

Content

Guide of use and maintenance of the actuator of the spring return VTS Actuator.

1. Introduction.....	1
2. Description of function and structure.....	1
2.1 Description of function.....	1
2.1.1 Torque output.....	1
2.1.2 Spring return.....	1
2.1.3 Travel limits.....	1
2.1.4 Adjustable opening	2
2.1.5 Manual operation.....	2
2.2 Structure figure and materials of main component.....	2
3. Installation and use of the actuator	3
3.1 Installation of the actuator	3
3.1.1 Actuator lifting.	3
3.1.2 Installation of the actuator.....	4
3.2 Actuator troubleshooting.....	4
3.3 Operation of manual mechanism.....	5
3.3.1 Manual screw	5
3.3.2 Manual bevel gear.....	6
4. Disassembly and installation of the actuator	7
4.1 Weight of the actuator	7
4.2 Disassembly of the cylinder	7
4.2.1 Disassembly of the spring.	8
4.2.2 Disassembly of the cylinder	9, 10
4.3 Installation of module.....	11
4.3.1 Installation of the spring.....	11
4.3.2 Installation of the cylinder.....	12

1. Introduction

This guide applies to the fork-type actuator of the spring return type of VTS. Please read this guide carefully before using it.

2. Description of function and structure

2.1 Description of function

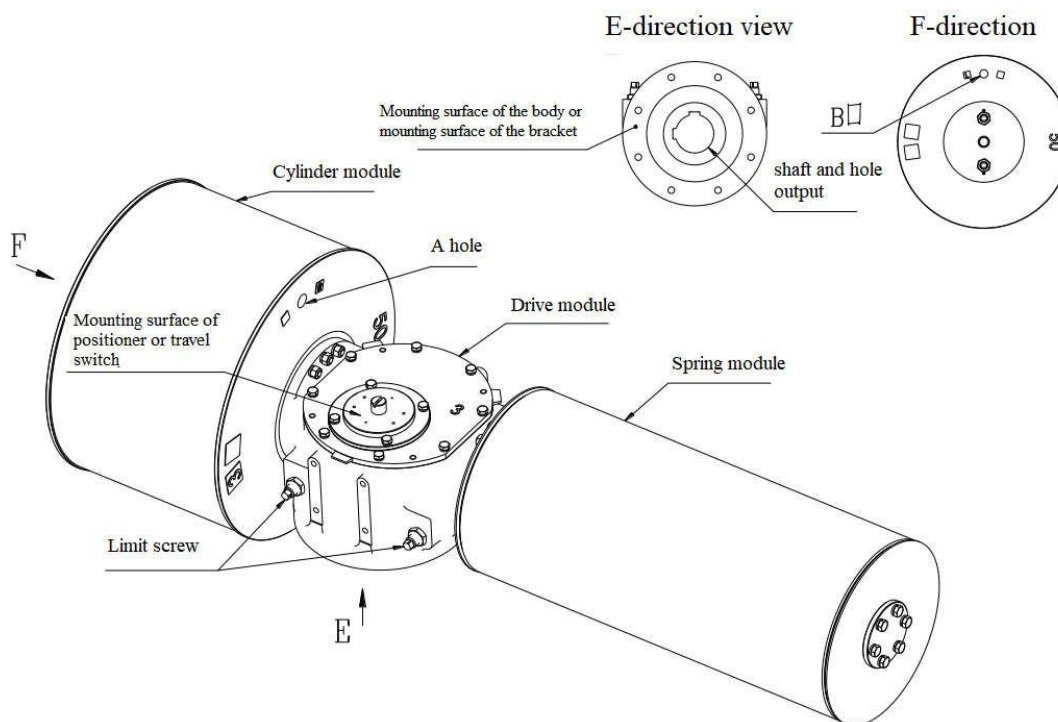


Figure 1 Actuator of the spring return of VTS Series

2.1.1 Torque output

The cylinder module is moved to one side by the air from Hole A (see Figure 1), which makes the fork shift and drive the module to rotate, and at the same time compresses the spring in the other side spring module, so that the actuator outputs torque.

2.1.2 Spring reset

After the Inlet A loses air, the spring force drives the fork back and rotates the module to its initial position.

