

USER MANUAL

A Function Description

This system is a complete system for helideck lighting control. This includes power source, control unit, local and remote control panel, and installation of the lighting equipment as well. Figure 1 is an overview of the equipment that is connected to the control unit.

The main component in the control system is the PLC, which allows section control of the lighting, automatic start-up of the status light system and adjustment of the brightness on the TD/PM lighting. The control unit is based on components from Wago.

The complete system has full power redundancy, with supply from both main and emergency switchboard, included an online UPS which allows back up power for full load in 41 minutes.

A Function Description

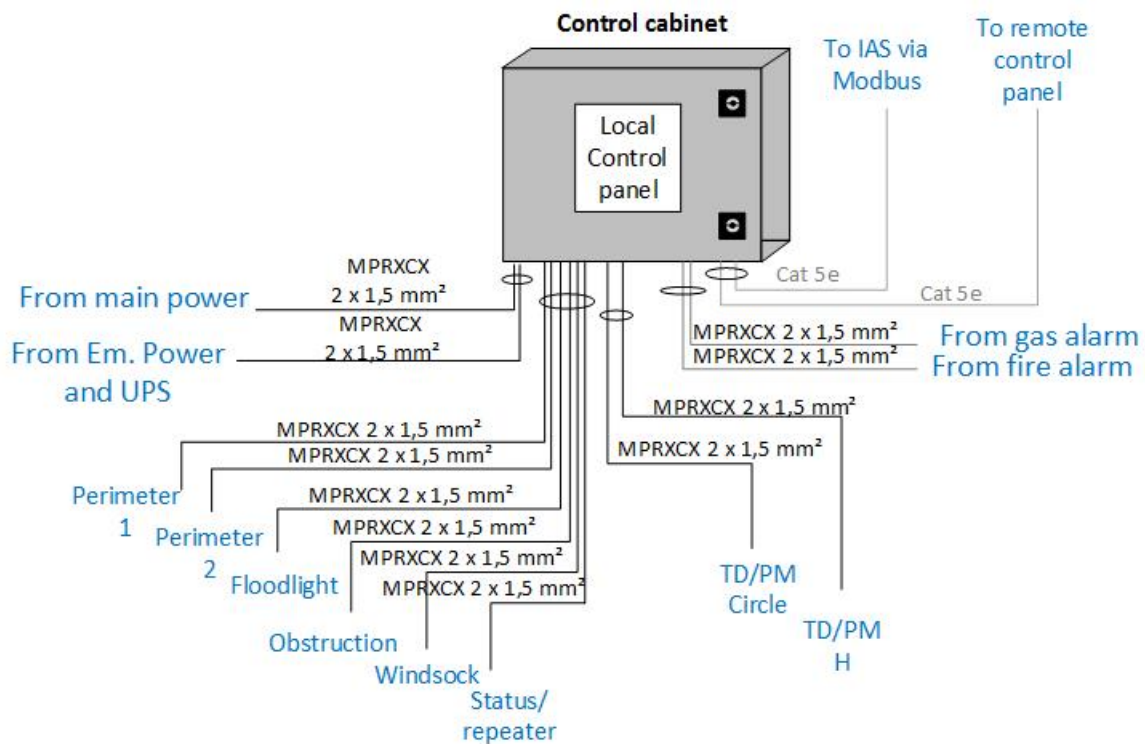


Figure 1: System overview.

A.1 Control system

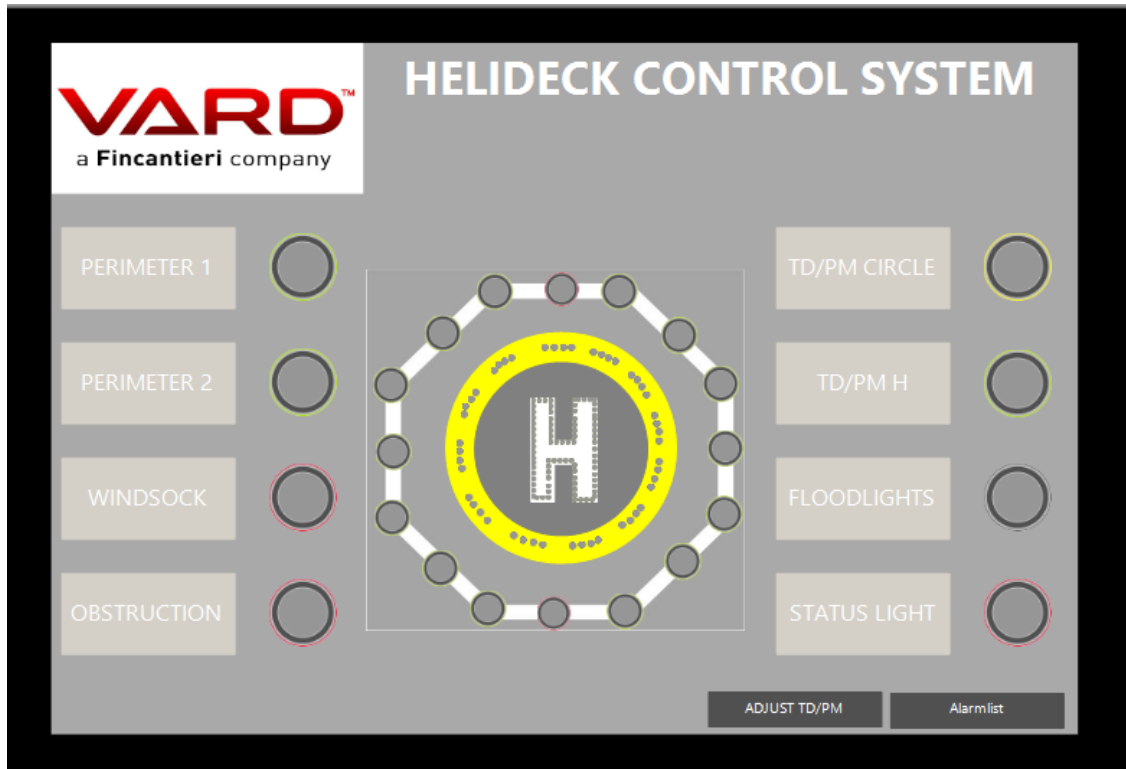
The control system consist of following equipment:

