

Module LLE 24mm 2000lm LVD HP ADV2

Modules LLE advanced



LLE 24x280mm 2000lm LVD HP ADV2



Module with LEDiL DAISY lens system

Product description

- _ Ideal for linear luminaires
- _ Push terminals for quick and simple wiring of LED module to LED module
- _ Design for LEDiL DAISY 7x1 ZT-25, 7x1-WAS and 7x1-O
- _ HE ... High Efficiency, NM ... Nominal Mode, HO ... High Output
- _ Long lifetime up to 100,000 hours
- _ 5 years guarantee (conditions at <https://www.tridonic.com/en/int/services/manufacturer-guarantee-conditions>)

Optical properties

- _ Colour temperatures 3,000 and 4,000 K
- _ Efficacy of the LED module up to 206 lm/W
- _ High colour rendering index CRI > 80 and CRI > 90
- _ High colour consistency (MacAdam 3) ^①
- _ Small luminous flux tolerances

Mechanical properties

- _ Module dimension 24 x 280 mm
- _ Simple installation of lens and module with M3 screws

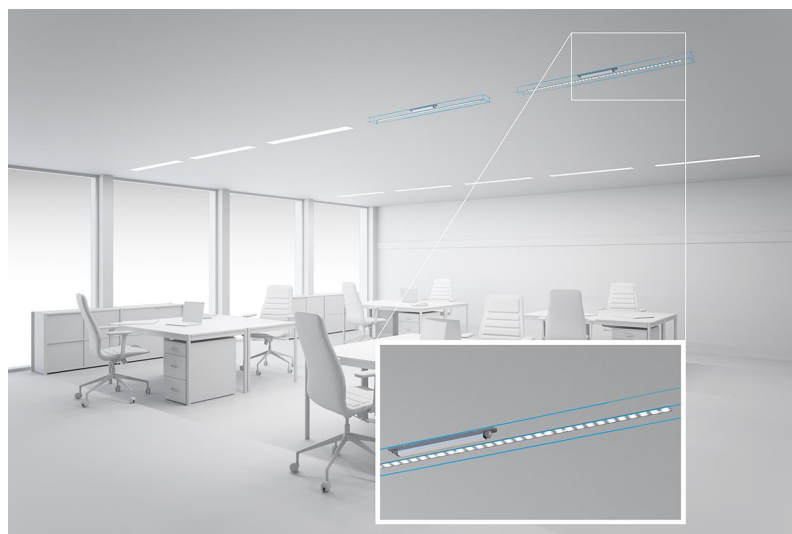
System solution

- _ Combine Tridonic's LED modules and dimmable drivers to achieve an outstanding system efficacy (configuration possible via <https://setbuilder.tridonic.com/>)

^① Integral measurement over the complete module.

Website

<http://www.tridonic.com/28005109>



Linear



High bay



Decorative



Downlights



Spotlights



Free-standing



Area



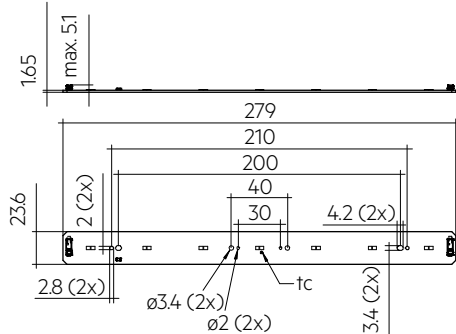
Floor | Wall



Street

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LLE 24x280mm 2000lm LVD HP ADV2

Ordering data

Type	Article number	Colour temperature	Packaging, carton	Weight per pc.
LLE 24x280mm 2000lm 830 LVD HP ADV2	28005109	3,000 K	240 pc(s).	0.032 kg
LLE 24x280mm 2000lm 840 LVD HP ADV2	28005110	4,000 K	240 pc(s).	0.032 kg
LLE 24x280mm 2000lm 930 LVD HP ADV2	28005111	3,000 K	240 pc(s).	0.032 kg
LLE 24x280mm 2000lm 940 LVD HP ADV2	28005112	4,000 K	240 pc(s).	0.032 kg

