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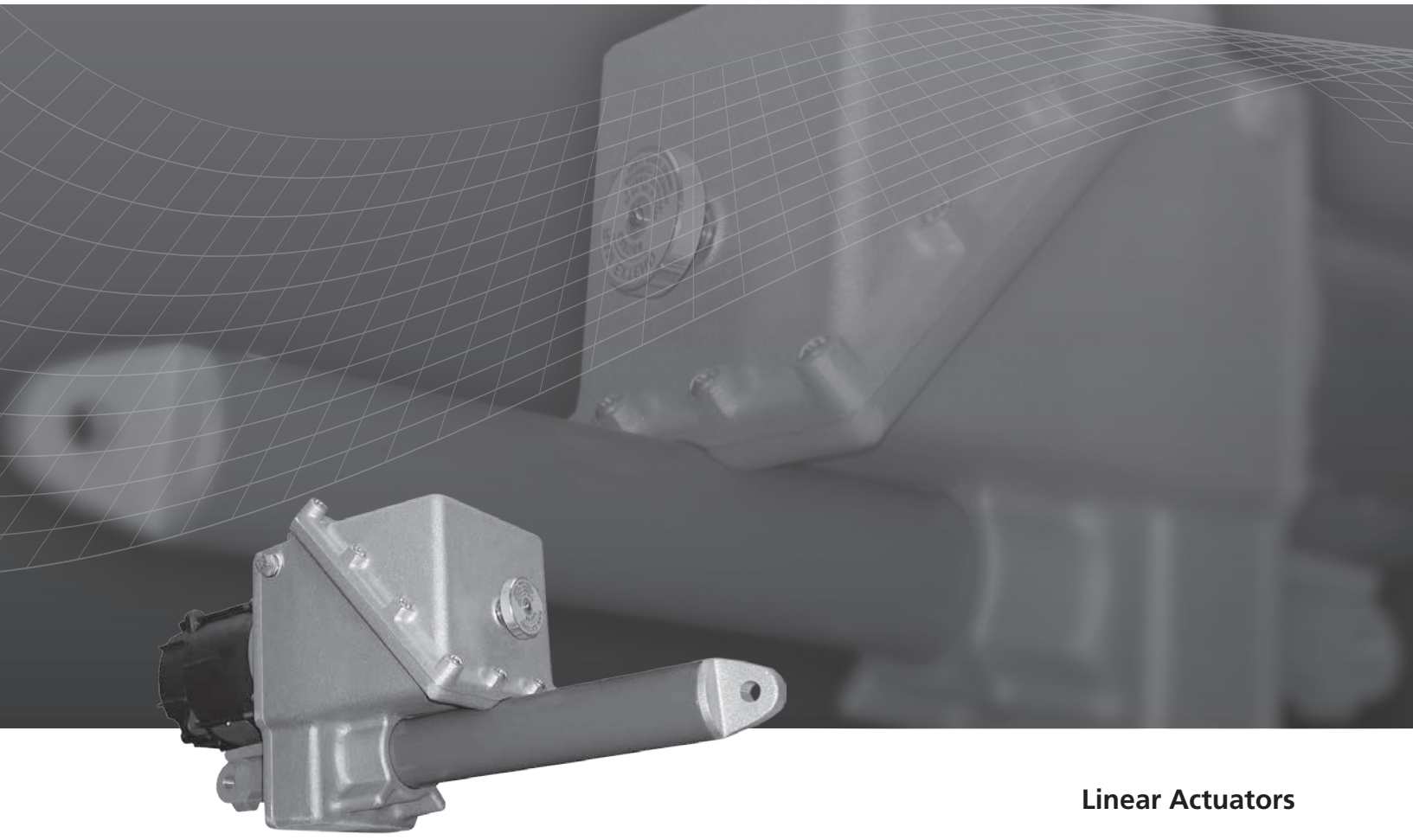
Process Controls

LA-2600 Series

Installation Manual



Linear Actuators

Redefining Flow Control

Contents

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DUE TO WIDE VARIATIONS IN THE TERMINAL NUMBERING OF ACTUATOR PRODUCTS, ACTUAL WIRING OF THIS DEVICE SHOULD FOLLOW THE DRAWING SUPPLIED WITH THE UNIT.

