GH-BETTIS

SERVICE INSTRUCTIONS

DISASSEMBLY & REASSEMBLY

KCB315-SRXX, KCB415-SRXX,

KCB420-SRXX, KCB520-SRXX,

KCB525-SRXX AND KCB725-SRXX

SPRING RETURN SERIES

K-MASS ACTUATORS

PART NUMBER: 074964

REVISION: "A"

RELEASE DATE: March 26, 1992

1.0 INTRODUCTION

1.1 This service procedure is offered as a guide to enable general maintenance to be performed on GH-Bettis KCB-SR Spring Return Series K-Mass coated actuators.

1.2 The maximum recommended service interval for this series actuators is five years. Storage time is counted as part of the service interval.

1.3 This procedure is written with the understanding that all operating power has been removed from the actuator, allowing the spring to stroke and rotate the yoke to the actuators fail position. Also it is understood that the actuator has been removed from the valve as well as all piping and accessories that are mounted on the actuator have been removed.

COMPLETE ACTUATOR REFURBISHMENT REQUIRES THAT THE ACTUATOR BE DISMOUNTED FROM THE VALVE

2.0 SUPPORT ITEMS AND TOOLS

2.1 Support Items - Service/Seal Kit, commercial leak testing solution, Latex window caulking and non-hardening thread sealant.

2.2 Tools - All tools are American Standard inch. Two adjustable wenches, Allen Wrench set, small standard screwdriver with sharp edges rounded off, medium size standard screwdriver, external snap ring pliers, ½" drive ratchet and deepwell socket set and a torque wrench (up to 2,000 in. lbs.).

3.0 GH-BETTIS REFERENCE MATERIALS

3.1 CB315-SR, CB420-SR, & CB525-SR Assembly Drawing 041006.
3.2 CB315-SR, CB420-SR, & CB525-SR Exploded Detail Drawing 062908.
3.3 CB415-SR, CB520-SR, & CB725-SR Assembly Drawing 041007.
3.4 CB415-SR, CB520-SR, & CB725-SR Exploded Detail Drawing 062910.
3.5 Base I Standard Dimensional Drawing 041875.

4.0 GENERAL

4.1 Numbers in parentheses, ( ) indicate the bubble number (reference number) used on the GH-Bettis Assembly Drawing, Exploded Detail Drawing, and Actuator Part List.

4.2 When removing seals from seal grooves, use a small screwdriver with sharp edges rounded off or a commercial seal removing tool.

4.3 Use a non-hardening thread sealant on all pipe threads. **CAUTION: Apply the thread sealant per the manufacture's instructions.**

4.4 Disassembly should be done in a clean area on a work bench.

4.5 LUBRICATION REQUIREMENTS: Standard and high temperature service (-20°F to 350°F) use Kronaplate 100 lubricant. This lubricant is provided in the GH-Bettis Service kit.

4.6 It is a good practice to operate the actuator with the nominal operating pressure (NOP), as listed on the actuator nametag or the pressure used by the customer to operate the actuator during normal operation, before starting the general disassembly of the actuator. Notate and record any abnormal symptoms such as jerky or erratic operation. NOTE: Pressure is not to exceed the maximum operating pressure rating listed on the name tag.

5.0 GENERAL DISASSEMBLY

5.1 Cut through the latex caulking that seals the cover cap on the outer end of the cylinder (2-10) and the cover cap that covers the housing stop screw (2-80).

5.2 Remove the breather (2-130) from the pipe extension nipple. **NOTE: Actuators piped for closed loop systems or piped for air assist will not have a breather.**

5.3 Remove a hex nut from the pipe extensions located on both ends of the actuator.

5.4 Remove both of the cover caps from the actuator. One cover cap covers the stop screw (2-70) and the other cover cap covers the stop screw (2-80).

5.5 The setting of the stop screw (2-70) and (2-80) should be checked and setting recorded before stop screws are loosened or removed.

5.6 Loosen and remove hex nut (2-90) from cylinder stop screw (2-70). Remove washer seal (3-80) and thread seal (3-70) from stop screw. Remove cylinder stop screw (2-70).

5.7 Loosen and remove hex nut (2-90) from housing stop screw (2-80). Remove seal washer (3-80) and screw thread seal (3-70) from housing stop screw. Remove stop screw (2-80).

6.0 SPRING CYLINDER DISASSEMBLY

6.1 **CAUTION: The spring in CB Series Spring Return Units is preloaded. Unit must be disassembled in the following manner.**

6.2 Remove acorn nut (2-110) from spring cylinder end cap (2-20) of center bar assembly (2-50).

6.3 Using a socket or wrench on the welded nut, located on the housing end of the center bar assembly (2-50), rotate the center bar assembly counter-clockwise (CCW). This will cause the spring cylinder end cap (2-20) to gradually unscrew from the center bar assembly (2-50).

