



PROMATION ENGINEERING

Precision Actuation for Industry

Installation & Operation Manual

This IOM is for the following
ProMation Engineering Products:

P2-120N4-090180

P2-230N4-090180

P3-120N4-090180

P3-230N4-090180



PROMATION ENGINEERING

Precision Actuation for Industry

Field Manual P2/3 HV-090180 with 0°-90°-180° option On/Off/Jog Control ISO5211 F07 8P22



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Product Specifications

Actuator Specifications	P2		P3	
	800”lbs/90Nm		1335”lbs/150Nm	
Torque “lb/Nm				
Supply Voltage	120vac	230vac	120vac	230vac
Max Inrush Current	1.8A	0.8A	1.8A	1.2A
Running Current	1.0A	0.5A	1.2A	1.0A
Motor	Split Phase Capacitor			
Runtime (90°@60Hz/vdc)	15 sec		22 sec	
Runtime (90°@50Hz)	17 sec		26 sec	
Duty Cycle	25%			
Motor Starts	1200 per hour			
Weight	26lbs/12kg			
Mechanical Connections	ISO5211 F07 8pt 22mm			
Electrical Entry	(2) 3/4” NPT			
Electrical Terminations	12-16ga			
Environmental Rating	NEMA 4/4X			
Manual Override	5” Handwheel			
Control	On/Off/Jog			
Actuator Case Material	Aluminum Alloy, Powder coated			
Motor Protection	230°F/110°C Thermal F* Class *Totally Enclosed Non-Ventilated Motors			
Ambient Temperature	-22°F to +125°F			
Operating Range	-30°C to +52°C			

Introduction

This document provides necessary information for set-up, calibration, testing and use of the P Series quarter-turn electric actuators stated on the cover page. Each unit is shipped from the factory with initial calibration of mechanical stops, cams and switches completed for 0-90-180 degree operation. 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:

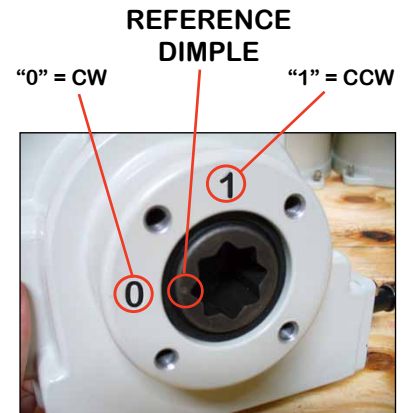
(example P2 series actuator running 3 seconds ON and 30 seconds OFF)

Runtime = 3s, Total time = 3s + 30s = 33s, therefore this duty cycle would be 9% (3/33)

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

Shipping and Handling

1. This actuator is shipped in the FULLY CW position (2 color position indicator shows "0" and the Reference Dimple aligns with "0").
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. This actuator has been **factory calibrated to operate between 0 degrees and 180 degrees with stops at 90 degrees from both directions. Most quarter-turn products will not require recalibration of these settings.** If any travel adjustment is necessary, please refer to pages 5-6 for instructions.



0 and 1 colored for clarity

Product Mounting and Setup

1. Fully CLOSE the valve or damper to which the actuator is to be mounted.
 - Keep in mind this actuator rotates CW (as viewed from above the unit) when driving CLOSED.
2. Assemble necessary linkage components and attach the actuator to the driven device.
3. Tighten mounting bolts, making sure actuator is centered on the device drive shaft.
4. Utilize the handwheel to check for unobstructed manual operation from fully CCW to fully CW positions BEFORE applying power to the unit.
5. Make the electrical connections per wiring diagram on page 4.
 - Connect POWER and CONTROL to terminals marked 1, 3, 5, 6, and 7.
6. Do NOT apply power at this time.

