

HYDRAULIC STEERING

SELECTION GUIDE

2019

BAYSTAR | SEASTAR | HYNAUTIC



 SEASTAR
SOLUTIONS®

SEASTAR JACKPLATE

GEN II NOW AVAILABLE!



- New high speed hydraulic actuator. Bottom to top 5.6" in 8 seconds.
- Xtreme Jackplates are rated up to 400HP in all setbacks.
- Environmentally sealed non-contact SmartStick position sensor kit for easy integration with a gauge or ProTap controller.
- Compatible with Power-Pole and Talon anchor systems.
- Complete rigid engine support at full thrust with no rattle!
- Easily moves engine up or down at full thrust.
- Designed to maximize engine tilt with SeaStar steering cylinders.
- High visibility lift scale for quick glance operation.
- Rocker Switch DK4020 Included with the Jackplates.

PROTAP CONTROLLER

- Gets your boat to max speed at the touch of a button.
- Memorize your favorite Jackplate and engine trim positions.
- Quickly tap control switch for fine adjustment of both Jackplate and engine trim in set increments.

AUTOPILOT & GPS ANCHOR AVAILABLE FOR OPTIMUS 360

SEASTATION



HEADING HOLD, POSITION HOLD, OR HEADING + POSITION HOLD

SeaStation will be ideal for holding your position when waiting for a bridge to lift or during specific fishing activities. It has been engineered to minimize shifting and engine movement with the same industry leading programming you have come to expect from the Optimus 360 system.

The SeaStation kit will include a Dual GPS Sensor, Device Net harness of 30' and T connect.

Software will be provided as part of the system to enable SeaStation to function.

HEADING, TRACK & ROUTE MODE

The SeaWays system can be set to operate in any one of three autopilot modes. The Heading Mode keeps the boat moving in the desired heading, but allows it to drift with wind or current. Track Mode holds a preset course over ground, allowing SeaWays to adjust the heading to stay on track. In Route Mode, SeaWays follows waypoints provided by third-party chartplotters to arrive at a specific destination.

ELECTRONIC POWER STEERING AND JOYSTICK CONTROL

AVAILABLE FOR TWIN, TRIPLE & QUAD OUTBOARD ENGINES



OPTIMUS360
BY SEASTAR

The Optimus 360 gives your boat a whole new dimension of control. By developing the joystick function to be intuitive, the Optimus 360 allows you to move your boat not only forward and back, but also sideways, by pushing the joystick to the left, or to the right, and even, rotate on a dime, all with a simple twist of the joystick. Optimus is the steering and joystick system chosen by many of the respected builders in the marine industry. Electronic Power Steering (EPS) is also available for stern drive and inboard applications.



Boating safety is everyone's responsibility.

As a boater, you are responsible for having all required safety equipment, for operating your boat safely and for ensuring the safety of those on board your vessel as well as those sharing the waterways. Boaters exercising courtesy and common sense will not create a hazard, threat, stress or an irritant to themselves, to others, to the environment, or to wildlife.

1. Wear an approved Personal Flotation Device (PFD).
2. **Read your owner's manual.**
3. Attach engine stop switch securely to your body or PFD.
4. Respect the speed limits and other boating restrictions.
5. Be cautious and courteous.
6. Navigate with care.
7. Understand the behavior characteristics of your vessel that might result from unexpected manoeuvres, such as sudden deceleration, high-speed obstacle avoidance, and other speed related issues.
8. It is good boating practice to rinse down your boat and exposed steering equipment with clean, fresh water after each use.
DO NOT use corrosive materials on SeaStar products.

Become informed and stay informed!

"Take an accredited boating safety course"


WARNING

Recommendations made in this selection guide are based on our experience with typical installations, applications and usage. Do NOT use products in applications that they were not intended for. It is the boat manufacturer and the installer's responsibility to ensure the components selected are sufficiently validated on the boat application for safe and acceptable operation.

Notice to Boat Manufacturer or Installer

NOTICE

Help protect your boating environment by ensuring that all used steering fluid is disposed of properly.

Throughout this publication, Warnings and Cautions (accompanied by the International Hazard Symbol ) are used to alert the manufacturer or installer to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly.

Observe Them Carefully!

These "safety alerts" alone, cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the installation and maintenance plus "common sense" operation are major accident prevention measures.

DANGER

Immediate hazards which **WILL** result in severe personal injury or death.

WARNING

Hazards or unsafe practices which **COULD** result in severe personal injury or death.

CAUTION

Hazards or unsafe practices which **COULD** result in minor injury or product or property damage.

NOTICE

Information which is important to proper installation or maintenance, but is not hazard-related.

NOTICE

Marine Canada Acquisition Inc. DBA SEASTAR SOLUTIONS is referred to as SeaStar Solutions throughout this publication.

TABLE OF CONTENTS

	SeaStar Hydraulic Steering	iii
	SeaStar/BayStar Hydraulic Steering	v
	Optimum Performance Chart	viii
1	BayStar Outboard Steering	1-1
2	BayStar Inboard Steering	2-1
3	SeaStar Outboard Steering	3-1
	SeaStar Front Mount Outboard Steering System	3-2
	SeaStar Pro Steering Systems	3-8
	SeaStar Tournament Series	3-11
	Catamaran Outboard Systems	3-16
	SeaStar Side Mount Outboard Steering System	3-17
	SeaStar Splashwell Mount Outboard Steering System	3-20
4	SeaStar/Hynautic Inboard Steering	4-1
	Catamaran Inboard Systems	4-7
5	SeaStar/Hynautic Sterndrive Steering	5-1
6	SeaStar/Hynautic/Capilano Helm Pumps	6-1
	SeaStar/SeaStar PRO Helm Pumps	6-1
	Hynautic Helm Pumps	6-9
	Capilano Helm Pumps	6-10
7	SeaStar Power Assist	7-1
	Power Assist Autopilot	7-4
8	SeaStar Power Steering	8-1
	DC Power Steering (Electric, Power Assist)	8-3
	Conventional Power Steering	8-4
9	SeaStar Hose, Tubing, Fittings and Accessories	9-1
	SeaStar Outboard Hose	9-2
	SeaStar Inboard/Sterndrive Tubing	9-7
	Fittings and Fitting Kits	9-9
	Additional SeaStar Steering Station or Autopilot Kit	9-11
	SeaStar Kicker Cable Tie Bar	9-15
	SeaStar Autopilot Pumps and Smartsticks	9-17
10	SeaStar Hydraulic Fluid	10-1
11	SeaStar Jackplates and Protap	11-1
	SeaStar Jackplates	11-1
	SeaStar ProTap Engine Position Controller	11-5
12	Tools and Technical Info/Specifications	12-1
	Tools	12-1
	Technical Info/Specifications	12-5
	Quick Reference Turns Chart	12-9
	Rudder Torque Data Sheet	12-10
13	Contact and Warranty Information	13-1
	SeaStar Solutions Technical Service	13-1
	SeaStar Solutions Service Centers/Distributors	13-1
	Statement of Limited Warranty	13-2
	Return Goods Procedure	13-2

SeaStar Hydraulic Steering

Our manual hydraulic steering systems are simple and efficient. The basic system consists of four main components;

1) the helm pump, 2) the cylinder, 3) the hose or tubing required to connect the cylinder to the helm pump, and 4) genuine SeaStar Steering Fluid.

These basic components are necessary in all applications. However, as the system variables increase (i.e.: multiple engines, rudders, steering stations, power assist and autopilots), additional components may be required.

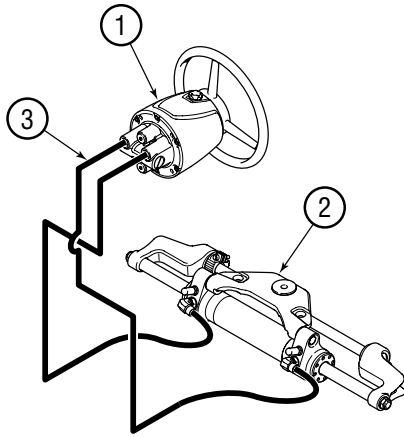


Figure i-1.

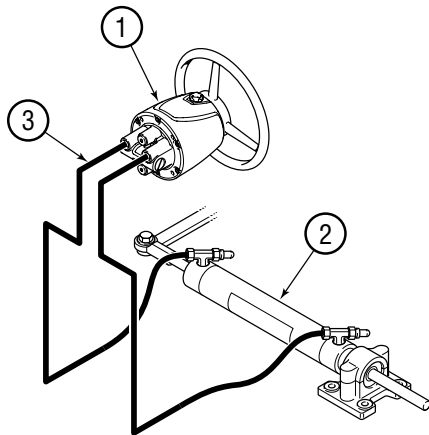


Figure i-2.

1. The Helm Unit

The helm pump is an axial piston pump specifically designed for manual steering. It has a built-in lock valve to prevent the steering load from feeding back to the driver. The lock valve will not allow the rudder or drive unit to move until you move it with the steering wheel. The lock valve section of the helm also includes a relief valve. This relief valve provides over-pressure protection for mechanical components, hydraulic hoses and fittings.

2. The Cylinder

The most important differences between the variety of steering systems available is the cylinder selection. Both BayStar and SeaStar systems have a cylinder for most steering applications.

IMPORTANT

3. Hoses and Tubes

Required to provide a path for the fluid to flow under pressure from the helm pump to the cylinder.

SeaStar hoses are a custom multi-layered composite design, engineered specifically for our systems. They are designed to exceed SAE and ABYC specifications and provide precise steering control not achievable with hydraulic industry standard hoses. Due to performance and safety concerns, SeaStar recommends that **ONLY** SeaStar or SeaStar Pro hoses be used in SeaStar steering systems.

IMPORTANT

4. Steering Fluid

Due to recent upgrades to our steering system components, SeaStar Solutions recommends use of SeaStar Steering Fluid **ONLY** in our hydraulic steering systems. SeaStar steering systems have been engineered and validated using our proprietary SeaStar Hydraulic Steering Fluid. SeaStar steering fluid is engineered with a special additive package that contains anti-foaming and anti-rust agents, anti-oxidants, viscosity stabilizers, corrosion inhibitors, wear additives as well as water emulsification adders that were formulated not to harm or degrade our components. It is highly recommended that SeaStar Steering Fluid be used to ensure optimum system performance and safety.

The System: How it works

The system is a two-line system. This makes operation very simple.

1. The steering wheel, which is attached to the helm pump, is rotated in the desired direction (ie: a turn to starboard or clockwise rotation).
2. Steering fluid is pumped out the corresponding port from the rear of the helm into the starboard line and then into the cylinder.
3. This causes the cylinder rod, which is attached to the vessels rudder or drive unit, to move (ie: rod moves to port) thus causing the vessel to alter course.
4. Fluid displaced from the opposite end (ie: the port end) of the cylinder flows (ie: into the port line) back to the helm pump.
5. For steering in the opposite direction, simply turn the helm the other way.
6. When no course corrections are required, the integral No-Feed-Back design holds the rudder or drive unit stationary.

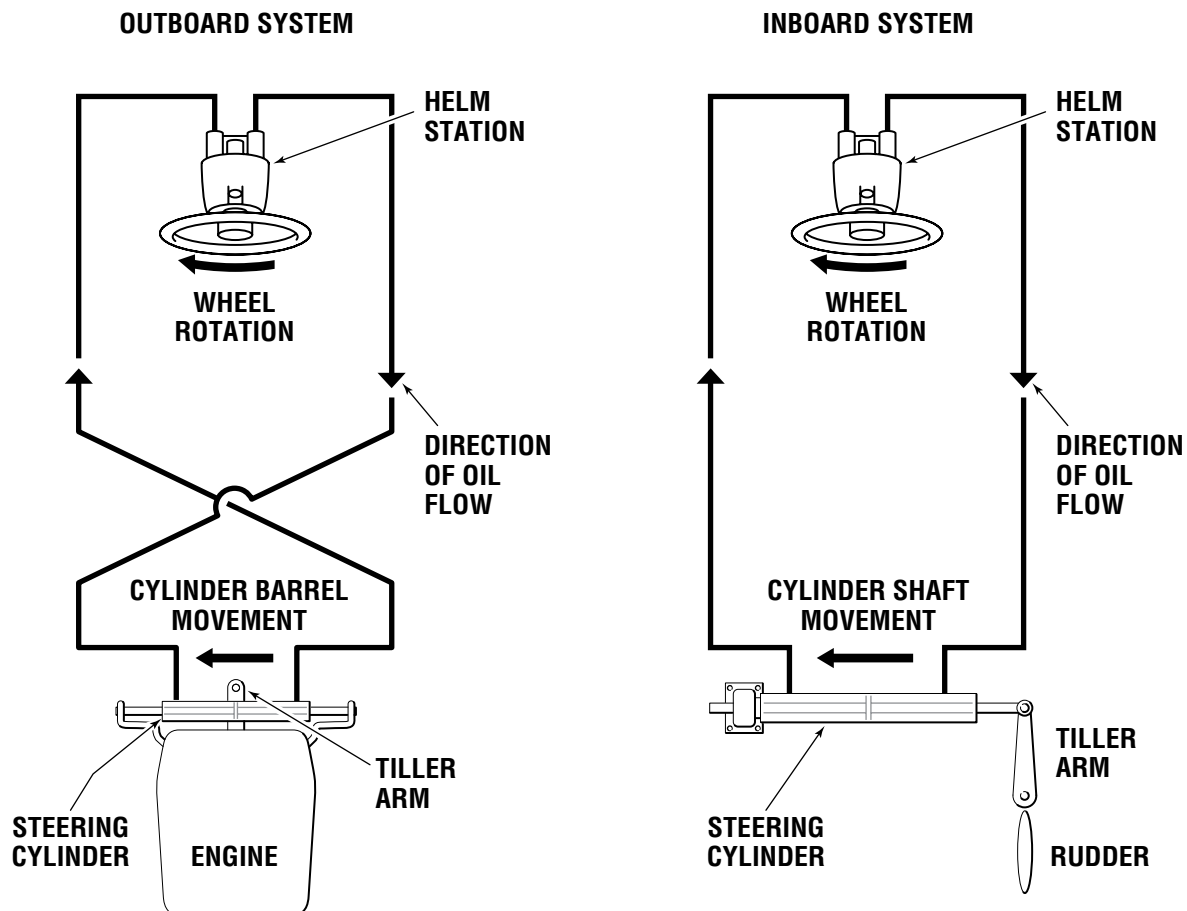


Figure i-3.

SeaStar/BayStar Hydraulic Steering

The BayStar Hydraulic Steering System is designed to add safety, reliability and comfort to single outboard powered **boats to a maximum 150HP**. The SeaStar Hydraulic Steering System is designed to provide that extra margin of muscle when needed. The SeaStar system conveniently handles Outboards, Sterndrive and Inboard boats.

System selection, installation and service is substantially simplified with just four major components — helm, cylinder, hose/tube and genuine SeaStar steering fluid. SeaStar has a comprehensive range of cylinders to conveniently handle the variety of Outboard, Sterndrive and Inboard steering applications. These are suitable for both pleasure and commercial applications. Extra steering stations and/or autopilots are easily added.

SeaStar hydraulic steering is a total commitment to quality, performance and simplicity.

BayStar & SeaStar, the hydraulic steering systems are;

Easy to install...

- Only four essential components; helm, cylinder, tube/hose and SeaStar steering fluid
- Compact and attractive helm design
- Variety of helm mounting configurations
- Simple tube/hose fitting connections
- Clear, complete installation instructions

Easy to fill and purge...

- Engineered bleed fittings on the cylinders
- A helm and lock valve design that enhances air removal
- A no-mess filler device
- A filling and purging time of normally less than 30 minutes
- Easy to check for proper installation
- Easy purging check via filler device
- No searching for difficult-to-find air leaks

Easy to turn...

- Anti-friction piston points

Designed to provide many years of service...

- Precision built
- No corrosive materials exposed to marine environment
- Field replaceable helm and cylinder shaft seals
- A no-hassle warranty — 2 years for pleasure use
— 1 year for commercial use (SeaStar)

BayStar and SeaStar... *Simply the best!*

Selecting the System

The objective is to match the steering system to the requirements of the vessel. This depends on four things;

1. hull type (ie: planing or displacement),
2. type of propulsion system in the vessel (ie: inboard, outboard, sterndrive, etc.),
3. the number of engines or rudders, and
4. the total power of the engines (ie: Horsepower).

Once the system and cylinder has been selected, the size of the helm pump must be determined. SeaStar systems also allow the following options to be specified;

1. the number of steering stations,
2. helm configuration (ie: standard or tilt helm),
3. additional features such as autopilots, and
4. power assist.

Notes on Steering Response versus Steering Effort

Steering wheel effort is directly proportional to the number of wheel turns lock to lock.

The number of wheel turns lock to lock is dependent on three things;

1. the volume of the cylinder,
2. the displacement of the helm pump,
3. the allowable movement of the rudder or drive unit.

Less wheel turns lock to lock results in more steering effort. More wheel turns lock to lock results in less steering effort. However, additional factors that can influence steering effort are;

1. vessel speed,
2. rudder size,
3. unusual propeller selections,
4. hull type (ie: displacement, planing, etc.),
5. improperly aligned counter balance skeg,
6. trim/position, and
7. propeller height relative to water.

WARNING

Recommendations made in this selection guide are based on our experience with typical installations, applications and usage. Do NOT use products in applications that they were not intended for. It is the boat manufacturer and the installer's responsibility to ensure the components selected are sufficiently validated on the boat application for safe and acceptable operation.

Typical Boat Designs that use BayStar/SeaStar Steering Systems

1. Inflatable

Boats manufactured from waterproofed fabric which are inflated with air in order to achieve their shape. The bottom of the hull may be made of fabric and/or fiberglass. They typically have narrow transoms. Boats may be single and/or dual engine, and is generally slower than 40 mph.

2. Cruiser

Cuddy/express/bridge cruiser primarily designed for cruising. It has overnight accommodations. Typically rigged with two steering stations. Boats may be single and/or dual engine, and is generally slower than 45 mph.

3. Runabout

Intended for day boating. Typically a single engine, but, can be a dual engine boat. This includes tournament Ski boats and performance outboards. Boat speeds are generally slower than 60 mph.

4. Fish "N" Ski

Single engine boat designed for day fishing or skiing in protected waters. Boats speeds are generally slower than 40 mph.

5. Fish Boat

Boat primarily designed and equipped for offshore fishing. May be rigged with a second station and may have single and/or dual outboards. Speeds are generally slower than 50 mph.

6. Center Console

Boats with the control station located on the center line of the boat. Designed specifically for fishing, may be single and/or dual engine(s). Boat speeds are generally slower than 65 mph.

7. Bass Boat

Single engine designed specifically for fishing in protected waters and has a flat bottomed hull. Generally performance orientated and speeds in excess of 60 mph.

8. Pontoon

Twin or triple hull boats. Single and dual engine capable. Generally speeds to not exceed 60 mph. Note: High steering loads when equipped with engines over 115 HP.

9. Catamaran

Twin hull vessels. Typically twin engine boats where the use of a mechanical tie bar is not possible. Speeds to not exceed 60 mph.

10. Commercial/Work/Rescue/Race

Any of the above noted boats but used in a more severe environment. Take special care when selecting a system for these boats to ensure that you have both comfortable and safe steering.

Optimum Performance Chart

How can we help?

When researching a hydraulic steering system for your boat there are several systems to choose from. The chart noted below will assist with selecting the proper system. It is recommended that boats with high steering loads (pontoons, bass boats and larger HP four stroke engines) use the SeaStar/SeaStar PRO Steering. Doing so will reduce the steering effort due to the fact that the SeaStar Steering Systems provide more output power, resulting in lower steering effort. If you are unsure of what system to choose, consult with your marine dealer, or SeaStar Solutions Technical Support.

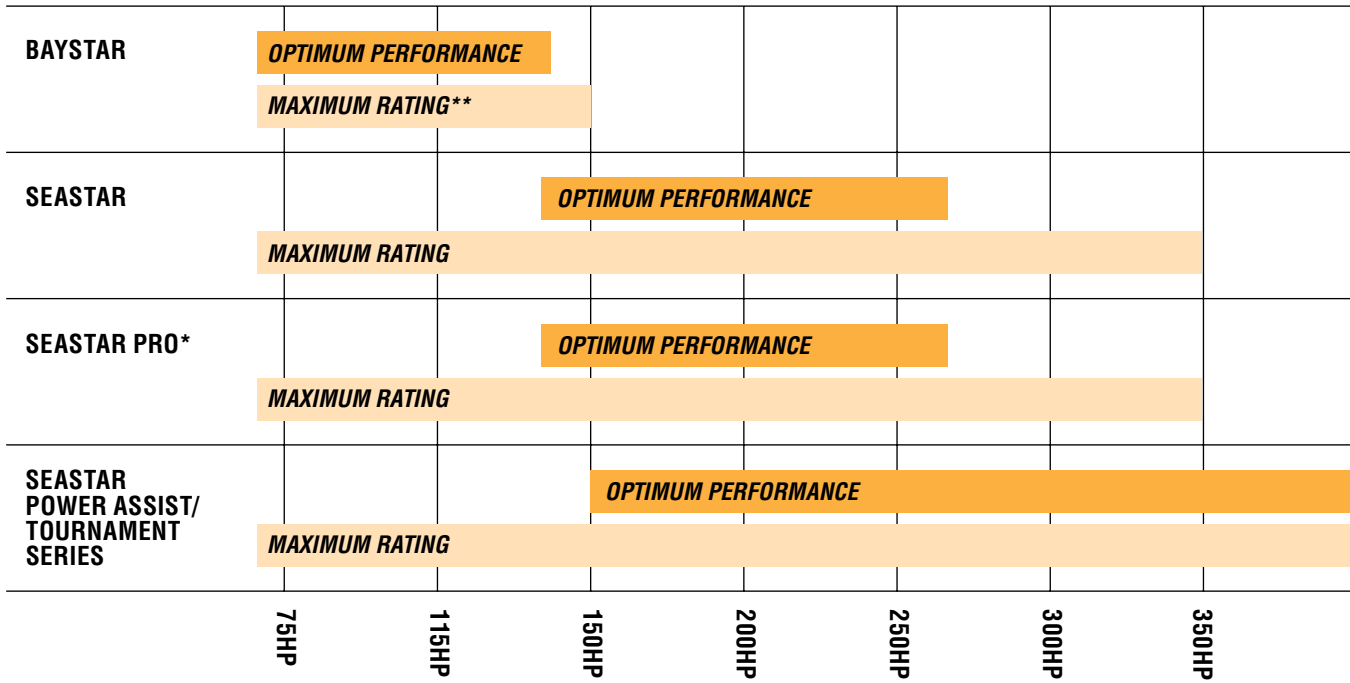


Table i-1.

Chart based on 'Optimum Comfort'

* Ideal for single engine, high speed boats, such as bass boats.

** High performance 150HP engines, such as Mercury Optimax should use SeaStar.

My Steering Components

Helm Model # Cylinder Model #

Hose/Tube..... Other.....

Autopilot Equipped Yes No Date Purchased

Boat: Make Model Length.....

Engine: Make H.P..... Quantity.....

BAYSTAR™

OUTBOARD STEERING



Figure 1-1.

BayStar™ hydraulic steering is brought to you by the manufacturers of SeaStar®, the most trusted name in pleasure boat steering. BayStar allows you to install all of the safety, reliability and comfort of hydraulic steering onto your single engine vessel with a Coast Guard approved transom/HP rating up to MAX 150HP. Combine this with the superior design team, rigid ISO quality control and teamed with the finest materials and precision manufacturing, BayStar continues the tradition bringing comfort and safety to boating.

Helm pumps now fitted with positionble O-Ring fittings (ORB).

The BayStar steering system consists of a super low friction helm for smooth comfortable steering, a balanced cylinder—featuring a compact design that fits most splashwells. The systems are easy to install with “cut-to-length” tubing. Available in complete kits or by individual components.

NOTICE

BayStar is NOT recommended in applications with high steering effort (i.e. such as those using high performance engines or boats capable of attaining high speeds), customers should consider upgrading the system to SeaStar/SeaStar Pro steering. This will reduce the steering effort due to the fact that SeaStar steering provides more output power resulting in lower steering effort.

NOTICE

Tilt Helms HH4315-3 & HH4316-3 are available separately. Currently not available in kit form.

Typical BayStar Installation

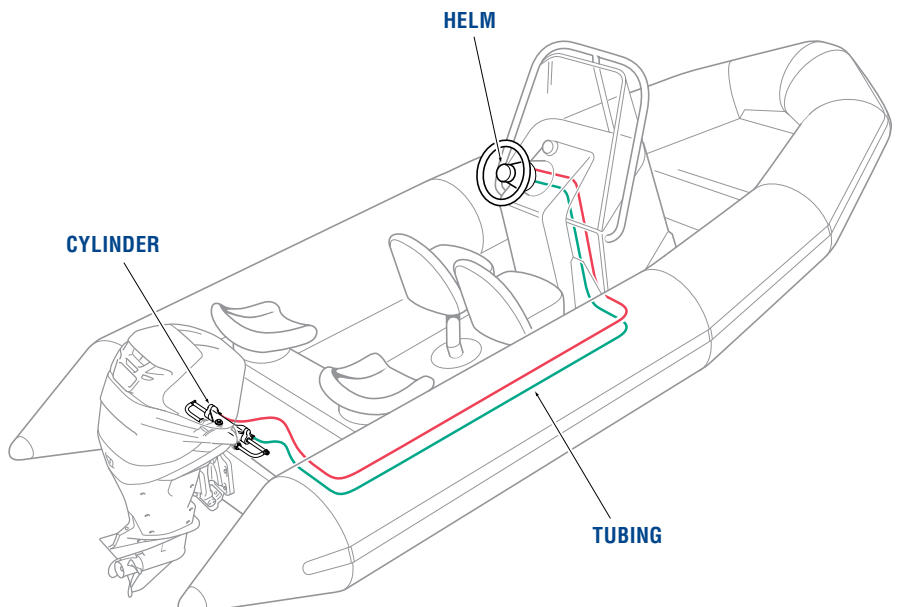


Figure 1-2.

CAUTION

Helm pumps now fitted with Positionable O-Ring fittings (ORB)

-3 helm pumps are fitted with positionable O-ring style hose fitting ports (commonly referred to as ORB). Do NOT attempt to install an NPT pipe fitting into a -3 helm hose fitting port. Doing so will lead to irreparable damage to the helm. ONLY use SeaStar Solutions O-ring style hose fittings (ORB).

Three easy steps to select your BayStar System

1. Check helm dimension. Both the Standard and Tilt helms require a 3" (76mm) cut-out hole in the dash.

Standard Helm Part # HH4311-3 and HH4314-3

HH4311-3 (1.1 cu.in.) Gives 6.5 wheel turns lock to lock.
HH4314-3 (1.4 cu.in.) Gives 5.2 wheel turns lock to lock.
 When using BayStar outboard cylinders.

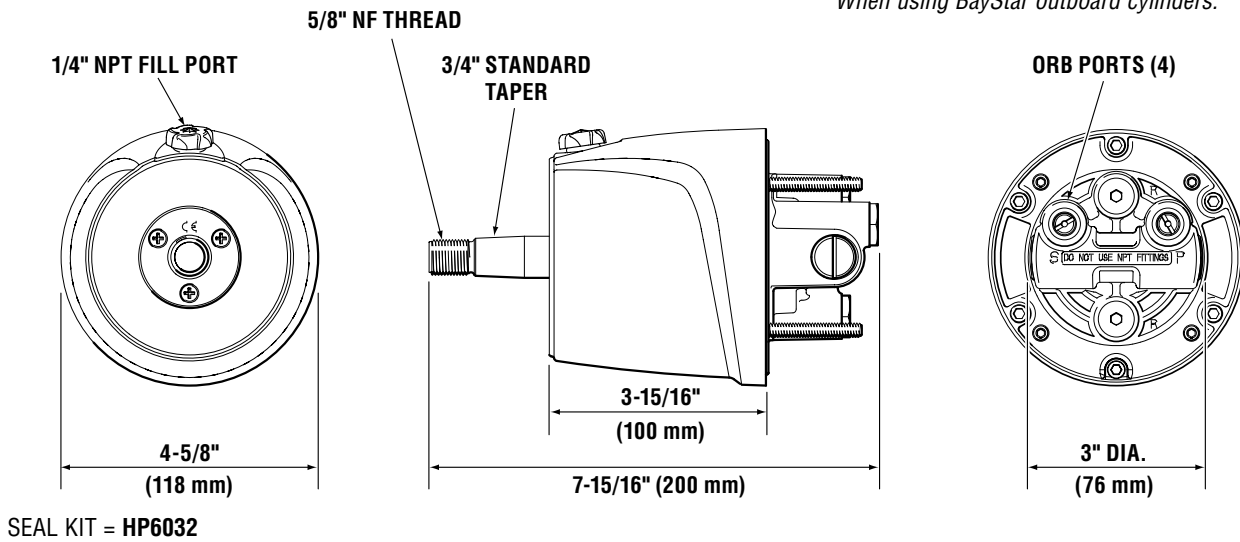


Figure 1-3.

Sport Tilt Helm Part # HH4315-3

HH4315-3 (1.4 cu.in.) Gives 5.2 wheel turns lock to lock.
 When using BayStar outboard cylinders.

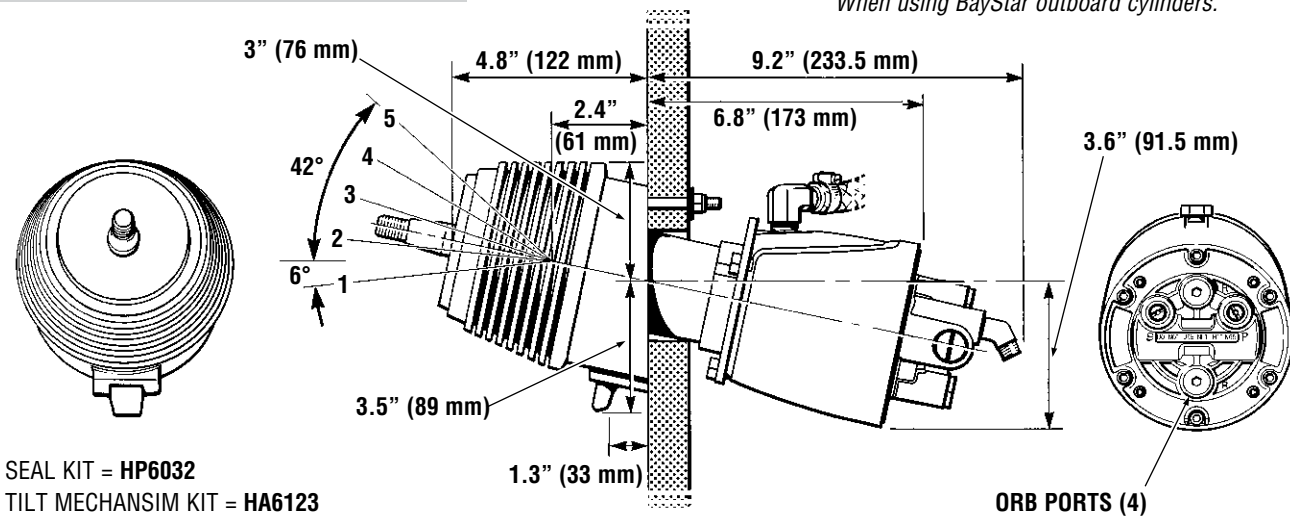


Figure 1-4.

Sport Plus Tilt Helm Part # HH4316-3

HH4316-3 (1.4 cu.in.) Gives 5.2 wheel turns lock to lock.

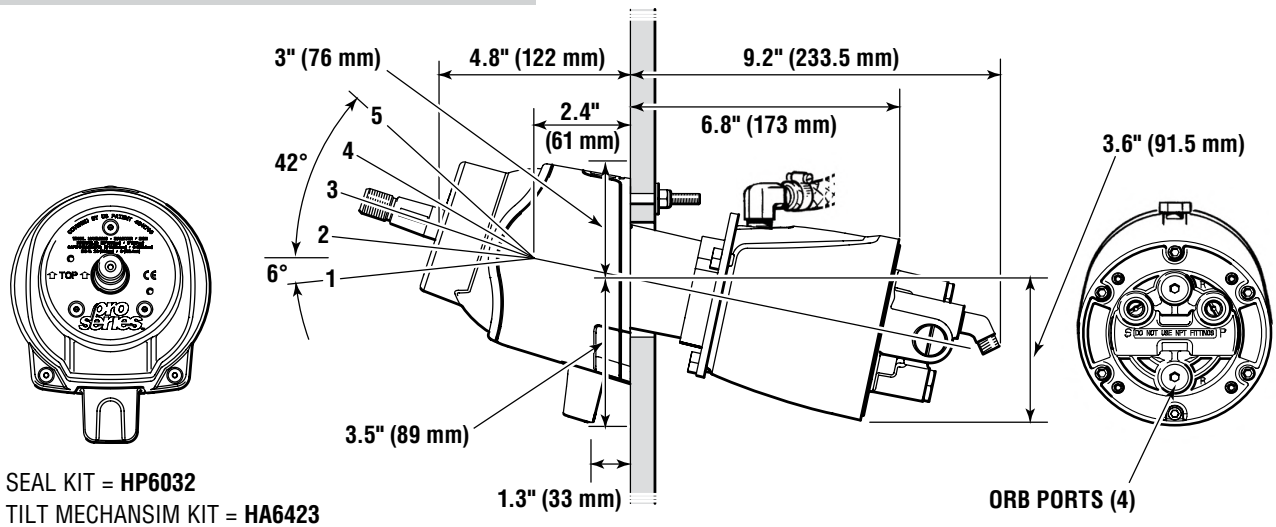
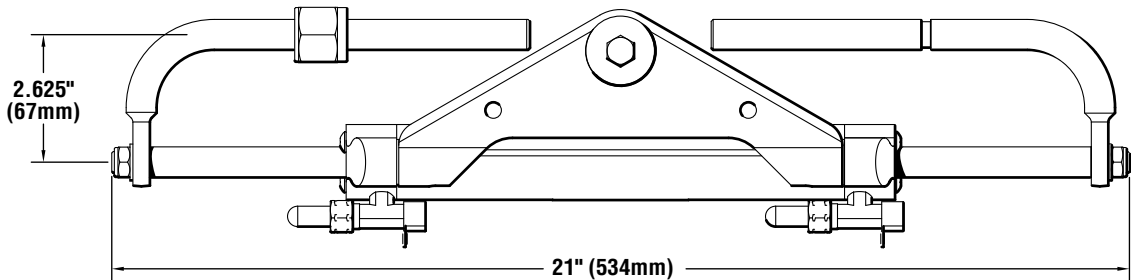


Figure 1-5.

2. Is the Splashwell wide enough?

The HC4645-3/47-3/48-3/58-3 require a minimum 21" (534 mm) Splashwell width.

BayStar Cylinder Part # HC4645-3 / 47-3 / 58-3



SEAL KIT = **HP4600** TEE/BLEEDER KIT = **HF4202** SUPPORT ROD/NUT/CLIP = **HP6050** PIVOT PLATE SEE page 1-5

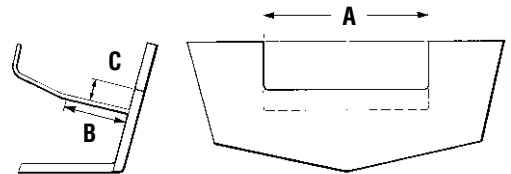
Figure 1-6.

3. Is there enough room in the splashwell for full engine tilt?

Find the dimensions (B & C) of your splashwell. Check them against the minimum splashwell dimensions for full engine tilt for your engine and cylinder.

Motor Well Dimensions required for BayStar front mount outboard steering systems

CYLINDER MODEL NO.	# OF ENGINES	A	B	C	MIN. ENGINE CENTER DISTANCE
HC4645-3/47-3/ 48-3/58-3	1	21" (534 mm)	6" (153 mm)	5" (127 mm)	N/A
	2	Twin engine applications not available at this time			



NOTES:

- i) Ensure there is no interference between the BayStar cylinder rod and the splashwell boot or engine controls & cables.
- ii) Dimensional restrictions also apply to external motor mount brackets.
- iii) Ensure dimension 'A' maintained through full trim/tilt range.
- iv) Maximum transom thickness 3" (76mm).
- v) Engines less than 70HP may require up to an additional 1" (25mm) of splashwell clearance.

BayStar Steering Kits

BayStar Steering kits come complete with everything needed for an install, (some engines require additional kits and/or cylinder plate change, see application chart on *page 1-5*) the cylinder does not require the engine manufacturer drag link for connection. For your convenience two lengths of 20' cut to fit tubing are supplied with the HK4200A-3 and two lengths of 30' cut to fit tubing are supplied with the HK4230A-3 kit.

NOTICE

HC4645-3 compact cylinder is included in both BayStar Steering Kits. If your engine requires the use of a cylinder other than HC4645-3 or HC4658-3 (refer to application guide on page 1-5) then purchase of a replacement Pivot Plate (noted on page 1-5) will be required.



Figure 1-7.

BAYSTAR STEERING KITS:

HK4200A-3 – BayStar helm, HC4645-3 cylinder, two 20' hoses and fluid.

HK4230A-3 – BayStar helm, HC4645-3 cylinder, two 30' hoses and fluid.

HK4300A-3 – BayStar helm, HC4645-3 cylinder and fluid, NO hose.

HK4500A-3 – BayStar PLUS helm, HC4645-3 cylinder and fluid, NO hose.

NOTICE

Effort Reduction — SeaStar Solutions has recently updated the BayStar cylinder. These updates include low friction main piston seals as well as low friction wiper and gland seals. If one chooses to further reduce steering effort, the following additional changes can be made:

- Consider plumbing the system using SeaStar Steering hoses. See page 9-2.
- Consider use of a BayStar Plus 1.4 cu.in. helm pump (HH4513-3/HH4514-3).
- Consider use of a BayStar 1.1 cu.in. helm pump (HH4311-3).

NOTE: Number of wheel turns will increase to 6.6 hard over to hard over.

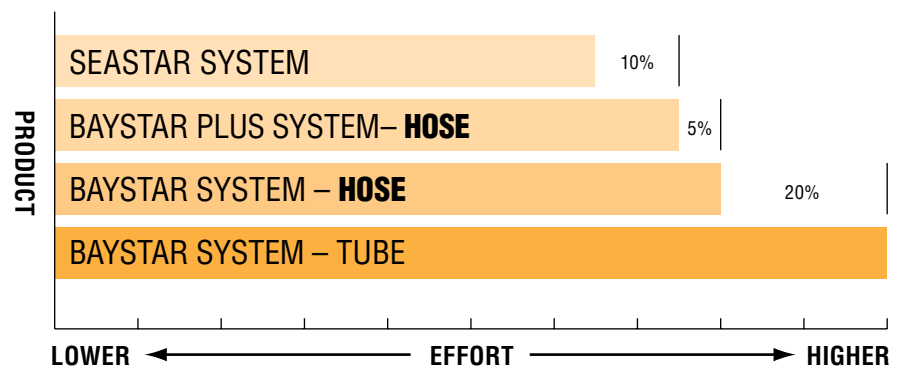


Figure 1-8.

BayStar Outboard Steering Application Guide

(BayStar Compact Cylinders HC4645-3/47-3/48-3/58-3)

MFG	YEAR	MODEL	CYLINDER	NOTES
HONDA	1992–DATE	30-50HP	HC4645-3	See Note 2
	1996–DATE	75-90HP	HC4645-3	
	2015–DATE	BF100	HC4645-3	
	1998–2010	115-130HP	HC4647-3	
	2003–DATE	135-150HP	HC4645-3	
	2010–DATE	115HP	HC4645-3	
JOHNSON/ EVINRUDE	1991–DATE	40–150 HP inc. E-Tec	HC4645-3	See Note 2 See Note 4 See Note 5 See Note 1, 2, 4
	1997–DATE	115 HP FICHT	HC4658-3	
	1997–DATE	75–150 HP FICHT	HC4645-3	
	1998–DATE	40–140 HP 4-Stroke	HC4658-3	
NOTICE Johnson 115 HP 2-stroke engines, required the pivot plate to be flipped. See note #4 below				
MERCURY/ MARINER	1984–DATE	75–150 HP	HC4645-3	See Note 5 See Note 1, 2
	1998–DATE	40–60 HP	HC4648-3	
SELVA	2000–DATE	25-70 HP	HC4648-3	See Note 1, 2 See Note 5
	2000–DATE	90-150 HP 4-Stroke	HC4645-3	
	2011–2013	115 HP	HC4658-3	
SUZUKI	1986–DATE	150 HP	HC4645-3	See Note 5 See Note 1 See Note 1, 2 See Note 1, 4
	1987–2002	115–140 HP	HC4645-3	
	1990–2000	90–100 HP	HC4645-3	
	1998–DATE	40–70 HP 4-Stroke	HC4645-3	
	2001–DATE	90–140 HP 4-Stroke	HC4658-3	
TOHATSU	1990–DATE	40–140 HP	HC4645-3	See Note 2
	2014–DATE	BFT60 - BFT150	HC4645-3	
YAMAHA	1998–DATE	40–50 HP	HC4645-3	See Note 2 See Note 3 See Note 1 See Note 5 See Note 1, 2
	1998–DATE	60 HP	HC4645-3	
	1986–DATE	70–90 HP 2-Stroke	HC4645-3	
	1997–DATE	80–150 HP 4-Stroke	HC4645-3	
	2000–DATE	25-70 HP 4-Stroke	HC4648-3	
	2011–DATE	F115A inc. SHO 90 & 115 HP	HC4658-3	
	2014–DATE	F115B	HC4645-3	

1. Requires Spacer kit part # HO5090
 2. Engine clamp brackets must be cut or ground, and the engine through bolted onto the transom, or interference will occur, restricting engine trim and tilt.
 3. Steering hook Yamaha Part # 63D-48511-00-4D must be installed
 4. Cylinder HC4645-3 may be used in these applications. The pivot plate will need to be flipped before installation. Instructions provided with Owner's Manual.
 5. High performance 150HP engines and any engine using a 4-3/4" gear-case such as Command Thrust MUST use SeaStar.

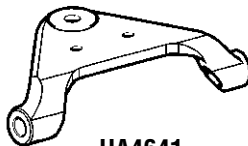
Revision Date: **SEPTEMBER 18th 2019**

NOTICE

HC4645-3 compact cylinder is included in the BayStar Steering kits. If your engine requires the use of a cylinder other than HC4645-3 or HC4658-3 then please refer to the figure below for additional replacement pivot plate.



HA4640
Comes with cylinder HC4645-3



HA4641
Converts HC4645-3 to HC4647-3



HA4642
Converts HC4645-3 to HC4648-3



HA4643
Converts HC4645-3 to HC4658-3

Figure 1-9.

INBOARD STEERING

Built in the same tradition as SeaStar Inboard Steering, these BayStar Systems are designed for relatively low torque inboard applications, including inland waterway boats and other low speed displacement vessels.

The systems are easy to install with “cut-to-length” tubing. Available in complete kits or by individual components.

** If unsure of total steering loads, contact SeaStar Solutions Technical Support for assistance.*

Features

- Compact cylinder design
- HC4460-3 – 6.25” stroke
- HC4461-3 – 6.0” stroke
- Optional Tilt helm available
- Helm fits standard 3” dash cut outs
- Fast easy installation

Order Guide



ORDER INFORMATION	PART NO.
BayStar 30kg/m (2600 in-lbs) Inboard cylinder	HC4461-3
BayStar 52kg/m (4500 in-lbs) Inboard cylinder	HC4460-3
BayStar Helm 1.1 cu-in	HH4311-3
BayStar Helm 1.4 cu-in	HH4313-3
BayStar 20ft tubing kit	HT4420
1 Litre Steering Fluid	HA5430
BayStar Sport Tilt Helm	HH4315-3
BayStar Mounting Kit	HA5476
BayStar 30kg/m (2600 in-lbs) Inboard Steering Kit (comprising: HH4314 helm, HC4461 cylinder, HT4420 tubing kit, 2 x HA5430 fluid)	HK4401
BayStar 52kg/m (4500 in-lbs) Inboard Steering Kit (comprising: HH4314 helm, HC4460 cylinder, HT4420 tubing kit + 2 x HA5430 fluid)	HK4400H

Table 2-1.

Standard Helm Part # HH4311-3 & HH4314-3

HH4311-3 (1.1 cu. in.) **HH4314-3** (1.4 cu. in.)
 Refer to page 12-9 for total wheel turns.

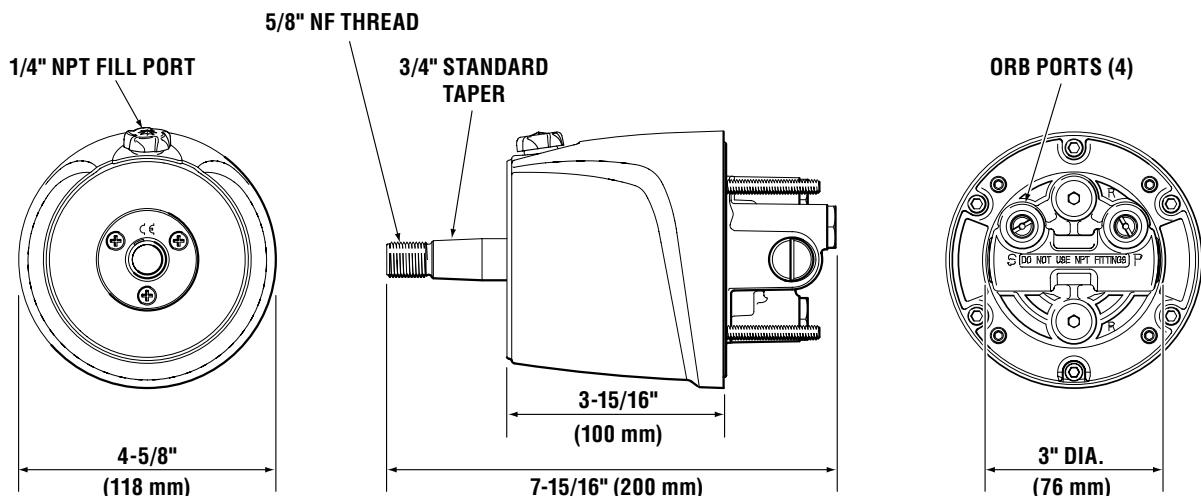
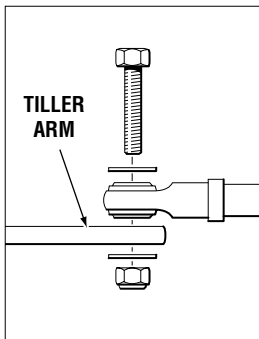


Figure 2-1.

HC4461-3
BA100-6ATM (2600 in-lbs)



ATTACHMENT TO TILLER ARM

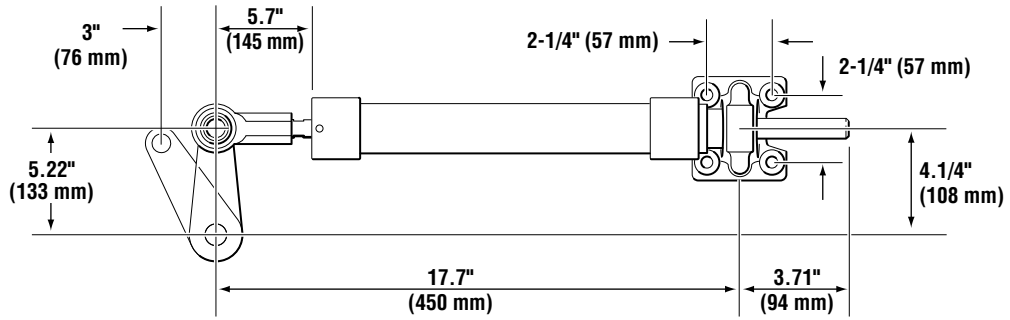
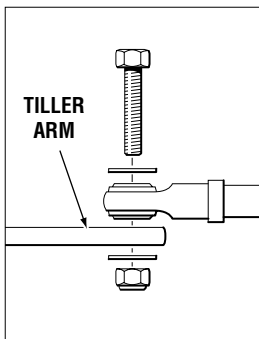


Figure 2-2.

