



Module P211-5

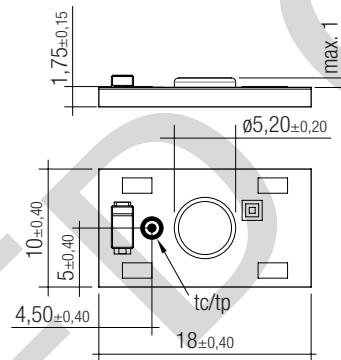
Modules Pxx

Product description

- General lighting
- Design and effect lighting
- Emergency lighting
- Spotlights
- High-flux LED module
- Narrow colour temperature tolerance band
- Compact design
- Excellent thermal management
- Integrated polarity reversal protection
- High-power LED module in chip-on-board technology (COB)
- Attached with premounted thermally conductive adhesive tape
- Available with or without connection cable
- Connection: Cable 200 mm
- Cooling required

Technical data

Beam characteristic	140°
Ambient temperature range	-25 ... +55 °C
tp rated	75 °C
tc [®]	75 °C
Max. DC forward current	700 mA
Max. permissible LF current ripple	1,900 mA
Max. permissible peak current	1,920 mA / max. 10 ms
Risk group (EN 62471:2008)	RG1
Risk group (EN 62471:2008) for P211-5 DL	RG2 at d = 200 mm, RG1 at d ≥ 2 m
Type of protection	IP00



Ordering data

Type	Article number	Colour [®]	Wave length	Colour temperature	Connection cable	Packaging carton	Weight per pc.
1 light point per module							
P211-5 DL	89601879	Daylight white	-	6,500 K	yes	100 pc(s).	0.002 kg
P211-5 NW	89601880	Neutral white	-	4,200 K	yes	100 pc(s).	0.003 kg
P211-5 WW	89601881	Warm white	-	3,000 K	yes	100 pc(s).	0.003 kg
P211-5 PM	89601882	Packed meat	-	-	yes	100 pc(s).	0.004 kg
P211-5 GOLD	89601883	Gold	-	2,700 K	yes	100 pc(s).	0.003 kg
P211-5 DL W/O-C	89601884	Daylight white	-	6,500 K	no	100 pc(s).	0.001 kg
P211-5 NW W/O-C	89601885	Neutral white	-	4,200 K	no	100 pc(s).	0.001 kg
P211-5 WW W/O-C	89601886	Warm white	-	3,000 K	no	100 pc(s).	0.002 kg
P211-5 PM W/O-C	89601887	Packed meat	-	-	no	100 pc(s).	0.001 kg
P211-5 GOLD W/O-C	89601888	Gold	-	2,700 K	no	100 pc(s).	0.001 kg



Standards, page 5

Colour temperatures and tolerances, page 8 and 9

Specific technical data

Type ^④	Photo-metric code	Forward current ^③	Luminous flux at tp = 25 °C ^②	Luminous flux at tp = 75 °C ^②	Power consumption ^⑥	Min. forward voltage at tp = 75 °C	Max. forward voltage at tp = 25 °C	Luminous efficacy module at tp = 25 °C	Luminous efficacy module at tp = 75 °C	Luminous efficacy system at tp = 75 °C ^⑤	Colour rendering index CRI
Operating mode HE at 350 mA											
P211-5 DL	765/459	350 mA	138 lm	120 lm	1.0 W	2.8 V	3.2 V	138 lm/W	120 lm/W	108 lm/W	70
P211-5 NW	842/459	350 mA	130 lm	110 lm	1.0 W	2.8 V	3.2 V	130 lm/W	110 lm/W	99 lm/W	80
P211-5 WW	830/459	350 mA	120 lm	100 lm	1.0 W	2.8 V	3.2 V	120 lm/W	100 lm/W	90 lm/W	80
P211-5 PM	–	350 mA	90 lm	80 lm	1.0 W	2.8 V	3.2 V	90 lm/W	80 lm/W	72 lm/W	–
P211-5 GOLD	927/459	350 mA	90 lm	80 lm	1.0 W	2.8 V	3.2 V	90 lm/W	80 lm/W	72 lm/W	90
Operating mode HO at 700 mA											
P211-5 DL	765/459	700 mA	243 lm	210 lm	2.2 W	3.0 V	3.5 V	106 lm/W	95 lm/W	86 lm/W	70
P211-5 NW	842/459	700 mA	230 lm	190 lm	2.2 W	3.0 V	3.5 V	100 lm/W	86 lm/W	77 lm/W	80
P211-5 WW	830/459	700 mA	220 lm	180 lm	2.2 W	3.0 V	3.5 V	96 lm/W	82 lm/W	74 lm/W	80
P211-5 PM	–	700 mA	160 lm	135 lm	2.2 W	3.0 V	3.5 V	70 lm/W	61 lm/W	55 lm/W	–
P211-5 GOLD	927/459	700 mA	165 lm	140 lm	2.2 W	3.0 V	3.5 V	72 lm/W	64 lm/W	58 lm/W	90

^① 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 tp-point is to be measured in the thermally stable state with a temperature sensor or or temperature-sensitive sticker as per EN 60598-1. For the precise position of the tp point see the drawing above.

