TRIDONIC

Tunable White LED compact

STARK SLE premium system data sheet STARK SLE

Product description

- Tunable White system with adjustable colour temperature along the planck's curve from 2.700 to 6.500 K
- New DALI device Type 8 for Tunable White
- Noise-free precise control via switchDIM, DALI, DSI or Colour Control Interface for local operation Necessary system components:
- STARK SLE premium (LED module)
- LCAU 2x20 W one4all (LED Driver)
- 5-year guarantee

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STARK SLE-PRE-W/OH-KIT





STARK SLE-PRE-KIT

Ordering data

5		
Туре	Article number	System components
STARK SLE 1400-927-965-PRE-KIT	89601740	LMAI + SLE1400 with housing
STARK SLE 1400-927-965-PRE-W/OH-KIT	89601741	LMAI + SLE1400 without housing
STARK SLE 2000-927-965-PRE-KIT	89601742	LMAI + SLE2000 with housing
STARK SLE 2000-927-965-PRE-W/OH-KIT	89601743	LMAI + SLE2000 without housing
LCAU 2x020/0048 L010 one4all	28000907	In-built LED Driver
LCAU 2x020/0048 L020 one4all	28000887	Remote LED Driver

STARK SLE premium KIT – part 1

SLE module system component

Product description

- Tunable White module with adjustable colour temperature along the planck's curve from 2.700 to 6.500 K^{\circledast}
- For spotlights and downlights
- Built-in LED module
- Diameter: 50 mm
- High efficiency
- High colour rendering index CRI > 90
- Low colour temperature tolerances (MacAdam 3)
- Low tolerances for luminous flux
- Plug & play plug connection
- Excellent thermal management by COB technology[®]
- Dimming range 15 to 100 %
- Constant luminous flux about colour temperature

Technical data

Beam angle	140°	
Ambient temperature ta®	-25 55 °C	
tp rated	65 °C	
tc	75 °C	
Risk group (EN 62471:2008)	1	







Without housing

With housing

0,6





2000 lm



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Standards, page 7

Colour temperature and tolerances, page 9

Product description, page 7

Specific technical data

Туре	Photometric code	Luminous flux [®] ®	Power consumption system ^{® ®}	Luminous efficacy system	Colour rendering index CRI®	Energy classification
STARK SLE 1400 PRE	927/3x9 to 965/3x9	1,350 lm	22.2 W	61 lm/W	> 90	В
STARK SLE 2000 PRE	927/3x9 to 965/3x9	2,050 lm	31.7 W	65 lm/W	> 90	А

23.3

Without housing

All values at ta = 25 °C, tp rated = 65 °C, 2,700 K.

^① Tolerance range for optical data: ±10 %.

[®] Tolerance range for electrical data: ±10 %.

[®] The stated power consumption refer to the system which consists of: LCAU + STARK SLE PRE-(W/OH)-KIT.

[®] If the max. temperature limits are exceeded, the life of the system will be greatly reduced or the system may be damaged.

The temperature of the LED module at the tc-point is to be measured in the thermally stable state with a temperature sensor or a temperature sensitive sticker according to EN 60598-1. For the precise position of the tc point see the above diagram.

[®] Colour temperature and CRI according to CIE 1931.

[®] Tunable White is based on the PI-LED^{*} technology. PI-LED^{*} is a trademark of Lumitech.

STARK SLE premium KIT – part 2

LMAI system component

Product description

- 500 mA PWM output signal
- Short-circuit protection with automatic restart
- No-load detection with automatic restart
- Intelligent temperature management for LED and LMAI (protection against thermal damage)
- Connecting cable, cable cross-section 0.5 2.5 mm²
- Power input on standby 0 W
- Output power max. 44 W
- Strain relief for snap in (only for LMAI with strain-relief set)

Properties

- Use only with LED Driver and LED module possible
- Dimming range 15 to 100 %
- Dimming curve adapted to the sensitivity of the eye
- Max. acceptable cable lenght between LMAI and module 500
 mm
- SELV
- Type of protection IP20 (for LMAI with strain-relief set)



LMAI with strain relief set



Technical data

Rated supply voltage DC	48 V
Input voltage, DC	47 – 51 V
Rated current (at 48 V DC)	0,9 A
Max. input power (with FAN)	45,5 W
Standby power	OW
Output voltage range	14 - 44 V
Output current tolerance	±7%
Output current	500 mA
Output power	44 W
Dimming range	15 – 100 %
PWM frequency	312 Hz
Voltage FAN DC	12 V
Max. operating current FAN	100 mA
Max. switch-on current FAN	200 mA (< 5 ms)
Max. permitted capacity FAN	58 µF
Ambient temperature ta (at life-time 50,000 h)	-20 +45 °C
Max. casing temperature tc	55 ℃
Storage temperature	-40 +80 °C



