



KTM PNEUMATIC ACTUATORS - AW, AWN SERIES

INSTALLATION AND OPERATION MANUAL

Please read through this manual completely before operating the actuators



ACTUATOR USE

AW, AWN Type Actuators are suitable for operating ball valves and V-port valves. Please use the actuators according to warnings and cautions described in this document. Failure to do so could result in an accident (due to wrong storage, installing, operation, maintenance and disassembling) and/or serious damage. Please keep this manual in a handy place for immediate reference; be sure to provide it to purchaser, contractor, piping designer, user, operator or maintenance technician.

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SECTION 1 - SAFETY PRECAUTIONS

Precautions for using AW, AWN type actuators safely are highlighted with the following two warning signs to indicate the level of danger posed. Please read the postscript carefully to ensure safety and prevent any damage from occurring before starting to use the product.

WARNING

A potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

A potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

SECTION 2 - SPECIFICATION

The performance and safety of AW, AWN type actuators and conformity with your equipment or system should be checked by the design engineer or the person specifying your system based on our catalog or specification data. Upon arrival, the applicable conditions (double acting, direct acting, reverse acting, operating pressure, etc.) should be first checked to make sure they are correct.

SECTION 3 - STORAGE

CAUTION

The following items should be strictly followed in order for the actuators to be installed and operated properly.

- 1. Do not unpack the actuator from shipping package until just prior to installing it.*
- 2. Store the package in dry and non-corrosive atmosphere.*
- 3. When unpacked, plug or cap inlet and outlet port and direct these ports in horizontal and downward position to protecting from entering rain and dust.*

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SECTION 4 - MODEL IDENTIFICATION

Example:		AW	17	S	Q	HW
Actuator type						
AW (AWN only applicable for size 13)						
Actuator size						
13	20					
17	28					
Operation type		Description (Supply pressure)				
Blank		Double acting type (0.3 to 0.7 MPa)				
S		Spring return type - Standard (0.4 to 0.7 MPa)				
L		Spring return type - Low pressure type (0.3 to 0.4 MPa)				
Special (Option)		Description				
Blank		No specials				
A		Direct-acting spring return (Counter-clockwise rotation under supply pressure loss)				
B		Stainless steel external bolts and nuts				
K		For high temperature (0°C to 120°C)				
T		For low temperature (-45°C to 60°C)				
Q		High speed / frequency (500,000 cycles): Available for double acting type				
		High speed: Available for spring return type				
S		High torque type (spring return)				
Accessories (Option)		Description				
Blank		Without any accessories				
CO		ESDV of CO ₂ gas type				
H		For double acting type with manual override handle lever: Available for AWN13 only				
HG		For double acting type with manual gear operator: Available for AW17 through AW28				
HW		For spring return type with manual override handle: Available for AWN13S through AW28S				
L		With lift-limiting unit				
PS		Partial stroke test				

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SECTION 5 - RANGE OF APPLICATION

Operating mechanism	Operation	Model no.	Pressure [MPa]
Scotch York (Para-arm piston rod pin)	Double acting	AWN13 AW17 AW20 AW28	0.3 - 0.7
	Single acting (Spring return)	AWN13S AW17S AW20S AW28S	0.4 - 0.7
	Single acting for low pressure range	AWN13L AW17L AW20L AW28L	0.3 - 0.4 0.2 - 0.4 0.3 - 0.5 0.2 - 0.4

CAUTION

Use Torque Cylinders within operating pressure ranges only.

Operation outside the specified range may cause damage to the cylinder or malfunction.

