

Type 3024C Diaphragm Actuator

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Figure 1. Type 3024C Actuator with Sliding-Stem Valve

Introduction

Scope of Manual

This instruction manual provides information on installation, adjustment, maintenance, and parts ordering for the Type 3024C actuator (figure 1) for sizes 30 to 45 and 30E to 45E.

Note

This manual assumes throughout that the valve construction is “push-down-to-close.”

Do not install, operate, or maintain a Type 3024C actuator without first ● being fully trained and qualified in valve, actuator, and accessory installation, operation and maintenance, and ● carefully reading and understanding the contents of this manual. If you have any questions about these instructions contact your Emerson Process Management™ sales office before proceeding.

Note

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.

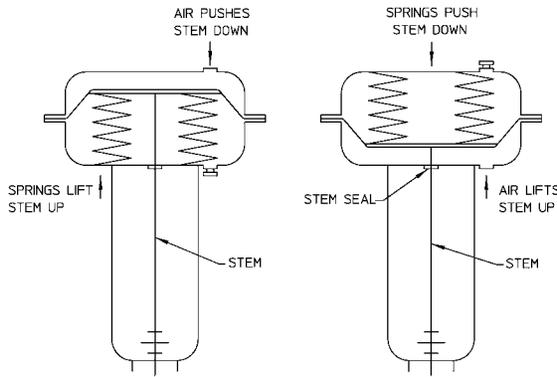
Description

The Type 3024C direct acting (extends stem/air-to-close) actuator (figure 8) and the reverse acting (retracts stem/air-to-open) actuator (figure 9) are spring-opposed pneumatic diaphragm actuators that provide automatic throttling or on-off operation of sliding-stem control valves.

The actuator will position the valve plug in response to varying pneumatic loading pressure on the actuator diaphragm. Figure 2 shows the operation of



3024C Actuator

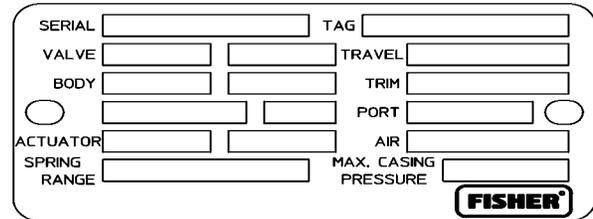


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AIR-TO-CLOSE (ATC)

AIR-TO-OPEN (ATO)

Figure 2. Schematic of Type 3024C



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Figure 3. Type 3024C Actuator Nameplate

an ATC (air-to-close) actuator and an ATO (air-to-open) actuator.

The 3024C can be equipped with a side mounted handwheel if required (figure 10). An adjustable up travel stop can also be fitted (figures 11 and 12).

The Type 3024C ATC (air-to-close) actuator springs are located under the diaphragm plate and they fully retract the actuator stem for fail action upon loss of diaphragm casing pressure. The Type 3024C ATO (air-to-open) actuator springs are located on top of the diaphragm plate and they fully extend the actuator stem upon loss of diaphragm casing pressure. The actuator is mounted on the valve by means of a cast yoke.

Specifications

Refer to table 1 for Specifications of the Type 3024C actuator. See the actuator nameplate (figure 3) for specific information about your actuator.

Table 1. Specifications

Specification	Actuator Size								
	30	30E	34	34E	40	40E	45	45E	
Nominal Effective Area	See tables 2 and 3.								
Maximum Operating Pressure to Diaphragm	Bar	6							
	psig	87							
Maximum Travel	mm	16	---	16	---	32	---	32	---
	Inch	---	0.75	---	0.75	---	2	---	2
Yoke Boss Diameter	Inch	2-1/8	2-1/8	2-1/8	2-1/8	2-13/16	2-13/16	2-13/16	2-13/16
	(mm)	(54 mm)	(54 mm)	(54 mm)	(54 mm)	(71 mm)	(71 mm)	(71 mm)	(71 mm)
Valve Stem Connector Thread	mm	M12 x 1.75	---	M12 x 1.75	---	M16 x 2	---	M16 x 2	---
	Inch	---	3/8-24	---	3/8-24	---	1/2-20	---	1/2-20
Temperature Range	°C	Nitrile diaphragm and steel studs and nuts: -40 to +82							
	°F	Nitrile diaphragm and steel studs and nuts: -40 to +180							
Pressure Connections	Inch	1/4 - 18 NPT							
Maximum Approximate Weight (without handwheel)	kg	9.5	9.5	18.0	18.0	19.5	21.5	33.5	35.5
	lb	20.9	20.9	39.7	39.7	43.0	47.4	73.9	78.3
Maximum Approximate Weight (with handwheel)	kg	16.5	16.5	25.0	25.0	26.5	28.5	40.5	42.5
	lb	36.4	36.4	55.1	55.1	58.4	62.8	89.3	93.7

Table 2. Additional Specifications (Action Air-to-Close)

Size	Spring Set/ Quantity	Travel		Spring Range		Effective Diaphragm Area (Note 1)		Maximum Output Thrust (Maximum Actuator Stem Force) (Note 2)	
		mm	Inch	Bar	Psig	cm ²	Inches ²	N	Lb
30	217/3 218/5 218/7	16	-	0.3 - 1.1	4 - 16	160	24.8	7840	1760
				1.3 - 2.0	19 - 29	160	24.8	6400	1440
				1.8 - 2.9	26 - 42	160	24.8	4960	1120
30E	217/3 218/5 218/7	-	0.75	0.3 - 1.3	4 - 19	160	24.8	7520	1690
				1.3 - 2.2	19 - 32	160	24.8	6080	1360
				1.8 - 3.0	26 - 44	160	24.8	4800	1070
34	219/3 212/5 212/7	16	-	0.3 - 1.1	4 - 16	400	62.0	19,600	4400
				0.9 - 1.7	13 - 25	400	62.0	17,200	3840
				1.3 - 2.3	19 - 33	400	62.0	14,800	3350
34E	219/3 212/5 212/7	-	0.75	0.3 - 1.3	4 - 19	400	62.0	18,800	4220
				0.9 - 1.8	13 - 26	400	62.0	16,800	3780
				1.3 - 2.5	19 - 36	400	62.0	14,000	3160
40	212/3 213/6 214/7	32	-	0.4 - 1.3	6 - 19	390	60.5	18,300	4110
				0.8 - 1.8	12 - 26	390	60.5	16,400	3690
				1.2 - 2.4	17 - 35	390	60.5	14,000	3150
40E	212/3 213/6 214/7	-	1.125	0.4 - 1.2	6 - 17	390	60.5	18,700	4230
				0.8 - 1.7	12 - 25	390	60.5	16,800	3750
				1.2 - 2.3	17 - 33	390	60.5	14,400	3270
	213/4 214/5 214/7	-	1.5	0.3 - 1.0	4 - 15	380	58.9	19,000	4240
				0.6 - 1.5	9 - 22	380	58.9	17,100	3830
				0.9 - 2.1	13 - 30	380	58.9	14,800	3360
	213/4 214/5 214/7	-	2	0.2 - 1.2	3 - 17	370	57.4	17,800	4220
				0.5 - 1.7	7 - 25	370	57.4	15,900	3560
				0.7 - 2.4	10 - 35	370	57.4	13,300	2980
45	221/8 221/12 223/12	32	-	0.8 - 1.6	12 - 23	790	122	34,800	7810
				1.2 - 2.5	17 - 36	790	122	27,600	6220
				1.5 - 3.1	22 - 45	790	122	22,900	5120
45E	221/8 221/12 223/12	-	1.125	0.8 - 1.6	12 - 23	790	122	34,800	7810
				1.2 - 2.3	17 - 33	790	122	29,200	6590
				1.5 - 3.0	22 - 44	790	122	23,700	5250
	221/8 221/12 223/12	-	1.5	0.5 - 1.4	7 - 20	780	121	35,900	8110
				0.8 - 2.2	12 - 32	780	121	29,600	6650
				1.0 - 2.7	15 - 39	780	121	25,700	5810
	221/8 221/12 223/12	-	2	0.5 - 1.7	7 - 25	770	119	33,100	7380
				0.7 - 2.5	10 - 36	770	119	26,900	6070
				0.9 - 3.1	12 - 45	770	119	22,300	5000

Note 1: Effective diaphragm area at 0% valve travel from seat.
 Note 2: Based upon 6 bar operating pressure to the diaphragm and valve travel at 0% from seat. This does not consider limitation to the valve such as stem buckling load. Consult your Emerson Process Management sales office for details.

