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# User Manual

*Including Installation Guide for Control Panels*  
PJC421 & PJC422



## SLEIPNER GROUP

P.O. Box 519

N-1612 Fredrikstad

Norway

[www.sleipnergroup.com](http://www.sleipnergroup.com)

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## Products

PJC421-PVREL - Single joystick, twist detent, thruster control and S-link Color LCD touch screen  
 PJC421-PVREL-DNV - Single joystick, twist detent, thruster control and S-link Color LCD touch screen  
 PJC421-LE90 - Single lever, detent, thruster control and S-link Color LCD touch screen  
 PJC421-LE90-DNV - Single lever, detent, thruster control and S-link Color LCD touch screen  
 PJC421-LF90 - Single lever, detent, thruster control and S-link Color LCD touch screen  
 PJC421-LF90-DNV - Single lever, detent, thruster control and S-link Color LCD touch screen  
 PJC421-LF90X - Single lever, detent, thruster control and S-link Color LCD touch screen  
 PJC421-LF90X-DNV - Single lever, detent, thruster control and S-link Color LCD touch screen

PJC422-PVREL - Dual joystick, twist detent, thruster control and S-link Color LCD touch screen  
 PJC422-PVREL-DNV - Dual joystick, twist detent, thruster control and S-link Color LCD touch screen  
 PJC422-LE90 - Dual lever, detent, thruster control and S-link Color LCD touch screen  
 PJC422-LE90-DNV - Dual lever, detent, thruster control and S-link Color LCD touch screen  
 PJC422-LF90 - Dual lever, detent, thruster control and S-link Color LCD touch screen  
 PJC422-LF90-DNV - Dual lever, detent, thruster control and S-link Color LCD touch screen  
 PJC422-LF90X - Dual lever, detent, thruster control and S-link Color LCD touch screen  
 PJC422-LF90X-DNV - Dual lever, detent, thruster control and S-link Color LCD touch screen



Sleipner Motor AS  
 P.O. Box 519, Arne Svendsensgt. 6-8  
 N-1612 Fredrikstad, Norway

MC\_0451

## General Operation Considerations and Precautions Guidelines

### For the operation of thrusters

Never use thrusters when close to objects, persons or animals in the water. The thruster will draw objects into the tunnel and the rotating propellers. This will cause serious injuries and damage the thruster.

Always turn the main power switch off before touching any part of the thruster. An incidental start while touching moving parts can cause serious injuries.

It is the owner, captains or other responsible parties full responsibility to assess the risk of any unexpected incidents on the vessel. If the thruster stops giving thrust for some reason while manoeuvring you must have considered a plan on how to avoid damage to persons or other objects.

- Always turn the control device off when the thruster is not in use or when leaving the boat.
- When leaving the boat always turn off the main power switch for the thruster.
- Never use thrusters out of water without load.
- If the thruster stops giving thrust while running, there is possibly a problem in the drive system. You must immediately stop running the thruster and turn it off. Running the thruster for more than a few seconds without resistance from the propeller can cause serious damage to the thruster.
- If two panels are operated with conflicting directions at the same time the thruster will not run. If both are operated in the same direction, the thruster will run in this direction.
- If you notice any faults with the thruster switch it off to avoid further damage.
- The primary purpose of the thruster is to manoeuvre or dock the vessel. Forward or reverse speed must not exceed 4 knots when operated.

## Product description

### PJC4 series

Control your thrusters with PJC4 – joystick and control panel. PJC4 consist of TP-35 control panel and optional joystick design. See below for overview of available joystick types and order numbers. All models can be delivered with extended functionality to comply with DNV requirements, for control and monitoring of thruster systems.

#### Proportional thruster control for S-Link™ thruster systems

- Back-lit touch colour LCD
  - System status and diagnostics
  - Indication of power and direction of thrust
  - Interactive multi-language menus
- IPX7 water ingress rated control panel
- Flush or top mount control panel (HxW: 149x112mm)
- Built-in Wi-Fi module
- S-Link™ CAN-bus communication
- Built-in alarm buzzer
- Plug & Play cables, waterproof and compact connectors
- Dedicated connector for IO signals
- Supports various joystick designs

#### Environmental testing

- DNVGL-CG-0339:2019
- IACS E10:2018
- IEC 60945
- IEC 60092-504:2016

#### DNV Design Approved product variants available

- Power supply fault monitoring
- Display of propeller RPM
- Gear leg low oil level monitoring
- Select station, command transfer between multiple operator stations



PJC421-LE90  
PJC421-LE90-DNV\*



PJC421-LF90  
PJC421-LF90-DNV\*



PJC421-LF90X  
PJC421-LF90X-DNV\*



PJC421-PVREL  
PJC421-PVREL-DNV\*



PJC422-LE90  
PJC422-LE90-DNV\*



PJC422-LF90  
PJC422-LF90-DNV\*



PJC422-LF90X  
PJC422-LF90X-DNV\*



PJC422-PVREL  
PJC422-PVREL-DNV\*

\*DNV Design Approved product variant

# Panel Layout & Functions

LCD touch screen

Left selection button: Functionality according to display information

Right selection button: Functionality according to display information

Push and hold to turn the panel ON or OFF. Adjustment of backlight level.

Up and down menu navigation. Dedicated functions in dashboard view.

Push to immediate stop thruster operation. Push for 2 seconds to disable the stop function.

X1 Joystick: Connect cable from joystick

X2 S-Link: Connect cable from S-Link bus

X3 I/O: See Detailed IO Description chapter for more information.

## Activating the bow thruster

\*Bow thruster installation only

## Activating the stern thruster

\*Stern thruster installation only

Activating both bow and stern thruster to push the boat sideways

Activating both bow and stern thruster to rotate the boat on axis

<b>Parameter</b>	<b>Specification</b>		
Supply Voltage	Min +9 VDC	Typical +24VDC	Max +31VDC
Rated max input power X2 S-Link	4.5W		
Rated max input power X3 I/O	1.3W		
Environmental testing	DNVGL-CG-0339:2019 IACS E10:2018 IEC 60945 IEC 60092-504:2016 ABYC S-31		
Operating temperature	-25°C to + 70°C  IEC 60068-2-1:2007 Cold test IEC 60068-2-2:2007 Dry heat test		
IP rating	IP x7  IEC 60529		
EMC tested	IEC 60945:2002 IEC 60533:2015		
Vibration	IEC 60068-2-6		
Damp heat	IEC 60068-2-30		
Salt mist	IEC 60068-2-52, Kb		
Compass Safe Distance	0.2m  IEC 61000-4-8:2010 ISO 25862: 2009		
Internal buzzer sound level	IEC 60945:2002		
External buzzer sound level	IEC 60945:2002		
TP-35 weight	260g		
Display size	3.5 inch		

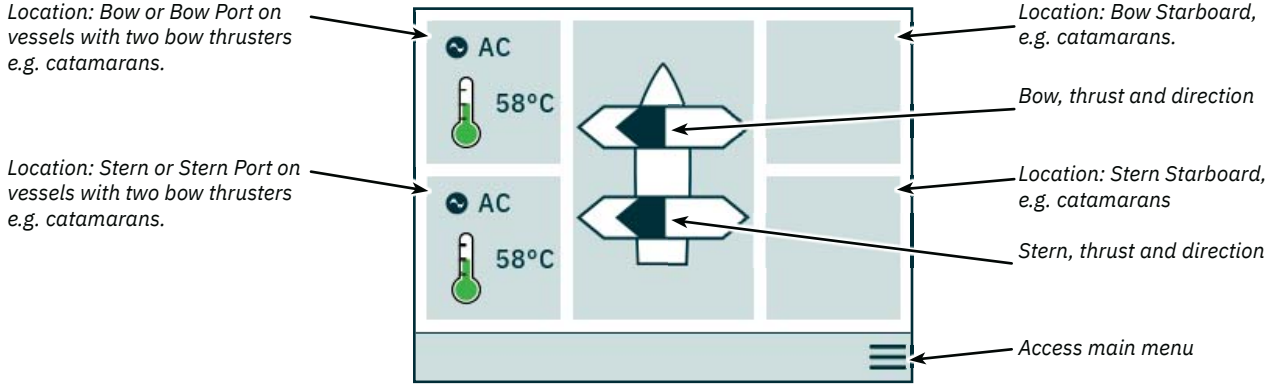


## Dashboard View Detailed Information

It is only possible to operate the thrusters when the dashboard view is active or when the backlight menu is accessed from the ON/OFF button.

The thruster dashboard view shows thruster type, applied thrust, direction of thrust and status information from up to four thrusters. The status information is oriented on the dashboard according to the physical location of the thrusters. For installations with two bow thruster, one joystick is used to operate both bow thrusters. The same amount of thrust is therefore applied to both thrusters and there is one common indicator for the amount and direction of thrust of both bow thrusters on the dashboard view. The same applies for vessels with two stern thrusters.

Below is an example of an installation with both bow and stern AC thrusters.



Thrusters with AC, DC and hydraulic motors can be operated by the control panel. Below figure describes the status information for the different thruster types.

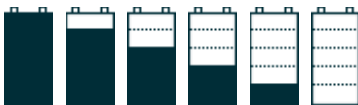
<p>Thruster type → AC</p> <p>Motor temperature indicator → 58°C</p> <p>Measured motor temperature</p>	<p>Thruster type → DC</p> <p>Motor temperature indicator →</p> <p>Battery capacity indicator</p>	<p>Thruster type → HYD</p> <p>Motor temperature indicator → 28°C</p> <p>Measured hydraulic oil temperature</p>
<p>AC Thruster</p>	<p>DC Thruster</p>	<p>Hydraulic thruster</p>

For hydraulic thrusters, the PHC-3 hydraulic controller can be used to control up to two hydraulic thrusters. Thus the dashboard shows only one hydraulic oil temperature symbol for installations where one PHC-3 hydraulic controller is used to control two thrusters.

The temperature icon has five levels. Green signifies normal temperature - Yellow signifies high temperature - Red signifies alarm stated due to too high temperature.



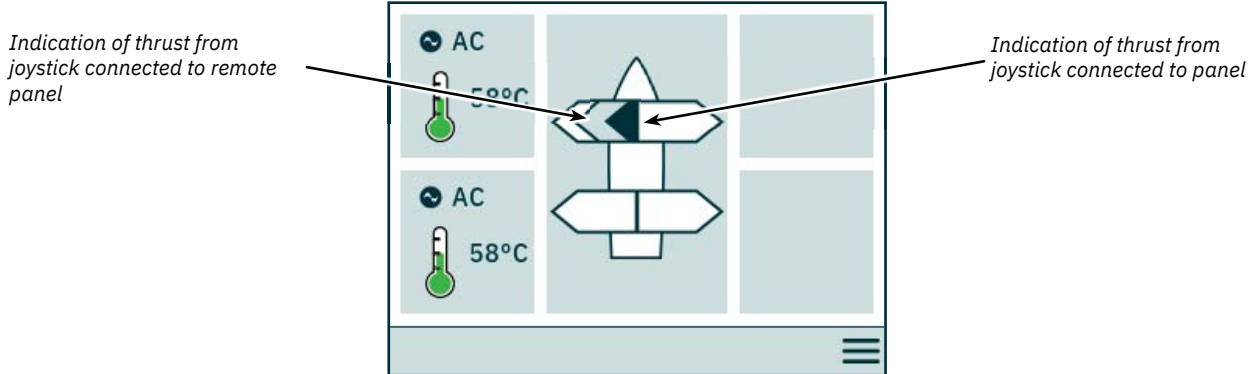
The battery status icon for DC thrusters has six levels. The shaded area in the battery symbol indicates the remaining battery capacity.



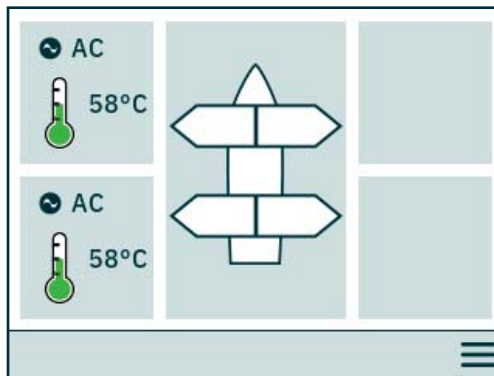
**Operation with more than one Control Panel**

Several control panels can be connected to the same S-Link bus and configured to control the same thruster. One example could be bridge and deck installation on the same vessel.

If joysticks are moved in the same direction on different control panels with different thrusts, the thruster will respond to the highest level. The panel will indicate thrust from the joystick connected to the panel with a dark blue coloured bar. If thrust from a remote panel is higher, it will be indicated with a light blue coloured bar.



If joysticks are moved in the opposing direction on different control panels, the thruster will not respond. In such situations the panel will indicate no thrust, refer to image below. The thruster will not respond before one of the joysticks has returned to zero position.

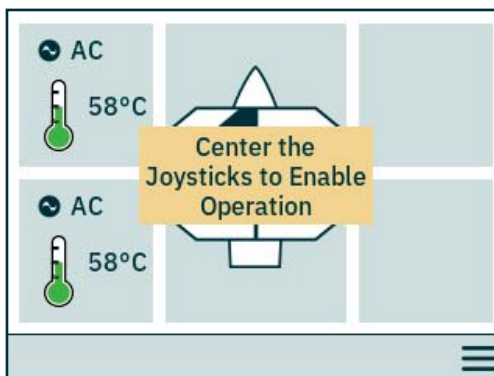


PJC4 part numbers that end with -DNV has additional functionality to ensure that only one control panel at the time can operate the thrusters. See chapter *Functionality of DNV models* for more information.

**Thruster Operation and Menu Navigation**

Thruster operation will be suspended if accessing Main Menu while running a thruster. If joysticks are not centred when returning to dashboard view the below notice will be shown and the joysticks must be centred to resume thruster operation. The same notice will be shown if the TP-35 is turned on with a joystick positioned out of centre.

This functionality is implemented as a safety function to prevent unintentional thruster operation.

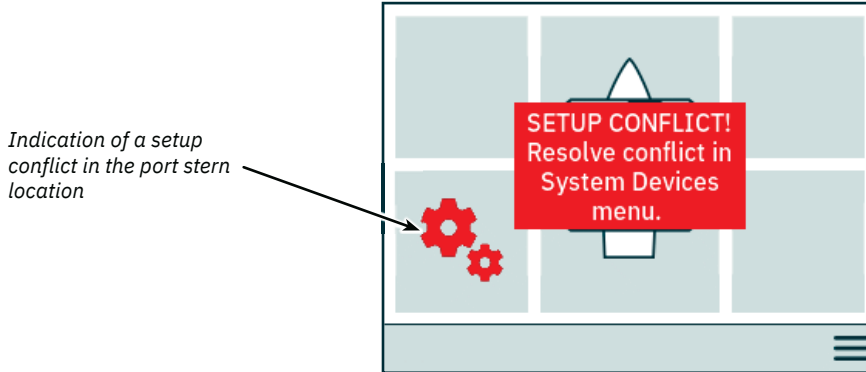


## Device Configuration

To enable operation of a thruster from the control panel the thruster must be associated to the control panel. Additionally, the thruster must be configured to ensure correct location in the thruster dashboard view and correct response when operating the joystick. For detailed information on how to associate and configure devices see *System Devices* chapter.

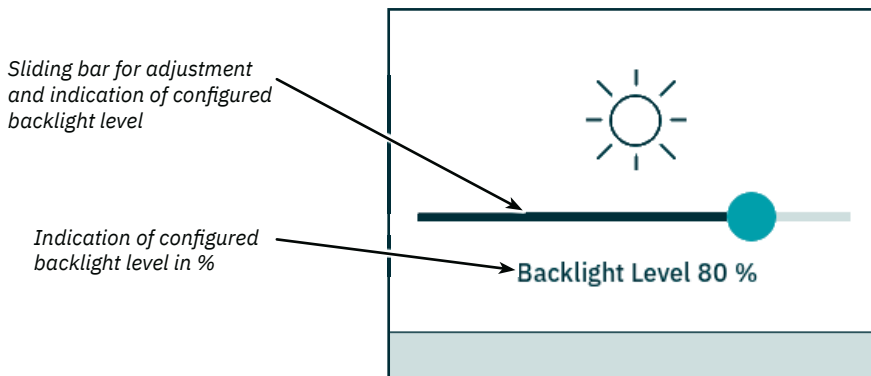
Configuring more than one associated device to be in the same location will result in a setup conflict. Thruster operation is suspended in the case of a setup conflict and a notice is displayed in the thruster dashboard view. Enter the System Devices menu to resolve such conflicts.

The image below shows an example of a setup conflict where more than one thruster controller has been configured to the port stern location.



## Adjustment of Backlight Level

Press and release the ON/OFF button to activate the backlight level adjustment menu. Pressing the ON/OFF button for more than 2 seconds will turn the panel OFF. Pushing the ON/OFF button when the backlight menu is active steps the backlight level between 20% - 50% - 80%. The backlight menu automatically closes after 3 seconds of inactivity. When turning on TP-35 the backlight level is always set to 80%.



The backlight level can be adjusted with 1% resolution using the slide bar on the touch screen.



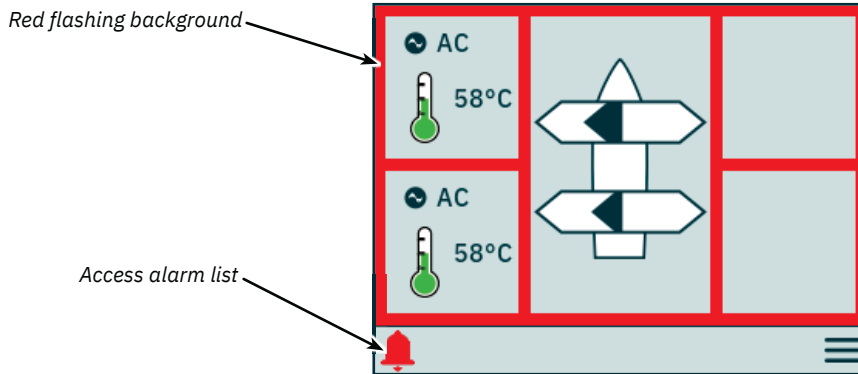
**Active Alarm**

All TP-35 that are connected to the S-Link bus enters alarm state if it receives an alarm code, regardless if the panel is turned ON or OFF. Communication alarms, due to lost communication with associated devices on the S-Link bus, will only be triggered when the panel is turned ON.

The alarm state is indicated by a blinking red background, an audible alarm signal, and the Access alarm list icon displayed in the lower-left corner. If an alarm code is received while the panel is turned OFF, the panel will automatically be turned ON and enter the alarm state. Turning the panel off when in an alarm state will mute the audible alarm signal, but not clear the active alarm. Generation of additional alarm codes will again turn the panel ON and activate the audible alarm signal.

Since configurations performed in the System Devices sub menus might affect potential alarm states, audible alarms are muted when entering the System Devices menu and all active alarms are cleared when exiting the System Devices menu.

It is not possible to operate thrusters with active alarms. Exceptions are *Oil over temperature alarm*, *Low oil level alarm* generated by PHC3, and *Auxiliary power supply alarm* on DNV product variants.

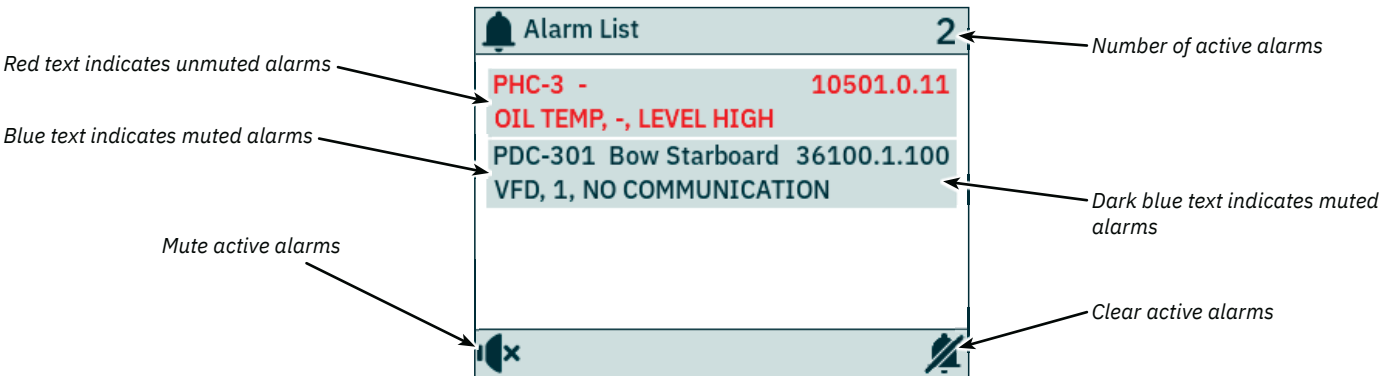


	Show list of active alarms.
--	-----------------------------

**Alarm List, Audible Alarm Signal Active**

Push *Mute active alarms* on one TP-35 to mute the audible alarm signals on all Sleipner control panels that are turned on and connected to the S-Link bus.

