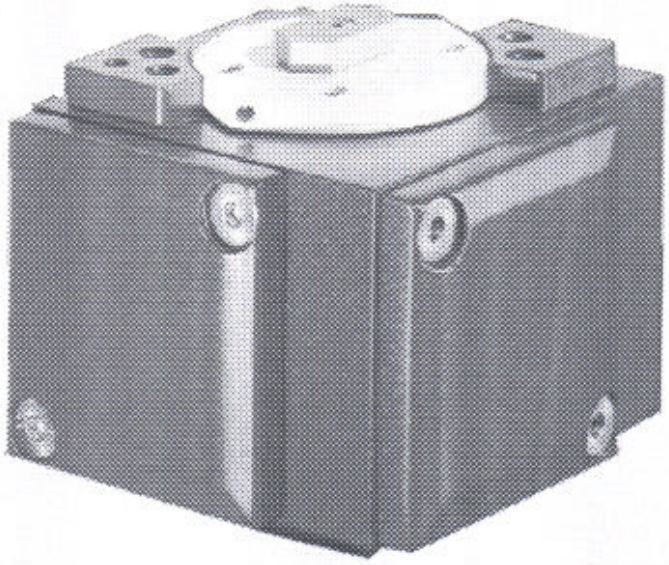
MACT-92

COMPACT

INSTALLATION OPERATING & MAINTENANCE MANUAL



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INTRODUCTION

The COMPACT Pneumatic Actuator is a 4-piston rack and pinion actuator, available in Double Acting (DA) and Spring Return (SR) versions. The unique design of four balanced pistons and center gear enables the actuator to operate without wear on the bearings, thus ensuring longer life and fewer maintenance problems. However in the event that maintenance is required, we recommend that maintenance personnel read this manual carefully before handling the actuator.

GENERAL INFORMATION

1. Line pressure:
   Standard operating pressure is 40-100 psi (3-7 bar), but the actuator will operate at any pressure from 20-120 psi (1.5 - 8 bar). The spring models can produce very small torques at low air supply pressure, requiring special spring configurations. Always ensure that the correct size of actuator is used for its particular application

   Maximum overload pressure:
   150 psi (10 bar).

2. Rotation:
   The actuator as delivered is adjusted to 90° rotation. The rotation can be adjusted between 80° and 93° at both ends of the stroke.
3. Operating temperature:
   From -4°F (-20°C) to 180°F (82°C). At sub-zero temperatures, the air must be dry and clean. For high or low temperature applications, consult the manufacturer.
4. Operating media:
   The recommended operating media for the actuator is unlubricated air. Non-corrosive gas is also acceptable. Filtration is recommended for humid air.

MOUNTING INSTRUCTIONS

The unique square design of the actuator makes it possible to mount it in any required position, Fail Close or Fail Open (FC or FO), without affecting the space requirement of the actuator. The actuator can be placed above, beneath or beside the valve.

It is recommended to mount the actuator so that the position of the valve is shown by indicating the stop on top of the actuator.

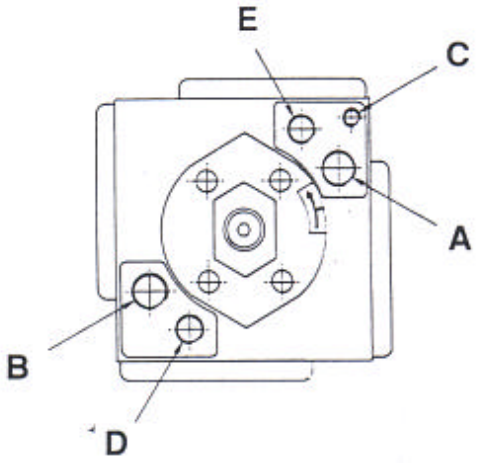
A standard sole plate, incorporating 4 holes corresponding to the ISO 5211 and DIN 3337 standards, can be supplied. Sole plates with different mounting hole configurations are available on request.

