



Instruction Manual  
**ELTROTEC Endolight FOT LED**

LED light source

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Certified acc. to DIN EN ISO 9001: 2008

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## 1. Safety

The handling of the system assumes knowledge of the instruction manual.

### 1.1 Symbols Used

The following symbols are used in the instruction manual.



Indicates a hazardous situation which, if not avoided, may result in minor or moderate injuries.



Indicates a situation which, if not avoided, may lead to property damage.



Indicates a user action.



Indicates a user tip.

Measure

Indicates a hardware or a button/menu in the software.

### 1.2 Warnings



Connect the power supply in accordance with the safety regulations for electrical equipment.

> Danger of injury

> Damage to or destruction of the light source

Do not look directly into the light source

> Danger of injury, damage to the eyes or skin

Let the light source cool off for a few minutes before changing the lamp.

> Risk of burns by the still hot lamp

Make sure that there is always proper ventilation and the rear side and the ventilation slots are not covered.

> Risk of fire by overheating

> Damage to or destruction of the light source

**NOTICE**

Do not use the light source at a location at which it comes in contact with liquids.

> Damage to or destruction of the light source

The power supply must not exceed the specified limits.

> Damage to or destruction of the light source

**1.3 Notes on CE Identification**

The following applies for the ELTROTEC Endolight FOT LED light source:

- EU-Richtlinie 2014/30/EU
- EU-Richtlinie 2014/35/EU
- EU-Richtlinie 2011/65/EU, "RoHS" category 5

Products which carry the CE mark satisfy the requirements of the quoted EU directives and the European standards (EN) listed therein. The EC declaration of conformity is kept available according to EC regulation, article 10 by the authorities responsible at

MICRO-EPSILON Eltrotec GmbH  
Heinkelstraße 2  
73066 Uhingen / Germany

The ELTROTEC Endolight FOT LED light source is designed for use in industry and endoscopy and satisfies the requirements.

#### **1.4 Proper Use**

- The ELTROTEC Endolight FOT LED light source is designed specifically for use in the industrial image processing and automation technology as well as for endoscopy.
- The ELTROTEC Endolight FOT LED light source is not suitable for medical purposes.
- The system may only be operated within the limits specified in the technical data, see Chap. [2.3](#).
- Use the ELTROTEC Endolight FOT LED light source in such a way that in case of malfunctions or failure personnel or machinery are not endangered.
- Take additional precautions for safety and damage prevention for safety-related applications.

#### **1.5 Proper Environment**

- Operating temperature: -10 °C to 40 °C (+14 °F to +104 °F )
- Storage temperature: -25 °C to 60 °C (-13 °F to +140 °F)
- Humidity: 30 to 90 %, non-condensing
- Ambient pressure: Atmospheric pressure

## **2. Functional Principle, Technical Data**

### **2.1 Short Description**

The Eltrotec Endolight FOT LED is an ideal light source for a variety of applications in industrial image processing and automation technology as and also for endoscopy.

Eltrotec Endolight FOT LED offers a very high light intensity, a simple operating concept, and versatile remote control options.

The light source is available with wight light color (typ. 6500 K) and compatible with fiber-optic lighting components from Micro-Epsilon Eltrotec (light guides with a connection diameter of 15 mm). Fiber-optic light guides with an active diameter of 4 mm can be used in conjunction with Eltrotec Endolight FOT LED.

### **2.2 Functions**

- 800 luminous flux  
(measured at the outlet of a 1800 mm light guide with an active diameter of 4 mm).
- Max. 50,000 hour LED lifetime (intensity declines to 50 %).
- Serial interface, digital-, analog- and trigger input.
- Storage of current settings if the power supply is interrupted
- Compact housing and simple system integration (M4 threaded rails on 4 sides).

Thanks to their characteristics, Eltrotec Endolight FOT LED is an intelligent and powerful LED light source for flexible use in individual applications and larger inspection facilities.