Unmuted alarms are listed in red, and muted alarms are listed in dark blue. Active alarms are not automatically cleared, even if the alarm state is no longer present in the device. Active alarms must always be cleared by the user to be removed from the alarm list.



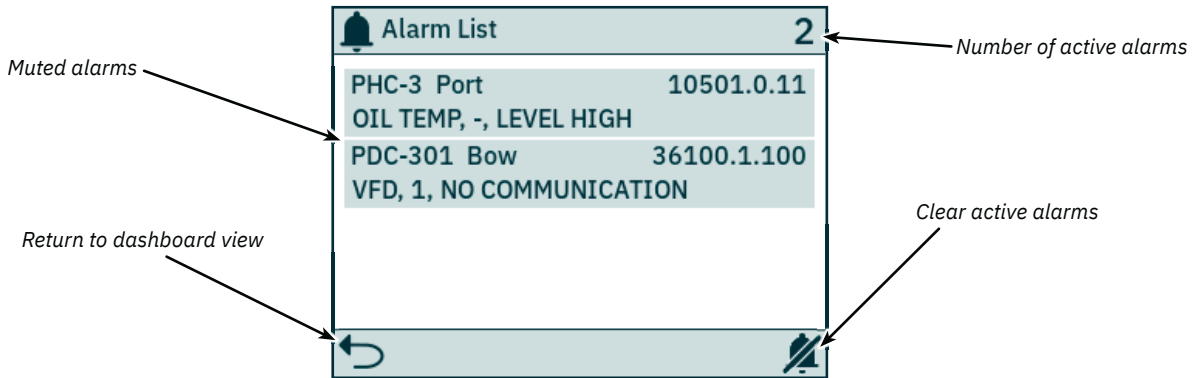
	Mute audible alarm signal.
--	----------------------------

	Clear all active alarms and mute audible alarm signals. A command to clear active alarms is sent to all devices connected to the S-Link bus. If an alarm state is still present in a device, a new alarm will be triggered in TP-35, and the audible alarm signal will be reactivated.
--	--

**Alarm List, Muted Audible Alarm Signal**

All active alarms are still listed after the audible alarm signal is muted.

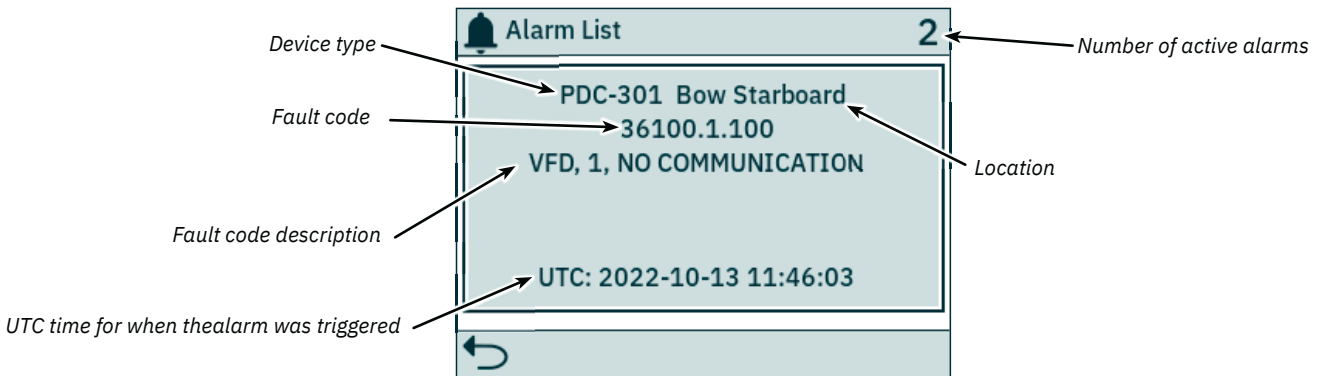
Clear active alarms have the same functionality as when the audible alarm signal is not muted.



	Selecting an alarm in the alarm list will display UTC time for when the alarm was triggered.
	Return to the dashboard view
	Clear all active alarms. A command is sent to all devices connected to the S-Link bus to clear active alarms. If the alarm state is still present in a device, a new alarm will be triggered in TP-35 and the audible alarm signal will be reactivated.

**Time Tagging of Alarms**

UTC time for when the alarm was triggered is displayed together with the device and fault code information.



	Return to the alarm list
--	--------------------------

**Immediate Stop Alarm**

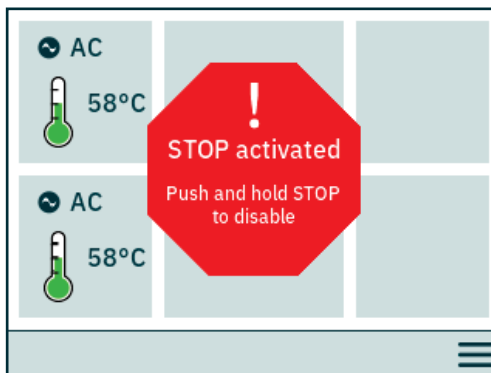
If the STOP button on TP-35 is pushed, a STOP message will be sent to all thrusters connected to the S-Link bus. An audible alarm signal will be given, and a notice will be displayed on the screen. The thrusters will immediately stop after receiving the STOP message and then broadcast the STOP Activated message.

If the STOP Activated message is not received by TP-35 within 1 second after the STOP button is pushed, the STOP notice will be closed.

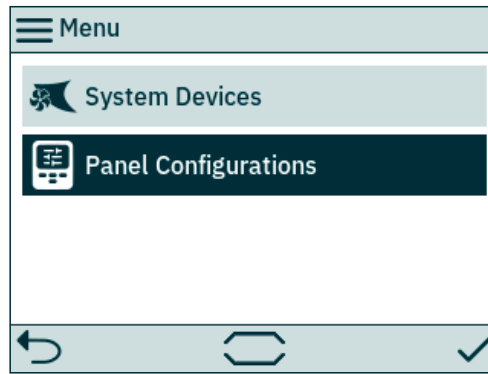
The STOP button must be pushed for 2 seconds to disable the stop function.

Pressing the STOP button with a hydraulic controller connected to the S-Link bus will activate the load sense dump valve and the oil pressure will be reduced to the standby pressure, which typically is 20 bar. Reducing to standby pressure will disable thruster operation, but other low consumption equipment connected to the same hydraulic system might be operable.

The STOP notice will be displayed on all Sleipner control panels that are turned on.



## Main Menu



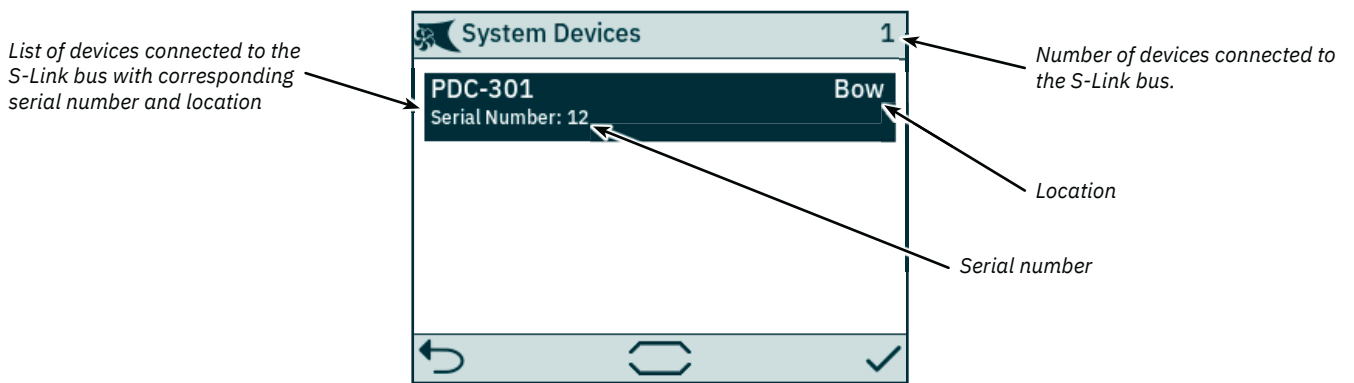
<b>System Devices</b>	List and configure devices connected to the S-Link bus
<b>Panel Settings</b>	Enables configuration of TP-35 behavior and displays serial number and firmware version.

### System Devices

When exiting the System Devices menu all listed devices are associated to the control panel. Once a device is associated the device type and unique serial number is stored in the control panel.

To disassociate a device that is disconnected from the S-Link bus the System Devices menu must be accessed. The disconnected device will no longer be present in the list, and when exiting the System Devices menu it will be automatically disassociated from the control panel.

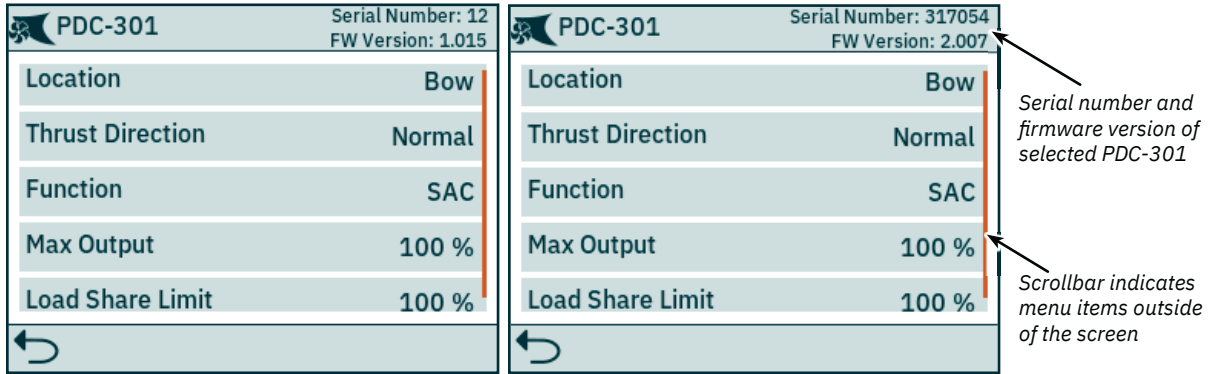
To ease the installation and configuration of connected devices it is recommended to fill out the list found in chapter *List of installed S-Link device of this manual*.



	Exit the System Devices menu and associate all listed devices to the control panel.
	Select desired device for configuration.

## PDC-301 Configuration

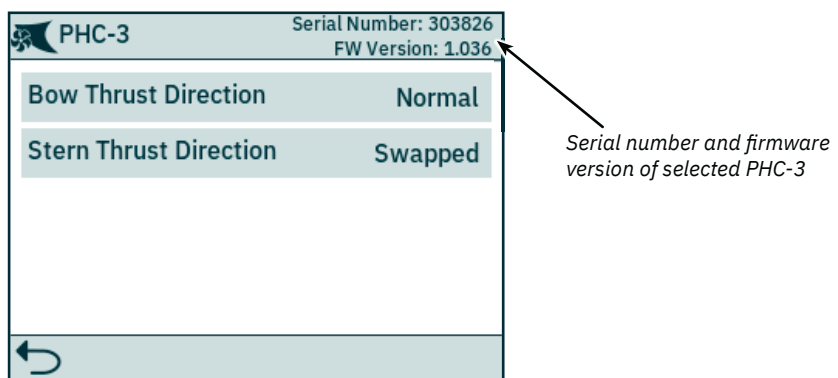
The proportional drive controller PDC-301 for AC thrusters has several parameters that can be configured.



<b>Location</b>	Specify the physical location where the device is installed. In a system with two bow or two stern thrusters, e.g. catamarans, use <i>Bow</i> or <i>Stern</i> for port thruster. For starboard thrusters use <i>Bow Starboard</i> or <i>Stern Starboard</i> . <ul style="list-style-type: none"> <li>• Bow (default)</li> <li>• Stern</li> <li>• Bow Starboard</li> <li>• Stern Starboard</li> </ul>
<b>Thrust Direction</b>	Set the running direction for the thruster. <ul style="list-style-type: none"> <li>• Normal (default)</li> <li>• Swapped</li> </ul>
<b>Function</b>	Configure thruster type. <ul style="list-style-type: none"> <li>• SAC - Tunnel thruster (default)</li> <li>• SRAC – Reserved for future functionality</li> </ul>
<b>Max Output</b>	Set the maximum thrust of the thruster. Value between 50% and 100% can be chosen (default 100%). PDC-301 will scale the joystick signal to this value.
<b>Load Share Limit</b>	Set the maximum thrust if both bow and stern thrusters are operated at the same time. Value between 0% and 100% can be chosen (default 100%). The Load Sharing limitation allows the system to limit the combined load on the generator when bow and stern thrusters are operated at the same time. The load sharing will dynamically limit the thrust request for each thruster depending on the joystick position and limit settings. For a detailed explanation and setup guide, see AC series thruster user manual, document ID 6054.
<b>Drive Type</b>	Select the type of Variable Frequency Drive (VFD) to be controlled by PDC-301. <ul style="list-style-type: none"> <li>• ABB ACS580/880 (default)</li> <li>• VACON</li> </ul>

## PHC-3 Configuration

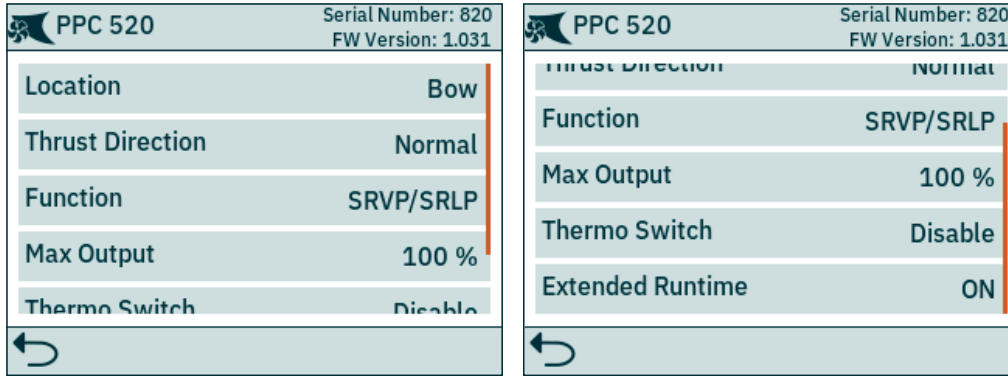
The proportional hydraulic controller PHC-3 has several parameters that can be configured. All these parameters are available for configuration on the PHC-3 controller’s display. See PHC-3 User Manual for more information, document ID 5267. Only the direction of thrust for PHC-3 can be configured from TP-35.



<b>Bow Thrust Direction</b>	Set the running direction for the bow thruster. <ul style="list-style-type: none"> <li>• Normal (default)</li> <li>• Swapped</li> </ul>
<b>Stern Thrust Direction</b>	Set the running direction for the stern thruster. <ul style="list-style-type: none"> <li>• Normal (default)</li> <li>• Swapped</li> </ul>

## PPC Configuration

The Proportional Power Controller models PPC520, PPC820 and PPC840 have the same configurable parameters.

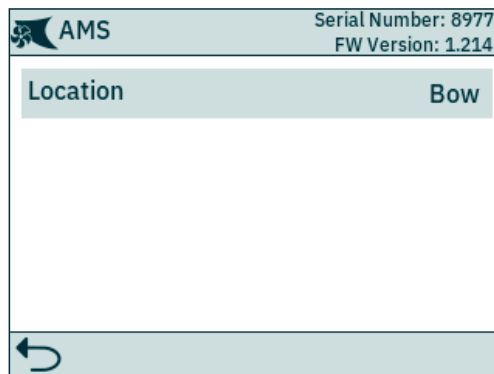


Serial number and firmware version of selected PPC

<b>Location</b>	Specify the physical location of the thruster which the PPC controls. Use Bow or Stern in conventional thruster system. In a system with two bow or two stern thrusters, for instance a catamaran, use Bow or Stern for port thruster. For starboard thrusters use Bow Starboard or Stern Starboard. <ul style="list-style-type: none"> <li>• Bow (default)</li> <li>• Stern</li> <li>• Bow Starboard</li> <li>• Stern Starboard</li> </ul>
<b>Thrust Direction</b>	Set the running direction for the thruster. <ul style="list-style-type: none"> <li>• Normal (default)</li> <li>• Swapped</li> </ul>
<b>Function</b>	Configure thruster type. <ul style="list-style-type: none"> <li>• SRP - Retract SR61242 with PPC</li> <li>• SRVP/SRLP - Retract SR150000 with PPC</li> <li>• SEP - Tunnel thruster with PPC</li> </ul>
<b>Max Output</b>	Set the maximum thrust of the thruster. Value between 50% and 100% can be chosen (default 100%). PPC will scale the joystick signal to this value.
<b>Thermo Switch</b>	Disable or Enables the thermo switch input on the PPC. If the thermo switch input is closed to 0V at power-up then this function is automatically set to Enable. <ul style="list-style-type: none"> <li>• Disable (default)</li> <li>• Enable</li> </ul>
<b>Extended Runtime</b>	The extended runtime function will increase the thrusters maximum runtime, by reduceing the maximum thrust when the motor temperature is high. Extended runtime can be used when thruster runtime needs to be extended, e.g. dynamic positioning- or docking systems. <ul style="list-style-type: none"> <li>• OFF (default) - Turn off extended runtime function.</li> <li>• ON - Turn on extended runtime function.</li> </ul>

## AMS Configuration

The Automatic Main Switch have one parameter that can be configured.

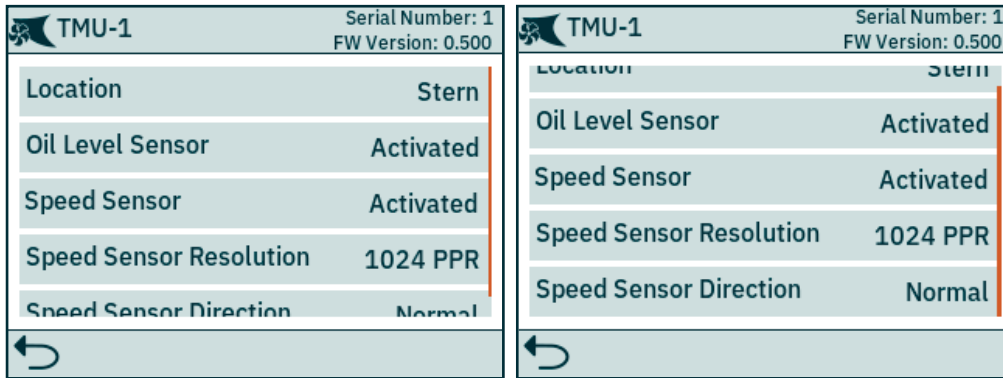


Serial number and firmware version of selected AMS

<b>Location</b>	Specify the physical location of the thruster which the AMS is connected to. Use Bow or Stern in conventional thruster system. In a system with two bow or two stern thrusters, for instance a catamaran, use Bow or Stern for port thruster. For starboard thrusters use Bow Starboard or Stern Starboard. <ul style="list-style-type: none"> <li>• Bow (default)</li> <li>• Stern</li> <li>• Bow Starboard</li> <li>• Stern Starboard</li> </ul>
-----------------	--

## TMU-1 Configuration

The Thruster Monitoring Unit (TMU-1) can be used to monitor additional thruster parameters such as motor RPM for AC and hydraulic thruster motors and low oil level on thruster gearlegs. Four parameters can be configured for TMU-1. See TMU-1 User Manual for more information on configuration, document ID 6995.

