

ALBALUX FM White Light Fiber Coupled Module Instruction Manual

1. Description of White Light Fiber Coupled Module

1.1. General Information

ALBALUX FM is a novel fiber coupled white light source that offers a high luminance output with long working distances, narrow beam angles and small optic spot sizes for special lighting applications.

The ALBALUX FM modules are delivered with integrated electronics, power supply and the fiber. The ALBALUX FM module however is not a stand-alone device and external cooling and power supply is required.

The purpose of this manual is to provide better understanding of the working principles of the module, to insure proper handling of the product. The manual also comprises an explanation of the application and the safety aspects of the product.



1.2. Technical Aspects

The product range includes the housed light module with integrated electronics to adjust the maximum output power of the light source to the customer's needs, the power supply (including US and EU plugs) and the fiber (plastic optical fiber; POF).

The included fiber (POF, length 1.3 m; core size 1 mm; numerical aperture 0.63) is adjusted to the light source and guarantees the specified luminous power output of 150 lm at the fiber end. Other fibers are not intended to be used and could lead to a reduced power output or performance. The optical power output can easily be adjusted by turning the potentiometer. See section 6 and 7 of this manual for further instructions.

The fiber coupled light module produces a divergent illumination profile (opening angle 80°). The fiber end is equipped with an SMA-connector to enable the use of different optics, such as collimators for homogeneous intensity distribution.

The ALBALUX FM light source must be operated with the provided power supply (operating voltage 12 V; max. operating current 2 A). An active cooling must be applied to limit the housing temperature to maximum 50 °C, which ensures a constant optical power output during operation.

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2. Use of the White Light Fiber Coupled Module

2.1. Intended Use

The ALBALUX FM module is intended to be used with the provided power supply and the attached POF fiber, only. For operation the fiber must not be removed from the device.

The output luminance power is specified to be at least 150 lm (equivalent to an optical power of 450 mW measured at the wavelength reference 530 nm with a thermal detector) at the fiber output. To avoid eye damage, never look directly into the beam or the point of emission. The light module is classified as a portable device with high brightness, which has a moderate photobiological risk (risk group 2 according to DIN EN 62471) in the visible wavelength range of incoherent light. Light modules of this kind do not present a photobiological risk, if eyelid closure and look away reflex limit the exposure time. Without an additional optic at the fiber end, the light source can be considered low risk (risk group 1 according to DIN EN 62471) if a working distance of more than 300 mm with respect to the fiber end is assured and is inaccessible to the naked eye. In combination with the associated ALBALUX collimator SM the safety distance increases to 500 mm. If the operation deviates from this safe normal operation, technical safety measures have to be invented and an appropriate eye protection (attenuation glasses with OD 1 or higher in the wavelength range between 400 nm and 700 nm) have to be applied.

The ALBALUX FM module is intended for the use in surrounding temperatures between 0 °C and 50 °C. Additionally, it requires active external cooling. The heat load that is produced during operation is estimated to be in a range of 20 W at maximal optical power. The heat is internally conducted to the housing. An external actively cooled heatsink, connected to the housings bottom, is necessary to achieve moderate temperatures below 50 °C and must be applied during operation. Higher temperatures of the ALBALUX FM module would decrease the optical power and might lead to heat damage and destruction of the entire module.

2.2. Improper Use

All applications and changes in the structure of module mentioned in the declaration of the intended use (see section 2.1) are considered as non-intended, irrespectively of their technical and practical feasibility. Non-intended use may increase the photobiological risk of the light source, especially the working distance for low risk. The manufacturer is not liable for any damage caused by improper use.

3. Basic Regulations and Standards

DIN EN 61326-1 VDE 0843-20-1 (2018-09-00): Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (IEC 65A/862/CD:2018)

DIN EN IEC 61326-2-2 VDE 0843-20-2-2 (2019-05-00): Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-2: Particular requirements - Test configurations, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage distribution systems (IEC 65A/905/CD:2018)

DIN EN 62471 VDE 0837-471 (2009-03-00): Photobiological safety of lamps and lamp systems (IEC 62471:2006, modified); German version EN 62471:2008

DIN EN 62471 Beiblatt 1 VDE 0837-471 Beiblatt 1 (2010-06-00): Photobiological safety of lamps and lamp systems - Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety (IEC/TR 62471-2:2009)

DIN EN 60825-1 VDE 0837-1 (2015-07-00): Safety of laser products - Part 1: Equipment classification and requirements (IEC 60825-1:2014)

4. Safety Instructions

The light source is based on a surface-packaged device (SMD), which includes a high-powered blue laser diode, packaged with phosphor that converts the laser light to white incoherent light. Additionally, blocking optics on the SMD-chip ensure that only incoherent white light leaves the package, eliminating laser eye-safety risk. The ALBALUX FM module is therefore classified as a class 1 laser product (according to DIN EN 60825-1).

