

**GLOBE CONTROL VALVE – ALUMINIUM CYLINDER
INSTALLATION & MAINTENANCE MANUAL**

CONTENTS

Sub Section	Title	Page No
1	INTRODUCTION	3
2	SIGNIFICANT EQUIPMENT DETAILS	3
3	ROUTINE MAINTENANCE AND INSPECTION	3
4	DISASSEMBLY OF THE VALVE	4
5	DISASSEMBLY OF THE ACTUATOR	5
6	ACTUATOR COMPONENT INSPECTION	5
7	VALVE COMPONENT INSPECTION	5
8	REASSEMBLY OF THE ACTUATOR	6
9	REASSEMBLY OF THE VALVE	8
10	REVERSING THE AIR ACTION	10
11	POSITIONER CALIBRATION	10
Appendix 1	TORQUE VALUES FOR BONNET NUTS	11
Appendix 2	TORQUE VALUES FOR NYLOK NUTS FOR SECURING PISTON	11
Appendix 3	SEAT LEAKAGE MEASUREMENT	11
Appendix 4	TROUBLE SHOOTING GUIDE	12
Appendix 5	VALVE PARTS IDENTIFIER	13
Appendix 6	VALVE PARTS DESCRIPTION	14

GLOBE CONTROL VALVE – ALUMINIUM CYLINDER INSTALLATION & MAINTENANCE MANUAL

1. INTRODUCTION

This document is a general maintenance manual intended for use on Mitech Globe Control Valves from sizes 12mm to 100mm with Aluminium Cylinders

The drawings included in this manual do not refer to a particular valve, but are used to show the typical layout of a Mitech Globe Control valve and actuator assembly. Additional documents are available from your local MITECH Branch.

For identification of parts and components numbers, please refer to the drawings and parts descriptions tables.

2. SIGNIFICANT EQUIPMENT DETAILS

- 2.2. The Mitech Globe Control Valve uses a top entry design to allow for easy trim inspection and service without having to remove the valve body from the line.
- 2.3. The standard valve will have PTFE or Graphite braid packing and may have live loading. Live loading can be identified by Bellville (Dished) washers under the Gland flange nuts. For more information on live loading, refer to the Live Loading Maintenance Manual.
- 2.4. Special valves may have the following trims or accessories. Should this be the case, please see the relevant maintenance manuals, or contact your nearest Mitech Sales branch for assistance. Other manuals available are :-

- Pressure Balanced Plugs
- Energy Dissipating Disk Stacks
- Low Noise Trims
- Cavitation Control
- ZZ Trim
- Bellows Seal
- Live Loading
- Soft Seat Inserts
- Cryogenic Valves

3. ROUTINE MAINTENANCE AND INSPECTION

To ensure optimum life from your valve the following routine inspections are recommended

3.1 Routine Maintenance

- 3.1.1 Once the valve has been installed into the line, the gland flange studs should be checked and tightened (if necessary) within two weeks after installation.
- 3.1.2 Compensate for the gland packing wear by occasionally retightening the gland flange nuts (15). Tighten until the leak stops, then an additional half turn more.
- 3.1.3 Never overtighten the gland flange nuts as this may shorten the life of the packing gland and also have an effect on the smooth operation of the valve.
- 3.1.4 The gland flange must be centralised and tightened evenly before operating the valve.

GLOBE CONTROL VALVE – ALUMINIUM CYLINDER INSTALLATION & MAINTENANCE MANUAL

3.2 Inspect and Determine what maintenance is required

- 3.2.1 Observe the valve movement and process instrument readings to determine whether or not the valve needs maintenance, repair or adjustment.
- 3.2.2 Look out for the following symptoms : -
 - 3.3 Poor controllability
 - 3.4 The action of the valve is no longer smooth
 - 3.5 When in the closed position, the valve is bypassing excessive product downstream
 - 3.6 Leaking at the gland flange after tightening the gland flange nuts
 - 3.7 The actuator leaking air
 - 3.8 Piston bypassing air

3.9 Trouble Shooting

- 3.9.1 For assistance with trouble shooting – refer to Appendix 3

4. DISASSEMBLY OF THE VALVE

Please refer to Figure 3 (pg 8) and Appendix 5 (pg 13) for parts identification

Warning : Depressurise the line to Atmospheric pressure and drain all line fluids before working on the valve. Should decontamination be required, ensure that all decontamination procedures have been adhered to and a decontamination certificate has been provided. Failure to do so can result in serious injury.

