



Module LLE 24x280mm 2000lm EXC

Module LLE EXCITE

Product description

- Ideal for linear and panel lights in industrial applications
- Reliable, high lifetime solution and extended temperature range in combination with the INDUSTRY control gears
- Luminous flux range from 2,230 – 3,150 lm
- LED system solution with outstanding system efficacy up to 128 lm/W
- Efficacy of the module up to 145 lm/W
- High colour rendering index CRI > 80
- Small colour tolerance MacAdam 3[®]
- Colour temperatures 3,000, 4,000, 5,000 and 6,500 K
- Perfectly uniform light, even if several LED modules are used together in a line
- Push terminals for simple wiring
- Simple installation via clips or screws
- Long life-time
- 8-year guarantee



Standards, page 6

Colour temperatures and tolerances, page 8

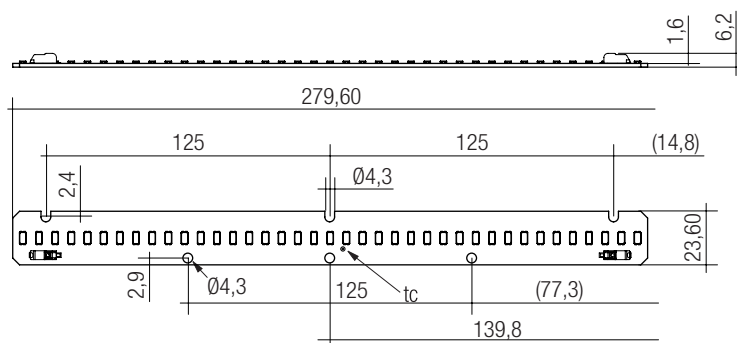


Module LLE 24x280mm 2000lm EXC

Module LLE EXCITE

Technical data

Beam characteristic	130°
Ambient temperature range	-40 ... +70 °C
tp rated	65 °C
tc	95 °C
Max. DC forward current	1,050 mA
Max. permissible LF current ripple	1,150 mA
Max. permissible peak current	1,200 mA / max. 10 µs
Max. permissible output voltage of LED Driver®	300 V
Insulation test voltage	1.6 kV
ESD classification	severity level 4
Risk group (EN 62471:2008)	1
Type of protection	IP00



Ordering data

Type	Article number	Colour temperature	Packaging carton	Weight per pc.
LLE 24x280mm 2000lm 830 EXC	89602077	3,000 K	210 pc(s).	0.024 kg
LLE 24x280mm 2000lm 840 EXC	89602078	4,000 K	210 pc(s).	0.024 kg
LLE 24x280mm 2000lm 850 EXC	89602079	5,000 K	210 pc(s).	0.024 kg
LLE 24x280mm 2000lm 865 EXC	89602080	6,500 K	210 pc(s).	0.024 kg

Specific technical data

Type®	Photo-metric code	Typ. luminous flux at tp = 25 °C®	Typ. luminous flux at tp = 65 °C®	Typ. forward current	Min. forward voltage at tp = 65 °C	Max. forward voltage at tp = 25 °C	Typ. power consumption at tp = 65 °C®	Efficacy of the module at tp = 25 °C	Efficacy of the module at tp = 65 °C	Efficacy of the system at tp = 65 °C	Colour rendering index CRI
Operating mode HE											
LLE 24x280mm 2000lm 830 EXC	830/349	2,300 lm	2,230 lm	350 mA	45.3 V	54.0 V	15.9 W	142 lm/W	140 lm/W	127 lm/W	> 80
LLE 24x280mm 2000lm 840 EXC	840/349	2,350 lm	2,240 lm	350 mA	45.3 V	54.0 V	15.9 W	145 lm/W	141 lm/W	128 lm/W	> 80
LLE 24x280mm 2000lm 850 EXC	850/349	2,350 lm	2,240 lm	350 mA	45.3 V	54.0 V	15.9 W	145 lm/W	141 lm/W	128 lm/W	> 80
LLE 24x280mm 2000lm 865 EXC	865/349	2,350 lm	2,240 lm	350 mA	45.3 V	54.0 V	15.9 W	145 lm/W	141 lm/W	128 lm/W	> 80
Operating mode HO											
LLE 24x280mm 2000lm 830 EXC	830/349	3,110 lm	2,900 lm	500 mA	47.4 V	56.6 V	23.9 W	128 lm/W	121 lm/W	113 lm/W	> 80
LLE 24x280mm 2000lm 840 EXC	840/349	3,150 lm	2,940 lm	500 mA	47.4 V	56.6 V	23.9 W	130 lm/W	123 lm/W	114 lm/W	> 80
LLE 24x280mm 2000lm 850 EXC	850/349	3,150 lm	2,940 lm	500 mA	47.4 V	56.6 V	23.9 W	130 lm/W	123 lm/W	114 lm/W	> 80
LLE 24x280mm 2000lm 865 EXC	865/349	3,150 lm	2,940 lm	500 mA	47.4 V	56.6 V	23.9 W	130 lm/W	123 lm/W	114 lm/W	> 80

