



PROMATION ENGINEERING

Precision Actuation for Industry

Installation & Operation Manual

**This IOM is for the following
ProMation Engineering Products:**

PL550-120PN4

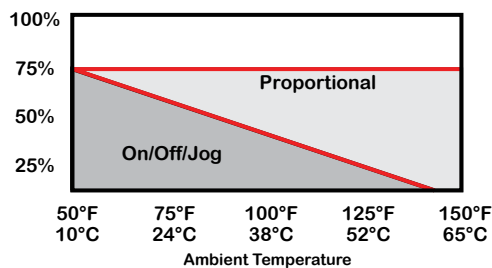
PL550-230PN4

PL1100-120PN4

PL1100-230PN4

Product Specifications

These units are equipped with internal force switches which protect the gear train, motor and controlled equipment from damage when high force conditions exist. These protective devices are NOT adjustable. More information on this technology is found throughout this manual.



Introduction

This document provides necessary information for set-up, calibration, testing and use of the PL Series linear electric actuators stated on the cover page. Each unit is shipped from the factory with initial calibration of end stop, cams and switches completed for 0-50mm or 0-100mm operation, depending on actuator model. However, these are general settings and serve as a starting point for proper calibration of the actuator in its real-world application.

Safety

Safety is a basic factor any time you maintain and operate mechanical equipment. Appropriate handling methods and proper use of tools and clothes can help prevent serious accidents -- accidents which can cause injuries to you or a fellow worker. This manual was created to enable a trained user to install, adjust and troubleshoot your ProMation actuator.

Only competent and trained personnel should install, maintain and operate ProMation actuators. Any work related to this actuator must be carried out in accordance with this manual and related codes and regulations. Local workplace health and safety rules should always be followed.

Duty cycle

Duty cycle is the percent of time that an actuator spends running as a fraction of the total time. Duty Cycle is directly related to heat; excessively repositioning an actuator typically results in motor overheating which can cause permanent damage and/or reduced service life.

Duty cycle can be calculated as follows: (example PL series actuator running 3 seconds ON and 30 seconds OFF) Runtime = 3s, Total time = 3s + 30s = 33s, therefore this duty cycle would be 9% (3/33)

Additionally, ProMation PL series actuators are designed for a maximum of 1200 starts per hour (one start every 3 seconds maximum).

Actuator Specifications	PL550		PL1100	
Torque "lb/Nm	550 lbs / 2.45 kN		1100 lbs / 4.89kN	
Supply Voltage	24v/120vac	230vac	24v/120vac	230vac
Max Inrush Current	0.5A	0.4A	0.5A	0.4A
Running Current	0.8A	0.5A	0.8A	0.5A
Motor	Split Phase Capacitor			
Full Travel Time	83 sec (0.6mm/sec) 50 mm max			
Duty Cycle	Proportional, 75% maximum			
Motor Starts	1200 per hour			
Weight	23lbs/11kg			
Mechanical Connections	ISO5211 F07 customizable stem coupling			
Electrical Entry	(2) 3/4" NPT			
Electrical Terminations	12-18ga			
Environmental Rating	NEMA 4/4X			
Manual Override	3.8" Handwheel			
Control	Proportional			
Aux Switches	(2) Dry Form C			
Actuator Case Material	Aluminum Alloy, Powder coated			
Motor Protection	230°F/110°C Thermal F* Class *Totally Enclosed Non-Ventilated Motors			
Ambient Temperature Operating Range	-22°F to +150°F -30°C to +65°C			

Shipping and Handling

1. This actuator is **shipped in the full stem down position** with a temporary stem block. Do not remove the stem block until the actuator has been assembled to the controlled device.
2. **NOTE, THIS ACTUATOR MUST HAVE WATER TIGHT EMT FITTINGS, WITH CONDUIT DRAINAGE INSTALLED AND POWER SUPPLIED TO UNIT TO KEEP THE HEATER WARM AT THE TIME OF INSTALLATION.**
3. **Storage: This unit should NOT be stored outside unless it is powered up and has proper conduit terminations. When NOT powered up, it should be stored in a clean, dry environment at all times.**
4. The actuator has been fully calibrated and tested to provide full range response for stem travel up to 50mm [PL550/1100] or 100mm [PL2200/4400].
5. **There are NO adjustable travel stops on this actuator.** Travel is electronically adjusted to match the stroke of the valve.