- 4.1 Disconnect all air lines and the positioner feedback arm (43) – Removing the cap screw (44) will disconnect the feedback arm.
- 4.2 Release pressure on the plug and seat by unscrewing the adjusting screw (33) on the top of the actuator.
- 4.3 Loosen the bonnet flange mounting nuts evenly (17), using the 8-pass conventional system.
- 4.4 Remove the Actuator bonnet and plug assembly from the valve, taking care to remove the actuator and plug straight out of the body to avoid damage to the plug (5), seat ring (4) and retainer (7).
- 4.5 **The plug should never be rotated while it is still on the seat.**
- 4.6 **Note** : For valves with CV lower than 0.5, it is recommended that air be used to lift the plug off the seat. This reduces the danger of the plug being damaged by bending.
- 4.7 The seat and retainer can then be withdrawn from the valve body (2) as these are loose fitting and held in position by the bonnet (9).
- 4.8 In order to check the plug thoroughly, loosen the gland flange nuts (15), and remove the stem clamp bolt (36).
- 4.9 Unscrew the plug from the actuator stem and withdraw from the bonnet.
- 4.10 Remove the gland flange nuts (10), spacers (12) and packing (46) by inserting a dowel rod, with a diameter slightly larger in diameter than the plug stem, through the bottom of the bonnet. The guides and packing must be removed from the top of the bonnet.

GLOBE CONTROL VALVE – ALUMINIUM CYLINDER INSTALLATION & MAINTENANCE MANUAL

5. DISASSEMBLY OF THE ACTUATOR

Please refer to Figure 1 (pg 7) and Appendix 5 (pg 13) for parts identification

- 5.1 Remove all air connections
- 5.2 The actuator assembly must be removed completely from the valve for servicing.
- 5.3 Relieve the spring tension by removing the spring adjusting screw (33).
Spring compression must be relieved before any further dismantling is undertaken
- 5.4 Measure and record the gap between the ends of the cylinder cap circlip (32).
- 5.5 Remove the cylinder cap circlip (32) and the cylinder cap (32).
- 5.6 On Fail Closed applications, withdraw the fail safe spring (30) and spring button (34).
- 5.7 Remove the piston (28) and actuator stem (25) by sliding them out of the cylinder.
- 5.8 On Fail Open applications, remove the spring from under the piston.
- 5.9 Loosen the piston retaining nut (29), taking care not to damage the actuator stem, slide the spacer (27) and piston (28) off the actuator stem.
- 5.10 Remove the stem bushes (26) (only if necessary), and the actuator stem O-ring (47) from the base of the cylinder.

6. ACTUATOR COMPONENT INSPECTION

- 6.1 Clean all the metal components with a suitable cleaning solvent.
- 6.2 Check the actuator cylinder for any signs of internal scoring and external damage to the nylon coating.
- 6.3 Check the actuator stem for any visible damage that might have been caused by galling or scoring.

7. VALVE COMPONENT INSPECTION

- 7.1 Clean all the metal components with a suitable cleaning solvent and inspect for any excessive wear or damage.
- 7.2 Check both the plug (5) and seat ring (4) seating surfaces for damage. Ensure that the seat ring recess, bonnet and body gasket seating surfaces are clean and undamaged.
- 7.3 Check the plug stem, guide liners (11) and guide retainers (10) for : -
 - Uneven wear
 - Any indication of cavitation, erosion, flashing or steam cutting
 - Check the plug and seat for : -
 - Any wear
 - Type of material, particularly if damage has occurred
 - Any indication of cavitation, erosion, flashing or steam cutting.

