

GH-BETTIS

OPERATING & MAINTENANCE INSTRUCTIONS

DISASSEMBLY & ASSEMBLY

FOR THE FOLLOWING MODELS

732-S, 732-M3-S & 732-M3HW-S

DOUBLE ACTING SERIES

SUBMERGED PNEUMATIC ACTUATORS

"S" INDICATES SUBMERGED SERVICE WITH
SPECIAL POSITION INDICATOR AND YOKE COVER

PART NUMBER: 074220

REVISION: "A"

RELEASE DATE: November, 1988

ER/ECN	DATE	REV LTR		BY *	DATE
74220	11/17/88	A	Compiled	BSC	12-02-88
			Checked		
			Approved	MR	12-02-88

1.0 **INTRODUCTION**

- 1.1 This service procedure is offered as a guide to enable general maintenance to be performed on GH-Bettis 732-S, 732-M3-S, and 732-M3HW-S "Scotch-Yoke" type actuators.
- 1.2 The maximum recommended service interval for this actuator is five years. 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.), commercial leak testing solution, and non-hardening thread sealant.

3.0 **REFERENCE GH-BETTIS MATERIALS**

- 3.1 Assembly Drawing Part Number 074334 for 732-S actuators.
- 3.2 Assembly Drawing Part Number 074513 for 732-M3HW-S actuators.
- 3.3 General Operating & Maintenance Instructions Part Number 074650.

4.0 **GENERAL**

- 4.1 Numbers in parenthesis, (), indicate the bubble number (reference number) used on the GH-Bettis Assembly Drawings and actuator Parts List.
- 4.2 This procedure is written using the stop screw side of the housing (1-10) as the front side of the actuator and the housing cover (1-20) as the top of the actuator.
- 4.3 Mating parts should be marked for ease of reassembly, i.e., cylinder to cylinder adapter, cylinder adapter to housing, right and left stop screws.
- 4.4 When removing seals from seal grooves, use a small screwdriver with the sharp edges rounded off or use a commercial seal removing tool.
- 4.5 Use a non-hardening thread sealant on all pipe threads.
- 4.6 Use the sealant (6-160) on all surfaces as indicated in note 5 of the assembly drawings.
- 4.7 Disassembly of actuator should be done in a clean area on a work bench.

4.8 LUBRICATION REQUIREMENTS

4.8.1 Standard and high temperature service (-20⁰F to 200⁰F) use Kronaplate 100.

4.8.2 Low temperature service (-50⁰F to +150⁰F) use Kronaplate 50.

4.8.3 For distributors of Kronaplate lubricants in your area call 800-428-7802.

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 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 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.

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 Unscrew and remove piston standard hex lock nut (2-70) from the piston rod (2-10).

6.5 Remove the piston (2-20).

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

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

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

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

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

- 6.8.3 Thread the jackscrew assembly (3-20) into the cylinder assembly -M3 (3-10) until the pin (6-160) and washer (6-170) are exposed.
- 6.8.4 Using a 3/16 inch pin punch, drive out and remove pin (3-50) and washer (3-60).
- 6.8.5 Optional Step - Thread the jackscrew assembly (3-20) out and remove.
- 6.8.6 Optional Step - Remove nut seal (3-30) from jackscrew weld assembly (3-20).

7.0 **HOUSING GROUP DISASSEMBLY**

- 7.1 Remove the dowel pin (1-220) from the position indicator (1-110).
- 7.2 Remove the socket cap screws (1-190) and gasket seals (6-80) from the yoke cover (1-230).
- 7.3 Remove the yoke cover (1-230) from the cover (1-20).
- 7.4 Remove the snubber (1-130) from the seapot fittings.
- 7.5 Remove cover screws (1-30) and seal gaskets (6-80).
- 7.6 Remove the housing cover (1-20).
- 7.7 Move the yoke arms to the center position.
- 7.8 Remove the upper yoke roller (1-50).
- 7.9 Life out and remove yoke pin (1-40).
- 7.10 Holding rod bushing (2-40) in place, pull the piston rod (2-10) out through the rod bushing (2-40).
- 7.11 Remove both rod bushings (2-40) from housing (1-10).
- 7.12 Lift the yoke (1-140) from the housing cavity.
- 7.13 Remove the lower yoke roller (1-50).
- 7.14 Remove the stop screws (1-60), jam nuts (1-70), seal washers (6-120), and thread seals (6-90). Be sure to identify stop screws as left and right.
- 7.15 It is not necessary to remove housing pipe plug (1-100) or cylinder adapter pipe plug (2-110).
- 7.16 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 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 bushings, 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), seal washer (6-120), thread seals (6-90), and stop screw jam nuts (1-70).
- 9.12 Prime and apply the sealant (6-160) to all surfaces marked with a flag numbered 5 on the assembly drawing.
- 9.13 If removed, install the position indicator (1-110) using flat counter sunk screws (1-120).

