



# INSTALLATION OPERATION & MAINTENANCE

## NEPTUNE Advanced Stroke Controller

NEP-131906



# Manual Introduction

**The following instructions must be followed and integrated with your safety program when installing and using Neptune products**

- Read and save all instructions prior to installing, operating and servicing this product
- If you don't understand any of the instructions, contact Neptune for clarification
- Follow all warnings, cautions and instructions marked on, and supplied with, the product
- Inform and educate personnel in the proper installation, operation and maintenance of the product
- Install equipment as specified in Neptune installation instructions and per applicable local and national codes. Connect all products to the proper electrical sources
- To ensure proper performance, use qualified personnel to install, operate, update and maintain the unit
- When replacement parts are required, ensure that the qualified service technician uses replacement parts specified by Neptune. Substitutions may result in fire, electrical shock, other hazards, or improper equipment operation
- Keep all product protective covers in place (except when installing, or when maintenance is being performed by qualified personnel), to prevent electrical shock, personal injury or actuator damage
- Operation of actuator in an inappropriate fashion may cause harm or damage to unit or other equipment surroundings

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# 1. Introduction

This manual has been produced to enable a competent user to install, operate, adjust and inspect the Neptune actuator.

Only Neptune approved actuator replacement parts should be used. Under no circumstances should any modification or alteration be carried out on the actuator, as this could invalidate the conditions under which its certification was granted.

The electrical installation, maintenance and use of these actuators should be carried out in accordance with the National Legislation and Statutory Provisions relating to the safe use of this equipment applicable to the site of installation.

Access to live electrical conductors is forbidden in a Hazardous Area unless it is done under a special permit to work, otherwise all power should be isolated, and the actuator moved to a non-hazardous area for repair or attention

For the USA: NFPA70, National Electrical Code® is applicable. Only persons competent by virtue of their training or experience should be allowed to install, maintain and repair Neptune actuators. Work undertaken must be carried out in accordance with instructions in the manual. The user and those persons working on this equipment should be familiar with their responsibilities under any statutory provisions relating to the Health and Safety of their workplace.

The mechanical installation should be carried out as outlined in this manual and also in accordance with any relevant national standard codes of practice. If the actuator nameplate indicates that it is suitable for use in a Potentially Explosive Atmospheres (Hazardous Areas) then the actuator is suitable for use in Zone 1 and Zone 2 (or Div 1 and Div 2) hazardous area classifications, as defined by the actuator's nameplate marking.

The enclosures on the Neptune actuator is manufactured from aluminum alloy with stainless steel fasteners.

The user must ensure that the operating environment and any materials surrounding the actuator cannot lead to a reduction in the safe use of, or the protection afforded by, the actuator. Where appropriate the user must ensure the actuator is suitably protected against its operating environment

Any equipment connected to the actuator should be of an equivalent (or better) hazardous area certification. The installation, maintenance and use of the actuator installed in a hazardous area must be carried out by a competent person and in accordance with all relevant codes of practice for the particular Hazardous Area certification.

Should further information and guidance relating to the safe use of the Neptune actuator be required, it will be provided on request.

Any inspection or repair of Hazardous Area approved actuators should not be undertaken unless it conforms to National Legislation and Statutory Provisions relating to the specific Hazardous Area.

## 2. Product Specifications

### Electrical

**Line Voltage:** 120/240 VAC (tolerance  $\pm 10\%$ )

**Frequency:** 50/60 Hz

**Power:** 2.37W (Stationary) / 44.5W (Moving Full Load) (Full Power Rating Table at the end of the manual)

**Command Signal Inputs:** 4-20mA DC

#### **Command Signal Adjustability**

Local/Remote Control - (Factory Setting – Local)

Zero and Span Position - (Factory Setting – 0% & 100%)

Limit, Lower and Upper - (Factory Setting – 0% & 100%)

**Terminals:** 18 AWG wire recommended

**Conduit Entry:** 4 Places,  $\frac{3}{4}$ "-14NPT

### Mechanical

**Stroke:** (Output Shaft Linear Travel)

500 Series Pump: 0.714" (18.14mm)

600 Series Pump: 1.428" (36.27mm)

**Shaft Motion:** Extend or retract on command Signal (adjustable)

**Speed:** 0.125 to 0.25 in/sec (6.35 mm/sec)

**Thrust:** 100 lbf

**Temperature Limit:** -4°F to 150°F (-20°C to 65°C)

**Altitude:** Up to 5000m

**Housing:** Casted aluminum alloy with gasketed window for stroke Position Indicator

**Local Control:** Handwheel, Manual Operation: Push to engage, Spring Return on Release

#### **Environmental Rating:**

**Canadian Hazardous Area – Factory Mutual Canada (FMC) Certified Explosionproof to Canadian electrical Code (CEC)**

Class	Division	Group	Standard Temperature
I	1	C, D	-20 to +65 °C (-4 to +150 °F)
II	1	E, F, G	-20 to +60 °C (-4 to +140 °F)

Enclosure types 4, IP67

Note: Reliability in respect to fatigue or long-term operation against CSA C22.2 No. 139 standard is not included in the Approval

**Non-Hazardous Area Enclosures**

**WT: Standard Watertight**

Standard	Rating	Standard Temperature
BS EN 60529 (1992)	IP67	-30 to +70 °C (-22 to +158 °F)

**Performance**

Linearity	1.0%	
Deadband	0.00% to 10.0%	Adjustable
Repeatability	0.5%	
Hysteresis	0.70%	
Resolution	0.2%	Linear

**Features:**

- Permanently Lubricated
- Absolute encoder
- LCD user Interface
- DC brushless electric motor
- Motor Controller with travel and thrust adjustment
- Manual Override
- Hazardous Area certification
- Explosion Proof

### 3. Warranty Information

#### LIMITED WARRANTY

All Neptune products are tested at the factory prior to shipment. Each part used in their construction has been carefully checked for workmanship.

If the Electric Stroke Controller-Positioner is installed properly, Neptune Chemical Pump Co. warrants to the purchaser of this product for a period of twelve months from the date of first use or eighteen months from shipment, whichever occurs first, this product shall be free of defects in material and/or workmanship, as follows:

1. Neptune Chemical Pump Co. will replace, at no charge, any part that fails due to a defect in material and/or workmanship during the warranty period, FOB our factory, Grand Terrace, CA. To obtain warranty service, you must forward the defective parts to the factory for examination, freight pre-paid.

2. This warranty period does not cover any product or product part which has been subject to accident, misuse, abuse or negligence. Neptune Chemical Pump Co. shall only be liable under this warranty if the product is used in the manner intended by the manufacturer as specified in the written instructions furnished with this product.

Any express warranty not provided in this warranty document, and any remedy for breach of contract that, but for this provision, might arise by implication or operation of law, is hereby excluded and disclaimed. Under no circumstances shall Neptune Chemical Pump Company be liable to purchaser or any other person for any charge for labor, repairs, or parts, performed or furnished by others, nor for any incidental consequential damages, whether arising out of breach of warranty, express or implied, a breach of contract or otherwise. Except to the extent prohibited by applicable law, any implied warranty of merchantability and fitness for a particular purpose are expressly limited in duration to the duration of this limited warranty.

Some states do not allow the exclusion or limitation of incidental or consequential damages or allow limitations on how long any implied warranty lasts, so the above limitations may not apply to you. This warranty gives you specific legal rights, and you may have other rights which may vary from state to state.

#### IMPORTANT NOTICE- RETURN GOODS AUTHORIZATION

1. All equipment returned to - Neptune Chemical Pump Company requires proper Returned Goods Authorization Number (RGA) and tags.

2. If returned goods is a pump, or is to be shipped attached to a pump, drain all oil and chemicals. All chemical contact areas must be thoroughly flushed and neutralized.

3. All equipment which -has been in contact with chemicals must be- accompanied by a copy of the Chemical Product Material Safety Data Sheet (MSDS).

4. Failure to comply with the above instructions; will result in equipment being returned to sender, freight collect, without service.

## 4. Parts and repair instructions

1. Complete model number and serial number of both the Stroke Control AND pump must be provided to insure prompt and accurate parts and repair service.

