OPERATING INSTRUCTION
M=LIGHT LED, 1000W 8LE-D23

Contents

Valid from serial number	17-00000
Valid from software version number	2.10.0.59

Chapter 1 About this operating instruction

Contents

1.1 Property rights according to ISO 16016

The content of this operating instruction is our intellectual property. We appreciate you understanding, that we CANNOT allow disclosure of this document, either in full or in part, to third parties, especially our competitors.

1.2 Meaning of this Operating Instruction

The operating instruction is part of your product. Consequently, you must keep this operating instruction so that it is easily accessible for the operating staff at all times.

When selling or leaving the product to third parties, the operating instruction must be handed over to the new owner or user. Immediately replace the operating instruction if it is lost or incomplete. In this event, contact MESSRING GmbH.

Together with this operating instruction, you shall receive documents of third party manufacturers, if necessary. Also familiarize yourself with these instructions and read the safety instructions and warnings contained therein.

For your own safety, observe all safety instructions and warnings in chapter 2 of this operating instruction. Also observe the warnings and safety instructions on the individual components and activities in the other chapters.

1.3 Description of Signs and Symbols

1.3.1 Warnings

Depending on the scope of the consequences occurring in case of NON-COMPLIANCE with a warning, there are four different risk levels. Each risk level is marked with a certain signal word and a warning sign.

DANGER! 	Refers to a dangerous situation which, in case of NON-COMPLIANCE, will lead to death or severe injuries. irreversible.

WARNING! 	Refers to a dangerous situation which, in case of NON-COMPLIANCE, may lead to death or severe injuries. irreversible

CAUTION! 	Refers to a dangerous situation which, in case of NON-COMPLIANCE, may lead to minor or moderately severe injury. reversible

NOTE! 	Damage to property

Warning sign	Meaning
	Hazard due to electric voltage
	Hazard due to optical radiation

1.3.2 Description of More Signs and Symbols

Symbol	Meaning
➢	Step.
➢	Instruction to avoid hazards.
✓	Result of a sequence of actions.
	Hint / additional information.
New Test	Element of the CrashSoft user interface or labeling of an operating element.
NOT	Negation

1.4 Contact

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Chapter 2 Health and Safety

This chapter provides information on dangers which emanate from the product. The safety instructions and warnings aim to avoid fatal accidents, severe injuries and damage to property.

- Carefully read and observe all instructions in this chapter.
- Observe the safety instructions and warnings on the individual components and activities in the following chapters.
- Completely read this operating instruction before beginning with operation or maintenance of the M=LIGHT LED.
- Observe regional, national and company-internal standards, directives and regulations.

Content

2.1 Target groups

The following sections of the chapter Health and Safety and Responsibility must be read in any case:

Target Group	Read paragraphs
Operator of the facility	Chapter 2, completely
Operating staff	Chapter 2, without section 2.6.2
Maintenance staff	Chapter 2, completely

2.2 Main Sources of Danger

The main sources of danger when handling this product are:

- Burns on hot surfaces.
- Hazards due to electric voltage.
- Remaining under suspended loads.
- Eye injuries due to optical radiation.
- Danger to life for persons with active implants (e.g. cardiac pacemaker).

2.3 Purpose

2.3.1 Intended Use

The M=LIGHT LED is used for stationary lighting of fast processes recorded with a camera in indoor areas, e.g.:

- Vehicle and sled tests in crash test facilities.
- Airbag ignition and unfolding.
- Tests with partial car bodies or vehicle interior equipment.

2.3.2 Warning of Misuse

- Do NOT use M=LIGHT LED in outdoor areas.
- Do NOT use M=LIGHT LED as work lighting for permanent work spaces.
- Do NOT use M=LIGHT LED as on-board lighting.
- Do NOT use M=LIGHT LED in the drip area under film pit covers.

Any use NOT described in section 2.3.1 is NOT as intended and consequently NOT PERMITTED.

2.4 Staff, Workplaces and Hazard Area

2.4.1 Qualification and Level of Knowledge

The M=LIGHT LED may be operated only by appropriately trained staff. The staff must carefully read the operating instruction for the M=LIGHT LED beforehand and be familiar with the mode of operation.

Maintenance and repair work on the M=LIGHT LED may only be carried out by qualified staff specially trained for this purpose.

- First read the Health and Safety chapter of the crash test facility completely before working at the crash test facility.
- First read the operating instruction of the M=LIGHT LED carefully before operating the M=LIGHT LED for the first time.
- Do NOT carry out any work for which you have NOT been trained.

The staff must know and comply with the applicable regulations for occupational health and safety and for accident prevention.

WARNING!	Severe injuries or death from reduced responsiveness through alcohol and other drugs or medications
	Even minor quantities of alcohol and drugs impair concentration and the ability to react. This may lead to very severe injuries or even death. ➢ Do NOT work with the M=LIGHT LED if your concentration and ability to react are impaired by drugs or alcohol.

2.4.2 Hazard area

For persons with active implants, the hazard area of 1 m around the M=LIGHT LED applies.

2.5 Operator's Duties

2.5.1 Information and Instructions

- Store the operating instructions within reach for operating and maintenance staff.
- Carefully read the operating instruction before using the product.
- Ensure that all persons are familiar with and comply with the current occupational health and safety regulations.

2.6 Technical Condition

2.6.1 Modifications and Changes

- DO NOT make any unauthorized changes to the product.

2.6.2 Maintenance and Repair

- Strictly comply with all test and maintenance intervals.
- Have maintenance work carried out only by appropriately trained maintenance staff.
- Have only work which is described in this operating instruction carried out.
- Have failures remedied immediately.

2.6.3 Malfunction

- DO NOT operate the M=LIGHT LED if there is a defect.
- DO NOT operate the M=LIGHT LED if a defect is suspected.
- Inform MESSRING Service in the event of a defect (Section 1.4, Page 4).

2.7 Safety during Normal Operation

2.7.1 Warnings during Normal Operation

DANGER! 	Severe injuries or death may be caused by electric shock from electric charge inside the housing. Immediately after disconnection, the contacts of the mains plug may still carry voltage for a short period. ➢ Do NOT touch the contacts of the mains plug directly after switch-off.

DANGER! 	Severe injuries or death for persons with active implants The magnetic field of the M=LIGHT LED may interfere with the function of implants, e.g. cardiac pacemakers, if the safety distance specified for the implant is not complied with. ➢ Persons with active implants must keep a distance of at least 1 m to the activated M=LIGHT LED.

DANGER! 	Severe injuries or death due to dangerous electrical shock or burns due to melting power cord Unsuitable power cords can cause the power cord to overheat, resulting in serious injury, death, burns, and dangerous voltage surges on the melting power cord. ➢ Use only the hot appliances power cord supplied by MESSRING with the M=LIGHT LED. ➢ DO NOT replace hot appliance power cords with other power cords.

DANGER! 	Severe injuries or death may be caused by electric shock from electric voltage Work on components that have NOT been disconnected and are under dangerous electric voltage will cause severe injuries (e.g. burns, paralysis, cardiac arrest), including death. ➢ Only have work carried out by qualified experts. ➢ Use only power cords supplied by MESSRING with the M=LIGHT LED. ➢ Observe the safety rules for switching-off and securing before working at power lines and devices.

CAUTION!

Eye injuries due to optical radiation

Radiation with light from the M=LIGHT LED may lead to damage of the retina and cornea of the eyes.

- Keep sufficient safety distance to activated M=LIGHT LEDs.
- Wear safety goggles when working on switched-on M=LIGHT LED (e.g. Infield, Terminator Orange UV-400 / Art. no.: 9380 420).
- Do NOT stay within radiation range of the lamp longer than required.
- Do NOT directly look into the beam of light.
- Do NOT use M=LIGHT LED as lighting for work stations.

CAUTION!

Burns at hot surfaces

Risk of burning on the housing of the M=LIGHT LED at temperatures of up to 100 °C.

- Allow M=LIGHT LED to cool down first before touching it.

Risk of burning on the shaft of the M=LIGHT LED suspension after prolonged operating time.

- Do NOT touch the shaft of the suspension during operation or shortly after switching off the M=LIGHT LED.

NOTE!

Damage and breakdown of the M=LIGHT LED

Overheating of the M=LIGHT LED due to insufficient ventilation.

- Do NOT cover the ventilation slots.
- Do NOT position the M=LIGHT LED directly on the housing.
- DO NOT install the M=LIGHT LED in the exhaust air flow of additional M=LIGHT LEDs.

NOTE!

Damage and breakdown of individual LEDs due to deposits of grease or sweat.

Destruction of individual LEDs due to overheated grease or sweat residues.

- Do NOT touch the LED array.
- If required, rub the LEDs with a dry, clean cotton cloth.
- Do NOT use cleaning agents.

NOTE!	Damage and malfunction of the LED array due to dripping liquids, as well as water or oil during operation of the M=LIGHT LED in film pits. Destruction of the LED array due to short circuit. ➢ Make sure NO liquids can drip on the M=LIGHT LED.

Chapter 3 System Description

Contents

3.1 Scope of Delivery

Quantity	Component
1	M=LIGHT LED, 1000 W
Option	M=LIGHT Connection set USB (8LE-D22-2)
Option	M=LIGHT Installation set (8LE-D24-2)

3.2 Specification

M=LIGHT LED for continuous or pulsed operation.

The M=LIGHT LED is made up of 98 LEDs and can be used in continuous or pulsed operation. In pulsed operation, the M=LIGHT LED is synchronized with the high-speed camera and twice as much light output can be achieved as in continuous mode. The M=LIGHT LED can optionally be operated manually or via the CAN-bus with the help of the software. In pulsed operation, it is possible to eliminate backlight effects due to control of separate M=LIGHT LED groups. For the elimination of backlight effects, only one camera synchronized with one M=LIGHT LED group is switched on (Figure 1).

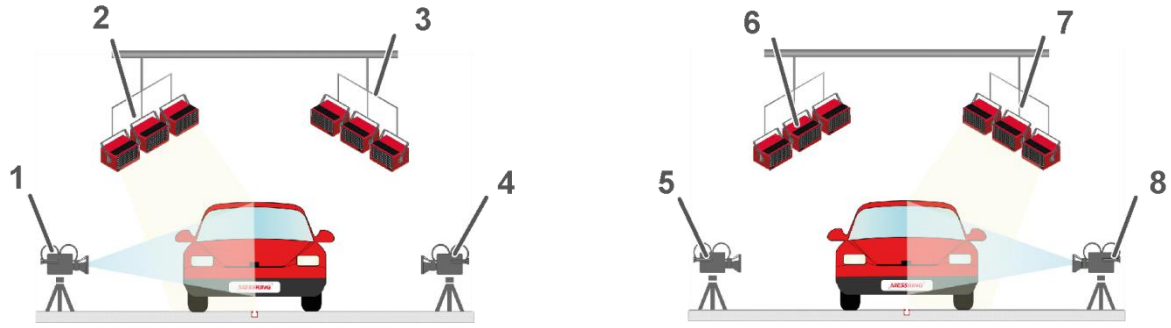


Figure 1: Synchronization in pulsed operation

Pos.:	Description
1	Camera 1 switched on
2	M=LIGHT LED group 1 switched on
3	M=LIGHT LED group 2 switched off
4	Camera 2 switched off
5	Camera 1 switched off
6	M=LIGHT LED group 1 switched off
7	M=LIGHT LED group 2 switched on
8	Camera 2 switched on

3.2.1 Special Properties and Performance Data

- NO warm-up time required; the M=LIGHT LED is ready for operation directly after being switched on.
- Test object is NOT overheated by radiation of heat.
- Can be synchronized with the Sync signal from a camera, a SYNC generator or M=Sync.
- CAN-bus-controlled.
- Non-flickering and dimmable.
- Stable aluminum housing.
- Customized lighting angles.
- Service life of the LEDs: more than 50,000 hours.
- Delay between Sync input and light flash: approx. 10 µs.

3.3 Main components of M=LIGHT LED

- LED array with status indication.
- Aluminum housing.
- Support bracket for one- and two-point attachment.
- CAN-bus connections.
- M=LIGHT control software for control of the M=Light LED via CAN-bus.
- CAN-bus interface for control of the CAN-bus via USB connection or network connection (optional).

3.4 Accessories

3.4.1 M=LIGHT connection set USB

M=LIGHT connection kit for mobile connection of M=LIGHT LED, camera system and PC.

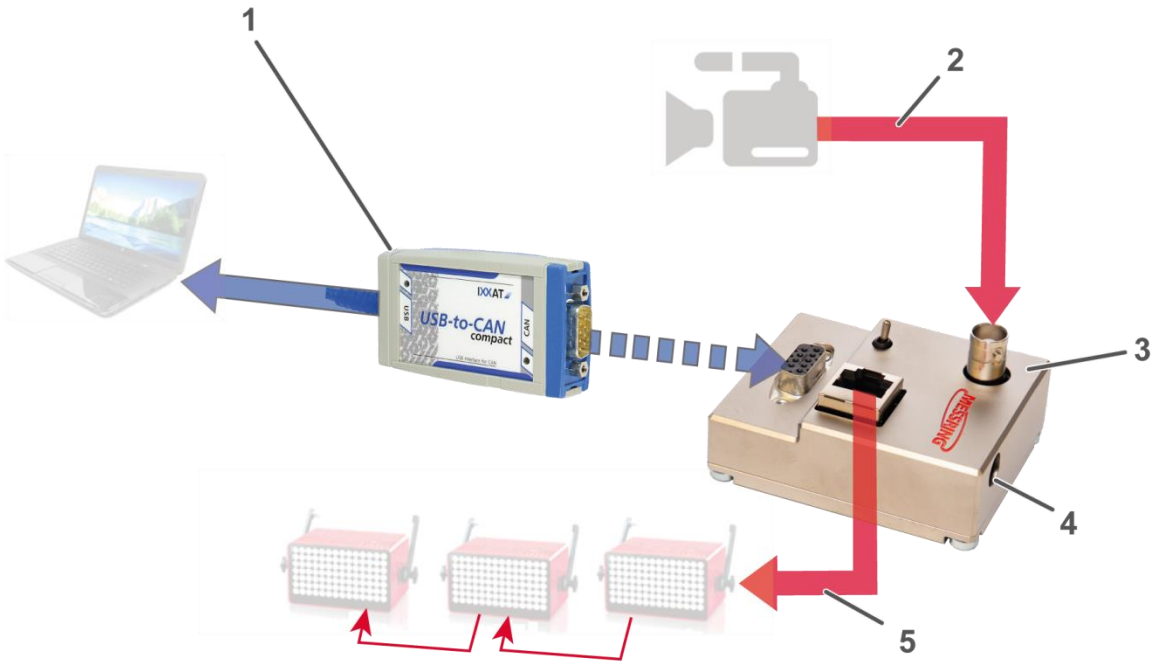


Figure 2: Connection M=LIGHT, camera and PC (schema)

Pos.:	Description
→	Cable NOT included in the scope of delivery
→	Cable included in the scope of delivery
1	USB-to-CAN Compact Interface Adapter
2	Cable length up to 90 m
3	M=LIGHT LED BUS Splitter mobile
4	12-24 V DC
5	Cable length up to 70 m

Pos.:	Description
1	M=LIGHT LED BUS Splitter mobile
2	USB-to-CAN Compact Interface Adapter
3	Power supply unit, power supply
4	Ethernet cable, software
5	Case

Figure 3: Scope of delivery for M=LIGHT connection set USB for mobile installation (8LE-D22-2)

3.4.2 M=LIGHT installation set for stationary installation

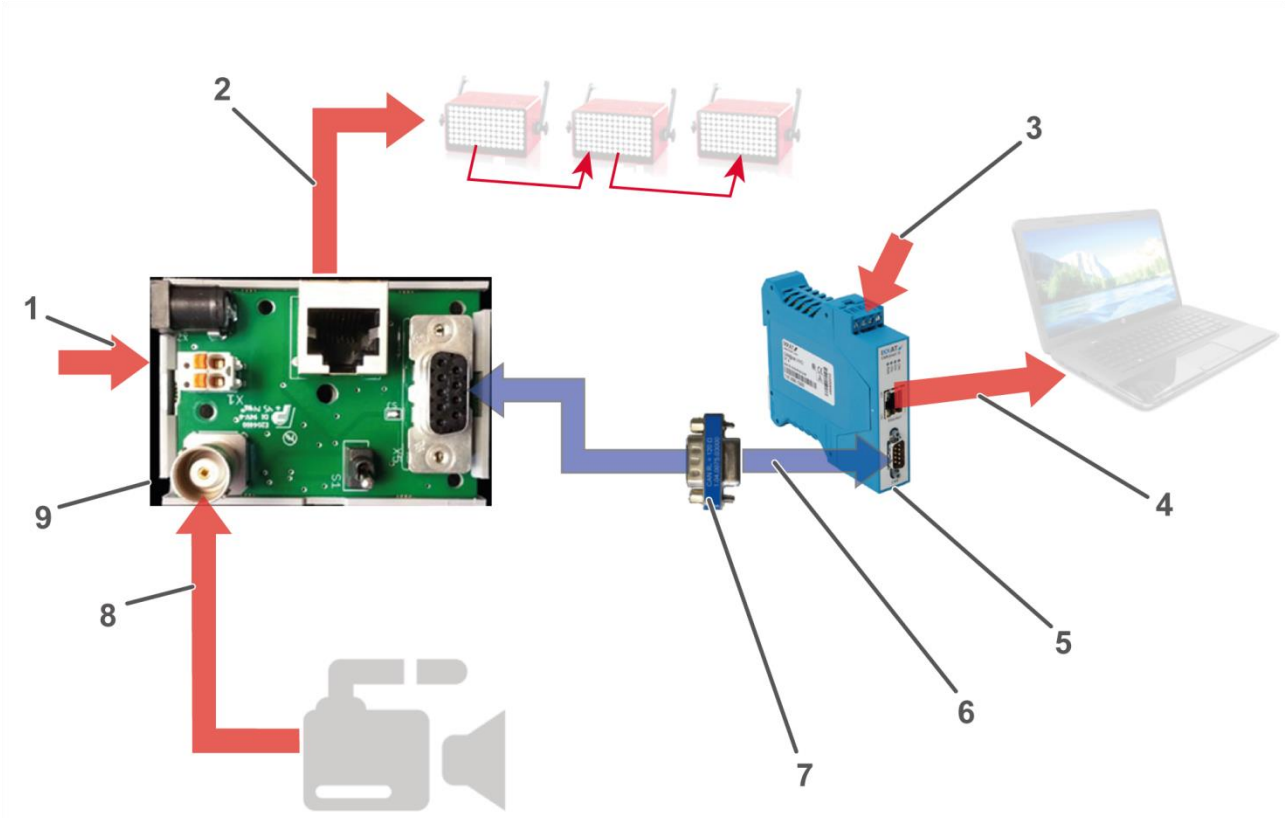


Figure 4: M=LIGHT installation set for stationary installation (schema)

Pos.:	Description
→	Cable NOT included in the scope of delivery
→	Cable included in the scope of delivery
1	12-24 V DC
2	Cable length up to 70 m
3	12-24 V DC
4	Cable length up to 90 m
5	CAN@net II Interface Adapter
6	Sub-D extension 9-pin included in the scope of delivery.
7	BUS terminator
8	Cable length up to 90 m
9	M=LIGHT LED BUS splitter for stationary installation

Pos.:	Description
1	Case
2	CAN@net II Interface Adapter
3	Sub-D extension 9-pin
4	M=LIGHT LED BUS splitter for stationary installation
5	BUS terminator
6	Ethernet cable

Figure 5: Scope of delivery of M=LIGHT installation set for stationary installation (8LE-D24-2).

