



Tritex[®] EVA Manual Intelligent Linear Valve Actuator

Installation and Maintenance Instructions



Class 1, Division 2, Groups A, B, C, D
Hazardous Environment Rating

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Tritex® EVA

Intelligent Linear Valve Actuator

1 Introduction

The Tritex EVA actuator includes the patented and proven Exlar inverted roller screw with integrated brushless motor plus electronics to provide a complete valve actuator solution, all housed in an environmentally sealed enclosure with hazardous area certification.

This manual is for use with Tritex EVA080 actuators only. Installation and service instructions for other Tritex actuators can be found at www.Exlar.com.

The following instructions must be followed when installing Curtiss-Wright actuation products:

Read all the instructions before installing, operating or maintaining this product

Contact Curtiss-Wright for any questions at cha_applications@curtisswright.com

Follow all warnings, cautions, and noted instructions on, and with the product

Qualified personnel trained and experienced in the installation, maintenance, and operation of hazardous area equipment should install, operate, update, and service the product

2 Health & Safety Considerations

Safety is of paramount importance during the installation and operation of your Tritex EVA actuator. Throughout this manual, content flagged with the cautionary symbols shown below should be read carefully by installers and operators to help avoid property damage, personal injury or death.



WARNING! Indicates a potentially hazardous situation which could result in serious injury or death if precautions are not taken.



CAUTION! Indicates the information following is necessary for avoiding the risk of damage to the product or other equipment.

Several general warnings and cautions follow. In addition, refer to the AGENCY APPROVALS section for Conditions of Use for additional limits and requirements to ensure safe installation and operation.



WARNING! General Failure to follow safe installation guidelines can cause death or serious injury. Voltages and currents within the actuator can cause electric shock or severe burns, potentially lethal. Always ensure the actuator is powered off and isolated before servicing. Extreme care is always necessary when working with or adjacent to the product. The installation must comply with all relevant safety legislation in the country of use. The forces created by the actuator could be lethal or cause severe injury if proper protection is not provided to keep personnel away from moving components. Before installing the actuator ensure that it is suitable for the intended application. Consult cha_applications@curtisswright.com if there are questions prior to installation.



WARNING! System Design & Safety for Personnel System Design and safety for personnel. The actuator is intended as a component for professional incorporation into complete equipment or a system.



WARNING! Hot Surface – Risk of Burn. Exposed surfaces of the actuator may exceed 70 °C under normal operation and can take a long time to cool, resulting in a risk of burns when touched. Wear appropriate protective gloves when handling after operation.



WARNING! Hazardous Area. Ensure the actuator cover is tight and properly installed before applying power to the actuator. Property damage or personal injury may result from fire or explosion if power is applied to the actuator with the cover removed in a hazardous area.



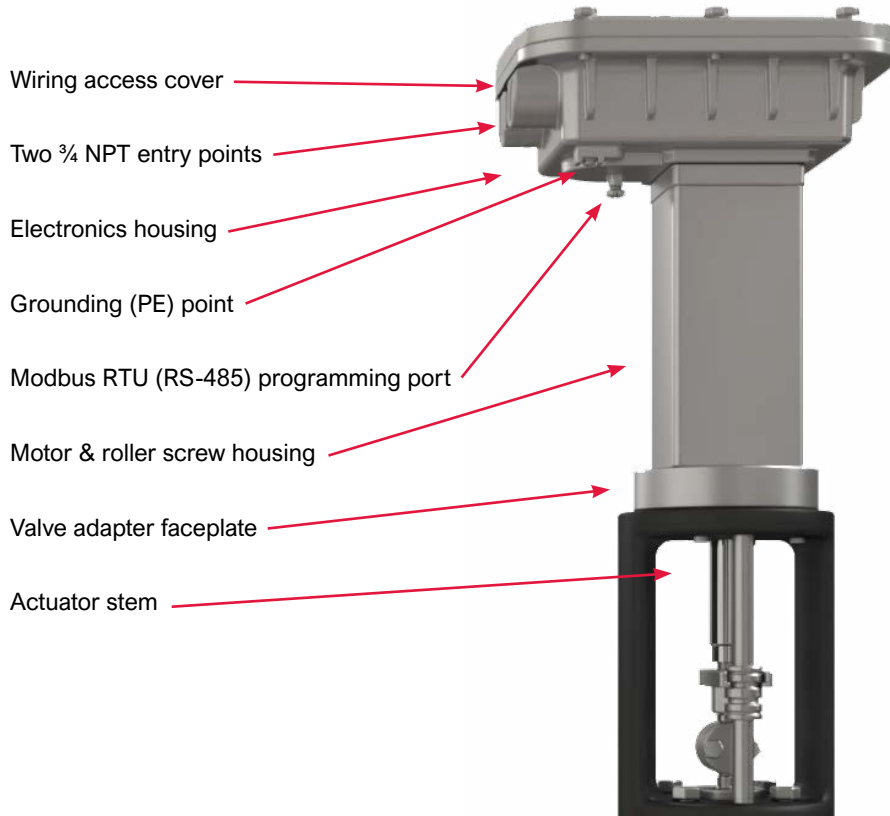
WARNING! Crush/Pinch Point Keep hands clear of stem when power is applied to actuator.

Exlar Tritex® EVA Intelligent Linear Valve Actuator

3 Product Information

The Tritex EVA actuator includes the patented and proven Exlar inverted roller screw with integrated brushless motor plus electronics to provide a complete valve actuator solution, all housed in an environmentally sealed enclosure with hazardous area certification.

3.1 Product Features



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3.2 Product Specifications

Power & Control	
Rated Thrust	1000 lbf (4.4 kN)
ISO Rated Seating Thrust (Peak)	1500 lbf (6.67 kN)
Rated Speed	1 in/s (25.4 mm/s) @ 24 Vdc
Max Stroke	4 in (101.6 mm)
Input Voltage	12-24 Vdc ±10% nominal, 9-32 Vdc max range
Input Current	12 A max, varies by thrust output
Idle Current	0.065 A enabled
Endurance & Life	
Endurance	Exceeds 10,000,000 starts, 3600+ starts per hour
Duty Cycle	100% continuous modulating duty cycle (Class D)
Life (Dynamic Load Rating)	5,516 lbf (24.5 kN)
Communication & Commissioning	
Serial Interface	Isolated Modbus RTU (RS485), max baud rate 38.4 k
Software Tool	Free-to-download Expert PC commissioning tool
Inputs & Outputs	
Digital Inputs	3 - Isolated, 9-30 Vdc
Digital Outputs	2 - Isolated, 9-30 Vdc
Analog Input	1 - Isolated, 4-20 mA, position / thrust demand
	0.1% resolution, 0.5% linearity over temperature range
Analog Output	1- Isolated, 4-20 mA, position / thrust feedback
	0.1% resolution, 0.5% linearity over temperature range
Environment & Mounting	
Enclosure	NEMA 4X, IP69K. For indoor and Outdoor use in wet or dry locations Pollution Degree PD3
Operating temperature	-40 to 149 °F (-40 to 65 °C)
Ambient storage temperature	-58 to 185 °F (-50 to 85 °C)
Noise	Less than 70 dB operation
Mounting	Face mount, any orientation
Weight	17.2 lbs. (7.8 kg)
Standards	
Approvals	cCSAus Class I, Div 2, Group A, B, C, D, T5
Product standards	ISO 22153, RoHS

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3.3 Label & Ordering Information

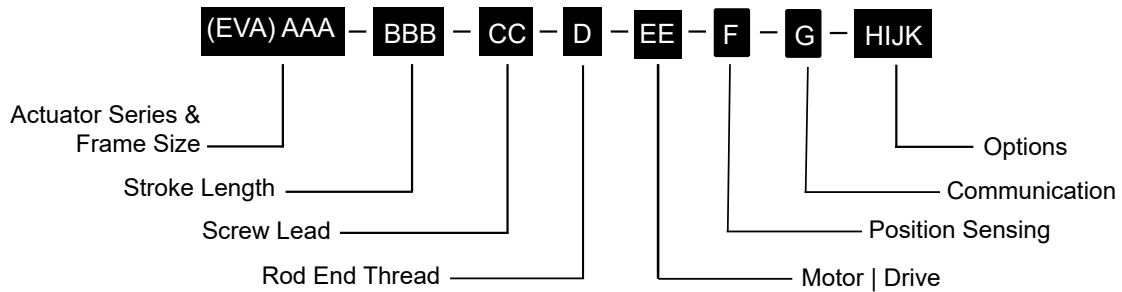
A product label is attached to each actuator under the conduit entry points.



Figure 1 - Typical Label Specifications

Ordering Info

Sample Product Number: EVA080-100-01-B-AA-A-R-XXXX



Actuator Series
EVA = Electric Valve Actuator, Linear

AAA = Actuator Frame Size
080 = 3.1 in (80 mm)

BBB = Stroke Length
100 = 4 in (100 mm)

CC = Screw Lead
01 = 0.1 in (2.54 mm), Roller Screw lead

D = Rod End Thread
B = Female Metric, M12x1.25

EE = Motor | Drive
AA = Standard Motor (A), Standard Servo Drive (A), 12-24 Vdc Input

F = Position Sensing
H = Absolute Position Sensing
A = Absolute Position Sensing on Powerloss (Standard)

G = Communication
R = Standard Modbus RTU (RS485)

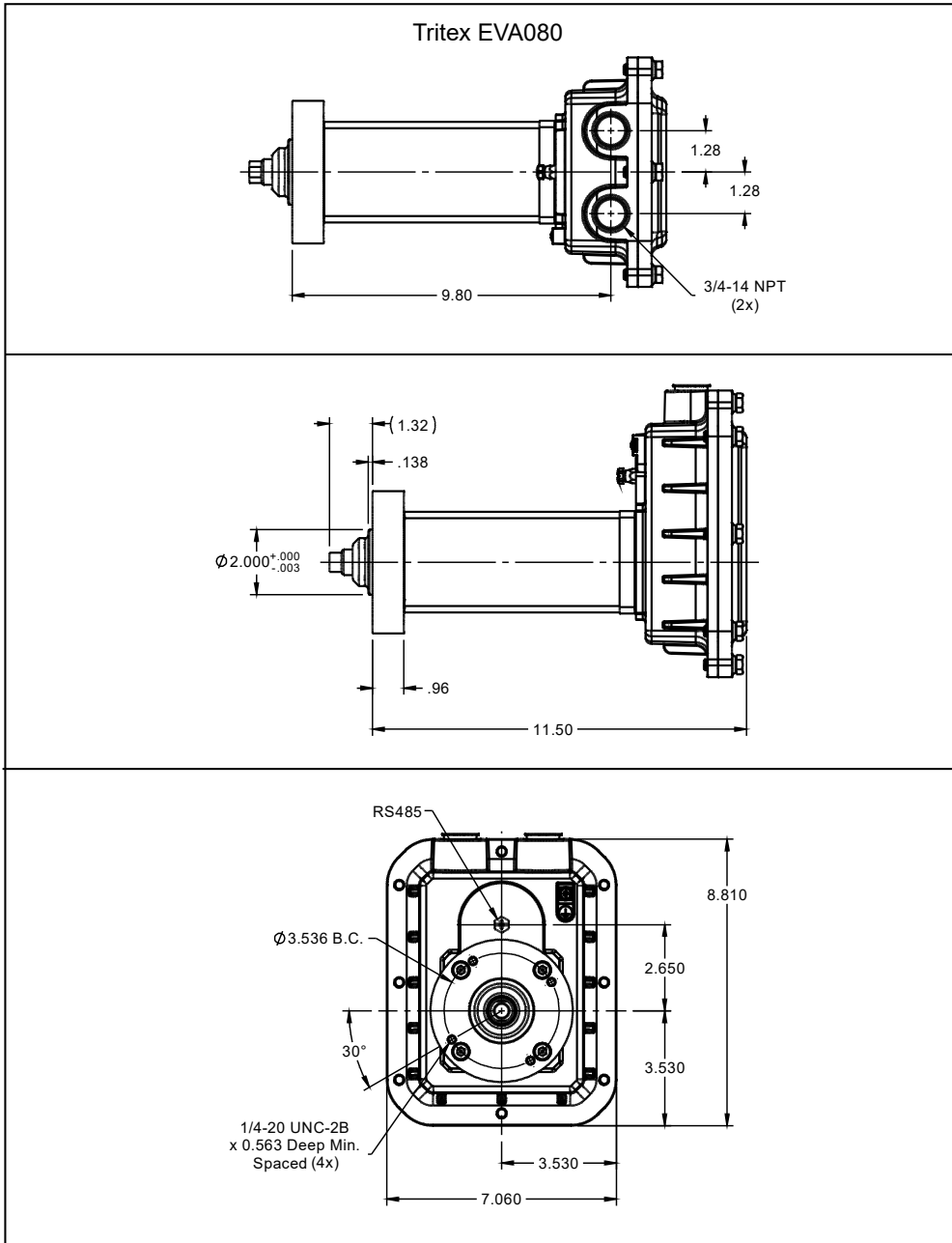
HIJK = Options
NNNN = None

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4 Installation

The Tritex EVA actuator is a complete motion system that combines a linear actuator, servo motor, and servo drive. The electrical to mechanical power conversion and control device are contained in the actuator.

4.1 Product Dimensions



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4.2 Mechanical Installation

4.2.1 Mounting & Mechanical Considerations

Every effort should be made to properly align the actuator main rod to the valve stem. Any misalignment will decrease the life of the components within the actuator and may create problems within the application associated with misalignment such as rod seal leakage.

The Tritex EVA080 can be mounted in any orientation without consideration of performance, but typically the actuator is mounted vertically, rod end down.

4.2.2 Lubrication Requirements

The actuator is shipped from the factory fully greased and ready for installation. Typical valve applications will not require relubrication during the life of the actuator. Exlar recommends using Tribolube 12T, a high performance, extreme-pressure grease. The unique physical properties of the synthetic base oil provide outstanding protection against wear, rust, corrosion and high or low-temperature degradation. Tribolube 12T allows for very low starting and running torque values.

4.2.3 Actuator Cover Removal

Maintain a minimum clearance of 1 in (25.4 mm) around the actuator cover for easy removal and wiring access. Ensure cover bolts (quantity 8) are tightened to the specified torque of 108 lbf-in (12.2 Nm). It is recommended to leave enough room for electrical installation and applicable installation guidelines followed.

4.2.4 Actuator Mounting Bolts

The actuator is mounted to the valve adapter using 4 bolts, 1/4-20 UNC-2B, equally spaced and must be engaged at a minimum of 0.5 in (12.7 mm) and must be tightened to 62 lbf-in. (7 Nm).

4.2.5 Conduit Entry

The actuator includes 2 conduit entry ports threaded 3/4" NPT. Conduit or cable glands should be tightened to 2-3 turns past finger tight or to ~54 lbf-in. (~6.1 Nm) of torque. Remove any transit plugs and seal unused entry points with threaded plugs.

NOTE: Power and signal wiring should be routed through different conduit entry points. If power and signal wires are routed through the same conduit entry point the plastic cap lug should be discarded and replaced with an approved plug and a minimum of five threads of engagement.

NOTE: Use of specialty seal tapes or thread sealants to help prevent galling, seizing, and corrosion.

NOTE: Unused conduit entries must be sealed with appropriately rated, certified threaded plugs suitable for hazardous locations, without adapters.

2X 3/4 NPT
Conduit
Entry Points



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CAUTION! Excessive side load on the actuator output rod will dramatically reduce the life of the actuator and should be avoided. Side load can result from misalignment or loading that is not in line with the actuator output rod.



CAUTION! Care should be taken not to exceed the physical travel limits of actuators. Doing so will cause the actuator to end-crash internally. End crashes can physically damage the roller screw and the internal components of the actuator.



CAUTION! If the actuator is mounted with the rod-end facing up, it must be externally protected from exposure to rain. The actuator is provided with a rod seal which has been tested to NEMA 4X, IP66 enclosure ratings however long-term wear or misalignment can cause degradation of the seal and eventually lead to moisture ingress.

4.2.6 Valve Mount

The following procedure uses the Motion Express valve mount adapter as an example. This adapter is not manufactured by Curtiss-Wright but is an official accessory. Support for 3rd party adapters is available. Any valve adapter must provide an anti-rotate feature to the lifter main rod.

Contact Motion Express or your local sales contact for standard valve mount kit availability.



www.motionexpressinc.com

General Valve Mount Procedure

1. Mechanically attach the valve mount adapter to the valve
2. Mount the Tritex valve actuator to the valve mount.
3. Attach the valve stem adapter to the main rod lifter.
 - a. Fasten the anti-rotate device to the main rod lifter.
 - b. Thread the valve stem adapter to main rod adapter (female M12x1.5)
4. Connect the lifter main rod to the valve stem. There are several options to position the main rod lifter to the proper valve stem attach point.
 - a. Tritex Expert Software - Power-up and connect to the Tritex valve actuator using Tritex Expert commissioning software. Then use Jog(+) Open/Jog(-) Close functions to position the lifter main rod. Further details can be found in section 4.6 Software tool commissioning.
 - b. Rotate Lifter Main Rod - If the valve mount adapter has an anti-rotate device can be mounted after the valve stem adapter is attached the lifter main rod can be rotated for manual positioning. One complete rotation will provide 0.1 in (2.54 mm) of linear travel).



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- c. Internal Manual Drive – Remove the Tritex valve actuators PCB electronics cover to access the internal manual drive. Utilize a ¼ in socket drive to manually position the main rod lifter. One complete rotation will provide 0.1 in (2.54 mm) of linear travel).
5. Once the Tritex valve actuator is mounted to the valve the actuator is ready for application commissioning.

4.3 Electrical Installation

4.3.1 Electrical Installation

Connections to the actuator are made using the two ¾” NPT entry ports defined in the mechanical installation section (Conduit Entry 4.2.7). Typically, one port is used for input power wiring while the other entry port is used for control wiring. The terminal blocks can be accessed by removing the cover (procedure defined in mechanical installation section (Actuator Cover Removal 4.2.5).



WARNING! For hazardous locations, install wiring and/or cable glands that are suitable for the environment. Environment examples include hazardous locations, ingress protection, and temperature. Failure to use suitable components may result in personal injury or property damage from fire or explosion.

Wiring connections must comply with all relevant local, regional, and national electrical codes specific to hazardous locations (Class 1, Div 2, Groups A, B, C, D). Failure to use suitable components may result in personal injury or property damage from fire or explosion.



WARNING! Disconnect power prior to servicing

4.3.2 Power Source

The power source nominal voltage is 12-24 Vdc. The maximum operating range is 9-32 Vdc. The power source can be a battery or a DC power supply. If a power supply is used, either a regulated or non-regulated supply can be used, if the above ranges are always maintained. Use regulated DC power supplies recommended for enhanced protection against voltage spikes and current surges.

4.3.2.1 Grid Power Supply

The maximum current required from the power supply is dependent on three factors: supply voltage, thrust required to operate the valve and the operating speed. Speed limit is a setup parameter within the actuator. The charts below show the maximum (peak) power supply current draw for various force and speed combinations for 12 Vdc and 24 Vdc supplies. Since the maximum speeds only occur for a short period of time which is dependent on speed and stroke distance, the peak input current draw is also for a short time, it is not a continuous value. When selecting a power supply, assure that it can supply 150 -200% of the maximum current needed for the required time to be sure abnormal conditions do not cause the power supply to fault.

2X 3/4 NPT
Conduit
Entry Points



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Power Supply Sizing Example

The example valve requires no more than 500 lbf (2.22 kN) seating/rated thrust and the desired close speed is 0.5 in/s (12.7 mm/s). The ISO 22153 standard for a linear valve load profile states that the seating thrust should account for the last 10% of the travel and the average thrust should be 30% of seating/rated thrust for 90% of the travel. What this means is that the equivalent thrust will be 50% of the seated/rated thrust. So, in this example using 500 lbf seating thrust (150 lbf average), the equivalent thrust will be 250 lbf. The seating thrust amps should be used to ensure the power supply has a peak available amp but will not represent total amp draw. Using the graph below a 500 lbf seating thrust requires a power supply with 2.6 Amps available. Some power supplies provide overload Amps. The typical power supply overload Amps can be used for seating thrust purposes. The 250 lbf average load thrust should be used to select a power supply's rated Amps. In this case that is approximately 1.24 amps. The power supply must be rated above 1.24 amps and provide an current overload or rated current above 2.6 amps.

