

Keep this
manual onboard!



User Manual

For Stabiliser Systems
TP-43A, SPS



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MC_0020

General Operation Consideration and Precaution Guidelines

For the operation of stabilisers

Never use the stabilizer when close to objects/ persons or pets in the water.

Prior to operation and use it is important the operator reads this manual thoroughly to ensure necessary knowledge of the product and safety measures.

Ensure there is no risk of the fins hitting any objects, the dock, dock mooring lines or any other submerged objects close to the boat when they start moving.

General description

The Sleipner Stabilizer System consists of two under water movable fins located on shaft and actuator assemblies penetrating through each side of the yachts hull and hydraulically powered with a Sleipner compact Hydraulic System. The system is electronically gyro controlled utilizing the Sleipner S-link (CanBus) network system & stabilizes the yachts rolling motion in the water at various speeds and sea conditions or at anchor (optional).

Before activating the stabilizer system, ensure that:

(It is recommended that following notes are included in the boats operator manual)

IMPORTANT

Always ensure that there are no leakages, hydraulic oil level is correct and cooling pump is running. Always check/monitor system temperature and pressure from the panel when system is running.

You either have one or both main engines running, or an alternative hydraulic power source (like the AC powerpack).

Always keep the stabilizer system active when running the boat in planning or "fast" semi-planning mode - also when on calm water.

- The reason for this is to perform their stabilizing function to the required level, the fins are a large part of the boats directional and heel stability, especially at high speeds when the boats wet surfaces and direct hull forces are reduced. If you leave the fin stabilizer system off so the fins are left in a fixed position, this can make the boat behave differently than expected at high speeds.
- With the stabilizer system active, it will ensure that the boats behaviour is predictable and as comfortable as possible at all times, improving comfort also on calm water.
- If, due to a malfunction or other reason you are unable to run with the stabilizers active, we strongly recommend that you run at a maximum speed where the boat is not planning so that the boats own directional and heel stability is the dominant factor.

Reverse the boat in minimal speed if the fins are not in LOCKED position.

- The fins should automatically centre and lock if you put the boat in reverse, but if this should not happen for some reason (hydraulic failure, reverse sensor malfunction etc.) it is important that you only reverse the boat as slow as possible.

1. Status screen (Touch arrow/triangle on the right) **(NB: System will not start if GPS signal is not available. System cannot operate without hydraulic pressure, either from PTO or Powerpack.)**

Green light is indicating:

- GPS available
- Powerpack VFD enabled
- Powerpack VFD ready

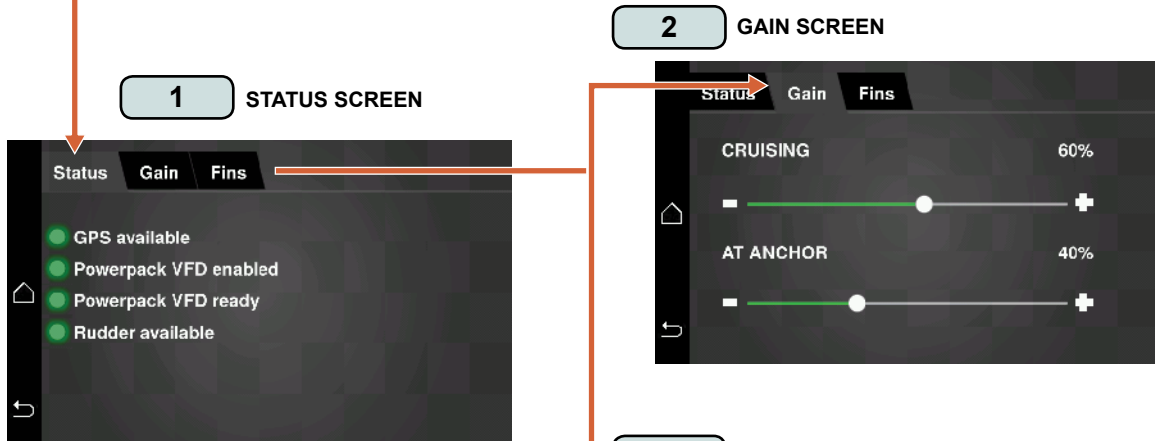
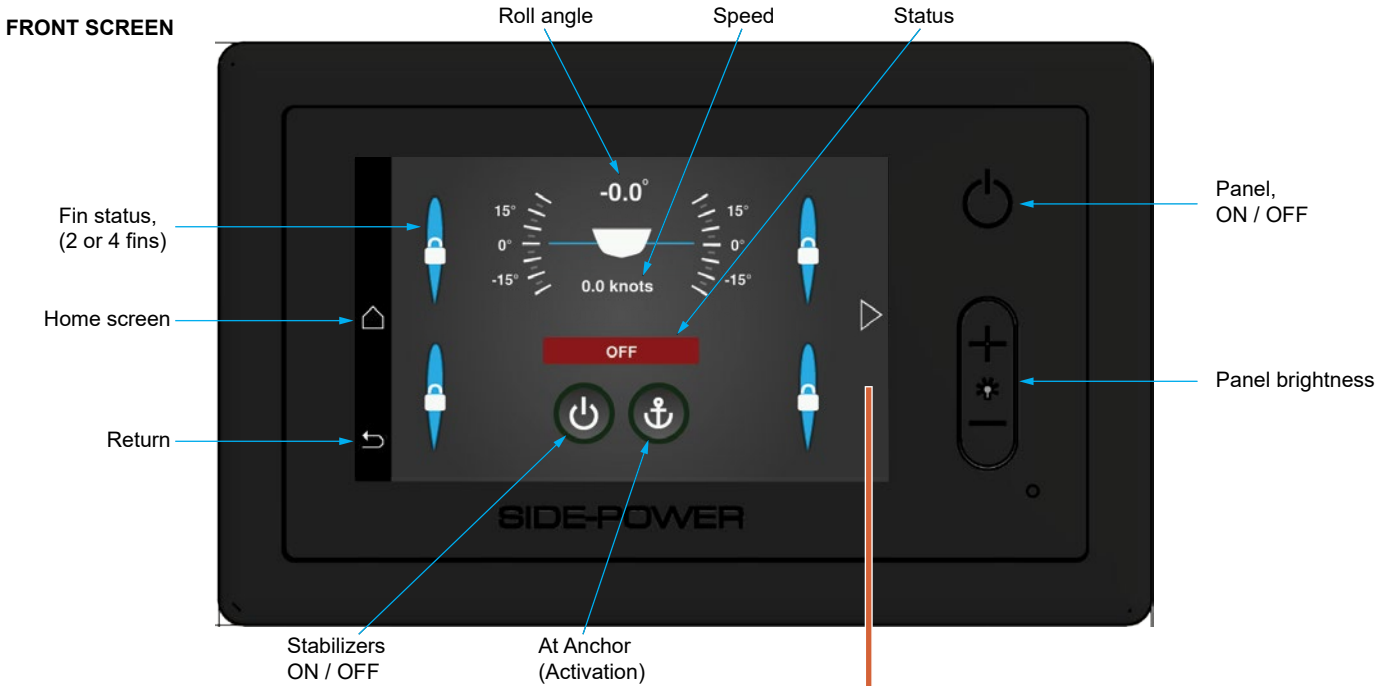
Red light is indicating not ready

2. Gain screen
 - (a) Possible to adjust the system's reaction to roll when cruising.
 - (b) Possible to adjust the system's reaction to roll when at anchor.

3. Fins screen (2 or 4 fin system)

Showing fins status, disabled or enabled. Fins can be disabled/enabled from this screen.

(NB: Displays disabled fins from an alarm via the FCU.)



The rudder signal is optional and a missing input will not stop the system from operating.

If a fin is disabled, it will be visible on the front screen. A disabled fin can be caused via an FCU fault or by deliberately turning the fin off.



A fin can be disabled to reduce forward forces, when at anchor if there is not enough space to have it safely on, docked next to a quay or another boat, people are swimming near the fin or if there is a hydraulic leak on that actuator.