GLOBE CONTROL VALVE – ALUMINIUM CYLINDER INSTALLATION & MAINTENANCE MANUAL

8. REASSEMBLY OF THE ACTUATOR

Please refer to Figure 1 (pg 7) and Appendix 5 (pg 13) for parts identification

8.1 *The following parts must be replaced before reassembly of the valve takes place :-*

- Piston “O”-ring (48)
- Cylinder cap “O”-ring (48)
- Piston stem “O”-ring (49)
- Actuator Stem “O”-ring (47)
- Adjusting screw “O”-ring (47)

8.2 ***If the stem bushings (26) 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 a loctite primer and a thin coat of loctite adhesive [601] to the first bush and press it in to the shoulder of the actuator neck.
- 8.2.3 Insert the actuator stem “O”-ring (47)
- 8.2.4 Repeat (8.2.1) on the second bush and make sure it does not press too tightly on the “O”-ring (47), leaving $\pm 0.5\text{mm}$ clearance. The top of the bush should be flush with the cylinder face.
- 8.2.5 Check that the piston shaft slides freely through the actuator stem “O”-ring.

8.3 **Fail Open Orientation Assembly**

- 8.3.1 Hold the actuator stem on the flats in a soft jaw vice.
- 8.3.2 Place the actuator spacer (27) onto the actuator stem.
- 8.3.3 Fit the piston stem “O”-ring onto the actuator spacer
- 8.3.4 Assemble the piston (28) to the actuator stem, making sure the groove of the piston is facing the actuator yoke and not the nylok nut side.
- 8.3.5 Place the spring button (34) on top of the piston (upside down)
- 8.3.6 Place the nylok nut (29) above the spring button onto the actuator stem and tighten. See appendix 2 for torque figures.
- 8.3.7 Smear a light coat of silicon grease on to the piston “O”-ring and fit to the piston.
- 8.3.8 Invert the actuator assembly and place on a table with the piston shaft facing upwards. (The nylok nut must rest on the table).
- 8.3.9 Place the spring (30) onto the piston and locate it into the piston groove.
- 8.3.10 Apply a liberal coat of silicon grease to the bore of the cylinder (23).
- 8.3.11 Fit the cylinder over the piston / piston shaft assembly until the spring rests on the bottom of the cylinder.
- 8.3.12 Rotate the actuator to the correct side up.

GLOBE CONTROL VALVE – ALUMINIUM CYLINDER INSTALLATION & MAINTENANCE MANUAL

8.4 **Fail Closed Orientation**

- 8.4.1 Hold the actuator stem (25) on the flats in a soft jaw vice.
 - 8.4.2 Fit the piston stem “O”-ring onto the actuator stem and assemble the piston (28) to the actuator stem. The groove in the piston must be at the top i.e. on the same side as the nylok nut (29).
 - 8.4.3 Place the actuator spacer (27) on top of the piston.
 - 8.4.4 Place and tighten the nylok nut on the actuator stem. (see appendix 2 for torque figures).
 - 8.4.5 Apply a liberal coat of silicon grease to the bore of the cylinder (23).
 - 8.4.6 Fit the piston / shaft assembly into the cylinder and ensure that it moves freely without fouling.
 - 8.4.7 Fit the spring (30) into the groove in the piston.
 - 8.4.8 Place the spring button (34) onto the spring. Ensure that each part fit correctly to each other.
- 8.5 Fit the cylinder cap “O”-ring (48) with a light smear of grease, and fit the cylinder cap (31) to the cylinder, taking care not to damage the cylinder cap “O”-ring.
 - 8.6 Insert the circlip (32) and tap it to ensure that it is properly seated. Measure the gap ; this measurement should correspond to the measurement taken when stripping the actuator.
 - 8.7 Fit “O”-ring to the adjusting screw (33) and tighten the bolt to the cylinder cap.
 - 8.8 Ensure that the piston assembly moves freely without fouling.
 - 8.9 Check the cylinder operation using an air line. Pressure should be approximately 5 Bar (500 kPa).
 - 8.10 Check for leaks at the cap end by pouring soupy water onto the cap and pressurising the cylinder using the air connection closest to the cylinder cap.
 - 8.11 Pour soup water into the cylinder neck and check for leaks through the bottom end of the actuator, by pressurising the cylinder using the air connection nearest the neck of the cylinder. If there is a leak on this side of the of the cylinder, the cylinder needs to be disassembled and the second bush needs to be pressed further in to compress the “O”-ring slightly.
 - 8.12 Stroke the actuator to ensure smooth operation of the actuator.

