

# Fisher™ 785C Piston Actuators

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Figure 1. Fisher 785C Single-Acting Spring Return with Handpump



X1851

## Introduction

### Scope of Manual

This instruction manual includes installation, maintenance, and parts information for the Fisher 785C piston actuator. Refer to separate instruction manuals for information regarding other equipment and accessories used with these actuators.



Do not install, operate, or maintain 785C actuators without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand, and follow all the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your [Emerson sales office](#) before proceeding.

Table 1. Specifications

**Operating Pressure<sup>(1)</sup>**

Minimum: 2.7 barg (40 psig)

Maximum Allowable: 10.3 barg (150 psig)

Consult your [Emerson sales office](#) for supply pressures under 2.7 barg (40 psig)

**Travel<sup>(2)</sup>**

16 mm (0.625 inch) through 610 mm (24 inch)

See table 2 and 4

**Thrust Capabilities**

See table 3, 6, and 7

**Stroking Speeds**

Varies with actuator size, spring, travel, and supply pressure. If stroking speed is critical, consult your Emerson sales office.

**Piston Diameter and Area<sup>(2)</sup>**

Available diameters range from 280 to 685 mm (11 to 27 inches).

See table 2, 4, and 5

For additional sizes, contact your Emerson sales office.

**Operative Temperature Limits<sup>(3)</sup>**

Standard: -20 to 100°C (-4 to 212°F)

Low Temperature Options:

-40 to 100°C (-40 to 212°F) or

-60 to 100°C (-76 to 212°F)

High Temperature Option:

-20 to 200°C (-4 to 392°F)

**Yoke Boss and Valve Stem Diameter**

Standard: ■ 90 mm (3-9/16 inch) yoke boss with 19 mm (3/4 inch) stem ■ 127 mm (5 inch) yoke boss with 25.4 mm (1 inch) stem ■ 127 mm (5H) yoke

boss with 32 mm (1-1/4 inch) stem ■ 178 mm (7 inch) yoke boss with 51 mm (2 inch) stem

High Performance: ■ 127 mm (5H) yoke boss with 32 mm (1-1/4 inch) stem ■ 178 mm (7 inch) yoke boss with 51 mm (2 inch) stem

**Pressure Connections**

Standard: 3/4 NPT

Optional: 1 and 1-1/4 NPT

**Instrument Mounting**

Standard mounting kits are available for use with FIELDVUE DVC6200 Series digital valve controllers up to 610 mm (24 inch) travel. High performance mounting kits are available for travel above 203 mm (8 inch).

**Construction Materials<sup>(4)</sup>**

Part	Material
Cylinder	Carbon Steel
Nameplate and Travel Scale	Stainless Steel
Piston	Carbon Steel
Piston Rod	Stainless Steel
Stem Connector	Carbon Steel or Stainless Steel
Tie Rod	Carbon Steel or Stainless Steel
Upper/Lower Heads	Carbon Steel
Yoke	Carbon Steel

**Lifting Point Load Ratings**

See table 8 and figure 2

**Options**

- Top mounted handwheel
- Side mounted handpump
- Pneumatic fail mode via Fisher 377 trip valve
- Volume boosters

**Optional Certifications<sup>(5)</sup>**

- Pressure Equipment Directive (PED) 2014/68/EU and Machinery Directive 2006/42/EC
- ATEX Group II Category 2 Gas and Dust
- Customs Union Technical Regulations (CUTR) 010/2011 and 012/2011
- Safety Instrumented System, SIL 3 Capable
- Inspection Documents EN 10204 3.1 Certificate

1. The pressure/temperature limits in this bulletin and any other applicable standard or code should not be exceeded.

2. Consult your Emerson sales office for longer travels or larger cylinder diameters. The Fisher 585C family of actuators can be used for smaller travels or cylinder diameters.

3. Standard temperature -20 to 100°C (-4 to 212°F) and -40 to 100°C (-40 to 212°F) are PED 2014/68/EU and 2006/42/EC compliant. The low ambient temperature option, -60 to 100°C (-76 to 212°F) is not PED compliant. The high temperature option, if used in conjunction with ATEX, is limited to 135°C (275°F).

4. Full stainless steel constructions are available upon request.

5. Refer to the product nameplates to determine which certifications each actuator construction possesses

## Description

The 785C product lines encompass medium to large spring-return single-acting and double-acting piston actuators that provide accurate, high thrust output for short to long travel applications. These actuators are designed for use with a variety of medium to large Fisher sliding-stem control valves.

The single-acting actuators feature an internal bias spring that forces the actuator piston rod to extend or retract upon a loss of supply pressure, thereby ensuring a fail-closed or fail-open mode of operation. This effectively eliminates the need for a trip valve and volume tank in most constructions.

## Specifications

Specifications for the 785C line of piston actuators are shown in tables 1 to 8. Refer to the nameplate affixed to the actuator yoke for specifications specific to individual constructions.

## Educational Services

Emerson Automation Solutions  
Educational Services - Registration  
Phone: 1-800-338-8158  
E-mail: [education@emerson.com](mailto:education@emerson.com)  
[emerson.com/mytraining](http://emerson.com/mytraining)

## Principle of Operation

785C piston actuators utilize a pneumatically controlled piston that moves inside of a cylinder to generate thrust. A seal contained on the circumference of the piston provides a seal between the top and bottom of the cylinder, preventing supply pressure leakage.

785C single-acting or double-acting spring-return piston actuators utilize a spring below the piston (outside the pressurized chamber) that will drive the piston rod upon a loss of supply pressure. This fail action will result in forcing an attached control valve to either fail-open or fail-closed. The fail action of 785C double-acting springless piston actuators relies on pneumatic system such as system with Fisher 377 trip valve.

From an equilibrium state, the actuator operates by reacting to a force unbalance that is created by change of supply pressure on one side of the piston for single-acting, or a change of differential pressure between each side of the piston for double-acting. This moves the piston up or down, and results in a repositioning of the attached control valve. Travel can be adjusted using travel limits within a valve positioner, which limit the travel range of the actuator. The option of a hard travel stopper is also available, consult your [Emerson sales office](#) for details. The optional manual override does not have the ability to act as a hard travel stop.

An optional manual override (top mounted handwheel or side mounted handpump) is capable of extending or retracting the actuator manually and can be engaged at any position from full open to full close. The top-mounted handwheel utilizes an engagement lever that couples the handwheel and piston rod. The handpump has a hydraulic cylinder attached to the piston rod. This enables the handpump to operate the actuator manually, unless the handpump is set to bypass position.

Table 2. 785C Double-Acting Springless Standard Constructions<sup>(1)</sup>

ACTUATOR SIZE	PISTON AREA				VALVE STEM CONNECTOR SIZE		YOKE BOSS DIAMETER		MAX TRAVEL	
	Without Manual Override		With Manual Override <sup>(2)</sup>		mm	Inch	mm	Inch	mm	Inch
	cm <sup>2</sup>	Inch <sup>2</sup>	cm <sup>2</sup>	Inch <sup>2</sup>						
280	616	95	616	95	19	3/4	90	3 9/16	203	8
					25	1	127	5		
					32	1 1/4	127	5H	610	24
335	881	137	881	137	19	3/4	90	3 9/16	203	8
					25	1	127	5		
					32	1 1/4	127	5H	610	24
385	1164	180	1164	180	19	3/4	90	3 9/16	203	8
					25	1	127	5		
					32	1 1/4	127	5H	610	24
					51	2	178	7		
435	1486	230	1474	228	25	1	127	5	203	8
					32	1 1/4	127	5H	610	24
					51	2	178	7		
485	1847	286	1828	283	25	1	127	5	203	8
					32	1 1/4	127	5H	610	24
					51	2	178	7		
535	2248	348	2228	345	25	1	127	5	203	8
					32	1 1/4	127	5H	610	24
					51	2	178	7		
585	2688	417	2660	412	32	1 1/4	127	5H	610	24
					51	2	178	7		
635	3167	491	3139	487	32	1 1/4	127	5H	610	24
					51	2	178	7		
685	3685	571	3657	567	32	1 1/4	127	5H	610	24
					51	2	178	7		

1. Consult your [Emerson sales office](#) for additional sizes.

2. Actuator size 280-385 are available with a top mounted handwheel. Size 435-685 are available with a side mounted manual handpump.

3. High Performance Yoke required for ODV packages with travel greater than 8 inches. Optional for use in high vibration or fast stroke package. When ordering a high performance yoke boss you will need to order a high performance mounting kit as well.

Table 3. 785C Double-Acting Springless Available Thrust

ACTUATOR SIZE	MAXIMUM ALLOWABLE CYLINDER PRESSURE		MAXIMUM ALLOWABLE THRUST			
	barg	psig	Without Manual Override		With Manual Override <sup>(1)</sup>	
			N	lb	N	lb
280	10.3	150	63682	14316	32635	7337
335			91157	20493	46715	10502
385			120399	27067	61700	13871
435			153702	34554	78726	17698
485			191066	42953	132291	29740
535			232492	52266	132291	29740
585			277979	62492	172788	38844
635			327527	73631	172788	38844
685			381137	85683	238555	53629

1. Actuator size 280-385 are available with a top mounted handwheel. Size 435-685 are available with a manual handpump.

Table 4. 785C Single-Acting Spring Return Standard Constructions<sup>(1)</sup>

ACTUATOR SIZE	PISTON AREA								VALVE STEM CONNECTOR SIZE		YOKE BOSS DIAMETER		MAX TRAVEL	
	Without Manual Override				With Manual Override <sup>(2)</sup>									
	Rod Extends		Rod Retracts		Rod Extends		Rod Retracts							
	cm <sup>2</sup>	Inch <sup>2</sup>	cm <sup>2</sup>	Inch <sup>2</sup>	cm <sup>2</sup>	Inch <sup>2</sup>	cm <sup>2</sup>	Inch <sup>2</sup>	mm	Inch	mm	Inch	mm	Inch
335	881.4	136.6	868.9	134.7	881.4	136.6	868.9	134.7	19	3/4	90	3 9/16	203	8
									25	1	127	5		
									32	1 1/4	127	5H		
385	1164	180.4	1152	178.5	1164	180.4	1152	178.5	19	3/4	90	3 9/16	203	8
									25	1	127	5		
									32	1 1/4	127	5H	318	12
									51	2	178	7		
435	1486	230.4	1474	228.4	1474	228.4	1474	228.4	25	1	127	5	203	8
									32	1 1/4	127	5H	420	16
									51	2	178	7		
485	1847	286.4	1835	284.4	1828	283.3	1835	284.4	25	1	127	5	203	8
									32	1 1/4	127	5H	420	16
									51	2	178	7		
535	2248	348.4	2235	346.5	2228	345.4	2235	346.5	25	1	127	5	203	8
									32	1 1/4	127	5H	420	16
									51	2	178	7		
585	2688	416.6	2660	412.2	2660	412.2	2660	412.2	32	1 1/4	127	5H	420	16
									51	2	178	7		
635	3167	490.9	3139	486.5	3139	486.5	3139	486.5	32	1 1/4	127	5H	420	16
									51	2	178	7		
685	3685	571.2	3657	566.8	3657	566.8	3657	566.8	32	1 1/4	127	5H	420	16
									51	2	178	7		

1. Consult your Emerson sales office for additional sizes.

2. Actuator size 335-385 are available with a top mounted handwheel. Size 435-685 are available with a side mounted manual handpump.

Table 5. 785C Double-Acting Spring Return Standard Constructions<sup>(1)</sup>

ACTUATOR SIZE	PISTON AREA								VALVE STEM CONNECTOR SIZE		YOKE BOSS DIAMETER		MAX TRAVEL	
	Without Manual Override				With Manual Override <sup>(2)</sup>									
	Rod Extends		Rod Retracts		Rod Extends		Rod Retracts							
	cm <sup>2</sup>	Inch <sup>2</sup>	cm <sup>2</sup>	Inch <sup>2</sup>	cm <sup>2</sup>	Inch <sup>2</sup>	cm <sup>2</sup>	Inch <sup>2</sup>	mm	Inch	mm	Inch	mm	Inch
280	615.8	95.4	603.2	93.5	615.8	95.4	603.2	93.5	19	3/4	90	3 9/16	203	8
									25	1	127	5		
									32	1 1/4	127	5H		
335	881.4	136.6	868.9	134.7	881.4	136.6	868.9	134.7	19	3/4	90	3 9/16	203	8
									25	1	127	5		
									32	1 1/4	127	5H		
385	1164	180.4	1152	178.5	1164	180.4	1152	178.5	19	3/4	90	3 9/16	203	8
									25	1	127	5		
									32	1 1/4	127	5H	318	12
									51	2	178	7		
435	1486	230.4	1474	228.4	1474	228	1473	228.4	25	1	127	5	203	8
									32	1 1/4	127	5H	420	16
									51	2	178	7		
485	1847	286.4	1835	284.4	1828	283	1835	284.4	25	1	127	5	203	8
									32	1 1/4	127	5H	420	16
									51	2	178	7		
535	2248	348.4	2235	346.5	2228	345	2235	346.5	25	1	127	5	203	8
									32	1 1/4	127	5H	420	16
									51	2	178	7		
585	2688	416.6	2660	412.2	2660	412	2660	412.2	32	1 1/4	127	5H	420	16
									51	2	178	7		
635	3167	490.9	3139	486.5	3139	486.5	3139	486.5	32	1 1/4	127	5H	420	16
									51	2	178	7		

- continued -

Table 5. 785C Double-Acting Spring Return Standard Constructions<sup>(1)</sup> (continued)

ACTUATOR SIZE	PISTON AREA								VALVE STEM CONNECTOR SIZE		YOKE BOSS DIAMETER		MAX TRAVEL	
	Without Manual Override				With Manual Override <sup>(2)</sup>									
	Rod Extends		Rod Retracts		Rod Extends		Rod Retracts		mm	Inch	mm	Inch	mm	Inch
	cm <sup>2</sup>	Inch <sup>2</sup>	cm <sup>2</sup>	Inch <sup>2</sup>	cm <sup>2</sup>	Inch <sup>2</sup>	cm <sup>2</sup>	Inch <sup>2</sup>						
685	3685	571.2	3657	566.8	3657	566.8	3657	566.8	32	1 1/4	127	5H	420	16
									51	2	178	7		

1. Consult your [Emerson sales office](#) for additional sizes.  
 2. Actuator size 280-385 are available with a top mounted handwheel. Size 435-685 are available with a manual handpump.

Table 6. Handwheel Specification

ACTUATOR SIZE	OUTPUT THRUST		HANDWHEEL DIAMETER		TURNS PER mm OF TRAVEL	TURNS PER INCH OF TRAVEL	MAXIMUM RIM FORCE REQUIRED	
	N	lbs	mm	Inch			N	lbs
280	32635	7337	850	33	0.2	4.2	437	98
335	46715	10502	1200	47	0.2	4.2	435	98
385	61700	13871	1400	55	0.2	4.2	489	110

Table 7. Handpump Specification

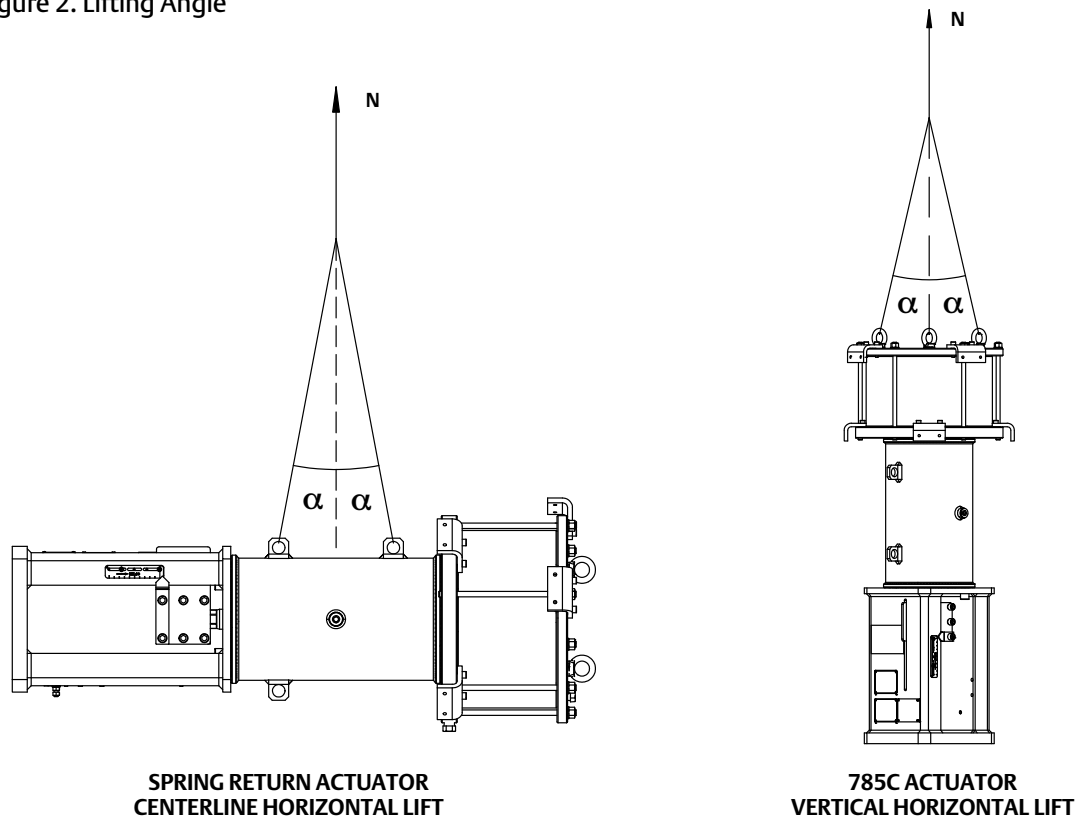
ACTUATOR SIZE	HYDRAULIC CYLINDER		OUTPUT THRUST	
	mm	Inch	N	lbf
435	135	5.3	78726	17698
485	175	6.9	132291	29740
535	175	6.9	132291	29740
585	200	7.9	172788	38844
635	200	7.9	172788	38844
685	235	9.3	238555	53629

Table 8. Lifting Point Load Ratings

ACTUATOR SIZE	LIFTING ORIENTATION	NUMBER OF LIFTING POINTS USED	MAXIMUM WELDED EYELET LOAD AT LIFTING ANGLE $\alpha \leq 20^\circ$ (SEE FIGURE 2)	
			Kg	lbs
280	Actuator Centerline Horizontal <sup>(1)</sup>	2	1572	3466
335		2	1572	3466
385		2	1572	3466
435		2	1572	3466
485		2	5697	12560
535		2	5697	12560
585		2	5697	12560
635		2	5697	12560
685		2	5697	12560
ACTUATOR SIZE	LIFTING ORIENTATION	NUMBER OF LIFTING POINTS USED	MAXIMUM LOAD AT EYEBOLT LIFTING ANGLE $\alpha \leq 45^\circ$ (SEE FIGURE 2)	
			Kg	lbs
280	Actuator Centerline Vertical <sup>(2)</sup>	4	864	1905
335		4	864	1905
385		4	864	1905
435		4	864	1905
485		4	3096	6826
535		4	3096	6826
585		4	3096	6826
635		4	3096	6826
685		4	3096	6826

1. Welded eyelets for horizontal lifting are only available for the 785C Spring Return.  
 2. Vertical lifting loads are applicable to both the 785C Springless and Spring Return.

Figure 2. Lifting Angle



## Installation

Key numbers in this procedure are shown in figures 9 to 28, unless otherwise indicated.

### **⚠ WARNING**

To avoid personal injury or property damage caused by cylinder fracture as a result of piston impact, install the stem connector securely before supplying pressure to the positioner. Use only a regulator-controlled air supply to move the actuator piston so that you can install the stem connector. Do not use the positioner to move the actuator piston before installing the stem connector.

Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury.

If installing into an existing application, also refer to the warning at the beginning of the Maintenance section in this manual.

Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

To avoid personal injury or property damage caused by bursting of pressure-retaining parts, be certain the cylinder pressure or other pressure ratings do not exceed the limits listed in table 1. Use pressure-limiting or pressure-relieving devices to prevent cylinder pressure or other pressures from exceeding these limits.

To avoid personal injury or equipment damage, use proper lifting and rigging practices while lifting the actuator or valve/actuator assembly. For all mounting procedures use an adequately sized chain, sling, hoist, or crane to handle the

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**actuator and any attached accessories and/or valve. Use caution during lifting and handling to prevent slippage, swinging, faulty equipment connections, or sudden shock loads.**

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## **NOTICE**

**Special care must be taken when installing an actuator in a horizontal service orientation. To avoid cantilever loads on the valve stem and yoke, it is the customer's responsibility to ensure proper support for a horizontal actuator.**

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The actuator may be installed in any orientation, but normal installation is with the actuator vertical above the valve.

If using a manual override in double acting application, a bypass valve should be furnished, allowing balance the pressure within both sides of the piston before operating the manual override.

If using a manual handpump, the handpump must be installed vertical above the valve (see figure 7).

If the supply source is capable of exceeding the maximum actuator operating pressure or instrument supply pressure, appropriate steps must be taken during installation to protect the instrument and all connected equipment against overpressure.

When an actuator and control valve are shipped together as a control valve assembly, the actuator is normally mounted on the valve. Follow the valve instructions when installing the valve in the pipeline. If the actuator is shipped separately or if it is necessary to mount the actuator on the valve, perform the actuator mounting procedures in this instruction manual. Refer to the individual product instruction manuals for the installation or mounting of a FIELDVUE DVC6200 digital valve controller.

If the actuator is being installed without a positioner, the cylinder loading pressures should be supplied through a 4-way solenoid valve or a switching valve.

Pressure connections are located on top of the pneumatic cylinder end flange (key 2210) and on the side of the pneumatic cylinder head flange (key 2201).

- The supply pressure medium should be clean, dry filtered air. If the supply source is capable of exceeding the maximum actuator operating pressure or positioner supply pressure, appropriate steps must be taken during installation to protect the positioner and all connected equipment against over pressurization.
- The control valve should be located where it will be accessible for servicing. Space should be left above and below the control valve to permit removal of the actuator and valve plug.

## Actuator Earth Grounding

All Fisher 785C series actuators are provided with a threaded actuator earth grounding interface on the yoke (spool) for the earth connection as shown in the figure 3.

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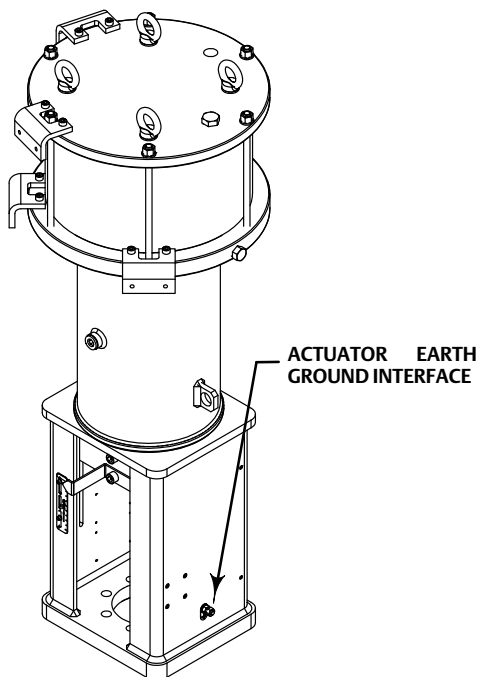
### **Note**

Proper connection to the earth grounding interface is required for compliance with ATEX regulations.

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Figure 3. Actuator Earth Grounding Interface



## Three-Way Valve Applications Note

In three-way valve applications where the actuator fully strokes at a frequency of once per minute or faster, and the stroking speed is rapid (less than 0.5 seconds per stroke), there is a possibility that the stem can fracture at the plug if the actuator cylinder pressure is greater than 5.5 bar (80 psig). This can cause loss of control of process fluid and further damage to the actuator. Considerations should be given to the use of high-strength, fatigue-resistant stem materials in these applications.

### **⚠ WARNING**

**To avoid loss of control of process fluid and subsequent personal injury or property damage caused by bursting of pressure-retaining parts, be sure the cylinder pressure does not exceed 5.5 bar (80 psig) in high cycle-rate, fast stroking speed, three-way valve applications.**

## Manual Override

The actuator can be equipped with a manual override. The manual override can be executed with a Manual Handwheel or a Manual Hydraulic Pump which can operate the actuator.

## Manual Handwheel Operation

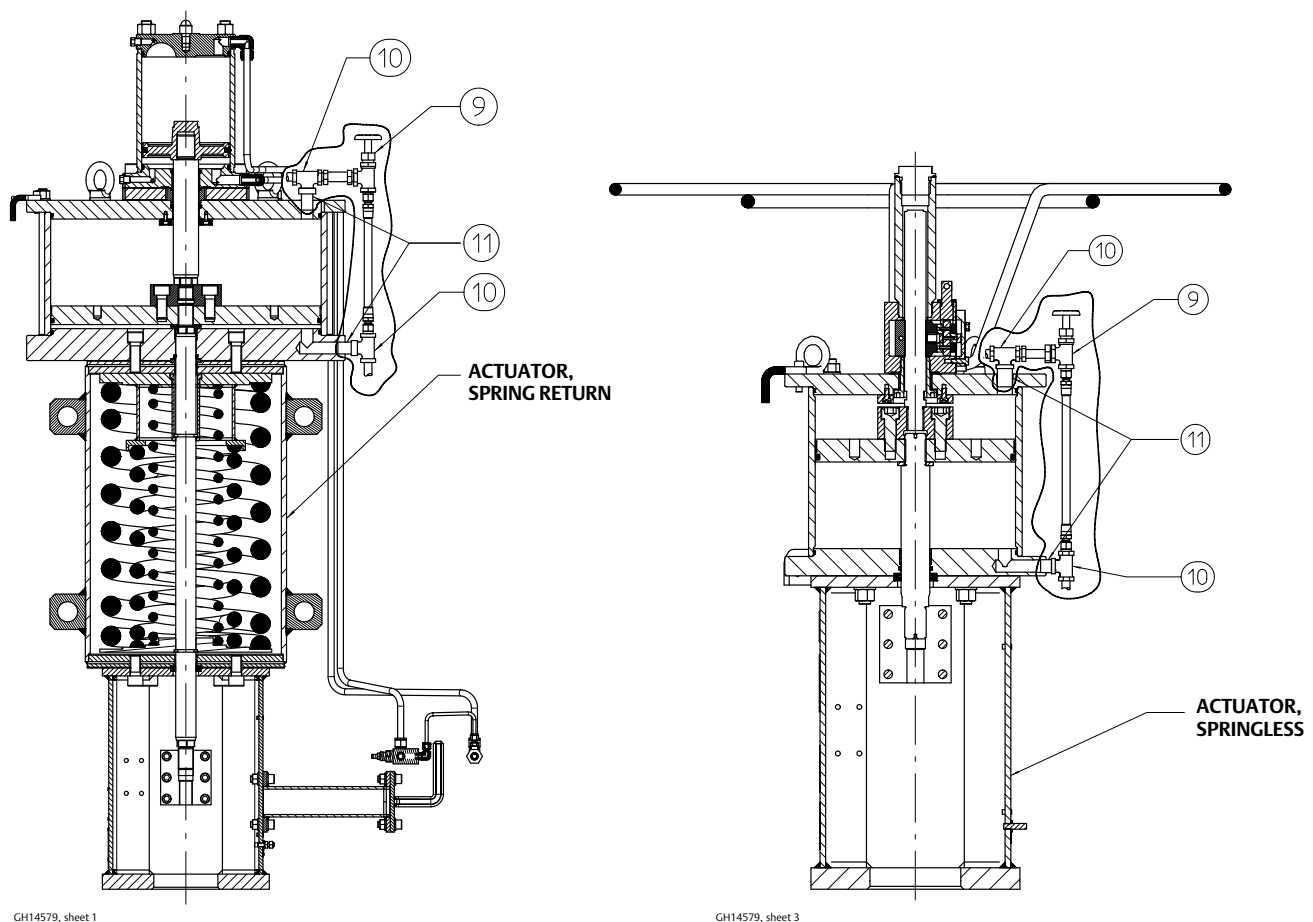
If manual operation is required for actuator sizes 280, 335, and 385 a manual handwheel should be equipped as standard construction.

### NOTICE

To avoid damage to actuator parts and difficult operation of actuator handwheels, open the bypass valve before using a handwheel. Do not disengage the handwheel if the spring thrust is not balanced by pneumatic load for spring return actuator.

A bypass assembly is furnished only when an actuator with manual override is specified, see figure 4. The bypass assembly allows the pressure to equalize on either side of the actuator piston, so that the manual override can be used to position the control valve. Flow through the bypass tubing is controlled by an angle needle valve, which is operated manually. This valve should be closed when air pressure is being used to operate the actuator.

Figure 4. Bypass Valve Examples for Double-Acting 785C Actuator with Manual Override



The following steps reference figure 5 and 6. Refer to table 6 for handwheel specifications.

