

Technical application guide

LINEARlight Flex Diffuse (LFD)

Light is OSRAM

OSRAM

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Please note:

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1 Product overview

1.1 General features

- Highly uniform flexible light
- Continuous light without shadows
- Excellent mechanical stability
- Extremely good optical stability over time, no yellowing effect
- Fine white binning (3 SDCM)
- Dimmable (PWM)
- Lifetime of up to 60000 hours (L90B10) at 25 °C
- Flammability: glow wire test at 650 °C – EN 60598-1
- Mixed gas corrosion test – IEC 60068-2-60
- IP67 or IP66 protection with high-performance silicone
 - Encapsulated electronics
 - UV-resistant
 - Salt-mist-proof
- Easy installation
 - Adhesive tape for easy mounting
 - Connectors and aluminum profiles available
- Scalable system
 - Cuttable every 5 cm
 - 24 V system with matching OPTOTRONIC LED driver and light management system
- Top-emitting and side-emitting versions: TOP (T) and SIDE (S)

1.2 Application areas

LINEARlight Flex Diffuse (LFD) are suitable for various applications that require a nice-looking, uniform light line with no dots, e.g. indoor and outdoor decoration. Together with polished architectural materials, LFD can also be effectively used for cove or high-class furniture lighting, where the indirect light is reflected by the surfaces.

Applications at a glance:

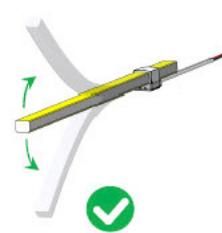
- General and cove lighting
- Marine lighting, wall integration
- Path illumination, illuminated signs
- Spa lighting
- Outdoor facade decoration

1.3 LINEARlight Flex Diffuse White TOP

Available versions: 400, 800, 1 300 lm/m
 Luminous efficacy: up to 82 lm/W
 Available CCT: 2 400 K, 2 700 K, 3 000 K, 3 500 K, 4 000 K, 6 500 K
 Available CRI : 80, 90
 Available lengths: LFD400T = 10 m, LFD800T = 6 m, LFD1300T = 4 m

Bending direction:

Allowed:



Not allowed:

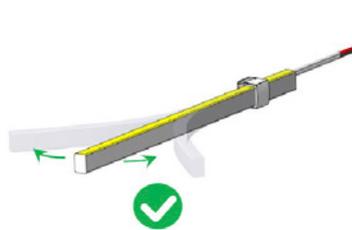


1.4 LINEARlight Flex Diffuse White SIDE

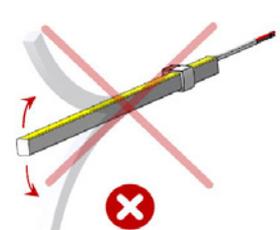
Available versions: 400, 600, 1 000 lm/m
 Luminous efficacy: up to 82 lm/W
 Available CCT: 2 400 K, 2 700 K, 3 000 K, 3 500 K, 4 000 K, 6 500 K
 Available CRI: 80, 90
 Available lengths: LFD400S = 10 m, LFD600S = 6 m, LFD1000S = 4 m

Bending direction:

Allowed:



Not allowed:



1.5 Nomenclature



1.6 Accessories

Connectors / End cap

Product type	LINEARlight Flex Diffuse (LFD) TOP	LINEARlight Flex Diffuse (LFD) SIDE
Middle power feeder		
	FX-DCS-G1-CM2PF-IP67-0500-X5	FX-DCS-G1-CM2PF-IP67-0500-X5
Strip-to-strip middle jumper		
	FX-DCS-G1-CM2PJ-IP67-0190-X5	FX-DCS-G1-CM2PJ-IP67-0190-X5
Endcaps and glue		
	FX-DCS-G1-ECT-KIT20	FX-DCS-G1-ECS-KIT20
Double-sided endcaps and glue		
	FX-DCS-G1-EHT-KIT20	FX-DCS-G1-EHS-KIT20
Silicone glue 25g		
	FX-DCS-G1-GL-25	FX-DCS-G1-GL-25

Mounting brackets

Product type	LINEARlight Flex Diffuse (LFD) TOP	LINEARlight Flex Diffuse (LFD) SIDE
Mounting bracket	 <p>FX-LFDM-G1-BT-17H11</p>	 <p>FX-LFDM-G1-BS-12H13</p>
Mounting bracket with additional wing	 <p>FX-LFDM-G1-BTL-17H11E9</p>	 <p>FX-LFDM-G1-BSL-12H13E9</p>

Aluminum profiles

Product type	LINEARlight Flex Diffuse (LFD) TOP	LINEARlight Flex Diffuse (LFD) SIDE
Standard aluminum profile	 <p>FX-LFDM -G1-TT-16H16-200</p>	 <p>FX-LFDM-G1-TS-16H16-200</p>
Alternative aluminum profile	 <p>FX-LFDM-G1-TTL-16H11W10-200</p>	 <p>FX-LFDM-BEND-1000</p>

2 Installation

2.1 Precautionary measures

Before installing LINEARlight Flex Diffuse, attention should always be paid to the following important issues:

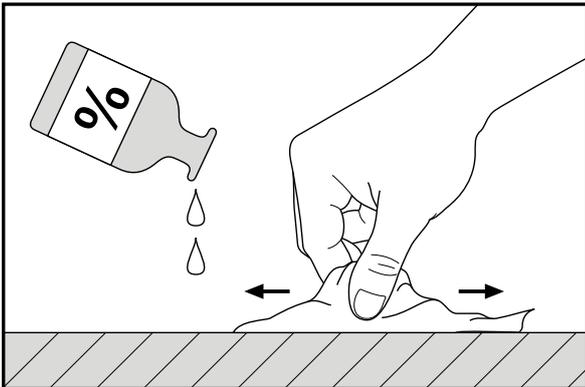
ESD

Be aware that the products can be damaged by electrostatic discharge (ESD). Earthing is a very effective measure to avoid damaging effects due to electrostatic discharge. Therefore, use a personal earthing system (ESD field kit) during mounting to prevent the build-up of static charge.



Cleaning

Depending on the surface, use a multi-purpose cleaner, such as isopropyl alcohol, to provide a clean and dry mounting surface, which is free of oils, silicone coatings and dirt particles.



Mechanical forces

Avoid mechanical forces on the connector (feeder) and the LEDs. A strain relief is recommended. In addition, mechanical stress must not be applied to the LED module itself (e.g. no twisting or bending in excess of the allowed radius as shown in the next images from 1 to 3).



