



# SHIP'S MANUAL

Navigation Light Controller with  
Mimic interface

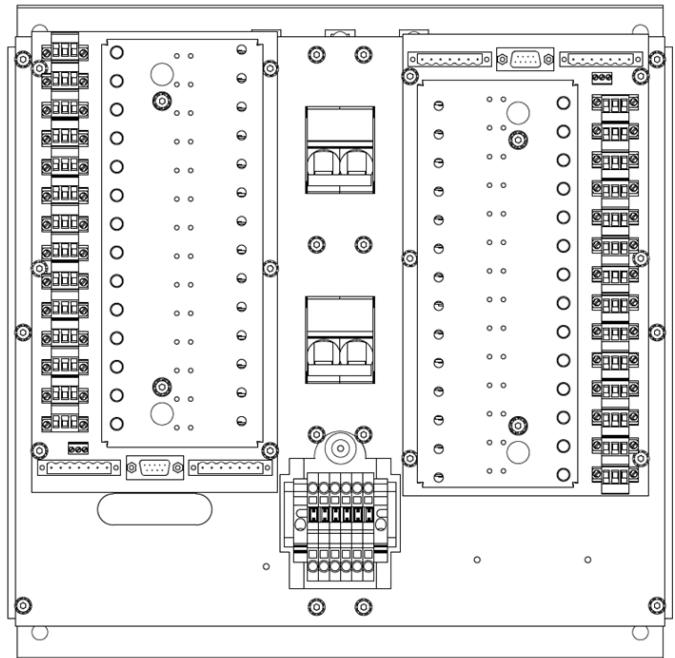
Manual\*

Rev. 2.3  
January 2024

Mimic panel(s)



Navigation light controller



**\*) This manual shall be read together with the software manual for the Mimic interface**

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## **1.0 Preface**

The Lopolight Navigation Light Controller (NLC) and Mimic panel(s), described in this document, is a simple to install and simple to operate system, that can control up to 60 Lopolight navigation lights.

The system is based on the type-approved Lopolight Monitoring Relay (LMR/Q).

Refer to section 2.0 for further information concerning approvals.

### **1.1 Modular Principle – up to 60 outputs.**

The core NLC controller consists of up to 14 outputs (navigation light connections), and can be extended with 14 additional outputs, totaling 28 controllable outputs per NLC.

If more than 28 channels/ connections are required, multiple systems can be installed in series.

The mimic panels are available in different sizes to fit most requirements.

### **1.2 Basic working principle**

The complete system consists of four basic components:

#### 1: The NLC

The NLC holds the LMR/Q monitoring relays, primary power-supply, secondary (emergency) power-supply, TCP/IP server.

Navigation light connection terminals as well as connection for the TCP/IP server.

#### 2: TCP/IP server

The TCP/IP server secures an easy communication between the NLC and the mimic panel via DisplayPort/HDMI and USB connections. If the system contains more than one mimic panel, an TCP/IP alarm client must be used. The TCP/IP alarm client converts ethernet data to HDMI/USB/RS232/NMEA0183 communication formats to connect the mimic panels. In principle, an unlimited number of mimic panels could be connected to the system.

### **1.3: TCP/IP alarm client**

The TCP/IP Alarm client secures an easy communication between the TCP/IP Webserver and an extra mimic panel

### **1.3: MIMIC PANEL**

The Mimic panel offers a graphical user interface for full operation and setup of the complete NLC system. Lopolight offers a range of mimic panels to fit most requirements. See separate data for mimic panels. The NLC can also be interfaced with any monitor/mimic panel on the Vessel, as long as this equipment contains a normal web browser.

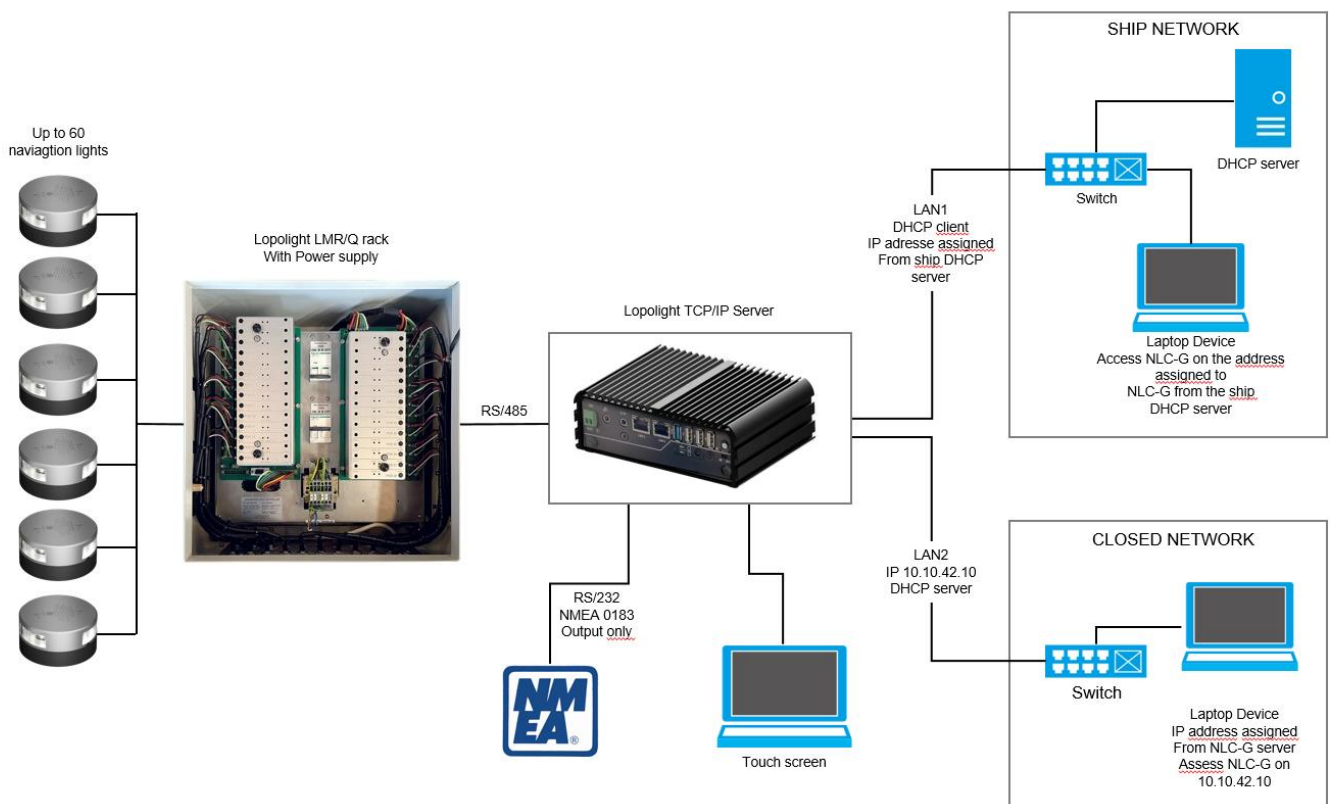
Multi-processor principle:

The controller holds one or multiple Lopolight Monitoring Relays (LMR/Q's), these are the basic components in the system. One LMR/Q is assigned to each individual output.

Each LMR/Q is assigned a logical address that can be controlled by a data telegram from the controller (panel or similar). The multi LMR/Q processor principle offers the highest possible degree of redundancy as every navigation light is monitored by a separate monitoring Relay.

