

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS





### ECP3, ECP5, ECP8 Series Actuators


TO PREVENT POTENTIAL INJURY OR DAMAGE TO PROPERTY, READ THIS MANUAL CAREFULLY AND COMPLETELY.

## IMPORTANT SAFETY INSTRUCTIONS

Basic safety precautions should always be followed, including the following: Failure to follow instructions can cause severe injury and/or death.


 This is the safety-alert symbol. When you see this symbol on your equipment or in this manual, look for one of the following signal words and be alert to the potential for personal injury.

 **WARNING** warns about hazards that could cause serious personal injury, death or major property damage and if ignored presents a potential hazard.


 **CAUTION** warns about hazards that will or can cause minor or moderate personal injury and/or property damage and if ignored presents a potential hazard. It can also make consumers aware of actions that are unpredictable and unsafe.


**Notice:** A notice indicates special instructions that are important but not related to hazards.




 **WARNING** - Read and follow all instructions in this IOM manual and on the equipment. Failure to follow instructions can cause severe injury and/or death.





 **WARNING** – **Risk of Electric Shock.** All electrical wiring **MUST** be in conformance with applicable local codes, regulations, and the National Electric Code (NEC). Hazardous voltage can shock, burn, and cause death or serious property damage. To reduce the risk of electric shock, do NOT use an extension cord to connect unit to electric supply. Provide a properly located electrical receptacle. **Before working on any electrical equipment, turn off power supply to the equipment.**

 **WARNING** – To reduce the risk of electric shock replace damaged wiring immediately.


 **WARNING** – Ground all electrical equipment before connecting to electrical power supply. Failure to ground all electrical equipment can cause serious or fatal electrical shock hazard.

 **WARNING** – Do NOT ground to a gas supply line.

 **WARNING** – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.

 **WARNING** – Failure to bond all electrical equipment to system structure will increase risk for electrocution and could result in injury or death. To reduce the risk of electric shock, see installation instructions and consult a professional electrician on how to bond all electrical equipment. Also, contact a licensed electrician for information on local electrical codes for bonding requirements.



 **CAUTION** – Potential pinch point. Equipment connected to or driven by this device may start unexpectedly and may cause personal injury or entrapment in linkage systems.

## TABLE OF CONTENTS

Important Safety Instructions .....	2	BB Battery Backup .....	16
Table of Contents .....	3	Setup For Fail CW/CCW .....	16
ECP Series Operational Concepts .....	3	Disassembly / Assembly .....	17
Technical Information .....	4	Adjusting CW End of Travel .....	18
Wire Sizing Chart .....	4	Cam Behavior .....	18
ECP Series Component Identification .....	5	Adjusting CCW End of Travel .....	19
Quick Reference Guide .....	6	Auxiliary Switch Cam Mapping .....	19
Shipping And Handling .....	7	Cam Behavior .....	19
Installation Notes .....	7	Troubleshooting .....	20
Actuator Handling And Installation .....	7	Mechanical Data .....	21
Product Mounting And Setup .....	8	Model: ECP3 .....	21
Operational Status Led .....	9	Model: ECP5 .....	21
On/Off Control .....	10	Model: ECP8 .....	22
Wiring Diagram .....	10	Internal Component Details .....	22
Calibration And Commissioning .....	11	ECP3, ECP5 & ECP8 .....	22
On/Off Control .....	11	Motor Power Consumption .....	23
Proportional Controller .....	12		
PC Option - External Self-Adjustment .....	13		
Wiring Diagram .....	13		
PC Option - Controller Setup .....	14		
Calibration And Commissioning .....	15		
Proportional Control .....	15		

## ECP SERIES OPERATIONAL CONCEPTS

ECP Series multivoltage electric actuators are motor powered, gear driven actuators for valves, dampers, and other applications. They can be used with any power supply 24VAC/VDC – 240VAC and feature manual override handwheels, easily visible position indicators, and a status LED.

All ECP Series actuators rotate CW to CLOSE the OUTPUT shaft out the bottom of the actuator when viewed from ABOVE. This includes the direction of rotation of the internal cam shaft when viewing with the cover and indicator removed.

All ECP Series actuators are designed to rotate between 0° and 90° (standard) or between 0° and 180° (option). When using the manual override system, be sure the yellow position indicator is situated in the correct quadrant before returning to automatic operation to prevent erratic operation of the actuator under power (see page 6).

Available options for the ECP Series include: Proportional Control with digital feedback, Battery Backup, or Rotation Options (0°–45°, 0°–90°, 0°–180°). Not all options are available in all combinations for all products in the series.

This IOM is supplied with ECP Series actuators that may have been shipped separately or as an assembly of the actuator and a Hayward ball or butterfly valve. If this actuator was provided as part of the Hayward assembly, a separate IOM for the valve should be included in your shipment.

**Notice:** ECP Series actuators are fully assembled, calibrated and tested prior to leaving our factory. In most cases, after you have mounted the actuator to your device, you should be able to operate the actuator from fully CLOSED (CW) to fully OPEN (CCW) and back again, and find that no adjustments are needed. The assembly can then be put into service immediately. However, should it be necessary to make adjustments to the end-of-travel positions to overcome any device related issues (i.e. valve shaft incorrectly timed to the drive stem), the procedures outlined on the page numbers referenced below should be followed to put the assembly into service.

*Pages 18-19 - Travel limits and Auxiliary switch cams for CW (CLOSED) & CCW (OPEN) positions*



## TECHNICAL INFORMATION

ACTUATOR SPECIFICATIONS		ECP3	ECP5	ECP8
24~240V VDC/VAC 50/60Hz	Supply			
	Torque Output (lbf-in / Nm)	309 / 35	486 / 55	752 / 85
	Maximum torque break (lbf-in / Nm)	336.3 / 38	531 / 60	796.6 / 90
	Current Draw (Max Load)	1.20 / 1.60 / 0.30 / 0.20	1.25 / 1.73 / 0.37 / 0.2	0.90 / 1.17 / 0.27 / 0.16
	24VDC / 24VAC / 120VAC / 230VAC			
	Speed (90°) 60Hz/50Hz, seconds	10	14	30
	Motor - 2P Brush, 24vdc	90W	90W	90W
	Duty Cycle (on/off and mod)	75%	75%	75%
	Motor Starts, per hour, Max	1200	1200	1200
	Motor Protection, Temp / Class	130°C / Class B	130°C / Class B	130°C / Class B
ALL	Electrical Entry (2)	EN175301-803 DIN Connectors		
	Control	On/Off or Proportional		
	Proportional Control Interface	4-20mA, 2-10vdc, 0-10vdc - Factory Installed (PC Option)		
	Battery Backup Option Available	Factory Installed (BB Option)		
	Ambient Operating Range	-20°C +70°C / -4°F +158°F		
	Humidity Range	0-95% RH		
	Altitude Limit	9850 ft / 3000 m		
	Working angle	0°-90°, 0°-180°		
	Limit switch	4 SPDT Microswitch ( 2 Travel Stop and 2 Aux) Rated 3A@250vac Max		
	Automatic heater	3.5 W		
	Protection IEC 60529 rating	IP67		
	Housing:	Polyamide (lid & body)		
	Main external shaft:	Stainless Steel		
	External screws:	Stainless Steel		
	Gears:	Steel and Polyamide		
	Visual position indicator:	Polyamide		
	Dome:	Polycarbonate		
	Adjustable internal cams:	Polyamide		
	Insulation:	Class B		
	ISO 5211 Plate	F03/F04/F05	F05/F07	F05/F07
	Drive Socket	14mm DSQ	14mm DSQ	14mm DSQ

## WIRE SIZING CHART

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



**WARNING** – Hayward assumes no responsibility for improper wire selection or improper wiring. Wire selection and installation is the ultimate responsibility of the user, and must follow local code requirements.



**WARNING** – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.

Maximum distance between Actuator and Power Supply (ft)

ACTUATOR	ECP3	ECP3	ECP3	ECP5	ECP5	ECP5	ECP8	ECP8	ECP8
Voltage	24	110	230	24	110	230	24	110	230
AWG \ Amps	1.6	0.3	0.2	1.73	0.37	0.20	1.17	0.27	0.16
20	67	1791	5150	62	1452	5150	92	1990	6438
18	107	2848	8187	99	2309	8187	146	3164	10234
16	170	4527	13016	157	3671	13016	232	5030	16270
14	270	7201	20702	250	5838	20702	369	8001	25878
12	429	11450	32917	397	9283	32917	587	12722	41147

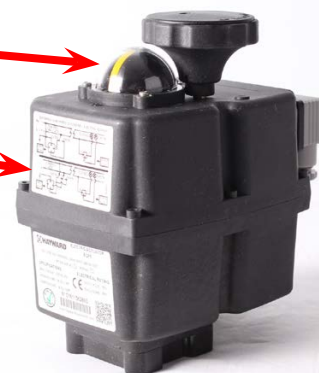
## ECP SERIES COMPONENT IDENTIFICATION

**Notice:** ECP Series Manual Override Handwheels rotate CW to close the output shaft out the bottom of the actuator when viewed from above **except the ECP8**, see the table below.

Model	Rotation					
	Hand wheel	Output Shaft	Indicator	Hand wheel	Output Shaft	Indicator
ECP3	CW	CW	CW	CCW	CCW	CCW
ECP5	CW	CW	CW	CCW	CCW	CCW
ECP8	CCW	CW	CW	CW	CCW	CCW

POSITION INDICATOR

PRODUCT LABELS



### MANUAL OVERRIDE HANDWHEEL

Note - See table above for handwheel rotation information by actuator model.

