KIMRAY INC.®

INSTALLATION OPERATIONS & MAINTENANCE

TRITEX II ELECTRIC ACTUATOR

12-48 V DC LINEAR ACTUATOR

IM0017

C 163694 US

CE

EtherNet/IP™ conformance tested

NOTICE:

This information is presented in good faith. Kimray assumes no liability for advice or recommendations made concerning results to be obtained from the user of any Kimray product or service. Responsibility for the selection, use and maintenance of any Kimray products remain with the purchaser and end-user.

Kimray reserves the right to modify or improve the designs or specifications of such products at any time without prior notice.

Warranty and Limitation of Liability

Products are warranted for two years from date of manufacture as determined by the serial number on the product label. Labels are generated and applied to the product at the time of shipment. The first and second digits are the year and the third and fourth digits represent the manufacturing week. Product repairs are warranted for 90 days from the date of the repair. The date of repair is recorded within Exlar™ Corporation's database tracked by individual product serial number.

Exlar warrants its product(s) to the original purchaser and in the case of original equipment manufacturers, to their original customer to be free from defects in material and workmanship and to be made only in accordance with Exlar's standard published catalog specifications for the product(s) as published at the time of purchase. Warranty or performance to any other specifications is not covered by this warranty unless otherwise agreed to in writing by Exlar and documented as part of any and all contracts, including but not limited to purchase orders, sales orders, order confirmations, purchase contracts and purchase agreements. In no event shall Exlar be liable or have any responsibility under such warranty if the product(s) has been improperly stored, installed, used or maintained, or if Buyer has permitted any unauthorized modifications, adjustments and/or repairs to such product(s). Seller's obligation hereunder is limited solely to repairing or replacing (at its opinion), at the factory any product(s), or parts thereof, which prove to Seller's satisfaction to be defective as a result of defective materials, or workmanship and within the period of time, in accordance with the Seller's stated product warranty (see Terms and Conditions above), provided, however, that written notice of claimed defects shall have been given to Exlar within thirty (30) days from the date of any such defect is first discovered. The product(s) claimed to be defective must be returned to Exlar, transportation prepaid by Buyer, with written specification of the claimed defect. Evidence acceptable to Exlar must be furnished that the claimed defects were not caused by misuse, abuse, or neglect by anyone other than Exlar.

Components such as seals, wipers, bearings, brakes, bushings, gears, splines, and roller screw parts are considered wear parts and must be inspected and serviced on a regular basis. Any damage caused by failure to properly lubricate Exlar products and/or to replace wear parts at appropriate times, is not covered by this warranty. Any damage due to excessive loading is not covered by this warranty.

The use of products or components under load such that they reach the end of their expected life is a normal characteristic of the application of mechanical products. Reaching the end of a product's expected life does not indicate any defect in material or workmanship and is not covered by this warranty.

Costs for shipment of units returned to the factory for warranty repairs are the responsibility of the owner of the product. Exlar will return ship all warranty repairs or replacements via UPS Ground at no cost to the customer.

For international customers, Exlar will return ship warranty repairs or replacements via UPS Expedited Service and cover the associated shipping costs. Any VAT or local country taxes are the responsibility of the owner of the product.

The foregoing warranty is in lieu of all other warranties (except as Title), whether expressed or implied, including without limitation, any warranty of merchantability, or of fitness for any particular purpose, other than as expressly set forth and to the extent specified herein, and is in lieu of all other obligations or liabilities on the part of Exlar.

Seller's maximum liability with respect to these terms and conditions and any resulting sale, arising from any cause whatsoever, including without limitation, breach of contract or negligence, shall not exceed the price specified herein of the product(s) giving rise to the claim, and in no event shall Exlar be liable under this warranty otherwise for special, incidental or consequential damages, whether similar or dissimilar, of any nature arising or resulting from the purchase, installation, removal, repair, operation, use or breakdown of the product(s) or any other cause whatsoever, including negligence.

The foregoing warranty shall also apply to products or parts which have been repaired or replaced pursuant to such warranty, and within the period of time, in accordance with Seller's stated warranty.

NO PERSON, INCLUDING ANY AGENT OR REPRESENTATIVE OF Exlar, IS AUTHORIZED TO MAKE ANY REPRESENTATION OR WARRANTY ON BEHALF OF Exlar CONCERNING ANY PRODUCTS MANUFACTURED BY Exlar, EXCEPT TO REFER PURCHASERS TO THIS WARRANTY.

Installation, Operation & Maintenance

Safety Considerations

As with any electro-mechanical device, safety must be considered during the installation and operation of your Tritex™ Series actuator. Throughout this manual you will see paragraphs marked with CAUTION and WARNING signs as shown below

WARNING:
"Warning" indicates the information following is essential to avoiding a safety hazard.

CAUTION:
"Caution" indicates the information following is necessary for avoiding a risk of damage to the product or other equipment.

WARNING:
Failure to follow safe installation guidelines can cause death or serious injury. The voltages used in the product can cause severe electric shock and/or burns and could be lethal. Extreme care is necessary at all times 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 actuator could be lethal or cause severe injury if proper protection is not provided to keep personnel away from moving components.

WARNING:
System Design and safety for personnel
The actuator is intended as a component for professional incorporation into complete equipment or a system. If installed incorrectly, the actuator may present a safety hazard.

The actuator uses high voltages and currents, carries a high level of stored electrical energy, and is used to control equipment which can cause injury. Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and this manual carefully.

None of the functions or features of the Tritex actuator may be used to ensure safety of personnel, i.e. they must not be used for safety-related functions. For example the actuators enable / disable, brake, stop/start and forward/reverse functions are not sufficient for use in safety-critical applications without additional independent channels of protection. Careful consideration must be given to the functions of the actuator which might result in a hazard, either through their intended behavior or through incorrect operation due to a fault. In any application where a malfunction of the actuator or its control system could lead to or allow damage, loss or injury, a risk analysis must be carried out, and where necessary, further measures taken to reduce the risk. For example a failsafe brake in case of loss of actuator breaking power.

WARNING:
If connected by plug and socket
A special hazard may exist where the actuator is incorporated into a system which is connected to the AC supply by a plug and socket. When unplugged, the pins of the plug may be connected to the drive input, which is only separated from the charge stored in the bus capacitor. It is the responsibility of the user to avoid any possibility of electric shock from the pins, if they are accessible.

WARNING:
Grounding - High Leakage Current
the event of a fault. This equipment has high earth leakage current. You must comply with local safety regulations with respect to minimum size and special installation requirements on the protective earth conductor for high leakage current equipment. The ground connections shown in this manual must be followed.

WARNING:
Fuses and Branch circuit protection
“The Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes”, or equivalent.
Fuses or over-current protection must be provided at the input in accordance with the instructions in the manual.


CAUTION:
Hot Surface - Risk of Burn

Before you start

CAUTION:
The instructions provided herein should be completely reviewed and understood before operating or repairing this equipment. All CAUTION and WARNING notes must be strictly observed to prevent personal injury or equipment damage.

Scope

NOTE:
Do not install, operate, or maintain a Kimray Tritex II Electric Actuator without being fully trained and qualified with the Kimray installation, operation and maintenance manual.

To avoid personal injury or property damage, it is important to carefully read, understand, and follow all the contents of this manual, including all safety cautions and warnings.

If you have any questions about this manual, contact your kimray applications support group before proceeding.

Introduction

This repair manual contains information for the Kimray Tritex II Electric Actuator

Description

The combination of the Kimray Tritex II Electric Actuator and control valve provides a precise and reliable method of control. This solution satifies Emissions regulations, automation needs and enables maximum control of all critical processes.

CAUTION:
When ordered, the Kimray Tritex II Electric Actuator configuration and construction materials were selected to meet specific pressure, temperature, pressure drop and fluid conditions. Since some body / trim material combinations are limited in their pressure drop and temperature ranges, do not subject the actuator to any other conditions without first contacting the Kimray Inc, sales office or a sales / applications representative.

CSA Certified Product

The Tritex II DC Linear Actuators are marked as shown after passing a rigorous set of design and testing criteria developed by CSA International (C22.2 No. 139). This label indicates that CSA certifies this product to be safe when installed according to the installation guidelines and used with the scope of the product specifications.

The conditions of acceptability required by CSA are:

- The drive voltage rating range and maximum current operating rating:

Voltage	Current (Adc)
12-24 Vdc	18.0A

- **Installation Requirements**

  - Hazardous Location (Class I Division 2 Group A, B, C, D) installations – ½" rigid conduit with NPT connections must be used.
  - For NPT connections the power wires must be UL approved copper only wires, 12 AWG, 300 Vac minimum rating, and 105º C minimum rating.
  - For other non-hazardous installations:
    - Use the above connection method, or
    - Cable with connector assemblies, or
    - Cables with cable glands are permitted.
  - When an AC to DC power supply is used to supply main power then the power supply must be agency approved and provided with its own enclosure.
  - If a customer requires an additional +24 Vdc power supply to provide power to the Digital I/O, 4-20 mA I/O, or the Analog Input then it must be a recognized or listed Class 2 Power Supply.
  - The full ratings are at 40C ambient temperature. Derate the input current linearly above the 40°C ambient temperature to 14.0Adc at maximum ambient temperature of 65°C.
  - These conditions of acceptability only apply to units with a CSA mark on the product label.

For additional information on cable installations or part numbers contact Exlar Corporation.

CSA INTERNATIONAL

Certificate of Compliance

Certificate: 2332992 **Master Contract:** 163694

Project: 2472487 **Date Issued:** January 27, 2012

Issued to: **Exlar Corporation**

18400 West 77th St
Chanhassen, MN 55317
USA

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

C US

Jay McVeigh

Issued by: Jay McVeigh

PRODUCTS
CLASS 3221 02 - VALVES - Actuators
CLASS 3221 82 - VALVES - Actuators - Certified to US Standards

CLASS 3221 02 - VALVES - Actuators

CLASS 3221 82 - VALVES - Actuators - Certified to US Standards

- Tritex II T2X & T2M Series Linear Actuators and R2M & R2G Series Rotary Actuators, input rated

100-240Vac, 6.3A max (90mm versions) / 8.3A max (115mm versions), 50-60Hz. -50°C ≤ Ta ≤ +65°C.

Tritex TDM & TDX Series Linear Actuators and RDM & RDG Series Rotary Actuators, input rated 12-24Vdc, 18.0A max., -40°C ≤ Ta ≤ +65°C.

Note: Derate input current linear above Ta = 40C to 14.0Adc max. at 65C.

Conditions of Certification

1. I/O terminals must be connected to Class 2 circuits when in use.

CSA INTERNATIONAL

Certificate: 2332992 **Master Contract:** 163694

Project: 2472487 **Date Issued:** January 27, 2012

CLASS 3228 02 - VALVES - Actuators - For Hazardous Locations

CLASS 3228 82 - VALVES - Actuators - For Hazardous Locations - Certified to US Standards

Class I, Division 2, Group A, B, C and D:

• Tritex II T2X & T2M Series Linear Actuators and R2M & R2G Series Rotary Actuators, input rated 100-240Vac, 6.3A max (90mm versions) / 8.3A max (115mm versions), 50-60Hz. Temperature Code T3 (200°C), -50°C ≤ Ta ≤ +65°C.

• Tritex II TDM & TDX Series Linear Actuators and RDM & RDG Series Rotary Actuators, input rated 12-24Vdc, 18.0A max. Temperature Code T4 (135°C), -40°C ≤ Ta ≤ +65°C.

Note: Derate input current linear above Ta = 40C to 14.0Adc max. at 65C.

Conditions of Certifications

1. The actuators may include a holding brake. The thermal effects of the brake pad have not been evaluated and are to be considered by the authority having jurisdiction.

