CONTENTS

1 GENERAL

The installation and maintenance of a sweep angle control valve is slightly different from the normal Globe Control Valve. This is due to the stuffing box arrangement and situation of the plug and seat. Both plug and seat are made of Tungsten Carbide to minimise the damage that might take place. The assembly of the sweep angle valve can vary depending on the size of the valve. Take note of arrangement when disassembling.

2 ROUTINE MAINTENANCE

The standard valve will have PTFE braid packing and live loading (Live loading can easily be recognised as the valve will have Belville washers on the gland flange). Routine maintenance consists of tightening the gland flange live load nuts, to compensate for packing wear. Never over tighten the gland flange nuts as this may shorten the life of the packing and will also have an effect on the smooth operation of the valve. The Gland Flange must be central and evenly tightened before operating the valve.

3 WHEN SHOULD MAINTENANCE BE CARRIED OUT?

3.1 Symptoms

- Sudden poor control.
- When action of the valve is no longer smooth.
- Valve passes excessive medium when in the closed position.
- Leaking at gland after the gland has been tightened.
- Actuator passes air.

3.2 Trouble shooting guide

- *Refer to Appendix 1*

4 DISASSEMBLY OF VALVE

WARNING – De-pressurise the line to atmospheric pressure and drain all line fluids before working on the valve. Ensure that decontamination procedures have been carried out if necessary. Failure to do so can result in serious injury.

4.1 Remove the valve from the line. Do **not** work on the valve until it is removed.
4.2 Disconnect all air lines and the positioner feedback arm. The feedback arm can be disconnected by loosening the cap screw holding the arm on the positioner shaft and sliding the arm off.
4.3 Release pressure on the plug and seat by unscrewing the adjusting screw on the top of the actuator.
4.4 The plug should never be rotated while it is still on the seat.
4.5 Remove the seat and check both the plug and seating surfaces for any damage, i.e. pit marks or galling.
4.6 In order to check the plug thoroughly, loosen the gland flange live loading nuts and withdraw the stem clamp bolt.
4.7 Remove the actuator mounting bolts and while holding the plug secure with a spanner to prevent it from turning, unscrew the actuator from the plug.
4.8 Withdraw the plug from the valve.
4.9 Remove the gland flange, live load nuts and disc washers.

4.10 Remove the guides, packing and spacers by using a dowel with a diameter slightly larger in diameter than the plug stem. The guides, packing and spacers must be removed through the top of the bonnet. **Record the arrangement and material of the guide, packing and spacers as this can vary**.

5 COMPONENT INSPECTION

5.1 Clean all the metal components with a suitable cleaning solvent and inspect for any excessive wear or damage.
5.2 Check both the plug and seat seating surfaces for damage.
5.3 Check the Plug Stem and Guides for uneven wear.
5.4 Questions to ask: -

- Has plug and seat been worn away? If yes…
- What is the plug and seat material? If yes…
- Has it worn due to cavitation, erosion, flashing or steam cutting

5.5 Consult your nearest Mitech branch.
Note: Due to the tungsten carbide on the plug and seat, they cannot be skimmed.

6 DISSASSEMBLY OF THE ACTUATOR

6.1 Remove all air connections.
6.2 The actuator assembly must be removed completely from the valve for servicing.
6.3 Relieve the spring pressure by removing the spring adjusting screw completely.
6.4 Measure the gap between the ends of the cylinder cap circlip and record value.
6.5 Unscrew the adjusting screw to remove spring compression.
6.6 Remove the cylinder cap circlip then remove the cylinder cap.
6.7 Withdraw the fail-safe spring and spring button (air to open).
6.8 Remove the piston and the actuator stem by sliding it out of the cylinder.
6.9 Loosen & remove the piston-retaining Nylok nut, then remove the actuator spacer and piston from the actuator stem.
6.10 Withdraw the fail-safe spring (air to closed).
6.11 Remove stem bushing (only if necessary) and stem "O" ring from the base of the cylinder.

