TRIDONIC

Module LLE 24mm 1250lm CRI90 LV ADV6 P

Modules LLE advanced



LLE 24x140mm 650lm LV ADV6 P



LLE 24x280mm 1250lm LV ADV6 P



LLE 24x560mm 2400lm LV ADV6 P

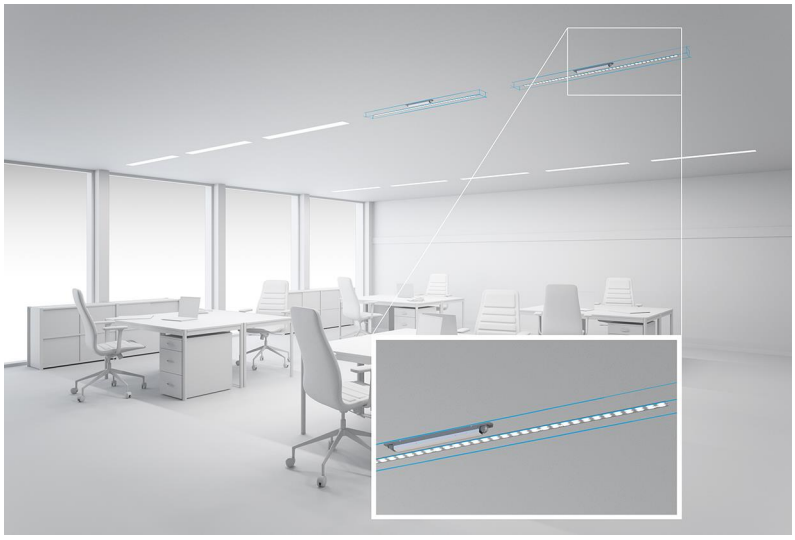
Product description
_ Ideal for linear and panel lights
_ 4 terminals for parallel wiring
_ COI approved acc. to AS/NZS1680.2.5:1997
_ Perfectly uniform light, even if several LED modules are used together in a line
_ Push terminals for quick and simple wiring of LED module to LED module
_ Broad portfolio from extruded lenses and covers available
_ 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 24 x 140 mm, 24 x 280 mm and 24 x 560 mm (ZHAGA compliant)
_ Simple installation via clips or screws

System solution
_ 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/28006138

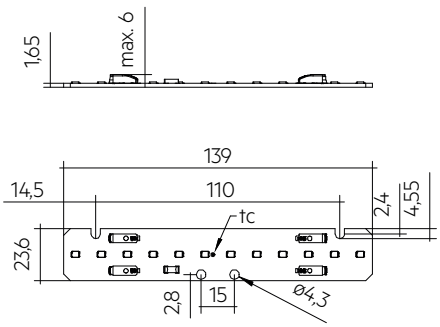


Linear | High bay | Decorative | Downlights | Spotlights | Free-standing | Area | Floor | Wall | Street

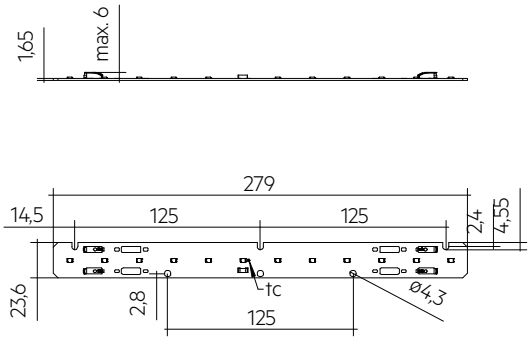
TRIDONIC

Module LLE 24mm 1250lm CRI90 LV ADV6 P

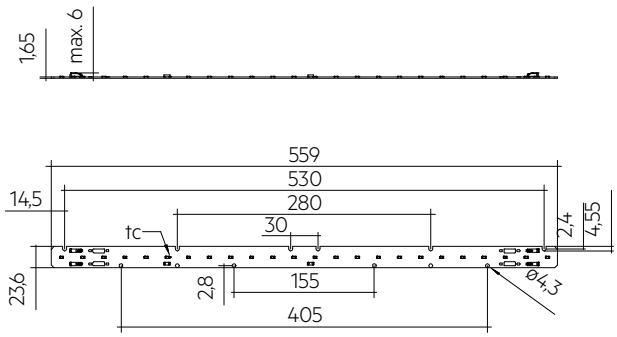
Modules LLE advanced



LLE 24x140mm 650lm LV ADV6 P



LLE 24x280mm 1250lm LV ADV6 P



LLE 24x560mm 2400lm LV ADV6 P

Ordering data

Type	Article number	Colour temperature	Packaging, carton	Weight per pc.
Frontside terminal				
LLE 24x140mm 650lm 940 LV ADV6 P	**28006138**	4,000 K	108 pc(s).	0.012 kg
LLE 24x280mm 1250lm 940 LV ADV6 P	**28006139**	4,000 K	108 pc(s).	0.024 kg
LLE 24x560mm 2400lm 940 LV ADV6 P	**28006140**	4,000 K	108 pc(s).	0.044 kg