2. I/O terminals must be connected to Class 2 circuits when in use.

Model Code Information:

T2M/Xxxx-xxxx-axx-xx-xbx-xx-230-xxx-(XX..XX-ccccc)

a – connection method

N - conduit hazardous locations

X – non-hazardous locations

b – stator voltage rating

1 - 115 Vrms

3 - 230 Vrms

XX – special options designation that may or may not be present or multiples

ccccc - special part number that may or may not be present

x or XX - denotes options not affecting safety

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CSA INTERNATIONAL

Certificate:	2332992	**Master Contract:**	163694
Project:	2472487	**Date Issued:**	January 27, 2012

R2M/Gxxx-xxx-xaxx-xx-xbx-xx-230-xxx-(XX..XX-ccccc)

a – connection method

N - Conduit hazardous locations

X – non-hazardous locations

b – stator voltage rating

1 - 115 Vrms

3 - 230 Vrms

XX – special options designation that may or maynot be present or multiples

ccccc - special part number that may or may not be present

x or XX – denotes options not affecting safety

TDM/X and RDM/G Model Code Information:

TDM/Xxxx-xxxx-axx-xx-xx8-xx-048-xxx-(XX..XX-bbbbb)

a – Connection method

N - conduit hazardous locations

X – non-hazardous locations

bbbbb - Special part number that may or may not be present

XX – Special options designation that may or may not be present or multiples

x or XX - Denotes options not affecting safety

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CSA INTERNATIONAL

Certificate: 2332992 **Master Contract:** 163694

Project: 2472487 **Date Issued:** January 27, 2012

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x or X can be any alphanumeric character

RDM/G-xxx-xxx-xaxx-xx-xx8-xx-048-xxx-(XX..XX-bbbbb)

a – Connection method

N - Conduit hazardous locations

X – non-hazardous locations

bbbbb - Special part number that may or may not be present

XX – Special options designation that may or may not be present or multiples

x or XX – Denotes options not affecting safety

x or X can be any alphanumeric character

APPLICABLE REQUIREMENTS

CSA C22.2 No 0 - 10	-	General Requirements - Canadian Electrical Code Part II
CSA C22.2 No 0.4 - 04	-	Bonding of Electrical Equipment
CSA C22.2 No 139 - 10	-	Electrically Operated Valves
CSA C22.2 No 213 - M1987	-	Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations
UL 429 - 6th ed	-	Electrically Operated Valves
ISA 12.12.01: 2007	-	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations

EU Declaration of Conformity for CE Mark

Declaration of Conformity

The undersigned, representing the Manufacturer

Exlar™ Corporation
18400 West 77th Street
Chanhassen, MN 55317 USA

and the authorized representative established within the community

Exlar™ GmbH
Frankfurter Str. 107
65479 Raunheim, Germany

declares, that the Exlar Brand products:

TDM, TDX, RDM, RDG Powered Linear and Rotary Actuators
(Complete Model Listing Below)

Model identification:

TDM060, TDX060,
RDM060, RDG060,
TDM075, TDX075,
RDM090, RDG090

to which this declaration relates and are in conformity with the relevant EU Directives listed below:

EU EMC Directive 2004/108/EC

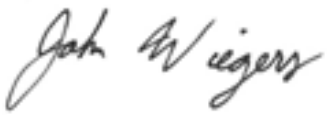
using the relevant section of the following EU standards and other normative documents:

EMC: IEC/EN 61800-3: 2004 Adjustable Speed Electrical Power Drive Systems – Part 3: EMC Requirements and Specific Test Methods

Year of CE Marking: 2012

Note 1: The above products operate at less than 75 VDC and thus are not subject to the requirements of the Low Voltage Directive.

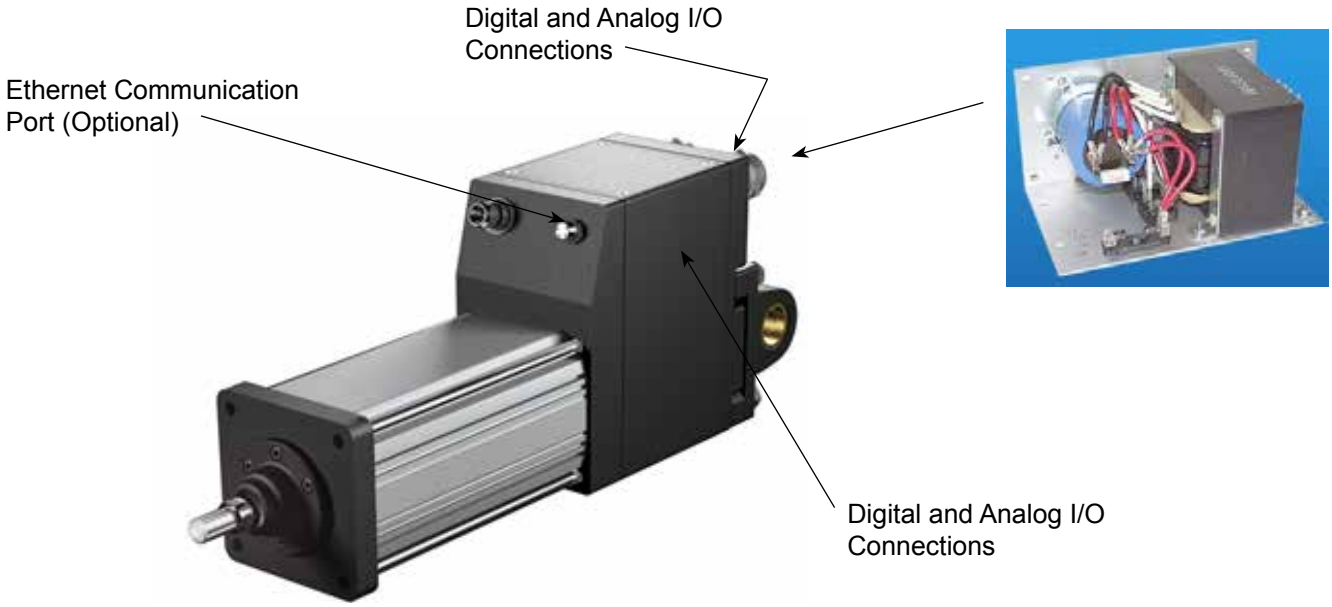
Manufacturer

Signature: 

Name: John Wiegers
Position: Director of Electrical Engineering
Date of Issue: 15-March-2012

Tritex™ Product Overview

The Exlar Tritex™ Series of electric actuators combines an integrated brushless servo motor, amplifier and motion controller. Optionally the system can be configured for remote mounting of the amplifier and motion control

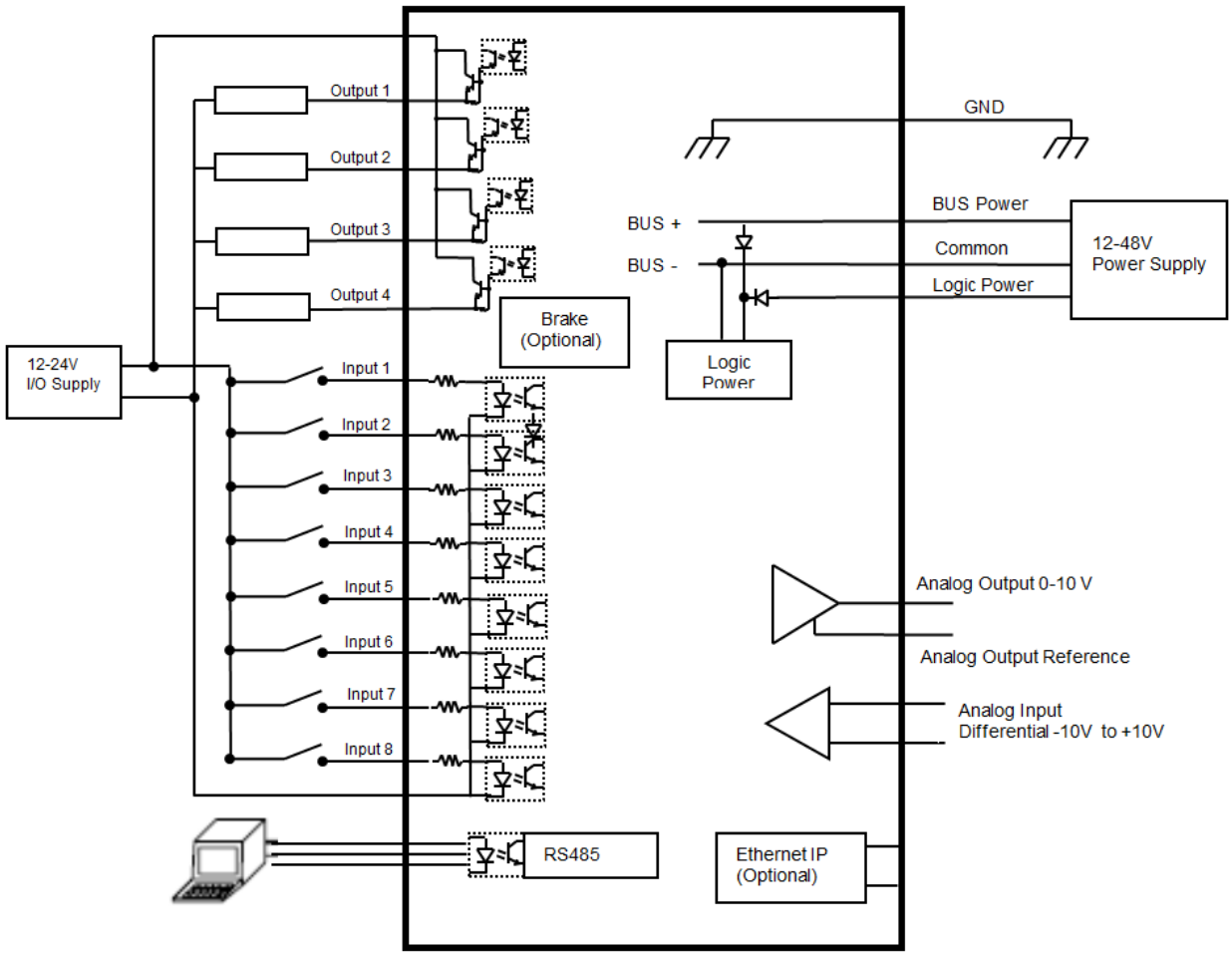


Integrated actuator, servo motor, amplifier and motion control

NOTE:
48V (Nominal) for full speed (except CSA certified installations). 24V and 12V(Nominal) will result in reduced speeds.

System overview, shown with SIO / Ethernet Option Board

All of the required power components and motion processor are contained in the actuator housing.



General Specifications

Drive specification for all Tritex II DC Models with embedded drives.

Embedded Drive Specifications			
Input Voltage, Bus and Logic	12-24 V DC nominal for CSA certified installation 12-48 V DC nominal for general use Internal logic remains active with Bus or Logic power at 9V min		
I/O Power Supply	12-24 V nominal, 30V max, 9V min Models with brakes require 24V +/- 10% for brake operation		
	SIO & Ethernet Options	IA4 4-20 mA Option	Details
Digital Inputs,	8	4	Opto-Isolated, 0-5V or 0-2mA OFF, 8-30V or >3mA ON, programmable functions
Digital Outputs,	4	3	Opto-isolated, 1V max ON state voltage drop, 100mA max continuous load, short circuit & overload protect, programmable functions
Analog Input,	+/- 10V, Differential input 13 bit resolution	Isolated 4-20 mA, with >14 bit resolution, ext power, 12V max drop @ 22mA	Programmable as position, velocity or torque command
Analog Output	0-10V, 11 Bit Resolution	Isolated 4-20 mA 12 bit resolution, ext power, 8V lift-off @ 21 mA	Programmable Functions
Serial Interface	RS485, Modbus RTU protocol, max baud rate 38.4k, Isolated		
Communication	Sinusoidal, 10kHz PWM		
Resolution (Std. Feedback)	0.001 Resolution		
Accuracy (Std. Feedback)	+ / - 0.002 Revolution		
Output Current	Continuous and peak output current is dependent on actuator		
Environmental	Ambient Temperature for rated output: 40°C Maximum Operating Temperature Range: 0°-65°C with power de-rating Humidity: 10-95% non-condensing Altitude: 3000 m above sea level maximum		

Installation

Mechanical Installation

Lubrication

The TDM / TDX Series actuators are shipped from the factory fully greased and ready for installation. Exlar™ recommends using Mobilith SHC 220, 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. For installations below -20 degrees C contact Exlar Application Engineer for lubrication options. See Maintenance section for detail on disassembly for greasing.

Mounting and Operating Considerations

Every effort should be made to minimize misalignment. Any misalignment will decrease the life of the components within the actuator and also may create problems within the application associated with misalignment.