IP rating

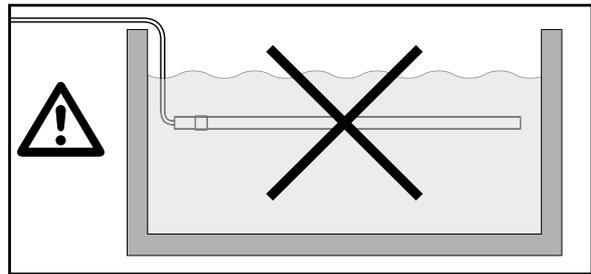
The IP rating specifies the degree of protection against the intrusion of solid objects (including body parts such as hands and fingers), dust and water in electrical enclosures. While the first digit of the IP rating indicates the protection against foreign bodies, the second digit indicates the protection against water. For more details on IP rating, please refer to “Technical application guide – IP codes in accordance with IEC 60529 and external environment impacts” in the following OSRAM DS website section:

<https://www.osram.com/ds/app-guides/index.jsp>

The following IP rating applies to LINEARlight Flex Diffuse:

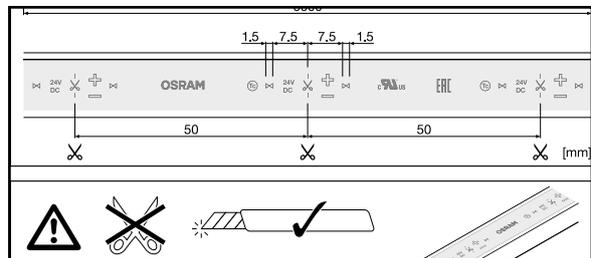
- IP66: [6] Full protection against contact and penetration of dust
[6] Protection against ingress of water in case of powerful water jets
- IP67: [6] Full protection against contact and penetration of dust
[7] Protection against ingress of water in case of temporary flooding

Note: Permanent submersion is not allowed.



Cutting

Ensure that the LED strips are cut properly at an angle of 90° before attaching the connector!



2.2 Connection with CONNECTsystem Diffuse

2.2.1 Basics

LINEARlight Flex Diffuse LED modules (TOP and SIDE) are compatible with the connectors dedicated for this product family. There are two components that can be used to power these LED modules:

Middle power feeder

This is the connector that connects the Flex Diffuse product to an LED driver. All LINEARlight Flex Diffuse LED modules are sold with already one of these connectors installed on the product. It consists of two parts:

- The transparent cage
- The white connector

Both parts are available either with the product FX-DCS-G1-CM2PF-IP67-0500 or with the KIT FX-DCS-G1-CM2PF-IP67.

Strip-to-strip middle jumper

This is a connector that connects two Flex Diffuse products when only one of these is powered by a 24 V_{DC} LED driver. It consists of three parts:

- Two transparent cages
- One white jumper with two heads

They are available either in the product FX-DCS-G1-CM2PJ-IP67-0190 and in the KIT FX-DCS-G1-CM2PJ-IP67

LINEARlight Flex Diffuse LED modules are also available with pre-mounted wires. This option is described in the chapter "2.5 Custom versions"

Specially developed for LINEARlight Flex Diffuse LED modules, these power feeders offer great advantages for your installations because:

- The installation will be easy thanks to the low number (only 2) of components (connector + cage)



Middle power feeder



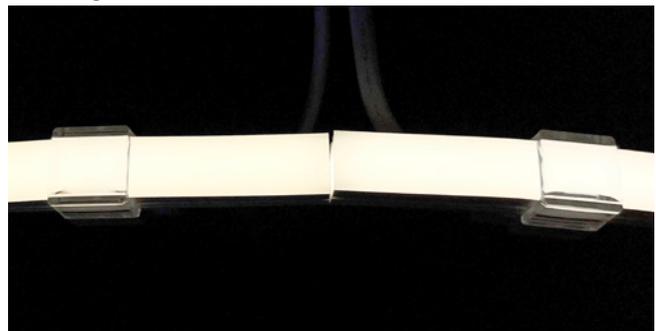
Competitor

- The LED modules can be cut as needed (min. segment length that can be used with this connector is 10 cm)
- Highly reliable connection
- Thanks to the transparent cage and to the special design that allows the electrical connection at the bottom of the LED module, this connector can be installed along the entire length of the LINEARlight Flex Diffuse LED module. The bottom side of each module is marked with a "scissors" symbol every 5 cm. This indicates the point where the LED module can be cut and where the connector can be installed.



- For longer installations where several LED modules have to be installed in series, the absence of a connector on the end allows to have a continuous and homogenous line of light without shadowing in between.

LINEARlight Flex Diffuse

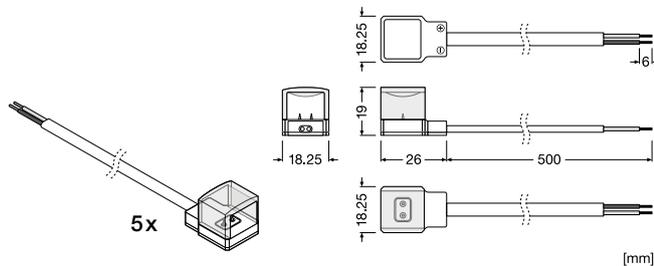


Competitor

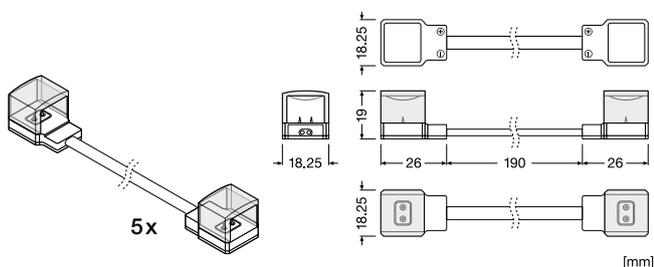
2.2.2 Mechanical dimensions

To have a clear indication about the space that each type of connector needs in the installation, please have a look at the images below.

FX-DCS-G1-CM2PF-IP67-0500-X5
EAN 4052899451971



FX-DCS-G1-CM2PJ-IP67-0190-X5
EAN 4052899452039



- The connector can be installed over any “scissors” symbol along the whole module. Once you have decided on the right point, slightly incise the transparent liner over the “scissors” symbol and remove 2 cm of the liner material in both directions.



- Insert the transparent cage as shown in the picture. It has to be centered with the “scissors” symbol.



