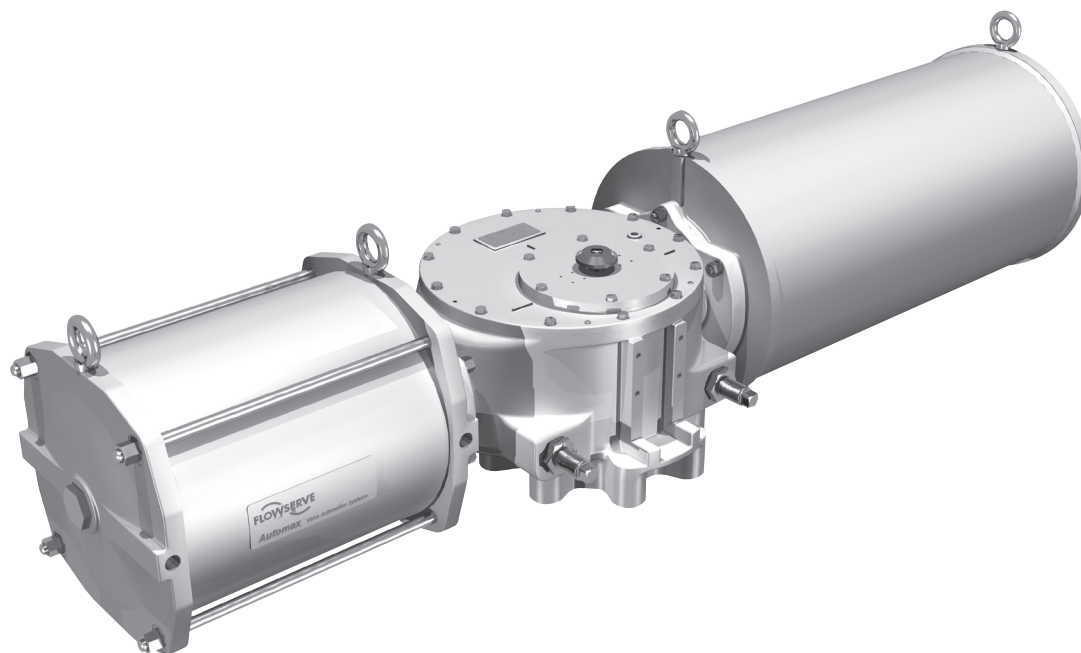




USER INSTRUCTIONS

Installation
Operation
Maintenance

RG Series Standard Actuator



Introduction

The RG Series is a fully modular design, scotch-yoke actuator; with torque range from 2000Nm to 250,000Nm (2,800 in-Lbs to 2.2 M in-Lbs) in eight models, RG1 through RG8, with maximum actuator torque and mounting base in compliance with ISO 5211.

The RG series Spring Return Actuators, in contrast with R-series, use Pull-to-Compress the spring design.

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2. Installation
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6. Torque Shaft
7. Long Term Storage

1 Using Flowserve Valves, Actuators and Accessories Correctly

1.1 General usage

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on FLOWSERVE products. Product users and maintenance personnel should thoroughly review this bulletin prior to installing, operating or performing any maintenance.

In most cases FLOWSERVE valves, actuators and accessories are designed for specific applications with regard to medium, pressure and temperature. For this reason they should not be used in other applications without first contacting the manufacturer.

1.2 Terms concerning safety

The safety terms **DANGER**, **WARNING**, **CAUTION** and **NOTE** are used in these instructions to highlight particular dangers and/or to provide additional information on aspects that may not be readily apparent.



DANGER: indicates that death, severe personal injury and/or substantial property damage will occur if proper precautions are not taken.



WARNING: indicates that death, severe personal injury and/or substantial property damage can occur if proper precautions are not taken.

CAUTION: indicates that minor personal injury and/or property damage can occur if proper precautions are not taken.

NOTE: indicates and provides additional technical information, which may not be very obvious even to qualified personnel.

Compliance with other, not particularly emphasised notes, with regard to transport, assembly, operation and maintenance and with regard to technical documentation (e.g. in the operating instruction, product documentation or on the product itself) is essential, in order to avoid faults, which in themselves might directly or indirectly cause severe personal injury or property damage.

1.3 Protective clothing

FLOWSERVE products are often used in problematic applications (e.g. extremely high pressures, dangerous, toxic or corrosive mediums). In particular valves with bellows seals point to such applications. When performing service, inspection or repair operations always ensure, that the valve and actuator are depressurised and that the valve has been cleaned and is free from harmful substances. In such cases pay particular attention to personal protection (protective clothing, gloves, glasses etc.).