HC4460-3
BA125-6.25 ATM (4500 in-lbs)



ATTACHMENT TO TILLER ARM

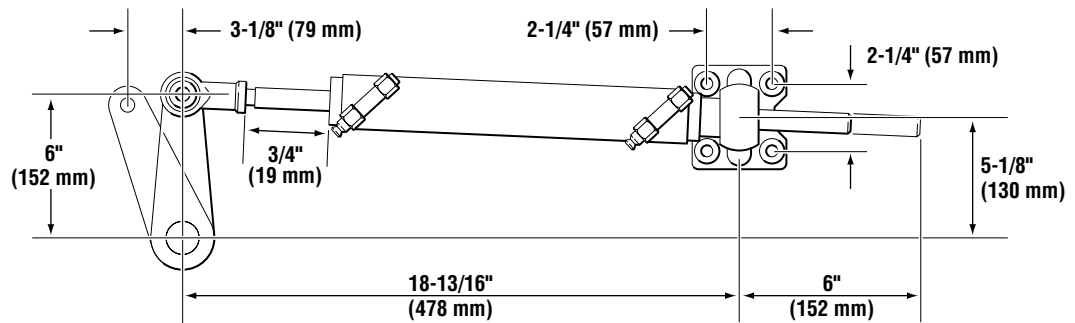


Figure 2-3.

CAUTION

If unsure of total steering loads, contact SeaStar Solutions Technical Support for assistance.

OUTBOARD STEERING

SeaStar Outboard Hydraulic Steering offers many models of steering cylinders to suit most applications. The standard and most commonly used model is the Front Mount steering cylinder. Before ordering it is necessary to determine the best possible application for your boat, taking into account the hull design, speed and usage of the boat. Keep in mind that engines today have become larger, more powerful and heavier than in the past. SeaStar Solutions encourages you to use the tables noted in this section and select your system accordingly.

Selecting the outboard steering system best suited for your boat

1. Using the table on page 3-3, select your system as per speed, horsepower and driving style.
2. Using the Application chart on page 3-6 choose the proper cylinder and tie bar equipment as per your outboard engine. If your engine is not noted, contact SeaStar Solutions or your distributor for details.
3. Proceed to page 9-9 for details on fitting kits and particular equipment that will be needed to add a second station and/or an autopilot.

Typical SeaStar Installation

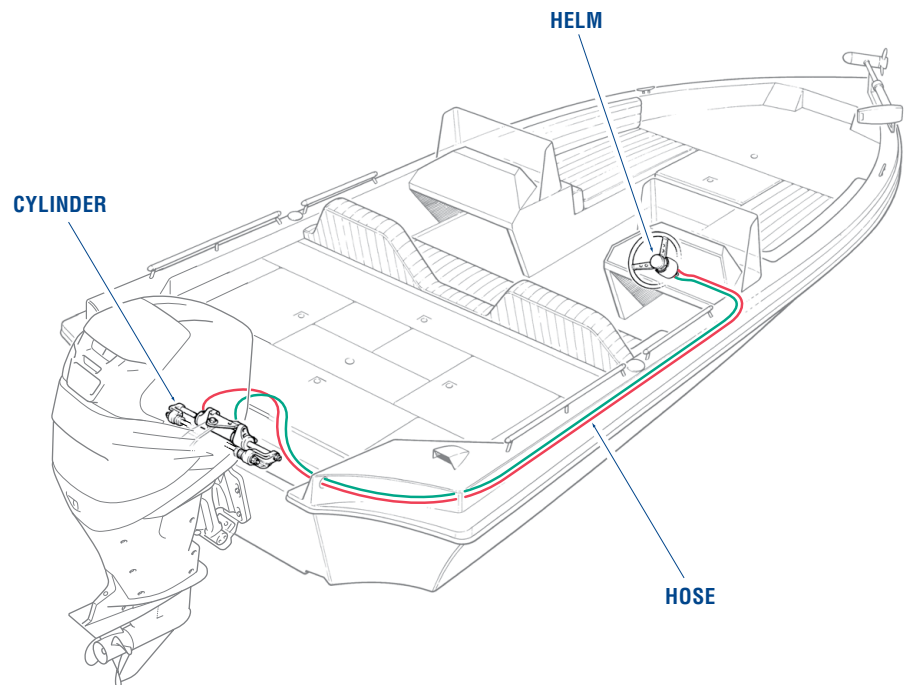


Figure 3-1.

SeaStar Front Mount Outboard Steering System

Features

- Independent engine tilt for twin engine installations.
- Easy steering.
- 5 turns lock to lock steering response (1.7 standard system).

Applications

- General purpose system.
- Single and multiple engine capability.
- Typical applications include center console fishboats and cruisers.

How to select a front mount outboard steering system

1. From the installation recommendations on page 3-3 select the system configuration based on:
 - a) the number of engines,
 - b) the total power of engine(s) to be installed and
 - c) driving use.
2. From the application guides, confirm that the Front Mount cylinder will fit your specific make, model and year of engine. Select the adapter kit for single engines or the tie bar kit for dual engines.
3. From Section 6 select the appropriate helms and accessory hardware for each steering station.
4. From Section 9 select the fitting and hose kits required for the installation.
5. Confirm that there is sufficient space available in the splashwell and dash areas for the steering components.
6. Determine if Power Assist is desired, Section 7.

HC5345-3



Figure 3-2. HC5345-3 cylinder shown.

⚠ CAUTION

- Not recommended for use in installations where;**
- a) chopper, cleaver or surface piercing propellers are used**
 - b) the engine is highly elevated on the transom**
 - c) engine trim tabs have been removed**
 - d) the boat speed exceeds 75mph (120km/h), or**
 - e) the power exceeds the maximum Coast Guard or M.O.T. recommendations for the boat**

Front Mount Outboard Installation Recommendations

Outboard recommendations made in this section are based on our experience with typical installations, applications and usage. Ensure you select the system which provides the best comfort versus performance.

It is the boat manufacturer and the installer's responsibility to ensure the components selected are sufficiently validated on the boat for safe and acceptable operation. DO NOT use SeaStar Solutions Steering in applications they are not intended for.

	NORMAL USE	AGGRESSIVE USE (SEE NOTE 1)
ENGINE	SEASTAR FRONT MOUNT <i>(Refer to page 3-4 through page 3-7)</i>	SEASTAR TOURNAMENT SERIES <i>(See Note 1 – Refer to page 3-8 through page 3-12)</i>
SINGLE ENGINE	SINGLE CYLINDER 350 HP Max 75 MPH Max HC53xx-3 Cylinder <i>(See Note 2)</i>	SINGLE CYLINDER 350 HP Max HC63xx-3 Pro Cylinder <i>page 3-8 through page 3-10 (See Notes 2 & 3)</i> or HC6845S <i>See page 3-12)</i>
DUAL ENGINE NON COUNTER ROTATING	SINGLE CYLINDER 450 HP Max 55 MPH Max HC53xx-3 Cylinder HO60xx Tie Bar	SINGLE CYLINDER Tournament Cylinders <i>(See page 3-11 through page 3-12)</i>
	DUAL CYLINDER Tournament Cylinders HC53xx-3 Cylinders HO60xx Tie Bar	DUAL CYLINDER Tournament Cylinders <i>See page 3-11 through page 3-12)</i>
DUAL ENGINE COUNTER ROTATING	SINGLE CYLINDER 600 HP Max 55 MPH Max HC53xx-3 Cylinder HO60xx Tie Bar	SINGLE CYLINDER Tournament Cylinders <i>(See page 3-11 through page 3-12)</i>
	DUAL CYLINDER 600 HP Max 55 MPH Max HC53xx-3 Cylinders HO60xx Tie Bar	DUAL CYLINDER Tournament Cylinders <i>(See page 3-11 through page 3-12)</i>
TRIPLE ENGINE ONE WITH COUNTER ROTATING	DUAL CYLINDER 600 HP Max 55 MPH Max HC53xx-3 Cylinders HO60xx Tie Bar <i>*MAX center engine drop <.75"</i>	DUAL CYLINDER Tournament Cylinders <i>(See page 3-11 through page 3-12)</i>
	TRIPLE CYLINDER 900 HP Max 55 MPH Max HC53xx-3 Cylinders HO60xx Tie Bar <i>*MAX center engine drop <.75"</i>	Consult SeaStar Solutions Technical Service
<p>1. SeaStar Solutions has specific steering equipment for boats that are driven aggressively, used in severe conditions or with more than 300 HP per engine.</p> <p>2. ALL ENGINES over 300 HP and all boats that are driven aggressively must use a high strength tiller bolt, kit part # HA5822. All front mount cylinders built after June 15, 2007 will have this high strength bolt included in the box. High strength tiller bolts can be identified by the marking "SEASTAR ARP" on the head of the bolt (refer to NOTICE page 3-6).</p> <p>3. HC63xx PRO Cylinders are designed for all those critical high speed, single outboard engine boats, such as Bass, Flats combo Race/Ski and other performance orientated boats capable of speeds in excess of 65 mph. For optimal performance, the use of SeaStar PRO helms and PRO Hoses are recommended.</p>		

SeaStar Front Mount Order Guide

(Normal and Aggressive Use)

SeaStar Steering Kits

Front Mount Cylinder part# HC5345-3 is included in the SeaStar Outboard Steering Kits HK6400A-3/HK63xxA-3. If your engine requires the use of a cylinder other than the HC5345-3 (see application guides on page 3-6 through page 3-7) you will need to purchase the individual components (helm, cylinder, hoses, etc.) separately.



Figure 3-3.

SeaStar Steering Kit (HK6400A-3)

Includes: Cylinder (HC5345-3), Helm (HH5271-3), two quarts of SeaStar steering fluid (HA5430[H]).

SeaStar Steering Kit (HK63XXA-3)

Includes: Hoses (H051XX), Cylinder (HC5345-3), Helm (HH5271-3), two quarts of SeaStar steering fluid (HA5430[H]).

SeaStar Steering Kit – Classic Tilt (HK6400TC-3)

Includes: Cylinder (HC5345-3), Classic Tilt Helm (HH6541-3), two quarts of SeaStar steering fluid (HA5430[H]).

SeaStar Steering Kit – Sport Tilt (HK6400TS-3)

Includes: Cylinder (HC5345-3), Sport Tilt Helm (HH61911-3), two quarts of SeaStar steering fluid (HA5430[H]).

SeaStar Normal Use Tie Bar Kits

SeaStar normal use tie bar (H06001) kits for normal use up to 600 HP in counter-rotating applications.

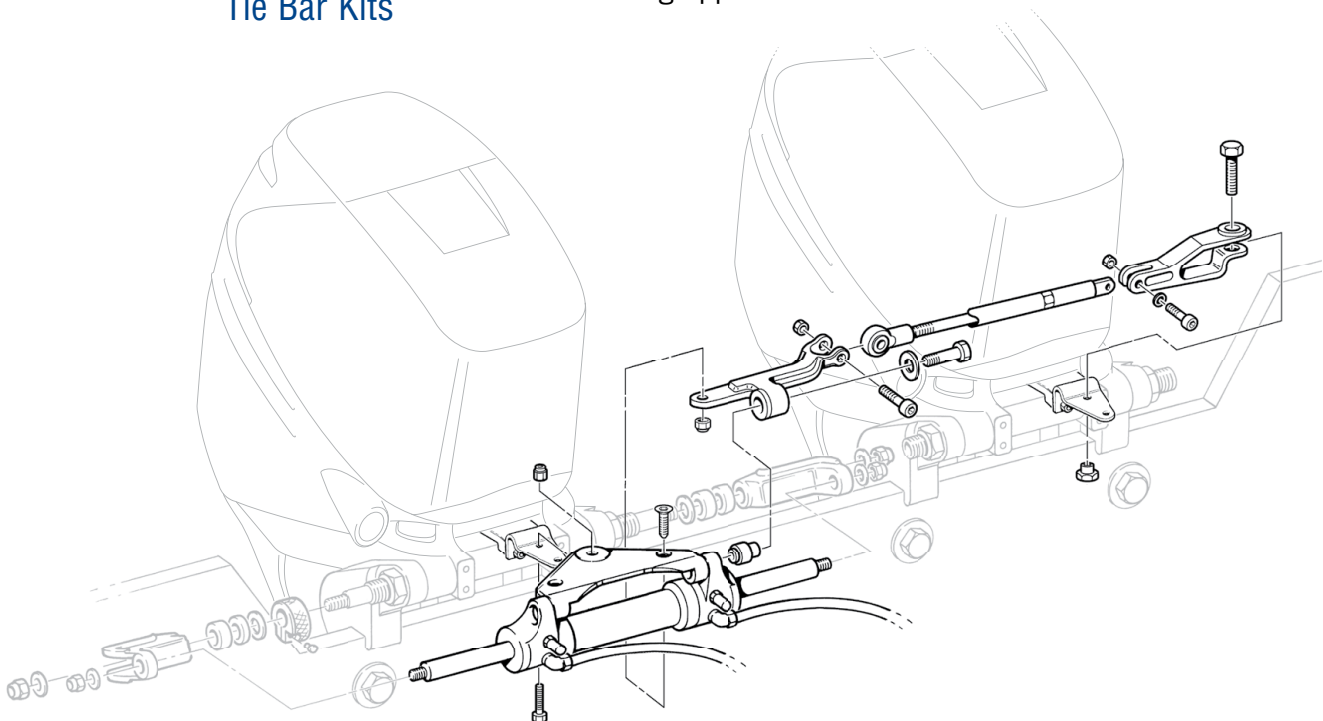


Figure 3-4.

SeaStar Aggressive Use Tie Bar Kits

SeaStar heavy duty tie bar system for aggressive use. Fully adjustable, for single cylinder and dual cylinder applications.

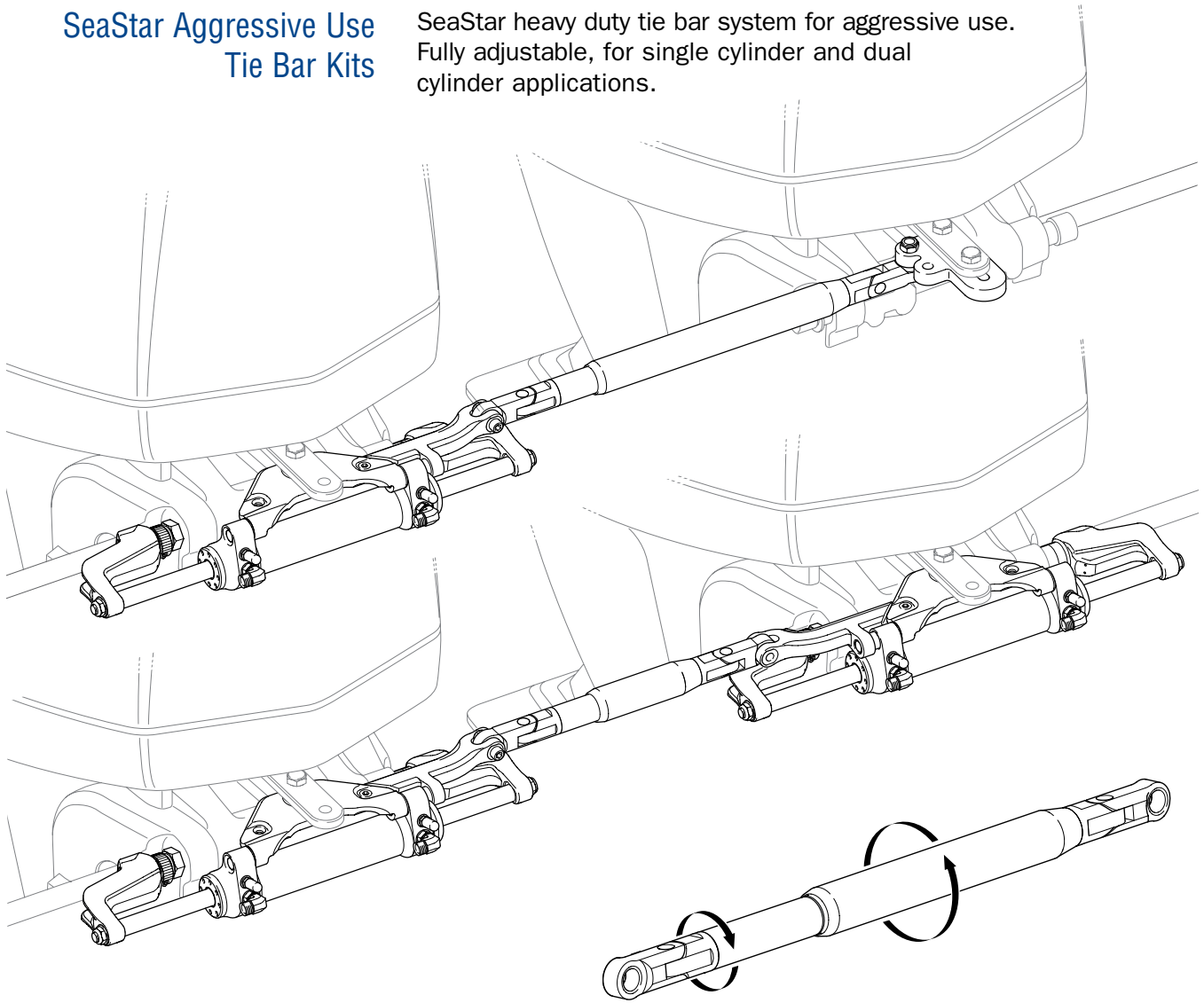


Figure 3-5.

CONFIGURATION	HARDWARE KIT		TIE BAR			
	Part #	Qty. Req.	Engine Center to Center Distance – Inches (mm)	Part #	Qty. Req.	Notes
TWIN ENGINE – SINGLE CYLINDER (Starboard)	HA5521	1	25.0 – 25.7 (635 – 653)	H06821	1	1, 3, 4, 5
	HA5521	1	25.8 – 30.7 (655 – 780)	H06822	1	1, 3, 4, 5
	HA5521	1	30.8 – 39.3 (782 – 998)	H06823	1	1, 3, 4
	HA5521	1	39.4 – 54.5 (1000 – 1384)	H06824	1	1, 3, 4
TWIN ENGINE – DUAL CYLINDER	HA5520	1	28.0 – 29.0 (771 – 737)	H06819	1	1, 2, 3, 4, 5
	HA5520	1	29.1 – 30.6 (739 – 777)	H06820	1	1, 2, 3, 4, 5
	HA5520	1	30.7 – 33.4 (779 – 848)	H06821	1	1, 2, 3, 4, 5
	HA5520	1	33.5 – 38.4 (850 – 975)	H06822	1	1, 2, 3, 4
	HA5520	1	38.5 – 47.1 (997 – 1196)	H06823	1	1, 2, 3, 4

NOTES

- Installation may vary according to the following factors: engine mounting height, transom thickness, use of transom savers, tiller bolt location, engine tilt range, and engine size.
- Cylinder's must be plumbed in parallel only, no series connections.
- Tiebar length may vary depending on toe in/toe out setup. To allow for toe, add or subtract from your nominal engine center to center distance.
- Based on recommended engine manufacturer minimum center to center distances. Deviating from these recommendations may require stroke limiting cylinders and/or engine tilt limiting, please consult SeaStar Solutions Technical Service.
- Cylinder interference may occur with independent trim/tilt of the engines.

Single Engine Application Guide

(Normal Use)

Prior to selecting a cylinder from this application guide, please refer to page 3-4 to ensure that you are selecting the correct cylinder for your engine/boat.

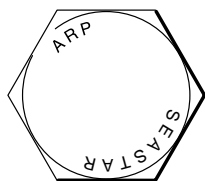
NOTICE

NOTICE

Front Mount Cylinder part# HC5345-3 is included in the SeaStar Outboard Steering Kits HK6400A-3/HK63xxA-3. If your engine requires the use of a cylinder other than the HC5345-3 (see application guides on this page through page 3-7) you will need to purchase the individual components (helm, cylinder, hoses, etc.) separately.

NOTICE

High Strength Tiller bolt, part# HA5822. ALL cylinders shipped after June 15th, 2007 have this bolt included in the cylinder package.



CAUTION

SeaStar Solutions recommends the use of SeaStar PRO (1500 psi) Kevlar steering hoses with SeaStar PRO Helms.

Is your Splashwell wide enough? Check page 3-10 for space requirements.

MFG	YEAR	MODEL	CYL	NOTES
HONDA	1996-DATE	75-90 HP 4-Stroke	HC5345-3	See Note 1 See Note 3
	1998-2009	115-130 HP 4-Stroke	HC5347-3	
	1998-DATE	30-50 HP 4-Stroke	HC5345-3	
	2001-DATE	BF150 4-Stroke	HC5345-3	
	2001-DATE	BF200-250 4-Stroke	HC5445-3	
	2003-DATE	BF135 HP 4-Stroke	HC5345-3	
	2010-DATE	115HP 4-Stroke	HC5345-3	
	2015-DATE	BF100 HP 4-Stroke	HC5345-3	
JOHNSON/ EVINRUDE	1991-DATE	40-300 HP 2-Stroke	HC5345-3	Inc. ETech See Note 1 See Note 1 Inc. H.O. Models
	1997-2006	75-300HP Ficht	HC5345-3	
	1998-DATE	40-140 HP 4-Stroke	HC5358-3	
	2000-2003	115HP Ficht	HC5358-3	
	2002-DATE	200-225 HP 4-Stroke	HC5345-3	
2007-DATE	3.3L V6 200-250HP	HC5345-3		
MERCURY	1989-DATE	75-300 HP 2-Stroke	HC5345-3	See Note 1 See Note 2
	1998-DATE	30-60 HP 2 & 4-Stroke	HC5348-3	
	2003-DATE	150-300 HP XS	HC6345-3	
	2004-DATE	150-200HP VERADO	HC5345-3	
	2017-DATE	175-200-225 HP 3.4L V6	HC5345-3	
	2018-DATE	250-300 HP 4.6L V8	HC5345-3	
OXE	2017-DATE	200 HP Diesel I4 2.4L	HC5345-3	
SELVA	2000-2013	90-115 HP	HC5358-3	
	2014-DATE	115 HP	HC5345-3	
	2000-DATE	150 HP	HC5345-3	
	2007-DATE	200-300 HP 4.2L V6	HC5345-3	
SUZUKI	1986-2000	DT-100 HP	HC5345-3	See Note 1 NOT 1996
	1998-DATE	40-140 HP 4-Stroke	HC5358-3	
	1986-2002	115-140 HP	HC5345-3	
	1986-2013	150-225 HP 2 & 4-Stroke	HC5345-3	
	2004-DATE	DF200-300 HP 3.6-4.0L V6	HC5358-3	
	2013-DATE	150-200 HP 4 Cylinder	HC5345-3	
2017-DATE	DF325-350 HP 4.4L V6	HC5358-3		
TOHATSU	1990-DATE	40-140HP	HC5345-3	
	2014-DATE	BFT60-BFT150	HC5345-3	
	2014-DATE	BFT200-BFT250	HC5445-3	
YAMAHA	1990-2003	40-90 HP 2 -Stroke	HC5345-3	See Note 1 See Note 1 See Note 3
	1986-DATE	100-300 HP 2-Stroke	HC5345-3	
	1997-DATE	80-250 HP 4-Stroke	HC5345-3	
	2000-DATE	150-300 HPDI	HC5345-3	
	2003-DATE	25-70 HP 4-Stroke	HC5348-3	
	2007-DATE	200-300 HP 4.2L V6 4-Stroke	HC5345-3	
	2007-DATE	F300-F350 HP 5.3V8	HC5345-3	
	2011-DATE	F115A inc. SHO 90 & 115 HP	HC5358-3	
	2012-DATE	150-200 HP 2.8L 4 Cyl.	HC5345-3	
	2014-DATE	F115B	HC5345-3	

- Requires Spacer Kit# HO5090.
- PRO XS **MUST** use HC6345-3.
- Optional cylinder part # HC5358-3. Slight interference may occur when using the HC5358-3, with the engine in the full tilt position.

The above engine applications are current through the revision date shown below.

Revision Date: **SEPTEMBER 18th 2019**

Twin Engine Application Guide

(Normal Use)

NOTICE

Is your Splashwell wide enough?
Check page 3-10 for space req.

Prior to selecting a cylinder from this application guide, please refer to page 3-3 to ensure that you are selecting the correct cylinder for your engine/boat.

NOTICE

HO6001, HO6002 and HO6003 are for engine centers up to 36". For wider engine centers please contact SeaStar Solutions Technical Support.

MFG	YEAR	MODEL	CYLINDER	TIE BAR KITS		NOTES
				Twin Engine Single Cylinder	Twin Engine Dual Cylinder	
HONDA	1996-DATE	75-90 HP	HC5345-3	HO6001	HO6002	See Note 3
	1998-2009	115-130 HP	HC5347-3	HO5063	HO5064	See Note 5
	1998-DATE	30-50 HP	HC5345-3	HO6001	HO6002	See Note 2
	2001-DATE	150 HP 4-Stroke	HC5345-3	HO6001	HO6002	See Note 8
	2001-DATE	BF200-250	HC5445-3	HO6001	HO6002	
	2003-DATE	BF135 HP	HC5345-3	HO6003	HO6002	
	2011-DATE	115HP	HC5345-3	HO6003	HO6002	
	2015-DATE	BF100	HC5345-3	HO6003	HO6002	See Note 7
JOHNSON/ EVINRUDE	1991-DATE	40-300 HP	HC5345-3	HO6003	HO6002	Inc. ETech Engines.
	1996-DATE	75-250 HP Ficht	HC5345-3	HO6003	HO6002	
	1998-DATE	40-140 HP 4-Stroke	HC5358-3	HO6003	HO6002	See Note 2
	2000-DATE	115 HP FICHT	HC5358-3	HO6003	HO6002	See Note 2
	2002-DATE	200-225 HP 4-Stroke	HC5345-3	HO6003	HO6002	
	2005-DATE	E250 DPX Vindicator	HC5348-3	HO6003	HO6002	
2007-DATE	3.3L/3.4L 200-250HP	HC5345-3	HO6003	HO6002	Inc. H.O. Models.	
MERCURY	1989-DATE	75-300 HP	HC5345-3	HO6001	HO6002	See Note 3
	1996-DATE	75-200 HP 2 & 4-Stroke	HC5345-3	HO6001	HO6002	See Note 8
	1998-DATE	30-60 HP	HC5345-3	HO6001	HO6002	See Note 2
	2002-2003	225 HP 4-Stroke	HC5358-3	HO6001	HO6002	See Note 1
	2004-DATE	150-200HP VERADO	HC5345-3	HO6001	HO6002	
	2003-DATE	150-200XS	<i>MUST Use Tournament Cylinders. Contact tech. support for details.</i>			
	2003-DATE	250-300 HP XS	<i>MUST Use Tournament Cylinders. Refer to page 3-11.</i>			
	2016-DATE	150 HP 3.0L 4-Stroke	HC5345-3	N/A	HA5520	See Note 9
2017-DATE	175-225 HP 4-Stroke 3.4L V6	HC5435-4	HO6001	HO6002		
2018-DATE	250-300 Pro XS 4-Stroke 4.6L	HC6345-3	HA5521	HA5520	See Note 9	
OXE	2017-DATE	200 HP Diesel I4 2.4L	<i>MUST Use Tournament Cylinders. Refer to page 3-11.</i>			
SUZUKI	2002-DATE	90-140 HP 4-Stroke	HC5358-3	HO6003	HO6002	See Note 2
	2003-DATE	DF90 HP	HC5358-3	HO6003	HO6002	
	2013-DATE	150-200 HP 4-Stroke 4 Cylinder	HC5345-3	HO6001	HO6002	
	2004-DATE	200-300 HP V6 4-Stroke	HC5345-3	HO6001	HO6002	
	2017-DATE	325-350 HP 4.4L V6	<i>MUST Use Tournament Cylinders. Refer to page 3-11.</i>			
YAMAHA	1990-2007	40-90 HP 2-Stroke	HC5345-3	HO6003	HO6002	
	1986-DATE	100-250 HP 2-Stroke	HC5345-3	HO6001	HO6002	
	2000-DATE	150-300 HPDI	HC5345-3	HO6001	HO6002	
	2001-2003	80-250 HP 4-Stroke	HC5358-3	HO6001	HO6002	See Note 1
	2003-DATE	F150-F250 3.3L	HC5358-3	HO6001	HO6002	
	2003-DATE	25-70 HP 4-Stroke	HC5348-3	HO6003	HO6002	See Note 2
	2007-DATE	200-300 HP 4.2L V6 4-Stroke	HC5345-3	HO6001	HO6002	
	2007-DATE	F300-F350 HP 5.3V8	<i>MUST Use Tournament Cylinders. Refer to page 3-11.</i>			
	2011-DATE	F115A inc. SHO 90 & 115 HP	HC5358-3	HO6003	HO6002	
	2014-DATE	F115B	HC5345-3	HO6001	HO6002	

1. HC5345-3 is optional for **SINGLE ENGINE ONLY** applications. **DO NOT** use HC5345-3 for twin engine applications as operational interference may occur.
2. Requires Kit HO5090.

3. Minimum Engine Center = 27".
4. May Require Extensive Cowling Modifications.
5. HO5030 and HO5064 comes without Tie Bar.
6. One cylinder per engine. Must use Mercury supplied tiller bolt for installation.

7. customer supplied SS washer must be installed under rod end.
8. Slight interference may occur with HO6001 tie bar, contact SeaStar Solutions technical support.
9. Refer to table on page 3-5 for tie bar part number.

The above engine applications are current through the revision date shown.

Revision Date: **SEPTEMBER 27th 2019**

SeaStar Pro Steering Systems

SeaStar PRO Outboard Steering systems are suited for all those critical high speed, single powered outboard boats, like Bass, Flats, combo Race/Ski and other performance orientated boats capable of speeds in excess of 65mph. Before ordering it is necessary to determine the proper cylinder and helm pump for your application. Using the table on page 3-9 , choose the correct cylinder as per your outboard engine. SeaStar Solutions recommends the use of a SeaStar PRO helm and SeaStar PRO (1500psi) reinforced Kevlar hoses with All SeaStar PRO systems.

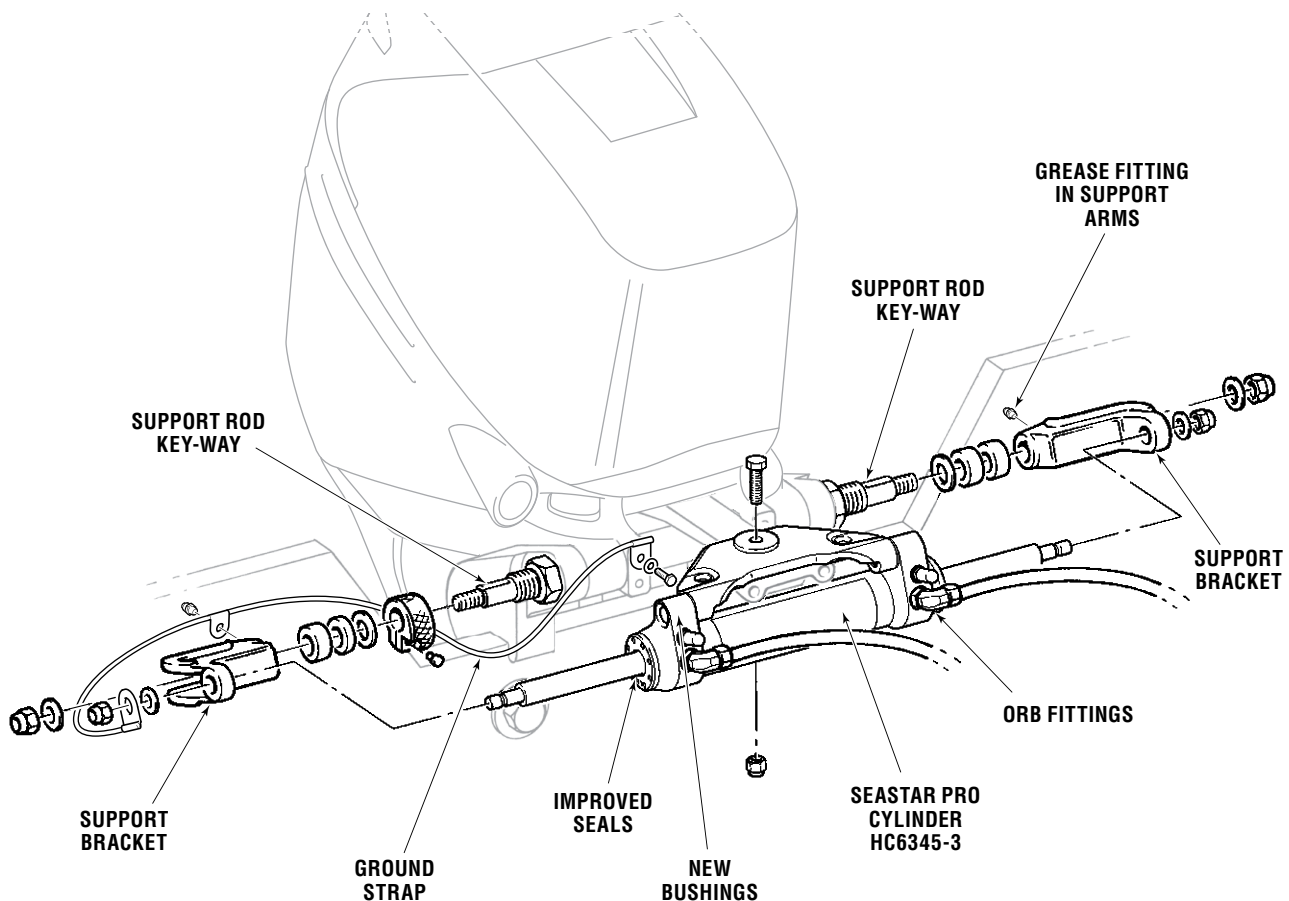


Figure 3-6. Cylinder Part# HC6345-3 shown.

Helm Pumps

SeaStar PRO Steering systems have the option to install a standard front mounting helm, both classic and sport tilt as well as rear mount helm pumps. Please refer to page 3-18 for style and page 6-5 for PRO Helm part numbers.

⚠ CAUTION

SeaStar Solutions recommends the use of SeaStar PRO (1500 psi) Kevlar steering hoses with SeaStar PRO Helms.

SeaStar Pro Application Guide

NOTICE

Is your Splashwell wide enough? Check page 3-10 for space requirements.

MFG	YEAR	MODEL	CYLINDER	NOTES
HONDA	2001-DATE	BF150-250 HP	HC6345-3	HA5472 stroke limit kit must be installed when using on BF200–BF250
JOHNSON/ EVINRUDE	2002-DATE 2003-DATE 2005-DATE	150-250 HP 4-Stroke 150-300 HP ETech E250 HP Vindicator	HC6345-3 HC6345-3 N/A	
MERCURY	1989-DATE	150-300 HP 2-Stroke, 4-Stroke and XS Engines Including 4.6L V8	HC6345-3	
SUZUKI	1986-DATE	150-300 HP 2 and 4-Stroke	HC6345-3	Includes ALL models.
YAMAHA	1986-DATE	150-350 HP 2 and 4-Stroke	HC6345-3	

Revision Date: **AUGUST 31st 2018**

⚠ WARNING

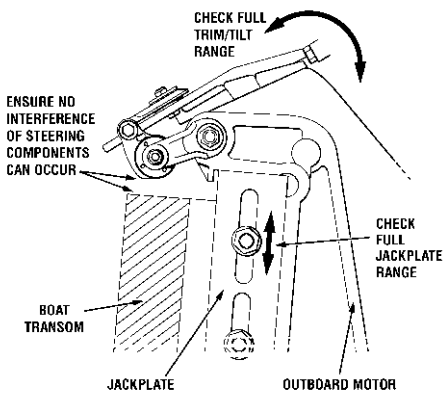
SeaStar PRO Steering Helms can not be used with an unbalanced steering cylinder.

SeaStar Solutions offers the following SeaStar PRO kits. Every kit ships with the HC6345-3 PRO Steering cylinder, HH5770-3 PRO helm pump, two bottles of SeaStar Steering fluid and two equal lengths of SeaStar PRO, Kevlar steering hoses.

Part Number	Hose Length
HK7500A-3	No hose
HK7516A-3.....	16'
HK7518A-3.....	18'
HK7520A-3.....	20'
HK7522A-3.....	22'
HK7524A-3.....	24'

Cylinder Installation, General Dimensions & Replacement Parts

WARNING



Operational interference of the steering cylinder/cylinder fittings and jackplates/transom/splashwell can occur under certain conditions. Check installation thoroughly throughout the full range of Motor Tilt, Jackplate Height and Trim before making final installation.

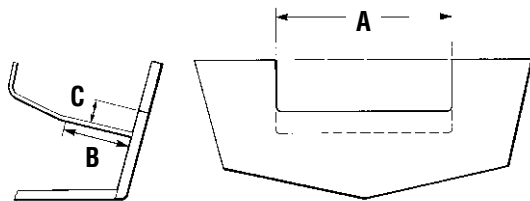
If interference is not eliminated total steering loss can occur, causing property damage and/or personal injury.

SEAL KIT = **HS5157**
 SUPPORT BRACKETS = **HP6018**
 SUPPORT ROD = **HP6016**
 SPACER KIT = **HP6033**

HOSE ELBOW FITTING = **HF6004**
 PIVOT PLATE = **N/A** (cylinder replacement/repair is required)

Figure 3-7.

Motor Well dimensions required for front mount ouboard steering systems



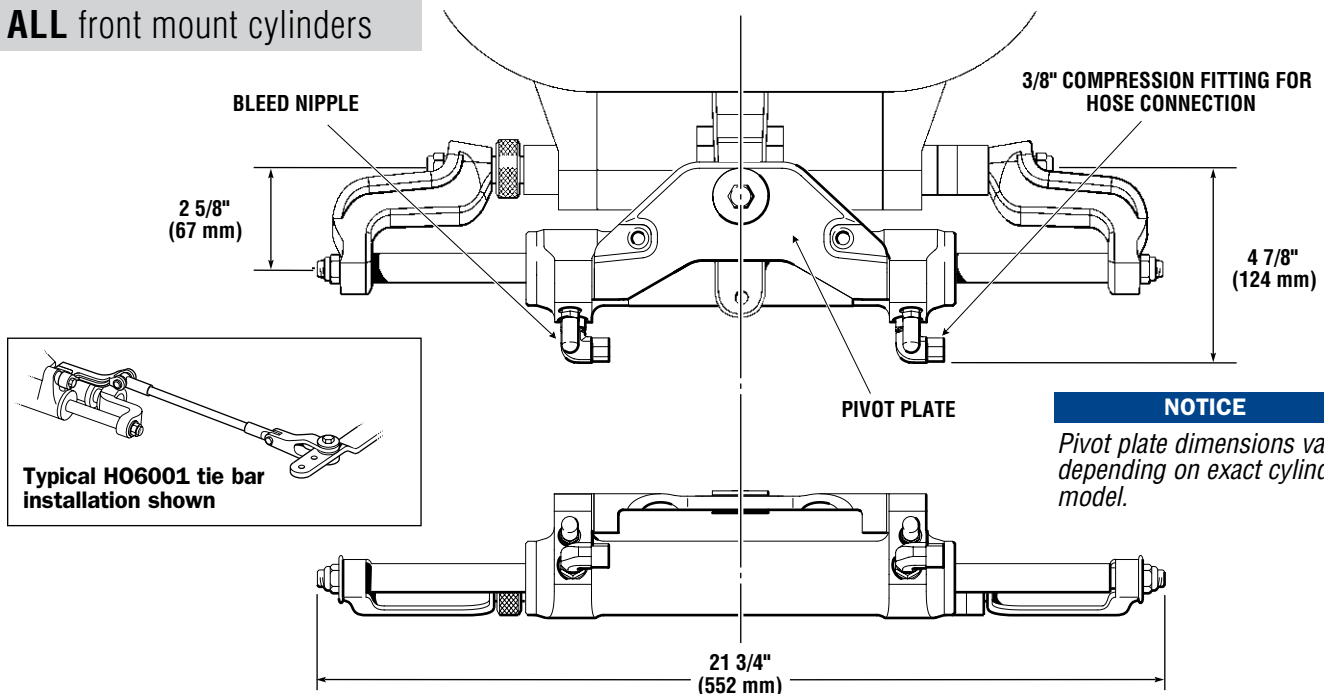
# OF ENGINES	A	B	C	MIN. ENGINE CENTER DISTANCE
1	22" (559mm)	6" (152mm)	5" (127mm)	N/A
2	49" (1244mm)	6" (152mm)	5" (127mm)	26" (660mm)

NOTES

- Dimensional restrictions also apply to external motor mount brackets.
- Maximum engine center distance for twin engine applications is 36" (914mm) using the standard tie bar. Dimension 'A' would have to be increased proportional to the tie bar length.
- Minimum engine center distance is 26" unless engine manufacturer recommendation is greater.
- Splashwells of less than 30" in overall width may require engine removal in order to install and service the support rod.

Figure 3-8.

ALL front mount cylinders



NOTICE

Pivot plate dimensions vary depending on exact cylinder model.

Figure 3-9.

SeaStar Tournament Series

(Aggressive Use)

Extreme heavy duty cylinders and tie bars designed for primarily high performance multiple engine applications. Also available for single engine applications.

Features

- Suitable for use with all SeaStar Helms & SeaStar Power Assist.
- Heavy duty universal cylinder.
- Reversible, bolt on stainless steel tie bar plates.
- Robust design with heavy duty support brackets, barrel, shaft & seals.
- Superior corrosion resistance.
- New pivot plate design provides smooth articulation and a sealed joint (patent pending).
- Heavy duty adjustable tie bar (patent pending).
- Equipped with stainless steel adjustable o-ring sealed elbow fittings which can be easily orientated in any direction.

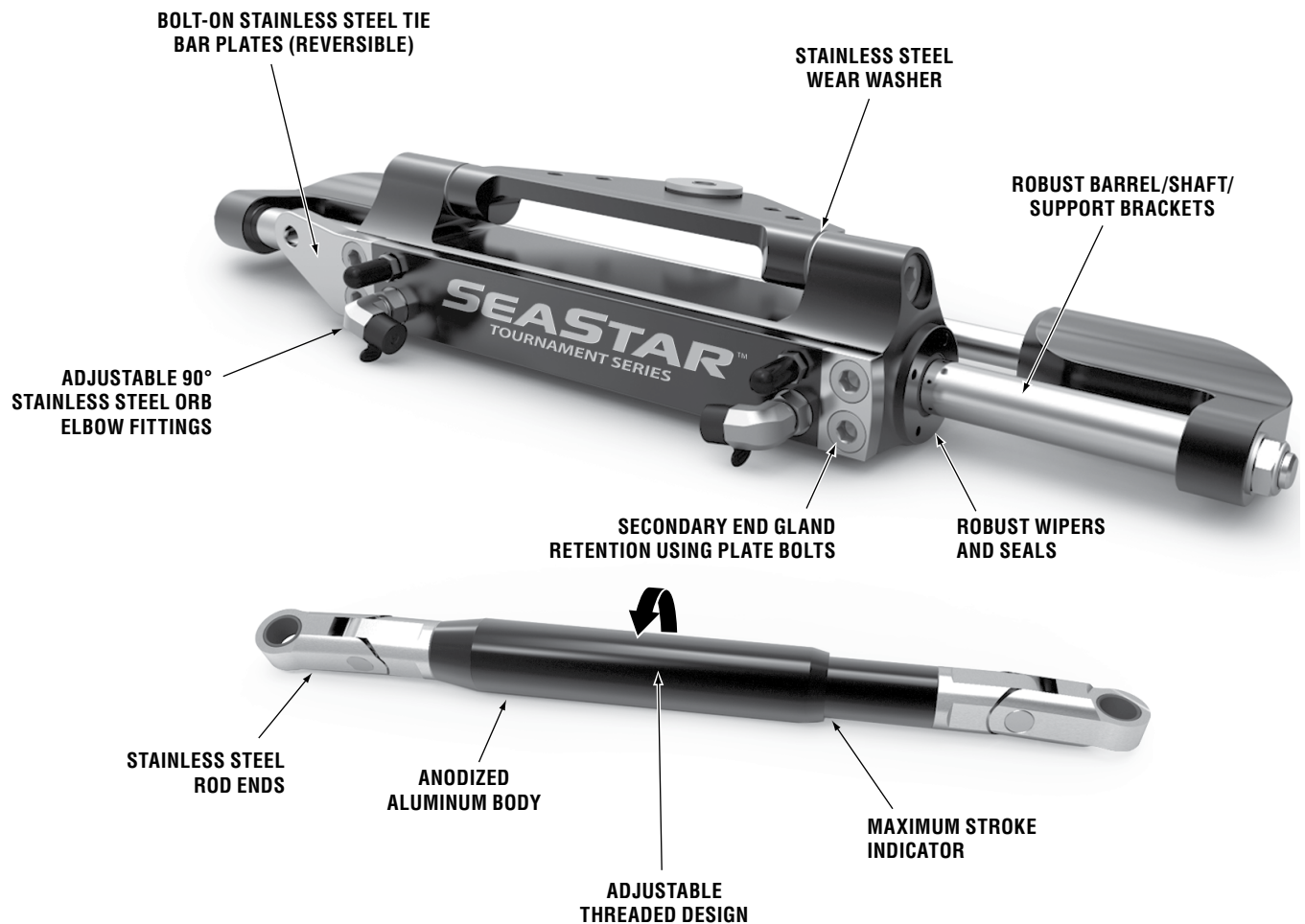


Figure 3-10.

Tournament Series Application Guide

CONFIGURATION	CYLINDER		HARDWARE KIT		TIEBAR				NOTES
	PART#	QTY	PART#	QTY	ENGINE CENTER DISTANCE (IN)	ENGINE CENTER DISTANCE (mm)	PART#	QTY	
SINGLE ENGINE – SINGLE CYLINDER	HC6845*	1	HA6801	1	N/A	N/A N/A	N/A	N/A	1
TWIN ENGINE† – SINGLE CYLINDER (Starboard)	HC6845*	1	HA6802	1	25.0" – 25.6" 25.7" – 30.6" 30.7" – 39.4" 39.5" – 54.0"	635 mm – 650 mm 653 mm – 777 mm 780 mm – 1001 mm 1003 mm – 1372 mm	HO6821 HO6822 HO6823 HO6824	1 1 1 1	1, 3, 4, 5 1, 3, 4, 5 1, 3, 4, 5 1, 3, 4, 5
TWIN ENGINE† – DUAL CYLINDER	HC6845*	2	HA6804	1	25.0" – 26.5" 26.6" – 29.3" 29.4" – 34.2" 34.3" – 43.0" 43.5" – 58.0"	635 mm – 673 mm 676 mm – 744 mm 747 mm – 869 mm 871 mm – 1092 mm 1105 mm – 1473 mm	HO6820 HO6821 HO6822 HO6823 HO6824	1 1 1 1 1	1, 3, 4, 5 1, 3, 4, 5 1, 3, 4, 5 1, 3, 4, 5 1, 3, 4, 5
TRIPLE ENGINE† – DUAL CYLINDER	HC6845*	2	HA6806	1	25.0" – 27.9" 28.0" – 36.0" 36.0" – 51.0"	635 mm – 709 mm 711 mm – 914 mm 914 mm – 1295 mm	HO6822 HO6823 HO6824	2 2 2	1, 2, 3, 4, 5, 6 1, 2, 3, 4, 5, 6 1, 2, 3, 4, 5, 6
QUAD ENGINE† – DUAL CYLINDER	HC6845*	2	HA6811	1	Consult SeaStar Solutions Technical Service				1, 2, 3, 4, 5
QUINTUPLET ENGINE (Plus)	Consult SeaStar Solutions Technical Service								1, 2, 3, 4, 5
NOTES	<ol style="list-style-type: none"> Installation may vary according to the following factors: engine mounting height, transom thickness, use of transom savers, tiller bolt location, engine tilt range, and engine size. For center engine drops greater than 3 inches (76mm), please consult SeaStar Solutions Technical Service. Tie Bar length may vary depending on toe in/toe out setup. To allow for toe, add or subtract from your nominal engine center to center distance. 				<ol style="list-style-type: none"> Based on recommended engine manufacturer minimum center to center distances. Deviating from these recommendations may require stroke limiting cylinders and/or engine tilt limiting, please consult SeaStar Solutions Technical Service. Cylinder's must be plumbed in parallel only, no series connections. Only exception is if cylinders are utilizing a liquid tie bar. Maximum drop: ≤ 3 inches (76mm). 				