2.3 Assembly

2.3.1 Assembly with middle power feeder

- Components for assembly:
 - LINEARlight Flex Diffuse TOP or SIDE (LFD600S)
 - Connector: Middle power feeder (transparent closing cage + white connector)



- Use a box cutter to cut the LFD module at one of the “scissors” symbols on the bottom side.



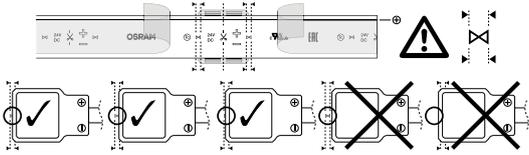
- Take the white connector and check that its polarity is aligned with the polarity indicated on the bottom side of LED module.



- Hold the white connector above the transparent cage and gently press it down until you feel both sides close with a click.



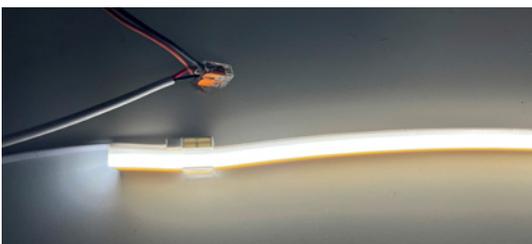
7. Ensure that the “hourglass” mark is still visible but not completely visible.



8. To install the end cap, remove the protection tape from the end of the LED module. Insert the silicone glue into the end cap and then insert the LED module. Wait 20 minutes for the glue to dry before proceeding with the installation. In case of a double-sided end cap, the process is the same for both parts of the LED strip.



9. Connect the LED module to the LED driver. Observe the correct polarity (red+ / black-). Perform a final operating test



Please note: When connecting two LINEARlight Flex Diffuse LED strips with the connector, ensure that the same polarities are always properly connected to each other.

2.3.2 Assembly with strip-to-strip middle jumper



1. Components for assembly:
 - LINEARlight Flex Diffuse TOP or SIDE (LFD600S)
 - Strip-to-strip middle jumper (transparent closing cages + white bridge connector)
2. Cut the LED module as described in paragraph 2.3.1.
3. For each connector head of the jumper, follow the same mounting steps as described in paragraph 2.3.1, starting from point 3.

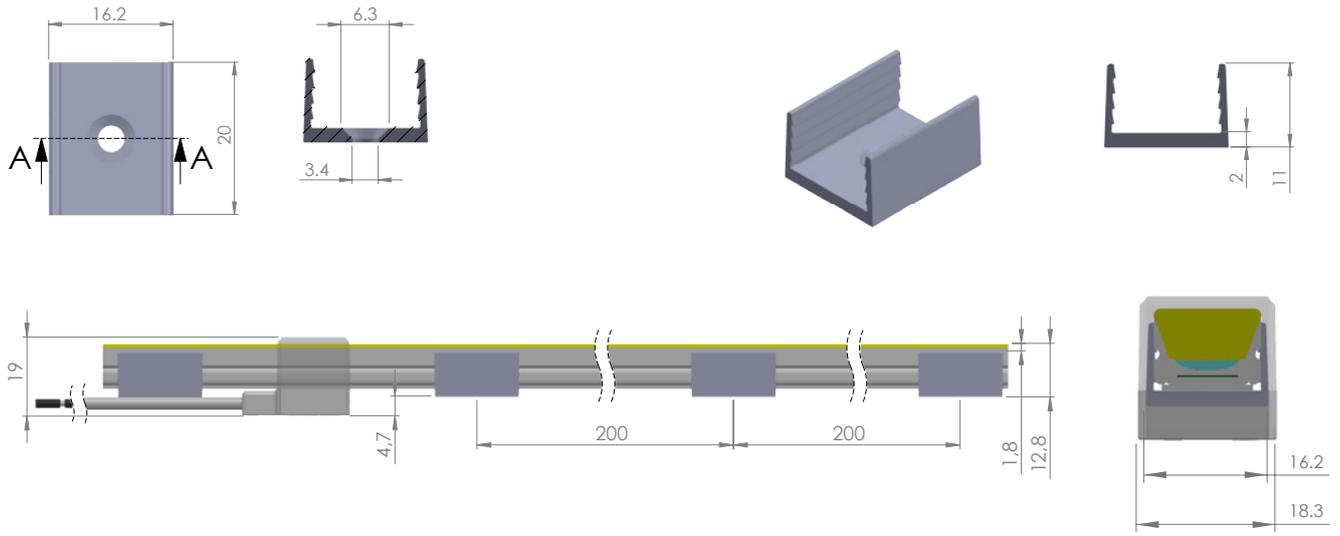
Please note: When connecting multiple LINEARlight Flex Diffuse LED strips in series, always consider the allowed power per single LED driver.

2.4 Installation with LINEARlight Flex Diffuse mounting system

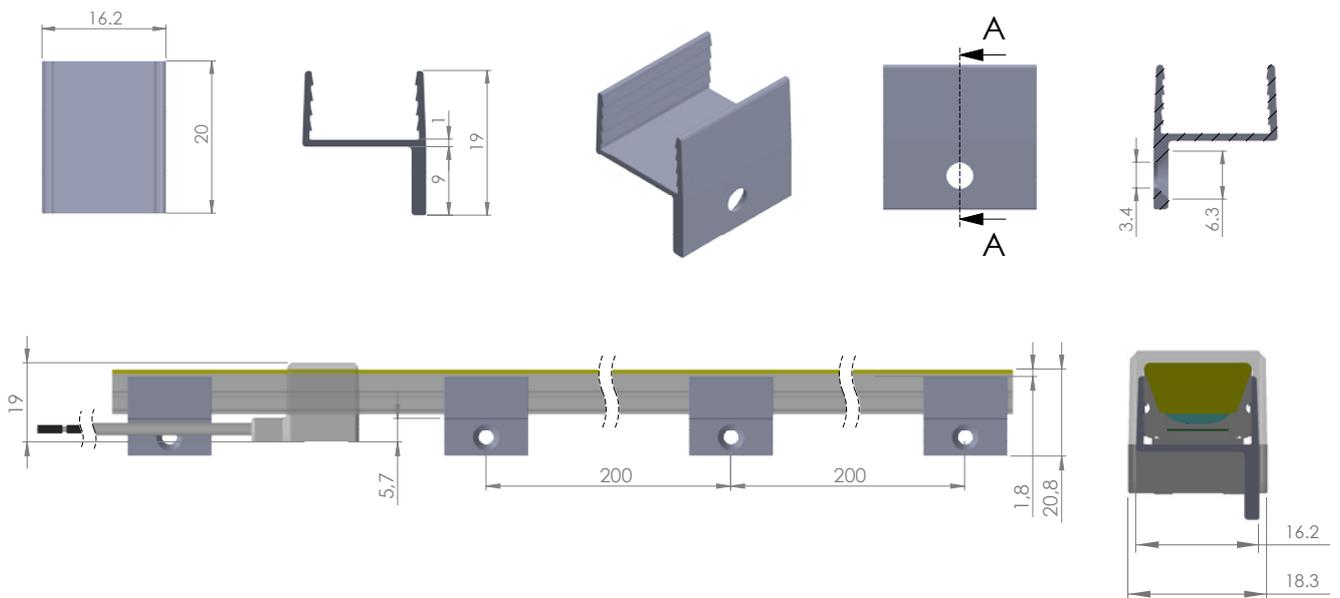
The images below show the mechanical details of installations of LINEARlight Flex Diffuse LED modules with the dedicated accessories developed for this product family.