Technical data

Beam characteristic	120°
Ambient temperature t_a	-40 ... +65 °C
t_p rated	65 °C
t_c	80 °C
I_{rated}	300 mA
I_{max}	1,200 mA
Max. permissible LF current ripple	1,320 mA
Max. permissible peak current	1,800 mA / max. 10 ms
Max. working voltage for insulation [®]	400 V
Insulation test voltage	1.8 kV
Colour tolerance [®]	3 SDCM
ESD classification	Severity level 1
Risk group (IEC 62471)	RG2 ($E_{thr} = 922 \text{ lx}$, RG1 bei $d \geq 56 \text{ cm}$ ($I > 295 - 1200 \text{ mA}$ (I_{max}))), RG1 ($I \leq 295 \text{ mA}$)
Classification acc. to IEC 62031	Built-in
Type of protection	IP00
Lumen maintenance L70B50	100,000 h
Guarantee (conditions at www.tridonic.com)	5 Year(s)

Approval marks



Standards

IEC 62031, IEC 62471, IEC 61000-4-2, IEC 62778, IEC 61547

Specific technical data

Type	Article number	Photometric code ^②	Useful luminous flux at tp = 25 °C ^④	Expected luminous flux at tp rated ^⑤	Typ. forward current	Min. forward voltage at tp rated	Max. forward voltage at tp = 25 °C	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
Operating mode HE											
LLE 24x280mm 2000lm 830 LVD HP ADV2	28005109	830/359	-	700 lm	100 mA	34.5 V	39.0 V	-	-	191 lm/W	>80
LLE 24x280mm 2000lm 840 LVD HP ADV2	28005110	840/359	-	760 lm	100 mA	34.5 V	39.0 V	-	-	207 lm/W	>80
LLE 24x280mm 2000lm 930 LVD HP ADV2	28005111	930/359	-	580 lm	100 mA	34.5 V	39.0 V	-	-	156 lm/W	>90
LLE 24x280mm 2000lm 940 LVD HP ADV2	28005112	940/359	-	590 lm	100 mA	34.5 V	39.0 V	-	-	161 lm/W	>90
Operating mode NM											
LLE 24x280mm 2000lm 830 LVD HP ADV2	28005109	830/359	2,070 lm	1,990 lm	300 mA	35.8 V	40.3 V	11.7 W	177 lm/W	173 lm/W	>80
LLE 24x280mm 2000lm 840 LVD HP ADV2	28005110	840/359	2,195 lm	2,140 lm	300 mA	35.8 V	40.3 V	11.7 W	188 lm/W	187 lm/W	>80
LLE 24x280mm 2000lm 930 LVD HP ADV2	28005111	930/359	1,720 lm	1,630 lm	300 mA	35.8 V	40.3 V	11.7 W	147 lm/W	142 lm/W	>90
LLE 24x280mm 2000lm 940 LVD HP ADV2	28005112	940/359	1,820 lm	1,680 lm	300 mA	35.8 V	40.3 V	11.7 W	156 lm/W	147 lm/W	>90
Operating mode HO											
LLE 24x280mm 2000lm 830 LVD HP ADV2	28005109	830/359	-	6,210 lm	1,050 mA	39.1 V	43.8 V	-	-	143 lm/W	>80
LLE 24x280mm 2000lm 840 LVD HP ADV2	28005110	840/359	-	6,730 lm	1,050 mA	39.1 V	43.8 V	-	-	154 lm/W	>80
LLE 24x280mm 2000lm 930 LVD HP ADV2	28005111	930/359	-	5,080 lm	1,050 mA	39.1 V	43.8 V	-	-	117 lm/W	>90
LLE 24x280mm 2000lm 940 LVD HP ADV2	28005112	940/359	-	5,250 lm	1,050 mA	39.1 V	43.8 V	-	-	120 lm/W	>90

① Integral measurement over the complete module.

② If mounted with M3 screws in combination with a lens like LEDiL DAISY.