VALVE ASSEMBLY

1. Rotate the valve to the desired position - FC or FO
2. Connect the adaptor to the actuator and place on the valve to check the orientation of the bracket.
3. Attach the bracket to the actuator. Do not tighten the bolts as yet.
4. Lower the actuator bracket assembly on to the valve, making sure that the actuator fits completely over the valve stem.
5. Connect the bracket to the valve, using the appropriate bolts.
6. Check that the actuator is in the right mode (FC or FO) and tighten all the bolts.
7. Pressurize the actuator. Check that the shaft of the actuator and the stem of the valve are properly aligned, thus eliminating side loads.
8. In the event of misalignment, loosen the bolts and adjust the assembly until a perfect fit has been obtained.

AIR CONNECTION

1. The actuator has 3 upper air ports (A, B. and C) and 2 threaded mounting holes (D and E).
2. Double Acting actuators are connected through ports A and B. Pressurizing A causes a counter-clockwise rotation, while pressurizing B causes a clockwise rotation. Port C is internally connected to port B and is used for solenoid valves. Port C is usually sealed.
3. Spring Return actuators are connected to port A and pressurized for counter clockwise rotation. Removal of the air pressure causes a clockwise rotation of the output shaft.



MOUNTING BLOCK

The actuator is designed to accept special mounting blocks that direct the top entry ports to the side, thus allowing other accessories (e.g. limit switches) to be mounted.

The mounting blocks come in 1/8" and 1/4" versions to correspond to the size of the actuator. The mounting blocks are identical in size to solenoid valves and other pneumatic devices, and mount on the actuators in the same manner.

The mounting blocks come in the following sizes:
01 - For actuators 15, 20, 25, 30, with 1/8" NPT/BSP thread
02 - For actuators 35, 45, with 1/4" NPT/BSP thread
60 - For actuator 60, with 1/4" NPT/BSP thread

The mounting block is fixed to the actuator by means of one large screw and a locating pin. The locating pin locates itself in the air port (A or B) on top of the actuator. The large counter-sunk head screw holds the block down (D or E) and leaves a flat surface on top for mounting accessories.

SOLENOID VALVE

The actuator can be supplied with its own direct mounted 4-way or 3-way solenoid valve. Like the mounting block, the solenoid valve comes in 1/8" and 1/4" sizes to fit on the corresponding air port sizes of the actuators.

When a solenoid valve is used, only one additional mounting block is needed to fit the top accessories.

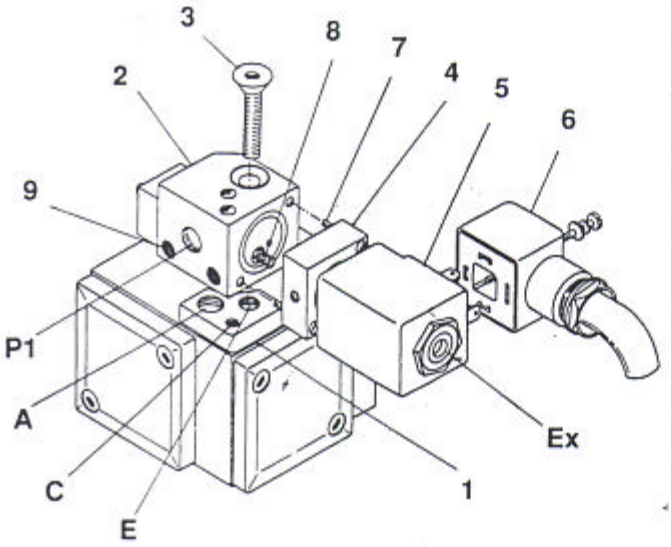
Two versions of solenoid valves are supplied: a 4-way for Double Acting actuator and a 3-way for Spring Return actuator.

The air supply is connected to the main port on the solenoid valve.

Note: The 3-way and 4-way solenoid valves use different pilot valves.

