

# **Hydraulic Steering System For Stern Drive**

**Manual for Owner, Installer**

**MS 250S TYPE**



**SEAFIRST**  
ENGINEERING

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Manual Version : SCSM-250-Ver.1

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## 1. Introduction

On board the boat, correct operation and handling according to this manual is essential at any time to assure the safety and the proper function. Incorrect operation and /or handling without fully understanding the contents of the manual can cause irreparable damage or fatal accident in the worst case. Read this manual carefully to have good understanding on the contents before setting out to sea.

- Read this manual carefully to have good understanding on the contents
- Always bring this manual with you to the boat, and keep it where it is readily available.
- Pay attention that the manual will not be lost or contaminated while not in use.
- In case of resale or transfer of the system, be sure to give this manual to the new owner.
- Please note that the illustration and/or contents of this manual may partly differ from the actual product due to the specification change. Etc.

### • Notice to Customers :

Thank you for purchasing Seafirst Hydraulic steering system.

This manual provides the information for correct installation, operation, maintenance and inspection of the system with cautionary remarks. Please read this manual carefully before starting operation to ensure the correct use of the system.

This system is intended for the installation by a person who has basic understanding and skill in the servicing of hydraulic steering system. Without such knowledge and skill, attempted installation could cause failures or mechanical damages to the system. Please have your system installed by your dealer, if you are not a specialized mechanic.

In the course of boat operation, always keep this manual on board where it would not be lost or get wet. If you transfer or resell this hydraulic steering system, be sure to give this manual to the new owner.

### • Notice to Dealers :

Please explain the product and address any cautionary remark to the customer. Make sure that this manual and part of it removed during the installation work be handed over to the customers.

Special attention should be paid for the cylinder installation. Notice to the transom limitation and mechanical interference of the cylinder, its linkage in steering and tilting-up operation

## 2. Instruction Symbols

### **CAUTION**

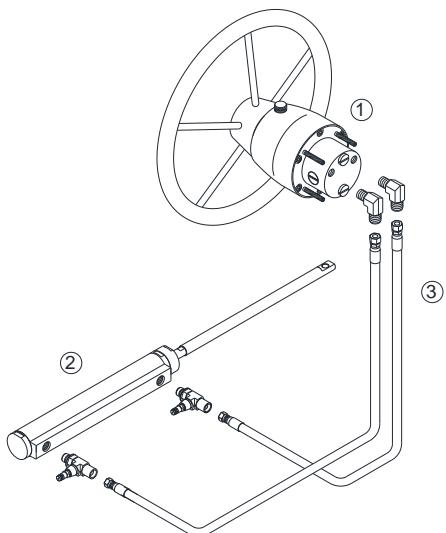
CAUTION indicates special precautions that must be taken to avoid damages to the outboard engine

### **IMPORTANT**

IMPORTANT is an importation to proper operation, inspection or maintenance.

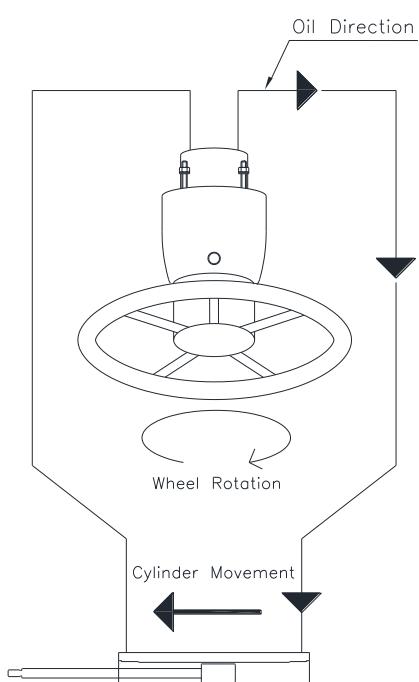
## 1. Components and its role

Our hydraulic steering system is consist of as table



Component	Description
1. Helm Pump	The piston pump is designed for manual hydraulic steering. It has inbuilt lock valve.
2. CYLINDER	Distinguished largely, it has two type of cylinder SSC 3214U and SSC 3214B. SSC3214U is for Power Assist, and SSC3214B is for Non Power Assist.
3. Hydraulic Hose	It s path for the oil to flow from the helm pump to the cylinder

## 2. How it works



If Steering wheel is rotated in clock wise, oil is pump out from the port ( right port from the front view) into the port of cylinder ( Starboard side ). This cause the cylinder rod move to the port side, which move the boat to right side ( starboard ) Oil displaced from the opposite end of the cylinder flows back to the helm pump For steering in the opposite direction, simply turn the helm pump the other way When no course corrections are required, the inbuilt lock valve holds the engine stationary

MAXIMUM OPERATING PRESSURE : 80 BAR  
RECOMMENDATIONS FOR THREAD SEALANT IF REQUIRED: LOCTITE 572

**1. Packaged system****1-1) MS 250S-U1**

Applicable Stern Drive		Remark
Maker	Model	
Mercruiser	Mercruiser 1, Alpha, Bravo 1/2/3,	Power Assist Stern Drive
Volvo	280, 290, DP-S	
BMW	All	
OMC	Cobra, King Cobra	
Yamaha	All	

