

SA Series Remote Proportional Actuators

GENERAL INSTRUCTIONS

The part identification numbers, i.e., [1], used throughout these instructions correspond to the callouts in the "Replacement Parts Drawing" and the parts list tables on page 3.

Read the instructions completely before beginning a repair, to become familiar with the correct procedure.

SEALS, O-RINGS AND SHIMS

Consistent with standard hydraulic service practice, all new seals and o-rings should be installed during reassembly. These are available in Seal Kit KS1025-0000.

EXTERNAL CLEAN-UP

Absolute cleanliness is necessary during servicing to prevent foreign material from contaminating the actuator and the hydraulic system. Clean external surfaces of the actuator with a solvent to remove dust, dirt, grease, loose paint and other potential contaminants.

DISASSEMBLY AND VISUAL INSPECTION

Remove actuator from machine, turn ports down to drain oil and place the actuator on a clean bench. Proceed carefully, referring to these instructions to insure against any unnecessary damage to the parts.

CAUTION: Parts can only be removed in the correct sequence.

1. To remove the filter, unscrew the filter cap [26] allowing the filter element [24] to be removed.
2. Clean filter [24] with an ultrasonic cleaner. If this is not available, wash the filter in a clean solvent. Then blow the filter off from inside-out. After doing this, clean filter once more in clean solvent and blow filter off from the outside-in. Check for residual contamination and reclean if necessary. Also, examine filter for evidence of collapse. If this is evident, the filter should be replaced.
3. The position of the force motor [1] determines the null position of the output rod [11]. Therefore, the motor must be screwed into the same position during reassembly. Before unscrewing, mark the position of the force motor and count and record the number of threads exposed.
4. To remove the force motor [1], loosen the set screw [not shown] which secures the force motor [1] in the actuator body [21]. Unscrew the force motor [1] (counter-clockwise) and remove it.
5. Note the presence of a nylon segment [not shown] under the set screw. On older models a small nylon ball was used. Remove this nylon.



The Remote Proportional Actuator (RPA) produces linear output rod displacement proportional to an electrical input signal. The electrical signal supplied to the force motor controls the movement of a pilot spool, which ports pilot flow to shift the output rod. Increasing the electrical signal results in more movement.

6. Next, remove the following items: spring [3] (on the pilot sleeve), pilot spool [4], pilot sleeve [5] and spring [6] (on the pilot spool).
CRITICAL: The pilot spool [4] and sleeve [5] must be treated with extreme care to prevent damage to the lands on the spool.
7. The plug [8], spring on the feedback cone [9] and feedback cone assembly [10] can now be removed.
8. Remove the retaining ring [15] and plug [22]. The plug can be pushed out using the output rod [11]. The output rod [11] can now be removed.
IMPORTANT: The output rod [11] must be removed through the force motor end of the actuator to prevent damage to the piston grooves and rings.
9. Remove the snap ring [15] retaining the gland [14] on the output rod end of the actuator. The gland [14], complete with seals [12] and [13], can now be removed through the output rod end of the actuator.
10. Examine all parts and seals for wear. Any damaged items should be replaced.

INSTALLATION OF SEAL KIT

To facilitate identification of parts, new parts should be installed immediately as old parts are removed. The old parts should be discarded. Seals and o-rings should be lightly coated with grease before installation to prevent damage.

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Clean parts thoroughly and assemble as follows:

1. Remove o-ring [2] from actuator body [21] and replace. Remove o-ring [7] from the filter cap [26] and replace. Remove gasket [23] from the actuator body [21] and replace. Remove o-ring [7] from the plug [8] and replace.
2. Remove o-ring [12] and back-up ring [13] from the gland [14]. Remove the step seal [17] and o-ring [18] from the inside groove of the gland [14].

IMPORTANT: Be certain that this groove is free from any contamination, dirt, or metal chips.

3. Install new o-ring [18] in the inside groove of the gland [14].
4. Next, install new step seal [17] on top of the o-ring [18] in the groove.