6.4 Continue to rotate the center bar assembly (2-50) counter-clockwise (CCW) until the spring preload is eliminated. As the preload is reduced it may be necessary to keep the spring cylinder end cap (2-20) from turning by holding the end cap stop screw nut (2-90) with a wrench.

6.5 After the spring preload is eliminated, unscrew the spring cylinder end cap (2-20) from the center bar assembly (2-50). It is not necessary to remove the end cap stop screw (2-70) to service the actuator.

6.6 Remove the spring (4) from within spring cylinder (2-10).

6.7 Hold housing torque shaft (1-30) and pull cylinder (2-10) away from housing (1-10); slide cylinder over piston (2-30) and remove.

6.8 Pull piston (2-30) out of housing (1-10) and carefully slide piston off of center bar assembly (2-50).

6.9 Remove piston cylinder seal (3-60) and piston center bar seal (3-50).

7.0 HOUSING DISASSEMBLY

7.1 On actuators equipped with a cylinder adapter (2-140) CB415-SR, CB520-SR, and CB725-SR, remove cylinder gasket (3-20) from cylinder adapter (2-140) and remove cylinder adapter (2-140) from housing.

7.2 Remove cylinder gasket (3-30) from flange of housing (1-10).

7.3 Slide center bar assembly (2-50) out of housing (1-10) and remove center bar thread seal (3-90) and washer seal (3-15) from center bar assembly (2-50).

7.4 Cut through the latex caulking that seals the cover to the mounting flange on the non valve mounting side of the housing. **NOTE: On some actuators there will be a cover cap over the torque shaft and on other actuators there may be a box in this location. What ever is in this location it is to be removed.**

7.5 Remove the screws that retain the cover over the torque shaft (1-30).

7.6 Remove both retaining rings (1-80) from torque shaft (1-30).

7.7 The following steps may need to be taken before disassembly can continue.

7.7.1 If the torque shaft has any raised burrs or sharp edges they should be removed, removing as little metal as possible.

7.7.2 If there is excessive paint build-up on torque shaft it should be removed.

7.8 Push the torque shaft (1-30) out one side of housing (1-10) until torque shaft o-ring seal (3-40) is clear of housing. Remove o-ring seal (3-40) from torque shaft.

7.9 Push torque shaft (1-30) back thru hosing and pull torque shaft completely out of housing while holding yoke key (1-50) in with your fingers.

7.10 Remove yoke key (1-50) and yoke key spring (1-70) from torque shaft (1-30).

7.11 Remove second o-ring seal (3-40) from torque shaft (1-30).

7.12 Remove yoke (1-20) from housing (1-10).

8.0 PRE-ASSEMBLY NOTES

8.1 Remove and discard all old seals and gaskets, taking care not to scratch or damage seal grooves.

8.2 All parts should be cleaned to remove all dirt and other foreign material prior to inspection.

8.3 All parts should be thoroughly inspected. Particular attention should be directed to threads, sealing surfaces and areas that will be subjected to sliding motion. Sealing surfaces must be free of deep scratches, pitting, corrosion and blistering or flaking coating.

8.4 All K-Mass coated parts should be inspected for damage to the K-Mass coating. Replace or repair all K-Mass parts that are damaged.

8.5 Before installing, coat all surfaces of actuators moving parts with lubricant.

8.6 Coat all seals with lubricant before installing into the seal grooves.

9.0 GENERAL REASSEMBLY

9.1 Apply a coating of lubricant to the housing(1-10) torque shaft holes.

9.2 Coat the yoke (1-20) with lubricant and insert into housing (1-10).

9.3 Insert the yoke key spring (1-70), with the ends pointing down, into the slot in the torque shaft (1-30). **CAUTION: Place the yoke key (1-50) on top of the spring with the tapered side outward. Refer to the assembly drawings for correct key orientation.**

9.4 Hold the yoke key (1-50) down with your thumb, insert the torque shaft (1-30) into and thru the housing and yoke. **NOTE: Rotate the torque shaft until the yoke key snaps into the keyway in the yoke.**

9.5 Push the torque shaft out of one side of the housing until the o-ring groove is clear of the housing.

9.6 Coat one of the torque shaft o-ring seals (3-40) with lubricant and install in the o-ring groove of the torque shaft (1-30).

9.7 Carefully push the torque shaft back into the housing until the o-ring groove on the opposite end of the torque shaft is just clear of the housing.

9.8 Coat the remaining torque shaft o-ring seal (3-40) with lubricant and install in the o-ring groove of the torque shaft (1-30).

9.9 Install one of the torque shaft retaining rings (1-80) onto the torque shaft, making certain it is properly seated in the torque shaft groove.

