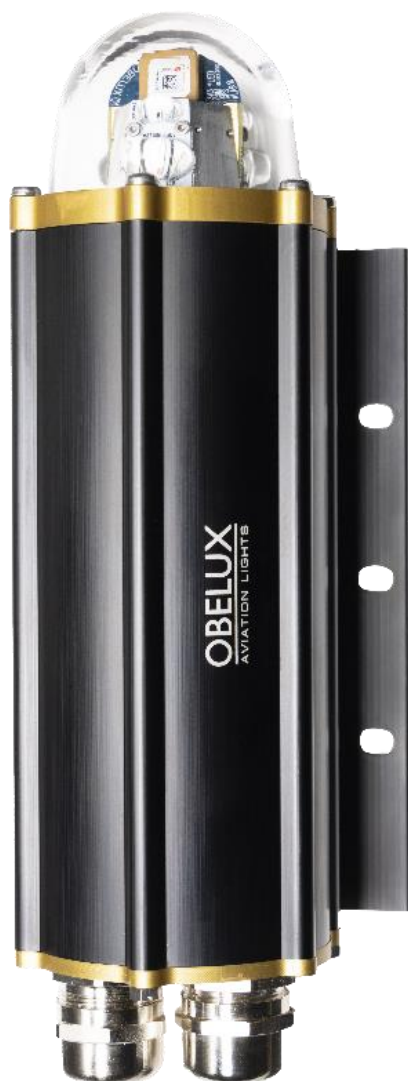




Obelux Low Intensity series manual

Low intensity 10cd/32cd/50cd red and infrared aviation obstruction lights

ICAO Low-Intensity Type A, B and E
NVG Compliant Infrared 850nm

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Changelog

Version	Date	Description	Author
0.1	16.02.2021	Document created	JSi
0.2	16.03.2021	Review	JSi
0.3	18.03.2021	Updated product codes	JSi
0.4	11.08.2021	Updated product codes	JSi
0.5	08.09.2021	Updated product codes, updated pictures, added Smart heater and DDP sections	JSi
0.6	02.02.2022	Changed back plate screws to Torx, added Part codes	JSi
0.7	02.04.2024	Updated power consumption, product codes	JSi

Acronyms and Abbreviations

DDP	Deep discharge protection
FPM	Flashes Per Minute
GPS	Global Positioning System
ICAO	International Civil Aviation Organization
IR	Infrared
LED	Light emitting diode
LI	Low intensity (Obelux light)
PCB	Printed Circuit Board

1 ABOUT THIS PRODUCT

Obelux low-intensity series LED obstruction lights provide 10 cd, 32 cd or 50 cd color aviation red light and optionally Night Vision Goggle (NVG) compliant infrared (850 nm) light. No external controllers are required to install and run these lights. In most use cases, mounting the standalone aviation obstruction light and connecting power supply cable are the only actions needed for operating the light. Obelux LI-10 and LI-32 series products meet their respective ICAO regulations.

Features

- ▶ Based on LED technology
- ▶ Low-intensity RED fixed and flashing light
- ▶ NVG compliant infrared (IR) 850nm
- ▶ Incorporated photocell for Day/Night switching
- ▶ Horizontal beam 360°, vertical beam 0°...10°
- ▶ Both stand-alone (incorporated alarm signal) and Modbus operation available
- ▶ Extremely low power consumption
- ▶ Provides long maintenance-free operating time
- ▶ Chassis anodized, marine-grade aluminum; glass dome, degree of protection IP65
- ▶ Robust overvoltage protection (Type II)
- ▶ Fault monitoring with dry contact alarm relay
- ▶ Operating temperature range -40°C...+55°C
- ▶ Thermostat controlled heater
- ▶ Smart heater (DC models)
- ▶ Deep discharge protection (DC models)
- ▶ Battery powered operation, Battery backup ON/OFF
- ▶ 5-year warranty
- ▶ Optional 10-year warranty

Optional Controllers

- ▶ CP-XX Series (Interfaces: Ethernet TCP/IP and RS-485/Modbus)
- ▶ CP-M1 Series (Interface: RS-485/Modbus)

1.1 Product codes: Low intensity 10cd red + Infrared (IR) Type A

Order code	ICAO	Output	Operating voltage	Power consumption	IR	Photocell	Alarm relay	Modbus	GPS sync	Fault monitoring	Heater
AC MODELS											
LI-AC-10-A	Type A	10cd	100-250VAC	0.65VA	No	Yes	Yes	No	No	Yes	Yes
LI-AC-10-AM	Type A	10cd	100-250VAC	0.8VA	No	Yes	Yes	Yes	No	Yes	Yes
LI-AC-10-GAM	Type A	10cd	100-250VAC	0.8VA	No	Yes	Yes	Yes	Yes	Yes	Yes
LI-AC-10-IR-A	Type A	10cd+IR	100-250VAC	0.85VA	Yes	Yes	Yes	No	No	Yes	Yes
LI-AC-10-IR-AM	Type A	10cd+IR	100-250VAC	0.85VA	Yes	Yes	Yes	Yes	No	Yes	Yes
LI-AC-10-IR-GAM	Type A	10cd+IR	100-250VAC	1.0VA	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DC MODELS											
LI-DC-10-A	Type A	10cd	10-60VDC	0.5W	No	Yes	Yes	No	No	Yes	Yes
LI-DC-10-AM	Type A	10cd	10-60VDC	0.5W	No	Yes	Yes	Yes	No	Yes	Yes
LI-DC-10-GAM	Type A	10cd	10-60VDC	0.65W	No	Yes	Yes	Yes	Yes	Yes	Yes
LI-DC-10-IR-A	Type A	10cd+IR	10-60VDC	0.72W	Yes	Yes	Yes	No	No	Yes	Yes
LI-DC-10-IR-AM	Type A	10cd+IR	10-60VDC	0.72W	Yes	Yes	Yes	Yes	No	Yes	Yes
LI-DC-10-IR-GAM	Type A	10cd+IR	10-60VDC	0.85W	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1.2 Product codes: Low intensity 10cd red + Infrared (IR) Type A, D (Germany)

Low intensity 10cd red + Infrared (IR) Type A, D (Germany): certified as Hindernisfeuer ES (inclusive IR)