PL550/1100 PN4 Series



Temporary Stem Block

Installation Notes

- **Do NOT apply power to this actuator until it has been mounted onto the controlled device and mechanically checked for proper assembly.**
- **Do NOT attempt to make any adjustments to the force limit control switches. These switches are NOT travel adjustment switches, and any adjustment will VOID the warranty of this device.**
- The manual handwheel, when pulled OUT, allows full automatic operation of the actuator. Pushing IN the handwheel allows manual operation. Turning the handwheel CCW will drive the stem UP, while turning the handwheel CW will drive the stem DOWN. Be sure to pull the handwheel OUT to return to automatic operation.
- These actuators are designed to be used in either a horizontal or upright position. Do NOT mount the assembly with the actuator top below a horizontal position.
- When installing conduit, use proper techniques for entry into the actuator. Use drip loops to prevent conduit condensate from entering the actuator.
- Both NPT conduit ports MUST use proper equipment to protect the NEMA 4X integrity of the housing.
- Signal cable drain wire (highly recommended) must be grounded at ONE END ONLY! (Preferably at the supply end).
- The internal heater is to be used in ALL applications.
- Do NOT install the actuator outdoors or in humid environments unless it is powered up and the heater is functioning.
- Use proper wire size to prevent actuator failure (see chart on page 6 for proper wire sizing).
- All terminals accept 12-18AWG solid/stranded wire.
- **Do NOT parallel wire multiple actuators together without utilizing isolation relays! If this is your intention, please contact ProMation Engineering for a multiple actuator parallel wiring diagram.**

Product Mounting and Setup

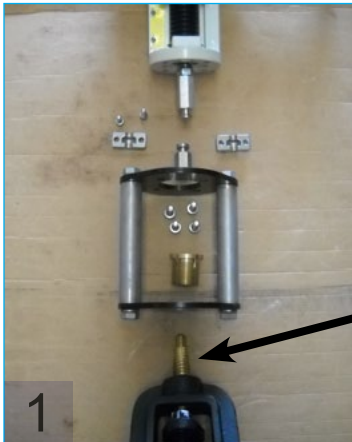
Linkage System: This actuator requires additional mechanical components to connect to a valve or damper system. This actuator is NOT designed to be used without a linkage system which, when connected to a valve will limit stroke between the 0% and 100% marks on the actuator lower casting.

It is the responsibility of the valve/damper assembler to design and manufacture the required components to properly connect the actuator to the controlled device. These components may also be acquired from ProMation Engineering at additional cost. Lead times for linkage systems are dependent on the valve manufacture and model.

Assembly of a PL Actuator to a valve using ProMation's standard linkage system is detailed on pages 4 and 5.

Mechanical Setup

This mechanical setup uses a common valve and ProMation linkage to describe the basic procedure of mounting a PL Series actuator to the valve.

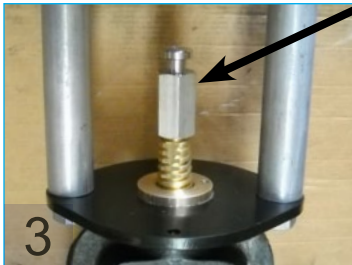


- There are a number of different types and configurations of valve design able to interface with the ProMation PL series actuator.
- Page 10 provides the necessary information to manufacture the required interface components to connect the actuator to the valve.
- For purposes of illustration, this instruction manual utilizes the ProMation Standard Pin & Plate Linkage design.
- The linkage shown in the following photos has been purpose designed and built to fit the valve shown.

1. Position the valve stem in the fully down position.



2. The linkage frame must sit evenly and completely on the valve mounting surface. Attach the securement nut and lock the linkage frame firmly and tightly against the valve mounting surface.



Valve stem adapter

3. Attach the valve stem adapter to the valve stem (this assumes the adapter has already been threaded to valve specifications). It should engage the valve stem thread a sufficient amount to be able to transfer the rated force of the actuator. **{WARNING: full thread engagement is critical to avoid damage to the valve stem threads}**



Actuator stem adapter

4. The actuator is shipped from the factory in the full stem DOWN position with a STEM BLOCK to prevent the actuator from moving BELOW the "0" graduated mark on the scale. Full stem down position is indicated by the position disc aligning with the "0" on the graduation plate.



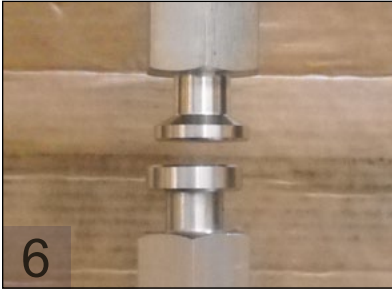
Screws and lock washers

Do NOT drive the stem down past the "0" indicator!
Do NOT remove the stem block until mechanical assembly to the valve is completed!

5. Attach the actuator to the linkage using (4) M8 SHCS screws and lock washers.

a. **Hand tighten the screws only, we want the actuator to be able to "float" a bit as we assemble and mate the stems.**

Mechanical Setup (continued)

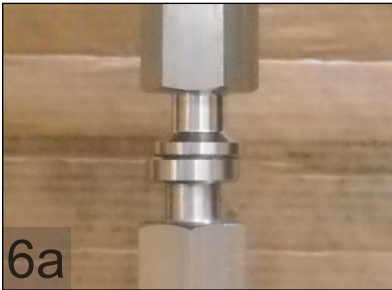


6. With the valve fully stem DOWN and the actuator fully DOWN, it will now be necessary to adjust the stem adapters to align and couple them together.
 - a. Rotate the actuator stem adapter DOWN (unscrew from the actuator stem) to meet the valve stem adapter.