OPERATIONAL STATUS LED

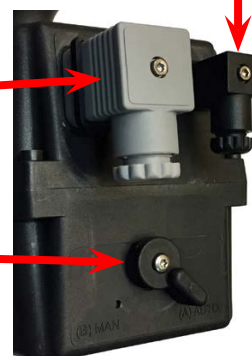
VOLT FREE AUXILIARY SWITCH PLUG

POWER SUPPLY PLUG

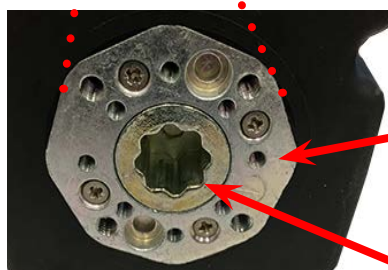
DECLUTCH LEVER  
Ref Pgs 10, 12



(On/Off Actuator Shown)



(On/Off Actuator Shown)



(ECP3 Actuator Shown)

ISO 5211  
MOUNTING FLANGE

14mm Double Square (DSQ)  
Drive Socket

POWER SUPPLY  
PLUG

INPUT / OUTPUT SIGNAL PLUG  
(4-20mA, 2-10V, 0-10V)



(Proportional Model)

VOLT FREE AUXILIARY  
SWITCH PLUG



## QUICK REFERENCE GUIDE



ECP Series shown at 0° rotation  
(FULL CW Position) with  
cover ON and with cover OFF.



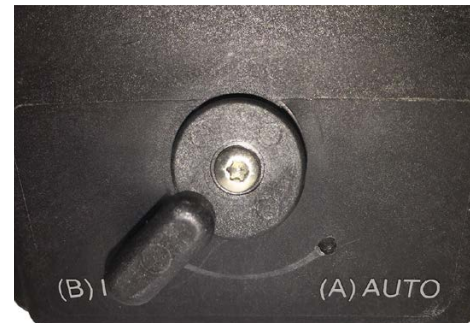
ECP Series shown at 90° rotation  
(FULL CCW Position) with  
cover ON and with cover OFF.



ECP Series shown with Declutch  
Lever in the (A) AUTO position (left)  
and the (B) MAN position (right).

Note: always remove power  
before using the (B) MAN mode.

Ref Pgs 10, 12



ISO 5211 Mounting on the bottom surface  
for ECP products. Hole patterns included are  
F03, F04 & F05 with 14mm DSQ drive socket  
for the ECP 3 and F05 & F07 with 14mm  
DSQ drive socket for the ECP 5 and ECP 8.



All electrical connections are made to the  
DIN Connectors. Large grey is for power  
and control. Small black is for Auxiliary  
Switch outputs. Proportional actuators  
have a third DIN Connector (center).

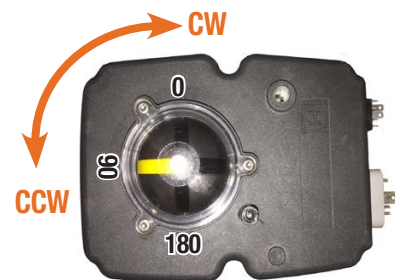
## ACTUATOR HANDLING AND INSTALLATION

### SHIPPING AND HANDLING

1. This actuator arrives in the FULLY OPEN (CCW) position. The yellow position indicator (see photo) shows full CCW (90°) position.
2. Storage: This unit should not be stored outside unless it is powered up and has proper electrical terminations. When not powered up, it should be stored in a clean, dry environment at all times.
3. This actuator has been factory tested and calibrated to operate between 0° and 90°. Most products will not require recalibration of these settings. If any travel adjustment is necessary, please refer to the Adjusting CW/CCW End of Travel section for instructions.
4. **Notice:** The ECP series actuators have NO mechanical stops to limit rotation. Do not operate with a rotation greater than 90° unless it has been properly calibrated to do so.
5. **Notice:** Protect the actuator from moisture by supplying power to the unit to keep the internal heater warm at the time of installation.
  - For On/Off actuators, in order to keep the 3.5W internal condensate heater powered up, the actuator needs to receive a continuous OPEN or CLOSED command at all times.
  - For modulating actuators, power on terminals 1 & 2 at all times provides the required power for the heater.

### INSTALLATION NOTES

- **There are no mechanical stops on the ECP series.** Use caution when operating the manual override. Rotating the drive beyond its intended rotational angle will cause erratic operation under power. Keep the yellow stripe between the established rotation angles – in most cases 0° to 90°.
- 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 (i.e. upside down).
- **Notice:** Use the DIN connectors supplied with the actuator for field wiring.
- Use supplied DIN connectors and gaskets during installation to protect the IP67 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 and cable sheath diameter to prevent actuator failure (see Wire Sizing Chart on page 4 for proper wire sizing).
- **Notice:** Parallel wiring of multiple on/off actuators is permissible on the ECP Series.
- ECP Series On/Off actuators utilize two DIN EN 175301-803 connectors for power and control to simplify field wiring and testing. ECP Series Proportional actuators utilize three DIN EN 175301-803 connectors.

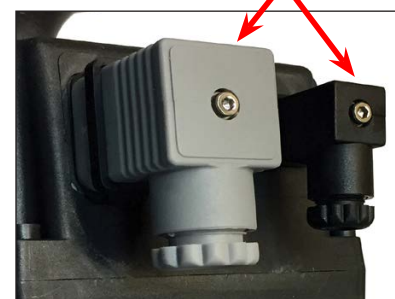


The actuator is shipped (assembled to a valve) from the factory in its fully CCW (90° OPEN) position. The YELLOW stripe indicates the position of the actuator. (0, 90, 180 highlighted for emphasis.)



The manual override handwheel (ECP3/5 shown), allows a user to position the valve or damper with or without power. The arrow molded in the handwheel cover shows the direction you must turn the handwheel to close the actuator and attached device (ECP8 is reversed).

DIN Connectors



Removable DIN EN 175301-803 connectors facilitate ease of field wiring and testing.



**WARNING** – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.

## PRODUCT MOUNTING AND SETUP

**Notice:** All ECP Series actuators rotate CW to close the output shaft out the bottom of the actuator **when viewed from above**. On all ECP models, the cam shaft and the indicator rotate CW to close as well.

1. Fully CLOSE the valve or damper to which the actuator is to be mounted.
2. Assemble necessary linkage hardware and attach the actuator to the valve or damper.
3. Center the actuator on the valve or damper drive shaft and tighten all hardware.
4. **Before applying power to the unit**, disengage the declutch lever by rotating it from (A) AUTO to (B) MAN and rotate the manual override handwheel from the fully CW to the fully CCW position to check for unobstructed manual operation of the valve or damper.

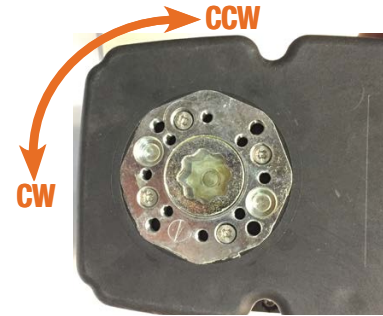


**CAUTION!** – Do not try to rotate the hand wheel without disengaging the declutch lever. This will damage the geartrain.

Make the electrical connections per wiring diagrams found in the Wiring Diagrams Sections of this document:

- To remove a connector from the actuator cover, unscrew the 2mm SHCS (socket head cap screw). Remove the connector and set the seal aside.
  - Gently pull the inner portion of the connector out of the housing. Slide the wiring cable into the housing past the cable seal.
  - Attach wires to the inner portion of the connector according to the appropriate wiring diagram.
  - After wiring, reinsert the inner portion of the connector into the housing.
  - Place the seal boot, flat side against actuator, and reattach the connector to the actuator cover using the 2mm SHCS.
  - Tighten the cable seal/lock. Use care as overtightening the cable lock can permanently damage the DIN Connector.
5. Connect POWER and CONTROL to the correct terminals.
  6. The smaller DIN connector on each On/Off actuator is for the (adjustable) aux switches. These are dry type (volt free) Form A contacts rated 250VAC @ 3A Max.
  7. Proceed to Commissioning for your On/Off or Proportional Actuator.

Model	On/Off	Proportional	Option	Wiring Diagram See Page:	Note
ECP3	X			<a href="#">10</a>	BB option for On/Off Actuator uses On/Off Wiring Diagram
ECP5	X			<a href="#">10</a>	
ECP8	X			<a href="#">10</a>	
ECP3		X	PC	<a href="#">13</a>	BB option for Proportional Actuator uses Proportional Wiring Diagram
ECP5		X	PC	<a href="#">13</a>	
ECP8		X	PC	<a href="#">13</a>	



Note that the rotation seen from below is a mirror of the direction viewed from above.