2.1.3 Travel limit

By rotating the limit screw (see Figure 1), the start and end positions of the fork can be adjusted when rotating, as a result of limit of the entire travel.

Details will be shown in 3.2.

Note: The travel range of this limit screw refers to $\pm 5^\circ$. If you need more travel, you need to select the adjustable opening.

2.1.4 Adjustable opening

After the adjusting the limit screw, the piston of the cylinder will be restricted by the adjustment of the screw to get the appropriate of the opening degree of the actuator.

Note: This function is optional. Please confirm whether it is available before selection.

2.1.5 Manual operation

If an actuator is equipped with a manual over-ride device, it will work by operating the manual mechanism in a air-loss state.

Details will be shown in 3.3

Note: This function is optional. Please confirm whether it is available before selection.

2.2 Structure figure and materials of main component

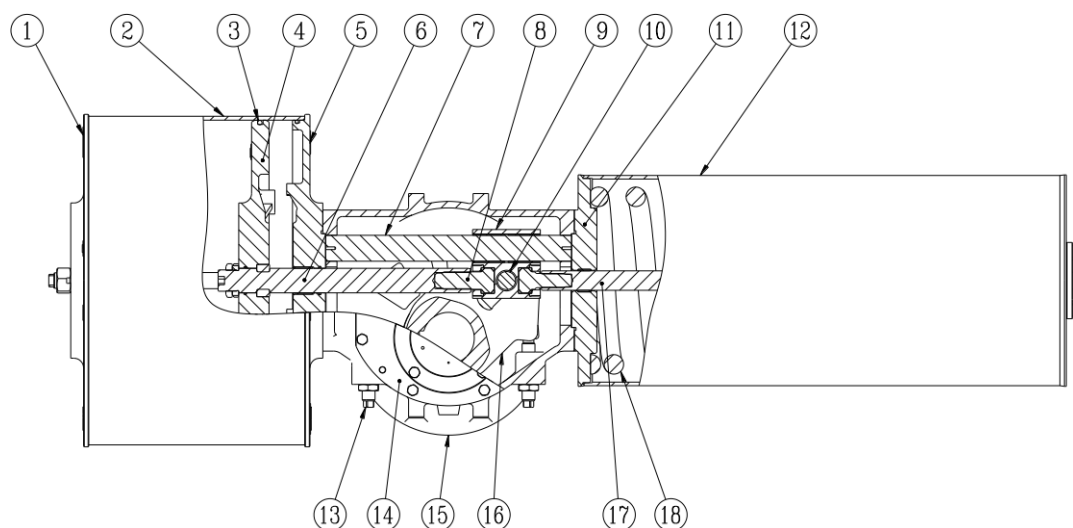


Figure 2 Structure figure of the actuator of the spring return of VTS

Table 1 Table of material of main parts

No.	Name	Material	No.	Name	Material
1	Cover of the outer cylinder	Spherical graphite iron	10	Drive pin	Alloy steel
2	Cylinder	Carbon steel	11	Spring Cover	Carbon steel
3	Seal ring	Nitrile-butadiene rubber	12	Spring cylinder	Carbon steel
4	Piston	Spherical graphite iron	13	Limit screw	Stainless steel

5	Inner Cylinder cover	Spherical graphite iron	14	Case Cover	Spherical graphite iron
6	Piston Rod	Alloy steel	15	Case Body	Spherical graphite iron
7	Guide rod	Alloy steel	16	Fork	Spherical graphite iron
8	Transmission joint	Alloy steel	17	Spring Rod	Alloy steel
9	Guide block	Spherical graphite iron	18	Spring	Alloy steel

3. Installation and use of the actuator



3.1 Installation of the actuator

3.1.1 Actuator lifting

Proper lifting of the actuator in accordance to the schematic diagram in Figure 3 during which it is necessary to maintain a slow and steady speed without impact, and the lifting straps should not have slack until the actuator is fixed securely.

Note: In order to ensure safe rigging, please select the appropriate lifting straps according to the weight of the actuator. Details are shown in Table 2.