Table 3. Additional Specifications (Action Air-to-Open)

Size	Spring Set/ Quantity	Travel		Spring Range		Effective Diaphragm Area (Note 1)		Maximum Output Thrust (Maximum Actuator Stem Force) (Note 2)	
		mm	Inch	Bar	Psig	cm ²	Inches ²	N	Lb
30	217/3 218/5 218/7	16	-	0.5 - 1.3	7 - 19	170	26.4	780	170
				1.4 - 2.2	20 - 32	170	26.4	2360	530
				2.0 - 3.1	29 - 45	170	26.4	3360	760
30E	217/3 218/5 218/7	-	0.75	0.3 - 1.3	4 - 19	175	27.1	550	120
				1.2 - 2.2	17 - 32	175	27.1	2180	490
				1.8 - 3.1	26 - 45	175	27.1	3110	700
34	219/3 212/5 212/7	16	-	0.6 - 1.4	9 - 20	410	63.6	2450	550
				1.1 - 1.9	16 - 28	410	63.6	4610	1040
				1.6 - 2.7	23 - 39	410	63.6	6560	1480
34E	219/3 212/5 212/7	-	0.75	0.4 - 1.4	6 - 20	420	65.1	1880	420
				1.0 - 1.9	15 - 28	420	65.1	4120	930
				1.4 - 2.7	20 - 39	420	65.1	5870	1320
40	212/3 213/6 214/7	32	-	0.4 - 1.3	6 - 19	450	69.8	1880	420
				0.8 - 1.8	12 - 26	450	69.8	3640	820
				1.2 - 2.4	17 - 35	450	69.8	5530	1240
40E	212/3 213/6 214/7	-	1.125	0.5 - 1.3	7 - 19	440	68.2	2200	500
				0.9 - 1.8	13 - 26	440	68.2	3970	890
				1.3 - 2.4	19 - 35	440	68.2	5920	1330
	213/4 214/5 214/7	-	1.5	0.4 - 1.1	6 - 16	410	63.6	1560	350
				0.7 - 1.6	10 - 23	410	63.6	3010	680
				1.0 - 2.3	15 - 33	410	63.6	4270	960
	213/4 214/5 214/7	-	2	0.2 - 1.2	3 - 17	440	68.2	1060	240
				0.5 - 1.8	7 - 26	440	68.2	2390	540
				0.8 - 2.5	12 - 36	440	68.2	3400	760
45	221/8 221/12 223/12	32	-	0.8 - 1.7	12 - 25	940	146	7790	1750
				1.2 - 2.5	17 - 36	940	146	11,700	2630
				1.6 - 3.2	23 - 46	940	146	14,700	3300
45E	221/8 221/12 223/12	-	1.125	0.9 - 1.7	13 - 25	910	141	8350	1880
				1.4 - 2.5	20 - 36	910	141	12,500	2810
				1.7 - 3.2	25 - 46	910	141	15,700	3530
	221/8 221/12 223/12	-	1.5	0.7 - 1.6	10 - 23	870	135	6150	1380
				1.1 - 2.4	16 - 35	870	135	9230	2080
				1.3 - 3.1	19 - 45	870	135	11,500	2590
	221/8 221/12 223/12	-	2	0.5 - 1.7	7 - 25	940	146	4740	1070
				0.8 - 2.6	12 - 38	940	146	7110	1600
				0.9 - 3.2	13 - 46	940	146	8800	1980

Note 1: Effective diaphragm area at 0% valve travel from seat.
 Note 2: Based on zero operating pressure to the diaphragm and valve travel at 0% from valve seat. This does not consider limitations such as stem buckling load. Consult your Emerson Process Management sales office for details.

Table 4. Handwheel Specifications

ACTUATOR SIZE	HAND-WHEEL DIAMETER		TURNS PER mm/INCH TRAVEL		RIM FORCE ^(1,2)		HAND-WHEEL OUTPUT FORCE	
	mm	In.	mm	In.	N	lb	N	lb
30 and 30E	200	7.87	0.24	6.1	179	40	5000	1125
34, 34E, 40, and 40E	250	9.84	0.21	5.4	286	64	10,000	2250
45 and 45E	250	9.84	0.21	5.5	400	90	14,000	3150

1. Tangential handwheel force required to produce the handwheel output force shown.
2. Brass operating nut and stainless steel screw.

When ordered, the valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions.

Responsibility for the safety of process media and the compatibility of valve materials with the process media rests solely with the purchaser and end user. Since some valve body/trim materials combinations are limited in their pressure drop and temperature ranges, do not apply any other conditions to the valve without first contacting your Emerson Process Management sales office.

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

Installation



WARNING

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

Personal injury or equipment damage caused by sudden release of pressure may result if the actuator assembly is installed where service conditions could exceed the limits given in tables 1, 2, and 3 or the appropriate nameplates. To avoid such injury or damage, provide a relief valve for overpressure protection as required by accepted industry and governmental codes and good engineering practices.

To avoid parts damage, do not use a normal operating pressure that exceeds the Maximum Diaphragm Casing Pressure (see table 1) or produces a force on the actuator stem greater than the Maximum Allowable Output Thrust (see table 2 or 3) or Maximum Allowable Valve Stem Load.

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

A Type 3024C diaphragm actuator is normally shipped mounted on a valve. Refer to the appropriate valve instruction manual 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 procedure given below. For information on mounting the positioner refer to the appropriate positioner instruction manual.

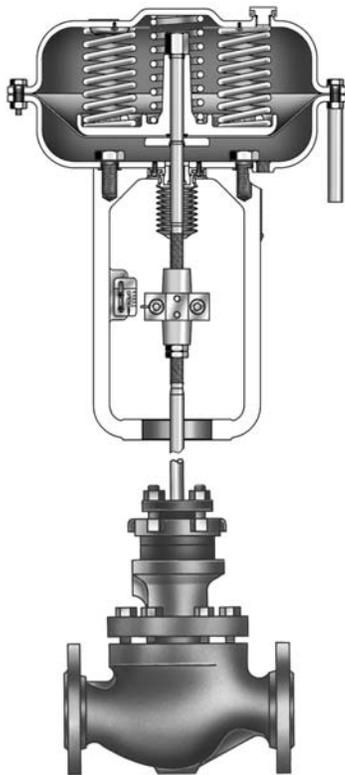
CAUTION

The Type 3024C actuators are designed to mount on push-down-to-close valves. Do not mount these actuators on any other type of valve without first contacting your Emerson Process Management sales office.

