

Module LLE 16mm 650lm CRI90 HV ADV6 P

Modules LLE advanced



LLE 16x140mm 325lm HV ADV6 P



LLE 16x280mm 650lm HV ADV6 P



LLE 16x560mm 1300lm HV ADV6 P

Product description

- _ Ideal for compact linear luminaire designs
- _ Homogenous illumination thanks to small package distance
- _ 2 terminals for serial wiring
- _ COI approved acc. to AS/NZS1680.2.5:1997
- _ Perfectly uniform light, even if several LED modules are used together in a line
- _ Push terminals for quick and simple wiring of LED module to LED module
- _ HE ... High Efficiency, NM ... Nominal Mode, HO ... High Output
- _ Long lifetime up to 102,000 hours
- _ 5 years guarantee (conditions at <https://www.tridonic.com/en/int/services/manufacturer-guarantee-conditions>)

Optical properties

- _ Colour temperature 4,000 K
- _ Efficacy of the LED module up to 200 lm/W
- _ High colour rendering index CRI > 90
- _ High colour consistency (MacAdam 3)
- _ Small luminous flux tolerances

Mechanical properties

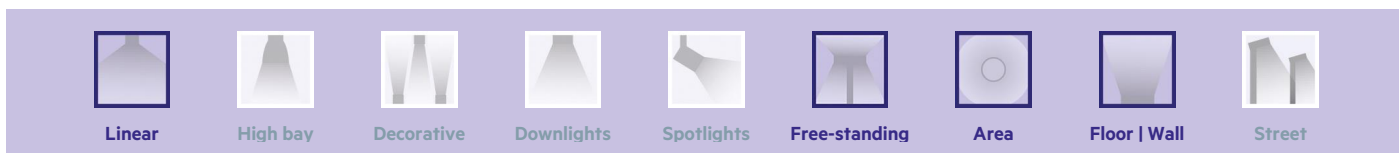
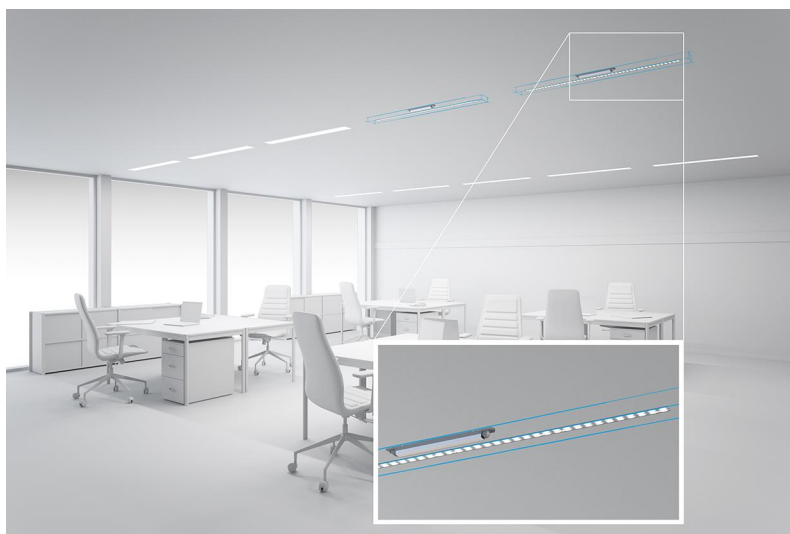
- _ Module dimension 16 x 140 mm, 16 x 280 mm and 16 x 560 mm
- _ Simple installation via clips or screws

System solution

- _ Integrate compatible partner products into your final system solution: <https://www.tridonic.com/en/int/products/accessories#partner>
- _ Combine Tridonic's LED modules and dimmable drivers to achieve an outstanding system efficacy (configuration possible via <https://setbuilder.tridonic.com/>)

