



Tri-Clover® Manual and Air Actuated Fractional Valves

Series 650 • 655 • 660

CONTENTS

Thank you for purchasing an Alfa Laval Product!

This manual contains disassembly and assembly instructions, maintenance procedures, and a complete parts list for all Tri-Clover® Air Actuated Series 650, 655, and 660 Valves.

READ THIS MANUAL carefully to learn how to service these valves. Failure to do so could result in personal injury or equipment damage.

SAFETY

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SAFETY



IMPORTANT SAFETY INFORMATION



Safety is very important!

DO NOT attempt to modify any Alfa laval product. To do so could create unsafe conditions and void all warranties. ***DO NOT place any Alfa Laval product in an application where general product service ratings are exceeded.***

The following DANGER, WARNING, AND CAUTION signs and their meanings are used within these instructions.

	<div data-bbox="743 562 982 613"> DANGER</div> <p data-bbox="532 646 1193 739">Indicates an imminently hazardous situation which, if not avoided, <i>will</i> result in death or serious injury. The word Danger is used in the most extreme cases.</p>
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	<div data-bbox="735 865 993 915"> WARNING</div> <p data-bbox="527 949 1166 1075">Indicates a potentially hazardous situation which, if not avoided, <i>may</i> result in minor or moderate injury. May also be used to alert against an unsafe operating or maintenance practice.</p>
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	<div data-bbox="735 1171 990 1222"> CAUTION</div> <p data-bbox="516 1276 1156 1339">Indicates a potentially hazardous situation which, if not avoided, <i>could</i> result in death or serious injury.</p>
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INTRODUCTION

This manual contains disassembly and reassembly instructions, with parts lists, for the Series 650, 655, and 660 Tri-Clover® Manual or Air-Actuated Sanitary Valves.

Series 650 and 655 Fractional Size Valves are available in 1/2" (12.7mm) and 3/4" (19.0mm) Tube OD sizes. Series 650 is available with two styles of seat: o-ring seal, which requires a plug o-ring, and lip seal, which has no replaceable o-ring. Series 655 are available with molded elastomer seat and replaceable o-ring stem seal. Instructions for four Actuator Types are included.

- Type 10 Actuator, air to close/spring to open
- Type 20 Actuator, air to open/spring to close
- Type 30 Actuator, air both ways
- Type 30x1 Actuator, air to open/spring to close with threaded vent port

Actuator Air Supply Specifications:

Air pressure range is 50-60 p.s.i.

Series 660 Sample Valve is available in 1/2" (12.7mm) Tri-Clamp® or 1/2" (12.7mm) Tri-Clamp inlet and 1/4" (6.4mm) Hosebarb outlet. The seat is available with an o-ring seal. The valve is available with a manual actuator of UHMW or bronze material.

MAINTENANCE

VALVE DISASSEMBLY



⚠ CAUTION

To prevent personal injury, keep hands away from plug assembly when applying or releasing air. The actuator stem assembly may move with extreme force and suddenness when air pressure is applied or released.

When disassembling and assembling the valve, bench area should be clean to prevent marring and nicking of seats.

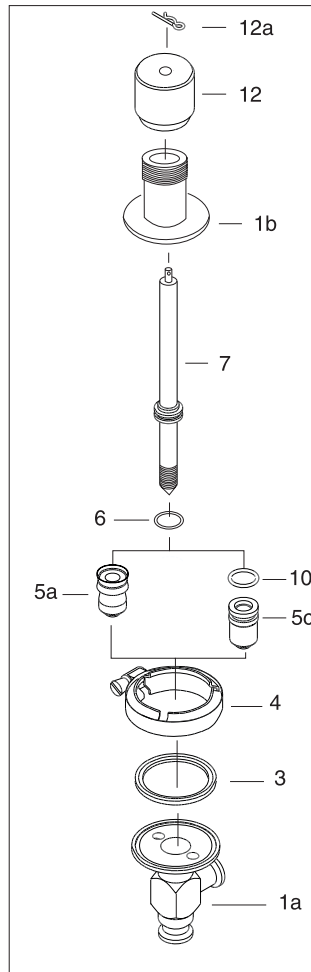
SERIES 650-DISASSEMBLY

Manual (Shut-Off Valve)

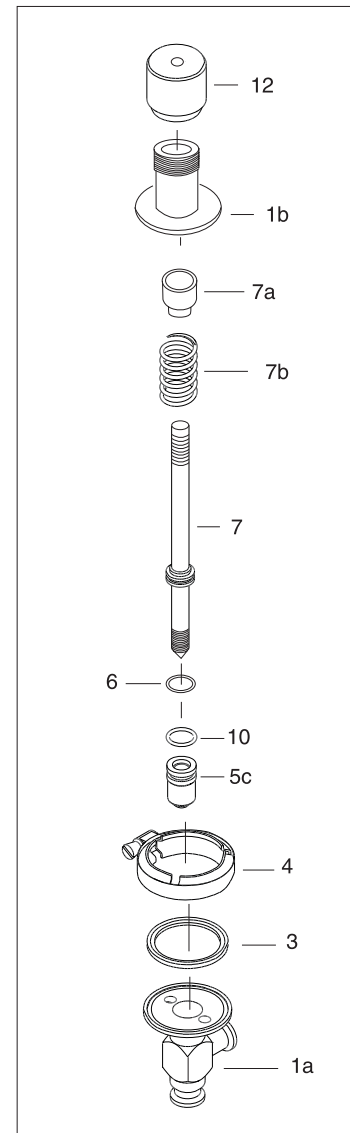
1. Remove the clamp (4).
2. Remove the cotter pin (12a) and unscrew the valve handle (12).
3. Remove the bonnet (1b) and gasket (3).
4. Remove the stem (7), o-ring (6) and plug o-ring (10) (if necessary).
5. Remove the plug (5a or 5c) from the stem by turning counterclockwise while holding the stem (7) stationary.

Manual (Relief Valve)

1. Remove the clamp (4).
2. Unscrew the valve handle (12).
3. Remove the spring spacer (7a).
4. Remove the spring (7b).
5. Remove the bonnet (1b) and gasket (3).
6. Remove the stem (7) and o-ring (10).
7. Remove the plug (5c) from the stem by turning counterclockwise while holding the stem (7) stationary.



