



11LAB65AA001 Valve & Actuator Overhaul
and Pneumatic Accessories Replacement
Procedure



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1. PURPOSE

The purpose of this procedure is to outline the methodology to be followed to overhaul the Valve, Actuator and Ancillary Components on the 10"x7" CL2500, KOSO 100D Economizer Inlet Control Valve, KKS Number 11LAB65AA001.

2. RESPONSIBILITIES

It is the responsibility of all personnel involved to uphold the procedures, methods and policies outlined to ensure works are performed safely and to the highest level of quality. The contents of this procedure have been included to ensure the safety of personnel and the environment and it is therefore mandatory that these instructions be adhered to by the relevant personnel.

3. PROCEDURE

3.1 SAFETY CONSIDERATIONS

- Prior to commencement of work, personnel involved in the servicing of this valve must review and fully understand the scope of works, this procedure and the requirements listed in the ITP. A work permit must also be obtained from TW Power Services and a JHA completed and signed prior to commencing any work.
- All personnel must comply to the PPE requirements including the use of chin straps for hard hats and use of lanyards to secure tools.

3.2 VALVE/ACTUATOR IDENTIFICATION AND AREA SET UP

- Once the permit has been obtained, verify that the valve details listed on the permit, ITP, Procedure and work pack match the valve i.e. valve KKS number, Manufacturer, Serial Number, Model Number, Size and Pressure Rating as applicable. If the KKS number on the Permit does not match the valve, ITP and procedure do not commence any work and advise Pro-Mech/TW Power Services of the discrepancy.
- After the valve details have been confirmed, all personnel working on the valve must sign on to and lock on to the permit.
- Inspect the work area and surroundings and prepare the JHA. The personnel working on the valve must identify, discuss and list the hazards, associated risks and the controls required to minimise the likelihood of the hazard to cause harm. The JHA must be reviewed and approved by the supervisor prior to commencing work.



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- Establish an exclusion zone using caution or danger tape as required to prevent unauthorised entry to the work area. Name and contact of the person in control of the work area must be detailed on the information tags.
- Set up the work area by laying drop sheets on the floor, wire mesh on the railings, complete the Dropped Object Checklist and implementing the controls identified in the JHA.
- Place the required tools and equipment in plastic tubs or tool boxes on the drop sheets away from the edges.

3.3 VALVE STRIP DOWN & ASSESSMENT

- Check that the valve, actuator and instruments have been isolated and that there is no trapped pressure in the line.
- Note, record the position and take as found photos of the valve.
- Note, record and take photos of the orientation of the actuator, instruments, tubing, wiring and accessories.
- Disconnect the tubing from the actuator and positioner. Electric disconnections will be carried out by TW Power Services Electrician.
- Using the rigging/chain block provided, sling the actuator through the lifting ring if provided or thorough the actuator yoke (item No. 101). Ensure there is sufficient support and tension on the sling to prevent uncontrolled movement/rotation of the actuator when it is disengaged from the valve body.

NOTE: Refer to GA drawing in Appendix A for identification of items corresponding to item numbers for valve components and GA drawing in Appendix B for Actuator Components.

- Relieve the air in the actuator from above and below the piston.
- Note and mark the position of stopper A (item No. 121).
- Disengage the valve and piston rod by removing the connector (item No. 125).
- Remove stopper B (item No. 122) from the piston rod.
- Remove yoke to bonnet bolting and lift the actuator assembly off the bonnet.

NOTE: Care must be taken not to score/damage the valve parts, especially the stem, when removing the actuator.

- Remove the gland flange, packing follower, gland packing and packing spacer noting the arrangement.
- Remove the bonnet from the valve taking care not to damage the valve stem when lifting the bonnet.
- Remove gaskets, item No's. 17 & 26 and remove spacers A & B (item No's. 16a & 16b).
- Remove seal spacer (item No. 14) and balance seal (item No. 15).
- Remove guide bushing (item No. 9).
- Remove the stem and plug assembly from the body.
- Remove the disk stack from the body using the lifting points provided.
- Remove the seat ring, seat ring spacer, and seat ring gasket.
- Clean and inspect the packing bore, valve stem, plug, seat ring, spacers, guides, packing follower and gland flange for damage and note the condition.
- Clean and inspect all other valve components, sealing surfaces and valve body noting the condition of each item.

