

# KOSO HAMMEL DAHL

## CONTROL VALVES

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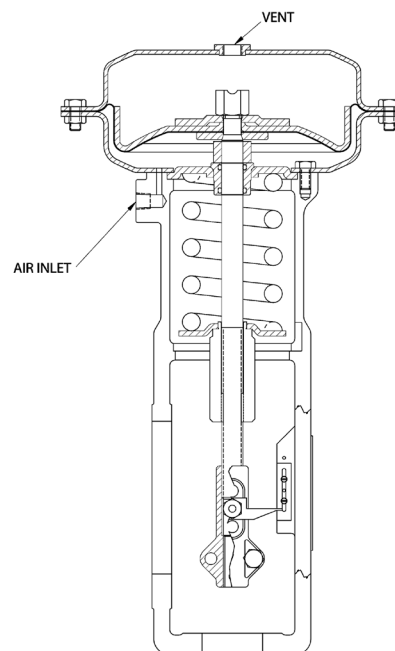
## Installation, Maintenance & Operating Instructions

### IMO - Type R

### REVERSE-ACTING LINEAR SPRING DIAPHRAGM ACTUATORS

### STANDARD SPECIFICATIONS

Model	Diaphragm (Effective area in square inches)	Standard Strokes (in inches)
RA	56	¾, 1, 1¼
RB	84	¾, 1, 1¼, 1½
RC	140	¾, 1, 1¼, 1½, 2, 2¼
RD	240	1½, 2, 2¼



Read these instructions carefully before installation or servicing.

### WARNING !

**FOR YOUR SAFETY AND PROTECTION, IT IS IMPORTANT THAT THE FOLLOWING PRECAUTIONS BE TAKEN PRIOR TO REMOVING THE VALVE FROM SERVICE OR BEFORE ANY DISASSEMBLY OF THE VALVE:**

1. At all times during this procedure, keep hands out of the valve. A remotely actuated valve could close at any time and result in serious injury.
2. Know what media is in the line. If there is any doubt, check with the proper authority.
3. Wear any protective clothing or equipment normally required when working with the media involved.
4. Depressurize the line and valves as follows:
  - a. Open the valve and drain the line.
  - b. Close and open the valve to relieve any residual pressure that may be in the valve prior to removing the valve from service.
  - c. After removal and prior to any disassembly, drain any remaining media by placing the valve in a vertical position and carefully opening and closing the valve several times.
5. The practical and safe use of this product is determined by both the trim and body ratings. Read the name tags and check both ratings. This product is available with a variety of trim materials. Some of the trim materials have pressure ratings that are less than the body ratings. All of the body and trim ratings are dependent on valve type and size, trim material, bolting material, and temperature. Do not exceed these ratings.

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*These instructions provide information about safe handling and operation of the valve and are subject to change without notice.*

## DESCRIPTION

Model RA, RB, RC, RD actuators are linear-motion spring-return pneumatic diaphragm actuators, primarily intended for use with rising stem type valves. In the “normal” position (no air pressure on the diaphragm), the reverse actuator holds the stem in its extended position by means of a mechanical spring. Increasing air pressure in the upper diaphragm chamber thrusts the actuator stem upward and compresses the spring.

Mounted on pull-stem-to-open valve body assemblies, the reverse actuator opens the valve when increasing air pressure is applied to the upper diaphragm chamber. Mounted on push-stem-to-open valve body assemblies, the reverse actuator closes the valve when increasing air pressure is applied to the upper diaphragm chamber. An external spring adjustment permits the spring compression to be changed within predetermined limits. These actuators are manufactured for and applied to meet the requirements of the valve and the service conditions as specified in the sales order, and are ordinarily shipped mounted on the valve body subassembly and with all accessory equipment mounted, piped, and adjusted.

