INTERVALVE® POONAWALLA LTD.

The name says it all

INTERVALVE IVC / IVCT

Wafer Type Swing Check Valve (Simple Solution for Back Flow Prevention)

Intervalve check valve models IVC and IVCT are primarily single plate swing check valve with a short pattern wafer body conforming to theAPI6D and ASME B16.10 face to face dimensions. The valve has a simple but reliable & robust construction. The low inertia disc design enables the valve to open or close with a very low differential pressure which make them ideal for services operating under low differential pressures.

The valve is ideal for pump discharge duties. The eccentric mounted hinge pin is combination with the disc seat guarantees a positive shut off of the returning media.

The short face to face dimensions and low weight allows a simple space saving installation between the mating companion flanges. The valves are suitable for mounting between weld neck or slip on type companion flanges of different standards. The need for flange gaskets during installation is totally eliminated in the case of IVC model due to the in-built face sealing 'O' rings provided on the sealing face. Gaskets are recommended while installing IVCT model valves.

Conformity to Codes & Standards :

General design & Face to Face Dimensions	:	API 6D /ASME B 16.10
Valve testing	:	API 598
Flange standard	:	ASME B 16.5 #150, DIN EN1092-PN10 & PN 16 BS 10 Table D & E

Technical specifications :

• Valve type	:	Self Acting Non Return Valve
• Description	:	Single Plate Wafer Type Swing Check Valve
• Body type	:	Short Pattern wafer Type
• Disc type	:	With Integral Hinge pin
• Model Nomenclature	:	IVC Check Valve with Rubber 'O' Ring Seat and Face Sealing IVCT Check Valve with PTFE Seat and Serrated Contact Faces
• Size range	:	IVC- DN 25 to DN 900 / IVCT DN 25 to DN 600
• Pressure rating		PN16 (max) for sizes up to DN 600 & PN 10 for Sizes ≥ DN650
• Operating temperaturc range	:	-25°C to 200°C (depending on MOC)
• Seat leakage	:	Zero Leak / Tight shut off
• Standard Material of Construction (MOC)		
Body & Disc	:	SGI / WCB / CF8 / CF8M /CS - IS2062
Seat	:	EPDM / Viton / Nitrile / Neoprene / Hypalon - for IVC PTFE or GFT - for IVCT

DIMENSIONS (mm)

VALVE SIZE	ØA	B	ØC				
			PN10	PN16	BS10D	BS10E	ANSI#150
25	14	16	72	72	69	69	64
40	22	19	93	93	86	86	83
50	30	19	108	108	97	97	102
65	40	19	128	128	110	110	121
80	52	19	143	143	129	129	134
100	71	19	163	163	161	161	172
125	93	19	193	193	193	193	194
150	114	19	219	219	218	215	220

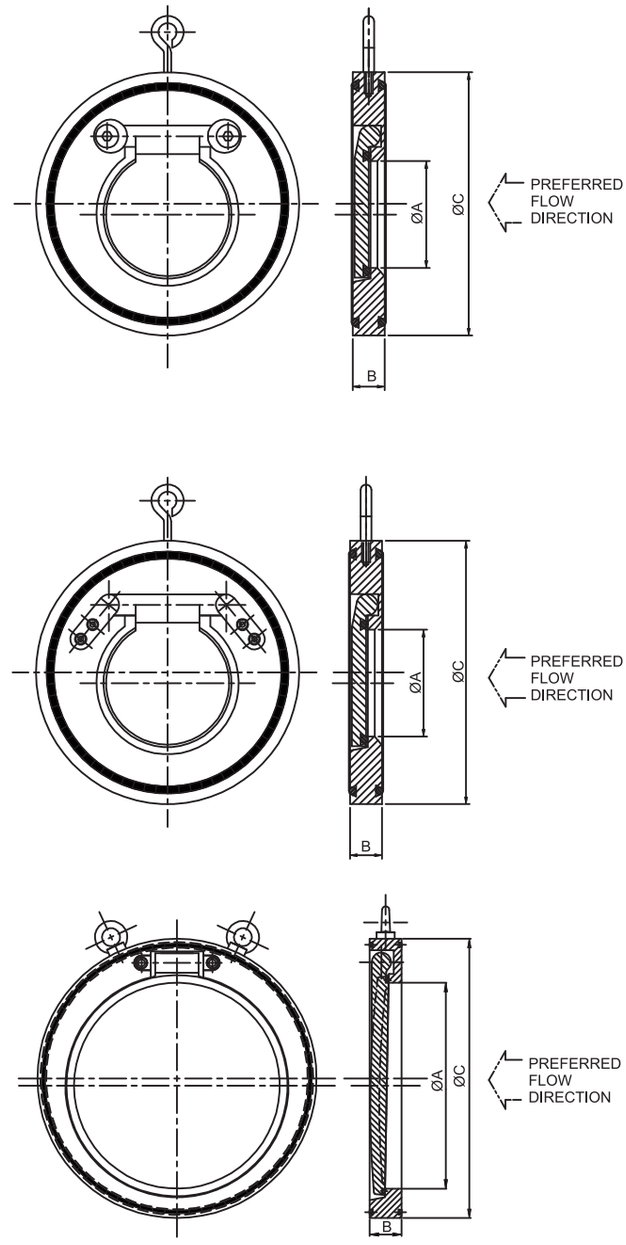
DIMENSIONS (mm)

VALVE SIZE	ØA	B	ØC				
			PN10	PN16	BS10D	BS10E	ANSI#150
200	157	28.5	274	274	274	272	277
250	195	28.5	329	329	335	335	337
300	230	38	379	385	385	383	407
350	270	44.5	438	444	446	446	448
400	310	51	489	496	496	496	512
450	360	60.5	538	555	559	559	545
500	406	63.5	593	616	616	616	602
600	490	70	695	733	727	724	714

DIMENSIONS (mm)

VALVE SIZE	ØA	B	ØC			
			PN10	PN16	BS3293	API 605/ANSI B16.47 S.B.
650	530	80	-	-	774	722
700	570	89	811	802	832	773
800	652	102	918	912	940	878
900	715	127	1017	1011	1047	984

IVC Check Valve



Key Features :

- Very low face to face dimensions hence space required for mounting is less than 10% of that of conventional valves.
- Very low weight - total weight is only approximately 1/6 the weight of a conventional check valve.
- Short wafer body enables mounting the valve with shorter length fasteners of lesser number compared to flanged swing check valve. Approximately 50% saving in cost of fasteners.
- Considerable secondary advantages resulting in substantial savings in handling, packing, transportation, installation and maintenance.
- Saving in terms of overall length required for piping.
- Tightening torque to be applied on the companion flange bolting is lower due to face sealing O-rings.
- Practically maintenance free due to fewer number of parts and simple construction.
- Self centering in pipeline due to controlled outside diameter, enables easy installation.

INTERVALVE® POONAWALLA LTD.

The name says it all

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E-mail : intervalve@poonawallagroup.com www.poonawallagroup.com

INTERVALVE® POONAWALLA LTD.