* HC6850 for Honda V6 or where stroke reduction is desired.

† Mercury multi engine applications may require additional parts, contact Tech support.

NOTICE

Required for triple engine installs on Mercury Optimax and PROxs and engines with a single tiller hole. May fit other applications, call SeaStar Solutions technical support for more information.

CONFIGURATION	CYLINDER		HARDWARE KIT		TIEBAR				NOTES
	PART#	QTY	PART#	QTY	ENGINE CENTER DISTANCE (IN)	ENGINE CENTER DISTANCE (mm)	PART#	QTY	
TRIPLE ENGINE – TRIPLE CYLINDER	HA6845*	3	HA6807	1	28.0" – 28.8" 28.9" – 30.5" 30.6" – 33.3" 33.4" – 38.3" 38.4" – 47.0" 47.1" – 62.1"	711 mm – 736 mm 737 mm – 774 mm 775 mm – 847 mm 848 mm – 974 mm 975 mm – 1,194 mm 1,195 mm – 1,578 mm	HO6819 HO6820 HO6821 HO6822 HO6823 HO6824	2	1, 2, 3, 4 1, 2, 3, 4 1, 2, 3, 4 1, 3, 4, 6 1, 3, 5, 6 1, 3, 7
NOTES	<ol style="list-style-type: none"> Installation may vary according to the following factors: engine mounting height, transom thickness, use of transom savers, tiller bolt location, engine tilt range, and engine size. Will require trim limiting at 0° (0 mm) drop.** 				<ol style="list-style-type: none"> Tie Bar length may vary depending on toe in/toe out setup. To allow for toe, add or subtract from your nominal engine center to center distance. Maximum drop 1.5" (38 mm) with trim limiting.** Maximum drop 1.5" (38 mm) without trim limiting. 		<ol style="list-style-type: none"> Maximum drop 3" (76 mm) with trim limiting.** Maximum drop 3" (76 mm) without trim limiting 		

* HC6850 for Honda V6 or where stroke reduction is desired.

** Trim limiting required as interference between the tie bar and support bracket will occur during independent trim/tilt.

Engine Configurations

It is important to note that each engine configuration requires a hardware kit and tie bar kit(s), with the exception of the single engine configuration, use the HC6845S.

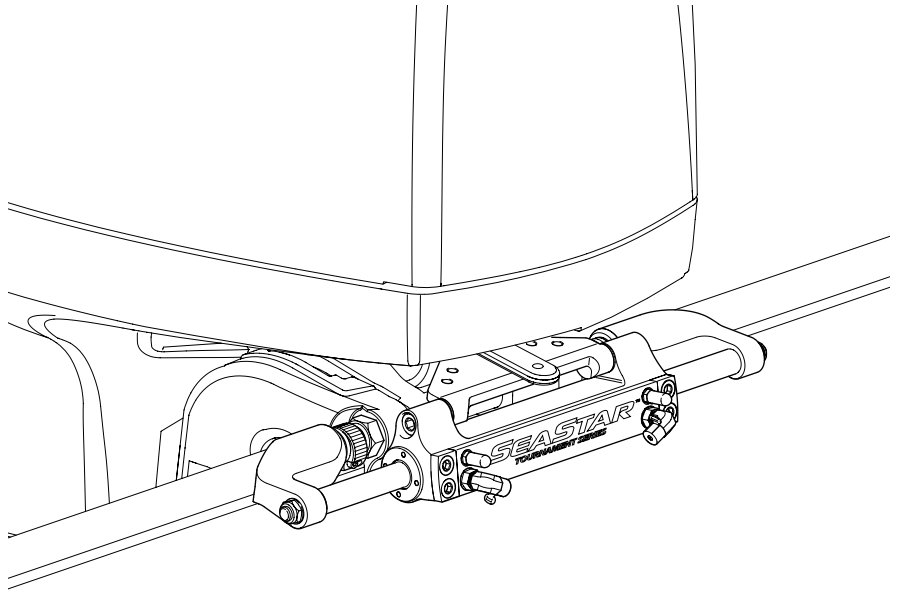


Figure 3-11. Single Engine – Single Cylinder Configuration.

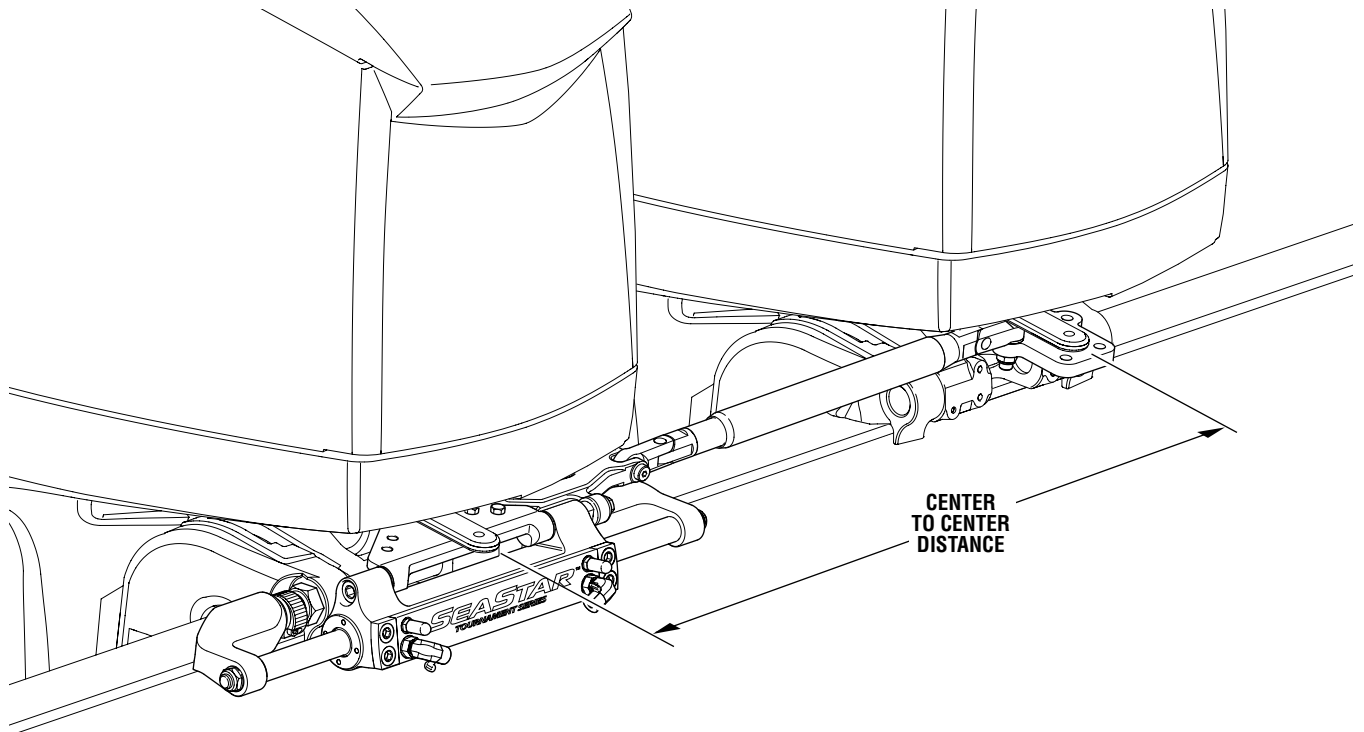


Figure 3-12. Twin Engine – Single Cylinder (Starboard) Configuration.

NOTICE

The Twin Engine – Single Cylinder configuration requires installation of the drive bracket “BEFORE” installing the steering cylinder onto the engine. (Refer to your installation manual.)

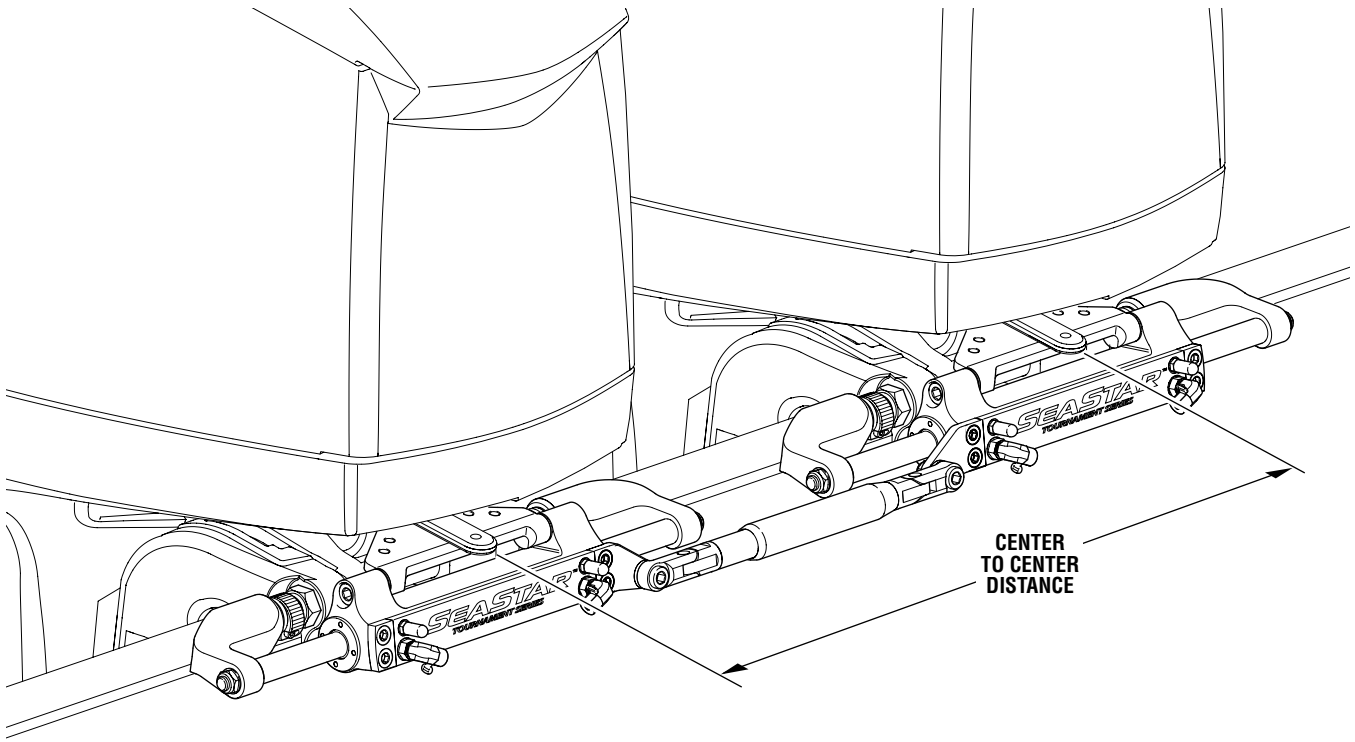


Figure 3-13. Twin Engine – Dual Cylinder Configuration.

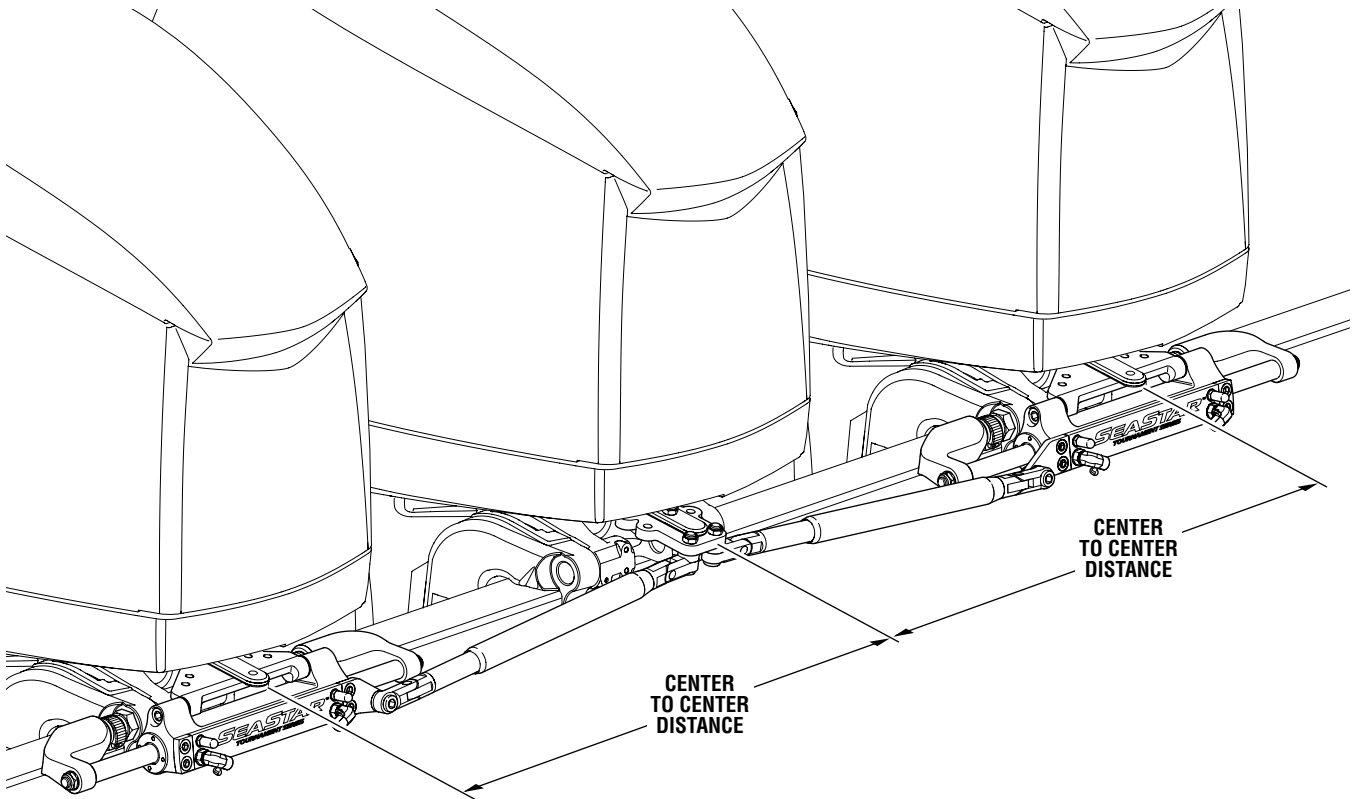
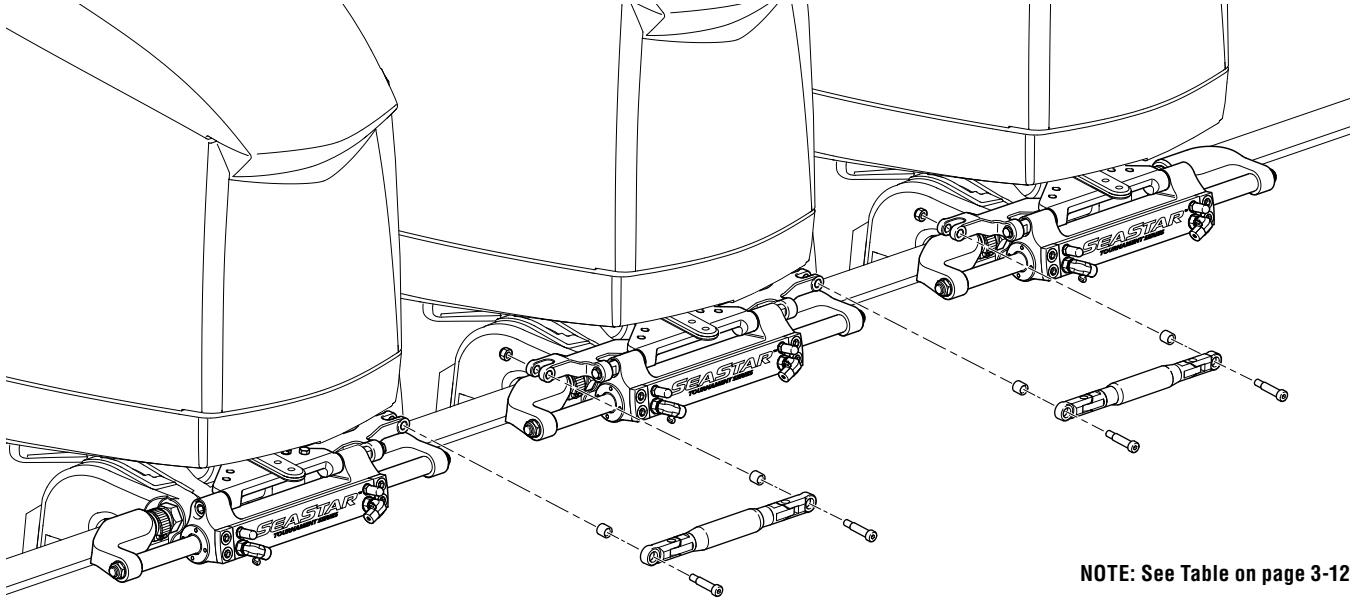


Figure 3-14. Triple Engine – Dual Cylinder Configuration.

NOTICE

Depending on engine, the cylinder may be mounted different than that shown below.



NOTE: See Table on page 3-12

Figure 3-15. Triple Engine – Triple Cylinder Configuration.

CAUTION

Before connecting the tie bars Refer to Section 3.5 of book 48 “Tie Bar Adjustment and Installation”.

Cylinder Dimensions

Maximum tilt angles shown – 67°.
Typical transom thickness shown, but will vary.

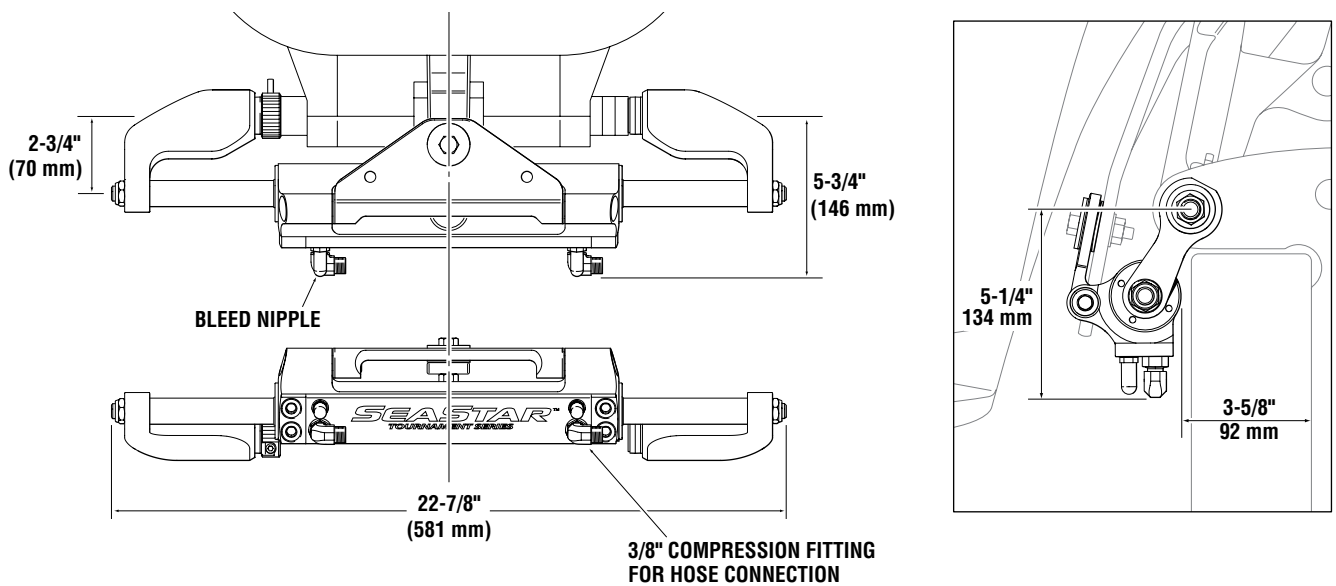


Figure 3-16. Tournament Cylinder Dimensions.

WARNING

Operational interference of the steering cylinder/cylinder fittings and jackplates/transom/splashwell can occur under certain conditions. Check installation thoroughly throughout the full range of Motor Tilt, Jack Height and Trim before making final installation. If interference is not eliminated total steering loss can occur, causing property damage and/or personal injury.

Catamaran Outboard Systems

SeaStar Solutions always recommends a mechanical tie bar between engines where possible. In applications where a mechanical tie bar cannot be fitted, it is recommended that you use a “Liquid Tie Bar Valve”. This valve will serve two purposes; assisting with the air removal from the system and allows the user to re-align the engines when they come out of sync. Regardless of the application, a mechanical, or liquid tie bar must be fitted. Due to the potential of leakage across the piston seals, use of standard SeaStar Outboard cylinders may require frequent engine realignment. If you must use a “Liquid Tie Bar”, SeaStar Solutions recommends that you order the following parts below. Doing so will decrease the amount of re-alignment required.

Steering Cylinders



Figure 3-17. Liquid Tie Bar Valve HA5471-2.

HA5471-2, Liquid Tie Bar Valve

This valve assists with air removal and re-alignment of the engines when required without having to break into the hydraulic system.

HC5375-3, Catamaran Steering Cylinder

The HC5375-3 steering cylinder has the same mounting and design properties as the HC5345-3 front mount cylinder. The internal piston seals are different. This difference decreases the amount of engine re-alignment that you may encounter.

SeaStar PRO Helm

Use of a SeaStar PRO helm coupled with the HC5375-3 steering cylinders will drastically reduce the amount of engine realignment that you may encounter.

SeaStar PRO Hose (Kevlar)

To further reduce engine misalignment, and increase system performance, SeaStar Solutions recommends the use of SeaStar PRO steering hoses.

NOTICE

Due to plumbing requirements, all “Liquid Tie Bar” systems should use a 1.4 cu.in. or 1.7 cu.in. helm pump. Even though there are physically two cylinders in the system, the total volume of the system is that of one cylinder. Use of a 2.4 helm will result in heavier steering effort.

NOTICE

As with all other, high horsepower engines, SeaStar Power Assist is recommend to reduce steering effort.

NOTICE

Bleeding of a “Liquid Tie Bar System” is different than a system fitted with a mechanical tie bar. Please refer to your Installation and Owner’s Manual that is shipped with the liquid tie bar valve.



SeaStar Side Mount Outboard Steering System

Part # HC5370-3

Features

- Alternative to Front Mount Cylinder.
- Unbalanced cylinder with 4.8/5.7 turns lock to lock (1.7 helm).
- Suitable for installation in shallow splashwells.

NOTICE

For Outboard engine use ONLY.

Applications

- All engines with threaded tilt (steering) tubes complying with ABYC P17/ABYC P21/NMEA/BIA standards for mechanical steering.
- Cylinder attaches to the engine tilt tube as per ABYC/NMEA/BIA standard.
- Single and multiple outboard engine installations.
- Total power to 600HP in Twin counter rotating application.
- Typical applications include center console fishboats and cruisers.
- Ease of installation.

How to select a side mount outboard steering system

1. From theon page 3-18 select the system configuration based on;
a) the number of engines, and
b) the total power of engine(s) to be installed.
2. From the order guide select the cylinder(s) & tie bar kits required.
3. From the order guide select the appropriate helms and accessory hardware for each steering station.
4. From the order guide select the fitting and hose kits required for the installation.
5. Confirm that there is sufficient space available in the splashwell and dash areas for the steering components.

⚠ WARNING

Not for use with SeaStar-Pro Helm Pumps.

Part # HC5370-3



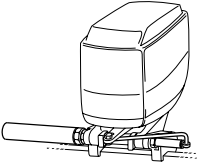
Figure 3-18. HC5370-3 cylinder shown.

NOTICE

Not recommended for use in installations where;

- a) chopper, cleaver, or surface piercing propellers are used,
- b) the engine is highly elevated on the transom,
- c) engine trim tabs have been removed,
- d) the boat speed exceeds 75mph (120km/h), or
- e) the power exceeds maximum Coast Guard or M.O.T. recommendations for the boat.

Order Guide

ENGINE/ CYLINDER CONFIGURATION	DESCRIPTION	QTY REQ	MODEL	PART NUMBER	REF. PAGE #	
SINGLE ENGINE (SINGLE CYLINDER) APPLICATIONS UP TO 300 HP MAX NUMBER OF TURNS 4.8/5.7 	CYLINDER	1	SIDE MOUNT	HC5370-3		
	HELM	1	* SEASTAR	HH5271-3	PAGE 6-6	
	HOSE KIT	1	OUTBOARD HOSE	HO51xx	PAGE 9-3	
	STEERING FLUID	3	SEASTAR FLUID	HA5430	PAGE 10-1	
	FOR EXTRA STEERING STATIONS ADD:					
	HELM	1	* SEASTAR	HH5271-3	PAGE 6-6	
	FITTING KIT	1	ADD A STATION	HF6007	PAGE 9-12	
	HOSE KIT	1	OUTBOARD HOSE	HO51xx	PAGE 9-3	
	STEERING FLUID	1	SEASTAR FLUID	HA5430	PAGE 10-1	
	OPTIONAL EQUIPMENT	BACK PLATE KIT		(FOR STANDARD HELMS)	HA5418	PAGE 6-3
20 DEGREE WEDGE			(FOR STANDARD HELMS)	HA5419	PAGE 6-3	
AUTOPILOT FITTING KIT			(FOR ALL -3 HELMS)	HF6007	PAGE 9-12	
POWER ASSIST STEERING				PA1200-2	PAGE 7-1	
* ALL NON-PRO HELM DESIGNS CAN BE USED, SEE PAGE 6-7 FOR OPTIONS.					PAGE 6-7	

General Dimensions

Tie Bar for Side Mount cylinders Part # H05009

ENGINE CENTRE DISTANCE	
MAXIMUM:	36" (914mm)
MINIMUM:	26" (660mm)

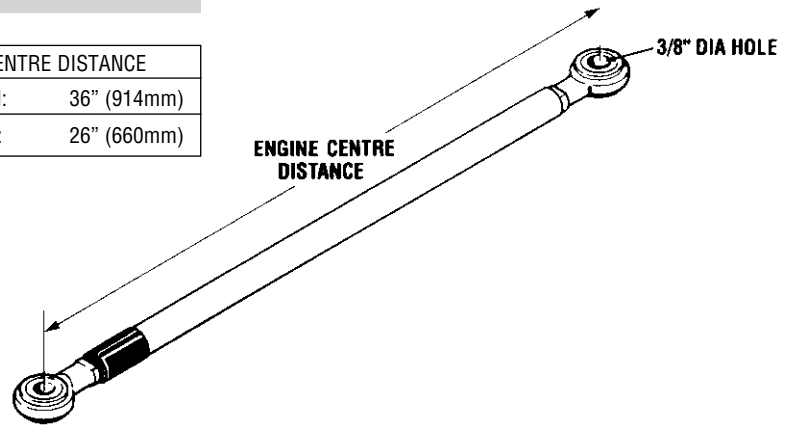


Figure 3-19. Tie Bar H05009.

Part # HC5370-3

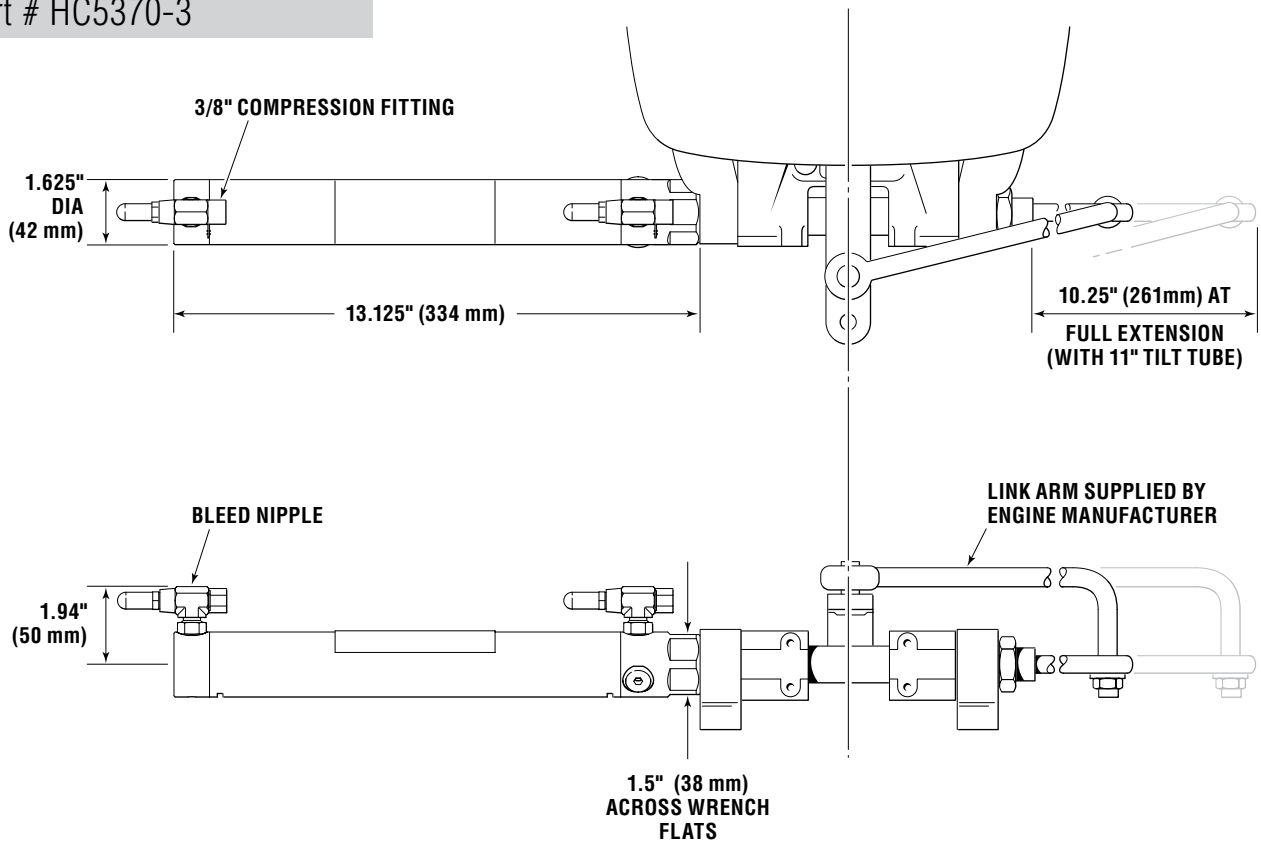


Figure 3-20.

CAUTION

DO NOT attempt to install NPT pipe fittings into the cylinder fitting ports on this, or any other -3 steering cylinder model. Doing so WILL lead to irreparable damage to the cylinder. ONLY use ORB hose fittings provided by SeaStar Solutions.



SeaStar Splashwell Mount Outboard Steering System

Part # HC5380-3

Features

- Light duty alternative to front & side mount cylinders.
- Unbalanced cylinder with 5.5/6.5 turns lock to lock.
- Fits engines with/without support (steering) tube.

Applications

- Single and multiple engine capability.
- Total power to 600HP in twin counter rotating applications (see order guide).
- Transom or hull mounted cylinder.
- Speeds to 60mph maximum (97km/h).

How to select a splashwell mount outboard steering system

1. From the order guide on page 3-21 select the system configuration based on;
 - a) the number of engines, and
 - b) the total power of engine(s) to be installed.
2. Select the cylinder and tie bar kit required.
3. From the order guide select the appropriate helms and accessory hardware for each steering station.
4. From the order guide select the fitting and hose kits required. You will have to determine the configuration, length, number of hose and fitting kits required for the installation (refer to page 9-2).
5. Confirm that there is sufficient space available in the splashwell and dash areas for the steering components.

WARNING

Not for use with SeaStar Pro Helms.

Part # HC5380-3



Figure 3-21. HC5380-3 cylinder shown.

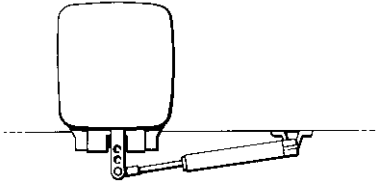
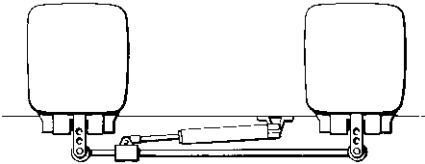
NOTICE

Not recommended for use in installations where;

- a) *chopper, cleaver, or surface piercing propellers are used,*
- b) *the engine is highly elevated on the transom,*
- c) *engine trim tabs have been removed,*
- d) *the boat speed exceeds 60mph (75km/h), or*
- e) *the power exceeds maximum Coast Guard or M.O.T. recommendations for the boat.*

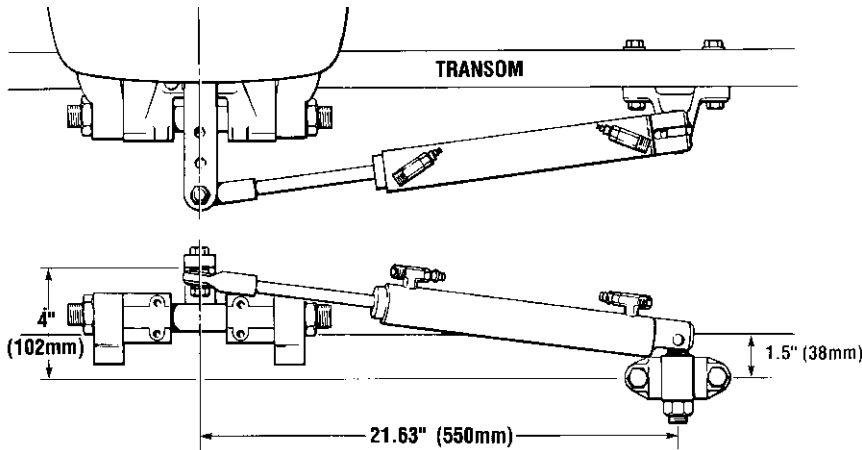
Order Guide

The splashwell mount cylinder (part no. HC5380-3) can be used on all engines complying with ABYC P17/NMEA/BIA standards provided they have a threaded attachment hole (3/8" – 24 UNF thread) in the steering arm. Not suitable for use on engines fitted with factory power steering.

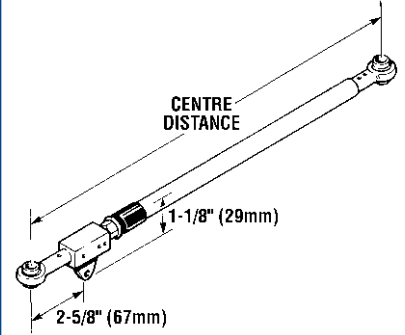
ENGINE/ CYLINDER CONFIGURATION	DESCRIPTION	QTY REQ	MODEL	PART NUMBER	REF. PAGE #
SINGLE ENGINE (SINGLE CYLINDER) APPLICATIONS UP TO 300 HP MAX NUMBER OF TURNS 5.5/6.5	CYLINDER	1	SPLASHWELL	HC5380-3	
	HELM	1	* SEASTAR	HH5271-3	PAGE 6-6
	HOSE KIT	1	OUTBOARD HOSE	HO51xx	PAGE 9-3
	STEERING FLUID	3	SEASTAR FLUID	HA5430	PAGE 10-1
	FOR EXTRA STEERING STATIONS ADD:				
	HELM	1	* SEASTAR	HH5271-3	PAGE 6-6
	FITTING KIT	1	ADD A STATION	HF6007	PAGE 9-12
	HOSE KIT	1	OUTBOARD HOSE	HO51xx	PAGE 9-3
	STEERING FLUID	1	SEASTAR FLUID	HA5430	PAGE 10-1
DUAL ENGINE (SINGLE CYLINDER) NON-COUNTER ROTATING APPLICATIONS UP TO 300 HP MAX COUNTER ROTATING ENGINE APPLICATIONS UP TO 600 HP MAX NUMBER OF TURNS 5.6/6.5	CYLINDER	1	SPLASHWELL	HC5380-3	
	TIE BAR KIT	1	SPLASHWELL		
	MOUNT TIE BAR			HO5010	
	HELM	1	* SEASTAR	HH5271-3	PAGE 6-6
	HOSE KIT	1	OUTBOARD HOSE	HO51xx	PAGE 9-3
	STEERING FLUID	3	SEASTAR FLUID	HA5430	PAGE 10-1
	FOR EXTRA STEERING STATIONS ADD:				
	HELM	1	* SEASTAR	HH5271-3	PAGE 6-6
	FITTING KIT	1	ADD A STATION	HF6007	PAGE 9-12
	HOSE KIT	1	OUTBOARD HOSE	HO51xx	PAGE 9-3
	STEERING FLUID	1	SEASTAR FLUID	HA5430	PAGE 10-1
OPTIONAL EQUIPMENT	BACK PLATE KIT		(FOR STANDARD HELMS)	HA5418	PAGE 6-3
	20 DEGREE WEDGE		(FOR STANDARD HELMS)	HA5419	PAGE 10-1
	AUTOPILOT FITTING KIT		(FOR ALL -3 HELMS)	HF6007	PAGE 9-12
	POWER ASSIST STEERING			PA1200-2	PAGE 7-1
	* ALL NON-PRO HELM DESIGNS CAN BE USED, SEE PAGE 6-7 FOR OPTIONS.				PAGE 6-7

General Dimensions

Mounting Configuration



Tie Bar Kit # H05010

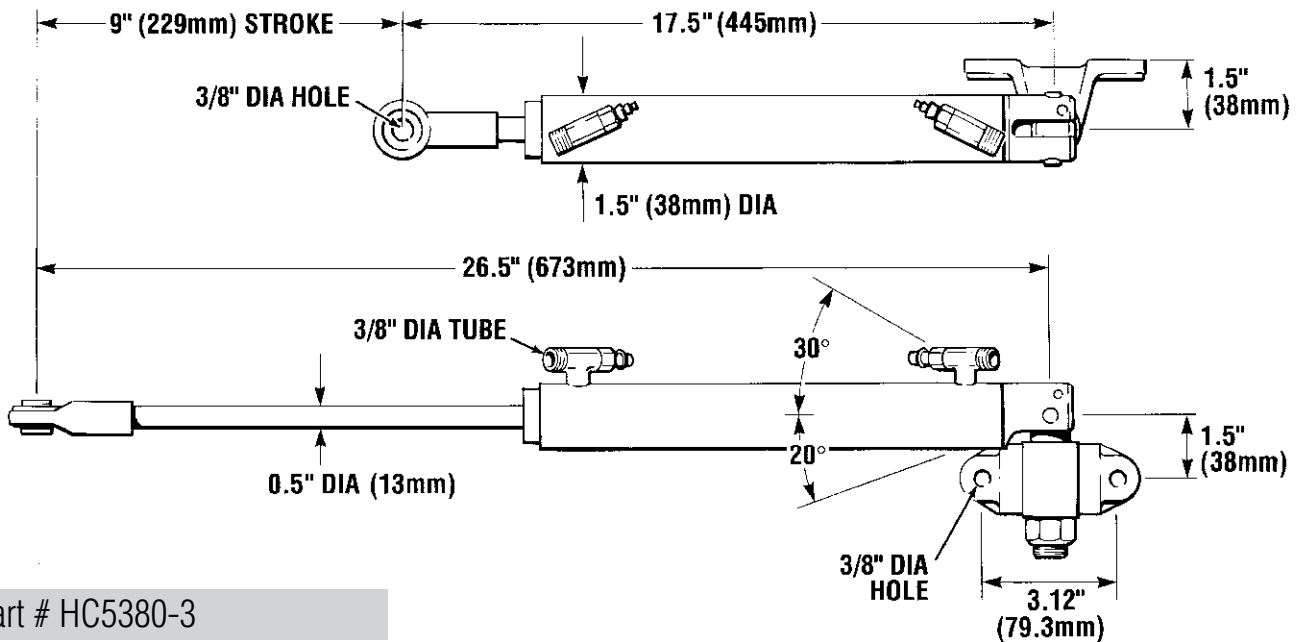


36" (914mm)	MAXIMUM ENGINE CENTRE DISTANCE
26" (660mm)	MINIMUM ENGINE CENTRE DISTANCE

Figure 3-22.

NOTICE

DO NOT use a PRO Helm pump with this, or any other unbalanced steering cylinder.



Part # HC5380-3

Figure 3-23.

CAUTION

DO NOT attempt to install NPT pipe fittings into the cylinder hose fitting ports on this, or any other -3 steering cylinder model. Doing so WILL lead to irreparable damage to the cylinder. ONLY use ORB hose fittings provided by SeaStar Solutions.

Features

- Regular duty cylinders.
- Heavy duty cylinders.
- Easy installation for single and dual rudder vessels.
- Cylinders supplied with bleeder fittings.
- Two axis articulation.
- Easy autopilot interface.

Steps to select a steering system for an inboard powered boats

1. Using the cylinder flow chart on page 4-2 determine the steps required.
2. If applicable gather the information needed to complete a torque rudder sheet or consult your naval architect.
3. Confirm that you have sufficient space available in;
 - a) the area the cylinder is to be mounted in
 - b) the dash area for all steering components.



Cylinder Selection Flowchart

NOTICE

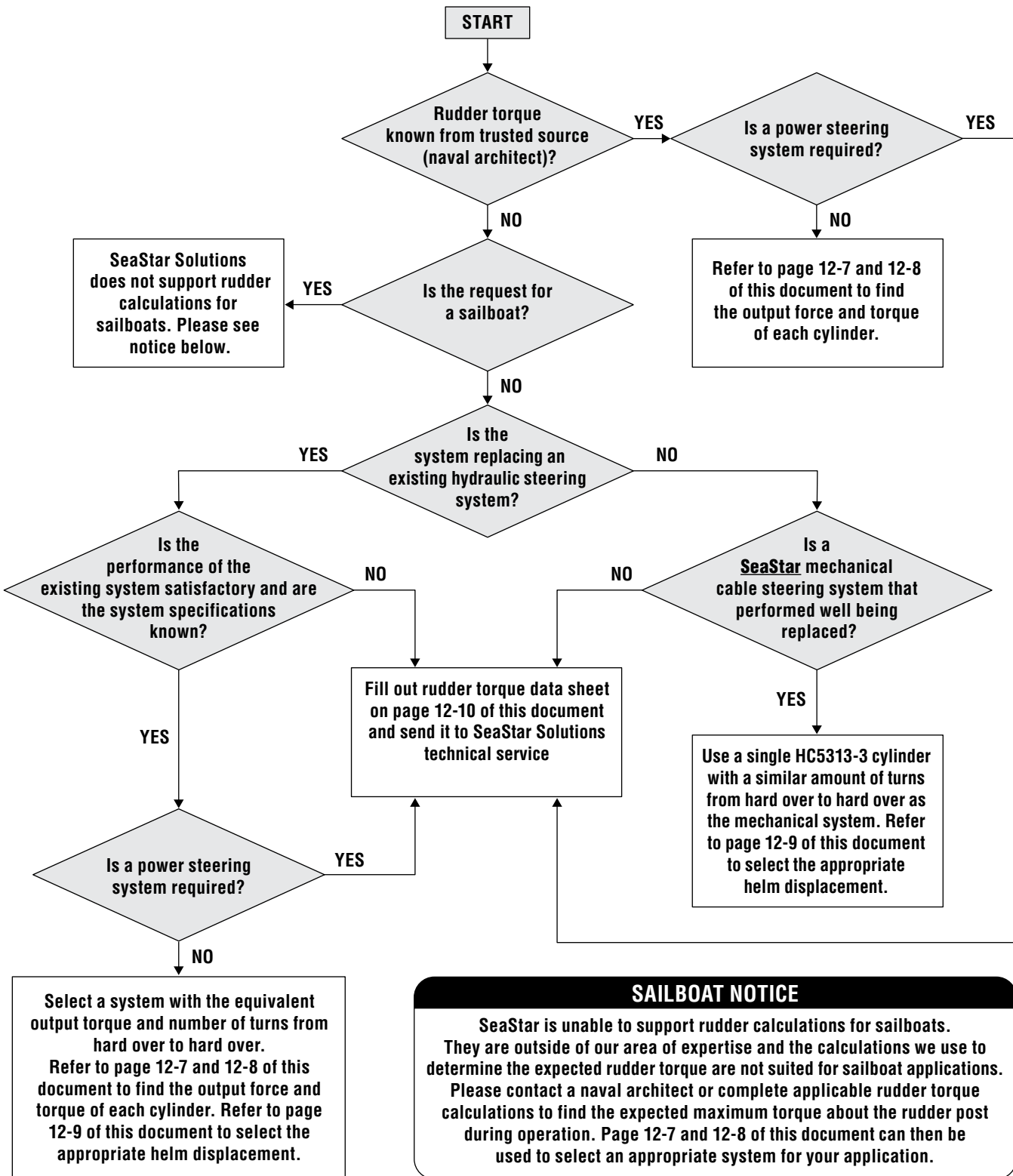


Figure 4-1.

General Dimensions—SeaStar

CAUTION

DO NOT attempt to install NPT pipe fittings into the cylinder hose fitting ports on any -3 model cylinder. Doing so will lead to irreparable damage to the cylinder. **ONLY** use ORB hose fittings provided by SeaStar Solutions.

ATM Cylinders (Aluminum): HC5312-3/ HC5313-3/ HC5314-3

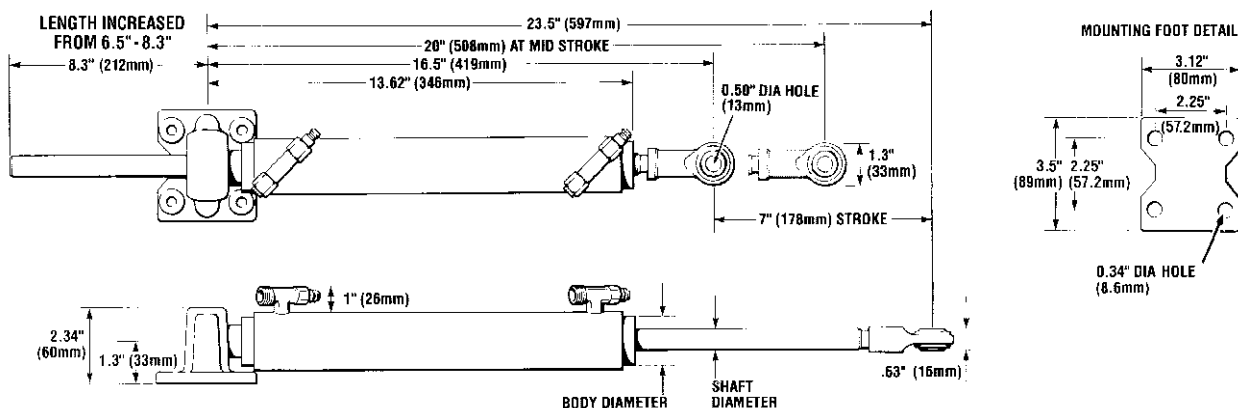


Figure 4-2.