650 Manual Shut-Off Valve

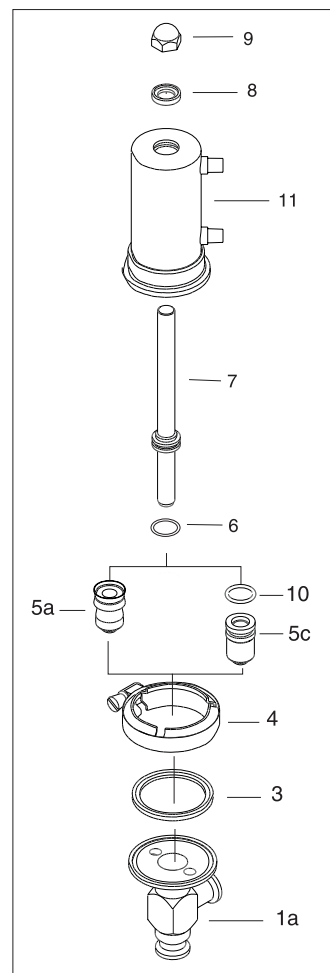


650 Manual Relief Valve

MAINTENANCE

Type 10, 20 , 30, and 30x1 Actuators

1. *(20 Actuator only)* Connect air supply to the actuator (11) to pull the stem off of the body seat.
2. Remove the clamp (4), body (1a) and gasket (3).
3. *(20 Actuator only)* Remove air supply.
4. Remove the acorn nut (9), stem washer (8) and stem assembly (7).
5. Remove the stem o-ring (6) and plug o-ring (10) (if necessary).
6. Remove the plug (5a or 5c) from the stem (7) by turning counterclockwise while holding the stem stationary.



650 Air Actuated Valve

MAINTENANCE

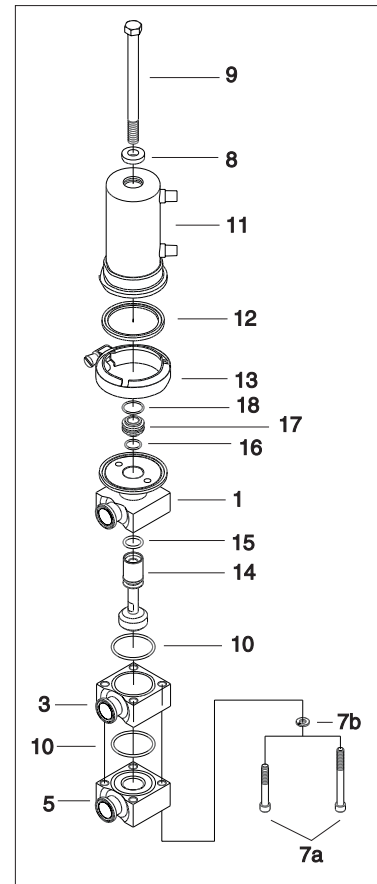
SERIES 655 - DISASSEMBLY

Type 10 and 30 Actuators

1. Remove four socket head cap screws (7a) and lockwashers (7b) and separate the lower (5) and middle (3) body sections from the upper body section (1) and actuator (11).
2. Connect air supply to the actuator (11).
3. Remove the stem retaining cap screw (9) and washer (8) from the top of actuator (11).
4. Remove the stem assembly (14).
5. Remove the air supply from the actuator (11).
6. Remove the clamp (13) and separate the upper body section (1), gasket (12) and stem bushing (17) from the actuator (11).

Type 20 and 30X1 Actuators

1. Connect air supply to the actuator (11) to pull the stem off of the lower body.
2. Remove four socket head cap screws (7a) and lockwashers (7b) and separate the lower (5) and middle (3) body sections from upper body section (1) and actuator (11).
3. Remove air supply from the actuator (11).
4. Remove the stem retaining cap screw (9) and washer (8) from the top of actuator (11).
5. Remove the stem assembly (14).
6. Remove the clamp (13) and separate the upper body section (1), gasket (12) and stem bushing (17) from the actuator (11).



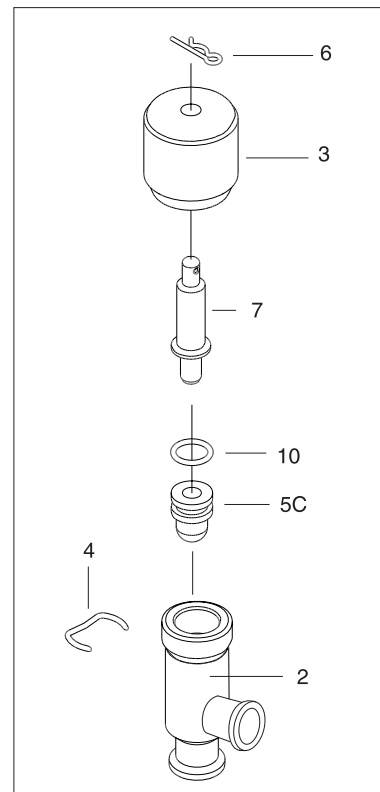
655 Air Actuated Valve
(Type 30 Actuator shown)

MAINTENANCE

SERIES 660 - DISASSEMBLY

Manual

1. Remove cotter pin (6) and unscrew the valve handle (3).
2. Remove the clip (4) from the valve body (2).
3. Remove the stem assembly (7).
4. Remove plug (5c) from stem (7) by turning counterclockwise while holding stem stationary.
5. Remove the plug o-ring (10).



660 Manual Valve

VALVE INSPECTION

- ✓ Inspect the valve seats in the valve bodies for nicks, scratches and other irregularities that can damage the plug.
- ✓ Examine the gaskets used at the port connections and plug o-ring or lip seal for cuts, abrasions or other damage that would allow leakage or ineffective cleaning.
- ✓ Carefully examine all o-rings for cuts, abrasions or damage that would allow leakage or ineffective cleaning.
- ✓ Inspect all air lines and fittings for leaks and retighten when and where necessary.
- ✓ Replace worn or damaged parts. Spray o-rings and lip seals with L-1011B Sanitary Lubricant.
- ✓ Operate all valves after assembly to be sure they are operating correctly.