**1-2) MS 250S-B1**

Applicable Stern Drive		Remark
Maker	Model	
Mercruiser	Alpha, Bravo 1/2/3,	Non-Power Assist Stern Drive
Volvo	280, 290, Diesel	

**1-3) Components included**

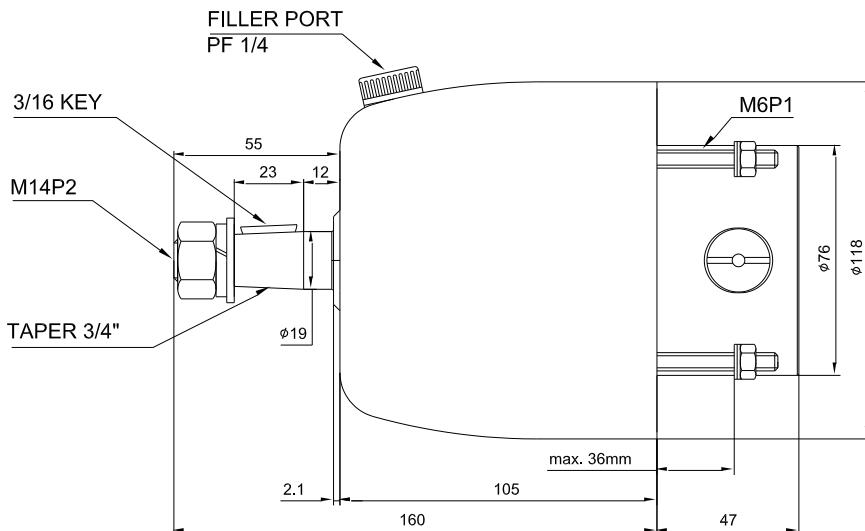
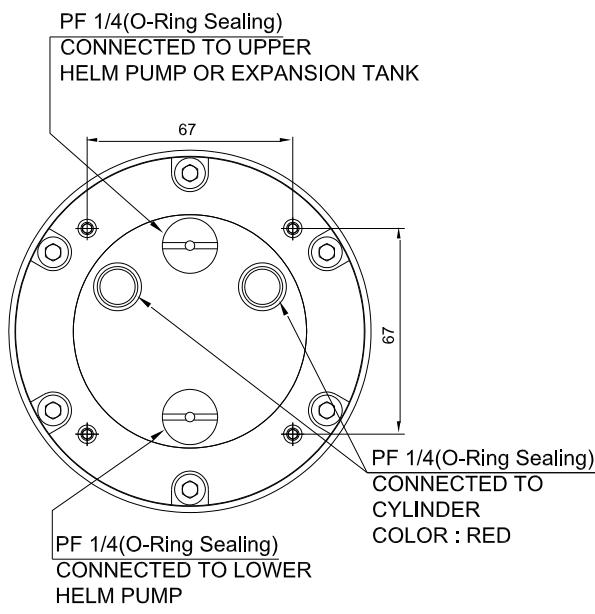
Model	Description
NSH 030 or 025 Helm Pump	Front Mount Helm pump 30cc or 25cc
SOC 3214U1/U2 CYLINDER	Side Mount cylinder. When ordering, specify the engine model.
SF OIL 15 Hydraulic Oil	Hydraulic oil 1 liter x 3 bottles. SAE NO 15.
NH 06-SS-20 Hydraulic Hose	3/8" Hydraulic Hose 20 meter x 1pcs, including two reusable hose couplings
Accessories Included	Helm pump fittings, Helm pump mounting hardware kit, Accessories kit OAK-100 (Bleed tube, Funnel, Oil supply tube)
The Steering Wheel is not included in the package.	