7 ACTUATOR COMPONENT INSPECTION

7.1 Clean all the metal components with a suitable cleaning solvent.
7.2 Check the actuator cylinder for any signs of internal scoring and external damage to the nylon coating.
7.3 Check the actuator stem for any visible damage that might have been caused by galling or scoring.
7.4 Check "O" rings for flatness. Replace anyway.

8 ASSEMBLY OF THE ACTUATOR - Fail Closed / Fail Open ORIENTATION

8.1 The following parts must be replaced:

- Piston “O”-ring.
- Cylinder cap “O”-ring.
- Piston stem “O”-ring.
- Actuator stem “O”-ring.
- Adjusting screw “O” ring.
- Piston Support “O” ring (on larger valves)

8.2 If the stem bushings were removed: -

8.2.1 Slightly roughen the outer surface of the stem bushes using Emery tape to improve adhesion of the loctite.
8.2.2 Apply loctite primer and a thin coat of loctite adhesive "601" to the first bush and press it right to the shoulder of the actuator stem neck.
8.2.3 Insert the actuator stem "O" ring.
8.2.4 Repeat (8.2.1) on the second bush and make sure it does not press too tightly on the "O" ring, leaving +/- 0.5mm clearance. The top of the second bush should be flush with cylinder face.
8.2.5 Check if the piston shaft slides freely through bushes and the actuator stem "O" ring.

8.3 Fail Closed Orientation

8.3.1 Hold the actuator stem on the flats in a soft jaw vice. Fit the piston stem "O" ring onto actuator stem and assemble the piston to the actuator stem. The groove in the piston must be at the top, i.e. on the same side as the nylok nut.
8.3.2 With the 6” sweep angle valve, the piston also incorporates a piston support washer and “O” ring on the topside of the piston.
8.3.3 Place the actuator spacer on top of the piston.
8.3.4 Tighten the nylok nut on the actuator stem. See appendix 2 for torque figures.
8.3.5 Put light smear of silicon grease on the piston "O" ring and fit to the piston.
8.3.6 Apply liberal coating of grease to the bore of the cylinder.
8.3.7 Fit the piston / piston shaft assembly into the cylinder and ensure that it moves freely without fouling.
8.3.8 Fit the spring into the groove in the piston.
8.3.9 Place the spring button onto the spring. Make sure that they are attached correctly to each other.

8.4 Fail Open Orientation

8.4.1 Hold the actuator stem on the flats in a soft jaw vice. Place the actuator spacer onto the actuator stem. Fit the piston stem "O" ring onto actuator spacer.
8.4.2 Place the spring around the actuator stem, resting on the bottom of the cylinder.

8.4.3 Assemble the piston to the actuator stem making sure the groove of the piston is at the bottom and the piston fits onto the spring securely.
8.4.4 With the 6” sweep angle valve, the piston also incorporates a piston support washer and “O” ring on the bottom side of the piston.
8.4.5 Place the spring button on top of the piston – upside down.
8.4.6 Place the nylok nut onto the actuator stem and tighten. See appendix 2 for torque figures.
8.4.7 Put light smear of silicon grease on the piston "O" ring and fit to the piston.
8.4.8 Apply liberal coating of grease to the bore of the cylinder.
8.4.9 Fit the piston / piston shaft assembly into the cylinder and ensure that it moves freely without fouling.

8.5 Fit the cylinder cap "O" ring to the cap with a light smear of grease, and fit the cylinder cap to the cylinder, taking care not to damage the cylinder cap "O" ring.
8.6 Insert the circlip and tap it to ensure that it is properly seated. Measure the gap; it should correspond to the measurement taken when disassembling.
8.7 Fit "O" ring to the cylinder cap screw (bolt) and tighten the bolt to the cap.
8.8 Check cylinder operation using an air line. Pressure should be approximately 5 Bar.
8.9 Check for leaks at cap end by pouring soap water onto the cap and pressurising cylinder using hole nearest the cap.
8.10 Pour soap water into the cylinder neck and check for leaks at this end by pressurising the cylinder using the hole nearest the neck. If the "O" ring on this side leaks, the cylinder must be dismantled and the second bush pressed further in to compress the "O" ring slightly.
8.11 Stroke the actuator to ensure smooth operation of the actuator.