Thrust (lbf)	Required Amps (peak)	Recommended Supply Amps (rated)
250 (equivalent)	1.24 A	≥ 1.5 A
500 (seating)	2.6 A	≥ 3 A (overload)

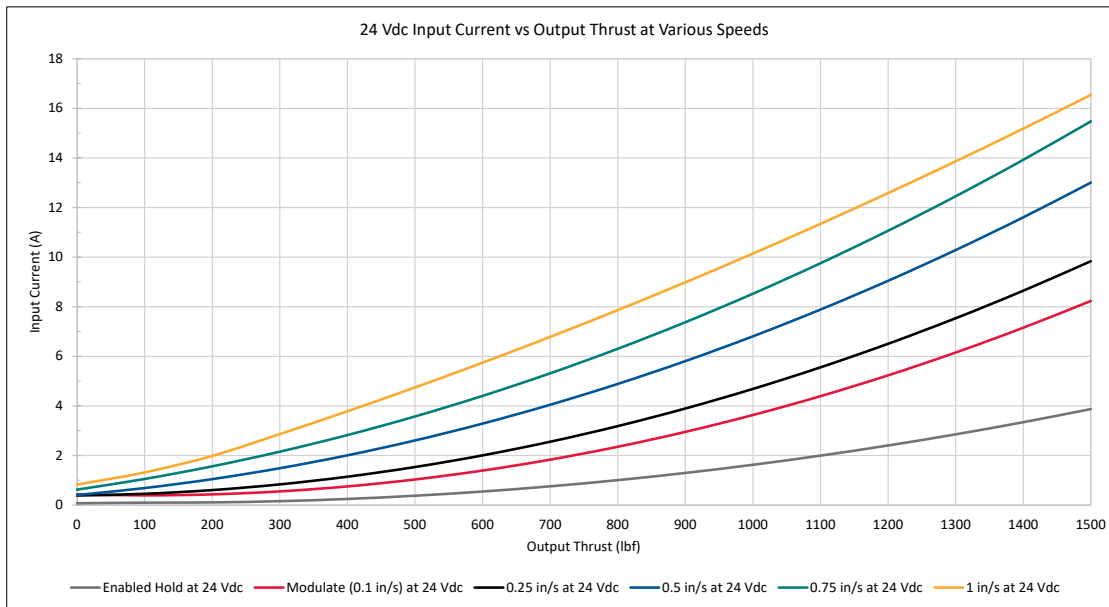


Figure 2 - Input Current Requirements at 24 Vdc

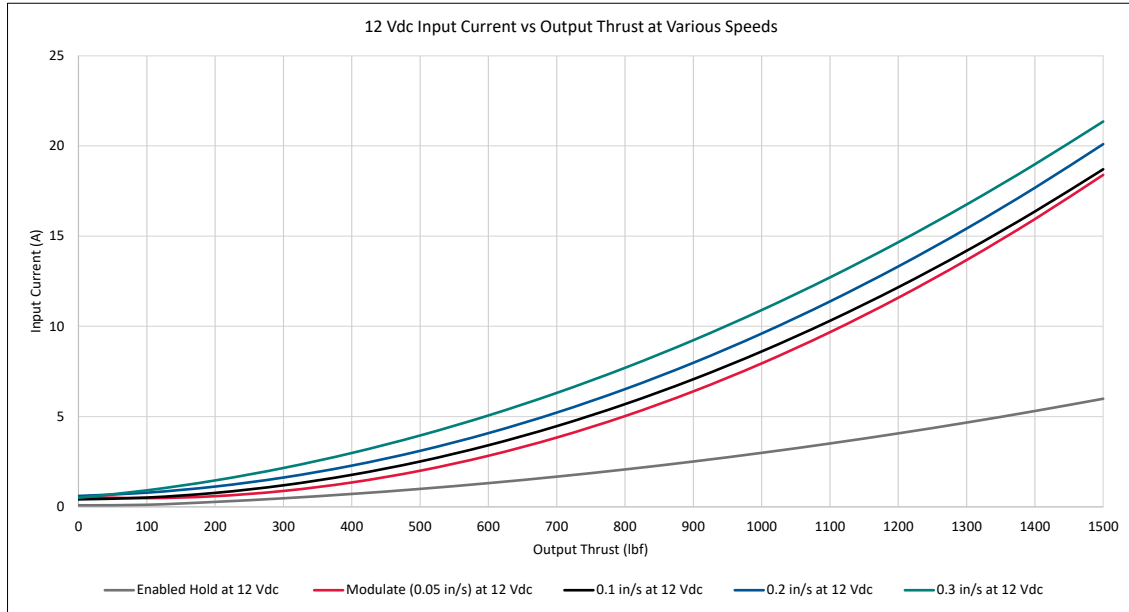


Figure 3 - Input current requirements at 12 V

Valve Application Typical Current Requirements

The example above provides guidance for selecting a power supply. Additional current draw testing has been conducted using the ISO 22153 valve thrust load provide where 10% of the stroke is at seating thrust and 90% of the stroke is at 30% of seating thrust. The chart below shows the measured current draw for different seating thrusts at different valve closing speeds. Using the example above of 500 lbf seating thrust a 3 in stroke move at 0.5 in/s valve closing speed would require 1.08 amps total to close / open the valve.

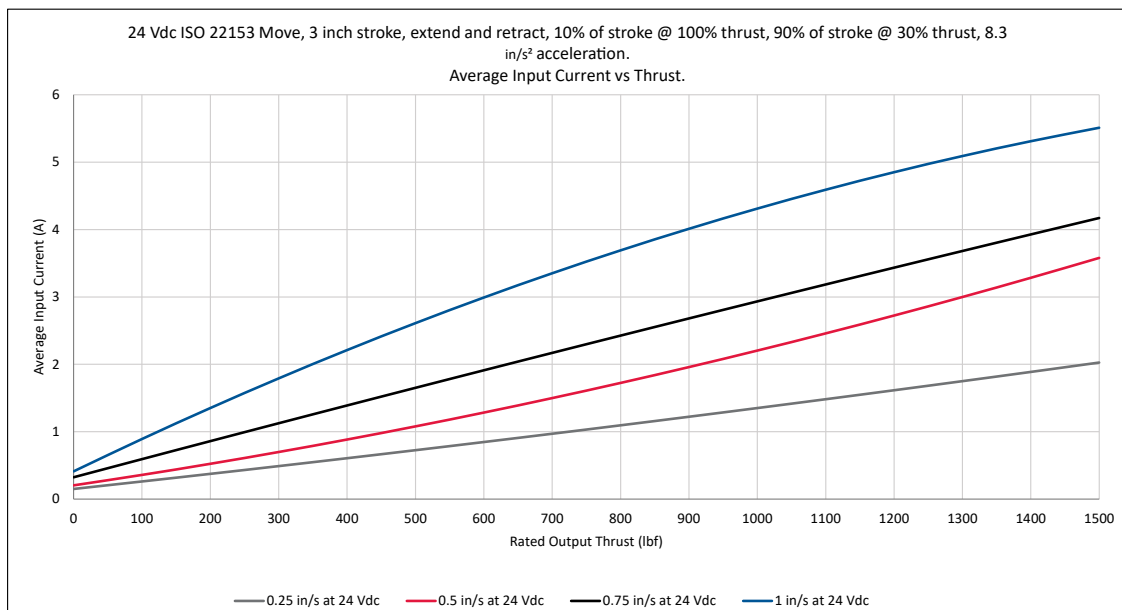


Figure 4 - 24 Vdc Average Input Current vs Thrust

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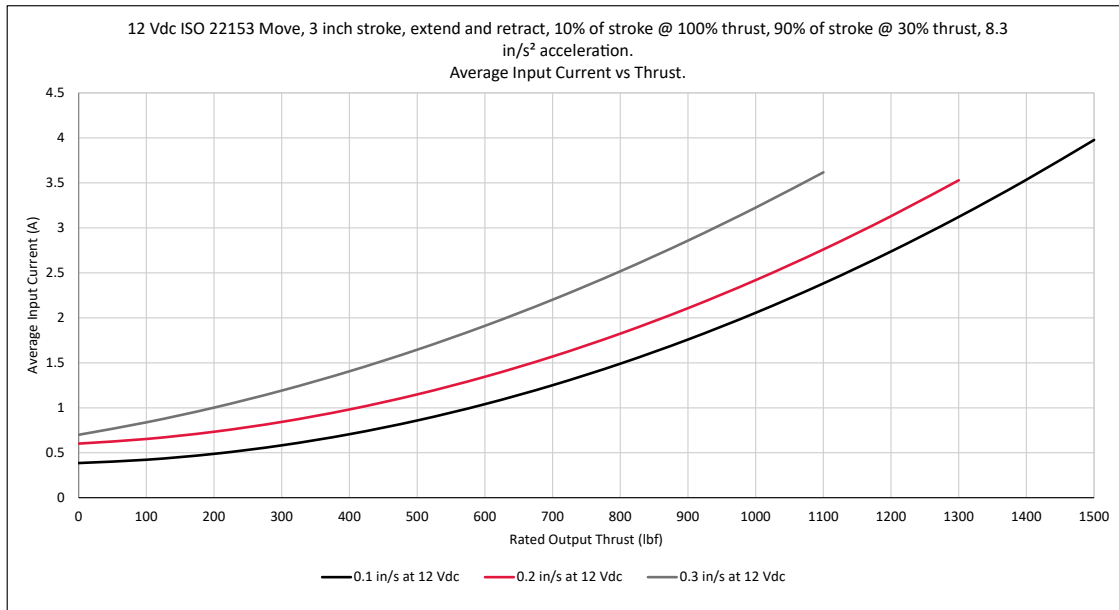


Figure 5 - 12 Vdc Average Input Current vs Thrust

4.3.2.2 Battery and Charging Supply Systems

The Tritex EVA080 is designed to work with a battery and charging system. With a battery system there is typically less concern about the maximum (peak) current drawn, as batteries can supply high current, but more concern about the average current drawn. The peaks from the chart below only occur during valve seating or unseating. The current required for holding a given thrust is about 30% of the zero speed or modulating current shown in the chart. To keep the input current as low as possible on battery systems with solar charging set the actuator speed to the maximum allowed by the available voltage.

Ripple Voltage from battery charging system is a factor that needs to be considered. The maximum peak ripple voltage allowed is 36 Vdc peak. Any instantaneous voltage above 38 Vdc will cause the Tritex EVA080 to fault out on High Voltage Fault.

4.3.3 Connecting to Terminals

Connections made to the Tritex EVA are made with tool-free lever-lock terminals. To make a connection, flip the lever lock on the desired terminal with your finger. The lever will lock open. Insert the conductor into the terminal (conductors should have an anti-splaying method applied such as ferrules, crimples or other methods). Once inserted, with a finger, actuate the terminal to the close position to clamp the conductor in place. One conductor per clamping unit is recommended.

Tritex EVA080

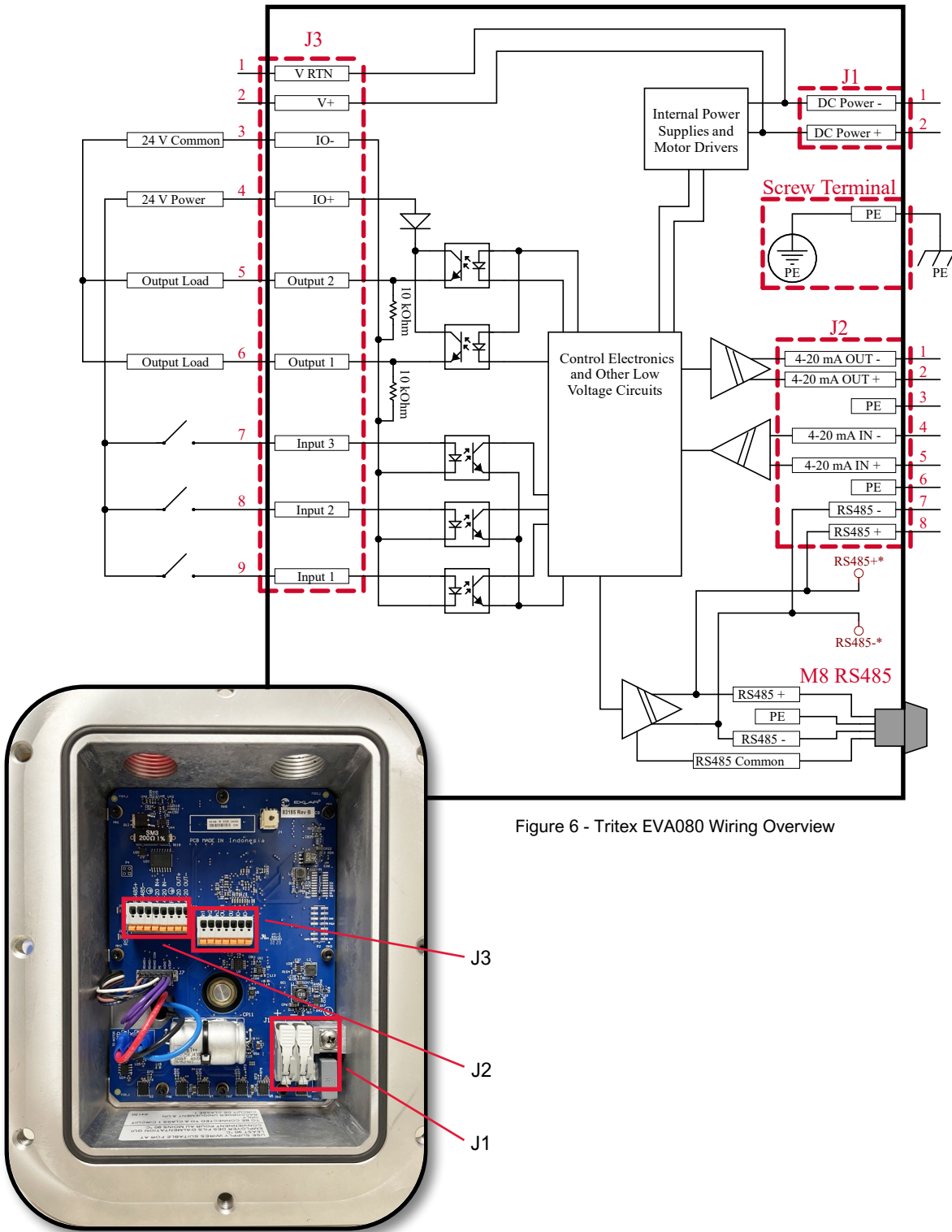


Figure 6 - Tritex EVA080 Wiring Overview

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Optionally, if isolation of digital IO is not required terminals 1 (V RTN) and 2 (V+) are internally connected to J1 Input Power. This is the factory recommended way to provide power to the IO (terminals 5 – 9) when isolation of digital IO is not required.

Tritex EVA080

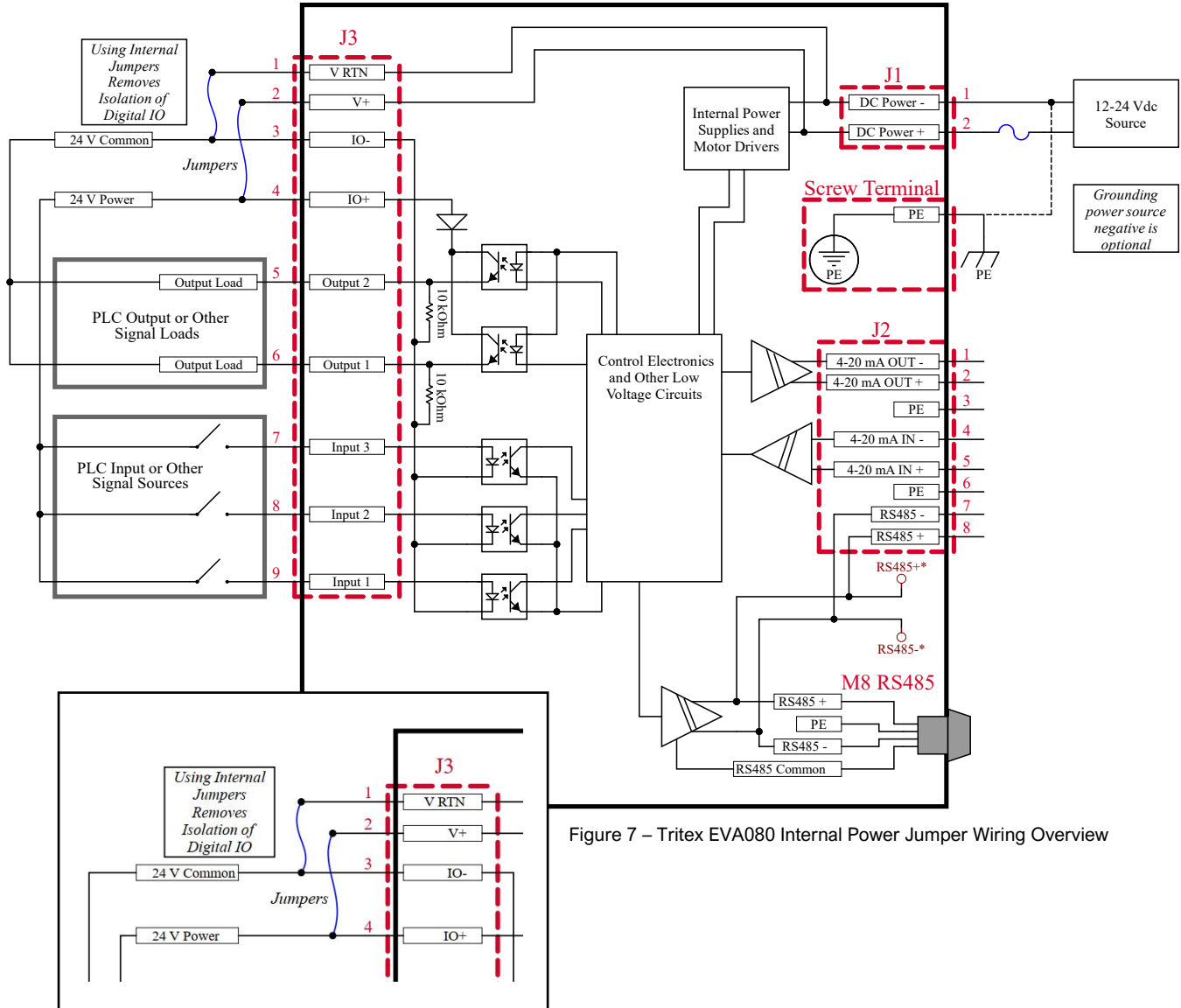


Figure 7 – Tritex EVA080 Internal Power Jumper Wiring Overview

4.3.3.1 Ground Connections

Internal and external grounding terminals are provided. For the internal connection the ground wire is intended to be run through the conduit and connected to ground near the power source or in the power panel. The second ground connection is external and is intended to provide a local ground connection.

Description	Location	Terminal #
DC Power -	J1	1
DC Power +	J1	2
PE	Screw Terminal	
4-20 mA OUT -	J2	1
4-20 mA OUT +	J2	2
PE	J2	3
4-20 mA IN -	J2	4
4-20 mA IN +	J2	5
PE	J2	6
RS485-	J2	7
RS485+	J2	8
VRTN	J3	1
V+	J3	2
IO-	J3	3
IO+	J3	4
Output 2	J3	5
Output 1	J3	6
Input 3	J3	7
Input 2	J3	8
Input 1	J3	9

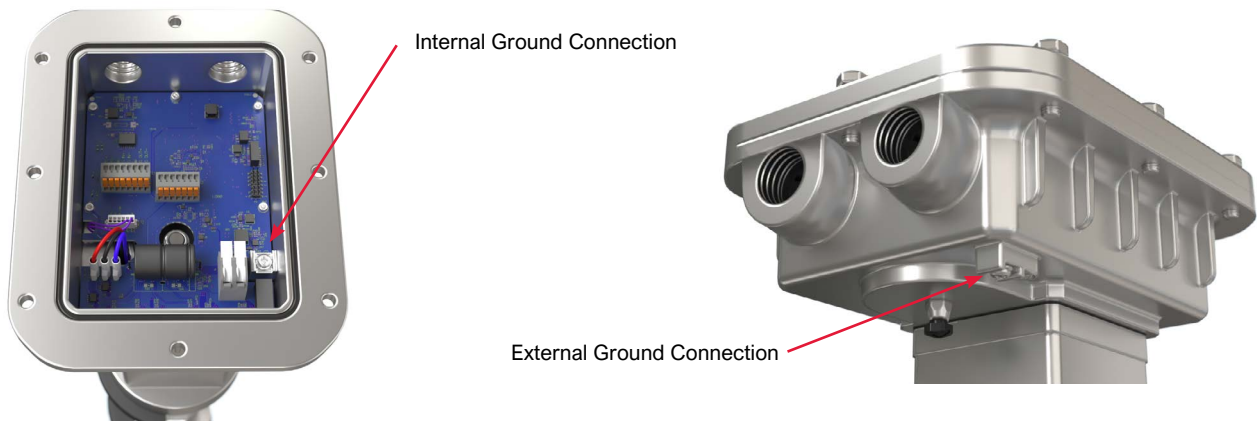


Figure 8 - Ground wire size should be a minimum of 14 AWG and not smaller than the DC +/- power wires.