Technical data

Beam characteristic	120°
Ambient temperature ta	-40 … +65 °C
tp rated	50 °C
tc	85 °C
Irated for 650 lm	100 mA
Irated for 1,250 lm	200 mA
Irated for 2,400 lm	400 mA
Imax for 650 lm	200 mA
Imax for 1,250 lm	400 mA
Imax for 2,400 lm	800 mA
Max. permissible LF current ripple for 650 lm	220 mA
Max. permissible LF current ripple for 1,250 lm	440 mA
Max. permissible LF current ripple for 2,400 lm	880 mA
Max. permissible peak current for 650 lm	300 mA / max. 10 ms
Max. permissible peak current for 1,250 lm	600 mA / max. 10 ms
Max. permissible peak current for 2,400 lm	1,200 mA / max. 10 ms
Max. working voltage for insulation SELV	60 V
Insulation test voltage	1.12 kV
Colour tolerance	3 SDCM
ESD classification	Severity level 2
Risk group (IEC 62471)	RG0
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, UL 8750

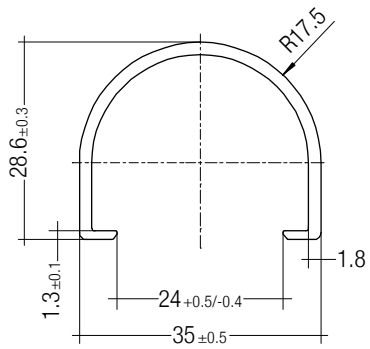
Specific technical data

Type	Article number	Photometric code①	Useful luminous flux at tp = 25 °C ②	Expected luminous flux at tp rated③	Typ. forward current	Min. forward voltage at tp rated	Max. forward voltage at tp = 25 °C	Power consumption Pon at tp = 25 °C④	Efficacy of the module at tp = 25 °C	Expected efficacy of the module at tp rated	Colour rendering index CRI
Operating mode HE											
LLE 24x140mm 650lm 940 LV ADV6 P	**28006138**	940/359	–	315 lm	50 mA	31.2 V	32.7 V	–	–	198 lm/W	>90
LLE 24x280mm 1250lm 940 LV ADV6 P	**28006139**	940/359	–	630 lm	100 mA	31.2 V	32.7 V	–	–	198 lm/W	>90
LLE 24x560mm 2400lm 940 LV ADV6 P	**28006140**	940/359	–	1,259 lm	200 mA	31.2 V	32.7 V	–	–	198 lm/W	>90
Operating mode NM											
LLE 24x140mm 650lm 940 LV ADV6 P	**28006138**	940/359	631 lm	613 lm	100 mA	32.1 V	33.6 V	3.3 W	191 lm/W	187 lm/W	>90
LLE 24x280mm 1250lm 940 LV ADV6 P	**28006139**	940/359	1,262 lm	1,225 lm	200 mA	32.1 V	33.6 V	6.6 W	191 lm/W	187 lm/W	>90
LLE 24x560mm 2400lm 940 LV ADV6 P	**28006140**	940/359	2,523 lm	2,450 lm	400 mA	32.1 V	33.6 V	13.2 W	191 lm/W	188 lm/W	>90
Operating mode HO											
LLE 24x140mm 650lm 940 LV ADV6 P	**28006138**	940/359	–	1,045 lm	175 mA	33.3 V	34.8 V	–	–	176 lm/W	>90
LLE 24x280mm 1250lm 940 LV ADV6 P	**28006139**	940/359	–	2,090 lm	350 mA	33.3 V	34.8 V	–	–	176 lm/W	>90
LLE 24x560mm 2400lm 940 LV ADV6 P	**28006140**	940/359	–	4,180 lm	700 mA	33.3 V	34.8 V	–	–	176 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 Pon ± 10 %. Measurement uncertainty ± 3 %.