Description

GENERAL

The LA-2600 actuator is an electro-mechanical, bi-directional linear actuator and may be single-phase or three-phase AC powered. The LA-2600 has a totally enclosed, permanently lubricated gear train with an acme screw/nut output drive. It can provide up to 8000 pounds of thrust with stroke lengths from 6 to 30 inches at a maximum velocity of approximately 1.6 inches per second.

This actuator features a built-in thrust overload switch mechanism to de-energize the actuator when the thrust rating of the unit is exceeded, and a manual override mechanism to allow the unit to be positioned without electrical power.

THEORY OF OPERATION

The LA-2600 actuator utilizes a single-phase or three-phase reversible motor to produce torque at the motor pinion gear. The motor torque is increased (with a corresponding decrease in speed) through two stages of spur gearing. The final spur gear is mounted on a bearing supported shaft with an acme thread profile on one end. Rotation of this screw shaft causes a mating nut to be pulled or pushed axially. This axial nut movement is transmitted through a tube to a clevis end providing the final thrust output. Also, fine pitch spur gearing from the screw shift allows the number of screw shaft revolutions necessary to produce the full linear stroke to be reduced (geared down) to an amount which can be used to rotate a precision potentiometer (optional) and activate position limit switches to sense end of travel and additional intermediate positions (with four or six limit switch option).

Possible damage to the actuator from running into an obstruction or exceeding the rated thrust capability is avoided by the thrust overload protection mechanism. The screw shaft incorporates a spring pack and a thrust limit switch assembly. If the actuator encounters an obstruction or is overloaded, the spring pack deflects, absorbing the overload. As the screw shaft deflects beyond rated load (-0% + 20%), thrust limit switches are actuated (tripped) to remove power from the motor.

A manual override is provided to allow the actuator to be manually positioned during installation, alignment, or power outage. When the motor is de-energized, the manual override plunger can be depressed to produce thrust and movement at the output shaft and will allow the actuator to be manually positioned.

Following the completion of manual positioning, the motor can be powered to resume automatic operation. Care should be taken when manually driving a load, since the thrust overload switch mechanism is not operational when the unit is de-energized and excess output thrust can be developed through the manual handknob.

CAUTION: Do not energize the actuator while manual positioning or attempt to engage the manual handknob while the unit is running. Rotation of the manual handknob by the motor could inflict personal injury.

When the motor is de-energized, the acme screw helix angle and gear inefficiencies are sufficient to prevent the actuator from being backdriven by the load. Thus the unit maintains the last position upon loss of power. All gears and the screw shaft are lubricated during manufacturing with a high quality grease which allows the actuator to be mounted in any position. Lubrication is not required under normal service conditions for the life of the unit.

Installation and Setup

GENERAL

Refer to page 10 for Major Dimensions. Upon initial receipt of actuator, the actuator clevis is taped to the actuator ram tube at the factory to prevent the actuator ram clevis from turning. If the tape has been broken or if the actuator clevis is allowed to rotate during initial start-up, the limit switch settings will be affected. The feedback and limit switches are operated by secondary gearing and allowing the clevis to rotate under motor power will turn the feedback and limit switches but the ram will not extend or retract. Likewise, turning the clevis with the motor stopped will extend or retract the ram without turning the feedback or limit switches.

DO NOT attempt to simply adjust the limit switches to correct the ram travel in case of the clevis being turned. The unit must be re-centered or damage may result.

To re-center ram travel:

Turn clevis CCW until clevis is moved away from the tube. The clevis should be turned out several inches. Apply power to the actuator to cause ram to retract. Run the actuator until limit switch LS2 trips open. If properly wired, the motor will be prevented from further powering the actuator in this direction once the limit switch is open. Make sure that the clevis is not touching the tube as tripping the thrust limit TLR will have the same effect. If the clevis contacts the tube before limit switch LS2 is tripped, remove power and turn clevis further CCW to move it away. When LS2 does trip, remove power. Turn clevis CW until it just touches the ram tube, and turn CCW to put the clevis hole in the proper plane. Apply power to energize the motor in the opposite direction. Prevent the clevis from turning and allow the ram to extend. The actuator should extend to its full limit and limit switch LS1 should trip open and stop the unit. These are the full limits of travel as set by the factory. The limit switches may be set for an actuator travel which is less than these preset positions but not for more. To set a limit other than the factory limit see "Position Limit Switch Adjustment Procedure". Limit switch LS1 operates at the extended end of travel and limit switch LS2 operates at the retracted end of travel (LS1 is at top of the Feedback Assembly). Optional limit switches LS3, LS4, LS5, & LS6 are adjustable over the whole stroke distance.