CAUTION! Ground conductors must be installed before power is applied.

4.3.3.2 Power Supply Wiring & Fusing

A fuse rated at 15 Amps, Class CC (Bussmann KTK-R or equivalent), must protect against polarity reversal and short circuits. Incorrect wiring or use of inadequate fuses can lead to actuator damage or fire hazards.

Power Input	Fuse	Conductor
12-24 Vdc	15 Amp Bussmann KTK R Class CC or equivalent	14 AWG (2.5 mm ²) 105 °C min.



CAUTION! Reversing polarity of the Power (+) and Power Common (-) will cause a short circuit, which must be protected by the external fuse. See fusing details below. If the proper fuse is not installed the actuator could be permanently damaged.

If the application does not require maximum power, and the power source is a UL Recognized power supply with current limiting protection, the wire gauge can be reduced with a corresponding reduction in fuse rating. The power supply connections are a tool-free lever-actuated connection. Use fingers to open the terminal connection. Insert power wires and closing levers with securing the wires.



WARNING! If the wire gauge for power wiring is reduced the fuse Amp rating must also be reduced in accordance with wire size and local regulations.



WARNING! All installations should provide a method of removing the power source during an emergency shutdown condition.

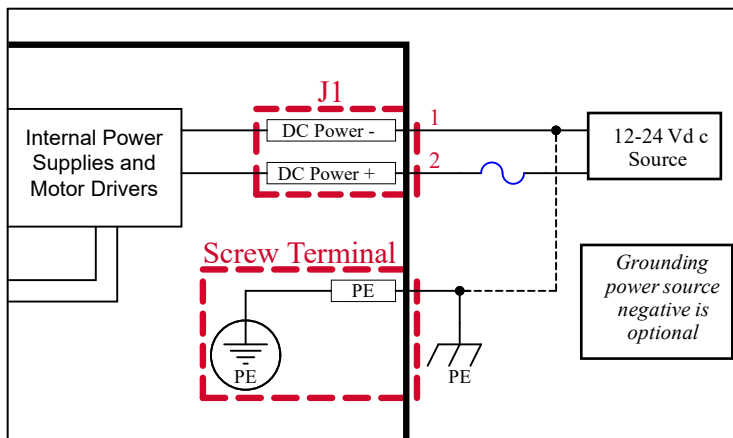


Figure 9 - Power Supply Wiring

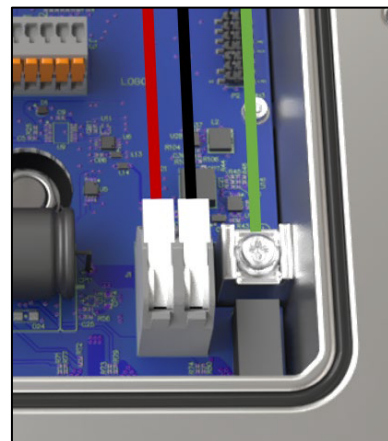


Figure 10 - Power supply wiring example

4.3.3.3 Control Wiring

The I/O on the Tritex EVA080 includes one 4-20 mA input, one 4-20 mA output, three digital inputs, and two digital outputs. All I/O circuits are isolated from each other as well as all other actuator I/O, ground, and commons. Analog and digital input / output connections use tool-free terminal blocks, which can be easily manipulated by hand. Control terminal blocks accept 26-14 AWG wires.

4.3.3.3.1 Analog Input Connections (4-20 mA)

The 4-20 mA input is a two-wire circuit. A small amount of power from the 4-20 mA signal is used to generate the internal power supplies needed for the isolation of the input section. This allows the input to float with the transmitter or loop power supply without inference from the other actuator grounds or commons. The power supply starts up when the input reaches 2 mA. When the 4-20 mA loop is unpowered, the software reads an off-scale value (defaulted to 2 mA low trip and 30 mA high trip) that should be configured to indicate a “Loss of Signal” condition. All analog I/O circuits require loop power provided externally; internal actuator circuits do not supply loop power. An alternative wiring method shown in Figure 13 as an example of providing external loop power – Connection to 2-Wire High Side Device or Figure 14 Connection to 2-Wire Low Side Device.

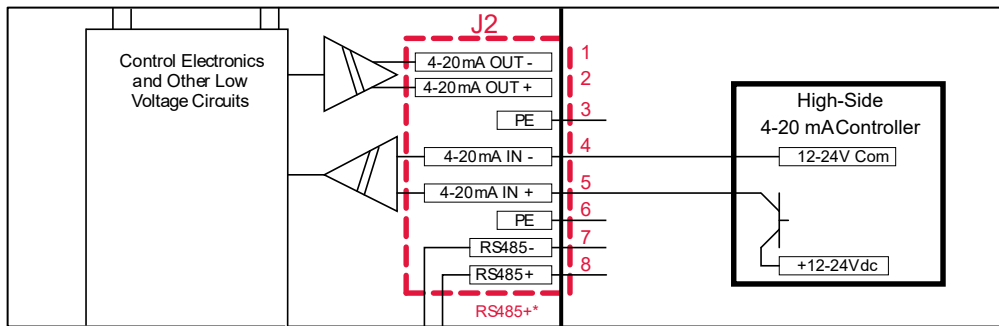


Figure 11 - Connection to the high side controller

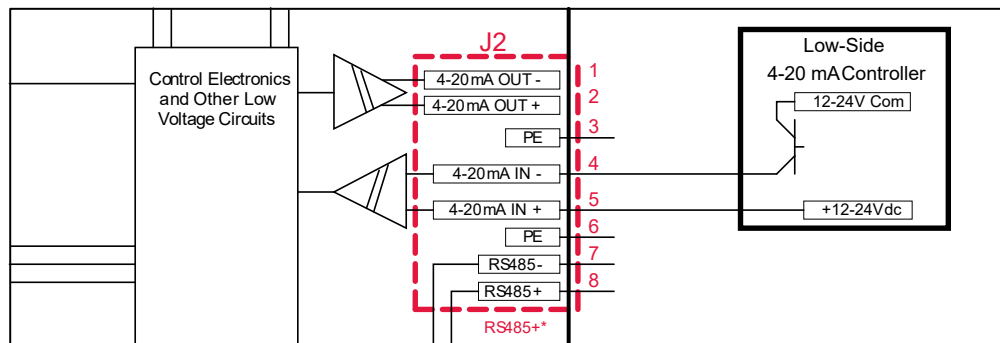


Figure 12 - Connection to the low side controller

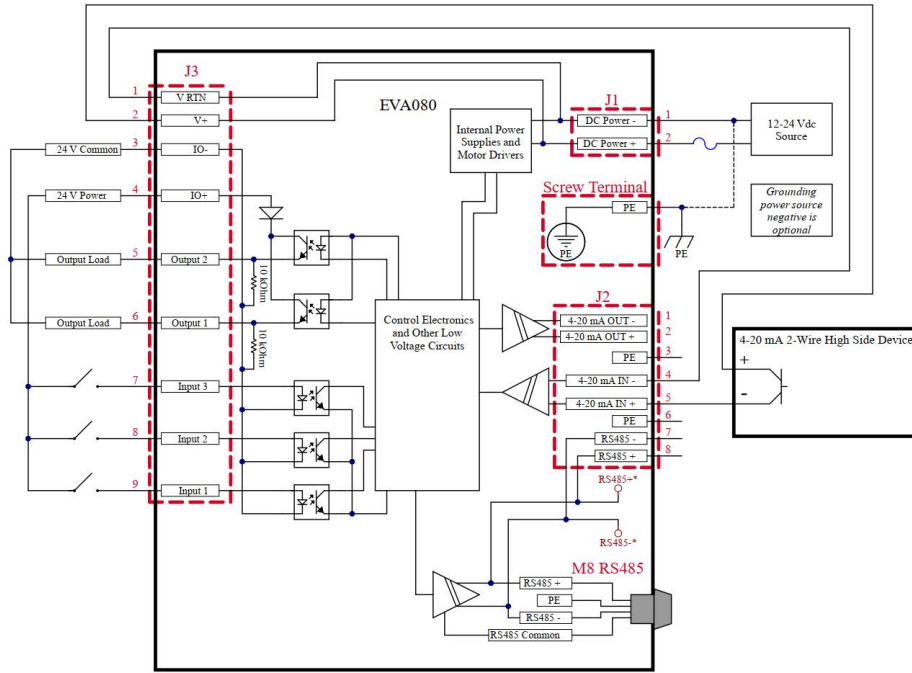


Figure 13 - Connection to 2-Wire High Side Device

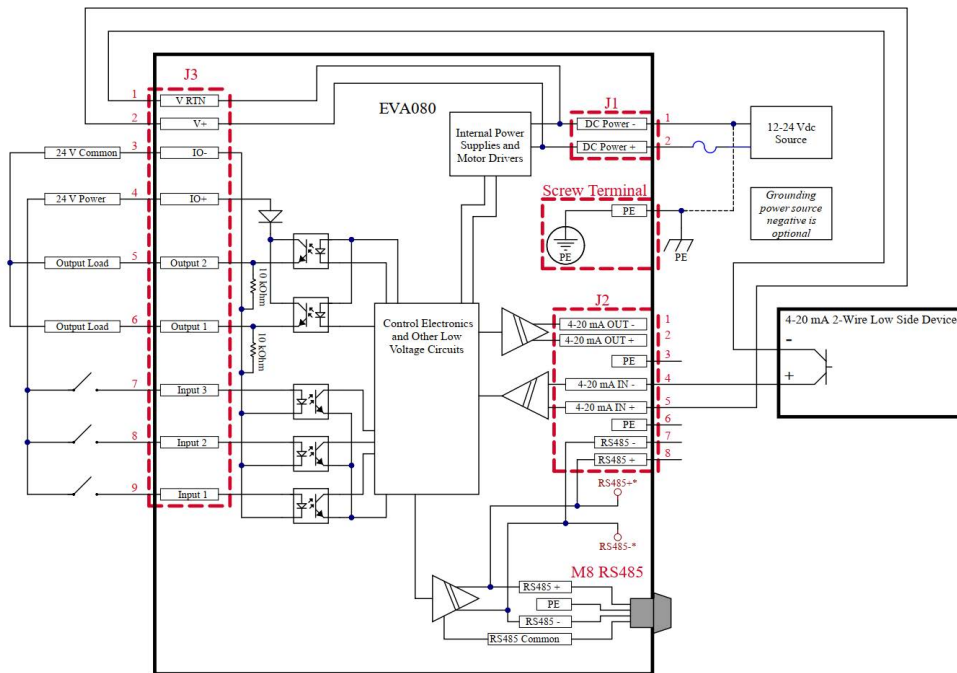


Figure 14 - Connection to 2-Wire Low Side Device

Exlar Tritex® EVA Intelligent Linear Valve Actuator

Analog Input Specification (4-20 mA)

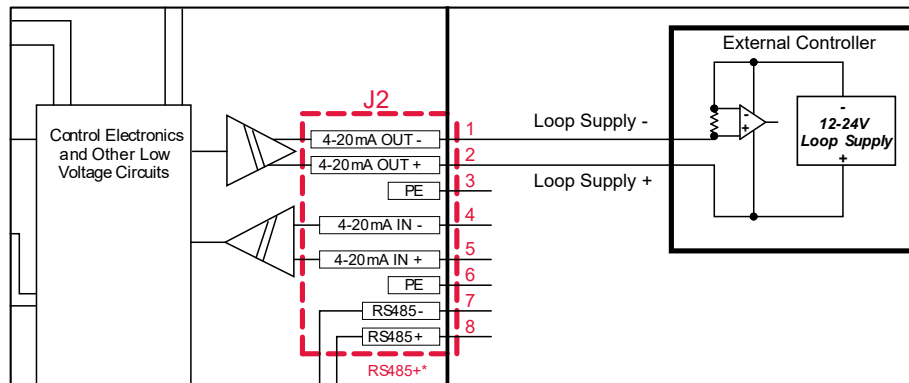
Description	Specification
Input Range	2 - 22.5 mA, Loss of Signal Condition <2.0 mA
Voltage Drop @ 20 mA	~9 V @ 20 mA
Input Resolution	>14 bits over 4-20 mA range (1.6 Amps DC value / μ A)
Update Rate	0.5 ms

4.3.3.3.2 Analog Output Connections (4-20 mA)

The 4-20 mA output is a two-wire circuit; it requires an external loop supply of 12-30 Vdc to generate the isolated supply voltages needed. The Tritex EVA circuit requires 8 V to operate; therefore, the max impedance the output can drive is dependent on the loop supply voltage. If the actuator is powered down, the output goes to an off-scale low output approximately 2 mA. All analog I/O circuits require loop power provided externally; internal actuator circuits do not supply loop power.

Analog Output Specification (4-20 mA)

Loop Supply Voltage	Maximum Impedance @ 20 mA	Minimum Impedance @ 20 mA
12 V	200 Ω	200 Ω
15 V	350 Ω	200 Ω
24 V	800 Ω	200 Ω
30 V	200 Ω	200 Ω



4.3.3.3.3 Digital Input (DI) & Digital Output (DO) Connections

All the Tritex EVA I/O are optically isolated from the main power supply and each IO section is isolated from each other. All the digital inputs have a common return connection at the IO- terminal and require a positive voltage on the Input terminals to turn on. The outputs have a common positive connection at the IO+ terminal and produce a positive voltage on the Output terminals when they are on.

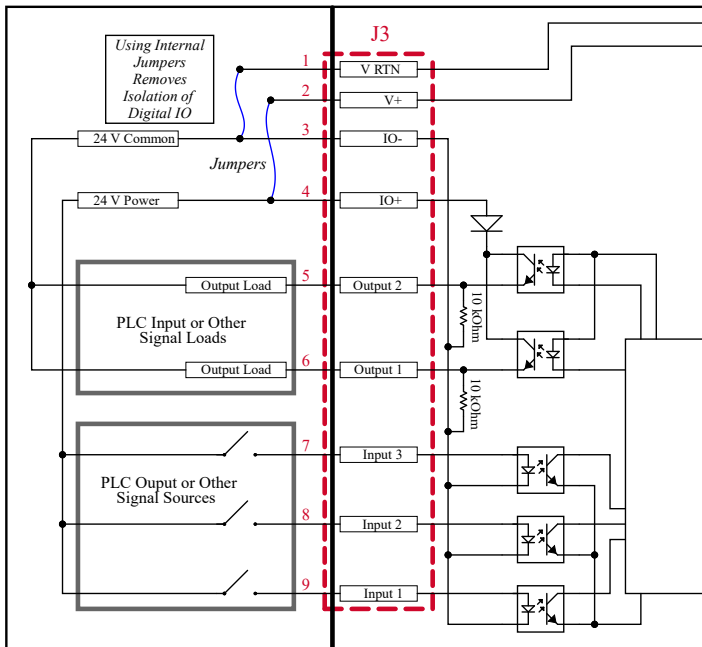


Figure 15 - Examples of digital IO field wiring

4.3.3.3.4 Digital Input Specifications

Description	Specification
Input Voltage	0-30 Vdc
On State Voltage Range	8-30 Vdc
Off State Voltage Range	0-7 Vdc
On State Current	
10 V (min)	3.5 mA
24 V (nominal)	5.1 mA
30 V (maximum)	5.7 mA
Nominal Impedance (24 V)	4.8 kΩ
Off State Current (max)	3.5 mA
Update Rate	1 ms (typical)

4.3.3.3.5 Digital Output Specifications

Description	Specification
Operating Voltage Range	0-30 Vdc
On State Maximum Continuous Current	100 mA
On state voltage drop @ 50 mA	0.5 V (typical)
Short Circuit Protection (auto reset)	0.5 A
Update Rate	1 ms (typical)

4.4 Communications

Modbus RTU (RS485) communications with the Tritex EVA are used for setup and control of the actuator. Remote operation and diagnostics are available.

4.4.1 Modbus RTU (RS485)

Serial communication to the actuator is provided through RS485 terminals located on the Tritex EVA control board. The serial interface is two wire opto-isolated Modbus RTU (RS485) network. The actuator supports the Modbus RTU protocol for access to all drive parameters (see Software Manual for Tritex Actuators found on www.Exlar.com). The Default baud rate is 19.2k. The default Modbus device address is 1. For networks with multiple actuators, assign unique device IDs to each actuator to avoid network conflicts.



WARNING!

The cap must be on when flammable gases are present. Used for Setup only. The cap should be tight during normal operation.



WARNING!

Hazardous Area Explosion hazard do not connect or disconnect when energized

Connector - Front View

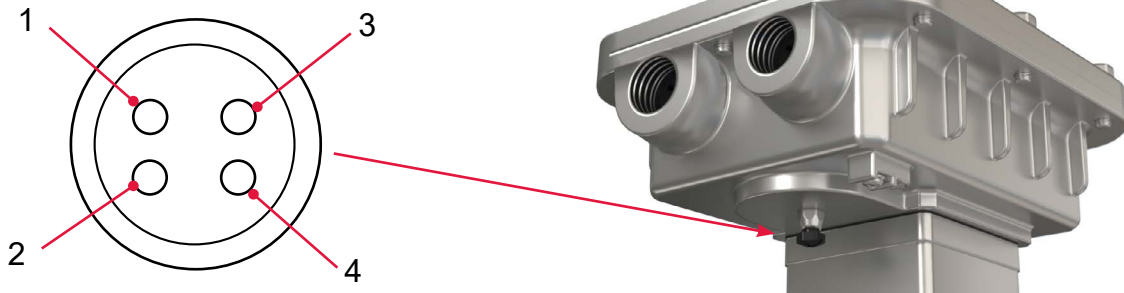


Figure 16 - M8 Communications Connector

Function	M8 Pin Number	Wire Color TTCOM	J7 Terminal
RS485+	1	Brown	6
RS485-	3	Blue	5
RS485 COM	4	Black	4
PE	2	Drain	3

Modbus RTU (RS485) is a multi-drop network, so multiple devices, some of which might not be Tritex EVA actuators, may be connected to a single Modbus master. Devices on any single network need to have unique Modbus Device ID's before connecting them to the network. To avoid multi-drop address collisions, Exlar recommends to set all units in normal operation to a Modbus device address other than 1. Any spares can be added as address 1 and later changed to an appropriate operational address. Since multiple masters are not supported, it is recommended to configure units using Expert software before final installation.

Because Modbus RTU (RS485) at speeds supported on Tritex EVA cannot be considered a high-performance link, data throughput and latency issues will limit the capabilities of Modbus RTU (RS485) as a multi-drop network. Due to biasing resistors at each node and data throughput limitations, the maximum number of devices on a network should not exceed eight. A multi-drop network can be useful for reporting status and changing parameters dynamically for different valve positions, or for providing a single access point for Expert software connection.

4.4.2 PC Communication (Connecting to the Actuator)

When using the Expert software for setup and diagnostics, a Modbus RTU (RS485) converter is required to interface between one of the PC communication ports and the actuator. The recommended Modbus converter (Exlar CBL-T2USB485-xxx) is intended for temporary connection during setup and commissioning only; it is not suitable for permanent installation.