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### 1.3 System overview



## 2.0 Standards and resolutions

The system meets and exceeds the following standards, type approvals and resolutions:

ABS approval 20-2067759-PDA

\*Refer to “Approvals” under

<https://www.lopolight.com/download/certificates>

## 3.0 Navigation Light Controller (NLC) basic data

Installed in cabinet (optional);

Cabinet: Steel enclosure (Schneider-Electric: Spacial S3D)

Dimensions (WxHxD): 400\*400\*200mm

Mounting: 4 wall brackets included

Weight: ~13 kg. (full version)

Ingress protec. IP66 (depending on selected cable entry system)

Cabinet certificates: BV, CUL, DNV, GL, LR, UL

Colour: RAL 7035 (Light grey)

Protective ground connection: M6 bolt connection protruding from cabinet  
Theoretical temperature rise: 25°C. above ambient @ 200W load.

Open installation (Standard, without cabinet);

Dimensions (WxHxD): 354\*350\*148.5mm

Mounting: 4 wall screws (not supplied with system)

Weight: ~5 kg. (full version)

Ingress protec. IP 22 Either install in sealed compartment or in Cabinet to achieve higher IP rating.

Protective ground connection: M6 bolt connection on base plate  
Theoretical temperature rise: 25°C. above ambient @ 200W load.

### 3.1 Mimic Panel, basic data

See separate data sheet

### 3.2 Controller power and connections:

#### Inputs;

Primary power-supply : 100-240VAC 50/60Hz, Maximum 250W

Primary power-supply : 19-32VDC, Maximum 250W

Sec. power-supply : 100-240VAC 50/60Hz, Maximum 250W

Sec. power-supply : 19-32VDC, Maximum 250W

Internal circuit protection: 100-240 VAC: 6A[C], 19-32 VDC: 10A[C]

Connections: Din rail terminals.

Isolation: Power supplies are galvanic isolated from vessel installations.

#### Outputs;

Number of nav. light connections: Up to 28 LMR/Q based outputs.

Max. output voltage: 32VDC

Max. output current: 2 Amp per output – automatic current limiter.

Max. total output: 220W (total max. consumption must be calculated) HW Alarm output Relay: Max. 200 mA. Normally open contact.

Power supply to TCP/IP server/client & mimic panel(s): 24 to 32VDC, max.

1,5A via data connectors.

#### Data communication;

Physical: RS-485: 38400, N,8,1 NMEA 0183 (OUTPUT ONLY)

Data protocol: Lopolight LMR/Q protocol



Data comm. interface option 1: Sub-D9 plug  
Data comm. interface option 2: 7-pin screw terminal plug  
Termination resistor: 120Ω in screw terminal. Normally located in NLC. Use only one per system.

TCP/IP Server :

Seatronx MPC 101-Lopo.  
See separate data sheet.

TCP/IP Alarm client:

Seatronx MPC 101-Lopo  
See separate data sheet.

Mimic panel;

Lopolight offers a range of Marine graded mimic Panels in different sizes.

See separate data sheets for the various models.

### **3.3 Navigation light controller (NLC) installation guide**

### Placement:

The controller must be installed in a protected\* environment at bridge level and is recommended to be installed on a vertical surface (wall mounted). (\* refer to EN 60945/IEC-60945 in section 8.2)

### Accessibility:

The enclosure door must be reachable, and it must be possible to open it fully to gain access to the manual (emergency) control buttons. It must be possible to gain full access to the manual control buttons within 2 minutes.

### Temperature:

Ambient temperature range: -15°C to 50°C

NB! Avoid placing the controller near other equipment that creates excessive heat.

### Mechanical:

Secure to bulkhead/wall using four pcs. of min. 10mm bolts. Ensure that the bulkhead/wall is suitable of carrying a load of ~13 kg – also under heavy vibration.

### Power supply:

Ensure that proper cable types and dimensions are used for the power supply/supplies. Refer to section 3.1 for details (suggested minimum cable dimensions is 2.5 mm<sup>2</sup>)

### Cable entries:

Power, communication and output cables must be strain relieved externally, in accordance with “good workmanship practice” and relevant standards.

### Output cable installation – internal:

Connect the individual cables to relevant output plug/terminal using appropriate ferrules to protect the wire strands.

Ensure correct polarity (L+=positive,L-=negative).

Scr. = screen/protective earth should be connected to cable screen, unless cable screens are ground connected elsewhere near the controller.

Secure plugs with screws before finishing installation.

Recommended cable dimensions: 0.5 to 2.5 mm<sup>2</sup>.

### Output cables:

Output cables may be connected directly to the controller. If heavy-duty ships cables are used, it may be necessary to terminate these at an external terminal bar, and then connect the external bar to the output plugs of the controller using cables or wires with a smaller dimension.

If the controller is installed in an enclosure, cables should be drawn from the gland plate (fitted at the bottom of the enclosure) at the underside of the support plate and emerge just before the dedicated connector (K1-14)

### Protective ground:

Protective ground must be connected to the cabinets or base plates ground point using proper sized grounding wire or mesh. (suggested minimum: 6 mm<sup>2</sup>)

**Compass safe distance: 0.5 meter (controller only).**

## **3.4 Mimic Panel, installation**

**guideline** See separate data sheet

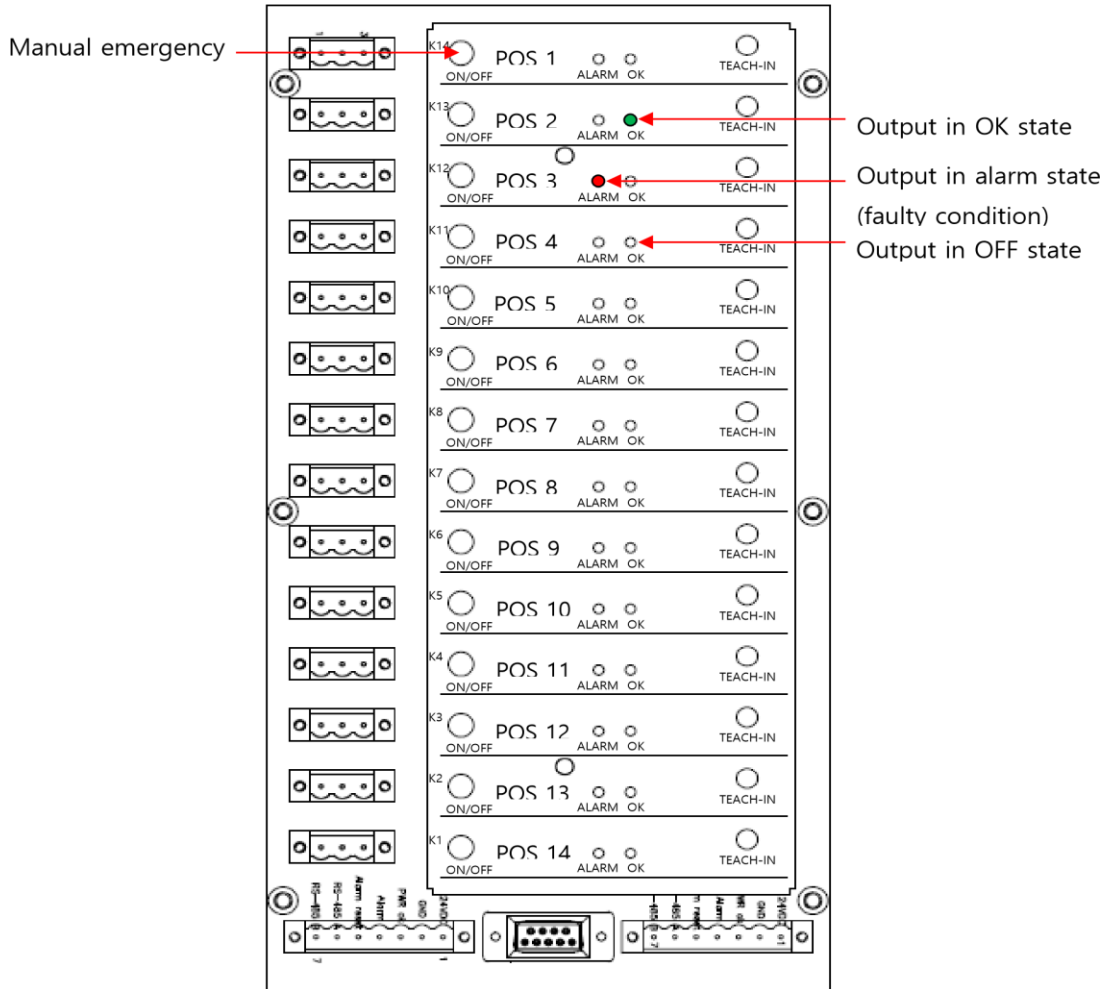
## **3.5 Controller, direct control (emergency operation)**

The individual Monitoring Relay (LMR/Q) outputs can be controlled manually by a simple keypress. The output will toggle between on and off at every key press.