SECTION 6 - CONSTRUCTION

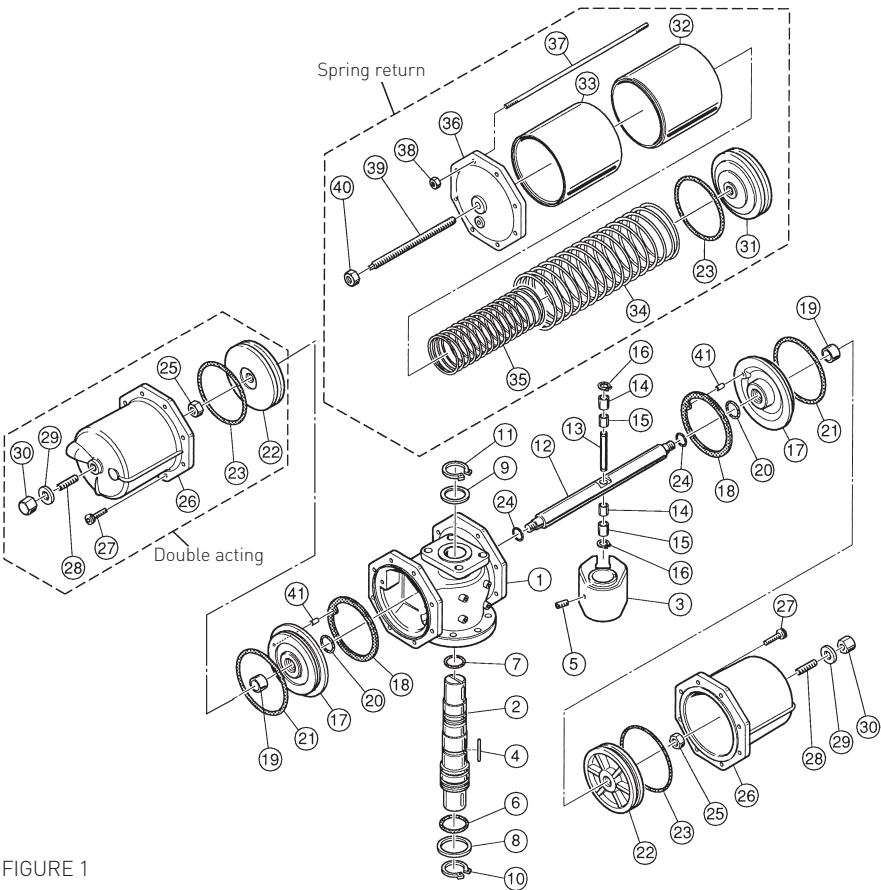


FIGURE 1

NOTE

Only AWN13 has an oval-shaped upper stem and a square-shaped lower stem.

PARTS LIST	
No.	Parts Nme
1	Body
2	Stem
3	Para-arm
4	Key
5	Set screw
6	O-ring
7	O-ring
8	Thrust bearing
9	Thrust bearing
10	Snap ring
11	Snap ring
12	Piston rod
13	Pin
14	Roller
15	Bearing
16	Snap ring
17	Adapter
18	Gasket
19	Bearing
20	O-ring
21	O-ring
22	Piston
23	O-ring
24	O-ring
25	Nut
26	Cylinder
27	Cap screw
28	Stopper bolt
29	Gasket
30	Cap Nut
31	Spring retainer
32	Cylinder
33	Spring case
34	Spring (Outer)
35	Spring (Inner)
36	Spring cover
37	Long bolt
38	Nut
39	Stopper bolt
40	Nut
41	Pipe

SECTION 7 - MOUNTING OF ACTUATOR TO VALVE

Ensure the following items before mounting the actuator to the ball valve.

1. Cleanse flanges of actuator and valve of dust and foreign substances.
2. When mounting, make sure that the valve opening (fully open or fully closed) coincides with the indicator position of the actuator.

Caution

Mismatching between indication of actuator and valve opening may result in operation trouble, which will cause accidents. Check the indication matching once more.

3. Use the following bolts for connection, which should be fastened in "criss-cross" pattern.
Stainless steel: JIS: SUS304 (AISI 304) with strength class more than 70
Carbon steel: JIS: S45C (AISI 1045) with strength class more than 8.8

SECTION 8 - ADJUSTMENT OF VALVE OPENING

After mounting the actuator to the valve, adjust fully open and fully closed position according to the following manner.

