OBELUX HID SERIES MANUAL

High-intensity aviation obstruction light

ICAO/Trafi High Intensity 50,000 cd white

ICAO Medium Intensity Type B/C 2,000 cd red

Changelog

Version	Date:	Description:	Author
0.1	23.04.2020	Document created	JSi
0.2	30.04.2020	Release for internal review	JSi

Acronyms and abbreviations

CCV	Cold climate version
cd	candela
DIP	Dual in line package
FPM	Flashes Per Minute
GPS	Global Positioning System
HI	High intensity
ICAO	International Civil Aviation Organization
IR	infrared
NVG	Night Vision Goggle
PC	photocell
PCB	Printed circuit board
Trafi	Finnish Civil Aviation Authority

CONTENTS

1 ABOUT THIS PRODUCT

Obelux HID series obstruction lights provide 50,000 white and 2,000 cd red (ICAO Medium-Intensity Type B/C) light. Some models also feature Night Vision Goggle (NVG) compliant infrared light (850nm). All models have built-in fault monitoring and GPS synchronization.

The HID series lights support both Stand-alone and Modbus operation. In Stand-alone mode, no external controllers are required to run the product. In most use cases, mounting the standalone aviation obstruction light and connecting power supply cable are the only actions needed to operate the light. In Modbus operation, the light is controlled with an Obelux controller as a part of an aviation light system.

The models come with built-in photocell that can drive the transitions between day, twilight and night modes. The operation of the light is based on an embedded microcontroller on the lights main circuit board.

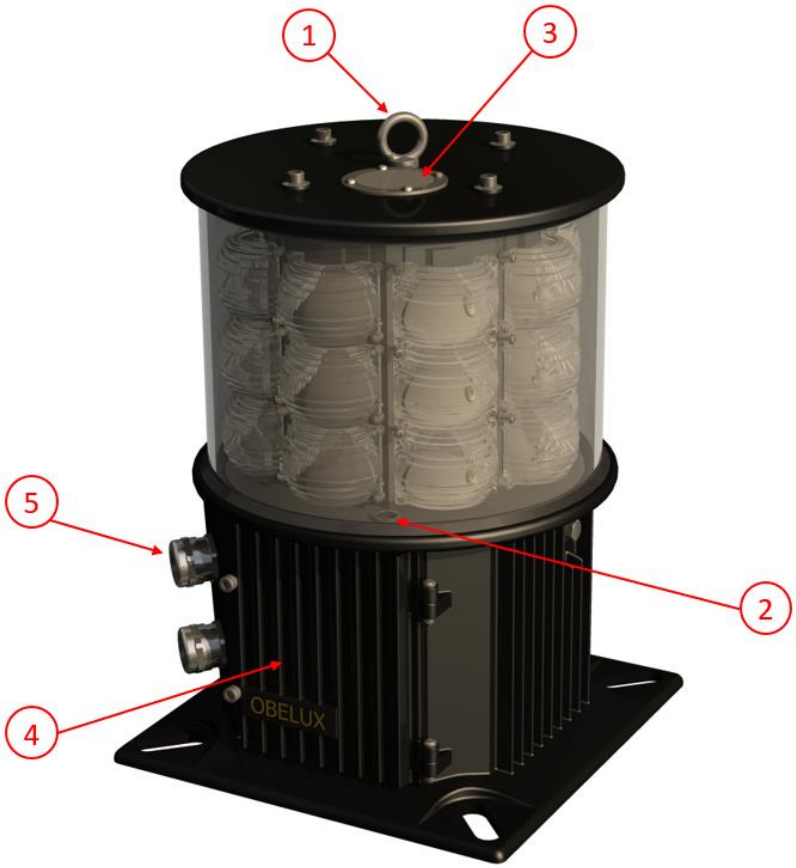


Figure 1: Main functional parts

1. Lug (for lifting the light)
2. Spirit level (for levelling the light during installation)
3. Location of photocell
4. Service access door
5. Cable glands

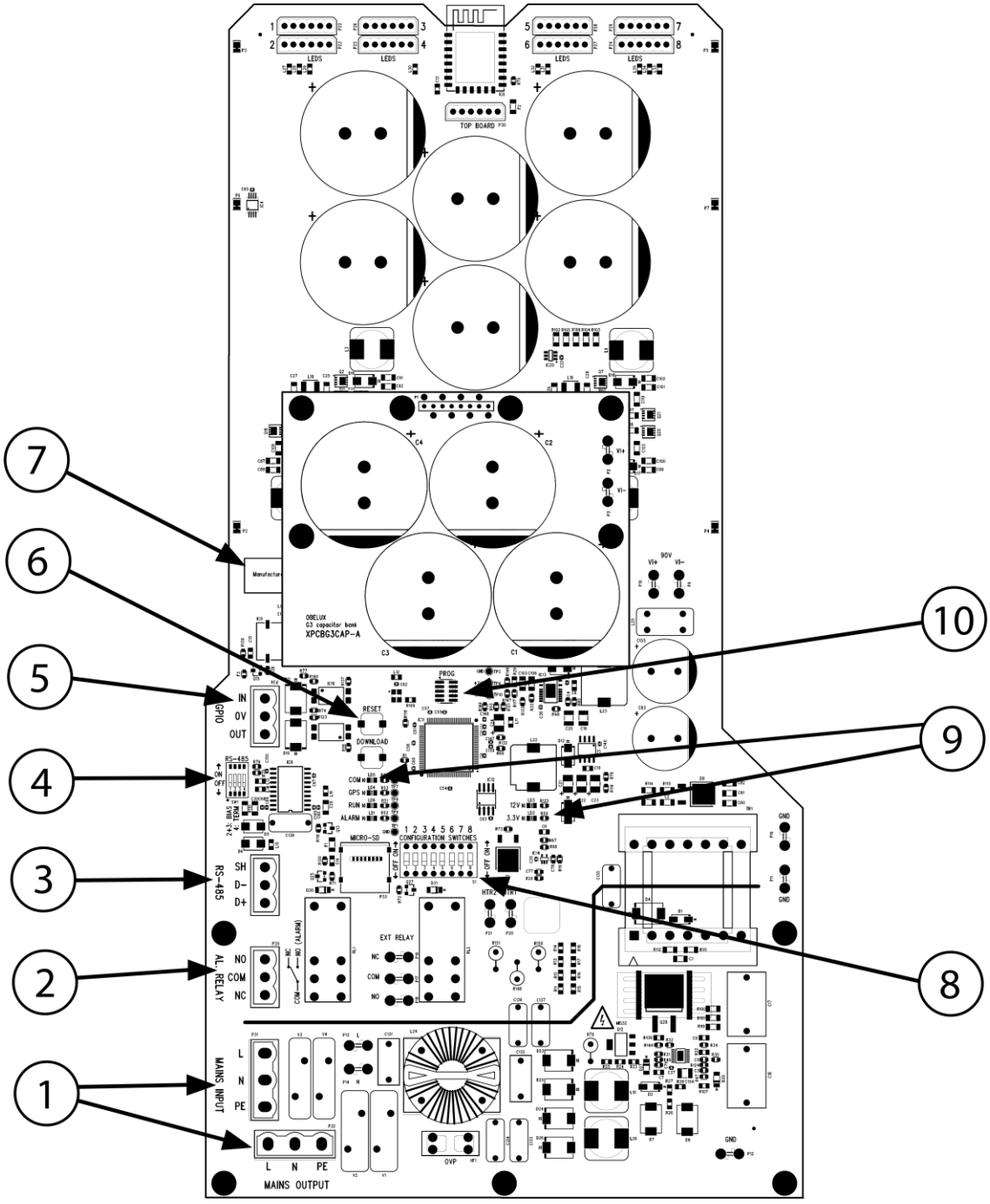


Figure 2: Controller board

1. Mains power supply connectors (AC version)
2. Alarm relay connector
3. Communications network connector (RS-485/Modbus)
4. RS-485 termination DIP switch (DIP4)
5. External signal input connector (GPIO)
6. Reset button
7. Software version label
8. Configuration DIP switches
9. Status LEDs
10. Programming terminal