Figure 5. Top Mounted Manual Handwheel

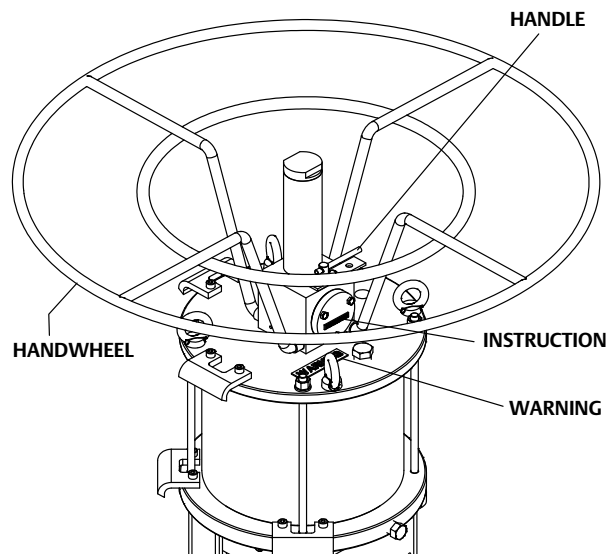
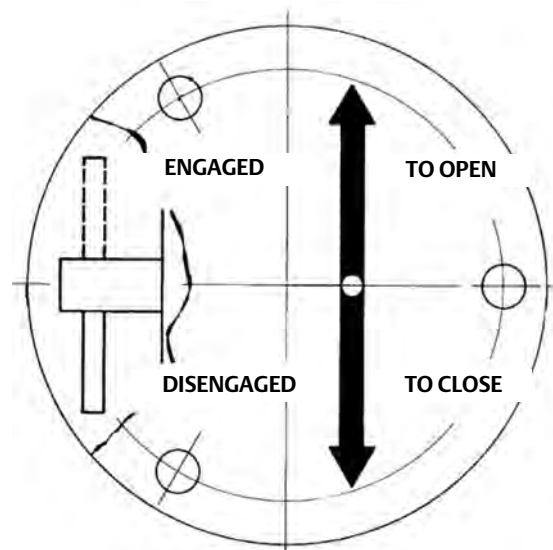


Figure 6. Top Mounted Manual Handwheel Engagement/Disengagement Instruction Label



1. Engage the manual override by rotating its handle, reference figure 5. Note that there is only one position (at 360° rotation of the handwheel) where the handle will correctly engage the manual operation. To reach that position during the rotation of the handle, slowly rotate the handwheel until the correct position, as indicated on the warning plate shown in figure 5.
2. Turn the handwheel of the manual override clockwise to close, or counterclockwise to open, as indicated on the instruction label shown in figure 6.
3. Check the correct operation of the actuator by monitoring the movement of the travel indicator.
4. Once manual operation is completed, the bypass valve should be close and remain shut off during pneumatic supply air operation.
5. Ensure the unbalanced thrust, such as spring return actuator spring thrust, is balanced by applying a pneumatic load and disengage the manual handwheel by rotating the handle as shown on the instruction plate. This allows the actuator to be operated by the pneumatic supply.

If it is necessary to keep the valve in its position and if the pneumatic supply is not restored yet, do not disengage the handwheel.

For spring return actuator, if it is not necessary to keep the valve in its position and if the pneumatic supply is not restored yet, in order to disengage the handwheel, turn the handwheel to the end which spring would fully release without applying any thrust to the handwheel, to get an easy disengagement of the handwheel.

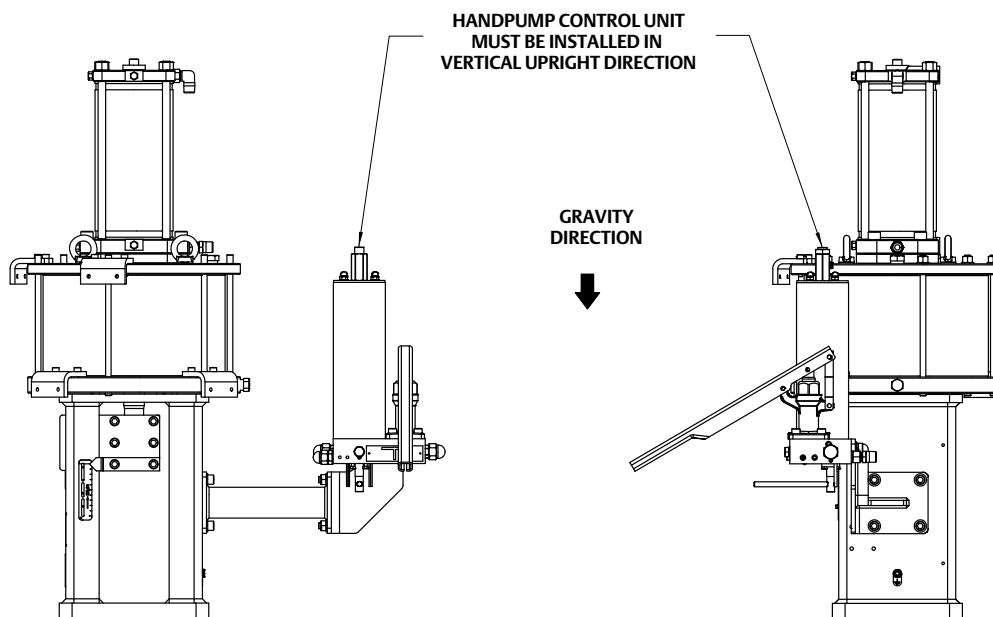
## Manual Hydraulic Handpump Operation

If manual operation is required, actuator sizes 435, 485, 535, 585, 635, and 685 should be equipped with a manual handpump as standard construction.

### Note

The manual handpump control unit must be installed in vertical up direction per figure 7. For application requiring actuator horizontal installation, a special design handpump support and hydraulic tubing must be used to install handpump in vertical up direction per figure 7. Contact your Emerson sales office for further information of manual handpump for actuator horizontal installation.

Figure 7. Handpump Orientation



GH15114 sheet 1

A bypass assembly is furnished only when an actuator with manual override is specified. The bypass assembly allows the pressure to equalize on either side of the actuator piston, so that the manual override can be used to position the control valve. Flow through the bypass tubing is controlled by an angle needle valve, which is operated manually. This valve should be closed when supply pressure is being used to operate the actuator.

The following steps are referenced in figures 8, 9, and 10. Refer to table 7 for handpump specifications and figures 11 through 17 for handpump schematics and more detail instructions.

1. Select “Manual Opening” or “Manual Closing” by rotating the Engagement/Disengagement handle as indicated on the instruction plate from pneumatic operation “REMOTE” mode.
2. Actuate the handpump according to figure 11 through 17 handpump schematic detail instructions until the desired position of the actuator is reached.
3. Check the correct operation of the actuator through the visual travel indicator.

4. Once manual operation is completed, rotate the handle to the “REMOTE” position, as indicated on the instruction plate in figure 8, to disengage the manual operator. Follow figure 11 through 17 handpump schematic detail instructions to allow the “REMOTE “operation with the pneumatic supply. Once manual operation is completed, the bypass valve should be close and remain shutoff during pneumatic supply air operation.

Figure 8. Manual Hydraulic Handpump Engagement/Disengagement Instructions Plate

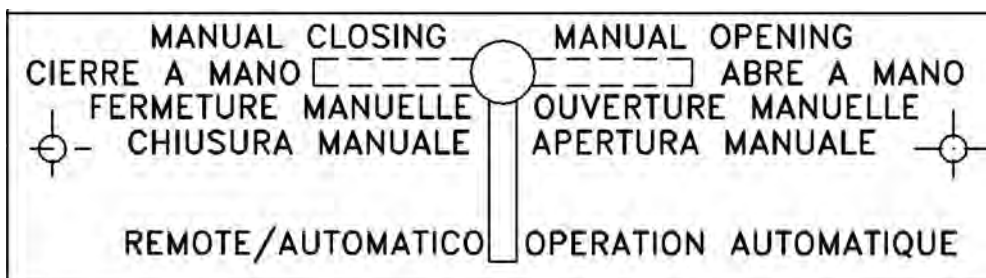


Figure 9. Manual Hydraulic Handpump Typical Constructions  
(Design Varies for Different Actuator Type and Handpump Type)

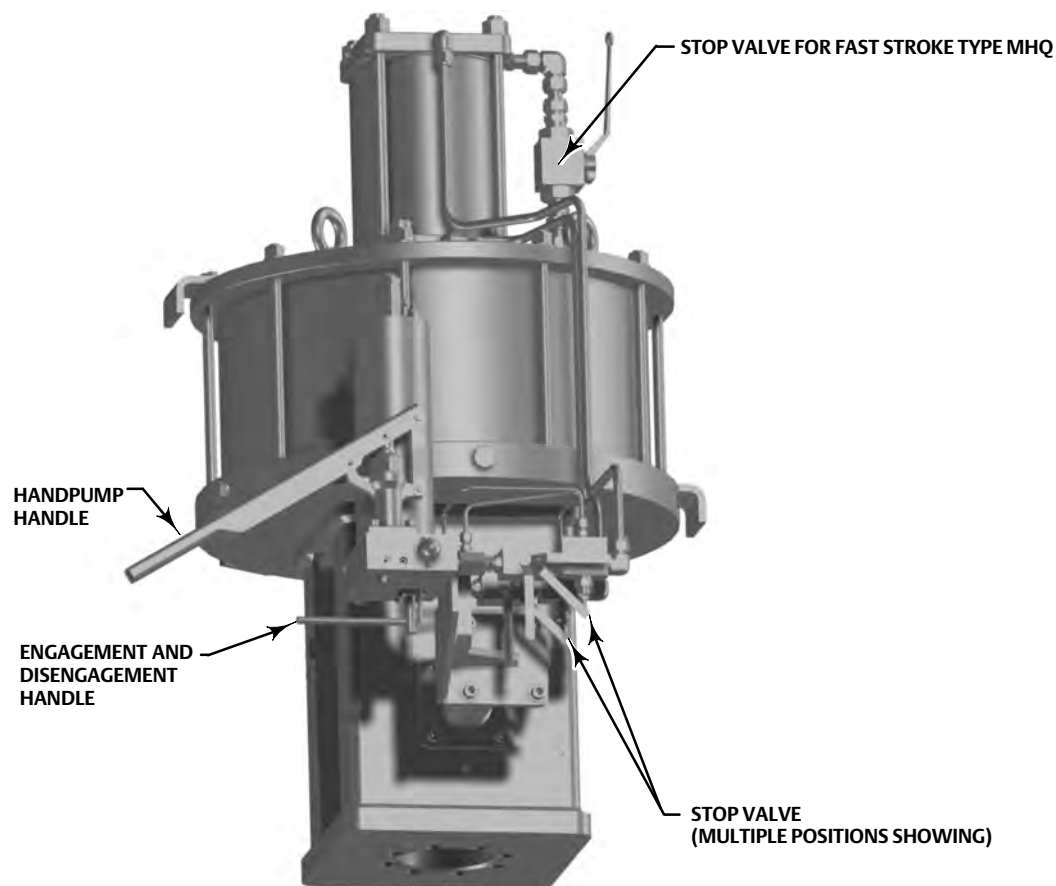


Figure 10. Manual Hydraulic Handpump Typical Constructions  
(Design Varies for Different Actuator Type and Handpump Type)

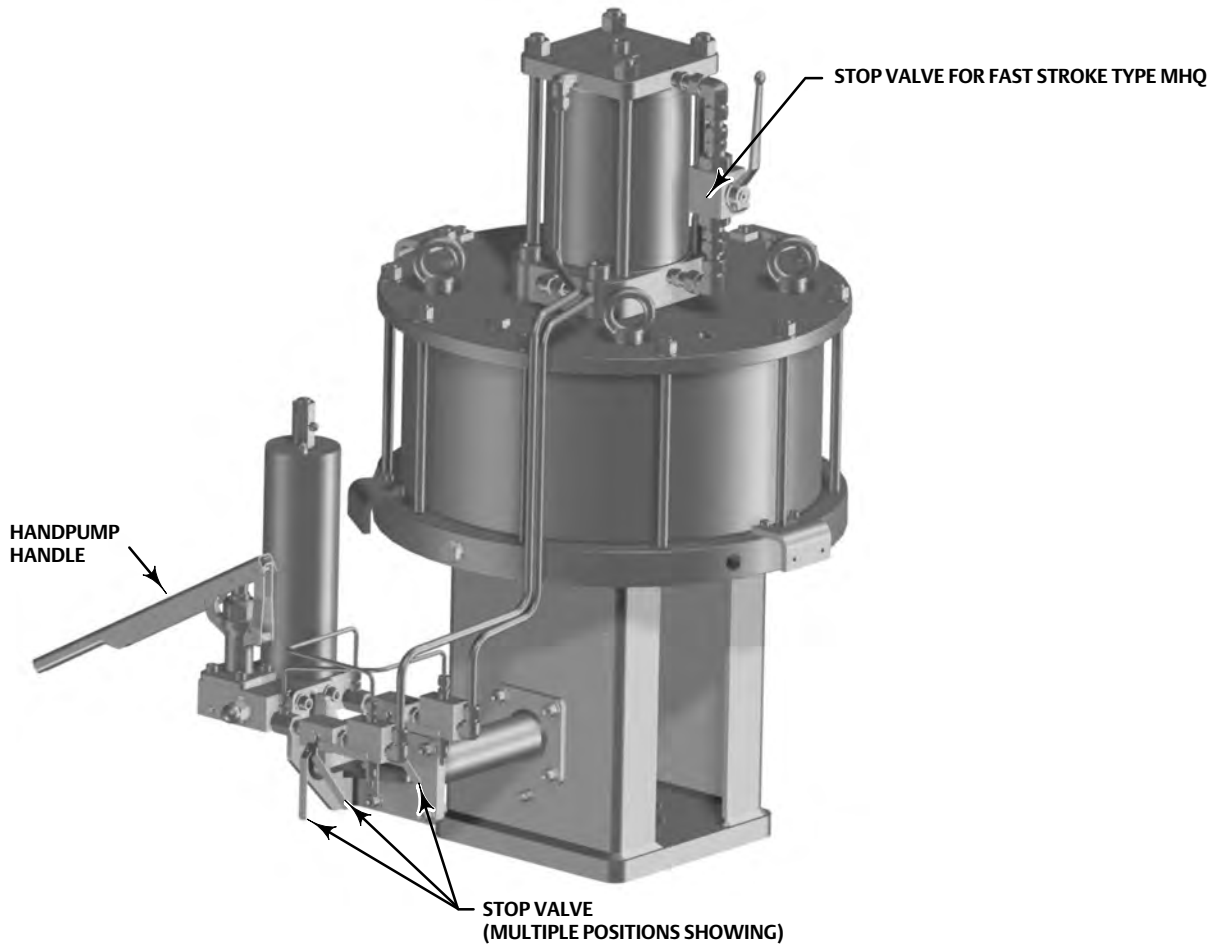
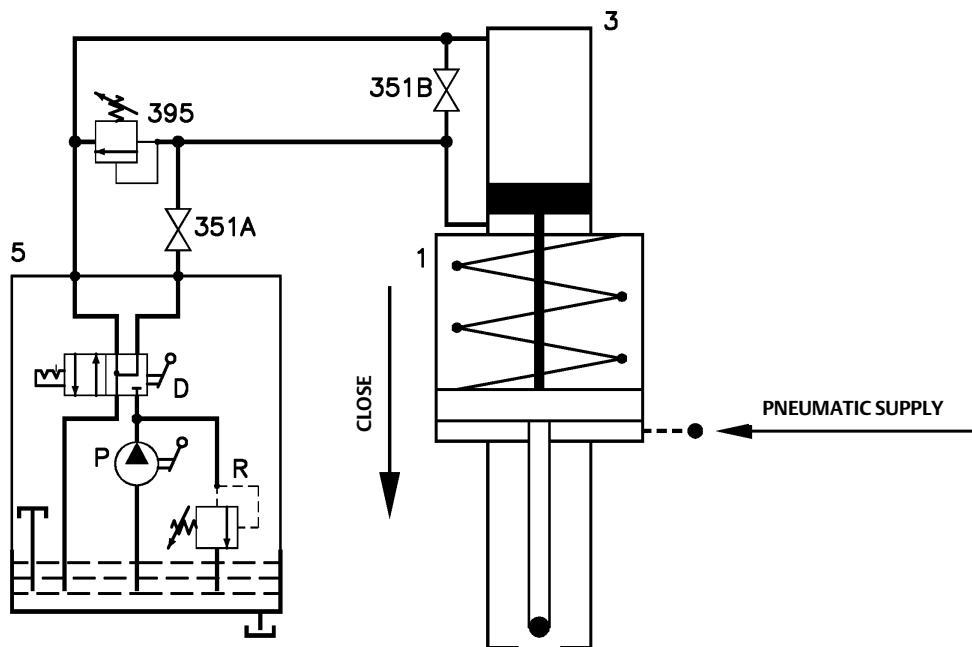


Table 9. Handpump Schematics<sup>(1)</sup>

Actuator Type	Handpump Type	Schematics Figure
785C Spring Return Rod Extend (Fail Down) Single- or Double-Acting	Fast Stroke MHQ	11
	Standard Stroke MHP	12
785C Spring Return Rod Extend (Fail Up) Single- or Double-Acting	Fast Stroke MHQ	13
	Standard Stroke MHP	14
785C Springless, Double-Acting	Standard Stroke MHP	15
	Fast Stroke MHQ	16 or 17

1. Notice the 785C Spring Return schematics drawn as single-acting would also work for double-acting.

Figure 11. Handpump Schematic: Fast Stroke MHQ Handpump for 785C Spring Return Rod Extend (Fail Down), Single- or Double-Acting



PNEUMATIC REMOTE CONTROL TO OPEN  
PRESSURIZED PERMANENTLY THE PNEUMATIC SUPPLY LINE.

PNEUMATIC REMOTE CONTROL TO CLOSE  
DE-PRESSURIZED THE PNEUMATIC SUPPLY LINE.

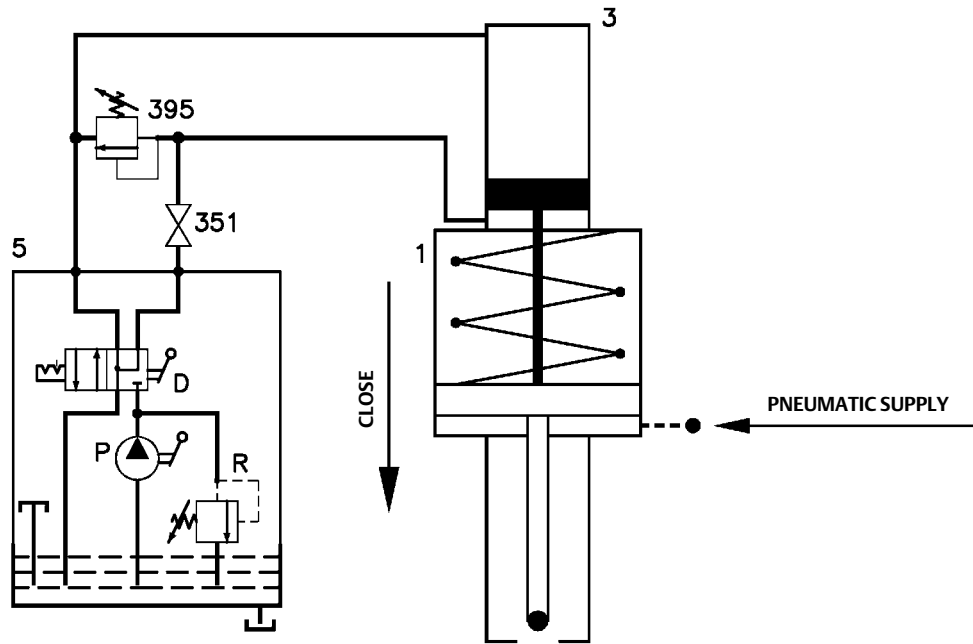
EMERGENCY MANUAL OPERATION

IN CASE OF PNEUMATIC SUPPLY FAILURE, CLOSE THE STOP VALVE 351B, SELECT BY THE VALVE "5-D" THE OPENING OPERATION AND ACTUATE THE HAND PUMP "5-P".

AT THE END OF THE OPENING OPERATION CLOSE THE VALVE 351A. NOTE: THE VALVE "5-D" MUST BE IN "REMOTE CONTROL" POSITION AND THE STOP VALVES 351A AND 351B MUST BE OPEN TO ALLOW THE OPERATION WITH PNEUMATIC SUPPLY.

- 1 SINGLE-ACTING SPRING RETURN PNEUMATIC LINEAR ACTUATOR
- 3 HYDRAULIC CYLINDER
- 5 MANUAL OVERRIDE
  - R — RELIEF VALVE
  - P — HAND PUMP
  - D — HAND OPERATED DIRECTIONAL CONTROL VALVE
- 351 STOP VALVE
- 395 RELIEF VALVE

Figure 12. Handpump Schematic: Standard Stroke MHP Handpump for 785C Spring Return Rod Extend (Fail Down), Single- or Double-Acting



PNEUMATIC REMOTE CONTROL TO OPEN  
PRESSURIZED PERMANENTLY THE PNEUMATIC SUPPLY LINE.

PNEUMATIC REMOTE CONTROL TO CLOSE  
DE-PRESSURIZED THE PNEUMATIC SUPPLY LINE.

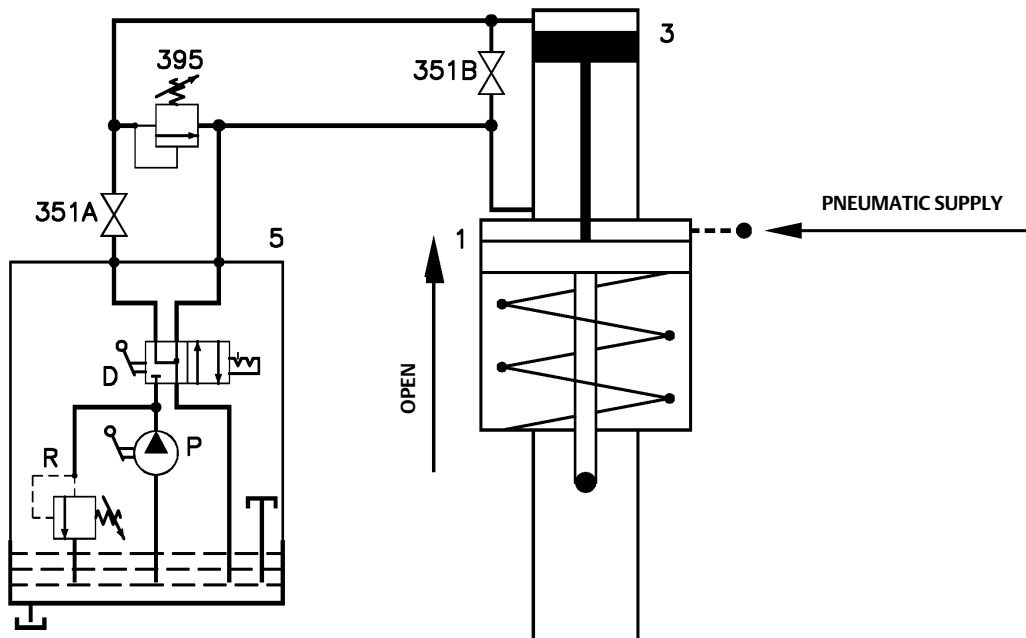
EMERGENCY MANUAL OPERATION

IN CASE OF PNEUMATIC SUPPLY FAILURE, SELECT BY THE VALVE "5-D" THE OPENING OPERATION AND ACTUATE THE HAND PUMP "5-P". AT THE END OF THE OPENING OPERATION CLOSE THE VALVE 351. NOTE: THE VALVE "5-D" MUST BE IN "REMOTE CONTROL" POSITION AND THE STOP VALVES 351 AND MUST BE OPEN TO ALLOW THE OPERATION WITH PNEUMATIC SUPPLY.

- 1 SINGLE-ACTING SPRING RETURN PNEUMATIC LINEAR ACTUATOR
- 3 HYDRAULIC CYLINDER
- 5 MANUAL OVERRIDE
  - R — RELIEF VALVE
  - P — HAND PUMP
  - D — HAND OPERATED DIRECTIONAL CONTROL VALVE
- 351 STOP VALVE
- 395 RELIEF VALVE



Figure 13. Handpump Schematic: Fast Stroke MHQ Handpump for 785C Spring Return Rod Retract (Fail Up), Single- or Double-Acting



PNEUMATIC REMOTE CONTROL TO CLOSE  
PRESSURIZED PERMANENTLY THE PNEUMATIC SUPPLY LINE.

PNEUMATIC REMOTE CONTROL TO OPEN  
DE-PRESSURIZED THE PNEUMATIC SUPPLY LINE.

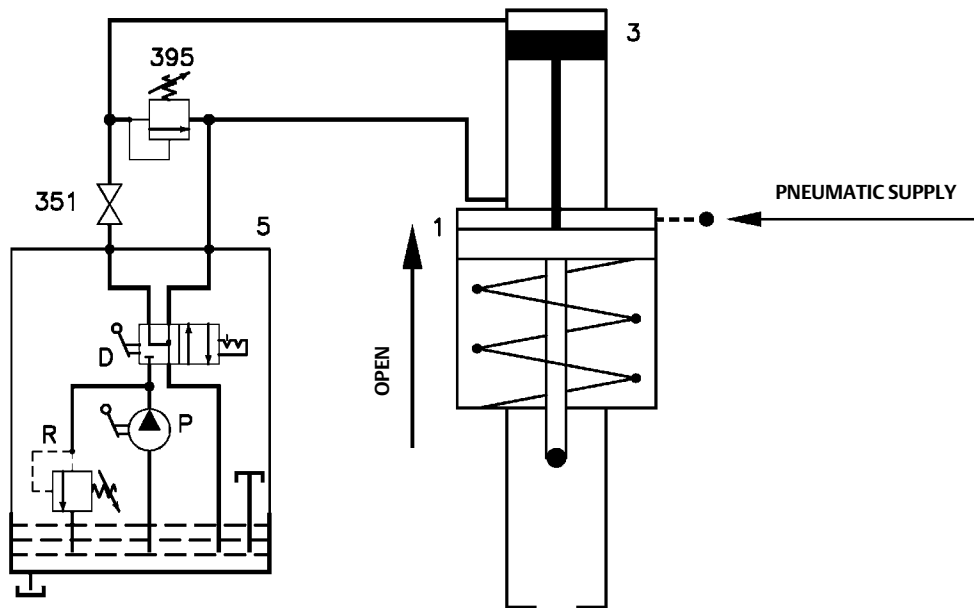
EMERGENCY MANUAL OPERATION

IN CASE OF PNEUMATIC SUPPLY FAILURE, CLOSE THE STOP VALVE 351B, SELECT BY THE VALVE "5-D" THE CLOSING OPERATION AND ACTUATE THE HAND PUMP "5-P".

AT THE END OF THE CLOSING OPERATION CLOSE THE VALVE 351A. NOTE: THE VALVE "5-D" MUST BE IN "REMOTE CONTROL" POSITION AND THE STOP VALVES 351A AND 351B MUST BE OPEN TO ALLOW THE OPERATION WITH PNEUMATIC SUPPLY.

- 1 SINGLE-ACTING SPRING RETURN PNEUMATIC LINEAR ACTUATOR
- 3 HYDRAULIC CYLINDER
- 5 MANUAL OVERRIDE
  - R - RELIEF VALVE
  - P - HAND PUMP
  - D - HAND OPERATED DIRECTIONAL CONTROL VALVE
- 351 STOP VALVE
- 395 RELIEF VALVE

Figure 14. Handpump Schematic: Standard Stroke MHP Handpump for 785C Spring Return Rod Retract (Fail Up), Single-or Double-Acting



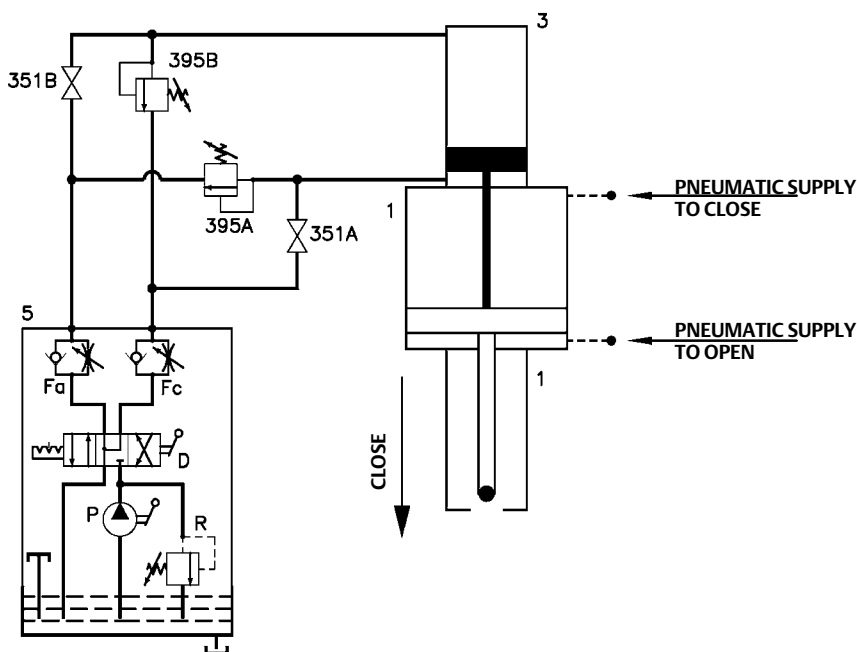
PNEUMATIC REMOTE CONTROL TO CLOSE  
PRESSURIZED PERMANENTLY THE PNEUMATIC SUPPLY LINE.

PNEUMATIC REMOTE CONTROL TO OPEN  
DE-PRESSURIZED THE PNEUMATIC SUPPLY LINE.

