



Module LLE FLEX 8mm EXC2

Modules LLE FLEX excite

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 life-time: 60,000 hours
- 5-year guarantee

Optical properties

- Colour temperature 2,700, 3,000, 4,000 and 6,500 K with SDCM 3[®]
- Luminous flux range of 600, 1,200, 1,800 and 2,500 lm/m
- Efficacy of the module up to 120 lm/W
- Small colour tolerance (MacAdam 3), CRI 90

Mechanical properties

- Extremely narrow pitch distance enables short distance to diffuser and outstanding homogeneity
- High design freedom due to 5 cm cut-options
- Self-adhesive 3M tape at the backside for simple mounting on different surfaces
- PCB to PCB and wire to PCB connectors for toolless handling and connection
- reel2reel – No solder joints on the tape, easy to separate and low length tolerances

System solution

- System solution in combination with Tridonic constant voltage LED Driver (fixed output and dimmable)



Standards, page 5

Colour temperatures and tolerances, page 7



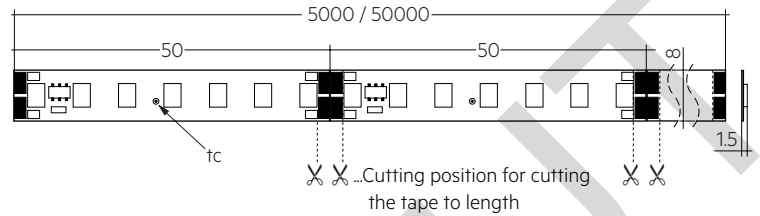


Module LLE FLEX 8mm EXC2

Modules LLE FLEX excite

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®	21.5 – 26.4 V
Insulation test voltage	0.5 kV
ESD classification	severity level 1
Risk group (IEC 62471)	RG1
Classification acc. to IEC 62031	Built-in
Type of protection	IP00
Life-time	up to 60,000 h
Guarantee	5 years



Ordering data

Type	Article number	Colour temperature	Packaging carton	Weight per pc.
5,000 mm reel				
LLE FLEX 8x5000 6W-600lm/m 927 EXC2	28002776	2,700 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 6W-600lm/m 930 EXC2	28002777	3,000 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 6W-600lm/m 940 EXC2	28002778	4,000 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 6W-600lm/m 965 EXC2	28002779	6,500 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 11W-1200lm/m 927 EXC2	28002780	2,700 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 11W-1200lm/m 930 EXC2	28002781	3,000 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 11W-1200lm/m 940 EXC2	28002782	4,000 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 11W-1200lm/m 965 EXC2	28002783	6,500 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 19W-1800lm/m 927 EXC2	28002784	2,700 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 19W-1800lm/m 930 EXC2	28002785	3,000 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 17W-1800lm/m 940 EXC2	28002786	4,000 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 17W-1800lm/m 965 EXC2	28002787	6,500 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 27W-2500lm/m 927 EXC2	28002788	2,700 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 27W-2500lm/m 930 EXC2	28002789	3,000 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 23W-2500lm/m 940 EXC2	28002790	4,000 K	40 pc(s).	0.049 kg
LLE FLEX 8x5000 23W-2500lm/m 965 EXC2	28002791	6,500 K	40 pc(s).	0.049 kg
50,000 mm reel				
LLE FLEX 8x50000 11W-1200lm/m 927 EXC2	28002812	2,700 K	6 pc(s).	0.490 kg
LLE FLEX 8x50000 11W-1200lm/m 930 EXC2	28002813	3,000 K	6 pc(s).	0.490 kg
LLE FLEX 8x50000 11W-1200lm/m 940 EXC2	28002814	4,000 K	6 pc(s).	0.490 kg
LLE FLEX 8x50000 19W-1800lm/m 927 EXC2	28002815	2,700 K	6 pc(s).	0.490 kg
LLE FLEX 8x50000 19W-1800lm/m 930 EXC2	28002816	3,000 K	6 pc(s).	0.490 kg
LLE FLEX 8x50000 17W-1800lm/m 940 EXC2	28002817	4,000 K	6 pc(s).	0.490 kg
LLE FLEX 8x50000 27W-2500lm/m 927 EXC2	28002818	2,700 K	6 pc(s).	0.490 kg
LLE FLEX 8x50000 27W-2500lm/m 930 EXC2	28002819	3,000 K	6 pc(s).	0.490 kg
LLE FLEX 8x50000 23W-2500lm/m 940 EXC2	28002820	4,000 K	6 pc(s).	0.490 kg