Mounting the Actuator on the Valve

The following procedure describes how to mount a Type 3024C actuator on a push-down-to-close valve so that the actuator stem and valve stem thread engagement allows full travel and proper shut-off. Refer to table 4 and figures 6 and 7 for actuator

3024C Actuator



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Figure 4. Actuator Mounting Components for Assembly with a Valve

dimensions. Key numbers referenced in the following steps are shown in figures 8 and 9.

1. Provide a temporary method of applying diaphragm air loading pressure to the diaphragm to move the actuator stem during adjustments.
2. Provide a vice or some other method of supporting the valve and the weight of the actuator during assembly.
3. Push the valve stem down until the valve plug is fully closed.
4. Screw the two stem locknuts (key 52) to the lower end of the valve stem thread.



WARNING

When moving the actuator stem with diaphragm loading pressure use caution to keep hands and tools out of the actuator stem travel path. Personal injury and/or property damage is possible if something is caught

between the actuator stem and other parts of the valve assembly.

Perform one of the following procedures as appropriate:

For a Type 3024C Air-To-Close Actuator with a Push-Down-to-Close Valve:

- a. Carefully place the actuator on the valve so that the yoke boss fits over the valve bonnet.
- b. Screw the yoke lock nut onto the bonnet and tighten.
- c. Lift the valve plug off the seat by the correct valve travel for the valve. This is stated on the nameplate or in table 1.
- d. Place the stem connector half (key 50) approximately halfway between the actuator and valve stems but observing the F dimension in table 5 so that any positioner lever (if fitted) is horizontal at mid-travel. Be sure that the actuator and valve stem threads are engaging the threads of the stem connector by at least the distance of one diameter of the stem.

CAUTION

Be sure that the length of the actuator stem and the valve stem in the connector (key 50) is equal to or greater than the diameter of that stem. Incomplete engagement of either the valve or actuator stem in the stem connector can result in stripped threads or improper operation.

In the following procedure do not rotate the valve plug while it is seated. This may damage the seating surface and cause excessive leakage. While making adjustments, use tools carefully to avoid damaging the valve stem. A damaged stem could cut the packing and allow leakage through the packing box.

- e. Install the other half of the stem connector and insert the socket screws and nuts and tighten them.
- f. Screw the two stem locknuts (key 52) up the valve stem to the stem connector and tighten. Do not over tighten.

g. Slowly decrease and then increase the diaphragm pressure several times stroking the valve from the lower end to the upper end of the spring range.

h. Apply air pressure to the diaphragm until the valve is in the closed position. Loosen the screws of the travel scale (key 26) and align it with the indicator on the stem connector.

i. Stroke the valve full travel to ensure that the travel matches the valve travel on the travel indicator plate.

j. If the valve travel is not correct, repeat the stem connector procedure. Remove the air pressure from the diaphragm, remove the stem connector and repeat steps c to i.

For a Type 3024C Air-to-Open Actuator with a Push-Down-to-Close Valve:

a. Apply approximately 0.5 bar pressure above the upper setting of the spring pressure range to the bottom of the diaphragm. This positions the actuator stem (key 8) at the highest point. The spring range is stated on the nameplate or in table 3.

b. Carefully place the actuator on the valve so that the yoke boss fits over the valve bonnet.

c. Screw the yoke lock nut onto the bonnet and tighten.

d. Lift the valve plug off the seat by the correct travel for the valve. The travel is stated on the nameplate or in table 1.

e. Place the stem connector half (key 50) approximately halfway between the actuator and valve stems but observing the F dimension in table 5 so that any positioner lever (if fitted) is horizontal at mid-travel. Be sure that the actuator and valve stem threads are engaging the threads of the stem connector by at least the distance of one diameter of the stem.

f. Install the other half of the stem connector and insert the socket screws and nuts and tighten them.

g. Screw the two stem locknuts (key 52) up the valve stem to the stem connector and tighten. Do not over tighten.

h. Slowly decrease and then increase the diaphragm pressure several times stroking the valve from the lower end to the upper end of the spring range.

i. Remove all air pressure from the diaphragm so that the valve is in its closed position. Loosen the screws of the travel scale (key 26) and align it with the indicator on the stem connector.

j. Stroke the valve full travel to ensure that the valve travel matches the valve travel on the travel indicator plate.

k. If the valve travel is not correct repeat the stem connector procedure. Apply approximately 0.5 bar pressure above the upper setting of the spring range to the bottom of the diaphragm, remove the stem connector and then repeat steps d to j.

Note

When disassembling the stem connector on Air-to-Open constructions it is essential to apply enough air pressure to the underside of the diaphragm to lift the valve plug off its seat. This will ensure that all residual spring compression in the actuator is supported while the stem connector is removed.

Actuator Maintenance

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

This section describes how the actuator can be completely disassembled and assembled. When inspection or repairs are required, disassemble only those parts necessary to accomplish the job; then start to assemble at the appropriate step.

Key numbers refer to figures 8 and 9.

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**WARNING**

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

- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- 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 from both sides of the valve. Drain the process media from both sides of the valve.
- Vent the power actuator loading pressure and relieve any actuator spring precompression.
- Use lock-out procedures to be sure that 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 under pressure 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.

Disassembly

1. For complete disassembly, the positioner and all accessories (if attached) must be removed from the actuator. Follow appropriate removal procedures in the instruction manuals supplied with the positioner and accessories.
2. Bypass the control valve. For a top-loaded Type 3024C Air-to-Close actuator reduce the diaphragm

air pressure to zero and remove the piping or tubing from the connection in the upper diaphragm casing (key 16). For a bottom loaded Type 3024C Air-to-Open apply air pressure to the diaphragm to open the valve.

Note

When disassembling the stem connector on Air-to-Open constructions it is essential to apply enough air pressure to the underside of the diaphragm to lift the valve plug off its seat. This will ensure that all residual spring compression in the actuator is supported while the stem connector is removed.

3. Undo the stem connector by first slackening the valve stem locknuts and then removing the socket bolts.
4. Undo the yoke locknut on the valve bonnet and carefully lift the actuator off the valve. As you undo the yoke locknut, ensure that the actuator is properly supported. If the actuator is a bottom loaded Air-to-Open type, reduce the diaphragm pressure to zero and remove the piping or tubing from the connection in the lower diaphragm casing (key 1).
5. Slightly loosen all diaphragm casing cap screws (key 19 and 21). Remove the plastic hose (key 22). Unscrew the short and long diaphragm casing cap screws and nuts (keys 19, 20 and 21) alternately, until only the long casing cap screws (key 21) remain engaged. Then allow the remaining spring compression to be slowly released by alternately unscrewing the long casing cap screws.
6. When removing the diaphragm and actuator springs perform one of the following procedures as appropriate:

For a Type 3024C Air-to-Open Actuator (figure 9)

- a. Lift off the upper diaphragm casing (key 16), the casing spacer (key 29) and seal ring (key 30) if fitted (see figure 13), and remove the springs (Key 15).
- b. Using a strap wrench or soft-jawed vice, hold the actuator stem (key 8) and remove the travel stop nut (key 14).
- c. Remove the diaphragm plate (key 13), diaphragm (key 11), O-Ring (key 12), pressure plate (key 10) and the split ring halves (key 9).