CRITICAL: The step seal [17] must be installed with the narrow edge of the seal facing toward the internal part of the actuator (refer to the detail drawing in the "Replacement Parts Drawing"). Be careful not to damage the step seal [17] or o-ring [18] on any sharp edges.

5. Remove wiper ring [16] from gland [14]. Install new wiper ring [16] in gland [14] with lip facing out. This is a press fit.
6. Install o-ring [12] and back up ring [13] in the groove on the outside diameter of the gland [14].

CRITICAL: Care should be taken to install these items so that the o-ring [12] is facing toward the internal part of the actuator when the unit is assembled.

7. Remove o-ring [12] and back-up ring [13] from plug [22] and replace. See "CRITICAL" above.
8. Remove both piston glide rings [20] and both o-rings [19] from the output rod [11].

IMPORTANT: Be sure that these grooves are free of dirt, contamination and chips.

9. Install a new o-ring [19] in each groove. Install a new piston glide ring [20] in each groove.

IMPORTANT: Be careful not to damage the new glide ring on any sharp edges.

ASSEMBLY

Clean parts thoroughly and reassemble with clean fluid as follows:

1. Install the plug [22] and insert the snap ring [15].
2. Install the output rod [11] through the output rod end of the unit and carefully fit the gland assembly [14], complete with seals [12] and [13], over the output rod [11]. Push the gland [14] into position and replace the retaining ring [15].
3. Install the feed cone assembly [10], spring [9] and plug [8]. Tighten the plug and torque to 45 lb•ft (61 N•m).
4. Next, fit the spring [6] into the sleeve [5] and carefully insert the spool [4] into the sleeve [5]. Ensure the spool [4] is correctly positioned as shown on the drawing.
5. Insert the spring [3] and screw the force motor [1] into the actuator body [21] to its original factory position, which was marked and recorded during disassembly. Remove the locking set screw [not shown]. Next, insert the nylon segment [not shown] into set screw hole. Note that in older models a small nylon ball was used.

CRITICAL: The force motor should never be screwed further than one complete turn into the actuator body from its original marked position, for this could cause internal damage to the force motor.

6. Loosely reinstall the set screw. Before tightening the set screw completely, the force motor null position must be set, as explained below.
7. Reinstall the filter [24]. When installing, make certain the spring [25] and gasket [23] are clean and in proper position.

ADJUSTMENT

Setup Instructions:

1. Before setting the null position of the force motor [1] and tightening the set screw [not shown], the actuator must be reconnected to the unit's hydraulic circuit, with the linkage and control signal electrical wires disconnected.
2. With the pilot supply at normal operating pressure, attach wires from the actuator force motor terminals to one of the unit's batteries [12 volt source only].

Purging air out of actuator:

1. Instructions for ± 0.5 inch [$\pm 12,7$ mm] stroke:
Attaching the wires will stroke the actuator to the extreme position. Reverse polarity of the wires to stroke actuator output rod [11] to the opposite extreme position. Change polarity a minimum of ten times to insure that all air is purged out of actuator.
2. Instructions for 1.0 inch [25,4 mm] stroke in one direction only:
Attaching wires should stroke the output rod 1.0 inch [25,4 mm] to the extreme position. If rod does not move, reverse polarity of the wires to stroke rod. By disconnecting and reconnecting wires, stroke rod a minimum of ten times to insure that all air is purged out of actuator.

Adjusting Null Position:

1. Instructions for ± 0.5 inch [$\pm 12,7$ mm] stroke:
The output rod must stroke a minimum of 0.5 inch [12,7 mm] in each direction from the null position. If it does not, adjust the null as explained below.

Instruction for 1.0 inch [25,4 mm] stroke:

The output rod must be nulled at one extreme position. With full electrical input, the rod should stroke 1.0 inch [25,4 mm] to the other extreme position. If it does not, adjust the null as explained below.

2. Disconnect all electrical wires. With pilot supply available, rotate the force motor slowly. Rotating it clockwise (screwing it into the actuator body) will cause the output rod to retract. Rotating the force motor counter-clockwise (screwing it out of the actuator body) will cause the output rod to extend.

