



Module LLE FLEX 12mm 48V EXC

Modules LLE FLEX excite

Product description

- Dimmable 48 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.
- 4,000 K CRI90 module COI approved acc. to AS/NZS1680.2.5:1997
- 1 reel = 10 m
- Long lifetime: 60,000 hours
- 5 years guarantee (conditions at www.tridonic.com)

Optical properties

- Colour temperature 2,700, 3,000, 4,000 and 6,000 K with SDCM 3[®]
- Useful luminous flux 4,160 lm/m at tp = 25 °C
- Efficacy of the LED module 157 lm/W at tp = 25 °C
- High colour rendering index CRI > 80 and CRI > 90 (on demand)

Mechanical properties

- Extremely narrow pitch distance enables short distance to diffuser and outstanding homogeneity
- High design freedom due to 6.25 cm cut-options
- Self-adhesive 3M tape at the backside for simple mounting on different surfaces
- reel2reel – No solder joints on the tape, easy to separate and low length tolerances[®]

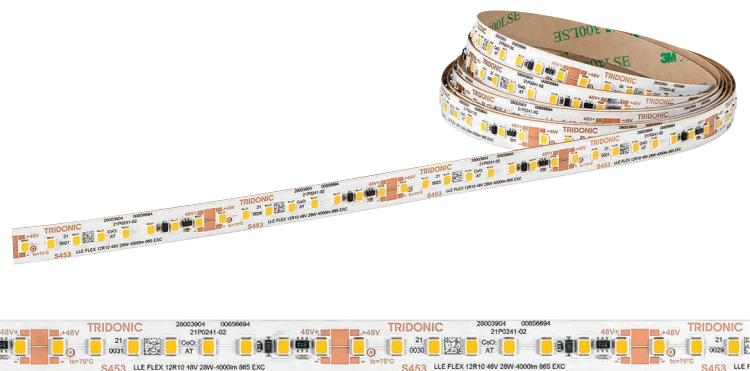
System solution

- System solution in combination with Tridonic constant voltage LED driver (dimmable)



Standards, page 4

Colour temperatures and tolerances, page 6



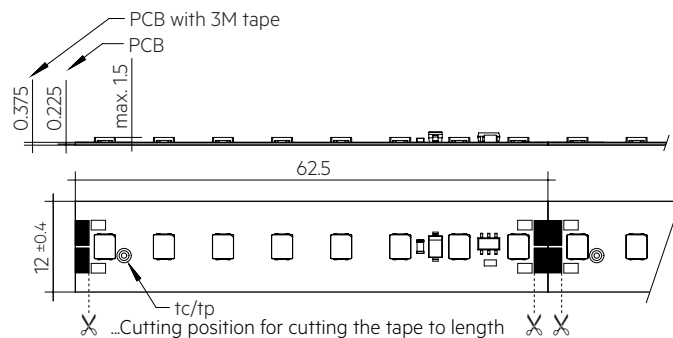


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Technical data

Beam characteristic	120°
Ambient temperature range	-35 ... +50 °C
tp rated	65 °C
tc	75 °C
DC supply voltage	48 V
DC supply voltage range ^①	45 – 51 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
Lumen maintenance L70B50	60,000 h
Guarantee (conditions at www.tridonic.com)	5 years



Ordering data

Type ^①	Article number	Colour temperature	Packaging carton	Weight per pc.
CRI 80				
LLE FLEX 12R10 48V 22W-3000lm 827 EXC	28003897	2,700 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 22W-3000lm 830 EXC	28003898	3,000 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 22W-3000lm 840 EXC	28003899	4,000 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 22W-3000lm 860 EXC	28003900	6,000 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 28W-4000lm 827 EXC	28003901	2,700 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 28W-4000lm 830 EXC	28003902	3,000 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 28W-4000lm 840 EXC	28003903	4,000 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 28W-4000lm 860 EXC	28003904	6,000 K	1 pc(s).	0.205 kg
CRI 90 (articles available on demand)				
LLE FLEX 12R10 48V 24W-3000lm 927 EXC	28003921	2,700 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 24W-3000lm 930 EXC	28003922	3,000 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 24W-3000lm 940 EXC	28003923	4,000 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 24W-3000lm 960 EXC	28003924	6,000 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 32W-4000lm 927 EXC	28003925	2,700 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 32W-4000lm 930 EXC	28003926	3,000 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 32W-4000lm 940 EXC	28003927	4,000 K	1 pc(s).	0.205 kg
LLE FLEX 12R10 48V 32W-4000lm 960 EXC	28003928	6,000 K	1 pc(s).	0.205 kg

^① 1 reel = 10 m.