The output can be in three states: OK, ALARM and OFF

If an output is off, then the indicator will be off. If the output is on, the green "ok" indicator will illuminate. If the connected navigation light is faulty the red alarm indicator will illuminate.

The direct controls are independent from the mimic panel and are classified as "Manual Emergency Control". See section 6.2 for full details



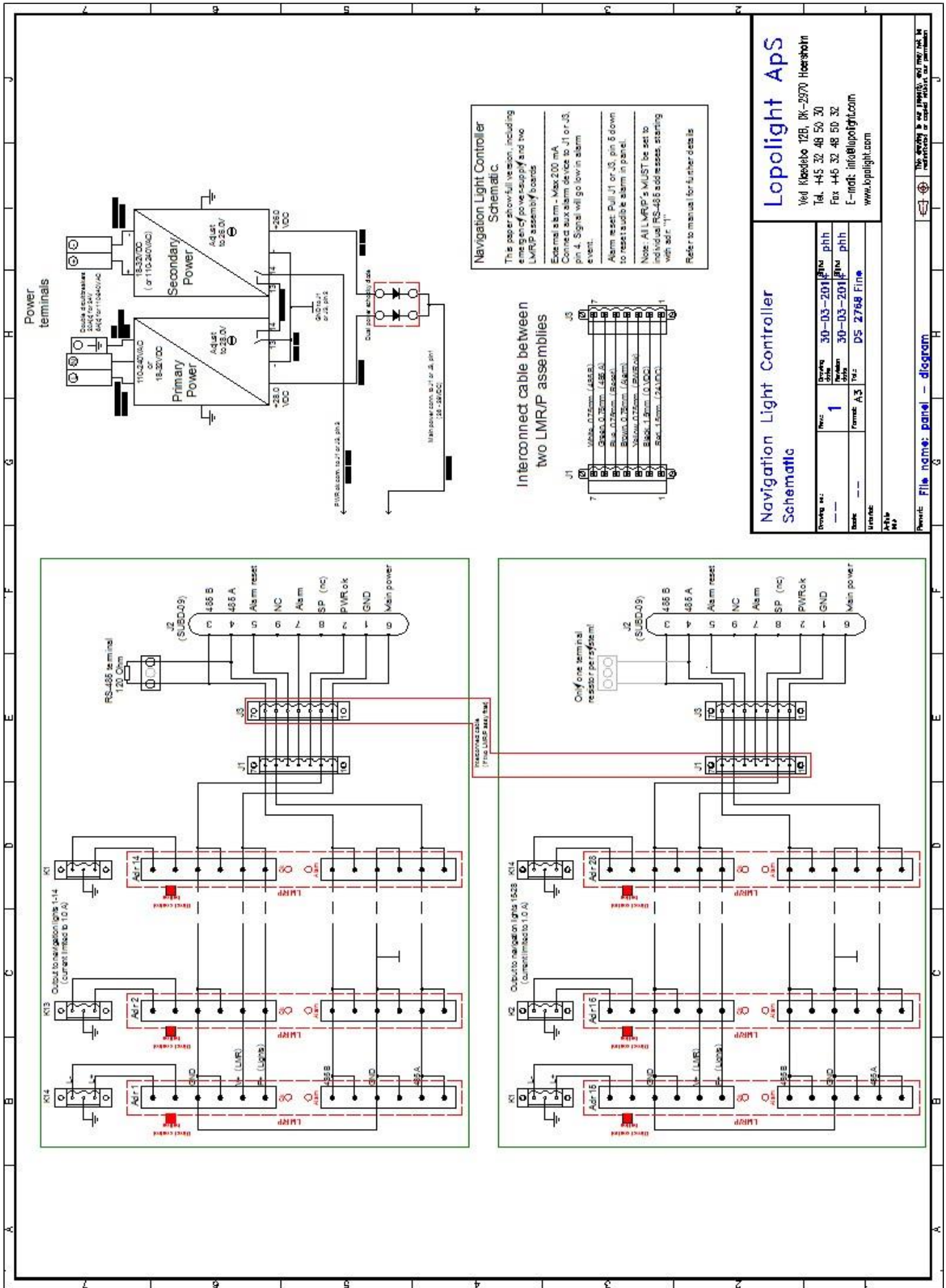
### 3.6 Controller schematics

Including power-supply and power monitoring function.

Note that the individual systems can have different power supplies as the

**system is offered with any combination of AC and DC inputs depending on project specifications.**





**Navigation Light Controller Schematic.**  
 This paper shows full version, including emergency power supply and two LMR/P assembly boards.  
 External alarm - Max 200 mA  
 Connect aux alarm device to J1 or J3, pin 4. Signal will go low in alarm event.  
 Alarm reset: Pull J1 or J3, pin 6 down to reset audible alarm in panel.  
 Note: All LMR/P's MUST be set to individual RS-485 address, starting with addr. "1"  
 Refer to manual for further details

Interconnect cable between two LMR/P assemblies



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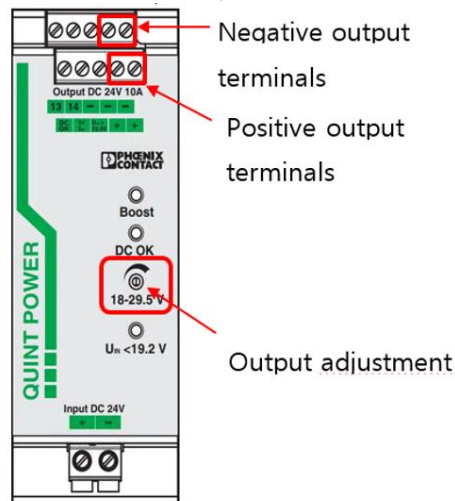
**Navigation Light Controller Schematic**

Drawing no:	1	Drawing date:	30-03-2011	Drawn by:	phh
Rev:	---	Revision date:	30-03-2011	Checked by:	phh
Scale:	---	Format:	A3	Tid:	DS 2768 Final
Unit no:					
Arch:					
MP:					

## 4.0 Controller, service and maintenance

Adjustment of power-supplies; (only applies if redundant power-supply is fitted)

Use a digital multimeter set to DC voltage, measure across any of the positive and negative output terminals on the power supply.



The power supply shown is a DC/DC, however the terminals and adjustment potentiometer is located in the same place on an AC/DC power supply

Adjust the power-supply in accordance with the listed outputs;

- Primary power supply output: 28 VDC.
- Secondary power supply output: 26 VDC.

### **LMR replacement;**

Please refer to the “Replacing the LMR instructions on page 25 in this manual.