Order code	ICAO	Output	Operating voltage	Average power consumption	IR	Photocell	Alarm relay	Modbus	GPS sync	Fault monitoring	Heater
AC MODELS											
LI-AC-10-IR-A-D	Type A	10cd+IR	100-250VAC	1.2W	Yes	Yes	Yes	No	No	Yes	Yes
LI-AC-10-IR-AM-D	Type A	10cd+IR	100-250VAC	1.3W	Yes	Yes	Yes	Yes	No	Yes	Yes
LI-AC-10-IR-GAM-D	Type A	10cd+IR	100-250VAC	1.4W	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DC MODELS											
LI-DC-10-IR-A-D	Type A	10cd+IR	10-60VDC	1.1W	Yes	Yes	Yes	No	No	Yes	Yes
LI-DC-10-IR-AM-D	Type A	10cd+IR	10-60VDC	1.1W	Yes	Yes	Yes	Yes	No	Yes	Yes
LI-DC-10-IR-GAM-D	Type A	10cd+IR	10-60VDC	1.3W	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1.3 Product codes: Low intensity 32cd red + Infrared (IR) Type B and E

Order code	ICAO / FAA	Output	Operating voltage	Power consumption	IR	Photocell	Alarm relay	Modbus	GPS sync	Fault monitoring	Heater
AC MODELS											
LI-AC-32-A	Type B/E / L-810	32cd	100-250VAC	1.2VA	No	Yes	Yes	No	No	Yes	Yes
LI-AC-32-AM	Type B/E / L-810	32cd	100-250VAC	1.2VA	No	Yes	Yes	Yes	No	Yes	Yes
LI-AC-32-GAM	Type B/E / L-810	32cd	100-250VAC	1.3VA	No	Yes	Yes	Yes	Yes	Yes	Yes
LI-AC-32-IR-A	Type B/E / L-810	32cd +IR	100-250VAC	1.4VA	Yes	Yes	Yes	No	No	Yes	Yes
LI-AC-32-IR-AM	Type B/E / L-810	32cd +IR	100-250VAC	1.4VA	Yes	Yes	Yes	Yes	No	Yes	Yes
LI-AC-32-IR-GAM	Type B/E / L-810	32cd +IR	100-250VAC	1.5VA	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DC MODELS											
LI-DC-32-A	Type B/E / L-810	32cd	10-60VDC	1.1W	No	Yes	Yes	No	No	Yes	Yes
LI-DC-32-AM	Type B/E / L-810	32cd	10-60VDC	1.1W	No	Yes	Yes	Yes	No	Yes	Yes
LI-DC-32-GAM	Type B/E / L-810	32cd	10-60VDC	1.2W	No	Yes	Yes	Yes	Yes	Yes	Yes
LI-DC-32-IR-A	Type B/E / L-810	32cd +IR	10-60VDC	1.3W	Yes	Yes	Yes	No	No	Yes	Yes
LI-DC-32-IR-AM	Type B/E / L-810	32cd +IR	10-60VDC	1.3W	Yes	Yes	Yes	Yes	No	Yes	Yes
LI-DC-32-IR-GAM	Type B/E / L-810	32cd +IR	10-60VDC	1.4W	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1.4 Product codes: Low intensity 50cd red + Infrared (IR)

Order code	ICAO / FAA	Output	Operating voltage	Power consumption	IR	Photocell	Alarm relay	Modbus	GPS sync	Fault monitoring	Heater
AC MODELS											
LI-AC-50-A	-	50cd	100-250VAC	2.4VA	No	Yes	Yes	No	No	Yes	Yes
LI-AC-50-AM	-	50cd	100-250VAC	2.4VA	No	Yes	Yes	Yes	No	Yes	Yes
LI-AC-50-GAM	-	50cd	100-250VAC	2.5VA	No	Yes	Yes	Yes	Yes	Yes	Yes
LI-AC-50-IR-A	-	50cd+IR	100-250VAC	2.6VA	Yes	Yes	Yes	No	No	Yes	Yes
LI-AC-50-IR-AM	-	50cd+IR	100-250VAC	2.6VA	Yes	Yes	Yes	Yes	No	Yes	Yes
LI-AC-50-IR-GAM	-	50cd+IR	100-250VAC	2.7VA	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DC MODELS											
LI-DC-50-A	-	50cd	10-60VDC	2.2W	No	Yes	Yes	No	No	Yes	Yes
LI-DC-50-AM	-	50cd	10-60VDC	2.2W	No	Yes	Yes	Yes	No	Yes	Yes
LI-DC-50-GAM	-	50cd	10-60VDC	2.3W	No	Yes	Yes	Yes	Yes	Yes	Yes
LI-DC-50-IR-A	-	50cd+IR	10-60VDC	2.4W	Yes	Yes	Yes	No	No	Yes	Yes
LI-DC-50-IR-AM	-	50cd+IR	10-60VDC	2.4W	Yes	Yes	Yes	Yes	No	Yes	Yes
LI-DC-50-IR-GAM	-	50cd+IR	10-60VDC	2.5W	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1.5 Product codes: IR only

Order code	Output (adjustable 1-400mWSR)	Operating voltage	Power consumption	IR	Photocell	Alarm relay	Modbus	GPS sync	Fault monitoring	Heater
AC MODELS										
LI-AC-IR-A-X	IR	100-250VAC	0.6VA	Yes	Yes	Yes	No	No	Yes	Yes
LI-AC-IR-AM-X	IR	100-250VAC	0.6VA	Yes	Yes	Yes	Yes	No	Yes	Yes
LI-AC-IR-GAM-X	IR	100-250VAC	0.8VA	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DC MODELS										
LI-DC-IR-A-X	IR	10-60VDC	0.4W	Yes	Yes	Yes	No	No	Yes	Yes
LI-DC-IR-AM-X	IR	10-60VDC	0.4W	Yes	Yes	Yes	Yes	No	Yes	Yes
LI-DC-IR-GAM-X	IR	10-60VDC	0.6W	Yes	Yes	Yes	Yes	Yes	Yes	Yes

X: IR power (mWSR)

Power consumption depends on output light intensity

Light intensity depends on beam width (default beam width 20%)

Beam width set in factory

Flash rate and power are software configurable (flashing is not limited to constant rates, any flash sequence can be programmed, e.g. SOS signal)

DC models idle power consumptions: 0.5W (light off, with GPS), 0.35W (light off, without GPS)

Heater increases power consumption by 7W; heater turns on when temperature drops below 10 °C; heater can be set ON/OFF

Factory setting: Heater ON

Water protection class IP65 applies when the device is mounted vertically glass cover facing up

All models available with IP67 water protection class (append -67 to product code, e.g. LI-AC-10-A-67)

Packing dimensions and weight: 280mm x 130mm x 100mm, 1.5kg

1.6 Other LI lights

Obelux has other versions of LI lights that have their own datasheets. These include lights adhering to following authorities' specifications:

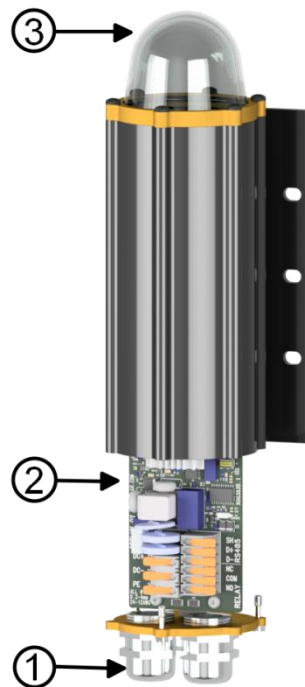
10cd lights: Obstacles à la navigation aérienne Bundesamt für Zivilluftfahrt BAZL

100cd lights: The Civil Aviation Safety Authority (CASA) of Australian Government

100cd (170cd) lights: Einordnung als Feuer W, rot ES gemäß Allgemeine Verwaltungsvorschrift zur Kennzeichnung von Luftfahrthindernissen

200cd lights: CAP 168 Civil Aviation Authority, London, UK

1.7 Product features



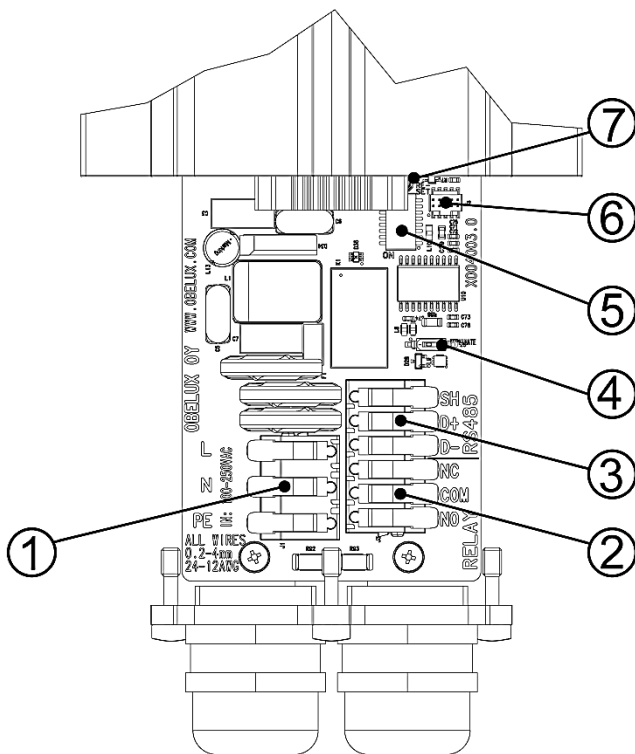
1. Location of cable glands (M25 (2))
2. Controller board
3. Glass cover, location of GPS, LED indicators and photocell (do not cover)

Factory installation:

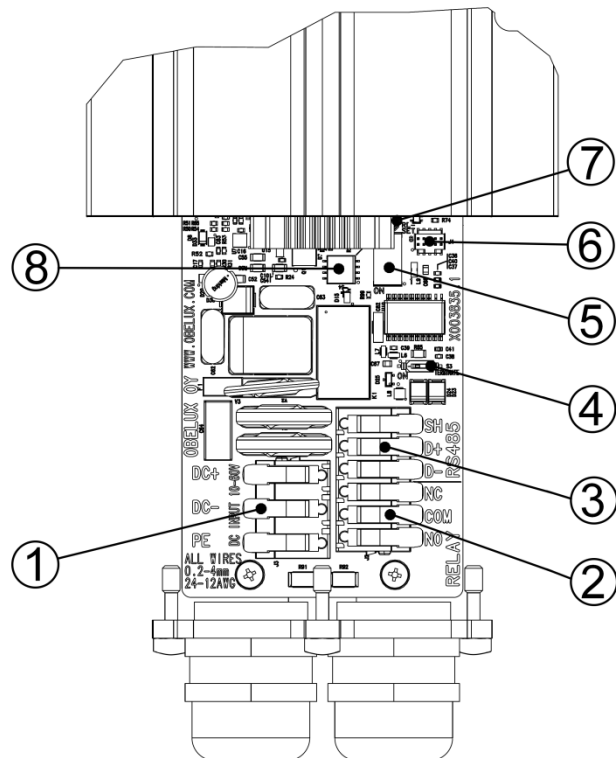
- All models: 1 M25 gland attached to light, other gland sealed

Accessories:

- 1 M25 gland, 1 gland sealant



AC models



DC models

1. Power connector
2. Alarm relay connector
3. RS-485 (Modbus) connector
4. RS-485 termination DIP switch
5. Configuration DIP switches (1-8)
6. Programming terminal
7. Reset button
8. Deep discharge protection switches (1-4) (DC models)

2 SAFETY INSTRUCTIONS

In this section are general safety instructions 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 and in compliance with local electrical code.

Keep your device away from heat sources, dust, smoke or other harmful substances.

Do not modify the device unless otherwise approved by the manufacturer.

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.

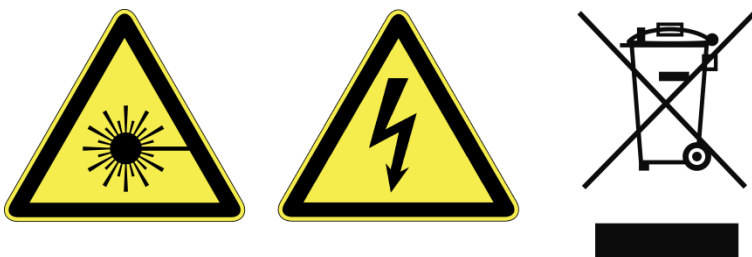
Obelux aviation obstacle light products sold inside European Union can be returned to manufacturer if no local WEEE separate collection and re-use services are available. Please contact Obelux for details.

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.

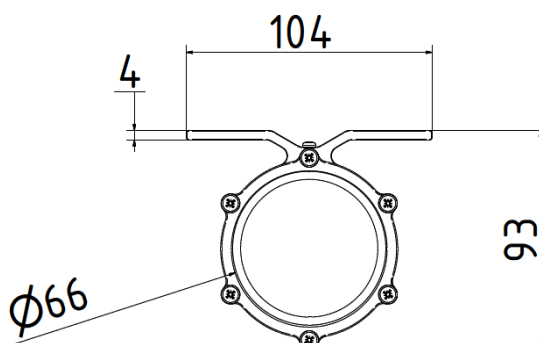
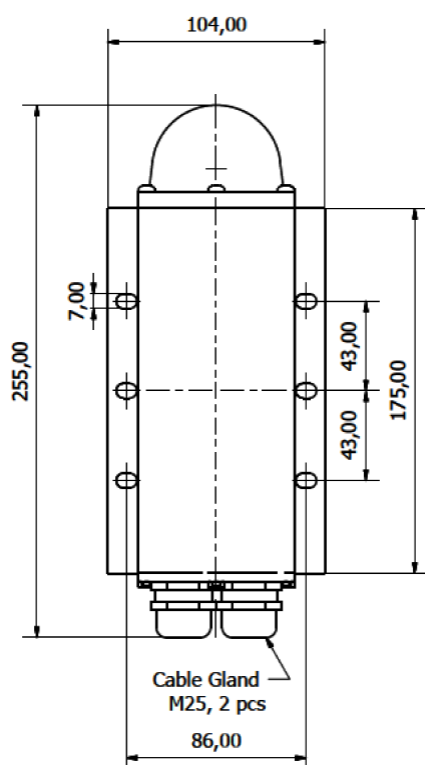
Obelux aviation obstruction lights are Class 2M LED devices. This class is safe for accidental viewing under all operating conditions. However, it may not be eye-safe for a person who deliberately stares into the LED beam by overcoming their natural aversion response to the very bright light.