9 REASSEMBLY OF THE VALVE BODY

9.1 The valve must be secured to prevent movement during assembly and should be built from the valve body up. Position the valve so that the inlet flange is pointing to your right and the seat flange is at the bottom.
9.2 Ensure that all components are free from dirt.
9.3 The following parts need to be replaced: -

- Gland packing.
- Seat gasket.
- Plug stem guides.

N.B. Under no circumstances should the spiral wound gasket be re-used

9.4 Reassemble the valve body using the sequence recorded when disassembling. The following is a typical arrangement, but it can vary depending on the size of valve.

9.5 Smaller valves (2” x3”) – see drawing 1

9.5.1 Re-insert the plug (4) from the bottom into the body, taking care not to score the stem.
9.5.2 Insert the bottom guide (5) then the delta ring (6).
9.5.3 Replace the lower packing (7) followed by the short spacer (11).
9.5.4 Replace the 2 larger spacers (9) followed by 4 packing rings (7).
9.5.5 Fit the flat ring (8) followed by the top guide (14).

9.5.6 Replace the gland flange (20) and live loading (12).
9.5.7 Screw the four mounting bars (16) into the body flange
9.5.8 Fit the actuator stem clamp (17) over the plug stem and the mounting bar so that the cutout in the stem clamp is on your right.
9.5.9 Slide the indicator plate (15) over the mounting bar furthest from you.
9.5.10 Fit the wiper into the mounting flange (18).
9.5.11 Place the mounting flange on the mounting bars with the counter sunk screws on top and the two small holes closest to you. Insert the cap screws and fix the mounting flange to the mounting bars.
9.5.12 Insert the actuator stem through the wiper and screw onto the plug stem.
9.5.13 Turn the actuator to the final position so that the airports are facing to your right.

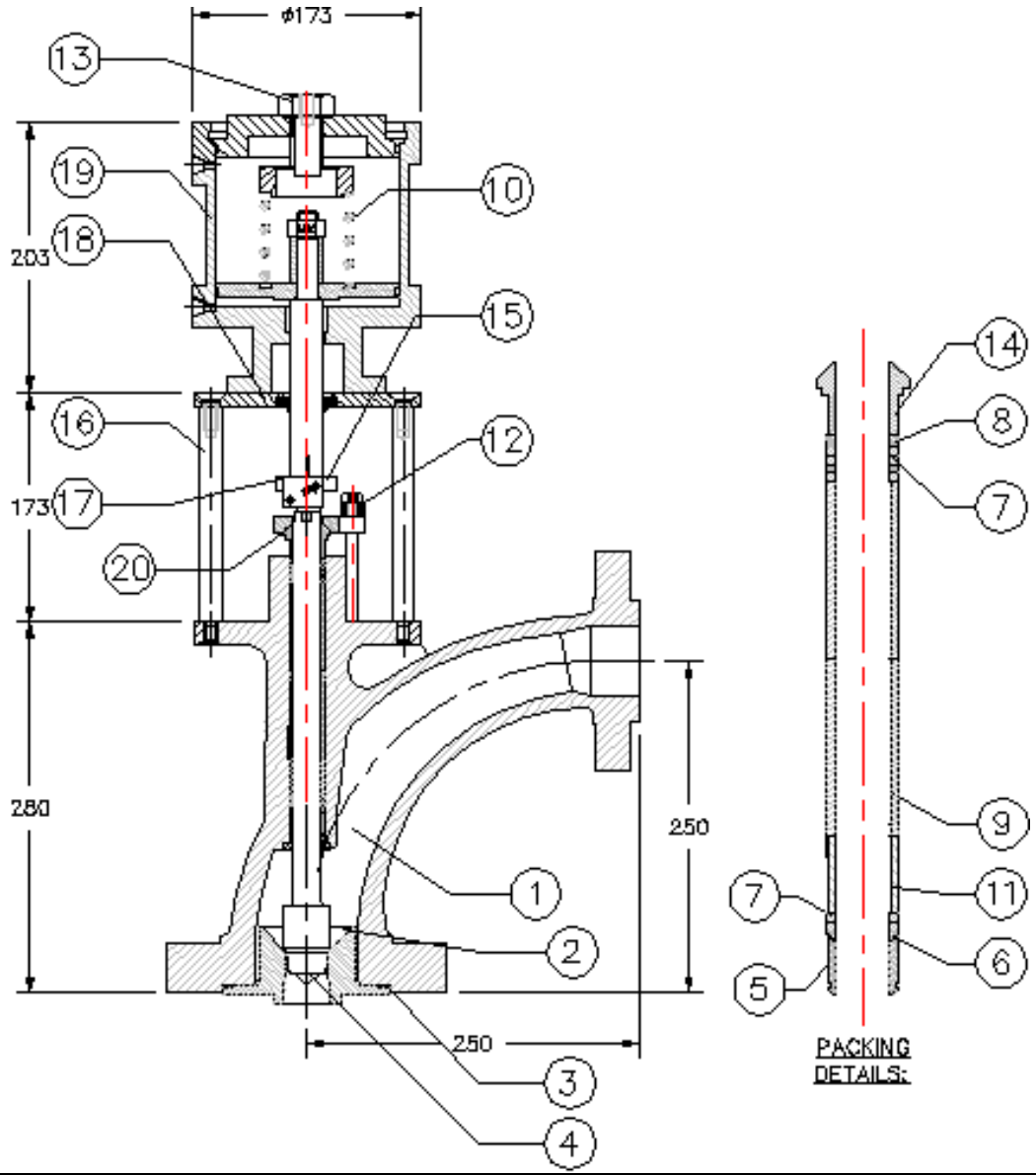
9.6 Larger valves (6”x6”)