The name says it all

INTERVALVE IVGKL

Superior performance at reduced cost

Rubber Lined Butterfly Valves for HVAC & Utilities

Intervalve's GKL series valves are designed to meet the demanding requirements of the general utility valve market with the HVAC segment in particular. IVGKL is a truly fit & forget valve, which requires minimal maintenance.

The body liner which also functions as the soft seat, comes in an integrally moulded (bonded) version and offers 100% bi-directional sealing. The wafer style body has universal design to fit between pipe flanges of almost all popular flange standards.

Conformity to Codes & Standards :

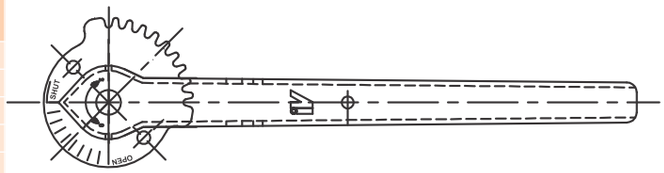
General design and manufacturing	:	EN 593
Valve face to face dimensions	:	EN 593 / API 609 category A / Short wafer as per ISO 5752 Tab 5
Top flange drilling	:	ISO 5211
Valve inspection and testing	:	EN 12266 PART 1
Flange standard	:	DIN EN 1092 - PN6 /PN 10, Class 150, JIS5K / 10K, BS10 Tab D&E, IS 6392 Tab 11 / 17

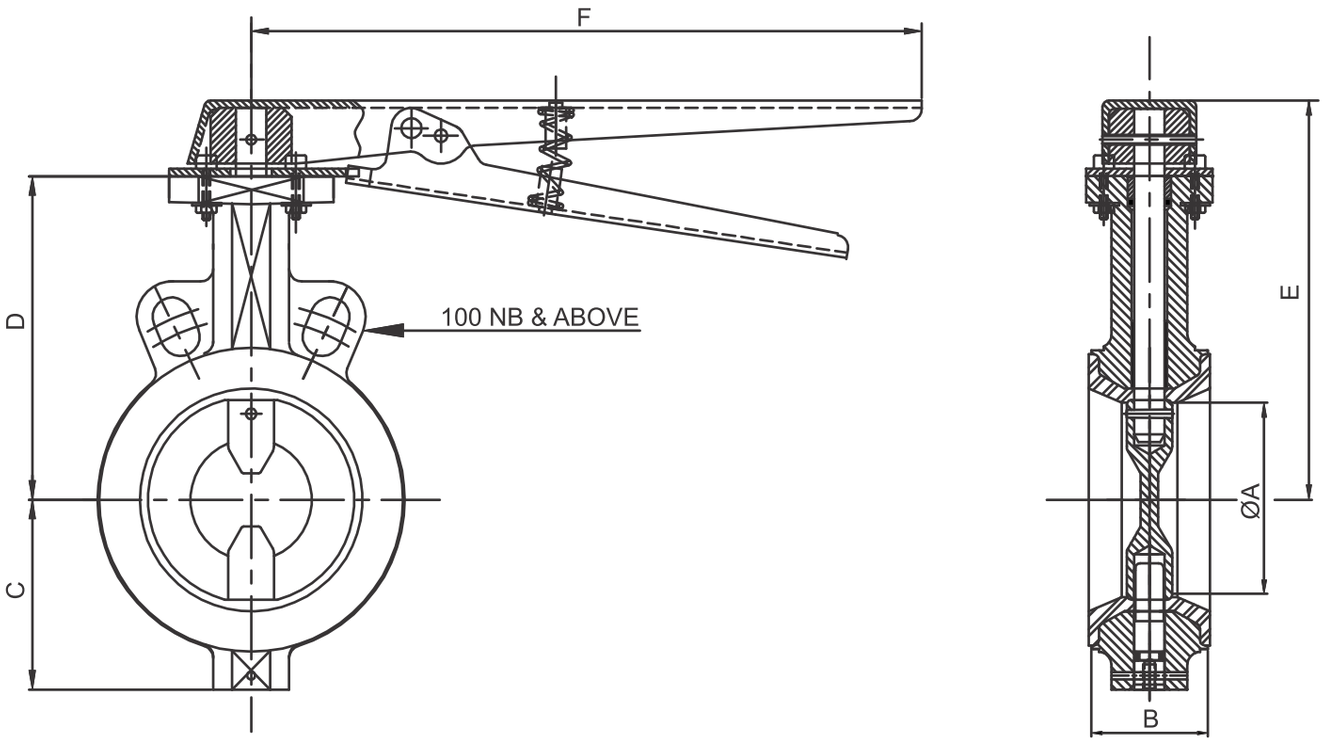
Technical specifications :

• Valve type	:	Centric Disc Rubber Lined Butterfly valve with a single piece body.
• Body type	:	Short wafer (Sandwiched between flanges)
• Seat type	:	Integrally moulded with the body.
• End Connection	:	Wafer Sandwiched
• Size range	:	DN40 to DN200
• Pressure rating	:	PN16 (max)
• Operating temperature range	:	-25^{0}C to 80^{0}C
• Seat leakage	:	Tight shut off (Bi-directional)
• Operation	:	Handlever for sizes from DN40 to DN200
• Standard Material of Construction (MOC)		
Valve Body	:	CI (IS 210 FG 260)
Valve Disc	:	SGI (GGG 40)
Seat liner	:	Nitrile
Drive end and non end shaft	:	SS 410

DIMENSIONS (mm) with Pressed Steel Handlever

VALVE SIZE	ØA	B	C	D	E	F	WT.(kg) Approx.
40	40	33	53	103	133	265	1.8
50	50	43	59	113	143	265	2.2
65	65	46	67	121	151	265	2.7
80	80	46	75	128	158	265	3.3
100	100	52	94	146	176	265	5.0
125	125	56	108	158	188	265	6.5
150	150	56	120	174	206	375	8.0
200	200	60	147	198	230	375	11.0





Key features :

- Integrally moulded seat liner on the body, which ensures excellent dimensional stability & guaranteed seat tightness.
- Seat liner extending on to the contact faces ensures perfect sealing and eliminates the need for separate flange gaskets.
- Unique triple sealing system for shaft sealing ensures zero leakage of the media past the shaft seals.
- Narrow land disc ensures perfect sealing with least operating torque requirements.
- A fully universal body design ensures fitment of the valve between companion flanges of all popular standards (viz : ANSI, BS, DIN, JIS, IS etc).
- A ten position notch disc and handlever ensures locking of the valve in 8 intermediate position in addition to closed and open position. Handlever lockable through pad lock for tamper proof positioning.
- Body castings made of superior FG 260 grade cast iron to ensure additional strength.
- Valve disc made of ductile cast iron instead of cast iron to withstand against possible water hammer or pressure surges.
- A truly line size body bore to ensure maximum flow capacity with the lowest pressure drop.
- Shafts made of martensitic stainless steel to ensure maximum strength and torsional rigidity.
- Both top and bottom shaft swiveling are guided by self-lubricated PTFE bearings.
- Fool proof handlever designed to prevent accidental pinching of hand between the handle and locking lever.