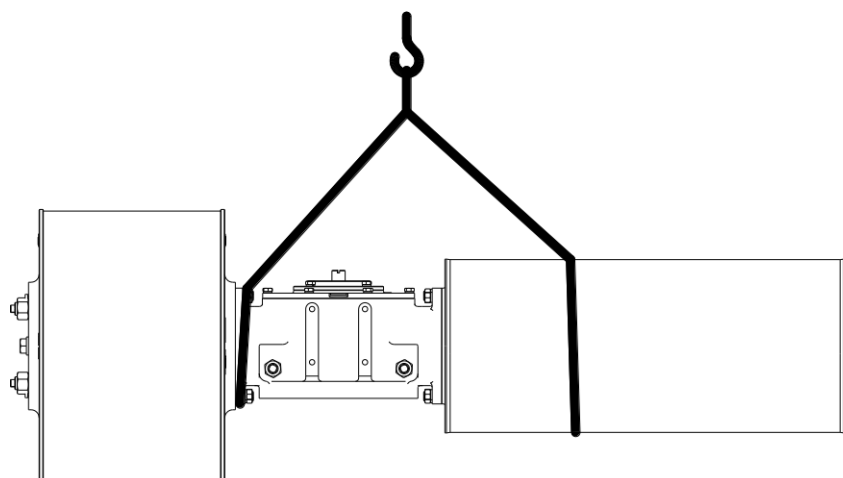


Figure 3 Schematic diagram of the actuator lifting

Table 2 Table of weight of VTS for reference

Model	Weight kg		Model	Weight kg
VTs1-200-SR	120		VTs5-500-SR	776
VTs1-250-SR	130		VTs5-600-SR	845
VTs1-300-SR	138		VTs5-700-SR	1025
VTs1-350-SR	146		VTs6-700-SR	1790
VTs2-300-SR	174		VTs6-800-SR	1902
VTs2-350-SR	182		VTs6-900-SR	2058
VTs2-400-SR	205		VTs7-800-SR	2470
VTs3-350-SR	251		VTs7- 900-SR	2610
VTs3-400-SR	274		VTs7-1000-SR	2758
VTs3-500-SR	322			
VTs4-400-SR	450			
VTs4-500-SR	482			
VTs4-600-SR	550			

Note: The weight of manual devices is excluded.

3.1.2 Installation of the actuator

Connect the mounting surface of the actuator to the body (see the mounting surface in Figure 1. Make sure that the bolts used are not below grade 8.8 of the steel to ensure sufficient friction between the mounting surfaces, refer to Table 3 for the tension torque of the bolt.

Table 3 Bolt Torque for mounting surface of the actuator

Model	Torque Nm		Model	Torque Nm
VTs1	185		VTs5	1240
VTs2	360		VTs6	2170
VTs3	185		VTs7	2170
VTs4	360			

3.2 Actuator troubleshooting

After the actuator and valve (or other equipment) are installed, Intake A (see Figure 1) activates the actuator, and then the open and closed positions of the valve will be adjusted by rotating the limit screw (see Figure 1).

Note: (1) In the operation of the actuator, it is necessary to keep the Hole B (see Figure 1) unobstructed.

(2) The actuator must not exceed the maximum allowable operating pressure (see the nameplate);



(3) If the actuator has a manual over-ride, make sure it is not engaged (see 3.3 operation of manual mechanism).

3.3 Operation of manual over-ride

This function is optional. Please confirm whether your actuator has this option. Please confirm which manual over-ride you have based on model and function requirement before operation.