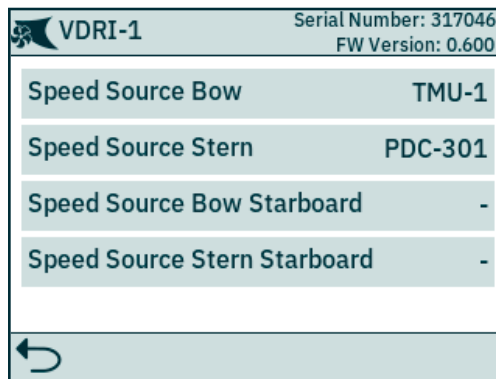


Serial number and firmware version of selected TMU-1

<b>Location</b>	Specify the physical location of the thruster which TMU-1 is connected to. Use Bow or Stern in conventional thruster system. In a system with two bow or two stern thrusters, for instance a catamaran, use Bow or Stern for port thruster. For starboard thrusters use Bow Starboard or Stern Starboard. <ul style="list-style-type: none"> <li>• Bow (default)</li> <li>• Stern</li> <li>• Bow Starboard</li> <li>• Stern Starboard</li> </ul>
<b>Oil Level Sensor</b>	Specify if the TMU-1 shall monitor the state of the level switch on the gearleg oil tank. <ul style="list-style-type: none"> <li>• Enable (default)</li> <li>• Disable</li> </ul>
<b>Speed Sensor</b>	Specify if the TMU-1 shall measure motor speed based on signals from RPM sensor on mounted on the thruster motor. <ul style="list-style-type: none"> <li>• Enable (default)</li> <li>• Disable</li> </ul>
<b>Speed Sensor Resolution</b>	Specify the number of pulses per revolution for the RPM sensor mounted on the thruster motor. Consult TMU-1 User Manual for a list of Pulses Per Revolution (PPR) values for different motor models. <ul style="list-style-type: none"> <li>• 1024 (default)</li> </ul>
<b>Speed Sensor Direction</b>	Set the sign of the reported RPM value. Swapped should be used if the Normal setting does not give positive reading for starboard direction and negative for port direction. <ul style="list-style-type: none"> <li>• Normal (default)</li> <li>• Swapped</li> </ul>

## VDRI-1 Configuration

The Voyage Data Recorder Interface (VDRI-1) can log thruster data from up to four different thruster installations and the control panels operating these thrusters. *Station Control* must be enabled to log data from the control panels, see *Station Control Settings* chapter for more information. For more information about VDRI-1, see *VDRI-1 User Manual*, document ID 6996.



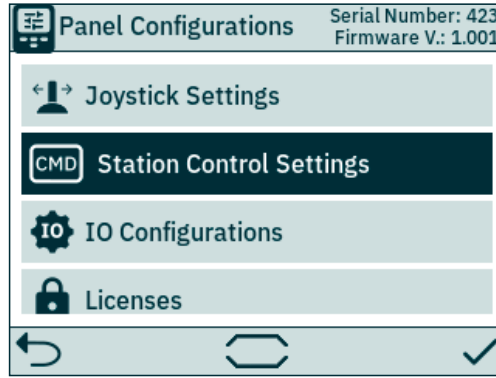
Serial number and firmware version of selected VDRI-1

<b>Speed Source Bow</b>	Configure Speed Source for installed thrusters. Use Bow or Stern in conventional thruster system. In a system with two bow or two stern thrusters, for instance a catamaran, use Bow or Stern for port thruster. For starboard thrusters use Bow Starboard or Stern Starboard. <ul style="list-style-type: none"> <li>• - (default) - No thruster data to be logged.</li> <li>• PDC-301 - Logged RPM data is based on calculated values from Variable Frequency Drive. Only available for AC thrusters.</li> <li>• TMU-1 - Logged RPM data is based on measurement performed by RPM sensor and requires TMU-1 to be installed and interfaced with an RPM sensor.</li> </ul>
<b>Speed Source Stern</b>	Same configuration options as Speed Source Bow.
<b>Speed Source Bow Starboard</b>	Same configuration options as Speed Source Bow.
<b>Speed Source Stern Starboard</b>	Same configuration options as Speed Source Bow.



## Panel Configurations

The *Panel Configurations* menu lists configuration options for TP-35 behaviour. Serial number and firmware version of TP-35 is also displayed in the Panel Settings menu.

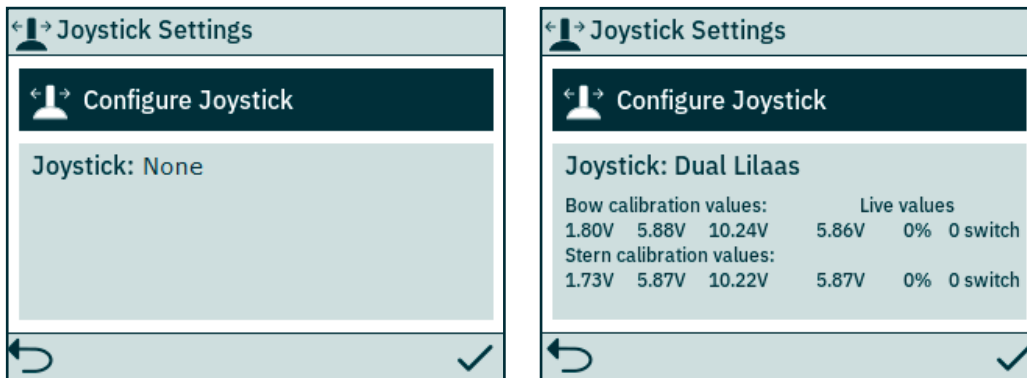


Serial number and firmware version of TP-35

<b>Joystick Settings</b>	Select joystick type and perform calibration.
<b>Station Control Settings</b>	Only available on -DNV product variants. Activate and configure the transfer of command functionality.
<b>IO Configurations</b>	Configure functionality of input and output signals available on the X3 I/O connector on the back of TP-35.
<b>Licenses</b>	List installed licenses. Option for adding new licenses.

## Joystick Settings

The Joystick Settings menu is used to initiate joystick calibration. If no calibration has been done, Joystick: None will be displayed. If a calibration has been completed the selected joystick type, calibration values and live values will be shown.



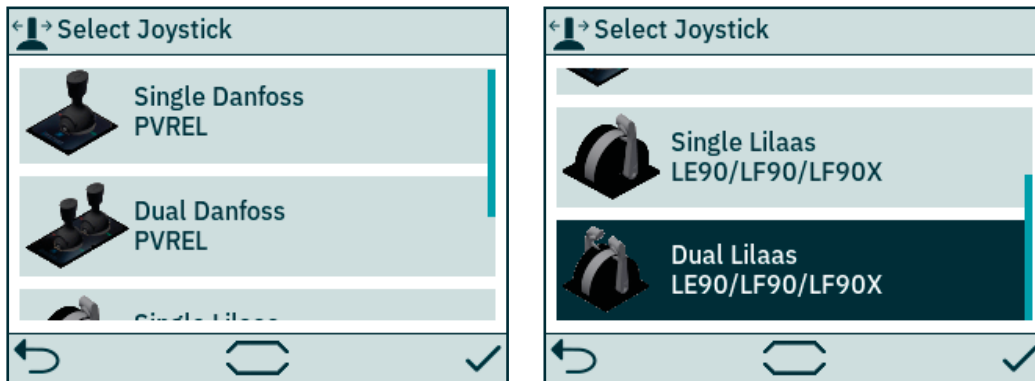
Calibration values show the measured voltage from the joystick potentiometer for fully port, centred and fully starboard position of the joystick.

Live values show the measured voltage from the joystick potentiometer and percentage of thrust according to the current joystick position. For joysticks with a centre switch, "0 switch" indicates joystick being centred and switch not triggered. "1 switch" indicates that the joystick has been moved out of centre and switch is triggered. Joysticks with no centre switch will always show "0 switch".

<b>Configure Joystick</b>	A new calibration is initiated.
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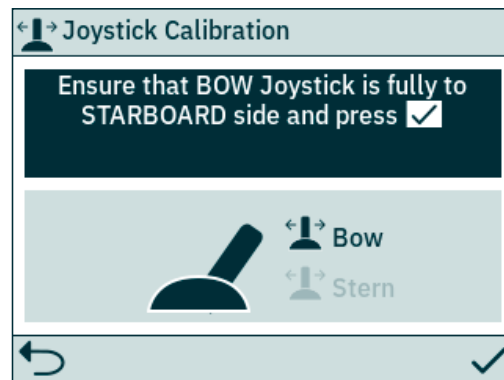
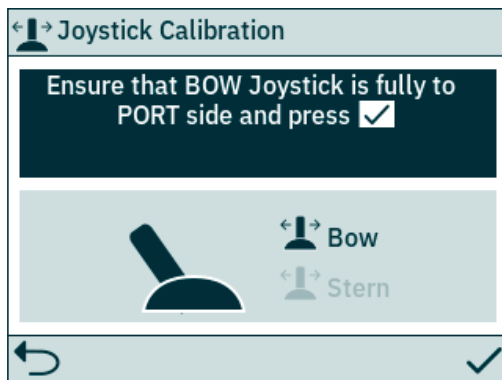
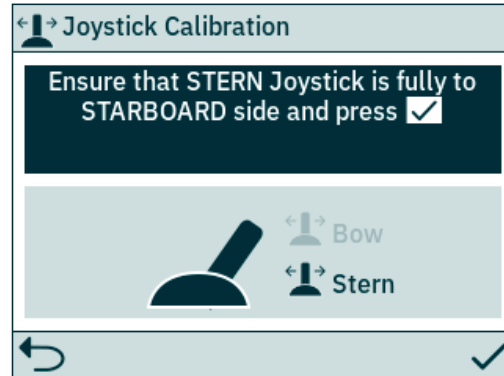
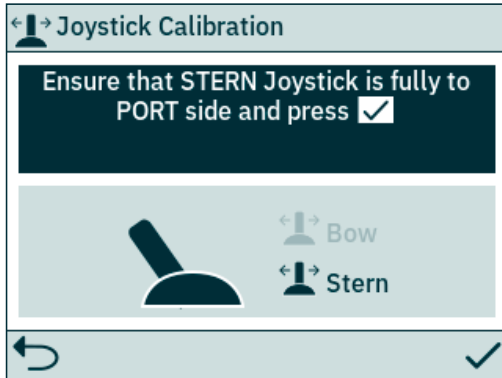
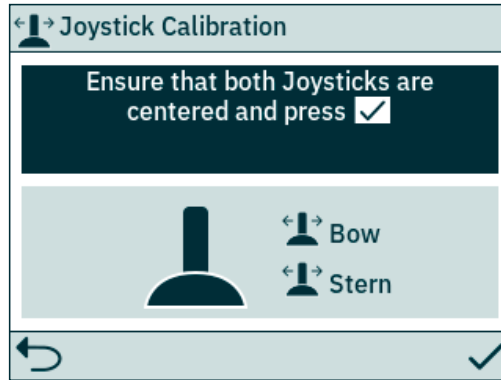
## Joystick Calibration

Select the joystick type which is connected to TP-35 and start the calibration . In case of dual bow and/or dual stern thruster installation the same joystick is used to operate both bow and/or both stern thrusters.



<b>Single Danfoss PVREL</b>	Select single Danfoss PVREL joystick for calibration.
<b>Dual Danfoss PVREL</b>	Select dual Danfoss PVREL joystick for calibration.
<b>Single Lilaas LE90/LF90/LF90X</b>	Select single Lilaas LE90, LF90 or LF90X joystick for calibration.
<b>Dual Lilaas LE90/LF90/LF90X</b>	Select dual Lilaas LE90, LF90 or LF90X joystick for calibration.
	Abort joystick calibration and return to <i>Joystick Setting</i> menu.
	Confirm joystick selection and initiate joystick calibration.

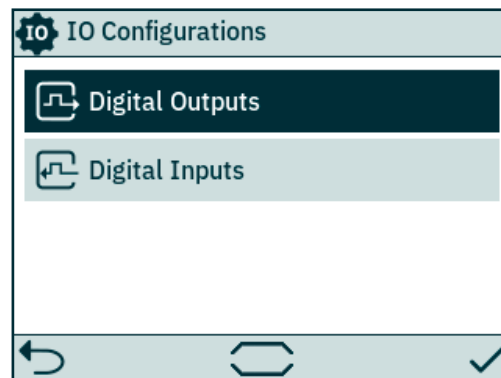
Follow the on-screen instructions to calibrate the joystick. It is important to keep the joystick in the specified position while pressing . Below is an example of the steps for calibrating a dual joystick.



	Abort joystick calibration and return to <i>Joystick Setting</i> menu.
	Confirm current calibration step.

### IO Configurations


This sub menu enables configuration of available IO signals. Two digital output pins, one isolated relay output and two digital IO pins are available on the X3 I/O connector of TP-35.



<b>Digital Outputs</b>	Configure functionality of digital output signals available on connector X3 I/O on the back of TP-35.
<b>Digital Inputs</b>	Configure functionality of digital input signals available on connector X3 I/O on the back of TP-35.

**Station Control Settings**

The Station Control Settings menu is only available on control panels with part numbers that end with -DNV. See detailed description in the *Functionality of DNV models* chapter.

CMD Station Control Settings	
Station Control	Activated
Workstation	Main
Location	Engine
	

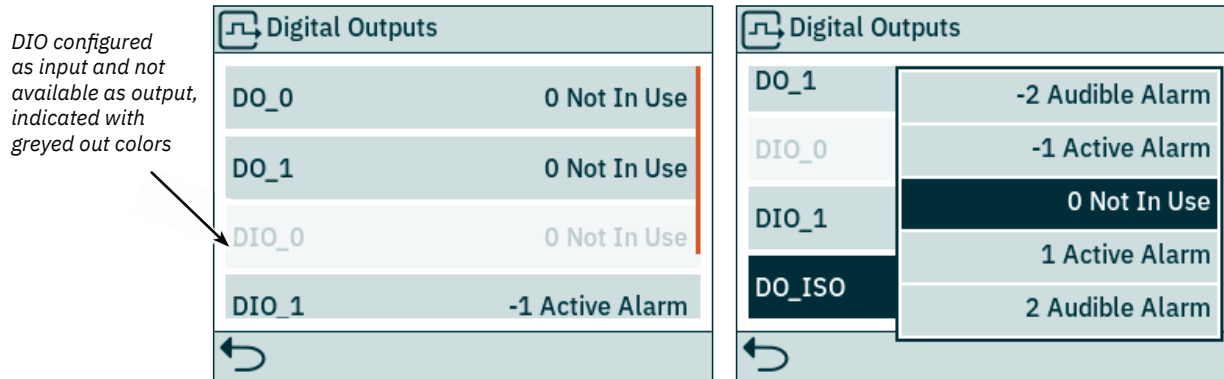
<b>Station Control</b>	<p>Enables or disables the Select station functionality and power supply failure alarm. By default Station Control is activated on all PJC4xx part numbers that ends with -DNV.</p> <ul style="list-style-type: none"> <li>• Activated (default)</li> <li>• Deactivated</li> </ul>
<b>Workstation</b>	<p>Defines the type of workstation, see <i>Select Station</i> chapter for detailed information.</p> <ul style="list-style-type: none"> <li>• Main (default)</li> <li>• Remote</li> </ul>
<b>Location</b>	<p>Defines the location of the control panel. Only used in systems with VDRI-1, see chapter <i>VDRI-1 Configuration</i> for more information.</p> <ul style="list-style-type: none"> <li>• Bridge</li> <li>• Port Wing</li> <li>• Starboard Wing</li> <li>• Engine Control Room</li> <li>• Engine</li> <li>• Wing (default)</li> </ul>

## Digital Outputs

Configure functionality of digital outputs by selecting the desired output signal and functionality. Listed functionalities are available on all digital outputs and the same functionality can be configured to multiple outputs. A negative value in front of the functionality inverts the output. E.g. if an active alarm exists *1 Active Alarm* will result in a high output, typical +12V or +24V, and *-1 Active Alarm* would result in a low output of 0V. If a DIO is configured as an input it will not be possible to configure it as an output until the corresponding input is set to "Not In Use", see *Digital Inputs* section for more information.

The DO\_ISO is an isolated relay output where high corresponds to closed connection and low would result in an open connection.

See *Control Panel - Alarms* chapter for more information of panel behavior in case of alarm situations.  
See *Detailed IO Description* chapter for more information of the available IOs.

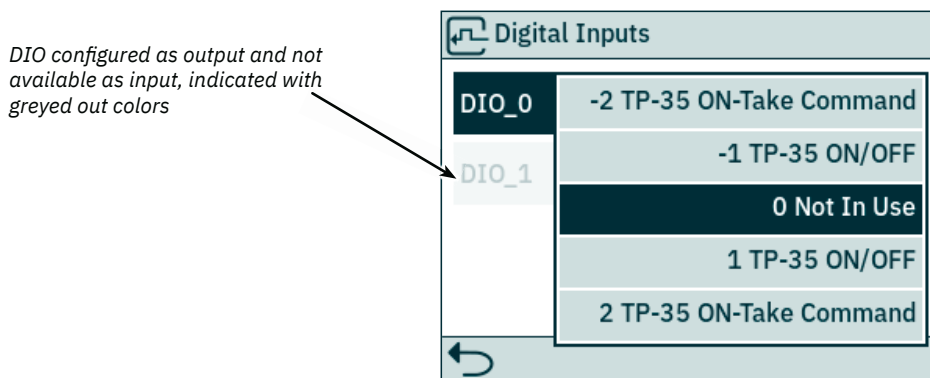


<b>DO_0</b>	0 Not in use (default) - Digital IO pin can be used as Digital Input. -1/1 Active alarm - Output is active if a device has an active alarm, regardless if panel is ON or OFF -2/2 Audible alarm - Output is active if a device has an active alarm and an active audible alarm signal.  Negative number in front of the function inverts the output.
<b>DO_1</b>	Same configuration options as DO_0.
<b>DIO_0</b>	Same configuration options as DO_0.
<b>DIO_1</b>	Same configuration options as DO_0.
<b>DO_ISO</b>	Same configuration options as DO_0.

## Digital Inputs

Configure functionality of digital inputs by selecting the desired input signal and functionality. Listed functionalities are available on all digital inputs and the same functionality can be configured to multiple inputs. A negative value in front of the functionality inverts the input. E.g. if an input is configured to *1 TP-35 ON/OFF* a transition from low to high will result in TP-35 being turned on, and *-1 TP-35 ON/OFF* would require transition from high to low to turn on TP-35. If a DIO is configured as an output it will not be possible to configure it as an input until the corresponding output is set to "Not In Use", see *Digital Outputs* section for more information.

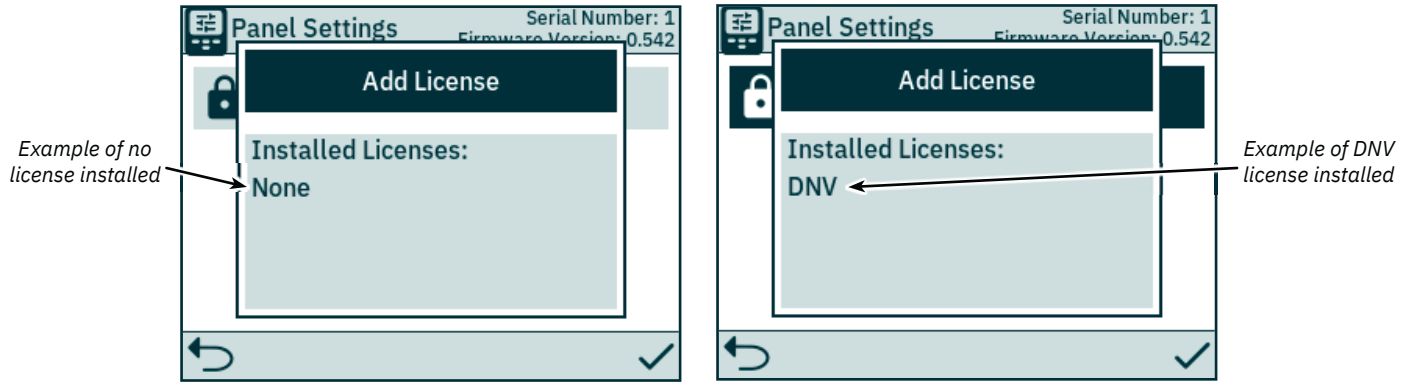
See *Select station* section for more information of transfer of command between control panels.  
See *Detailed IO Description* chapter for more information of the available IOs and trigger levels of digital inputs.