CAUTION

Since the adjusting procedure is performed during supplying compressed air, do not touch the moving parts of the actuator. Doing so may cause injury.

For supplying the compressed air, refer to Section 9 "Piping and Installation".

The procedure explained below applies to the combination of actuator and valve, when turning the stem clockwise operates the valve to closed position.

8.1 Procedure for Double Acting Actuator

1. Supply compressed air to inlet port to open the valve and check fully open position of the valve.
2. If the position is not correct, exhaust the compressed air and perform steps 4 and 5.
3. Loosen hexagon nut for locking stopper bolt on open side, turn the stopper bolt in respective direction by using hexagon bar wrench. Clockwise turning of the bolt reduces travel angle of the actuator, and counterclockwise turning widens the range of the travel angle.
4. After ensuring correct position of the valve by supplying compressed air to the actuator, tighten the locking nut of the stopper bolt.
5. Supply compressed air to inlet port to close the valve and check the fully closed position.
6. If the position is not correct, perform the above described procedure for closed side stopper bolt.

8.2 Procedure for Single Acting Actuator

(including the model with manual operator "HW")

1. Supply compressed air to the inlet port to the valve open and check fully open position of the valve.
2. If the position is not correct, exhaust the compressed air letting the valve to close the valve. Then perform the following steps 3 and 4.
3. Loosen hexagon nut for locking open side stopper bolt, turn the stopper bolt in respective direction by using hexagon bar wrench. Clockwise turning of the bolt reduces travel angle of the actuator, and counterclockwise turning widens the range of the travel angle.
4. After ensuring correct position of the valve by supplying compressed air to the actuator, tighten the locking nut of the stopper bolt.
5. With no compressed air in the actuator, check the fully closed position of the valve.
6. If the position is not correct, loosen the hexagon nut for locking stopper bolt on closed side, then perform the following procedures 7 and 8.
7. Turn the stopper bolt in the respective direction by using hexagon bar wrench. Clockwise turning of the bolt reduces travel angle of the actuator, and counterclockwise turning widens the range of the angle.
8. After ensuring the correct position of the valve, tighten the locking nut of the stopper bolt.

SECTION 9 - PIPING AND INSTALLATION

When operating actuator in piping work, please pay attention to the following points.

1. Avoid installing the actuators in a place where they are exposed to seawater, chemicals, and high- and/or low-temperature (above 80°C, under -20°C). If it is inevitable, protect the actuators by appropriate covering, or protect sufficiently with anticorrosive painting.
2. Usually, copper tubes are used for connecting attachments. When the joints loosen by intensive vibrations, air leakage may occur. Additional tightening will be necessary accordingly. In vibrational environments, use Nylon tubing.
3. Since accessories have been adjusted already in the factory, further adjustments are not necessary.
4. For air piping of accessories, use $\Phi 8 \times \Phi 6$ tube or larger for AWN13~AW20, and $\Phi 10 \times \Phi 8$ tube or larger for AW28. If quick operation is required, use large size tube according to the desired speed.
5. For air piping from compressor or air tank to supply port of actuator (or inlet port of attachment device, if equipped), use steel pipe of size not smaller than the air supply port of the actuator.

CAUTION

In piping work, care should be taken for fragments of the sealing tape not to enter in the pipe. Foreign matters in the tube will cause malfunctions of accessories.

WARNING

Never climb on the actuator or accessories in field working, which will cause failure in adjustment or human injury.