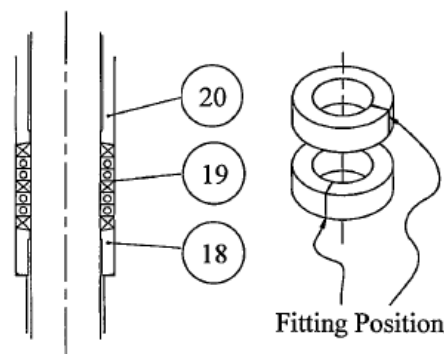
NOTE: Should any of the above parts be irreparable, replace if available, with new parts as required.

3.4 VALVE OVERHAUL & REASSEMBLY

NOTE: When reassembling the valve, anti-seize should be used on bolting to prevent them from seizing. All other parts, internal and external should be lubricated with the correct lubricants where required.

- Clean and polish the packing bore valve stem, packing spacer, packing follower and guides.
- Clean and lap the sealing faces on the plug and the seat to remove minor scoring.
- Pressure clean the disc stack to remove any scales / deposits.
- Clean the bonnet, bolting, gland flange and bolting.
- Clean the gasket sealing faces on the seat pocket, bonnet and body.
- Install a new seat ring gasket, re-install the seat ring and spacer. Ensure that the seat ring is sitting flat on the gasket and is not cocked.
- Install the disk stack on the seat ring in the valve body. Ensure that the seat retainer is sitting flat on the seat ring and is not cocked. Refer to the GA drawing shown in Appendix A for the correct orientation of the seat retainer.

- Turn the disc stack left and right a few times by about 45 degrees and check that the seat ring and the disc stack are firmly assembled.
- Carefully install the stem and plug assembly from the body. Do not drop the plug on to the seat as this may damage the sealing faces.
- Install guide bushing (item No. 9).
- Install the balance seal (item No. 15) and seal spacer (item No. 14).
- Install spacers A & B (item No's. 16a & 16b) and new gaskets, item No's. 17 & 26.
- Reinstall the bonnet on to the valve taking care not to damage the valve stem when installing the bonnet.
- Once the bonnet is resting on the body, reinstall and tighten the bonnet flange bolting finger tight.
- Install the packing spacer, gland packing, packing follower and gland flange. Do not tighten the packing at this stage. When installing the packing, ensure that the cut joint of each ring is 90° apart from that of the adjacent rings as shown below.



- ☒ P4519, P6528, P6315CL, P6610CL, P6610CH
- P4519, P4519, P6315CL, P6710CL, P6710CH

- Carefully move the plug assembly up and down to seat the plug two or three times to centre the seat ring.
- Leaving the valve in the closed position and tighten the bonnet flange bolting in a crisscross pattern that will keep the bonnet square with the valve. Tighten the first bolt 1/6 turn, then tighten the bolt directly opposite 1/6 turn.

- Continue tightening all bolting until the bonnet is firmly seated, metal to metal, in the body. This can be easily felt through the wrench. Proper bonnet gasket compression occurs when the bonnet is seated metal-to-metal in the body. Refer to Appendix C for flange bolting torque values and Appendix D for the tightening sequence.
- Tighten the packing box bolting to the torque values listed in the table below.

NOTE: Do not overtighten packing. This can cause excessive packing wear and high stem friction that may impede plug movement.

Tightening Torque Square-Formed Gland Packing

(Unit : N · m)

Rating	Stem Dia. (Inch)	Packing Material				
		P4519 P4519	P6528 P4519	P6315CL P6315CL	P6610CL P6710CL	P6610CH P6710CH
Up to 600# Up to 40K	5/8	10.5				
	1	15				
	1.5	45				

3.5 ACTUATOR STRIP DOWN & ASSESSMENT

- Remove all the pneumatic accessories connected to the actuator.
- Remove stopper A (item No. 121).
- Disassemble the actuator by removing the bolts/washers (item No. 109 & 110) and separating cylinder covers A & B (item No's. 102 & 103) from the cylinder (item No. 105).
- Remove O-rings, item No's. 115 & 116.
- Remove the C-type retaining ring (item No. 120) located on top of the piston rod.
- Remove the retaining ring (item No. 114), split ring (item No. 113) piston (item No. 104), O-ring (item No. 118) and pull the piston rod (item No. 106) towards the yoke (item No. 101).
- Separate the yoke from the bottom cylinder cover, cylinder core A and remove the O-ring (item No. 117) and dust seal (item No. 119).

NOTE: Care must be taken to ensure that the yoke does not impact the piston rod.

- Visually assess the condition of the DU bush (item No. 107). Do not remove the bush unless it is damaged.