<b>DIO_0</b>	0 Not in use (default) - Digital IO pin can be used as Digital Output. -1/1 TP-35 ON/OFF - Activation of input turns TP-35 on, and deactivation of the input turns TP-35-OFF. -2/2 TP-35 ON-Take Command - Activation of input turns TP-35 on and request command. If TP-35 is already turned on, activation of input only request command. Deactivation of input results in no action.  Negative number in front of the function inverts the input.
<b>DIO_1</b>	Same configuration options as DIO_0.

**Add License**

Installed licenses are listed. The DNV license gives access to the functionality described in chapter *Functionality of DNV models*. All PJC4xx part numbers that ends with *-DNV* have the DNV license installed prior to shipment.

**Add License**

Keyboard is displayed for registration of license key, see chapter Menu navigation for description of the keyboard functionality.

**Control Panel - DNV Models****Functionality of DNV Models**

All PJC4xx part numbers that end with *-DNV* has additional functionality for compliance with DNV-RU-SHIP-Pt4Ch9 - Control and monitoring systems.

The following features are available with part numbers that end with *-DNV*:

- Power supply failure alarm
- Display of motor RPM
- Gear leg low oil level alarm
- Select station

For compliance with DNV-RU-SHIP-Pt4Ch9 independent emergency stop must be installed in addition to enabling of the functions listed above.



**Power Supply Failure Alarm**

An auxiliary power supply input is available on the X3 I/O connector. When powering TP-35 from both the S-Link interface and the I/O connector, an alarm will be triggered if one of the power supplies falls outside the rated input voltage range. See *Detailed IO Description* chapter for information on auxiliary power supply connection.

A failure on the S-Link power supply will suspend thruster operation from the control panel. If the auxiliary power supply falls outside rated voltage ratings, an alarm will be triggered, but thruster operation will be allowed.

An IO cable that mates with connector X3 I/O is included in all PJC4xx part numbers that end with -DNV.

**Display of Motor RPM and Gear Leg Low Oil Level Alarm**

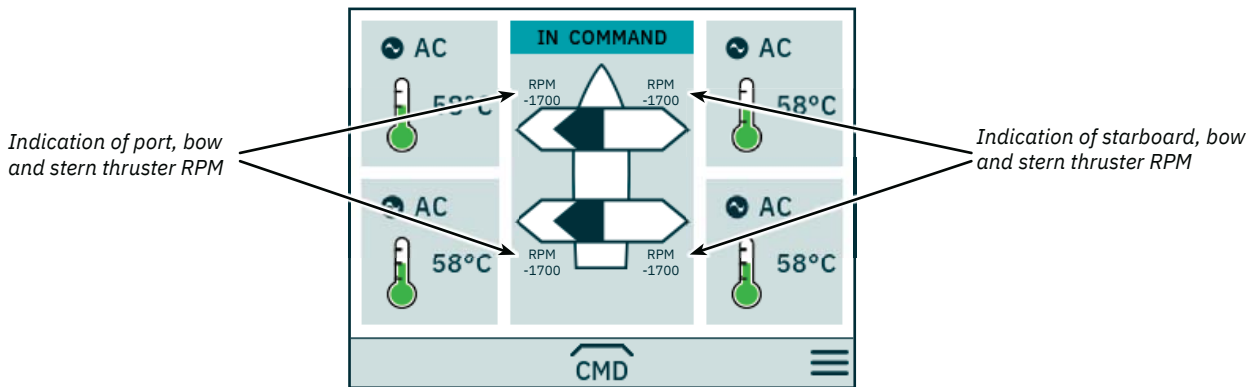
Sleipner Thruster Monitoring Unit-1 (TMU-1) must be installed and connected to the S-Link bus to display measured motor RPM and gear leg low oil level alarm on TP-35. For AC thrusters, estimated RPM from the VFD is displayed if TMU-1 is not installed.

The thruster motor must be equipped with an RPM sensor connected to TMU-1. An oil tank with a level switch must be installed and connected to TMU-1. RPM sensor signal and oil tank level switch signal from one thruster shall be connected to the same TMU-1, and there must be one TMU-1 for each thruster. See TMU-1 user manual for more information.

The RPM of the thruster is positive for starboard direction and negative for port.

When configuring the TMU-1 Location parameter, it is important to select the option that matches the physical installation of the thruster to ensure that the read RPM value is displayed at the correct location in the thruster dashboard view. See the *System Devices* chapter for more information on configuring the TMU-1

The thruster dashboard view example below shows an installation with four AC thrusters with an RPM sensor.

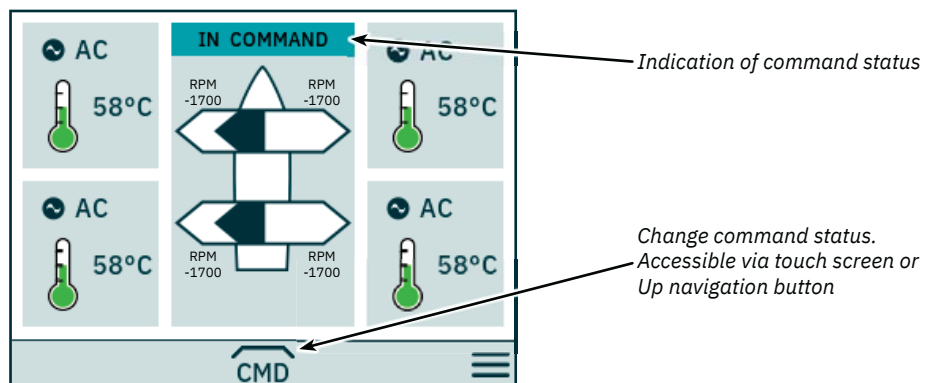


**Select Station**

This functionality ensures that the thrusters can only be operated by one control panel at a time. It requires that all control panels connected to the S-Link bus supports the Select station functionality and that this functionality is enabled.

The control panels installed on a vessel must be defined to be either Main Workstation or Remote Workstation. The type of workstation determines how the transfer of command can be conducted. It is only the workstation that is in the state IN COMMAND that can operate the thrusters. When turning on a control panel, it will automatically be IN COMMAND if none of the control panels connected to the S-Link bus is IN COMMAND.

Configuration of the select station functionality is described in the *Station Control Settings* chapter.



**Transfer of Command**

Main Workstation can obtain command from other Main Workstations and Remote Workstations.

Remote Workstation cannot obtain command from any other Workstation.

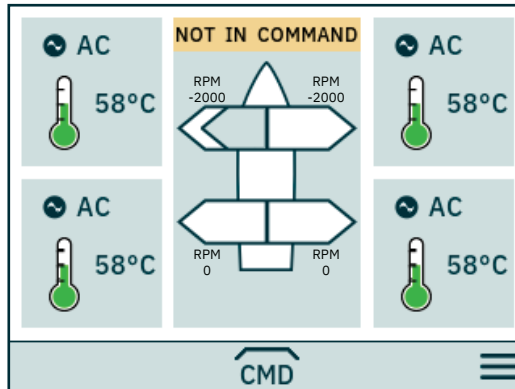
Remote Workstation and Main Workstation can obtain command when no other station is in command.

The control panel must be IN COMMAND to operate thrusters.

When the control panel is NOT IN COMMAND, thruster operation is suspended. If the connected joysticks are adjusted, no joystick signal is shown in the thruster dashboard view.

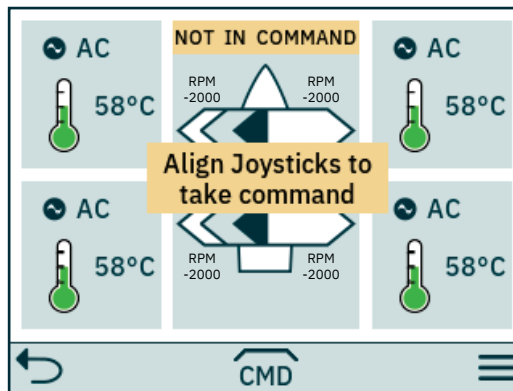
Operation of joysticks connected to a remote control panel being IN COMMAND will be shown with light blue arrows on the thruster dashboard view.

The measured RPM of the thruster motor is always displayed even if the control panel is NOT IN COMMAND.



Take command, when not IN COMMAND.

Joysticks must be aligned before a workstation can take command. If joysticks are not aligned when command is requested, a notice is displayed for 10 seconds. If the operator aligns the joysticks while this notice is displayed, command is taken, and an audible signal is given. If the joysticks are not aligned during the time the notice is displayed or the notice is manually closed, the workstation continues to be NOT IN COMMAND.



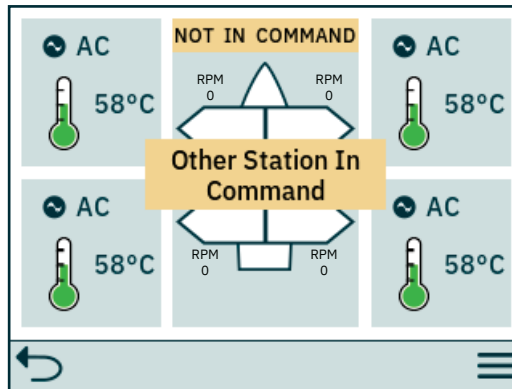
Closes the notice.



Command is transferred.

If a Remote Workstation request command when another Main or Remote Workstation is in command, a notice is displayed informing that another workstation is in command. The notice disappears after 3 seconds, or it can be manually closed.

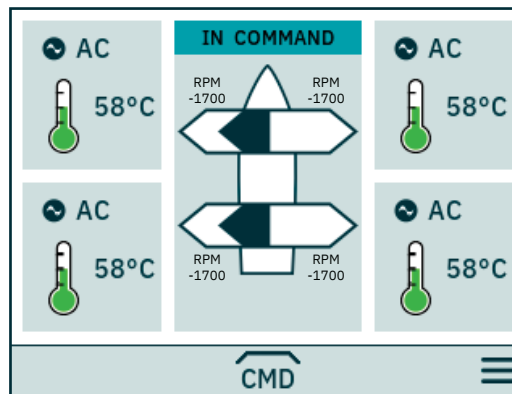
In such a situation, the other workstation must release the command before the command can be transferred.



Closes the notice.

### Release Command

When the control panel is IN COMMAND, Main Workstations and Remote Workstations can release command to allow for other workstations to take command. When command is released, an audible signal will be given to indicate that the state of the control panel has changed from IN COMMAND to NOT IN COMMAND. If command is released when thrusters are running, the thrusters will stop. Turning off the control panel will release command.



Release command.

# S-Link Fault Codes

Some fault situations in S-Link compliant products generates Fault Codes which are broadcasted on the S-Link bus. If a control panel receives a Fault Code, it will trigger an alarm in the control panel and the user will be able to get information about which product that reports the fault and the corresponding Fault Code. Please see the user manual of your S-Link compliant control panel for more information on how to access Fault Code information in case of an alarm situation.

Some of Sleipner S-Link compliant products have product specific Fault Codes. If a product does not have a dedicated set of Fault Codes it is covered by Sleipner Generic Fault Codes.

## PDC-301 Fault Codes

Fault Code	Fault Name	Fault Description	Action
10600.0.208	Retract Controller - INTERLOCK	Retract Interlock	-Check if retract is deployed. -No communication with Retract Controller, check Retract Controller has power. -Check PDC-301 and Retract Controller setup.
36100.1.24	VFD Instance 1 Fault	VFD faulted	-See VFD for more information
36100.1.100	VFD Instance 1 No Communication	PDC-301 has no MODBUS communication with VFD.	-Check communication cable with VFD -Check if VFD has power
36101.1.200	VFD PMS Instance 1 Timeout	VFD is not ready within 60 after power request.	-Check if VFD has power
36101.1.204	VFD PMS Instance 1 SIGNAL LOST	Lost Power Management signal from VFD, VFD not available anymore.	-Check VFD for more information.
36103.1.0	VFD IN LOCAL Instance 1 -	VFD in Local or Hand Mode	-Change mode in VFD panel.

# PHC-3 Fault Codes

MC\_0117

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

# PHC-3 Fault Codes

MC\_0117

Fault Code	Fault Name	Fault Description	Action
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
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

## PPC Fault Codes

MC\_0538

Fault Code	Fault Name	Fault Description	Action
10000.0.11	Motor Temp - Level High	Motor temperature is higher than 120C/248F	- Cool down motor below 110C/230F
10000.0.13	Motor Temp - Open Circuit	Motor temperature sensor open circuit	-Check for an open circuit on the temperature sensor on the motor
10000.0.16	Motor Temp - Short Circuit	Motor temperature sensor short circuit	-Check for an short circuit on the temperature sensor on the motor
10001.0.13	Motor Thermo Switch - Open Circuit	Thermoswitch input is activated	-Thruster needs to cool down before operated again -If motor is not warm then check for thermoswitch open circuit or if wrong setup
10100.0.11	Device Cooling Fin Temp - Level High	PPC controller temperature is higher than 80C/176F	-Cool down PPC to below 45C/113F
10200.0.10	System Voltage - Level Low	Low motor voltage when motor is running. 12V thruster below 8.00V 24V thruster below 12.00V	-Recharge thruster battery -Reset or power off for 30 seconds
20000.0.73	IPC - Contact Before Energized	IPC error, motor relay fault before energized	-Turn off thruster battery main switch. -Thruster must be serviced by authorized personell
20000.200.70	IPC Starboard No Contact Energized	IPC error, motor relay no contact when energized to starboard side	-Turn off thruster battery main switch. -Thruster must be serviced by authorized personell
20000.201.70	IPC Port No Contact Energized	IPC error, motor relay no contact when energized to port side	-Turn off thruster battery main switch. -Thruster must be serviced by authorized personell
30000.200.51	Thruster Solenoid Starboard Current High	Motor starboard contactor fault	-Check motor contactor connections -Check for short circuit -Check for dead relay
30000.201.51	Thruster Solenoid Port Current High	Motor port contactor fault	-Check motor contactor connections -Check for short circuit -Check for dead relay
30100.0.51	Thruster Motor Current - Current High	Motor current to high.	-Thruster must be serviced by authorized personell -Reset or power OFF then wait 30sec and then power the PPC ON -Check groining on the propeller -Check obstacles in the thruster tunnel
30100.0.52	Thruster Motor Current - Current Critical	Motor current critical high.	-Thruster must be serviced by authorized personell -Reset or power OFF then wait 30sec and then power the PPC ON
30300.0.19	Cooling Fan Speed - Under Limit	Cooling fan stopped running or running to slow	PPC must be sent for service

## AMS Fault Codes

MC\_0537

Fault Code	Fault Name	Fault Description	Action
153.0.24	Supply Voltage - Fault	Supply Voltage Fault	-Check power connections
22000.0.0	AMS Manual Override - -	Main switch manually overridden	-Pull main switch
22001.0.0	AMS Fuse Blown - -	Fuse blown	-Replace fuse -Check if main cable from battery and main cable to thruster has been switched

## TMU-1 Fault Codes

MC\_0470

Fault Code	Fault Name	Fault Description	Action
10103.0.10	Gearleg Oil - Level Low	Gearleg oil level is low	-Check level indicator on the external oil tank. If low oil level in tank, refill oil and check gearleg for leakage. -If oil level is ok, check that cable between TMU-1 and oil tank sensor is connected and not damaged.
10104.0.212	Motor Speed - Overspeed	Motor speed higher than 5.000 RPM	-Verify that Pulse Per Revolution configuration on TMU-1 matches RPM sensor specification. -Check that cable between TMU-1 and RPM sensor is connected and not damaged.

## VDRI-1 Fault Codes

MC\_0449

Fault Code	Fault Name	Fault Description	Action
109.0.0	Configuration Error - -	Potential causes: -No Speed Source configured. At least one instance must be configured for VDRI to log data. -An instance does not receive data according to the configured Speed Source. -An instance receives data when no Speed Source is configured.	Check configuration and installed devices on S-Link bus.



## Responsibility of the Installer

MC\_0038

The installer must read this document to ensure necessary familiarity with the product before installation.

Instructions in this document cannot be guaranteed to comply with all international and national regulations. It is the responsibility of the installer to follow all applicable international and national regulations when installing Sleipner products.

The recommendations given in this document are guidelines ONLY, and Sleipner strongly recommends that advice is obtained from a person familiar with the particular vessel and applicable regulations.

This document contains general installation instructions intended to support experienced installers. If you are not skilled in this type of work, please contact professional installers for assistance.

If required by local regulation, electrical work must be done by a licensed professional.

Appropriate health and safety procedures must be followed during installation.

Faulty installation of Sleipner products will render all warranties given by Sleipner Motor AS.

When installing an S-Link™ system DO NOT connect any other control equipment directly to the S-Link™ bus except original Sleipner S-Link™ products.

In case of connecting third-party equipment, it must always be connected through a Sleipner-supplied interface product.

Any attempt to directly control or connect into the S-Link™ control system without a designated and approved interface will render all warranties and responsibilities of all of the connected Sleipner products.

If you are interfacing the S-Link™ bus by agreement with Sleipner through a designated Sleipner supplied interface, you are still required to install at least one original Sleipner control panel to enable efficient troubleshooting if necessary.

MC\_0105

The TP-35 has two mounting options.

### Top Mount

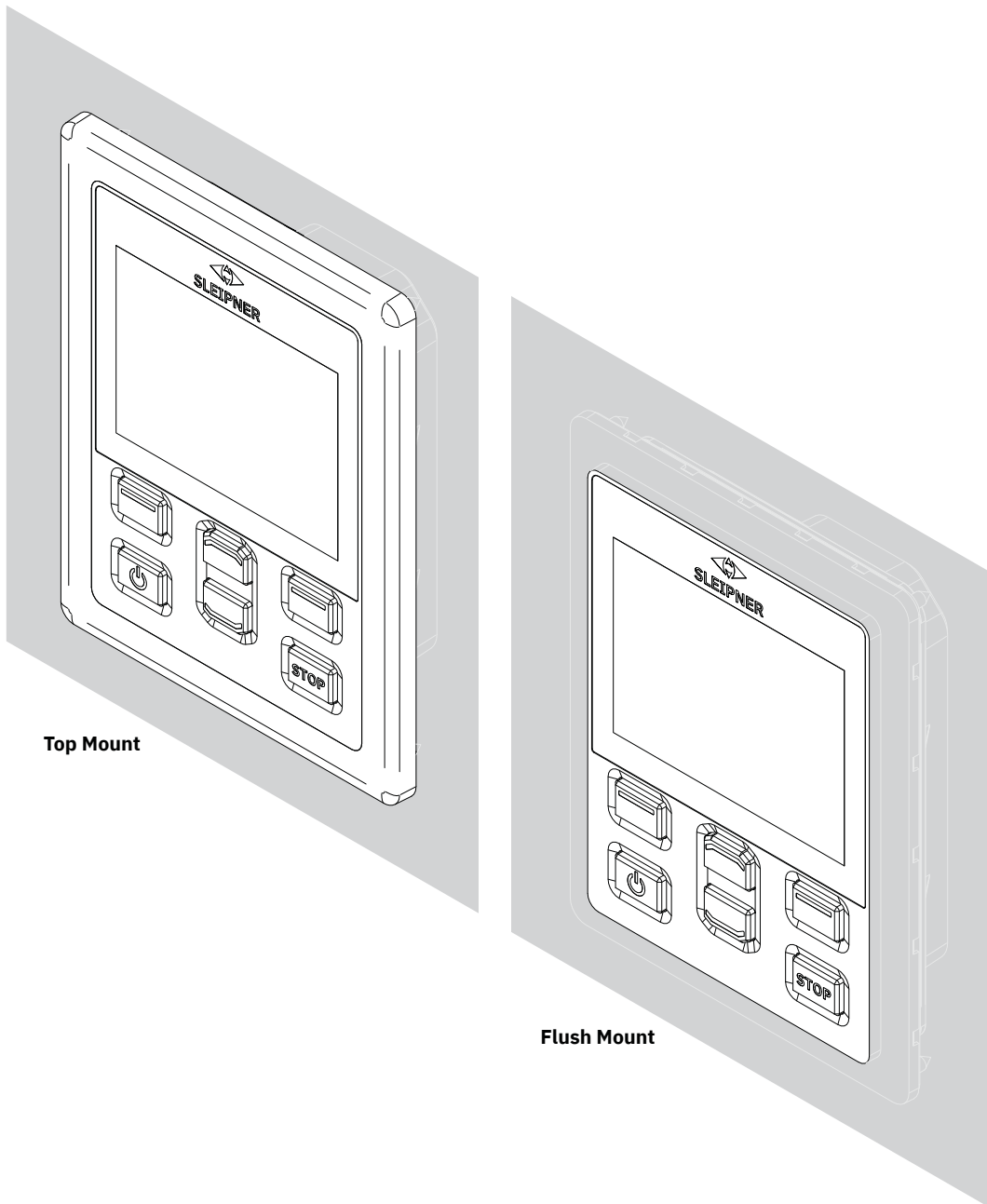
For the simplest installation the top mount design sits on the console board.