- 9.14 Coat the yoke bore in the cover (1-20) with lubricant.
- 9.15 Install the housing cover (1-20) and the two cover screws (1-30) with gasket seals (6-80) onto the housing (1-10).
- 9.16 Install the position indicator seal (6-170) and the cover o-ring (6-180) into the yoke cover (1-230).

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 Install the cylinder adapter (2-30) over the piston rod and retain with the cylinder adapter ferry head 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.
- 10.4 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.
- 10.5 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.
- 10.6 Coat the piston o-ring seal (6-50) with lubricant and install onto the piston rod (2-10).
- 10.7 Install the piston (2-20) onto the piston rod and retain with hex lock 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 lock nut (2-70) to approximately 146 ft. pounds.
- 10.8 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.
- 10.9 For actuators equipped with M3 jackscrew overrides, pre-assembly the M3 into cylinder (3-10), using the following procedure.
 - 10.9.1 Apply a light coating of lubricant to the threads of jackscrew assembly (3-20).
 - 10.9.2 If removed, install nut seal (3-30), onto jackscrew assembly (3-20) with the teflon side facing away from the welded nut.
 - 10.9.3 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.

- 10.9.4 Install washer (3-60) and pin (3-50) as shown on the assembly drawing.
- 10.9.5 Turn the jackscrew until the washer (3-60) just comes into contact with the cylinder end cap.
- 10.9.6 If desirable, wipe away excess lubricant on jackscrew after operation. If preferred, lubricant may be left on jackscrew to provide additional corrosion protection.
- 10.9.7 Turn seal nut (3-30) until fully tight against end cap.
- 10.10 Apply a very light coating of lubricant to the cylinder threads and the bore of the cylinder assembly (3) or (3-10).
- 10.11 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.
- 10.12 With the actuator yoke rotated to its full clockwise (cw) position install the dowel pin (1-220) into the position indicator (1-110) as shown on the assembly drawings.

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 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 or 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 Replace software components of snubber (1-130). Install the snubber (1-130) in the seapot fittings.
- 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 Reinstall any piping and accessories that were removed.
- 12.6 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.

- 12.6.1 Place the handwheel (8-10) onto the welded nut. The handwheel hub has a cast hexagon hole that fits over the welded nut.
- 12.6.2 Place lockwasher (8-20) onto M3 up against handwheel hub.
- 12.6.3 Place hex nut (8-30) onto M3 and thread up against lockwasher, torque to 250 foot pounds.
- 12.7 All accessories, including solenoid valves, positioners, pressure switches, etc., should be hooked up and tested for proper operation and replaced, if found defective.

CHART 1

PRESSURE REQUIREMENTS & LIMITATIONS FOR MODEL 732-S SERIES PNEUMATIC ACTUATORS

ACTUATOR MODEL (2)	NOMINAL OPERATING PRESSURE _____ (NOP)	MAXIMUM OPERATING PRESSURE _____ (MOP)	MAXIMUM HYDROSTATIC TEST PRESSURE
732-S	(1)	150	200

(1) Per customer specification or not applicable.

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

World Area Configuration Centers (WACC) offer sales support, service, inventory and commissioning to our global customers. Choose the WACC or sales office nearest you:

NORTH & SOUTH AMERICA

19200 Northwest Freeway
Houston, TX 77065
USA
T +1 281 477 4100
F +1 281 477 2809

Av. Hollingsworth,
325, Iporanga Sorocaba
SP 18087-105
Brazil
T +55 15 3238 3788
F +55 15 3228 3300

ASIA PACIFIC

No. 9 Gul Road
#01-02 Singapore 629361
T +65 6501 4600
F +65 6268 0028

No.1 Lai Yuan Road
Wuqing Development Area
Tianjin 301700
P.R.China
T +86 22 8212 3300
F +86 22 8212 3308

MIDDLE EAST & AFRICA

P. O. Box 17033
Dubai
United Arab Emirates
T +971 4 811 8100
F +971 4 886 5465

P. O. Box 10305
Jubail 31961
Saudi Arabia
T +966 3 340 8650
F +966 3 340 8790

24 Angus Crescent
Longmeadow Business Estate
East P.O. Box 6908; Greenstone
1616 Modderfontein, Extension 5
South Africa
T +27 11 451 3700
F +27 11 451 3800

EUROPE

Berenyi u. 72- 100
Videoton Industry Park,
Building #230
Székesfehérvár 8000
Hungary
T +36 22 530 950
F +36 22 543 700

For complete list of sales and manufacturing sites, please visit
www.emersonprocess.com/valveautomationlocations
Or contact us at info.valveautomation@emerson.com

www.emersonprocess.com/bettis

©2016 Emerson Process Management. All rights reserved.

The Emerson logo is a trademark and service mark of Emerson Electric Co. Bettis is a mark of one of the Emerson Process Management family of companies. All other marks are property of their respective owners.

The contents of this publication are presented for information purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available on request. We reserve the right to modify or improve the designs or specifications of our products at any time without notice.

BETTIS™



EMERSON™
Process Management