INSTALLATION MANUAL

OCTOPUS 38 & 45 mm Bore Linear Actuator

Sailboat Drive – Style LAU

OC1675

OCTOPUS
AUTOPILOT DRIVE SYSTEMS

Revision History

Revision	Description
A	Released in Book Format

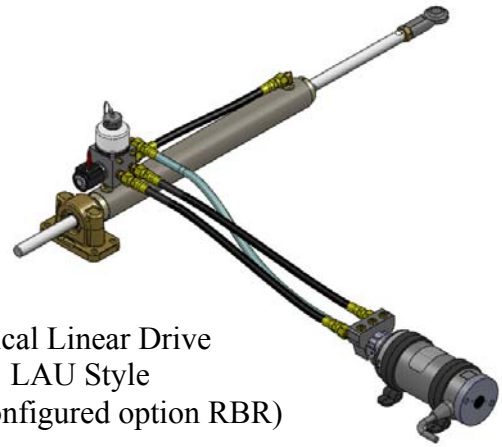
Contents

A. LINEAR ACTUATOR STYLE LAU - SYSTEM OVERVIEW:

Octopus 38 & 45 mm bore hydraulic linear actuators offer a simple, efficient and reliable way of driving the rudder on vessels with mechanical steering systems. The LAU system comprises of a hydraulic cylinder, a bypass valve, a pump set and connecting hoses. The bypass valve is mounted directly to the cylinder (resulting in extremely low drag when hand steering) in any 1 of 6 positions (3 front and 3 rear), the pump set connects to the bypass valve with 3 hoses (hose length to suit installation). These features make the system highly configurable enabling customization to suit the limited space available in many of today's below deck installations.

The assembly of the hydraulic cylinder and bypass valve is mounted on the rudder quadrant and hull superstructure. The pump set can be mounted in a convenient adjacent location. The system reservoir is mounted on top of the bypass valve and MUST be maintained as the highest point in system. When the autopilot is not in use (hand steering) the cylinder runs freely along with the rudder. When the autopilot is in use, the coil on the bypass valve is energized; this locks the cylinder. Steering correction signals from the autopilot are now fed to the dc motor which drives the pump to move the cylinder back and forth.

De-energizing the solenoid valve immediately disconnects the automatic pilot from the rudder enabling hand steering. The unit has a small translucent oil reservoir making it easy to check the fluid level. The system is shipped from the factory filled with oil and requires no additional hydraulic plumbing or purging.



Typical Linear Drive
LAU Style
(shown configured option RBR)

B. SELECTION:

The systems are available in 12" (305mm) or 9" (229mm) stroke for the 45mm bore cylinders 12" (305mm) or 7" (178mm) stroke for the 38mm bore cylinders. 12v or 24v pump and bypass valve voltage. The standard hose length supplied (between the bypass valve and the pump set) is 30" (750mm) – custom lengths are available.

Make sure you have selected the correct model actuator for your vessel see tables 1 thru 4 on page 7. Actuators of the same bore size produce the same thrust force – the radius distance from the rudder post dictates the amount of torque. The shorter stroke actuators require a smaller installation envelope. For best performance higher torque is desirable.

For installation geometry and envelope see diagrams on pages 17 -22.

- How To Order

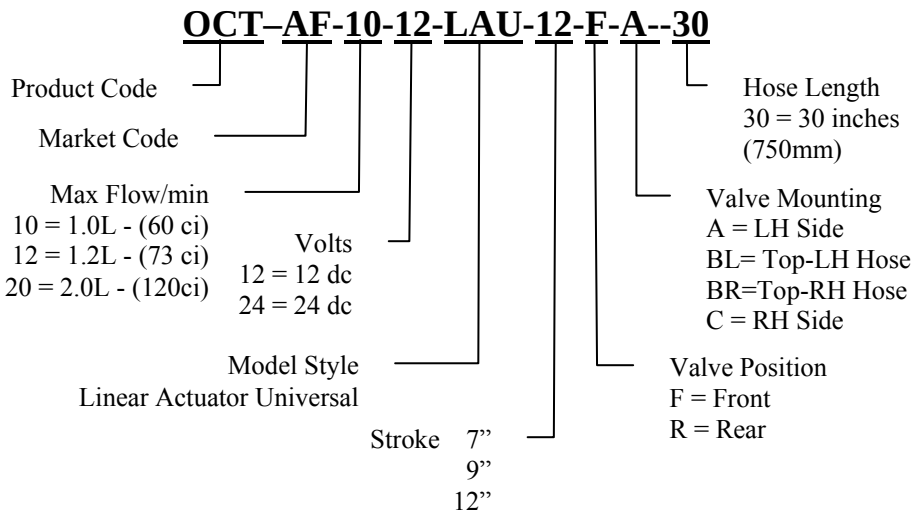


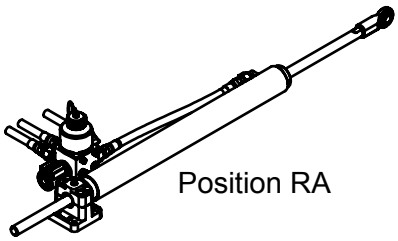
Table 1 – 45mm Bore Cylinders									
Recommended for Vessels up to 70'- (21m) – 37,500lb (1,7050 kg)									
Stroke		**Tiller Radius**		**HO Angle**	**Peak Thrust**		**HO-HO Time**	**Rudder Torque**	
in	**mm**	**in**	**mm**	**degree**	**lbs**	**kg**	**seconds**	lb.in	Nm
9	229	7.8	200	± 35	1320	600	12	10,300	1163