CRITICAL: The force motor should never be screwed into the actuator body further than one complete turn from its original marked position, for this could cause internal damage to the force motor.

3. When the null position has been properly set, lock the force motor in position by tightening the set screw in the actuator body. Do not over tighten or force motor body will become distorted. Electrical connections and actuator linkage can now be reconnected.

REPLACEMENT PARTS DRAWING

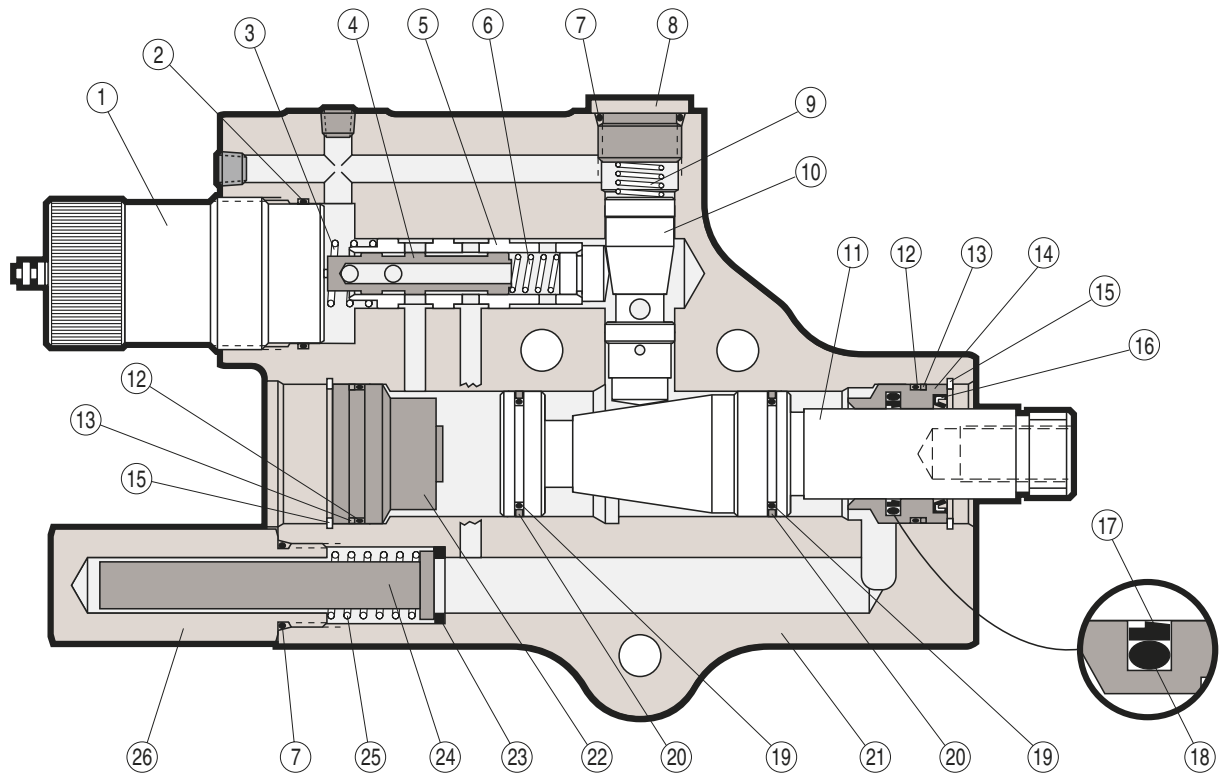


TABLE A – BASIC PARTS LIST

Identification Number	Part Number	Description	Quantity Required
1	See Table B	Force Motor Assembly	1
2	①	O-ring, 1.239 Inch [31,47mm] ID	1
3	50071100	Spring [Sleeve Assembly]	1
4	50026170	Pilot Spool	1
5	See Kit Table C	Sleeve Assembly	1
6	50061100	Spring [Pilot Spool]	1
7	①	O-ring, 0.644 inch [16,36 mm] ID	2
8	50090060	Plug	1 ^②
9	50081100	Spring [Feedback Cone]	1
10	See Kit Table C	Feedback Cone Assembly	1
11	50041070	Output Rod	1
12	①	O-ring, 1.114 inch [28,30 mm]	2
13	①	Back-up Ring	2
14	50060190	Gland	1
15	21250490	Retaining Ring	2
16	①	Wiper Ring	1

