LED solutions

Tunable White technology made easy

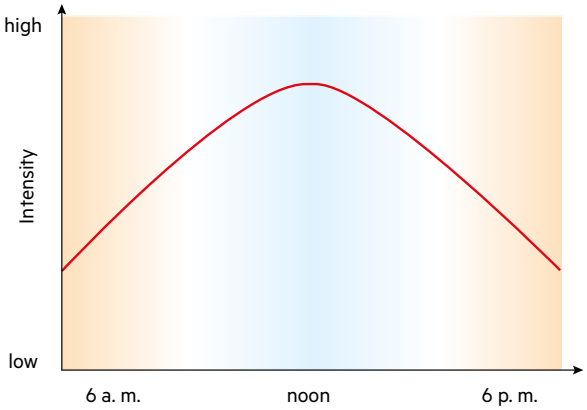
Module, Driver and Controls

TRIDONIC

The sequence of daylight

Dynamic colour temperatures based on nature's example

Studying nature illustrates how even the slightest changes in light can influence our moods and how we perceive objects. This notion is at the heart of Tunable White Technology, which is based on the natural colour changes in the light over the course of the day.



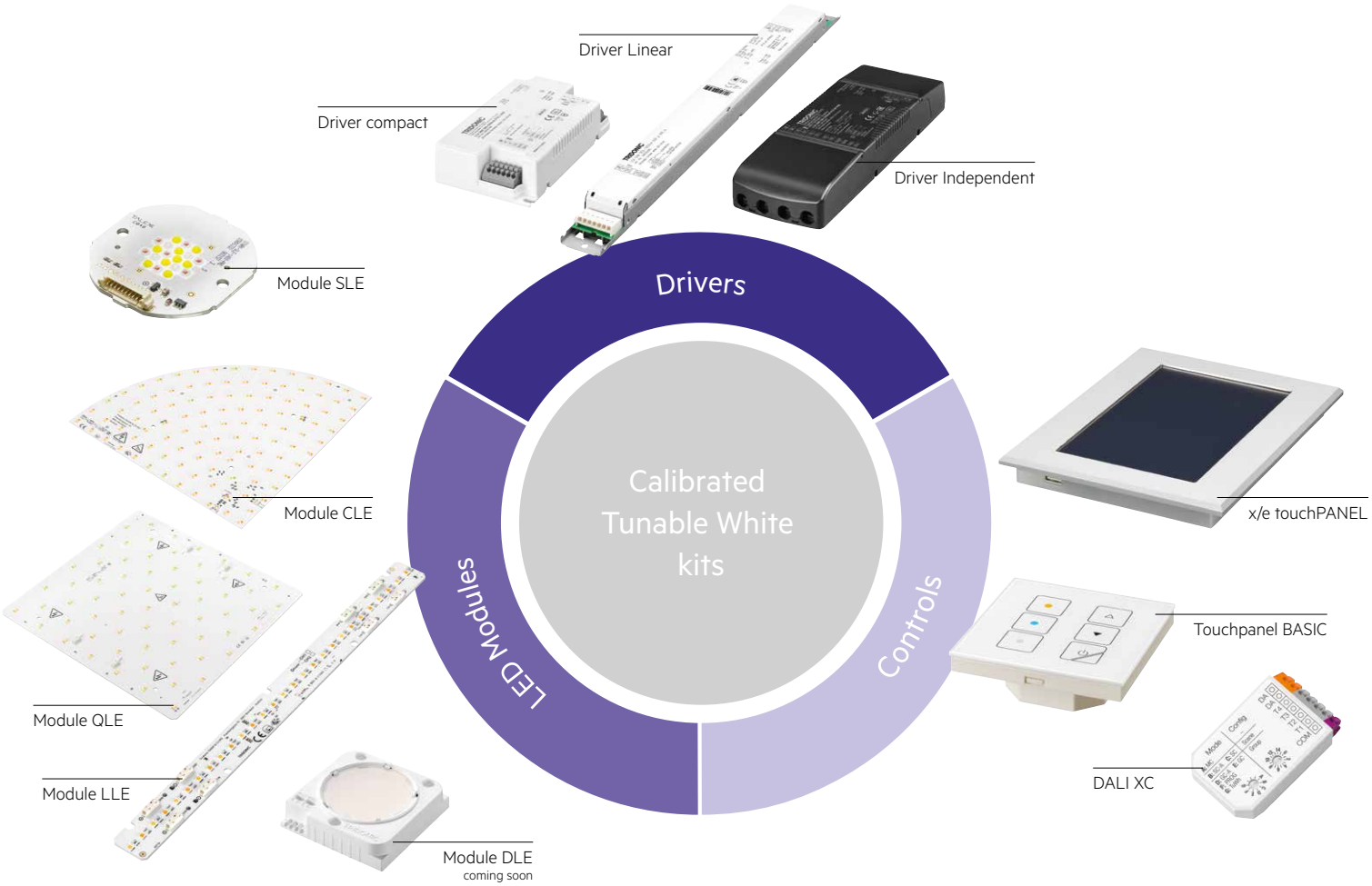
As humans, it is not uncommon for us to spend most of our day in enclosed areas. Seamlessly adjustable colour temperatures – from cool white to warm white – bring natural lighting effects, with all of the associated advantages, from outside to inside, and make it possible to properly target individual needs and situations. As a result, Tunable White supports the concept of Human Centric Lighting (HCL), which puts people at the heart of lighting design. As well as perfect conditions for reading and working, HCL is primarily focused on the circadian rhythm, which controls, among other things, our body clocks. As studies have shown, cool white light with a high proportion of blue light has a stimulating effect and promotes concentration, whereas warm white light is calming. Therefore, Tunable White creates an environment that helps us in a natural way – just like daylight.