3.4.3 Web IO Digital for TCP/IP

Figure 6: 9.1 Web IO Digital for TCP/IP

The Web IO is an interface between the PLC of a test rig or crash test facility and the M=LIGHT Control. The Web IO is used to enable an external PLC to send signals to the M=LIGHT Control or to receive them from the M=LIGHT Control.

Chapter 4 Setup and Functioning

Contents

4.1 LED Array

The status display in the LED array shows the most important operating states of the M=LIGHT LED.

Figure 7: LED array with status indication

Pos.:	Description
1	Status indication in the LED array
2	LED matrix
3	Front plate

4.1.1 Status display and fan speed with the LED matrix activated

The status display is switched off immediately after switching on the LED matrix.

The fan comes on when the LED array reaches a temperature of 26 °C.

4.1.2 Status display and fan speed with the LED matrix deactivated

When the LED matrix is switched off, the status indicator is enabled automatically and displays the temperature status. Status display and LED matrix do NOT light up at the same time.

Temp. (LED array) [°C]	Color of status display
0 – 54	Green
55 – 59	Green
60 – 69	Blue
70 – 94	Yellow
95 – 99	Red
> 100	Red (flashing)

Indication:	Operating condition
green	operational
light blue	Update mode is active
blue	operational
flashing blue	Maintenance mode is activated
yellow	switched on and operating
lit permanently red	Excess temperature critical state. Operation is NOT recommended. M=LIGHT LED switches off as soon as 100 °C has been reached.
flashing red	Defective and disabled. possible causes: l Fan defective l The electronic assembly for output control is defective ➢ Notify MESSRING Service.
off	Switched off, defective or is NOT supplied with operating voltage.

4.2 Lighting angles

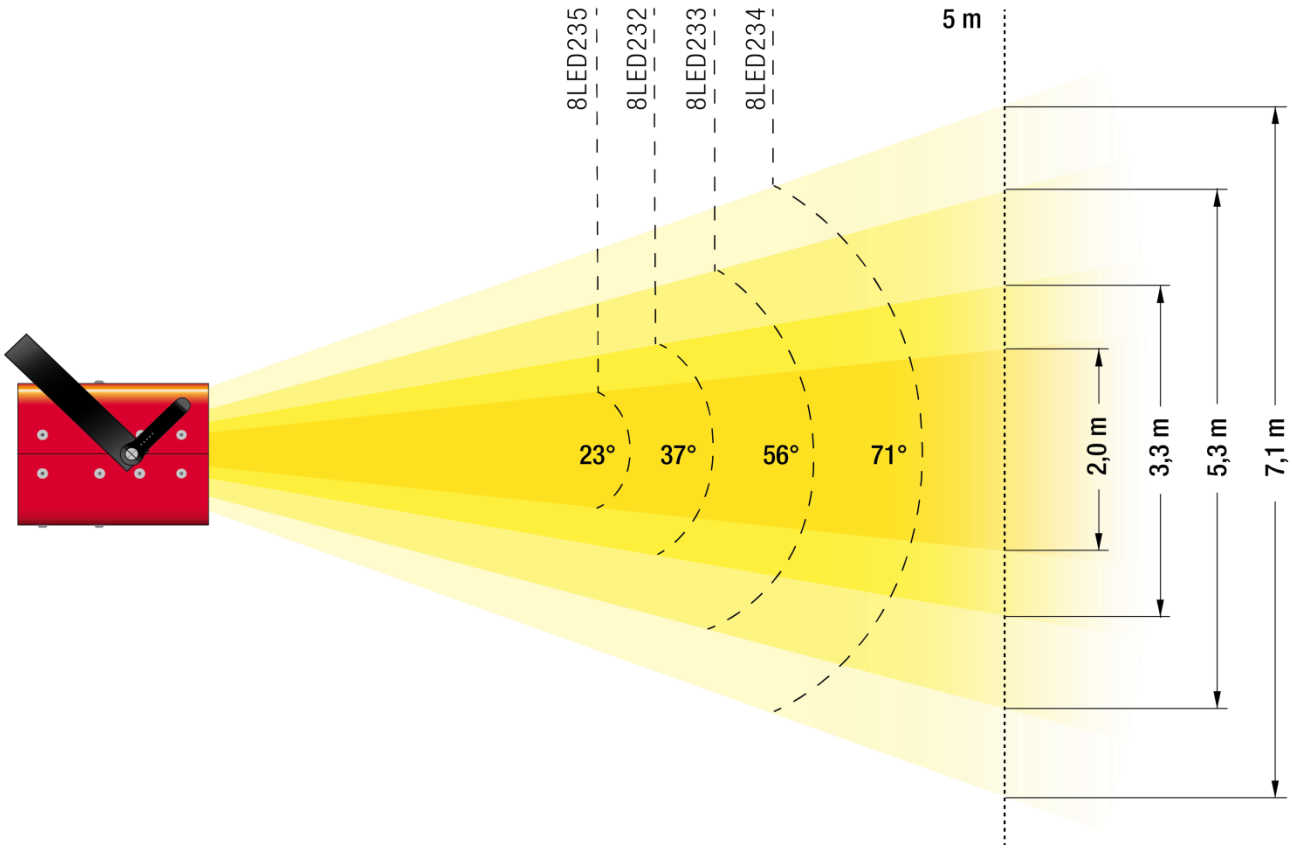


Figure 8: Lighting angles

The lighting angle is customer-specific and can:

- be determined via the software M=LIGHT Control (Figure 9).
- or read on the type plate, the back of the housing (Figure 10, Pos.3).

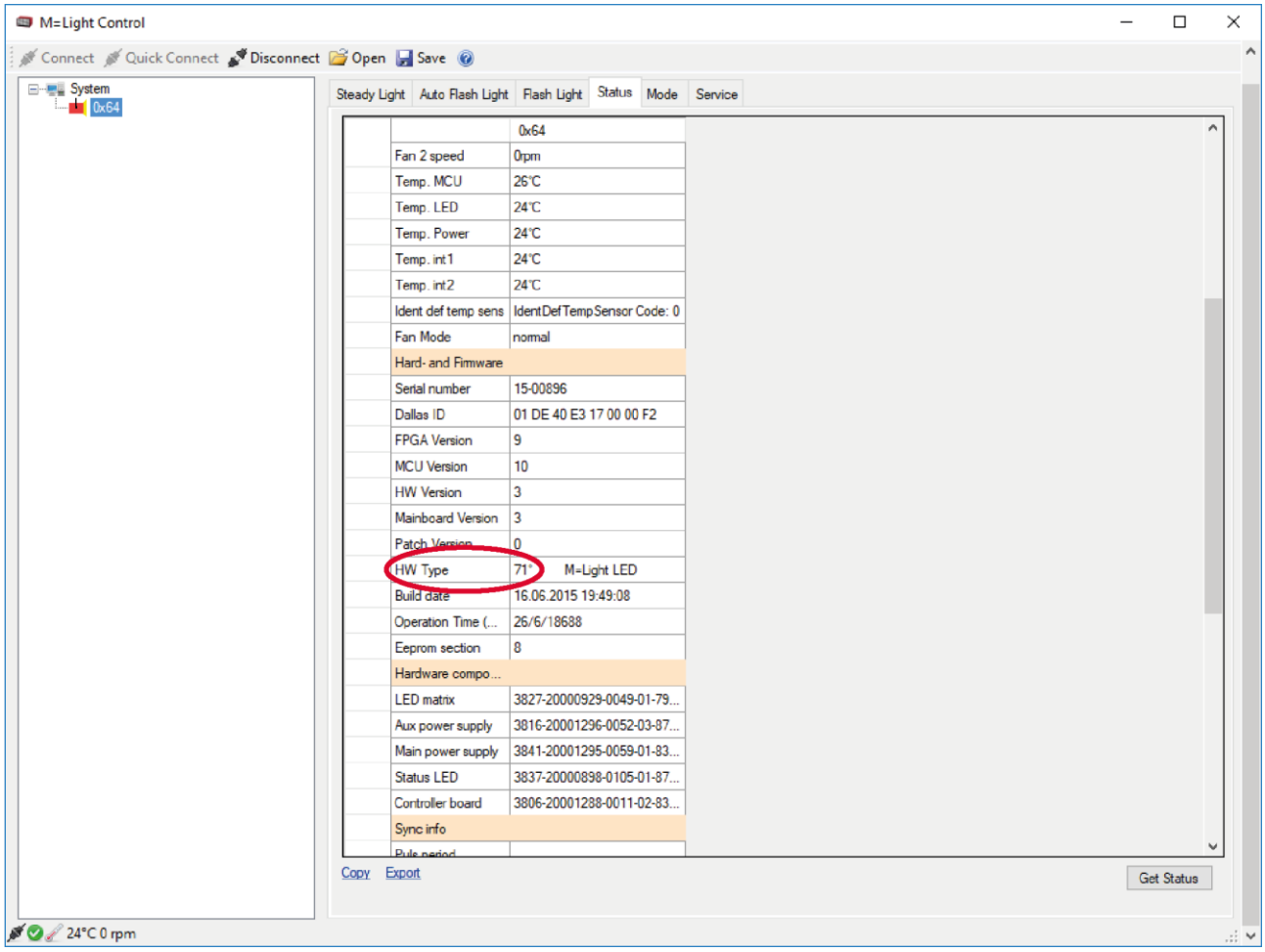
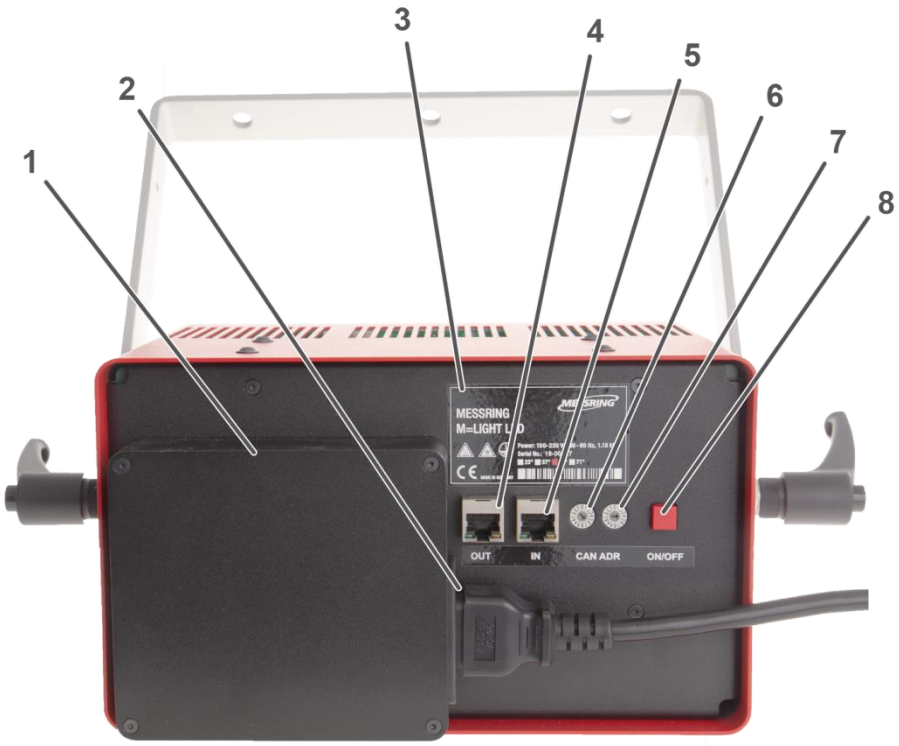


Figure 9: Display of the lighting angle in the software

4.3 Rear Side of the Housing



Pos.:	Description
1	EMC filter
2	Supply connection for hot devices power supply cord
3	Nameplate
4	CAN-bus Out
5	CAN-bus In
6	CAN-bus address (MSB)
7	CAN-bus address (LSB)
8	On / Off-switch, manual operating mode.

Figure 10: Connections and control elements on the rear side

4.3.1 Connecting / Disconnecting Voltage Supply

Connecting Voltage Supply

- Establish line voltage via hot devices power supply cord (Figure 10, Pos. 2).
  - Note the connection rating (Section 7.2, Page 78).
  - Note the limits for voltage and frequencies (Section 7.2, Page 78).
  - Do NOT supply several M=LIGHT LEDs via multiple socket outlets.
  - Do NOT obstruct or block the line connection.
  - The line connection must be accessible at all times.
- ✓ The M=LIGHT LED is now supplied with operating voltage.

Disconnecting Voltage Supply

DANGER! 	**Severe injuries or death may be caused by electric shock from electric voltage** Work on components that have NOT been disconnected and are under dangerous electric voltage will cause severe injuries (e.g. burns, paralysis, cardiac arrest), including death. ➢ Have work carried out only by qualified staff. ➢ Use only the hot appliances power cord supplied by MESSRING with the M=LIGHT LED. ➢ Observe the safety rules for switch-off and securing before working at current lines and devices.

DANGER! 	**Severe injuries or death may be caused by electric shock from electric charge inside the housing.** Immediately after disconnection, the contacts of the mains plug may still carry voltage for a short period. ➢ Do NOT touch the contacts of the mains plug directly after switch-off.

CAUTION! 	**Burns at hot surfaces** Risk of burning on the housing of the M=LIGHT LED at temperatures of up to 100 °C. ➢ Allow M=LIGHT LED to cool down first before touching it. Risk of burning on the shaft of the M=LIGHT LED suspension after prolonged operating time. ➢ Do NOT touch the shaft of the support bracket during operation or shortly after switching off of the M=LIGHT LED.

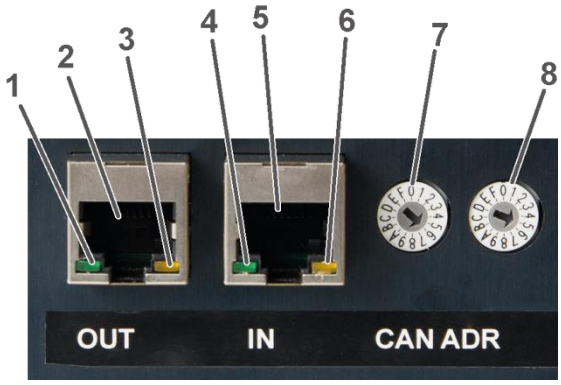
➢ Switch off M=LIGHT LED.

➢ Allow M=LIGHT LED to cool down.

➢ Disconnect the hot devices power supply cord from the M=LIGHT LED.

✓ The M=LIGHT LED is disconnected from the power supply.

4.3.2 Establishing Signal Connections



Pos.:	Description
1	LED +9 V I/O
2	CAN-Bus OUT (Figure 13, Page 27)
3	LED CAN-bus TX active
4	LED V I/O external
5	CAN-Bus IN (Figure 12, Page 27)
6	LED CAN-bus RX active
7	CAN-bus address (MSB)
8	CAN-bus address (LSB)

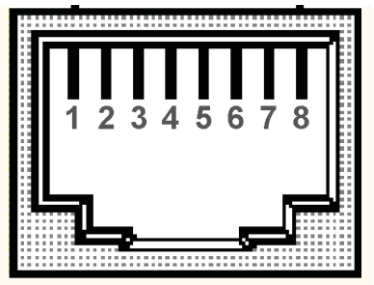
Figure 11: CAN-bus on the rear side of the housing

- ➢ Connect M=LIGHT LED with the control PC.
- ➢ Connect the RJ45 input IN of the first M=LIGHT LED with the M=LIGHT LED BUS Splitter.
- ➢ Connect the RJ45 output OUT of the first M=LIGHT LED with the input IN of the second M=LIGHT LED.
- ➢ Connect additional M=LIGHT LED accordingly.
- ➢ Specify an individual CAN-bus address for each M=LIGHT LED in the same CAN-bus line.
- ➢ Restart M=LIGHT LED.
- ✓ Now, the signal connections have been completely established.

The CAN-bus and the Sync bus are automatically terminated by the internal terminating resistor of the M=LIGHT LED last connected.

