

USER MANUAL



This User Manual applies to following Obelux SAL aviation obstacle lights:

Obelux MI-20KW	Obelux HI-50KW
Obelux MI-20KW-x-A	Obelux HI-50KW-x-A
Obelux MI-20KWD-x-A	Obelux HI-50KWD-x-A

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1 Overview

Obelux MI-20KW-x-A is aviation obstacle light product to customers needing an obstacle light that provides 20 000 cd white and can provide 2 000 cd red (model MI-20KWD-x-A) and/or infrared beacons in the same unit with factory-installed options. White light can be dimmed in night mode.

Respectively, Obelux HI-50KW-x-A is aviation obstacle light product to customers needing an obstacle light that provides 50 000 cd white and can provide 2 000 cd red (model HI-50KWD-x-A) and/or infrared beacons in the same unit with factory-installed options. White light can be dimmed in twilight and night modes.

Replace –x- with operating voltage. Values are presented in tables below.

2 Models

2.1 Medium Intensity

2.1.1 20 000 cd white

This obstacle light is available in following configurations:

Light output: 20 000 cd white	
Voltage	Obelux product code
100 V _{AC}	Obelux MI-20KW-100-A
115 V _{AC}	Obelux MI-20KW-115-A
200 V _{AC}	Obelux MI-20KW-200-A
230 V _{AC}	Obelux MI-20KW-230-A

Obelux MI-20KW-x-A, being a 20 000 cd product, meets the light output specifications of ICAO Medium Intensity Type A and FAA L-865, L-866.

ICAO Medium Intensity, Type A (flash rate 20 – 60 fpm) FAA Medium Intensity, Type L-865 (flash rate 40 fpm) FAA Medium Intensity, Type L-866 (flash rate 60 fpm)	
Mode	Light output
Day	20 000 cd ± 25% flashing white
Twilight	20 000 cd ± 25% flashing white
Night	2 000 cd ± 25% flashing white

2.1.2 20 000 cd white and 2 000 cd red

This obstacle light is available in following configurations:

Light output: 20 000 cd white and 2 000 cd red	
Voltage	Obelux product code
100 V _{AC}	Obelux MI-20KWD-100-A
115 V _{AC}	Obelux MI-20KWD-115-A
200 V _{AC}	Obelux MI-20KWD-200-A
230 V _{AC}	Obelux MI-20KWD-230-A

Obelux MI-20KWD-x-A meets the following light output specifications (user-selectable):

ICAO Medium Intensity, Type A (flash rate 20 – 60 fpm)
 FAA Medium Intensity, Type L-865 (flash rate 40 fpm)
 FAA Medium Intensity, Type L-866 (flash rate 60 fpm)

Mode	Light output
Day	20 000 cd ± 25% flashing white
Twilight	20 000 cd ± 25% flashing white
Night	2 000 cd ± 25% flashing white

ICAO Medium Intensity, Type B (flash rate 20 – 60 fpm)
 FAA Medium Intensity, Type L-864 (flash rate 20-40 fpm)
 FAA Medium Intensity, Type L-885 (flash rate 60 fpm)

Mode	Light output
Day	N/A
Twilight	N/A
Night	2 000 cd ± 25% flashing red

ICAO Medium Intensity, Type C

Mode	Light output
Day	N/A
Twilight	N/A
Night	2 000 cd ± 25% fixed red ("steady burning")

2.2 High Intensity

2.2.1 50 000 cd white

Obelux HI-50KW-x-A is high-Intensity obstacle light designed especially for wind-mill applications where civil aviation authority for aviation security allows using two (or more) 50 000 cd units instead of one 100 000 cd unit. This product is a replacement to 100,000 cd high intensity aviation obstacle light only in cases where local authority allows using two or more 50 000 cd (white) obstacle lights instead of 100 000 cd (white) obstacle light.

With two or more HI-50KW obstacle lights, this product conforms to performance required from ICAO High Intensity Type B and it meets regulations set by Finnish Civil Aviation Authority (part of Finnish Transport Safety Agency).