Declutch Lever



Ref Pgs 10, 12



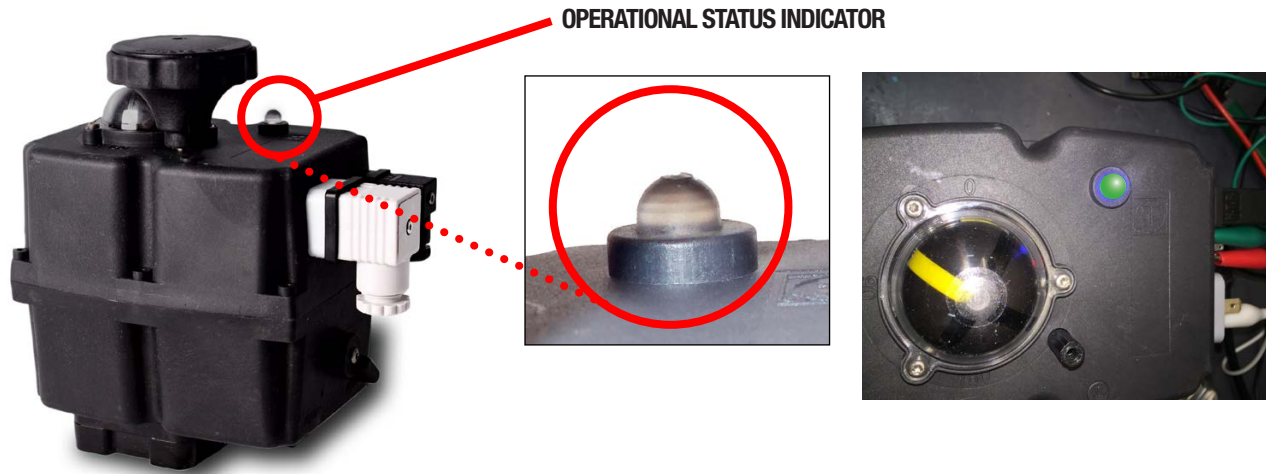
Attach wires to the inner portion of the connector according to the appropriate wiring diagram



## OPERATIONAL STATUS LED

The LED Light provides visual communication between the actuator and the user.

The active operational status is shown by different LED colors described in the table below.

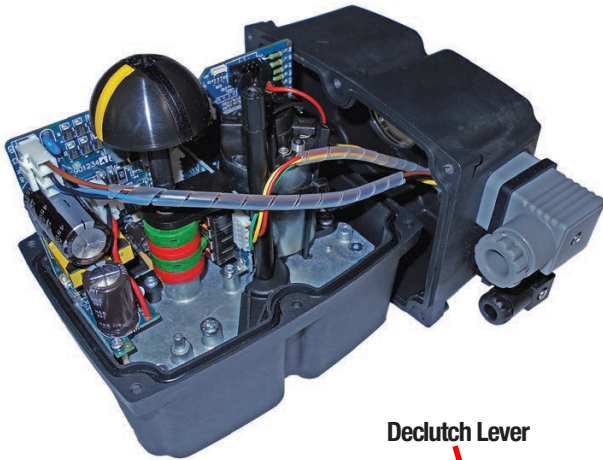


Actuator Operational Status	Actuator Action	LED Behavior	LED Colors
Actuator Without NO Power Supplied		LED Off	●
Actuator With Power Supplied (Normal On/Off Operation)	Position: CW (Close) Position: CCW (Open)	Red LED Green LED	● ●
Actuator Moving: (Flashing LED)	Driving CW (Closed) Driving CCW (Open)	Red / Orange Green / Orange	● ● ● ●
Actuator With Torque Limiter Function On (Flashing LED)	Driving CW (Closed) Driving CCW (Open)	Red / Off Green / Off	● ● ● ●
Actuator In Manual Mode		Orange / Off (Symmetric Sequence)	● ●
Battery Backup: Actuator Without Power (Maximum 3 Minutes)	BSR in NC Position BSR in NO Position	Red / Off Green / Off	● ● ● ●
Battery Backup: Danger, the battery needs recharging.	BSR not functioning	Orange / Off (Asymmetric Sequence)	● ●
Battery Backup: Power Failure with quick recovery(*) (less than 3 minutes)	BSR not functioning	Orange / Off (Asymmetric Sequence) Repeated 5 times.	● ●
Actuator with Proportional Controller (Normal Proportional Operation)	Stop Driving CW (Closed) Driving CCW (Open)	Blue Red / Blue Green / Blue	● ● ● ● ●

(\*) When an actuator with a BSR 2015 experiences a power supply failure but recovers in less than 3 minutes, it will recover and the LED will signal the fault.

To reset this fault, the actuator should be disconnected from the power supply, and wait until the LED is off (approximately 3 minutes).

After the LED resets the actuator is again operational.

**ON/OFF CONTROL**


The ECP Series actuators in their base configurations are designed to operate in On/Off Control applications. These models will also allow a “Jog” Control scheme to stop at any point between the full CW and full CCW positions.

The ECP Series actuators have 2 operating modes, automatic and manual. Use the Declutch Lever on the lower half of the actuator housing to select the required mode.



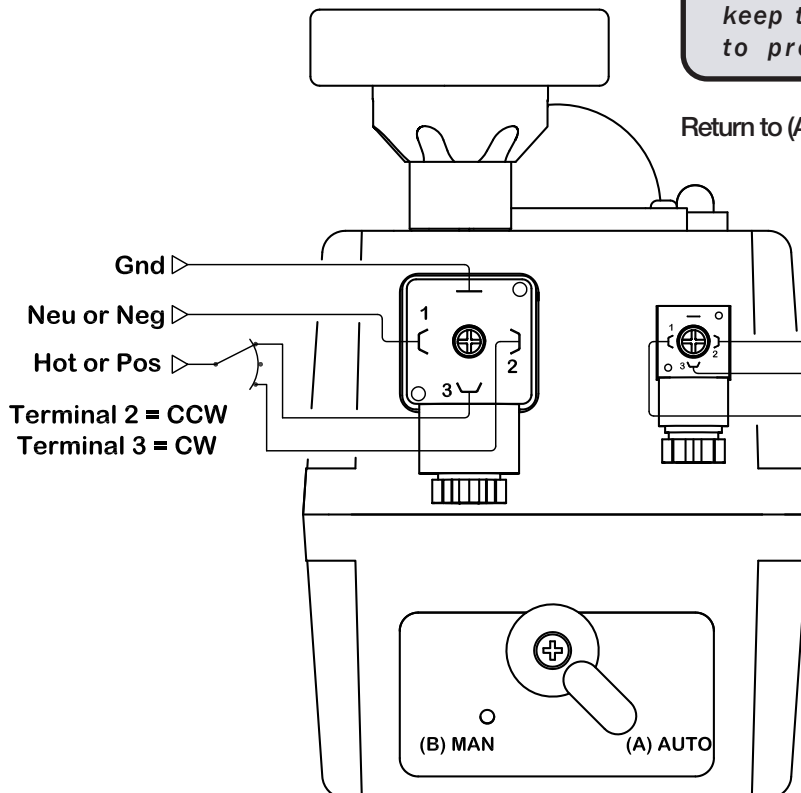
**CAUTION!** - Do not remove the declutch lever securing screw. This will cause irreparable damage to the actuator's gearbox and will invalidate the warranty.

When (B) MAN function is desired:

1. Remove power to the actuator.
  - The Operational Status LED will not be lit.
2. Rotate the Declutch Lever to (B) MAN.
  - The output shaft drive train disengages from the motor, allowing it to move.
3. The manual override hand wheel can now be used to reach the desired position.



**CAUTION!** - ECP actuators have no mechanical stops. When in Manual Operation mode always keep the actuator within the 0° to 90° quadrant to protect the valve or damper attached.

**WIRING DIAGRAM**


VIEW LOOKING AT ACTUATOR


Return to (A) AUTO after being in (B) MAN position:

1. Rotate the Declutch Lever to (A) AUTO.
2. ROTATE THE HANDWHEEL SLIGHTLY IN EITHER DIRECTION to re-engage the geartrain to the motor drive line.
  - You will hear a “click” from inside the actuator and then the handwheel will no longer be able to rotate.
  - FAILURE TO MANUALLY POSITION THE HANDWHEEL until the “click” is heard will prevent the motor drive from re-engaging the output, and the actuator will fail to move.
3. Reapply power to the actuator.
4. The actuator will respond to the On/Off control signals.

## CALIBRATION AND COMMISSIONING

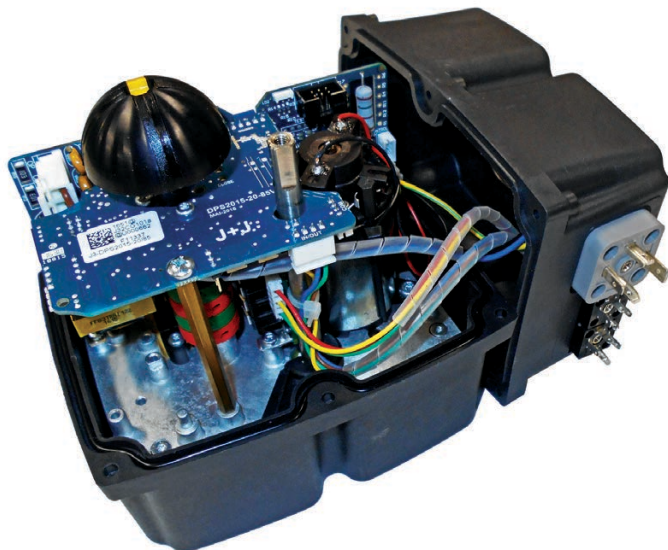
This actuator has been factory calibrated to operate over the full range of a quarter turn valve with end-of-travel stops set and tested. There should be no reason to make adjustments to these settings. If this actuator was provided installed to a Hayward valve the stops have been set for that valve. However, if the actuator was provided as a separate component, you may find it is necessary to set the end-of-travel stops. In that case refer to the sections “Adjusting CW(CCW) End of Travel” before proceeding.