③ The detailed explanation, see data sheet section 1.1.

④ Tolerance of useful light flux - 0 % / + 15 %. Measurement uncertainty ± 10 %.

⑤ Measurement uncertainty ± 10 %. Based on calculation.

⑥ Tolerance of power consumption Pon ± 10 %. Measurement uncertainty ± 5 %.

1. Standards

IEC 62031
IEC 62471
IEC 61000-4-2
IEC 62778
IEC 61547

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	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)		
				Code	Luminous flux	
7				70 – 79	7	≥ 70 %
8				80 – 89	8	≥ 80 %
9	≥90			9	≥ 90 %	

1.2 Risk group

LLE 24x280mm 2000lm LVD HP ADV2

Forward current	Risk group (IEC 62471)
≤ 295 mA	RG1
> 295 - 1200 mA (Imax)	RG2 (Ethr=922lx, RG1 at d ≥ 56 cm)

1.3 Energy classification

Type	Colour temperature	Forward current	Energy classification	Energy consumption
LLE 24x280mm 2000lm 830 LVD HP ADV2	3,000 K	300 mA	C	12 kWh / 1,000 h
LLE 24x280mm 2000lm 840 LVD HP ADV2	4,000 K	300 mA	C	12 kWh / 1,000 h
LLE 24x280mm 2000lm 930 LVD HP ADV2	3,000 K	300 mA	D	12 kWh / 1,000 h
LLE 24x280mm 2000lm 940 LVD HP ADV2	4,000 K	300 mA	D	12 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	-40...+80°C
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Operation only in non condensing environment.

Humidity during processing of the module should be between 30 to 70 %.

2.3 Heat sink values

LLE 24x280mm 2000lm LVD HP ADV2

ta	tp	Forward current	R _{th, hs-a}	Cooling area
25°C	65°C	100 mA		self cooling
25°C	65°C	300 mA	6.62 K/W	101 cm ²
25°C	65°C	1,050 mA	1.89 K/W	353 cm ²
35°C	65°C	100 mA		self cooling
35°C	65°C	300 mA	4.96 K/W	134 cm ²
35°C	65°C	1,050 mA	1.41 K/W	471 cm ²
40°C	65°C	100 mA		self cooling
40°C	65°C	300 mA	4.14 K/W	161 cm ²
40°C	65°C	1,050 mA	1.18 K/W	566 cm ²
45°C	65°C	100 mA	9.93 K/W	67 cm ²
45°C	65°C	300 mA	3.31 K/W	202 cm ²
45°C	65°C	1,050 mA	0.94 K/W	708 cm ²
50°C	65°C	100 mA	7.45 K/W	89 cm ²
50°C	65°C	300 mA	2.48 K/W	269 cm ²
50°C	65°C	1,050 mA	0.70 K/W	946 cm ²
55°C	65°C	100 mA	4.96 K/W	134 cm ²
55°C	65°C	300 mA	1.65 K/W	404 cm ²
55°C	65°C	1,050 mA	0.47 K/W	1425 cm ²
60°C	65°C	100 mA	2.48 K/W	269 cm ²
60°C	65°C	300 mA	0.82 K/W	810 cm ²
60°C	65°C	1,050 mA	0.23 K/W	2,883 cm ²

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.

For applications with a small distance between LED module and lens, screw mounting is recommended to ensure a reliable thermal connection between LED module and cooling surface.

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 modules 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.

With parallel wiring tolerance-related differences in output are possible (thermal stress of the module) and can cause differences in brightness. For best homogeneity, only connect modules from one batch in parallel.

If a wire breaks or a complete module fails then the current passing through the other module increases. This may reduce its life considerably.

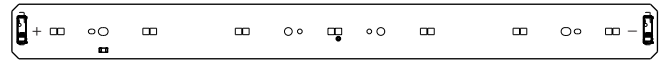
The max. permissible output current of the LED driver for parallel wiring is 2.1 A.