3.3.1 Manual screw

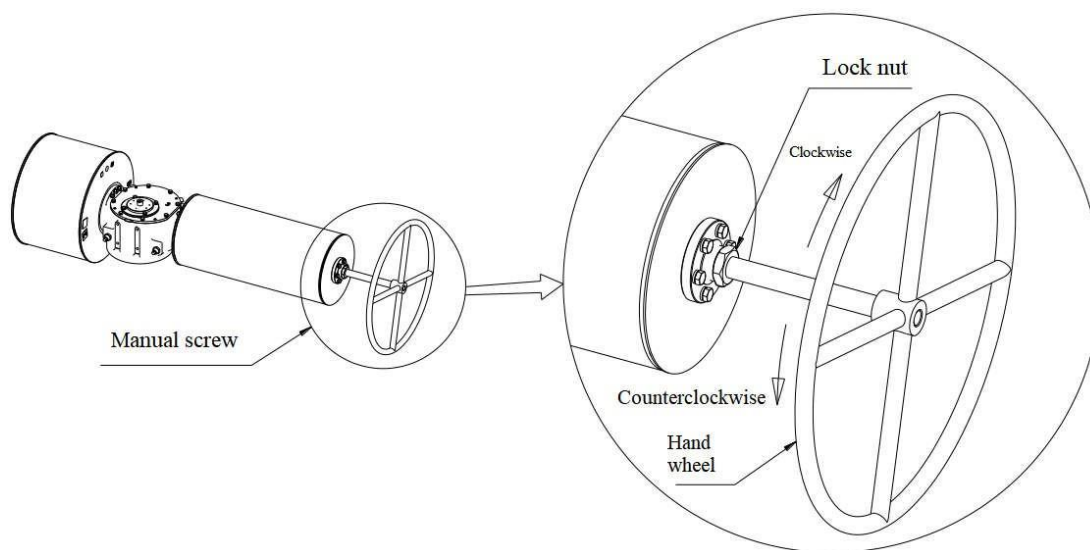


Figure 4 Manual screw

Note: please note that the supply source must be isolated before operation! See Figure 4

for the operation of manual screw (over-ride). Please follow the steps carefully:

- 1) Loosen the lock nut
- 2) Turn the hand wheel to operate the manual screw. Please note: turn the hand wheel clockwise and the output shaft of the actuator moves clockwise Movement; turn the hand wheel counterclockwise, and the output shaft of the actuator moves counterclockwise.
- 3) Re-tighten the lock nut when the desired opening is obtained by the manual mechanism.

Note: When it is necessary to switch back to the pneumatic state, the screw must be manually returned, see Table 4.

Table 4

Type of the actuator	Way of manual exit
Turning the spring return actuator (FC)	Turn the hand wheel clockwise to completely withdraw the screw manually
Turning the spring return the actuator (FO)	Turn the hand wheel counterclockwise to completely withdraw the screw manually

3.3.2 Manual bevel gear

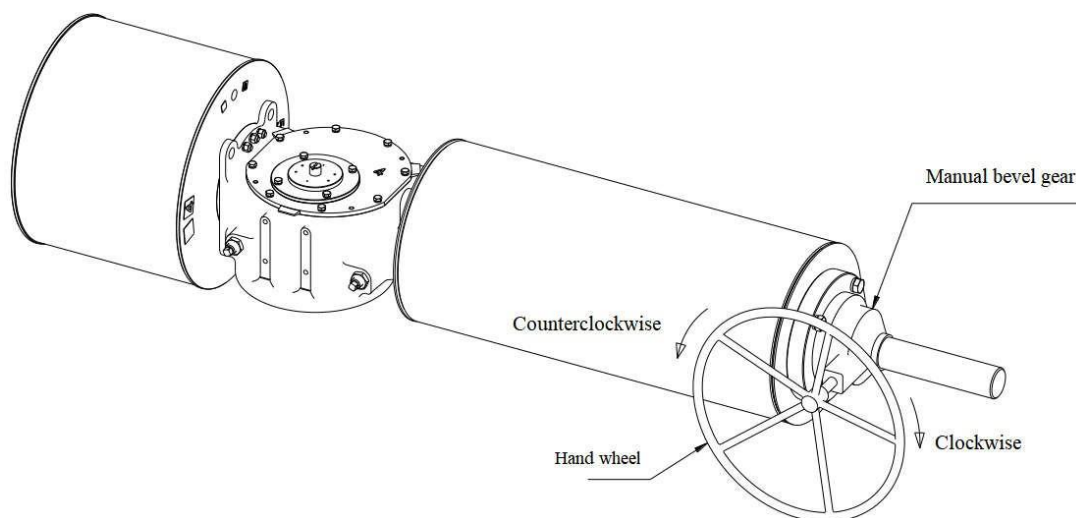


Figure 5 Manual bevel gear

Note: Please ensure the air supply has been locked out before operation!

The manual bevel gear type is shown in Figure 5.

Turn the hand wheel to operate the manual bevel gear. The relationship between the direction of rotation of the hand wheel and that of the output shaft of the actuator is shown in Table 5.

