



## TECHNICAL DATASHEET

DATE: 25.09.2023

REV: 01

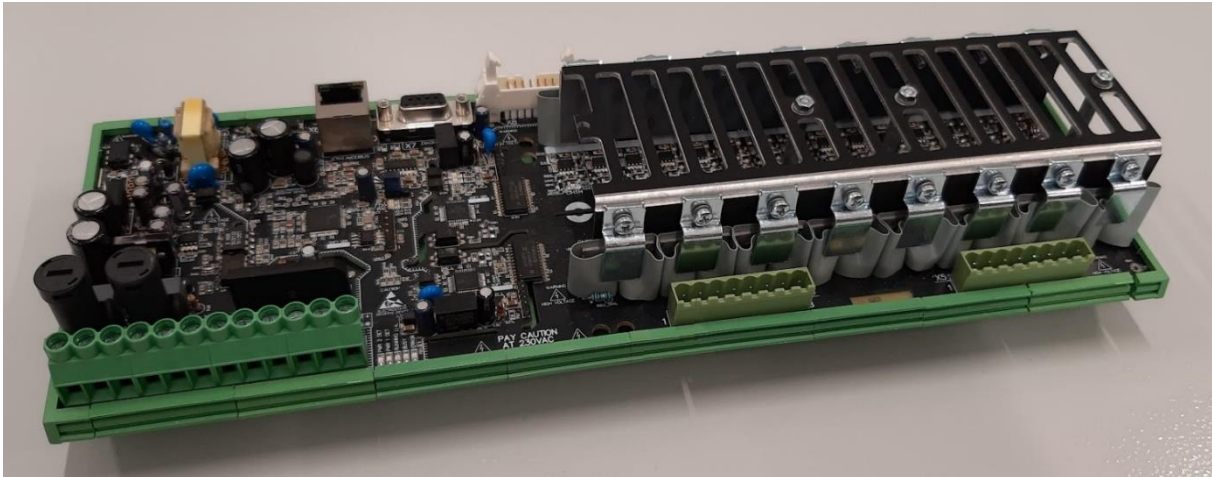
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### NAVIGATION LIGHT CONTROLLER / SAFETY CIRCUITS CONTROLLER

TYPE: NCL\_V1.2-ST


ISSUED BY: S.BOSIACKI

APPROVED BY: J.TRZASKA



#### Features of navigation lights controller / safety circuits controller:

- Low profile design for installation on standard 35mm rails in consoles, control panels and cabinets (certified for wheelhouse mount),
- Control and monitoring of 16 circuits (i.e. navigation lights, safety circuits loads), extendable without limitation (an external Ethernet switch required for bigger applications),
- Outputs are short-circuit-proof and two-way current-monitored (source and return),
- Outputs in Safety Circuits Controller have optional a continuity checking mode. In the event of a lack of load or line breakage, the device will trigger an alarm,
- Fast and reliable electronic short-circuit and overload protection with a trip time below 25ns,
- Soft start for high inrush current loads (i.e. bulbs, electromagnets) that extends load lifetime,
- Onboard timers that calculate channel runtime (0.5h accuracy) for load end-of-lifetime indication ( i.e. required by regulations for LED navigation lamps),
- Power supply monitored on both power supplies,
- Ethernet communication with MODBUS protocol, for easy and universal system fitting with any available HMI panel, PLC or SCADA systems,
- Serial interface for debugging and external control RS232,
- Website server on board, for control, troubleshoot configuration and operation monitoring,

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## 1. Introduction

NCL\_V1.2\_ST is microprocessor-controlled device that provide full functionality for control and monitoring 16 outputs. System fulfill all requirements to control navigation and signal lights, with LED or incandescent lamps, on board ships.

The STEMOR NCL\_V1.2\_ST is a system tailored for controlling and monitoring electronics devices, especially those serving critical safety functions. It offers dual power supply support, ensuring continuous operation in case of a power supply failure. Additionally, it provides a direct control connection for manual or alternative operation during electronic control system malfunctions.


This system incorporates operating hour monitoring for individual outputs, especially beneficial for LED lights, aiding in maintenance and replacement scheduling. Its modular design allows easy adaptation to various ship requirements. It is compatible with different voltages i.e. 24VDC, 24VAC, 115VAC, or 230VAC and can drive any device within maximal output current.

## 2. Safety and operation.

In the NCL\_V1.2\_ST system, precise current measurement is available on both the supply and return paths for each channel. During commissioning, the current values can be stored, enabling anomalies such as: LED segment failure, filament burnout, relay coil interlayer shortage and also system critical issues like: detection of grounding to the ship's hull, and increased current consumption due to factors like water ingress into the lamp fixture. This functionality aids in diagnosing and addressing potential issues to ensure its reliable performance.