MAINTENANCE

VALVE REASSEMBLY



⚠ CAUTION

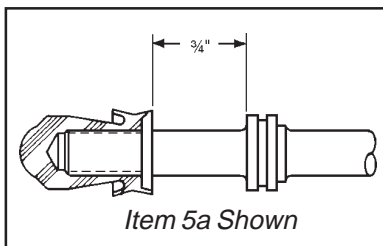
To prevent personal injury, keep hands away from plug assembly when applying or releasing air. The actuator stem assembly may move with extreme force and suddenness when air pressure is applied or released.

When disassembling and assembling the valve, bench area should be clean to prevent marring and nicking of seats.

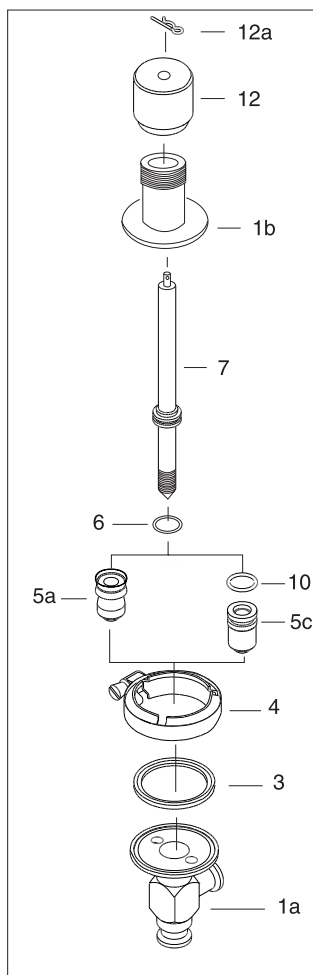
SERIES 650 - REASSEMBLY

Manual Valve

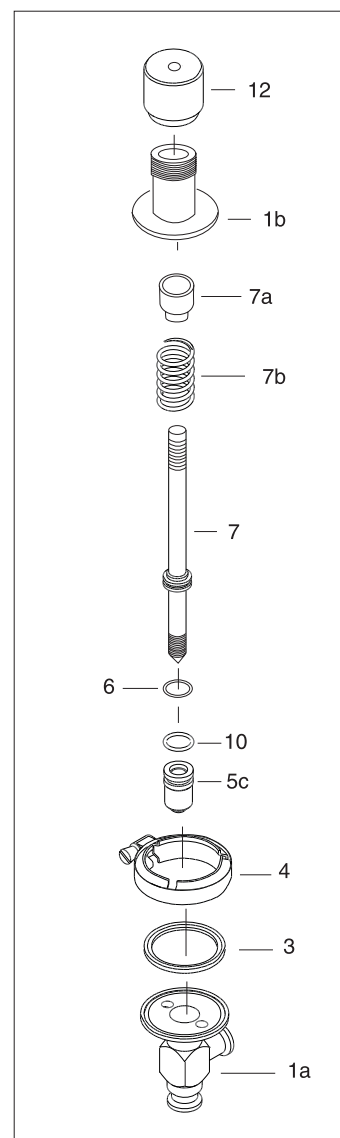
1. Hand thread plug (5a or 5c) onto stem (7). The plug is properly installed when the distance between the top of plug and shoulder on stem is $\frac{3}{4}$ " (19 mm). Refer to the figure below. If $\frac{3}{4}$ " (19 mm) dimension is not obtained, check plug and stem to determine cause of problem.



2. Install the stem o-ring (6) and plug o-ring (10, type 5c plug only).
3. Install the gasket (3) onto valve body (1a).
4. Install the stem assembly (7) in the valve body (1a).
5. Install the upper body (1b).
6. (Relief Valve only) Install spring (7b) onto stem (7).
7. (Relief Valve only) Install the spring washer (7a) onto stem (7).
8. Install the clamp (4).
9. Screw the handle (12) onto the bonnet (1b).
10. (Shut-Off valve only) Insert the cotter pin (12a) into the top of the stem (7).



650 Manual Shut-Off Valve



650 Manual Relief Valve

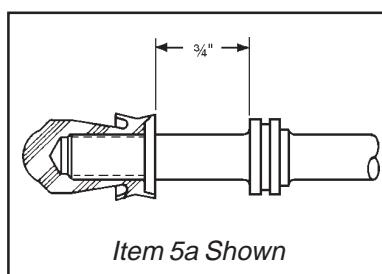
MAINTENANCE

SERIES 650 - REASSEMBLY


Type 10, 20, 30, and 30x1 Actuators

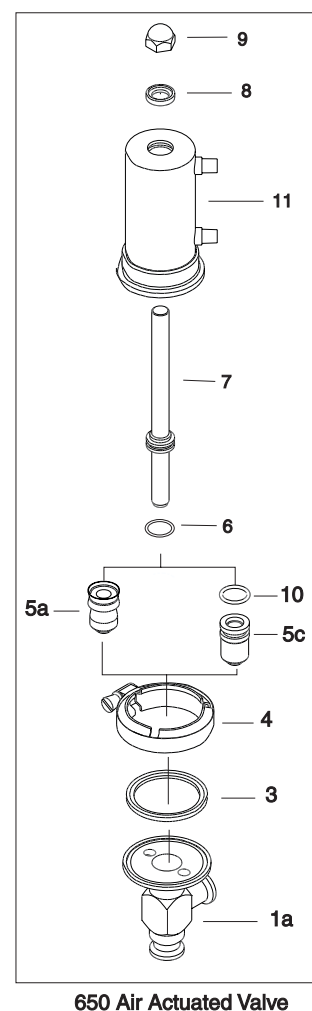
SPRAY O-RINGS WITH SANITARY LUBRICANT.

1. Hand thread the plug (5a or 5c) onto stem (7). Plug is properly installed when the distance between the top of plug and the shoulder on the stem is $\frac{3}{4}$ " (19mm). Refer to the figure below. If $\frac{3}{4}$ " (19mm) dimension is not obtained, check the plug and stem to determine the cause of the problem.



2. Install the stem o-ring (6) and plug o-ring (10), if applicable (Type 5c plug only).
3. Install the stem assembly (7) in actuator (11). Replace the stem washer (8), and hand tighten the acorn nut (9). Using a wrench, tighten the acorn nut (9) an additional one-half turn.

	<p>CAUTION</p> <p>Actuator/stem assembly must be inserted straight into body, to avoid damage to plug. Improper installation could cut o-ring, or cause lip seal to be dented or rolled back, resulting in leakage.</p>
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4. (20 and 30x1 Actuators only) Connect air supply to actuator.
5. Replace the gasket (3), body (1a), and clamp (4).
6. (20 and 30x1 Actuators only) Remove air supply.

