



**RELIANCE Approach Flash System**  
Elevated and Inset

**User Manual**

UM-4006, Rev. 2.2, 2023/02/14





## A.0 Disclaimer / Standard Warranty

### CE certification

The equipment listed as CE certified means that the product complies with the essential requirements concerning safety and hygiene. The European directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

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Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

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**Note**

See your sales order contract for a complete warranty description.

Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

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**Liability****WARNING**

Use of the equipment in ways other than described in the catalog leaflet and the manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in the manual.

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Unintended uses, includes the following actions:

- Making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine ADB SAFEGATE replacement parts or accessories.
- Failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards if not in contradiction with the general rules.
- Using materials or auxiliary equipment that are inappropriate or incompatible with your ADB SAFEGATE equipment.
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# 1.0 Safety instructions

- Work on these systems, particularly when they have been opened up, may be carried out only by qualified electricians or persons trained in electrical engineering, in due compliance with occupational safety regulations!
- If you are not familiar with the occupational safety regulations and the general safety rules involved, please get in touch with your responsible manager!
- If the flash lighting system is switched off via the remote control system or the service control system, the power supply to the chain may remain activated. The chain can be safely de-energized only by using the main switch (miniature circuit-breaker) of the control unit!
- The LEDs of the flashing lights generate a light flash of very high brightness! The utmost care must be taken to avoid viewing this without eye protection from a short distance away from the LED light sources!
- Switching off, or making a change to the system that restricts its actual function, may be carried out only in consultation with the responsible traffic control!

## 1.1 Safety

### Introduction to Safety







This section contains general safety instructions for installing and using ADB SAFEGATE equipment. Some safety instructions may not apply to the equipment in this manual. Task- and equipment-specific warnings are included in other sections of this manual where appropriate.

## 1.2 Safety Messages

### HAZARD Icons used in the manual

For all HAZARD symbols in use, see the Safety section. All symbols must comply with ISO and ANSI standards.

Carefully read and observe all safety instructions in this manual, which alert you to safety hazards and conditions that may result in personal injury, death or property and equipment damage and are accompanied by the symbol shown below.

	<b>WARNING</b> Failure to observe a warning may result in personal injury, death or equipment damage.
	<b>DANGER - Risk of electrical shock or ARC FLASH</b> Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage. ARC Flash may cause blindness, severe burns or death.
	<b>WARNING - Wear personal protective equipment</b> Failure to observe may result in serious injury.
	<b>WARNING - Do not touch</b> Failure to observe this warning may result in personal injury, death, or equipment damage.
	<b>CAUTION</b> Failure to observe a caution may result in equipment damage.
	<b>ELECTROSTATIC SENSITIVE DEVICES</b> This equipment may contain electrostatic devices.

## Qualified Personnel

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### Important Information

The term **qualified personnel** is defined here as individuals who thoroughly understand the equipment and its safe operation, maintenance and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations and have been trained to safely install, operate, maintain and repair the equipment. It is the responsibility of the company operating this equipment to ensure that its personnel meet these requirements.

Always use required personal protective equipment (PPE) and follow safe electrical work practice.

---

### 1.2.1 Introduction to Safety



## CAUTION

### Unsafe Equipment Use

This equipment may contain electrostatic devices, hazardous voltages and sharp edges on components

- Read installation instructions in their entirety before starting installation.
- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Install all electrical connections to local code.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.

**Failure to follow this instruction can result in serious injury or equipment damage**

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## Additional Reference Materials

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### Important Information

- IEC - International Standards and Conformity Assessment for all electrical, electronic and related technologies.
  - IEC 60364 - Electrical Installations in Buildings.
  - FAA Advisory: AC 150/5340-26 (current edition), Maintenance of Airport Visual Aid Facilities.
  - Maintenance personnel must refer to the maintenance procedure described in the ICAO Airport Services Manual, Part 9.
  - ANSI/NFPA 79, Electrical Standards for Metalworking Machine Tools.
  - National and local electrical codes and standards.
-

## 1.2.2 Intended Use



### CAUTION

#### Use this equipment as intended by the manufacturer

This equipment is designed to perform a specific function, do not use this equipment for other purposes

- Using this equipment in ways other than described in this manual may result in personal injury, death or property and equipment damage. Use this equipment only as described in this manual.

**Failure to follow this instruction can result in serious injury or equipment damage**

## 1.2.3 Material Handling Precautions: Storage



### CAUTION

#### Improper Storage

Store this equipment properly

- If equipment is to be stored prior to installation, it must be protected from the weather and kept free of condensation and dust.

**Failure to follow this instruction can result in equipment damage**

## 1.2.4 Material Handling Precautions: Fasteners



### DANGER

#### Foreign Object Damage - FOD

This equipment may contain fasteners that may come loose - torque properly.

- Only use fasteners of the same type as the one originally supplied with the equipment.
- Use of incorrect combination of gaskets, bolts and nuts can create severe damages to the product installation and create safety risk .
- You need to know what base the light fixture will be installed in, in order to chose the correct gasket, bolts and nuts.
- Bolt type, length, and torque value are determined by type of base, height of spacers used, and clamp force required in FAA Engineering Brief No 83 (latest revision).
- Due to the risk of bolts vibrating loose, do not use any type of washer with the fixing bolts (such as split lock washers) other than an anti-vibration washer. Anti-vibration washers as defined in FAA EB 83 (latest edition) must be used. For installations other than FAA, use the base can manufacturer's recommendations.
- Always tighten the fasteners to the recommended torque. Use a calibrated torque wrench and apply the recommended adhesive type.
- Obey the instructions of the adhesives necessary for the fasteners.

**Failure to follow these warnings may cause the fasteners to loosen, damage the equipment, potentially to loosen the equipment. This can lead to a highly dangerous situation of FOD, with potential lethal consequences.**

### Note

To minimize the risk of errors, the ADB SAFEGATE Sales Representative will have information on which gasket goes with which base. This information is also provided in the product Data sheets, the User Manuals and the Spare Part Lists.



## CAUTION

Use of incorrect combination of gaskets, bolts and nuts can create severe damages to the product installation and create multiple safety risks.

To obtain a safe and watertight installation the O-ring and retaining bolt stated in the document must be used.

You need to know what base the light fixture will be installed in, in order to choose the correct gasket, bolts and nuts.

**Failure to follow these cautions can result in equipment damage or aircraft FOD.**

---

### 1.2.5 Operation Safety



## CAUTION

### Improper Operation

Do Not Operate this equipment other than as specified by the manufacturer

- Only qualified personnel, physically capable of operating the equipment and with no impairments in their judgment or reaction times, should operate this equipment.
- Read all system component manuals before operating this equipment. A thorough understanding of system components and their operation will help you operate the system safely and efficiently.
- Before starting this equipment, check all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the system if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks or locked-out electrical disconnects or pneumatic valves.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Never operate equipment with a known malfunction.
- Do not attempt to operate or service electrical equipment if standing water is present.
- Use this equipment only in the environments for which it is rated. Do not operate this equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.
- Never touch exposed electrical connections on equipment while the power is ON.

**Failure to follow these instructions can result in equipment damage**

---

### 1.2.6 Maintenance Safety



## DANGER

### Electric Shock Hazard

This equipment may contain electrostatic devices

- Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.
- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.

**Failure to follow these instructions can result in death or equipment damage**

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## 1.2.7 Material Handling Precautions, ESD



### CAUTION

#### Electrostatic Sensitive Devices

This equipment may contain electrostatic devices

- Protect from electrostatic discharge.
- Electronic modules and components should be touched only when this is unavoidable e.g. soldering, replacement.
- Before touching any component of the cabinet you shall bring your body to the same potential as the cabinet by touching a conductive earthed part of the cabinet.
- Electronic modules or components must not be brought in contact with highly insulating materials such as plastic sheets, synthetic fiber clothing. They must be laid down on conductive surfaces.
- The tip of the soldering iron must be grounded.
- Electronic modules and components must be stored and transported in conductive packing.

**Failure to follow this instruction can result in equipment damage**

## 1.2.8 Arc Flash and Electric Shock Hazard



### DANGER

#### Series Circuits have Hazardous Voltages

This equipment produces high voltages to maintain the specified current - Do NOT Disconnect while energized.

- Allow only qualified personnel to perform maintenance, troubleshooting, and repair tasks.
- Only persons who are properly trained and familiar with ADB SAFEGATE equipment are permitted to service this equipment.
- An open airfield current circuit is capable of generating >5000 Vac and may appear OFF to a meter.
- Never unplug a device from a constant current circuit while it is operating; Arc flash may result.
- Disconnect and lock out electrical power.
- Always use safety devices when working on this equipment.
- Follow the recommended maintenance procedures in the product manuals.
- Do not service or adjust any equipment unless another person trained in first aid and CPR is present.
- Connect all disconnected equipment ground cables and wires after servicing equipment. Ground all conductive equipment.
- Use only approved ADB SAFEGATE replacement parts. Using unapproved parts or making unapproved modifications to equipment may void agency approvals and create safety hazards.
- Check the interlock systems periodically to ensure their effectiveness.
- Do not attempt to service electrical equipment if standing water is present. Use caution when servicing electrical equipment in a high-humidity environment.
- Use tools with insulated handles when working with airfield electrical equipment.

**Failure to follow these instructions can result in death or equipment damage**





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## 2.0 Introduction

The RELIANCE Approach Flash System, referred to as SFL, serves as a sequential approach flash lighting system and threshold identification lighting system at airports.

It meets all the requirements of ICAO Annex 14 and the requirements for military lighting systems in compliance with STANAG 3316 and the "Manual for Lighting Systems".

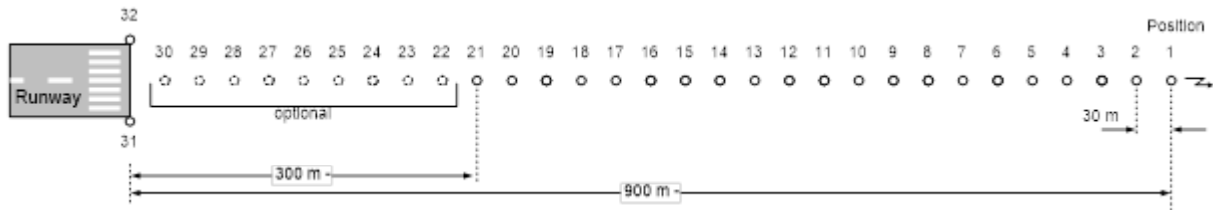
No functional guarantee is accepted for use of the system for other than its intended purpose, or for operating it outside the specified framework data.



## 3.0 Configurations of the system

The approach flash lighting system, referred to as SFL, consists of the main chain and a pair of threshold identification lights. The main chain (Lights 1 to 30) forms the extension of the runway centerline up to 900 m before the threshold. The flashing lights of the main chain, beginning with the light at Position 1, are lit one after the other in such a way that the approaching pilot has a continuous light signal guiding him/her to the runway.

**Figure 1: Layout of a complete system**



In order to avoid dazzle effects, the main chain can be reduced by the final 300 m segment (22 to 30) before the threshold. In a fully equipped main chain, this segment can be switched off, if needed.

The runway threshold is marked by a pair of flashing lights (31 and 32) on the left and right next to the threshold lighting. These threshold identification lights (abbreviated below to TILs) are lit together after the sequence of the main chain. In order to avoid misleading the pilot, if one of the two threshold identification lights fails, the second one will be automatically switched off.

To distinguish between runways or as an additional signaling option, the sequence frequency can be switched over from the customary 2 sequences per second (2 Hz) to one sequence per second (1 Hz).

Three brightness steps enable the SFL system to be matched to the ongoing weather situation.

The individual-light monitoring capability of the SFL assures detailed technical remote control even in readiness mode.

The SFL system offers the following fixed or dynamic system configurations <sup>1</sup>:

- Full main chain with TIL
- Reduced main chain with TIL
- TIL without main chain

There is an option for having the SFL system externally synchronized: Here, the flash chain sequence is initiated once in each case by an external trigger signal. This enables the SFL system to be synchronized to be effected with upstream guide lights, for example.

### 3.1 Approach Flash System

#### Compliance with Standards (current Versions)

<b>FAA</b>	EB 67D
<b>ICAO</b>	Annex 14, Vol. I
<b>IEC</b>	TS 61827
<b>NATO</b>	STANAG 3316

#### Uses

LED light used for approach sequential flash and threshold identification for CAT I, II and III operations

<sup>1</sup> Configurations of a main chain can be implemented without TILs as a special function.

Principle terminal diagram of the system

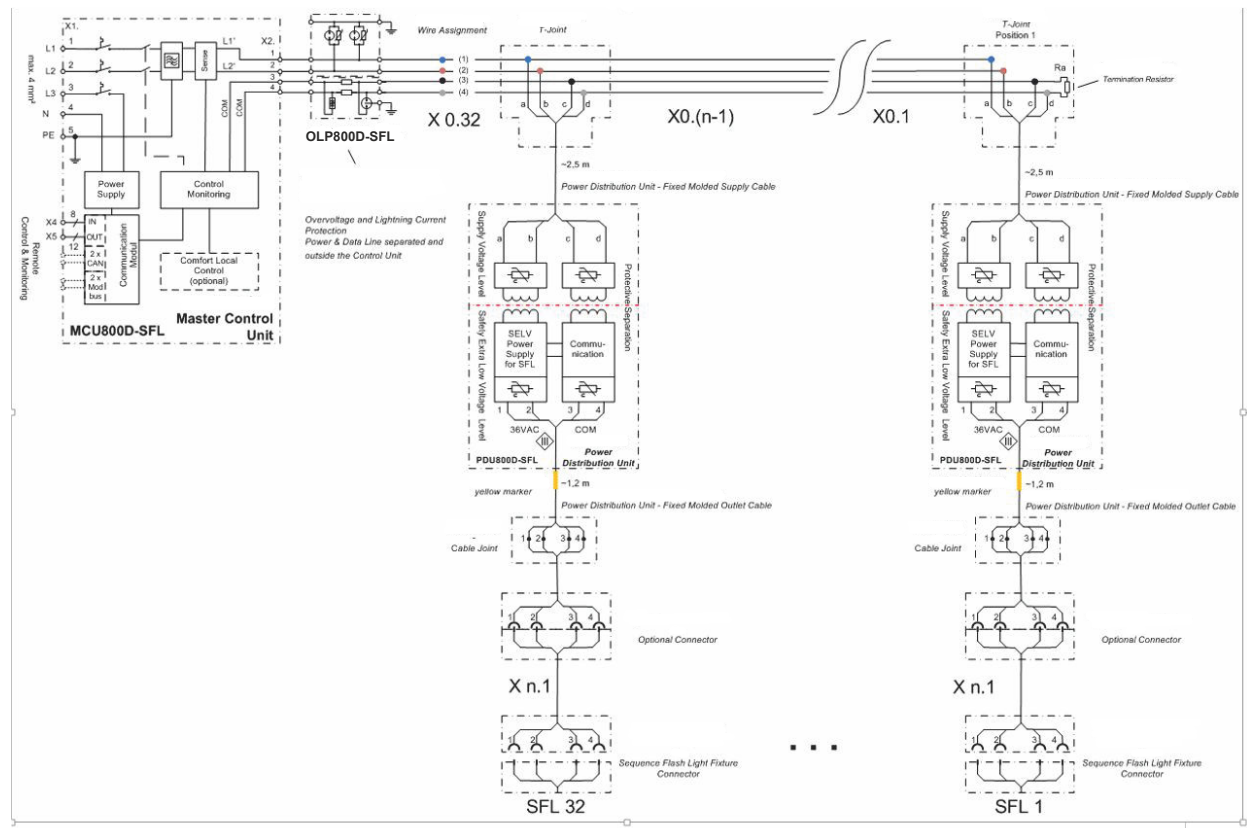


Table 1: Control cabinet and software

Ordering Code	Part	Description
MCU800D-SFL-20	MCU 800D-SFL	Multiwire
MCU800D-SFL-21	MCU 800D-SFL	CAN Bus
MCU800D-SFL-22	MCU 800D-SFL	Modbus
MCU800D-SFL-23	MCU 800D-SFL	Single Profibus
MCU800D-SFL-24	MCU 800D-SFL	Redundant Profibus
MCU800D-SFL-25	MCU 800D-SFL	Single Ethernet
MCU800D-SFL-26	MCU 800D-SFL	Redundant Ethernet
P1299	lucDMC	lucDMC + License Dongle for 1 PC
P1300	lucDMC	lucDMC + License Dongle for 2 PC
P1301	lucDMC	lucDMC + License Dongle for 3 PC

**Table 1: Control cabinet and software (Continued)**

Ordering Code	Part	Description
P1302	lucDMC	lucDMC + License Dongle for 4 PC
P1303	lucDMC	lucDMC + License Dongle for 5 PC
P1030	PSD800D-SFL	Dongle For Inset Lights

**Table 2: Section Transformers, connection and mounting**

Ordering Code	Part	Description
P864	PDU800D-SFL	SELV Isolating Unit
P1006	OLP800D-SFL	Optional Overvoltage Protection
P1029	JBX800D-SFL	T Connection Box - JBX800D
300.241	QPD Plug	Phoenix Connector Plug (QPD Nut included)
300.245	QPD Receptacle	Phoenix Connector Receptacle (QPD Nut included)
300.244	QPD H Connector	Phoenix H - Connector
300.243	QPD Dustcap	Phoenix Dustcap to seal off unused connections
300.246	QPD Nut	Phoenix Nut (To reuse Plug or Receptacle)
205.016	FAA 4 pole Cable Lead Plug	FAA 4 pole Cable Lead Plug - 280 mm
205.017	FAA 4 pole Cable Lead Receptacle	FAA 4 pole Cable Lead Receptacle -2000 mm
205.043	FAA 5 pole Cable Plug	FAA 5 pole Cable Plug - 300 mm
205.044	FAA 5 pole Cable Receptacle	FAA 5 pole Cable Receptacle - 2000 mm
061.607	Base Plate	Base plate 2"/ NPS
061.186	Pedestal	Frangible pedestal
211.319	Shallow Base	Eurobase waterproof with O-Ring(OC 7080.90.650)



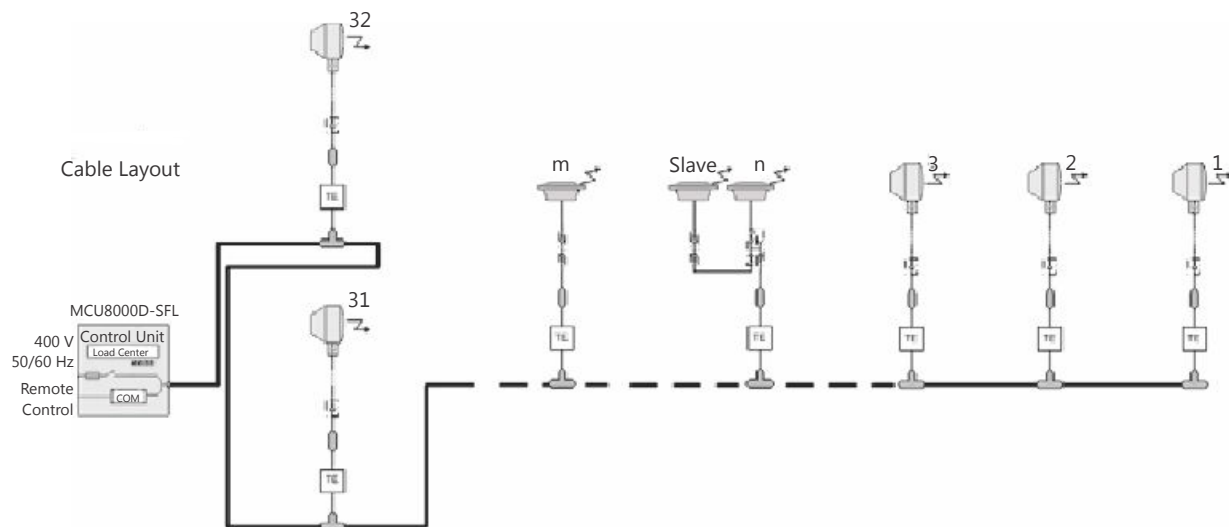
## 4.0 System architecture of the system

In the RELIANCE Approach Flash System, referred to as the SFL, instead of the traditional gaseous-discharge technology, lights with modern light-emitting diodes (LEDs) are used as the light source. The white high-performance LEDs generate the light flash using an extremely short light pulse with very high peak brightness. In contrast to gaseous discharge tubes, the LED technology does not require an internal high-voltage. This enables the lights to be designed for sturdiness, long lifetimes and safety.