ACTIVATE Stabilizers

4. From HOME menu: Touch STABILIZER
5. Fins are locked and system in OFF status

Activate Stabilizers to CRUISING mode:

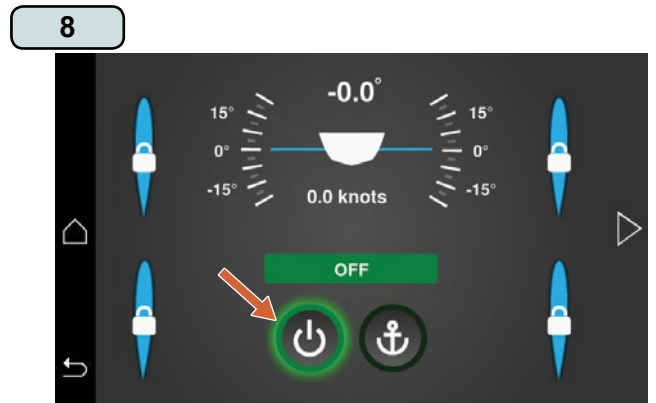
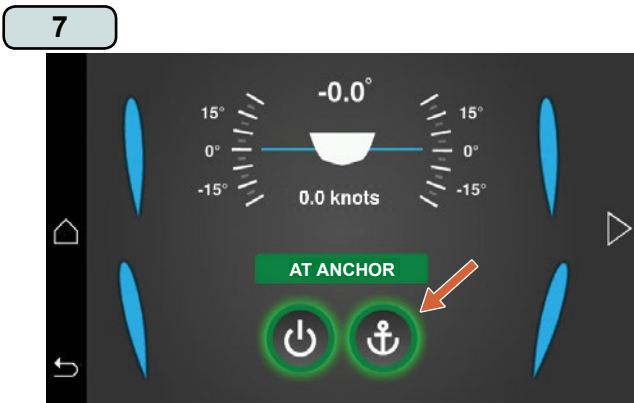
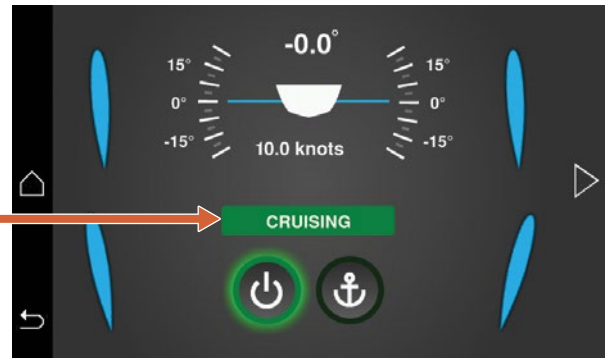
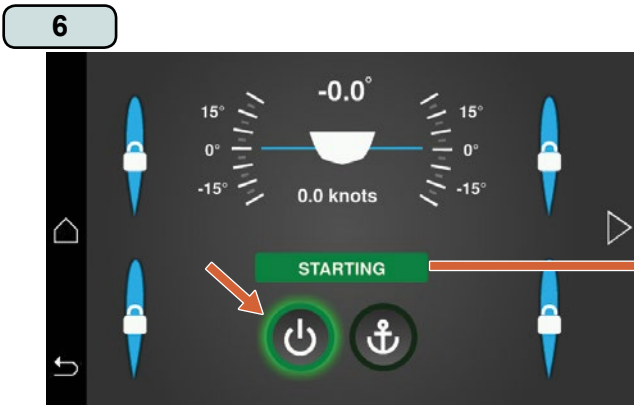
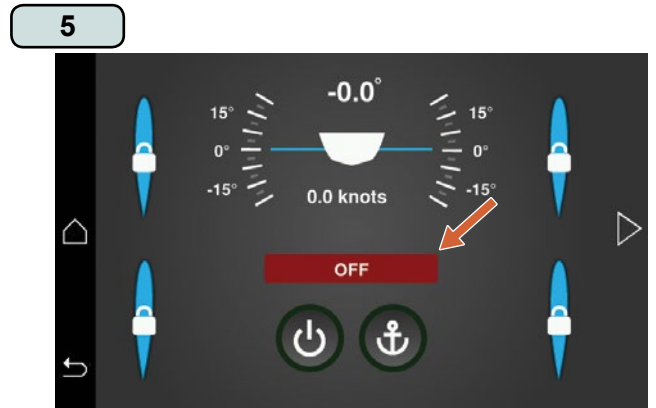
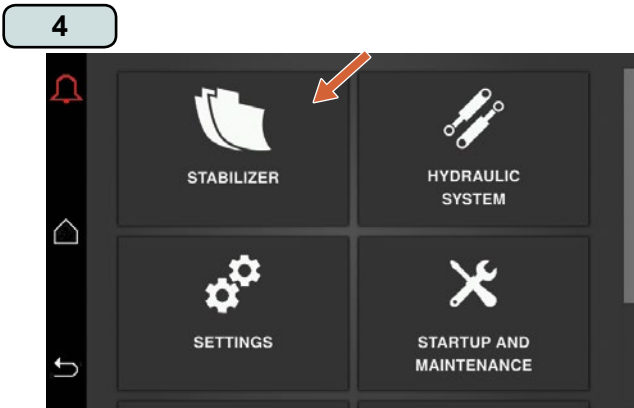
6. Touch ON/OFF button - system is starting
Stabilizers are active in CRUISING mode Usually in use from 3/4 knots and up. **(NB: System change automatically between Cruising/At Anchor when both are activated.)**

Activate Stabilizers to AT ANCHOR mode:

7. Touch ANCHOR button - system is starting and running
Usually in use from 0 to 3/4 knots. To turn At Anchor OFF, touch Anchor again. **(NB: System change automatically between Cruising/At Anchor when both is activated.)**

Turn system OFF:

8. Touch ON/OFF button - fins are centred, locked and not active.
(NB: The system can also be turned ON/OFF through the PJC-2xx panel. See the PJC-2xx manual for more information.)



9. BACKING the yacht.

When the yacht/gearbox is put in reverse the fins will automatically be centred and locked. BACKING will be indicated on the screen. After reversing, the system will either resume operation or turn off, according to the setting of “suspend exit state”

ALARMS - Alarms are indicated in upper left corner of the screen.

10. Touch the red alarm bell to view alarm list.

11. Touch the active alarm for more details and Correct the cause of the alarm.

Alarm codes and troubleshooting actions are shown in user manual. Alarm actions will also be presented in this screen.

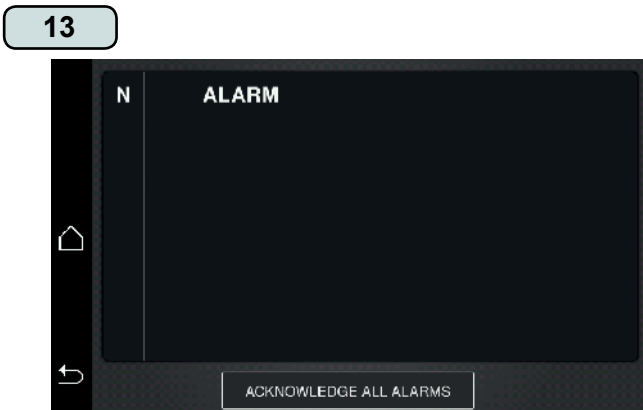
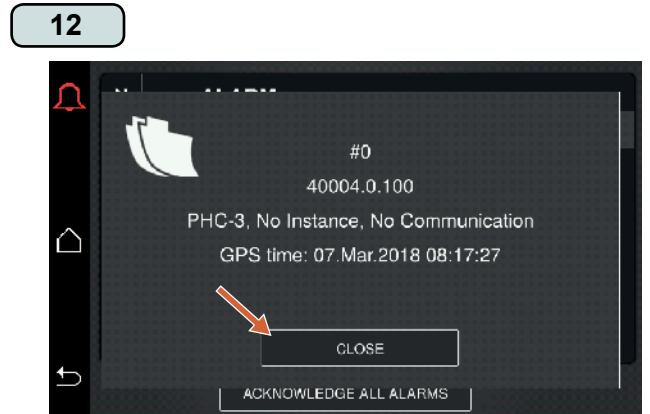
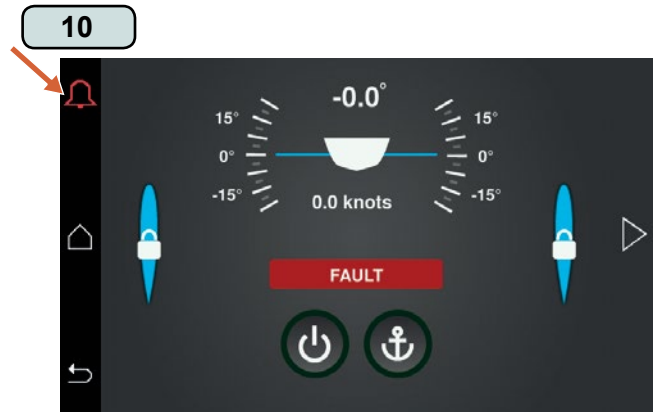
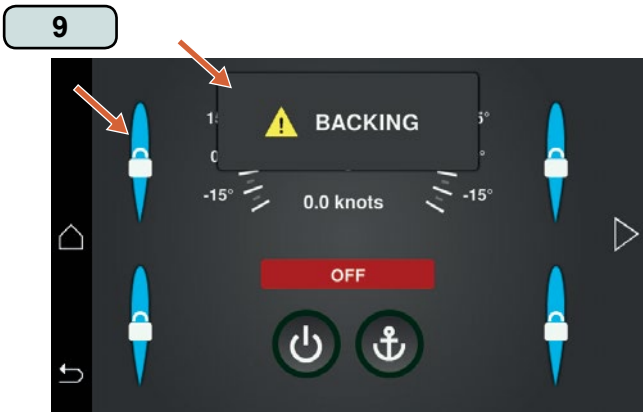
(NB: For new parts required to correct the alarm issue, contact Sleipner representative.)