### **Other service operations:**

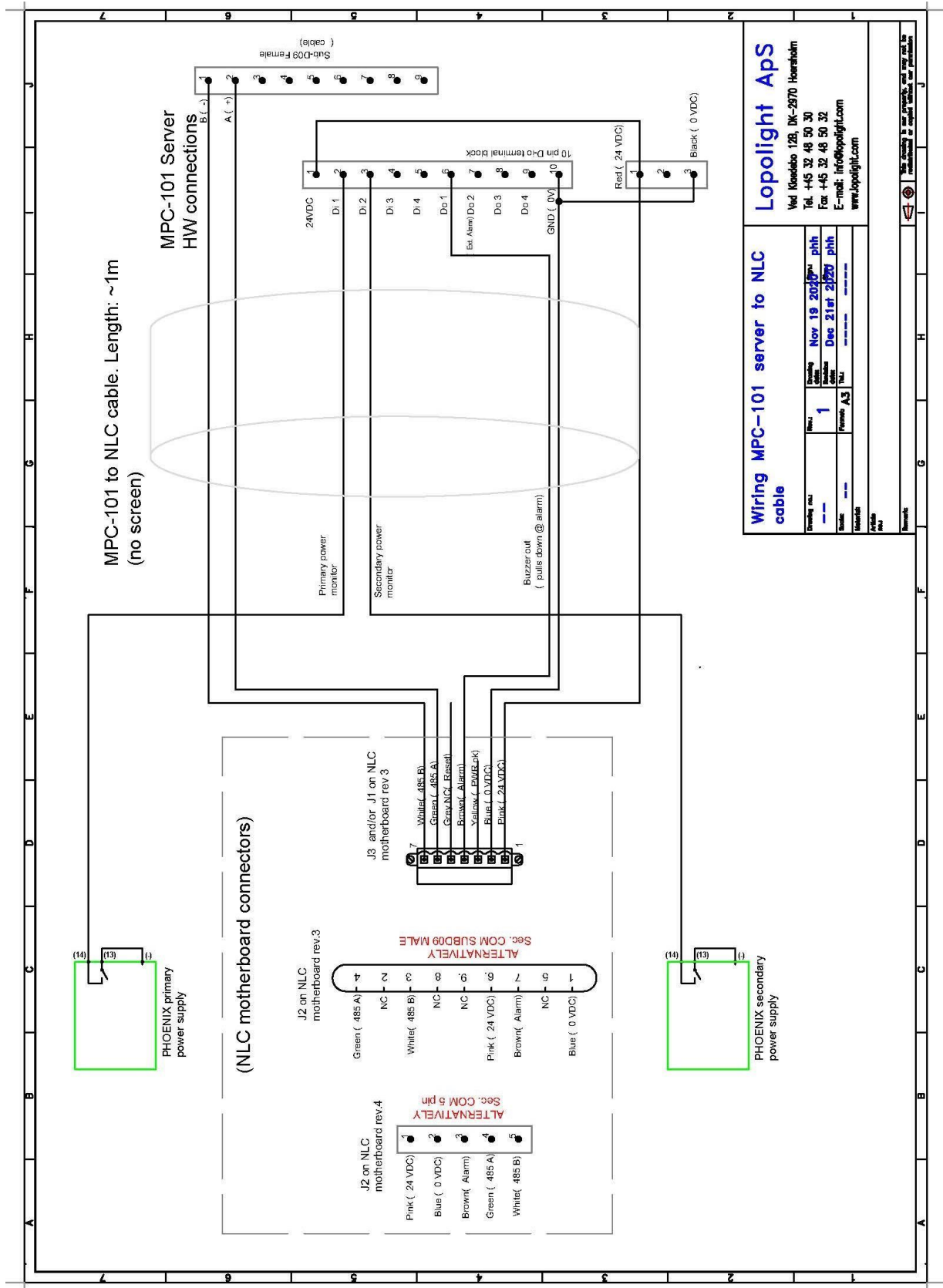
**The system should not be disassembled in any other way than specifically described in this manual.**

**For other service operations, please check the website ([www.lopolight.com](http://www.lopolight.com)) for**

**instructions, if not found please request the appropriate manual at [info@lopolight.com](mailto:info@lopolight.com)**

**Failure to comply with this will potentially void warranty.**

## 5.0 Connection NLC to TCP/IP server





## 6.0 Initial installation and set-up.

Protective ground connections - general guidelines:

The NLC must be connected to ships protective ground (hull) via the external grounding point, marked PE. Use the M6 terminal and appropriate lock washers to ensure good connectivity even under challenging circumstances.

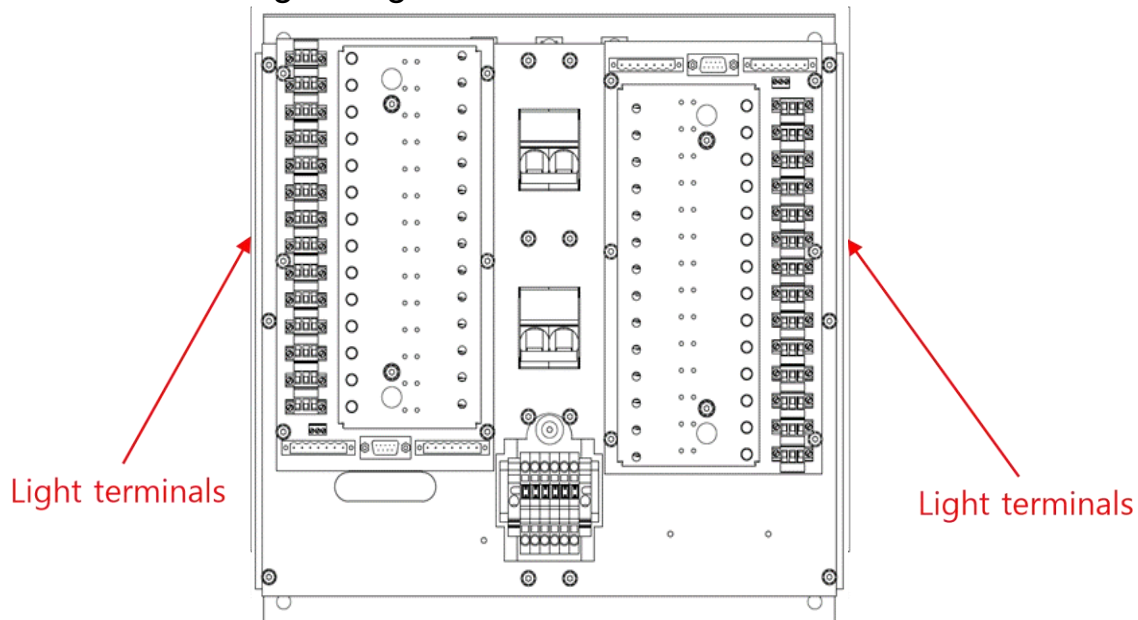
If the feed wires to the individual navigation lights are of a screened type, then the screens must be connected to a PE point. This can be accomplished by using the middle pin on the 3-pin connector(s) for the lights or connecting to a PE point outside of the enclosure.

It is permitted not to use un-screened cables the last ~2 meters before the enclosure.

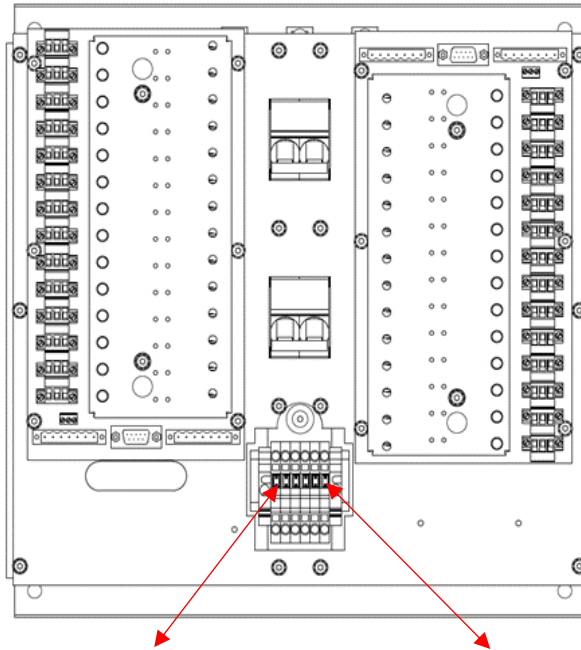
Hardware connections, NLC:

Make sure the two circuit breakers are open.