LINEAR COVER LLE

Accessory



Product description

_ LINEAR COVER for LLE
_ Protection against direct touch for non-SELV applications (recommendation LLE 20: use all fixing points and screwed Endcap, recommendation LLE 24: use all fixing points)
_ Fast snap on mounting on to LLE 20: with M4 screws and plastic washers, to LLE 24: with clips or plastic washers
_ High transmission: transparent, semi-transparent and diffuse
_ Material: PMMA
_ Tolerances: ± 1 mm for 597 mm length (ends finished), + 10 mm from length 1,150 mm (ends raw)

Website
http://www.tridonic.com/28000338

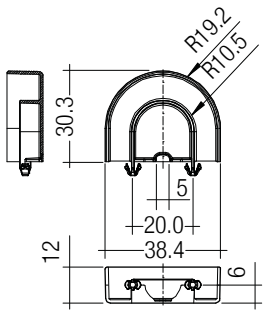
Ordering data

Type	Article number	Colour	Length L	Efficiency	Packaging, carton	Weight per pc.
LINEAR COVER SY Transparent 1600mm	**28000338**	Transparent	1,600 mm	94 %	12 pc(s).	0.272 kg
LINEAR COVER SY Frosted 1800mm	**28000437**	Semi-transparent	1,800 mm	87 %	12 pc(s).	0.308 kg
LINEAR COVER SY Frosted 1600mm	**28000339**	Semi-transparent	1,600 mm	87 %	12 pc(s).	0.272 kg
LINEAR COVER SY Frosted 1500mm	**28000435**	Semi-transparent	1,500 mm	87 %	12 pc(s).	0.244 kg
LINEAR COVER SY Frosted 1200mm	**28000422**	Semi-transparent	1,200 mm	87 %	12 pc(s).	0.205 kg
LINEAR COVER SY Frosted 597mm	**28000340**	Semi-transparent	597 mm	87 %	12 pc(s).	0.102 kg
LINEAR COVER SY Diffuse 1800mm	**28000438**	Diffuse	1,800 mm	76 %	12 pc(s).	0.308 kg
LINEAR COVER SY Diffuse 1600mm	**28000341**	Diffuse	1,600 mm	76 %	12 pc(s).	0.272 kg
LINEAR COVER SY Diffuse 1500mm	**28000436**	Diffuse	1,500 mm	76 %	12 pc(s).	0.257 kg
LINEAR COVER SY Diffuse 1200mm	**28000434**	Diffuse	1,200 mm	76 %	12 pc(s).	0.205 kg
LINEAR COVER SY Diffuse 597mm	**28000342**	Diffuse	597 mm	76 %	12 pc(s).	0.102 kg

ACL ENDCAP LLE

Accessory





Product description

_ ENDCAP for LLE
_ PUSH-FIX: Fast snap on mounting (sheet thickness 0.5 – 1.0 mm), for drilling hole 4 mm
_ SCREW-FIX: Screw mounting with EJOT Delta PT WN 5451 30x8 (not included), tightening torque 0.7 Nm
_ Clip made of polycarbonate

Website

http://www.tridonic.com/28001037

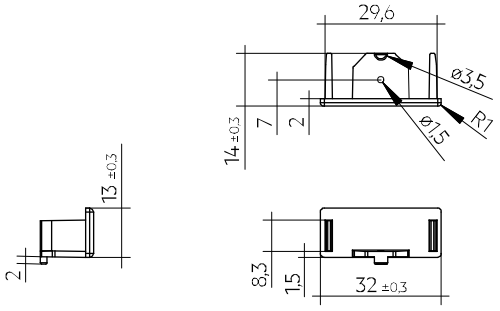
Ordering data

Type	Article number	Colour	Packaging, carton	Weight per pc.
ACL ENDCAP LLE24 PUSH-FIX	**28001037**	White	480 pc(s).	0.003 kg
ACL ENDCAP LLE24 SCREW-FIX	**28002315**	White	480 pc(s).	0.003 kg

ACL LINEAR LENS 24mm

Accessory





Product description LINEAR LENS

_ Linear lens for LLE 20 / 24
_ Available with different beam characteristics
_ Protection against direct touch for non-SELV applications (recommendation: use all fixing points)
_ Fast snap on mounting on to LLE 20: with M4 screws and plastic washers, to LLE 24: with clips or plastic washers
_ Recommendation: Fastening with screws and plastic washers, see 2.3 Heat sink specifications in data sheet
_ Material: PMMA
_ Available lengths: 1,200, 1,500 and 1,800 mm, Tolerance: + 10 mm (ends raw)
_ Max. permissible temperature 80 °C
_ Photometric data available on website

Product description Endcap

_ ENDCAP for LINEAR LENS 24mm INTENSE, ASY and DASY
_ Mounting by clipping in and screwing from below using screw EJOT Delta PT WN 5451 20x4, tightening torque 0.7 Nm
_ Made of Polyamide UL94 V0