***For a Type 3024C Air-to-Close Actuator
(figure 8)***

- a. Lift off the upper diaphragm casing (key 16) and casing spacer (key 29) and seal ring (key 30) if fitted (see figure 14).
 - b. Using a strap wrench or soft-jawed vice, hold the actuator stem (key 8) and remove the travel stop nut (key 14).
 - c. Remove the pressure plate (key 10), O-ring (key 12), diaphragm (key 11), diaphragm plate (key 13) and the split ring halves (key 9).
7. Carefully slide the actuator stem (key 8) out of the bottom of the lower diaphragm casing (key 1) and set it on a protective surface to prevent damage to the O-ring sealing surface.
 8. Remove the bellows (key 31), if used.
 9. Unscrew the cheese head screws (key 7), then remove the bushing (key 6).
 10. With the actuator disassembled, inspect all parts for excessive wear and replace as necessary.

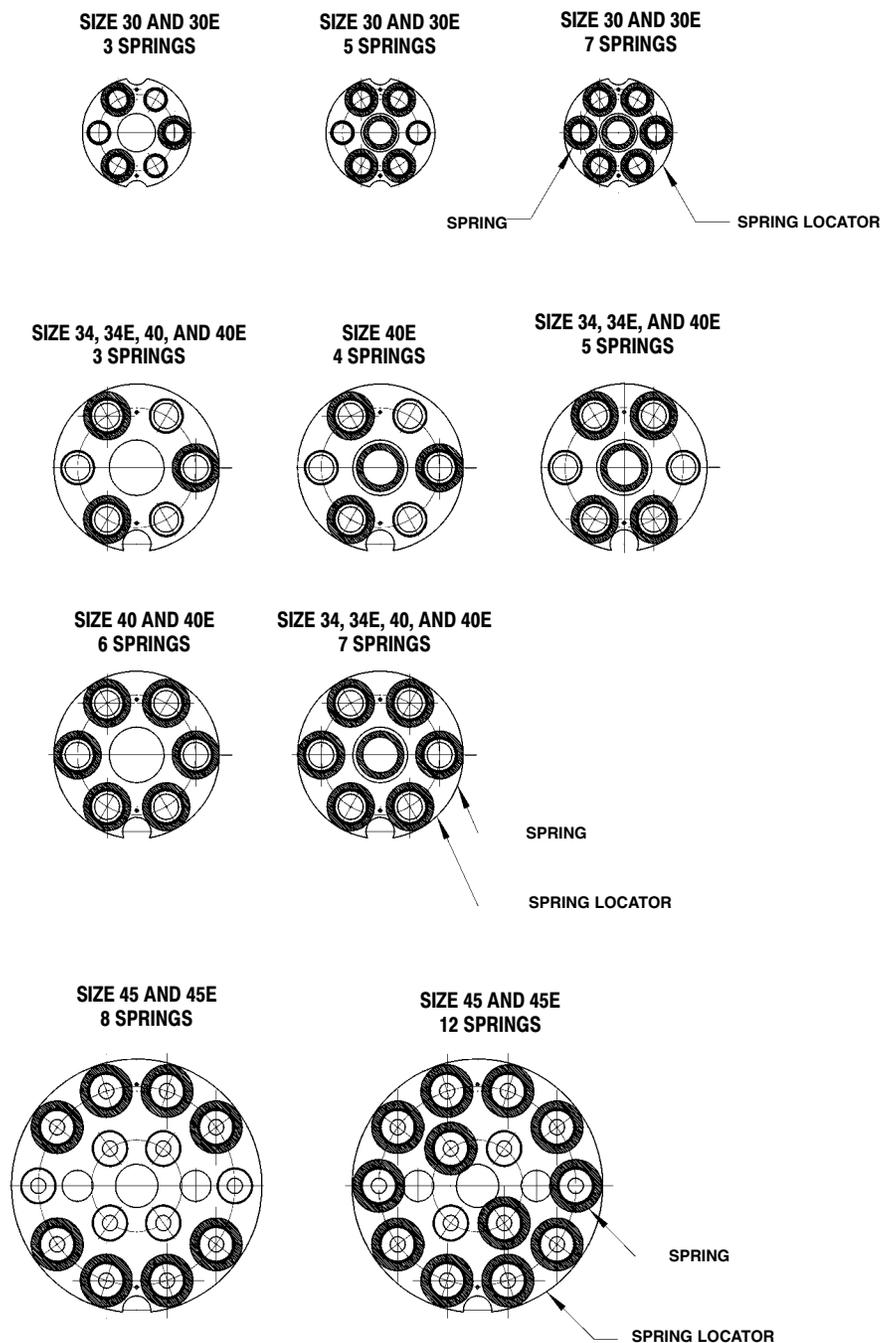
Assembly

This procedure assumes that the actuator is completely disassembled. If it is not, start the instructions at the appropriate step.

1. Before starting assembly, apply lithium grease (key 200) to the O-ring in the bushing (key 6 and key 12). Install the new bushing (key 6) and assemble with the cheese head screws (key 7) onto the lower diaphragm casing (key 1). Use a torque of 0.4 N•m (3 lbf•in).
2. Assemble the ring halves (key 9), pressure plate (key 10), O-ring (key 12), diaphragm (key 11) and diaphragm plate (key 13) on to the actuator stem as shown in figure 9 for Air-to-Open or figure 8 for Air-to-Close.
3. Apply thread locking adhesive (high strength) (key 201) to the thread on the upper end of the actuator stem, fit the travel stop nut (key 14) but do not tighten. Then perform one of the following procedures as appropriate.

***For a Type 3024C Air-to-Open Actuator
(figure 9)***

- a. Carefully slide the actuator stem (key 8) (with the assembled parts) down through the bushing (key 6).



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Figure 5. Type 3024C Spring Arrangements

b. Position the actuator springs (key 15) symmetrically on the diaphragm plate (key 13) as shown in figure 5.

c. Install the upper diaphragm casing (key 16) so that the springs fit correctly over the seat bosses

of the spring locator (key 17). Rotate the upper diaphragm casing along with the diaphragm/diaphragm plate assembly so that the air connection in the upper diaphragm casing is located directly above the air connection in the lower diaphragm casing. Then rotate the

diaphragm without moving either the upper diaphragm casing or the diaphragm plate so that the diaphragm holes line up with those in the casings.

d. Lift off the upper diaphragm casing and remove the springs. Tighten the travel stop nut (key 14 as follows: Sizes 30, 30E, 34, and 34E, tighten to 36 N•m (27 lbf•ft); Sizes 40, 40E, 45, and 45E, tighten to 87 N•m (64 lbf•ft).

e. Replace the spring as previously.

f. For actuator sizes 40E and 45E with 1.5 and 2 inch travels, a casing spacer is fitted between the upper and lower diaphragm casings. Place the casing spacer (key 29) on the diaphragm and then the gasket (key 30) as shown in figure 13.

For a Type 3024C Air-to-Close Actuator (figure 8)

a. Position the actuator springs symmetrically on the spring locator (key 17) as shown in figure 5.

b. For actuator sizes 40E and 45E with 1.5 and 2 inch travels, a casing spacer (key 29) is fitted between the upper and lower diaphragm casings. Place the gasket (key 30) on the lower casing and then the casing spacer (key 29) as shown in figure 14.

c. Carefully slide the actuator stem with the assembled parts down through the bushing and position it so that the springs fit correctly over the seat bosses on the upper side of the diaphragm plate (key 13). Rotate the diaphragm (key 11) without moving the diaphragm plate (key 13) so that the diaphragm holes line with the lower diaphragm casing holes.

d. Tighten the travel stop nut (key 14) as follows: Sizes 30, 30E, 34 and 34E tighten to 36 N•m (27 lbf•ft); Sizes 40, 40E, 45 and 45E tighten to 87 N•m (64 lbf•ft).