A single supply cable suffices for supplying, controlling and monitoring the flashing lights. An isolating unit decouples the supply voltage and the data transmission for each light from the supply cable route.

The output of the isolating unit meets the requirements for a safety extra-low voltage (SELV) and thus permits unrestricted, safe work on an active light. This personnel protection feature makes possible and also facilitates installation in public parts of the approach lighting system located outside the airport itself.

**Figure 2: General cable diagram for the system**



The low connected load of the flashing lights enables small cable cross-sectional areas to be used. Thanks to the safety extra-low voltage supply to the lights and the completely insulated construction of the primary cabling, the SFL system does not require a protective conductor to be incorporated.

If on the approach route a lightning protection system or equipotential bonding is installed, the arresters and equipotential connections must be routed independently and at a distance from the supply to the flash lighting system.

The LED light source is formed by a cluster of individual LEDs. A diffuser lens in front of each individual LED covers the entire range of diffusion required. The failure of an individual LED does not result in any change to the light distribution, but reduces the brightness of the light only by its proportion in the cluster. Thanks to this redundant construction of the light source, the SFL achieves an enormously long operational lifetime, which is many times longer than can be achieved using a single light source, e.g. gaseous discharge tubes.

Details of the elevated and inset flashing lights can be found in the separate data sheets.





## 5.0 Functional description

### 5.1 Power supply

For supplying power to the flash chain, the control unit feeds 400 V AC voltage at 50 or 60 Hz to the supply cable.

In the isolating unit, the primary supply voltage for powering the flashing lights is transformed down to a dependably isolated safety extra-low voltage of approx. 36 VAC. An overvoltage protection feature in the isolating unit protects the system against voltage spikes.

The SELV supply voltage is fed into the flashing light directly or via an optional 4-pole plug connector. In the flashing light, a power capacitor unit provides the briefly required energy for the light flash.

In order to avoid a high making current when the flash chain is switched on, there is an automatic time-delay on the initial charging of the flashing light capacitors.

### 5.2 Nominal brightness

The nominal brightness of the elevated flashing lights can be adjusted to suit the requirements of flight operations in the general system configuration settings.

At the default setting, the elevated light supplies an effective flash brightness of approx. 12.500 cd, with the advantages of a very lengthy lifetime and correspondingly long maintenance cycles.

At the high setting, selection, the elevated flashing lights are operated with an effective flash brightness of more than 20.000 cd, with a peak value of 100.000 cd. This high brightness may significantly increase the far-distance visibility of the system. Please check before opting for increased brightness whether a mode of this kind is permissible for your airport.

Inset flashing lights supply a light output of approx. 6.500 cd effective. Due to the smaller optical system of an inset light design, the brightness of elevated flashing lights cannot be reached. If the output has to be matched to the default brightness of the elevated lights, the inset lights can be operated in parallel at one light position as a *double light pair*.

### 5.3 Brightness adjustment of the flash lighting system

The flashing lights have been designed for operation in the following steps: 100 %, 10 % and 3 % of the nominal brightness. You use the control system to switch over between them.

The effective brightness is changed by shortening the luminance pulse while retaining the same peak brightness.

### 5.4 Data transmission to the flashing lights

The flashing lights are controlled and monitored via a half-duplex data link between the control unit and the flashing lights. Data transmission features a bus system, utilizing two reserved wires of the supply cable.

Data transmission is decoupled from the supply to the flashing lights using the isolating units, ensuring that in the event of a secondary cable fault the bus will not be disturbed if at all possible.

Via the data link, the control unit creates the desired system configuration of the chain, and the ongoing flash brightness, while assuring synchronization of the flash sequences. Continual repetition of the data transmitted smooths over any brief disturbances in communication.

Each of the flashing lights is assigned to its installation position by means of an address, where the first light of the chain is Number 1. The lights at the threshold accordingly have Number 31 and 32. The addresses are used to ensure that the flashes are triggered in the specified temporal sequence. In order to keep the flash sequence in the chain synchronized, the control unit initiates each sequence with a synchronization signal. The lights use internal timers to smooth over the failure of a synchronization signal, and are thus unaffected by brief disturbances in communication.

After the flash has been triggered, each light signals its own status to the control unit, where the messages are evaluated, displayed, and passed to the remote control system.

A special category in this context is the configuration of a double-light, comprising two inset flashing lights. Here, the first light is connected as the *master* via an isolating unit to the power supply and the communication bus, while the second light is supplied by the first light as a *slave*, triggered and monitored in synchronization.

To safeguard data transmission, the two data lines in the cable joint at the end of the cable at Light Position 1 are connected to a terminating resistor.

## 6.0 Operator control at the control unit

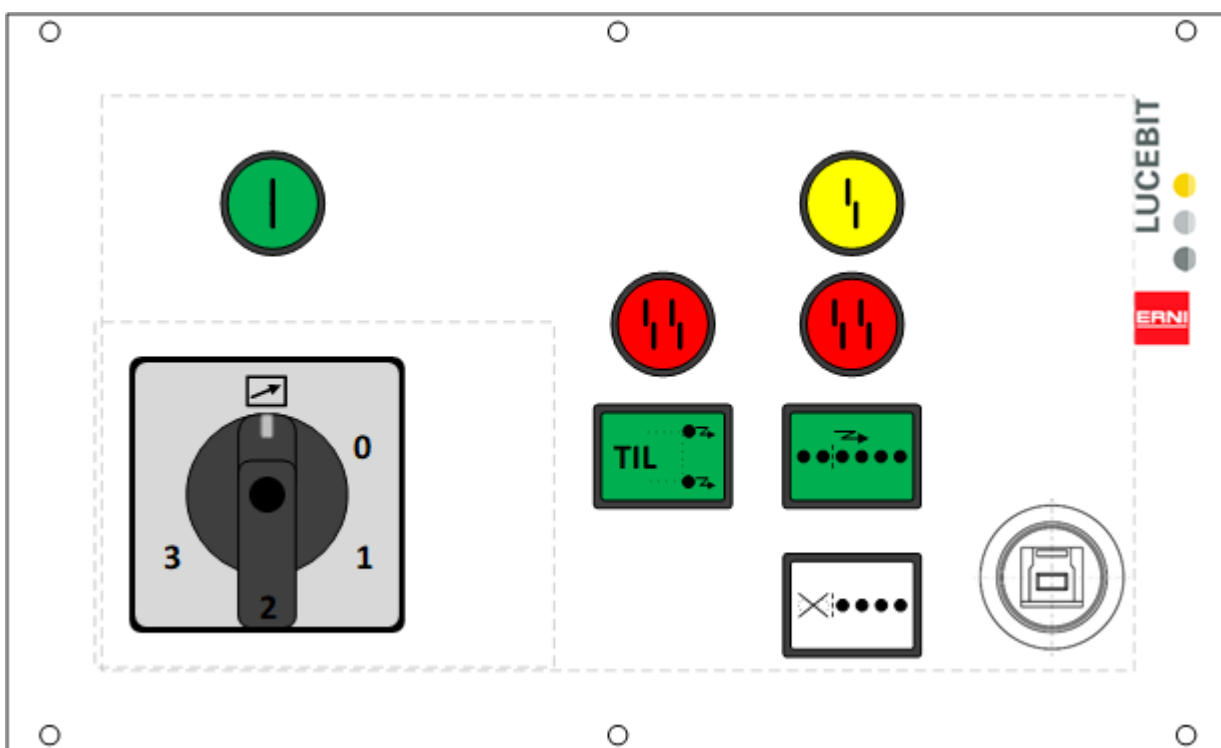
The control unit is designed for continuous operation with a remote control system (I&C) via a parallel or serial interface. For operation, internal control elements are provided for the system's basic functions.

For operator control of the flash lighting system, there are in the standard version 3 options available at the control unit:

- Operator control and monitoring of the basic functions using a control panel in the door of the device.
- Extensive operator control and configuration of the system is possible via an external service computer using the optional lucDMC service software package.
- Operator control using the local service control system in the device for trained maintenance staff.

In specific projects, different or further operator control options may be provided. The handling modalities will then be covered in the project documents.


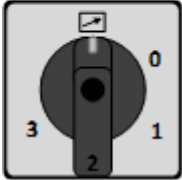








### 6.1 Local control and status displays at the front of the control cabinet



For operator control of the flashing light system, the control unit is fitted with a control panel in the front door. This control panel enables the flashing light system to be operated in its basic functions, and displays the system's operating status.

Please note that some functions of the operator control unit may be changed by the device configuration process, and thus matched to special features of an individual system. If this is the case, instructions will be found in the project documents. Here, descriptions are given for the functions in the standard version.

The control panel illustrated here is merely an example. The shape and configuration of the operator controls and displays may differ.

Elements	Functions
 	<p>The monitor lamp indicates that the control unit is ready for operation.</p> <p>The settings of the rotary switch have the following functions:</p>  <p>Remote control is active. The system will follow the control signals at the active control interface.</p> <p>0 – The flash system has been switched off. Please note: depending on the configuration involved, the system may not be de-energized in this setting!</p> <p>1 – The lowest brightness step (3 %) with the configured sequence frequency has been pre-selected for local operating mode.</p> <p>2 – The medium brightness step (10 %) with the configured sequence frequency has been pre-selected for local operating mode.</p> <p>3 – The highest brightness step (100 %) with the configured sequence frequency has been pre-selected for local operating mode.</p> <p>In Settings 0 – 3, the system is isolated from the remote control system.</p>
 	<p>These elements are assigned to the threshold identification lights. If no threshold identification lights have been installed, these elements are without a function.</p> <p>Failure: Malfunction and automatic switch-off of the threshold identification lights. The malfunctioning light can be identified using lucDMC.</p> <p>Button: ON / OFF for the threshold identification lights with the pre-selected brightness.</p>
   	<p>These elements are assigned to the flash chain. If no flashing lights have been installed for the chain, these elements are without a function.</p> <p>Partial malfunction: At least one malfunctioning flashing light has been detected in the chain.</p> <p>Failure: The number of malfunctioning flashing lights in the chain has reached or exceeded the preset signaling threshold LF2.</p> <p>Button: ON/OFF of the chain with the pre-selected brightness.</p> <p>Button: The 300 m segment before the threshold has been deactivated/activated. If the segment has not been installed, the button has no function.</p>
	<p>USB receptacle for connecting the service computer to the lucDMC service software package. The adapter cable supplied may have to be used for connection. Other devices or software are not supported by the interface. The functions of the service software package are described in detail in a separate section.</p>

## 6.2 Internal service local control and status displays

There are buttons located inside and outside the housing. Only the external buttons are intended to be used by the the users in the field.

The service mode local control system is integrated on the control module inside the control unit.



### NOTICE

- These service mode operator controls may be used **only by properly trained personnel**.
- Read the [Safety instructions](#) chapter before you start.



## CAUTION

**If the control unit has been opened up, the relevant safety instructions must be complied with.**

- Switching operations may be performed only in consultation with the responsible traffic control.
- If a general local operator control option is required, please use the local control panel in the front door or the optionally available easy-to-use operator control at the control unit.
- DO NOT use the buttons located inside of the housing unless it can not be avoided.
- Use them only in a case of emergency or for maintenance purposes, if absolutely necessary.

**The service mode local control system isolates the flash lighting system from the remote control.**

**Figure 3: Control unit**



For the service local control mode, see [Figure 4](#), outside the cover of the control module, five buttons and a rotary switch are provided.

For monitoring the flash lighting system, the control module has nine LED displays under the transparent cover.

**Figure 4: Service, operator control and display elements at the control module**



### 6.2.1 Functions of the configuration buttons

The buttons serve for dynamic modification of the system's configuration. Some functions are conditional upon enabling of dynamic configuration in the system configuration. The system is activated with the configuration pre-selected here using the rotary switch. The change to the configuration will take effect immediately even when the flash lighting system is switched on.

Please note that for operating the system at least the chain or TILs should have been pre-selected.



Designation	Function of the button
TIL ON/OFF	Pre-selection whether the TILs shall also run in the configuration concerned.
CHAIN ON/OFF	The flash chain installed before the threshold is pre-selected. The lights are operated with the brightness set at the rotary switch.
Chain 21/30	Pre-selection changeover switch between full chain with all 30 flashing lights and the reduced chain with 21 flashing lights. In the reduced configuration (21 lights), the final 300 m before the threshold are switched off. If flashing lights 22 to 30 have not been installed, this button has no function.
LED POWER	(Without function)
SEQUENCE 1 Hz/2 Hz	Altering the sequence frequency between 1 sequence per second (1 Hz) and 2 sequences per second (2 Hz). On civil airfields, a sequence frequency of 2 Hz is the standard setting.

### 6.2.2 Rotary switch

Designation	Function of the rotary switch
9-REMOTE	The remote control interface of the flash lighting system has been activated and can be switched using a remote control system.
0-OFF	The flash chain is disconnected from the remote control and switched off. Depending on the system configuration involved, the flash lighting system may remain in readiness and energized. A positive switch-off of the threshold identification lights can be canceled only in this position of the switch.
1-STEP1	Service local mode with 3% brightness.

Designation	Function of the rotary switch
2-STEP2	Service local mode with 10% brightness.
3-STEP3	Service local mode with 100% brightness.
Settings 4 - 8	No function. The last defined status is retained. Depending on the direction of rotation involved, this will be REMOTE or STEP3. If in this position of the rotary switch, the supply voltage for the control unit is connected, the flash lighting system is switched off.

### 6.2.3 LED displays

Designation	Color	Meaning of the display
On	Green	Supply voltage is connected and the system is ready.
ERROR >= 1 HEAD	Red	Short pulse  at least one light in the main chain is defective. (Warning LF1). Long pulse  second configured failure threshold of the main chain has been reached or a fault has been detected in the threshold identification light (TIL).
LOCAL	Yellow	The flash lighting system is disconnected from the remote control.
TIL	Yellow	Steady light: TIL is in operation. Flashing light: TIL is pre-selected but not yet switched on (Brightness Step 0).
CHAIN	Yellow	Steady light: The main chain is in operation. Flashing light: The main chain is pre-selected but not yet switched on (Brightness Step 0).
SHORT/LONG CHAIN	Yellow	The entire main chain, incl. the 300 m segment before the threshold, has been configured.
LED POWER Half/full	Yellow	As an option, elevated flashing lights can be configured for operation at increased brightness.
SEQUENCE	Yellow	Indicates the beginning of each new sequence with brief flashing. (1 or 2 light pulses per second corresponding to the sequence frequency involved).

### 6.3 Easy-to-use operator control at the control unit

To provide an expanded local control capability for the LED flash lighting system, an optional easy-to-use operator control feature can be connected to the control unit.





## 7.0 Installation

The RELIANCE Approach Flash System, referred to as SFL, is installed as an extended approach centerline in front of the runway. The length is usually 900 m, with an interval of 30 m between the lights. The length and individual spacing may vary, and can be found in the project drawings.

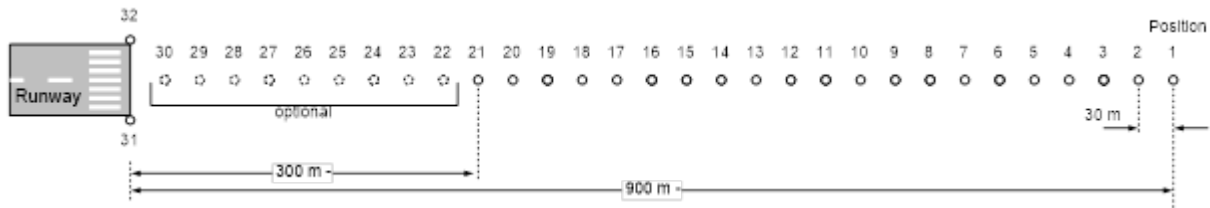
Since the approach centerline is already occupied by normal approach lights, the flashing lights are installed directly next to the approach lights. Avoid any offsetting inside the main chain.

The two threshold identification lights (TILs, Lights 31 and 32) are placed on the outside next to the green threshold lighting.

In order to avoid dazzle effects, no flashing lights are often installed in a 300 m zone before the threshold (Lights 22 – 30).

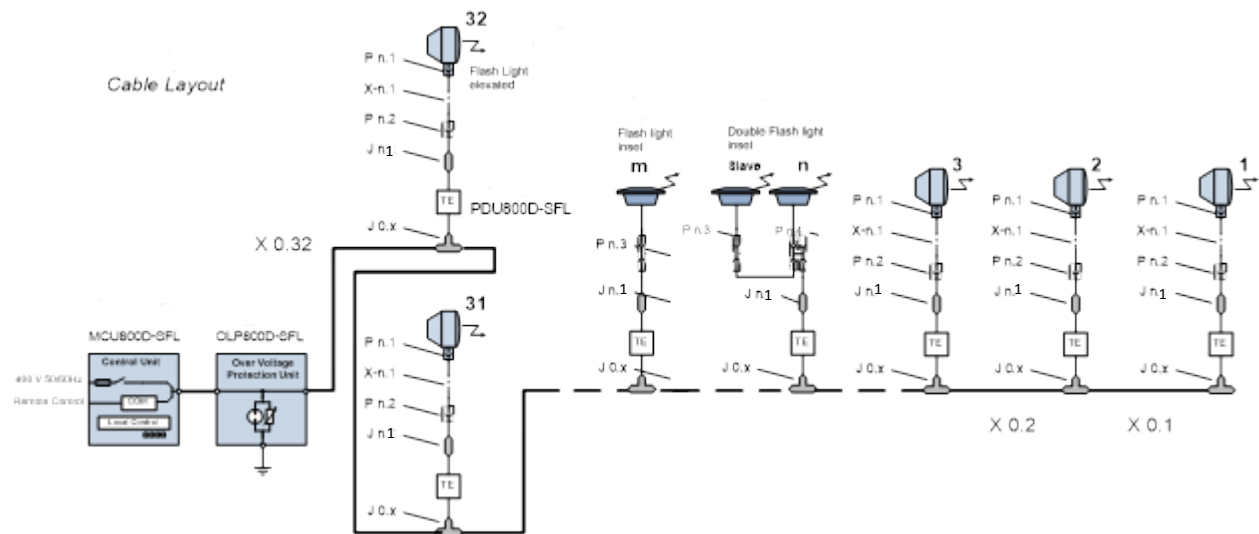
Elevated lights that have been installed on the ground or on short masts inside the 300 m zone must be fitted with a mechanical and electrical coupling.