## 1. HELM PUMP

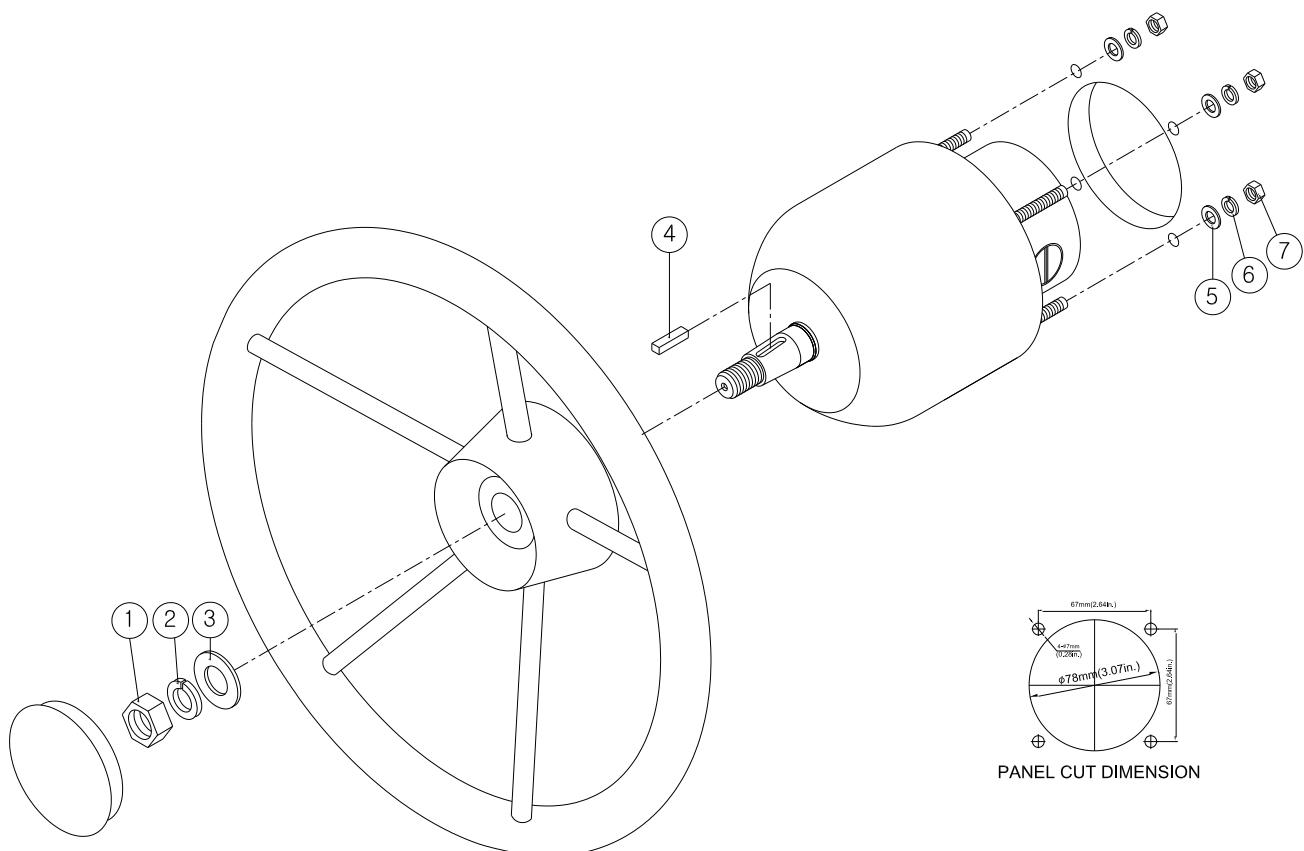
### 1-1) : SPECIFICATION & FUNCTION

Model	Displacement		Lock valve	Steering Wheel
	cc / rev	cu.in / rev		
NSH 025	25	1.52	Built-in	Min Dia 350mm
NSH 030	30	1.83		Min Dia 350mm

- Maximum durability
- 3 ball bearings supporting the rotar, which make the helm pump be used for heavy duty use.
- SS 304 shaft
- At factory, the two ports on the rear are blocked tightly with black plugs while the two ports are blocked loosely with red plugs for an easy open to connect hydraulic hose fittings.
- Fixed displacement
- Lock Valve Inbuilt
- Mounting Hardware and steering wheel mounting hardware supplied as standard
- Interconnecting ports (black plugs) for dual stations of steering .
- Common dash hole mount for easy replacement with other brand



## 1-2) MOUNTING THE HELM PUMP IN FRONT



### Mounting the helm pump (NSH series)

1. To install the pump, cut a hole of diameter 78mm in the dash board ( panel ).
2. Mark the location of the four holes by using Template supplied additionally
3. Drill 4 holes with Diameter 7mm.
4. Install the helm pump into the hole and tighten the helm pump with 4 x Nuts and Washers supplied as mounting hardware.

### Mounting the wheel

1. Make sure that your steering wheel is suitable for 3/16" straight key and taper on 3/4" shaft.
2. Grease the shaft cone and install the wheel on the shaft with key supplied.
3. Tighten the wheel with M8 screw, Plain Washer and Spring Washer supplied as mounting hardware.

### Mounting Hardware Kit

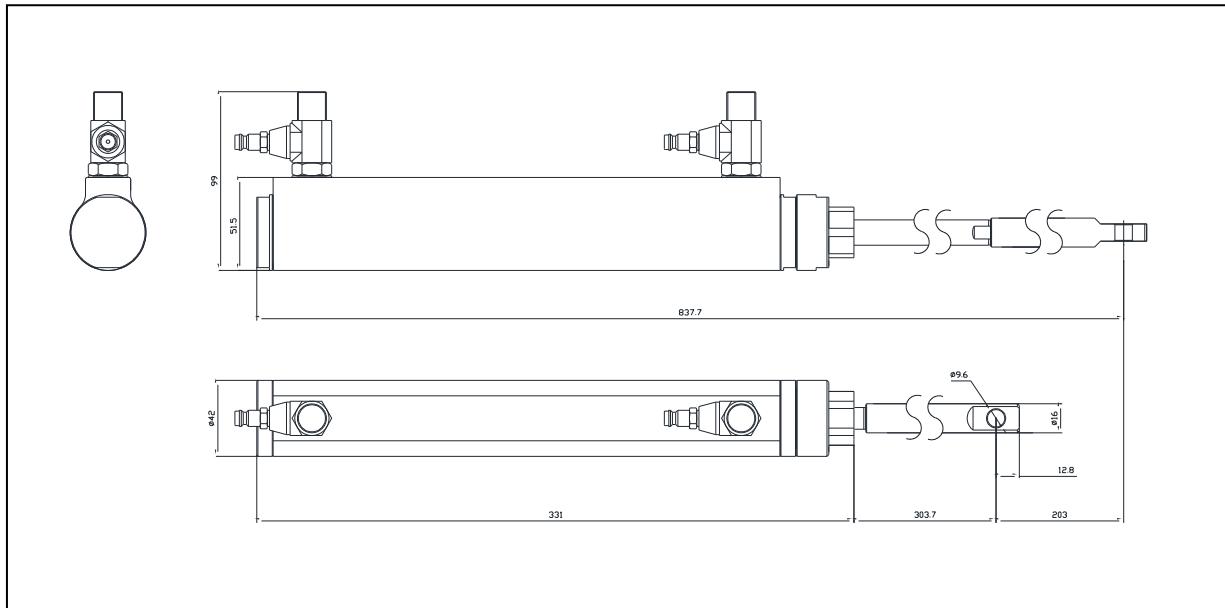
No	Description	Q'ty	No	Description	Q'ty
1	Nut M14	1	5	Plain Washer M6	4
2	Spring Washer M14	1	6	Spring Washer M6	4
3	Plain Washer M14	1	7	Nut M6	4
4	Straight Key 3/16"	1			