Light output: 50 000 cd white

Voltage	Obelux product code
100 V _{AC}	Obelux HI-50KW-100-A
115 V _{AC}	Obelux HI-50KW-115-A
200 V _{AC}	Obelux HI-50KW-200-A
230 V _{AC}	Obelux HI-50KW-230-A

2.2.2 50 000 cd white and 1 000 cd red

This obstacle light is available in following configurations:

Light output: 50 000 cd white and 1 000 cd red

Voltage	Obelux product code
100 V _{AC}	Obelux HI-50KWD-100-A
115 V _{AC}	Obelux HI-50KWD-115-A
200 V _{AC}	Obelux HI-50KWD-200-A
230 V _{AC}	Obelux HI-50KWD-230-A

Like HI-50KW-x-A, with two or more HI-50KW obstacle lights, this product conforms to performance required from ICAO High Intensity Type B and it conforms to regulations issued by Finnish Transport Safety Agency.

Obelux HI-50KWD-x-A meets the following light output specifications:

[TraFi - Finland]	
Mode	Light output
Day	50 000 cd ± 25% flashing white
Twilight	10 000 cd ± 25% flashing white
Night	1 000 cd ± 25% flashing white

Mode	Light output
Day	N/A
Twilight	N/A
Night	1 000 cd ± 25% flashing red

Mode	Light output
Day	N/A
Twilight	N/A
Night	1 000 cd ± 25% fixed red ("steady burning")

2.3 Common elements in all models

No external controllers are required to install and run these products. In most use cases, mounting the standalone aviation obstacle light and connecting power supply cable are the only actions needed to operate this light.

These models come with built-in photocell that can drive the transitions between day, twilight and night modes. In some ICAO aviation obstacle light types, twilight mode is not specified and day mode is used until night.

Various operating modes and responses to parameters are realised using embedded microcontroller on the controller card.

These Obelux aviation obstacle lights are Class 2M LED device. 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 Options

These Obelux standalone aviation obstacle lights can be extended with factory-installed options like GPS synchronisation, Ethernet/IP interface and infrared LEDs. Infrared LEDs are typically used to achieve NVG compatibility.

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GPS synchronisation is an industry-wide solution to make aviation obstacle lights to synchronise their flashing regardless of location. These models can even be controlled and monitored from a remote control room using optional Ethernet/IP interface.

Factory-installable options available:

For Obelux MI-20KW-x-A	
Option	Added functionality
OPT-GPS-20KW-A	GPS Receiver
OPT-IR-20KW-A	Infrared (855 nm)
OPT-LAN-20KW-A	Ethernet/IP interface

For Obelux MI-20KWD-x-A	
Option	Added functionality
OPT-GPS-20KWD-A	GPS Receiver
OPT-IR-20KWD-A	Infrared (855 nm)
OPT-LAN-20KWD-A	Ethernet/IP interface

For Obelux HI-50KW-x-A	
Option	Added functionality
OPT-GPS-50KW-A	GPS Receiver
OPT-IR-50KW-A	Infrared (855 nm)
OPT-LAN-50KW-A	Ethernet/IP interface

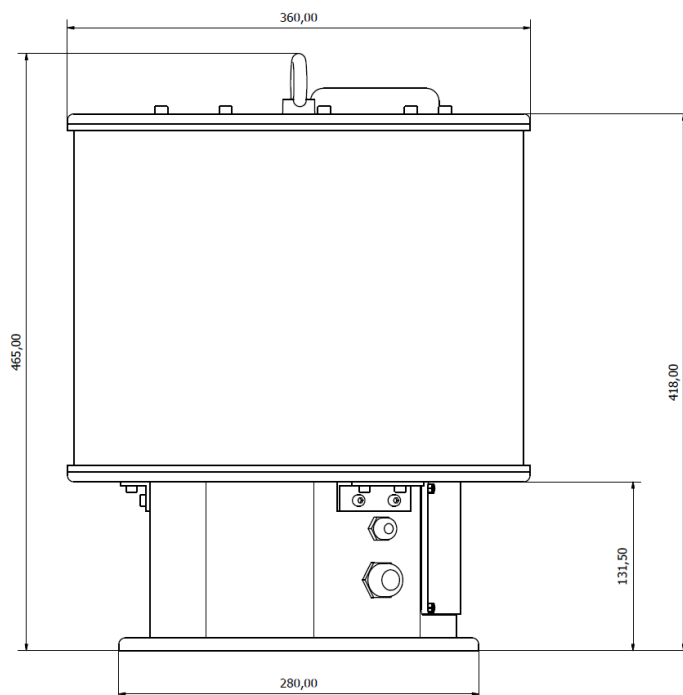
For Obelux HI-50KWD-x-A	
Option	Added functionality
OPT-GPS-50KWD-A	GPS Receiver
OPT-IR-50KWD-A	Infrared (855 nm)
OPT-LAN-50KWD-A	Ethernet/IP interface

Options are ordered together with the aviation obstacle light.

