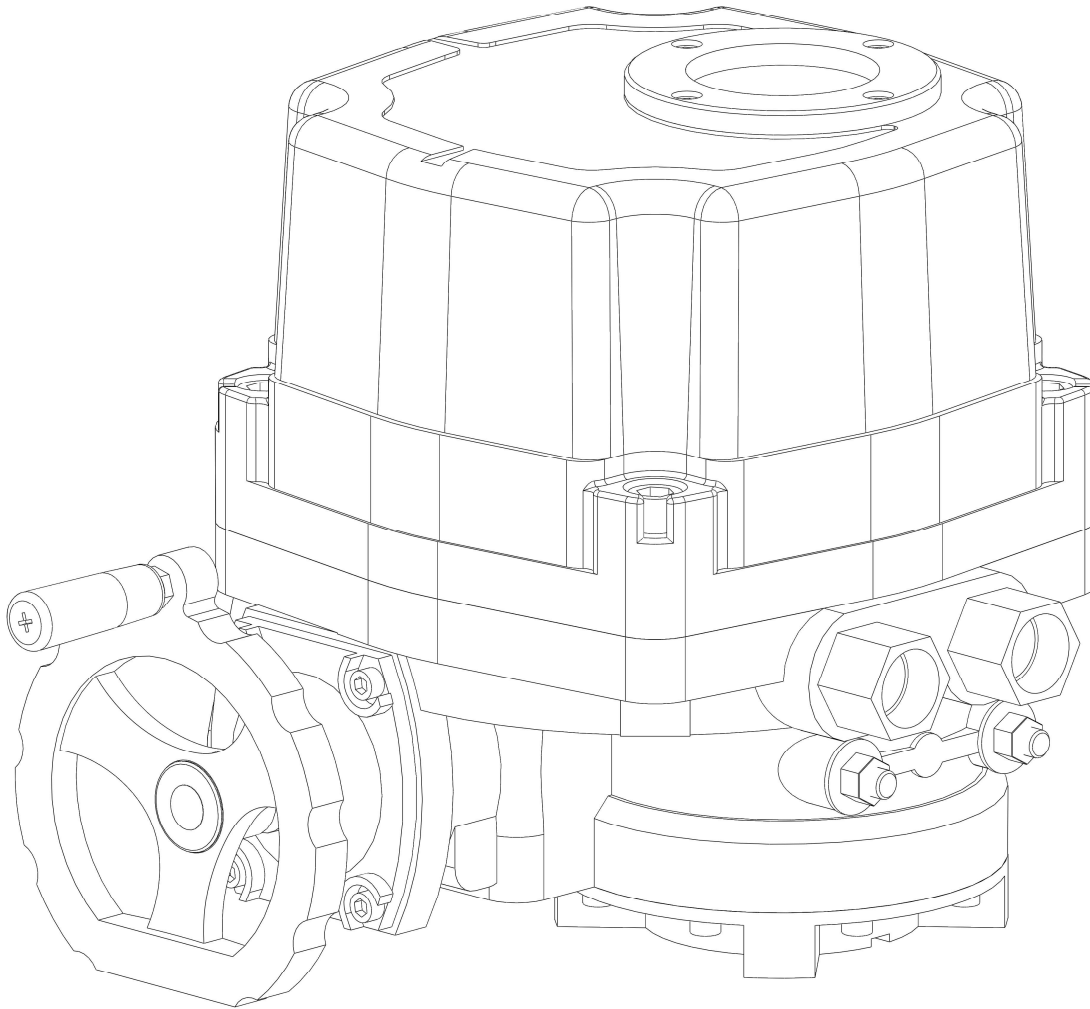


Installation and Operation Manual



WE/XE/SE-690 thru WE/XE/SE-2590
XC-00690 thru XC-25900

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1. Purpose

This manual provides explanation on the installation, operation and maintenance of WE, SE, XE and XC series electric actuators. Not all options are covered in this manual. For additional details on an option, refer to that option's specific manual.

2. Safety

2.1. Safety Notices



WARNING: Identifies a potentially hazardous situation or practice that may lead to personal injury or death.



SHOCK HAZARD: Indicates dangerous voltage may be present.



CAUTION: Indicates general precaution that could lead to personal injury or damage to equipment.

2.2. Safety Instructions

- This device was shipped from the factory in a proper condition to be safely installed and operated in a hazard-free manner. The notes and warnings in this document and on the actuator should be maintained and followed to ensure safe operation of the device.
- Take all necessary precautions to prevent damage to the actuator due to rough handling, impact, or improper storage.
- Do not use abrasive compounds to clean the actuator, or scrape metal surfaces with any objects.
- The system controlling the actuator must have proper safeguards to prevent damage to equipment, or injury to personnel should failure of system components occur.
- A qualified person in terms of this document is one who is familiar with the installation, commissioning and operation of the electric actuator and who has appropriate qualifications, which may include:

- Is trained in the operation and maintenance of electric equipment and system in accordance with established safety practices.
- Is trained or authorized to energize, de-energize, ground, tag and lock electric circuits and equipment in accordance with established safety practices.
- In cases where the actuator is installed in a potentially explosive (hazardous) location, is trained in the installation, commissioning, operation and maintenance of equipment in hazardous locations.

- The actuator must be installed, commissioned, operated and repaired by qualified personnel.
- All installation, commissioning, operation and maintenance must be performed under strict observation of all applicable codes, standards and safety regulations.
- Reference is specifically made here to observe all applicable safety regulations for actuators installed in potentially explosive (hazardous) locations.