1.4 Qualified personnel

Qualified personnel are people who, on account of their training, experience and instruction and their knowledge of relevant standards, specifications, accident prevention regulations and operating conditions, have been authorised by those responsible for the safety of the plant to perform the necessary work and who can recognise and avoid possible dangers.

1.5 Installation

DANGER: Before installation check the order-no., serial-no. and/or the tag-no. to ensure that the valve/ actuator is correct for the intended application.

Do not insulate extensions that are provided for hot or cold services.

Pipelines must be correctly aligned to ensure that the valve is not fitted under tension.

Fire protection must be provided by the user.

1.6 Spare parts

Use only FLOWSERVE original spare parts. FLOWSERVE cannot accept responsibility for any damages that occur from using spare parts or fastening materials from other manufactures. If FLOWSERVE products (especially sealing materials) have been on store for longer periods check these for corrosion or deterioration before using these products.

1.7 Service / repair

To avoid possible injury to personnel or damage to products, safety terms must be strictly adhered to. Modifying this product, substituting nonfactory parts, or using maintenance procedures other than outlined in this instruction could drastically affect performance and be hazardous to personnel and equipment, and may void existing warranties. Between actuator and valve there are moving parts. To avoid injury FLOWSERVE provides pinch-point-protection in the form of cover plates. If these plates are removed for inspection, service or repair special attention is required. After completing work the cover plates must be refitted.

Apart from the operating instructions and the obligatory accident prevention directives valid in the country of use, all recognised regulations for safety and good engineering practices must be followed.



WARNING: Before products are returned to FLOWSERVE for repair or service FLOWSERVE must be provided with a certificate which confirms that the product has been decontaminated and is clean. FLOWSERVE will not accept deliveries if a certificate has not been provided (a form can be obtained from FLOWSERVE).

1.8 Storage

Flowserve actuators are typically provided with an epoxy resin coating or with other painting systems as agreed with the customer. This means that FLOWSERVE products are well protected from corrosion. Nevertheless FLOWSERVE products must be stored adequately in a clean, dry environment. Plastic caps are fitted to protect the flange faces to prevent the ingress of foreign materials. These caps should not be removed until the valve is actually mounted into the system.

1.9 Valve and actuator variations

These instructions cannot claim to cover all details of all possible product variations, nor can they provide information for every possible example of installation, operation or maintenance. This means that the instructions normally include only the directions to be followed by qualified personal where the product is being used for its defined purpose. If there are any uncertainties in this respect particularly in the event of missing product-related information, clarification must be obtained via the appropriate FLOWSERVE sales office.

1.10 Unpacking

Each delivery includes a packing slip. When unpacking, check all delivered valves and accessories using this packing slip.

Report transport damage to the carrier immediately.

In case of discrepancies, contact your nearest FLOWSERVE location.

2 Installation

- 2.1 All actuators are factory lubricated for life, but still should be protected from the elements and stored in-doors until ready for use. The ports of the actuator are plugged as supplied from the factory. If actuators are stored for a long period of time prior to installation, follow the Long Term Storage instructions.
- 2.2 Prior to assembly, manually open and close valve (if possible), to ensure freeness of operation. Be sure, valve and Automax actuator rotate in the same direction and are in the same position (i.e., valve closed, actuator closed).
- 2.3 Check the mounting surfaces, the stem adaptor and the bracket to assure proper fit. Secure the valve in the closed position with the stem vertical. Bolt the bracket to the valve and place the stem adaptor on the valve stem. Position the actuator over the valve and lower, to engage the stem adaptor to the actuator's bore. Continue to lower until the actuator seats on the bracket mounting surface. In order to align the bolt holes, it may be necessary to loosen the valve-to-bracket bolting to allow more play in the bracket. The mounting bolts should easily fit into the bolt holes without any binding. If needed, turn or stroke the actuator a few degrees and/or adjust the actuator travel stops. Bolt the actuator to the bracket.
- 2.4 Adjust the travel stop bolts of the actuator for the proper open and closed valve positions, per valve manufacturer's recommendations. Pneumatically stroke the actuator several times to assure proper operation. The stem adaptor should not bind during operation. If the actuator is equipped with an UltraSwitch or other accessories, adjust them at this time.

- 2.5 To prolong actuator life use only clean, dry plant air. Lubricated air is not required, however it is recommended particularly for high cycle applications. Do not use lubricated air with positioners.

⚠ CAUTION! Lifting bolts holes on the actuator are for lifting the actuator modules only with eye bolts, not a complete valve and actuator assembly.

3 Travel Stop Adjustments

All actuated valves require accurate travel-stop adjustments at both ends of the stroke to obtain optimum performance and valve seat life. The accumulation of tolerances in the adaption of actuators to valves is such that there must be a range of adjustments for both ends of the stroke to achieve optimum performance.