2. Address all inquiries and purchase orders for parts and factory repair to:

Customer Service Department  
Neptune PSG California  
22069 Van Buren Street  
Grand Terrace, CA 92313  
USA  
Tel: 1-909-422-1700

Email: [Quotes.Neptune@psgdover.com](mailto:Quotes.Neptune@psgdover.com)

3. Mechanical Stroke Control repairs may be made by purchaser. Refer to Figure 1 for parts identification. Order from Neptune Customer Service by description.

4. Existing Neptune 500 & 600 & 6000 series manual diaphragm pumps can be upgraded by adding Stroke Control. See Section 7 for self-retrofitting instruction. It is suggested to bring the unit to our local representative or distributor for the service. Find your local distributor at:

<https://www.psgdover.com/neptune/contact-us/representative-locator>

5. If purchaser desires to perform a field pump upgrade by adding Stroke Control, a kit consisting of a Stroke Controller-Positioner and an appropriate pump Connector Rod Assembly will be prepared. See retrofitting instruction at later section in this document. Prior to ordering, consult with Customer Service Department to review required tools and consumables.

6. Electrical repairs are limited to replacing the stepper motor, and factory repairing or replacing the two printed circuit boards. The upper and lower printed circuit boards are interconnected and are replaced as a single assembly. The Purchaser may send the faulty Printed Circuit Board Assembly to Neptune for evaluation and repair or replace it with a new assembly. Replacement PC Board Assemblies are shipped with "Factory Settings" (configuration, calibration, and adjustments) to match the pump the Stroke Control is mounted on. Stepper motors are not repairable.

### IMPORTANT NOTICE - RETURN GOODS AUTHORIZATION

1. All equipment shipped to Neptune Chemical Pump Company for repair, evaluation or upgrade requires proper Returned Goods Authorization Number (RGA) and tags.

2. If shipped goods are a pump, or is to be shipped attached to a pump, drain all oil and chemicals. All chemical contact areas must be thoroughly flushed and neutralized.

3 All equipment which has been in contact with chemicals must be accompanied by a copy of the Chemical Product Material Safety Data Sheet (MSDS).

4. Failure to comply with the above instructions, will result in equipment being returned to sender, freight collect, without service ...



## 5. Warning & Safety

**Please read thoroughly before installation, operation, or maintenance of any Neptune pump**

- Correct installation, operation and servicing of Stroke Controller-Positioner, and associated pump, in Hazardous areas is entirely the responsibility of the user
- Protection provided by the equipment may be impaired if used in a manner not specified in this document
- Electric Shock Hazard: Installation and Servicing must be performed only by qualified personnel
- Electrostatic Discharge: This equipment houses static sensitive devices. To protect the internal components never touch the printed circuit boards without using electrostatic (ESD) control procedure
- Actuator castings are manufactured from aluminum alloy with stainless steel fasteners. The user must ensure that the operating environment and any materials surrounding the actuator cannot lead to a reduction in the safe use of, or the protection afforded by the actuator
- Note that under no circumstances should any additional lever device such as a wheel key or wrench be applied to the hand-wheel in order to develop more force when closing or opening the valve. This may cause damage to the valve and/or actuator and it may also cause the valve to become stuck in the seated or back seated position.
- The screws securing the outer window frame maintain the integrity of the flame proof enclosure and must NOT be removed
- Do not remove the top cover assembly or conduit entry blanking plugs when an explosive environment is present.
- The equipment utilizes a non-metallic outer coating and has a potential static hazard. Clean only with a damp cloth.

## 6. Unboxing & Unit Overview





### Unboxing Inspection

Receiving inspection: Carefully inspect for shipping damage. Damage to the shipping carton is usually a good indication that it has received rough handling. When unpacking a pump or chemical feed system, be certain that no parts are thrown away. Examine the equipment for possible damage. If damage has occurred, file a claim with the common carrier within 24 hours. Neptune will assist in estimating the repair costs.

Stroke Controller-Positioners are normally shipped mounted on, and configured for, the pump with which it will be used. Unless the customer order specifically instructs otherwise, the stroke controller will be shipped with standard "Factory Settings". See Calibration and Adjustments in next section.

### Identification Label

An identification tag is attached to each actuator. When ordering parts, request information or service assistance, please provide all of the tag information.

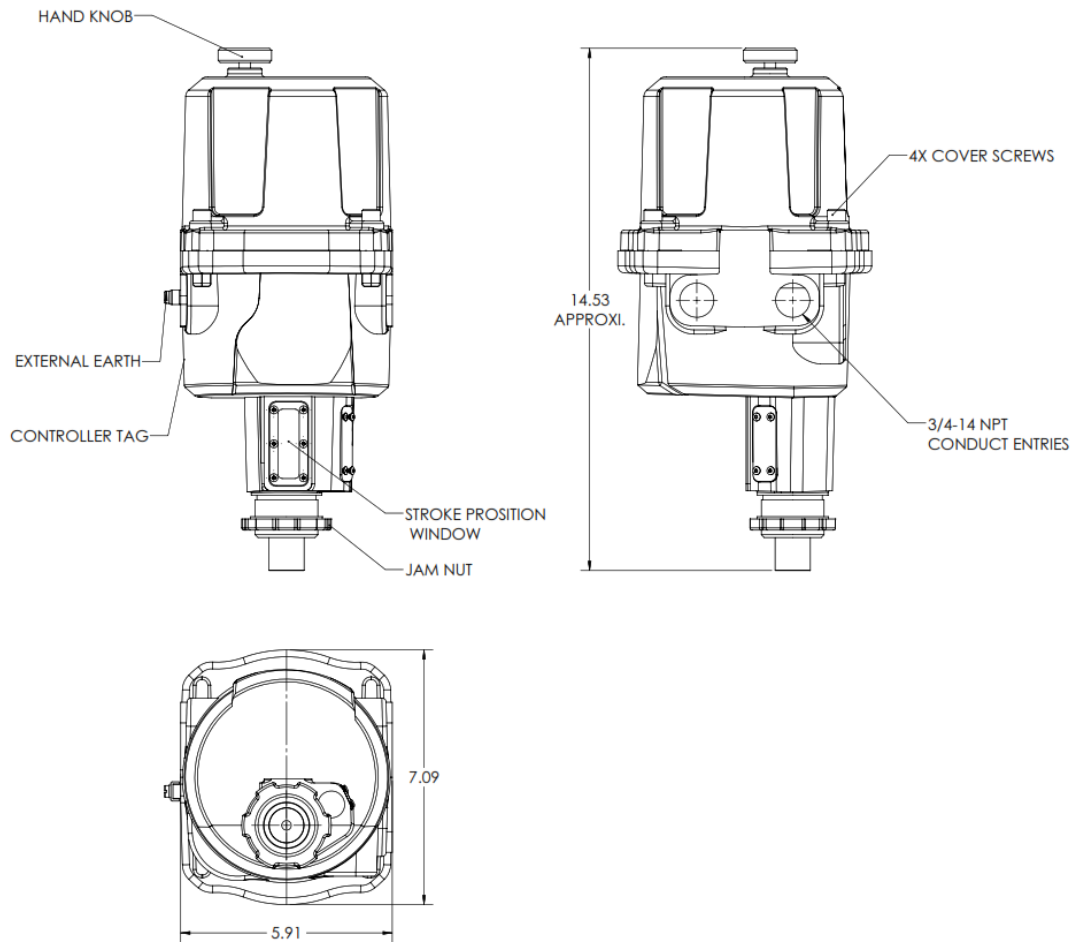
	psgdover.com/neptune Tel: 909-422-1700	PSG CALIFORNIA LLC GRAND TERRACE, CA, USA			
Neptune number	NEP-131906	 FM APPROVED	Unit weight	8.3	kg
serial number			Year of manufacture		
wiring diagram	M00-00	Enclosure type /IP rating	T4	IP67	
output max.	100 LB (444.8 N)	Indication contacts	3A 150VAC 30VDC		
conduit thread	.75-14 NPT	EXPLOSIONPROOF, CLASS I, DIV 1, GROUPS C & D, T4 DUST-IGNITIONPROOF, CLASS II, DIV 1, GROUPS E, F, & G, CLASS III			
Actuator supply	110-240 VAC		Ex db IIB T4 Gb Ex tb IIIC T85C Db MAX. RATED AMBIENT TEMP 150 °F (65 °C) MIN. RATED AMBIENT TEMP -4 °F (-20 °C) wiring in this compartment may reach 82 °C in ambient of 65 °C		
Rated current	1 PH/0.37-0.17 Amp		FM22CA0028X 049548-B		
<small>DO NOT OPEN WHEN EXPLOSIVE ATMOSPHERE PRESENT. CONDUIT SEAL REQUIRED TO BE SEALED AT HOUSING. NE PAS OUVRIR EN PRESENCE D' ATMOSPHERE EXPLOSIVE. LE JOINT DE CONDUIT DOIT ETRE SCELLE AU LOGEMENT. COVER JOINTS MUST BE CLEANED BEFORE REPLACING COVER. NETTOYER LES SURFACES DE CONTACT DU COUVERCLE AVANT DE LE REMETTRE EN PLACE.</small>					