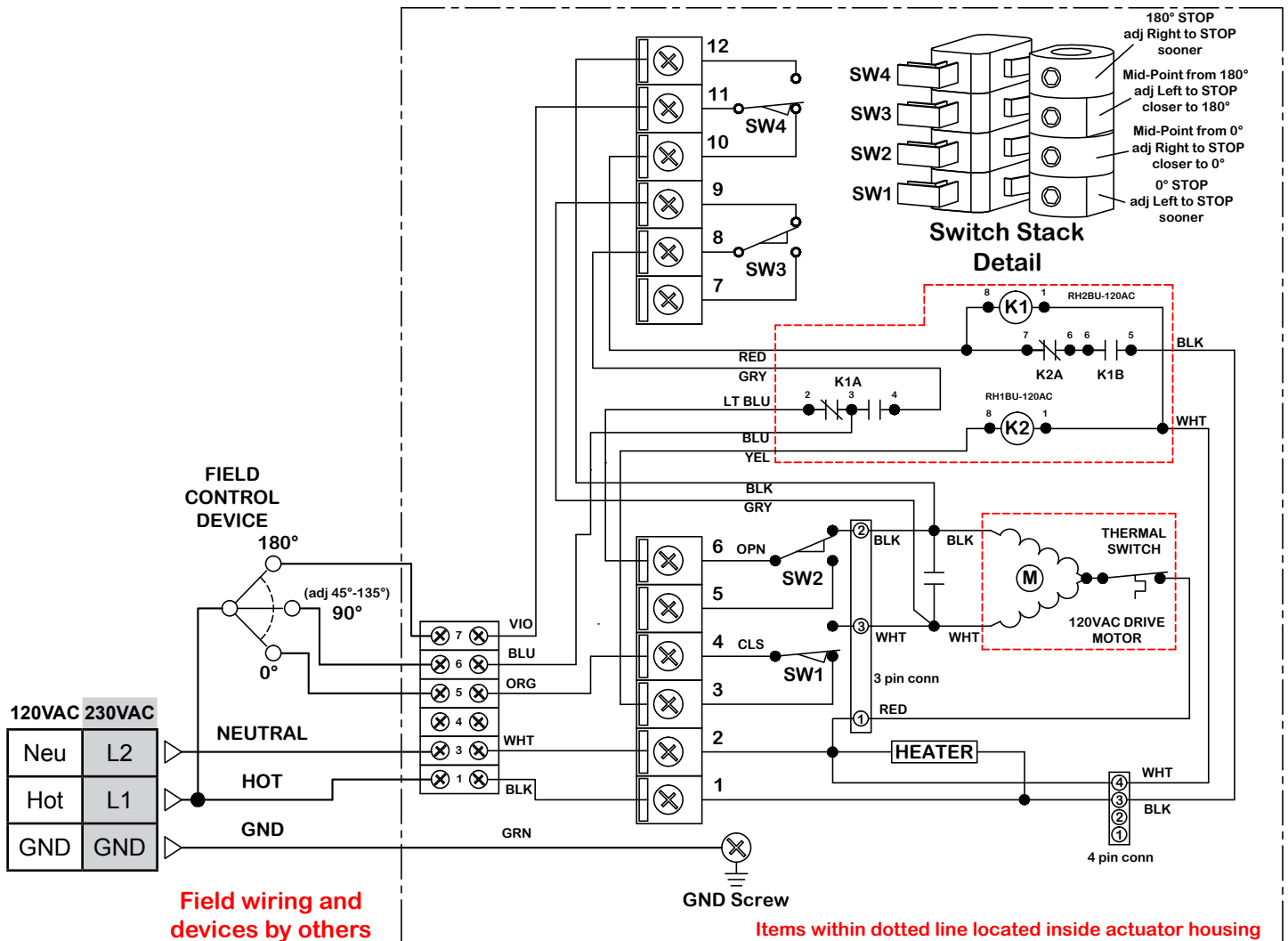
Installation Notes

- These actuators are designed to be used between a horizontal and 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.
- Mechanical travel stops are not included for this product.
- Both NPT conduit ports MUST use proper equipment to protect the NEMA 4X integrity of the housing.
- 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 4 for proper wire sizing).
- All terminals accept 12-16AWG solid/stranded wire.

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Wiring Diagram

On/Off Control



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Wire Sizing Data

Wire sizing data is provided in the table to assist in the selection of the proper wire size for these actuators using various wire sizes over distance.

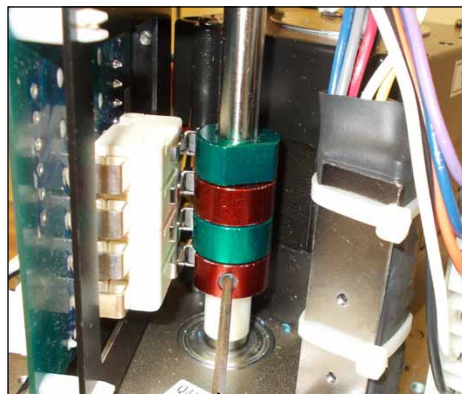
Please make sure to reference the correct voltage and do not exceed the indicated length of the wire run for each model.