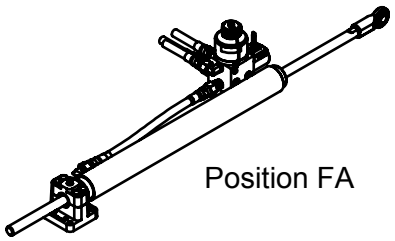
Table 2 – 45mm Bore Cylinders									
Recommended for Vessels up to 80'- (24m) – 44,000lb (20,000 kg)									
Stroke		**Tiller Radius**		**HO Angle**	**Peak Thrust**		**HO-HO Time**	**Rudder Torque**	
in	**mm**	**in**	**mm**	**degree**	**lbs**	**kg**	**seconds**	lb.in	Nm
12	305	10	250	± 35	1320	600	16	13,200	1491

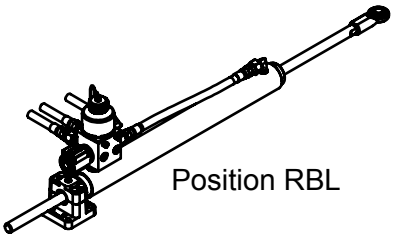
Table 3 – 38mm Bore Cylinders									
Recommended for Vessels up to 45' (14m) – 24,200lb (11,000 kg)									
Stroke		**Tiller Radius**		**HO Angle**	**Peak Thrust**		**HO-HO Time**	**Rudder Torque**	
in	**mm**	**in**	**mm**	**degree**	**lbs**	**kg**	**seconds**	lb.in	Nm
7	1785	6	150	± 35	882	400	12-14	6,630	750

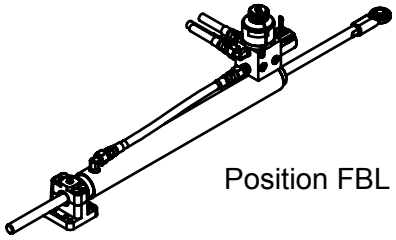
Table 4 – 38mm Bore Cylinders									
Recommended for Vessels up to 60' (18m) – 33,000lb (15,000 kg)									
Stroke		**Tiller Radius**		**HO Angle**	**Peak Thrust**		**HO-HO Time**	**Rudder Torque**	
in	**mm**	**in**	**mm**	**degree**	**lbs**	**kg**	**seconds**	lb.in	Nm
12	305	10	250	± 35	882	400	14-16	10,600	1200

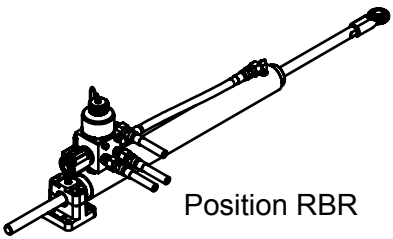
C. CONFIGURATION OPTIONS:

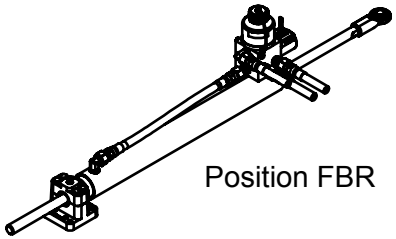


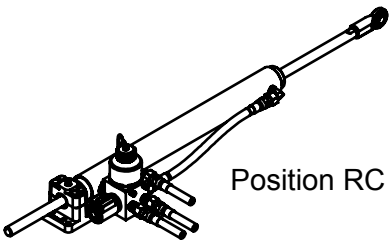


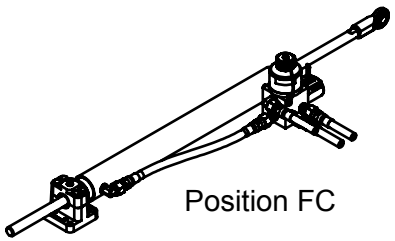






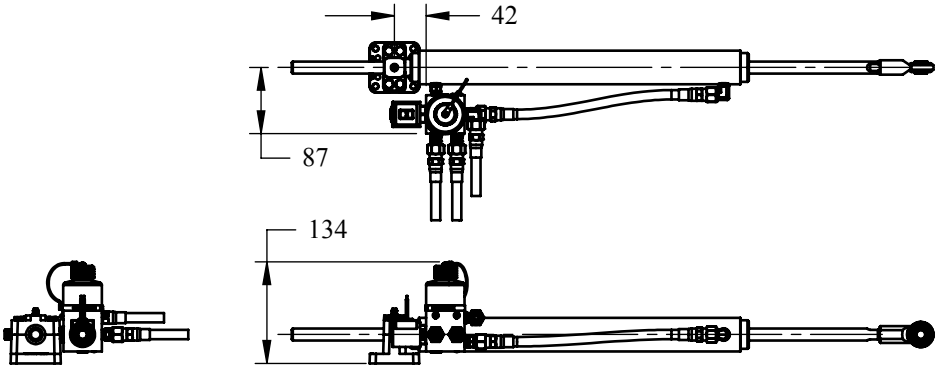




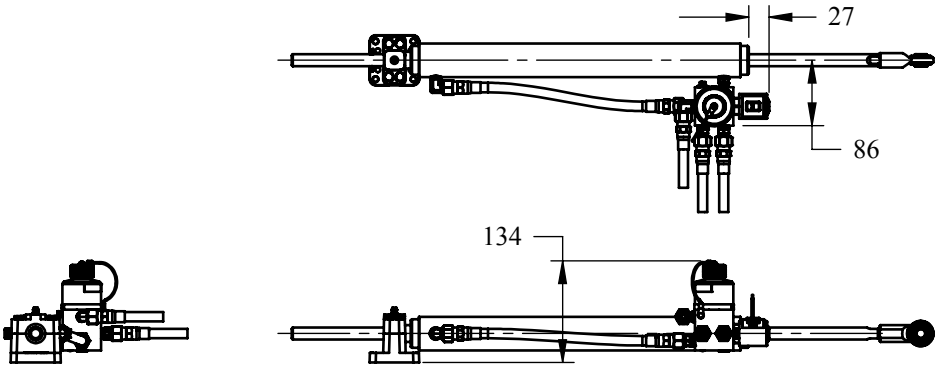


D. BYPASS VALVE ENVELOPE – Mounted on 38mm Bore:

D1: RC Option Shown (RA Option Opposite)

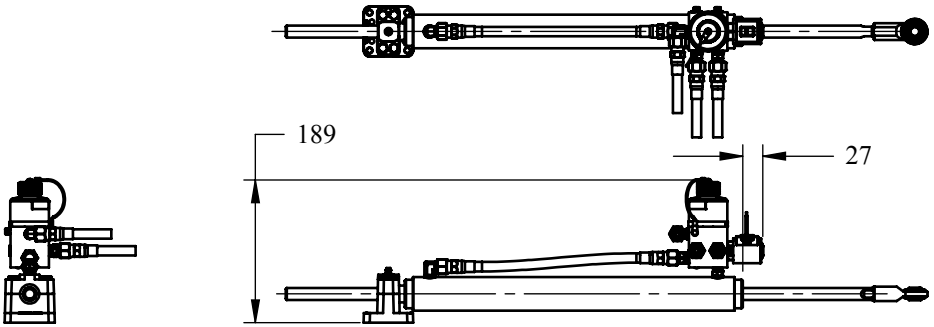


D2: FC Option Shown (FA Option Opposie)



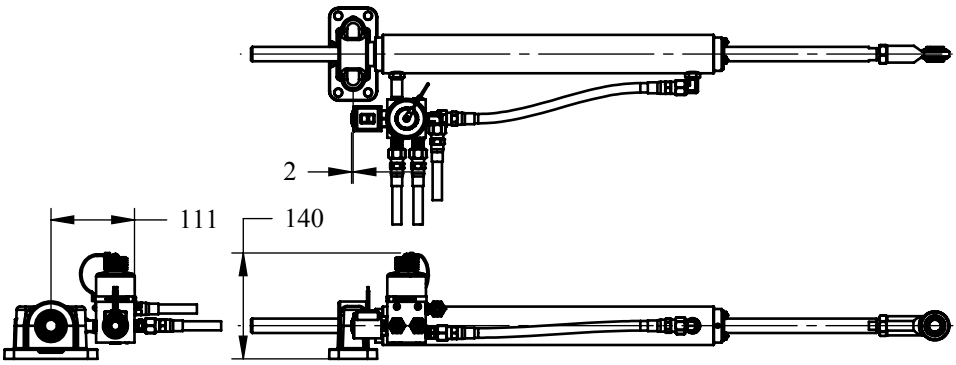
D3: FBR Option Shown (FBL Option Opposite)

See page 17 & 18 for Options RBL & RBR Data

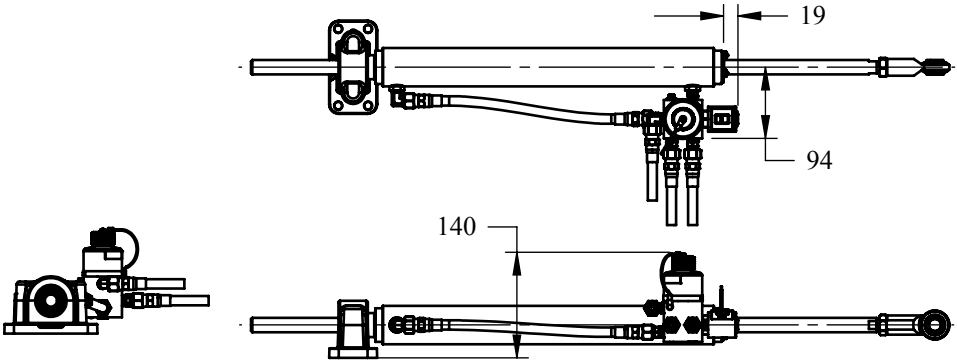


E. BYPASS VALVE Envelope – Mounted on 45mm Bore:

E1: RC Option Shown (RA Option Opposite)

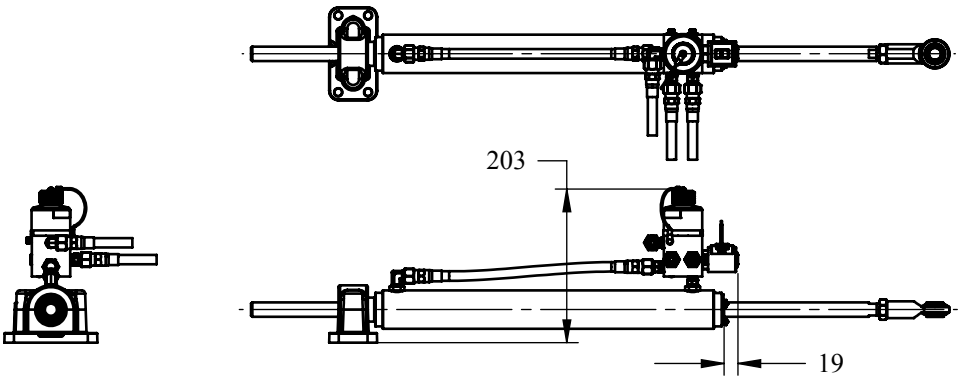


E2: FC Option Shown (FA Option Opposie)



