SEARCHLIGHT SYSTEM BY LUMINELL

INSTALLATION & USER'S MANUAL



SL2
SL2IR

AC&DC versions (3GS)

Revision nr:	**F1.2**
Revision date:	**2022-11-09**

ENG

Dear Customer.

Thank you for choosing a searchlight from Luminell.
Our products are assembled in Sweden by a dedicated team of technicians and the components we use are chosen with highest focus on both performance and quality.

We hope that you will be totally satisfied with your searchlight.

If you have a question or if there is a problem with the product, please don't hesitate to contact our support team in Sweden.

Luminell Sweden AB
Service & Technical Support
service.sweden@glamox.com
Phone: +46 35 38280



All information in this manual was correct at time of publication. However, as our engineers are always updating and improving our products, your system's software might provide a slightly different appearance or modified functionality than presented in this manual.

If your system lacks any function presented in this manual, there is possibly a software update available to resolve this, please contact Luminell for more information.

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1. DOCUMENT REVISIONS AND APPROVALS

Date	Rev.	Document changes	Required firmware
20-03-27	F1.0	Initial release	V 0.6.3.21
20-04-08	F1.1	Added Insulation monitor note (Page 24)	V 0.6.3.21

1.1 Document approvals

Approvals		
written by:	reviewed by:	approved by:
Luigi Guglielmo	Markus Lundqvist	Jonas Boslander

2. WARNINGS AND INFORMATION



CAUTION!
Before servicing any part of the searchlight system, make sure all power is switched off!



Cleaning
Never wash the searchlight with water under high pressure because this can penetrate through the seals and cause damage to mechanical and electrical components.
Do not use strong solvents such as thinner or acetone to clean the searchlight body or the operator panel.

Deicing
Removal of ice should be done with caution. Physical violence can damage the LED-lamp modules or the searchlight driving mechanics.



Safety reminder

Remember to break all electrical power to system before starting any work in the electrical box or the searchlight unit.

3. WARRANTY CONDITIONS SL2

Luminell General Terms and Conditions can be found on our website www.glamox.com.
These terms govern the contractual relationships between Luminell and the Purchaser.
In the event of any conflict between this document and our General Terms and Conditions, the General Terms and Conditions shall take precedence.

Product specific conditions
A correctly installed searchlight system from Luminell requires no planned regular maintenance or service other than regular cleaning and care during the first 10 years of operation.

The “Maintenance and Service plan” describes how to keep the product in good condition.

The warranty is conditioned by below mentioned key points.

Before powering up the unit, make sure that:

- ☐ Vibration dampers are mounted correctly according to this installation manual.
- ☐ The mechanical fundament where the searchlight is placed is robust.
- ☐ Warranty seal on the service hatch is unbroken.
- ☐ Outgoing cable radius from the searchlight is smooth and not stressed.
- ☐ All cables used for the installations are as per Luminell’s specifications or as per separate made agreement.
- ☐ Signal cables are not placed together with high power cables.
- ☐ Electrical connections are made according to electrical scheme and wiring diagram.
- ☐ Length of cables are not exceeding the recommended maximum lengths as stated below:
  - Power/signal cables between searchlight and E-box for 100-240VAC-system: Max 30 meter
  - Power cables between searchlight and E-box for 24 VDC-system: Max 7 meter
  - Remote cable / Ethernet cable between E-box and remote control: Max 100 meter (longer distance requires an amplifier or fibre optic version).
- ☐ E-box (EB) is placed in a non-condense environment with a minimum temperature of +5 C (indoor) if not customised for other installation.
- ☐ The remote panel (OP) is bridge mounted in an IP56 environment. If placed outside, it must be under a protection hood when not in use.
- ☐ Remote panel is screwed in bridge panel, properly grounded and correct installed.

After above checkpoints are verified the system should be started up as per this manual to verify the functionalities.

In case of any questions related to the warranty, please contact us at service.sweden@glamox.com for additional support.

4. MAINTENANCE AND SERVICE PLAN

Although the system does not require regular maintenance to function, we recommend, however, that this preventive maintenance plan is followed in order to keep the searchlight in good condition and in time detect if something is wrong and needs to be corrected.

Recommended inspection on a weekly basis

1. Make visual inspection of the searchlight housing and cabling. Look for any potential mechanical damage caused by external force. A damage can lead to reduced or non-functionality.

2. Make a visual inspection of the searchlight glasses. Verify that they are without any crack or broken in any way. A crack can lead to water penetration inside the housing followed by potential electrical and mechanical problem.

3. Perform a function test. Start up the searchlight system, rotate the searchlight in horizontal and vertical direction.

4. Clean the searchlight. Rinse with fresh water to wash away the salt deposits. If dirtier, use a very soft sponge and soap that is not caustic, contains strong solvents such as acetone or thinner base. The house can be both polished and waxed for a shiny and durable surface, but the glass should under no circumstances be waxed. Under no circumstances can the searchlights be washed with high pressure water as this can lead to penetration inside the housing followed by potential electrical and/or mechanical problem.

5. Deicing. Wintertime the system should be deiced with caution. First turn the lights on to let the heat melt the ice before operating the system horizontally and vertically.

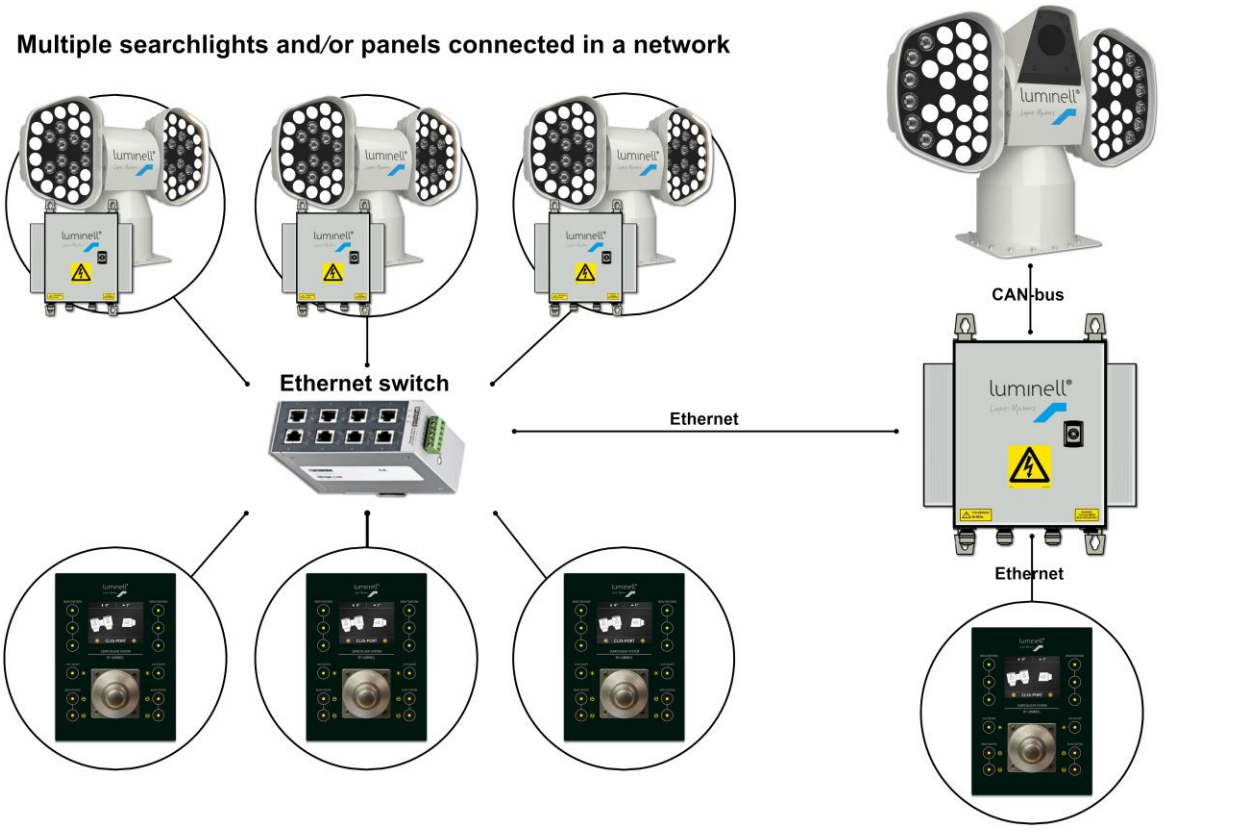
5. LUMINELL SEARCHLIGHT SYSTEM

5.1 Short system info

Luminell control system for searchlights is a flexible and future-proof system in which several searchlight assemblies (SL2, CLITE2, CLED, CL20, CL25 and CL35/38) and operator panels can be connected to a dedicated network and communicate via the Ethernet infrastructure.

Internal communication between the box and searchlight is using the stable CAN bus technology.

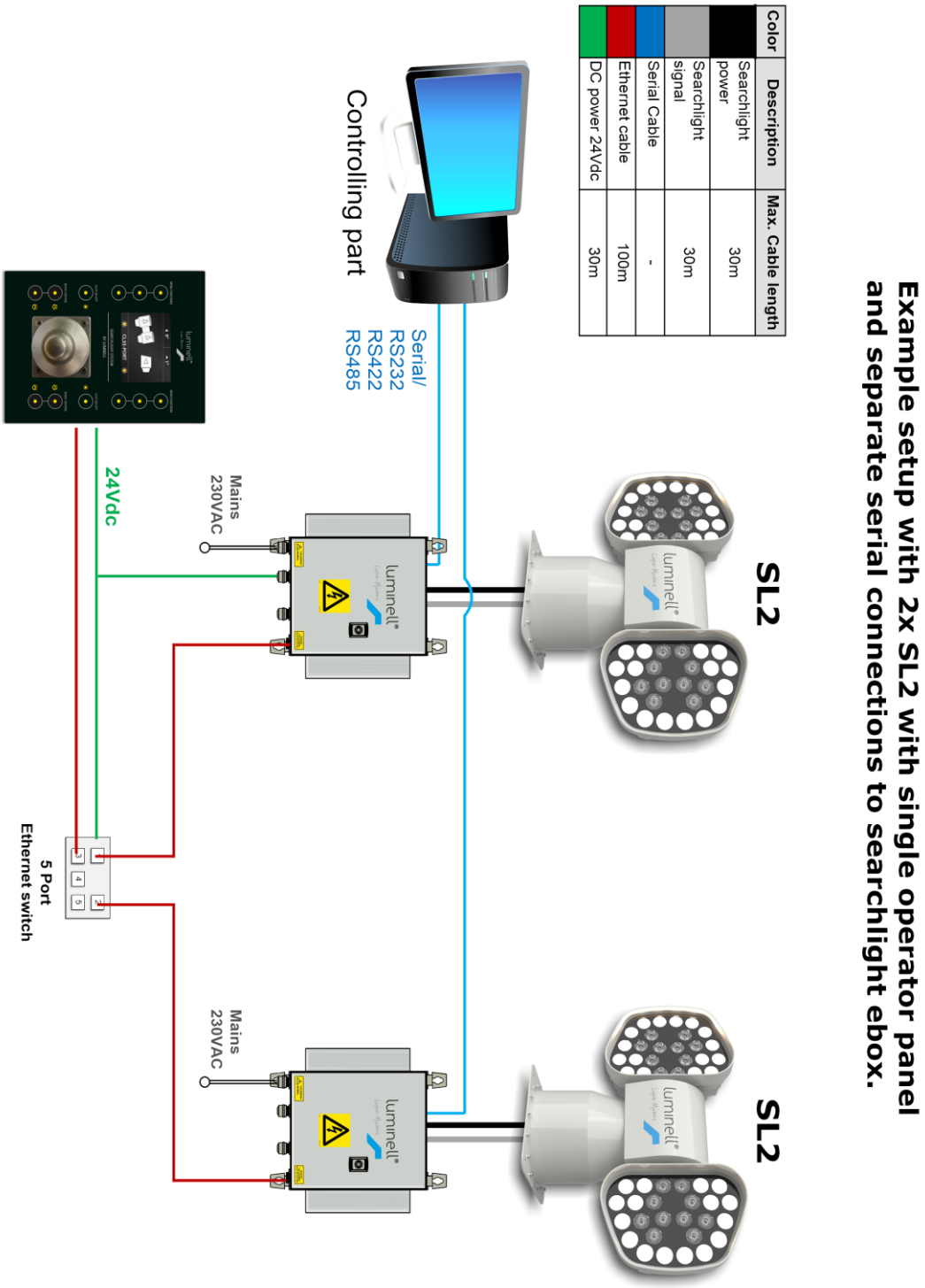
The searchlights drive motors (horizontal and vertical) are of the type brushless servo motors, with excellent performance, long lifetime and high reliability.
The motor drivers are located inside the searchlight and are of an "intelligent" type, which constantly analyzes the motor condition, and if problems arise, such as tripped over current protection; this will be presented as an alarm in the operator panel.



5.2 External control interface

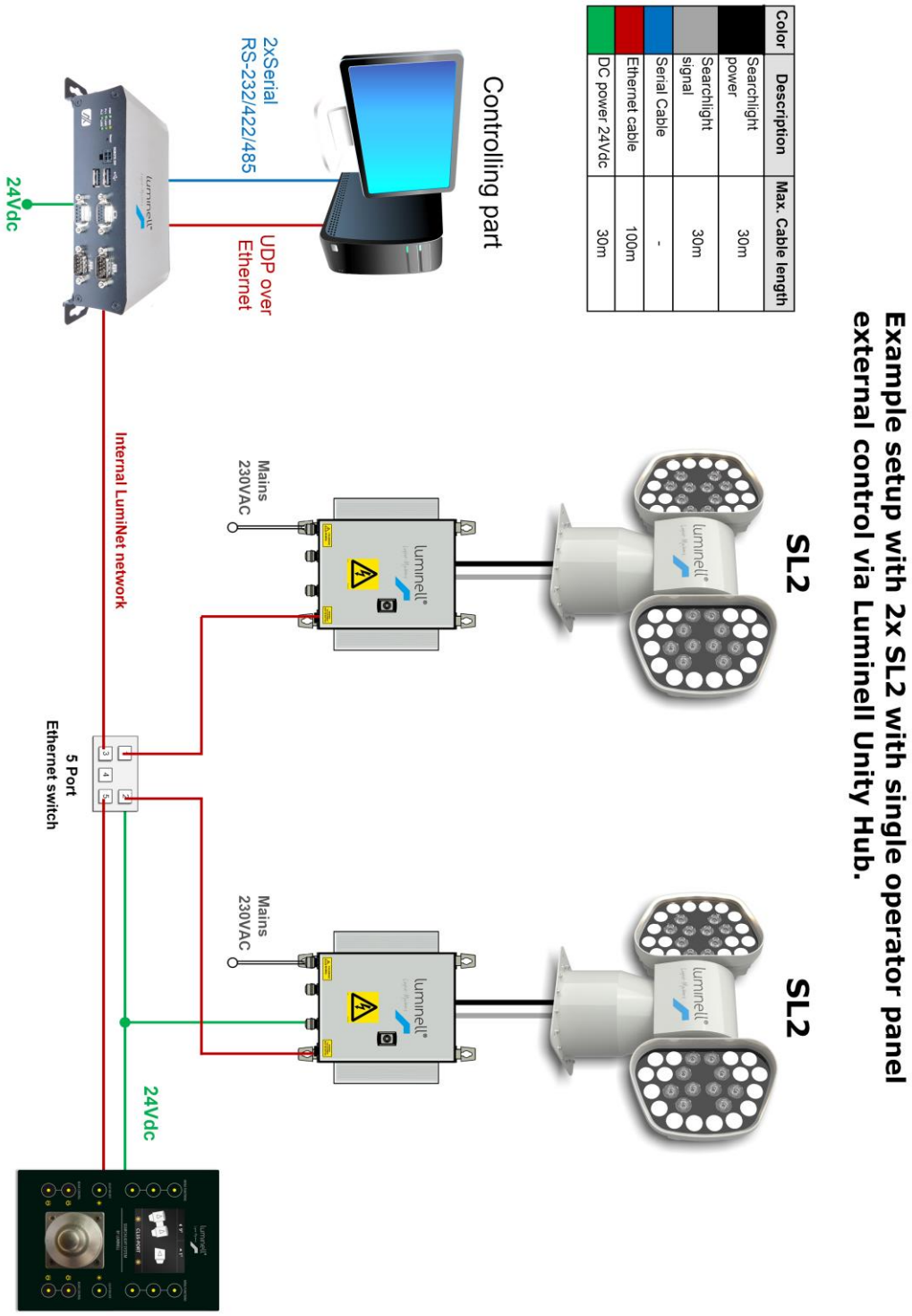
Control-computers and navigation equipment can be connected directly to the serial port on the electrical boxes and communicate by RS232/RS485 (half duplex).

Contact Luminell for a free ICD protocol documentation, a windows-based debugger tool for integration development is also available.

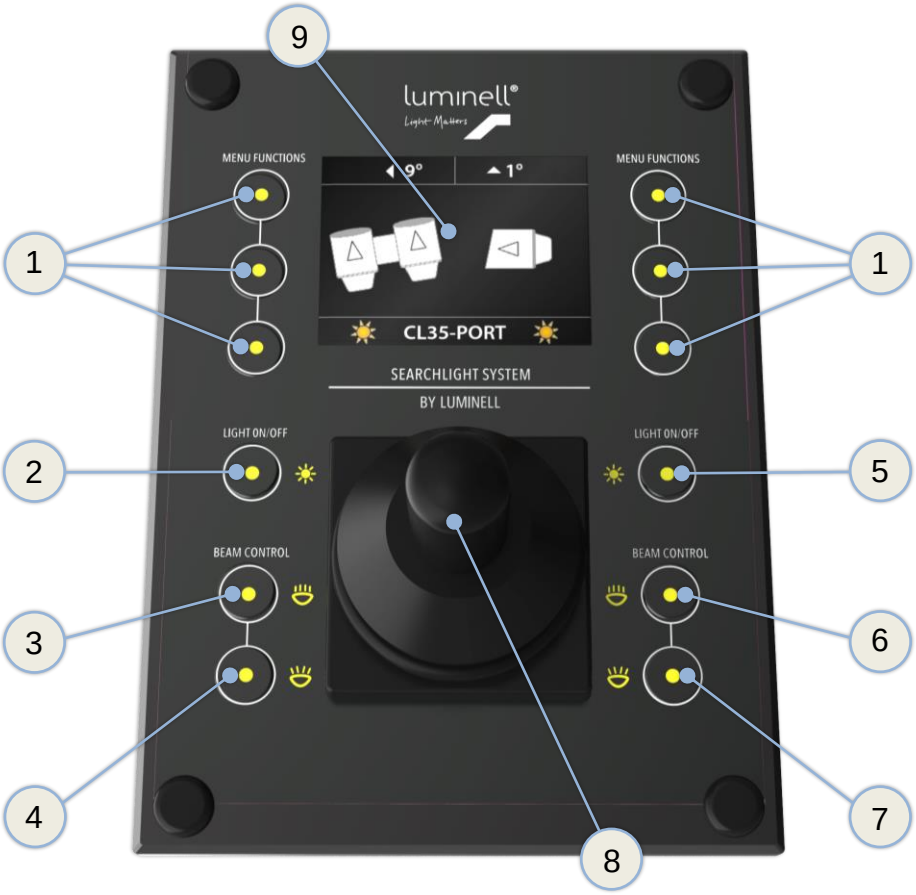


5.3 Luminell Unity Hub

If several searchlights are connected in a network, then the Luminell Unity Hub can be an appropriate part of the integration.
The Hub computer acts like a firewall between external controlling part and the LumiNet searchlight network which ensures the best system performance and stability.
With a single connection the system integrator is now able to reach all searchlights for external control, whether this is done via UDP over Ethernet or RS232/RS422/RS485.



6. OPERATOR PANEL, OVERVIEW

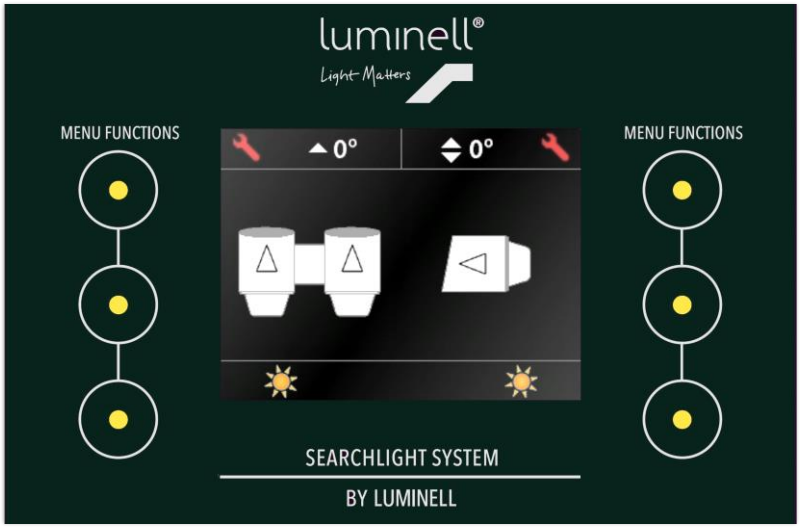


1. **"Soft button":** the function appears in the display window next to the button.
2. **Both lamps ON/OFF.**
3. **Spot beam** (restarted at last used setting).
4. **Flood beam** (restarted at last used setting).
5. **Both lamps ON/OFF**.
6. **Increase light intensity** (Dim **up** in five steps, restarted at last used level *****).
7. **Decrease light intensity** (Dim **down** in five steps, restarted at last used level *****).
8. **Joystick** (”Hall effect” proportional).
9. **Display** (TFT 2,4”).

***** LED intensity levels are 20% - 40% - 60% - 80% - 100%.

Note: Several sections of the manual refer to the above figures

7. DISPLAY SYMBOLS AND MESSAGES





Symbol for switched off white light.



Symbol for switched on white light.



Symbol for any electro-mechanic error. Might be referred as an over voltage or over current for motor drivers. Communication error with motor drivers will result in the same symbol. This error symbol can be reset by simply enter the main menu and select status. Then press "**dismiss**". If over current have occurred the problem might be referred as a stucked lamp housing – check for any icing issues. Each axis has its own symbol showing in upper left or right corner of the display.



This symbol and a similar symbol indicate the direction of the lamp housing both for the vertical axis and for the horizontal axis. The arrows in the shown symbol indicate the elevation angle for the vertical axis according to the horizontal-plane.

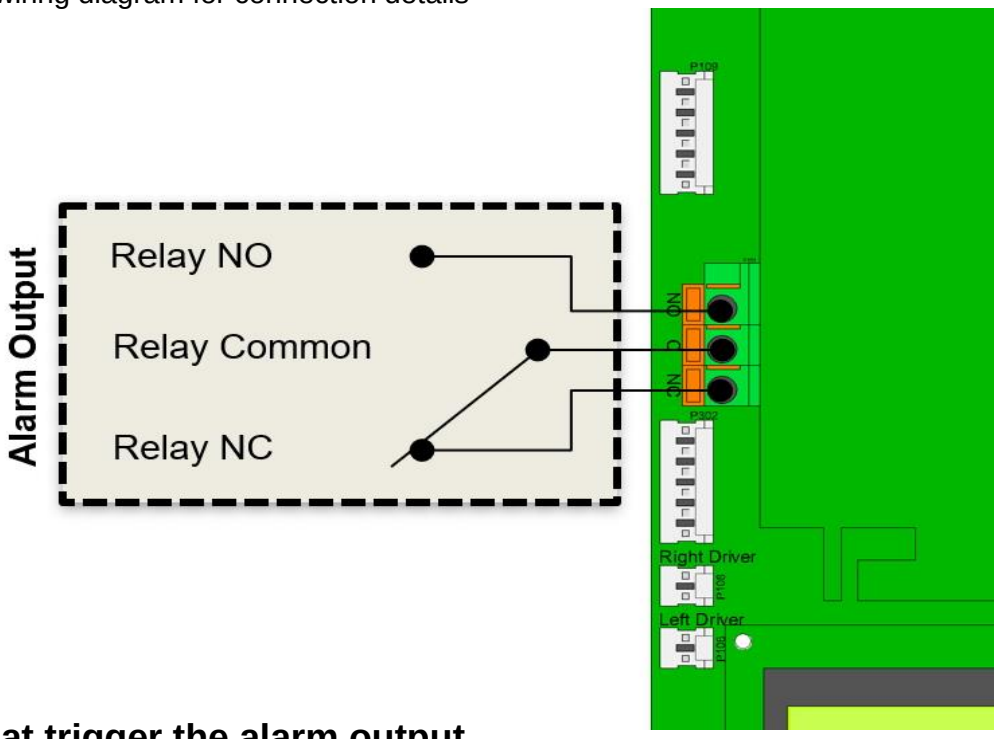
For the horizontal symbol and axis these small arrows indicate if the housing is directed to the left, front, right or back of the centerline.



If the arrows are replaced by questionmarks then the system needs to be internally calibrated. The easiest way to do the internal calibration is by simply choose the "**Park**" in the quick start menu, please see 15.6 Off and park.

7.1 Ebox alarm relay

The searchlights electrical and mechanical condition are constantly monitored and if there is a malfunction in the system this is indicated by icons in the panel display with clarifying warning messages found in the panels status menu, see 16.7 Status.
The control box also has a relay output that can be connected to the alarm monitoring system; see below and the wiring diagram for connection details



7.2 Errors that trigger the alarm output.

Status Message	Error	Remedy
Communication error	Transmission issues on the CAN bus	Check for loose CAN-wires in the electrical box or junction points (if any) and contact Luminell.
Over current	Overcurrent protection triggered; movement blocked	Check that the searchlight is able to rotate freely. In winter, heavy icing can be the cause of this error.
Over voltage	Overvoltage protection triggered, voltage to searchlight motordriver/s have exceeded 40Vdc.	Reset the error, if error recurs repeatedly, please contact Luminell.
Under voltage	Undervoltage protection triggered, voltage to searchlight motordriver/s has fallen below 8,5Vdc	Reset the error, if error recurs repeatedly, please contact Luminell.
OPWDT (message in box only)	Ethernet communication broken to all panels, see *(4.1) OP WDT.* Fault auto-resets if contact is restored with at least one panel.	Check Ethernet wires and connections to panel(s) and switch.

8. INSTALLATION

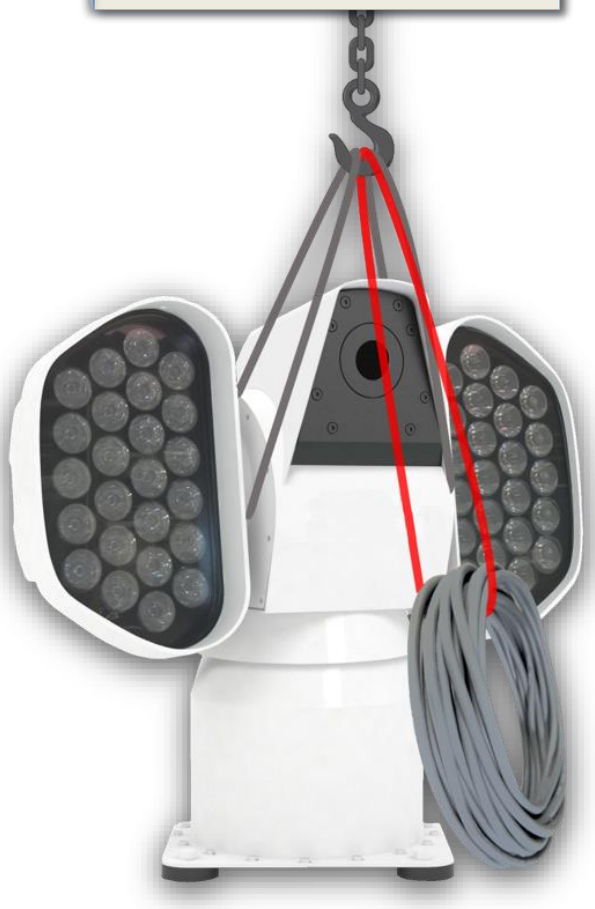
8.1 Lifting the searchlight



SL2 Standard

Preferable lift the searchlight by the temporary lift loop on top of the center house. After safely fixed the searchlight, remove the lift loop.