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

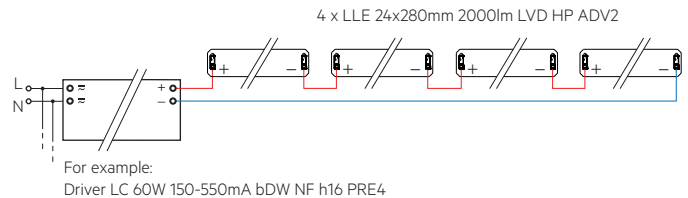


LLE are basic insulated up to 400 V (if mounted with M3 screws in combination with LEDiL DAISY lens) against ground and can be mounted directly on earthed metal parts of the luminaire. If the max. output voltage of the LED driver (also against earth) is above 400 V, an additional insulation between LED module and heat sink is required (for example by insulated thermal pads) or by a suitable luminaire construction.

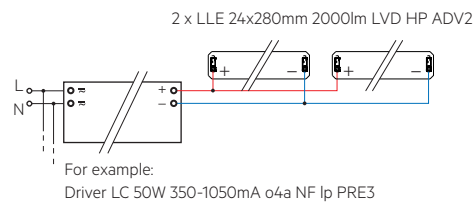
3.2 Wiring



Wiring example serial

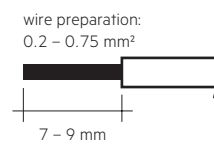


Wiring example parallel



3.3 Wiring type and cross section

For wiring use stranded wire with ferrules or solid wire from 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 4 screws per module.



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. 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.

4.2 Lumen maintenance

Forward cur,	tempera- ture	tp					
		L90 / B10	L90 / B50	L80 / B10	L80 / B50	L70 / B10	L70 / B50
100 mA	40 °C	>100k h	>100k h	>100k h	>100k h	>100k h	>100k h
	50 °C	>100k h	>100k h	>100k h	>100k h	>100k h	>100k h
	60 °C	99k h	>100k h	>100k h	>100k h	>100k h	>100k h
	70 °C	94k h	>100k h	>100k h	>100k h	>100k h	>100k h
300 mA	75 °C	91k h	>100k h	>100k h	>100k h	>100k h	>100k h
	40 °C	>100k h	>100k h	>100k h	>100k h	>100k h	>100k h
	50 °C	>100k h	>100k h	>100k h	>100k h	>100k h	>100k h
	60 °C	99k h	>100k h	>100k h	>100k h	>100k h	>100k h
1050 mA	70 °C	93k h	>100k h	>100k h	>100k h	>100k h	>100k h
	75 °C	91k h	>100k h	>100k h	>100k h	>100k h	>100k h
	40 °C	47k h	53k h	94k h	>100k h	>100k h	>100k h
	50 °C	45k h	53k h	91k h	>100k h	>100k h	>100k h
1050 mA	60 °C	44k h	53k h	89k h	>100k h	>100k h	>100k h
	70 °C	42k h	53k h	86k h	>100k h	>100k h	>100k h
	75 °C	42k h	53k h	85k h	>100k h	>100k h	>100k h

LOC10 >100k h. At tp rated and Irated, based on 10 switching cycles per day.

4.3 Switching capability

100,000 cycles

30 s on / 30 s off at Imax and 25 °C

5. Electrical values

5.1 Declaration of electrical parameters

I_{rated} ... Nominal operating current the module is designed for.

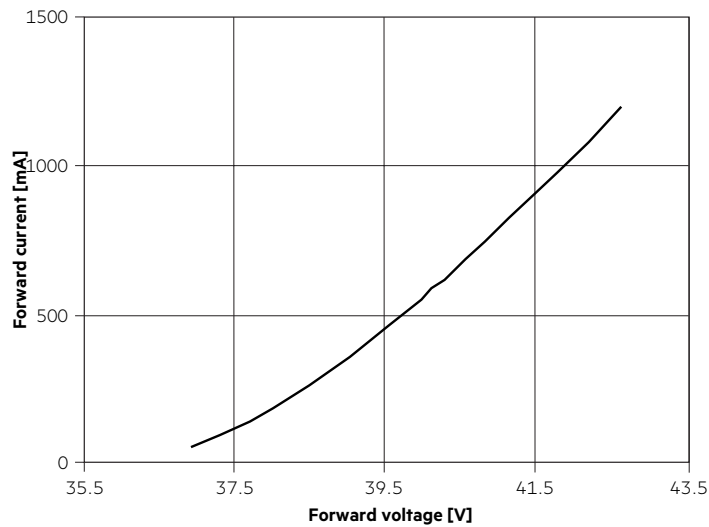
I_{max} ... Max. permissible continuous operating current incl. The tolerances of the LED driver.