### 2.3 Technical Data

Model	ELTROTEC Endolight FOT LED
Power supply	24 VDC $\pm$ 10 %
Power consumption	Max. 55 W
Power supply unit	External universal power supply unit 24 V/60 W
Reverse polarity protection	Yes
Temperature control	Yes
Light sender	White high-power LED
Luminous flux at fiber optic output	Active diameter 4 mm, NA = 0.54, L = 1.8 m
	Type 800 Lumen
Color temperature	Type 6500 K
Color Rendering Index	Type 74 %
Aperture angle	Type 0.5
Active fiber optic diameter	Optics adapted for 5 mm - 14 mm
LED life time <sup>1</sup>	30.000 h > 70 % intensity
	50.000 h > 50 % intensity
Manual intensity adjustment	Stepless rotary potentiometer
Operating modes	On, Off, Multiport
Serial interface	RS-232 (9-pin), optional USB
Multiport connection	See pin assignment, see Chap. <a href="#">4.3.2</a>
Intensity resolution	0.1 %
Intensity setting tolerance	$\pm$ 2.5 %;
	After 10 min stabilization time and intensity > 10 %
Response time	Approx. 7 ms (0 - 10 V Step)
Mechanical fiber optic connection	Outer diameter/ Volpi 15 mm
	Schott-Fostec 18.3 mm, penetration depth 22 mm

<b>Model</b>	<b>ELTROTEC Endolight FOT LED</b>
Housing	Aluminum, anodized
IP protection class	IP 3X
Mounting device	M4 threaded rails (6 mm deep)
Dimensions ( L x B x H)	168 mm x 100 mm x 100 mm
Weight (without power supply unit)	1.6 kg
Operating temperature	-10 °C to 40 °C (+14 °F to +104 °F)
Storage temperature	-25 °C to 60 °C (-13 °F to +140 °F)
Electromagnetic compatibility (EMC)	EN 61000-6-1: 2007 and EN 61000-6-4: 2007

1) Average at room temperature +25 °C (+77 °F)

## 2.4 Light Intensity

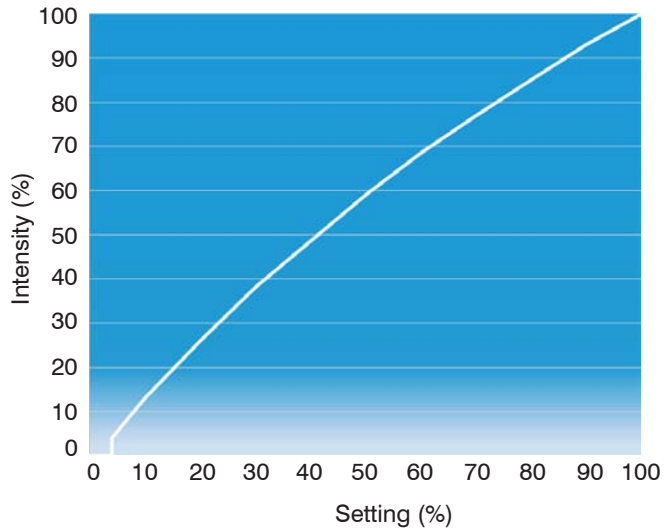


Fig. 1 Light intensity in relation to the intensity setting

## 2.5 Typical Light Spectrum

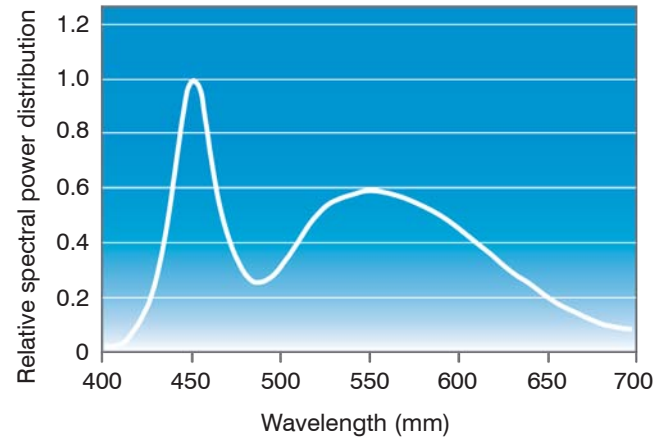



Fig. 2 Typical light spectrum (High-Power LED white)

### **3. Delivery**

#### **3.1 Unpacking**

- 1 ELTROTEC Endolight FOT LED light source
- 1 Power supply unit
- 1 Power supply cable
- 1 Connector for multiport connection
- 1 Instruction manual

You will find the suitable fiber optics and fiber-optic lighting units under Optional Accessories, see Chap. [A 1](#).