4. Install the upper diaphragm casing (key 16) so that the air connection is located directly above the air connection in the lower diaphragm casing (key 1). Using the long cap screws (key 21) and hex nuts (key 20) first, and then the shorter cap-screws (key 19) and hex nuts (key 20), bolt the two diaphragm casings together. Fit the safety plastic hose (key 22) over the exposed thread of the long cap-screws (key 21).

CAUTION

Over tightening the diaphragm cap screws and nuts can damage the diaphragm. Do not exceed the torque of 13 N•m (10 lbf•ft) for sizes 30, 30E, 34 and 34E and 17 N•m (12 lbf•ft) for sizes 40, 40E, 45, and 45E.

Note

Be sure to use the long cap screws (key 21) first, installing them on opposite sides of the diaphragm casing. Tighten them evenly, using a criss-cross pattern to ensure a proper seal.

5. Mount the actuator on the valve in accordance with the Installation Procedures.

Changing the Actuator Action

The actuator can be changed from a Type 3024C Air-to-Open to a 3024C Air-to-Close action or vice versa. Remove the pressure plate, diaphragm, O-ring, diaphragm plate, travel stop nut, springs, spring locator, self tapping screws and vent assembly (keys 10, 11, 12, 13, 14, 15, 17, 18 and 23) and reinstall them for the appropriate action. Follow the instructions in the section on Assembly on page 8.

Side-Mounted Handwheel

A side-mounted handwheel assembly (figure 10) is usually used as a manual operator. When mounted on an Air-to-Close Type 3024C actuator, turning the handwheel clockwise always closes the valve. When mounted on an Air-to Open actuator, turning the handwheel clockwise always opens the valve. A lever (key 101, figure 10) on the handwheel assembly opens or closes the valve by moving the valve stem.

Instructions are given below for complete disassembly and assembly. Perform the disassembly only as far as is necessary to accomplish the required maintenance; then begin the assembly at the appropriate step.

Refer to figure 10 for key numbers.

Disassembly

1. If desired, the handwheel assembly can be removed from the actuator yoke. To do this, remove

3024C Actuator

the eight hex cap screws (key 113) that hold the assembly to the yoke.

- Loosen the lock (key 115) that secures the drive screw assembly (key 103).
- Remove the retaining ring (key 110) and screw out the drive screw assembly (key 103).
- Remove the retaining ring (key 108) and drive out the pivot pin (key 104).
- Remove the bushings (key 107) from the body (key 100).
- There is a cap screw (key 111), hex nut (key 112) and spacer (key 105) that hold the two levers (key 101) together. Remove the cap-screw and hex nut and the two levers can be separated in order to remove the operating nut (key 102).

Assembly

- Assemble the operator nut (key 102), the two levers (key 101) and the spacer (key 105) using the cap-screw (key 111) and hex nut (key 112).
- Install the bushings (key 107) in the body (key 100).
- Attach the levers (key 101) to the body (key 100) using the pivot pin (key 104) and the retaining ring (key 108).
- Apply lithium grease (key 200) to the drive screw assembly (key 103) and screw it on to the operating nut (key 102).
- Install the retaining ring (key 110) to secure the collar to the body (key 100).
- If the handwheel assembly was removed from the actuator yoke, position the assembly within the yoke so that the eight mounting holes on the assembly align with those on the yoke and fit the cap-screws (key 113) tightening to 28 N•m (20 lbf•ft). Should difficulty be experienced fitting the levers (key 101) over (for ATC) or under (for ATO) the actuator/valve stem connector, then partially stroke the actuator/valve by applying air pressure to the actuator diaphragm.

Adjustable Travel Stops

The adjustable up travel stop (figures 11 and 12) limits the actuator stroke in the upward direction (limits retraction of the actuator stem).



WARNING

When performing the following adjustment procedures, take care to

avoid injury when positioning components.

For Sizes 30, 30E, 34, 34E, 40, and 40E

- Relieve the air pressure on the diaphragm. Loosen the hex nut (key 25) and turn the adjuster (key 24) clockwise into the diaphragm case to move the actuator stem downward or counter-clockwise to allow the actuator stem to move upward. Since the valve has push-down-to-close action, full opening can be restricted. Check the actuator travel and then tighten the hex nut (key 25).

CAUTION

The travel stop hex nut (key 25) has an elastic stop on its underside to provide an air seal around the travel stop thread. It is therefore important, before slackening this nut, to release any air pressure on the diaphragm.

For Sizes 45 and 45E

The adjustable up travel stop for the sizes 45 and 45E is shown in figure 12. For sizes 45 and 45E, the adjustable up travel stop cannot be used with a side mounted handwheel.

- Remove the screws (key 41) and nuts (key 42) which hold the protective covers (key 40) to the actuator yoke and remove the covers.
- Loosen the machined cheese head screw (key 37) and turn the adjustment nut (key 38) clockwise into the bushing (key 36) to increase travel or counter-clockwise to shorten the actuator travel.
- Check the actuator travel and then tighten the machined cheese head screw (key 37).
- Assemble the protective cover plates (key 40) to the actuator yoke with the screws (key 41) and nuts (key 42) taking care to ensure that there is no gap between the cover plate and the diaphragm casing.

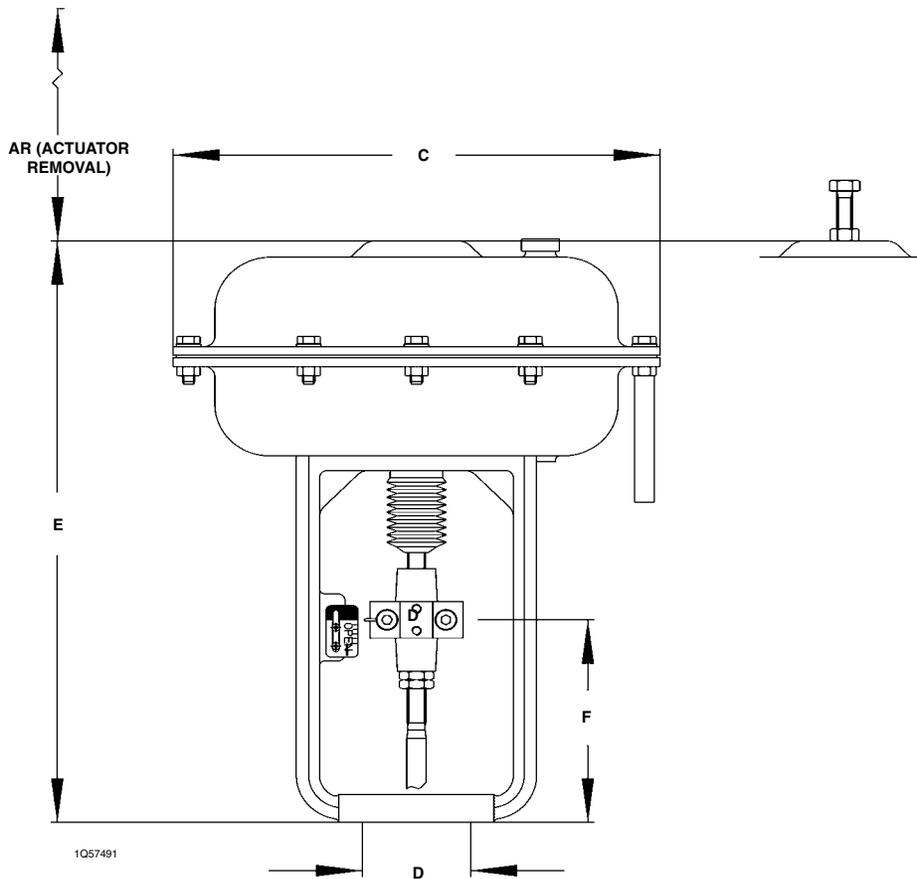


Figure 6. Actuator Dimensions

Actuator Dimensions

Refer to figures 6 and 7 and table 5 for dimensions.

