furrows or marks.

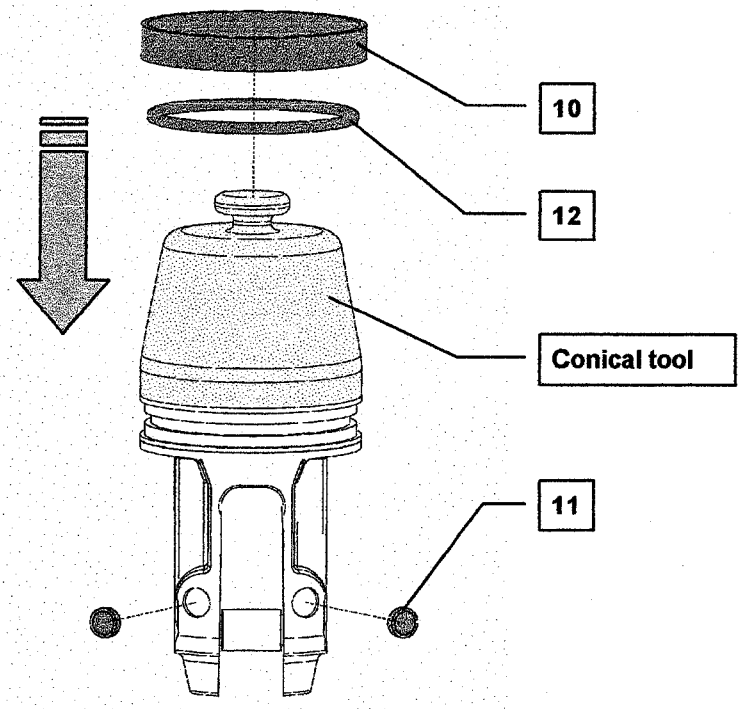


D) When the components are disassembled, they should be properly cleaned and wear checked prior to being greased and reassembled. In case the sealing parts are too much worn out use new parts from the spare parts kit.

Attention. Due to the design of the scotch-yoke shaft blow-out security system the shaft disassembly operation must be carried out by trained technician only.

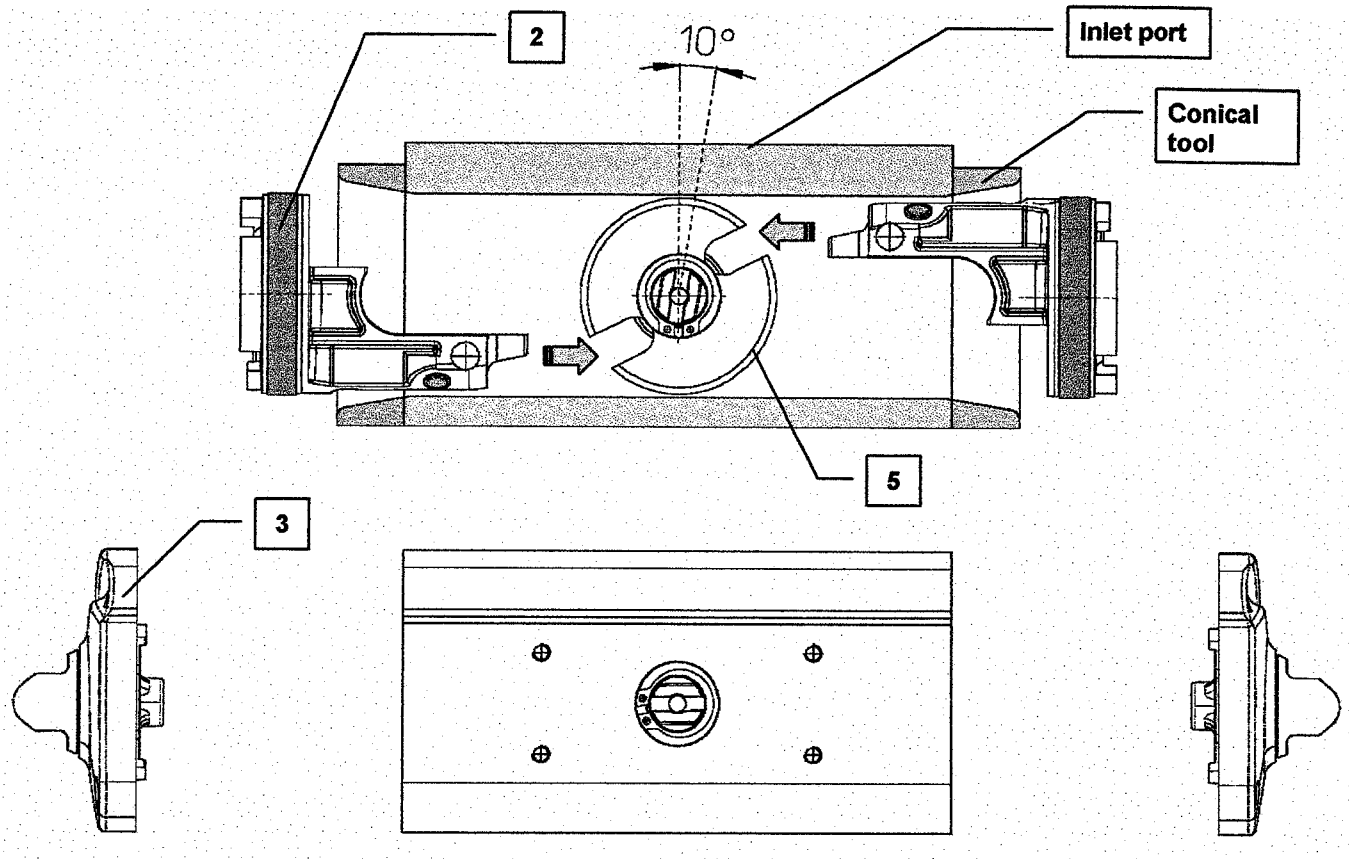
Assembly.