Wire Sizing Chart

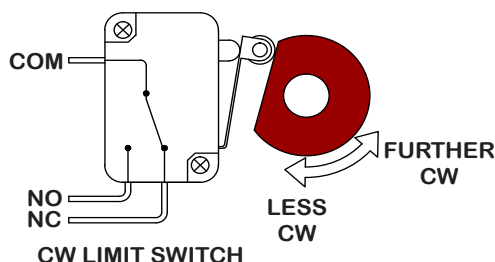
Actuator	MAX distance between Actuator and Supply (feet)			
	P2		P3	
Voltage	120VAC	230VAC	120VAC	230VAC
Wires Amps Gage	1.8A	0.8A	1.8A	1.2A
16	722	3111	722	2074
14	1166	5026	1166	3351
12	1783	7687	1783	5125
10	3030	13068	3030	8712
8	4523	19505	4523	13003

Adjusting the actuator 0 and 90 degree positions

This actuator has been factory calibrated to operate between 0 degrees and 180 degrees with stops set for 90 degrees from either direction. These settings are for your reference. Your actuator has been initially calibrated at the factory and **you may not need to perform this calibration.**



Cam 1



Adjust Cam 1

1. The FIRST cam is the 0° limit switch. Apply power and drive the actuator to the 0° position.

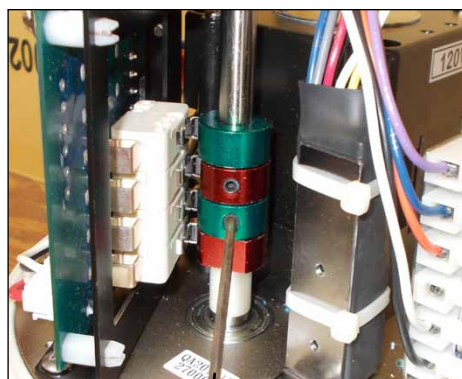
POWER OFF the actuator and use the manual hand wheel to position the actuator to your required 0° position. This must be within +/- 3° of the factory setting.

Use a 2.5mm hex key to free up the cam set screw. Once it is free, rotate the hex key to the RIGHT a few degrees to reset the switch roller arm. Then snug the set screw up against the camshaft (CW) until slight pressure is felt.

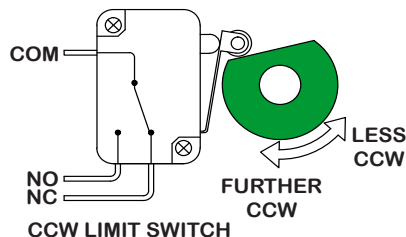
Then SLOWLY rotate the hex key pushing the cam to the LEFT until you hear the “click” on the switch indicating that correct adjustment has been achieved. Tighten the cam set screw.

2. Apply power to the actuator and drive towards 90° at least 15-20°. Then drive the actuator back to 0° until the cam stops the electrical travel. Check to be sure this is the correct 0° position you require. Repeat step 1 if further adjustment is needed.

3. Apply power to the actuator and drive the actuator to the 90° position.



Cam 2



Adjust Cam 2

4. The SECOND cam is the 90° limit switch when traveling from 0°.

POWER OFF the actuator and use the manual hand wheel to position the actuator to your required 90° position. This must be within +/- 3° of the factory setting.

Use a 2.5mm hex key to free up the cam set screw. Once it is free, rotate the hex key to the LEFT a few degrees to reset the switch roller arm. Then snug the set screw up against the camshaft (CW) until slight pressure is felt.

Then SLOWLY rotate the hex key to the RIGHT until you hear the “click” on the switch indicating that correct adjustment has been achieved. Tighten the cam set screw.

5. Apply power to the actuator and drive towards 0° at least 15-20°. Then drive the actuator back to 90° until the cam stops the electrical travel. Check to be sure this is the correct 90° position you require. Repeat step 4 if further adjustment is needed.