Specific technical data

Type	Photometric code	Useful luminous flux at tp = 25 °C ^④	Expected luminous flux at tp rated ^⑤	Typ. current consumption at tp rated	Power consumption Pon at tp = 25 °C ^⑥	Efficacy of the module at tp = 25 °C	Expected efficacy of the module at tp rated	Colour rendering index CRI at tp = 25 °C
CRI 80								
LLE FLEX 12R10 48V 22W-3000lm 827 EXC	827/359	3,030 lm/m	2,820 lm/m	450 mA/m	21.6 W/m	141 lm/W	131 lm/W	> 80
LLE FLEX 12R10 48V 22W-3000lm 830 EXC	830/359	3,130 lm/m	2,920 lm/m	450 mA/m	21.6 W/m	145 lm/W	135 lm/W	> 80
LLE FLEX 12R10 48V 22W-3000lm 840 EXC	840/359	3,090 lm/m	2,880 lm/m	424 mA/m	20.4 W/m	152 lm/W	141 lm/W	> 80
LLE FLEX 12R10 48V 22W-3000lm 860 EXC	860/359	3,090 lm/m	2,880 lm/m	424 mA/m	20.4 W/m	152 lm/W	141 lm/W	> 80
LLE FLEX 12R10 48V 28W-4000lm 827 EXC	827/359	4,030 lm/m	3,760 lm/m	597 mA/m	28.7 W/m	141 lm/W	131 lm/W	> 80
LLE FLEX 12R10 48V 28W-4000lm 830 EXC	830/359	4,150 lm/m	3,870 lm/m	597 mA/m	28.7 W/m	145 lm/W	135 lm/W	> 80
LLE FLEX 12R10 48V 28W-4000lm 840 EXC	840/359	4,160 lm/m	3,880 lm/m	552 mA/m	26.5 W/m	157 lm/W	146 lm/W	> 80
LLE FLEX 12R10 48V 28W-4000lm 860 EXC	860/359	4,015 lm/m	3,740 lm/m	552 mA/m	26.5 W/m	151 lm/W	141 lm/W	> 80
CRI 90 (articles available on demand)								
LLE FLEX 12R10 48V 24W-3000lm 927 EXC	927/359	2,910 lm/m	2,710 lm/m	504 mA/m	24.2 W/m	120 lm/W	112 lm/W	> 90
LLE FLEX 12R10 48V 24W-3000lm 930 EXC	930/359	3,020 lm/m	2,820 lm/m	504 mA/m	24.2 W/m	125 lm/W	117 lm/W	> 90
LLE FLEX 12R10 48V 24W-3000lm 940 EXC	940/359	2,980 lm/m	2,780 lm/m	469 mA/m	22.5 W/m	132 lm/W	123 lm/W	> 90
LLE FLEX 12R10 48V 24W-3000lm 960 EXC	960/359	2,930 lm/m	2,730 lm/m	469 mA/m	22.5 W/m	130 lm/W	121 lm/W	> 90
LLE FLEX 12R10 48V 32W-4000lm 927 EXC	927/359	3,940 lm/m	3,670 lm/m	683 mA/m	32.8 W/m	120 lm/W	112 lm/W	> 90
LLE FLEX 12R10 48V 32W-4000lm 930 EXC	930/359	4,080 lm/m	3,800 lm/m	683 mA/m	32.8 W/m	125 lm/W	116 lm/W	> 90
LLE FLEX 12R10 48V 32W-4000lm 940 EXC	940/359	4,040 lm/m	3,770 lm/m	637 mA/m	30.6 W/m	132 lm/W	123 lm/W	> 90
LLE FLEX 12R10 48V 32W-4000lm 960 EXC	960/359	3,980 lm/m	3,710 lm/m	637 mA/m	30.6 W/m	130 lm/W	121 lm/W	> 90

^① Integral measurement over the complete module.

^② For 10 m reel max. 2 solder joints.

^③ 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.

^④ Tolerance of useful light flux - 0 % / + 20 %. Measurement uncertainty ± 10 %. Values given for 1 m LLE FLEX.

^⑤ Tolerance of expected light flux - 0 % / + 20 %. Measurement uncertainty ± 10 %. Values given for 1 m LLE FLEX. Based on calculation.