A) O-ring (part N° 12) and P.T.F.E. fascia (part N° 10) shall be mounted onto the piston seat using the proper conical tool, (see the drawing) that allows an easy and perfect slip-in of the items without any damage.

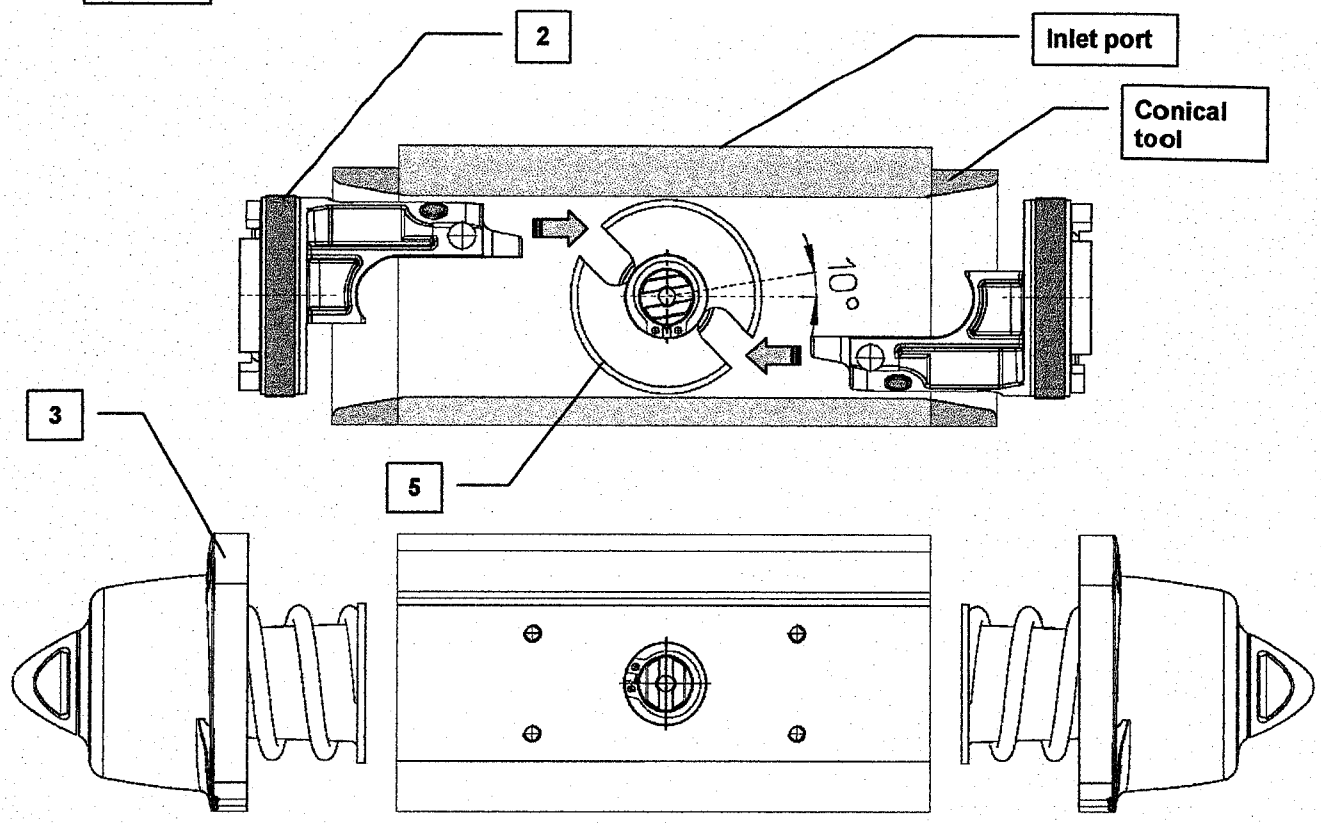


B) Push into its piston seats the P.T.F.E. supports (part N° 11).
C) Grease the pistons (part N° 2) on the replaced parts (parts N° 10+11+12), and the piston bearings (part N° 8).
D) Grease the internal cylinder surface (part N° 1).
E) Position the scotch-yoke shaft (part N° 5) in order to have the groves in position for the pistons insertion and the right shaft required direction of rotation.
F) Insert the pistons (part N°2) in the scotch-yoke grooves (part N° 5) and press simultaneously the two pistons inside of the cylinder (part N° 1). The Actuatech scotch-yoke system will avoid pistons misalignment. Holding the actuator on a vice rotate the shaft to verify the shaft rotation direction and the easy movement.
G) Replace the sealing O-ring (part N° 19) on its end cap seat (part N° 3) and grease it. Fit the end caps to the body insert the screws (part N° 20)and tighten across corners.

GD



GS



7) Atex 94/9/EC

In conformance with the European Directive ATEX 94/9/EC for the suitability of the equipment intended for the use in Potentially Explosive Atmosphere, The manufacturer declares the conformity of the scotch-yoke actuator of the above mentioned Atex directive in the limits of its Classification and Zone Classification.

Classification:
Product Classification: Equipment Group II Category 2
Zone Classification: Suitable for Gas Zone 1 & 2, and Dust Zone 21 & 22.
Protection Class : "c" constructional safety
Temperature Class T6, Determined by Environmental Temperature and Operating Media Temperature.