Light individualisation with Tunable White

Tunable White describes the variable colour temperature controls from warm white to cool white light. If the right colour temperature and illuminance are achieved, artificial light can promote human well-being in areas such as offices and educational institutions, as well as hospitals and care homes. As a pioneer in the area of Tunable White technology, Tridonic has consistently developed its opportunities and components since 2013.

Product portfolio

To simulate daylight in a manner that is as true to nature as possible, light from cool white and warm white LEDs covering the entire colour palette from 2,700 to 6,500 Kelvin is mixed together. A **driver** with intelligent technology and a wide dimming range of 3% to 100% are the basis of the Tunable White system. Pre-calibrated kits ensure that colour tolerances are balanced out and the colorimetric locus remains constant across all modules and dimming levels. Suitable **control** and operating elements from Tridonic, ranging from simple button controls through wireless control and all the way to integration in DALI systems, round off the system perfectly.



Typical aplications

Tunable White for everyone

Natural daylight and its lighting dynamics lay the foundations for our well-being. However, we spend most of our lives in artificially lit rooms. A lack of daylight has been linked with causing a lack of information needed for the human rhythm to function properly. That is why we should not regard artificial light as a rigid and homogeneous installation, but rather as a “dynamic design of a visual indoor atmosphere”. Optimal lighting takes into account different situations in rooms, but considers our needs as humans as a priority. This requires a continuous adjustment to the individual's vision, work tasks and activities, as well as changes according to the weather situation and the time of day and year. Light that is intelligently controlled in this way increases motivation, concentration and quality of life in any office, production hall, public building or sports and leisure centre. In addition, Tunable White allows rooms to be lit properly at the press of a button and is therefore multifunctional.

Focus on personal needs: Individualisation and concentration

In the Human Centric Lighting concept, the light is tuned to our individual needs as humans, which vary according to the time of day and year, age, activity and state of mind. For example, as age increases, the need for higher illuminance also rises. A favoured lighting set-up also depends on the task at hand. Whereas neutral white light promotes concentration, warm white light creates a calmer atmosphere for creative activities, brainstorming or relaxed breaks.

Promoting well-being and health

The health-enhancing properties of light have been a hot topic for years. Certain colour temperatures can have a positive effect on the recovery process and general well-being, which are particularly beneficial for hospitals and care institutions. In addition, colour temperatures are also essential for the subjective perception of rooms. Depending on whether the proportion of warm white or cool white light is predominant, the ambience is perceived as either cosy or cool. This can go so far that some people feel cold in cool white light.

Tunable White for objects

As a design element, light is capable of making materials, exhibitions and entire rooms look utterly different. Colour temperatures give rooms a characteristic atmosphere and underline the beauty and brilliance of different objects and surfaces. With the right light spectrum, colours can be emphasised and powerfully presented. Works of art are also perfectly staged, as are jewellery, fashion or design elements and materials.

One of Tunable White's great advantages is that a lighting atmosphere can be completely changed at the press of a button, meaning that it is even possible to bring a sense of daylight into rooms and buildings that have no windows.

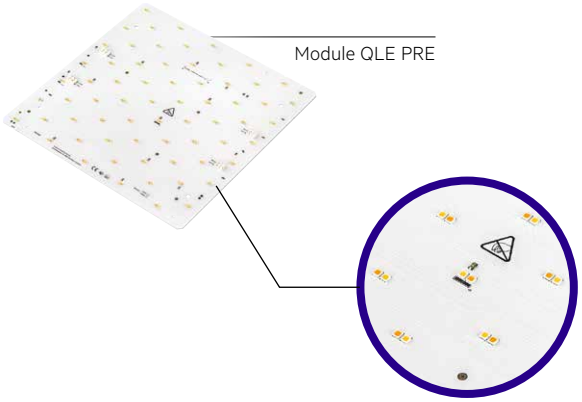
Silver at 2,700 K | Rose gold at 4,000 K | Gold at 6,000 K

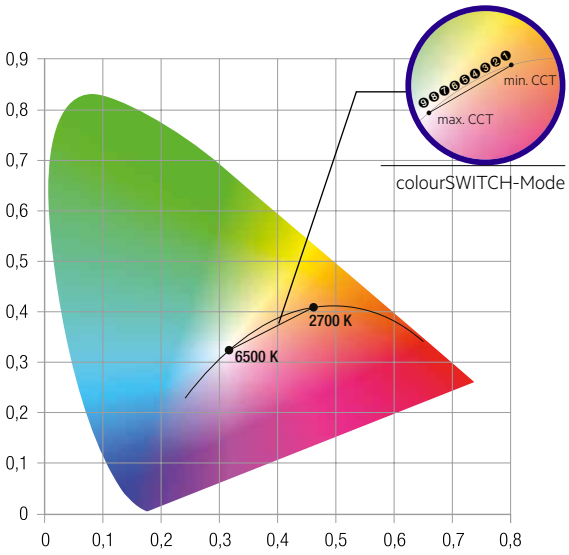
Presenting objects authentically

Tunable White not only reproduces colours authentically, but its effects can be further amplified using the right colour temperature. For example, it can make food look more appetising and clothes look to be of a higher quality in shops. If the shop's range changes, the right light spectrum is always available at the touch of a button, touch panel, smartphone or tablet. This flexible adjustment makes it easy to test how products look in different lighting moods. As a result, it is easier to see, for example, how articles of clothing appear in various environments – from a brightly lit gym to the park at sunset.

