GH BETTIS

OPERATING & MAINTENANCE INSTRUCTIONS

DISASSEMBLY & ASSEMBLY

FOR THE FOLLOWING MODELS

732-12, 732-M3-12 & 732-M3HW-12

DOUBLE ACTING SERIES ACTUATORS

PART NUMBER 72611

REVISION "A"

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1.0 INTRODUCTION

1.1 This service procedure is offered as a guide to enable general maintenance to be performed on GH Bettis 732-12, 732-M3-12, and 732-M3HW-12 "Scotch-Yoke" type actuators.

1.2 The maximum recommended service interval for this actuator is six hundred twenty five cycles or five years which ever occurs first. Storage time is counted as part of the service interval.

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

2.0 BASIC TOOLS

All tools are American Standard inch. Large adjustable wrench, two each medium standard screwdriver, small standard screwdriver with edges removed, chain wrench, putty knife, allen wrench set, 3/16" pin punch, 1/2" drive socket set, rubber or leather mallet, torque wrench (up to 2,000 in.lbs.), leak testing solution, and non-hardening thread sealant.

3.0 REFERENCE GH BETTIS MATERIALS

3.1 Assembly Drawing Part Number 72608.
3.2 Exploded Detail Drawing 72609.
3.3 General Operating & Maintenance Instructions Part Number 71584.

4.0 GENERAL

4.1 Numbers in parenthesis, (), indicate the bubble number (reference number) used on the GH Bettis Assembly Drawings, Exploded Detail Drawing, and actuator Parts List.

4.2 This procedure is written using the stop screw side of the housing (1-10) as a reference and this side will be considered the front side

4.3 Refer to Chart 2 for correct actuator weights.

4.4 Mating Parts should be marked for ease of reassembly, i.e., cylinder to cylinder adapter, cylinder adapter to housing, right and left stop screws.

4.5 When removing or installing seals, use a small screwdriver with sharp edges rounded off or use a commercial seal removing tool.

4.6 Use a non-hardening thread sealant on all pipe threads.

4.7 Disassembly must be done in a clean area on a work bench.

4.8 LUBRICATION REQUIREMENTS. Dow Corning Molykote 44 (medium grade).

5.0 GENERAL DISASSEMBLY

5.1 Remove all operating pressure from actuator cylinder (3) or cylinder assemblies -M3 (3-10)

5.2 Remove all piping and accessories mounted on actuator.

5.3 For actuators equipped with M3HW jackscrew override with handwheel option, remove hex nut (8-30), lockwasher (8-20), and handwheel (8-10).

5.4 The setting of stop screws (1-60) should be checked and setting recorded before stop screws are loosened or removed.

5.5 Remove socket cap screws (1-120) from position indicator (1-110), yoke weather cover (6-110) and remove position indicator/yoke weather cover.

5.6 Remove snubber (1-130) from the housing (1-10).

5.7 Remove actuator from valve and valve mounting bracket.

6.0 PRESSURE CYLINDER DISASSEMBLY

6.1 The following steps may be performed on one cylinder and then on the other cylinder or simultaneously on both cylinders.

6.2 Secure the chain wrench around the cylinder (3) or cylinder assembly -M3 (3-10) as close to the welded end cap as possible. Using the mallet, break the cylinder loose sufficiently so it can be removed.

6.3 Remove the cylinder and when setting the cylinder aside, care should be taken to protect the chamfered edge and cylinder threads.

6.4 Remove the piston cup seals (6-10).

6.5 Unscrew and remove piston standard hex nut (2-70) and lockwasher (2-80) from the piston rod (2-10). Some actuators will not have the lockwasher (2-80) but will use a self-locking jam nut (2-70).

6.6 Remove the piston (2-20).

6.7 Remove piston rod o-ring seal (6-50).

6.8 Remove the o-ring seal (6-40) from the cylinder adapter (2-30).

6.9 Unscrew and remove the four cylinder adapter screws (2-90) and gasket seals (6-80) from the cylinder adapter (2-30).

6.10 Remove the cylinder adapter (2-30), taking care not to scratch the piston rod (2-10) or disengage the rod bushing (2-40).