Table 5 Operation direction of hand wheel of the bevel gear

Type of the actuator	Rotation direction of the hand wheel	Rotation direction of the output shaft of the actuator
Turning the spring return the actuator (FC)	Clockwise	Clockwise
	Counterclockwise	Counterclockwise
Turning the spring return the actuator (FO)	Clockwise	Clockwise
	Counterclockwise	Counterclockwise

Note: When returning to service operation (pneumatic state), the bevel gear screw must be manually returned, see Table 6.

Table 6

Type of the actuator	Way of manual exit
Turning the spring return of the actuator (FC)	Turn the hand wheel clockwise to completely
Turning the spring return of the actuator (FO)	withdraw the screw manually

4. Disassembly and installation of the actuator

4.1 Weight of the actuator

Table 5 Weight of the modulus for reference

Name	Weight Kg		Name	Weight Kg
VTS1 Drive module	32		200 cylinder module	26
VTS2 Drive module	45		250 cylinder module	36
VTS3 Drive module	75		300 cylinder module	44
VTS4 Drive module	113		350 cylinder module	52
VTS5 Drive module	234		400 cylinder module	75
VTS6 Drive module	425		500 cylinder module	123
VTS7 Drive module	670		600 cylinder module	190
VTS1 Spring module	62		700 cylinder module	392
VTS2 Spring module	85		800 cylinder module	500
VTS3 Spring module	124		900 cylinder module	637
VTS4 Spring module	246		1000 cylinder module	788
VTS5 Spring module	420			
VTS6 Spring module	995			
VTS7 Spring module	1300			



4.2 Disassembly of the cylinder

Note: Before disassembly, please follow the steps

- 1) Since the module is heavy, please prepare the necessary lifting equipment in (refer to Table 5 Weight of the module).*
- 2) Whether removing the spring module or the cylinder module, it must be certain that the spring is fully open. See step 1.)2).3) in 4.2.1*
- 3) When the actuator is in operation, please take all precautions that the module disassembly does not affect the corresponding equipment.*



4.2.1 Disassembly of the spring

Please follow the steps below to complete the removal:

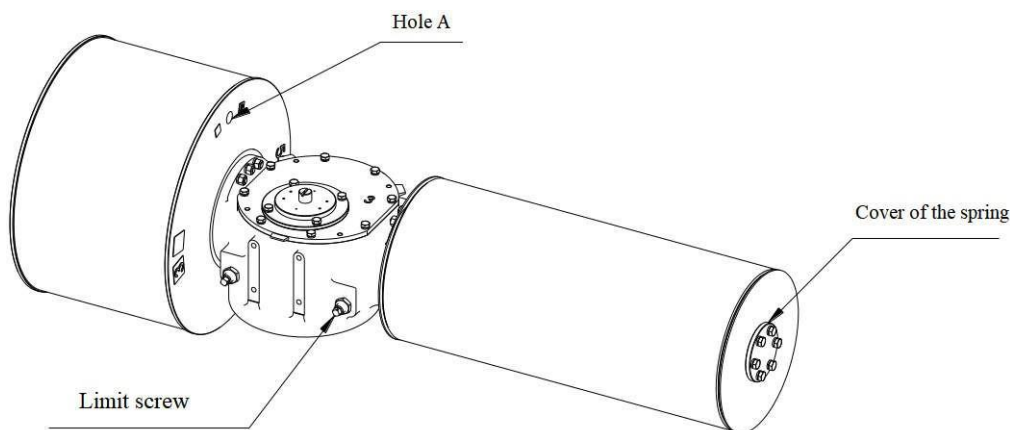


Figure 6

- 1) Venting from Inlet A to rotate the actuator at a certain angle;
- 2) Completely remove the travel stops on the side of the spring center module;
- 3) Zero the air pressure from Hole A to make the spring fully open;

- 1) Remove drive cover bolts and remove cover.

Note: Do not lose or damage the seal O-ring of the cover.