 Check the delivery for completeness and shipping damage immediately after unpacking.

 In case of damage or missing parts, please contact the manufacturer or supplier immediately.

#### **3.2 Storage**

- Storage temperature: -25 °C to +60 °C (-13 °F to +140 °F)
- Humidity: 30 to 90 %, non-condensing
- Ambient pressure: Atmospheric pressure

## 4. Mounting

### 4.1 Installation and Mounting

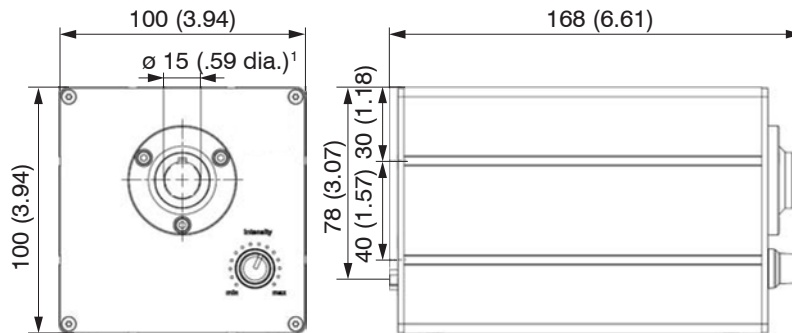


Fig. 3 Dimensional drawing ELTROTEC Endlight FOT LED light source

Dimensions in mm, not to scale

**I** Pay attention to careful handling during mounting and operation.



The vents are located on the rear side and must not be covered.

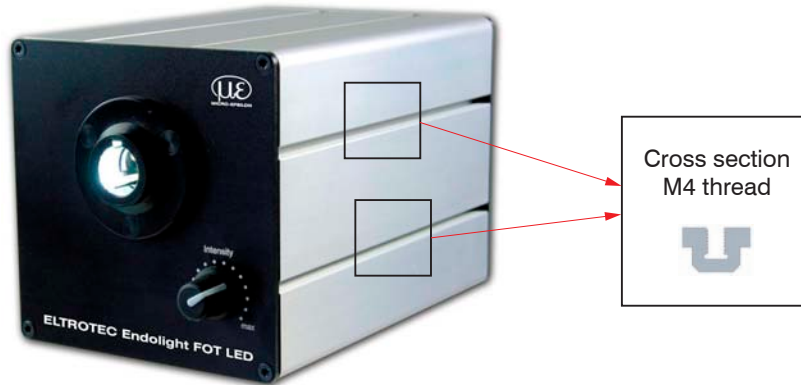
- > Risk of fire by overheating
- > Damage to or destruction of the light source

The minimum distance is 10 cm.

**I** Do not open the light source housing. The light source may only be opened by MICRO-EPSILON Eltrotec authorized personnel, see Chap. 9., see Chap. 10.