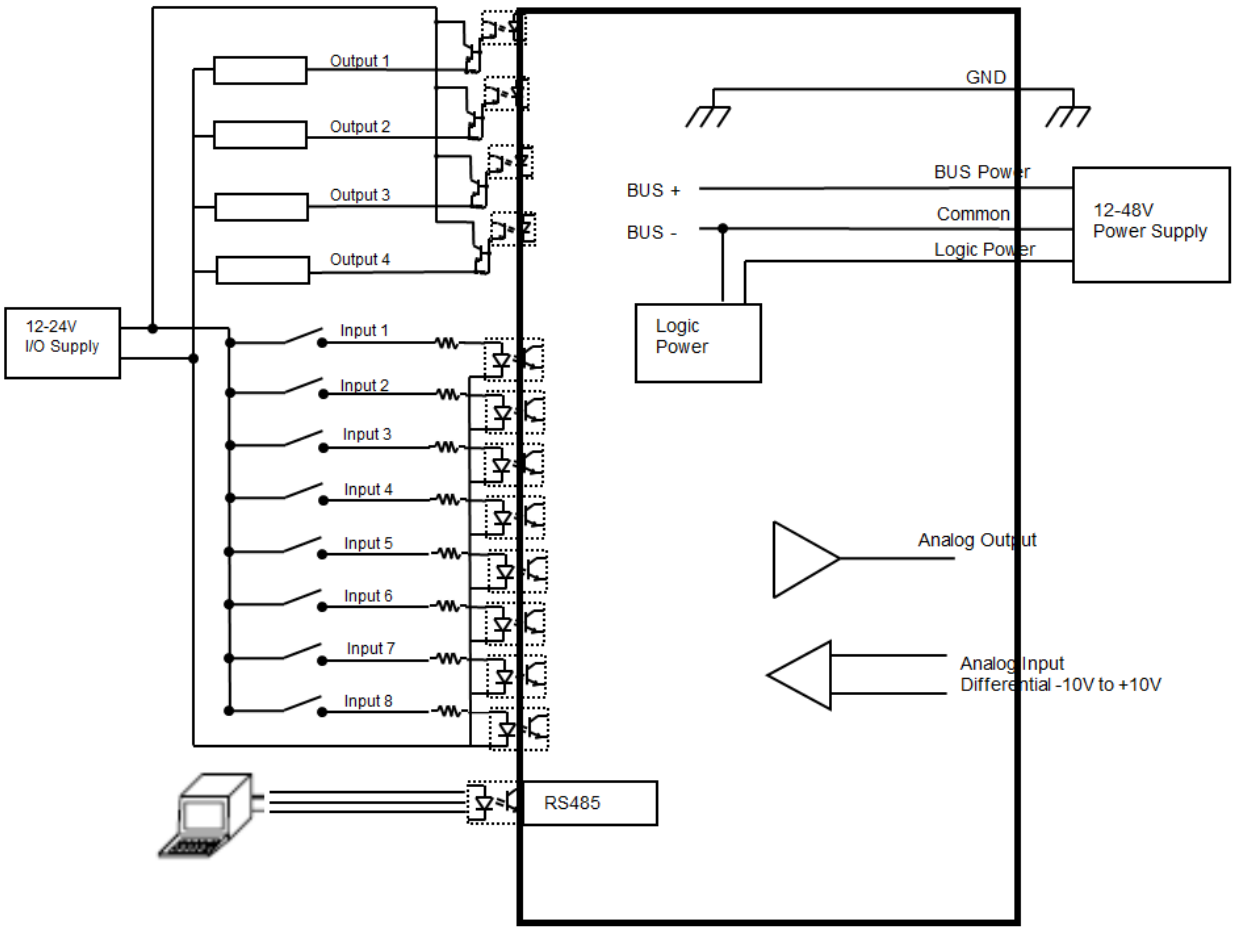
Excessive side load on the output rod of the actuator will dramatically reduce the life of the actuator and should be avoided completely. Side load can be caused from misalignment or loading that is not in line with the actuator output rod.

Care should be taken not to exceed the physical travel limits of TDM Series 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.

Electrical Installation

Introduction

All of the required power components and motion processor are contained in the actuator or drive housing.



Main Power Supply Selection

The Tritex actuator requires DC power from a power supply or batteries. The actuator will operate on voltages from 12-48V DC nominal. The continuous operating range is 10-53V DC. If the bus voltage rises above 85 V DC a High Bus Fault will occur and the drive will disable. The voltage threshold may be set lower through a user parameter where appropriate to protect a power supply from overvoltage during regen. The power supply output current rating depends on the maximum actuator power required for the installation.

A 48V supply will allow the motor to deliver maximum rated speed, (specifications in Overview section) a 24V supply will allow the motor to deliver ½ the maximum rated speed, and a 12V Supply will allow the motor to deliver ¼ the maximum rated speed.

Power supply selection and connection is complicated by three factors associated with variable speed servo drives: high peak loads, power regeneration (regen) and switching frequency ripple current. Peak loads and regen will depend on the application. Ripple current can adversely affect some power supplies.

NOTE:
This section does not pertain to an I/O or Holding Brake Power Supply. The I/O supplies have different limits and it is often inappropriate to use the same supply for all. See section on I/O Supply.

Power supply sizing for motion is based mainly on maximum mechanical power delivered to the load, which is force times velocity for linear or torque times angular velocity for rotary. The power supply has to provide this power which is rated voltage times maximum current plus about 20% to cover losses.

Either regulated or unregulated power supplies can be used for the bus and logic power. Different considerations pertain to each type, and each has advantages and disadvantages.

Exlar™ offers a 48V unregulated supply rated at 10 amps continuous output, TTPS1048 (see Accessories section). It can deliver about 450W continuous output power. Due to its higher output voltage at light load, it may be necessary to connect to a higher voltage tap, such as the 132V tap for 120V operation. This supply requires an external fuse in the AC input.

Un-regulated AC/DC Power Supplies

Tritex II DC operates well from a transformer isolated, un-regulated DC power supply. This type of supply should be sized and connected such that the maximum output voltage under high-line and light-load conditions does not exceed the drive maximum voltage rating, 48V + 10%. For instance, when using the TTPS1048 power supply, if the line voltage ever rises above 120V AC, the supply should be connected for 132V AC operation to lower the output voltage by 9%.

Un-regulated supplies have the advantage of being able to supply peak currents without overloading and will not trip on high voltage. Un-regulated supplies have larger capacitance at the output, especially when compared to regulated switching supplies, providing greater energy recovery and storage during regen and tolerating high ripple current. See section on regen for more information on handling energy from regeneration. They have the disadvantage of output voltage droop as the current rises.

Un-regulated supplies are usually rated only by continuous output current. For a very short time, not exceeding 1 second, they can typically output up to 200% of continuous current. Voltage droop may be significant above continuous voltage rating, which can reduce maximum speed. One sizing technique is to calculate the required average power over the worst 5 second interval in a machine cycle, add 20% and use that to the determine continuous rated output power for an un-regulated supply.

Regulated AC/DC Power Supplies

Most AC/DC power supplies available today are regulated switching power supplies. They are generally not designed to directly power brushless DC (BLDC) drives, but can do so with special consideration for the load that BLDC drives present to the supply and the overload characteristics of the power supply. These supplies provide very good output voltage regulation as well as high efficiency and smaller size and weight compared with unregulated linear supplies.

Due to overcurrent protection, regulated supplies must generally be rated for the peak power required by the drive. Because the supplies limit output current, fuses between power supply and drive may not be able to interrupt fault current to the drive. The power supply must have output current foldback and / or output cycling on overload. Foldback is where the output current limit is reduced more or less proportionally with the output voltage. Output cycling removes all output power on overload and waits a few seconds before attempting to restore power, limiting average power during faults. Fuses can still be very useful in isolating a fault when a large power supply is used to power several loads. Where conditions of use by an approval agency require fuse protection, the fuses must be installed even if they would not immediately clear a fault.

CAUTION:
During deceleration of the load the energy generated from the motor and the load will increase the bus voltage and could possibly damage the output of a regulated power supply. If a regulated power supply is used for bus power, a blocking diode should be installed to protect the power supply. See Power Supply Wiring Diagrams section below.

Regenerative energy due to deceleration, spring action, or gravity on the mechanical load will increase bus voltage and attempt to drive energy backward into a power supply. Regulated supplies may trip on overvoltage or recover slowly after being out of regulaton causing a dip in output voltage at the end of a regen event. It may be necessary to use a blocking diode to allow the bus voltage at the drive to rise above normal supply voltage without any reverse current. Exlar™ offers a Power Distribution and Surge Filter assembly that includes a blocking diode, TDCESF1 (see Accessories section). See the section below on Handling Regen Energy.

Another aspect of BLDC drive loads is that it tends to take pulses of current at twice internal switching frequency creating high ripple current. Some regulated supplies may not be able to tolerate high ripple current, depending on the final filter capacitors. The Power Distribution and Surge Filter assembly includes a small inductor that reduces ripple current. The blocking diode (if used) also reduces ripple current. Power wiring or power cables more than 30 ft (10 m) long provide enough impedance to reduce ripple current as well. Contact Exlar applications support for additional information.

Power from Battery Systems

Tritex II DC is designed to be powered directly from 12V and 24V lead-acid batteries in vehicles. Regen energy and ripple current are not generally of concern with battery applications of this type. Battery systems generally will be able to supply peak power to the actuator. The average power may be a consideration in sizing the charging circuits for the battery system. Other battery powered applications are possible, but would require additional engineering considerations.

The product has not been tested for immunity to “load dump” conditions. An external voltage clamp designed specifically for load dump protection may be necessary on 24V systems.

Handling Regen Energy – Internal Shunt Resistor and Regulator

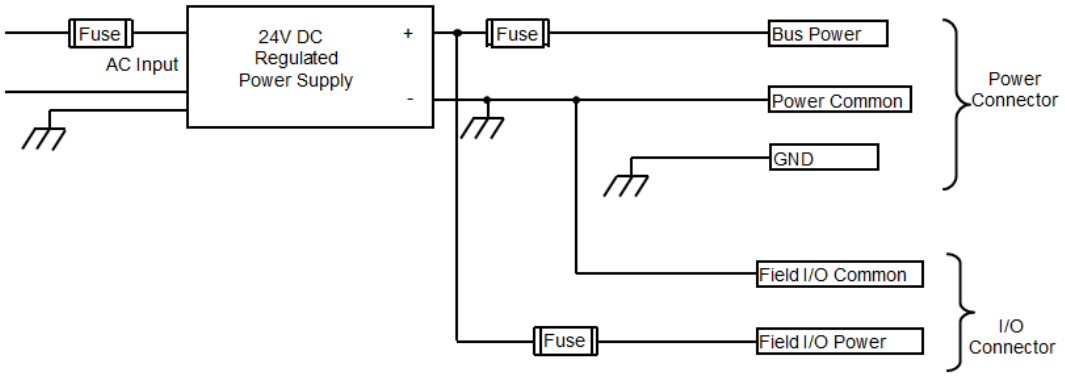
Tritex II DC has a built in controller and small internal shunt resistor that can handle up to 10 joules of energy at a time as long as average power does not exceed 8W. Though not high capacity, it is adequate to handle the inertia for many linear and geared applications and for some low-inertia rotary applications. It is usually inadequate to handle energy from a vertical load or spring return. The controller will turn off the shunt upon reaching either energy or power limits. If there is more regen energy, the bus voltage will rise, resulting in a high bus fault.

NOTE:
A poorly tuned system may have some oscillation that results in the bus voltage pumping up and down enough to turn on the shunt. This reduces the available capacity for handling expected energy from deceleration. Likewise, if an overly aggressive move profile results in significant following error, there can be velocity overshoot followed by deceleration that causes unnecessary regen energy to reach the internal shunt resistor.

As shipped from the factory the internal regulator is set to a value to protect the Tritex from an overvoltage fault condition (85 V). this parameter will not require adjustment as long as the power supply can be back-driven to 85 V like most unregulated 48 V supplies, or can handle all the regen energy like most battery applications, or is isolated with a blocking diode. For other applications, the built in regulator can be adjusted to restrict bus voltage to a level that will protect the power supply from regen energy. Set the User Overvoltage Fault Limit Parameter found in Expert software on the System Set-up page / Limits tab to a value that the power supply can tolerate. The Tritex shunt regulator will operate at 90% of the User Overvoltage Fault Limit value. The drive will trip with a High Bus Voltage fault at the User Overvoltage Fault Limit value or at 85 V, whichever is lower. The default setting of 0 is a special case that means the factory parameter values of 85 V for trip and 76.5 V for shunt operation will be used.

In the example below a single 24 volt supply is used to power bus, logic and Field I/O, the logic power is derived internally from the bus power, the 24 volt regulated supply will keep the I/O voltage under the 30 volt limit.