® Tolerance range for optical and electrical data: ±10 %.

® If mounted with M4 screws and plastic washers.

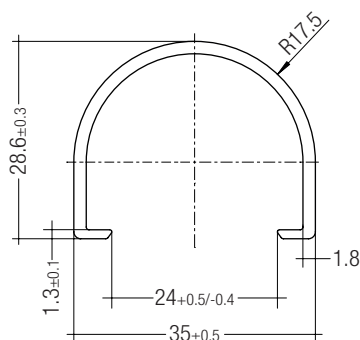
® Integral measurement over the complete module.

® HE ... high efficiency, HO ... high output.

LINEAR COVER SY

Product description

- LINEAR COVER for LLE 24
- Protection against direct touch for non-SELV applications
- Fast snap on mounting on to LLE 24 with clips or plastic washers
- High transmission: transparent 94 %, semi-transparent 87 %, diffuse 76 %
- Made of PMMA
- Tolerances: ± 1 mm for 597 mm length (ends finished),
+ 20 mm for 1,200 / 1,500 / 1,600 / 1,800 mm length (ends raw)



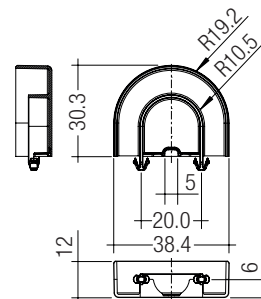
Ordering data

Type	Article number	Colour	Length	Packaging carton	Weight per pc.
LINEAR COVER SY Transparent 1600mm	28000338	Transparent	1,600 mm	12 pc(s).	0.272 kg
LINEAR COVER SY Frosted 1800mm	28000437	Semi-transparent	1,800 mm	12 pc(s).	0.308 kg
LINEAR COVER SY Frosted 1600mm	28000339	Semi-transparent	1,600 mm	12 pc(s).	0.272 kg
LINEAR COVER SY Frosted 1500mm	28000435	Semi-transparent	1,500 mm	12 pc(s).	0.244 kg
LINEAR COVER SY Frosted 1200mm	28000422	Semi-transparent	1,200 mm	12 pc(s).	0.205 kg
LINEAR COVER SY Frosted 597mm	28000340	Semi-transparent	597 mm	12 pc(s).	0.102 kg
LINEAR COVER SY Diffuse 1800mm	28000438	Diffuse	1,800 mm	12 pc(s).	0.308 kg
LINEAR COVER SY Diffuse 1600mm	28000341	Diffuse	1,600 mm	12 pc(s).	0.272 kg
LINEAR COVER SY Diffuse 1500mm	28000436	Diffuse	1,500 mm	12 pc(s).	0.257 kg
LINEAR COVER SY Diffuse 1200mm	28000434	Diffuse	1,200 mm	12 pc(s).	0.205 kg
LINEAR COVER SY Diffuse 597mm	28000342	Diffuse	597 mm	12 pc(s).	0.102 kg

ACL ENDCAP LLE24 PUSH-FIX

Product description

- ENDCAP for LLE 24
- Fast snap on mounting (sheet thickness 0.5 – 1.0 mm), for drilling hole 4 mm
- Made of Polycarbonat



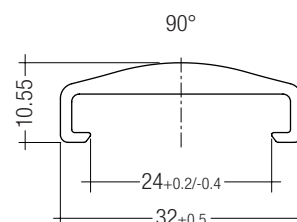
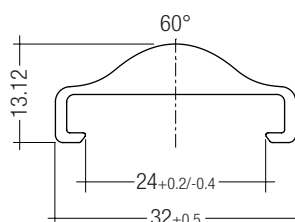
Ordering data