The actuator is mounted with customer supplied clevis pins through the rear and front clevises. The rear clevis is normally the stationary end. The device to be positioned must be such that it will not allow the front clevis to rotate when positioning but only move in and out. Side loading must be avoided. Side loading can lead to excessive operating thrust requirements which could cause premature bearing failure. The device to be positioned must not require greater thrust than the thrust rating of the actuator or the thrust limit switches will be activated and positioning will cease.

CAUTION: The actuator is supplied with eyebolts designed for lifting the actuator only. Never use the eyebolts for lifting the actuator with other equipment mounted to the actuator.

Do not rotate or allow the front clevis to rotate during the installation of the actuator. Mount the rear clevis to the stationary actuator support device first, then move the traveling portion of the device to the front clevis and mount it or turn the manual handknob to move the front clevis to the device. If you elect to turn the manual handknob be sure no electrical power is applied to the actuator. Hold the front clevis while turning the handknob so the clevis will not rotate and will only extend or retract. Do not use any type of tool to assist in the turning of the handknob. Use your hand only, as use of a tool can damage the actuator.

ELECTRICAL INTERCONNECT

The LA-2600 is available with a 240/480 VAC three-phase motor (LA-2610), or a 120/240 VAC single-phase motor (LA-2620). Check the available power supply to insure that it does not vary by more than 10% of the motor voltage rating. Low AC line voltage can cause the motor to stall and high line voltage can overheat and reduce the life of the motor. Refer to pages 8 & 9 for standard wiring diagrams.

Installation and Setup

START UP

LA-2610

The three phase motor should be installed with a reversing contactor or with two four-pole motor contactors, one for extend motor power and one for retract motor power. The fourth contact is used as an interlock to prevent both contactors from being energized at the same time. Checking for proper phasing requires two people, one to operate the controls and one to observe the actuator shaft travel and limit switches for proper operation. Apply power to the actuator and activate the extend contactor. If the actuator shaft extends, the motor phasing is correct.

If the actuator shaft retracts, remove power immediately. Disconnect power to the actuator and reverse any two of the motor leads. Position the shaft to the mid-point of its travel by turning the manual handknob. Apply power and activate the extend contactor. The actuator shaft should now extend. With the shaft extending, trip LS1 by hand or by disconnecting the wire to the limit switch circuit. The actuator must stop. If the actuator does not stop, disconnect power immediately to prevent damage to the actuator. Repeat the procedure using the retract contactor. If actuator still does not run properly check wiring per wiring diagram on page 8. Call service department for assistance.

NOTE: Extend thrust limit switch (TLE) is switch nearest housing. Retract (TLR) switch is located farthest from housing.

LA-2620

The single phase motor position limit switches and torque limit switches are factory wired and tested per the wiring diagram on page 9. To check wiring apply single phase voltage to terminals #1 and #2 (#1 being motor common): the actuator must extend and trip LS1. When the actuator is running hand trip LS1: the actuator must stop. Apply voltage to terminals #1 & #3. The actuator must retract and trip LS2. Hand trip LS2 when the actuator is retracting. The actuator must stop. If the actuator runs in the wrong direction or does not stop when required check per wiring diagram on page 9. Call service department for assistance.

NOTE: Clevis must not turn when the actuator is running.

MAINTENANCE

Under normal service conditions the motor, gearing, bearings, and parts do not require periodic maintenance. If for any reason the unit is disassembled in the field, all Oilite bushings should be saturated with a S.A.E. 30 (non-detergent) oil and all gearing heavily coated with an Amoco-Amolith all-weather grease or equal. Care should be taken to ensure that no foreign material is in the grease, which will cause premature failure. The screw shaft should be lubricated with Allex EP-115/RS-1306 grease or equivalent.