During the lift, the searchlight cables must be secured to the hook to avoid straining and damage on the cable glands.



SL2IR (camera house)

The picture on the right shows how to place the lifting slings when there is no lift loop available.

Also in this case the searchlight cables must be secured to the hook to avoid straining and damage on the cable glands.

9. CLI-30001, ANTI VIBRATION KIT

Service instruction no: **CLI-30001**
Revision date: **2016-02-10**
Applicable models: **SL2, CLITE2, CL20-11, CL25-**, CL35/38-****

Spareparts needed (refer to CL spareparts list)

1	CLS-25130 Anti vibration-kit × 1 (included in delivery)
2	

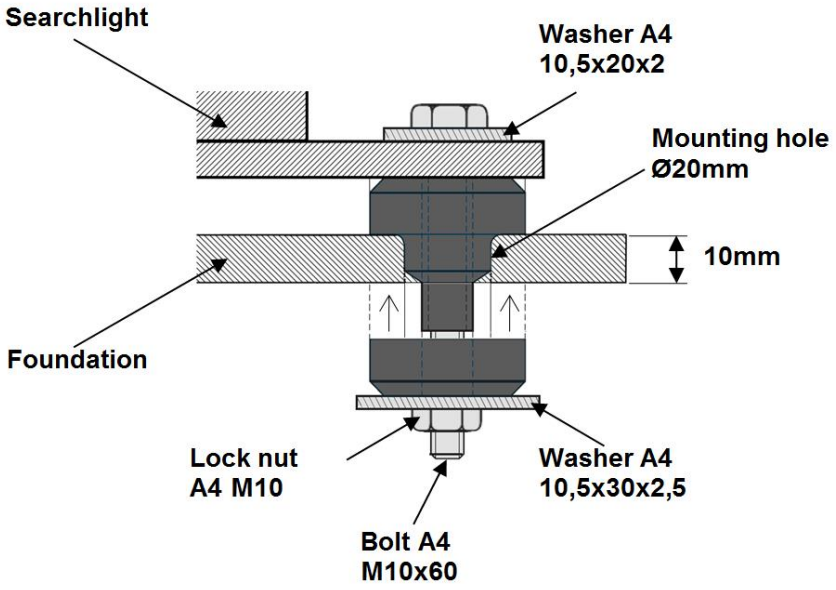
Tools and supplies required:

1	17mm ratchet wrench × 1
2	17mm wrench × 1
3	
4	

Important information

This instruction shows how to install the anti-vibration kit which consists of four dampers with integrated stainless-steel tubes.
The dampers main function is to absorb the harmful vibrations that can damage the mechanics and shorten the life of the bulbs (CL20, CL25 CL35/38). Searchlight installations without dampers will uncompromisingly, void the warranty.

Figure 1



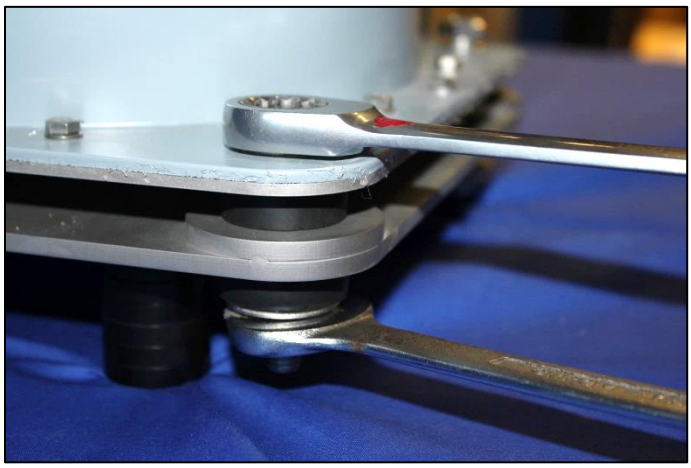
1. Overview of the damper assembly and its parts.



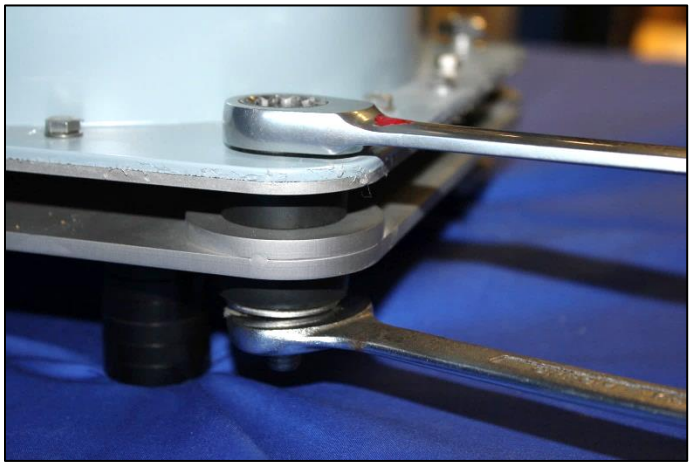
2. Push the dampers tube part thru the mounting holes in the foundation.



3. Mount the dampers rubber part from other side of the foundation.



4. Lower the searchlight on top of dampers and mount bolt washers and nuts as shown in figure 1.



5. The lock nut is tightened with two wrenches size 17mm, tighten nut firmly.
   The dampers rubber part will be compressed slightly, after assembly the searchlight will be rigidly secured but still resistant to vibrations.

10. ELECTRICAL SYSTEM

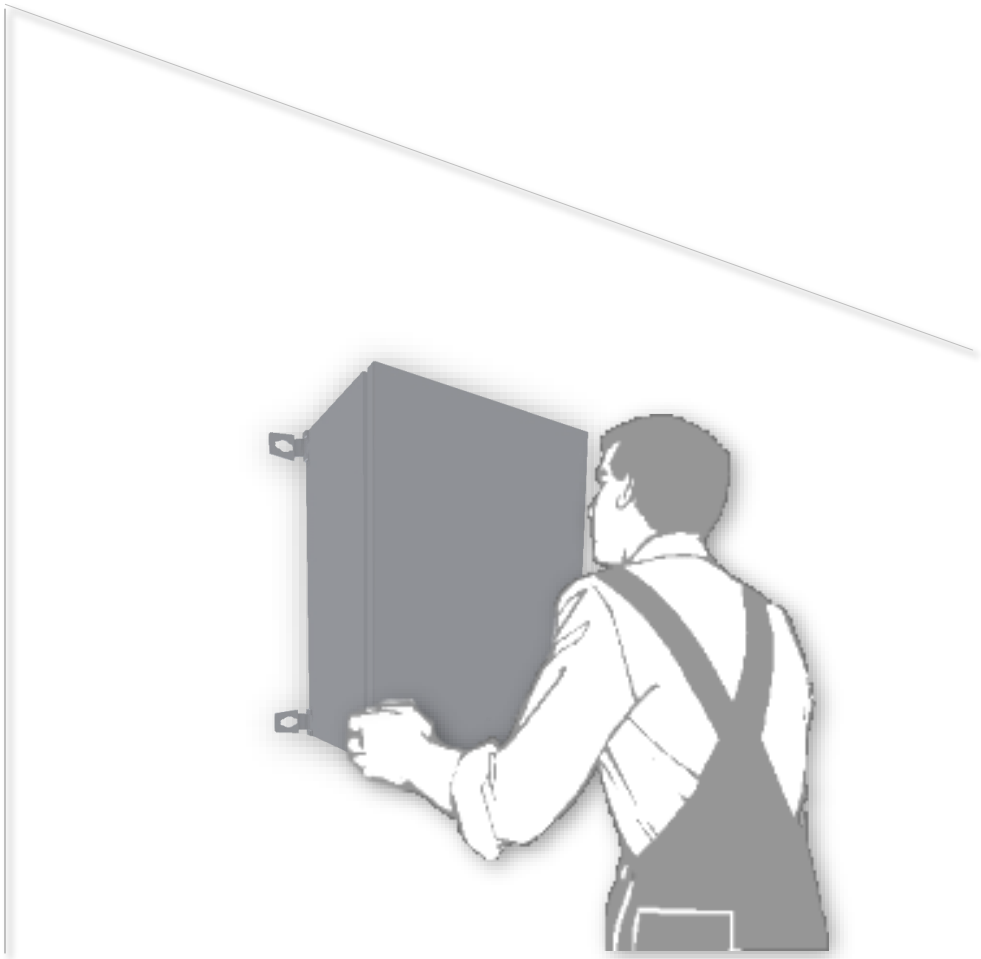
IMPORTANT!



The electric supply to the e-box must be disconnected before beginning any work inside the box; it's not enough to turn off the internal main switch.

10.1 Electrical box mounting position

The electrical control box must be mounted on a wall as shown below, do not mount horizontally on the floor or in ceiling as this leads to reduced airflow with increased risk of overheated components.



10.2 Electrical box installation

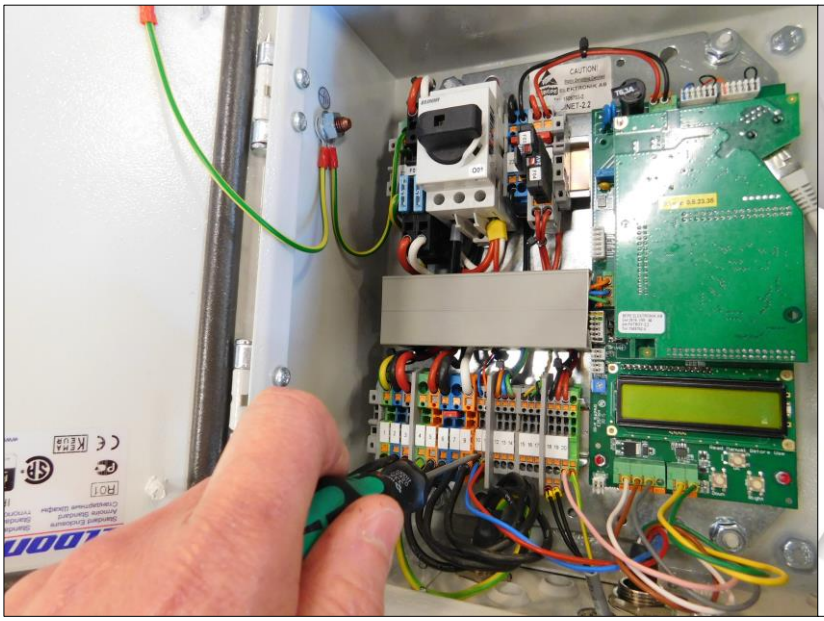
Tools and supplies required:

1	Screwdriver 0,6×3,5 mm
2	Adjustable wrench type Bacho 8071
3	Wrench 13 mm
4	

Important information

The complete system is undergoing final testing before delivery and therefore has the searchlight cables installed in box.

1. Ensure that the switch Q01in box is set to off.
2. Remove all the cables in the terminals, the terminals are push-in type and the wire is released easily by pressing the orange button with a screwdriver while pulling lightly in the wire.
3. Loosen the cable glands with an adjustable wrench and pull out the cables.
4. Mount the electric box on a firm foundation with the help of the wall brackets.
5. Install in reverse order and pay special attention so that the cables shields are mounted correct in the cable glands, see figure 2 below for guidance.
   Cables are connected according to the wiring diagram and double-checked before the power is turned on using the main switch Q01 in the electric box.



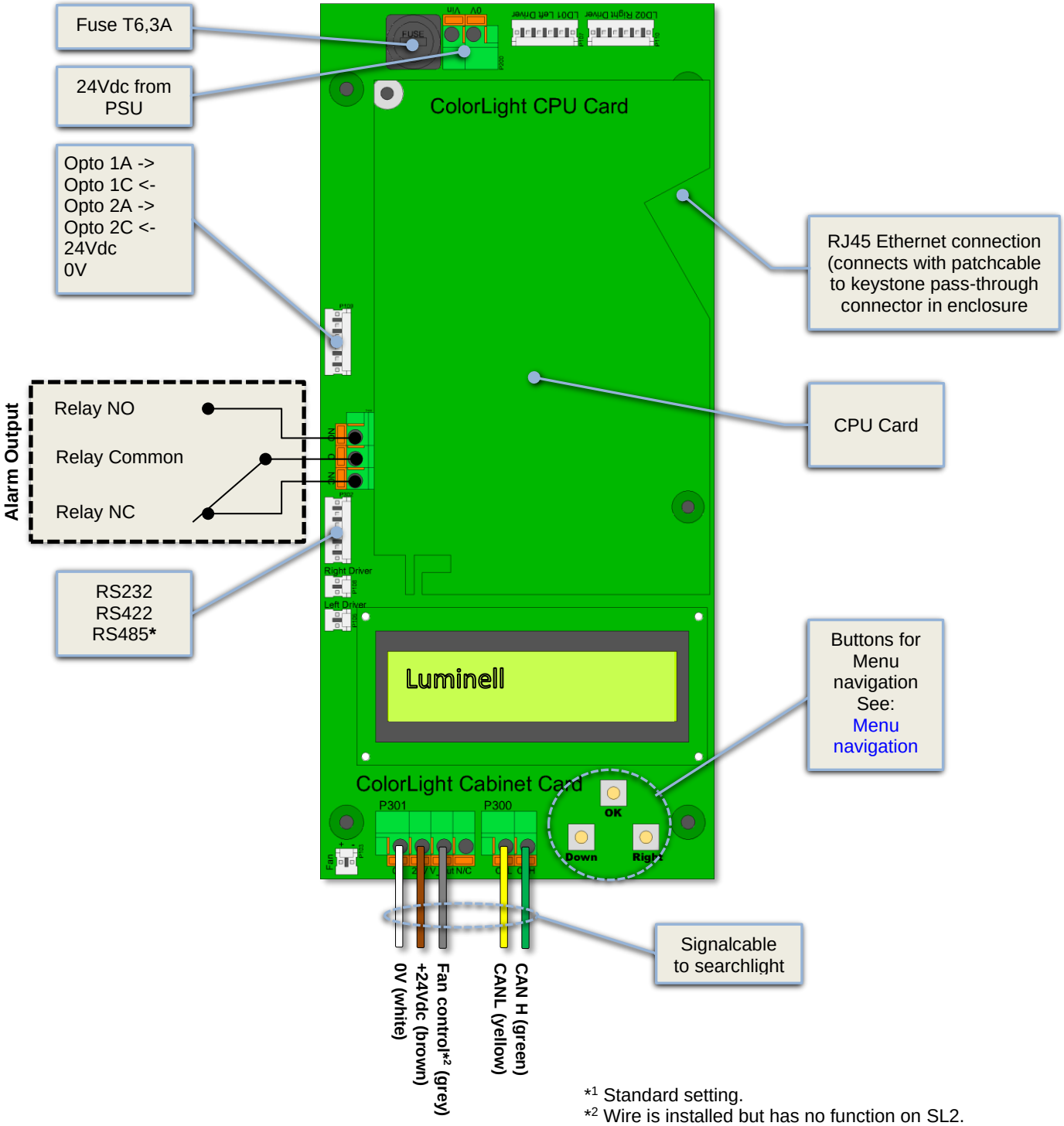
SL2 Electrical Box (24Vdc)



EMC Gland Shield Connection

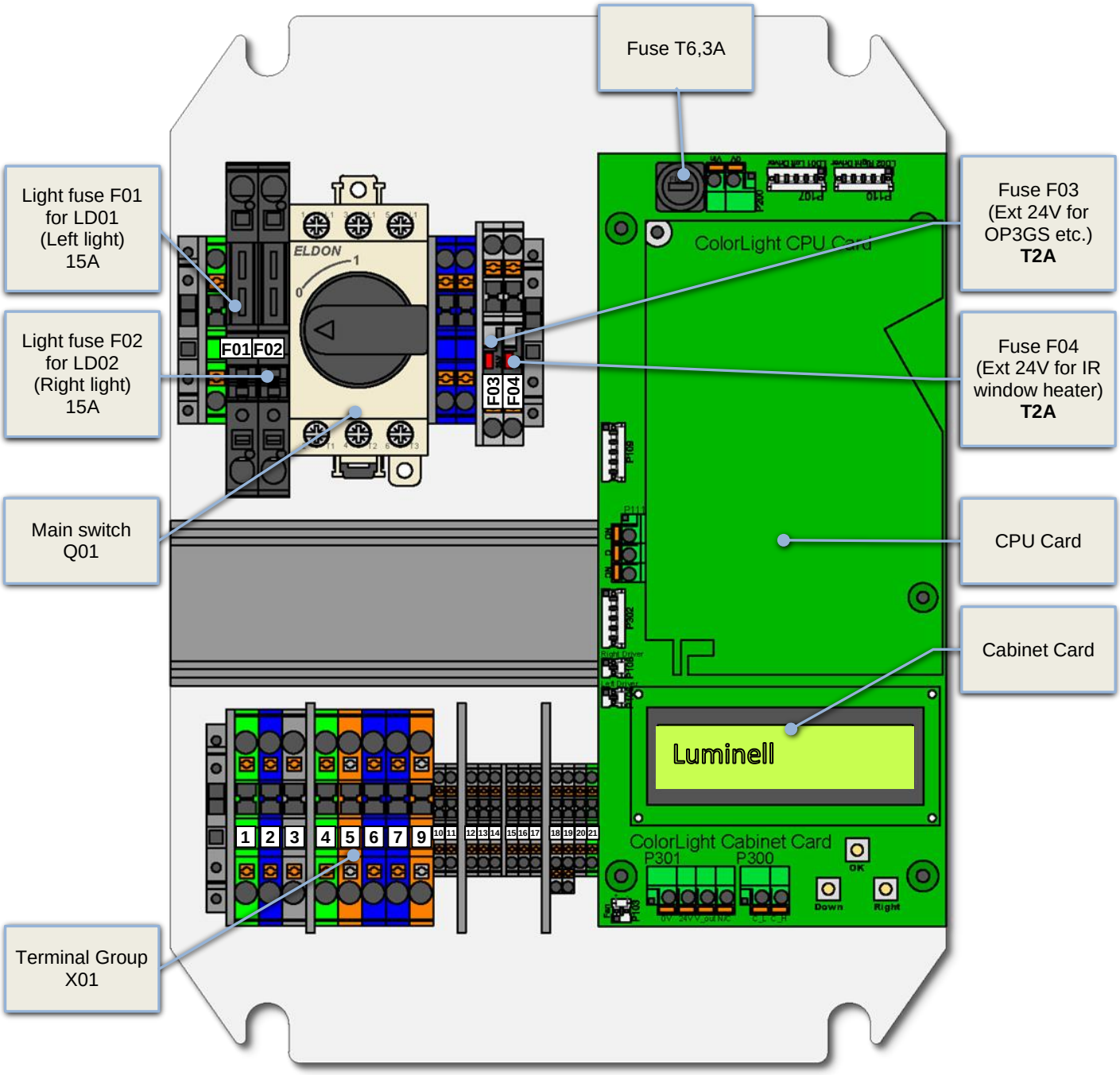
10.3 Cabinet card

Luminells control system is stable and future-proof and the cabinet card is equipped with several inputs and outputs as to allow the communication with the searchlight but also communicate with computers, radio receivers, limit switches (via optocoupler) etc.
On the output side, we have relay-controlled alarm output (NO, NC) for external alarm handling and outputs for controlling relays (via optocoupler).



*1 Standard setting.
*2 Wire is installed but has no function on SL2.

10.4 SL2 electrical-box overview (24VDC)



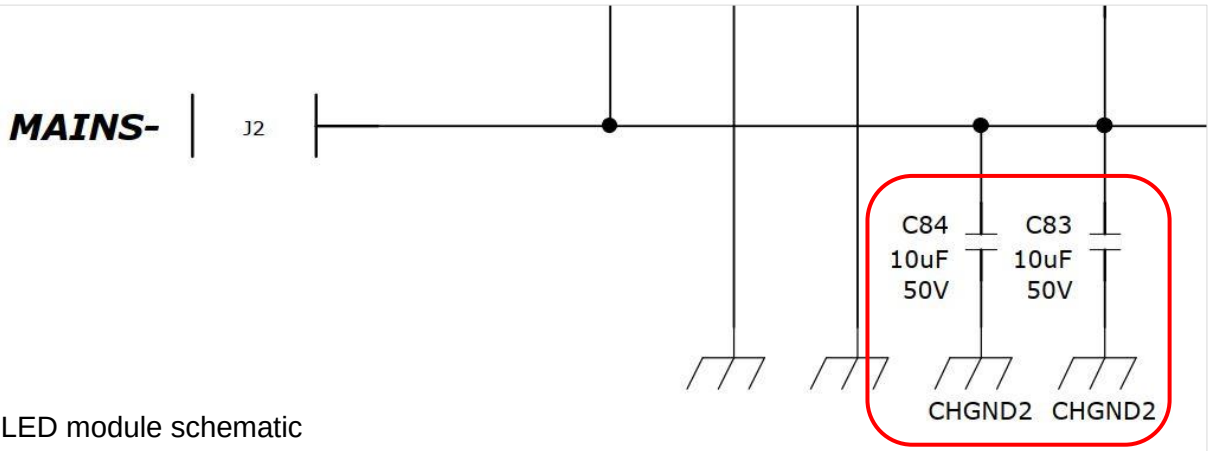
10.4.1 Selecting/adjusting the insulation monitoring device, 24VDC network

Luminell's LED searchlight module is built for optimal light performance along with an effective EMI-reducing circuit design.
Large capacitors between searchlight 0V and ground is an effective way to reduce emissions but can also have a negative impact for some insulation monitors that use a measurement method in the form of a pulsed voltage applied between supply 0V and ground.

It is very important to select and/or adjust the maximum capacitance for the insulation monitoring device according to the correct total capacitance in the supply network or it will give an incorrect reading or depending on setpoint, a false earth fault warning.

If any of the below searchlight models are supplied directly by the vessels 24VDC network, the following capacitance should be considered, the figures apply to a single searchlight:

Searchlight model	Internal total capacitance	Details
SL1	20µF	1xLED module
SL2	40µF	2xLED modules

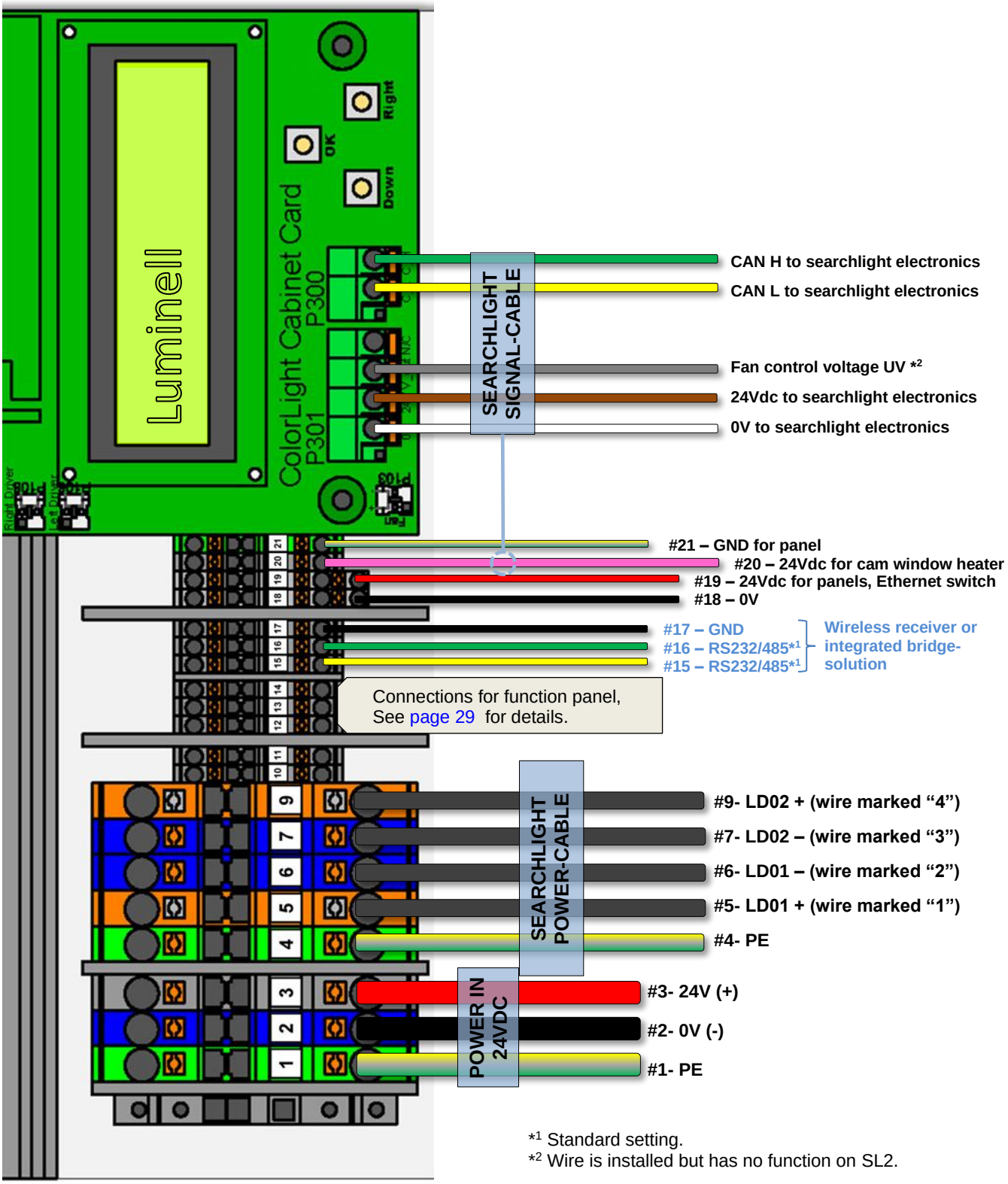


LED module schematic

Note: The above only applies if the searchlight system is powered directly by the vessels DC network.