Website

http://www.tridonic.com/28001428

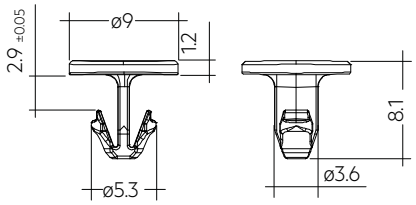
Ordering data

Type	Article number	Length L	Beam characteristic	Efficiency	Packaging, carton	Weight per pc.
ACL LINEAR LENS 24x1200mm 60°	**28001428**	1,200 mm	60°	97 %	21 pc(s).	0.196 kg
ACL LINEAR LENS 24x1200mm 90°	**28001429**	1,200 mm	90°	97 %	21 pc(s).	0.165 kg
ACL LINEAR LENS 24x1500mm 60°	**28000953**	1,500 mm	60°	97 %	21 pc(s).	0.261 kg
ACL LINEAR LENS 24x1500mm 90°	**28000955**	1,500 mm	90°	97 %	21 pc(s).	0.221 kg
ACL LINEAR LENS 24x1200mm INTENSE	**28002024**	1,200 mm	40°	95 %	18 pc(s).	0.261 kg
ACL LINEAR LENS 24x1500mm INTENSE	**28002025**	1,500 mm	40°	95 %	18 pc(s).	0.326 kg
ACL LINEAR LENS 24x1800mm INTENSE	**28002026**	1,800 mm	40°	95 %	18 pc(s).	0.392 kg
ACL LINEAR LENS 24x1200mm BATWING	**28002027**	1,200 mm	batwing	95 %	18 pc(s).	0.275 kg
ACL LINEAR LENS 24x1500mm BATWING	**28002028**	1,500 mm	batwing	95 %	18 pc(s).	0.344 kg
ACL LINEAR LENS 24x1800mm BATWING	**28002029**	1,800 mm	batwing	95 %	18 pc(s).	0.412 kg
ACL LINEAR LENS 24x1200mm ASY	**28002030**	1,200 mm	asymmetric	95 %	18 pc(s).	0.250 kg
ACL LINEAR LENS 24x1500mm ASY	**28002031**	1,500 mm	asymmetric	95 %	18 pc(s).	0.312 kg
ACL LINEAR LENS 24x1800mm ASY	**28002032**	1,800 mm	asymmetric	95 %	18 pc(s).	0.375 kg
ACL LINEAR LENS 24x1200mm DASY	**28002033**	1,200 mm	double asymmetric	92 %	18 pc(s).	0.249 kg
ACL LINEAR LENS 24x1500mm DASY	**28002034**	1,500 mm	double asymmetric	92 %	18 pc(s).	0.311 kg
ACL LINEAR LENS 24x1800mm DASY	**28002035**	1,800 mm	double asymmetric	92 %	18 pc(s).	0.373 kg
ACL Endcap LENS 24mm PSF	**28002669**	–	–	–	3,600 pc(s).	0.003 kg

ACL CLIP 4.3mm

Accessory





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 PUSH-FIX and 1 – 2 mm for PUSH-FIX Long)
_ For drilling hole 4 mm
_ Clip made of polycarbonate
_ Minimum sales quantity 500 pcs.

Website

http://www.tridonic.com/28001036

Ordering data

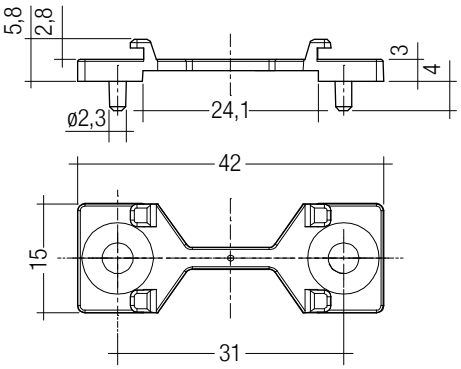
Type	Article number	Colour	Packaging, bag ①	Weight per pc.
ACL CLIP 4.3mm PUSH-FIX	**28001036**	White	500 pc(s).	0.001 kg
ACL CLIP 4,3mm PUSH-FIX Long	**28002314**	Transparent	500 pc(s).	0.001 kg

① Minimum sales quantity 500 pcs.

ACL BRIDGE LLE24/40

Accessory





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 ①
_ 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
_ Material: white polycarbonate
_ Minimum sales quantity 600 pcs.

① Beam characteristics will change due to the elevated fixation (see photometric files for details).