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E-mail : intervalve@poonawallagroup.com www.poonawallagroup.com

INTERVALVE® POONAWALLA LTD.

The name says it all

Ball Valves Series Intervalve I8F

Class 600/800, Regular/Full port, Screwed, Socket, Butt Weld Floating design

3-PIECE BALL VALVES / 2-WAY.

- 3-Piece swing-Out Design, Easy In-lineMaintenance.
- ISO 5211 Mounting Pad
  Allows for mounting of actuator.
- Maintenance free live loaded double sealing stem packing ensures high cycles life and positive sealing.
- Blow-Out Proof Stem.

The 3-piece design is available for varoius schedule pipes. This type of construction is of swing-out design and easy inline maintenance. By removing body bolts & nuts the complete valve may be lifted out of the line or swing-out by keeping one bolt. The valve can easily swing out of the line providing complete entry and fast disassembly or maintenance. The swing away feature also maintains pipe alignment during inline maintenance. The 3-piece design offers the function of both valve as well as a union. It can be used in screw pipe ends, socket weld pipe ends, butt weld ends, extended butt weld pipe ends. These ball valves can be easily used for automation by using pneumatic and electric actuators.

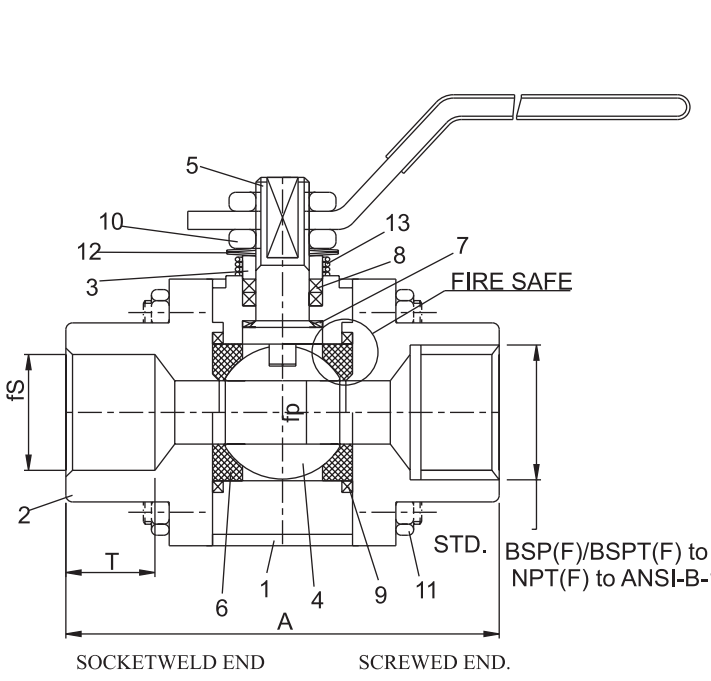
Conformity to codes & standards:

General design & manufacturing.	:	EN-17292 API-6D
Valve face to face dimensions.	:	Manufacturers standard.
Valve inspection & testing	:	EN 12266
	:	Hydro shell: 211 kg/sq.cm
	:	Seat test : 69 kg/sq.cm
	:	Air seat : 7 kg/sq.cm
Special features	:	Fire safe to API-607/6FA
		Metal to Metal Seat

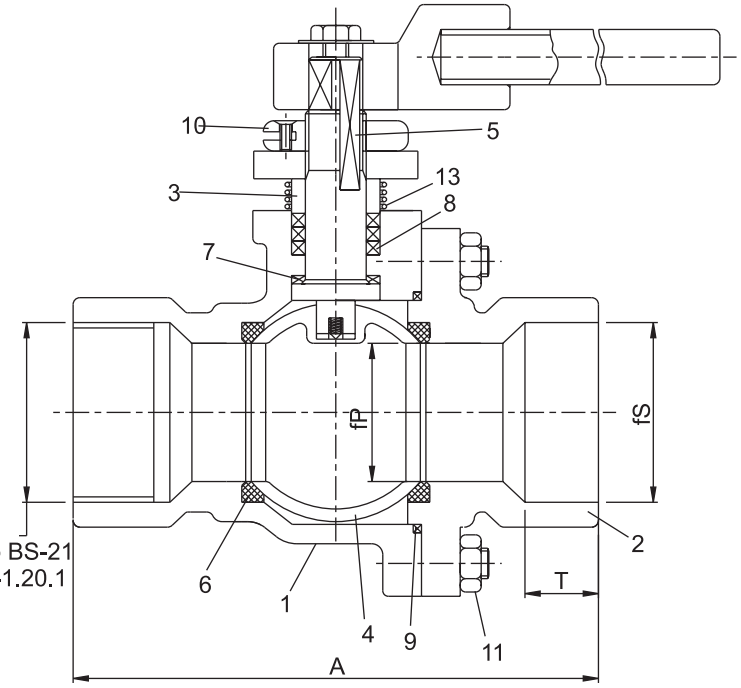
Technical specification:

Valve type	:	Floating design ball valve.
Body type	:	3 pc
Seat Type	:	Soft / Metal.
End connection	:	Screwed, socket & butt weld ends./Nipple Extn.
Size range	:	15NB to 50NB
Pressure rating	:	Class 800
seat leakage	:	Class VI - soft seat, Class V-Metal seat.
Operation	:	Hand lever/ Gear / Actuator (Electrical / Pneumatic).

CLASS 600 / 800 FLOATING DESIGN BALL VALVE



REDUCED PORT



FULL BORE

Dimensional Data In mm

Size	A	fP		fS	T
		RP	FB		
15	65	9.5	13	21.8	10
20	75	13	19	27.4	13
25	88	19	25	34.1	13
32	105	25	32	42.7	13
40	115	32	38	49	13
50	125	38	50	61	16

Standard material of construction:

1. Body : A105, WCB, CF8, CF8M, CF3, CF3M, F304, F316, CN7M.
2. Pipe end : A105, WCB, CF8, CF8M, CF3, CF3M, F304,F316,CN7M.
3. Gland : ANSI410, 304, 316, 316L, MONEL, ALLOY20, HAST-B, C.
4. Ball : ANSI410, 304, 316, 316L, MONEL, ALLOY20, HAST-B, C.
5. Stem : ANSI410, 304, 316, 316L, MONEL, ALLOY20, HAST-B, C.
6. Seat : PTFE, GFT, CFT / Metal to Metal / Delrin, Nylon.
7. Stem seal : GFT
8. Gland Packing : PTFE, Grafoil.
9. Body seal : PTFE, Grafoil.
10. Gland nut : Carbon steel.
11. Body stud/nut : B7/2H, B8/B8M.
12. Belleville spring : Spring steel
13. Antistatic spring : SS 304

Valves above 50 mm size can be offered in 2-Piece Design on request, solid ball on request.
All sizes of ball valves can also be provided with Gear, Actuator (Electrical/ Pneumatic).
For Cast Valves, Pressure rating will be class 600
For forged Valves, Pressure rating will be class 800

IMPORTANT : READ THIS MANUAL THOROUGHLY BEFORE INSTALLATION OR SERVICING

CONTENTS :

1. DESCRIPTION :

Solenoid valve is a pilot device which on receiving signal, directs air supply to service ports 'A' or 'B'.