^⑥ Tolerance of power consumption Pon ± 15 %. Measurement uncertainty ± 5 %. Values given for 1 m 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 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 lifetime (max.6000h)	Luminous flux after 25% of the lifetime (max.6000h)
7	70 – 79	MacAdam initial	(max.6000h)	Code
8	80 – 89			Luminous flux
9	≥90			

1.2 Energy classification

Type	Colour temperature	Energy classification	Energy consumption
CRI80			
LLE FLEX 12R10 48V 22W-3000lm 827 EXC	2,700 K	E	22 kWh / 1,000 h
LLE FLEX 12R10 48V 22W-3000lm 830 EXC	3,000 K	E	22 kWh / 1,000 h
LLE FLEX 12R10 48V 22W-3000lm 840 EXC	4,000 K	D	21 kWh / 1,000 h
LLE FLEX 12R10 48V 22W-3000lm 860 EXC	6,000 K	D	21 kWh / 1,000 h
LLE FLEX 12R10 48V 28W-4000lm 827 EXC	2,700 K	E	29 kWh / 1,000 h
LLE FLEX 12R10 48V 28W-4000lm 830 EXC	3,000 K	E	29 kWh / 1,000 h
LLE FLEX 12R10 48V 28W-4000lm 840 EXC	4,000 K	D	27 kWh / 1,000 h
LLE FLEX 12R10 48V 28W-4000lm 860 EXC	6,000 K	D	27 kWh / 1,000 h
CRI90			
LLE FLEX 12R10 48V 24W-3000lm 927 EXC	2,700 K	E	25 kWh / 1,000 h
LLE FLEX 12R10 48V 24W-3000lm 930 EXC	3,000 K	E	25 kWh / 1,000 h
LLE FLEX 12R10 48V 24W-3000lm 940 EXC	4,000 K	E	23 kWh / 1,000 h
LLE FLEX 12R10 48V 24W-3000lm 960 EXC	6,000 K	E	23 kWh / 1,000 h
LLE FLEX 12R10 48V 32W-4000lm 927 EXC	2,700 K	E	33 kWh / 1,000 h
LLE FLEX 12R10 48V 32W-4000lm 930 EXC	3,000 K	E	33 kWh / 1,000 h
LLE FLEX 12R10 48V 32W-4000lm 940 EXC	4,000 K	E	31 kWh / 1,000 h
LLE FLEX 12R10 48V 32W-4000lm 960 EXC	6,000 K	E	31 kWh / 1,000 h

Energy label and further information at 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	-35 ... +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 3000lm/m 8xx EXC

ta	tp	R _{th, hs-a} ^①	Cooling area ^①
25 °C	65 °C	71.55 K/W	9 cm²
35 °C	65 °C	53.64 K/W	12 cm²
40 °C	65 °C	44.69 K/W	15 cm²
45 °C	65 °C	35.73 K/W	19 cm²
50 °C	65 °C	26.78 K/W	25 cm²

LLE FLEX 4000lm/m 8xx EXC

ta	tp	R _{th, hs-a} ^①	Cooling area ^①
25 °C	65 °C	54.13 K/W	12 cm²
35 °C	65 °C	40.57 K/W	16 cm²
40 °C	65 °C	33.79 K/W	20 cm²
45 °C	65 °C	27.02 K/W	25 cm²
50 °C	65 °C	20.24 K/W	33 cm²

LLE FLEX 3000lm/m 9xx EXC

ta	tp	R _{th, hs-a} ^①	Cooling area ^①
25 °C	65 °C	51.66 K/W	13 cm²
35 °C	65 °C	38.72 K/W	17 cm²
40 °C	65 °C	32.25 K/W	21 cm²
45 °C	65 °C	25.78 K/W	26 cm²
50 °C	65 °C	19.31 K/W	35 cm²

LLE FLEX 4000lm/m 9xx EXC

ta	tp	R _{th, hs-a} ^①	Cooling area ^①
25 °C	65 °C	37.82 K/W	18 cm²
35 °C	65 °C	28.34 K/W	24 cm²
40 °C	65 °C	23.60 K/W	28 cm²
45 °C	65 °C	18.86 K/W	35 cm²
50 °C	65 °C	14.13 K/W	47 cm²

^① Values for a single segment of the LLE FLEX (62.5 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 62.5 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.

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



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 EXC

Supply voltage	tp temperature	L90/B10	L90/B50	L80/B10	L80/B50	L70/B10	L70/B50
48 V	40 °C	34k h	51k h	>60k h	>60k h	>60k h	>60k h
48 V	45 °C	34k h	50k h	>60k h	>60k h	>60k h	>60k h
48 V	50 °C	33k h	48k h	>60k h	>60k h	>60k h	>60k h
48 V	55 °C	32k h	46k h	>60k h	>60k h	>60k h	>60k h
48 V	60 °C	32k h	44k h	>60k h	>60k h	>60k h	>60k h
48 V	65 °C	31k h	43k h	>60k h	>60k h	>60k h	>60k h
48 V	70 °C	31k h	41k h	>60k h	>60k h	>60k h	>60k h
48 V	75 °C	30k h	40k h	>60k h	>60k h	>60k h	>60k h

LOC10 > 60k h. At tp rated, based on 10 switching cycles per day.