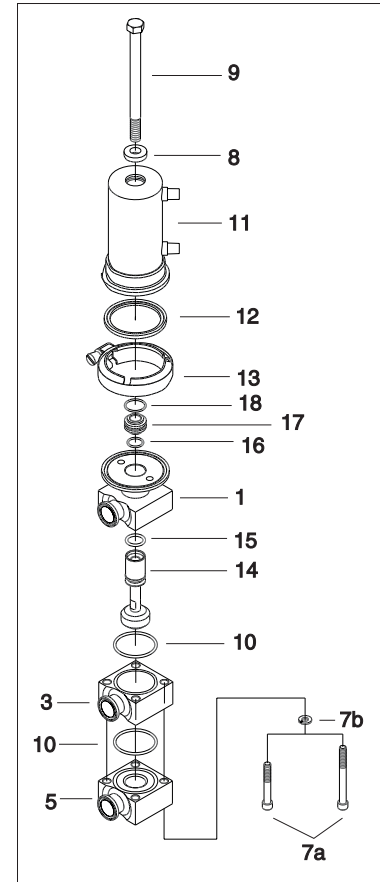
MAINTENANCE

SERIES 655 - REASSEMBLY

Type 10, 30 and Actuators

SPRAY O-RINGS WITH L-1011B SANITARY LUBRICANT.

1. Install the o-rings (16 and 18) on the stem bushing (17) and insert the bushing into the actuator (11).
2. Assemble the gasket (12), upper body (1) section and clamp (13) to the actuator (11).
3. Connect air supply to actuator (11).
4. Assemble the o-ring (15) to the stem (14) and insert the stem into the upper body (1) and actuator (11).
5. Install the stem retaining cap screw (9) and washer (8) through the top of the actuator (11) and into the threads in the stem. Tighten cap screw.
6. Remove air supply from actuator (11).
7. Install the o-rings (10) in remaining body sections (3 and 5) and assemble to the upper body section (1) and actuator (11) using four socket head cap screws (7a) and lockwashers (7b).



655 Air Actuated Valve
(Type 30 Actuator shown)

Type 20 and 30x1 Actuators

SPRAY O-RINGS WITH L-1011B SANITARY LUBRICANT.

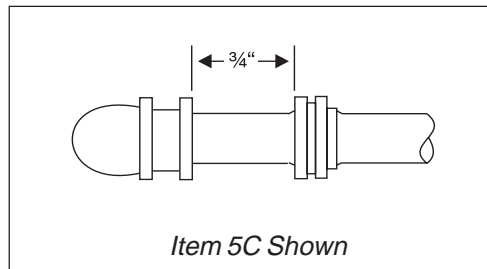
1. Install the o-rings (16 and 18) on the stem bushing (17) and insert bushing into actuator (11).
2. Assemble gasket (12), upper body (1) sections and clamp (13) to actuator.
3. Assemble o-ring (15) to stem (14) and insert stem into upper body (1) and actuator (11).
4. Install the stem retaining cap screw (9) and washer (8) through top of the actuator (11) and into the threads in the stem. Tighten cap screw.
5. Connect air supply to the actuator (11).
6. Install the o-rings (10) in the remaining body sections (3 and 5) and assemble to the upper body section and actuator using four socket head cap screws (7a) and lockwashers (7b).
7. Remove air supply from the actuator.

MAINTENANCE

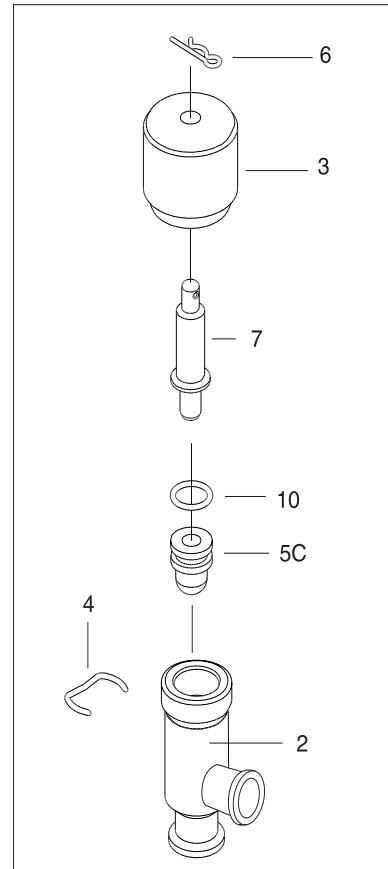
SERIES 660 - REASSEMBLY

Manual

1. Replace the plug o-ring (10), if necessary.
2. Hand thread the plug (5c) onto the stem (7). The plug is properly installed when the distance between the top of the plug and the shoulder on the stem is $\frac{3}{4}$ " (19mm). Refer to the figure below. If $\frac{3}{4}$ " (19mm) dimension is not obtained, check the plug and stem to determine the cause of problem.



3. Place the stem (7) with the plug (5c) attached into the valve body (2).
4. Place the clip (4) around the outside of the valve body (2) just beneath the threads, so that the clip rests in the clip slot on the body.
5. Replace the handle (3) and insert the cotter pin (6) into the hole in the top of the stem (7).



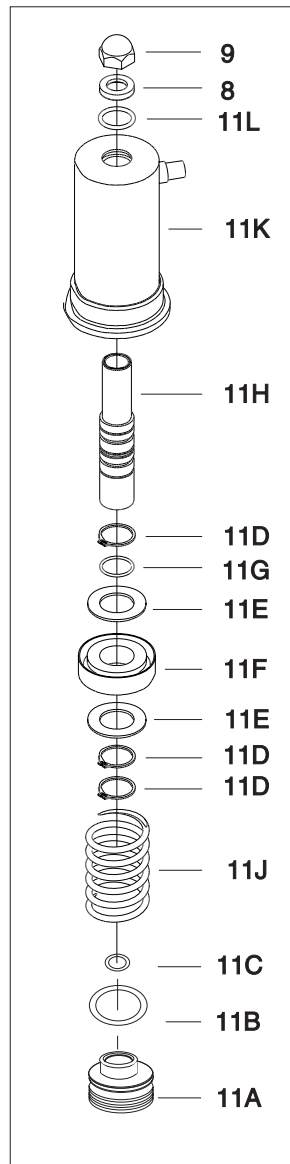
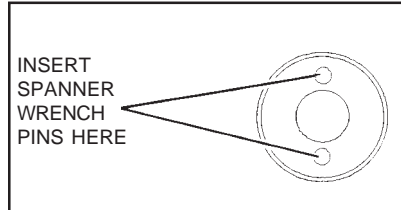
660 Manual Valve