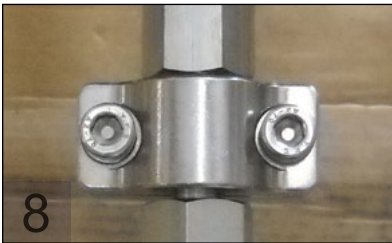
Do NOT raise the valve stem UP to meet the actuator stem adapter.

Do not drive the actuator stem below "0" to meet the valve stem adapter.

The valve stem and actuator stem MUST have a sufficient amount of thread engagement to transfer the rated force of the actuator.



7. Once the adapters are aligned correctly attach one half of the coupling to the two adapters.



8. Assemble the other half of the coupling using the screws and lock washers provided.



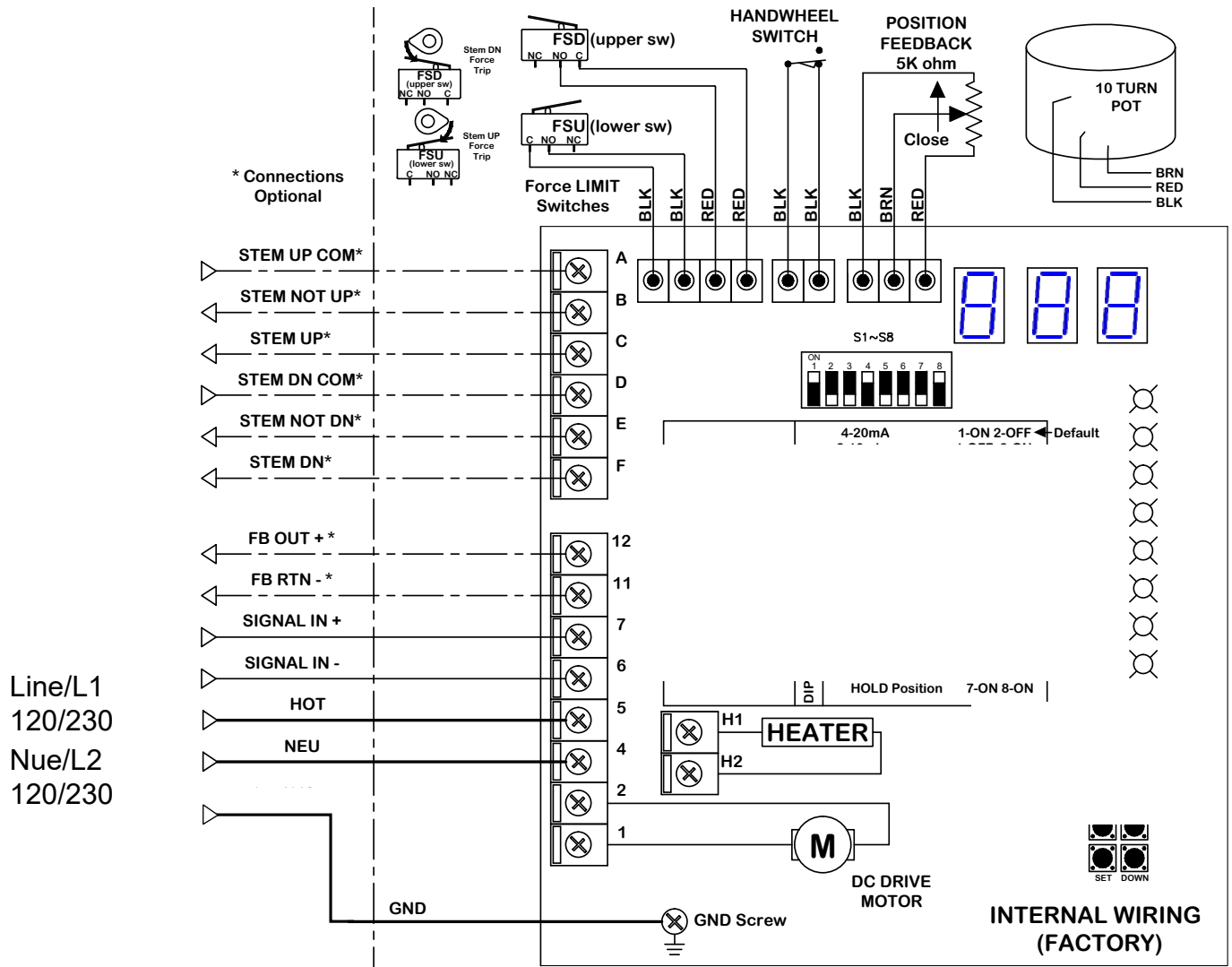
9. Tighten all mounting hardware at this time
10. Lock the actuator stem nut to the actuator stem adapter. Repeat for the valve stem, if applicable.
11. This completes the mechanical assembly of the actuator to the valve body.