Once it has been determined that end-of-travel positioning is correct, and the auxiliary switch cams are also properly set, the installed assembly can be commissioned as follows:

 **WARNING** – *Serious Damage to connected valves or devices will result if the motor is allowed to drive past the mechanical limits of the valve or driven device! Remove power from this device BEFORE making any travel adjustments.*

### Calibration Procedure - On/Off Control

1. On battery back-up equipped units, disconnect the battery before proceeding.
2. Disconnect power and place the declutch lever in “Man” position.
3. Manually rotate the hand wheel to exercise the valve through its full travel fully CW and back to full CCW positions.
  - This checks for obstructions in the operation of the valve.
  - If no hindrances to valve travel are found, return the declutch lever to “Auto” position.
4. Reconnect Battery pack if so equipped.
5. Apply power and command the actuator to drive to the full CW position.
  - The actuator should drive CW until the yellow indicator line reaches the 0° mark.
  - The actuator should stop even with the control signal remaining active.
6. Apply power and command the actuator to drive to the full CCW position.
  - The actuator should drive CCW until the yellow indicator line reaches the 90° mark (or the 180° mark on TW Series Ball Valves).
  - The actuator should stop even with the control signal remaining active.
7. On battery backup equipped units, the unit needs to charge for 24 hours after applying power before the battery acquires a full charge.
  - The battery system may be tested here by driving the actuator to a mid-travel point, and then disconnecting power.
  - The actuator should (if it has enough charge) drive the valve to the chosen fail-safe direction (see page 15 of this document).
  - On battery back up equipped units, the battery system is charging when the actuator is receiving either a full-time drive CW or CCW command.
  - When there is no drive signal present, the battery system is NOT charging. Charge the battery system for at least 24 hours before reaching full capacity.
8. **Commissioning is complete. Unit can be put into service.**

**PROPORTIONAL CONTROLLER**


Proportional Control (PC) is an interface for the ECP Series electric actuators that effectively turns the actuator into a servo controlled valve positioner.

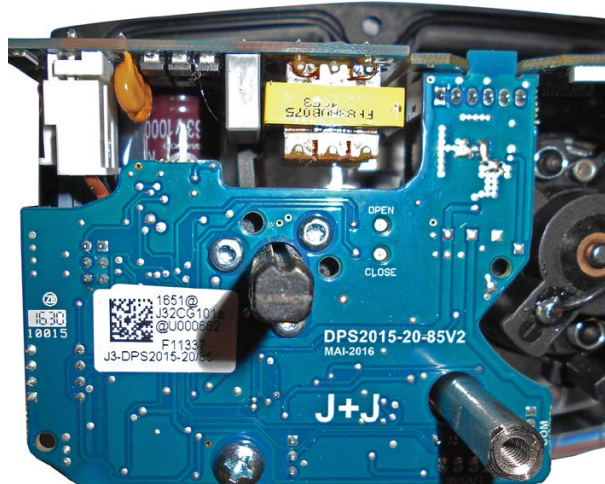
The PC is a microprocessor (CPU) module which digitally manages the analog input and output and compares them with the position of the actuator to establish a uniform relationship.

The analog inputs are sent to the CPU where they are processed for continuous comparison with the position of the actuator. This allows for very high sensitivity along with very high repeatability of the position (see Controller Specifications).

Proportional Control ECP Series actuators can be configured to receive and send 4-20mA, 2-10V, or 0-10V signals.



**CAUTION!** - If so equipped, the BB Option (see page 16) must be installed prior to the PC Option.



When (B) MAN function is desired:

1. Remove power to the actuator.
  - The Operational Status LED will not be lit.
2. Rotate the Declutch Lever to (B) MAN.
  - The output shaft drive train disengages from the motor, allowing it to move.
3. The manual override hand wheel can now be used to reach the desired position.

Return to (A) AUTO after being in (B) MAN position:

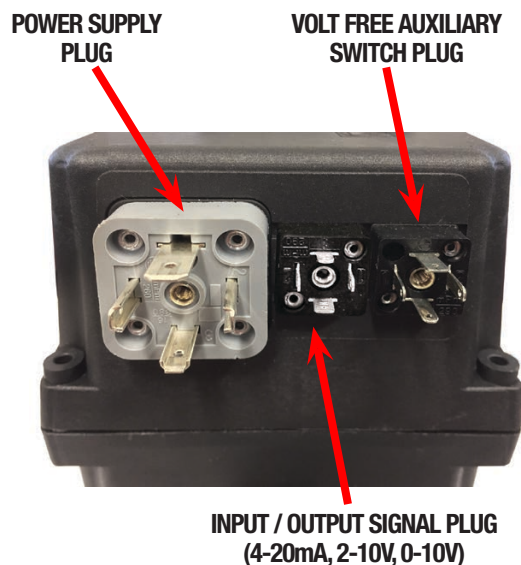
1. Rotate the Declutch Lever to (A) AUTO.
2. ROTATE THE HANDWHEEL SLIGHTLY IN EITHER DIRECTION to re-engage the geartrain to the motor drive line.
  - You will hear a “click” from inside the actuator and then the handwheel will no longer be able to rotate.
  - FAILURE TO MANUALLY POSITION THE HANDWHEEL until the “click” is heard will prevent the motor drive from re-engaging the output, and the actuator will fail to move.
3. Reapply power to the actuator.
4. The actuator will respond to the Proportional control signals.

**CONTROLLER SPECIFICATIONS**

	ECP3	ECP5	ECP8
Accuracy	3 % F.S.	3 % F.S.	3 % F.S.
Linearity	2 % F.S.	2 % F.S.	2 % F.S.
Hysteresis	3 % F.S.	3 % F.S.	3 % F.S.
Min. Steps at 4-20mA	142 steps 90°	142 steps 90°	142 steps 90°
Min. Steps at 2-10V	88 steps 90°	88 steps 90°	88 steps 90°
Min. Steps at 0-10V	88 steps 90°	88 steps 90°	88 steps 90°
Min. Steps at 1-10V	85 steps 90°	85 steps 90°	85 steps 90°
4-20mA Input signal impedance	100 Ohm	100 Ohm	100 Ohm
2-10V Input signal impedance	25K Ohm	25K Ohm	25K Ohm
0-10V Input signal impedance	25K Ohm	25K Ohm	25K Ohm
Class	B+C to E DIN EN 15714 Inching + Modulation		
Weight (lb / Kg)	1.32 / 0.600	1.32 / 0.600	1.32 / 0.600



## PC OPTION - EXTERNAL SELF-ADJUSTMENT



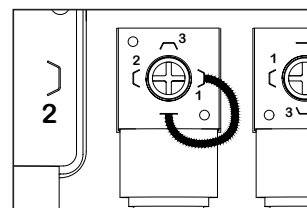
Note that the center black DIN Connector is mounted upside down from the right DIN Connector.

### Proportional Controller Self Adjustment

Test the basic functionality of proportional card before attaching the drive signal.

#### Disconnect power.

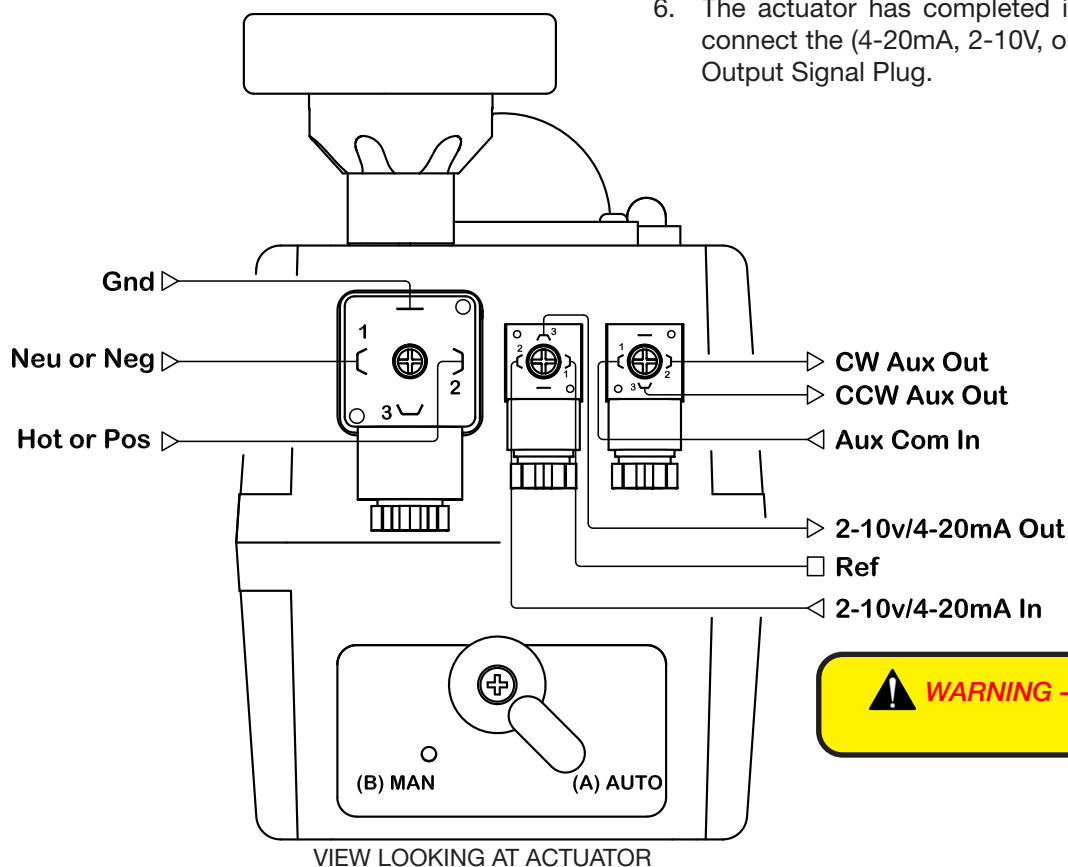
1. Remove the Input / Output Signal Plug (center plug) and **connect** a jumper between PIN 1 (on the right side) and PIN Earth (on the bottom).
2. On the Power Supply Plug, **connect** power as shown in the wiring diagram below.