MAINTENANCE

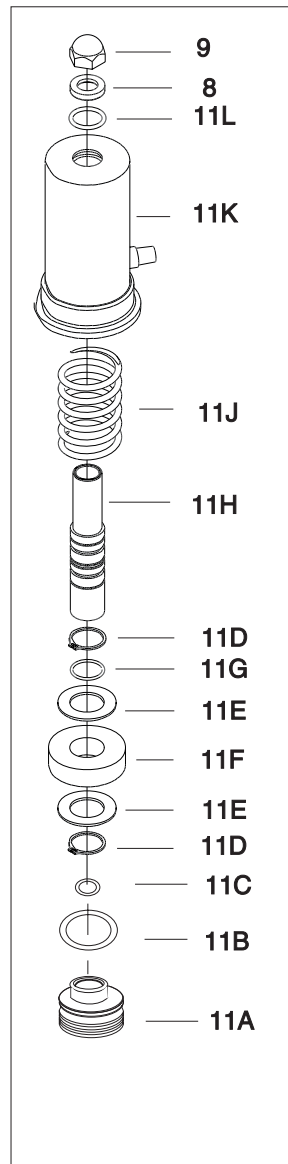
ACTUATOR DISASSEMBLY

Type 10, 20, 30, and 30x1 Actuators

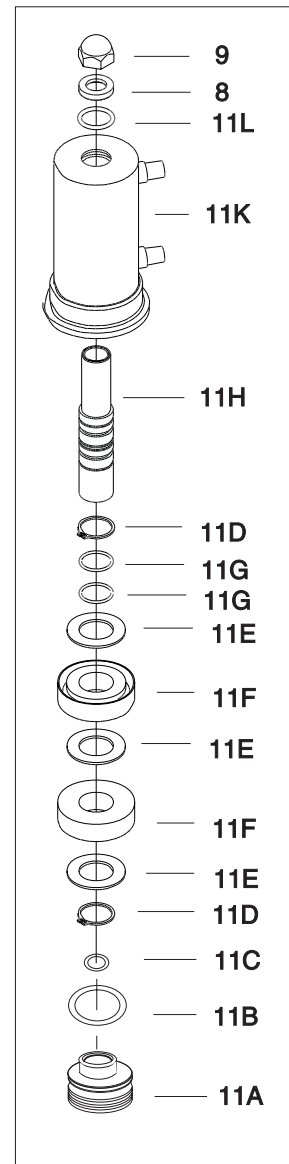
1. Insert the pins of the spanner wrench into the holes in the face of the actuator bonnet (11A) and rotate the actuator bonnet counterclockwise to remove from cylinder. (See figure at right.)
2. Remove the inner (11C) and outer (11B) bonnet o-rings.
3. For type 10, remove the spring (11J) and piston assembly (11F). For type 20, remove the piston assembly ((11F) and spring (11J). For type 30, remove the piston assembly (11F).
4. Remove the retaining rings (11D), piston washers (11E), piston (11F) and piston o-rings (11G) from the stem sleeve (11H).
5. Remove the stem sleeve o-ring (11L) from the actuator cylinder (11K).



Type 10 Actuator



Type 20 Actuator



Type 30 Actuator

MAINTENANCE

ACTUATOR REASSEMBLY

INSPECTION

Carefully examine all o-rings for cuts, abrasions or damage that would allow leakage. Replace worn or damaged parts. Operate actuators after assembly to be sure they are operating correctly. Check the inside of the cylinder to be sure it is free of score or scratch marks.

REASSEMBLY

Type 10 and 20 Actuators

IMPORTANT: USE C137 LUBRICANT ON STEM SLEEVE O-RING, AND BONNET O-RING. USE C137 LUBRICANT ON THE CYLINDER THREADS.

1. Replace stem sleeve o-ring (11L) in actuator cylinder (11K).
2. Replace piston o-ring (11G), piston (11F), piston washers (11E), and retaining rings (11D) on stem sleeve (11H).

Type 10

- Piston should be located towards the section of the sleeve which is smaller in diameter with the piston lip facing the smaller diameter of the sleeve.

Type 20

- Piston should be located away from the section of the sleeve which is smaller in diameter with the piston lip facing the larger diameter of the sleeve.

3. Type 10

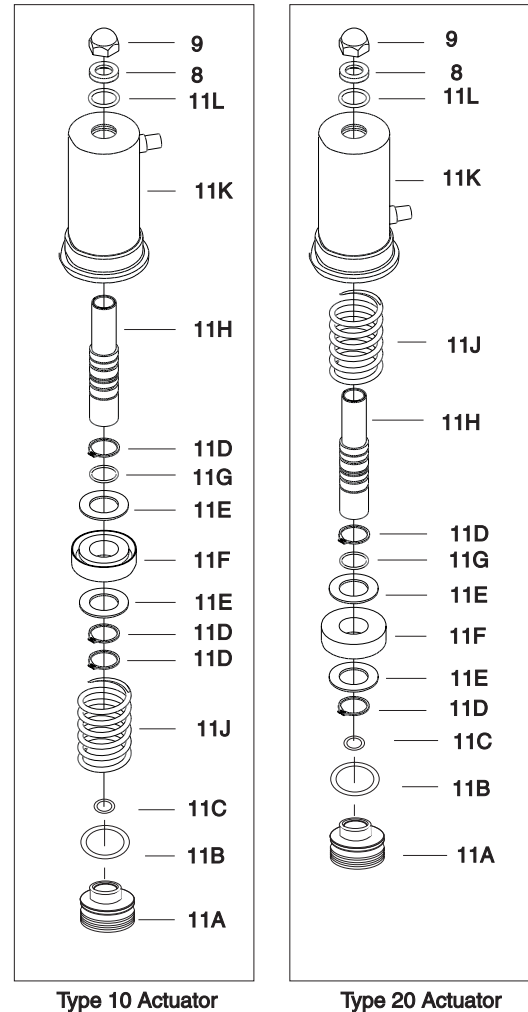
- Install piston assembly in cylinder (11K) using shim stock (or special tool).
- Replace spring (11J).