TM Cylinders (Brass): HC5318/ HC5319/HC5369

NOTICE

Inc. CAT cylinder HC5318CAT and HC5319CAT

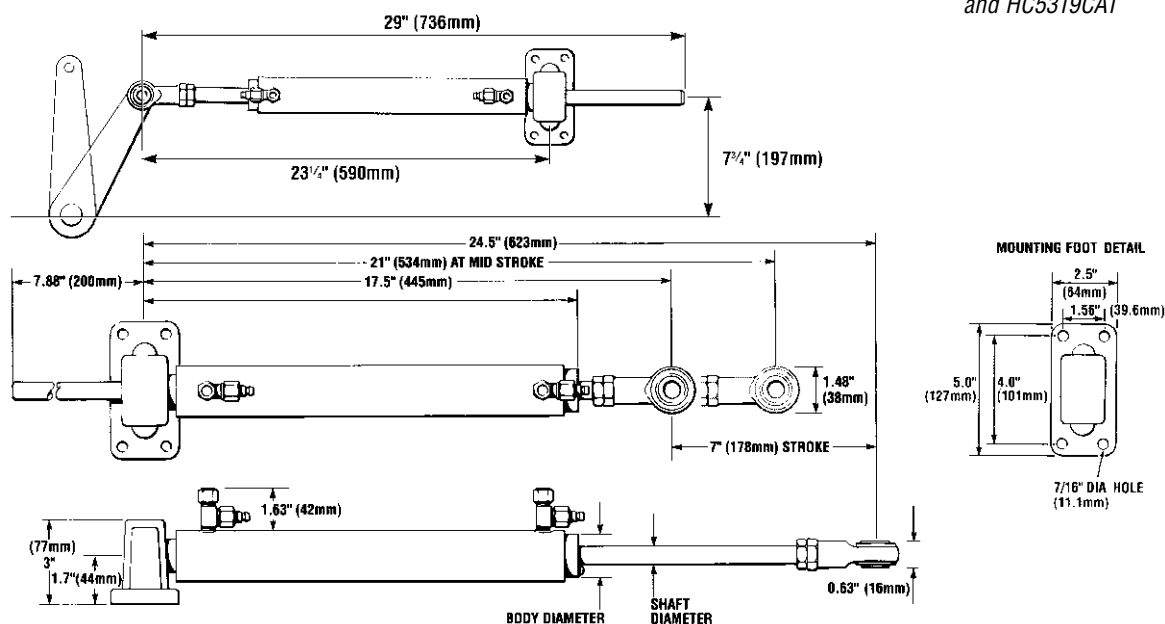


Figure 4-3.

Cylinder Dimensions Specific to Model

CYLINDER MODEL	PART No.	BODY DIA. (ID)	SHAFT DIA.
BA125-7ATM	HC5312-3	1.25" (32 mm)	0.50" (12.7 mm)
BA135-7ATM	HC5313-3	1.35" (34 mm)	0.63" (15.9 mm)
BA150-7ATM	HC5314-3	1.50" (38 mm)	0.63" (15.9 mm)
BA150-7TM*	HC5318	1.50" (38 mm)	0.63" (15.9 mm)
BA175-7TM*	HC5319	1.75" (45 mm)	0.75" (19.1 mm)
BA150-9TM	HC5369	1.50" (38 mm)	0.63" (15.9 mm)

Table 4-2. * CAT cylinders have the same dimensions (HC5318CAT & HC5319CAT)

General Dimensions—Hynautic

⚠ CAUTION

DO NOT attempt to install NPT pipe fittings into the cylinder hose fitting ports on any -3 model cylinder. Doing so will lead to irreparable damage to the cylinder. ONLY use ORB hose fittings provided by SeaStar Solutions.

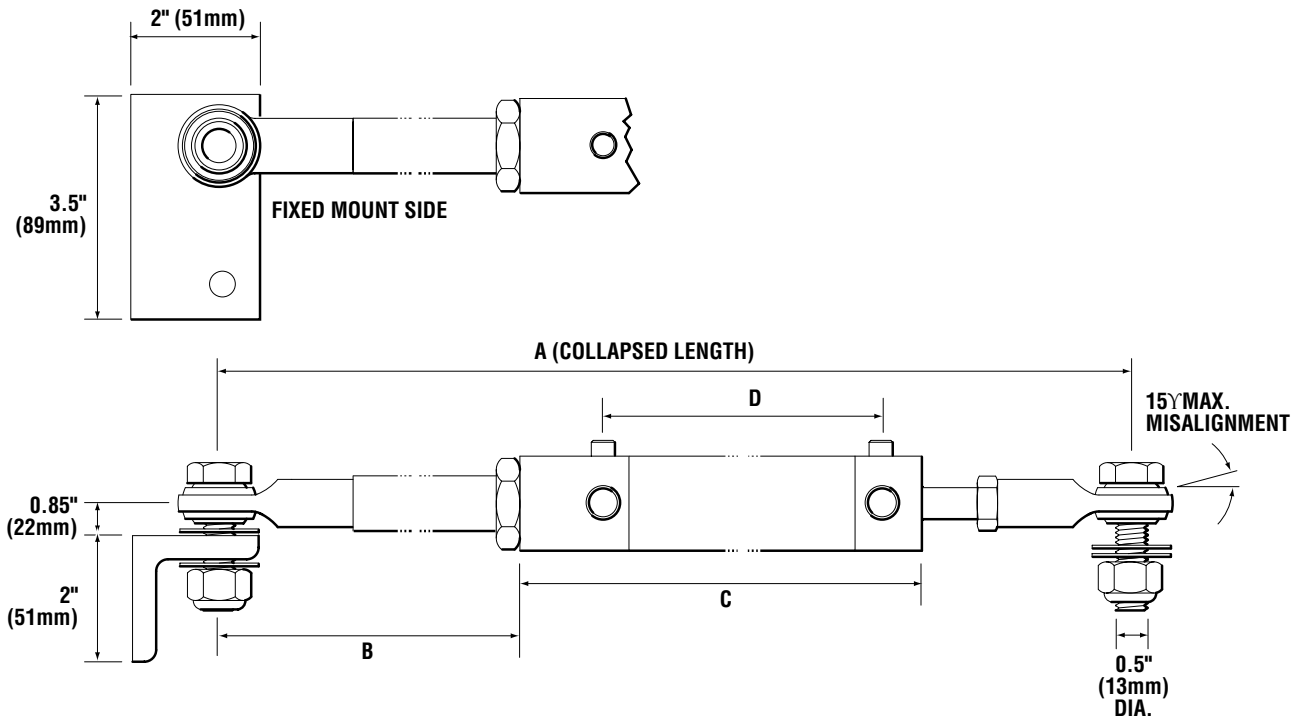
Universal Mount Cylinders

HC5322-3 (K-18 cylinder replacement)

HC5323-3 (K-19 cylinder replacement)

These balanced cylinders are double rod ended, each end held in place with internal wire ties. Every cylinder is equipped with a swivel joint at each end. One provides for a fixed mount attachment point at the end of the housing to protect the moving rod. The other swivel joint, located at the rod end, allows for free movement of the cylinder without binding when attached to the rudder arm.

HC5322-3 (K-18 cylinder replacement) HC5323-3 (K-19 cylinder replacement)



CYL. MODEL	DIMENSIONS				BORE	STROKE	DISP.
	A	B	C	D			
HC5322-3	24.5" (662 mm)	9.31" (237 mm)	11.75" (299 mm)	9.875" (251 mm)	1.25" (32 mm)	7" (178 mm)	7cu.in.
HC5323-3	28.5" (724 mm)	11.31" (287 mm)	13.75" (350 mm)	11.875" (302 mm)	1.25" (32 mm)	9" (229 mm)	9cu.in.

Figure 4-4.

Fixed Mount and Pivot Mount Models: K-22 and K-31

These Brass cylinders are for larger boats up to approximately 70 ft. Tubes, ends, and external rods are brass: cylinder rods are 17-4 stainless steel: mounts are manganese bronze. There are two different types of mounting packages for Brass cylinders: fixed mount and pivot mount.

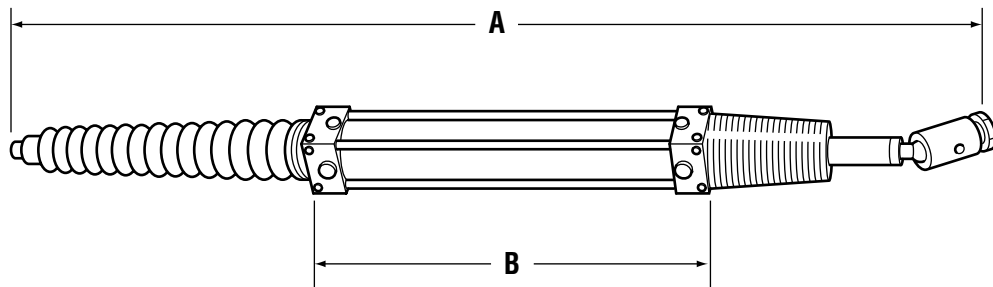
NOTICE

SeaStar Solutions has discontinued the manufacturing of the K-27 steering cylinder. If replacement is required, order cylinder part # K-22 and adapter kit part # HP6039.

NOTICE

The K-27 cylinder can act as the tie bar between two rudders.

K-22

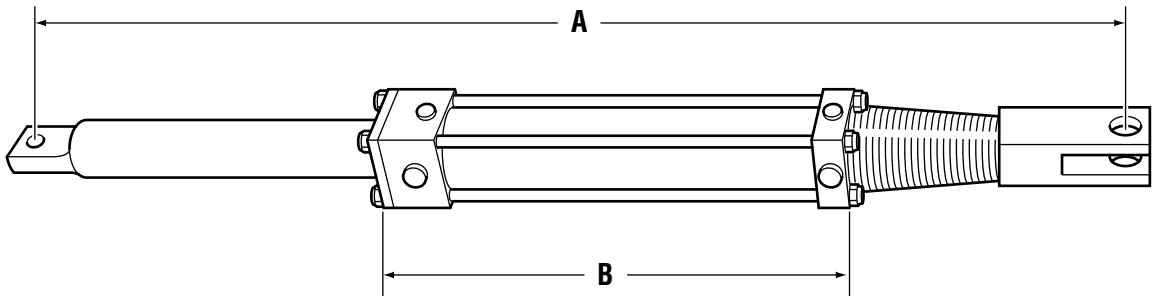


CYL. MODEL	A	DIMENSIONS B	BORE	STROKE	DISP.
K-22	*34.12" (867 mm)	13.25" (337 mm)	1.5" (38 mm)	10" (254 mm)	13.20 cu.in.

Figure 4-5. *Dimensions shown with the cylinder rod centered.

K-31

For use with Capilano helms shown on page 6-10.



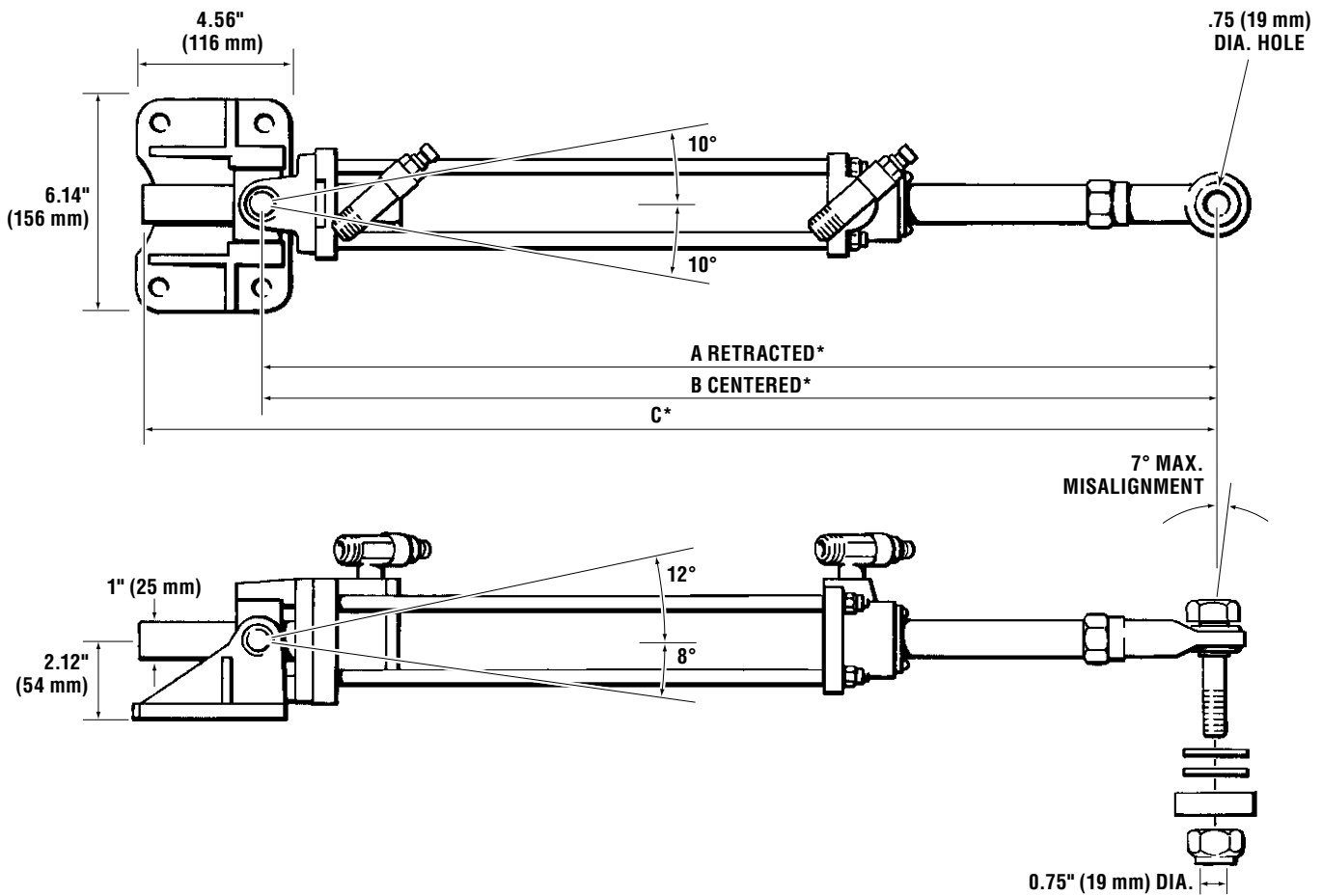
CYL. MODEL	A	DIMENSIONS B	BORE	STROKE	DISP.
K-31	*38.37" (975 mm)	14.12" (359 mm)	2.0" (51 mm)	10" (254 mm)	25.5 cu.in.

Figure 4-6. *Dimensions shown with the cylinder rod centered.

Large I/B Cylinders

The H5806 cylinder is a balanced hydraulic cylinder. Each cylinder is equipped with 3/8s NPT ports and a stainless steel ball joint. Porting is through two 1/4" NPT ports at each end of the cylinder.

HC5806



CYL. MODEL	DIMENSIONS			BORE	STROKE	DISP.
	A	B	C			
HC5806	22.32 (567 mm)	26.82 (681 mm)	34.07 (865 mm)	2.5" (64 mm)	9" (229mm)	74.33 cu.in.

Figure 4-7.

Catamaran Inboard Systems

SeaStar Solutions always recommends a mechanical tie bar between rudders where possible. In applications where a mechanical tie bar cannot be fitted, it is recommended that you use a “Liquid Tie Bar Valve”. This valve will serve two purposes; assisting with the air removal from the system and allows the user to re-align the rudders when they come out of sync. Regardless of the application, a mechanical, or, liquid tie bar must be fitted. Due to the potential of leakage across the piston seals, use of standard SeaStar Inboard cylinders may require frequent engine realignment. If you must use a “Liquid Tie Bar”, SeaStar Solutions recommends that you order the following parts below. Doing so will decrease the amount of re-alignment required.

Steering Cylinders



Figure 4-8. Liquid Tie Bar Valve HA5471-2.

HA5471-2, Liquid Tie Bar Valve

This valve assists with air removal and re-alignment of the rudders when required without having to break into the hydraulic system.

HC5318CAT, HC5319CAT Catamaran Steering Cylinders

The HC5318CAT and HC5319CAT have the same properties as the HC5318, HC5319 inboard cylinder but the internal piston seals are different. This difference will decrease the amount of rudder re-alignment that you would encounter.

SeaStar PRO Helm

Use of a SeaStar PRO helm coupled with the inboard steering cylinders will drastically reduce the amount of rudder realignment that you may encounter.

SeaStar PRO Hose (Kevlar)

To further reduce rudder misalignment, and increase system performance, SeaStar Solutions recommends the use of SeaStar PRO steering hoses.

NOTICE

As with all other, high horsepower engines, SeaStar Power Assist is recommend to reduce steering effort.

NOTICE

Bleeding of a “Liquid Tie Bar System” is different than a system fitted with a mechanical tie bar. Please refer to your Installation and Owner’s Manual that is shipped with the liquid tie bar valve.

Features

- Easy installation.
- Simple autopilot interface.
- Simple multiple steering station connection.

Applications

- Fits most power and non-power assist sterndrives.
- Single and multiple drives.

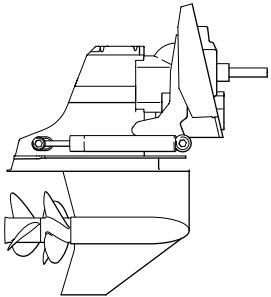
How to select a steering system for a Sterndrive

1. From the order guide on page 5-2 select the drive configuration based on the number of drives.
2. From the application guide on page 5-3 confirm that a cylinder is available for your specific make, model and year of drive unit. Select the cylinder that is appropriate for the drive.
3. From the order guide select the appropriate helm and accessory hardware. Note that helm pumps of different displacements are available for power steered sterndrives. The displacement of the helm affects the number of turns lock to lock. Select the helm displacement on the basis of the desired steering response.
4. Select the appropriate tube or hose and fitting kits.
5. Confirm that sufficient space is available in the dash and engine compartments for the equipment.



Figure 5-1.

Order Guide

SYSTEM CONFIGURATION	COMPONENT DESCRIPTION	QTY REQ	MODEL	PART #	PAGE REF #	
SINGLE & DUAL STERNDRIVE (For dual sterndrive applications use engine manufactures supplied tie bar.) 	CYLINDER	1	SEE APPLICATION GUIDE			
	HELM	1	* SEASTAR (SEE NOTE 1)	HH5271-3	6-6	
			** SEASTAR (SEE NOTE 2)	HH5272-3	6-6	
	STEERING FLUID TUBE/HOSE	3	SEASTAR FLUID	HA5430	10-1 9-7	
	FOR EXTRA STEERING STATION ADD:					
	HELM	1	* SEASTAR (SEE NOTE 1)	HH5271-3	6-6	
			** SEASTAR (SEE NOTE 2)	HH5272-3	6-6	
	FITTING KIT	1	ADD A STATION - FOR USE WITH SEASTAR STEERING "HOSE"	HF6007	9-12	
			- FOR USE WITH SEASTAR TUBE/COPPER	HF6010	9-13	
	STEERING FLUID EXTRA TUBE/HOSE	1	SEASTAR FLUID		10-1 9-7	
BACK PLATE KIT			(FOR STANDARD HELMS)	HA5418	6-3	
20 DEGREE WEDGE KIT			(FOR STANDARD HELMS)	HA5419	6-3	
AUTOPILOT FITTING KIT			(FOR USE WITH SEASTAR HOSE)	HF6007	9-12	
			(FOR USE WITH SEASTAR TUBE/COPPER)	HF6010	9-13	
POWER ASSIST STEERING				PA1200-2	7-1	
* ALL HELM DESIGNS CAN BE USED, SEE PAGE 3-18 FOR OPTIONS.						

1. SeaStar helms are the standard recommendation for both non-power and power steered applications.
2. SeaStar helms with a higher displacement can be specified for less wheel turns where faster response is desired. Consult chart on page 5-3 for options.
3. For dual stern drives – use the tie bar supplied by the engine manufacturer.

NOTICE

These recommendations apply to factory stock stern drives only. Modified installations and high performance applications may require a higher capacity steering system. If in doubt, contact SeaStar Solutions technical service for assistance.

Application Guide

ENGINE MANUFACTURER	STEERING CONFIGURATION	ENGINE/DRIVE DESCRIPTION	YEAR	CYLINDER DESCRIPTION		NUMBER TURNS LOCK TO LOCK		NOTES
				MODEL No.	ORDERING PART No.	SEASTAR 1.7 HELM	SEASTAR 2.4 HELM	
MERCUISER	NON POWER ASSIST	ALPHA I	2000 TO DATE	BA135-7EM	HC5332	5.0	3.5	1,4,5,6
		BRAVO I	2000 TO DATE	BA135-7EM	HC5332	5.0	3.5	1,4,5,6
		BRAVO II	2000 TO DATE	BA135-7EM	HC5332	5.0	3.5	1,4,5,6
		BRAVO III	2000 TO DATE	BA135-7EM	HC5332	5.0	3.5	1,4,5,6,7
	POWER ASSIST	ALPHA I	2000 TO DATE	125-8EM	HC5328-3	4.9/5.8	3.4/4.1	2
		BRAVO I	2000 TO DATE	125-8EM	HC5328-3	4.9/5.8	3.4/4.1	2
		BRAVO II	2000 TO DATE	125-8EM	HC5328-3	4.9/5.8	3.4/4.1	2
		BRAVO III	2000 TO DATE	125-8EM	HC5328-3	4.9/5.8	3.4/4.1	2
VOLVO	NON POWER ASSIST	290	TO DATE	BA135-7EM	HC5332	5.0	3.5	1,4,5,6
		DIESEL	TO DATE	BA135-7EM	HC5332	5.0	3.5	1,4,5,6
		DPS	2000 TO DATE	BA135-7EM	HC5332	5.0	3.5	1,4,5,6
	POWER ASSIST	290	TO DATE	125-8EM	HC5328-3	4.8/5.8	3.4/4.1	2
		DIESEL	TO DATE	125-8VEM	HC5329-3	4.9/5.8	3.4/4.1	2
		DPS & SX	1996 TO DATE	125-6VPS	HC5331-3	4.8/5.5	3.4/4.1	2
YANMAR	NON POWER ASSIST	ZT370	TO DATE	BA135-7EM	HC5332	5.0	3.5	1,4,5,6,7
	POWER ASSIST	ZT370	TO DATE	125-8EM	HC5328-3	4.9/5.8	3.4/4.1	2

1. Balanced system – ie: the number of turns lock to lock is equal port to starboard or vice-versa.
2. Unbalanced system – ie: the number of turns lock to lock is not equal port to starboard or vice-versa.
3. Requires cylinder rod end adapter HA5424 supplied by SeaStar Solutions. Refer to diagram on page 5-4.
4. **HC5332-3 replaces HC5326-3 as of January 2000.** If installing HC5326 additional clevis supplied by engine manufacturer required. Mastry Engine part # SUN144 *not provided by SeaStar Solutions.
5. **The installation of the HC5332-3 sterndrive cylinder requires the use of SeaStar Outboard hose only. DO NOT use 3/8" copper or nylon tube.**
6. If engine outdrive is NOT equipped with a torque tab on the underside of the lower leg one must be installed to reduce prop torque.
7. Yanmar Engines using the Bravo III drives require the use of cylinder HC5326-3.

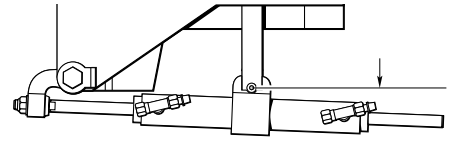
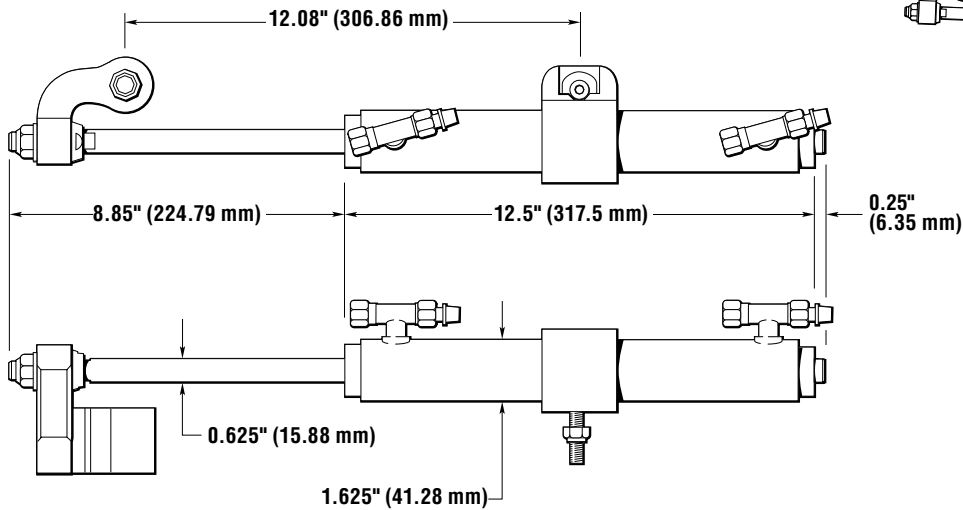
Revision Date: **AUGUST 7th 2019**

General Dimensions

⚠ CAUTION

DO NOT attempt to install NPT pipe fittings into the cylinder hose fitting ports on any -3 model cylinder. Doing so will lead to irreparable damage to the cylinder. ONLY use ORB hose fittings provided by SeaStar Solutions.

HC5332 BA135-6.88EM



5" (127mm) REQUIRED FOR UNRESTRICTED MOUNTING

NOTICE

If engine outdrive is NOT equipped with a torque tab on underside of lower leg, one must be installed to reduce prop torque.

⚠ CAUTION

Due to cylinder body movement during steering, this cylinder requires use of SeaStar outboard hose (H051xx), see page 9-2 for details.

Figure 5-2.

HC5326-3 BA150-7EM

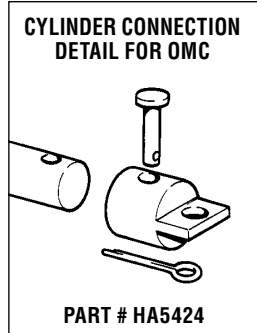
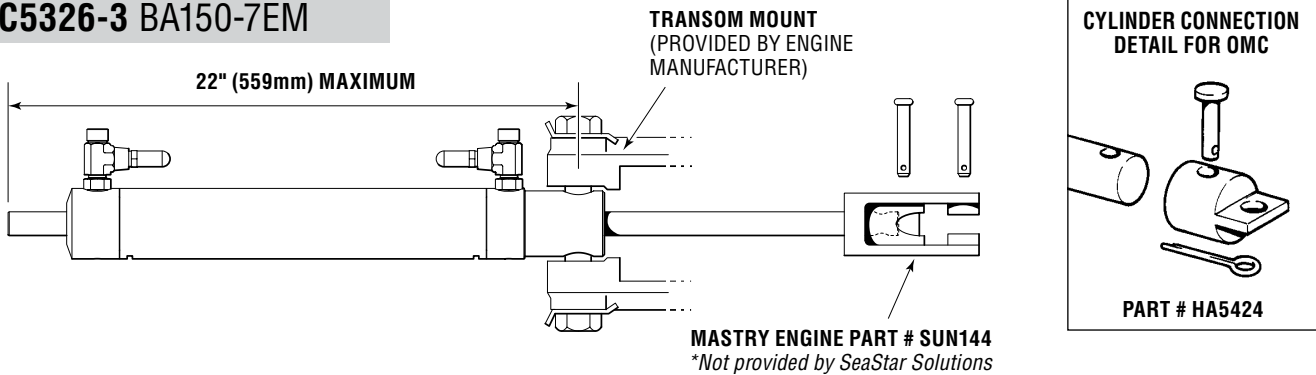
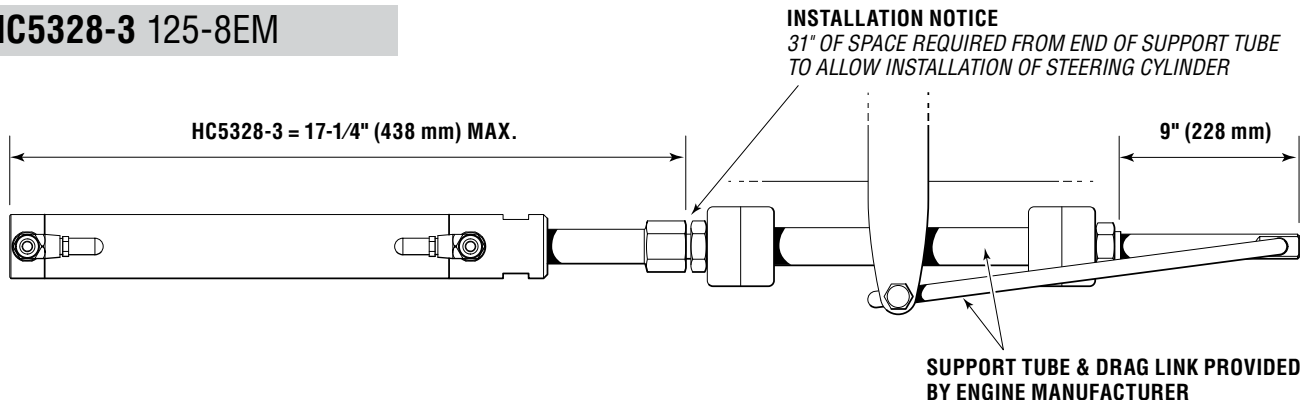


Figure 5-3.

HC5328-3 125-8EM



INSTALLATION NOTICE
 31" OF SPACE REQUIRED FROM END OF SUPPORT TUBE TO ALLOW INSTALLATION OF STEERING CYLINDER

SUPPORT TUBE & DRAG LINK PROVIDED BY ENGINE MANUFACTURER

Figure 5-4.

General Dimensions

HC5329-3 125-8VPEM

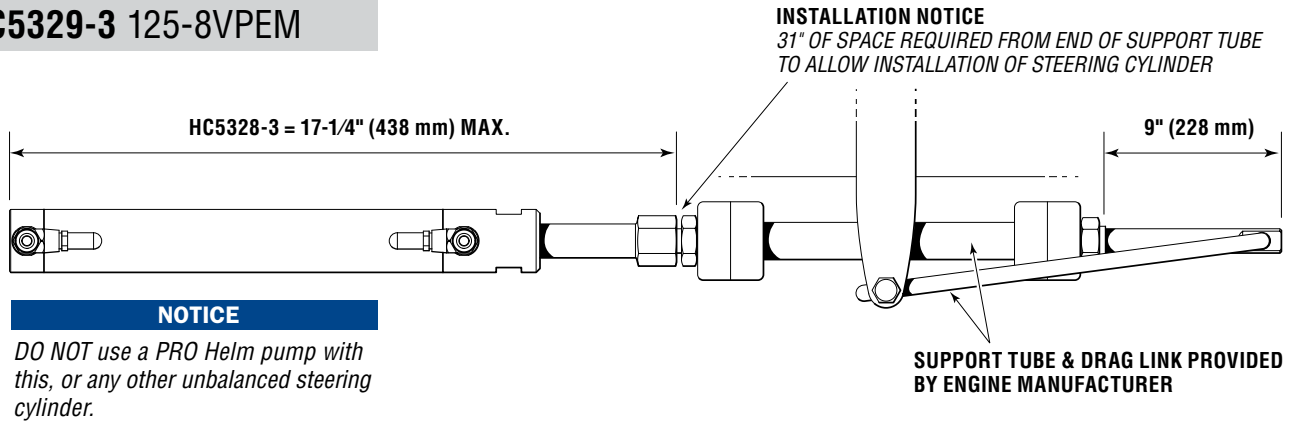


Figure 5-5.

HC5330-3 BA125-8EMV

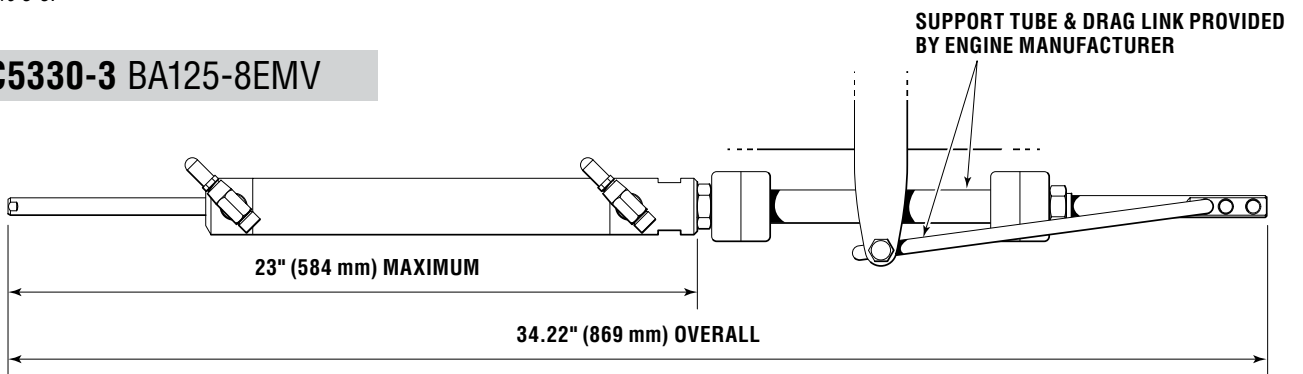


Figure 5-6.

HC5328-3 Yanmar

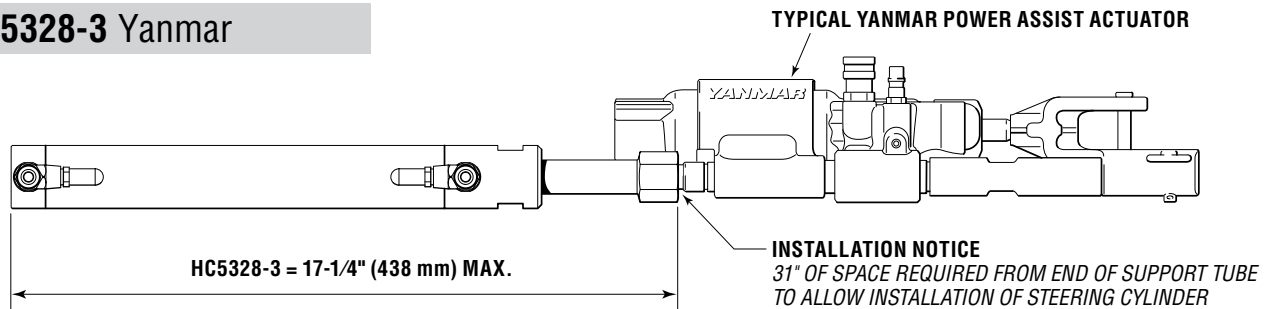


Figure 5-7.

HC5328-3 Volvo

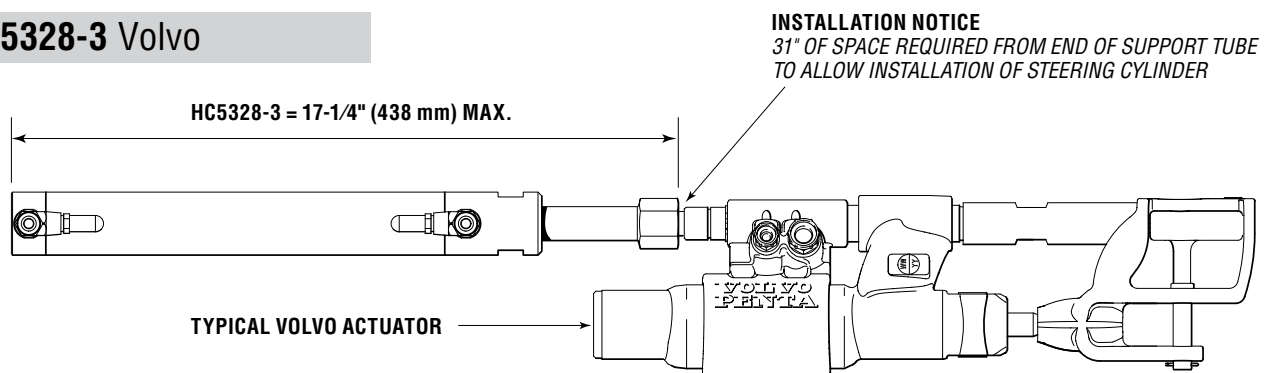


Figure 5-8.

General Dimensions

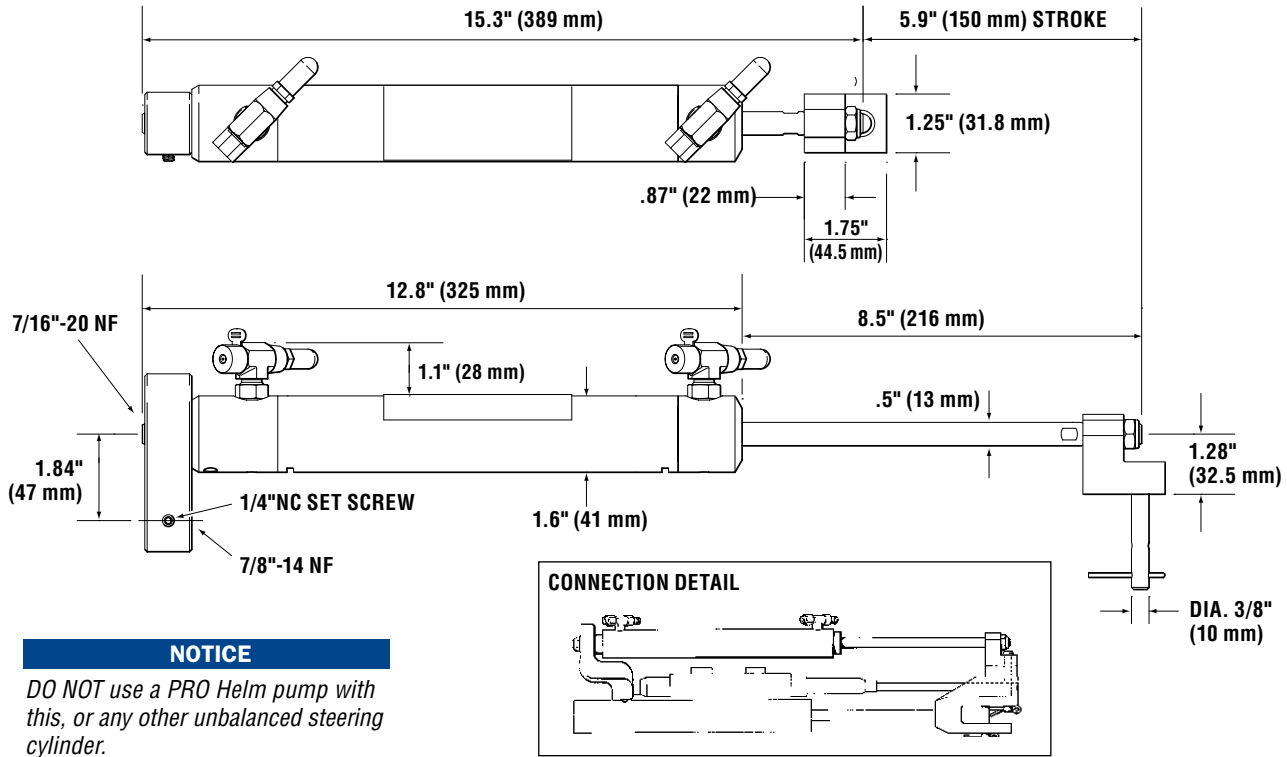


Figure 5-9.

HC5314-3 BA150-7ATM

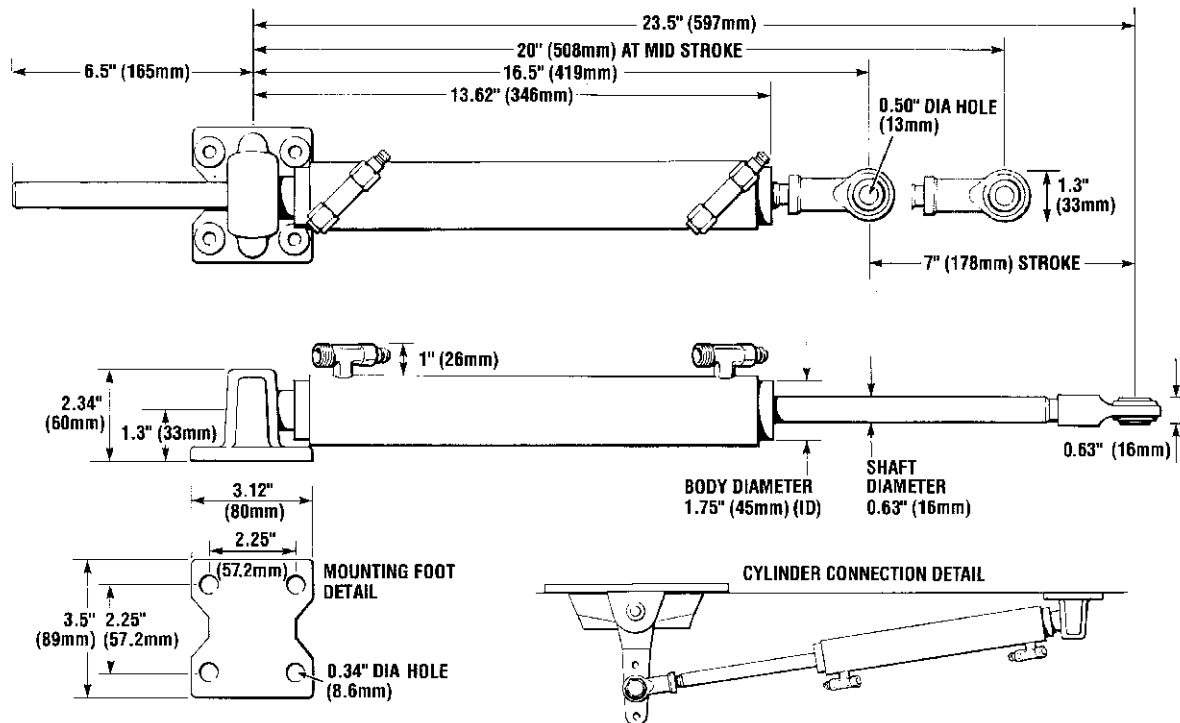


Figure 5-10.

Performance I/O and Outboard Cylinders

The K-5-B cylinder was designed for inboard/outboard boats requiring external cylinders of substantial size and strength. The K-5 cylinders are nickel plated for aesthetics and protection against the elements. This cylinder does not include the wing plates or hardware required for mounting to the outdrive. Porting is through 1/4 NPT ports on each end of cylinder.

NOTICE

K-5-B steering cylinders have a large volume. To keep total wheel turns at a reasonable amount, it is recommended to use a larger displacement helm pump, such as Capilano HH5275 (5.4 cu.in. displacement MAX).

K-5-B

BORE	STROKE
1.5" (38mm)	9" (229mm)

DISP EXT.	DISP RET.
15.9cu in	10.5cu in

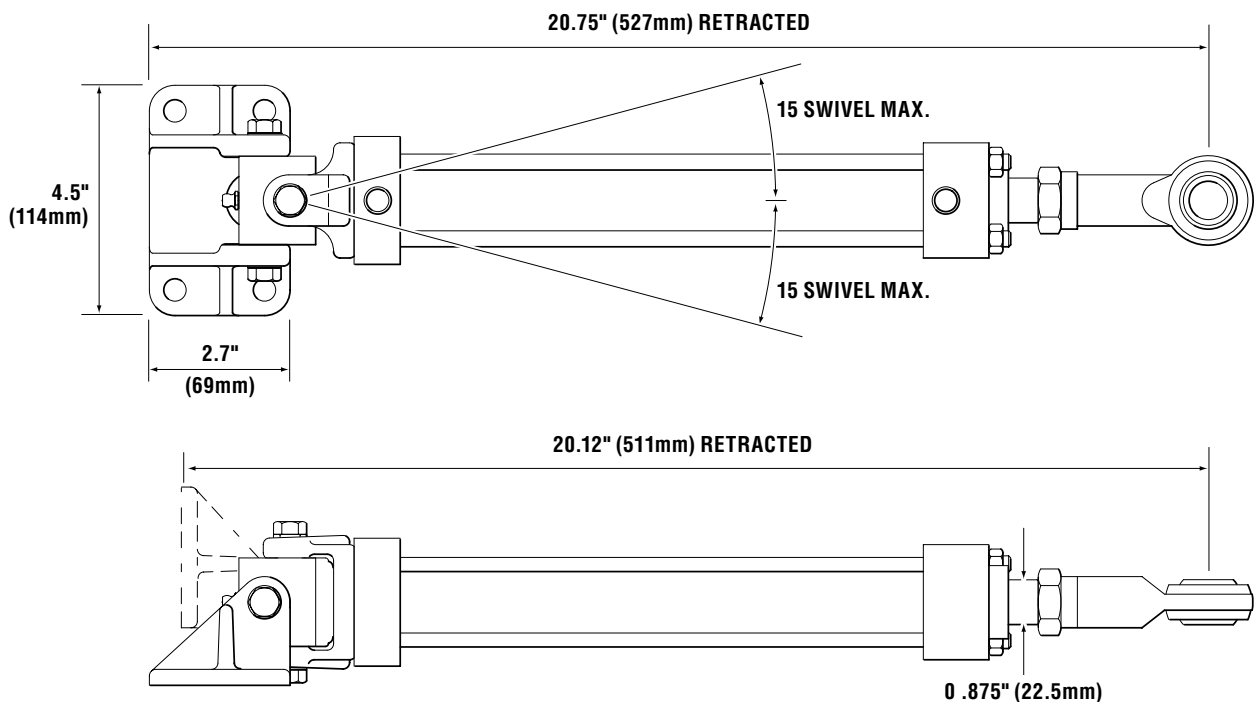
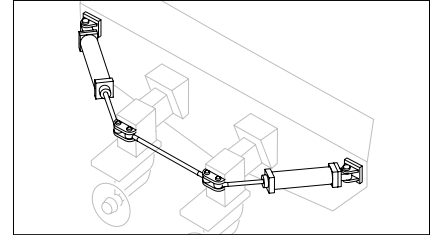


Figure 5-11.

NOTICE

K-5 Cylinders are UN-balanced Cylinders, unequal amount of fluid on either side of the piston.

NOTICE

DO NOT use a PRO Helm pump with this, or any other unbalanced steering cylinder.

NOTICE

SeaStar Solutions does NOT make connecting hardware to attach this cylinder to the out drive.

Now fitted
with Positionable
O-ring fittings

SEASTAR™

HELM PUMPS

CAPILANO™
Hynautic

The SeaStar helm pump is the heart of the hydraulic steering system. SeaStar helm pumps are the product of many years of research and experience by the world's foremost builder of manual hydraulic steering systems. Our efforts have resulted in a design which represents the ultimate in efficiency, safety and reliability, yet is easy to install and maintain. Superior design, teamed with the finest materials, precision manufacturing and rigid quality control all add up to an outstanding product which is certain to set industry standards for years to come.

Front Mount Helm Features

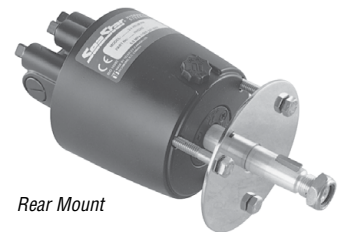
- Compact, stylish design.
- Available in 1.4, 1.7, 2.0, 2.4 and 3.0 cubic inch displacements.
- Convenient front of dash fill.
- Small 3.0" hole cutout on dash.
- Can be retrofitted into old SeaStar 4.5" hole cutout.
- Complete with elbow fittings.

Front Mount



Rear Mount Helm Features

- Behind dash mounting configuration.
- Available 1.4, 1.7, 2.0, 2.4 and 3.0 cubic inch displacements.
- Remote fill point.
- Complete with elbow fittings.
- 1-1/16" hole required.

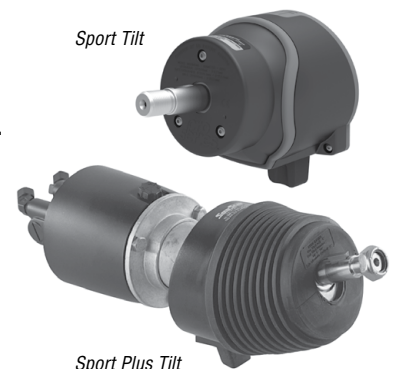


Rear Mount

Sport/Sport Plus Tilt Helm Features

- 5 wheel positions allow adjustment to most comfortable steering position.
- 48° tilt range (12° down – 36° up).
- Available in 1.4, 1.7, 2.0 and 2.4 cubic inch displacements.
- Remote fill point.
- Complete with elbow fittings.
- Comes with newly designed tilt mechanism.
- 3" dash cutout.

Sport Tilt



Sport Plus Tilt

Classic Tilt Helm Features

- 5 wheel positions allow adjustment to most comfortable steering position.
- 48° tilt range (18° down – 30° up).
- Available in 1.4, 1.7, 2.0 and 2.4 cubic inch displacements.
- Convenient front of dash fill.
- Complete with elbow fittings.
- 4.5" hole cutout



Classic Tilt

Features of SeaStar Helm Pumps

Features

Now fitted
with Positionable
O-ring fittings

1. Helm rotor supported by three roller bearings.
2. Ball bearing piston race.
3. Field replaceable shaft seal.
4. -5 ORB ports.
5. Built-in lock valve for positive rudder lock.
6. Patented bleed tubes.
7. Patented internal air pocket eliminates steering fluid expansion overflow.
8. Integral relief valve.