Intelligent technology

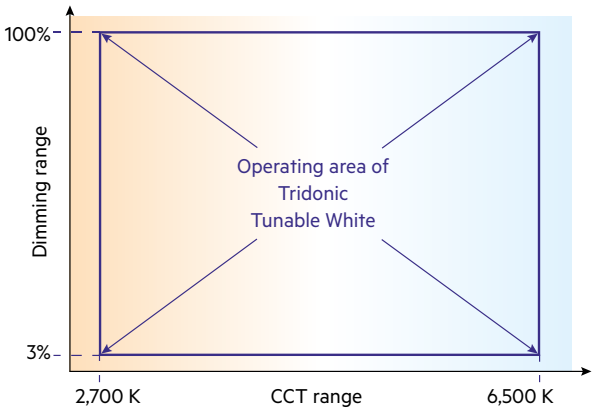
2-channel modules – wide range of colour temperatures
The 2-channel modules optimally cover the colour spectrum from 2,700 to 6,500 Kelvin. The different colour temperatures are generated using cool white and warm white LEDs, with two terminals available for each.





2-channel driver DT8 – constant colorimetric locus across all dimming levels
The second generation drivers guarantee even greater room for manoeuvre in terms of design with the enhanced dimming range of 3 % to 100 %. Colour temperatures are controlled precisely and with infinite variability, while the drivers reliably maintain the selected range across all dimming levels. The colourSWITCH function makes it possible to select the colour temperature, while the light can be dimmed with the switchDIM function. With the PREMIUM category drivers, the Tunable White solution can be controlled via DT8 using a push button or touch panel.

Drivers and modules are available as a pre-calibrated kit, which makes it considerably easier to implement Tunable White systems and also ensures perfect colour consistency between the modules, and therefore between all lights in a room.



No colourshift at dimming

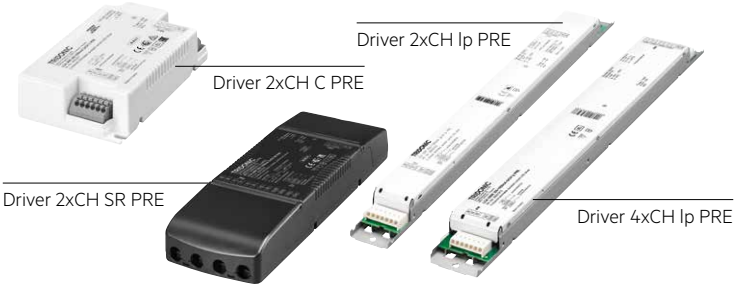
Tunable White

Driver PREMIUM

one4all Two channel DT6 and Tunable White DT8

Driver PREMIUM | two channel DT6

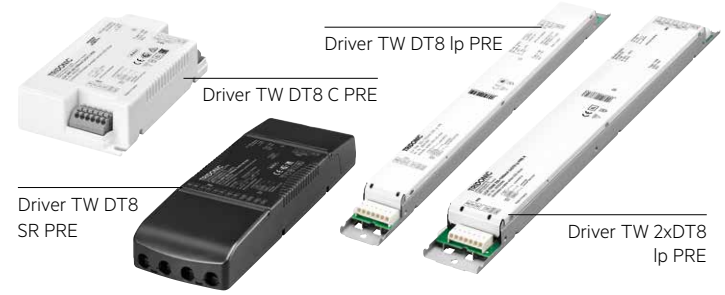
The two separate channels in one driver are ideal for the efficient operation of pendants and floor stands with direct/indirect light or for simple Tunable White applications. The output currents can be set varied via I-SELECT 2 plugs or DALI for each channel. What's more, proportion-SWITCH provides the option of selecting from predefined dimming scenes. The one4all interface, which covers DALI DT6, DSI, switchDIM and corridorFUNCTION V2, adds to this high level of flexibility.



NEW	Designation	Output current (mA)	Output voltage range (V)	Output power (W)	SELV 60 V	Input voltage (V)	Size (mm)	Order No.
	LCA 50W 350-1050mA 2xCH lp PRE	350–1,050	20–50	50	yes	220~240	360 x 30 x 21	28001910
	LCA 100W 350-1050mA 4xCH lp PRE	350–1,050	20–50	100	yes	220~240	360 x 40 x 21	28001912
	LCA 38W 350-1050mA 2xCH C PRE	350–1,050	20–50	38	yes	220~240	120 x 70 x 28,3	28002201
	LCA 38W 350-1050mA 2xCH SR PRE	350–1,050	20–50	38	yes	220~240	215 x 70 x 31	28002204

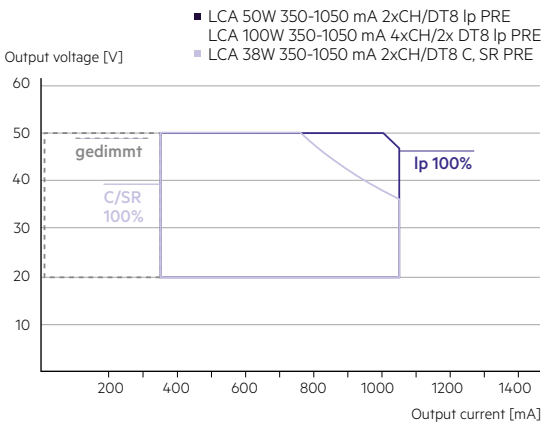
Driver PREMIUM | Tunable White DT8

Combined with the Tunable White modules from Tridonic, the calibrated kits of the Tunable White driver ensure that the colour locations remain constant throughout all dimming levels.
Other advantages are provided by the extremely high efficiency of up to 90 percent and the significantly extended dimming range of 3 to 100 percent. Equipped with colourSWITCH and switchDIM, the drivers also combine continuously adjustable, predefined colours and convenient control.