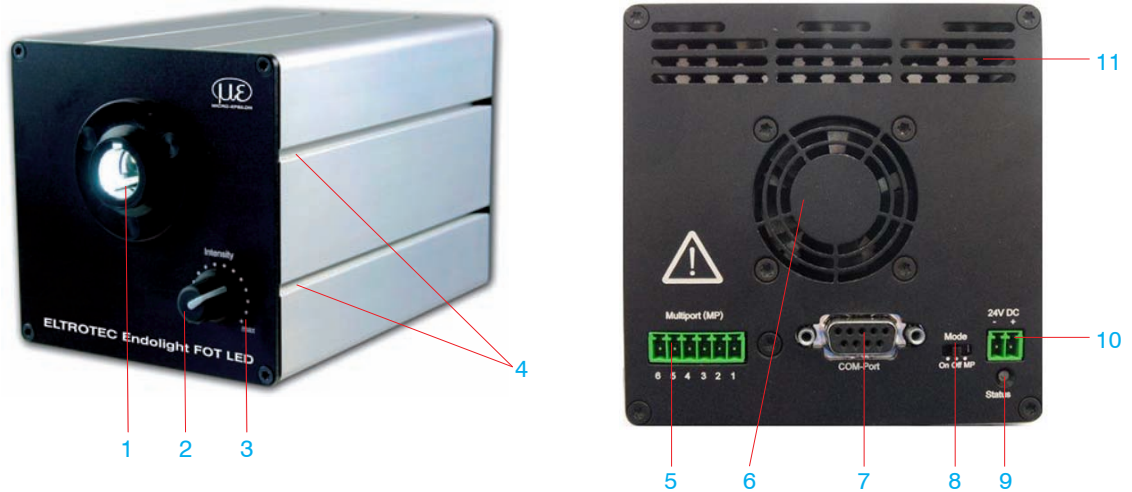
1) Fiber optic connection 15 mm (18.3 mm) / .59 ( .72) inches

The light source housing has on 4 sides thread rails for mounting with M4 screws, in each case 2 from front to the back, see Fig. 4.  
The mounting points can be selected optionally along these rails. We recommend at least 4 mounting points.



*Fig. 4 View on mounting rails*

## 4.2 Operating Elements



1 Connection for fiber optics	8 Mode selector switch
2 Intensity potentiometer	9 Status LED display
3 Intensity scale	10 Power supply 24 VDC
4 Assembly thread rails M4 (two rails on 4 sides)	11 Ventilation slots (air exhaust)
5 Multiport connection	
6 Fan (air induction)	
7 COM-Port (standard RS232)	

*Fig. 5 Operating elements front side and rear side*

**NOTICE****4.3 Electrical Connections****4.3.1 Power Supply**

Operate the ELTROTEC FOT LED light source only with a power supply of 24 VDC  $\pm 10\%$ .

> Damage to or destruction of the light source

Pin	Pin assignment
1	24 V
2	GND

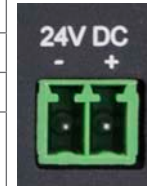


Fig. 6 Pin assignment power supply

Fig. 7 Port for power supply

**4.3.2 Multiport Connection**

Pin	Pin assignment
1	Analog input (0 - 10 V, max. 15.5 V)
2	Analog GND (0 V)
3	Trigger input (low: 0 - 0.8 V / high: 2.0 - 24 V)
4	Digital GND (0 V)
5	NC (not assigned)
6	Error output (open drain ( $I_{max}$ : 10 mA, $U_{max}$ : 24 V) $\Rightarrow$ no error: open / error: closed

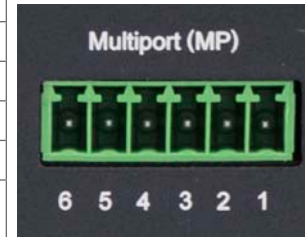


Fig. 8 Pin assignment Multiport connection

Fig. 9 6-pin. Multiport connection



### 4.3.3 COM-Port

Pin	Pin assignment
1	NC
2	TX
3	RX
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

*Fig. 10 Pin assignment Com-Port connection*



*Fig. 11 9-pin. COM-Port female connection respectively RS232 interface*

### 4.3.4 Status LED

During operation, the status LED should be green. Is it out or flashes, see Chap. 8.2.



*Fig. 12 View on status LED*

## 5. Operation

### 5.1 Commissioning

- Set the mode selector switch (8), see Fig. 5, in the *Off* position.
- Connect the supplied power supply unit with the power supply (10), see Fig. 5.
- Connect the power supply cable with the power supply unit, see Fig. 13 and plug the power supply cable into the wall socket.



Fig. 13 Power supply unit and power supply cable

#### Optional

The light source can also be connected to an existing mains supply via the power supply (10), see Fig. 5

#### NOTICE

Operate the ELTROTEC FOT LED light source only with a power supply of 24 VDC  $\pm$ 10 %.