**CAUTION!** - Do not swap the center plug and right plug. Doing so will damage the PC Module. Note that these plugs are keyed.

3. Allow at least 3 seconds and proceed to the next step.
4. On the Input / Output Signal Plug, **disconnect** the jumper between PIN 1 (right side) and PIN Earth (bottom pin).
5. The actuator will make a complete 0°-90°-0° maneuver and then remain in the CW (CLOSED) position.
6. The actuator has completed its self test and is ready to connect the (4-20mA, 2-10V, or 0-10V) signal to the Input / Output Signal Plug.

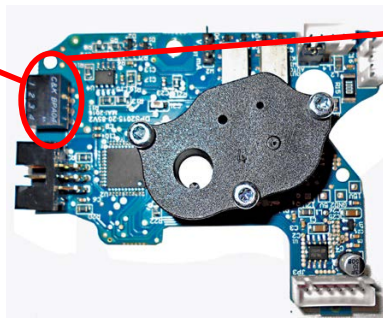
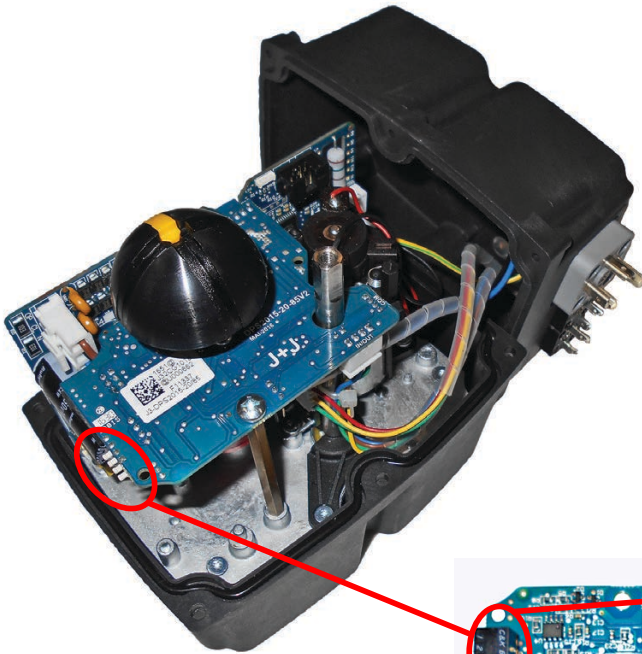
## WIRING DIAGRAM



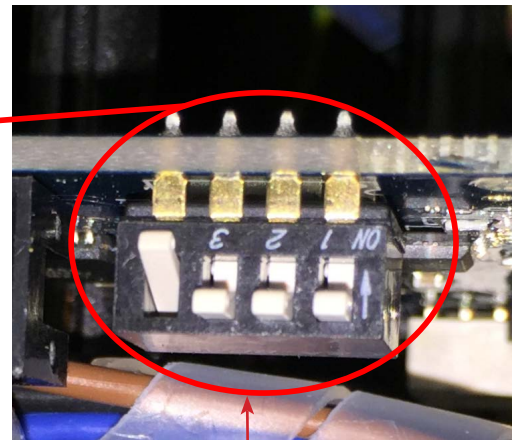
**WARNING** – Instrumentation Signal Only - No Voltage

## PC OPTION - CONTROLLER SETUP

Choose the configuration you need by moving the DIP switches located on the edge of the PC Option Positioner PCB.



(PCB is shown bottom side up for component clarity)



## Configuration Options



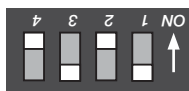
**4 – 20mA  
Direct Acting**



**2 – 10 VDC  
Direct Acting**



**0 – 10 VDC  
Direct Acting**



**4 – 20mA  
Reverse Acting**



**2 – 10 VDC  
Reverse Acting**



**0 – 10 VDC  
Reverse Acting**


Configure the actuator control by using the DIP Switches shown in pictures above.

- Put DIP 1 in ON position, connect the grey connector to the power supply, put DIP 1 back to the prior position. Wait until the actuator makes a complete 0°-90°-0°maneuver.
- Choose the configuration you need and set the DIPs as shown.
- Disconnect the grey connector from the power supply.

## CALIBRATION AND COMMISSIONING

This actuator has been factory calibrated to operate over the full range of a quarter turn valve with end-of-travel stops set and tested. There should be no reason to make adjustments to these settings. If this actuator was provided installed to a Hayward valve the stops have been set for that valve. However, if the actuator was provided as a separate component, you may find it is necessary to set the end-of-travel stops. In that case refer to the sections “Adjusting CW(CCW) End of Travel” before proceeding.

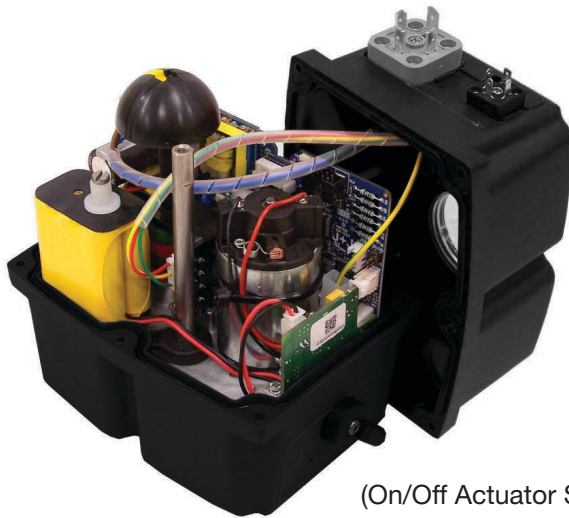
Once it has been determined that end-of-travel positioning is correct, and the auxiliary switch cams are also properly set, the installed assembly can be commissioned as follows:

 **WARNING** – *Serious Damage to connected valves or devices will result if the motor is allowed to drive past the mechanical limits of the valve or driven device! Remove power from this device BEFORE making any travel adjustments.*

### Calibration Procedure - Proportional Control

1. On battery back-up equipped units, disconnect the battery before proceeding.
2. Disconnect power and place the declutch lever in “Man” position.
3. Manually rotate the hand wheel to exercise the valve through its full travel fully CW and back to full CCW positions.
  - This checks for obstructions in the operation of the valve.
  - If no hindrances to valve travel are found, return the declutch lever to “Auto” position.
4. Reconnect Battery pack if so equipped.
5. Apply power and command the actuator to drive to the full CW position (refer to page 14 of this document for signal detail).
  - The actuator should drive CW until the yellow indicator line reaches the 0° mark and the actuator should stop.
6. Read the feedback signal being generated by the proportional control module.
  - The feedback signal follows the position of the actuator and is a function of DIP settings (see page 14 of this document).
7. Command the actuator to drive to the full CCW position.
  - The actuator should drive CCW until the yellow indicator line reaches the 90° mark (or the 180° mark on TW Series Ball Valves) and the actuator should stop.
8. Read the feedback signal being generated by the proportional control module.
9. On battery backup equipped units, the unit needs to charge for 24 hours after applying power before the battery acquires a full charge.
  - The battery system may be tested here by driving the actuator to a mid-travel point, and then disconnecting power.
  - The actuator should (if it has enough charge) drive the valve to the chosen fail-safe direction (see page 16 of this document).
  - On battery back up equipped units, the battery system is charging when power is applied to the actuator, and does NOT require an active command signal to charge the battery system.
  - Charge the battery system for at least 24 hours before reaching full capacity.
10. **Commissioning is complete. Unit can be put into service.**

## BB BATTERY BACKUP

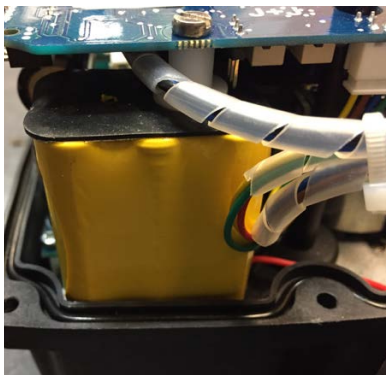


(On/Off Actuator Shown)

The BB Battery Backup option, when properly installed in the ECP Series electric actuators, uses internal battery power to drive the actuator and linked valve or damper to a Fail CW or Fail CCW position in case of a power supply failure.

Inside the housing there is a BB printed circuit board and a battery pack, which is kept continuously charged when the actuator is receiving a continuous drive CW or drive CCW command.

