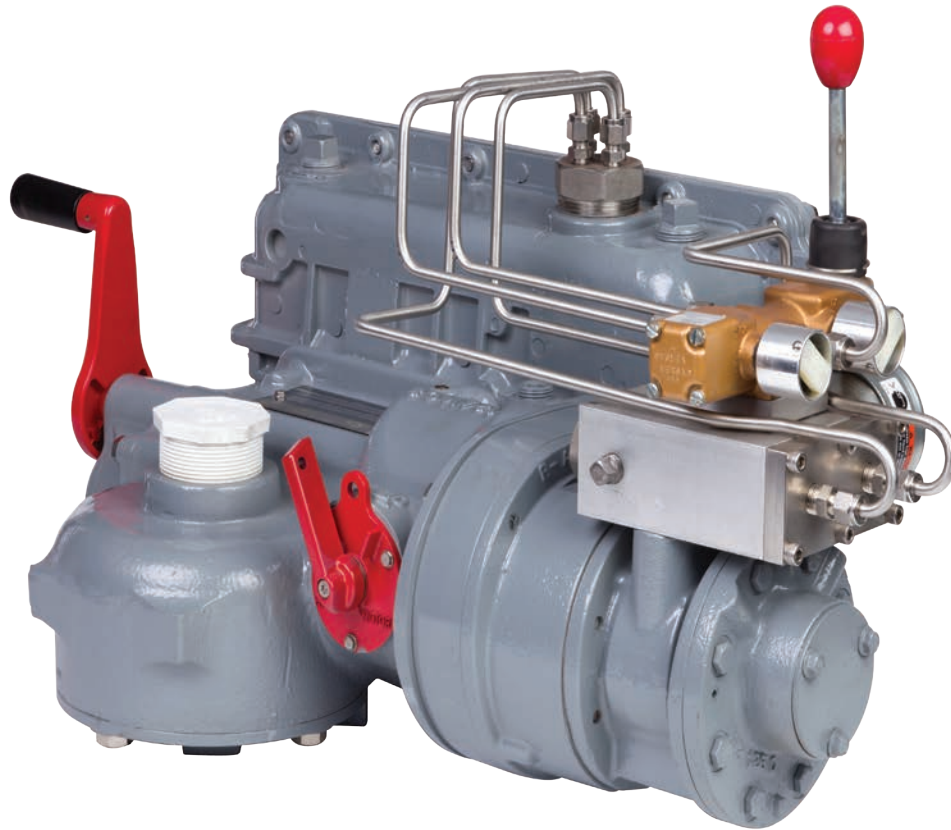


# Series 2000LP Low Pressure Pneumatic Actuator



**When communicating with EIM for replacement parts or for technical questions, we MUST have actuator nameplate information, including Job, Serial, and Model numbers. This allows us to check records of EIM equipment furnished.**

**When ordering parts, specify repair part by EIM part number and description from drawings furnished with actuator.**



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# Section 1: Introduction

This installation and operation manual explains how to install, operate, and maintain the 2000LP valve actuator.

Carefully follow the instructions in this manual and make sure you install the actuator correctly and according to your requirements.

Safety notices in this manual detail precautions the user must take to reduce the risk of personal injury and damage to the equipment. The user must read these instructions in their entirety. Failure to observe these safety notices could result in serious bodily injury, damage to the equipment, voiding of the warranty, or create operational difficulty.

Safety notices are presented as follows:

## **⚠ WARNING:**

Alerts user of potential danger; failure to follow the warning notice could result in serious personal injury or death.

## **⚠ CAUTION:**

Identifies precautions the user must take to avoid personal injury or equipment damage.

## **NOTE:**

Highlights information critical to the user's understanding of the 2000LP valve actuator installation or operation.

## **⚠ WARNING:**

**Read this manual in its entirety before installing, operating, or performing maintenance on the 2000LP actuator.**

## **⚠ WARNING:**

**Use caution when working on, with, or around valves and actuators. High pressures, forces, voltages and flammable media can be present.**

## **⚠ WARNING:**

**Failure to follow instructions for proper electrical wiring, storage, setup, and maintenance may cause serious injury, damage equipment, or void warranty.**

**⚠ WARNING:**

If the actuator is being installed within a hazardous area, take into account that:

- Improper installation in hazardous areas can cause an explosion.
  - Assembly, disassembly and maintenance are only allowed at the actuator when, at the time of the activity, an explosive mixture is not present.
-

## Section 2: Storage Instructions

If your actuator cannot be installed immediately, the following procedures are to be followed. This will ensure optimum performance from your 2000LP actuator.

Failure to comply with recommended procedures could lead to actuator malfunction and will void the warranty.

The 2000LP actuator is an inherently weatherproof unit when shipped from the factory, providing that all compartment covers and entry plugs remain intact. The actuator should be immediately stored in a clean, dry warehouse, free from vibration and rapid temperature changes, until it can be installed and commissioned.

If the actuator must be stored outside, it should be stored off of the ground, at an elevation sufficient to prevent it from being immersed in water or buried in snow, and covered to prevent damage from site debris.

If not attached to a valve, the preferred orientation is with the motor and control compartment horizontal.

If the actuator is mounted on a valve and the valve stem protrudes from the unit, a suitable stem protector must be installed to prevent drive sleeve corrosion. Stem protectors may be purchased from your local EIM distributor.

### **⚠ CAUTION:**

Condensation or moisture that enters the actuator can damage internal components, which may ultimately result in failures.

- (1) Ensure integrity of gaskets and O-rings.
- (2) Seal all conduit openings, whether used or not.
- (3) Replace any plastic conduit plugs with pipe plugs appropriate for the application.
- (4) Place a packet of dessicant in the control housing to absorb excessive moisture.

For storage procedures exceeding one year, contact your local EIM representative for recommendations.

Contact information is located on the last page of this manual.

## Section 3: Product Data

The EIM 2000LP pneumatic actuator from Emerson is a multi-turn air driven actuator that is perfect for applications using linear stem, rising stem or rotating stem valves. It can be powered by air, nitrogen, or natural gas at pressures between 60 and 100 psi. Manual controls and/or a number of remote pneumatic or electric control options can be provided as shown in the table below.

**Table 1. Standard Control Diagrams**

Type	Description	Diagram
Manual	No Controls	PD-100
	Local 2-Way	PD-101
Pneumatic	Fail Close	PD-102
	Fail Open	PD-103
	Double Acting	PD-104
Electric	Fail Close	PD-105
	Fail Open	PD-106
	Double Acting	PD-107

There is a five digit alpha-numeric code used to describe basic actuator features for computer assisted order entry. This number appears on the actuator nameplate affixed to the actuator gear housing. The most significant designators for a sample 2CLG-AF actuator are shown below.