4.3 Switching capability

100,000 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

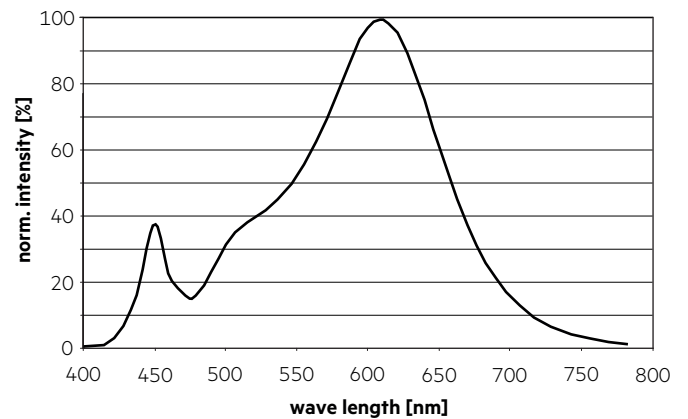
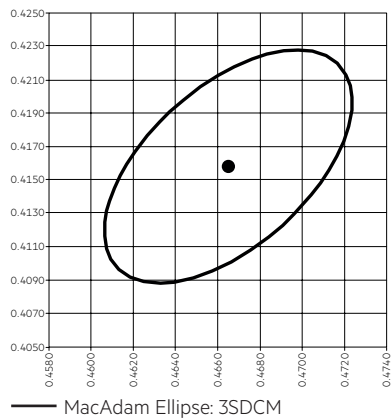
The specified colour coordinates are measured integral by a current impulse with typical values of module and a duration of 100 ms.

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

The measurement tolerance of the colour coordinates are ± 0.007 .

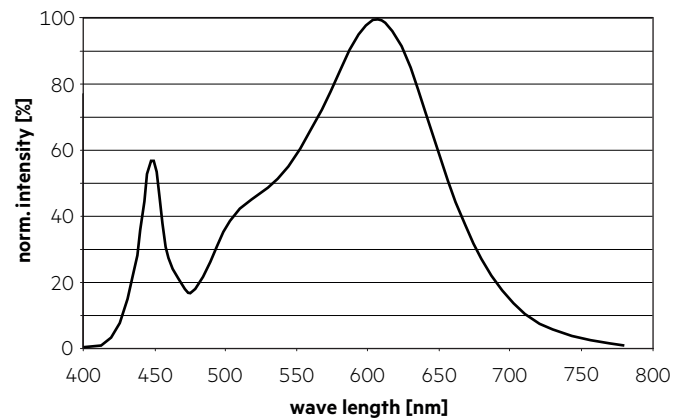
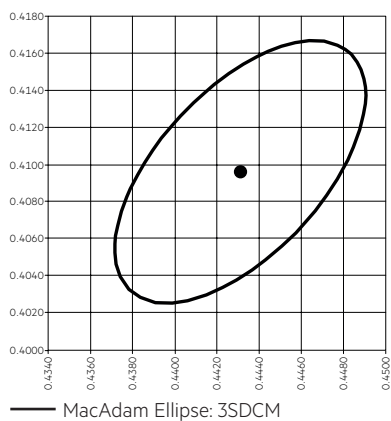
2,700 K – CRI80