**Figure 5: General layout of the system**



Power is fed to the flash lighting systems through a supply cable from one of the lighting stations. This cable is usually, routed beginning from the station, via the threshold to the first light. The positioning of the two threshold identification Lights 31 and 32 can be freely chosen, and, depending on the cable routing involved, can also be the other way round.

**Figure 6: Cable layout of the system, example with elevated lights (see P. 18/19 for legend)**



### 7.1 Principal components of the flash lighting system

Pos.	Quantity	Designation	Type	Remark
-	1	Control unit	MCU800D-SFL	Supply and monitoring unit of the system
TE	32 (23)	Isolating unit	PDU800D-SFL	Safer isolation of the light incl. overvoltage protection.
OLP	1	Overvoltage protection unit	OLP800D-SFL	Overvoltage protection for power and data cables into the field

Pos.	Quantity	Designation	Type	Remark
J0.x	32 (23)	Branch joint		Matched to the supply cable used onto H07RN-F 5G2.5 branch
Jn.1	32 (23)	Straight joint		Suitable for H07RN-F 5G2.5
Pn.1	.. 32 (23)	Light connecting cable for elevated lights with frangible-coupling installation	04-95MR8J-x.x (x.x = length required in meters) <sup>1</sup>	4-pole receptacle FAA Style 8 Thomas & Betts Limited 120 Nashdene Road Scarborough, ON Canada M1V2W3
Pn.2		Cable connector for connecting an elevated light without frangible-coupling installation	Cable connector QPD C 4PE2.5 2X9-16 BK – 1403836	Delivery with light Phoenix Contact
Pn.3	Optional Quantity as required	Intermediate plug connector in the light connecting cable, consisting of plug connector and receptacle	Receptacle 04-95MR7J-x.x Plug connector: 04-95MPJ-x.x (x.x = length required in meters) <sup>1</sup> Cable sleeve if necessary, corr. to Jn.1 (see remark)	4-pole plug connector and receptacle Thomas & Betts Limited
	or	Cable connector for creating an extended connection line	Cable connector QPD C 4PE2.5 2X9-16 BK – 1403836	
Pn.4	As required	Coupling for connecting an inset light	5-pole cast connector	Included in the delivery package for an inset flashing light
Pn.5	As required	Cable connector for connecting an inset light pair as a double light	1* H-distributor - QPD H 4PE2.5 4X9-16 BK - 1406369 1* guard cap - QPD QSK BK 5X2.5 FS - 1404525	Included in the delivery package of a double inset flashing light set

**Notes**

<sup>1</sup> The cable length between the isolating unit and the light is limited to 25 m over all subsections.

The quantities relate to a full chain with 32 flashing lights. The figure in brackets is for a reduced flash chain with 23 lights.

The material list does not contain any of the customary small installation material (e.g. self-bonding insulating tape for securing exposed plug-connectors). The cable joints must be selected to suit the cables being used and the installation options involved. The joints must be suitable for use outdoors.

Standard cables (see also system planning documents for details)

Cable segment	Section	Type	Remark
X 0.32	Station up to threshold	NYO-O 4 x 4 RE	Minimum cross-sectional area for up to 1000 m feed cable length between control unit and threshold light; Extended lengths necessitate an increased cross-sectional area.
X 0.2... X 0.n:	Sections in between the light 1 to n	NYO-O 4 x 2.5 RE	Minimum cross-sectional area for customary direct cable routing. Extended lengths necessitate an increased cross-sectional area.
X n.1	Connection between isolating unit and flashing light	H07RN-F 5G2.5	Protective conductor is not used! Note maximum length of 25 m.
X n.2	Connection between master and slave inset flashing lights	H07RN-F 7G1.5	Superfluous conductors and protective conductors are not used! Note maximum length of 3 m.

For cable lengths used and any cable types altered, please consult the project documents.

**Figure 7: Cable layout of the system – Elevated lights**

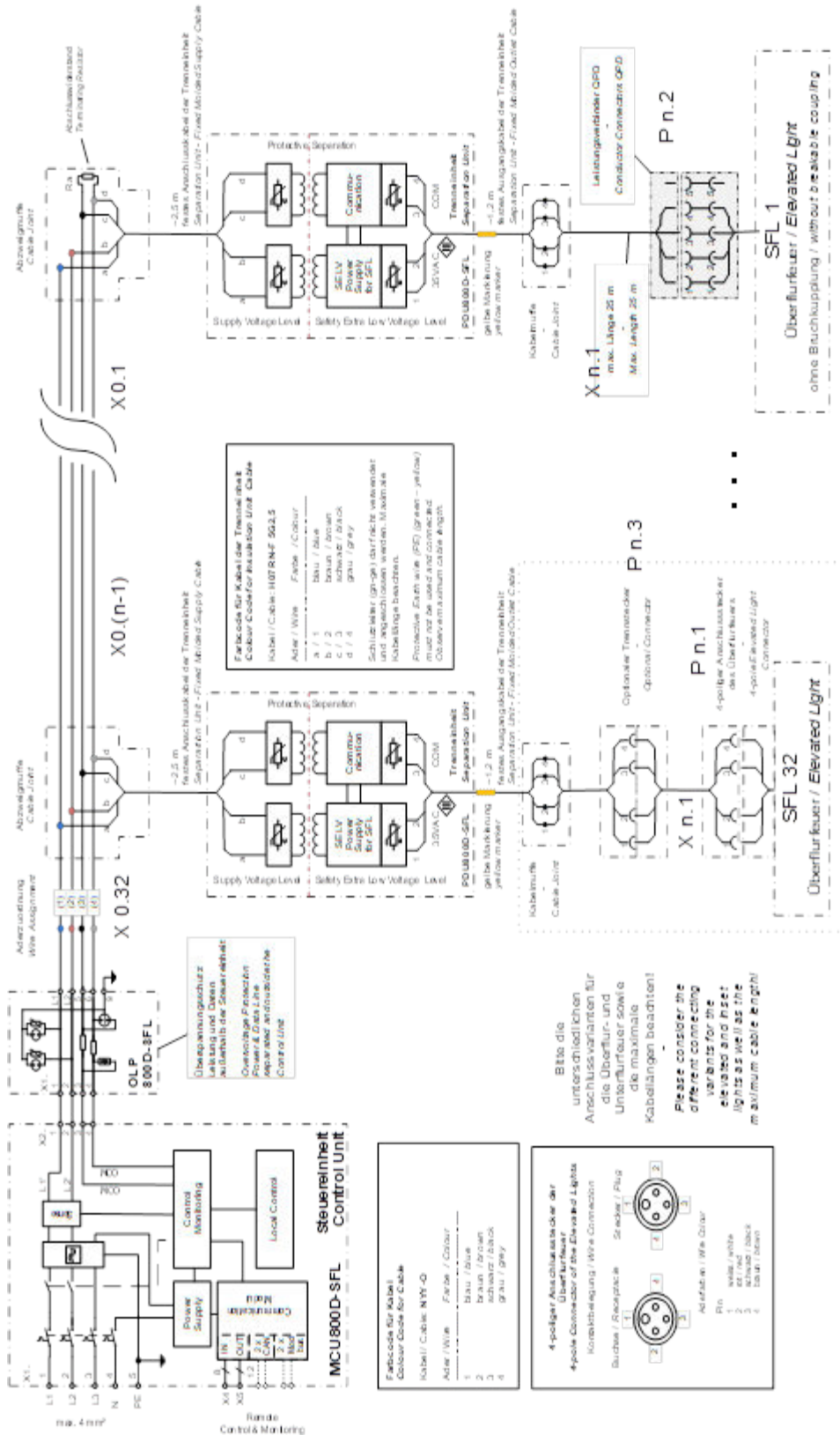
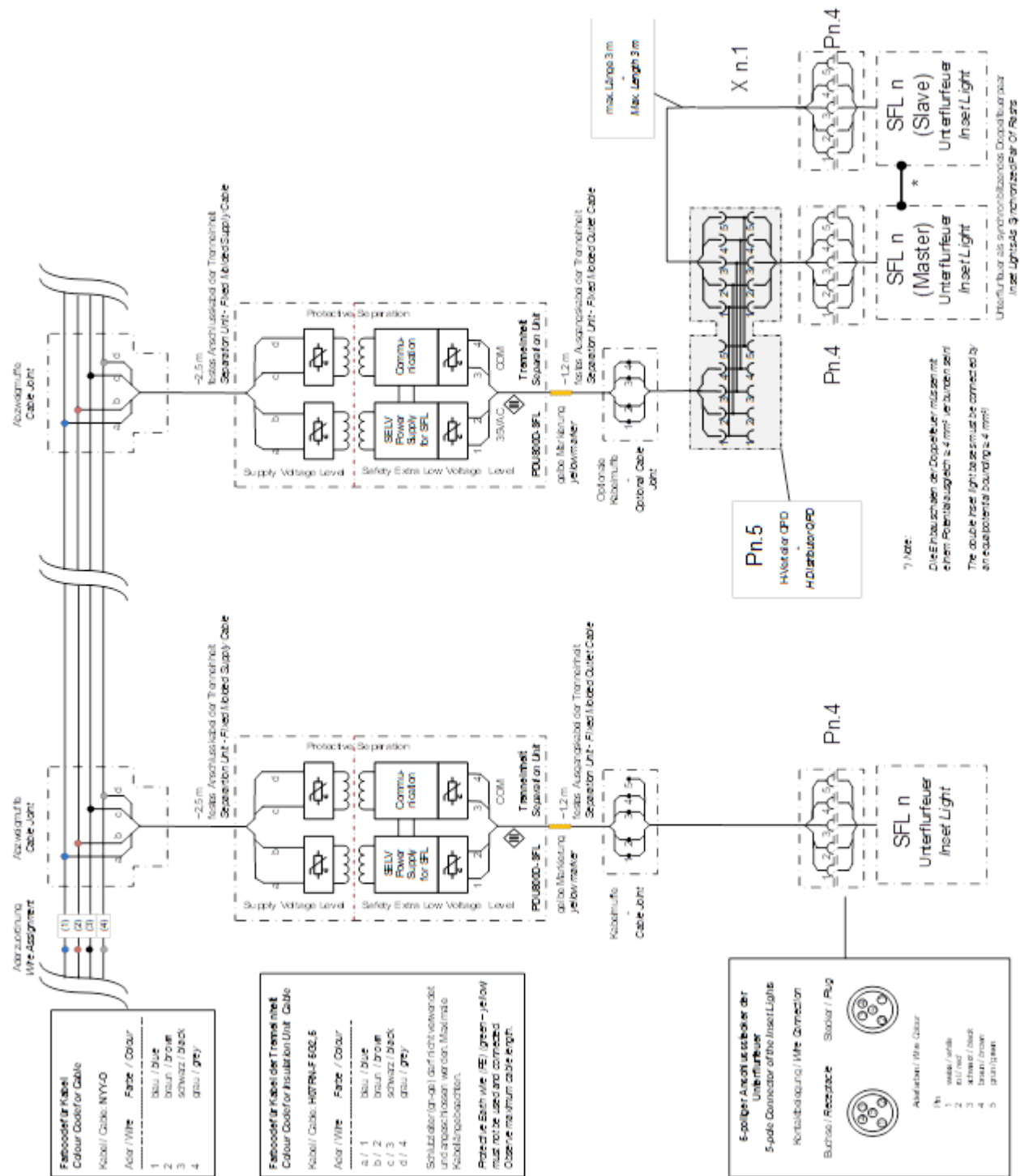


Figure 8: Cable layout – Inset flashing lights as single and double lights



## 7.2 Special connecting cables for inset flashing lights

Inset flashing lights can also be provided with special cables and special plug connectors, to suit the specific project concerned.

The assignments and types involved can be found in the project documentation. Special programming adapters may be required for the special plug connectors. Their use and functions, however, correspond to this description.

## 7.3 Control unit MCU800D-SFL

The power connections of the control unit are described here.

Details for connecting the remote control system are provided in [Remote control](#).

### 7.3.1 Power supply

Terminal Block X1

Terminal	Connector	Signal	Signal level
1	1.5 – 4 mm <sup>2</sup>	Phase L1	400 / 230 V AC
2	1.5 – 4 mm <sup>2</sup>	Phase L2	400 / 230 V AC
3	1.5 – 4 mm <sup>2</sup>	Phase L3	400 / 230 V AC
4	1.5 – 4 mm <sup>2</sup>	N	-
5	1.5 – 4 mm <sup>2</sup>	Protective conductor	-

### 7.3.2 Power supply to the flashing light chain

Terminal Block X2

Terminal	Connection	Signal	Signal level	Cable Number / Color of the supply cable
1	2.5 – 6 mm <sup>2</sup>	Power L1'	400 V AC	1 / blue
2	2.5 – 6 mm <sup>2</sup>	Power L2'	400 V AC	2 / brown
3	2.5 – 6 mm <sup>2</sup>	Communication COM	Data level ~ 2.5 V	3 / black
4	2.5 – 6 mm <sup>2</sup>	Communication COM	Data level ~ 2.5 V	4 / grey

## 7.4 Overvoltage protection unit OLP800D-SFL

In order to protect the system against overvoltages from outside, surge arresters must be installed for the power cables and for the data lines. The overvoltage protection features for the power and for the data cables are integrated into the OLP 800D-SFL overvoltage protection unit.

The OLP unit must be installed outside the control unit, as close as possible to the building's cable inlet. The OLP unit's routing to ground potential must be as short as possible and routed to the building's ground potential at a distance from the protected segment of the power cable or other cables. The place of installation will depend on the specific system concerned; it is shown in the project drawings.

**Figure 9: OLP unit**



**Figure 10: Overvoltage protection unit for the power and data cables**



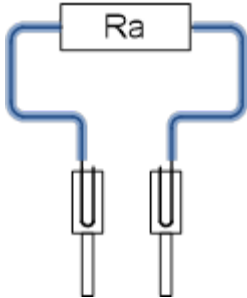
The supply cables (2.5 mm<sup>2</sup> to 10 mm<sup>2</sup>) are connected to the overvoltage protection unit as follows:

Terminal X1.		Signal	Signal level	Wire number / Color of the supply cable
1	Input	Power Phase 1 from the control unit	400 V AC	1 / blue
2	Input	Power Phase 2 from the control unit	400 V AC	2 / brown
3	Input	Data cable from the control unit	~2.5 V AC	3 / black
4	Input	Data cable from the control unit	~2.5 V AC	4 / grey
L1	Output	Power Phase 1 supply output	400 V AC	1 / blue
L2	Output	Power Phase 2 supply output	400 V AC	2 / brown
5	Output	Data output into the field	~2.5 V AC	3 / black
6	Output	Data output into the field	~2.5 V AC	4 / grey
9 (Grounding)		Discharge against building's ground potential (at least 10 mm <sup>2</sup> )	-	Separate cable

## 7.5 Terminating resistor

In order to avoid reflections at the end of the cable, a terminating resistor is provided as part of the circuitry for the two data transmission lines. The resistor is installed at the end of the cable in the connection joint of the first light position between the two data lines. For connection in the joint, the resistor's connection wires should be protected with an insulating sleeve and the ends fitted with plug-in cable lugs. Care must be taken to ensure a sufficient distance from the two supply lines.

**Figure 11: Terminating unit of the supply cable**



### Material for the terminating resistor

Quantity	Description	Type / Size	Vendor
1	Resistor's carbon layer	300 Ohm 0.5 W	<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;"> </div> <div> <p><b>NOTICE</b></p> <p>In order to avoid inductive contents, do not use a metal layer or wire resistors.</p> <hr/> <p>The resistance value will depend on the cable being used, and may have to be adjusted accordingly. The project drawings are determinant here. See also system planning documents.</p> </div> </div>
2	Plug-in cable lugs	1.5 mm <sup>2</sup>	
n.B.	Shrink-on sleeve for resistor connections		

## 7.6 Addressing of the flashing lights

For operation, the flashing lights require fixed addressing. The address corresponds to the position in the chain, beginning with 1 as the first light and ending with Positions 31 and 32 for the two threshold identification lights (TILs). The address determines the order of the flashes in the sequence involved. The two threshold identification lights (31 and 32) constitute a special case: these two lights are triggered simultaneously at the end of the sequence, and thus mark the threshold to the runway.

It may happen that due to constructional difficulties light positions cannot be fitted with a flashing light. Just as often, the 300 m segment before the threshold is not installed. In the address assignments, positions not installed must also be counted. The visual impression of a light running towards the runway is thus retained.

### 7.6.1 Addressing of elevated flashing lights

In the case of an elevated flashing light, the setting for the address is accessible behind a screw union in the rear wall of the housing.

The Position Number (Address) is set at the two rotary switches as a two-digit decimal number (01, 02, ... 32). Addresses above 32 may trigger the special functions described in the text below.

**Figure 12: Elevated flashing lights, rear, addressing**



**Table 3: Switches S1 and S2 under the address setting have the following functions**

S1:	<b>OFF :</b>	The light's electronics have been set up for an elevated light (standard)
	<b>ON :</b>	Reserved for the function in the inset light. Do not set!
S2:	<b>OFF :</b>	Synchronization dropout on the communication cable is briefly compensated for by an internal lagging synchronization. (Standard)
	<b>ON :</b>	Synchronization dropouts will not be compensated for. Has to be set in operation using an external trigger input.

**Table 4: Special addresses and their functions for test mode**

Address	Function
33	No function
34	Test mode with 3 % standard brightness
35	Test mode with 10 % standard brightness
36	Test mode with 100 % standard brightness
37	Test mode with 3 % high brightness
38	Test mode with 10 % high brightness
39	Test mode with 100 % high brightness
40 ... 99	No function

### 7.6.2 Addressing and parameterization of the inset light using the parameterizing adapter PSD800D-SFL

The inset light shall not be opened in the field, in order to prevent leaks and thereby protect the electronics. The addressing and parameter settings of the inset light are effected via the service interface integrated into the light connection.

The light to be parameterized is connected directly to the parameterizing unit with the adapter cable, see Connection A in [Figure 13](#). The light's electronics are supplied via the parameterizing unit for data transmission and parameter storage. Before its first use with this type of connection, each inset light has to be configured as a single flashing light, a master or a slave (factory setting). Single lights and master must additionally be provided with a valid address.

