



#### Module LLE FLEX 8mm PRE

Modules LLE FLEX premium

#### Product description

- Dimmable 24 V constant voltage LED flextape (SELV)
- Ideal for application on aluminum extrusions but also for various decorative lighting applications such as cove lighting, façade accent lighting etc.
- Long lifetime: 60,000 hours
- 5 years guarantee

#### Optical properties

- Linear Tunable White LED module with 2,700 and 6,500 K SMT packages
- Useful luminous flux 765 lm at  $t_p = 25\text{ °C}$
- Efficacy of the LED module 95 lm/W at  $t_p = 25\text{ °C}$
- Small colour tolerance (MacAdam 3), CRI 90<sup>®</sup>

#### Mechanical properties

- Extremely narrow pitch distance enables short distance to diffuser and outstanding homogeneity
- High design freedom due to 7.5 cm cut-options
- Self-adhesive tape at the backside for simple mounting on different surfaces
- reel2reel – No solder joints on the tape, easy to separate and low length tolerances<sup>®</sup>

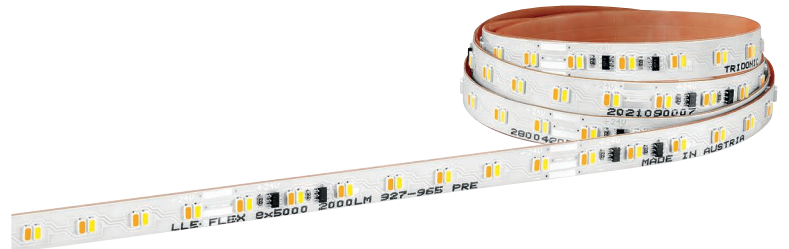
#### System solution

- System solution in combination with Tridonic constant voltage LED driver (fixed output) and basicDIM Wireless PWM CV 4CH for colour temperature control



**Standards**, page 3

**Colour temperatures and tolerances**, page 6



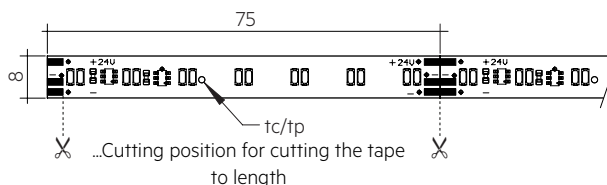


### Module LLE FLEX 8mm PRE

Modules LLE FLEX premium

#### Technical data

Beam characteristic	120°
Ambient temperature range	-25 ... +45 °C
tp rated	65 °C
tc	75 °C
DC supply voltage	24 V
DC supply voltage range <sup>®</sup>	21.5 – 26.4 V
Insulation test voltage	0.5 kV
ESD classification	severity level 2
Risk group (IEC 62471)	RGO
Classification acc. to IEC 62031	Built-in
Type of protection	IP00
Lumen maintenance L70B50	60,000 h
Guarantee	5 years



#### Ordering data

Type	Article number	Colour temperature	Packaging carton	Weight per pc.
<b>LLE FLEX 8x5000 1300lm 927-965 PRE</b>	<b>28004204</b>	2,700 – 6,500 K	40 pc(s).	0.09 kg
<b>LLE FLEX 8x5000 2000lm 927-965 PRE</b>	<b>28004205</b>	2,700 – 6,500 K	40 pc(s).	0.09 kg
<b>LLE FLEX 8x5000 3000lm 927-965 PRE</b>	<b>28004206</b>	2,700 – 6,500 K	40 pc(s).	0.09 kg

