



# OCTOPUS

## SELECTION & INSTALLATION GUIDE



### CRB SERIES CONTINUOUS RUNNING PUMPSET

#### A. GENERAL DESCRIPTION:

Octopus CRB pumpsets are heavy duty, continuously running, electric motor driven pumps which are used for jog systems and automatic pilot drive service on larger yachts and commercial vessels. They are very reliable quiet and efficient devices, which will give you thousands of hours of trouble free service. They are based upon a continuously running D.C. or A.C. motor driving a gear pump. They can be used on steering cylinders up to 3500 cc (200 cu in) in volume. For serviceability, the design is based upon modular construction enabling either a motor module or a pump module to be easily changed with no special skills. They have a mechanical seal between the motor and the pump ensuring a longer life than the traditional lip seal which wears a groove in the shaft as it seals. They also feature a built in adjustable pressure relief valve, a pressure gage and have no external plumbing. When selecting a flow rate to drive your specific steering cylinder you should aim to operate the rudder from full left hard over to full right hard over in about 15 seconds.

#### B. BASIC MODELS

CRB pumpsets are available in a wide combination of flow rates and both A.C. & D.C. voltages. For example in model CRB-08-24-24-A, the first 3 characters signify a CRB pump type, the fourth & fifth characters signify 08 litres/min (2.0 gpm) flow rate and the sixth & seventh characters signify 24 vdc motor, the eighth & nine characters signify 24 vdc control coils, the tenth character (suffix A) signifies the basic pump unit (single speed only).

#### B1. OPTIONS AVAILABLE ON ANY CRB PUMPSET

##### i. FLOW CONTROL:

This feature allows the flow to be adjusted down from the rated maximum to approximately 65%. This option is signified by suffix B in the model #.

##### ii. TWO SPEED WITH FLOW CONTROL ON LOWER SECOND SPEED:

This feature adds a second lower speed, the lower speed has an adjustable flow control which allows the flow to be adjusted down from a maximum of the rated second speed approximately 65%. With this option, the pump normally runs at the slower speed, the higher speed is engaged by energizing an auxiliary solenoid valve. This is useful for hand jog applications where fast response is desirable. This option is signified by suffix C in the model #.

#### C. MECHANICAL INSTALLATION:

Mount the pump anywhere in the vessel where it is close to the tubes connecting the hand steering helm pump to the rudder cylinder. Preferably this should be on a stable and rigid horizontal surface in a clean dry area. The best location is usually in the engine room. There are 5 attachment holes, 4 in the motor baseplate and 1 in the reservoir support leg, use 5 x 3/8 bolts. Note that you should ensure that the mechanical installation does not induce any loads into the reservoir/manifold flange. We recommend that you use the spacer supplied under the reservoir support leg and also use additional shims if required to protect against this. The rigidity of the mounting surface can also induce loads into this flange area. Be careful to mount the pump with the ports and solenoid connections accessible, and to allow enough clearance above the unit for filling with oil. The unit will generate up to 150 watts of heat, so avoid installing it in a poorly ventilated area.

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**D. HYDRAULIC CONNECTIONS:**

In any hydraulic system it is important to use flexible hoses between the pump and the copper tubing to protect the tubing against fatigue. Three lengths of 3/8" dia SAE100R1 hose must be used. It is most important to keep all dirt, including dust, out of the system during installation. Blow out all hydraulic lines before assembly. Ensure **ADEQUATE** venting of reservoir as recommended below. If the system on which this unit is installed has been in use for more than 2 years, it should be drained and refilled with new hydraulic oil. It is a good idea when draining older systems to dismantle and clean inside the steering cylinders where dirt particles often accumulate. An hour or two spent cleaning an older hydraulic steering system can prevent endless frustration later.

**ALL 3 HYDRAULIC LINES MUST BE USED**

**D1. CONNECTING THE 2 PRESSURE LINES:**

The 2 lower ports on the sides of the manifold (one front & one rear, below steering solenoid valve coils) must be "Tee" connected into the tubes connecting the hand steering helm pump to the steering cylinder (existing steering lines). At the pump end the hoses should be fitted with male 3/8" N.P.T. pipe fittings, at the "Tee" ends, the hoses should be fitted with suitable fittings to connect to the existing steering lines.

**D2. CONNECTING THE VENT & FILLING LINE:**

For venting and filling, one of the ports on the top of the pump reservoir **MUST** be connected to the existing reservoir on the steering system. There is usually a port on the bottom of the helm pump. If there are 2 helm stations, use the lowest. Also an overflow tank of at least 1 gallon (4 litres) must be fitted above the highest helm station, this tank must be vented to atmosphere. At the pump end the hose should be fitted with a male 3/4" N.P.T. fitting, at the helm station end, the hose should be fitted with suitable fittings to connect to the helm port.