- 5) Use the special tool provided by the factory to extend into the spring module and insert into the end of the spring rod, see Figure 7; this is a female socket hex head the tool is removing

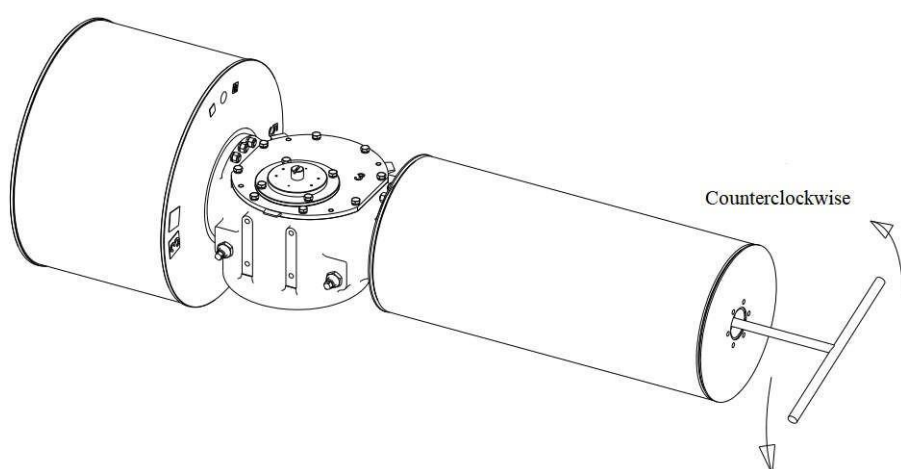


Figure 7

- 6) Rotate the special tool counterclockwise in the direction shown in Figure 7 to completely disengage the spring rod from the transmission joint. Refer to Table 6 for the number of rotations;

Table 6 Number of rotations of the spring rod

Name	Number of rotation		Name	Number of rotation
VTS1	19		VTS5	27
VTS2	19		VTS6	32
VTS3	25		VTS7	40
VTS4	22			

- 7) Take the necessary lifting measures for the spring module, refer to Figure 8. Unscrew the nut between the spring module and the drive module and remove the spring module. Note: Do not lose or damage the seal O-ring between modules.

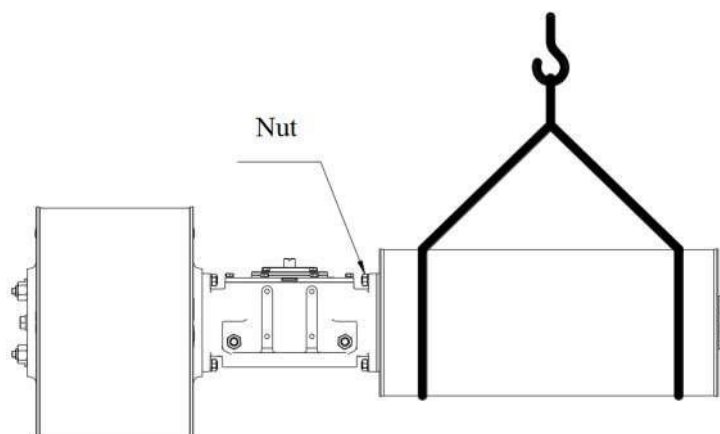


Figure 8

4.2.2 Disassembly of the cylinder

Note: (1) If the spring module is not removed, you must first perform step 1), 2), 3) in 4.2.1 to fully open the spring;
(2) Turn off the air supply;

Please follow the steps:

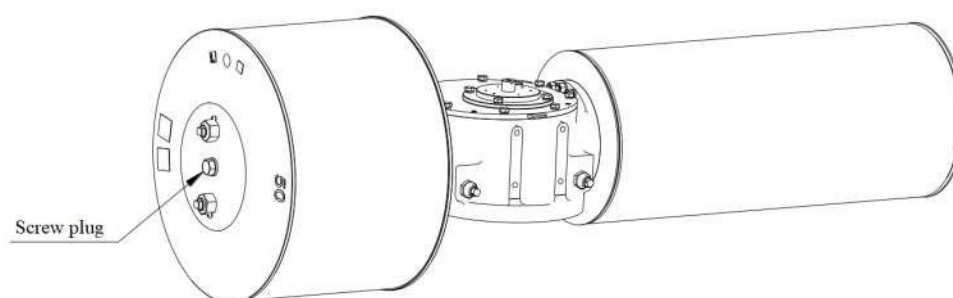


Figure 9

1) Unscrew the screw plug on the cover of the outer cylinder (see Figure 9);

Note: Do not lose or damage the seal O-ring of the plug.