Alarm list shows current alarms, with alarm description. To acknowledge alarm(s) touch ACKNOWLEDGE ALARMS in the bottom of the screen.

12. Touch close to finish alarm acknowledgement.

13. All alarms are acknowledged.

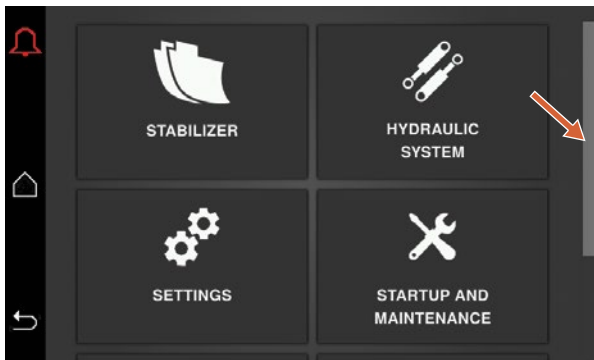
For fault codes, troubleshooting and advanced panel information please contact your Sleipner representative.



VIEW HISTORICAL ALARMS

14. Go to home page - Scroll to System devices - Touch System devices.
15. Touch desired device(s).
16. Historical Alarms pop(s) up - Touch Historical alarms.
17. Historical Alarms is shown - Touch Alarm(s) to view more information.
18. Alarm details are shown - Touch close to return to list.
(NB: Check code against the list at the end of the document to find what to check.)

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DEVICE	SN	HW	FW
GW-1	50007	C	1.010
PJC 222	6721	2.000	2.023
DMC-SCU	1	A	1.005

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DEVICE	SN	HW	FW
GW-1	50007	C	1.010
PJC 222	6721	2.000	2.023
DMC-SCU	1	A	1.005

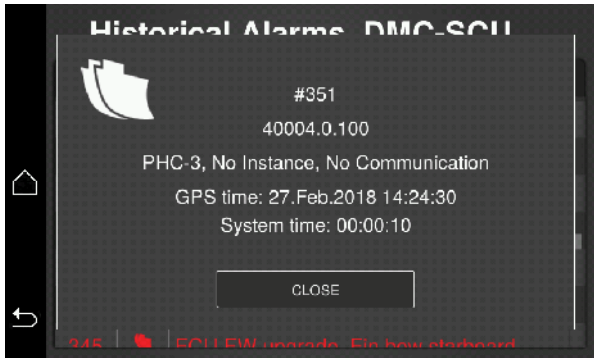
Historical Alarms
Close popup

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Historical Alarms, DMC-SCU

N	ALARM
351	PHC-3, No Instance, No Communication
350	FW Upgrade, No Instance, No Condition
349	PHC-3, No Instance, No Communication
348	FW Upgrade, No Instance, No Condition
347	FCU FW upgrade, Fin bow port, Timeout
346	FCU Communication, Fin bow port, TI...
345	FCU FW upgrade, Fin bow port, TI...

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If an alarm occurs so the stabilizer system is not running, but the fins are centred and locked, you can operate the boat normally, remembering the general warning about high speeds and inactive stabilizers. See Alarm list and boat handling restrictions in table below for more details.

IMPORTANT

If the fins are NOT centred and locked, do NOT run forward in more than the minimum necessary steering speed

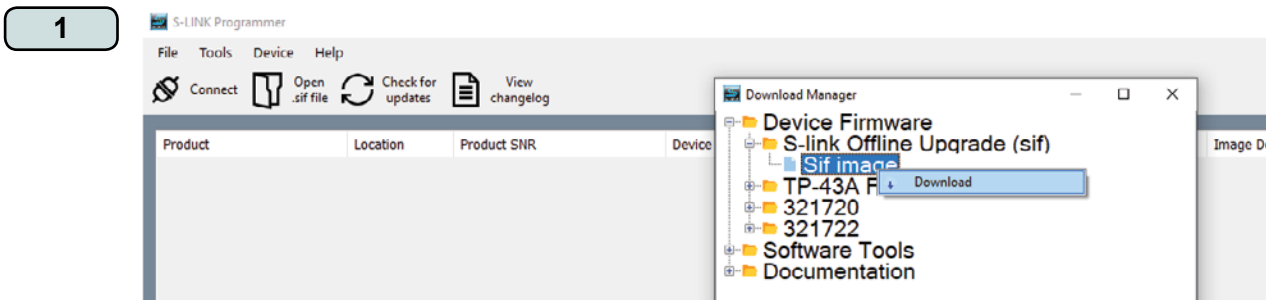
BOAT HANDLING RESTRICTIONS	L1	L2	L3	L4
Remember the general warning about high speed running without active stabilizers	X	X	X	X
Do not reverse the boat in more than absolute minimal speed		X	X	X
Do not run forward in more than the minimum necessary steering speed		X	X	X
If you have severely overheating oil - do not operate any hydraulics - run main engines (if pumps are connected) at less load while giving the oil time to cool down.			X	
If you are running out of oil in your tank - beware that the pumps will be destroyed if run dry and can then also cause other damage to the power source driving them. If you have to run engines with pumps directly fitted, disconnect mechanically the pump first so that it does not pump. If you have severely overheating oil - do not operate				X

If the panel software V1.105 or newer is installed, it is possible to download the latest S-Link device software from USB or internet to the units installed on-board.

USB installation

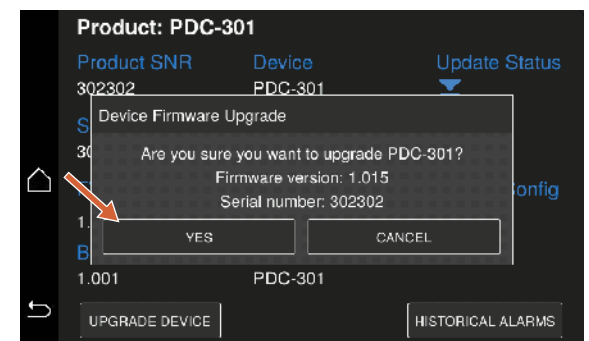
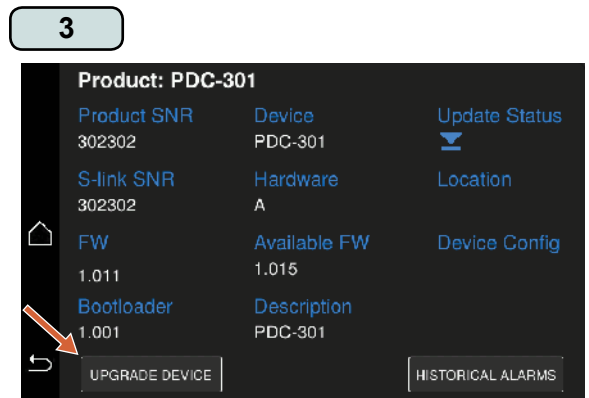
1. Start S-Link programmer. Open the download manager found in the tools menu/download manager menu. Proceed to select S-Link off-line upgrade and download the file to a FAT32-formatted USB memory stick of good quality:
2. Insert the USB stick to the USB port at the back of the stabilizer panel (or the USB extension port if installed for easier access). Go to the SYSTEM DEVICES page: Products with an available software upgrade will show a blue download button in the status column. Select a device to see the details:
3. Select UPGRADE DEVICE and acknowledge:

After upgrade, go back and proceed to upgrade other devices.