- Control unit
- Local Control panel
- Remote Control panel

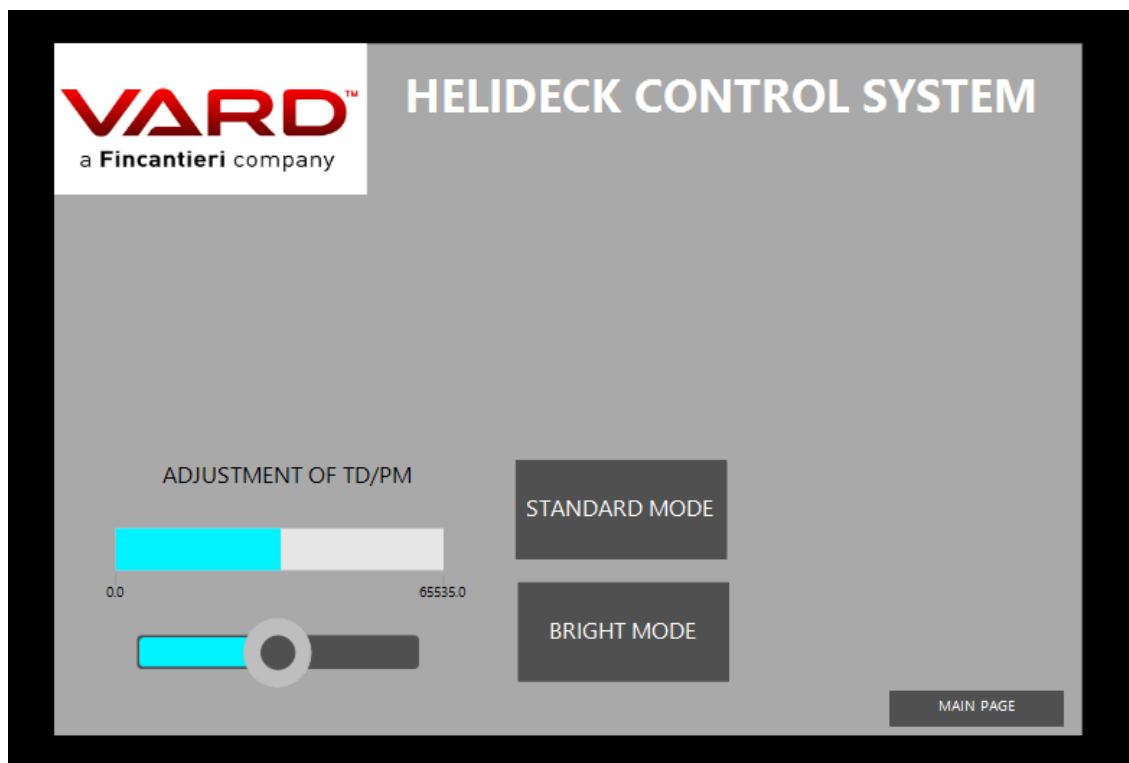
The control unit is based on components from Wago. The system is powered from both main and emergency switchboard, included a UPS, to accomplish redundancy in the system. Therefore the PLC are supplied with 24 VDC from two power supplies and a redundancy module.

A Function Description

The control system consist of two control panels. The system allows control of the lighting sections on the ships helideck. The remote control panel is the main panel located in the wheelhouse on the ship. This control panel is a Wago touch screen connected to Wago Web Server, which allows Webvisualization. Se figure 2 and 3.