Generally 3/2 valve is used for Single Acting (Spring Return) Actuators and 5/2 for Double Acting Actuators.

Solenoid valves with NAMUR port configuration can be directly mounted on the Actuator using 2 nos. of M5 screws, thus eliminating the requirement of brackets, connectors and piping. Ensure the presence of O-rings on the interface of the valve and Actuator before assembly.

Compressed air supply connection is made to P (1) port of the Solenoid Valve.

2. OPERATION :

SINGLE ACTING : (SPRING RETURN)

When the Solenoid (in standard version of a 3/2 spring offset fail close valve FIG. 1a) is energized, air supply is established to port “A” thereby pressurising the centre chamber of the Z Actuator. This results in the outward movement of the pistons. Air from the end chambers of the Actuator is pushed out through port 'B' of the Actuator and exhaust to the atmosphere.

When the Solenoid is de-energised reverse action takes place. Compressed springs push the piston inward. Air from the centre chamber is pushed out through port 'A' and in turn through the Solenoid Valve, exhaust to the atmosphere.

3. SPECIFICATIONS :

NO. OF POSITION	:	2/3
NO. OF PORTS	:	2/3/4/5
CONTROL ELEMENT	:	POPPET / SPOOL
AIR CONNECTION	:	$^1/_4$", $^3/_8$" OR ½" BSP / NPT
TYPE OF OPERATION	:	ELECTRICAL / SPRING RETURN / SPRING CENTRED
ELECTRICAL SOLENOID VOLTAGE	:	AC / DC VOLTAGE 12/24/110/220
ELECTRICAL CONNECTION	:	FLYING LEAD / PLUG IN TERMINAL BOX / FLAMEPROOF ENCLOSURE
ENVIRONMENTAL PROTECTION	:	IP 55/65/67 IIA / IIB, IIC, INTRINSICALLY SAFE

SYMBOL

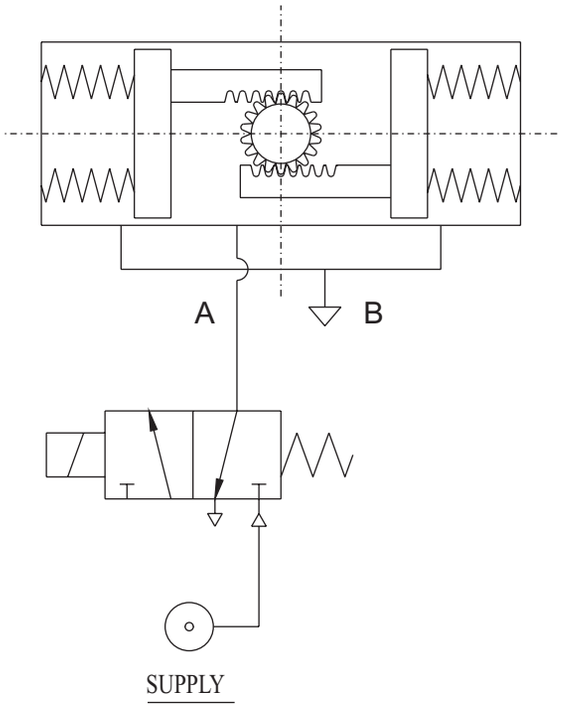
a) NORMALLY CLOSE **b) NORMALLY OPEN**

FIG. 1

3/2 SOL VLV

4. LOGIC DIAGRAMS :

EXAMPLE

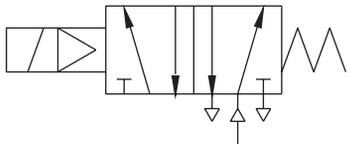


SPRING RETURN ACTUATOR AND 3/2 SOLENOID VALVE

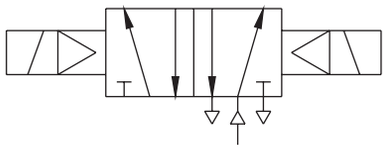
SYMBOL

FIG. 2

5/2 SOL VLY



a) SINGLE COIL



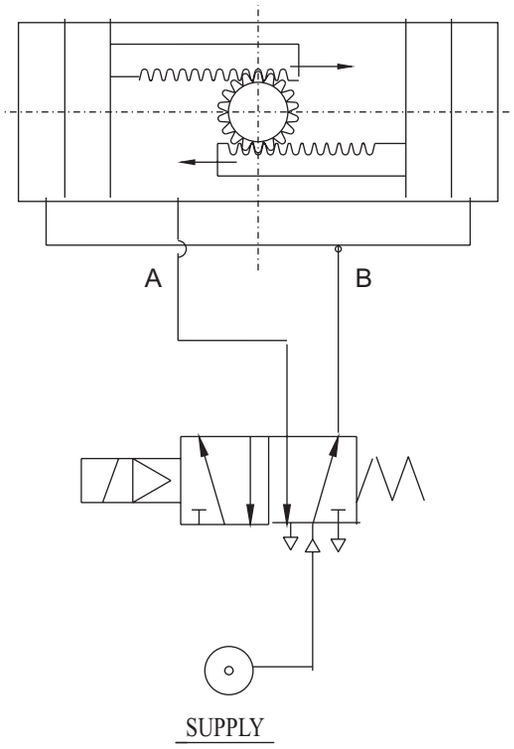
b) DUAL COIL

DOUBLE ACTING : (TWO POSITION)

When the Solenoid (in standard version of a 5/2 spring offset fail close valve, FIG. 2a) is energized. air supply is established to port 'A', thereby pressurising the centre chamber of the Actuator. This result in the outward movement of the pistons. Air from the end chambers of the Actuator is pushed out through port 'B' of the Actuator and in turn through the Solenoid Valve, exhausts to the atmosphere.

When the Solenoid is de-energised, reverse action takes place. Air supply is established to port 'B' pressurising the outer chamber of the Actuator. This results in the inward movement of the pistons. Air from the centre chamber is pushed out through port 'A' and in turn through the Solenoid valve exhaust to the atmosphere.

EXAMPLE



DOUBLE ACTING ACUATOR AND 5/2 SOLENOID VALVE

DOUBLE ACTING : (THREE POSITION)

This Solenoid valve uses two Solenoids. When one of the Solenoids is energised, air supply is established to port 'A' there by pressurising the centre chamber of the Actuator. This results in the outward movement of the pistons. Air from the end chambers of the Actuator is pushed out through port 'B' of the Actuator and in turn through Solenoid Valve exhaust to the atmosphere.