**CAUTION!** - If so equipped with the PC Option (see page 12), the BB Option must be installed prior to the PC Option.

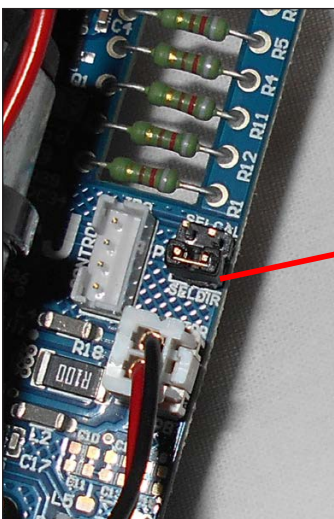


(Battery installed beneath Proportional Model PCB)

CONTROLLER SPECIFICATIONS	ECP3	ECP5	ECP8
Number of operations before recharge (from 100% battery charge)	5	5	5
Recharge time/working operation (Minutes)	21	48	58
Battery consumption/working operation (W)	3.0	6.8	8.3
Full charge time 100% (Hours)	28	28	28
Nominal capacity +/- 5% (mAh)	1000	1000	1000
NO or NC Selection	Jumper	Jumper	Jumper
Current/one working operation with battery (mA)	14	31.6	38.6
Battery charge (mA/h)	40	40	40
Weight (lb / Kg)	0.6 / 0.27	0.6 / 0.27	0.6 / 0.27

Note: Unit needs to charge for 24 hours after applying power before the battery acquires a full charge. This must be done before placing the Battery Backup Option in service.

## SETUP FOR FAIL CW/CCW



### Fail CW Set-Up

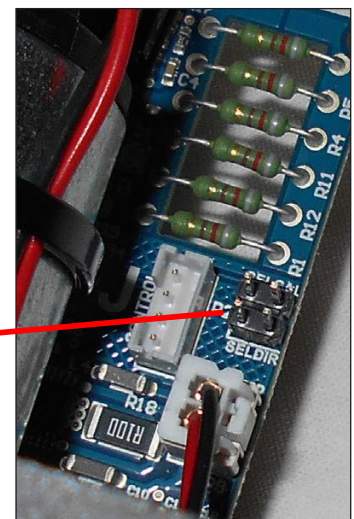
If, in case of a power supply failure, we want the actuator go to the CW (CLOSED) position:

Place jumper 1 **ON** the SELDIR position.

### Fail CCW Set-Up

If, in case of a power supply failure, we want the actuator go to the CCW (OPEN) position:

Be sure jumper 1 is **NOT ON** the SELDIR position.



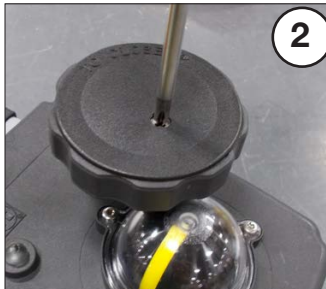


## DISASSEMBLY / ASSEMBLY

This actuator has been factory calibrated and tested and most installations will likely not require entry into the body of the actuator. See page 18 for a more in depth explanation before using the instructions on this page.



**WARNING** – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.



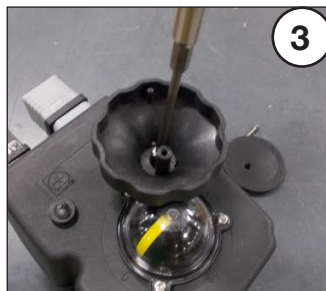
2

### Disassembly of actuator

Use the photos at left, the numbers indicate the disassembly step to follow.

#### 1. Disconnect power.

2. Remove the phillips screw holding the cover onto the manual override handwheel. Remove the cover and set both parts to the side.
3. Use a T15 Torx drive to remove the socket head cap screw (SHCS) holding the manual override handwheel. Carefully pry straight up to remove the handwheel and set both parts to the side.
4. Use a T15 Torx drive to remove the six socket head cap screws (SHCS) holding the cover to the body of the actuator.
5. Carefully pull the cover straight up approximately 2 inches to separate it from the body.

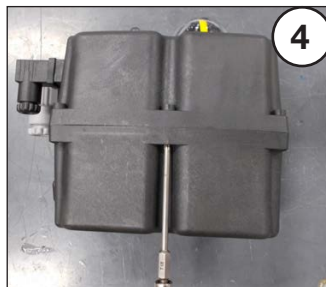


3

A. Use caution because the wiring inside the actuator is attached to both the cover and the body.

B. Carefully pull the cover the rest of the way up and set the cover behind the actuator, minding the cables so they do not stretch or pull.

6. You now have access to the interior of the actuator.



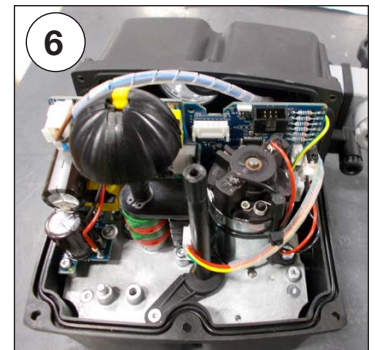
4

### Assembly of actuator

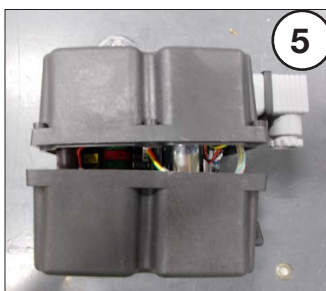
Use the photos at left in reverse order for reference.

#### 7. Disconnect power.

8. Carefully pull the cover from its resting place and reposition it over the actuator body.
  - A. Align the manual override handwheel shaft with the hole in the cover.
  - B. Mind the cables so they do not stretch, pull, get hung up on the actuator components, or get pinched in the cover as it comes down into place.
9. Use a T15 Torx drive to replace the six socket head cap screws (SHCS) which hold the cover to the body of the actuator.
10. Carefully align the handwheel to the manual override handwheel shaft. DO NOT force it into place. Gently push it down into position, it should be a smooth fit. Use a T15 Torx drive to reattach the socket head cap screw (SHCS) which secures the manual override handwheel.



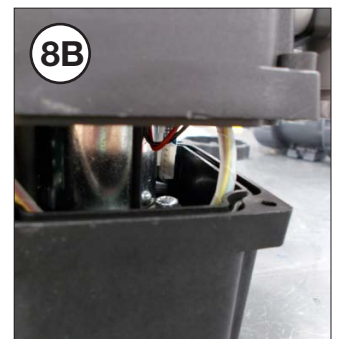
6



5



5B



8B

11. Replace the phillips screw into the cover of the manual override handwheel and secure it.
12. You now have completed reassembly.

[Back to TOC](#)

## ADJUSTING CW END OF TRAVEL

This actuator has been factory calibrated and tested to stop at 0 degrees for CW position and to stop at 90 degrees for CCW position. Most installations onto valves or dampers will likely not require recalibration of these settings. Please mount the valve or damper and proceed on these pages only if adjustments are required. Note that for most actuators these positions are independent - for instance the CW position is set correctly while the CCW needs adjustment.



**WARNING** – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.

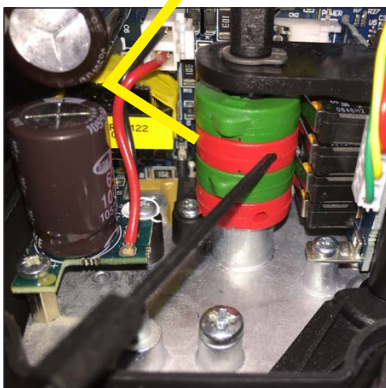


Plastic Hex Key



Cam 1 - CW Cam

Cam 3 - CW Auxiliary Cam



### Cam Adjustment Tool and Adjusting Cams

#### 1. Disconnect power.

2. Cam adjustment tool is stored next to the DC drive motor and is held in place by a wire tie surrounding the motor. The tool must be used to make adjustments to the cam positions.

- This key is nonconducting.

3. All adjustments with the hex key affect a worm gear in the cam. This means fine adjustments may be made to actuator positioning by rotating the hex key for instance 1-3 degrees CW and then 1-3 degrees CCW.

4. Take care not to drive the actuator out of its original 0°–90° quadrant.

#### Adjust CW Cam (Bottom)

5. Cam 1 is the bottom cam (red) and is the end-of-travel adjustment for the actuator CW position.

- With power OFF and the actuator at its required CW position, insert the adjustment tool into the bottom cam.
- Rotate the tool CCW to stop the actuator SOONER (less CW or closed).
- Rotate the adjustment tool CW to stop the actuator LATER (more CW or closed).

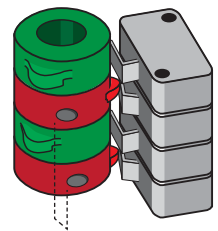
6. Apply power and test the new setting.

- If the actuator stops at the required position, proceed to the next step.
- If it does NOT stop in the correct position, repeat step 5.

#### Adjust CW Auxiliary Cam (Cam 3)

7. Adjust Cam 3 (the Auxiliary switch cam) AFTER adjusting Cam 1 (the end of travel cam).

- Ensure that Cam 3 LEADS the end-of-travel cam by a few degrees, thereby changing state before the end of travel cam stops the actuator.
- The adjustment tool hole for Cam 3 should be a few degrees to the LEFT of Cam 1 adjustment tool hole, see illustration.

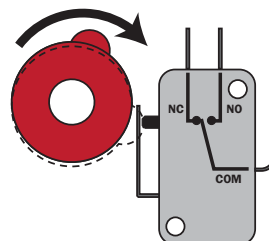


8. Test the Cam 3 setting and readjust if necessary.

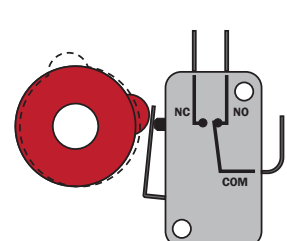
9. CW Cam settings are now complete.