LINEARlight Flex Diffuse TOP

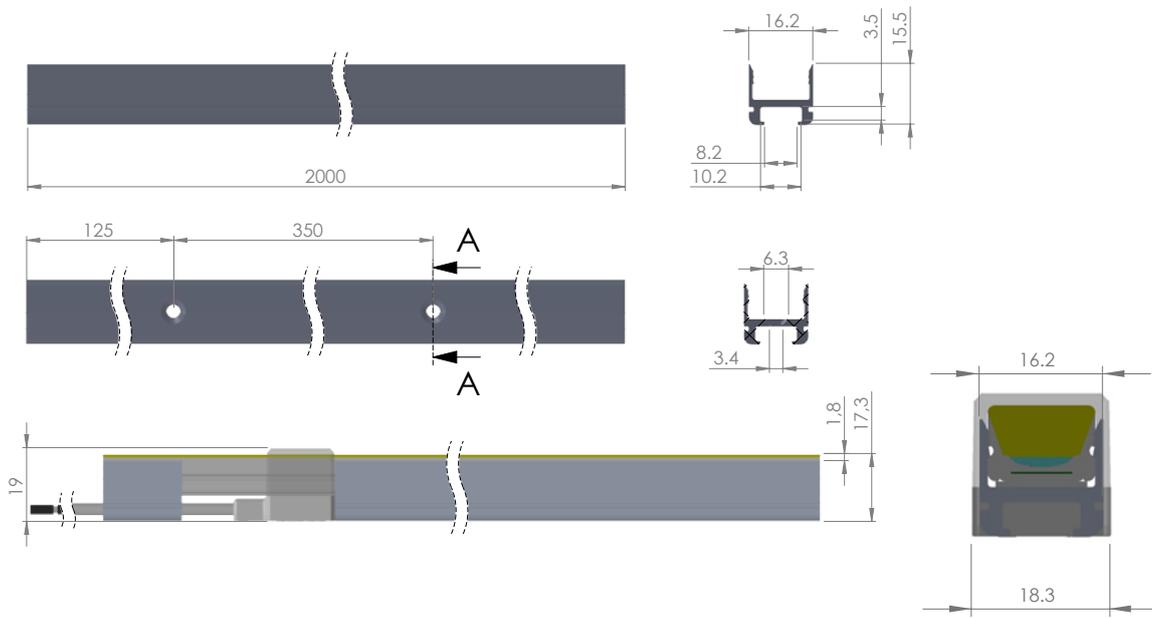
FX-LFDM-G1-BT-17H11



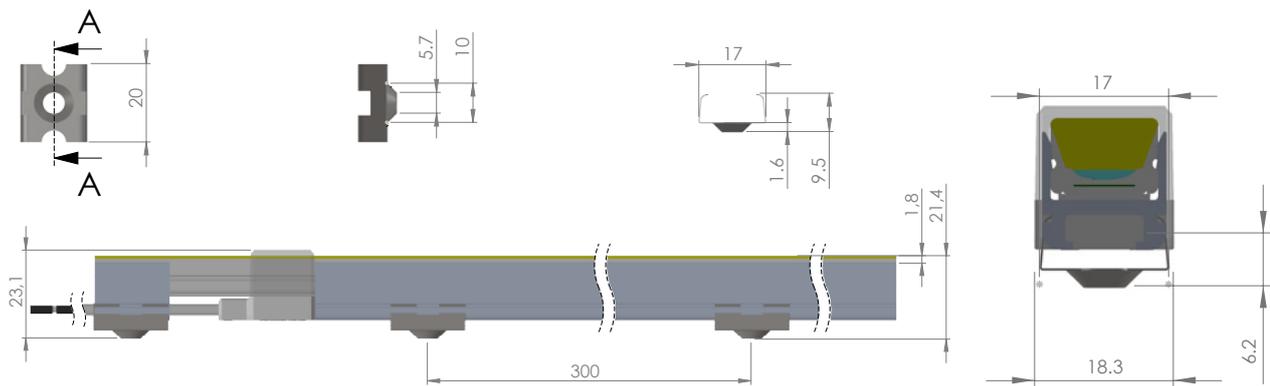
FX-LFDM-G1-BTL-17H11E9



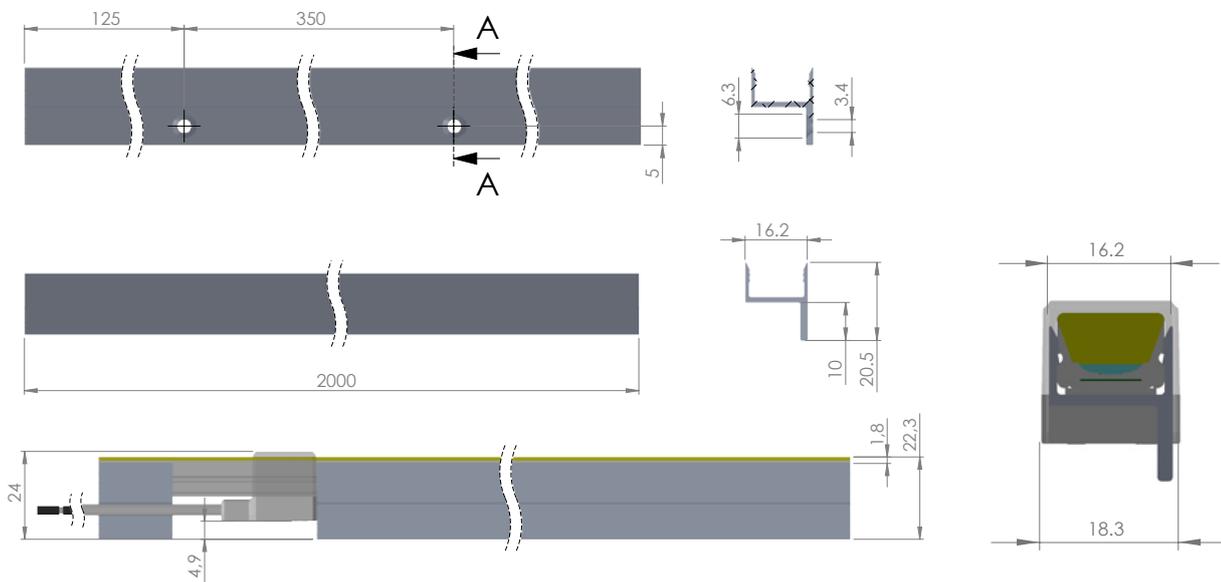
FX-LFDM-G1-TT-16H16-200



FX-LFDM-G1-TT-16H16-200 + clip BMZI

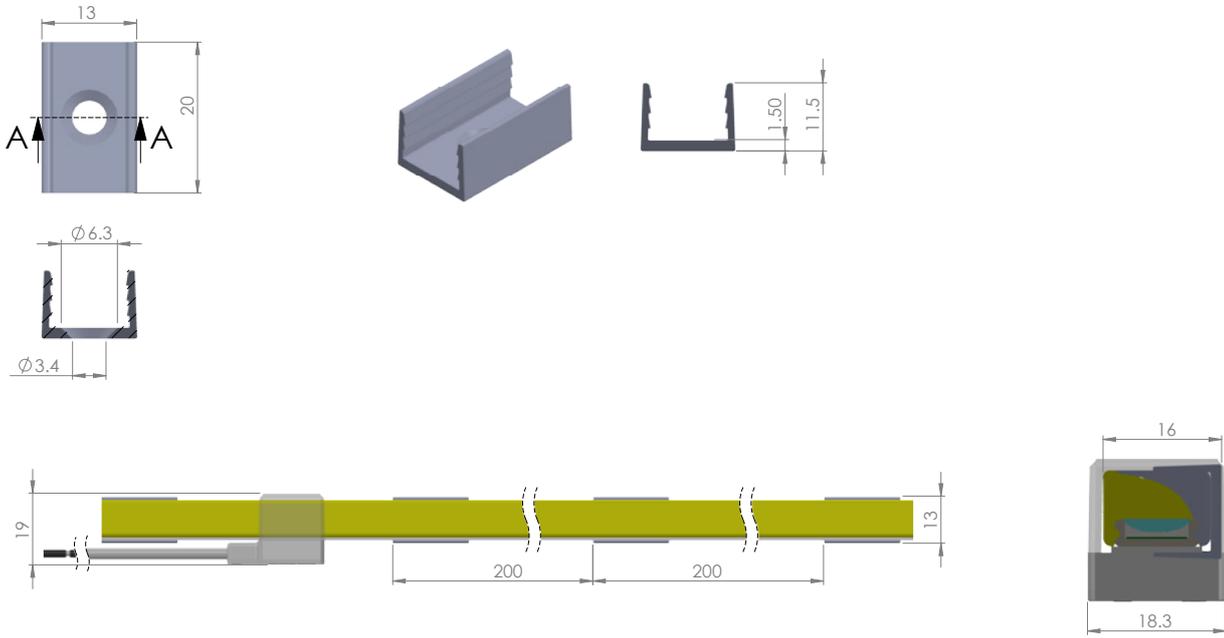


FX-LFDM-G1-TTL-16H11W10-200