#### Specific technical data

Type	Channel	Photo-metric code	Useful luminous flux at tp = 25 °C <sup>®</sup>	Expected luminous flux at tp rated <sup>®</sup>	Typ. current consumption at tp rated	Power consumption Pon at tp = 25 °C <sup>®</sup>	Efficacy of the module at tp = 25 °C	Expected efficacy of the module at tp rated	Colour rendering index CRI
<b>LLE FLEX 8x5000 1300lm – Values for 52.5 cm (7 segments)</b>									
<b>LLE FLEX 8x5000 1300lm 927-965 PRE</b>	WW	927/359	320 lm	260 lm	121 mA	3,2 W	100 lm/W	90 lm/W	> 90
	CW	965/359	–	285 lm	121 mA	–	–	101 lm/W	> 90
<b>LLE FLEX 8x5000 2000lm – Values for 52.5 cm (7 segments)</b>									
<b>LLE FLEX 8x5000 2000lm 927-965 PRE</b>	WW	927/359	487 lm	402 lm	189 mA	5,0 W	99 lm/W	89 lm/W	> 90
	CW	965/359	–	448 lm	189 mA	–	–	100 lm/W	> 90
<b>LLE FLEX 8x5000 3000lm – Values for 52.5 cm (7 segments)</b>									
<b>LLE FLEX 8x5000 3000lm 927-965 PRE</b>	WW	927/359	765 lm	650 lm	313 mA	8,1 W	95 lm/W	86 lm/W	> 90
	CW	965/359	–	725 lm	313 mA	–	–	98 lm/W	> 90

<sup>®</sup> Integral measurement over the complete module.

<sup>®</sup> For 5 m reel max. 1 solder joint.

<sup>®</sup> Exceeding the max. operating voltage leads to an overload on the LLE FLEX. This may in turn result in a reduction in lifetime or even in destruction.

<sup>®</sup> Tolerance of useful light flux - 0 % / + 20 %. Measurement uncertainty ± 10 %. Values given for 52.5 cm LLE FLEX.

<sup>®</sup> Tolerance of expected light flux - 0 % / + 20 %. Measurement uncertainty ± 10 %. Values given for 52.5 cm LLE FLEX. Based on calculation.

<sup>®</sup> Tolerance of power consumption Pon ± 15 %. Measurement uncertainty ± 5 %. Values given for 52.5 cm LLE FLEX.

## 1. Standards

IEC 62031  
IEC 62471  
IEC 61000-4-2  
UL 8750 (for CLASS2 circuits and dry locations)

### 1.1 Photometric code

Key for photometric code, e. g. 830 / 349

1 <sup>st</sup> digit	2 <sup>nd</sup> + 3 <sup>rd</sup> digit	4 <sup>th</sup> digit	5 <sup>th</sup> digit	6 <sup>th</sup> digit
Code CRI	Colour temperature in Kelvin x 100	MacAdam initial	MacAdam after 25% of the lifetime (max.6000h)	Luminous flux after 25% of the lifetime (max.6000h)
7 70 – 79				Code Luminous flux
8 80 – 89				7 $\geq 70$ %
9 $\geq 90$				8 $\geq 80$ % 9 $\geq 90$ %

### 1.2 Energy classification

Type	Colour temperature	Energy classification	Energy consumption
LLE FLEX 8x5000 1300lm 927-965 PRE	2,700 K	F	4 kWh / 1,000 h
LLE FLEX 8x5000 2000lm 927-965 PRE	2,700 K	F	5 kWh / 1,000 h
LLE FLEX 8x5000 3000lm 927-965 PRE	2,700 K	F	9 kWh / 1,000 h

Energy label and further information at [www.tridonic.com](http://www.tridonic.com) in the certificates tab of the corresponding product page and at the EPREL data base <https://eprel.ec.europa.eu/>

## 2. Thermal details

### 2.1 tc point, ambient temperature and lifetime

The temperature at tp reference point is crucial for the light output and lifetime of a LED product.

For LLE a tp temperature of 65°C has to be complied in order to achieve an optimum between heat sink requirements, light output and lifetime.

Compliance with the maximum permissible reference temperature at the tc point must be checked under operating conditions in a thermally stable state. The maximum value must be determined under worst-case conditions for the relevant application.