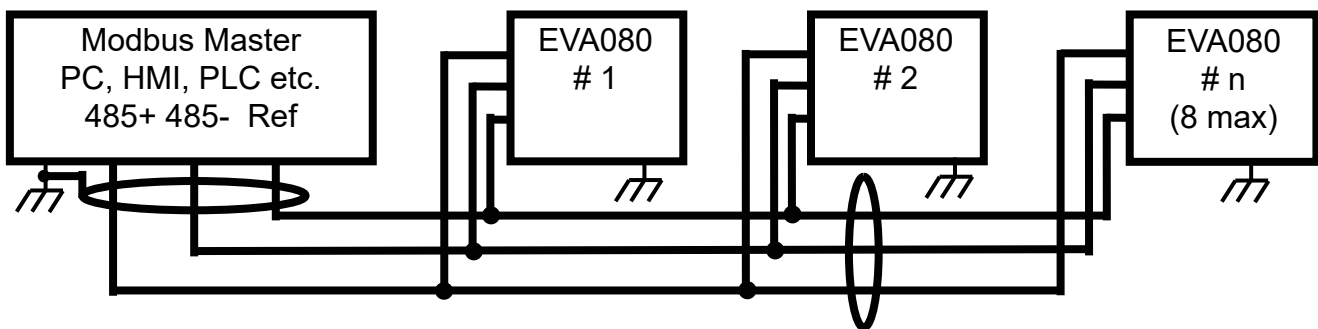
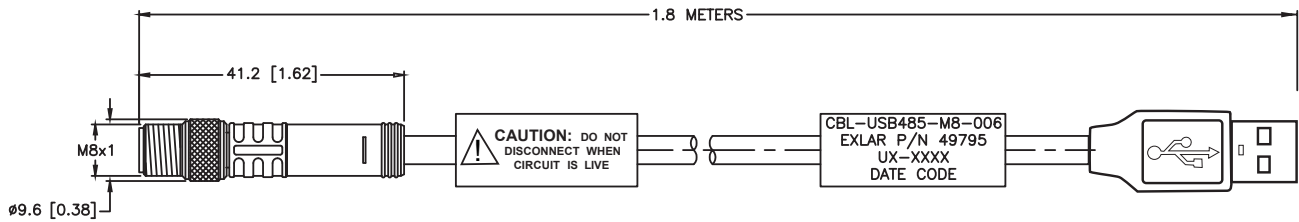
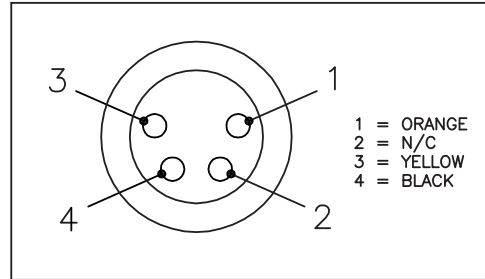


Figure 17 - Connecting multiple Tritex EVA actuators to Modbus RTU (RS485) master host

4.4.2.1 CBL-T2USB485-M8-xxx Communication Cable

xxx = cable length in ft. Available lengths are 6 (006) and 15 (015) feet.



Curtiss-Wright offers a USB to Modbus RTU (RS485) converter with an M8 connector ready to connect to the Tritex EVA080 port. Model # CBL-T2USB485-M8-xxx. This converter is not isolated and is not recommended for permanent installation.

Description	Specification
Contact Carrier Material / Color	Nylon or PUR / Black
Molded Head Material / Color	Thermoplastic PUR / Yellow
Contact Material / Plating	Brass / Gold
Coupling Nut Material / Plating	Brass / Nickel
Rated Current	2.0 A
Rated Voltage	125 Vdc
Outer Jacket Material / Color	PUR / Black
Conductor Insulation Material	PVC
Number of Conductors	3x24 AWG
Drain / Shield	26 AWG Drain / Foil
Temperature Range	-40 °C to +105 °C (-40 °F to +221 °F)
Protection Class	Meets NEMA 1, 3, 4, 6P & IEC, IP67

NOTE: If another master is on the network such as PLC or HMI, this converter must be removed from the Modus RTU (RS485) end. Leaving it connected with the USB end unconnected will load down the Modus RTU (RS485) network and not allow it to function.



Figure 18 - CBL-T2USB485-M8-xxx

4.5 Position Tracking on Power Loss

This standard feature allows the position tracking of the actuator to be maintained during power off, in the case that a seeking valve close (calibration) is not desired on power up the saved position can be used. The actuator employs a battery-backed counter for absolute position tracking during power interruptions, eliminating the need for recalibration upon power restoration.

Model	Part Number	Parts Included
EVA080	84095	Absolute positioning on power-loss battery assembly

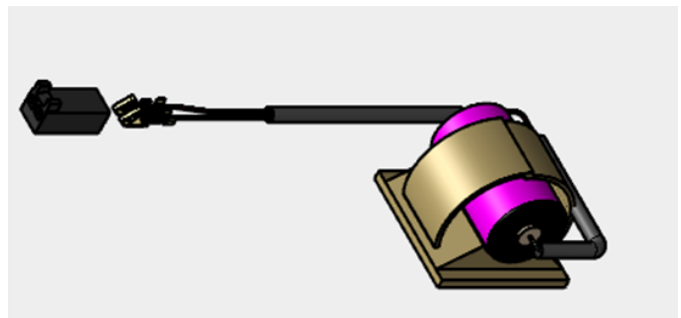


Figure 19 - Absolute Positioning on Power-loss Battery Assembly, Exlar Part Number 84095

Battery life information:

The battery can provide power to counter for approximately 10 years of power off time, or shelf life. In operation with power applied 100% of the time, with an average internal operating temperature of 80 °C the expected battery life is 15 years.

Low Battery Warning:

A battery voltage warning is generated when the battery voltage falls below at 3.2 V. The Low Battery Warning will not keep the actuator from operating and not trigger a fault unless configured to do so. If power loss occurs and battery voltage has fallen too low to maintain the position memory during a power failure a seek close calibration can automatically be performed on the next power up and the actuator will operate normally, if selected in startup options.

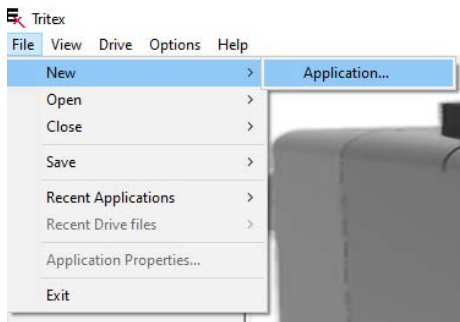
5.0 Expert PC Tool - Valve expert

Software Guide – Valve Expert

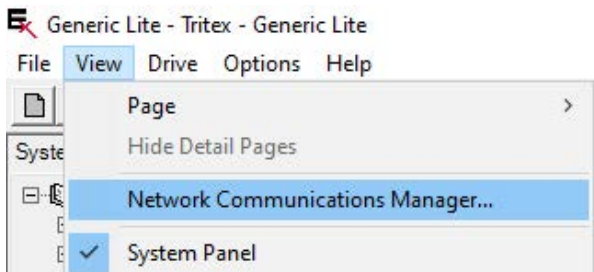
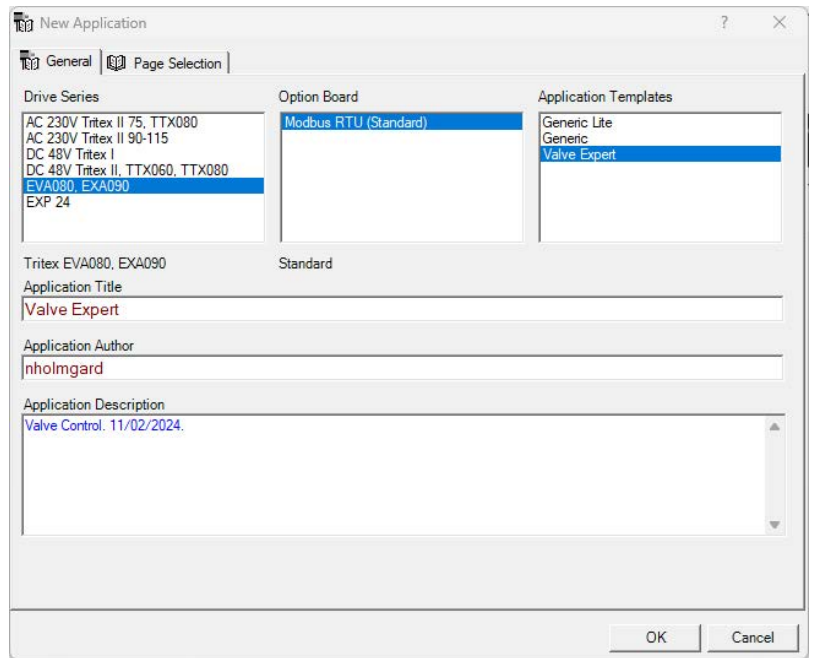
The software guide provides an overview of the Valve Expert parameters. Valve expert is organized in a series a page where parameters with similar functions are grouped.

5.1 New Application – Valve Expert

- a. Open the Exlar Expert Software
- b. Under the “File” drop-down menu, select “New” > “Application”



- c. Select “EVA080, EXA090” and then “Valve Expert”
- d. Enter a name for the application. It is recommended that the name defines the location or some other identifying information for the application installation.
- e. Enter the application author
- f. Enter the Application Description. Some suggestions for the application description include the actuator function, location, and installation date.
- g. Click the “OK” button

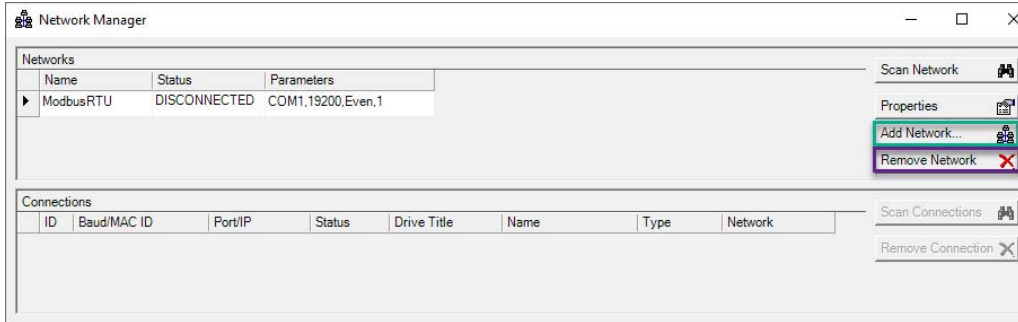


5.1.1 Communicating with the actuator (Modbus RTU)

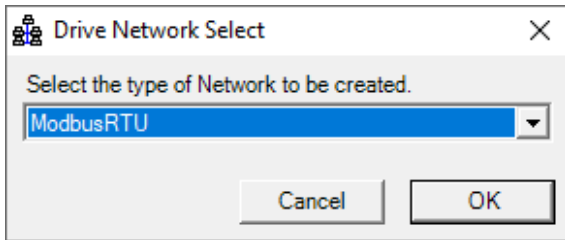
NOTE: Before proceeding ensure the proper driver is installed for the Modbus RTU (RS485) to USB adapter.

- a. Under the “View” drop-down menu, select “Network Communications Manager”

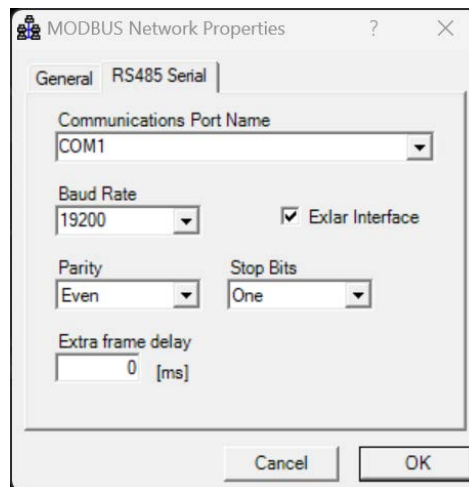
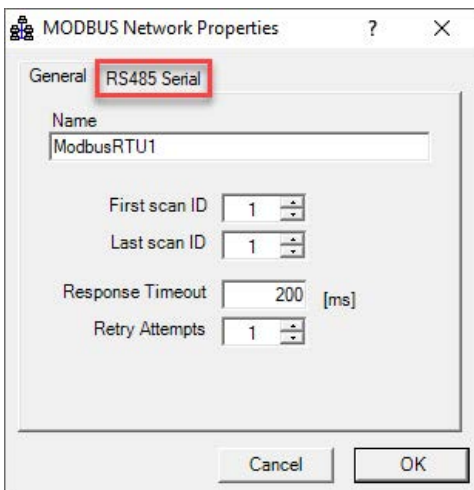
- b. In the Network Manager window, press the “Remove Network” button, then the “Add Network” button. Removing Network is recommended because clearing old connection data ensures a new connection can be made.



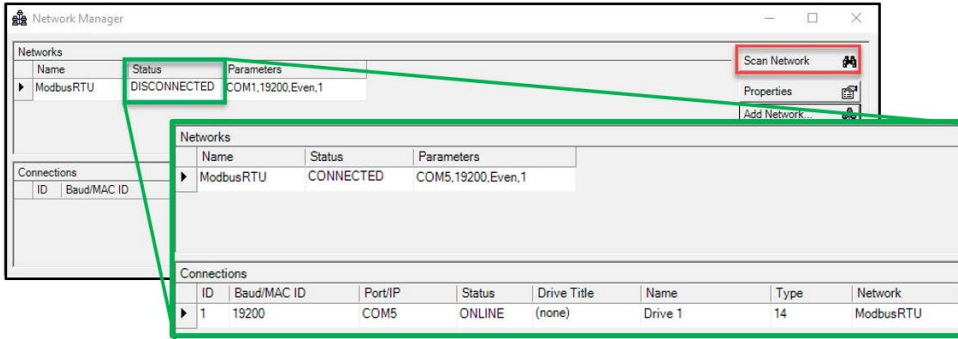
- c. The Tritex EVA and EX Series are only compatible with the default “ModbusRTU”. Press the OK button.



- d. In the MODBUS Network Properties menu default values in the “General” tab can be used for establishing communications with the Exlar Modbus RTU adapter for configuration purposes. Navigate to the “RS485 Serial” tab
- i. Use the Communications Port Name drop-down menu to select the COM port associated with the USB to Modbus RTU (RS485) serial adapter.
 1. If the Curtiss-Wright CBL-T2USB485-xx-xxx adapter is in use and the “Exlar Interface” is checked, then the software will automatically select the correct Communication Port Name as the only available option.
 - ii. Click the “OK” button.



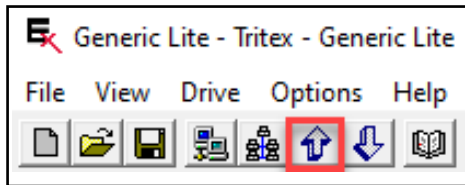
- e. Click the “Scan Network” button. The status should now show “CONNECTED” and the Network Manager window can now be closed.
- i. If not; to select the COM port that the Modbus RTU (RS485) adapter is connected to.
- ii. Or check the USB to Modbus RTU (RS485) adapter is functioning correctly.



5.2 Actuator Setup – Valve Expert

5.2.1 Setup

- i. Click the upload from drive button found on the menu board. This will read the parameters stored in the actuator to the Expert PC tool.
- ii. Upload / Download Parameters
 1. Up Arrow – Upload configuration file stored in the Tritex actuator
 2. Down Arrow – Download the Tritex Expert software configuration to the Tritex Actuator



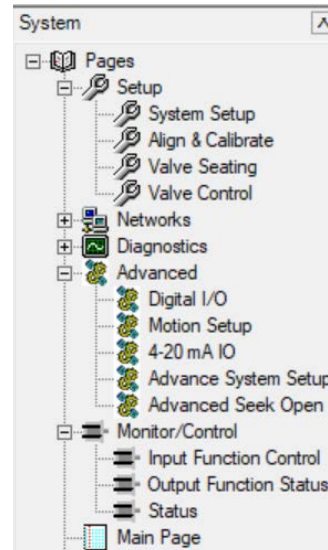
- iii. Navigate Tree

The Tritex Expert menu is displayed as a setup tree. Clicking pages on this menu tree will open configuration pages.

Diagnostics – Last 10 status log, diagnostics scopes, and general actuator diagnostics

Advanced – Pages to access advanced parameters to fine tune the Tritex actuator to a specific application.

Monitor / Control – Toggle the status bar, input function control, and output function status pages.



Setup – Setup & configuration of the Tritex actuator.

Networks – View and configure the Modbus RTU (RS485) configuration.

Exlar Tritex® EVA Intelligent Linear Valve Actuator

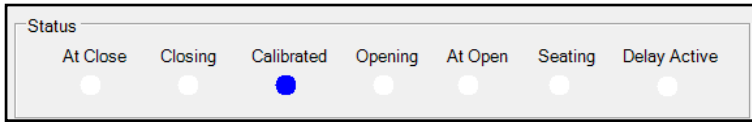


Figure 20 - Status Bar

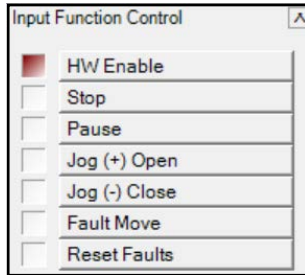


Figure 22 - Input Function Control

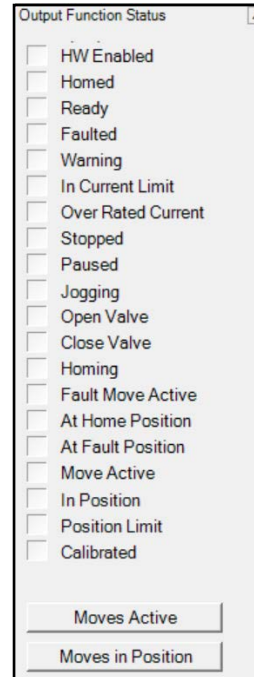


Figure 21 - Output Function Status

5.2.2 Setup > System Setup > Options

The System Setup, Options page is where the startup options, user units, and mechanical offsets are defined.

- I. Auto-Enable on Start-up - When powered the actuator will immediately be ready to move under normal operation (recommended for typical installations)
- II. Auto Seek Close on Enable - When enabled the actuator will self-calibrate (if not calibrated), (recommended for typical installations). Units equipped with position sensing on power loss battery do not require calibration on power cycle. This function will only operate if the battery is not equipped, fails, or “Disable Position Sensing on Power Loss” is enabled..
- III. Disable Position Sensing on Power Loss – When enabled the actuator will not retain calibration on power loss. A calibration will be required on every power cycle.
- IV. User Units

In the Output Current drop-down menu select “Percent” or “Amps”

1. Percent is recommended as it displays a percentage of the output current being supplied to the motor. Selecting Amps will show the output current, in Amps, supplied to the motor from the drive internally.

NOTE: This is not related to the input current supplied to the actuator via the J1 terminal.

NOTE: The “Save Changes” must be pressed when changing this parameter.

Exlar Tritex® EVA Intelligent Linear Valve Actuator

Parameter Name	Description
Auto-Enable on Startup	Actuator will be Enable on startup.
Auto-Seek Close on Enable	Actuator will calibrate auto-seek close if not calibrated.
Disable Position Sensing on Power Loss	Actuator will not retain calibration on power loss. Actuator will require a calibration on every power-up cycle.
Enable Close Offset	Used to offset valve close position if different from mechanical hard stop.
Close Offset	Defines offset distance from mechanical close hard stop.
Offset Velocity	Defines travel speed to close offset.
Enable Open Offset	Used to offset valve open position if different from mechanical hard stop.
Open Offset	Defines offset distance from mechanical open hard stop.
Offset Velocity	Defines travel speed to open offset.
Units (Inches, Millimeters)	Selects user units from Inches or Millimeters; default Inches.
Units, Distance	Sets user units distance resolution.
Units, Velocity	Sets user units velocity resolution.
Units, Acceleration	Sets user units acceleration resolution.
Output Current	Defines output current unit Percent or Amps; default Percent When changing Output Current units, press Save Changes button after change

System Setup Options



WARNING! Crush/Pinch Point

Keep hands clear of stem when power is applied to actuator. The actuator may conduct a calibration routine if Auto-Enable on Startup and Auto Home on Enable are configured

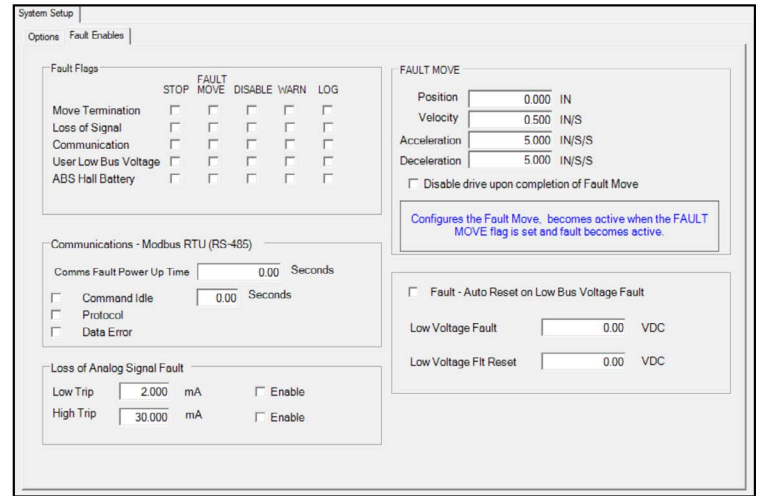
5.2.3 Setup > System Setup > Fault Enables

Select the “Fault Enables” page in the System Panel under “Setup > System Setup”. The Fault Enables page is where the user configures the type of fault and how the actuator will respond to the fault.