### Flush Mount

The flush mount allows for a sleek and seamless display option exposing only the main screen, operation buttons and minimised panel surface. Note that flush installations require adequate access to the back surface of the dash board to allow for the installation process.

When deciding your installation preference ensure to.

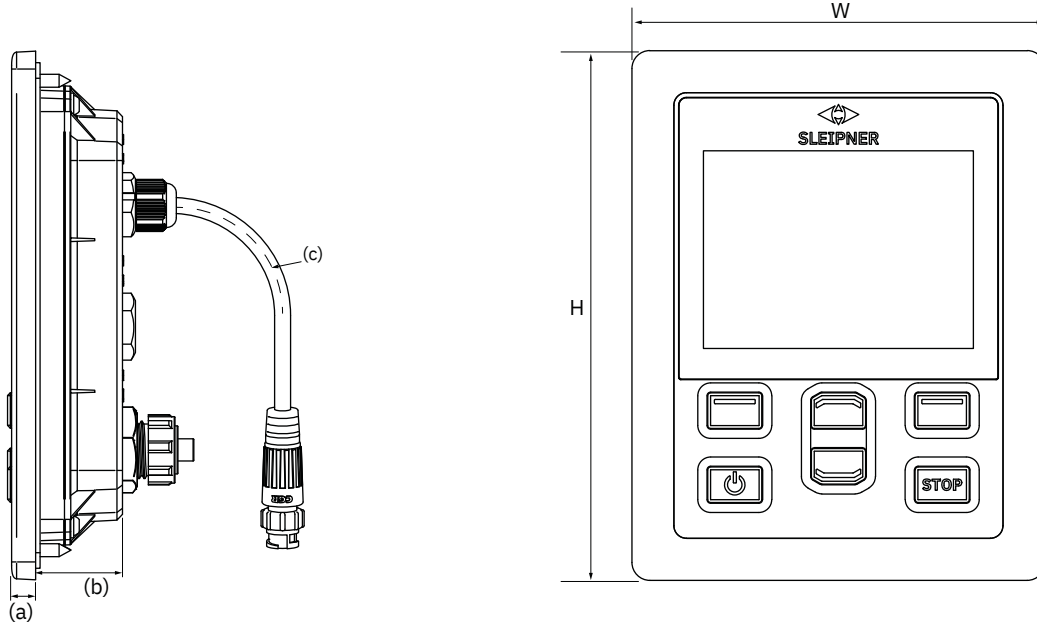
1. Find a suitable location for the control panel where it does not obstruct or is obstructed by other devices. Install the control panel on a flat surface where it is easy to use.
2. Ensure the panel should be mounted 20 cm away from any compass to ensure that the accuracy of the compass is not affected.
3. If the panel is mounted in an weather exposed location mounting the covering is recommended when the panel is not used.



MG\_0463

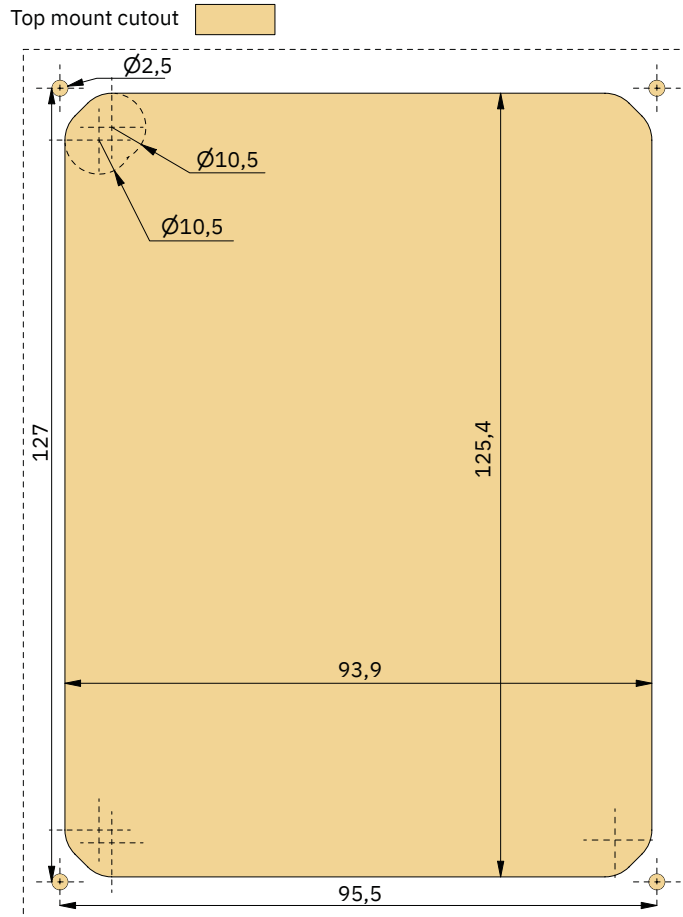
Measurement code	Measurement description	TP-35 Top Mount	
		mm	inch
H	Panel Height	143.1	5.6
W	Panel width	111.6	4.4
(a)	Raised height above the dashboard	6.5	0.26
(b)	Depth behind the dashboard (not inc. cables)	23.5	0.9
(c)	Cable bend radius	35	1.4

Top mount



MG\_0455

### Cutout Template



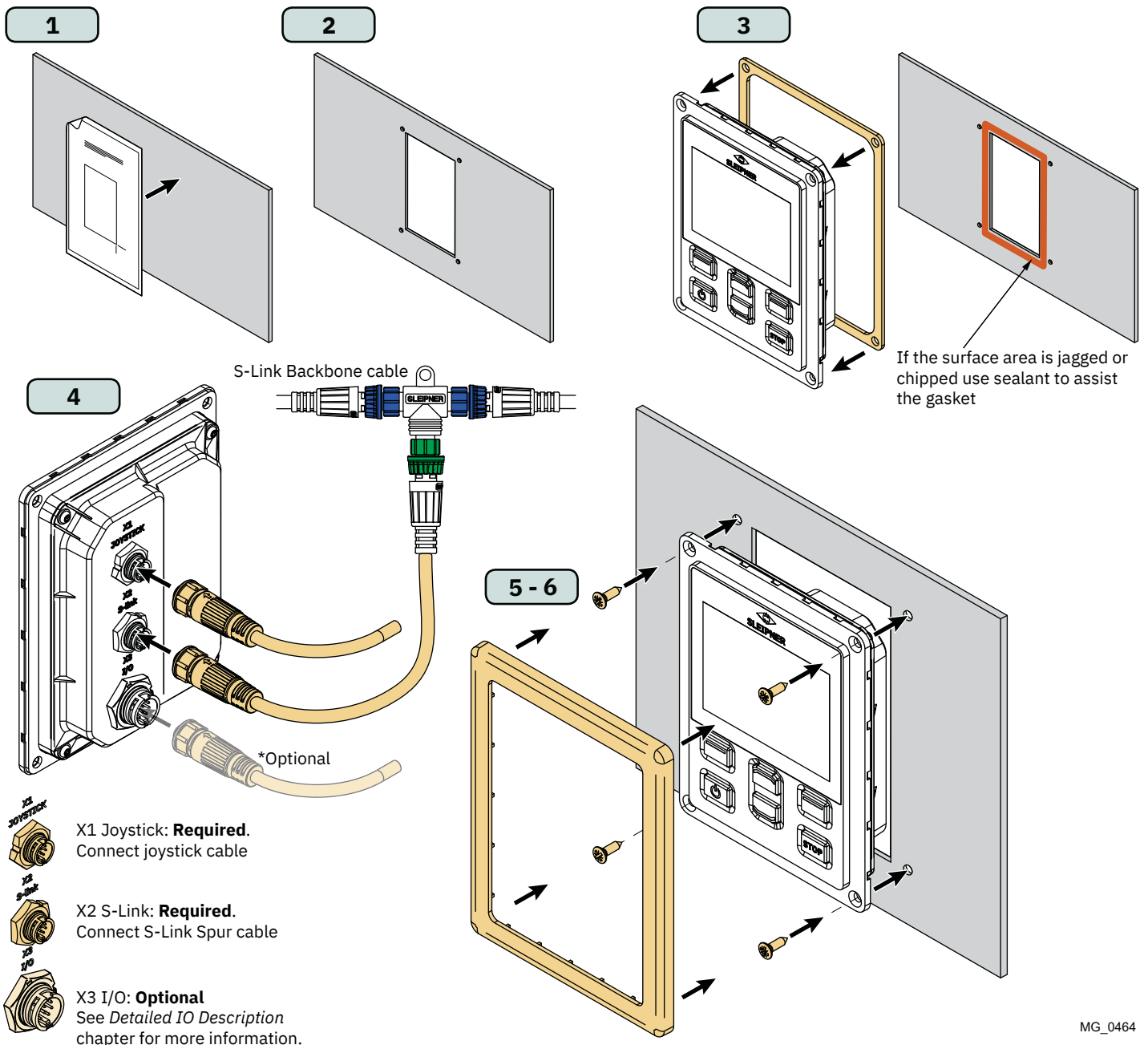
TP-35 Top Mount installation.

1. Place the supplied cut-out template on the desired installation location.
2. Cut out the area according to the template.
3. Place the gasket to the back face of the panel. If the front surface around your cut out is jagged or chipped, use a sealant to assist the gasket.
4. Plug cables into the connectors at the rear of the control panel. Note that access to the back of the control panel might be impossible after installation. The included joystick cable is 1.5 meter long. If longer distance between control panel and joystick is required, a 2 meter joystick extension cable can be ordered, order number: SM909741. The joystick cable is unshielded and a long cable is therefore more susceptible for noise. To ensure proper performance it is recommended to not connect more than five extension cables in series.

For the product variants *-LF90* and *-LF90X* the joystick cable is terminated in the joystick. If it is impossible to access the back of the control panel after installation, the joystick must be installed and joystick cable routed before fastening of the control panel.

Choose a S-Link spur cable with sufficient length to reach the nearest Backbone T-connector, see S-Link System Description chapter for detailed information about S-Link.

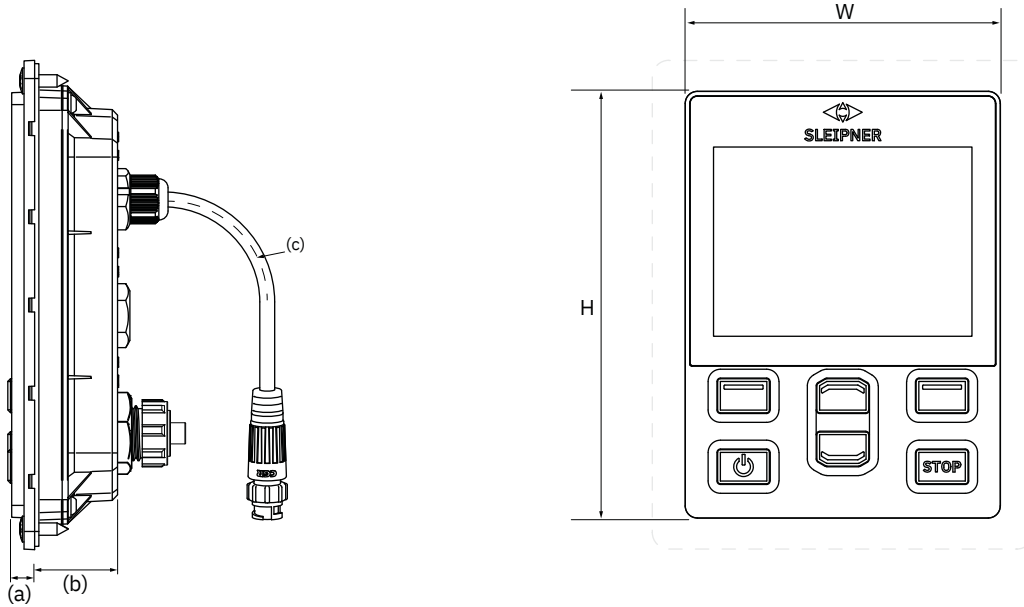
5. Insert the control panel in place and fasten screws.
6. Mount cover frame



MG\_0464

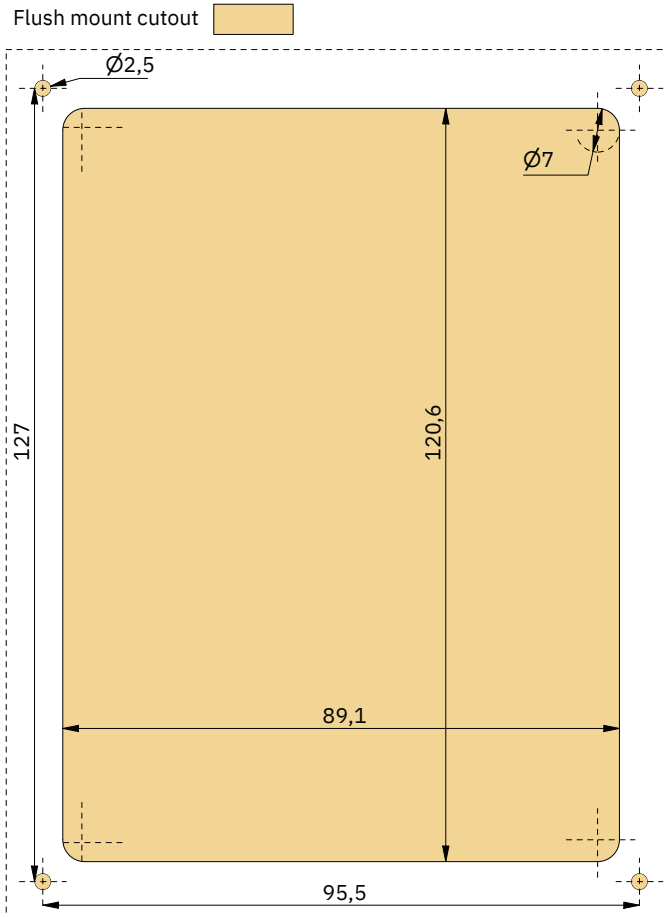
Measurement code	Measurement description	TP-35 Flush Mount	
		mm	inch
H	Panel Height	120.5	4.7
W	Panel width	89	3.5
(a)	Raised height above the dashboard	6.5	0.26
(b)	Depth behind the dashboard (not inc. cables)	23.5	0.9
(c)	Cable bend radius	35	1.4

Flush mount



MG\_0475

### Cutout Template



TP-35 Flush Mount installation.

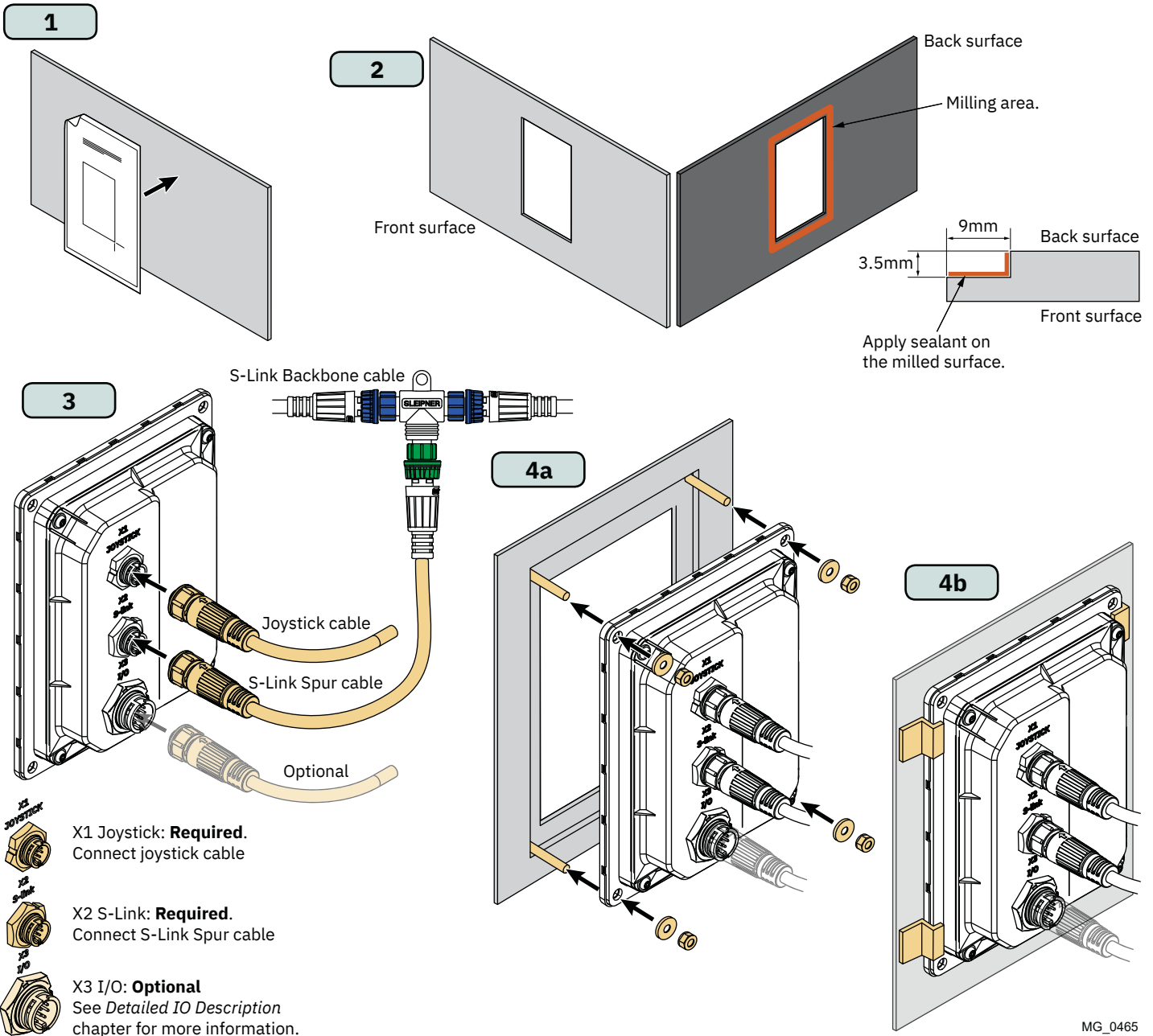
1. Place the supplied cut-out template on the desired location.
2. Cut out and mill the marked area on the template. Use a sealant on the milled surface to protect against water ingress around the panel.
3. Plug cables into the connectors at the rear of the control panel. Note that access to the back of the control panel might be impossible after installation. The included joystick cable is 1.5 meter long. If longer distance between control panel and joystick is required, a 2 meter joystick extension cable can be ordered, order number: SM909741. The joystick cable is unshielded and a long cable is therefore more susceptible for noise. To ensure proper performance it is recommended to not connect more than five extension cables in series.

For the product variants *-LF90* and *-LF90X* the joystick cable is terminated in the joystick. If it is impossible to access the back of the control panel after installation, the joystick must be installed and joystick cable routed before fastening of the control panel.

Choose a S-Link spur cable with sufficient length to reach the nearest Backbone T-connector, see S-Link System Description chapter for detailed information about S-Link.