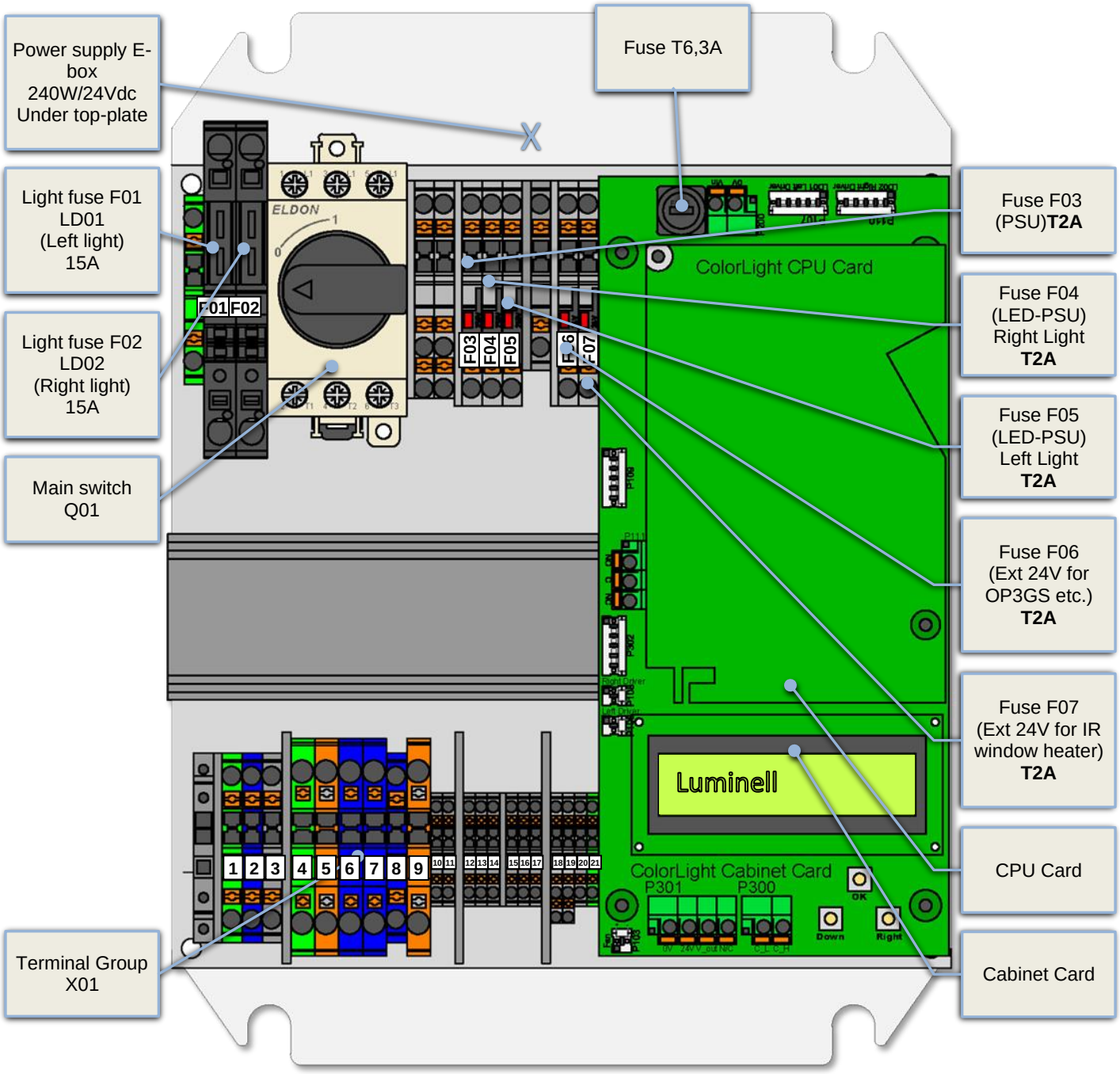
10.4.2 **SL2 electrical-box connection (24VDC)**

This connection diagram shows our standard connection for SL2 with electrical box supplied with **DC voltage**. Deviations may occur for customized solutions.



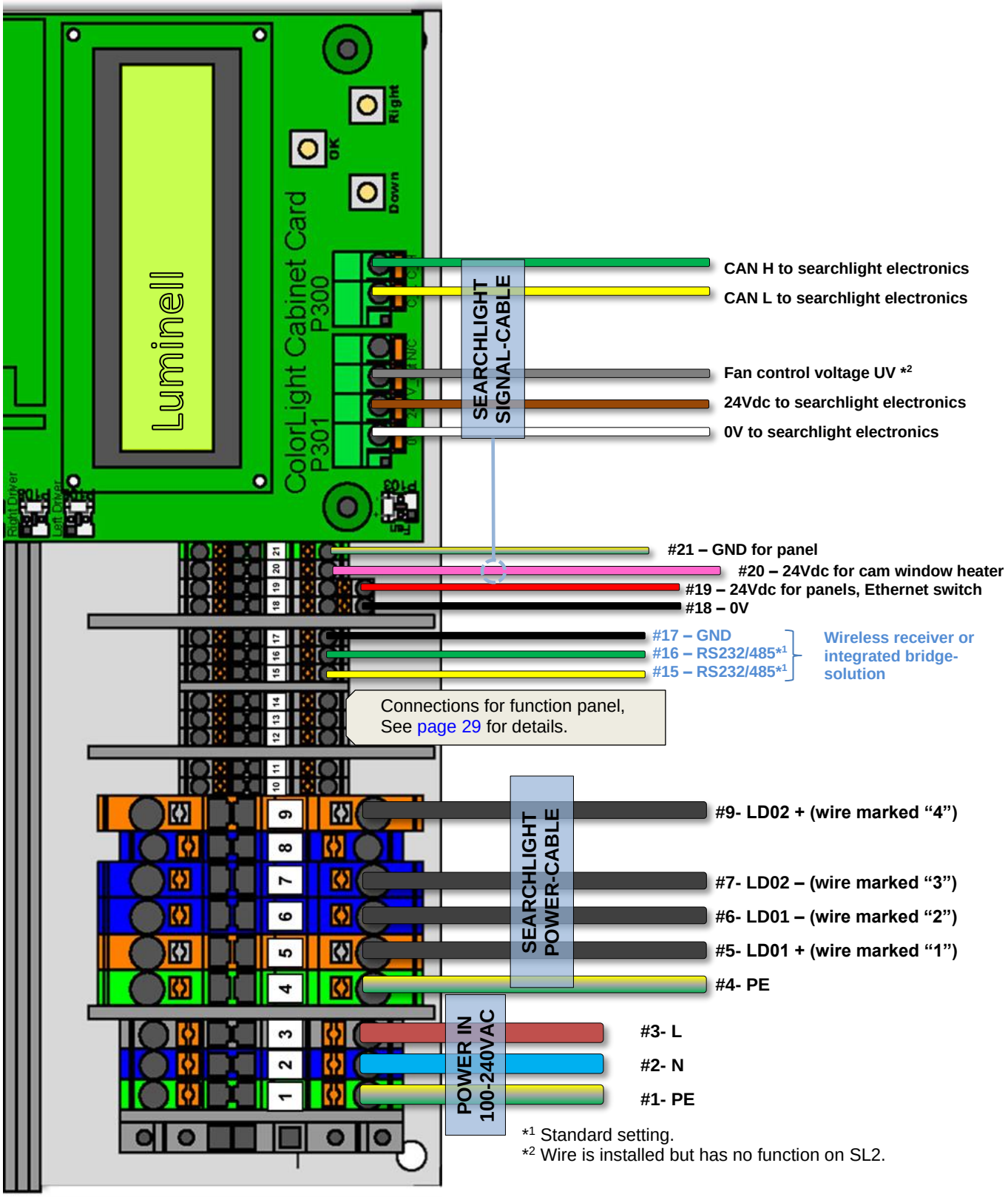
*1 Standard setting.
*2 Wire is installed but has no function on SL2.

10.5 SL2 electrical-box overview (100-240VAC)



10.5.1 SL2 electrical-box connection (100-240VAC)

This connection diagram shows our standard connection for SL2 with electrical box supplied with **AC voltage**. Deviations may occur for customized solutions.



*1 Standard setting.
*2 Wire is installed but has no function on SL2.

10.6 Operator panel connections

The operator panel is designed to be immersed into the bridge panel, for dimensions, see drawing in section 18.6.1 Operator Panel.

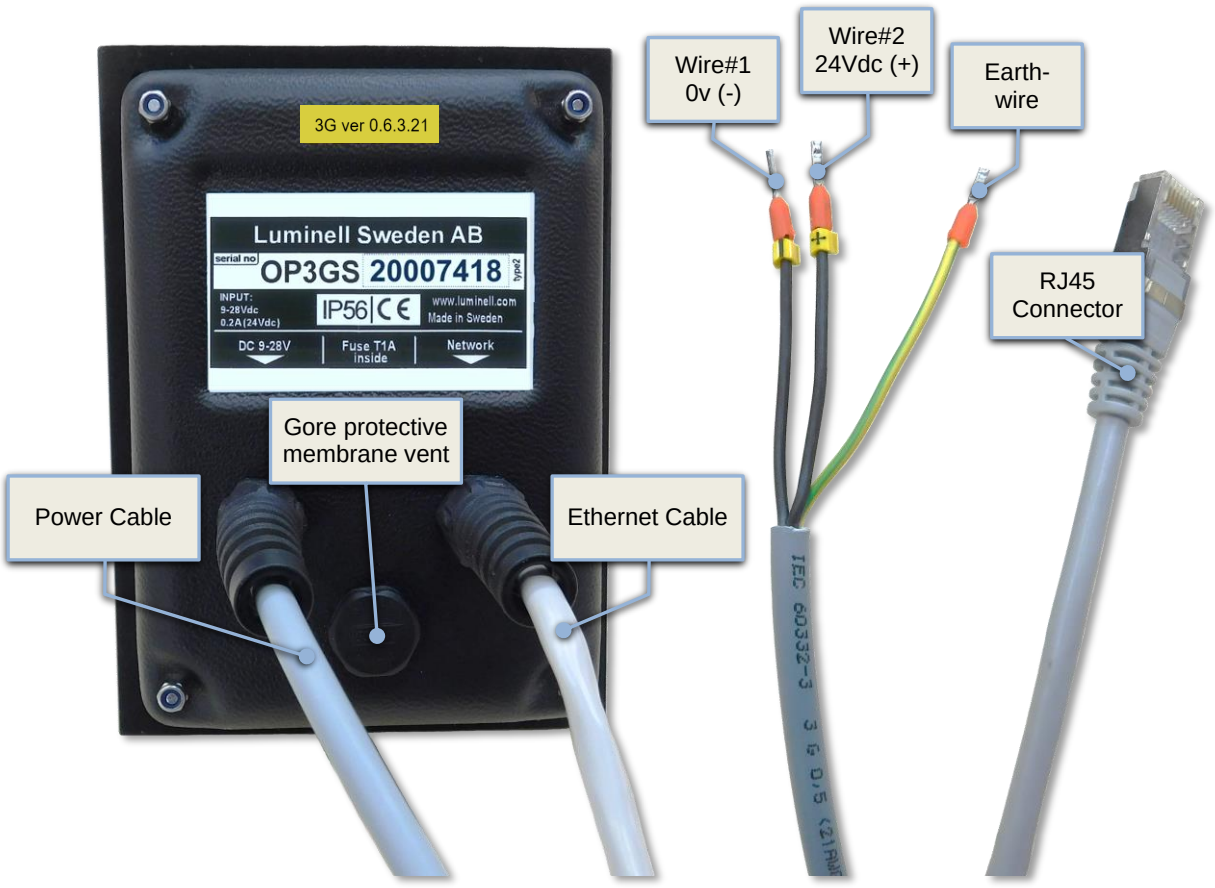
The following connections are available on the back of the panel:

1. Power supply 9-28 VDC via local power supply on the boat or 24VDC via terminals in the E-box. One of the benefits of supplying power to the panel from the box is that the panel will be de-energized together with the e-box via the main switch.

2. Ethernet connection directly to the electrical cabinet or Ethernet switch via RJ45 connector. Shielded Keystone Modular Feed through Coupler, RJ45-RJ45 included.

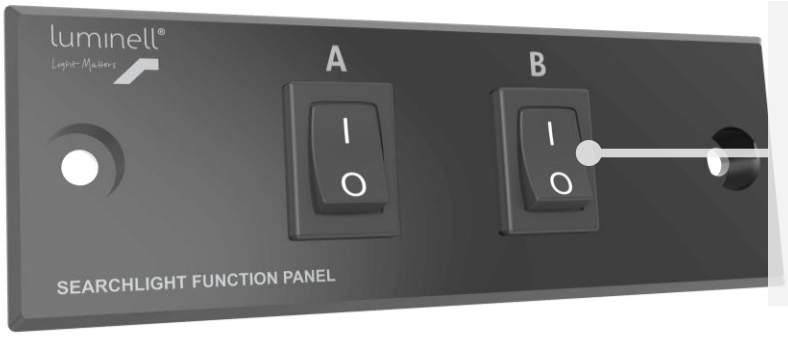
3. Earth connection to the panel, this is needed to suppress electrical disturbances and prevent ESD discharge damaging.

Electrical protection:
The panel is protected against wrong polarity and over-current protected by an internal, type: T1A (Slow-Blow glass fuse 5x20mm).



10.7 External switch panel

In addition to controlling functions from the operator panel and/or external control, we have put together a few predefined activities that can be started with a simple flip of a switch.
Via a button connected to terminals in our electrical cabinet you can define what activity to run when the button is being activated and deactivated



By default, switch **B** is assigned to turn light **ON/OFF**.

This control work in parallel with the operator panel and external controller.
Activated switch also wakes the operator panel from standby.

Below functions can be assigned to switch A and B and unlocked with a code in the Ebox

A or B (activated)

-
- Turn on camera
- Turn on/off white light
- Turn on/off UV light
- Send searchlight to position A and turn on white light
- Open serial port (mainly used for NMEA tracking of radar or a Rhotheta Radio Direction Finder, contact Luminell for more info)

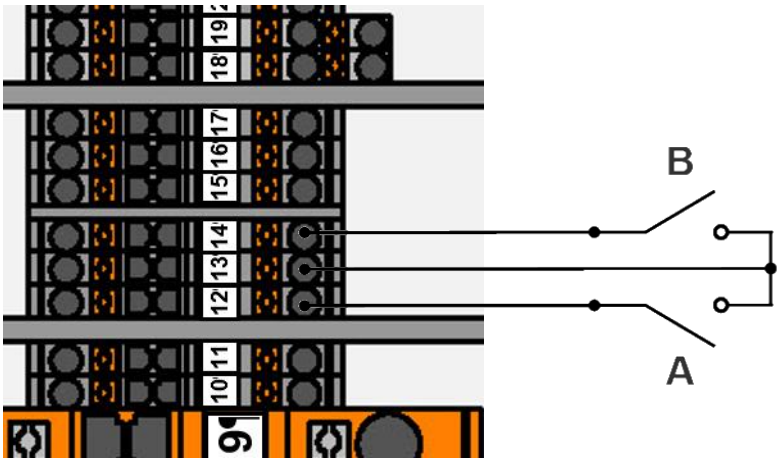
A or B (deactivated)

- Park searchlight (and light off)

10.7.1 Connecting the switch panel to the ebox

The Luminell switch panel (or alternative corresponding to below schematics) is connected to the ebox terminal #12(A), #13(common) and #14(B).

Switch requirement: 24Vdc, 100mA



Use two maintained switches. (stays in one state until actuated into a new one, and then remain in that state until acted upon once again).

10.8 Searchlight NMEA Tracking (optional)

The control system have the possibility of listening to NMEA-data through the ebox serial port (NMEA 0183) and use it for positioning the searchlight, the function is limited to specific parts of the TTM and RSD sentences.3G searchlight systems now have the possibility of listening to NMEA-data through the ebox serial port. A switch connected to the ebox will activate the searchlight positioning according to incoming message.

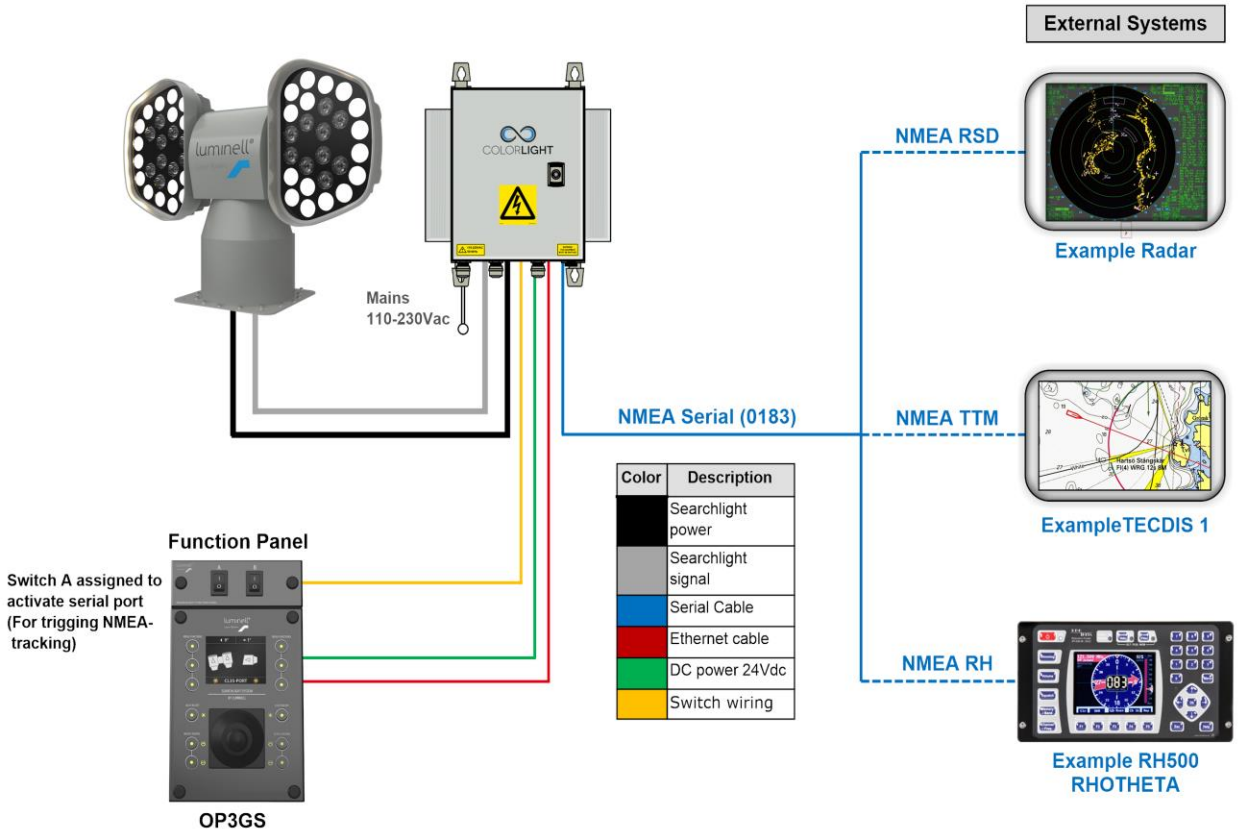
10.8.1 NMEA Priority

Tracking is done using the following priority order:

1. TTM number currently locked on.
2. TTM next number.
3. RSD valid VRM1/EBL1 combination.
4. RSD valid VRM2/EBL2 combination.
5. RSD cursor value.

TTM. The searchlight will follow (if the switch is activated) the first radar target that comes in and holds on its number until it disappears from the list, after this there is a timeout of 10 messages before the searchlight locks on the next target which in itself doesn't have to be the next number in the list but the next message we receive.

For more information about Searchlight NMEA Tracking, please contact Luminell Sweden.

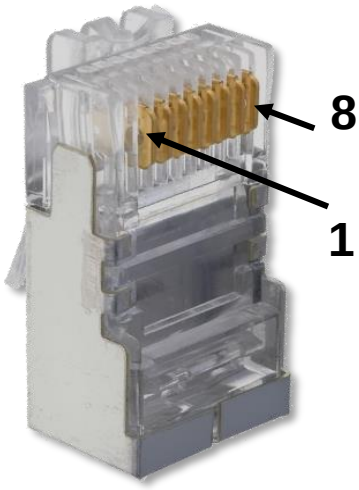


10.9 Ethernet wiring

Luminell searchlight systems should be connected to their own dedicated network; they should never be connected into the vessels existing computer network.

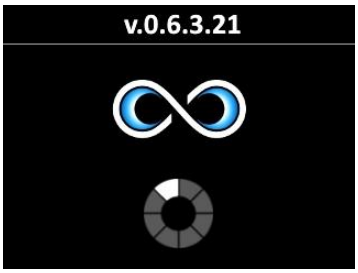
An Ethernet cable supplied from Luminell complies with the standard **TIA/EIA-568-B** and is always tested together with the complete searchlight system to ensure full functionality.

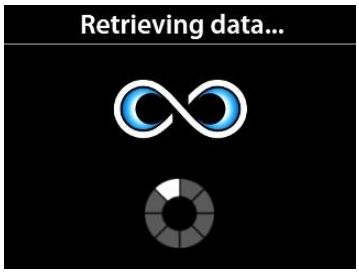
If customers choose to assemble their own Ethernet cables, they must be of type FPT Cat5 or better and the connections should be done according to the following information.

Pin	T568A Pair	T568B Pair	T568A Color	T568B Color	Pins on plug face
1	3	2	white/green stripe	white/orange stripe	
2	3	2	green solid	orange solid	
3	2	3	white/orange stripe	white/green stripe	
4	1	1	blue solid	blue solid	
5	1	1	white/blue stripe	white/blue stripe	
6	2	3	orange solid	green solid	
7	4	4	white/brown stripe	white/brown stripe	
8	4	4	brown solid	brown solid	

Note that the only difference between T568A and T568B is that pairs 2 and 3 (orange and green) are swapped. Both configurations wire the pins "straight through", i.e., pins 1 through 8 on one end are connected to pins 1 through 8 on the other end. Also, the same sets of pins connect to the opposite ends that are paired in both configurations: pins 1 and 2 form a pair, as do 3 and 6, 4 and 5, and 7 and 8.
One can use cables wired according to either configuration in the same installation without significant problem. The primary thing one has to be careful of, is not to accidentally wire the ends of the **same cable** according to **different configurations**

11. ACTIONS AFTER INSTALLATION AND POWER FAILURE





At system startup, the panels will start to scan the network to find connected electrical boxes, during this time, the panel software version will be displayed.
If not the panel made contact by displaying home screen within 30 seconds, it may be due to the following:

- Electrical box is not turned on, applies only if the panel has a separate power supply.
- There are problems in the network cabling between the electrical box and the operator panel.

11.1 Automatic recovery of stored searchlight position in panel.

A new feature was introduced with the release of the control software, **v 0.5.23.35** for ebox and **v 0.6.0.7** for the operator panels, from these versions this is a standard feature*.

With this new feature the system always stores the searchlight position after the movement has been idle for 20 seconds. The position is stored in in a non-volatile memory.

When the system is restarted after power loss, the last stored position will automatically be reloaded into the panel.

11.1.1 If panel position indicator differs from the actual position of the searchlight.

At boot up, the panel position indicator can differ from the searchlight actual position for the following reasons:

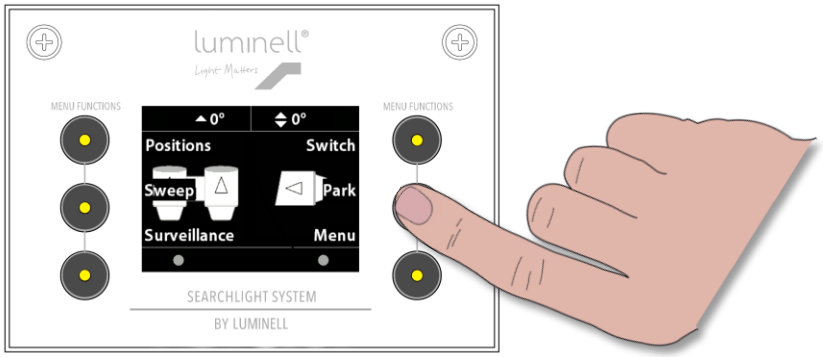
- The system power was interrupted in the middle of a joystick maneuver.
- The searchlight had just been maneuvered but the power interruption occurred before the 20 seconds elapsed and therefore the new position was not stored.
- The searchlight axis has turned away from latest stored position while it was switched off, manually or by wind gusts.

Positional deviations depending on the above will be automatically corrected when the next “Park” is commanded.

Note: always synchronize before setting sweep*, fixed positions* or surveillance* to ensure that the system is not rebooted with deviating positions, please see 11.2 Synchronize the system.

*Older systems can be updated, please contact us for more information.

11.2 Synchronize the system



The easiest way to synchronize the system after reboot is to enter the quick start menu and select the “**Park**” function; the system will then activate the horizontal and vertical movement until the searchlight absolute position sensors sends their signals back to the control system and thereby updating it with the correct positioning.

If a parking position has been set, the searchlight will end this procedure by parking.
If necessary, the origin can be set after the steps above to give an accurate readout of the indicator. To set the origin, please see 16.8.5.1 Store origin.

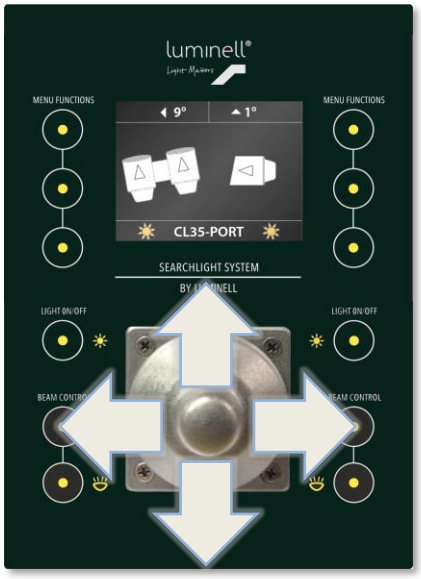
12. STARTING SYSTEM

When the system is in sleep mode the buttons and symbols glows with orange light and the display is totally shut down to save power. Buttons and symbols are always active but dimmed to a lower intensity during sleep mode.

Pressing any button on the operator panel will activate the system and the display will now show the position indicator image, buttons and symbols are now brighter.
Buttons, symbols and display intensity can be adjusted, please see *16.8.1 Backlight brightness.*

13. JOYSTICK FUNCTIONS

The joystick (**8**) moves the searchlight horizontally and vertically. There are no limitations to the movement of the searchlight thanks to the slip ring technology developed by Luminell.
The more the joystick is moved to its end position the faster the searchlight rotates.
Searchlight rotation speed can be set, see *16.8.4 Maximum rotation speed.*
The vertical axis reaction to the joystick's movement can be reversed if decided by operator. To change this reaction please see *16.8.3 Joystick direction.*



The joystick can also be used to navigate in menus containing more than one choice.
Move the joystick up or down to navigate in the menu. In most menus' joystick moved to the right will act as "**OK**" button and moved to the left will go back one step as the "**Back**" button.



14. LIGHT CONTROL

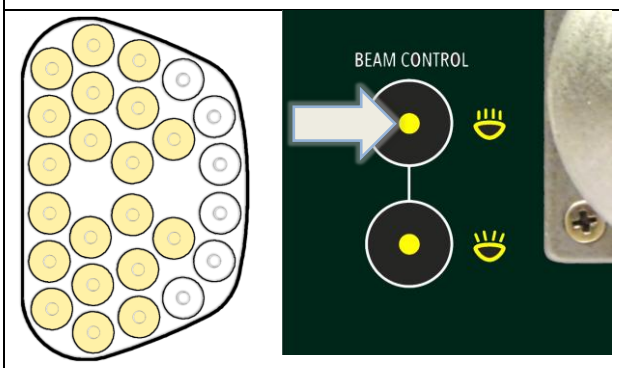
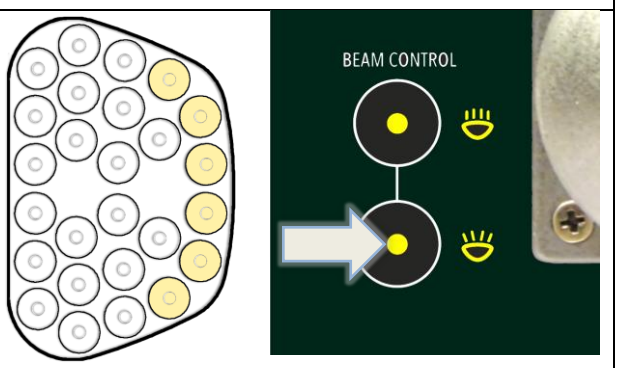
14.1 Light ON/OFF

This searchlight is equipped with two LED lamp modules containing both spot and flood capability.
Both lamps will always be turned on by pressing button (**2**) or (**5**) and starts with last used setting for dim level and beam angle. Light ON is indicated by the sun symbol.
To turn off the light, press button (**2**) or (**5**) again.