## 2 Cylinder 2-1 ) Specification

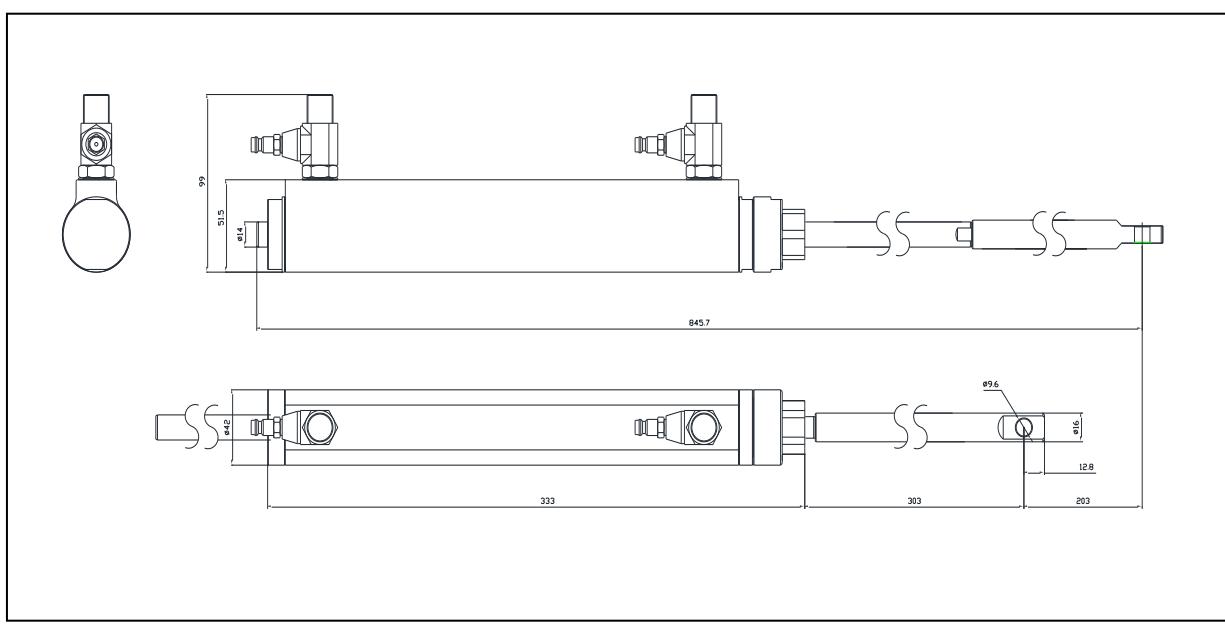
Model	SSC3214U	SSC3214B
Volume	164cc/132cc	132cc
Shaft diameter	14mm	14mm
Bore diameter	32mm	32mm
Stroke	203mm	203mm

- Stainless steel shaft with hard chrome plate
- Aluminum tube with anodizing
- Compact Design for less space installation