E3: FBR Option Shown (FBL Option Opposite)

See page 19 & 20 for Options RBL & RBR Data



F. INSTALLATION:

1. When planning an installation; provision should be made to access the unit for topping up the reservoir and service purposes and care should be taken to prevent water from splashing or dripping onto the actuator.

2 See page ?? to determine the most suitable configuration option to accommodate the available space.

3. Mount the cylinder directly to the quadrant or tiller and the bypass valve with the plastic oil reservoir upmost. Take note of the mid-position and necessary clearances for operating from full H.O. to full H.O., see diagrams on pages 17 & 22.

4. After mounting, swing the rudder from side to side to make sure that there is no binding in the cylinder or mountings.

5. The rudder stops on the vessel should be set so that the cylinder does not "bottom out" at the ends of its stroke.

5. Mount the pump set in an adjacent location and secure.

6. Make electrical connections according to the information supplied by the autopilot manufacturer.

7. The unit is shipped with a white plastic sealing cap on the plastic reservoir; this should be REMOVED and REPLACED with the METAL VENTED cap that is supplied attached by a nylon line to the valve block.

7. Save the plastic cap in case the unit needs to be shipped for service in the future.

8. If the unit is installed before construction of the vessel is complete, protect the unit (especially the cylinder rod) from dirt, paint and damage.

G. TOPPING UP & PURGING:

The drive system is shipped from the factory filled, tested and ready for service. It should run immediately on installation. If however the oil has been displaced during shipping, the unit may need to be topped up and re-purged of air before running. Re-purging may also be required if the unit has been inoperative for a long period or has been driven for extended periods by the rudder without using the autopilot.

G1. TOPPING UP:

Check the oil level occasionally and top up as required. Do not overfill. Use Shell Tellus 22 hydraulic oil or automatic transmission oil (ATF). Do not use thinner grades of oil such as are used in some hydraulic systems. The oil in the system will show some discoloration with use. This is quite normal. A film of oil will show on the cylinder rod - this is normal.

G2. PURGING:

DO NOT RUN THE PUMP DURING PURGING OPERATION

A. To purge air from the cylinder, proceed as follows:

1. Undo the 2 brass bleeder screws 2 TURNS ONLY. They are located on either side of the valve block just below the plastic reservoir.

2. Energize the solenoid valve coil.

3. Turn the steering wheel from full lock left to full lock right and back again for a few minutes. Air will be seen bubbling from the cylinder into the tank. Top up the oil level if needed. Stop the procedure when no more bubbles are observed.

4. Close the 2 brass bleeder screws firmly.

B. To purge air from the complete system; see FILLING section on page 13.

H. SYSTEM OIL CHANGE:

H1. DRAINING:

- Remove the complete system from the vessel.
- Remove the 3 hoses from both the pump set and the bypass valve.
- Remove the metal vented cap from the plastic reservoir and open the 2 brass bleeder screws – 2 full turns only.
- Invert the actuator and drain the oil out whilst sliding the rod back and forth by hand.
- Drain the 3 hoses.
- Remove the shut off valve from the front of the pump set.
- Drain the pump set by tilting – applying voltage to the motor brush leads will run the pump and assist in expelling residual oil.

H2. FILLING:

- Hold pump set 20 degrees from vertical & vent port uppermost.
- Fill pump chamber through vent port – allow air to escape.
- Assemble shut off valve (complete with 3 O rings & 4 screws).
- Fill cavity in 3 brass fittings – leave pump vertical.
- Assemble 2 steering lines to bypass valve.
- Verify 2 x brass screws on bypass valve are full closed.
- Energize leads on coil – 12 or 24v as required.
- Immerse line ends in container of fluid.
- Clamp cylinder assembly trunnion in a vice or onto a bench.
- Steady push/pull cylinder rod HO to HO – min 10 x full cycle.
- Assemble vent line to bypass valve – hold with slight incline upwards – line end just above top of reservoir.
- Fill reservoir with fluid – allow fluid to flow to end of vent line.
- Attach 3 hoses to pump – minimize any oil spill – torque.
- Open the 2 x brass screws on bypass valve 2 full turns.
- Verify that 3 x brass screws on shut off valve are open 2 full turns from fully closed.
- De-energize leads on coil.
- Steady push/pull cylinder rod H.O. to H.O. – min 5 x full cycle.
- Close 2 x brass screws on bypass valve and tighten.
- Supply voltage to pump set to run cylinder H.O. to H.O. – min 7 full cycles – Note initial pump action may cavitate.
- Top up reservoir.

I. SERVICE:

1. The Octopus pump requires no routine service.

2. The marine hydraulic cylinder requires no routine service.

3. The fluid level in the system reservoir should be maintained.

4. A complete oil change should be made about once every 3 years - more often if used for extended cruising.

5. Check all electrical connections on a periodic basis.

J. TROUBLESHOOTING:

If the unit fails to operate after installation is complete, check for the following common causes.