LMAI without strain relief set



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Product description, page 10

LMAI with strain relief set

IP20 SELV 🦁 🖲 🖾 🙆 🤇 € 🛞 Rohs

Driver LCAU 2x20 W one4all

Product description

- LED Driver for premium modules
- Output power: 2 x 25 W or 1 x 40 W
- Max. output power 44 W
- Connecting cable, cable cross-section 0.5 2.5 mm²
- Power input on standby < 0.5 W
- Strain relief by remote LED Driver
- RJ45 connector for plug & play

Properties

- switchDIM (with memory function)
- colourSWITCH 2,700 6,500 K (with memory function) $^{\odot}$
- New DALI device Type 8 for Tunable White
- Noise-free precise control via switchDIM or DALI/DSI
- Powerless switching via a digital interface (no need for switching via mains)
- Intelligent Temperature Guard (protection against thermal damage)
- Short-circuit shutdown feature with automatic restart (every 7 s)
- No-load shutdown feature with automatic restart (every 7 s)
- Overload protection by restricting output[®]
- SELV
- Plastic casing black
- Type of protection IP20 (remote LED Driver)

Technical data

Rated supply voltage	220 - 240 V
Input voltage range, AC	198 – 264 V
Input voltage range, DC	170 – 264 V
Rated current (at 230 V 50 Hz)	0.21 A
Mains frequency	0 / 50 / 60 Hz
Efficiency	90 %
λ (at 230 V 50 Hz, full load)	0.95
Control input ^{® ®}	DSI, DALI, switchDIM, colourSWITCH
Stand-by power [@]	< 0.5 W
Output voltage	49 V ±2 V
Output power	2 x 25 W / 1 x 40 W
Dimming range	15 – 100 %
Set up time (at 230 V 50 Hz)	< 1 s
Switchover time AC/DC and DC/AC	< 1 s
Leakage current (FE)	0.25 mA
ta operating (at life-time 50,000 h)	-20 +45 °C
Max. casing temperature tc (at life-time 50,000 h)	65 ℃
[®] In DC operation the last set colour is used	

[®] No colourSWITCH at DC operation.

No colourswirter ar De operation

 $^{\odot}$ If the overload is too high the LED Driver switches off and tries to restart every 7 s.

^④ No fan operation on standby.



In-built LED Driver

Remote LED Driver





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In-built LED Driver



5.3

Remote LED Driver

Ordering data

Туре	Article number	Packaging car	kaging carton Packaging pallet	
LCAU 2x020/0048 L010 one4all	28000907	10 pc(s).	560 pc(s).	0.2 kg
LCAU 2x020/0048 L020 one4all	28000887	10 pc(s).	560 pc(s).	0.2 kg

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Product description, page 11

ACCES-SORIES

CONNECT – RJ45 U

Product description

- Connection cable 1 or 2 m for connectingLMAI and LCAU
- RJ45 unshielded



Ordering data

Туре	Article number	Lenght	Packaging	Weight per pc.
RJ45/RJ45 U 1.0m	24166480	1 m	1 pc(s).	0.040 kg
RJ45/RJ45 U 2.0m	24166481	2 m	1 pc(s).	0.079 kg

ACCES-SORIES

CONNECT 10PIN PLUG / 10PIN PLUG

Product description

- Connection cable 0.2 m for connecting STARK and REMOTE LMAI
- 10-pin plug to 10-pin plug Molex
- Halogen free

Ordering data

Туре	Article number	Lenght	Packaging ca	rton Weight per pc.
Connection calbe 0.2 m	24166482	0.2 m	10 pc(s).	0.008 kg

ACCES-SORIES

Mixing cap

Product description

- Mixing chamber for homogenous light distribution
- To push on the SLE housing
- Glow wire test acc. IEC 60695-2-11 at 700 °C passed



Туре	Article number	Diameter d	Packaging carton	Weight per pc.
LED Mixing Cap STARK SLE	88167564	20 mm	2,000 pc(s).	0.001 kg
LED Mixing Cap STARK SLE	88167565	24 mm	2,000 pc(s).	0.001 kg

ACCES-SORIES

Strain-relief set

Product description

- Strain relief for up to 3 cables suitable for cable with diameter from 2.5 up to 9 mm
- A: 2.5 5 mm diameter
- B: 5 9 mm diameter
- C: 5 9 mm diameter
- 5-year guarantee



Ordering data

Туре	Article number	Packaging carton
Strain-relief set	28000881	10 pc(s).