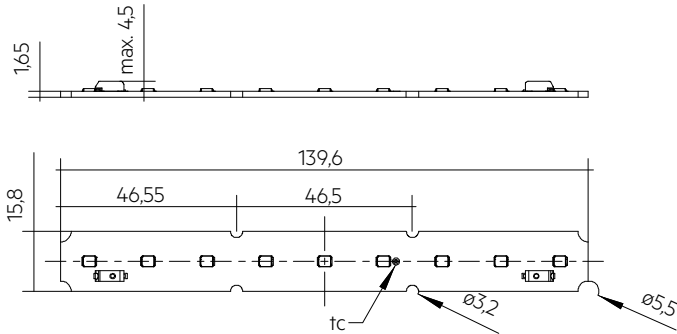
Website

<http://www.tridonic.com/28006125>

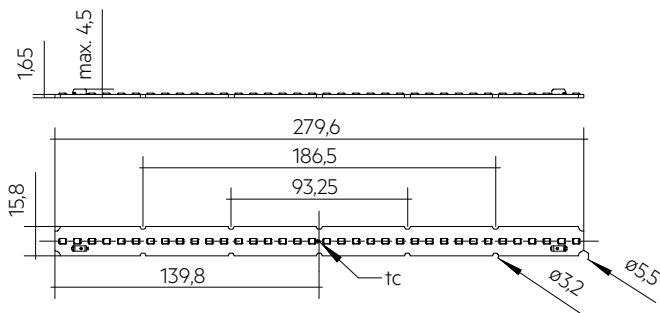


Module LLE 16mm 650lm CRI90 HV ADV6 P

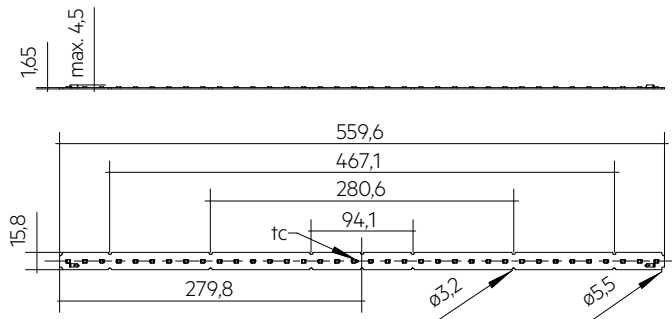
Modules LLE advanced



LLE 16x140mm 325lm HV ADV6 P



LLE 16x280mm 650lm HV ADV6 P



LLE 16x560mm 1300lm HV ADV6 P

Ordering data

Type	Article number	Colour temperature	Packaging, carton	Weight per pc.
LLE 16x140mm 325lm 940 HV ADV6 P	28006125	4,000 K	144 pc(s).	0.007 kg
LLE 16x280mm 650lm 940 HV ADV6 P	28006126	4,000 K	144 pc(s).	0.014 kg
LLE 16x560mm 1300lm 940 HV ADV6 P	28006127	4,000 K	144 pc(s).	0.028 kg

Technical data

Beam characteristic	120°
Ambient temperature t_a	-40 ... +65 °C
t_p rated	50 °C
t_c	85 °C
I _{rated}	200 mA
I _{max}	700 mA
Max. permissible LF current ripple	800 mA
Max. permissible peak current	1,350 mA / max. 10 ms
Max. working voltage for insulation	440 V
Insulation test voltage	1.88 kV
Colour tolerance	3 SDCM
ESD classification	Severity level 2
Risk group (IEC 62471)	RG1 (> 600 – 700 mA (I _{max})), RGO (≤ 600 mA)
Classification acc. to IEC 62031	Built-in
Type of protection	IP00
Lumen maintenance L70B50	102,000 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 ^①	Useful luminous flux at $t_p = 25$ °C ^②	Expected luminous flux at t_p rated ^③	Typ. forward current	Min. forward voltage at t_p rated	Max. forward voltage at $t_p = 25$ °C	Power consumption P_{on} at $t_p = 25$ °C ^④	Efficacy of the module at $t_p = 25$ °C	Expected efficacy of the module at t_p rated	Colour rendering index CRI
Operating mode HE											
LLE 16x140mm 325lm 940 HV ADV6 P	28006125	940/359	-	154 lm	100 mA	7.7 V	8.1 V	-	-	195 lm/W	>90
LLE 16x280mm 650lm 940 HV ADV6 P	28006126	940/359	-	308 lm	100 mA	15.4 V	16.2 V	-	-	196 lm/W	>90
LLE 16x560mm 1300lm 940 HV ADV6 P	28006127	940/359	-	616 lm	100 mA	30.8 V	32.4 V	-	-	195 lm/W	>90
Operating mode NM											
LLE 16x140mm 325lm 940 HV ADV6 P	28006125	940/359	324 lm	315 lm	200 mA	7.9 V	8.3 V	1.6 W	200 lm/W	197 lm/W	>90
LLE 16x280mm 650lm 940 HV ADV6 P	28006126	940/359	649 lm	630 lm	200 mA	15.7 V	16.5 V	3.2 W	200 lm/W	196 lm/W	>90
LLE 16x560mm 1300lm 940 HV ADV6 P	28006127	940/359	1,298 lm	1,260 lm	200 mA	31.5 V	33.0 V	6.5 W	200 lm/W	196 lm/W	>90
Operating mode HO											
LLE 16x140mm 325lm 940 HV ADV6 P	28006125	940/359	-	885 lm	600 mA	8.4 V	8.8 V	-	-	172 lm/W	>90
LLE 16x280mm 650lm 940 HV ADV6 P	28006126	940/359	-	1,770 lm	600 mA	16.8 V	17.6 V	-	-	172 lm/W	>90
LLE 16x560mm 1300lm 940 HV ADV6 P	28006127	940/359	-	3,540 lm	600 mA	33.7 V	35.2 V	-	-	172 lm/W	>90

