

MANUAL FILLING AND PURGING

NOTICE

Power Purge Users. Please refer to the instructions included with your power purge unit.

NOTICE

Power Assist Users. You **MUST** refer to the bleeding instructions included with your SeaStar Power Assist Unit.

Read First

Steps 1 – 5 noted on page 25 refer to a single station, single cylinder installation. For twin station and/or twin cylinder installations you **MUST** perform steps 1 – 5 first, then, see page 26 and page 27 to complete the removal of air from the system.

NOTICE

This procedure requires two people. One person may not be able to remove all the air from the system which will result in spongy, unresponsive steering.

During the entire filling procedure, oil **must** be visible in the filler tube. **Do NOT** allow the oil level to disappear into the helm pump, as this may introduce air into the system and increase your filling time.

Hydraulic Fluid

Acceptable and recommended oils for your steering system are:

- SeaStar Hydraulic Fluid, part #. HA5430
- Texaco H015
- Aero Shell Fluid #41
- Esso Univis N15 or J13
- Chevron Aviation Fluid A
- Mobil Aero HFA
- Fluids meeting Mil H5606C specifications.

⚠ CAUTION

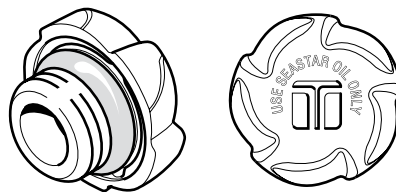
Never use brake fluid. Any non-approved fluid may cause irreparable damage, loss of steering, and cancellation of warranty.

Automatic transmission fluid Dexron II may be used in an emergency.

In cases of extreme emergency any non-toxic, non-flammable fluid may provide temporary steering.

SeaStar hydraulic oil is not available from your local gas station. Order a spare bottle from your marine parts dealer.

Vent Plug (part #HA5431)



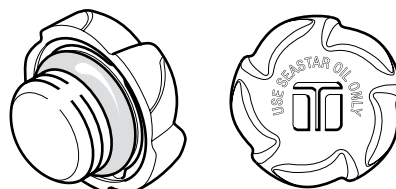
- Must be used with helm pump on all single steering station systems.
- Must be used on upper-most helm pump only on multi-steering station systems.
- Vent hole: actual size as shown.
- Colour: threads, silver – cap, black

Figure 26.

Non-Vent Plug (part #HA5432)

⚠ CAUTION

Failure to install a non-vent plug in ALL lower helms of multi-helm systems will result in fluid leaking out of the vent cap.



- Must be used on all helm pumps other than upper-most helm pump on multi-steering station systems.
- This non-vent plug is supplied with additional station fitting kit no. HF5501 and HF5502.
- Actual size shown.
- Colour: black (previously silver)

Figure 27.

HYDRAULIC STEERING

FILLING AND PURGING

Hydraulic Oil Requirements

2 bottles (2 quarts or litres) for single station and single cylinder systems.

1 additional bottle for each additional helm, cylinder, or auto pilot.

NOTICE

These instructions will result in hydraulic oil flushed in and out of the system. Oil can be re-used if filtered through a fine mesh screen such as used for gasoline. If unable to filter oil, an additional bottle of oil is required.

NOTICE

“Bleeder” refers to cylinders fitted with bleed tee fittings. If fitted with bleed tee fitting, open bleeder by unscrewing bleed nipple nut two turns.

⚠ CAUTION

Unbalanced Cylinders.

The oil level in the helm must be set with the cylinder rod fully retracted. Failing to observe this caution will result in an oil spill at the helm.

NOTICE

Filling the helm full of oil can be done faster if oil is poured into the helm prior to connecting filler tube and oil bottle to the helm.