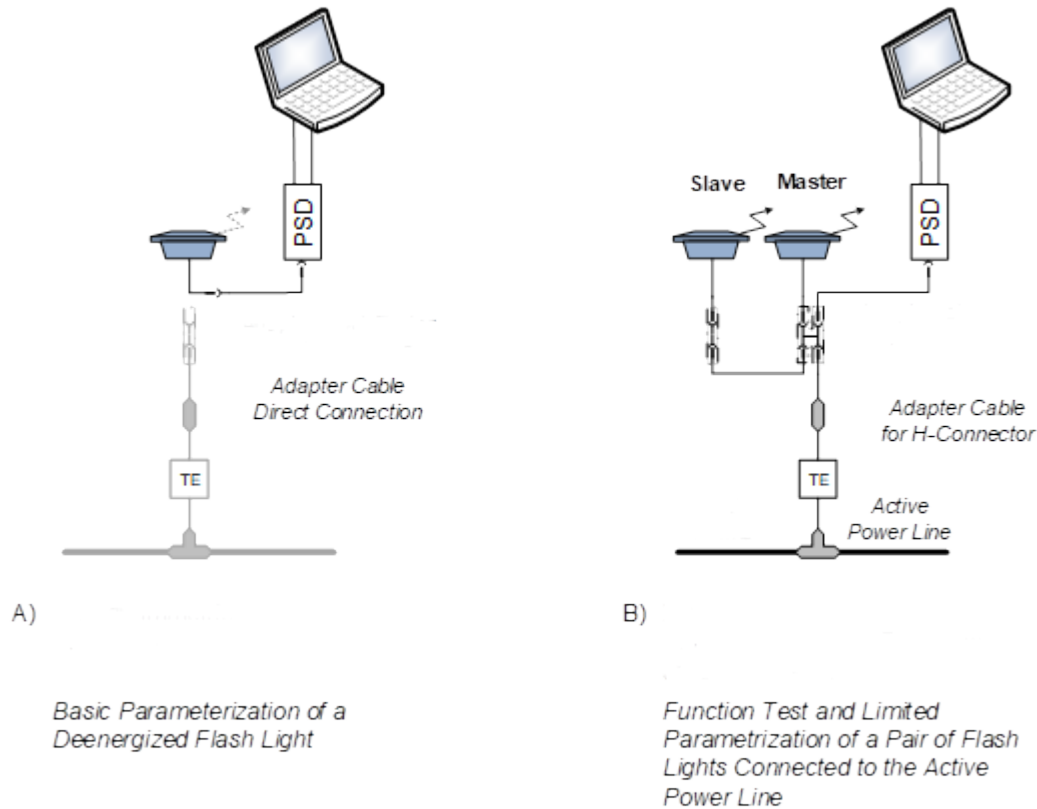


If the inset flashing light is installed as a double light, the parameterizing unit can also be used in the field for a function test with the light pair. For this purpose, the parameterizing unit must be connected to the light pair with the appropriate adapter cable via the free connection of the H-connector, see Connection B in Figure 13. With this type of connection, the lights are supplied via the flash chain. This type of connection enables a direct function test to be performed, and some of the lights' parameters to be adjusted. You can also view the communication status between the master and slave lights.

The parameterizing adapter is always supplied from the USB interface or by 12-24 V DC auxiliary voltage receptacle.

If different light connecting cables are used for a specific project, the adapter cables supplied must be used appropriately.

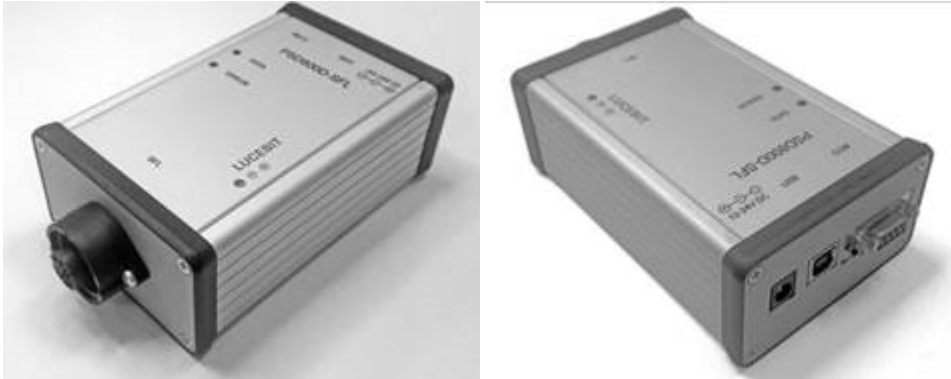
**Figure 13: Connecting the inset light to the parameterizing adapter**



**Figure 14: Parameterizing adapter for the settings of an inset flashing light**



**Figure 15: Connections of the parameterizing adapter for the inset light, the service computer and of the alternative auxiliary voltage supply via USB or DC input receptacle**



**Figure 16: Adapter cable for the single light and the double lights (via H-connector)**



After the service computer has been connected, the main menu for monitoring and parameterizing the flashing light will be displayed automatically in the lucDMC service software.

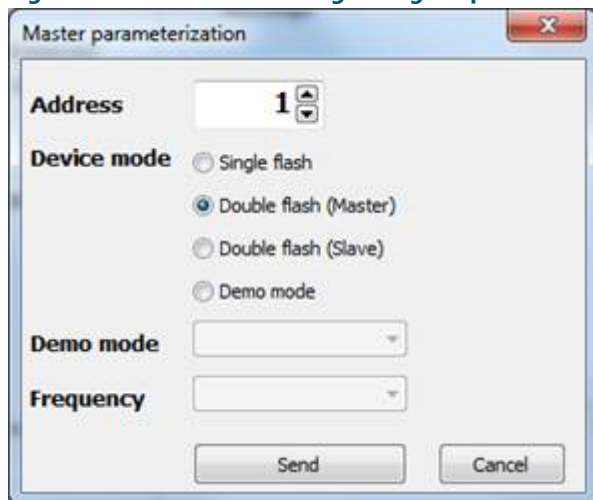
**Figure 17: Main menu of the light configuration display**



In the display, the ongoing operating parameters for the master light and the slave light are shown. The slave light is provided only in the case of a double-light inset light installation. When the light has been installed as a single light, the data will be displayed under **Master**.

For changes to the configuration, an entry window is opened using the Parameterization-switch.

**Figure 18: Window for setting the light's parameters**



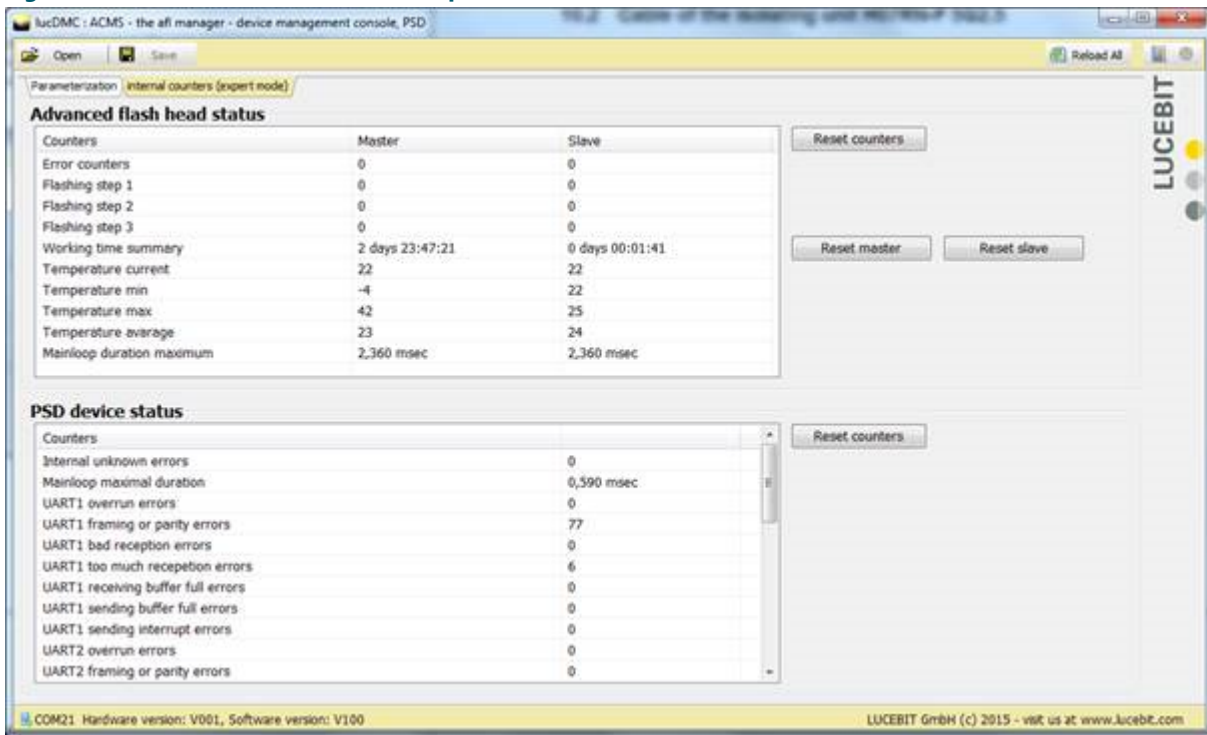
As with the elevated light, the address corresponds in the light's installation position in the chain.

You can set the operating mode you want in the **Device mode** setting.

Mode	Function
Single flashing light	The inset light is operated as a single light at the defined address.
Double flashing light (master)	The inset light is operated as master of a double light pair at the defined address.
Double flashing light (slave)	The inset light is connected to a "master light" as a "slave" in a double light pair. The slave light does not need an address of its own: it automatically accepts the address of the master light.
Demo mode	This setting enables the light to be operated with the parameters set as a "self-running" system even without a control unit.
Send	The settings are transferred to the light.
Abort	The configuration routine is aborted.

For extended monitoring of the light, the internal counters can be displayed in the **Internal counters (expert mode)** tab. These data in *Expert mode* do not necessarily correspond to physical variables. They enable the service personnel to perform an extended analysis of the system and device functions.

Figure 19: Menu – Internal counters (expert mode)



## 8.0 Color coding of the cables and contact assignments of the light connecting cables

As an aid to installation, the standard conductor colors are listed with their assignments to the conductor numbers listed for the cables recommended.

### 8.1 Main supply cable NYY-O

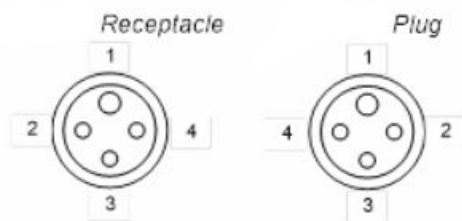
Ader / Wire	Farbe / Color
1	blau / blue
2	braun / brown
3	schwarz / black
4	grau / gray

### 8.2 Cable of the isolating unit H07RN-F 5G2.5

Ader / Wire	Farbe / Color
a / 1	blau / blue
b / 2	braun / brown
c / 3	schwarz / black
d / 4	grau / gray
PE <i>must not be used or connected</i>	gn-ye / gn – ye

### 8.3 4-pole light plug connector of the elevated light with electrical frangible coupling

Figure 20: Connection diagram for the system



Pin	Farbe / Color
1	weiss / white
2	rot / red
3	schwarz / black
4	braun / brown



## 9.0 Remote control

The SFL system has been designed to be operated with a remote control system and remote monitoring.

For simple link-up to any remote control system, a parallel interface is provided with 24 VDC inputs and outputs to the industrial standard. At the adapter terminal, the signal voltages and reference points are available for each input and output. The interface can accordingly be operated using potential-isolated contacts or equivalent digital interfaces without additional external voltage sources.

For integration of the flash lighting system into the ADB SAFEGATE remote control system, 2 redundant CAN-Bus interfaces are provided.

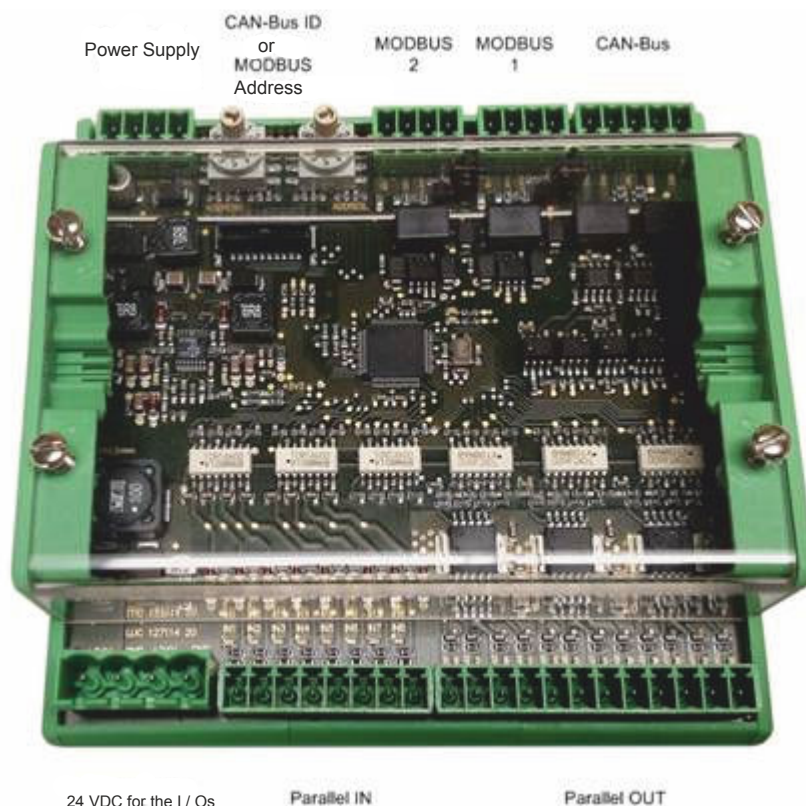
For serial integration of the SFL into a different remote control system, additional communication modules (GCI) are available as an optional extra, with the following redundant serial interfaces:

- RS-485 (EIA-485) MODBUS / RTU, RCOM, RCOMplus (default)
- ETHERNET MODBUS / TCP (optional)
- PROFIBUS DP (optional)
- CANBUS (optional)

The functions and terminal assignments of the communication modules optionally used are dealt with in a separate description.

The basic configuration of the flash lighting system, interface assignments and functions can be altered using the lucDMC service software package. The descriptions in this manual relate to the standard factory settings. If the configuration has been altered, the changes concerned have to be taken into due account. The ongoing configuration can be read out at any time with the aid of the service software package.

**Figure 21: Communication module for parallel, CAN-Bus and RS485-MODBUS interfaces**



## 9.1 Parallel interface

### 9.1.1 Inputs of the parallel control interface

In the control unit, the inputs and outputs of the communication module are connected to two-tier terminals for linking up the parallel interface. The upper level (a) provides the control voltage for the lower input level. This means the control system can be implemented using potential-isolated contacts or equivalent digital interfaces without an external control voltage source.

Signal definition: ON = + 24 VDC; OFF = no signal

Terminal Block X4

Terminal (Level b)	Designation	Signal	Art
1	Step 1	Brightness preselection Step 1 (3%)	IN +24 V DC
2	Step 2	Brightness preselection Step 2 (10%)	IN +24 V DC
3	Step 3	Brightness preselection Step 3 (100%)	IN +24 V DC
4	TIL	Threshold identification lights switched on	IN +24 V DC
5	CHAIN	Flash chain switched on before the threshold. The basic configuration of the system determines whether the 300 m segment before the threshold is activated as well.	IN +24 V DC
6	Input AUX 1	Configurable control input. For the function assignments of this input, please note the configuration of the system and the project documents. When the external trigger is being used, this input is used as standard for enabling the trigger function. Enable for the external trigger. If the signal is active, the flash chain will wait for the external trigger signal before starting a one-off sequence. If the signal is switched off, the flashing light will run steadily without external synchronization.	IN +24 V DC
7	Input AUX 2	Configurable control input. For the function assignments of this input, please consult the system configuration and the project documents.	IN +24 V DC
8	EXECUTE	Validity signal for accepting the control signals. Acceptance with rising edge with a pulse duration of not less than 10 ms.	IN +24 V DC

### 9.1.2 Logic of the control system

Signals at the parallel input are not accepted until the rising edge of the EXECUTE signal arrives.

Without an acceptance signal, the most recent control commands remain saved internally. This likewise applies in the case of invalid control signal combinations, which also assures uninterrupted operation of the flash lighting system if the remote control system fails.

For fault-free control, the following signals are required:

- Brightness step (1 out of 3; in the case of multiple assignments, the highest step is valid)
- Preselection signal for the threshold identification lights (TILs), if stipulated
- Preselection signal for the flash chain before the threshold, if stipulated
- Acceptance signal after setting the control commands to at least 10 ms

#### Standby mode

As special functions, the flash chain incorporates a *standby mode* for monitoring communication and supply.

The operating mode must be set in the system configuration, and is then set automatically instead of a system switch-off (no brightness step selected).



In standby mode, the system is in full operational readiness, and the power capacitors of the flashing lights are charged. Data communication runs as normal, and the lights provide periodic feedback of their operational readiness. No flash, however, is emitted via the LEDs.

Standby mode thus permits

- full function monitoring of the control system without impairing flight operations
- immediate functional readiness when switching over to active mode
  - no "ramp-up" of the control system
  - no loading time-delays for making current limitation
  - no charging time-delays for making current limitation
- In standby mode, the supply cable and the communication function remain activated in readiness mode even in the "switched-off" status of the flash chain.
- The flash lighting system cannot be safely de-energized via the service control system or via the remote control system!

### 9.1.3 Signal outputs of the parallel control interface

For connection to the parallel interface, two-tier terminals are provided in the control unit. The upper level (a) provides the ground reference for the status signals of the lower signal level.

Signal definition: ON = + 24 VDC; OFF = no signal;

Error messages (FAULT STATUS) are for safety reasons provided as closed-circuit-current signals (ON = no fault).

Maxi Maximum loading on the signal outputs

< 2 A per signal output

- < 2 A maximum total over all signal outputs

**Table 5: Terminal block X5**

Terminal	Designation	Signal	Art
1	Step 1	Brightness Step 1 (3%) is switched on.	Out +24 V DC
2	Step 2	Brightness Step 2 (10%) is switched on.	Out +24 V DC
3	Step 3	Brightness Step 3 (100%) is switched on.	Out +24 V DC
4	TIL	Threshold identification lights are switched on.	Out +24 V DC
5	CHAIN	Flash chain before the threshold is switched on.	Out +24 V DC
6	LOCAL	The flash lighting system has been disconnected from the remote control system by the service control system.	Out +24 V DC
7	TIL FAULT STATUS	ON: TIL is working faultlessly OFF: At least one of the threshold identification lights (TILs) has been detected as faulty and the threshold identification lights have been positively switched off.	Out +24 V DC
8	LF1 FAULT STATUS	ON: no lamp fault in the chain OFF: WARNING; a flashing light in the chain before the threshold has been detected as faulty.	Out +24 V DC
9	LF2 FAULT STATUS	ON: LF2 threshold not reached OFF: ALARM; the configured signaling threshold LF2 of the faulty flashing lights in the main chain has been reached.	Out +24 V DC

**Table 5: Terminal block X5 (Continued)**

Terminal	Designation	Signal	Art
10	Output AUX 3	Configurable signal output For the functional assignments of this output, please note the configuration of the system and the project documents. If the external trigger is being used, this output is as standard used for signaling "The external trigger has been enabled".	Out +24 V DC
11	Output AUX 4	Configurable signal output	Out +24 V DC
12	Operational readiness	Flash lighting system is ready for operation	Out +24 V DC

## 9.2 Optional CAN-Bus interface

The CAN-Bus is used only for connection to the ADB SAFEGATE remote control system. Consult the project drawings to see whether the interface has been activated and has been wired to the output terminal area of the control unit.