The RG actuators have travel stop adjustments in both the clockwise and counter-clockwise directions. The +/- 3 degree adjustment feature provides shaft rotation from 84 to 96 degrees.

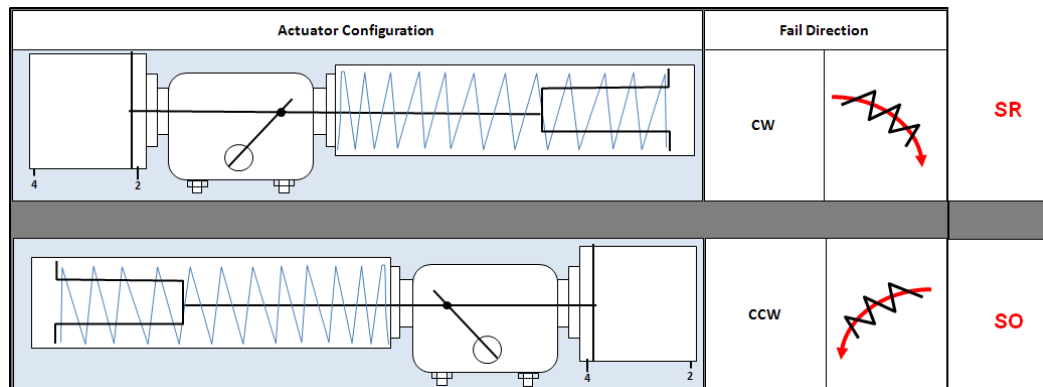
4 Maintenance Instructions

4.1 Disassembly Instructions

- 4.1.1 Disconnect all air and electrical supplies from actuator.
- 4.1.2 Remove all accessories from actuator and dismount actuator from valve.
- 4.1.3 Drawing References: Drg # 263188, Drg # 263189

4.2 Spring Module (see Fig.: 1)

⚠ CAUTION! Personal Injury may result if Step 2 is attempted before Step 1 is completed.



4.2.1 Apply air pressure to port 2 on FCW (port 4 on FCCW) actuator, raising pressure slowly, enough to release spring pressure from the Stop Bolt (17). Back off fully both Stop Bolts on the Torque Module and release air pressure. This will relieve the spring preload.

4.2.2 The Spring Module is welded into an integral component and cannot be disassembled. To remove from actuator, remove Spring Module end cover (60) and using an extended socket spanner /tube spanner, unscrew and disconnect the Pull Rod (54) from the Torque Module.

⚠ CAUTION! Take extra care not to drop the socket/ small tools inside the spring can. Small objects dropped inside may fall through the spring guide and get stuck in the spring coils.

NOTE: A retainer ring on the threaded side of the Pull Rod stops it from being removed completely from the Spring Module.

4.2.3 Sling the Spring Module using lifting bolts on the Module and remove the Adapter Nuts (19) and Lock washers (20). Spring Module can now be removed from the Torque Module.

4.2.4 Before reassembling Spring Module to body, make sure stud threads are clean of any dirt, shavings, or other debris. Clean threads with rag and solvent if required, and lubricate threads with an anti-seize compound.

NOTE: Support the Spring Module during removal so as not to damage the Pull Rod and the studs' threads.

4.3 Pressure Module

4.3.1 Pressurize rod end of cylinder, enough to stroke to end. Vent out the air from the cylinder.

4.3.2 Remove end cover plate/plug from pressure module and unscrew the piston rod with a socket/tube spanner.

4.3.3 Sling the pressure module from the eye bolts, remove the Adaptor Stud Nuts (19) and Lock washers (20) and take the Pressure module off the Torque module.

4.3.4 Remove the Tie Rod Nuts (37), the End Plate (33) and Tie Rods (36).

4.3.5 Slide the Cylinder (34) over and off the Piston (38), being careful not to scratch or dent the honed and chrome plated surface of the cylinder.

4.3.6 Slide out the Piston-Piston Rod assembly off the Adapter Plate (32).

4.3.7 Remove the Retainer Ring (40) and take the Split Collar (39) off the Piston Rod (35). Pull the Piston Rod off the Piston.

4.4 Torque Module (Body Group)

NOTE: Spring Module and Pressure Module must be removed before disassembling the Torque Module

4.4.1 Remove the Indicator (29), if fitted.

4.4.2 Remove Top Cover Bolts (65) and the cover, O-ring and the Namur Shaft Assembly (15).

4.4.3 Remove Body Cover Bolts, Lock Washers (26) and Thread Plugs (31).

4.4.4 Using the removed Body Cover Bolts, jack open the cover by threading in the bolts in the two tapped holes until cover is separated enough to pry apart. Take care to jack the bolts evenly, as the cover is positioned by four dowel pins, and cross loading may cause bending/ breakage of pins on small actuator sizes.