Troubleshooting Guide

PROBLEM	POSSIBLE CAUSE	REMEDY
The motor does not run.	A. No power applied to the motor. B. The actuator is at the full extend or retract position and the opposite thrust limit switch is actuated, cutting off the power to the motor. C. The thrust limit switch is activated from overloaded condition. D. The motor is wired incorrectly. E. The motor is in thermal overload. F. The motor is defective or there is a thermal overload.	A. Restore the power. B. Remove the cause of the thrust overload. C. Operate the actuator in the opposite direction to reset the thrust limit switch. Locate and remove overload. D. Correct the wiring per the wiring diagram. E. Let the motor cool. Reduce the load and/or duty cycle. F. Replace the motor.
The motor operates but the screw shaft does not move.	A. Damaged power gearing. B. Screw drive nut stripped or pulled out of the tube.	A. Replace the damaged gears. B. Repair or replace screw drive nut.
Position limit switch does not stop the motor operation.	A. Position limit switch is not properly wired to the control circuit. B. Defective position limit switch. C. Switches are not aligned.	A. Correct the wiring per the wiring diagram. B. Replace the switch. C. Re-align the switches.
Thrust limit switch does not stop motor operation.	A. Thrust limit switch is not properly wired to control the circuit. B. Thrust limit switch collars are loose or are not properly adjusted. C. Thrust limit switch is defective. D. Thrust limit switch shaft is bent and binding. E. Thrust limit switch mounting or bushing is bent or damaged. F. Thrust limit switch mounting switch is not aligned or secured.	A. Correct the wiring per the wiring diagram. B. Adjust and tighten the collars as required. C. Replace the switch. D. Replace the shaft. E. Replace as required. F. Align and secure the blocks as required.
The retract thrust limit switch is always activated.	A. The actuator is overloaded in a retract operation. B. The switch collar is loose or out of adjustment. C. The switch actuator does not pivot on its retaining rivet. D. The switch is defective. E. Screw shaft main bearings are frozen to the screw shaft or housing.	A. Operate the actuator in the opposite direction to reset the thrust limit switch. Locate and remove overload condition. B. Adjust and secure. C. Remove and replace rivet. D. Replace the switch. E. Repair and replace as required.
The extend thrust limit switch is always activated.	A. The actuator is overloaded in the extend direction. B. Switch collar is loose or out of adjustment. C. Switch shaft is bent. D. Switch shaft spring is weak or broken. E. Switch block is bent or bushing is bent in the main housing. F. Bolt on the end of the screw shaft backed out.	A. Operate the actuator in the opposite direction to reset the thrust limit switch. Locate and remove overload condition. B. Adjust and secure. C. Replace the switch shaft. D. Replace the spring. E. Repair or replace the switch block and bushing. F. Tighten bolt.
Position feedback device is not operating.	A. Loosen set screws in the hub of LS1 cam assembly. B. Loosen or broken feedback gear(s).	A. Tighten both set screws. B. Tighten or replace gear(s).

Subassembly Alignments

HEAVY DUTY POSITION LIMIT SWITCH ADJUSTMENT PROCEDURE

The limit switch assembly features up to six independently adjustable position limit switches. The setting of one switch does not affect the settings of the others. Limit switch #1 (LS1) is set to stop the actuator at the actuator fully extended position. Limit switch #2 (LS2) is always set to stop the actuator at the actuator fully retraced position. LS3, LS4, LS5, & LS6 may be set for any desired position within the range of LS1 & LS2. Each limit switch is activated by a limit switch actuator and a cam. The bushing of each limit switch actuator rides in the "low" dwell area of the cam when the limit switch is in the inactivated position. Each limit switch becomes activated when the "high" part of the cam rotates to the bushing and pushes the limit switch actuator which in turn activates the limit switch. To readjust the limit switches for the required actuator stroke, the following method is recommended:

1) With no power applied to the circuits, manually turn the manual handknob until there is a slight gap between the front clevis and the outer support tube.

2) Loosen the setscrew of LS2 (1/2 turn max.) which is in the hole marked #2 (hole #3 if unit has a pot) with a long shaft 1/8" Allen wrench and manually rotate the cam for LS2 counterclockwise until the "high" part of the cam just pushes against the roller of the limit switch actuator and the limit switch is heard to activate (signified by a "click"). Then tighten the setscrew with moderate force to lock the cam in position.