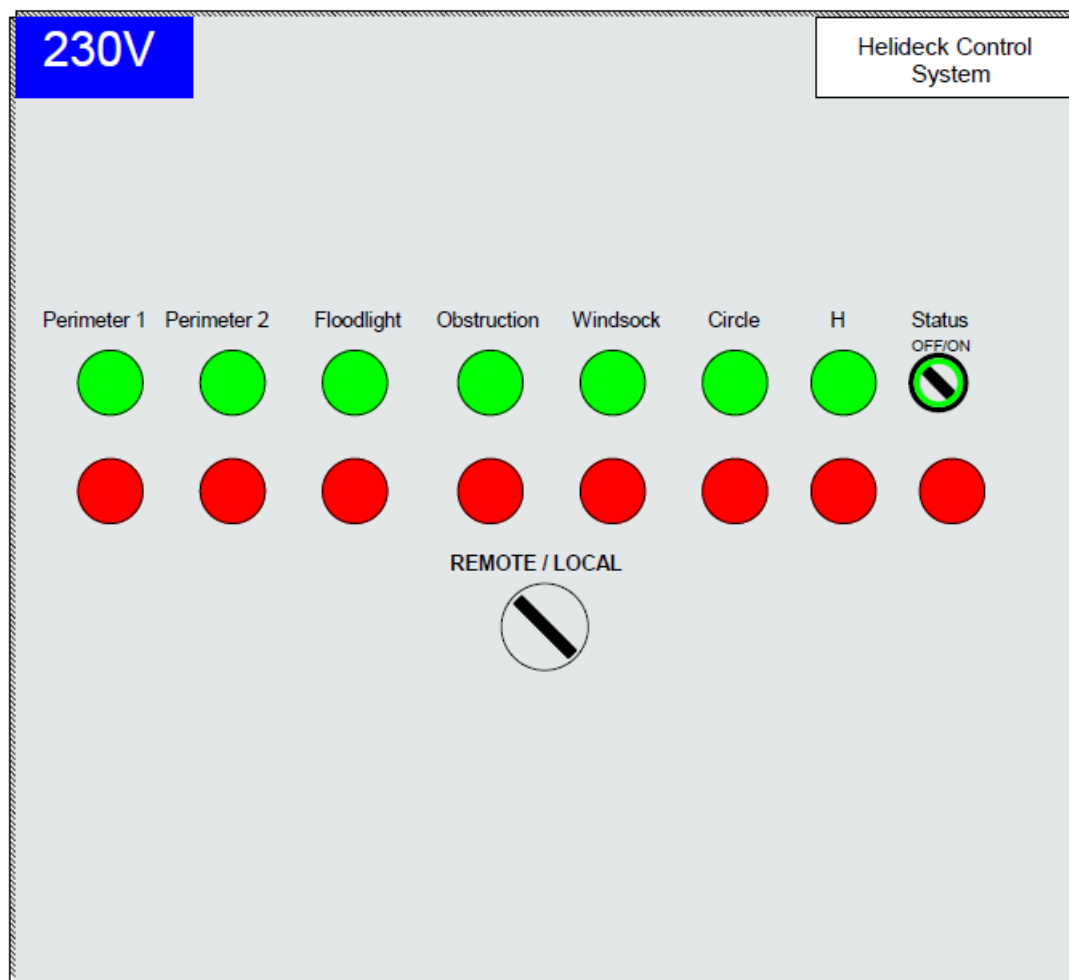
Figur 2: Remote control panel, page 1.



Figur 3: Remote control panel, page 2.

The local control panel is the emergency control panel located on the control unit in technical room. This control panel consist of physical buttons for section control of the lighting. See figure 4.

The PLC is programmed in Wagos software e!cockpit, and performs section control of the helideck lighting, automatic start-up of status lights, and adjustable brightness on the TD/PM lighting.



Figur 4: Local control panel.

A.2 Section Control

The control panel operates the lighting system in following sections.

Section	Main function	Addition
Perimeter 1	On/Off	
Perimeter 2	On/Off	
Floodlights	On/Off	
Windsock	On/Off	
Obstruction Lights	On/Off	
TD/PM H-light	On/Off	Dim light
TD/PM Circle light	On/Off	Dim light
Status light	On/Off	Automatic start-up of flashing light
Spare		

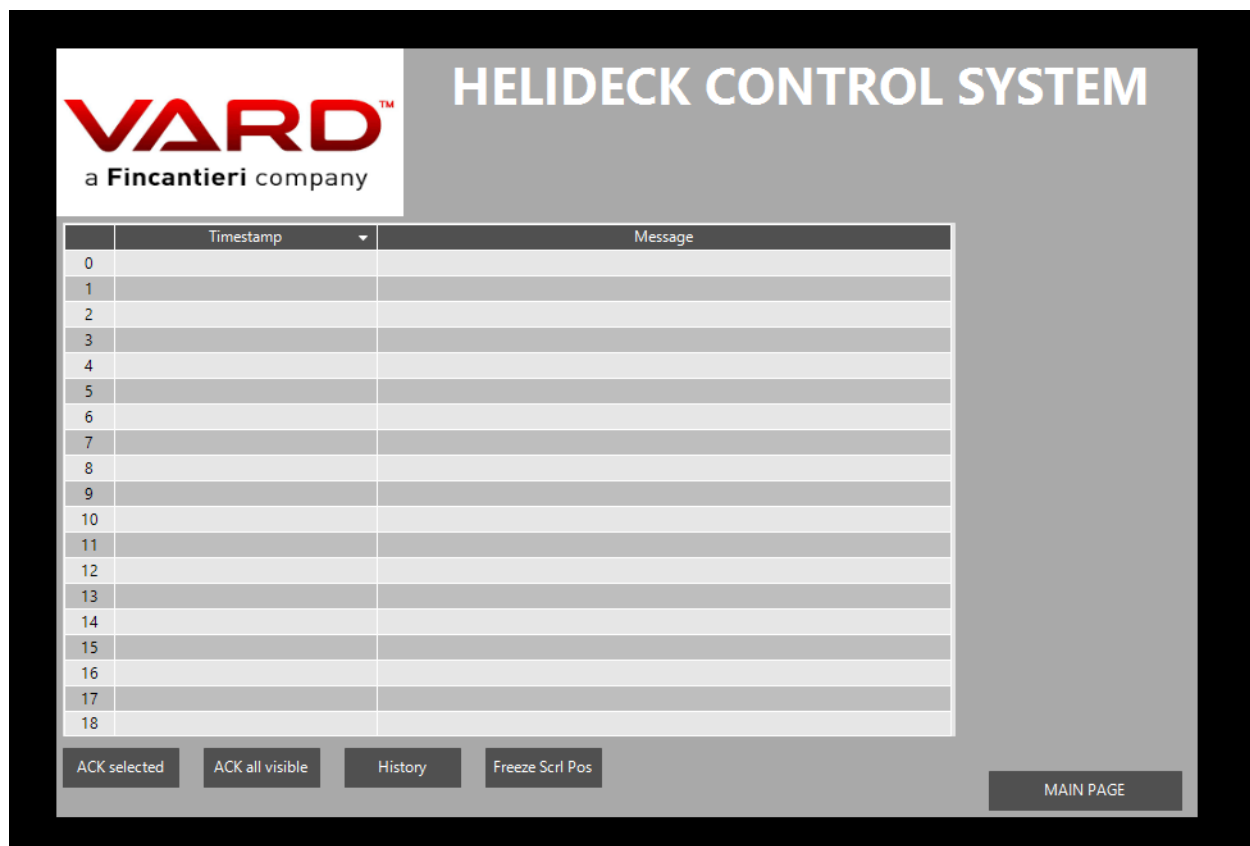
Tabell 1: Overview of the functions for the control system.