The tc and tp temperature of LED modules from Tridonic are measured at the same reference point.

### 2.2 Storage and humidity

Storage temperature	-30...+80 °C
---------------------	--------------

Operation only in non condensing environment.

Humidity during processing of the module should be between 0 to 70 %.

### 2.3 Thermal design and heat sink

The rated life of LED products depends to a large extent on the temperature. If the permissible temperature limits are exceeded, the life of the LLE will be greatly reduced or the LLE may be destroyed.

### 2.4 Heat sink values

#### LLE FLEX 1300lm PRE

ta	tp	R <sub>th, hs-a</sub> <sup>①</sup>	Cooling area <sup>①</sup>
25°C	65°C	–	self cooling
35°C	65°C	–	self cooling
45°C	65°C	–	self cooling

#### LLE FLEX 2000lm PRE

ta	tp	R <sub>th, hs-a</sub> <sup>①</sup>	Cooling area <sup>①</sup>
25°C	65°C	–	self cooling
35°C	65°C	–	self cooling
45°C	65°C	18.00 K/W	39 cm <sup>2</sup>

#### LLE FLEX 3000lm PRE

ta	tp	R <sub>th, hs-a</sub> <sup>①</sup>	Cooling area <sup>①</sup>
25°C	65°C	18.90 K/W	35 cm <sup>2</sup>
35°C	65°C	13.00 K/W	49 cm <sup>2</sup>
45°C	65°C	7.90 K/W	79 cm <sup>2</sup>

<sup>①</sup> Values for a single segment of the LLE FLEX (75 mm).

### Notes

The actual cooling surface can differ because of the material, the structural shape, outside influences and the installation situation. A heat transfer coefficient of 0,0015 is used for the calculation.

### 3. Installation / wiring

#### 3.1 Electrical supply/choice of LED driver

LLE modules from Tridonic are not protected against overvoltages, overcurrents, overloads or short-circuit currents. Safe and reliable operation can only be guaranteed in conjunction with a LED driver which complies with the relevant standards. The use of LED driver from Tridonic in combination with LLE modules guarantees the necessary protection for safe and reliable operation.

If a LED driver other than Tridonic is used, it must provide the following protection:

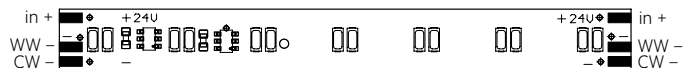
- SELV
- Short-circuit protection
- Overload protection
- Overtemperature protection



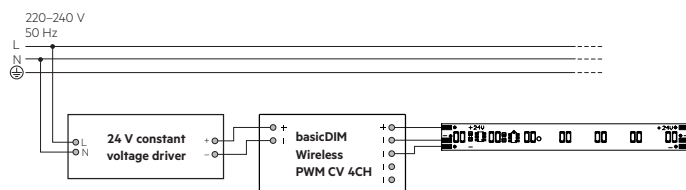
LLE modules must be supplied by a constant voltage LED driver. Operation with a constant current LED driver will lead to an irreversible damage of the module.

Wrong polarity can damage the LLE FLEX.

#### 3.2 Wiring



#### Wiring examples for serial wiring



#### 3.2 Mounting instruction



None of the components of the LLE (substrate, LED, electronic components etc.) may be exposed to tensile or compressive stresses.

The LLE FLEX is separable each 75 mm with the full function of each segment.

The LLE FLEX is to be installed within 2 weeks after it has been removed from the ESD blister packaging (contacting by means of soldering).

Insulation must be ensured at the contact area of the segments (e.g. by using additional insulation in the area of the solder connection).

The fixing/cooling surface must be cleaned before installing the LLE FLEX modules to remove all dirt, dust and grease.

Prevent shear- or peel forces

Min. bending radius of the LLE FLEX is 2 cm.