9.6.1 Re-insert the plug (4) into the body from the bottom; take care not to score the stem.
9.6.2 Re-insert the bottom guide (5) and then the delta ring (6).
9.6.3 Replace the 2 rings of lower packing (7) followed by the flat ring (8).
9.6.4 Re-insert the long spacer (9) followed by 4 packing rings (7) and the short spacer (11).
9.6.5 Place 4 rings of packing then the top guide (14).
9.6.6 Replace the gland flange (20) and live loading (12).
9.6.7 Screw the four mounting bars (16) into the body flange.
9.6.8 Fit the actuator stem clamp 17) over the plug stem and the mounting bar so that the cutout in the stem clamp is closest to you.
9.6.9 Slide the indicator plate (15) over the mounting bar on your right.
9.6.10 Fit the wiper into the mounting flange (18).
9.6.11 Place the mounting flange on the mounting bars with the counter sunk screws on top and the two small holes to your left. Insert the cap screws and fix the mounting flange to the mounting bars.
9.6.12 Insert the actuator stem through the wiper and screw onto the plug stem.
9.6.13 Turn actuator to the final position so the airports are facing to you.

9.7 Insert the feed back shoulder screw in the far left hole in the stem clamp.
9.8 Fit the positioner bracket and positioner. Re-pipe the actuator.
9.9 Stroke the valve to check the smooth operation of the plug.
9.10 Stroke the actuator and adjust the required plug contact with the seat. The plug can be screwed in or out depending on contact. The plug and seat must just touch with the gasket in position.
9.11 Calibrate positioner.
9.12 Check the full stroke of the valve by making the appropriate signal changes on the positioner and compare with indicator plate.
9.13 Check all air connections, gland packing and gaskets for air leaks using soap water.
9.14 Check that the valve fails in the right direction.