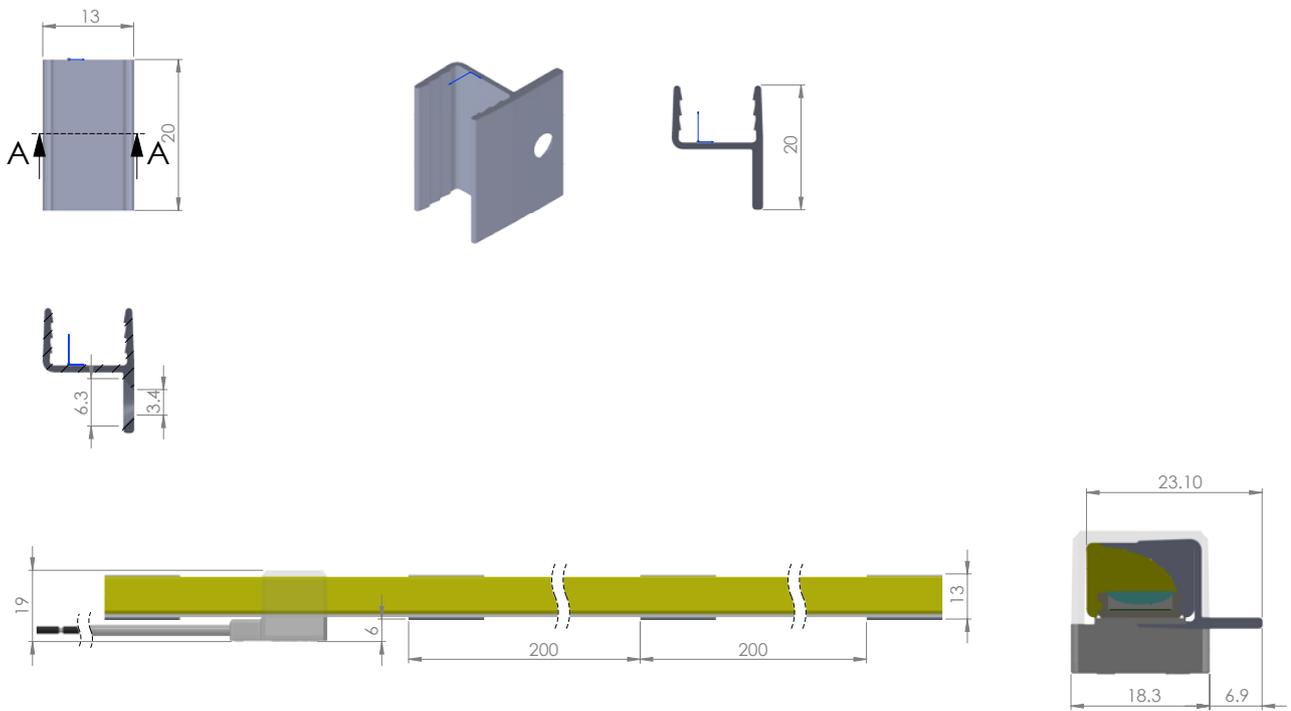


LINEARlight Flex Diffuse SIDE

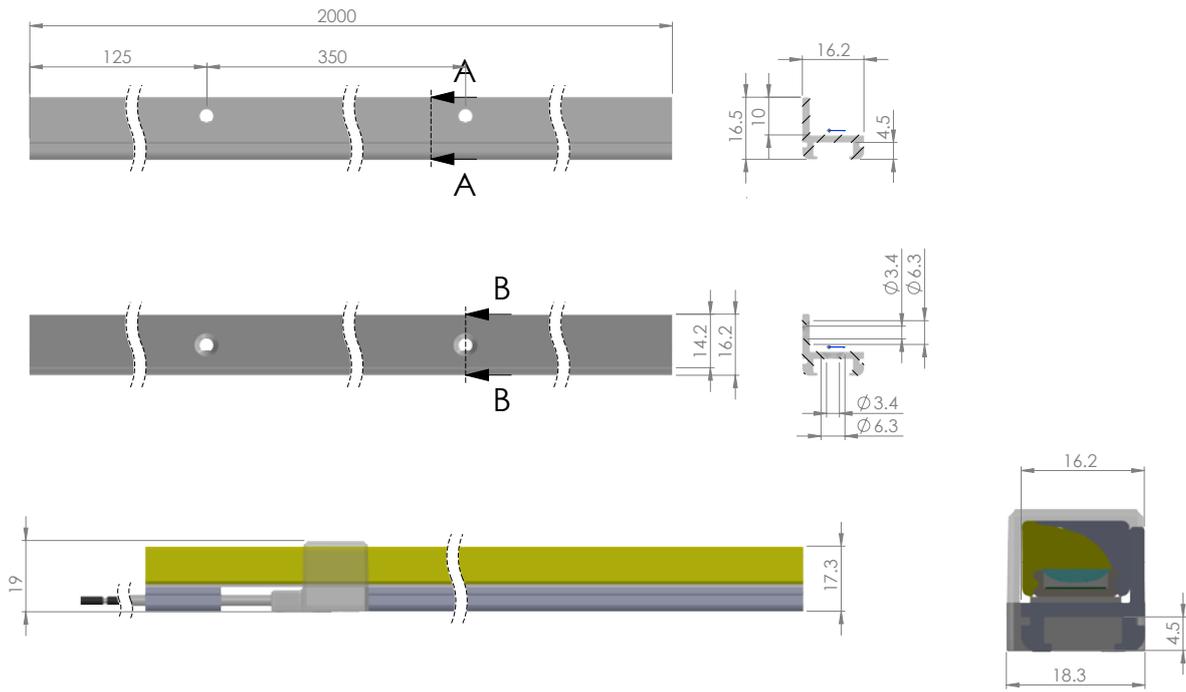
FX-LFDM-G1-BS-12H13



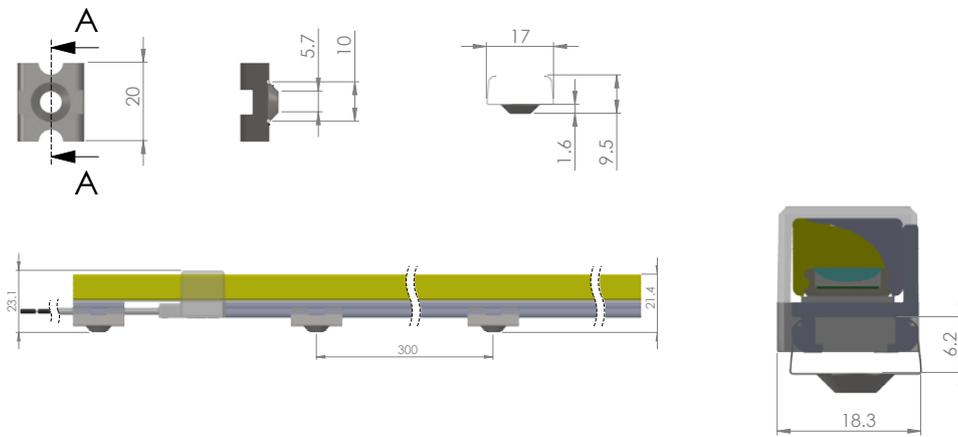
FX-LFDM-G1-BSL-12H13E9



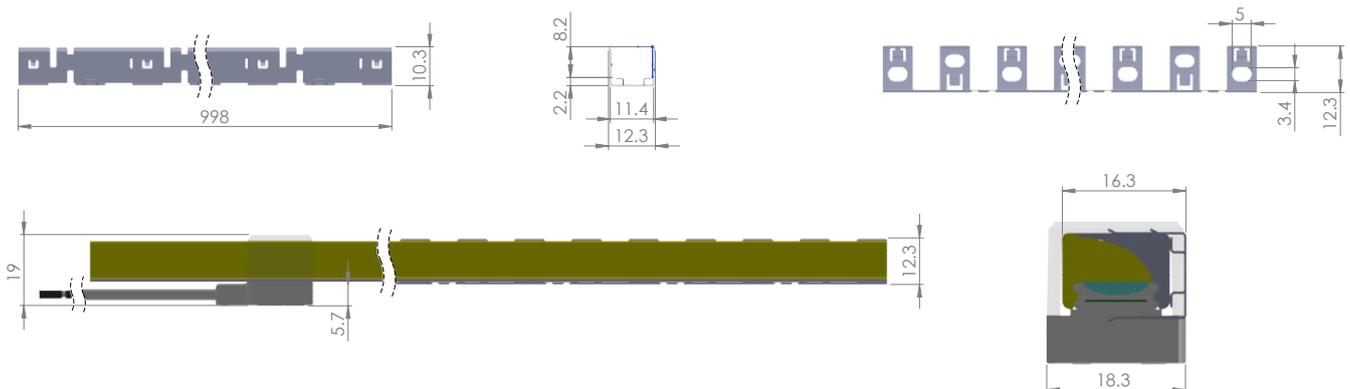
FX-LFDM-G1-TS-16H16-200



FX-LFDM-G1-TS-16H16-200 + BMZI



FX-LFDM-BEND-1000

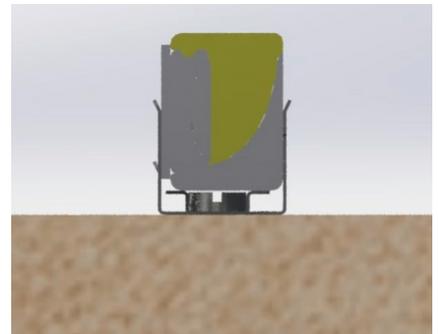


Notes for FX-LFDM-BEND-1000 installation

- To install this bendable profile correctly, it is recommended to use at least 10 screws per meter.
- The installation of this bendable profile must not be done with countersunk screws. The thickness of the screw head has to be less than 1.8mm.