Specific technical data

Type	Photometric code	Typ. luminous flux at tp = 25 °C ^①	Typ. luminous flux at tp = 65 °C ^①	Typ. current consumption at tp = 65 °C ^②	Typ. power consumption at tp = 65 °C ^②	Efficacy of the module at tp = 25 °C	Efficacy of the module at tp = 65 °C	Colour rendering index CRI at tp = 25 °C ^③
5,000 mm reel								
LLE FLEX 8x5000 6W-600lm/m 927 EXC2	927/359	585 lm/m	503 lm/m	220 mA/m	5.3 W/m	100 lm/W	93 lm/W	> 90
LLE FLEX 8x5000 6W-600lm/m 930 EXC2	930/359	615 lm/m	530 lm/m	220 mA/m	5.3 W/m	105 lm/W	98 lm/W	> 90
LLE FLEX 8x5000 6W-600lm/m 940 EXC2	940/359	704 lm/m	600 lm/m	220 mA/m	5.3 W/m	120 lm/W	112 lm/W	> 90
LLE FLEX 8x5000 6W-600lm/m 965 EXC2	965/359	704 lm/m	600 lm/m	220 mA/m	5.3 W/m	120 lm/W	112 lm/W	> 90
LLE FLEX 8x5000 11W-1200lm/m 927 EXC2	927/359	1,210 lm/m	1,040 lm/m	460 mA/m	11.0 W/m	100 lm/W	93 lm/W	> 90
LLE FLEX 8x5000 11W-1200lm/m 930 EXC2	930/359	1,230 lm/m	1,095 lm/m	460 mA/m	11.0 W/m	105 lm/W	98 lm/W	> 90
LLE FLEX 8x5000 11W-1200lm/m 940 EXC2	940/359	1,450 lm/m	1,250 lm/m	460 mA/m	11.0 W/m	120 lm/W	112 lm/W	> 90
LLE FLEX 8x5000 11W-1200lm/m 965 EXC2	965/359	1,450 lm/m	1,250 lm/m	460 mA/m	11.0 W/m	120 lm/W	112 lm/W	> 90
LLE FLEX 8x5000 19W-1800lm/m 927 EXC2	927/359	2,010 lm/m	1,730 lm/m	800 mA/m	19.2 W/m	98 lm/W	91 lm/W	> 90
LLE FLEX 8x5000 19W-1800lm/m 930 EXC2	930/359	2,110 lm/m	1,820 lm/m	800 mA/m	19.2 W/m	103 lm/W	96 lm/W	> 90
LLE FLEX 8x5000 17W-1800lm/m 940 EXC2	940/359	2,140 lm/m	1,840 lm/m	700 mA/m	16.8 W/m	118 lm/W	110 lm/W	> 90
LLE FLEX 8x5000 17W-1800lm/m 965 EXC2	965/359	2,140 lm/m	1,840 lm/m	700 mA/m	16.8 W/m	118 lm/W	110 lm/W	> 90
LLE FLEX 8x5000 27W-2500lm/m 927 EXC2	927/359	2,790 lm/m	2,400 lm/m	1,120 mA/m	26.9 W/m	95 lm/W	89 lm/W	> 90
LLE FLEX 8x5000 27W-2500lm/m 930 EXC2	930/359	2,930 lm/m	2,520 lm/m	1,120 mA/m	26.9 W/m	100 lm/W	94 lm/W	> 90
LLE FLEX 8x5000 23W-2500lm/m 940 EXC2	940/359	2,890 lm/m	2,500 lm/m	960 mA/m	23.0 W/m	116 lm/W	108 lm/W	> 90
LLE FLEX 8x5000 23W-2500lm/m 965 EXC2	965/359	2,890 lm/m	2,500 lm/m	960 mA/m	23.0 W/m	116 lm/W	108 lm/W	> 90
50,000 mm reel								
LLE FLEX 8x50000 11W-1200lm/m 927 EXC2	927/359	1,210 lm/m	1,040 lm/m	460 mA/m	11.0 W/m	100 lm/W	93 lm/W	> 90
LLE FLEX 8x50000 11W-1200lm/m 930 EXC2	930/359	1,230 lm/m	1,095 lm/m	460 mA/m	11.0 W/m	105 lm/W	98 lm/W	> 90
LLE FLEX 8x50000 11W-1200lm/m 940 EXC2	940/359	1,450 lm/m	1,250 lm/m	460 mA/m	11.0 W/m	120 lm/W	112 lm/W	> 90
LLE FLEX 8x50000 19W-1800lm/m 927 EXC2	927/359	2,010 lm/m	1,730 lm/m	800 mA/m	19.2 W/m	98 lm/W	91 lm/W	> 90
LLE FLEX 8x50000 19W-1800lm/m 930 EXC2	930/359	2,110 lm/m	1,820 lm/m	800 mA/m	19.2 W/m	103 lm/W	96 lm/W	> 90
LLE FLEX 8x50000 17W-1800lm/m 940 EXC2	940/359	2,140 lm/m	1,840 lm/m	700 mA/m	16.8 W/m	118 lm/W	110 lm/W	> 90
LLE FLEX 8x50000 27W-2500lm/m 927 EXC2	927/359	2,790 lm/m	2,400 lm/m	1,120 mA/m	26.9 W/m	95 lm/W	89 lm/W	> 90
LLE FLEX 8x50000 27W-2500lm/m 930 EXC2	930/359	2,930 lm/m	2,520 lm/m	1,120 mA/m	26.9 W/m	100 lm/W	94 lm/W	> 90
LLE FLEX 8x50000 23W-2500lm/m 940 EXC2	940/359	2,890 lm/m	2,500 lm/m	960 mA/m	23.0 W/m	116 lm/W	108 lm/W	> 90