1. Motor does not run:

   i. No voltage applied to motor. (Check voltage at motor with voltmeter).
   ii Autopilot not switched onto correct setting. (Check autopilot manual).

2. Motor runs but pump does not move the rudder:

   i. System not filled with oil. (Fill and purge system).
   ii. Bypass valve open. (Check autopilot output for signal).
   iii. Pump adjustment set too low. (Adjust flow setting up).
   iv. Bleed screws not closed (tighten 2 brass screws on by pass valve).
   v. Pump has been dismantled and not assembled correctly. (Ensure piston is not backwards).
   vi. U-cup seal failure. (Install new cylinder seal kit).

3. Excess oil leaking from front or rear of cylinder, along shaft:

   i. Shaft seal failure (inspect shaft for damage, including nicks, scratches, varnish/paint spots - install new cylinder seal kit and either repair or replace the shaft).

4. Shaft seizes into barrel and unit does not run freely:

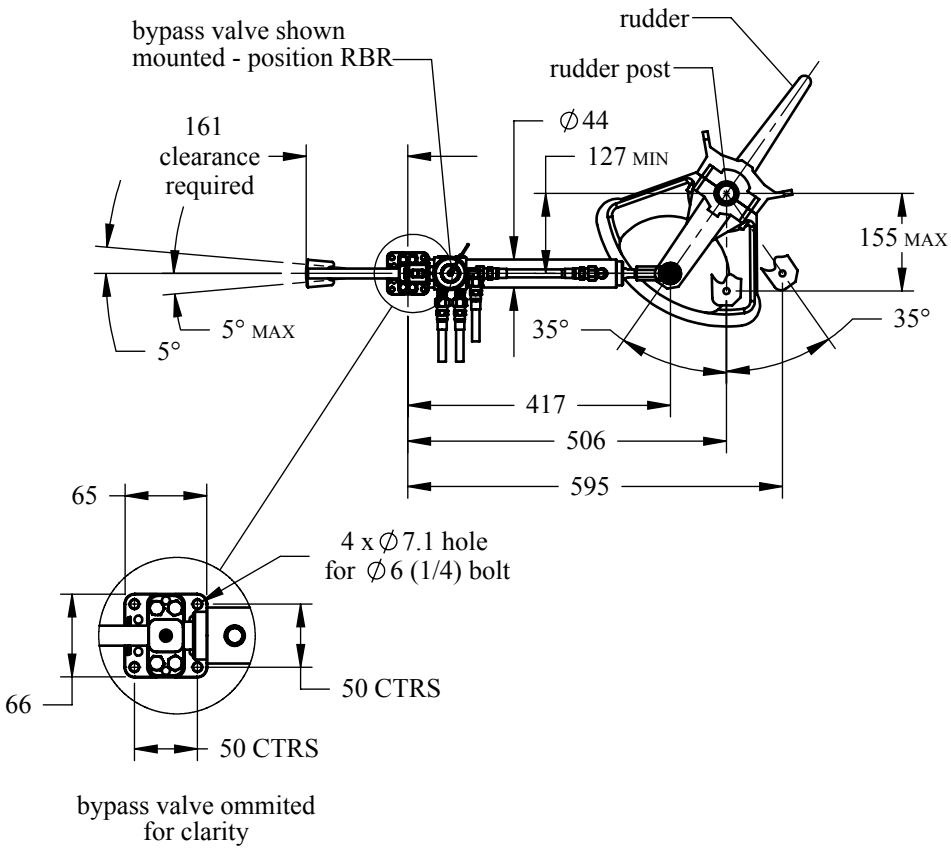
   i. Shaft bent or rear gland damaged. (Inspect shaft for straightness or damage and rear gland/trunnion for damage, also ensure integrity of structural attachment to hull - either repair or replace damaged parts).

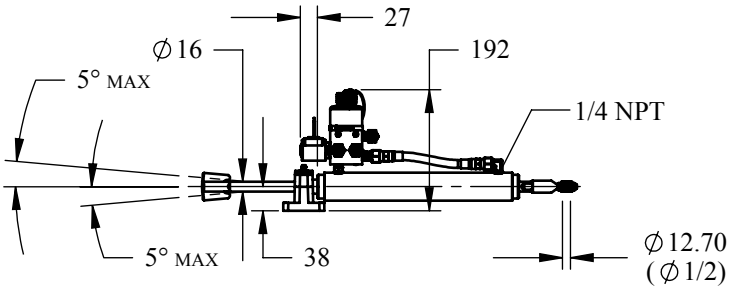
K. SPARE PARTS:

The following parts are available as spares and are recommended for vessels undertaking extensive passages or when autopilot downtime must be kept to an absolute minimum.