When the Solenoid is de-energised, the valve comes to mid position and system will be in stay put condition in the case of fig 3a and in float condition in the case of FIG. 3b.

When the second solenoid is energised. reverse action takes place. Air supply is established to port 'B' pressurizing the outer chamber of the Actuator. This results in the inward movement of the pistons. Air from the centre chamber is pushed out through port 'A' and in turn through the solenoid valve exhaust to the atmosphere.

When the solenoid is de-energised. the valve comes to mid position.

SYMBOL

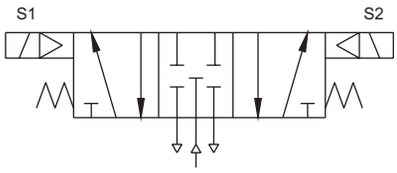
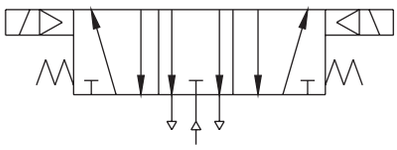


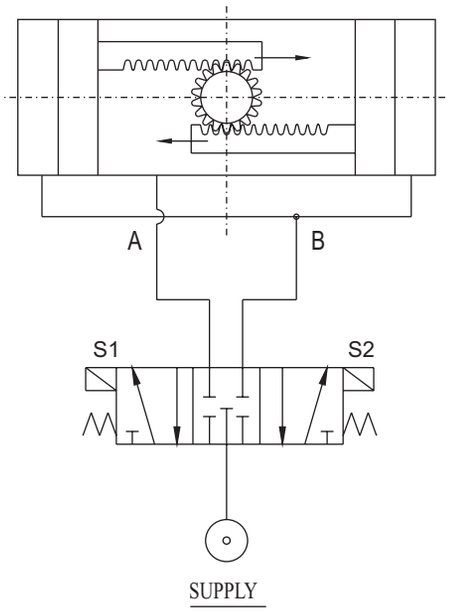
FIG. 3
5/3 SOL VLV

a) STAYPUT



b) FLOAT

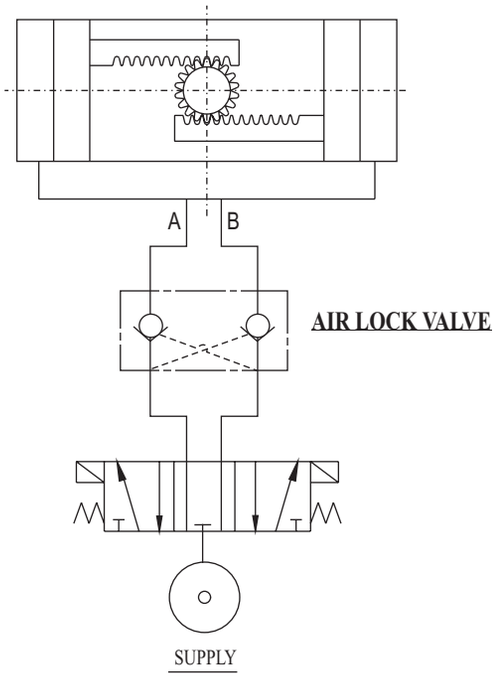
EXAMPLE



DOUBLE ACTING ACTUATOR AND 5/3 SOLENOID VALVE

ELECTRICAL FAIL TO STAYPUT

EXAMPLE



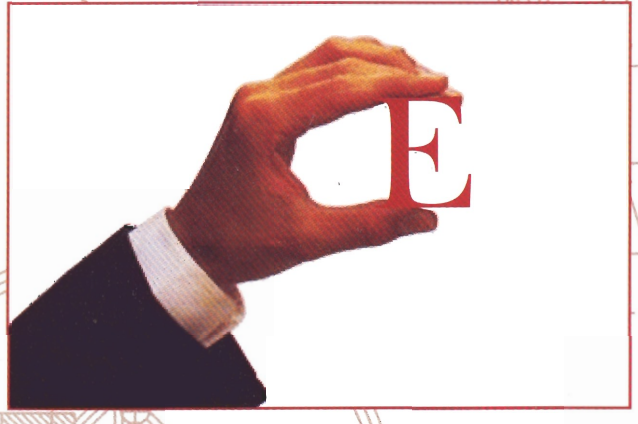
DOUBLE ACTING ACTUATOR AND 5/3 SOLENOID VALVE

AIR & ELECTRICAL FAIL TO STAYPUT

EL-O-MATIC (INDIA) PVT. LTD.

(IN COLLABORATION WITH EL-O-MATIC B.V. OF HOLLAND)

POONAWALLA GROUP



ENGINEERING MANUAL

CONTENTS

PRECAUTION

!	**READ THIS MANUAL THOROUGHLY BEFORE ATTEMPTING TO INSTALL OR SERVICE THIS EQUIPMENT.**

!	**PAY CAREFUL ATTENTION TO THE PRECAUTIONARY INSTRUCTIONS GIVEN AT VARIOUS PLACES IN THE USER MANUALS IN OUTLINE BOXES.**

SECTION 1

PRELIMINARY INFORMATION

1.1 How to use this manual

Section 1 of this manual contains instructions relating to how to use this manual, ordering spares.
Contact your nearest branch of our headquarters if you require :

- Service Assistance
- Spare parts
- Actuators or valve / actuator systems

Section 2 gives details which are specific to this order: Customer's order reference, our works reference, and scope of supply. Drawings of the valve / actuator systems supplied are also given in this section.

Section 3 contains separate manuals for each major component of the valve / actuator systems supplied under this order. Each user manual is complete with respect of the system component it covers. It includes detailed specifications, standard drawings, and instruction, disassembly, re-assembly, and trouble shooting.

1.2 How to order spares :

Spares for El-o-matic Actuators and valve actuator systems can be ordered through the El-o-matic Branch office nearest to you.

PLEASE FOLLOW PART NUMBERS AND PART NAMES ACCURATELY AS GIVEN IN THE USER MANUALS. OTHERWISE, IT CAN LEAD TO ERRORS AND / OR DELAYS IN EXECUTING ORDERS.

IMPORTANT : READ THIS MANUAL THOROUGHLY BEFORE INSTALLATION OR SERVICING

CONTENTS :

1. DESCRIPTION :

El-o-matic Pneumatic Actuators are pneumatic quarter turn (90°) actuators, Special versions are available for half turn (180°) applications. The design utilizes a double rack and single pinion. A unique patented features of the actuator is the application of a 3 point support for pistons. Three carbon filled Teflon guide bands are a balanced piston and the cylinder walls which eliminates wear and increases the actuator life.

The unit has an extended top shaft and a complete modular design which allows simple attachment to a variety of control accessories.

The bottom mounting pad of the actuator is as per ISO 5211. Thus it can be directly mounted on any valve which conforms to ISO 5211 flange configuration.

Details relating to dimensions, assemblies, part list, and materials are given in the drawings / data sheets in sections 13, 14, 15 and 16.