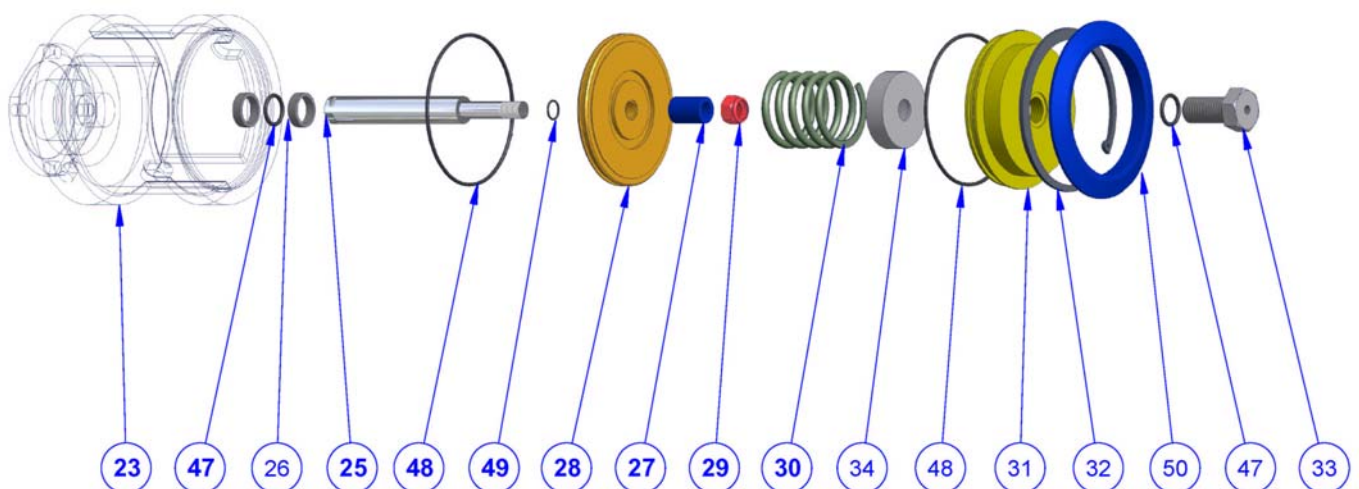


Figure 1: Cylinder Assembly

GLOBE CONTROL VALVE – ALUMINIUM CYLINDER INSTALLATION & MAINTENANCE MANUAL

9. REASSEMBLY OF THE VALVE

Please refer to Figure 2+3 (pg 8) and Appendix 5 (pg 13) for parts identification

- 9.1 On reassembly of the valve, the following parts must be replaced :-
- Gland packing (46)
 - Seat Gasket (3)
 - Bonnet Gasket (6)
 - Plug Steam guide liner (11)

NB : Under no circumstances should spiral wound gaskets be re-used.

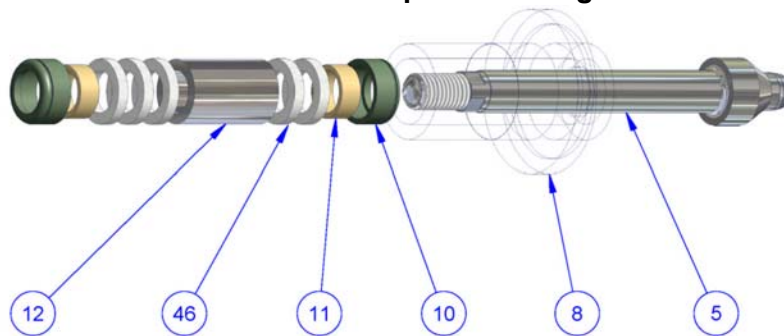


Figure 2: Packing

- 9.2 The reassembly of the valve must be done from the valve body upwards.
9.3 The valve body must be secured to prevent any movement during assembly.
9.4 All parts must be clean.
9.5 Place the seat gasket (3), the seat ring (4) and seat retainer (7) into the valve body. Refer to fig 2 for orientation of the seat.
9.6 Ensure that the bonnet studs (16) are secure in the body.
9.7 Place the bonnet gasket (6) into the valve body