The system is equipped with a "manual override" interface, which allows for the manual activation of individual channels, bypassing the electronic control. In this mode, all protective functions remain active. This feature facilitates the control of critical equipment in the event of damaged control panels or communication cables, ensuring uninterrupted operation even under such circumstances.

As a safety circuits controller, the system periodically measures each line by supplying power for a duration of less than 1 millisecond and measuring the returning current. This enables the verification of line continuity even when the receiving device is switched off. It allows for the control of devices such as trigger circuits in electrical system switches, power

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circuits for electromagnets, coils in safety systems, and all controlled power supply systems for end devices. The system ensures the certainty of activating the end device.

### 3. Power supply.

The integrated power supply, equipped with flyback switching converter, ensures the proper functioning of control and logic systems even when the supply voltage drops below specified range (60V in the case of a 110V and 230V system, for 24V systems minimal safe voltage is below 18V). Continuous voltage monitoring on both the main and emergency channels ensures reliable and uninterrupted operation. The system includes safeguards against writing operations at excessively low voltages, preventing configuration loss or error recording in the device's memory. The power source selection is accomplished via an external SPDT type switch.

### 4. Remote control.

The system supports external control using the MODBUS TCP protocol, and the default application enables control from a HMI touch panel, any SCADA computer system or PLC equipped with an Ethernet interface (STEMOR can also provide fully customized panel with buttons and lights that can control device). This allows for the full implementation of system functionality and alarm lists. MODBUS TCP permits flexible grouping of loads, and the system's architecture enables control through individual 16-bit words, simplifying and expediting application development. System can be purchased with dedicated customized panel, or STEMOR can assist in software development by customer.

NCL\_V1.2\_ST does not feature a built-in audio-visual alarm system. To implement such signaling, system developer should utilize the functionality of connected control devices (HMI touch panel or PLC). In the absence of this option, channel 16 can be configured as a monitored signaling output, allowing for the activation of any signaling device i.e. horns and lights.



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5. Modbus register table.

Address	Direction	Name	Value type	Description
400001	R/W	Channel enable	Bool array [16]	Each corresponding bit enables channel when set to 1, and disable channel when cleared.
400002	R/W	Channel lock	Bool array [16]	Each corresponding channel bit is set when channel enable cleared by logic circuit, lock must be cleared manually otherwise channel enable will be automatically cleared.
400003	R	Overcurrent high lines	Bool array [16]	Each corresponding channel bit is set when overcurrent occurs at high side. Bit is cleared when Channel lock is cleared.
400004	R	Overcurrent low lines	Bool array [16]	Each corresponding channel bit is set when overcurrent occurs at low side. Bit is cleared when Channel lock is cleared.
400005	R	Manual override status	Bool array [16]	Each corresponding channel bit is set when manual override is enabled, it switches channel on and disables external control.
400006	R	Fault code	Bool array [16]	Each bit is set when fault operation occurred check fault table.
400007	R	CPU usage	Unsigned 16	Represent CPU usage from 0-100%.
400008	R	CPU tick	Unsigned 16	Represent CPU timer tic (for debug purpose only).
400009	R	Modbus traffic	Unsigned 16	Represent Modbus usage in registers send per second.
400010	R	Channel 1 voltage	Unsigned 16	Store line 1 input voltage.
400011	R	Channel 2 voltage	Unsigned 16	Store line 2 input voltage.
400012	R	Device status	Bool array [16]	Not implemented yet.
400013	R	Line break	Bool array [16]	Each corresponding channel bit is set when device detect absence of load at output (i.e. line break or device damage).
400014	R	Source current CH1	Unsigned 16	Stores output sourcing current in ma RMS to corresponding 16 channels use formula



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				(4014+channelNo-1) to access other channels.
400030	R	Return current CH1	Unsigned 16	Stores output returning current in ma RMS to corresponding 16 channels use formula (4030+channelNo-1) to access other channels.
400046	R/W	LED select	Bool array [16]	Each bit corresponds channel, when set enable timer that count up always when channel is enabled.
400047	R/W	Maximal operation time	Unsigned 16	Stores timer maximal count, when overflow sets timer exceed flag.
400048	R	Time exceed flag	Bool array [16]	Each bit corresponds channel and stores timer overflow flags.
400049	R	Half hour flag	Bool array [16]	Each bit corresponds channel and stores flags that represent 30 minutes of run time.
400050	R	Hour counter	Unsigned 16	Stores timer value that represent full hours of working time of corresponding 16 channels to access rest of channels use (4050+channelNo-1).
400066	R/W	Flash counter	Unsigned 32	Keeps flash write cycles in 4066 stores 16 low and in 4067 stores 16 high.