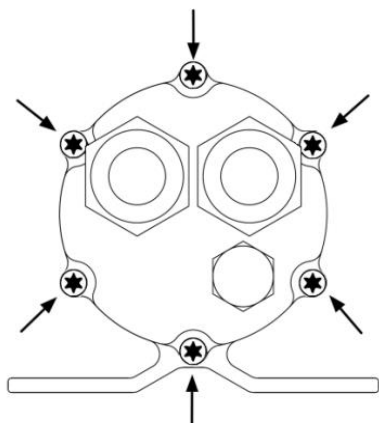
3 INSTALLATION

3.1 Device installation

The light has 6 holes for M6 bolts on the bottom. Photocell is located on top of the light under the glass and should have an uninterrupted view of the sky to work correctly. M25 cable glands accept cables of 6-17 mm in diameter. Make sure that all unused glands or gland holes are sealed. When the back plate is open, check that there is no inflow of water (incl. hail and snow) into the light.



Dimensions (mm)



Back plate screws (T20)

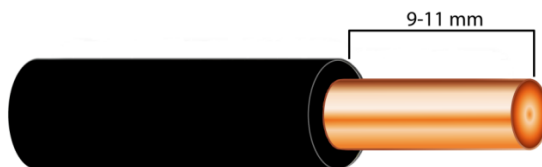
3.2 Wiring

Open the back plate screws. Back plate and the main circuit board slides out. Route cables through cable glands on back of the light. Connect power cable wires securely to power terminal connector. Connect Modbus/RS-485 cable wires to Modbus/RS-485 connector. Use the same connectors to distribute power and data signals to next light if necessary. Connect alarm relay cable wires to alarm relay connector.

Power



Alarm relay/RS-485



Terminal block connectors and wire strip length

3.2.1 AC Input (AC models)

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

Use a power supply with Protective Earth. The connectors are Wago Push-in CAGE CLAMP® type.

Conductor cross-section	0.2mm ² - 4mm ² (24-12 AWG)
Recommended conductor size	2.5mm ² (14 AWG)
Power supply type	100-250VAC, 50/60Hz, 1 phase

3.2.2 DC Input (DC models)

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

The connectors are Wago Push-in CAGE CLAMP® type.

Conductor cross-section	0.2mm ² - 4mm ² (24-12 AWG)
Recommended conductor size	2.5mm ² (14 AWG)
Power supply type	10-60VDC

3.2.3 Modbus/RS-485 (Input/Output)

Mark	Description	Information
D+	Data +	RS-485 non-inverting pin
D-	Data -	RS-485 inverting pin
SH	Shield	Shield

The isolated RS-485 network (bus) input/output. Unused Modbus connectors can be left floating, i.e. no wiring there is required. The connector is Wago Push-in CAGE CLAMP® type.

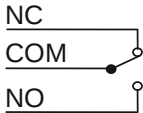
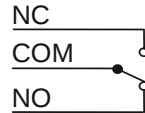
Conductor cross-section	0.2mm ² - 4mm ² (24-12 AWG)
Recommended conductor size	0.75mm ² - 1.5mm ² (20-16 AWG) or CAT cable

3.2.4 Relay (Alarm relay, Output)

Mark	Description	Information
NO	Normally Open	Normally open contact; in alarm, connected with COM
COM	Common	Common relay contact
NC	Normally Connected	Normally connected with COM; in alarm, open contact

Unused alarm relay connectors can be left floating, i.e. no wiring there is required. The connector is Wago Push-in CAGE CLAMP® type.

Conductor cross-section	0.2mm ² - 4mm ² (24-12 AWG)
Recommended conductor size	0.75mm ² - 1.5mm ² (20-16 AWG) or CAT cable
Relay maximum loads	250VAC @ 8A; 50VDC @ 1A

	
Alarm relay during normal operation	Alarm relay during start-up, active alarm and/or during loss-of-power

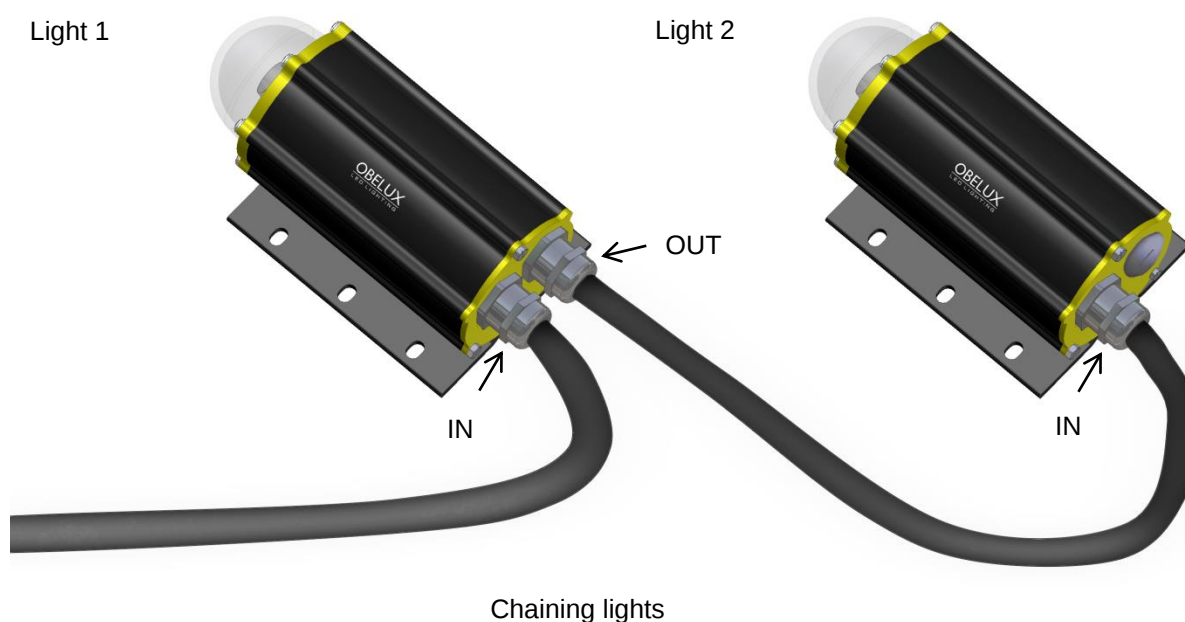
NC: Normally Closed, COM: Common, NO: Normally Open