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- Clean the cylinder internals, piston rod, yoke and piston including all the O-ring groves.
- Inspect the cylinder internals, piston rod, yoke, piston and all the O-ring groves for scoring or pitting.
- Clean and inspect nuts and bolts for damage.

NOTE: Should any of the above parts are irreparable, replace with new parts as required.

3.6 ACTUATOR OVERHAUL & REASSEMBLY

NOTE: When reassembling the actuator, anti-seize should be used on bolting to prevent them from seizing where required. All other parts, internal and external should be lubricated with the correct lubricants where required.

- Clean and polish the piston rod.
- Wire brush/buff screws and nuts.
- Thoroughly clean the internal wall of the cylinder.
- Thoroughly clean all the O-ring groves.
- If the DU bushing has been removed, install new bush.
- Install a new O-ring (item No. 117) and dust seal (item No. 119).
- Reassembly the yoke to the bottom cylinder cover, cylinder core A.
- Install the piston rod and new O-ring (item No. 118).
- Reassemble the piston on the piston rod and install the split ring (item No. 113) retaining ring (item No. 114).
- Install the C-type retaining ring (item No. 120) on top of the piston rod.
- Install new O-rings, item No's. 115 & 116.
- Assemble the actuator by install the cylinder (item No. 105) over the piston till it bottoms out on the cover A.
- Install cover B on top of the cylinder and secure using the bolts/washers (item No. 109 & 110).

NOTE: Care must be taken not to damage the piston O-ring.

3.7 ASSEMBLE THE ACTUATOR ON TO THE VALVE

- Using slings and chain block, position and place the actuator assembly onto the valve body. Ensure care is taken not to damage the valve plug whilst positioning the assembly over the valve body.



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NOTE: Ensure that the actuator is orientated the same direction as found prior to overhaul.

- Lower the actuator squarely into the valve body. Care should be taken to avoid damaging the stem while fitting the assembly in to the body.
- Install the yoke to bonnet bolting and torque to the required valve.
- Reinstall stopper A (item No. 121) in the original position is marked during disassembly.
- Reinstall the connector (item No. 125) and stopper B (item No. 122). Ensure that the position indicator on the connector is set to the closed position on the indicator plate (as the valve should be in the fully closed position at this stage) and tighten the bolts.
- Slowly stroke the plug up and down to check the alignment of the plug with the seat retainer. If binding, sticking or scraping noises are heard, stop stroking valve immediately. Disassemble the valve to determine noise and to detect possible damage.