Website

http://www.tridonic.com/28001205

Ordering data

Type	Article number	Colour	Packaging, carton	Weight per pc.
ACL BRIDGE LLE24/40 SCREW-FIX	**28001205**	White	600 pc(s).	0.001 kg

1. Standards

IEC 62031
IEC 62471
IEC 61000-4-2
IEC 62778
IEC 61547
UL 8750 (for CLASS2 circuits and dry locations)

1.1 Photometric code

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

1st digit		2nd + 3rd digit	4th digit	5th digit	6th 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)	
					Code	Luminous flux
7	70 – 79				7	≥ 70 %
8	80 – 89				8	≥ 80 %
9	≥90				9	≥ 90 %

1.2 Energy classification

Type	Colour temperature	Forward current	Energy classification	Energy consumption
LLE 24x140mm 650lm 940 LV ADV6 P	4,000 K	100 mA	C	4 kWh / 1,000 h
LLE 24x280mm 1250lm 940 LV ADV6 P	4,000 K	200 mA	C	7 kWh / 1,000 h
LLE 24x560mm 2400lm 940 LV ADV6 P	4,000 K	400 mA	C	14 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 … +80 °C

Operation only in non condensing environment.
Humidity during processing of the module should be between 30 to 70 %.

2.3 Heat sink values

LLE 24x140mm 650lm LV ADV6 P

ta	tp	Forward current	$R_{th, hs-a}$	Cooling area
25 °C	50 °C	100 mA	14.66 K/W	45 cm²
25 °C	50 °C	175 mA	6.54 K/W	102 cm²
35 °C	50 °C	100 mA	8.22 K/W	81 cm²
35 °C	50 °C	175 mA	3.35 K/W	199 cm²
40 °C	50 °C	100 mA	5.01 K/W	133 cm²
40 °C	50 °C	175 mA	1.76 K/W	379 cm²
45 °C	50 °C	100 mA	1.79 K/W	373 cm²
45 °C	50 °C	175 mA	0.16 K/W	4,052 cm²

LLE 24x280mm 1250lm LV ADV6 P

ta	tp	Forward current	$R_{th, hs-a}$	Cooling area
25 °C	50 °C	200 mA	7.33 K/W	91 cm²
25 °C	50 °C	350 mA	3.27 K/W	204 cm²
35 °C	50 °C	200 mA	4.11 K/W	162 cm²
35 °C	50 °C	350 mA	1.68 K/W	398 cm²
40 °C	50 °C	200 mA	2.50 K/W	266 cm²
40 °C	50 °C	350 mA	0.88 K/W	759 cm²
45 °C	50 °C	200 mA	0.89 K/W	746 cm²
45 °C	50 °C	350 mA	0.08 K/W	8,104 cm²

LLE 24x560mm 2400lm LV ADV6 P

ta	tp	Forward current	$R_{th, hs-a}$	Cooling area
25 °C	50 °C	400 mA	3.66 K/W	182 cm²
25 °C	50 °C	700 mA	1.63 K/W	408 cm²
35 °C	50 °C	400 mA	2.06 K/W	324 cm²
35 °C	50 °C	700 mA	0.84 K/W	796 cm²
40 °C	50 °C	400 mA	1.25 K/W	533 cm²
40 °C	50 °C	700 mA	0.44 K/W	1,517 cm²
45 °C	50 °C	400 mA	0.45 K/W	1,491 cm²
45 °C	50 °C	700 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, 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.

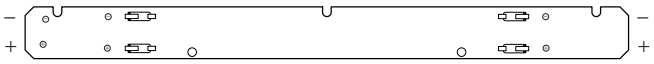
The max. permissible output current of the LED driver for parallel wiring is 2.8 A.

With parallel connection and a supply on one side, the Irated current must not be exceeded.
With parallel connection and supply on both sides, the forward current for the high output operating mode must not be exceeded.

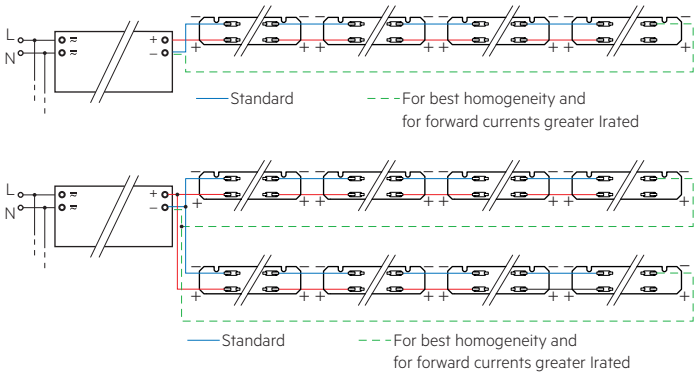
LLE have to be operated with SELV LED drivers.

LLE are basic insulated up to 60 V SELV (if mounted with M4 screws with head diameter 7 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 60 V SELV, 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

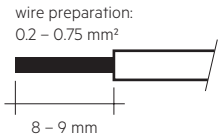


Wiring examples



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 (8–9 mm).



To remove the wires use a suitabel tool (e.g. BJB release pin) 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 min. 3 screws per module or ACL CLIP 4.3mm.