EMERGENCY MANUAL OPERATION  
IN CASE OF PNEUMATIC SUPPLY FAILURE, SELECT BY THE VALVE "5-D"  
THE CLOSING OPERATION AND ACTUATE THE HAND PUMP "5-P".  
AT THE END OF THE CLOSING OPERATION CLOSE THE VALVE 351.  
NOTE: THE VALVE "5-D" MUST BE IN "REMOTE CONTROL" POSITION  
AND THE STOP VALVES 351 MUST BE OPEN TO ALLOW THE OPERATION  
WITH PNEUMATIC SUPPLY.

- 1 SINGLE-ACTING SPRING RETURN PNEUMATIC LINEAR ACTUATOR
- 3 HYDRAULIC CYLINDER
- 5 MANUAL OVERRIDE
  - R — RELIEF VALVE
  - P — HAND PUMP
  - D — HAND OPERATED DIRECTIONAL CONTROL VALVE
- 351 STOP VALVE
- 395 RELIEF VALVE

Figure 15. Handpump Schematic: Standard Stroke MHP Handpump for 785C Springless Double-Acting



PNEUMATIC REMOTE CONTROL TO OPEN  
 PRESSURIZE THE OPENING PNEUMATIC SUPPLY LINE.  
 THE OPENING TIME IS ADJUSTABLE BY THE FLOW REGULATOR 5-Fa.

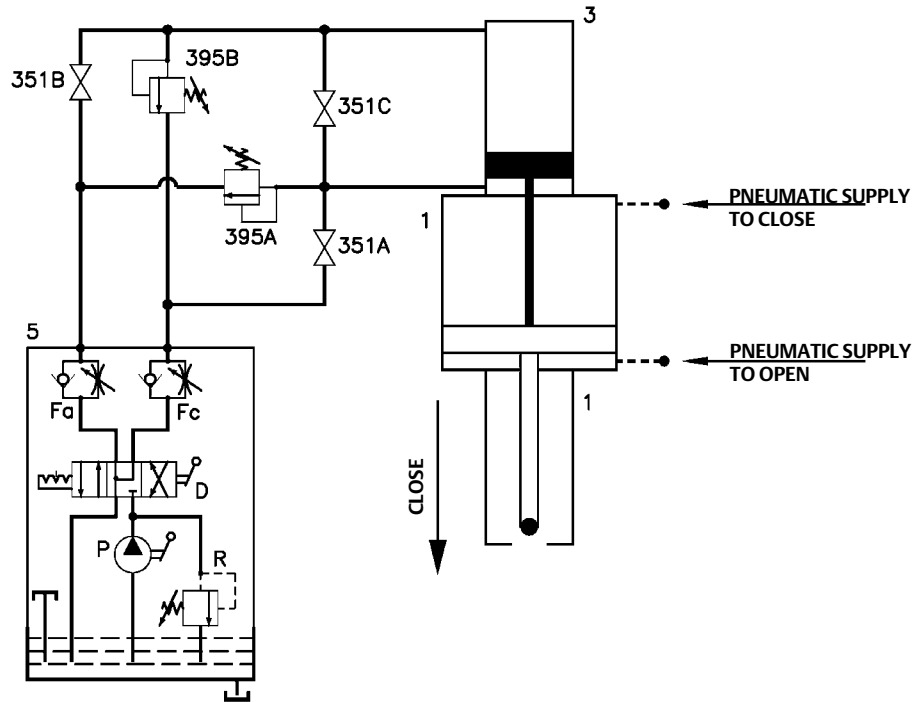
PNEUMATIC REMOTE CONTROL TO CLOSE  
 PRESSURIZE THE OPENING PNEUMATIC SUPPLY LINE.  
 THE CLOSING TIME IS ADJUSTABLE BY THE FLOW REGULATOR 5-Fc.

EMERGENCY MANUAL OPERATION

DE-PRESSURIZE BOTH PNEUMATIC SUPPLY LINE AND OPEN BOTH STOP VALVES 351A/B.  
 SELECT BY THE VALVE "D" THE OPENING OR CLOSING OPERATION AND ACTUATE THE HAND PUMP "P".  
 CLOSE THE STOP VALVE 351A TO KEEP THE ACTUATOR IN OPEN POSITION OR CLOSE THE STOP VALVE 351B TO KEEP THE ACTUATOR IN CLOSED POSITION.  
 NOTE: THE VALVE "D" MUST BE IN "REMOTE CONTROL" POSITION AND THE STOP VALVES 351A AND 351B MUST BE OPEN TO ALLOW THE OPERATION WITH GAS SUPPLY.

- |     |   |
|-----|---|
| 1   | DOUBLE-ACTING PNEUMATIC LINEAR ACTUATOR           |
| 3   | HYDRAULIC CYLINDER                                |
| 5   | MANUAL OVERRIDE                                   |
| R   | RELIEF VALVE                                      |
| P   | HAND PUMP   |
| D   | HAND OPERATED DIRECTIONAL CONTROL VALVE           |
| Fa  | UNIDIRECTIONAL FLOW REGULATOR (OPENING OPERATION) |
| Fc  | UNIDIRECTIONAL FLOW REGULATOR (CLOSING OPERATION) |
| 351 | STOP VALVE  |
| 395 | RELIEF VALVE                                      |

Figure 16. Handpump Schematic: Fast Stroke MHQ Handpump Type 1 for 785C Springless Double-Acting



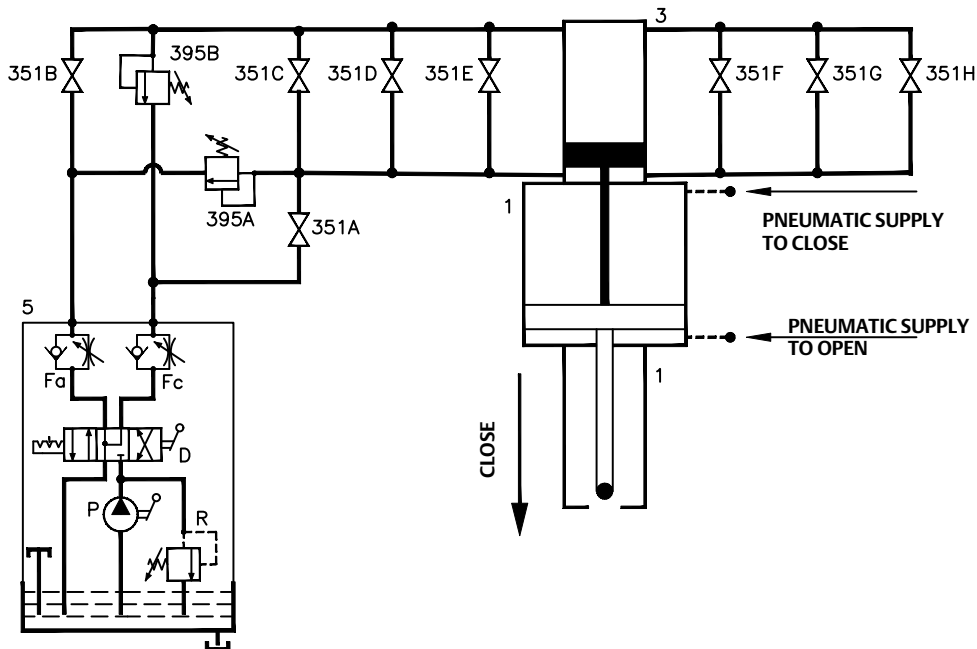
PNEUMATIC REMOTE CONTROL TO OPEN  
 PRESSURIZE THE OPENING PNEUMATIC SUPPLY LINE.  
 THE OPENING TIME IS ADJUSTABLE BY THE FLOW REGULATOR 5-Fa.

PNEUMATIC REMOTE CONTROL TO CLOSE  
 PRESSURIZE THE OPENING PNEUMATIC SUPPLY LINE.  
 THE CLOSING TIME IS ADJUSTABLE BY THE FLOW REGULATOR 5-Fc.

EMERGENCY MANUAL OPERATION  
 DE-PRESSURIZE BOTH PNEUMATIC SUPPLY LINE AND OPEN BOTH STOP VALVES 351C AND OPEN BOTH STOP VALVES 351A/B. SELECT BY THE VALVE "D" THE OPENING OR CLOSING OPERATION AND ACTUATE THE HAND PUMP "P".  
 CLOSE THE STOP VALVE 351A TO KEEP THE ACTUATOR IN OPEN POSITION OR CLOSE THE STOP VALVE 351B TO KEEP THE ACTUATOR IN CLOSED POSITION.  
 NOTE: THE VALVE "D" MUST BE IN "REMOTE CONTROL" POSITION AND THE STOP VALVES 351 MUST BE OPEN TO ALLOW THE OPERATION WITH GAS SUPPLY.

- |     |  |
|-----|--|
| 1   | DOUBLE-ACTING PNEUMATIC LINEAR ACTUATOR                |
| 3   | HYDRAULIC CYLINDER                                     |
| 5   | MANUAL OVERRIDE  |
|     | R — RELIEF VALVE                                       |
|     | P — HAND PUMP  |
|     | D — HAND OPERATED DIRECTIONAL CONTROL VALVE            |
|     | Fa — UNIDIRECTIONAL FLOW REGULATOR (OPENING OPERATION) |
|     | Fc — UNIDIRECTIONAL FLOW REGULATOR (CLOSING OPERATION) |
| 351 | STOP VALVE   |
| 395 | RELIEF VALVE   |

Figure 17. Handpump Schematic: Fast Stroke MHQ Handpump Type 2 for 785C Springless Double-Acting



PNEUMATIC REMOTE CONTROL TO OPEN  
 PRESSURIZE THE OPENING PNEUMATIC SUPPLY LINE.  
 THE OPENING TIME IS ADJUSTABLE BY THE FLOW REGULATOR 5-Fa.

PNEUMATIC REMOTE CONTROL TO CLOSE  
 PRESSURIZE THE CLOSING PNEUMATIC SUPPLY LINE.  
 THE CLOSING TIME IS ADJUSTABLE BY THE FLOW REGULATOR 5-Fc.

EMERGENCY MANUAL OPERATION  
 DE-PRESSURIZE BOTH PNEUMATIC SUPPLY LINE, OPEN BOTH  
 STOP VALVES 351A/B AND CLOSE THE STOP VALVES 351C/D/E/F/G/H.  
 SELECT BY THE VALVE "D" THE OPENING OR CLOSING OPERATION  
 AND ACTUATE THE HAND PUMP "P".  
 CLOSE THE STOP VALVE 351A TO KEEP THE ACTUATOR IN OPEN  
 POSITION OR CLOSE THE STOP VALVE 351B TO KEEP THE  
 ACTUATOR IN CLOSED POSITION.  
 NOTE: THE VALVE "D" MUST BE IN "REMOTE CONTROL" POSITION  
 AND THE STOP VALVES 351 MUST BE OPEN TO ALLOW THE  
 OPERATION WITH GAS SUPPLY.

- |     |  |
|-----|--|
| 1   | DOUBLE-ACTING PNEUMATIC LINEAR ACTUATOR                |
| 3   | HYDRAULIC CYLINDER                                     |
| 5   | MANUAL OVERRIDE  |
|     | R — RELIEF VALVE                                       |
|     | P — HAND PUMP  |
|     | D — HAND OPERATED DIRECTIONAL CONTROL VALVE            |
|     | Fa — UNIDIRECTIONAL FLOW REGULATOR (OPENING OPERATION) |
|     | Fc — UNIDIRECTIONAL FLOW REGULATOR (CLOSING OPERATION) |
| 351 | STOP VALVE   |
| 395 | RELIEF VALVE   |

## Actuator Mounting

The following procedure describes how to mount a 785C actuator on a push down to close valve so that the piston rod to valve plug stem connection allows full travel and proper shutoff. Key numbers referenced in the following steps are shown in figures 24 through 38 and 48. If you purchase a 785C actuator for field installation on a control valve, mount the actuator on the valve and secure it to the bonnet with the bonnet-to-actuator bolts. The stem connection should then be made up to clamp the actuator stem and valve plug stem together to provide proper valve travel.

### **⚠ WARNING**

**When moving the piston rod with loading pressure applied, exercise caution to keep hands and tools out of the piston rod travel path. If the loading pressure is accidentally disconnected, personal injury and property damage is possible if something is caught between the piston rod and other control valve parts.**

### **NOTICE**

**The 785C spring extend actuator spring load will force the piston rod to extend out of the cylinder, and it can come into contact with the valve stem during actuator mounting.**

**If the valve stem is allowed to remain in the up position (towards the actuator) during mounting, it can interfere with the actuator mounting, possibly damage valve stem threads or bend the valve stem. Be sure the valve stem is pushed down (into the valve body), away from the actuator while mounting.**

**To avoid damaging the valve plug seating surfaces, do not rotate the valve plug while it is seated. Also avoid damage to the valve plug stem by careful use of tools during travel adjustment.**

1. Using the given lifting eye bolts (key 2215), hoist the actuator vertically oriented. Slowly lower it over the valve taking care not to contact the stem in manner that could cause damage.
2. Once the actuator is seated on the bonnet yoke, install the studs through the yoke mounting plate. Install the nuts and tighten to the appropriate torque as specified in the applicable valve instruction manual.

### **⚠ CAUTION**

**Before pressurizing the cylinder, ensure the plastic plugs are removed from the pneumatic cylinder and replaced with appropriate metal plugs or other pressure-retaining devices.**

3. Starting with the piston (key 2206) at the top of the pneumatic cylinder, manually, or with air pressure, extend the piston rod (key 2350 or 2402) to the specified valve travel.
4. With the valve plug on the seat, attach the valve stem connector (key 4301) by inserting the socket head cap screws (key 4302), clamping the piston rod (key 2350) to the valve stem. Make sure to attach the travel indicator (key 5000) and anti-rotator plate (key 4850) if supplied. Confirm proper operation and check travel, travel indicator adjustment, etc. before placing the actuator into operation.

## Maintenance

Actuator parts are subject to normal wear and must be inspected and replaced when necessary. The frequency of inspection and replacement depends on the severity of service conditions.

### **⚠ WARNING**

**Avoid personal injury and property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance operations:**

- Do not remove the actuator from the valve while the valve is still pressurized.
- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure on both sides of the valve. Drain the process media from both sides of the valve.
- Vent the power actuator loading pressure and relieve any spring pre-compression.
- Use lock-out procedures to be sure the above measures stay in effect while you work on the equipment.
- The valve packing box may contain process fluids that are pressurized, even when the valve has been removed from the pipeline. Process fluids may spray out when removing the packing hardware or packing rings, or when loosening the packing box pipe plug.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Instructions are given below for complete disassembly of the actuator, seal replacement, and O-ring replacement. When inspection or repair is necessary, disassemble the actuator only as far as is required to accomplish the job. Key numbers referenced in the following steps are shown in figures 18 through 53.

## Actuator Removal

The following procedure is for the removal of the actuator from the valve.

### **⚠ WARNING**

**To avoid personal injury or equipment damage, use proper lifting and rigging practices while lifting the actuator assembly.**

**To avoid personal injury due to the sudden uncontrolled movement of parts, do not loosen the stem connector hex nuts when the stem connector has spring force applied to it.**

1. Ensure the valve and actuator are de-energized (mechanical, pneumatic, and electric) and appropriately isolated. Disconnect the actuator tubing from the pressure connections on the pneumatic cylinder head flange and end flange (key 2201 and 2210) and positioner. Provisions may need to be made to the actuator and spring if the design is spring extended.

For 785C Spring Extend actuator: It may be necessary to apply a temporary loading pressure to the bottom cylinder pressure connection to move the piston rod away from the valve stem during removal. If it is not possible to provide a temporary loading pressure, exercise caution when removing the actuator to prevent damage or personal injury.

2. Disconnect the stem connection by removing socket head cap screws (key 4302) from the valve stem connector (key 4301).

3. Remove the bonnet-to-actuator bolting securing the actuator to the bonnet. Make sure the actuator is supported and secured by other means prior to loosening nuts.
4. Using the lifting points provided (key 2215), hoist the actuator vertically taking care not to contact the stem in a manner that would cause damage.

## Disassembling the Pneumatic Cylinder

The following procedure is for the replacement of the internal piston seals, bearing seals, and O-rings (see figure 19):

1. Complete Actuator Removal procedures per the applicable section of this instruction manual. Ensure the actuator is de-energized and isolated from the process.
2. Loosen the tie-rod hex nuts (key 2212) in a crisscross pattern to remove the pneumatic cylinder tie rod bolts (key 2213).
3. Remove the top cylinder end flange (key 2210) using the lifting lugs.
4. Remove the tie rods (key 2213). Remove the cylinder (key 2209) from the head flange (key 2201).

For a **partial replacement** of the pneumatic cylinder seals (namely, to replace all the seals with the exception of the head flange seal, (key 2102, 2107 and 2202), proceed to the Replacing Pneumatic Cylinder Seals section .

For complete **total replacement** of the pneumatic cylinder seals (namely, to replace all the seals), the pneumatic cylinder disassembly procedure proceed to step 5.

5. Unscrew the piston (key 2206) from the actuator stem using the two threaded holes (for actuator sizes 280 - 435 thread size is M10; for sizes 485 - 685 thread size is M16) by rotating counter-clockwise. Then lift and remove the piston from the actuator stem. Retain the washer (key 2205) located beneath the piston on to the stem. This operation is facilitated by the presence of threaded holes (figure 18).
6. Loosen and remove the fasteners holding the head flange (key 2201, figure 18 and 21).
7. Lift and remove the head flange (key 2201) from the spring can of 785C Spring Return Actuator or yoke of 785C Springless Actuator.

Figure 18. 785C Pneumatic Cylinder Components

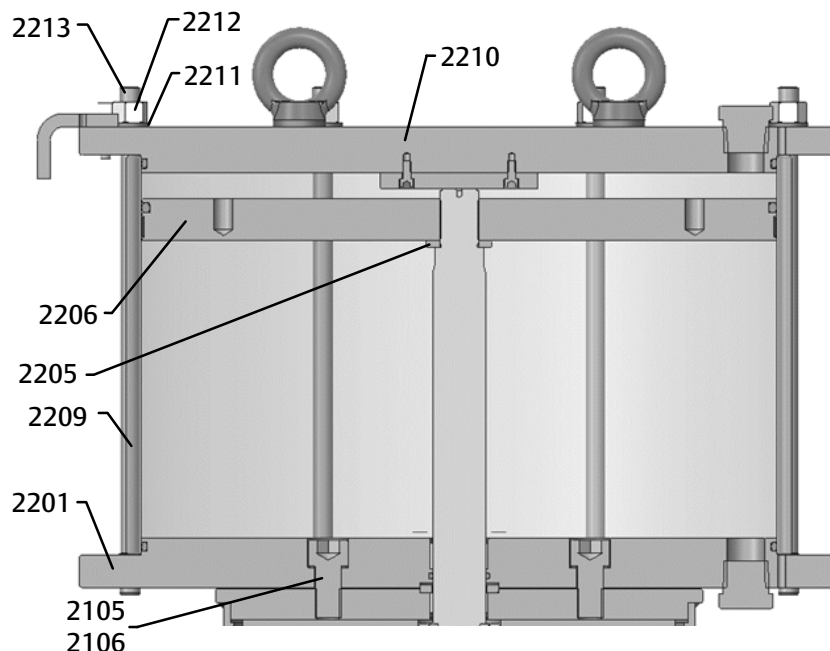
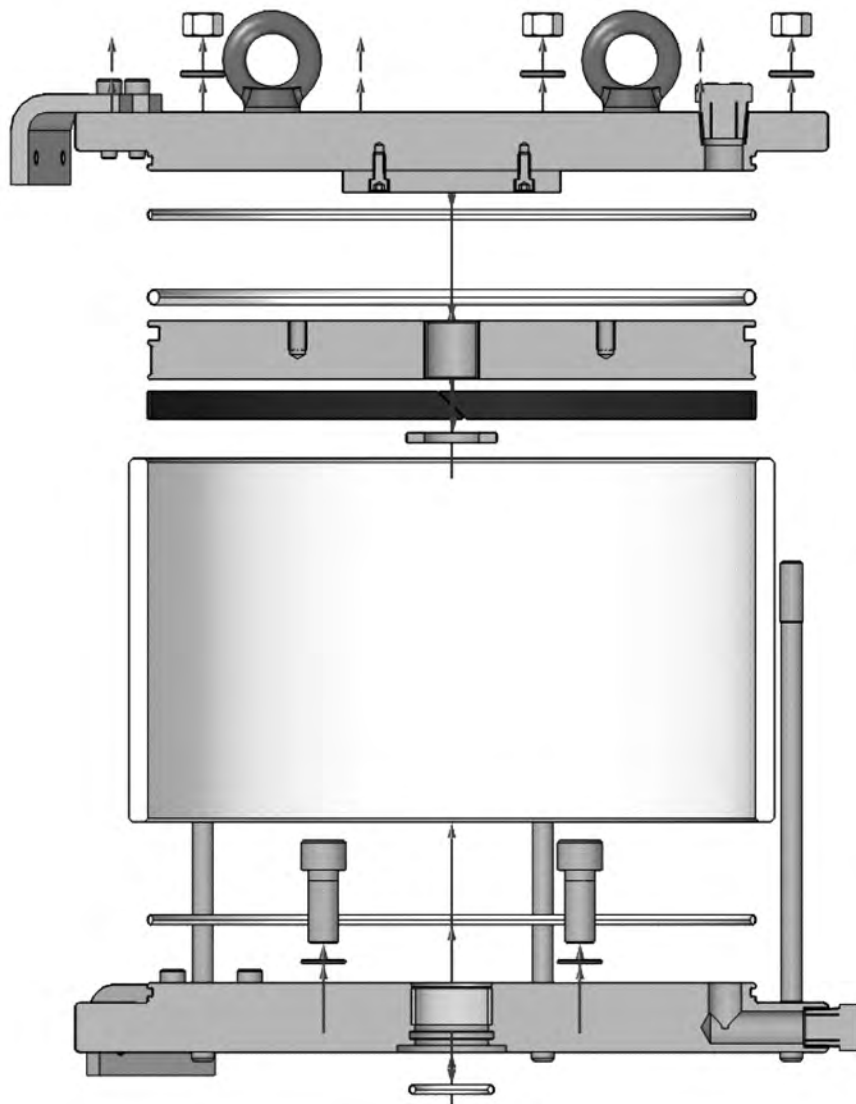




Figure 19. 785C Actuator Pneumatic Cylinder Components Disassembly Sequence

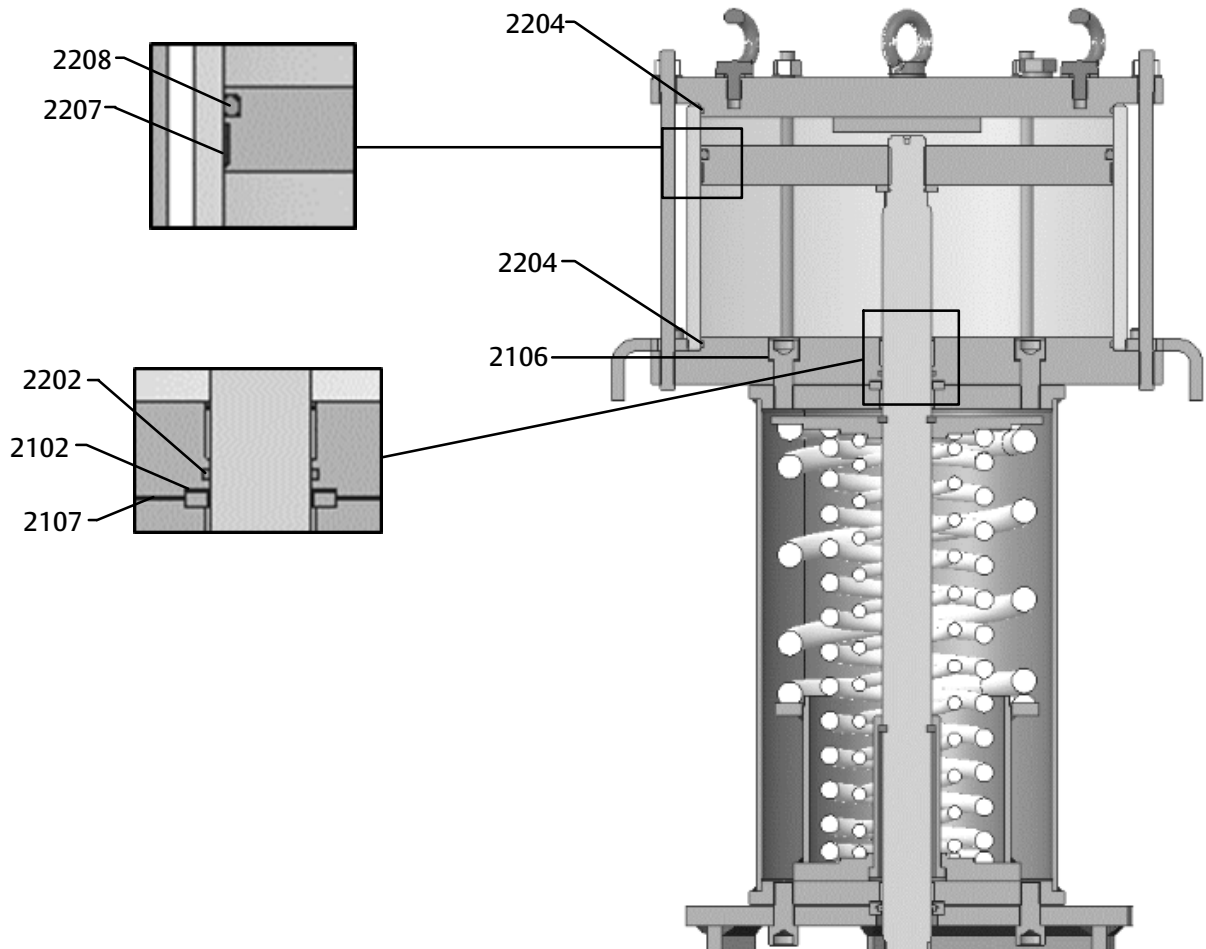


## Replacing the Pneumatic Cylinder Seals

When the pneumatic cylinder is totally disassembled, all the seals can be replaced referencing figures 18, 34, 35, and 36. Pneumatic cylinder seals might include piston rod seal (key 2202), end flange seal (key 2204), piston sliding ring (key 2207), piston outside seal (key 2208), scraper ring (key 2102), washer (key 2106), gasket (key 2107), O-ring (key 2222) (only for with manual handpump).

1. Thoroughly clean the slots and housings of seals and sliding ring; lubricate with protective oil or with a thin film of grease. Inspect all parts, including the piston rod (key 2350) and cylinder tube (key 2209), for damage and wear.
2. Put the seals and sliding ring accurately in place on the relevant component, being careful that the material does not get pinched or damaged.
3. Grease and lubricate the seals in their housings and the sliding ring. See table 11 for recommended lubricants.

Figure 20. Typical Sectional View of 785C Spring Return Actuator Pneumatic Cylinder Seals



NOTE: KEY 2222 PART NOT SHOWN (ACTUATOR WITH HANDPUMP ONLY)

Figure 21. Threaded Holes in Pneumatic Cylinder



## Assembling the Pneumatic Cylinder

The cylinder is reassembled by following in reverse order the sequence described in section Disassembling the Pneumatic Cylinder. The screws must be tightened properly. Refer to table 10.

If only a partial replacement of the pneumatic cylinder seals has been performed, the pneumatic cylinder assembly procedure starts from step 3.

1. Ensure the seals (key 2102, 2107 and 2202) of the head flange (key 2201) have been replaced, lubricated, and are properly seated.
2. Install the head flange (key 2201) on to the spring cylinder (in case of 785C spring return actuator) or on to the yoke (in case of 785C springless actuator).
3. Place the washers (key 2106).
4. Lubricate bolts (key 2105) and torque to values given in table 10.
5. Ensure the seal (key 2204) of the head flange (key 2201) is replaced, lubricated, and properly seated.
6. Place the washer (key 2205) on the stem. Thread the piston (key 2206) on to the stem. Rotate clockwise until it seats on the piston then turn another 1/4 turn.
7. Ensure the seal and gasket (key 2207 and 2208) of the piston (key 2206) are replaced and properly seated. Make sure the seal is well lubricated.
8. Lift the cylinder (key 2209) and put it back in place by performing the operations below:
  - a. Thoroughly clean the cylinder (key 2209) inner surface and ensure the surface nor the chamfers are damaged.
  - b. Lubricate the entire inner surface and chamfers.
  - c. Slide the cylinder (key 2209) onto the piston taking care not to damage the cylinder inner surface, piston seal (key 2208), gasket (key 2207) and the head flange seal (key 2204).
  - d. The full mating surface of the cylinder (key 2209) should rest against the head flange (key 2201). The cylinder (key 2209) is not provided with screw interfaces for handling purposes. Use padded clamps or jaws to prevent damaging.
9. Ensure the seal (key 2204) of the top end flange (key 2210) is replaced and properly seated.
10. Assemble the end flange (key 2210) by centering it with the inside diameter of the cylinder (key 2209), taking care not to damage the seal (key 2204). The full surface of the end flange should rest against the mating cylinder (key 2209) face. Align the top and bottom end flange (key 2210) tie rod holes.
11. Screw each tie rod (key 2213) back in its housing on the head flange.
12. Install the washers (key 2211) and tighten the nuts (key 2212) on the tie rods (key 2213) in a crisscross pattern to the appropriate torque per table 10.
13. Refer to the Actuator Mounting section of this manual for instructions on mounting and reinstalling the actuator onto the valve. As best practice, check for leakage after installation for all sealing surfaces.