## 9.3 Optional serial RS485 interfaces

Two serial RS485 interfaces are available for connecting the remote control system. MODBUS / RTU, RCOM or RCOMplus are available as protocols.

As an option, the interfaces can be connected to an adapter terminal of the control unit.

A detailed description of the interfaces with data definitions is available on request.

### 1. Serial interface; RS-485 (EIA-485)

For terminal block designation, see project drawing

Terminal	Designation	Signal	Art
1	B+	RX/TX Data +	Data
2	A-	RX/TX Data –	Data
3	GND	+ 3.3 V	Data
4	GND	Ground	Data

### 2. Serial interface; RS-485 (EIA-485) MODBUS/RTU

For terminal block designation, see project drawing

Terminal	Designation	Signal	Art
1	B+	RX/TX Data +	Data
2	A-	RX/TX Data –	Data
3	GND	+ 3.3 V	Data
4	GND	Ground	Data

## 9.4 Optional MODBUS / TCP or PROFIBUS DP interface

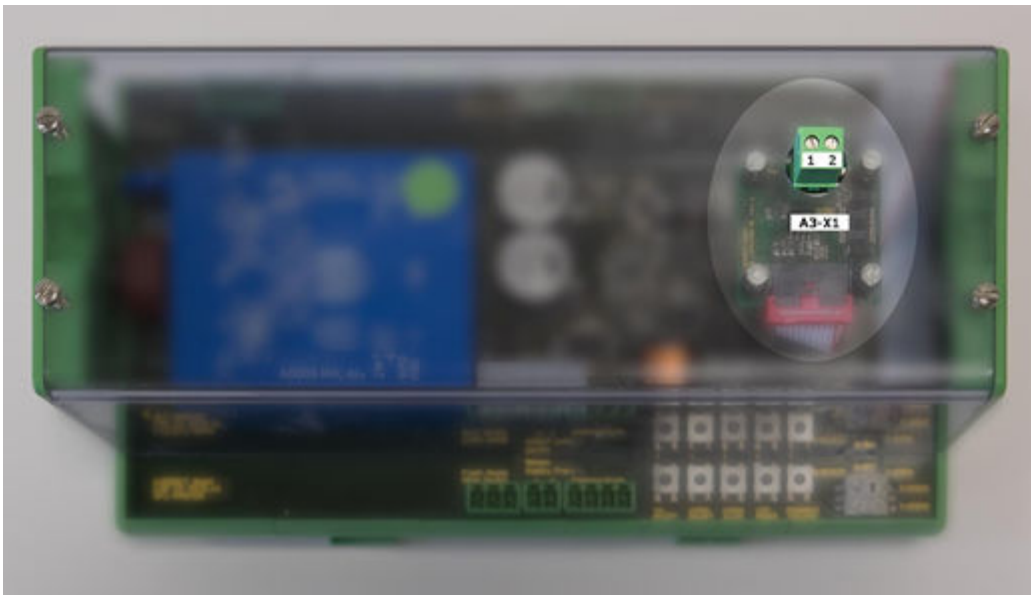
There is also an option for providing a MODBUS/TCP or a PROFIBUS DP interface for controlling and monitoring the flash lighting system. For this purpose, the control unit is fitted with an additional communication unit (GCI).

Detailed descriptions of the optional interface are provided in a separate document and in the project documentation.

## 9.5 External trigger

The external trigger permits a flash sequence to be initiated by an external trigger signal. The trigger input is accommodated on the control module as an additional module.

**Figure 22: External trigger input on the control module**



External trigger:

Terminal block designation A3-X1

Terminal	Designation	Signal	Type
1	GND	0 (+24 VDC)	IN 0 (+24 V DC)
2	External trigger signal	+24 VDC	IN +24 V DC (optically decoupled)

The trigger signal will be heeded only if the trigger signal has been enabled at Terminal X4.6 of the communication module or by serial control.

For the function of the trigger, the following conditions have to be met:

- The trigger pulse must lie inside the range between +12 and max. +60 VDC
- The length of the trigger pulse has to be at least 10 ms
- The trigger acts on the rising edge of the signal
- The minimum time interval between two trigger pulses must not be less than 450 ms
- The chain is triggered with the end of the entire network half-wave following the trigger pulse. The time-lag in the chain sequence thus lies between 10 and 20 ms.



## 10.0 Service software package lucDMC

### 10.1 General remarks

The lucDMC service software is available as an accessory provided for configuring and analyzing the SFL800D flash lighting system. The software is universally suitable for all ADB SAFEGATE devices, and is accordingly required only once. A software update may be needed for operating the flash lighting system. If necessary, please get in touch with ADB SAFEGATE Service.

If you do not yet possess a service system, we recommend purchasing a complete unit, with a laptop, an adapter cable and the appropriate software. This is essential in order to ensure that all hardware and software requirements for the system are met.

### 10.2 Safety instructions

Alterations in the system should be carried out only by appropriately trained specialist personnel or by ADB SAFEGATE Service. Please comply with the following safety instructions.

- Changes to the system's parameters may be implemented immediately without any further requests for confirmation!
- Some functions of the service software will temporarily impair the functions of the flash lighting system. Use only functions and system parameters with which you are familiar!
- If system parameters of the flash lighting system have been altered, the system should be checked by a function test before it is started up again!

### 10.3 Help functions and expanded descriptions

The service software is intended for appropriately trained service personnel. This description contains a general overview of the basic functions and options provided by the service software. Since we continually endeavor to improve the software, and adapt it to include new functions, a current software version may deviate from this description. Please consult the explanations and help functions integrated into the software package.



#### Note

For training courses on how to work with the service software and the RELIANCE Flash Lighting System, please get in touch with ADB SAFEGATE Service.

### 10.4 Connection

For connecting up the service capability, the service computer is connected to the control module's service plug connector. The service software detects the type of device involved automatically, and after successful connection will display the service masks for the SFL system.

### 10.5 Header menu

At the top of the page, a menu will appear with the principal menu options provided by the software package. Besides general functions, the further pages of the software can be accessed here. The contents of the header menu will depend on the page currently being displayed. The current page is not listed.

**Table 6: General functions available in the header menu**

<b>Load Save</b>	Configuration and parameters for the behavior of the flash lighting system.
<b>SFL operator control</b>	Status displays and operator control of the flash lighting system.
<b>SFL settings</b>	Configuration and parameters for the behavior of the flash lighting system.
<b>Update all parameters</b>	The data displayed are replaced by the ongoing system values.

**Table 6: General functions available in the header menu (Continued)**

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Display of the protocols saved and the log files of the lucDMC service software package.

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General settings of the lucDMC software package.

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## 10.6 Footer status line

The main status of the SFL system is displayed at the bottom edge of the screen.

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**SFL status**

General operating status of the system.  
GREEN: switched on and fault-free operation  
YELLOW: Pre-warning LF1  
RED: there is an LF2 fault message or TIL fault ongoing.

---

**Software: ---**

Displays the version statuses of the control module.

---

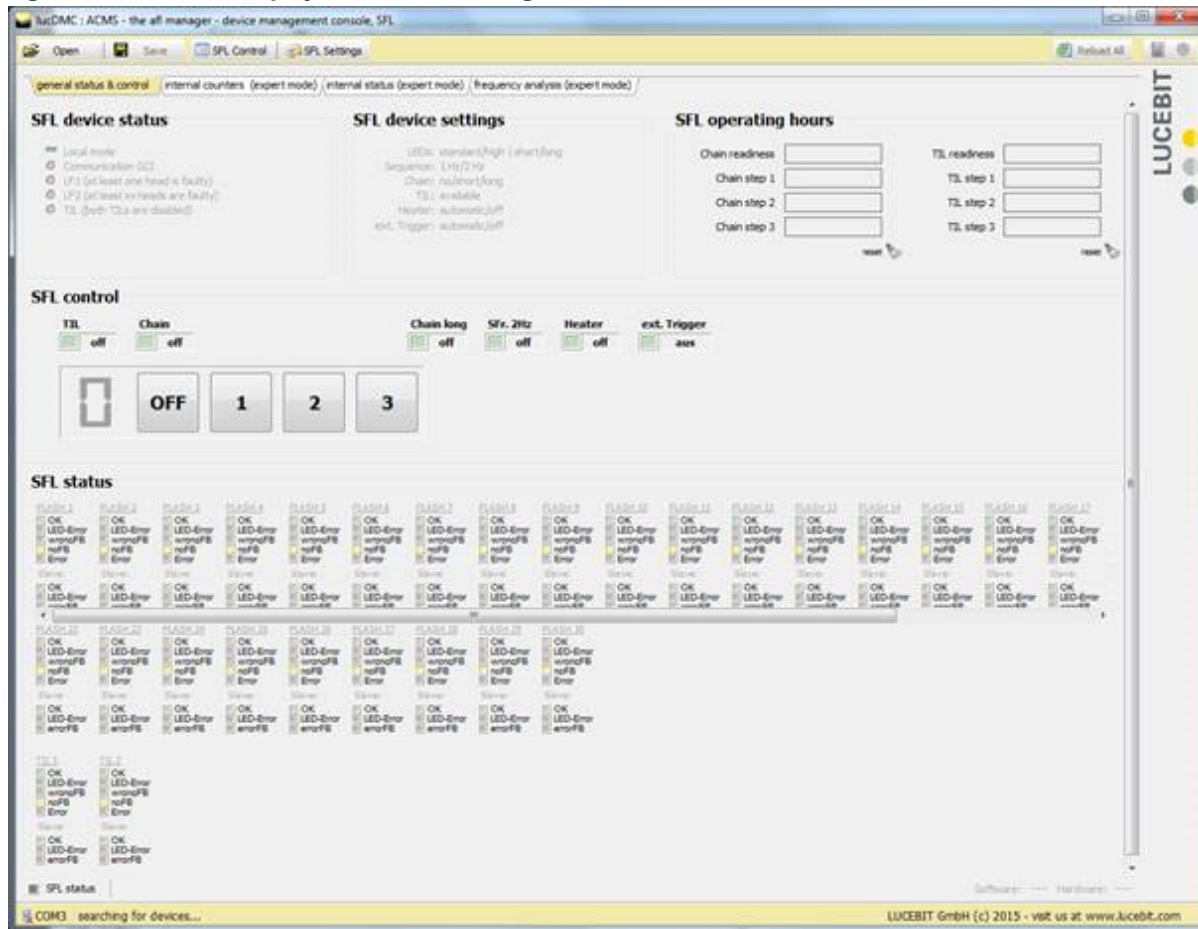
**Hardware:---**

## 10.7 SFL operator control

### 10.7.1 General status and control

In the top section of the window, you will find the status displays for the SFL system.

**Figure 23: The basic display for SFL monitoring and control via the lucDMC**



**Table 7: SFL device status**

○ <b>Local mode</b>	The system has been switched off using the service local control feature, or is now in local mode. The remote control has been de-activated.
○ <b>Communication GCI</b>	Status of the data link to the General Communication Interface (GCI)
○ <b>LF1</b>	Indicates that at least one flash head of the chain (excluding TILs) has failed
○ <b>LF2</b>	Indicates that the fault signaling threshold LF2 of the chain has been reached (excluding TILs)
○ <b>TIL</b>	A defective threshold identification light TIL, (Pos. 31 or 32) has been detected, and both threshold identification lights have been positively switched off.

**Table 8: SFL device settings**

<b>LED</b>	Display of the internal light pulse configuration. <b>standard</b> the chain contains lights with the standard brightness or the optional high-performance lights are being operated at the standard brightness in order to extend their useful lifetime. <b>high</b> optional high-performance lights are operated at maximum brightness <b>long pulse</b> standard light pulse length <b>short pulse</b> shortened light pulse length with increased LED energization
<b>Sequence frequency</b>	Displays the sequence frequency: <b>1 Hz</b> or <b>2 Hz</b>
<b>Chain length</b>	Displays the configured or activated length of the flash chain. <b>none</b> no main chain <b>short</b> Flashing lights 1 to 21 <b>long</b> Flashing lights 1 to 30

**Table 9: SFL operating hours**

Here, the operating hours of the chain and the TILs are displayed, broken down by the different operating steps. They can also be reset here.

**Table 10: SFL control**

**In this section, the flash lighting system can be switched directly by the service program. For this purpose, the rotary switch of the control module must be in the OFF position (0). After the service program has been terminated, or after the service computer has been disconnected from the control module, the flash lighting system will be switched off.**

<input type="checkbox"/> <b>TIL</b>	Preselection of the threshold identification lights.
<input type="checkbox"/> <b>Chain</b>	Preselection of the main chain.
<input type="checkbox"/> <b>Chain long</b>	Chain configuration preselection (long / short). <b>ON</b> entire chain has been preselected (long) <b>OFF</b> reduced chain has been preselected (short) This function is available only if the change has been enabled for the remote control system. (see also SFL settings).
<input type="checkbox"/> <b>Dfr 2 Hz</b>	Preselection of the chain's sequence frequency. <b>ON</b> 2 Hz <b>OFF</b> 1 Hz <i>This function is available only if the change has been enabled for the remote control system. (see also SFL settings)</i>
<input type="checkbox"/> <b>ext. trigger</b>	Activation of the trigger for external initiation of a sequence.
<b>Numerical display</b>	Display of the ongoing flashing light brightness 0, 1, 2 or 3 as indicated by the system feedback.
<b>Taster „OFF“</b>	Switches the flash lighting system to Brightness 0.
<b>1, 2, 3</b>	Switches the preselected segments of the flash lighting system to Brightness 1 (3%), 2 (10%) or 3 (100%).

**Table 11: SFL status**

**In this section, you will see the detailed information for each individual flashing light. Flash 1 to Flash 30 stands here for the chain's flashing lights at Positions 1 to 30. TIL1 and TIL2 refer to the threshold identification lights at Positions 31 and 32.**

<b>OK</b>	The flashing light is in readiness mode.
<b>LED error</b>	A failure of one or more LED segments has been detected in the light. The light continues to be operated using the remaining LEDs with reduced brightness.



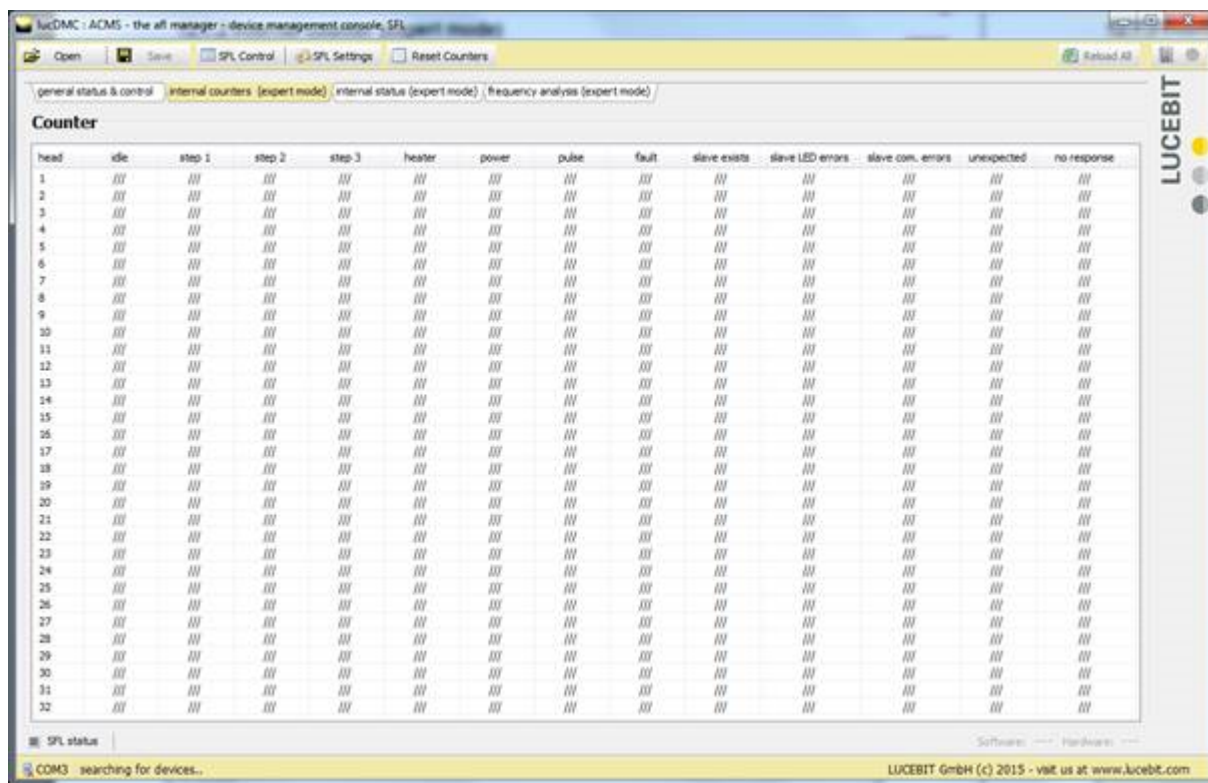
**Table 11: SFL status (Continued)**

<b>f.RM</b>	<p>Faulty feedback not compliant with the control instruction: Possible causes of the error:</p> <ul style="list-style-type: none"> <li>• disturbed data transmission to the light,</li> <li>• a general error in the light's electronics.</li> </ul> <p>No statement can be made on the ongoing status of the light.</p>
<b>k.RM</b>	No (or no evaluable) signals are being received from the light.
<b>Error</b>	The flashing light is malfunctioning. One of the above-listed errors is ongoing.