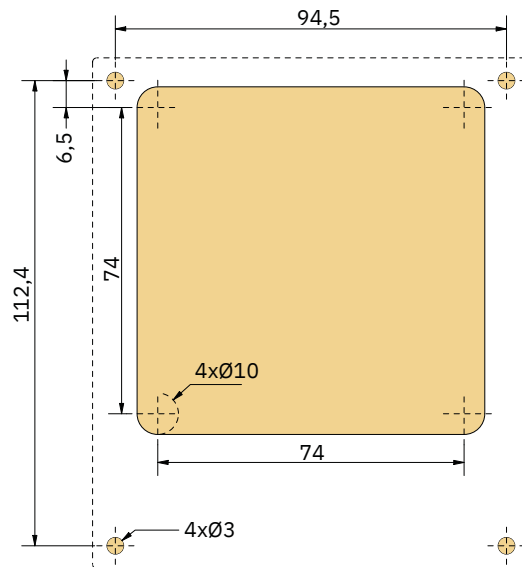
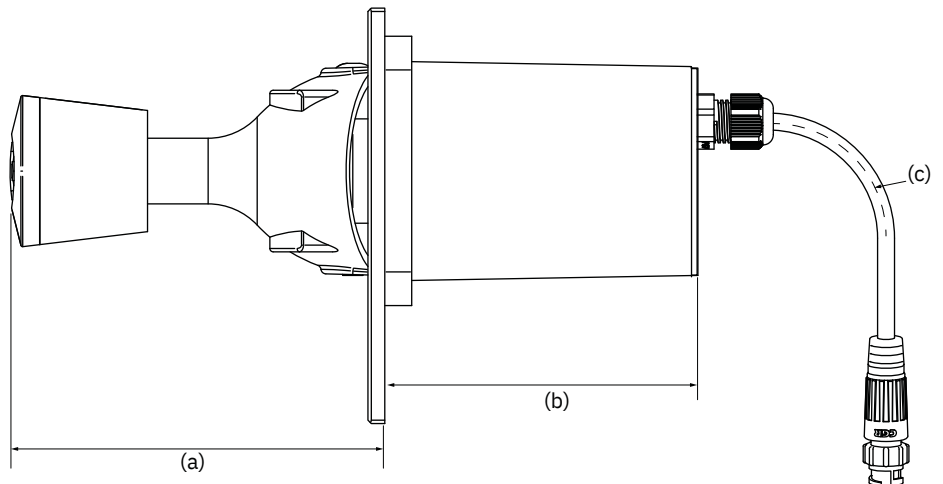
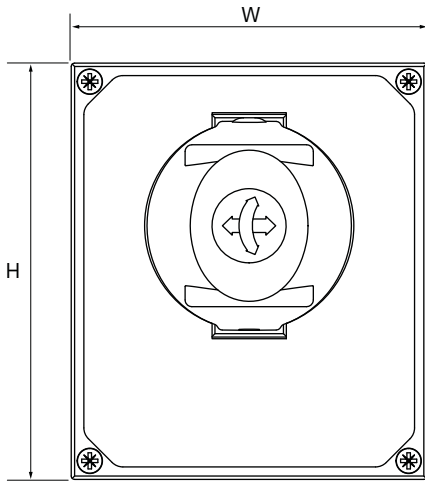
Flush mount installations can be installed in multipliable ways. Two options are using fastening studs or fastening brackets to hold the TP-35 in place.

- 4a. On the rear face secure four studs in the milled area using the template as a guide. How to secure these studs will depend on the material of the dashboard. Insert the control panel in place and fasten with a washer and nut. Fastening studs, washers and nuts are not included.
- 4b. Insert the control panel in place. Create fastening brackets to secure the TP-35 in place on the rear face of the dashboard. Fastening brackets is not included and must be customized by the installer.



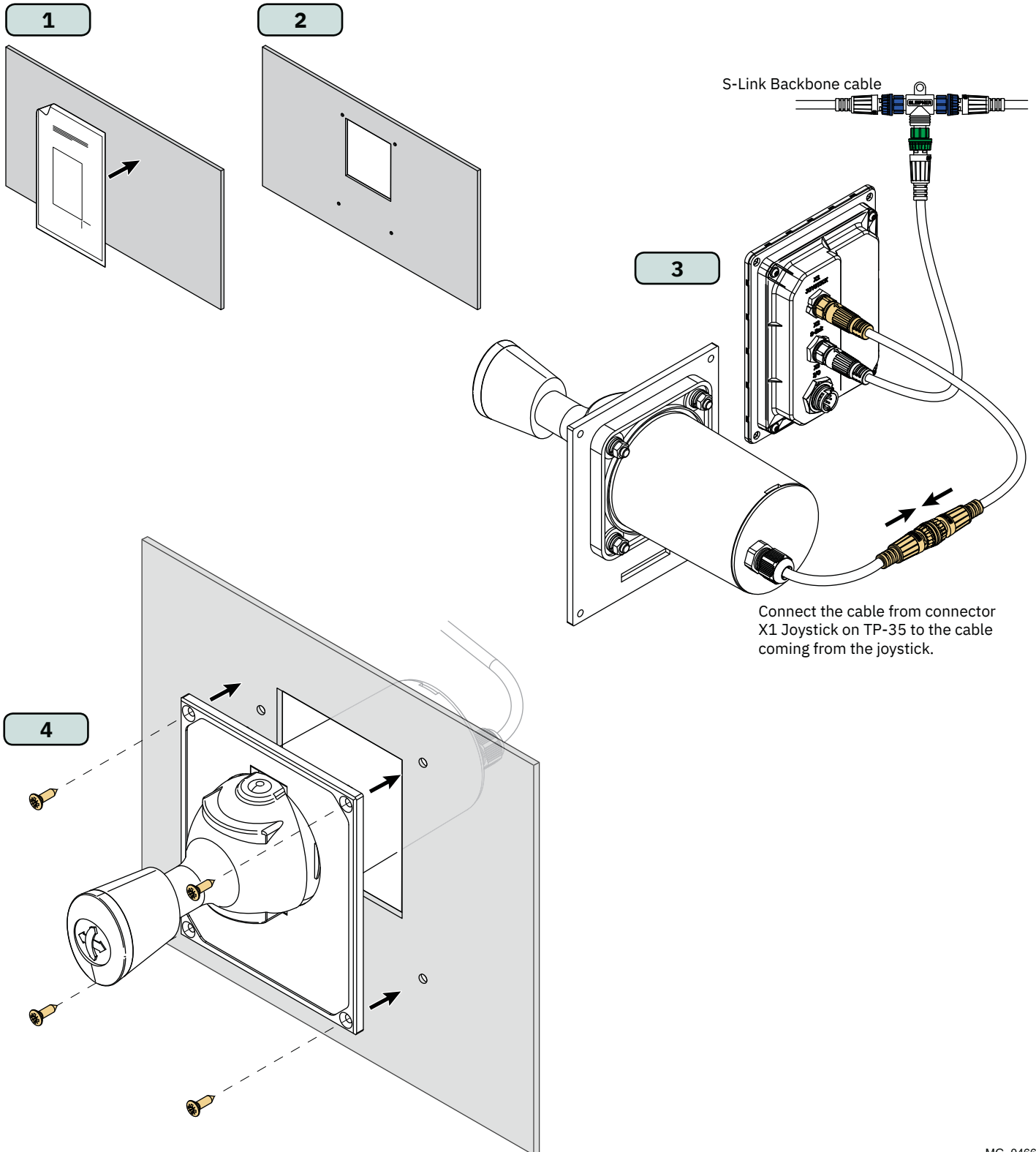
MG\_0465

Measurement code	Measurement description	PJC421	
		mm	inch
H	Panel Height	123.4	4.9
W	Panel width	105.5	4.1
(a)	Raised height above the dashboard	111.3	4.4
(b)	Depth behind the dashboard (not inc. cables)	94.7	3.7
(c)	Cable bend radius	35	1.4



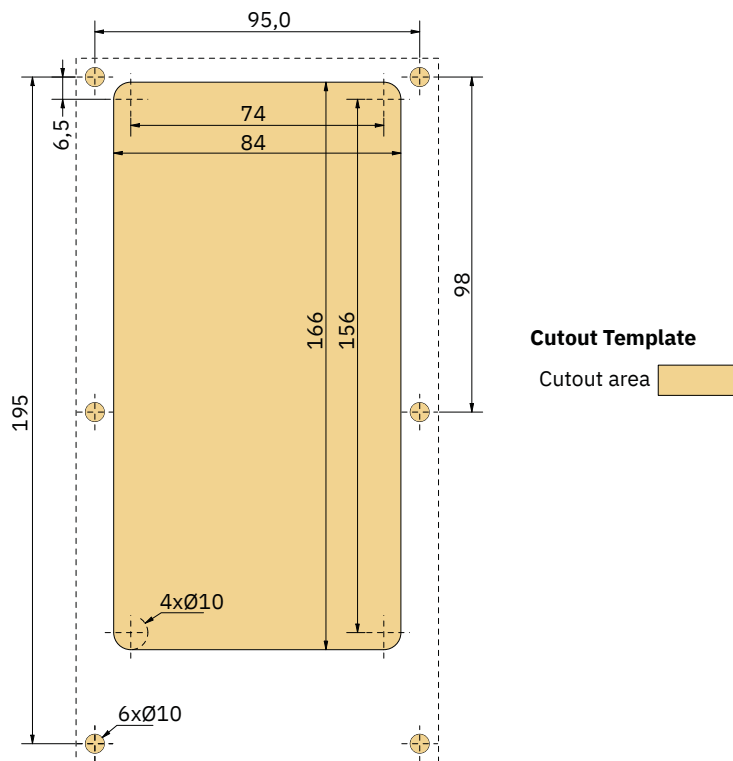
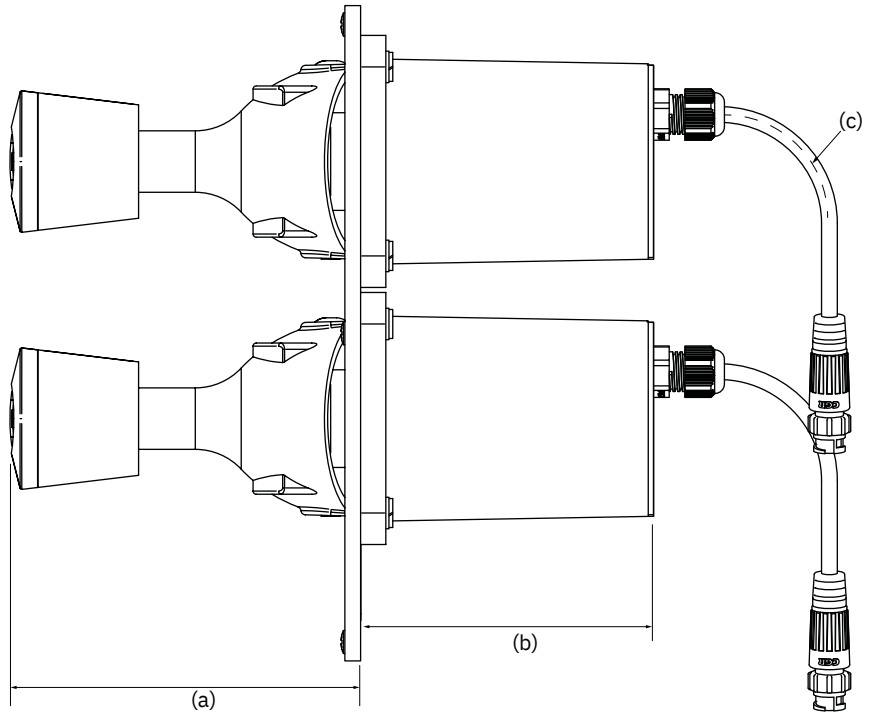
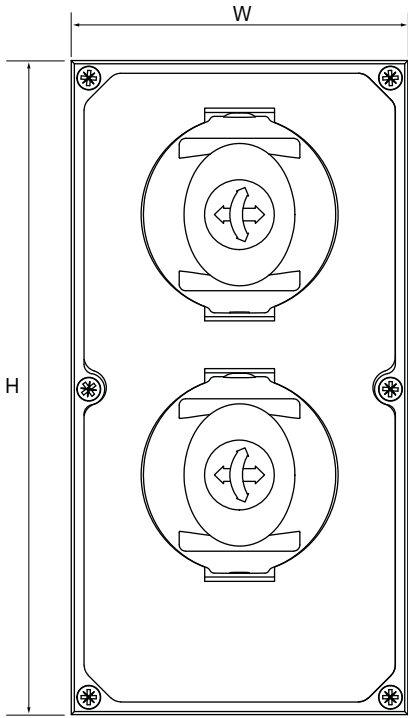
**Cutout Template**  
Cutout area

1. Place the supplied cut-out template on the desired installation location.
2. Cut out the area according to the template.
3. Plug cable from joystick into the cable coming from TP-35 (X1 Joystick).
4. Insert the joystick and fasten with screws.





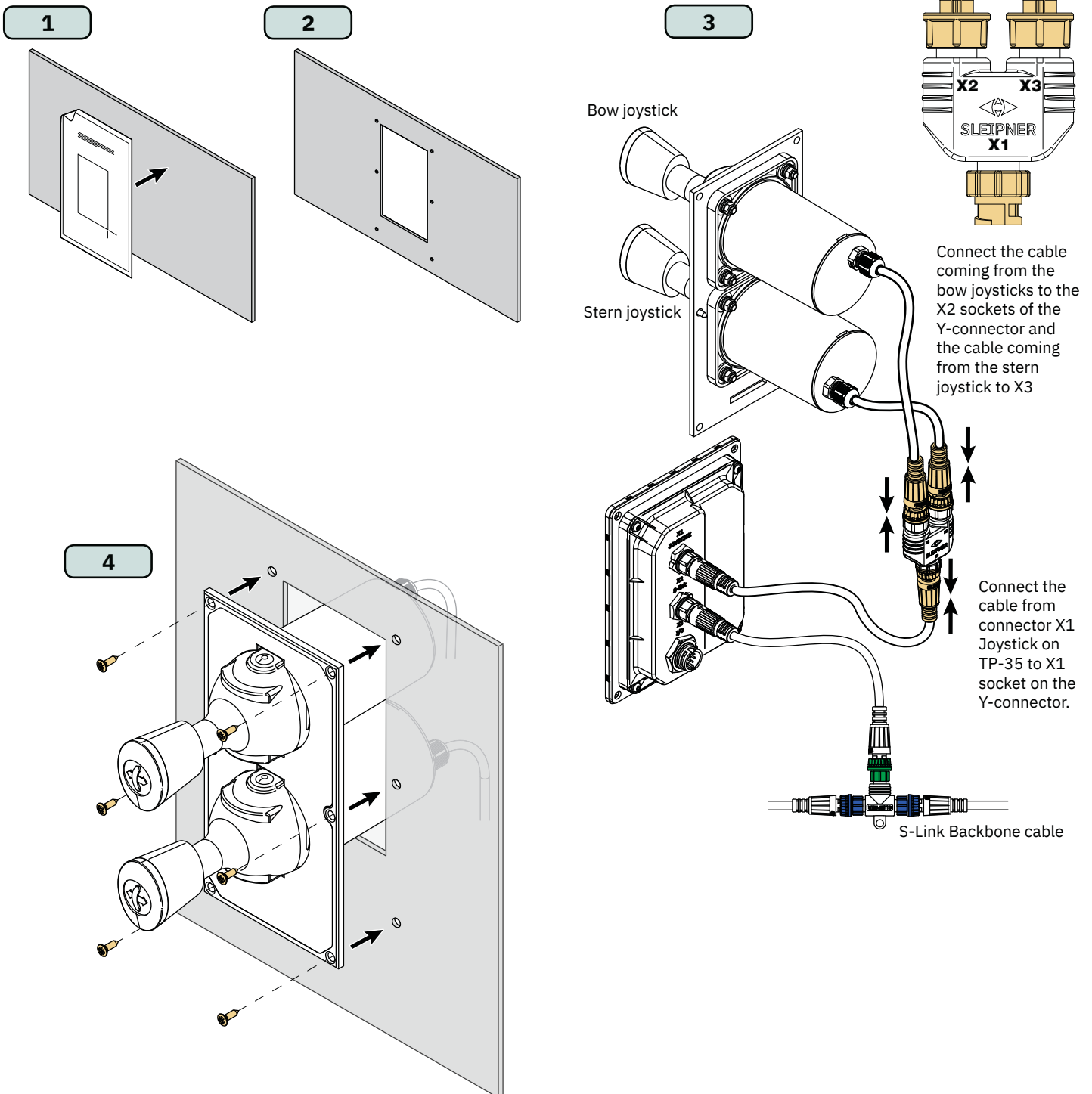
Measurement code	Measurement description	PJC422	
		mm	inch
H	Panel Height	206	8.1
W	Panel width	106	4.2
(a)	Raised height above the dashboard	111.3	4.4
(b)	Depth behind the dashboard (not inc. cables)	94.7	3.7
(c)	Cable bend radius	35	1.4



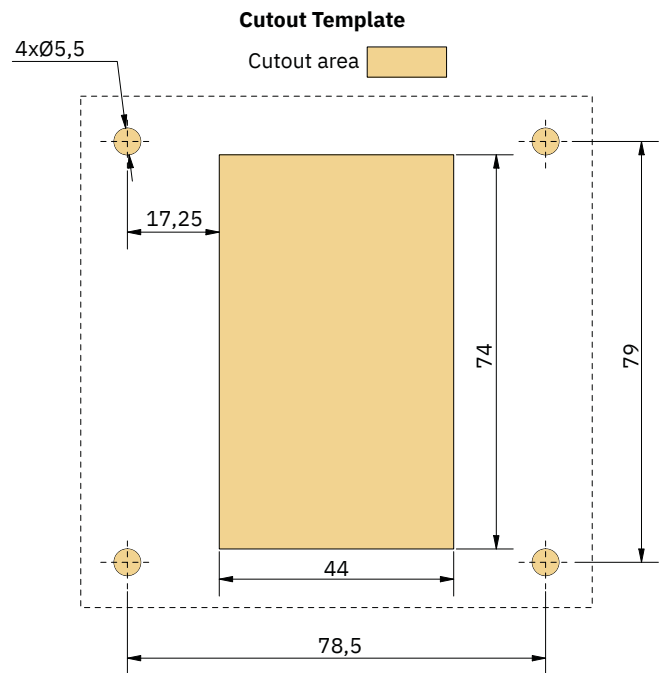
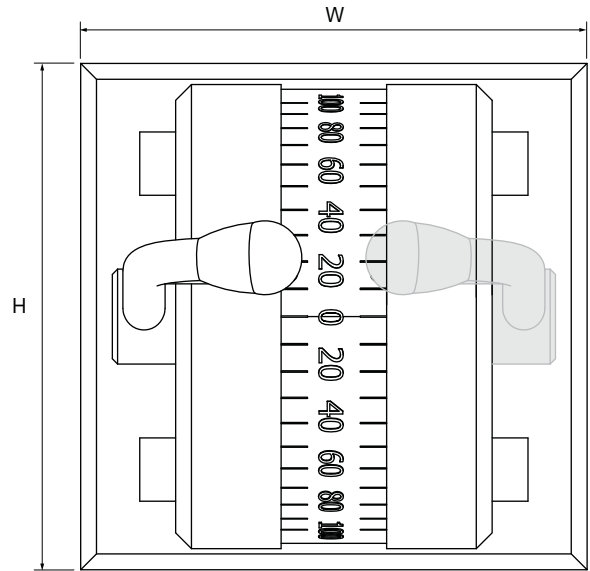
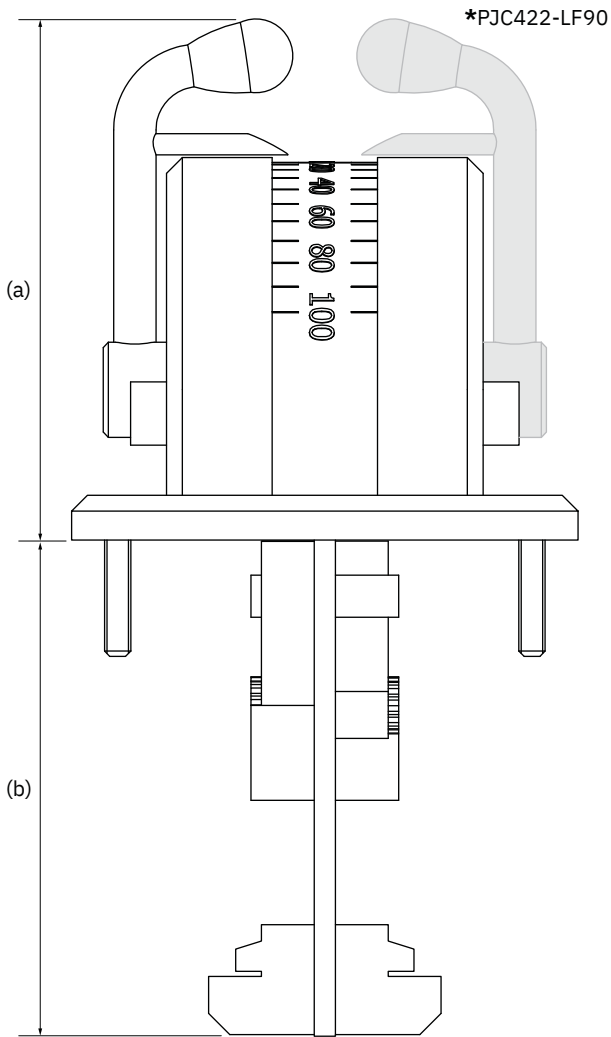
1. Place the supplied cut-out template on the desired installation location.
2. Cut out the area according to the template.
3. If not already attached, connect both cables from the joystick to the upper sockets of the Y-connector. Please note that these cables can be attached in any arrangement to the two upper sockets. However, swapping these cables will also change which joystick operating the bow and stern thruster. Selecting which joystick to control the bow and stern thruster can also be done by performing a joystick calibration. See chapter *Joystick Settings* for more information.