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PRODUCT	SNR	HW	FW	STATUS
PJC 222	5810	2.000	2.030	✓
PJC 222	1	2.000	2.030	✓
DMC-SCU	1001	A	1.029	⌵
MSI 8730B	1610	1.100	1.211	✓
PDC-301	302302	A	1.011	⌵ ← Available for update



Internet download

Activate the wireless network or use Ethernet connection from the panel menu:

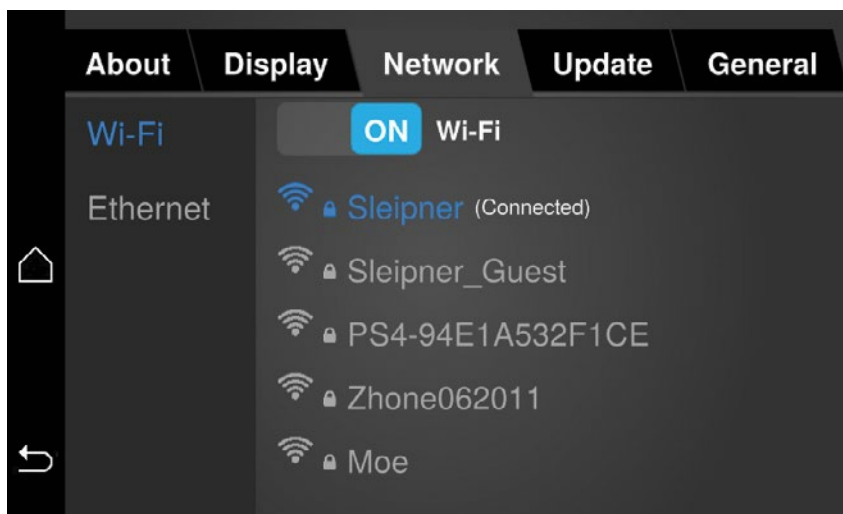
When connection is established, go to the SYSTEM DEVICES page and proceed to upgrade the devices.

Allow some time for hand-shake between panel and server. Go to the UPDATE tab, Online update to check for a panel software update. The panel will download available device firmware updates when entering the System device menu with working internet connection.

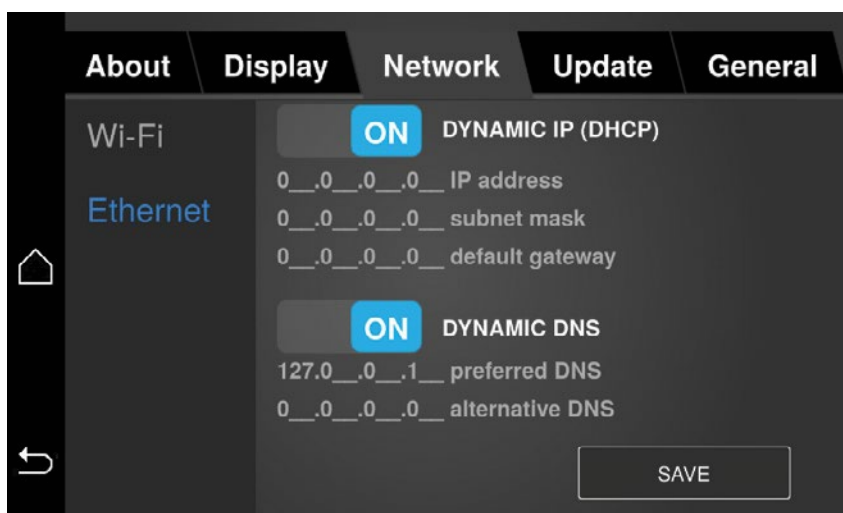
IMPORTANT

Turn wi-fi off after downloading, before resuming system operation.

WIFI



Ethernet



MG_0392

Fault Code	Description	Cause	Action
100.0.0	System Error - -	Internal Error	-Consult Sleipner dealer
201.0.200	NMEA2000 Transmission parameter - Timeout	No NMEA2000 (pgn127493) transmission message received for 2seconds.	-Check if GW-1 status is ok by checking the GW-1 status LED (See GW-1 user manual). -Check cabling
10101.0.11	Device CPU Temp - Level High	CPU temperature higher than 85 degrees.	-Ventilate the room were the ECU is sitting. -Consult Sleipner dealer
35000.0.200	GPS signal lost - Timeout	No GPS data from GW-1 received for 3 seconds	-Check if GW-1 status is ok by checking the GW-1 status LED (See GW-1 user manual). - Check cabling
40001.0.201	SCU Sensor board fault 1 - INIT FAIL	Sensor board fault.	-Consult Sleipner dealer
40001.0.202	SCU Sensor board fault 1 - READ FAIL	Sensor board fault.	-Consult Sleipner dealer
40002.0.201	SCU Sensor board fault 2 - INIT FAIL	Sensor board fault.	-Consult Sleipner dealer
40002.0.202	SCU Sensor board fault 2 - READ FAIL	Sensor board fault.	-Consult Sleipner dealer
40003.0.201	SCU Sensor board fault 3 - INIT FAIL	Sensor board fault.	-Consult Sleipner dealer
40003.0.202	SCU Sensor board fault 3 - READ FAIL	Sensor board fault.	-Consult Sleipner dealer
40004.0.24	PHC-3 - Fault	Detected fault on PHC-3	-Check PHC-3 faults for more information
40004.0.100	PHC-3 - No Communication	PHC-3 Communication lost for more than 500ms	-Check if PHC-3 is powered and is working -Check S-Link cabling
40004.0.200	PHC-3 - Timeout	PHC-3 startup timed out. Trigger when startup takes longer than 60 seconds	-Check if PHC-3 is able to build up the pressure. -Check PHC-3 faults for more information. -Check PHC-3 system pressure reading when PTO is not running against PHC-3 parameter 1009-PTO PUMP PRESSURE DETECT LEVEL. -Check PHC-3 system pressure sensor.
40004.0.210	PHC-3 - DEVICE IN MANUAL MODE	Trigger when the SCU try to startup PHC-3 and the PHC-3 is running in manual mode.	-Stop running the PHC-3 in manual mode
40006.0.24	SCU Sensor board fault 4 - Fault	Sensor board fault.	-Consult Sleipner dealer
40006.0.150	SCU Sensor board fault 4 - ID Fault	Sensor board fault.	-Consult Sleipner dealer
40006.0.151	SCU Sensor board fault 4 - Self-Test Fault	Sensor board fault.	-Consult Sleipner dealer
40006.0.203	SCU Sensor board fault 4 - Not Calibrated	Sensor board fault.	-Consult Sleipner dealer
40007.0.100	SCU Sensor board fault 5 - No Communication	Sensor board fault.	-Consult Sleipner dealer
40007.0.150	SCU Sensor board fault 5 - ID Fault	Sensor board fault.	-Consult Sleipner dealer
40008.0.24	SCU Sensor board fault 6 - Fault	Sensor board fault.	-Consult Sleipner dealer
40009.0.150	SCU Sensor board fault 7 - ID Fault	Sensor board fault.	-Consult Sleipner dealer
40009.0.151	SCU Sensor board fault 7 - Self-Test Fault	Sensor board fault.	-Consult Sleipner dealer
40010.0.150	SCU Sensor board fault 8 - ID Fault	Sensor board fault.	-Consult Sleipner dealer
40011.0.150	SCU Sensor board fault 11 - ID Fault	Sensor board fault.	-Consult Sleipner dealer
40012.100.51	FCU Current Fin bow port Current High	Current to the FCU is too high. Trigger at 10A.	-Check cabling between SCU and FCU for short circuit.
40012.101.51	FCU Current Fin bow starboard Current High	Current to the FCU is too high. Trigger at 10A.	-Check cabling between SCU and FCU for short circuit.
40012.102.51	FCU Current Fin stern port Current High	Current to the FCU is too high. Trigger at 10A.	-Check cabling between SCU and FCU for short circuit.
40012.103.51	FCU Current Fin stern starboard Current High	Current to the FCU is too high. Trigger at 10A.	-Check cabling between SCU and FCU for short circuit.
45000.100.21	FCU Tuning Fin bow port Failed	Tuning sequence has failed. Trigger if fin movement is less than 50 degrees.	-Run bleeding to get rid of air in the hydraulic system -Check encoder belt and pulleys.
45000.101.21	FCU Tuning Fin bow starboard Failed	Tuning sequence has failed. Trigger if fin movement is less than 50 degrees.	-Run bleeding to get rid of air in the hydraulic system -Check encoder belt and pulleys.
45000.102.21	FCU Tuning Fin stern port Failed	Tuning sequence has failed. Trigger if fin movement is less than 50 degrees.	-Run bleeding to get rid of air in the hydraulic system -Check encoder belt and pulleys.
45000.103.21	FCU Tuning Fin stern starboard Failed	Tuning sequence has failed. Trigger if fin movement is less than 50 degrees.	-Run bleeding to get rid of air in the hydraulic system -Check encoder belt and pulleys.
45001.100.21	FCU Encoder Fin bow port Failed	Encoder fault	-Run bleeding to get rid of air in the hydraulic system -Check encoder belt and pulleys. -Check if something is blocking the actuators -Check if all the hydraulics mounted correctly to the actuators. -Check if a PHC-3 fault is present.
45001.100.22	FCU Encoder Fin bow port Out off position	Encoder position is outside the end stop position.	-Run the detect end stop sequence. -Check encoder belt and pulleys. -Consult Sleipner dealer
45001.100.209	FCU Encoder Fin bow port MOTION FAULT	Encoder position do not change.	Check encoder belt, encoder cable or if the fin is locked in one position.
45001.101.21	FCU Encoder Fin bow starboard Failed	Encoder fault	-Run bleeding to get rid of air in the hydraulic system -Check encoder belt and pulleys. -Check if something is blocking the actuators -Check if all the hydraulics mounted correctly to the actuators. -Check if a PHC-3 fault is present.
45001.101.22	FCU Encoder Fin bow starboard Out off position	Encoder position is outside the end stop position.	-Run the detect end stop sequence. -Check encoder belt and pulleys. -Consult Sleipner dealer
45001.101.209	FCU Encoder Fin bow starboard MOTION FAULT	Encoder position do not change,	Check encoder belt, encoder cable or if the fin is locked in one position.