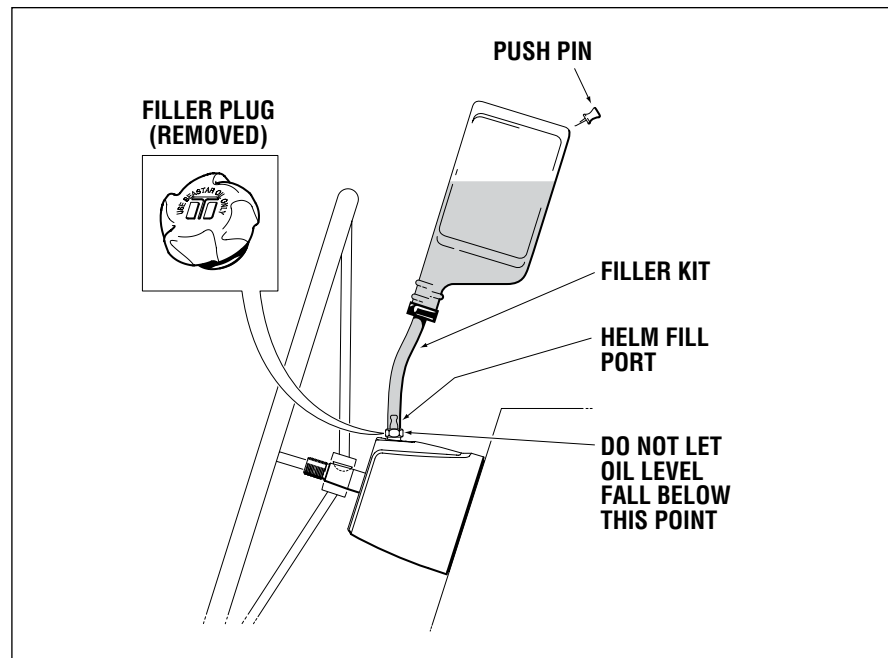


Figure 28

Single Station One Cylinder

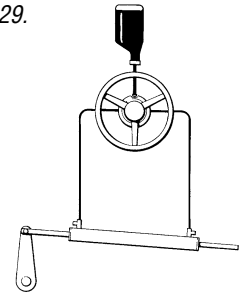
HYDRAULIC STEERING

FILLING AND PURGING

Step 1

- Screw the threaded end of the filler tube into the helm filler hole.
- Remove the cap from the oil bottle and holding upright, screw into the filler tube bottle cap. Poke hole in the bottom of the bottle.
- Fill the helm pump full of oil (Oil should always be visible in the filler tube). Use the next bottle at any time throughout the procedure when the oil level drops in the filler tube. Do not proceed with step two until helm is full of oil.

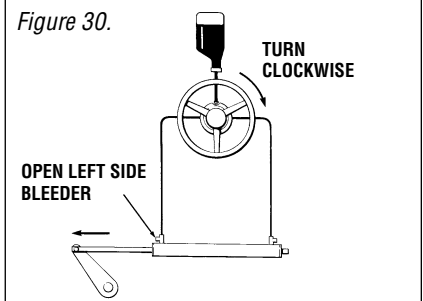
Figure 29.



Step 2

- Turn the steering wheel clockwise until the cylinder rod is fully extended on the left side of the cylinder.
- Open left side bleeder.

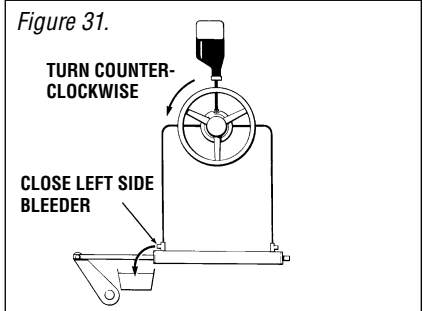
Figure 30.



Step 3

- Holding the cylinder rod (to prevent it from moving back into the cylinder) turn the steering wheel counter-clockwise until a steady stream of air free oil comes out of the bleeder. (Drain out approx. 1/2 bottle of oil or as required.)
- While continuing to turn the wheel, close the left side bleeder and let go of the cylinder rod.

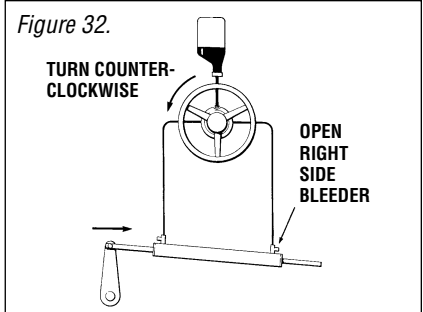
Figure 31.