Table 10. Tie Bolt Torque<sup>(1)</sup>

BOLT DIAMETER	TIE ROD MATERIAL	NUT MATERIAL	TORQUE	
			N•m	lbf•ft
M10 x 1.5	ASTM A320-L7	ASTM A194 GR 7 S3	40	30
M12 x 1.75			70	52
M16 x 2			160	118
M20 x 2.5			320	236
M24 x 3			550	406
M27 x 3			800	590
M10 x 1.5	ASTM A320 B8M CL-2	EN ISO3506-2 A4-80	30	23
M12 x 1.75			58	43
M16 x 2			130	96
M20 x 2.5			250	185
M24 x 3			440	325
M27 x 3			535	395

1. For other bolting materials or lubricants contact your [Emerson sales office](#) for torque information.

## Lubrication

The type of grease used and recommended for lubrication purposes at normal operating temperature, is described in table 11.

Table 11. Recommended Lubricant

MANUFACTURER	AGIP
TYPE	GR MU/EP2
NLGI GRADE	2
WORKED PENETRATION (DMM)	280
DROPPING POINT ASTM (°C)	185
ISO GRADE	X2
EQUIVALENT GREASE	ESSO BEACON EP2 BP GREASE LTX2 SHELL ALVANIA GREASE R2 ARAL ARALUB HL2 CHEVRON DURALITH GREASE EP2 CHEVRON SPHEEROL AP2 TEXACO MULTIFAK EP2 MOBILPLEX 47 PETROMIN GREASE EP2

## Check and Restore Manual Handpump Hydraulic Oil Level

During the actuator operation, the oil tank has to be closed (not in connection with the atmosphere). To avoid cavitation, it is necessary to proceed as follows to check the oil tank oil level.

Refer to figure 45 and 46 unless otherwise indicated:

1. Remove the oil tank dipstick (key 2751-1.7).
2. Move the actuator into the open position.
3. Check that the oil level in the oil tank (key 2751-4) corresponds to the maximum level mark of the dipstick (figure 22).
4. With the dipstick still removed, move the actuator to the closed position using the handpump.

5. Reinstall and tighten the dipstick.

**To replace or add oil, proceeding as follow:**

1. Remove the dipstick (key 2751-1.7) from the tank cover (key 2751-22).
2. To drain oil, unscrew the plug (key 2751-27) and remove the washer (key 2751-9).

**Note**

If dirt and/or sludge is found in the oil drained from the tank, before filling with new oil in the tank, disassemble the oil tank tube by unscrewing the two cap nuts (key 2751-2) and clean the internal surfaces of the tank. If necessary replace the tank O-ring (key 2751-21).

3. Reinstall the washer (key 2751-9) and tighten the plug (key 2751-27) onto the plate (key 2751-11). Pour the new oil into the tank through the dipstick hole on the cover (key 2751-22).
4. Reinstall and tighten the dipstick (key 2751-1.7).
5. If the oil in the tank is below the minimum level mark (figure 22) add additional oil per table 12.

Figure 22. Hydraulic Manual Handpump Dipstick Oil Level Mark

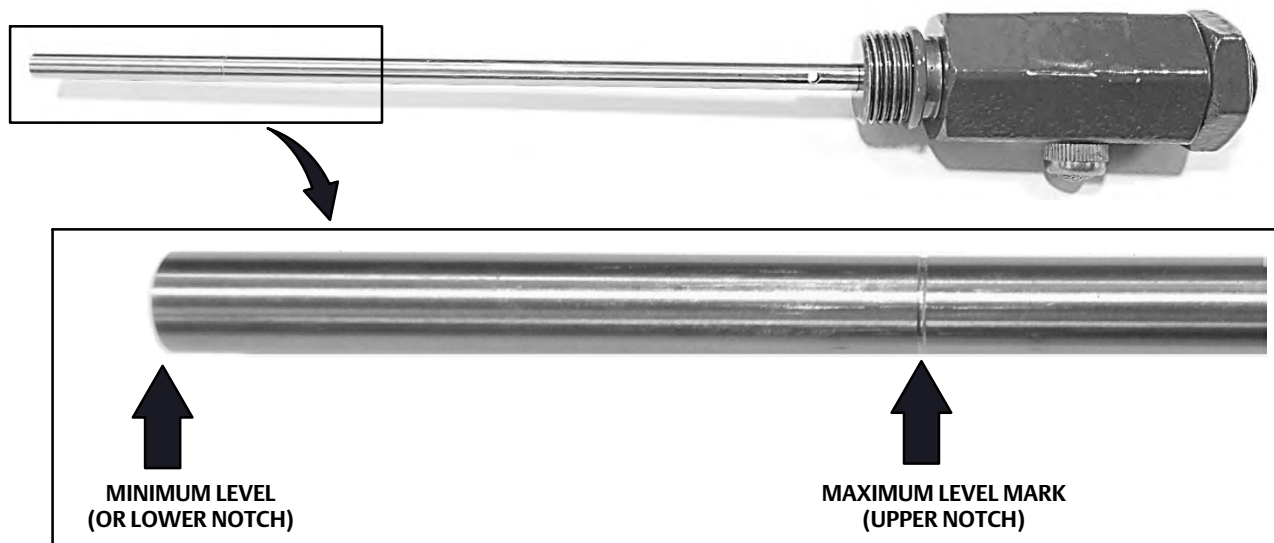


Table 12. Handpump Hydraulic Oil

Lower Temperature	Hydraulic Oil
Standard: -20 to 100 °C (-4 to 212 °F)	AGIP ARNICA 22 or equivalent oils (SHELL TELLUS PLUS 22, CHEVRON HYDRAULIC OIL AW ISO 22, MOBIL DTE22, EXXON UNIVIS N22, EQUIVIS ZS22, BP ENERGOL HLP-HM22, CASTROL DYSPIIN AWS22)
Low Temperature Options: -40 to 100°C (-40 to 212°F) or -60 to 100°C (-76 to 212°F)	Aeroshell Fluid 41

## Disassembling the Handpump Hydraulic Cylinder

### **⚠ WARNING**

**Refer to the WARNING at the beginning of the Maintenance section in this instruction manual.**

If there are leaks in the 785C Actuator manual handpump hydraulic cylinder, a malfunction in the mechanical components, or in case of scheduled preventive maintenance, the actuator must be disassembled, and the seals must be replaced with reference to the sectional drawings and following procedures:

1. Deenergize the actuator and valve assembly.
2. Drain the hydraulic fluid from the piston via the drain ports.
3. Remove the nuts (key 2714) from the tie rods (key 2713) at the end flange (key 2712) side.
4. Slide off the end flange and the hydraulic cylinder (key 2711).
5. Slide off the piston rod (key 2706) from the head flange (key 2701).

## Handpump Hydraulic Cylinder Seals Replacement

1. Prior to reassembly check that the actuator components are in good condition.
2. Lubricate all mating surfaces with recommended lubricant (see table 11).
3. If the O-ring must be replaced, remove the existing one from its groove, clean the groove carefully and lubricate it with protective oil film. Assemble the new O-ring into its groove and lubricate.
4. Replace the O-rings (key 2708) of the head flange (key 2701).
5. Replace the O-ring (key 2708) of the end flange (key 2712).

**For replacement of piston rod seal ring (key 2705) and of the O-ring (key 2704) proceed as follows:**

1. Remove the existing PTFE seal ring (key 2705) and the O-ring (key 2704) from their groove.
2. Clean the groove carefully and lubricate.
3. Assemble the new O-ring (key 2704) into its groove and lubricate.
4. Assemble the new PTFE seal ring (key 2705) into the flange groove, on the rubber O-ring (key 2704), by bending it. Take care bend the seal the least amount required.
5. Enlarge the seal ring with your fingers to restore its round shape. Pay attention not to utilize any tools, which can damage the seal ring.

**For replacement of piston rod seal ring (key 2710) and of the O-ring (key 2709) proceed as follows:**

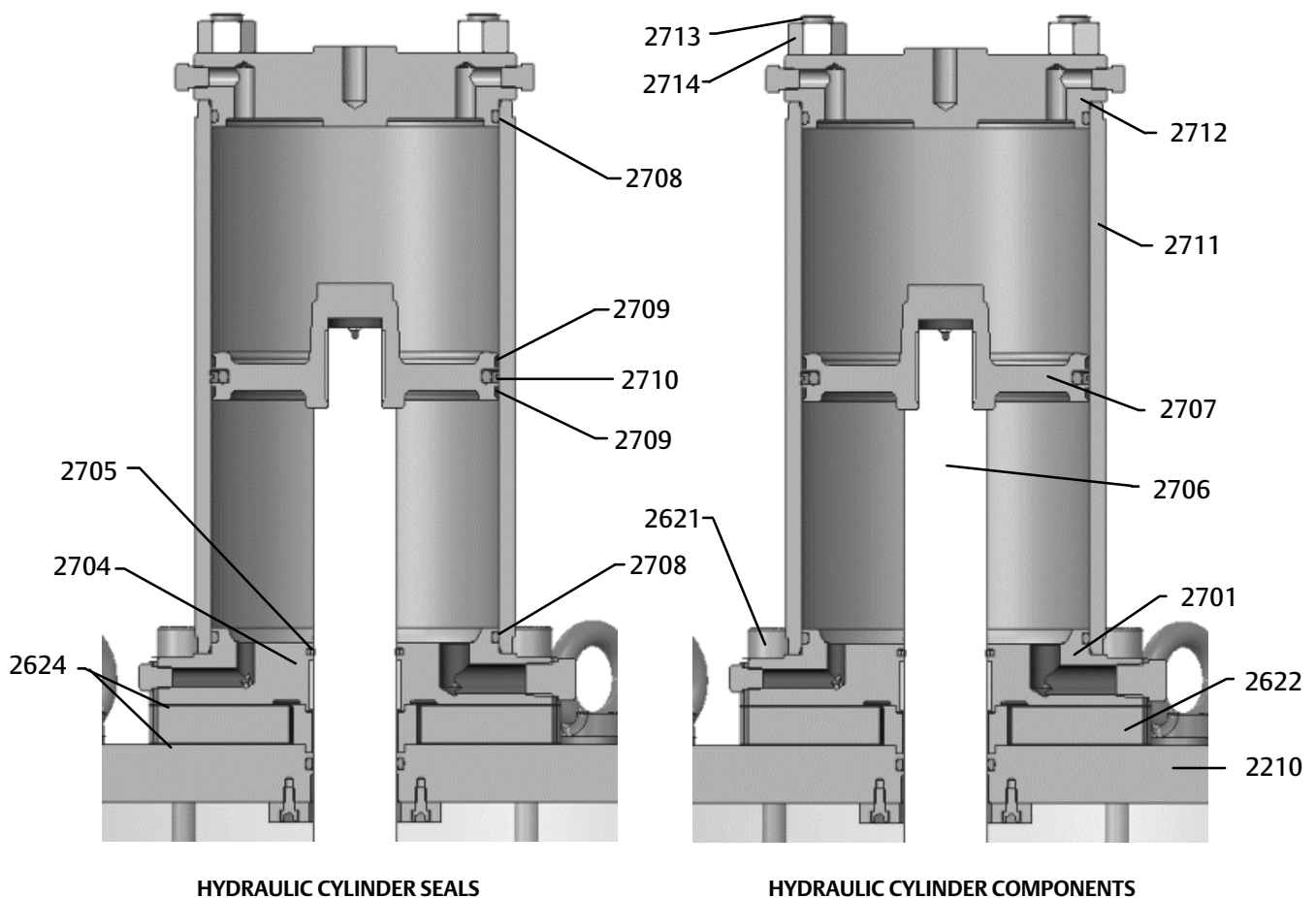
1. Remove the existing PTFE seal ring (key 2710) and the O-ring (key 2709) from their groove.
2. Clean the groove carefully and lubricate.
3. Assemble the new O-ring (key 2709) into its groove and lubricate.
4. Assemble the new PTFE seal ring (key 2710) on its rubber O-ring by introducing one side into the groove and then enlarge it with your fingers so as to seat it into the groove. Take care to enlarge it uniformly without any tools which could possibly damage it. The elastic memory of the of the PTFE the seal ring will allow the ring to shrink back to its previous dimension.

## Handpump Hydraulic Cylinder Reassembling

1. Assemble the new gasket (key 2624) after cleaning the surfaces of pneumatic cylinder head flange (key 2210), spacer (key 2622) and head flange hydraulic (key 2701) which are in contact.

2. Assemble the head flange and tighten the screws (key 2621) to the recommended torque (see table 10).
3. Clean and lubricate the piston rod (key 2706) surface, particularly that of the bevel, and insert it into the head flange hole, taking care not to damage the PTFE seal ring (key 2705). The piston rod bevel has to enlarge the seal ring.
4. Carefully clean the inside of the tube (key 2711) and check that the entire surface, particularly that of the bevels, is not damaged. Lubricate the tube inside surface and the bevels at the ends.
5. Slide the tube onto the piston taking care not to damage the PTFE seal ring (key 2710). The tube bevel has to smoothly compress the seal ring. Take care to not damage the head flange O-ring (key 2708).
6. Assemble the end flange (key 2708) by centering it on the inside diameter of the tube, taking care not to damage the O-ring (key 2708).
7. Assemble the nuts (key 2714) onto the tie rods (key 2713). Tighten the nuts to the recommended torque per table 10, alternating between opposite corners.

Figure 23. 785C MHP/MHQ Hydraulic Cylinder



## Other Maintenance Specifications

Table 13. Fisher 785C Series Actuator Pneumatic Cylinder Seal Replacement Information<sup>(1)</sup>

CYLINDER, DN	TRAVEL (mm)	MANUAL OVERRIDE	CYLINDER			NUT / TIE ROD TYPE	END FLANGE	HEAD FLANGE	PISTON			
			DN (mm)	Height (mm)	Weight (kg)	Thread	Weight (kg)	Weight (kg)	Weight (kg)	Lug Thread		
280	102	0	280	195	12.7	M12x1.75	19.9	29.7	14.7	2x M10x1.5		
335			335	195	20.3	M12x1.75	29.4	39.7	21.3	2x M10x1.5		
385			385	195	20.3	M12x1.75	37.4	50.5	28.3	2x M10x1.5		
435			435	195	23.7	M12x1.75	46.5	62.8	36.2	2x M10x1.5		
485			485	205	28.8	M16x2	62.8	118.2	49.6	2x M16x2		
535			535	205	32.8	M16x2	79.8	140	55.1	2x M16x2		
585			585	218	39.4	M16x2	108	163.6	76.3	2x M16x2		
635			635	218	52.3	M16x2	126.4	192.1	92.5	3x M16x2		
685			685	230.5	57.6	M16x2	139.7	251.8	117.7	2x M16x2		
280			MHW	280	232	15.1	M12x1.75	19.9	29.7	14.7	2x M10x1.5	
335				335	232	20.3	M12x1.75	29.4	39.7	21.3	2x M10x1.5	
385				385	232	24.1	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435		MHP/MHQ		435	229	27.9	M12x1.75	46.5	62.8	36.2	2x M10x1.5	
485				485	242	34	M16x2	62.8	118.2	49.6	2x M16x2	
535				535	244	39	M16x2	79.8	140	55.1	2x M16x2	
585				585	252	45.5	M16x2	108	163.6	76.3	2x M16x2	
635				635	253	60.7	M16x2	126.4	192.1	92.5	3x M16x2	
685				685	269.5	67.3	M16x2	139.7	251.8	117.7	2x M16x2	
1. The cylinder DN, the travel and the available manual override can be read from the model string, e.g. PLAS-100K-335-13K-115-CL-SE-F2-0000.												
280		203		0	280	296	19.3	M12x1.75	19.9	29.7	14.7	2x M10x1.5
335					335	296	30.8	M12x1.75	29.4	39.7	21.3	2x M10x1.5
385			385		296	30.8	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435			435		296	36	M12x1.75	46.5	62.8	36.2	2x M10x1.5	
485			485		306	43	M16x2	62.8	118.2	49.6	2x M16x2	
535	535		306		49	M16x2	79.8	140	55.1	2x M16x2		
585	585		319		57.7	M16x2	108	163.6	76.3	2x M16x2		
635	635		319		76.5	M16x2	126.4	192.1	92.5	3x M16x2		
685	685		331.5		82.8	M16x2	139.7	251.8	117.7	2x M16x2		
280	MHW		280		333	21.7	M12x1.75	19.9	29.7	14.7	2x M10x1.5	
335			335		333	29.1	M12x1.75	29.4	39.7	21.3	2x M10x1.5	
385			385		333	34.6	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435			MHP/MHQ	435	330	40.2	M12x1.75	46.5	62.8	36.2	2x M10x1.5	
485				485	343	48.2	M16x2	62.8	118.2	49.6	2x M16x2	
535				535	345	55.1	M16x2	79.8	140	55.1	2x M16x2	
585	585			353	63.7	M16x2	108	163.6	76.3	2x M16x2		
635	635			354	84.9	M16x2	126.4	192.1	92.5	3x M16x2		
685	685			370.5	92.5	M16x2	139.7	251.8	117.7	2x M16x2		
1. The cylinder DN, the travel and the available manual override can be read from the model string, e.g. PLAS-100K-335-13K-216-CL-SE-F2-0000												

-continued-



Table 13. Fisher 785C Series Actuator Pneumatic Cylinder Seal Replacement Information<sup>(1)</sup> (continued)

CYLINDER, DN	TRAVEL (mm)	MANUAL OVERRIDE	CYLINDER			NUT / TIE ROD TYPE	END FLANGE	HEAD FLANGE	PISTON		
			DN (mm)	Height (mm)	Weight (kg)	Thread	Weight (kg)	Weight (kg)	Weight (kg)	Lug Thread	
280	305	0	280	398	25.5	M12x1.75	19.9	29.7	14.7	2x M10x1.5	
335			335	398	34.8	M12x1.75	29.4	39.7	21.3	2x M10x1.5	
385			385	398	41.4	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435			435	398	49.8	M12x1.75	46.5	62.8	36.2	2x M10x1.5	
485			485	408	57.3	M16x2	62.8	118.2	49.6	2x M16x2	
535			535	408	66	M16x2	79.8	140	55.1	2x M16x2	
585			585	421	76.1	M16x2	108	163.6	76.3	2x M16x2	
635			635	421	101.1	M16x2	126.4	192.1	92.5	3x M16x2	
685			685	433.5	108.3	M16x2	139.7	251.8	117.7	2x M16x2	
280			MHW	280	435	27.9	M12x1.75	19.9	29.7	14.7	2x M10x1.5
335		335		435	38.1	M12x1.75	29.4	39.7	21.3	2x M10x1.5	
385		385		435	45.3	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435		MHP/MHQ		435	432	54	M12x1.75	46.5	62.8	36.2	2x M10x1.5
485				485	445	62.5	M16x2	62.8	118.2	49.6	2x M16x2
535				535	447	72.3	M16x2	79.8	140	55.1	2x M16x2
585				585	473	85.6	M16x2	108	163.6	76.3	2x M16x2
635				635	474	113.8	M16x2	126.4	192.1	92.5	3x M16x2
685				685	490.5	122.5	M16x2	139.7	251.8	117.7	2x M16x2
1. The cylinder DN, the travel and the available manual override can be read from the model string, e.g. PLAS-100K-335-13K-318-CL-SE-F2-0000											
280		406	0	280	500	32.1	M12x1.75	19.9	29.7	14.7	2x M10x1.5
335	335			500	43.8	M12x1.75	29.4	39.7	21.3	2x M10x1.5	
385	385			500	52	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435	435			500	62.5	M12x1.75	46.5	62.8	36.2	2x M10x1.5	
485	485			510	71.7	M16x2	62.8	118.2	49.6	2x M16x2	
535	535			510	82.5	M16x2	79.8	140	55.1	2x M16x2	
585	585			523	94.6	M16x2	108	163.6	76.3	2x M16x2	
635	635			523	125.6	M16x2	126.4	192.1	92.5	3x M16x2	
685	685			535.5	133.8	M16x2	139.7	251.8	117.7	2x M16x2	
280	MHW			280	537	34.5	M12x1.75	19.9	29.7	14.7	2x M10x1.5
335			335	537	47	M12x1.75	29.4	39.7	21.3	2x M10x1.5	
385			385	537	55.9	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435			MHP/MHQ	435	534	66.8	M12x1.75	46.5	62.8	36.2	2x M10x1.5
485				485	547	76.9	M16x2	62.8	118.2	49.6	2x M16x2
535				535	549	88.8	M16x2	79.8	140	55.1	2x M16x2
585				585	575	104	M16x2	108	163.6	76.3	2x M16x2
635				635	576	138.3	M16x2	126.4	192.1	92.5	3x M16x2
685				685	592.5	148	M16x2	139.7	251.8	117.7	2x M16x2
1. The cylinder DN, the travel and the available manual override can be read from the model string, e.g. PLAS-100K-335-13K-420-CL-SE-F2-0000											

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Table 13. Fisher 785C Series Actuator Pneumatic Cylinder Seal Replacement Information<sup>(1)</sup> (continued)

CYLINDER, DN	TRAVEL (mm)	MANUAL OVERRIDE	CYLINDER			NUT / TIE ROD TYPE	END FLANGE	HEAD FLANGE	PISTON		
			DN (mm)	Height (mm)	Weight (kg)	Thread	Weight (kg)	Weight (kg)	Weight (kg)	Lug Thread	
280	508	0	280	601	38.6	M12x1.75	19.9	29.7	14.7	2x M10x1.5	
335			335	601	52.6	M12x1.75	29.4	39.7	21.3	2x M10x1.5	
385			385	601	62.5	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435			435	601	75.1	M12x1.75	46.5	62.8	36.2	2x M10x1.5	
485			485	611	85.9	M16x2	62.8	118.2	49.6	2x M16x2	
535			535	611	98.8	M16x2	79.8	140	55.1	2x M16x2	
585			585	624	112.9	M16x2	108	163.6	76.3	2x M16x2	
635			635	624	149.8	M16x2	126.4	192.1	92.5	3x M16x2	
685			685	636.5	159	M16x2	139.7	251.8	117.7	2x M16x2	
280			MHW	280	638	41	M12x1.75	19.9	29.7	14.7	2x M10x1.5
335		335		638	55.8	M12x1.75	29.4	39.7	21.3	2x M10x1.5	
385		385		638	66.4	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435		MHP/MHQ		435	635	79.4	M12x1.75	46.5	62.8	36.2	2x M10x1.5
485				485	648	91.1	M16x2	62.8	118.2	49.6	2x M16x2
535				535	650	105.1	M16x2	79.8	140	55.1	2x M16x2
585				585	676	122.3	M16x2	108	163.6	76.3	2x M16x2
635				635	677	162.6	M16x2	126.4	192.1	92.5	3x M16x2
685				685	693.5	173.2	M16x2	139.7	251.8	117.7	2x M16x2
1. The cylinder DN, the travel and the available manual override can be read from the model string, e.g. PLAS-100K-335-13K-521-CL-SE-F2-0000											
280		610	0	280	703	45.1	M12x1.75	19.9	29.7	14.7	2x M10x1.5
335	335			703	61.5	M12x1.75	29.4	39.7	21.3	2x M10x1.5	
385	385			703	73.2	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435	435			703	87.9	M12x1.75	46.5	62.8	36.2	2x M10x1.5	
485	485			713	100.2	M16x2	62.8	118.2	49.6	2x M16x2	
535	535			713	115.3	M16x2	79.8	140	55.1	2x M16x2	
585	585			726	131.3	M16x2	108	163.6	76.3	2x M16x2	
635	635			726	174.3	M16x2	126.4	192.1	92.5	3x M16x2	
685	685			738.5	184.5	M16x2	139.7	251.8	117.7	2x M16x2	
280	MHW			280	740	47.5	M12x1.75	19.9	29.7	14.7	2x M10x1.5
335			335	740	64.8	M12x1.75	29.4	39.7	21.3	2x M10x1.5	
385			385	740	77	M12x1.75	37.4	50.5	28.3	2x M10x1.5	
435			MHP/MHQ	435	737	92.1	M12x1.75	46.5	62.8	36.2	2x M10x1.5
485				485	750	105.4	M16x2	62.8	118.2	49.6	2x M16x2
535				535	752	121.6	M16x2	79.8	140	55.1	2x M16x2
585				585	778	140.7	M16x2	108	163.6	76.3	2x M16x2
635				635	779	187.1	M16x2	126.4	192.1	92.5	3x M16x2
685				685	795.5	198.7	M16x2	139.7	251.8	117.7	2x M16x2
1. The cylinder DN, the travel and the available manual override can be read from the model string, e.g. PLAS-100K-335-13K-623-CL-SE-F2-0000											

# Troubleshooting

Table 14. 785C Troubleshooting

Symptom	Common Possible Cause	Solution
Inadequate operation of actuator using handpump	Handpump control unit (key 2751) not in required vertical up orientation per figure 7	Contact your <a href="#">Emerson sales office</a> to modify the handpump control unit into correct installation orientation per figure 7
	Handpump hydraulic oil level too low	Check and restore correct handpump hydraulic oil level
	Too much air within hydraulic cylinder	Contact your Emerson sales office to bleed the handpump hydraulic cylinder air
Pneumatic stroking speed too slow for actuator with handpump	Standard Stroke MHP handpump Engagement/Disengagement handle at “Manual Opening” or “Manual Closing” position	Set Standard Stroke MHP handpump Engagement/Disengagement handle to “REMOTE” position per figure 8 and the correct schematic figure 12, 14, or 15
	Fast Stroke MHQ handpump hydraulic cylinder bypass stop valve at close position	Open Fast Stroke MHQ handpump hydraulic cylinder bypass stop valve per the correct schematic in figure 11, 13, 16, or 17
	Flow restriction in hand pump or hydraulic system affecting actuator stroking speed	Contact your Emerson sales office to upgrade to 785C Fast Stroke MHQ handpump type 1 or type 2
Single acting spring return actuator will not achieve full travel	Flow restriction in pneumatic system affecting actuator stroking speed	Contact your Emerson sales office to investigate the stroking speed sizing problem
	Actuator venting port blocked	Clean venting side vent assemblies, e.g. Y602 vent
Actuator movement not smooth	Supply air pressure too low to fully extend/retract actuator	Increase supply air pressure back to actuator sizing required pressure
	Erratic, or jerky, actuator movement may indicate excessive actuator or valve friction	Contact your Emerson sales office to complete ValveLink scan of actuator and valve movement to identify if valve or actuator repair is required
Valve positioner out of calibration during fast stroking or high vibration	Severe application conditions affecting positioner or mounting kit	Contact your Emerson sales office to investigate the issue, and determine if upgrading to the high performance mounting kit is recommended

## Parts Ordering

When corresponding with your [Emerson sales office](#) about this equipment, refer to the serial number. When ordering replacement parts, also specify the key number, part name, using the Parts List.

### **⚠ WARNING**

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson should not, under any circumstances, be used in any Fisher valve, because they may void your warranty, might adversely affect the performance of the valve, and could cause personal injury and property damage.