Type	Article number	Colour	Packaging carton	Weight per pc.
ACL ENDCAP LLE24 PUSH-FIX	28001037	White	480 pc(s).	0.003 kg

LINEAR LENS

Product description

- Linear lens for LLE 24
- Available in 60° and 90° light distribution
- Protection against direct touch for non-SELV applications
- Fast snap on mounting on to LLE 24 with clips or plastic washers
- High transmission: semi-transparent 97 %
- Linear lense made of PMMA
- Tolerances: ± 20 mm for 1,600 mm length (ends raw)



Ordering data

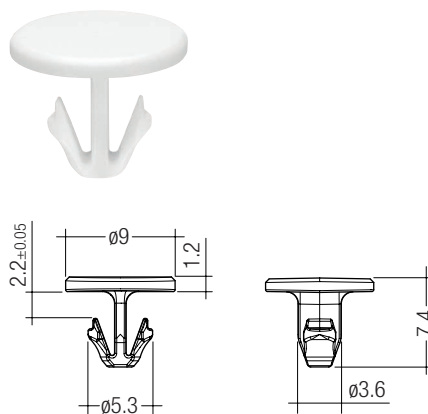
Type	Article number	Colour	Length	Packaging carton	Weight per pc.
ACL LINEAR LENS 24x1200mm 60°	28001428	Semi-transparent	1,200 mm	21 pc(s).	0.196 kg
ACL LINEAR LENS 24x1200mm 90°	28001429	Semi-transparent	1,200 mm	21 pc(s).	0.165 kg
ACL LINEAR LENS 24x1600mm 60°	28000953	Semi-transparent	1,600 mm	21 pc(s).	0.261 kg
ACL LINEAR LENS 24x1600mm 90°	28000955	Semi-transparent	1,600 mm	21 pc(s).	0.221 kg

ACCESSORIES

CLIP 4.3mm

Product description

- Clip for fixation of LED modules with 4.3 mm holes
- Fast snap on mounting (sheet thickness 0.5 – 1.0 mm)
- For drilling hole 4 mm
- Clip made of Polycarbonat



Ordering data

Type	Article number	Colour	Packaging bag ^①	Weight per pc.
ACL CLIP 4.3mm PUSH-FIX	28001036	White	500 pc(s).	0.001 kg

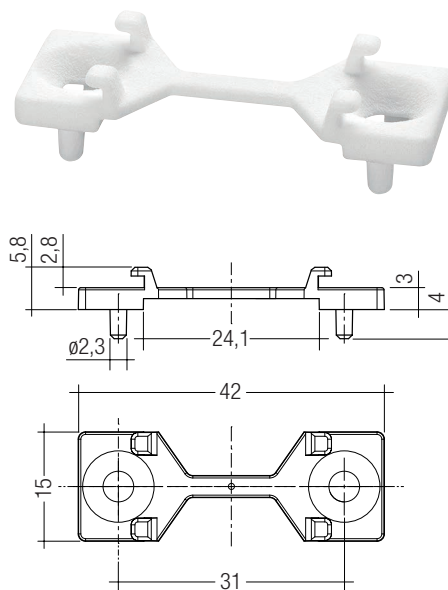
^① Minimum sales quantity 500 pcs.

ACCESSORIES

BRIDGE LLE24/40

Product description

- Enables the fixation of 24 mm wide Tridonic LED modules to fixtures made for 40 mm wide modules
- Ideal for extruded aluminium gear trays made for 40 mm modules with pre-alignment knobs
- Clip-on for LINEAR COVER and LINEAR LENS[®]
- For LLE 24 with 280 mm module minimum 2 bridges required
- For LLE 24 with 560 mm module minimum 3 bridges required
- Fixation via M3 or M4 countersunk screw, max. tightening torque 0.5 Nm
- BRIDGE made of white polycarbonate



Ordering data

Type	Article number	Colour	Packaging carton ^①	Weight per pc.
ACL BRIDGE LLE24/40 SCREW-FIX	28001205	White	600 Stk.	0.001 kg

^① Minimum sales quantity 600 pcs.