4.4.5 Gently tap with PU/Plastic hammer and pull off the Guide Bar (2) from the body.

4.4.6 Lift Yoke Sub Assembly out of body bore.

4.4.7 Remove Delrin Plate (7) retaining screws. Pull out the Yoke Pin (9), and Slider Block (10).

4.4.8 Slide out the Guide Block (11) out of the Yoke and remove the bottom Slider Block.

4.4.9 Remove Yoke Seals (5) and Yoke Bushing (4) if worn out/damaged.

4.5 Reassembly Instructions

4.5.1 Inspect all parts for wear and replace any worn parts as needed. Normally, all O-rings and seals should be replaced when reassembling an actuator. Use seal lubricant, Dow Corning 55 for all lubrication in the pressure group.

Ensure the replacement seals are suitable for the service temperature.

4.5.2 The Metal backed Bronze-PTFE bearings may be inspected and assessed for replacement, referring to guide (see Fig.: 2) on the useful residual life

To replace the bearings, the unit or the subassembly needs to be brought in to workshop, with suitable facilities to carefully remove the bearing without damaging the housing and to press new bearing with proper pressing tools per manufacturer's instructions and a press.

Do not attempt to pry out any of the bearings in the actuator with sharp tools, or hammer in a replacement bearing.

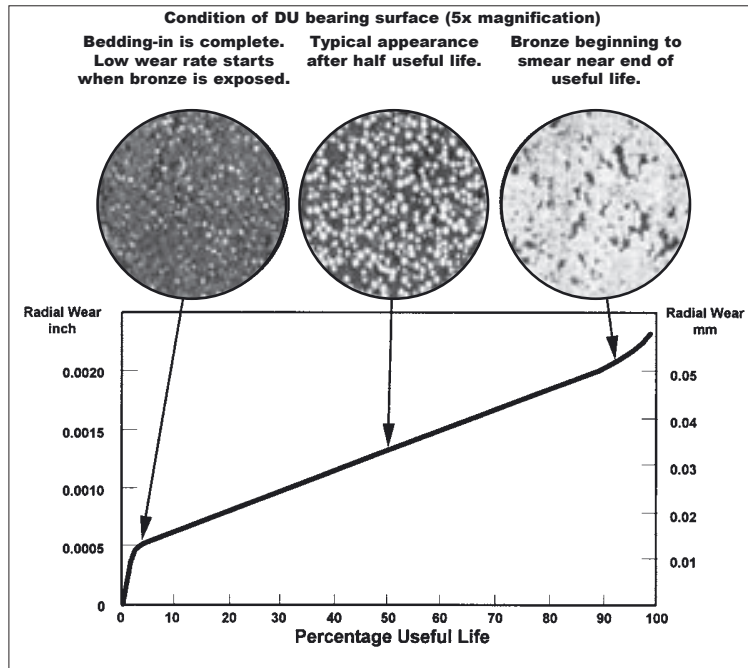


Fig.: 2 Residual Life Guide

4.5.3 Clean thoroughly and grease all Torque Module components with NLGI grade 2 multi-purpose grease. Use Shell Alvania EP2 for Standard Actuators. For low temperature units, use Dow 55 grease or equivalent.

4.5.4 Reverse the disassembly procedures to reassemble. Apply recommended torque, refer torque chart, on the Tie Rod Locknuts, the Mounting Flange Nuts, the Body Cover & Top Plate bolts, the Piston Rod / Pull Rod (see tables on page 7). The Tie Rod and Mounting Flange Stud threads should be tightened with thread lock, Loctite 243 or equivalent. The Pull /Piston Rod threads and cover bolts to be tightened with thread lock compound, Loctite 243 or equivalent.

4.5.5 Refer to parts and materials drawings for all required spare parts (see pages 9 + 10).
Test the actuator for smooth operation and air leakage at service pressure before reinstalling into service.

5 Field Conversion from Fail CW to Fail CCW
(For Spring Return Actuators)

The RG spring return actuator can be converted from fail CW to fail CCW easily, without having to remove the Torque Module, mounting bracket, stem adaptor and the shaft driven accessories, mounted on the centre body. Simply switch the positions of the Pressure and Spring Modules. Actuator Designation needs to be suitably changed on the name plate.