- Do not remove the liner from the adhesive tape on the bottom of LINEARlight Flex Diffuse SIDE.
- During the design of the installation, please consider that the light output of LINEARlight Flex Diffuse SIDE can only have an orthogonal direction to the installation surface.



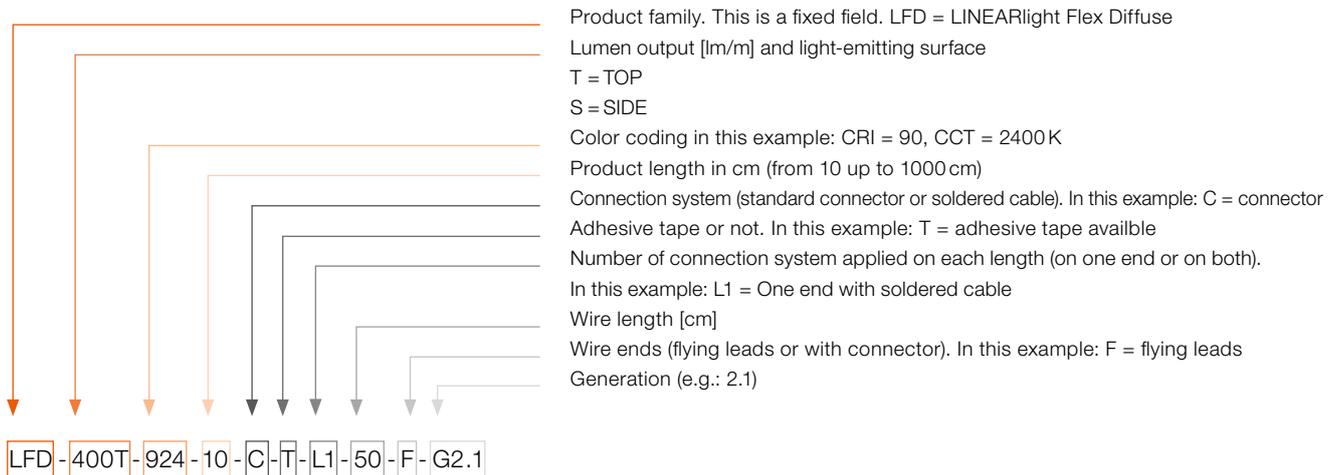
2.5 Custom versions

2.5.1 General description

The LINEARlight Diffuse product family is also available with some customizations that can be defined by using the **Speaking Code Generator** available via the following link:

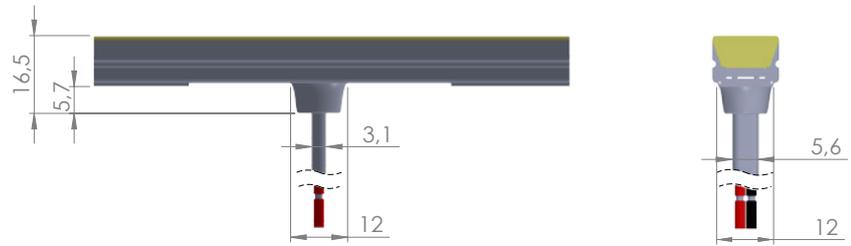
https://www.osram.com/ds/flexible-lighting-systems/tools-and-support/ds_speakingcodegenerator_diffuse.jsp

Using a reference code as a basis, the following is a description of each field that makes up the Speaking Code:



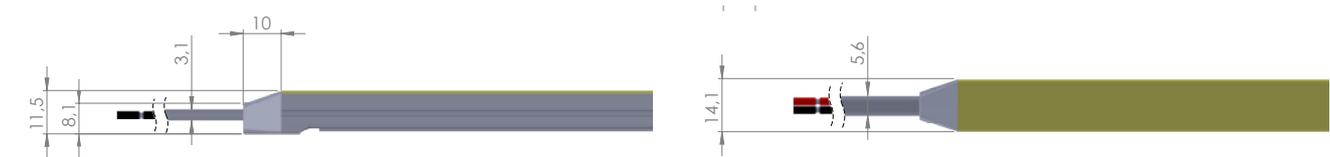
2.5.2 Technical details

If a system connection based on soldered cables is defined in the **Speaking Code**, the section of LINEARlight Flex Diffuse close to the connection area is different from that defined in the previous paragraph. More details are shown in the images below.



Cable on the bottom

The drawing above shows the cable applied on a LINEARlight Flex Diffuse TOP. The same concept with the same dimensions is also available for LINEARlight Flex Diffuse SIDE.



Cable at the end

The drawing above shows the cable applied on a LINEARlight Flex Diffuse TOP. The same concept with the same dimensions is also available for LINEARlight Flex Diffuse SIDE.

3 System connection

3.1 Basic steps of system planning

1. Select the suitable LINEARlight Flex Diffuse LED module with regard to your application and its requirements (level of light output, bending direction, etc.).
2. Determine the required level of control for the application (dimming, control interface, etc.).
3. Determine the number of LINEARlight Flex Diffuse LED modules and total wattage to be installed.
4. Consider all possible limitations of the setup: Cable lengths (for this, please have a look at the application guide for OPTOTRONIC constant-voltage LED drivers and at the technical documentation available for each OT CV device), thermal load, mechanical forces, ambient conditions and all other factors that may occur in a certain application.

3.2 Standard connection

The electrical connection between the secondary side of the OPTOTRONIC LED driver and the LINEARlight Flex Diffuse LED module must be IP-rated. Therefore, a clamp with an appropriate IP rating has to be applied.



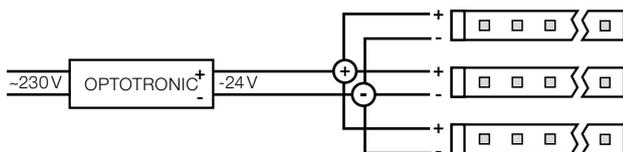
Apply a clamp with appropriate IP rating

Note:

For further information, please see the datasheets of the OPTOTRONIC LED drivers.

3.3 Parallel and series connection

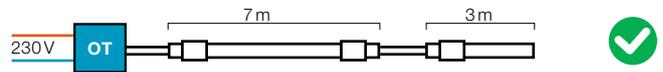
If multiple LINEARlight Flex Diffuse LED modules are connected to one LED driver, they must be connected in parallel as shown in the image below.