Connect the individual navigation lights to the NLC light terminals located along the right hand and left-hand side of the NLC.



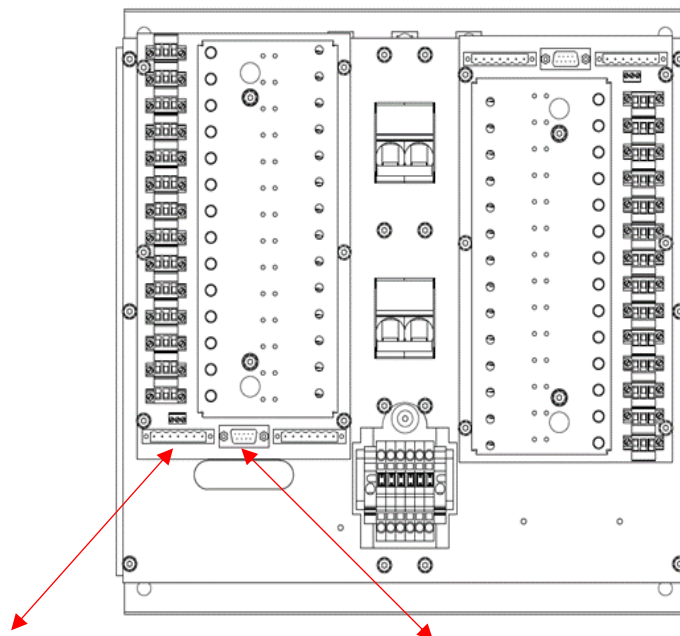
Connect primary and secondary power to the NLC.



Secondary power supply

Primary power supply

Connect the cables (depending on type) from the mimic panel to the TCP/IP server. If the TCP/IP server is placed inside the Lopolight enclosure, the connectors are found on the cable gland plate at the bottom of the enclosure



J-1 7-pin connector

J-2 9 pin SUBD-9 connector

Turn on system by closing the circuit-breakers. (Alarm will sound now. Can be silenced by pressing Alarm reset button on panel)

6) The system is now ready for first time setup.

6.1 **First time Setup:** (also please refer to the software manual for the Mimic interface)

All setup, including initial teach-in procedure, installing “ship image” file, naming lights, choosing icons type and positioning icons on ships image, pairing of lights, grouping of lights etc. Are all performed from the Lopolight software installed on the TCP/IP server.

To access the setup pages in the software, please refer to the **“Graphical interface software manual”**.

Note! The setup pages in the software are password protected and to be used only by trained technicians.

## 6.2 Manual control:

Every navigation light is connected to an individual monitoring relay (LMR/Q) in the NLC. Each LMR/Q carries a manual/Emergency control button labelled “ON/OFF”, two status LEDs (Green = ON, red = alarm). Using the manual/emergency on/off button the lights can be controlled directly from the LMR/Qs, however if a touch panel is connected and active, the LMR/Q will shut off after a few seconds, because the command was not sent through the system to operate the light in question. To avoid this, simply click the “manual emergency control” switch to “on” position in order to disconnect the RS485 connection between the motherboard and the TCP/IP Server panel for manual override control.

### 6.3 Factory reset:

If a factory reset is needed, this can be performed from the password protected part of the Lopolight software. This process should only be performed by a trained technician.

please refer to the “Graphical interface software manual”.

Factory reset will delete **ALL** settings. Image, groups etc.

### 6.4 Setting the address of the LMR/Qs:

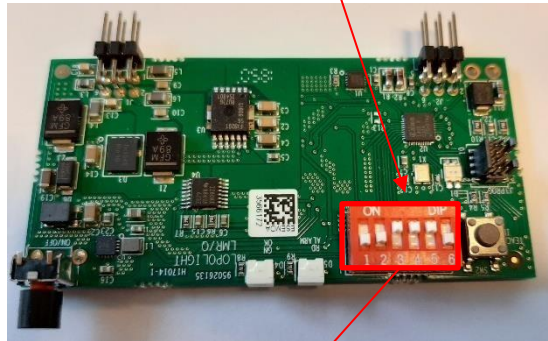
Each individual LMR/Q must be assigned an individual address used by the RS485 network in order to respond to commands sent from either the control panel or an external device.

When a system is delivered from Lopolight, all LMR/Qs has already been set up with their corresponding addresses.

Address 1 through 60 are all legal. Whereas address 0 (zero) is NOT.

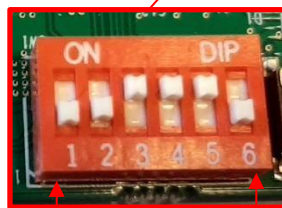
The addresses are set using binary logic on the small dip-switch on the LMR/Q.

DIP switches



Ex sample showing address  $4+8+16=28$

On  
Off



Sw 1

Sw 6

The following table shows the configuration of the LMRs for each address.

Adress.	Sw 1	Sw 2	Sw 3	Sw 4	Sw 5	Sw 6
1	On					
2		On				
3	On	On				
4			On			

5	On		On			
6		On	On			
7	On	On	On			
8				On		
9	On			On		
10		On		On		
11	On	On		On		
12			On	On		
13	On		On	On		
14		On	On	On		

15	On	On	On	On		
16					On	
17	On				On	
18		On			On	
19	On	On			On	
20			On		On	
21	On		On		On	
22		On	On		On	
23	On	On	On		On	
24				On	On	
25	On			On	On	
26		On		On	On	
27	On	On		On	On	
28			On	On	On	

29	On		On	On	On	
30		On	On	On	On	
31	On	On	On	On	On	
32						On
33	On					On
34		On				On
35	On	On				On
36			On			On
37	On		On			On
38		On	On			On
39	On	On	On			On
40				On		On
41	On			On		On
42		On		On		On
43	On	On		On		On
44			On	On		On
45	On		On	On		On
46		On	On	On		On
47	On	On	On	On		On
48					On	On
49	On				On	On
50		On			On	On
51	On	On			On	On
52			On		On	On
53	On		On		On	On
54		On			On	On

55	On	On			On	On
56			On		On	On
57	On		On		On	On
58		On	On		On	On
59	On	On	On		On	On
60			On	On	On	On

Table 1 \* See explanation below

The numerical values for each Sw is binary, thus giving each bit the following values for addresses;

- Sw 1 = Binary 1
- Sw 2 = Binary 2
- Sw 3 = Binary 4
- Sw 4 = Binary 8
- Sw 5 = Binary 16
- Sw 6 = Binary 32



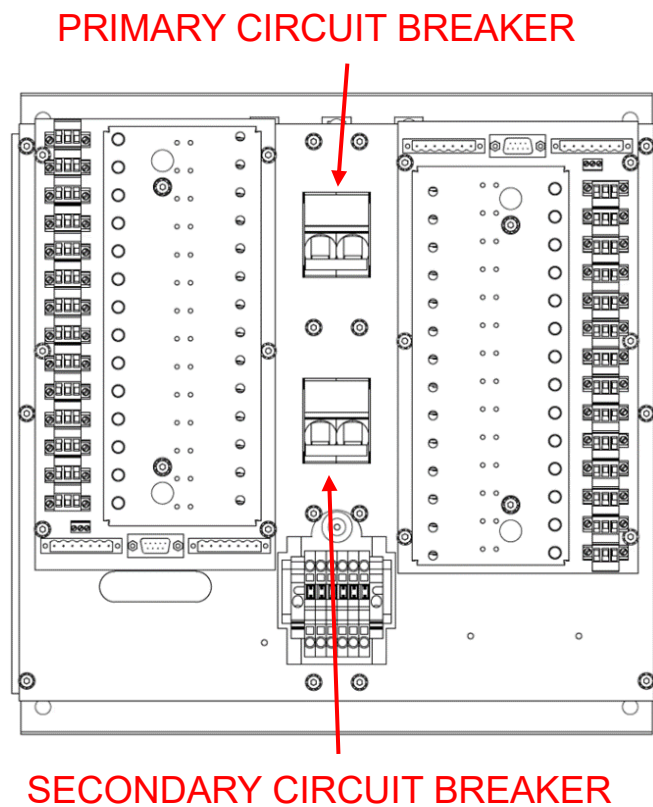
## 7.0 Spare parts:

### Lopolight P/N: Name:

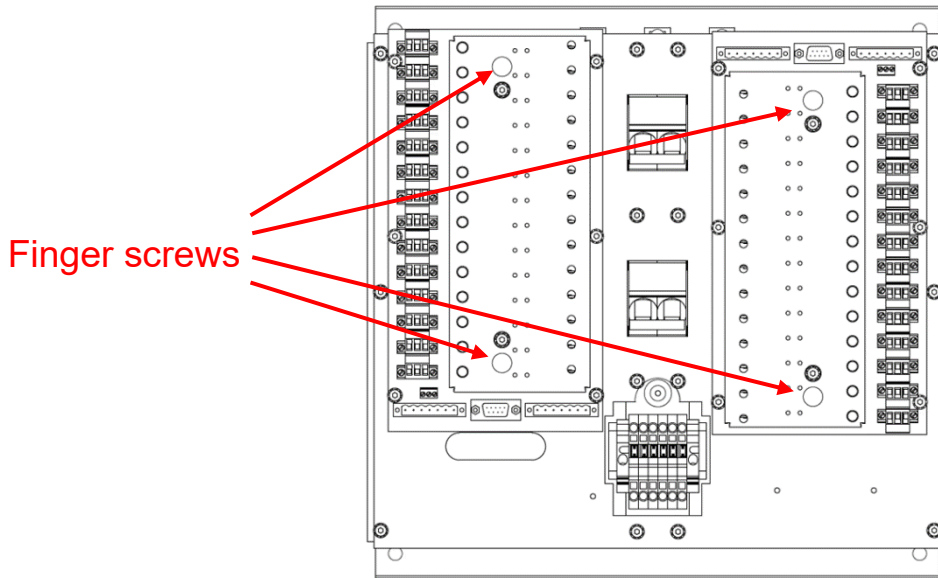
400-018/Q	LMR/Q card
600-917	115/240 VAC Phoenix power-supply
600-918	24/24 VDC Phoenix power-supply
601-117	Circuit-breaker (10A) for 24 VDC
600-927	Circuit-breaker (20A) for 24VDC (Only Ice-class)
600-928	Circuit-breaker (6A) for 115/240VDC
600-930	3-pin plug for navigation light connection in NLC
900-733	Ground strap for NLC enclosure (15 cm mesh)
500-150	TCP/IP web server
500-151	TCP/IP alarm client
800-145	NLC to mimic panel Power cable with buzzer
800-146	NLC to TCP/IP server cable
601-120	USB- type A to USB type A cable, 5 meters
601-121	HDMI to HDMI cable, 5 meters
601-122	DisplayPort to HDMI cable, 5 meters

## 9.0 Replacing LMR card

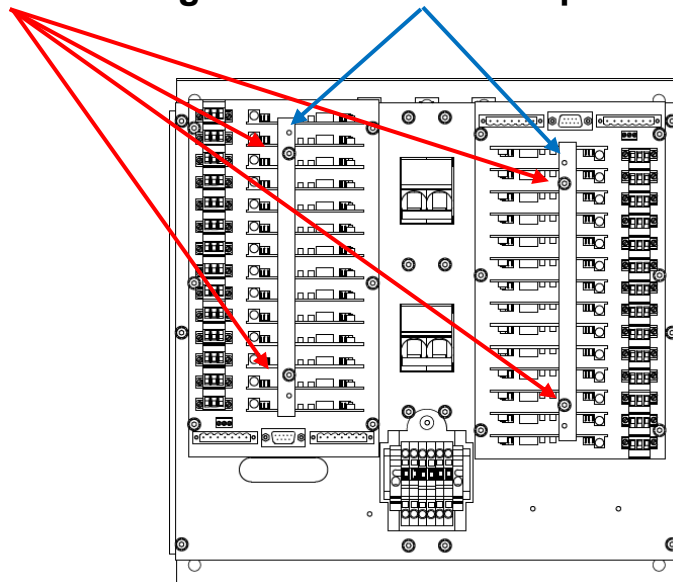
- 9.1 Open the door of the NLC using the handle.
- 9.2 Turn off supply voltage for the NLC, simply by setting the circuit breaker(s) in the off position.



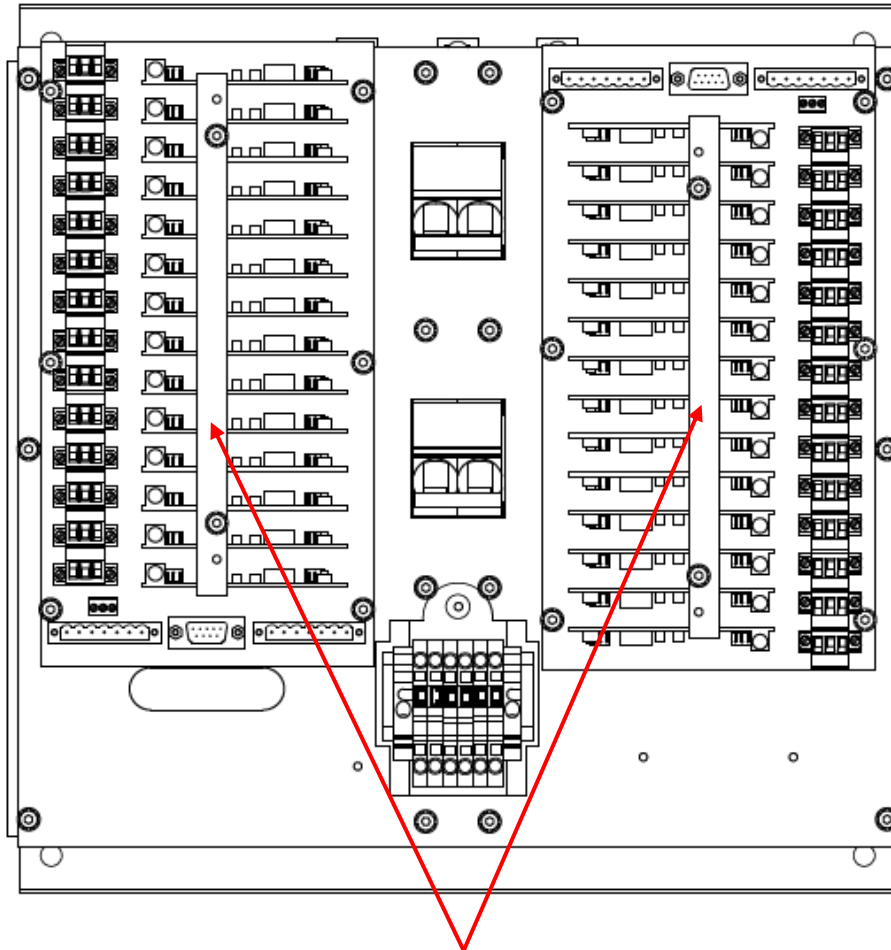
9.3 Remove the two finger screws fastening the cover of the LMRs.