1.1 Versions

Obelux HID series is available as the following models:

Order code	Output	ICAO	Operating voltage	GPS	IR	CCV	PC and fault monitoring	Packing dimensions and weight
HID-ACWGAM	50,000cd	HI + Type B/C	90-265VAC	Yes	No	No	Yes	460x330x330mm, 15,5kg
HID-ACWIRGAM	50,000cd	HI + Type B/C	90-265VAC	Yes	Yes	No	Yes	460x330x330mm, 15,5kg
HID-ACWCCVGAM	50,000cd	HI + Type B/C	90-265VAC	Yes	No	Yes	Yes	460x330x330mm, 15,5kg
HID-ACWCCVIRGAM	50,000cd	HI + Type B/C	90-265VAC	Yes	Yes	Yes	Yes	460x330x330mm, 15,5kg
HID-DCGAM	50,000cd	HI + Type B/C	20-60VDC	Yes	No	No	Yes	460x330x330mm, 15,5kg
HID-DCIRGAM	50,000cd	HI + Type B/C	20-60VDC	Yes	Yes	No	Yes	460x330x330mm, 15,5kg
HID-DCCCVGAM	50,000cd	HI + Type B/C	20-60VDC	Yes	No	Yes	Yes	460x330x330mm, 15,5kg
HID-DCCCVIRGAM	50,000cd	HI + Type B/C	20-60VDC	Yes	Yes	Yes	Yes	460x330x330mm, 15,5kg

2 SAFETY INSTRUCTIONS

In this section, you will find general safety instruction for the device. Please read the instructions carefully before installing or using the device to avoid any personal, environmental or material damages.

2.1 General considerations

Install device observing manufactures installation guide.
Use only cables and connectors specified by the manufacturer.
Keep your device away from heat sources, dust, smoke or other harmful substances.
Do not add or remove any components inside the device unless otherwise approved by the manufacturer.
Do not spill food or other liquids on device.
If you have any error situation with the device, do not try to fix it by yourself, contact your reseller.

2.2 Environmental considerations

The European Parliament and the Council of European Union issued directive 2012/19/EU to contribute to sustainable production and consumption by, as a first priority, the prevention of WEEE and, in addition, by the re-use, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste and to contribute to the efficient use of resources and the retrieval of valuable secondary raw materials.

Obelux aviation obstacle light products sold inside European Union can be returned to manufacturer if no local WEEE separate collection and re-use services are available. Please contact Obelux for details.

Obelux does not refurbish returned items but forwards them to authorized WEEE treatment facility.

2.3 Personal considerations

HIGH VOLTAGE! Device contains high voltage which is very dangerous; do not try to service the device when it is powered on.

Obelux aviation obstruction lights are Class 2M LED devices. This class is safe for accidental viewing under all operating conditions. However, it may not be eye-safe for a person who deliberately stares into the LED beam by overcoming their natural aversion response to the very bright light.

3 INSTALLATION

3.1 Device installation

Mount the obstruction light to selected mounting point using quality-made fasteners. This aviation obstruction light comes with four bolt holes to mount this product securely. One of the mounting points is not painted. This mounting point can be used as additional grounding. Level the light using spirit level (bubble level), if the mounting point is not already levelled. Tighten nuts and bolts. Obelux recommends 100 Nm tightening torque for M12 hot-dipped 8.8 bolts with a suitable washer between bolts and mounting plate. When the service access door is open, check that there is no inflow of water (incl. hail and snow) into aviation obstacle light. Photocell is located on top of the light. Photocell should have an uninterrupted view of the sky to work correctly. All dimensions are in millimetres (mm).

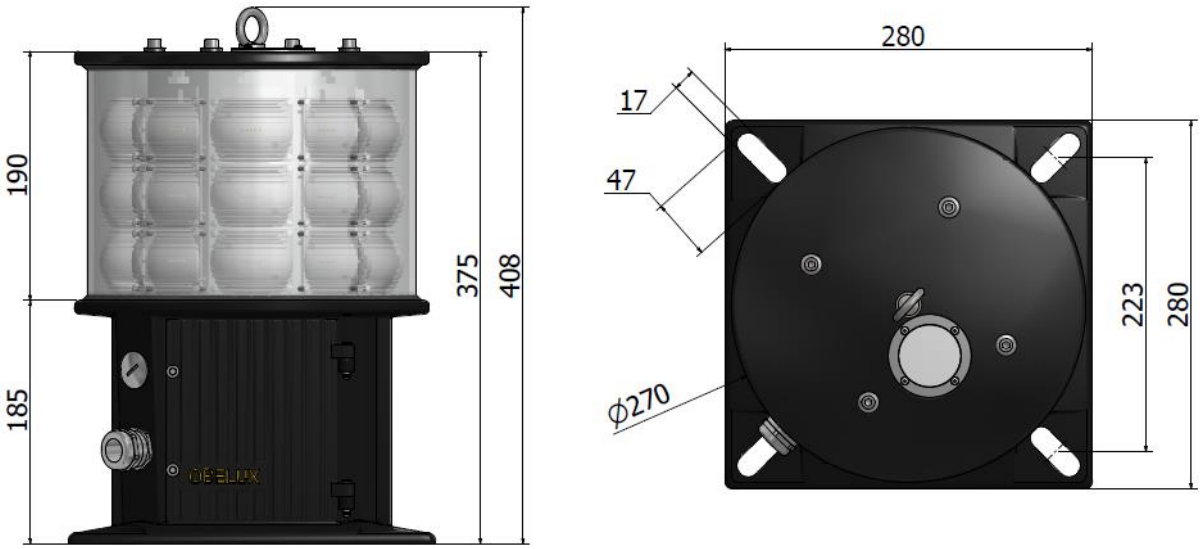


Figure 3: Dimensions

3.2 Wiring

Route cables using cable glands on side of the light head. Connect the cable wires securely to appropriate terminal block connectors. Connectors can be disconnected from the terminals on the main circuit board for easier access. Second row of terminals in the Alarm relay / RS-485 connector can be used to distribute alarm and data signals to next light head.