- > Damage to or destruction of the light source

Using a data cable R232, see Chap. A 1, you can also connect data via the COM-Port (7), see Fig. 5.

#### CAUTION

Make sure that there is always proper ventilation and the rear side and the ventilation slots are not covered.

- > Risk of fire by overheating
- > Damage to or destruction of the light source

The minimum distance is 10 cm.

## 5.2 Operating Modes

You can adjust the desired operating mode using the mode selector switch (8), see Fig. 5, see Fig. 14.

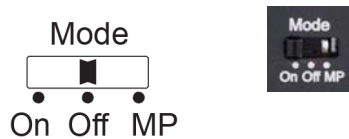


Fig. 14 Mode selector switch graphic and view

### 5.2.1 ON

- The light intensity can be adjusted via the intensity potentiometer (2), see Fig. 5, at the front side of the device.
- The fan will be switched on/off based on the temperature.
- The source for the intensity setting can be selected via the COM-Port (7), see Fig. 5:
  - Potentiometer - preselected,
  - Analog input or
  - COM-Port

### 5.2.2 Off

- No light.
- Fan is off.

! Switching the mode selector switch from ON or MP to Off the following states are reset:

- Input source (set via COM-Port (7), see Fig. 5)
- Trigger logic (set via COM-Port (7), see Fig. 5)
- Error (if the error is no longer present)

### 5.2.3 MP (Multiport)

- The light intensity can be set via the analog input of the Multiport (5), see Fig. 5.
- The fan will switch on/off based on the temperature.
- The source for the intensity setting can be selected via the COM-Port (7), see Fig. 5:
  - Analog input - preselected,
  - Potentiometer or
  - COM-Port.
- The logic of the trigger input on the multiport can be determined via the COM-Port (7), see Fig. 5:
  - High-active - preselected,
  - Low-active.

You will find the pin assignment of the Multiport connection under Technical Data, see Chap. 2.3.

## 5.3 Operation

After the initial start-up and operating mode selection, the light source can be operated via the selected source for the intensity setting.

Mode selection On (basic setting):	The light intensity can be adjusted using the potentiometer from no light to 100 %.
Mode selection MP (basic setting):	The light intensity can be adjusted using the analog input on the Multiport from no light to 100 %.
Mode selection Off:	No light is emitted. Communication via the COM port is active.

## 5.4 Power Failure

If the power supply is interrupted, the current settings (input source, trigger logic) will be automatically saved in the light source.

## 6. Serial Interface

The HyperTerminal of Microsoft Windows can be used as a means of communication.

HyperTerminal is no longer included in Windows operating systems since the introduction of Windows Vista. HyperTerminal or alternative programs can be installed in current operating systems. Please contact technical service for support, see Chap. 10.

Serial interface settings on the HyperTerminal:

Bits/s	9600
Data bits	8
Parity	none
Stop bits	1
Flow control	none

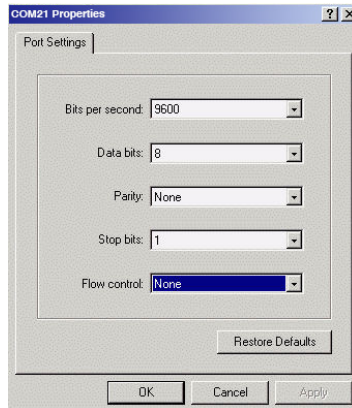


Fig. 15 Screen COM21 Properties

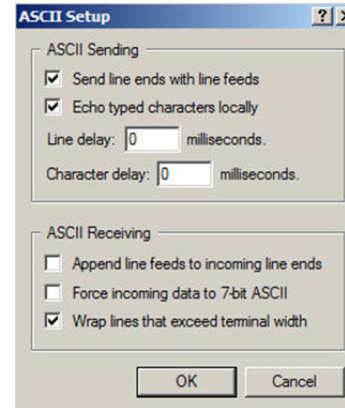


Fig. 16 Screen ASCII Setup

## 7. Serial Protocol

The light source understands 11 commands, all of which begin with the start character “>” (corresponds to ASCII 0x3E) and must be concluded with the enter key ↵ (corresponds to ASCII “CR LF” or ASCII 0x0D, 0x0A).