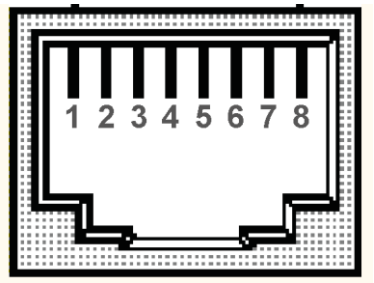
	For the connection of the M=LIGHT LEDs, use a patch cable according to CAT5 EIA/TIA-568 or higher.

4.3.3 Contact Assignment of CAN-Bus Connections



Pos.:	Signal
1	Flash_L
2	Flash_H
3	GND out
4	+9 V out
5	GND in
6	+9 V in
7	CAN_L
8	CAN_H

Figure 12: Contact assignment of CAN-bus **IN**



Pos.:	Signal
1	Flash_L
2	Flash_H
3	Term -
4	Term +
5	GND
6	+9 V out
7	CAN_L
8	CAN_H

Figure 13: Contact assignment of CAN-bus **OUT**

Pos.:	Description
Flash_L	Input for physical CAN-bus signal for switching the M=LIGHT LED on and off.
Flash_H	Input for physical CAN-bus signal for switching the M=LIGHT LED on and off.
GND out	Ground connection to previous M=LIGHT LED (Term-) for switch-off of the terminating resistor at the Flash and CAN output.
+9 V D I/O	9 V output to previous M=LIGHT LED (Term+) for switch-off of the terminating resistor at the Flash and CAN output.
GND	Ground for 9 V output.
+9 V out	9V output
CAN_L	Input for physical CAN-bus signal for parameterization of the M=LIGHT LED.
CAN_H	Input for physical CAN-bus signal for parameterization of the M=LIGHT LED.
Term -	Input from next M=LIGHT LED for switch-off of the terminating resistor at the Flash and CAN output.
Term +	Input from next M=LIGHT LED for switch-off of the terminating resistor at the Flash and CAN output.

4.4 Support bracket

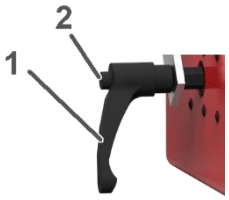
Figure 14: Support bracket

Pos.:	Description
1	Fixing screw for support bracket
2	Mounting bores ø 10 mm (3x)
3	Support bracket for attachment of M=LIGHT LED
4	Support bracket as base for M=LIGHT LED

Positioning support bracket

- ➢ Open attachment screws at left and right screws until the support bracket can be turned with light resistance.
- ➢ Turn the support bracket in position.
- ➢ Tighten attachment screws at left and right.
- ✓ The support bracket is in the intended position.

4.4.1 Changing the handle position of the attachment screws



Pos.:	Description
1	Grip
2	Fastening screw

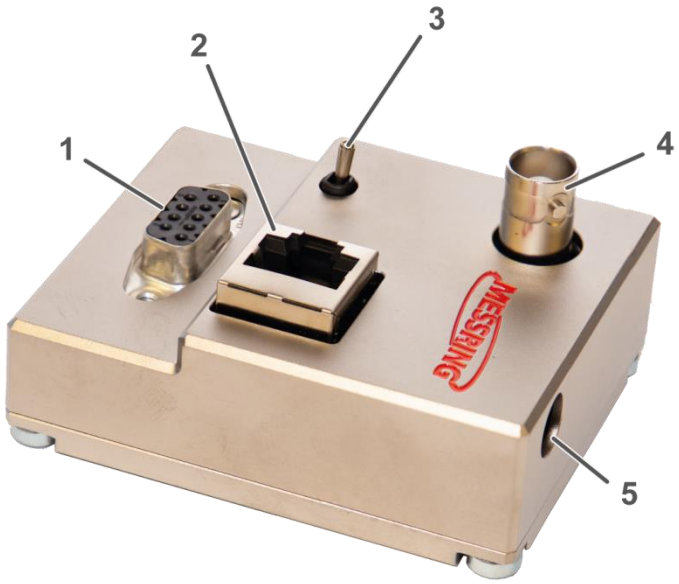
Figure 15: Fastening screw

- ➢ Pull the handle of the attachment screw and turn to any preferred position.
- ➢ Release handle of attachment screw.
- ✓ Handle position of the attachment screw is changed.

4.5 M=LIGHT connection set USB

4.5.1 M=LIGHT LED BUS Splitter mobile

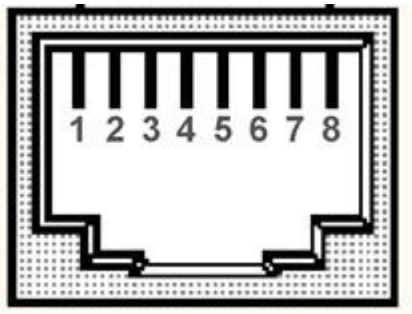
The M=LIGHT LED BUS Splitter mobile separates the incoming CAN bus signals and flash signals, which are transmitted via the RJ45 Ethernet cable from the M=LIGHT LED.



Pos.:	Description
1	DB9 port
2	BNC connection
3	Switch for inversion of Sync signal
4	RJ45 connection
5	Power connection

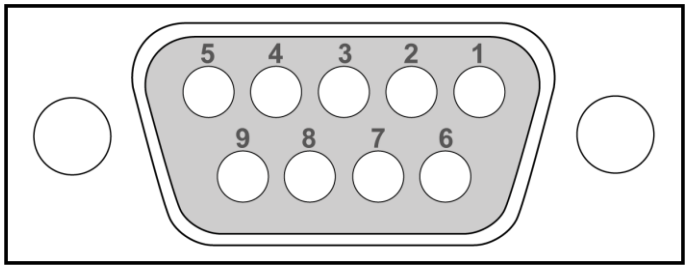
Figure 16: M=LIGHT LED BUS Splitter mobile

4.5.2 Connections M=LIGHT LED BUS Splitter mobile



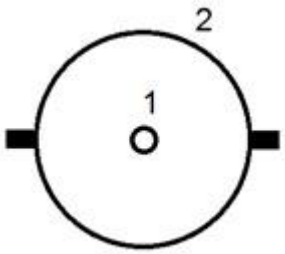
Pos.:	Description
1	Flash_L
2	Flash_H
3	GND
4	9 V
5	GND
6	9 V
7	CAN_L
8	CAN_H

Figure 17: RJ45 connection for CAN-bus line



Pos.:	Description
1	NOT connected
2	CAN_L
3	GND
4	NOT connected
5	NOT connected
6	NOT connected
7	CAN_H
8	NOT connected
9	9 V

Figure 18: DB9 socket connection for USB-to-CAN Compact Interface Adapter



Pos.:	Description
1	Signal
2	GND

Figure 19: BNC connection for high-speed camera with TTL-Sync line

4.5.3 USB-to-CAN Compact Interface Adapter

USB-to-CAN Compact Adapter serves the communication between M=LIGHT LED and PC.

Pos.:	Description
1	Cable with USB port
2	USB Status LED
3	CAN Status LED
4	DB9 male connector

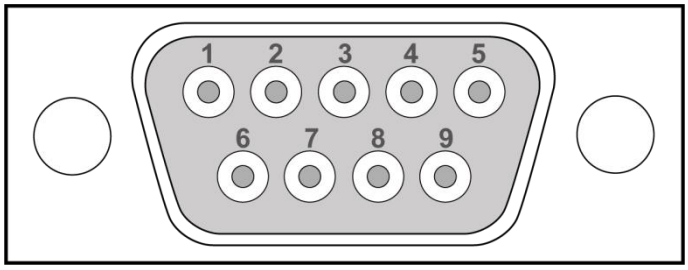
Figure 20: USB-to-CAN Compact Interface Adapter

Status of the LEDs on the USB-to-CAN Compact Interface Adapter:

Status	Description
USB Status LED green	Communication possible via USB port
USB Status LED red	Communication via USB port NOT possible
CAN Status LED flashing green	Error-free transmission
CAN Status LED flashing red	Error message
CAN Status LED red	CAN Controller is in Bus off mode

Connect USB-to-CAN Compact Interface Adapter

- ➢ Connect DB9 male connector to M=LIGHT BUS Splitter mobile.
- ➢ Connect the USB connection to the USB port of the PC.
- ✓ The USB-to-CAN Compact Interface Adapter is connected.

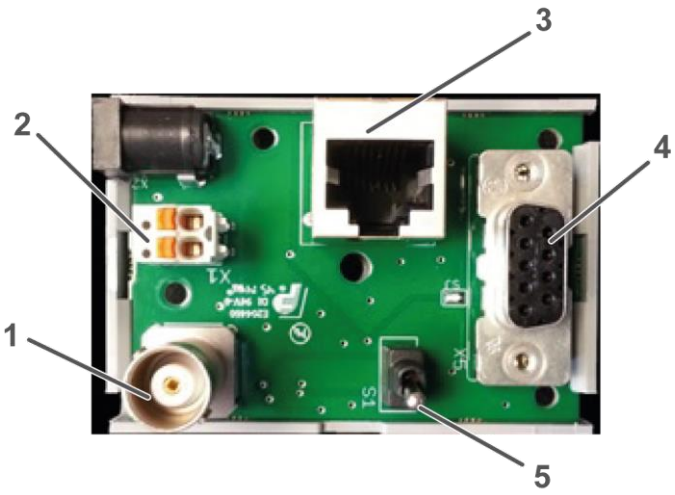


Pos.:	Description
1	NOT connected
2	CAN_L
3	GND
4	NOT connected
5	NOT connected
6	NOT connected
7	CAN_H
8	NOT connected
9	NOT connected

Figure 21: DB9 male connector USB-to-CAN Compact Interface Adapter

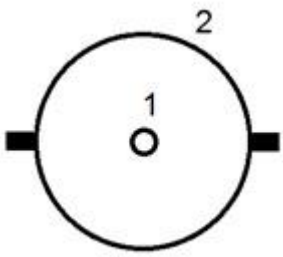
4.6 M=LIGHT LED BUS splitter stationary

The M=LIGHT LED BUS Splitter stationary separates the incoming CAN bus signals and flash signals, which are transmitted via the RJ45 Ethernet cable from the M=LIGHT LED.



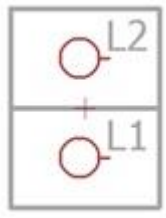
Pos.:	Description
1	BNC connection for camera
2	Power connection for top hat rail installation
3	RJ45 connection
4	DB9 port
5	Switch for inversion of Sync signal

Figure 22: M=LIGHT LED BUS splitter for stationary installation



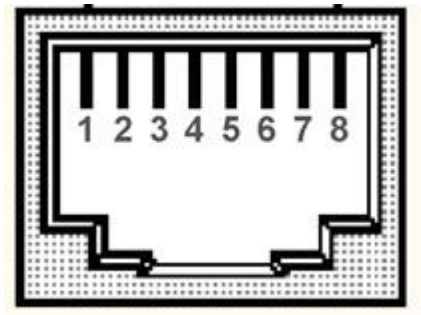
Pos.:	Description
1	Signal
2	GND

Figure 23: BNC connection for high-speed camera with TTL-Sync line



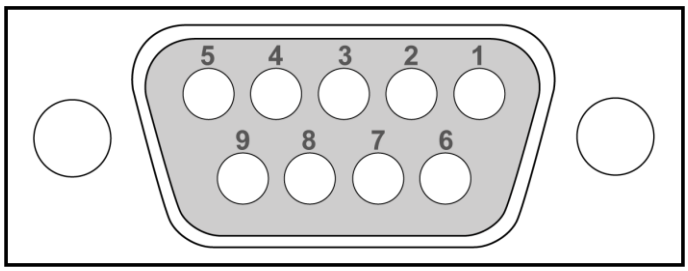
Pos.:	Description
L1	0V
L2	12 - 24 V DC

Figure 24: Supply voltage connection with top-hat rail mounting



Pos.:	Description
1	Flash_L
2	Flash_H
3	GND
4	9 V
5	GND
6	9 V
7	CAN_L
8	CAN_H

Figure 25: RJ45 connection for M=LIGHT LED

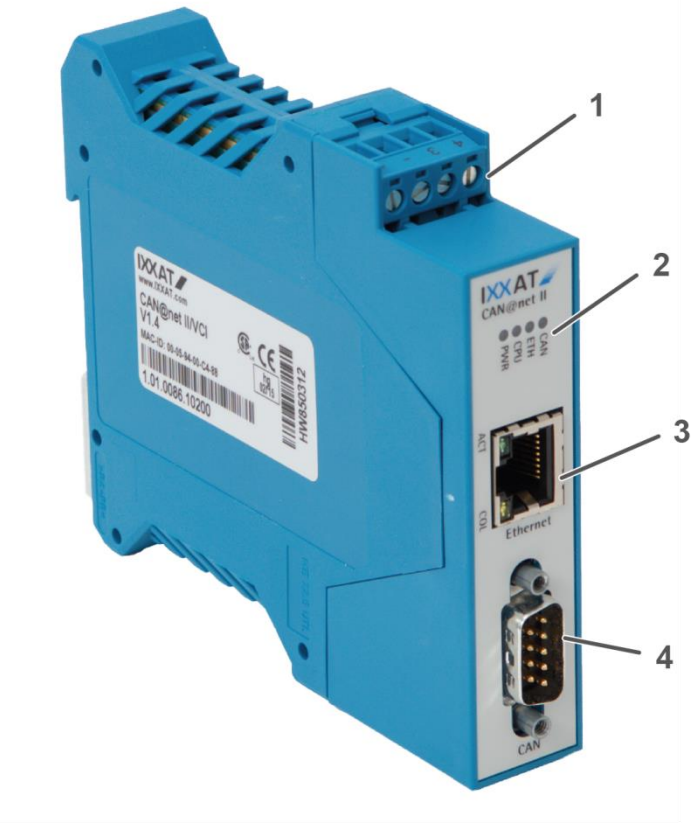


Pos.:	Description
1	NOT connected
2	CAN_L
3	GND
4	NOT connected
5	NOT connected
6	NOT connected
7	CAN_H
8	NOT connected
9	9 V

Figure 26: DB9 female connector for CAN@net II Interface Adapter

4.6.1 CAN@net II

The CAN@net II facilitates simple and flexible access of the PCs to the CAN System via Ethernet. Through the support of the TCP/IP protocol the CAN@net II can be connected directly to a PC.

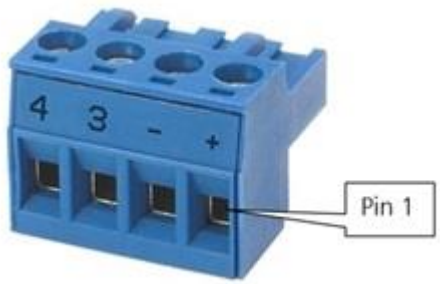


Pos.:	Description
1	4-pin plug-in screw terminal
2	LEDs to indicate the communication status
3	RJ45 connection
4	D-SUB male connector, 9-pin

Figure 27: CAN@net II

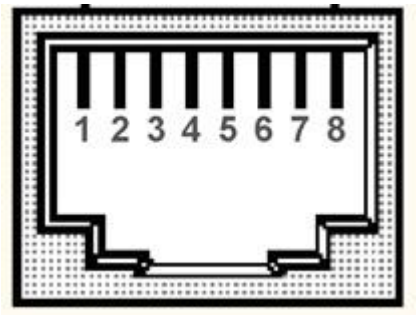
Figure 28: CAN@net II LEDs to display the communication status

The CAN@net II has six LEDs. These LEDs display the communication status of the pertaining interface or the device status. The respective statuses of the LEDs are listed in the enclosed user manual of the CAN@net II.



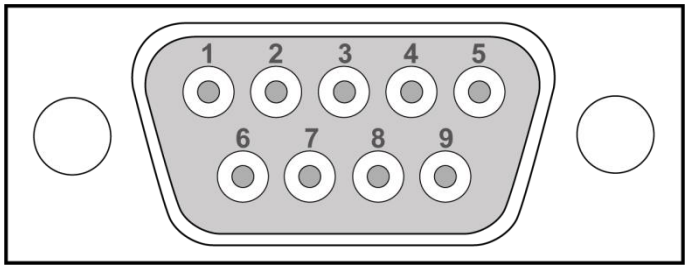
Pos.:	Description
+	9 - 32 V DC
-	0V
3	NOT connected
4	NOT connected

Figure 29: CAN@net II 4-pin plug-in screw terminal



Pos.:	Description
1	TX +
2	TX -
3	RX +
4	Connected to pin 5
5	Connected to pin 4
6	RX -
7	Connected to pin 8
8	Connected to pin 7

Figure 30: CAN@net II RJ45 connection



Pos.:	Description
1	NOT connected
2	CAN_L
3	GND
4	NOT connected
5	NOT connected
6	NOT connected
7	CAN_H
8	NOT connected
9	NOT connected

Figure 31: DB9 Male connector CAN@net II

4.6.2 Bus terminator

The bus terminator is a CAN-bus terminating resistor in the form of a feed-through connector. The bus terminator has the resistance of the transmission medium and ensures that NO reflections occur at the cable end.

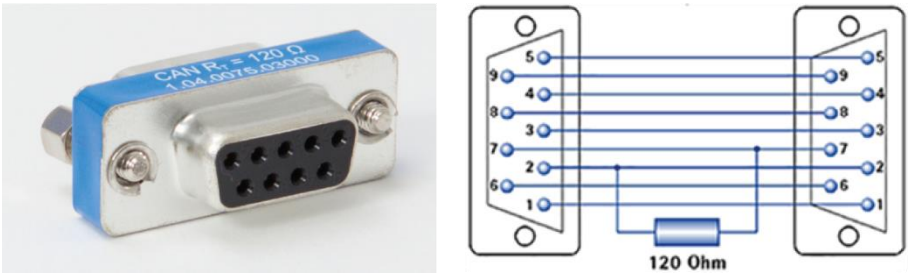


Figure 32: Bus terminator and connections of the bus terminator

4.6.3 Sub-D extension 9-pin

Connecting cable between CAN@net II and M=LIGHT Bus Splitter. The Bus terminator is connected between the Sub-D extension and CAN@net II.