### Tools & Equipment Required (General Guideline Only)

Top Cover Fixings - 6 mm Allen Wrench  
Electrical Connections - Terminal Screwdriver  
Command & Feedback - 4 to 20 mA Command source/meter  
Actuator to Valve fixings - As required

## Knowing your controller

### Dimension & Components

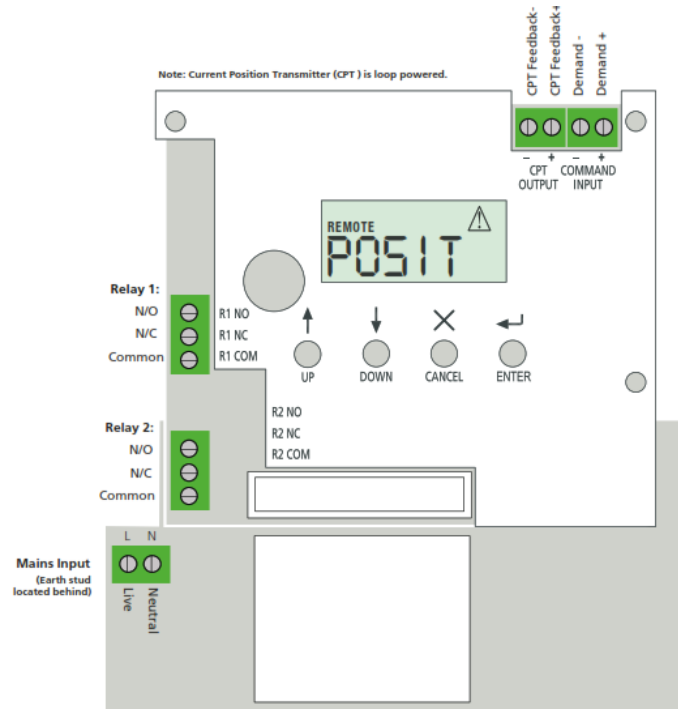


**Handwheel Operation** The handwheel is located on the top cover. Push and hold the handwheel down and rotate to extend/retract or rotate the actuator output drive. Verify direction of output shaft rotation for clockwise operation of the handwheel. Stroke position can be found at the local display window

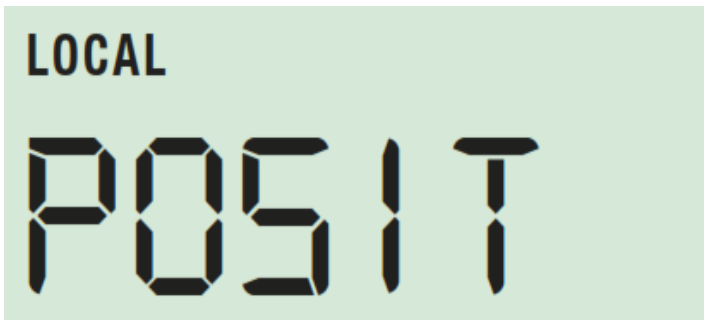


## Inside the unit

### Main Printed Circuit Board (PCB) Layout



### LCD Display

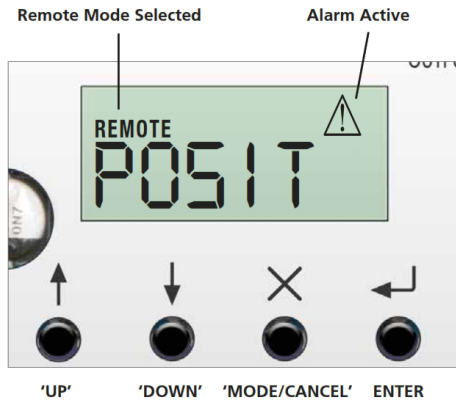


The main PCB has a LCD Display used to show STATUS and configuration information.

On power up the default screen is the POSIT parameter. **See Basic Menu structure for the rest of the parameters**

The actuator will indicate Local or Remote mode selected in top left-hand corner of the LCD.

## Setup Pushbuttons



Four push button switches are located on the main PCB below its LCD Display and are used to view and change the actuator configuration parameters.

The Switch Functions are as follows:

**'UP'**

Used to navigate menus in view mode. Increase parameter values in Edit Mode.

**'DOWN'**

Used to navigate menus in view mode. Decrease parameter values in Edit Mode.

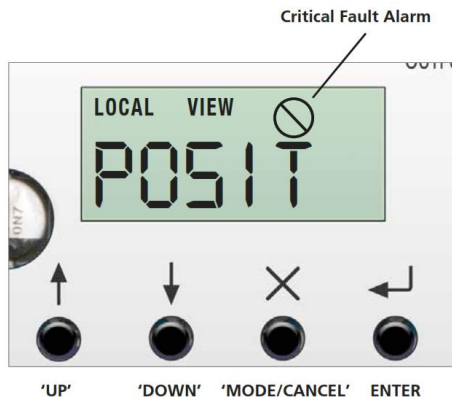
**'MODE/CANCEL'**

Used to exit and go to previous Menu.

**ENTER**

Used to enter and save changes to configuration parameters.

## FAULT



### NON-CRITICAL FAULT

An alarm condition exists which does not prohibit actuator movement.

Non-critical faults are:

**STALL**

Torque / Thrust Overload

Loss of Communications

Loss of Demand Signal

Over Temperature

Power Loss

### CRITICAL FAULT

An alarm exists which prohibits actuator movement.

Critical faults are:

Loss of Feedback

EEPROM Fault

## 7. Retrofitting Existing Neptune Diaphragm pump

WARNING! Do not perform pump retrofit in a Hazardous Area or a damp / wet location.

WARNING! Verify pump power is disconnected (de-energized) and Locked-Out.

WARNING! Close isolation valves (shut off process fluid). Bleed Pressure. Drain all oil and process fluids.

FACTORY RETROFIT: Existing manual Neptune diaphragm pumps can be upgraded with an Electric Stroke Control. It is suggested to bring the unit to our local representative or distributor for the service. Find your local distributor at:

<https://www.psgdover.com/neptune/contact-us/representative-locator>

FIELD RETROFIT: If a field retrofit is planned, the appropriate instructions should be reviewed for required manuals, tools, connector rod assembly, replacement gaskets and consumables (e.g. hydraulic oil, Loctite). The process should be analyzed to see if a precise determination of the pump ZERO setting is required.

CLEARANCE: Examine pump location for clearances to install Stroke Controller-Positioner. If Stroke Positioner is to be installed with pump remaining in pipeline, verify clearances required for draining oil and process fluids.