Mains Power **Alarm relay / RS-485 data**

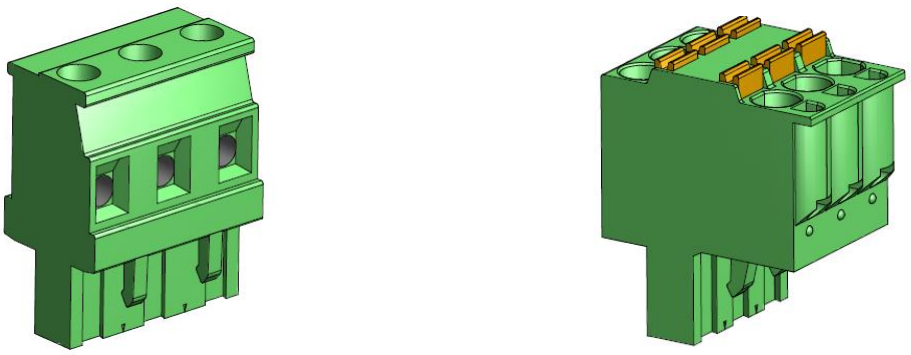


Figure 4: Terminal block connectors

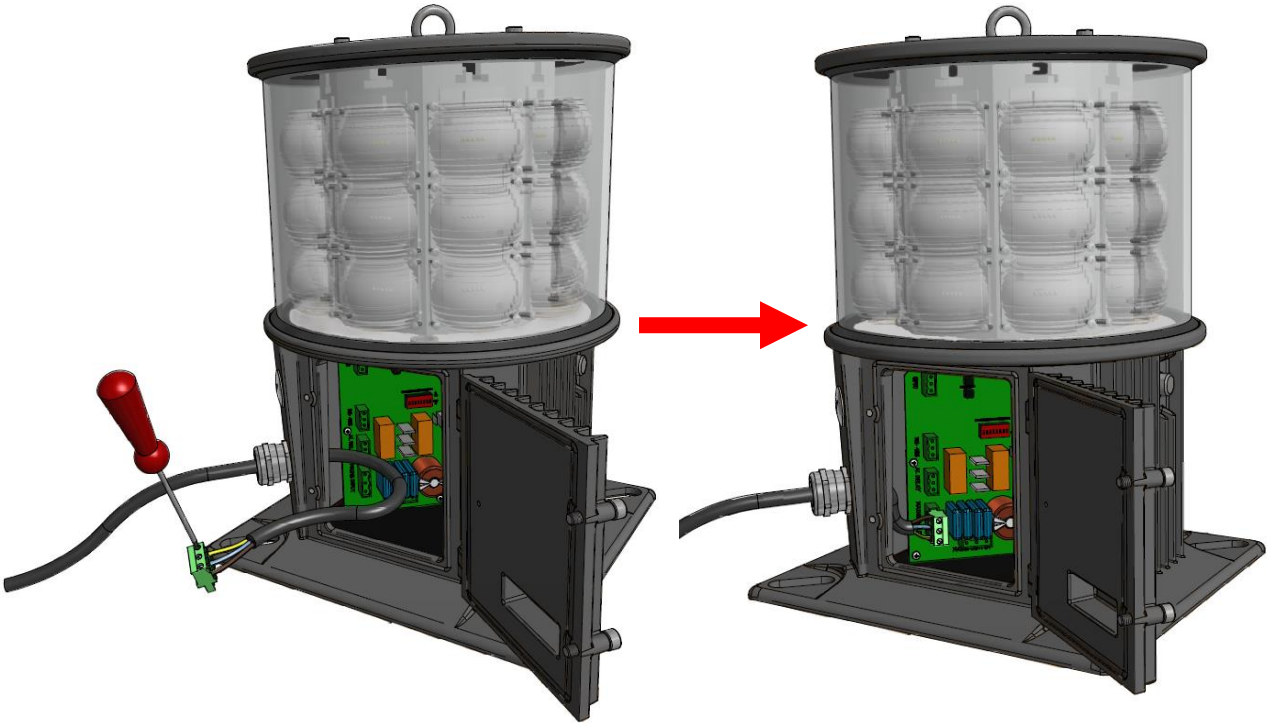


Figure 5: Wiring the Mains Input

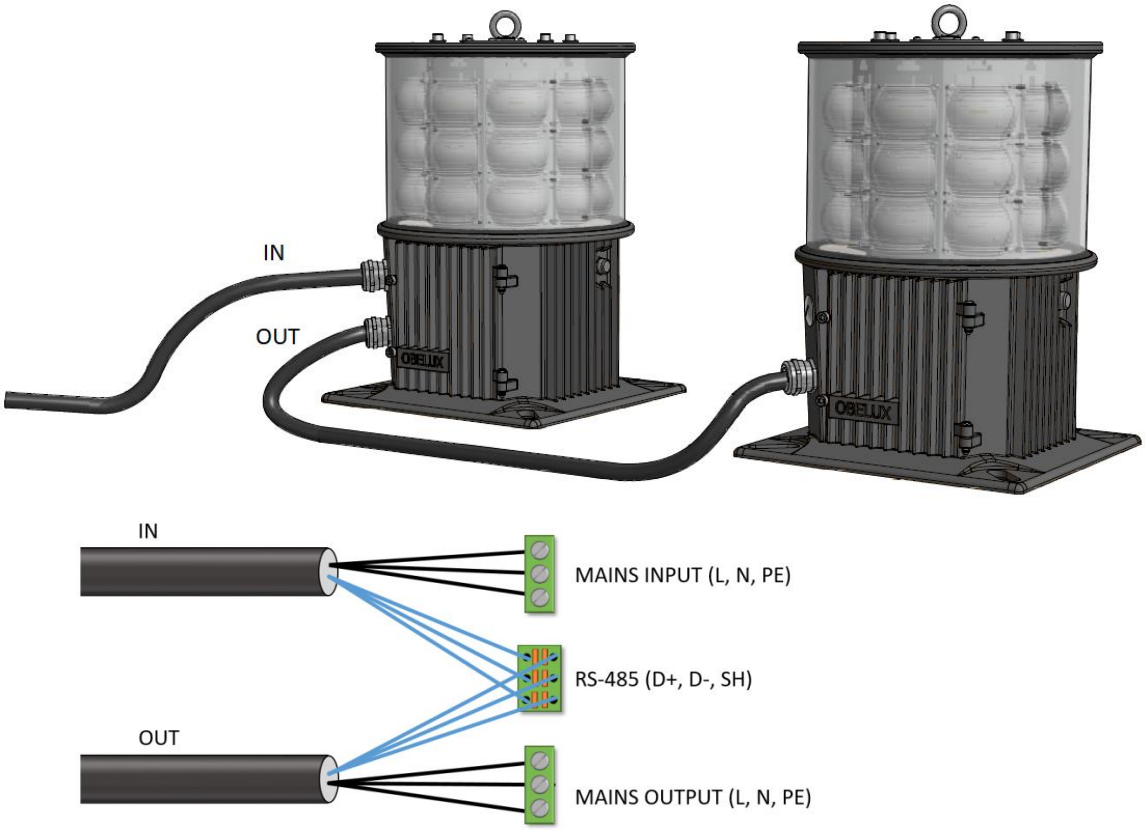


Figure 6: Distributing power and data to next light head

Make sure that all unused cable glands or gland holes are sealed. There are two cable glands on the light.

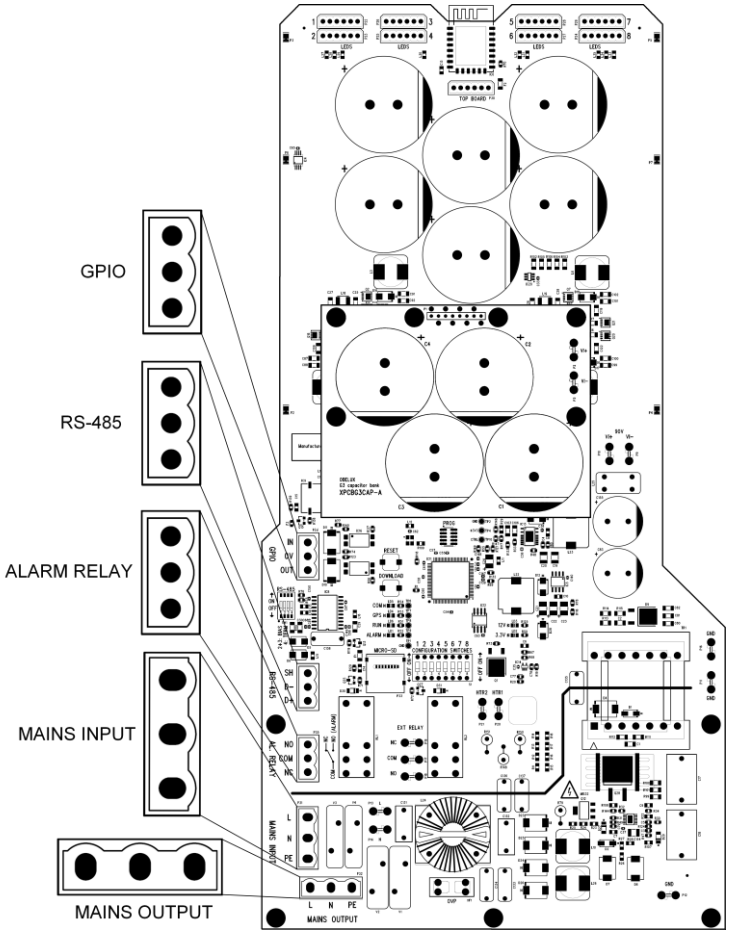


Figure 7: Light head terminals

3.2.1 Mains input (AC versions)

Mark	Description	Information
L	Live terminal	Connect the mains power supply Live (brown) wire into this pole.
N	Neutral terminal	Connect the mains power supply Neutral (blue) wire into this pole.
PE	Protective earth	Connect the protective earth (yellow/green) wire into this pole.