Connect the cable coming from TP-35 (X1 Joystick) to the lower socket of the Y-connector.

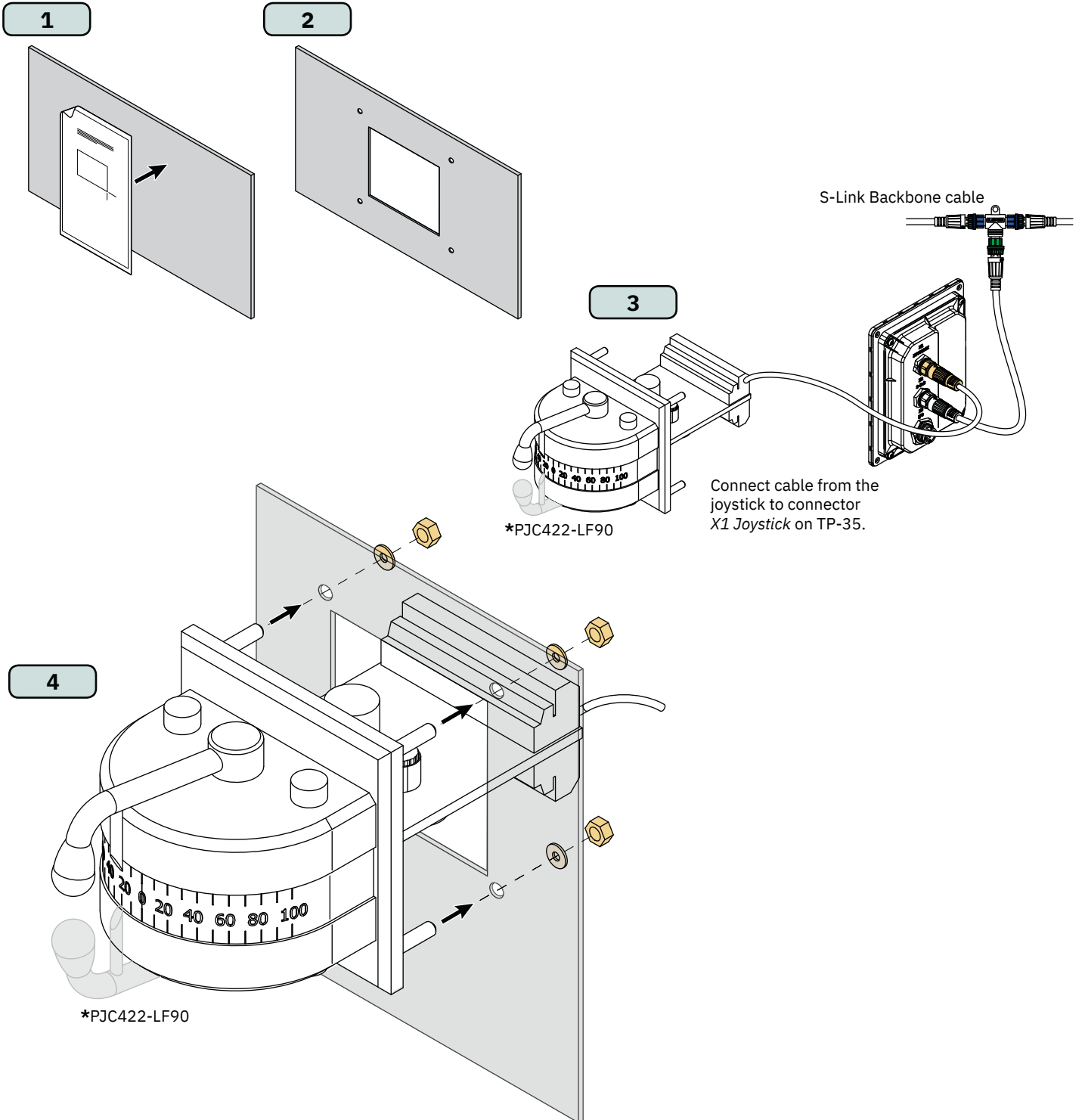
4. Insert the joystick and fasten with screws.



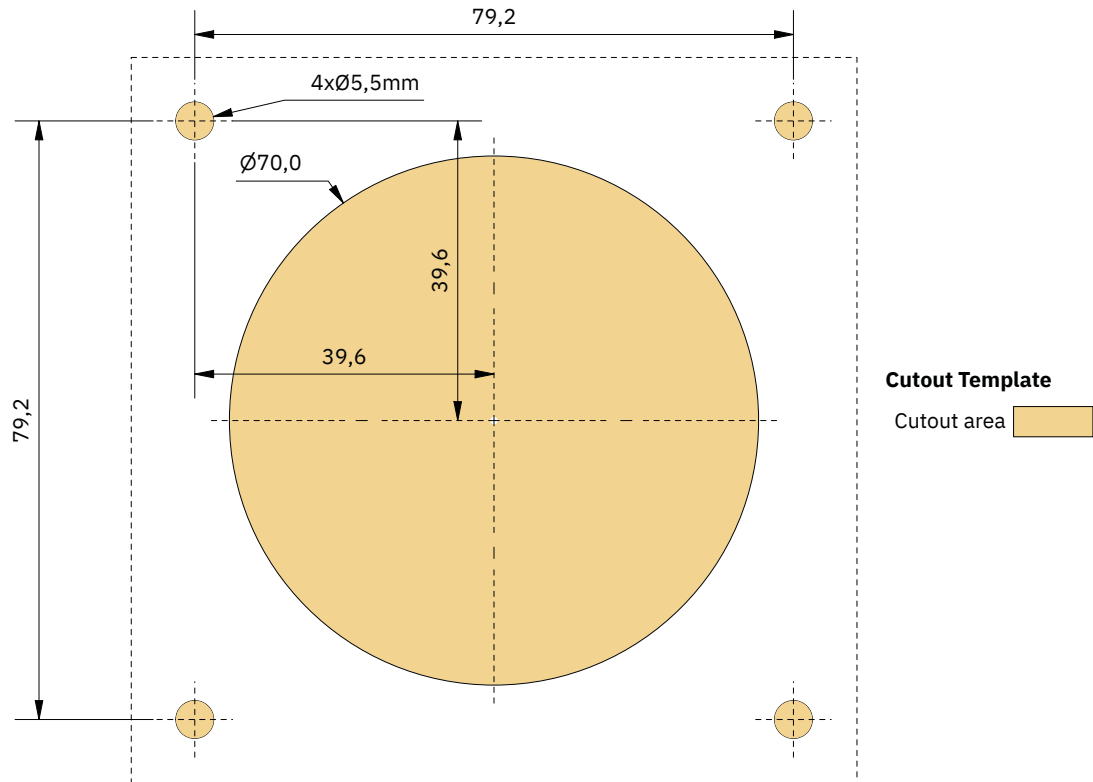
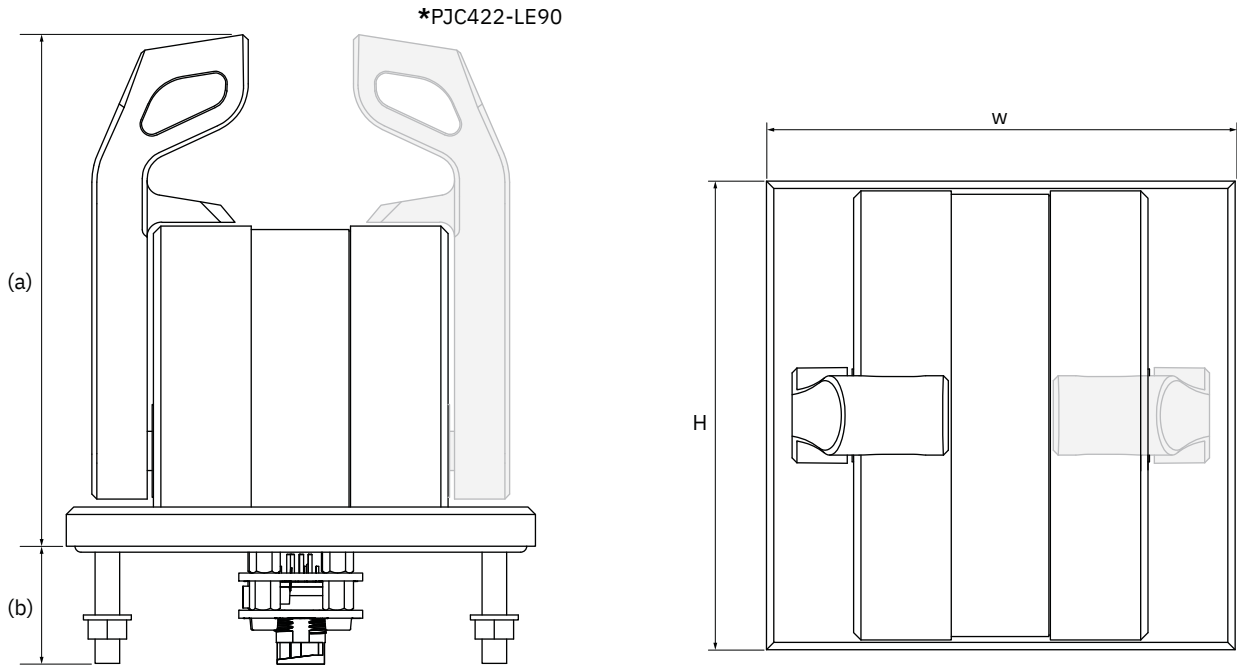
Measurement code	Measurement description	PJC421 LF90/-DNV		PJC422 LF90/-DNV	
		mm	inch	mm	inch
H	Panel Height	96	3.8	96	3.8
W	Panel width	96	3.8	96	3.8
(a)	Raised height above the dashboard	98.8	3.9	98.8	3.9
(b)	Depth behind the dashboard (not inc. cables)	94	3.7	94	3.7



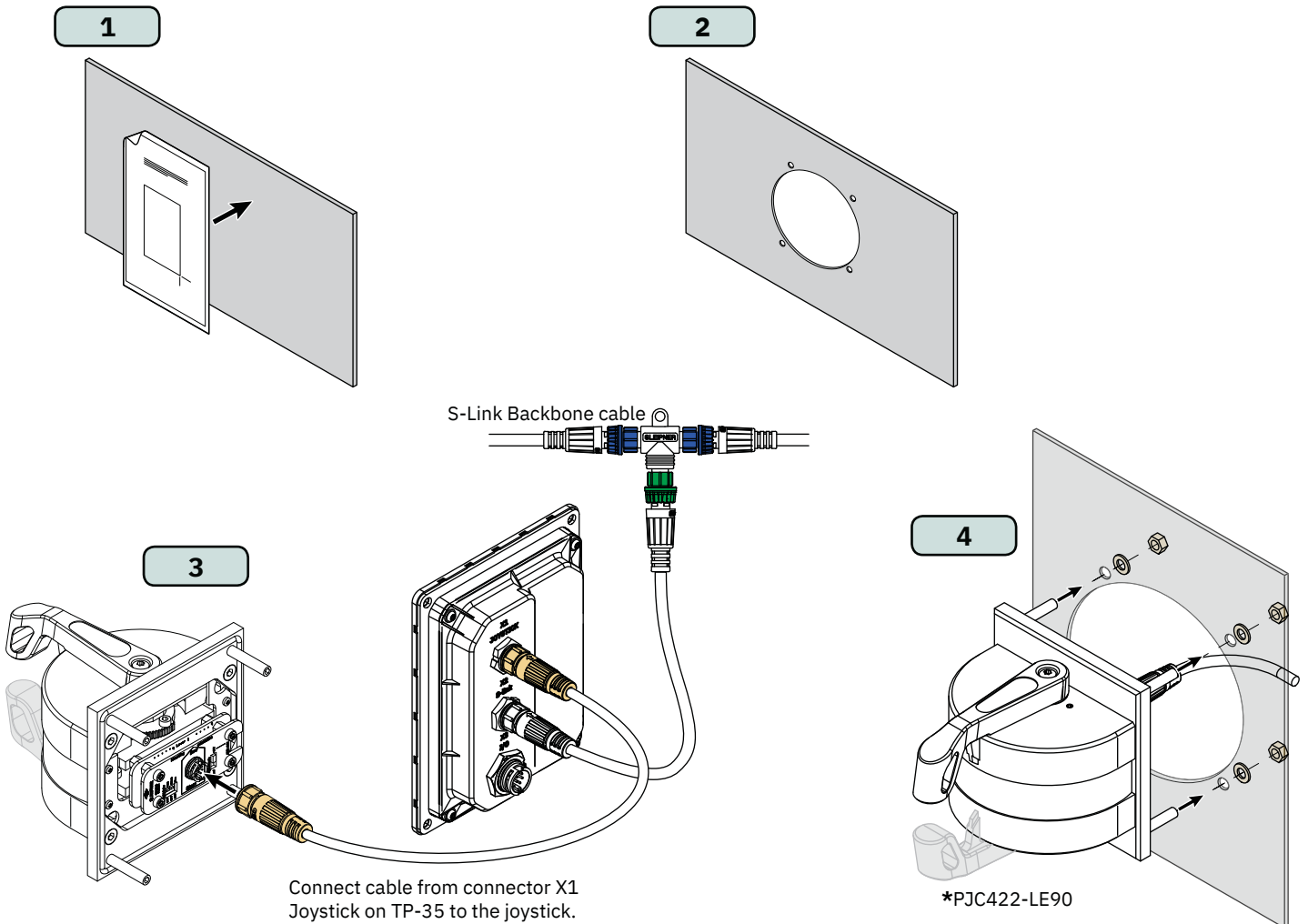
1. Place the supplied cut-out template on the desired installation location.
2. Cut out the area according to the template.
3. Plug the cable coming from the joystick into the *X1 Joystick* connector on TP-35.
4. Insert the joystick in place and fasten screws.



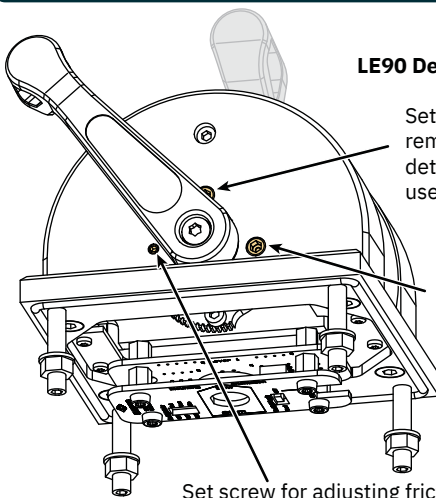
Measurement code	Measurement description	PJC421 LE90/-DNV		PJC422 LE90/-DNV	
		mm	inch	mm	inch
H	Panel Height	96	3.8	96	3.8
W	Panel width	96	3.8	96	3.8
(a)	Raised height above the dashboard	104.7	4.1	104.7	4.1
(b)	Depth behind the dashboard (not inc. cables)	17.2	0.7	17.2	0.7



1. Place the supplied cut-out template on the desired installation location.
2. Cut out the area according to the template.
3. Plug the cable coming from the X1 Joystick connector on TP-35 into the connector on the back of the joystick.
4. Insert the control panel in place and fasten screws.



## PJC421-LE90 and PJC422-LE90 Configuration

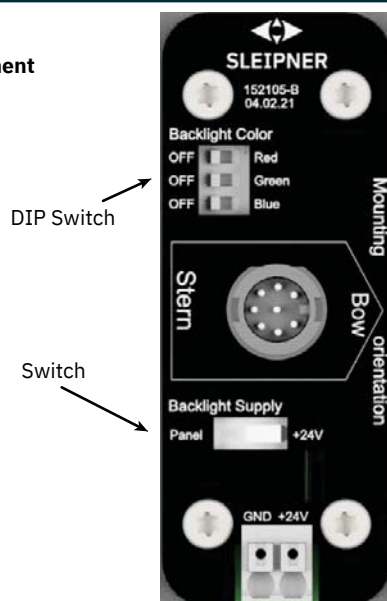


### LE90 Detent and friction adjustment

Set screw for removing handle detent point.  $\pm 10\%$  use 3mm Hex. Key.

Set screw for removing handle detent point. 0% use 3mm Hex. Key.

Set screw for adjusting friction use 1.5mm Hex. Key.



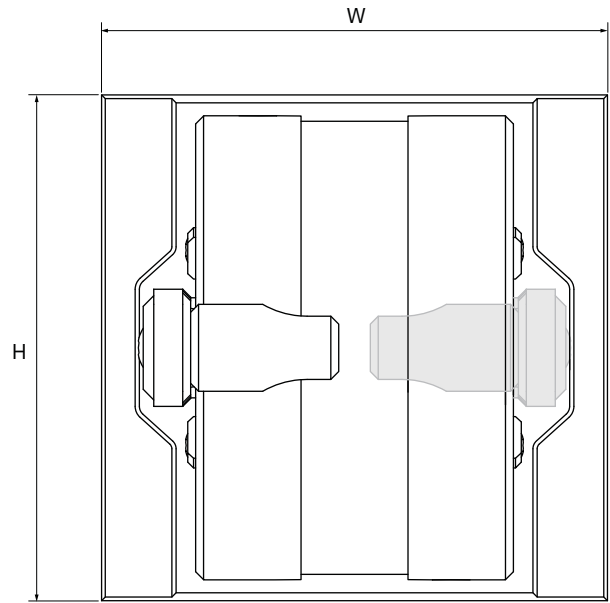
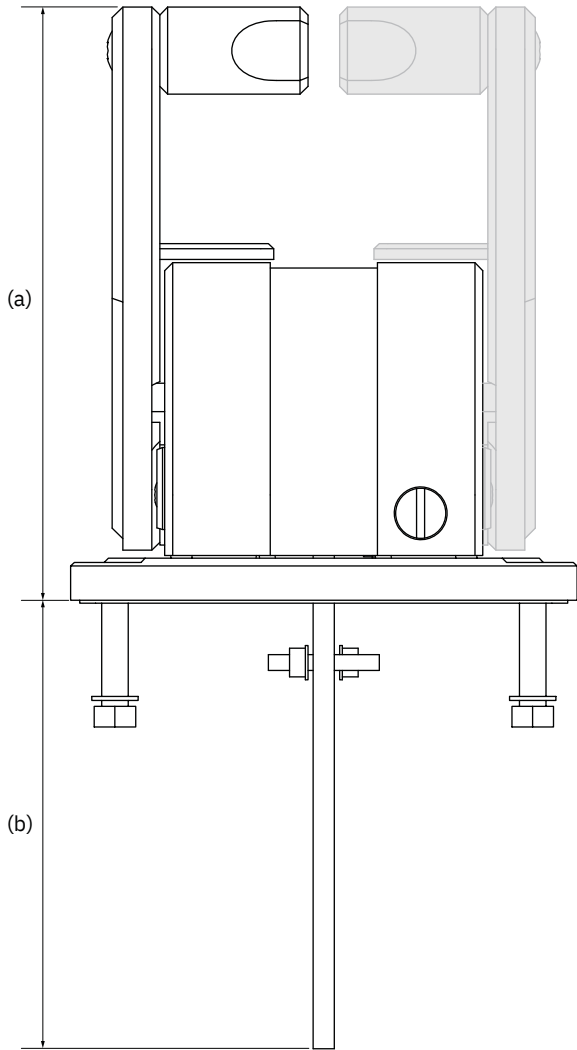
### LE90 Backlight configuration

Use DIP switch to set back light color of LE90. Turning ON all three colors enables white light.