## Parts Kits

Table 15. 785C Single-Acting Spring Return (Spring Restricts) Spare Part Kits

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	SPRING	MATERIAL	
			NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
			Parts Kit Number	
335	4	F1	R785X335C12	R785X335C32
385		F1	R785X385C12	R785X385C32
		F2		
435		F1	R785X435C22	R785X435C52
		F2	R785X435C12	R785X435C42
485		F1	R785X485C12	R785X485C32
		F2		
535		F1	R785X535C72	R785X535C92
		F2	R785X535C12	R785X535C32
585		F1	R785X585C72	R785X585C82
		F2		
635		F1	R785X635C22	R785X635C42
		F2		
685		F1	R785X685C12	R785X685C32
	F2	R785X685C22	R785X685C42	
335	8	F1	R785X335C72	R785X335C82
385		F1	R785X385C22	R785X385C42
435		F1	R785X435C32	R785X435C62
485		F1	R785X485C22	R785X485C42
535		F1	R785X535C22	R785X535C42
585		F1	R785X585C22	R785X585C42
635		F1	R785X635C22	R785X635C42
685		F1	R785X685C22	R785X685C42

Table 16. 785C Single-Acting Spring Return (Spring Extend, Fail Down) Spare Parts Kits

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	SPRING	MATERIAL	
			NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
			Parts Kit Number	
335	4	F1	R785X335C22	R785X335C42
		F2		
385		F1	R785X385C22	R785X385C42
		F2		
435		F1	R785X435C22	R785X435C52
		F2		
485		F1	R785X485C12	R785X485C32
		F2		
535		F1	R785X535C12	R785X535C32
		F2	R785X535C22	R785X535C42
585		F1	R785X585C12	R785X585C32
		F2	R785X585C22	R785X585C42
635		F1	R785X635C22	R785X635C42
		F2		
685		F1	R785X685C22	R785X685C42
		F2		
		F3		
335		8	F1	R785X335C22
385	F1		R785X385C22	R785X385C42
	F2			
	F3			
435	F1		R785X435C32	R785X435C62
	F2			
	F3			
485	F1		R785X485C22	R785X485C42
	F2			
	F3			
535	F1		R785X535C12	R785X535C32
	F2		R785X535C22	R785X535C42
	F3			
585	F1		R785X585C22	R785X585C42
	F2			
	F3			
635	F1		R785X635C22	R785X635C42
	F2			
	F3			
685	F1	R785X685C22	R785X685C42	
	F2			
	F3			

Table 17. 785C Double-Acting Spring Return (Spring Retract, Fail Up) Spare Part Kits

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	SPRING PRELOAD CODE	SPRING	MATERIAL	
				NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
				Parts Kit Number	
280	4	7K	F1	R785X280C32	R785X280C62
		12K	F1		
		16K	F1		
335	4	7K	F2	R785X335C12	R785X335C32
		12K	F1		
		16K	F1		
		16K	F2	R785X335C22	R785X335C42
		14K	F2		
		21K	F1		
385	4	16K	F1	R785X385C12	R785X385C32
		16K	F2	R785X385C22	R785X385C42
		20K	F1		
		21K	F2	R785X385C12	R785X385C32
		25K	F1		
435	4	16K	F1	R785X435C12	R785X435C42
		21K	F1		
		25K	F1		
		27K	F1	R785X435C22	R785X435C52
		22K	F2		
485	4	25K	F1	R785X485C72	R785X485C82
		33K	F1	R785X485C12	R785X485C32
		30K	F2		
535	4	34K	F1	R785X535C22	R785X535C42
585	4	34K	F1	R785X585C12	R785X585C32
685	4	38K	F1	R785X685C12	R785X685C32
		74k	F1	R785X685C22	R785X685C42
		83K	F2		
		75K	F3		
280	8	7K	F1	R785X280C32	R785X280C62
		12K	F1		
		16K	F1		
335	8	7K	F1	R785X335C12	R785X335C32
		8K	F2	R785X335C22	R785X335C42
		12K	F1		
		16K	F2		
		21K	F1	R785X335C12	R785X335C32
		16K	F1		
385	8	8K	F1	R785X385C12	R785X385C32
		12K	F1	R785X385C22	R785X385C42
		12K	F2		
		21K	F3	R785X385C12	R785X385C32
		13K	F1		
		16K	F1		
		17K	F1	R785X385C12	R785X385C32
		21K	F1		
		22K	F1		
		29K	F1	R785X385C22	R785X385C42

- continued -

Table 17. 785C Double-Acting Spring Return (Spring Retract, Fail Up) Spare Part Kits (continued)

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	SPRING PRELOAD CODE	SPRING	MATERIAL	
				NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
				Parts Kit Number	
435	8	16K	F1	R785X435C32	R785X435C62
		21K	F1		
		25K	F1		
		27K	F1		
		17K	F2		
		16K	F3		
485	8	25K	F1	R785X485C12	R785X485C32
		34K	F1	R785X485C22	R785X485C42
		21K	F2		
		20K	F3		
535	8	34K	F1	R785X535C22	R785X535C42
		30K	F2		
		29K	F3		
585	8	34K	F1	R785X585C12	R785X585C32
		32K	F3	R785X585C22	R785X585C42
685	8	38K	F1	R785X685C22	R785X685C42
		51K	F1		
		49K	F2		
		64K	F3		
385	12	19K	F1	R785X385C22	R785X385C42
435	12	12K	F1	R785X435C12	R785X435C42
		23K	F1	R785X435C22	R785X435C52
485	12	23K	F1	R785X485C12	R785X485C32
535	12	32K	F1	R785X535C82	R785X535CA2
585	12	31K	F1	R785X585C22	R785X585C42
685	12	35K	F1	R785X685C82	R785X685CA2
435	16	18K	F1	R785X435C22	R785X435C52
485	16	18K	F1	R785X485C12	R785X485C32
535	16	29K	F1	R785X535C82	R785X535CA2
585	16	26K	F1	R785X585C22	R785X585C42
635	16	33K	F1	R785X635C72	R785X635C92
685	16	33K	F1	R785X685C72	R785X685C92

Table 18. 785C Double-Acting Spring Return (Spring Extend, Fail Down) Spare Part Kits

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	SPRING PRELOAD CODE	SPRING	MATERIAL	
				NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
				Parts Kit Number	
535	2	12K	F1	R785X535C12	R785X535C32
335	2	14K	F1	R785X335C22	R785X335C42
385	2	15K	F1	R785X385C22	R785X385C42
435	2	12K	F1	R785X435C22	R785X435C52
485	2	33K	F1	R785X485C72	R785X485C82
535	2	38K	F1	R785X535C12	R785X535C32
585	2	24K	F1	R785X585C12	R785X585C32
635	2	33K	F1	R785X635C12	R785X635C32

- continued -

Table 18. 785C Double-Acting Spring Return (Spring Extend, Fail Down) Spare Part Kits (continued)

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	SPRING PRELOAD CODE	SPRING	MATERIAL			
				NBR (Standard Temperature)	Fluorosilicone (Low Temperature)		
				Parts Kit Number			
280	4	7K	F1	R785X280C32	R785X280C62		
		12K	F1				
		14K	F1				
		8K	F1	R785X280C42	R785X280C72		
		11K	F1				
		16K	F1				
16K	F2						
335	4	7K	F1	R785X335C12	R785X335C32		
		12K	F1	R785X335C22	R785X335C42		
		16K	F2				
		21K	F1				
385	4	16K	F1	R785X385C12	R785X385C32		
		21K	F2				
		24K	F1				
		25K	F1				
435	4	16K	F1	R785X435C12	R785X435C42		
		21K	F1				
		25K	F1				
		21K	F2	R785X435C32	R785X435C62		
		36K	F1	R785X435C22	R785X435C52		
485	4	25K	F1	R785X485C72	R785X485C82		
		37K	F1	R785X485C22	R785X485C42		
535	4	34K	F1	R785X535C22	R785X535C42		
		58K	F1	R785X535C82	R785X535CA2		
		67K	F1	R785X535C72	R785X535C92		
585	4	34K	F1	R785X585C12	R785X585C32		
		65K	F1				
		36K	F1	R785X585C72	R785X585C82		
635	4	38K	F1	R785X635C12	R785X635C32		
685	4	38K	F1	R785X685C12	R785X685C32		
280	8	7K	F1	R785X280C32	R785X280C62		
		12K	F1				
		14K	F1	R785X280C42	R785X280C72		
		16K	F1	R785X280C52	R785X280C82		
335	8	7K	F1	R785X335C12	R785X335C32		
		8K	F1				
		9K	F1				
		12K	F1			R785X335C22	R785X335C42
		16K	F2				
		19K	F1				
21K	F1						

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Table 18. 785C Double-Acting Spring Return (Spring Extend, Fail Down) Spare Part Kits (continued)

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	SPRING PRELOAD CODE	SPRING	MATERIAL	
				NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
				Parts Kit Number	
385	8	13K	F1	R785X385C12	R785X385C32
		16K	F1		
		17K	F1		
		21K	F1		
		22K	F1	R785X385C22	R785X385C42
		29K	F1		
435	8	12K	F1	R785X435C32	R785X435C62
		16K	F1		
		21K	F1		
		25K	F1		
		35K	F1	R785X435C22	R785X435C52
485	8	25K	F1	R785X485C12	R785X485C32
		32K	F1	R785X485C22	R785X485C42
535	8	19K	F1	R785X535C72	R785X535C92
		25K	F1	R785X535C22	R785X535C42
		34K	F1		
585	8	34K	F1	R785X585C12	R785X585C32
635	8	19K	F1	R785X635C22	R785X635C42
		38K	F1		
		55K	F1		
		67K	F1		
685	8	36K	F1	R785X685C22	R785X685C42
	8	38K	F1		
	8	73K	F1		
	8	81K	F1		
385	12	19K	F1	R785X385C22	R785X385C42
435	12	20K	F1	R785X435C22	R785X435C52
		23K	F1		
485	12	23K	F1	R785X485C12	R785X485C32
535	12	32K	F1	R785X535C82	R785X535CA2
585	12	31K	F1	R785X585C22	R785X585C42
635	12	35K	F1	R785X635C82	R785X635CA2
	12	45K	F1	R785X635C22	R785X635C42
685	12	35K	F1	R785X685C82	R785X685CA2
	12	49K	F1	R785X685C22	R785X685C42
435	16	18K	F1	R785X435C22	R785X435C52
485	16	18K	F1	R785X485C12	R785X485C32
535	16	29K	F1	R785X535C82	R785X535CA2
585	16	26K	F1	R785X585C22	R785X585C42
635	16	33K	F1	R785X635C72	R785X635C92
685	16	33K	F1	R785X685C72	R785X685C92

Table 19. 785C Double-Acting Springless Spare Part Kits

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	MATERIAL	
		NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
		Parts Kit Number	
280	4, 8, 12, 16, 20, 24	R785X280C12	R785X280C22
335		R785X335C52	R785X335C62
385		R785X385C52	R785X385C62
435		R785X435C72	R785X435C82
485		R785X485C52	R785X485C62
535		R785X535C52	R785X535C62
585		R785X585C52	R785X585C62
635		R785X635C52	R785X635C62
685		R785X685C52	R785X685C62

Table 20. 785C Double-Acting Springless with Manual Override Spare Part Kits

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	MATERIAL	
		NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
		Parts Kit Number	
280	4, 8, 12, 16, 20, 24	R785X280M82	R785X280M72
335		R785X335M82	R785X335M72
385		R785X385M62	R785X385M52
435		R785X435M82	R785X435M72
485		R785X485M82	R785X485M72
535		R785X535M92	R785X535M82
585		R785X585M92	R785X585M82
635		R785X635MA2	R785X635M92
685		R785X685MA2	R785X685M92

Table 21. 785C Spring Return Actuators with Manual Override Spare Parts Kit

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	MAXIMUM PRELOAD	SPRING	MANUAL OVERRIDE	MATERIAL	
					NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
					Parts Kit Number	
280	4	7K	F1	Hand Wheel	R785X280M42	R785X280M12
		12K				
		14K <sup>(1)</sup>				
	8	7K	F1	Hand Wheel	R785X280M52	R785X280M22
		12K				
		8k <sup>(1)</sup>				
	4	11K <sup>(1)</sup>	F1	Hand Wheel	R785X280M62	R785X280M32
		16K	F2			
		16K <sup>(1)</sup>	F1			
	8	14K <sup>(1)</sup>	F1	Hand Wheel	R785X280M62	R785X280M32
16K		F1				

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Table 21. 785C Spring Return Actuators with Manual Override Spare Parts Kit (continued)

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	MAXIMUM PRELOAD	SPRING	MANUAL OVERRIDE	MATERIAL	
					NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
					Parts Kit Number	
335	4	7K	F1	Hand Wheel	R785X335M42	R785X335M12
		7K <sup>(2)</sup>	F2			
		12K	F1			
	8	7K	F1	Hand Wheel	R785X335M52	R785X335M22
	2	14K	F1			
	4	14K <sup>(2)</sup>	F2			
		16K	F1			
		16K	F2			
		13K	F2			
	8	21K	F1			
		8K	F1			
		8K <sup>(2)</sup>	F2			
		9K <sup>(1)</sup>	F1			
		12K	F1			
		16K	F1			
16K		F2				
19K	F1					
21K <sup>(1)</sup>	F1					
335	8	8K <sup>(2)</sup>	F1	Hand Wheel	R785X335M62	R785X335M32
385	4	9K <sup>(2)</sup>	F1	Hand Wheel	R785X385M32	R785X385M12
		9K <sup>(2)</sup>	F2			
		16K	F1			
		21K	F2			
		24K <sup>(1)</sup>	F1			
	25K	F1				
	8	8K	F1			
		16K	F1			
		21K	F1			
		21K	F3			
		13K	F1			
		17K	F1			
22K		F1				
385	2	15K	F1	Hand Wheel	R785X385M42	R785X385M22
	4	21K <sup>(1)</sup>	F1			
		16K	F2			
		20K <sup>(2)</sup>	F1			
	8	9K <sup>(2)</sup>	F1			
		12K	F1			
		12K	F2			
		28K <sup>(1)</sup>	F1			
		29K	F1			
12	19K	F1				

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Table 21. 785C Spring Return Actuators with Manual Override Spare Parts Kit (continued)

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	MAXIMUM PRELOAD	SPRING	MANUAL OVERRIDE	MATERIAL					
					NBR (Standard Temperature)	Fluorosilicone (Low Temperature)				
					Parts Kit Number					
435	4	12K <sup>(2)</sup>	F2	Hand Pump	R785X435M42	R785X435M12				
		16K	F1							
		21K	F1							
		25K	F1							
	12	12K <sup>(2)</sup>	F1							
435	2	12K <sup>(1)</sup>	F1	Hand Pump	R785X435M52	R785X435M22				
	4	12K <sup>(2)</sup>	F1							
		27K	F1							
		22K	F2							
			36K <sup>(1)</sup>				F1			
	8	35K <sup>(1)</sup>	F1							
	12	20K <sup>(1)</sup>	F1							
23K		F1								
	16	18K	F1							
435	4	21K <sup>(1)</sup>	F2	Hand Pump	R785X435M62	R785X435M32				
	8	11K <sup>(2)</sup>	F1							
		12K	F1							
		27K	F1							
		17K	F2							
		16K	F1							
		16K	F3							
		21K	F1							
25K	F1									
485	2	33K <sup>(1)</sup>	F1	Hand Pump	R785X485M42	R785X485M12				
	4	25K	F1							
485	4	13K <sup>(2)</sup>	F1	Hand Pump	R785X485M52	R785X485M22				
		13K <sup>(2)</sup>	F2							
		33K	F1							
		30K	F2							
	8	25K	F1							
	12	23K	F1							
16	18K	F1								
485	4	37K <sup>(1)</sup>	F1	Hand Pump	R785X485M62	R785X485M32				
	8	11K <sup>(2)</sup>	F1							
		34K	F1							
		21K	F2							
		20K	F3							
		32K <sup>(1)</sup>	F1							
535	2	12K <sup>(1)</sup>	F1	Hand Pump	R785X535M42	R785X535M12				
	2	38K <sup>(1)</sup>	F1							
	4	14K <sup>(2)</sup>	F2							
		43K <sup>(1)</sup>	F1							
	8	40K <sup>(1)</sup>	F1							

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Table 21. 785C Spring Return Actuators with Manual Override Spare Parts Kit (continued)

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	MAXIMUM PRELOAD	SPRING	MANUAL OVERRIDE	MATERIAL	
					NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
					Parts Kit Number	
535	4	38K <sup>(1)</sup>	F2	Hand Pump	R785X535M52	R785X535M22
		34K	F1			
	8	13K <sup>(2)</sup>	F1			
		30K	F2			
		29K	F3			
		34K	F1			
535	4	25K <sup>(1)</sup>	F1	Hand Pump	R785X535M62	R785X535M32
		14K <sup>(2)</sup>	F1			
	67K <sup>(1)</sup>	F1				
535	8	19K	F1	Hand Pump	R785X535M72	R785X535MA2
	4	58K <sup>(1)</sup>	F1			
535	12	32K	F1	Hand Pump	R785X535M72	R785X535MA2
		16	29K			
	2	24K <sup>(1)</sup>	F1			
585	4	34K	F1	Hand Pump	R785X585M52	R785X585M12
		51K <sup>(1)</sup>	F1			
		65K <sup>(1)</sup>	F1			
	8	34K	F1			
585	8	45K <sup>(1)</sup>	F2	Hand Pump	R785X585M62	R785X585M22
		16K <sup>(2)</sup>	F1			
		49K <sup>(1)</sup>	F1			
		33K <sup>(1)</sup>	F2			
	32K	F3				
	12	31K	F1			
585	4	26K	F1	Hand Pump	R785X585M72	R785X585M42
		16K <sup>(2)</sup>	F1			
		16K <sup>(2)</sup>	F2			
635	2	36K <sup>(1)</sup>	F1	Hand Pump	R785X635M52	R785X635M12
		33K <sup>(1)</sup>	F1			
635	4	38K <sup>(1)</sup>	F1	Hand Pump	R785X635M62	R785X635M22
		35K <sup>(1)</sup>	F1			
635	4	19K <sup>(2)</sup>	F1	Hand Pump	R785X635M72	R785X635M32
		19K <sup>(2)</sup>	F2			
		62K <sup>(1)</sup>	F1			
		52K <sup>(1)</sup>	F2			
	8	17K <sup>(2)</sup>	F1			
		19K <sup>(1)</sup>	F1			
		60K <sup>(1)</sup>	F1			
		40K <sup>(1)</sup>	F2			
		38K <sup>(1)</sup>	F3			
		38K <sup>(1)</sup>	F1			
		55K <sup>(1)</sup>	F1			
		67K <sup>(1)</sup>	F1			
	12	45K <sup>(1)</sup>	F1			

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Table 21. 785C Spring Return Actuators with Manual Override Spare Parts Kit (continued)

CYLINDER SIZE	MAXIMUM TRAVEL, INCHES	MAXIMUM PRELOAD	SPRING	MANUAL OVERRIDE	MATERIAL	
					NBR (Standard Temperature)	Fluorosilicone (Low Temperature)
					Parts Kit Number	
635	16	33K	F1	Hand Pump	R785X635M82	R785X635M42
685	4	21K <sup>(2)</sup>	F1	Hand Pump	R785X685M52	R785X685M12
		38K	F1			
685	12	35K	F1	Hand Pump	R785X685M62	R785X685M22
685	4	21K <sup>(2)</sup>	F2	Hand Pump	R785X685M72	R785X685M32
		74K	F1			
		85K <sup>(1)</sup>	F2			
		75K	F3			
		83K <sup>(2)</sup>	F2			
	8	21K <sup>(2)</sup>	F1			
		38K	F1			
		51K	F1			
		49K	F2			
		64K	F3			
		36K <sup>(1)</sup>	F1			
		73K <sup>(1)</sup>	F1			
	81K <sup>(1)</sup>	F1				
12	49K <sup>(1)</sup>	F1				
685	16	33K	F1	Hand Pump	R785X685M82	R785X685M42

Note:  
 1. Only available for spring extend (fail down) model.  
 2. Only available for spring retract (fail up) model.

## Parts List

### Note

Contact your [Emerson sales office](#) for Part Ordering information.

Key	Description
1	785C Nameplate
2	Drive Screw
3	Travel Scale
4	Bushing
5	Vent Assembly
6	Nipple
7	Max Cylinder Pressure Warning Tag
8	Stem Connector Nuts
9	Bypass valve (see figure 4)
10	Tee (see figure 4)
11	Nipple (see figure 4)

### 1000 Nameplate Kits (figure 50)

Key	Description
1001	Linear Actuator Label
1002	Rivet
1003	Lifting Point Label
1004	Actuator Lifting Label

### 2000 Yoke (Spool) Assembly (figure 37)

Key	Description
2001	Yoke (Spool)
2002	Screw
2003	Screw
2004	Washer
2005	Screw
2006	Screw

### 2100 Repair Kit 785C Spring Return Assembly (figure 51 and 52)

Key	Description
2101	Scraper Ring Flange
2102*	Scraper Ring
2105	Screw
2106*	Washer
2107*	Gasket
2108	Washer
2109	Nut
2110	Screw

### 2200 Pneumatic Cylinder Assembly (figure 34, 35, and 36)

Key	Description
2201	Head Flange
2202*	O-Ring
2203	Bushing
2204*	O-Ring
2205	Washer
2206	Piston
2207*	Guide Sliding Ring, Piston
2208*	O-Ring
2209	Cylinder Tube
2210	End Flange
2211	Washer
2212	Nut
2213	Tie Rod
2214	Washer
2215	Eyebolt
2216	Plug
2217	End Stroke
2218	Screw
2219	Hub
2220	Screw
2221	Plug
2222*	O-Ring
2350	Piston Rod, Pneumatic Cylinder

### 2400 Spring Can (Spring Cartridge) Assembly (figure 38)

Key	Description
2401	Flange
2402	Rod
2403	Bushing
2404	Retainer Ring
2405	Piston Rod Guide Tube
2406	Flange
2407	Spring
2408	Spring
2409	Spring
2410	Calendered Sheet
2411	End Flange
2412	Lifting Eyelet
2413	Tube
2414	Plug

### 2600 Manual Handwheel Assembly (figure 39 and 40)

Key	Description
2601	Manual Handwheel
2601-1	Cover
2601-2*	Cover Gasket
2601-3	Engagement Level Pin
2601-4	Flange
2601-5	Fork
2501-6	Body
2501-7	Bush
2601-8*	Thrust Shoulder Washer
2601-9	Screw Nut

\*Recommended spare parts

Key	Description
2601-10	Plug
2601-11	Thrust Block Ring Nut
2601-12	Jack Screw
2601-13	Protection Pipe
2601-14	Spring
2501-15	Kit Cams & Pin
2601-16	Screw
2601-17	Screw
2601-18	Screw
2601-19*	O-Ring
2601-20*	O-Ring
2601-21*	O-Ring
2601-22	Pin
2601-23	Pin
2601-24	Ball
2601-25	Ball

2609\* Seal Kit

## 2620 Hydraulic Cylinder Kit Assembly (figure 53)

Key	Description
2621	Screw
2622	Spacer
2623	Flange
2624*	Gasket

## 2700 Manual Handwheel Assembly (figure 23)

Key	Description
2701	Head Flange
2702	Plug
2703	Bushing
2704*	O-Ring
2705*	Piston Rod Sealing Ring
2706	Piston Rod
2707	Piston
2708*	O-Ring
2709*	Guide Sliding Ring, Piston
2710*	Piston Seal Ring
2711	Cylinder Tube
2712	End Flange
2713	Tie Rod
2714	Tie Rod
2715	Screw

## 2750 Hydraulic Control Unit & Handpump Assembly (figure 45, 46, and 47)

Key	Description
2751	Hydraulic Control Unit
2751-1.1	Check Valve
2751-1.2	Flow Regulator
2751-1.3	Relief Valve for Automatic Operation
2751-1.4	Relief Valve for Manual Operation

Key	Description
2751-1.5	Relief Valve Low
2751-1.6	Relief Valve High
2751-1.7	Oil Tank Dipstick
2751-2	Cap Nut
2751-3	Washer
2751-4	Hydraulic Tank
2751-6*	O-Ring
2751-7	Ball
2751-8	Spring
2751-9	Washer
2751-10	Screw
2751-11	Plate
2751-12	Flange
2751-13	Screw
2751-14	Lever
2751-15	Distributor
2751-16*	O-Ring
2751-17*	O-Ring
2751-18	Nozzle
2751-19	Screw
2751-20*	O-Ring
2751-21*	O-Ring
2751-22	Tank Cover
2751-23	Tie Rod
2751-24	Screw
2751-25	Flange
2751-26	Check Valve Body
2751-27	Plug
2751-28	Flow Control Valve Setting Screw
2751-29	Spring Pin
2751-30	Nut
2751-31	Flange
2751-32*	O-Ring
2751-33	Spring
2751-34	Plug
2751-35	Retainer Ring
2751-36	Spring Pin
2751-37	Screw
2751-38	Operation Instruction Plate
2751-39	Screw
2751-40	Spring
2751-41	Ball
2751-42	Ball
2751-43	Spring
2751-44	Relief Valve Setting Screw
2751-45	Spring Pin
2751-46	Screw
2751-47	Spring
2751-48	Nut
2751-49	Washer
2751-50	Washer
2751-51	Dipstick
2751-52*	Plug and O-Ring
2751-53	Spring
2751-54	Screw
2751-55	Nut
2751-56	Silencer
2751-57*	O-Ring
2751-58	Retainer Ring
2751-59	Dipstick Body
2751-60	Nut
2751-61	Relief Valve Body



Key	Description
2752	Handpump
2752-1	Ball
2752-2	Delivery Valve Bush
2752-3	Suction Valve Bush
2752-4	Spring
2752-5	Suction Valve Seat
2752-6	Spring Retainer Ring
2752-7	Fork
2752-8	Pin
2752-9	Retainer Ring
2752-10	Rod
2752-11	Body
2752-12	Lever
2752-13	Split Pin with Rope
2752-14	Scarper Ring
2752-15	Threaded Bush
2752-16	Rod Seal Ring
2752-17	O-Ring
2752-18	O-Ring
2752-19	Piston Rod Bushing

2759\* Seal Kit

### 2760 Hydraulic Control Unit & Handpump Support Assembly (figure 42)

Key	Description
2761	Support
2762	Washer
2763	Screw
2764	Support
2765	Screw
2766	Nut

### 2780 Hydraulic Fittings Kits (figure 43)

Key	Description
27H1	Nipple
27H2	Relief Valve
27H3	Tee Pipe Fitting
27H4	Stop Valve
27H5	Straight Fitting Male Connector
27H6	90° Elbows Fitting Unions Connector

Key	Description
27H7	90° Elbows Fitting Unions Connector
27H8	90° Elbows Fitting Unions Connector
27H9	Adapter Pipe Fitting
2786U	Power Up Tube
2786D	Power Down Tube
2787U	Pilot Up Tube
2787D	Pilot Down Tube

### 2790 MHQ Hydraulic Fitting and Tubing Kit (figure 44)

Key	Description
2791	Male Tube Adapter
2792	Straight Fitting Male Connector
2793	90° Elbows Fitting Unions Connector
2794	Tube
2795	Stop Valve

### 4300 Valve Stem Connector Assembly (figure 48)

Key	Description
4301	Split Coupling Block
4302	Screw
4850	Anti-Rotator Plate
5000	Travel Indicator

### 6520 Mounting Bracket & Screw Assembly (figure 49)

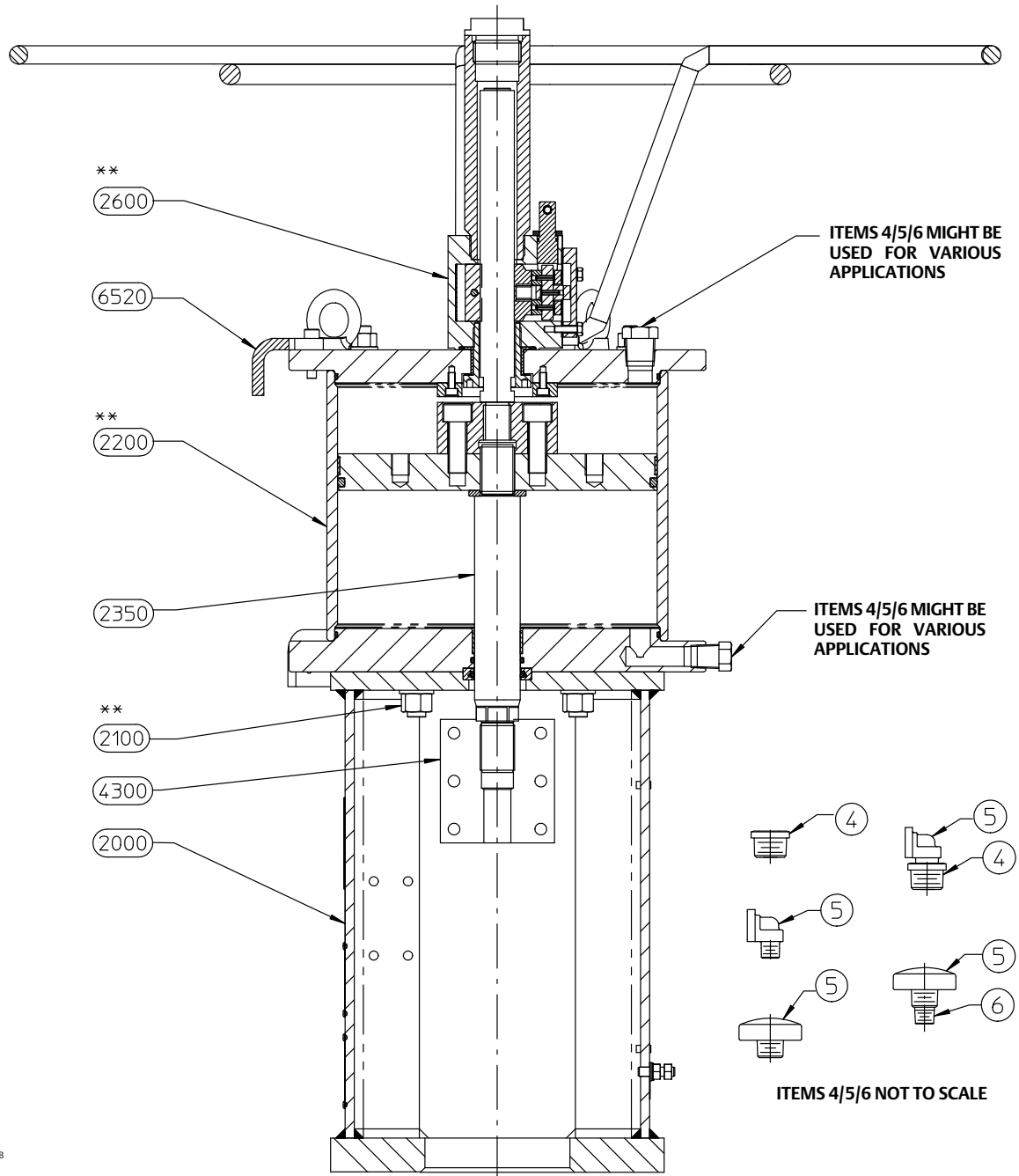
Key	Description
6521	Mounting Boss
6522	Screw
6523	Screw

### Items Not Shown

Key	Description
400	Painting
500	Actuator Grease
600	MHP/MHQ Handpump Oil

# Assembly Drawings

Figure 24. Fisher 785C Double-Acting Springless Actuator with Top Mounted Handwheel



GH01816\_B

\*\* COMPONENT INCLUDES RECOMMENDED SPARE PART  
PARTS NOT SHOWN: KEY 400 AND 500

Figure 25. Fisher 785C Double-Acting Springless Actuator with Top Mounted Handwheel