9.10 Push the torque shaft back into the housing and install the remaining retaining ring (1-80) on the torque shaft.

9.11 Rotate the torque shaft so that the yoke arms point outward.

9.12 Apply a generous amount of lubricant to the slots in the yoke arms.

9.13 Coat the center bar assembly (2-50) with lubricants, being sure to cot the exposed threads.

9.14 Carefully slide the washer seal (3-15), chamfered side facing the thread seal, and then center bar thread seal (3-90) onto the center bar assembly (2-50) until it rests against the welded nut.

9.15 Insert the center bar assembly (2-50) into the center hole of housing (1-10) and slide center bar assembly thru housing until washer seal (3-15), thread seal (3-90) and welded nut are flush against the housing. **CAUTION: Care should be taken during installation of the center bar so as to not scratch it.**

9.16 Install cylinder gasket (3-30) on housing flange. On actuators equipped with a cylinder adapter (2-140) CB415-SR, CB520-SR and CB725-SR, install the cylinder adapter (2-140) onto the housing flange, with the stepped outer diameter facing away from the housing, and place a cylinder gasket (3-20) onto the stepped diameter on the cylinder adapter (2-140).

10.0 SPRING CYLINDER REASSEMBLY

10.1 Re-coat the center bar assembly (2-50) with lubricant.

10.2 Coat the piston center bar o-ring seal (3-50) with lubricant and install in the internal groove in the head of piston (2-30).

10.3 Coat the piston cylinder seal (3-60) with lubricant and install onto the piston.

10.4 Coat the head of the piston along with the exposed ends of yoke pin (1-40) with lubricant.

10.5 With the piston head facing away from the housing (1-10) and with the yoke pin (1-40) up, carefully slide the piston (2-30) onto the center bar assembly (2-50).

10.6 Slide the piston (2-30) along the center bar (2-50) until the yoke pin (1-40) engages the yoke slots. Push the piston into the housing as far as it will go, while holding the center bar assembly flush against the housing.

10.7 Apply a thin coating of lubricant to the cylinder bore of cylinder (2-10).

10.8 Slip the lubricated cylinder (2-10) over the piston and onto the flange of housing (1-10). **NOTE:** Cylinder (2-10) will slip onto the flange of cylinder adapter (2-140) on CB415-SR, CB520-SR and CB725-SR models.

10.9 Apply a coat of lubricant on the spring and carefully slide the spring (4) into the open cylinder until it contacts the piston head.

10.10 On models CB315-SR, CB420-SR and CB525-SR install gasket (3-30) onto the flange of outer end cap (2-20). On models CB415-SR, CB520-SR and CB725-SR install gasket (3-20) onto the flange of outer end cap (2-20).

10.11 Screw the spring cylinder end cap (2-20) onto the center bar assembly (2-50) until it just touches the spring (4).

10.12 Position the spring cylinder end cap (2-20) so that the breather port is at the bottom and the stop screw (2-70 is at the top.

10.13 Keep the spring cylinder end cap (2-20) from turning by holding the end cap stop screw nut (2-90) with a wrench.

10.14 Using a socket or wrench on the welded nut, located on the housing end of the center bar assembly (2-50), rotate the center bar assembly clockwise (CW). This will cause the spring cylinder end cap (2-20) to gradually screw further onto the center bar assembly (2-50).

10.15 Continue to rotate the center bar assembly (2-50) clockwise until the spring (4) if fully compressed, the cylinder is seated against the housing flange or adapter (2-140) and the spring cylinder end cap (2-20) is properly seated against the cylinder (2-10).

10.16 Tighten the center bar assembly to the proper torque as specified in Chart 1.

10.17 Install the gasket seal (3-10) on the exposed end of the center bar assembly (2-50).

10.18 Place the acorn nut (2-110) on the exposed end of the center bar assembly (2-50) and tighten securely.

10.19 Insert the stop screw (2-80) into the housing (1-10) and screw in until stop screw contacts the piston.

10.20 Thread the stop screw thread seal (3-70) onto the stop screw (2-80) until it is flush with the housing.

10.21 Slip the washer seal (3-80) onto the stop screw with the chamfer facing the thread seal (3-70).

10.22 Thread the stop screw nut (2-90) onto the stop screw (2-80) until hand tight.

10.23 Install stop screw (2-70) into end cap (2-20).

10.24 Thread the stop screw thread seal (3-70) onto the stop screw (2-70) until it is flush with the end cap (2-20).

10.25 Slip the washer seal (3-80) onto the stop screw with the chamfer facing the thread seal (3-70).

10.26 Thread the remaining stop screw hex nut (2-90) onto SR stop screw (2-70).

10.27 Adjust both stop screws (2-70) and (2-80) back to setting recorded in Step 5.5 under General Disassembly. Tighten both stop screw hex nuts (2-90) securely, while holding stop screw (2-70) and (2-80).