### 10.7.2 Internal counter (expert mode)

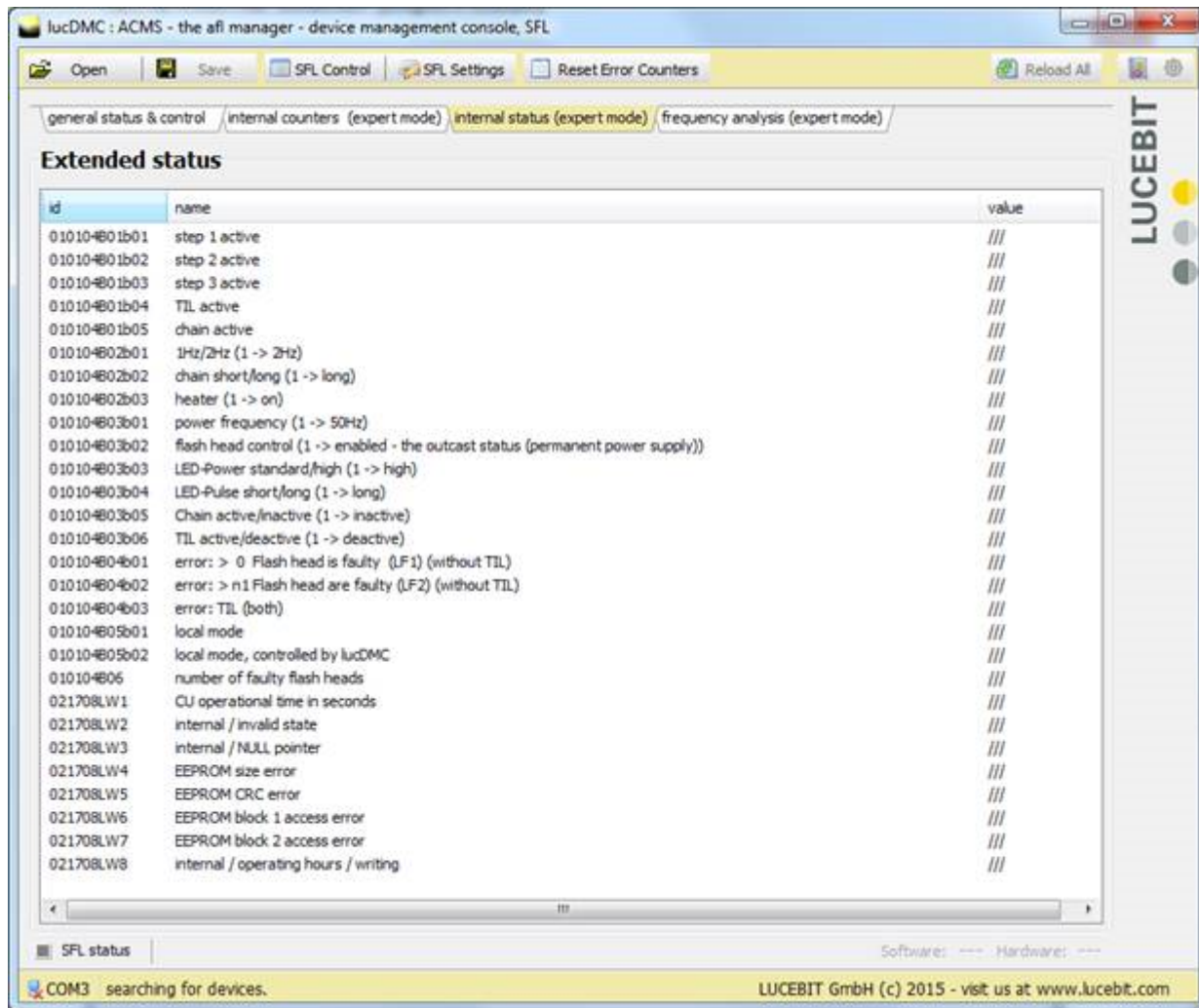
On this page, the number of detailed signals from the lights is displayed. These data are used by ADB SAFEGATE Service to analyze the system.

The counters can be set to zero by clicking the **Reset Counters** check-box.



### 10.7.3 Internal status (expert mode)

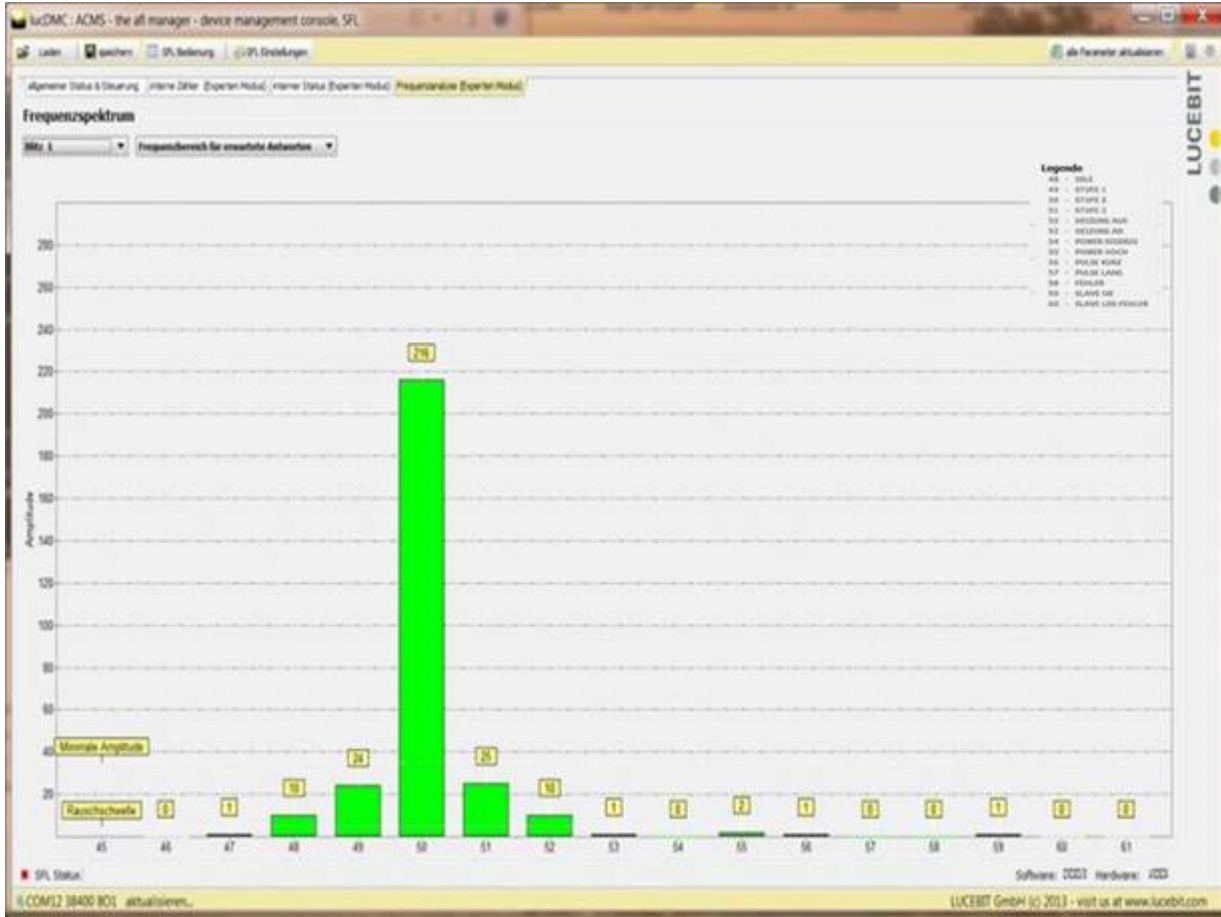
On this page, all control and monitoring messages and internal measured values are displayed. These data are used by ADB SAFEGATE Service for analyzing the system. Any values stated do not necessarily correspond to physical variables, but are internal scaled data intended for analyzing the system's behavior.



### 10.7.4 Frequency analysis (expert mode)

On this page, the activities and levels in the frequency bands of field communication can be monitored. The legend describes the meanings assigned to the frequency bands. For purposes of analysis, a flashing light and the frequency range to be examined must be selected.

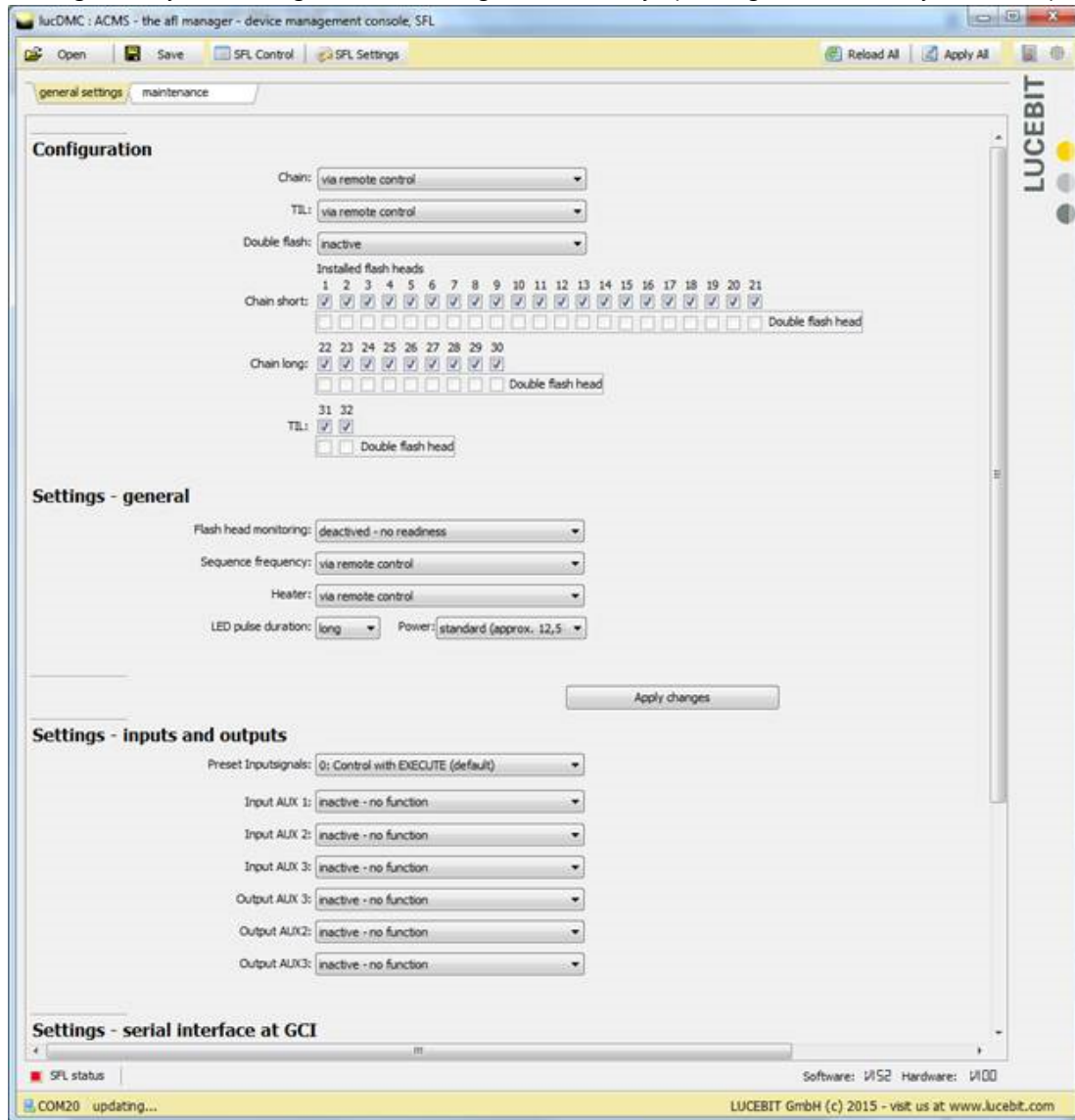
These data are used by ADB SAFEGATE Service for analyzing the system. Any values stated do not necessarily correspond to physical variables, but are internal scaled data intended for analyzing the system's behavior.



## 10.8 SFL settings

### 10.8.1 General settings

In the general system settings, the basic configuration and any operating modes of the systems are specified.



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## Configuration

---

Chain:	<p><b>Via remote control:</b> The configuration can be set and altered via the remote control.</p> <p><b>Long, remote control ignored:</b> The full chain has been installed, and is being operated as a fixed configuration. It is not possible to alter the configuration via the remote control.</p> <p><b>Short, remote control ignored:</b> The reduced chain Lights 1 to 21 has been installed, and is being operated as a fixed configuration. It is not possible to alter the configuration via the remote control.</p> <p><b>Not available, remote control ignored:</b> No chain (Lights 1 to 30) installed. The remote control of the chain is blocked.</p>
TIL:	<p><b>Via remote control:</b> The threshold identification lights (TILs) can be switched using the remote control.</p> <p><b>Not available, remote control ignored:</b> No threshold identification lights (TILs) installed. The remote control of the TILs is blocked.</p>
Double flashing light:	<p><b>Deactivated:</b> No inset flashing lights as a double light pair have been installed in the system.</p> <p><b>Activated:</b> Inset flashing lights as a double-light pair have been installed in the system. The positions of the double lights must be stated in the following flashing light matrix.</p>
Flash heads installed:	<p><b>Short chain:</b> In this matrix, it is necessary to mark Light Positions 1 to 21, which are fitted with a flashing light. If the "Double-flash" function has been activated above, the slave lights of an inset double flashing light can also be assigned to a position.</p> <p><b>Long chain:</b> In this matrix, Light Positions 22 to 30, which are fitted with a flashing light, must be marked correspondingly.</p> <p><b>TIL:</b> Here, the threshold identification lights (TILs) installed must be marked.</p>

---

## Settings - General

---

Flash head monitoring:	<p><b>Activated – continuous readiness</b></p> <p><b>Deactivated – no readiness</b></p> <p>Here you specify whether the system changes automatically to readiness mode when the light is switched off.</p>
Sequence frequency	<p>It is here that the sequence frequency of the flash chain is set.</p> <p><b>Via remote control:</b> The sequence frequency can be set and altered using the remote control.</p> <p><b>2 Hz, remote control ignored:</b> The sequence frequency is set to a fixed 2 sequences per second. It is not possible to alter the configuration via the remote control system.</p> <p><b>1 Hz, remote control ignored:</b> The sequence frequency is set to a fixed 1 sequence per second. It is not possible to change the configuration via the remote control system.</p>
Elevated LED pulse duration	<p>The ON duration of the elevated flashing lights can be set between short and long. This does not alter the brightness. Remember that the thermal pulse loading of the LEDs will rise with a short flash duration.</p> <p><b>Long</b> - standard setting</p> <p><b>Short</b> - shorter light flash with increased LED energization</p>
Power	<p>If the optional LED flashing lights with a higher light output have been installed, you can choose here between the nominal brightnesses. If brightness values are stated here, these will be merely examples for high and low brightnesses. The actual brightness values can be found in the technical data for the flashing lights installed.</p> <p><b>Standard:</b> The nominal brightness is reduced to the standard value. This ensures a significantly longer useful lifetime of the LEDs and the power section of the light. Thanks to the lower thermal loading, this operating mode is also recommended for use in zones with high ambient temperatures.</p> <p><b>High:</b> The maximum possible nominal brightness of the high-performance flashing lights is configured</p>

### Settings – inputs and outputs

---

This is where the appropriate functions to the variable control inputs and signal outputs of the parallel interface are assigned.

---

Input AUX 1: Input AUX 2:	Here, one of the following functions is assigned to the corresponding control input. <b>Deactivated – no function:</b> Input without function. <b>Activated - 1Hz/2Hz (1 -&gt; 2Hz):</b> The control input switches over the sequence frequency. A signal applied activates 2 Hz. <b>Activated - chain short/long (1 -&gt; long):</b> The control input switches over the chain's configuration. A signal applied activates the entire chain (1 - 30).
Input AUX 3:	Not freely available. May be required internally for the local control function. The setting should not be altered.
Output AUX 1: Output AUX 2:	Here, one of the following functions is assigned to the corresponding signal output. <b>Deactivated – no function:</b> Output without function. <b>Activated - 1Hz/2 Hz (1 -&gt; 2Hz):</b> Signals the ongoing sequence frequency. 0 (no signal): 1 Hz, 1 (active signal): 2 Hz <b>Activated - chain short/long (1 -&gt; long):</b> Signals the ongoing configuration of the chain. 0 (no signal): reduced chain (1 - 21), 1 (active signal): full chain (1 - 30) <b>Activated - 1Hz/2 Hz (1 -&gt; 2Hz):</b> Signals the ongoing sequence frequency. 0 (no signal): 1 Hz, 1 (active signal): 2 Hz
Output AUX 3:	Not freely available. May be required internally for the function of the local control system. The setting should not be altered.

---

### Settings – serial interface on the communication module (GCI)

The additional maintenance interface on the communication module is set up here. The interface is intended only for use by the ADB SAFEGATE service personnel. The settings should not be altered.

#### Setting – failure signal

It is here that the second signaling threshold (LF2) is specified for the chain's light failure threshold without TILs.

The entry value has to lie between 2 and 30 failed lights.

#### Accept changes

This is used to transfer the entries of all data from all sides to the control module. This switch has equal rights to the switch in the header menu.

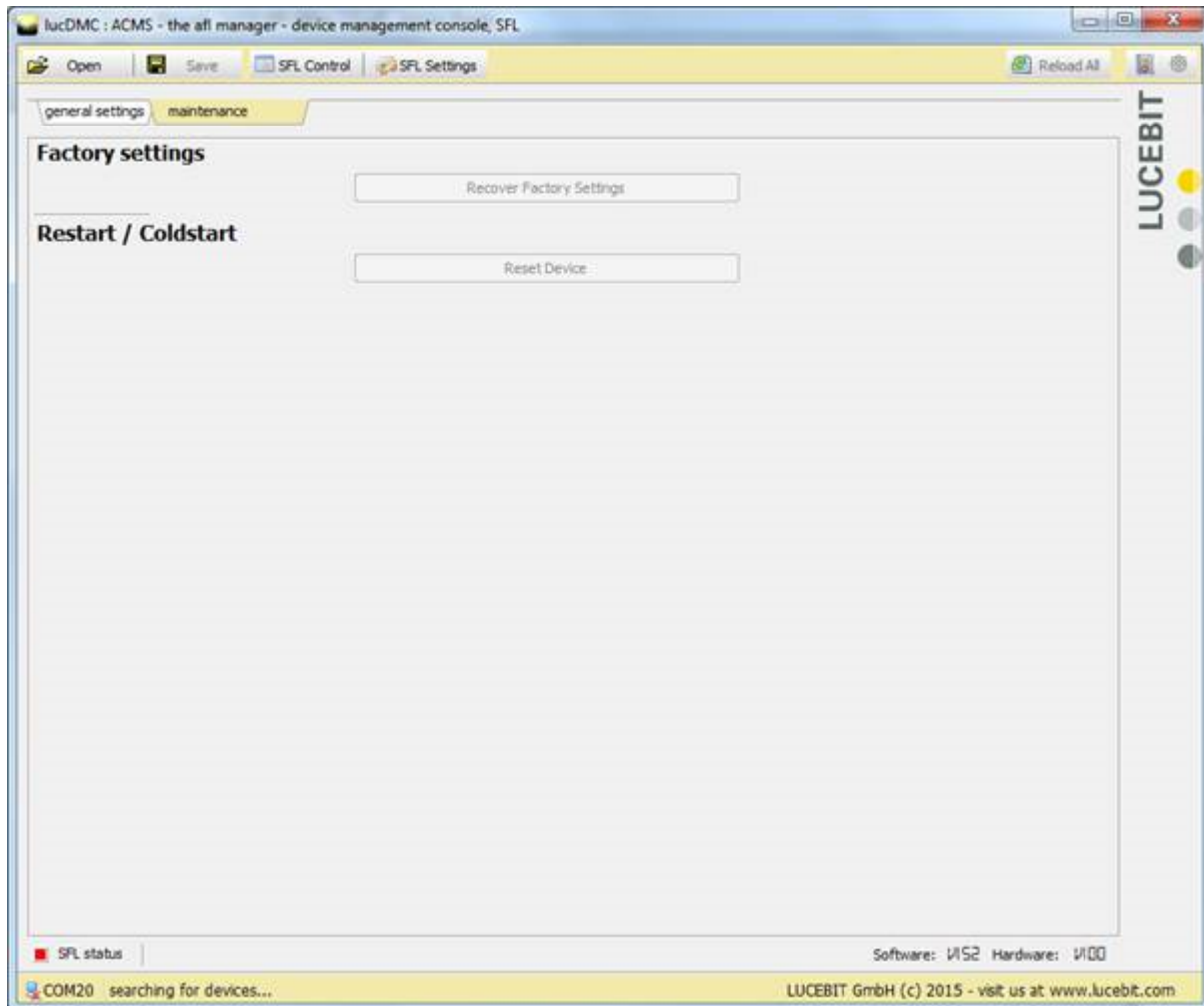
## 10.8.2 Maintenance

### Factory settings

To reset all configuration data of the control module to the default values set in the factory, click the **Recover Factory Settings** button.