4.7 Web IO installation and programming

The Web-IO Digital is provided for installation in the control cabinet. Fasten the Web-IO Digital on a 35 mm top hat rail according to DIN EN 50022.

The connection of the Web-IO Digital is outlined in the commissioning manual of the manufacturer.

4.7.1 Activate Web IO for M=LIGHT Control

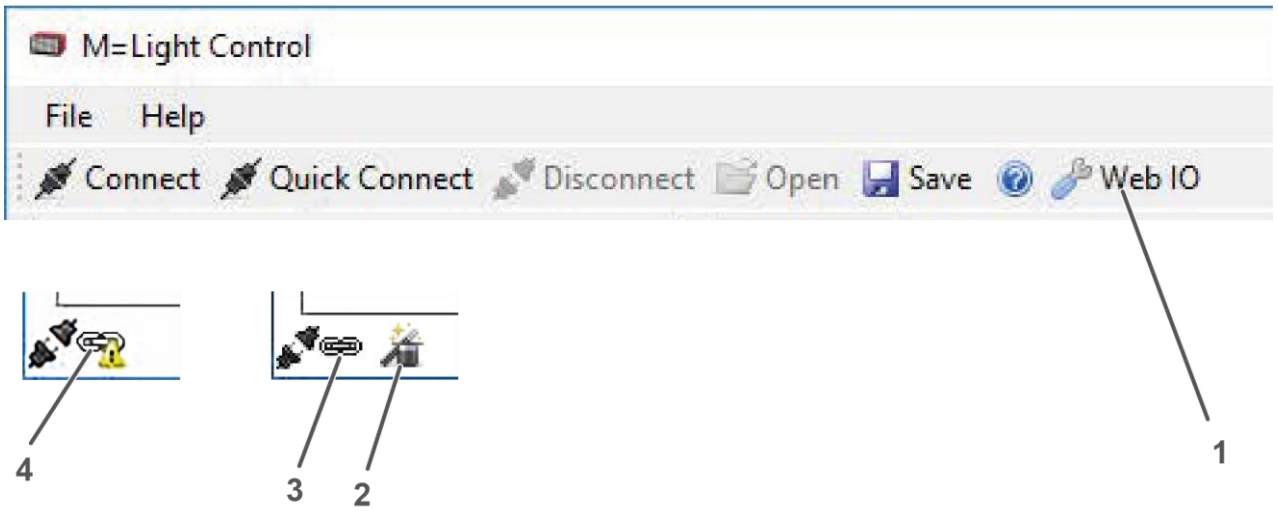


Figure 33: Web IO Status connected and Status not Connected

Pos.:	Description
1	The Web IO symbol appears in the command line.
2	Status: M=LIGHT Control is controlled by different software and is disabled.
3	Status: connected
4	Status: NOT connected

The Web IO is activated by the MESSRING Service.

4.7.2 Adjusting the Web IO Digital

Adjusting the Web IO Config

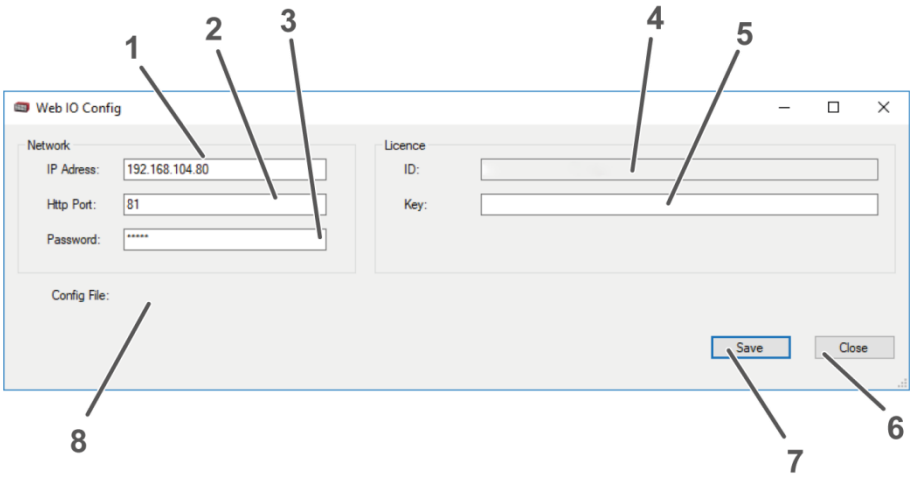


Figure 34: Web IO Config

Pos.:	Description
1	Input of IP-Adress the Web-IO Digital
2	Input of Http Port (Figure 35, , Page 40).
3	Input Password.
4	Input of Licence ID. The Licence ID is transmitted automatically during the first login.
5	Input of Licence Keys. The Licence Key is supplied when purchasing the Web-IO Digital.
6	Save saves the data entered.
7	Close, closes the window without saving.
8	Storage location of .xml file.

- ➢ Open M=LIGHT Control.
- ➢ Press the Web IO symbol (Figure 33, Page 38, Pos. 1).
- ➢ The Web IO Config window opens.
- ➢ IP-Adresse enter.
- ➢ Http Port enter.
- ➢ Licence ID enter.
- ➢ Licence Key enter.
- ➢ Press Save.
- ➢ Press Close.
- ✓ The Web IO Config has been configured.

Configure the network

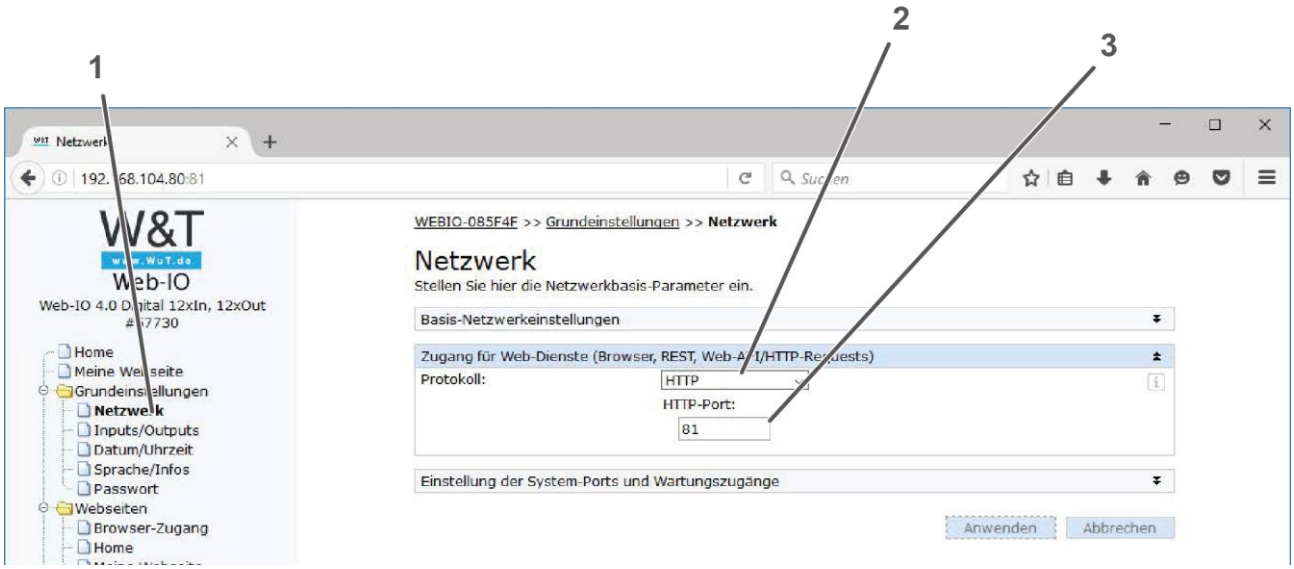


Figure 35: Web IO network settings

Pos.:	Description
1	Folder structure, basic settings, network
2	Protocol type
3	HTTP-Port Input

- ➢ Enter IP address in web browser.
- ➢ Log in to W&T Homepage,
- ➢ Open folder Grundeinstellungen.
- ➢ Netzwerk select (Figure 35, Page 40, Pos. 1).
- ➢ HTTP select as protocol type (Figure 35, Page 40, Pos.2).
- ➢ HTTP-Port enter (Figure 35, Page 40, Pos. 3).
- ✓ The network has been configured.

- ➢ Make sure that the value set in field HTTP-Port on the W&T homepage is the same as the value in the Web IO Config window (Figure 34, Page 39, Pos. 3).

Setting the browser access

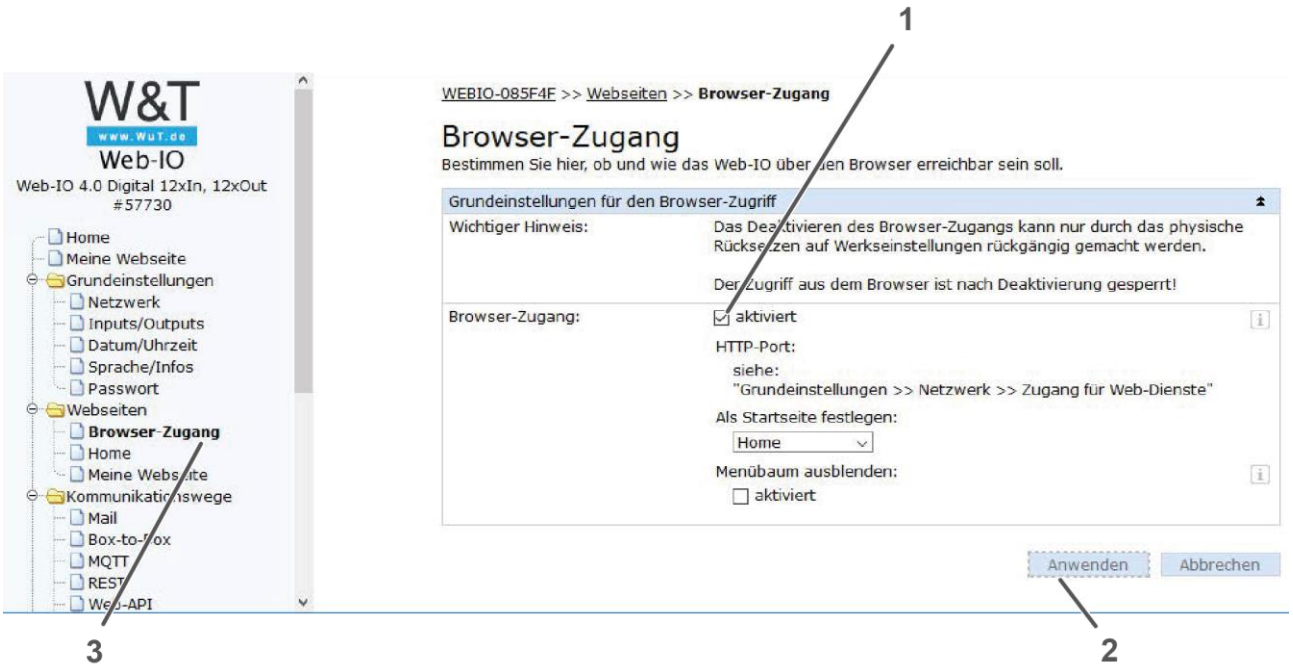


Figure 36: Web IO Browser access

Pos.:	Description
1	Checkmark to activate the browser access
2	Button **Anwenden**
3	Folder structure, web pages, browser access

- Open folder **Webseiten**.
- **Browser-Zugang** select (Figure 36, Page 41, Pos. 3).
- Set a checkmark at **aktiviert** (Figure 36, Page 41, Pos. 1).
- **Anwenden** press (Figure 36, Page 41, Pos. 2).
- ✓ The Web IO Browser access has been activated.

4.7.3 Select Web IO operating mode and light group

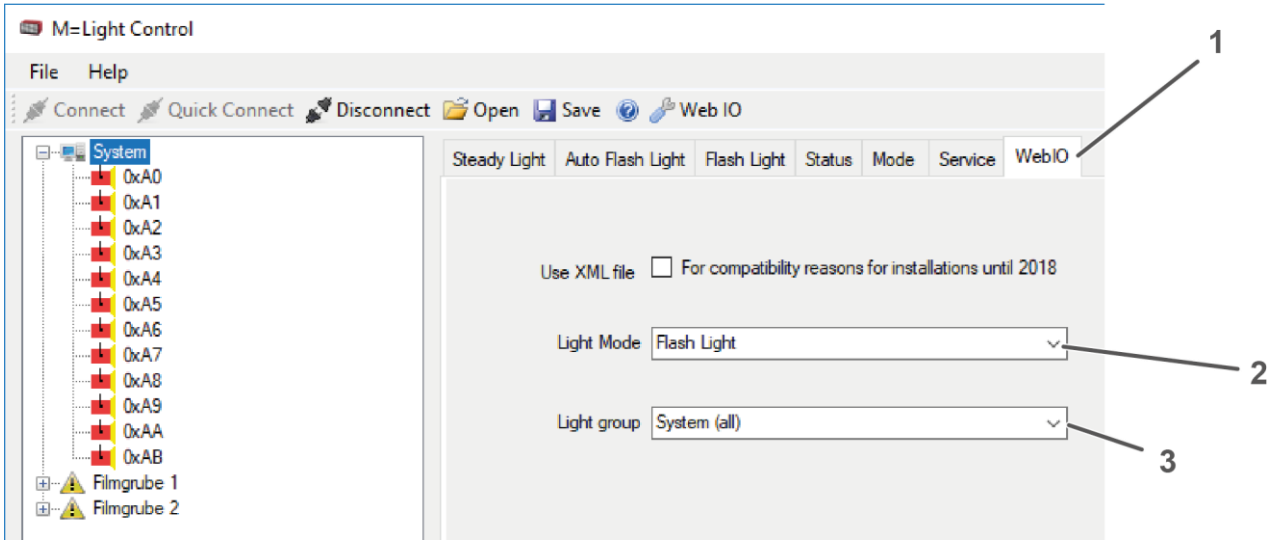


Figure 37: Web IO M=LIGHT

Pos.:	Description
1	Tab WebIO
2	Drop-down menu for Light Modus.
3	Drop-down menu for Light Group.

- ➢ M=LIGHT Control open.
- ➢ Open the WebIO tab (Figure 37, Page 42, Pos. 1).
- ➢ Highlight M=LIGHT LED or group or system in the M=LIGHT Control Explorer.
- ➢ Light Mode select, Steady Light, Flash Light or Auto Flash Light.
- ➢ Light group select.
- ✓ Operating mode and light groups for the WebIO operation have been selected.

Chapter 5 M=LIGHT Control

Contents

5.1 Purpose

The software is used for control and parameterization of the M=LIGHT LED. The settings are stored in the M=LIGHT LED and are retained when the M=LIGHT LED is disconnected from the power supply or the CAN bus line.

The following settings are stored:

Operating mode	saved settings
Steady Light	Power (%)
Flash light:	Power (%)
	Sync Input
	Pulse periode (µs)
	Pulse width (µs)
	Pulse delay (µs)
	Pulse Count
	Invert Input

5.2 Install M=LIGHT Control software

5.2.1 System Prerequisites

- PC with USB or network connection.
- Up-to-date Windows operating system.
- CAN-Bus Interface Adapter for USB connection of network connection (Section 3.4.1, Page 15 and Section 4.5, Page 30).

5.2.2 Installation Process

- ➢ Connect the data carrier supplied with the M=LIGHT LED to the PC.
- ➢ Open the data medium in Windows Explorer.
- ➢ Run SetupForCustomers.exe.
- ➢ Select a language.
- ✓ The installation routine guides you through the installation of the software **MESSRING M=LIGHT Control** and subsequently through the installation of the driver for the CAN-bus interface.