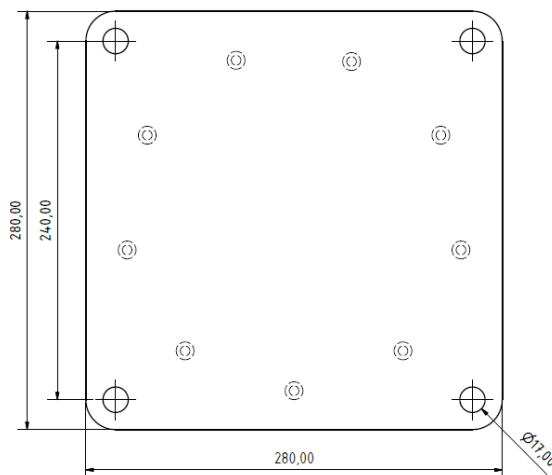
Installing OPT-IR makes this product compliant with NVGs (Night Vision Goggles).

4 Dimensions

All dimensions stated in illustrations are in millimetres (mm).



Mechanical dimensions



Mechanical dimensions – Mounting plate

5 Parts

User-accessible parts are illustrated and explained in the table below. These parts are accessible through the service access hatch on the lower chassis area.

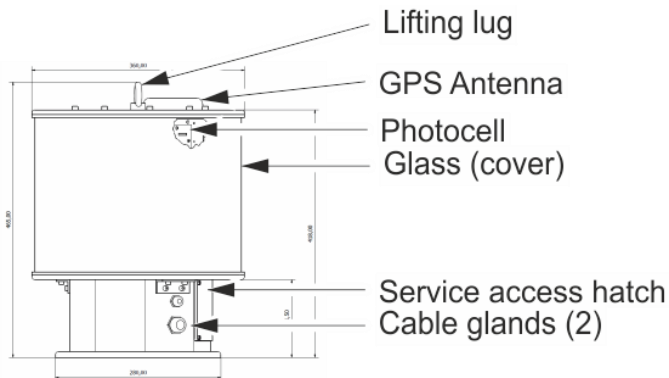
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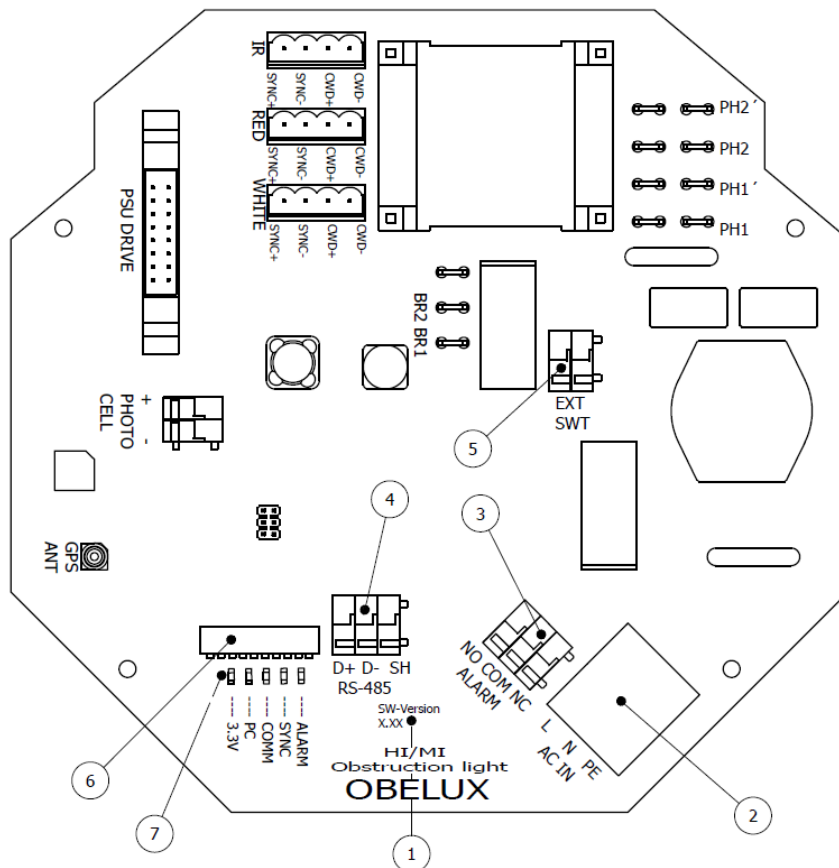
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Connectors on the system board are designed to house mains power supply wires of size up to 4(6) mm² nominal cross section and communications cable wires of size up to 1.5 mm². Power supply cable wires are secured using screw terminals; the communication cable wires are secured using spring-cage clamp terminals.