For details see Application Note: [www.tridonic.com](http://www.tridonic.com)



Chemical substance may harm the LED module. Chemical reactions could lead to colour shift, reduced luminous flux or a total failure of the module caused by corrosion of electrical connections.

Materials which are used in LED applications (e.g. sealings, adhesives) must not produce dissolver gas. They must not be condensation curing based, acetate curing based or contain sulfur, chlorine or phthalate.

Avoid corrosive atmosphere during usage and storage.

#### 3.3 Soldering guidelines



The modules are suitable only for manual soldering (max. 275 °C, 2 seconds).

#### 3.3 EOS/ESD safety guidelines



The device / module contains components that are sensitive to electrostatic discharge and may only be installed in the factory and on site if appropriate EOS/ESD protection measures have been taken. No special measures need be taken for devices/modules with enclosed casings (contact with the pc board not possible), just normal installation practice. Please note the requirements set out in the document EOS / ESD guidelines (Guideline\_EOS\_ESD.pdf) at: <http://www.tridonic.com/esd-protection>

## 4. Lifetime

### 4.1 Lifetime, lumen maintenance and failure rate

The light output of an LED module decreases over the lifetime, this is characterized with the L value.

L70 means that the LED module will give 70 % of its initial luminous flux. This value is always related to the number of operation hours and therefore defines the lifetime of an LED module.

As the L value is a statistical value and the lumen maintenance may vary over the delivered LED modules.

The B value defines the amount of modules which are below the specific L value, e.g. L70B10 means 10 % of the LED modules are below 70 % of the initial luminous flux, respectively 90 % will be above 70 % of the initial value. In addition the percentage of failed modules (fatal failure) is characterized by the C value.

The F value is the combination of the B and C value. That means for F degradation and complete failures are considered, e.g. L70F10 means 10 % of the LED modules may fail or be below 70 % of the initial luminous flux.

### 4.2 Lumen maintenance for LLE FLEX PRE

Supply voltage	tp temperature	L90/B10	L90/B50	L80/B10	L80/B50	L70/B10	L70/B50
24 V	50 °C	>60k h	>60k h	>60k h	>60k h	>60k h	>60k h
24 V	65 °C	19k h	23k h	39k h	46k h	>60k h	>60k h
24 V	75 °C	19k h	23k h	39k h	46k h	>60k h	>60k h

### 4.3 Switching capability

30,000 cycles

Test according to IEC 62717 Cl 10.3.3

30 s on / 30 s off at I<sub>max</sub>

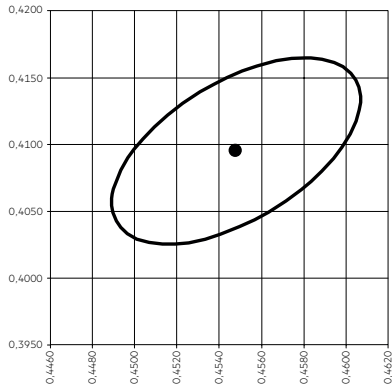
## 6. Photometric characteristics

### 6.1 Coordinates and tolerances according to CIE 1931

The specified colour coordinates are measured integral by a current impulse with typical values of module and a duration of 100 ms.  
The ambient temperature of the measurement is  $t_a = 25^\circ\text{C}$ .  
The measurement tolerance of the colour coordinates are  $\pm 0.007$ .