	x0	y0
Centre	0.4665	0.4158



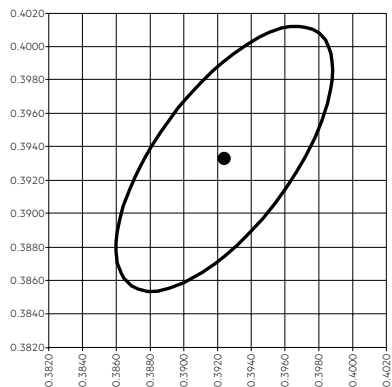
3,000 K – CRI80

	x0	y0
Centre	0.4431	0.4096

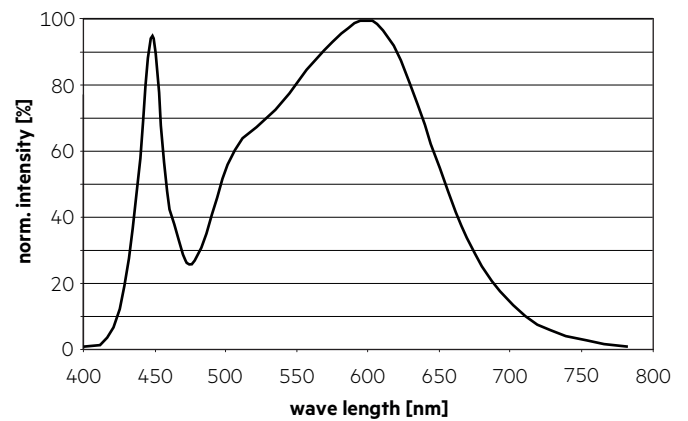


4,000 K – CRI80

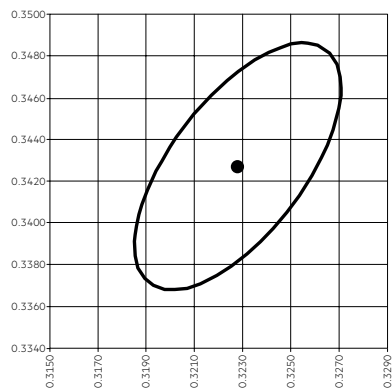
	x0	y0
Center	0.3924	0.3933



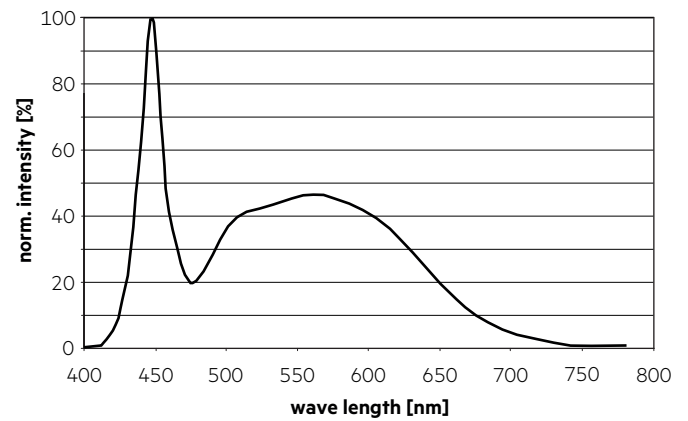
— MacAdam Ellipse: 3SDCM

**6,000 K – CRI80**

	x0	y0
Center	0.3228	0.3427

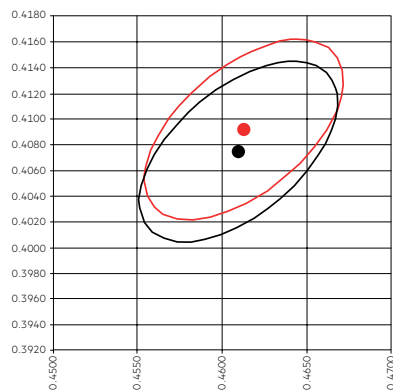


— MacAdam Ellipse: 3SDCM

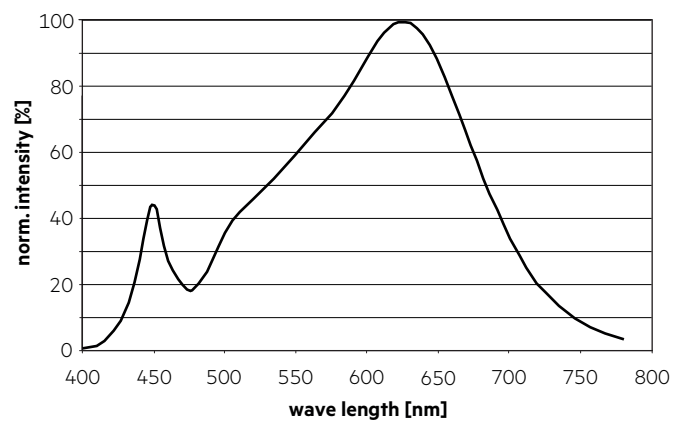


2,700 K – CRI90

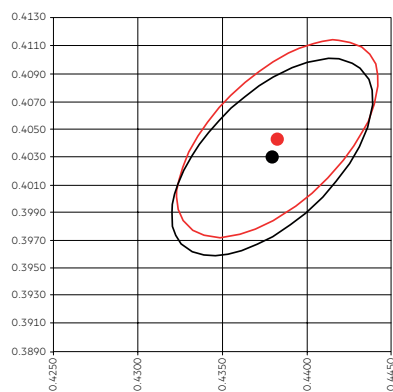
	x0	y0
Centre 3,000 lm/m	0.4609	0.4075
Centre 4,000 lm/m	0.4613	0.4092