2) Use the special tools provided by the factory to extend into the cylinder module and insert into the end of the piston rod, as shown in Figure 10;

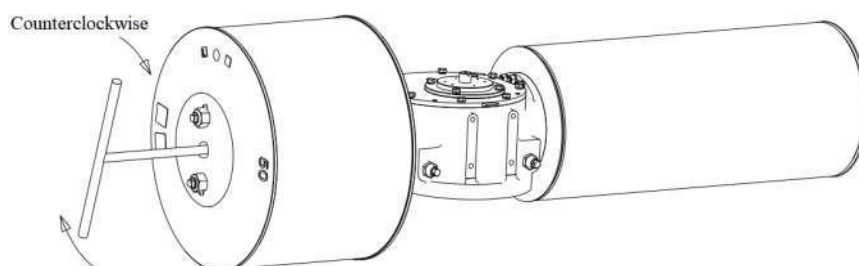


Figure 10

3) Rotate the special tool counterclockwise in the direction shown in Figure 10 to completely disengage the piston rod and the transmission joint. Refer to Table 7 for the number of rotations;

Table 7 Number of rotations of the piston rod

Model	Number of rotations		Model	Number of rotations
200 Cylinder module	19		600 Cylinder module	27
250 Cylinder module	19		700 Cylinder module	32
300 Cylinder module	19		800 Cylinder module	32
350 Cylinder module	19		900 Cylinder module	40
400 Cylinder module	25		1000 Cylinder module	40
500 Cylinder module	22			

4) At Hole A of the cylinder (see Figure 1), the air pressure is applied to move the piston to the outermost side;

5) Perform the necessary lifting measures for the cylinder module, refer to Figure 11.

Unscrew the nut between the cylinder module and the drive module and remove the cylinder module.

Note: Do not lose or damage the seal O-ring of the plug.

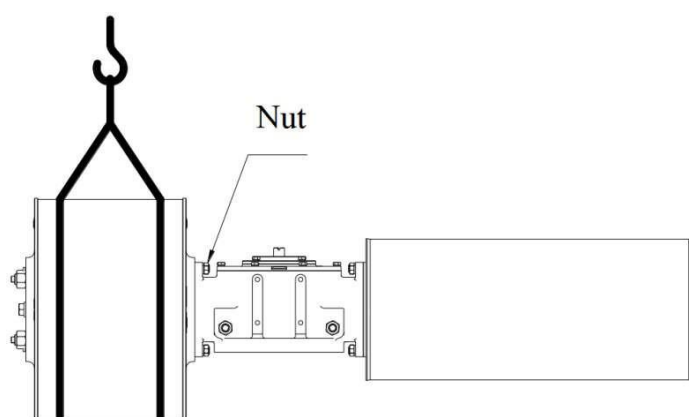


Figure 11

4.3 Installation of module

Note: Before installation

1) Due to the heavy weight of the module, please prepare the necessary lifting equipment in advance (refer to Table 5 Weight of module).

2) When the actuator works, please evaluate whether the installation will do harm to the corresponding equipment.

4.3.1 Installation of the spring

Please follow the steps:

1) Lift the cylinder module (including the O-ring between the modules) to the mounting surface of the drive module (as shown in Figure 11), and tighten the nut;

Note: Make sure the O-rings between the modules are properly installed:

2) Slowly apply air into Hole B of the cylinder (see Figure 1) to move the piston forward, so that the piston rod and the transmission joint are pre-fitted;

3) Unscrew the screw plug on the outer cylinder to vent air(see Figure 9)

Note: Do not lose or damage the seal O-ring of the plug.