NEW	Designation	Output current (mA)	Output voltage range (V)	Output power (W)	SELV 60 V	Input voltage (V)	Size (mm)	Order No.
	LCAI 38W 125mA DT8 lp	100–150	125–250	38	no	220~240	360 x 30 x 21	28001457
	LCA 50W 350-1050mA DT8 lp PRE	350–1,050	20–50	50	yes	220~240	360 x 30 x 21	28001909
	LCAI 75W 125mA DT8 lp	200–300	125–250	75	no	220~240	360 x 30 x 21	28001458
	LCA 100W 350-1050mA 2xDT8 lp PRE	350–1,050	20–50	100	yes	220~240	360 x 40 x 21	28001911
	LCA 38W 350-1050mA DT8 C PRE	350–1,050	20–50	38	yes	220~240	120 x 70 x 28.3	28002199
	LCA 38W 350-1050mA DT8 SR PRE	350–1,050	20–50	38	yes	220~240	215 x 70 x 31	28002202

Operating window 350-1.050 mA lp

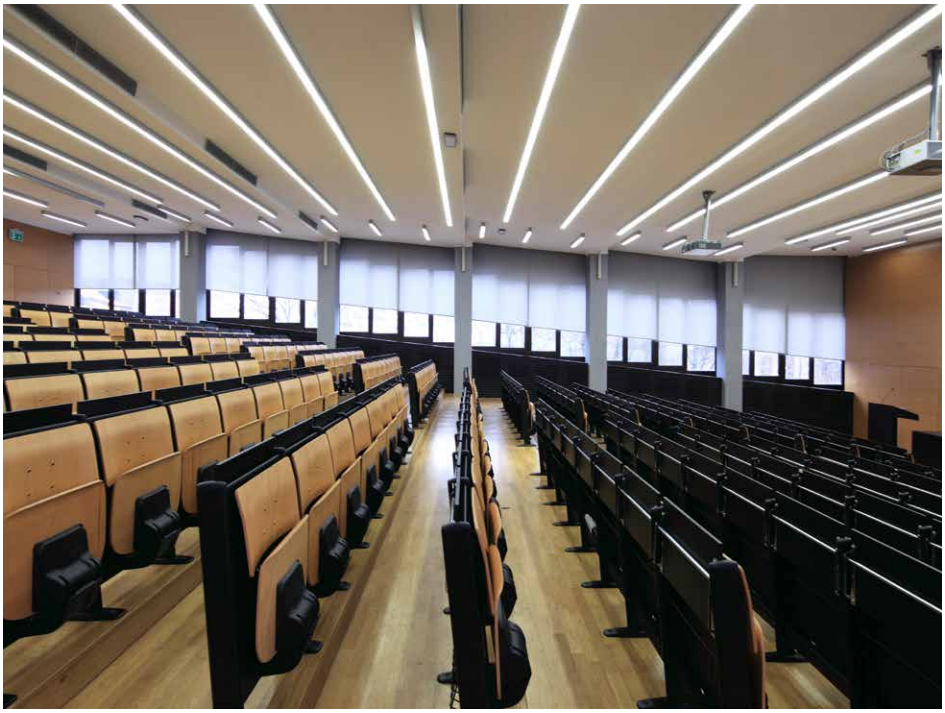


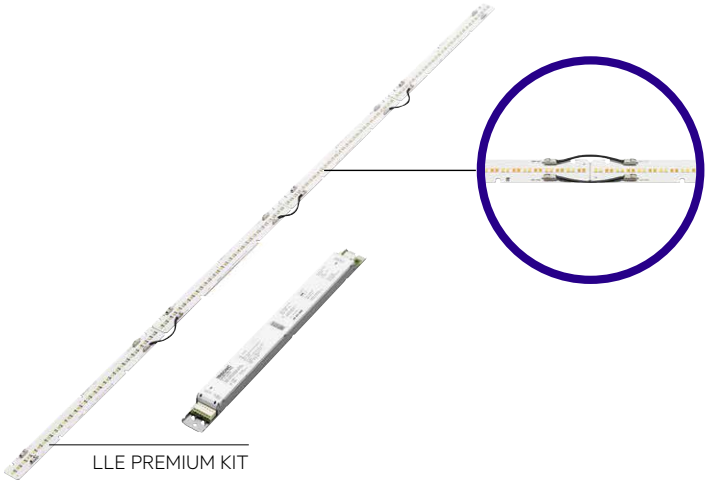
Tunable White

Engine LLE

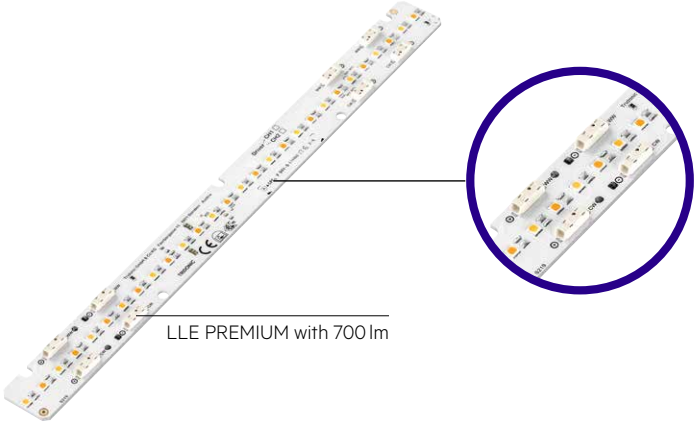
For Linear and Wide Area Lighting

Typical applications





LLE PREMIUM KIT



LLE PREMIUM with 700 lm

At a glance: Engine LLE PREMIUM

- LED modules also available individually
- Linear Tunable White system with infinitely adjustable colour temperature between 2,700 K and 6,500 K
- Available in CRI > 80 and CRI > 90
- Sets calibrated at the factory to ensure high quality of light and colour consistency (SDCM 3) across the entire adjustable range
- Dimming range of 100 % to 3 % without changing the colour temperature
- Low-profile LED Drivers with digital interface (DALI DT8, DSI, switchDIM, colourSWITCH) and very low standby power
- Linear LED modules with 700 lm and 1,500 lm
- Long lifetime of 50,000 hours
- System guarantee: 5 years