A.3 Broken cable detection

The control system monitors the current floating in the circuit to detect a broken cable or light bulb. The 3-phase current module *Wago 750-493* and *Wago 750-494/000-001* measures the current in the circuit, and make sure the current is inside its normal range. If the current rise/drops above or below the limit, the PLC is programmed to give alarm.

A.4 Alarm list

When an alarm becomes active, the "Alarmlist" button on the remote control panel becomes red. The third page of this panel consist of an alarmlist. This list gives an overview of the active alarms, and can show the alarm history as well. See figure 5. To acknowledge the alarm when the alarm is not active anymore, select the alarm and press "Ack selected" or "Ack all". Click on "History" to check the alarm log.



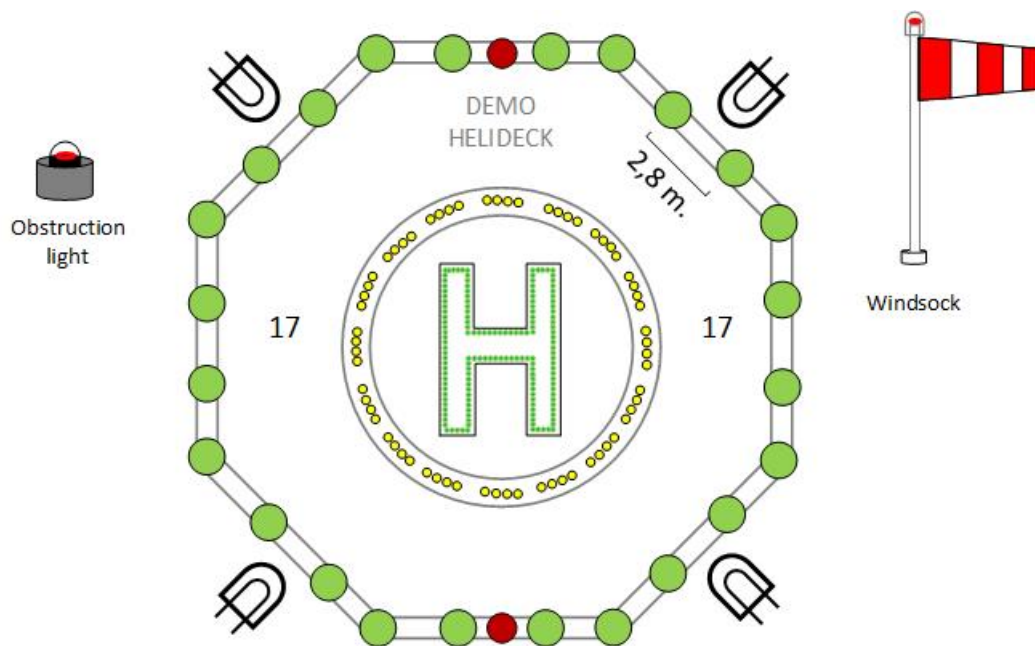
Figur 5: Remote control panel, page 3.

A.5 Transfer status

The control system communicates with the ship alarm system through Modbus TCP/IP. This allows the control system to transfer the status on the helideck lighting to the ship alarm system. If a failure appears, there will be a "Common alarm" on the ship alarm system.

A.6 Lighting system

The helideck lighting are in compliance with CAP 437 Edition 8 Amendment. The lighting provides safe operations for pilots during night. This system is specially designed for cruise and yachts, where the visual aspects of the electrical installation has high priority. Figure 6 shows an overview of the equipment installed on the helideck.



Figur 6: Overview of the equipment on the helideck.