^① Tolerance range for optical data ±15 %, measurement uncertainty ±7.5 %. Values given for 1 m LLE FLEX.

^② Tolerance range for electrical data ±15 %, measurement uncertainty ±5 %. Values given for 1 m LLE FLEX.

^③ Measurement uncertainty CRI ±2.

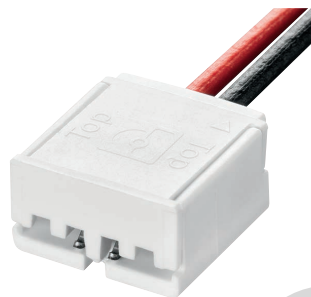
^④ Exceeding the max. operating voltage leads to an overload on the LLE FLEX. This may in turn result in a reduction in life-time or even in destruction.

^⑤ Integral measurement over the complete module.

Connector for LLE FLEX

Product description

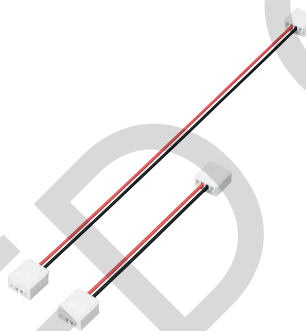
- For connection of LLE FLEX modules
- For internal wiring only (no strain relief functionality)
- Easy assembly: remove adhesive 3M tape on the backside of the LLE FLEX in the connection area, insert the LLE FLEX into the connector and lock it by pressing down the top of the connector
- The insertion length of the LLE FLEX must be at least 4 mm (cut the LLE FLEX at the dotted lines)
- Glow wire test according to IEC 60695-2-11: 650 °C
- Max. 4 A in connection with LLE FLEX EXC2
- Urated = 29,9 V
- Wire cross section AWG 22