Follow steps below, if operating the valve is permitted:

- 5.1** Apply enough air pressure to the actuator to relieve spring load on the stopper bolt.
- 5.2** Back off both the stopper bolts on the Torque Module and depressurize the actuator.
- 5.3** Remove Spring Module end cover, unscrew and disconnect the Spring Pull Rod.
- 5.4** Pressurize rod end of Pressure Module, to end of stroke. Depressurize and remove the end cover/plug on the Pressure Module. Use a tube/socket spanner, loosen piston rod by one turn, fit back end cover/plug and pressurize cap end, enough to stroke to end. Depressurize, remove end cover/plug and fully unscrew and disconnect the piston rod from the Torque Module.
- 5.5** Remove the Pressure and Spring Modules off the Torque Module by removing the mounting flange stud nuts.

Bolt Torques

Fastener	Model	RG1	RG2	RG3	RG4	RG5	RG6	RG7	RG8	
Mounting Flange Nut	Thread Size	M8	M10	M12	M12	M16	M16	M20	M24	
	Tightning torque	ft-lb	10 to 12	18 to 22	30 to 35	30 to 35	80 to 90	80 to 90	140 to 160	280 to 320
		kgm	1.4 to 1.7	2.5 to 3.0	4.2 to 4.8	4.2 to 4.8	11.0 to 12.5	11.0 to 12.5	19 to 22	38 to 44
Body Cover Bolts	Thread Size	M6	M6	M8	M8	M10	M10	M16	M16	
	Tightning torque	ft-lb	3 to 5	3 to 5	10 to 14	10 to 14	18 to 22	18 to 22	26 to 30	26 to 30
		kgm	0.5 to 0.7	0.5 to 0.7	1.4 to 2.0	1.4 to 2.0	2.5 to 3.0	2.5 to 3.0	3.5 to 4.0	3.5 to 4.0
Top Plate Bolts	Thread Size	M6	M6	M8	M8	M10	M10	M16	M16	
	Tightning torque	ft-lb	3 to 5	3 to 5	10 to 14	10 to 14	18 to 22	18 to 22	22 to 26	22 to 26
		kgm	0.5 to 0.7	0.5 to 0.7	1.4 to 2.0	1.4 to 2.0	2.5 to 3.0	2.5 to 3.0	3.0 to 3.5	3.0 to 3.5
Stopper Bolt Locknuts	Thread Size	M16	M20	M20	M30	M36	M48	M56	M64	
	Tightning torque	ft-lb	75 to 85	90 to 100	90 to 100	100 to 110	120 to 130	140 to 150	175 to 200	200 to 240
		kgm	10 to 12	12 to 14	12 to 14	14 to 15	16 to 18	19 to 21	25 to 28	28 to 33
Piston Rod/Pull Rod	Hex Size A/F	18	18	24	30	36	46	65	85	
	Tightning torque	ft-lb	116	116	217	651	651	1,476	2,336	4,116
		kgm	16	16	30	90	90	204	323	569

Tie Rod Nut Torque

Cylinder Size (in)	5	6	7	8	9	10	12	14	16	18	20	22	24	28	32	32T	36	36T	40
Tie Rod Nut Size	M10	M10	M10	M10	M12	M12	M16	M16	M20	M20	M24	M24	M30	M30	M30	M36	M30	M36	M30
Tightening Torque (ft Lb)	8	11	14	19	28	34	64	88	143	181	268	325	485	330	431	1028	564	876	673

5.6 Switch the positions of the two modules, connect the Pressure Module first and ensure the ports are on the stopper bolts side of actuator. Thread in and torque the piston rod to recommended value, fit back end cover plate/plug. Pressurize cap end to stroke the actuator to end.

5.7 Reinstall Spring Module, torque the pull rod to recommended value, fit end cover back. Pressurize rod end of cylinder and adjust the stopper bolts.

5.8 Check actuator for proper operation, at the rated working pressure.

NOTE: If operation of valve is not permitted, during changing of the Fail Safe direction, then the actuator needs to be taken off the valve and reconfigured, as explained above.