6.11 Remove rod seal (6-30) from housing side of cylinder adapter (2-30).

6.12 For actuators equipped with M3 or M3HW jackscrew override, the following steps will be used for disassembly of the M3 from cylinder assembly -M3 (3-10).

6.12.1 Early model actuators may or may not have provision for retaining the M3 in the actuator cylinder. If your actuator does not have a spiral pin (6-160) and flat washer (6-170) or a hex cap screw, then ignore steps 6.12.4 thru 6.12.6 or any reference to these items in this procedure.

6.12.2 With the cylinder assembly -M3 (3-10) on a work bench, lubricate jackscrew assembly (3-20) threads with lubricant.

6.12.3 Loosen and thread jam nut (3-30) all the way back to the welded nut.

6.12.4 Thread the jackscrew assembly (3-20) into the cylinder assembly -M3 (3-10) until the pin (6-160) and washer (6-170) are exposed.

6.12.5 Using a 3/16 inch pin punch, drive out and remove pin (6-160).

6.12.6 Remove washer (6-170).

6.12.7 Thread the jackscrew assembly (3-20) out and remove.

6.12.8 Remove thread screw seal (6-130) and countersunk washer seal (6-120) from jackscrew weld assembly (3-20).

7.0 HOUSING GROUP DISASSEMBLY

7.1 Remove cover screws (1-30) and seal gaskets (6-80).

7.2 Remove the housing cover (1-20).

7.3 Remove o-ring seal (6-20) from cover.

7.4 Move the yoke arms to the center position.

7.5 Remove the upper yoke roller (1-50).

7.6 Life out and remove yoke pin (1-40).

7.7 Holding rod bushing (2-40) in place, pull the piston rod (2-10) out through the rod bushing (2-40).

7.8 Remove both rod bushings (2-40) from housing (1-10).

7.9 Lift the yoke (1-140) from the housing cavity.

7.10 Remove the lower yoke roller (1-50).

7.11 Remove o-ring seal (6-20) from the housing.

7.12 Remove the remaining stop screw (1-60), jam nut (1-70), and gasket seal (6-90). Be sure to identify this stop screw.

7.13 It is not necessary to remove housing pipe plug (1-100) or cylinder adapter pipe plug (2-110).

7.14 Using putty knife, remove cover gasket (6-60) and cylinder adapter gaskets (6-70).

8.0 GENERAL RE-ASSEMBLY

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

8.2 Before starting the assembly of an actuator, all parts should be thoroughly inspected, cleaned and de-burred. Particular attention should be directed to threads, sealing surfaces and areas that will be subjected to sliding motion.

8.3 After inspection, the parts should be carefully cleaned to remove all dirt, gaskets and other foreign material.

8.4 Coat all seals with lubricant, before installing into seal grooves.

9.0 CENTER HOUSING GROUP RE-ASSEMBLY

9.1 If removed, install a pipe plug (1-100) into the drain port of the housing (1-10).

9.2 Coat one of the yoke o-ring seals (6-20) with lubricant and install into the housing (1-10).

9.3 Apply lubricant to the yoke bore in the body and arrange the body with the yoke bore nearest you. Lubricate the raised ribs in the bottom of the housing.

9.4 Apply a generous amount of lubricant to the slots in the upper and lower yoke arms of yoke (1-140).

9.5 Coat the bearing surfaces of the yoke (1-140) with lubricant and install into the body. The wide yoke arm should be installed toward the top of the housing.

9.6 Coat the piston rod bushings (2-40) with lubricant and install into both sides of the housing (1-10).

9.7 Coat one of the yoke rollers (1-50) with lubricant and place into the lower yoke arm slot nearest the cylindrical portion of the yoke.

9.8 Apply a light coat of lubricant to the piston rod (2-10) and install thru the bushing, in the housing.

9.9 Coat the yoke pin (1-40) with lubricant and install thru the piston rod (2-10) into the lower yoke roller (1-50).

9.10 Coat the remaining yoke roller (1-50) with lubricant and install over the yoke pin and into the slot in the upper yoke arm.