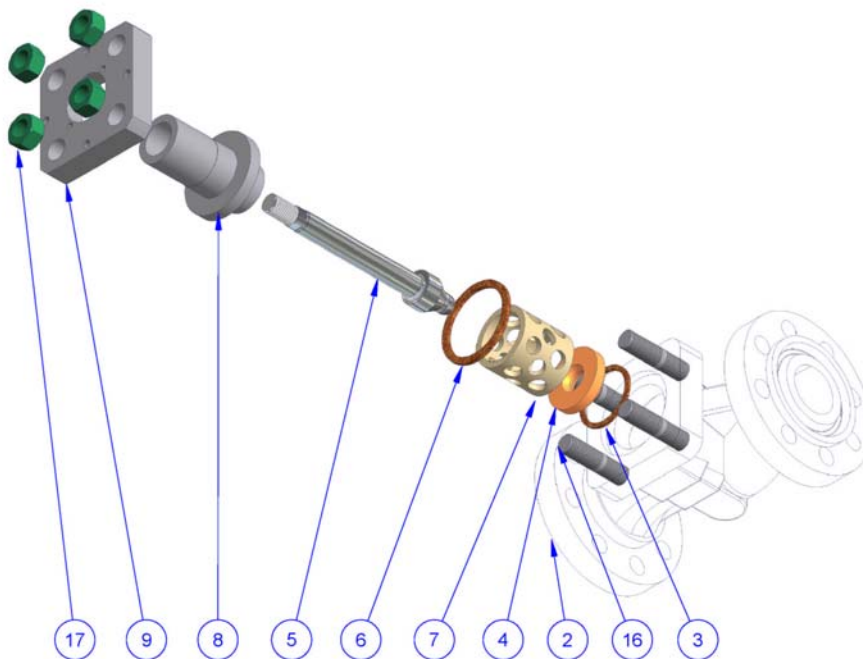


Figure 3: Body Assembly

GLOBE CONTROL VALVE – ALUMINIUM CYLINDER INSTALLATION & MAINTENANCE MANUAL

- 9.8 Slide the bonnet (8) over the plug stem, taking care not to score the stem. Insert the bonnet assembly into the valve body.
- 9.9 Insert the lower guide retainer (10) or the retainer with the liner (11) into the bonnet.
- 9.10 Insert the lower gland packing (46).
- 9.11 Insert the packing spacer (12)
- 9.12 Insert the upper gland packing (46).
- 9.13 Insert the upper guide retainer (10) or the retainer with liner. See figure 3
- 9.14 Fit the bonnet flange (9) into position and screw the bonnet nuts (17) on loosely.
- 9.15 Screw the Actuator mounting bars (19) into the bonnet flange tightly.
- 9.16 Fit the gland flange studs (13) into the bonnet flange (9).
- 9.17 Fit the gland flange (14) and loosely screw on the gland flange nuts (15).
- 9.18 Insert the position indicator (38) over the Actuator mounting bars (19) on the bar at the rear section of the valve opposite to the pillar on which the position will be fitted.
- 9.19 Position the stem clamp (35) over the plug stem.
- 9.20 Replace the actuator mounting flange (18) and tighten with the counter sunk screw (20).
- 9.21 Ensure that the gland flange (14) and the stem clamp are located over the plug stem.
- 9.22 Screw the plug stem (5) into the actuator stem (25). Leave approximately 5 threads exposed.
- 9.23 Slide the stem clamp over the actuator stem, align it with the cut out in the stem with the bolt hole in the stem clamp and fit the bolt (36).
- 9.24 Insert actuator mounting bolts (24) and tighten evenly.
- 9.25 To properly align the seat ring and plug : -
 - On fail closed valves, screw in the adjusting screw (33) so that the spring is under tension and the plug is forced into the seat.
 - For fail open valves – use low air pressure to move the plug into the seat.
- 9.26 Tighten each bonnet nut (17) one flat at a time working diagonally across one to the other.
- 9.27 Tighten all the bolts evenly. Refer to the torque figures in Appendix 1.
- 9.28 Reconnect the positioner (1) and piping.
- 9.29 Stroke the valve to check the smooth operation of the plug.
- 9.30 Check the full stroke of the valve by making the appropriate signal changes on the positioner and compare with the indicator plate.
- 9.31 Check all air connections, gland packing and gaskets for air leaks using soap water.
- 9.32 Check the seat leakage of the valve. Place the valve in a test bench, pressurise the line, and connect the outlet to a rotameter. Take the measurement of the rotameter and compare to the standard seat leakage rate tables. See appendix 4
- 9.33 Check that the valve moves in the correct direction (Air to open or air to close).