① The detailed explanation, see data sheet section 1.1.

② Tolerance of useful light flux - 10 % / + 10 %. Measurement uncertainty ± 5 %.

③ Measurement uncertainty ± 5 %. Based on calculation.

④ Tolerance of power consumption P_{on} ± 10 %. Measurement uncertainty ± 3 %.

ACL BRIDGE LLE16

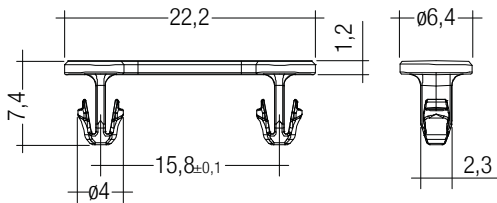
Accessory

**Product description**

- _ Clip for fixation for LLE16
- _ Fast snap on mounting (for sheet thickness 0.5 – 1.0 mm)
- _ For drilling hole 3 mm
- _ Clip made of polycarbonate
- _ Minimum sales quantity 200 pcs.

Website

<http://www.tridonic.com/28001035>

**Ordering data**

Type	Article number	Colour	Packaging, bag	Weight per pc.
ACL BRIDGE LLE16 PUSH-FIX	28001035	White	200 pc(s).	0.001 kg

ACL LINEAR COVER 16mm

Accessory

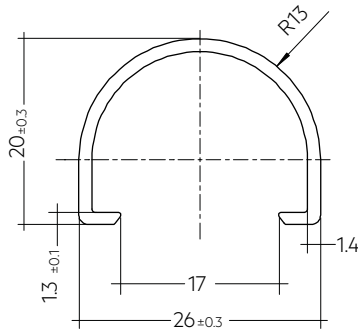
**Product description**

- _ LINEAR COVER for LLE 16
- _ Protection against direct touch for non-SELV applications (recommendation: use all fixing points) ^①
- _ Fast snap on mounting on to LLE 16 with clips or plastic washers
- _ High transmission: transparent, semi-transparent and diffuse
- _ Linear lense made of PMMA
- _ Tolerances LINEAR COVER: + 10 mm for 1,600 / 1,200 mm length (ends raw)

① Ends must be covered by the luminaire construction.

Website

<http://www.tridonic.com/28000950>

**Ordering data**

Type	Article number	Colour	Length L	Packaging, carton	Weight per pc.
ACL LINEAR COVER 16x1600mm FROSTED	28000950	Semi-transparent	1,600 mm	24 pc(s).	0.147 kg
ACL LINEAR COVER 16x1200mm FROSTED	28002827	Semi-transparent	1,200 mm	24 pc(s).	0.100 kg
ACL LINEAR COVER 16x1600mm DIFFUSE	28000951	Diffuse	1,600 mm	24 pc(s).	0.147 kg
ACL LINEAR COVER 16x1200mm DIFFUSE	28002828	Diffuse	1,200 mm	24 pc(s).	0.100 kg