In the bottom part of the display there are two sun-symbols  that indicates the status of the LED-lamps.

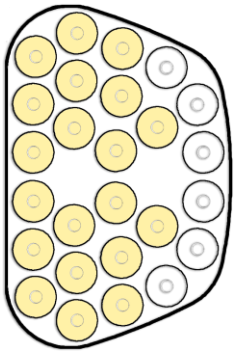
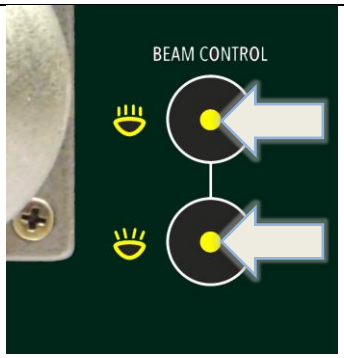
14.2 Spot & flood control

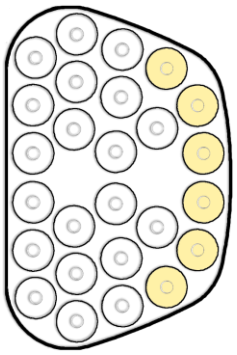
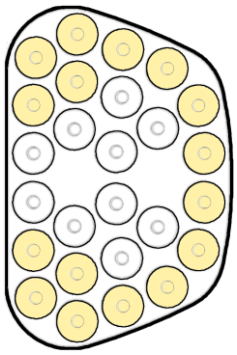
Each LED lamp module have both flood and spot sectors, these sectors are controlled from the operator panel according to the below illustration.
The light always starts with the last used beam setting, both LED modules is always controlled together and cannot have separate settings, no visible indication of selected beam angle in display.

Spot beam	**Flood beam**
	
Press button (3) to activate the spot sector on both LED modules (above in yellow).	Press button (4) to activate the flood sector on both LED modules (above in yellow).
	

14.3 Dim adjustment

LED lamp dimming is controlled from the operator panel in fixed steps according to below illustration, no visible indication of selected dim level in the operator panel display.

Spot LED intensity levels are 20% - 40% - 60% - 80% - 100%.	
	
Press button (3) to activate the spot sector on both LED modules (above in yellow).	

Flood LED intensity levels	
20% - 40%	**60% - 40% - 80% - 100%**
	
	
Press button (3) to activate the spot sector on both LED modules (above in yellow). When light intensity above 40% is selected then the spot beam will fill up with low intensity light to avoid a dead area in beam center.	

15. QUICK START MENU

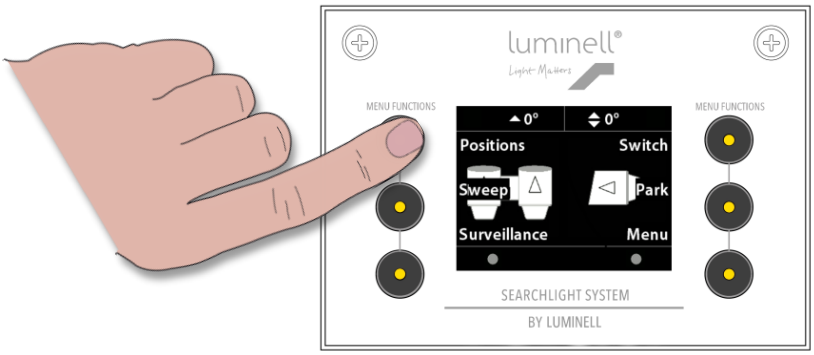
The operator panel features a quick start menu where you can reach some of the searchlight's functions.

To open up the quick start menu, press any of the quick start menu buttons (**1**) when showing the logo or indicator screen. The quick start menu will close after 5 seconds.

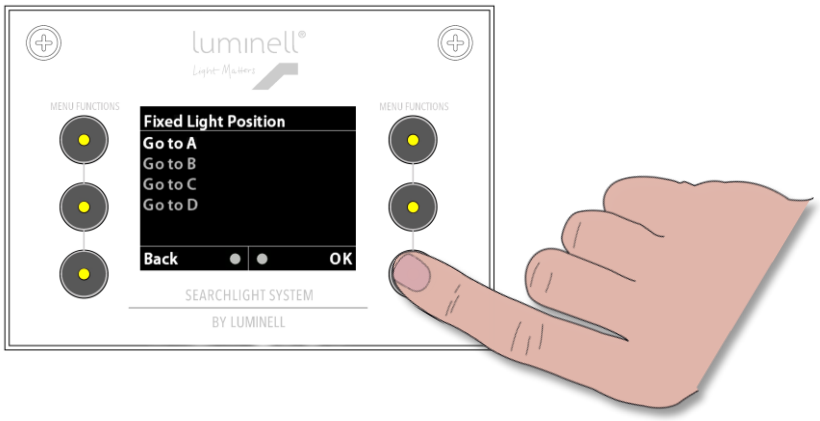
15.1 Fixed positions

There are up to four different programmable fixed positions in Luminell Searchlight System.

15.1.1 Go to fixed position



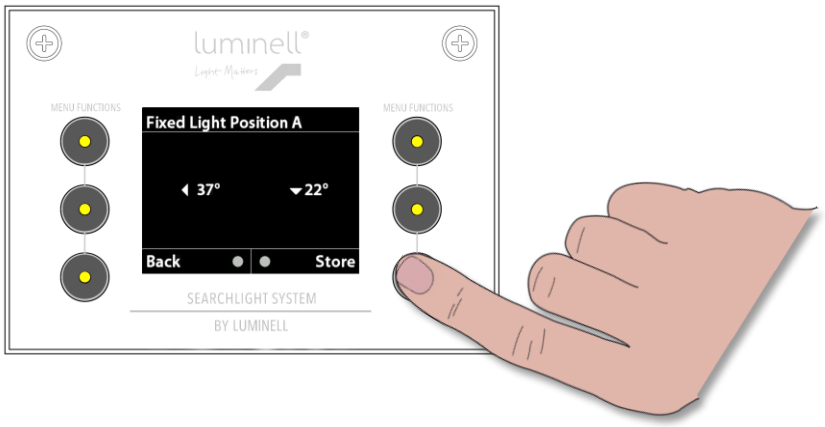
To enter the *"***Fixed Light Position***"* submenu, open the quick start menu and press the upper left button "**Positions**".



There are up to four fixed position memories (**A, B, C** and **D**) which can be individually programmed.
By selecting one of the positions the menu will change and show the current direction of the searchlight in degrees and move the searchlight to this preprogrammed position automatically.

15.1.2 **Store fixed position**

If no position has been stored or the searchlight is already at the stored position it will not move.



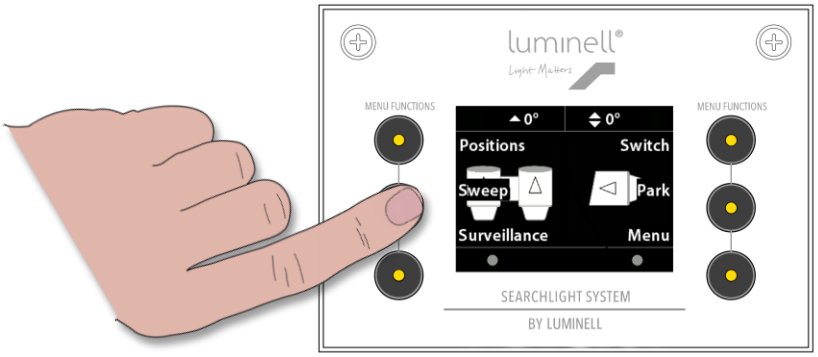
To store a new or change a fixed position, enter one of the regarded memories (**A, B, C** or **D**) in the menu. If there is already a preprogrammed fixed position stored at the selected memory, the searchlight will start to move to that position.
Either select a free memory or, if you want to change this item, take control over the searchlight by moving the joystick (also aborting an eventual movement of the searchlight).

Now – by using the joystick - move the searchlight to the desired new position and select light beam angle and dimlevel to be stored with the position, the light will be activated when position is reached. Press "**Store**".
The current position is now stored.
Note that you always overwrite a previously stored position.

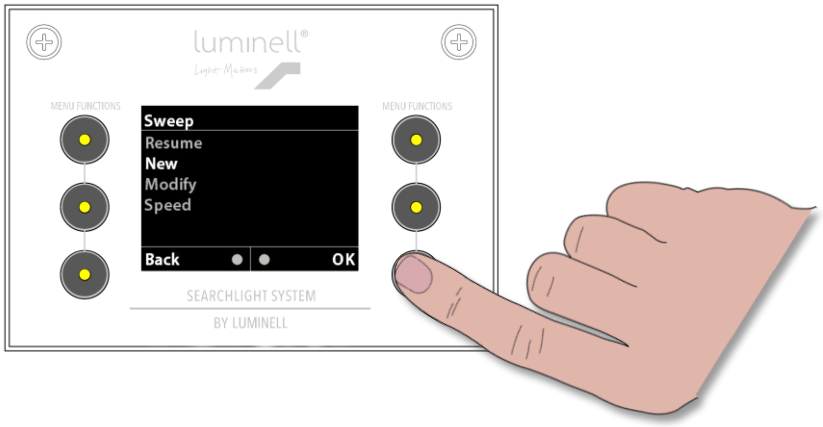
15.2 Sweep

At sweep mode, the searchlight automatically moves back and forth between two individually programmable positions in the horizontal plane.

15.2.1 New Sweep



To enter the *"**Sweep**"* submenu, open the quick start menu and press the left middle button "**Sweep**".

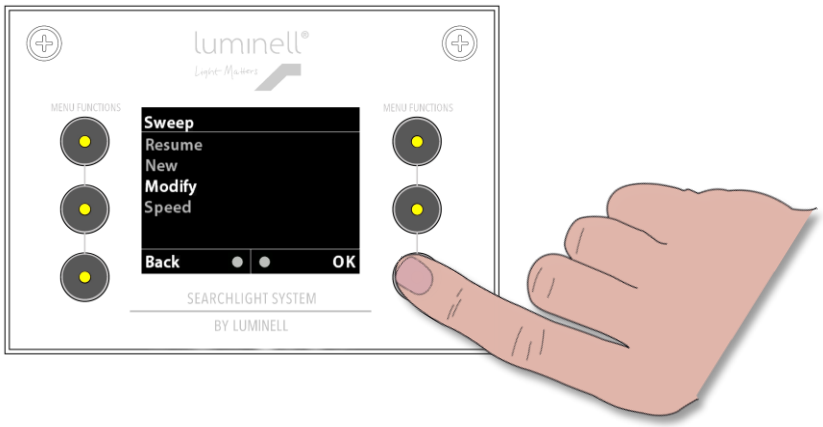


To start a new sweep, navigate down to "**New**" in the "**Sweep**" menu and press "**OK**".
The default setting for a sweep is a horizontal sweep of 20°.

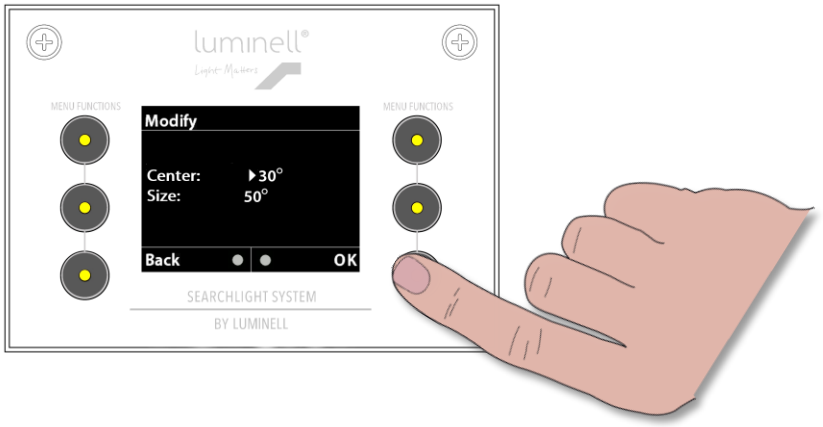
To stop a sweep, enter the *"**Sweep**"* submenu and choose "**Stop**" or just move the searchlight by using the joystick.

To resume the sweep, enter the *"**Sweep**"* submenu and choose "**resume**".

15.2.2 **Modify sweep parameters**

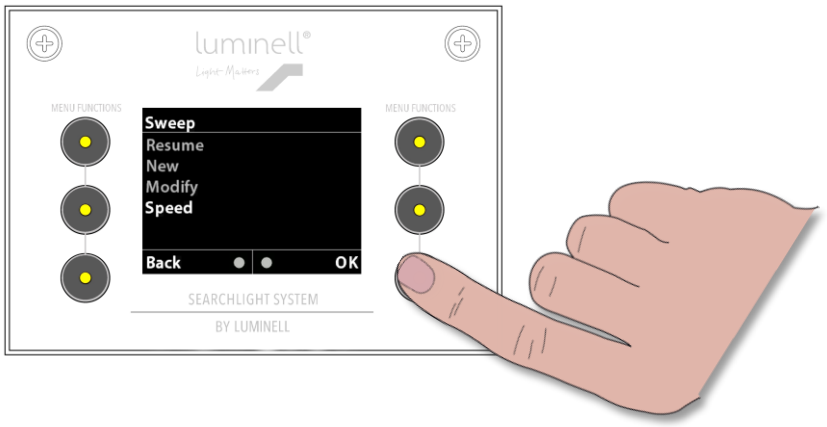


To modify the sweep angle and / or the center of the sweep enter the “**Sweep**” menu and navigate down to “**Modify**”, press “**OK**”.

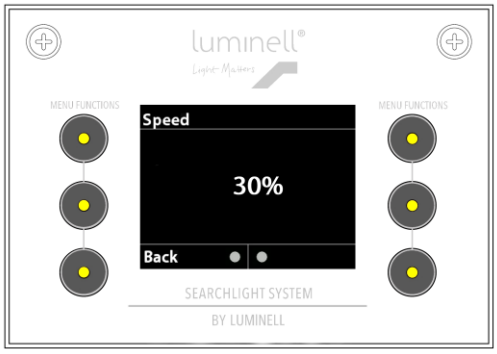


This menu changes the sweep angle and center point of the sweep, modification can be carried out both during movement and while searchlight is standing still.

To change the center point of the horizontal sweep, move the joystick to the left or right until the desired center point is reached.
To change size of the sweep angle move the joystick up or down.
Press “**OK**” to save and update the searchlight with the new values.



The default speed of the sweep is set to 50% of the maximum speed of the searchlight. To change the speed of the sweep, enter the "**Sweep**" menu and navigate down to "**Speed**". Press "**OK**" to enter the "**Speed**" submenu.



To change the speed, move the joystick up or down to desired speed, press "**OK**" to update the searchlight with the new speed.

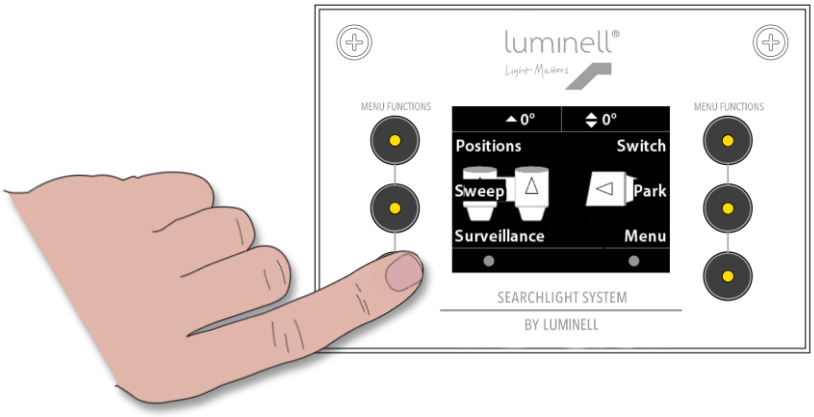
Note: If the rotation speed is updated during runtime this will affect only after the searchlight has reached its next end point.

15.3 Surveillance

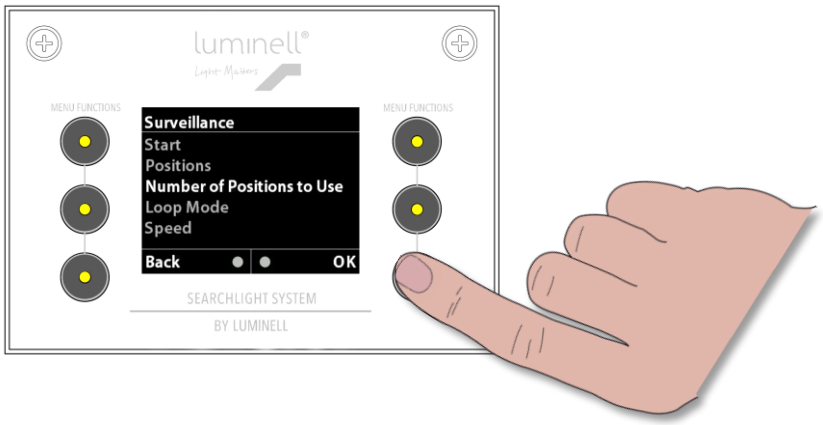
Surveillance is an advanced sweep, where up to five different points, at any azimuth and elevation can be set for surveillance.

15.3.1 Setting a new surveillance sweep

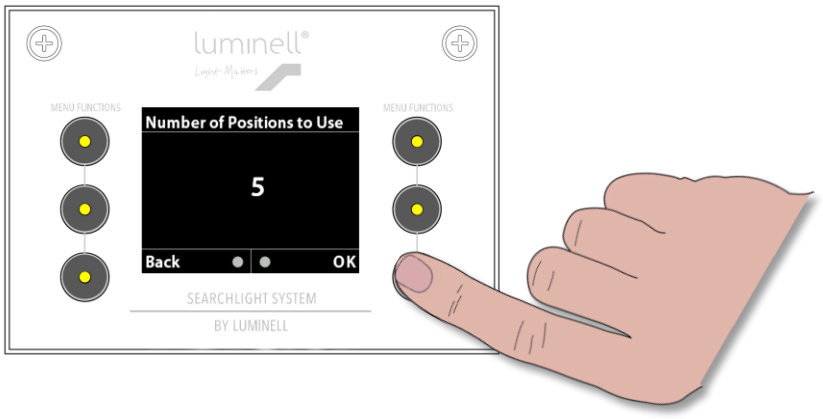
To set a new surveillance sweep the number of positions must first be set.



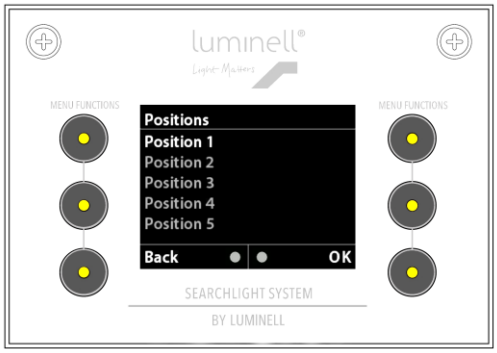
To enter the "**Surveillance**" submenu, open the quick start menu and press the bottom left button.



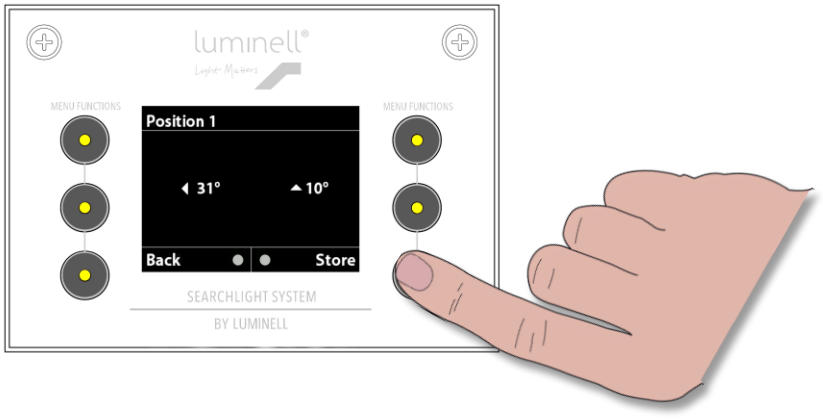
Navigate down to "**Number of Positions to Use**" and press "**OK**".



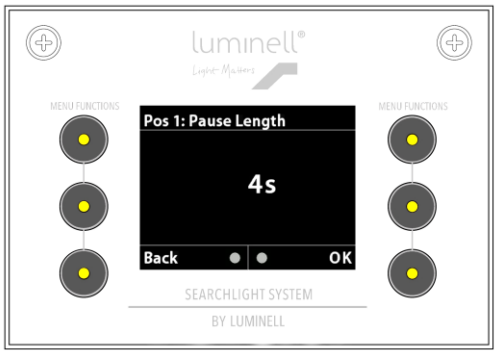
Select the requested number of positions (max. five) to be used in this surveillance sweep.
Press “**OK**” to save and return to the “**Surveillance**” submenu.



To set the positions in a surveillance sweep enter the “**Positions**” menu in the “**Surveillance**” submenu.
The selected number of positions is shown in the display.



To set a position, enter the desired position, then move the searchlight to the by using the desired position by the joystick. Press “**Store**” to store each position.



After pressing "**Store**" a new menu will appear, "**Pause Length**". This defines how long the searchlight will rest at this position before starting to move to the next position. Pause length can be set between zero and ten seconds.

Repeat this for the desired number of positions.
When done go back to the "**Surveillance**" submenu by pressing "**Back**".
Navigate to "**Start**" and press "**OK**" to start the surveillance sweep.

The surveillance sweep will start from position one and go to position two and so until the searchlight has come to the number set in "**Number of Positions to Use**"

15.3.2 **Changing surveillance settings**

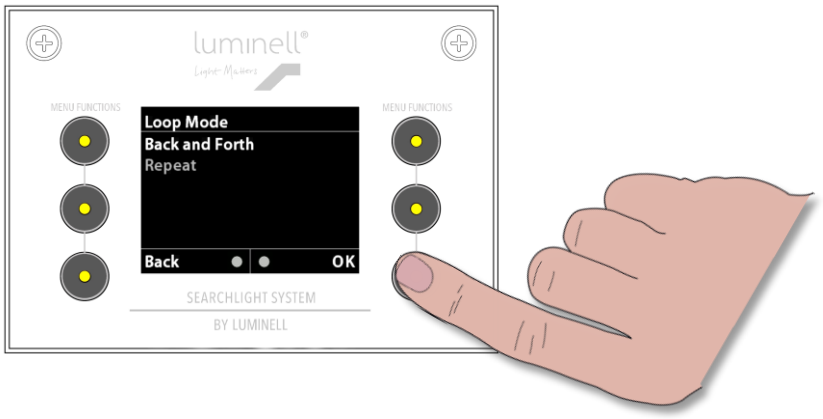


Surveillance has a couple of different settings, "**Loop Mode**" and "**Speed**".
In "**Loop Mode**" there are two choices, "**Back and Forth**" and "**Repeat**".

To set "**Back and Forth**" or "**Repeat**" enter the "**Surveillance**" submenu then "**Loop Mode**".

When using "**Back and Forth**" the surveillance sweep will go from position one to two and so on until it reaches the last one set in "**Number of Positions to Use**". Then it will start calling these positions in reverse order!

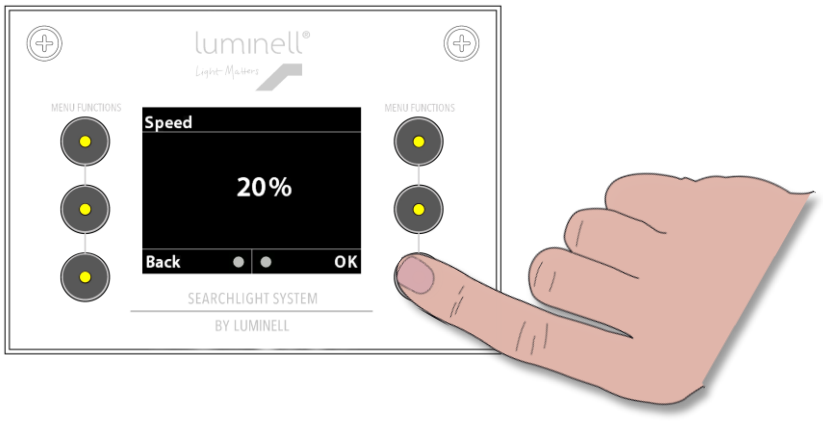
When using "**Repeat**" the surveillance sweep will go from position one to two and so on until it reaches the last one set in "**Number of Positions to Use**".
From there it will start the same sequence at position one instead of going to the previous position.



Navigate to the preferred setting and press "**OK**" to save the setting and return to the "**Surveillance**" menu.



"**Speed**" is where the speed of the rotation of the searchlight is set. Default setting is 50% of maximum speed of the searchlight.
To change the actual speed of the surveillance sweep, enter the "**Surveillance**" submenu then "**Speed**".

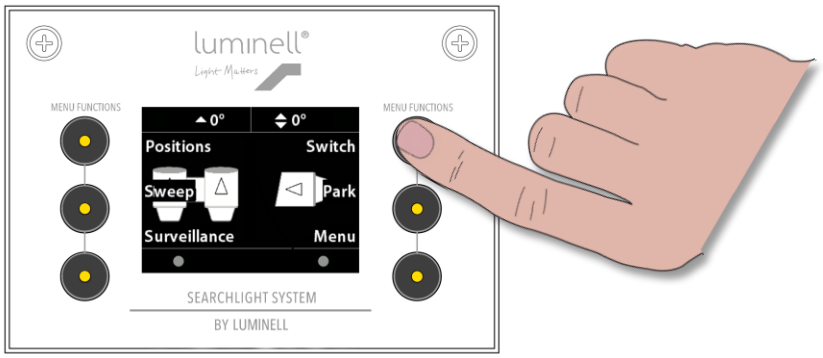


Change the setting by moving the joystick up or down in the speed menu until the requested value is shown. The speed can be set between 5-100% of the maximum rotation speed.

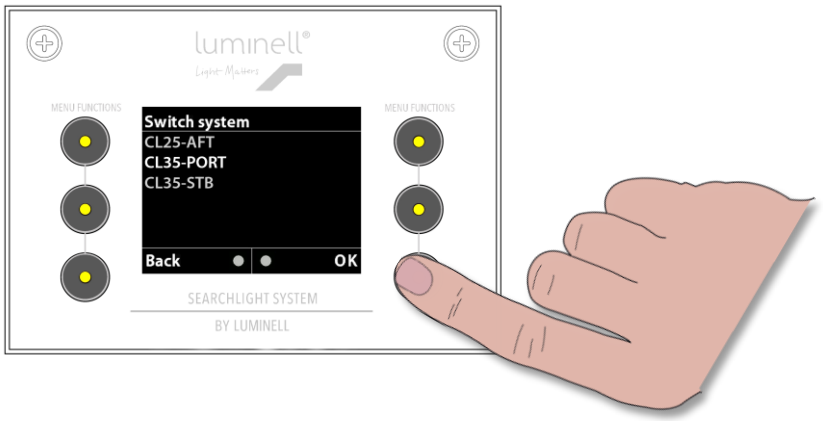
Note: If the rotation speed is updated during runtime this will affect only after the searchlight has reached its next end point.