Drawing 1:

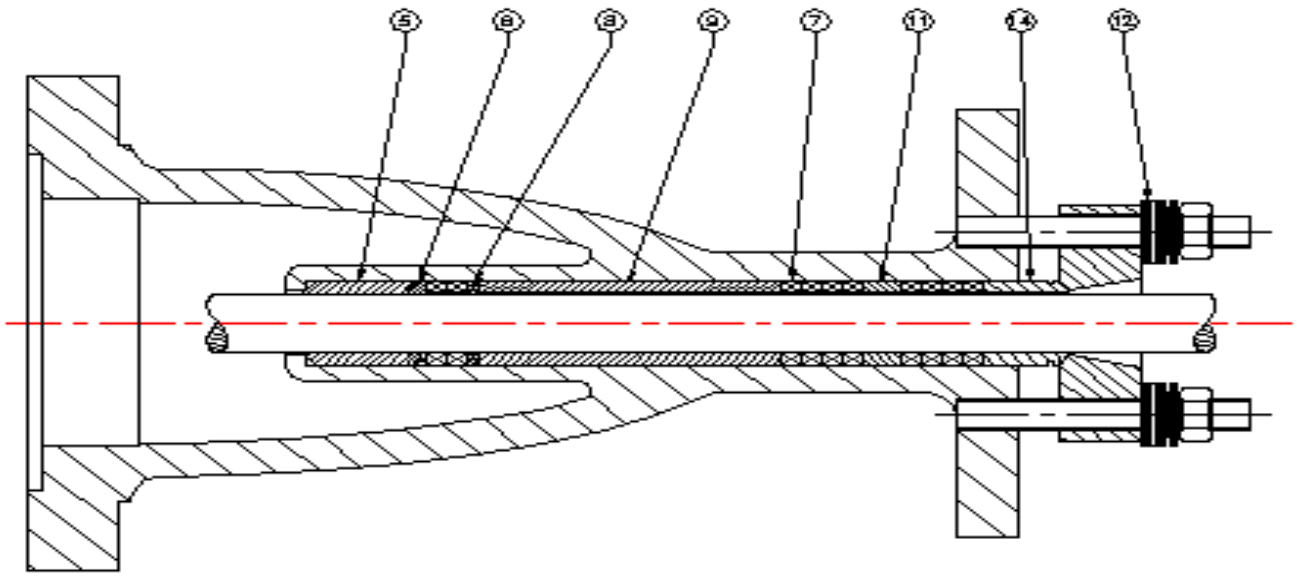
Small Sweep Angle Control Valve – showing stuffing box arrangement