<b>2</b>	<b>C</b>	<b>L</b>	<b>G</b>	<b>-</b>	<b>A</b>	<b>F</b>
Frame Size	Motor Size	Motor Gears	Worm Gears		Control System	Special Services
1 = 1000	X = 6AM				A = No controls	
2 = 2000	Y = 8AM				B = Local Manual	
3 = 3000	Z = 16AM				C = Remote	

The 2000LP is based on the proven EIM Series 2000 platform and shares many of its distinctive features and benefits such as direct mounting and handwheel operation during power loss or emergency situations.

The three most common frame sizes of EIM actuators, the 1000, 2000 and 3000, establish the foundation for the 2000LP. Subsequently, most major 2000LP mechanical components are interchangeable with standard EIM electric actuators, which facilitates the acquisition of spare parts.

The control housing is also a shared EIM electric component, resulting in NEMA 4, 4X and IEC IP66 product ratings for the 2000LP. Working temperature range is listed at -20 / +150°F (-29 / +66°C).

## Section 4: Lubrication and Maintenance

An annual check of the following items should be made of your EIM 2000LP actuator.

1. Check for any external leaks and tighten fittings appropriately and/or replace failed components.
2. Check for internal component leakage by testing for the presence of air exiting the exhaust port(s) while the actuator is not moving.
3. Open the control housing to inspect and tighten any loose connections.
4. Visually inspect for any mechanical damage. Replace worn or damaged components.
5. Replace any seals that permit oil leakage or water ingress.
6. Lubrication consistency and quantity needs to be checked only after 3000 cycles unless the actuator has been leaking oil or making excessive noise. Fill or replace with recommended fluid if required .

Lubrication – EIM actuator gear housings are factory filled with a high quality lubricant carefully selected to ensure proper performance under specified operating conditions. Refer to EIM JOB SPEC SHEET to identify the lubricant provided. Normal operation *may not* require lubricant replacement.

Lubricant level in the gear housing should be maintained at the following quantity. **Do not overfill.**

- **1000 and 2000 Frame Sizes**  
(See “product data” section of this manual for determining frame size)
  - Oil: 54 oz (1.54 Liters). Oil is recommended for all drive sleeve speeds over 51RPM.
  - Grease: 3.5 lbs (1.58 Kg.). Grease is adequate for drive sleeve speeds under 51RPM.
- **3000 Frame Size**
  - Oil: 62 oz (1.83 Liters). Grease is not recommended for use in the 3000 Frame Size



The following recommended lubricants are manufactured by Schaeffer Manufacturing Company, but may be replaced with equivalent products manufactured by other reputable companies. Lubricant selection must be made based upon ambient temperature and application.

**Table 2. Schaeffer Manufacturing Company Lubricants / Temperature for EIM Products**

Product	Continuous Operating Range	Part Number
#158 (ISO 68) Low Temp Oil	-65 / +400°F (-54 / 204°C)	3000100228
#267 EIM Std. Oil	-20 / +350°F (-29 / 177°C)	3000100227
#229 EIM Std. Grease	-25 / +350°F (-32 / 177°C)	3000100222
#200 SUG (Special for EIM)	-40 / +400°F (-40 / 204°C)	3000100212
#197 Low Temp, Grease	-60 / +500°F (-51 / 260°C)	3000100219
#271 Food Grade	-15 / +500°F (-26 / 260°C)	3000100216
#276 Food Grade Oil	-15 / +300°F (-26 / 149°C)	3000100218
#286 High Temp	*Na / +900°F (*Na / 482°C)	3000100220
#167 (Gear Oil) 75-140 Wt.	-50 / +350°F (-45 / 177°C)	3000100230
#238 EP 1 Grease	-10 / +350°F (-23 / 177°C)	3000100226

**NOTE:**

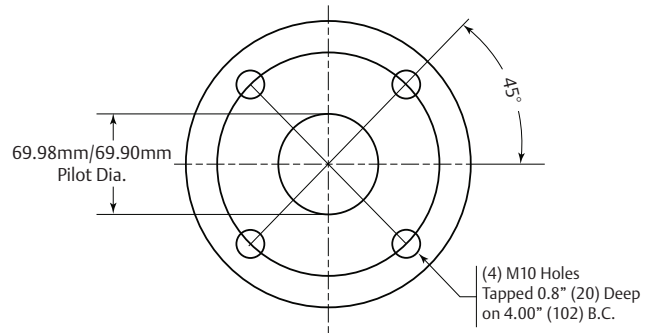
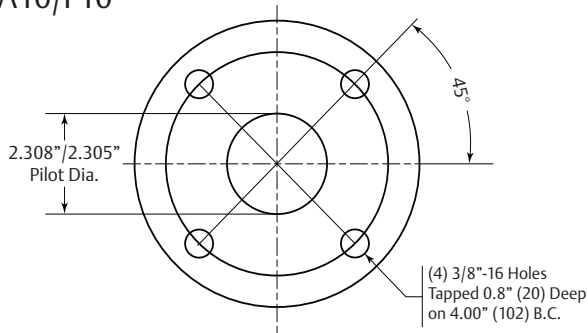
During operation of this actuator, gear housing temperature increase in combination with variations of outdoor temperature may cause a small pressure build-up within the actuator gear box. EIM furnishes Pressure Relief Vent Fitting Part No. 83385 to prevent excessive pressure build-up. Pressure Relief Vent Fitting placement on the actuator can be determined after field location and position of the valve have been determined. Select the highest 1/2NPT vent location of the actuator gear box; remove the ½ NPT plug and replace with Part No. 83385.

## Section 5: Mounting Dimensions

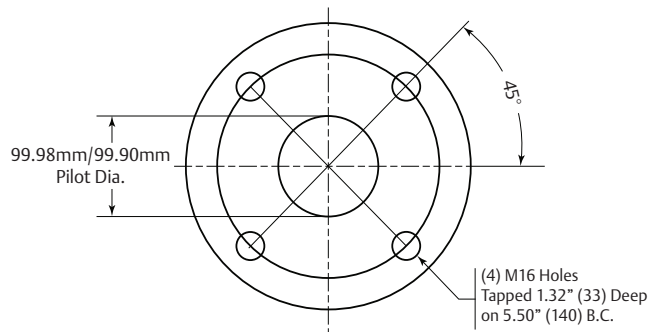
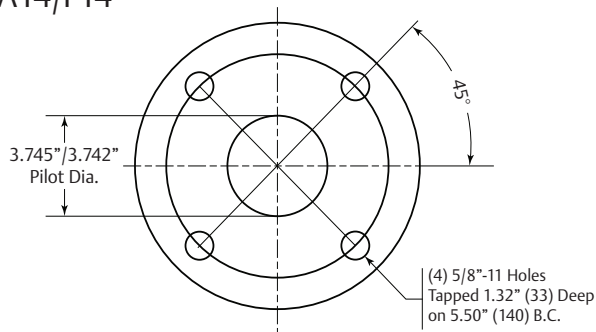
EIM Standard mounting is MSS SP-102 (FA) – Left column