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 24mm LV ADV6 P

Forward current	tp temperature	L90 / B10	L90 / B50	L80 / B10	L80 / B50	L70 / B10	L70 / B50
350 mA / ft (280 mm module length)	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 Imax

5. Electrical values

5.1 Declaration of electrical parameters

Irated ... Nominal operating current the module is designed for.

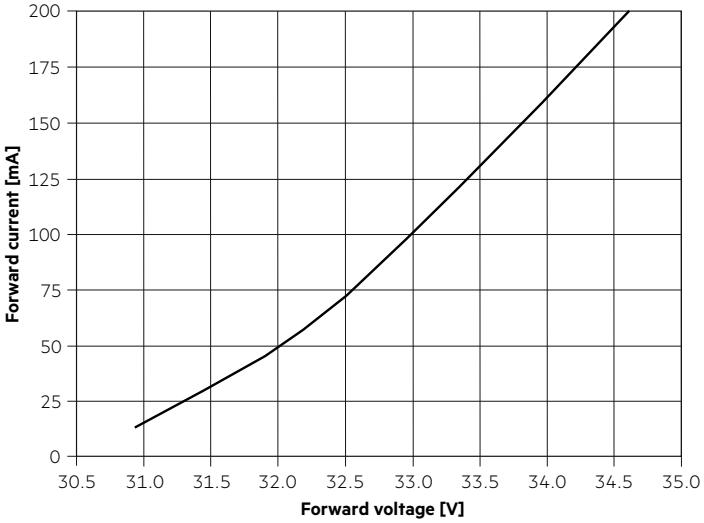
Imax ... Max. permissible continuous operating current incl. The tolerances of the LED driver.

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

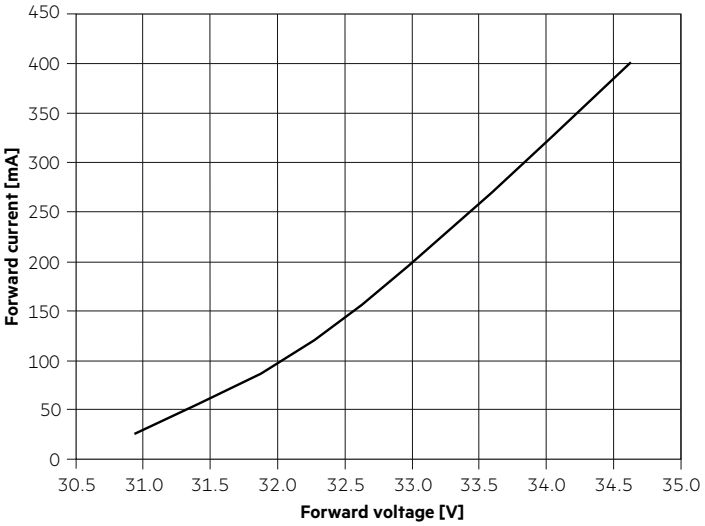
Max. permissible peak current ... The max. output peak current of the LED driver must not exceed this value.