9.11 Install the stop screws (1-60), stop screw gasket seals (6-90), and stop screw jam nuts (1-70).

9.12 Coat the yoke bore in the cover (1-20) with lubricant.

9.13 Coat the remaining yoke o-ring seal (6-20) with lubricant and install into the housing cover (1-20).

9.14 Lightly coat the cover gasket (6-60) with lubricant and place onto the housing.

9.15 Install the housing cover (1-20) and the four cover screws (1-30) with gasket seals (6-80) onto the housing (1-10).

10.0 PRESSURE CYLINDER RE-ASSEMBLY

10.1 The following steps may be performed on one cylinder and then on the other cylinder or simultaneously on both cylinders.

10.2 Coat the piston rod seal (6-30) with lubricant and install, lip first, into the cylinder adapter (2-30). Energizer ring of rod seal (6-30) must face the cylinder adapter (piston side).

10.3 Lightly coat the cylinder adapter gasket (6-70) with lubricant. Install the adapter gasket over the piston rod bushing and up against the housing.

10.4 Install the cylinder adapter (2-30) over the piston rod and retain with the cylinder adapter screws (2-90) and gasket seals (6-80). Arrange the cylinder adapter with the single cast stiffening rib on the housing side pointing toward the yoke bore and up at 45 degrees. The arrangement of the ports may be different on your actuator depending on plumbing and accessory requirements. Care should be taken at this point not to scratch the piston rod when installing the cylinder adapter.

10.5 If removed, install a pipe plug (2-110) into the cylinder adapter pressure port that is pointing away from the yoke bore and down at 45 degrees.

10.6 Coat the cylinder adapter o-ring seal (6-40) with lubricant and install into the cylinder adapter (2-30) in the groove at the inner end of the threads.

10.7 Coat the piston o-ring seal (6-50) with lubricant and install onto the piston rod (2-10).

10.8 Install the piston (2-20) onto the piston rod and retain with lockwasher (2-80) and standard hex nut (2-70). One side of the piston has a raised boss in the center that is counter bored to accept an "O" ring. This side should be installed against the shoulder of the piston rod. Torque the piston hex nut (2-70) to approximately 1,750 inch pounds or 146 ft. pounds.

10.9 Lightly coat one of the piston cup seals (6-10) with lubricant and install into the piston outermost groove. The lips of the seal should point outward toward the welded end of the cylinder.

10.10 For actuators equipped with M3 jackscrew overrides, pre-assembly the M3 into cylinder (3-10), using the following procedure.

10.10.1 Apply a light coating of lubricant to the threads of jackscrew assembly (3-20).

10.10.2 Install jam nut (3-30), countersunk seal washer (6-120) and thread screw seal (6-130), onto jackscrew assembly (3-20). The countersink of washer (6-120) should face the thread screw seal (6-130). Thread these items until they are up against the welded nut.

10.10.3 Thread the jackscrew assembly (3-20) into the end cap of cylinder (3-10). Turn the jackscrew until the end of the assembly protrudes out of the end of the cylinder.

10.10.4 Install washer (6-170) and pin (6-160) as shown on assembly drawing.

10.10.5 Turn the jackscrew until the washer (6-170) just comes into contact with the cylinder end cap.

10.10.6 If desirable, wipe away excess lubricant on jackscrew after operation. If preferred, lubricant may be left on jackscrew to provide additional corrosion protection.

10.10.7 Turn jam nut (3-30) until fully tight against countersunk washer (6-120) thread screw seal (6-130) until fully tight against end cap.

10.11 Apply a very light coating of lubricant to the cylinder threads and the bore of the cylinder (3-10).

10.11.1 CAUTION: Excess lubrication in the cylinder bore may cause erratic or jumpy/jerky operation.

10.12 Install the cylinder (3) or cylinder assembly M3 (3-10) over the piston, screwing into the cylinder adapter. Tighten with a chain wrench. Exercise caution to prevent pinching of the piston cup seal lip during installation. It is necessary to depress the seal lip while working the cylinder over it. The chain wrench should be secured as close to the welded end cap as possible.

11.0 ACTUATOR TESTING

11.1 Leakage Test - General

11.1.1 All areas, where leakage to atmosphere may occur, are to be checked using a leak testing solution.

11.1.2 Before leak testing may be accomplished, it will be necessary to provide a piping system whereby pressure may be applied simultaneously to all common pressure ports.

11.1.3 All leak testing will use 65 psig pneumatic pressure.

11.2 Before testing for leaks, alternately apply and release the 65 psig pressure to each side of the piston to stroke the actuator fully. Repeat this cycle approximately five times. This will allow the new seals to seek their proper working attitude.