Tunable White

Engine LLE

For Linear and Wide Area Lighting

Engine, Module LLE Premium CRI > 90

Type	Colour-temperature (K)	Typ. luminous flux[1] (lm)	CRI	Mac Adam	Size (mm)	Order No.	Size per module (mm)	Order No.
LLE G2 24x280mm 3x700lm 927-965 LV PRE (1 LED Driver 50 W + 3 LED module à 700 lm)	2,700 –6,500 Tunable White	2,100	> 90	SDCM 3	20.5	up to 102	24 x 280	89602931
LLE G2 24x280mm 4x700lm 927-965 LV PRE (1 LED Driver 50 W + 4 LED module à 700 lm)	2,700 –6,500 Tunable White	2,800	> 90	SDCM 3	26.4	up to 106	24 x 280	89602932
LLE G2 24x280mm 5x700lm 927-965 LV PRE (1 LED Driver 50 W + 5 LED module à 700 lm)	2,700 –6,500 Tunable White	3,500	> 90	SDCM 3	32.0	up to 109	24 x 280	89602933
LLE G2 24x280mm 6x700lm 927-965 LV PRE (1 LED Driver 50 W + 6 LED module à 700 lm)	2,700 –6,500 Tunable White	4,200	> 90	SDCM 3	38.4	up to 109	24 x 280	89602934
LLE G2 24x280mm 2x1500lm 927-965 LV PRE (1 LED Driver 50 W + 2 LED module à 1,500 lm)	2,700 –6,500 Tunable White	3,000	> 90	SDCM 3	28.6	up to 104	24 x 280	89602935
LLE G2 24x280mm 3x1500lm 927-965 LV PRE (1 LED Driver 50 W + 3 LED module à 1,500 lm)	2,700 –6,500 Tunable White	4,500	> 90	SDCM 3	41.1	up to 109	24 x 280	89602936
LLE G2 24x280mm 4x1500lm 927-965 LV PRE (1 LED Driver 100 W + 4 LED module à 1,500 lm)	2,700 –6,500 Tunable White	6,000	> 90	SDCM 3	54.1	up to 110	24 x 280	89602937
LLE G2 24x280mm 5x1500lm 927-965 LV PRE (1 LED Driver 100 W + 5 LED module à 1,500 lm)	2,700 –6,500 Tunable White	7,500	> 90	SDCM 3	67.3	up to 111	24 x 280	89602938
LLE G2 24x280mm 6x1500lm 927-965 LV PRE (1 LED Driver 100 W + 6 LED module à 1,500 lm)	2,700 –6,500 Tunable White	9,000	> 90	SDCM 3	79.9	up to 112	24 x 280	89602939

[1]Tolerance range for optical data: ±5 % and tolerance range for electrical data: ±15 %.

Type	Colour-temperature (K)	Typ. luminous flux[1] (lm)	CRI	Mac Adam	Size (mm)	Order No.
TW LLE G2 24x280mm 700lm 927-965 PRE (LED module)	2,700	670	> 90	SDCM 3	24 x 280	89602922
	6,500	740	> 90	SDCM 3	24 x 280	
TW LLE G2 24x280mm 1500lm 927-965 PRE (LED module)	2,700	1,470	> 90	SDCM 3	24 x 280	89602923
	6,500	1,610	> 90	SDCM 3	24 x 280	

[1]Tolerance range for optical data: ±5 % and tolerance range for electrical data: ±15 %.

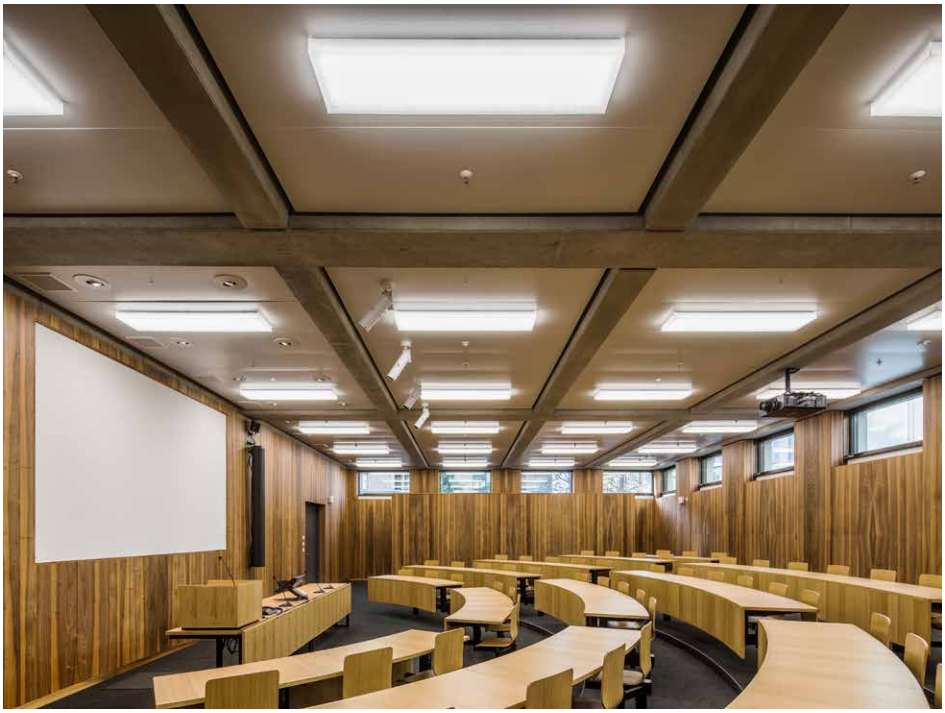
Matching Driver LLE G2 (in each KIT included)