GLOBE CONTROL VALVE – ALUMINIUM CYLINDER INSTALLATION & MAINTENANCE MANUAL

10. REVERSING THE AIR ACTION

Note :

- For specialised trims, be aware that flow direction is specific and this needs to be taken into account.
- Reversing the fail action can affect the piping.

- 10.1 To reverse the air action, disassemble the actuator in accordance with section 5.
- 10.2 When changing the air action, it is likely that the flow direction may also need to be changed.
- For fail closed valves (air to open), flow should be over the plug
 - For fail open valves (air to close), flow should be under the plug.
 - NB : For trims smaller than 0.5 CV or 3mm, the flow direction is generally under the plug, irrespective of the fail action.
- 10.3 Reassemble the actuator in accordance with section 8. for fail open or fail closed operation.
- 10.4 For air to open, the control air port for the positioner is connected to the lower cylinder port and the balance air output to the top port.
- 10.5 For Air to close (fail open), reverse these connections on the positioner.
- 10.6 Please consult figure 4 below to verify arrangement of parts.

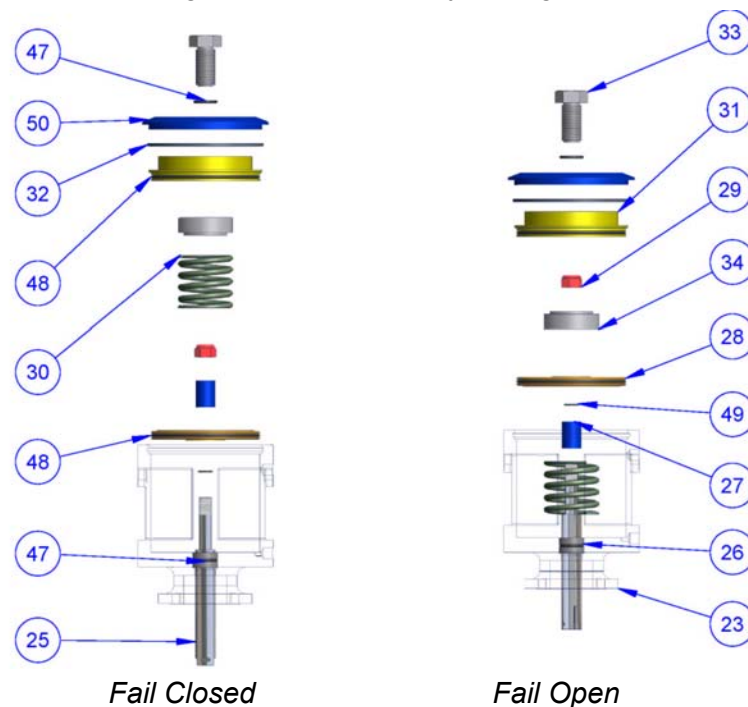


Figure 4: Cylinders with Fail Open and Fail Closed Orientation

11. POSITIONER CALIBRATION

While the valve is still in the workshop, the positioner must be calibrated. See the positioner maintenance manual for assistance in positioner set up and calibration. Once the valve is installed in the line, the unit should be tested again.

**GLOBE CONTROL VALVE – ALUMINIUM CYLINDER
INSTALLATION & MAINTENANCE MANUAL**

APPENDIX 1: TORQUE VALUES FOR BONNET NUTS

VALVE SIZE	GRADE	BOLT SIZE	TORQUE (Nm)
25mm (1")	ASTM A193 B7 (M/S)	5/8" UNC	237
	316 (A4)	St/St 5/8" UNC	144
40mm (1½")	ASTM A193 B7 (M/S)	¾" UNC	420
	316 (A4)	St/St 5/8" UNC	281
50mm (2")	ASTM A193 B7 (M/S)	¾" UNC	420
	316 (A4)	St/St 5/8" UNC	281
80mm (3")	ASTM A193 B7 (M/S)	1" UNC	1000
	316 (A4)	St/St 1" UNC	269
100mm (4")	ASTM A193 B7 (M/S)	1" UNC	1000
	316 (A4)	St/St 1" UNC	269