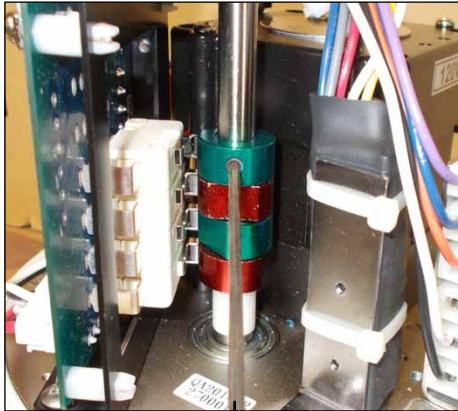
6. Apply power to the actuator and drive the actuator to the 180° position.

You must drive the actuator all the way to the 180° position or the motor will not reverse direction.

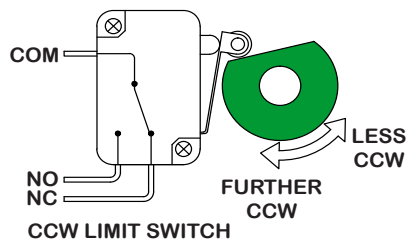
Adjusting the actuator 180 and 90 degree (returning) positions

This actuator has been factory calibrated to operate between 0 degrees and 180 degrees with stops set for 90 degrees from either direction. These settings are for your reference. Your actuator has been initially calibrated at the factory and **you may not need to perform this calibration.**

The actuator must be all the way to the 180° position.



Cam 4



Adjust Cam 4

7. The FOURTH cam is the 180° limit switch.

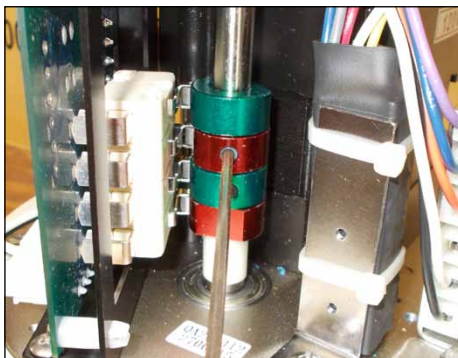
POWER OFF the actuator and use the manual hand wheel to position the actuator to your required 180° position. This must be within +/- 3° of the factory setting.

Use a 2.5mm hex key to free up the cam set screw. Once it is free, rotate the hex key to the LEFT a few degrees to reset the switch roller arm. Then snug the set screw up against the camshaft (CW) until slight pressure is felt.

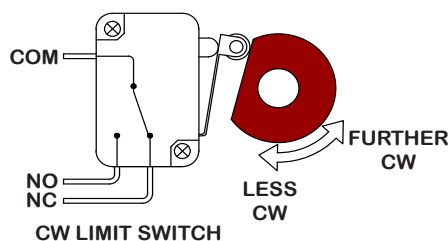
Then SLOWLY rotate the hex key to the RIGHT until you hear the “click” on the switch indicating that correct adjustment has been achieved. Tighten the cam set screw.

8. Apply power to the actuator and drive towards 0° at least 15-20°. Then drive the actuator back to 180° until the cam stops the electrical travel. Check to be sure this is the correct 180° position you require. Repeat step 7 if further adjustment is needed.

9. Apply power to the actuator and drive the actuator to the 90° position.



Cam 3



Adjust Cam 3

10. The THIRD cam is the 90° limit switch when traveling from 180°.

POWER OFF the actuator and use the manual hand wheel to position the actuator to your required 90° position. This must be within +/- 3° of the factory setting.

Use a 2.5mm hex key to free up the cam set screw. Once it is free, rotate the hex key to the RIGHT a few degrees to reset the switch roller arm. Then snug the set screw up against the camshaft (CW) until slight pressure is felt.