11.3 Leakage Test - Procedure

11.3.1 Simultaneously apply 65 psig pressure to the pressure ports in the end of one cylinder (3) or cylinder assembly -M3 (3-10) and in the other cylinder adapter (2-30).

11.3.2 Apply leak testing solution to the following areas:

11.3.2.1 The pressure inlet port in the cylinder adapter (2-30), checks piston to cylinder and piston to piston rod seals.

11.3.2.2 The pressure inlet port hole in the end of the other cylinder checks the piston to cylinder wall and piston to piston rod seals.

11.3.2.3 The threaded joint between the cylinder and cylinder adapter (2-30), checks the cylinder to cylinder adapter o-ring seal.

13.3.2.4 The joint between the cylinder adapter and the housing.

13.3.2.5 The snubber port hole located in the housing, checks the cylinder adapter to piston rod seal.

11.3.3 Repeat steps 11.3.1 thru 11.3.2.5 for the other cylinder and cylinder adapter.

11.3.4 If excessive leakage 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.

11.3.5 If an actuator was disassembled and repaired, the above leakage test must be performed again.

11.4 Operational (Functional) Test

11.4.1 This test is used to verify proper function of the actuator and must be done when actuator is off of the valve or when the valve stem is not coupled to the actuator yoke.

11.4.2 Cycle the actuator at 10% of the maximum operating pressure. Any jumpy or jerky operation, not attributed to seal drag of limited flow capacity, must be corrected.

11.4.3 All accessories, including solenoid valves, positioners, pressure switched, etc., must be hooked up and tested for proper operations and replaced, if found defective.

12.0 RETURN TO SERVICE

12.1 Install the snubber (1-130) in the housing next to the housing cover.

12.2 Re-install actuator to valve mounting bracket and valve.

12.3 Adjust both stop screws (1-60) back to settings recorded in step 5.4 under General Disassembly.

12.4 Tighten both jam nuts (1-70) securely, while holding stop screws (1-60).

12.5 Rotate the yoke to the full clockwise (CW) position. Position the yoke weather cover (6-110) and position indicator (1-110) on the yoke (1-140) with the pointer facing the piston rod and perpendicular to the cylinder assemblies.

12.6 Install and tighten yoke position indicator/yoke weather cover screw (1-120). These screws will need to be rechecked for tightness after the actuator has been cycled.

12.7 Reinstall any piping and accessories that were removed.

12.8 For actuators equipped with M3 jackscrew override and require an optional handwheel, install the handwheel using the following procedure. NOTE: Old style M3 jackscrew overrides with handwheel was a weldment and the handwheel is not removable or replaceable as an option.

12.8.1 Place the handwheel (8-10) onto the welded nut. The handwheel hub has a cast hexagon hole that fits over the welded nut.

12.8.2 Place lockwasher (8-20) onto M3 up against handwheel hub.

12.8.3 Place hex nut (8-30) onto M3 and thread up against lockwasher, torque to 250 foot pounds.

12.9 All accessories, including solenoid valves, positioners, pressure switches, etc., should be hooked up and tested for proper operation and replaced, if found defective.

12.10 Refer to General Operating & Maintenance Instructions Part Number 71584 for actuator start-up procedures.

CHART 1

**PRESSURE REQUIREMENTS & LIMITATIONS
FOR MODEL
723-12 SERIES PNEUMATIC ACTUATORS**

ACTUATOR MODEL	NOMINAL OPERATING PRESSURE	MAXIMUM OPERATING PRESSURE	MAXIMUM HYDROSTATIC TEST PRESSURE
732-12	(1)	150	200

(1) Per customer specification or not applicable.

(2) Includes actuator models that have -M3-12 and -M3HW-12 included in their model numbers, i.e., 732-M3-12 or 732-M3HW-12.

CHART 2

**WEIGHTS FOR MODELS
723-12 SERIES ACTUATORS**

ACTUATOR MODEL	APPROXIMATE WEIGHT WEIGHT (LBS) (3)
732-12	207
732-M3-12	217
732-M3HW-12	227

(3) Weights listed for each model are for bare actuators without valve mounting brackets and accessories.

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