Remove the STEM BLOCK at this time.

Next step is electrical calibration.



1. BEFORE POWER IS APPLIED: The actuator must be mechanically mounted onto the controlled device.
2. BEFORE POWER IS APPLIED: Utilize the handwheel to check for unobstructed manual operation from full STEM DOWN to full STEM UP positions.
3. Connect POWER AND CONTROL to terminals marked 4, 5, 6, and 7
 - Note the polarity of the SIGNAL IN.
4. Do NOT apply power at this time.



Field Wiring

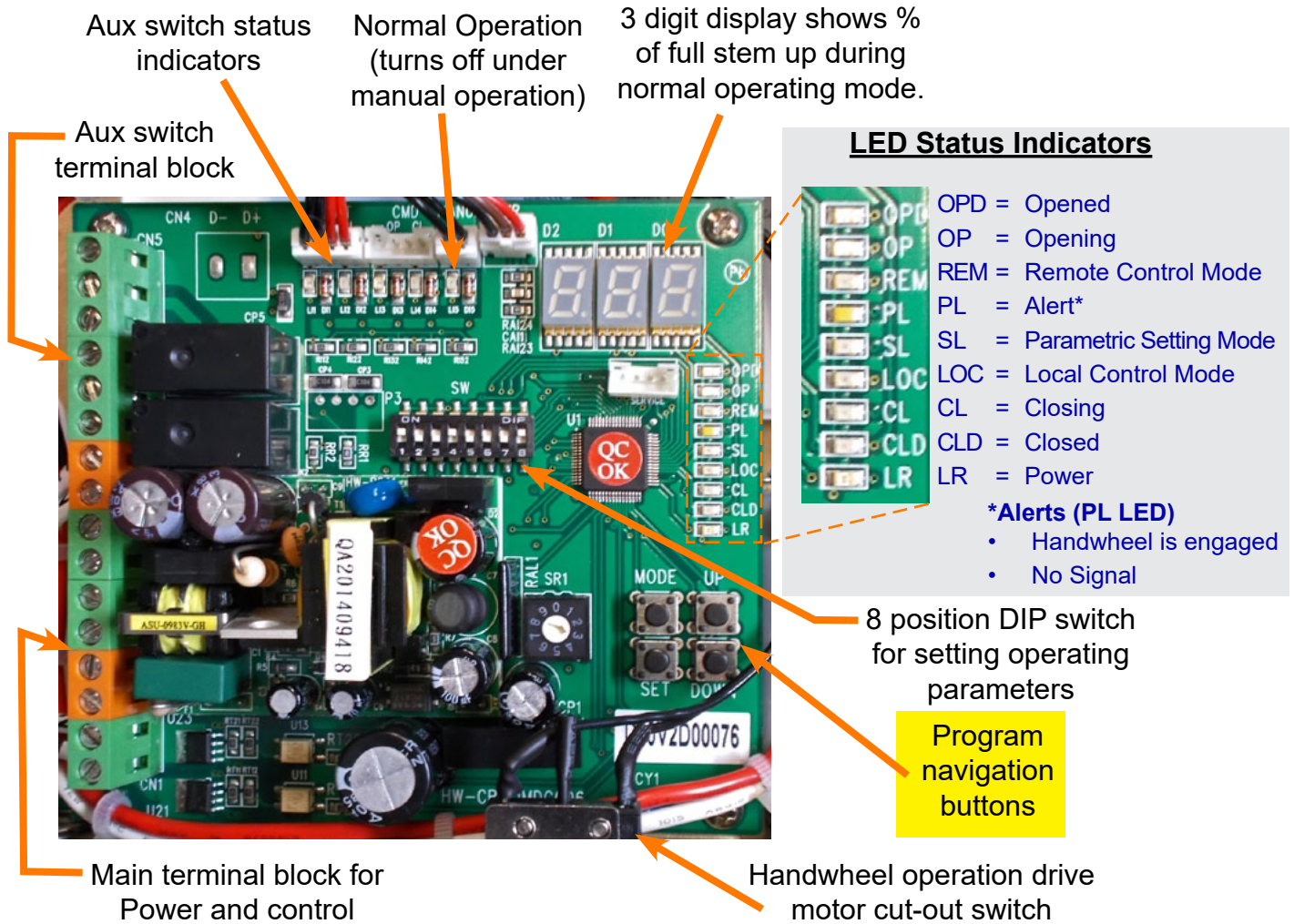
Internal Actuator Wiring

Wire Sizing Chart

Wire sizing data is provided in the table to assist in the selection of the proper wire size for ProMation actuators using various wire sizes over distance. Please make sure to reference the correct voltage and do not exceed the indicated length of the wire run for each model.