Step 4

- Continue turning the steering wheel counter-clockwise until the cylinder rod is fully extended to the right. (Steering wheel will come to a stop.)
- Open the right bleeder.

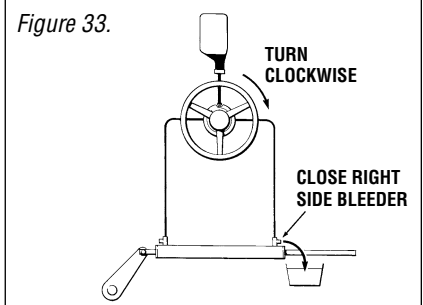
Figure 32.



Step 5

- Holding the cylinder rod (to prevent it from moving back into the cylinder) turn the steering wheel clockwise until a steady stream of air free oil comes out of bleeder.
- While continuing to turn the wheel, close the right side bleeder and let go of the cylinder rod.

Figure 33.



Fill and purge is now complete.

HYDRAULIC STEERING

FILLING AND PURGING

Oil Level Set

- Proper oil level set can be obtained by opening right bleeder and turning steering wheel to the right until fluid level reaches top of plastic filler fitting and then turning wheel one more full turn.

⚠ CAUTION

For unbalanced cylinders the oil level in the helm must be set with the cylinder rod fully retracted. Failing to observe this caution will result in an oil spill at the helm.

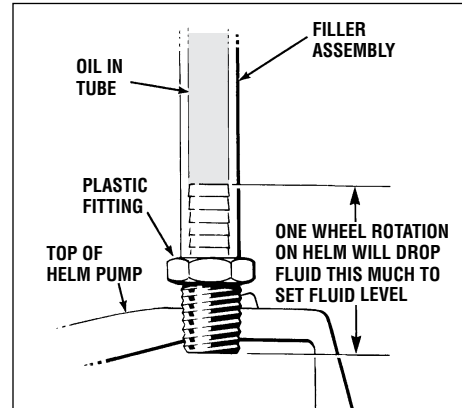


Figure 34.

Twin Station Single Cylinder

- Perform steps 1 through 5 at station no.1. Then repeat steps 1 – 5 at station no.2.
- Oil requirements 4 – 5 bottles.

NOTICE Refer to Oil Level and System Proof Check on page 28.

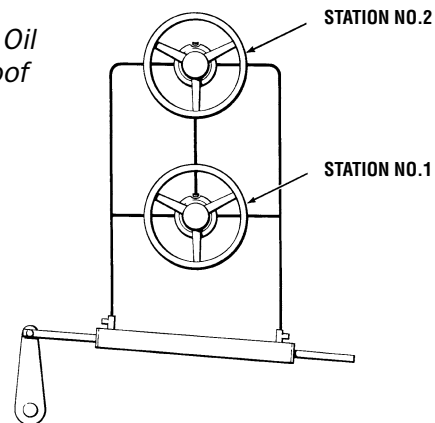


Figure 35.

Single Station Twin Cylinder

- When performing steps 1 through 5, perform instructions in each step first on cylinder no.1 and then on cylinder no.2, before proceeding to the next step. ie: Perform instructions referring to right side of cylinder first on cylinder no.1 and then on cylinder no.2.
- Oil requirements 4 – 5 bottles.

NOTICE Refer to Oil Level and System Proof Check on page 28.

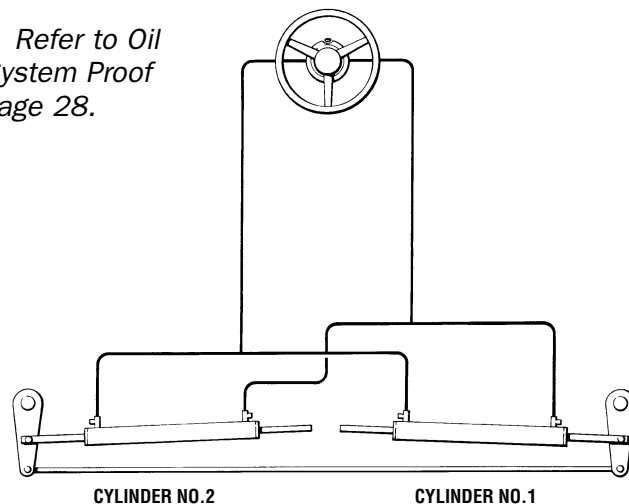


Figure 36.