180° actuators are available only in the' P series. (Type PD and PE). Dimensions of 180° actuators correspond to those of 90° actuators. Torque ratings of 180° actuators are different.

2. SPECIFICATIONS :

P SERIES

1. Pressure range : PD - 0.2 to 10 bar
   PE - 6 to 10 bar standard springs
   PE - 3 to 10 bar, reduced springs
2. Torque : 23 to 4955 Nm, at 6 bar working pressure
3. Media : Air (dry or lubricated) non-corrosive gas or light hydraulic oil
4. Construction : Suitable for indoor or outdoor Installation
5. Temperature : -20° C to +80° C
6. Rotation : Counter-clockwise to open, with port "A" pressurized.
   Spring return actuators air fail to close, clockwise
7. Movement : 91.5° from - 0.5 CW to 91° CCW
8. Lubrication : Factory lubricated for the normal life of the actuator.

Actuator size (PD or PE)		60	150	280	500	750	1100	2500	4000	Units
Bore		80	110	135	164	200	210	300	325	mm
Stroke		18.8	25.1	31.4	37.6	37.6	50.3	56.8	81.7	mm
Weight	PD	2.6	5.3	9.2	14.0	22.4	30.8	64.7	97.8	kg
	PE	3.0	6.4	11.6	19.2	33.4	41.5	97.9	143.0	kg
Operating time (standard)		1.2	2.3	3.4	4.2	4.8	6.0	7.0	12.0	sec.
Air Consumption	Port A	0.27	0.60	1.50	1.90	3.20	4.20	8.00	13.50	Litres
(actual volume at 1 atmosphere)	Port B	0.38	0.80	1.60	2.50	4.20	5.40	9.30	17.50	Litres

E SERIES

1. Pressure range : ED : 0.2 to 10 bar
   ES : 6 to 10 bar standard springs
   ES : 3 to 10 bar, reduced springs
2. Torque : 9 to 251 Nm, at 6 bar working pressure
3. Media : Air (dry or lubricated) non-corrosive gas or light hydraulic oil
4. Construction : Suitable for indoor or outdoor Installation
5. Temperature : -20° C to +80° C
6. Rotation : Counter-clockwise to open with port "A" pressurized.
   Spring return actuators air fail to close, clockwise
7. Movement : 91.5° from -0.5° CW to 91° CCW
8. Lubrication : Factory lubricated for the normal life of the actuator

Actuator size (ED or ES)		12	25	40	100	200	350	600	950	1600	Units
Bore		46	56	70	91	110	145	175	200	230	mm
Stroke		12.6	15.7	18.8	25.1	37.7	37.7	44.0	50.3	62.8	mm
Weight	ED	0.61	1.3	2.0	3.7	6.8	10.4	19.4	26.4	42.7	Kg
	ES	0.67	1.7	2.6	5.0	10.3	16.9	27.6	38.6	65.8	Kg
Operating time (Standard)		0.4	0.5	0.7	1.2	2.3	3.6	3.6	5.4	6.9	Sec
Air Consumption	Port A	0.05	0.10	0.16	0.35	0.80	1.80	2.90	4.70	7.30	Litres
(Actual volume at 1 atmosphere)	Port B	0.06	0.11	0.22	0.49	1.00	1.90	3.10	4.90	8.00	Litres

3. ORIENTATION :

The actuator is normally installed with its major axis parallel to the pipeline. The actuator can be oriented above, beside or beneath the valve without affecting its operation.

The unique full machined shaft and square drive mounting pattern .allows reorientation of the actuator to accommodate installations where physical obstructions might otherwise be prohibitive.

All El-o-matic actuators feature a blow out proof shaft design. This means that the pistons must be removed before the shaft can be reoriented.

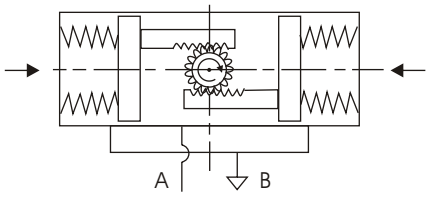
4. AIR SUPPLY :

El-o-matic actuators are factory lubricated. For optimum operation, the use of clean, dry air / gas is recommended. Lubricated air is not necessary.

Standard double acting actuators require 1 to 8 bar air supply pressure and spring return actuators 3 to 8 bar.

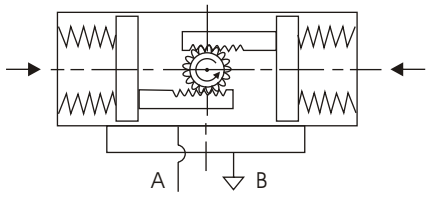
5. OPERATION :

The El-o-matic actuator drive shaft rotates through a full 90° (180° actuators are available on special order). Rotation is accomplished by feeding supply air into the center chamber (through port A) forcing the two opposing pistons outward, resulting in counter-clockwise rotation of the drive shaft to the 'Open' position.



ACTUATOR ASSY. MODE-A
SPRING TO CLOSE - CW

FIG. 1



ACTUATOR ASSY. MODE-D
SPRING TO OPEN - CCW

For double-acting actuators, closure is obtained by feeding supply air into the end cap chambers (through port B) which forces the pistons inward, resulting in clock-wise rotation of the drive shaft.

For spring return actuators, closure is accomplished by means of springs contained in the end cap chambers, which force the pistons inward when the supply air to the center chamber (port A) is allowed to exhaust.

To reverse the stroke direction of the actuator, remove both the pistons, rotate them by 180° and re-install. This will reverse the direction of rotation of the output shaft. (see FIG.1).

6. MANUAL OPERATION :

In the event of air failure, the actuator can be cycled manually. This is accomplished by applying a wrench to the exposed top shaft of the actuator and turning it in the desired direction. This is not recommended on Model PD 500 and larger size of actuators. For these, El-o-matic offers, optional Manual Override gear units, with declutchable hand wheels. Manual wrench is not recommended for spring return actuators.

CARE MUST BE TAKEN TO ENSURE THAT THE ACTUATOR IS NOT OPERATED AUTOMATICALLY THROUGH AIR SUPPLY WHILE MANUAL OPERATION IS BEING PERFORMED!

Air must be allowed to exhaust from the actuator for manual operation. This may call for disconnecting air lines or providing three-way vent valves at inlet ports, depending on the pneumatic circuits.

7. AIR CONSUMPTION :

The charts showing the amount of air consumed per 90° of stroke in litres / stroke are given in specifications above.

8. MAINTENANCE :

THE ACTUATOR MUST BE ISOLATED BOTH PNEUMATICALLY AND ELECTRICALLY BEFORE ANY MAINTENANCE IS CARRIED OUT!

Periodic checks should be performed to make sure that all fasteners remain tight.

All actuators are supplied with sufficient lubrication for their normal working life. If required, recommended lubricant for all standard actuators is GREASE SERVOGEM 2. Consult El-o-matic for lubricants used for high or low temperature applications.