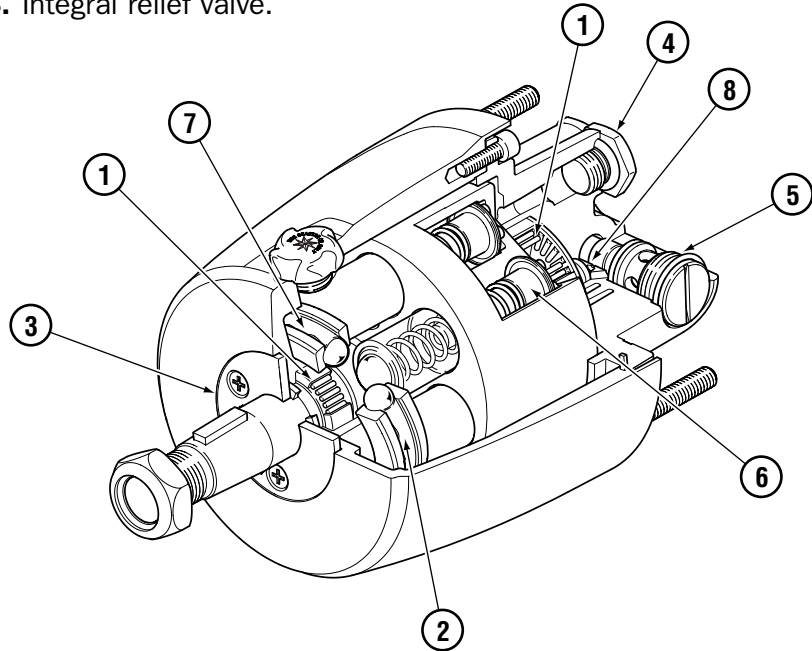


Figure 6-1.

Illustration is not intended to assist in the repair of a helm pump. Any repair to a hydraulic steering system must be completed by an authorized repair center. Refer to page 13-1 for authorized repair centers.

Commercial Helms

Part# HH5217-3, HH5218-3,
HH5224-3 and HH5225-3

NOTICE

For Commercial Use.

STAINLESS STEEL
SHAFT

HEAVY DUTY
SHAFT SEAL
AND WIPER

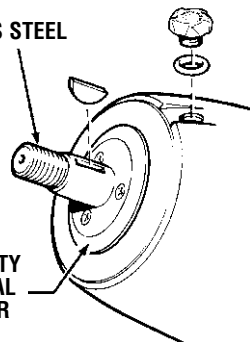


Figure 6-2.

Specifically designed to be used on smaller fishing vessels involved in the Lobster and Crabbing Industries. The Commercial Helm Pumps are designed with a stainless steel shaft and heavy duty shaft seal and wiper. This new shaft and seal help protect the Helm Pump from the abrasive effects of sediment that is brought on board by the operator handling Traps or Pots.

Accessories

Backplate Kit (Part # HA5418)

- Used to retrofit a new SeaStar standard helm in the old 4.5" (115 mm) diameter hole, or
- reduce the helm protrusion from the dash by the thickness of the dash, or
- retrofit new SeaStar standard helm into hole cutouts for mechanical and hydraulic steering as per chart.

STEERING MANUFACTURER	HELM MODEL TYPE	SYSTEM	BACKPLATE KIT REQ.
SeaStar Solutions	Safe-T	Mechanical	Yes
	Big-T	Mechanical	Yes
	Rotary	Mechanical	No
	Rack And Pinion	Mechanical	No
	Syten	Hydraulic	Yes
Morse	Rotary	Mechanical	No
	Rack and Pinion	Mechanical	No
Hynautic	H-50 Series	Hydraulic	Yes
	H-60 Series	Hydraulic	Yes
	H-80 Series	Hydraulic	Yes
	H-300 Series	Hydraulic	Yes

Table 6-1.

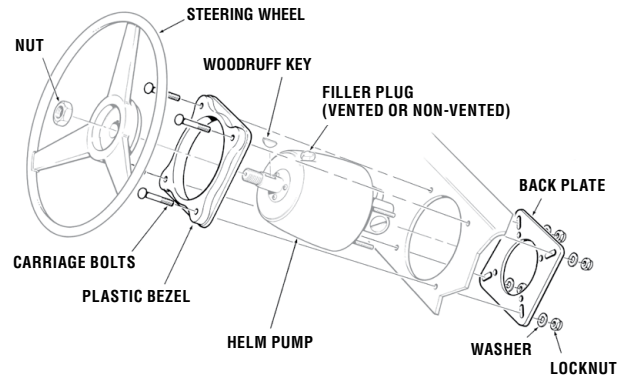


Figure 6-3.

Round Bezel

(Part # HA5478 SeaStar & Part # HA5476 BayStar)

Reduces the distance the helm protrudes from the front of the dash to 3.75" (93mm).

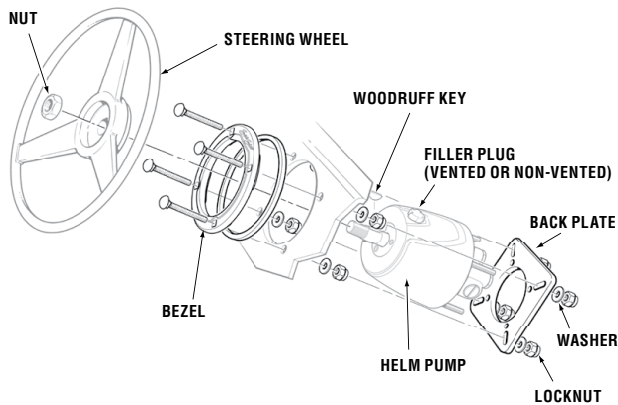


Figure 6-4.

Vent Plug "Black"

(Part # HP6126, 5 per kit)

Supplied with SeaStar Helm Pump. Must be used with Helm Pump on all single steering station systems.

Must be used on uppermost Helm Pump on multi steering station systems.

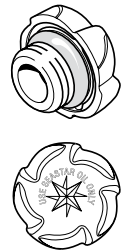


Figure 6-5.

Non-Vent Plug "Gray" 2018<

(Part # HP6000, 5 per kit)

Must be used on all Helm Pumps other than uppermost Helm Pump on multi steering station systems.

A Non-Vent cap is supplied with both "Add A Station Fitting Kits" Part No. HF6007 & HF6010.

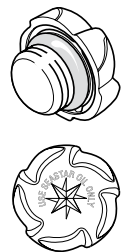


Figure 6-6.

20° Wedge (Part # HA5419)

NOTICE

Not for use with BayStar helm pumps.

This kit is designed to mount the helm at a 20° angle to the mounting surface. 4 possible mounting configurations are available.

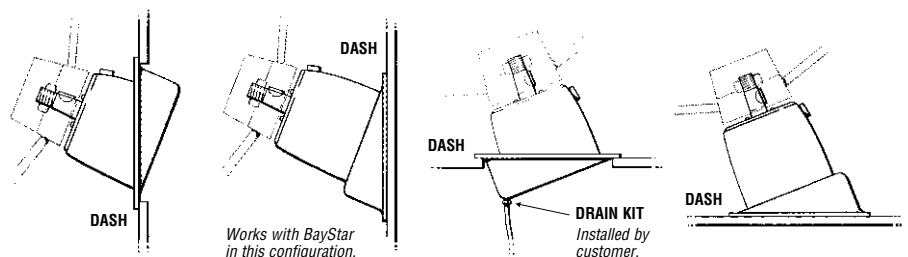


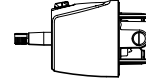
Figure 6-7.

SeaStar Helm—Order Guide

⚠ CAUTION

-3 helm pumps are fitted with Positionable O-ring style hose fitting ports (commonly referred to as ORB). Do NOT attempt to install an NPT pipe fitting into a -3 helm hose fitting ports. Doing so will lead to irreparable damage to the helm. ONLY use SeaStar Solutions O-ring style hose fittings (ORB).

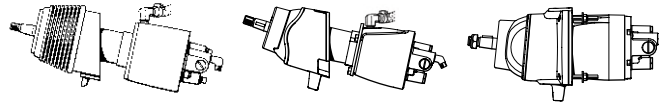
SeaStar Front Mount



PART NUMBER	HELM DESCRIPTION	DISPLACEMENT CU. IN./REV (CC/REV)	RELIEF VALVE SETTING PSI (BAR)	NOTES
HH5269-3	Front Mount	1.4 (23.0)	1000 (70)	
HH5271-3	Front Mount	1.7 (27.8)	1000 (70)	
HH5217-3	Front Mount (Commercial)	1.7 (27.8)	1000 (70)	2
HH5273-3	Front Mount	2.0 (33.0)	1000 (70)	
HH5272-3	Front Mount	2.4 (39.3)	1000 (70)	
HH5224-3	Front Mount (Commercial)	2.4 (39.3)	1000 (70)	2
HH5285-3	Front Mount	3.0 (49.1)	1000 (70)	New product

SeaStar Tilt

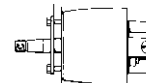
NOTE: All sport tilt helms are shipped with the remote filler tube.



HH6193-3	Sport Tilt	1.4 (23.0)	1000 (70)	New Product
HH6544-3	Classic Tilt	1.4 (23.0)	1000 (70)	Replaces HH5744
HH6541-3	Classic Tilt	1.7 (27.8)	1000 (70)	Replaces HH5741
HH6191-3	Sport Tilt	1.7 (27.8)	1000 (70)	Replaces HH5291
HH6491-3	Sport Plus	1.7 (27.8)	1000 (70)	New product
HH6543-3	Classic Tilt	2.0 (33.0)	1000 (70)	Replaces HH5743
HH6145-3	Sport Tilt	2.0 (33.0)	1000 (70)	Replaces HH5745
HH6445-3	Sport Plus	2.0 (33.0)	1000 (70)	New product
HH6345-3	Sport Plus (Spline Shaft)	2.0 (33.0)	1000 (70)	New product
HH6542-3	Classic Tilt	2.4 (39.3)	1000 (70)	Replaces HH5742
HH6192-3	Sport Tilt	2.4 (39.3)	1000 (70)	Replaces HH5292
HH6492-3	Sport Plus	2.4 (39.3)	1000 (70)	New product

SeaStar Rear Mount

NOTE: All rear mount helms are shipped with the remote filler tube.



HH5260-3	Rear Mount	1.4 (23.0)	1000 (70)	
HH5279-3	Rear Mount (1" Straight Shaft)	1.4 (23.0)	1000 (70)	
HH5261-3	Rear Mount	1.7 (27.8)	1000 (70)	
HH5281-3	Rear Mount (1" Tapered Shaft)	1.7 (27.8)	1000 (70)	
HH5263-3	Rear Mount	2.0 (33.0)	1000 (70)	
HH5262-3	Rear Mount	2.4 (39.3)	1000 (70)	
HH5265-3	Rear Mount	3.0 (49.1)	1000 (70)	New product

NOTES

1. SeaStar PRO helms cannot be used with an unbalanced cylinder. SeaStar reinforced Kevlar Outboard style hoses should be used with ALL SeaStar PRO helms.
2. Commercial helms use a stainless steel shaft and a better sealing top plate for use in extreme conditions and or commercial type applications.

Table 6-2.

SeaStar PRO Helm—Order Guide

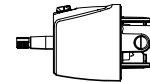
⚠ CAUTION

-3 helm pumps are fitted with Positionable O-ring style hose fitting ports (commonly referred to as ORB). Do NOT attempt to install an NPT pipe fitting into a -3 helm hose fitting ports. Doing so will lead to irreparable damage to the helm. ONLY use SeaStar Solutions O-ring style hose fittings (ORB).

⚠ WARNING

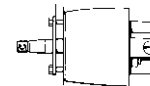
DO NOT use with an unbalanced cylinder. Steering lock up WILL occur.

SeaStar PRO Front Mount



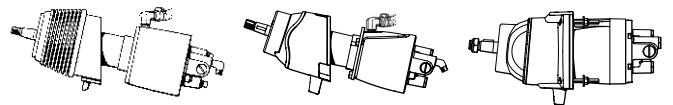
PART NUMBER	HELM DESCRIPTION	DISPLACEMENT CU. IN./REV (CC/REV)	RELIEF VALVE SETTING PSI (BAR)	NOTES
HH5779-3	Front Mount	1.7 (27.8)	1500 (103)	1
HH5218-3	Front Mount (Commercial)	1.7 (27.8)	1500 (103)	1, 2
HH5770-3	Front Mount (Long studs)	2.0 (33.0)	1500 (103)	1
HH5772-3	Front Mount	2.4 (39.3)	1500 (103)	1

SeaStar PRO Rear Mount



HH5778-3	Rear Mount	1.7 (27.8)	1500 (103)	1
HH5771-3	Rear Mount	2.0 (33.0)	1500 (103)	1

SeaStar PRO Classic and Sport Tilt



HH6573-3	Classic Tilt	1.7 (27.8)	1500 (103)	Replaces HH5773
HH6489-3	Sport Plus	1.7 (27.8)	1500 (103)	New Product
HH6574-3	Classic Tilt	2.0 (33.0)	1500 (103)	Replaces HH5774
HH6490-3	Sport Plus	2.0 (33.0)	1500 (103)	New product
HH6189-3	Sport Tilt	1.7 (27.8)	1500 (103)	1
HH6190-3	Sport Tilt	2.0 (33.0)	1500 (103)	1

NOTES

- SeaStar PRO helms cannot be used with an unbalanced cylinder. SeaStar reinforced Kevlar Outboard style hoses should be used with ALL SeaStar PRO helms.
- Commercial helms use a stainless steel shaft and a better sealing top plate for use in extreme conditions and or commercial type applications.

Table 6-3.

Now fitted
with Positionable
O-ring fittings

Front/Rear Mount Helm Dimensions

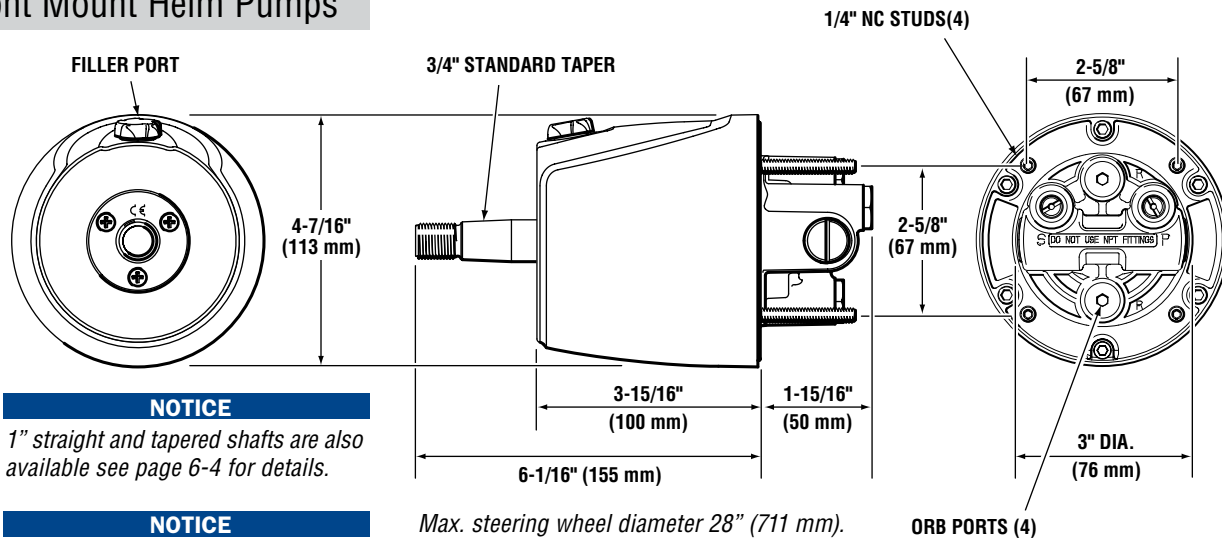
CAUTION

-3 helm pumps are fitted with Positionable O-ring style hose fitting ports (commonly referred to as ORB). Do NOT attempt to install an NPT pipe fitting into a -3 helm hose fitting ports. Doing so will lead to irreparable damage to the helm. ONLY use SeaStar Solutions O-ring style hose fittings (ORB).

NOTICE

ALL SeaStar helm pumps can be mounted horizontally to vertically and anywhere in between. In ALL cases the filler port must be in the uppermost position.

Front Mount Helm Pumps



NOTICE

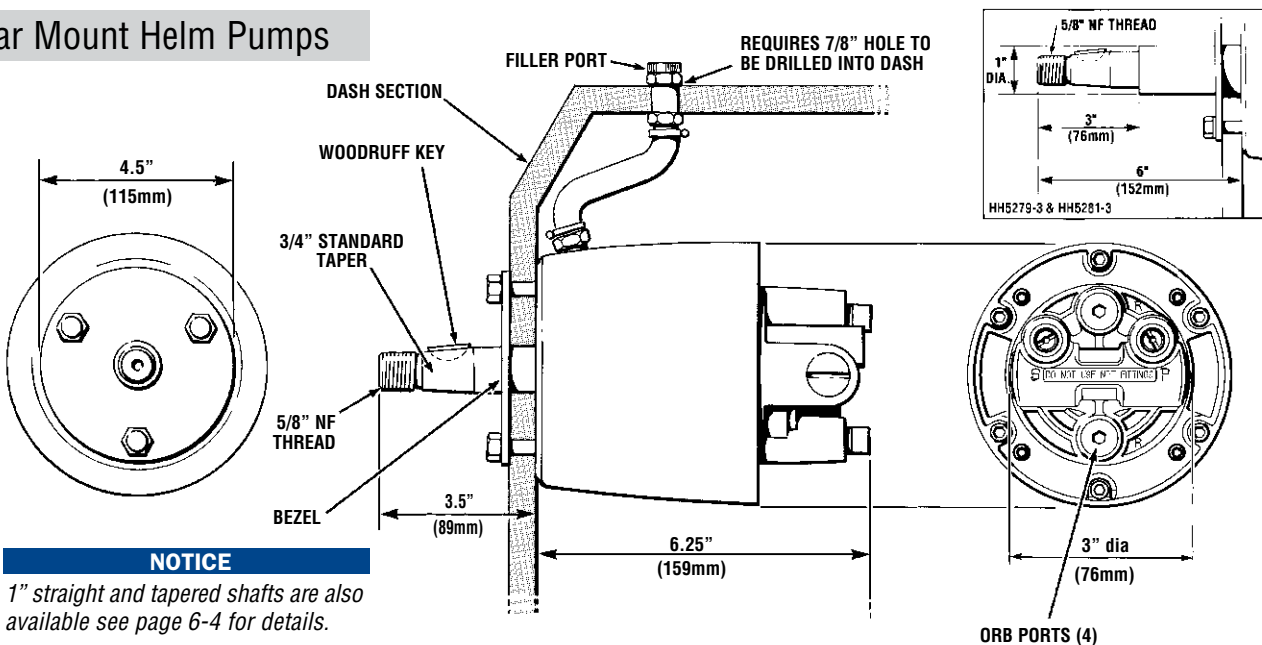
1" straight and tapered shafts are also available see page 6-4 for details.

NOTICE

Max. steering wheel diameter 28" (711 mm).

Figure 6-8.

Rear Mount Helm Pumps



NOTICE

1" straight and tapered shafts are also available see page 6-4 for details.

NOTICE

Max. steering wheel diameter 28" (711 mm). Min. dash thickness 1" (25.5 mm), Max. dash thickness 1.5" (38 mm).

Figure 6-9.

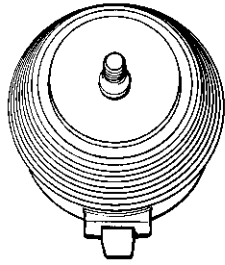
Now fitted
with Positionable
O-ring fittings

Tilt/Sport Tilt Helm Dimensions

CAUTION

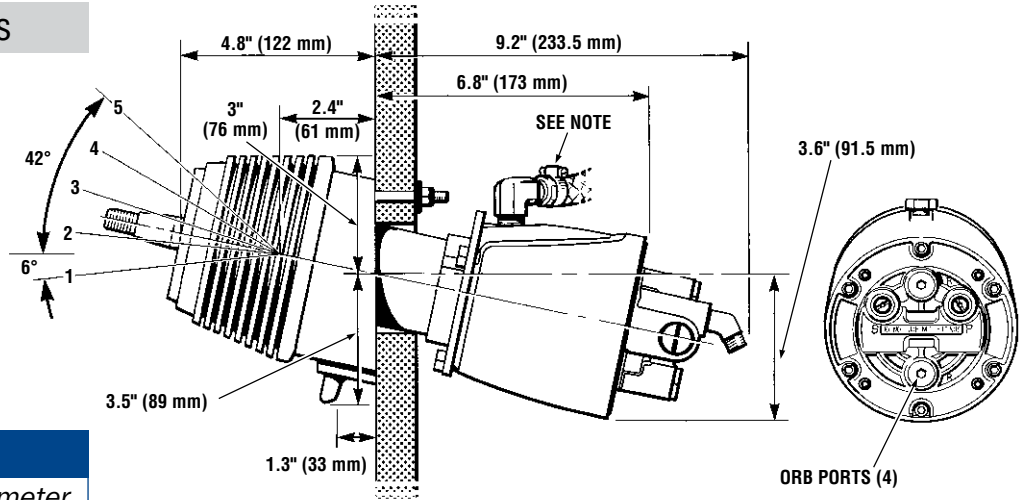
-3 helm pumps are fitted with Positionable O-ring style hose fitting ports (commonly referred to as ORB). Do NOT attempt to install an NPT pipe fitting into a -3 helm hose fitting ports. Doing so will lead to irreparable damage to the helm. ONLY use SeaStar Solutions O-ring style hose fittings (ORB).

Sport Tilt Helm Pumps



NOTICE

Max. steering wheel diameter 20" (508 mm).



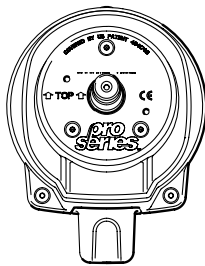
NOTE: Remote fill requires 7/8" hole on dash.

Figure 6-10.

NOTICE

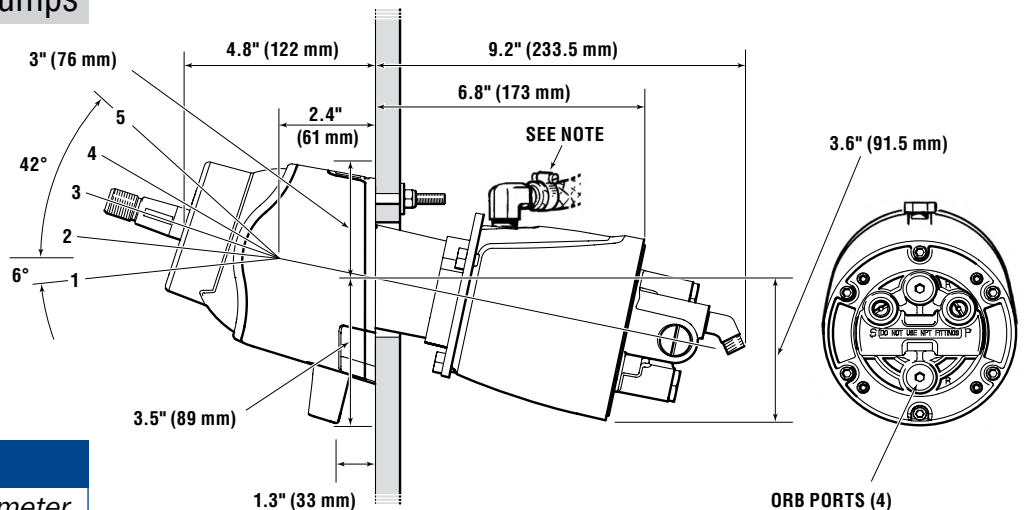
Remote fill and vent kit (included with helm pump) requires a 7/8" hole to be drilled into the dash board and above the helm pump. Please refer to page 12-3, HA6450 for details.

Sport Plus Tilt Helm Pumps



NOTICE

Max. steering wheel diameter 20" (508 mm).



NOTE: Remote fill requires 7/8" hole on dash.

Figure 6-11.

NOTICE

Remote fill and vent kit (included with helm pump) requires a 7/8" hole to be drilled into the dash board and above the helm pump. Please refer to page 12-3, HA6450 for details.

Now fitted
with Positionable
O-ring fittings

CAUTION

Classic Tilt Helm Dimensions

-3 helm pumps are fitted with Positionable O-ring style hose fitting ports (commonly referred to as ORB). Do NOT attempt to install an NPT pipe fitting into a -3 helm hose fitting ports. Doing so will lead to irreparable damage to the helm. ONLY use SeaStar Solutions O-ring style hose fittings (ORB).

Classic Tilt Helm Pumps

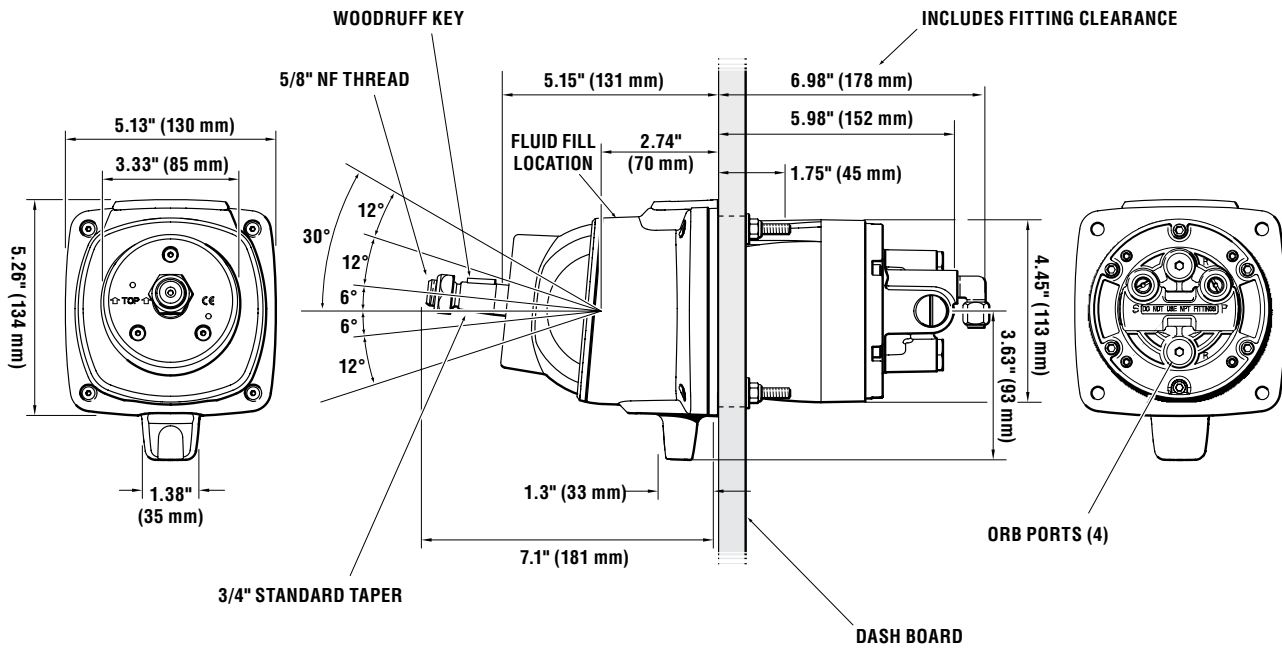


Figure 6-12.

NOTICE

Max. steering wheel diameter 20" (508 mm).

Hynautic Helm Pumps

Heavy Duty Helm Pump H-20 Series

HELM	DISPL	SHAFT STYLE DIA. & TYPE	KEYWAY	INTEGRAL VALVING	
20 Series	H-21	2.75 cu in	1" Straight	1/4" Square	Yes
	H-22	2.00 cu in	1" Straight	1/4" Square	Yes
	H-25	2.75 cu in	3/4", 1"/ft Tapered	#9 Woodruff	Yes
	H-26	2.00 cu in	3/4", 1"/ft Tapered	#9 Woodruff	Yes

H-21

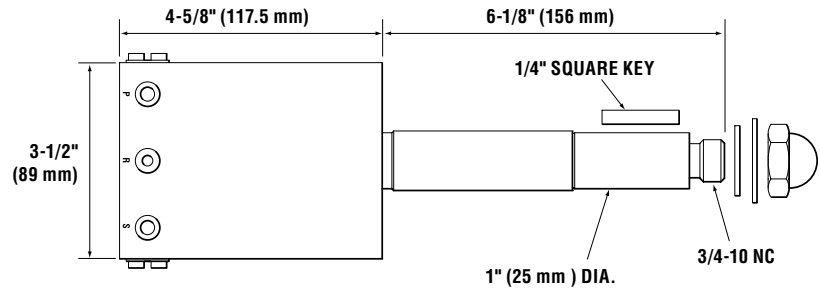


Figure 6-13.

NOTICE

Max steering wheel diameter 36" (914 mm). HF-07 trim plate sold separately.

Heavy Duty Helm Pump H-40 Series

HELM	DISPL	SHAFT STYLE DIA. & TYPE	KEYWAY	INTEGRAL VALVING	
40 Series	H-41	5.50 cu in	1 Straight	1/4" Square	Yes
	H-41-2	5.50 cu in	3/4", 1"/ft Tapered	#9 Woodruff	Yes
	H-42	4.00 cu in	1 Straight	1/4" Square	Yes
	H-42-02	4.00 cu in	3/4", 1"/ft Tapered	#9 Woodruff	Yes

H-41

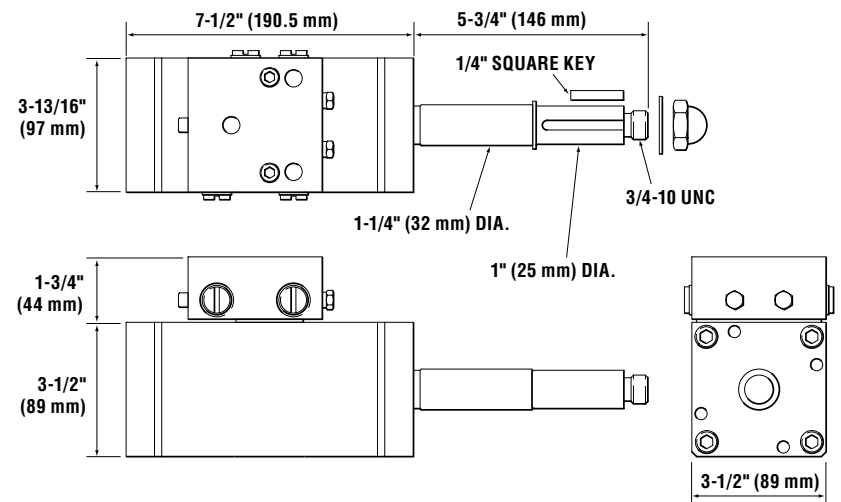
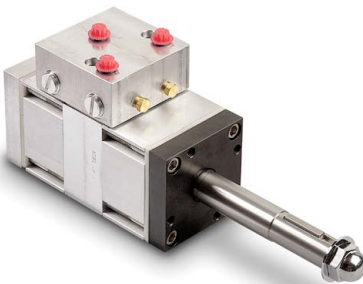


Figure 6-14.

NOTICE

Max steering wheel diameter 47" (1193 mm). HF-07 trim plate sold separately.

NOTICE

Hynautic H-20/40 Series helms require the use of an external Pressure relief valve (Part # MSV-21) and an external fluid reservoir (part #HP5810).

Capilano Helm Pumps

1250V & 1275V Models

Model	Part #
1250V	HH5250
1275V	HH5275

A unique variable displacement feature on these helms allows the number of steering wheel turns to be adjusted by the helms-person to their preference within a predetermined range.

Recommended wheel size (1250V) is between 20" and 36".

Recommended wheel size (1275V) is between 26" and 36".

1250V & 1275V

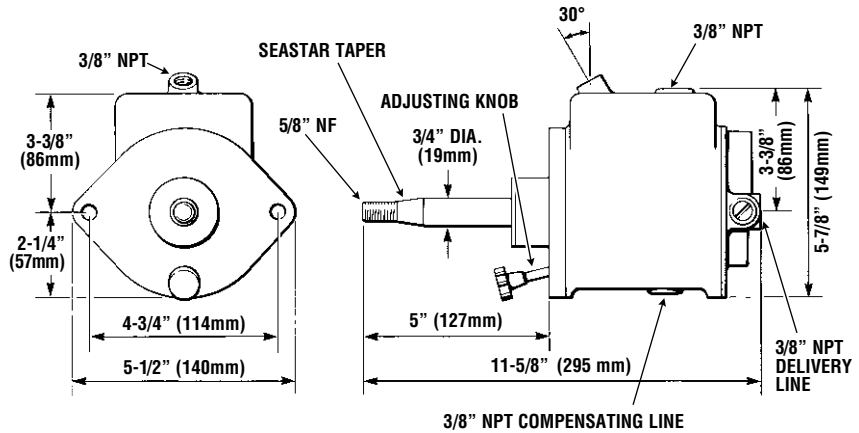


Figure 6-15.

1350 Models

Model	Part #
1350	HH0426

This steering system is designed for pleasure and commercial boats where the steering torque is between 28,000 in/lbs and 62,900 in/lbs.

Recommended wheel size (1350) is between 30" and 48".

1350

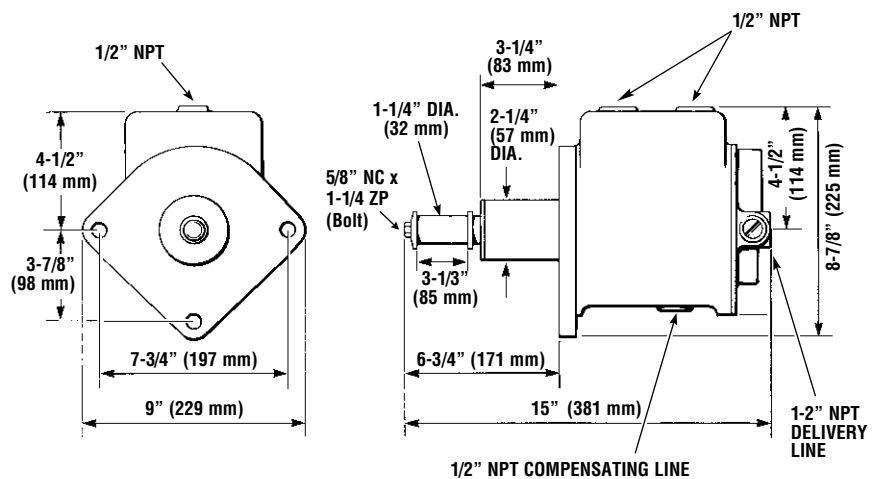


Figure 6-16.

⚠ WARNING

Use self-locking type fasteners only; substituting non-self locking fasteners can result in loosening or separation of equipment and loss of steering control.

DO NOT exceed 110 in-lbs. (12 Nm) torque on helm nuts & bolts.

SEASTAR[™] PA POWER ASSIST



Figure 7-1.

The Marine Industry is continually introducing heavier outboard engines, higher horse power engines, more aggressive propellers, bigger/faster boats...

Boat operators are asking for increased comfort and lighter steering loads... These were the driving forces behind the design of SeaStar and SeaStar PRO Power Assist.

This innovative product is highly recommended on any 150HP and above outboard application to give your boat the same, easy steering you are accustomed to in your car. Power Assist is also recommended for the following;

- Twin and Triple engine applications
- Bass Boats
- Pontoon Boats (150HP+)
- Power Catamarans
- Inboard powered cruisers without engine driven power assist.

How the System Works

SeaStar P/A (Power Assist) steering uses an electronically controlled on-demand hydraulic pump to provide “Power” for your SeaStar Hydraulic Steering system.

The SeaStar P/A system is comprised of two circuits: a hand operated manual system, which is the control element, and a hydraulic power pump, which is the working element.

The manual system consists of a helm pump with internal relief and check valves, as well as a built in reservoir. Two steering lines and a compensating line which provide a routing for fluid to transmit through the system, and a steering cylinder which moves the steering device on the boat from side to side.

The power system, is an electronically controlled hydraulic pump that boosts the fluid being sent from the helm pump to the steering cylinder (this will result in much easier effort at the wheel—even when under heavy loads). A compensating line connects the P/A unit to the helm pump, allowing the P/A unit to share fluid with the helm reservoir.

The SeaStar P/A is compatible with multiple steering stations, and with the use of an autopilot. In the event of a P/A power loss or failure the hydraulic system will automatically revert to a manual hydraulic system.

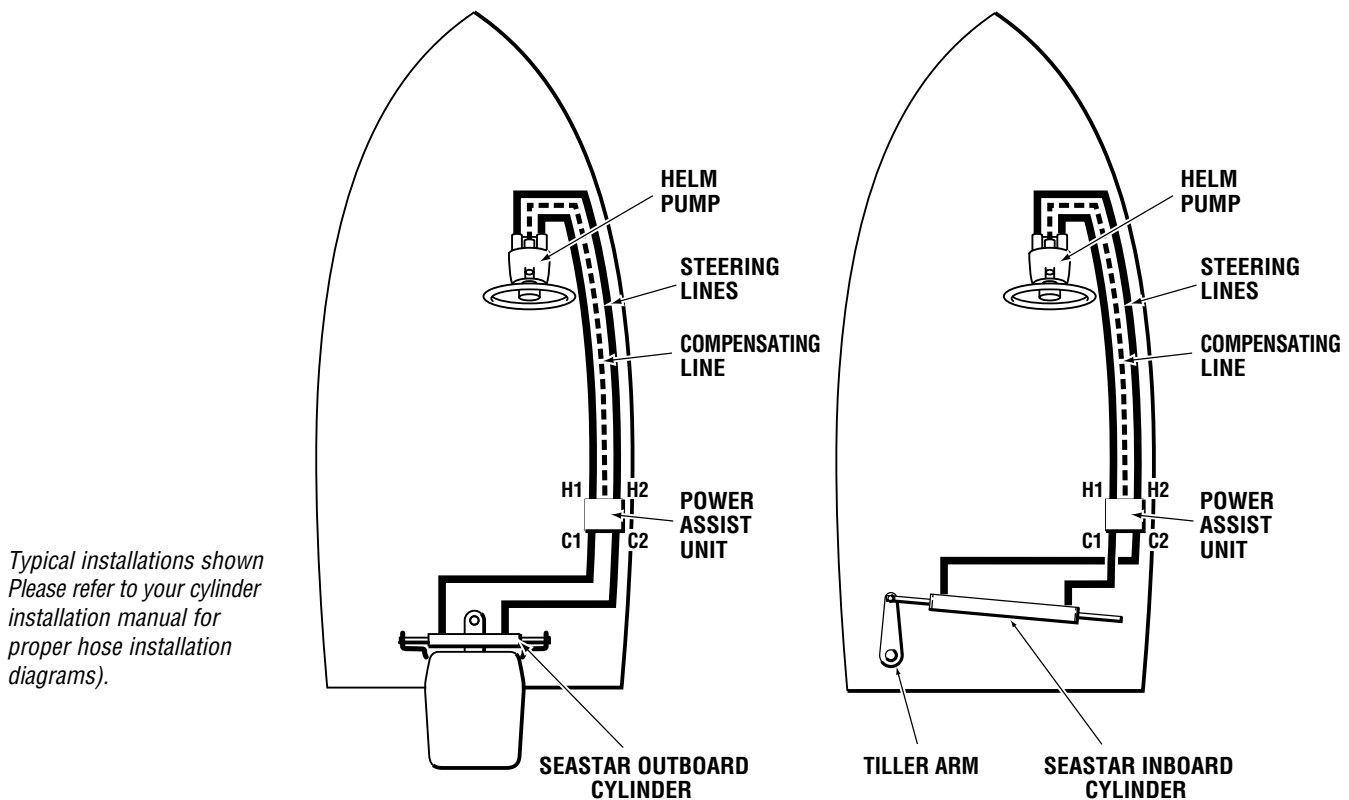


Figure 7-2.

SeaStar P/A Compatibility

NOTICE

For helm displacements greater than 2.4, twin power assist pumps **MUST** be used. Contact Technical Support for details.

The P/A is designed for use in recreational marine applications in conjunction with SeaStar Hydraulic Steering. Optimal performance will be obtained when used with SeaStar 1.4, 1.7, 2.0 and 2.4 cu in (1000psi) helm pumps, or, 2.0 cu in (1500 psi) SeaStar P/A PRO Hydraulic Steering.

Recommended convenience parts to be purchased

- Dual Ignition Control Kit, Part # HA1201
- 50 amp Harness Fuse Kit, Part # HA1206

NOTICE

SeaStar nylon tube may **ONLY** be used for the compensating line. **DO NOT** use SeaStar Nylon tube to plumb any other portion of the steering system.

NOTICE

Plan ahead. The Power Assist **MUST** be mounted in a **“DRY”** location. Hose lengths **MUST** be at least 6' (feet) between the power assist and helm pump and/or between the power assist and steering cylinder(s).

NOTICE

When fitted with a SeaStar PRO helm pump and a Power Assist pump there will be variations in steering effort. At the beginning of a trip the wheel will be very easy to turn and will get progressively heavier after several wheel turns are made. This is not considered a fault.

NOTICE

Use **ONLY** SeaStar Solutions products with the P/A unit as with **ALL** SeaStar Solutions systems. Failure to do so may void your warranty.

NOTICE

Retrofit kit part # HA1205 will be required to mount to a PA1200-2 Power Assist Pump.

Specifications

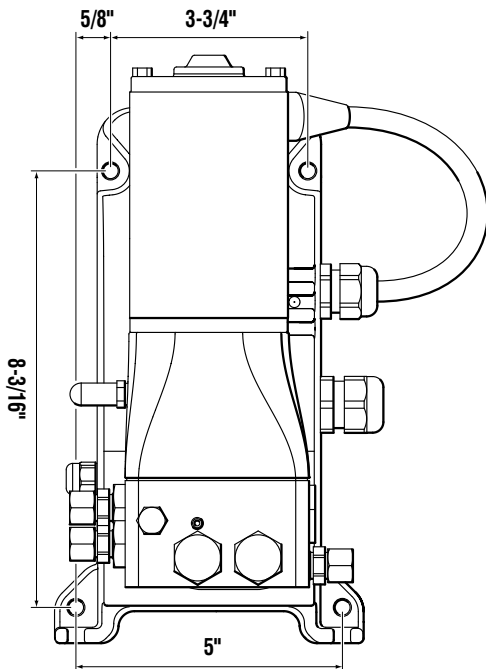


Figure 7-3.

SEASTAR POWER ASSIST 12/24V (PA1200-2 & PA1225-2)

- 12/24 Volts (automatically recognized)
- 1000psi MAX system peak pressure (500psi working load)
- Relief pressure 2000 psi
- MAX current draw = 50 amps
- Typical current draw = ~3 amps
- Purple ignition wire MAX current draw = 1 amp

SEASTAR PRO POWER ASSIST, 12/24V (PA1315-2)

- 12/24 Volts (automatically recognized)
- 1500psi MAX System peak pressure (500psi working load)
- Relief pressure 2000 psi
- MAX current draw = 50 amps
- Typical current draw = ~3 amps
- Purple ignition wire MAX current draw = 1 amp

Part No.	Harness Length	Voltage (auto recognized)
PA1200-2	15'	12/24 Volt
PA1200-2HP*	15'	12/24 Volt
PA1206-2	6'	12/24 Volt
PA1220-2	20'	12/24 Volt
PA1225-2	25'	12/24 Volt
PA1315-2	15'	12/24 Volt

Table 7-1. *High pressure, recommended for all DF325/350 and high steering load applications.

NOTICE

Use SeaStar PRO Power Assist with a SeaStar PRO helm for best performance.

Power Assist Autopilot

Converts manual hydraulic steering for dramatic reduction in steering wheel torque and at the same time provides a pump for an autopilot installation.

The SeaStar Power Assist Autopilot pump is the standard power assist product with the addition of a Type 1 or Type 2 autopilot pump. The SeaStar Autopilot pump is a fixed flow, reversible pump set that uses an internal hydraulic gear pump, producing very little vibration or noise. It is offered in 12 and 24 volt configurations, as well as two different pump sizes (type 1 & type 2).



Figure 7-4.

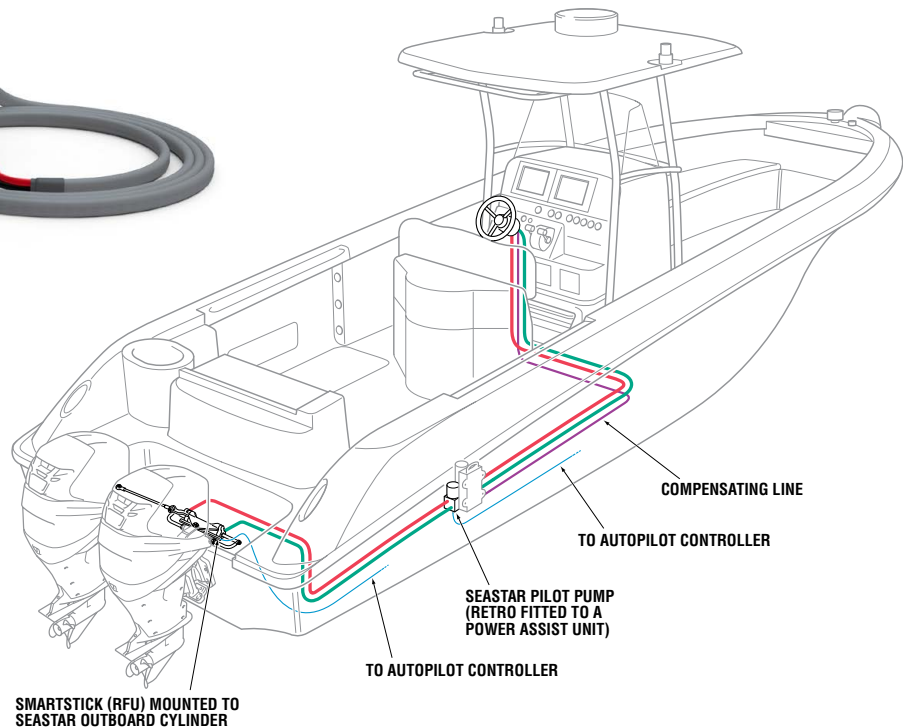


Figure 7-5.

Features

- Autopilot ready – a single installation (i.e. no need to break into system for install of pump)
- Converts manual hydraulic steering to power steering
- Dramatic reduction in steering wheel torque
- Easy installation
- OEM or Retrofit
- Simple add on to an existing SeaStar manual system
- (from 1.4–2.4 SeaStar helm pumps)
- Compatible with power purge system
- Ignition protected (SAE J-1171)
- ABYC, CE, NMMA, ISO 10592 Approved
- Replaces other 12 & 24 volt systems

Specifications

Voltage	12 or 24 Volts
Fittings	Compatible with Standard SeaStar Hoses (HO51xx etc.)
Wire Length	24"
Wire Gauge	12 awg
Connector	None – Bare Leads
Oil Compatibility	SeaStar Steering Fluid (MIL 5606)
Weight	4.9 lbs (2.2 Kg)
Autopilot Pump Sizes	Type 1: 60 in ³ /min (no-load) Type 2: 100 in ³ /min (no-load)
Maximum Pressure	1000 psi
Typical Current Draw (Depending on Application)	12V Type 1: 4 – 8 amps 12V Type 2: 5 – 11 amps 24V Type 1: 2 – 4 amps 24V Type 2: 3 – 6 amps
Autopilot Pump Cylinder Capacity	Type 1: 4.9 in ³ – 12.5 in ³ Type 2: 2.5 in ³ – 21.0 in ³

Table 7-2.