Fault Code	Description	Cause	Action
45001.102.21	FCU Encoder Fin stern port Failed	Encoder fault	-Run bleeding to get rid of air in the hydraulic system -Check encoder belt and pulleys. -Check if something is blocking the actuators -Check if all the hydraulics mounted correctly to the actuators. -Check if a PHC-3 fault is present.
45001.102.22	FCU Encoder Fin stern port Out off position	Encoder position is outside the end stop position.	-Run the detect end stop sequence. -Check encoder belt and pulleys. -Consult Slepner dealer
45001.102.209	FCU Encoder Fin stern port MOTION FAULT	Encoder position do not change.	Check encoder belt, encoder cable or if the fin is locked in one position.
45001.103.21	FCU Encoder Fin stern starboard Failed	Encoder fault	-Run bleeding to get rid of air in the hydraulic system -Check encoder belt and pulleys. -Check if something is blocking the actuators -Check if all the hydraulics mounted correctly to the actuators. -Check if a PHC-3 fault is present.
45001.103.22	FCU Encoder Fin stern starboard Out off position	Encoder position is outside the end stop position.	-Run the detect end stop sequence. -Check encoder belt and pulleys. -Consult Slepner dealer
45001.103.209	FCU Encoder Fin stern starboard MOTION FAULT	Encoder position do not change.	Check encoder belt, encoder cable or if the fin is locked in one position.
45003.100.200	FCU Communication Fin bow port Timeout	FCU communication lost. Trigger if no FCU is detected for 25 seconds at startup or after 1.5 seconds with no communication during normal operation. .	-Check cabling between SCU and FCU
45003.101.200	FCU Communication Fin bow starboard Timeout	FCU communication lost. Trigger if no FCU is detected for 25 seconds at startup or after 1.5 seconds with no communication during normal operation. .	-Check cabling between SCU and FCU
45003.102.200	FCU Communication Fin stern port Timeout	FCU communication lost. Trigger if no FCU is detected for 25 seconds at startup or after 1.5 seconds with no communication during normal operation. .	-Check cabling between SCU and FCU
45003.103.200	FCU Communication Fin stern starboard Timeout	FCU communication lost. Trigger if no FCU is detected for 25 seconds at startup or after 1.5 seconds with no communication during normal operation. .	-Check cabling between SCU and FCU
45006.100.13	FCU Proportional Valve 1 Fin bow port Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45006.100.51	FCU Proportional Valve 1 Fin bow port Current High	Current through valve is too high. Trigger at 3.75A	-check for short circuit
45006.101.13	FCU Proportional Valve 1 Fin bow starboard Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45006.101.51	FCU Proportional Valve 1 Fin bow starboard Current High	Current through valve is too high. Trigger at 3.75A	-check for short circuit
45006.102.13	FCU Proportional Valve 1 Fin stern port Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45006.102.51	FCU Proportional Valve 1 Fin stern port Current High	Current through valve is too high. Trigger at 3.75A	-check for short circuit
45006.103.13	FCU Proportional Valve 1 Fin stern starboard Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45006.103.51	FCU Proportional Valve 1 Fin stern starboard Current High	Current through valve is too high. Trigger at 3.75A	-check for short circuit
45007.100.13	FCU Proportional Valve 2 Fin bow port Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45007.100.51	FCU Proportional Valve 2 Fin bow port Current High	Current through valve is too high. Trigger at 3.75A	-check for short circuit
45007.101.13	FCU Proportional Valve 2 Fin bow starboard Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45007.101.51	FCU Proportional Valve 2 Fin bow starboard Current High	Current through valve is too high. Trigger at 3.75A	-check for short circuit
45007.102.13	FCU Proportional Valve 2 Fin stern port Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45007.102.51	FCU Proportional Valve 2 Fin stern port Current High	Current through valve is too high. Trigger at 3.75A	-check for short circuit
45007.103.13	FCU Proportional Valve 2 Fin stern starboard Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45007.103.51	FCU Proportional Valve 2 Fin stern starboard Current High	Current through valve is too high. Trigger at 3.75A	-check for short circuit
45010.100.200	FCU Centering normal Fin bow port Timeout	FCU did not manage to center the fin within 10seconds.	-Check if a PHC-3 fault is present. -Check encoder belt and pulleys.
45010.101.200	FCU Centering normal Fin bow starboard Timeout	FCU did not manage to center the fin within 10seconds.	-Check if a PHC-3 fault is present. -Check encoder belt and pulleys.
45010.102.200	FCU Centering normal Fin stern port Timeout	FCU did not manage to center the fin within 10seconds.	-Check if a PHC-3 fault is present. -Check encoder belt and pulleys.
45010.103.200	FCU Centering normal Fin stern starboard Timeout	FCU did not manage to center the fin within 10seconds.	-Check if a PHC-3 fault is present. -Check encoder belt and pulleys.
45011.100.200	FCU Centering fast Fin bow port Timeout	FCU did not manage to center the fin within 10seconds.	-Check if a PHC-3 fault is present. -Check encoder belt and pulleys.
45011.101.200	FCU Centering fast Fin bow starboard Timeout	FCU did not manage to center the fin within 10seconds.	-Check if a PHC-3 fault is present. -Check encoder belt and pulleys.

Fault Code	Description	Cause	Action
45011.102.200	FCU Centering fast Fin stern port Timeout	FCU did not manage to center the fin within 10seconds.	-Check if a PHC-3 fault is present. -Check encoder belt and pulleys.
45011.103.200	FCU Centering fast Fin stern starboard Timeout	FCU did not manage to center the fin within 10seconds.	-Check if a PHC-3 fault is present. -Check encoder belt and pulleys.
45012.100.200	FCU FW upgrade Fin bow port Timeout	SCU failed to upgrade the FCU FW.	-Check cabling between SCU and FCU -Consult Sleipner dealer
45012.101.200	FCU FW upgrade Fin bow starboard Timeout	SCU failed to upgrade the FCU FW.	-Check cabling between SCU and FCU -Consult Sleipner dealer
45012.102.200	FCU FW upgrade Fin stern port Timeout	SCU failed to upgrade the FCU FW.	-Check cabling between SCU and FCU -Consult Sleipner dealer
45012.103.200	FCU FW upgrade Fin stern starboard Timeout	SCU failed to upgrade the FCU FW.	-Check cabling between SCU and FCU -Consult Sleipner dealer
45013.100.13	FCU Float valve Fin bow port Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45013.100.16	FCU Float valve Fin bow port Short Circuit	Current through valve is too high. Trigger at 1.5A	-check for short circuit
45013.101.13	FCU Float valve Fin bow starboard Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45013.101.16	FCU Float valve Fin bow starboard Short Circuit	Current through valve is too high. Trigger at 1.5A	-check for short circuit
45013.102.13	FCU Float valve Fin stern port Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45013.102.16	FCU Float valve Fin stern port Short Circuit	Current through valve is too high. Trigger at 1.5A	-check for short circuit
45013.103.13	FCU Float valve Fin stern starboard Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45013.103.16	FCU Float valve Fin stern starboard Short Circuit	Current through valve is too high. Trigger at 1.5A	-check for short circuit
45014.100.13	FCU Lock valve Fin bow port Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45014.100.16	FCU Lock valve Fin bow port Short Circuit	Current through valve is too high. Trigger at 1.5A	-check for short circuit
45014.101.13	FCU Lock valve Fin bow starboard Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45014.101.16	FCU Lock valve Fin bow starboard Short Circuit	Current through valve is too high. Trigger at 1.5A	-check for short circuit
45014.102.13	FCU Lock valve Fin stern port Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45014.102.16	FCU Lock valve Fin stern port Short Circuit	Current through valve is too high. Trigger at 1.5A	-check for short circuit
45014.103.13	FCU Lock valve Fin stern starboard Open Circuit	No current detected through the valve when the valve is turned on.	-Check for open circuit
45014.103.16	FCU Lock valve Fin stern starboard Short Circuit	Current through valve is too high. Trigger at 1.5A	-check for short circuit