CONNECTING THE SOLENOID VALVE

1. To fit a 4-way valve on the COMPACT DA actuator, plug port B with an appropriate pipe plug and unplug port C. Connect the solenoid valve (see drawing) and bolt it down on mounting hole E. The solenoid valve will center itself on port A.
2. To fit a 3-way valve on the COMPACT SR actuator, connect as above to port A, leaving port C plugged and port B to breathe atmospheric air.
3. The DA actuator can be supplied with two 3-way valves by connecting one valve to port A and the other to port B.

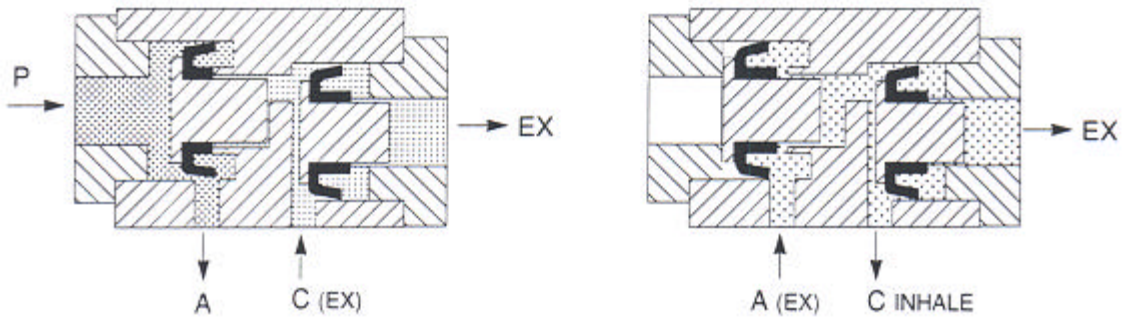


ITEM	QTY	DESCRIPTION
1.	1	ACTUATOR
2.	1	SOLENOID SPOOL VALVE
3.	1	FIXING CSK SCREW
4.	1	FLANGED 3/2 PILOT VALVE
5.	1	COIL
6.	1	DIN CONNECTOR
7.	2	PILOT VALVE FIXING SCREWS
8.	1	SOLENOID SPRING
9.	2	SINTERED FILTER
P1.	-	VALVE MAIN AIR ENTRY
A.	-	ACTUATOR MAIN AIR ENTRY
C.	-	ACT. SECOND AIR ENTRY FOR DA MODELS
E.	-	ACTUATOR FIXING THREAD
EX.	-	PILOT VALVE EXHAUST PORT

BREATHER BLOCK

The breather block mounted on ports A and C is a device that diverts the exhaust air from port A to port C on SR actuators. thus preventing corrosive atmospheric air from entering the spring chamber.

To connect the breather block to the actuator, plug port B and unplug port C. Then connect the breather block to the actuator as you would connect a solenoid valve.



Note: When using the 4-way valve or breather block and an additional mounting block, plug the air entry of the mounting block that mounts on port B.

ELECTRICAL FAILURE

In the event of electrical failure, a solenoid operated COMPACT actuator will turn clockwise.

AIR FAILURE

In the event of air failure, an SR COMPACT actuator will turn clockwise, whilst a DA COMPACT actuator will remain in its last position.

STROKE ADJUSTMENT

The actuator is factory adjusted to provide 90° rotation. The indictation stop should be adjusted only if the setting has been disturbed or if a different setting is required.

To adjust the stroke, observe the following:

a) The stop has 4 adjustment screws, one pair at each end of the stroke.

b) Turn actuator counter-clockwise, pressurizing port A. Loosen screws 1 and 3.

c) Turn screw 1 to the desired rotation point.

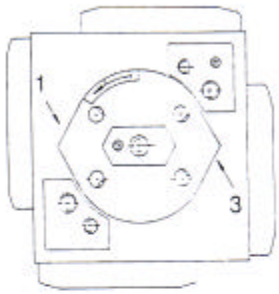
d) If needed, depressurize port A for ease of setting.

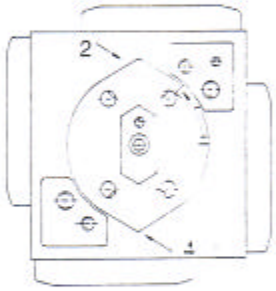
e) After setting, pressurize port A and tighten screw 3 so that it makes the same contact as screw 1.

f) It is recommended to use thread glue to prevent the loosening of the screws.

g) Pressurize port B (or allow spring return rotation) and repeat for screws 2 and 4.