RG Series Standard Actuator

Actuator Model Designation

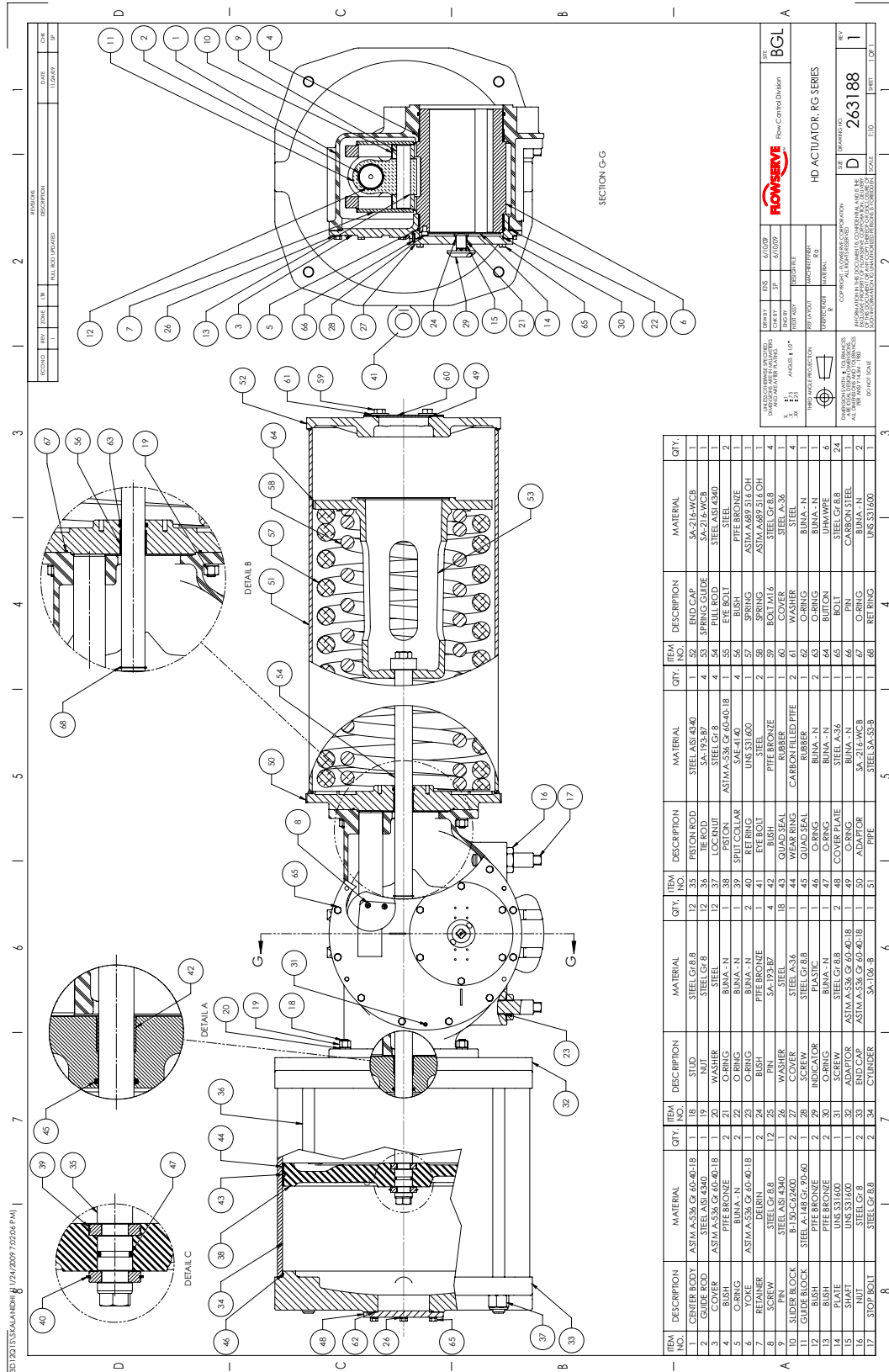
How to Order									
Series	Body Size	Cylinder Size	Action	Spring Module	Torque Pattern (Yoke)	Sealing/Temp	Manual Override	Coatings	Options
	1	05 06 07 08 09 10 12	DA- Double Acting Single Cylinder	0	S- Symmetrical C- Canted	N- Nitrile, -20°F to 180°F V- Viton, 0°F to 300°F L- wLow Temp, -55°F to 180°F Extreme Low Temp, Below than -55°F to 180°F E-	O- None S- S Series Sandwich Declutch Gbox A- A Series Sandwich Declutch Gbox J- Jackscrew D- Gear Drive Jackscrew H- Hydraulic	PO- Primer Only GE- Grey Epoxy WE- White Epoxy SP- Special Paint	OO- None TC- Extended Stopper -CW TO- Extended Stopper -CCW TB- Extended Stopper -Both Dir XXXX- Specials code
	2	08 09 10 12 14 16	DD- Double Acting Dual Cylinder						
	3	10 12 14 16 18 20							
	4	14 16 18 20 22 24							
	5	16 18 20 22 24 28							
	6	18 20 22 24 28 32 36	SR- Spring Return Fail CW						
	7	24 28 32 36 40	SO- Spring Return Fail CCW						
	8	28 32 36 40 32T 36T							
Model Code Example:									
RG	5	22	SR	6	S	N	O	GE	OO

Body Size	Maximum Cylinder Size		
	DA	DD	SR/SO
1	9	8	12
2	12	10	16
3	16	14	20
4	20	16	24
5	22	20	28
6	28	24	36
7	36	32	40
8	40	40	40