ISO (F) Mounting can be supplied if requested – Right column

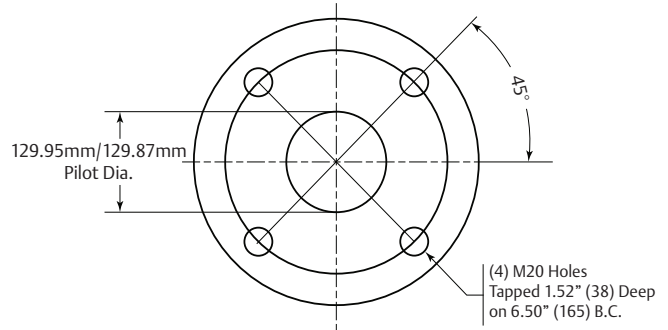
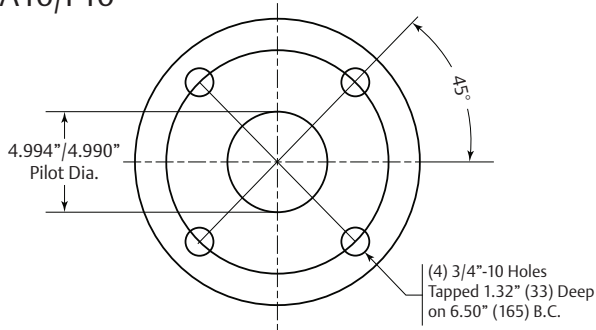
### FA10/F10



### FA14/F14



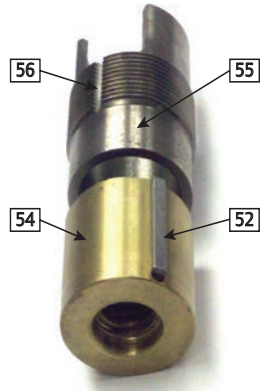
### FA16/F16



## Section 6: Assembly to Valve

### 6.1 Multi-Turn Valve Stem Nut Installation

Figure 1



1. Unscrew Locknut (55) holding Bronze Stem Nut (54) and remove Stem Nut and Key (52).
2. Lubricate Stem and run Stem Nut (54) down stem to check acme thread fit, then remove Stem Nut and set aside.
3. Lower actuator over stem onto valve flange. After ensuring proper flange mating and valve actuator orientation, insert Grade 5 mounting screws thru valve flange into actuator. Screws must engage a minimum of one full screw diameter into bottom base and be torqued to the following value:
  - 3/8-16 = 50 lbf-ft (M10 = 68 Nm)
  - 5/8-11 = 225 lbf-ft (M16 = 305 Nm)
  - 3/4 -10 = 400 lbf-ft (M20 = 542 Nm)

**NOTE:**

If EIM supplied adaption, the mounting screws are included. If the adaption to the valve was the responsibility of others, the mounting screws are not furnished by EIM. Screws thru adapter **MUST** engage a minimum of one screw diameter into EIM actuator base.

4. Screw Stem Nut (54) onto valve stem until it enters the Drive Sleeve. Align Nut Key (52) with Drive Sleeve keyway and insert Stem Nut Key (52).
5. Turn handwheel in Open direction, pulling the Stem Nut into Drive Sleeve until it bottoms out (valve will begin to open).
6. Place Locknut (55) over Valve Stem and screw into place firmly against top of Stem Nut (54). Tighten Locknut by tapping ears with brass drift.

**⚠ CAUTION:**

Locknut must be screwed very tightly against stem nut.

## 6.2 Lockpin Installation

1. Using a number 30 (.1285) drill; drill a hole 3/4 inch deep into the Drive Sleeve assembly threads for the Locknut Lockpin(56). Use groove in Stem Nut Locknut threads as a guide.
2. Install Locknut Lockpin (56) into drilled hole to prevent the Stem Nut Locknut from working loose and turning.

---

**NOTE:**

When installing, the Lock-nut Lockpin should extend 1/4 inch above the Drive Sleeve Assy to allow for easy removal.

---

## 6.3 Thrust Spool Installation (Multi-Turn)

1. Locate Thrust Mounting bolts.
2. Remove the eight mounting bolts and separate the Spool from the actuator.
3. Position the Spool over the valve stem. Thread the Spool onto the valve stem until it meets the valve plate.
4. Bolt and secure Spool onto valve.
5. Position actuator above Spool. Lower actuator onto Spool while manually rotating the unit until ears on the stem nut and ears on main Drive Sleeve mesh.
6. Grease flange face before securing unit to Spool.
7. Re-install thrust plate mounting bolts. Tighten to proper torque.

---

**NOTE:**

Reverse procedure if the stem nut needs to be replaced. Actuator does not need to be returned to factory for this procedure.

---

## 6.4 Spline Bushing (Quarter-Turn)

EIM removable Spline Bushing allows easy adaption to valve shaft diameter and key. Actuator may be rotated with respect to the valve shaft for unexpected or awkward field installations.

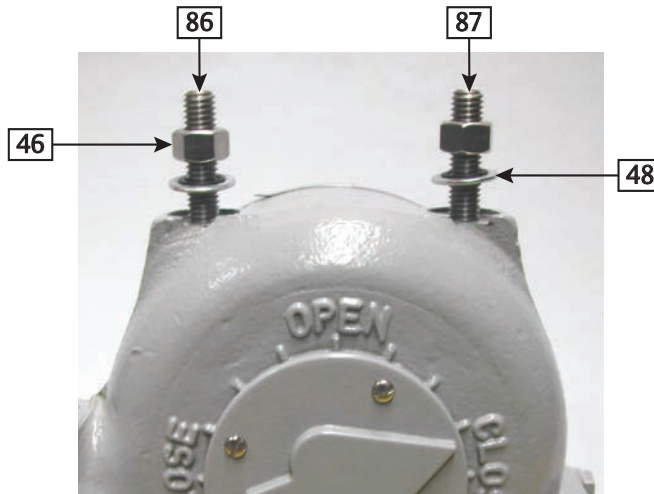
1. Move valve to full Open or Close.
2. Place Splined Bushing on valve shaft with key and tighten set screw.
3. Using the handwheel on actuator, move the Gear position indicator arrow to full Open or full Close (duplicating the position in Step 1).
4. Position actuator so the Splined Bore is correctly aligned with the Splined Bushing on stem shaft.
5. Lower the actuator onto the shaft until the flange faces properly mate. Secure with screws thru the adapter flange into the base of the actuator.

## 6.5 Quarter Turn Gearbox Stop Setting Procedure

Built-in mechanical stops are provided in the gearbox to prevent operation beyond total valve travel of 90° ( $\pm 6^\circ$ ).

End of travel stops are independently adjusted, locked in place and sealed.