Table 5. Dimensions

Actuator Size	Valve Travel	Yoke Boss, Inches	C	E	F ⁽¹⁾	AR	Js	Hs	M (ATO)	M (ATC)
			Millimeters							
30	16 mm	2-1/8 (54 mm)	215	370	140	105	205	280	185	80
34	16 mm	2-1/8 (54 mm)	315	400	140	105	250	280	185	80
40	32 mm	2-13/16 (71 mm)	315	420	170	133	250	280	210	100
45	32 mm	2-13/16 (71 mm)	420	450	170	133	250	280	210	100
Inches										
30E	0.75	2-1/8	8.5	14.6	5.6	4.7	8.1	11.0	7.3	3.1
34E	0.75	2-1/8	12.4	15.8	5.6	4.7	9.8	11.0	7.3	3.1
40E	1.125	2-13/16	12.4	17.9	8.1	6.6	9.8	11.0	9.6	5.5
40E	1.5	2-13/16	12.4	18.9	8.3	6.6	---	---	---	---
40E	2	2-13/16	12.4	18.9	8.5	6.2	---	---	---	---
45E	1.125	2-13/16	16.5	19.3	8.1	6.6	9.8	11.0	9.6	5.5
45E	1.5	2-13/16	16.5	20.1	8.3	6.6	---	---	---	---
45E	2	2-13/16	16.5	20.1	8.5	6.2	---	---	---	---

1. This is the distance between the base of the yoke to the centre of the stem connector at the fully-up position. This ensures the positioner feedback arm, if fitted, is horizontal at mid-travel.

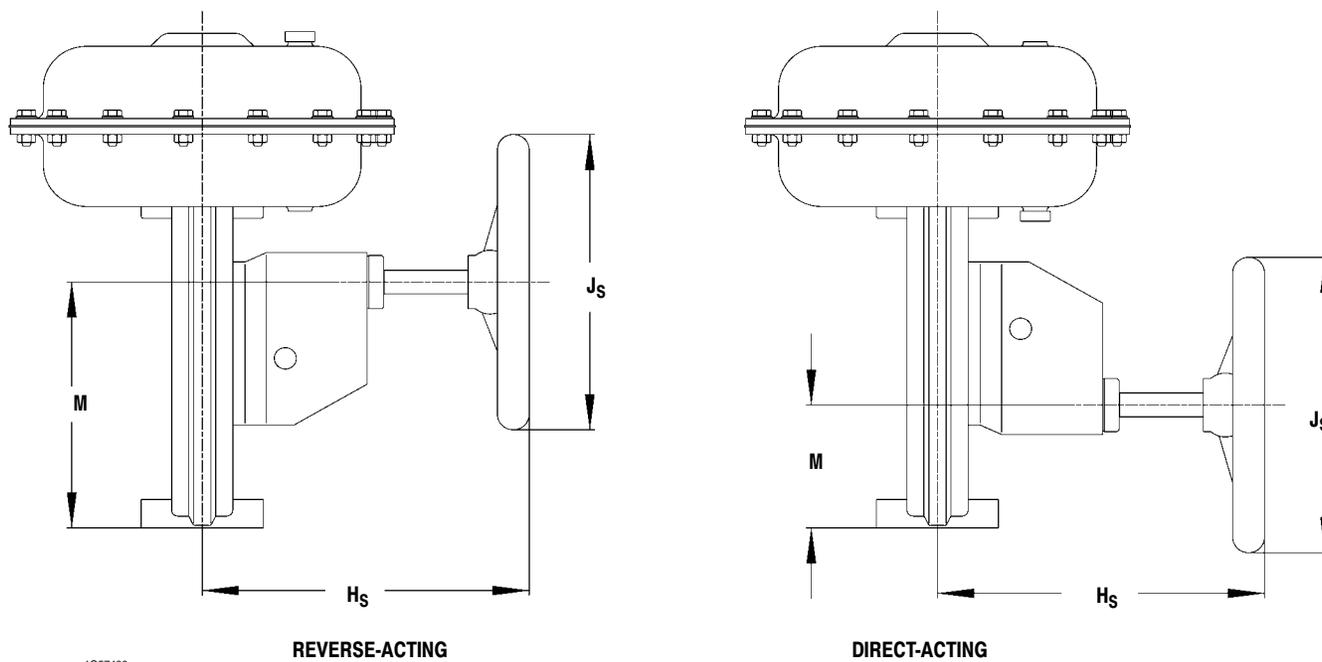


Figure 7. Actuator Dimensions with Handwheel

Parts Ordering

Each actuator has a serial number stamped on the nameplate (figure 2 and key 34 on figures 8 and 9). Refer to the serial number when ordering replacement parts or when corresponding with your Emerson Process Management sales office for technical assistance. Also specify the complete 7 or 11 character part number from the following parts list when ordering replacement parts.