MAX distance between Actuator and Supply (feet)		
Actuator/ Voltage	PL550/1100 120VAC	PL550/1100 230VAC
	Wires Gage	0.8A
18	1033	3168
16	1623	4978
14	2622	8042
12	4011	12299
10	6818	20909
8	10176	31208

Below is a photo for reference during the wiring and calibration of the proportional controller in the PL550/1100 series actuators. The controller has been installed and calibrated at the factory before shipping. The unit has been calibrated for 0mm - 50mm travel corresponding to 4mA and 20mA (default) input signals respectively. (Other signals are calibrated if placed at time of order).



LED Status Indicators

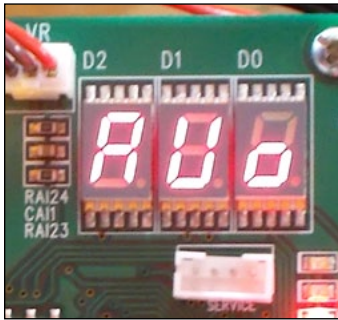
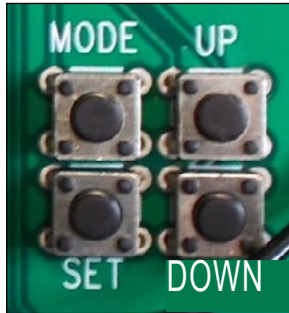
- OPD = Opened
 - OP = Opening
 - REM = Remote Control Mode
 - PL = Alert*
 - SL = Parametric Setting Mode
 - LOC = Local Control Mode
 - CL = Closing
 - CLD = Closed
 - LR = Power
- *Alerts (PL LED)**
- Handwheel is engaged
 - No Signal

Input, Feedback, Direct Acting, and Loss of Signal Table

Default Settings

DIP Switch Setting	DIP Switch Setting	DIP Switch Setting	Functions
DIP 1 On	DIP 2 Off		4-20mA Signal Input
DIP 1 Off	DIP 2 Off		1-5V Signal Input
DIP 1 Off	DIP 2 On		2-10V Signal Input
DIP 3 Off	DIP 4 On	Dip 5 Off	4-20mA Signal Output
DIP 3 On	DIP 4 Off	Dip 5 On	2-10V Signal Output
DIP 6 Off			Direct Acting Mode
	DIP 7 On	DIP 8 On	Stay in Place on LOSS of Input Signal
	DIP 7 Off	DIP 8 On	Stem Down on LOSS of Input Signal
	DIP 7 On	DIP 8 Off	Stem Up on LOSS of Input Signal
DIP 6 On			Reverse Acting Mode
	DIP 7 On	DIP 8 On	Stay in Place on LOSS of Input Signal
	DIP 7 Off	DIP 8 On	Stem Up on LOSS of Input Signal
	DIP 7 On	DIP 8 Off	Stem Down on LOSS of Input Signal

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Remove the Stem Block if not already done.

Begin Auto-Calibration

1. Do NOT apply power to this actuator until it has been mounted onto the controlled device and mechanically checked for proper assembly.
2. Press MODE five times until “AUo” shows on the three digit display.
3. Hold SET until LOC LED turns on, indicating that Auto-Calibration has commenced.
 - A. Actuator will drive stem UP until the end of the valve stroke is reached and the actuator stops linear motion due to the force limit switch tripping.
 - B. Actuator will drive stem DOWN until the end of the valve stroke is reached and the actuator stops linear motion due to the force limit switch tripping.
4. After Auto-Calibration the unit will return to automatic operation and respond to signal inputs, such as 4-20mA.
 - Input signal is automatically adjusted so high signal (example: 20mA) will drive valve full stem up.

Mechanical Calibration

1. Set the stem DOWN software reference point:

Power up the actuator and use the handwheel (CCW) to drive stem fully DOWN until the CLD led comes on. (Pull handwheel OUT to return to auto operation)

Using the navigation buttons, press:

- MODE (x3) to read LOC on the display,
 - SET (x1) until led SL comes on,
 - SET (hold in) until SL turns off and led LOC lights
 - UP (repeatedly) until led CLD turns off
 - DOWN (slowly) until led CLD just comes on.
 - SET (x1) saves input parameter in memory.
 - MODE (x3) to return to auto mode.
- This sets the stem DOWN software parameter.

2. Set the stem UP software reference point:

Generate a 20mA control signal on terminals 6(-) & 7(+). (Handwheel may be used to speed up this process - pull out to return to power mode).

Using the navigation buttons, press:

- MODE (x3) to read LOC on the display,
 - SET (x1) until led SL comes on,
 - SET (hold in) until SL turns off and led LOC lights
 - DOWN (repeatedly) until led OPD turns off
 - UP (slowly) until led OPD just comes on.
 - SET (x1) saves input parameter in memory.
 - MODE (x3) to return to auto mode.
- This sets the stem UP software parameter.

3. Set the stem DOWN signal response position:

Generate a 4mA control signal. (Handwheel may be used to speed up this process - pull out to return to power mode).