Figure 2



Loosen both LOCKNUTS (46) and back out two STOPBOLTS (86 & 87) to allow valve to close and open fully. Ensure Travel Limit Valves have been properly adjusted (see appropriate section of this manual), and then proceed as follows:

1. Run actuator pneumatically to full closed position.
2. Screw CLOSE STOPBOLT (86) in until it seats, then back off 1/2 TURN. Install WASHER (48) and tighten LOCKNUT (46).
3. Run actuator pneumatically to full open position.
4. Screw OPEN STOPBOLT (87) in until it seats, then back off 1/2 TURN. Install WASHER (48) and tighten LOCKNUT (46).

### **⚠ CAUTION:**

Do not set Actuator Travel Limit valves to drive into mechanical stops. Damage can occur if actuator is allowed to repeatedly stall into end stops.

## Section 7: Pneumatic Hookup

1. When mounting is complete, per previous instructions in Assembly to Valve, move the valve position to mid-stroke with the actuator's Handwheel. This will provide sufficient time to stop actuator operation in case of incorrect pneumatic connection(s).
2. Identify a means of removing power from the actuator during hook up and check out.
3. Be sure no erroneous remote signal can be received that would cause the actuator to energize.
4. Each pneumatic actuator is supplied with a directional valve that is sized to deliver an air volume at the necessary required to achieve design performance for each actuator. The following criteria should be used when selecting your air system. The air motor size can be found on the unit ID (serial number) tag.

See Product Data Section of this manual to determine motor size.

**Table 3. Motor Pressure Consumption**

Port Size	(PSIG)	(SCFM)	SIZE
X	100	130	1/2" NPT
Y	100	180	1/2" NPT
Z	100	280	1" NPT

5. Consumption at a lower pressure is proportional to the data shown. Consideration must be given to your piping system. At a normal 100 psi supply, schedule 40 piping, or tubing with an equal internal diameter is recommended. A filter and lubricator MUST have threaded connections equal to port sizes shown. Piping size should be the same as that shown and connected to a larger header as close to the actuator as possible.  
  
Depending on the condition of the air supply, a filter may be required to maintain filtration in a 40-50 micron range. Filter selection must meet this operating criteria.
6. Install an automatic lubricator in the air line leading to the motor. It should be mounted in a horizontal pipe run as near as possible to the actuator.

---

**NOTE:**

Refer to "typical control diagrams" in this manual to determine proper piping location for accessory connections.

---

**NOTE:**

Do not hang pipe loads on the actuator. Use external support or flexible connections to the actuator.

---

The lubricator should be adjusted to feed one drop of oil for every 50-75 SCFM of air going to the actuator. For example, an "X" motor running for one minute would require a minimum of three drops of oil from the lubricator.

Figure 3 TYPICAL FILTER, REGULATOR AND LUBRICATOR PACKAGE



7. A lubricant is required for all internal moving parts of the air motor and air control valves. This is intended to reduce wear and prevent rust. Brand name oils are suitable if they are mineral base, wax free & aniline point in the range of 200-220°F. Oils must be thin enough to atomize in the lubricator. This should be in the range of Group D, Turbine Light with a viscosity of 32 at 100°F. Listed below is a representative group of suitable light oils that may be considered for use.
- Chevron - GTS Oil 32
  - Exxon - Teresstic T32
  - Mobil - Light
  - Shell - Turbo 32
  - Texaco - Capella 32 WF

**NOTE:**

Do not use penetrating oils or detergent type oils as they will damage seals and thicken in cold weather.

**NOTE:**

Any temperature below 32°F may require the addition of small amounts of pure ethylene glycol into the air system to prevent freezing. Do not concede the volume of oil normally used.

**NOTE:**

This product, as well as similar devices such as cylinders, solenoid valves, ESD valves, etc. emit air to atmosphere in their normal operating mode. Confer with established codes and safety regulations.

**⚠ CAUTION:**

Use of the product on any power medium other than compressed air or nitrogen may establish a potential hazard.

## Section 8: Travel and Torque Limits

### 8.1 General Information

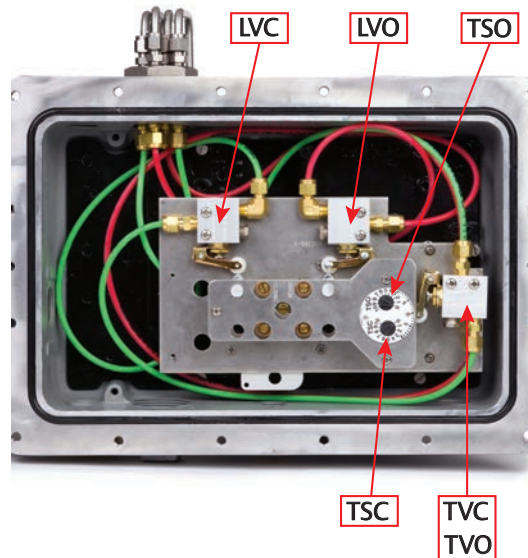
All Series 2000LP pneumatic actuators are provided with 3-way pneumatic travel limit valves (LVO and LVC). They are activated at each end of stroke to neutralize the control and stop the actuator in the proper position.

See figure 4 for location in control housing.

Series 2000LP actuators are also provided with 3-way pneumatic torque limit valves (TVO and TVC). They are activated when an over-torque condition is detected in either the opening or closing direction and will neutralize the control in order to prevent valve damage. They may also be set to provide the correct amount of torque for torque seated valves.

See figure 4 for location in control housing.

**Figure 4**



**NOTE:**

All position and torque limit valves must be set according to the instructions on the following pages of this manual after mounting the actuator to the valve.

The control assembly can also be fitted with auxiliary pneumatic limit valves for remote indication or other logic circuits as desired. These valves are mounted on top of the travel limit valves (LVO - LVC) and are actuated by the same cams as the travel limit valves. Consequently they cannot be adjusted to operate at any valve position other than full open and full closed with the travel limits. These valves can be used as 3-way normally closed, 3-way normally open or selector valves depending on port selection.



Pneumatic valve details:

- Maximum operating pressure rating - 125 psig
- Flow coefficient – 0.1 (20 CFM at 125 psig)
- Port size – 1/8 NPT
- With the roller actuator out (extended), the NO port is Open to Cylinder. This blocks the NC port on the valve.
- When the roller actuator depressed, the NC port is open to Cylinder and the NO port is blocked.

---

**NOTE:**

Optional electrical contacts are also available as needed. See pages 19 and 20 of this manual for electrical limit switch information and wiring diagram. It must also be recognized that auxiliary pneumatic limit valves and electrical limit switches cannot both be supplied on the same unit.

---

## Section 9: Setting Travel Limit Valves

Before setting limits it must be noted that actuators ordered specifically for torque-seated valve applications are assembled at the factory without tubing on the closing side limit valve. The close side limit valve is physically installed but the tubing bypasses it and runs directly to the torque limit.

1. **Determine full-open valve position**

Open the valve completely using the handwheel. Observe the rotational direction of the adjusting shaft (1) during opening. When the valve is fully open, close several turns (clockwise) to prevent overtravel.