Whenever the actuator may be installed in the Potentially Explosive Atmosphere the operator before start the installation must observe the suitability of the equipment Classification and special installation instruction included that follow the actuator. In case of instruction missing or any doubts please call the Actuatech technical department.

Attention.
Keep the actuator in its original box until the installation, and store in dry clean environmental conditions at ambient temperature.

8) Actuators - Special Versions.

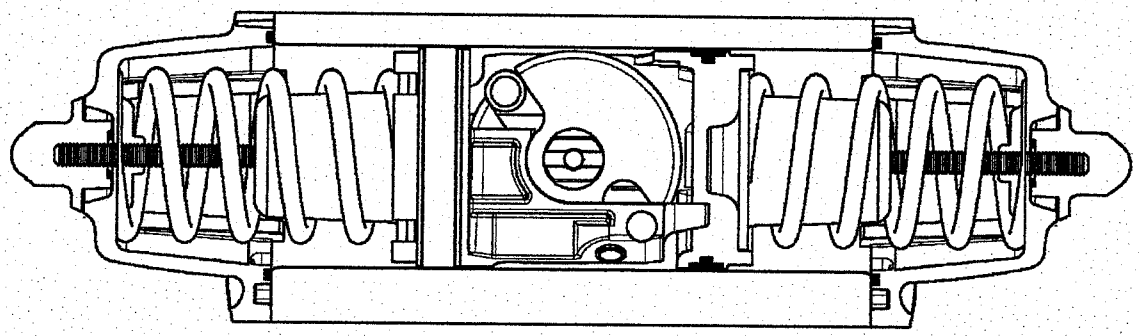
Special actuators versions are available for specific actuator use and environmental conditions.

a)External protections.
All the standard version could be supply with different external protection according with the plant ambient working condition (see G Series catalogue or contact Tomoe Valve Ltd Sales Office.)

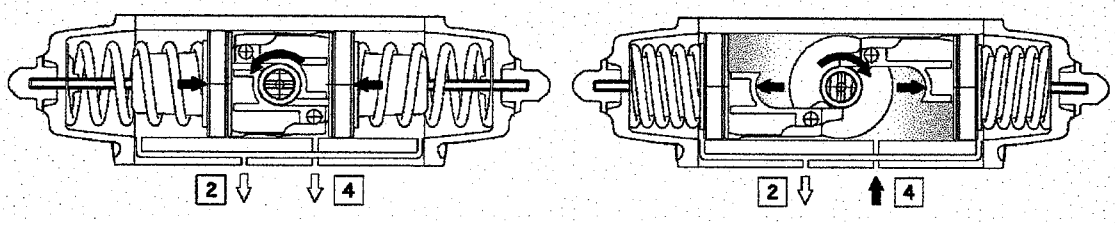
b)Stainless Steel Actuators
For food and chemical plants a Stainless Steel version is available. The body and all the external part are made in stainless steel AISI 316.
The range of Double Acting and Spring Return actuators start from the 15Nm up to 480Nm.
The rotary system is the same Scotch-Yoke used for the standard actuators.
For the stainless steel actuators performances please refers to the standard actuators data tables.

c)Simple Acting spring return Fail to Open.
Spring Return Fail to Open actuators are required when in case of the pressurised air or electrical power supply are off the valve should be automatically opened.
In the fail to open actuators the pistons are inserted into the cylinder like the Double acting version, and due to the spring force the actuator is Normally Open.