**Max. Pressure Rating:** 65 psig

**Actuator Temp. Rating:** - 20°F to + 180°F (-29°C to +82°C)

**Action:** Air-to-open on down seated valves

**Air Connection:** ¼” (6 mm) NPT

## DISASSEMBLY

1. Remove all pneumatic and electric inputs to the actuator.
2. Disconnect and remove all accessories and input lines to the actuator.
3. Disconnect the split coupling (26) engaging the valve stem and spring stem (7).
4. Remove all spring compression by unscrewing the spring adjuster (11) completely from the spring stem (7).

**Note:** The spring adjuster button (21), the spring (6), and also the spring adjuster thrust bearing with actuators with #3 spring barrel (a #3 spring barrel can be identified as having an opening in the side of the barrel) will drop into the yoke portion of the spring barrel (1) along with the spring adjuster(11).

**CAUTION: Do not proceed further with disassembly without clearly determining that the spring is fully decompressed and loose.**

5. Remove the diaphragm case cap screws (17) and nuts (18) and lift off the upper diaphragm case (4).
6. Withdraw the diaphragm subassembly.

Note: Do not disassemble the diaphragm subassembly unless there is evidence of damage or failure to the

diaphragm (2) or other subassembly components, or disassembly is for the purpose of reversing the action of the actuator.

**Note:** Perform this step only if needed, due to part damage of pneumatic failure, or if disassembly is for the purpose of reversing the action of the actuator.

7. Remove the lower diaphragm case cap screws (20) and lift off the lower diaphragm case (5), the lower case gasket (10), and the packing box/packing box flange subassembly consisting of (13) and (9).

**Note:** The packing box/packing box flange, (13)/(9), subassembly should not be disassembled unless absolutely necessary.

8. If disassembly is required, however, a press will be needed to push the packing box (13) out of the flange(9) due to the combination of press fit and locktight sealer used at assembly.

**CAUTION: Care must be used to prevent distortion or damage to the subassembly components if they are disassembled.**

## ASSEMBLY

**Note:** This instruction assumes that assembly is starting with all components disassembled. In reassembly, disregard those instructions that do not apply.

### Diaphragm Subassembly

1. Place the spring stem (7) in a soft jawed vise, gripping it above the spring adjustment (larger diameter) threads.
2. Drop the diaphragm button (16) tapered bore down, onto the spring stem (7).
3. Drop the inverted diaphragm (2), the diaphragm “O” ring (25), the inverted piston (3), and the inverted piston back-up plate (15) down on the spring stem (7).
4. Assemble the following in sequence: the inverted diaphragm (2), the diaphragm “O” ring (25), the inverted piston (3), and the inverted piston back-up plate (15) down on the spring stem (7).
5. Apply loctite #271 to the threads of the spring stem . Then install the spring stem nut (19). Apply 90 lb-ft (122 Nm) of torque to the 5/8” (16 mm) nut used for the smaller case sizes and 200 lb-ft (271 Nm) to the 7/8” (22 mm) nut used for the 240 in2 (1548 cm2) case sizes.e that the torque arrestor projection tab on the barrel bridge (8) is engaged in the torque arrestor cavity in the spring barrel (1) and that the barrel bridge (8) is properly seated in the machined recess of the spring barrel (1).

## Packing Box/Packing Box Flange Subassembly

**Note:** Assembly of the packing box (13) to the packing box flange (9) is a press fit operation requiring the use of a suitable tubular tool of sufficient length, having an I.D. greater than the press fit diameter of the packing box (13), and a soft-jawed vise of adequate size.

1. Drop the packing box (13) into the center hole of the packing box flange (9).
2. Drop the loose subassembly down on the tubular tool and center it.
3. Place the subassembly/tool sandwich into the soft-jawed vise such that the exposed ends of the tool and packing box (13) interface with the soft jaws.
4. Take up on the vise jaws until the packing box (13) is with 4/8" (13mm) of bottoming in the packing box flange (9).
5. Apply Loctite® #242 sealer to the shoulder of the packing box (13) such that a positive 360° seal is achieved.
6. Drive the packing box (13) the remaining 1/8" (3mm) until its shoulder makes contact with the packing box flange (9).
7. Remove the subassembly from the vise and wipe off excess Loctite® sealant.