Table 1 Modbus register summary.



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6. Fault code list.

Bit	Fault description
0	<i>Not implemented yet</i>
1	Read from flash failure
2	Write to flash failure
3	Low line zero cross detection failure
4	High line zero cross detection failure
5	Low line ACPU communication failure
6	High line ACPU communication failure
7	CPU internal error
8	Line 2 fail no voltage
9	Line 2 Under voltage
10	Line 2 Over voltage
11	Line 1 fail no voltage
12	Line 1 Under voltage
13	Line 1 Over voltage
14	Not implemented yet
15	Not implemented yet

*Table 2 Fault register byte description.*



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7. Mechanical dimensions

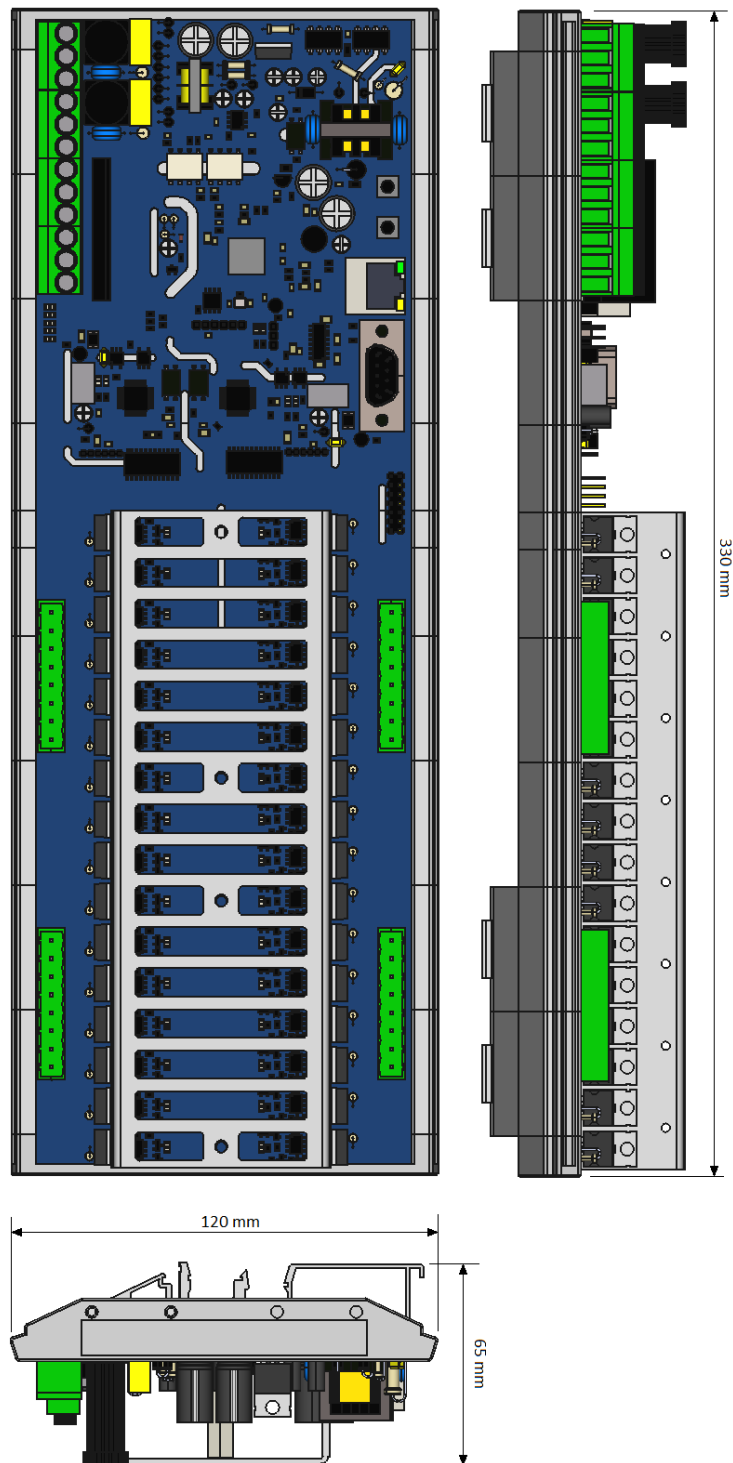


Figure 1. Orthogonal view



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8. Electrical connections

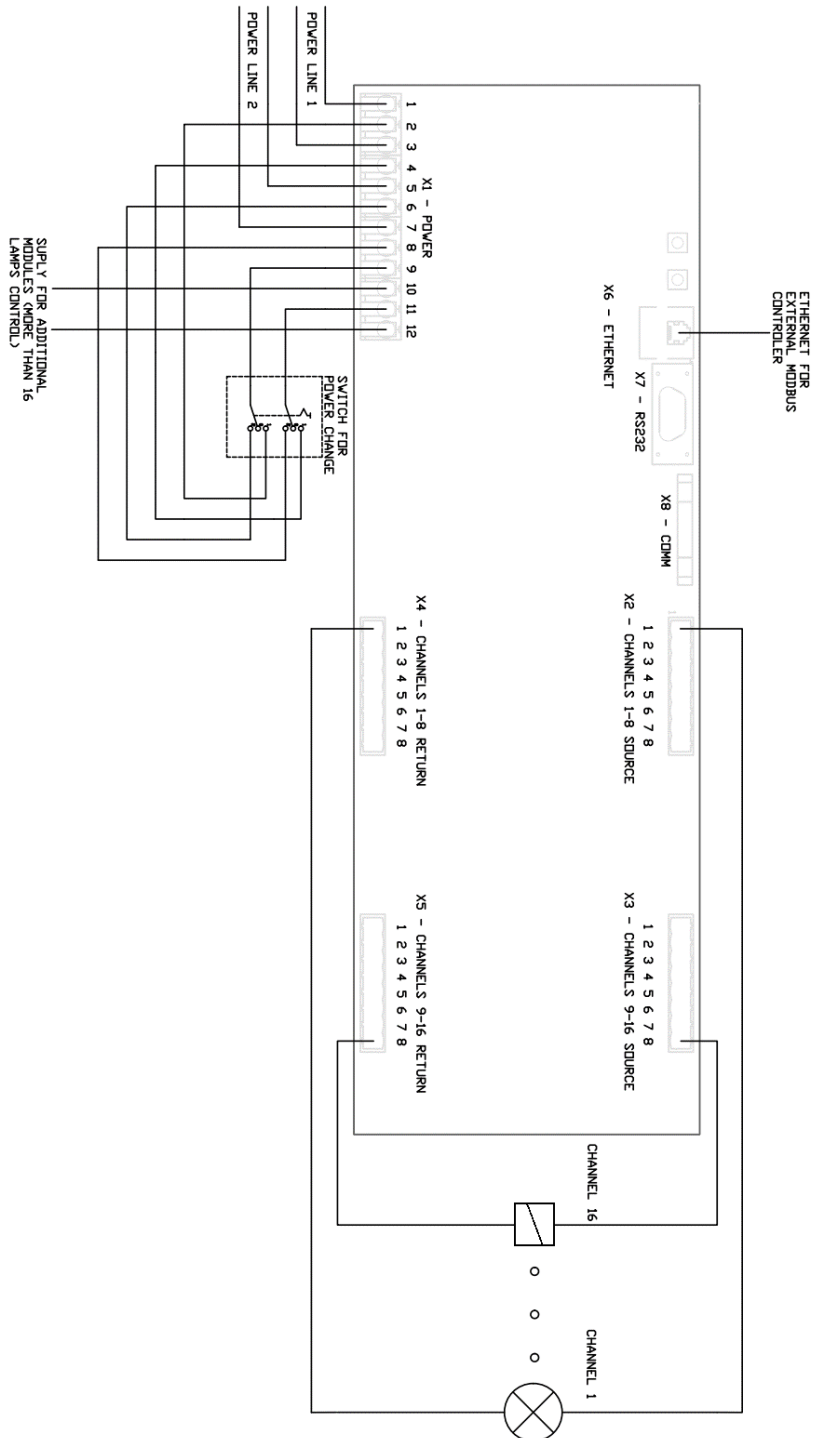



Figure 2 External wiring



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## 9. Technical parameters

<b>Power supply (depending on model)</b>	24VAC/DC (+30% / - 25%) fitted for battery power 115VAC/DC (+30% / - 40%) 230VAC/DC (+20% / - 50%) up to 350VDC (maximal safe)
<b>Current consumption (device only)</b>	24V – 100...350mA 115V – 10... 100mA 230V – 5...50mA
<b>Operating temperature</b>	-25 °C...70 °C
<b>Storage temperature</b>	-30 °C...85 °C
<b>Weight</b>	0,76 kg
<b>External dimensions</b>	330 x 120 x 65 mm
<b>Interfaces</b>	1x Ethernet – Modbus TCP/IP, web server, OTA 1x DSUB9F – RS232, debug remote control 1x Communication bus – for manual override function
<b>Channel protections</b>	24V – 3A 115V – 1A 230V – 500mA
<b>Maximal input current</b>	24V – 20A <sup>1</sup> 115V - 8A 230V – 8A
<b>Mounting</b>	DIN TS 35 Rail

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<sup>1</sup> For 24V option if channels uses standard 60W single module will not allow to turn on more than 8 channels at time.