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6. When using the actuators outdoor in cold or snowy areas moving parts of accessories (positioner, limit switches, etc.) may be frozen. Protect the devices by proper covering in such cases.
7. When installation orientation of actuator is changed for convenience of positioning, the following caution should be taken.
 1. Exhaust port of the actuator and accessories (solenoid valve, air operate valve, quick exhaust valve, etc.) should be directed downward by attaching elbows. If doing so is difficult due to surrounding area environment, use elbow for exhausting downward.
 2. Since attaching orientation of filter regulator or lubricator is limited, drains should be directed downward.
9. Pneumatic diagram for actuator and accessories Schematic diagrams of piping for solenoid valve to actuator are shown below. Select appropriate mode according to the operating purpose.

CAUTION

Do not position single acting torque cylinders in such orientation that springs are facing upward. By doing since, the inside of the cylinder may be corroded by entering of water, which may cause malfunctions.

8. In piping for operating actuator work, care should be taken as follows.
 1. Clean joint and tubing sufficiently by using compressed air before piping.
 2. When sealing tape is used, apply tape to thread starting two threads back from end of fitting in order for the fragments of the tape not to enter inside of the pipe.
 3. Since copper tubes are regularly used for connecting accessories, avoid vibrational place for installing. In severe vibrational environments, use Nylon tubing. (The copper tube loosen by vibration may cause leakage.)
 4. Do not tighten the joint excessively to the supply port of the actuator.

CAUTION

Excessive fastening of joint may cause cracking of supply port leading air leakage.

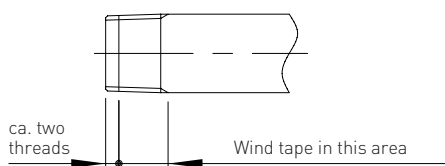


FIGURE 2

NORMALLY CLOSE (ENERGIZED TO OPEN)

- Double Acting type

AWN13
AW17
AW20
AW28

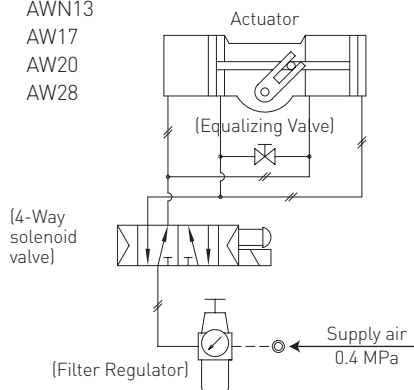


FIGURE 3

- Single Acting type

AWN13S
AW17S
AW20S
AW28S

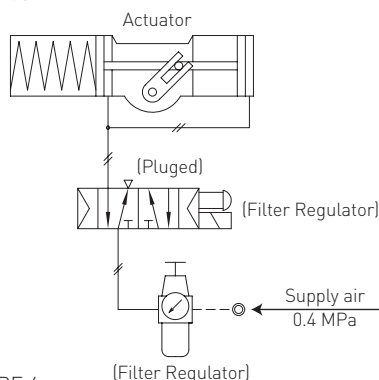


FIGURE 4

NORMALLY OPEN (ENERGIZED TO CLOSE)

- Double Acting type

AWN13
AW17
AW20
AW28

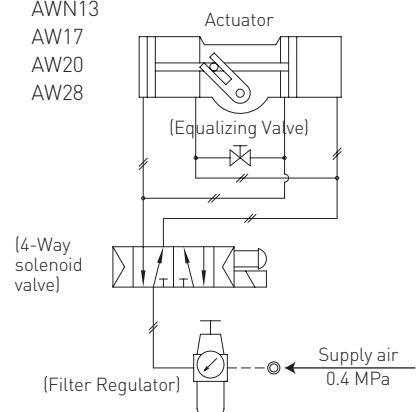


FIGURE 5

- Single Acting type

AWN13S
AW17S
AW20S
AW28S

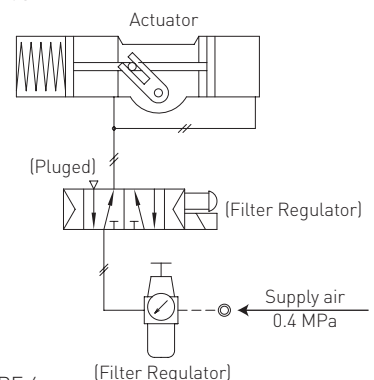


FIGURE 6

SECTION 10 - AIR SUPPLY FLOW RATE

The volume of air necessary for cylinder operation is determined to obtain the following two types of flow rates:

1. Momentary Flow Rate QD, QS

Calculation of the momentary flow rate is necessary to determine operating time. The shorter the operating time with the same cylinder size, the larger the momentary flow rate. In order to obtain the desired operating time, the supply source capacity, piping diameter, pressure reducing valve capacity, solenoid valve orifice diameter (C_v value), etc. are necessary. This enables the momentary flow rate to be determined by the following formulas (1) and (1'). If multiple cylinders are operated simultaneously, then the capacity of each devices used, multiplied by the number of cylinders will provide the momentary flow rate.

Momentary flow rate of Double Acting cylinder:
[$N \ell / min$]

$$Q_D = A \left(\frac{P + 0.1}{0.1} \right) \frac{60}{T} \quad (1)$$

Momentary flow rate of Spring Return type Cylinder: [$N \ell / min$]

$$Q_S = B \left(\frac{P + 0.1}{0.1} \right) \frac{60}{T} \quad (1')$$

2. Air consumption VD, VS

This shows the volume of air consumed in a period of time. For the same size cylinder, air consumption increases in direct proportion to the operating time. The consumption is determined by the following formula. Incidentally, the total air consumption is identical to a sum value obtained for the total units.

Air Consumption of Double Acting cylinder:
[$N \ell / min$]

$$V_D = (A + B) \left(\frac{P + 0.1}{0.1} \right) n \quad (2)$$

Air Consumption of Spring Return type cylinder:
[$N \ell / min$]

$$V_D = B \left(\frac{P + 0.1}{0.1} \right) n \quad (2')$$

Remarks

- QD = Momentary flow rate in Double Acting cylinder [$N \ell / min$]
 QS = Momentary flow rate in Spring Return type cylinder [$N \ell / min$]
 VD = Air Consumption of the Double Acting cylinder [$N \ell$]
 VS = Air Consumption of the Spring Return type cylinder [$N \ell$]

- A, B = Cylinder capacity [ℓ]
 P = Operating pressure (MPa)
 T = Operating time (Sec)
 n = Operating cycles in a time period (One cycle means one reciprocating action)

Cylinder model	Cylinder capacity (ℓ)		
	A	B	A + B
AWN13	3.10	3.10	6.20
AW17	6.70	6.70	13.40
AW20	14.80	14.80	29.60
AW28	34.60	34.60	69.20

SECTION 11 - CAUTIONS PRIOR TO OPERATION

1. Check air leakage in pipeline from compressor or tank to supply port by using soap liquid or leak check liquid.
2. Be sure that supplying compressed air pressure is within the range specified in Section 5 "Range of Application".
3. Check electric power supply voltage of solenoid valve.
4. Check air pressure of filter regulator outlet port if attached.
5. Check speed of speed controller or quick exhaust valve if attached.
6. Ensure that the actuator and valve travel smoothly by operating accessories (solenoid valve, air operate valve, positioner, etc.).
7. Ensure that electric wiring of solenoid valve or limit switches are shielded by cable gland, cable protection tube, etc. Wiring port should be directed in horizontal and downward position.

SECTION 12 - CAUTIONS DURING OPERATION

1. Use clean and dry compressed air through dryer and filter. (Dew point below -15°C). Drain sufficiently to prevent freezing especially in cold areas.
2. Periodical draining of filter or filter regulator should be performed.
3. Supply lubricating oil (turbine oil JIS K2213, ISO VG32 with additives) periodically to lubricator.

CAUTION

Do not use machine oils and spindle oils, which may cause troubles.

4. Manual operation is inhibited while automatic operation.

WARNING

Never place or leave lever handles, spanners and wrenches at the upper portion of the stem. They are driven while operation and cause human injury and equipment damages.