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 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 ≥ 70 %
9 ≥90				8 ≥ 80 %
				9 ≥ 90 %

1.2 Energy classification

Type	Colour temperature	Forward current	Energy classification	Energy consumption
LLE 16x140mm 325lm 940 HV ADV6 P	4,000 K	200 mA	B	2 kWh / 1,000 h
LLE 16x280mm 650lm 940 HV ADV6 P	4,000 K	200 mA	B	4 kWh / 1,000 h
LLE 16x560mm 1300lm 940 HV ADV6 P	4,000 K	200 mA	B	7 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 50 °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 ... +85 °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 16x140mm 325lm ADV6 P

ta	tp	Forward current	R _{th, hs-a}	Cooling area
25 °C	50 °C	200 mA		self cooling
25 °C	50 °C	650 mA	6.04 K/W	110 cm ²
35 °C	50 °C	200 mA	19.13 K/W	35 cm ²
35 °C	50 °C	650 mA	2.77 K/W	241 cm ²
40 °C	50 °C	200 mA	12.04 K/W	55 cm ²
40 °C	50 °C	650 mA	1.13 K/W	590 cm ²
45 °C	50 °C	200 mA	4.95 K/W	135 cm ²
45 °C	50 °C	650 mA	-	-

LLE 16x280mm 650lm ADV6 P

ta	tp	Forward current	R _{th, hs-a}	Cooling area
25 °C	50 °C	200 mA		self cooling
25 °C	50 °C	650 mA	3.02 K/W	221 cm ²
35 °C	50 °C	200 mA	9.56 K/W	70 cm ²
35 °C	50 °C	650 mA	1.38 K/W	482 cm ²
40 °C	50 °C	200 mA	6.02 K/W	111 cm ²
40 °C	50 °C	650 mA	0.56 K/W	1,181 cm ²
45 °C	50 °C	200 mA	2.47 K/W	270 cm ²
45 °C	50 °C	650 mA	-	-

LLE 16x560mm 1300lm ADV6 P

ta	tp	Forward current	R _{th, hs-a}	Cooling area
25 °C	50 °C	200 mA		self cooling
25 °C	50 °C	650 mA	1.51 K/W	442 cm ²
35 °C	50 °C	200 mA	4.78 K/W	139 cm ²
35 °C	50 °C	650 mA	0.69 K/W	964 cm ²
40 °C	50 °C	200 mA	3.01 K/W	222 cm ²
40 °C	50 °C	650 mA	0.28 K/W	2,361 cm ²
45 °C	50 °C	200 mA	1.24 K/W	539 cm ²
45 °C	50 °C	650 mA	-	-

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 or operating currents higher than 500 mA, 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.

The LLE module is designed for serial wiring.

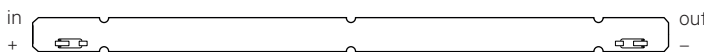
LLE can be operated either from SELV LED drivers or from LED drivers with LV output voltage.



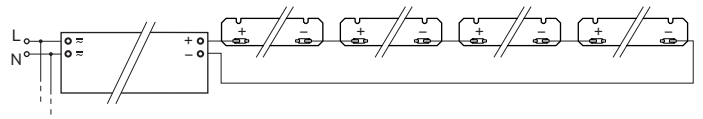
LLE are basic insulated up to 440 V (if mounted with M3 screws with head diameter 6 mm in combination with plastic washers) against ground and can be mounted directly on earthed metal parts of the luminaire. If the max. output voltage of the LED driver (also against earth) is above 440 V, an additional insulation between LED module and heat sink is required (for example by insulated 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



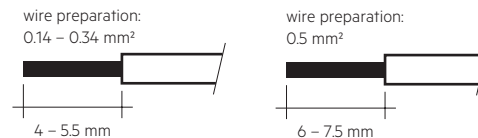
Wiring examples for serial wiring



3.3 Wiring type and cross section

For wiring use solid wire from 0.14 to 0.5 mm².

No reconnection with smaller diameters possible if used with >0.34 mm².



To remove the wires use a suitable tool (Wago 206-859) or through twist and pull.