Order Guide SeaStar P/A Unit complete with Pilot Pump

ORDER INFORMATION	PART NO.
Standard SPA Plus Type 1 12V pump	PA6010
Standard SPA Plus Type 2 12V pump	PA6020
Standard SPA Plus Type 1 24V pump	PA7010
Standard SPA Plus Type 2 24V pump	PA7020

Table 7-3.

Technical Data

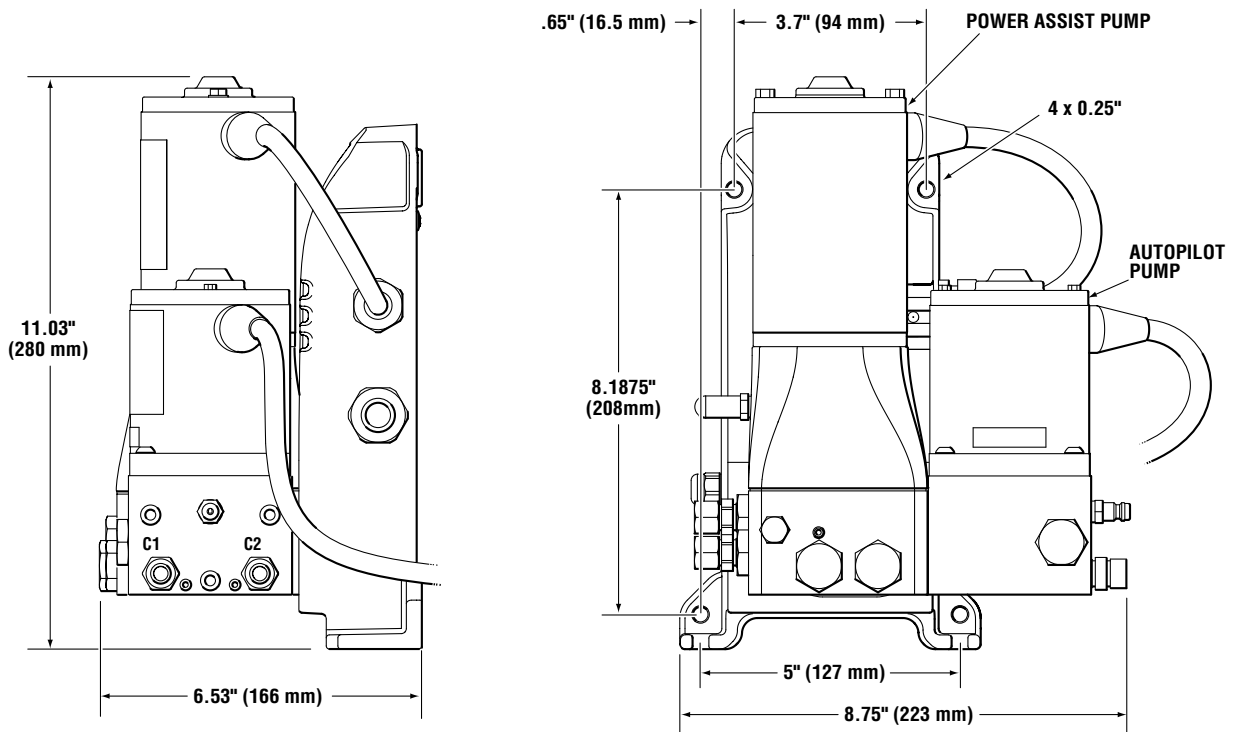


Figure 7-6.

SEASTAR™

POWER STEERING

Larger yachts require a larger steering system to handle the higher loads typically seen at the rudder(s). This system consists of two distinct operating circuits;

- a “manual” operated hydraulic system, consisting of a standard SeaStar Helm pump and a hydraulic steering cylinder (fitted with integral servo cylinder and power steering valve), and
- a “power” steering system consisting of either an engine driven pump (conventional), or, an electrically driven power assist pump (electric).

The manual circuit provides the control portion of the steering system and the power circuit provides the power to turn the rudder(s). SeaStar manufactures two options for the power circuit. Regardless of the power option you choose, the correct steering cylinder(s) and helm pump(s) (manual circuit) will need to be determined first (see page 8-2 for selection process). The power steering cylinders as well as the helm pump are common between the two “power” systems. Before choosing your preferred “power” option, you must determine what cylinder is required for your application.

If you have any questions regarding the selection of your steering system, please contact Technical Support for assistance “before” you select your system.

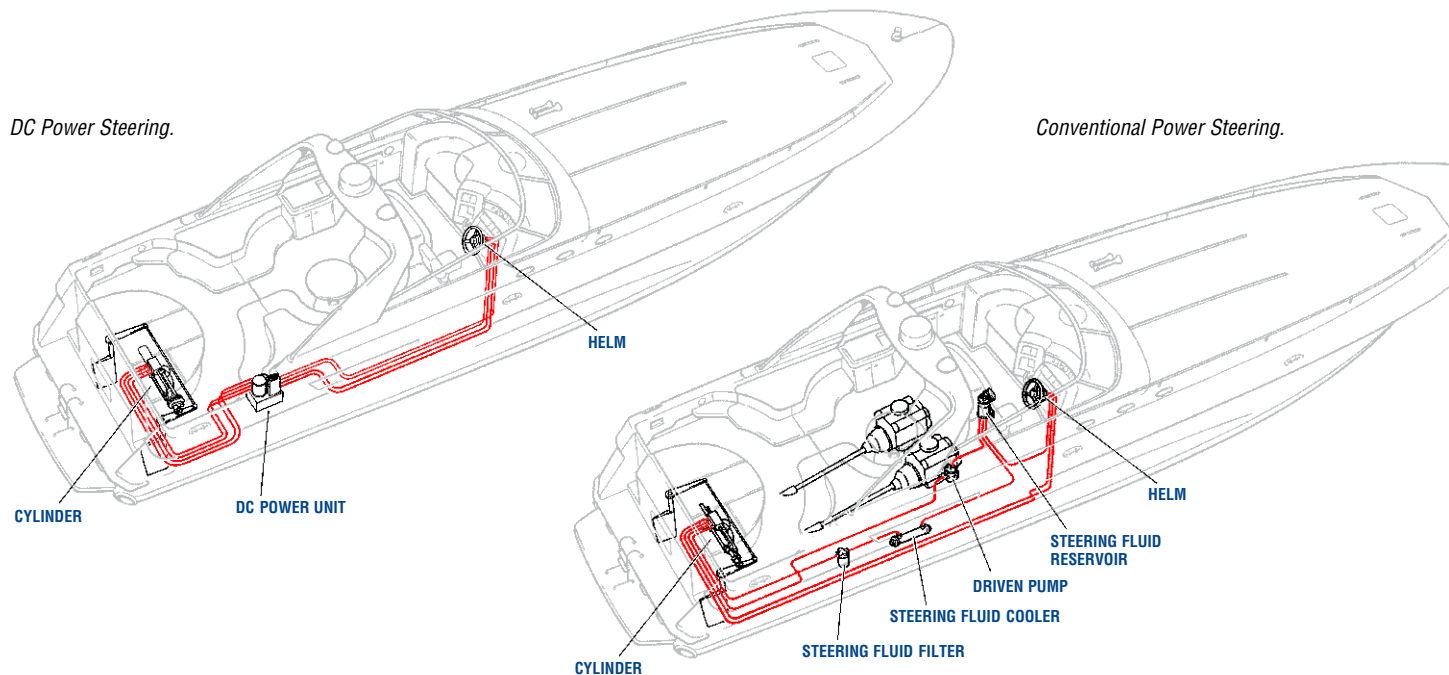


Figure 8-1.

Steering Cylinder(s) and Helm Pump Selection

Review the Cylinder selection guide below to choose the correct cylinder for your application, then, consult with helm pump selection to determine what helm you wish to purchase to provide your desired wheel turns from hard over to hard over.

NOTICE

The Cylinder Selection Guide below is for vessels fitted with "standard" rudders currently using SeaStar Steering Systems. For all boats over 70' and boats that are fitted with large rudders, steering loads should be reviewed by SeaStar Solutions Technical Service prior to selecting your cylinder (see Rudder Torque Data Sheet on page 12-10).

General guide for selecting a Power Steering Cylinder

All boats over 70' should have steering loads reviewed by factory.

CYLINDER PART NUMBER	DISPLACEMENT HULLS (standard)	DISPLACEMENT HULLS (heavy duty)	PLANING HULLS
SINGLE 9" x 1 CYLINDER (HC5801-2)	UP TO50' (15m)	UP TO40' (12m)	UP TO65' (20m)
TWIN 9" x 2 CYLINDER (HC5802)	UP TO75' (22m)	UP TO55' (17m)	UP TO85' (26m)
SINGLE 11" x 1 CYLINDER (HC5803-2)	UP TO60' (18m)	UP TO50' (15m)	UP TO75' (23m)
TWIN 11" x 2 CYLINDER (HC5804)	UP TO85' (26m)	UP TO60' (18m)	UP TO100' (31m)
* SINGLE 9" x 2.5 CYLINDER (HC5805)	UP TO100' (31m)	UP TO70' (22m)	UP TO110' (34m)
* TWIN 9" x 2.5 CYLINDER (HC5806)	UP TO110' (34m)	UP TO80' (25m)	UP TO120' (37m)

Table 8-1. * Larger 2.5" cylinder bore than HC5801-2 and HC5802.

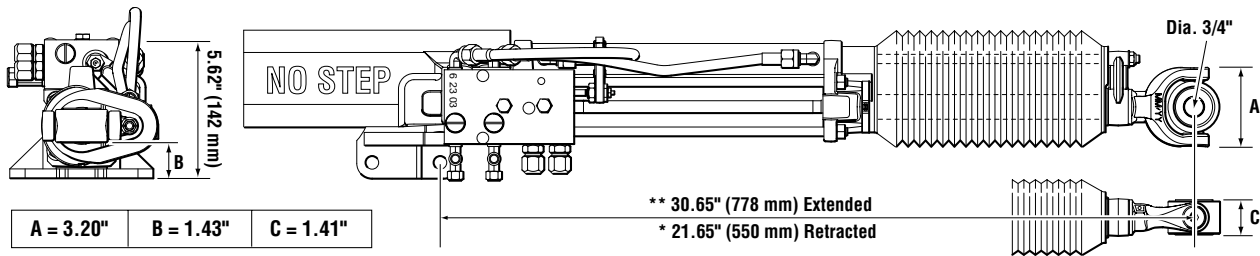


Figure 8-2. * Add 2" (50 mm) to this dimension for HC5803-2. ** Add 4" (101 mm) to this dimension for HC5803-2.

Technical Data

CYLINDER PART NUMBER	DISPLACEMENT	BORE	STROKE	OUTPUT FORCE	MAX. TORQUE (35' from centre)
SINGLE 9" CYLINDER (HC5801-2)	21.25 in ³ (348cc)	2.0" (51 mm)	9" (229 mm)	2946 lbs _f (13,090 N)	18,900 in-lbs (2130 Nm)
SINGLE 11" CYLINDER (HC5803-2)	26.00 in ³ (426cc)	2.0" (51 mm)	11" (280 mm)	2946 lbs _f (13,090 N)	23,140 in-lbs (2610 Nm)
TWIN 9" CYLINDER (HC5802)	42.50 in ³ (697cc)	2.0" (51mm)	9" (229 mm)	5892 lbs _f (26,190 N)	37,800 in-lbs (4260 Nm)
TWIN 11" CYLINDER (HC5804)	52.00 in ³ (853cc)	2.0" (51 mm)	11" (280 mm)	5892 lbs _f (26,190 N)	46,280 in-lbs (5220 Nm)
SINGLE 9" CYLINDER (HC5805)	37.11 in ³ (608cc)	2.5" (64 mm)	9" (229 mm)	5154 lbs _f (22,926 N)	33,065 in-lbs (3736 Nm)
TWIN 9" CYLINDER (HC5806)	74.22 in ³ (1216cc)	2.5" (64 mm)	9" (229 mm)	10,308 lbs _f (45,852 N)	66,130 in-lbs (7472 Nm)

Table 8-2.

Helm Pump Selection

NOTE: Wheel turns and autopilot pumps are based upon 6.0 cubic inch (9-inch stroke) or 7.4 cubic inch (11-inch stroke) servo cylinders.

	CYLINDER PART NUMBER								
	HC5801-2 (Single and Twin)			HC5803-2 (Single and Twin)			HC5805 (Single and Twin)		
HELM PUMP	1.4	1.7	2.0	1.4	1.7	2.0	1.4	1.7	2.0
WHEEL TURNS (Hard Over to Hard Over)	4.3	3.5	3.0	5.3	4.3	3.7	4.3	3.5	3.0

Table 8-3.

NOTICE

For system using the DC power pack, use only helms with either 1.4 or 1.7 cubic inches. Larger displacement helms may cause poor performance.

DC Power Steering

(Electric, Power Assist)

Features

SeaStar Power Steering provides super responsive automotive style steering performance for today's large motor yachts. The SeaStar DC Power Steering Unit is the heart of the system providing reliable and economical hydraulic flow to the steering cylinder whenever the wheel is turned.

Whether docking or cruising at high speed, the system will deliver 100% power regardless of engine speed.

SeaStar's superior design and selection of materials, precision manufacturing and rigid quality control all add up to an outstanding robust and versatile system for all large boat applications.

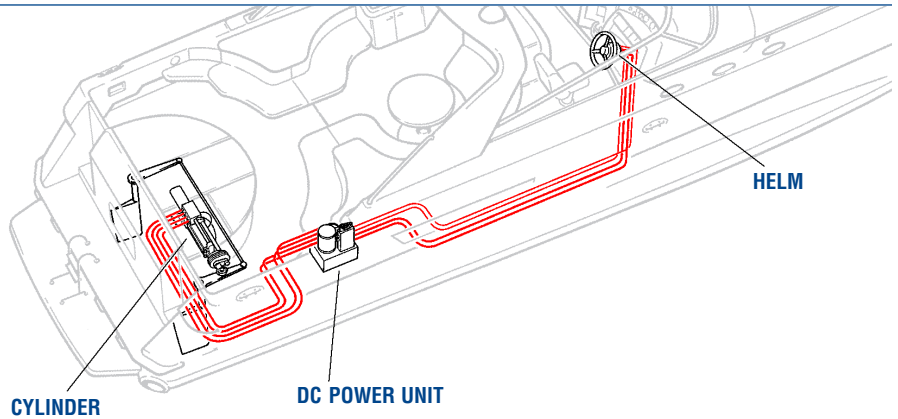


Figure 8-3.

- Easy to troubleshoot
- Fewer components: filter, reservoir, pump and power are included in a single package
- Quick and easy steering regardless of engine speed
- Low number of turns lock to lock (based on helm selection)
- Less installation time: fewer components, lines & fittings
- Semi-Auto purge feature
- Suitable for multi-station applications
- Integrated autopilot pump
- Suitable for use with most SeaStar helms (including tilt versions)
- Automatic manual back up system

Technical Data

MODEL	DC1000	DC2000
Main Motor	24 Volts	24 Volts
Autopilot Motor	12 Volts	24 Volts
Peak Current Draw @ 1250psi	72 amps	72 amps
Idle Current Draw	0.2 amps max	0.2 amps max
Average Current Draw (Depending on application)	10-12 amps	10-12 amps
Weight (Dry)	55lbs (25 kg)	55lbs (25 kg)
Tank Capacity	7 Liters	7 Liters
Adjustable Flow Autopilot	0 – 60 in ³ /min (984cc)	0 – 60 in ³ /min (984cc)

Table 8-4.

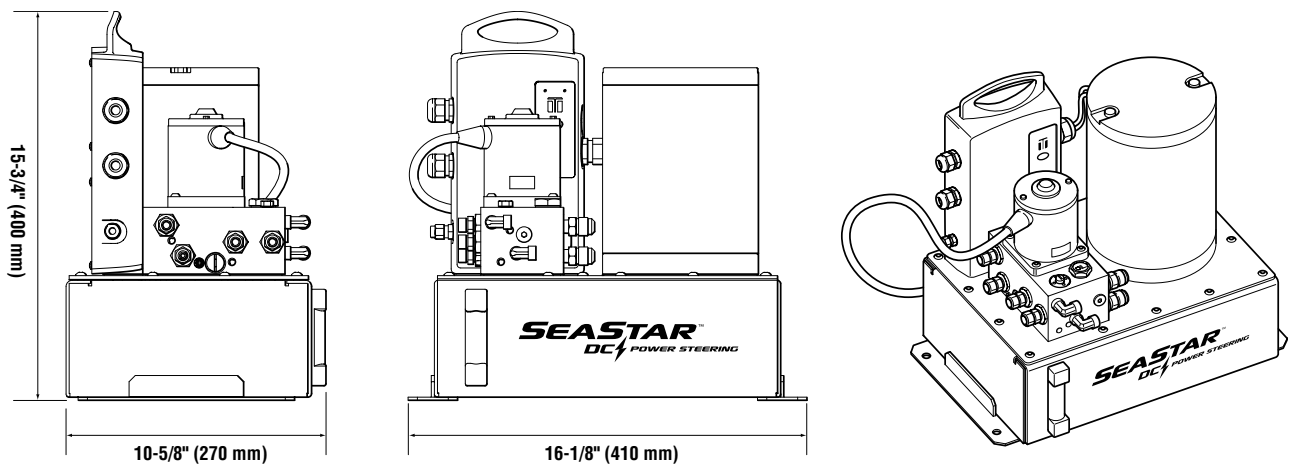


Figure 8-4.

Conventional Power Steering

Power Circuit Options

Features

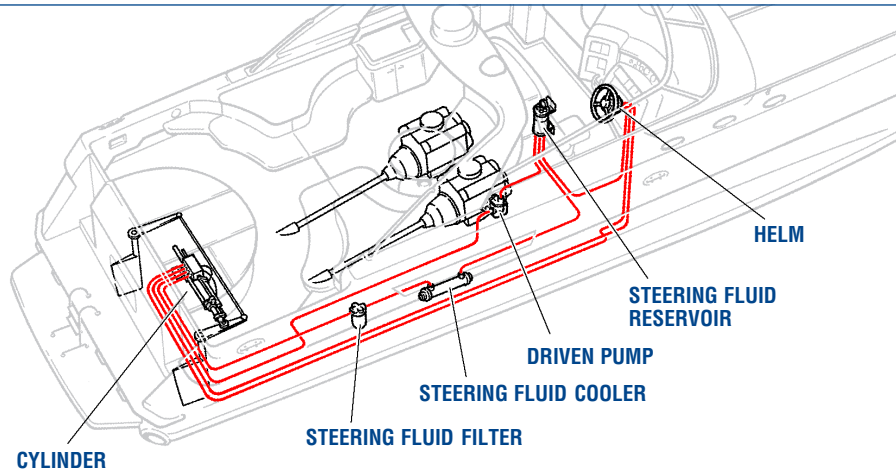


Figure 8-5.

- Effortless steering from docking to top speed
- Responsive steering 3-1/2, turns lock to lock (or to suit)
- Automatic manual back up steering
- Multiple steering stations
- Easy autopilot interface

How it works

SeaStar hydraulic power steering uses the ship's engine(s) to provide the "power" for the steering system, via an engine or electric motor driven hydraulic pump.

A manual hydraulic steering system, consisting of a standard SeaStar helm and a hydraulic steering cylinder, (fitted with an integral servo cylinder and a power steering valve) supplies the "control" portion of the steering system.

Under normal conditions, with engines running, a hydraulic fluid supply is in a stand-by mode, ready to be directed to the steering cylinder as dictated by the steering wheel, servo cylinder and power steering valve.

Turning the steering wheel left or right makes the system go from stand-by into operating mode and move the steering cylinder accordingly.

In the event of a power source failure, hydraulic fluid, from the steering helm, is automatically diverted directly into the servo and steering cylinder, providing the helmsman with manual back-up steering.

An engine room mounted steering fluid reservoir allows easy system fill and assists the in-line steering fluid cooler in cooling the hydraulic fluid. An in-line steering fluid filter helps to protect the steering system components against contaminants.

For the power circuit, use a -8 or 1/2-inch ID hose that meets a SAE 100R specification.

For the manual circuit, use a 5/16-inch ID hose with a minimum 1000 PSI working pressure or 3/8-inch OD copper or stainless tubing.

System designed to use SeaStar Steering Fluid (SeaStar EPS Fluid) or Dexron II (ATF) if using 1250V or 1275V helms.

Power Circuit Selection

Power Steering Cylinders	Part #
9" (228mm) stroke	HC5801-2
<i>See page 8-2 for correct cylinder selection.</i>	
11" (279mm) stroke	HC5803-2
<i>See page 8-2 for correct cylinder selection.</i>	
9" (228mm) stroke	HC5805
<i>See page 8-2 for correct cylinder selection.</i>	
Add-On Cylinders	Part #
9" (228mm) stroke	HC5802
<i>See page 8-2 for correct cylinder selection.</i>	
11" (279mm) stroke	HC5804
<i>See page 8-2 for correct cylinder selection.</i>	
9" (228mm) stroke	HC5806
<i>See page 8-2 for correct cylinder selection.</i>	
Steering Helms (For 3-1/2 Turn System)	Part #
SSI Helm, Standard Mount	HH5271-3
SSI Helm, Rear Mount.....	HH5261-3
SSI Helm, Tilt	HH6541-3
SSI Helm, Rear Mount, 1" Shaft	HH5281-3
Steering Fluid Reservoir, Cooler and Filter	Part #
Steering Fluid Reservoir.....	HP5810
Steering Fluid Cooler, 2.25 KW, 1" water lines	HP5825
Steering Fluid Cooler, 6.25 KW, 2" water lines	HP5826
Steering Fluid Filter	HP5815
Miscellaneous	Part #
Outlet Check Valve (Power Pump).....	HP5820
Auto Flow Control (Twin Pump)	HP5821
Crossover Pressure Relief.....	HP5822
System Pressure Gauge Kit	HA5821
Adapter Kit, Twin Disk #5061	HA5824
SeaStar Steering Fluid, 1 liter	HA5430
SeaStar Steering Fluid, 4 liter	HA5440
Pressure Relief Valve, (1250psi setting)	*HP5818

* Required in a system where the Power pump does NOT have a built in pressure relief valve.
ALL SeaStar Power Pumps have built in Pressure Relief Valves.

HOSE, TUBING, FITTINGS, AND ACCESSORIES

SeaStar Steering Hose Introduction

SeaStar Steering hoses are a custom multi-layered composite design, engineered specifically for our systems. They are designed to exceed SAE and ABYC specifications and provide precise steering control not achievable with hydraulic industry standard hoses.

SeaStar Hoses are engineered to provide the system with very low thermal expansion properties and are kink and abrasion resistant. Our hoses also feature a swaged solid fitting connection with an O-ring seal and a metal to metal backup to the primary seal.

Due to performance and safety concerns, SeaStar Solutions recommends that **ONLY** SeaStar or SeaStar PRO steering hoses be used in SeaStar Steering Systems. It is recommended for hose lengths over 30ft that SeaStar PRO hose is used.

Tubing/Hose

The tubing or hose requirements depend on the type of steering system being considered. Please double check the application in which you are using as in some cases Nylon or copper tube is not to be used.

⚠ WARNING

DO NOT cut outboard hydraulic hose.

APPLICATION	TUBING/HOSE REQ.	PAGE #
OUTBOARDS, INBOARDS, SEASTAR POWER ASSIST, or STERNDRIVE CYLINDER # HC5332	OUTBOARD HOSE	Page 9-2 – Page 9-6
CAUTION: DO NOT USE NYLON TUBING IN OUTBOARD AND/OR POWER ASSIST STEERING APPLICATIONS.		

Table 9-1.

General Considerations

In most hydraulic steering installations the cylinder body moves as the motor, outdrive or tiller arm is articulated. Provide sufficient hose length to allow full-uninterrupted steering motion including trim and tilt. If your splashwell is rated for a dual engine application or you are mounting the engines on a gill bracket you must provide enough steering hose to rig either twin or single engines. Inboard or Sterndrive steering installations that use 3/8" copper or extruded nylon tube must have a swaged hydraulic hose kit (HF5508) between the steering cylinder and the rigid tube to provide a flexible connection.

⚠ WARNING

DO NOT use extruded nylon tubing with SeaStar Outboard cylinder, HC5332 stern drive cylinders and/or SeaStar Power Assist Applications.

SeaStar Outboard Hose

⚠ WARNING

SeaStar PRO Helm systems require the use of SeaStar PRO (1500 psi) reinforced Kevlar Hoses ONLY.

SeaStar and SeaStar PRO steering hoses are available in kits (two, equal lengths of hose per kit). Before ordering you must consider the following areas to ensure that you order the correct length for the cleanest installation. In ALL applications, hydraulic hose/tubing should be secured along the routing path where possible and should not be allowed to hang free in any area where they may become a safety hazard. SeaStar Solutions recommends the use of a rigging tube, PVC piping or conduit for the safe installation and protection of the steering hose/tube. DO NOT install hoses in such a way that they become exposed to high heat areas such as engine components (i.e. manifolds or exhaust components), or in highly corrosive areas such as battery fumes or electrical connections. Each part number contains two hoses of equal length.

NOTICE

SeaStar Bulkhead hoses provide the cleanest hose routine.

SeaStar Solutions offers two different types of steering hoses;

- Standard (straight line hoses, not passing through bulkheads) from 2' to 5' (1' increments), 6' to 30' (2' increments), both SeaStar standard and SeaStar PRO available.
- Bulkhead hoses (for use where the hose is required to pass through a bulkhead). Available from 2' to 5' (1' increments) 6' to 30' (2' increments), both SeaStar standard and SeaStar PRO available.

Bulkhead Hose Kits

For the cleanest installation.

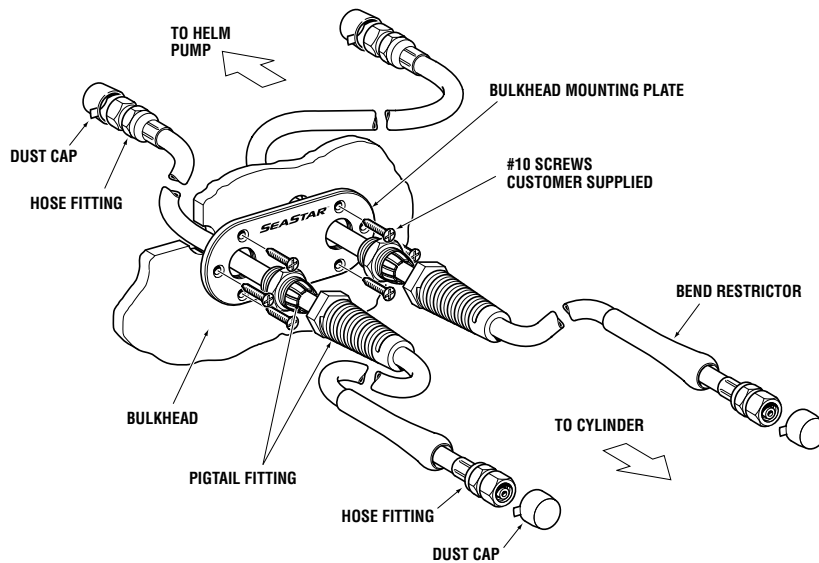


Figure 9-1. H088xx Dual Polished Plate shown.

SeaStar Hose Kits: How to Order

Each part number contains two hoses of equal length.

PART NO.	KIT DESCRIPTION
* H051xx	SeaStar Standard Outboard Hose Kit (2 hoses)
* H057xx	SeaStar Pro Hose Kit (2 hoses)
** H081xx	SeaStar Bulkhead Hose Kit, Standard (2 hoses)
** H082xx	SeaStar Bulkhead Hose Kit, Pro (2 hoses)
** H086xx	SeaStar Bulkhead Hose Kit, Polished Plate (2 hoses)
** H087xx	SeaStar PRO Bulkhead Hose Kit, Polished Plate (2 hoses)
** H088xx	SeaStar Bulkhead Hose Kit, Polished Plate double (2 hoses)
** H089xx	SeaStar PRO Bulkhead Hose Kit, Polished Plate double (2 hoses)

Table 9-2.

* SeaStar Standard and Pro Hose Kits are available in lengths from 2' – 30'.

** SeaStar Standard and Pro Bulkhead Hose Kits are available in lengths from 4' – 30'.

NOTICE

Outboard hoses are supplied with pre-attached hose fittings on both ends. In order to prevent hose kinking, bend restrictors are supplied on one end of each hose in the kit. The end of the hose with the bend restrictor is to be attached to the cylinder.

NOTICE

Correct hose length is crucial to the operation of your SeaStar steering system, please be sure that you take all the following measurements correctly to avoid damage to the steering hose.

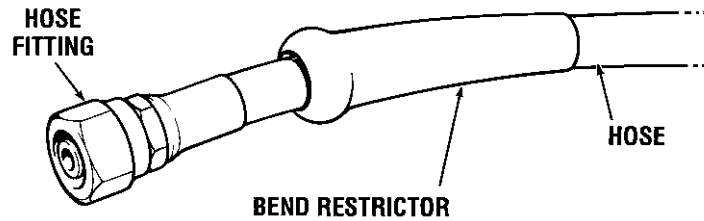


Figure 9-2. Standard Hose Kit.

How to Measure Hoses

Select from the illustrations that follow (figures A through I), the situation which best suits your application and note the:

- cylinder location,
- number of cylinders,
- type of cylinders,
- number of steering stations, and
- the number of hose and fitting kits required.

NOTICE

- Measure from center of the cylinder(s) and helm(s)
- Some installations require more than 1 hose kit and additional fitting kits (see parts list for each figure).
- Minimum bend radius for outboard hose is 2-1/2" (6 cm).
- Outboard cylinders move. They are subject to engine trim & tilt. Enough slack must be left in the hoses to prevent kinking.

⚠ CAUTION

DO NOT cut the hose. This will destroy the hose. Once cut there is no means to field swage fittings to the ends of the hose.

How to Measure Hoses: Single Station, Single Cylinder, NO Bulkhead

Helm to Steering Cylinder. Using the illustrations below:

1. Measure from center of steering wheel to the starboard side wall.
2. Measure the intended path of the hoses from the starboard side wall to the center of the engine.
3. Round UP the measurement to the nearest 'even' number and add 2 feet (0.6m). This is the length of hose kit required.
4. Order hose kit part no. HO51xx (item 1). The last two digits correspond to the length of hose.

Figure A

Single Front Mount Cylinder
Note: cylinder body moves.

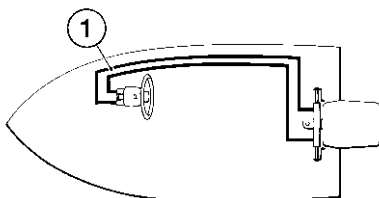


Figure B

Single Side Mount Cylinder
Note: cylinder body stationary.

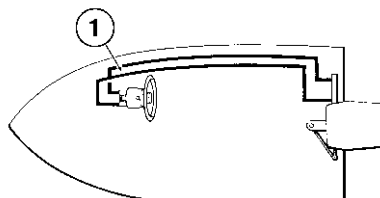


Figure C

Single Splashwell Mount Cylinder
Note: cylinder body stationary.

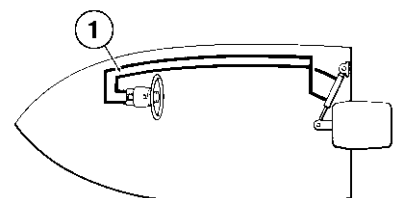


Figure 9-3.

Single Station

How to Measure Hoses: Single Station, Dual Cylinders, NO Bulkhead

Helm to hose tee fittings. Using the illustrations below:

1. Measure from center of steering wheel to the starboard side wall.
2. Measure from the starboard side wall to the transom.
3. Measure from the transom to your hose tee fittings (item 6).
4. Round UP the measurement to the nearest 'even' number. This is the length of hose kit required.
5. Order hose kit part no. HO51xx (item 1). The last two digits correspond to the length of hose.

Hose tee fittings to steering cylinders. Using the illustrations below:

1. Measure the intended path of the hoses from the tee fitting (item 6) to the center of the PORT side engine.
2. Round UP the measurement to the nearest 'even' number and add 2 feet (0.6m). This is the length of the hose kit required.
3. Order hose kits part no. HO51xx (items 2 & 3). The last two digits correspond to the length of hose.

NOTICE

This configuration also requires the purchase of Tee fitting kit # HF5530.

Figure D

Dual Front Mount Cylinders

Note: cylinder body moves.

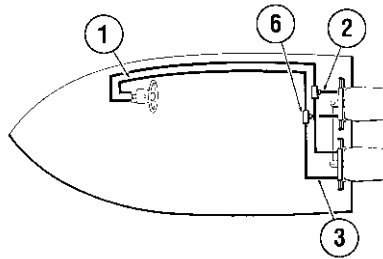


Figure E

Dual Side Mount Cylinders

Note: cylinder body stationary.

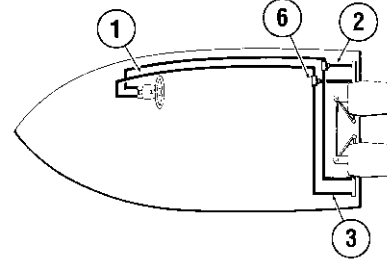


Figure 9-4.

How to Measure Hoses: Single Station, Single Cylinder, WITH Bulkhead

Helm to Steering Cylinder. Using the illustrations below:

1. Measure from center of steering wheel to the starboard side wall.
2. Measure the intended path of the hoses from the starboard side wall to the center of the engine.
3. Round UP the measurement to the nearest 'even' number and add 2 feet (0.6m). This is the length of the bulkhead hose kit required.
4. Order hose kit part no. HO81xx (item 4). The last two digits correspond to the length of hose.

Figure F

Single Front Mount Cylinder

Note: cylinder body moves.

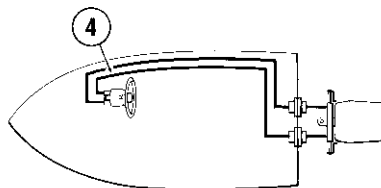


Figure G

Single Side Mount Cylinder

Note: cylinder body stationary.

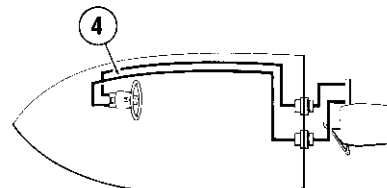


Figure 9-5.

How to Measure Hoses: Single Station, Dual Cylinders, WITH Bulkhead

Helm to hose tee fittings. Using the illustrations below:

1. Measure from center of steering wheel to the starboard side wall.
2. Measure from the starboard side wall to the transom.
3. Measure from the transom to your hose tee fittings (item 6).
4. Round UP the measurement to the nearest 'even' number. This is the length of hose kit required.
5. Order hose kit part no. H051xx (item 1). The last two digits correspond to the length of hose.

Hose tee fittings to steering cylinders. Using the illustrations below:

1. Measure the intended path of the hoses from the tee fitting (item 6) to the center of the PORT side engine.
2. Round UP the measurement to the nearest 'even' number and add 2 feet (0.6m). This is the length of hose kit required.
3. Order bulkhead hose kits part no. H081xx (items 4 & 5). The last two digits correspond to the length of hose.

NOTICE

This configuration also requires the purchase of Tee fitting kit # HF5530.

Figure H

Dual Front Mount Cylinders

Note: cylinder body moves.

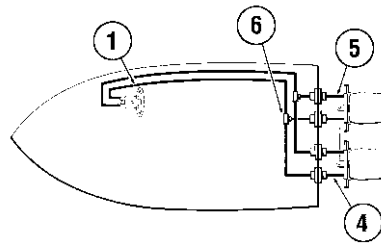


Figure I

Dual Side Mount Cylinders

Note: cylinder body stationary.

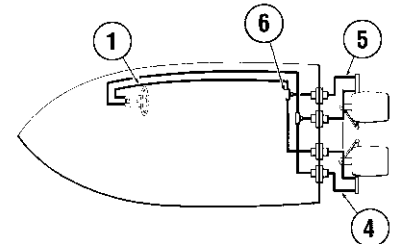


Figure 9-6.

Part Numbers for Figures A, B, C, D, E, F, G, H & I

ITEM	PART #	DESCRIPTION
1	H051xx	Hose Kit
2	H051xx	Hose Kit
3	H051xx	Hose Kit
4	H081xx	Bulkhead Hose Kit
5	H081xx	Bulkhead Hose Kit
6	HF5530	Tee Fitting Kit (3 per Kit)

Table 9-3.

NOTICE

See page 9-9 'Fittings and Fitting Kits' for add a station and/or autopilot fitting kits.

Additional Stations or Autopilot Integration

Additional Steering Station or Autopilot Power pack

1. Determine the location of the 2nd station or power pack.
2. Measure along the intended path of the hose routing from the upper helm pump to the 2nd station or autopilot power pack.
3. Round up the measurement to the next even digit. This is the length of hose kit required.
4. Order hose kit(s) part number H051xx the last two digits correspond to the length of hose.

Note

- a) **All hoses should be routed with a gradual rise so that air will not be trapped in the lower station.**
- b) Some installations require more than 1 hose kit and additional fitting kits.
- c) Minimum bend radius for outboard hose is 2-1/2" (6 cm).
- d) A compensating line is required between helm stations or the helm and autopilot power pack.

⚠ WARNING

DO NOT cut hydraulic hose.

Figure J
2nd Steering Station or Autopilot Power Pack Installation

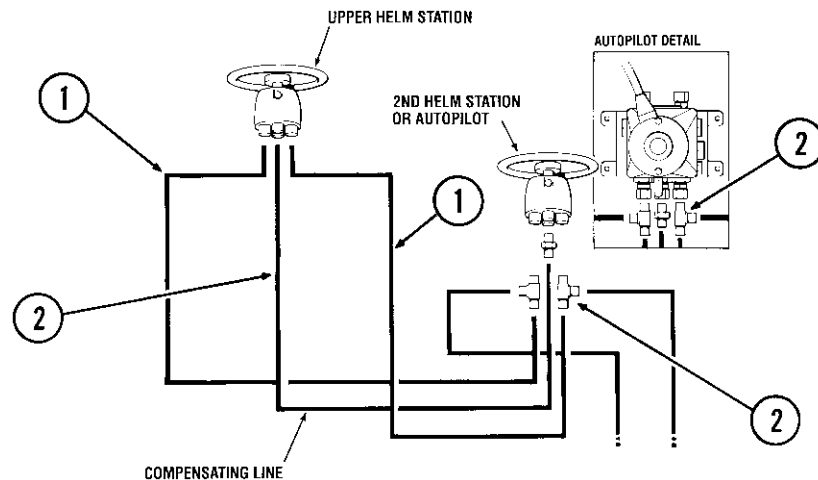


Figure 9-6.

Parts list

For figure J

ITEM #	DESCRIPTION	PART NUMBER	QUANTITY REQUIRED	REF PAGE #
1	HOSE KIT	H051xx	1	
2	FITTING KIT* (For use with -3 helms ONLY)	HF6007	1	9-12

Table 9-4. * Includes 25' of 3/8" dia. Nylon tubing to be used for the compensating line ONLY.

For NPT helm pumps use Kit # HF5501.

SeaStar Inboard/Sterndrive Tubing

Two types of tubing materials are available for plumbing Inboards and Sterndrives.

1. SeaStar 3/8" outside diameter nylon tubing
2. 3/8" outside diameter copper refrigeration tubing

Nylon Tubing

SeaStar 3/8" outside diameter nylon tubing is recommended for;

- a) Inboard,
- b) Sterndrive, and
- c) Seadrive steering systems with SeaStar (1.7 cubic inch/rev displacement) helms only.

SeaStar 3/8" outside diameter nylon tubing is available in the following lengths:

LENGTH FEET	(METERS)	TUBING PART #'S
25'	(7.6m)	HT5092
50'	(15.2m)	HT5095
75'	(22.8m)	HT5097
100'	(30.5m)	HT5100
1000'	(305.0m)	HT5101

Table 9-5.

NOTICE

SeaStar 3/8" extruded nylon is NOT recommended for use in systems with SeaStar 2.4 or SeaStar PRO helm pumps. It is also not to be used in systems where total tubing runs exceed 100', in these cases SeaStar Outboard hoses and/or 3/8" copper tubing must be used.

⚠ WARNING

SeaStar Solutions recommends the use of SeaStar PRO (1500 psi) reinforced Kevlar Hoses with SeaStar PRO Helm systems.

Copper Tubing

3/8" outside diameter copper tubing is recommended for;

- a) inboard,
- b) sterndrive, and
- c) seadrive steering systems with SeaStar (2.4 cubic inch/rev displacement) helms only, or where the length of tubing run exceeds 100 feet (30.5m).

Additional SeaStar hose kit part number HF5508 is required to connect the tubing to the cylinder.

3/8" copper tubing should be obtained through a local vendor based on the following tubing specifications.

Specification for copper tubing:

Soft annealed copper tubing, Type 'L' produced under ASTM B280.

To determine the required length of tubing for single and dual configurations:

From the illustrations (figures A and B), select the situation which best suits your application and note;

- a) the type of drive system, and
- b) the number of steering stations.

Single Station

1. From the illustration which best suits your application note the number of lengths of tubing and fitting kits required.
2. Measure along the intended path of tube routing for each of the tubing runs.
3. Determine if 3/8" nylon tube can be used or if copper tubing is required based on lengths of tubing runs required.
4. Total up the entire length of tubing required and round up to the next available tube kit length.

Figure A

Single Inboard Cylinder

- fittings required supplied with helm & cylinder

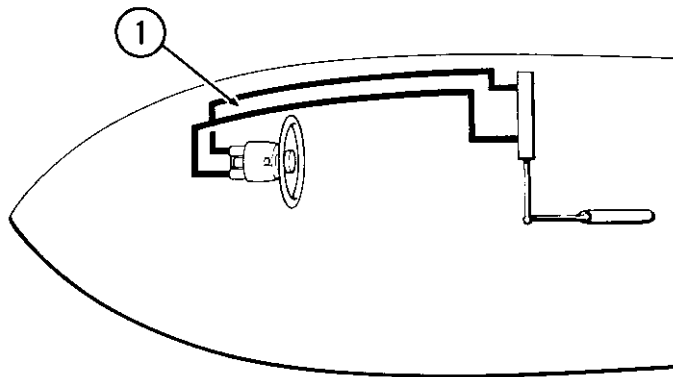


Figure 9-7.

Figure B

Single Sterndrive Cylinder

- fittings required supplied with helm & cylinder

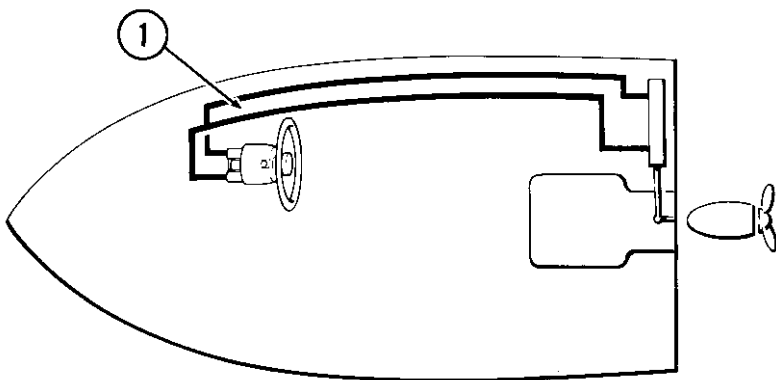


Figure 9-8.

Parts list

For figures A & B

ITEM #	DESCRIPTION	PART NUMBER	QUANTITY REQUIRED
1	3/8" DIA NYLON OR COPPER TUBE (or SeaStar hose)		AS MEASURED

Table 9-6.

Fittings and Fitting Kits

Fittings

All SeaStar Manual Hydraulic steering systems utilize the same style of fittings for all applications. These are 3/8" compression fittings which utilize a 9/16"-24 extra fine thread. See page 9-10 for NPT fitting details.

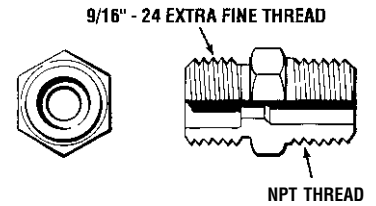


Figure 9-9. Typical NPT fitting.



ORB Fittings

These fittings are made of corrosion resistant stainless steel and now thread into the cylinders/helms via Positionable O-ring hose ports. Fittings can be easily orientated in any direction to accommodate tube routing. see this page through page 9-13 for details.

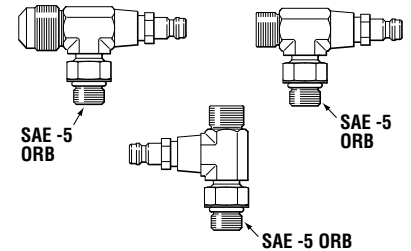


Figure 9-10.

CAUTION

For use with -3 helms and cylinders only.

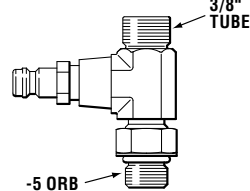
Positionable O-Ring Hose Fittings (ORB)

CAUTION

NOT for use in an NPT helm/cylinder hose fitting port.

HF6001 Vertical Bleeder Tee

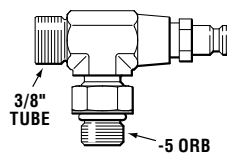
(2 per kit)



ORB, -3 cylinders/helms ONLY.

HF6002 Horizontal Bleeder Tee

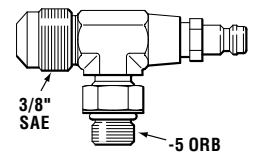
(2 per kit)



ORB, -3 cylinders/helms ONLY.

HF6003 Hydraulic Bleeder Tee

(2 per kit)

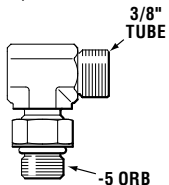


For use with Hydraulic 5/16" or 3/8" HOSE

ORB, -3 cylinders/helms ONLY.

HF6004 Elbow Fitting

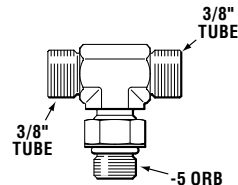
(2 per kit)



ORB, -3 cylinders/helms ONLY.

HF6005 Tee Fitting

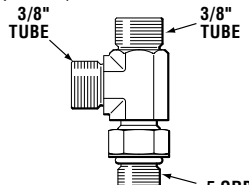
(2 per kit)



ORB, -3 cylinders/helms ONLY.

HF6006 Tee Fitting

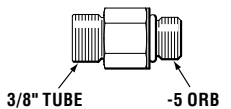
(2 per kit)



ORB, -3 cylinders/helms ONLY.

HF6009 Straight Fitting

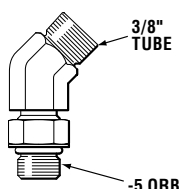
(2 per kit)



ORB, -3 cylinders/helms ONLY.

HF6011 45° Fitting

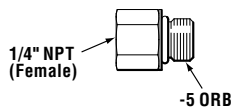
(2 per kit)



ORB, -3 cylinders/helms ONLY.

HF6012 -5 ORB (M) - 1/4 NPT (F)

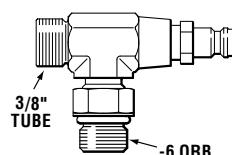
(3 per kit)



ORB, -3 cylinders/helms ONLY.

HF6013 Horizontal Bleeder Tee

(2 per kit)



ORB, Mercury Verado ONLY.

HF6007 Fitting Kit



ORB, add autopilot or second station.

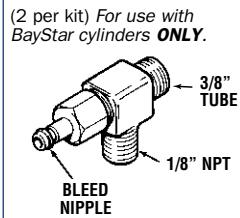
NPT Fittings

All SeaStar Manual Hydraulic steering systems utilize the same style of fittings for all applications. These are 3/8" compression fittings which utilize a 9/16"-24 extra fine thread. Refer to page 9-9.

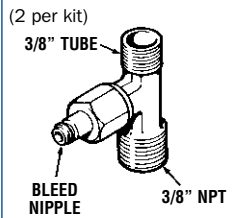
⚠ CAUTION

NPT fittings are not to be used in a -3 helm and/or cylinder. Doing so will result in irreparable damage to the helm/cylinder. ONLY use a SeaStar Solutions ORB Hose Fitting in a -3 helm and/or cylinder.