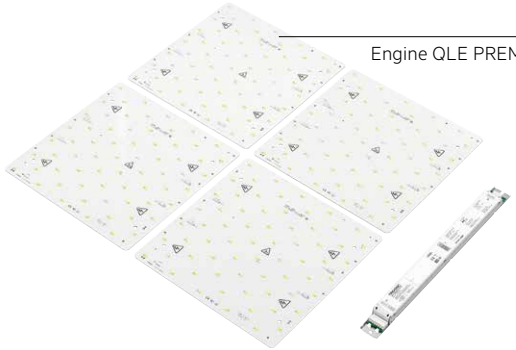
Driver LCA 50W 350–1050mA DT8 lp PRE	Driver LCA 100W 350–1050mA 2xDT8 lp PRE
	
Size: 360 x 30 x 21 mm 3–6 LLE Module à 700 lm 2–3 LLE Module à 1,500 lm	Size: 360 x 40 x 21 mm 3–6 LLE Module à 1,500 lm

Tunable White

Engine QLE
For Wide Area Lighting

Typical applications





At a glance: Engine QLE PREMIUM

- Quadratic Tunable White system with adjustable colour temperature between 2,700 K and 6,500 K at constant luminous flux
- Available in CRI > 80 and CRI > 90
- Precalibrated set for optimum quality of light and colour consistency (SDCM 3), consisting of an LED driver and 2–6 quadratic LED modules
- LED modules are also available individually
- Dimming range of 100–3 % with no change in colour temperature
- Low-profile LED drivers with digital interface (DALI DT8, DSI, switchDIM, colourSWITCH)
- Long lifetime of 50,000 hours with 5-year system guarantee

Tunable White

Engine QLE
For Wide Area Lighting

Engine, Module QLE Premium CRI > 90

NEW Typ	Colour-temperature (K)	Typ. luminous flux[1] (lm)	CRI	Mac Adam	Typ. power consumption[1] (W)	System efficacy (lm/W)	Size per module (mm)	Order No.
QLE G2 270x270mm 2x1250lm 927-965 LV PRE (1 LED Driver 50 W + 2 LED module à 1,250lm)	2,700 –6,500 Tunable White	2,500	> 90	SDCM 3	19.8	up to 126	270 x 270	89602940
QLE G2 270x270mm 3x1250lm 927-965 LV PRE (1 LED Driver 50 W + 3 LED module à 1,250lm)	2,700 –6,500 Tunable White	3,750	> 90	SDCM 3	28.4	up to 132	270 x 270	89602941
QLE G2 270x270mm 4x1250lm 927-965 LV PRE (1 LED Driver 50 W + 4 LED module à 1,250lm)	2,700 –6,500 Tunable White	5,000	> 90	SDCM 3	36.9	up to 135	270 x 270	89602942
QLE G2 270x270mm 5x1250lm 927-965 LV PRE (1 LED Driver 100 W+ 5 LED module à 1,250lm)	2,700 –6,500 Tunable White	6,250	> 90	SDCM 3	46.5	up to 134	270 x 270	89602943
QLE G2 270x270mm 6x1250lm 927-965 LV PRE (1 LED Driver 100 W + 6 LED module à 1,250lm)	2,700 –6,500 Tunable White	7,500	> 90	SDCM 3	55.1	up to 136	270 x 270	89602944

[1]Tolerance range for optical data: ±5 %, Tolerance range for electrical data: ±15 %, tp = 45 °C

NEW Typ	Colour-temperature (K)	Typ. luminous flux[1] (lm)	CRI	Mac Adam	Typ. power consumption[1] (W)	Module efficacy[1] (lm/W)	Size per module (mm)	Order No.
TW QLE G2 270x270mm 1250lm 927-965 PRE (LED module)	2,700	1,250	> 90	SDCM 3	8.1	154	270 x 270	89602924
	6,500	1,360	> 90	SDCM 3	8.1	167	270 x 270	

[1]Tolerance range for optical data: ±5 %, Tolerance range for electrical data: ±15 %, tp = 45 °C

Matching Driver (in each KIT included)

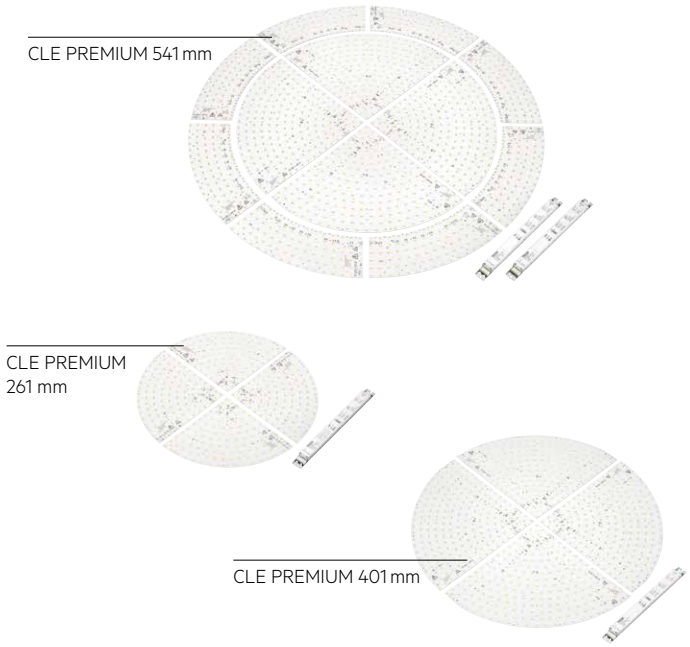
Driver LCA 50W 350–1050mA DT8 lp PRE	Driver LCA 100W 350–1050mA 2xDT8 lp PRE
	