NOTE: Excessive force on the setscrew is not required and can cause damage to the assembly.

3) Energize motor and run front clevis to the fully extended position. DO NOT ALLOW THE FRONT CLEVIS TO TURN OR ROTATE WHEN RUNNING OR THE ADJUSTMENT WILL CHANGE. Loosen the setscrew of LS1 which is located in the hole marked #1 (hole #2 if unit has a pot) on the end adaptor. Manually rotate the cam for LS1 clockwise until the "high" part of the cam just pushes against the bushing of the limit switch actuator and the limit switch is heard to activate (signified by a "click"). Tighten the setscrew of LS1.

4) The end of travel position limits LS1 & LS2 are now set for full stoke of the actuator. LS3, LS4, LS5, & LS6 are intermediate positions and may bere-adjusted for any desired position within the range of LS1 & LS2.

5) Apply electrical power and run the actuator through its range to check for proper limit switch adjustment. **DO NOT ALOW THE FRONT CLEVIS TO TURN OR ROTATE WHEN RUNNING OR THE ADJUSTMENTS WILL CHANGE.**

POSITION FEEDBACK ALIGNMENT (POTENTIOMETER)

Position feedback is provided through the use of potentiometer attached to the limit switch assembly. As the switches are driven by the actuator gearing, the potentiometer is simultaneously driven to provide position feedback.

1) Establish if full extend or full retract is to be used for zero indication. On slide gate installations, zero indication is normally used when the actuator is fully extended and the gate closed.

2) Make sure end of travel limit switches are correctly set for the proper stroke length.

NOTE: LS1 (Extend) limit switch is at top of feedback assembly

3) Use an Ohmmeter to monitor the position of the feedback potentiometer wiper to determine which end of the pot gives a low ohm resistance indication.

4) If the reading is greater than 50 Ohms:

5) Loosen the setscrew located in the hole marked #1 on the limit switch/pot assembly.

6) Rotate the pot gear until 50 Ohms is obtained.

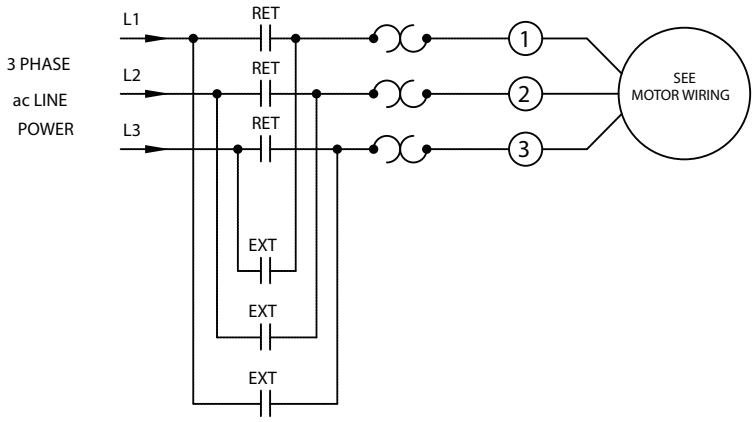
7) Tighten the setscrew with moderate force to lock the gear in position.

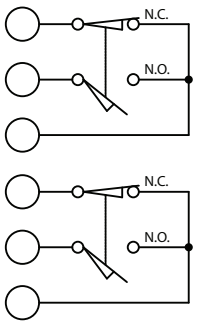
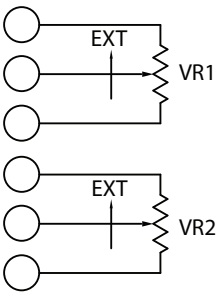
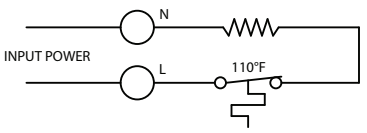
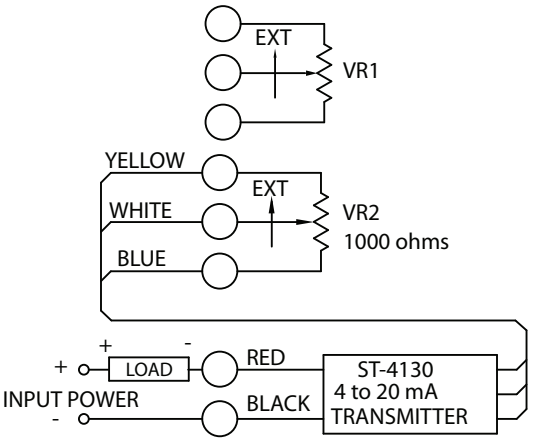
NOTE: On tandem potentiometer assembly, try to set the bottom potentiometer to approximately 50 Ohms, especially if the 4 to 20mA transmitter is being used.