Depending upon the conditions under which the actuator must work such as extended duty, non-compatible operating media, or abnormal operating conditions, periodic replacement of internal seals is recommended. Repair kits containing all necessary seals can be ordered from El-o-matic.

On spring return actuators, the springs may need replacement after extended duty, since springs may be subject to fatigue.

SPRINGS SHOULD ALWAYS BE REPLACED IN COMPLETE SETS ONLY !

Spring kits are available from El-o-matic.

9. RECOMMENDED SPARES / REPAIR KIT :

All soft seals, bearings and non-reusable parts are included in the recommended spare part kit.

Each kit includes:

Guide band, piston	2 nos.
Guide band, housing	1 / 2 nos.
O-rings, piston	2 nos.
O-rings, endcap	2 nos.
O-rings, shaft	2 nos.
Guide bush, shaft	1 no.
Bearing band, shaft	1 no.
Washer, shaft	1 no.
Circlip, shaft	1 no.
Passage O- rings	2 / 4 nos.

The spare parts kit is identical for both the double-acting and the spring return models. For the spring return models, it is safe to have a set of spare springs for each different model in addition to the recommended spare parts kit. Keep in mind that, when necessary springs are to be replaced in complete set.

Racks are not recommended for replacement, instead, piston-rack assemblies should be replaced, if required.

10. DISASSEMBLY :

Before disassembling any actuator, be sure that the complete repair kit is available and that the kit has been checked for all parts.

1. Disconnect the air supply and electrical service to the actuator.

2. Remove the actuator from its mounting bracket.

DISASSEMBLY AND REASSEMBLY OF THE ACTUATOR MUST BE DONE IN CLEAN, DUST FREE ENVIRONMENTS!

BALL VALVES AND PLUG VALVES CAN TRAP PRESSURIZED MEDIA IN THE CAVITY. ISOLATE THE PIPING SYSTEM IN WHICH THE ACTUATOR VALVE ASSEMBLY IS MOUNTED AND RELIEVE ANY PRESSURE ON THE VALVE

3. Remove solenoid valve by unscrewing the mounting screws. Take care to retain the solenoid valve O-rings.

4. Each endcap is fitted into the body with a set of end cap bolts. Remove all endcap bolts from both endcaps by loosening them evenly and a little at a time. After the screws are removed, gently pry off each endcap being careful not to damage the endcap O-rings.

IF THE ACTUATOR IS A 'SPRING RETURN' MODE, UNIFORMLY LOOSEN ALL END CAPS . SCREWS ON EACH END CAP TWO TO THREE TURNS AT A TIME, IN SEQUENCE, TO RELIEVE PRE-LOAD OF THE SPRINGS. ON ALL ACTUATORS WITH SPRINGS, USE CAUTION WHEN REMOVING ENDCAPS !

5. The two pistons can now be removed by rotating the actuator shaft, driving the piston assembly outward until the gear rack and pinion have disengaged.

6. Remove and discard circlip and the washer from the shaft.

7. Remove the shaft through the bottom of the body.

8. All repair kit O-rings, guide bands and bearings may now be installed, if all the actuator surfaces are clean and free of grit and scratches. If the inside wall of the body is scored, the actuator will leak after Rebuilding. New 'unscored' parts should be obtained from the factory. Light tracing, barely detectable to touch is acceptable.

9. Lubricate the standard actuator thoroughly with grease Servogem 2. Apply a light film of grease to all O-rings.

10. If converting over to a 'high temperature' actuator, or rebuilding an existing one, consult El-o-matic for proper high temperature silicone or graphite base grease.

11. REASSEMBLY :

DOUBLE ACTING ACTUATOR

1. Replace the top and bottom shaft bearings.

2. Replace the shaft in the body through the bottom of each actuator body. The bottom hole in the actuator body is larger inside diameter than the top hole in the body.

3. Very carefully align the shaft square to the body.

4. Align the pinion gear so that the teeth on the center gear will 'pick-up' the piston assembly's rack teeth, when turning the top extension of the center gear clockwise (CW).

5. To ensure proper meshing of the teeth, rotate the center gear 45° (or two teeth) counter clockwise (CCW) from its normal position with the piston assemblies located at the body ends. Normal positions is that position which provides the proper output shaft orientation required.

6. With the piston assemblies in the body, gently push each piston into the body. Turn the top shaft extension clockwise (CW). At the proper point of engagement between the center gear and piston assemblies, both piston assemblies will move toward the center of the body when turning top shaft extension of the actuator clockwise (CW).

7. Once the pinion gear and pistons are properly engaged, ensure that smooth movement and 90° operation can occur without moving the pistons out of the actuator body. This is important.

8. Take care of seal O-rings while replacing the actuator endcaps.

9. Replace the washer over the top shaft extension.

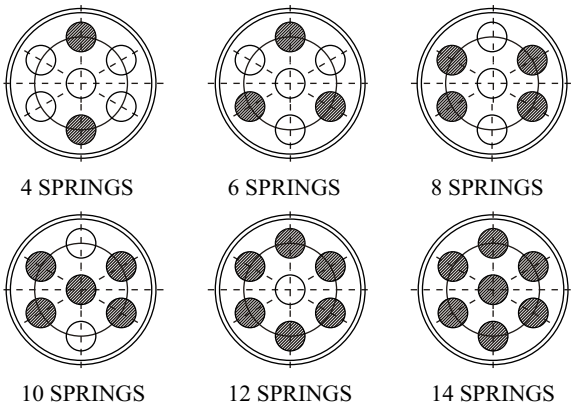
10. Install the NEW circlip into its mating groove on the top shaft extension. (The removed shaft clip is not to be re-used). When properly installed, the shaft clip should rotate freely within the groove.

SPRING RETURN ACTUATOR :

P SERIES *(Model SR)*

11. When replacing spring return actuator, ensure that the springs are replaced in their identical position in the end cap from where they were removed.

    When less than the standard number of seven springs are used in each end cap, these springs should be positioned in balanced configuration (refer FIG. 2 below)



= **SPRING.**

FIG. 2

PE SERIES ACTUATOR

12. If a spring return actuator is being repaired due to a failed spring, replace ALL the springs in this actuator, as well as any other parts which may have been damaged.

13. When replacing the springs, place the actuator body on a clean, flat surface. Position it so that it stands on one end. Ensure that the pistons are stroked fully inward toward the center of the actuator. This may be done by rotating the actuator shaft with a wrench.

14. Place the springs on the piston face, engaging them with the bosses cast into the piston.

15. Place the endcap over the springs. Align them with the corresponding bosses on the endcap.

16. Place the endcap bolts through the retention holes of the endcaps.

IF CONVERTING A DOUBLE ACTING UNIT TO SPRING RETURN, BE SURE TO USE NEW END CAPS.

17. Engage the bolts with the tapped holes in the actuator body by forcing down slightly on the cap. Tighten each bolt in SMALL and EQUAL turns.

E SERIES *(Model ES).*

18. When replacing ES springs in a spring return actuator, ensure that the springs are replaced in their identical positions in the spring pack from where they were removed.