Fault Code	Fault Name	Fault Description	Action
10500.0.10	PHC Oil Level - Level Low	Hydraulic oil level is low	-Limit use of thruster -Inspect hydraulic oil level -Check system for leaks and refill hydraulic oil
10500.0.13	PHC Oil Level - Open Circuit	Analog oil level sensor open circuit	-Sensor not connected or wire break. -Verify sensor type in parameter 0201 -Disconnect sensor and measure that sensor resistance value is in range 0-180ohm.
10501.0.11	PHC Oil Temp - Level High	Oil temperature higher than 75°C (167°F)	-Limit use of thruster to prevent temperature to rise. -Check if cooling pump is running and there is cooling water flow. -Inspect seawater filter -Verify that cooling pump is enabled in parameter 0301
10501.0.13	PHC Oil Temp - Open Circuit	Analog oil temp sensor open circuit	-Sensor not connected or wire break. - Disconnect sensor and measure that sensor resistance value is in range 104ohm-147Kohm -Wrong sensor is defined in parameter 0201
10501.0.16	PHC Oil Temp - Short Circuit	Analog oil temp input short circuit	-Input shorted to GND, check wiring/sensor -Disconnect sensor and measure that sensor resistance value is in range 104ohm-147Kohm
10501.0.55	PHC Oil Temp - Overtemp	Hydraulic oil temperature has been higher than 120°C (248°F).	-Wait for oil temperature to cool down. -Check oil level and refill if level is low. -Check if cooling pump is running. -Check if cooling system gets water
10502.0.13	PHC Stabilizer Pressure - Open Circuit	Stabilizer pressure sensor open circuit	-Sensor not connected or wire break. -System incorrectly configured with stabilizer, parameter 1001 -Replace sensor
10502.0.16	PHC Stabilizer Pressure - Short Circuit	Stabilizer pressure sensor short circuit	-Wires shorted or sensor defective, check wiring/sensor -Replace sensor
10502.0.19	PHC Stabilizer Pressure - Under Limit	Stabilizer pressure has dropped below 20bar.	-Check accumulator charge pressure -Check PTO pressure (if PTO powered) -Check system for oil leaks -Check generator power supply to the VFD (is VFD motor speed maximum when pressure alarming low)
10502.0.20	PHC Stabilizer Pressure - Over Limit	Stabilizer pressure is higher than: parameter 1013 PTO OVER-PRESSURE FAULT LEVEL running from PTO (FW V1.029 an older, set point + 30bar running from PTO) or set point + 15bar running from AC motor	-Check Parameter 1013 PTO OVER-PRESSURE FAULT LEVEL -Check PTO pressure setting -Check accumulator charge pressure -Check unload valve operation
10502.0.26	PHC Stabilizer Pressure - VALUE MAX	Stabilizer pressure reached sensor max value.	-Check that correct sensor is fitted -Check that sensor range parameter 1010 match the sensor -Check PTO pressure setting
10502.0.200	PHC Stabilizer Pressure - Timeout	Stabilizer pressure has not reached 60% of set point parameter 1003 after 30sec.	-Check pump feed shutoff valve. -Check PTO pressure (if PTO powered) -Check system for oil leaks
10503.0.13	PHC System Pressure - Open Circuit	System pressure sensor open circuit	-Sensor not connected or wire break. -Verify system pressure, parameter 0104
10503.0.16	PHC System Pressure - Short Circuit	System pressure sensor short circuit	-Wires shorted or sensor defective, check wiring/sensor -Replace sensor
10504.0.13	PHC AI 1 - Open Circuit	Analog Input 1 (4-20mA) sensor open circuit	-Sensor not connected or wire break.
10504.0.16	PHC AI 1 - Short Circuit	Analog Input 1 (4-20mA) sensor short circuit	-Wires shorted or sensor defective, check wiring/sensor -Replace sensor
10505.0.13	PHC AI 2 - Open Circuit	Analog Input 2 (4-20mA) sensor open circuit	-Sensor not connected or wire break.
10505.0.16	PHC AI 2 - Short Circuit	Analog Input 2 (4-20mA) sensor short circuit	-Wires shorted or sensor defective, check wiring/sensor -Replace sensor
10508.0.13	PHC DOUT AC PUMP UNLOAD - Open Circuit	AC Pump Unload valve open circuit	-Check for open circuit, power consumption < 5.0 Watt -System incorrectly configured with stabilizer, parameter 1001
10508.0.51	PHC DOUT AC PUMP UNLOAD - Current High	AC Pump Unload valve current higher than 4.0A	-Check wires and connections for short circuit
10509.0.13	PHC DOUT ACCUMULATOR DUMP - Open Circuit	Accumulator Dump valve open circuit	-Check for open circuit, power < 5.0 Watt -System incorrectly configured with stabilizer, parameter 1001
10509.0.51	PHC DOUT ACCUMULATOR DUMP - Current High	Accumulator Dump valve current higher than 4.0A	-Check wires and connections for short circuit
10510.0.13	PHC DOUT STABILIZER - Open Circuit	Stabilizer valve open circuit	-Check for open circuit, power consumption < 5.0 Watt -System incorrectly configured with stabilizer, parameter 1001
10510.0.51	PHC DOUT STABILIZER - Current High	Stabilizer valve current higher than 4.0A	-Check wires and connections for short circuit
10511.0.13	PHC DOUT COOLING PUMP HYDRAULIC - Open Circuit	Hydraulic Cooling Pump valve open circuit	-Check for open circuit, power consumption < 5.0 Watt -Wrong cooling pump configured, parameter 0301
10511.0.51	PHC DOUT COOLING PUMP HYDRAULIC - Current High	Hydraulic Cooling Pump valve current higher than 4.0A	-Check wires and connections for short circuit
10512.0.13	PHC DOUT LS DUMP - Open Circuit	LS-Dump valve open circuit	-Check for open circuit, power consumption < 5.0 Watt -System wrong configured with thrusters, parameter 2001 or 2101
10512.0.51	PHC DOUT LS DUMP - Current High	LS-Dump valve current higher than 4.0A	-Check wires and connections for short circuit
10513.0.51	PHC DOUT PUMP #2 - Current High	Pump #2 valve current higher than 4.0A	-Check wires and connections for short circuit
10514.0.13	PHC DOUT 5 - Open Circuit	Digital Output 5 is configured as crossover and output is open circuit	-Check for open circuit, power consumption < 5.0 Watt -Output configured wrong, parameter 0505
10514.0.51	PHC DOUT 5 - Current High	Digital Output 5 current higher than 4.0A	-Check wires and connections for short circuit
10515.0.13	PHC DOUT 6 - Open Circuit	Digital Output 6 is configured as crossover and output is open circuit	-Check for open circuit, power consumption < 5.0 Watt -Output configured wrong, parameter 0506