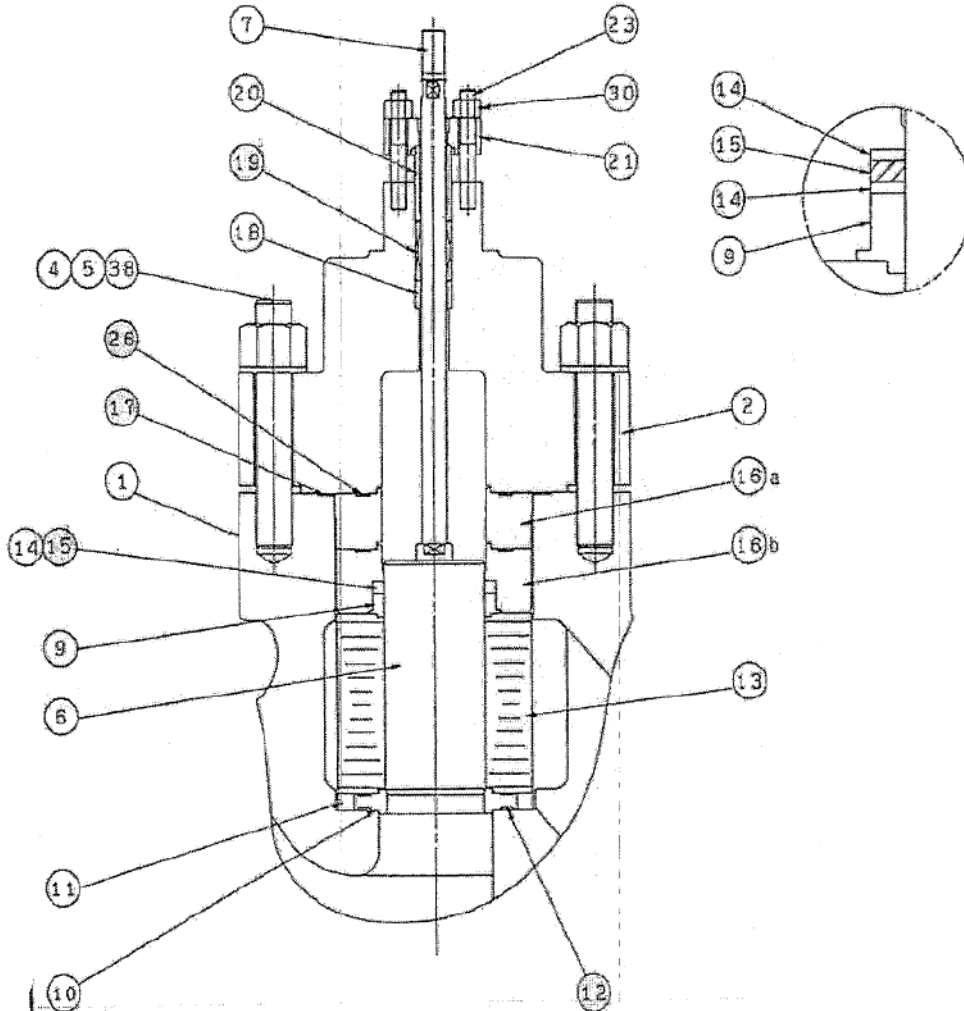
3.8 PNEUMATIC ACCESSORIES REPLACEMENT

- Replace and install all the pneumatic accessories with new.
- Where new accessories are not available, overhaul and reuse the exiting accessories.
- Connect the linkages to the valve/actuator stem assembly ensuring that the orientation is the same as in the as found condition.
- Connect the tubing to the positioner and actuator.

3.9 FUNCTION TEST AND RE-PROFILE VALVE & ACTUATOR ASSEMBLY

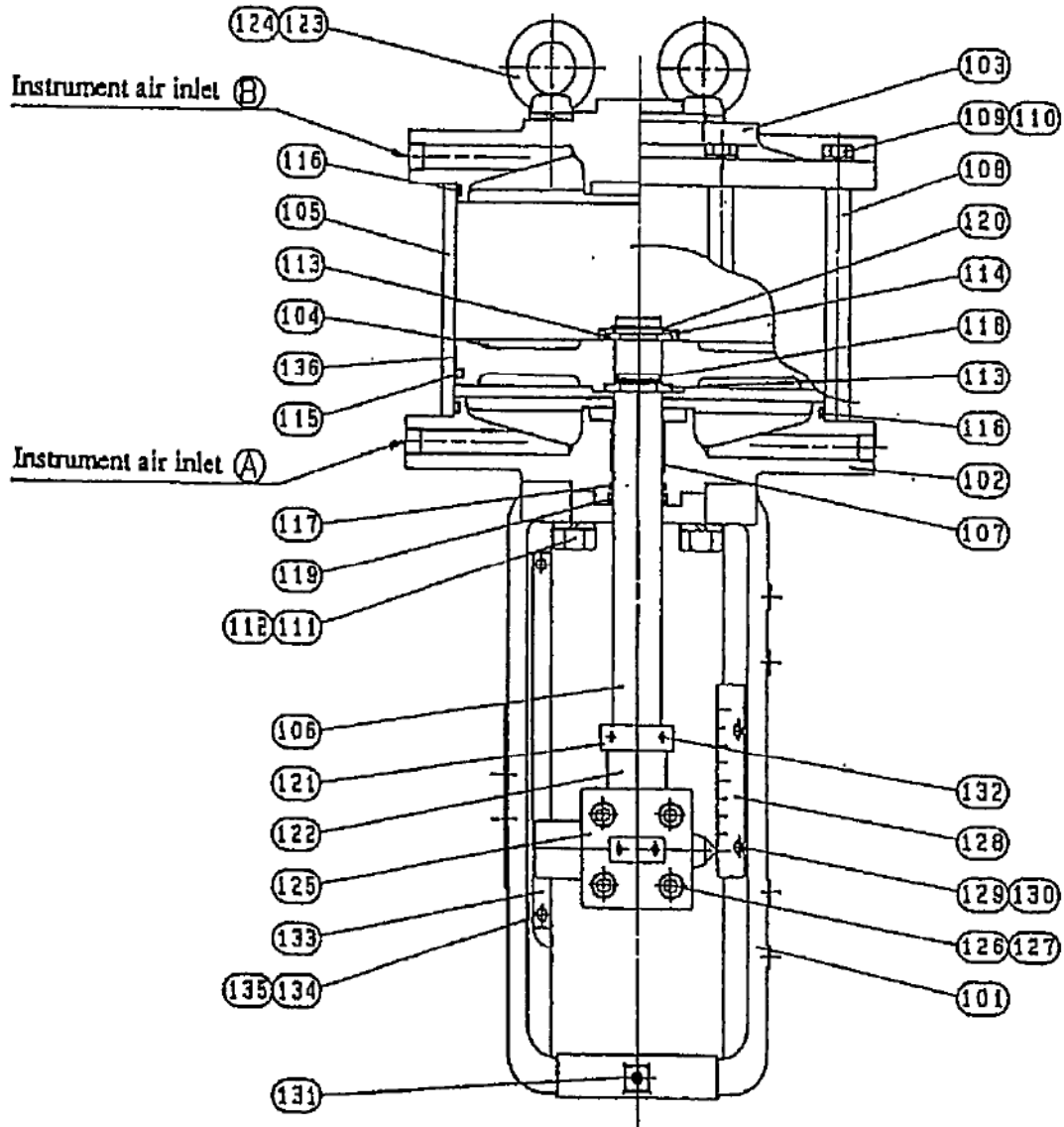
- Check the air tubing and connections for any leaks.
- Connect the profiler to the actuator and the positioner.
- Calibrate the positioner to suit the required input signal to open and close the valve.
- Record parameters such as stroke time, hysteresis, friction and positioner calibration on the profiler.
- Leave the valve and actuator in the as found position.