Single-phase power supply with Protective Earth. Secure the wires using a flat-head screwdriver.

Conductor cross-section	0.2mm² - 2.5mm²

3.2.2 Mains output (AC versions)

Mark	Description	Information
L	Live terminal	Bridged connection to Mains input +
N	Neutral terminal	Bridged connection to Mains input -
PE	Protective earth	Bridged connection to Mains input PE

This terminal is used to distribute power from the light head to the next light head. Secure the wires using a flat-head screwdriver.

Conductor cross-section	0.2mm² - 2.5mm²

3.2.3 DC input (DC versions)

Mark	Description	Information
+	Positive	Connect the power supply positive wire into this pole.
-	Negative	Connect the power supply negative wire into this pole.
GND	Ground	Connect the power supply ground wire into this pole.

Secure the wires using a flat-head screwdriver.

Conductor cross-section	0.2mm² - 2.5mm²

3.2.4 DC output (DC versions)

Mark	Description	Information
+	Positive	Bridged connection to DC input +
-	Negative	Bridged connection to DC input -
GND	Ground	Bridged connection to DC input PE

This terminal is used to distribute power from the light head to the next light head. Secure the wires using a flat-head screwdriver.

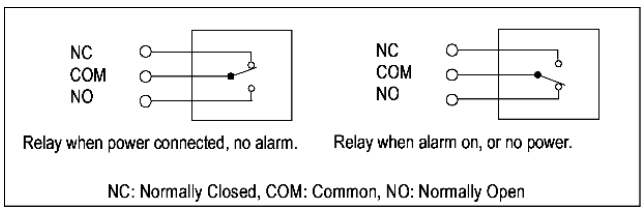
Conductor cross-section	0.2mm² - 2.5mm²

3.2.5 Alarm Relay Output

Mark	Description	Information
NO	Normally Open	In alarm, connected with COM
COM	Common	Common relay contact
NC	Normally Connected	During normal operations, connected with COM

Unused alarm relay connectors can be left floating i.e. no wiring there is required. Push-in spring connection.

Conductor cross-section	0.2mm² - 2.5mm²



3.2.6 RS-485 input

Mark	Description	Information
D+	Data +	RS485 non-inverting pin
D-	Data -	RS485 inverting pin
SH	Shield	Shield

The RS-485 network (bus) input. Push-in spring connection.

Conductor cross-section	0.2mm² - 2.5mm²

4 OPERATION

Open the two bolts that secure the service access door to the chassis using a 5mm hex key. Using the DIP switches, configure the desired parameters into the light. DIP switches are numbered 1-8. Embedded software in the obstruction light reads configuration switches regularly. Configuration change becomes effective within a few seconds. The light can be configured between Stand-alone and Modbus operating modes. Light reset is needed when changing between the modes.

Stand-alone mode: In this mode, the light operation is configured with DIP switches. No additional controllers are needed. Light head will use its internal photocell to determine the time of day (day, twilight or night). The light will change its flashing mode based on photocell data and how the user has configured the light. Light heads will synchronize their flashing with the built-in GPS module. After light head start-up, it will take some time for it to acquire a GPS lock.

Modbus mode: In Modbus mode, the light is being controlled with an Obelux controller. If Modbus connection is lost to the controller, the light will keep working on its own. It will use its internal photocell and GPS to determine the time of day and synchronize flashing. The light will return to Modbus operation when the connection is recovered.

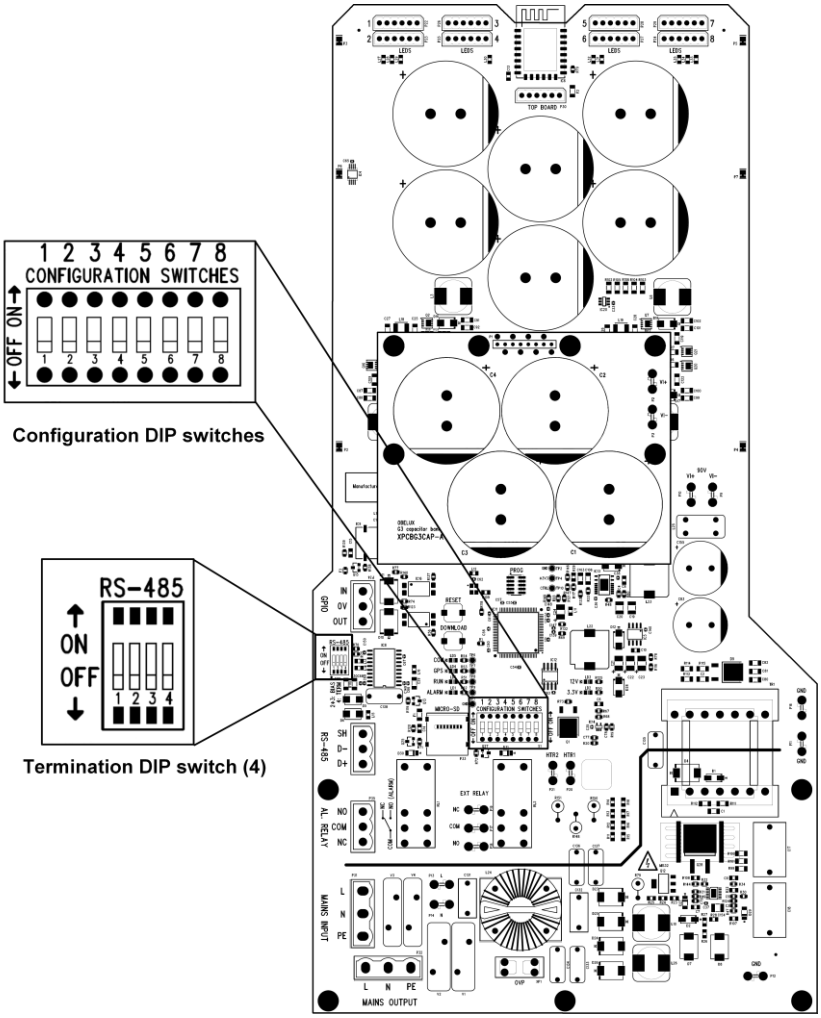


Figure 8: Location of the DIP switches

4.1 Stand-alone mode

The light is in stand-alone mode when DIP switch 8 is off.

DIP switch 8	Operation mode
off	Stand-alone
on	Modbus

Flashing mode of light is selected with DIPs 1-3. Note that all HID series lights don´t have infrared light included. Using IR configuration in a non-IR light will give an unnecessary alarm. Photocell light limit for the day mode is 1600 lux and 157 lux for the night mode unless specified otherwise.

HID series lights are configured with the following DIP settings. Flash pulse length in day and twilight mode is 100 ms. Flash pulse length for the RED can be selected as 50% (50:50) of the selected flash rate or to a fixed 200 ms.

DIP switch			Light Type (HID series)		
1	2	3	Day	Twilight	Night
off	off	off	50,000 cd white (flashing)	10,000 cd white (flashing)	2,000 cd white (flashing)
on	off	off	50,000 cd white (flashing)	10,000 cd white (flashing)	2,000 cd red, 50:50
off	on	off	50,000 cd white (flashing)	10,000 cd white (flashing)	2,000 cd white and infrared (flashing)
on	on	off	50,000 cd white (flashing)	10,000 cd white (flashing)	2,000 cd red and infrared, 50:50
off	off	on	50,000 cd white (flashing)	10,000 cd white (flashing)	2,000 cd red, 200ms
on	off	on	50,000 cd white (flashing)	10,000 cd white (flashing)	2,000 cd red and infrared, 200ms
off	on	on	Reserved (OFF)		
on	on	on	Reserved (OFF)		

Flashing rate (FPM) in Day, Twilight and Night mode is selected with DIPs 4-5.