The ALBALUX FM module with the associated POF fiber show a medium risk (RG 2) for photochemical retinal damage and a low risk (RG 1) for thermal retinal damage (according to DIN EN 62471). The light source is considered safe within the exposure time of 0.25 s, which is equivalent to the fact, that the exposure time is limited by the eyelid closure reflex. Longer exposure times can lead to retinal damage. The threshold irradiance is reached at 300 mm distance from the fiber tip. For larger working distances, the ALBALUX FM module can be operated as a low risk (RG 1) light source.

The photobiological risk group was evaluated according to the current regulations. The spectrally weighted irradiance (B-weighted for biochemical retinal damage, R-weighted for thermal retinal damage) was evaluated at a reference distance of 200 mm and an aperture diameter of 7 mm and used for the determination of the photobiological risk group. The distance in which the threshold irradiance is reached was also evaluated with a circular aperture of 7 mm.

Additional optics (e.g. a collimator at the fiber end) might change the working distance for the threshold irradiance. This value has to be carefully be considered and determined by the customer.

Caution:

Never look directly into the light source!

With the associated POF fiber and no further optics, except for the ALBALUX collimator SM, the ALBALUX FM white light source can be regarded a low risk (RG1) for a working distance larger than 500 mm.



Caution:

Laser product with laser class 1: Never look directly into the light source!



5. Light Source Design and Operation

The ALBALUX FM module is a “plug and play” fiber coupled device containing the light source, in-house custom-build drive electronics within an EMI shielded fully nickel-plated metal housing. The size is depicted in Fig. 1. The typical spectral power distribution of the light source is shown in Fig. 2.

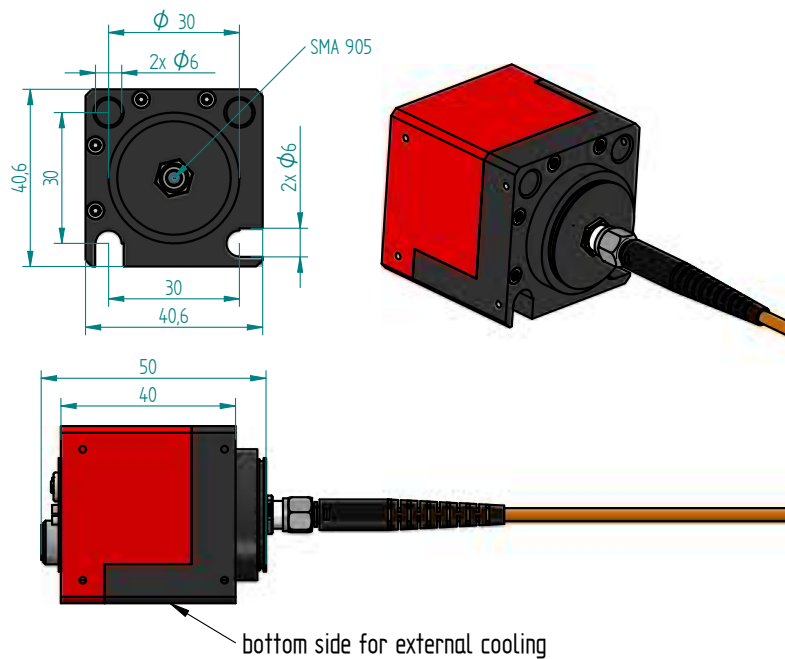


Fig. 1: Design of the ALBALUX FM module: All lengths specifications in mm.