### 7.1 RETROFITTING SERIES 5000, 500 & 560 DIAPHRAGM PUMPS

#### REQUIRED EQUIPMENT:

- Small Screwdriver
- 11/16" 6-point socket wrench
- Analog Signal Generator
- Valve (on pump discharge)
- Calibrated Measuring Cylinder (on pump suction) Pipe Stand with Drain

7.1.1 **PUMP MODIFICATION:** Refer to illustrations in the Series 5000, 500 or 560 Pump Operating & Instruction Manual for parts identification and other information referenced in the instructions. Individual parts are identified by "Figure Numbers" (F/N). Manual includes tables that cross reference Figure Numbers to part descriptions and Neptune Part Numbers (P/N). Replacement parts are ordered by their Part Number (P/N). Note: Control Rod Assemblies for Series 5000/500 & 560 pumps are not interchangeable. Correct control rod Assembly will be included with a Stroke Controller-Positioner purchased for retrofit.

7.1.2 Remove gear box drain plug F/N 510 from gear box F/N 500 and allow hydraulic oil to drain completely from the gear box. Replace the drain plug.

7.1.3 Remove two slotted head screws F/N 521 from pump body F/N 513 allowing the indicator plate F/N 520 to hang loosely.

7.1.4 Turn control knob F/N 524 counterclockwise until the threads disengage from the sealing nut F/N 526. Pull the control knob and attached metering rod from the pump body.

7.1.5 With an 11/16" 6-point socket wrench, remove the sealing nut.

7.1.6 Parts 520, 521, 524, and 526 are no longer needed.

7.1.7 The sealing plate F/N 518 remains in position Within the pump body.

7.1.8 Screw adapter P/N 002705 into the pump body and tighten securely against the seal plate.

NOTE: A small hole is drilled in the side of the adapter. This hole must face down to allow any oil leakage to drain out of the adapter. Shims are provided to position the adapter. If, when the adapter is tightened the hole is not between 5 o'clock and 7 o'clock, unscrew the adapter and add shims between the adapter and the sealing plate to reposition the drip hole.

7.1.9 The control rod is supplied attached to the connector, P/N 002707. Apply 1 drop of low strength (blue) Loctite to the threads on the connector P/N 002707. Screw the connector completely into the threaded rod projecting from the nose of the Electric Stroke Control. Allow the Loctite to set.

7.1.10 **MOUNT ELECTRIC STROKE CONTROL:** The Stroke Controller-Positioner is installed as a unit. Do not disassemble or remove the cover from the unit.

7.1.11 If the output shaft of Stroke Controller-Positioner is not in the ZERO position (output shaft fully retracted) turn the Manual Adjustment Handwheel clockwise until the shaft is fully retracted (see Section 6, Handwheel Operation).

7.1.12 Turn the large Mounting Nut on the nose of the Stroke Controller-Positioner so that there is 1/4" between the face of the nut and the face of the stroke control unit (see Section 6, Handwheel Operation).

7.1.13 Coat the tip of the control rod F/N 515 with STP, or heavy machine oil, to allow it to slip easily into the sealing plate O-ring.

7.1.14 Center the control rod in the sealing plate and, using hand pressure on the back of the control housing, push the control rod through the O-ring in the sealing plate. This operation is best undertaken with two people, one to position the Stroke Controller-Positioner and the other to apply the pressure.

7.1.15 Engage the threads on the Stroke Controller-Positioner with the threads in the adapter. Screw the Stroke Controller-Positioner into the adapter until the jam nut contacts the pump body.

7.1.16 Orient the Stroke Controller-Positioner with the nameplate and viewing window up and parallel to the pump mounting surface.

7.1.17 Tighten the Mounting Nut securely against the pump body.

7.1.18 **PREPARE PUMP:** Fill the pump gear box with hydraulic oil per Pump IOM

7.1.19 Using the scale on the top of the stroke control unit and the Manual Adjustment Handwheel on the back of the Stroke Controller-Positioner, follow the pump Start-up Procedure, in the Pump Operating & Instruction Manual.

7.1.20 The pump is now ready to be returned to service. Follow start-up procedure as if starting a new pump..

7.1.21 Review Warnings at the beginning of Operating Manual and at the beginning of this section.

7.1.22 Remove cover from Stroke Controller-Positioner.

7.1.23 Connect Analog Signal Generator to the appropriate Command Input terminals

7.1.24 Energize Stroke Controller-Positioner. Start pump motor. Increase simulated Command Input Signal

7.1.25 Start pumping by opening discharge valve.

7.1.26 Confirm back pressure duplicates normal operation.

7.1.27 Refer to Section 9 of this manual on Configuration, Calibration and Adjusting the unit

## 7.2 RETROFITTING SERIES 600 DIAPHRAGM PUMPS

### REQUIRED EQUIPMENT:

- Small Screwdriver
- Analog Signal Generator
- Valve (on pump discharge)
- Calibrated Measuring Cylinder (on pump suction) Pipe Stand with Drain

7.2.1 **PUMP MODIFICATION:** Refer to illustrations in the Series 600 Pump Operating & Instruction Manual for parts identification and other information referenced in the instructions. Individual parts are identified by "Figure Numbers" (F/N). Manual includes tables that cross reference Figure Numbers to part descriptions and Neptune Part Numbers (P/N). Replacement parts are ordered by their Part Number (P/N). Note: Control Rod Assemblies differ for the various Series 600 models. Correct control rod Assembly will be included with a Stroke Controller-Positioner purchased for retrofit.

7.2.2 Remove gear box drain plug F/N 0130 from gear box F/N 0101 and allow hydraulic oil to drain completely from the gear box. Replace the drain plug.

7.2.3 Remove two slotted head screws F/N 0142 from pump body F/N 1401 allowing the indicator plate F/N 0118 to hang loosely.

7.2.4 Turn control knob F/N 0117 counterclockwise until the threads disengage from the sealing plate retainer F/N 0116. Pull the control knob and attached control rod from the pump body.

7.2.5 Remove the sealing plate retainer by removing the four (4) socket head cap screws F/N 0144. Pull the sealing nut retainer out of the pump body.

7.2.6 Parts 0116, 0117, 0118, and 0143 are no longer needed.

7.2.7 The sealing plate F/N 1407 remains in position within the pump body.

7.2.8 Slide adapter F/N 002706 into pump body and secure with the 4 socket head cap screws F/N 0144.

7.2.9 The control rod is supplied as an assembly attached to the connector, P/N 002708. Apply 1 drop of low strength (blue) Loctite the threads on the connector PIN 002708. Screw the connector completely into the threaded rod projecting from the nose of the Electric Stroke Control. Allow the Loctite to set.

7.2.10 **MOUNT ELECTRIC STROKE CONTROL:** The Stroke Controller-Positioner is installed as a unit. Do not disassemble or remove the cover from the unit.

7.2.11 If the output shaft of the Controller-Positioner is not in the ZERO position {output shaft fully retracted} turn the Manual Adjustment Handwheel clockwise until the shaft is fully retracted.

7.2.12 Turn the large Mounting Nut on the nose of the Stroke Controller-Positioner so that there is 1/4" between the face of the nut and the face of the stroke control unit (see Section 6, Handwheel Operation).



7.2.13 Coat the tip of the control rod with STP, or heavy machine oil, to allow it to slip easily into the sealing plate O-ring.

7.2.14 Center the control rod in the sealing plate and, using hand pressure on the back of the control housing, push the control rod through the O-ring in the sealing plate. This operation is best undertaken with two people, one to position the Stroke Controller-Positioner and the other to apply pressure.

7.2.15 Engage the threads on the Stroke Controller-Positioner with the threads in the adapter. Screw the Stroke Controller-Positioner into the adapter until the jam nut contacts the pump body.

7.2.16 Orient the Stroke Controller-Positioner with the nameplate and viewing window up and parallel to the pump mounting service. .

7.2.17 Tighten the Mounting Nut securely against the pump body.

7.2.18 **PREPARE PUMP:** Fill the pump gear box with 4 quarts of hydraulic oil, (two P/N 002372) containers. Refer to Series 600 Pump Instruction Manual.

7.2.19 Using the scale on the top of the stroke control unit and the manual control knob on the back of the unit, follow the pump Start-up-Procedure, in the Pump Manual.