Twin Station Twin Cylinder

- Follow same procedure as instructed for single-station/ twin-cylinders, beginning at station no.1, and repeat entire procedure at station no.2.

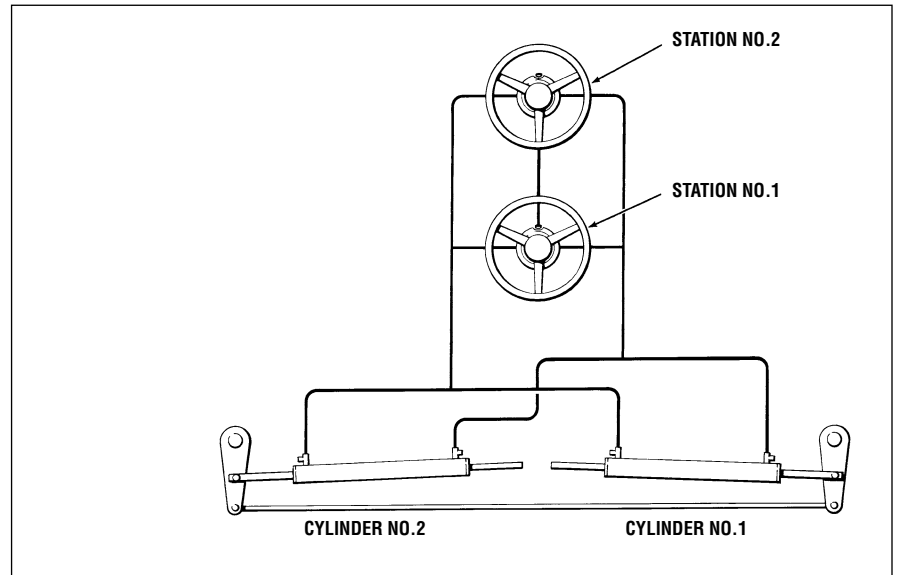


Figure 37.

OIL LEVEL AND SYSTEM PROOF CHECK

STEP 1

Oil Level Setting

WARNING

The oil level **MUST** be checked and maintained **BEFORE** each use to ensure the safe operation of your steering system. Failure to adhere to this warning may lead to loss of steering control. Loss of steering control may result in unpredictable boat behavior, collision with an obstacle and/or ejection from vessel, leading to property damage personal injury and/or death.

CAUTION

When setting fluid level in a system fitted with an unbalanced cylinder, the cylinder shaft **MUST** be fully retracted (IN). Failure to have cylinder shaft retracted (IN) will lead to very stiff steering and/or oil spillage at the helm pump.

- For helms mounted with the wheel shaft completely horizontal **MUST** be filled to the bottom of the filler hole **AT ALL TIMES**. **DO NOT** allow oil level to drop more than 1/4" below the filler port threads.
- For helms mounted on a 20° angle, or, with wheel shaft in the vertical position the oil level must be no lower than 1/2" below filler port threads and no higher than 1/8" below filler port threads.

STEP 2

System Proof Check

WARNING

The System Proof Check **MUST** be completed after installation. Doing so will ensure the safe operation of your steering system. Any fault (leaks or malfunction) will present itself during this check. Failure to adhere to this check may result in loss of steering control. Loss of steering control may lead to unpredictable boat behavior, leading to a collision with an obstacle and/or ejection from the boat, resulting in property damage personal injury and/or death.

- Turn steering wheel hard over to hard over to confirm unrestricted movement of steering components.

NOTICE

If equipped with a tilting helm, repeat this step in "EVERY" tilt position.

- Confirm that rudder(s) and outdrive(s) are turning to the proper direction.
- If no interference is noticed and rudder(s) and/or outdrive(s) are turning to the proper direction, go to next point
- Take steering wheel hard over to starboard. Once the wheel reaches its stop point, force the wheel another 1/4 – 1/2 turn past stop. Leave wheel in this position while you inspect ALL fittings, helms and hose/tubes for any signs of a leak.
- Repeat above step to the starboard side of each steering station
- Repeat above steps to the port side of each steering station.
- If ANY leaks are noticed they **MUST** be repaired **BEFORE** operating your boat.