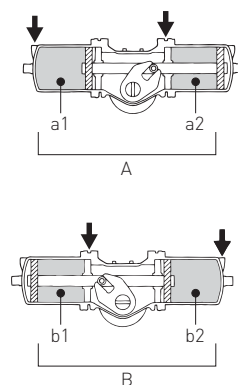


FIGURE 7

SECTION 13 - MANUAL OPERATION

WARNING

Manual operation must only be done after stopping the air supply for both double and single acting actuators. Manual operation while air supply will cause injury. In operating single acting actuator, use manual operating device "HW" for single acting actuator. Never use spanners or wrenches. Doing so may cause injury.

- Manual operation of double acting actuators (lever handle) AWN13
 - Stop compressed air supply.
 - Open equalizing valve if attached. Otherwise, loosen the joint of supply port of the actuator to purge air in the actuator.
 - Apply lever handle at the upper portion of stem to turn it. The turning range should be within 90 degrees.
 - After manual operation, recover air supply by closing equalizing valve or retighten the joint at supply ports.
- Double Acting (Manual Gear HG) AW17 to AW28
- Single acting actuator (Manual operator HW) AWN13S to AW28S

The HW Type Side Handle can be used as manual valve operation device when loss of air supply occurs in single acting actuator. The procedure of manual operation with HW Type Side Handle is as follows.

- Equalize pressure between inside of cylinder and atmosphere by respective methods according to the piping configurations around the actuator. For example: Switch the power off of solenoid valve used for operating the actuator. Manipulate pressure-exhausting valve.

WARNING

- After manual operation, be sure to remove the lever handle. Pneumatic operation while leaving the tools will cause injury.
- Operate the valve with stable posture from a set direction. Make sure that the handle is reliably inserted into the stem's end. Insufficient insertion and forced operation of the handle may result in damage or injury if the handle slips out.
- Excessive handle operation may break the lever and injure the operator.

CAUTION

- When valve is open or closed, indicator nut ④ moves toward "OPEN" side or "SHUT" side. Return the nut to "AUTO" position correctly by turning Handle. Incorrect positioning of nut ④ deviating from "AUTO" position will cause insufficient opening or closing in automatic operation or operation malfunctions.
- After resetting the nut ④ to correct "AUTO" position, lock the Handle ② by chain and lock to prevent misoperation.

CAUTION

Manual operation with side handle without equalizing pressure between inside of cylinder and atmosphere will bring extreme increase in required operating force, which may cause disabling operation or failure of actuator.

- Operate valve by turning the side handle manually
Reverse Acting type: Turning the handle counterclockwise opens the valve.
Direct Acting type: Turning the handle counterclockwise closes the valve.

CAUTION

Over winding by applying excessive force after the valve is fully opened will cause failure of the actuator. Never use pipe or such things to lengthening the handle arm.

- Be sure to turn the handle clockwise until it stops to reset manual operation mode before returning to pneumatic operation.

CAUTION

Leaving the handle halfway will cause trouble in automatic operation, and the valve does not open or close completely.