#### 2,700 K - 1,300 lm

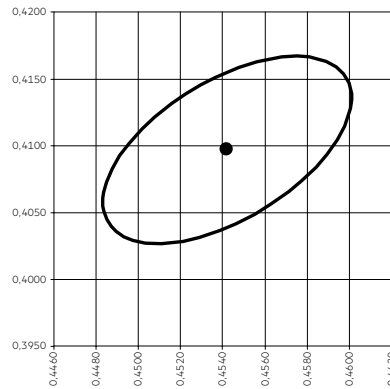
	x0	y0
Centre	0.4548	0.4095



MacAdam Ellipse: 3SDCM

#### 2,700 K - 2,000 lm

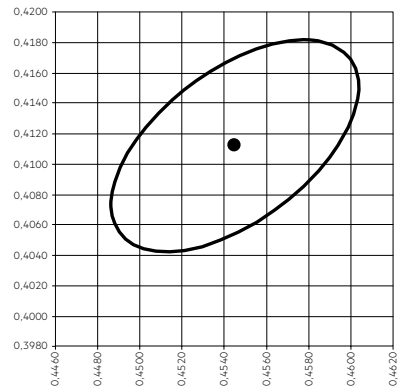
	x0	y0
Centre	0.4542	0.4097



MacAdam Ellipse: 3SDCM

#### 2,700 K - 3,000 lm

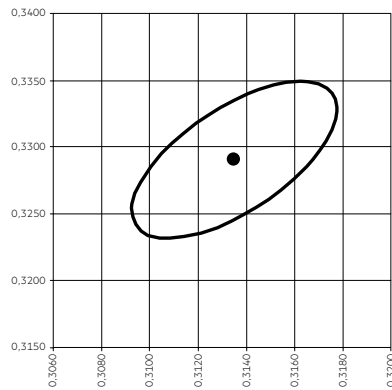
	x0	y0
Centre	0.4545	0.4112



MacAdam Ellipse: 3SDCM

#### 6,500 K - 1,300 lm

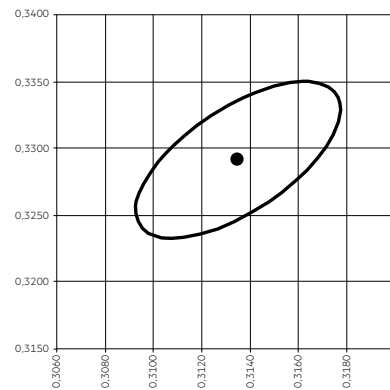
	x0	y0
Centre	0.3135	0.3290



MacAdam Ellipse: 3SDCM

#### 6,500 K - 2,000 lm

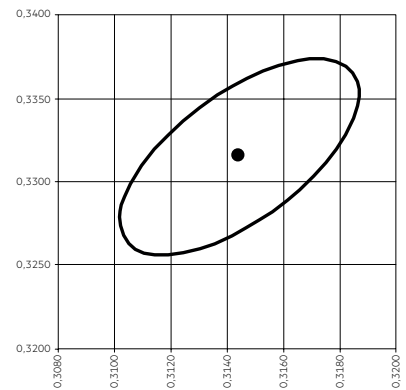
	x0	y0
Centre	0.3135	0.3291



MacAdam Ellipse: 3SDCM

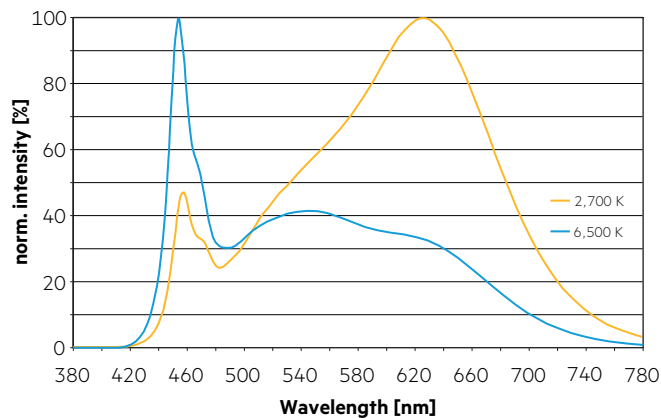
#### 6,500 K - 3,000 lm

	x0	y0