WARNING

Failure to correct **ANY** problem that becomes present during the 'System Proof Check' may lead to loss of steering control. Loss of steering control can lead to unpredictable boat behavior and/or collision with obstacle and/or ejection from vessel resulting in property and/or personal injury or death.

⚠ WARNING

ROUTINE MAINTENANCE

Following the routine maintenance schedules as outlined below, in the time frame noted will ensure years of service from your SeaStar Steering System, as well as keep you and your passengers safe from the dangers that are present on and off the water.

1. Owner(s) (End Users)

Prior to every use.

1. Check Fluid level in highest helm pump (see page 28) for proper fluid level setting).
2. Verify immediate steering response when turning steering wheel(s). (Ensure drive(s)/rudder(s) move when steering wheel(s) are turned.)
3. Visually inspect all steering hoses and fittings for wear, kinking and/or leaks.
4. Check for binding, loose, worn or leaking steering components.

⚠ WARNING

DO NOT operate boat if any component is not in proper working condition.

2. Qualified Marine Mechanic

⚠ WARNING

Any work being performed with the steering system MUST be completed by a qualified mechanic with the working knowledge of the system.

After first 20 hours, then every 100 hours or 6 months thereafter (which ever comes first).

- All points noted above.
- Check tightness of ALL fasteners throughout the steering system. Tighten as required.
- Check for mechanical play or slop throughout steering system, correct as required.

After every 200 hours or 12 months (which ever comes first).

- All points noted above.
- Power Assisted Drives:
 - Remove cylinder from power assist steering tube. Clean steering tube and re-grease using a good quality marine grease.
- Inboard:
 - Grease ball joint (rudder connection) using a good quality marine grease.
 - Ensure rudder(s) are able to be moved freely by hand.
- Remove steering wheel and re-grease wheel shaft using a good quality marine grease.
- Inspect hydraulic oil for cleanliness, flush if required.

TROUBLESHOOTING GUIDE

SeaStar hydraulic steering will provide years of safe reliable performance with a minimum of service if properly installed with correct cylinder.

SeaStar steering systems have been designed with protection against over-pressure situations, by a pressure relief valve, to minimize the possibility of total loss of steering.

Most faults occur when the installation instructions are not followed and usually show up immediately upon filling the system. Provided below, are the most common faults encountered and their likely cause and solution. The term “Rudder” also applies to stern drives, when applicable.

Sometimes when returning the wheel from a hardover position, a slight resistance may be felt and a clicking noise may be heard. This should not be mistaken as a fault, as it is a completely normal situation caused by the releasing of the lockspool in the system.

WARNING

Whenever in the following text, a solution calls for removal from vessel and/or dismantling of steering system components, such work must only be carried out by a qualified marine hydraulic mechanic. SEASTAR SOLUTIONS offers the following as a guide only and is not responsible for any consequences resulting from incorrect dismantling repairs.

FAULT

1 During Filling, the helm becomes completely jammed.

CAUSE

- Blockage in the line between the helm(s) and the cylinder(s).

SOLUTION

- Make certain that tubing has not collapsed during installation. If so, the collapsed section must be removed and re-fitted with a new piece with the aid of tube connectors. Check fittings for incomplete holes. Fittings with incomplete holes, however, are not common.

2 System is very difficult to fill. Air keeps burping out top of helm even after system appears full.

- Cylinder(s) has been mounted upside down. This causes air to be trapped in the cylinder(s).
- Air in system.

- Mount cylinder(s) correctly, according to cylinder installation instruction. Ports should always be kept in uppermost position.
- Review filling instructions.

FAULT

3 Steering is stiff and hard to turn, even when the vessel is not moving.

CAUSE

- Rudder post glands are too tight or rudder post is bent, causing mechanical binding. The same applies to tiller arm and linkage on outdrives.
- Restrictions in hose, copper tubing, piping or fittings.
- Air in oil.
- Wrong oil has been used to fill steering system, like A.T.F. (automatic transmission fluid, or any other oil with a high viscosity factor).
- Support tube corroded or seized restricting movement of hydraulic cylinder.