Size: 360 x 30 x 21 mm 2–4 QLE Module à 1.250 lm	Size: 360 x 40 x 21 mm 5–6 LLE Module à 1.200 lm

Tunable White

Engine CLE

For decorative pendant and surfacemounted ceiling luminaires

Typical applications



At a glance: Engine CLE PREMIUM

- Circular Tunable White system with adjustable colour temperature from 3,000 to 6,000 K at constant luminous flux
- Sets calibrated at the factory to ensure high quality of light and colour consistency (SDCM 3) across the entire adjustable range
- Dimming range 10–100 % without change of colour temperature
- Low-profile LED Driver with digital interface (DALI Device Type 8, DSI, switchDIM, colourTEMPERATURE)
- Self cooling (no additional heat sink required)
- Long life-time of 50,000 h and 5-year system guarantee

Tunable White

Engine CLE

For decorative pendant and surfacemounted ceiling luminaires

Type	Colour-temperature (K)	Typ. luminous flux[1] (lm)	CRI	Mac Adam	Typ. power draw[1] (W)	System efficacy (lm/W)	Size per module (mm)	Order No.
TW CLE G1 261mm 4x1150lm 830-860 PRE KIT (1 LED-Driver + 4 LED-Module)	3.000 –6.000 Tunable White	4.650	> 80	SDCM 3	28,4	up to 160	261 x 261	89602612
TW CLE G1 401mm 4x2450lm 830-860 PRE KIT (LED-Driver + 4 LED-Module)	3.000 –6.000 Tunable White	9.610	> 80	SDCM 3	58	up to 162	401 x 401	89602613
TW CLE G1 541mm 8x900lm 830-860 PRE KIT (1 LED-Driver + 8 LED-Module)	3.000 –6.000 Tunable White	7.410	> 80	SDCM 3	43,5	up to 166	541 x 35	89602614

[1]Toleranzbereich elektrische Daten: ±5 %. Toleranzbereich lichttechnische Daten: ±15 %

Tunable White

Engine SLE
For Spotlights

Typical applications

SLE PREMIUM KIT
mit LED-Driver

SLE PREMIUM KIT

At a glance: Engine SLE PREMIUM

- Colour temperature: 2,700 K to 6,500 K; Tunable White (dimmable and controllable colour temperatures along the planckian curve)
- Extended colour space for individual colour spectrum e.g. for lighting for food
- Colour rendering/colour tolerance: CRI > 90 / MacAdam 3
- Dimming range of 100 to 15 % without changing the colour temperature
- Low-profile LED Drivers with digital interface (DALI DT8, DSI, switchDIM, colourSWITCH) and very low standby power (<0.5 W)
- Luminous flux (tp = 65 °C): 2,050 lm or 1,350 lm
- Long lifetime of 50,000 hours
- System guarantee: 5 years

Tunable White

Engine SLE
For Spotlights

Type	System components	Colour temperature (K)	Mac Adam	Typ. luminous flux[1] (lm)	CRI	Typ. power consumption.[1] (W)	System efficacy (lm/W)	Size (mm)	Order No.	
									without housing	with housing
STARK-SLE-2000-927-965-PRE-KIT	LMAI + SLE-2000	2,700 K – 6,500 Tunable White	SDCM 3	2,050	> 90	31.7	65	Ø 50	89601743	89601742
STARK-SLE-1400-927-965-PRE-KIT	LMAI + SLE-1400	2,700 K – 6,500 Tunable White	SDCM 3	1,350	> 90	22.2	61	Ø 50	89601741	89601740

1)Tolerance range for electrical and optical data: ±10 %

Matching Driver

Type	Driver remote LCAU 2x020/0048 L020 one4all Order No. 28000887	Driver built-in LCAU 2x020/0048 L010 one4all Order No. 28000907	Driver LMAI 44/500 P020 SPI 48V (already in KIT included)
STARK-SLE-2000-927-965-PRE-KIT	■	■	■
STARK-SLE-1400-927-965-PRE-KIT	■	■	■

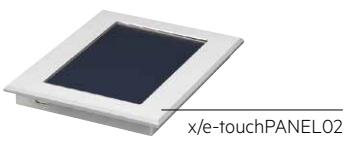
Matching connection cable
Accessory CONNECT

Type	Connection	Order No.	Length (m)
RJ45/RJ45 1,0m	Driver LCAU to Driver LMAI	24166480	1
RJ45/RJ45 2,0m		24166481	2
10PIN PLUG/10 PIN PLUG 0,2m	Driver LMAI to Module	24166482	0,2

The appropriate cap for an uniform distribution of light
Accessory LENS MIXING CAP