9.4 Remove the **screws** holding the **LMR retainer** in place using a 4 mm hex key.

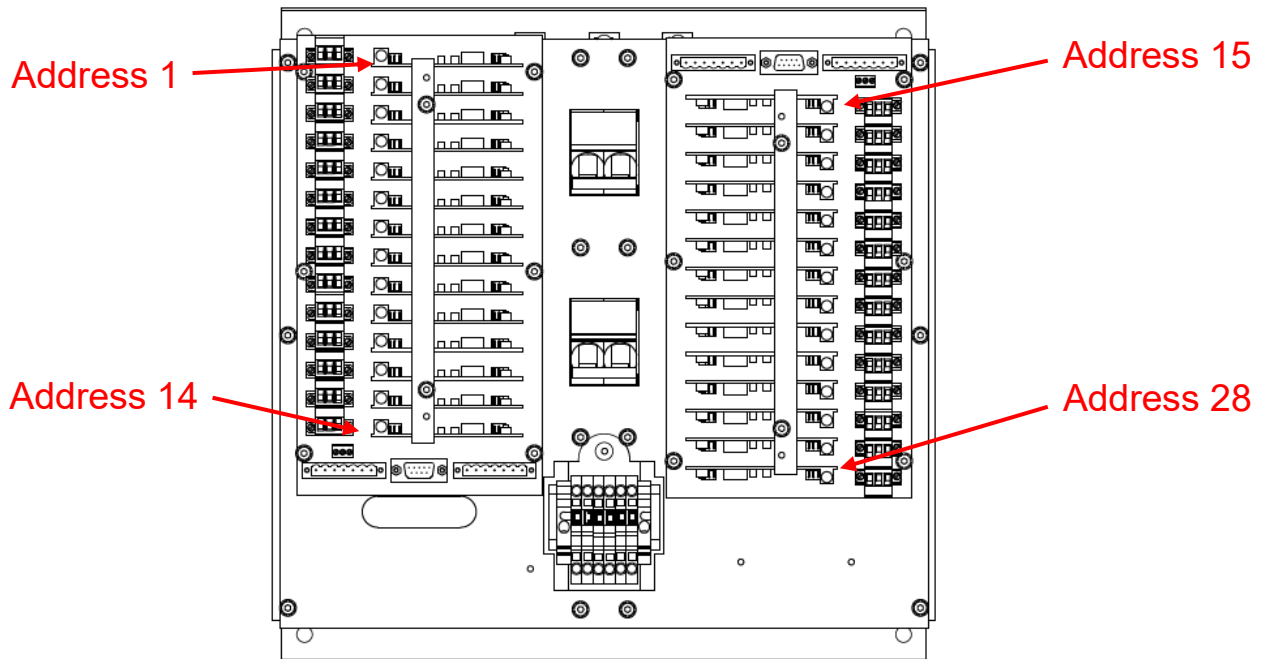


**9.5 Remove the LMR retainer keeping the orientation in mind as installing it with the wrong orientation may cause issues.**



LMR Retainers

**9.6 Remove the LMR in question by pulling it out of the NLC. The position number can be found on the LMR cover in case of doubt.**



- 9.7** Set the new LMR with the correct address (Refer to section 9.3 in this manual to setup of the LMR cards)
- 9.8** Insert the new LMR in the correct position in the NLC and assemble in reverse order.  
NOTE! Make sure all the pins on the LMR are correctly inserted into the connector on the motherboard!
- 9.9** Apply power to the system and switch the light connected to the replaced LMR on. (Alarm may sound)
- 9.10** Wait 35 seconds and then perform the “teach-in” procedure (Refer to section 6.4 in this manual on how to perform “teach-in” procedure) on the LMR, letting the LMR register the power values of the light on the LMR for monitoring purposes.
- 9.11** The system is now ready for normal operation.

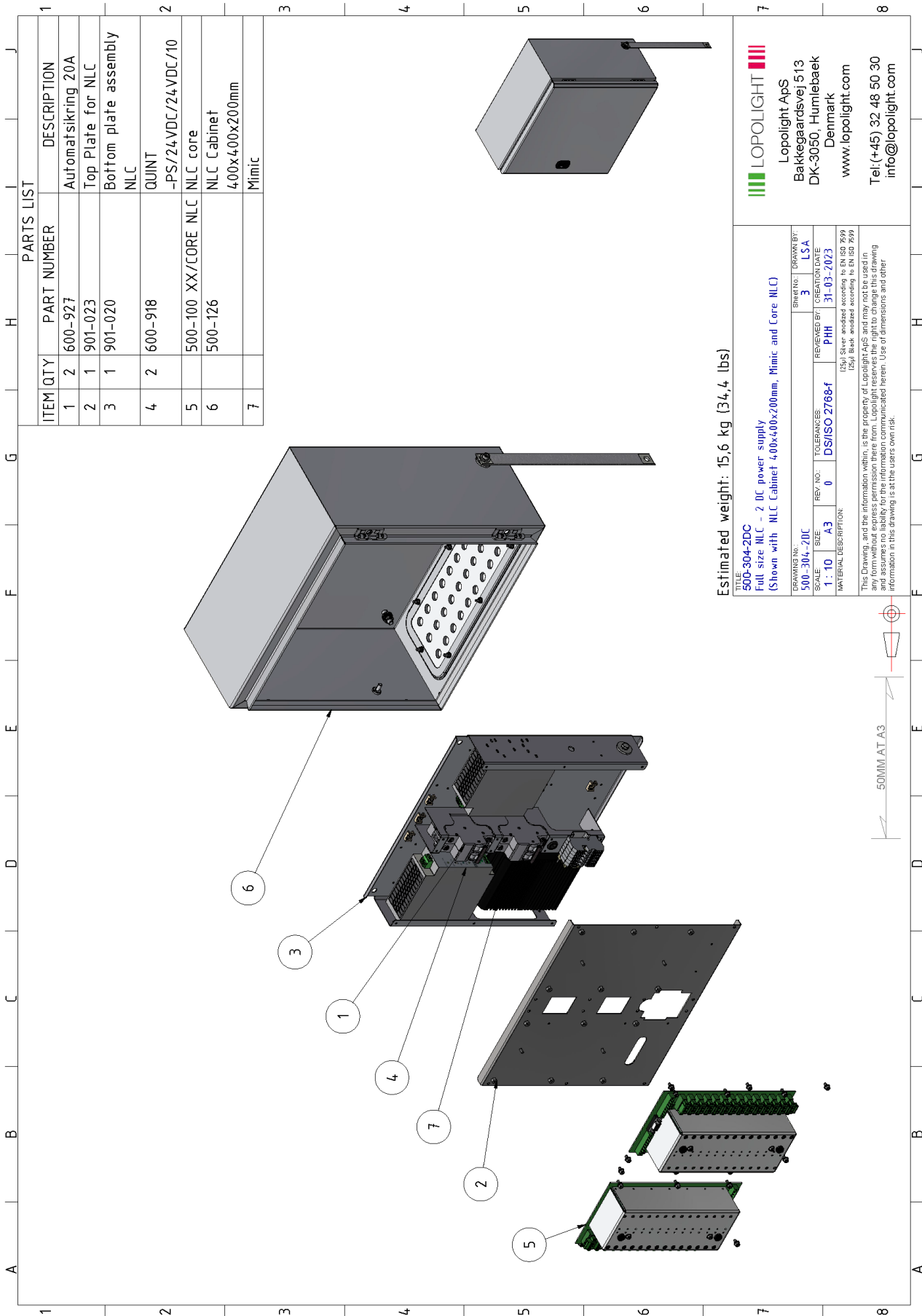
## 10.0 Troubleshooting guide and instructions

### Error indications on LMR cards (in NLC)

Situation: (one) navigation light supposed to be on – activated either from panel or manual/emergency switch