Centre	0.3144	0.3315



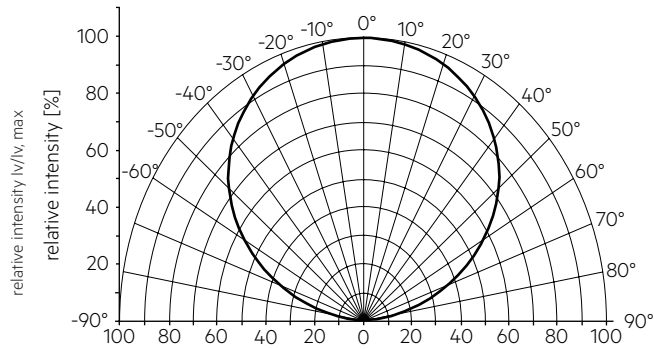
MacAdam Ellipse: 3SDCM

### Colour spectrum at different colour temperatures



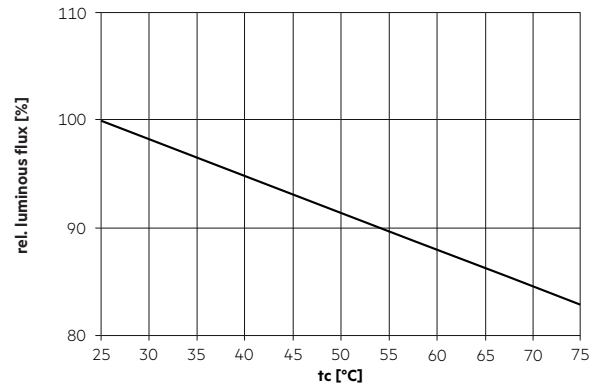
### 6.2 Light distribution

The optical design of the LLE product line ensures optimum homogeneity for the light distribution.



The colour temperature is measured over the complete module. To ensure an ideal mixture of colours and a homogeneous light distribution a suitable optic (e. g. PMMA diffuser) and a sufficient spacing between module and optic (typ. 5 cm) should be used.

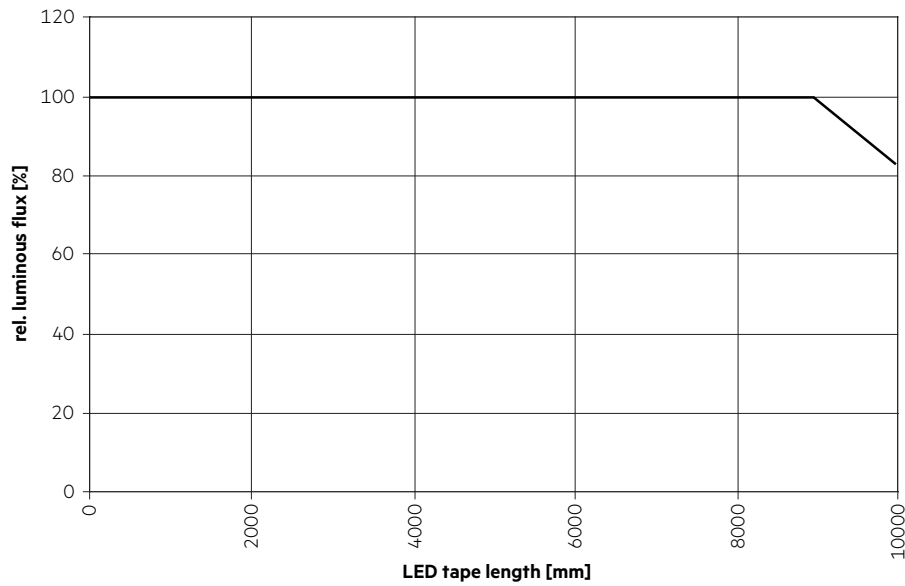
### 6.3 Relative luminous flux vs. tc temperature