## 2-2) Dimension of Cylinder (SSC3214U)

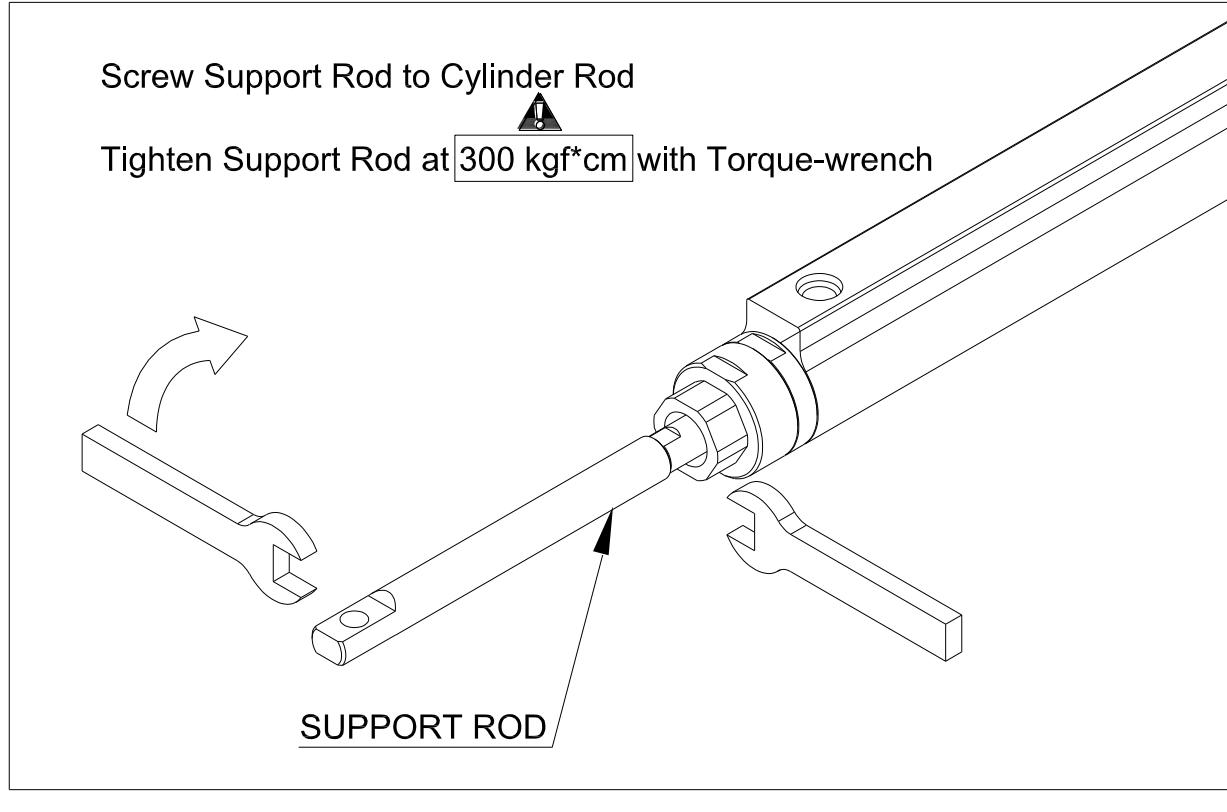
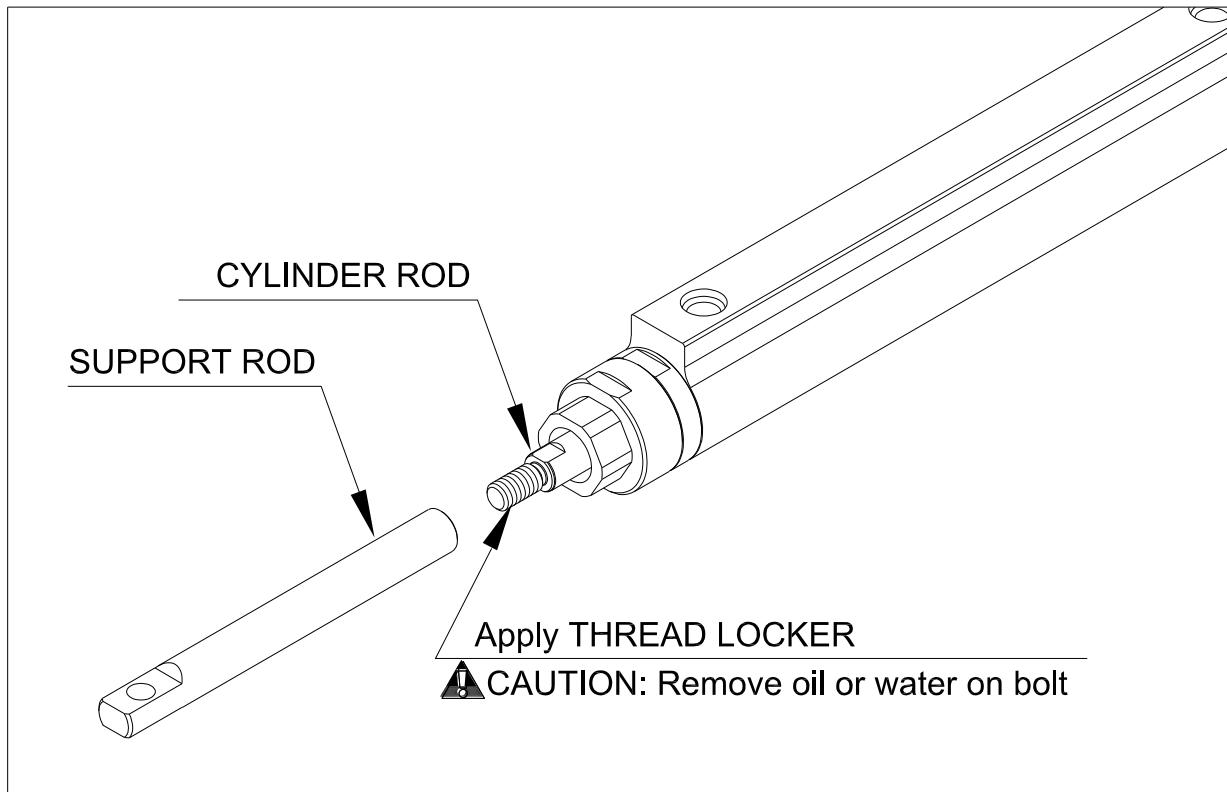