XC actuators must observe the following installation instructions.

- Use supply wires suitable for at least 90°C (194°F)
- Disconnect circuit before removing cover.
- Install in location that shall not be exposed to acetic acid or methanol.
- Install a seal within 50mm of the enclosure.

3. Introduction

3.1. Storage

Actuators must be installed in a clean, cool and dry environment off the floor and covered.

Actuators should be stored with the cover installed and cable entries sealed.

When actuators are stored outdoors, they must be stored off the ground and high enough to prevent being immersed in water or buried in snow.

3.2. Initial Inspection

Ensure product specification on nameplate and wiring diagram matches the application and order.

Check actuator for any physical damage that may have occurred during shipment.

If there are any discrepancies, contact your Triac distributor to solve the problem immediately.

3.3. Terminology

Standard actuator direction and position references are as follows.

Close = Clockwise
Open = Counter-clockwise

For the sake of this document, these terms may be used interchangeably.

4. Information and Features

The WE, SE, XE and XC series electric actuators are for use on quarter-turn valves and dampers requiring between 690 to 25900 in-lbs of torque to operate.

Actuator positioning is achieved by travel limit switches that disconnect power to the motor when engaged by cams attached to actuator output shaft. A thermal protector switch is built into the motor windings to automatically disconnect the motor power if the motor temperature exceeds the motor rating. Torque switches are included on all actuators, except -690 size, as a safeguard to prevent stalling and overheating the motor.

The ratio of the motor and gear train determines the actuator speed and utilizes two worm gear sets to transfer the motor torque to the output shaft. The double worm gear configuration prevents the load from back driving the output shaft. Accurate positioning is achieved by the indicator cam shaft connecting directly to the output drive.

4.1. Standard Specification

Enclosure	<u>WE</u> : Weatherproof, IP67, CSA approved for NEMA 4, 4X <u>SE</u> : Submersible, IP68, 10m for 72hrs. Type 4, 4X & 6 <u>XE</u> : ATEX/IECEX certified to Ex d IIB T4 Gb, IP67 <u>XC</u> : CSA Class I, Division 1, Group C & D, T4; Ex d IIB T4 Gb, Class I, Zone 1, AEx d IIB T4 Gb
Supply Power	12/24VDC, 24/110/220VAC 1PH, 50/60Hz, ±10% 220/380/440/460/480 VAC 3PH, 50/60Hz, ±10%
Motor	Class F reversible induction motor, fan cooled
Duty Cycle	<u>WE/XE/SE</u> : IEC60034-1 S4, 50-70%, 1200 starts per hour (50% max torque at 77°F (25°C)) <u>XC</u> : IEC60034-1 S4, 30-70%, (100% max torque at 140°F (60°C))
Operational Limit Switches	Open / Close, SPDT, 16A 1/2HP 125/250VAC, 0.6A 125VDC, 0.3A 250VDC
Auxiliary Limit Switches	Open / Close, SPDT, 16A 1/2HP 125/250VAC, 0.6A 125VDC, 0.3A 250VDC
Torque Switches	Open / Close, SPDT, 16A 1/2HP 125/250VAC, 0.6A 125VDC, 0.3A 250VDC
Stall Protection/Operating Temp	Built-in thermal protection, open 302°F (150°C) / close 207°F (97°C)
Travel Angle	0 to 90° ± 10°
Indicator	Continuous position indicator
Manual Override	Declutching mechanism
Self-Locking	Provided by double worm gearing
Travel Stops	2 x external adjustable screws
Space Heater	5W or 10W Anti-condensation
Conduit Entries	2 x 3/4" NPT
Lubrication	Grease moly (EP type)
Terminal Block	Spring loaded lever push type
Materials	Steel, Aluminum alloy, Al bronze, Polycarbonate
Ambient Temperature	<u>WE/SE</u> Standard: -4°F (-20°C) to 158°F (70°C) <u>XE/XC</u> Standard: -4°F (-20°C) to 140°F (60°C)
Ambient Humidity	90% RH Max. (non-condensing)
Vibration	X Y Z 10g, 0.2~34Hz, 30 minutes
External Coating	Anodizing treatment before Polyester dry powder

4.2. Standard Performance Technical Data

4.2.1. WE/SE/XE Series

Actuator Models	Output Torque	90° Cycle Time (sec)	Motor Size	Full Load Amps				Locked Rotor Amps				Duty Cycle	Handwheel Turns	Weight		
				AC/DC	1 Phase		3 Phase		AC/DC	1 Phase					3 Phase	
WE / XE	In-Lbs.	60 / 50 Hz	Watts	24V	110V/60Hz	220V/60Hz	380V	440V	24V	110V/60Hz	220V/60Hz	380V	440V	IEC 34-1 S4	N	Lbs.
-690	690	13 / 16	15	5	1.2	0.6	N/A	N/A	12.8	1.4	0.7	N/A	N/A	70%	10	16.4
-1350	1350	21 / 25	40	6	2	1	0.28	0.36	16.9	2.5	1.2	0.75	0.66	70%	11	36.7
-1700	1700	21 / 25	40	7.4	2.3	1.1	0.28	0.36	16.9	2.5	1.2	0.75	0.66	70%	11	36.7
-2640	2640	26 / 31	40	8.9	2.3	1.3	0.27	0.34	30.8	2.9	1.4	1	0.87	70%	13.5	48.6
-4400	4400	26 / 31	90	N/A	4.5	1.9	0.42	0.47	N/A	5	2.4	1.73	1.5	70%	13.5	50.8
-5200	5200	26 / 31	90	N/A	4.5	2	0.42	0.47	N/A	5	2.4	1.73	1.5	70%	13.5	50.8
-6900	6900	31 / 37	180	N/A	5.1	2.4	0.61	0.67	N/A	7.3	3.8	2.73	2.38	50%	16.5	64
-10500	10500	31 / 37	180	N/A	5.4	3.4	0.61	0.67	N/A	7.3	3.8	2.73	2.38	50%	16.5	64
-17500	17500	95 / 112	180	N/A	5.8	2.4	0.61	0.67	N/A	7.3	3.8	2.73	2.38	50%	49.5	167
-25900	25900	95 / 112	180	N/A	6.3	3.4	0.61	0.67	N/A	7.3	3.8	2.73	2.38	50%	49.5	167