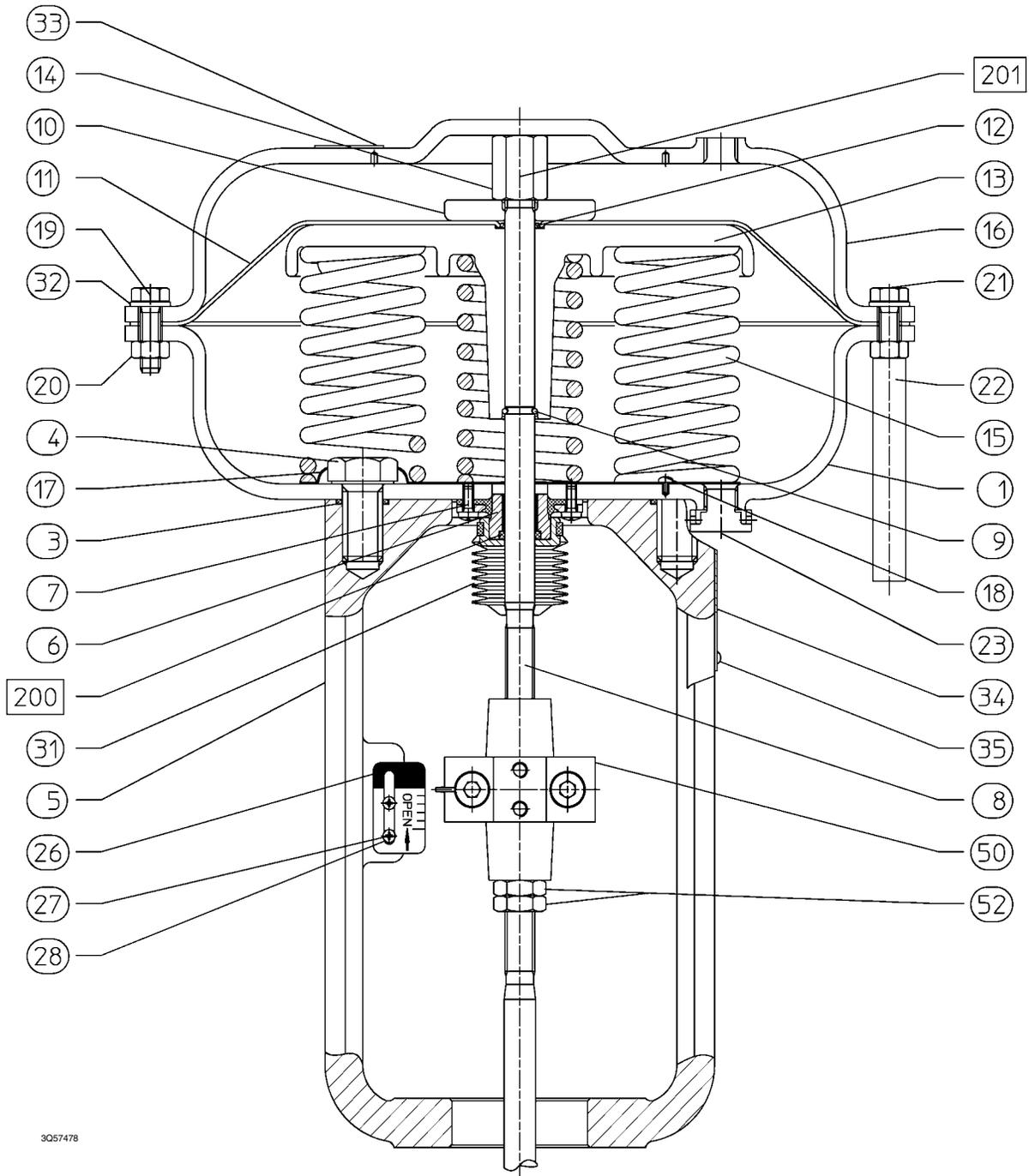
WARNING

Use only genuine Fisher® replacement parts. Components that are not supplied by Emerson Process

Management should not, under any circumstances, be used in any Fisher valve, because they will void your warranty, might adversely affect the performance of the valve, and could give rise to personal injury and property damage.

Note

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.



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Figure 8. Direct-Acting Actuator (Air-to-Close)

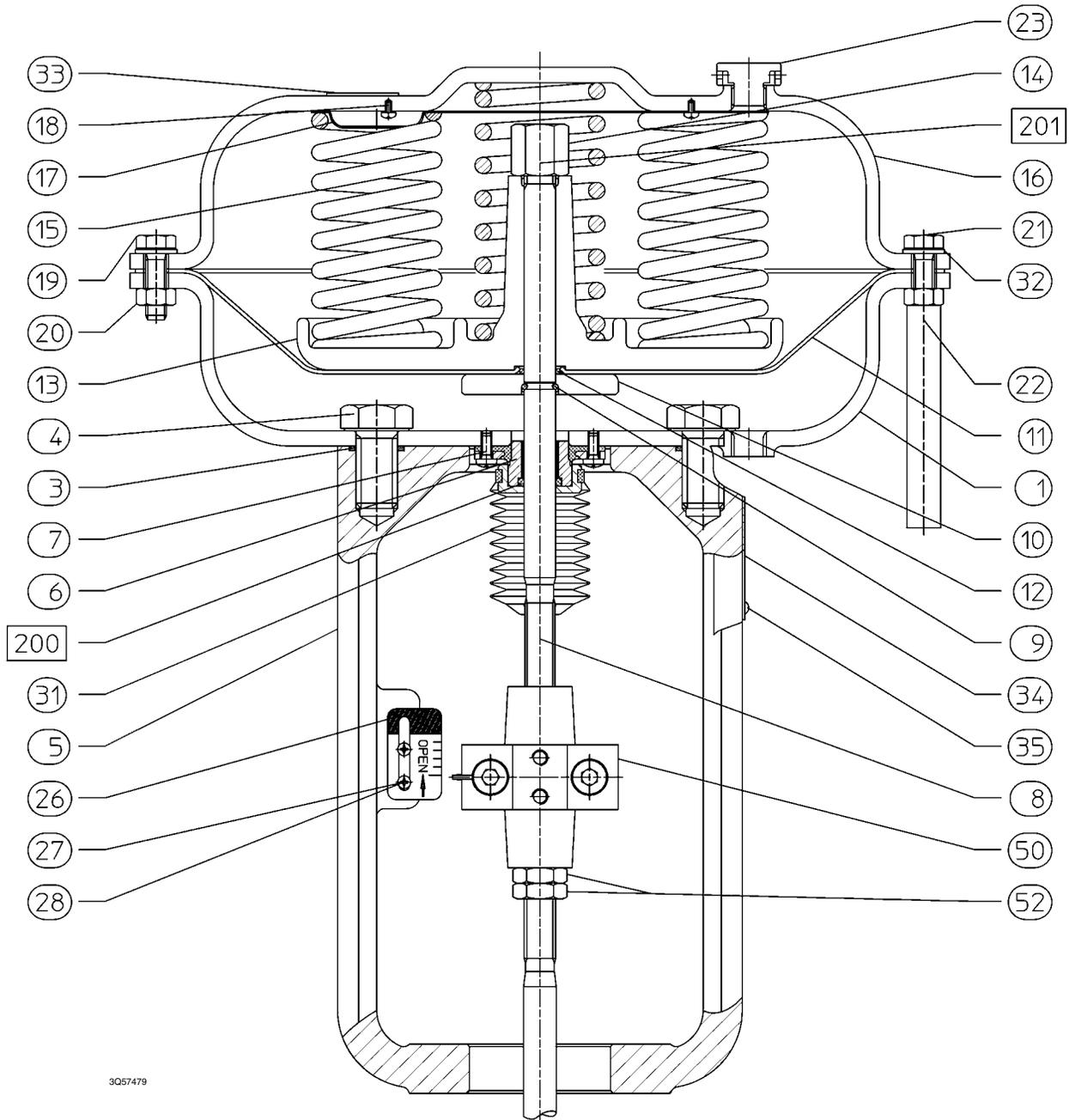


Figure 9. Reverse-Acting Actuator (Air-to-Open)

Parts List

Note

For part numbers not shown, contact your Emerson Process Management sales office.

Actuator

Key	Description	Part Number
1	Lower Diaphragm Casing, steel	
3*	O-Ring (2 required) Sizes 30 & 30E	0409073
	Sizes 34, 34E, 40, 40E, 45 & 45E	0411736
4	Cap-Screw, hex head (2 required)	
5	Yoke, steel	
6*	Bushing Assembly Sizes 30, 30E, 34, 34E, 40 and 40E	0409065
	Sizes 45 and 45E	0411159
7	Machined Screw, pan head (6 required)	
8	Actuator Stem	
9	Split Ring, half (2 required)	
10	Pressure Plate	
11*	Diaphragm Sizes 30 and 30E	0410705
	Sizes 34, 34E, 40 and 40E	0410357
	Sizes 45 and 45E	0411868
12*	O-Ring Sizes 30, 30E, 34, 34E, 40 and 40E	0409073
	Sizes 45 & 45E	0411736
13	Diaphragm Plate	
14	Nut, Hex	
15	Springs (see tables 2 and 3 for quantity, set number & colour)	
16	Upper Diaphragm Casing, Steel	
17	Spring Locator	
18	Drive Screw (2 required)	
19	Hex Head Cap Screw Sizes 30, 30E (7 required) Sizes 34, 34E, 40, and 40E (12 required) Size 45, 45E (17 required)	
20	Hex Nut Size 30, 30E (10 required) Size 34, 34E, 40, and 40E (15 required) Size 45, 45E (20 required)	
21	Hex Head Cap Screw (3 required)	
22	Plastic Hose (3 required)	
23	Vent	
26	Travel Indicator Scale	
27	Twin-Speed Nut	
28	Self-Tapping Screw (2 required)	
29	Casing Spacer (Size 40E and 45E only)	
30	Seal Ring (Size 40E and 45E only)	