## Spring Barrel/Lower Diaphragm Case Subassembly

1. Restrain the spring barrel (1) by strapping it down to an assembly bench or by gripping the lower end lightly in a bench vise.
2. Place the packing box/packing box flange subassembly into the recess in the upper face of the spring barrel (1) with the packing box (13) oriented as shown in Figure 1.
3. Place the lower case gasket (10) on the upper face of the spring barrel (1).

**Note:** Take care to see that the air passage hole is properly aligned with the air connection hole in the spring barrel (1) and that all bolt circle holes are aligned with the tapped holes in the spring barrel (1).

4. Place the lower diaphragm case (5) on the lower case gasket (10), again taking care that all holes are properly aligned, and that all components are concentrically positioned.
5. Install the case cap screws (20) using good bolt circle tightening procedures. Tighten the cap screws to 22–26 lb-ft (30–35 Nm).

## Final Assembly

1. Lubricate the “O” rings (14) and the packing box grease reservoir liberally with an appropriate grease (Houghton “O” lubricant or equivalent). Install the

two packing box “O” rings (14) in the packing box (13).

2. Install the diaphragm subassembly by passing the spring stem (7) down through the packing box (13).
3. Turn the resulting subassembly upside down on the bench.
4. Snake the spring (6) down over the spring stem (7) and properly seat it in relationship to the guide diameter of the packing box flange (9).
5. Slip the spring adjuster button (21) oriented as shown in Figure 1 over the spring stem (7) and pilot it down onto the spring (6). With actuators with #3 spring barrel (units having an opening in the side of the barrel), place the spring adjuster thrust bearing (31) in the recess in the spring adjuster button (21).
6. Screw the spring adjuster (11) down on the spring stem (7) until it engages the bore of the spring adjuster button (21).
7. Turn the resulting subassembly case end up and align the bolt circle of the diaphragm (2) with the flange bolt holes of the lower diaphragm case (5).
8. Place the upper diaphragm case (4) over the diaphragm (2) taking care to align the flange bolt holes.
9. Install the diaphragm case cap screws (17) and the case cap screw nuts (18). Tighten the cap screws (17) to 22–26 lb-ft (30–35 Nm).

## ADJUSTING THE ACTUATOR

Actuator Bench Setting is accomplished while the actuator is not attached to the valve. The initial Bench setting “Bench Init” is identified on the valve identification tag (27) as the lower number listed in the Bench Set block and is achieved by turning the spring adjuster (11) clock-

wise to compress the spring (6). Turn the spring adjuster several turns until the spring begins to compress. Check the setting by slowly increasing the air supplied to the diaphragm case. When the actuator stem begins to move upward, stop increasing the air supplied to the diaphragm case. This is the actuator Bench Init value. If it is not the required Bench Init, reduce

the diaphragm case pressure to zero and readjust the spring adjuster clockwise to increase the Bench Init and counter-clockwise to reduce it. Slowly increase

SERIAL NO.   
 CATALOG NUMBER   
 ACTUATOR   
 SIZE  CLASS   
 BODY MAT'L   
 CHAR/Cv   
 TRIM MAT'L   
 PACKING   
 MAX. TEMP. F   
 FAILS  STROKE   
 BENCH SET   
 PUSH DOWN TO   
 RTG. 100 F   
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### Typical Nameplate

**Note:** If actuator action or flow conditions are changed, pressures listed on nameplate no longer apply. If application changes, new valve trim may be required.

the air pressure to the diaphragm case to recheck the pressure when the actuator begins to move. Once the proper Bench Init has been set, check that the actuator has the proper upper Bench setting for the travel. Increase the air pressure to the diaphragm case to the Bench Init value. Slowly increase the air pressure further while watching the actuator stroke scale (23).

**CAUTION: Do not increase the air pressure above recommended maximum air pressure for the actuator.**

When the actuator reaches its proper travel as indicated by the stroke scale (23), note the air pressure. This is the upper Bench setting of the actuator. The actuator should stroke the full travel smoothly with no hesitations throughout its entire stroke.