4.2.2. XC Series

Actuator Model	Output Torque				90° Cycle Time (sec)				Full Load Amps (FLA)				Locked Rotor Amps (LRA)				Duty Cycle*				Hand-wheel Turns	Lbs		
	In-Lbs				60Hz	60Hz	60Hz/DC	DC	60Hz	60Hz	60Hz/DC	DC	60Hz	60Hz	60Hz/DC	DC	S4 (IEC 60034-1)							
XC	110 VAC	220 VAC	24V AC/DC	12 VDC	110 VAC	220 VAC	24V AC/DC	12 VDC	110 VAC	220 VAC	24V AC/DC	12 VDC	110 VAC	220 VAC	24V AC/DC	12 VDC	110 VAC	220 VAC	24V AC/DC	12 VDC				
-00690	690	690	620	350	20	20	17	11	1.2	0.6	5	13.5	1.4	0.7	12.8	21.7	40%	40%	30%	30%	10	16.4		
-00860	860	790	700	440	20	20	20	11	1.2	0.6	6.3	13.5	1.4	0.7	12.8	21.7	40%	40%	30%	30%	10	16.4		
-01350	1350	1350	1350	-	21	23	22	-	2	1	6	-	2.5	1.2	16.9	-	70%	35%	40%	-	11	36.7		
-01700	1700	1590	1410	-	21	23	22	-	2.3	1.1	7.4	-	2.5	1.2	16.9	-	70%	35%	40%	-	11	36.7		
-02640	2640	2300	2120	-	26	26	32	-	2.3	1.3	8.9	-	2.9	1.4	30.8	-	70%	40%	35%	-	13.5	48.6		
-04400	3980	3980	-	-	29	29	-	-	4.5	1.9	-	-	5	2.4	-	-	30%	30%	-	-	13.5	50.8		
-06900	6900	6900	-	-	31	34	-	-	5.1	2.4	-	-	7.3	3.8	-	-	30%	30%	-	-	16.5	64		
-10500	9600	8300	-	-	31	34	-	-	5.4	3.4	-	-	7.3	3.8	-	-	30%	30%	-	-	16.5	64		
-17500	17500	17500	-	-	93	93	-	-	5.8	2.4	-	-	7.3	3.8	-	-	30%	30%	-	-	49.5	167		
-25900	25900	25900	-	-	93	93	-	-	6.3	3.4	-	-	7.3	3.8	-	-	30%	30%	-	-	49.5	167		