2. **Disengage drive pinion**

Push the spring loaded shaft (2) down and rotate it 90° to the captured position. This disengages the gear drive from the G/L pinion. The shaft (1) will now rotate freely.

3. **Rotate adjustment shaft**

Observe position of limit valve roller cam for one of two positions.

- Position One - if the cam has not actuated the LVO valve, rotate the adjusting shaft (1) in the same direction noted in step one until the rotating cam actuates the limit valve.
- Position Two – if the cam has actuated the LVO valve, rotate the adjusting shaft (1) in the opposite direction until the rotating cam actuates the limit valve.

Note – Limit valves are actuated when the cam is pointing at the center of the limit valve roller.

---

**NOTE:**

Many turns maybe required to set travel limits. It may be convenient to use a reversible variable speed drill to rotate the adjusting shafts instead of a screwdriver.

---

4. **Re-engage drive pinion**

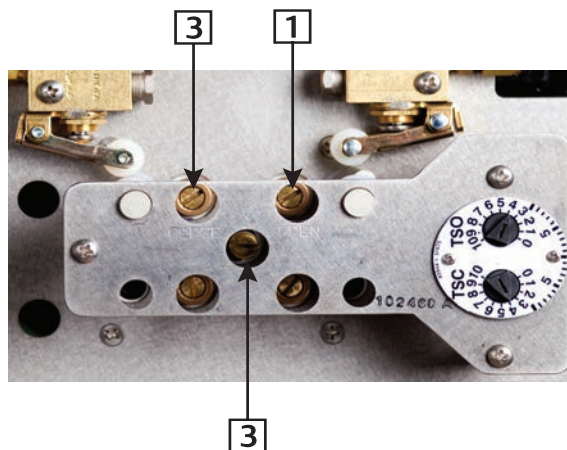
Rotate the spring-loaded shaft (2) 90°. The shaft will rise when locked in place.

5. **Important**

Lightly jiggle all adjusting shafts back and forth with a screwdriver to ensure correct engagement: shafts should not turn when locked in place.

6. **Determine full-close valve position**  
Close the valve completely using the handwheel. Observe rotational direction of adjusting shaft (3) during closing. Once the valve is closed, open it several turns (counterclockwise) to prevent overtravel.  
Repeat steps 2 thru 5 for LVC limit valve.

Figure 5



## Section 10: Setting Torque Limit Valves

Torque limit valves prevent mechanical overload in the Closed (TVC) and Open (TVO) positions. The torque limit valves are mounted in a stacked configuration. The top torque limit valve (TVO) controls the actuator opening torque and the bottom limit valve (TVC) controls the actuator closing torque.

Refer to the EIM Job Specification Sheet supplied with each actuator to review the customer-provided valve torque requirement shown at the top of the sheet. The bottom of the specification sheet shows numerous torque switch dial settings relative to output torque trip point limits. All actuators are shipped from the factory at minimum torque dial setting unless otherwise specified by customer.

---

**NOTE:**

Closing torque limits for torque-seated valve applications are factory set.

---

**NOTE:**

The customer supplied torque values on EIM Job Specification Sheets already includes a safety factor.

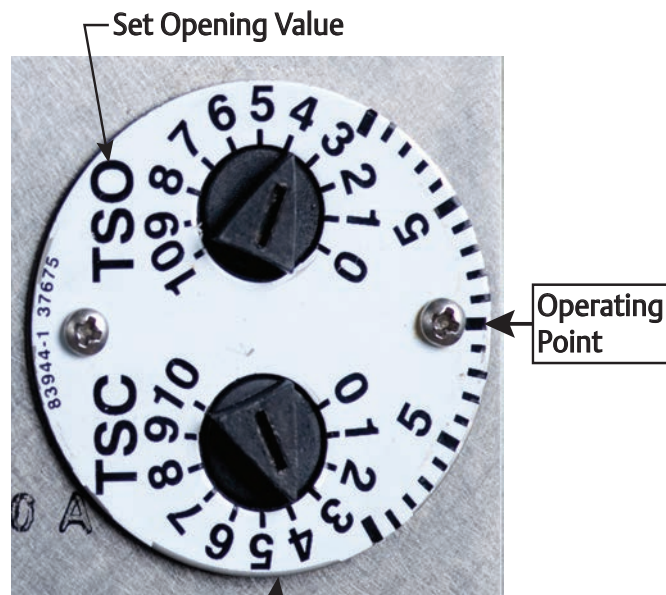
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### 10.1 Opening Torque

Using the handwheel, open the valve completely while observing the Torque Dial rotation for a reference operating point.

---

**Figure 6**



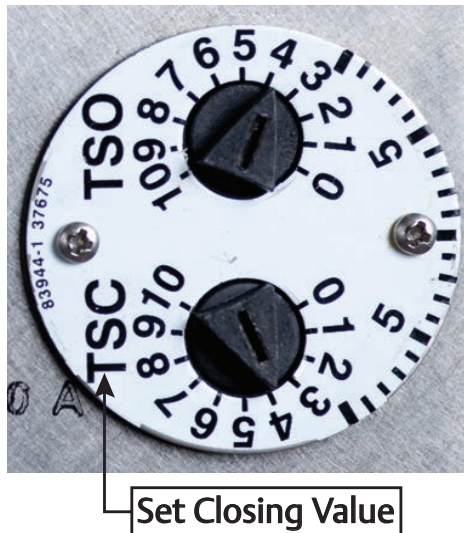
Refer to the EIM Job Specification Sheet for additional suggested setpoints. Determine appropriate setpoint and press down on the TSO dial indicator approximately 1/16" with a flat blade screwdriver and position the arrow for the desired setting. Release to secure in place.

Partially open the valve and reset with the Handwheel to ensure the set point is accurate.

## 10.2 Closing Torque

Using the handwheel, close the valve completely while observing the Torque Dial rotation for a reference operating point.

Figure 7



Refer to the EIM Job Specification Sheet for additional suggested setpoints. Determine appropriate setpoint and press down on the TSC dial indicator approximately 1/16" with a flat blade screwdriver and position the arrow for the desired setting. Release to secure in place.

Partially open the valve and reseal with the Handwheel to ensure the set point is accurate.