STARK SLE premium KIT – part 1

Mounting instruction

SLE module system component

Standards

EN 62031 EN 62471 EN 61347-1 EN 61547 EN 55015

Glow wire test

according to EN 61347-1 with increased temperature of 850 °C passed.

Photometric code

Key for photometric code, e.g. 930 / 359

1 ^{s1}	digit	2 nd + 3 rd digit	4 th digit	5 th digit	é	th digit																											
Codo	CDI			MacAdam	Luminou	s flux after 25%																											
COUE	CRI	Colour	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	MacAdam	after 25%	Code	Luminous flux
7	70 – 79	temperature in	initial	of the	7	≥ 70 %																											
8	80 - 89	Kelvin x 100		lite-time	8	≥ 80 %																											
9	≥90			(max.o000h)	9	≥ 90 %																											

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 STARK SLE will be greatly reduced or the STARK SLE may be destroyed.

Therefore the STARK SLE needs to be mounted onto a heat sink.

Tridonic's excellent thermal design for the LED module products provides the lowest thermal resistance and therefore allowing new compact designs without sacrificing quality, safety and life-time.

tc point, ambient temperature and life-time

The temperature at tc reference point is crucial for the light output and life-time of a LED module.

For STARK SLE a tc temperature of max. 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.



STARK SLE from Tridonic which needs cooling for corret operation, has to be connected with heat-conducting paste and fixed with M3 screws to the heat sink or fan.

The fixing/cooling surface must be cleaned before installing the LED module to remove all dirt, dust and grease.

Max. torque for fixing: 0.5 Nm.

The LED modules without housing are mounted with 2 screws per module.

In order not to damage the modules only rounded head screws and an additional plastic flat washer should be used.

For further information please refer to to the brochure entitled "Technical Design-In-Guide SLE Premium".

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.

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

Temperature monitoring

There is an integrated thermal management system that automatically reduces luminous flux when the critical temperature is reached. It returns to normal operation by itselfs.

This protects the STARK SLE PRE KIT and ensures it reaches its full life-time.



STARK SLE PRE KIT has to be supplied by LED Driver LCAU.

Operation with other LED Drivers are not allowed.

LED compact

Heat sink values

STARKT SLE premium 1,400 lm

ta	tc	R th, hs-a
25°C	65 °C	2.4 K/W
35°C	65 °C	1.9 K/W
45 °C	65 °C	1.3 K/W
55 °C	65 °C	0.7 K/W

STARKT SLE premium 2,000 lm

ta	tc	R th, hs-a
25°C	65 °C	1.0 K/W
35°C	65 °C	0.7 K/W
45 ℃	65 °C	0.4 K/W
55 °C	65 °C	0.1 K/W

Notes

The actual cooling surface can differ because of outside influences and the installation situation. A thermal connection between LED module and heat sink with heat-conducting paste or heat conducting adhesive film is absolutely necessary.

Additionally the LED module has to be fixed on the heat sink with M3 screws to optimise the thermal connection.

Thermal behaviour

-30 +80 °C		
-25 +55 ℃		
65 °C		
75 °C		
080%		

Environment

 $\ensuremath{\mathsf{SLE}}$ has been designed for interior applications and does not have IP protection.

Lumen maintenance

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

tc temperature in °C	luminous flux in %	operating time in h
	80	60.000
25	70	81.000
	50	132.000
	80	44.000
45	70	64.000
	50	110.000
	80	32.000
65	70	50.000
	50	91.000

Optical characteristics STARK SLE

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

Light distribution



Colour rendering index vs. colour temperature



The diagrams are based on statistic values.

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

Coordinates and tolerances according to CIE 1931

The ambient temperature of the measurement is ta = 25 °C. The measurement tolerance of the colour coordinates are ± 0.01.





700	κ			
	_	 _	_	

2,

	xO	yО
Centre	0.4630	0.4200

MacAdam ellipse: 3SDCM



MacAdam ellipse: 3SDCM



Colour spectrum at different colour temperatures



STARK SLE premium KIT – part 2

LMAI system component

Standards

EN 55015 EN 61347-1 EN 61347-2-13 EN 61547 EN 62384

Glow wire test

according to EN 61347-1 with increased temperature of 960 °C passed.