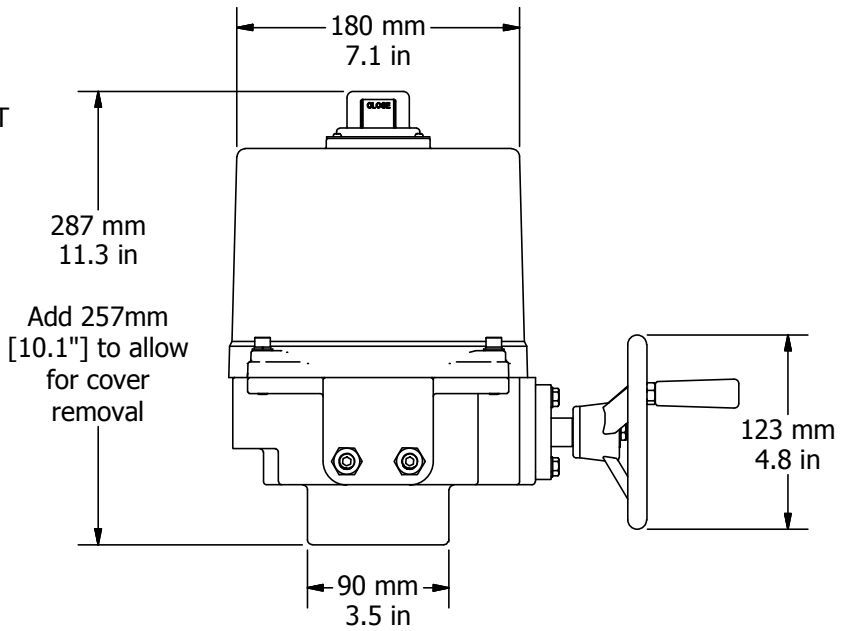
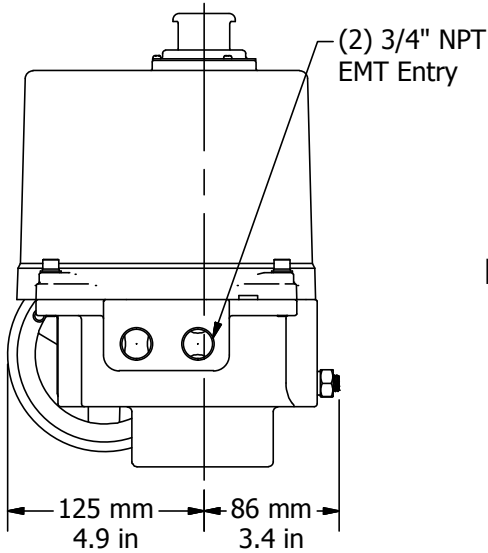
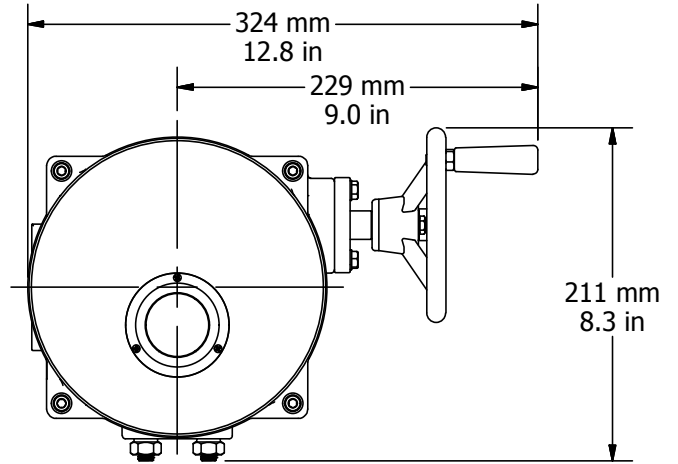
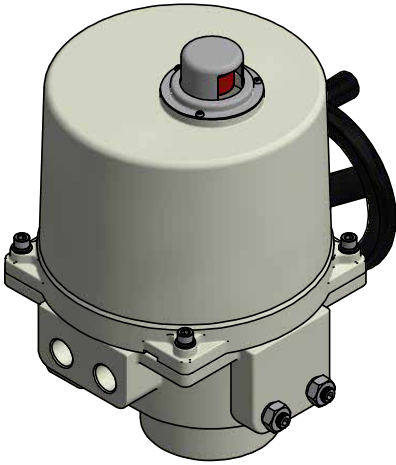
Then SLOWLY rotate the hex key to the LEFT until you hear the “click” on the switch indicating that correct adjustment has been achieved. Tighten the cam set screw.

11. Apply power to the actuator and drive towards 180° at least 15-20°. Then drive the actuator back to 90° until the cam stops the electrical travel. Check to be sure this is the correct 90° position you require. Repeat step 10 if further adjustment is needed.