15.4 **Switch**

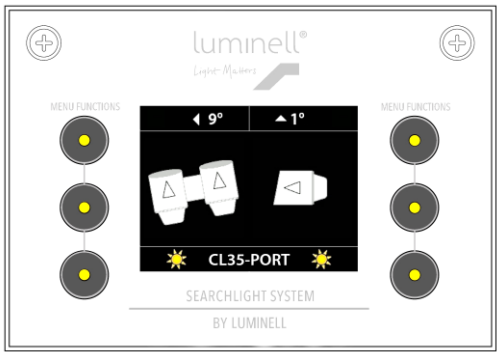
If there are more than one Luminell searchlight in the network, then any operating panel can control any of the connected Luminell searchlights. Each searchlight should be given a unique name during installation for this to work properly.



To enter the "**Switch**" submenu open the quick start menu and press the upper right button.



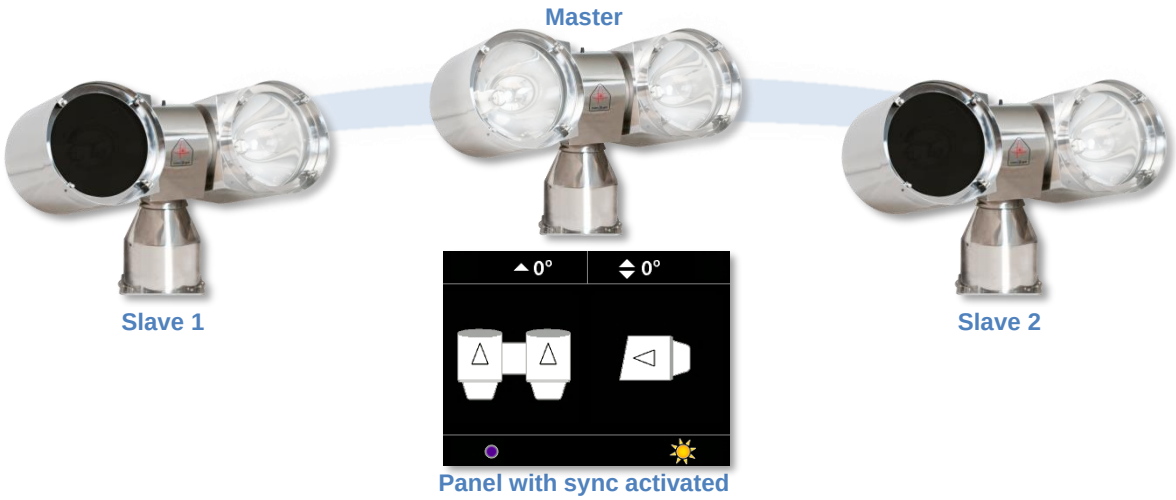
In this menu all the available searchlights should be listed. To change which searchlight being controlled, navigate to the desired searchlight and press "**OK**".



The operating panel should now control the newly selected searchlight which is shown on the indicator screen.

15.5 Synchronized control

This function is available in the “**Switch**” submenu if there is more than one Luminell Search Light in the network and at least one operator panel has the option "**Synchronized control**" enabled. The feature gives the user control over multiple searchlights at the same time from a single operator panel and can therefore obtain optimal light on the same area.
For this feature to be easy to handle, the searchlights should be given a unique name, for example by mounting location on the boat, please see *16.8.5.3 Name system.*



Panel with sync activated

The following basic functions will be synchronized if “Sync” is enabled in the operator panel:

- **Horizontal and vertical movement** based on position, i.e. there may be a small discrepancy during real-time movement with joystick, but the final position will always be identical on all synced system when movement stops.

- **Light / on off,** white light button will turn on and off all the white lights on master and synchronized slaves and UV button does the same with any UV light.

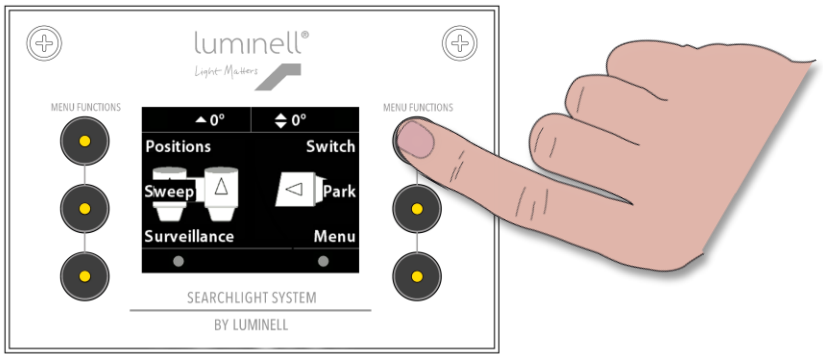
- **Off and park,** if the parking command in panel is selected, the master and all connected slaves will simultaneously turn off the lights and park.

The Sweep, Fixed positions or Surveillance features will not be synchronized, but only started on the searchlight in the network that the operator panel points to, even if this searchlight is the master.

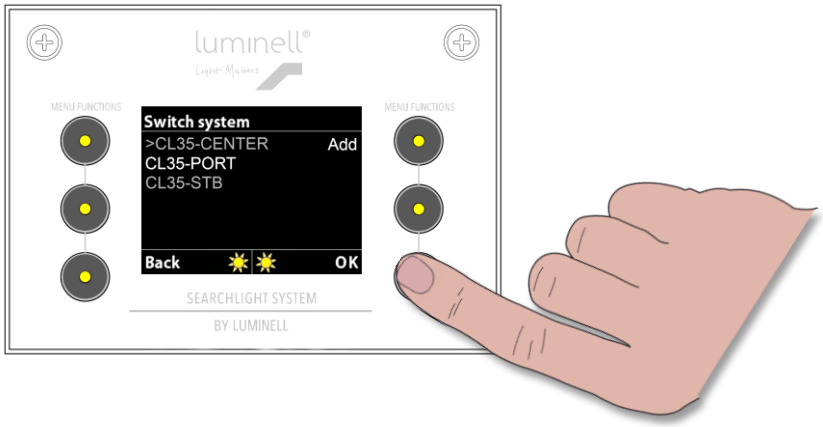
Important, the following settings must have been performed during installation or power failure on each of the systems in the network before they can be included in the synchronized group control.

- Actions after installation or power failure please see *11. ACTIONS AFTER INSTALLATION OR POWER FAILURE.*

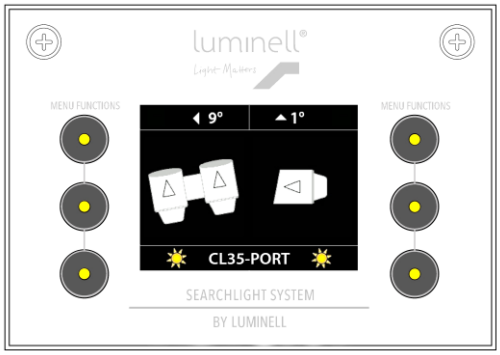
- *Store origin, please see 16.8.5.1 Store origin.*



To enter the "**Switch**" submenu open the quick start menu and press the upper right button.



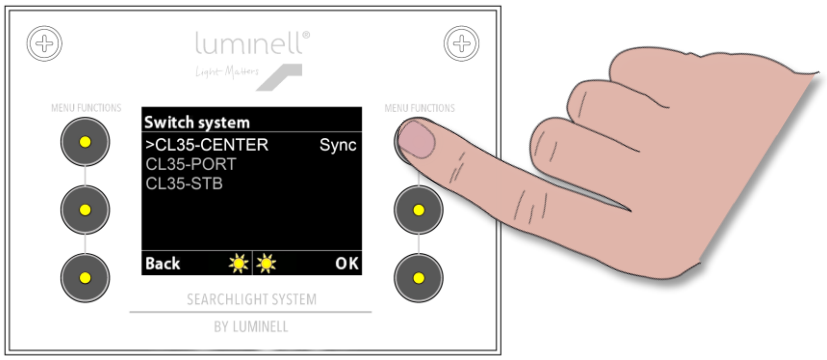
In this menu all the available searchlights should be listed. To change which searchlight being controlled, navigate to the desired searchlight and press "**OK**".



The operating panel should now control the newly selected searchlight which light status and position is shown on the indicator screen.

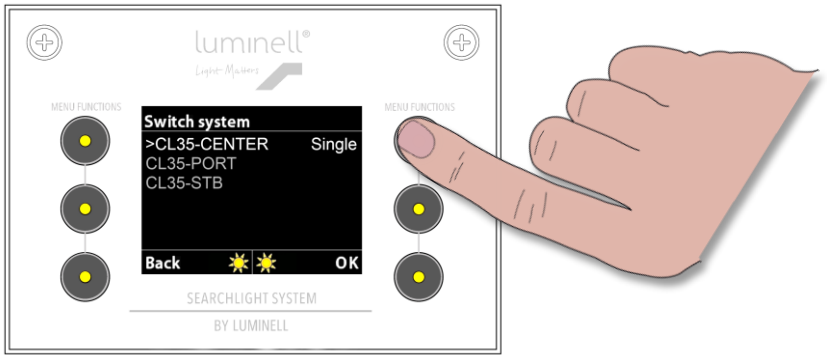
15.5.1 **Set the master control searchlight on/off**

The master is the searchlight that you actively control with your operator panel and it is the master's indicator and error message that is displayed in the operator panel display.
Light icons however, changes to the configurations that are currently available in the group
.
If the master has two white lights (11) and you add a slave who has one white and one UV (12), the master's indicator field will immediately update so that there is a UV light available in the group.



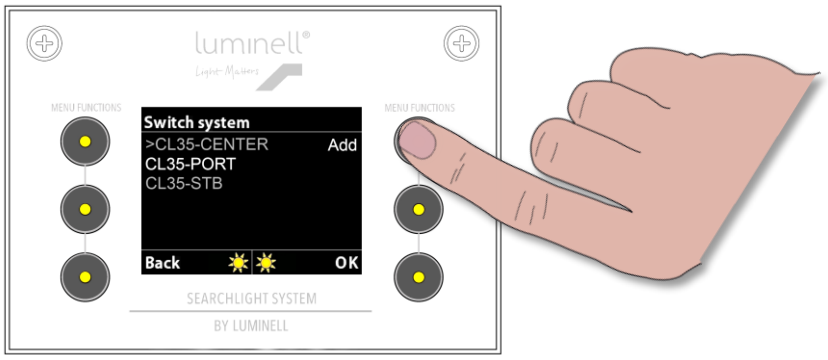
Once you have switched over to the searchlight which you want to be master in the system, press the "**Sync**" button, in this case, we choose CL35 CENTER as our master.
The arrow in front of the selected CL35 CENTER tells us that this system is the "master" in the network and if the sync function is activated all the slaves will follow the master's movement.

Important, to add and remove slaves, please see *15.5.2 Add and remove slaves.*

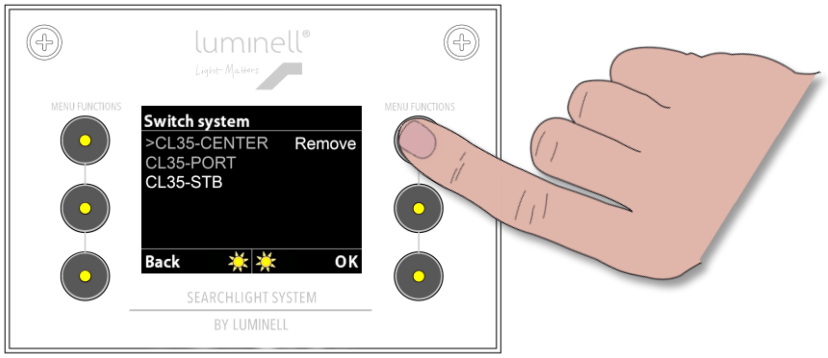


To disconnect the master and run the CL35 CENTER searchlight as a single searchlight go into the "**Switch**" submenu, navigate to the master searchlight and press the *"***Single***"* button.

15.5.2 **Add and remove slaves**

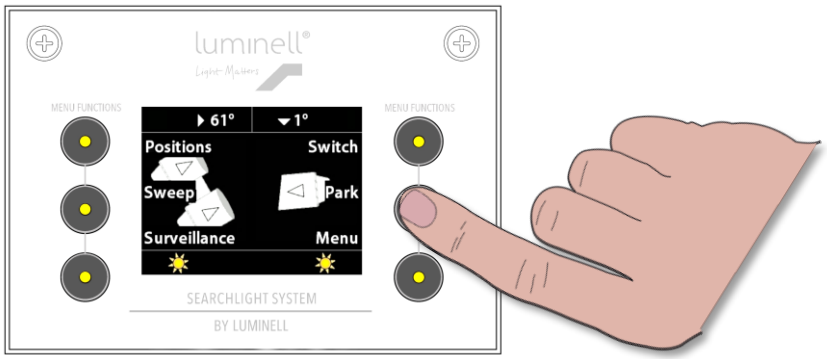


Add or remove one or more slaves is done by entering the "**switch**" submenu and with the joystick scroll through the list of available searchlights, If the searchlight in the list is not connected in the synchronized group control, the text "**Add**" appears next to the top left button, to add this searchlight to the group, press the "**Add**" button.



If the searchlight marked is already listed as slave in the group, the text "**Remove**" appears next to the top left button, to remove this searchlight from the group, press the "**Remove**" button.

15.6 Off and park



By pressing the button next to *"***Park***"*, any lighted lamp will be turned off and the searchlight will automatically look up the preprogrammed parking position, during this time you'll see "**Parking ...**" in the bottom middle of the display.
When parked, the operator panel will turn off the display after a few seconds and the LEDs behind the buttons will be dimmed to a lower intensity.

16. MAIN MENU

From the quick start menu, select *"***Menu***"* to enter the system's main menu.
To navigate in the main menu, use the joystick; push the joystick forward/up once to go up one step in the menu and backwards/down to go down one step. Keep holding the joystick up or down will scroll up and down in menus with “autorepeat”.

To confirm your choice use "**OK**" button and to leave the displayed menu, use the button *"***Back***"*. In many menus the joystick can be used as the “**OK**” button if moved to the right and as the “**Back**” button if moved to the left.

16.1 Off and Park

Please see *15.6 Off and park* for information regarding this menu choice.

16.2 Switch system

Please see *15.4 Switch* for information regarding this menu choice.

16.3 Light Position

Please see *15.1 Fixed positions* for information regarding this menu choice.

16.4 Sweep

Please see *15.2 Sweep* for information regarding this menu choice.

16.5 Surveillance

Please see *15.3 Surveillance* for information regarding this menu choice.

16.6 Info



This menu shows information that is needed to be known during support from Luminell or if any optional functions should be added to the operator panel after purchase (more about this under *16.8.5.7 Options setup*).

16.7 **Status**



This menu will give information in form of text messages if there is errors.in the system, it also contains a "**Lamp-hour counter**" showing the accumulated total running time in hours for each LED-module.

Errors can be reset from this menu by simply press the button marked "**Dismiss**", if errors persist despite resetting, contact Luminell.

The errors presented below will also trigger the alarm output relay and give an audible and/or visual alarm if connected to the vessels alarm monitoring system.

Status Message	**Error**	**Remedy**
Communication error	Transmission issues on the CAN bus	Check for loose CAN-wires in the electrical box or junction points (if any) and contact Luminell.
Over current	Overcurrent protection triggered; movement blocked	Check that the searchlight is able to rotate freely. In winter, heavy icing can be the cause of this error.
Over voltage	Overvoltage protection triggered, voltage to searchlight motordriver/s have exceeded 40Vdc.	Reset the error, if error recurs repeatedly, please contact Luminell.
Under voltage	Undervoltage protection triggered, voltage to searchlight motordriver/s has fallen below 8,5Vdc	Reset the error, if error recurs repeatedly, please contact Luminell.
OPWDT (message in box only)	Ethernet communication broken to all panels, see *(4.1) OP WDT.* Fault auto-resets if contact is restored with at least one panel.	Check Ethernet wires and connections to panel(s) and switch.

16.8 Settings

This opens a new menu with six sub menus.

16.8.1 Backlight brightness (adjust the button´s/ display light intensity)



In this menu the intensity of the button LEDs and the display backlight can be adjusted between 5-100%.
The adjustment is done by moving the joystick forward for increasing the intensity and backward to decrease. The selected intensity is confirmed with "**OK**".

16.8.2 Language

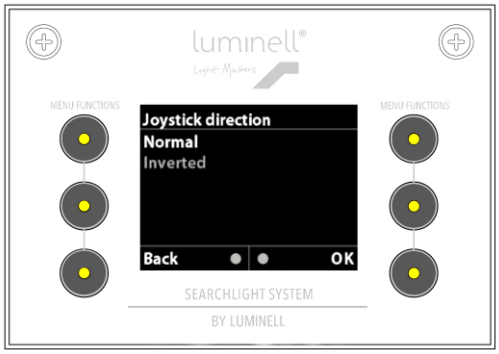


The language in the display can be changed depending on which language sets that are installed in the operator panel.

Currently, the following languages are available (Q2 2016):
English, Swedish, Chinese, French, German, Italian, Portuguese, Russian.

If you find that your language is missing, please contact Luminell

16.8.3 **Joystick direction**



Some operators want to have their joystick to move the lamp housing vertically in the same direction as the joystick's physical direction:

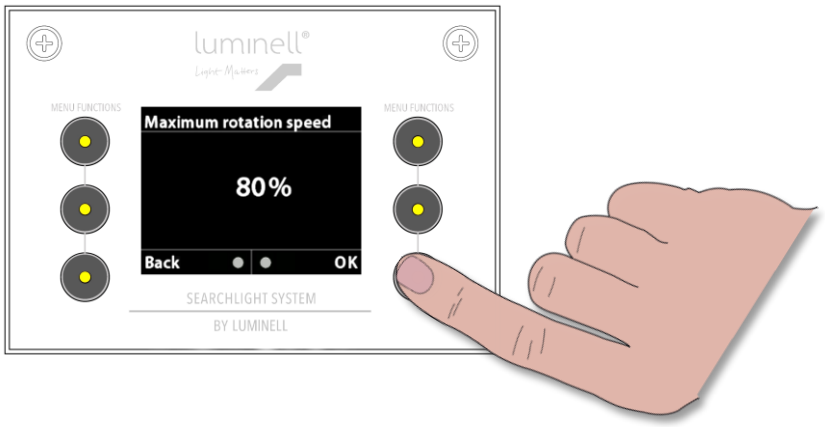
(joystick up=lamp housing moving upwards), this is called "**Inverted**" in the menu.

Normally the joystick acts like an airplane joystick:

(joystick up=lamp housing moving downwards), this is called "**Normal**" in the menu.

16.8.4 Maximum rotation speed

This menu gives the operator the opportunity to limit the actual maximum rotation speed of the searchlight in relation to its absolute maximum rotation speed.



The adjustment is done by moving the joystick forward to change speed in increments of 5% and backwards to decrease. Minimum speed is 20% and maximum 100%, when the choice is confirmed with "**OK**", the display jump back to the previous "**Settings**" - menu.

16.8.5 Installation

In this menu there are six sub menus each described below:



16.8.5.1 *Store origin*

This menu is used to calibrate the systems “ZERO” point for both vertical and horizontal axis.

Before the “**Store origin**” command is stored it is necessary that the synchronization between operator panel and electrical box is done properly. The easiest way to do the synchronization is by turning the system off with the “**Park**” command, please see *15.6 Off and park.*

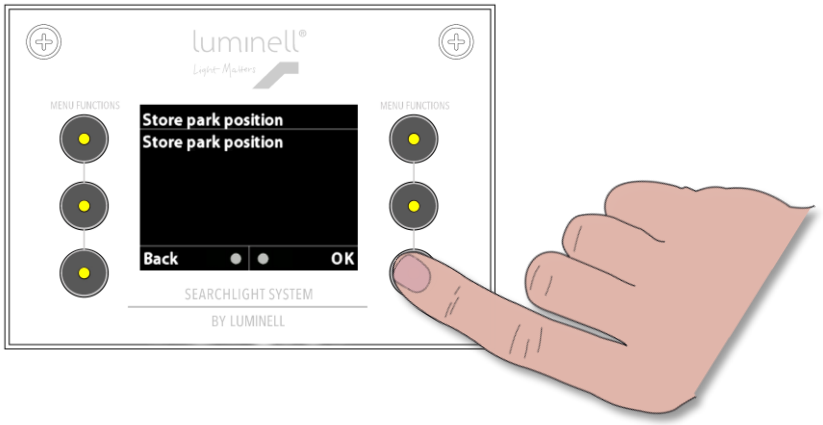
Start the system according to *12. STARTING SYSTEM* (normal start). Now the position of the lamp housings should be adjusted to be in level with horizontal plane and in direction straight forward of the vessel (normally)! Then “**Store origin**” is executed and setting is stored.

16.8.5.2 *Store park position*

This menu enables the storing of a park position (lamp housing pointing at any direction when the “**Park**” command is selected.

Before changing the default park position it’s necessary that the synchronization between operator panel and electrical box is done properly. The easiest way to do the synchronization is by just turn the system off with the “**Park**” command, please see *15.6 Off and park.*

From the default logo screen or display indicator*-screen, move the searchlight to the new desired park position and when satisfied select **menu>settings>Installation** and enter sub menu “**Store park position**”.

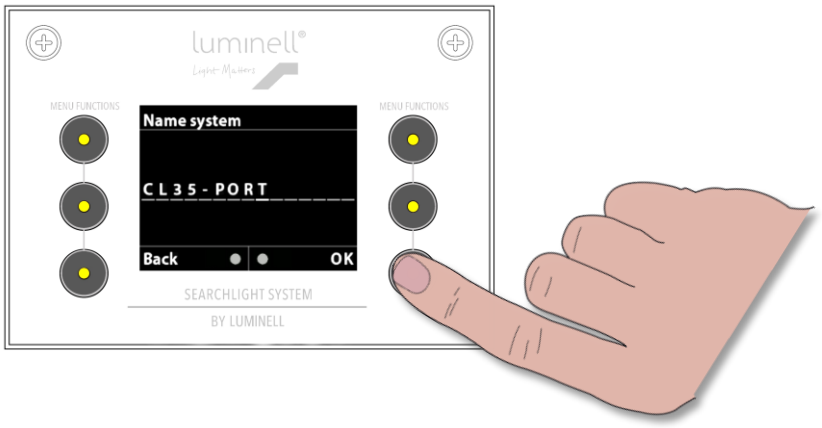


Press “**OK**” to save the new park position and return to the default logo screen or display indicator*-screen

Suitable park position for SL2 is pointing straight ahead 0/0 degree; this is also the default parking position

16.8.5.3 *Name system*

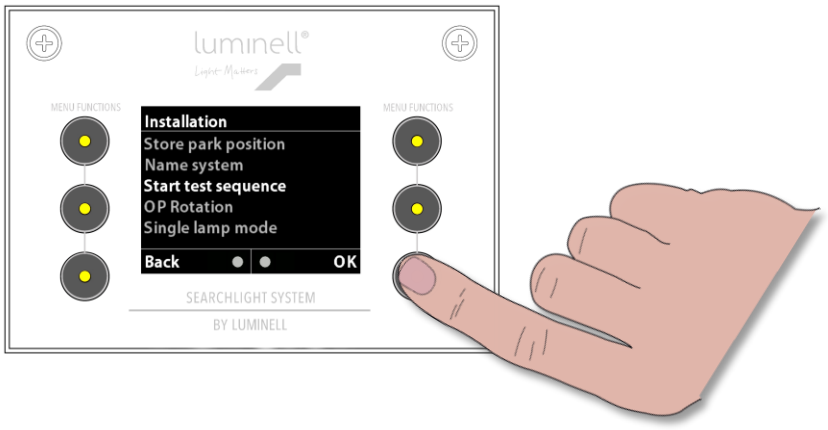
The dedicated Luminell network can contain several searchlights and operator panels. To make the whole network easy to navigate; each electrical box and its corresponding searchlight can be named to a well-known name for the operator.



The name is set by moving the joystick up and down to select correct character. To move to next character in the name the joystick is moved to the right. Finish the name process and save the name by select “**OK**” by pushing the button at the right bottom corner of the display.

16.8.5.4 *Start test sequence*

This menu starts a test sequence which tests the movement of the lamp housings and focus for each lamp house one at a time.



The test sequence will perform as follows:

At test sequence startup the lamp housing will be moved to parking position.
The horizontal axis will be rotated one full revolution clockwise.
The vertical axis will be rotated one full revolution clockwise.
The left lamp houses focus motor is activated for 10 seconds (not valid for LED searchlight).
The right lamp houses focus motor is activated for 10 seconds (not valid for LED searchlights).

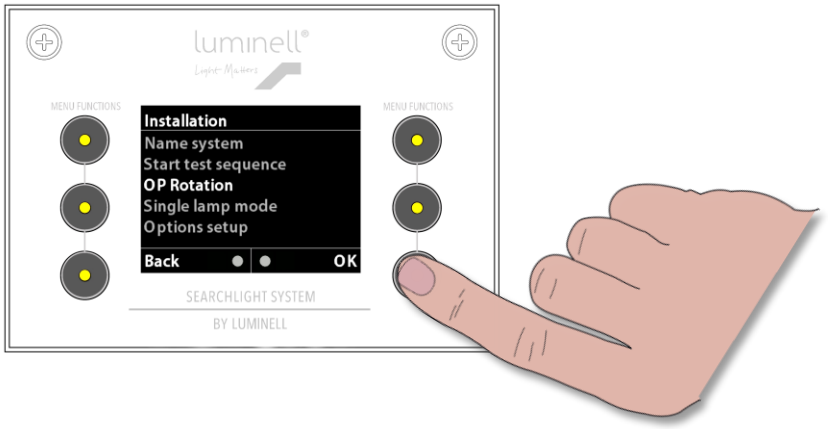
The whole sequence above will be repeated 5 times before the test sequence is automatically abandoned. Every even time the rotation will be anti-clockwise and every odd time the rotation will be clockwise. During the test sequence the operator can switch on and off lights by simply press the button (**2**) and (**5**) according to the figure in *6. OPERATOR PANEL, OVERVIEW.* The test sequence can't be abandoned by the operator without switching off the main power in the electrical box.

16.8.5.5 *Single lamp mode*

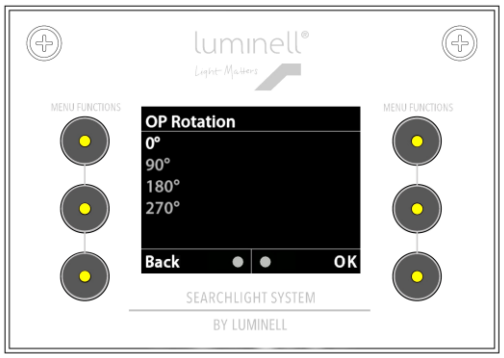
Note: This function is not available on SL2, for this model, both LED modules **always** light up at the same time

16.8.5.6 *OP Rotation*

This menu is used if you have mounted an operator panel pointing in a different direction than towards the bow of the boat.