4 TO 20 mA TRANSMITTER ALIGNMENT

Before adjusting output of transmitter, refer to switch & position feedback alignments. After stroke and potentiometer are properly set, and power supply and load are wired per installation wiring print, move actuator to fully retracted position. Adjust the "Elevation" trim pot to get 4.0 mA output. Run actuator to full extend position. Adjust the "Range" trim pot on transmitter to get 20.0 mA output. Repeat until interaction no longer occurs. For an increasing feedback signal with the actuator shaft retracting, interchange blue and yellow leads. Recalibration and realignment of pot and transmitter may be necessary.

Typical Wiring Diagram LA-2610



LIMIT SWITCHES	POTENTIOMETER(S)
 PL3 PL4	
HEATER	**TRANSMITTER**
	

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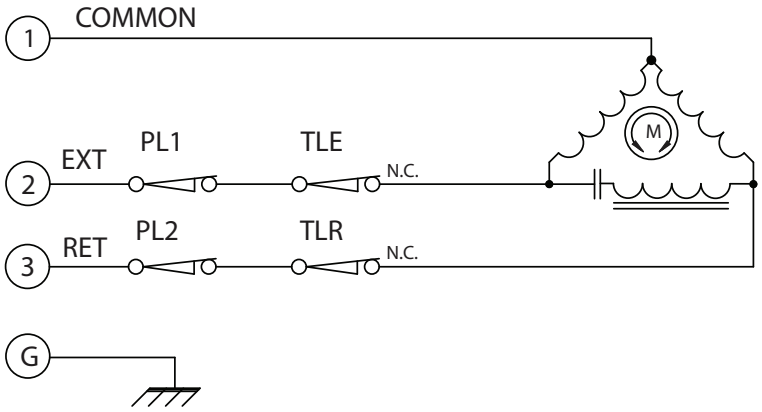
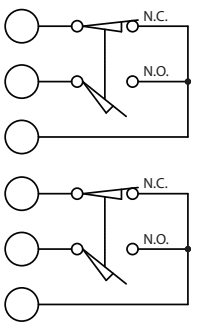
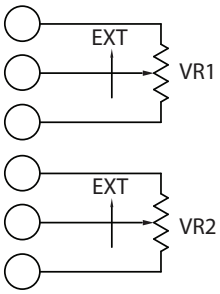
Typical Wiring Diagram LA-2612



LIMIT SWITCHES	POTENTIOMETER(S)
	