- I. Fault Flags – The check box defines how the actuator will respond to the various drive/motor faults.
- II. Communications (RS485) – Define how the actuator will respond to the various Modbus RTU (RS485) faults.
- III. FAULT MOVE – Defines the position of the actuator once the FAULT MOVE fault flag becomes active. FAULT MOVE position is generally used on battery backup system to move to a fail-safe valve position (open, close, other) under user defined conditions (power loss, signal loss, etc.). Typically, the “0” position is the Valve Closed position.

NOTE: The FAULT MOVE has priority on all operating modes.

NOTE: The FAULT MOVE requires the actuator to be calibrated (homed) before a FAULT MOVE can be executed.



Parameter Name	Description
Comms Fault Power Up Time	The time between power-up and when communication is expected to be established
Command Idle	Enable command idle fault time fault
Command Idle Time	Defines time before command idle time fault enabled
Protocol	Enable Protocol Comms Fault
Data Error	Enable Data Error Comms Fault
LoASF, Low Trip	Loss of Analog Signal Fault Low Value
LoASF, Low Trip, Enable	Enable Loss of Analog Signal Fault Low Trip
LoASF, High Trip	Loss of Analog Signal Fault High Trip Value
LoASF, High Trip, Enable	Enable Loss of Analog Signal Fault High Trip
Fault Move, Position	Defines FAULT MOVE position. 0 = Close Move
Fault Move, Velocity	Defines travel velocity to FAULT MOVE position
Fault Move, Acceleration	Defines acceleration to FAULT MOVE position
Fault Move, Deceleration	Defines deceleration to FAULT MOVE position
Disable Drive Fault Move	Once Fault Move position is reached the actuator is disabled
Auto Reset on Low Bus Voltage	Enables the drive to auto reset when voltage is above Low Voltage Fault Reset value
Low Voltage Fault Trip	Defines Low Voltage Fault trip value
Low Voltage Fault Reset	Defines Low Voltage Fault reset value

System Setup Fault Enables

5.2.4 Setup > Align & Calibrate

Select the Setup > Align & Calibrate page. This page allows the monitoring of status, manual jog control, and calibration controls for the actuator. To operate the actuator in regular service the actuator must be calibrated.

- I. Status – Information bar on the top of the page that displays the status of the actuator.

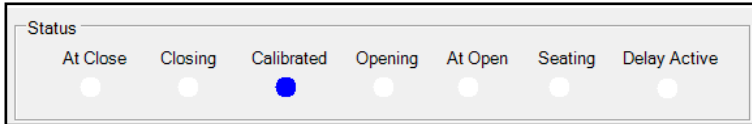


Figure 23 - Align & Calibrate Status

Parameter Name	Description
At Close	Indicates the actuator is at the close valve position
Closing	Indicates the actuator is closing
Calibrated	Indicates the actuator is calibrated to the valve
Opening	Indicates the actuator is traveling to the open position
At Open	Indicates the actuator is at the open valve position
Seating	Indicates the actuator is seating the valve
Seeking	Indicates the actuator is seeking the calibrated position
Position	Displays current position of actuator in user units

Align & Calibrate Status

- II. Jog Control – Software local control to manually control the position of the actuator.

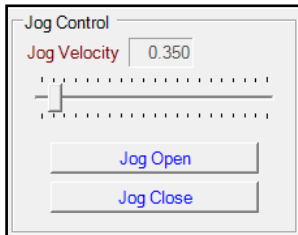


Figure 24 - Jog Control

Parameter Name	Description
Jog Velocity	Displays configured jog open/close speed. Use slider to adjust.
Jog Open	Actuator will travel towards the Open position
Jog Close	Actuator will travel towards the Close position

Jog Control

III. Calibration Controls – This function is used to align and calibrate the actuator to the 0 position.

Figure 25 -- Calibration Controls

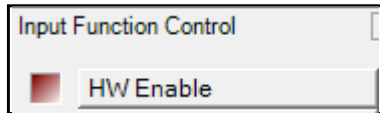
Function	Description
Hard-Stop Close - Enter Stroke Length	Seek mechanical close position. Enter Functional stroke of valve to define Open Valve position. Requires mechanical hard stop in close position.
Hard-Stop Open - Enter Stroke Length	Seek mechanical open position. Enter Functional stroke of valve to define Close Valve position. Requires mechanical hard stop in open position.
Hard-Stop Close/Open - Auto Seek Both	Seeks mechanical close position, then seeks mechanical open position. Requires mechanical limits in both open and close position.
Hard-Stop Close - Jog/Teach Open	Seeks mechanical close position. Manually jog actuator to open position and select “Set Open” to define open position. Requires mechanical limit in close position.
Start Calibration	Prepares the actuator to be calibrated
Accept / Save	Save the calibrated and configured values to the actuator.
Calibrate Active	Indicates the actuator is performing a calibration
Calibrate Complete	Indicates the actuator has completed the calibration

Calibration Controls

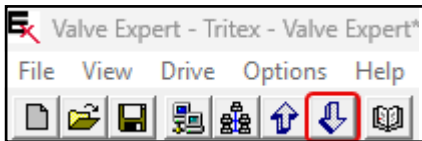
5.2.5 Calibration procedures

There are four user selectable procedures to calibrate the actuator to the valve stroke.

NOTE: The actuator must be hardware enabled before beginning the calibration procedure. This can be confirmed by the Input Function Control page, HW Enable.



NOTE: Once calibration is complete, to save, the drive file must be downloaded to drive.



Start by selecting the stroke type.

1. Hard-Stop Close – Enter Stroke Length

2. Press "Start Calibration"
3. Enter valve functional stroke
4. Press "Seek Close" to begin calibration
5. Press "Accept/Save" to save & complete calibration

1. Hard-Stop Open – Enter Stroke Length

2. Press "Start Calibration"
3. Enter valve functional stroke
4. Press "Seek Close" to begin calibration
5. Press "Accept/Save" to save & complete calibration

1. Hard-Stop Close/Open – Auto Seek Both

2. Press "Start Calibration"
3. Press "Seek Close-Open" button to begin calibration
4. Press "Seek Close" to begin calibration
5. Press "Accept/Save" to save & complete calibration

1. Hard-Stop Close – Jog/Teach Open

2. Press "Start Calibration"
3. Press "Seek Close" to begin calibration
4. Use "Jog (+) Open" and "Jog (-) Close" to adjust the valve to the open position
5. Press "Set Open" to set the valve open position
6. Press "Accept/Save" to save & complete calibration

5.2.6 Setup > Valve Seating

Select the Setup > Valve Seating page. This page defines the valve seating routine for the actuator.

- i. Seating – The actuator is capable of an advanced seating routine designed to minimize the electrical current draw while obtaining a good valve seat. Additionally, this routine minimizes the mechanical wear of the valve with superior position control and slow seat speed.

Parameter Name	Description
Enable min (-)	Enable to use the seating routine when closing. Position value is the location when the actuator will transition from a move to the seating routine.
Enable max (+)	Enable to use the seating routine when opening. Position value is the location when the actuator will transition from a move to the seating routine.
Use percent of analog range	Changes the unit from a linear position to a % of analog range to define the location when the actuator will transition from a move to the seating routine.
Seating Velocity	Defines the speed of the actuator when the seating routine is active. Recommended value is 0.1 in/s
Hold Close Current	Defines the current output (thrust) of the actuator will maintain after the actuator has completed the seating routine.
Seating Current	Defines the current output (thrust) of the actuator will utilize while completing the seating routine. The time value (seconds) is how long the actuator will hold the seating thrust before transitioning to the Hold Close Current value. Ensure seating current value equivalent thrust does not exceed the valves maximum stem thrust.
Jog using position limit foldback current	Jog (+) Open and Jog (-) Close will use the Hold Close Current value for output current (thrust).

Figure 26 - Valve Seating

- ii. Valve Seating Routine – The graphic below details the valve seating routine to provide the user with a better understanding of how the actuator operates.

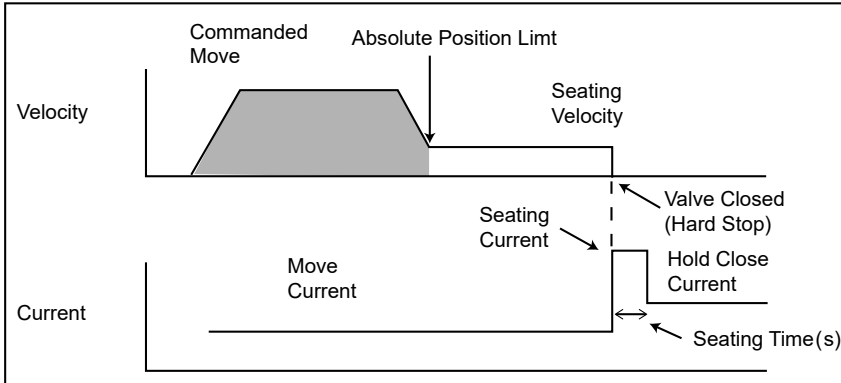
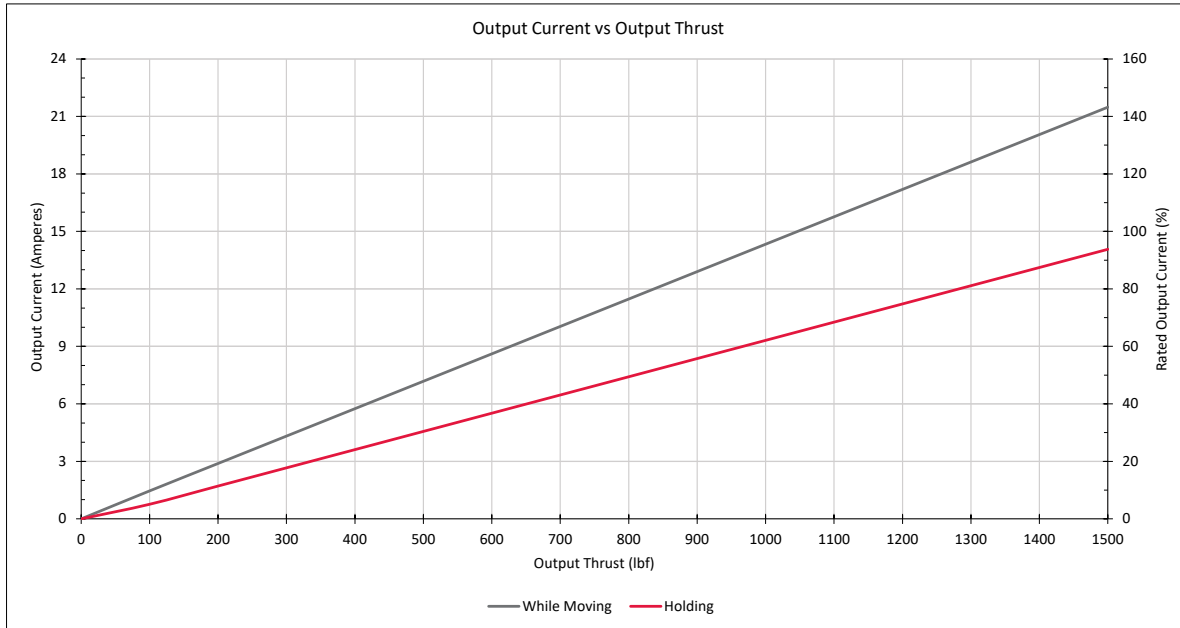


Figure 27 - Valve Seating Routine

- iii. Valve seating setup – The valve seating defaults are suitable for most applications. However, below are some situations where the defaults should be adjusted.

Condition	Resolution Techniques
Valve flow occurs when the valve actuator is in the close position.	It's possible that the Hold Close Current value is set too low. Adjust the value higher (recommended increments of 5%) until the valve no longer flows in the actuator close position.
Actuator draws too much current in the Valve Close position.	Adjust the Hold Close Current down (recommended increments of 5%) until the valve closes in the actuator's close position. Then increase the Hold Close Current in increments of 1% until the valve no longer flows in the actuator valve close position. This procedure optimizes the actuator to draw as little current as possible.
Actuator does not complete the valve seating routine and complete the valve close move.	The Seating Current value can be adjusted up to 150% which means the actuator will output 1500 lbf. If increasing the Seating Current (thrust) does not resolve this, repeat the calibration procedure.
Mechanical max stem thrust is lower than the rated thrust of the actuator	At 100% Seating Current the actuator will output 1000 lbf of thrust. Lowering the Seating Current will limit the output thrust of the actuator during the seating routine to protect the mechanical integrity of the valve.

iv. Valve Output Current vs Output Thrust – The actuator is very energy efficient and automatically draws only the current needed to complete the commanded move. The graph below indicates the output current as it relates to actuator output thrust.



5.2.7 Valve Control

Select the Setup > Valve Control page. This page is used to configure the actuator’s operating mode and provide local control for valve servicing.

i. Status - Information bar on the top of the page that displays the status of the actuator.

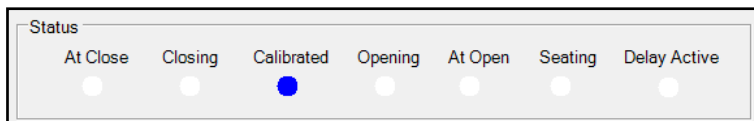


Figure 28 - Valve Control Status Bar

Parameter Name	Description
At Close	Indicates the actuator is at the close valve position
Closing	Indicates the actuator is closing
Calibrated	Indicates the actuator is calibrated to the valve
Opening	Indicates the actuator is traveling to the open position
At Open	Indicates the actuator is at the open valve position
Seating	Indicates the actuator is seating the valve
Delay Activated	Indicates the actuator time delay is activated

Valve Control Status Bar

- ii. Valve Position – Digital valve position indicator. Close position is always 0, Open is the calibrated open position. The bar is displayed as % of open/close.

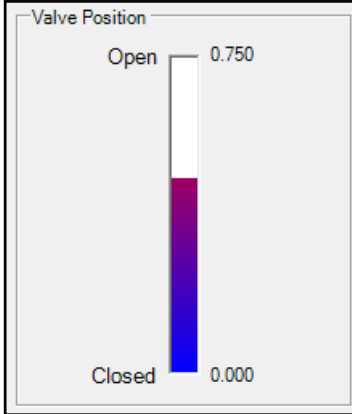
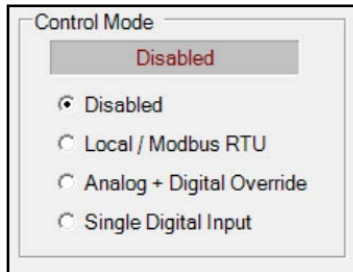


Figure 29 - Valve Position

- iii. Control Mode

- 1. **Disabled** – Actuator is out of service. Actuator will not respond to external control signals; Expert jog controls are enabled.



- 2. **Local / Modbus RTU** – Local Expert software control for commissioning, maintenance, and testing. Additionally, used for digital modulating position command from Modbus RTU master controller (Modbus ID244).

- Position – Adjust slider bar or update value to provide local position command to actuator.
- Velocity – Defines the travel speed of the actuator

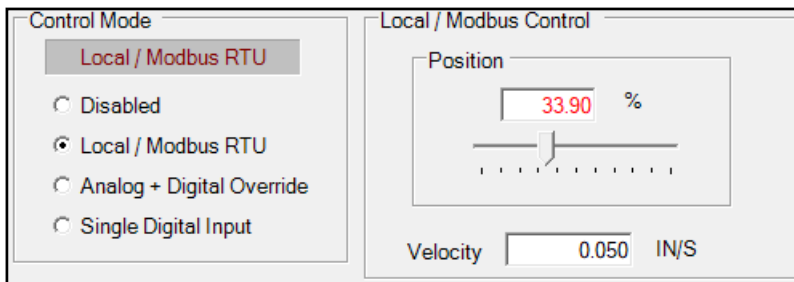


Figure 30 - Local / Modbus RTU Control Mode

- 3. Analog + Digital Override** – The actuator will take modulating position command from a 4-20 mA controller. Default for 4 mA is Close Valve, default for 20 mA is Open valve. Digital inputs override the 4-20 mA analog command. Default for Digital Input 1 is Open Valve, default for digital input 2 is Close Valve.

Figure 31 - Analog + Digital Override Control Mode

4-20 mA – Monitor and configure 4-20 mA analog control

Parameter Name	Description
Target Position	Displays the commanded position (user units).
Command	Displays the current 4-20 mA analog value.
Velocity	Defines the 4-20 mA analog modulating velocity.

Digital Override – Configure and locally control digital inputs to override 4-20 mA position command. If a digital input move is commanded, the actuator will travel to the commanded digital input position (Valve Open or Valve Close) and ignore the 4-20 mA position command.

Parameter Name	Description
Velocity Open	Defines the open move velocity
Open Button	Latching button that opens the valve
Velocity Close	Defines the close move velocity
Close Button	Latching button that closes the valve

Timer – Configure a time delay on or delay off that will delay the action of the associated digital input. The Move can be configured for Open, Close, Move 3, Move 4, and Fault Move.

Value in seconds will define either a delay in reaction to an input going high (Delay On) or a delay in action after a bit goes low (Delay Off). Only one timer can be configured at a time. Timer is only available in Analog + Digital Override control mode.

- Timer Delay Off Example:** Digital Input 1 (Open Valve) signal goes high. The valve opens. When Digital Input 1 (Open Valve) goes low, the timer will go active. The configured time (seconds) value must complete before the actuator responds to another move command. If Digital Input 2 (Close Valve) goes high while the timer is active the actuator will not respond until the timer is complete. This is useful for applications where the valve should remain open for a limited time after a level switch goes low such as ensuring a tank is drained.
- Timer Delay On Example:** Digital Input 1 (Open Valve) signal goes high. The timer will go active for the configured time (seconds) before the actuator will move to the Open Valve position. If Digital Input 1 goes low before a timer is complete the actuator will not move. The Digital Input going high again will reset the time. This feature can be used to avoid opening the valve too soon when sloshing fluids in the tank trigger an upper limit switch.

Parameter Name	Description
Assign Move	Drop down menu to assign timer function to a move or disables Timer function. Select Disable, Open, Close, Move 3, Move 4, and Fault Move.
Seconds	Time value in seconds to delay action before or after command to move (0.00 to 655.35)
Delay Action	Select Delay Off or Delay One. Delay Off begins the timer after move command transitions to low. Delay On begins the timer after the move command transitions to high.

- 4. Single Digital Input** – Single digital input (single-wire) mode enables a single input to command Open Valve and Close Valve. Digital Input one low (0 V) will Close Valve, Digital Input one high (24 V) will open valve. This mode allows digital input 2 to be configured for other uses.

NOTE: The default configuration for digital input 2 is “Close Valve”. This move is disabled in Single Digital Input control mode as digital input 1 serves as both open and close. Digital input 2 is now available to be configured for Move 3, Move 4, Fault Move, or Reset Faults.

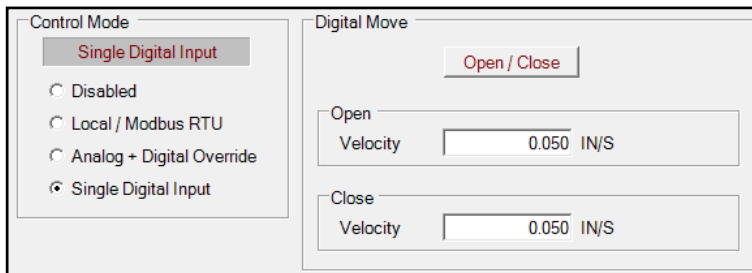


Figure 32 - Single Digital Input Control Mode

Parameter Name	Description
Open / Close Button	Latching button that opens the valve when pressed and closes when depressed
Velocity Open	Defines the open move velocity
Velocity Close	Defines the close move velocity

5.3 Networks

Network pages allow the user to set the actuator communication parameters to match the requirements of the communication network.