5.2 Typ. forward voltage vs. forward current

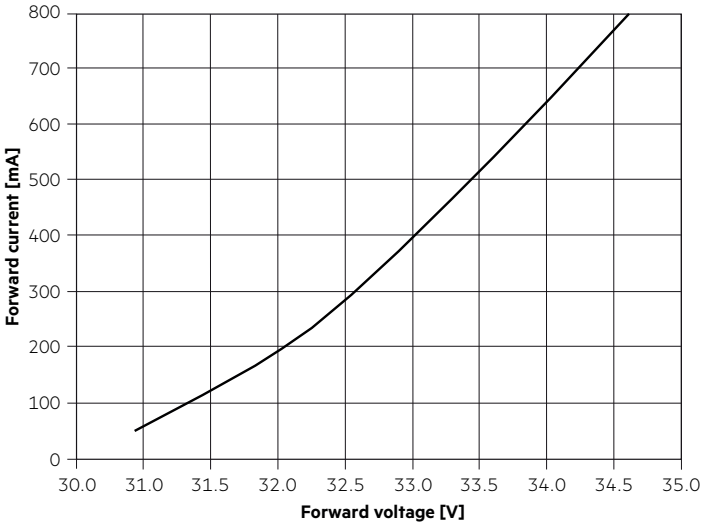
LLE 24x140mm 650lm 9xx LV ADV6 P



LLE 24x280mm 1250lm 9xx LV ADV6 P

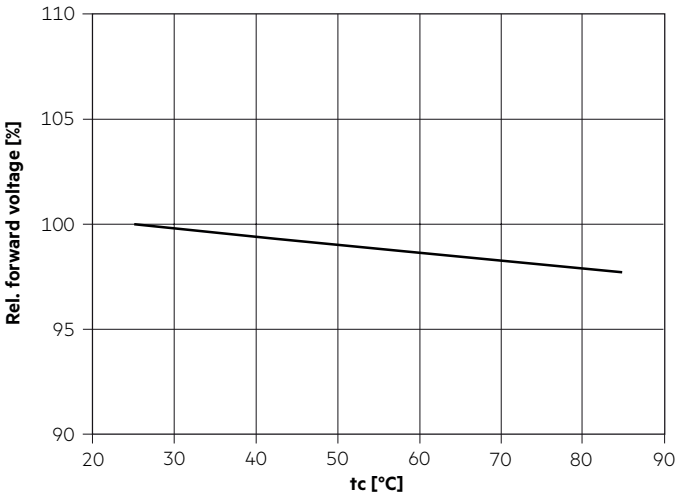


LLE 24x560mm 2400lm 9xx LV ADV6 P



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.

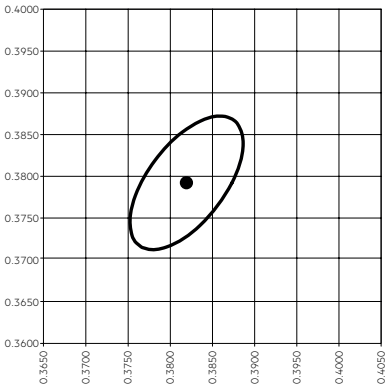
6. Photometric characteristics

6.1 Coordinates and tolerances according to CIE 1931

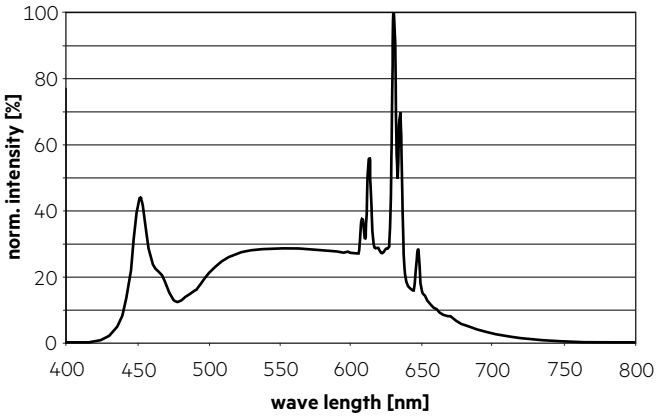
The specified colour coordinates are integral measured by current impulse of 195 mA and a duration of 100 ms.
The ambient temperature of the measurement is ta = 25 °C.
The measurement tolerance of the colour coordinates are ± 0.01.