4) Insert the special tool provided by the factory into the cylinder module and insert it into the end of the piston rod, as shown in Figure 12;

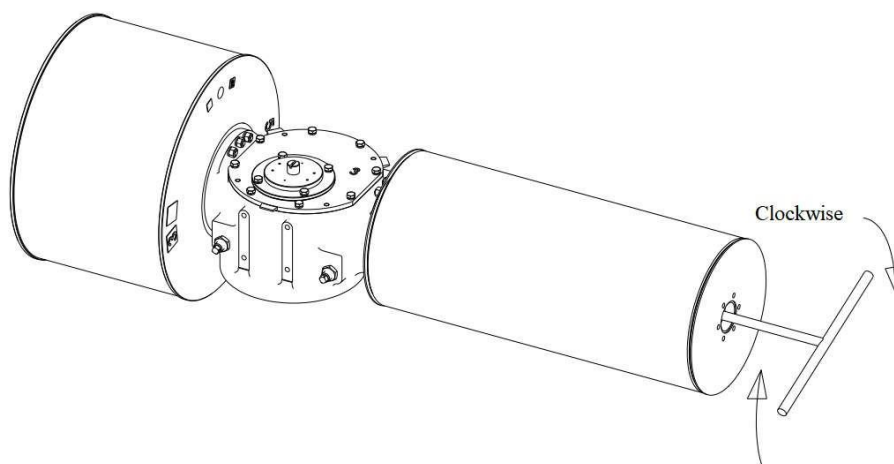


Figure 12

6) Rotate the special tool clockwise in the direction shown in Figure 12 to combine the piston rod with the transmission joint. Refer to Table 8 for the torque;

Table 8 Tightening torque of the piston rod

Model	Torque Nm		Model	Torque Nm
200 Cylinder module	90		600 Cylinder module	300
250 Cylinder module	90		700 Cylinder module	360
300 Cylinder module	90		800 Cylinder module	360
350 Cylinder module	90		900 Cylinder module	450
400 Cylinder module	130		1000 Cylinder module	450
500 Cylinder module	230			

7) Re-install the screw plug and the O-ring onto the outer cylinder;

4.3.2 Installation of the cylinder

Note: (1) Please make sure that the cylinder module is connected to the drive module, otherwise the installation will fail.

(2) Turn off the air supply of the cylinder module. Please follow the steps:

1) Lift the spring module (including the O-ring between the modules) to the mounting surface of

the drive module (as shown in Figure 8), and tighten the nut;
Note: Make sure the O-rings between the modules are properly installed;

- 2) Unscrew the fixing screw of the cover of the spring and open it
Note: Do not lose or damage the seal O-ring of the cover.

- 1) Insert the end of the spring rod with the special tool provided by the factory and push it forward to the bottom, then slowly ventilate Hole B of the cylinder (see Figure 1) to move the piston toward the side of the spring module until the special tool is extended to the outside and stop the ventilation;

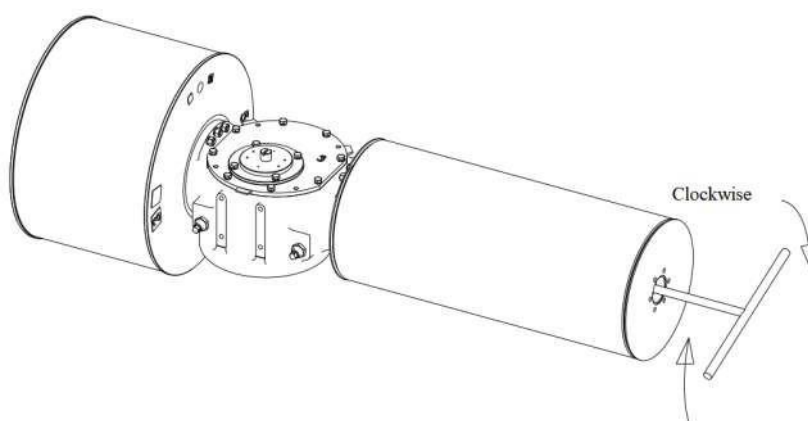


Figure 13

- 4) Rotate the special tool clockwise in the direction shown in Figure 13 to combine the spring rod with the transmission joint. Refer to Table 9 for the torque;

Table 9 Tightening torque of the piston rod

Model	Torque Nm		Model	Torque Nm
VTS1 Spring module	90		VTS5 Spring module	300
VTS2 Spring module	90		VTS6 Spring module	360
VTS3 Spring module	130		VTS7 Spring module	450
VTS4 Spring module	230			

- 5) Re-install the cover and the O-ring onto the spring module.

Notes:

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Vtek Controls, LLC • 420- H Wards Corner Rd, Cincinnati, OH 45140 • Phone: (513) 928-3630 • www.vtekcontrols.com