19. If a spring return actuator is being repaired due to a failed spring, replace ALL springs in this actuator as well as any other parts which may have been damaged.

20. To change springs, open the endcaps, remove nut cover, locknut, washer and O-ring.

21. Remove the spring retaining socket bolt using a hexagon wrench.

22. Remove and (if necessary) replace springs as indicated by the spring return torque chart. Be sure that all springs are located correctly in the end cap and the spring pack retainer. (FIG. 3)

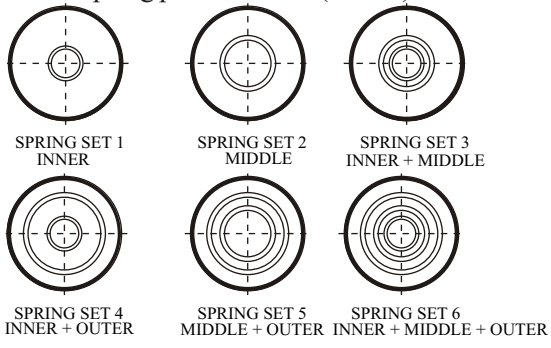


FIG. 3

= **SPRING.**

ES SERIES ACTUATOR

23. Repeat steps 20 to 22 for the other spring pack.

24. Re-assemble in reverse order. (FIG. 1)

CAUTION !

When spring return actuators are used in a highly corrosive atmosphere, or when installed in the open, there are chances of corrosive media or water entering during suction through the silencer / breather provided on the spring chamber port (Port 'B'). This may lead to corrosion to springs or excessive wear and early failure to piston sealing ring.

To avoid such problems customers are advised to use BREATHER BLOCK. Breather block avoids suction of atmospheric air into spring chamber (Port 'B'). During spring stroke it allows air from centre chamber (Port 'A') to fill the spring chamber and then exhaust to atmosphere.

12. TROUBLE SHOOTING :

ACTUATOR

For identification of all numbered parts refer to drawing numbers in sections 14 and 16.

> ! AN ACTUATOR SHOULD NEVER BE REMOVED FROM THE SERVICE(PROCESSVALVE UNDER PRESSURE

Make sure that all internal port passages are clear and free of any obstructions.

Make sure that the actuator is lubricated, and that there is no solidified grease between the pinion and the piston racks.

1. If the actuator has no lubrication, apply generous amounts of grease. If the actuator is for high or low temperature operation, consult El-o-matic for proper lubricant.
2. If solidified grease between the pinion and the piston racks is present, clean, dry, regrease and reassemble.
3. Verify that the actuator pinion shaft and / or pistons are bound. If bound, reassemble following the rebuilding Instructions.
4. If the actuator exhibits excessive amounts of backlash, check teeth in piston racks for wear. If worn, replace piston gear rack assembly.
5. In spring return actuators, check for misplaced or broken springs. If springs are broken, check the body bore for Scoring.

ACTUATOR SYSTEM

IMPORTANT: READ THESE GUIDELINES BEFORE ATTEMPTING ANY REPAIRS

SR. NO.	FAULT	PROBABLE CAUSE	REMEDIAL ACTION
A.	FOR SOLENOID OPERATED ACTUATORS :		
1.	Actuator does not function.	Valve jammed / seized.	Check valve operation through Wrench / Manual Override (MO), if provided otherwise, remove actuator and check valve for smooth operation.
		Excessive friction in valve gland.	Check gland packing, loosen gland if required.
		Solenoid valve not operating / Functioning	Check solenoid coil and ensure that specified supply voltage is applied to coil.
		Air supply not reaching actuator	Check solenoid valve operation (listen for "click" sound). Replace coil / valve if not functioning. Check pneumatic line and connections. Check air after regulator setting (use local pressure. gauge for checking supply pressure).
		Insufficient air supply pressure	Check air supply pressure and ensure specified air supply pressure.
		Manual Override engaged in manual mode (where MO is mounted)	Declutch manual override and disengage handwheel.
		Equalizing valve open (if provided - only for system with MO).	Check equalizing valve and close valve fully before giving air supply.
		Speed control valve (regulating valve) fully closed (for system with speed control valve)	Check position of speed control valve. Ensure that valve is kept partially opened.
		Actuator undersize for the given application.	Cross check valve torque requirements. Select correct size of actuator.

SR. NO.	FAULT	PROBABLE CAUSE	REMEDIAL ACTION
2.	Actuator functions but exhibits lack of power	Leakage in pneumatic line.	Check all pneumatic connections and tighten properly. Use Teflon tape / thread sealants on threads.
		Leakage across pistons or between ports A & B (can happen only due to prolonged operation over a period of time)	Pressurise port A/B and check for leakage from the others. Change sealing parts if required
		Low air supply pressure.	Check supply pressure and ensure correct air supply pressure.
		Severe misalignment between actuator and valve	Check linkage. loosen mounting bolts and align actuator correctly for friction free rotation.
3.	Full stroke of actuator not achieved	Excessive friction in gland packing	Check gland and loosen if required.
		Excessive clearance / play in adaptor / linkage	Change adaptor.
		Mounting bolts loose or wrongly Oriented	Align correctly and tighten bolts.
		Limit stops on actuator (if provided, not set correctly)	Check and reset limit stop screws to achieve required stroke.
		Limit stops on MO (incase of systems with MO) not set properly.	Check limit stop settings on MO and readjust if required to achieve full rotation.
		Obstruction in valve or linkage.	Check for mechanical obstructions if any and remove
		Excessive spring torque (in case of spring return actuators). Low air supply pressure.	Check air supply pressure and ensure specified supply pressure. Check spring selection.

SR. NO.	FAULT	PROBABLE CAUSE	REMEDIAL ACTION
4.	Noise inside actuator	Improper clearance between rack and pinion. Broken or loosened rack bolts.	Open actuator and check tightness of rack bolts. If loose tighten properly. If worn out replace racks /shaft.
		Insufficient lubrication . (due to prolonged use at high ambient temperatures.)	Open actuator, clean and lubricate with specified lubricant/grease.
		Metal to metal contact due to worn out sealing / guiding elements.	Replace guide bands / sealing elements.
B.	ACTUATORS CONTROLLED WITH POSITIONERS (Additional checks)		
5.	Actuator not functioning on increasing signal pressure	Leakage in signal line signal not reaching Positioner.	Check signal line fittings and tighten properly. Check for blockage in signal line.
		Insufficient supply air pressure	Check and ensure specified air supply pressure
		Faulty Positioner / seized spool valve	Check and repair (See Positioner instruction manual) or replace Positioner
6.	Incorrect positioning	Feed back mechanism not functioning / broken	Check Positioner feed back linkage ensure positive feed back.
		Excessive play in feed back mechanism	Check linkage and connect properly. Tighten grub screws provided on adaptor.
		Wrong span and zero adjustment.	Check span and readjust to obtain specified span. Correct zero Adjustment.
		Wrong selection of feed back cam profile	Check selected cam profile and ensure that the required profile only selected.