Fault Code	Fault Name	Fault Description	Action
10515.0.51	PHC DOUT 6 - Current High	Digital Output 6 current higher than 4.0A	-Check wires and connections for short circuit
10516.0.13	PHC DOUT 3 - Open Circuit	Digital Output 3 is configured as crossover and output is open circuit	-Check for open circuit, power consumption < 5.0 Watt -Output configured wrong, parameter 0503
10516.0.51	PHC DOUT 3 - Current High	Digital Output 3 current higher than 4.0A	-Check wires and connections for short circuit
10517.0.13	PHC DOUT 2 - Open Circuit	Digital Output 2 is configured as crossover and output is open circuit	-Check for open circuit, power consumption < 5.0 Watt -Output configured wrong, parameter 0502
10517.0.51	PHC DOUT 2 - Current High	Digital Output 2 current higher than 4.0A	-Check wires and connections for short circuit
10518.0.13	PHC DOUT 1 - Open Circuit	Digital Output 1 is configured as crossover and output is open circuit	-Check for open circuit, power consumption < 5.0 Watt -Output configured wrong, parameter 0501
10518.0.51	PHC DOUT 1 - Current High	Digital Output 1 current higher than 4.0A	-Check wires and connections for short circuit
10519.0.13	PHC DOUT 4 - Open Circuit	Digital Output 4 is configured as crossover and output is open circuit	-Check for open circuit, power consumption < 5.0 Watt -Output configured wrong, parameter 0504
10519.0.51	PHC DOUT 4 - Current High	Digital Output 4 current higher than 4.0A	-Check wires and connections for short circuit
10520.0.51	PHC ECI PUMP POWER FEED - Current High	ECI cooling pump power current higher than 8.0A	-Check pump cable for damage and short circuits -Make sure the connector on the cooling pump is correct inserted. -Replace cooling pump
10521.0.51	PHC Bow Thruster Power - Current High	Bow thruster PVG feed current higher than 3.0A	-Check PVG wires and connections for short circuit
10522.0.51	PHC Stern Thruster Power - Current High	Stern thruster PVG feed current higher than 3.0A	-Check PVG wires and connections for short circuit
10523.0.51	PHC Thruster Power - Current High	Bow or Stern PVG feed current higher than 3.3A	Check all bow and stern PVG signal wires for short circuits
10524.0.51	PHC ECI Cooling Pump - Current High	ECI cooling pump current higher than 13.0A	-Check ECI cooling pump cable for damage and short circuits -Replace ECI cooling pump
10524.0.53	PHC ECI Cooling Pump - Overvoltage	ECI cooling pump overvoltage, voltage higher than 33.0V	-Check PHC-3 input voltage is below 33.0V -Replace ECI cooling pump
10524.0.54	PHC ECI Cooling Pump - Undervoltage	ECI cooling pump under voltage, voltage is lower than 18.0V	-Check PHC-3 input voltage is higher than 18.0V -Replace ECI cooling pump
10524.0.55	PHC ECI Cooling Pump - Overtemp	ECI cooling pump temperature higher than 100°C (212°F).	-Check ECI cooling pump for damages -Replace ECI cooling pump
10524.0.100	PHC ECI Cooling Pump - No Communication	No communication with ECI cooling pump	-Check if ECI pump is connected -Check wires to ECI pump for open circuits -Check power supply cooling pump -Wrong cooling pump configured, parameter 0301
10524.0.205	PHC ECI Cooling Pump - HW FAULT	ECI cooling pump hardware fault	-Replace ECI cooling pump
10526.0.0	PHC ECI Cooling Pump Blocked - -	ECI cooling pump is blocked	-Reset fault and if fault reappears, cooling pump need service or replacement. -Check pump inlet for obstacles
10527.1.0	PHC VFD Not Ready Instance 1 -	VFD not ready	-VFD external run enable/power available signal is lost.
10528.1.10	PHC VFD ABB Parameter Instance 1 Level Low	ABB ACS550 parameter values 2001 or 2002 cannot be a negative value.	-Check ABB ACS550 parameter 2001 and 2002.
10529.0.19	PHC ECI Cooling Pump Speed - Under Limit	ECI pump motor speed under limit. Motor speed is below 100 rpm, or not getting minimum 750 rpm with in 3 seconds.	-Check hose for dirt -Check pump inlet for obstacles
10530.0.201	PHC PTO ENGINE INSTANCE - INIT FAIL	Parameter 1011-PTO ENGINE INSTANCE is not defined	-Set parameter 1011-PTO ENGINE INSTANCE
10531.0.100	CC MODULE - No Communication	No communication with CC Module	-Check if CC Module is connected -Check wires to CC Module for open circuits -Check power supply CC Module
10532.0.24	CC MODULE AC PUMP - Fault	The CC Module AC pump curcuit is open and pump is not running	-Check if AC generator is running -Check if the AC pump contactor is tripped -Check wires to the pump for open circuit
10533.0.24	CC MODULE DC PUMP - Fault	The CC Module DC pump curcuit is open and pump is not running	-Check if DC pump contactor has 24VDC -Check if the DC pump contactor is tripped -Check wires to the DC pump for open circuit
36000.1.24	ABB ACS550 Instance 1 Fault	ABB ACS550 fault	Se ABB ACS550 drive for more details
36002.1.24	VACON Instance 1 Fault	VACON VFD Fault	Se VACON drive for more details
36003.1.24	ABB ACS580 Instance 1 Fault	ABB ACS580 fault	Se ABB ACS580 drive for more details
36004.1.24	EHP Instance 1 Fault	EHP Fault	-See fault from EHP for more details
36100.1.100	VFD Instance 1 No Communication	Lost communication with VFD	-VFD not powered up -VFD communication cable not connected or incorrectly wired -On the VFD make sure the RS485 BUS TERMINATION is in ON position
36103.1.0	VFD IN LOCAL Instance 1 -	VFD in local mode	-Switch VFD to remote mode

FIN ACTUATOR UNITS

The stabilizer system is in general a low maintenance product, but as all moving parts some degree of preventive maintenance will increase the lifetime and reliability of the system.

A chart for recommended check and service points is thereby offered at the end of this section.

For all new installations, or after a major parts change, a basic check should be done after the first 100 hours of operation or after the first week of proper use:

- Check that all hydraulic fittings are tight.
- Check all hoses for chaffing, and ensure they are not in contact with any moving parts.
- Inspect hydraulic cylinder rods and gland seals for damage, leaking, or scratches.
- Inspect the dirt indicator on the return oil filter.
- “Shake” the fins from the outside to feel if there is any play in any connection.
- Open the fins manual decouple valve (at the actuator point of allow movement) and manually move the fin fully to both sides to feel that there is not specific tough spot in the bearings.

Every time the boat is out of the water for service or other reason, we recommend that you take this opportunity to more thoroughly check some points that is not possible when the boat is in the water. A proper cleaning and check of the fins anodes (if fitted, can also be bonded to boats large anode system) is also appropriate during a haul out.

- Axial and radial play in the shaft can also be checked at this time; see the table below that details play allowances. A dial indicator is recommended for this procedure.
 - o Radial play should be checked with the indicator/micrometer positioned just below the seal housing between the top of the fin and the underside of the hull.
 - o Axial play should be checked by measuring the relative distance between the top of the axle shaft and hull plate. By using a crow bar on the twin yoke, moving and feeling the tightness of the bearings inside the boat while measuring from a fixed point with a micrometer.

	Shaft Radial Play (mm)	Shaft Axial Play (mm)
	Maximum	Maximum
SPS 65/66/67	0.10	0.20
SPS 55/90/91/92/93/94/96/97	0.15	0.30

(NB: Because of the big variation in different vessels actual use and operation, system specifications and maintenance, it is not possible to accurately predict the anticipated service life of the main shaft bearings. Thereby, Sleipner recommends general inspection and corrective actions if required. and that the bearing clearances be checked periodically when possible so to avoid extra hallout between normal service need.)

The service timing indicated in the chart is based calculations and experience, but please note that because of the variations in use and load, both due to different operation and for example different fin sizes allowed on the same actuator size, the life of bearings and seals can be both longer and shorter than indicated by the maintenance chart.

FINS

It is recommended that a thorough inspection of the fins be performed when the vessel is lifted out of water for maintenance. Damages on the fin surface must be repaired with vinylester/epoxy done by professionals

HYDRAULICS

The pressure filters require periodic element changes as per the maintenance schedule. The valves and manifolds are to be inspected regularly for external damage. To avoid corrosion and deterioration, a water inhibitor such as WD-40 or similar should be applied to the valves and fittings immediately after wash-down of the equipment. ***(NB: Refer to your hydraulic installation manual for more information.)***

***Filter replacement:**

We recommend to replace pressure and return line filter elements after the initial start up and test period, and latest at 50 operating hours. Thereafter every 2000 operating hours or every 2nd year.

Both pressure filter and return filter have pressure drop indicators. Check indicators every 6th month. The check have to be done with oil temperature above 40 °C, and the most flow demanding consumer active. Filter element replacement are required if indicators are in the red area.

Hydraulic oil replacement:

Every 4000 operating hours or every 3rd year. For heavy duty applications and commercial use, we recommend oil sample analyses every year. ***Check oil colour every 6th month. White or grey oil indicates water ingress or heavy condensation. This will require filter replacement, oil replacement and flushing of the system. See schedule and Hydraulic system manual.

CONTROL SYSTEM

With the exception of keeping the electrical parts and wiring clean, dry and damage-free, no maintenance is required for these parts. In general, all electrical equipment should be periodically checked to ensure that there are no mechanical damage or water build-up.

POWER UNIT

The power unit and its associated components require maintenance and have a lifetime so will in the future require replacement which can be done preventively as indicated within the charts here, to avoid potential follow damage to other parts.

The hydraulic oil integrity must be checked as per the schedule by extracting a sample from the system for analysis to ensure it is within the standards of its specifications.

The hydraulic power unit motor should not stay unused for longer periods, and either manually rotated every 3 months or started to ensure proper lubrication of the shafts and bearings on its shaft and bearings.

PREVENTATIVE MAINTENANCE SCHEDULE

The maintenance schedules in this section indicate the recommended preventative maintenance intervals for equipment supplied by Sleipner. Components utilized in Sleipner Stabilizer Systems but not supplied by Sleipner are not included in the maintenance schedule or under any Sleipner warranty.