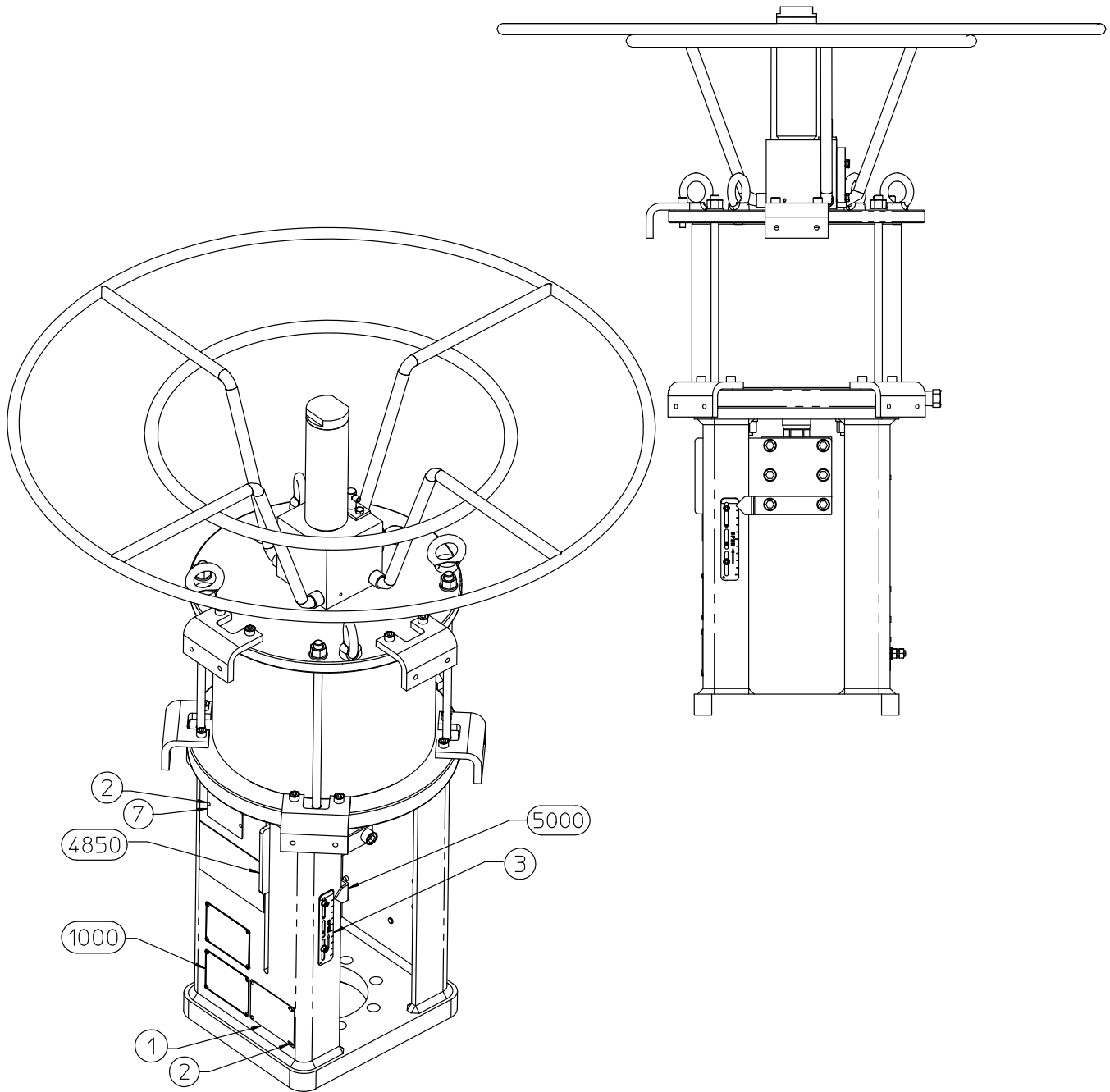
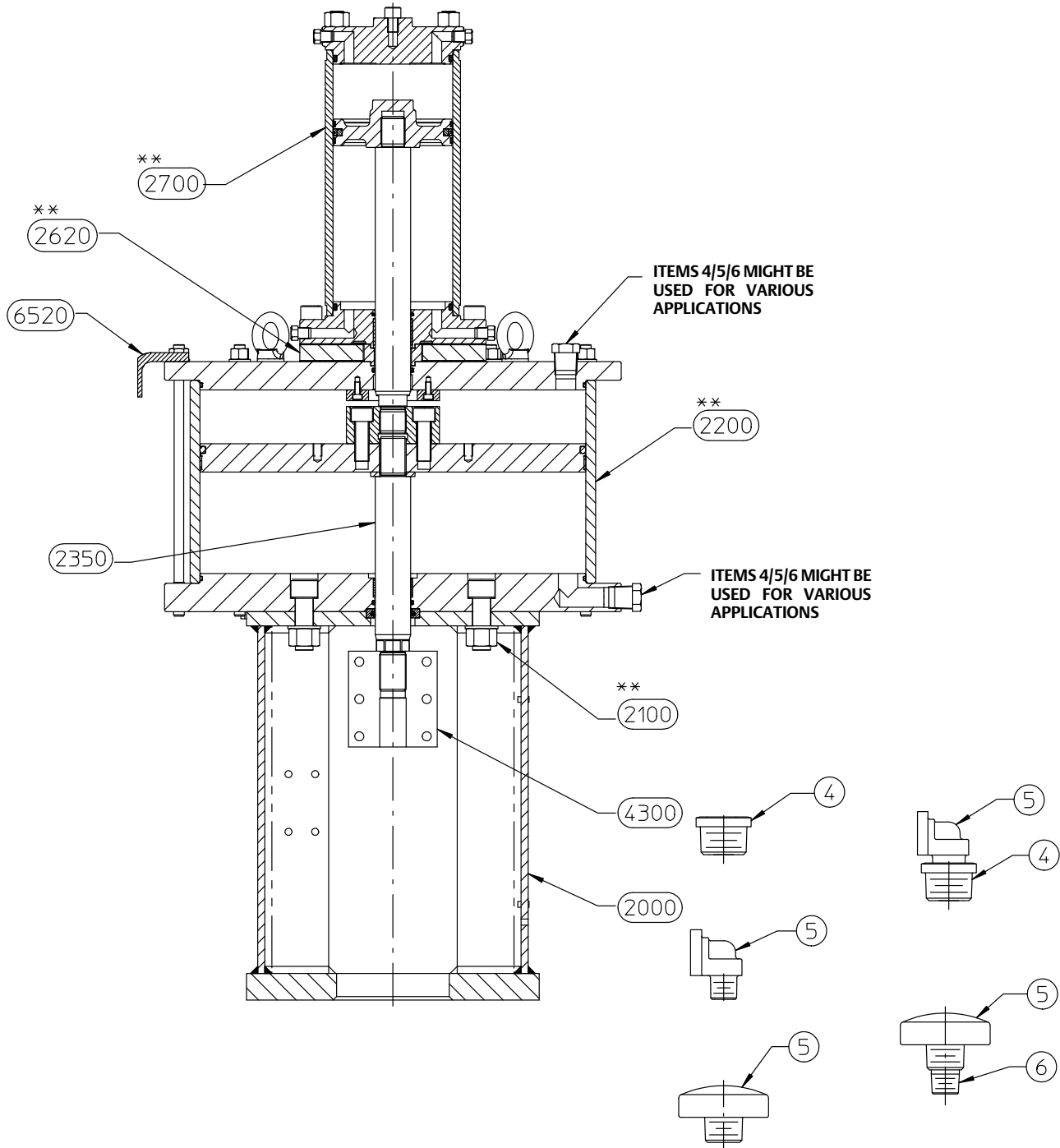


Figure 26. Fisher 785C Double-Acting Springless Actuator with Side Mounted Handpump

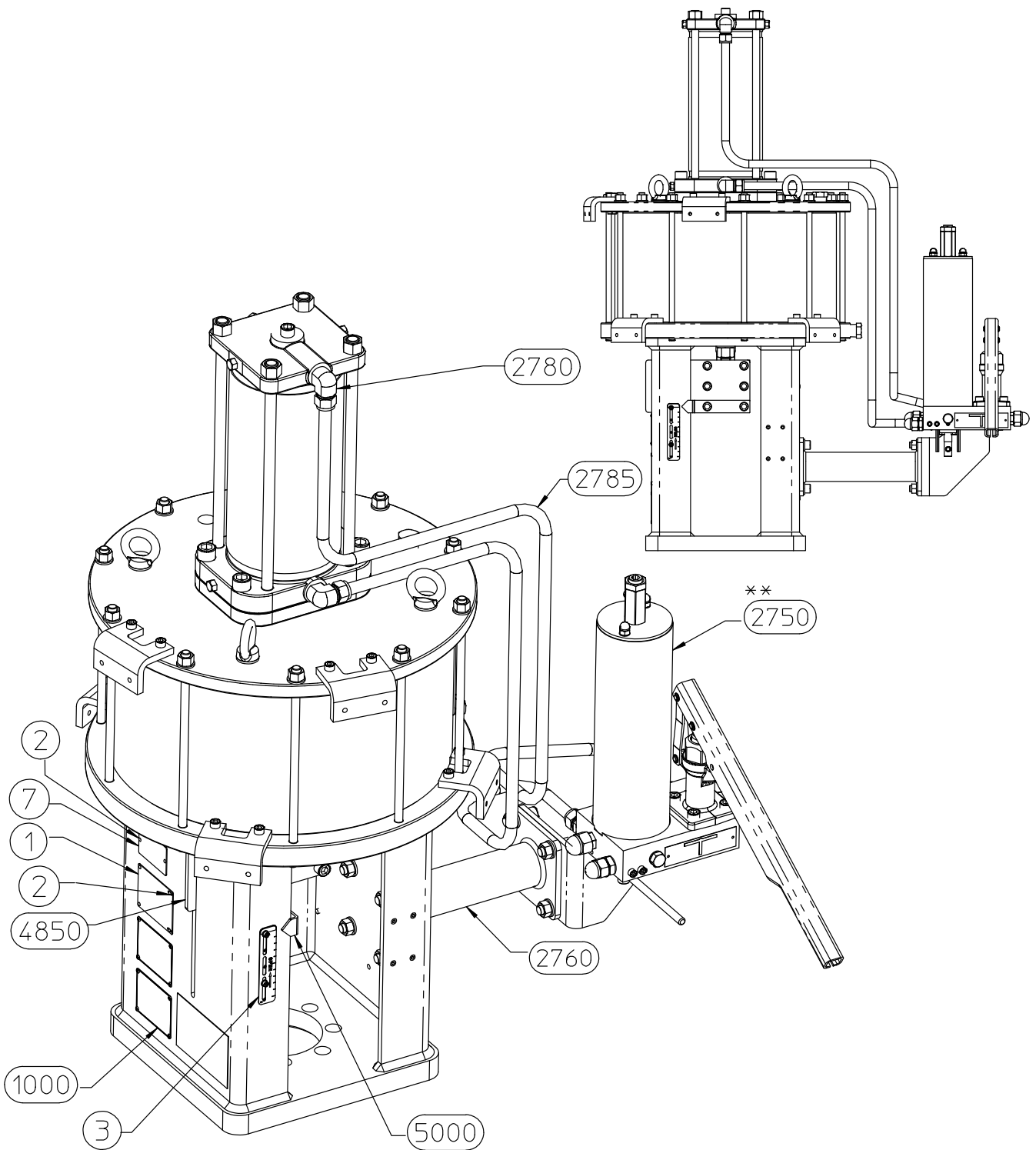


\*\* COMPONENT INCLUDES RECOMMENDED SPARE PART  
 PARTS NOT SHOWN: KEY 400, 500, AND 600

ITEMS 4/5/6 NOT TO SCALE

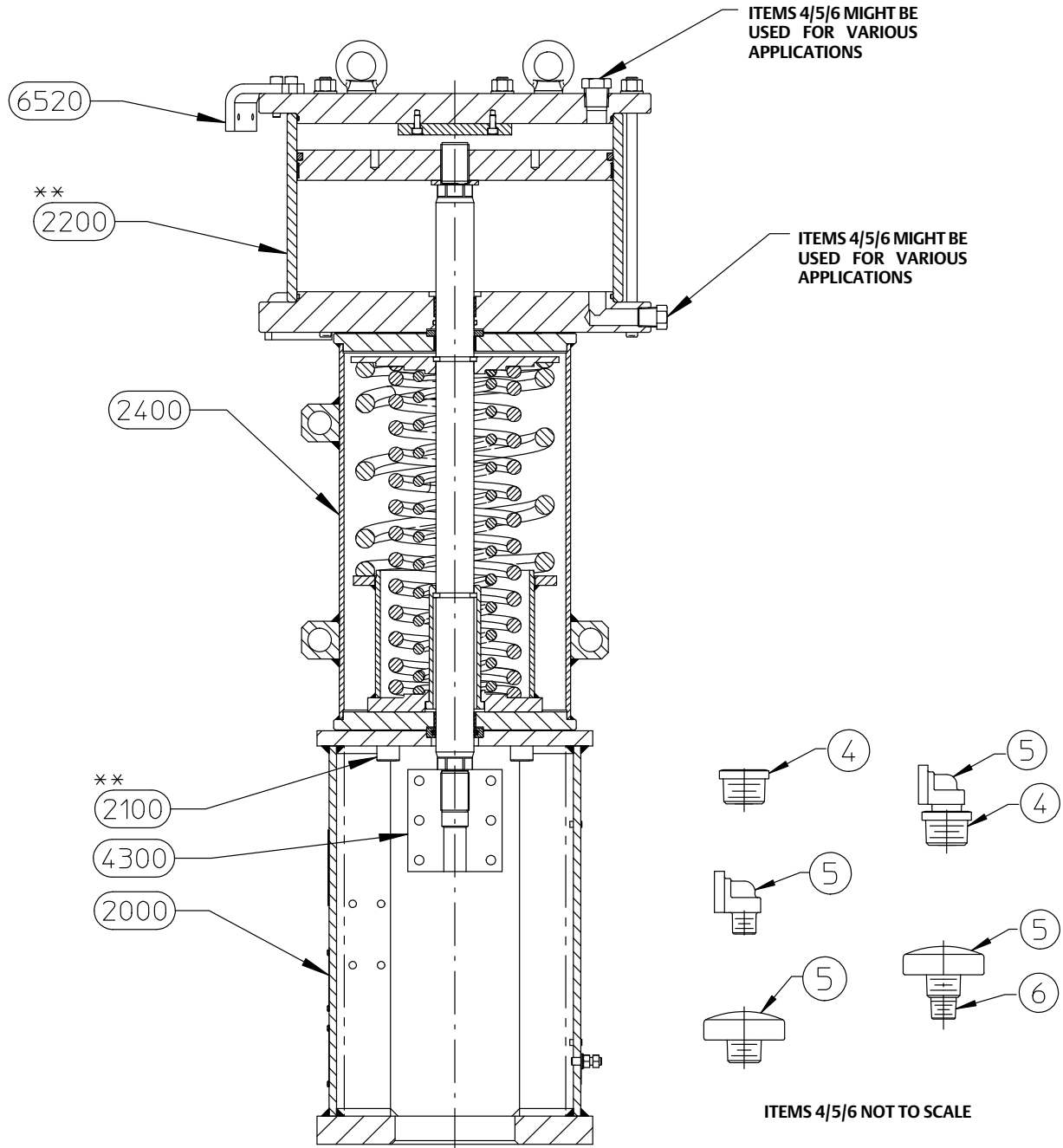
GH01791\_B

Figure 27. Fisher 785C Double-Acting Springless Actuator with Side Mounted Handpump



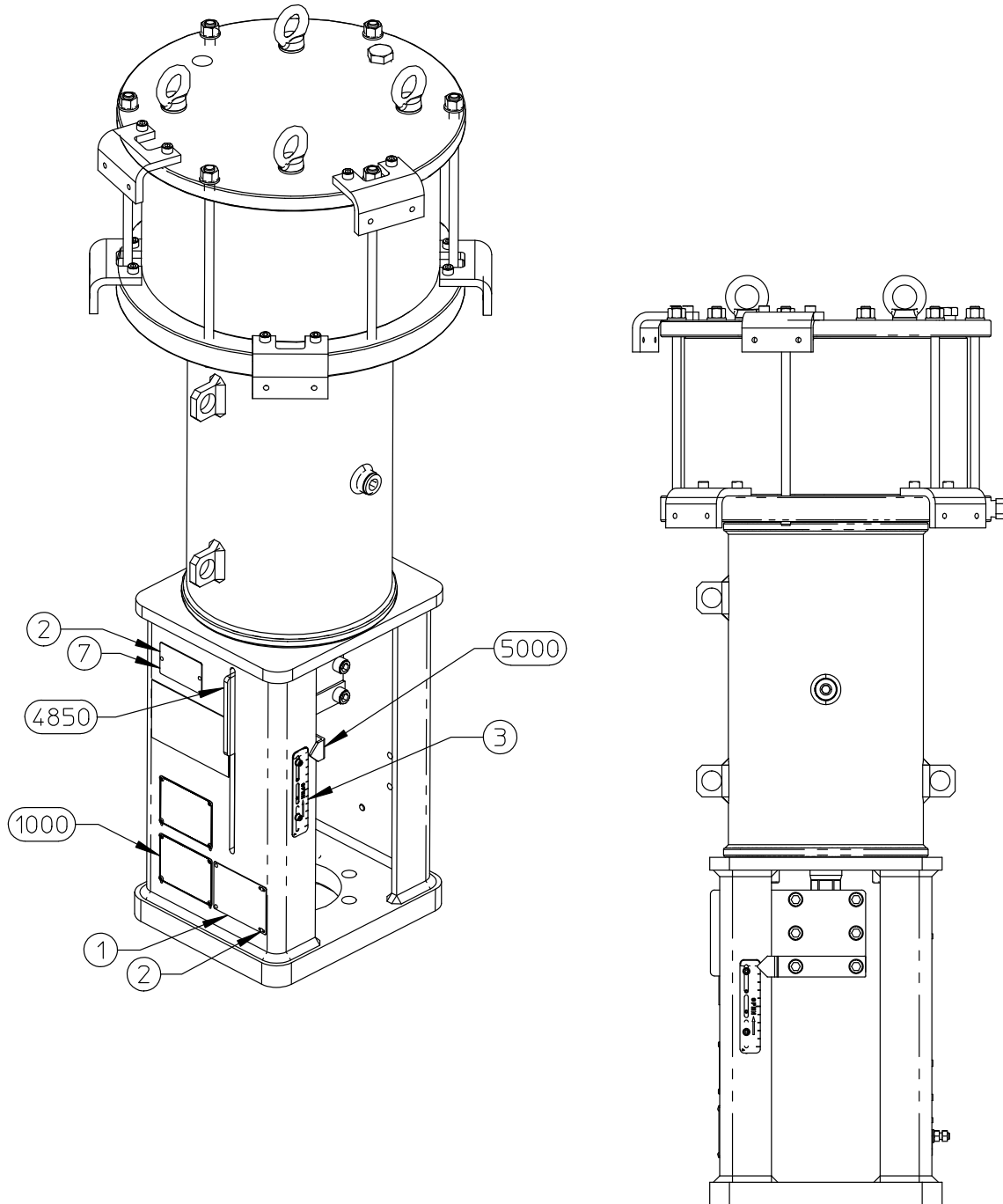
GH01791\_B

Figure 28. Fisher 785C Single-Acting Spring Return Actuator without Manual Override



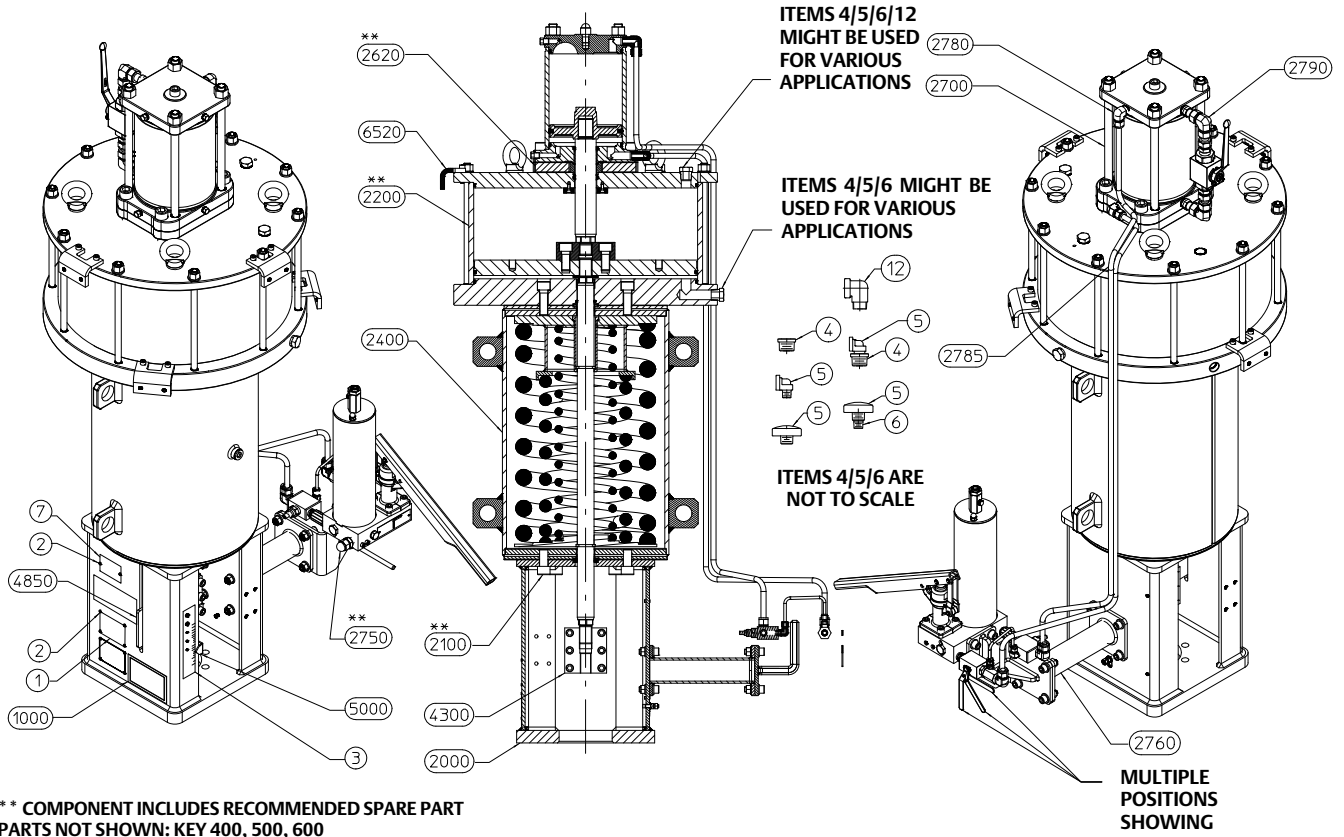
GH01864\_B

Figure 29. Fisher 785C Single-Acting Spring Return Actuator without Manual Override



GH01864\_B

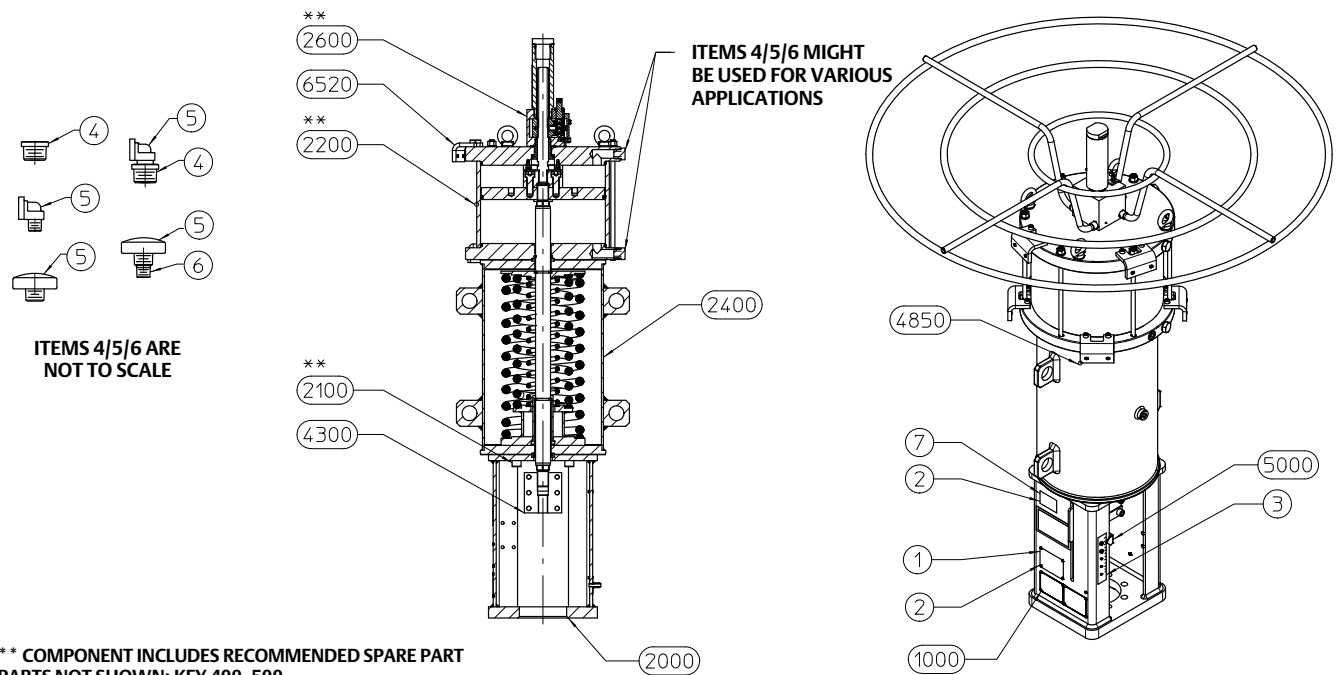
Figure 30. Fisher 785C Spring Return Assembly with Side Mounted Handpump, Rod Extend



\*\* COMPONENT INCLUDES RECOMMENDED SPARE PART  
PARTS NOT SHOWN: KEY 400, 500, 600

GH14039

Figure 31. Fisher 785C Spring Return Assembly with Top Mounted Handpump, Rod Retract

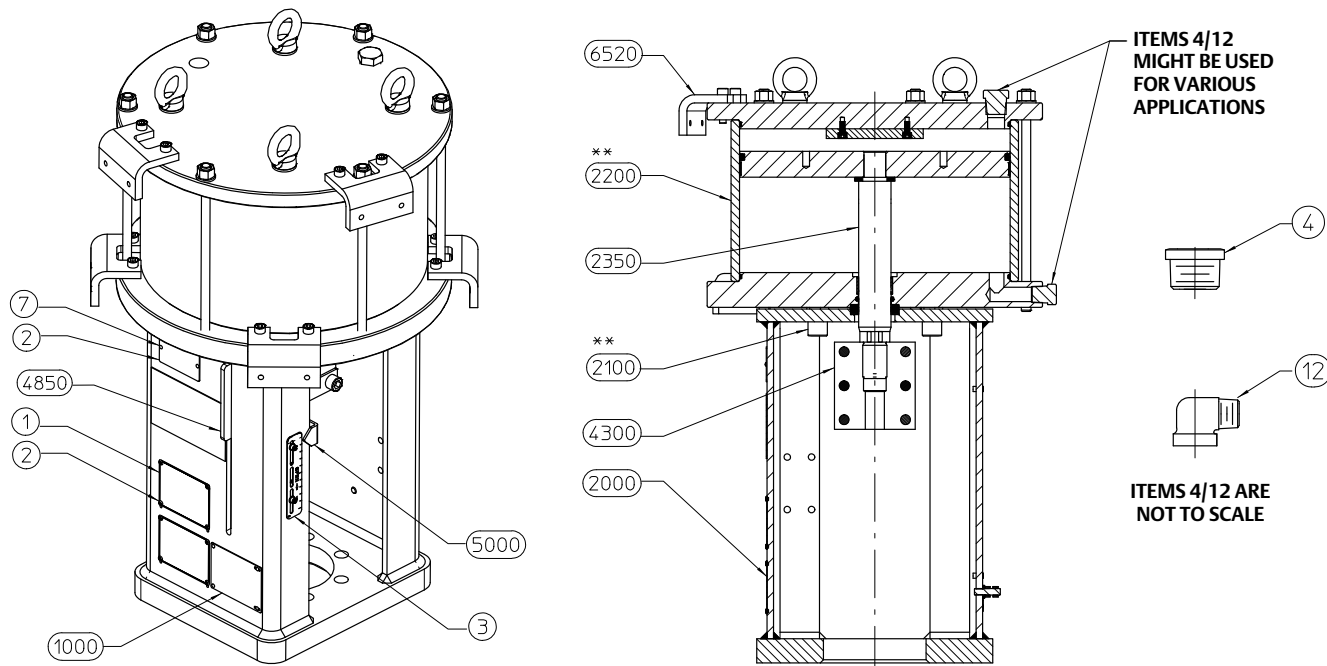


\*\* COMPONENT INCLUDES RECOMMENDED SPARE PART  
PARTS NOT SHOWN: KEY 400, 500

GH14077



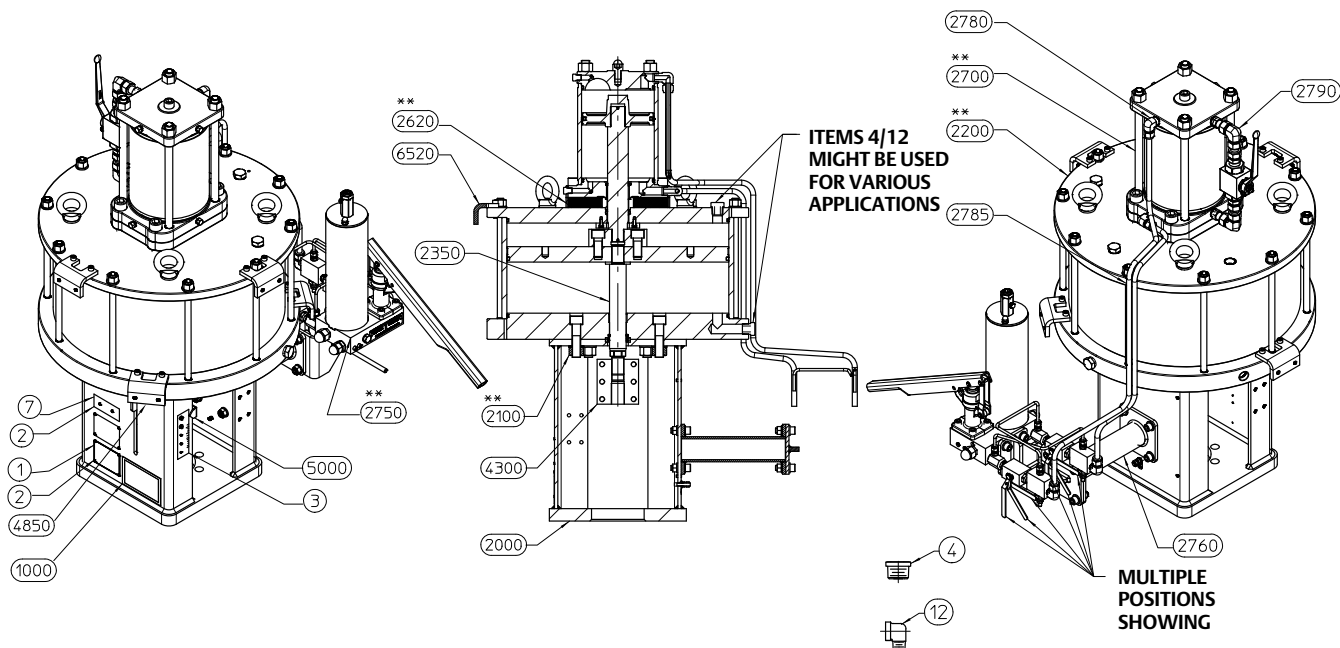
Figure 32. Fisher 785C Springless Assembly without Manual Override