APPENDIX A: GA DRAWING SHOWING ITEMS NUMBERS



NO	PART NAME	MATERIAL
1	BODY	A216-WCB
2	BONNET	A105
4	STUD BOLT	5NB7
5	HEX NUT	S45C
6	PLUG	SUS410(HT)
7	STEM	SUS410(HT, Hcr)
9	GUIDE BUSHING	SUS410
10	SEAT RING	SUS410(HT)
11	SEAT RING SPACER	A105
12	GASKET	#1
13	DISK STACK	410(HT)
14	SEAL SPACER	SCM440
15	BALANCE SEAL	GLAFDIL
16a	SPACER(A)	SUS410
16b	SPACER(B)	SUS410
17	GASKET	#1
18	PACKING SPACER	SUS410
19	STEM PACKING	#1
20	PACKING FOLLOWER	SUS410
21	GLAND FLANGE	CARBON STEEL
23	GLAND STUD	5NB7
26	GASKET	#1
30	HEX NUT	S45C
38	PLAIN WASHER	22H

APPENDIX B: GA DRAWING FOR ACTUATOR



No.	Designation	No.	Designation	No.	Designation	No.	Designation
101	Yoke	112	Spring washer	122	Stopper B	130	Hexagon nut
102	Cylinder cover A	113	Split ring	123	Eyebolt	131	Hexagon socket set screw
103	Cylinder cover B	114	Retaining ring	124	Spring washer	132	Guide plate
104	Piston	115	O-ring	125	Connector	133	Cross recessed head screw
105	Cylinder	116	O-ring	126	Hexagon socket head cap screw	134	Hexagon nut
106	Piston rod A	117	O-ring	127	Conical Spring washer	135	Piston guide
107	Bushing	118	O-ring	128	Division plate		
108	Cylinder binder	119	Dust seal	129	Cross recessed head screw		
109	Hexagon bolt	120	Retaining ring C-type				
110	Spring washer	121	Stopper A				
111	Hexagon bolt						



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APPENDIX C: FLANGE BOLTING TORQUE VALUES

1 Kgf·m = 9.80665 N·m

Bolt size	Tightening torque	Bolt size	Tightening torque
1/2 -13 M12	46 N·m	1 5/8 - 8 M42	1890 N·m
5/8 -11 M16	91 N·m	1 3/4 - 8 M45	2393 N·m
3/4 -10 M20	162 N·m	1 7/8 - 8 M48	2977 N·m
7/8 - 9 M22	262 N·m	2 - 8 M52	3651 N·m
1 - 8 M24	390 N·m	2 1/4 - 8 M56	5281 N·m
1 1/8 - 8 M27	583 N·m	2 1/2 - 8 M64	7343 N·m
1 1/4 - 8 M30	812 N·m	2 3/4 - 8 M72	9872 N·m
1 3/8 - 8 M36	1105 N·m	3 - 8 M80	12935 N·m
1 1/2 - 8 M39	1465 N·m		

APPENDIX D: BONNET BOLT TIGHTENING SEQUENCE