- MODE (x2) to read PAR on the display
 - SET (x1) to read SPD on the display
 - DOWN (x3) to read ZRL on the display
 - SET (hold in) until led SL turns on
 - DOWN (x1) until led CLD turns off
 - UP (slowly) until led CLD just comes on
 - SET (x1) saves signal reference in memory
 - MODE (x4) to return to auto mode.
- This sets the stem DOWN software parameter.

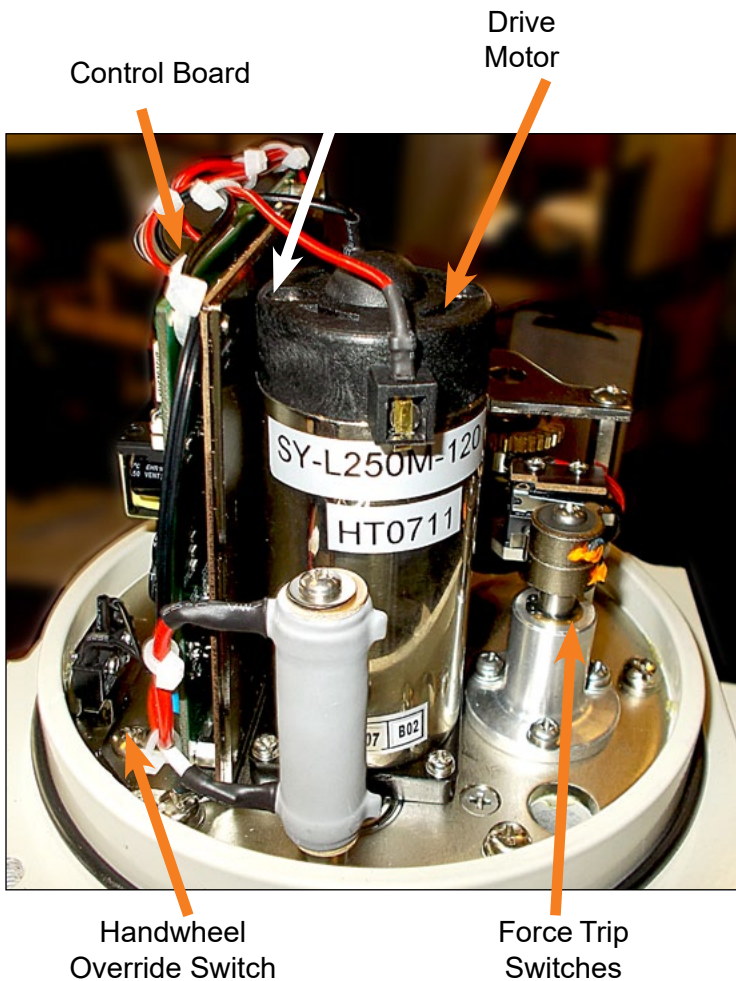
4. Set the stem UP signal response position:

Generate a 20mA control signal and wait for actuator to drive stem UP. (Handwheel may be used to speed up this process - pull out to return to power mode).

- MODE (x2) to read PAR on the display
 - SET (x1) to read SPD on the display
 - DOWN (x4) to read FUL on the display
 - SET (hold in) until led SL turns on
 - UP (repeatedly) until led OPD turns off
 - DOWN (slowly) until led OPD just comes on
 - SET (x1) saves signal reference in memory
 - MODE (x4) to return to auto mode.
- This sets the stem UP software parameter.

Calibration complete.

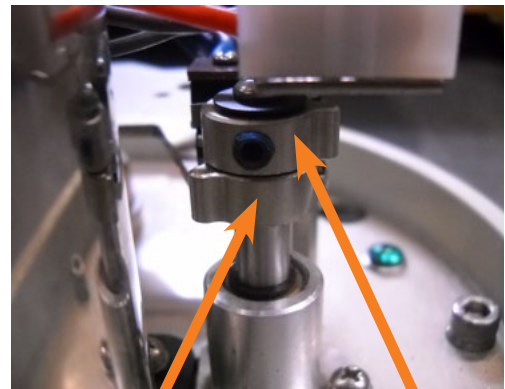
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Force Limit Switches: Over-travel protection is provided by load force control switches for both directions of travel. These switches are designed to stop electrical travel when the actuator reaches it's force load limit at each end of valve travel.

Do NOT attempt to make any adjustments to the force limit control switches. These switches are NOT travel adjustment switches, and any adjustment will VOID the warranty of this device.

Force Limit Switches



Full Stem Up
Force Cam
(Do NOT Adjust)

Full Stem Down
Force Cam
(Do NOT Adjust)

Handwheel Operation

The handwheel mechanically activates the handwheel override switch (see photo at right) which supplies power to the motor. The manual handwheel, when pulled OUT, allows full automatic operation of the actuator. Pushing IN the handwheel switches off motor power and allows manual operation.