NOTE:
There is no external diode, isolating the power supply from the Bus voltage. For this example, set the User Overvoltage Fault Limit to 33 V. The Tritex™ shunt regulator will attempt to limit the Bus Voltage to 30 volts (90% of 33 V) to protect the power supply from overvoltage faults & shutdowns and the I/O from overvoltage. If the regen energy is too large, the shunt regulator will turn off to protect itself and a high bus voltage fault will occur at 33 V, disabling the drive and protecting the power supply and I/O circuits.



Un-regulated supplies often have very large capacitors that can store regen energy if allowed to be back driven. This characteristic can be used in conjunction with the internal shunt resistor and regulator. The shunt operating point is set to the working voltage of the capacitors. Regen energy is stored in the capacitor until its voltage rises to the shunt operating point. Then the internal shunt accepts up to 10 J of additional energy.

Handling Regen Energy – External Shunt Resistor and Regulator
For applications lowering vertical loads or decelerating a large inertia or working to hold back some force, regen energy will exceed the ability of the internal shunt resistor and power supply to dissipate or store it. The TTSR1 Shunt Regulator can handle at least two hundred joules of energy at up to 95 Watt average power. It has a fixed operating voltage of 77V, so the power supply must be able to be back driven to more than this voltage or a blocking diode is required. The TDCESF1Power Distribution and Surge Filter accessory may be used to simplify wiring when an external shunt regulator is used with single or multiple Tritex™ II DC.

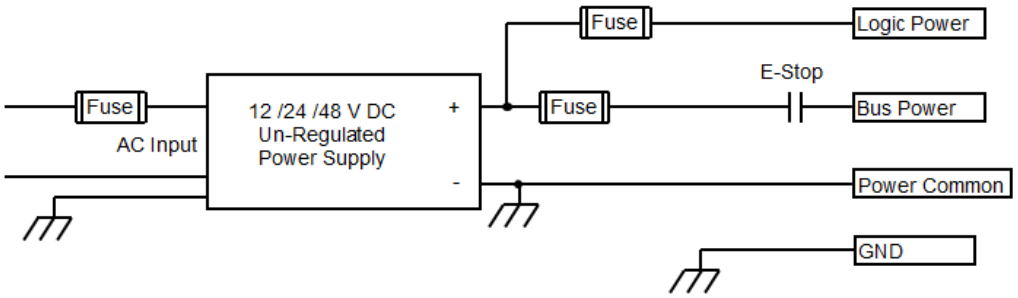
Logic Power Supply

A logic power supply can be used to maintain the control and position information with bus power removed. This power supply is optional and requires about 2 watts of power. It is wired to the Logic Power terminal (+) and Power Common terminal (-). if it is not connected the logic power will come the bus power.

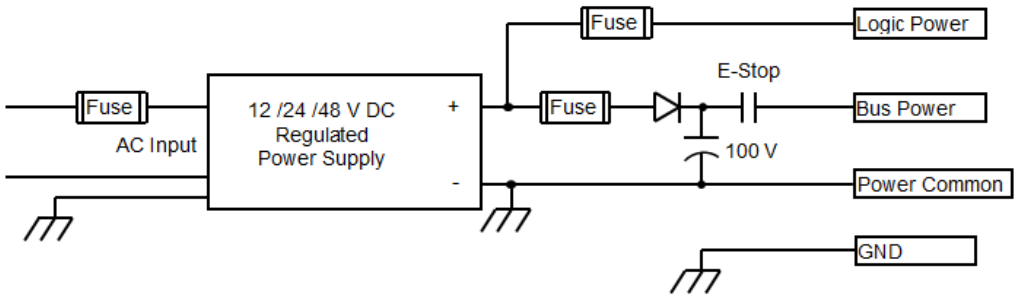
NOTE:
That the main power and logic power share a return path. Logic Power can be the same wide range as the main power supply, 12 V, 24 V, or 48 V nominal, and can handle the regen voltages that appear on the main supply. A single supply may be used for both with a relay contact in series with the main supply positive connection to remove bus power.

Power Supply Wiring Diagrams

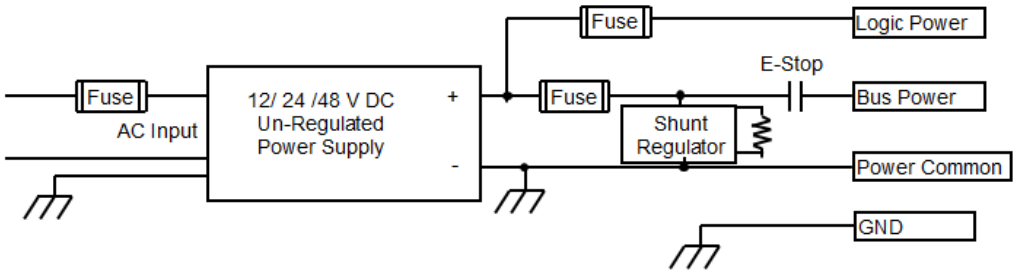
WARNING:
All installations should provide a method of removing bus power during an emergency stop condition. The actuator enable function should not be relied on for this function when equipment or personnel safety is required. Disconnect only the + bus power, do not disconnect the – bus power.



Un-Regulated Power Supply for Logic and Bus power



Regulated Power Supply for logic and Bus power, with diode isolation and optional extra capacitance



Un-Regulated Power Supply for Logic and Bus power, with a shunt regulator such as Exlar TTSR1

CAUTION:
Reversing polarity of the Bus Power (+) and Power Common (-) will cause a short circuit, which must be protected by the input fuse. See fusing below If a fuse is not installed the drive could be permanently damaged.

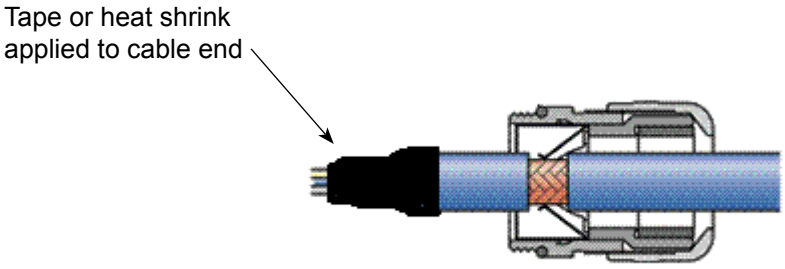
Power Supply Wiring and Fusing		
	Fuse	**Wire**
Bus Power	20 amp 125 V DC Bussmann type ABC or Similar	12 guage (4 mm²)
Logic Power	2 amp 125 V DC Bussmann type ABC or Similar	18 guage (1,5 mm²)

12 gauge wire is recommended for bus power to reduce voltage drop across the wire during peak power demands. If the application does not require high peak or continuous power, the wire gauge can be reduced, with a corresponding reduction in fuse rating.

WARNING:
If the wire gauge for bus power is reduced the fuse Amp rating must also be reduced in accordance with wire size, type and local regulations.

Shielding

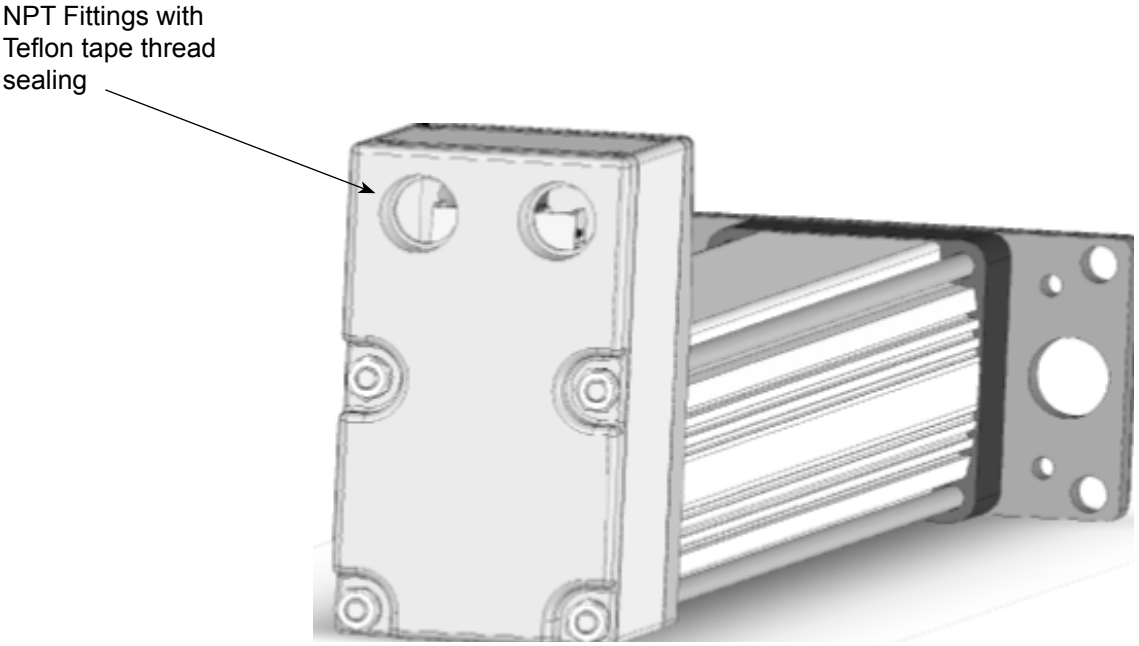
For best EMC practices the power and I/O cable shields should be connected to the enclosure at the entry / exit point. This is most easily accomplished with EMC type cable glands.



CAUTION:
Always apply tape or heat shrink to the end of the shield to prevent stands of the braided shield from breaking off and shorting internal electronics

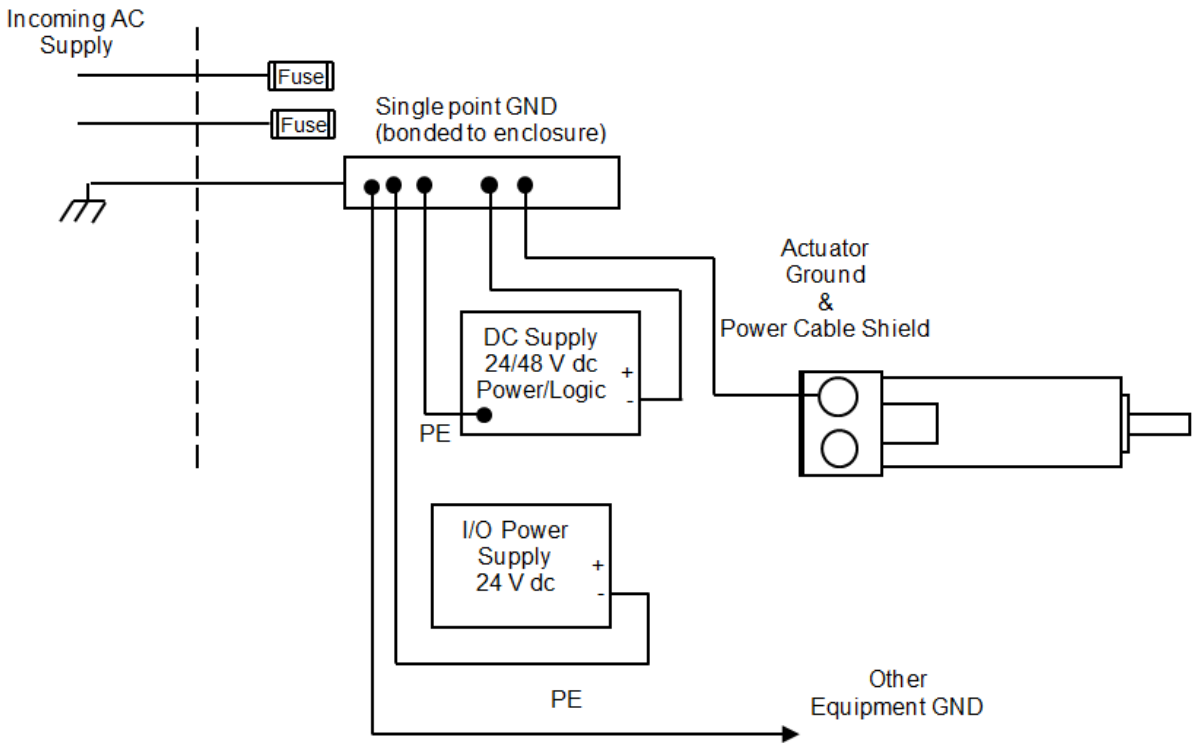
NPT Connections

When the connector option “N” is selected the Power and I/O wiring access holes are machined for ½ inch NPT fittings. Teflon tape or the equivalent must be used to seal the NPT thread connections. .