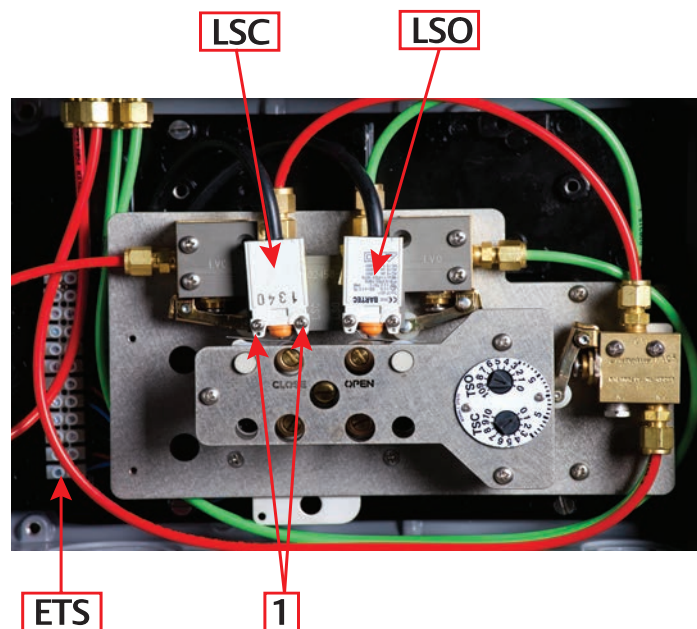
## Section 11: Optional Electric Limits

### 11.1 General Information

Two optional limit switches are available for Series 2000LP pneumatic actuators, one for open position (LSO) and one for the close position (LSC) – see Figure 8.

The 12 point electrical terminal strip (ETS) for customer connection is mounted on the backplate - see Figure 8.

Figure 8



Limit switches LSO and LSC are mounted to a bracket located on top of the limit valves. They are actuated by the same cam that actuates the limit valves and may be independently adjusted by loosening the mounting screws (1) and repositioning the switch in the slotted mounting bracket.

**NOTE:**

Electrical limit switches cannot be installed if auxiliary pneumatic limit valves are required.

## 11.2 Standard Wiring Diagram

Limit switches are supplied with a potted flexible connecting cable containing four wire leads; one blue lead, one black lead, one brown lead and one gray lead. These leads are factory prewired to the terminal strip (ETS) for each end of travel limit – see Figure 9.

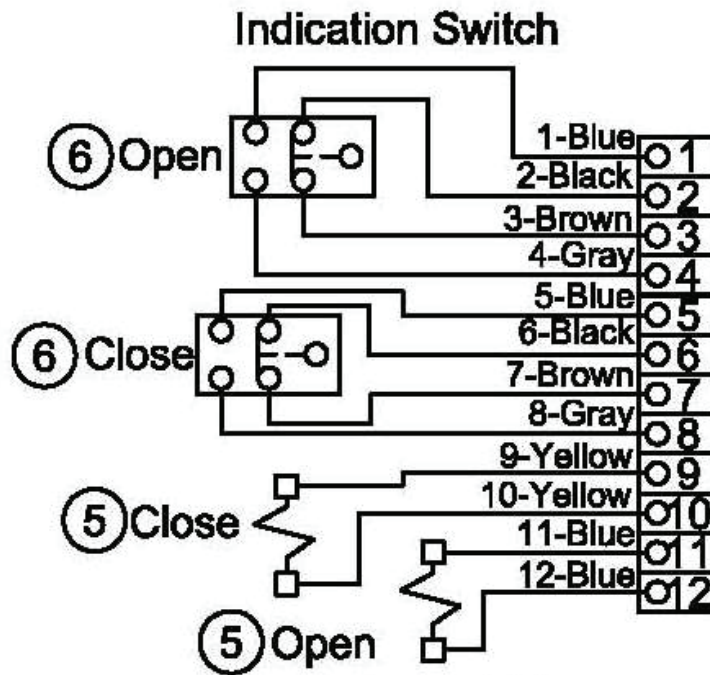
**NOTE:**

When provided, solenoids will be wired to terminals 9, 10, 11 and 12, as shown in Figure 9.

**Table 4. Rated Switching Capacity**

	AC		DC	
	Resistive	Inductive	Resistive	Inductive
400V	3A	2A		
250V	5A	3A	0.4A	0.03A
30V	7A	5A	7A	5A

**Figure 9**



**NOTE:**

Limit switches are always wired to terminals #1 through #8 as shown, even when solenoids are not provided.

# Section 12: Typical LP Control Package

REV	DESC	DESCRIPTION	DATE	BY	APPD
B	18128	Updated to Emerson Template	JUL 8/7/11		

ITEM	QTY.	DESCRIPTION	PART NO.
1	1	LIMIT SWITCH PLATE	102366
2	1	TOP PLATE	102460
3	4	HUMPHREY MINI LIMIT VALVE ASSY.	100077
4	3	SPACER POST, TOP PLATE	102136
5	2	SPACER POST, LIMIT SWITCH PLATE	102371
6	1	TORQUE LIMIT ASSEMBLY	SEE BOM
7	1	TORQUE SHAFT BUSHING	102140
8	1	TORQUE SHAFT	102171
9	2	CAM	102462
10	3	ALIGNMENT BAR, #8-32	102689
11	4	NYLON WASHER, 3/8" ID X .06 THK.	404600032
12	4	PAN HD PHILLIPS SCW, #8-32 X 1" LG.	4042610242
13	10	PAN HD PHILLIPS SCW, #8-32 X 1/2" LG.	4042612119
14	4	FLAT HD PHILLIPS SCW, #8-32 X 1/2" LG.	4042630076
15	10	FITTING, 1/8" NPT X 3/16" SWAGELOCK	111300-1-2-B
16	2	ELBOW, 1/8" NPT X 3/16" SWAGELOCK	111300-2-8
17	1	1-1/2" PORTED NUT, 4 PORTS	102362
18	4	FITTING, 1/8" NPT X 1/4" SWAGELOCK	111400-1-2-SS
19	4	VENT, 1/8" NPT	4300090011
20	1	SPACER BLOCK	102459
21	2	PAN HD PHILLIPS SCW, #8-32 X 1-3/4" LG.	4042612121