The defaults setting when delivered (0 degrees) requires that the operator panel is mounted pointing towards the bow of the boat, *see page 61.*

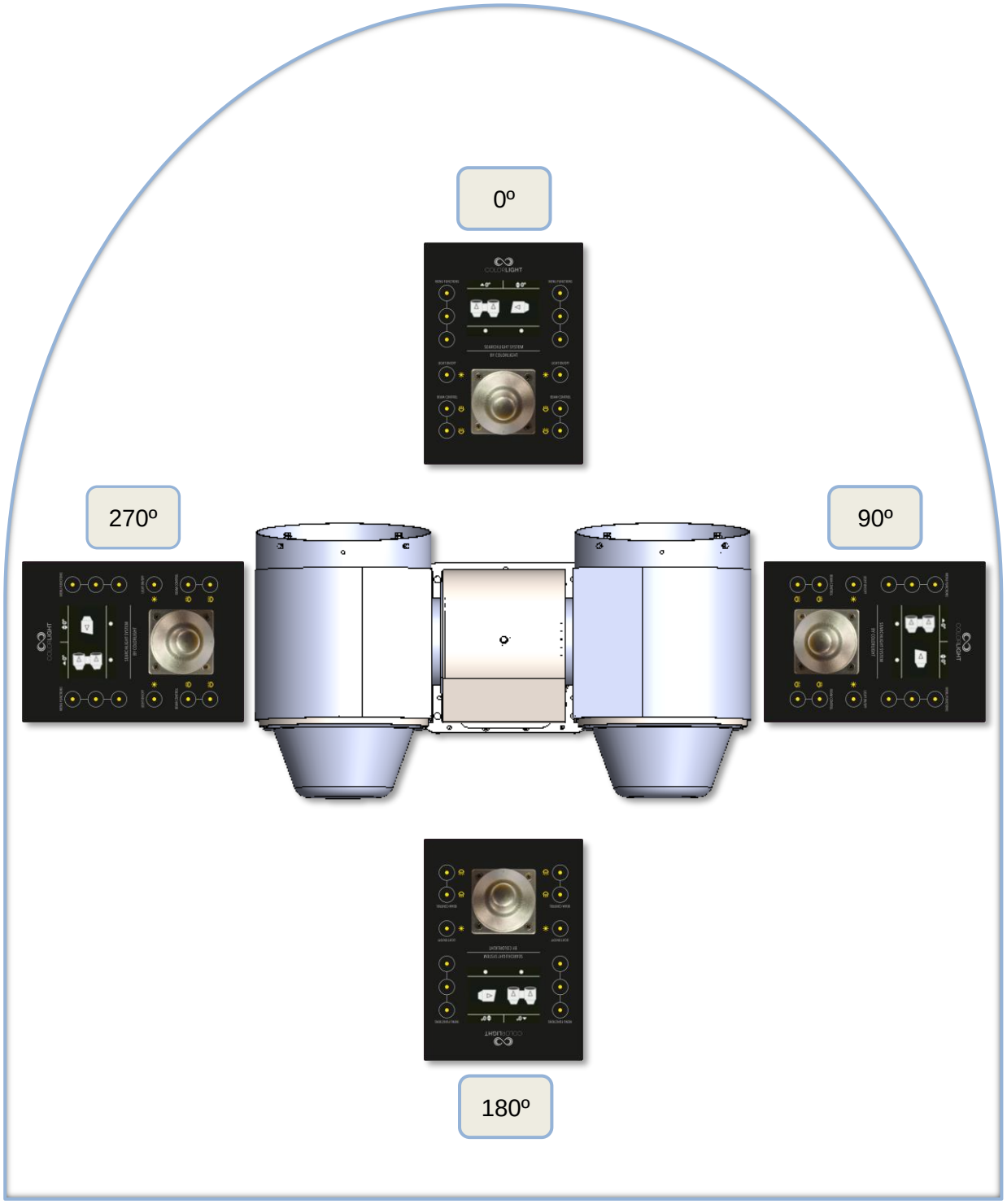


By changing this setting, you can compensate for different mounting positions while maintaining accurate indicator function, you can choose from four different positions.

0 degrees (default)
90 degrees
180 degree
270 degree

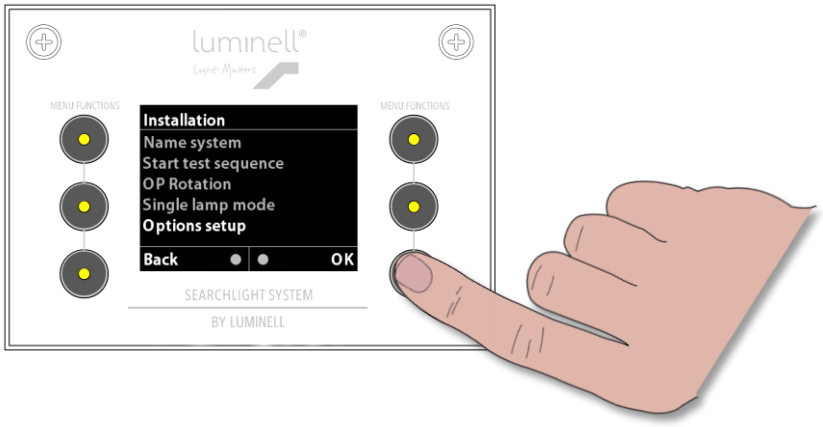
Press “**OK**” to save and exit back to the “**Installation**” submenu.

OP Rotation illustration.



16.8.5.7 *Options setup*

This menu is used for installing unlock codes that provide access to additional options.



Press “**OK**” to enter the “**Enter Code**”-screen.



The code is entered by moving the joystick up and down to select correct character. To move to next character the joystick is moved to the right. Finish the process by select “**OK**” by pushing the button at the right bottom corner of the display

The codes are individual for each operator panel. For obtaining unlock codes please contact Luminell for quotation. Luminell also need the MAC-id of the related control panel to generate the correct code. Please see 16.6 Info.

The following options are activated as default but can be deactivated by entering a code:

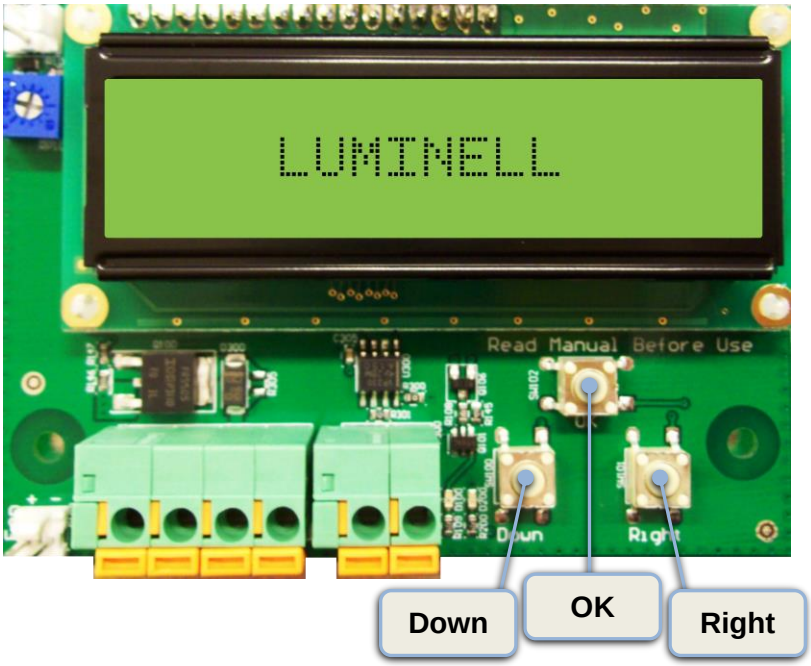
- Display indicator,
- Fixed positions, please see *15.1 Fixed positions.*
- Sweep (auto sweep horizontal), please see *15.2 Sweep.*
- Surveillance, please see *15.3 Surveillance.*
- Synchronized control, please see *15.5 Synchronized control.*
- Language *16.8.2 Language.*
-

Not activated and need a code from Luminell:

- Restricted zone

17. CABINET CARD MENU SYSTEM

This chapter describes the menu system of the Luminell Cabinet Card displayed on the on-board LCD.



17.1 Menu navigation

The user interacts with the menu system using the three buttons, the "**Down**" button, the "**Right**" button and the "**OK**" button.

17.1.1 Down Button

The main function of the "**Down**" button is to shift between the menu categories. It also has two alternate generic functions.
1. While in submenus listing items of various types the "**Down**" button scrolls down in the list.
2. While entering a value of some sort, the "**Down**" button decrements that value.

17.1.2 Right Button

The main function of the "**Right**" button is to shift between the submenus of the selected menu category. It also has two alternate generic functions.
1. While in submenus listing items of various types the "**Right**" button scrolls up in the list.
2. While entering a value of some sort, the "**Right**" button increments that value.

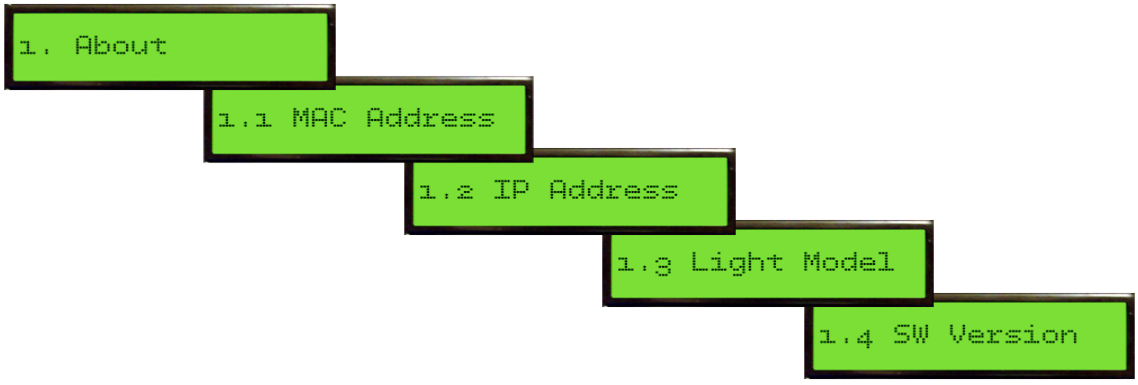
17.1.3 OK Button

The "**OK**" button enters and exits submenus.

1. About	1.1 MAC Address	1.2 IP Address	1.3 Light Model	1.4 SW Version
2. Diagnostics	2.1 Start	2.2 View Results		
3. Usage Stats	3.1 Left Light	3.2 Right Light	3.3 Reset Left	3. 4 Reset Right
4. Settings	4.1 OP WDT	4.2 OP WDT Stats	4.3 OP WDT Reset	

17.2 Category 1: About

In this chapter all of Category 1 menu items will be explained.



17.2.1 (1.1) MAC Address

Displays the MAC address of the Cabinet Card, according to the standard (IEEE 802) in six groups of two hexadecimal digits, separated by colons (':'), in transmission order, e.g. "01:23:45:67:89:ab". One exception from the standard is made, the leftmost colon is missing, due to the 16-character limit of the LCD.

17.2.2 (1.2) IP Address

Displays the IPv4 address of the Cabinet Card, in four groups of one to three decimal digits, separated by dots ('.'), e.g. "169.254.17.5".

17.2.3 (1.3) Light Model

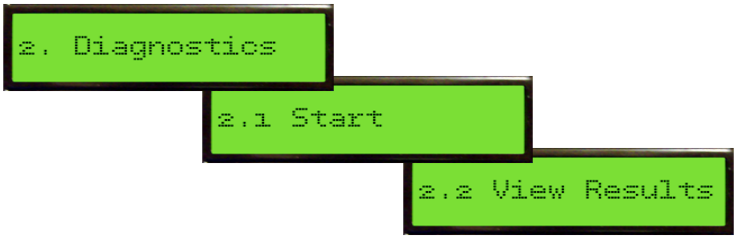
Displays the searchlight model that the Cabinet Card is configured to use, e.g. "Model: CL25-12".

17.2.4 (1.4) SW Version

Displays the firmware version of the Cabinet Card, e.g. "0.1.2.3".

17.3 Category 2: Diagnostics (support tool)

In this chapter all of Category 2 menu items will be explained.



17.3.1 (2.1) Start

Press the OK button to run the on-board diagnostic test suite to sense the electrical and mechanical condition of the searchlight. (contact Luminell for help with this feature).

T1. Measurement of voltage and current when the searchlight is in “non operating mode”

T2 (HCW). Measurement of current drawn by the horizontal motor; motor rotates clockwise for 30 seconds.

T3 (HCCW). Measurement of current drawn by the horizontal motor; motor rotates counterclockwise for 30 seconds.

T4 (VCW). Measurement of current drawn by the vertical motor; motor rotates clockwise for 30 seconds.

T5 (VCCW). Measurement of current drawn by the vertical motor; motor rotates counterclockwise for 30 seconds and the value is temporary stored.

T6 /T7 (not valid for this model).

T8 (H MAG). Test of horizontal magnetic sensor; the horizontal motor is running at full speed for a predetermined time and number of triggers is recorded.

T9 (V MAG). Test of vertical magnetic sensor; the vertical motor is running at full speed for a predetermined time and number of triggers is recorded.

T10 (Lights). LED-module test; both lights should ignite and be lit for 30 seconds.
(first 15 sec will run the spot beam only9.
LED modules provide no feedback to to the Ebox and the test result for **T10** will always show "OK", therefore this light test must be visually verified to ensure that the LED modules light up.

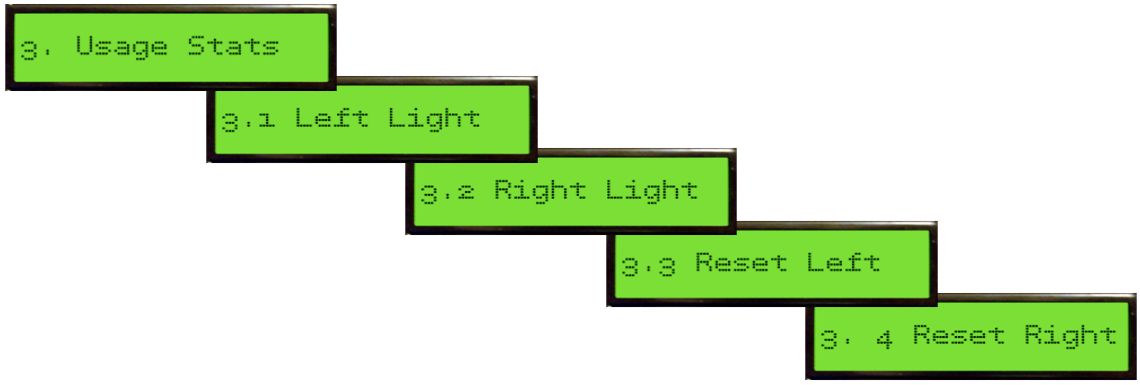
T11 (OP count). Counting the number of connected operator terminals in the network.

17.3.2 (2.2) View Results

Displays the result of the last run diagnostics test suite.
Use the “**Down**” button to cycle through the tests results.
Use the “**Right**” button to cycle through different test result information for the selected test.
Only applicable for test “T1” and test “T10”.

17.4 Category 3: Usage Stats

In this chapter all of Category 3 menu items will be explained.



17.4.1 (3.1) Left Light

Displays the usage of the left light source in hours:minutes:seconds, e.g. “Left: 1:23:45”.

17.4.2 (3.2) Right Light

Displays the usage of the right light source in hours:minutes:seconds, e.g. “Right: 1:23:45”.

17.4.3 (3.3) Reset Left

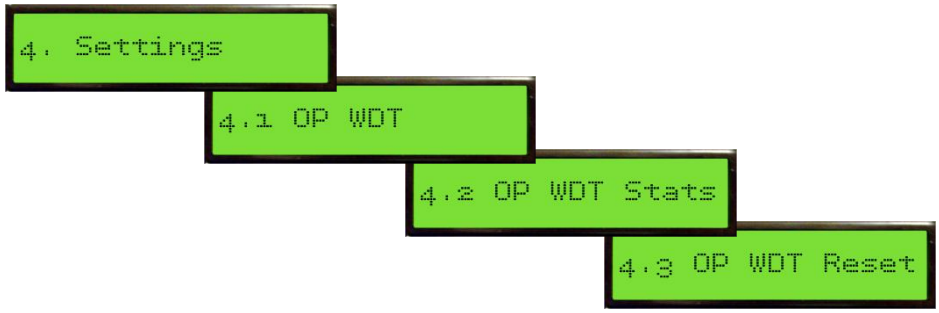
Resets the usage counter of the left light source.
A confirmation message, “**If sure press OK**”, is displayed upon entering the menu. Press the “**OK**” button at this point to reset the counter and exit the menu. Press the “**Down**” or “**Right**” button to exit the menu without resetting the counter.

17.4.4 (3.4) Reset Right

Resets the usage counter of the right light source.
A confirmation message, “**If sure press OK**”, is displayed upon entering the menu. Press the “**OK**” button at this point to reset the counter and exit the menu. Press the “**Down**” or “**Right**” button to exit the menu without resetting the counter.

17.5 Category 4: Settings

In this chapter all of Category 4 menu items will be explained.



17.5.1 (4.1) OP WDT

Ethernet communications guard OP WDT (Operator Panel Watchdog Timer)

If a hardware failure occurs that breaks the Ethernet communication between the box and operator panel, a safety function will step in and automatically turn off the light within 3 seconds, the OP WDT will also interrupt an ongoing sweep or surveillance activity.



If an OP WDT event has occurred an error message will be displayed in the electrical box and the alarm relay will trigger. When communication returns the message will disappear and the alarm will be reset.

For multiple panel systems: OP WDT will step in only when communication is lost to all panels.

Possible reasons why OP WDT turn off the lights:

- The power supply to the operator panel is broken.
- The power supply to the Ethernet switch (if any) is broken.
- Broken Ethernet cable between electrical box/ Ethernet switch (if any) and operator panel.

OP WDT is disabled by default, to enable press "**OK**" button in menu "4.1 OP WDT" screen and press the "**Down**" or "**Right**" button to toggle the function on/off.



17.5.2 **(4.2) OP WDT Stats**

Displays a counter that keeps track of the number of times the Ethernet communication has recovered from an OP WDT event.
In case of suspected cable problems with connected operator panels, this counter can be helpful when troubleshooting.



17.5.3 **(4.3) OP WDT Reset**

Resets the OP WDT counter.
A confirmation message, “**If sure press OK**”, is displayed upon entering the menu. Press the “**OK**” button at this point to reset the counter and exit the menu. Press the “**Down**” or “**Right**” button to exit the menu without resetting the counter.

18. TECHNICAL DATA

18.1 SL2 searchlight

SL2 Searchlight	SL2	SL2IR
Mechanical performance		
Motor Technology	Brushless digital controlled servo motors	
Horizontal movement (Pan)	- Unlimited movement with slipring technology - Horizontal movement max speed 33°/second	
Vertical movement	- Unlimited movement with slipring technology - Horizontal movement max speed 33°/second	
Light spec		
Light technology	LED	
Spot beam	3.5° / 3600 kCd / 1900 m	
Wide beam	15° / 840 kCd / 24000 lm	
Initial luminous flux	Over 60 000 lm	
CRI	Min. 70	
Color temp	6000 K	
LED life	~30.000 hours L70 @ 25 deg C T ambient. At high ambient temperatures and no wind, the LED will limit the light output to ensure lifetime	
Input power	Powered from ebox	
Environmental		
Operating ambient temperature	-40ºC to +55ºC	
Storage temperature	-25°C to +70°C	
IP class	IP66	
Vibration	Designed for IEC 60945	
Shock	Designed for IEC 60945	
Dimensions & weight (see drawings for details)		
Static size (WxDxH) mm	642 x 255 x 502	642 x 255 x 530
Weight	27 kg	29,5 kg
Materials & Colors		
LED-casing	Seawater resistant; casted, anodized, and powder coated aluminum	
Base, body	Stainless steel AISI 316L (1.4404), A4	
Available Colors	- Powder coat White RAL 9016, gloss level 70 - Powder coat matt jet black RAL 9005, gloss level 20 - Powder coat matt light grey RAL 7035, gloss 20	
Glass	Tempered glass	
General Spec		
Electrical interface	- Signal cable: 4x2x1 shielded, twisted pair - -Power cable: 5G4 shielded - -OP3G cable: Ethernet CAT5-FTP. Fiber available for long distance	

18.2 SL2 Electrical box

SL2 Electrical box	EBOX DC	EBOX AC
Input spec		
Nominal voltage	24VDC (20...28VDC)	100-240VAC 50-60Hz
System power consumption	~800W	
Recommended Fuse	30A	10A
System boot time (from power off)	15 sec	
Environmental		
Operating ambient temperature	+5ºC to +45ºC	
Storage temperature	-25°C to +70°C	
IP class	IP22	
Cooling	Convection	
Vibration	Designed for IEC 60945	
Shock	Designed for IEC 60945	
Dimensions & weight (see drawings for details)		
Static size (WxDxH) mm	335 x 168 x 300	340 x 168 x 388
Weight	6 kg	11 kg
Materials & Colors		
Box casing	Coated steel	
Available Colors	Powder coat grey RAL 7035	
General Specifications		
System boot time (from power off)	15 sec	

18.3 Operator Panel

Technical Data Operator Panel	
Input Spec	
Nominal voltage	24VDC (20...28VDC)
Power consumption in operation (panel only)	Max 5W
Power consumption in standby mode (parked, light off)	2,2W
Current at 24V	Max 0,2A
Environmental Specifications	
Operating ambient temperature	-20ºC to +55ºC
Storage temperature	-25°C to +70°C
IP class	IP56
Vibration	Designed for IEC 60945
Shock	Designed for IEC 60945
Dimensions & weight (see drawings for details)	
Static size (WxDxH) mm	116 x 114 x 158
Weight	0,5 kg
Materials & Colors	
Panel / back cover	Anodized aluminum / ABS
General Specifications	
Electrical interface to vessel	- DC power 3 wires (+/-/earth) (see picture on page 28 for details) - Ethernet to operator control panel or switch (if any)
Mechanical interface to vessel	- 4 x Ø3,5mm holes for screws (screws not included) - Sealing between vessel and panel (attached)
Functions	
Direct button functions	- Horizontal and vertical movement - Light on/off - Beam angle spot/flood - Dimming step by step
Standard menu functions	- Configurable park position - Up to 4 programmable fixed positions - Sweep in horizontal direction - Surveillance in horizontal and vertical direction - Switch to another searchlight in the network - Synchronize searchlights

18.4 Optional Hardware

Optional Hardware	
Wireless radio control	Ethernet switch, 5 port and 8 port
Thermal camera unit (not for retrofitting)	Fiber optic control cable
Daylight camera unit (not for retrofitting)	Customized color
Extra remote panel (s)	Wet paint (AWL grip or similar)
External power supply for panel (s)	

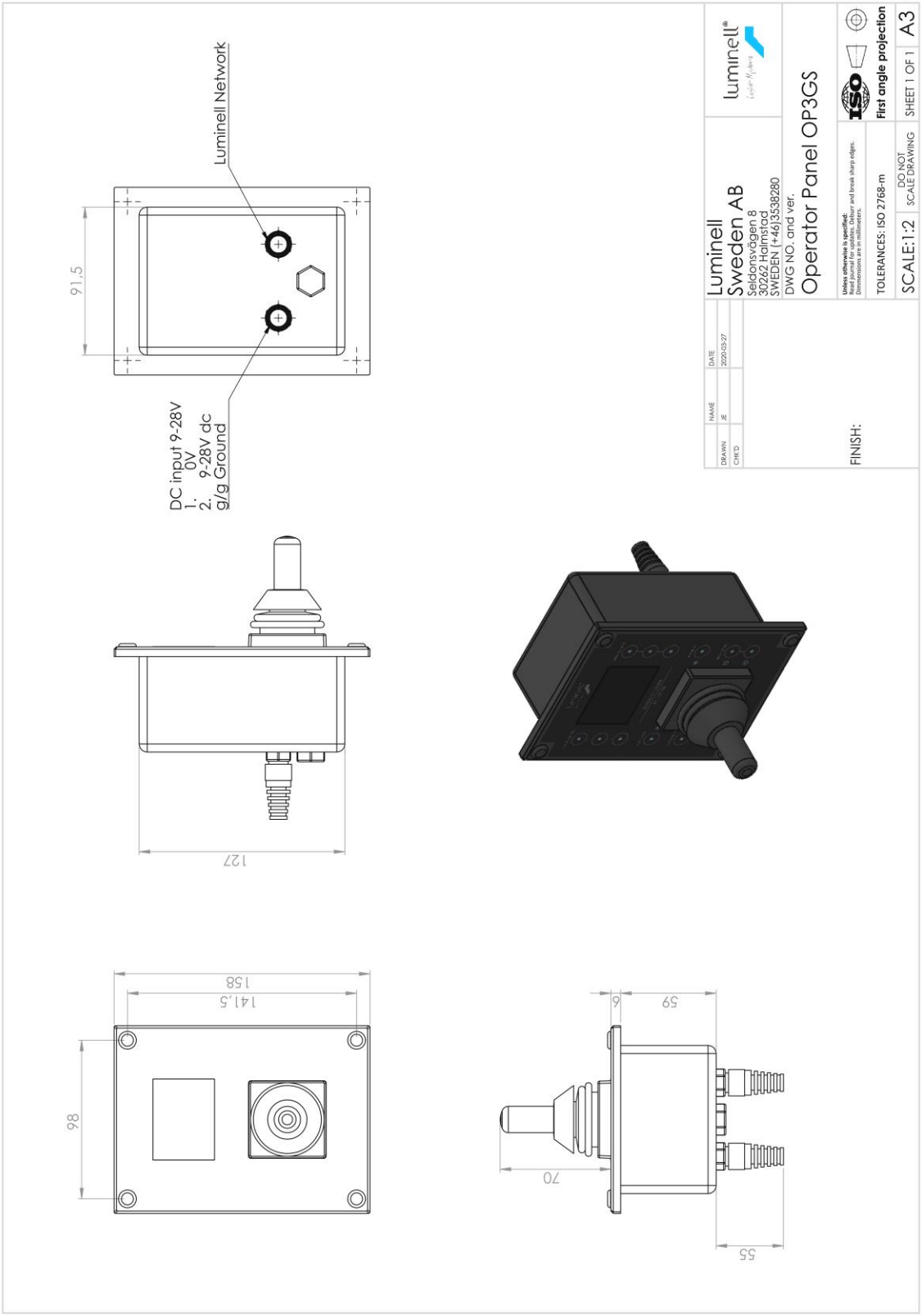
18.5 Optional software functions

Optional Software	
Restricted Zone (unlock code) *	
NMEA tracking see page 30 (unlock code) *	

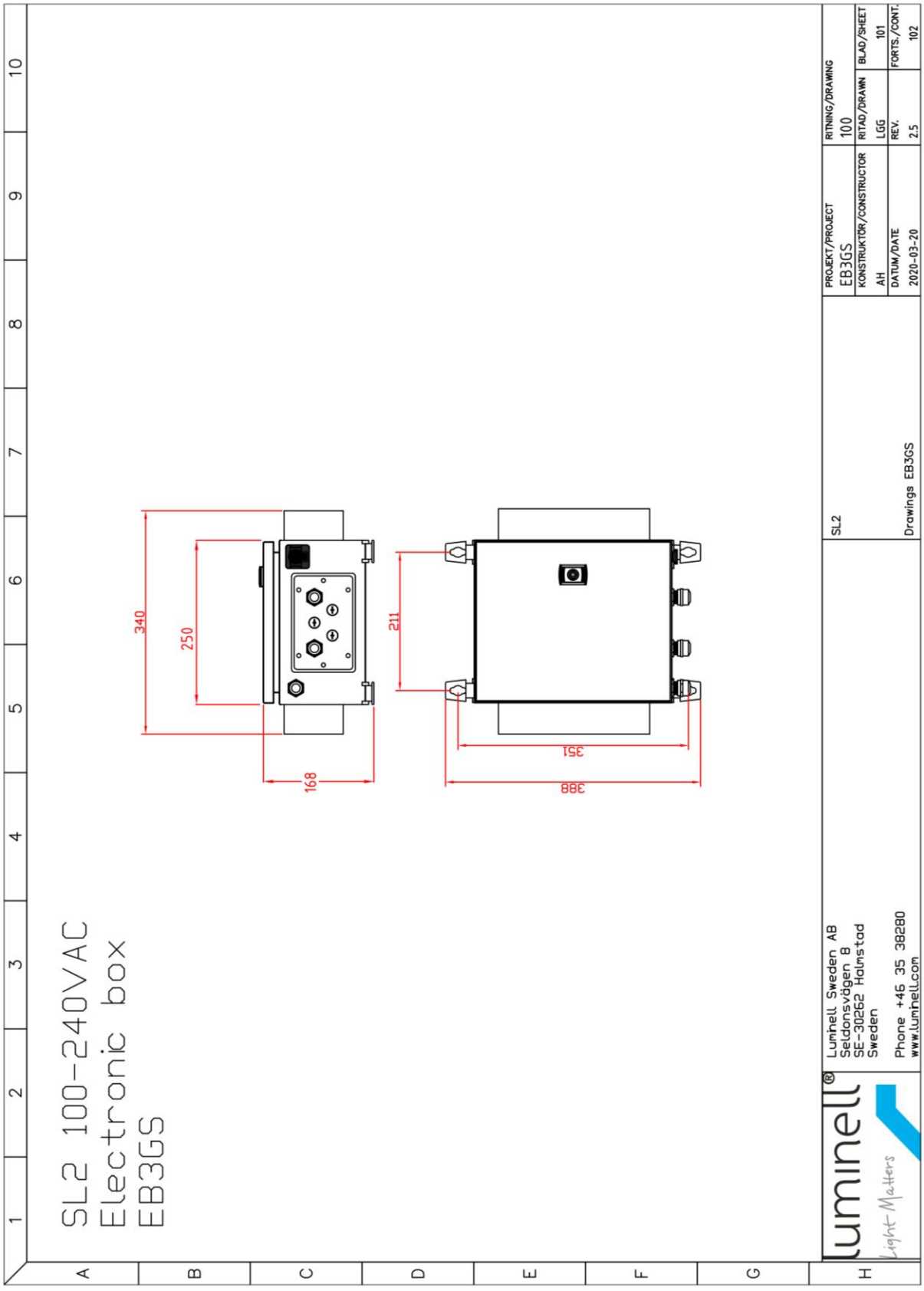
* Contact Luminell Sweden for details.