3.4 Mounting instruction

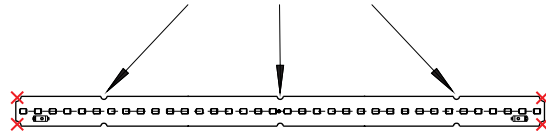


None of the components of the LLE (substrate, LED, electronic components etc.) may be exposed to tensile or compressive stresses.

Max. torque for fixing: 0.5 Nm.

The LED modules are mounted onto a heat sink with M3 screws with plastic washers or ACL BRIDGE LLE16 PUSH-FIX. All fastening point must be used for mounting. The cut-outs on the end faces must not be used for fastening.

Use only these holes for mounting!



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 for LLE 16mm HV ADV6 P

Forward current	tp	L90 / B10	L90 / B50	L80 / B10	L80 / B50	L70 / B10	L70 / B50
	tempera- ture						
700 mA	40 °C	52k h	52k h	> 102k h	> 102k h	> 102k h	> 102k h
	85 °C	52k h	52k h	> 102k h	> 102k h	> 102k h	> 102k h

L00C03 > 102k h. At tp rated and I rated, based on 10 swichting 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 I_{max}

5. Electrical values

5.1 Declaration of electrical parameters

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

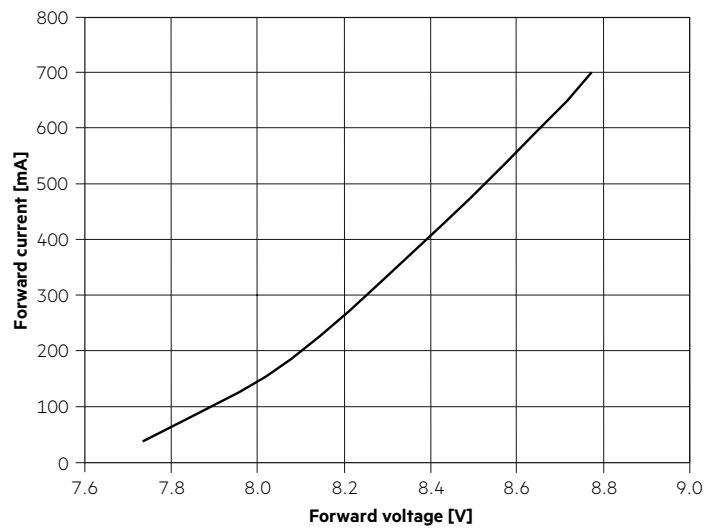
I_{max} ... Max. permissible continuous operating current incl. The tolerances of the LED driver.

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

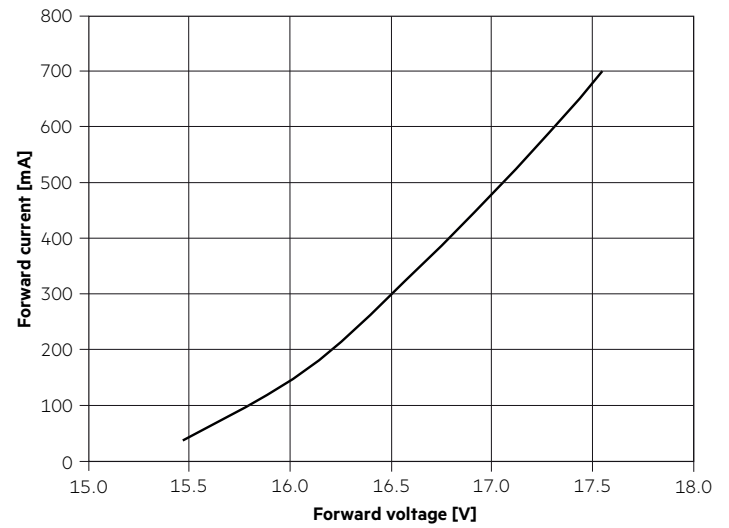
Max. permissible peak current ... The max. output peak current of the LED driver must not exceed this value.