## 2-3) Dimension of Cylinder (SSC3214B)



## 2 Cylinder

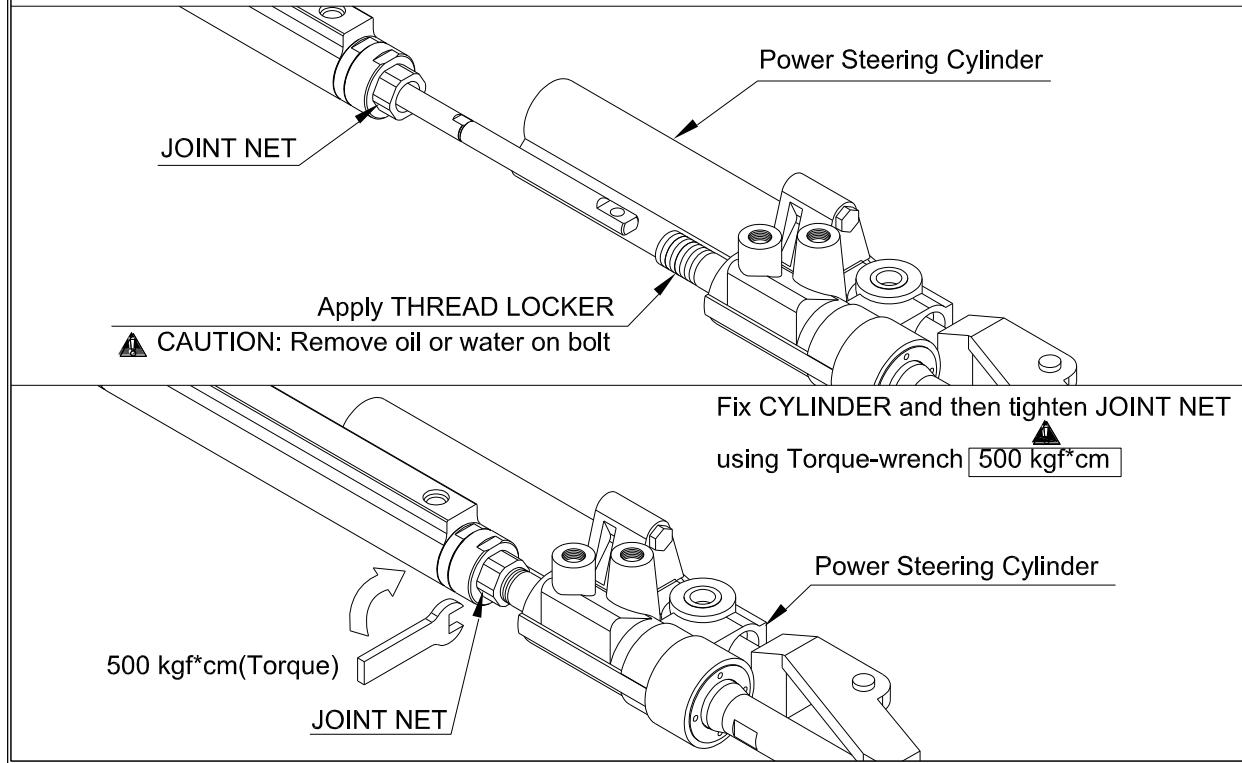
### 2-4) How to assemble Cylinder Rod and Support Rod