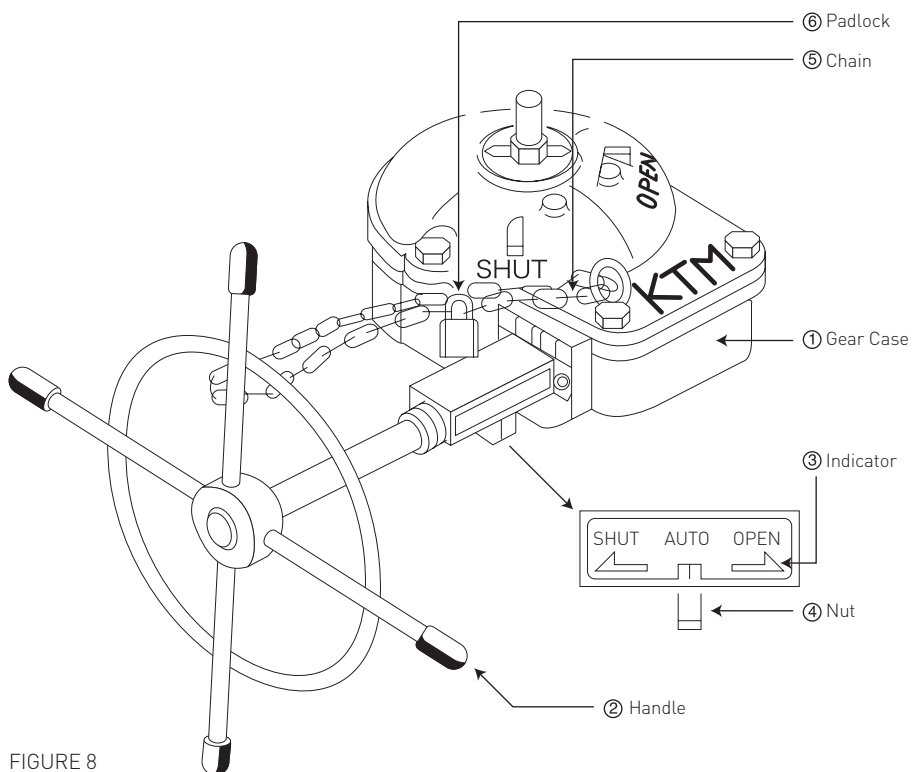


FIGURE 8

- Unlock Padlock ⑥ of Manual operator and remove chain ⑤.
- Turning Handle ② enables operation of valve to open or close.
Turning the handle ② clockwise operates to valve closing, and counter clockwise operates valve opening.

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SECTION 14 - TROUBLESHOOTING

Trouble examples	Causes	Measures
Valve does not operate	Failure in electric power source or control signal.	Check and repair of electric power source and/or control devices.
	No or insufficient supply air.	Check and repair of air source and attachments (compressor, filter, reducing valve, etc.)
	Failure of attachments (solenoid valve, air actuated control valve, positioner, etc.)	After checking each attachment separately, repair or replace it.
	Failure in actuator.	After operating actuator separately, disassemble and repair.
Unstable operation of valve	Failure of valve.	Check and disassemble valve, and repair or replace it.
	Fluctuation or low supply air pressure (insufficient supply or fluctuation).	Increase capacity of compressed air supply. Install accumulator. Increase pipe diameter.
	Failure of attachments (solenoid valve, air actuated valve, positioner, etc.)	After trying each attachment separately, repair or replace it.
	Leakage at or failure of piston.	Replace piston O-ring.
	Wear or damage of piston bearing.	Replace piston bearing.
	Seal leakage in stem.	Replace sealing O-ring.
	Insufficient power of actuator.	Replace actuator with larger one. Increase supply pressure.
	Unstable valve operating torque or increase of valve operating torque.	Disassembling and checking valve. Repair or replace valve parts. Replace actuator with larger one. Increase supply pressure.

CAUTION

If there are any troubles in valve, read the Installation and Maintenance Instructions of the valve thoroughly and disassemble the valve carefully.

SECTION 15 - MAINTENANCE

Regular maintenance period depends on the operating environment and conditions. Generally maintenance after 100,000 operations or after 24 months from initial operation, (whichever comes earlier), is recommended. Replacing of spring units of single acting actuator after 200,000 operations or 60 months from first operation, (whichever comes earlier), is recommended. Consumption supplies should be replaced with new ones at the same time regardless the degree of wear and deterioration. For purchasing spare parts, please consult a Service Company affiliated with Emerson or a branch office of Emerson.

SECTION 16 - WARRANTY

The warranty period is one year from the date of installation by the first use of the goods, or eighteen (18) months from the date of shipment to the first user, whichever occurs first.

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