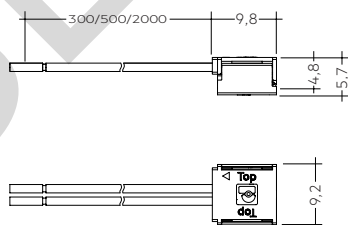
ACL plug connector Wire to PCB



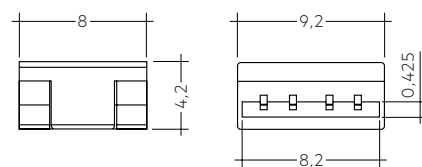
ACL plug connector PCB to PCB



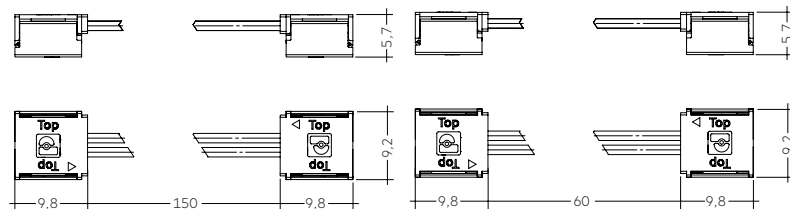
ACL plug corner connector



ACL plug connector Wire to PCB



ACL plug connector PCB to PCB



ACL plug corner connector 150x9.8x5.7mm

ACL plug corner connector 60x9.8x5.7mm

Ordering data

Type	Article number	Cable length	Packaging carton	Packaging bag	Weight per pc.
ACL plug connector Wire to PCB 9x4.2mm	28000994	300 mm	500 pc(s).	20 pc(s).	0.004 kg
ACL plug connector Wire-PCB 500x9x5.7mm	28001657	500 mm	20 pc(s).	–	0.008 kg
ACL plug connector Wire-PCB 2000x9x5.7mm	28001656	2,000 mm	10 pc(s).	–	0.018 kg
ACL plug connector PCB to PCB 8x4.2mm	28000995	–	25 pc(s).	25 pc(s).	0.001 kg
ACL plug corner connector 150x9.8x5.7mm	28001654	–	10 pc(s).	–	0.002 kg
ACL plug corner connector 60x9.8x5.7mm	28001655	–	20 pc(s).	–	0.002 kg

1. Standards

IEC 62031
IEC 62471
IEC 61000-4-2

1.1 Photometric code

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

1 st digit	2 nd + 3 rd digit	4 th digit	5 th digit	6 th digit
Code	CRI	Colour temperature in Kelvin x 100	MacAdam after 25% of the life-time (max.6000h)	Luminous flux after 25% of the life-time (max.6000h)
7	70 – 79	MacAdam initial	(max.6000h)	Code
8	80 – 89			Luminous flux
9	≥90			
				7 ≥ 70 %
				8 ≥ 80 %
				9 ≥ 90 %

1.2 Energy classification

Type	Energy classification
LLE FLEX EXC2	A+

2. Thermal details

2.1 tc point, ambient temperature and life-time

The temperature at tp reference point is crucial for the light output and life-time 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 life-time.

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
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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 600lm/m 9xx EXC2			
ta	tp	R _{th, hs-a} ^①	Cooling area ^①
45 °C	< 75 °C	–	self cooling

LLE FLEX 1200lm/m 9xx EXC2

ta	tp	R _{th, hs-a} ^①	Cooling area ^①
45 °C	< 75 °C	–	self cooling

LLE FLEX 1800lm/m 9xx EXC2

ta	tp	R _{th, hs-a} ^①	Cooling area ^①
35 °C	< 75 °C	–	self cooling
45 °C	65 °C	18 K/W	39 cm²

LLE FLEX 2500lm/m 9xx EXC2

ta	tp	R _{th, hs-a} ^①	Cooling area ^①
25 °C	65 °C	24.7 K/W	27 cm²
35 °C	65 °C	18.0 K/W	37 cm²
45 °C	65 °C	11.3 K/W	59 cm²

① Values for a single segment of the LLE FLEX (50 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 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 50 mm with the full function of each segment.

Insulation must be ensured at the contact area of the segments (e.g. by using the connector ACL or 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



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. Life-time

4.1 Life-time, lumen maintenance and failure rate

The light output of an LED module decreases over the life-time, 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 life-time 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 EXC2

Supply voltage	tp temperature	L90/F10	L90/F50	L80/F10	L80/F50	L70/F10	L70/F50
24 V	45 °C	>60,000 h	>60,000 h	>60,000 h	>60,000 h	>60,000 h	>60,000 h
24 V	55 °C	48,000 h	55,000 h	>60,000 h	>60,000 h	>60,000 h	>60,000 h
24 V	65 °C	35,000 h	39,000 h	>60,000 h	>60,000 h	>60,000 h	>60,000 h
24 V	75 °C	21,000 h	23,000 h	45,000 h	49,000 h	>60,000 h	>60,000 h