Note: Stroke adjustment can be performed before or after mounting the actuator on the valve.





MANUAL OPERATION

In the event of air failure, the actuator can be cycled manually via the exposed top shaft by using a wrench to turn in the required direction.

Larger actuators should be cycled by using a declutchable override.

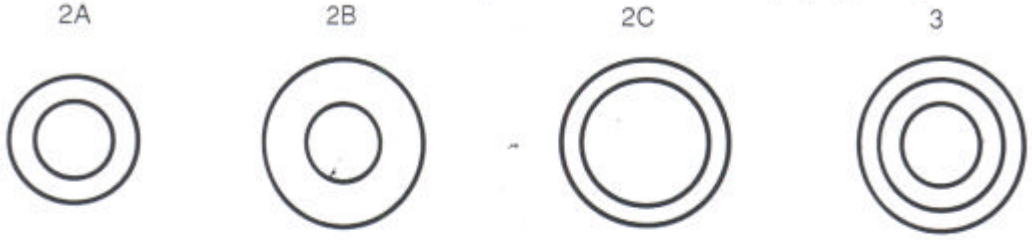
When performing a routine check on an actuator equipped with the solenoid control block, use the integral manual override screw on the solenoid body. Turn the screw 90° and the actuator will cycle. If the air supply is still switched on the actuator will cycle to its original position when the screw is turned back.

CAUTION!
DISCONNECT AIR SUPPLY BEFORE ANY ATTEMPT TO MANUALLY OVERRIDE THE ACTUATOR.

SPRING CONFIGURATION

The SR actuator is supplied with a full load of springs for operation at pressures of 100 psi (7 bar) and above.

Every end cover contains 3 springs, except the H-15 which has only 2 springs. Fewer springs are required for lower air pressures. The torque charts list the following spring configurations:



For lower air pressures or better flexibility of output, a single spring can be used.

REPLACING SPRINGS

When replacing or removing springs, dismantle the end covers by loosening the screws so that each screw advances the other by one full turn. Before the final thread is removed, the end cover should be pushed in slightly to prevent a sudden release of springs. After the springs have been replaced, reassemble the spring cover by gradually tightening each screw. Final tightening should provide good sealing to prevent moisture and dirt from entering the spring chambers.

Note:

1. If one spring needs replacing due to failure, replace all the springs in the actuator, as well as other parts which may have been damaged.
2. An equal number of springs must be used on each opposing piston.

WARNING:
NEVER ATTEMPT TO REMOVE SPRING COVERS WHILE PORT "A" IS PRESSURIZED.

MAINTENANCE

1. It is recommended that periodic checks be performed to make sure that all fasteners remain tight.
2. The actuator is supplied ready-lubricated - no further lubrication is required. If lubrication is deemed necessary, use EP-I grease.
3. Under certain working conditions (heavy duty, non-compatible operating media or abnormal operating conditions) internal seals should be checked periodically and replaced when necessary. A repair kit can be supplied for each actuator.
4. On Spring Return actuators, spring fatigue may set in requiring the replacement of springs. Springs should always be replaced in full sets.

CAUTION:
BEFORE BEGINNING ANY MAINTENANCE OPERATIONS, MAKE CERTAIN THAT THE ACTUATOR IS PNEUMATICALLY AND ELECTRICALLY DISCONNECTED.

TROUBLESHOOTING

PROBLEM: Actuator fails to function on a valve.

ACTION:

1. Check that the valve rotates freely (see MANUAL OPERATION - p.5).
2. Check that the actuator size is correct.
3. Ensure that the correct voltage is supplied to the solenoid which operates this actuator.
4. Make certain that sufficient air supply is available at the solenoid valve inlet. (Inlet pressure on a 4-way solenoid valve should be at least 40 psi-3 bar).

PROBLEM: Voltage and air pressure have been verified, valve is free, but actuator does not function.