7.2.20 The pump is now ready to be returned to service. Follow start-up procedure as if starting a new pump..

7.2.21 Review Warnings at the beginning of Operating Manual and at the beginning of this section

7.2.22 Remove cover from Stroke Controller-Positioner

7.2.23 Connect Analog Signal Generator to the appropriate Command Input terminals

7.2.24 Energize Stroke Controller-Positioner. Start pump motor. Increase simulated Command Input Signal

7.2.25 Start pumping by opening discharge valve.

7.2.26 Confirm back pressure duplicates normal operation.

7.2.27 Refer to Section 9 of this manual on Configuration, Calibration and Adjusting the unit

### 7.3 RETROFITTING SERIES 6000 DIAPHRAGM PUMPS

#### REQUIRED EQUIPMENT:

- Small Screwdriver
- 15/16" 6-point socket wrench
- Analog Signal Generator
- Valve (on pump discharge)
- Calibrated Measuring Cylinder (on pump suction) Pipe Stand with Drain

7.3.1 **PUMP MODIFICATION:** Refer to illustrations in the Series 6000 Pump Operating & Instruction Manual for parts identification and other information referenced in the instructions. Individual parts are identified by "Item Numbers" (I/N) on BOM page 20 & 22. Manual includes tables that cross reference Figure Numbers to part descriptions and Neptune Part Numbers (P/N). Replacement parts are ordered by their Part

Number (P/N). Note: Control Rod Assemblies for Series 6000 pumps are not interchangeable. Correct control rod Assembly will be included with a Stroke Controller-Positioner purchased for retrofit.

7.3.2 Remove gear box drain plug I/N 67 from gear box I/N 1 and allow hydraulic oil to drain completely from the gear box. Replace the drain plug.

7.3.3 Remove two slotted head screws I/N 45 from pump body I/N 29 allowing the indicator plate I/N 46 to hang loosely.

7.3.4 Turn control knob I/N 44 counterclockwise until the threads disengage from the sealing nut I/N 39. Pull the control knob and attached metering rod from the pump body.

7.3.5 With an 15/16" 6-point socket wrench, remove the sealing nut.

7.3.6 Parts 39, 44, 45, and 46 are no longer needed.

7.3.7 The sealing plate F/N 38 remains in position Within the pump body.

7.3.8 Screw adapter P/N 004252 into the pump body and tighten securely against the seal plate.

NOTE: A small hole is drilled in the side of the adapter. This hole must face down to allow any oil leakage to drain out of the adapter. Shims are provided to position the adapter. If, when the adapter is tightened the hole is not between 5 o'clock and 7 o'clock, unscrew the adapter and add shims between the adapter and the sealing plate to reposition the drip hole.

7.3.9 The control rod is supplied attached to the connector, P/N 004251. Apply 1 drop of low strength (blue) Loctite to the threads on the connector P/N 004251. Screw the connector completely into the threaded rod projecting from the nose of the Electric Stroke Control. Allow the Loctite to set.

7.3.10 **MOUNT ELECTRIC STROKE CONTROL:** The Stroke Controller-Positioner is installed as a unit. Do not disassemble or remove the cover from the unit.

7.3.11 If the output shaft of Stroke Controller-Positioner is not in the ZERO position (output shaft fully retracted) turn the Manual Adjustment Handwheel clockwise until the shaft is fully retracted (see Section 6, Handwheel Operation).

7.3.12 Turn the large Mounting Nut on the nose of the Stroke Controller-Positioner so that there is 1/4" between the face of the nut and the face of the stroke control unit (see Section 6, Handwheel Operation).

7.3.13 Coat the tip of the control rod I/N 53 with STP, or heavy machine oil, to allow it to slip easily into the sealing plate O-ring.

7.3.14 Center the control rod in the sealing plate and, using hand pressure on the back of the control housing, push the control rod through the O-ring in the sealing plate. This operation is best undertaken with two people, one to position the Stroke Controller-Positioner and the other to apply the pressure.

7.3.15 Engage the threads on the Stroke Controller-Positioner with the threads in the adapter. Screw the Stroke Controller-Positioner into the adapter until the jam nut contacts the pump body.

7.3.16 Orient the Stroke Controller-Positioner with the nameplate and viewing window up and parallel to the pump mounting surface.

- 7.3.17 Tighten the Mounting Nut securely against the pump body.
- 7.3.18 **PREPARE PUMP:** Fill the pump gear box with hydraulic oil per Pump IOM
- 7.3.19 Using the scale on the top of the stroke control unit and the Manual Adjustment Handwheel on the back of the Stroke Controller-Positioner, follow the pump Start-up Procedure, in the Pump Operating & Instruction Manual.
- 7.3.20 The pump is now ready to be returned to service. Follow start-up procedure as if starting a new pump.
- 7.3.21 Review Warnings at the beginning of Operating Manual and at the beginning of this section.
- 7.3.22 Remove cover from Stroke Controller-Positioner.
- 7.3.23 Connect Analog Signal Generator to the appropriate Command Input terminals
- 7.3.24 Energize Stroke Controller-Positioner. Start pump motor. Increase simulated Command Input Signal
- 7.3.25 Start pumping by opening discharge valve.
- 7.3.26 Confirm back pressure duplicates normal operation.
- 7.3.27 Refer to Section 9 of this manual on Configuration, Calibration and Adjusting the unit

## 8. Electrical Installation

### 8.1 Cable Entries



The cable entries are tapped ¾" NPT.

Remove any transit plugs.

Make off cable entries appropriate to the cable type and size. Ensure that threaded adaptors, cable glands or conduit are tight and fully waterproof.

Seal unused cable entries with steel or brass threaded plugs.

**If the actuator is to be installed in a hazardous area, a suitably certified cable gland must be fitted with the use of a certified thread adaptor where appropriate. Unused entries must be closed with a suitably certified stopping plug. Wire type must meet local and certifying agency (FMC) requirements and have a minimum temperature rating of 88 °C. Wiring installation must comply with local statutory regulations.**

### 8.2 Connecting to Terminals

#### Uncovering

**⚠ Ensure all power supplies are isolated before removing actuator covers.**

The wiring diagram supplied is particular to each actuator and must not be interchanged with any other actuator. If in doubt check the wiring diagram number with that on the actuator.

Refer to the wiring diagram to identify functions of terminals. Check that the supply voltage is the same as that marked on the actuator nameplate. Check that the supply voltage agrees with that stamped on the actuator nameplate. A fused switch or circuit breaker must be included in the wiring installation of the actuator. The switch or circuit breaker must be installed as close as possible to the actuator and shall be marked to indicate that it is the disconnecting device for that particular actuator. Actuator must be mounted such that it is not difficult to operate the disconnecting device.

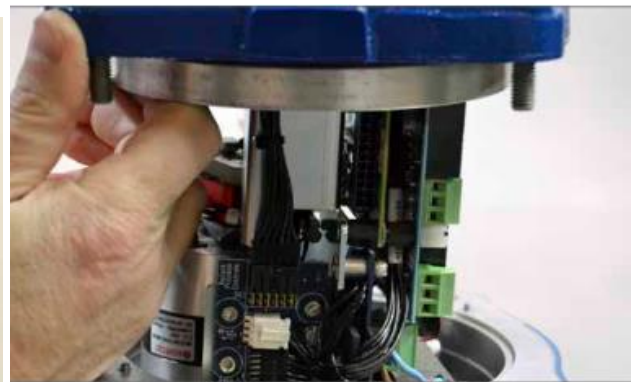
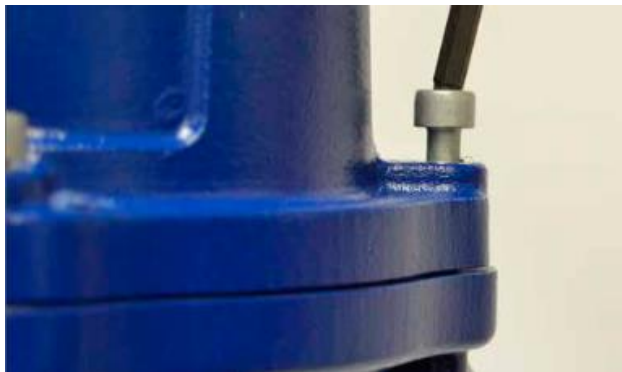
The actuator must be protected with an over current protection device

## Earth Ground Connections



A lug is cast adjacent to the conduit entries for attachment of an external protective Earth (Ground) cable. An internal earth terminal is also provided. Consult local and certifying agency codes to determine which earth connectors is to be used.