Type	Order No.
LED MIXING CAP STARK SLE 1500	88167564
LED MIXING CAP STARK SLE 2500	88167565

Matching accessories



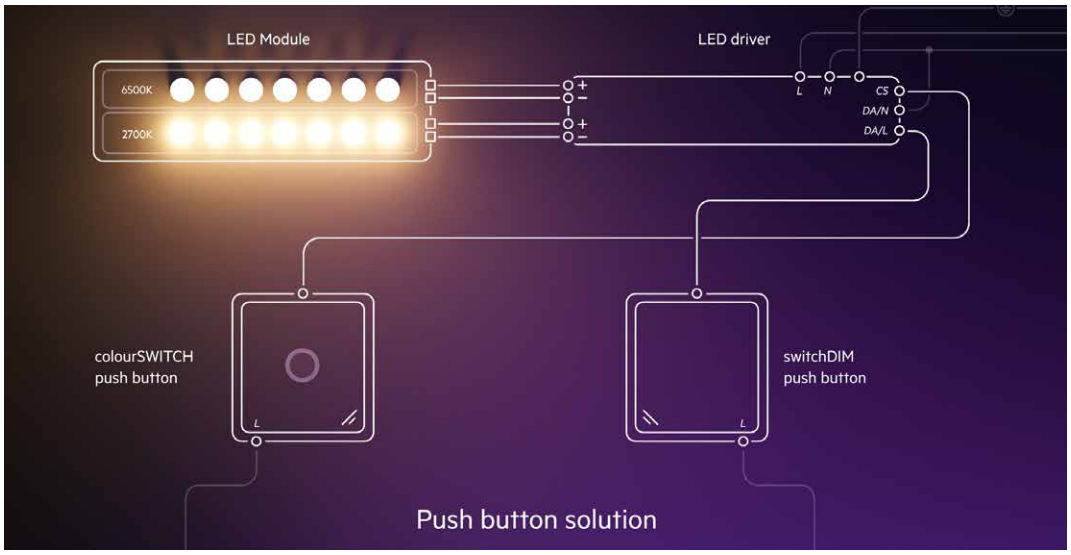
Type	Order No.
DALI Touchpanel 02	28000022
x/e-touchPANEL 02	28000005

Tunable White made easy

The right control for any needs

Tunable White's entire repertoire can be chosen from and operated easily with the right controls. This is where Tridonic weighs in with a wide range of options, from simple button operation through to wireless app control via the basicDIM Wireless module. It can also be integrated in DALI systems, which in future will be controlled via a web-based platform. The wiring is just as easy as the controls and can be carried out with minimal effort.

Buttons

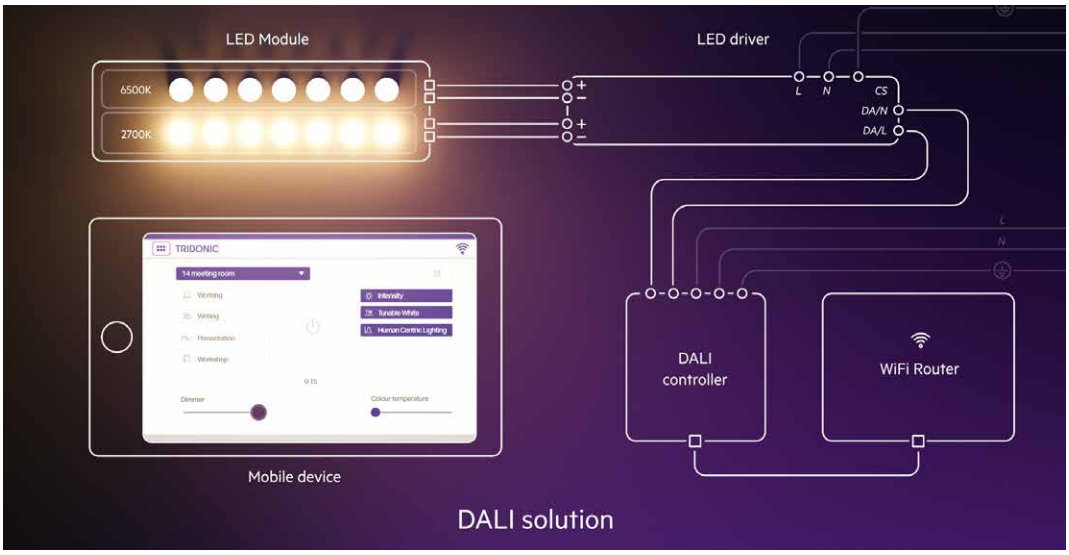


The combination of switchDIM and colourSWITCH buttons makes it easy to adjust the illuminance and colour temperature. While the light can be dimmed using switchDIM, the proportion of cool white and warm white light can be mixed and customised with colourSWITCH.

Wireless control via basicDIM Wireless

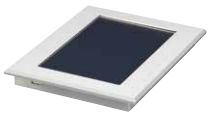
The wireless module does not need a control line. The light is controlled conveniently on a smartphone or tablet using the 4remote BT app.

Integration in DALI systems



DALI systems like sceneCOM XL make it easy to implement and control complex lighting solutions. Built-in components can be controlled and adjusted directly.

Additional controls hardware



DALI x/e-touchPANEL 02
Touch panel
With the DALI x/e-touchPANEL 02 you can program lighting scenes and RGB colour mixes and call them up them via the graphical user interface as well. The panel also includes a sequencer which is used to automate calendar-controlled se-quences.

DALI TOUCHPANEL 02
Touch panel
Setting up and operating DALI systems – Tridonic touch panels enable you to accomplish this conveniently via a graphical user interface. DALI TOUCHPANEL 02 has a keypad with user-selectable key functions for manually controlling lighting groups and lighting scenes. It is programmed by using masterCONFIGURATOR software, which is available free of charge.

DALI XC
comfortDIM momentary-action switch module
Conventional momentary-action switches can be connected quickly and easily to the comfortDIM XC module. This gives you the opportunity to custom design your lighting. These momentary-action switch modules are used to group luminaires together, define scenes and program macros. Tunable White also allows colour temperature variations.

Support and advice
From a single source

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Engine CLE

Engine CLE Integrated

Engine LLE-FLEX

Engine SLE

Engine EM ready2apply

Engine LLE

Engine QLE

We will help you to create lighting solutions that are unbeatable in terms of economy and functionality, according to the slogan:
We devote all our energy to your light.

As an international company, Tridonic is represented worldwide by 30 branch offices and partners in 73 countries.

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