Max. permissible LF current ripple ... Max. output current of the LED driver incl. Tolerances and LF current ripple must not exceed this value.

Max. permissible peak current ... The max. output peak current of the LED driver must not exceed this value.

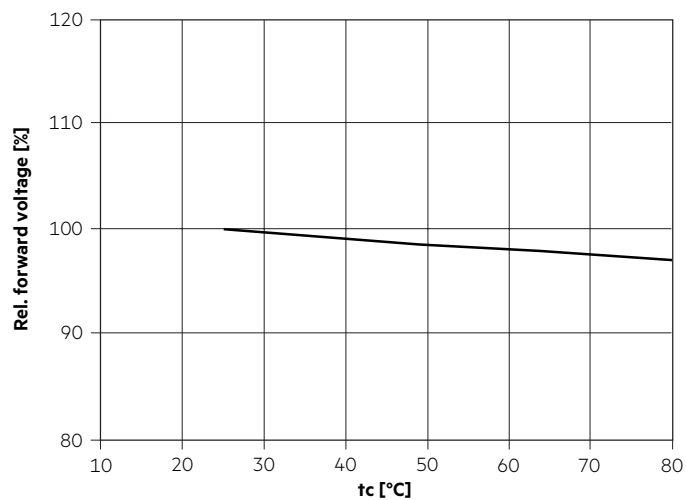
5.2 Typ. forward voltage vs. forward current

LLE 24x280mm 2000lm LVD HP ADV2



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

5.3 Forward voltage vs. tc temperature



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

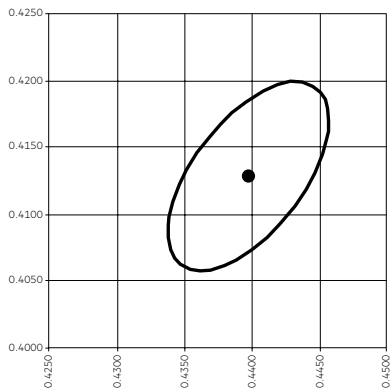
6. Photometric characteristics

6.1 Coordinates and tolerances according to CIE 1931

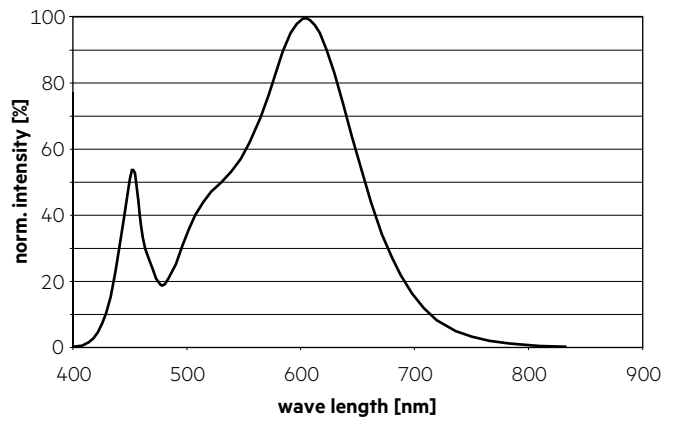
The specified colour coordinates are integral measured by current impulse of 300 mA and a duration of 100 ms.
 The ambient temperature of the measurement is $t_a = 25^\circ\text{C}$.
 The measurement tolerance of the colour coordinates are ± 0.01 .