^② Beam characteristics will change due to the elevated fixation (see photometric files for details).

1. Standards

IEC 62031
IEC 62471
IEC 62717
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	McAdam after 25% of the life-time (max.6000h)	Luminous flux after 25% of the life-time (max.6000h)
7	70 – 79	initial	(max.6000h)	Code
8	80 – 89			Luminous flux
9	≥90			
				7 ≥ 70 %
				8 ≥ 80 %
				9 ≥ 90 %

1.2 Energy classification

Type	Forward current	Energy classification
LLE 24x280mm 2000lm 830 EXC	350 mA	A++
	500 mA	A+
LLE 24x280mm 2000lm 840 EXC	350 mA	A++
	500 mA	A+
LLE 24x280mm 2000lm 850 EXC	350 mA	A++
	500 mA	A+
LLE 24x280mm 2000lm 865 EXC	350 mA	A++
	500 mA	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
---------------------	----------------

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 24x280mm 2000lm

ta	tp	Forward current	Rth, hs-a	Cooling area
25 °C	85 °C	350 mA	3.71 K/W	112 cm²
25 °C	85 °C	500 mA	5.93 K/W	180 cm²
35 °C	85 °C	350 mA	3.09 K/W	135 cm²
35 °C	85 °C	500 mA	4.95 K/W	216 cm²
45 °C	85 °C	350 mA	2.46 K/W	169 cm²
45 °C	85 °C	500 mA	3.95 K/W	271 cm²
55 °C	85 °C	350 mA	1.88 K/W	227 cm²
55 °C	85 °C	500 mA	2.93 K/W	356 cm²
65 °C	85 °C	350 mA	1.25 K/W	346 cm²
65 °C	85 °C	500 mA	2.93 K/W	535 cm²
75 °C	85 °C	350 mA	0.62 K/W	718 cm²
75 °C	85 °C	500 mA	1.93 K/W	1,077 cm²

Notes

The actual cooling surface can differ because of the material, the structural shape, outside influences and the installation situation. Depending on the heat sink a heat conducting paste or heat conducting film might be necessary to keep the specified tp temperature.

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:

- Short-circuit protection
- Overload protection
- Overtemperature protection



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

Wrong polarity can damage the LLE.

If LLE modules are wired in parallel and a wire breaks or a complete module fails then the current passing through the other module increases. This may reduce its life considerably. In addition there can be slight differences in light output caused by tolerances.

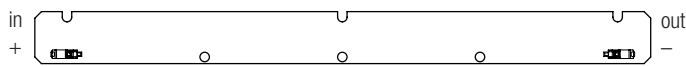
LLE modules can be operated either from SELV LED Drivers or from LED Drivers with LV output voltage.



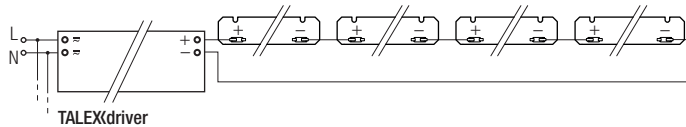
LLE are basic isolated up to 300 V (if mounted with M4 screws in combination with plastic washers) against ground and can be mounted directly on earthed metal parts of the luminaire. If the max. output voltage of the LED Driver (also against earth) is above 300 V, an additional isolation between LED module and heat sink is required (for example by isolated thermal pads) or by a suitable luminaire construction.

At voltages > 60 V an additional protection against direct touch (test finger) to the light emitting side of the module has to be guaranteed. This is typically achieved by means of a non removable light distributor over the module.

3.2 Wiring

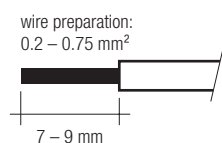


Wiring examples



3.3 Wiring type and cross section

The wiring can be solid cable with a cross section of 0.2 to 0.75 mm².
For the push-wire connection you have to strip the insulation (7–9 mm).



Inserting stranded wires / removing wires by lightly pressing on the push button.

3.4 Mounting instruction



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

Max. torque for fixing: 0.5 Nm.

The LED modules are mounted onto a heat sink with min. 4 screws per module. In order not to damage the modules only rounded head screws and an additional plastic flat washer should be used.



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.

3.5 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.