Use switch to configure power source for LE90 backlight. Choose "Panel" to power backlight from TP-35. The backlight intensity can then be controlled from TP-35. Choose +24V to power backlight from terminal block connection. This is typically used on installation with a common bridges backlight control.

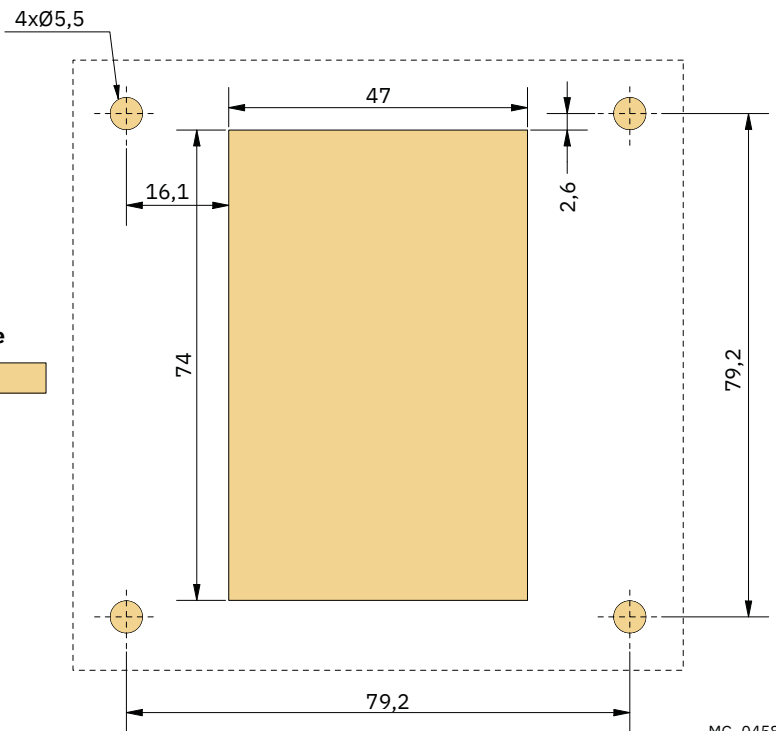
Measurement code	Measurement description	PJC421 LF90X/-DNV		PJC422 LF90X/-DNV	
		mm	inch	mm	inch
H	Panel Height	96	3.8	96	3.8
W	Panel width	96	3.8	96	3.8
(a)	Raised height above the dashboard	112.5	4.4	112.5	4.4
(b)	Depth behind the dashboard (not inc. cables)	85	3.3	85	3.3

\*PJC422-LF90X



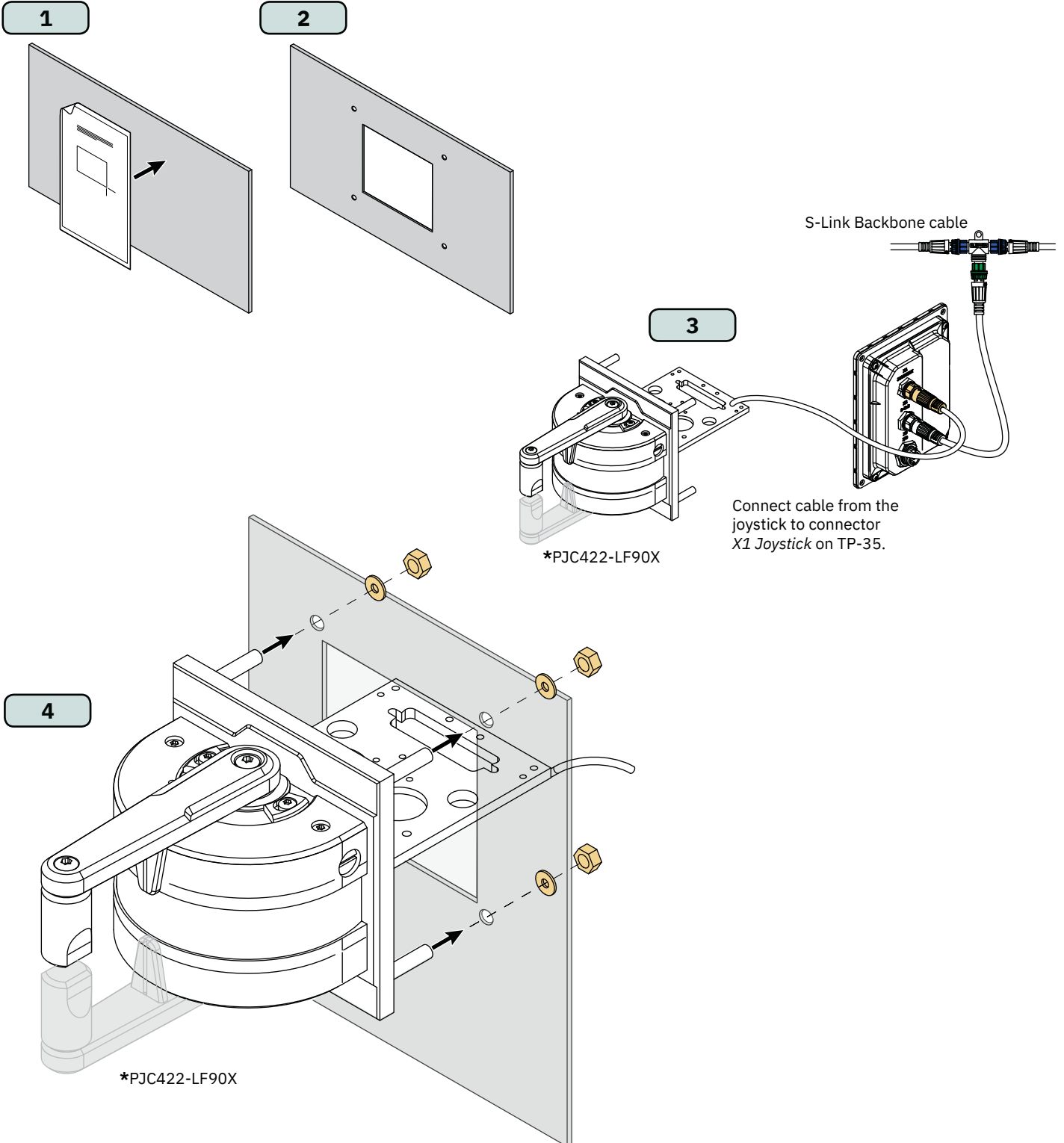
Cutout Template

Cutout area 



MG\_0458

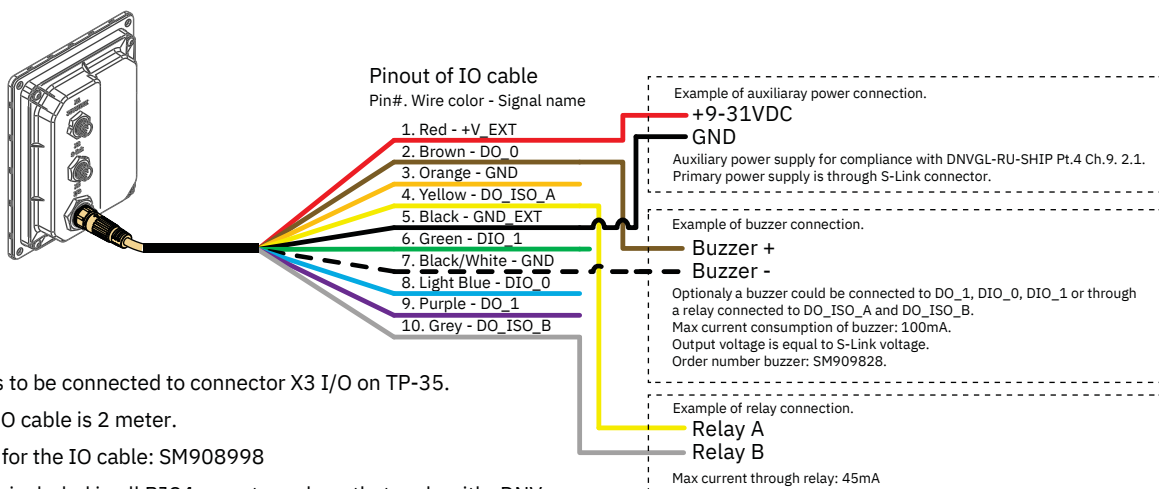
1. Place the supplied cut-out template on the desired installation location.
2. Cut out the area according to the template.
3. Plug the cable coming from the joystick into the *X1 Joystick* connector on TP-35.
4. Insert the control panel in place and fasten screws.





Description	Value	Comment
Available interfaces	X1 Joystick -1x +12V/+5V to joystick -1x AGND -2x analog inputs -2x digital input -1x +5V to joystick LED -1x LIN data	8 pin male connector  Max current drawn on: +12V to joystick - 40mA* +5V to joystick - 40mA* +5V to joystick LED - 80mA**
	X2 S-Link -Vin -GND -CANH -CANL	5 pin S-Link male connector
	X3 IO -2x digital output -2x digital IO -2x GND -1x DO_ISO_A -1x DO_ISO_B -1x Vin Ext -1x GND Ext	10 pin male connector  Digital out signals on DO_0, DO_1, DIO_0 and DIO_1 are only available when TP-35 is powered through the S-Link interface.  Digital out puts are high side drivers.  DO_ISO_A and DO_ISO_B is an isolated relay output.
Output voltage on digital output pins	Same as supply voltage	
Max total current drawn on digital output pins	100mA	
Max current drawn on one digital output pin	100mA	
Max current drawn thru isolated relay output	45mA	DO_ISO_A and DO_ISO_B
IO protection	31VDC and 0VDC	All accessible IOs tolerate connection to GND and the same voltage as the used supply voltage, maximum +31V.
Voltage level digital input	High = >4.5 VDC Low = <0.5 VDC	

\*Intended for joystick potentiometers  
\*\*Intended for joystick backlight



The IO cable is to be connected to connector X3 I/O on TP-35.  
Length of the IO cable is 2 meter.  
Order number for the IO cable: SM908998  
The IO cable is included in all PJC4xx part numbers that ends with -DNL.

S-Link is a CAN-based control system used for communication between Sleipner products installed on a vessel. The system uses BACKBONE Cables as a common power and communication bus with separate SPUR Cables to each connected unit. Units with low power consumption are powered directly from the S-Link bus therefore one power cable must be connected to the BACKBONE Cable through a T-Connector.

**Main advantages of S-Link system:**

- Compact and waterproof plugs.
- BACKBONE and SPUR Cables have different colour coding and keying to ensure correct and easy installation. BACKBONE Cables have blue connectors and SPUR Cables have green connectors.
- Different cable lengths and BACKBONE Extenders makes the system scalable and flexible to install.

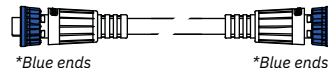
**Installation of S-Link cables:**

Select appropriate cables to keep the length of BACKBONE- and SPUR Cables to a minimum. In case of planned installation with total BACKBONE Cable length exceeding 100 meters please consult your local distributor. The S-Link cables should be installed to ensure sharp bend radius's is avoided. Locking mechanism on connectors must be fully closed. To ensure long lifetime, cables, T-Connectors and Extenders should not be located so that they are permanently immersed in water or other fluids. It is also recommended to install cables such that water and condensation do not run along the cables and into the connectors.

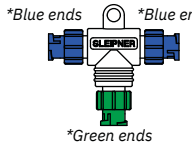
The POWER Cable should ideally be connected around the middle of the BACKBONE Cable to ensure an equal voltage drop at each end of the BACKBONE Cable. The yellow and black wire in the POWER Cable shall be connected to GND and the red wire connected to +12VDC or +24VDC.

To reduce the risk of interference, avoid routing the S-Link cables close to equipment such as radio transmitters, antennas or high voltage cables. The backbone must be terminated at each end with the END Terminator.

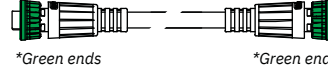
SPUR cables can be left unterminated to prepare for the installation of future additional equipment. In such cases, ensure to protect open connectors from water and moisture to avoid corrosion in the connectors.




**BACKBONE Cable**  
Forms the communication and power bus throughout a vessel. Available in different standard lengths.



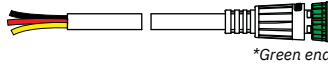
**T-Connector**  
Used for connection of SPUR or POWER Cable to the BACKBONE Cable. One T-Connector for each connected cable.



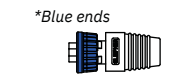
**SPUR Cable**  
Used to connect S-Link compliant products to the backbone cable. One SPUR Cable must be used for each connected component, with no exceptions. Recommended to be as short as practically possible. Available in different standard lengths.



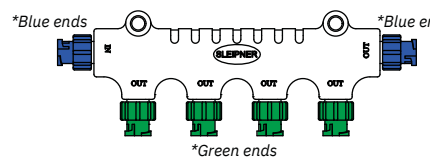
**BACKBONE Extender**  
Connects two BACKBONE Cables to extend the length.



**POWER Cable**  
Required in all installations for connection of BACKBONE Cable to a power supply. It shall not be more than one POWER Cable in an installation.

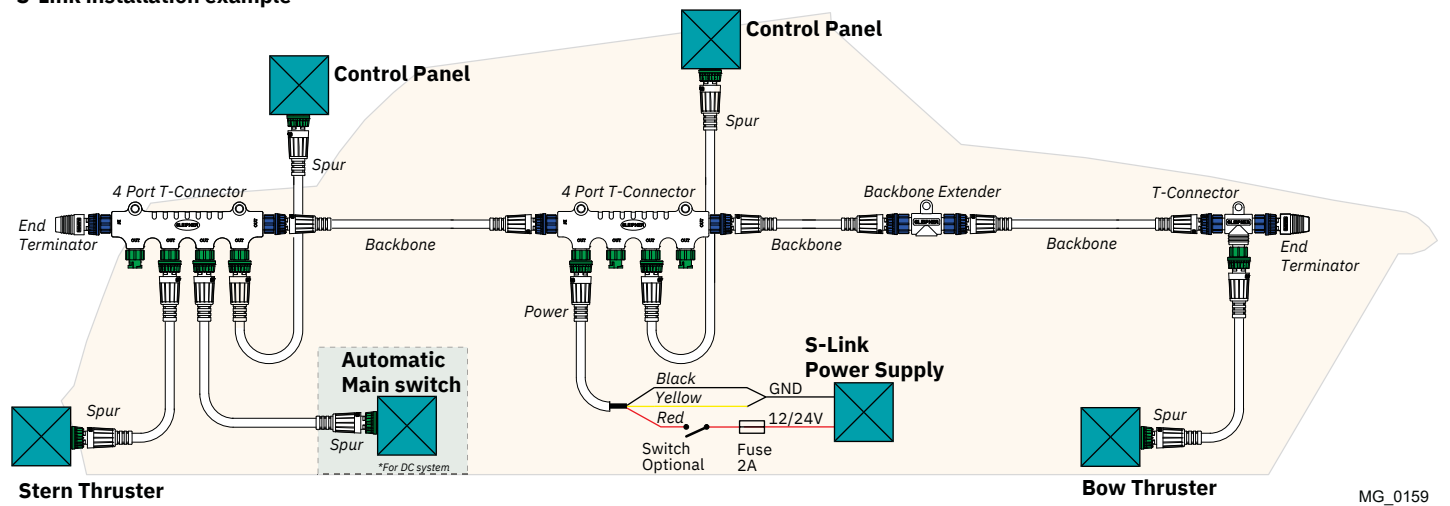


**END Terminator**  
Must be one at each end of the BACKBONE bus.



**4-Port T-Connector**  
The 4-PORT T-connector allows multiple SPUR Cables to be connected. The 4-PORT T-connector comes with two sealing caps to protect unused ports.

**S-Link installation example**





**Find your local professional dealer from our certified worldwide network for expert service and support. visit our website [www.sleipnergrouper.com/support](http://www.sleipnergrouper.com/support)**

## Product Spare Parts and Additional Resources

**For additional supporting documentation, we advise you to visit our website [www.sleipnergrouper.com](http://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](http://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](http://www.sleipnergrouper.com/patents)

## CE Declaration of conformity (DoC)

We, The Manufacturer:	<b>Sleipner Motor AS</b> Arne Svendsens gate 6-8, NO 1612 Fredrikstad, Norway		
With ISO 9001 certificate:	1484-2007-AQ-NOR-NA, issued by DNV-GL		
Declare that the product:			
<b>Product Description:</b> Thruster Proportional Joystick Control			
<b>Model Numbers:</b>			
PJC421-PVREL	PJC421-LE90	PJC421-LF90X	PJC421-LF90
PJC421-PVREL-DNV	PJC421-LE90-DNV	PJC421-LF90X-DNV	PJC421-LF90-DNV
PJC422-PVREL	PJC422-LE90	PJC422-LF90X	PJC422-LF90
PJC422-PVREL-DNV	PJC422-LE90-DNV	PJC422-LF90X-DNV	PJC422-LF90-DNV
Subject to installation, maintenance and use conforming to their intended purpose, is in conformity with the provisions of the following EU Directives:			
<ul style="list-style-type: none"> <li>• Radio equipment - Directive 2014/53/EU</li> <li>• Restriction of the Use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) - Directive 2011/65/EC</li> </ul>			
The product is tested to meet the standards and criteria outlined in:	<b>Radio</b>	EN 300328 V2.1.1	
	<b>EMC</b>	EN 60945:2002 IEC 60533:2015 EN 301489-1 V2.2.0 EN301489-17 V3.2.0	
	<b>Safety</b>	EN609501:2006 /A11:2009/A1:2010/A12:2011/A2:2013 EN 62311:2008 EN 62368-1 2020	
	<b>RoHS</b>	EN 63000:2018	

This declaration of conformity is issued under the exclusive responsibility of the manufacturer.

Fredrikstad, 28th of April 2022

Ronny Skauen, President and CEO



**Sleipner**  
P.O. box 519  
NO-1612 Fredrikstad, Norway  
Phone: +47 69 30 00 60  
Fax: +47 69 30 00 70

**Bank:** 5122.05.33267  
**Org. Nr.:** NO 932 455 463 mva  
**Web:** sleipnergroup.com

**A part of Sleipner Group**  
Arne Svendsensgt. 6-8  
NO-1612 Fredrikstad, Norway  
Phone: +47 69 30 00 60  
Fax: +47 69 30 00 70

## UK Declaration of conformity (DoC)

We, The Manufacturer:	<b>Sleipner Motor AS</b> Arne Svendsens gate 6-8, NO 1612 Fredrikstad, Norway																		
With ISO 9001 certificate:	1484-2007-AQ-NOR-NA, issued by DNV-GL																		
Declare that the product: <b>Product Description:</b> Thruster Proportional Joystick Control <b>Model Numbers:</b> <table border="0"> <tr> <td>PJC421-PVREL</td> <td>PJC421-LE90</td> <td>PJC421-LF90X</td> <td>PJC421-LF90</td> </tr> <tr> <td>PJC421-PVREL-DNV</td> <td>PJC421-LE90-DNV</td> <td>PJC421-LF90X-DNV</td> <td>PJC421-LF90-DNV</td> </tr> <tr> <td>PJC422-PVREL</td> <td>PJC422-LE90</td> <td>PJC422-LF90X</td> <td>PJC422-LF90</td> </tr> <tr> <td>PJC422-PVREL-DNV</td> <td>PJC422-LE90-DNV</td> <td>PJC422-LF90X-DNV</td> <td>PJC422-LF90-DNV</td> </tr> </table>				PJC421-PVREL	PJC421-LE90	PJC421-LF90X	PJC421-LF90	PJC421-PVREL-DNV	PJC421-LE90-DNV	PJC421-LF90X-DNV	PJC421-LF90-DNV	PJC422-PVREL	PJC422-LE90	PJC422-LF90X	PJC422-LF90	PJC422-PVREL-DNV	PJC422-LE90-DNV	PJC422-LF90X-DNV	PJC422-LF90-DNV
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This declaration of conformity is issued under the exclusive responsibility of the manufacturer.

Fredrikstad, 28th of April 2022

Ronny Skauen, President and CEO











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**SLEIPNER GROUP**

P.O. Box 519

N-1612 Fredrikstad

Norway

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