5.3.1 Networks > Modbus RTU (RS485)

- i. Local configuration connection must match the actuator's Modbus RTU settings. The user must ensure the local connection is updated to the Modbus Master network settings if default is changed.

Function	Description
Drive ID	Modbus node ID. Change delayed until actuator restarted (power cycle).
Baud Rate	Baud rate for serial communications. Change delayed until actuator restarted (power cycle).
RX Timeout	Additional time beyond the standard "1.5" character time before a receive command "times out", also called the inter-character gap. Modbus masters should be able to send messages without significant gap and the value can remain 0. Some PC's may occasionally introduce gaps, requiring a non-zero value for reliable communications
RX to TX Delay	Delay time between when a command is received, and the response is transmitted. Typically set to 0, but some Modbus masters may hold the net- work for a while at the end of a message, requiring a non-zero value for reliable communications
Parity	Sets parity type, Even and Odd Parity require one stop bit, and No Parity requires two stop bits from the master. These settings must match the settings in the Modbus master, usually the PC running Expert software, see the Port Settings section for Expert above. Change delayed until actuator restarted (power cycle).
Save Parameters	Button to save any changes made to the parameters.

Modbus RTU Parameters



WARNING!

Changes to the critical parameters will not be sent to the drive unless the Save parameters to drive button on this page is pressed. A normal download will not write these parameters to the drive. This allows a drive file prepared for any Drive ID to be downloaded to the connected drive without changing the Drive ID

5.4 Diagnostics

The Tritex actuator is equipped with onboard diagnostics for troubleshooting and monitoring. Actuator diagnostics include Status Log, Scope, and Diagnostics pages.

5.4.1 Diagnostics > Status Log

In the system tree navigate to Diagnostics > Status Log.

Parameter Name	Description
Power-Up	Displays the number of times the actuator has been power cycled.
Time	Displays the amount of time (HRS) actuator has been enabled (ready for operation).
Last Fault / Warning	Displays the number of fault occurrences and the power-up count and run time of the most recent occurrence for each fault condition.

Status Log

Status Log				
Power-Up	143	Time	13.70 HRS	Page Rev 1.2
Last Fault/Warning				
Fault Name	Count	Power-Up	Time	[HRS]
Peak Current	0	0	0	0.00
Continuous Current	0	0	0	0.00
Position Tracking	4	101	9.68	
Low Bus Voltage	0	0	0	0.00
High Bus Voltage	0	0	0	0.00
Following Error	0	0	0	0.00
Board Temperature	0	0	0	0.00
Communications	0	0	0	0.00
Actuator Temperature	0	0	0	0.00
Abs Hall Battery	0	0	0	0.00
Loss of Signal	0	0	0	0.00
Hardware Current Trip	0	0	0	0.00
Invalid Parameters	0	0	0	0.00
System Parameters	0	0	0	0.00
User Low Bus Voltage	0	0	0	0.00

Figure 33 - Last Fault/Warning

i. Recent Fault History

Displays the last-10 faults the actuator. This is a useful tool for troubleshooting.

Recent Fault History			
	Power-Up	Time [HRS]	Fault Name
1	101	9.68	Position Tracking
2	100	9.68	Position Tracking
3	99	9.68	Position Tracking
4	0	0.00	
5	0	0.00	
6	0	0.00	
7	0	0.00	
8	0	0.00	
9	0	0.00	
10	0	0.00	

Figure 34 - Recent Fault History

Fault/Warning	Description
Peak Current	The Peak Current fault threshold is set at the factory and is above the Factory Current limit, meaning the actuator will never command enough current for a Peak Current fault. This fault can only occur under serious upset to the control loops operating in the actuator, possibly from a hard stop or severe supply voltage upset. The Oscilloscope function can be used to monitor the current to find upsets if there are nuisance Peak Current faults. They should not be ignored.
Output Current / Continuous Current	The actuator continuously monitors motor current using an I2t calculation and compares the actual value to a factory limit. On reaching this limit, the actuator will limit current to not exceed the limit if the Foldback on continuous current box is checked on the Option tab of the System Setup page. Otherwise, the actuator will fault and immediately disable. The Continuous Current fault is one of the most important protections against overload for the actuator. Continuous Current can be monitored on the Monitor or Status
Tracking Error	This is an internal fault that can only occur if the drive senses invalid position feedback signals. This condition by performing a drive re-pairing procedure. This procedure can only be completed by an authorized Curtiss-Wright, Exlar representative.
Low Bus Voltage	A Low Bus Voltage limit is set at the factory. Anytime the voltage goes below this preset value while the actuator is enabled, the drive immediately faults. A Low Bus Voltage condition is only considered a fault if the drive is enabled, that is, trying to operate when there is insufficient power to do anything. The Bus Voltage can be monitored on the Diagnostics page.
High Bus Voltage	A High Bus Voltage limit is set at the factory, and on DC actuators a lower User High Bus fault may be set. Anytime the voltage goes above this preset value, the drive immediately faults. A High Bus Voltage fault can occur from overvoltage on the main power supply, but more likely from the bus voltage rising due to motor regeneration energy. For an AC powered actuator, the solution is generally to connect an external braking resistor, though occasionally slower deceleration, or better position loop performance (less overshoot) is enough. For DC actuators regenerated energy handling can be more complicated and involve an RSR and blocking diodes to protect power supplies. (See the Installation Manuals for more details). The Bus Voltage can be monitored on the Diagnostics page, or with the Scope.
Following Error	This fault occurs if the Following Error (difference between target position and actual position) is beyond the Following Error limit and the Time in Following Error limit is exceeded. This will typically occur if the actuator cannot provide enough force/torque to get to the desired position, either because the active current limit is set too low or a there is a machine jam, hard stop, or end travel has been reached. Another cause could be attempting to accelerate a high inertia load too quickly. Following Error can and should be kept low by keeping requested motion within the limits of the actuator and properly tuning the actuator for its application.
Board Temperature	This condition occurs when a temperature sensor near the processor in the control electronics is over the factory set limit. This can occur if the actuator is continuously used above its power rating, or at high ambient temperatures.
Communications	This fault occurs if there is no activity on a communications channel for a configurable timeout interval. See the System Setup page Comms Faults tab for settings. This condition should be ignored – not even logged – unless continuous communications is required for operation, such as commands via Modbus or another fieldbus.
Actuator Temperature	This condition occurs when the temperature sensor in the stator winding reports a temperature higher than the factory set limit.
Absolut Hall Battery	This condition should generally be set as a warning rather than a fault. It indicates that the battery that maintains multi-turn absolute position is running low. If it gets too low, position will not be retained, and a home sequence will have to be performed after a power-down.
Loss of Signal	This fault condition occurs only when the Enable High Trip or Enable Low Trip box is checked, and the Analog Input value drops out of range that is entered. See analog input page.
Hardware Current Trip	This fault indicates an abnormal current has been detected by high speed short-circuit detection electronics. It usually indicates an insulation breakdown, though can occur due to a severe transient voltage. If this fault recurs immediately on attempting to re-enable the actuator, do not keep trying to reset the fault. Secondary failures will eventually occur, causing supply fuses to open. This fault must not be ignored. Contact our tech support.
User Low Bus Voltage	A User Low Bus Voltage limit is set by the user; anytime the voltage goes below this value, the fault condition occurs. The Bus Voltage can be monitored on the Diagnostics page.

Move Termination	This condition can occur in any motion type with three different possible causes: (See the Move page). If the Fault if not terminated by switch or current limit box is checked and the move is terminated by reaching the designated position without having activated a switch or reached the Current Limit value. If either Terminate on switch (active or inactive) is selected or Fault if terminated by switch is selected and the motion is terminated by the Switch Input rather than by Current Limit or reaching the designated position. If the Terminate on current limit and the Fault if terminated by current limit boxes are checked and the Current Limit for the motion is hit before the Switch Input is sensed or before the designated position is reached.
Invalid System Parameters	These faults involve parameter images in non-volatile memory. It is recommended that a drive file for each actuator is always saved, though having a drive file for each actuator is more likely to be used to install a spare actuator for other maintenance or repair purposes. Contact the Tech Support group for recovery.

ii. Maximum Stress Values

This section displays the highest amp, voltage, board temperature °C, and actuator/motor temperature °C the actuator has experienced in operation.

Maximum Stress Values	
Current	16.8 AMPS
Voltage	25.78 VOLTS
Board Temp	32 DEG C
Actuator Temp	29 DEG C

Figure 35 - Maximum Stress Values

iii. Current Power-On Stress Values

This section displays the current power-on stress values of the actuator. Completing a power cycle will reset these values.

Current Power-On Stress Values	
Current	0.2
Voltage	24.16

Figure 36 - Current Power-On Stress Values

5.4.2 Diagnostics > Scope

- The Tritex Expert software has a virtual oscilloscope that can plot up to four channels with either high speed or continuous data capture mode.
- For instructions on using the Scope tool, see Expert Software Manual found on Curtiss-Wright Actuation website.

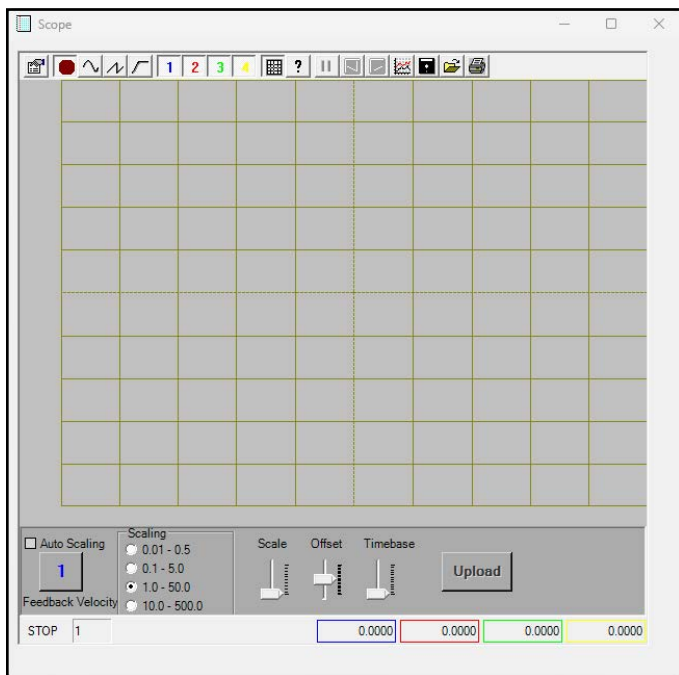


Figure 37- Scope

5.4.3 Diagnostics > Diagnostics

Displays the current status of the actuator in operation.

Fault/Warning	Description
Firmware Information	Shows the Firmware and Boot version of the actuator
Factory	Displays factory serial numbers for PCB, Actuator, model code, and continuous current rating.
Monitor	Shows the critical actuator information, such as position, temperature, and limits
H/W Output Status	Actuator outputs with method to set output to a logic state
Comms Channel	Channel A and B communication status
Comms Errors	Channel A and B Modbus communication fault information
Fault Status	Displays the currently active faults and their severity F – Firmware hard fault is active, which could cancel the move operation. W – Firmware soft fault warning is active; the Warning will clear when the fault condition clears. A – Fault and/or Warning is active See status log section for detailed descriptions of each fault.

The screenshot displays the 'Diagnostics' interface with the following sections:

- Monitor:** A list of parameters with input fields and units:
 - Following Error: 0.000 IN
 - Tracking Error: 0.038 IN
 - Bus Voltage: 24.2 VOLTS
 - Board Temp: 31.2 DEG(C)
 - Actuator Temp: 24.6 DEG(C)
 - Heatsink Temp: 0 DEG(C)
 - Position Limit (-): 0.100 IN
 - Position Limit (+): 0.000 IN
 - Current Limit (-): -10.0 %
 - Current Limit (+): 66.0 %
 - Bus Current: 0.1 AMPS
 - Feedback Battery Voltage: 3.56 VOLTS
- Fault Status:** A list of fault types with checkboxes:
 - F W A** (Fault Warning Active)
 - Peak Current
 - Continuous Current
 - Position Tracking
 - Move Termination
 - Low Bus Voltage
 - High Bus Voltage
 - Following Error
 - Board Temperature
 - Actuator Temperature
 - Loss of Signal
 - Invalid Parameters
 - System Parameters
 - Hardware Restart
 - Hardware Current Trip
 - Communications
 - User Low Bus Voltage
 - Abs Hall Battery
 Below the list is a 'Reset Faults' button and the text '(F)ault - (W)arning - (A)ctive'.
- Comm Channel:** Shows '485' and a 'Faulted' checkbox.
- Comms Errors:** Shows '485' and a list of error types with checkboxes:
 - Command Idle
 - Protocol
 - Data Error
 - Module
 - Rx Count
 - CRC
 - Rx Overflow
 - Parity
 - Framing
 - Unexpected Char
- Firmware:** Shows 'Version: 1.06', 'Drive Type: 14', 'Boot Version: 1.04', and 'Boot Type: 3 2808'.
- Factory:** Shows 'Drive PCB PN-REV - S/N: 83186B-232500004', 'Actuator PN/REV - S/N: 83156C-23340021', 'Model: EVA080-DD-D024', and 'Continuous Current: 15.0 AMPS'.
- H/W Output Status:** A table for overriding outputs:

	Override	Set
Output 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
Output 2	<input type="checkbox"/> 2	<input type="checkbox"/> 2

Figure 38 - Actuator Diagnostics

5.5 Advanced

Advanced pages in Valve expert contain functions used for non-typical applications. The default values found in Advanced pages are suitable for typical valve applications.

5.5.1 Advanced > Motion Setup

The Motion Setup pages are used for advance move types, calibrations and analog position setup.

i. Move

The move tab is used to configure Move 3 and Move 4. Move 3 and Move 4 are useful for applications that require additional discrete positions beyond Close Move, Open Move, and FAULT Move. Additionally, the velocity, acceleration and deceleration and move current limit can be adjusted on Move 3 and Move 4. These parameters are not adjustable on Close Move and Open Move. This is useful for applications that require a different open and close speed.

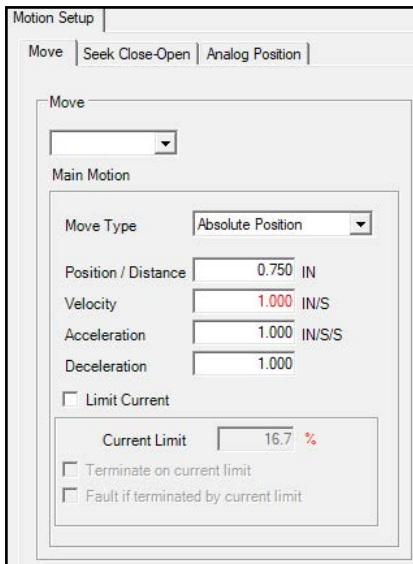


Figure 39 - Motion Setup, Move

ii. Seek Close-Open

The Seek Close-Open tab allows for the configuration of the calibrate close and open functions. The default values are suitable for typical valve applications.

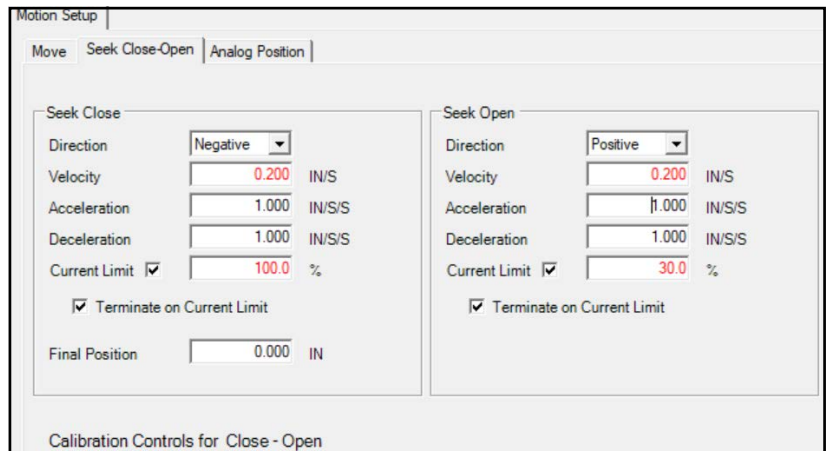


Figure 40 - Motion Setup, X Seek Close-Open

iii. Analog Position

The Analog Position allows the viewing of the 4-20 mA position control parameters setup during the calibration and Valve Control page with the addition of allowing the use to adjust the acceleration.

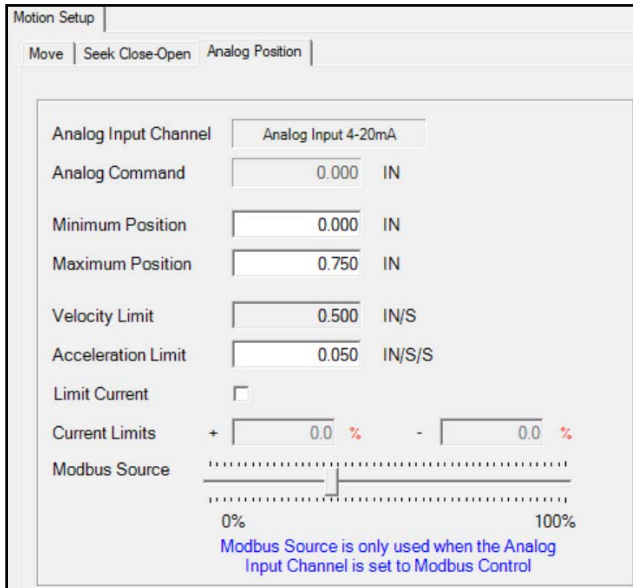


Figure 41 - Motion Setup, Analog Position

5.5.2 Advanced > 4-20 mA IO

The 4-20 mA IO page is used to calibrate and configure the function of the 4-20 mA analog input.

i. 4-20 mA IO > Input Setup

- Bandwidth** - The value is essentially the maximum frequency the filter will allow. This filter is used to eliminate higher frequency interference on the analog signal. Typical values for Analog Position Mode are 1-5 Hz (default 1 Hz).
- Closed** - mA value the actuator will associate with the Valve Close position. Using the Set Input Value button will set the Close Valve position value to the 4-20 mA signal the actuator is currently reading.
- Open** - mA value the actuator will associate with the Valve Open position. Using the Set Input Value button will set the Open Valve position value to the 4-20 mA signal the actuator is currently reading.

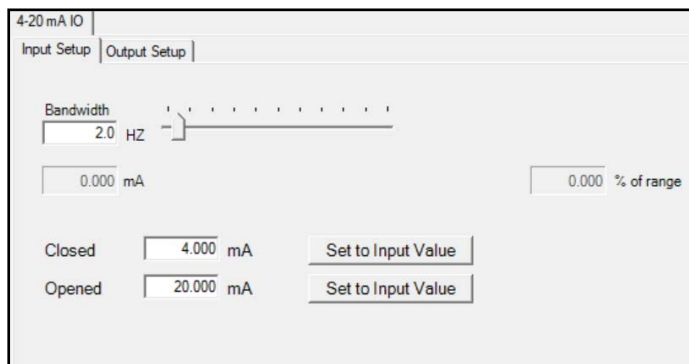


Figure 42 - 4-20 mA Input Setup

ii. 4-20 mA IO > Input Calibration

The analog input circuit is factory calibrated and does not typically need periodic calibration. The purpose of calibration is to represent accurately the current applied at the channel as a digital value. Converting that value to a position value for instance is called scaling and is done elsewhere. Calibration should only be done if a calibration checks by applying known currents and comparing them with the values appearing in the “mA” monitor box on the Input Setup tab of the IA4 Option Board page indicate calibration is required.

To access the calibration page, click on the red Calibrate button on the 4-20 mA IO page, Input Setup tab. If such a button is not visible, right click in the area just outside of the border of the Input Setup tab. Then click on the Show Page Details line in the menu that pops up. The Calibrate button will then appear. The IA4 Option Configuration page is shown below. Follow the instructions below, or on the screen and click the Save Calibration points button when complete.