5.3 User Interface

5.3.1 User interface and status display M=LIGHT Control

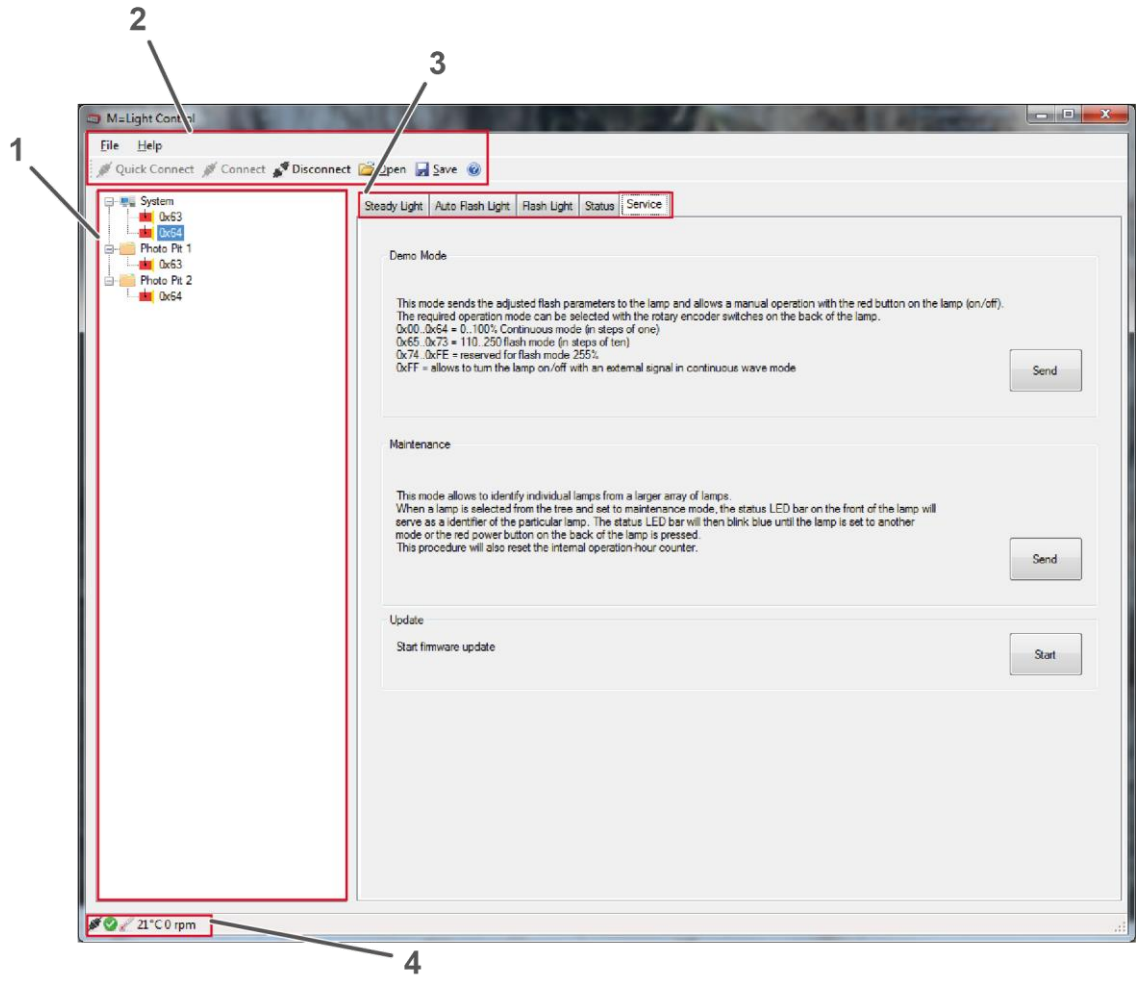
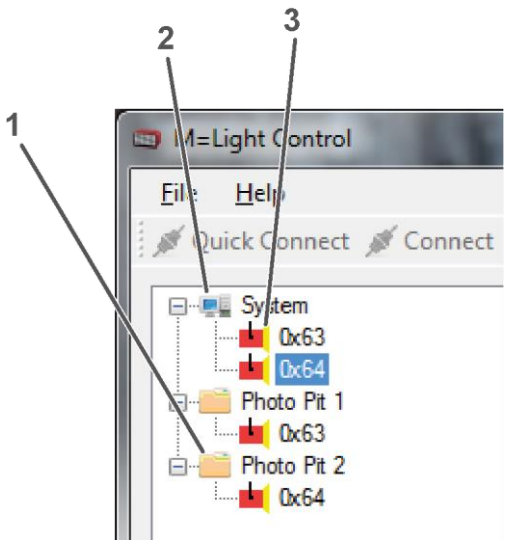


Figure 38: User Interface

Pos.:	Description
1	M=LIGHT Control Explorer.
2	Menu and command line.
3	Tabs for operation and status display of M=LIGHT LED, highlighted in the M=LIGHT Control Explorer.
4	Status bar

5.3.2 M=LIGHT Control Explorer

All M=LIGHT LEDs connected with the software are displayed in the M=LIGHT Control Explorer. The connected M=LIGHT LEDs are displayed individually or in groups. M=LIGHT LEDs can be marked individually, as a group or as a system.



Pos.:	Description
1	Group
2	System – all connected M=LIGHT LEDs
3	Individual M=LIGHT LED

Figure 39: M=LIGHT Explorer

Pos.:	Description
System	Shows all M=LIGHT LEDs connected with the software, regardless of any group in which the LEDs may also be included.
Block	Group of M=LIGHT LED WITHOUT error message.
Film Pit	Group of M=LIGHT LED with error message.
Right (0xA1)	Individual M=LIGHT LED WITHOUT error message.
0x02	Individual M=LIGHT LED with error message.

Highlight M=LIGHT LED in the M=LIGHT Control Explorer

- ➢ Mark an individual M=LIGHT LED, a group, or the system using the left mouse button.
- ➢ The M=LIGHT LED, the group or the system are highlighted in blue.
- ✓ The M=LIGHT LEDs are marked and can be configured.

5.3.3 M=LIGHT Control menu and command line

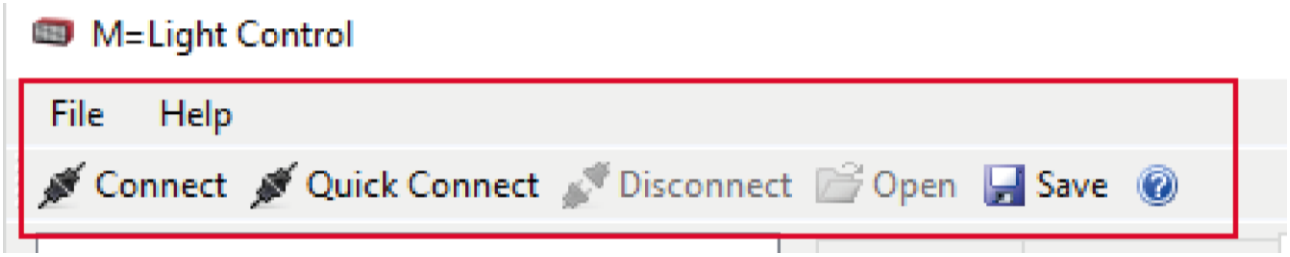


Figure 40: M=LIGHT Control menu and command line

Pos.:	Description
File	Open: Opens the Windows Explorer. Save: Saves current Setting data of Steady Light, Auto Flash Light and Flash Light in one file (*.led). Exit: Exits the M=LIGHT Control.
Help	Manual (English): Opens the operating instruction in English Manual (Deutsch): Opens the operating instruction in German. About: Opens window with software information (e.g. version number M=LIGHT Control).
Connect	Scans the entire bus section (up to 256 addresses). ➢ Connect used if the wiring, the CAN-bus address of the M=LIGHT LEDs or the Groups.ini file has been changed. ➢ Press Connect. ✓ The entire bus line is scanned and all M=LIGHT LEDs are connected to the software. This process may take a few minutes.
Quick Connect	Connects the M=LIGHT LED already detected during the previous application with the software. ➢ Quick Connect use if the wiring, the CAN-bus address of the M=LIGHT LEDs or the Groups.ini file has NOT been changed. ➢ Press Quick Connect. ✓ The M=LIGHT LEDs already detected during the previous use are connected with the software.
Disconnect	Disconnects all connected M=LIGHT LEDs from the software. ➢ Press Disconnect. ✓ All connected M=LIGHT LEDs are disconnected from the software.
Open	Dialog for opening the configuration file opens (*.led). When double-clicking the file, the configuration data of Steady Light, Auto Flash Light and Flash Light is accepted.
Save	Save the current configuration data of Steady Light, Auto Flash Light and Flash Light in a file (*.led).
	Operating instruction of M=LIGHT LED opens. The M=LIGHT LED operating instructions were installed with the software M=LIGHT Control .

5.3.4 M=LIGHT Control tabs

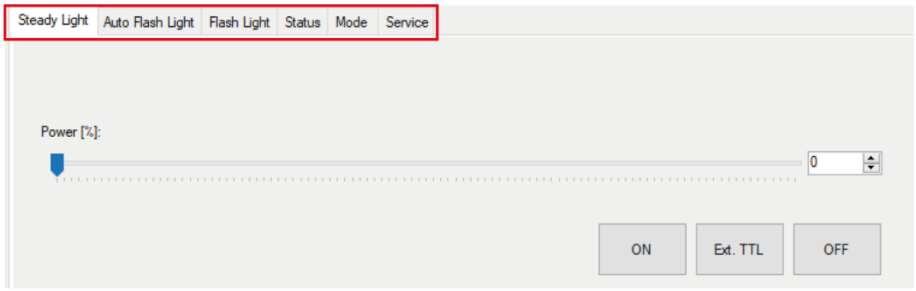


Figure 41: User interface and status display with connected M=LIGHT LED

Designation	Description
Steady Light	Tab for continuous light settings.
Auto Flash Light	Tab for settings in pulsed, simplified operation.
Flash Light	Tab for settings in pulsed operation
Status	Status of the M=LIGHT LED highlighted in the M=LIGHT Explorer.
Mode	Conversion to maintenance operating mode and setting of the fans.
Service	Configuring logging, temperature warning as well as firmware and FPGA Updates.

5.3.5 M=LIGHT Control status bar

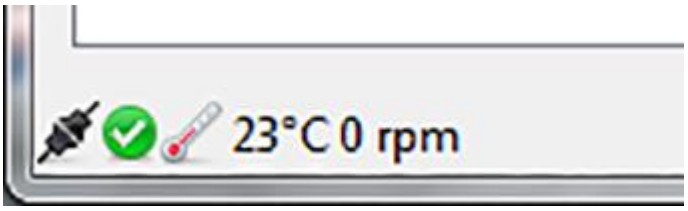
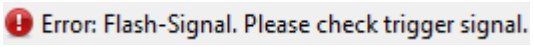
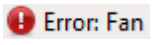
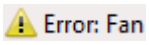
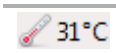
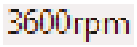


Figure 42: Status bar

	Connection status: highlighted M=LIGHT LEDs connected
	Connection status: highlighted M=LIGHT LEDs NOT connected.
	M=LIGHT LED operational.
	Shows the number of CAN Controllers found.
	NO Sync signal available. Switching on Auto Flash Light and Flash Light NOT possible.
	One or more fans have failed, M=LIGHT LED was switched off.
	One or more fans had failed, M=LIGHT LED was switched off. The fans are working again, the M=LIGHT LED can be switched back on.
	Temperature of M=LIGHT LED. Several connected M=LIGHT LEDs show the highest temperature.
	Speed of the fans. Several connected M=LIGHT LEDs show the lowest speed.

5.4 Adjust and operate the M=LIGHT LED

5.4.1 Group M=LIGHT LED

After installation of M=LIGHT Control, NO groups are defined. In the M=LIGHT Explorer all M=LIGHT LEDs are displayed below each other.

If certain M=LIGHT LEDs are regularly configured in the same way, this arrangement can be grouped. The configuration will be adopted for the entire group.

One M=LIGHT LED can be assigned to several groups.

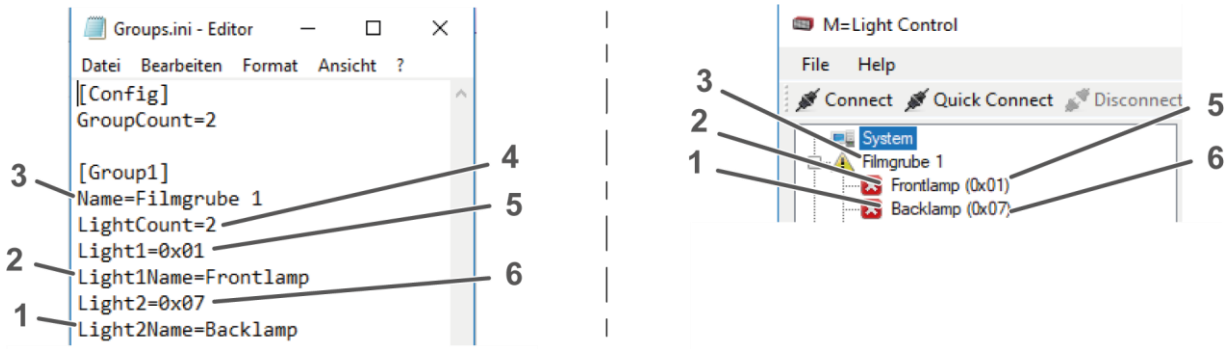


Figure 43: Groups.ini

Pos.:	Description
GroupCount	Number of defined groups
1	Name M=LIGHT 2
2	Name M=LIGHT 1
3	Name Group 1
4	Number of M=LIGHTs
5	Address of M=LIGHT 1
6	Address of M=LIGHT 2

- Copy file example_Groups.ini from C:\Program Files (x86)\Messring\MLight to the desktop .
- Rename the file example_Groups.ini into Groups.ini.
- Move the file Groups.ini to the folder C:\Program Files (x86)\Messring\MLight .
- Open file Groups.ini with an editor.
- Change of addresses and names only after the equal sign (=).
  - Change name of group (Name).
  - Change name of the M=LIGHT 1 (Light1Name).
  - Change number of M=LIGHTS under (LightCount).
  - Change address of the M=LIGHT 1 (Light1).
- Store data.
- Restart M=LIGHT Control.
- Press Connect. It may take some time for the connection to be established, since the entire bus is scanned.

✓ Grouping in the M=LIGHT Control Explorer appears as defined in the Groups.ini (Figure 43, Page 50).

5.4.2 Configuring M=LIGHT LED for continuous light operation

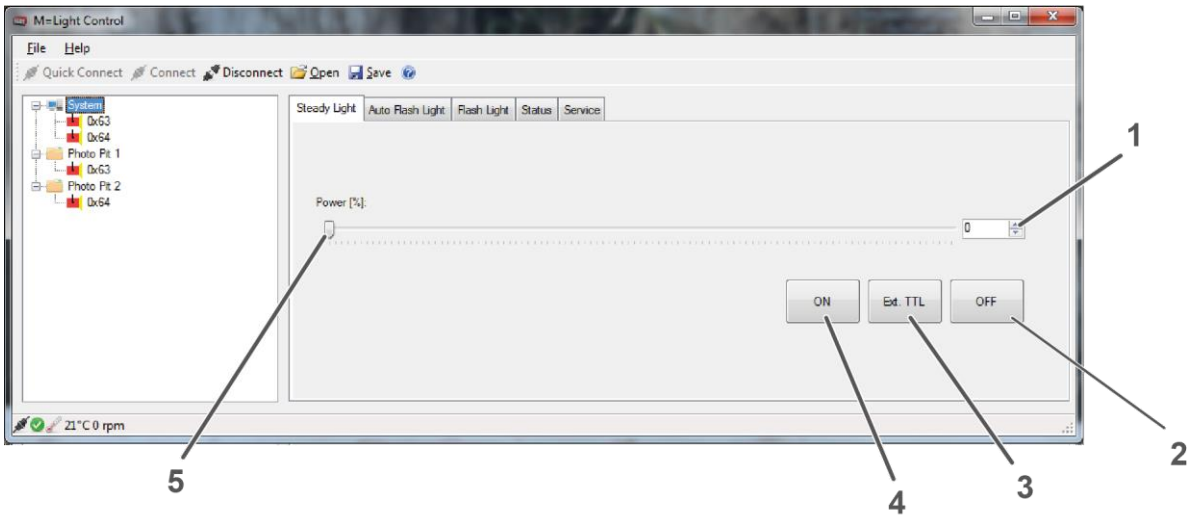


Figure 44: Steady light tab

Pos.:	Description
1	Arrow key with numeric field for setting the intensity **Power (%)**.
2	**OFF**: Switch-off M=LIGHT LED permanently.
3	**Ext. TTL**: Permanent switch-on or switch-off of M=LIGHT LED via TTL input (Flash H / Flash L).
4	**ON**: Permanently switch on the M=LIGHT LED with the selected intensity.
5	Slide control for setting the intensity **Power (%)**.

The M=LIGHT LEDs can be switched on and off individually, as a group or as a system, manually or automatically via a signal at the TTL input.

Change intensity of the M=LIGHT LED

- Open tab **Steady Light**.
- Mark M=LIGHT LED or group in M=LIGHT Control Explorer.
- Adjust desired intensity with the slide control or the arrow keys **Power [%]**, .

✓ The intensity of the M=LIGHT LED or group is changed to the currently set value.

Switch-on M=LIGHT LED permanently

- Open tab **Steady Light**.
- Mark M=LIGHT LED or group in M=LIGHT Control Explorer.
- Adjust desired intensity with the slide control or the arrow keys **Power [%]**, .
- Press **On**.

✓ The M=LIGHT LED or group are switched on for permanent operation as soon as voltage is supplied.

Switch M=LIGHT LED on and off via Ext.TTL

- Mark M=LIGHT LED in M=LIGHT Control Explorer.
- Open tab **Steady Light**.
- Adjust desired intensity with the slide control or the arrow keys **Power [%]**, .
- Press **Ext. TTL**.

✓ The M=LIGHT LED is switched on for permanent operation when the level at the input (Flash H / Flash L) is changed from recessive to dominant. If the level drops from dominant to recessive, the M=LIGHT LED is switched off.

Switch-off M=LIGHT LED permanently

- Mark M=LIGHT LED in M=LIGHT Control Explorer.
- Open tab **Steady Light**.
- Press **Off**.

✓ The M=LIGHT LED is permanently switched off and can only be switched on again by pressing **On**.