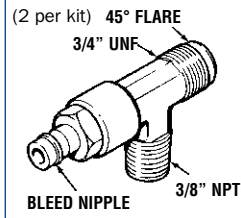
HF4202 Horiz. Bleeder Tee



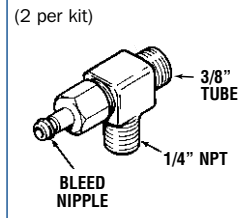
HF5518 Vertical Bleeder Tee



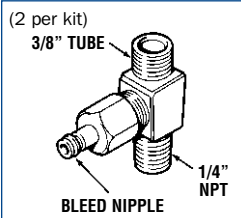
HF5519 Bleed Tee (TM Cylinders)



HF5520 Horiz. Bleeder Tee



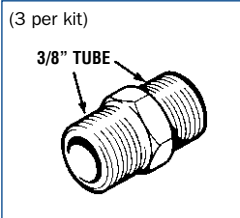
HF5521 Vertical Bleeder Tee



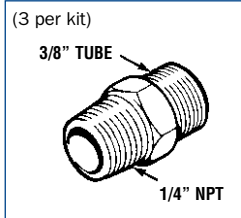
HF5548 Bleed Nipple



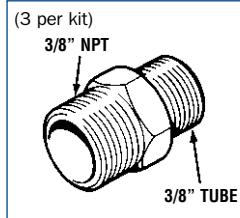
HF5527 Union Coupling Fitting



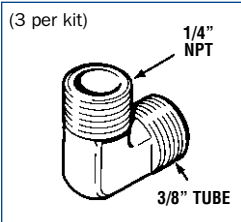
HF5528 Straight Fitting



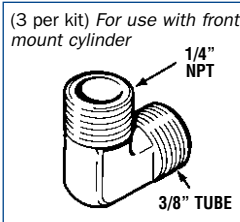
HF5532 Connector Fitting



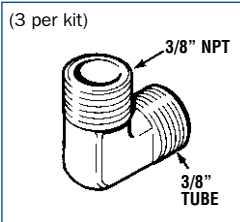
HF5529 Elbow Fitting



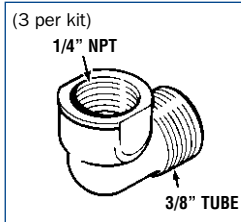
HF6145 SS Elbow Fitting



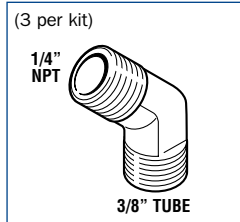
HF5534 Elbow Fitting



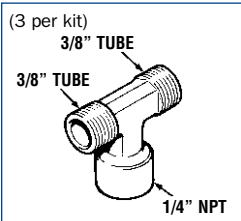
HF5538 Street Elbow



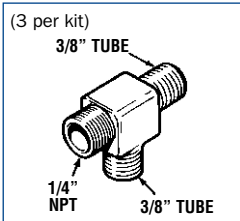
HF5540 45° Fitting



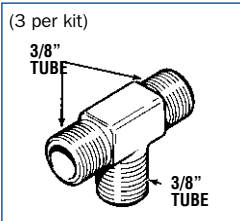
HF5533 Tee Fitting



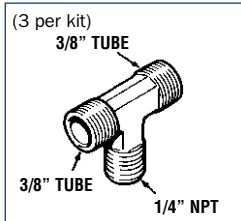
HF5531 Tee Fitting



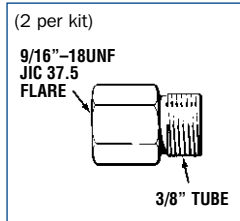
HF5530 Tee Fitting



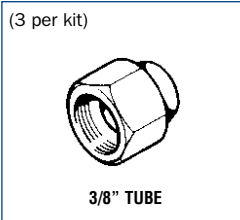
HF5536 Tee Fitting



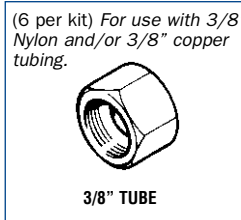
HF5566 Adapter Fitting



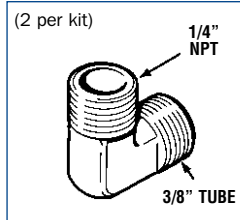
HF5524 Cap Plug Nut



HF5526 Tube Nut



HF6145 Hose Fitting (Pivot Cyl.)



Additional SeaStar Steering Station or Autopilot Kit

1. Refer to illustration Figure E.
2. Determine the location of the second station or autopilot power pack.
3. Measure along the path of the tube routing from the upper helm pump to the second station or autopilot power pack. Multiply this length by three for the amount of tubing required.
4. Select the tubing kit based on the total system tubing requirement.

⚠ WARNING

DO NOT cut SeaStar steering hose.

Figure E

2nd Steering Station/autopilot when using 3/8" nylon tubing, or, 3/8" copper tubing.

NOTICE

- a) A compensating line is required between helm stations or the helm and autopilot power pack.
- b) All hoses should be routed with a gradual rise (particularly the compensating line) so that air will not be trapped in the lower helm station.
- c) The second helm station or autopilot power pack may be connected at any location between the upper helm station and the cylinder. For existing single station installations the nylon or copper tubing may be cut and the tee fittings installed at any convenient location.

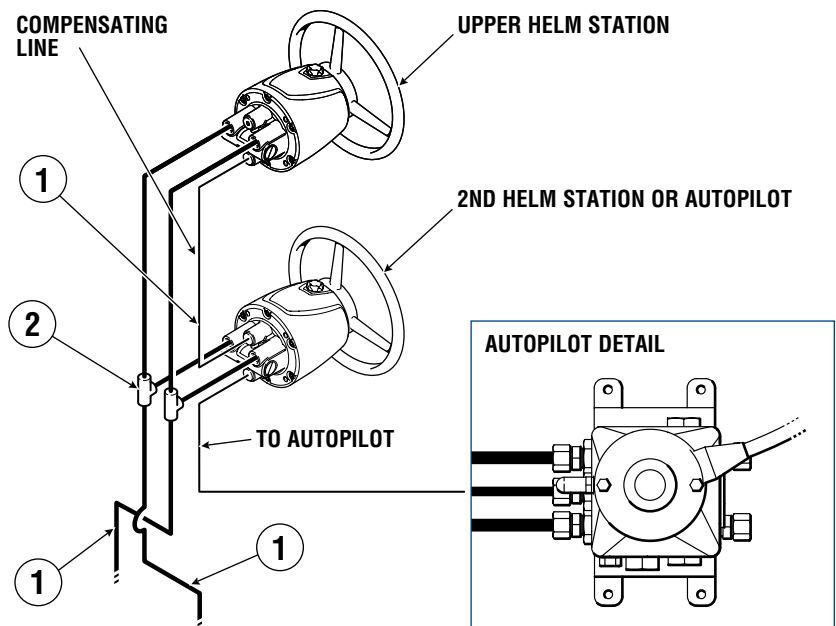


Figure 9-11.

ITEM #	DESCRIPTION	PART NUMBER	QUANTITY REQUIRED	REF PAGE #
1	3/8" DIA NYLON OR COPPER TUBE	HT5_ _ _	AS MEASURED	
2	FITTING KIT*	HF6010	1	Page 9-13

Table 9-7. * For NPT helms use HF5502.

Required details for the addition of an autopilot.

1. SeaStar Helm pumps are fitted with a built in check valve which are required for installations of additional steering stations and/or autopilot pumps. If your helm pump is not fitted with an internal check valve an external valve will be required.
2. Autopilot mfg. requires the volume of your steering cylinder(s) to provide an adequate autopilot pump, refer to page 12-6 for cylinder specifications.

HF6007

Application

Fitting kit to add a 2nd station or autopilot to an outboard system.

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Tee Fitting 1 End - 5 ORB 1 End - 3/8" Tube Center - 3/8" Tube	2	343196
2A	Connector Fitting -5ORB - 3/8" Tube	2	343088
2B	Connector Fitting 1/4" NPT - 3/8" Tube	3	600602
3	Tube Nut - 3/8" Dia.	6	280327
4	Non-Vented Filler Plug	1	HA5432
5	SeaStar Nylon Tube 3/8" Dia.	25ft	HT5092
A*	Elbow 3/8" Tube (M) - -5 ORB	2	

Table 9-8. * Supplied with helm pump.

NOTE: HF6007 fitting kit is to be used when the system has been plumbed with SeaStar outboard steering hose only.

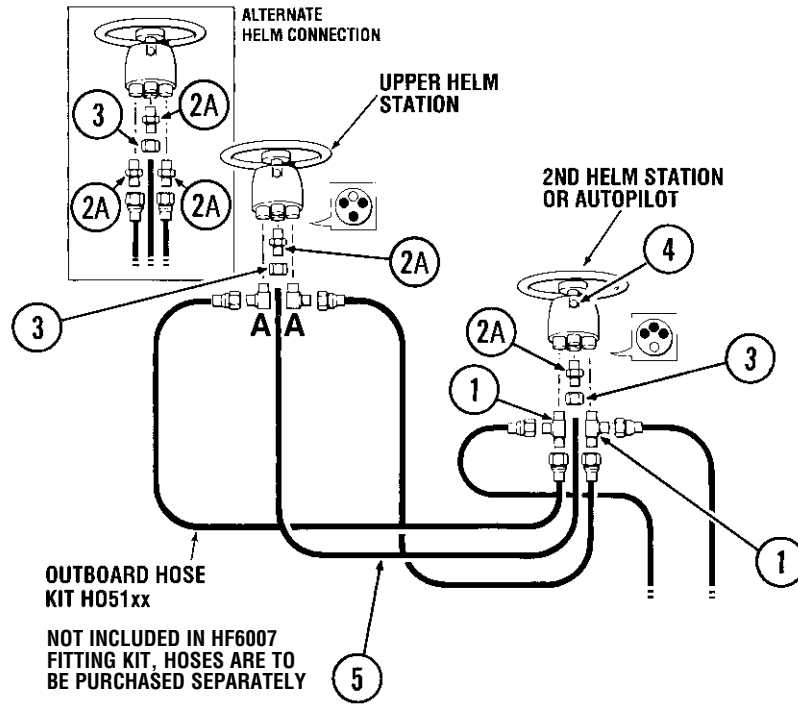


Figure 9-12.

CAUTION

For use with -3 helms ONLY.

WARNING

DO NOT cut SeaStar steering hose.

Autopilot powerpack connection

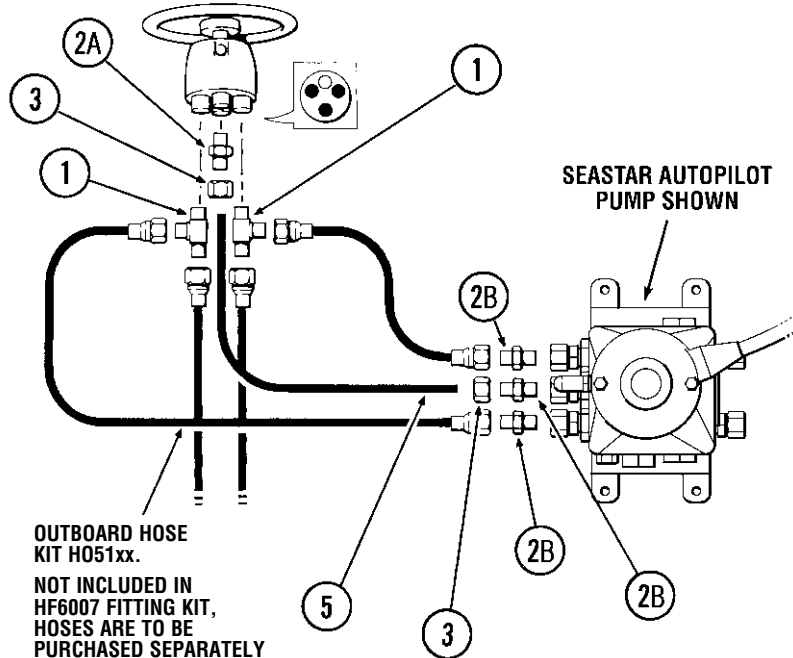


Figure 9-13.

NOTICE

Typical plumbing layout shown. When using a SeaStar Autopilot Pump, **ALWAYS** refer to the Installation Manual shipped with your autopilot pump.

CAUTION

DO NOT cut SeaStar Outboard Steering hose. Once cut there is no means to field swage fittings to the ends of the hoses.

HF6010

Application

Fitting kit to add a 2nd station or autopilot to an inboard or sterndrive system.

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Tube Nut – 3/8" Dia.	12	280327
2A	Connector Fitting -5ORB – 3/8" Tube	2	343088
2B	Connector Fitting 1/4" NPT – 3/8" Tube	3	600602
3	Tee Fitting 3 Ends – 3/8" Tube	2	600605
4	Non-Vented Filler Plug	1	HA5432
A*	Tube Nut – 3/8" +Dia.	2	
B*	3/8" Elbow -5 ORB	2	

Table 9-9. * Supplied with helm pump.

NOTE: used in systems plumbed with 3/8" diameter nylon or copper tube.

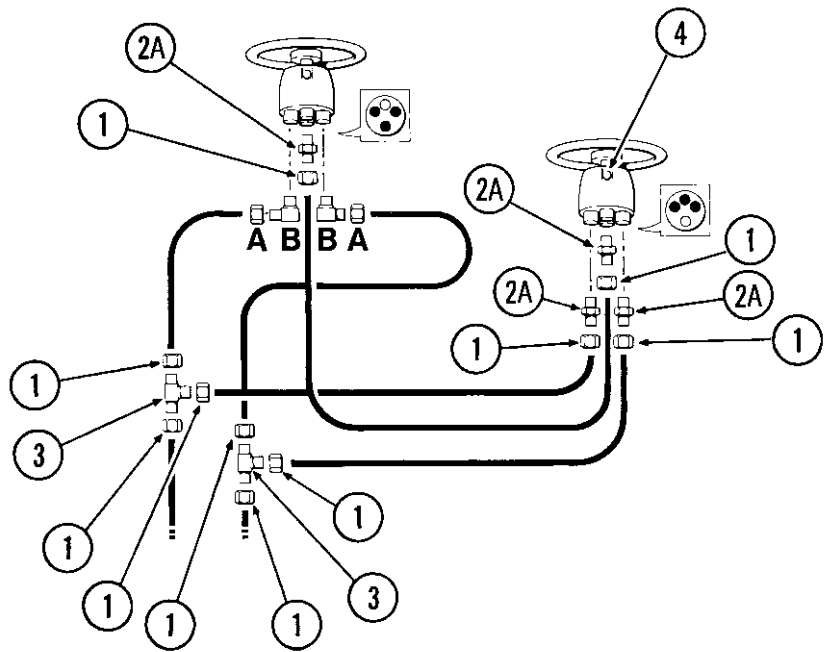


Figure 9-14.

CAUTION

For use with -3 helms ONLY.

Autopilot powerpack connection

NOTICE

Typical plumbing layout shown. When using a SeaStar Autopilot Pump, **ALWAYS** refer to the Installation Manual shipped with your autopilot pump.

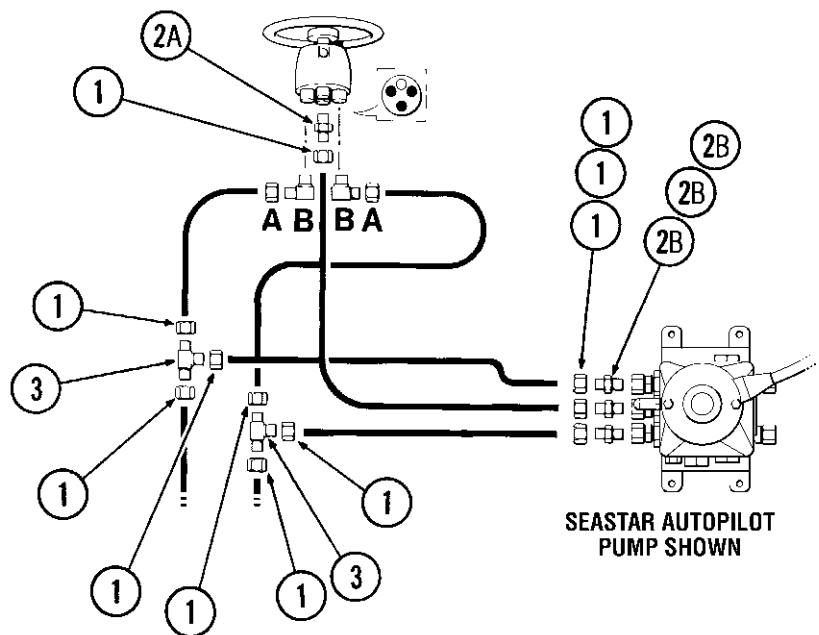


Figure 9-15.

HF5507

Application

Kit to connect 3/8" diameter copper tubing to SeaStar cylinders (using 3/8" diameter nylon tubing).

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Tube Nut – 3/8" Dia.	4	280327
2	Connector Fitting 3/8" Tube 3/8" Tube	2	280929
3	Nylon Tubing 3/8" Dia.	6ft	795628

Table 9-10.

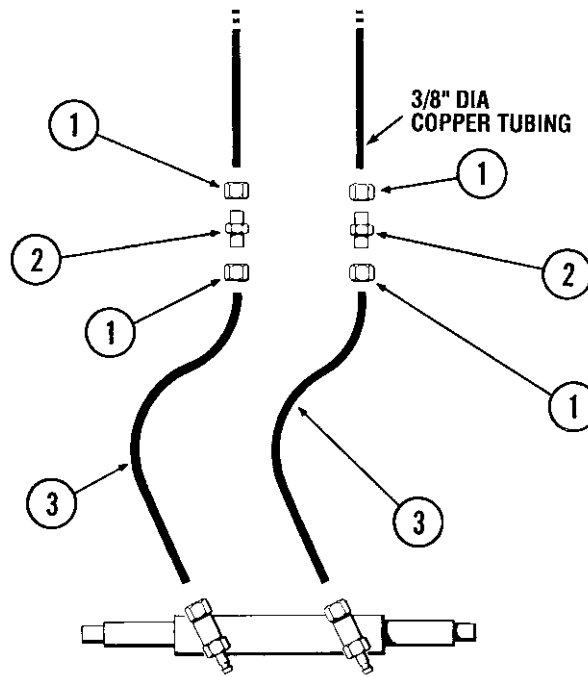


Figure 9-16.

NOTICE

DO NOT use with SeaStar Outboard Cylinders and/or SeaStar Sterndrive cylinder # HC5332.

HF5508

Application

Kit to connect 3/8" diameter copper tubing to SeaStar cylinders (using SeaStar outboard hose).

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Tube Nut – 3/8" Dia.	2	280327
2	Connector Fitting 3/8" Tube 3/8" Tube	2	280929
3	18" Hose c/w Fittings	2	338621

Table 9-11.

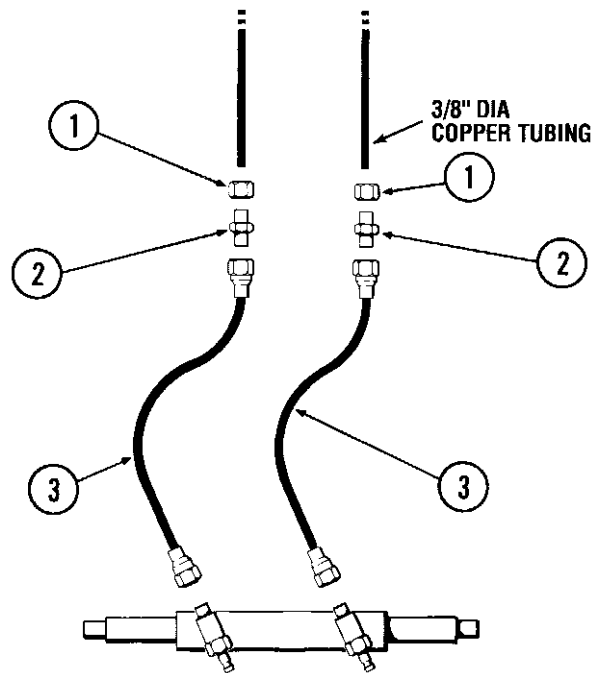


Figure 9-17.

CAUTION

DO NOT cut SeaStar Outboard Steering hose. Once cut there is no means to field swage fittings to the ends of the hoses.

SeaStar Kicker Cable Tie Bar



This new member of the SeaStar family allows users to manually steer an auxiliary engine (kicker/trolling motor) using their existing SeaStar Hydraulic Steering system. This is accomplished with a variety of solid mechanical linkages between the main steering cylinder and the auxiliary engine. SeaStar Solutions has developed a patent pending design that incorporates a XTREME cable as the linkage between the two engines.

Key Features

- Flexible cable allows for adjustable locations of kicker motor.
- Allows independent trim/tilt of both engines.
- Allows full steering stroke of both engines.
- Simplified installation using universal ABYC steering connection (as per ABYC P17 & P21 standards) on kicker motors.
- Retrofittable to SeaStar Front Mount Cylinders, part numbers HC5345, HC5358, HC5348, HC5345-3, HC5358-3 and HC5348-3 ONLY or the HC5445-3.
- Incorporates unique patented cable technology.
- Kicker can be mounted on either side of the main engine(s).

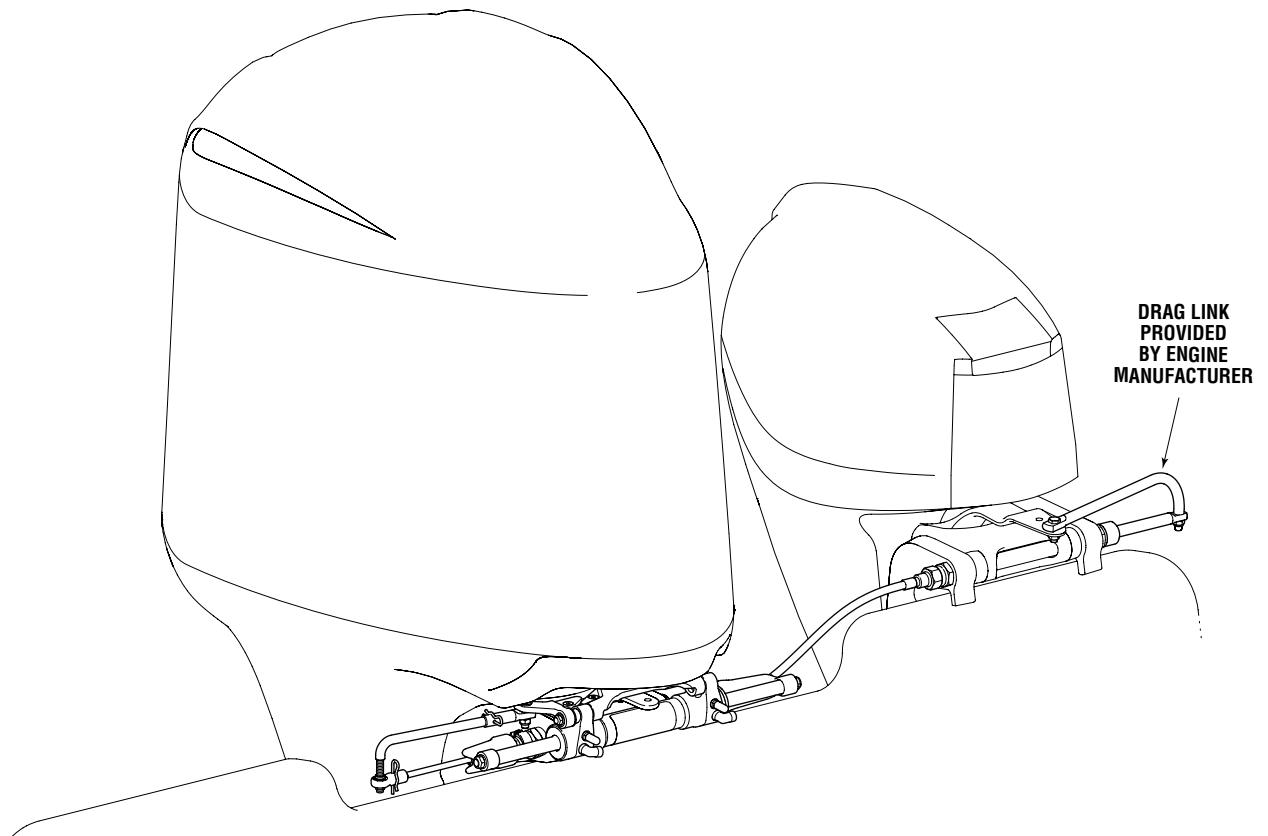


Figure 9-18.

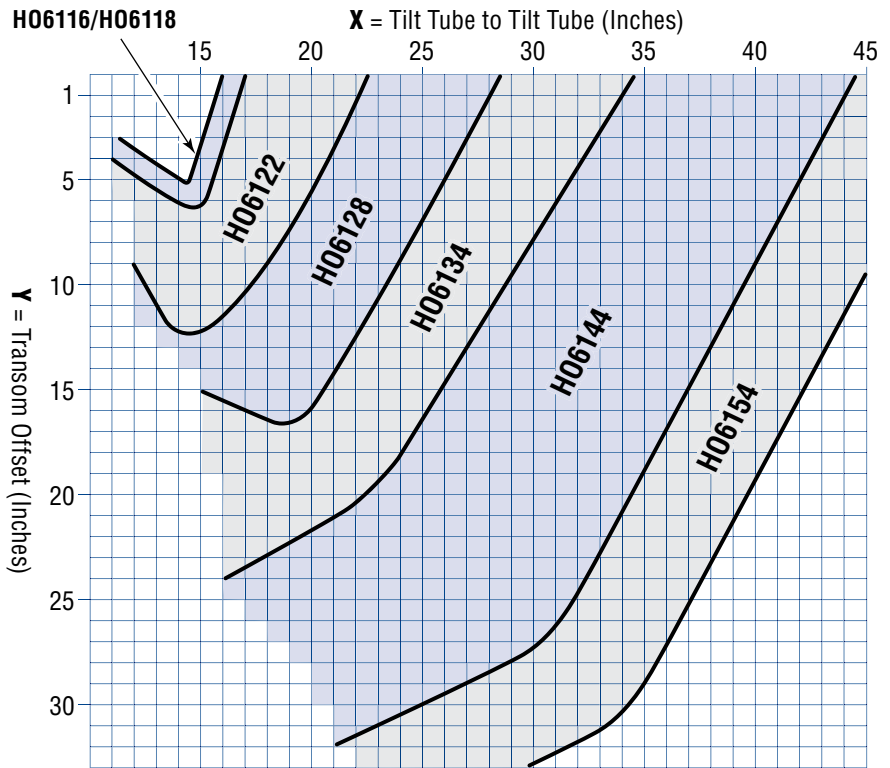
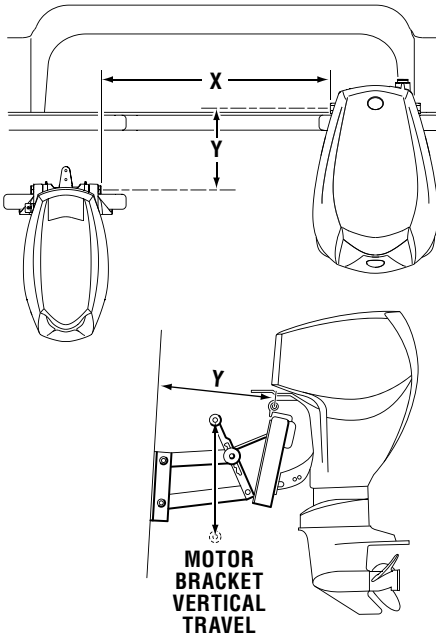
CAUTION

Contact Seastar technical support when using on BF200–BF250 engines.

Measuring Cable Length

Jackplate Vertical Travel	Add to 'X' Dimension
10" — 12"	X + 3"
13"	X + 4"
14" — 15"	X + 5"
16" — 20"	X + 6"

Table 9-12.



1. For a Kicker installed on a motor bracket, add additional length to X dimension.
2. For Main engine installed on a motor bracket add an additional 2" to X dimension.
3. **Kicker cable tie bar systems require a minimum clearance of 14" from the end of the tilt tube towards the motor side well gunnel.**
4. Longer cable lengths are available. Contact SeaStar Solutions for more information.

Figure 9-19.

⚠ CAUTION

DO NOT install on applications that are outside of the cable ranges. Doing so may lead to irreparable damage to the Kicker Cable Tie Bar.

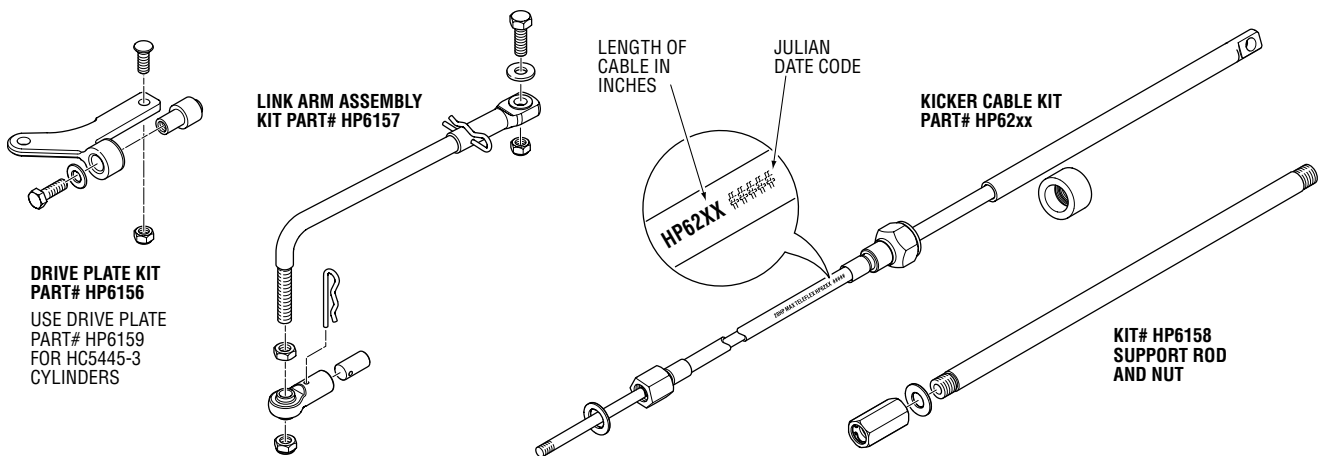


Figure 9-20.

SeaStar Autopilot Pumps and SmartSticks

SeaStar Autopilot Pump

Part# AP1219, AP1233

AP2419, AP2433

The SeaStar Autopilot pump is a fixed flow, reversible type set that uses an internal hydraulic gear pump, producing very little vibration or noise. It is offered in 12 and 24 volt configurations, as well as two different pump sizes (type 1 & type 2). It can be used as a stand alone pilot pump or can be mounted to a previously installed SeaStar Power Assist unit and can prevent the need to break into the hydraulic lines.

Features

SEASTAR
PA



- Long life DC Motor (i.e. long life brushes)
- Compact design
- Simplified installation
- Low power consumption
- ABYC, CE and J1171 compliant
- Superior corrosion resistance
- Quiet operation
- Mounting bracket included
- Stand alone or mounts to SeaStar Power Assist unit
- Replaces other 12 and 24 volt pumps

Figure 9-21.

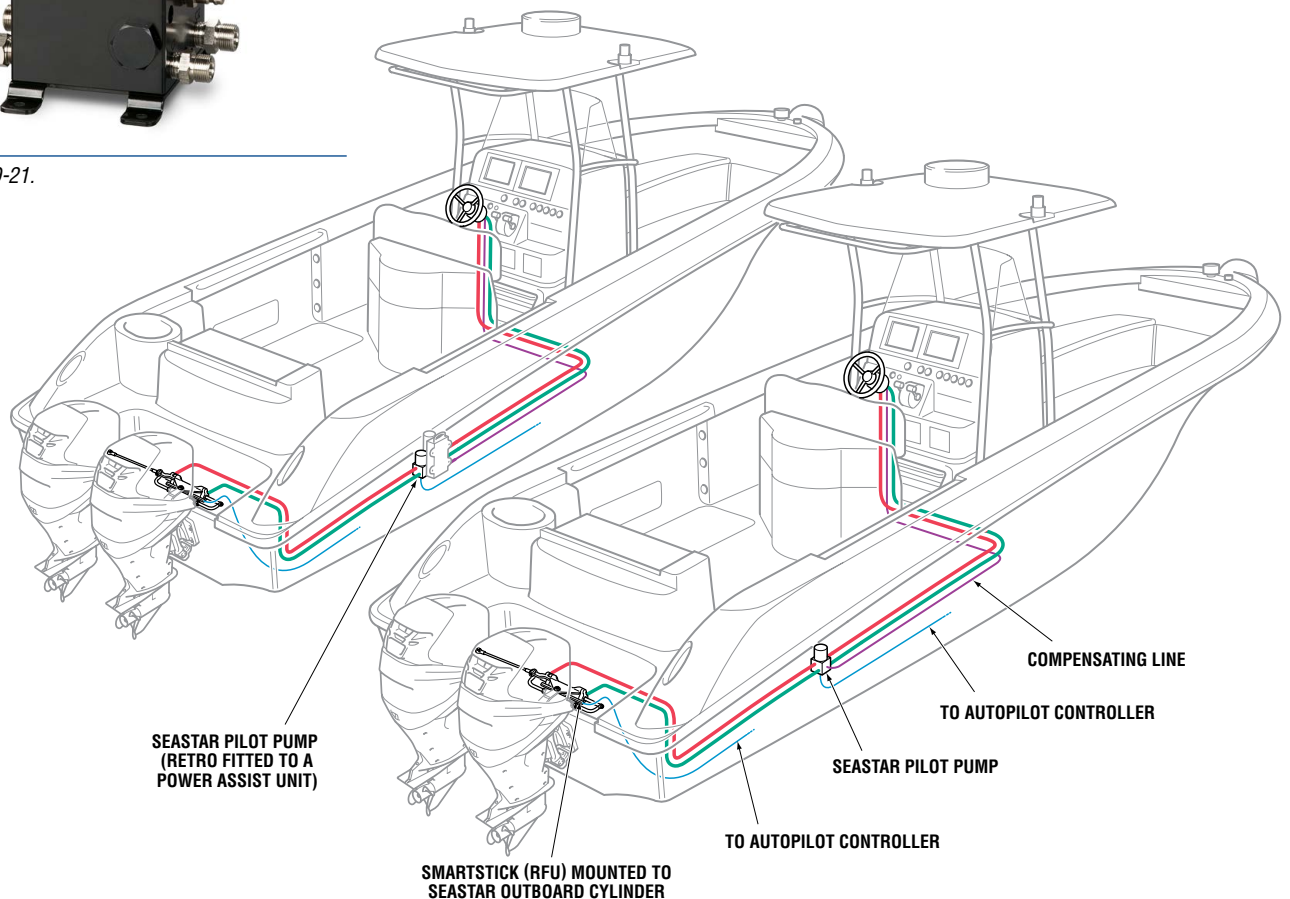


Figure 9-22.

Technical Data

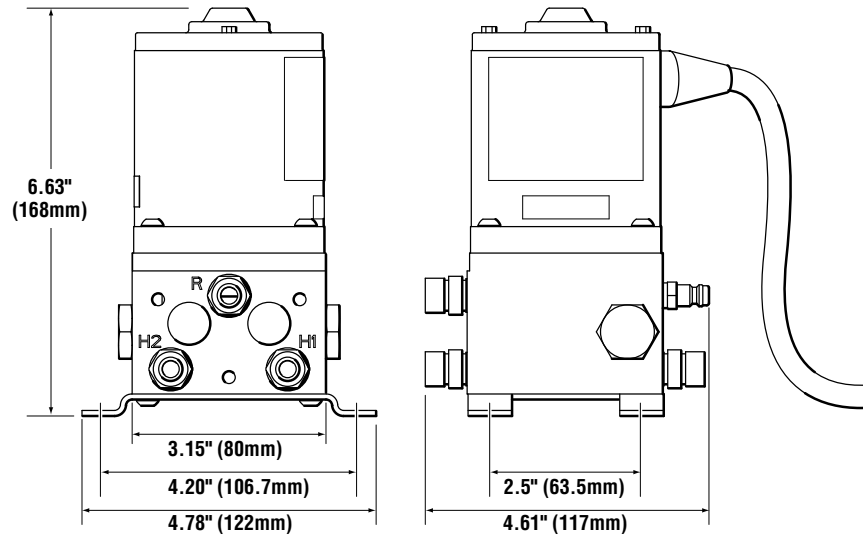


Figure 9-23.

Technical Specifications

Voltage	12 Volt or 24 Volt
Fittings	Compatible with Standard SeaStar Hoses (HO51xx etc)
Wire: Length / Gauge / Connector	24" / 12 awg / None—Bare Leads
Oil Compatibility	SeaStar Steering Fluid (MIL 5606)
Weight	4.9 lbs (2.2 kg)
Autopilot Pump Size	Type 1: 60 in ³ /min (no-load) Type 2: 100 in ³ /min (no-load)
Maximum Pressure	1000 psi
Typical Current Draw <i>(Depending on Application)</i>	12V Type 1: 4 – 8 amps 12V Type 2: 5 – 11 amps 24V Type 1: 2 – 4 amps 24V Type 2: 3 – 6 amps
Autopilot Cylinder Capacity	Type 1 4.9 in ³ - 12.5 in ³ Type 2 12.5 in ³ - 21 in ³

Table 9-12.

Ordering Information

Description	Part #
Type 1 – 12V – 60cu.in/min	AP1219
Type 2 – 12V – 100cu.in/min	AP1233
Type 1 – 24V – 60cu.in/min	AP2419
Type 2 – 24V – 100cu.in/min	AP2433

Table 9-13.

NOTE: Retrofit kit part # HA1205 will be required to mount to a PA1200-2 Power Assist Pump.

SeaStar SmartStick

Part # AR4502RM, AR4502SI
AR4502



SmartStick is a non-contact autopilot position sensor that mounts to SeaStar Solutions outboard front mount cylinders (HC5345-3, HC5358-3*).

The new SmartStick models replace the previous generation AR4102 and AR4202 models. There are three new SmartStick models available.

Figure 9-24.

* HC5358-3 must be installed on Yamaha and Evinrude engines with AR4502 series SmartSticks to ensure adequate clearance. Installing AR4502 series with HC5345 on Yamaha and Evinrude outboards may result in interference between the sensor and the cylinder.

Applications

- Non-contact sensing – no moving parts to wear
- Convenient installation – no linkages or external parts to mount
- Electrical components sealed in potting – corrosion resistant

SmartStick Enhancements Include:

- No external black box – electronics integrated into sensor body, making cable easy to route through rigging with no splicing
- 35' of cable can be trimmed to any length and jacket is labelled
- Digital Electronics are more immune to electromagnetic interference (EMI) – cleaner signal allows autopilot to perform better
- Installation of sensor is more convenient and faster
- Part Numbers are autopilot specific, no jumpers to cut
- Lower cost

Technical Specifications

AR4502 SERIES	
Range	8.0"
Resolution	0.012"
Linearity	0.048"
Repeatability	0.024"
Environmental Resitstance	<ul style="list-style-type: none"> • Salt Spray 1000 hours • IEC IP67 (Submersible to 1m) • Immune to dirt, oil, SAE Fluids • Thermal Shock and Vibration Resistant (MIL-STD810F)

Table 9-14.

Ordering Information

Model	Autopilot	Output
AR4502RM	Ray Marine Installations Only	2.2V to 2.8V
AR4502SI	SimRad Installations Only	2.8kHz to 4.0kHz
AR4502	Generic	0.5V to 4.5V

Table 9-15. HA5479 – Low Profile Magnet is required for -3 cylinders.

SEASTAR™

HYDRAULIC FLUID

⚠ WARNING



Figure 10-1. HA5430-1L, HA5440-1G, HA5458-5G.

ANY NON-APPROVED FLUID MAY CAUSE SERIOUS DAMAGE TO THE STEERING SYSTEM RESULTING IN POSSIBLE LOSS OF STEERING, CAUSING PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

Due to recent upgrades in our steering system components, SeaStar Solutions recommends use of SeaStar Steering Fluid **ONLY** in our hydraulic steering systems. SeaStar Steering Systems have been engineered and validated using our proprietary SeaStar Hydraulic Steering Fluid. SeaStar Steering fluid is engineered with a special additive package that contains anti-foaming and anti-rusting agents, anti-oxidants, viscosity stabilizers, corrosion inhibitors, wear additives as well as water emulsification additives. It is highly recommended that SeaStar Steering Fluid be used to ensure optimum system performance and safety.

Use of any non-approved fluid may result in the following;

- Higher steering effort, particularly at ambient or lower temperatures and/or over time due to steering fluid degradation and breakdown.
- Increased steering slip and/or drift resulting in lost motion.
- Foaming or air entrapment causing a bumpy feel during steering.
- High rates of moisture absorption causing internal component corrosion.
- Scratched steering cylinder bores and shafts due to contamination or elevated wear rates.
- Seal degradation — incompatibility with various proprietary seal compounds used in our products.

In an emergency, SeaStar EPS Fluid, any MD-3/4 rated ATF or MIL-PRF-5606H equivalent fluid that is filtered through a fine mesh screen can be used. The system **MUST** be thoroughly flushed as soon as possible with genuine SeaStar Steering Fluid after using an emergency fluid.

In an **EXTREME** emergency, any non-toxic, non-flammable fluid that is filtered through a fine mesh screen may provide temporary steering.

Optional Filler Kit

Part# HA5438

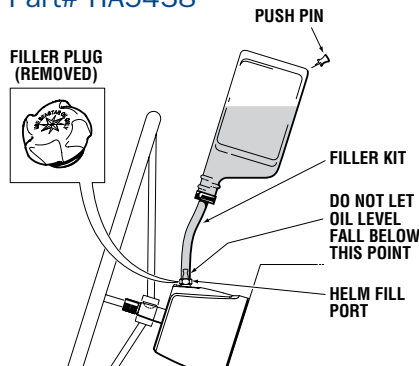


Figure 10-2.

⚠ WARNING

Use of non-standard fluids will require an immediate and complete system flush using approved fluids, by an approved steering technician.

⚠ WARNING

NEVER FILL OR MIX BRAKE FLUIDS, TRIGLYCERIDES OR POLYALKYLENE GLYCOLS WITHIN A HYDRAULIC STEERING SYSTEM.

NOTICE

SeaStar Hydraulic Steering Fluid can be used in Hynautic, BayStar and BayStar Plus steering systems.

NOTICE

Help protect your boating environment by ensuring that all used steering fluid is disposed of properly.

SEASTAR™ JAEKPLATE

JACKPLATES & PROTAP



SEASTAR™ XTREME

JACKPLATE

Features

- Utilizing high strength materials the SeaStar Xtreme Jackplates are easily capable of handling up to 400 HP engines.
- The standard SeaStar Jackplates are capable of handling up to 300 HP engines.
- Rapid hydraulic response in 8.5 seconds.
- Complete rigid engine support at full thrust.
- Easily moves engine up or down at full thrust.
- Composite bushings ensure smooth operation.
- Easy wrench access to engine bolts from side.
- Compatible with Power Pole® and Talon®.

Part Numbers

RATED FOR 300 HP	
Hydraulic Jackplate 4" Setback Standard	JP5040R*
Hydraulic Jackplate 6" Setback Standard	JP5060R
Hydraulic Jackplate 8" Setback Standard	JP5080R
Hydraulic Jackplate 10" Setback Standard	JP5100R
Hydraulic Jackplate 12" Setback Standard	JP5120R
RATED FOR 400 HP	
Hydraulic Jackplate 4" Setback Xtreme	JP5040X*
Hydraulic Jackplate 6" Setback Xtreme	JP5060X
Hydraulic Jackplate 8" Setback Xtreme	JP5080X
Hydraulic Jackplate 10" Setback Xtreme	JP5100X
Hydraulic Jackplate 12" Setback Xtreme	JP5120X

* Accessory adapter DK4600 required for installation of Power Pole® or Talon® on JP5040R and JP5040X.

Table 11-1.

Dimensions & Weights

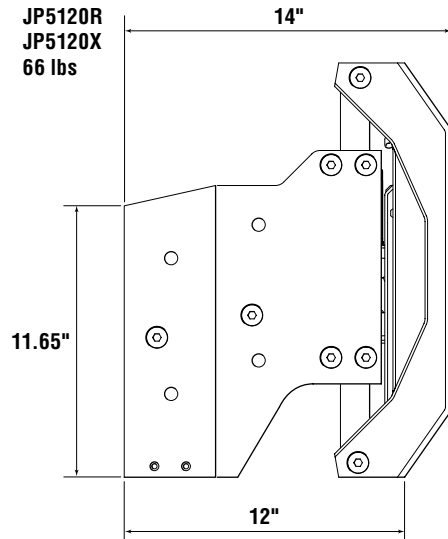
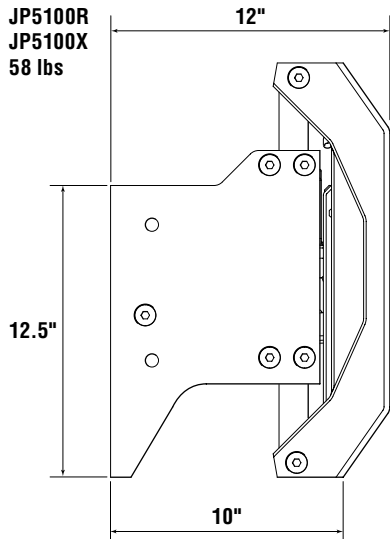
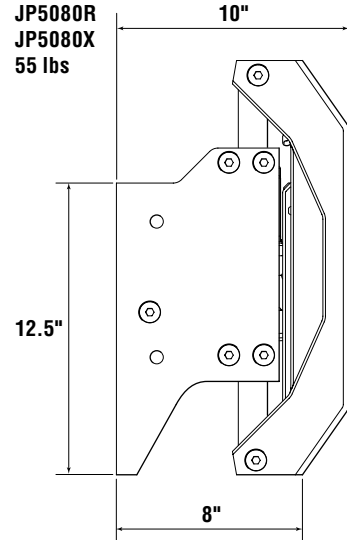
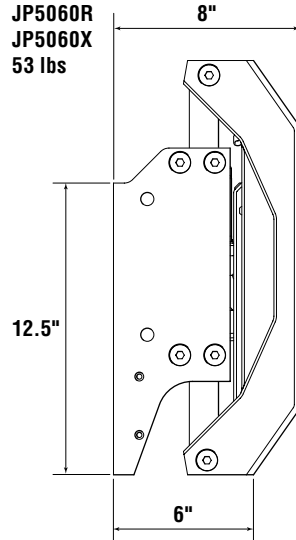
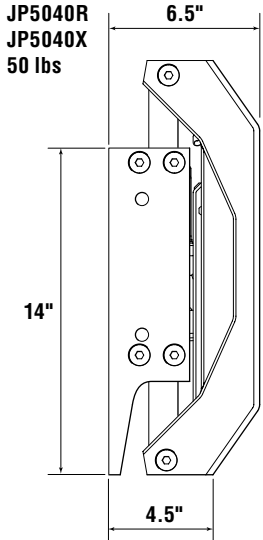
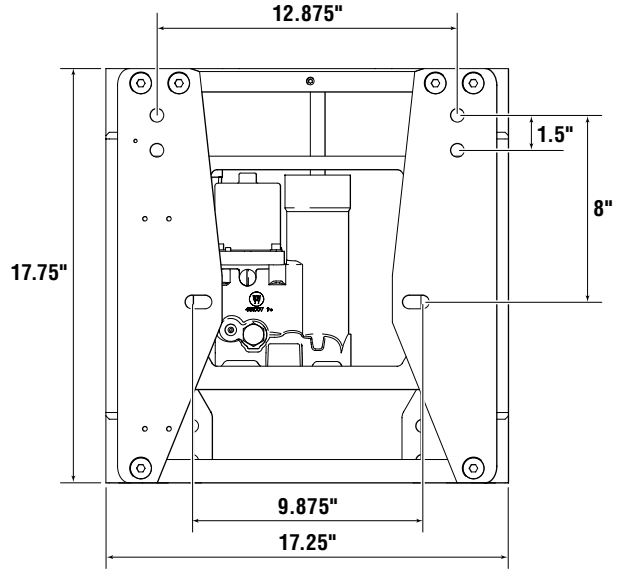
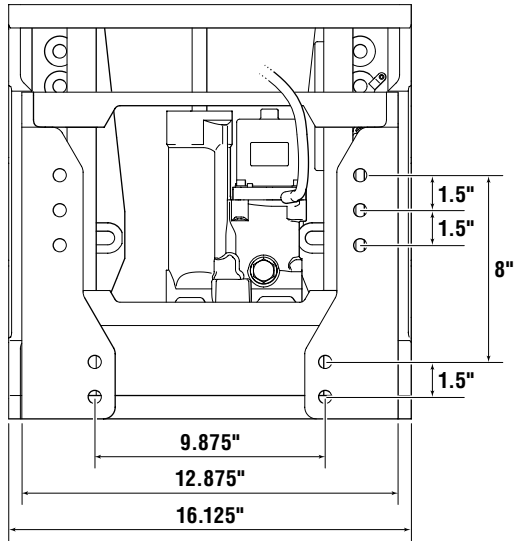


Figure 11-1.