4.3 Switching capability

30,000 cycles

Tridonic test according to IEC 62717 Cl 10.3.3

30 s on / 30 s off at Imax

6. Photometric characteristics

6.1 Coordinates and tolerances according to CIE 1931

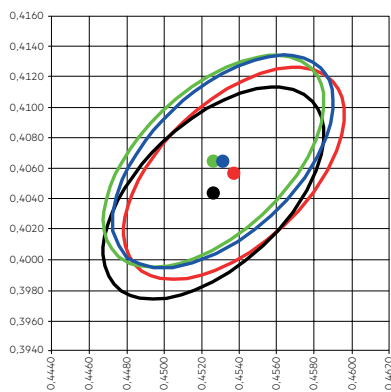
The specified colour coordinates are measured integral by a current impulse with typical values of module and a duration of 100 ms.

The ambient temperature of the measurement is $t_a = 25^\circ\text{C}$.

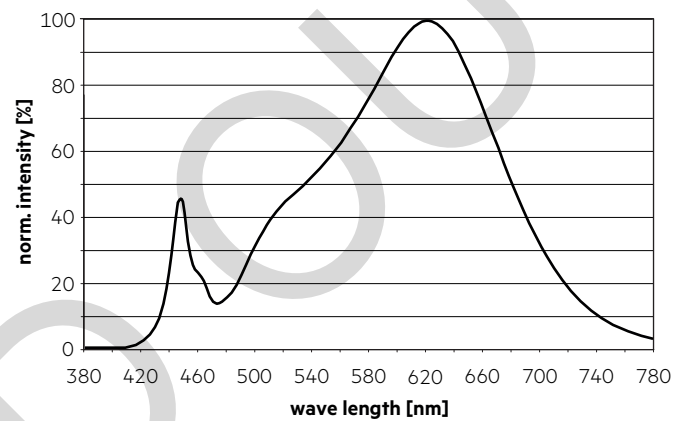
The measurement tolerance of the colour coordinates are ± 0.007 .

2,700 K

	x0	y0
Centre 600 lm/m	0.4526	0.4044
Centre 1,200 lm/m	0.4537	0.4057
Centre 1,800 lm/m	0.4526	0.4065
Centre 2,500 lm/m	0.4531	0.4065

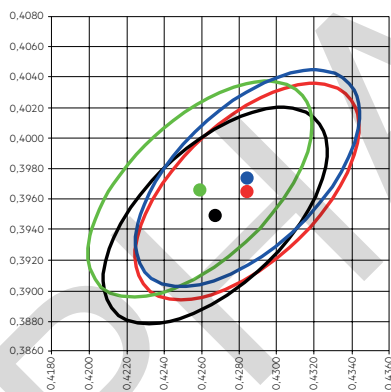


— MacAdam Ellipse: 3SDCM

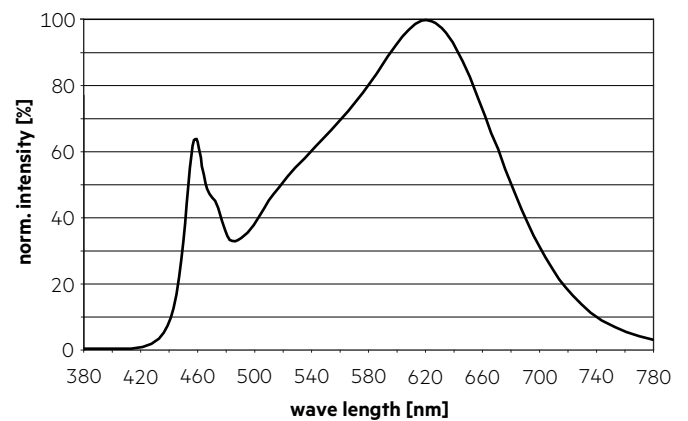


3,000 K

	x0	y0
Centre 600 lm/m	0.4267	0.3949
Centre 1,200 lm/m	0.4284	0.3965
Centre 1,800 lm/m	0.4259	0.3966
Centre 2,500 lm/m	0.4284	0.3974