5.4.3 Configuring M=LIGHT LED for pulsed operation

In pulsed operation, there are two different operating modes:

- **Auto Flash Light**
- **Flash Light**

5.4.3.1 Auto-Flash Light operating mode

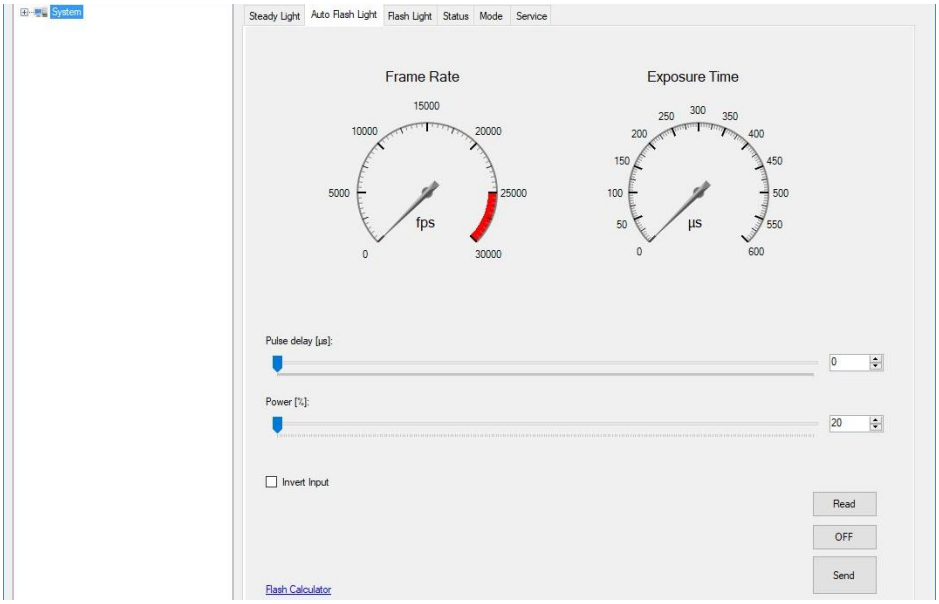


Figure 45: Tab **Auto Flash Light**

Designation	Description
Frame Rate:	Indicates the measured frequency of the selected M=LIGHT LED.
Exposure Time:	Indicates the measured pulse duration of the selected M=LIGHT LED.
Pulse delay [µs]	Indicates the pulse delay in µm. Adjustable with slide control or arrow keys If **Pulse delay** is set to 0, the delay between Sync signal and flash is approx. 10 µs.
Power [%]	Indicates the intensity in % with which M=LIGHT LED is to be switched on as long as the pulse is active. Adjustable via slide control or arrow keys.
Read:	Indicates the current setting of the selected M=LIGHT LED.
OFF:	Switches all connected M=LIGHT LEDs to power = 0%.
Send:	Transfer settings to M=LIGHT LED.
Flash Calculator:	Opens window for checking **Frame rate** and **Power rate**.
Invert Input:	Select input signal for the Sync. **Invert Input** NOT selected: rising edge of Sync signal. **Invert Input** selected: falling edge of Sync signal.

The operating mode **Auto Flash Light** switches the M=LIGHT LED to simplified flash operation. In **Auto Flash Light** the M=LIGHT LED follows the incoming Sync signal of the connected camera regarding the flash times. This is only possible by considering one of the following three conditions:

- Up to 170% flash time must be < 1/frame rate * 0.5
- Up to 200% flash time must be < 1/frame rate * 0.4
- Over 200% flash time must be < 1/frame rate * 0.2

If a signal has too long a pulse duration, the control built into the M=LIGHT LED prevents the triggering of flashes so that a sufficient cooling phase of the LEDs is ensured.

Switch on operating mode **Auto-Flash Light** :

- Mark M=LIGHT LED in M=LIGHT Control Explorer.
- Adjust pulse delay on the slide control or the arrow keys **Pulse delay [µs]**.
- Adjust **Power [%]** on the slide control or the arrow keys.
  - Select input signal either for **Invert Input** falling edge of Sync signal,
  - or input signal for **Invert Input** Do NOT select for rising edge of the Sync signal.
- Press **Send**.
- ✓ The operating mode Auto **Flash Light** has been set.

5.4.3.2 Flash Light operating mode

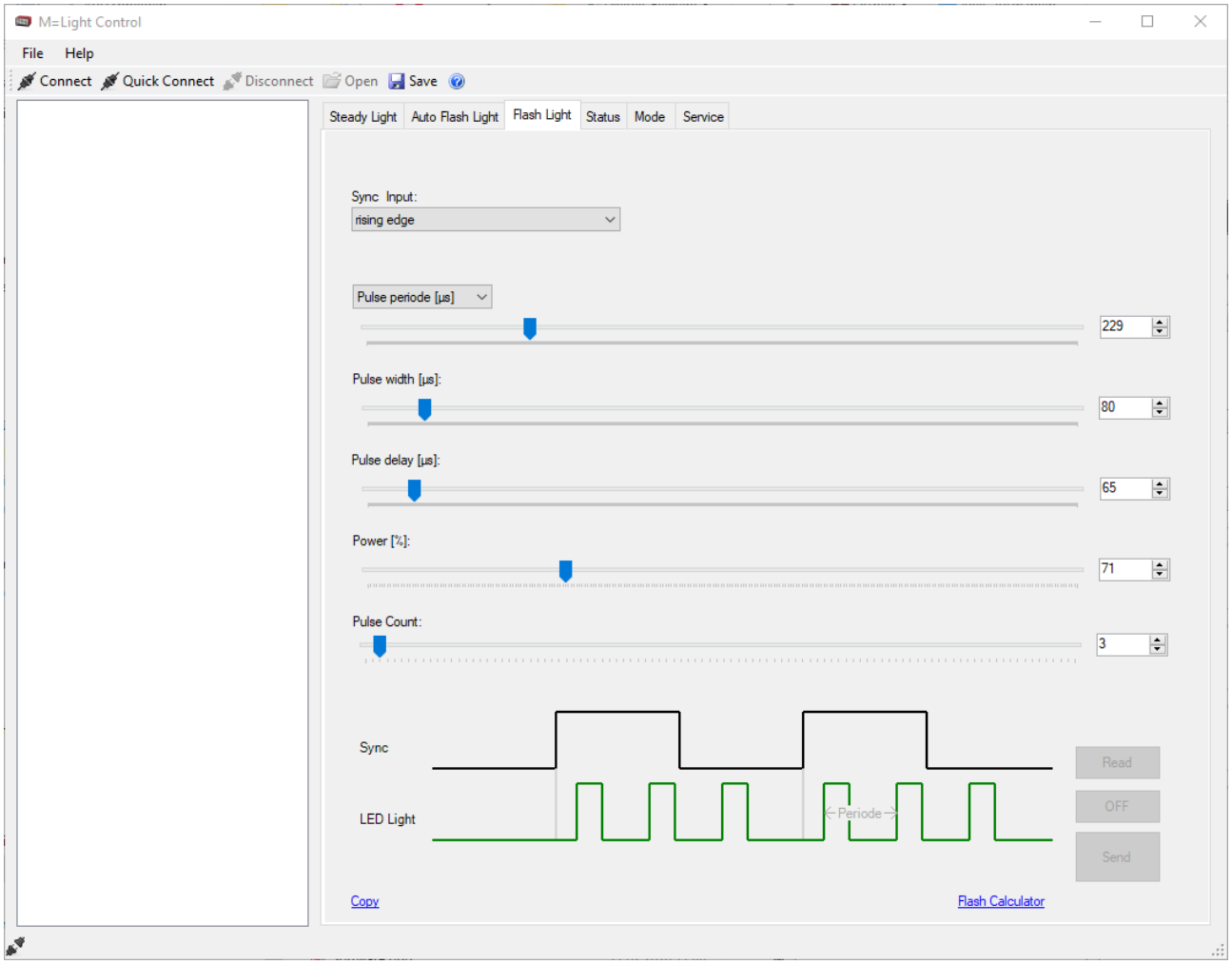


Figure 46: **Flash Light**

Pos.:	Description
Sync Input:	Input signal for Sync signal (Figure 47, Page 57).
Puls periode:	Duration of a period (pulse + pause) in µs or fps. Adjustable via slide control or arrow keys.
Pulse width [µs]	Duration of pulse in µs. Adjustable via slide control or arrow keys.
Pulse delay [µs]	Indicates the pulse delay in µm. Adjustable with slide control or arrow keys If Pulse delay is set to 0, the delay between Sync signal and flash is approx. 10 µs.
Power [%]	Indicates the output in % with which M=LIGHT LED is to be switched on as long as the pulse is active. Adjustable via slide control or arrow keys. In pulsed operation the output can be increased to max. 255%.
Puls Count	Number of pulses per Sync signal. Adjustable via slide control or arrow keys.
Read	Indicates the current setting of the selected M=LIGHT LED.
OFF	Switches all connected M=LIGHT LEDs to power = 0%.
Send	Transfer settings to M=LIGHT LED.
Flash Calculator:	Opens window for checking Frame rate and Power rate (Figure 52, page 61).
Copy:	Creates screenshot and stores it on the clipboard.
Sync / LED Light	Graphic illustration of the settings.

Set Sync input

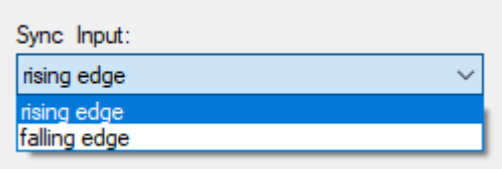


Figure 47: Pull-down menu: **Sync Input**

Designation	Description
rising edge	Activate M=LIGHT LED when the level at the input (Flash H / Flash L) is changed from recessive to dominant.
falling edge	Activate M=LIGHT LED when the level at the input (Flash H / Flash L) is changed from dominant to recessive.

- Mark M=LIGHT LED or group in M=LIGHT Control Explorer.
- Determine the required Sync signal from the camera manufacturer's manual.
- Open tab **Flash Light**.
- Select **Falling edge** or **rising edge**.
- Press **Send** .

✓ **Sync Input** ist, passend zur angeschlossenen Kamera, eingestellt.

Adjusting the pulse period

Pulse period determines the duration of a period (pulse + pause) in µs or fps.

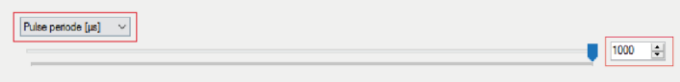


Figure 48: Pulse period

- Mark M=LIGHT LED in M=LIGHT Control Explorer.
- Set the slide control or arrow key value so that the slide control does NOT become red.
- **Send** press.

✓ **Pulse Periode** is set for the selected M=LIGHT LED or group.

Adjusting the Pulse Count

Pulse Count determines the number of pulses per Sync signal.

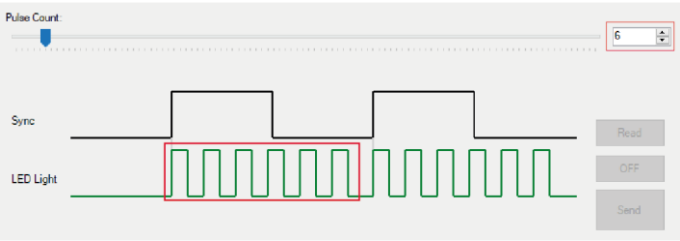


Figure 49: Pulse Count

- Mark M=LIGHT LED or group in M=LIGHT Control Explorer.
- Adjust desired number of pulses per Sync signal with the slide control or the arrow keys.
- Press **Send**.

✓ **Pulse Count** is set for the selected M=LIGHT LED or group.

Adjust pulse width

Pulse Width determines the duration of the light pulse

- Mark M=LIGHT LED or group in M=LIGHT Control Explorer.
- Adjust **Pulse Periode [µs]** on the slide control or the arrow keys.
- Adjust **Power [%]** on the slide control or the arrow keys.
- **Pulse Width [µs]** set the slide control or arrow keys so that the slide control does NOT become red.

Power [%]	Settings of **Pulse Width [µs]** and **Pulse Periode [µs]**
≤ 175 %	**Pulse Width** may be max. 50% of the value at **Pulse Periode** .
≤ 200 %	**Pulse Width** may be max. 40% of the value at **Pulse Periode** .
> 200	**Pulse Width** may be max. 20% of the value at **Pulse Periode** .

- Press **Send**.
- ✓ **Pulse Width [µs]** Is set for the selected M=LIGHT LED or group.

Figure 50: Settings of **Pulse Width**, **Pulse Periode** and **Power**

Pos.:	Description
1	**Power [%]** max. 175%, **Pulse Periode [µs]** = 1000 µs, **Pulse Width [µs]** = max. 500 µs
2	**Power [%]** = max. 200%, **Pulse Periode [µs]** = 1000 µs, **Pulse Width [µs]** = max. 400 µs
3	**Power [%]** = max. 255%, **Pulse Periode [µs]** = 1000 µs, **Pulse Width [µs]** = max. 200 µs

Pulse delay [µs] einstellen

Pulse delay determines the delay between Sync signal and light flash in µs.

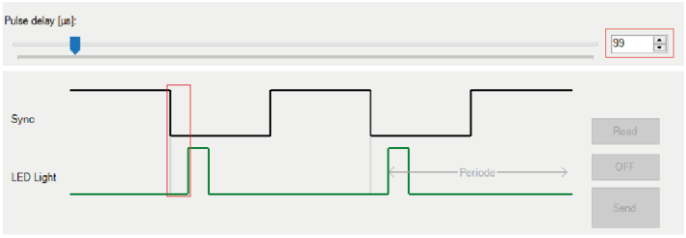


Figure 51: Pulse delay

- Mark M=LIGHT LED or group in M=LIGHT Control Explorer.
- **Pulse delay [µs]** adjust on the slide control or the arrow keys.
- Press **Send**.

✓ **Pulse delay [µs]** is set for the selected M=LIGHT LED or group.

Adjusting the operating mode **Flash Light**:

- Mark M=LIGHT LED or group in M=LIGHT Control Explorer.
- select **Sync Input** (Figure 47, Page 57).
- Adjust pulse count (Figure 49, Page 58).
- Set **Pulse period [µs]** or **[fps]** (Figure 48, Page 58).
- Adjust **Pulse width [µs]** (Figure 50, Page 59).
- Adjust pulse delay **Pulse delay [µs]** (Figure 51, Page 60).
- Press **Send**.

✓ The **Flash Light** operating mode is set for the selected M=LIGHT LED or group.

Send the settings to M=LIGHT LED

- Pre-select the parameters as required.
- Mark M=LIGHT LED or group in M=LIGHT Control Explorer.
- Press **Send**.

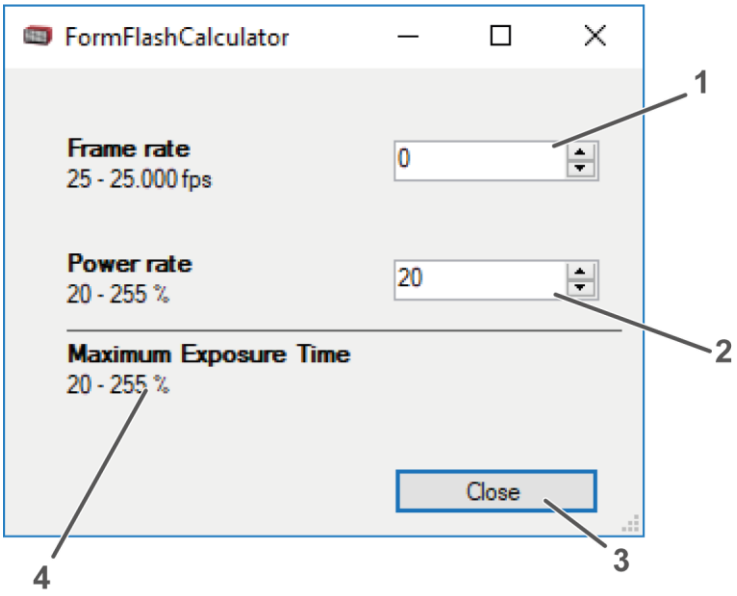
✓ The set parameters are transmitted to the highlighted M=LIGHT LEDs or group.

Switch off activated M=LIGHT LED or group.

- Mark M=LIGHT LED or group in M=LIGHT Control Explorer.
- Press **OFF**.

✓ The highlighted M=LIGHT LED or group is switched off.

Calculate maximum exposure time



Pos.:	Description
1	Set frame rate
2	Adjust the power
3	Close window
4	maximum exposure time

Figure 52: FormFlashCalculator

➢ Press Flash Calculator.

✓ The FormFlashCalculator window opens.

➢ Enter frame rate.

➢ Enter level of performance.

✓ The maximum exposure time for the set values is displayed automatically.

Identification and correction of invalid parameters

If an invalid value is set for a configuration, the corresponding setting is marked in red.

The graphic illustrations for Sync and LED Light are NOT displayed.

The settings must meet the following conditions:

- Pulse delay [µs] must be smaller than Puls periode[µs].
- Puls periode [µs] must be smaller than period of SYNC signal.
- Pulse width [µs] must be between 20 µs and 500 µs.
- The ratio of Pulse width [µs] to Puls periode [µs] must match the set intensity Power [%] (Figure 50, page 59).

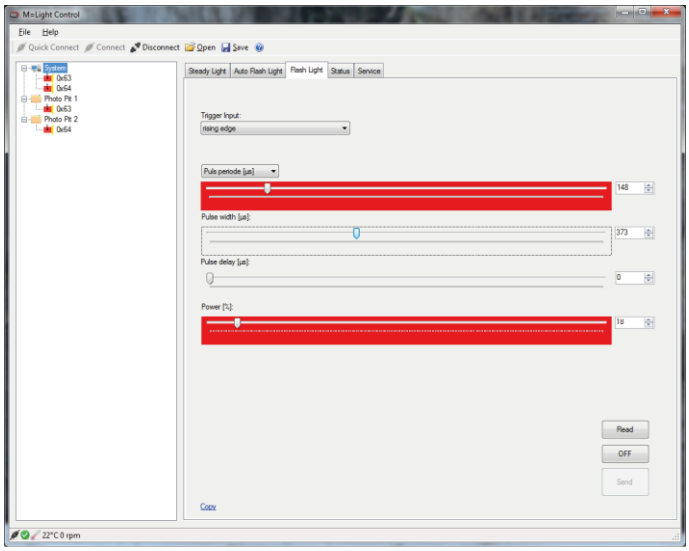


Figure 53: invalid parameter (schematic diagram)

- ➢ Check whether all conditions are met.
- ➢ Adjust settings highlighted in red to fulfil the conditions listed above.
- ✓ The highlighted M=Light LED or group is adjusted. The graphic illustrations **Sync** and **LED Light** are displayed.