Essentially, the commands are divided into 2 groups SET commands and GET commands. With the SET commands, actions are carried out in the light source and/or data are written. If data are written in the light source, they must consist of 5 digits from 0 - 9. The interpretation of these 5 digits and the commands are described in the appendix, see Chap. A 2.

GET commands are used to read the data from the light source.

## 8. Instructions for Operation

### 8.1 Cleaning


- ➡ Turn off the ELTROTEC Endolight FOT LED light source and disconnect the power supply cable from the wall socket and from the rear side of the device.
- ➡ Wipe the exterior surfaces using a damp cloth with mild soapy water.
- **i** Please do not use cleaning agents which contain solvents, oil distillates, volatile or flammable substances.

### NOTICE

Do not immerse the device in water. Liquid must not get into the housing. Do not connect the device/power supply cable during the cleaning or if it is damp. The light source may get damaged or destroyed.

## 8.2 Troubleshooting

Error	Possible cause	Solution
No light	No or insufficient power supply	➡ Check cables and connector plugs, replace power supply unit if necessary.
	Operating mode is set to Off .	➡ Set operating mode to On or MP .
		➡ Adjust the intensity (trigger signal could be needed depending on the settings).
	Intensity setting is too low.	➡ Increase intensity.
No fan sound	System temperature is low.	No action required.
No light, status LED is flashing slowly.	Overtemperature, air inlet and/or outlet is covered.	➡ Please check if air inlets and outlets are uncovered. Minimum distance is 10 cm.
No light, no fan sound, status LED is flashing slowly.	Overtemperature due to broken fan.	➡ Please contact our technical service, see Chap. 10.
No light, status LED is flashing rapidly.	LED seems to be defective.	➡ Please contact our technical service, see Chap. 10.
Light flickers.	Low power supply.	Power supply unit must be 24 VDC $\pm$ 10 %/ 55 W.
No COM-Port connection possible.	No connection to COM-Port.	➡ Please check cable and connections.
	Wrong COM-Port, incorrect settings.	➡ Reset the settings, see Chap. 6.

Error	Possible cause	Solution
Other failures		 Please contact our technical service, see Chap. 10.

**i** Do not open the light source housing. The light source may only be opened by MICRO-EPSILON Eltrotec authorized personnel, see Chap. 9., see Chap. 10.

## 9. Warranty

All components of the device have been checked and tested for perfect function in the factory. In the unlikely event that errors should occur despite our thorough quality control, this should be reported immediately to MICRO-EPSILON Eltrotec.

The warranty period lasts 12 months following the day of shipment. Defective parts, except wear parts, will be repaired or replaced free of charge within this period if you return the device free of cost to MICRO-EPSILON Eltrotec. This warranty does not apply to damage resulting from abuse of the equipment and devices, from forceful handling or installation of the devices or from repair or modifications performed by third parties.

No other claims, except as warranted, are accepted. The terms of the purchasing contract apply in full. MICRO-EPSILON Eltrotec will specifically not be responsible for eventual consequential damages. MICRO-EPSILON Eltrotec always strives to supply the customers with the finest and most advanced equipment. Development and refinement is therefore performed continuously and the right to design changes without prior notice is accordingly reserved.

For translations in other languages, the data and statements in the German language operation manual are to be taken as authoritative.



## 10. Service, Repair

In the event of a defect on the ELTROTEC Endolight FOT LED light source or the power supply cable please send the affected parts for repair or exchange.

In the case of faults the cause of which is not clearly identifiable, the entire measuring system must be sent back to:

MICRO-EPSILON Eltrotec GmbH  
Heinkelstraße 2  
73066 Uchingen / Germany

Tel. +49 (0) 7161/ 98872-300  
Fax +49 (0) 7161 / 98872-303  
eltrotec@micro-epsilon.de  
www.micro-epsilon.com

## 11. Decommissioning, Disposal



➡ Disconnect the power supply cable on the light source.






Incorrect disposal may cause harm to the environment.