DIP switch		Flash rate (FPM)
4	5	
off	off	20
on	off	30, night mode, 54 lux*
		40, day and twilight mode, 645 lux*
off	on	40
on	on	60

*Photocell limits for time of day changes (Day 645 lux, Night 54 lux)

In addition, the operating mode of the RED light in night mode is configured with DIP6.

DIP switch 6	Night mode operation
off	Red and infrared LEDs flash at selected flash rate
on	Red and infrared LEDs in steady-burning mode

Using DIP switch 7, the obstruction light can be set to operate as a master in a light network. Only one obstruction light shall be the master in a network domain. Master unit broadcasts time and illumination data to slave units. Time is typically received from GPS and illumination information comes from photocell. If the information flow from master unit to slave units is interrupted, the slave units will use local photocell setting and local clock in their operations. As data flow resumes, the slaves automatically synchronise themselves with the master unit.

DIP switch 7	Master/Slave mode
off	This device is slave
on	This device is master

RS-485 bus should be terminated with on-board 120 ohm resistors on both ends of the bus. Turn on DIP4 from the termination DIP switches. Location of the termination DIP switches can be seen in Figure 8.

4.2 Modbus mode

The light is in Modbus mode when the DIP switch 8 is on.

DIP switch 8	Operation mode
off	Stand-alone
on	Modbus

Configuration DIP switches 1-4 are used to give the light RS-485 bus address. Duplicate addresses on the same bus are not allowed. Give lights connected to the same communication bus an address starting from one.

DIP switch				Modbus Address
1	2	3	4	
on	off	off	off	Address 01
off	on	off	off	Address 02
on	on	off	off	Address 03
off	off	on	off	Address 04
on	off	on	off	Address 05
off	on	on	off	Address 06
on	on	on	off	Address 07
off	off	off	on	Address 08
on	off	off	on	Address 09
off	on	off	on	Address 10
on	on	off	on	Address 11
off	off	on	on	Address 12
on	off	on	on	Address 13
off	on	on	on	Address 14
on	on	on	on	Address 15

RS-485 bus should be terminated with on-board 120 ohm resistors on both ends of this communications bus. Turn on DIP4 on from the termination DIP switches. Location of the termination DIP switches can be seen in Figure 8.

4.3 Test mode

To enter test mode, turn off the power and set DIP7 and DIP8 on. The light will enter test mode when power is turned on. To leave test mode, turn off the power. Then set back the normal settings. When power is turned on again, the light returns to normal operation.

DIP switch		Test mode
7	8	
on	on	Test mode enabled.

Light mode is selected with DIPs 1-2. There is normally a delay when changing time day modes (day, twilight and night) based on photocell data. Using accelerated photocell mode will decrease the delay to a few seconds.

DIP switch		Light mode
1	2	
off	off	Accelerated photocell light behavior
on	off	WHITE light only
off	on	RED light only
on	on	IR light only
off	off	WROT mode (overrides all FPM except steady)

DIP3 will force all RED and IR light modes to function with WROT flash sequence.

DIP switch	WROT mode
3	
off	WROT mode off
on	WROT mode on (overrides all FPM except steady)

Flashing rate (FPM) is selected with DIPs 4-5.

DIP switch		Flash rate (FPM)
4	5	
off	off	Steady
on	off	20
off	on	40
on	on	60

The light can be dimmed with using DIP6 and DIP7. Dimming is light brightness as percentage of full power.

DIP switch		Dimming
6	7	
off	off	100%
on	off	30%
off	on	100%
on	on	10%

HID series lights can be configured in Stand-alone or Modbus operation modes.

4.4 Heater operation

All HID models have a 5.5 W heater element on the main PCB. The heater starts working when the light internal temperature drops below 10 °C. The heater reaches 100% power when temperature drops below 5 °C and stops working after the temperature rises above 10 °C.

The cold climate versions (-CCV) have a 60 W heater on back side of the main PCB. The larger heater has the same temperature limits for operation as the smaller heater.

4.5 Causes for alarm

The following events can cause an ALARM:

- Internal power failure
- Light source failure, including decreased intensity level below rated level of light
- Loss of GPS synchronization signal or GPS module failure
- Incorrect photocell operation

The ALARM LED will turn on and ALARM relay will activate.

4.6 Onboard LEDs

Status indication LEDs are located on the controller board. Some of the status indicators have three operating states (off, lit and blinking).

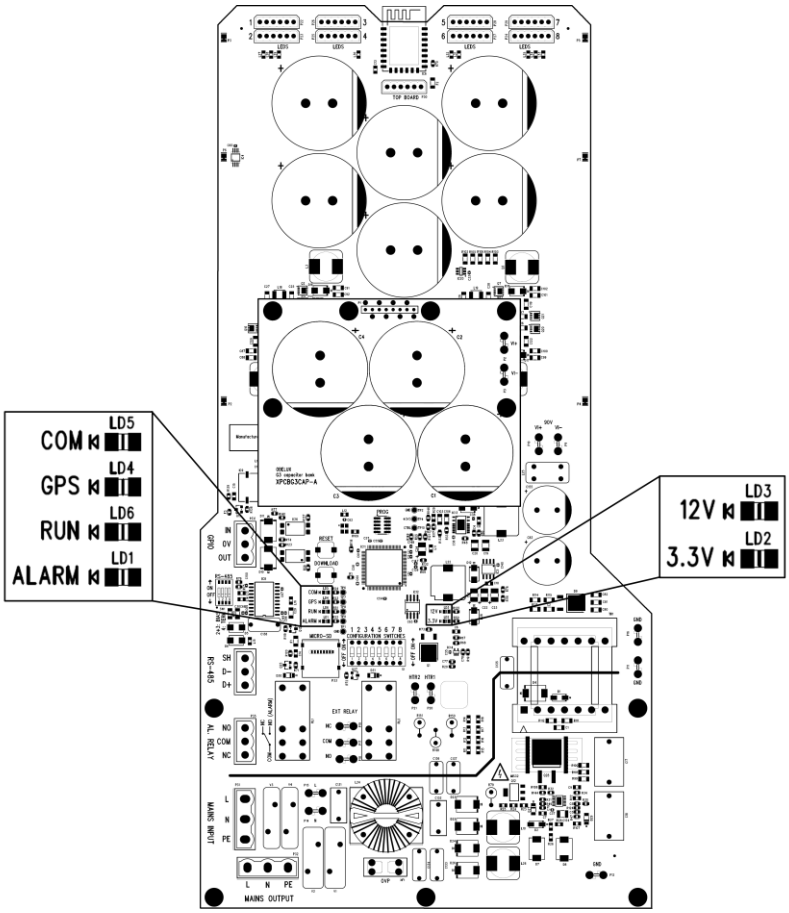


Figure 9: Location of the status LEDs

Obelux HID series lights have six status LEDs on the controller board. These status LEDs are visible only when service access door is open.

LED	**Description**
3.3V	**Internal operating voltage (GREEN)** LED OFF: Power off LED ON: Power on
12V	**Internal operating voltage (GREEN)** LED OFF: Power off LED ON: Power on
COM	**Communication (GREEN)** LED OFF: Waiting for external signals LED FLASHING: Master-slave communications occurring on the network

GPS	**GPS fix (GREEN)** LED OFF: No GPS fix LED FLASHING: Light GPS module has fix on GPS place and time. Light is not yet fully synchronized. LED ON: Light GPS module has fully resolved the UTC time. It may take several minutes for the GPS module to receive the necessary data.
RUN	**Synchronization (GREEN)** LED OFF: All outputs are off LED ON: At least one output is active. Led is flashing at same time and frequency as the aviation light.
ALARM	**Alarm indicator (RED)** LED OFF: Normal operation, no alarms LED ON: Active alarm condition

4.7 Troubleshooting

The light doesn´t start

- No power (check that the 3.3V and 12V status LEDs are illuminated).
- Incorrect configuration (check DIP switches, make sure Test mode is turned off).
- Loose wires (check that all wires are properly seated in terminal block connectors).
- Do not exceed maximum operating voltage. Mains power supply input is protected with overvoltage protection circuit that is tuned to stated operating voltage range.