Type 20

- Replace spring (11J).
- Install piston assembly in cylinder (11K).

4. Install inner (11C) and outer (11B) bonnet o-rings.

5. While compressing spring (11J), thread actuator bonnet (11A) into cylinder (11K) using spanner wrench. Bonnet will bottom on cylinder and no threads will be exposed when properly tightened.

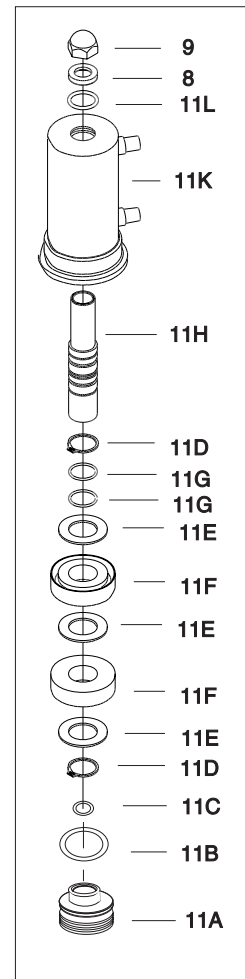


MAINTENANCE

Type 30 Actuator

IMPORTANT: USE C137 LUBRICANT ON STEM SLEEVE O-RING, AND BONNET O-RINGS. USE C137 LUBRICANT ON THE CYLINDER THREADS.

1. Replace stem sleeve o-ring (11L) in actuator cylinder (11K).
2. Install piston o-rings (11G), pistons (11F), piston washers (11E) and retaining rings (11D) on stem sleeve (11H).
3. Install piston assembly in cylinder (11K) using shim stock (or special tool).
4. Install inner (11C) and outer (11B) bonnet o-rings.
5. Thread actuator bonnet (11A) into cylinder (11K) using spanner wrench. Bonnet will bottom on cylinder and no threads will be exposed when properly tightened.



Type 30 Actuator

PARTS LIST

650, 655, AND 660 SERIES VALVES (COMPLETE)

All orders for repair parts must contain the following data.

1. Complete model number (from nameplate).
2. Serial number (from nameplate).
3. Key number and description from the parts list.

The following exploded view and accompanying parts list facilitate ordering repair parts from the factory. All parts illustrated are indexed to the parts list by key number.

Type A seat style is not available in Type R40 Relief Valves - fluoroelastomer lip seal not recommended for use in cross body valves (30M). Use only PTFE Lip Seal or PTFE O-Ring in Type 30M Valves. Contact Alfa Laval, Inc. for application assistance when applying Tri-Clover valves in processes where ambient temperatures may be below 45°F. Some modifications may be required. When ordering, use complete valve part number as shown in Catalog FV. **Available with Tri-Clamp® end connections only.**

Valve Part Number	Size		Seat Style*
	in	mm	
Manual Relief Valves			
650-10M-R40	½	13	B or C
650-30M-R40	½	13	C
650-10M-R40	¾	19	B or C
650-30M-R40	¾	19	C
Manual Shut-Off Valves			
650-10M-40	½	13	A, B, or C
650-30M-40	½	13	A or C
650-10M-40	¾	19	A, B, or C
650-30M-40	¾	19	A or C
Air-Actuated Shut-Off Valves			
650-10M-(actuator)	½	13	A, B, or C
650-30M-(actuator)	½	13	A or C
650-10M-(actuator)	¾	19	A, B or C
650-30M-(actuator)	¾	19	A or C
Air-Actuated Divert Valves			
655-21M-(actuator)	½	13	A, B, C, or D
655-21M-(actuator)	¾	19	A, B, C, or D
Sample Valve - Series 660			
Check Valves			
C45MP-(size)-316L	½	13	With Type 316 SS Ball
C45MP-(size)-316L	¾	19	With Type 316 SS Ball
C45MPS-(size)-316L	½	13	With PTFE plug/spring
C45MPS-(size)-316L	¾	19	With PTFE plug/spring
Part Number 660-10-40-1 ½-1 ¼-C-316L			

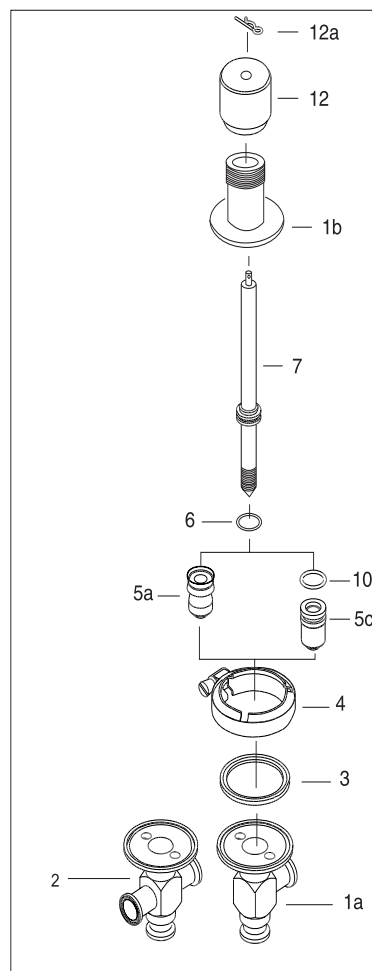
* Note: Seat type A should not be used in 3A approved applications.

PARTS LIST

650 MANUAL SHUT-OFF VALVE

Key #	Description	Part Number
1a	Lower Valve Body (Tee)	7-996TM-SIZE-316L
1b	Bonnet	12-481-316L
2	Lower Valve Body (Cross)	7-996CM-SIZE-316L
3	Gasket	42MP-Mat'l-2
4	Clamp	16-32-2
5A	PTFE Plug with Lip Seal	20-516-G
5A	PTFE Plug with Lip Seal (Type 30)	20-516C-G
5B	Viton Plug with Lip Seal (Type 10)	20-516-SFY
5C	PTFE Plug with O-Ring	20-516A-G
6	Stem o-ring	01-1154-13-34-MAT'L
7	Stem	19-1238-316L
10	Plug O-ring for #5C Plug only	17-5-SFY
12a	Cotter Pin	9-294-SS
12	Handle	8-30-BR

Part number for reference only. Contact Alfa Laval.