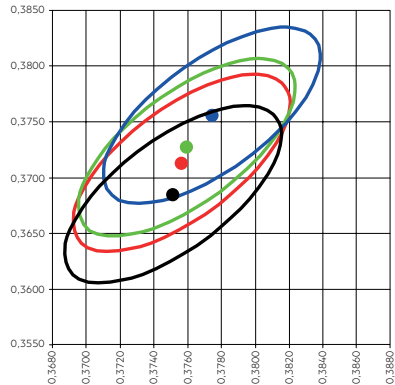


— MacAdam Ellipse: 3SDCM

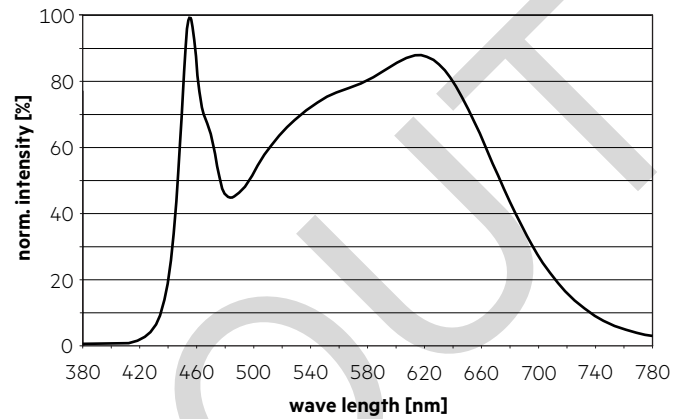


4,000 K

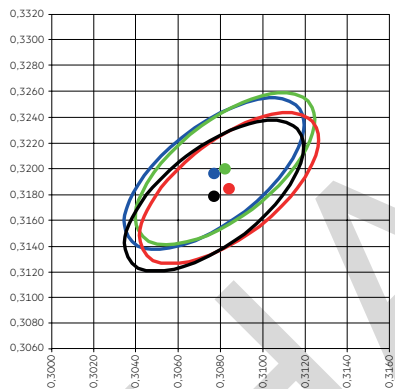
	x0	y0
Centre 600 lm/m	0.3751	0.3685
Centre 1,200 lm/m	0.3756	0.3713
Centre 1,800 lm/m	0.3759	0.3728
Centre 2,500 lm/m	0.3774	0.3756



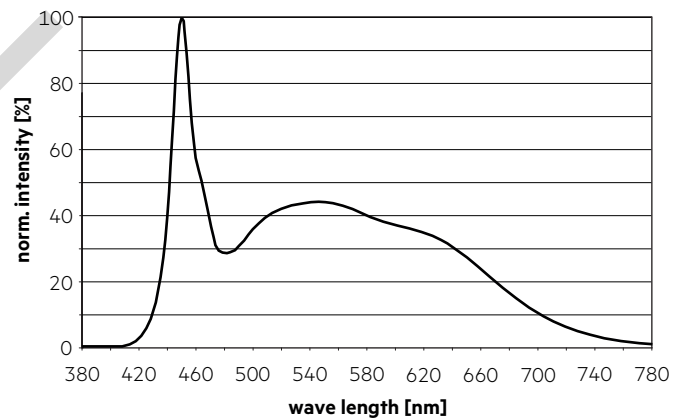
— MacAdam Ellipse: 3SDCM

**6,500 K**

	x0	y0
Centre 600 lm/m	0.3077	0.3179
Centre 1,200 lm/m	0.3084	0.3185
Centre 1,800 lm/m	0.3082	0.3200
Centre 2,500 lm/m	0.3077	0.3197