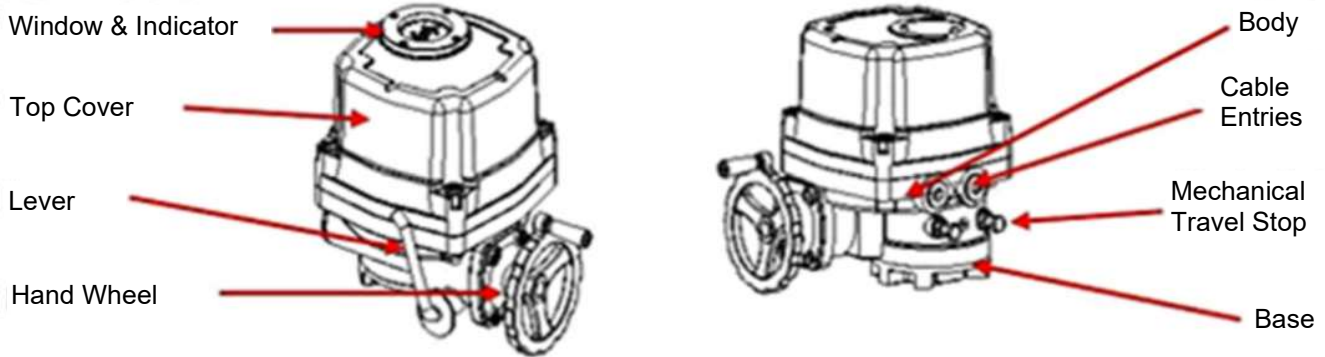
*DUTY CYCLE: FULL LOAD WITH 158°F AMBIENT TEMP

4.3. Optional Features

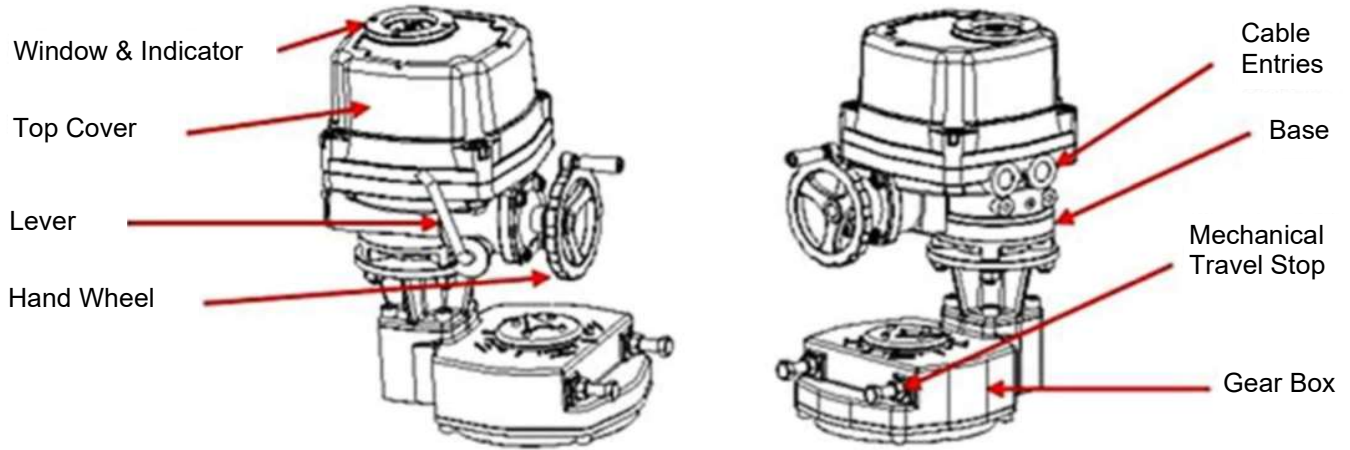
Explosion-proof enclosure	XE/XC Series only
Watertight enclosure (IP68 10M 72HR)	SE Series
Potentiometer unit (1K ~10K)	WE/XE/SE Series
Proportional / Modulating control - See TMC3 or TDC servo cards	WE/XE/SE/XC Series
Additional Aux switches (SPDT, 250V AC 10A Rating)	WE/XE/SE Series
SICU Semi-integral control unit (Local/Remote Selector Switches)	WE/XE/SE Series - except 690
ICU Intelligent Digital control unit (Local/Remote Selector Switches)	WE/XE/SE Series - except 690
Current position transmitter (output 4-20mA DC)	WE/XE/SE Series
Extended Rotation 120°, 180°, 270° turn	WE/XE/SE Series - except 10500 & 25900
Signal lamp unit (white-power on, red-close, green-open, yellow-over torque)	WE/XE/SE Series
Fire Proofing Actuator 1050 ±5°C/50 min	consult factory
Fire Proofing Actuator 250 ±5°C/150 min	consult factory

4.4. Standard Model Parts

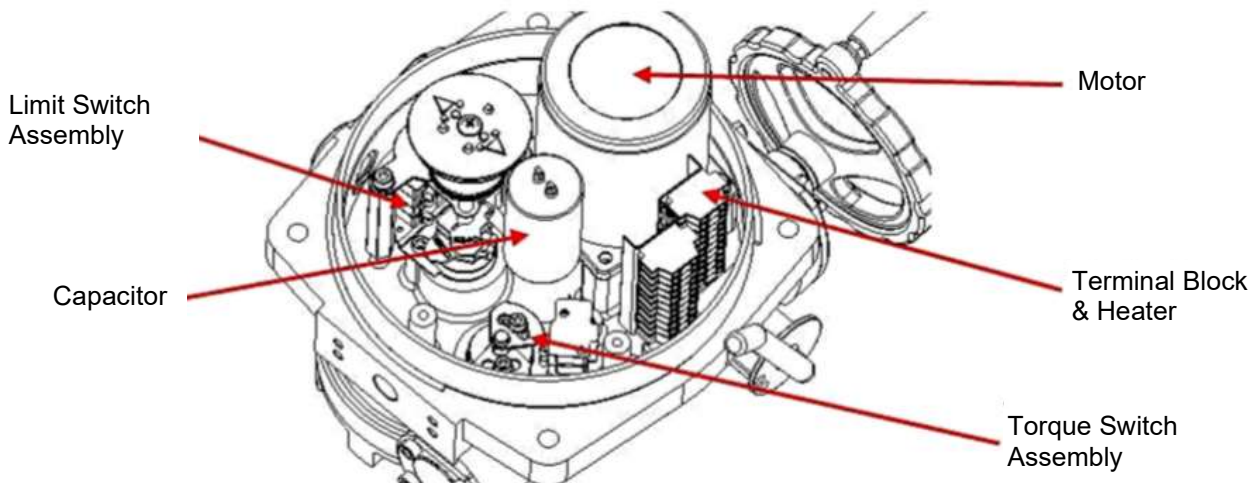
4.4.1. Size -690 thru -10500



4.4.2. Size -17500 and -25900



4.4.3. Standard Model Internal Parts



CAUTION:

The -690 size actuator does not contain torque switch assembly. Forcing actuator into mechanical stops, or preventing rotation in some other manner may damage motor.

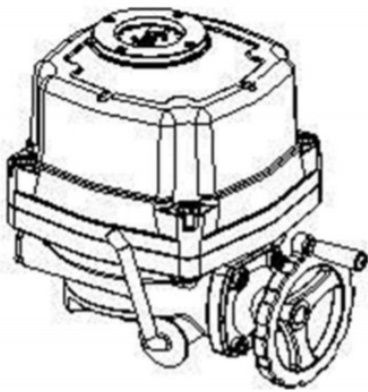
4.5. Manual Operation Handwheel

Actuators are provided with a declutchable manual override system to allow operation without electrical power. To operate manually, pull the lever towards the handwheel to engage the manual override. If the lever does not remain engaged, pull the lever while turning the handwheel.