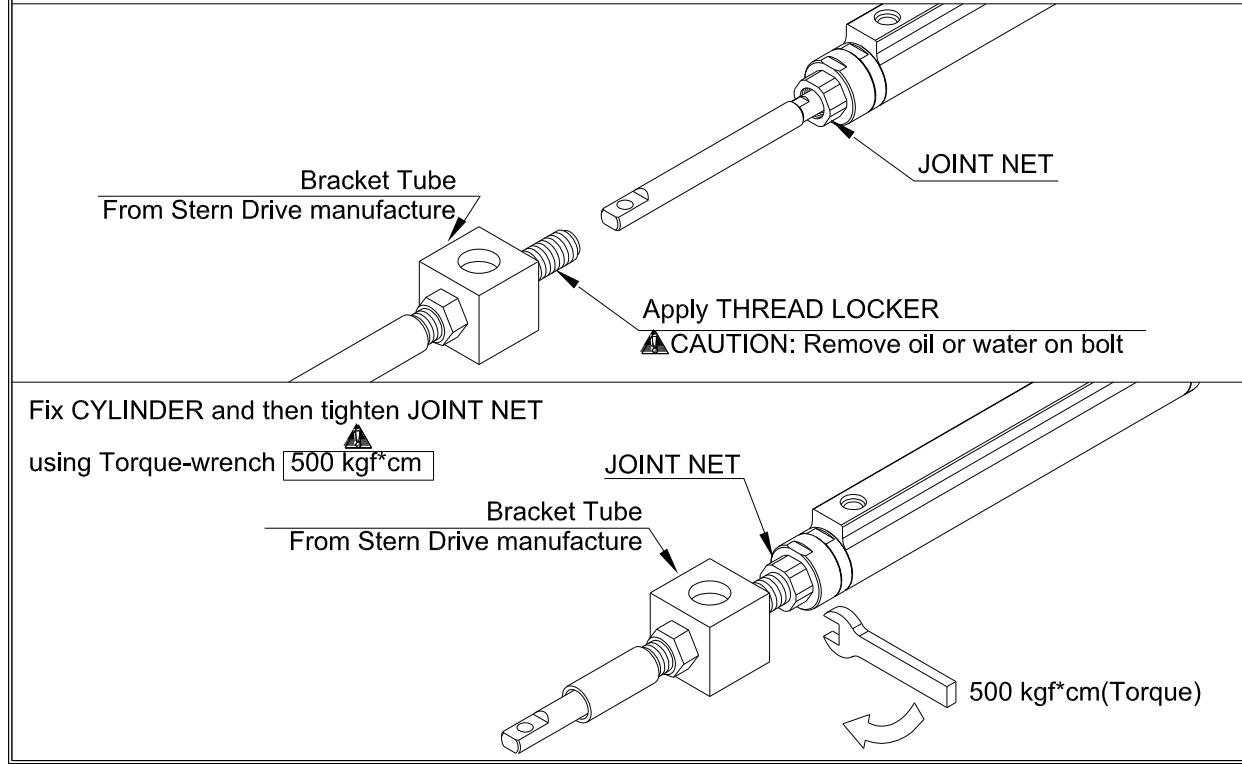
## 2 Cylinder

2-5) How to assemble cylinder  
according to power assistant and non-power assist

### Power Assist



### Non-Power Assist



# Installation – Test Procedures

## 3. Test Procedures

### 3-1) Test Procedures after Installation

Procedure	Test	Check Point
1. Leakage Test	For the test, apply a pressure on the cylinder, hose and helm pump by rotating steering wheel further at the end of steering.	<ul style="list-style-type: none"><li>•Helm pump : Two ports which oil come out</li><li>•Hose : Hose couplings</li><li>•Cylinder : Two ports which oil come out/in</li></ul>
2. Wheel turn	For the test, rotate steering wheel from left to right and count the wheel turn. Also count the wheel turn from right to left	<p>Ideal wheel turn to achieve with SSC3514U</p> <ul style="list-style-type: none"><li>•25cc helm pump : 6.5 / 5.3</li><li>•30cc helm pump : 5.5 / 4.4</li></ul> <p>Ideal wheel turn to achieve with SSC3514B</p> <ul style="list-style-type: none"><li>•25cc helm pump : 5.3</li><li>•30cc helm pump : 4.4</li></ul>
3. Hose kinked	For the test, check the entire hose from helm pump to cylinder	
4. Cylinder interface	For the test, rotate steering wheel. Check if any interference of cylinder , hose etc	

# Installation – Oil Filling and bleeding

## 4. Oil Filling and Air Bleeding

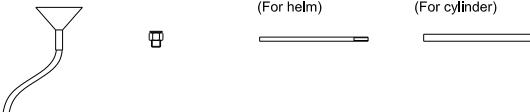
These instructions show how to fill and purge the manual hydraulic steering system. Incorrect oil supply or incorrect air-vent will cause helm-mans feel heavy of the steering wheel while rotation of the steering wheel and will cause a continuous wheel turn without stopping.

Recommend Hydraulic Fluid : ISO 15.

### Oil bleeding Kit & Method

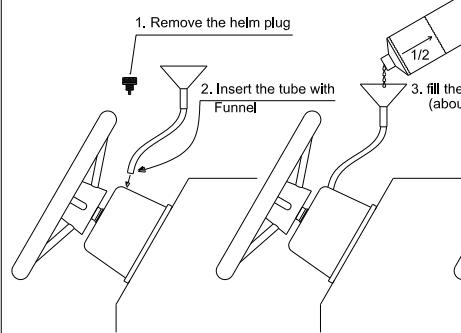
#### 1) Oil bleeding kit(OAK-100)

1. Funnel & tube
2. One touch fitting
3. Tube 1M (O.D. 6mm)  
(For helm)
4. Tube 1M(O.D 10mm)  
(For cylinder)



#### 2) How to supply oil

1. Remove the helm plug



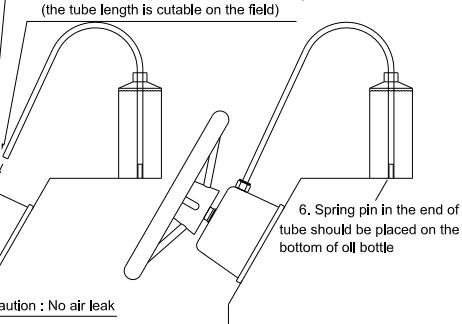
2. Insert the tube with  
Funnel



3. fill the oil into helm fully  
(about 350cc)

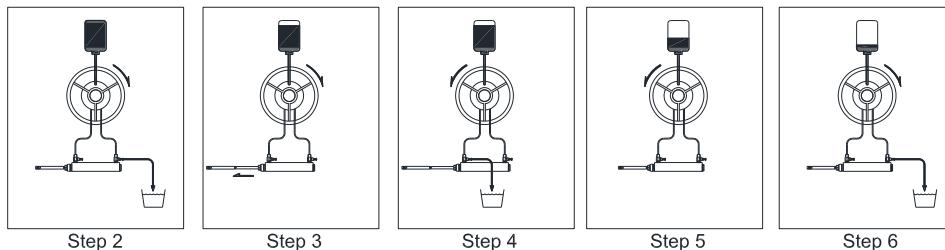
4. Screw to tighten the one touch fitting on the helm

5. push the tube(1M) into the one touch fitting  
(the tube length is cuttable on the field)



6. Spring pin in the end of  
tube should be placed on the  
bottom of oil bottle

Step 1 : Fill the helm pump full of oil.