The correct installation of the **VENT & FILLING LINE** is crucial for the operation of the pump & protecting the reservoir from structural damage due to momentary overpressurization.

**D3. PRESSURIZED STEERING SYSTEMS:**

For pressurized steering systems, connect the 2 pressure lines as D1 above and connect the vent filling line as D2 above with the exception of the vented overflow tank, this is **NOT** required. Air pressure in the system should not exceed 1 bar (15 p.s.i.).

Note:

1. Ensure that the existing hydraulic system incorporates non-return (lock out) valves in the helm pump (check with the steering system manufacturer); if it does not, then suitable valves must be fitted. Most North American steering systems have non-return valves.
2. It is advantageous and recommended that shut off valves be installed in the 3 connecting lines to this pump. The shut off valves enable the pump unit to be removed from the vessel without draining the steering system. These valves must be rated for 1000 p.s.i.
3. A suitable liquid pipe thread sealer may be used sparingly. Do not use plastic or PTFE tape, this can very easily separate and allow fragments into the system.
4. **DO NOT RUN THE PUMP WITHOUT SUITABLE VENTING - THIS WILL CAUSE DAMAGE.**

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### E. FILLING THE SYSTEM:

To fill the system you will need a 9/16 AF allen key. After installing the Octopus CRB Pump the steering system can be filled following the following procedure:

- i. Remove a port plug on the top of the pump reservoir, using a funnel as required, fill tank with clean hydraulic oil or automatic transmission fluid as recommended by your steering system manufacturer. Replace the plug and tighten.
- ii. Open the 3 shut off valves between the pump and the steering system.
- iii. Fill the steering system following the steering system manufacturers recommended procedure.
- iv. If the steering system is of the pressurized type, re-pressurize the system but do not exceed 15 p.s.i. pressure. Running the steering system with pressure in excess of 15 p.s.i. is unnecessary and will reduce the life of the pump seals.
- v. Start the pump motor. For a few minutes, repeatedly direct oil into each steering line by energizing the solenoid coils.

### F. ADJUSTING PRESSURE RELIEF SETTING:

To adjust the pressure relief setting you will need a 3/4 AF wrench and a 1/4 AF allen key. The CRB pump is shipped with the pressure relief set at approx. 950 p.s.i., the cartridge style pressure relief valve is located on the front face of the pump. When facing the front of the pump, the motor will be on your right and the reservoir will be on your left. This pressure relief valve cartridge has an adjusting screw with a lock nut. The standard pressure range is 100 to 1200 p.s.i. To make pressure relief adjustments:

- i. Using both the wrench and the allen key, crack the lock nut on the adjusting screw.
- ii. Using the allen key, turn the adjusting screw clockwise (in) to increase pressure relief setting or counterclockwise (out) to decrease pressure relief setting.
- iii. After achieving desired setting use wrench and allen key to re-tighten the lock nut.
- iv. Be careful not to unscrew the whole cartridge body during this procedure.
- v. You cannot over or under adjust the adjusting screw, there are definite stop points.

### G. ADJUSTING PUMP FLOW (OPTIONS SUFFIX B AND C) :

To adjust the flow you will need a 3/4 AF wrench and a 1/4 AF allen key. The CRB pump is shipped set at its maximum rated flow, the cartridge style flow control valve is located on the rear face of the pump, this valve has an adjusting screw with a lock nut. When facing the front of the pump, the motor will be on your right and the reservoir will be on your left. Note that on the 2 speed models, only the lower speed has an adjustable flow. To make flow adjustments:

- i. Using both the wrench and the allen key, crack the lock nut on the adjusting screw.
- ii. Using the allen key, turn the adjusting screw clockwise (in) to reduce flow to desired setting.
- iii. After achieving desired setting use wrench and allen key to re-tighten the lock nut.
- iv. Be careful not to unscrew the whole cartridge body during this procedure.
- v. You cannot over or under adjust the adjusting screw, there are definite stop points.
- vi. It may be necessary to try several settings to get the best autopilot performance.