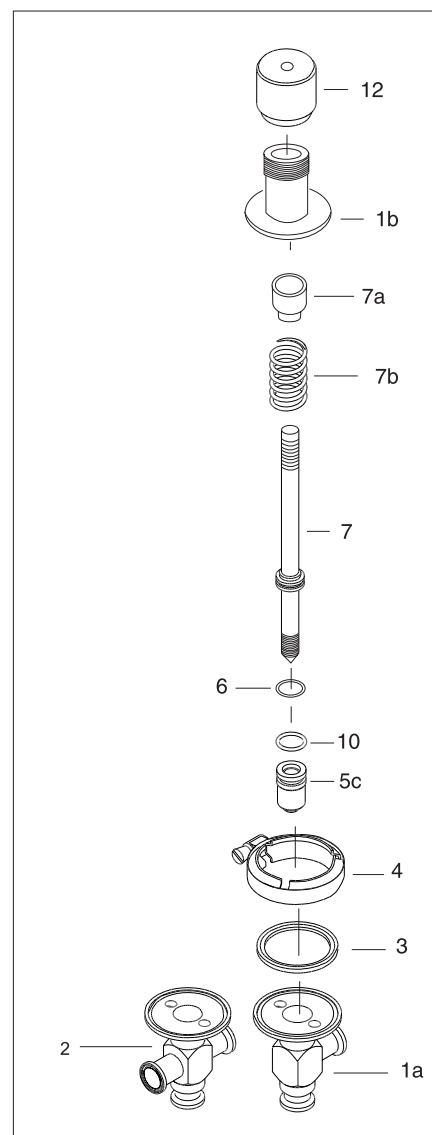


650 Manual Valve

PARTS LIST

650 MANUAL RELIEF VALVE

Key #	Description	Part Number
1a	Lower Valve Body (Tee)	7-996TM-SIZE-316L
1b	Bonnet	12-481-316L
2	Lower Valve Body (Cross)	7-996CM-SIZE-316L
3	Gasket	42MP-Mat'l-2
4	Clamp	16-32-2
5A	PTFE Plug with Lip Seal	20-516-G
5B	Viton Plug with Lip Seal (Type 10)	20-516-SFY
5C	PTFE Plug with O-Ring	20-516A-G
6	Stem o-ring	01-1154-13-34-MAT'L
7	Stem	19-1239-316L
7a	Spring Spacer	24-66-HN
7b	Spring	4-86-S
10	Plug O-ring for #5C Plug only	17-5-SFY
12a	Cotter Pin	9-294-SS
12	Handle	8-29-HN



650 Manual Valve

PARTS LIST

650 AIR ACTUATED VALVE

650 AIR ACTUATED VALVES

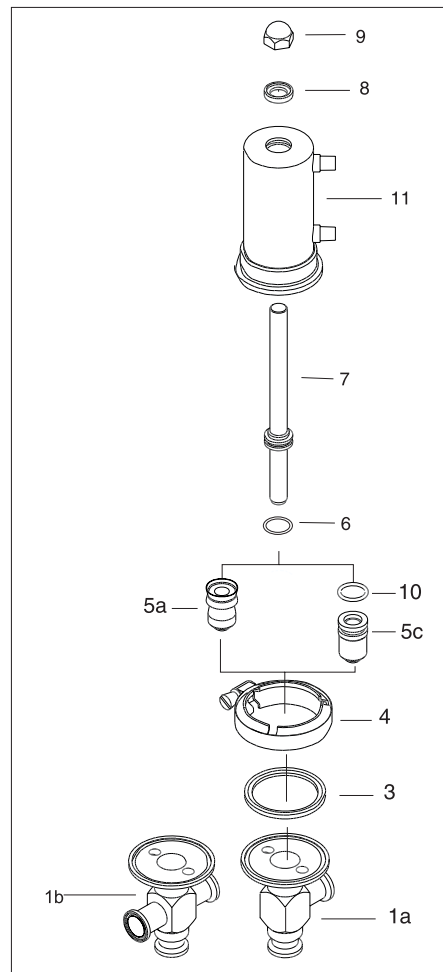
Key #	Description	210	220	230
* 1	Valve Body, Type 10 (Tee Body)	7-996TM-1/2-316L 7-996TM-3/4-316L	7-996TM-1/2-316L 7-996TM-3/4-316L	7-996TM-1/2-316L 7-996TM-3/4-316L
* 2	Valve Body, Type 30 (Cross Body)	7-996CM-1/2-316L 7-996CM-3/4-316L	7-996CM-1/2-316L 7-996CM-3/4-316L	7-996CM-1/2-316L 7-996CM-3/4-316L
* 3	Tri-Clamp® Gasket	42MP-SFY-2	42MP-SFY-2	42MP-SFY-2
4	Tri-Clamp® Clamp	16-32-2	16-32-2	16-32-2
* 5A	PTFE Plug-Lip Seal, Type 10	20-516-G	20-516-G	20-516-G
	PTFE Plug-Lip Seal, Type 30	20-516C-G	20-516C-G	20-516C-G
* 5B	Viton Plug-Lip Seal (For Type 10 Only)	20-516-SFY	20-516-SFY	20-516-SFY
* 5C	PTFE Plug w/ O-ring, Type 10	20-516A-G	20-516A-G	20-516A-G
	PTFE Plug w/ O-ring, Type 30	20-516B-G	20-516B-G	20-516B-G
* 6	Stem O-ring	17-311-SFY	17-311-SFY	17-311-SFY
7	Stem	19-1237-316L	19-1237-316L	19-1237-316L
8	Stem Washer	15-168-HN	15-168-HN	15-168-HN
9	Acorn Nut	MS-36A-142A-112-S	MS-36A-142A-112-S	MS-36A-142A-112-S
* 10	Plug O-ring for #5C Plug only	01-1154-13-34-SFY	01-1154-13-34-SFY	01-1154-13-34-SFY
11	Actuator			

SEE ACTUATOR CHART FOR BOTH SERIES 650 AND 655

+ 1/2 or 3/4 designates port size
required for 1/2" or 3/4" valves.