Actuator rotation direction is cast on the handwheel. Rotating handwheel in the identified direction will rotate the actuator output as follows.

Close = Clockwise
Open = Counter-clockwise

The manual override will automatically disengage when electric power is applied, and motor begins to rotate.



CAUTION:

- Do not use excessive amount of pull force when turning the handwheel.
- Do not pull or force the lever to disengage the manual override. Only use an electrical control signal to disengage the manual override lever. Forcing the lever to disengage can damage the internal lever shear pins.

4.6. Space Heater

Condensation may form in the actuator due to change in ambient temperature. Powering the internal space heater will help prevent this. Standard heaters are ceramic with thermostat to prevent over heating above 140°F (60°C).

Actuator Size	Voltage	Heater
-690	110VAC	5W, 4.5kΩ
	220VAC	5W, 18kΩ
	24VDC	5W, 200Ω
	12VDC	5W, 47Ω
-1350 to -25900	110VAC	10W, 2kΩ
	220VAC	10W, 8kΩ
	24VDC	10W, 100Ω
	12VDC	10W, 27Ω

5. Installation

5.1. Pre-Installation

Check actuator nameplate to ensure correct model, torque output, operating speed, voltage and enclosure type before installation or use. It is important to verify the torque output of the actuator is appropriate for the torque requirements of the valve and that the duty cycle of the actuator is appropriate for the intended application.



WARNING:

- The actuator generates a large mechanical force during normal operation.
- Installation, commissioning, maintenance and repairs must only be performed by qualified personnel with extensive knowledge on working with electrical equipment according to enclosure ratings.
- Any modification to actuators is prohibited as it may change enclosure ratings.

5.2. Tools


- Metric Hex Wrench Set
- Metric Combination Wrench Set
- Flat-Head Screwdriver (1/8" or 3mm)
- Wire Stripper
- Multimeter

5.3. Actuator Mounting

- Mounting actuator is easiest with valve shaft pointing vertically upwards, but mounting is possible in any other position.
- Actuator should be mounted to ensure sufficient room to easily remove housing cover and access internal components for wiring and repair.
- Actuators are supplied with female drive output. Output drive bushing is removable for ease of machining or replacing.
- Standard ISO 5211 bolt patterns are provided on mounting base. Actuator must be firmly secured to a sturdy mounting bracket or directly to the valve's ISO

mounting pad. High tensile bolts or studs with spring locking washers must be used. To avoid backlash, there should be no flexibility in the mounting.

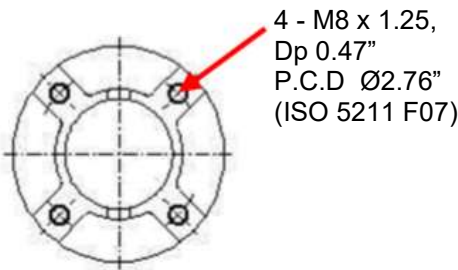
- Valve output shaft must be in line with actuator output drive to avoid side-loading the shaft. Operate with handwheel before fully tightening mounting hardware to ensure correct alignment.
- Ensure both valve and actuator are in the same open or closed position before mounting.



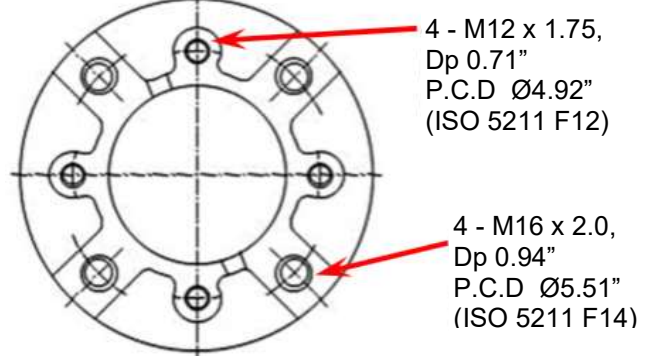
CAUTION:
Prior to mounting, the actuator must be checked for any damage. Damaged parts must be replaced by original spare parts only.