\*\* COMPONENT INCLUDES RECOMMENDED SPARE PART  
PARTS NOT SHOWN: KEY 400, 500

GH14253

Figure 33. Fisher 785C Springless Assembly with Fast Stroke Side Mounted Handpump MHQ

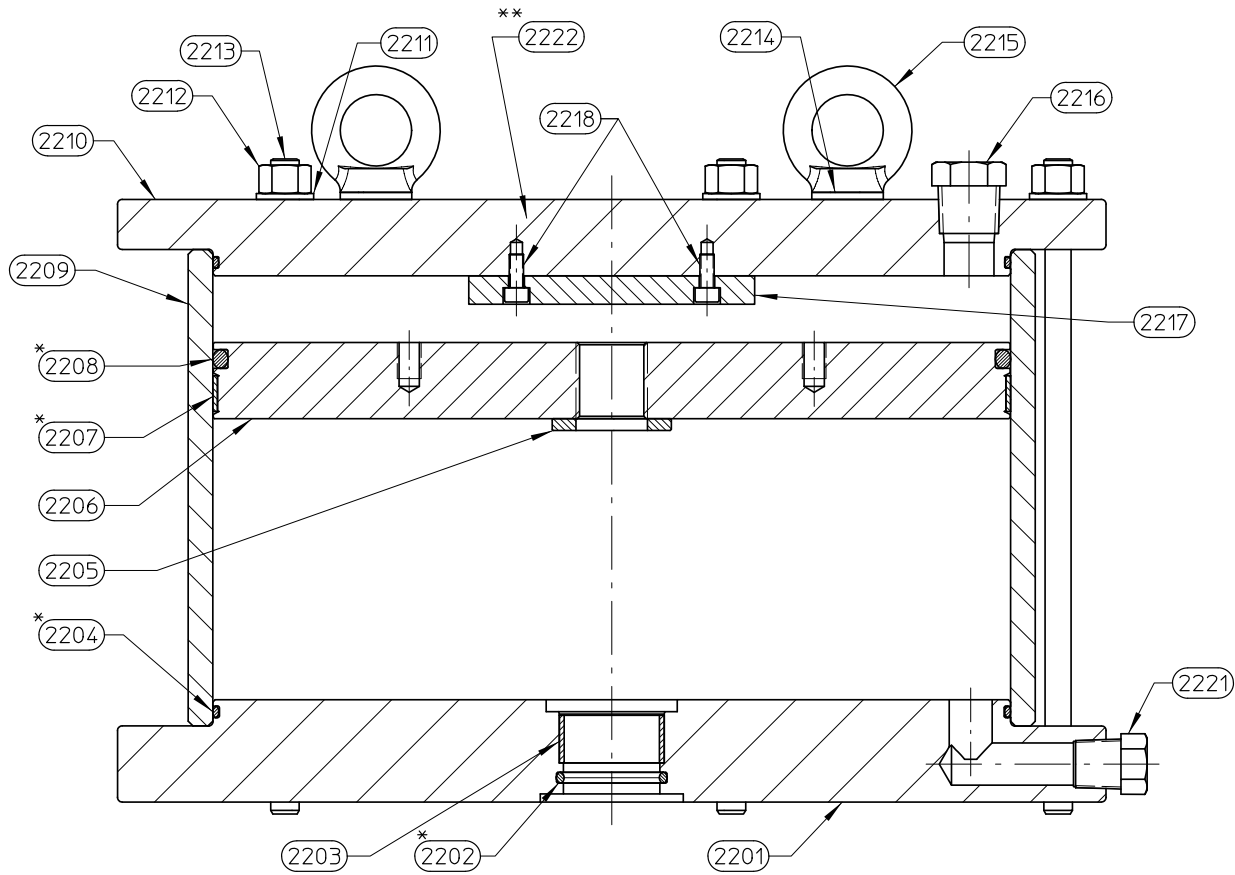


\*\* COMPONENT INCLUDES RECOMMENDED SPARE PART  
PARTS NOT SHOWN: KEY 400, 500, 600

GH14084

ITEMS 4/12 ARE NOT TO SCALE

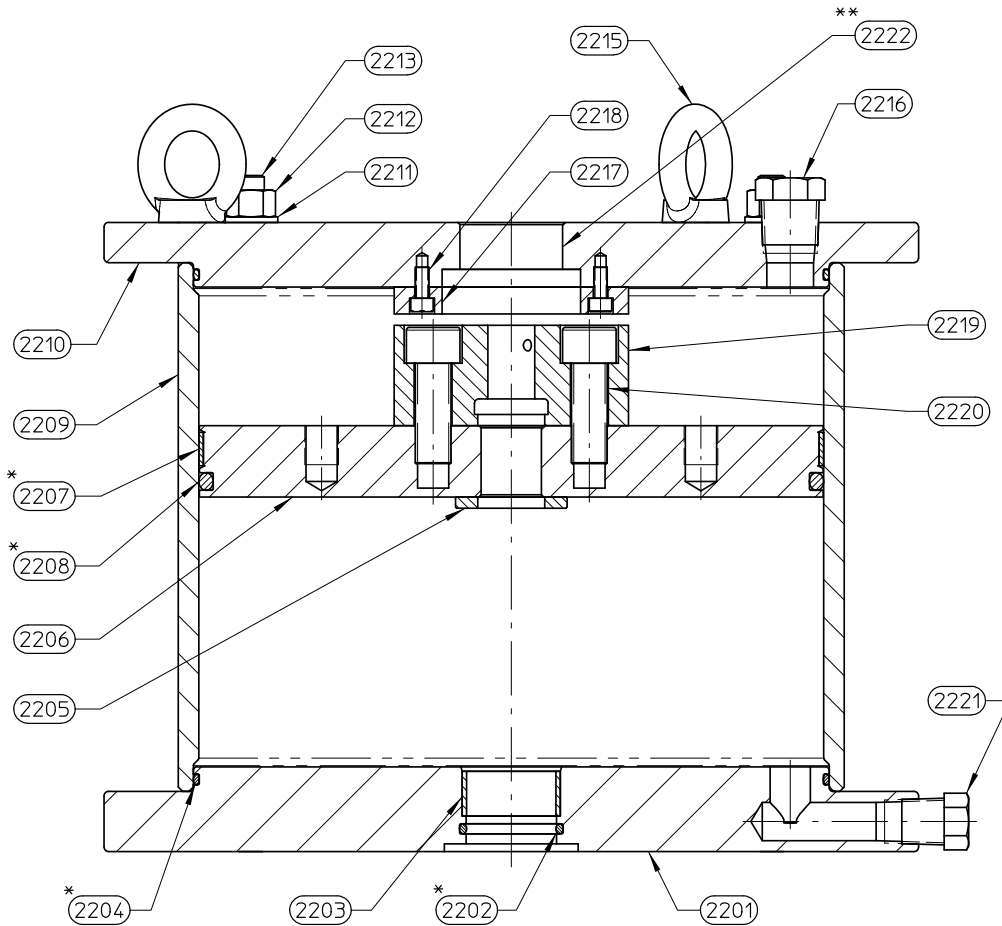
Figure 34. Pneumatic Cylinder Assembly of Fisher 785C Actuator without Manual Override, Springless or Spring Return, Single- or Double-Acting



\* COMPONENT INCLUDES RECOMMENDED SPARE PART  
\*\* ITEM NOT REQUIRED FOR THIS ASSEMBLY

GH01624\_B

Figure 35. Pneumatic Cylinder Assembly of Fisher 785C Actuator with Top Mounted Handwheel, Springless or Spring Return, Single- or Double-Acting

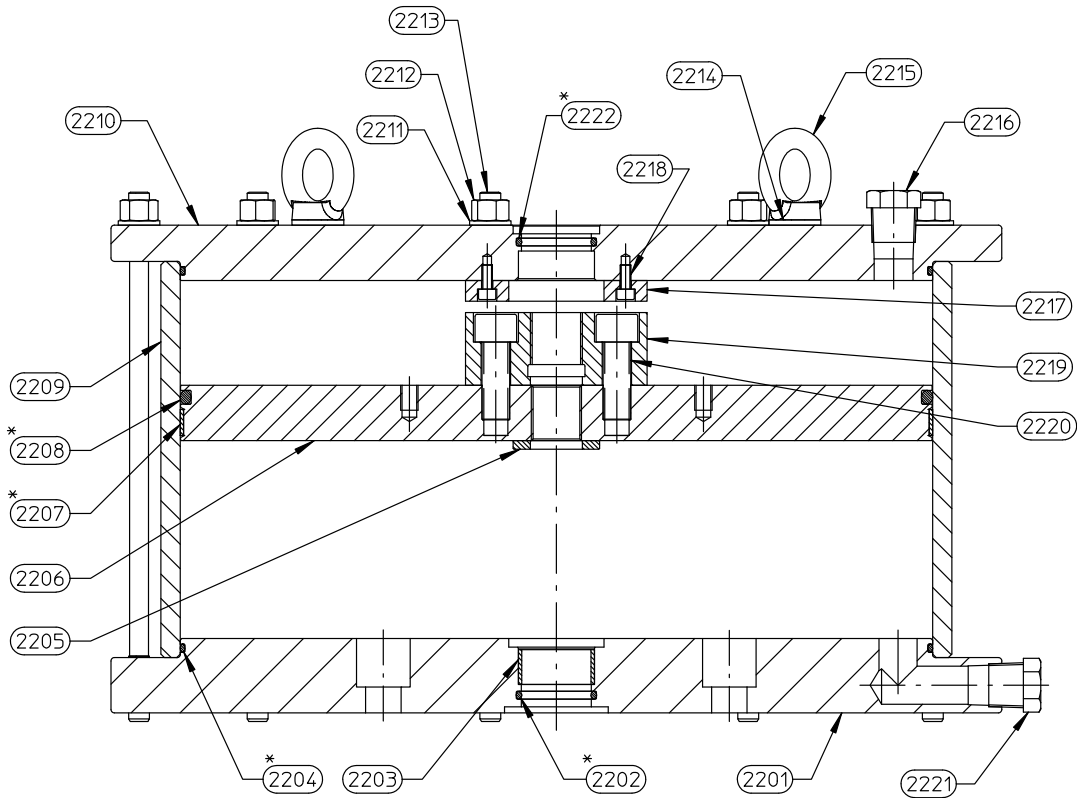


\* COMPONENT INCLUDES RECOMMENDED SPARE PART

\*\* ITEM NOT REQUIRED FOR THIS ASSEMBLY

GH01756\_b

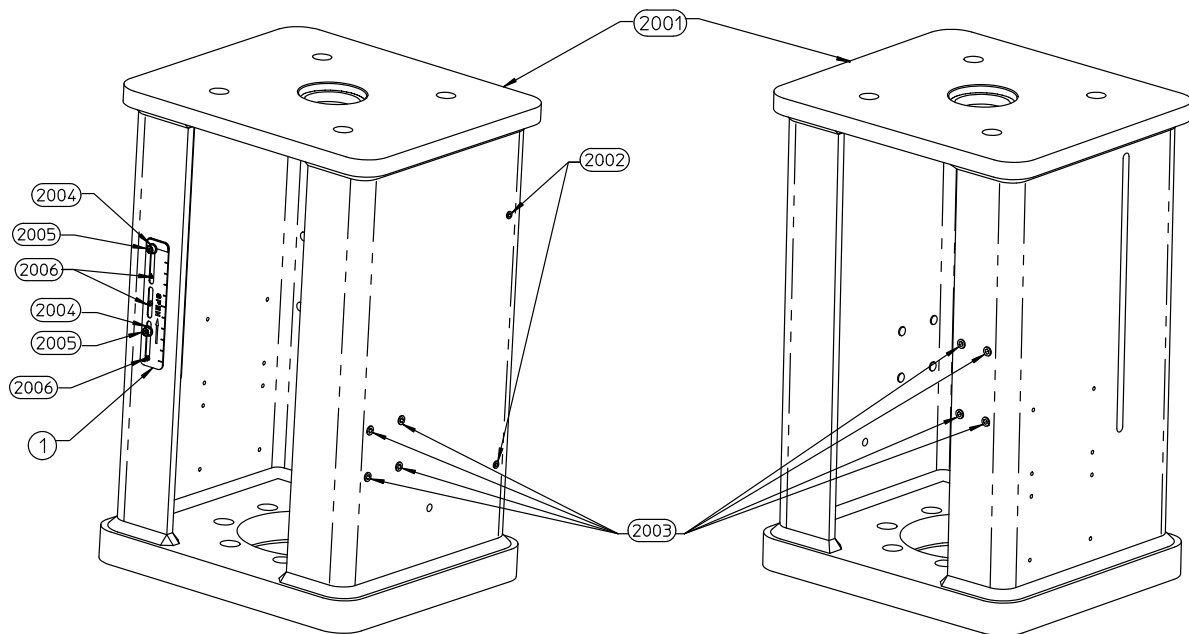
Figure 36. Pneumatic Cylinder Assembly of Fisher 785C Actuator with Side Mounted Handpump, Springless or Spring Return, Single- or Double-Acting



\* COMPONENT INCLUDES RECOMMENDED SPARE PART

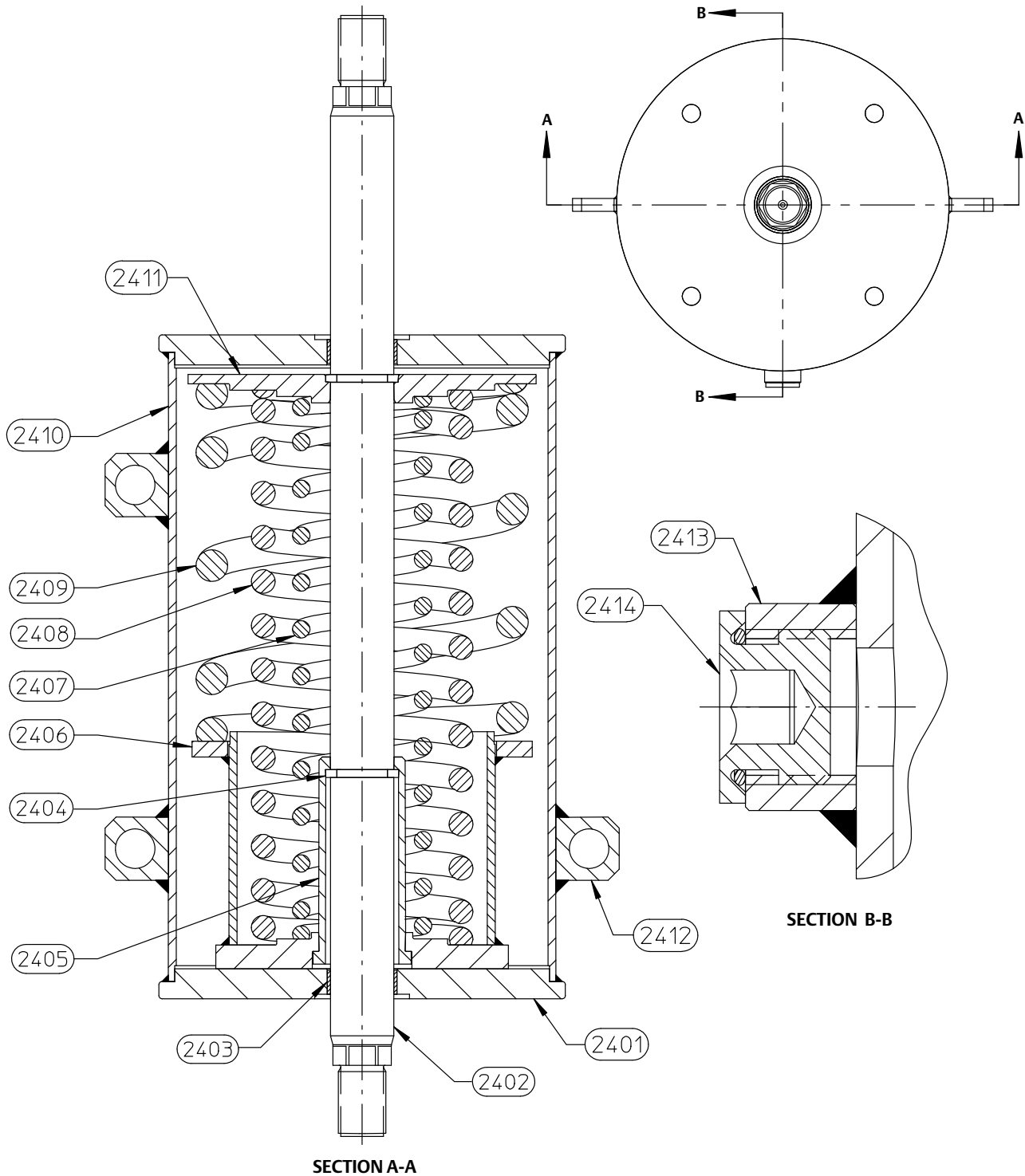
GH01644\_A

Figure 37. Yoke (Spool) Assembly of Fisher 785C Actuator Springless or Spring Return, Single- or Double-Acting



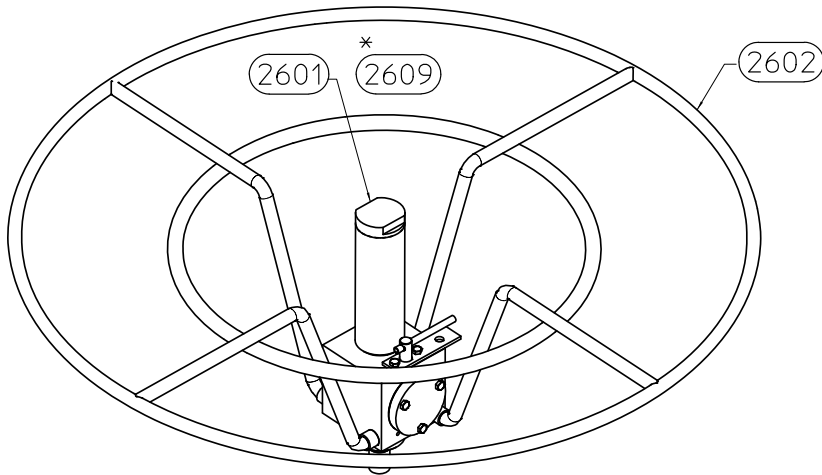
GH01609\_A

Figure 38. Spring Can (Spring Cartridge) Fisher 785C Single-Acting Spring Return Actuator Single- or Double-Acting



CH01764\_A

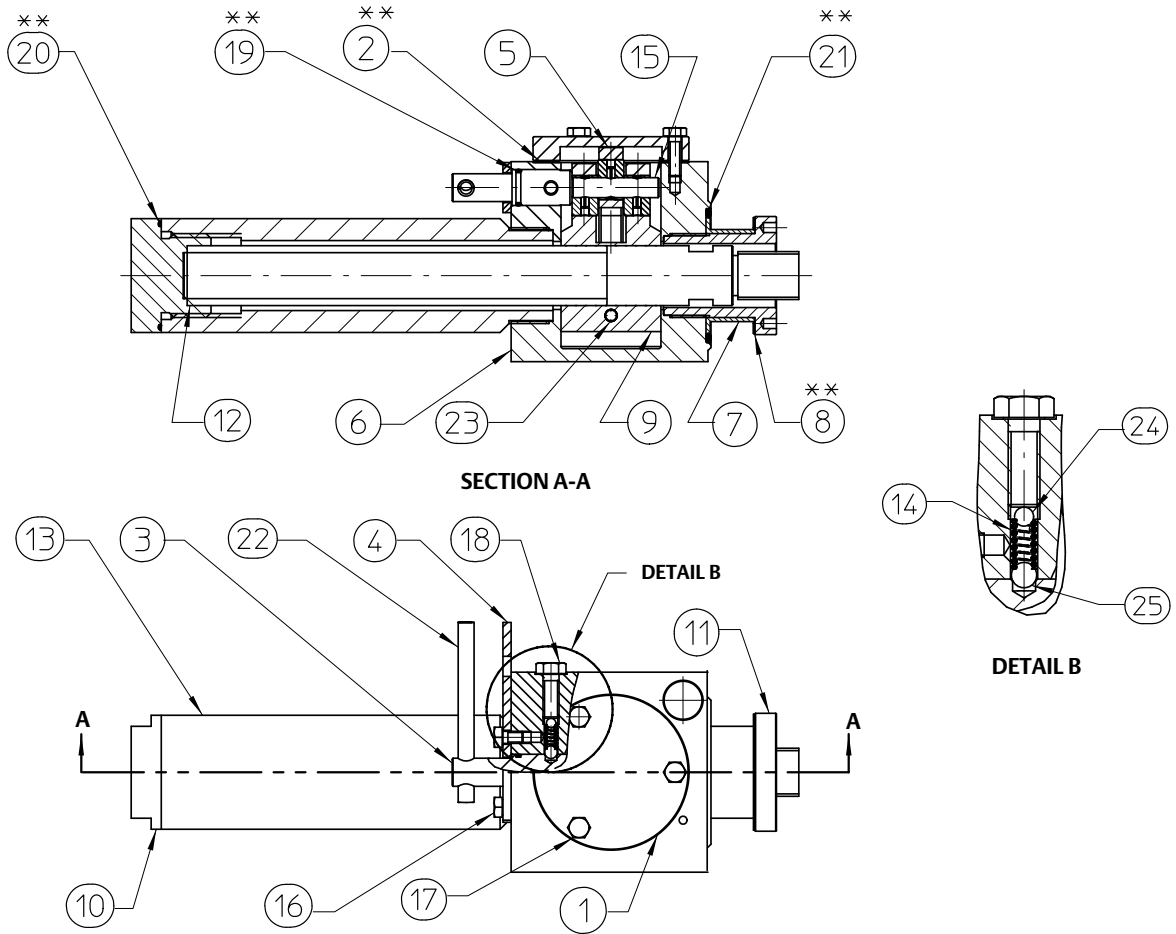
Figure 39. Top Mounted Handwheel of Fisher 785C Actuator, Springless or Spring Return, Single- or Double-Acting



\* COMPONENT INCLUDES RECOMMENDED SPARE PART  
PARTS NOT SHOWN: 2609

GH01762\_B

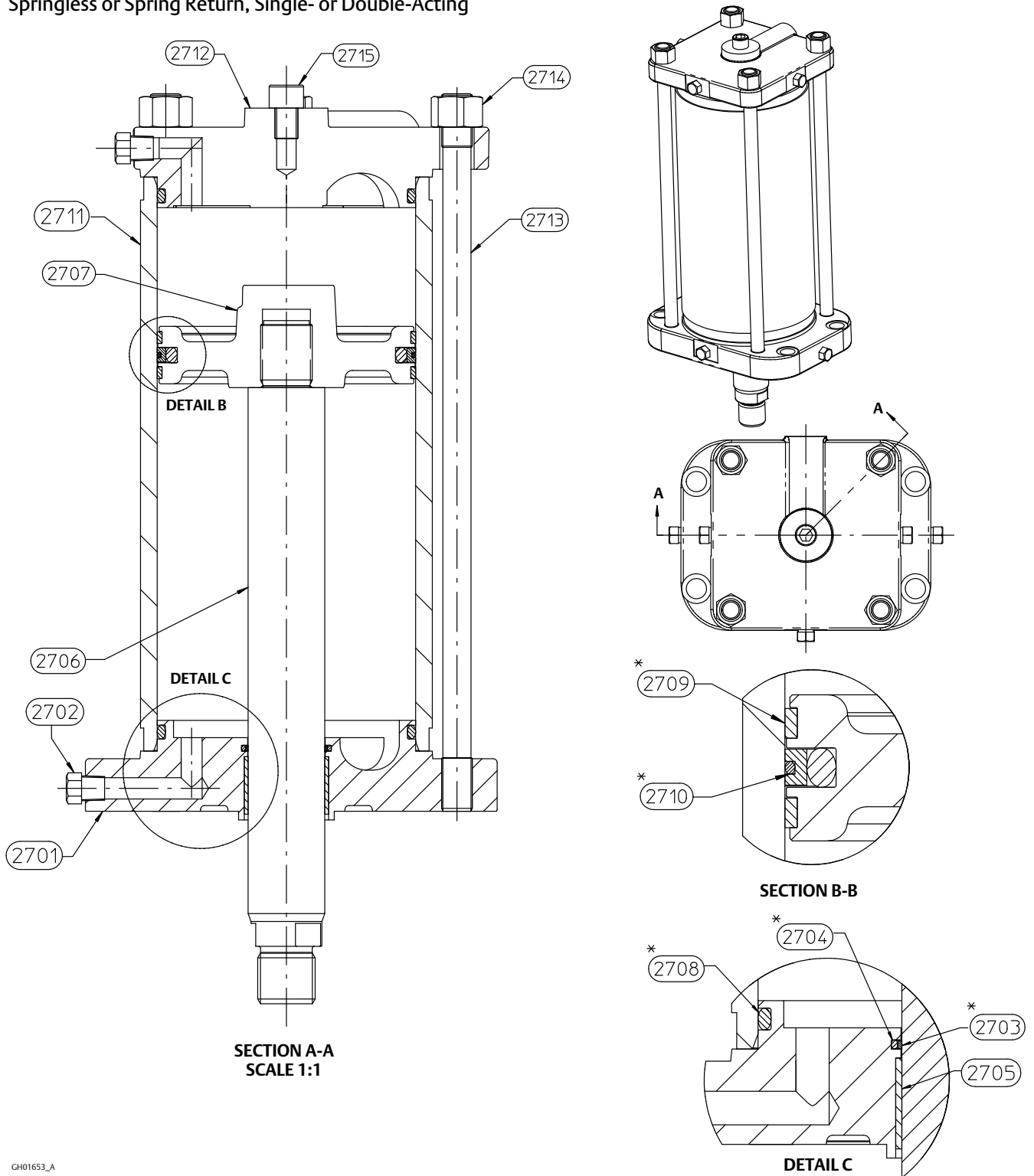
Figure 40. Handwheel MHW Unit (Key 2601)