Step 2 : Open the right bleeder. Slowly turn steering wheel clockwise until a steady stream of air free oil comes out of the right bleeder.

Step 3 : Close the right bleeder. Continue to turn steering wheel clockwise until the cylinder rod is fully pulled out. Open the left bleeder

Step 4 : Holding the cylinder rod ( to prevent it from moving back) slowly turn the steering wheel anti-clockwise until a steady stream of air free oil comes out of the left bleeder . While continuing to turn the wheel, close the left bleeder and let go of the cylinder rod.

Step 5 : Continue turning the steering wheel anti-clockwise until the cylinder tube is fully pushed in. The steering wheel will come to a stop. Open right bleeder .

Step 6 : Slowly turn the steering wheel clockwise until a steady stream of air free oil comes out of bleeder. While continuing to turn the steering wheel, close the right bleeder. Now, fill and purge is complete.

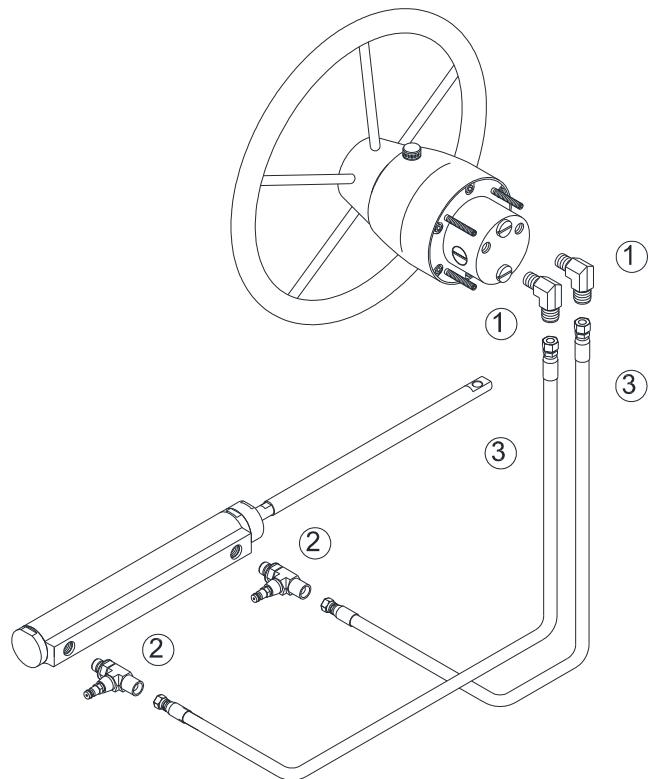
### CAUTION

During the filling the oil, turn the steering wheel slowly. If you turn the steering wheel too fast, foam may grow in the oil. In this case you can continue the filling after 24 hours.

# System Diagram –Single Engine

## 1. SINGLE ENGINE

### 1-1) For single station



Fitting and Hose supply

No	Part Number	Part Name	Q'TY	Remark
1	HLO14N0	Elbow fitting (PF 1/4Oring x PF 3/8)	2	Standard Supply in MS 250U1 / U2 package.
2	C3214118	Elbow fitting-SUS (PF1/4 Oring x PF 3/8)	2	
3	NH06-SS-XX	Hose XXM ( PF 3/8 hose coupling)	2	

**CAUTION**

Poor installation and maintenance may result in loss of steering and cause property damage and/or personal injury. Maintenance requirement change according to climate, frequency and the use. Inspections are necessary at least every year and must carry out by specialized marine mechanics. Check the cylinder fittings and the seals and the helm O-rings to prevent leaks. Replacement if necessary. To keep a suitable oil level in the helm pump, fill and bleed the system as described in the manual. Check the hose and entire system wear, the nut and bolt tightening every six months and make sure that they are not damaged.

**Trouble Shooting**

Description of failure	Cause of failure	Corrective action
There is some instability when the steering wheel is turned	Air remain	Repeat the air bleeding procedure
	Low oil level in the helm pump	Add the hydraulic oil
	Oil leak	Repair
Steering is hard to turn	The cylinder is not connected properly to the stern drive	Check and correct the connecting area on the cylinder
	Interference or breakage of hoses and/or fittings	Check for any sharp bent of the hose, or interference and/or breakage on the hose fittings.
	Application of unauthorized hydraulic oil having higher viscosity	Replace the oil with SEAFIRST OIL or alternatively ISO # 15
Cylinder does not move in response to the steering wheel operation	Foreign matters stuck between the check valve and the seat in the helm pump	Contact your dealer for the check valve replacement
Cylinder returns to the initial position as the steering wheel stops its operation	Air remains in the system	Repeat the air bleeding procedure
	Foreign matters stuck between the check valve and the seat in the helm pump	Contact your dealer for the check valve replacement

**Cleaning**

Clean the system using water and non-abrasive soap



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