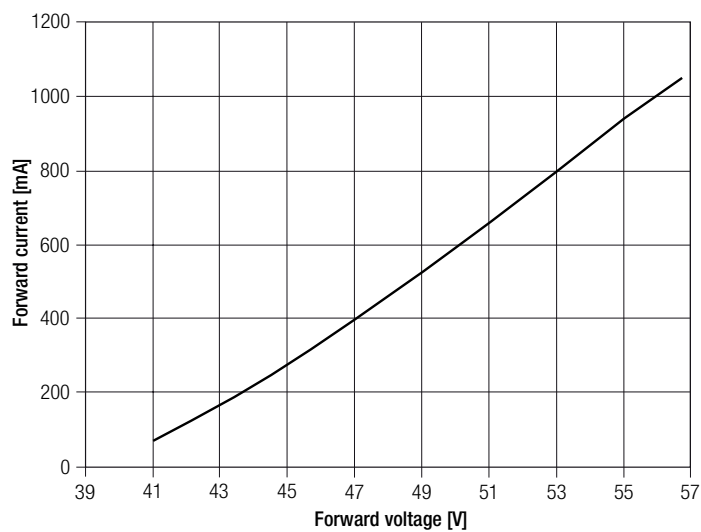
4.2 Lumen maintenance for LLE 24x280mm 2000lm

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

Forward current	tp temperature	L90 / F10	L90 / F50	L80 / F10	L80 / F50	L70 / F10	L70 / F50
350 mA	65 °C	64,500 h	65,500 h	>100,000 h	>100,000 h	>100,000 h	>100,000 h
350 mA	85 °C	61,000 h	62,000 h	>100,000 h	>100,000 h	>100,000 h	>100,000 h
500 mA	65 °C	52,500 h	53,500 h	>100,000 h	>100,000 h	>100,000 h	>100,000 h
500 mA	85 °C	46,000 h	47,000 h	>100,000 h	>100,000 h	>100,000 h	>100,000 h

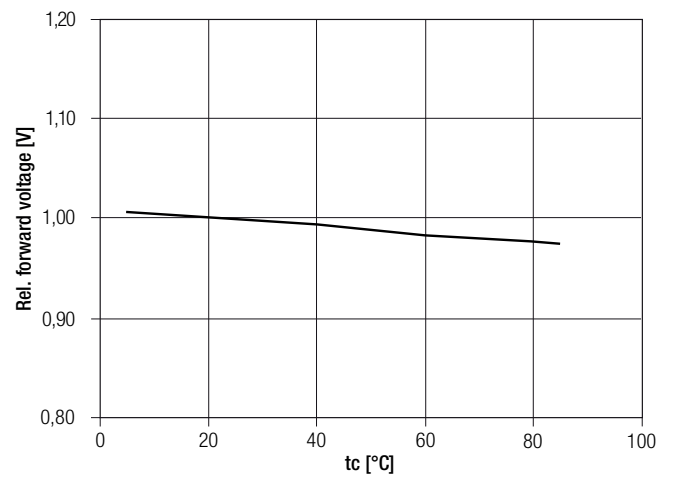
5. Electrical values

5.1 Typ. forward voltage vs. forward current



The diagrams are based on statistic values.
The real values can be different.