ACCESSORIES

DESCRIPTION	PART NUMBER
Hole Shot Plate 6"	HSP5060
Hole Shot Plate 8"	HSP5080
Hole Shot Plate 10"	HSP5100
Hole Shot Plate 12"	HSP5120
Bolt Kit, 1/2–20 UNC 2.5" L, 4 pack	DK6125
Bolt Kit, 1/2–20 UNC 3.5" L, 4 pack	DK6135
Bolt Kit, 1/2–20 UNC 4.5" L, 4 pack	DK6145
Bolt Kit, 1/2–20 UNC 6.5" L, 4 pack	DK6165
Basic Rocker Switch	DK4020*
ProTrim Switch Single Function	PT1000-1P
ProTrim Switch Dual Function	PT2000-1P
SmartStick and Gauge Kit	DK4220
Gauge and Harness Kit	DK4320
Accessory Adapter	DK4600
Jackplate Replacement Relay	DK3010
Jackplate Wire Harness	DK4420
Actuator Kit, 3/8" Mount Bolt, 5/16" Socket	DK4710**
Actuator Kit, 7/16" Mount Bolt, 3/8" Socket	DK4720***
SeaStar Stabilizer Clips, (pack of 2)	HYCL-001
Transom Plate, Small, 2" x 15"	18-79987
Transom Plate, Large, 4" x 17"	18-79988

Table 11-2.

* Included with Jackplate harness.

** Used on Jackplates with serial numbers D4000-00001 to D4000-001843.

*** Used on Jackplates with serial numbers above D4000-001843 and any Jackplate serial numbers starting with JPXXXX.

Horse Power Rating

PART No.	75 HP	105 HP	115 HP	200 HP	250 HP	300 HP	350 HP	400 HP
JP5040R								
JP5060R								
JP5080R								
JP5100R								
JP5120R								
JP5040X								
JP5060X								
JP5080X								
JP5100X								
JP5120X								

Table 11-3.

Engine Lift Per Setback

With Jackplates in fully lowered position there is a prebuilt lift of 2.657" from top transom bolts to top engine bolts. On a 12° transom, the actual engine lift to water level changes as a function of a setback. See figure 11-2.

Example: Engine lift is 0" to horizontal on a 12" setback when placed on 12° transom.

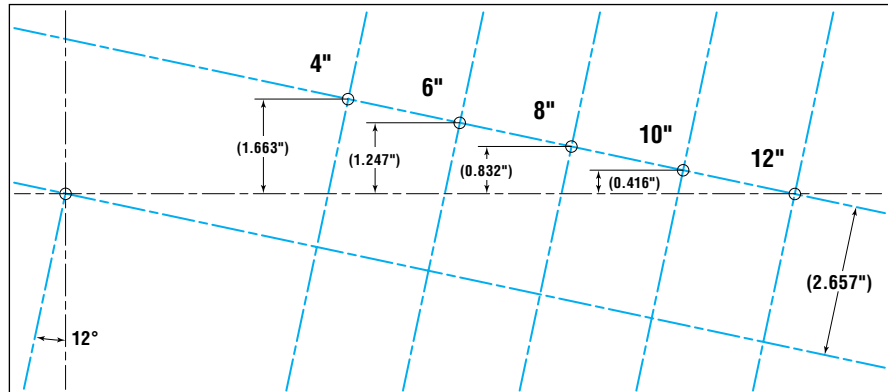
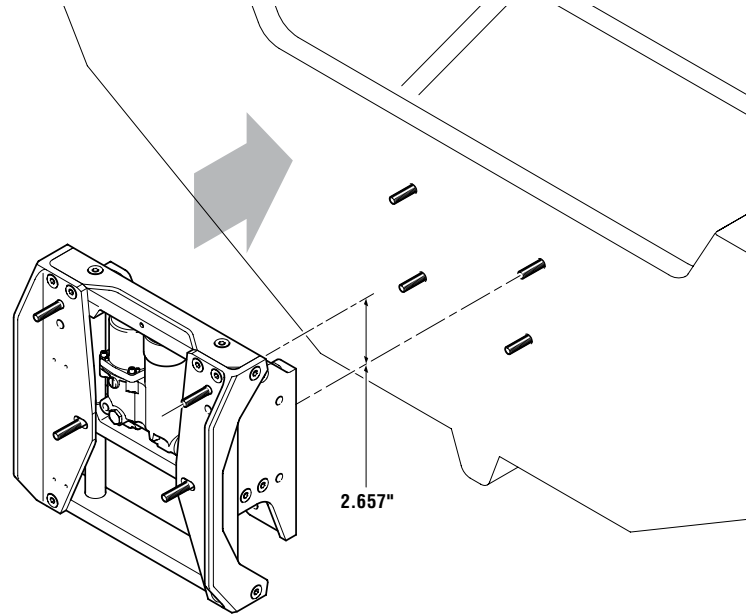


Figure 11-2.

SeaStar ProTap Engine Position Controller

ProTap offers the ultimate in outboard engine position control

- Gets your boat to max speed at the touch of a button
- Memorizes Jackplate and engine trim positions
- Provides fine Jackplate and engine trim adjustment
- Synchronizes 2 Jackplates with each other
- Provides 0–5V Jackplate height signal
- Provides engine tilt protection



Features

- Get to max speed faster with ProTap controller in Bay/Bass Mode
- Experience fast shallow water reaction time with ProTap controller in Flats Mode
- Engine tilt protection
- Synchs two Jackplates

Part Numbers

PROTAP KIT	
B-Mode ProTap	JC4010
B-Mode ProTap/SmartStick Kit	JC4110
F-Mode ProTap	JC4020
F-Mode ProTap/SmartStick Kit	JC4120
HARNESS	
ProTap, NMEA 2000	PTK5010
Yamaha, 2 wire sender	PTK5020
Yamaha, 3 wire sender	PTK5021
Mercury, Smartcraft digital sender	PTK5040
Mercury, Verado	PTK5041

Table 11-4.

B-Mode #JC4010

This mode is designed to get the boat quickly up to speed by quickly getting the Jackplate and engine trim to the pre-memorized setting set by the user.

- Two Memory Presets: Memorize your favorite Jackplate or engine trim positions by holding the switch up or down for more than 5 seconds.
- Two Memory Recall: Quickly transition to your memorized position by holding the Jackplate or engine trim switch up or down for 1–5 seconds.
- Bump Mode: Tap the Jackplate or engine trim switch up or down and the plate will move in 1/4" increments while engine trim moves in 1/20 of trim range increments.
- Bump Memory: Sequential taps on the switch will be memorized for a continuous Jackplate or engine trim movement.

F-Mode #JC4020

This mode is designed to move the plate quickly up and down in large steps for fast driving through really shallow water.

- Double tap your switch up to move the plate all the way up.
- Double tap your switch down to move the plate all the way down.
- Single tap up or down will move the plate in 2" increments from your current position.
- Continuously holding the Jackplate switch up or down will move the plate up or down for the duration the switch is engaged.

Mounting Dimensions

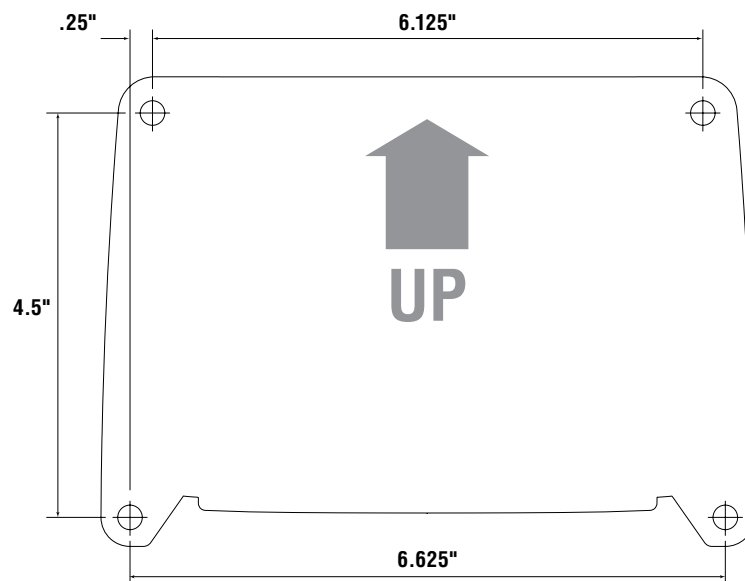


Figure 11-3.

System Schematic

An example of a Single Jackplate and Trim system schematic is shown in figure 11-4. Other options available.

TOOLS AND TECHNICAL INFO/SPECIFICATIONS

SeaStar Power Purge JR.

Part # HA5445-2

SeaStar/BayStar Power Purge Jr. is the quickest way to bleed a SeaStar/BayStar system in the field & assure a rock-solid steering feel every time! The Power Purge Jr. reduces installation and warranty costs while enhancing the quality of the boat to the end user. A typical manual fill and purge takes the average experienced installer or service technician about 30 minutes per boat — by using the Power Purge Jr. this can be reduced to 10 minutes or less.



Figure 12-1. Power Purge JR. HA5445-2.



Figure 12-2. Dual cylinder purge kit HA5461.

Advantages

- Steering feel is solid every time
- Complete Fill & Purge in 10 minutes or less
- Fast and efficient
- Easy to operate
- Screens contaminants from steering fluid
- Quick connect fittings
- Convenient portable size
- Convenient electrical hook-up utilizing 12 volt boat battery
- Optional Dual Cylinder Purging Kit HA5461 available
- Optional 50' Hose Extension Kit HA5462, for longer runs

NOTICE

Larger SeaStar Power Purge Sr. also available for high volume users, part # HA5447. Contact Technical Support for details.

Replacement Parts List

- Service kit, Kit # HP6125
- Helm adapter, Kit # HP6148 (*one per kit*)
- Quick connect fitting replacement, Kit # HP6170 (*includes all quick connect fittings, NO hose*)
- Hose/quick connect replacement, Kit # HP6171
- Power Purge motor replacement, Kit # HP6116
- Low profile cylinder bleed adapter, Kit # HP6149.



Figure 12-3. Helm adapter kit HP6148.



Figure 12-4. Service kit HP6125.



Figure 12-5. Quick connect kit HP6170.



Figure 12-6. Low profile bleed adapter HP6149.

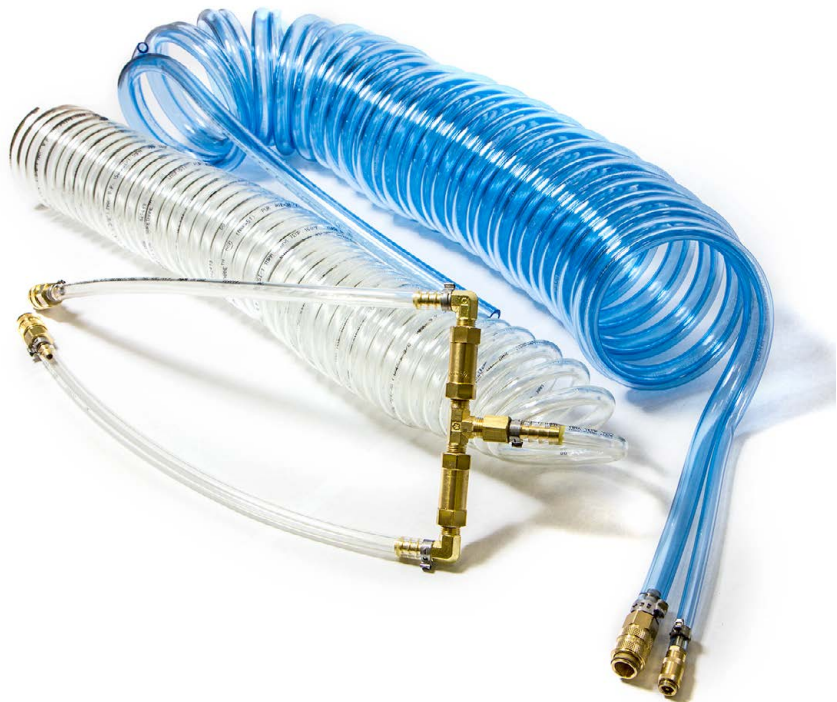


Figure 12-7. Hose/quick connect kit HP6171.



Figure 12-8. Power Purge motor kit HP6116.

SeaStar Bleed Hose

Part # HA5438

- This kit is needed to properly bleed the SeaStar Outboard steering kit
- Screws onto the SeaStar and equivalent fluid to bleed the SeaStar system
- Makes for a clean bleed when used properly

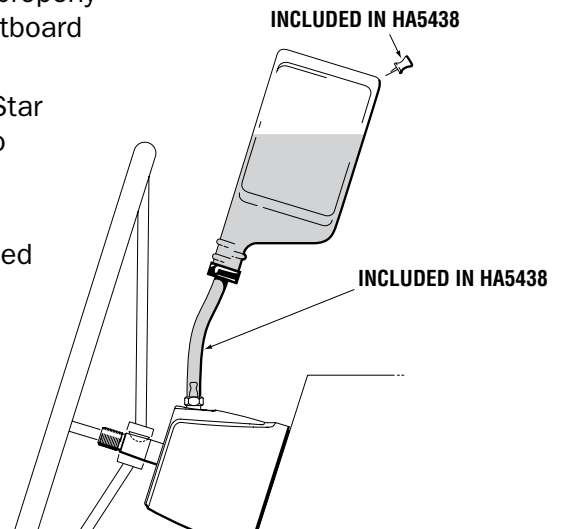


Figure 12-9.

SeaStar Remote Fill

Part # HA6450

- Can be used with ALL SeaStar Helm pumps
- Relocate your fill plug to a more convenient or hidden place

NOTICE

Requires 7/8" hole to be drilled onto dash above helm pump.

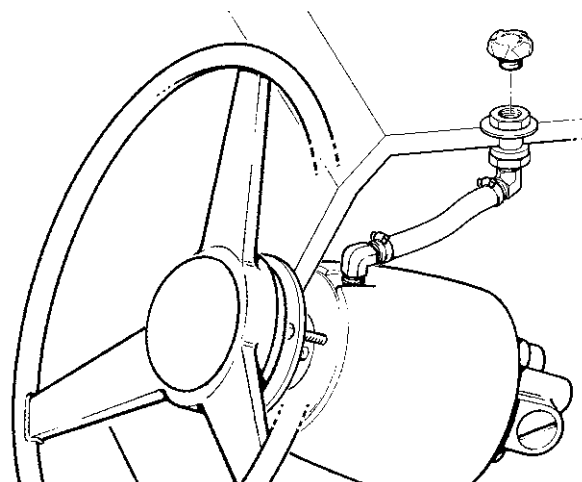
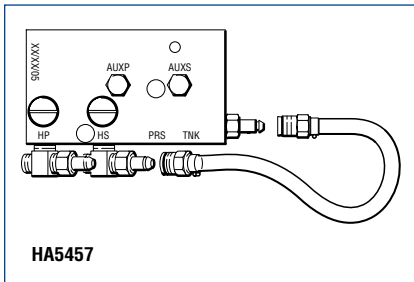


Figure 12-10.

SeaStar Power Steering Purge Kit Part # HA5457

- Makes bleeding even easier than before.
- Central bleeding location—no need to run hoses to reservoir.
- Can only be used with Power Steering Cylinders made after October 2005.



SeaStar Power Steering Purge Kit Part # HA5456

- Comes with 25' of hose to go from the steering cylinder to the reservoir.
- Makes bleeding easier and cleaner than before.

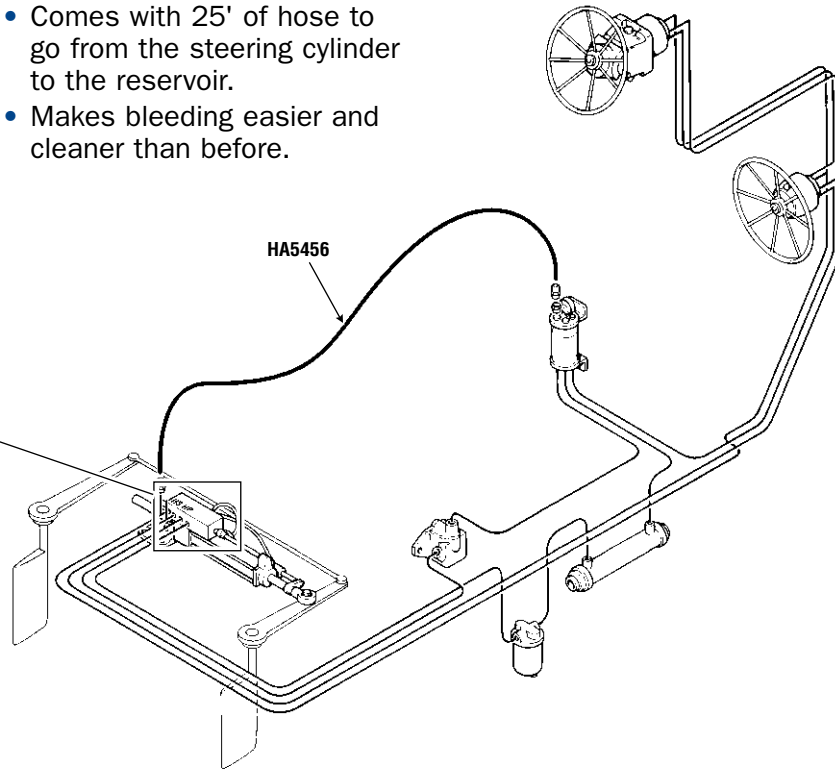


Figure 12-11.

SeaStar Helm Pump Drill Jigs

HA5466 Drill Jig for drilling mounting holes for standard SeaStar and SeaStar Pro helms. A 3 inch dashboard hole is required.

HA5467 Drill Jig for drilling mounting holes for standard SeaStar and SeaStar Pro helms where dashboard has a 3-1/4 inch hole from a previously mounted mechanical helm.

HA5468 Drill Jig for drilling mounting holes for SeaStar and SeaStar Pro Classic Tilt helms (HH6541-3, HH6542-3, HH6543-3). Also back Mount Kit (HA5418). A 4-1/2 inch dashboard hole is required.

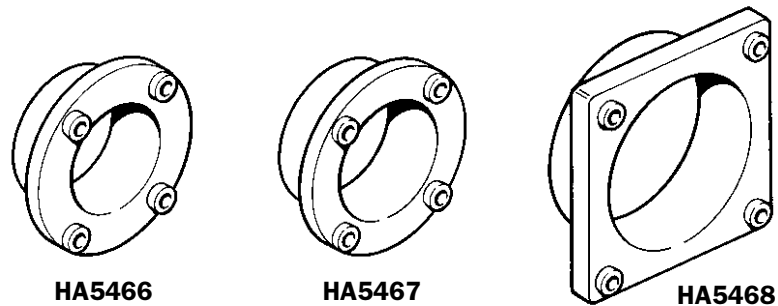


Figure 12-12.

Technical Info/Specifications

NOTICE

Contact your nearest dealer or distributor to order replacement parts.

BayStar/SeaStar Helm Pump Shaft Details

Taper: 3/4" Standard Taper (1" PER FOOT), **WHEEL SHAFT Threads:** 5/8"–18 UNF, **Key:** #606 Woodruff Key (3/16"), **PORT SIZES:** -5 ORB Hose (F).

NOTICE

Theoretical torque about pivot point at 35° rudder arc with 1000 psi (70 bar) system pressure.

Table A: BayStar/SeaStar Helm Pumps

HELM DESCRIPTION		PART NUMBER	DISPLACEMENT CU. IN./REV (cc)	RELIEF VALVE SETTING PSI (BAR)	MAXIMUM WHEEL DIA. INCHES (mm)	SEAL KIT	NOTES
BayStar	Front Mount	HH4311-3	1.1 (18.02)	1000 (70)	28 (711)	HP6032	
BayStar	Front Mount	HH4314-3	1.4 (23.0)	1000 (70)	28 (711)	HP6032	
BayStar	Sport Tilt	HH4315-3	1.4 (23.0)	1000 (70)	20 (508)	HP6032	
BayStar	Sport Plus Tilt	HH4316-3	1.4 (23.0)	1000 (70)	26 (660)	HP6032	
BayStar	Front Mount	HH4016	1.6 (26.2)	800 (55)	26 (660)	HS5147	<i>Discontinued</i>
BayStar	Sport Tilt	HH4015	1.6 (26.2)	800 (55)	26 (660)	HS5147	<i>Discontinued</i>
BayStar Plus	Front Mount	HH4514-3	1.4 (23.0)	1000 (70)	28 (711)	HP6032	
BayStar Plus	Sport Tilt	HH4513-3	1.4 (23.0)	1000 (70)	28 (711)	HP6032	
SeaStar	Front Mount	HH5269-3	1.4 (23.0)	1000 (70)	28 (711)	HP6032	
SeaStar	Front Mount	HH5271-3	1.7 (27.8)	1000 (70)	28 (711)	HP6032	
SeaStar	Front Mount	HH5273-3	2.0 (33.0)	1000 (70)	28 (711)	HP6032	
SeaStar	Front Mount	HH5272-3	2.4 (39.3)	1000 (70)	28 (711)	HP6032	
SeaStar	Front Mount	HH5217-3	1.7 (27.8)	1000 (70)	28 (711)	HP6037	<i>Commercial Helm (Stainless Shaft)</i>
SeaStar	Front Mount	HH5224-3	2.4 (39.3)	1000 (70)	28 (711)	HP6037	<i>Commercial Helm (Stainless Shaft)</i>
SeaStar	Front Mount	HH5285-3	3.0(46.16)	1000 (70)	28 (711)	HP6032	
SeaStar Pro	Front Mount	HH5779-3	1.7 (27.8)	1500 (103)	28 (711)	HP6032	
SeaStar Pro	Front Mount	HH5770-3	2.0 (33.0)	1500 (103)	28 (711)	HP6032	
SeaStar Pro	Front Mount	HH5772-3	2.4 (39.3)	1500 (103)	28 (711)	HP6032	
SeaStar Pro	Front Mount	HH5218-3	1.7 (27.8)	1500 (103)	28 (711)	HP6032	<i>Commercial Helm (Stainless Shaft)</i>
SeaStar	Rear Mount	HH5260-3	1.4 (23.0)	1000 (70)	28 (711)	HP6032	
SeaStar	Rear Mount	HH5261-3	1.7 (27.8)	1000 (70)	28 (711)	HP6032	
SeaStar	Rear Mount	HH5263-3	2.0 (33.0)	1000 (70)	28 (711)	HP6032	
SeaStar	Rear Mount	HH5262-3	2.4 (39.3)	1000 (70)	28 (711)	HP6032	
SeaStar	Rear Mount	HH5265-3	3.0 (49.1)	1000 (70)	28 (711)	HP6032	
SeaStar Pro	Rear Mount	HH5778-3	1.7 (27.8)	1500 (103)	28 (711)	HP6032	
SeaStar Pro	Rear Mount	HH5771-3	2.0 (33.0)	1500 (103)	28 (711)	HP6032	
SeaStar	Sport Tilt	HH6193-3	1.4 (23.0)	1000 (70)	20 (508)	HP6032	<i>New Product</i>
SeaStar	Sport Tilt	HH6191-3	1.7 (27.8)	1000 (70)	20 (508)	HP6032	<i>Replaces HH5291</i>
SeaStar	Sport Tilt	HH6145-3	2.0 (33.0)	1000 (70)	20 (508)	HP6032	<i>Replaces HH5745</i>
SeaStar	Sport Tilt	HH6192-3	2.4 (39.3)	1000 (70)	20 (508)	HP6032	<i>Replaces HH5292</i>
SeaStar Pro	Sport Tilt	HH6189-3	1.7 (27.8)	1500 (103)	20 (508)	HP6032	<i>Replaces HH5289</i>
SeaStar Pro	Sport Tilt	HH6190-3	2.0 (33.0)	1500 (103)	20 (508)	HP6032	<i>Replaces HH5190</i>
SeaStar	Sport Plus Tilt	HH6491-3	1.7 (27.8)	1000 (70)	20 (508)	HP6032	<i>New Product</i>
SeaStar	Sport Plus Tilt	HH6445-3	2.0 (33.0)	1000 (70)	20 (508)	HP6032	<i>New Product</i>
SeaStar	Sport Plus Tilt	HH6492-3	2.4 (39.3)	1000 (70)	20 (508)	HP6032	<i>New Product</i>
SeaStar	Sport Plus Tilt	HH6345-3	2.0 (33.0)	1000 (70)	20 (508)	HP6032	<i>Splined Shaft</i>
SeaStar Pro	Sport Plus Tilt	HH6489-3	1.7 (27.8)	1500 (103)	20 (508)	HP6032	
SeaStar Pro	Sport Plus Tilt	HH6490-3	2.0 (33.0)	1500 (103)	20 (508)	HP6032	
SeaStar	Classic Tilt	HH6544-3	1.4 (23.0)	1000 (70)	20 (508)	HP6032	<i>Replaces HH5775</i>
SeaStar	Classic Tilt	HH6541-3	1.7 (27.8)	1000 (70)	20 (508)	HP6032	<i>Replaces HH5741</i>
SeaStar	Classic Tilt	HH6543-3	2.0 (33.0)	1000 (70)	20 (508)	HP6032	<i>Replaces HH5743</i>
SeaStar	Classic Tilt	HH6542-3	2.4 (39.3)	1000 (70)	20 (508)	HP6032	<i>Replaces HH5742</i>
SeaStar Pro	Classic Tilt	HH6573-3	1.7 (27.8)	1500 (103)	20 (508)	HP6032	<i>Replaces HH5773</i>
SeaStar Pro	Classic Tilt	HH6574-3	2.0 (33.0)	1500 (103)	20 (508)	HP6032	<i>Replaces HH5774</i>

Table 12-1.

Table B: Hynautic Helm Pumps

HELM DESCRIPTION	PART NUMBER	DISPLACEMENT CU. IN./REV (cc)	SHAFT STYLE	KEY WAY	SEAL KIT
Hynautic	h-21	2.75 (45.1)	1" Straight	1/4" Square	HS-02
Hynautic	H-22	2.00 (32.8)	1" Straight	1/4" Square	HS-02
Hynautic	H-29	2.75 (45.1)	1" Straight	1/4" Square	HS-02
Hynautic	H-25	2.75 (45.1)	3/4" Tapered	#9 Woodruff	HS-02
Hynautic	H-26	2.00 (32.8)	3/4" Tapered	#9 Woodruff	HS-02
Hynautic	H-41	5.50 (90.1)	1" Straight	1/4" Square	HS-04
Hynautic	H-42	4.00 (65.5)	1" Straight	1/4" Square	HS-04
Hynautic	H-42-2	4.00 (65.5)	3/4" Tapered	#9 Woodruff	HS-04

Table 12-2.

Table C: Capilano Helm Pumps

HELM DESCRIPTION	PART NUMBER	DISPLACEMENT CU. IN. (cc)	SHAFT STYLE	KEY WAY	SEAL KIT
Capilano	1250V	1.7–3.4 (27.8–55.7)	3/4" Tapered	3/16"	HS5161
Capilano	1275V	2.7–5.4 (44.2–88.4)	3/4" Tapered	3/16"	HS5161
Capilano	1350	8.00 (131.0)	1-1/4" Straight	3/16"	HS5171

Table 12-3.

Table D: BayStar/SeaStar/Hynautic Outboard Cylinders

MAKER	PART NUMBER	CYLINDER TYPE	SHAFT DIA IN (mm)	STROKE IN (mm)	SEAL KIT	VOLUME CU. IN (cc)	NOTES
BayStar	HC4600	Outboard	.63 (16.0)	8 (203)	HP5608/HP5607	7.24 (118.6)	<i>Discontinued</i>
BayStar	HC4645-3	Outboard	.63 (16.0)	8 (203)	HP4600	7.24 (118.6)	
BayStar	HC4647-3	Outboard	.63 (16.0)	8 (203)	HP4600	7.24 (118.6)	
BayStar	HC4648-3	Outboard	.63 (16.0)	8 (203)	HP4600	7.24 (118.6)	
BayStar	HC4658-3	Outboard	.63 (16.0)	8 (203)	HP4600	7.24 (118.6)	
SeaStar	HC5345-3	Outboard	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	
SeaStar	HC5347-3	Outboard	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	
SeaStar	HC5348-3	Outboard	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	
SeaStar	HC5358-3	Outboard	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	
SeaStar Pro	HC6345-3	Outboard Pro	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	
SeaStar Pro	HC6358-3	Outboard Pro	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	
SeaStar	HC6750	Outboard Tournament	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	<i>Discontinued (See page 3-11)</i>
SeaStar	HC6751	Outboard Tournament	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	<i>Discontinued (See page 3-11)</i>
SeaStar	HC6752	Outboard Tournament	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	<i>Discontinued (See page 3-11)</i>
SeaStar	HC6753	Outboard Tournament	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	<i>Discontinued (See page 3-11)</i>
SeaStar	HC6754	Outboard Tournament	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	<i>Discontinued (See page 3-11)</i>
SeaStar	HC6755	Outboard Tournament	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	<i>Discontinued (See page 3-11)</i>
SeaStar	HC5370-3	Outboard Side Mount	.50 (12.7)	8 (203)	HP6088	8.3 (135.2)	<i>Replaces HC5370-71</i>
SeaStar	HC5380-3	Outboard Splashwell	.50 (12.7)	9 (228)	N/A	9.3 (152.1)	<i>Replaces HC5380</i>
SeaStar	HC5375-3	Outboard Catamaran	.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	
SeaStar	HC5343	Outboard Cat Fixed	.75 (19.0)	10 (254)	HS5157	8.13 (133.2)	
SeaStar	HC5445-3	Outboard Limited Stroke	.75 (19.0)	6.75 (171)	HS5157	7.04 (115)	
SeaStar	HC6845	Outboard Tournament	.875 (22.2)	8 (203)	HP6160	8.34 (136.6)	
SeaStar	HC6845S	Outboard Tournament	.875 (22.2)	8 (203)	HP6160	8.34 (136.6)	
SeaStar	HC6850	Tournament Limited Stroke	.875 (22.2)	7 (178)	HP6160	8.34 (136.6)	
Hynautic	K-6-NI	Outboard	.875 (22.2)	7.75 (197)	KS-19	9.00	
SeaStar	HC5374-3	Outboard Cat Fixed	.75 (19.0)	10 (254)	KS-06	13.3 (217.9)	
SeaStar	HC5340-42	Outboard Slide	.75 (19.0)	10 (254)	HS5157	8.34 (133.2)	<i>Discontinued</i>
SeaStar	HC5342	Outboard Slide	.75 (19.0)	10 (254)	HS5157	8.34 (133.2)	<i>Discontinued</i>

Table 12-4.

NOTICE

Theoretical torque about pivot point at 35° articulation with 1000 psi (70 bar) system pressure.

Table E: SeaStar Sterndrive Cylinders (For NEW -3 cylinders see table H.)

MAKER	PART NUMBER	MODEL NUMBER	BORE DIA IN (mm)	SHAFT DIA IN (mm)	STROKE IN (mm)	SEAL KIT	TORQUE IN-LB (Kg-m)	VOLUME CU. IN. (cc)	NOTES
SeaStar	HC5311	BA125-6.25ATM	1.25 (31.7)	0.63 (16.0)	6.25 (15.9)	HS5154	N/A	5.66 (92.7)	Obsolete
SeaStar	HC5332	BA135-7EM	1.35 (34.9)	.625 (15.9)	7 (178)	HS5155	5741 (66.1)	8.3 (135.2)	
SeaStar	HC5327	BA135-8EM	1.35 (34.9)	.63 (16.0)	8 (203)	HS5155	6557 (75.5)	9.5 (155.4)	Obsolete
SeaStar	HC5326	BA150-7EM	1.50 (38.1)	.625 (15.9)	7 (178)	HS5156	8853 (102.0)	8.3 (135.2)	Replaced by HC5326-3
SeaStar	HC5328	125-8EM	1.25 (31.7)	.50 (12.7)	8 (203)	HS5154	7142 (82.3)	8.3 (135.2)	Replaced by HC5328-3
SeaStar	HC5329	125-8VPEM	1.25 (31.7)	.50 (12.7)	8 (203)	HS5154	N/A	8.3 (135.2)	Obsolete
SeaStar	HC5331	92VPS	1.25 (31.7)	.50 (12.7)	8 (203)	HS5154	N/A	8.3 (135.2)	Replaced by HC5331-3
SeaStar	HC5330	BA125-8EMV	1.25 (31.7)	.50 (12.7)	8 (203)	HS5154	7142 (82.3)	8.3 (135.2)	Replaced by HC5330-3

Table 12-5.

Table F: SeaStar/Capilano Inboard Cylinders (For NEW -3 cylinders see table H.)

MAKER	PART NUMBER	MODEL NUMBER	BORE DIA IN (mm)	SHAFT DIA IN (mm)	STROKE IN (mm)	SEAL KIT	TORQUE IN-LB (Kg-m)	VOLUME CU. IN. (cc)	NOTES
SeaStar	HC5303	BA125-3ATM	1.25 (31.7)	.63 (16.0)	3 (76)	HS5154		3.12 (51)	Replaced by HC5303-3
SeaStar	HC5312 & HC5312-2	BA125-7ATM	1.25 (31.7)	.63 (16.0)	7 (178)	HS5154	5025 (57.9)	7.2 (118)	Replaced by HC5312-3
SeaStar	HC5313	BA135-7ATM	1.35 (34.9)	.63 (16.0)	7 (178)	HS5155	5741 (66.1)	8.3 (136)	Replaced by HC5313-3
SeaStar	HC5314	BA150-7ATM	1.50 (38.1)	.63 (16.0)	7 (178)	HS5156	7117 (82.0)	10.2 (167)	Replaced by HC5314-3
SeaStar	HC5318	BA150-7TM	1.50 (38.1)	.63 (16.0)	7 (178)	HS5182	7117 (82.0)	10.2 (167)	Brass Cylinder
SeaStar	HC5319	BA175-7TM	1.75 (44.4)	.75 (19.0)	7 (178)	HS5183	9569 (110.2)	13.7 (225)	Brass Cylinder
SeaStar	HC5369	BA150-9TM	1.50 (38.1)	.63 (16.0)	9 (229)	HS5182	9375 (107.7)	13.1 (215)	Brass Cylinder
Capilano	HC5349	BA150-7TM	1.50 (38.1)	.63 (16.0)	7 (178)	HS5182	7117 (82.0)	10.2 (167)	Brass Cylinder
Capilano	HC5350	BA175-7TM	1.75 (44.4)	.75 (19.0)	7 (178)	HS5183	9569 (110.2)	13.7 (225)	Brass Cylinder
Capilano	HC5351	BA200-7TM	2.00 (50.8)	.75 (19.0)	7 (178)	HS5184	13200 (151)	18.9 (310)	Brass Cylinder
Capilano	HC5373	BA175-9TM	1.75 (44.4)	.75 (19.0)	9 (229)	HS5183	12600 (145.5)	17.7 (290)	Brass Cylinder
Capilano	HC5378	BA200-11TM	2.00 (50.8)	1 (25.4)	11 (279)	HS5185	18500 (213.1)	26.0 (426)	Brass Cylinder
Capilano	HC5379	BA200-11TMC	2.00 (50.8)	1 (25.4)	11 (279)	HS5185	18500 (213.1)	26.0 (426)	Brass Cylinder Clevis Connection
SeaStar	HC5802	BA200-9TM	2.00 (50.8)	1 (25.4)	9 (229)	HS5198	15140 (174.4)	21.25 (345)	Brass Cylinder
SeaStar	HC5804	BA200-11TM	2.00 (50.8)	1 (25.4)	11 (279)	HS5198	18500 (213.1)	26.0 (426)	Brass Cylinder

Table 12-6.

Table G: Hynautic Cylinders

MAKER	PART NUMBER	CYLINDER TYPE	SHAFT DIA IN (mm)	STROKE IN (mm)	SEAL KIT	VOLUME CU. IN. (cc)	NOTES
Hynautic	K-1	N/A	.75 (19.0)	9 (229)	KS-11	11.9 (195)	Replaced by HC5369
Hynautic	K-2	N/A	.75 (19.0)	9 (229)	KS-12	17.7 (290)	Replaced by HC5373
Hynautic	K-3	N/A	.875 (22.2)	9 (229)	KS-13, or KS-17	22.9 (375)	Replaced by HC5802
Hynautic	K-4	N/A	.875 (22.2)	12 (305)	KS-13, or KS-17	30.5 (500)	Replaced by HC5378
Hynautic	K-5	Unbalanced	.875 (22.2)	9 (229)	KS-15	15.9 (261)	
Hynautic	K-6	N/A	.875 (22.2)	7.75 (197)	KS-19	9 (147)	
Hynautic	K-8	N/A	1 (25.4)	9.5 (241)	KS-09 or KS-18	39.2 (642)	Replaced by HC5806
Hynautic	K-9	N/A	1 (25.4)	14.5 (168)	KS-09 or KS-18	55 (901)	
Hynautic	K-10	N/A	.75 (19.0)	9.5 (241)	KS-07	7.5 (123)	Replaced by HC53XX
Hynautic	K-11	Unbalanced	.75 (19.0)	9 (229)	KS-01	11 (117)	Replaced by HC5370-3
Hynautic	K-12	Unbalanced	.75 (19.0)	7 (178)	KS-01	8.6 (141)	Replaced by HC5370-3
Hynautic	K-13	N/A	.75 (19.0)	9 (229)	KS-01	11 (117)	Replaced by HC5380-3
Hynautic	K-14	N/A	.75 (19.0)	7 (178)	KS-01	8.6 (141)	Replaced by HC5380-3
Hynautic	K-18	N/A	.75 (19.0)	7 (178)	KS-02	7 (115)	Replaced by HC5322-3
Hynautic	K-19	N/A	.75 (19.0)	9 (229)	KS-02	9 (147)	Replaced by HC5323-3

Table 12-7.

Table H: NEW -3 Steering Cylinders

MAKER	PART NUMBER	MODEL NUMBER	BORE DIA IN (mm)	SHAFT DIA IN (mm)	STROKE IN (mm)	SEAL KIT	TORQUE IN-LB (Kg-m)	VOLUME CU. IN. (cc)	NOTES
SeaStar	HC5303-3	BA125-3ATM	1.25 (31.7)	.63 (16.0)	3 (76)	HP6026	N/A	3.12 (51)	
SeaStar	HC5312-3	BA125-7ATM	1.25 (31.7)	.63 (16.0)	7 (178)	HP6026	5025 (57.9)	7.2 (118)	
SeaStar	HC313-3	BA135-7ATM	1.35 (34.9)	.63 (16.0)	7 (178)	HP6025	5741 (66.1)	8.3 (136)	
SeaStar	HC5314-3	BA150-7ATM	1.50 (38.1)	.63 (16.0)	7 (178)	HP6025	7117 (82.0)	10.2 (167)	
SeaStar	HC5326-3	BA150-7EM	1.50 (38.1)	.63 (16.0)	7 (178)	HP6086	8853 (102.0)	8.3 (136.2)	
SeaStar	HC5328-3	125-8EM	1.25 (31.7)	.50 (12.7)	8 (203)	HP6087	7142 (82.3)	8.3 (136.2)	
SeaStar	HC5329-3	125-8VPEM	1.25 (31.7)	.50 (12.7)	8 (203)	HP6027	N/A	8.3 (136.2)	
SeaStar	HC5331-3	125-8EM 92VPS	1.25 (31.7)	.50 (12.7)	8 (203)	HP6027	N/A	8.3 (136.2)	
SeaStar	HC5330-3	BA125-8EMV	1.25 (31.7)	.50 (12.7)	8 (203)	HP6027	7142 (82.3)	8.3 (136.2)	

Table 12-8.

Quick Reference Turns Chart

BayStar Helm Pumps Turns

GOOD

OPTIMAL

		BAYSTAR HELM DISPLACEMENT (in ³ /rev)			
		1.1	1.4		
OUTBOARD CYLINDERS	DISP. (in³)				
HC4645-3 – SINGLE	7.17	6.6	5.2		
INBOARD CYLINDERS	DISP. (in³)				
BA125-6.25	6.7	6.1	4.8		
BA100-6	3.53	3.2	2.5		

Table 12-9.

SeaStar Helm Pumps Turns

GOOD

OPTIMAL

		SEASTAR HELM DISPLACEMENT (in ³ /rev)				
		1.4	1.7	2.0	2.4	3.0
FRONT MOUNT, OUTBOARD PIVOT CYLINDERS***	DISP. (in³)					
SINGLE	8.3	5.9	4.9	4.2	3.5	2.8
DUAL**	16.6	11.9	9.8	8.3	6.9	5.5*
TRIPLE**	24.9	17.8	14.6	12.5	10.4	8.3*
QUAD**	33.2	23.7	19.5	16.6	13.8	11.1*
INBOARD CYLINDERS	DISP. (in³)					
BA125-7	7.2	5.1	4.2	3.6	3.0	2.4*
BA135-7	8.2	5.9	4.8	4.1	3.4	2.7*
BA150-7	10.2	7.3	6.0	5.1	4.3	3.4*
BA175-7	13.7	9.8	8.1	6.9	5.7	4.6*
BA150-9	13.1	9.4	7.7	6.6	5.5	4.4*
BA175-9	17.7	12.6	10.4	8.9	7.4	5.9*
BA200-7	18.9	13.5	11.1	9.5	7.9	6.3*
BA200-9	21.25	15.2	12.5	10.6	8.9	7.1*
BA200-11	29.7	21.2	17.5	14.9	12.4	9.9

Table 12-10.

Capilano Helm Pumps Turns

GOOD

OPTIMAL

		CAPILANO HELM DISPLACEMENT (in ³ /rev)				
		1250V MIN	1250V MAX	1275 MIN	1275 MAX	1350
FRONT MOUNT, OUTBOARD PIVOT CYLINDERS***	DISP. (in³)	1.7	3.4	2.7	5.4	8.0
SINGLE	8.3	4.9	2.4	3.1	1.5	1.0
DUAL**	16.6	9.8	4.9	6.1	3.1	2.1
TRIPLE**	24.9	14.6*	7.3*	9.2*	4.6*	3.1
QUAD**	33.2	19.5*	9.5*	12.3*	6.1*	4.2
INBOARD CYLINDERS	DISP. (in³)					
BA125-7	7.2	4.2	2.1	2.7	1.3	0.9
BA135-7	8.2	4.8	2.4	3.0	1.5	1.0
BA150-7	10.2	6.0	3.0	3.8	1.9	1.3
BA175-7	13.7	8.1*	4.0*	5.1	2.5	1.7
BA150-9	13.1	7.7*	3.9*	4.9	2.4	1.6
BA175-9	17.7	10.4*	5.2*	6.6*	3.3*	2.2
BA200-7	18.9	11.1*	5.6*	7.0*	3.5*	2.4
BA200-9	21.25	12.5*	6.25*	7.9*	3.9*	2.7
BA200-11	29.7	17.5	8.7	11.0*	5.5*	3.7

Table 12-11.

* Any system using a helm greater than 2.4 in 3 /rev & Power Assist , requires dual SPA's in parallel.
 ** Displacement is total effective cylinder volume (assumes cylinders are plumbed in parallel not series).
 *** Includes Tournament Series and -3 outboard cylinders.

Rudder Torque Data Sheet

Name: _____

Contact: _____

Displacement Hull:..... Yes No

Planning Hull: Yes No

Sail Boat:..... Yes No

Catamaran: Yes No

Vessel – Length: ft.

Vessel – Make/Model: _____

Vessel – Top Speed: Knots

Vessel – Cruising Speed: Knots

Vessel – Displacement:

Vessel – Use:

Number of Engines:.....

Each Engine Shaft Horsepower HP

Prop. Diameter: in.

Rudder Arc: (Midship to Hardover)..... Degrees

Number of Rudders:.....

Rudder Cross Section:

Foil Flat Plate Other (please specify)

Estimated load per rudder:..... ft-lbs.

(It is suggested that you confirm load with your Naval Architect.)

Perpendicular distance from the rudder shaft to the propeller: ft. ____ in.

(See figure 12-13, dimension 'A'.)

Distance parallel to the rudder shaft from rudder base to the center of lower rudder bearing..... ft. ____ in.

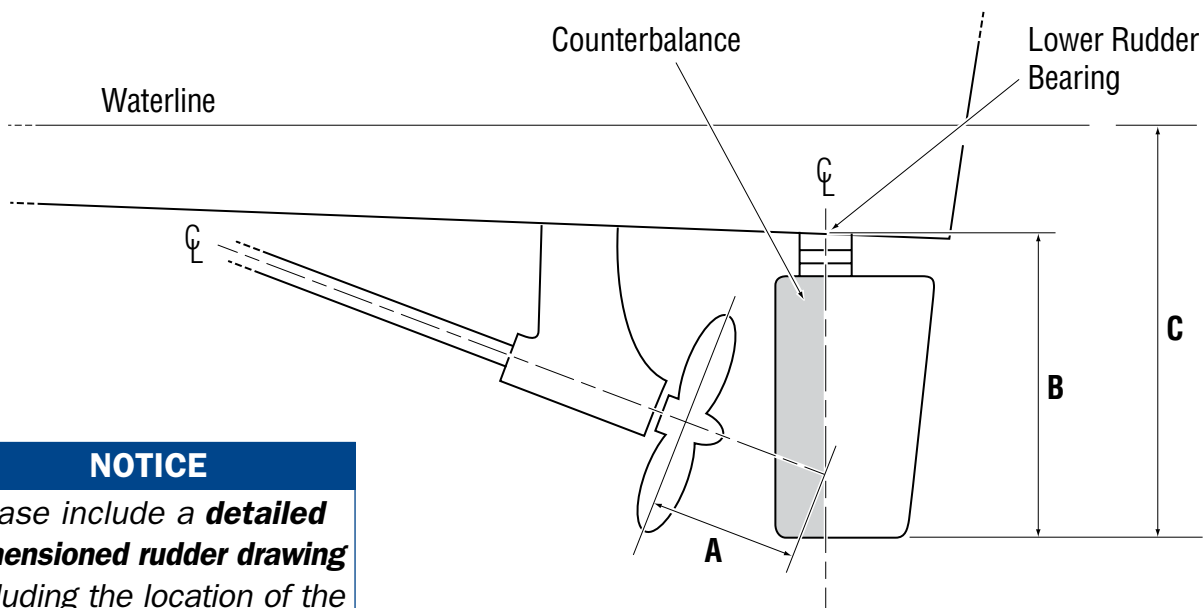
(See figure 12-13, dimension 'B'.)

Perpendicular distance from the waterline to the rudder base:..... ft. ____ in.

(See figure 12-13, dimension 'C'.)

Rudder drawing included:..... Yes

(See notice below left.)



NOTICE

Please include a **detailed dimensioned rudder drawing** including the location of the rudder post. This **MUST** be provided to get a steering system recommendation.

Figure 12-13.

Print/scan COMPLETED form & detailed dimensioned rudder drawing.