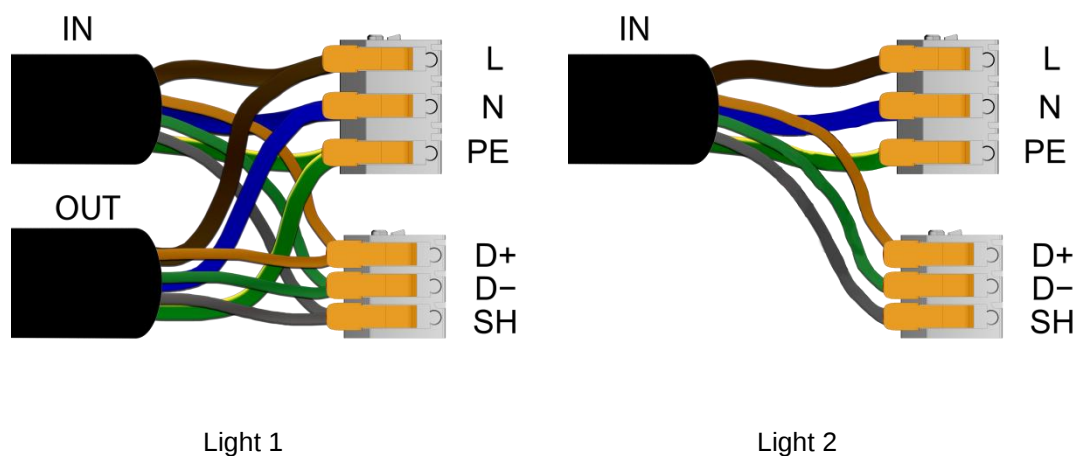
During normal operation, terminals ALARM COM and ALARM NC are connected, i.e. short-circuited. If an alarm is raised, ALARM COM and ALARM NO are short-circuited with the short-circuiting link between ALARM COM and ALARM NC is removed.

Note that the ALARM COM and ALARM NO are short-circuited when controller card is starting and running the start-up tests.

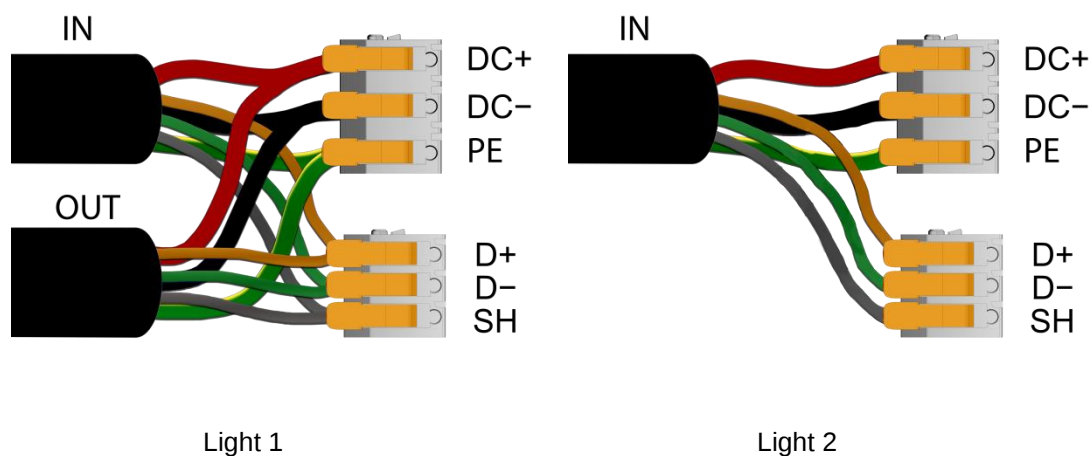
3.2.5 Chaining Lights

Lights are easy to chain together (no need for junction box) (connection can be protected with a 6A or 10A fuse or with a circuit breaker (C curve: C6A or C10A)).





Distributing power and data to next light on the network (AC version)



Distributing power and data to next light on the network (DC version)

When chaining the RS-485 connectors, note the maximum conductor size of 1.5mm² (16 AWG). Remember to set the termination DIP switch on both ends of the RS-485/Modbus bus.