No Modbus data connection to Obelux controller

- Check DIP settings. Check that light has a correct Modbus address and that there are no conflicting addresses. Make sure the light is configured to Modbus mode (DIP8).
- Too many RS-485 termination resistors (120ohm) on the same RS-485 communication bus. Only the last light on the bus should have the termination resistor in use.
- Check Modbus data wiring.

Light does not change modes between day, twilight and night

- Check that the photocell has an uninterrupted view of the sky and has no dirt.
- Check that there are no external light sources that interfere with the photocell.
- Photocell is sampled once in a minute and read value are averaged to avoid sudden state changes. Unless test mode is enabled, it takes approx. three (3) minutes to change system state between day, twilight and night.

Light does not flash in sync

- GPS antenna is mounted on top of obstruction light. Antenna needs non-blocked view to GPS satellites in orbit. After start-up, GPS receiver may take up to 30 min to obtain correct time data from GPS satellites. This operation requires data from several GPS satellites.

4.8 Spare parts

Part code	Description
SSAL20G3PSU	Main board for HID-light
XPCBG3CAP-A	Capacitor board
GC-MID17	Glass Cover with gaskets for HID-light

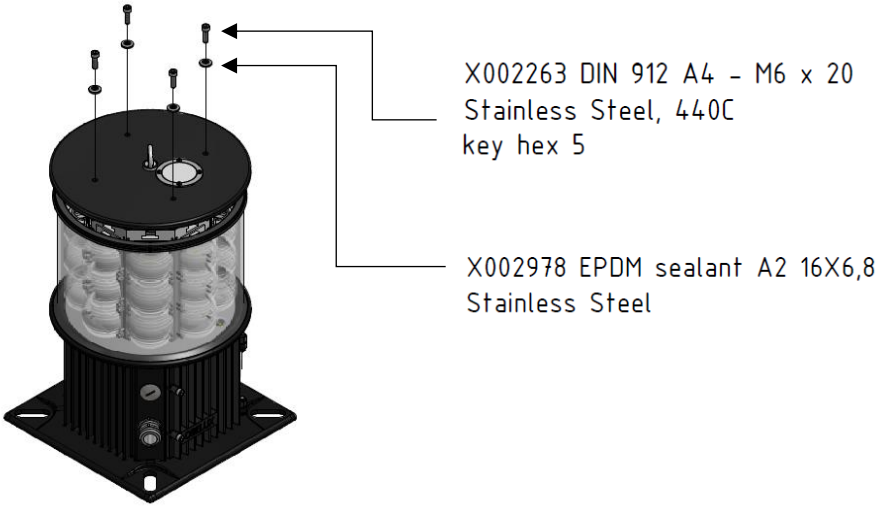
5 MAINTENANCE

Obelux obstruction lights are designed to have more than 20 years of maintenance free operating lifetime. The fault monitoring feature will give an alarm signal when the unit requires attention. A yearly visual examination of the products and operation is sufficient.

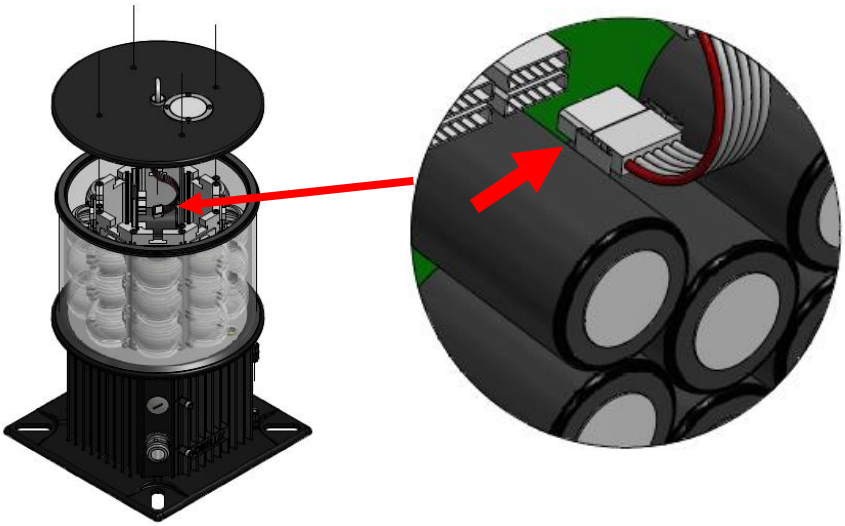
5.1 Replacing the glass cover

This section contains instructions for replacing a broken glass.

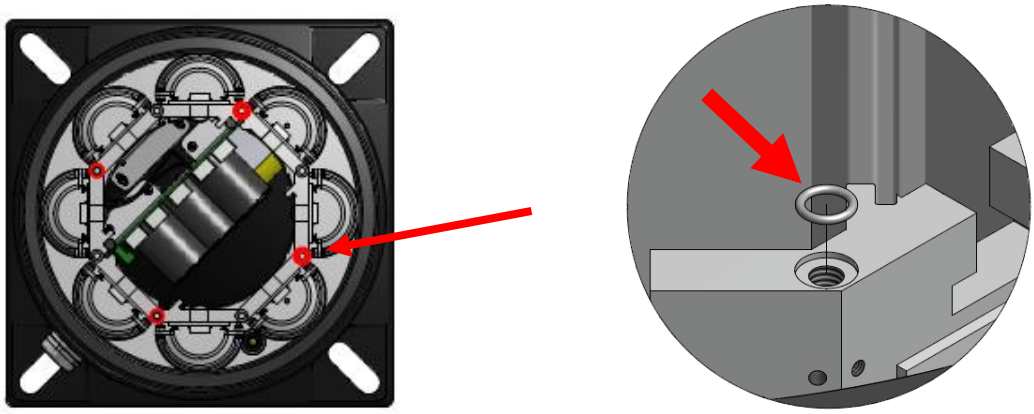
1. Disconnect power supply to the light head.
2. Open all four M6x20 stainless steel bolts on the top plate using a 5mm hex key.



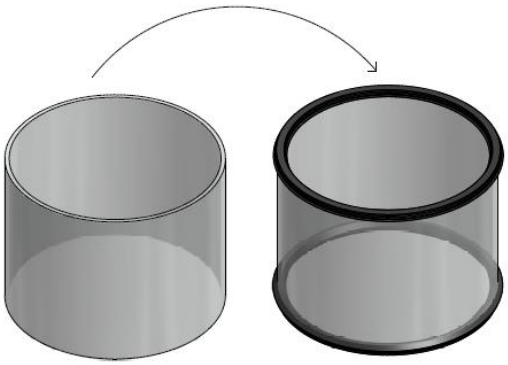
3. When lifting the top lid, make sure you disconnect the GPS antenna cable from the light head circuit board.



4. Check that you don´t lose the four O-rings that are between the chassis and the lid.



5. Lift the glass carefully off the light head. Remove the seals from the old glass and move both of them to the new glass.



6. Place the new glass with the seals back in its place on the light head. Check that the seals are properly seated.

7. Check that the four rubber O-rings on the chassis are in place.

8. Connect the GPS antenna cable of the lid back to the light main circuit board (connector name Top Board). After this, rotate the lid before putting it back to its position on the light head chassis. This is done so that the GPS antenna cable doesn´t get caught between the lid and the light head chassis. Align the four lid screw holes with the four O-rings on the chassis.