To release wire from terminal block, push the orange lever on top of connector chassis backwards to open the terminal. A slot head screwdriver is recommended.





Controller board

1	Software version label
2	Mains power supply connector (Single-phase supply with Protective Earth)
3	Alarm relay connector
4	Communications network connector (RS-485 or Ethernet/IP RJ-45)
5	External signal input connector
6	Configuration DIP switches (1-10)
7	Status LEDs

6 Options

Obstacle light may have factory-installed Ethernet/IP and/or GPS options already mounted on the controller board.

6.1 Ethernet/IP network

Ethernet/IP option replaces RS-485; if Ethernet/IP is equipped, the RS-485 is unavailable. Ethernet/IP enables remote control and monitoring without RS-485 bus, allowing longer distances and monitoring off-site.

6.2 GPS

GPS receiver makes it possible to synchronise obstacle lights to external clock (GPS time). This option is typically used in master units or non-networked lights to have all aviation obstacle lights to follow same flashing pattern. External GPS antenna is located on top of light.

6.3 Infrared

Obstacle light may have factory-installed Night Vision Goggles-compatible infrared LEDs.

7 Installation

7.1 Verify model

Find the Obelux product label on the light and note the product model. It should state the light output and operating voltage of that particular light. Use the following information to decode Obelux product label information:

Product code (sample)

Obelux MI - 50KW - 230 - A

1	Serie
HI	High Intensity
MI	Medium Intensity

2	Light output
20KW	20 000 cd white
20KWD	20 000 cd white and 2 000 cd red
50KW	50 000 cd white
50KWD	50 000 cd white and 2 000 cd red

3	Operating voltage (AC only)
100	100 V _{AC}
115	115 V _{AC}
200	200 V _{AC}
230	230 V _{AC}

4	Standalone
A	Standalone model

Using information on the product label, check and verify that the product matches supply voltage on the site. Incorrect voltage on the supply terminals can cause permanent damage on this device. Using incorrect supply voltage also voids the product warranty.

7.2 Configuration

Open all four (4) screws that secure the service access hatch to the chassis using a slot-head screwdriver. You do not need to remove the screws completely to open this hatch. Hatch is secured using a strap between hatch and chassis.

Using the DIP switches visible and accessible via service access opening, configure the desired parameters into standalone light. To configure this light the following parameters shall be set according to the local regulations and permit:

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- Operating mode during night time (e.g. ICAO Medium-Intensity Type B: flashing-red, Type C: fixed-red)
- Flash rate (flashes per minute)

DIP switch #9 is unused.

DIP switch #10 controls RS-485 communication bus termination. When this DIP switch is turned ON (i.e. facing up), the 120 Ω termination resistor is connected to the RS-485 bus on the controller board.

DIP switches are numbered 1-10, the lowest number (1) being on the leftmost edge of the red/white DIP switch block looked from service access door.

Embedded software in the obstacle light reads configuration switches regularly. Configuration change becomes effective within few seconds.

7.2.1 Light

The controller board shall be configured according to the hardware installed in the aviation obstacle light i.e. as the aviation obstacle light has been manufactured.

Some alternatives in the table below may be inapplicable to a certain product (i.e. 20 000 cd light MI-20KW cannot operate as HI-50KW providing 50 000 cd light and fulfilling requirements). Make sure that you return the proper configuration setting in case test mode (explained below) has been engaged and required tests have been carried out.