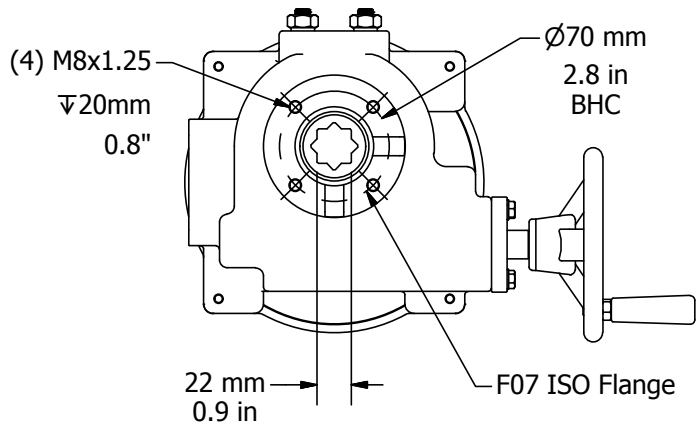
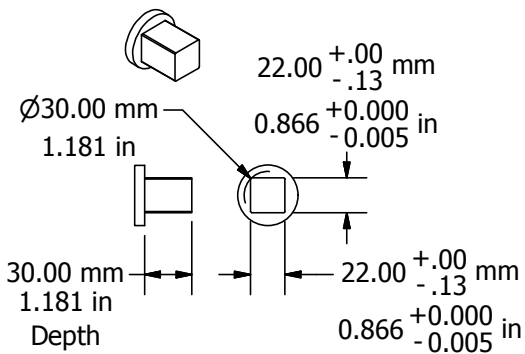
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Mechanical Data