4,000 K

	x0	y0
Center	0.3818	0.3797

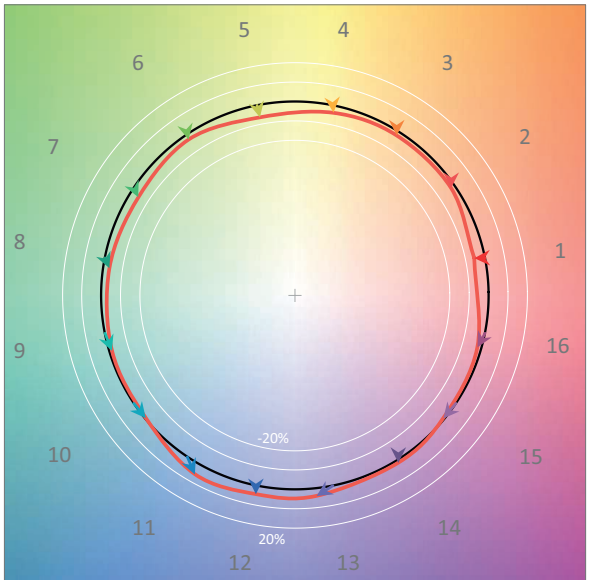


MacAdam Ellipse: 3SDCM



TM30		CRI	
Rf	Rg	Ra	R9
89	97	93	62

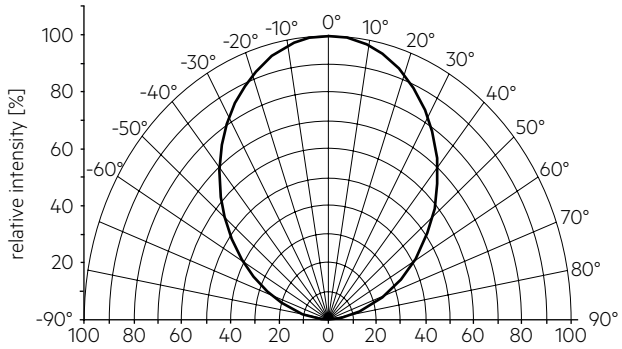
Colour vector graphic



Reference source
Test source

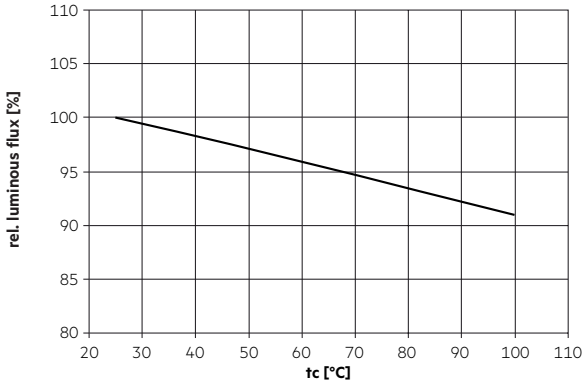
6.2 Light distribution

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



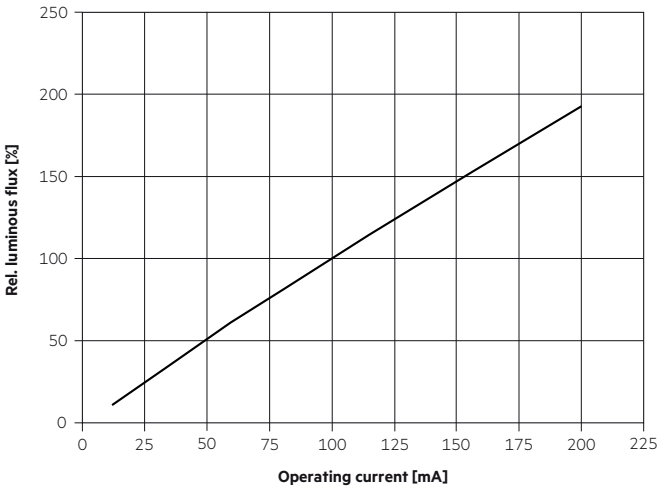
The colour temperature is measured integral over the complete module. The single LED light points can have deviations in the colour coordinates within MacAdam 3.
To ensure an ideal mixture of colours and a homogeneous light distribution a suitable optic (e. g. PMMA diffuser) and a sufficient spacing between module and optic (typ. 4 cm) should be used.

6.3 Relative luminous flux vs. tc temperature

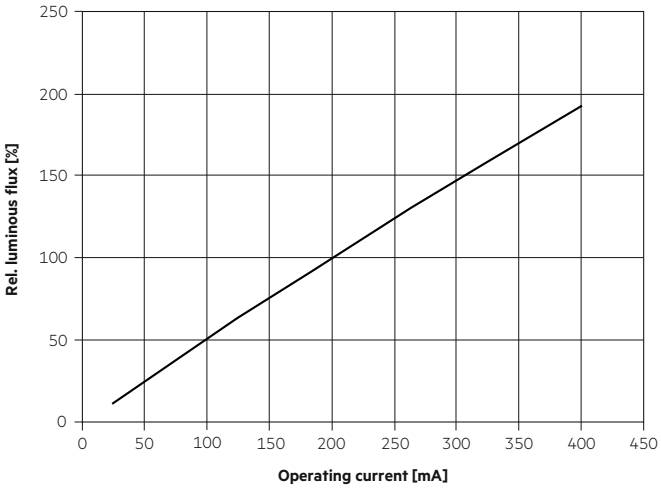


6.4 Relative luminous flux vs. operating current

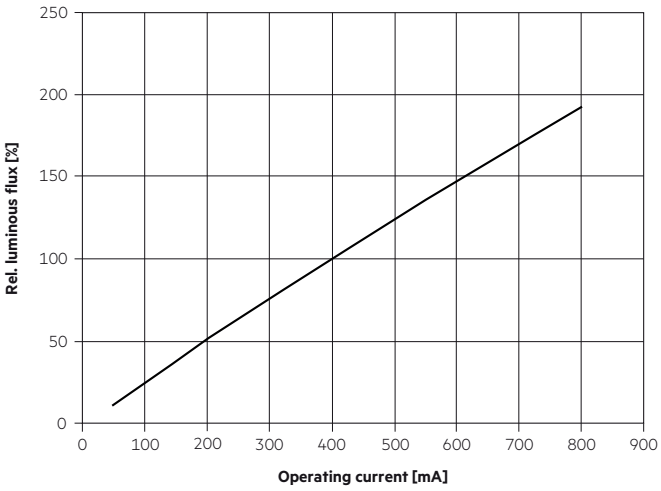
LLE 24x140mm 650lm 9xx LV ADV6 P



LLE 24x280mm 1250lm 9xx LV ADV6 P



LLE 24x560mm 2400lm 9xx LV ADV6 P



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.