ACTION:

1. Turn on signal voltage and check the solenoid for clicking sound.
2. If solenoid functions:
   a) Remove the valve block, connect to reduced air supply (50 psi) and the correct voltage.
   b) Turn on the signal voltage and check that air flows from one output port only. (You may need to obstruct the outlet ports in order to move the valve spool).
   c) If air comes out of more than one output port, replace the solenoid valve.
3. If solenoid does not function, i.e. no sound is detected, unscrew the solenoid and stem from the block and reapply the signal voltage. If the solenoid plunger does not retract, replace solenoid.

PROBLEM: Actuator functions but exhibits leakage and/or power loss.

ACTION:

1. Check that voltage is +/- 10% of the specified voltage.
2. Check that there is no sharp drop in air supply caused by a solenoid valve failure when unit is cycled.
3. If the piston seal leaks, the leakage will be detected on each cycle of the actuator. Remove the solenoid valve, pressurize port A, and check for leakage on port B. Then do the opposite, pressurize B and check port A for leakage.
4. If leakage continues, replace all the parts of the actuator with the aid of the repair kit.

PROBLEM: Actuator fails to function (actuators without solenoid control block, or block and solenoid operating correctly).

CAUTION:
REMEMBER THAT ACTUATOR SHOULD NEVER BE REMOVED FROM THE VALVE WHILE UNDER PRESSURE!

ACTION:

1. Remove the actuator from the valve.
2. Apply air pressure (10-15 psi for DA; 20-30 psi for SR). If actuator cycles in no-load mode, the problem is in the valve. Consult valve manufacturer.
3. If actuator does not cycle, follow actuator disassembly instructions.
4. Check that all internal ports are unobstructed.
5. Check that the actuator is lubricated. If not, apply EP-1 generously. (If actuator is prepared for high or low temperature operation, consult manufacturer for the appropriate lubricant).
6. Check for presence of congealed grease between the pinion and piston racks. Clean, dry, regrease and reassemble where required.
7. Check whether actuator pinion shaft and/or pistons are bound. If so, follow reassembly instructions.
8. Check unit for excessive backlash and check whether the piston rack teeth are worn. Replace piston gear rack if necessary.
9. Check body bore of SR actuator for misplaced or broken springs. Replace if necessary.
10. Once the actuator and valve are free, and the control block (where appropriate) is shifting air properly, reassemble and retest. If unit still fails to operate, consult manufacturer.

ACTUATOR DISASSEMBLY

CAUTION!
BEFORE ATTEMPTING TO DISASSEMBLE THE ACTUATOR, AIR CONNECTIONS MUST BE DEPRESSURIZED AND DISCONNECTED.

Note: Before disassembly, make certain that you are fully conversant with the following reassembly instructions:

1. Each end cover is held to the body by two screws. Loosen the screws and remove the end cover from the actuator. To remove SR end cover, see instructions in REPLACING SPRINGS p. 6.
2. The stop on top is held by a single screw. Ease the actuator out of its locked end stroke and remove the screw and stop from the actuator.
3. Hold the lower part of the gear and rotate the body clockwise (driving the 4 pistons outwards).
4. Remove the gear assembly from the lower end of the actuator.

SPARE PARTS REPLACEMENT

A STANDARD REPAIR KIT contains the following:

2 output shaft O-rings
4 piston O-rings
4 cover O-rings
2 shaft bearings
4 back bearings - pads

This spare kit is identical for DA and SR models. It is recommended that an extra set of springs be kept for SR models.

Springs should always be replaced in full sets.