Line:	Error indication:	Possible reason	Fault finding action: Check if OK	Action if NOT ok
1	Green OK indicator not active	Navigation light faulty	Navigation light illuminates	Check if navigation light works
2	Red alarm indicator illuminated (1)	Missing "Teach-in"	Perform Teach-in	Line 3
3	Red alarm indicator illuminated (2)	Navigation light faulty	Navigation light connection/function	Change navigation light if proven faulty
4	Center-indicator orange (1)	Short circuit in cable to navigation light (Current limiter is in function)	Check cabling/connections/connectors	Go to line 5
5	Center-indicator orange (2)	Short circuit in navigation light (Current limiter is in function)	Navigation light connection/function	Change navigation light if proven faulty
6	Center-indicator is blinking orange after pressing teachin button	Teach-in procedure running (some 5 seconds)	No action. Not an error	--
7	Center-indicator is <u>NOT</u> blinking orange after pressing teachin button (1)	Navigation light not connected to output terminals (or not using any current)	Navigation light connection/function	Check functionality of navigation light
8	Center-indicator is <u>NOT</u> blinking orange after pressing teachin button (2)	LMR faulty	Replace LMR (Remember dip-sw. settings AND teach-in procedure)	--
9	Alarm on panel. Navigation light not on. LMR: Centerindicator blinking green AND no indications on Green/red front indicators.	Navigation light activated on panel – but switched off at manual/emergency button on LMR	Switch on at LMR (press manual/emergency button once)	--
10	Center-indicator constant red	Navigation light failure	Navigation light connection/function	Change navigation light if proven faulty
11	Center-indicator blinking green slowly AND front indicator constant green	Navigation light will expire within 2000 hours	Change navigation light when convenient	--
12	Center-indicator alternating red/green AND front indicator constant red	Navigation light has expired it 50.000 hour lifetime	Change navigation light as soon as possible.	--

# 11.0 Exploded view of the NLC cabinet.

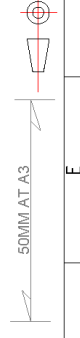


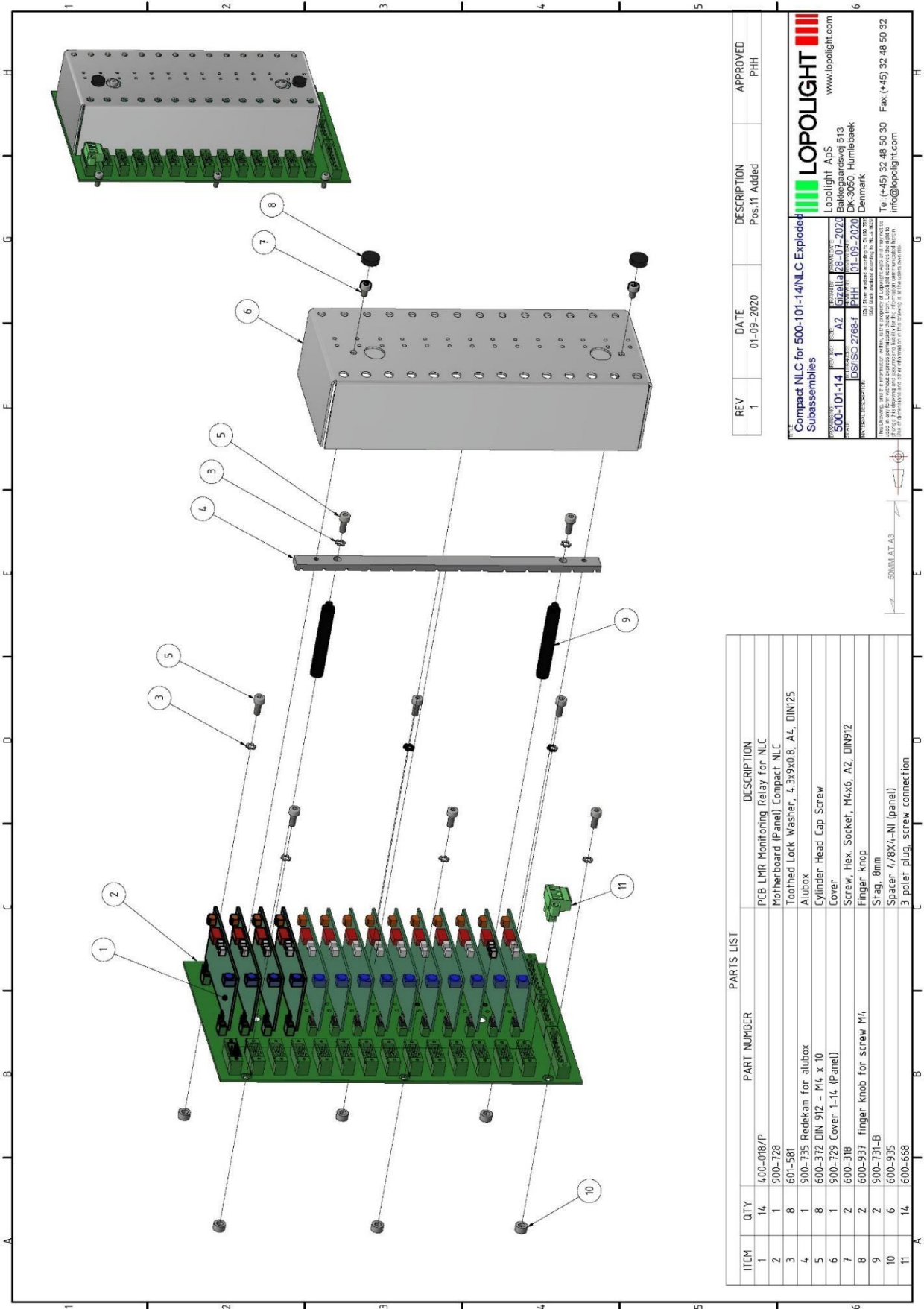
PARTS LIST		
ITEM	QTY	DESCRIPTION
1	2	Automatsikring 20A
2	1	Top Plate for NLC
3	1	Bottom plate assembly NLC
4	2	QUINT -PS/24VDC/24VDC/10
5	500-100	XX/CORE NLC NLC core
6	500-126	NLC Cabinet 400x400x200mm
7		Mimic

Estimated weight: 15,6 kg (34,4 lbs)

DRAWING No.:		DRAWN BY:	
500-304-2DC	3	LSA	
TITLE:		REVIEWED BY:	
500-304-2DC		PHH	
Full size NLC - 2 DC power supply		CREATION DATE:	
(Shown with NLC Cabinet 400x400x200mm, Mimic and Core NLC)		31-03-2023	
SCALE:	REV. NO.:	TOOLERANCES:	MATERIAL DESCRIPTION:
1:10	0	DS/ISO 2768-f	(25µ) Silver anodized according to EN ISO 7699 (25µ) Black anodized according to EN ISO 7699

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REV	DATE	DESCRIPTION	APPROVED
1	01-09-2020	Pos.11 Added	PHH

**LOPOLIGHT**  
 Lopolight ApS  
 Bakkesgadevej 513  
 DK-3050, Humlebaek  
 Denmark  
 www.lopolight.com

Compact NLC for 500-101-14/NLC Exploded Subassemblies

Part No: 500-101-14  
 Rev: 1  
 Date: 01-09-2020  
 Author: Gzella  
 Checked: PHH  
 Approved: PHH

ISO 9001:2015  
 ISO 14001:2015  
 ISO 45001:2018

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ITEM	QTY	PART NUMBER	DESCRIPTION
1	14	400-018/P	PCB LMR Monitoring Relay for NLC
2	1	900-728	Motherboard (Panel) Compact NLC
3	8	601-581	Toothed Lock Washer, 4, 3x9x0,8, A4, DIN125
4	1	900-735	Redekam for alubox
5	8	600-372	DIN 912 - M4 x 10
6	1	900-729	Cover 1-1/4 (Panel)
7	2	600-318	Cylinder Head Cap Screw
8	2	600-937	Screw, Hex. Socket, M4x6, A2, DIN912
9	2	900-731-B	Finger knob
10	6	600-935	SI-4g, 8mm
11	14	600-688	Spacer 4/8x4-NI (panel) 3 pole plug, screw connection



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