➡ Dispose of the device, its components and accessories, as well as the packaging materials in compliance with the applicable country-specific waste treatment and disposal regulations of the region of use.

## Appendix

### A 1 Optional Accessories

Fiber optic cable			
Designation	Photo	Description	Article number
Fiber optic cable EL 1/4 1800 MEP/S with Lemo 1 adapter		Endoscope fiber optic fibers with high packing density, fiber bundle diameter: 4 mm Length: 1800 mm Metal protective conduit with PVC coating. One side FOT light source connector One side Lemo1 connector = cladding diameter 7.6 mm	20710831
Liquid fiber optic cable EFL 1/4 1800 MEP with Lemo 1 adapter		Endoscope liquid fiber optic cable, fiber bundle diameter: 4 mm Length: 1800 mm Cladding diameter: Metal protective conduit with PVC coating. One side FOT light source connector One side Lemo1 connector.	20710446

Designation	Photo	Description	Article number
Fiber optic 1 arm, UL1 - 1200		Length: 1200 mm, metal protective conduit with PVC coating, outer diameter 8 mm, fiber bundle diameter 3 mm, one side FOT light source connector	20710424
Fiber optic 1 arm, UL1 - 1800		Length: 1800 mm, metal protective with PVC coating, outer diameter 8 mm, fiber bundle diameter 3 mm, one side FOT light source connector	20710425
<b>Faser-optic lighting units</b>			
Gooseneck attachment		Gooseneck attachment from semi-rigid metal-tube, chrome plated. Fiber bundle diameter 3 mm. Attachable to cable type UL	20710430
Rigid probe, Straight model UST/A		Attachable to UL fiber optic cables, length 150 mm, outer diameter 3 mm, bundle diameter 2 mm for the illumination of drill holes, specially for tool making	21060435
Rigid probe Lightly angled, UST/C			21060436
Rigid probe Angled at 90°, UST/B, r = 10 mm			21060547

Designation	Photo	Description	Article number
Mirror deflection		US1 mirror on fixture, $\varnothing$ 21 mm	21060432
		US2 mirror on fixture, $\varnothing$ 25 mm	21060433
		USP mirror fixture	21060431
Focussing lens		Focussing lens, UFL 21060438; attachable to UL fiber optic	21060438

More fiber optics or faser-optic lighting units are available on request.

**A 2 ASCII Communication****A 2.1 Command Overview**

Group	Chapter	Command	Short info
<b>Intensity</b>			
	Chap. <a href="#">A 2.2.1.1</a>	>si00100	Adjust intensity
	Chap. <a href="#">A 2.2.1.2</a>	>giCRLF	Readout intensity
	Chap. <a href="#">A 2.2.1.3</a>	>gzCRLF	Firmware/software version
	Chap. <a href="#">A 2.2.1.4</a>	>gtCRLF	System temperature
<b>Source for intensity setting</b>			
	Chap. <a href="#">A 2.2.2.1</a>	>spCRLF	Potentiometer
	Chap. <a href="#">A 2.2.2.2</a>	>saCRLF	Analog input
	Chap. <a href="#">A 2.2.2.3</a>	>srCRLF	COM-Port
<b>Setting the trigger logic</b>			
	Chap. <a href="#">A 2.2.3.1</a>	>slCRLF	Trigger low-active
	Chap. <a href="#">A 2.2.3.2</a>	>shCRLF	Trigger high-active
<b>System status</b>			
	Chap. <a href="#">A 2.2.4.1</a>	>gsCRLF	System status
<b>Error reset</b>			
	Chap. <a href="#">A 2.2.5.1</a>	>syCRLF	Error reset
<b>Reply to an undefined query via the COM-Port</b>			
	Chap. <a href="#">A 2.2.6</a>		Response to an undefined request via the COM-Port

**A 2.2 Commands****A 2.2.1 Intensity**

The intensity can be adjusted with a resolution of 0.1 %.

**A 2.2.1.1 Adjust Intensity (Set)**

```
>si00100←↵
```

Declaration:

>	Start character
s	SET command
i	Intensity command
00100	5 digits for the value: 00100 = 100 * 0.1 % = 10.0 %
←↵	Stop sign CRLF

After sending this command the source for the intensity control will be automatically changed to COM-Port and the entered value will be set.