Thermal monitoring of the LED module

The LED module has a temperature sensor that is evaluated by the LMAI (LED Temperature Guard). This function protects the LED module from overheating. If it gets too hot during operation the LED module is switched off. Thermal monitoring is also used for stabilising the colour location (colour compensation).

Thermal protection of the LMAI

The LMAI is equipped with overtemperature protection (LMAI Temperature Guard). This protects the LMAI from overheating. If the device is operated at too high a temperature the LMAI is switched off.

Dimming

Connections

Input: Power supply and communication via RJ45. LED output: 10-pole connector (Order nr. for MOLEX connector: 903270310) FAN output: 2-pole connector (Type for Neltron connector: 2218H-02-F4)

Colour Control Interface (CCI)

The colour and dimming level of the LED module can be controlled at the CCI input by means of a floating switch (normally open) or with a continously variable potentiometer.

For further information please refer to to the brochure entitled "Technical Design-In-Guide SLE premium".

Input terminal CCI





The STARK SLE PRE KIT components form a matched and calibrated unit. Therefore it is not allowed to separate and operate the components in different combinations!

There is a label on the LMAI 044/0500 with the corresponding module information.

Code: 89601742 Type: STARK-SLE-2000-927-965-PRE-KIT Batch: 654363

Only use with matching LED module!

Module Nr.: 7.3 Module Batch.: 1254587

Date: 31.01.2013

TALEX(converter LCAU 2x20 W one4all

Product description

Standards

EN 55015 EN 61000-3-2 EN 61000-3-3 EN 61347-1 EN 61347-2-13 EN 62384 EN 62386-101 EN 62386-102 EN 62386-207 EN 62386-209 (DALI DEVICE Type 8) according to EN 50172 (only valid for central batteries systems)

Glow wire test

according to EN 61347-1 (remote LED Driver) or EN 61347-1 (in-built LED Driver) with increased temperature of 960 $^\circ C$ passed.

Control input (DA/D1, DA/D2)

Digital DALI signal or switchDIM can be wired on the same terminals (DA/D1 and DA/D2).

Digital signal DALI/DSI

The control input is non-polar and protected against accidental connection with a mains voltage up to 264 V. The control signal is not SELV. Control cable has to be installed in accordance to the requirements of low voltage installations.

Different functions depending on each module.

Colour types

Supported colour types according to DALI-Device Type 8:

- xy-coordinates
- colour temperature tc

Thermal protection of the unit

The unit also has an ITG (Intelligent Temperature Guard). This protects the LCAU 2x20 W one4all from thermal overload by reducing the output power or switching off in case of operation above the thermal limits of the luminaire or ballast. Depending on the luminaire design, the ITG operates at about 8 °C (\pm 5 °C) above tc temperature.

Control via switchDIM

A conventional double pushbutton switch can be used for control via switchDIM. One of the pushbuttons is used to set the colour temperature, the other to set the dimming level.



Pushbuttons with glow lamps affect the switchDIM, colourTEMPERATURE and colourSWITCH functions and should therefore not be used for this purpose.

For control via a switchDIM switch different settings can be made:

- Setting for the colour temperature via colourTEMPERATURE mode or colourSWITCH mode with 8 predefined values between 2,700 K and 6,500 K.
- Stepless setting for the dimming level between 15 and 100 %.

The colourTEMPERATURE mode and colourSWITCH mode differ in the position of the individual colour values along the Planckian curve. The colourTEMPERATURE mode is designed to meet the requirements of general and shop illumination, whereas the colourSWITCH mode is designed for food lighting.

On start-up the device first activates colour temperature setting in the colourTEMPERATURE mode. The starting values are a colour temperature of 2,700 K and a dimming level of 100 %.

colourTEMPERATURE mode



Location of the colour temperatures along the Planckian curve

1	2,700 K	5	4,500 K
2	3,000 K	6	5,000 K
3	3,500 K	7	5,700 K
4	4,000 K	8	6,500 K

colourSWITCH mode



Location of the defined colour temperatures

1 Gold (2,700 K) for bread and cakes		5	Cheese yellow, x = 0.35, y = 0.38
2	2,800 K, fruit and vegetables	6	5,000 K
3	3,000 K	7	Cool Meat, x = 0.3630, y = 0.3070
4	Fish, x = 0.38, y = 0.38	8	Cool Meat+, x = 0.3827, y = 0.2960

Setting the colour temperature

The procedure for setting the colour temperature is identical for both the colourTEMPERATURE mode and the colourSWITCH mode:

• Press the pushbutton briefly (approx. 1 s) to advance the colour temperature by one value



Once the maximum value has been reached, the next press takes you directly back to the minimum value.