- Turning the handwheel CCW will drive the stem UP.
- Turning the handwheel CW will drive the stem DOWN.
- **Be sure to pull the handwheel OUT to return to automatic operation.**
- **Do NOT use power tools to turn the manual override it will DAMAGE the gear train or motor and VOID the warranty.**

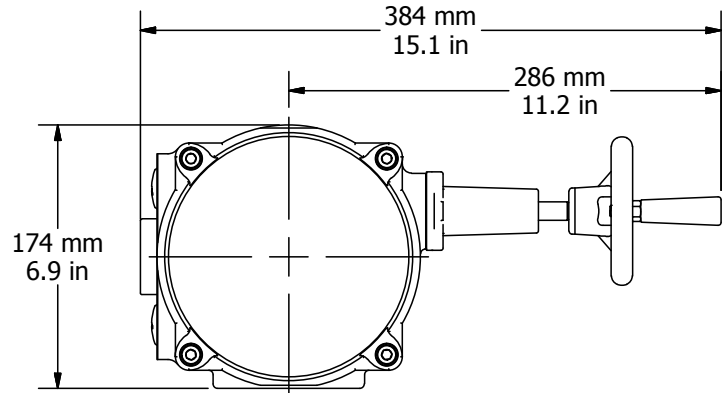
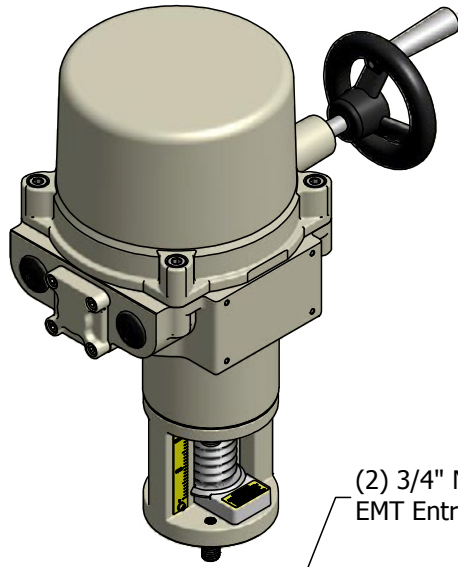
Handwheel Override Switch



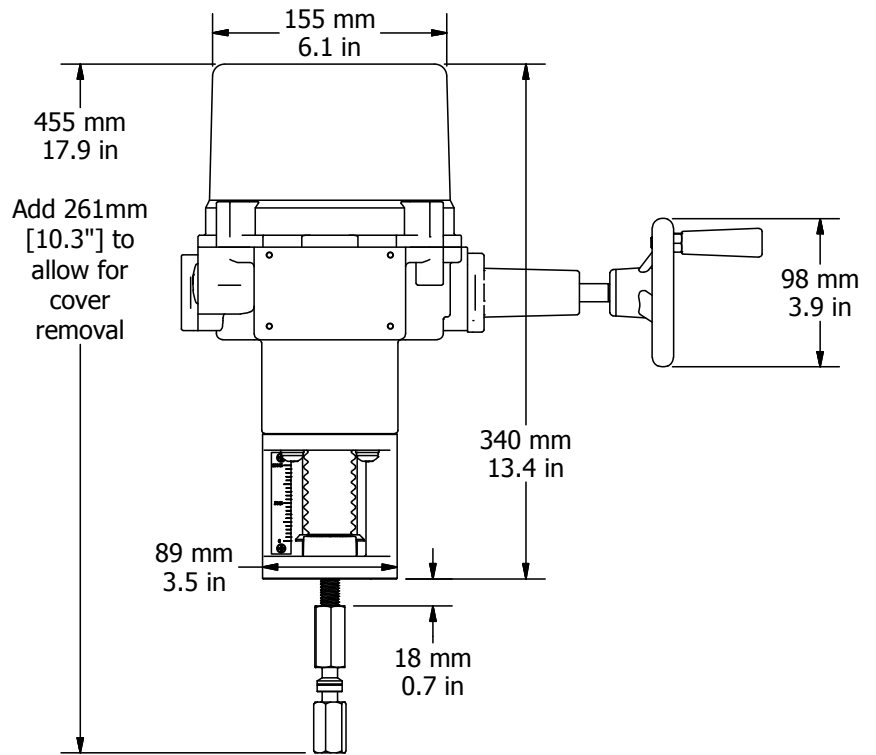
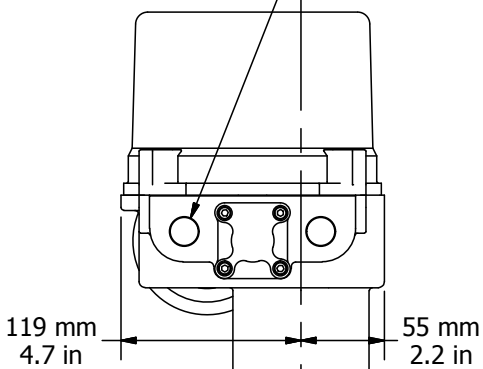
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Mechanical Data