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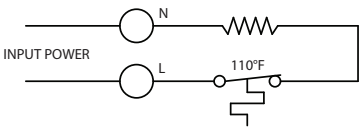
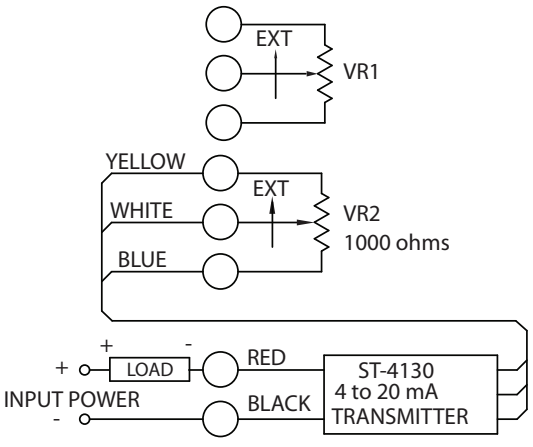
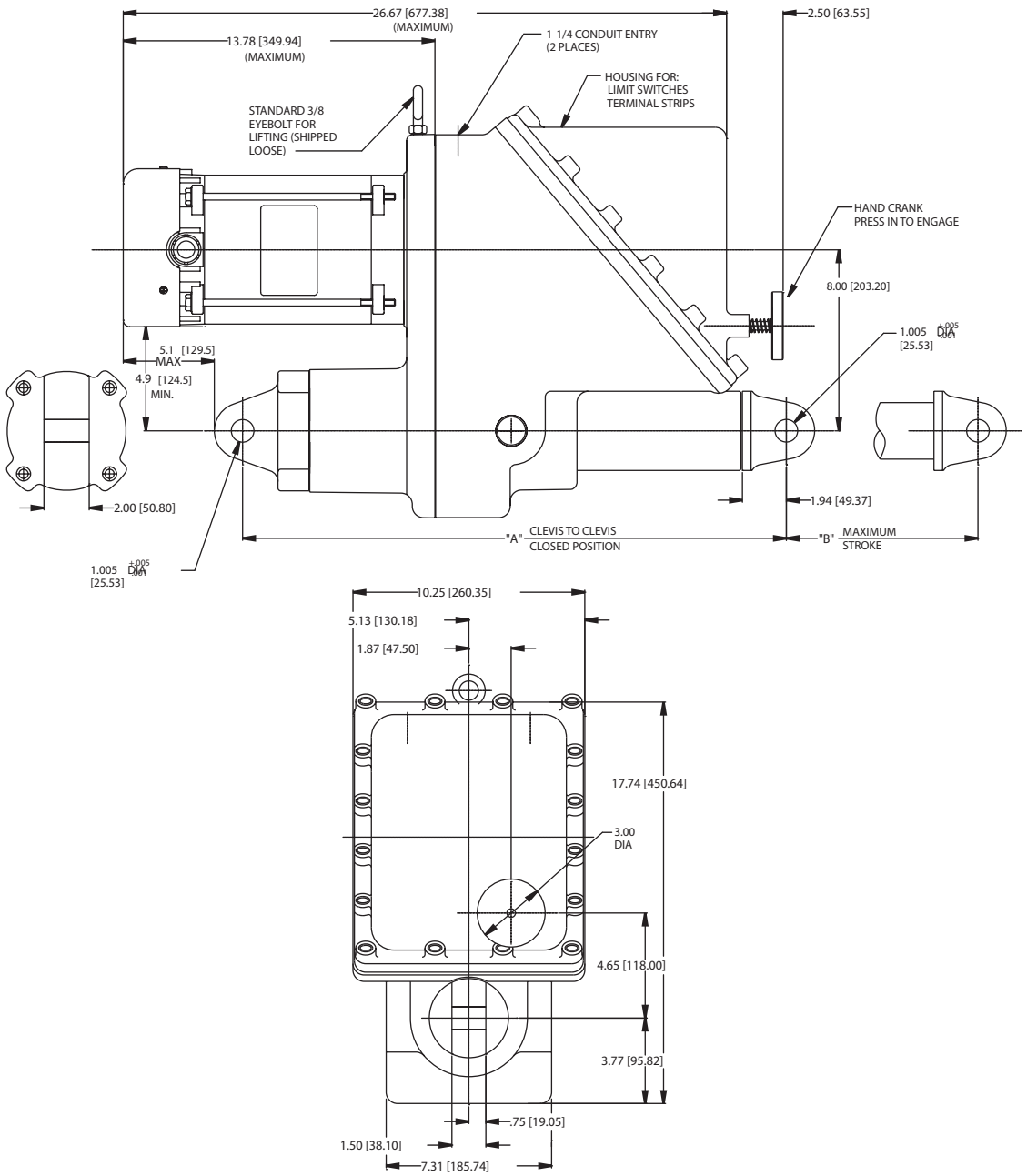
	

Major Dimensions



MAXIMUM THRUST lbf (N)		"B" Dimension (Stroke Length)				
LA-2600		6 in. (152 mm)	12 in. (305 mm)	18 in. (457 mm)	24 in. (610 mm)	30 in. (762 mm)
2,500 (11,120)	"A"	22.14 (569)	28.41 (722)	35.35 (898)	42.29 (1,074)	49.23 (1,250)
3,600 (16,013)		25.02 (636)	31.02 (788)	37.96 (964)	44.90 (1,140)	51.84 (1,317)
4,700 (20,906)		24.10 (612)	30.10 (765)	37.04 (941)	43.98 (1,117)	50.92 (1,293)
6,150 (27,355)		25.95 (659)	31.95 (812)	38.89 (988)	45.83 (1,164)	52.77 (1,340)