APPENDIX 2: TORQUE VALUES FOR PISTON SECURING NYLOK NUTS

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

APPENDIX 3: SEAT LEAKAGE MEASUREMENT

SEAT LEAKAGE	MEASURE
ANSI II.	<ul style="list-style-type: none"> • 0.5 % of rated C_v. • Used for pressure balanced trims with metal seals.
ANSI IV	<ul style="list-style-type: none"> • 0.1 % of rated C_v. • Used for all standard valves with metal seals.
ANSI V.	<ul style="list-style-type: none"> • 4 x 10⁻¹² m³/hr per mm of orifice dia per bar pressure drop
ANSI VI.	<ul style="list-style-type: none"> • Bubble tight. • Used for soft seated valves where tight shut off is important.

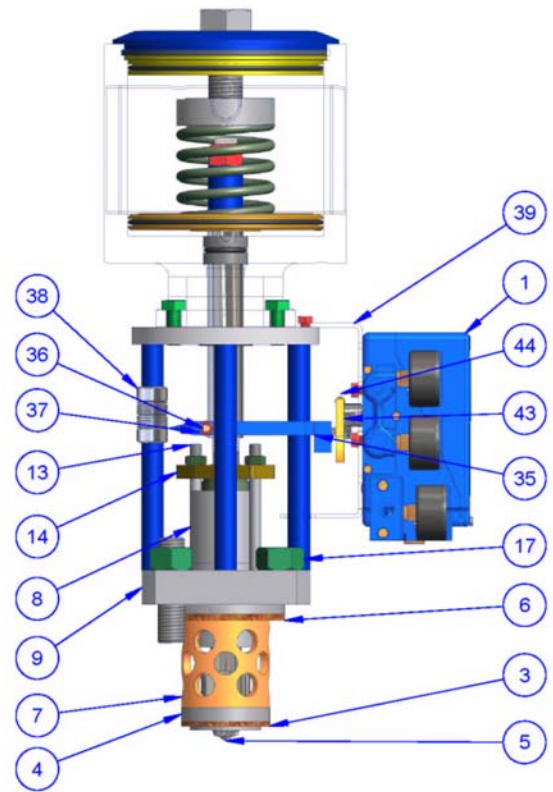
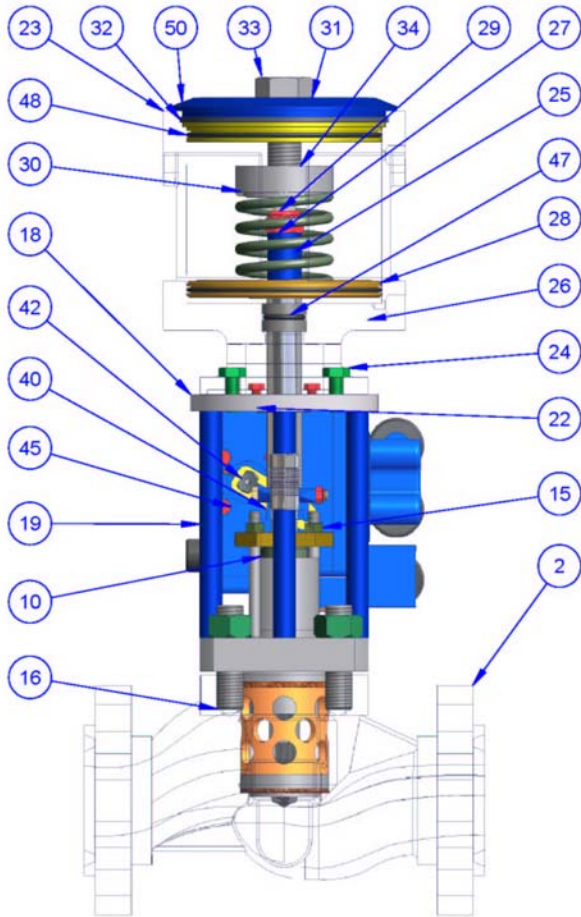
**GLOBE CONTROL VALVE – ALUMINIUM CYLINDER
INSTALLATION & MAINTENANCE MANUAL**