5.2 Typ. forward voltage vs. forward current

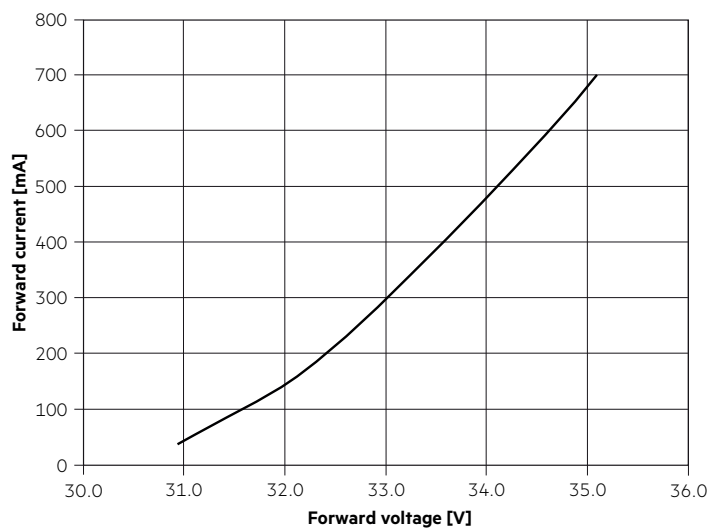
LLE 16x140mm 325lm 9xx HV ADV6 P



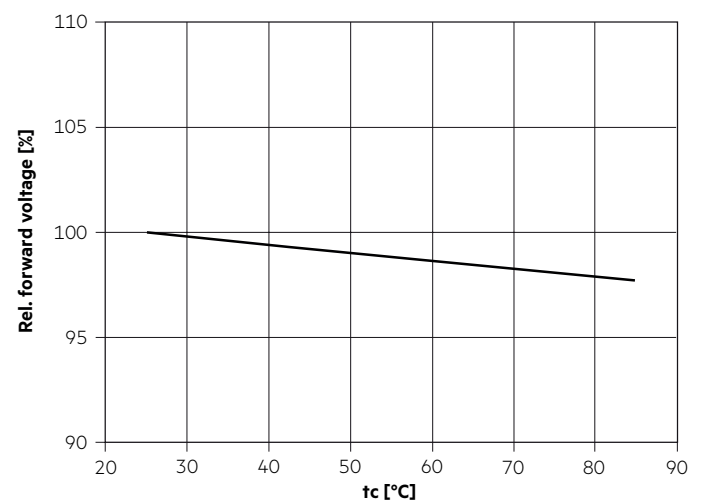
LLE 16x280mm 650lm 9xx HV ADV6 P



LLE 16x560mm 1300lm 9xx HV ADV6 P



5.3 Forward voltage vs. tc temperature



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

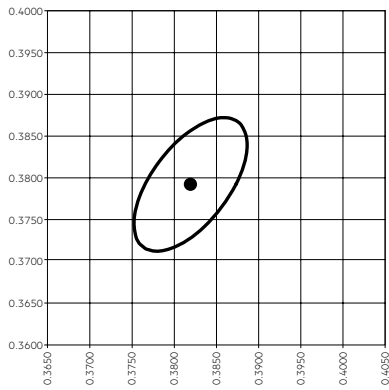
6. Photometric characteristics

6.1 Coordinates and tolerances according to CIE 1931

The specified colour coordinates are integral measured by current impulse of 195 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 .