11.0 ACTUATOR TESTING

11.1 Leakage Test: All areas where leakage to atmosphere may occur are to be checked using a soapy solution.

11.2 Procedure: Cycle the actuator five times at the Nominal Operating Pressure (NOP) as per Chart 2, for the model being tested. This will allow the seals to seek their proper working attitude.

11.3 If excessive leakage across the piston is noted, generally a bubble which breaks three seconds or less after starting to form, the unit must be disassembled and the cause of leakage must be determined and corrected.

11.4 Stroke the actuator with Nominal Operating Pressure (NOP) and allow the unit to stabilize.

11.5 Apply a leak testing soap solution to the following areas:

11.5.1 Cylinder to housing joint on CB315-SR, CB420-SR, and CB525-SR or cylinder to cylinder adapter to housing joints on CB415-SR, CB520-SR, and CB725-SR actuators.

11.5.2 Center bar seal and nut to housing.

11.5.3 Housing stop screw and stop screw thread seal.

11.5.4 Torque shaft seals.

11.5.5 Cylinder breather port hole.

11.6 If an actuator was disassembled and repaired as a result of this procedure, the above leakage test must be performed again.

11.7 Operational (Functional) Test: This test is used to verify proper function of the actuator. **THIS TEST IS TO BE DONE OFF OF THE VALVE OR WHEN VALVE STEM IS NOT COUPLED TO THE ACTUATOR TORQUE PLUG.**

11.8 Adjust the pressure regulator to the pressure rating indicated in Column "B" of Chart 2 for the model actuator being tested.

11.9 Apply the above pressure to the actuator and allow the unit to stabilize. The actuator should stroke a full 90° travel with the stops properly set. **CAUTION: IF STEP 11.9 IS DONE ON THE VALVE IT IS NOT A VALID TEST.**

12.0 K-MASS COVER INSTALLATION

12.1 Install the cover cap on the end cap (2-20). and retain with a hex nut.

12.2 Install the cover cap over the stop screw (2-80) and retain with a hex nut.

12.3 Install the cover over the torque shaft (1-30) and retain with the retaining screws removed in step 7.5.

12.4 Using a tube of Latex window caulk seal all joints that where cut thru during disassembly.

13.0 RETURN TO SERVICE

13.1 Re-install breather (2-130) into the pipe extension that is in the end cap (2-20).

13.2 Re-install any piping and accessories that were removed.

13.3 All accessories, including solenoid valves, positioners, pressure switches, etc., should be hooked up at this point and tested for proper operations and replaced if found defective.

CHART 1

TORQUE REQUIREMENTS

FOR KCB SERIES CENTER BARS

ACTUATOR MODEL	MAXIMUM TORQUE IN.LBS.	FT.LBS.
KCB315-SRXX	660	55
KCB415-SRXX	660	55
KCB420-SRXX	1,200	100
KCB520-SRXX	1,200	100
KCB525-SRXX	1,560	130
KCB725-SRXX	1,560	130

CHART 2

PRESSURE REQUIREMENTS & LIMITATIONS FOR

KCB SPRING RETURN SERIES ACTUATORS

ACTUATOR MODEL	NOMINAL OPERATING PRESSURE	MAXIMUM OPERATING PRESSURE	MAXIMUM ALLOWABLE WORKING PRESS	MAXIMUM AIR ASSIST PRESSURE	COLUMN B SPRING SELECTION PRESSURE
KCB315-SR40	40	145	240	98	28
KCB315-SR60	60	160	240	86	42
KCB315-SR80	80	170	240	74	56
KCB315-SR100	100	180	240	62	70
KCB415-SR40	40	90	160	56	30
KCB415-SR60	60	100	160	48	44
KCB415-SR80	80	115	160	33	57
KCB415-SR100	100	130	160	17	75
KCB420-SR40	40	140	240	96	29
KCB420-SR60	60	155	240	83	45
KCB420-SR80	80	165	240	71	58
KCB420-SR100	100	180	240	57	75
KCB520-SR40	40	100	160	55	30
KCB520-SR60	60	110	160	43	44
KCB520-SR80	80	125	160	31	59
KCB520-SR100	100	135	160	13	78
KCB525-SR40	40	160	240	97	28
KCB525-SR60	60	175	240	84	42
KCB525-SR80	80	190	240	71	57
KCB525-SR100	100	200	240	59	72
KCB725-SR40	40	95	160	56	28
KCB725-SR60	60	105	160	43	44
KCB725-SR80	80	120	160	30	58
KCB725-SR100	100	135	160	15	75

ECN	DATE	REV		BY *	DATE
Released	March 26, 1992	A	COMPILED	O. K.	26 March 1992
			CHECKED	B. C.	26 March 1992
			APPROVED	R. M. M.	26 March 1992

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