Grounding

WARNING:
The actuator and all power supply PEs and negative connections must be properly grounded using a single point grounding method.



Grounding Diagram

Power Supply Connections

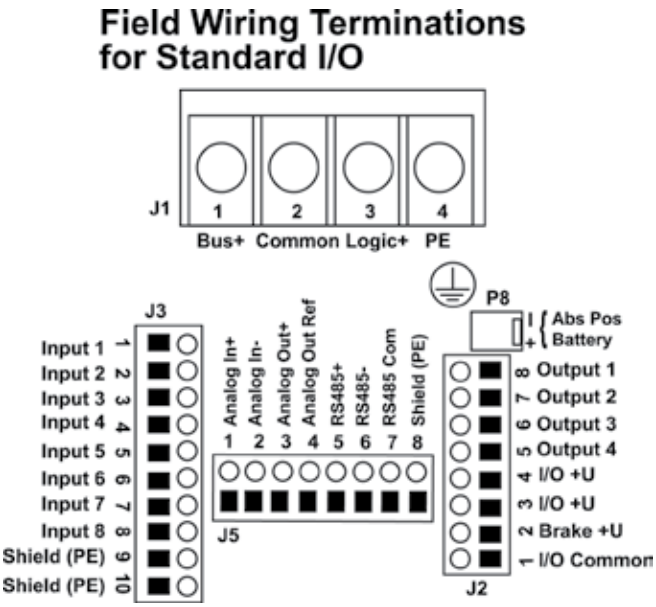
The actuator and all power supply PEs and negative connections must be properly grounded using a single point grounding method.

Signal	Terminal Label for “N” or “G”	Minimum Wire AWG
Bus Power (+) 12-48V dc	Bus +	12
Power Common (-)	COMMON	12
Logic Power (+) 12-48V dc	LOGIC +	18
PE (GND)	PE	12

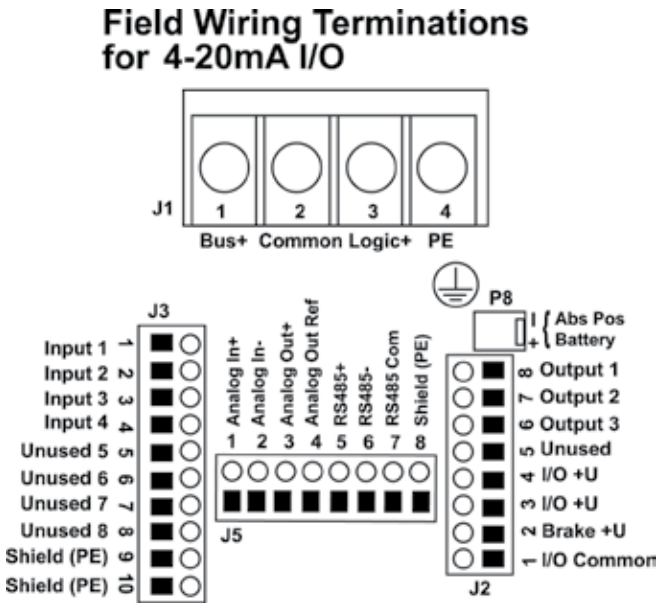
Tritex Input and Output Wiring

Input / Output Connections					
J3 Terminal #	**Function**	**J2 Terminal #**	**Function**	**J5 Terminal #**	**Function**
1	INPUT 1	1	Field I/O Com.	1	*Analog IN +
2	INPUT 1	2	Brake Power +	2	*Analog IN -
3	INPUT 1	3	Brake Power +	3	*Analog OUT
4	INPUT 1	4	Field I/O Power	4	*Analog REF
5	*INPUT 1	5	*Out 4	5	RS485 +
6	*INPUT 1	6	Out 3	6	RS485 -
7	*INPUT 1	7	Out 2	7	RS485 COM
8	*INPUT 1	8	Out 1	8	PE
9	PE	Pin header P8 used for Absolute Position Battery Connector.			
10	PE				

* For the IA4 4-20 mA option Inputs 5, 6, 7 & 8 and Output 4 are removed. The analog voltage input and output are replaced with 4-20 mA input and output.



SIO and Ethernet Option

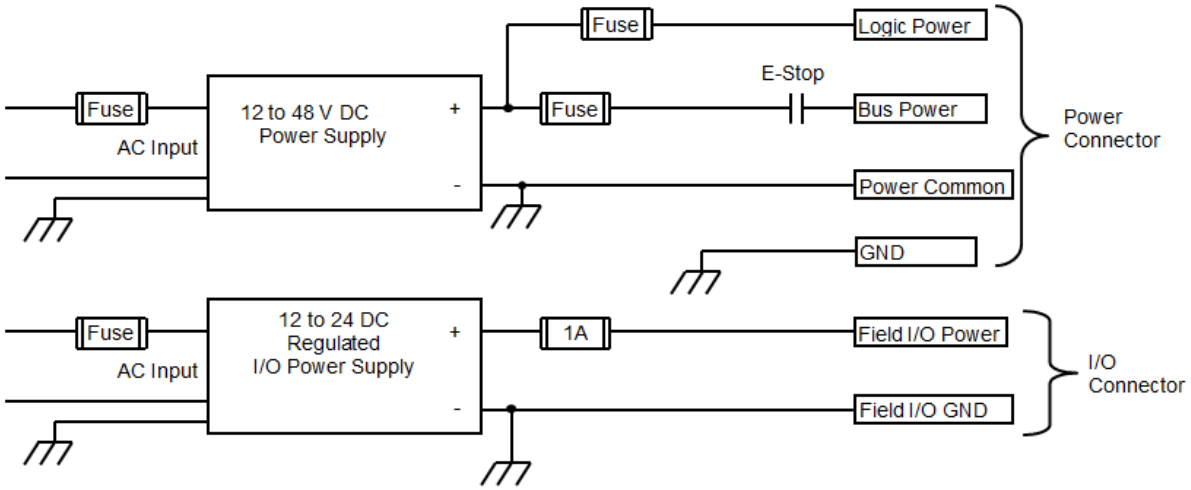


4-20 mA Option

I/O Power Supply

The digital inputs and outputs are optically isolated from the other power supplies. If it is desired to maintain this isolation, a separate power supply must be used with an output within the range of
10 V to 30 V DC.

Two Power Supply Configuration

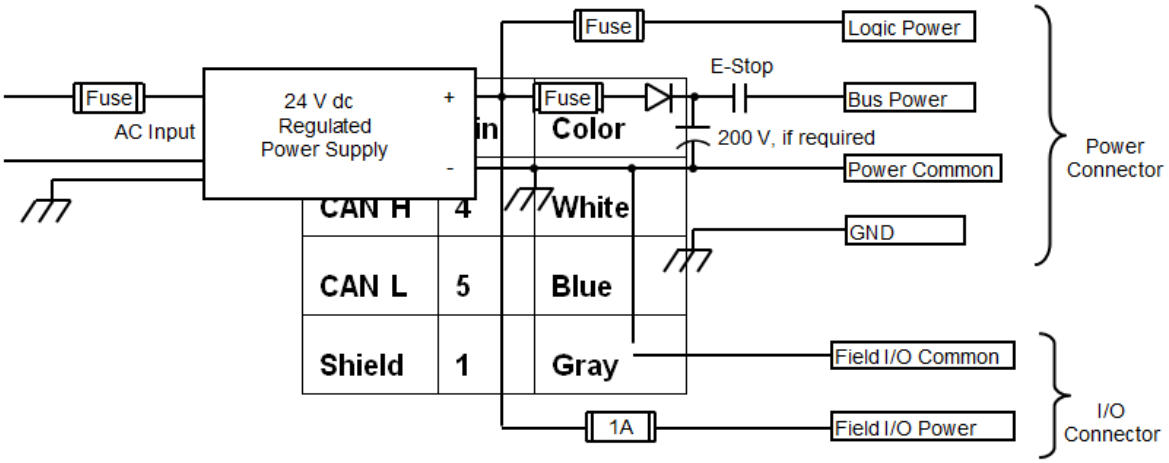


Two Power Supply Configuration, Maintaining I/O Isolation

Single Power Supply Configuration

For applications not requiring I/O isolation a single power supply can be used; however, the supply must be a regulated to 30 V or less.

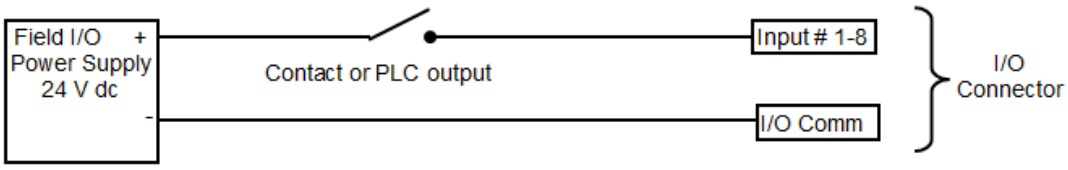
CAUTION:
The single power supply configuration cannot be used when bus power supply is greater than 30V. When a single power supply configuration is used for bus power and I/O power a blocking diode must be added to prevent the I/O voltage from rising above 30 V due to regen energy.



Single Power Supply Configuration

Digital Inputs

Tritex digital inputs are optically isolated from drive main power, but have a common negative side. SIO and Ethernet options have 8 inputs, the IA4 option has 4 inputs. They require a positive voltage to turn on, so are compatible with sourcing outputs only. Each input can be assigned to any of the internal input functions (see software section).



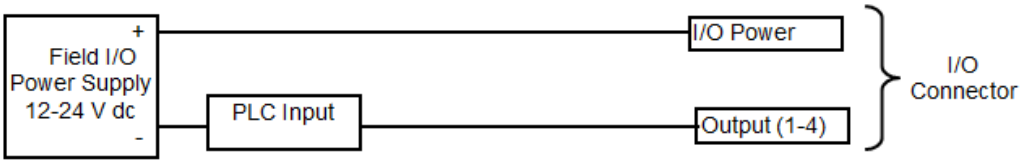
Input Wiring (External)

Digital Input Specification	
Description	**Specification**
Input Voltage Range	0-30 V DC
On State Voltage Range	8-30 V DC
Off State Voltage Range	0-5 V DC
On State Current	
10V (min)	3.3 mA
24V (min)	5.0 mA
30V (min)	5.7 mA
Nominal Impedance (24V)	4.8 kΩ
Off State Current (Max)	2.0 mA
Update Rate	1 ms (Typical)

Digital Outputs

The Tritex digital outputs are optically isolated from drive main power, but have a common positive side. SIO and Ethernet options have four outputs, the IA4 option has three outputs.. These outputs are sourcing only, they provide a positive voltage when on. The outputs have short circuit and thermal protection, and protection against inductive kick at turn-off. Each output can be assigned to any of the internal output functions (see software manual).

CAUTION:
Each output is rated to continuously drive a 100 mA load and is short protected at 500 mA with automatic reset after the short fault is removed.



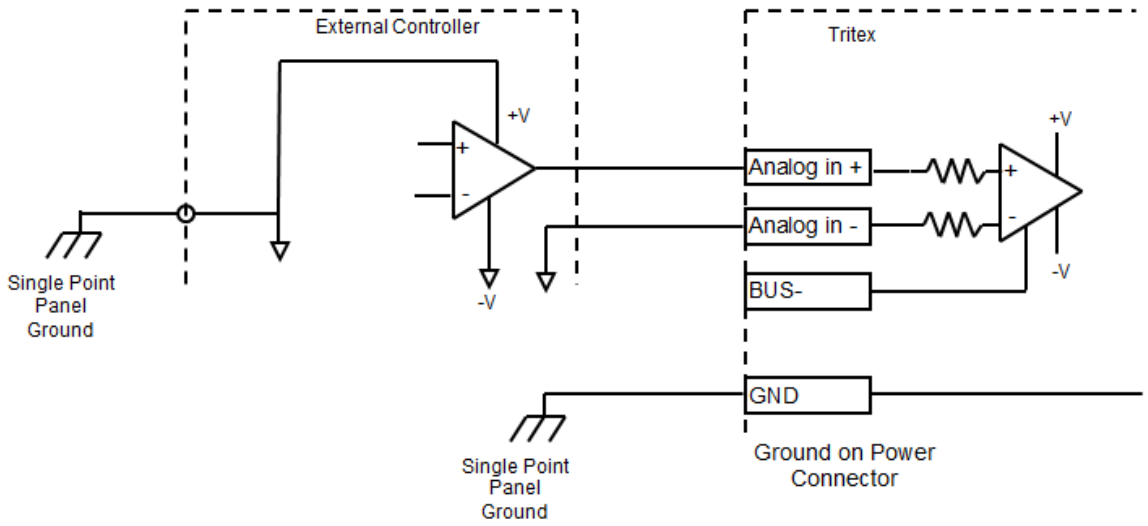
External Wiring of Outputs for Connection to PLC or Any Load.