### Restart / Coldstart

To trigger a master reset of the control module, click the **Reset Device** button.







## 11.0 Maintenance

### 11.1 Regular or unscheduled maintenance work

The components of the flash lighting system are designed for maintenance-free operation.

In order to assure the availability of the SFL, the system must be regularly checked for the following points, and any faults remedied appropriately:

- Overvoltage protection modules in the lighting station
  - Check the protective equipment and replace any defective modules
- Flashing lights
  - Check for secure fit on the mounting and correct alignment of the light
  - Mechanical damage to the housing
  - Soiling of the optical system
  - Moisture in the light (if necessary, replace the moisture bonding agent)
  - Damage to the feeder cable
    - Abraded areas in the vicinity of the mounting, due to loose attachment
    - Animal bites at the cable
- Connection between isolating unit and flashing lights
  - Damage to the cables, e.g. intermediate plug-connectors and connecting joints
  - Abraded areas, particularly in the vicinity of the cable bends
  - Animal bites
- Isolating unit and connection point to the main supply cable
  - Damage to the housings
  - Damage and leaks (visual inspection)
  - Damage to the cables, connecting joints or housings
- Isolating unit and connection point to the main supply cable
  - Animal bites
- The supply to the flashing light through the isolating unit is designed as a safety extra-low voltage (SELV). In order to retain the protective effect, no active part of the feeder may be grounded. Any damage to the insulation must be repaired, and the insulating effect restored. If there are any doubts concerning the quality of the insulation, an appropriate test measuring routine must be carried out with the system switched off.
- The isolating unit establishes dependable isolation between the mains supply and the power supply to the lights. If there is any damage to the isolating unit or the connecting cables, the unit must be replaced immediately.
- The flashing lights are connected to the supply cable via the PDU800-SFL isolating units. These isolating units contain overvoltage protection elements with a low response threshold. This means the cables must never be tested with voltages above 400V when the isolating units are connected!

### 11.2 Repairing the SFL

For repairs to the SFL, only original spare parts and components may be used.

If a light has been replaced or detached from its mounting, the same alignment of the light must be restored.

The new light must be coded with the address of the light replaced.



## 12.0 Troubleshooting

### 12.1 Trouble-shooting help

For trouble-shooting, always consult the project drawings, where the actual architecture and configuration of the system are described.

In the event of malfunctions in the system, the following points should always be addressed and checked:

- Please note that a positive switch-off of the threshold identification lights is unlocked only via the service local control system in position 0 of the rotary switch.
- Is the rotary switch of the service local control system in the right position, and has the system configuration been correctly set?
- Use the service software to check the detailed messages from the system and the individual flashing lights.
- If the system has been reconfigured using lucDMC, please check whether the new configuration is free from faults and complete, and corresponds to the system's architecture.
- If the malfunction occurs only in remote control mode, check whether the control system is setting a valid signal configuration for the brightness command, and whether in the case of parallel control the transfer signal is being given correctly.
- The overvoltage modules installed in the station must be taken into due account, and tested when checking the supply cable.
- In the event of malfunctions in the data link, then independently of the trouble-shooting help, the overvoltage protection module should be removed and function-checked.
- For trouble-shooting in the outdoor cabling, it may be helpful to regularly measure and record the cable resistances during maintenance work.
- Please note that high-voltage tests must never be carried out on the supply cable with PDU800-SFL isolating units and overvoltage protection unit OLP800D-SFL connected. A high-voltage measuring procedure will trigger the overvoltage protection elements, and may destroy the arresters and any filters installed.

For fast detection and elimination of malfunctions, you can proceed in accordance with the trouble-shooting tree, see [Figure 24](#) and [Figure 25](#). The optional lucDMC service software enables you, in addition, to view and analyze the detailed information.

**Figure 24: Trouble-shooting tree - Power supply and control system**

Flash light system  
 faulty

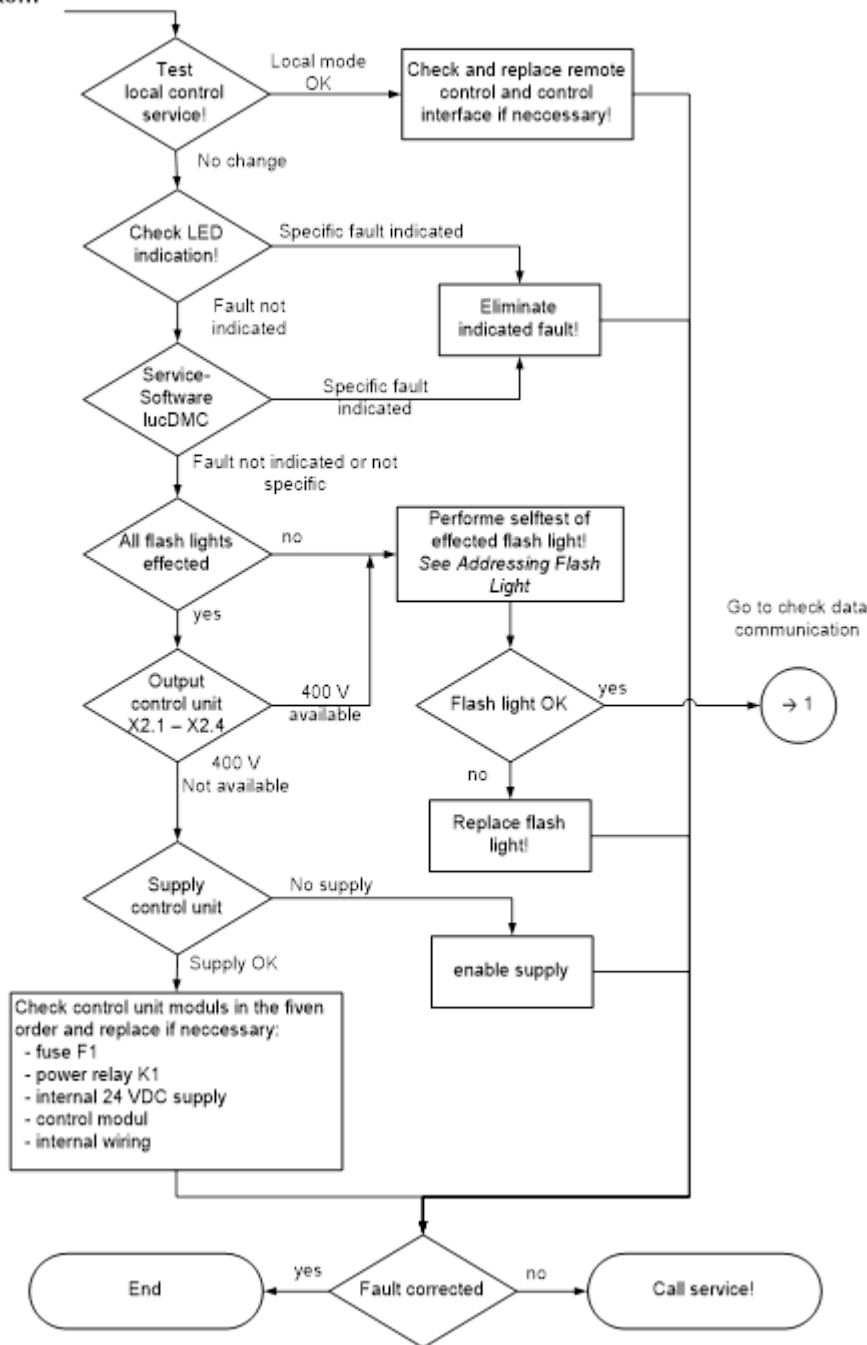
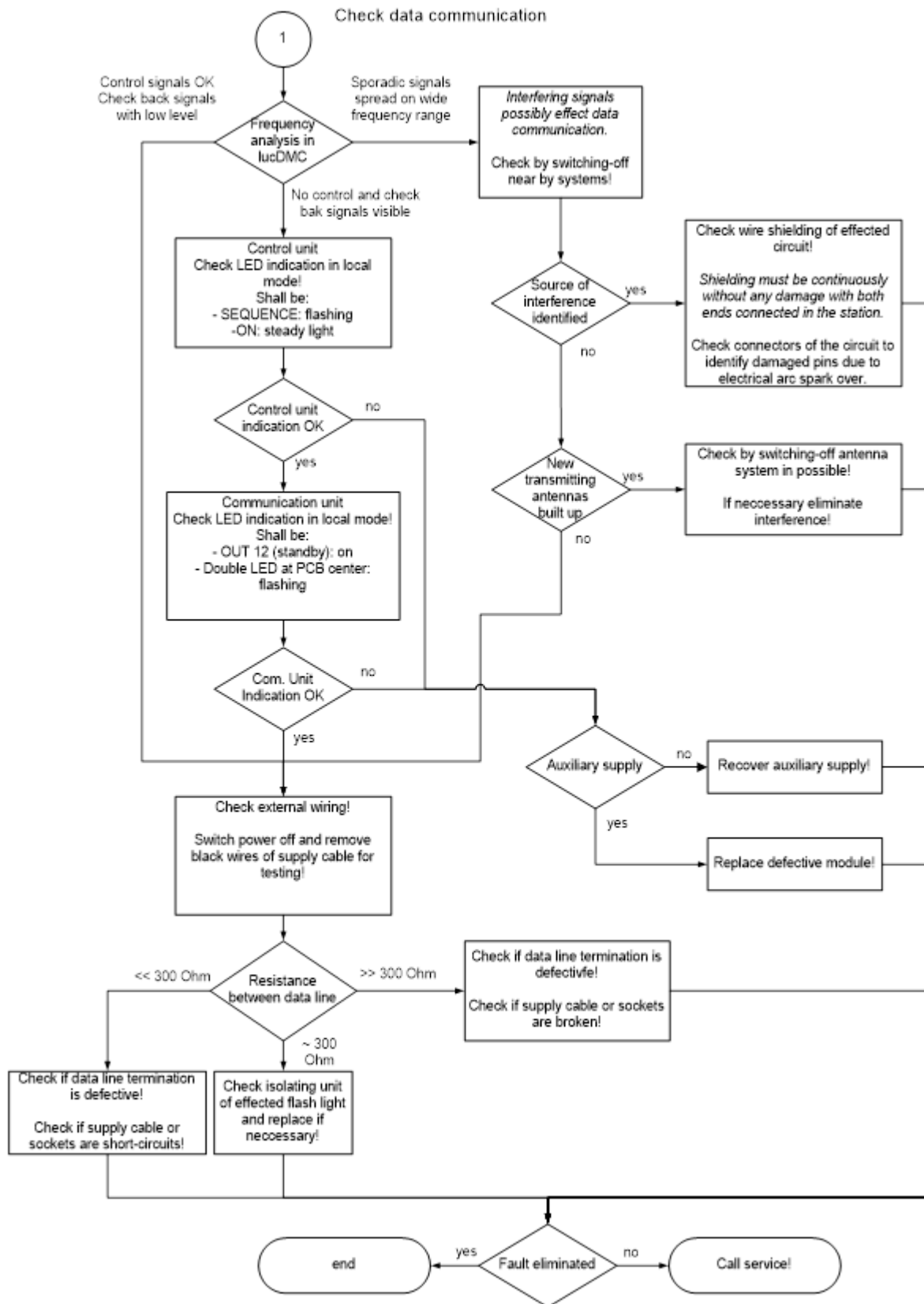


Figure 25: Trouble-shooting tree 2 - Data transmission





# 13.0 System planning

## 13.1 Supply cable

Thanks to its flexible parameterization options, the SFL system is suitable for any system configuration.

The number and types of the lights concerned must be planned and positioned in compliance with the relevant national and international regulations.

Information on the lights, the optical and mechanical data, and interfaces, can be found in the documentation for the lights. The lights must be suitable for use in the SFL system. Lights other than LED flashing lights are not available for the system.

The cabling must be executed in accordance with the procedures and preferred cable types described in this manual. You will find detailed information on this in [Installation](#).

If lengths other than those listed here are required for the supply cable, the cross-sectional areas must be modified accordingly. The necessity for a maximum cable resistance of 12 Ohm must be complied with here for the single cable length. This resistance is determined from the output terminal of the control unit to the cable joint at Light Position 1.

The supply cable does not necessarily have to be used with the same conductor cross-sectional area throughout. To optimize the costs involved, the supply route can be divided up into different sub-segments. The cable's resistance is then entailed by the series connection of the segments. If there are different conductor cross-sectional areas involved, then the largest cross-sectional area planned must be that exiting from the station and leading to the next-smaller one.

The resistance of the different segments can be calculated with the following formula:

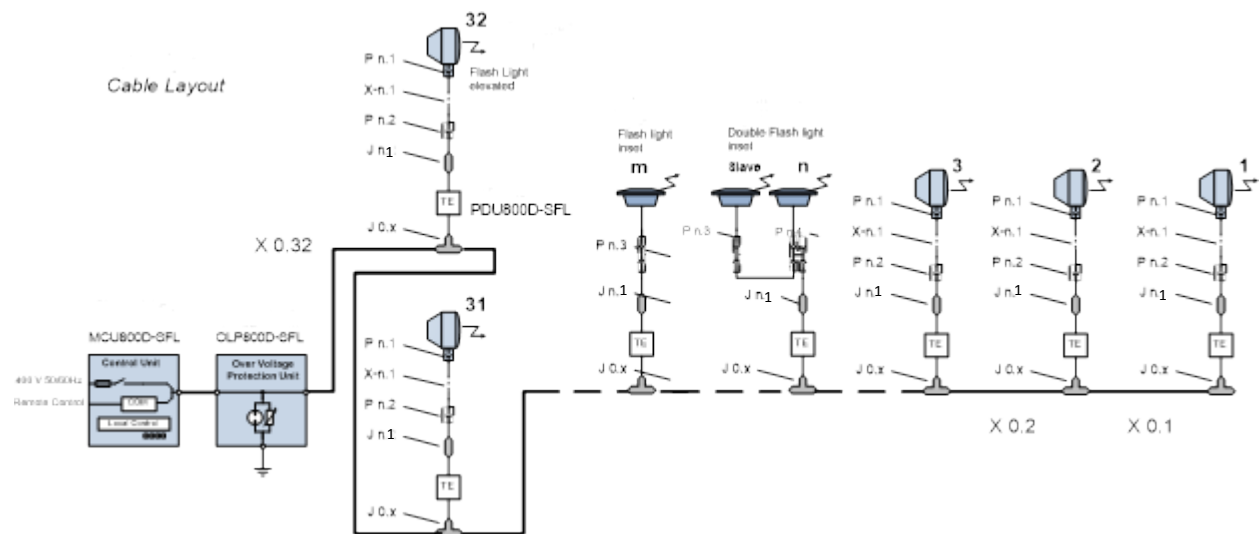
$$R_{Leitung} = \sum_{Segment=1}^n \frac{L_{Segment}}{56 \left[ \frac{m}{\Omega * mm^2} \right] * A_{Segment}} \leq 12 \Omega$$

L: Length of segment in m (cable length)

A: Conductor cross - sectional area of the segment in mm<sup>2</sup>

In actual practice, the use of not more than 2 different cable cross-sectional areas for the supply cable has proved sufficient. The smaller cross-sectional area (e.g. 2.5 mm<sup>2</sup>) for connections between flashing lights 1 to 32 and a larger cross-sectional area (e.g. 4 - 6 mm<sup>2</sup>) for the feeder from the station

**Figure 26: Cable segments of the supply cable**



For simple determination of the conductor resistance, the values for copper cables with standard cross-sectional areas are listed in the Table 12.

**Table 12: Copper cable values for copper conductors at 20°C**

Cable length	Cable cross-sectional area				
	2.5 mm <sup>2</sup>	4.0 mm <sup>2</sup>	6.0 mm <sup>2</sup>	10.0 mm <sup>2</sup>	16.0 mm <sup>2</sup>
100 m	0.7 Ω	0.4 Ω	0.3 Ω	0.2 Ω	0.1 Ω
200 m	1.4 Ω	0.9 Ω	0.6 Ω	0.4 Ω	0.2 Ω
300 m	2.1 Ω	1.3 Ω	0.9 Ω	0.5 Ω	0.3 Ω
400 m	2.9 Ω	1.8 Ω	1.2 Ω	0.7 Ω	0.4 Ω
500 m	3.6 Ω	2.2 Ω	1.5 Ω	0.9 Ω	0.6 Ω
600 m	4.3 Ω	2.7 Ω	1.8 Ω	1.1 Ω	0.7 Ω
700 m	5.0 Ω	3.1 Ω	2.1 Ω	1.3 Ω	0.8 Ω
800 m	5.7 Ω	3.6 Ω	2.4 Ω	1.4 Ω	0.9 Ω
900 m	6.4 Ω	4.0 Ω	2.7 Ω	1.6 Ω	1.0 Ω
1000 m	7.1 Ω	4.5 Ω	3.0 Ω	1.8 Ω	1.1 Ω
1100 m	7.9 Ω	4.9 Ω	3.3 Ω	2.0 Ω	1.2 Ω
1200 m	8.6 Ω	5.4 Ω	3.6 Ω	2.1 Ω	1.3 Ω
1300 m	9.3 Ω	5.8 Ω	3.9 Ω	2.3 Ω	1.5 Ω
1400 m	10.0 Ω	6.3 Ω	4.2 Ω	2.5 Ω	1.6 Ω
1500 m	10.7 Ω	6.7 Ω	4.5 Ω	2.7 Ω	1.7 Ω
1600 m	11.4 Ω	7.1 Ω	4.8 Ω	2.9 Ω	1.8 Ω
1700 m	<b>not applicable</b>	7.6 Ω	5.1 Ω	3.0 Ω	1.9 Ω
1800 m	<b>not applicable</b>	8.0 Ω	5.4 Ω	3.2 Ω	2.0 Ω
1900 m	<b>not applicable</b>	8.5 Ω	5.7 Ω	3.4 Ω	2.1 Ω
2000 m	<b>not applicable</b>	8.9 Ω	6.0 Ω	3.6 Ω	2.2 Ω
2100 m	<b>not applicable</b>	9.4 Ω	6.3 Ω	3.8 Ω	2.3 Ω
2200 m	<b>not applicable</b>	9.8 Ω	6.5 Ω	3.9 Ω	2.5 Ω
2300 m	<b>not applicable</b>	10.3 Ω	6.8 Ω	4.1 Ω	2.6 Ω
2400 m	<b>not applicable</b>	10.7 Ω	7.1 Ω	4.3 Ω	2.7 Ω
2500 m	<b>not applicable</b>	11.2 Ω	7.4 Ω	4.5 Ω	2.8 Ω
2600 m	<b>not applicable</b>	11.6 Ω	7.7 Ω	4.6 Ω	2.9 Ω
2700 m	<b>not applicable</b>	<b>not applicable</b>	8.0 Ω	4.8 Ω	3.0 Ω
2800 m	<b>not applicable</b>	<b>not applicable</b>	8.3 Ω	5.0 Ω	3.1 Ω
2900 m	<b>not applicable</b>	<b>not applicable</b>	8.6 Ω	5.2 Ω	3.2 Ω
3000 m	<b>not applicable</b>	<b>not applicable</b>	8.9 Ω	5.4 Ω	3.3 Ω
3100 m	<b>not applicable</b>	<b>not applicable</b>	9.2 Ω	5.5 Ω	3.5 Ω
3200 m	<b>not applicable</b>	<b>not applicable</b>	9.5 Ω	5.7 Ω	3.6 Ω
3300 m	<b>not applicable</b>	<b>not applicable</b>	9.8 Ω	5.9 Ω	3.7 Ω
3400 m	<b>not applicable</b>	<b>not applicable</b>	10.1 Ω	6.1 Ω	3.8 Ω
3500 m	<b>not applicable</b>	<b>not applicable</b>	10.4 Ω	6.3 Ω	3.9 Ω
3600 m	<b>not applicable</b>	<b>not applicable</b>	10.7 Ω	6.4 Ω	4.0 Ω



**Table 12: Copper cable values for copper conductors at 20°C (Continued)**

Cable length	Cable cross-sectional area				
	2.5 mm <sup>2</sup>	4.0 mm <sup>2</sup>	6.0 mm <sup>2</sup>	10.0 mm <sup>2</sup>	16.0 mm <sup>2</sup>
3700 m	not applicable	not applicable	11.0 Ω	6.6 Ω	4.1 Ω
3800 m	not applicable	not applicable	11.3 Ω	6.8 Ω	4.2 Ω
3900 m	not applicable	not applicable	11.6 Ω	7.0 Ω	4.4 Ω
4000 m	not applicable	not applicable	11.9 Ω	7.1 Ω	4.5 Ω

**i NOTICE**

The table cells which are marked with "not applicable" indicate that the cable cannot be used with resistance values above 12 Ohms. For the related cable lengths, a higher wire size is required for cable cross-sectional areas with 2.5 or 4.0 square millimeters.