A Loop Calibrator instrument that provides loop power and an accurate current is very useful for calibrating a 4-20 mA input. The input is best calibrated at 4 mA and 20 mA.

4-20mA Input Calibration

Input Value 0.000 mA 0.0000 ADC

Calibration CANNOT be accomplished unless in communication with the drive. Make sure that the analog input value from the drive (above) is being monitored and actually changing !!!

The drive requires two calibration points from which it can then calculate the offset and scaling factors required to convert the analog input. The exact values are not critical, but a larger range between the points will produce a larger scaling resolution and therefore more accurate conversions over the full range. Produce an analog source input near the high end of the input range, enter the exact value (from an external meter) in the 'High' box, and click 'Calibrate High'. Then produce an input near the low end of the input range, enter the exact value in the 'Low' box, and click 'Calibrate Low'. Note that the value being displayed from the drive will not be accurate until BOTH points have been given to the drive.

High Point 20.000 mA Calibrate High

Low Point 4.000 mA Calibrate Low

Before calibrating either point, make sure that the input is not saturated and the input value being displayed is still changing.

New calibration values will not be remembered between power-ups until saved in non-volatile memory.

Save calibration points

Figure 43 - 4-20 mA Input Calibration

iii. 4-20 mA > Output Setup

The Tritex EVA is equipped with one 4-20 mA analog output that can be configured to correlate to an actuator parameter variable such as position, or output current (force).

1. Bandwidth - Is the break frequency in Hz of a digital low-pass filter on the Analog Output. This filter is used to smooth out sharp steps, spikes or dithering on the measured signal on the way to the output signal. The lower the number the more damping is applied. Do not enter 0, though it may be allowed in present firmware and software, because this will freeze the output.
2. Var Max – This is the maximum value of the selected output parameter variable. The Var Max value will produce 20 mA on the Analog Output.
3. Var Min – This is the minimum value of the selected parameter. The Var Min value will produce 4mA on the Analog Output.
4. Output Variable - Select from the drop-down menu the parameter variable to be assigned to the Analog Output. Once the parameter variable is selected press “Select” to confirm.
 - 4-Feedback Position – Var Max will correlate to valve open feedback position. Var Min will correlate to valve close feedback position.
 - Continuous Current – Continuous current value between the drive and the motor. This actuator parameter correlates with output force. This value is NOT current draw from power supply.
 - Bus Voltage – Measured value of input voltage from power supply.
 - Board Temperature – Average value of three separate temperature sensors on the actuators PCB. Each sensor is located next to critical components.
 - Actuator Temperature – Temperature value of a PT1000 thermistor located in the actuator stator.
 - Analog Input – Value of 4-20 mA analog input.
 - Bus Current – Measured current value of input power supply.

4-20 mA IO

Input Setup | Output Setup

Bandwidth 20.0 HZ

Output Variable FeedbackPosition Select

Var Max 2.829 20 mA

Var Min 0.000 4 mA

0.00 % 2.85 mA

iv. 4-20 mA IO > Output Calibration

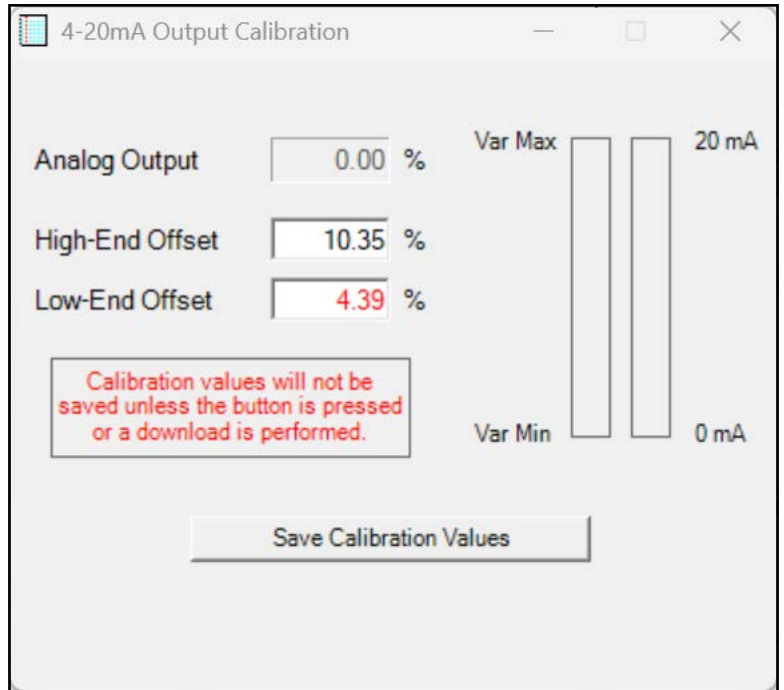
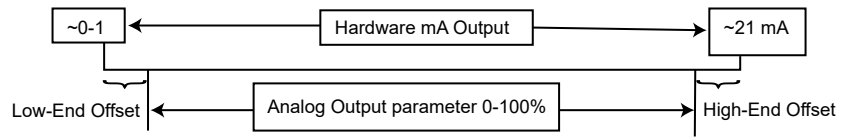
The 4-20 mA Output has been calibrated at the factory so 0-100% covers a span of 4 mA to 20 mA. Typically, calibration not required unless a different range is desired or if re-calibration is required to match the 4-20 mA Output to a measurement device, such as another controller's analog input or an ammeter.

To access the Output Calibration page, right click in the area just outside of the Output Setup tab and then select (left click) the Show Page Details line in the menu. Then click on the Calibrate button that appears near the 4-20 mA bar.

The actual hardware output is designed to allow an output span that is greater than 4mA to 20 mA, this assures that 4-20 mA can always be delivered to the Host considering all component tolerances and other losses before the signal gets to the host controller.



CAUTION! Make sure all configuration changes are saved to the actuator and save the drive file before calibrating.



5.5.3 Digital I/O

Select the I/O > Digital I/O page

Digital inputs are used to command preconfigured moves such as “Open Valve” or “Close Valve” while the digital outputs can be configured to indicate the actuator status. Virtual IO can be used to utilize actuator parameters as actions without taking up a digital input. They are often paired with the Advanced Comparator function.

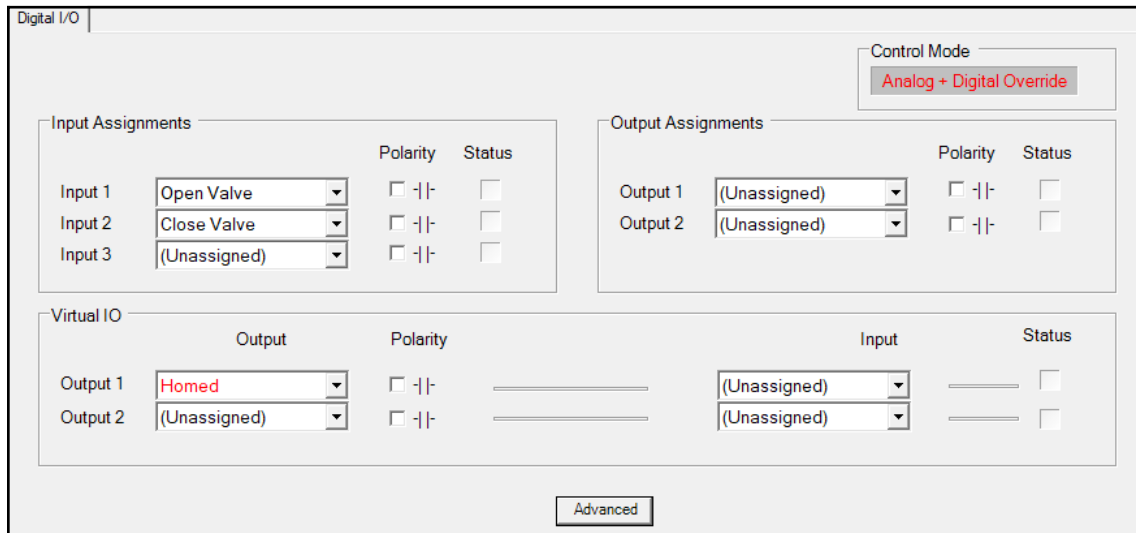


Figure 44 - Digital I/O

i. Digital Inputs

Digital inputs can be used to command position or jog the actuator using a 24 V signal. They can be used stand-alone or in conjunction with 4-20 mA position control in Digital + Override mode. The Tritex actuator uses a move priority system to determine which move will be executed in the case where both Digital Input 1 and Digital Input 2 are high. The move priority is as follows:

Fault Move > Open Valve > Close Valve > Move 3 > Move 4

Example 1: If digital input 1 (Open Valve) and digital input 2 (Close Valve) are both high, the actuator will move to the open position.

Example 2: If digital input 1 (Open Valve) is high and digital input 3 (if configured for Fault Move) goes high the actuator will move to the Fault Move position.

Parameter Name	Description
Input 1	Digital input 1 (24 V), default value: Open Valve
Input 2	Digital input 2 (24 V), default value: Close Valve
Input 3	Digital input 3 (24 V), default value: Unassigned

NOTE: In Control Mode “Single Digital Input” Input 1 must be configured for “Open Valve”. The actuator will not respond to any other configured move in ANY input.

ii. **Polarity** – Clicking the polarity button switches each input, output, or virtual IO to positive or negative. Example: Negative polarity means the output will be off when the function is active, and on when the function is inactive.

NOTE: This does not change the electrical characteristics of the I/O line.

NOTE: The lowest move value takes priority in the case of more than one move command is received.

iii. Input Assignments – Drop down menu to assign an actuator function to the digital inputs.

Parameter Name	Description
Open Valve	The actuator will move to the configured Open Valve position. Default function for digital input 1.
Close Valve	The actuator will move to the calibrated close position (0). Default function fir digital input 2.
Move 3	User defined move configured in Advanced > Motion Setup. User moves allow for more advanced configurability such as user defined acceleration, deceleration, and output current limits.
Move 4	User defined move configured in Advanced > Motion Setup. User moves allow for more advanced configurability such as user defined acceleration, deceleration, and output current limits.
Fault Move	Fault position configured in System Setup > Fault Enables. Fault move can be triggered by a digital input or a configured internal condition such as loss of signal or low bus voltage.
Reset Faults	Actuator will reset all faults.
Jog Open (+)	Actuator will travel towards the open position.
Jog Close (-)	Actuator will travel towards the close position.
Calibrate Close	Actuator will perform the calibrate close procedure. Open valve position will NOT be updated.

5.5.4 Digital Outputs

Digital outputs turn on a 24 V output when configured parameter conditions are met.

Parameter Name	Description
Output 1	Digital output 1 (24 V), default value: Unassigned
Output 2	Digital output 2 (24 V), default value: Unassigned

i. **Polarity** – Clicking the polarity button switches each input, output, or virtual IO to positive or negative. Example: Negative polarity means the output will be off when the function is active, and on when the function is inactive.

NOTE: This does not change the electrical characteristics of the I/O line.

NOTE: The lowest move value takes priority in the case of more than one move command is received.

ii. Output Assignments – Drop down menu to assign an actuator function to the digital outputs.

Parameter Name	Description
At Open Valve Position	Actuator is at the Open Valve position.
At Close Valve Position	Actuator is at the Close Valve position
At Move 3 Position	Actuator is at the user defined Move 3 position.
At Move 4 Position	Actuator is at the user defined Move 4 position.
At Fault Move Position	Actuator is at the Fault Move Position.
Comparator 1	Comparator 1 status is active.
Comparator 2	Comparator 2 status is active.
Enabled	Actuator is enabled and ready for service
Calibrated	Actuator is calibrated.
Ready	Actuator is ready
Faulted	Actuator is in fault state.
Warning	Actuator is in a warning state.
Fault or Warning	Actuator is a fault or warning state.

5.5.5 Virtual IO

Virtual IO can be used to utilize actuator parameters as triggers for actions such as move without the use of a digital input. They are often paired with the Advanced Comparator Function.

Example: The actuator Warning status can be configured to command the actuator to the Close Valve position.

Output	Polarity	Input	Status
Output 1: Warning	<input type="checkbox"/> - +	Close Valve	<input type="checkbox"/>
Output 2: (Unassigned)	<input type="checkbox"/> - +	(Unassigned)	<input type="checkbox"/>

Figure 45 - Virtual IO example

i. **Polarity** – Clicking the polarity button switches each input, output, or virtual IO to positive or negative. Example: Negative polarity means the output will be off when the function is active, and on when the function is inactive.

ii. **Virtual Output Assignments** – Drop down menu to assign an actuator function to the virtual outputs.

1. At Open Valve Position – Actuator is at the Open Valve position.
2. At Close Valve Position - Actuator is at the Close Valve position.
3. At Move 3 Position – Actuator is at the user defined Move 3 position.
4. At Move 4 Position – Actuator is at the user defined Move 4 position.
5. At Fault Move Position – Actuator is at the Fault Move Position.

6. Comparator 1 – Comparator 1 status is active.
 7. Comparator 2 – Comparator 2 status is active.
 8. Enabled – Actuator is enabled and ready for service
 9. Calibrated – Actuator is calibrated.
 10. Ready – Actuator is ready
 11. Faulted – Actuator is in fault state.
 12. Warning – Actuator is in a warning state.
 13. Fault or Warning – Actuator is a fault or warning state.
- iii. Virtual Input Assignments – Drop down menu to assign an actuator function to the virtual inputs.
1. Open Valve – The actuator will move to the configured Open Valve position. Default function for digital input 1.
 2. Close Valve – The actuator will move to the calibrated close position (0). Default function for digital input 2.
 3. Move 3 – User defined move configured in Advanced > Motion Setup. User moves allow for more
 4. Move 4 – User defined move configured in Advanced > Motion Setup.
 5. Fault Move – Fault position configured in System Setup > Fault Enables. Fault move can be triggered by a digital input or a configured internal condition such as loss of signal or low bus voltage.
 6. Reset Faults – Actuator will reset all faults.

5.5.6 Comparator – Advanced Function

The Tritex actuator can intelligently monitor configured values and turn on a virtual output based on a logic condition

Advanced

Comparator

Two comparators allow output events to be set based on the state of the comparator outputs. The Comparator output events are Comparator 1 and Comparator 2. After selecting Comparator Variable, press the Channel select button to configure Variable, allowing the Setpoint and Hysteresis to be recalculated.

	Comparator Variable	Select	Operator	Setpoint	Hysteresis		Active
1	<input type="text" value=""/>	<input type="text" value="1"/>	<input type="text" value=""/>	<input type="text" value="0.000"/>	<input type="text" value="0.000"/>	<input type="text" value=""/>	<input type="checkbox"/>
2	<input type="text" value=""/>	<input type="text" value="2"/>	<input type="text" value=""/>	<input type="text" value="0.000"/>	<input type="text" value="0.000"/>	<input type="text" value=""/>	<input type="checkbox"/>

Figure 46 - Comparator

Parameter Name	Description
Comparator Variable 1	Selected the desired Comparator Variable from the drop-down list of possible variables. Appropriate Units must be selected. The state of the Comparator Output is determined by the variable's value with respected to the selected Operator, Setpoint, and Hysteresis values
Operator 1: >	Output will be active if Variable is greater than Setpoint. The Output will go inactive once the value drops below the value Setpoint – Hysteresis
Operator 1: <	Output will be active if Variable is less than Setpoint. The Output will go inactive once the value goes above the value Setpoint + Hysteresis.
Operator 1: +/-	Output will be active if Variable is within the range Setpoint +/- Hysteresis.
Setpoint 1	The value that is compared to the present value of the Comparator Variable to determine the state of the comparator output. Both values will have the same units.
Hysteresis 1	For > or < operators, this is a true hysteresis, modifying the effective setpoint by the hysteresis in order to turn the output from active to inactive. This value is designed to prevent the output from repeatedly changing state due to normal fluctuation or dither on the comparator variable. For the +/- operator, the hysteresis value sets a range on either side of the setpoint and the output will be active if within this range.
Comparator Active 1	Software indication that the Comparator is active. The comparator can be used with digital outputs or virtual IO as an input function.
Select 1	Recalculates the setpoint units to the configured comparator variable.
Comparator Variable 2	Selected the desired Comparator Variable from the drop-down list of possible variables. Appropriate Units must be selected. The state of the Comparator Output is determined by the variable's value with respected to the selected Operator, Setpoint, and Hysteresis values.
Operator 2: >	Output will be active if Variable is greater than Setpoint. The Output will go inactive once the value drops below the value Setpoint – Hysteresis
Operator 2: <	Output will be active if Variable is less than Setpoint. The Output will go inactive once the value goes above the value Setpoint + Hysteresis.
Operator 2: +/-	Output will be active if Variable is within the range Setpoint +/- Hysteresis.
Setpoint 2	The value that is compared to the present value of the Comparator Variable to determine the state of the comparator output. Both values will have the same units.
Hysteresis 2	For > or < operators, this is a true hysteresis, modifying the effective setpoint by the hysteresis to turn the output from active to inactive. This value is designed to prevent the output from repeatedly changing state due to normal fluctuation or dither on the comparator variable. For the +/- operator, the hysteresis value sets a range on either side of the setpoint and the output will be active if within this range.
Comparator Active 2	Software indication that the Comparator is active. The comparator can be used with digital outputs or virtual IO as an input function.
Select 2	Recalculates the setpoint units to the configured comparator variable.

Comparator

Two comparators allow output events to be set based on the state of the comparator outputs. The comparator output events are Comparator 1 and Comparator 2. After selecting Variables, press the Channel Select button to configure variables, allowing the set point and hysteresis to be recalculated.

- i. Comparator Variable 1 & 2 – Drop down menu to select the variable comparator 1 will monitor.

Parameter Name	Description
Feedback Position	Drop down menu to select the variable comparator 1 will monitor.
Continuous Current	Variable to monitor the position of the actuator.
Bus Voltage	Variable to monitor bus voltage.
Bus Current	Variable to monitor bus current.
Board Temperature	Variable to monitor actuator PCB temperature.
Actuator Temperature	Variable to monitor actuator servo motor temperature.
Analog Input	Variable to monitor analog input (4-20 mA).

- ii. Setpoint & Hysteresis Explanation Examples

1. **Setpoint** – Defines the value the operator logic condition to go active.
2. **Hysteresis** – If the operator is configured for > or < then the hysteresis value will modify the effective setpoint by the hysteresis value to change the comparator status from active to inactive. If the operator is +/-, the hysteresis value sets a range on either side of the setpoint, and the output will be comparator will be active within its range.

Example 1: If operator is set to >, setpoint set to 15, and hysteresis set to 2 then when the variable increases to 15 the comparator will go active. The comparator will remain active until the variable decreases to 13 (setpoint minus hysteresis).

Example 2: If operator is set to <, setpoint is set to 15, and hysteresis set to 2 then when the variable decreases to 15 the comparator will go active. The comparator will remain active until the variable increases to 17 (setpoint plus hysteresis).

Examples 3: if operator is set to +/-, setpoint is set to 15, and hysteresis is set to 2 then when the variable is within the range of 13 to 17 the comparator will be active (setpoint plus hysteresis sets upper limit, setpoint minus hysteresis sets lower limit).

- iii. Comparator & Virtual IO Application Examples

Example 1: The user wants Comparator 1 to be active if the Analog Input (4-20 mA) variable is greater than (>) a setpoint of 15. The user wants the Comparator to be inactive when the Analog Input (4-20 mA) variable is less than a setpoint of 10 (Hysteresis).

Comparator

Two comparators allow output events to be set based on the state of the comparator outputs. The Comparator output events are Comparator 1 and Comparator 2. After selecting Comparator Variable, press the Channel select button to configure Variable, allowing the Setpoint and Hysteresis to be recalculated.

	Comparator Variable	Select	Operator	Setpoint	Hysteresis	Active
1	Analog Input	1	>	7.500	2.500	<input type="checkbox"/>
2		2		0.000	0.000	<input type="checkbox"/>

Figure 47 - Comparator Example 1

Using the Virtual IO the Comparator status can be used to provide position command for stand-alone applications. The user wants the actuator to move to the Open Valve position when the Analog Input (4-20 mA) is greater than (>) 15 mA and then close when the Analog Input (4-20 mA) is below 5 mA (Setpoint 15 minus 10 Hysteresis = 5 mA). Virtual Output 1 is configured for Comparator 1, normal open polarity, to command the Open Valve move. Virtual Output 2 is configured for Comparator 1, normal close polarity, to command the Close Valve move. This means that when Comparator 1 is active the valve will open, and when comparator 1 is inactive the valve will close.