## Removing Terminal Cover



Using a 6 mm Allen key loosen the captive fixings securing the terminal compartment cover. Do not attempt to lever off the cover with a screwdriver as this will damage the o-ring seal and may damage the flamepath on a certified unit.

If necessary, locate the two set screws and use them to lift the cover away from its seat.

## 8.3 Wiring

### Installation Wiring

Route cabling through the most appropriate conduit entry making sure that cables will not foul on the cover assembly or internal components after refitting. Refer to the actuator wiring diagram for connection details.

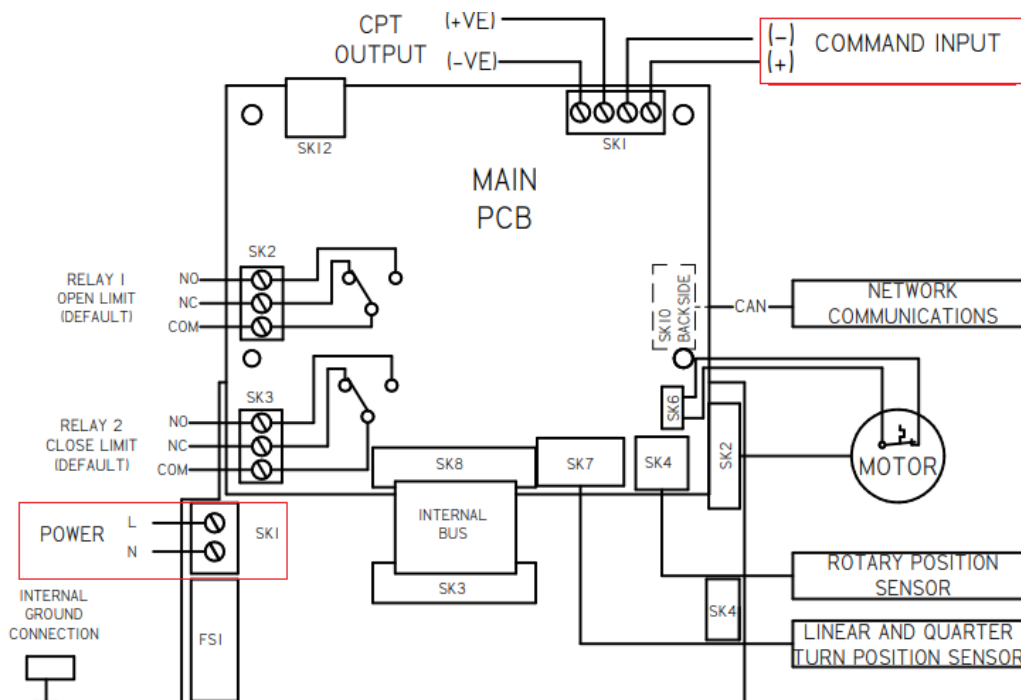
Wire type must meet local and certifying agency (FMC) requirements and have a minimum temperature rating of 88 °C.

#### Note:

**For ease of wiring the use of 18 AWG wire for remote control and indication connections is recommended.**

**WARNING: The actuator must be checked to ensure that the voltage specified on the actuator identification nameplate matches the supply voltage.**

Terminate the power, control and indication wiring with appropriate ferrules. Connect wiring to the terminal block connectors. Ferrules for power connector must be Phoenix Contact AI 2,5 - 8 or AI 1,5 - 8 series ferrules or equivalent with a temperature range of -40 to +105 °C, a minimum current rating of 5 A across the temperature range and approved for field wiring purposes. Take care to route the wiring away from the spigot housing on the gearcase.



### 8.4 Overcurrent Protection Fuses

Fuse is a 5 x 20, slow acting, glass type with a 250 volt rating. Use only a 1 amp fuse.

### 8.5 Relays

Each relay features Normally Open (N/O) and Normally Closed (N/C) volt-free contacts. Due to the constraints

of the Low Voltage Directive, the maximum allowable voltage that can be applied to the relay terminals is 150 VAC. For DC however, the maximum voltage that can be applied is 30 VDC. Rated Current is 3 A

### **8.6 CPT Feedback**

The Loop-powered transmitter provides 4 to 20 mA signal that corresponds to position. Loop supply is 24 VDC nominal (18-30 VDC max).

### **8.7 Demand**

The 4-20 mA command signal is used to control actuator position.

## 9. Set Up and Calibration

### 9.1 Basic Setup

Basic setup is required once the actuator has been mounted on to the valve.

Procedures include:

Step 1 Select Local Operation

Step 2 Set Output Torque/Thrust

Step 3 Select Action at End of Travel (Limit or Force)

Step 4 Set Close Limit of Travel

Step 5 Set Open Limit of Travel

Step 6 Calibrate Command Signal Zero Setpoint

Step 7 Calibrate Command Signal Span Setpoint

The Basic Setup procedure is carried out by using the 4 pushbutton switches mounted below the LCD display on the main PCB.



**NOTE: SETTINGS CAN ONLY BE CHANGED WITH THE ACTUATOR SET TO LOCAL OPERATION.**



## 9.2 Basic Menu Structure

POSITION

SETPOINT

THRUST or TORQUE

LOCAL/REMOTE OPERATION

MANJOG

CLOSE TORQUE/THRUST

OPEN TORQUE/THRUST

CLOSE ACTION

OPEN ACTION

CLOSE LIM

OPEN LIMIT

FIELD COMMAND SIGNAL 4

FIELD COMMAND SIGNAL 20

COMMAND INVERT

TRANSMITTER INVERT

DEADBAND

STATUS

FAULT HISTORY

ADV MENU ACCESS

DEFAULTS

**BASIC**

**POSIT**

Position

**SET PT**

Setpoint

**THRUST or TORQUE**

Thrust Display or  
Output Torque

**LOCREM**

Local / Remote Operation

**MANJOG**

Manual Jog

**TORQ/THRSTC**

Close Torque/Thrust

**TORQ/THRSTO**

Open Torque/Thrust

**CL ACT**

Close Action

**OP ACT**

Open Action

**CL LIM**

Close Limit (zero)

**OP LIM**

Open Limit (span)