5.3.1. Mounting Base Details (ISO 5211)

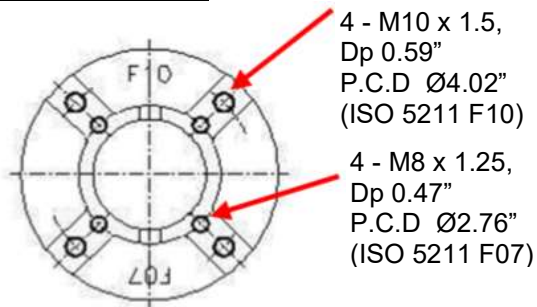
Size -690



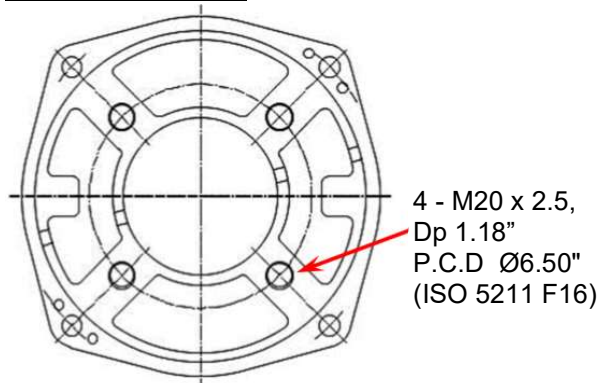
Size -6900, -10500



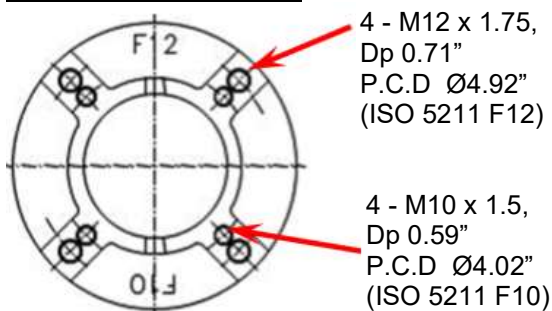
Size -1350, -1700



Size -17500, -25900



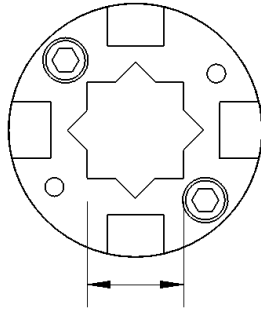
Size -2640, -4400, -5200



5.3.2. Drive Bushing

Standard drive bushings are ISO 5211 star. Verify actuator drive bushing matches valve or actuator device stem before mounting.

Actuator Size	Std. Drive Size
-690	17mm
-1350, 1700	19mm
-2640, 4400, 5200	27mm
-6900, 10500	36mm
-17500, 25900	36mm

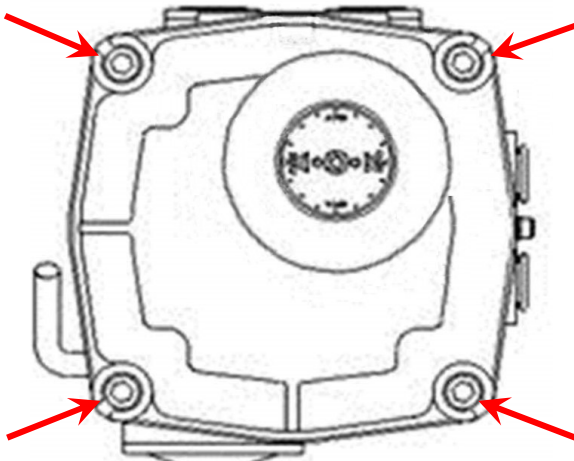


5.4. Housing Cover



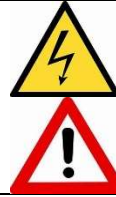
WARNING:
Flamepath surfaces on XE and XC actuators must not be damaged in any way. **DO NOT FORCE** cover onto actuator body.

Actuator housing covers are attached with bolts in each corner. Unscrew bolts to remove cover.



Actuator Size	Bolt Hex Size
-690	6mm
-1350, 1700	8mm
-2640, 4400, 5200	10mm
-6900, 10500	10mm
-17500, 25900	10mm

5.5. Limit Switch Setting



WARNING:
Hazardous voltage. Turn off all power and lock out service panel before installing or modifying any electrical wiring. Use caution when energizing inputs.



CAUTION:
Setting limit switches incorrectly may result in actuator stopping by the mechanical stops. This may overheat the motor and force it into thermal overload. Electrical operation will not be possible until overload resets. The motor may eventually fail if repeatedly overheated.

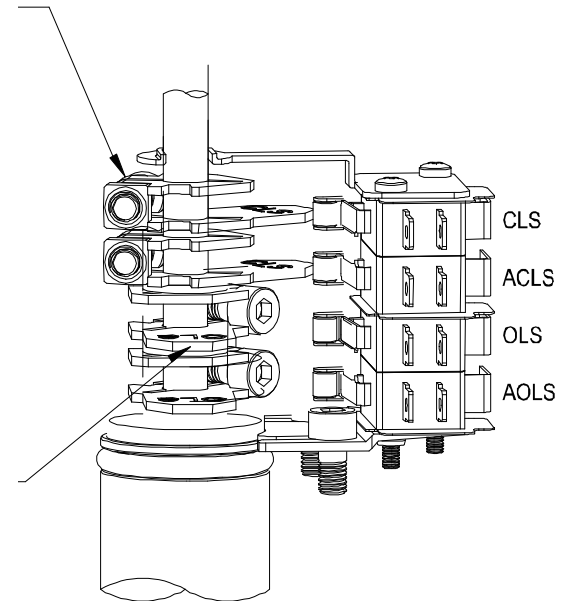
The motor control limit switches and auxiliary switches have independently adjustable cams.

Switch order from top to bottom of the stack:

- CLS = Close motor control
- ACLS = Auxiliary close
- OLS = Open motor control
- AOLS = Auxiliary open.

CLS CAM
(Close Limit Switch Cam)

OLS CAM
(Open Limit Switch Cam)




To set Close (CW) position, rotate the actuator to the closed position with the manual handwheel. Loosen CLS cam and rotate clockwise until switch trips. Retighten cam.

To set Open (CCW) position, rotate the actuator to the open position with the manual handwheel. Loosen OLS cam and rotate counterclockwise until switch trips. Retighten cam.

Verify limit switch setting by operating the actuator to each position, making sure the limit switches cams press in the limit switch lever.

5.6. Torque Switch Setting

Torque switches are installed to prevent damaging the valve and actuator under overload conditions. When the actuator is under overload, an integrated torque spring mechanism trips the torque switches to stop the actuator immediately.