5.2 Forward voltage vs. tp temperature



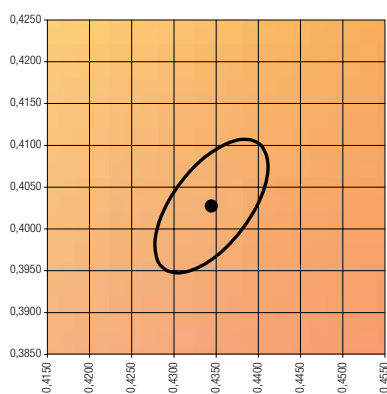
6. Photometric characteristics

6.1 Coordinates and tolerances according to CIE 1931

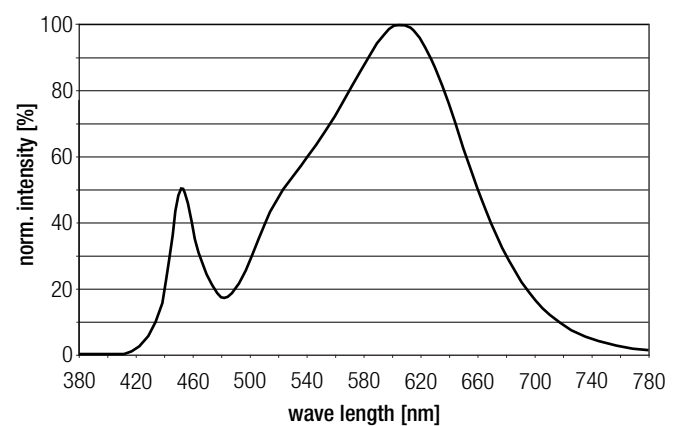
The specified colour coordinates are integral measured by a current impulse with typical values of module and a duration of 100 ms.
The ambient temperature of the measurement is $t_a = 25^\circ\text{C}$.
The measurement tolerance of the colour coordinates are ± 0.01 .