18.6 Mechanical drawings

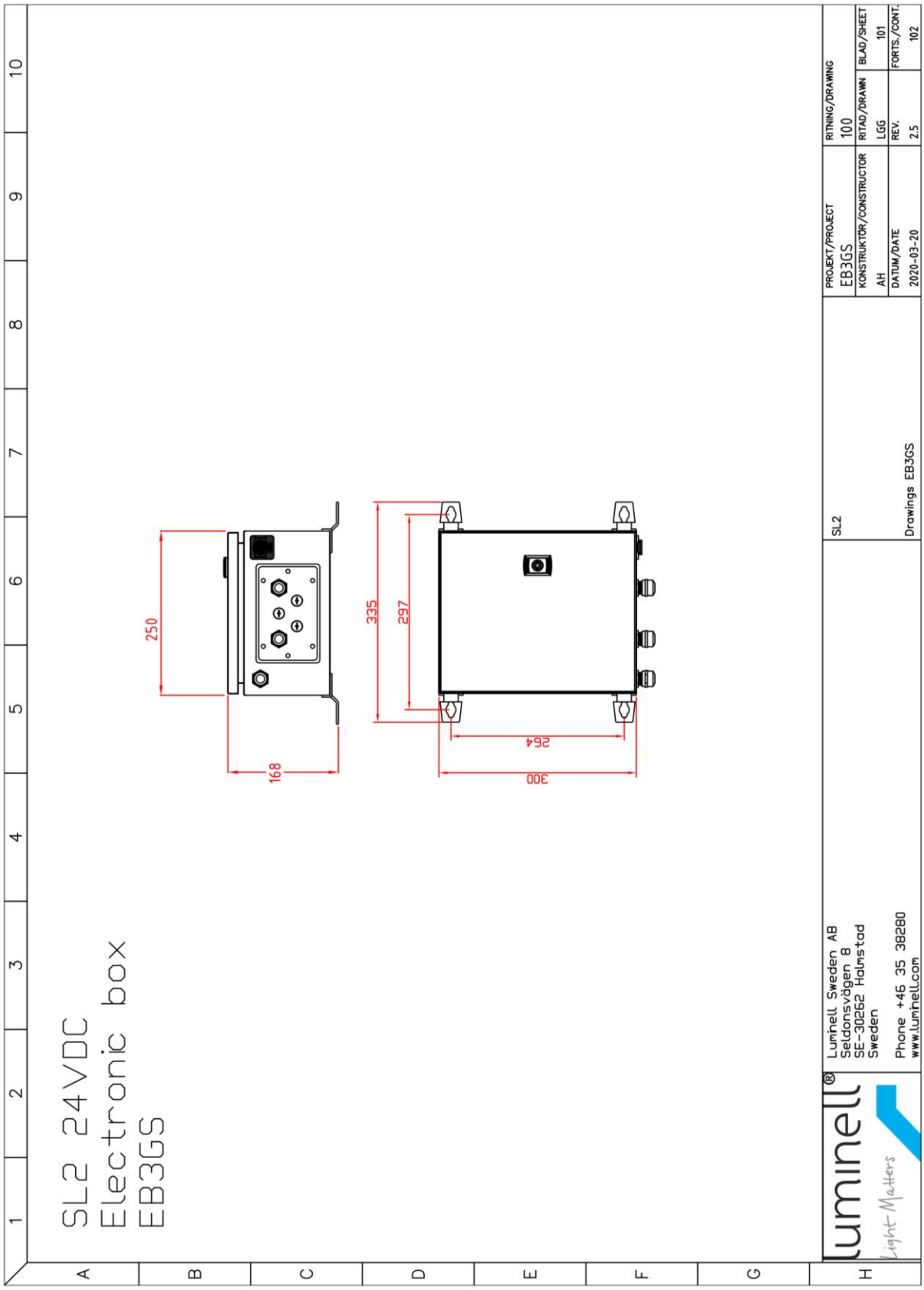
18.6.1 Operator Panel



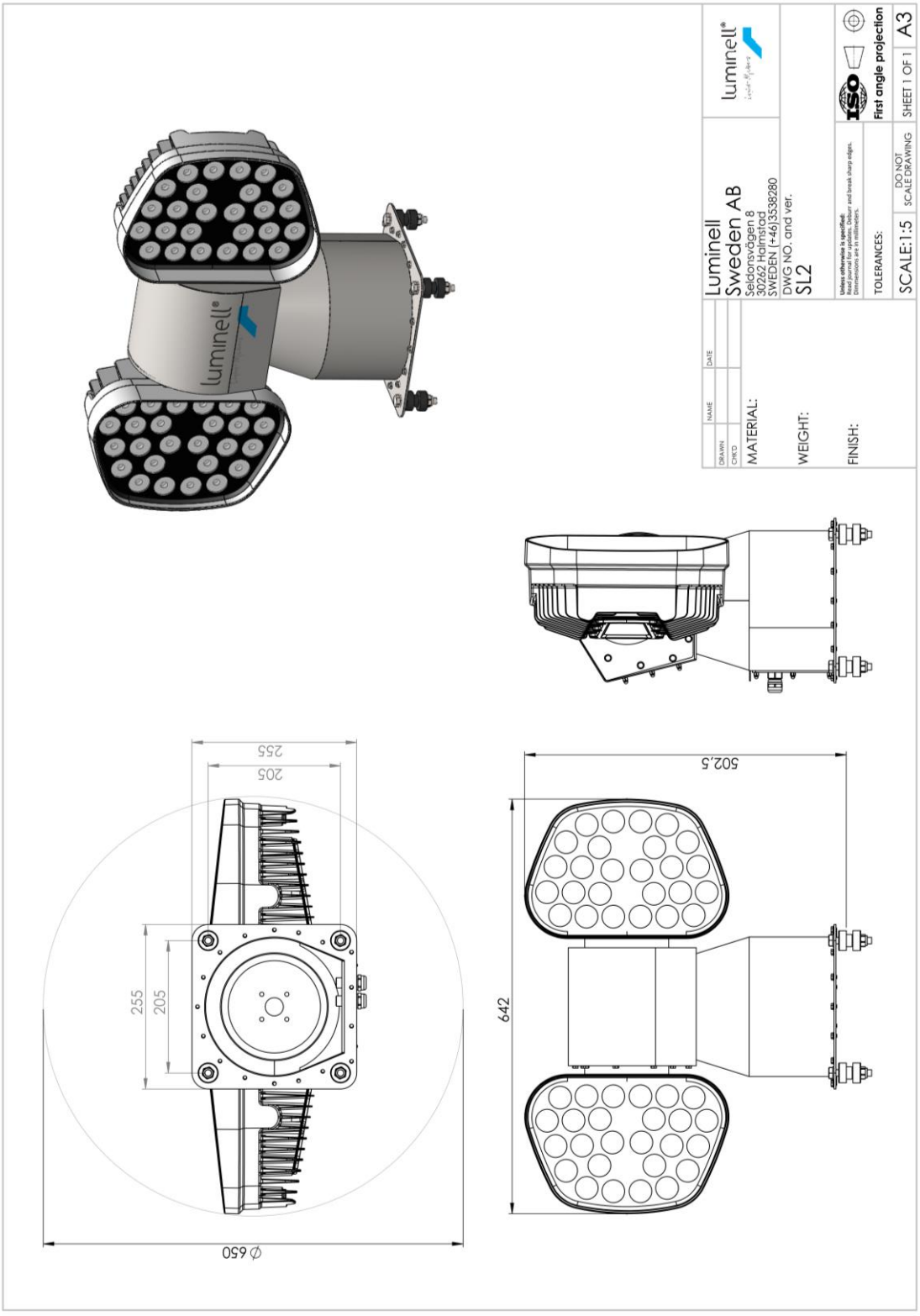
18.6.2 **Electrical box SL2, 100-240VAC**



18.6.3 **Electrical box SL2, 24VDC**

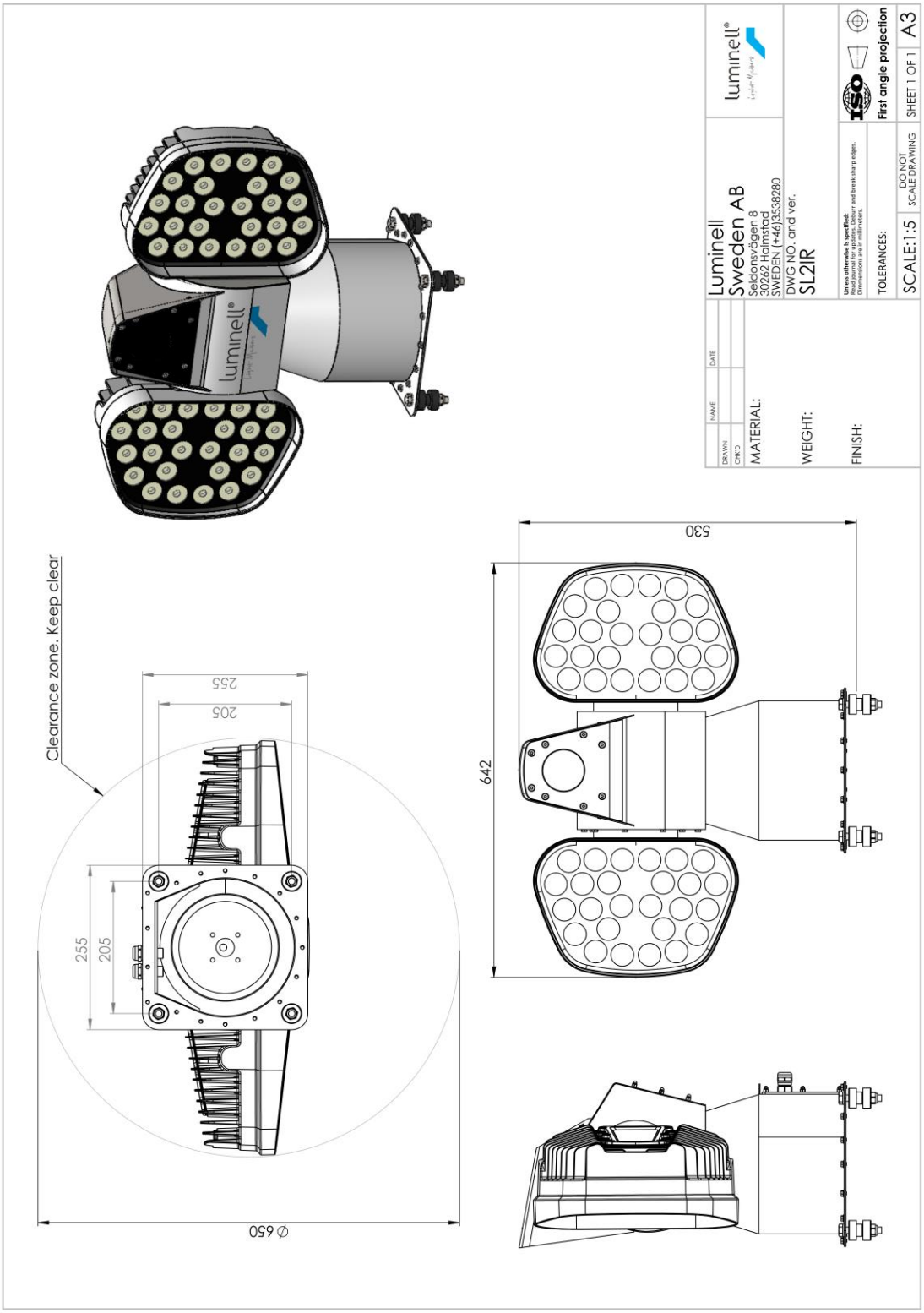


18.6.4 **Searchlight SL2 (standard)**



The searchlights cable glands are rated IP68 but for extra protection during heavy weather situations it's still recommendable to install the searchlight, so the cable exits are facing the stern.

18.6.5 **Searchlight SL2 IR (with camera)**



The searchlights cable glands are rated IP68 but for extra protection during heavy weather situations it's still recommendable to install the searchlight, so the cable exits are facing the stern.

19. SL2 SEARCHLIGHT WITH THERMAL CAMERA

19.1 Thermal camera introduction

SL2*IR*: Luminell searchlight with integrated Infra-red thermal camera.
The thermal night vision camera unit from FLIR® is placed in a robust, modern designed housing mounted on top of the searchlight middle part; this means that the camera always follows the searchlights horizontal movement from the joystick.
The thermal camera is mounted in a special tilt unit that make it easy to adjust the camera vertically from the operator panel.

The front is provided with a germanium window with an integrated temperature-controlled and self-regulating heating element, the element will prevent condensation and ice build-up on the front window that would otherwise disrupt the cameras line of sight.
The infrared thermal camera provides a clear picture based on temperature differences, even in total darkness. This is possible since the camera is sensitive to thermal infrared radiation.

By design, the camera image will freeze momentarily on a periodic basis, this can also be heard as quiet clicking noise from the camera housing.
A shutter activates inside the camera and provides a target of uniform temperature, allowing the camera to correct for ambient temperature changes and provide the best possible image.

General technical description of infrared imaging
All objects with a temperature over the absolute zero-point -273 C (0-degree K) generates infrared radiation. The hotter the temperature, the more infrared radiation.
The IR sensor also sense differences of the materials emissivity, reflection and transmission. Emissivity – the materials capability to emit infrared radiation. Reflection – the material capability to reflect infrared radiation. Transmission – the material capability of transmitting infrared radiation.

To keep it very simple
Materials with a temperature over -273 C will be detected by the thermal sensor and different materials with same temperature will appear different on the monitor due to the different properties in the materials.

Weak point with thermal sensor
Rain, fog, snow reduces the optical sight and it also effect the range of IR detection. Depending distance, size of object and level of temperature (IR radiation) there is no simple answer how much the detection range is affected – but it is affected.
A combined solution with thermal sensor and visible light will support your improved visibility depending the actual conditions during your operations.

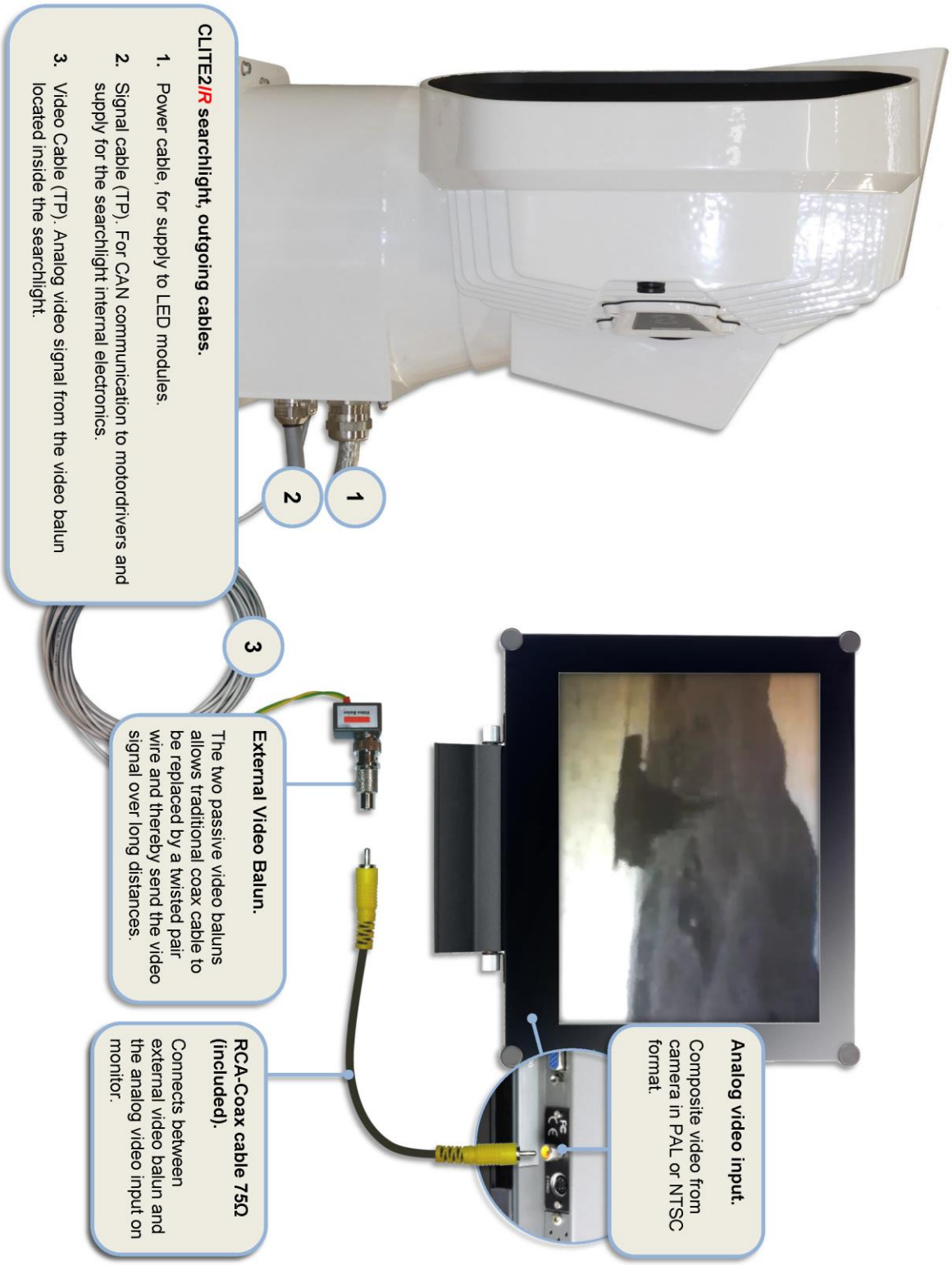
19.2 SL2IR additional Specifications

Thermal unit		
Camera core		
Camera core type	FLIR (uncooled longwave thermal imager)	
Lens	25mm	
Field of view	13x10 degrees	
Video output	Analog Channel Composite Video (Male RCA connector) PAL (Standard), NTSC. To change the video standard, see section 21. SET CAMERA VIDEO FORMAT STANDARD	
Camera type	FLIR Tau 2, 336	FLIR Tau 2, 640
Detector resolution	336x256, 17µm	640 × 512, 17µm
Field of view (h × v)	13° × 10°	25° × 20°
Detection man/vessel	820m / 2200m	
Detection man/vessel	210m / 580m	
Recognition man/vessel	104m / 290m	
Video resolution	640 × 480 (NTSC); 640 × 512 (PAL)*1	
Refresh rate	25 Hz (PAL), 30 Hz (NTSC)	
Mechanical		
Technology	Menu controlled tilt function	
Horizontal movement	Unlimited movement together with searchlight	
Vertical movement	+/- 20 degrees	
Speed horizontal movement	See information on each searchlight model	
Functions, menu controlled from panel		
Camera power	On/Off	
Tilt function	Up/Down with graphical indicator	
Focus	- X2 - -X4 - -X8 (640 only)	
Color palettes	- White Hot - Black Hot - Fusion - Rainbow - Glowbow - Ironbow 1 - Ironbow 2 - Sepia - Color 1 - Color 2 - Ice Fire - Rain	

*1 Tau 336 analog video is upsampled & interpolated to 640 × 480 for NTSC, and to 640 × 512 for PAL

<table>
<tr><th colspan="2">Spec - Front window heater/ Deicer</th></tr>
<tr><td>Type</td><td>Etched Polyimide foil heater with temperature controller</td></tr>
<tr><td>Rated Power</td><td>~10W</td></tr>
<tr><td>Supply</td><td>24Vdc supplied from electric box</td></tr>
<tr><td>Switch-on temperature</td><td>+12C or bellow</td></tr>
<tr><th colspan="2">Materials & Colors</th></tr>
<tr><td>Material housing</td><td>Acid proof stainless steel 1.4401</td></tr>
<tr><td>Paint housing</td><td>- Powder coat White RAL 9016, gloss 70
- Powder coat grey RAL 7035, gloss 20
Powder coat black RAL 9005, gloss 20</td></tr>
<tr><td>Front window material</td><td>Germanium</td></tr>
<tr><th colspan="2">Environmental - Camera housing</th></tr>
<tr><td>Operating ambient temperature</td><td>-40ºC to +55ºC</td></tr>
<tr><td>Storage temperature</td><td>-25°C to +70°C</td></tr>
<tr><td>IP class</td><td>IP66</td></tr>
<tr><td>Thermal Shock</td><td>No damage or permanent degradation after extreme thermal shock from one extreme of the operating temperature range to the other.</td></tr>
<tr><td>Mechanical Shock</td><td>No damage or permanent degradation after exposure to shock pulses of 250 g (1.5msec half-sine) and 500g (0.8msec half sine) along any axis.</td></tr>
<tr><td>Vibration</td><td>Meets all requirements of this specification and exhibits no damage or permanent degradation after exposure to random vibration along any axis up to 4.3 grms per the profile specified below.
<table>
<tr><th>Frequency (Hz)</th><th>Acceleration Density (G2/Hz)</th></tr>
<tr><td>10</td><td>0.040</td></tr>
<tr><td>20</td><td>0.100</td></tr>
<tr><td>100</td><td>0.100</td></tr>
<tr><td>800</td><td>0.002</td></tr>
<tr><td>1000</td><td>0.002</td></tr>
</table></td></tr>
<tr><td>Altitude</td><td>Meets all requirements of this specification and exhibits no damage or permanent degradation after exposure to pressure equivalent to 12 km above sea level.</td></tr>
</table>

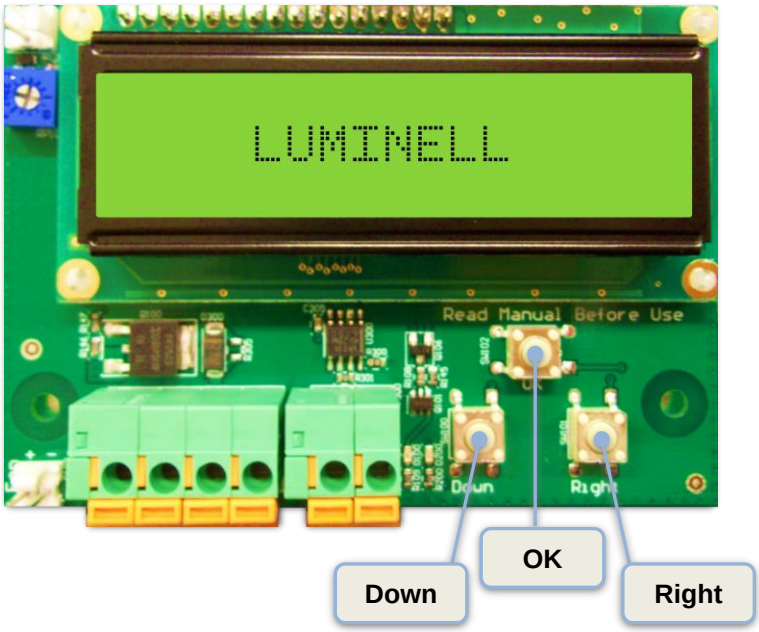
20. SL2*IR* - *VIDEO* CONNECTION



21. SET CAMERA VIDEO FORMAT STANDARD

This chapter describes how to configure the cabinet control-system to change the video format during camera startup.
The video standard is NTSC for the United States, Canada, Mexico, Asia and South America. PAL is used primarily in Europe.
The unit is usually configured with video output set as PAL as standard setting.
Change of video standard requires that you enter the system's “Factory setup”-menu.

Note: navigation in “Factory setup”-menu should be done with extreme caution as incorrect settings can change the searchlight behavior and make features unusable.



21.1 Menu navigation

The user interacts with the menu system using the three buttons, the “**Down**” button, the “**Right**” button and the “**OK**” button.

21.1.1 Down Button

The main function of the “**Down**” button is to shift between the menu categories. It also has two alternate generic functions.
1. While in submenus listing items of various types the “**Down**” button scrolls down in the list.
2. While entering a value of some sort, the “**Down**” button decrements that value.

21.1.2 Right Button

The main function of the “**Right**” button is to shift between the submenus of the selected menu category. It also has two alternate generic functions.
1. While in submenus listing items of various types the “**Right**” button scrolls up in the list.
2. While entering a value of some sort, the “**Right**” button increments that value.

21.1.3 OK Button

The “**OK**” button enters and exits submenus.

21.2 Factory setup, how to change between PAL and NTSC.

In the systems hidden installation menu, named "Factory setup" it is possible to choose between the two different video standards. Your monitor may be compatible with only NTSC or only PAL or both. See your product manual for detailed info.
Follow these steps to boot the system in “Factory Setup”-mode.