CAUTION:

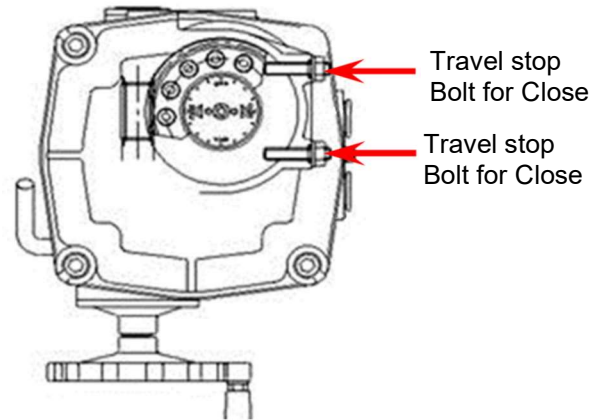
- Torque switch cams and spring mechanism are set by the factory based on the rated actuator output torque and should not be adjusted by the user. Adjustment can cause damage to the motor and gearing and will void the warranty.
- Size -690 actuators do not contain torque switches.


5.7. Mechanical Travel Stop Adjustment

Loosen jam nuts for both the clockwise and counterclockwise travel stop bolts.

To set the close mechanical stop bolt, operate the actuator clockwise to the Close (CW) position until the CLS limit switch trips. Tighten the close travel stop bolt until it stops on the secondary worm wheel gear, then loosen the stop bolt back out by 3 turns. Retighten the jam nut.

To set the open mechanical stop bolt, operate the actuator counterclockwise to the Open (CCW) position until the OLS limit switch trips. Tighten the open travel stop bolt until it stops on the secondary worm wheel gear, then loosen the stop bolt back out by 3 turns. Retighten the jam nut.







CAUTION:

If the actuator stops by the mechanical travel stops instead of the limit switches, the motor may overheat and go into thermal overload. Electrical operation will not be possible until overload resets. Motor failure may occur if repeatedly overheated.

5.8. Control Options

There are many control options available. Please refer to specific control option manual or wiring diagram for details on each specific option.

6. Wiring and Operation

WARNING:

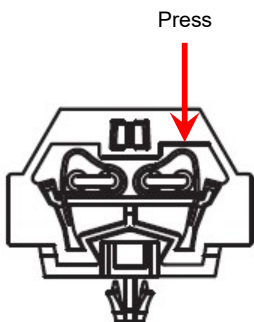
- Hazardous voltage. Turn off all power and lock out service panel before installing or modifying any electrical wiring. Use caution when energizing inputs.
- All work on the electrical system of equipment must be performed by qualified personnel under strict observation of all applicable codes, standards and safety regulations.
- The actuator generates a large mechanical force during normal operation.

6.1. Wiring

- Remove actuator cover and ensure power supply voltage matches the nameplate or label, and that power supply is capable of providing the stated full load current.
- Two conduit entries are provided on each actuator; one for power and the other for control signal.
- A minimum of 18AWG wiring is recommended for all field wiring.
- Wiring diagram showing terminations is provided in each actuator.
- The actuator should be wired and grounded in accordance with local and national electrical codes.
- Conduit should be sealed at the actuator housing to prevent water or moisture from entering the actuator through the conduit openings.
- The compartment heater should be continuously energized to reduce accumulation of moisture within actuator housing.
- Unused conduit entries must be closed off with plug fitting approved for use per actuator enclosure ratings.

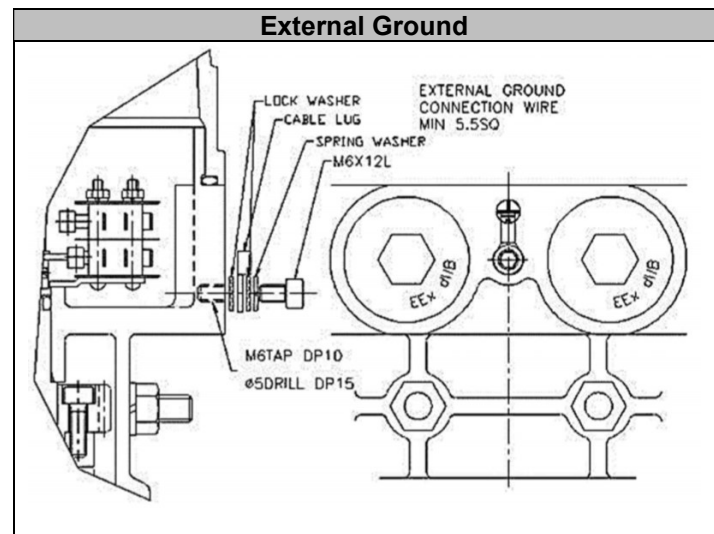
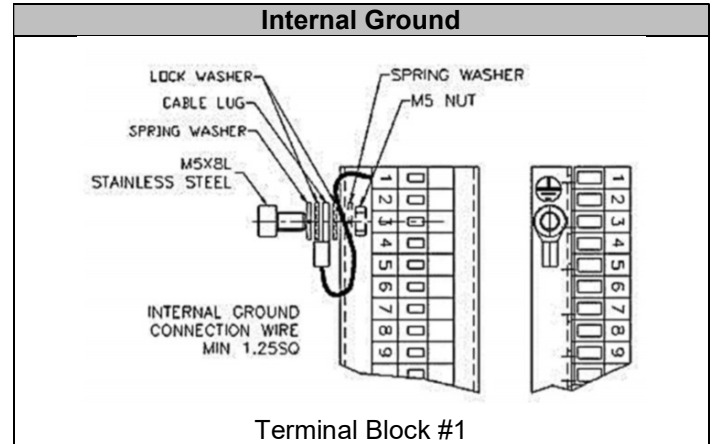
CAUTION:
Each actuator must have its own independent control contact. Actuators wired in parallel will not operate properly and doing so may cause damage to the actuator.