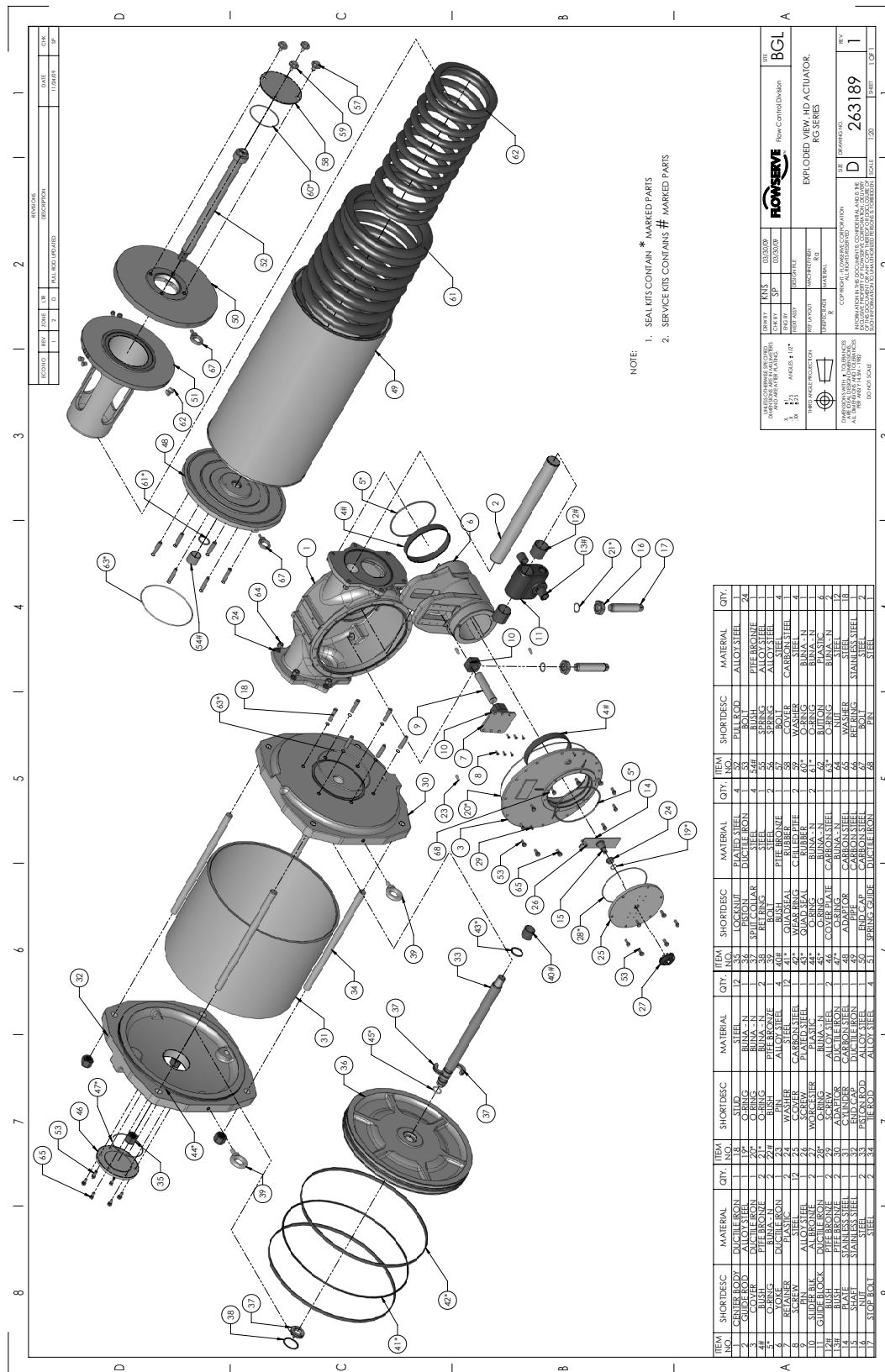
Module Weights (approx.)