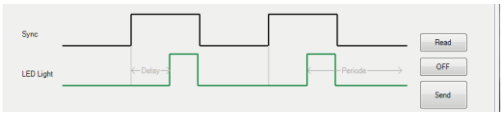


Figure 54: graphic illustration **Sync** and **LED Light**

5.4.3.3 Error message in Auto-Flash Light und Flash Light operating mode

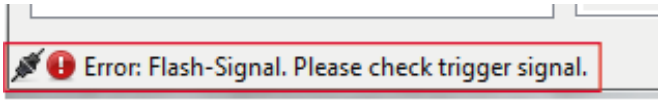


Figure 55: Error message in status bar

Error cause:

- The incoming Sync signal does NOT correspond to the permissible switch-on duration of the M=LIGHT LED at preselected intensity (Power [µs]).
- The set value Pulse delay [µs] does NOT correspond to the permissible pulse delay to the period of the Sync signal.
- Wrong signal polarity set (Sync Input).

Consequence of the error:

- Sync switch-on processes are NOT performed, which results in bright / dark frame sequences in the shots.

Preventing errors:

- ➢ Check if the incoming Sync signal corresponds to the permitted switch-on duration of the M=LIGHT LED at the pre-selected intensity (Power [µs]).
- ➢ Check whether the Invert Input checkmark or the Sync Input Signal are set correctly.
- ➢ Power [%] adapt to M=LIGHT LED in tab Auto Flash Light .
- ➢ Check whether Pulse delay [µs] is smaller than the period of the Sync signal.
- ➢ Adjust slide control Pulse delay [µs] on tab Auto Flash Light / Flash Light.
- ✓ The input signal of the M=LIGHT LED has been adjusted.

5.5 Status

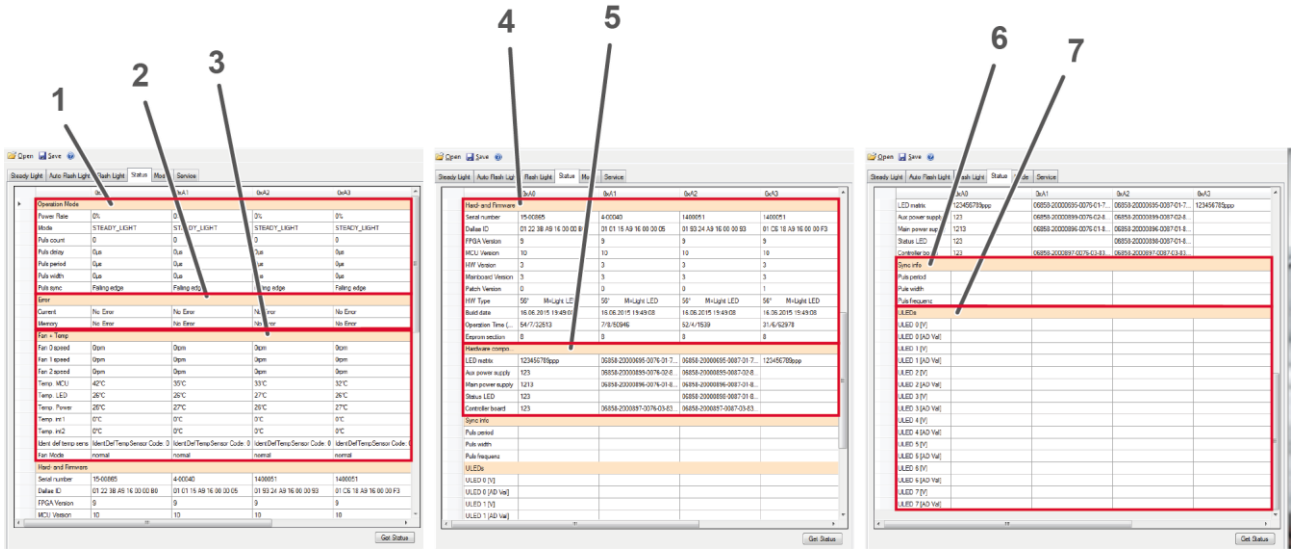


Figure 56: Status

All information about the M=LIGHT LEDs marked in the M=LIGHT Control Explorer is listed on the Status tab. Individual connected M=LIGHT LEDs are listed in the columns. This allows reading all status information for each M=LIGHT LED individually.

Pos.:	Description
1	**Operation Mode** shows all settings from the operating modes **Steady Light**, **Auto Flash Light** and **Flash Light**.
2	**Error** shows current and stored error messages.
3	**Fan + Temp** shows the status of the individual fans and temperatures in the respective M=LIGHT LED.
4	**Hard- and Firmware** shows all information about the hardware and firmware.
5	**Hardware compo…** shows the addresses of the hardware components.
6	**Sync info** shows transmitted data of the connected camera.
7	**ULEDs** shows voltages and reference voltages of the connected LEDs.

Display status information of highlighted M=LIGHT LEDs

- ➢ Highlight M=LIGHT LED or group in M=LIGHT Control Explorer.
- ➢ Press **Get Status**.
- ✓ Status information for highlighted, individual M=LIGHT LEDs or for highlighted groups is displayed.

5.6 Mode

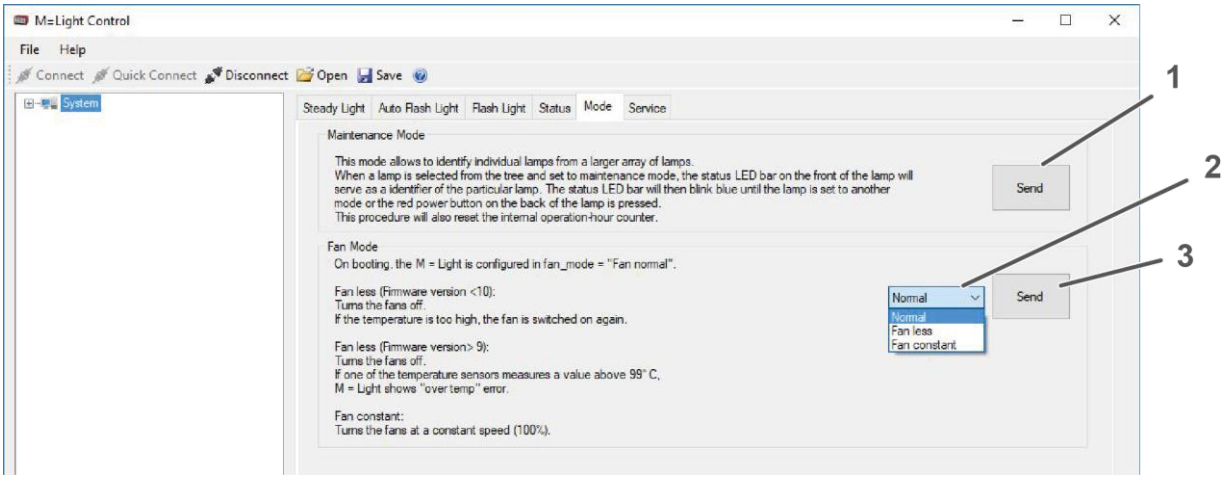


Figure 57: Tab mode

Pos.:	Description
1	Transferring maintenance mode
2	Drop-down menu for Fan Mode
3	Transfer fan mode

5.6.1 Maintenance Mode

Each M=LIGHT LED features an internal operating hours counter. Servicing the M=LIGHT LED after 150 hours is recommended (Chapter 6, Page 71). To quickly identify which of the connected M=LIGHT LEDs have already reached this counter, the **Maintenance Mode** can be activated here.

Maintenance Mode activate

- Mark System in M=LIGHT Control Explorer.
- Go to the **Mode** tab in the field **Maintenance Mode** and press **Send** (Figure 57, Page 65).

✓ Status display on the M=LIGHT LED flashes blue, the maintenance mode is active.

5.6.2 Fan Mode

The fans have three operating modes that are set in the drop-down menu.

Operating mode:	Description
Normal	The speed of the fans is controlled dynamically depending on the temperature of the M=LIGHT LED.
Fan less	The M=LIGHT LED switches off when reaching a temperature of 99 °C. Intended for short-term operation in an environment with high particle density in the ambient air.
Fan constant	The fans are always operated at full output (even when the M=LIGHT LED is switched off). Permits maximum cooling output.

Change operating mode of fans

- Mark System in M=LIGHT Control Explorer.
- Select the desired operating mode in the drop-down menu.
- Press Send.

✓ The fans of the selected system are adjusted to the selected operating mode.

5.7 Service

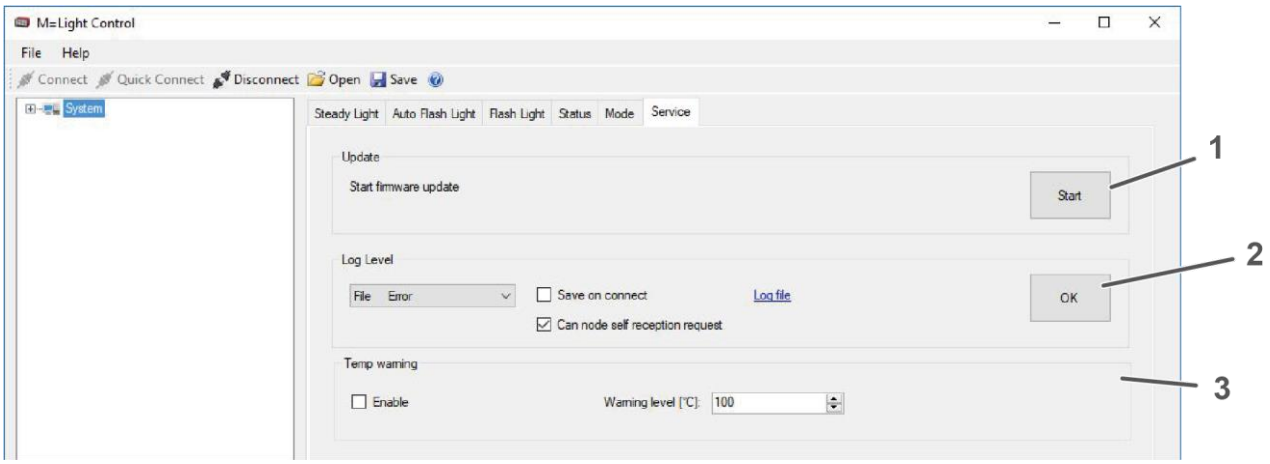


Figure 58: Service tab

Pos.:	Description
1	**Update**, **Start** opens the window **Firmware und FPGA Updates.**
2	**Log Level**, activates generation of a log file.
3	**Temp warning**, setting the temperature from which the software warns the operator.

5.7.1 Firmware and FPGA Updates

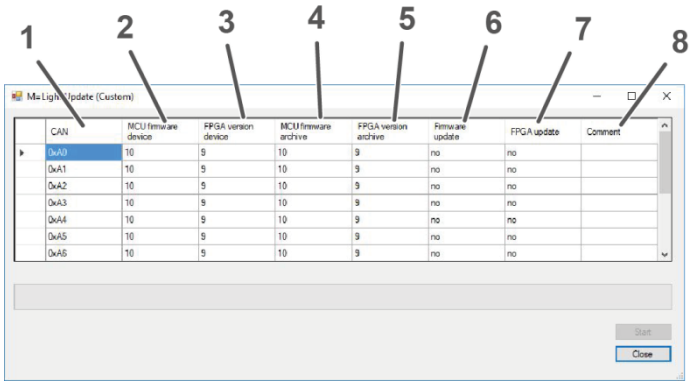


Figure 59: M=LIGHT Update window

Pos.:	Description
1	Shows the CAN address of the highlighted M=LIGHT LED.
2	Shows the firmware version of the highlighted M=LIGHT LED.
3	Shows the FPGA version of the highlighted M=LIGHT LEDs.
4	Shows the most current available firmware version.
5	Shows the most current available FPGA version.
6	Shows whether a firmware update is recommended (yes/no).
7	Shows whether a FPGA update is recommended (yes/no).
8	Shows comments, e.g. “Update started”.

Firmware and FPGA Updates may be available after the installation of a new software version or a new M=LIGHT LED.

Perform Firmware and FPGA Updates

- Press **Start** on the **Service** tab in the **Update** area.
- The **M=LIGHT Update (Custom)** window opens.
- Check in the window **M=LIGHT Update (Custom)** whether an update is recommended (Figure 59, Pos. 5 and 6).
- If an Update is recommended, press **(Custom) Start** in the **M=LIGHT Update** window.
- In the **M=LIGHT Update (Custom)** press **Close**.
- ✓ Updates performed successfully.

5.7.2 Set and view logs under Log Level

Activates generation of a log file. This may be helpful for MESSRING Service in case of problems. Depending on the problem, MESSRING Service may specify the desired settings.

Log Level:

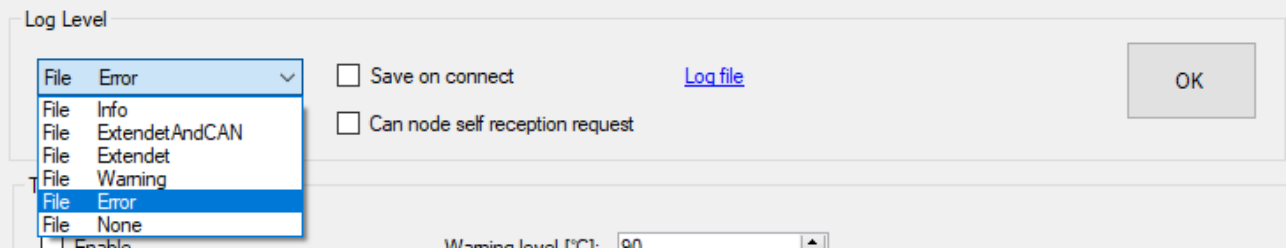


Figure 60: **Log Level** Options

Pos.:	Description
Info	Errors, warnings, additional information, CAN messages and other information is logged.
Extendet and CAN	Errors, warnings, additional information and CAN messages are logged.
Extendet	Errors, warnings and additional information is logged.
Warning	Errors and warnings are logged.
Error	Errors are logged.
None	NO logging takes place.
Save on connect	Saves while connecting.
Can node self reception request	Saves on request.
Log file	Opens a window with the log data.

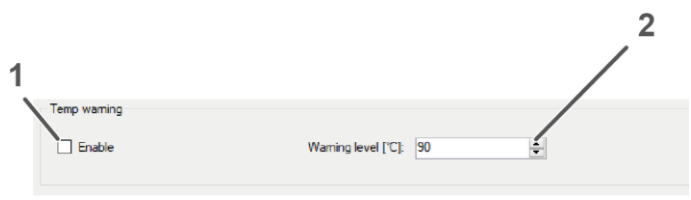
Adjust logging

- **Log Level** select (Figure 60).
- Press **OK**.
- ✓ Logging has been configured.

- **Save on connect** and **Can node self reception request** are specified by MESSRING Service.
- The linked protocols can be viewed via **Log file**.

5.7.3 Temp warning

Temp warning is where the temperature above which a warning is given by the software is set.



Pos.:	Description
1	Activation field for temperature warning
2	Temperature setting

Figure 61: **Temp warning**

Set temperature above which a warning shall be given

- In the **Enable** field set a checkmark to activate temperature warning.
- In the **Warning level [°C]:** field, use the arrow keys (▲▼) or directly enter the numerical value to set the temperature above which the system should warn.

✓ The temperature above which a warning is given is set.

Chapter 6 Maintenance

Contents

6.1 Maintenance intervals

The following maintenance intervals must be complied with:

- Before execution of a test series
- Semi-annual maintenance (or after 150 combustion hours)

6.2 Categories

Category	Description
A	Facility operator with MESSRING operator training
B	Operator's maintenance staff with MESSRING maintenance training
C	Network administrator
D	MESSRING system specialist

6.3 Before Execution of a Test Series

6.3.1 M=LIGHT LED

Tasks	Comment	Cat	OK?	Defects (description)	Measured values
Visual inspection					
Switch on the voltage supply and check if all M=LIGHT LEDs signal ready for operating status.	Green display in LED array (Section 4.1, Page 20).	A	☐ **OK**		
Functional check					
Briefly switch on the M=LIGHT LEDs in set operating mode.	Check if all required M=LIGHT LEDs operate in the desired operating mode.	A	☐ **OK**		

6.4 Semi-annual Maintenance

6.4.1 Ventilation slots

Tasks	Comment	Cat	OK?	Defects (description)	Measured values
Visual inspection					
Check ventilation slots for coarse soiling.	Remove soiling using a vacuum cup or compressed air with the voltage supply disconnected. Do NOT propel fans by means of compressed air.	A	☐ **OK**		

6.4.2 Housing

Tasks	Comment	Cat	OK?	Defects (description)	Measured values
Visual inspection					
Check power cords for kinks and chafing points.	Immediately replace power cords with chafing and kinks and optimized installation of the power cords.	A	☐ **OK**		
Check support bracket and fixing screws for tight fitting and external damage.		A	☐ **OK**		

6.5 Maintenance Instructions

6.5.1 Acting Safely

WARNING! 	Hazardous electrical body voltage inside the housing If objects are inserted into the ventilation slots of live M=LIGHT LEDs, this may cause death or severe injury due to hazardous electrical body voltage. ➢ Disconnect the M=LIGHT LED first from the line supply before beginning with maintenance work. ➢ Do NOT insert objects into the M=LIGHT LED. ➢ M=LIGHT LED must only be cleaned dry, NOT with water. ➢ Do NOT operate the M=LIGHT LED in outdoor areas.

NOTE! 	Damage to the fan motors due to overspeed If a fan motor is propelled, e.g. by means of compressed air, at speed rates far beyond its nominal speed, it may be damaged. ➢ Ventilation slots are best cleaned using a vacuum cleaner. ➢ Do NOT run the fan with compressed air when blowing out the ventilation slots.