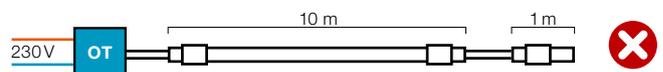
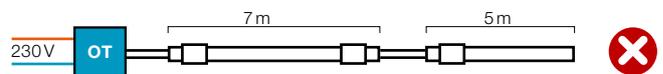
Series connection, made possible by using FX-DCS-G1-CM2PJ-IP67-0190-X5, is allowed. However, the connection of different LED modules to the ECG must be done carefully, without exceeding the maximum operable length of LED modules (the product length is a technical information available on each technical datasheet or specification sheet of each LFD product).

Example:

LFD400S-G2-xxxx-10 is a 10-m product. A section of 3m can be connected with another one of 7m (10m in total), as shown below:

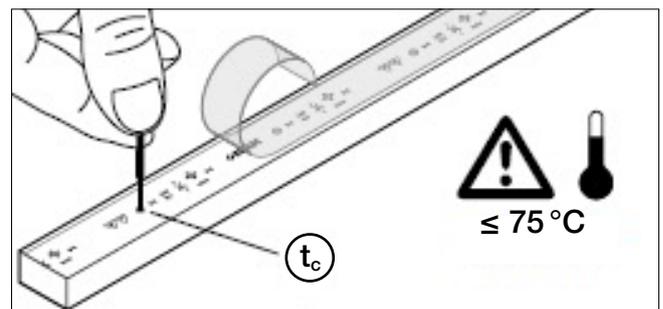


However, more sections **cannot** be connected in series if the sum of their lengths is longer than the maximum operable length of the standard product.



3.4 Temperature

For final application, it is important to check if the case temperature t_c of the product is lower than the maximum declared value. An ambient temperature change during the day (due to, for example, a different sun exposure or the turning on of a heating system) can in fact influence the t_c value when the LED module is on. For this reason, it is required to measure the case temperature at the t_c point in the worst possible conditions of the installation. Where to measure the case temperature t_c and the respective maximum temperature values are shown below:



4 Flexessories

To support the installation of Flex LED strips, a whole range of Flexessories – dedicated accessories for Flex LED strips – is available. Our new extended range of Flexessories facilitates a quick and easy installation.

CONNECTsystem Diffuse for LINEARlight Flex Diffuse TOP

Product type	Product description	Product code (EAN 10)	Package content (EAN 10)
Middle power feeder	FX-DCS-G1-CM2PF-IP67-0500-X5	4052899451971	5 x feeder
Strip-to-strip middle jumper	FX-DCS-G1-CM2PJ-IP67-0190-X5	4052899452039	5 x jumper
Feeder kit with end caps and glue	FX-DCS-G1-CM2PF-IP67-TOPKIT5	4052899451995	5 x feeder, 10 x endcap, 1 x glue (5g)
Jumper kit with end caps and glue	FX-DCS-G1-CM2PJ-IP67-TOPKIT5	4052899452053	5 x jumper, 10 x endcap, 1 x glue (5g)
End caps and glue	FX-DCS-G1-ECT-KIT20	4052899452107	20 x endcap, 2 x glue (5g)
Double-sided end caps and glue	FX-DCS-G1-EHT-KIT20	4052899452176	20 x endcap, 1 x glue (25g)
Silicone glue 25 g	FX-DCS-G1-GL-25	4052899452244	1 x glue (25g)

CONNECTsystem Diffuse for LINEARlight Flex Diffuse SIDE

Product type	Product description	Product code (EAN 10)	Package content (EAN 10)
Middle power feeder	FX-DCS-G1-CM2PF-IP67-0500-X5	4052899451971	5 x feeder
Strip-to-strip middle jumper	FX-DCS-G1-CM2PJ-IP67-0190-X5	4052899452039	5 x jumper
Feeder kit with end caps and glue	FX-DCS-G1-CM2PF-IP67-SIDEKIT5	4052899452015	5 x feeder, 10 x endcap, 1 x glue (5g)
Jumper kit with end caps and glue	FX-DCS-G1-CM2PJ-IP67-SIDEKIT5	4052899452077	5 x jumper, 10 x endcap, 1 x glue (5g)
End caps and glue	FX-DCS-G1-ECS-KIT20	4052899452121	20 x endcap, 2 x glue (5g)
Double-sided end caps and glue	FX-DCS-G1-EHS-KIT20	4052899452206	20 x endcap, 1 x glue (25g)
Silicone glue 25 g	FX-DCS-G1-GL-25	4052899452244	1 x glue (25g)

Diffuse mounting system: Brackets and aluminum profiles for LINEARlight Flex Diffuse TOP

Product type	Product description	Product code (EAN 10)	Package content (EAN 10)
Mounting bracket for aluminum profile	FX-QMS-G1-BMZI-DIV1	4052899446861	40 x mounting bracket
Mounting bracket	FX-LFDM-G1-BT-17H11	4052899452480	50 x mounting bracket
Mounting bracket with additional wing	FX-LFDM-G1-BTL-17H11E9	4052899452510	50 x mounting bracket
Aluminum profile TOP	FX-LFDM -G1-TT-16H16-200	4052899544949	5 x profile
Aluminum profile TOP wings	FX-LFDM -G1-TTL-16H11W10-200	4052899544963	5 x profile

Diffuse mounting system: Brackets and aluminum/steel profiles for LINEARlight Flex Diffuse SIDE

Product type	Product description	Product code (EAN 10)	Package content (EAN 10)
Mounting bracket for aluminum profile	FX-QMS-G1-BMZI-DIV1	4052899446861	40 x mounting bracket
Mounting bracket	FX-LFDM-G1-BS-12H13	4052899452541	50 x mounting bracket
Mounting bracket with additional wing	FX-LFDM-G1-BSL-12H13E9	4052899452572	50 x mounting bracket
Aluminum profile SIDE	FX-LFDM-G1-TS-16H16-200	4052899544925	5 x profile
Steel profile bendable SIDE	FX-LFDM-BEND-1000 KIT 3 PCS	4062172192583	3 x profile

Symbols

 K	Color temperature in K	 lm/W	Luminous efficacy
 V	Voltage in V		No. of LEDs per meter
 COLOR	Color		Length l in mm
 λ	Wavelength		Minimal length l in mm
 W METER	Nominal wattage per meter in W		Width w in mm
 lm METER	Luminous flux per meter		Height h in mm
	Energy efficiency class		

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