- Terminals in -690 actuator accept maximum wire size of 16AWG. Terminals in -1350 thru -25900 size actuators accept maximum wire size of 14AWG.
- Press in spring clamp with small flat head screwdriver to open terminal for wiring.



6.2. Grounding

Internal and external ground connections are provided.



6.3. Operation

6.3.1. General

Manually operate the actuator to the 50% open position. Electrically operate the actuator to the fully Open (CCW) position. The motor should rotate actuator counterclockwise and then de-energize when the OLS cam trips the open position limit switch.

Electrically operate the actuator to the fully Close (CW) position. The motor should rotate the actuator clockwise and then de-energize when the CLS cam trips the close position limit switch.



CAUTION:

- Do not immediately reverse the motor direction. A one second delay before reversing motor direction is recommended.
- Do not energize both actuator inputs simultaneously.
- If the actuator stops by the mechanical travel stops instead of the limit switches, the motor may overheat and go into thermal overload. Electrical operation will not be possible until overload resets. The motor may eventually fail if repeatedly overheated.

6.3.2. 3 Phase and DC Voltage Actuators

A 3-phase actuator without a control module, or DC voltage actuator without reversing control card will require the operator to check the phase and polarity connection prior to operation. Manually operate the actuator to the 50% open position then apply power to the actuator motor connections. This will rotate motor in one direction. To reverse the direction, exchange wire 1 with wires 2 or 3 on the 3-phase voltage actuator, or swap wires wires on DC voltage actuator.



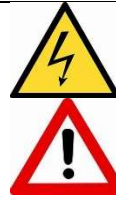
CAUTION:

- Energizing the motor directly risks the actuator driving into the mechanical stops. Verify limit switch and mechanical stop adjustment before checking direction and make sure to disconnect power to motor before limit switches are activated to avoid stalling the motor.
- Command inputs to controller used to reverse direction should be wired through travel limit switches.

6.3.3. Jamming

If the actuator travels into a mechanical travel stop, the worm gear will jam. Remove power from the command input. Briefly apply power in the reverse direction to release the pressure from the worm gear. The limit switches and mechanical travel stops should be readjusted per the instructions if jamming occurs.

7. Maintenance



WARNING:

- Hazardous voltage. Turn off all power and lock out service panel before performing maintenance on the actuator.
- Potentially high-pressure vessel. Before removing or disassembling the actuator, ensure that the valve or other actuator device is isolated and not under pressure.
- Any issue detected that may affect the safe operation of the actuator must have immediate action taken to repair.

Under normal conditions, maintenance should be carried out at six-month intervals. More frequent maintenance is advised if operating in more severe conditions.

- Ensure the actuator is properly aligned with the valve or other actuated device.
- Ensure all wiring is undamaged and insulated, connected and terminated properly.
- Ensure all screws are present and tight.
- Ensure internal electrical components and devices are clean and free from dust or debris.
- Ensure cable and conduit connections are properly installed and dry.
- Check inside of housing for any signs of condensation or moisture.
- Check power to the internal heater.
- Check enclosure o-rings.
- Verify manual override functions properly.
- Visually inspect the open/close cycle.
- Inspect the identification labels for wear and replace if necessary.
- Check for damage to enclosure.



CAUTION:

Use only original factory parts for repairs and replacement.

8. Troubleshooting

Problem	Cause	Solution
Actuator does not respond or operate	No power to actuator	Turn on power
	Low voltage to actuator	Check power supply and wire gauge
	Motor and supplied voltage are different	Check nameplate voltage
	Wiring is loose	Check connection to terminals
	Wiring is incorrect	Wire according to supplied diagram
	Limit switch or torque switch is tripped	Manually operate to mid position
	Worm gear is jammed	Refer to section on jamming
Torque switch tripped	Mechanical travel stop set prior to position limit switch	Reset travel stops
	Foreign object between valve seat and ball/disc	Clear objects
	Actuator is undersized	Check torques
Unable to manually operate with handwheel	Lever is not fully engaged	Turn handle slowly while pulling lever
	Worm gear is jammed	Refer to section on jamming
	Power is still on	Turn off power
Actuator performance is erratic	Motor is overheating and in thermal overload	Check duty cycle – tune control loop
	Motor is overheating and in thermal overload	Check ambient temperature

A-T Controls product, when properly selected, is designed to perform its intended function safely during its useful life. However, the purchaser or user of A-T Controls products should be aware that A-T Controls products might be used in numerous applications under a wide variety of industrial service conditions. Although A-T Controls can provide general guidelines, it cannot provide specific data and warnings for all possible applications. The purchaser / user must therefore assume the ultimate responsibility for the proper sizing and selection, installation, operation, and maintenance of A-T Controls products. The user should read and understand the installation operation maintenance (IOM) instructions included with the product and train its employees and contractors in the safe use of A-T Controls products in connection with the specific application.

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A-T Controls, Inc. • 9955 International Boulevard, Cincinnati, OH 45246 • Phone: (513) 530-5175 • Fax: (513) 247-5462 • www.atcontrols.com