Digital Output Specification	
Description	**Specification**
Operating Voltage Range	0 to 30 V DC
On State Maximum Continuous Current	100 mA
On State Voltage Drop (@ 50 mA)	.5V Typical
Short Circuit Protection (Auto Reset)	.5 A
Update Rate	1 ms

Analog Input

An analog input is provided for use as a position, velocity or current command.
Differential input range is -10 V to +10 V. Input range on Analog IN+ is -15 V to +15 V with respect to I/O Common. Input range of Analog IN- is -15 V to +12 V with respect to I/O Common. Due to voltage drop in the wiring to BUS-, the analog signal must be wired differentially with a return wire to the analog signal source.

(See software section for configuration of the analog input and analog positioning parameters.)



Analog Input Wiring From Voltage or Current Control External Controller

NOTE:
Analog input reference from an external controller must be referenced to single point ground to prevent damage to the analog input circuit.

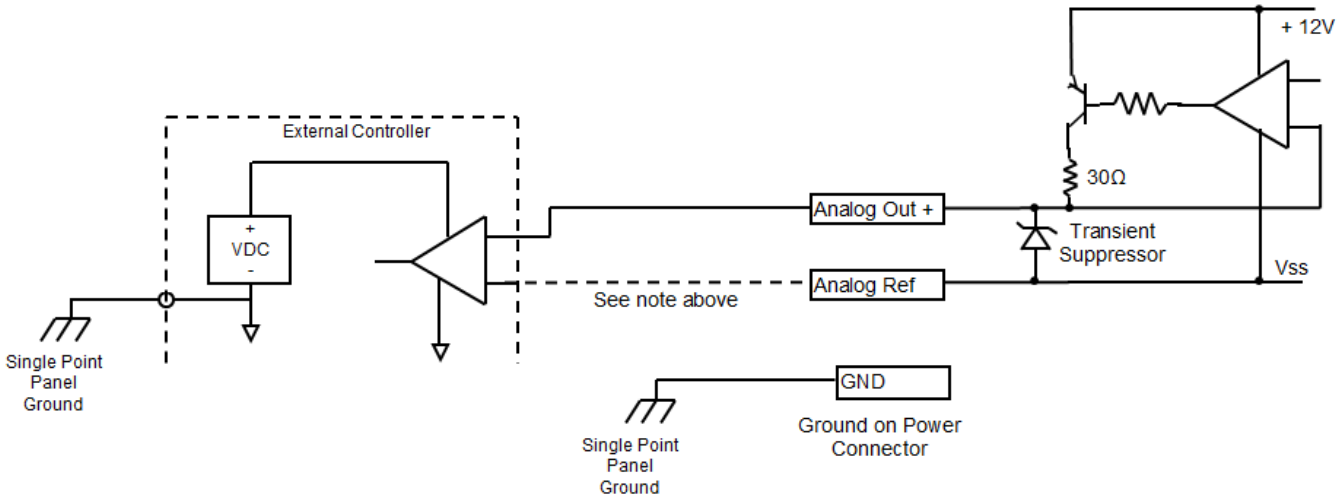
Analog Input Specifications	
Description	**Specification**
Voltage Input Range	-10 V to +10 V
Input Impedance	100 kΩ
Input Resolution	13 Bits Overfull -10 V to +10 V Range
Update Rate	0.5 ms

Analog Output

A 0-10 V analog output is provided. The function of this output is programmable. It can be used for position, velocity or current monitoring.

The intent of this output is to provide a “monitor” type value not a “control” value, meaning the performance is not intended for the user to close a high speed position loop around this signal.

The Analog Reference terminal should only be connected when used with an isolated or differential input.
DO NOT CONNECT TO A GROUNDED POINT EXTERNALLY!



Analog Current Output Specifications	
Description	**Specification**
Current Output Range	0 - 10 V
Load Range	20 kΩ min
Output Resolution	11 Bits

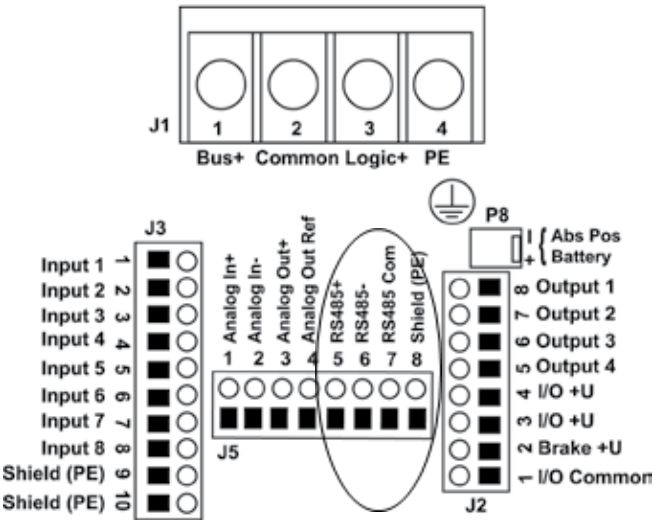
Communications

Serial communication to the actuator is provided through the 8 mm communication connector on the front of the actuator and also via terminal connection on J5 under the access cover on 75 mm model. The serial interface is two wire opto-isolated RS485 network. The actuator supports the Modbus RTU protocol for access to all drive parameters (see Modbus Parameter Reference). The Default baud rate is 19.2k. The default Modbus address is 1.

8mm Communications
Connector

Front View

Field Wiring Terminations for Standard I/O

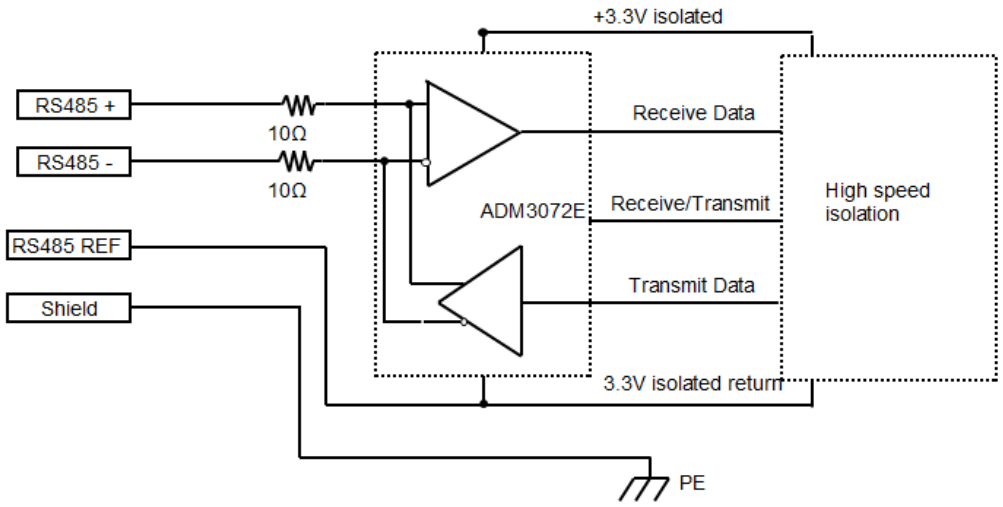


Optional RS 485 Field Wiring For 75 mm

Function	8mm Pin #	Wire Color For TTCOM	J5 Terminal #
485+	1	Brown	5
485-	3	Blue	6
485 COM	4	Black	7
Shield	2	Drain	8

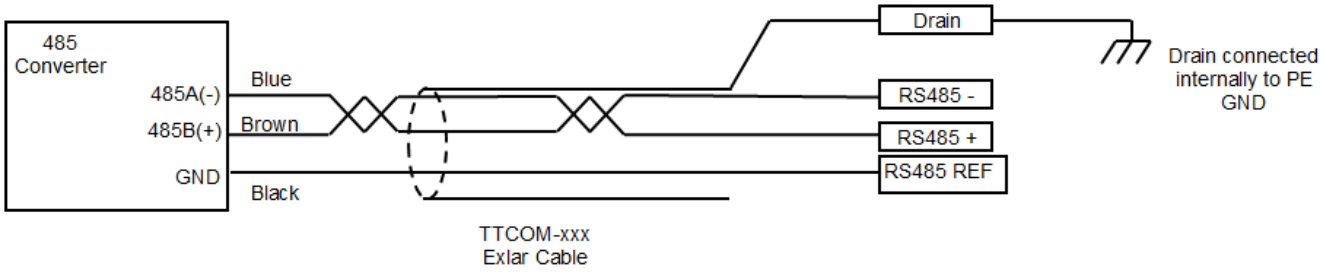
PC Communications

When using the Expert software for set-up and diagnostics an RS485 converter will be required to interface between one of the PC communication ports and the RS485. This can be either a USB to 485 converter, such as the Kimray KSET49795 or KSET49796 or any other standard 485 converter.



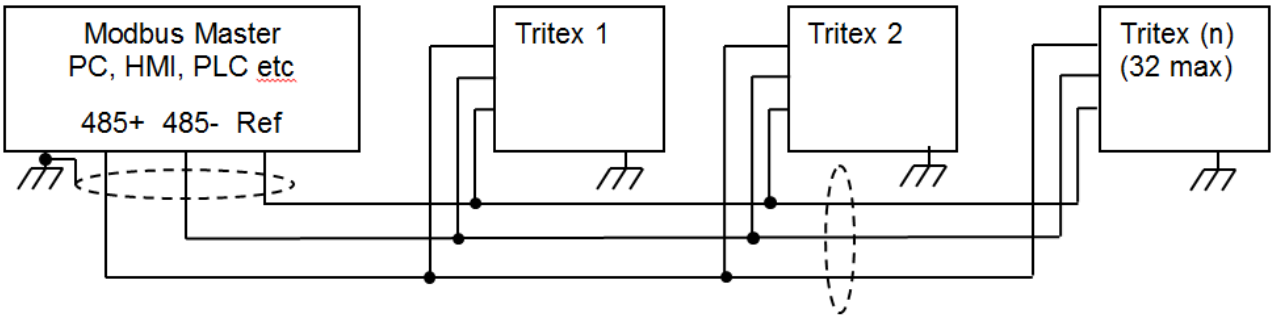
Internal RS 485 Circuit

CAUTION:
It is important that the RS485 REF is connected to the circuit common of the converter RS485 output. Failure to connect could cause damage to the drive, the converter or the PC port.



Typical RS485 Connection to External Converter

Connecting Multiple Tritex Actuators to a Modbus Master Host



Important Considerations

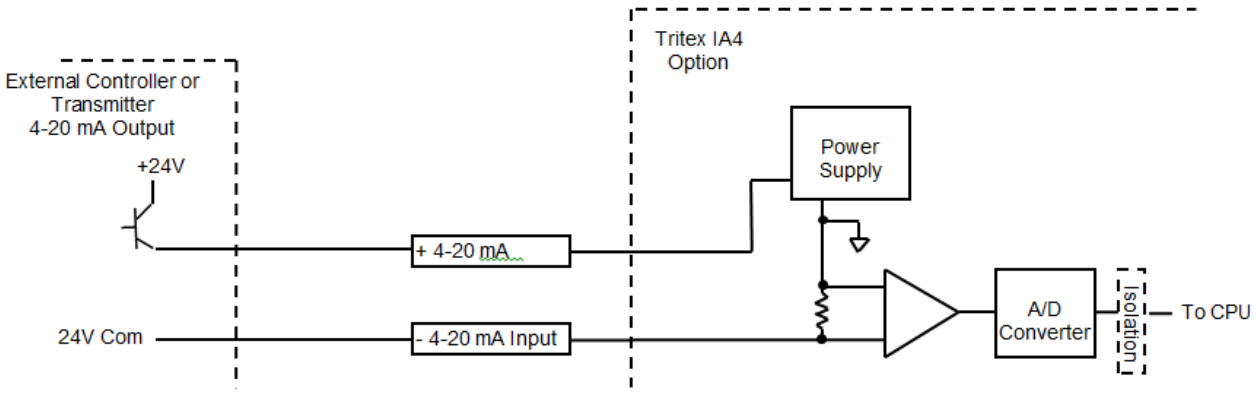
- Always use 3 conductors, RS485 +, RS485 – and Reference.
- A twisted pair for 485+ and 485- is preferred.
- RS485 is a “multi-drop” network as opposed to a “star”, therefore keep the drop (stub) to each actuator as short as possible. When using the 8 mm connector use a T connector, such as the Exlar™ PN TT458SP.
- A termination resistor is not usually required.