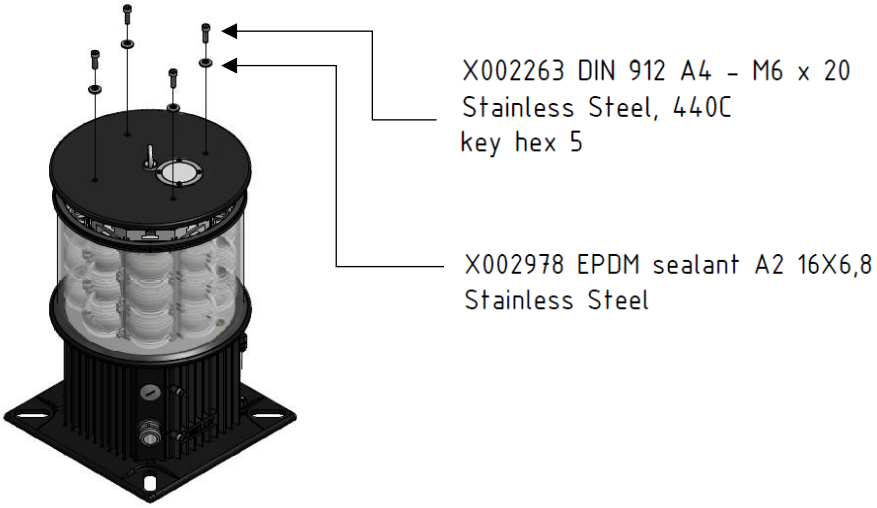
9. Screw the four hexagon-socket-head bolts back with the washers. Recheck that all the glass seals are properly seated.

10. Connect power and verify that the unit starts up successfully.

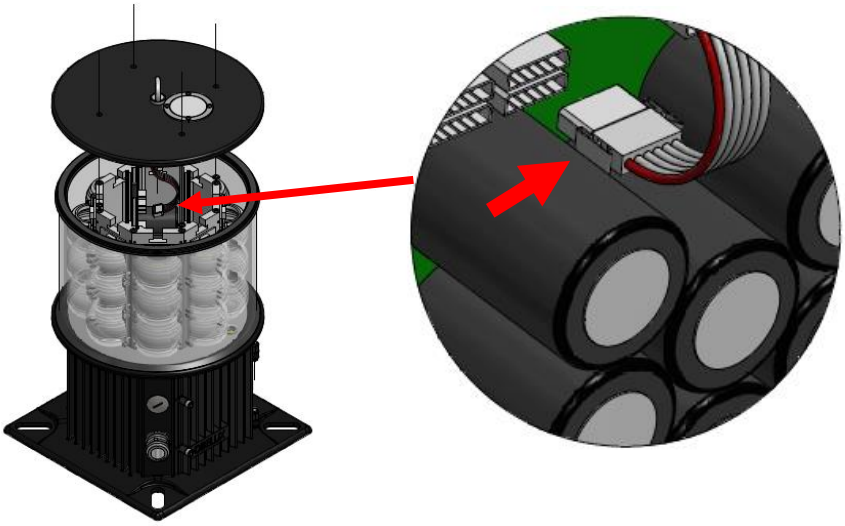
5.2 Replacing main controller board

This section contains instructions for replacing the main controller board.

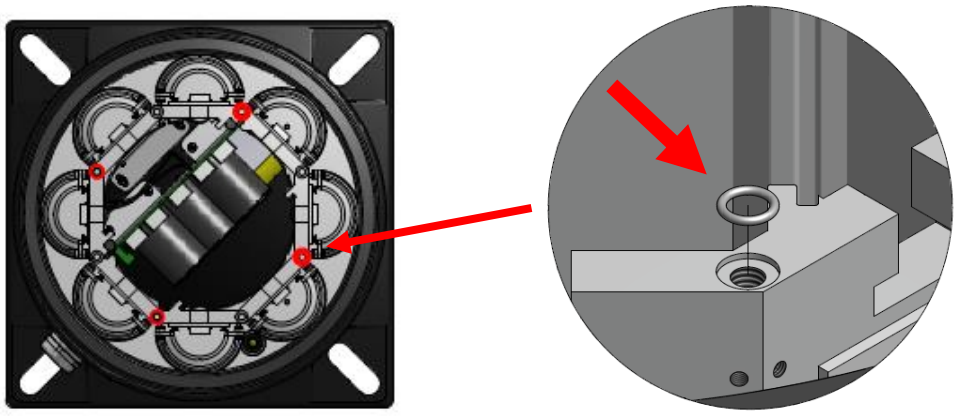
1. Disconnect power supply to the light head.
2. Open all four M6x20 stainless steel bolts on the top plate using a 5mm hex key.



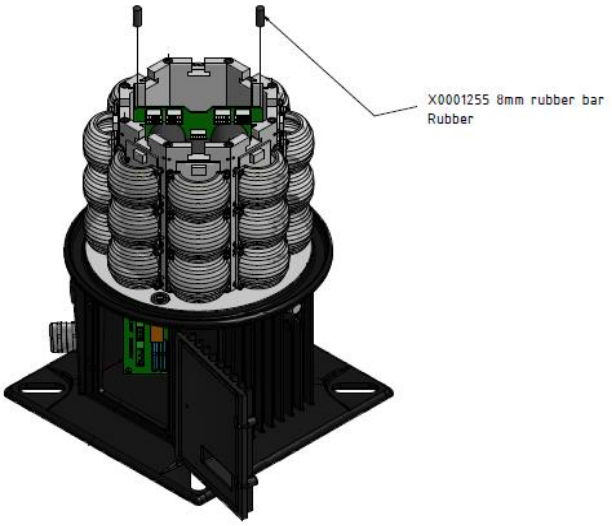
3. When lifting the top lid, make sure you disconnect the GPS antenna cable from the light head circuit board.



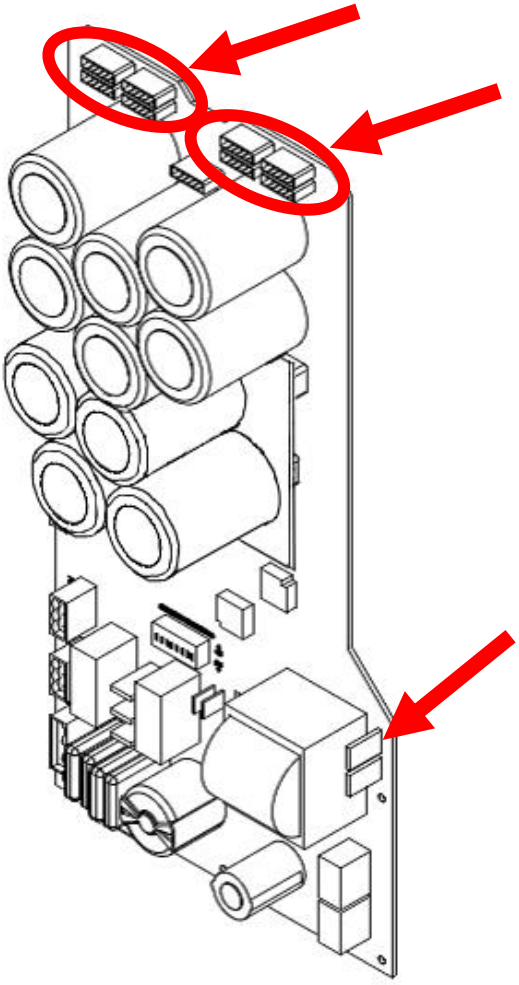
4. Remove the four O-rings that are between the chassis and the lid.