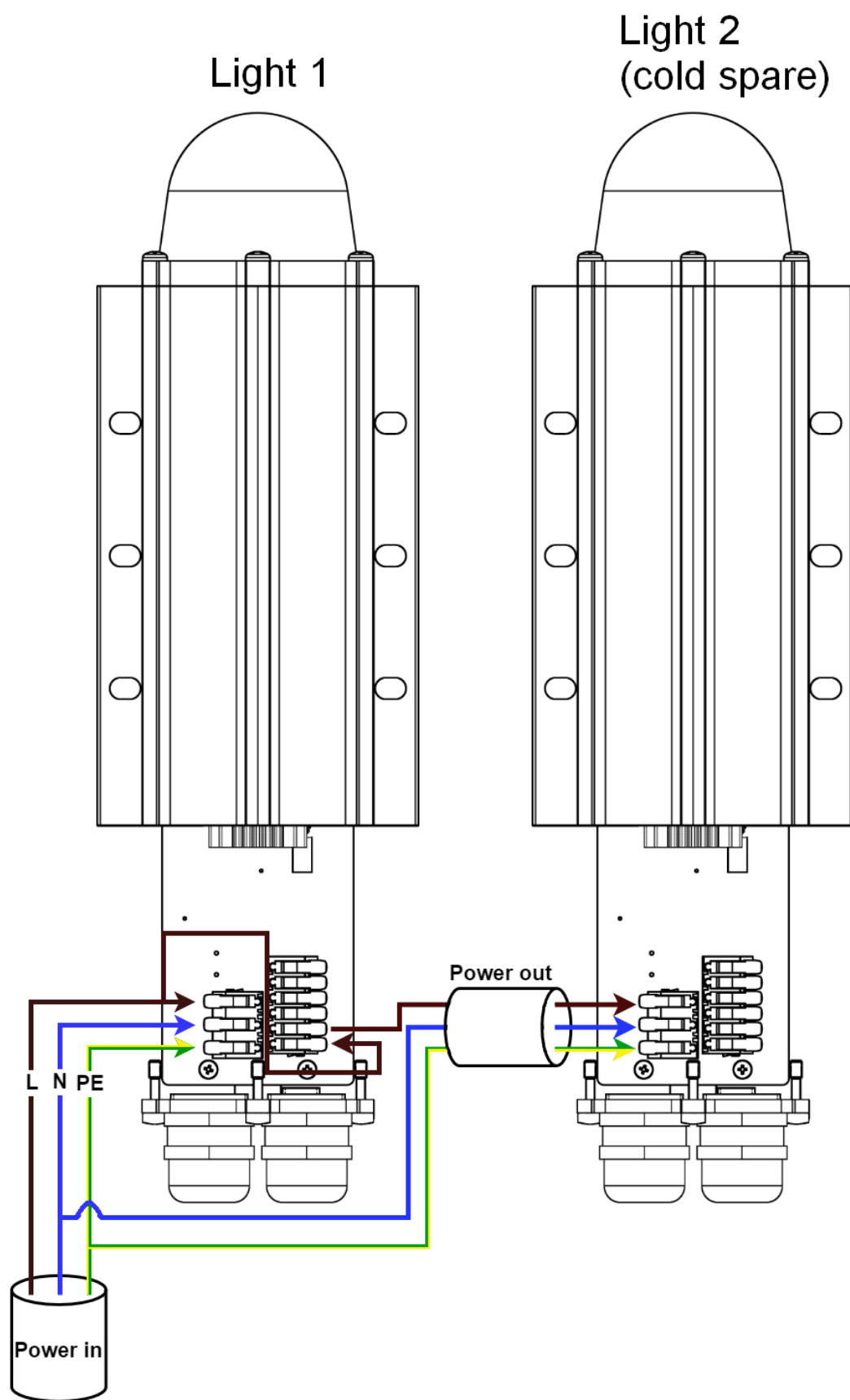
3.2.6 Cold spare connection

In cold spare operation, when primary light (Light 1) has an alarm, the spare light (Light 2) turns on. When alarm turns on in light 1, the NO-COM pins in its alarm relay will short and provide L (phase) to light 2 powering it on. Light 2 will turn off if alarm condition of light 1 clears. Note that both lights can have lights on during the light 1 alarm.



Chaining lights via alarm relay for stand-by redundant operation.

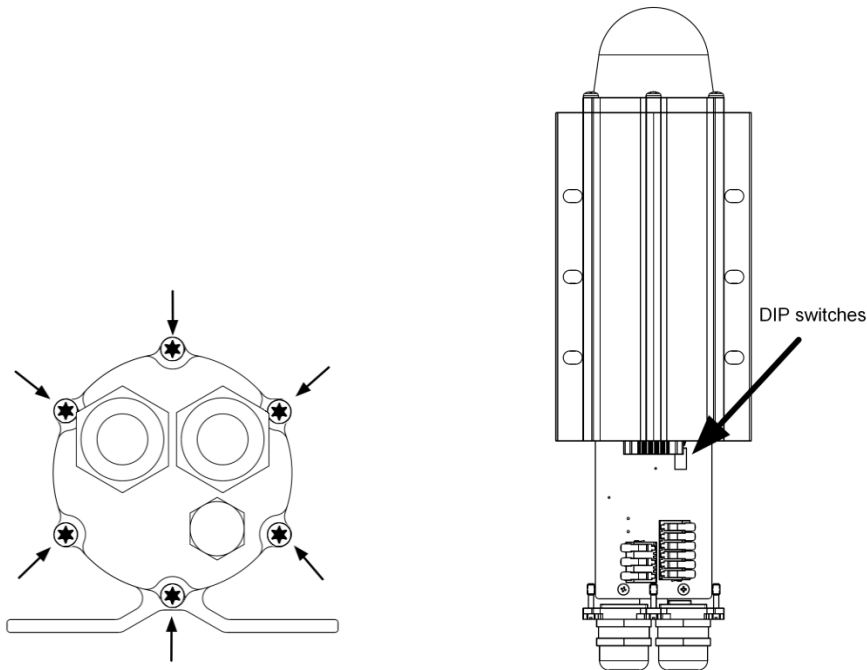
Light 1		Light 2 (cold spare)
Power in connector	Alarm relay connector	Power in connector
L	NO	
	COM	L
N		N
PE		PE



Wiring picture

4 OPERATION

To configure the obstruction light, open the screws on the back of the light to gain access to DIP switches on the controller board. Using the configuration DIP switches, configure the desired parameters into the light. The configuration 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 two different operating modes. Light reset is needed when changing between the modes.



Stand-alone mode: In this mode, the light operation is configured with its DIP switches. No additional controllers are needed. Light 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. Lights will synchronize their flashing with the built-in GPS module. After light start-up, it will take some time for the light to acquire a GPS lock. All models can operate in Stand-alone mode.

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

4.1 Stand-alone mode

Photocell is configured with DIP switches 1-2. With the photocell operation enabled, the obstruction light turns on when the ambient light level has dropped below the selected level. The light turns off when the ambient light level has exceeded the selected value. The turn-on and turn-off times are approximately 3 minutes. Low powered obstruction light has practically no visibility in day. The light causes no light pollution. It is recommended to keep the light on all the time. The power consumption is very small. Having the light on all the time adds to the lights life expectancy.

DIP switch		Photocell threshold
1	2	
off	off	Photocell disabled * (light on all the time)
on	off	200 lx
off	on	400 lx
on	on	1600 lx (between twilight and midday) (recommended if photocell is used)

Flashing rate is selected with DIP switches 3-4. FPM is also configurable with software, e.g. Morse code or 60 FPM are possible.

DIP switch		Flash rate (FPM)
3	4	
off	off	Steady burning *
on	off	20
off	on	30
on	on	40

Infrared light can be turned ON / OFF with DIP switch 5. By default, lights that don't have IR have DIP switch 5 OFF.

DIP switch	Infrared
5	
off	OFF
on	ON *

Heater is controlled with DIP switch 6.

Heater is controlled with DIP switch 6.	
DIP switch	Heater **
6	
off	OFF
on	ON *

With DIP switch 7, the light can be set to a Master or Slave mode. In Master mode, the light can control other lights.

DIP switch	Master/Slave mode
7	
off	Slave *
on	Master

DIP switch 8 selects operating mode between Stand-alone and Modbus.

DIP switch		Operating mode
8		
off		Stand-alone *
on		Modbus

* Factory default

** In DC models, in battery power, it is recommended to set to OFF or use Smart heater feature to reduce power consumption

4.2 Modbus mode

This mode is only applicable to -AM and -GAM models.

Configuration DIP switches 1-5 are used to set the light a Modbus address. Duplicate addresses on the same bus are not allowed. Give each device a unique address. The addresses need to be set from lowest to highest in order. E.g. if 3 devices are used, they need to be in addresses 1, 2 and 3.