### CAM BEHAVIOR

Will drive 90° CW



CW Limit Switch  
Shown in CCW Position



CW Limit Switch  
Shown in Full CW Position

## ADJUSTING CCW END OF TRAVEL

This actuator has been factory calibrated and tested to stop at 0 degrees for CW position and to stop at 90 degrees for CCW position. Most installations onto valves or dampers will likely not require recalibration of these settings. Please mount the valve or damper and proceed on these pages only if adjustments are required. Note that for most actuators these positions are independent - for instance the CW position is set correctly while the CCW needs adjustment.



**WARNING** – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.



Cam 2 - CCW Cam



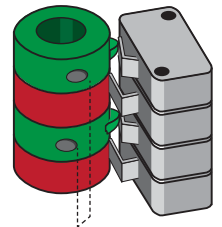
Cam 4 - CCW Auxiliary Cam

### Adjust CCW Cam (Cam 2)

1. Cam 2 is the second cam (green) and is the end-of-travel adjustment for the actuator CCW position.
  - With power OFF and the actuator at its required CCW position, insert the adjustment tool into the bottom cam.
  - Rotate the tool CW to stop the actuator SOONER (less CCW or open).
  - Rotate the adjustment tool CCW to stop the actuator LATER (more CCW or open).
2. Apply power and test the new setting.
  - If the actuator stops at the required position, proceed to the next step.
  - If it does NOT stop in the correct position, repeat step 1.

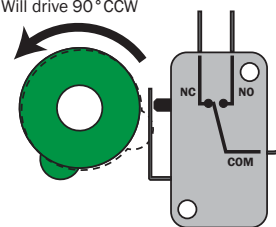
### Adjust CCW Auxiliary Cam (Cam 4)

3. Adjust Cam 4 (the Auxiliary switch cam) AFTER adjusting Cam 2 (the end of travel cam).
  - Ensure that Cam 4 LEADS the end-of-travel cam by a few degrees, thereby changing state before the end of travel cam stops the actuator.
  - The adjustment tool hole for Cam 4 should be a few degrees to the RIGHT of Cam 2 adjustment tool hole, see illustration.
4. Test the CW aux switch cam setting and readjust if necessary.
5. CW Cam setting are now complete.

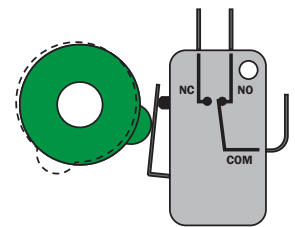


### CAM BEHAVIOR

Will drive 90° CCW



CCW Limit Switch  
Shown in Full CW Position



CCW Limit Switch  
Shown in CCW Position

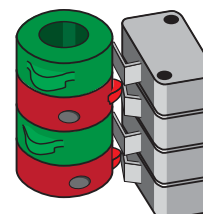
### AUXILIARY SWITCH CAM MAPPING

CW			CCW			
-5° 0° 5°			85° 90° 95°			
D	Fully CCW (OPEN)			} SW4 CW AUX (Adjustable)		
C	Common					
B	Fully CW (CLOSED)			} SW3 CW AUX (Adjustable)		
A	Common					

Common Switch Terminal

Common Switch Terminal

SW1 and SW2  
Used by Controller



CAM 4 / SW4  
CAM 3 / SW3  
CAM 2 / SW2  
CAM 1 / SW1

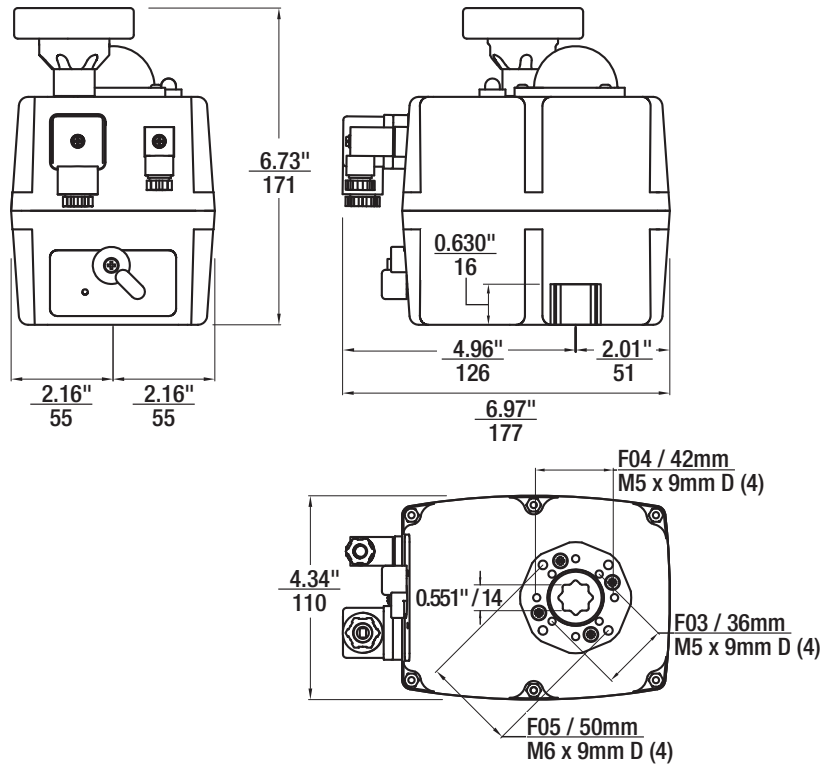
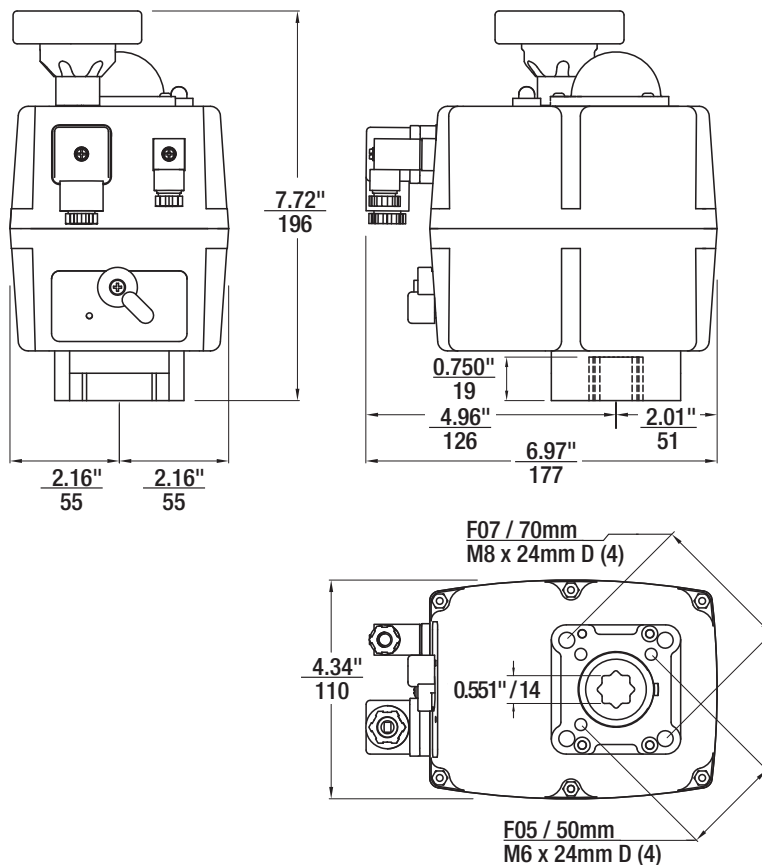


## TROUBLESHOOTING

After completing all mounting and wiring procedures and main power is available, if the actuator does NOT respond as expected, the following procedure(s) may help in identifying the problem. If using this troubleshooting guide does not resolve your issue please contact Hayward Flow Control Technical Services at 888-429-4635.

Symptom	Target	Action
Actuator does not move when commanded to do so.	Power Source	Measure incoming power AT the actuator Power Supply Plug.
	Control Problem	Generate move commands by the field device. Measure correct voltage changes between terminals 1 and 3 (CCW) and between terminals 1 and 2 (CW) on the Power Supply Plug.
	Declutch Lever set to (B) MAN	Reset Declutch Lever to (A) Auto. THEN ROTATE THE HANDWHEEL SLIGHTLY IN EITHER DIRECTION to re-engage the geartrain to the motor drive line. You will hear a “click” from inside the actuator, after which the handwheel will no longer be able to rotate.
	Wire Sizing	Check for correct wire size per Wire Sizing Chart.
	Improper Wiring	Check wiring per wiring diagram
Supply and controls are measured to be correct, but actuator still does not move.	Overtorque	Remove the actuator from the driven device. If the actuator now moves, the torque required by the mechanical device exceeds that of the actuator. Increase actuator size.
		With the actuator removed from the mechanical equipment, manually rotate the valve or damper through its intended range of travel to check for mechanical problems or an obstruction.
	DIP Switch Settings (Proportional Only)	Check to be sure the DIP Switch Settings match the incoming control signal
	Insufficient power supply and/or incorrect wire size during installation.	Measure the voltage between terminals 1 & 2 WHILE commanding the actuator to move. The measured voltage cannot drop more than 10%.
	Cams improperly set.	<b>Remove Power.</b> Cams MUST be secure and set according to the procedures in the Adjusting CW/CCW End of Travel section.
Actuator does not stop at correct position at either end of travel	Actuator is out of quadrant	The manual override system has been employed to rotate the actuator beyond its intended angle of rotation. Use the manual override to rotate the actuator back into its correct quadrant of operation.
	Travel cams not positioned correctly	Reset end-of-travel cams as detailed in the Adjusting CW/CCW End of Travel section.
Motor is extremely hot to the touch.	Control “noise” or excessive duty cycle	Check for stray voltage fluctuations on the incoming control signals. The on/off actuators have a maximum 75% duty cycle.
		Check the site as-built wiring diagrams to verify.
	Overtorque	Remove the actuator from the driven device. If the actuator now moves, the torque required by the mechanical device exceeds that of the actuator. Increase actuator size.
		With the actuator removed from the mechanical equipment, manually rotate the valve or damper through its intended range of travel to check for mechanical problems or an obstruction.