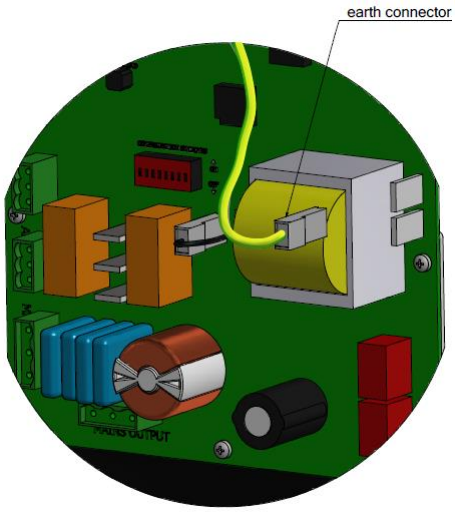


5. Lift the glass carefully off the light head.
6. Remove rubber bars holding the main circuit board in place.

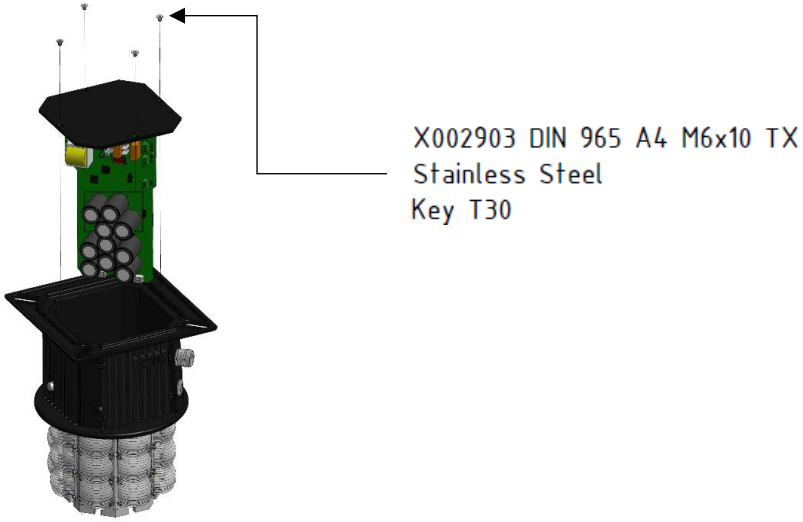


7. Disconnect LED wires and the earth connector (green/yellow wire) from the main circuit board. You can access the earth wire through the service door.

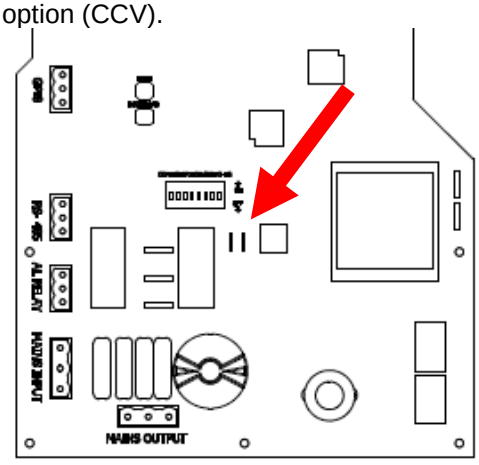


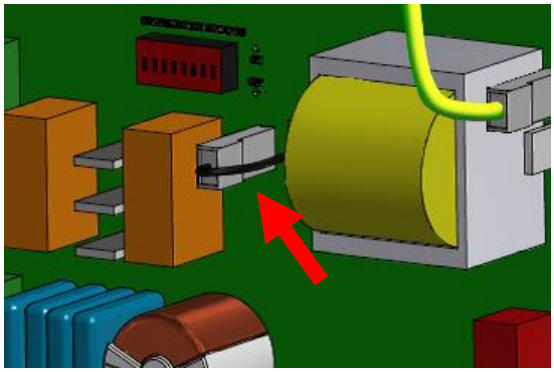


8. Open the four screws from the bottom of the light head and pull the bottom plate assembly out of the light head.

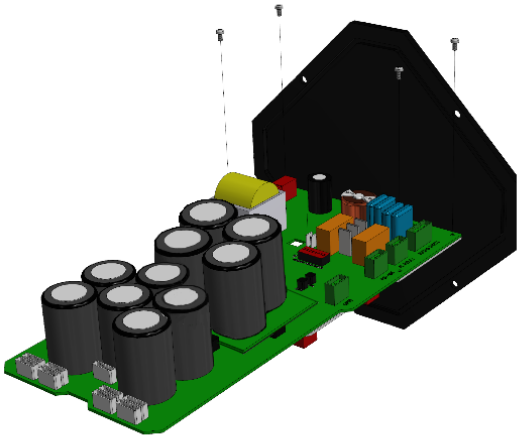


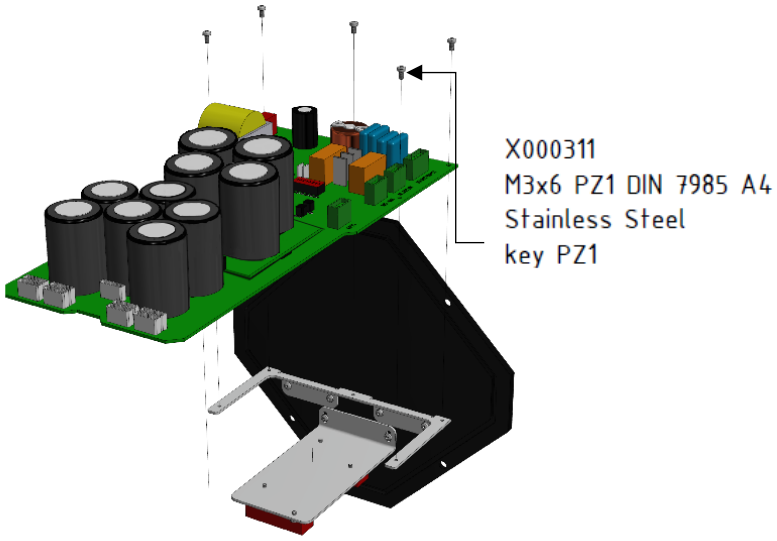
9. Disconnect the heater wires from the main circuit board. This applies only for light heads with heater option (CCV).





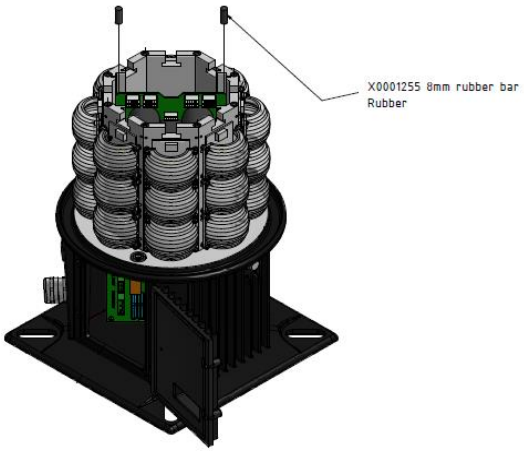
10. Open the four screws holding the main circuit board on the bottom plate assembly. Replace the old circuit board with the new circuit board and reattach the heater cable.





11. Push the bottom place assembly back to the light head and attach the bottom screws.

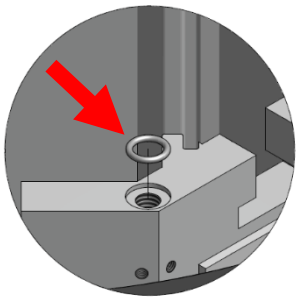
12. Push the rubber bars back in place.



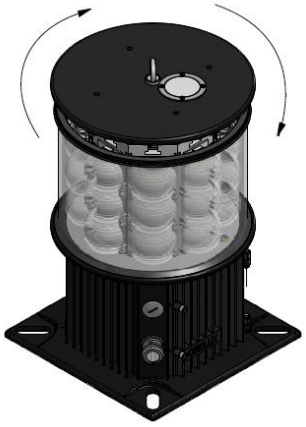
13. Connect the earth connector and LED wires. It does not matter which LED wire is connected to which LED connector.

14. Place the new glass with the seals back in its place on the light head. Check that the seal is properly seated.

15. Put the four rubber O-rings back in place.



16. Connect the GPS antenna cable of the lid back to the light main circuit board (connector name Top Board). After this rotate the lid before putting it back to its position on the light head chassis. This is done so that the GPS antenna cable doesn´t get caught between the lid and the light head chassis. Align the four lid screw holes with the four O-rings on the chassis.



17. Screw the four hexagon-socket-head bolts back with the washers. Recheck that all the glass seals are properly seated.

18. Connect power and verify that the unit starts up successfully.