DIP switch					Modbus Address
1	2	3	4	5	
on	off	off	off	off	Address 01
off	on	off	off	off	Address 02
on	on	off	off	off	Address 03
off	off	on	off	off	Address 04
on	off	on	off	off	Address 05
off	on	on	off	off	Address 06
on	on	on	off	off	Address 07
off	off	off	on	off	Address 08
on	off	off	on	off	Address 09
off	on	off	on	off	Address 10
on	on	off	on	off	Address 11
off	off	on	on	off	Address 12
on	off	on	on	off	Address 13
off	on	on	on	off	Address 14
on	on	on	on	off	Address 15
off	off	off	off	on	Address 16
on	off	off	off	on	Address 17
off	on	off	off	on	Address 18
on	on	off	off	on	Address 19
off	off	on	off	on	Address 20
on	off	on	off	on	Address 21
off	on	on	off	on	Address 22
on	on	on	off	on	Address 23
off	off	off	on	on	Address 24
on	off	off	on	on	Address 25
off	on	off	on	on	Address 26
on	on	off	on	on	Address 27
off	off	on	on	on	Address 28
on	off	on	on	on	Address 29
off	on	on	on	on	Address 30
on	on	on	on	on	Address 31

DIP switch	Heater **
6	
off	OFF
on	ON *

DIP switch 7 must be off (Slave mode).

DIP switch	Master/Slave mode
7	
off	Slave *
on	Master

Light is in Modbus mode when DIP switch 8 is on. The light is being controlled with an Obelux controller.

DIP switch		Operating mode
8		
off		Stand-alone *
on		Modbus

* Factory default

Setting this switch OFF enables Stand-alone mode for Modbus capable lights.

** In DC models, in battery power, it is recommended to set to OFF or use Smart heater feature to reduce power consumption

RS-485 bus should be terminated with on-board 120 ohm resistors by turning on the RS-485 termination DIP switch on both ends of the communications bus.

4.3 Test mode

To enter test mode, power off the light, set DIP switches 7 and 8 on and all other DIP switches off. The light will enter test mode when power is turned on. To leave the test mode, turn off DIP switches 7 and 8 and restart the light.

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

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

DIP switch		Light mode
1	2	
off	off	Accelerated photocell light behavior
on	off	RED light only
off	on	IR light only
on	on	Reserved

Flashing rate is selected with DIP switches 4 and 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 by using DIP switches 6 and 7. Dimming is light brightness as percentage of full power.

Note that the light stays in test mode despite DIP switch 7 is turned off.

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

4.4 Master light mode (Master – Slave functionality)

Any obstruction light can be set as a master of a light network. Only one light shall be the master in the network. Master unit broadcasts time and illumination data to slave units via RS-485 / Modbus. Time is typically received from GPS and illumination information comes from photocell. If the information flow from the master unit to slave units is interrupted, the slave units will use local photocell setting and local time in their operations. As the data flow resumes, the slaves automatically synchronize themselves with the master unit.

Chain the lights as shown in the example in section 3.2.5.

Set a light to master mode by switching its DIP switch 7 on. Set DIP switch 7 off in the slave lights to put them to slave mode.

DIP switch	Master/Slave mode
7	
off	Slave
on	Master

Set the master light to stand-alone mode and the slave lights to Modbus mode with DIP switch 8.

DIP switch	Operating mode
8	
off	Stand-alone (master)
on	Modbus (slaves)

Use configuration DIP switches 1-5 to give the slave lights Modbus addresses. Refer to Modbus address DIP switch configuration table in Chapter 4.2. Duplicate addresses on the same bus are not allowed. Give lights connected to the same RS-485 bus an address starting from one. RS-485 bus should be terminated with on-board 120 ohm resistors by turning on the RS-485 termination DIP switch on both ends of the communications bus.

Additionally, lights web server configuration is necessary.

In the master light, use lights Web server interface or light configuration tool to configure the following settings:

- ▶ Settings -> Num. Slaves
Set the number of slave lights.
- ▶ Settings -> Slave Options
 - Transmit Behavior Bits
- ▶ Settings -> Slave Behavior
 - LI Red Twilight
Low intensity lights have red light on during Twilight.
 - LI Flash (visible)
Low intensity lights flash visible light.
 - LI Flash (IR)
Low intensity lights flash infrared light.
- ▶ Settings -> Options2
 - Transmit FPM (Master mode only)
 - Hot-Spare function
- ▶ Settings -> Slave Timeout
How long to wait for answer from Modbus slave units.

In the slave lights, use lights Web server interface or light configuration tool to configure the following settings:

- ▶ Settings -> Options2
 - Do not use own photocell (will use default ToD, if no master connection)
 - Use Default FPM if master connection lost

- Failsafe FPM when no Master connection

Then reset the lamps for the settings to take effect.

The master can monitor the slave alarms from:

- Modbus -> Alarm State
Currently active alarm sources
 - B14: Slaves

And:

- Status -> Slave Alarms
Currently active slave alarms are displayed.

4.5 Programming terminal

Light software and configuration settings are upgradable via programming terminal or RS-485 (Modbus) terminal. The programming terminal is used in lights that don't have the Modbus option. Setting a flash rate, photocell threshold and special flash sequences are possible, e.g. Morse code. Updates can be made either with a RS-485 configuration cable (Part code: CONFIG01-RS-485) via RS-485 port by or with a RS-232 configuration cable (Part code: CONFIG01-RXTX) via the programming terminal. The configuration cables connect to a computer via USB. Software in the computer establishes a connection to the light and makes the updates.

4.6 Heater operation

All models have an integrated 7 W heater element. The heater turns on when the lights internal temperature drops below 10 °C and reaches 100% operation when temperature drops below 5 °C. The heater turns off after the temperature rises above 10 °C.

In cold climates, the heater is meant to evaporate moisture and keep the light thawed from snow and ice. Low-intensity lights power consumption is very low and it doesn't produce a lot of heat, so in cold and damp conditions using the heater is recommended. The heater is beneficial to keep the light operating more reliably.

4.7 Smart heater (DC models)

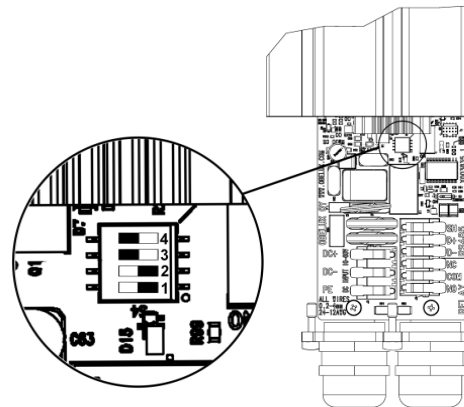
Smart heater means, the heater can be programmatically set ON/OFF based on light's input voltage.