Identification Number	Part Number	Description	Quantity Required
17	①	Step Seal	1
18	①	O-ring, 0.924 inch [23,47 mm] ID	1
19	①	O-ring, 0.864 inch [15,24 mm] ID	2
20	①	Piston Glide Ring	2
21	③	Body	1
22	50020060	Plug	1
23	①	Gasket (Filter)	1
24	80310180	Filter	1
25	50091100	Spring (Filter)	1
26	50010980	Filter Cap	1 ^②
Not Shown	80040160	Nylon Segment (Force Motor)	1 ^④
Not Shown	80350270	Set Screw (Force Motor)	1

① Available only in Seal Kit KS1025-0000

② Torque to 45 lb-ft (61 N-m).

③ Not a replaceable part. A complete actuator must be purchased.

④ This was a nylon ball on older models.

TABLE B — FORCE MOTOR OPTIONS^①

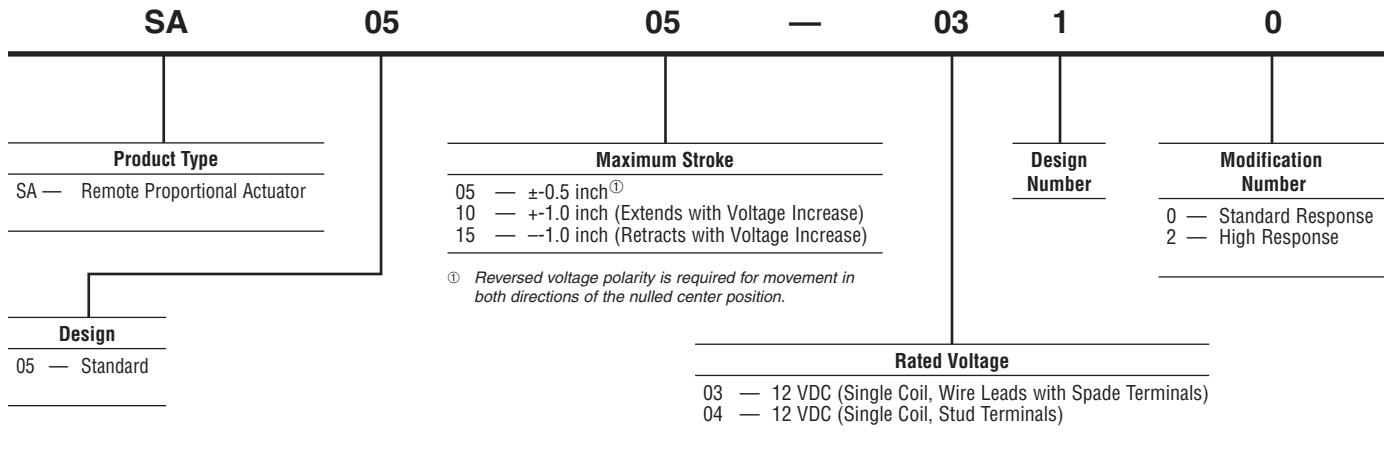
Force Motor Code	Terminal Description	Part Number
03	12 VDC, Wire Leads Included	50449000
04	12 VDC, Stud Terminals Only (Shown)	50073720

① Prior to 1999, models were also available with 2-wire cable terminal configuration. Either of the above force motors are functional equivalents.

TABLE C — SLEEVE AND FEEDBACK CONE KITS

Maximum Stroke Code	Description	Design/Modification Number	Kit Number	
			Sleeve	Feedback Cone
05	± 0.5 Inch	10	KS30029000	KS10252900
		12	KS30049000	
10	+ 0.5 Inch (Extends)	10	KS30019000	KS10253000
		12	KS30039000	
15	- 0.5 Inch (Retracts)	10	KS30019000	KS10253000
		12	KS30039000	

Typical Model Code



For more information
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