A.7 Helideck Monitoring System (HMS) Installation guide

From the 1st of april 2021, the requirements in CAP437 for HMS is upgraded. This includes four status and repeater lights on the helideck. The system has therefore integrated two more floushmounted pots for future installation on the helideck.

B Installation Guide

The helideck lighting and control system are designed in compliance with CAP 437 Edition 8 Amendment. The lighting provides safe operations for pilots during night. This system is specially designed for cruise and yachts, where the visual aspects of the electrical installation has high priority.

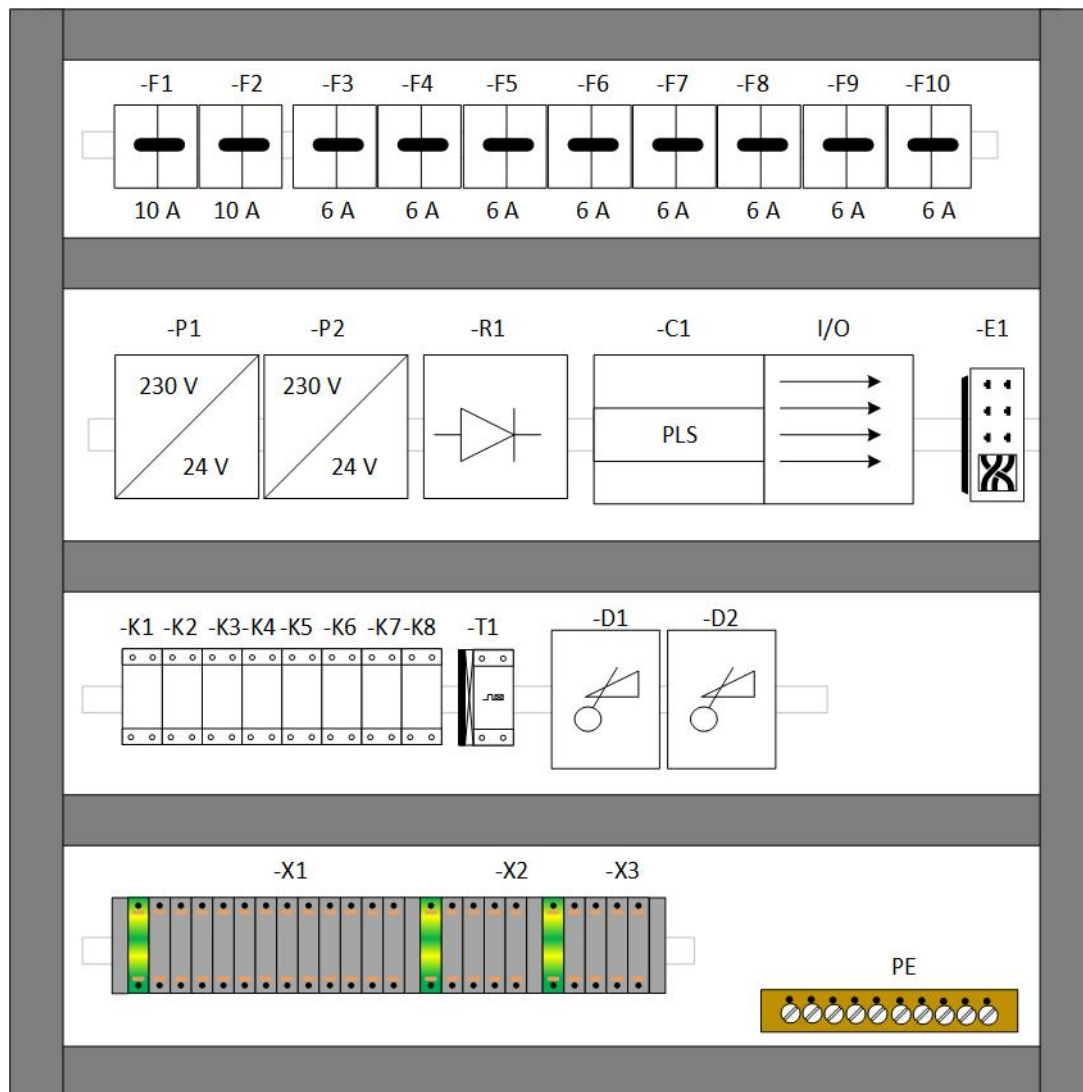
This guide is an instruction of installation of the control unit and lighting equipment. The technical documentation is attached in appendix ???. The PLC-program is programmed in Wago e!cockpit, and is commented to help the reader understand the code. The code is attached in appendix ???.

B.1 Control cabinet

The control cabinet is the systems "brain". All of the components for controlling the helideck lighting is mounted in this cabinet. The control cabinet is placed on a technical room near the helideck.

The control cabinet consists mainly of components from Wago. The equipment and materials is mounted on DIN-rails in the control cabinet.

The technical documentation is available in appendix ???.



Figur 7: Arrangement drawing of control unit.

B.2 Terminal blocks

The terminals is mounted for the wires and cables that goes in and out from the cabinet. It is mounted three sets of terminal blocks.

B.3 Fuses

The fuses -F1 and -F2 is 10 A fuses for the main and emergency power. Eight 6 A fuses is mounted for each circuit. These are connected to relays that gets activated by the control circuit.