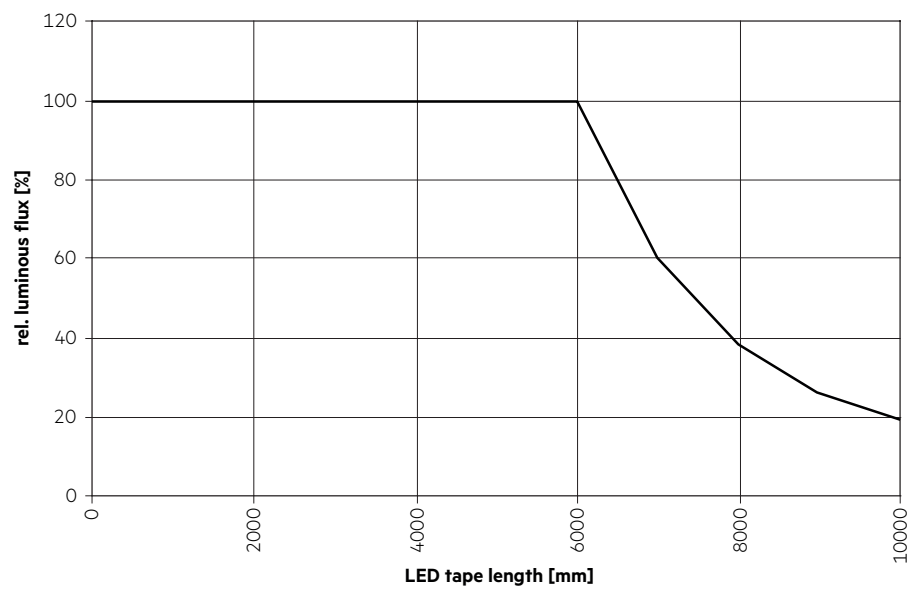
### 6.4 Relative luminous flux vs. LED tape length

The graphs show the luminous flux drop of the first compare to the last segment over the used tape length.

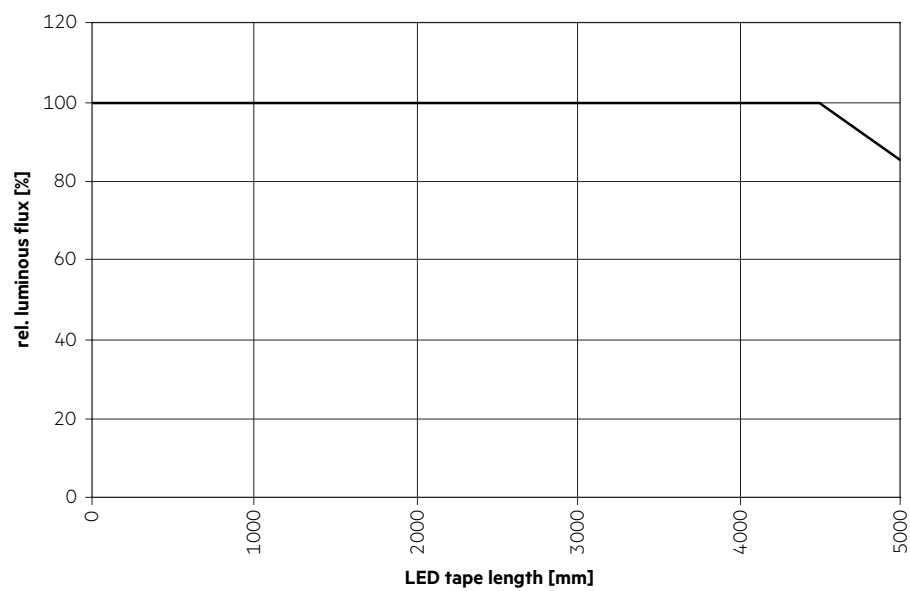
LLE FLEX 1300lm PRE:



LLE FLEX 2000lm PRE:



LLE FLEX 3000lm PRE:



## 7. Miscellaneous

### 7.1 Additional information

Additional technical information at [www.tridonic.com](http://www.tridonic.com) → Technical Data

Guarantee conditions at [www.tridonic.com](http://www.tridonic.com) → Services

Lifetime declarations are informative and represent no warranty claim.