* It is recommended that one of each of
these items be stocked as spare parts.

Note: It is also recommended that a tube
of C137 Lubricant be stocked
for servicing stainless steel actuators.



650 Air Actuated Valve

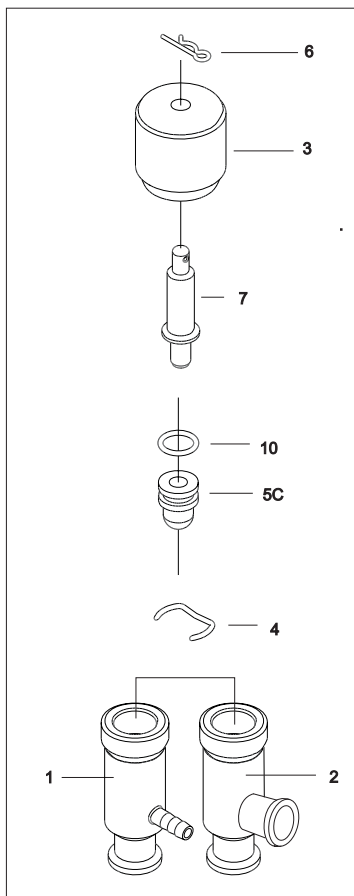
PARTS LIST

660 MANUAL VALVE

660 MANUAL VALVES

Key #	Description	Part Number
+ 1	Valve Body, 1/2" x 1/4"	7-1029-1/2x1/4-316L
2	Valve Body, 1/2" x 1/2"	7-999-1/2x1/2-316L
3	Handle (UHMV)	8-30-HN
	Handle (Aluminum Bronze)	8-30-BR
4	Clip	16-157-316
* 5C	PTFE Plug- with o-ring	20-517A-1/2-G
6	Pin	9-294-SS
7	Stem	19-1241-316L
* 10	Plug O-ring for #5C	17-5-SFY
	Plug only	

- * It is recommended that one of each of these items be stocked as spare parts.
- + Body type 1 is not used in 3A approved applications.



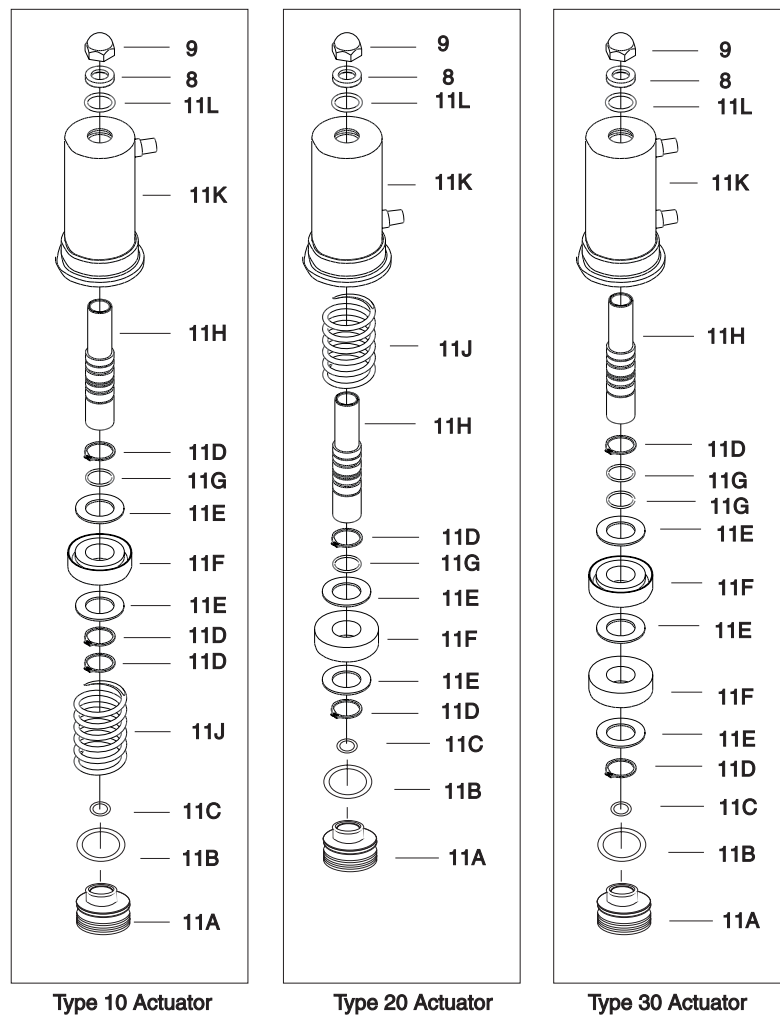
650 AND 655 VALVE ACTUATORS

650 AND 655 VALVE ACTUATORS

Key #	Description	210	No. Req'd.	220	No. Req'd.	230	No. Req'd.
11	Actuator Assembly (complete)	25-260-210-S	1	25-650-220-S	1	25-650-230-S	1
11A	Actuator Bonnet	12-479-316	1	12-479-316	1	12-479-316	1
* 11B	Outer Bonnet O-ring	17-142-2-U	1	17-142-2-U	1	17-142-2-U	1
* 11C	Inner Bonnet O-ring	17-313-U	1	17-313-U	1	17-313-U	1
* 11D	Retaining Ring	16-156-S	3	16-156-S	2	16-156-S	2
11E	Piston Washer	15-167-S	2	15-167-S	2	15-167-S	3
* 11F	Piston	52-136-HN	1	52-136-HN	1	52-136-HN	2
* 11G	Piston O-ring	17-311-SFY	1	17-311-SFY	1	17-311-SFY	2
11H	Stem Sleeve	39-38-S	1	39-38-S	1	39-38-S	1
11J	Spring	4-87-S	1	4-87-S	1	N/A	-
11K	Cylinder	25-650-210-01-316	1	25-650-220-01-316	1	25-650-230-01-316	1
* 11L	Stem Sleeve O-ring	01-1154-13-34-SFY	1	01-1154-13-34-SFY	1	01-1154-13-34-SFY	1

*It is recommended that one of each of these items be stocked as spare parts.

Note: It is recommended that C137 Lubricant be stocked for servicing stainless steel actuators.



Alfa Laval

manufactures

a complete line of

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BEVEL SEAT fittings

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AUTOMATED FLOW CONTROL SYSTEMS

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