B.4 Power supply

The system consist of two power supplies. One from main power, and one from emergency power. To keep the power sources undependent, they are connected to the PLC through a redundancy module.

B.5 Inputs

It is mounted a 8-channel digital input module for the PLS. The input gets signal from each power supply module, and as well the fire alarm system and gas alarm system.

B.6 Outputs

One 8-channel digital output is mounted. Each output is connected to one relay module, who can activate the lighting sections.

It is also mounted a 4-channel analog output which is connected to two dimmer switches. The dimmer gets a signal between 0 and 10 VDC, and controls the TD/PM lighting.

B.7 Power measuring module

The system detects broken cable or light bulb in each circuit. This is done by measuring the current. The cable is connected between phase and N. The alarm limits has to be configured in Wago IO Check.

B.8 Software

The PLC program is programmed in e!cockpit. This controls the lighting with section control, starts up the status and repeater lights automatically, and adjusts the TD/PM lighting. The system is communicating with the remote control panel through Ethernet, and communication with the ship alarm system through Modbus TCP/IP.

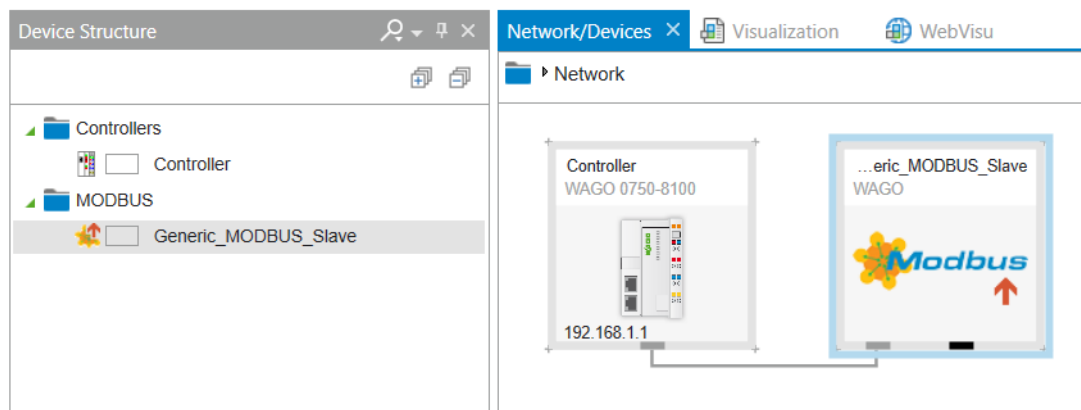
The PLC code is set up by three functions and two function blocks. The global variables is attached to the visualization and the digital inputs and outputs, and as well an analog output. See code in appendix ??.

B.9 Communication

The remote control panel communicates via Ethernet. The device needs to be connected to the same local network. The touch panel needs to be configured to connect to Wago Web Server, and then have permission to run the system from Web visualization.

To communicate with the ship alarm system, a "Modbus Slave" needs to be set up in the device structure. See figure 8.

B Installation Guide



Figur 8: Modbus slave configuration.

To find the correct slave, go to "settings" and type the IP-adress and unit-ID for the slave unit. Double click on the controller and define the "Common alarm"-variable. See figure 9.

MODBUS slave

Local bus I/O Mapping

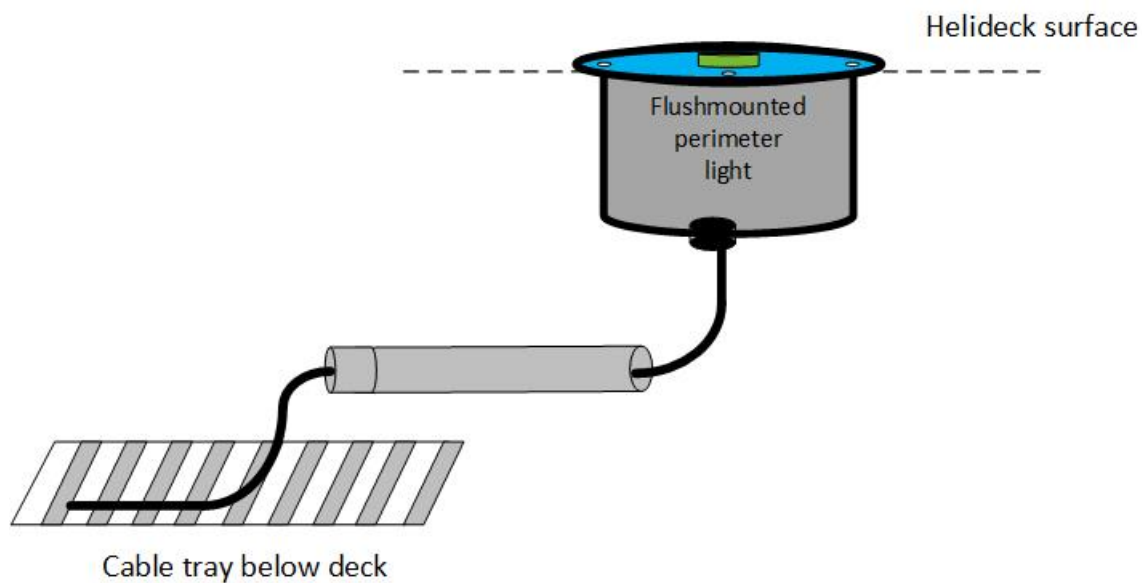
Data points

<div> <div>+</div> <div></div> </div> <div>Name</div>	Direction	Variable	Mapping	Data type	Length of the array	MODBUS address
PLC variables						

Figur 9: Declare variable on Modbus slave.