NOTE: ITEM 6 CHANGE TO BLACK TORQUE SWITCH FOR LEFT WORMGEAR

PORTED NUT ASSEMBLY FOR INSTALLATION IN WALL OF CONTROL BOX

OPEN TORQUE  
CLOSE TORQUE

**EMERSON**  
Process Management

CONTROLS LAYOUT, LOW PRESSURE, LVO, LVC, TVO, TVC, HUMPHREY VALVES

TITLE: **100013-2** DATE: 5-5-03  
BY: VTM CHECK: CH

LAYOUT NO. **100013-2** REV. **B**

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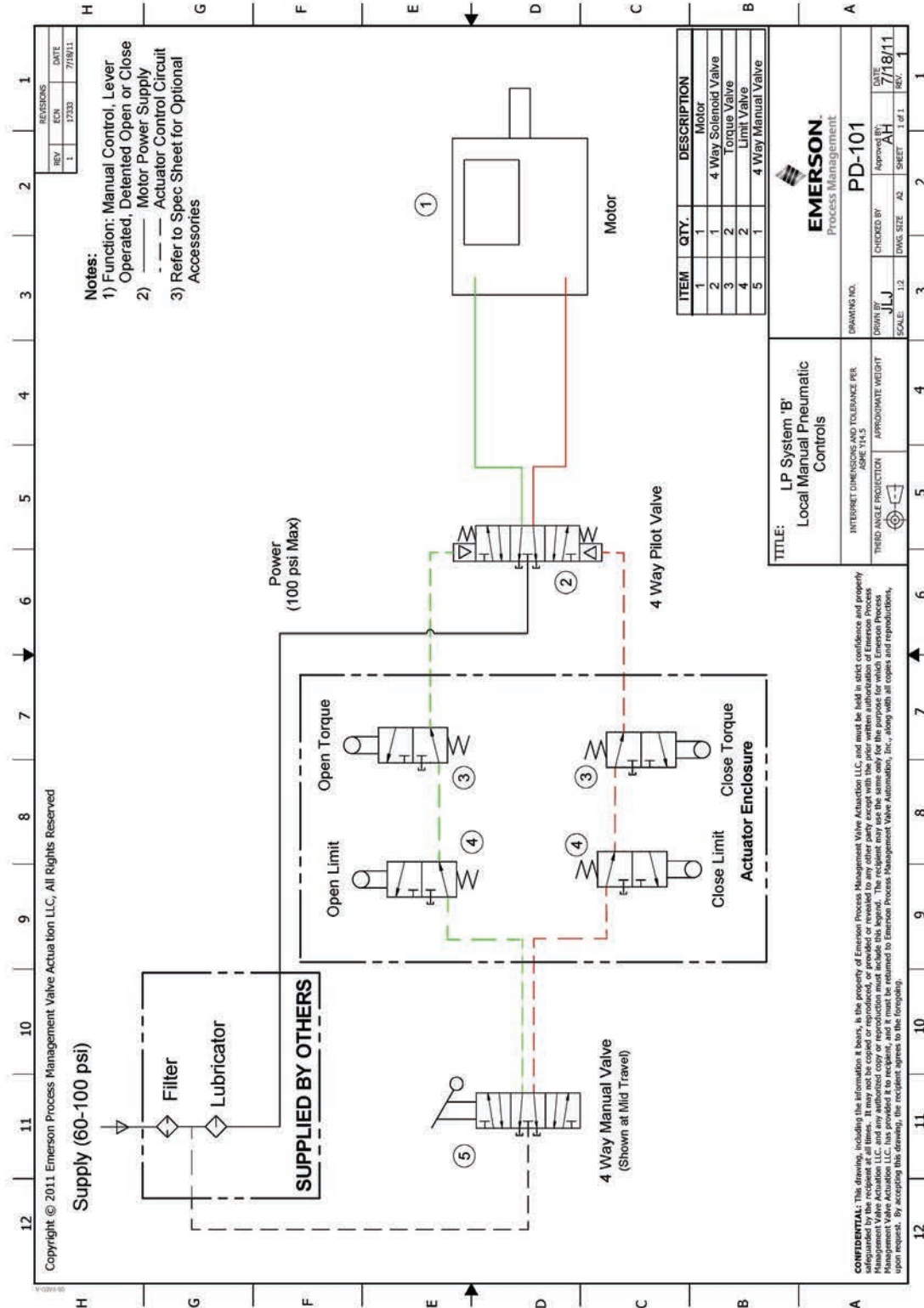
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**NOTES:**  
1. MARK "PART NO." - REV. "LETTER"  
2. BLUE LOCK TIGHT ITEMS 14, 15 & 16  
3. USE THREAD SEALANT ON ITEMS 17, 18 & 21  
4. USE GREY RTV

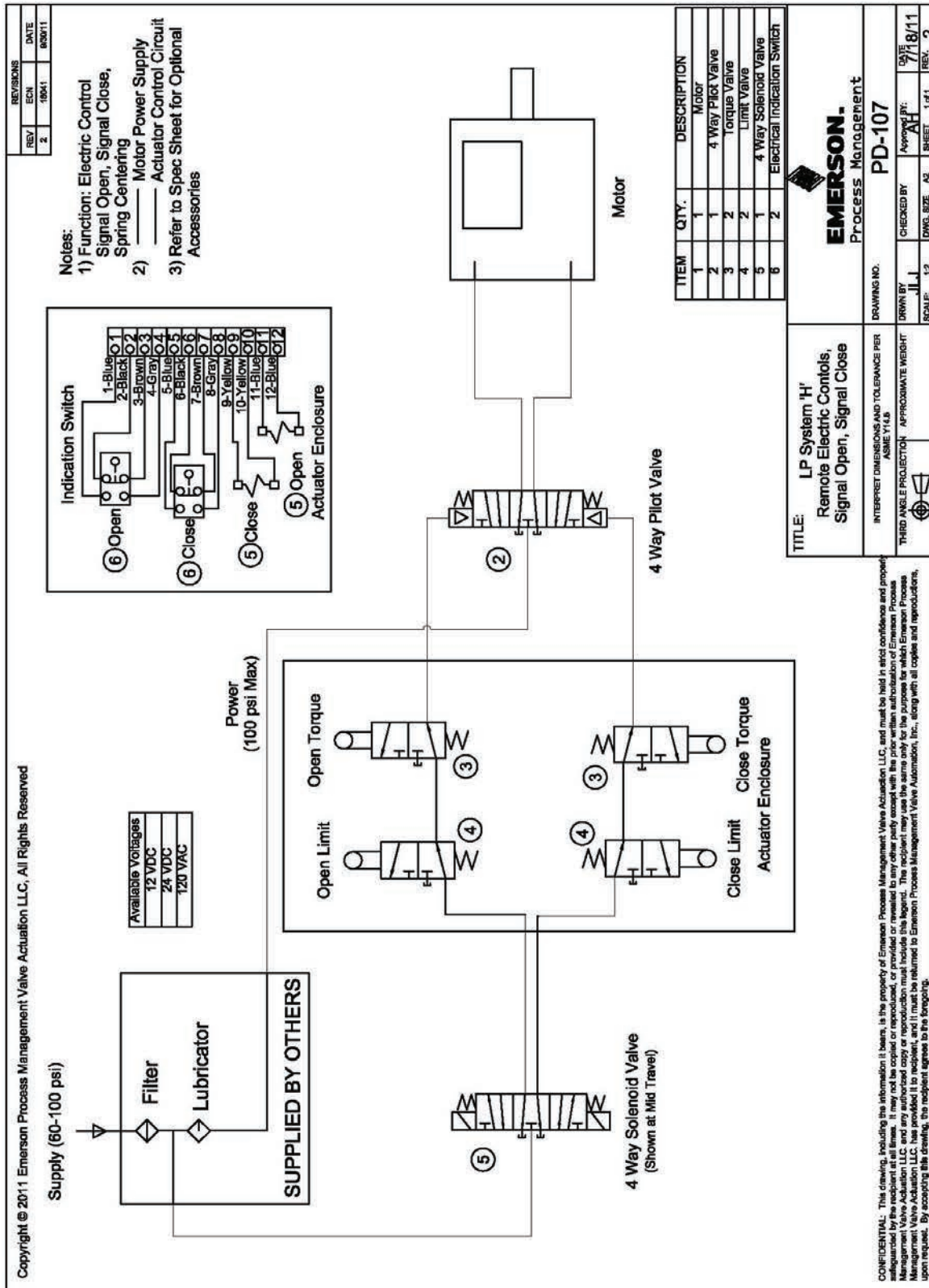


# Section 13: Typical Control Diagram

## Example One - Local Manual Control



## Example Two - Double Acting Electric



**EMERSON**  
Process Management

TITLE: LP System 'H' Remote Electric Controls, Signal Open, Signal Close

DRAWING NO. PD-107

INTERPRET DIMENSIONS AND TOLERANCE PER ASME Y14.5

THIRD ANGLE PROJECTION APPROXIMATE WEIGHT

DRWN BY J.L.J. CHECKED BY J.L.J. DATE 7/18/11

SCALE: 1:2 DWG. SIZE: A2 SHEET 1 of 2 REV. 2

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## Section 14: Gast Pneumatic Motor