SOLUTION

- To test, disconnect cylinder(s) from the tiller arm and turn the steering wheel. If it turns easily, correct above mentioned problems. Please note that excessively loose connections to tiller arm or tie-bar can also cause mechanical binding.
- Find restriction and correct. **Note:** Collapsing of copper tubing during bending is enough to cause restrictions.
- See filling instructions supplied with helm units.
- Drain system and fill with recommended oils.
- Remove cylinder, clean and re-grease.

4 One helm unit in system is very bumpy and requires too many turns from hardover to hardover.

- Dirt in inlet check of helm pump.

- Contact Authorized repair center and/or replace helm pump.

5 Steering is easy to turn at the dock, but becomes hard to turn when vessel is underway.

- Steering wheel is too small.
- Cylinder(s) too small.
- Incorrect setting of trim tab(s) on stern drive.
- Incorrectly designed or adjusted rudders, causing binding on rudder post and/ or tie bar at cruising speeds.

- Fit larger wheel if possible, see installation instructions. If the problem cannot be rectified by the above mentioned solution, proceed with next cause and solution or consult factory.
- Replace with larger cylinder(s).
- Adjust tab(s).
- Seek professional help. Have competent, qualified marine mechanic correct problem.
- Fit system with SeaStar Power Assist. **NOTE:** *SeaStar Power Assist is not intended to compensate for a weak, or improperly installed steering cylinder.*

HYDRAULIC STEERING

TROUBLESHOOTING

FAULT

CAUSE

SOLUTION

6 Rudder drifts to port or starboard while vessel is underway, even when wheel is not being turned.

- Dirt in check valves.

- Contact authorized repair center and/or replace helm pump.

7 Turning one wheel causes the second steering wheel to rotate.

- See fault No. 6.

- See fault No. 6.

8 Consistent wearing of rod end ball and or mounting foot.

- Excess vibration at rudder.

- Consult with boat builder and/or Naval architect for vibration cure.

9 Sterndrive system is hard to turn with engine off.

- Engine driven power steering pump not operating.

- This is normal in a power steering application.

SeaStar Technical Support Contacts

Phone: 604-248-3858

Web: www.seastarsolutions.com

e-mail: seastar@seastarsolutions.com

Hours: 05:00 – 15:30 PST

TECHNICAL INFORMATION

Bolt Torque Specifications

Values are stated in: **in/lbs (N.m)**

Bolt Size	18-8SS	Brass	Bolt Size	18-8SS	Brass	Bolt Size	18-8SS	Brass
2-56	2.5 (.282)	2.0 (.226)	6-32	9.6 (1.08)	4.9 (.554)	5/16"-18	132.0 (14.91)	107.0 (12.10)
2-64	3.0 (.338)	2.5 (.282)	6-40	12.0 (1.35)	9.9 (1.12)	5/16"-24	142.0 (16.04)	116.0 (13.11)
3-48	3.9 (.440)	3.2 (.361)	8-32	20.0 (2.25)	16.0 (1.81)	3/8"-16	236.0 (26.66)	192.0 (21.71)
3-56	4.4 (.497)	3.6 (.407)	8-36	22.0 (2.48)	18.0 (2.03)	3/8"-24	259.0 (29.20)	212.0 (23.97)
4-40	5.2 (.587)	4.3 (.486)	10-24	23.0 (2.59)	19.0 (2.14)			
4-48	6.6 (.740)	5.4 (.610)	10-32	32.0 (3.61)	26.0 (2.94)			
5-40	7.7 (.869)	6.3 (.712)	1/4"-20	75.0 (8.47)	62.0 (7.01)			
5-44	9.4 (1.06)	7.7 (.869)	1/4"-28	94.0 (10.6)	77.0 (8.70)			