## GENERAL INSTRUMENTATION MOUNTING GUIDELINES

*Note: Specific customer instructions may supersede these general guidelines; please consult the factory order or your supervisor for specific instructions.*

**Globe Valve Orientation:** View the valve such that the piping flow direction is from left to right. The valve inlet sill now be on the left side and the valve outlet will be on the right side. The side of the valve you are looking at is the Front of the valve. View the valve such the the piping flow direction if from right to left. The valve inlet will now be on the right side, and the valve outlet will be on the left side. The side of the valve you are looking at is the Back of the valve.

**Actuator Orientation:** When looking at the side of the valve, the stroke scale mounting tab of the cast actuator yoke will always be located at the right side of the valve, and the slot in the actuator leg will be located on the left side.

Actuator side mounted handwheels will be mounted on the back side of the actuator yoke.

Actuator air supply is to be set at 5 psig above the upper range of the actuator.

**Positioner Mounting/Spring and Diaphragm Actuators:** The positioner will always be mounted on the Front side of the valve and positioned to the left of the actuator center line. The distance the positioner is placed left of the actuator center line is determined by the valve stroke

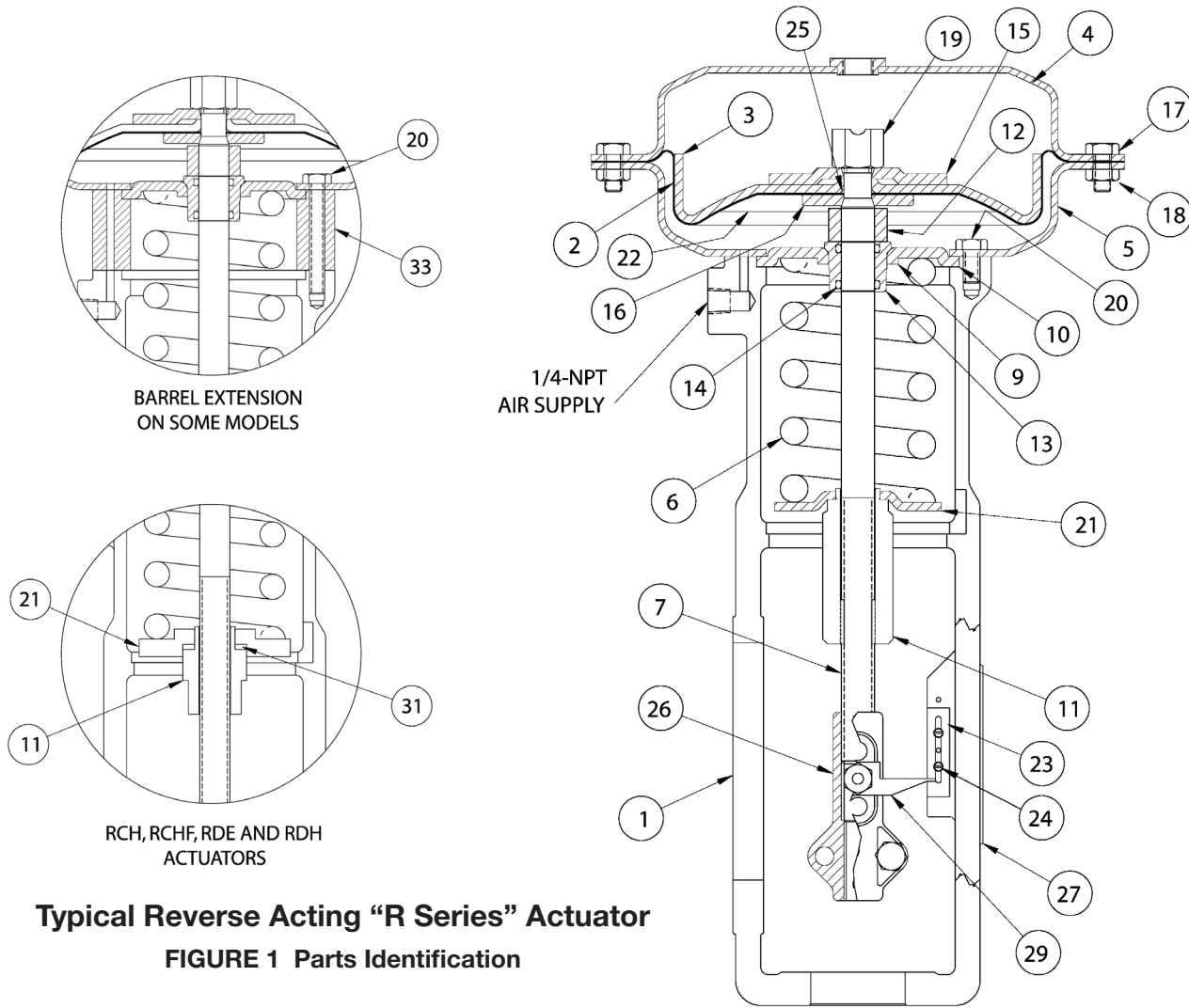
The positioner filter air regulator will be closed nipple mounted to the actuator. Solenoid valves with manual reset will be bracket mounted to the yoke of the actuator.