DIP switch			Light
1	2	3	
off down	off down	off down	MI-20KW 20 000 cd white (flashing)
on up	off down	off down	MI-20KWD 20 000 cd white (flashing) and 2 000 cd red
off down	on up	off down	MI-20KW with OPT-IR-20KW-A 20 000 cd white (flashing) and infrared
on up	on up	off down	MI-20KWD with OPT-IR-20KWD-A 20 000 cd white (flashing), 2 000 cd red and infrared

The red light on MI-20KWD is disabled when DIP switch #1 is off.

DIP switch			Light
1	2	3	
off down	off down	on up	HI-50KW 50 000 cd white (flashing)
on up	off down	on up	HI-50KWD 50 000 cd white (flashing) and 2 000 cd red
off down	on up	on up	HI-50KW with OPT-IR-50KW-A 50 000 cd white (flashing) and infrared
on up	on up	on up	HI-50KWD with OPT-IR-50KWD-A 50 000 cd white (flashing), 2 000 cd red and infrared

The red light on HI-50KWD is disabled when DIP switch #1 is off.

7.2.2 Flash rate

DIP switches #4 and #5 control the flash rate. Standard controller can run the light with following flash rates. Customer-specific flash rates are available on request.

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DIP Switch		Flash rate
4	5	
off down	off down	20 fpm (flashes per minute); one flash in three seconds
on up	off down	30 fpm (flashes per minute); one flash in two seconds
off down	on up	40 fpm (flashes per minute); one flash in 1.5 seconds
on up	on up	60 fpm (flashes per minute); one flash in every second

7.2.3 Night mode parameters

Using DIP switch #6, the flashing mode for red (models MI-20KWD and HI-50KWD) and infra-red (models with OPT-IR) can be set.

DIP Switch	Night mode
6	
off down	Red and infrared (IR) lights flash at the selected flash rate.
on up	Red and infrared (IR) lights are burning steady.

7.2.4 Device mode

Using DIP switch #8, the obstacle light can be set to operate as master in network. Only one obstacle light shall be 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 (internal or external). If the information flow from master unit to slave units is interrupted, the slave units will use local photocell setting and local clock (time) in their operations. As data flow resumes, the slaves automatically synchronise themselves with master unit.

DIP Switch	Device mode select
8	
off down	This unit is a slave in the Obelux aviation obstacle lighting system/network.
on up	This unit is master in the Obelux aviation obstacle lighting system/network.

7.2.5 RS-485 bus termination

DIP Switch	RS-485 termination
10	
off down	RS-485 bus not terminated on controller board.
on up	RS-485 bus terminated to 120Ω on controller board.

7.3 Mounting

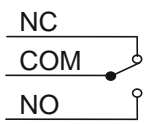
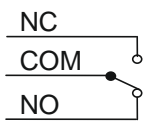
7.3.1 Physical installation

Mount the obstacle light to selected mounting point using quality-made fasteners. This Obelux standalone light comes with four bolt holes to mount this product securely.

Photocell is located under top lenses row. See illustration on page 8 for more information.

Level the light using spirit level (bubble level) if the mounting point is not already levelled. Tighten bolts & nuts. Obelux recommends 100 Nm tightening torque for M12 hot-dipped 8.8 bolts with suitable washer between bolt and mounting plate.

7.3.2 Alarm relay

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

When the controller board starts, after a short delay, the contacts NC (Normally Connected) and COM (Common) are short-circuited. 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.

7.3.3 Wiring

Open the service access hatch.

Connect the RS-485 bus (if applicable), alarm relay cables (if applicable) and mains power supply cable wires securely to appropriate terminal block connectors. Route cables using cable glands on the right side of obstacle light. Note polarity.

Mains power (N, L, PE)		
Conductor cross section solid and stranded min.	Conductor cross section solid max.	Conductor cross section stranded max.
0.5 mm ²	6 mm ²	4 mm ²

Minimum AWG according to UL/CUL is 24 and maximum AWG is 10.

Signal wires

	Conductor cross section solid and stranded min.	Conductor cross section solid and stranded max.
Signals: Alarm	0.2 mm ²	1.5 mm ²
Signals: RS-485 bus	0.2 mm ²	1.5 mm ²

RS-485 bus is unavailable on standalone models having Ethernet/IP option installed. With this Ethernet option installed, use high-grade CAT5 (or better) Ethernet copper cable and RJ-45 connectors.