Model	Torque Module	Module Weights, Lbs (kgs)																											
		Pressure Module																Spring Module											
		5	6	7	8	9	10	12	14	16	18	20	22	24	28	32	36	40	1	2	3	4	5	6	7	8			
RG1	68 (31)	31 (14)	35 (16)	47 (22)	53 (24)	66 (30)	94 (43)	139 (63)	-	-	-	-	-	-	-	-	-	88 (40)	97 (44)	101 (46)	103 (47)	106 (48)	114 (52)	119 (54)	119 (54)				
RG2	99 (45)	-	-	-	56 (25)	69 (32)	99 (45)	143 (65)	209 (95)	320 (145)	-	-	-	-	-	-	-	128 (58)	145 (66)	154 (70)	158 (72)	158 (72)	178 (82)	180 (82)	186 (85)				
RG3	143 (65)	-	-	-	-	-	100 (45)	142 (64)	200 (91)	318 (145)	406 (185)	561 (255)	-	-	-	-	-	226 (103)	260 (118)	267 (121)	269 (122)	276 (125)	330 (150)	321 (146)	-				
RG4	295 (134)	-	-	-	-	-	-	-	217 (99)	339 (154)	427 (194)	586 (266)	741 (337)	942 (428)	-	-	-	402 (183)	442 (201)	462 (210)	477 (217)	510 (232)	545 (248)	565 (257)	581 (254)				
RG5	510 (231)	-	-	-	-	-	-	-	-	356 (162)	455 (207)	610 (277)	853 (388)	994 (452)	1634 (743)	-	-	-	639 (290)	737 (335)	770 (350)	783 (356)	901 (410)	955 (434)	-	-			
RG6	933 (423)	-	-	-	-	-	-	-	-	-	493 (224)	616 (280)	861 (391)	1,051 (478)	1,732 (787)	2,321 (1,055)	3,044 (1,384)	-	1,283 (583)	1,738 (790)	1,671 (760)	1,730 (787)	2,061 (937)	1,995 (907)	-	-			
RG7	1881 (853)	-	-	-	-	-	-	-	-	-	-	-	-	-	1,824 (829)	2,411 (1,096)	3,156 (1,435)	3,913 (1,779)	2,283 (1,038)	2,946 (1,339)	3,043 (1,383)	3,177 (1,444)	3,630 (1,650)	3,709 (1,686)	-	-			
RG8	3718 (1686)	-	-	-	-	-	-	-	-	-	-	-	-	-	2,165 (984)	2,819 (1,282)	3,372 (1,533)	4,159 (1,891)	4,627 (2,103)	5,800 (2,637)	6,113 (2,779)	6,227 (2,830)	7,111 (3,232)	7,423 (3,374)	-	-			

Drawing # 263188



Drawing # 263189



6 Torque Shaft

The output shaft is recommended to have two key engagements. Shaft material shall be alloy steel with minimum yield strength of 85,000psi. The recommended hardness of keys is 25-28HRc.

Recommended engagement length of the keys is as below (see Fig.: 3).

Model	L_k (mm)	L_o (mm)
RG1	165	180
RG2	195	210
RG3	200	215
RG4	255	270
RG5	300	315
RG6	350	375
RG7	500	515
RG8	585	610

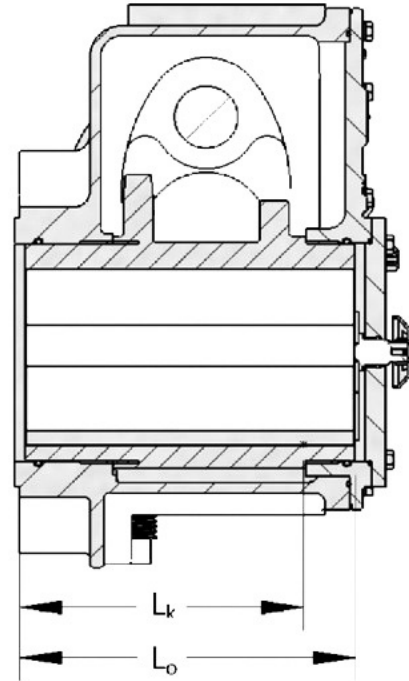


Figure: 3 Key Length

7 Long Term Storage

It is recommended to take precautions and certain measures when storing the actuators for extended periods of time, more than 4 months to two years. Potential problems and recommended protections are as below:

Potential Problem	Protection
Water entry into pneumatic cylinder, degrades the cylinder, particularly in saline or corrosive environment. Temperature swings cause condensation inside cylinders.	<ul style="list-style-type: none"> • Store actuator in clean, dry and protected warehouse, or under ventilated dust cover. • Plug all ports after purging with dry instrument air or nitrogen. • Store vertical, to avoid seal set.
Seal compression set	<ul style="list-style-type: none"> • Cycle actuator 5-6 times with clean dry instrument air or nitrogen, every three months.
Degradation of seals in excessively corrosive or hot environments.	<ul style="list-style-type: none"> • Do not store in locations subjecting the actuator to temperatures in excess of seal rating. Standard seals are Nitrile, max temp 180°F. • Do not store in environments harmful to resilient seals.
Physical damage to actuator or accessories.	<ul style="list-style-type: none"> • Store actuator assembly on skid, off the floor, out of pathways.

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