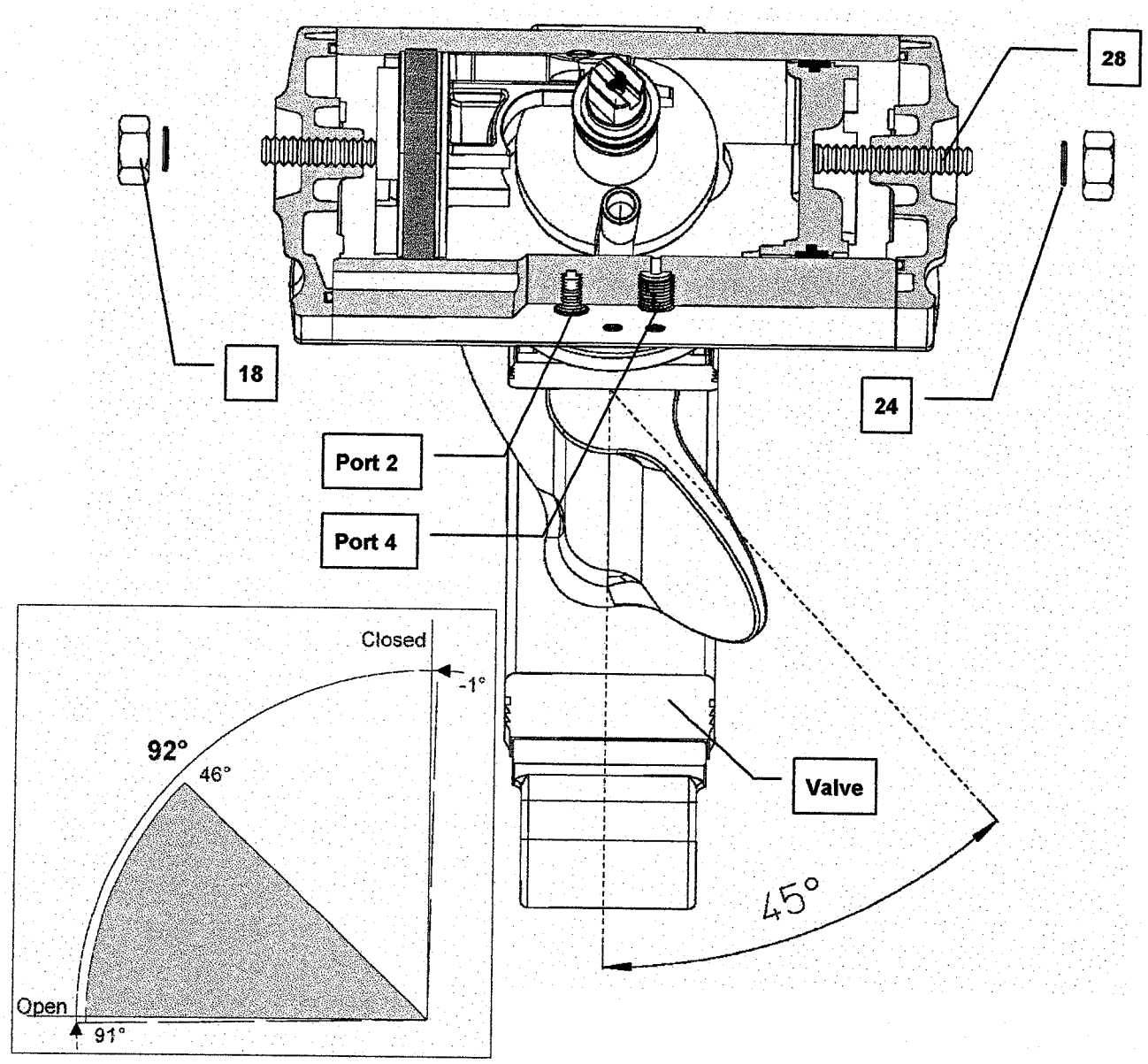
Attention. Nominal torque and torque performances in Spring Return Fail to Open version, due to its construction, are different from the Spring Return Fail to Close standard versions. For sizing and application please refer to Tomoe technical department.



Simple Acting Spring Return fail to open operation cycle .



d) This double acting GD special version, with the pistons rotated and extra long adjustment screws, limits the actuator/valve travel in the open position and is used when the valve should never be totally open, but limited up to 45% of its capacity.



Attention. Double Acting GD and Spring Return GS special version develop different torque forces and before installation and maintenance please consult Tomoe Valve Ltd technical department for their technical data and torque diagrams.