SPARE PARTS REPLACEMENT PROCEDURE

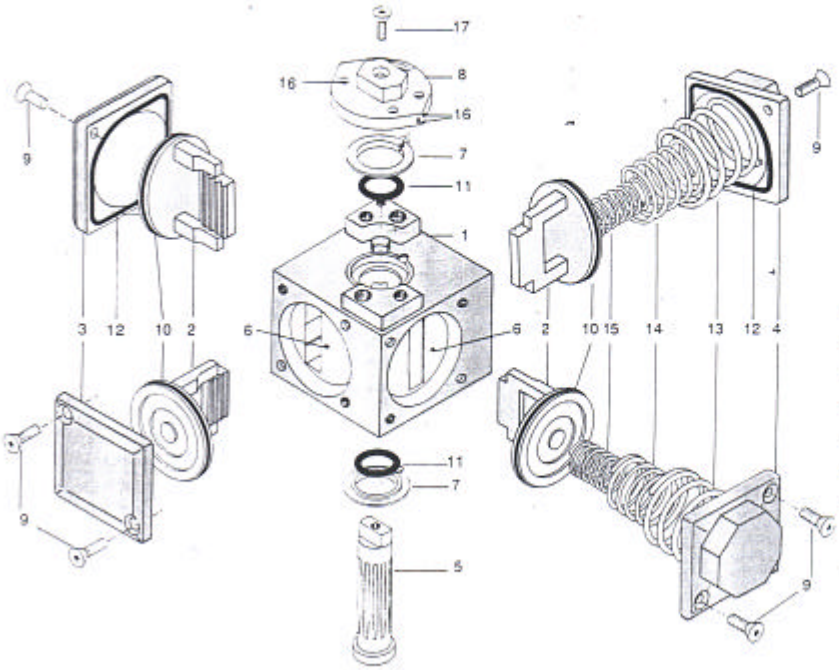
1. Replace all the soft seals and bearings.
2. The pads inside the body (in the center of each of the bores) are pushed in. Insert new pads from the inside of body by using the tip of your finger through the lower hole in the body.
3. The O-rings are glued to the cover. If they are damaged and need to be replaced, dip them in an appropriate glue solvent and glue new ones with cyanoacrylic glue.
4. Now lubricate the entire actuator assembly, using EP-I grease. Apply the grease around the rack and pinion assembly and around all the O-rings and bearings

ACTUATOR REASSEMBLY

1. Place the shaft in a vice which grips the lower side. Grease the shaft, mainly inside the teeth gap.
2. Place the lower O-ring and shaft bearing in the body and lower the body on the shaft.
3. Turn the body so that the flats on top point in the direction of the lugs - about 25° from the body center line.
4. Grease one piston and place in the bore. Push the piston inward while rotating the body counter-clockwise. While the piston is in the body, check that the movement of the piston produces a 90° rotation of the body and that the flats are parallel to the body side at each end of the stroke.
5. Turn the body clockwise so that the piston just leaves the bore. Grease the other 3 pistons and insert them into their bores. Slightly push the pistons upwards and inwards, and rotate the body counter-clockwise, making sure that all pistons have made contact. Rotate within same 90° segment, checking that the flats are parallel to the body at each end of the stroke.
6. Place the upper O-ring and shaft bearing on top of the shaft, carefully pushing them into the body. Place the stop on top, and tighten the screw all the way, using a locking agent (e.g. LOCTITE).

   Note: On earlier version actuators, the shaft bearing is a flat ring. After tightening the stop, release the screw a 1/4 to a 1/2 turn.
7. Replace the actuator end covers, making sure that the O-rings are in good condition and in place. Tighten gradually, especially on SR models.

Parts List



	Description	*Qty*	*Material*
1.	Body	1	AL 356-T6
2.	Piston	4	AL 356-T6
3.	D. A. Cover	4	AL 356/380-T6
4.	S. R. Cover	4	AL 356/380-T6
5.	Gear	1	Steel
6.	Pad	4	Delrin
7.	Thrust Washer	2	Delrin
8.	Stop	1	AL 356/380-T6
9.	Cover Screw	8	ST. ST.
10.	Piston O-ring	4	Buna N
11.	Gear O-ring	2	Buna N
12.	Cover O-ring	4	Buna N
13.	Outer Spring	4	Spring steel
14.	Middle Spring	4	Spring steel
15.	Inner Spring	4	Spring steel
16.	Stroke Adjustment Screw	4	ST. ST.
17.	Top Screw	1	ST. ST.

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