3,000 K

	x0	y0
Centre	0.4342	0.4028

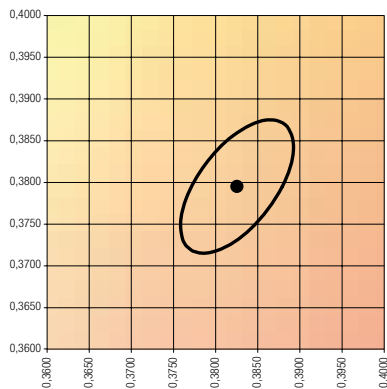


— MacAdam Ellipse: 3SDCM

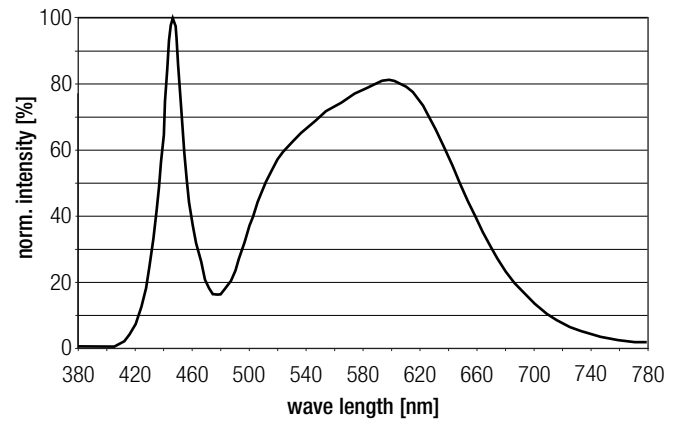


4,000 K

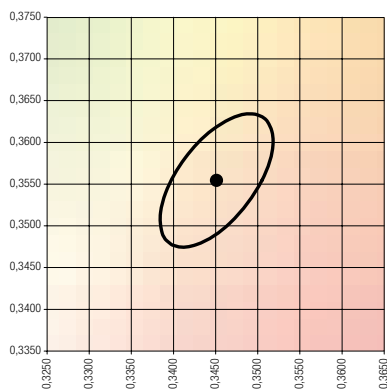
	x0	y0
Centre	0.3825	0.3798



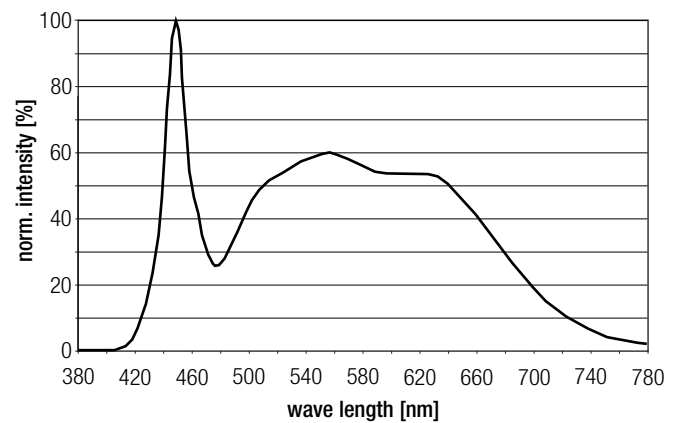
MacAdam Ellipse: 3SDCM

**5,000 K**

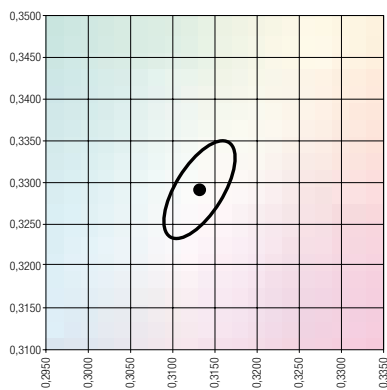
	x0	y0
Centre	0.3451	0.3554



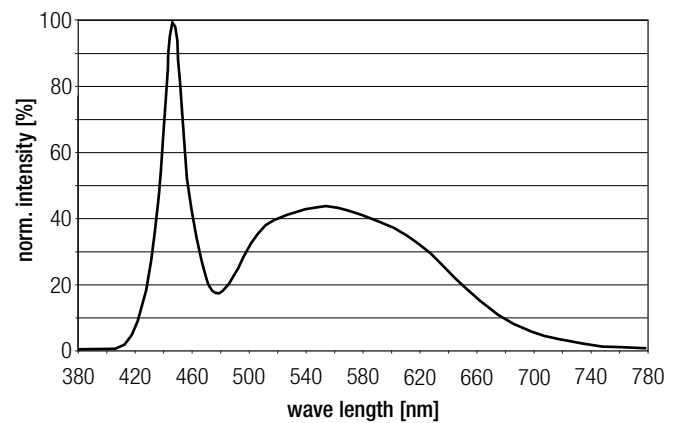
MacAdam Ellipse: 3SDCM

**6,500 K**

	x0	y0
Centre	0.3130	0.3290

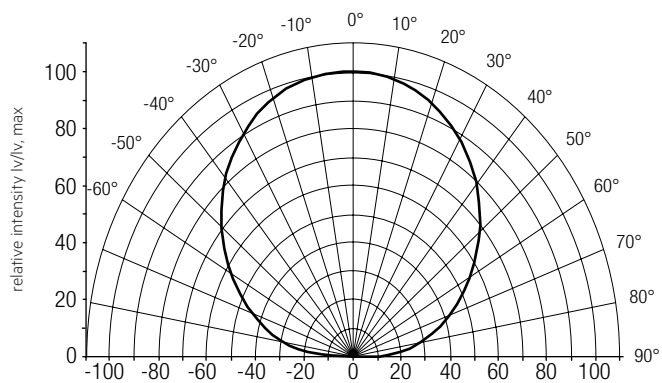


MacAdam Ellipse: 3SDCM



6.2 Light distribution

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

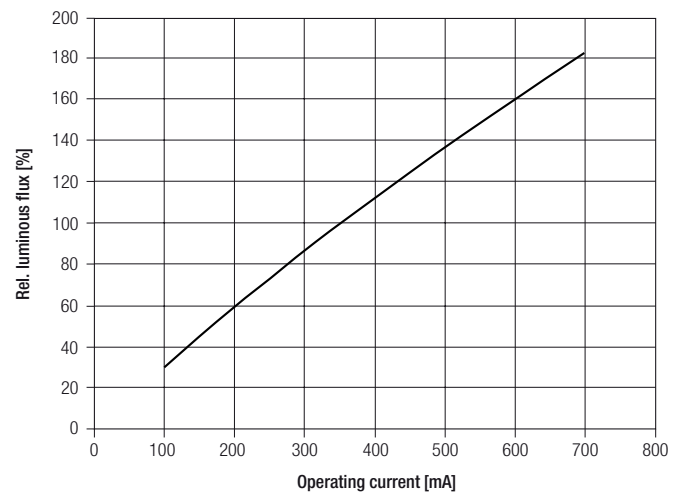


The colour temperature is measured integral over the complete module. The single LED light points can have deviations in the colour coordinates within MacAdam 7.

To ensure an ideal mixture of colours and a homogenous light distribution a suitable optic (e. g. PMMA diffuser) and a sufficient spacing between module and optic (typ. 4 cm) should be used.

For further information see Design-in Guide, 3D data and photometric data on www.tridonic.com or on request.

6.4 Relative luminous flux vs. operating current



The diagrams are based on statistic values.

The real values can be different.

6.3 Relative luminous flux vs. tc temperature