B.10 Lighting equipment on helideck

All cables for the equipment on the helideck is mounted in pipes and/or cable trays below the surface of the helideck, as show in figure 10 and 14. Table 2 describes the installation method for each ligting sections on the helideck.

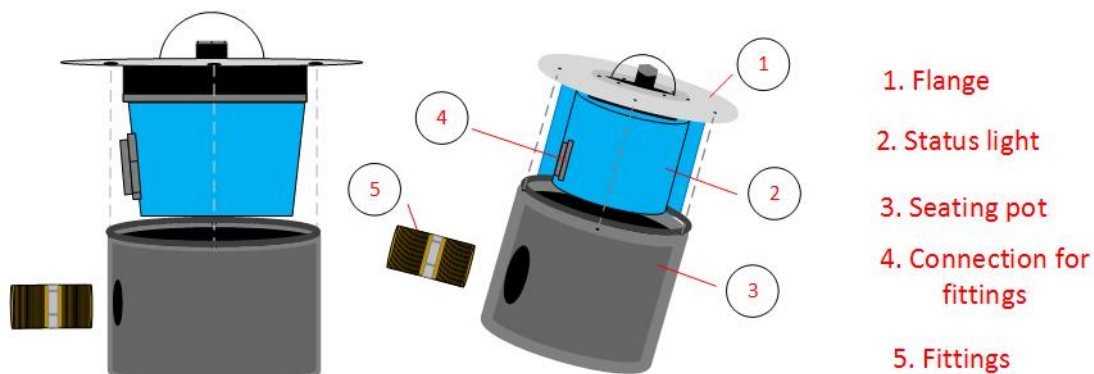


Figur 10: Illustration of the pipes in the helideck and assembly to the perimeter light.

Tabell 2: Overview of installation description for each lighting sections on the helideck.

Section	Installation description
Flood lights	Mounted on the rails outside the surface of the helideck.
Perimeter lights	Flushmounted in seating pots.
Status lights	Flushmounted in seating pots.
TD/PM Circle	Mounted on cable ducting brackets on deck. Inset junction boxes allows cables to be mounted below deck in cable trays. Supply cable is mounted in a pipe.
TD/PM Circle H	Mounted on cable ducting brackets on the surface of the helideck. Supply cable is mounted in same pipe as cable for circle light.
Windsock	Mounted as far from landing area as possible.

The perimeter lights are mounted in a seating pots that are installed in the helideck. The same seating pots are used for the status- and repeater lights. To attach these lights in the flushmounted pots, a flange needs to be fitted. Figure 11 demonstrates how the lights are connected.



Figur 11: Illustration of the flushmounted status and repeater lights.

B.11 TD/PM lighting

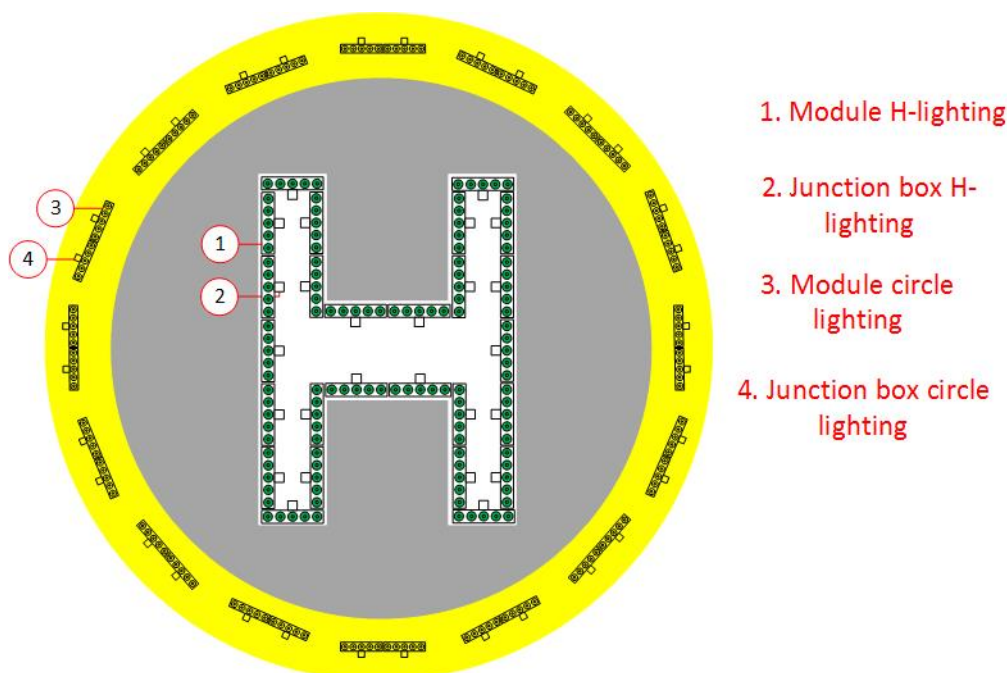


Figure 12: Installation of TD/PM lighting.