P2/3 Series Dimensional Data



Drive Coupling Fabrication Data

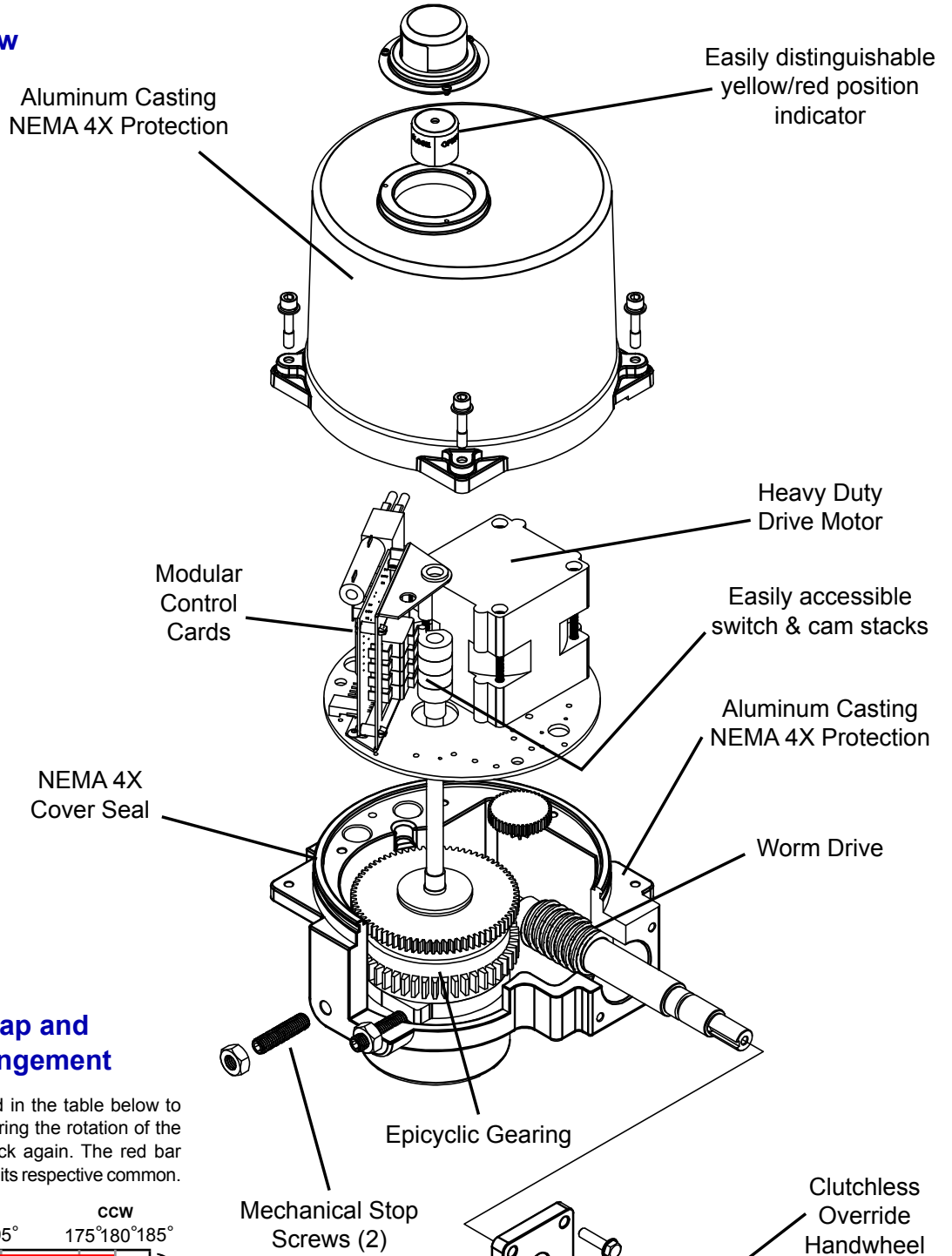


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Mechanical Data

P Series Exploded View

(P2/3-120N4 unit is shown)



Switch Logic Map and Switch/Cam Arrangement

Switch sequencing data is provided in the table below to show the change-of-state points during the rotation of the actuator from CCW to CW and back again. The red bar shows when that terminal makes with its respective common.

Terminal ID#	CW			MID			CCW		
	-5°	0°	5°	85°	90°	95°	175°	180°	185°
12	Not Open						Not Open		
11	Open Common						Open Common		
10	Open						Open		
9	Not 90° (from CCW)			Not 90° (from CCW)			Not 90° (from CCW)		
8	90° (from CCW) Common						90° (from CCW) Common		
7	Midpoint (from CCW)						Midpoint (from CCW)		
n/a	Not 90° (from CW)			Not 90° (from CW)			Not 90° (from CW)		
6	SW2 Common						SW2 Common		
5	Midpoint (from CW)			Midpoint (from CW)			Midpoint (from CW)		
n/a	Not Closed								
4	SW1 Common						SW1 Common		
3	Closed								



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Commissioning

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 rotate the actuator and damper, valve or other connected device through its full travel from fully CW to fully CCW 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. From a fully CW position, manually position the actuator to an approximately 45 degree position.
3. Make certain the 3 wire orange plug is fully seated on the 3-pin receptacle on the switch board.
4. Apply correct power to the unit.
 - 4.A Measure correct power on terminals 1 (Hot / L1) & 3 (Neu / L2) on the terminal block.
 - 4.B Measure correct power on the two heater terminals on the switch board.
5. Command the field device to generate a 0° signal. The actuator rotates in a CW direction (as viewed from above).
 - Measure terminals 3 and 5 for correct voltage (matching that measured in step 4.A).
6. Command the field device to generate a 90° signal. The actuator rotates in a CCW direction (as viewed from above).
 - Measure terminals 3 and 6 for correct voltage (matching that measured in step 4.A).
7. Command the field device to generate a 180° signal. The actuator rotates in a CCW direction (as viewed from above).
 - Measure terminals 3 and 7 for correct voltage (matching that measured in step 4.A).
8. Command the field device to generate a 90° signal. The actuator rotates in a CW direction (as viewed from above).
 - Measure terminals 3 and 6 for correct voltage (matching that measured in step 4.A).
9. Command the field device to generate a 0° signal. The actuator rotates in a CW direction (as viewed from above).
 - Measure terminals 3 and 5 for correct voltage (matching that measured in step 4.A).
10. Generate a mid-position signal at the field device to move the actuator off its full CW trip position.
11. Test the possible functions: 0-90°, 0-180°, 90°-180°, 180°-90°, 180°-0°, 90°-0°.
12. Actuator is now commissioned and operational.

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Industrial Applications

ProMation Engineering actuators have been installed to operate process controls such as butterfly valves, ball valves, high performance valves, plug valves, gate valves and dampers, in a broad range of demanding industrial applications.

**Power
Generation**



**Water
Processes**



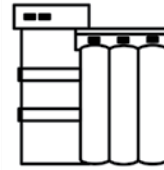
Mining



Oil and Gas



Agriculture



Chemicals



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