3,000 K – CRI80

	x0	y0
Centre	0.4397	0.4128

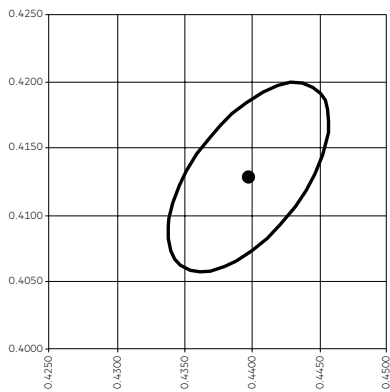


— MacAdam Ellipse: 3SDCM

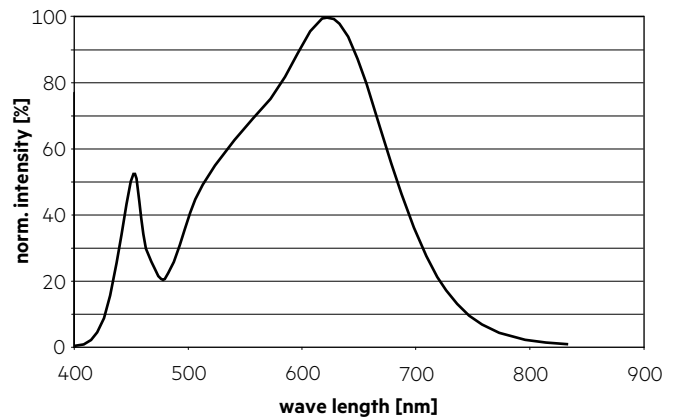


3,000 K – CRI90

	x0	y0
Centre	0.4397	0.4128

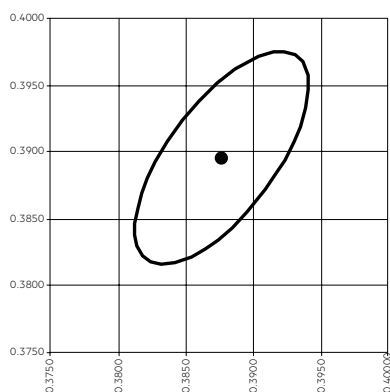


— MacAdam Ellipse: 3SDCM

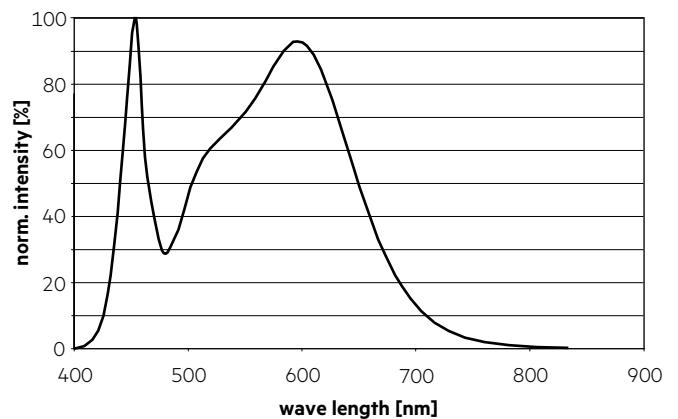


4,000 K – CRI80

	x0	y0
Centre	0.3877	0.3895

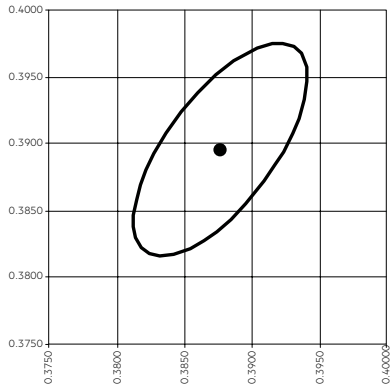


— MacAdam Ellipse: 3SDCM

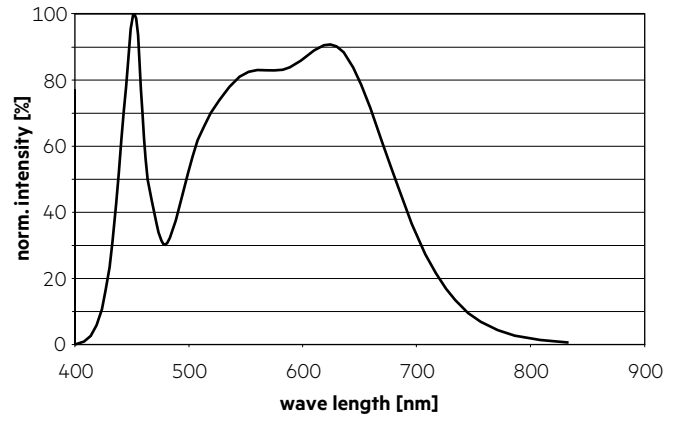


4,000 K – CRI90

	x0	y0
Center	0.3877	0.3895

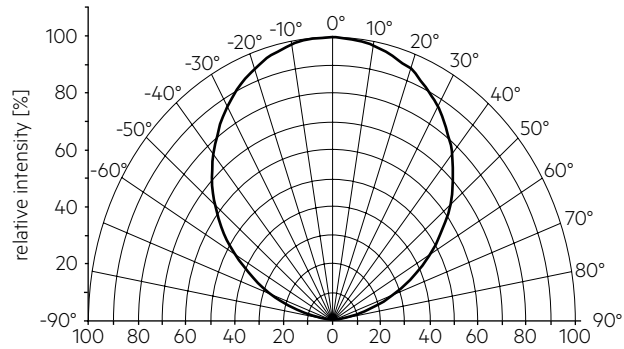


— MacAdam Ellipse: 3SDCM



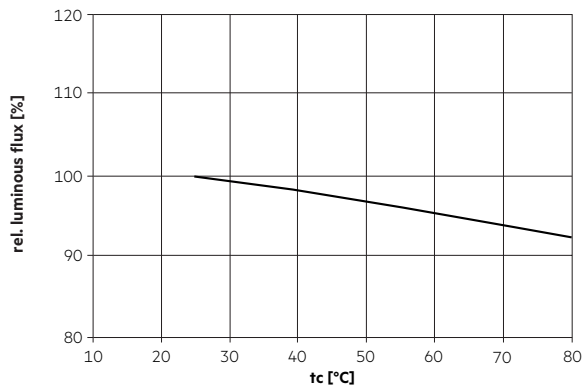
6.2 Light distribution