	Description	Part Number
1.	2.0L – 12volt motor & pump assembly	OC14SUK12
2.	2.0L – 24volt motor & pump assembly	OC14SUK15
3.	12volt Type 2 motor module assembly	OC14SUK21
4.	24volt Type 2 motor module assembly	OC14SUK22
5.	2.0L pump module assembly	OC14SUK25
6.	1.2L pump module assembly	OC14SUK24
7.	1.0L pump module assembly	OC14SUK23
8.	# 8 Solenoid valve cartridge	OC1712
9.	# 8 Solenoid valve coil 12 volt	OC1713
10.	# 8 Solenoid valve coil 24 volt	OC1714
11.	Reversing pump seal kit	OC14SUK26
12.	45mm bore cylinder seal repair kit	OC16SUK09
13.	38mm bore cylinder seal kit	OC16SUK08
14.	#8 by-pass valve seal kit	OC17SUK14
15.	Hose assembly x length – steering line	OC17SU41-XX
16.	Hose assembly x length – reservoir line	OC17SU42-XX

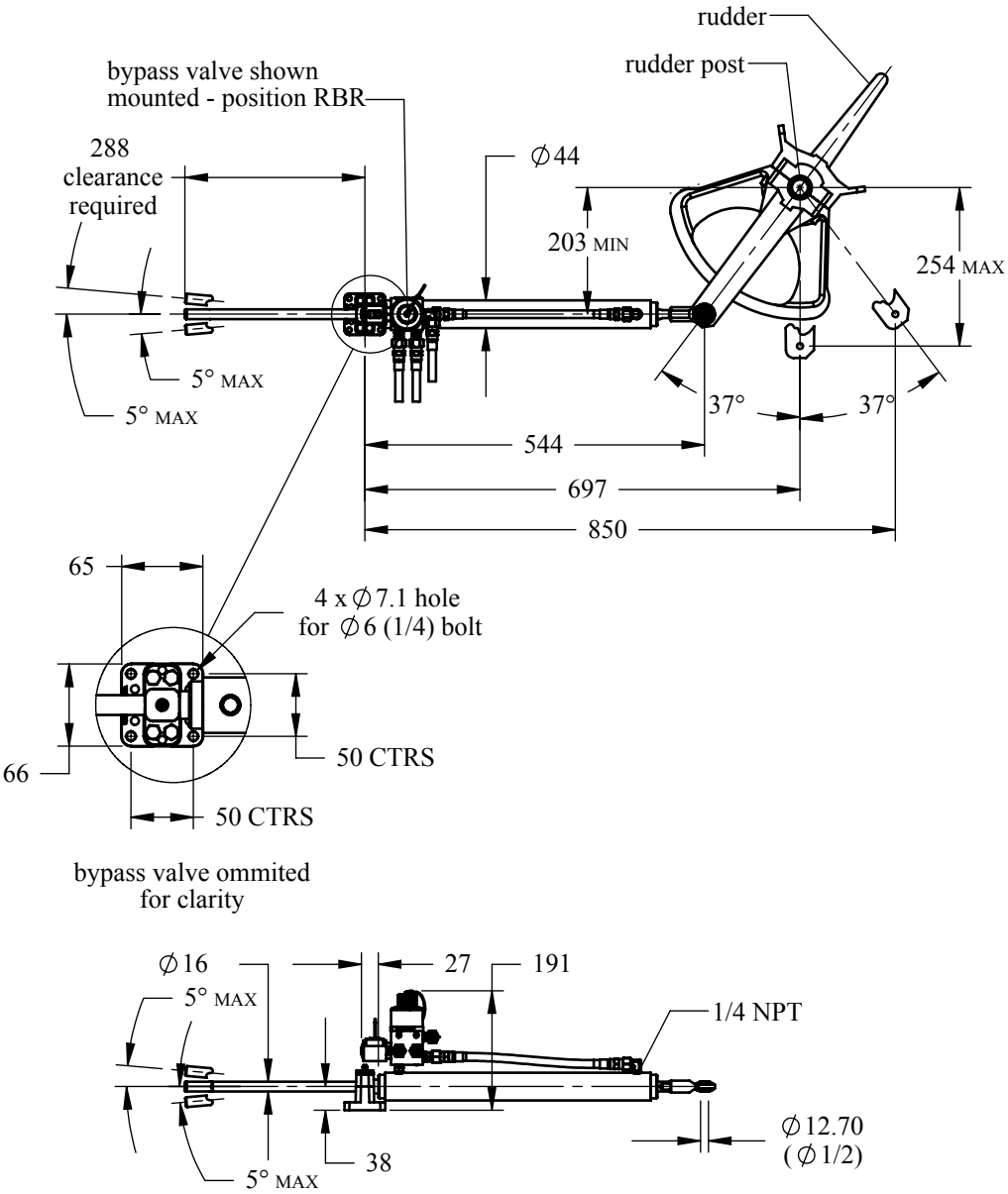
L. INSTALLATION ENVELOPE: 38mm BORE – 7" STROKE:





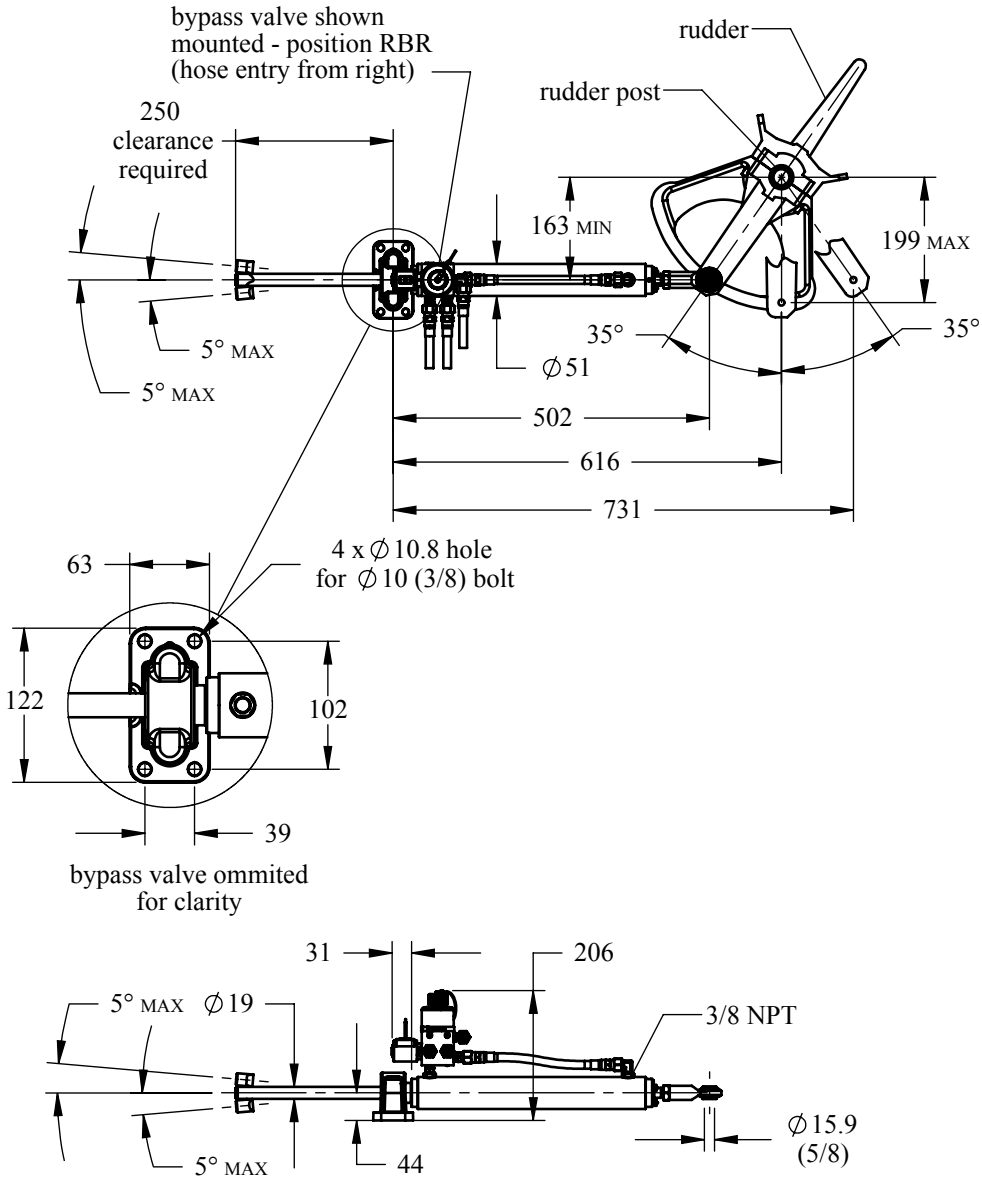
Note: See page 9 for additional bypass envelope data.

D. INSTALLATION ENVELOPE: 38mm BORE – 12" STROKE:



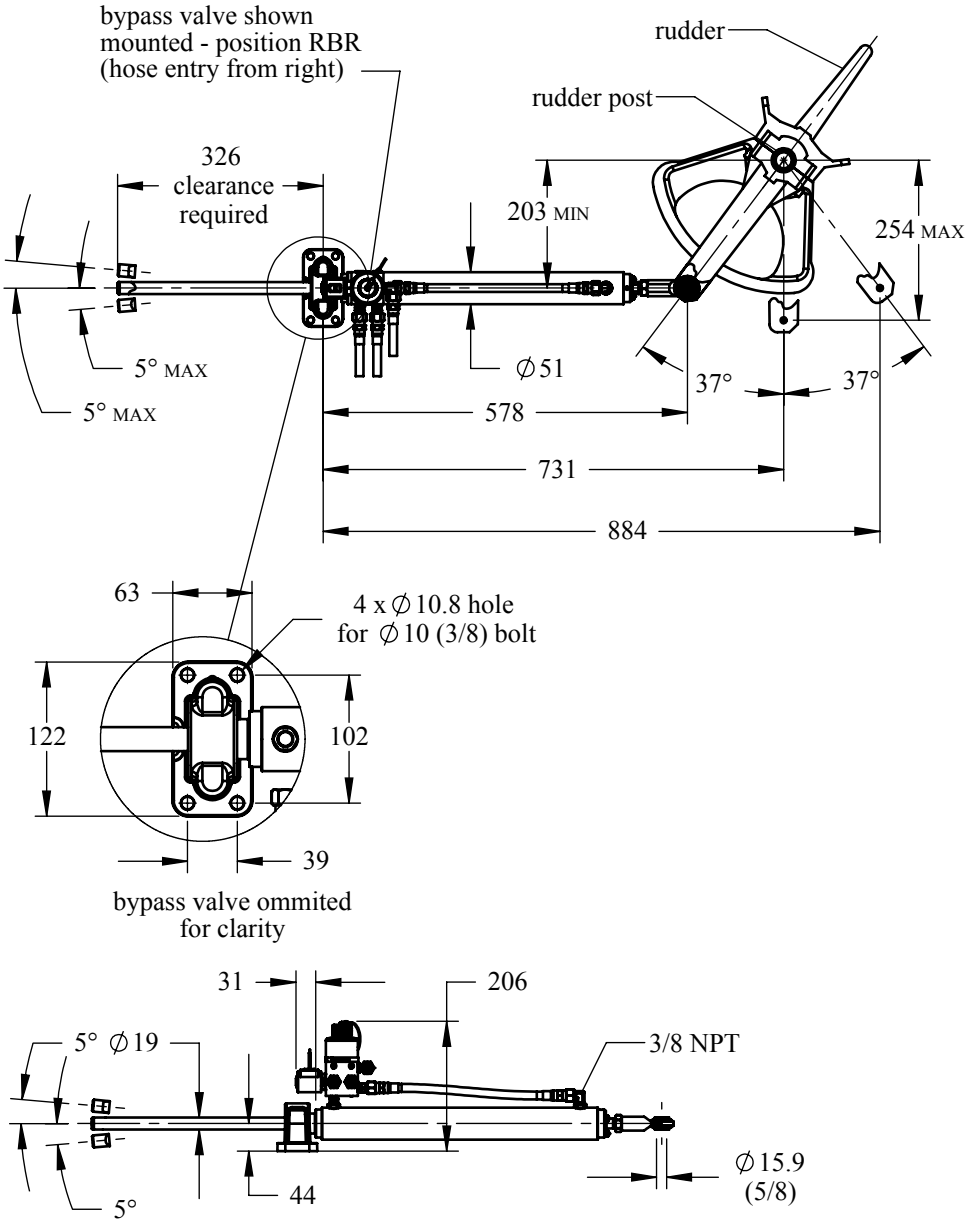
Note: See page 9 for additional bypass envelope data