Query	>si00100
Reply	>si00100

**A 2.2.1.2 Readout Intensity (Get)**

```
>giCRLF
```

Query	>giCRLF
Reply	>gi00555CRLF
Value	00555 = 555 * 0.1 % = 55.5 %

**A 2.2.1.3 Firmware/Software Version (Get)**

```
>gzCRLF
```

Query	>gzCRLF
Reply	>gz00010CRLF
Value	00010 = 10 * 0.1 % = 1.0 (Version 1.0)

**A 2.2.1.4 System Temperature (Get)**

&gt;gtCRLF

Query	>gtCRLF
Reply	>gt00356CRLF
Value	000356 = $356 * 0.1 = 35.6$ °C

**A 2.2.2 Source for Intensity Setting**

The source for the intensity setting can be selected with 3 different commands:

**A 2.2.2.1 Potentiometer (Set)**

&gt;spCRLF

Query	>spCRLF
Reply	>spCRLF

**A 2.2.2.2 Analog Input (Set)**

&gt;saCRLF

Query	>saCRLF
Reply	>saCRLF

**A 2.2.2.3 COM-Port (Set)**

&gt;srCRLF

Query	>srCRLF
Reply	>srCRLF

### A 2.2.3 Setting the Trigger Logic

The trigger logic can be set with 2 different commands. Trigger function is only active in operating mode MP (Multiport). In Low-Active the source for intensity setting is enabled with the trigger input signal "0". In High-Active it is enabled with the signal "1".

#### A 2.2.3.1 Trigger Low-Active (Set)

>s1CRLF

Query	>s1CRLF
Reply	>s1CRLF

#### A 2.2.3.2 Trigger High-Active (Set)

>shCRLF

Query	>shCRLF
Reply	>shCRLF

### A 2.2.4 System Status

The system status can be read out in all operating settings (On, Off, MP).



### A 2.2.4.1 System Status (Get)

>gsCRLF

Query	>gsCRLF
Reply	>gsnnnnnCRLF
Value	nnnn

n n nn n

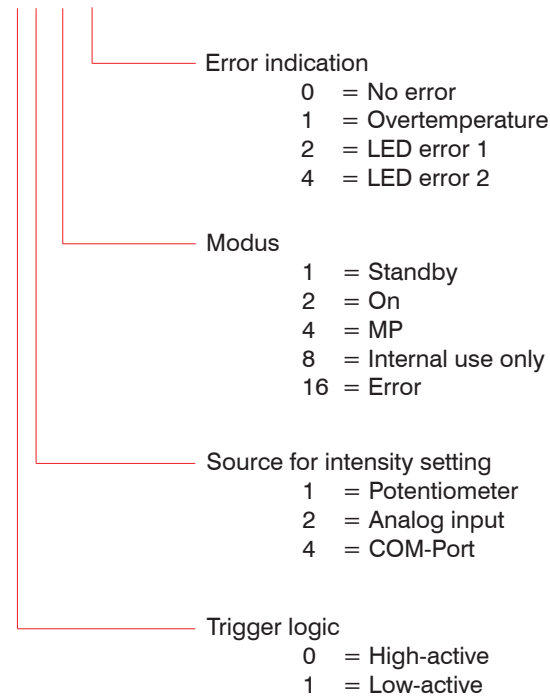


Fig. 17 Declaration of value variables

**A 2.2.5 Error Reset**

If an error is no longer present it can be resetted with one of the following ways:

1	Set operating switch to <code>OFF</code> and reset.
2	Disconnect and restore the power supply.
3	Send a <code>SET</code> command via the COM-Port.

**A 2.2.5.1 Failure Reset (Set)**

>syCRLF

Query	>syCRLF
Reply	>syCRLF

**A 2.2.6 Reply to an Undefined Query via the COM-Port**

In case of undefined queries via COM-Port or a timeout the light source replies with an `Error`.

Query	undefined or timeout
Reply	>errCRLF





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