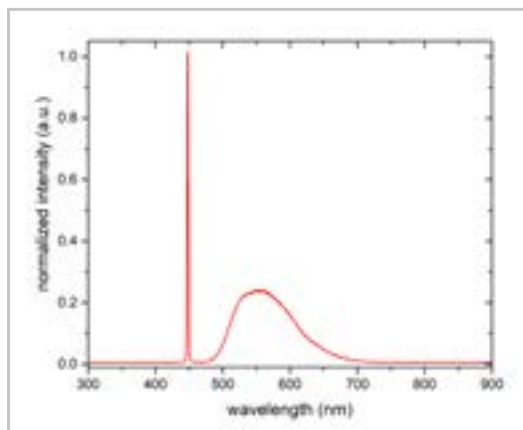


Fig. 2: Typical spectral optical power distribution of the ALBALUX FM light source.

The ALBALUX FM module is operated with a standard 12 V DC power supply. The optical output power is adjustable to the customer's needs.

6. Instructions on Operation

For operation of the ALBALUX FM module the device has to be mounted on an actively cooled heat sink, which is capable of conducting about 20 W heat load. The ALBALUX FM module is delivered with a switched of optical power output and attached fiber. Fig. 3 shows the back face of the ALBALUX FM module.

For starting and operating the ALBALUX FM module, please carry out the following steps:

1. Mount the ALBALUX FM module in the right position on the heat sink and start cooling.
2. Fix the fiber end for the operation and remove the protection cap at the fiber SMA-connector:
Caution: Ensure the right working distance and prevent the possibility of direct eye sight to the beam. Ensure that the fiber is connected to the device. Avoid any mechanical damage or dirt on the fiber tip. Therefore, never touch the fiber end.
3. Plug in the power supply (12 V DC) to the power connector. Assure that the green LED is on, but the red LED is still turned off, indicating that the optical power is still turned off.
4. Increase the optical power output by turning the potentiometer to the left side (counter clock wise) with a screw driver. If the light color changes to blue, turn the potentiometer back until the light source is shining bright white and the maximal output power is reached.
Caution: Always ensure, that the protecting cap of the fiber is removed before increasing the optical power and the fiber end is in free space. Complete absorption of the optical power directly at the fiber end could lead to heat, that could damage the fiber end or the material in contact to the fiber.
5. Adjust the optical power by turning the potentiometer to the applications need.

For turning off the ALBALUX FM module,

1. Switch off the optical power output, by turning the potentiometer to the right (clock wise) until the red LED expires.
2. Protect the fiber tip with the protecting cap, but leave the fiber connected to the device.
3. Disconnect the power supply.



Fig. 3: Housing back face with power connectors, potentiometer and indicator LEDs.

7. Maintenance and Repair

The light modules run maintenance free.

The fiber tip (SMA-adapter) is polished for best performance and must be protected from mechanical damage or contamination. Damage or dirt on the fibers end face decreases the optical power output. Do not use detergents to remove contaminations, but pressurized clean air to remove particles.

8. Disposal

The modules are manufactured according to RoHS and REACH regulations. They can be disposed of after use as electronic waste.

9. Troubleshooting

This section gives a brief overview of commonly troubles that might occur during operation. For persisting problems, please contact the manufacturer directly.

Description	Possible Origin	Resolution
No power output	Potentiometer turned out	Ensure that the green light is on, but the red light is out: Turn the potentiometer counter clock wise until the red LED turns on and light is emitted.
Output power to low	Potentiometer not adjusted correctly	Turn the potentiometer counter clock wise to increase the optical power.
	Fiber end contaminated or damaged	Try to clean the fiber tip with pressurized air. With severe damage, please contact supplier.
	Wrong fiber adapted	Make sure that only the fiber, provided with the ALBALUX is used for operation. Check fiber and connectors.
Changed light color	Potentiometer turned up too much	Turn the potentiometer clock wise until the light color changes to bright white.
Optical power decrease during operation	Heat removal too low	Make sure that an actively cooled heat sink is used, which is capable of removing up to 20 W heat power. The housing temperature has to stay constant below 50 °C.

10. Warranty

The warranty ends 12 months after delivery.

Repairs or changes to the module may only be made by the manufacturer; otherwise all rights under the warranty will be rendered void.

Detailed information on the warranty is available in the General Terms and Conditions of Sale by LASER COMPONENTS GmbH at www.lasercomponents.com.