30*	Gasket Size 40E	0598313
	Size 45E	0607304
31*	Bellows	
32	Plain Washer Size 30, 30E (10 required) Size 34, 34E, 40, and 40E (15 required) Size 45, 45E (20 required)	
33	Warning Label	
34	Nameplate	
35	Drive Screw (2 required)	
50	Stem Connector Assembly	
52	Hex Jam Nut (2 required)	
200	Lithium Grease	
201	Thread Locking Adhesive (High Strength)	

Side Mounted Handwheel

Key	Description	Part Number
100	Body	
101	Lever (2 required)	
102	Operating Nut	
103	Drive Screw Assembly	
104	Pivot Pin	
105	Spacer	
106	Shim Ring	
107	Bushing (2 required)	
108	Retaining Ring (2 required)	
109	Thrust Washer	
110	Retaining Ring	
111	Cap-Screw, hex head	
112	Nut, hex	
113	Cap-Screw, hex head (8 required)	
115	Lock	
117	Nut, hex	
200	Lithium Grease	

Adjustable Up Travel Stop

Key	Description	Part Number
Sizes 30, 30E, 34, 34E, 40 and 40E		
16	Upper Diaphragm Casing	
24	Cap-Screw, hex head	
25	Hex Nut	
Sizes 45 and 45E		
16	Upper Diaphragm Casing	
36	Adjustment Nut	
37	Machined Screw, cheese head	
38	Bushing	
40	Protective Cover (2 required)	
41	Hex Cap Screw (2 required)	
42	Hex Nut (2 required)	

*Recommended spare parts

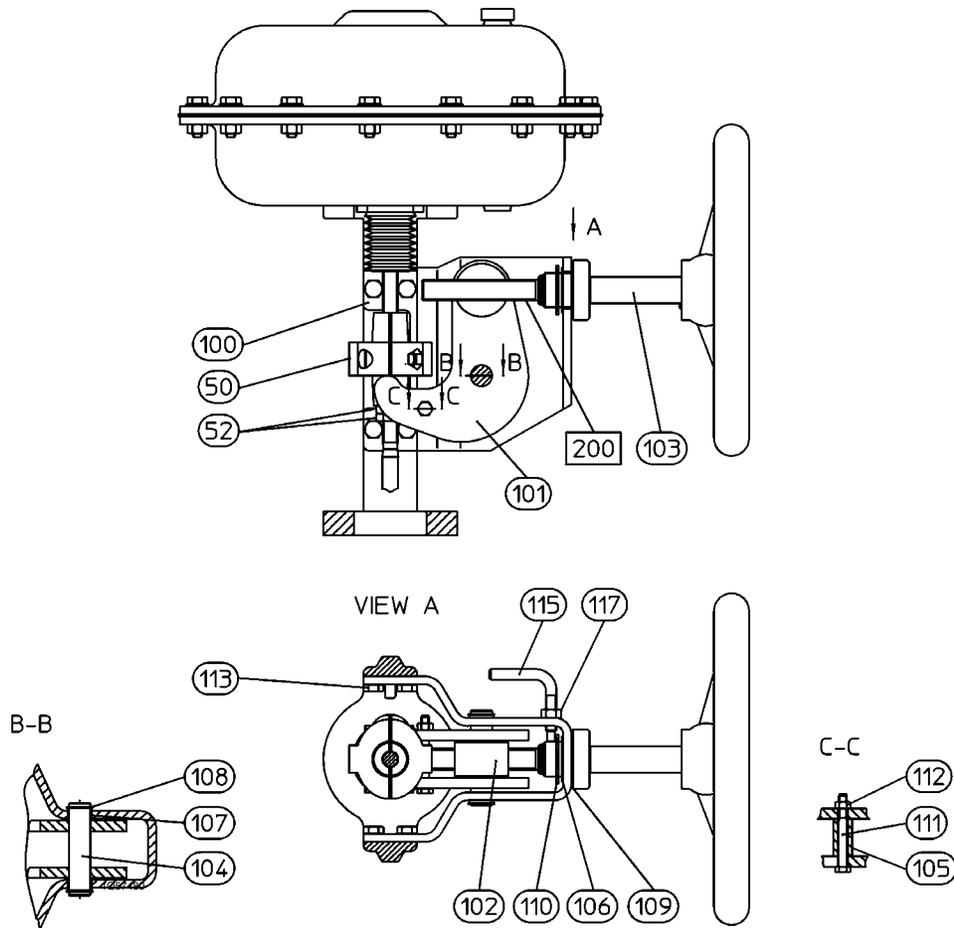
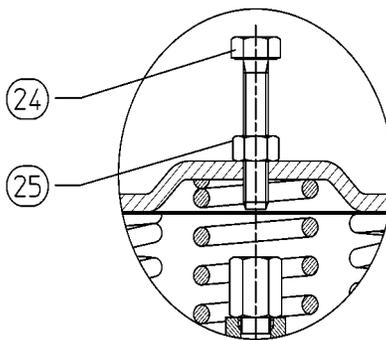
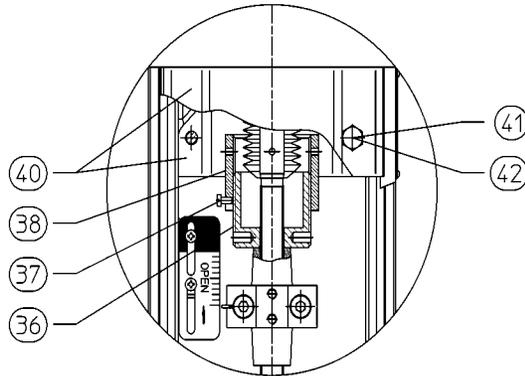


Figure 10. Side-Mounted Handwheel for Type 3024C Actuators



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Figure 11. Adjustable Up Travel Stop for Sizes 30 to 40E



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Figure 12. Adjustable Up Travel Stop for Sizes 45 to 45E

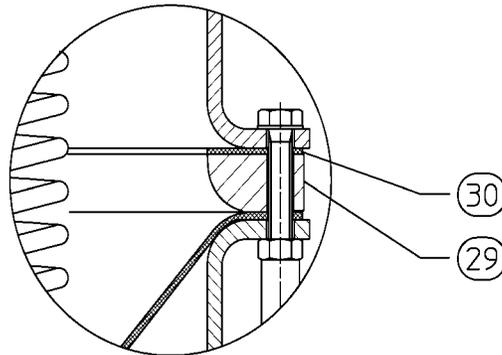


Figure 13. Casing Spacer Detail for ATO

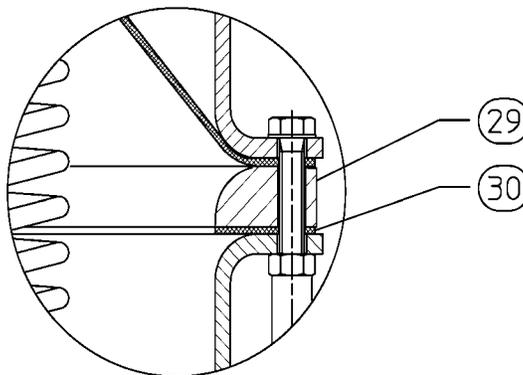


Figure 14. Casing Spacer Detail for ATC

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Emerson Process Management

Marshalltown, Iowa 50158 USA

Cernay 68700 France

Sao Paulo 05424 Brazil

Singapore 128461

www.Fisher.com