The TD/PM lighting consists of lighting modules with five parallel connected LEDs. Each module has one junction box. For the circle lighting, one lighting segment consists of two modules, see figure 13.

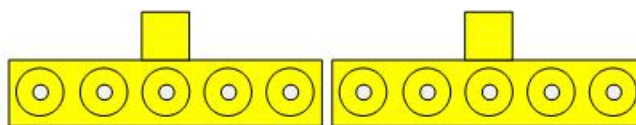
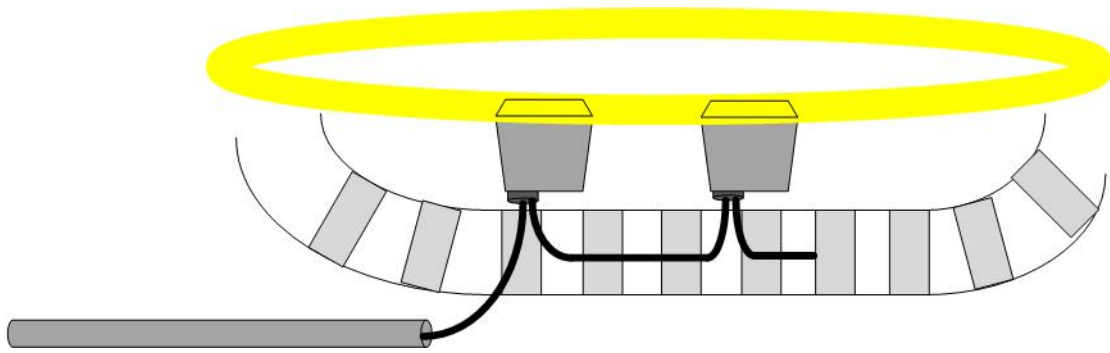


Figure 13: One lighting segment in circle lighting.

The TD/PM lighting is mounted so no cables are mounted on the deck. The junction box on each module is flush mounted, and the cables are laid below the helideck. This means it needs to be mounted a cable tray along the circle and H below the deck. Between the control cabinet and cable tray, the cable is in a pipe. See figure 14.



Figur 14: Sketch of cabling for TD/PM lighting.

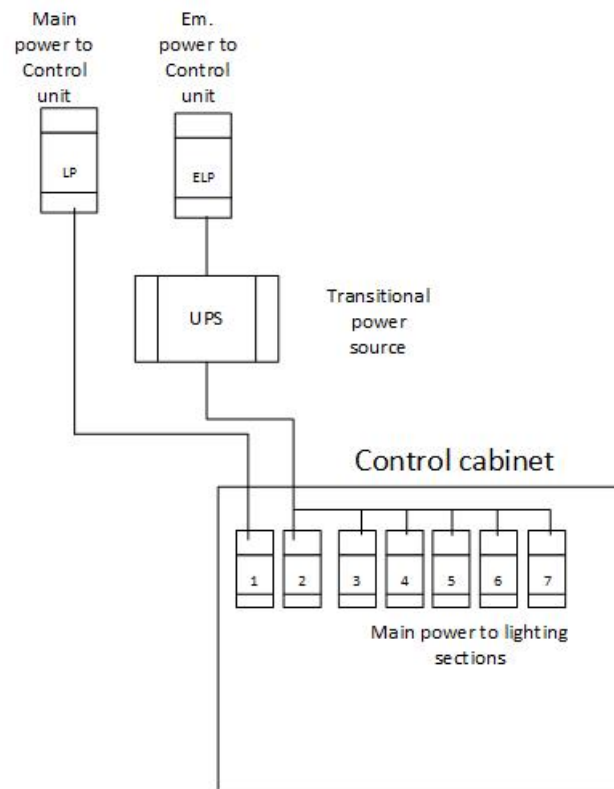
B.12 Requirements according to CAP 437

In order to meet the regulations in CAP 437 for installation of helideck lighting, the following requirements must be complied with:

- The perimeter lights should not be installed more than 3 meters apart.
- The TD/PM Circle lighting should contain minimum 16 lighting segments with a distance of minimum 0,5 meters.
- The TD/PM H-lighting should be mounted along the H-markings.

B.13 Power supply

The system has full power redundancy, with power supply from main and emergency power, including an UPS for transitional power source. Figure 15 shows a sketch of the 230 V power distribution.



Figur 15: Sketch of power distribution.

C Maintenance plan

The helideck is exposed for extreme and heavy weather during the year. To keep the system running continuously, the equipment on the helideck should be maintained. This maintenance plan contains the recommended maintenance to prevent failure in the equipment and in the system. It is recommended that the following items should be integrated in the companies internal system.

C.1 Monthly maintenance

1. Visual inspection of the helideck lighting system.
 - Check junction box and lighting for water and salt. Clean or dry as needed.
2. Visual inspection of control panel.
3. Function test of touch panel and lighting.
 - Test the functions on the touch panel located on the bridge, and make sure every lighting sections are in good working condition.

C.2 Maintenance every 6 month

- Insulation test of cables.
 - Test the insulation between phase and earth in the cables for each lighting sections. **Note:** Disconnect electronic equipment. Test with Megger tester on 500 V.

NB! Make sure that work on electrical installations is performed according the Regulations on safety during work in and operation of electrical installations (FSE).