**MECHANICAL DATA**
**MODEL: ECP3**

**MODEL: ECP5**




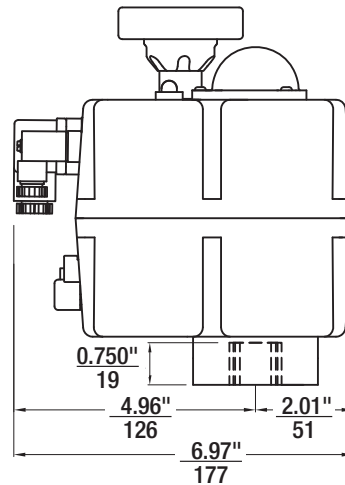
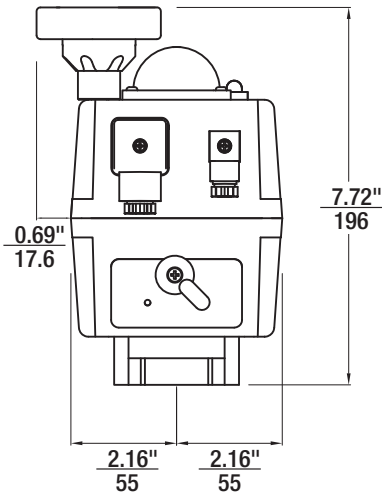
# HAYWARD®

## MODELS: ECP3, ECP5 & ECP8

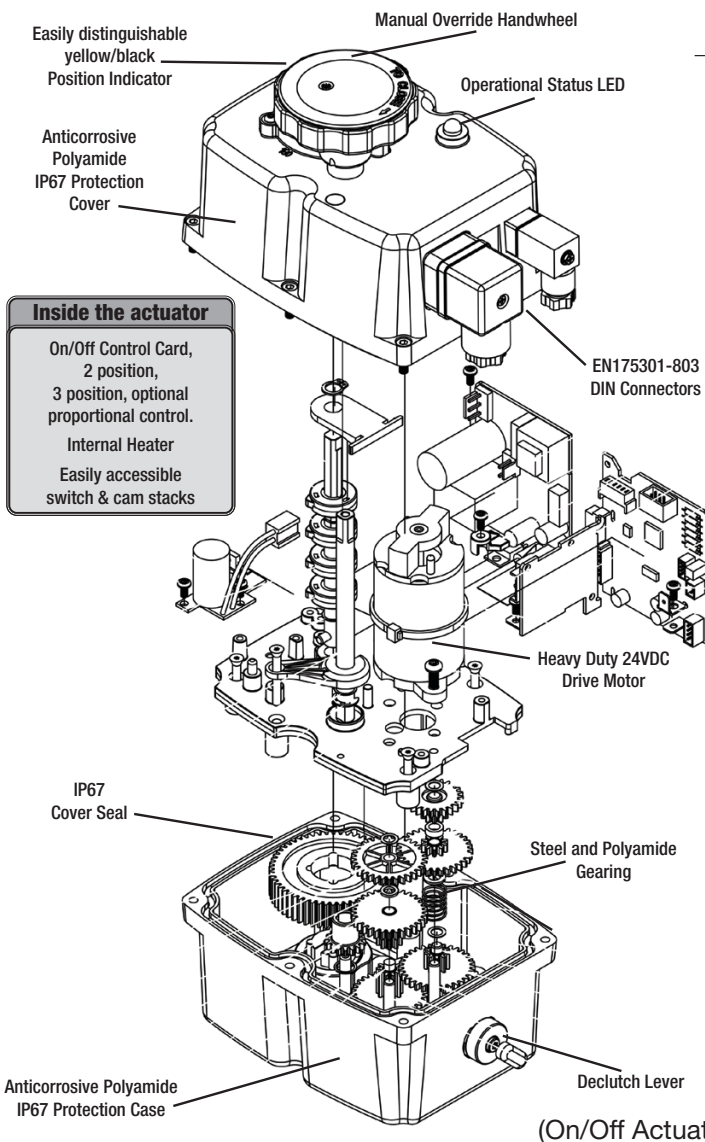
### On/Off & Proportional Control

### 24~240V

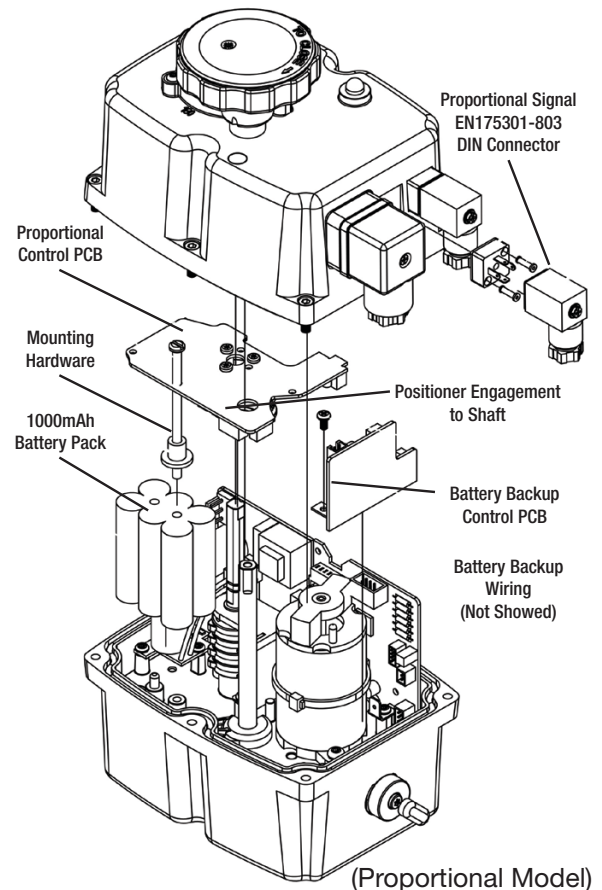
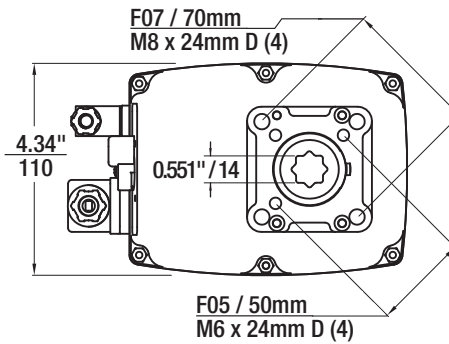
## MODEL: ECP8



## ECP3, ECP5 & ECP8



(On/Off Actuator)



(Proportional Model)

[Back to TOC](#)

## MOTOR POWER CONSUMPTION

Actuator power consumption data is provided in the table below to assist in estimating the power consumption of the actuators in this product line.

ECP3 CONSUMPTION			Unload		Max. Operational Torque 35Nm		Max. Torque Break 38Nm	
Voltage	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
24 VDC	0.40	10.20	1.20	27.60	1.20	28.20		
48 VDC	0.20	9.30	0.50	24.40	0.50	25.40		
110 VDC	0.10	7.30	0.20	18.20	0.20	18.60		
24 VAC	0.60	14.10	1.50	36.40	1.60	38.10		
48 VAC	0.40	17.20	0.90	41.90	0.90	43.80		
110 VAC	0.10	15.20	0.30	37.30	0.30	38.00		
240 VAC	0.10	22.70	0.20	45.90	0.20	45.90		

ECP5 CONSUMPTION			Unload		Max. Operational Torque 35Nm		Max. Torque Break 38Nm	
Voltage	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
24 VDC	0.33	08.00	1.21	29.00	1.25	30.00		
48 VDC	0.18	08.40	0.56	27.00	0.59	28.30		
110 VDC	0.06	06.10	0.17	18.20	0.18	19.60		
24 VAC	0.47	11.20	1.69	40.70	1.73	41.60		
48 VAC	0.29	14.20	0.97	46.50	1.01	48.30		
110 VAC	0.12	13.60	0.36	39.20	0.37	40.70		
240 VAC	0.09	21.10	0.20	47.50	0.20	48.00		

ECP8 CONSUMPTION			Unload		Max. Operational Torque 35Nm		Max. Torque Break 38Nm	
Voltage	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
24 VDC	0.33	7.90	0.88	21.20	0.90	21.20		
48 VDC	0.17	8.10	0.44	21.20	0.48	23.20		
110 VDC	0.05	5.80	0.13	14.80	0.15	16.50		
24 VAC	0.45	10.80	1.16	27.70	1.17	28.00		
48 VAC	0.28	13.30	0.28	33.10	0.71	34.10		
110 VAC	0.11	12.30	0.26	29.00	0.27	29.50		
240 VAC	0.08	18.50	0.16	38.00	0.16	38.00		

This page intentionally left blank