7.3.4 Testing

If needed, operations of the Obelux MI-20KW-x-A and HI-50KW-x-A lights can be tested using test mode. Further information is available on chapter 10 (see page 15). Restore normal operation mode when testing has been completed.

For testing, the mains power supply to the light must be available.

Ambient light is measured using photocell under glass cover on top of light. To avoid too frequent changes of intensity level, the new ambient light level must be constantly active for more than three minutes in normal operations mode. Test mode provides rapid feedback.

7.3.5 Post-installation actions

Place the service access hatch properly on its place and securely tighten all four screws on the corners of this hatch.

7.3.6 Power-On

The obstacle light starts with daytime intensity level. Depending on the light, the first flashes will be at 20 000 cd or 50 000 cd effective intensity. After three minutes, the intensity level can be decreased to twilight or night mode with information from photocell.

8 Status indications

Status indications are LEDs mounted on the controller board in front of configuration DIP switches. Some of the status indicators have three operating states (off, lit and blinking).

Indicators listed below follow their order (from left to right) on the controller board.

This Obelux standalone light has five (5) status LEDs on the controller board. These status LEDs are visible only when service access hatch is open.

Indicator		3V3
Colour:	Green	
off		Power off.
on		Unit is powered on.

Indicator		PC
Colour:	Green	
off		Photocell not in use
on		Day mode
blinking fast		Twilight mode
blinking slowly		Night mode

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Indicator		COMM
Colour:	Green	
off		Waiting for external signals.
on		Valid GPS signal is available.
blinking		Master-slave communications occurring on the network.

Indicator		SYNC
Colour:	Green	
off		All outputs are off.
on		At least one output is active.

Indicator		ALRM
Colour:	Red	
off		Normal operation, no alarms.
on		Active alarm condition.

See chapter 9 for conditions when ALRM is active.

9 Causes for ALARM

The following events can cause ALRM to signal active alarm:

- Internal power failure
- Light source failure, including decreased intensity level below rated level of light
- Loss of synchronisation
- Loss of light status information in networked installations
- Incorrect photocell operation.

10 Testing

Using DIP switch #7, the obstacle light can be set to test mode. In test mode, the DIP switches take the meanings described here, replacing the default meaning described above.

Use test mode with caution while working with installed aviation obstacle light outdoors.

Before commencing test, the light must be powered on and configuration done according to light type. Turn DIP switch #7 from off (facing down) to on (facing up) to start unit testing.

DIP Switch	Test mode
7	
off down	Normal operation.
on up	Test mode. Use with caution in live installations.

10.1.1 Functional test

When doing functional tests the light head test DIP switches (4-5, see next chapter) should be set to off. Similarly, during light head tests the functional test DIP switches 1-3 should be set to off.

While in test mode, the DIP switches have the following meaning:

DIP switch				Selected test
1	2	3	7	
off down	off down	off down	on up	Off test All lights off
on up	off down	off down	on up	Night mode test All lights set to night-time operation
off down	on up	off down	on up	Twilight mode test All lights set to twilight-time operation
on up	on up	off down	on up	Day mode test All lights set to daytime operation
off down	off down	on up	on up	Photocell test Photocell value read once in every second
on up	off down	on up	on up	Communications test Synchronisation messages sent to network
off down	on up	on up	on up	Reserved
on up	on up	on up	on up	Reserved

10.1.2 Light head test

Note that the amount of light output during the light head tests does not exactly match normal operation. The light head test modes should not be used when measuring the output intensity.

DIP switch			Light tests
4	5	7	
off down	off down	on up	Off test All lights off
on up	off down	on up	Turns on the white light, at approximately 10% power
off down	on up	on up	Turns on the red light, at approximately full power
on up	on up	on up	Turns on the IR light, at approximately full power

11 Configuration example

This example illustrates DIP switch settings for MI-20KW-x-A (flashing white 20 000 cd) that flashes once in every three seconds. Internal photocell controls mode selection (day, and night). During night mode, the white light output is reduced down to 2 000 cd.

DIP switch			Light type
1	2	3	
off down	off down	off down	MI-20KW 20 000 cd white (flashing)

DIP Switch		Flash rate
4	5	
off down	off down	20 fpm (flashes per minute); one flash in three seconds

DIP Switch		Night mode
6		
off (down)		Not applicable

DIP Switch		Test mode
7		
off (down)		Normal operation.