### H. ELECTRICAL CONNECTIONS:

Before making any connections, ensure that the supply voltages match the pump & solenoid voltages (motor & solenoid voltages may be different) as identified on the model specification plate on the end of the reservoir. The motor should be connected to the supply via a suitable circuit breaker and using cable that is heavy enough to carry the rated power as shown on the motor label. The solenoid valves can be connected using 14-awg cable. It may be advisable to install a starter relay so that the pump can be started from the bridge with light control cable. Note the following when making the electrical connections :

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**H. ELECTRICAL CONNECTIONS (Cont...):**

- i. In d.c. systems the red wire in the motor must be positive “+”.
- ii. In a.c. systems follow diagram on motor label for jumper and wiring options.
- iii. For autopilot connections to the steering direction solenoid coils, follow the automatic pilot manufacturer’s instructions.
- iv. For manual jog systems, limit switches should be installed to prevent the rudder being driven into the rudder stops.
- iv. On the 2 speed option : The solenoid coil should be controlled by an appropriate control circuit. Remember that the system runs in the higher speed when this solenoid coil is energized. This coil uses about 15 watts to operate.

**I. STARTING AND TESTING:**

Before testing the pump, ensure that the 3 shut off valves between the pump and the steering system are open. To test the pump:

- i. Turn on the supply power to the motor.
- ii. Turn on the supply positive power to the starter relay (if fitted), this is usually switched by an output terminal on the autopilot becoming positive when the pilot is turned on.
- iii. The pump motor will start and run with a smooth hum. To confirm correct polarity, the cooling fan in the rear of the motor should be turning in a counter clockwise direction when viewed from the rear of the motor.
- iv. To test for steering control, momentarily energize one steering direction solenoid coil and note that the motor noise will change slightly and the rudder will move in one direction. To test for opposite rudder direction momentarily energize the other steering direction solenoid coil. This test can be achieved by using jumper cables (depending upon voltages) or by using autopilot controls as per autopilot manufacturers instructions.
- v. During these tests avoid running the rudder into the stops.

**J. MAINTENANCE:**

You will need a 5 mm AF allen key. To ensure longer life it is recommended that at about one year intervals the following cleaning procedure is performed:

- i. Drain the hydraulic oil out of the complete steering system. Ensure adequate venting whilst removing the old oil.
- ii. Using the 5 mm AF allen key, crack and remove the 4 allen screws holding the hydraulic oil to the center manifold.
- iii. Pull off the hydraulic oil reservoir, as it seals on an ‘O’ ring, a firm pull is required.
- iv. Removal of the reservoir will expose a filter basket, unscrew this basket from the elbow and clean off the filter mesh.
- v. Re-attach the basket to the elbow, ensuring that basket is pointing towards the bottom of the reservoir.
- vi. Clean the inside of the reservoir including the small magnet, which may have trapped magnetic particles.
- vii. Replace the oil reservoir with a firm push to overcome the ‘O’ ring friction, ensure correct alignment.
- viii. Install and tighten the 4 allen screws using the 5 mm AF allen key.

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### K. 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. Check power supply and circuit breaker.
- iii. Check starter relay.
- iv. Autopilot not switched on correct setting. (check autopilot manual).
- v. Check motor brushes.

#### 2. Motor runs but solenoid valve does not operate:

- i. System not filled with oil. (fill system).
- ii. Shut off valve(s) closed. (fully open 3 x shut off valves).
- iii. Check motor polarity ( see section I-iii).
- iv. Hydraulic connection incorrect. (check that 2 side ports connect to steering cylinder hoses).
- v. Vent/Filling line not connected. (Must connect to reservoir).
- vi. Check that switching power is reaching solenoids.
- vii. Check solenoid coil continuity.
- viii. Dirt in solenoid valve. (see item 4 below).

3. Deformed lugs on pump reservoir at connection with center manifold, resulting in leak of hydraulic fluid. This condition is caused by excessive pressure build up in pump reservoir from return steering line. Ensure reservoir is vented as per section D2. If the lugs are deformed, you must remove the reservoir and either replace or repair it.

4. Dirt in the solenoid valve will cause excessive power consumption and solenoid valve failure. This condition may be detected by small rise in the operating pressure when the unit is running at idle. This condition will eventually stop the pump from steering and therefore must be rectified as soon as possible. To replace or clean the solenoid valve :

- i. Close the 3 shut off valves on the connecting hoses to the pump.
- ii. Disconnect the electrical control lines from the solenoid valve.
- iii. Remove the solenoid valve from the pump.
- iv. Drain the pump reservoir and then remove reservoir (see section J above).
- v. Wash out the reservoir and filter basket and re-assemble to pump.
- vi. Wash the solenoid valve with varsol and blow dry with compressed air. If this procedure does not clear away the blockage, it is recommended that a new valve unit is fitted.
- vii. Re-assemble the solenoid valve to pump manifold.
- viii. Fill system with oil as per section E above, start and test as per section I above.

### L. 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. Specify serial number of pump when ordering.

1. Motor Module.
4. Seal Kit

2. Pump Module
5. Solenoid Kit

3. Solenoid Valve

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