6.5.2 Cleaning the Housing

- Switch off M=LIGHT LED.
- Disconnect the M=LIGHT LED from the mains line.
- Wipe with a dry cloth.
- Under NO CIRCUMSTANCES apply grease or cleaning liquid on the LED array.
- Lightly wipe the LED array with a dry, clean, soft cotton cloth.
- ✓ You have cleaned the M=LIGHT LED.

6.5.3 Cleaning the Ventilation Slots

- Switch off M=LIGHT LED.
- Disconnect the M=LIGHT LED from the mains line.
- Guide a narrow piece of plastic or wood from below through the vent slots to lock the fan in place.
- Carefully blow or suction the ventilation slot clean while holding the fan blade.
- Repeat the procedure with all additional vent slots.
- ✓ The ventilation slots are cleaned.

6.5.4 Reset operating hours counter

- Start M=LIGHT Control.
- Connect M=LIGHT LED with M=LIGHT Control (Section 8.1, Page 80).
- **Maintenance Mode** activate (section 5.6.1, page 65).
- Press the On/Off switch at the rear of the M=LIGHT LED (Figure 10, Page 24).
- ✓ The operating hours counter of the M=LIGHT LED has been set again to 0.

Chapter 7 Technical data

Contents

7.1 Dimensions and Weights

Length	187.6 mm
Width	251 mm
Height	147 mm
Mass	5.5 kg

7.2 Voltage supply

Supply voltage	120-230 VAC
Frequency	50-60 Hz
Power consumption	1,000 W

7.3 Performance Data

Color temperature	6,500-7,100 K (daylight)
Light current continuous operation	75 kilo lumen
Light current flash operation	150 kilo lumen
Service life of the LEDs	50,000 h
Angle of radiation, depending on design	23°, 37°, 56°, 71°
Ambient temperature	0-50 °C
Hardware-related delay between Sync input and light flash	approx. 10 µs

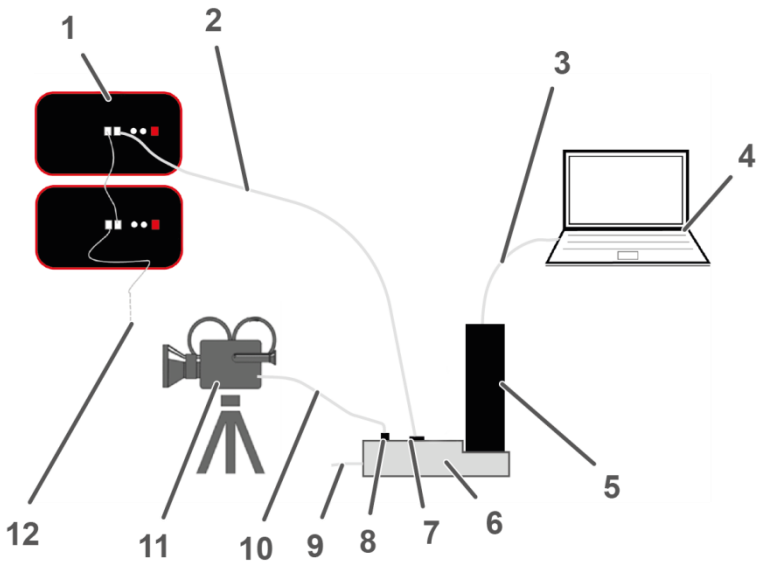
Chapter 8 Handling

Contents

8.1 Connect M=LIGHT LED

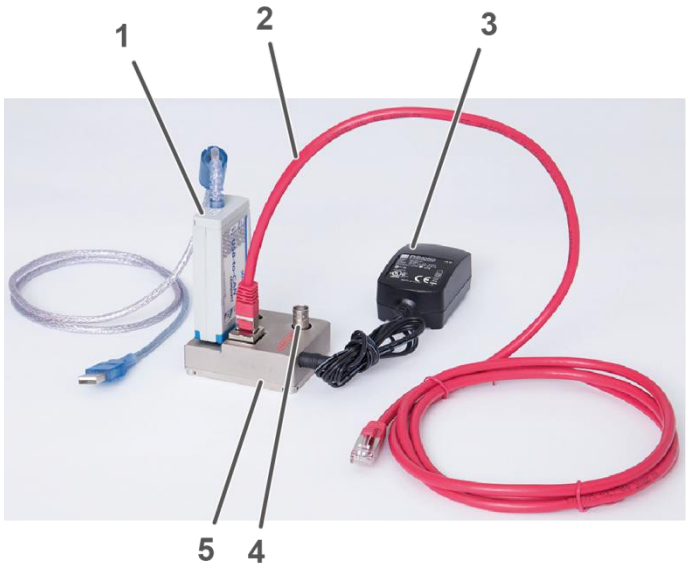
8.1.1 Connect the M=LIGHT LED with CAN Compact Interface Adapter, high-speed camera and PC

Remote controlled switch-on and switch-off of the M=LIGHT LED is performed by means of the Flash H and Flash L signals at the Pin 1 and Pin 2 input (Figure 12, Page 27).



Pos.:	Description
1	M=LIGHT LED
2	Ethernet cable,
3	USB cable
4	PC with M=LIGHT Control
5	USB-to-CAN Compact Interface Adapter
6	M=LIGHT LED BUS Splitter mobile
7	RJ45 Ethernet Connection
8	BNC connection
9	Power supply unit, power supply
10	TTL-sync line from the camera
11	High-speed camera
12	Patch cable for additional M=LIGHT LEDs

Figure 62: Connection M=LIGHT LED, (schematic diagram)



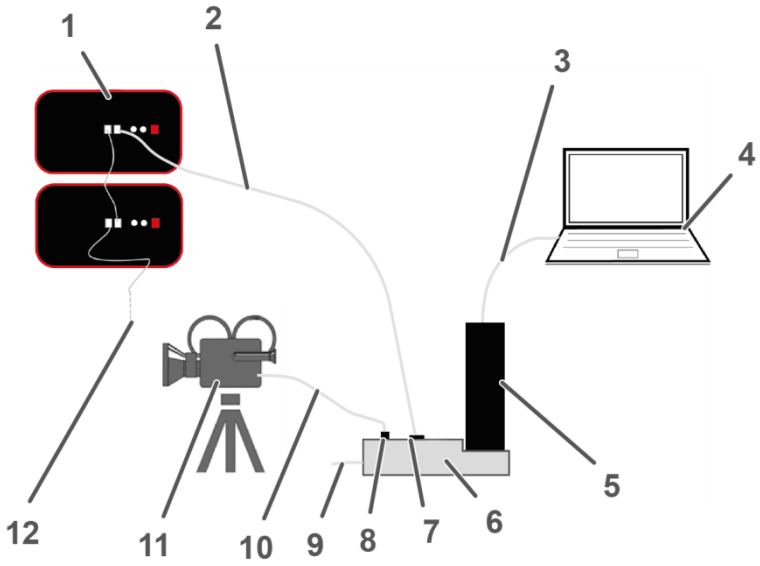
Pos.:	Description
1	USB-to-CAN Compact Interface Adapter
2	Ethernet cable
3	Power supply unit, power supply
4	BNC connection
5	M=LIGHT LED BUS Splitter mobile

Figure 63: M=LIGHT LED Bus Splitter

- ➢ Connect power supply unit to the M=LIGHT LED BUS Splitter mobile.
- ➢ Connect power supply unit of the M=LIGHT LED BUS Splitter mobile power supply.
- ➢ Connect the USB-to-CAN Compact Interface Adapter to the DB9 female connector of the M=LIGHT LED Bus Splitter mobile.
- ➢ Connect PC with USB cable to USB-to-CAN Compact Interface Adapter.
- ➢ Connect high-speed camera with TTL-Sync line to BNC connection of the M=LIGHT LED Bus Splitter mobile.
- ➢ Connect M=LIGHT LED with CAN-bus line to the RJ45 connection of the M=LIGHT LED Bus Splitter mobile.
- ➢ Assign an individual CAN-BUS address to all M=LIGHT LEDs in the same CAN-bus line.
- ✓ M=LIGHT LED BUS Splitter mobile is connected.

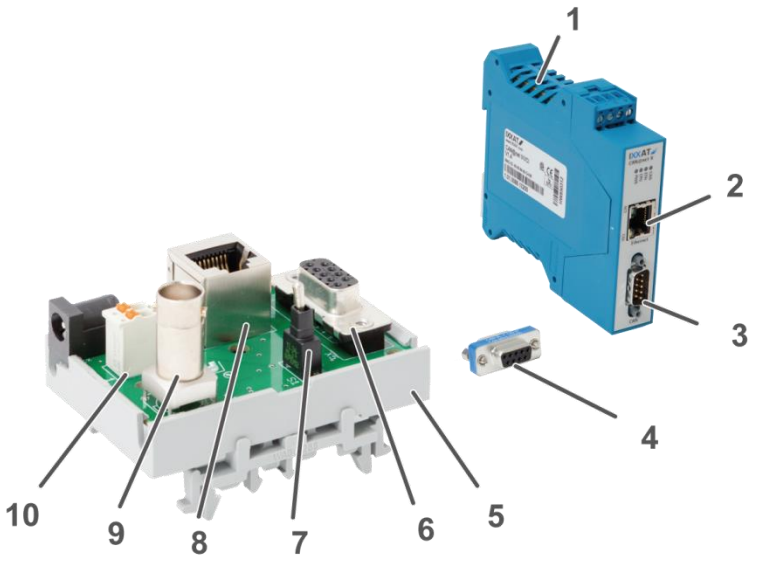
The connected M=LIGHT LEDs can be set with the M=LIGHT Control Software (Section 5.4, Page 50).

8.1.2 Connect M=LIGHT LED via system control PLC



Pos.:	Description
1	M=LIGHT LED
2	Ethernet cable,
3	Ethernet cable,
4	PC with M=LIGHT Control
5	CAN@net II-Adapter
6	M=LIGHT LED BUS splitter stationary
7	RJ45 Ethernet Connection
8	BNC connection
9	Power supply unit, power supply
10	TTL-sync line from the camera
11	High-speed camera
12	Patch cable for additional M=LIGHT LEDs

Figure 64: Connection M=LIGHT LED, (schematic diagram)

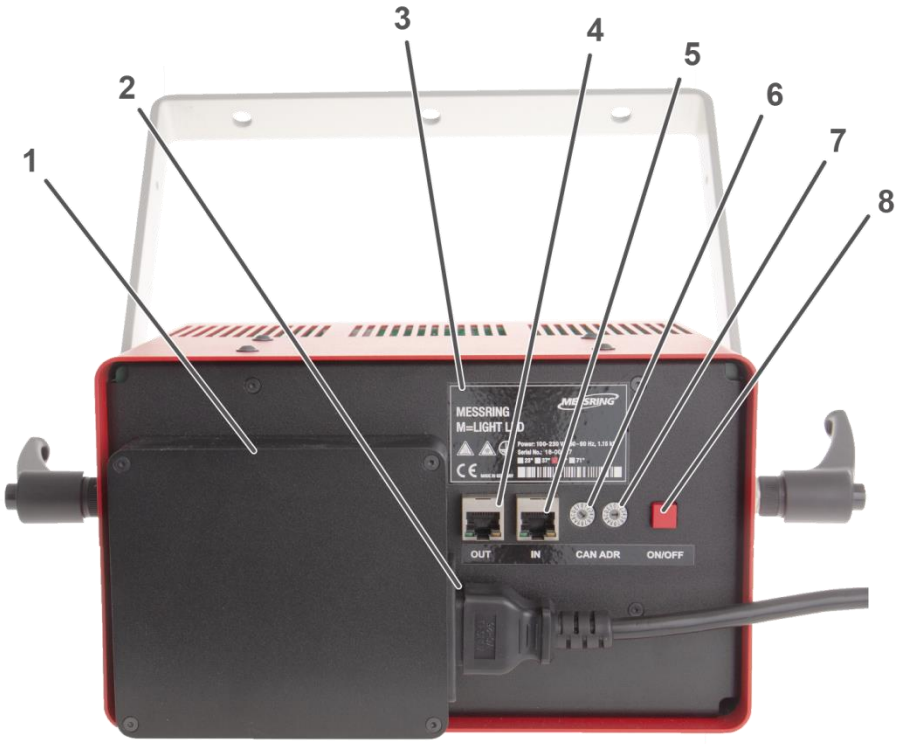


Pos.:	Description
1	CAN@net II-Adapter
2	RJ45 Ethernet connection for PC connection
3	DB9 connection
4	BUS terminator / CAN Bus terminating resistor
5	M=LIGHT LED BUS splitter stationary
6	DB9 connection
7	Switch for inversion of Sync signal
8	RJ45 Ethernet connection for M=LIGHT LED
9	BNC connection
10	Voltage supply

Figure 65: M=LIGHT LED BUS splitter stationary

- ➢ Connect M=LIGHT LED BUS Splitter stationary to power supply (Figure 65, Page 82, Pos. 2).
- ➢ Connect Bus Terminator to CAN@net II-Adapter (Figure 65, Page 82, Pos. 3, 4).
- ➢ Connect Sub-D extension 9-pin to M=LIGHT LED BUS splitter stationary and CAN@net II adapter with Bus Terminator (Figure 65, Page 82, Pos. 3, 4, 6).
- ➢ Connect PC with Ethernet cable to CAN@net II-Adapter (Figure 65, Page 82, Pos. 2).
- ➢ Connect high-speed camera with TTL Sync line to the BNC connection of the M=LIGHT LED Bus splitter (Figure 65, Page 82, Pos. 9).
- ➢ Connect the M=LIGHT LED with Ethernet cable to the RJ45 Ethernet port of the M=LIGHT LED Bus splitter (Figure 65, Page 82, Pos. 8).
- ➢ Connect additional M=LIGHT LEDs via patch cable with M=LIGHT LED.
- ➢ Assign an individual CAN-BUS address to all M=LIGHT LEDs in the same CAN-bus line.
- ✓ The M=LIGHT LEDs are connected with the CAN@net II-Adapter, the high-speed camera and the PC.
- ✓ The connected M=LIGHT LEDs can be set with the M=LIGHT Control Software (Section 5.4, Page 50).

8.2 Operate M=LIGHT LED in manual mode



Pos.:	Description
1	EMC filter
2	Supply connection for hot devices power supply cord
3	Nameplate
4	RJ45 Ethernet Connection CAN-bus Out
5	RJ45 Ethernet Connection CAN-bus In
6	CAN-bus address (MSB)
7	CAN-bus address (LSB)
8	On / Off-switch, manual operating mode.

Figure 66: Connections and control elements on the rear side

In the case the M=LIGHT LED has NOT yet been parameterized via CAN-bus, manual mode is activated automatically when applying the power supply.

8.2.1 Set M=LIGHT LED WITHOUT RJ45 Ethernet connection

- ➢ Disconnect M=LIGHT LED from RJ45 Ethernet connection (Figure 66, Page 84, Pos. 4).
- ➢ Supply M=LIGHT LED with operating voltage.
- ➢ Press the ON button on the rear of the housing (Figure 66, Pos. 8).
- ✓ M=LIGHT LED is in manual mode.

The intensity can be set with the CAN-Bus address switches on the rear of the M=LIGHT LED (Figure 66, Pos. 6 and 7).

Default setting in manual mode:

- **Sync Input**: neg. Flanke
- **Pulse Count**: 1
- **Pulse Width**: 300 µs
- **Pulse Delay**: 0 µs
- Intensity corresponds to the settings at the address switches (table).

CAN address		Description
MSB	LSB	
0	1	Steady light, power 1%*
…	….	*Continuous light in 1% increments
6	4	Continuous light, power 100%*
0	0	Flash, power 100%
6	5	Flash, power 110%
6	6	Flash, power 120%
6	7	Flash, power 130%
6	8	Flash, power 140%
6	9	Flash, power 150%
6	A	Flash, power 160%
6	B	Flash, power 170%
6	C	Flash, power 180%
6	D	Flash, power 190%
6	E	Flash, power 200%
6	F	Flash, power 210%
7	0	Flash, power 220%
7	1	Flash, power 230%
7	2	Flash, power 240%
7	3	Flash, power 250%
7	4	Flash, power 255%
F	F	Ext. TTL, Power 100%

8.2.2 Switch-on M=LIGHT LED in manual mode

- Set the M=LIGHT LED by using the CAN-bus address switch for the manual mode.
- Supply M=LIGHT LED with operating voltage via the male connector.
- Press the red ON/OFF button on the rear side of the housing.
- ✓ M=LIGHT LED is switched on in manual mode.

8.2.3 Switch-off M=LIGHT LED in manual mode

- Press the On/Off switch (ON/OFF) on the rear side of the housing.
- ✓ The M=LIGHT LED is switched off.

Chapter 9 EU Declaration of Conformity

CUTTING-EDGE SAFETY TESTING SINCE 1968. MESSRING Systembau MSG GmbH
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MESSRING

EU – Konformitätserklärung

Produktnummer : 8LED23

Anschrift: MESSRING Systembau MSG GmbH
Robert-Stirling-Ring 1
82152 Krailling, Germany

Abbildung:

Allgemeine Produktbezeichnung: M=Light LED, 1000W

Hiermit wird bestätigt, dass das oben beschriebene Gerät die Anforderungen der Richtlinie 2014/35/EU erfüllt.

Angewandte harmonisierte Norm: DIN EN 55015 : 2013-05 +A1:2015
EN 61547:2009

INNOVATIONS FOR SAFETY TESTING MESSRING

Krailling, den 18-12-2017

Dierk Arp (Geschäftsführung)

P0302002 CE MLight.Docx

Figure 67: EU Declaration of Conformity

Chapter 10 Annex

10.1 User Manual CAN@net II

10.2 Commissioning Manual Web-IO Digital