IA4 Option Board Connections
4-20 mA Isolated I/O, IA4 Option

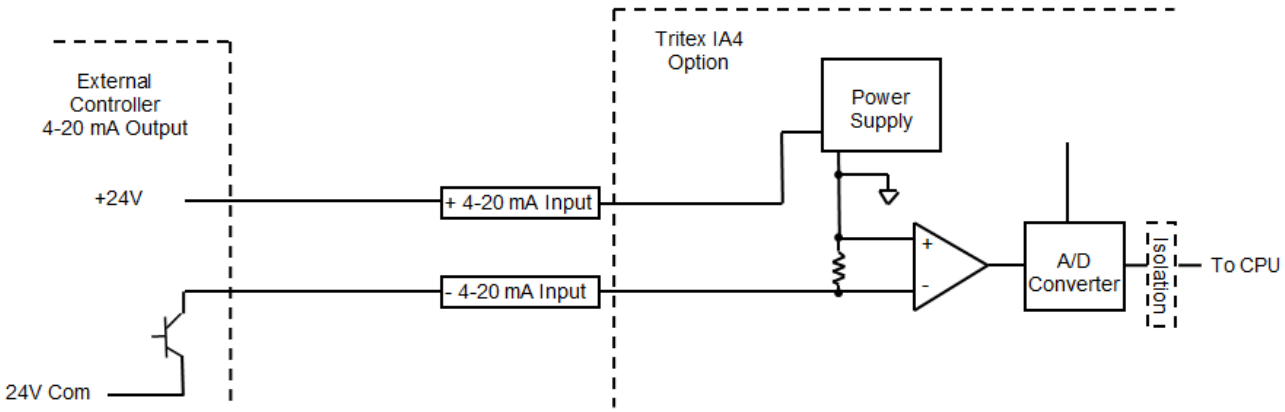
The IA4 option board replaces the standard I/O board and provides one 4-20 mA isolated analog input and one 4-20 mA isolated analog output; these I/O circuits are isolated from each other as well as all other actuator I/O, grounds and commons. The IA4 option also includes four isolated digital inputs and three isolated digital outputs; this is a reduction from the eight inputs and four outputs available on the standard I/O board.

The 4-20 mA input is a two wire circuit. A small amount of power from 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 3 mA. When the 4-20 mA loop is unpowered, the software reads an off-scale high value that should be configured to indicate a “Loss of Signal” condition.

4-20 mA input connection



Connection to High Side Controller



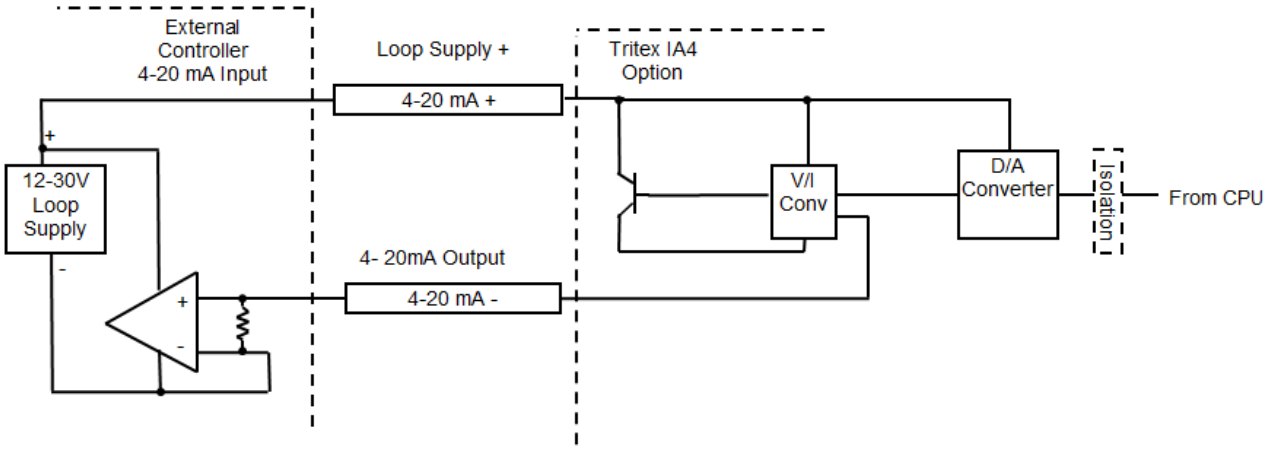
Connection to Low Side Controller

4-20 mA Input Specifications	
Description	**Specification**
Input Range	2 mA to 22 mA (Loss of Signal Condition < 2.0 mA)
Voltage Drop @ 20 mA	11V Typ.
Input Resolution	> 14 Bits over 4-20 mA Range
Update Rate	0.5 ms

4-20 mA Output

The 4-20 mA output is a two wire circuit; it requires an external loop supply of 12 to 30 V DC to generate the isolated supply voltages needed. The Tritex circuit requires 8V to operate; therefore the max impedance the output can drive is dependent on the loop supply voltage. If the drive is powered down, the output goes to an off-scale low output approximately 2 mA.

Loop Supply Voltage	Maximum Impedance @ 20 mA	Minimum Impedance @ 20 mA
12V	200 Ω	200 Ω
15V	350 Ω	200 Ω
24V	800 Ω	200 Ω
30V	1100 Ω	200 Ω



4-20 mA Output Connection

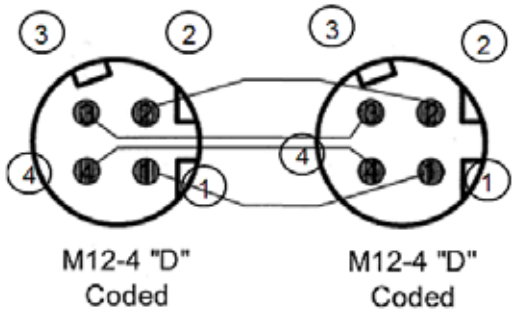
4-20 mA Output Specifications	
Description	**Specification**
Output Current Range	3 - 21 mA
Load Range	200 to 1100 Ω (See table above)
Output Resolution	12 Bits
Update Rate	0.5 ms

Ethernet Options, EIP,TCP or ProfiNet

The Ethernet Option provides an Ethernet rated M12 connector for connection to the Network at the rear of the actuator. An IP 67 4-pole M12 D coded connector is used, this type of connector must only be used with two pair cables. When the Ethernet connection is made via an Ethernet switch or hub, a straight though cable set must be used. If there is a single node connection direct from the Ethernet PC/PLC to the Tritex then a crossover cable may be required. Some PC Ethernet cards have capability to detect a crossover connection. See Expert™ Software section for setup of Tritex Ethernet parameters.

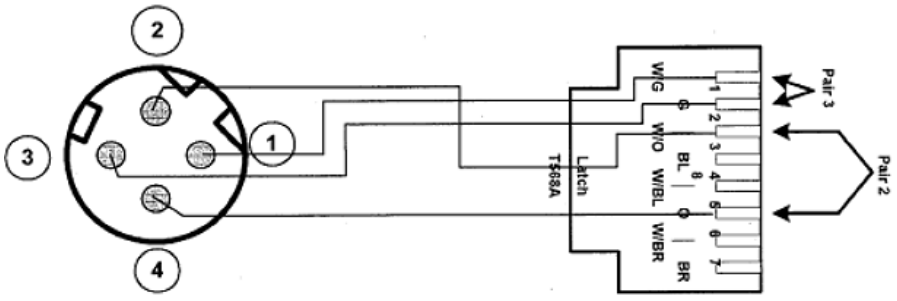
Cord Sets

Pin	Signal Name	
12 V	Transmit + (TX+)	Pair
15 V	Transmit - (TX-)	
24 V	Receive + (RX+)	Pair
30 V	Receive - (RX-)	



M12 D Coded Straight Through Cord Set

8-Way Modular	4M12	Signal	
1	1	TX+	Pair
3	2	TX-	
2	3	RX+	Pair
6	4	RX-	



Conversion From M12 D Coded to 8 Way Modular Straight Through Cord Set

Shielded or Unshielded Cables

The Tritex can be used with either shielded or un-shielded Ethernet cables. If a shielded cable is used it is important that the shield is not connected at the Tritex M12 end of the cable. Off the shelf shielded Ethernet cables with M12 connectors usually connect the shield through the M12 connector coupling nut, be sure the shield is not connected to the Tritex end of the coupling nut. The Tritex M12 connector is in direct contact with the enclosure which is connected directly to PE. Typically the shield should be connected to PE at the switch or hub end only. Connecting the shield at both ends can cause ground loop noise on the shield which can degrade communication performance.

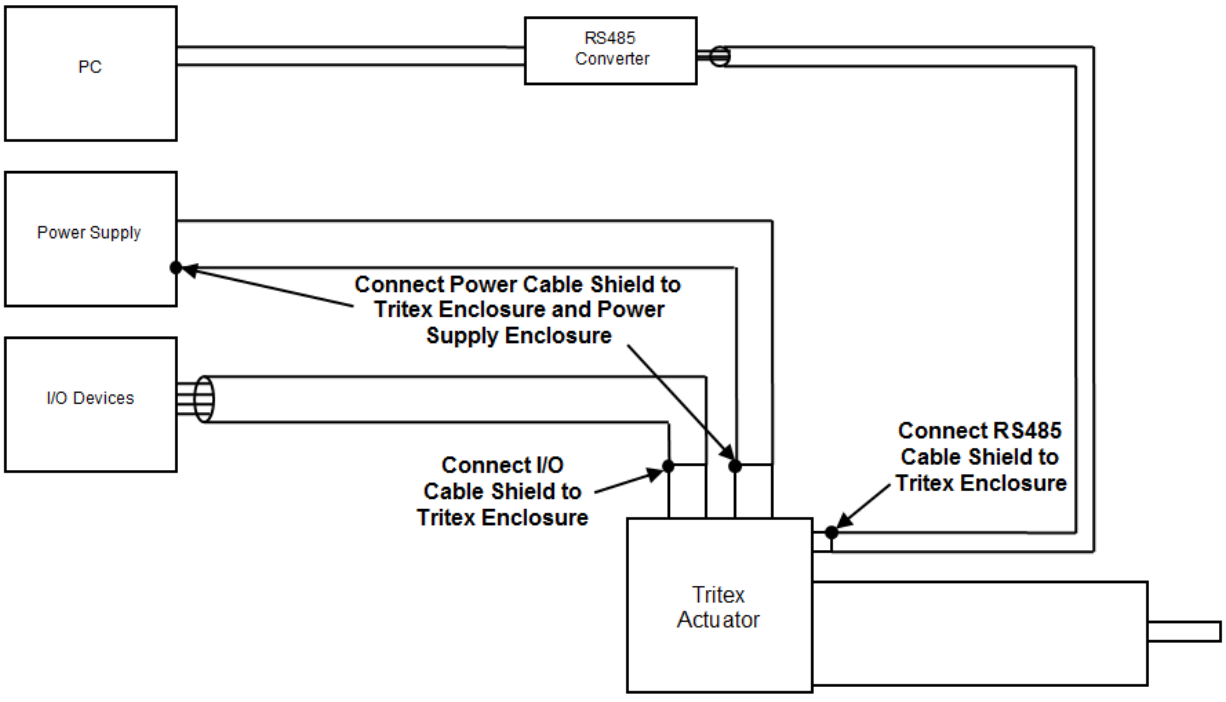
For more details on the installation of an Industrial Ethernet network download the EtherNet/IP Media Planning and Installation Manual, found in the EtherNetIP library at www.ODVA.org

EMC Considerations

Tritex actuators are designed not to create or be affected by electromagnetic interference in most applications. Under extreme conditions there may be unwanted electromagnetic interaction between the Tritex actuator and other equipment. It is the responsibility of the installer to ensure that the complete system meets all relevant EMC (electromagnetic compatibility) emission and immunity requirements.