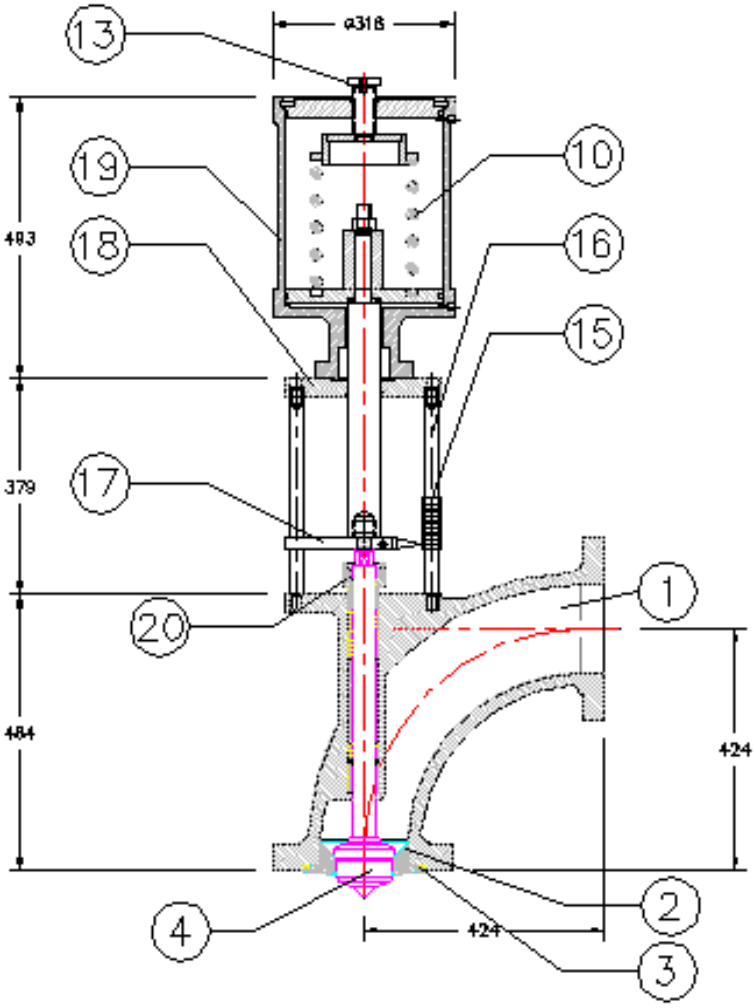


Item No.	Description	Item No.	Description
1	Valve Body	11	Short Spacer
2	Seat Ring	12	Belleville Washer – Live Loading
3	Seat Ring Gasket	13	Adjusting Screw
4	Plug	14	Top Guide
5	Bottom Guide	15	Indicator Plate
6	Delta Ring	16	Mounting Bar
7	Packing Braid	17	Stem Clamp
8	Flat Ring	18	Mounting Flange
9	Long Spacer	19	Cylinder
10	Spring	20	Gland Flange

Drawing 2:

Large Sweep Angle Control Valve – showing stuffing box arrangement





Item No.	Description
1	Valve Body
2	Seat Ring
3	Seat Ring Gasket
4	Plug
5	Bottom Guide
6	Delta Ring
7	Packing Braid
8	Flat Ring
9	Long Spacer
10	Spring
11	Short Spacer
12	Live Loading
13	Adjusting Screw
14	Top Guide
15	Indicator Plate
16	Mounting Bar
17	Stem Clamp
18	Mounting Flange
19	Cylinder
20	Gland Flange

Appendix 1

CONTROL VALVE TROUBLE SHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Valve operation not smooth	Gland Flange over tightened	Loosen Gland Flange Nuts and re tighten just over finger tight.
	Packing too dry	Lubricate packing. Warning: do not use oil on valves for oxygen service.
	Poor air supply	Check air supply pressure to Actuator during operation.
	Alignment of actuator stem and Plug.	Check actuator cylinder is square & tight on mounting flange.
	Actuator faulty	Service actuator as per maintenance bulletin
Valve passing excessive product when closed	Poor air supply	Check air supply pressure during operation
	Calibration out	Check readings on Positioner gauges and re calibrate if necessary.
	Actuator cylinder passing air	Check for air leaks with soap water at cylinder cap and neck air connections by removing one pipe whilst stroking the valve.
	Plug not achieving full travel	Check plug travel against indicator plate
	Incorrect flow direction	Check flow corresponds with direction on valve.
	Damaged Seat or Plug surfaces	Check Plug and Seat as per Maintenance Bulletin
Valve not opening fully	Poor air supply	Check air supply pressure during operation.
	Calibration out	Check readings on Positioner gauges and re calibrate if necessary.
	Actuator cylinder passing Air	Check for air leaks with soap water at cylinder cap and or neck whilst stroking the valve
	Plug not achieving full travel	Check plug travel against indicator plate.
Poor Control	Poor air supply	Check air supply pressure during operation
	Speed and accuracy of response	Check that the speed of response and the position of the plug correspond with signal changes.
Excessive Noise	Cavitation (liquid)	Check Trim type is suitable for the application. Refer to supplier
	Flashing (liquid)	
	Velocity (gas)	
	Cavitation (gas)	
Damage to plug and or seat	**Cavitation.** Recognised by dull colour and material looks porous	Change trim type.
	Flashing. Can be recognised by shiny colour and loss of material similar to erosion	Add Hard facing.
	Erosion. Can be recognised by polished finish.	Add Hard facing.
	Corrosion. Various	Change Materials.

Appendix 2

NYLOK NUT SECURING PISTON TORQUE FIGURES

CYLINDER SIZE	NUT SIZE (mm)	TORQUE (Nm)
MT-12	12	80
MT-25	16	150
MT-50	20	180