Limit switches will be bracket mounted to the actuator yoke and located on the back side of the valve and to the right of the actuator center line while looking at the front side of the valve.

**Tubing:** Standard tubing will be elastomer covered rubber hose with brass push-type fittings. All tubing will be piped as close to the actuator spring barrel as possible. Metal tubing will have at least two right hand bends from connector to connector to allow for flexibility.

## CHANGING ACTUATOR FROM REVERSE ACTING TO DIRECT ACTING

1. Completely disassemble the actuator as explained previously in steps 1 through 8 under "DISASSEMBLY."
2. Put aside the packing box flange (8), lower case gasket (10), spring adjuster (11), packing box (13), and packing box "O" rings (14), which will no longer be needed.
3. Reassemble the actuator as explained IMO - Type D (Direct-Acting Linear Spring Diaphragm Actuators) in steps 1 through 3 under "ASSEMBLY," using the following direct acting actuator parts: the spring bridge (8), spring adjuster (11), and limit stop nut (28). Make sure that the diaphragm (2), piston (3), diaphragm button (16), and diaphragm "O" ring are inverted.
4. Readjust the actuator as specified in IMO - Type D ■



**Typical Reverse Acting "R Series" Actuator**  
**FIGURE 1 Parts Identification**

**Table 1**

Part No.	Part Name	Qty.	Part No.	Part Name	Qty.	Part No.	Part Name	Qty.
1	Spring Barrel	1	12	Down Travel Stop	1	22	Diaphragm Disc	1 <sup>1</sup>
2	Diaphragm	1	13	Packing Box	1	23	Travel Indicator Scale	1
3	Piston	1	14	Packing Box O-ring	2	24	Self Tap Screw	6
4	Upper Diaphragm Case	1	15	Piston Back-up Plate	1	25	Diaphragm O-ring	1
5	Lower Diaphragm Case	1	16	Diaphragm Button	1	26	Split Coupling	1
6	Spring	1	17	Hex Head Cap Screw	A	27	Identification Tag	1
7	Spring Stem	1	18	Hex Nut	A	28	Stop Nut	1
9	Packing Box Flange	1	19	Up Travel Stop	1	29	Travel Indicator	1
10	Lower Case Gasket	1	20	Hex Head Cap Screw	B	31	Spring Adjuster Thrust Bearing	1 <sup>3</sup>
11	Spring Adjuster	1	21	Spring Adjuster Button	1	33	Spring Barrel Extension	1 <sup>4</sup>
A: 56 in <sup>2</sup> case (16) 140 in <sup>2</sup> case (24)			B: 56, 84, and 140 in <sup>2</sup> case (6) 240 in <sup>2</sup> case (10)			Note: 1. Except RDE, RDH. 3. RDE and RDH. 4. RCE only.		

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