Virtual IO		Output	Polarity	Input	Status
Output 1	Comparator 1	<input type="checkbox"/> - -		Open Valve	<input type="checkbox"/>
Output 2	Comparator 1	<input checked="" type="checkbox"/> - -		Close Valve	<input type="checkbox"/>

Figure 48 - Comparator Example 1 - Virtual IO

Example 2: The user wants to monitor if the valve is more than half open or half close; not just if the valve is at the Valve Open or Valve Close position. The valve stroke for this example is 1.0 in. Set the Comparator Variable to FeedbackPosition, Operator to greater than (>) and the setpoint to 0.5 as the midpoint. Since the application requires Comparator 1 to be active above the midpoint and inactive below the hysteresis will be set at 0.000.

Comparator						
Two comparators allow output events to be set based on the state of the comparator outputs. The Comparator output events are Comparator 1 and Comparator 2. After selecting Comparator Variable, press the Channel select button to configure Variable, allowing the Setpoint and Hysteresis to be recalculated.						
Comparator Variable	Select	Operator	Setpoint	Hysteresis		Active
1 FeedbackPosition	1	>	0.500	0.000	<input type="checkbox"/>	<input type="checkbox"/>
2	2		0.000	0.000	<input type="checkbox"/>	<input type="checkbox"/>

Figure 49 - Comparator Example 2

The digital outputs can be assigned to activate from the comparator status. Output 1 and Output 2 should be configured to Comparator 1. The polarity of output 2 should be normal close. Output 1 will indicate the valve is more than half open, Output 2 will indicate the valve is less than half close.

Output Assignments			Polarity	Status
Output 1	Comparator 1	<input type="checkbox"/> - -	<input type="checkbox"/>	
Output 2	Comparator 1	<input checked="" type="checkbox"/> - -	<input type="checkbox"/>	

Comparator Example 2 – Outputs

5.5.7 Advanced System Setup

The advanced system setup page is used to adjust the internal limits of actuators settings. The actuator defaults are suitable for most applications.

Parameter Name	Description
User Current Limit (+)	Sets maximum output current (thrust) for the actuator traveling in the positive direction.
User Current Limit (-)	Sets maximum output current (thrust) for the actuator traveling in the negative direction. If value is set to (0.0) then User Current Limit (+) value will be used for both travel directions.
Max Following Error	Sets maximum allowable following error between commanded position and actual position. If following error exceeds this limit for more than Following Error Time Limit, a fault will occur.
Following Error Time Limit	Allowable time the following error can exceed Max Following Error before fault condition occurs.
In Current Limit Time	Sets the amount of time the current limit is active before activating the current limit output status flag.
Stop Ramp	Sets the deceleration (response) the actuator will use when the Fault Flag, Stop condition is activated

Advanced System Setup		
Limits		
User Current Limit (+)	150.0	%
User Current Limit (-)	0.0	%
Max Following Error	0.050	IN
Following Error Time Limit	0.01	seconds
In Current Limit Time	0.1	seconds
Stop Ramp	1.000	IN/S/S

Figure 50 - Advanced System Setup, Limits

6.0 Product Maintenance

In most process control applications, the Tritex EVA080 is a free maintenance actuator. In the case where the actuator is used in industrial applications the following provide maintenance procedures.

6.1 Lubrication Renewal Procedure

Under normal valve actuator conditions, the Tritex EVA080 typically requires no maintenance. For industrial applications or to maximize the life of the actuator it is recommended to perform a lubrication renewal every 5 years or 10 million cycles, whichever occurs first. Use Tribolube 12T grease exclusively.

1. Remove the four bolts connecting the faceplate from the front of the actuator.
2. Remove the roller screw by turning it counterclockwise and threading it out of the cylinder. To remove the screw, it may be necessary to hold the roller screw cylinder to keep it from turning. Turning the shaft will help force the faceplate assembly to break free of its housing.
3. Use a brush to work approximately 15 cm³ (0.9 in³) of grease into the roller screw assembly. Be sure all the threaded surfaces of the screw assembly are covered. This can be accomplished by applying grease to a few places on the roller screw assembly and rotating the components repeatedly in both directions to work the grease into the assembly.

IMPORTANT! Do not over fill. Excess grease does not improve lubrication and requires greater torque when the motor is returned to operation.

4. With the actuator in the vertical position and the open end of the roller screw cylinder facing up, position the roller screw above the cylinder so that it is aligned axially with the roller screw cylinder.
5. Slowly turn the roller screw clockwise in quarter to half turn increments while maintaining contact with the interior threaded cylinder (ITC). This helps align the threads on the roller screw with the threads in the ITC. Do NOT force the roller screw into the cylinder. If the roller screw does not turn freely, remove it and begin again. When the screw is properly threaded into the cylinder, it will roll freely into the actuator.

NOTE: When the roller screw reaches the portion of the cylinder that contains the motor magnets, it will be more difficult to turn because of the magnetic field of the magnets - this is normal. Continue to thread the roller screw into the cylinder until it reaches the bottom (it will become difficult to turn, and the motor and bearings will begin to rotate with it).

6. Place a small amount of seal lubricant on the inside surface of the seal/bushing assembly.
7. Carefully slide the faceplate over the actuator rod end while guiding the four cap screws through their respective holes in the rear end cap of the actuator. Ensure the faceplate seats completely and squarely on the front of the actuator.

NOTE: The seal is a tight fit on the rod end. Use caution to avoid damaging the seal on the threads of the extending rod. The inner surface of the faceplate provides the pre-loading for the bearings, so it is important that it be properly seated. Torque the four cap screws of the faceplate assembly to 108 lbf-in (12.2 Nm) rotating between bolts in a star pattern.

6.2 Seal Maintenance

Inspect actuator rod seals annually or after 1 million cycles. Replace immediately if any damage, wear, or leaks are detected. Exlar recommends that the faceplate assembly containing the main rod seal and bushing assembly be replaced during the re-lubricating procedure. To have this service performed for you, contact the Exlar Returns Department (CHA>Returns@CurtissWright.com) to send your unit in for service. If any additional maintenance or repair is needed, consult Exlar. It may be necessary to return the actuator to the factory or an authorized repair center for refurbishment.

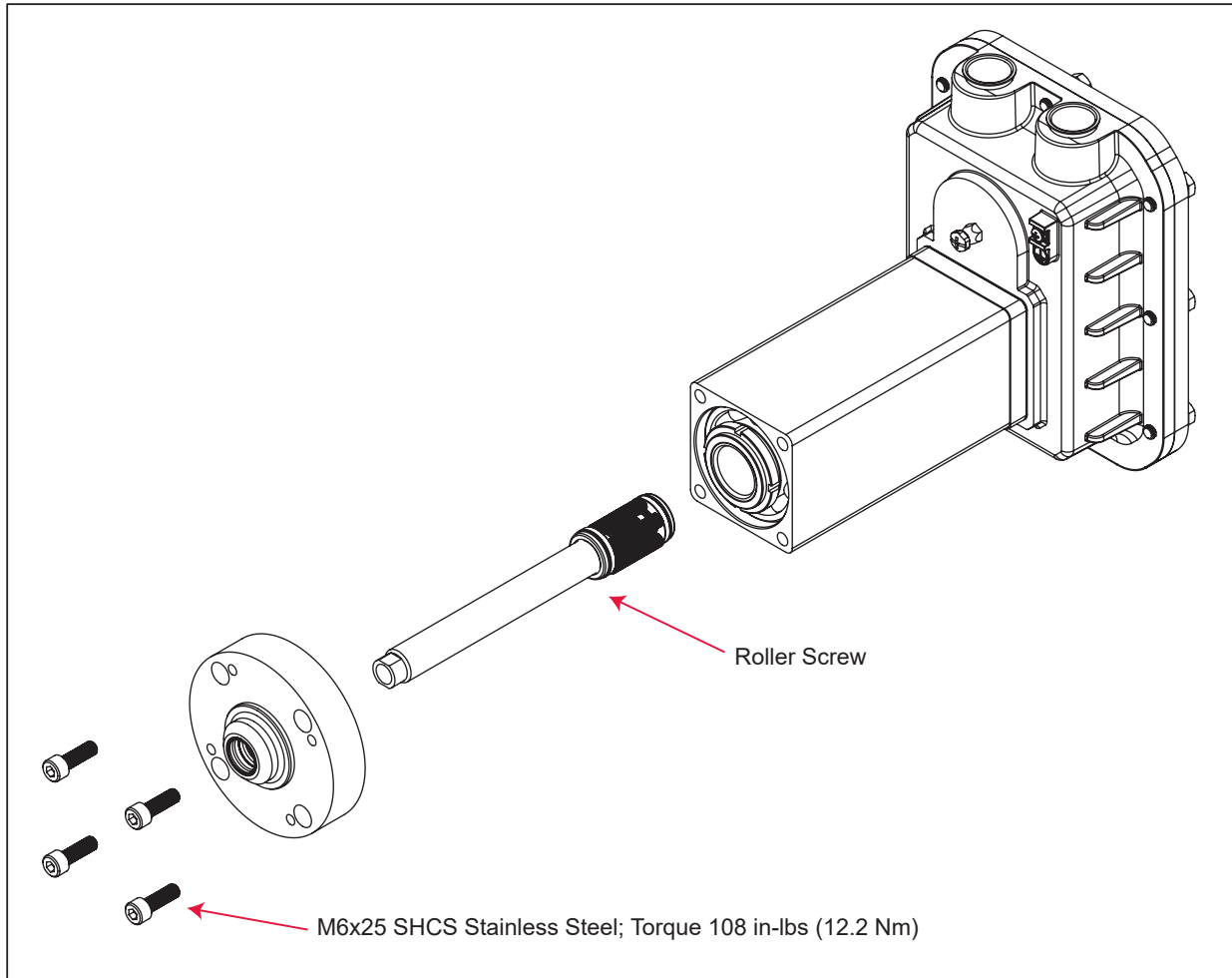
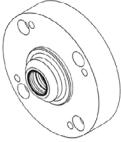


Figure 51 - Lubrication Renewal Procedure Reference

6.3 Inspection, Transportation, & Product Storage

Inspection | Transportation

Before unboxing carefully inspect box for shipping damage. Damage to the shipping box is a strong indicator that it has received rough handling during the shipping process. Please report all damage to the shipping box to the freight carrier. During unboxing take care to avoid damage and save shipping box and packing material in case a return is necessary. Verify that the items on the external box label, product label, and customer documentation matches.

Faceplate	Model	Part Number	Parts Included
	EVA080	83536	Faceplate, O-ring, bushing, seal, wiper, and fasteners

Product Storage

If the Tritex actuator cannot be installed immediately store it in a clean, dry place until ready for installation.

If the actuator is unboxed and installed but not yet wired it is recommended that the plastic transport cable entry point plugs be replaced with suitable sealed plugs that comply with location requirements.

The sealed electrical compartment and stem seal will protect the actuator components in accordance with NEMA 4X and IP66 environments. Curtiss-Wright, Exlar cannot accept responsibility for damage to the actuator once installed on-site. Each Tritex EVA has been fully tested at the factory and will provide years of trouble-free operation as long as the cover is properly re-installed after wiring and cable entry points are properly sealed.

6.4 Product Returns

1. Before requesting an RGA number, please contact Exlar Technical Support to see if it is possible to resolve the issue prior to return.
2. If it is determined that an RGA number is required, please do so by completing an online RGA request form found on the Exlar website. For international repairs, closely follow instructions provided by the Exlar Returned Goods Administrator. Failure to comply with issued instructions may result in delays for repair and return.

7.0 Certifications & Compliance



Certificate of Compliance

Certificate: 70060591

Master Contract: 163694

Project: 80163757

Date Issued: 2023-11-17

Issued To: Exlar Corporation
18400 West 77th St
Chanhassen, Minnesota, 55317
United States

Attention: Robert Schulz

The products listed below are eligible to bear the CSA Mark shown

Issued by: *Steven Simkevitz*
Steven Simkevitz



PRODUCTS

CLASS - C322802 - VALVES Actuators - For Hazardous Locations

Class I, Div.1, Gr. C and D

Explosionproof Linear Actuator Model EXA090, Input rated 12-24 Vdc, 12A max., 1000 lbf. Output force, $-40^{\circ}\text{C} \leq T_a \leq +65^{\circ}\text{C}$, T5; Type 4X;

Three inches travel distance with a speed of 1 inch/sec at 24Vdc and continuous duty.

Notes:

1. Actuator assemblies are intended for use as components in end-product stationary equipment the suitability of the combination is determined by CSA Group.
2. Input voltage comes from a class 2 circuit. The class 2 circuit is not a part of the scope of this project.
3. This product is not evaluated to be used as the safety valve actuator.
4. The instruction manual of the product shall indicate that a Certified input Fuse is to be installed by the end user.

Exlar Tritex® EVA Intelligent Linear Valve Actuator



Certificate: 70060591
Project: 80163757

Master Contract: 163694
Date Issued: 2023-11-17

CLASS - C322802 - VALVES Actuators - For Hazardous Locations
CLASS - C322882 - VALVES Actuators - For Hazardous Locations-Certified to U.S. Standards

Class I, Division 2, Groups A, B, C and D; T5;

Nonincendive (Non Arcing/Non Sparking) Linear Actuator Model EVA080, Input rated 12-24 Vdc, 12A max., 1000 lbf. Output force, $-40^{\circ}\text{C} \leq \text{Ta} \leq +65^{\circ}\text{C}$; T5
Three inches travel distance with a speed of 1 inch/sec at 24Vdc and continuous duty.

Notes:

1. Actuator assemblies are intended for use as components in end-product stationary equipment the suitability of the combination is determined by CSA Group.
2. This actuator assembly model EVA080 has not been evaluated for use in damp and wet locations.
3. Input voltage comes from a class 2 circuit. The class 2 circuit is not a part of the scope of this project.
4. This product is not evaluated to be used as the safety valve actuator.
5. The instruction manual of the product shall indicate that a Certified input Fuse is to be installed by the end user.
6. Model EVA080 has an external connector used for RS-485 communications to setup the equipment. It is not to be used during normal operations and is for initial configuration only. Do not connect or disconnect when the equipment is energized.

APPLICABLE REQUIREMENTS

Explosionproof Linear Actuator Model EXA090:

CSA C22.2 No 139 - 2019	-	Electrically Operated Valves
CSA C22.2 No. 30:20, Update No. 1 March 2023	-	Explosion-proof equipment
CAN/CSA-C22.2 No.94-M91(reaffirmed 2011)	-	Special Purpose Enclosures

Nonincendive (Non Arcing/Non Sparking) Linear Actuator Model EVA080:

CSA C22.2 No 139 - 2019	-	Electrically Operated Valves
CSA C22.2 No. 213-17, Reaffirmed 2022, Third Edition	-	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
UL 429, Seventh Edition, With Revisions March 19, 2021	-	Electrically Operated Valves
UL 121201, Ninth Edition, With Revisions April 1, 2021	-	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations

MARKINGS

The manufacturer is required to apply the following markings:

- Products shall be marked with the markings specified by the particular product standard.



Certificate: 70060591
Project: 80163757

Master Contract: 163694
Date Issued: 2023-11-17

- Products certified for Canada shall have all Caution and Warning markings in both English and French.

Additional bilingual markings not covered by the product standard(s) may be required by the Authorities Having Jurisdiction. It is the responsibility of the manufacturer to provide and apply these additional markings, where applicable, in accordance with the requirements of those authorities.

The products listed under class 3228-02, model EXA090 is eligible to bear the CSA Mark shown for Canada only. Refer to label drawing 69153.

The products listed under class 3228-02 and 3228-82, model EVA 080 is eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US (indicating that products have been manufactured to the requirements of both Canadian and U.S. Standards) or with adjacent indicator 'US' for US only or without either indicator for Canada only. Refer to label drawing 84142.

Markings as follows appear on an aluminum nameplate using printing photo anodized aluminum technology, attached by 4 screws to the enclosure:

- Manufacturer's name: Exlar name, trademark, or the CSA file number (adjacent the CSA Mark).
- Date code / Serial number traceable to month and year of manufacture.
- Catalogue / Model designation:
- Complete electrical rating (amps and volts).
- Hazardous locations designation;
- Temperature Code;
- Ambient Temperature;
- The CSA Mark.

Note: applicable warnings are dependent on the specific model.

Model EXA090 (Explosionproof): "CAUTION – DO NOT OPEN WHEN EXPLOSIVE ATMOSPHERE IS PRESENT" and "ATTENTION – NE PAS OUVRIR EN PRÉSENCE D'UNE ATMOSPHÈRE EXPLOSIVE"

Model EVA080 (Nonincendive (Non-arcing/Non-sparking)): "WARNING – EXPLOSION HAZARD. DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED" and "AVERTISSEMENT – RISQUE D'EXPLOSION. NE PAS BRANCHER NI DÉBRANCHER SOUS TENSION" as well as "WARNING: DO NOT OPEN WHEN AN EXPLOSION ATMOSPHERE MAY BE PRESENT", and "AVERTISSEMENT: NE PAS OUVRIR SI UNE ATMOSPHERE D'EXPLOSION PEUT ETRE PRESENTE"

-Maximum output force;

- "3/4" NPT Conduit Entries"

- "Conduit entries shall be sealed within 18 inches of the enclosure." (Model EXA090)

- "For Supply Connections, Use Wires Suitable for at least +90 °C (194 °F)

Additionally, items may appear on a Brady B486 metallized polyester adhesive film label manufactured by Brady Worldwide Inc. CSA accepted label and tested previously under project 1538184.

Notes:

Exlar Tritex® EVA Intelligent Linear Valve Actuator



Certificate: 70060591
Project: 80163757

Master Contract: 163694
Date Issued: 2023-11-17

Products certified under Class C322802 have been certified under CSA's ISO/IEC 17065 accreditation with the Standards Council of Canada (SCC). www.scc.ca



Exlar Tritex® EVA Intelligent Linear Valve Actuator

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Supplement to Certificate of Compliance

Certificate: 70060591

Master Contract: 163694

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
80163757	2023-11-17	Project to update report 70060591 to evaluate: i) Changes to the ELT090 model with Class I, Division 1, Groups C and D construction consisting of model name change (ELT090 to EXA090), update to latest edition CSA C22.2 No. 30:20, evaluation of a new consolidated PCB board, new dowel - located outside of the flamepaths, removal of an optional metal plug, change to the thermal sensor for the motor and minor constructional changes. ii) Add a new model EVA080 for Class I, Division 2, Groups A, B, C and D for Canada and the United States. The EVA080 has a similar construction to the EXA090 and share a common PCB. iii) Removal of standard CSA C22.2 No. 0-10, General requirements - Canadian Electrical Code, Part II. iv) Removal of standard of standard CSA C22.2 No. 0.4-04, Bonding of Electrical Equipment.
70113600	2017-01-10	Update the report to make correction to the class number on the CofC.
70060591	2016-06-30	Certification for CAN of ELT090 actuator for Class I Div.1 Gr.C and D, T5, Type 4X enclosure

EU Declaration of Conformity

This declaration is issued under the sole responsibility of the manufacturer.

*The undersigned, representing the
Manufacturer
Exlar Corporation
18400 West 77th Street
Chanhassen, MN 55317 USA*

Declares, that the Exlar Brand Products:

Tritex EVA080 series actuators

(Complete Model Listing Below)

Model identification:

EVA080-XXX-XX-X-XX-X-X-XXXX

The objects of the declaration described above are in conformity with the relevant
Union harmonization legislation.

Per directives listed below:

EU EMC Directive 2014/30/EU

EU RoHS 2011/65/EU and amended with Directive 2015/863

Using the relevant section of the following EU standards and other normative documents:

EMC: EN 61800-3:2023 Adjustable speed electrical power drive systems - Part 3: EMC
requirements and specific test methods for PDS and machine tools

Year of CE Marking: 2026

Note: The above product operates at less than 75 VDC and thus is not subject to the requirements
of the Low Voltage Directive

Signature:

Name: Angela Forrest

Position: Director of Engineering

Date of Issue: 10/30/2025



8.0 Warranty and Limitation of Liability

Please see our warranty on our website here: <https://actuation.curtisswright.com/en-gb/about/terms-conditions>



SENSORS & ACTUATION

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