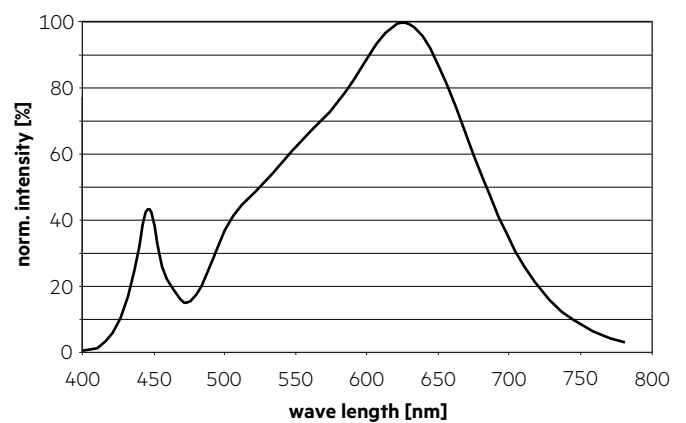
— MacAdam Ellipse: 3SDCM

**3,000 K – CRI90**

	x0	y0
Centre 3,000 lm/m	0.4379	0.4030
Centre 4,000 lm/m	0.4382	0.4043

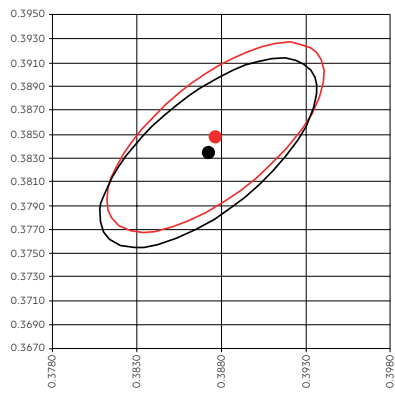


— MacAdam Ellipse: 3SDCM

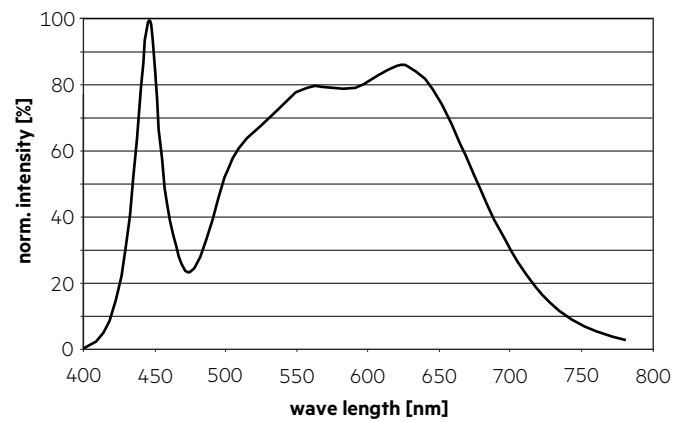


4,000 K – CRI90

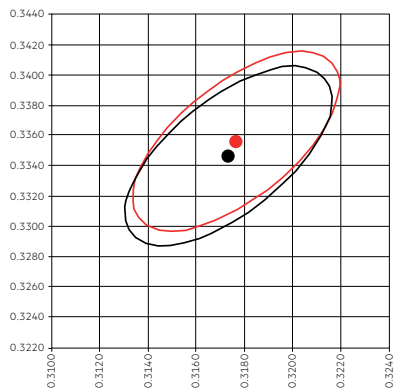
	x0	y0
Centre 3,000 lm/m	0.3872	0.3834
Centre 4,000 lm/m	0.3876	0.3847