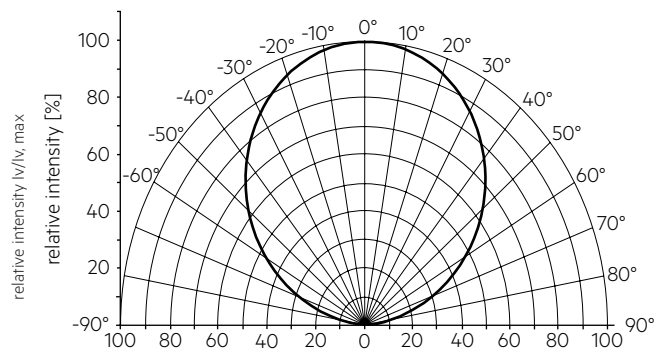


— MacAdam Ellipse: 3SDCM



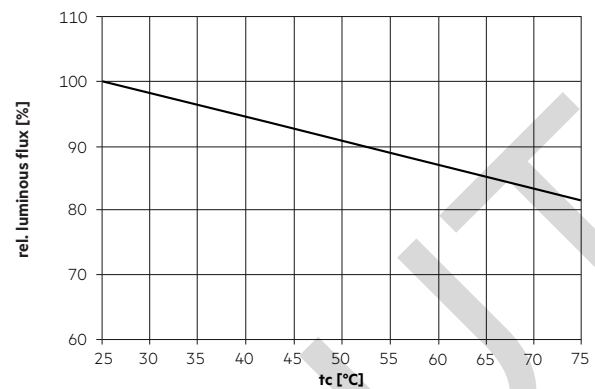
6.2 Light distribution

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.

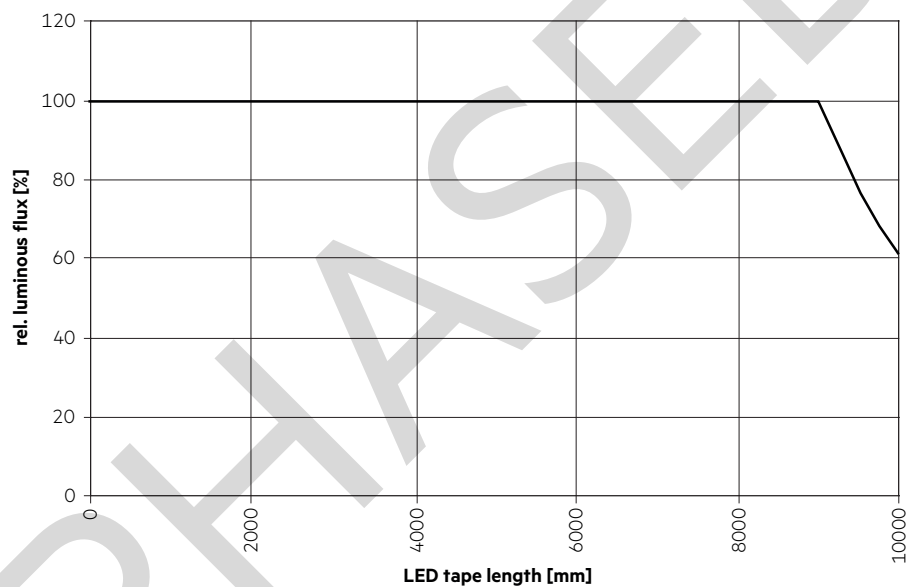
6.3 Relative luminous flux vs. tc temperature



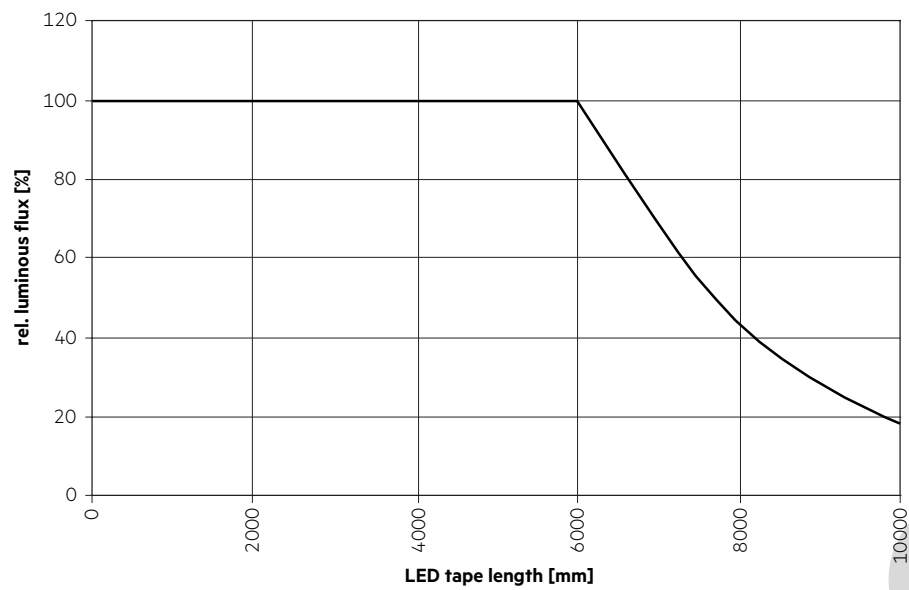
6.4 Relative luminous flux vs. LED tape length