- Monitors light's input voltage and turns off heater if the input voltage falls below a configured value
- Software controlled
- Heater must be set on with configuration DIP switch 6
- Heater is thermostat controlled, it is OFF if temperature is above 10 °C
- Smart heater configurable via RS-485 (Modbus) and programming terminals and configuration software on a computer.
- Settable threshold voltage in which the heater will be disabled.
The voltage is set slightly below battery's charging voltage. The charging voltage depends on the types of battery and charger.
Recommendation: Set the heater threshold voltage 1V below battery charging voltage (with 24V battery)
Example: 24V battery, battery charging voltage 27.5V, set the threshold voltage to 26.5V
- Heater off during battery discharge enables longer power on time for the light
- Factory setting: Heater is in use, Smart heater is not in use

4.8 Battery deep discharge protection (DDP) (DC models)

DIP switch				Battery voltage	Light voltage (light turns off)
1	2	3	4		
off	off	off	off	12V	Power off
off	off	off	on	12V	10.84V
off	off	on	off	12V	10.4V
off	off	on	on	12V	10.08V *
off	on	off	off	24V	Power off
off	on	off	on	24V	22.02V
off	on	on	off	24V	21.18V
off	on	on	on	24V	20.38V
on	off	off	off	48V	Power off
on	off	off	on	48V	44.3V
on	off	on	off	48V	42.55V
on	off	on	on	48V	40.9V
on	on	off	off	Reserved	
on	on	off	on	Reserved	
on	on	on	off	Reserved	
on	on	on	on	Reserved	

* Factory setting = lowest operating voltage



DDP switches

DDP is intended to protect against battery voltage dropping too low to prevent damage to the battery. External deep discharge protection is not needed. Typical application for battery powered lights is cranes. In the above table, voltage levels mean the voltage where the light turns off if voltage at light's input drops below this level. Lower voltages allow the use of longer cables (more voltage drop) or longer operation time at the expense of more discharged battery. Use settings highlighted in yellow for maximum battery protection.

If more battery utilization is needed, use the formula below.

Formula to calculate DC voltage drop in cable: $\Delta V = \frac{IL^2R}{1000}$, where

I = Current in amperes

Light's current can be calculated from Product Code tables by formula $I = P/U$, where

P = light's power consumption in watts

U = battery voltage in volts

L = Cable length in meters

R = Cable resistance in ohm/km

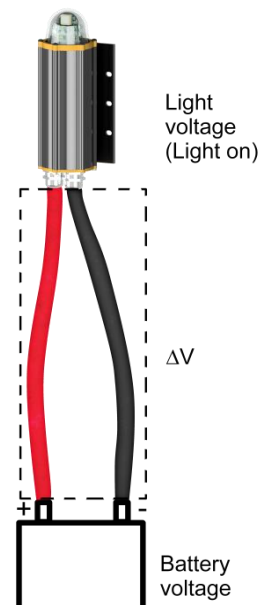
Conductor resistance of copper:

1.50 mm² conductor - 13.3 ohm/km

2.50 mm² conductor - 7.98 ohm/km

Example. LI-DC-32-A (1.1W), 50m cable 1.5 mm², 12V battery

$$\Delta V = \frac{IL^2R}{1000} = \frac{\left(\frac{P}{U}\right)L^2R}{1000} = \frac{\left(\frac{1.1}{12}\right) * 50 * 2 * 13.3}{1000} \approx 0.12V$$



DIP switches				Light voltage (DDP voltage level)	Battery voltage
1	2	3	4		
off	off	off	off	POWER OFF	POWER OFF
off	off	off	on	10.84V	10.96V
off	off	on	off	10.4V	10.52V
off	off	on	on	10.08V	10.2V

Voltages of light and battery of the example at light turn off point.

Alternatively, the voltages in the battery + and – terminals and light input + and – terminals can be measured and the difference calculated. The light must be on when measurements are made.

4.9 Causes for ALARM

The following events can cause an ALARM:

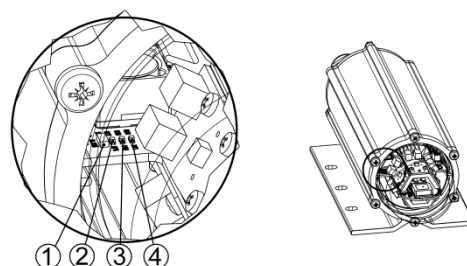
- Internal hardware or power failure.
- Light source failure, including decreased intensity level below rated level of light.
- Loss of GPS synchronization signal or GPS module failure.
- Incorrect photocell operation.

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

4.10 On-board indicator LEDs

Status indication LEDs are located on the controller board. Some of the status indicators have three operating states (off, on and flashing). The lights have three status LEDs on the controller board. These status LEDs are visible only when service access hatch is open, except the ALARM LED that can be seen through the glass cover.

	LED	Description
1	ALARM	Alarm indicator (RED) LED OFF: Normal operation, no alarms LED ON: Active alarm condition
2	GPS	GPS (GREEN) LED OFF: No GPS fix LED FLASHING: Lights GPS module has malfunction. Light is not synchronized. LED ON: Lights GPS module has fully resolved the UTC time. It may take several minutes for the GPS module to receive the necessary data.
3	COM	Communication (GREEN) LED OFF: Waiting for external signals LED FLASHING: Master-slave communications occurring on the network
4	3V3	Internal operating voltage (GREEN) LED OFF: power off LED ON: power on



4.11 GPS operation

In stand-alone mode, lights will automatically synchronize their flashing with their built-in GPS module. After light start-up, it will take some time for the light to acquire a GPS lock, because the lights need a signal from multiple GPS satellites. The GPS provides same timing information for all the lights causing them to flash in sync.

4.12 Troubleshooting

The light doesn't start

- No power (check that the operating voltage status LED is 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 switch 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 (DIP switch 8).
- Too many RS-485 termination resistors (120 ohm) 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.
- Check that there are no external light sources that interfere with the photocell.
- Photocell is sampled once in a minute and read values 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's PCB under the glass cover. Antenna needs a non-blocked view to GPS satellites in orbit. After start-up, GPS receiver may take up to 30 mins to obtain correct time data from GPS satellites. This operation requires data from several GPS satellites.

4.13 Part codes

Code	Information
CONFIG01-RXTX	configuration RS-232 cable Cable usages: special flash settings, photocell threshold, Smart heater and Master – Slave functionality through programming terminal
CONFIG01-RS-485	configuration RS-485 cable (Modbus) Cable usages: special flash settings, photocell threshold, Smart heater and Master – Slave functionality