DIP Switch		Device mode select
8		
off (down)		This unit is a slave in the Obelux aviation obstacle lighting system/network.

DIP Switch		Reserved
9		
off (down)		

DIP Switch		RS-485 termination
10		
off (down)		RS-485 bus termination resistor is not connected to RS-485 bus.

12 Troubleshooting

Potential sources for errors during start-up are:

- No power (check that the 3V3 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)
- Too many RS-485 termination resistors (120Ω) on the same RS-485 communication bus

This obstacle light is available for AC input, only. Do not attempt to use this equipment with DC supply.

Do not exceed maximum operating voltage. Mains power supply input is protected with overvoltage protection circuit that is tuned to stated operating voltage range.

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. These intensity steps are set in the factory.

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GPS antenna is mounted on top of obstacle light. Antenna needs non-blocked view to GPS satellites in orbit.

After start-up, GPS receiver may take some minutes to obtain correct time from GPS satellites. This operation requires data from more GPS satellites than the GPS receiver needs to maintain the time.

13 Spare parts

The following list applies to MI-20KW-A and MI-20KWD-A models:

Part code	Description
GC-SAL	Replacement glass cover
CONT-20-SAL	Controller board
CAP-20-SAL	Capacitor board
PS-20-SAL	Power supply board

The following list applies to MI-50KW-A and MI-50KWD-A models:

Part code	Description
GC-SAL	Replacement glass cover
CONT-50-SAL	Controller board (50 000 cd unit)
CAP-50-SAL	Capacitor board (50 000 cd unit)
PS-50-SAL	Power supply board

14 Configuration sheets

14.1 Normal operation

DIP	DIP	DIP	Function
1	2	3	Light Type (Note 1)
off	off	off	MI-20KW-A
on	off	off	MI-20KWD-A
off	on	off	MI-20KW-A + OPT-IR-20KW-A
on	on	off	MI-20KWD-A + OPT-IR-20KWD-A
off	off	on	HI-50KW-A
on	off	on	HI-50KWD-A
off	on	on	HI-50KW-A + OPT-IR-50KW-A
on	on	on	HI-50KWD-A + OPT-IR-50KWD-A

4	5	Flash rate (Note 2)
off	off	20 fpm
on	off	30 fpm
off	on	40 fpm
on	on	60 fpm

6	Night mode operation (Note 3)
off	Red and infrared LEDs flashing
on	Red and infrared LEDs in steady-burning mode

7	Test mode enable
off	Normal operation
on	Test mode enabled (see Test mode chart for DIP switch settings)

8	Master/Slave mode
off	This device is slave
on	This device is master

9	Reserved
---	----------

10	RS-485 termination
off	Termination resistor on controller board unconnected.
on	120Ω bus termination resistor on controller board connected to RS-485 bus.

Remarks	
Note 1	Various operating voltages are omitted here for clarity.
Note 2	Customer-specific flash rates available.
Note 3	Applicable to models with suitable hardware and required options installed.

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14.2 Test mode

This test mode configuration sheet is valid on these lights while DIP switch #7 (Test mode) is turned on. Test mode is ended when DIP switch #7 is turned off, restoring normal operations.

To enable test mode, while having power on this obstacle light, first turn the DIP switch #7 to ON (i.e. up). Then, turn DIP switches #1 to #5 off (down). Do not turn the power of the light to ON when DIP switch #7 is ON as the light head type would then be missed.

DIP	DIP	DIP	Function
1	2	3	Test selector
off	off	off	Light turned off
on	off	off	Night mode test
off	on	off	Twilight mode test
on	on	off	Day mode test
off	off	on	Photocell test
on	off	on	Communications test
off	on	on	Reserved
on	on	on	Reserved

4	5		Light head test
off	off		All lights turned off
on	off		Turns on white light at approximately 10 % power level
off	on		Turns on red light at approximately full power
on	on		Turns on infrared light at approximately full power

7		Test mode
off		Normal mode
on		Test mode enabled

After leaving test mode (turning DIP switch #7 to off), always restore configuration: configure the light using DIP switches 1-6 and 10 to operate properly.

15 Change log

Version	Date	Created	Changes
1	05-June-2013	RJä	First release
2	13-December-2013	RJä	Tightening torque specified
2.1	19-December-2013	RJä	Spare part list
2.2	14-January-2014	RJä	Corrections in intensity (HI-50KW)

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