APPENDIX 4: TROUBLE SHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Valve operation not smooth	<ul style="list-style-type: none"> • Gland flange over tightened • Packing too dry • Poor air supply • Alignment of actuator stem and plug • Actuator faulty 	<ul style="list-style-type: none"> • Loosen Gland Flange nuts and re-tighten just over finger tight • Lubricate packing. <p>Warning : Do not use oil on valves for oxygen service</p> <ul style="list-style-type: none"> • Check air supply pressure to actuator during operation • Check actuator cylinder is square and tight on the mounting flange • Service the actuator as per the maintenance manual.
Valve passing excessive product when closed	<ul style="list-style-type: none"> • Poor air supply • Calibration out • Actuator cylinder passing air • Plug not achieving full travel • Incorrect flow direction • Damaged seat or plug surfaces 	<ul style="list-style-type: none"> • Check the air supply during operation • Check the readings on the positioner gauges and re-calibrate, if necessary. • Check for air leaks using soapy water at the cylinder cap and neck air connections by removing one supply pipe whilst stroking the valve. • Check plug travel against indicator plate • Check that the flow corresponds with the flow direction arrow on the valve. • Check the plug and seat as per the maintenance manual and establish possible reasons for damage, if necessary replace trim with material more suited to counter the damage.
Valve not opening fully	<ul style="list-style-type: none"> • Poor air supply • Calibration out • Actuator cylinder passing air • Plug not achieving full travel 	<ul style="list-style-type: none"> • Check air supply during operation • Check readings on positioner gauges and re-calibrate if necessary • Check for air leaks using soapy water at the cylinder cap and neck air connections by removing one supply pipe whilst stroking the valve. • Check plug travel against indicator plate
Poor Control	<ul style="list-style-type: none"> • Poor air supply • Speed and accuracy of response 	<ul style="list-style-type: none"> • Check air supply during operation • Check that the speed of response and the position of the plug correspond with the signal changes
Excessive noise	<ul style="list-style-type: none"> • Cavitation (liquid) • Flashing (liquid) • Velocity (gas) 	<ul style="list-style-type: none"> • Check trim types for the application • Check trim types for the application • Refer to supplier

**GLOBE CONTROL VALVE – ALUMINIUM CYLINDER
INSTALLATION & MAINTENANCE MANUAL**

APPENDIX 5: VALVE PARTS IDENTIFIER



**GLOBE CONTROL VALVE – ALUMINIUM CYLINDER
INSTALLATION & MAINTENANCE MANUAL**

APPENDIX 6: VALVE PARTS DESCRIPTION

ITEM	DESCRIPTION		ITEM	DESCRIPTION
1	Positioner		26	Stem Bushing
2	Body		27	Actuator Spacer
3	Seat Gasket		28	Piston
4	Seat Ring		29	Nut Nylok - Piston Retaining
5	Plug		30	Spring
6	Bonnet Gasket		31	Cylinder Cap
7	Retainer		32	Cylinder Cap Circlip
8	Bonnet		33	Adjusting Screw
9	Bonnet Flange		34	Spring Button
10	Guide Retainer		35	Stem Clamp
11	Guide Liner		36	Stem Clamp Bolt
12	Packing Spacer		37	Nut Nylok
13	Gland Flange Stud		38	Indicator Plate
14	Gland Flange		39	Positioner Bracket
15	Gland Flange Nut		40	Bolt
16	Bonnet Stud		41	Shoulder Screw
17	Bonnet Nut		43	Feedback Arm
18	Mounting Flange (Actuator)		44	Positioner Capscrew
19	Mounting Bar		45	Star Washer
20	Screw - Mounting Flange		46	Packing Braid
21	Wiper Adapter		47	Actuator Stem "O" ring
22	Wiper Rod		48	Piston / Cylinder "O" ring
23	Cylinder		49	Piston Stem "O" ring
24	Actuator Mounting Bolts		50	Cover Ring
25	Actuator Stem		55	Insert Bolt "O" Ring