**CMD4**

Field Command Signal4

**CMD20**

Field Command Signal20

**CMD IV**

Command Invert

**CPT IV**

Transmitter Invert

**DBAND**

Deadband

**STATUS**

**FLTHST**

Fault History Access

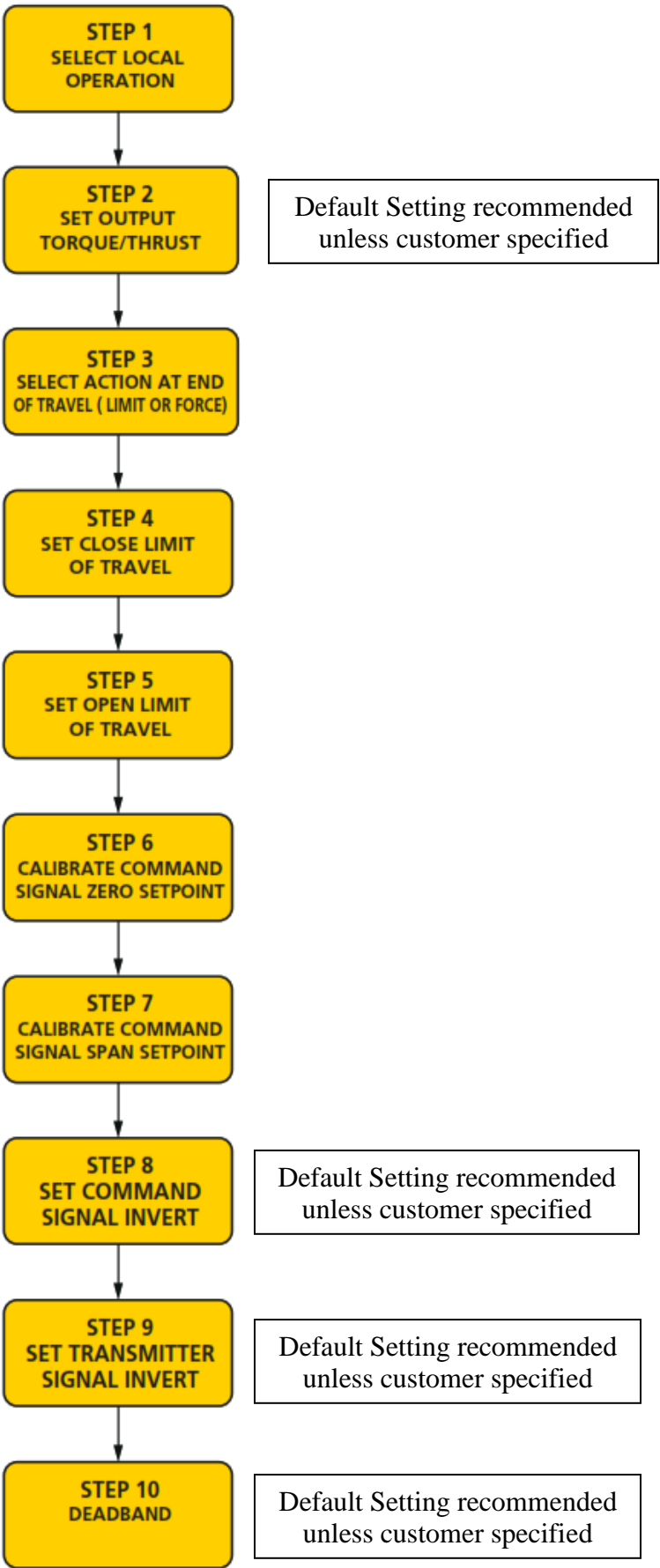
**ADVANC**

Advanced Menu

**DEFLT**

Default Menu Access

9.3 Basic Setup Flowchart





## 9.4 Select Local Operation

Screen shows the actuator set to Remote operation mode with alarms active. The actuator must be set to Local operation mode before the travel limits can be set.

Using the 4 push button switches mounted below the LCD.

### PRESS 'DOWN'

SETPOINT parameter is now displayed.

Press ENTER to view the current setpoint if required.

### PRESS 'DOWN'

THRUST or TORQUE parameter is now displayed depending on actuator type CML, CMQ, CMR.

Press ENTER to view current Thrust or Torque output value.

If these settings are correct and do not require adjustment move on to step 4 to set the close limit.

LOCAL/REMOTE parameter is now displayed.

### PRESS ENTER

The display now goes in to VIEW mode.

### PRESS ENTER

The display now goes in to EDIT mode.

Use the UP or DOWN button to scroll through the settings until LR LOC is displayed.

### PRESS ENTER

The actuator is now selected to LOCAL Operation mode and the change is acknowledged as 'SAVED'.

Press CANCEL to go back to top level menu.

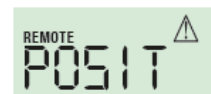


Fig 10.2



Fig 10.3



Fig 10.4



Fig 10.5



Fig 10.6



Fig 10.7



Fig 10.8



Fig 10.9



## 9.5 Set Output Torque/Thrust

Before operating the actuator electrically, it may be necessary to reduce the output torque or thrust of the actuator to prevent valve becoming jammed at the end of travel during setup.

**Note that the default value (100%) thrust is sufficient to be used in Neptune application. No change is needed. Move on to Step 9.6 for Limits Calibration**

Use UP/DOWN buttons until TORQ C or THRSTC is displayed.

**Press ENTER**

to view the Close output Torque or Thrust set value.

The Torque or Thrust Output is adjustable between 60% and 150% of its rated value.

If the Close Torque/Thrust value requires adjustment

**press ENTER.**

The actuator is now in EDIT Mode and the parameters can be modified.

Use the UP/DOWN buttons until the correct Torque/Thrust Value is displayed.

**Press ENTER** to save the changes.

Visually confirm that the parameter is saved.

**Press CANCEL** to return to previous menu.

Use UP/DOWN buttons until TORQ O or THRSTO is displayed.

**Press ENTER** to view the Open output Torque or Thrust set value.

The Torque or Thrust Output is adjustable between 60% and 150% of its rated value.

Fig 10.16 shows the Opening Torque value set to 100% of its rated value.

**Press ENTER** to change the Open Torque or Thrust set value.

**NOTE: When the Torque/Thrust is selected above the 100% Rated value this additional effort is only available at the end of travel to seat the valve for tight shut off applications.**

**NOTE: The output Torque or Thrust setting must be sufficient to operate the valve under full working process conditions.**

The actuator is now in EDIT Mode and the parameters can be modified.

Use the UP/DOWN buttons until the correct Torque/Thrust Value Is displayed.

Press ENTER to save the changes. Visually confirm that the parameter is saved.

**NOTE: The Output Torque or Thrust setting must be sufficient to operate the valve under full working process conditions.**

Press CANCEL to return to previous menu.



Fig 10.10

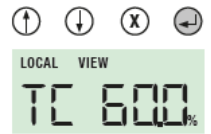


Fig 10.11



Fig 10.12



Fig 10.13



Fig 10.14



Fig 10.15

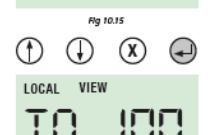


Fig 10.16



Fig 10.17



Fig 10.18



Fig 10.19

## 9.6 Select Action at End of Travel

The actuator can be configured to stop on position limit at the end of travel where valves do not require torque or thrust to be applied to the valve seat.

To provide tight shut off at end of travel the actuator can be configured to apply its configured torque or thrust to the valve seat in either direction.

**Note that the default value of the End of Travel (Limit) is ready to operate in in Neptune application. No change is needed. Move on to Step 9.7 for Limits Calibration**

Use the UP/DOWN buttons until CL ACT is displayed.

Press ENTER to view the Close Action setting.

**CA LIM** shows the actuator is set for Position Limit action at the Closed end of travel.

**To change the end of travel action press ENTER.**

The actuator is now in EDIT Mode.

Use the UP/DOWN buttons to select the required end of travel action.

**Fig 10.23** shows the Closed End of Travel Action set to FRC (FORCE) and the set output closing torque or thrust will be applied to the valve seat at the end of travel.

**Press ENTER to save any changes.**

**Press CANCEL to return to previous menu.**

**NOTE Ensure that any changes to parameters are SAVED before returning to VIEW Mode.**

Use the UP/DOWN Buttons to select the Open Action (OP ACT) and repeat the procedure to select the Action at End of Travel.

**AFTER SAVING ANY CHANGES PRESS CANCEL UNTIL YOU HAVE RETURNED TO THE TOP LEVEL BASIC MENU AND POSIT IS DISPLAYED**



Fig 10.20



Fig 10.21



Fig 10.22



Fig 10.23



Fig 10.24

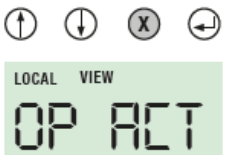


Fig 10.25

STEP 4  
SET CLOSED LIMIT  
OF TRAVEL

## 9.7 Set Closed Limit of Travel (0% Flow / 4mA Position)

To set the Closed limit of travel for the actuator

**press the DOWN** button until CL LIM is displayed.

**Press ENTER** to put the actuator in to EDIT Mode. This will allow parameter changes to be made.

**Use the UP and DOWN** buttons to move the actuator output drive to the required CLOSED Position.

Press ENTER and the new CLOSED End of Travel Limit is saved to the actuators memory.