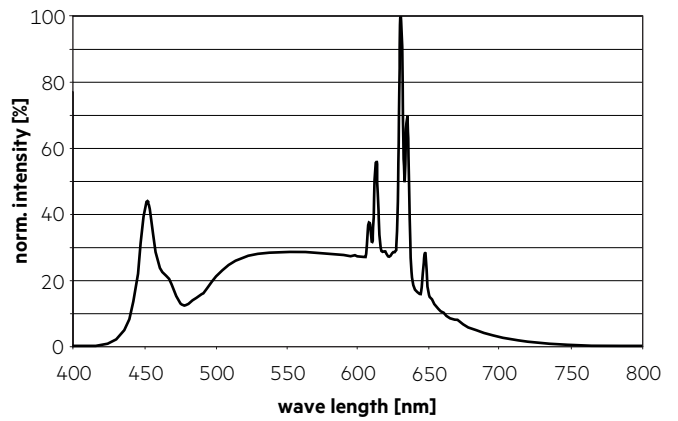
4,000 K

	x0	y0
Center	0.3818	0.3797

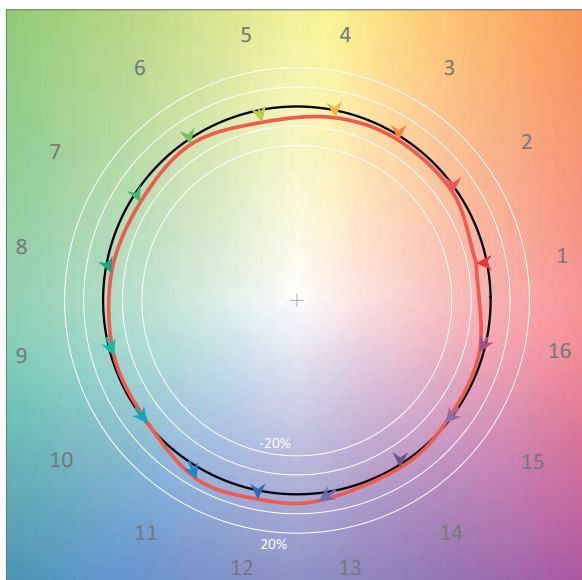


— MacAdam Ellipse: 3SDCM

TM30		CRI	
Rf	Rg	Ra	R9
89	97	93	62



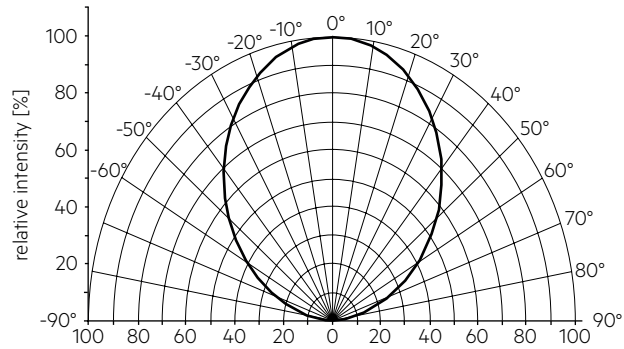
Colour vector graphic



— Reference source
 — Test source

6.2 Light distribution

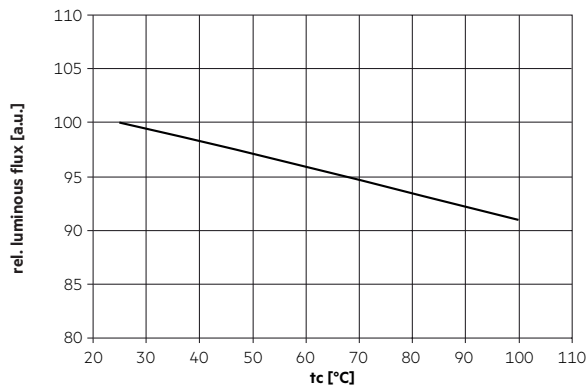
The optical design of the LLE product line ensures optimum homogeneity for the light distribution.



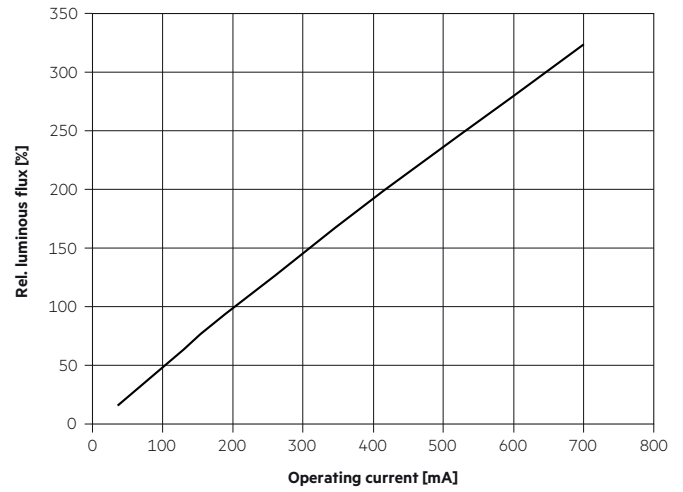
The colour temperature is measured integral over the complete module. The single LED light points can have deviations in the colour coordinates within MacAdam 5.

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. 4 cm) should be used.

6.3 Relative luminous flux vs. tc temperature



6.4 Relative luminous flux vs. operating current



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

Lifetime declarations are informative and represent no warranty claim.