Notes

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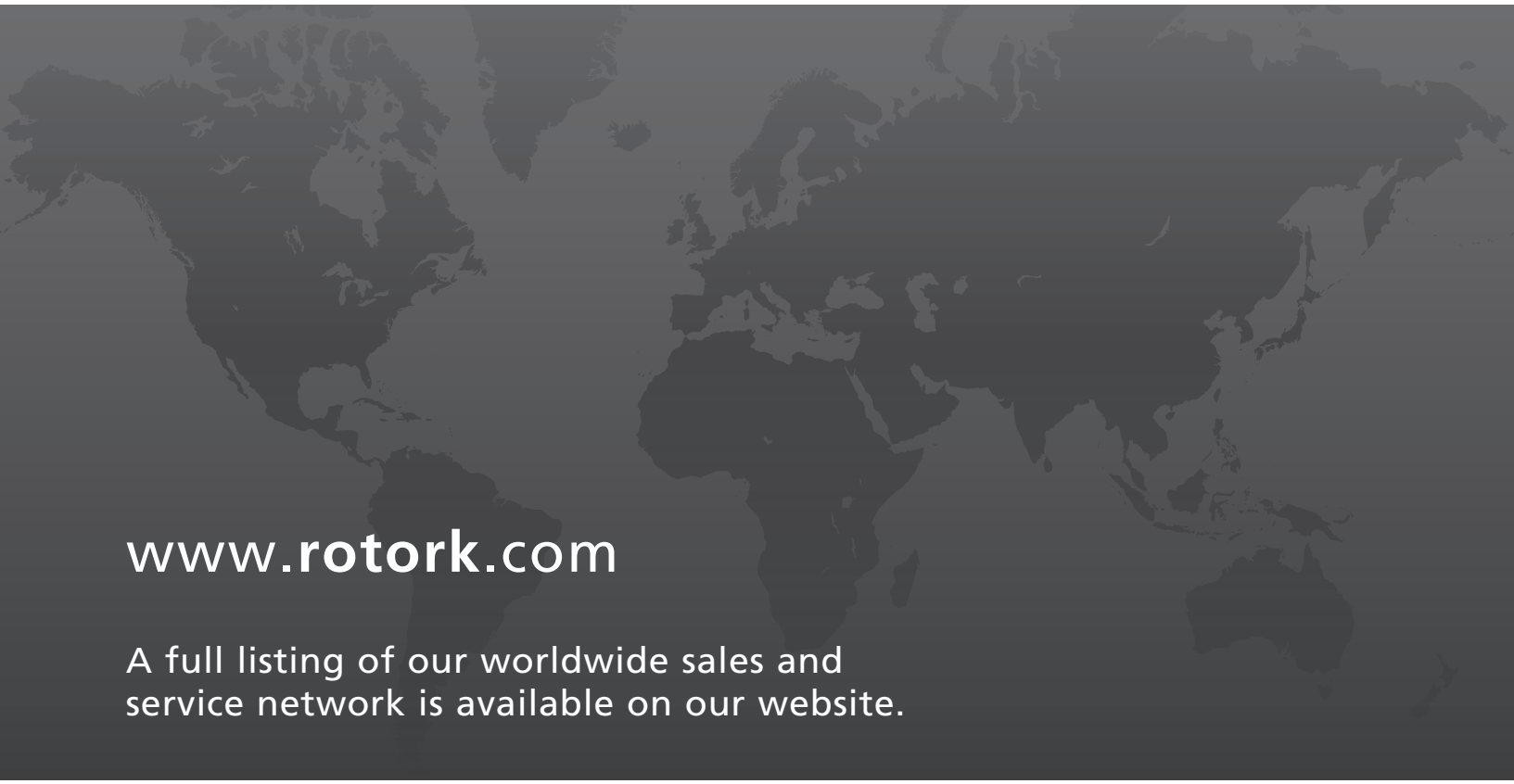
Redefining Flow Control



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