Tritex Embedded drives are designed to be IEC/EN 61800-3:2004-08 compliant when using shielded cables. Some installations may require an external filter.
General EMC guidelines that should be followed when installing and designing a system include:

- House all components in conductive enclosures
- Connect components using shielded cables grounded to the component enclosures (see diagram below)
- Ground components using the single point grounding scheme described in the Grounding section of this manual
- When necessary, remove paint from mating surfaces that may prevent a good ground connection from being made
- Make ground connections as short as possible and use flat braided cable when available to create low impedance ground connections
- Keep cable runs as short as possible and power and signal cables as far apart as possible, only crossing them at right angles, as described in the Cable Routing section of this manual.



Cable Shield Grounding Example

Troubleshooting Procedures

This section provides you with guidelines and hints on troubleshooting various problems that may be encountered during installation and operation of your Tritex Series actuator.

Symptom / Trouble	Possible Cause / Trouble shooting Procedure
No response from actuator.	1. Check drive for faults that may indicate problem via I/O or Expert Software. 2. Check to insure that drive is powered and enabled. 3. Check for proper wiring.
Actuator seems to be enabled (receiving current) but is not operating or is operating erractically.	1. Drive may be improperly tuned. Check all gain settings. 2. Check for load irregularities or excess compliance.
Actuator cannot move load.	1. Load is too large for the capacity of the actuator or too much friction is present. 2. Excessive side load. 3. Misalignment of output rod to load. 4. Current limit in drive is set too low. 5. Power supply has too low of current capacity.
Actuator housing moves or vibrates when shaft is in motion	1. Check actuator mounting. Ensure that the actuator is securely mounted. 2. Drive is improperly tuned (wrong gain setting).
Output rod rotates during motion and thus does not provide proper linear motion.	1. Install Exlar™ anti-rotation assembly or incorporate anti-rotation into the application.
Actuator is overheating.	1. Insufficient cooling for application requirements. Contact Exlar engineering. 2. Ambient temperature is too high. 3. Actuator is being operated outside of continuous ratings. 4. Amplifier is poorly tuned causing excessive unnecessary current to be applied to motor. (check gain settings). 5. Over Voltage limit set too low causing internal shunt control to remain active.

Maintenance

Procedures for Roller Screw Re-Greasing

CAUTION:
If your actuator has a preloaded roller screw, do not remove it from the cylinder. Preloaded screws require special tooling and procedures for proper disassembly and reassembly. Contact Exlar Corporation to arrange for maintenance of a preloaded screw actuator.

Disassembly
Refer to the exploded view on the following page.

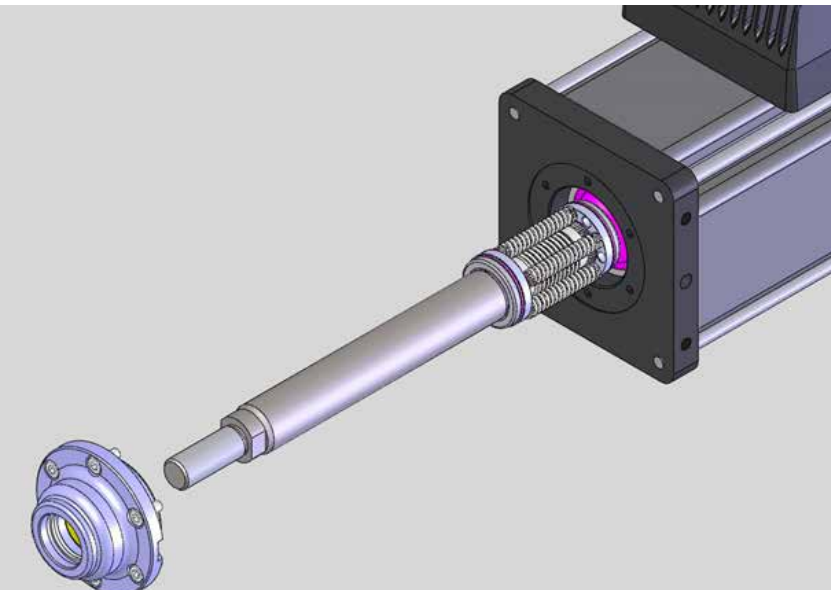
1.) Remove the actuator assembly from the machine by disconnecting the cables, main rod coupling and actuator mounting bolts or fasteners.

2.) If your unit does not have an external anti rotate assembly, skip this step. Loosen the two machine screws that clamp the anti-rotate cross member to the actuator output rod. Slide the anti-rotate mechanism forward and off the actuator.

CAUTION:
The end cap houses the Tritex drive and control. Extreme care should be taken when removing the tie rod nuts or tie rods so as not to twist or pull on the drive section of the actuator. Do not disconnect the wiring between the drive and the actuator.

3) Remove the screws holding the seal gland to the face plate. With the screws removed, pull the seal gland off. Pry spots are located on each side of the gland to aid in removal.

4.) When the seal gland is removed, the open end of the roller screw internally threaded cylinder (ITC) is visible. The roller screw can be removed by turning it counter clockwise and threading it out of the cylinder. It may be necessary to keep the roller screw cylinder from turning to remove the screw.



Lubrication Maintenance

Exlar™ recommends using Mobilith SHC 220, a high performance, extreme-pressure grease. Grease lubricated units will require periodic inspection and renewal of the roller screw grease. The table below shows the recommended grease renewal period.

RMS Rotation Speed (RPM)	Recommended Grease Renewal Period (Hours)	
	Case Temp 65°C (149°F)	Case Temp 80°C (176°F)
250	10,000	5,000
500	8,500	4,250
1000	6,000	3,000
1500	3,500	1,750

Grease Renewal

The angular contact thrust bearings located in the front of the actuator, the roller screw cylinder, and the roller screw assembly are the components that require grease. They require a coating of grease. They do not need to be packed with grease. Excess grease requires more torque from the motor when returned to operation, and does not improve the lubrication of the unit.

1.) Use a brush to work approximately 0.5 in^3 of grease for every 3 inches of stroke length into the roller screw cylinder. Be sure to cover all of the threaded areas of the cylinder.

2.) Use a brush to work grease in to the roller screw assembly. Be sure to cover all the threaded surfaces of the screw assembly. 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.

Reassembly

1.) Rethread the roller screw into the internally threaded cylinder (ITC). It is a multiple start screw, and this is not always easy. **DO NOT FORCE THE ROLLER SCREW INTO THE CYLINDER**. It is best to have the actuator vertical with 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 ITC. Slowly turn the roller screw 1/4 to 1/2 a turn counterclockwise with it in contact with the ITC. This will help to align the threads on the roller screw with the threads in the ITC. Rotate the roller screw clockwise and it should begin to thread into the cylinder. If it does not turn freely, remove it and begin again. When threading the screw into the cylinder, it will roll freely into the actuator. When it reaches the portion of the cylinder that contains the motor magnets, the roller screw 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. When it reaches the bottom, it will become difficult to turn and the motor and bearings will begin to rotate with it. The roller screw is now fully inserted into the cylinder.

2.) Place a small amount of seal lubricant on the inside surface of the seal/bushing assembly.

3.) Carefully slide the bushing/seal assembly over the actuator rod end. The seal is a tight fit on the rod end. Take care not to damage the seal on the threads of the extending rod. Standard TDM Series rods have a chamfer to provide a lead in for replacement of the seal and bushing. The mounting screws should have a low or medium strength thread locker added, such as Loctite 222MS. The mounting screws torque values are as follows.

Tritex 75: 10 in-lbs (0.83 lbf-ft, 1.13 N-m)

4.) If your actuator has an external anti-rotate mechanism, slide the rod or rods of the anti-rotate mechanism through the front flange and into the guide bushing or bushings mounted to the rear of the flange. Position the extending rod so that the wrench flats are parallel to the long side of the flange. Slide the cross member assembly of the anti-rotate mechanism over the end of the rod and onto the wrench flats. Tighten the two screws that clamp the assembly to the actuator rod.

Procedures for Complete Re-Greasing

Disassembly

Refer to the exploded view on the following page.

1.) Remove the actuator assembly from the machine by disconnecting the cables, main rod coupling and actuator mounting bolts or fasteners.

2.) If your unit does not have an external anti-rotate assembly, skip this step. Loosen the two machine screws that clamp the anti-rotate cross member to the actuator output rod. Slide the anti-rotate mechanism forward and off the actuator.

3.) Remove the rear tie rod nuts from the back of the actuator.

CAUTION:
The end cap houses the Tritex drive and control. Extreme care should be taken when removing the tie rod nuts or tie rods so as not to twist or pull on the drive section of the actuator. **DO NOT** disconnect the wiring between the drive and the actuator. **DO NOT** pinch wires when housing is reassembled.

4.) If your actuator does not have a front flange, skip this step. Slide the front flange forward and off the actuator. The tie rods will remain attached to the front flange.

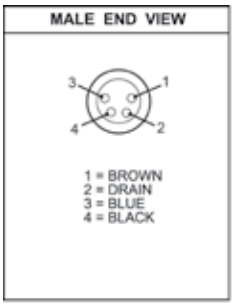
5.) When the face plate is removed, the thrust bearing and the open end of the roller screw internally threaded cylinder (ITC) are visible. The roller screw can be removed by turning it counter clockwise and threading it out of the cylinder. It may be necessary to keep the roller screw cylinder from turning to remove the screw.

Accessories

Cables

TTICO-xxx Communications Cable

Kimray Communication Cable PN's.
6ft. KSET49795
15ft. KSET49796

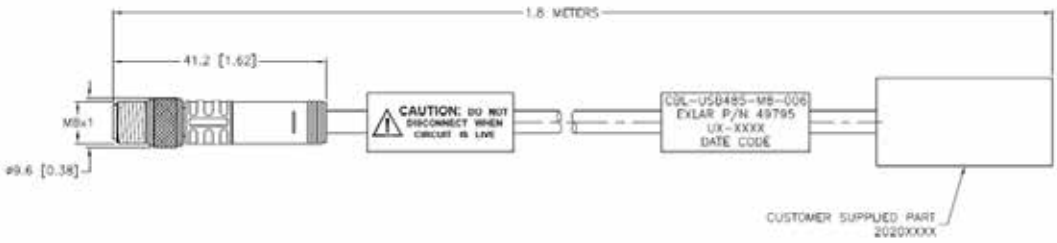


SPECIFICATIONS	
CONTACT CARRIER MATERIAL/COLOR	NYLON OR PUR/BLACK
MOLDED HEAD MATERIAL/COLOR	THERMOPLASTIC PUR/YELLOW
CONTACT MATERIAL/PLATING	BRASS/GOLD
COUPLING NUT MATERIAL/PLATING	BRASS/NICKEL
RATED CURRENT [A]	2.0 A
RATED VOLTAGE [V]	125 VAC/VDC
OUTER JACKET MATERIAL/COLOR	PUR/BLACK
CONDUCTOR INSULATION MATERIAL	PVC
NUMBER OF CONDUCTORS [AWG]	3 X 24 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 AND IEC IP67

Communication Converters

When connecting the Tritex RS485 port to PC, a communication converter will typically be required.
Kimray offers a USB to RS485 converter with an M8 connector ready to connect to the Tritex port. Kimray model # KSET49795 for 6ft. and KSET49796 for 15ft. This converter is not isolated and is not recommended for permanent installation.

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



Kimray is an ISO 9001- certified manufacturer.
Kimray quality assurance process maintains strict controls
of materials and the certification of parts used with Kimray products.

Please visit our website for up to date product data
www.Kimray.com

WHO WE ARE

Kimray designs and manufactures oil and gas control products. Based on over 65 years of pioneering product development, we provide products and services that work better, smarter and are more inventive. We generate meaningful solutions by staying curious and engaging in customers' needs. Our product ideas are fueled by a deep desire to make a difference that is both personal and unique to the customer.

We have made it our life's work to provide products and services that are positively impactful. Through the years this pursuit has built strong relationships. Our customers have known that when buying from Kimray, it's about much more than the product. The relationships between Kimray representatives and our customers extend from before the sale through the life of the product. Those relationships, along with quality Kimray products are the result of a company striving for excellence for our customers, our company and our community.

Visit Kimray.com to learn more about our company and the products we create.

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