D. INSTALLATION ENVELOPE: 45mm BORE – 9" STROKE:



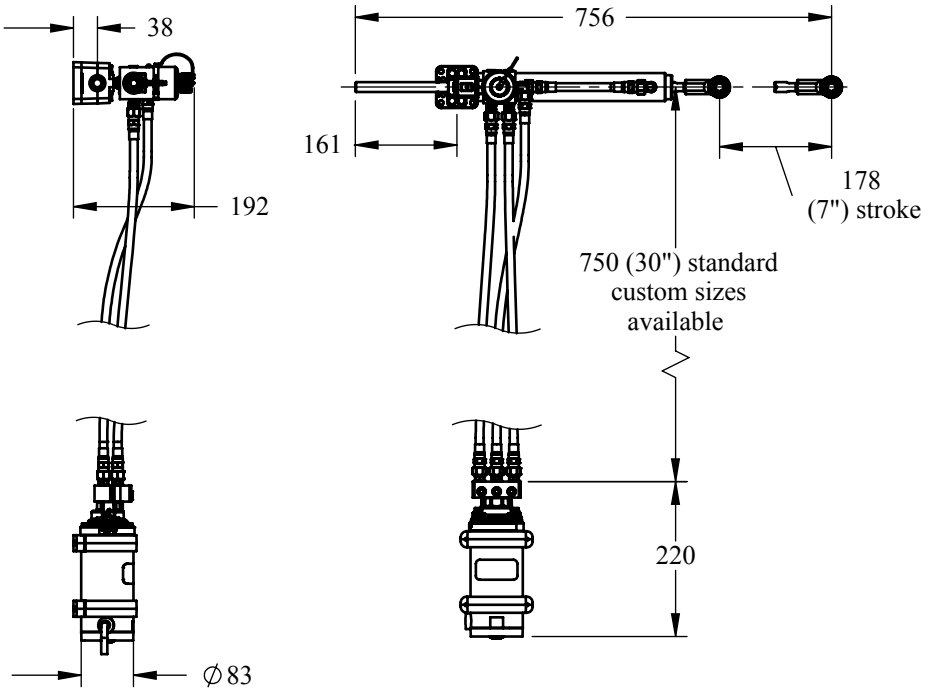
Note: See page 10 for additional bypass valve envelope data

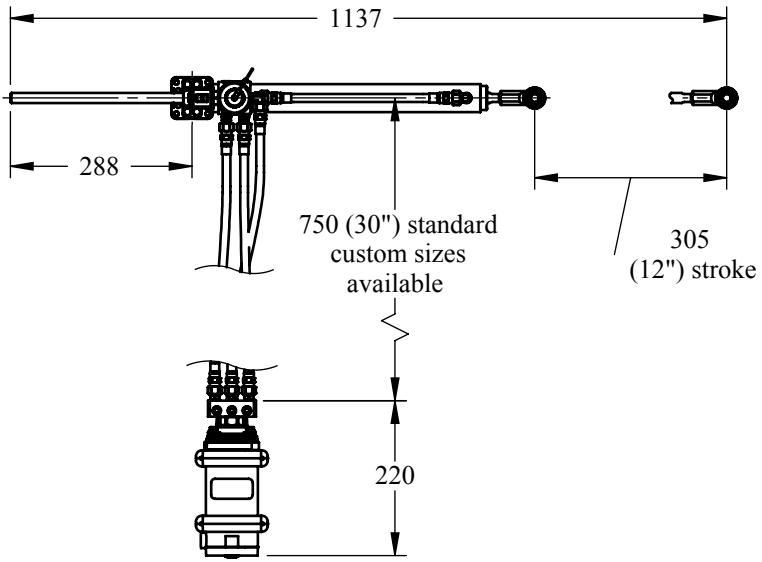
D. INSTALLATION ENVELOPE: 45mm BORE – 12" STROKE:



Note: See page 10 for additional bypass valve envelope data

D. INSTALLATION ENVELOPE: 38mm BORE SYSTEMS:





D. INSTALLATION ENVELOPE: 45mm BORE SYSTEMS