PL550/1100 Series Dimensional Data



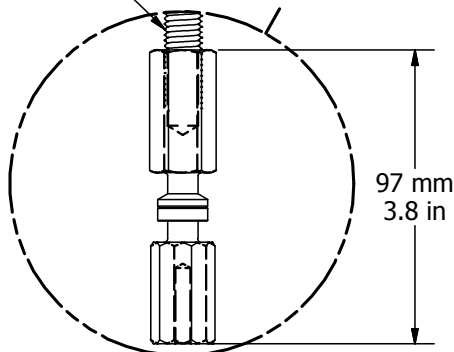
(2) 3/4" NPT
EMT Entry



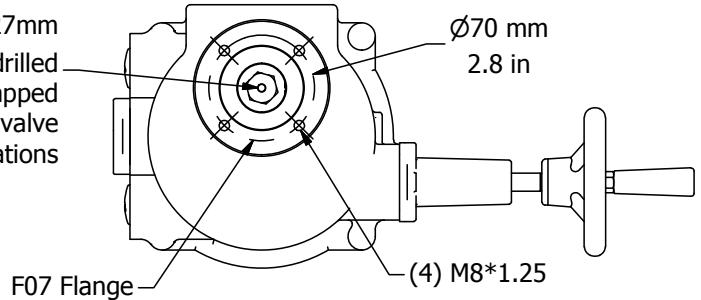
*Coupling
Hardware
NOT shown

M12*1.75

A



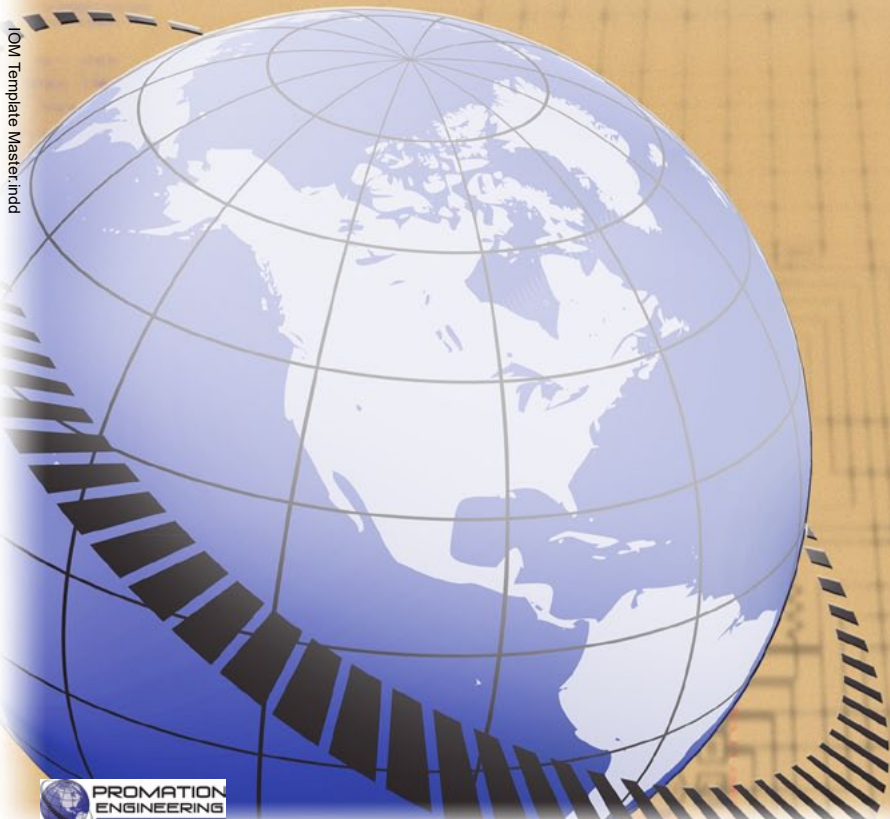
5mm Hole
▽ 27mm
To be drilled
and tapped
to valve
specifications



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After completing all mounting and wiring procedures and main power is available, it is now possible to commission the actuator.

1. Utilize the handwheel to move the actuator and damper, valve or other connected device through its full travel from full stem UP to full stem DOWN and back again to check for any possible interference. Do NOT utilize any mechanical advantage devices to rotate the handwheel (pipes, wrenches, extension bars, etc.).
2. Apply correct power to the unit.
3. Measure correct power on terminals 5 (Hot / L1) & 4 (Neu / L2) on the switch board.
4. Command the field device to generate a signal to drive the actuator towards the stem UP position.
5. Actuator will stop when it reaches it's full stem UP position.
6. Command the field device to generate a signal to drive the actuator towards the stem DOWN position
7. Actuator will stop when it reaches it's full stem DOWN position.
8. Actuator is now commissioned and operational.





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