Values are stated in: **ft/lbs (N.m)**

Bolt Size	18-8SS	Brass	Bolt Size	18-8SS	Brass	Bolt Size	18-8SS	Brass
7/16"-14	31.0 (42.00)	26.0 (35.25)	5/8"-11	93.0 (126.09)	76.0 (103.04)	1"-8	287.0 (389.12)	235.0 (318.62)
7/16"-20	33.0 (44.74)	27.0 (36.61)	5/8"-18	104.0 (141.00)	85.0 (115.24)	1"-14	259.0 (351.16)	212.0 (287.43)
1/2"-13	43.0 (58.30)	35.0 (47.45)	3/4"-10	128.0 (173.55)	104.0 (141.00)			
1/2"-20	45.0 (61.01)	37.0 (50.17)	3/4"-16	124.0 (168.12)	102.0 (138.29)			
9/16"-12	57.0 (77.28)	47.0 (63.72)	7/8"-9	194.0 (236.03)	159.0 (215.58)			
9/16"-18	63.0 (85.42)	51.0 (69.15)	7/8"-14	193.0 (261.67)	158.0 (214.22)			

Helm Pump

SeaStar I
SeaStar II

DISPLACEMENT

1.7 cu. in. (27.8 cc)
2.4 cu. in. (39.3 cc)

RELIEF VALVE

1000 PSI (68 Bar)
1000 PSI (68 Bar)

PORTS

1/4" NPT
1/4" NPT

Helm Pump Shaft

SeaStar I
SeaStar II

TAPER

3/4" Standard, 1" per ft.
3/4" Standard, 1" per ft.

THREAD

5/8" NF
5/8" NF

KEY SIZE

3/16"
3/16"

Cylinder

		STROKE	VOLUME	TORQUE 1000psi-70 BAR-35°
HC5303-3	BA125-3ATM inboard type	3" (76 mm)	3.1 cu.in. (51 cc)	N/A
HC6324-3	BA150-3.5ATM inboard type	3.5" (89 mm)	5 cu.in. (82 cc)	N/A
HC5339-32	125-6.5EM sterndrive type	6.5" (165mm)	7.9 cu.in. (129 cc)	N/A
HC5312-3	BA125-7ATM, inboard type	7" (178 mm)	7.2 cu.in. (118.0 cc)	5024 in/lbs (58Kg)
HC5313-3	BA135-7ATM, inboard type	7" (178 mm)	8.2 cu.in. (134.4 cc)	5741 in/lbs (66Kg)
HC5314-3	BA150-7ATM, inboard type	7" (178 mm)	10.2 cu.in. (167.1 cc)	7117 in/lbs (82Kg)
HC5318	BA150-7TM, inboard type	7" (178 mm)	10.2 cu.in. (167.1 cc)	7117 in/lbs (82Kg)
HC5319	BA175-7TM, inboard type	7" (178 mm)	13.7 cu.in. (224.5 cc)	9569 in/lbs (110Kg)
HC5326-3	BA150-7EM, sterndrive type	7" (178 mm)	10.2 cu.in. (167.1 cc)	7117 in/lbs (82Kg)
HC5328-3	125-8EMV, sterndrive type	8" (203 mm)	8.5 cu.in. (139.2 cc)	5850 in/lbs (67Kg)
HC5329-3	125-8VPEM, sterndrive type	8" (203 mm)	8.5 cu.in. (139.2 cc)	5850 in/lbs (67Kg)
HC5330-3	BA125-8EMV, sterndrive type	8" (203 mm)	8.5 cu.in. (139.2 cc)	5850 in/lbs (67Kg)
HC5331-3	92VPS, sterndrive type	8" (203 mm)	8.5 cu.in. (139.2 cc)	N/A (N/A)
HC5332-3	BA135-7EM, sterndrive type	7" (178 mm)	8.2 cu.in. (134.4 cc)	5741 in/lbs (66Kg)
HC5369	BA150-9TM, inboard type	9" (229 mm)	13.1 cu.in. (214.7 cc)	9375 in/lbs (108Kg)
HC5373	BA175-9TM, inboard type	9" (229 mm)	17.7 cu.in. (290.1 cc)	12600 in/lbs (145Kg)

Fittings

SeaStar cylinder and all other fittings are 3/8" compression type fittings. Threads are 9/16" x 24 extra fine. A brochure on all SeaStar fittings is available from SeaStar.

SeaStar I, II Hose

- SeaStar I, II hose inside diameter – 5/16" (8 mm).
- Other recommended hose is Aeroquip 2651 or equivalent. Inside diameter should not be smaller than 5/16"