The maintenance intervals are listed in hours of operation and time where relevant. Maintenance is to be performed according to this schedule utilizing time or hour intervals, whichever comes first. . The maintenance schedule incorporates the minimum required maintenance to ensure correct operation of the system. Should these guidelines not be followed, the warranty for those items will be void.

To perform maintenance, replacement parts may need to be purchased. Refer to the recommended spares list and/or drawings for associated part numbers.

Cooling System

cooling system. Must be flushed with fresh water and emptied if boat is left unused more than 2 weeks. Cooler maintenance: consult Bowman manual.



Contact a Authorized Sleipner technician.

* If analysis of the scheduled oil sample indicates an elevated level of brass particles in the hydraulic system, the pumps should be replaced or overhauled as soon as possible. Delay in component removal and system flushing will lead to contamination problems throughout the hydraulic system. Erratic component operation may be a symptom of hydraulic fluid contamination.







*** 2000 operating hours or annually, whichever occurs first.

**** Fins should be inspected annually by diver if possible

The data in the table below is provided to assist the vessel in scheduling the appropriate service staff and coordination of vessel docking (haul out) for maintenance procedures.

Level	Description
1	Onboard maintenance possible at sea No shore support required
2	Shore supported maintenance and corrective measures
3	Trained personnel required - Slepner personnel or equivalent
D	Dry - Vessel must be out of water to perform task
W	Wet - Vessel can be in water to perform task

A. HULL UNIT

Maintenance schedule	Service level	250h	500h	2000h	4000h	8000h	12000h	When out of water	When required	Months/Year
1. Change oil in bearing assembly 	1 D				✓					36/3 rd
2. Inspect spherical bearings, and Main Cylinders for external leakage	1 W			✓						
3. Inspect Stabilizer Manifolds	1 W			✓						
4. Inspect Stabilizer Manifolds Electrical Connections	1 W			✓						
5. Inspect Fin Angle Sensor Belts	1 W			✓						
6. Inspect Twin Yoke Area	1 W			✓						
7. Inspect Hydraulic Hoses	1 W			✓						
8. Check Shaft Clearances 	3 D							✓		
9. Replace Lower Shaft Seals 	3 D								✓	
10. Replace Main Shaft Bearings 	3 D								✓	
11. Inspect and replace Spherical Bearings and Cylinder Pins if necessary. (NOT relevant for SPS55) 	2 W				✓				✓	
12. Rebuild/Replace Cylinders 	3 W				✓				✓	
13. Replace the Fin Angle Belt	1 W				✓				✓	
14. Replace hydraulic actuator hoses	3 W				✓				✓	36/3 rd
15. Add pint for SPS55 actuator	1 W		✓							
16. Check and grease racks	1 W		✓							

B. FINS

Maintenance schedule	Service level	250h	500h	2000h	4000h	8000h	12000h	When out of water	When required
1. Inspect Fin Surfaces	1 D ****			✓****				✓	

B. HYDRAULIC POWER UNIT

Maintenance schedule	Service level	250h	500h	2000h	4000h	8000h	12000h	When out of water	When required	Months/ Year
1. Inspect the Dirt Indicator of the return filter, replace when required	1 W		✓							6/0.5
2. Inspect Flexible Hoses	1 W		✓							
3. Inspect Suction Hoses	1 W		✓							
4. Inspect Electrical Connections	1 W			✓						
5. Inspect Cooling Pump	1 W		✓							
6. Inspect Oil Cooler Tubes	1 W						✓			
7. Inspect Pump Drive Coupling	1 W				✓					
8. Inspect Motor and Frame Mounts	1 W			✓						
9. Test Hydraulic Oil Quality by means of taking sample***	2 W			✓					✓	12/1 st
10. Replace Return Filter Element*	1 W			✓					✓	24/2 nd
11. Replace Pressure Filter Element*	1 W			✓					✓	24/2 nd
12. Change Oil. Refill with mineral based hydraulic oil ISO - VG46	1 W				✓				✓	36/3 rd
13. Replace Drive Coupling Element	3 W					✓				
14. Rebuild/Replace Cooling Pump	3 W								✓	
15. Replace Hydraulic Hoses	3 W								✓	
16. Replace Oil Cooler	3 W								✓	
17. Replace Hydraulic Pumps*	3 W								✓	

B. CONTROL SYSTEM

Maintenance schedule	Service level	250h	500h	2000h	4000h	8000h	12000h	When out of water	When required
1. Clean the Cooling Fan of the VFD ①	1/3 W			✓					

Find your local professional dealer from our certified worldwide network for expert service and support. visit our website www.sleipnergrouper.com/support

Product Spare Parts and Additional Resources

For additional supporting documentation, we advise you to visit our website www.sleipnergrouper.com and find your Sleipner product.

Warranty statement

1. Sleipner Motor AS (The “Warrantor”) warrants that the equipment (parts, materials, and embedded software of products) manufactured by the Warrantor is free from defects in workmanship and materials for purpose for which the equipment is intended and under normal use and maintenance service (the “Warranty”).
2. This Warranty is in effect for two years (Leisure Use) or one year (Commercial and other Non-leisure Use) from the date of delivery/purchase by the end user, with the following exceptions;
 - (a) For demonstration vessels, or vessels kept on the water, the dealer is considered as the end user from 6 months after their launch of the vessel;
 - (b) The warranty period starts no later than 18 months after the first launch of the vessel.
 Please note that the boat manufacturer and dealer must pay particular attention to correct maintenance and service both by the products manuals as well as general good practice for the location the boat is kept in the period the boat is in their care. In cases where the 6 and 18 months grace periods for boat builders and dealers are passed, it is possible to obtain a full warranty upon inspection and approval of the warrantor or such representative.
3. Certain parts, classified as wearable or service parts, are not covered by the warranty. A failure to follow the required maintenance and service work as described in the product manual render all warranty on parts or components directly or indirectly affected by this void. Please also note that for some parts, time is also a factor separately from actual operational hours.
4. This Warranty is transferable and covers the equipment for the specified warranty period.
5. The warranty does not apply to defects or damages caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion except for equipment specifically designed as waterproof.
6. In case the equipment seems to be defective, the warranty holder (the “Claimant”) must do the following to make a claim:
 - (a) Contact the dealer or service centre where the equipment was purchased and make the claim. Alternatively, the Claimant can make the claim to a dealer or service centre found at www.sleipnergrouper.com. The Claimant must present a detailed written statement of the nature and circumstances of the defect, to the best of the Claimant’s knowledge, including product identification and serial nbr., the date and place of purchase and the name and address of the installer. Proof of purchase date should be included with the claim, to verify that the warranty period has not expired;
 - (b) Make the equipment available for troubleshooting and repair, with direct and workable access, including dismantling of furnishings or similar, if any, either at the premises of the Warrantor or an authorised service representative approved by the Warrantor. Equipment can only be returned to the Warrantor or an authorised service representative for repair following a pre-approval by the Warrantor’s Help Desk and if so, with the Return Authorisation Number visible postage/shipping prepaid and at the expense of the Claimant.
7. Examination and handling of the warranty claim:
 - (a) If upon the Warrantor’s or authorised service Representative’s examination, the defect is determined to result from defective material or workmanship in the warranty period, the equipment will be repaired or replaced at the Warrantor’s option without charge, and returned to the Purchaser at the Warrantor’s expense. If, on the other hand, the claim is determined to result from circumstances such as described in section 4 above or a result of wear and tear exceeding that for which the equipment is intended (e.g. commercial use of equipment intended for leisure use), the costs for the troubleshooting and repair shall be borne by the Claimant;
 - (b) No refund of the purchase price will be granted to the Claimant, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so. In the event that attempts to remedy the defect have failed, the Claimant may claim a refund of the purchase price, provided that the Claimant submits a statement in writing from a professional boating equipment supplier that the installation instructions of the Installation and Operation Manual have been complied with and that the defect remains.
8. Warranty service shall be performed only by the Warrantor, or an authorised service representative, and any attempt to remedy the defect by anyone else shall render this warranty void.
9. No other warranty is given beyond those described above, implied or otherwise, including any implied warranty of merchantability, fitness for a particular purpose other than the purpose for which the equipment is intended, and any other obligations on the part of the Warrantor or its employees and representatives.
10. There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives based on this Warranty for injury to any person or persons, or damage to property, loss of income or profit, or any other incidental, consequential or resulting damage or cost claimed to have been incurred through the use or sale of the equipment, including any possible failure or malfunction of the equipment or damages arising from collision with other vessels or objects.
11. This warranty gives you specific legal rights, and you may also have other rights which vary from country to country.

Patents

At Sleipner we continually reinvest to develop and offer the latest technology in marine advancements. To see the many unique designs we have patented visit our website www.sleipnergrouper.com/patents

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