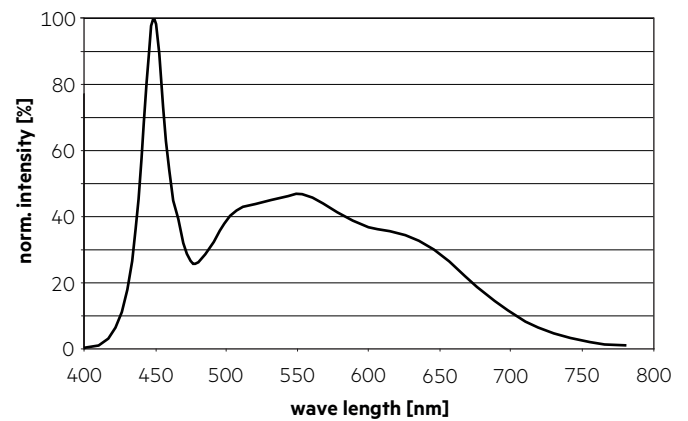
— MacAdam Ellipse: 3SDCM

**6,000 K – CRI90**

	x0	y0
Centre 3,000 lm/m	0.3173	0.3346
Centre 4,000 lm/m	0.3176	0.3356

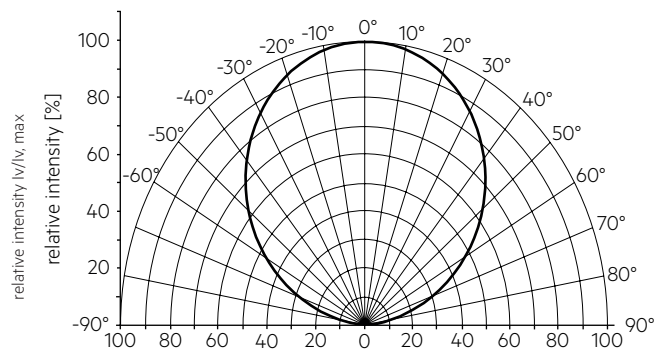


— MacAdam Ellipse: 3SDCM



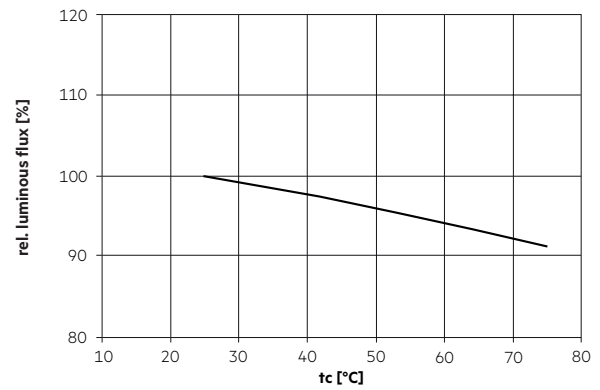
6.2 Light distribution

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.

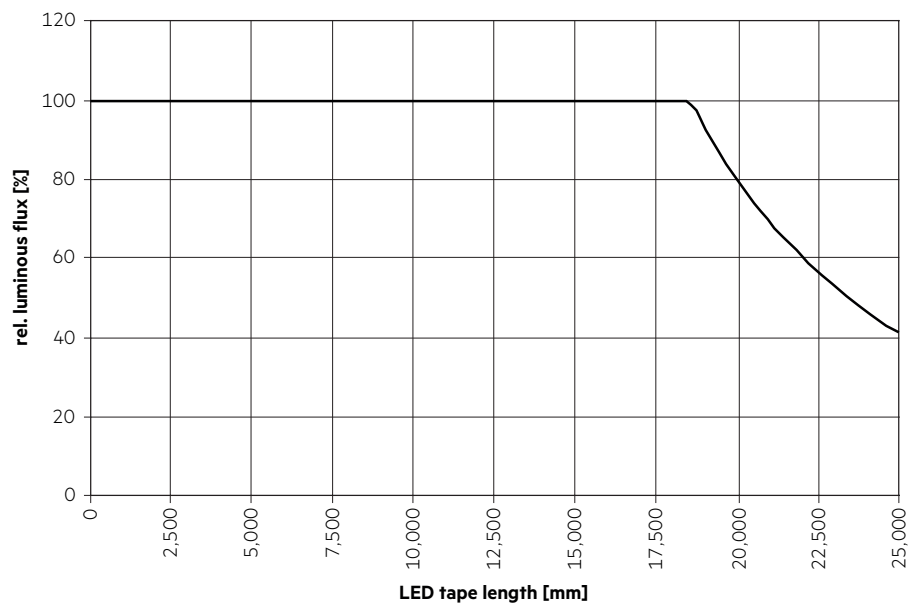
6.3 Relative luminous flux vs. tc temperature



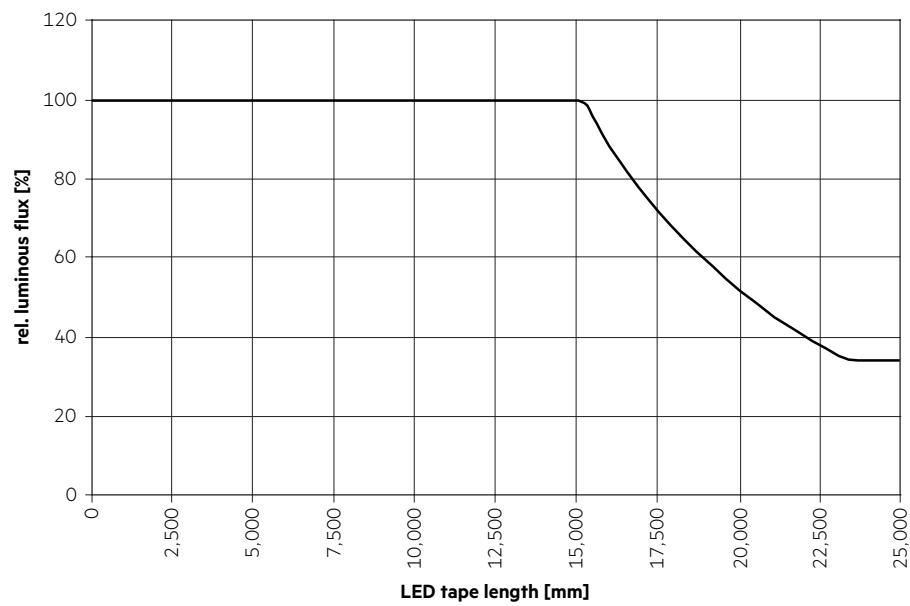
6.4 Relative luminous flux vs. LED tape length