Changing the mode

To toggle between colourTEMPERATURE mode and colourSWITCH mode you need to hold down the pushbutton. After 10 and 15 seconds the device will flash briefly. These are known as the 1st and 2nd flashing phases. Depending on the flashing phase in which the pushbutton is released (1st or 2nd), the changes are as follows:

- 1st flashing phase (after about 10 s): The device changes from colourTEMPERATURE mode to colourSWITCH mode
- 2nd flashing phase (after about 15 s): The device changes from colourSWITCH mode to colourTEMPERATURE mode



If the pushbutton is released more than 5 seconds after the 2nd flashing phase this cannot be assigned to either flashing phase and will be ignored.

This can be used to avoid incorrect entries.

If the right time for releasing the pushbutton has passed all you need to do is to allow the appropriate time to elapse and start the process again.



The factory settings for colour temperature and dimming level are 2,700 K and 100 %.

For further information please refer to to the brochure entitled "Technical Design-In-Guide SLE premium".

Dimming

Dimming range 15 to 100 %Digital control with:DSI signal: 8 bit Manchester Code Speed 15 to 100 % in 1.4 s

 DALI signal: 16 bit Manchester Code Speed 15 to 100 % in 0.1 s Programmable parameter: Minimum dimming level Maximum dimming level Default minimum = 15 % Programmable range 15 % ≤ MIN ≤ 100 % Default maximum = 100 % Programmable range 100 % ≥ MAX ≥ 15 %

Dimming curve is adapted to the eye sensitiveness.





Dimming characteristics as seen by the human eye

LED compact

Maximum loading of automatic circuit breakers

Automatic circuit breaker type	C10	C13	C16	C20	B10	B13	B16	B20	Inrush	current
Installation Ø	1.5 mm ²	1.5 mm ²	1.5 mm ²	2.5 mm ²	1.5 mm ²	1.5 mm ²	1.5 mm ²	2.5 mm ²	l max	time
LCAI 2x020/0048 L0xx one4all	10	14	18	24	5	7	9	12	38 A	256 µs

Harmonic distortion in the mains supply (at 230 V / 50 Hz and full load) in %

Туре	THD	3	5	7	9	11
LCAI 2x020/0048 L0xx one4all	< 13	9	5	4	3	2

Installation instructions

Wiring type and cross section (mains supply)

Stranded wire with end ferrule with a cross section up to 0.5 $\rm{mm^2}$ or solid wire up to 2.5 $\rm{mm^2}$ may be used for wiring.

For mains-side through-wiring on a single terminal we recommend the use of the same wire cross section.



Terminals

Screw type M3 Torque 0.5 Nm

Connection earth

To keep the EMV guidlines the earth has to be connected.

Storage conditions

Humidity: 5 % up to max. 85 %, not condensed (max. 56 days/year at 85 %)

Storage temperature: -40 °C up to max. +80 °C

The devices have to be within the specified temperature range (ta) before they can be operated.

Connection STARK SLE premium KIT (SEC)

Connection: 2x RJ45

For the connection between Driver LCAU and STARK SLE premium KIT you have to use Tridonic specific cables. Don't use a standard ethernet cable.

art.-no.: 24166480 (length: 1 m) art.-no.: 24166481 (length: 2 m)

LCAU 2x20/0048 L0xx is suitable for operating the following LED modules:

• STARK SLE 1400 PRE KIT (art.-no. 89601740, 89601741)

• STARK SLE 2000 PRE KIT (art.-no. 89601742, 89601743)

Product label 28000887



Product label 28000907



Possible connections

	Number of STAF per Ll	Operation with fan	
	SLE 2000 PRE KIT	possible	
combination 1	2	-	NO
combination 2	1	-	YES
combination 3	-	1	YES

Note

The operation with a fan is only possible with one STARK SLE premium KIT connected.

No fan operation on standby.

Tunable White

Wiring diagram for switchDIM and colourSWITCH for STARK SLE premium

Operating with one STARK SLE premium



Tunable White

Wiring diagram for DALI for STARK SLE premium

Operating with one STARK SLE premium



Wiring diagram for STARK SLE premium to control by CCI (Colour Control Interface)

Operating with single momentary-action switch



Additional information

Additional technical information at <u>www.tridonic.com</u> \rightarrow Technical Data

Guarantee conditions at <u>www.tridonic.com</u> \rightarrow Services

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