The air motor supplied is a precision built rotary vane type. Internal components take up their own wear & will last approximately 5 to 15 thousand hours of use. This depends on motor speed, method of oiling, operating air pressure and plant preventative maintenance practices.

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### MOTOR SIZES

4AM 6AM 8AM 16AM

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### 14.1 Installation

Install a moisture trap and filter in the air line ahead of the actuator's air motor. For efficiency of output and speed control, use air lines the same size or in the next pipe size larger than the intake port of the motor.

The motors are piped up to work equally well in both directions of operation. The control valve makes reversing possible (refer to typical control diagram).

When coupling or connecting the motor to a driven member, avoid any end or side thrust on the motor shaft. Do not hammer on the shaft itself.

### 14.2 Lubrication

Lubrication is necessary for all internal moving parts and rust prevention. An auto-matic air line lubricator must be installed in the air line just ahead of the air motor. The lubricator should be adjusted to feed one drop of oil for every 50 – 75 SCFM of air going through the motor. Oil specifications can be found in the Pneumatic Hookup section of this manual.

Excessive moisture in the air line can cause rust formation in the motor and might also cause ice to form in the muffler due to expansion of air through the motor.

The moisture problem can be corrected by installing a moisture separator in the line & by installing an aftercooler between the compressor and air receiver.

### 14.3 General Information

The air motor is designed to be driven by compressed air. Under no circumstances should it be driven by fluids, particles, solids or any substance mixed with air, particularly combustible substances likely to cause an explosion.

#### **⚠ WARNING:**

Do not drive with flammable or explosive gases.

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#### **⚠ WARNING:**

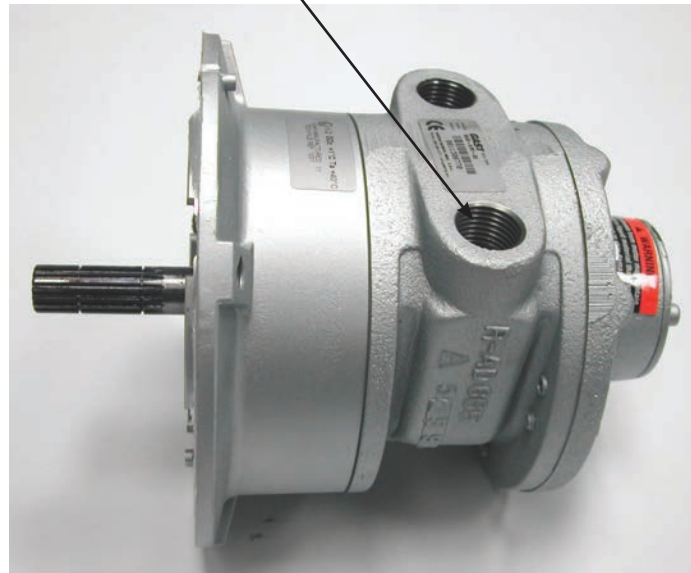
Do not allow corrosive gases or particulate material to enter the motor. Water vapor, oil-based contaminants, or other liquids must be filtered out.

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## 14.4 Servicing

If the motor is sluggish or inefficient, try flushing with an approved solvent:

- To flush, disconnect air line and muffler, add several teaspoons or spray solvent directly into the motor.
- Rotate the shaft by hand in both directions for a few minutes, reconnect the air line and slowly apply pressure until there is no trace of solvent in exhaust air.
- Flush unit in a well ventilated area.
- Re-lubricate the motor with a squirt of oil in the chamber.



8AM SHOWN ABOVE

**Table 5. Air Motor Consumption (SCFM)**

Motor	60 psi	80 psi	100 psi
4AM	40	50	62
6AM	70	90	110
8AM	95	120	145
16AM	135	175	220

## Section 15: Troubleshooting

SYMPTOM	PROBABLE CAUSE	CORRECTION
MOTOR WILL NOT RUN	No power to actuator	Check Air Supply
	Low Air Pressure – Filter is clogged in power or control circuit or	Clean or replace filter
	Motor Vanes are Worn	Check worn motor vanes
HANDWHEEL HARD TO TURN	Valve stem improperly lubricated	Lubricate with grease
	Actuator lubrication has broken down	Clean out old grease and replace with new
	Valve Packing Gland too tight	Loosen packing gland nuts
	Drive Sleeve Bearing Failure	Replace bearing
	Jammed Valve	Refer to Valve Maintenance
VALVE ONLY OPENS OR CLOSSES PARTIALLY WITH MOTOR	Torque Setting too Low	Check setting & recalibrate
	Limit Improperly Set	Check actuation & reset
TORQUE VALUE IS CORRECTLY SET, BUT ACTUATOR TORQUES OUT IN MID-TRAVEL	Damaged or bent valve stem	Refer to Valve Maintenance
	Valve Packing too Tight	Refer to Valve Maintenance
	Jammed Valve (obstruction in line)	Refer to Valve Maintenance
HANDWHEEL WILL NOT OPERATE VALVE	Handwheel shaft bearing assembly malfunction	Repair or replace
	Sheared gear key or stripped gearing	Replace
	P/S shifter in wrong position or malfunctioning	Shift into proper position Replace parts as required
	Broken Handwheel shaft	Repair or replace
	Broken valve stem or stripped stem nut	Replace as required
MOTOR RUNS BUT WILL NOT OPERATE THE VALVE	Motor Bearing assembly malfunction	Repair/Replace
	Sheared gear key [fastener, pin]	Replace
	Stripped gearing	Replace
	Broken valve stem or stripped stem nut	Repair/Replace
MOISTURE IN CONTROL ENCLOSURE	Leakage through conduit entry	Tighten all conduit plugs
	Enclosure is not correctly sealed	Inspect & replace o-ring
GREASE [OIL] IN CONTROL ENCLOSURE	Pressure relief fitting not installed	Install pressure relief fitting
	Bad Torque Limit or Gear Limit assembly	Replace assembly
	Bad Torque Limit or Gear Limit seal	Replace seal

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