1. If the system is powered up, turn it off by turning the main switch to "**0**".



2. Press all three buttons on cabinet card while turning the main switch to "**1**", keep pressing until the text "**Factory Setup**" appears on the display.



3. Repeatedly press the “**Right**” button until the submenu "**0.9 Set Camera**" appears in the display. Press the “**OK**” button to enter this menu.



4. With the “**Right**” button you can step through the following settings:

- **Camera Off**: disables the possibilities to control the camera from the operator panel, **do not select this if you have a SL-IR unit.**
- **Camera PAL**: Sets video output to PAL (25Hz) when cam is activated.
- **Camera NTSC**: Sets video output to NTSC (30Hz) when cam is activated.

When preferred setting is displayed, Press “**OK**” to save, submenu "**0.9 Set Camera**" is shown.

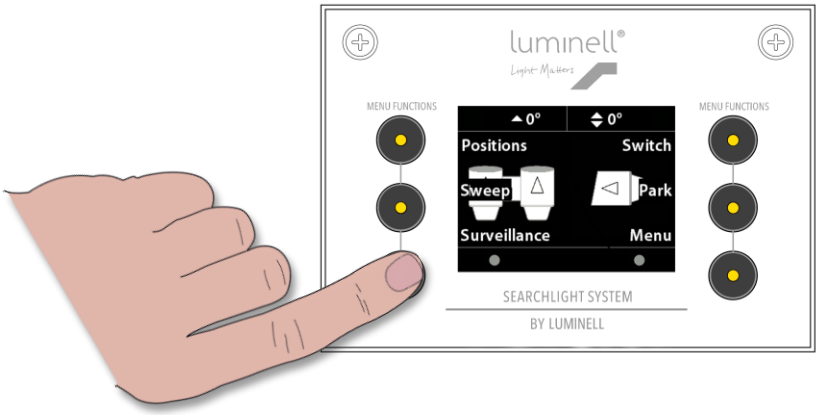
5. Now press the “**Down**” button once, menu "**1. About**" appears in the display.
6. Setup complete, recycle power on main switch.

22. USING THE THERMAL CAMERA IN CAM MODE

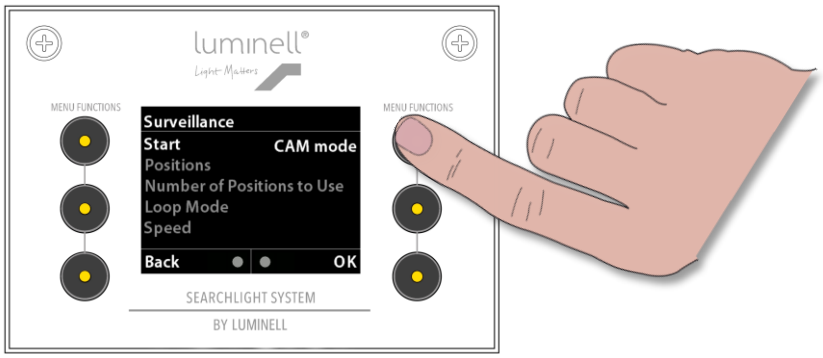
22.1 Activate the thermal camera

Note:

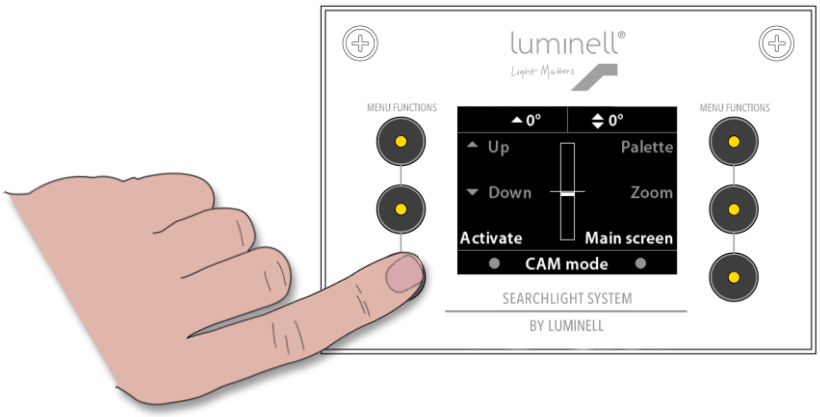
- Make sure your monitor is powered on before activating the camera.
- Activation takes a few seconds, don't press any cam-buttons until the image is visible in the monitor.
- During each camera-activation, configuration data is sent to the camera and the image will flash for a second and then become stable, this is a completely normal start-up phase for the camera.
- Changes in CAM mode takes effect immediately and does not require confirmation.
- Camera settings can only be accessed if camera is activated.
- Activation must be done from the CAM-mode screen.
- Activated camera is indicated by the letter "**C**" in the bottom left of the display.



To activate the camera, first select "**Surveillance**" from the quick start menu.



In "Surveillance" submenu, select "**CAM mode**".



By pressing "**Activate**" the thermal camera is powered up and the video signal is sent to the monitor. All camera settings will change from grey to white text and be selectable, see description below. A second press on the same button turns the camera off.

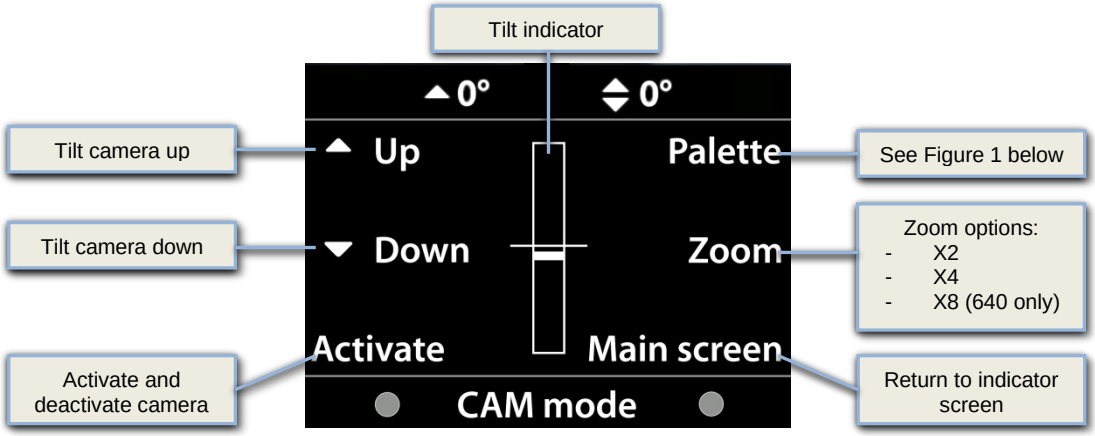
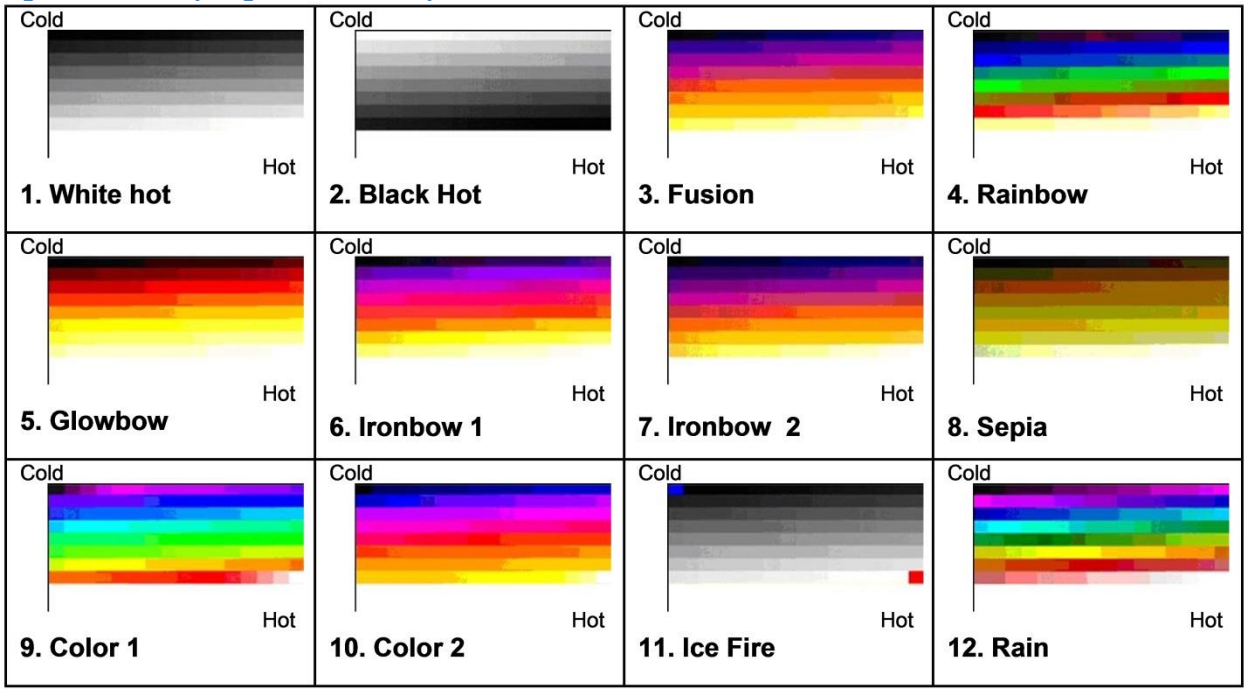


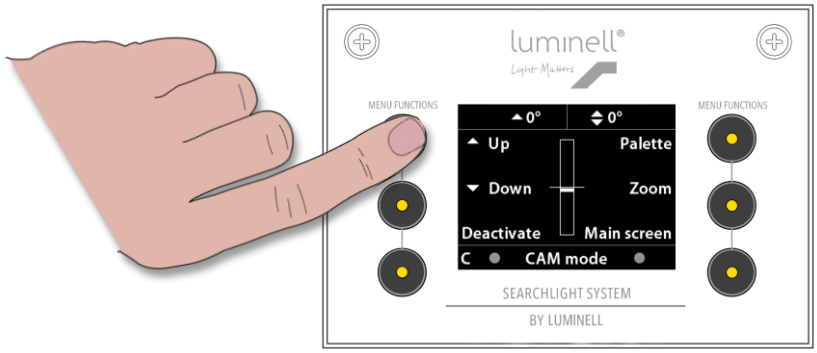
Figure 1 Palette. (Image source FLIR®)



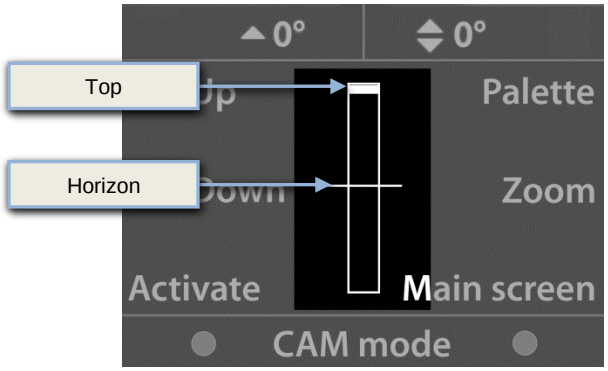
22.2 Camera tilt

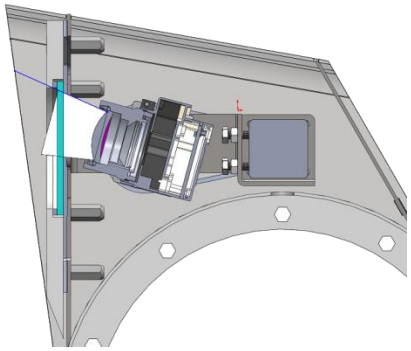
The camera tilt angle is adjustable + / - 20 degrees by the mechanical mounting in a software-controlled tilting unit.

22.2.1 Tilt up



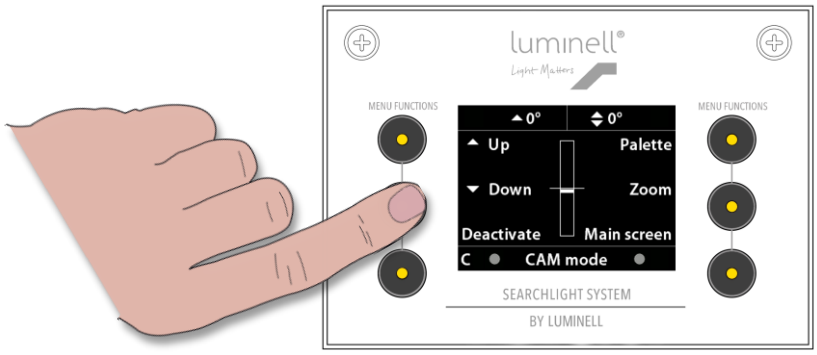
In “**CAM mode**”, press "**Up**”-button repeatedly to adjust the camera view angle upwards.



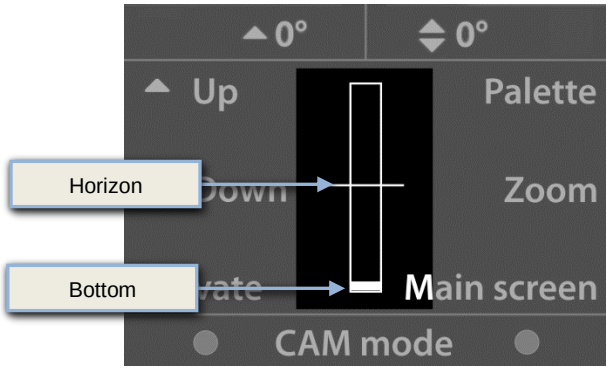


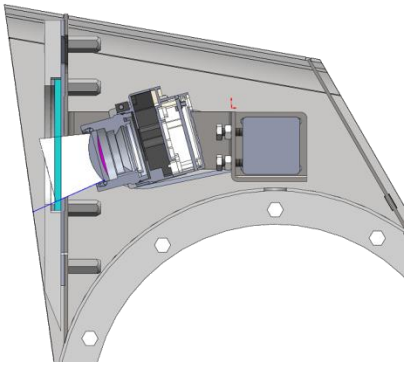
The camera will tilt upward in steps until the end position is reached, the tilt indicator will follow the camera movement.
Press the button repeatedly until the preferred tilt angle is found, the setting is saved as default and in the event of power failure, the camera will go directly to this position.

22.2.2 **Tilt down**



In “**CAM mode**”, press "**Down**”-button repeatedly to adjust the camera tilt angle downwards.





The camera will tilt downwards in steps until the end position is reached, the tilt indicator will follow the camera movement.
Press the button repeatedly until the preferred tilt angle is found, the setting is saved as default and in the event of power failure, the camera will go directly to this position.

22.3 Spot meter

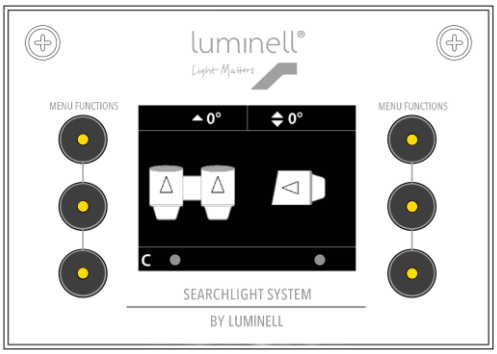
In the center of the screen, an onscreen pixel area acts as a tool for measuring temperatures.



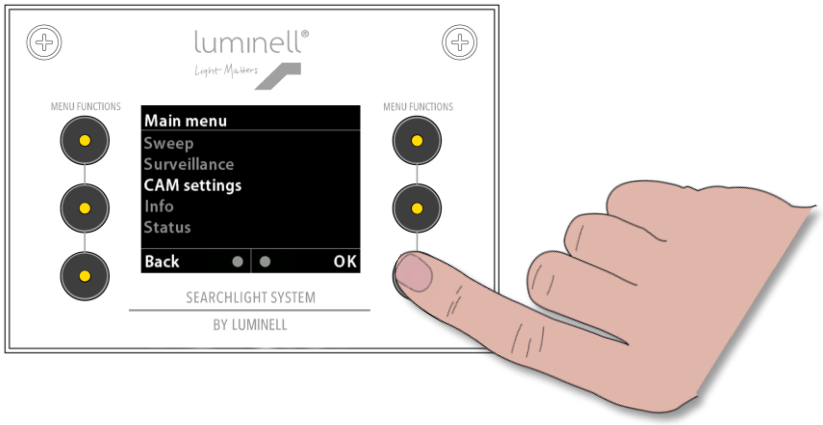
Center this area over an object to measure; the temperature is displayed in the lower left corner of the screen.

23. MENU – CAMERA SETTINGS

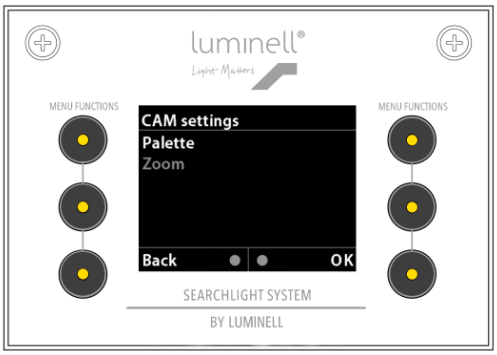
The camera settings “**Zoom**” and “**Palette**” can be accessed in two ways; either you set them directly from **CAM mode**-screen described in chapter *22* or by selecting “**CAM settings**” in the main menu.



The basic camera settings can only be accessed if the camera is activated. Activated camera is indicated by the letter “**C”** in bottom left of the display.
If the menu rows are dimmed the camera must first be activated before changes can be made please see *22.1 Activate the thermal camera.*



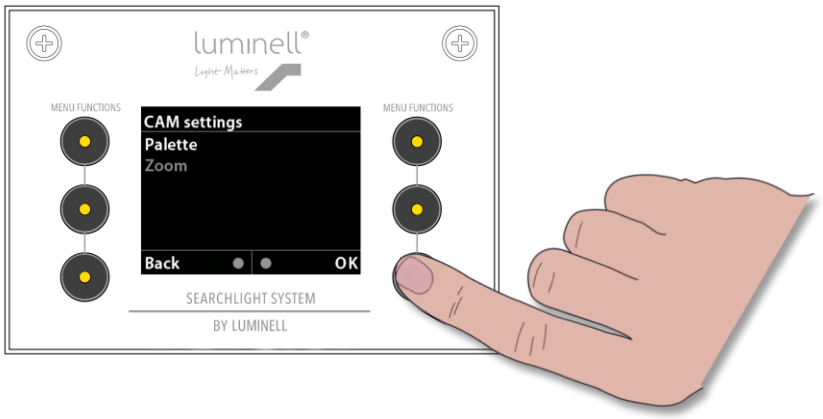
Navigate down to “**CAM settings**” and press “**OK**”.



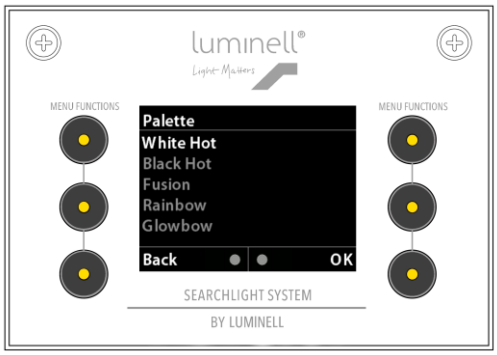
Basic camera settings.

23.1 Palette

The camera settings “**Zoom**” and “**Palette**” can be accessed in two ways, either you can set them by selecting “**Cam settings**” in the main menu or you can use the “**CAM mode**” which is an active cam screen where all our camera functions can be easily accessed and where the changes requires no confirmation.



In “**CAM settings**”-menu, navigate to palette and press “**OK**”.



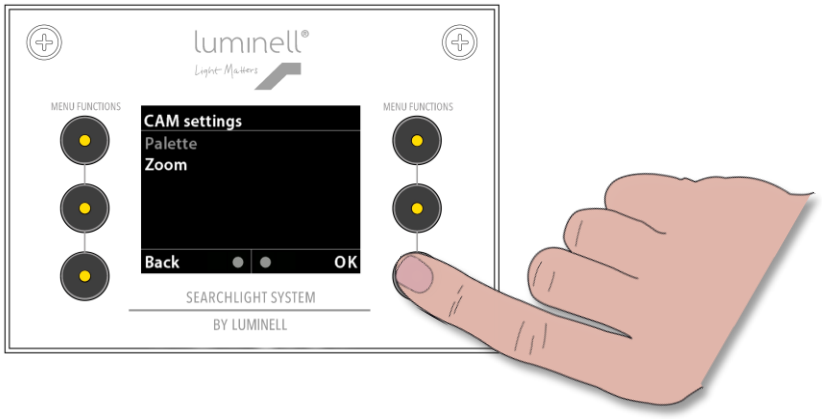
Unlike settings in CAM mode, one can in this menu see what color palette that is selected. Change the setting by moving the joystick up or down in the list until the requested palette is shown. For evaluation, all changes take effect immediately on the monitor.

Press “**OK**” to save the new setting or “**Back**” to return to previous selected palette.

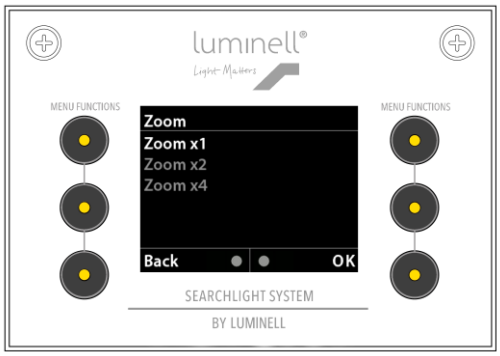
The following color palettes are available (also see Figure1: Palette):

1. **White Hot**	7. **Ironbow 2**
2. **Black Hot**	8. **Sepia**
3. **Fusion**	9. **Color 1**
4. **Rainbow**	10. **Color 2**
5. **Glowbow**	11. **Ice Fire**
6. **Ironbow 1**	12. **Rain**

23.2 **Zoom**



In “**CAM settings**”-menu, navigate to “**Zoom**” and press “**OK**”.

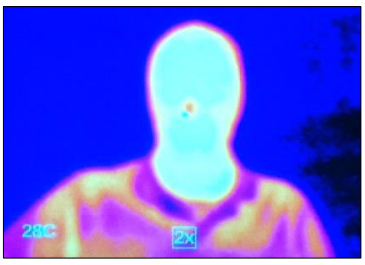


Change the image magnification by moving the joystick up or down in the list until the requested zoom setting is shown. For evaluation, all changes take effect immediately on the monitor. Press “**OK**” to save the new setting or “**Back**” to return to previous selected zoom level.

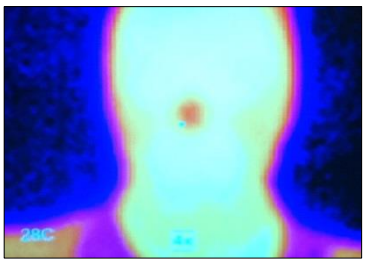
X1 – Normal mode, no magnification.
X2 - Digital zoom - x2 magnification.
X4 - Digital zoom – x4 magnification.
X8 - Digital zoom – x8 magnification (only available for 640 cameras)



X1



X2



X4

24. SUPPORT

If you have questions about the sales related topics, please contact Glamox sales support worldwide, see www.glamox.com/global-marine/contact/ for contact details.

For searchlight service or technical questions contact Luminell head office:

Luminell Sweden AB
Service & Technical Support
service.sweden@glamox.com
Phone: +46 35 38280

If you want to upgrade your system with additional options as described in this document, section (16.8.5.7), please contact:

Luminell Sweden AB
Phone: +46 35 38280
www.glamox.com
www.glamox.com/global-marine/contact/

Delivery address:

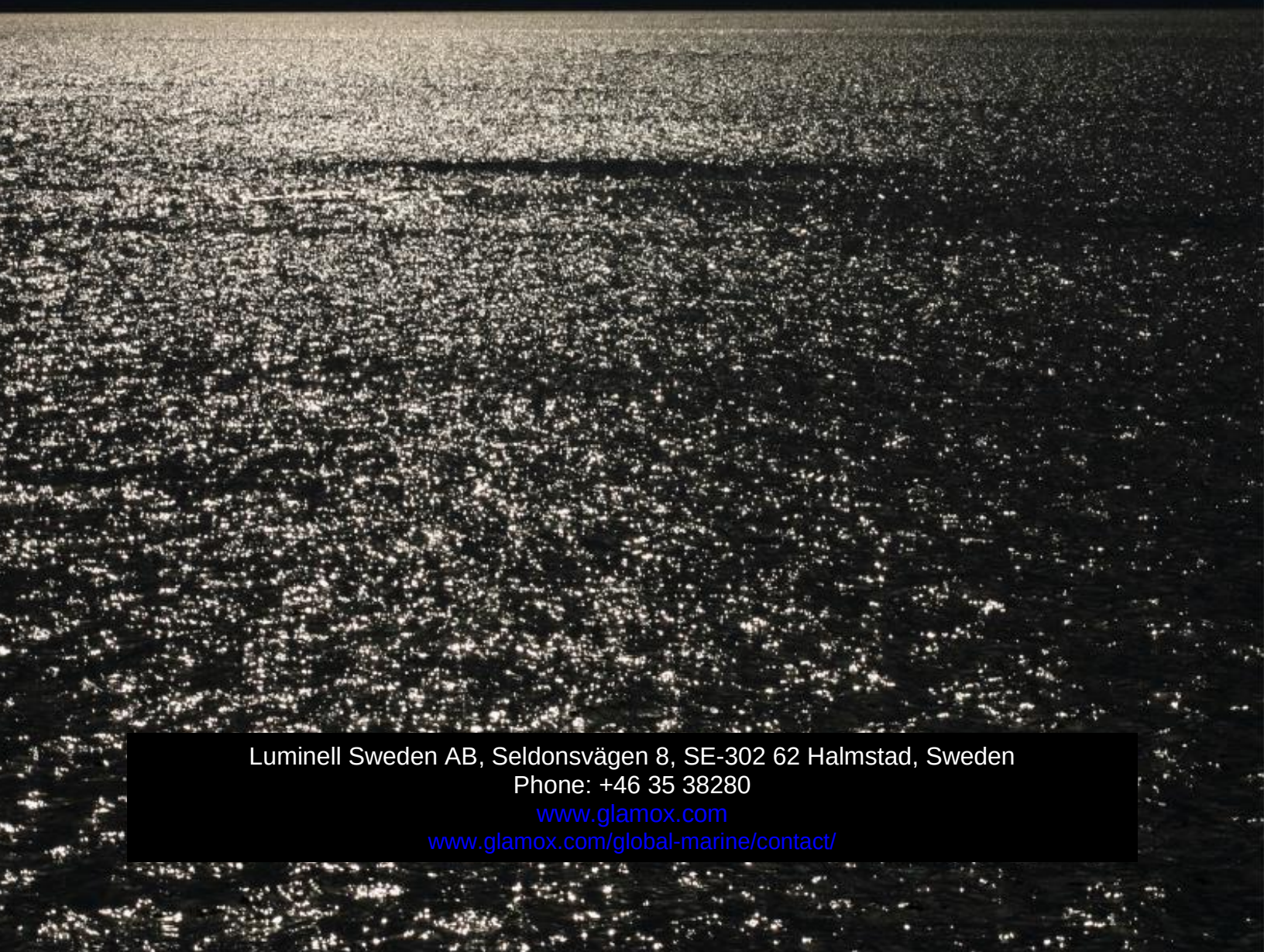
Luminell Sweden AB
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Notes:

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Light Matters

SL2



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