**THE CLOSED END OF TRAVEL LIMIT IS SET.**

**Press CANCEL** to go back to top level menu.



STEP 5  
SET OPEN LIMIT  
OF TRAVEL

## 9.8 Set Open Limit of Travel (100% Flow / 20mA Position)

**Press the DOWN** arrow until the OP LIM menu is displayed.

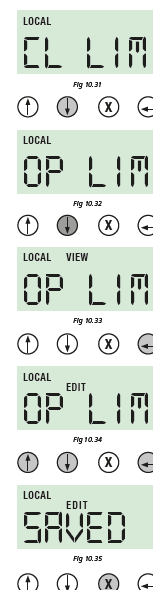
**Press ENTER** to put the actuator in to EDIT Mode. This will allow parameter changes to be made.

**Use the UP and DOWN buttons** to move the actuator output drive to the required OPEN position.

**Press ENTER** and the new OPEN End of Travel Limit is saved to the actuator memory.

**THE OPEN END OF TRAVEL LIMIT IS SET.**

**Press CANCEL** to go back to top level menu.



**STEP 6  
CALIBRATE COMMAND  
SIGNAL ZERO SETPOINT**

## 9.9 Calibrate Command Signal Zero Setpoint

After the open/close limit is set the 4 to 20 mA signal is automatically calibrated to those positions. The 4 mA input command will send you to CLOSED LIMIT, the 20 mA and will send you to OPEN LIMIT.

### 9.9.1 Basic Setup

The controller enables the actuator to automatically position a valve or actuated device in proportion to an analogue mA current. A signal derived from the actuator position feedback is compared with a signal proportional to the input signal. The difference (error) is used to energize the motor and drive the output to the required position to cancel the error.

Unwanted frequent operation can be prevented by adjustment of the deadband.

**NOTE: The 4 mA command signal is automatically referenced to the fully closed limit position. If necessary reverse the limits of travel to achieve the desired command signal response**



Fig 10.36

**STEP 6  
CALIBRATE COMMAND  
SIGNAL ZERO SETPOINT**

### 9.9.2 Calibrate Command Signal Zero Setpoint Using an External 4-20 mA Signal

Press the **DOWN** arrow until the CMD 4 menu is displayed.

Press **ENTER** until 'EDIT' is displayed.

Apply **LOW** setpoint signal (4 mA).

Press **ENTER**.

The actuator Zero setpoint is automatically calibrated to the applied analogue signal.

Press **CANCEL** to go back to top level menu.



Fig 10.37



Fig 10.38



Fig 10.39



Fig 10.40

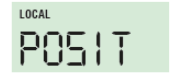


Fig 10.42

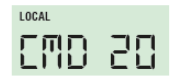


Fig 10.43



Fig 10.44



Fig 10.45

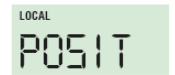


Fig 10.46

**STEP 7  
CALIBRATE COMMAND  
SIGNAL SPAN SETPOINT**

### 9.9.3 Calibrate Command Signal Span Setpoint Using an External 4-20 mA SIGNAL

Press the **DOWN** arrow until the CMD 20 menu is displayed.

Press **ENTER** until 'EDIT' is displayed.

Apply **HIGH** setpoint signal (20 mA).

Press **ENTER**.

The actuator SPAN setpoint is automatically calibrated to the applied analogue signal.

Press **CANCEL** to go back to top level menu.

STEP 8  
SET COMMAND  
SIGNAL INVERT

## 9.10 Set Command Signal Invert

**Note that the default value is ready to operate in Neptune application. No change is needed. Move on to Step 9.11 if necessary**

Press the **DOWN** arrow until the CMD IV menu is displayed.

Press **ENTER** until 'EDIT' is displayed.

Screen shows Command Signal Invert set to OFF.

Command Signal Invert is adjustable to ON or OFF.

Use the **UP/DOWN** buttons to set the Command Signal Invert ON or OFF.

Set to OFF for 4 mA as the close position and 20 mA as the open position.

Set to ON to invert the signal, 4 mA is open and 20 mA is close.

Press **ENTER** to save the current Command Signal Invert setting.

Press **CANCEL** to go back to top level menu.



STEP 9  
SET TRANSMITTER  
SIGNAL INVERT

## 9.11 Set Transmitter Signal Invert

**Note that the default value is ready to operate in Neptune application. No change is needed. Move on to Step 9.12 if necessary**

Press the **DOWN** arrow until the CPT IV menu is displayed.

Press **ENTER** until 'EDIT' is displayed.

Screen shows Transmitter Signal Invert set to OFF.

Transmitter Signal Invert is adjustable to ON or OFF.

Use the **UP/DOWN** buttons to set the Transmitter Signal Invert ON or OFF.

Set to OFF for 4 mA as the close position and 20 mA as the open position.

Set to ON to invert the signal, 4 mA is open and 20 mA is close.

Press **ENTER** to save the current Transmitter Signal Invert setting.

Press **CANCEL** to go back to top level menu.





## 9.12 Set Deadband

**Note that the default value is ready to operate in Neptune application. No change is needed.**

Press the **DOWN** arrow until the DBAND menu is displayed.

Press **ENTER** until 'EDIT' is displayed.

Screen shows the Deadband set to 0.1%.

Deadband is adjustable between 0 to 10% of the Analogue signal.

Use the **UP/DOWN** buttons to select the desired Deadband.

Select the value of Deadband that gives the required control response.

It may be necessary to increase the deadband if the actuator 'Hunts' or overshoots the command setpoint giving spurious operation.

Press **ENTER** to save the current Deadband Value.

Press **CANCEL** to go back to top level menu.



## 9.13 Completing Basic Setup

### WARNING

**IF NO FURTHER SETTING IS REQUIRED THE ACTUATOR MUST BE SET TO REMOTE OPERATION MODE BEFORE REFITTING COVER!**

For further information on the Basic and Advanced setting menus refer to section 10.

If no further adjustment is necessary the top cover can now be replaced.

### REFIT TOP COVER ASSEMBLY

### WARNING

**ISOLATE ALL ELECTRICAL SUPPLIES BEFORE REASSEMBLY.**

### CAUTION

**REASSEMBLY WITH THE TOP COVER INCORRECTLY ALIGNED MAY RESULT IN DAMAGE TO THE ELECTRONIC AND MANUAL OVERRIDE COMPONENTS.**

Visually check the alignment of the cover and the Handwheel shaft with its original orientation.



### 9.13 Completing Basic Setup (cont'd)

Ensure that the spigot face is clean and greased with the o-ring seal fitted and in good condition.

**Note:**

Carefully align the cover assembly and handwheel shaft.

Ensure that all wiring is fitted correctly and will not foul the top cover assembly once fitted.

Lower the top cover into place. Check operation of the handwheel and that no cables are trapped.

Tighten the four cap head screws.



Fig 10.66

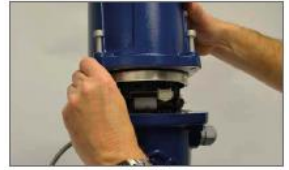


Fig 10.67



Fig 10.68

## 10. Appendix

### Flame Path chart

1. In accordance with clause 5.1 of CAN/CSA C22.2 No. 60079-1 (2016), the critical dimensions of the flamepath are:

Flamepath	Maximum Gap (mm)	Minimum Length (mm)
Lid/Base	0.15	12.8
Base/screw shaft	0.145 <sup>1</sup>	13.5
Base/feedback shaft bush	-0.02 <sup>2</sup>	13.7
Feedback shaft/lid	0.06	13.7
Handknob shaft/lid	0.10	25.9

Note 1: The dimension includes an allowance for the 0.05mm requirements defined in clause 8.1.2 of CAN/CSA C22.2 No.60079-1 (2016)

Note 2: Negative sign denotes an interference fit.

2. The equipment utilizes a non-metallic outer coating and has a potential static hazard. Clean only with a damp cloth.
3. The screws securing the outer window from maintain the integrity of the flameproof enclosure and must not be removed.

### Power Ratings

Listed below are the nominal current ratings for the Neptune actuator:

Current rating at nominal line voltages (A)								
Ambient	Power(W)	110 VAC	115 VAC	120 VAC	208 VAC	220 VAC	230 VAC	240 VAC
20 °C	16.36	0.21	0.20	0.19	0.11	0.11	0.10	0.10
-20 °C	27.82	0.37	0.35	0.37	0.20	0.19	0.18	0.17

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