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



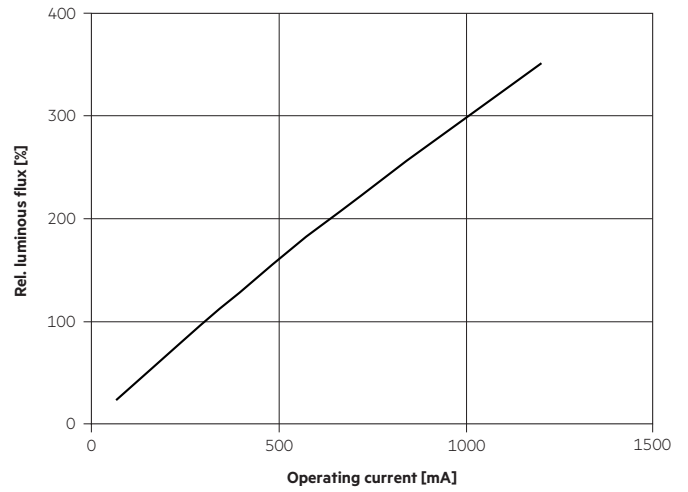
! The colour temperature is measured integral over the complete module. The single LED light points can have deviations in the colour coordinates within MacAdam 3.

6.3 Relative luminous flux vs. tc temperature



6.4 Relative luminous flux vs. operating current

LLE 24x280mm 2000lm LVD HP ADV2



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

7. Miscellaneous

7.1 Additional information

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

Guarantee conditions at www.tridonic.com → Services

Lifetime declarations are informative and represent no warranty claim.