\*\* RECOMMENDED SPARE PART

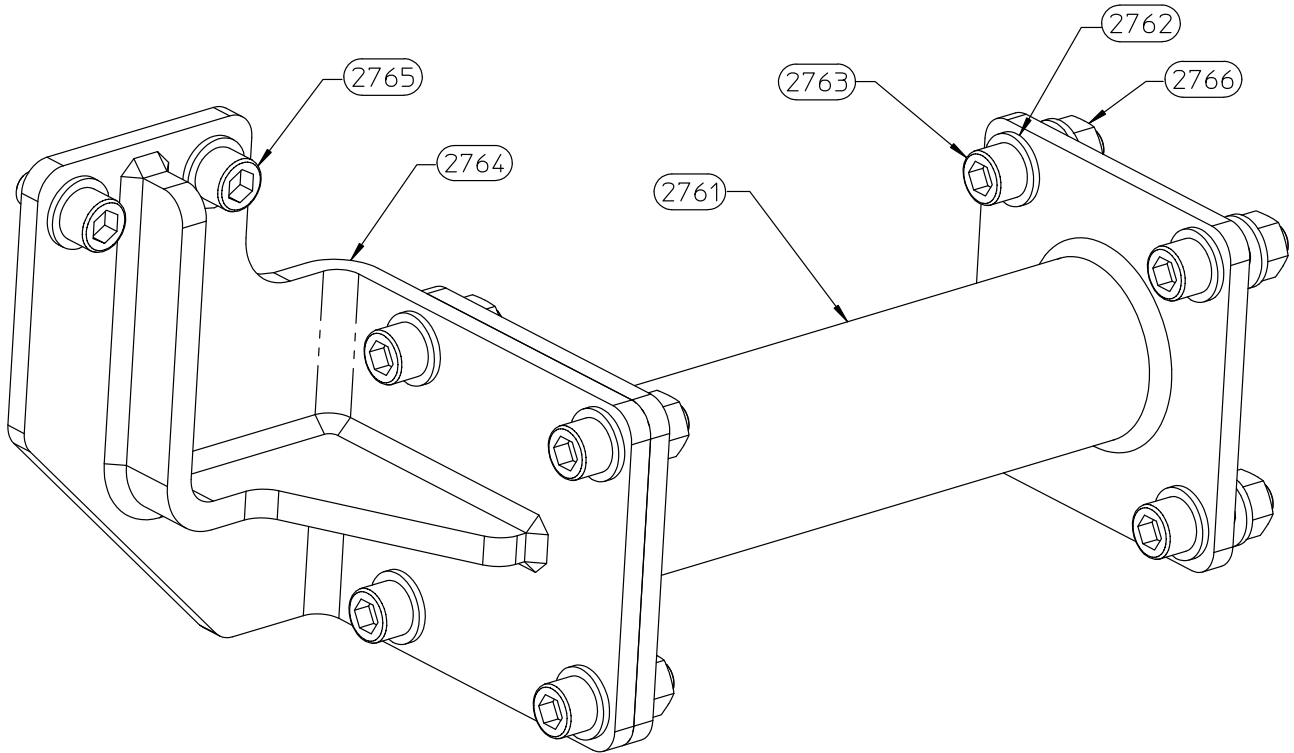
GH14287

**Figure 41. Side Mounted Handpump Hydraulic Cylinder Assembly of Fisher 785C Actuator  
Springless or Spring Return, Single- or Double-Acting**



GH01653\_A

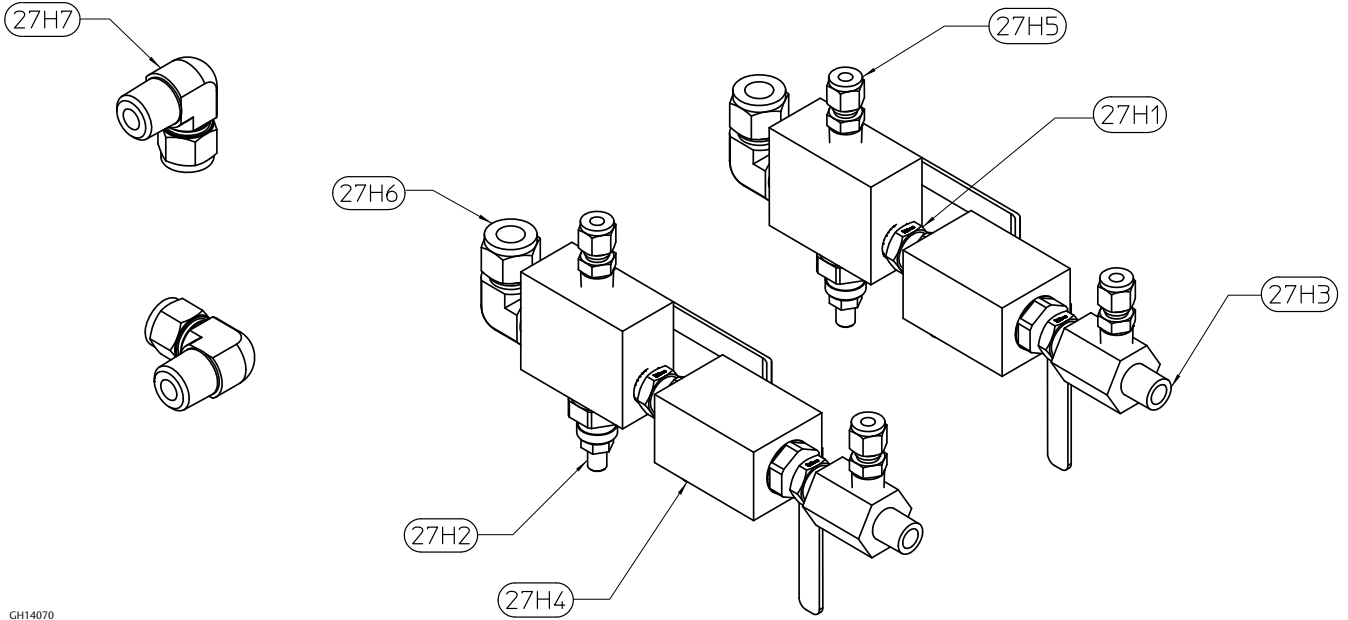
Figure 42. Side Mounted Handpump Support of Fisher 785C Actuator  
Springless or Spring Return, Single- or Double-Acting



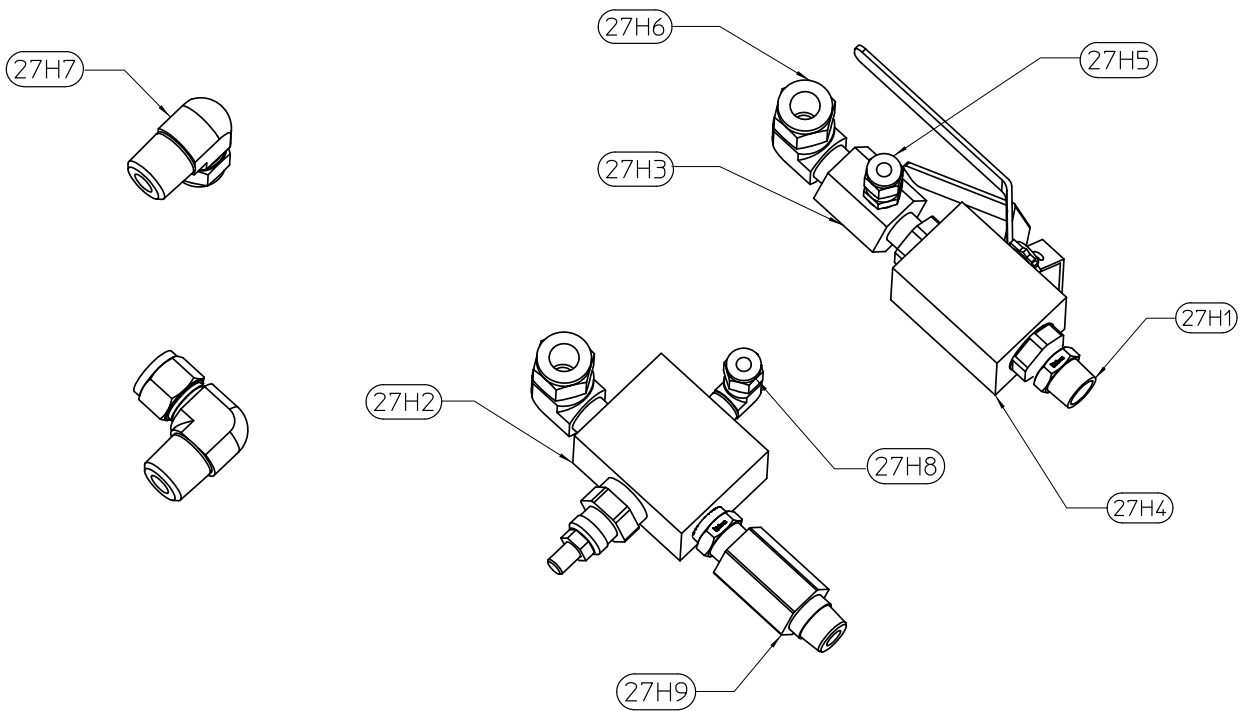
GH01747\_A



Figure 43. MHP Hydraulic Fittings

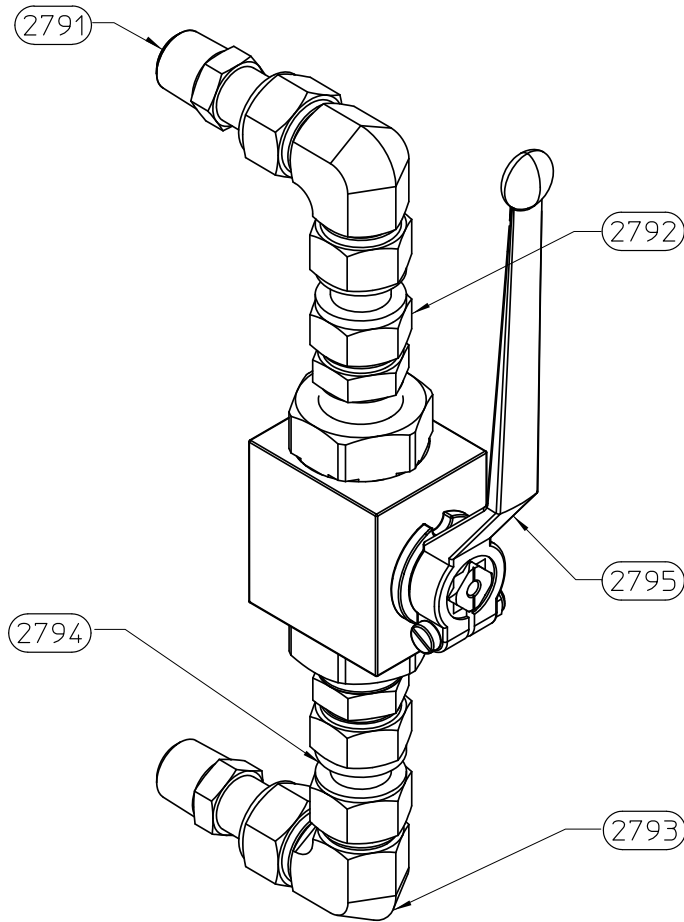


GH14070



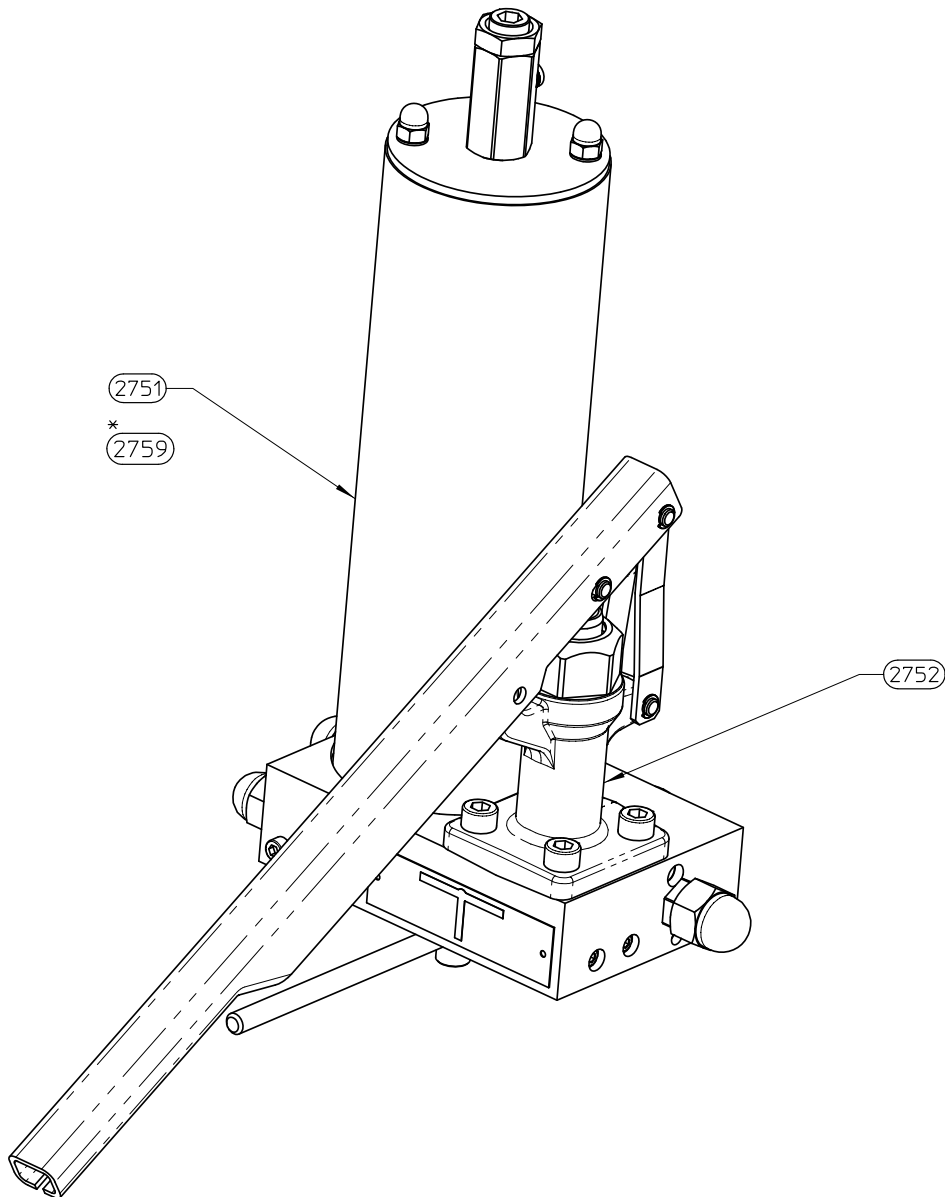
GH14490

Figure 44. MHQ Hydraulic Fitting, Tubes and Stop Valve



GH14073

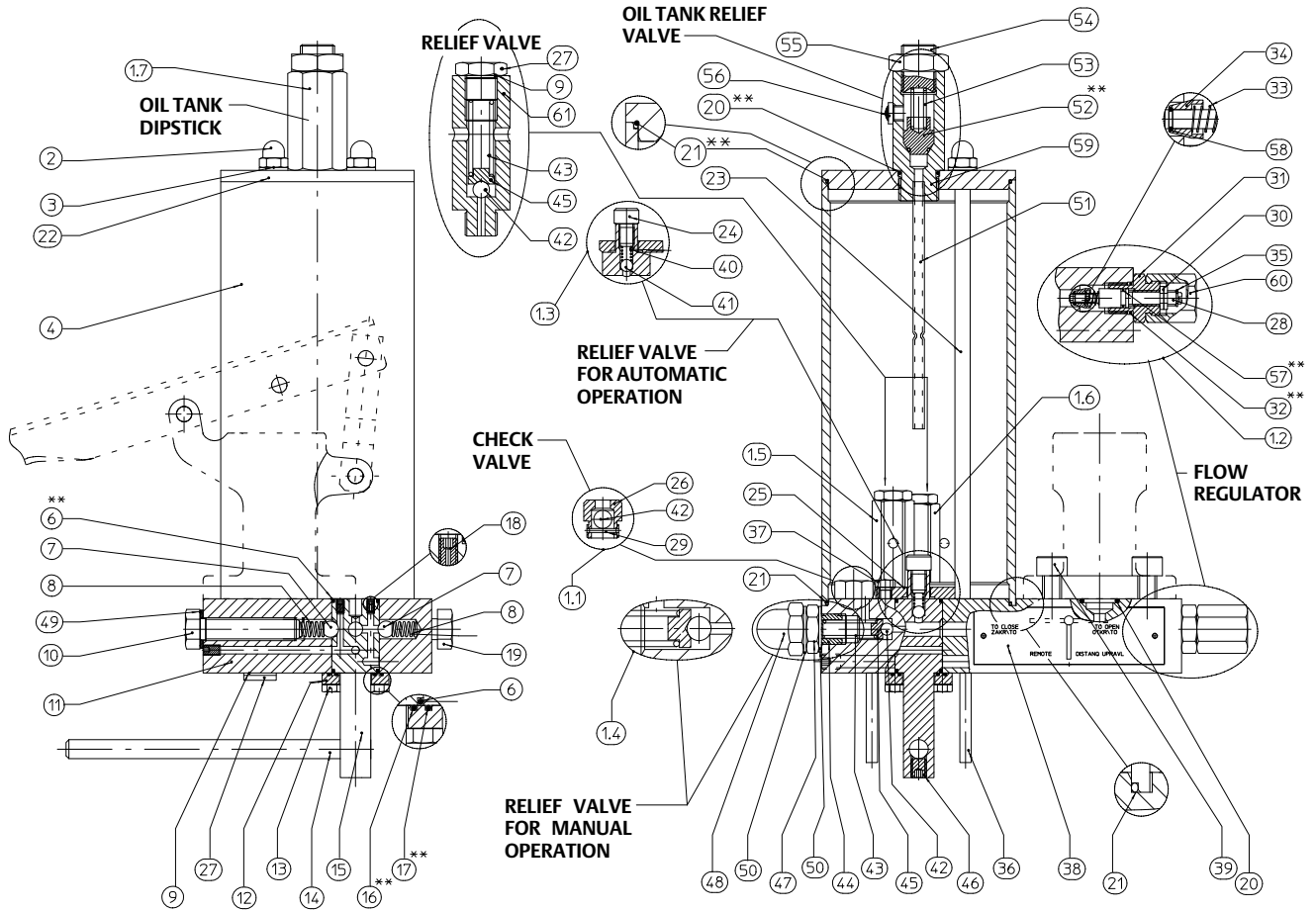
Figure 45. Side Mounted Handpump Hydraulic Control Unit of Fisher 785C Actuator  
Springless or Spring Return, Single- or Double-Acting



\* COMPONENT INCLUDES RECOMMENDED SPARE PART  
PARTS NOT SHOWN: 2759

GH0172\_9

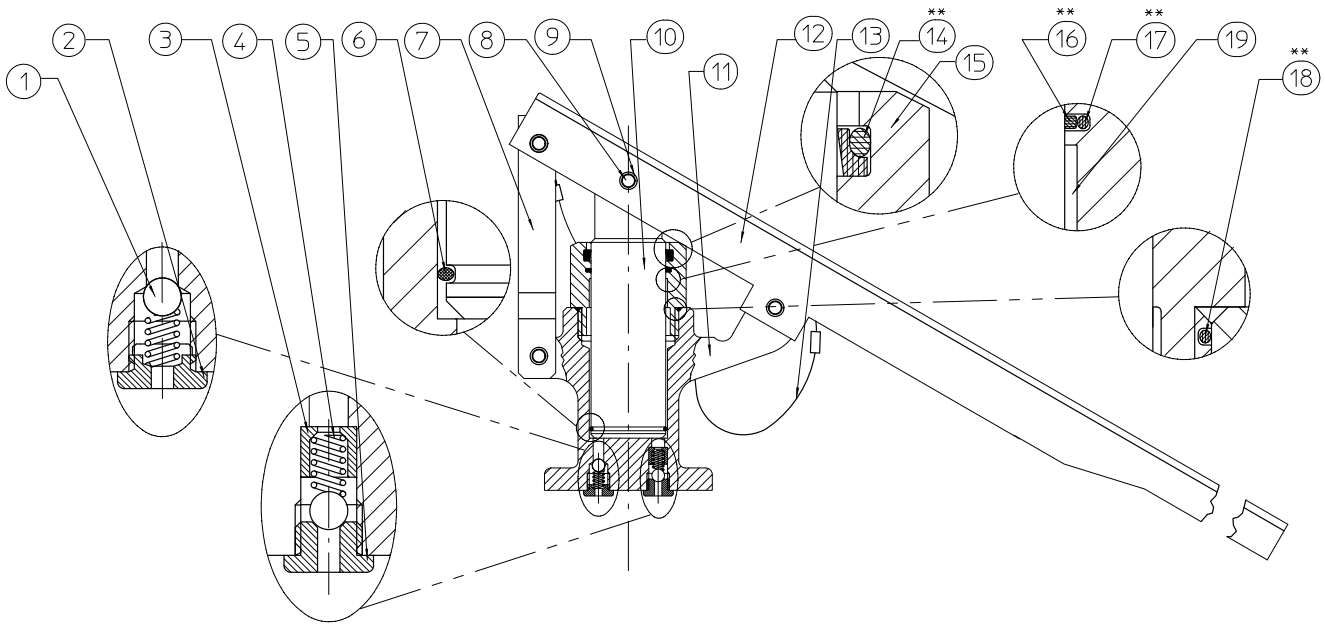
Figure 46. Handpump MHP/MHQ Hydraulic Control Unit (Key 2751)



\*\* RECOMMENDED SPARE PART

GH14297

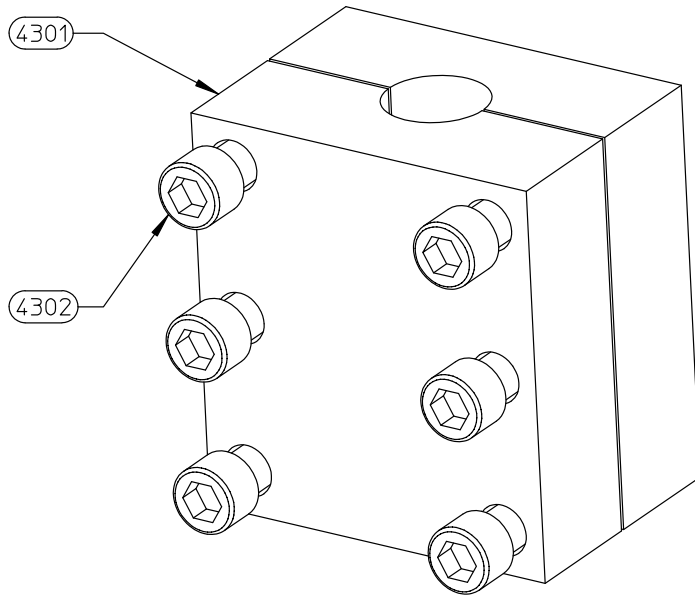
Figure 47. MHP/MHQ Handpump (Key 2752)



**\*\*RECOMMENDED SPARE PART**

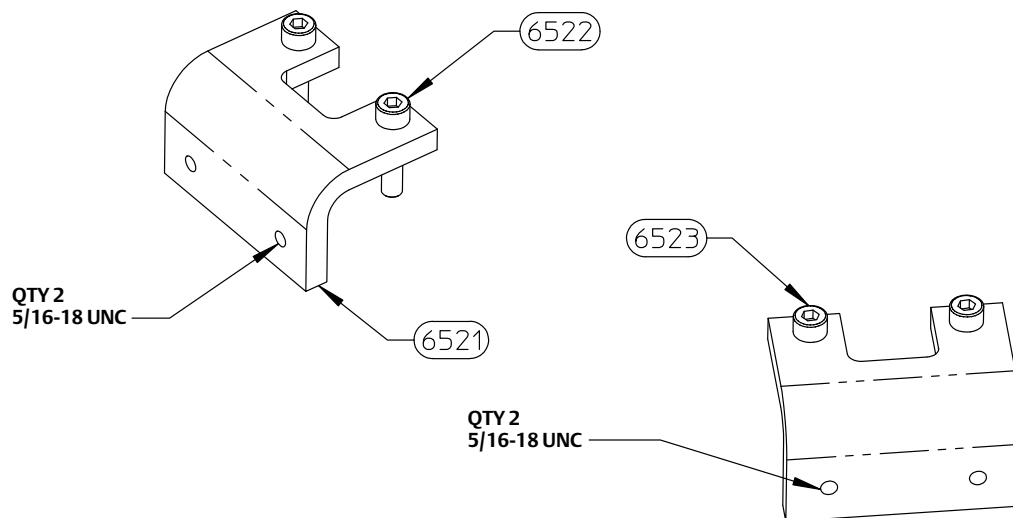
GH14482

Figure 48. Valve Stem Connector Assembly of Fisher 785C Actuator  
Springless or Spring Return, Single- or Double-Acting



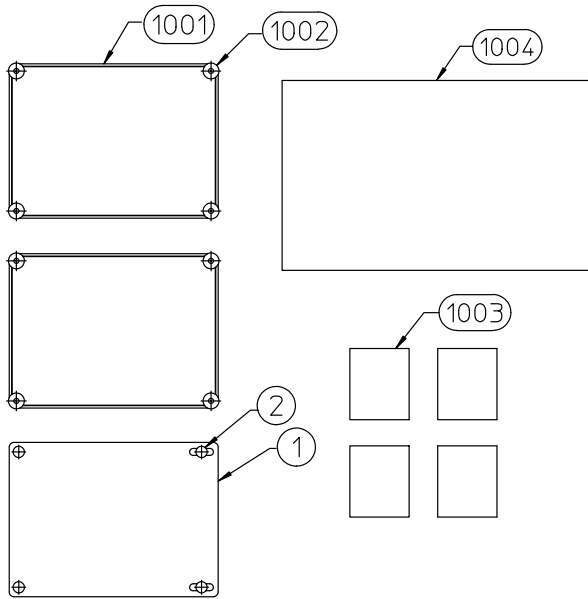
GH01638\_A

Figure 49. Mounting Bracket Assembly of Fisher 785C Actuator  
Springless or Spring Return, Single- or Double-Acting



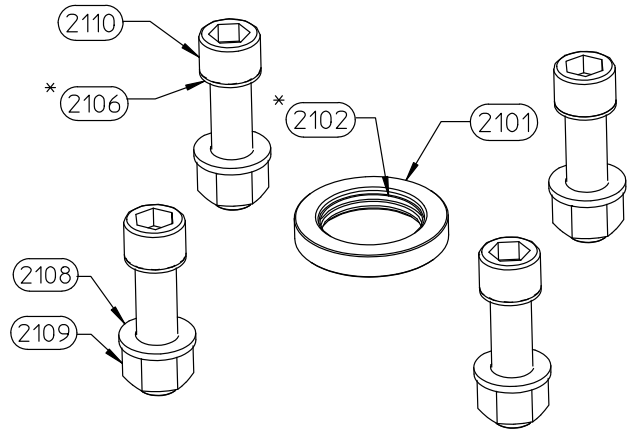
GH01643\_A

Figure 50. Nameplate Assembly Kit of Fisher 785C Actuator Springless or Spring Return, Single- or Double-Acting



GH01593\_A

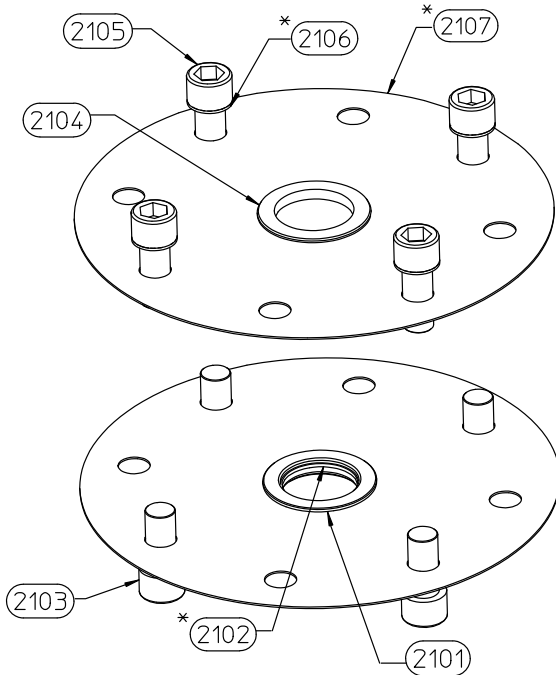
Figure 52. Fisher 785C Springless Actuator Repair Kit, Double-Acting



\* COMPONENT INCLUDES RECOMMENDED SPARE PART

GH01657\_A

Figure 51. Fisher 785C Spring Return Actuator Repair Kit, Single- or Double-Acting

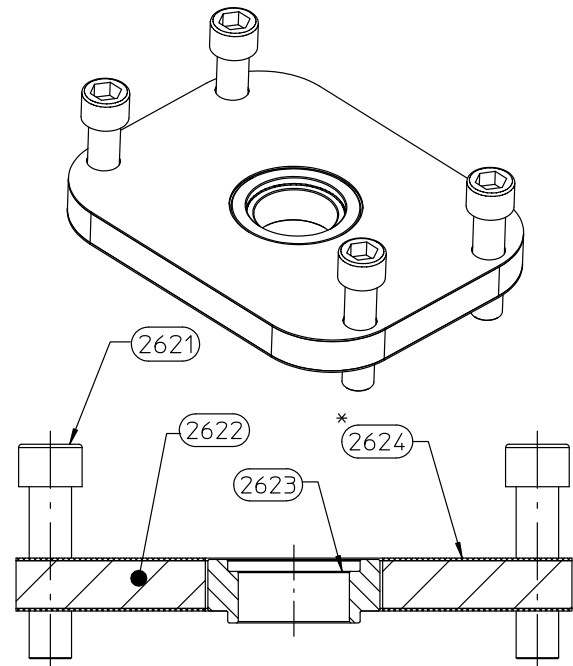


\* COMPONENT INCLUDES RECOMMENDED SPARE PART

NOTE: UPPER PORTION LOCATES BETWEEN CYLINDER AND SPRING CAN. LOWER PORTION LOCATES BETWEEN SPRING CAN AND YOKE.

GH01658\_A

Figure 53. Side Mounted Handpump Hydraulic Cylinder Kit of Fisher 785C Actuator Springless or Spring Return, Single- or Double-Acting



\* COMPONENT INCLUDES RECOMMENDED SPARE PART

GH01650\_A

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Emerson Automation Solutions  
Marshalltown, Iowa 50158 USA  
Sorocaba, 18087 Brazil  
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