The standard cable type is NYY-O 4x X RE.

If different types of cable are being used, care must be taken to ensure for data transmission a surge impedance similar to NYY-O 4x X RE. Different types of cable shall not be mixed.

If existing cables are to be used in a modification job, the cables' characteristics may have to be metrologically determined. Adapter elements may be needed for the existing cables. If you require any assistance with the planning work, we are always at your disposal.

### 13.2 Overvoltage protection for the supply cable

In order to achieve adequate protection of the control unit against overvoltages on the supply cable, the OLP 800D-SFL overvoltage protection unit has to be installed.

In order not to route the discharge currents unnecessarily through the building and into the control unit, the overvoltage protection modules should be installed as close as possible to the building's cable inlet. The arresters (ground connections) should have a cross-sectional area of minimum 10 mm<sup>2</sup> and, if at all possible, be routed directly to the building's ground potential. Since in the event of a trip the arrester carries high pulse currents, care must be taken to ensure a sufficient distance from other cables and the protected inner side of the supply cable. The place of installation is specific to the system involved, and is specified in the project drawings.

**i Note**

The arrester should be routed directly to the building's equipotential bonding rail or to the building's earth electrode. Never route the arrester to the protective earth distribution inside the low-voltage distribution panel. This might cause the high leakage currents to be coupled into the building's power supply.

### 13.3 Light connecting cable

The output cable marked in yellow of the PDU800-SFL isolating unit must be extended as far as the light via a straight joint with a light connecting cable.

The maximum length of the connecting cable must not exceed 25 m with a cable cross-sectional area of 2.5 mm<sup>2</sup>.

The lights' connecting cables are available in different variants. The permanently installed light connecting cables and the associated connecting cables, plus the mating connectors for fastening the connecting cables, are included in the lights' scope of delivery. To select the connection variant, please consult the current data sheet for the flashing lights.

The elevated lights are supplied for installation on a frangible coupling with a compatible 4-pole plug connector with dimensions in accordance with FAA AC 150/5345-26 PLUG-CLASS A, TYPE II, STYLE I and a receptacle with dimensions in accordance with FAA AC 150/5345-26 RECEPTACLE-CLASS A, TYPE II, STYLE 8. The receptacle has a cable length of 2 m for connecting to the isolating unit or an extension.

For mast installation without a frangible coupling, an elevated light is available with a 5-pole, severable cable connector. This enables a longer connecting cable to the isolating unit to be created simply on site.

Inset lights are always supplied with a cast 5-pole plug connector with dimensions in accordance with FAA AC 150/5345-26 PLUG-CLASS A, TYPE II, STYLE I. The mating piece with a 5-pole receptacle with dimensions in accordance with FAA AC 150/5345-26 RECEPTACLE-CLASS A, TYPE II, STYLE 7 and a 2 m connecting cable is supplied with every inset light.

For creating a double light pair, an H-cable connector is provided with the inset light set for linking the inset lights concerned.

If connecting cables are produced on the spot or the connections are lengthened, then for reasons of availability standard H07RN-F 5G2.5 cables are frequently used. This standard cable contains a protective conductor. Since the supply to the flashing lights is passed through the isolating unit with a safety extra-low voltage (SELV), the protective conductor must not be used or connected!

When creating a double light pair, the installation shells of the two inset flashing lights must be conductively connected to each other via sufficient equipotential bonding (> 4 mm<sup>2</sup>)!

## 13.4 Protective measures

The main power supply has been designed as a totally insulated, fully enclosed system. Connection joints or junction boxes are made from insulating materials, and always in fully-cast design internally. A protective conductor is accordingly not provided in the supply cable.

If different types of joints or boxes are to be used, care must be taken to ensure the same characteristics of double insulation for non-conductive housings. If this cannot be implemented, or you do not wish it, the degree of protection for the primary cabling must be modified, and if necessary protective conductors and equipotential bonding systems must be planned separately. In order not to affect the cable's characteristics, we recommend that this protective conductor be separately routed.

If because of airport stipulations a lightning protection system is specified for outdoor areas, this must be installed separately from the supply for the flash lighting system. The arresters must, in order to avoid interference, be laid at a sufficient distance from the supply cables to the flash lighting system.

The power supply to the flashing lights features safety extra-low voltage (SELV). The isolating unit PDU800-SFL reduces the 400 VAC supply to approx. ~36 VAC using a dependably isolated transformer. The data lines are likewise dependably decoupled electrically, so that the supply voltage cannot cause a disruptive discharge on the lights' side if the supply cable is damaged.

The SELV protection feature enables staff to work on the lights without restrictions even when they are in powered-up mode, thus significantly facilitating system maintenance. The system can be used quite safely in the outdoor areas of the airport. In contrast to the high-voltage engineering involved in gas discharge flashes, no hazardous touch voltages can occur here, even if light housings have been damaged (accident, vandalism, etc.).



### NOTICE

When planning the cabling for the lights, please remember that in the safety extra-low voltage supply (SELV) it is forbidden under the relevant standard to connect an active conductor to the ground potential.

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The choice of miniature circuit-breaker in the control unit (all-pole switch-off 5 x10 A, Characteristic K) is designed as line protection for the outdoor system with a minimum cross-sectional area of 2.5 mm<sup>2</sup>. This means the supply cable is protected against thermal overloading even in the event of a short-circuit. By reason of the fusing characteristic involved, when the maximum conductor resistance is utilized there could be no instantaneous tripping in the event of a short-circuit in the supply cable. If by reason of special local regulations instantaneous tripping is required, the cables' cross-sectional areas must be increased correspondingly.

## 13.5 Power supply to the control unit

The SFL system requires a 3-phase 400 V 50/60Hz supply (L1, L2, L3, N).

In the context of the power supply, and in particular when UPS systems are being used, please remember that the phase loads are highly asymmetrical.

The main power (~1.4 kVA) is tapped between Phases 1 and 2. Phase 3 is required for the auxiliary supply and for synchronizing the system. When the chain's power supply is switched on, the initial charging of the lights' capacitors and the start-up of the power supplies may cause a higher level of power consumption for brief periods.

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For selective fuse protection of the flash lighting system in the low-voltage distribution panel, the fusing characteristic K of the internal fuse must be taken into due account.



## 14.0 System data and functions in overview

<b>Connection:</b>	3 phase, 400 V, 50/60Hz, 1.4 kW, asymmetrical load, main load on L1-L2 Internal miniature circuit-breaker 4-pole 10 A, tripping characteristic K
<b>Power-up behavior:</b>	Making current limitation using time-delayed charging start after system power-up. Operational time-delay approx. 1 s after power-up. Standby mode for avoiding the time-delay is possible.
<b>Power supply to the light chain:</b>	Power supply and data transmission via a power cable with minimized cross-sectional areas. Maximum permissible simple feeder resistance of 12 Ω.
<b>Power supply to the flashing lights:</b>	Safety extra-low voltage (SELV) and data transmission decoupled from the main supply by an isolating unit. 4-pole connecting cable 2.5 mm <sup>2</sup> with maximally 25 m feeder length. Light connection via 4-pole plug connector.
<b>Protection classes:</b>	<ul style="list-style-type: none"> <li>• Main supply is routed into the field as a totally insulated enclosed system without a protective conductor.</li> <li>• Power supply from the isolating unit as safety extra-low voltage (SELV) permits unrestricted working while the flashing light is switched on. Dependable protection even if the light housing is damaged (due to accident or vandalism).</li> <li>• Lightning protection must be planned separately if needed.</li> </ul>
<b>System configurations:</b>	<ul style="list-style-type: none"> <li>• Full chain: 30 flash lights + 2 threshold identification lights</li> <li>• Reduced chain: 21 flash lights + 2 threshold identification lights</li> <li>• Threshold lighting: 2 threshold identification lights</li> </ul> <p>Special configurations possible. Each standard configuration can be dynamically switched over to a reduced standard configuration. The threshold identification lights can be switched separately from the upstream chain.</p>
<b>Light configurations:</b>	<p>Single light: Elevated lights or inset lights for a light at the addressed position. Power supply and control are provided for each light via an isolating unit.</p> <p>Double light: Two inset lights form, as a light pair (master and slave), a light at the addressed position in order to increase the brightness. Power supply and control are provided via a shared isolating unit.</p>
<b>Sequence frequencies:</b>	1 Hz and 2 Hz permanently configured or dynamically alterable through the control system.
<b>Brightness steps:</b>	100 %, 10 %, 3 %
<b>Readiness mode:</b>	In order to avoid a time-delay at power-up and for continuous monitoring the system offers a readiness mode.
<b>Monitoring:</b>	<ul style="list-style-type: none"> <li>• Individual-light monitoring.</li> <li>• Continuous monitoring in readiness mode.</li> <li>• Monitoring of the threshold lights with automatic switch-off in the event of an individual fault.</li> </ul>

<b>Operator control:</b>	Service operator control option integrated in the control unit Operator control, detailed monitoring and system configuration using the lucDMC service software package
<b>Interfaces for remote control:</b>	<ul style="list-style-type: none"><li>• 24 VDC control inputs (8) and signal outputs (12) for parallel control</li><li>• optionally redundant CAN-Bus interface for linking up to a ADB SAFEGATE remote control system</li><li>• optionally redundant RS485 interfaces with MODBUS/RTU, RCOM or RCOM plus protocol</li><li>• optionally redundant ETHERNET interface with MODBUS/TCP protocol</li><li>• optionally redundant PROFIBUS DP interface</li></ul>
<b>Standards:</b>	ICAO Annex 14, Aerodrome Design Manual Part 4; Visual Aids; Fourth Edition – 2004 STANAG 3316 Manual for Lighting Systems on Airfields / Airfields for NATO and National Installations (HB BA); General Reprint No. 174 DIN VDE V 0161-11 (VDE V 0161-11)

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## 15.0 Technical data

### 15.1 Control unit MCU800D-SFL in the standard housing

<b>Supply voltage:</b>	400 V, 50/60 Hz, 3-phase
<b>Connected load:</b>	1.4 kW, asymmetrical load, main load on L1 – L2 Internal miniature circuit-breaker 4-pole 10 A, tripping characteristic K
<b>Supply terminals:</b>	5 x 1.5 mm <sup>2</sup> to 4 mm <sup>2</sup>
<b>Output terminals to the flash chain:</b>	5 x 1.5 mm <sup>2</sup> to 6 mm <sup>2</sup>
<b>Operating temperature:</b>	-25°C – +45°C (without easy-to-use control system)
<b>Humidity:</b>	10% ... 90%, not condensing
<b>Degree of protection:</b>	IP 43
<b>Elevation above sea level (operation):</b>	-100 m ... +2 500 m
<b>Housing:</b>	Metal housing for wall mounting, 600 mm x 600 mm x 210 mm (B x H x D), ~22 kg
<b>Standards:</b>	ICAO Annex 14, Aerodrome Design Manual Part 4; Visual Aids; Fourth Edition – 2004 STANAG 3316 Manual for Lighting Systems on Airfields / Airfields for NATO and National Installations (HB BA); General Reprint No. 174 DIN VDE V 0161-11 (VDE V 0161-11)

### 15.2 Isolating unit PDU800D-SFL

<b>Supply voltage:</b>	340 - 400 V, 50/60 Hz
<b>Output to flashing light:</b>	Safety extra-low voltage ~ 36 V, 5 A (SELV compliant)
<b>Operating temperature:</b>	-40°C .. +55°C
<b>Elevation above sea level (operation):</b>	-100 m ... +2 500 m
<b>Connecting cable:</b>	Molded cable (5 x 2.5 mm <sup>2</sup> ) approx. 2.2 m (protective conductor incorporated in the cable is not used or connected)
<b>Feeder cable:</b>	Molded cable (4 x 2.5 mm <sup>2</sup> ) approx. 1 m with yellow marking protective conductor incorporated in the cable is not used or connected)
<b>Housing:</b>	Fully cast PU housing
<b>Degree of protection:</b>	IP 68 up to 1 m immersion depth
<b>Dimensions:</b>	142 mm x 192 mm (D x L) without cables
<b>Weight:</b>	~ 6.5 kg
<b>Standards:</b>	Aerodrome Design Manual Part 4; Visual Aids; Fourth Edition – 2004 DIN VDE V 0161-11 (VDE V 0161-11)





## Appendix A: INTEROPERABILITY

**Table 13: SFL/TIL (IL868D)**

Base type	Required O-ring	Bolt installation		Stud installation	
		Required dimension	Recommended torque	Required nut	Recommended torque
ADB 12 in Eurobase	O-ring D259.3×5.7 SP.013114/10 pc SP.013115/100 pc	1411.20.482, metric screw kit 12 in M10×25 mm	21 Nm + Loctite 2701 or 638	1411.20.500, self- locking nut kit 12 in M10 H100	21 Nm <sup>1</sup>
L-868 with flange	O-ring D259.3×5.7 SP.013114/10 pc SP.013115/100 pc	1411.20.452, UNC Screw kit	Reference EB83	N/A	N/A

**Notes**

<sup>1</sup> Do not use Loctite or washer with self-locking nut.



## Appendix B: SUPPORT

Our experienced engineers are available for support and service at all times, 24 hour/7 days a week. They are part of a dynamic organization making sure the entire ADB SAFEGATE is committed to minimal disturbance for airport operations.

### ADB SAFEGATE Support

#### Live Technical Support - Americas

If at any time you have a question or concern about your product, just contact ADB SAFEGATE's technical service department. Trained in all areas of system issues, troubleshooting, quality control and technical assistance, our highly experienced Technical support specialists are available 24 hours a day, seven days a week to provide assistance over the phone.

ADB SAFEGATE **Americas Technical Service & Support (US & Canada): +1-800-545-4157**

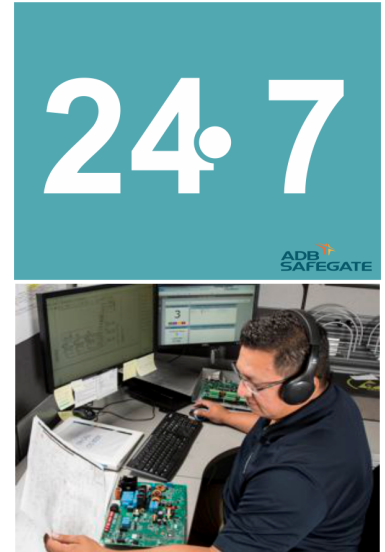
**ADB SAFEGATE Americas Technical Service & Support (International): +1-614-861-1304**

During regular business hours, you can also Chat with a Service Technician. We look forward to working with you!

#### Before You Call

When you have an airfield lighting or system control system problem it is our goal to support airfield maintenance staff as quickly as possible. To support this effort we ask that you have the following information ready before calling.

- The *airport code*
- If not with an airport, then company name (prefer customer id number)
- Contact phone number and email address
- Product with part number preferable or product number
- Have you reviewed the product's manual and troubleshooting guide
- Do you have a *True RMS* meter available (and any other necessary tools)
- Be located with the product ready to troubleshoot



#### Note

For more information, see [www.adbsafegate.com](http://www.adbsafegate.com), or contact ADB SAFEGATE Support via email at [support@adbsafegate.com](mailto:support@adbsafegate.com) or

Brussels: +32 2 722 17 11

Rest of Europe: +46 (0) 40 699 17 40

Americas: +1 614 861 1304. Press 3 for technical service or press 4 for sales support.

China: +86 (10) 8476 0106

### B.1 ADB SAFEGATE Website

The ADB SAFEGATE website, [www.adbsafegate.com](http://www.adbsafegate.com), offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more.

## B.2 Recycling

### B.2.1 Local Authority Recycling

The disposal of ADB SAFEGATE products is to be made at an applicable collection point for the recycling of electrical and electronic equipment. The correct disposal of equipment prevents any potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling. The recycling of materials helps to conserve natural resources. For more detailed information about recycling of products, contact your local authority city office.

### B.2.2 ADB SAFEGATE Recycling

ADB SAFEGATE is fully committed to environmentally-conscious manufacturing with strict monitoring of our own processes as well as supplier components and sub-contractor operations. ADB SAFEGATE offers a recycling program for our products to all customers worldwide, whether or not the products were sold within the EU.

ADB SAFEGATE products and/or specific electrical and electronic component parts which are fully removed/separated from any customer equipment and returned will be accepted for our recycling program.

All items returned must be clearly labeled as follows:

- For *ROHS/WEEE* Recycling
- Sender contact information (Name, Business Address, Phone number).
- Main Unit Serial Number.

ADB SAFEGATE will continue to monitor and update according for any future requirements for *EU directives* as and when *EU member states* implement new *regulations* and or *amendments*. It is our aim to maintain our *compliance plan* and assist our customers.

## Company Addresses

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ADB SAFEGATE, China	ADB SAFEGATE Airfield Technologies Ltd. China Unit 603, D Block, CAMIC International Convention Center, No 3, Hua Jia Di East road, ChaoYang district, Beijing 100102 P.R. China
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