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

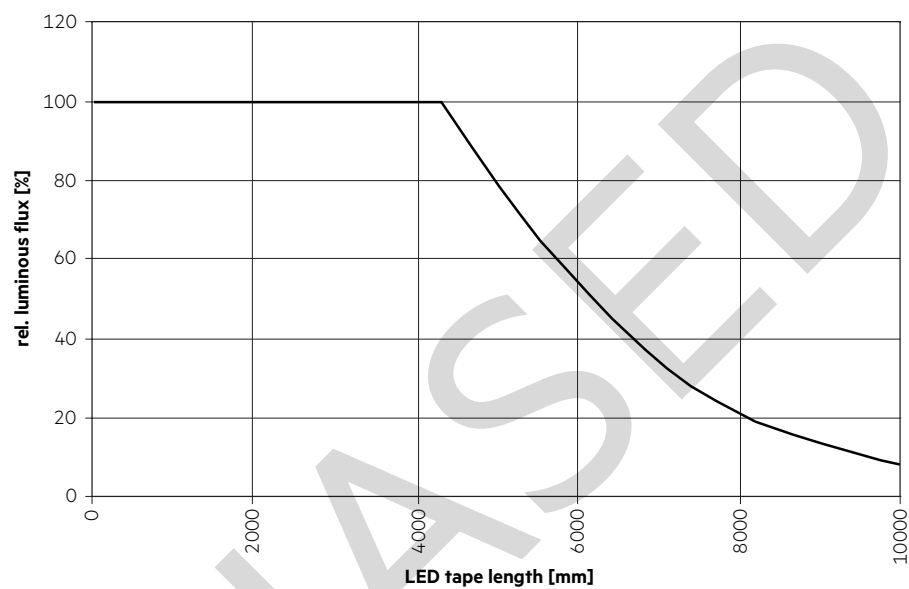
LLE FLEX 600lm/m EXC2:



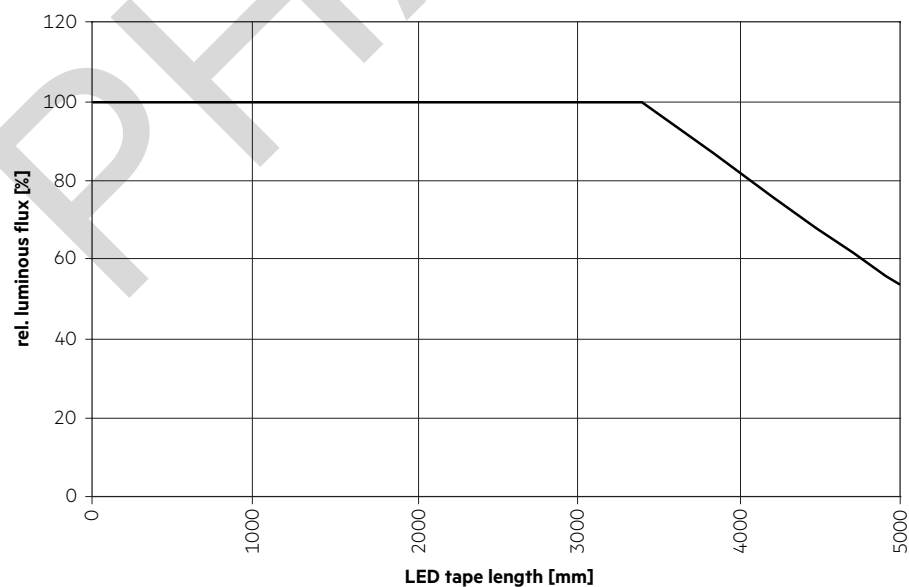
LLE FLEX 1200lm/m EXC2:



LLE FLEX 1800lm/m EXC2:



LLE FLEX 2500lm/m EXC2:



7. Miscellaneous

7.1 Additional information

Additional technical information at www.tridonic.com → Technical Data

Guarantee conditions at www.tridonic.com → Services

Life-time declarations are informative and represent no warranty claim.