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

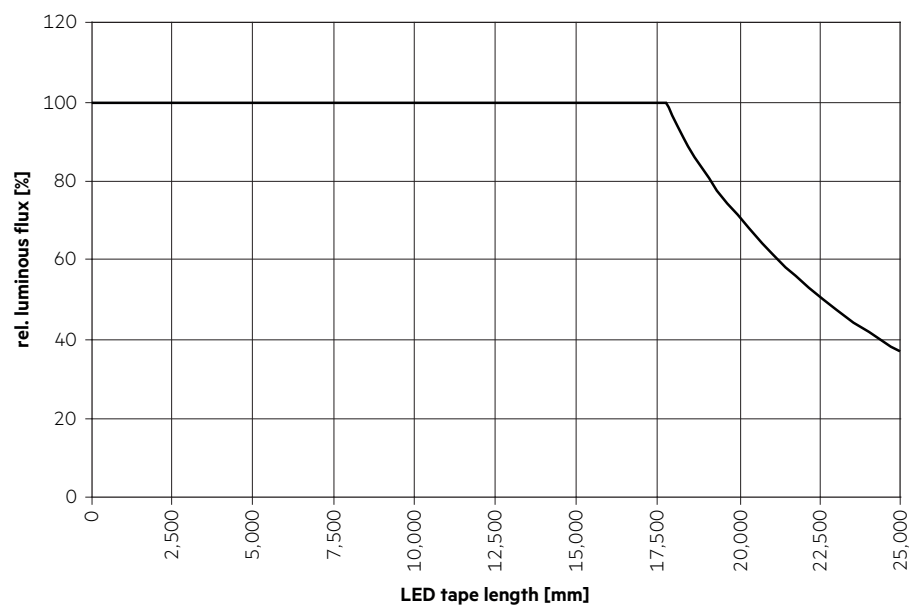
LLE FLEX 3000lm/m 8xx EXC:



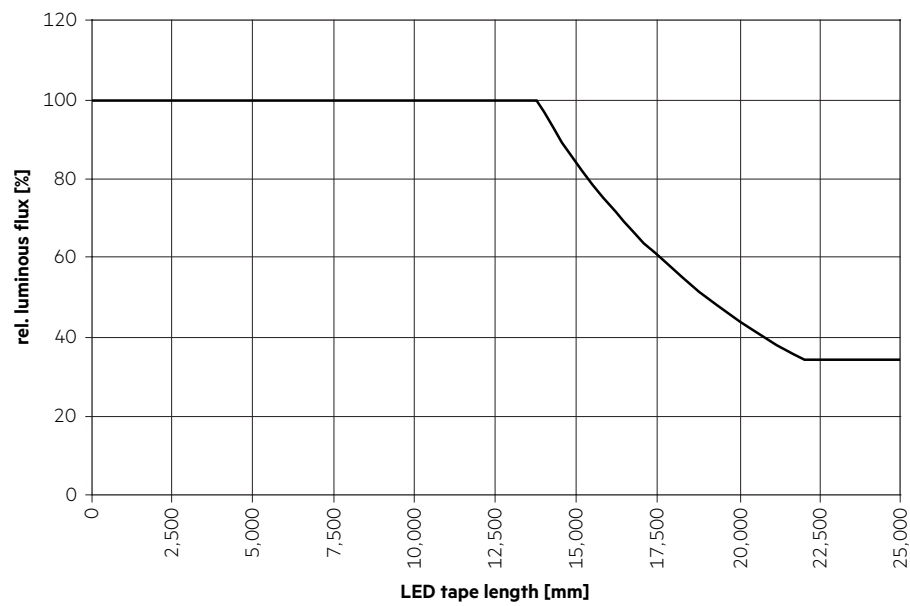
LLE FLEX 4000lm/m 8xx EXC:



LLE FLEX 3000lm/m 9xx EXC:



LLE FLEX 4000lm/m 9xx EXC:



7. Miscellaneous

7.1 Additional information

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

Lifetime declarations are informative and represent no warranty claim.