^② Tolerance range for optical data: ±10 %.

^③ Exceeding the max. operating current leads to an overload on the LED module. This may in turn result in a significant reduction in life-time or even destruction of the LED module.

^④ HE ... high efficiency, HO ... high output.

^⑤ Assumed efficiency for the LED Driver is 0.9.

^⑥ All values at tp = 75 °C.

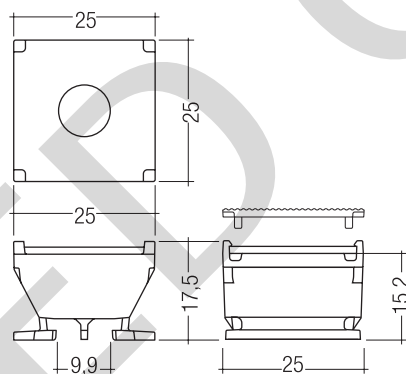
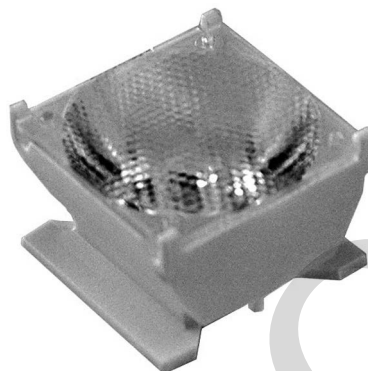
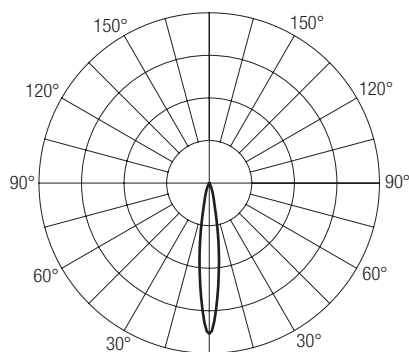
RoHS

ACCES-
SORIES

Lens O211-2

Product description

- Narrow-beam lens for P211-5
- For general, design and effect lighting
- As a spotlight
- High efficiency and quality of light
- Simple installation
- 10° beam angle for colours
- 20° beam angle for white
- Attached with ready-made adhesive tape
- Material: PC / PMMA
- Colour: white / transparent



Ordering data

Type	Article number	Dimensions L x W x H	Packaging carton	Weight per pc.
O211-2 spot lens 10°	24139148	25 x 25 x 17.7 mm	10 pc(s).	0.007 kg

RoHS

ACCES-
SORIES

Lens O211-2 diffusion lens

Product description

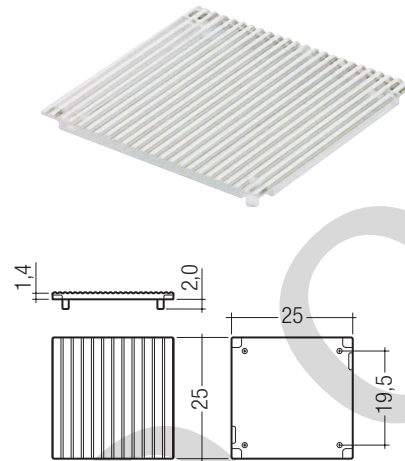
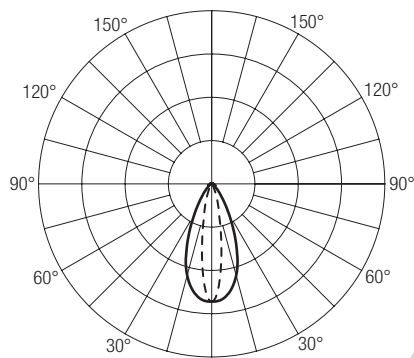
- Diffusion lens for P211-5
- In combination with LENS O211-2 spot lens
- No tools required for installing
- Material: PMMA
- Colour: transparent

Asymmetrical beam angle 10° / 40°

- For wallwash applications
- As an asymmetrical spotlight

Symmetrical beam angle 40°

- As a symmetrical spotlight



Ordering data

Type	Article number	Dimensions L x W x H	Packaging carton	Weight per pc.
O211-2 diffusion lens 10 / 40°	24139011	25 x 25 x 1.4 mm	8,000 Stk.	0.001 kg
O211-2 diffusion lens 40°	24166036	25 x 25 x 1.4 mm	10 Stk.	0.001 kg

Standards

EN 62031
EN 62471
EN 62717

Photometric code

Key for photometric code, e. g. 830 / 459

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	McAdam initial	McAdam after 25% of the life-time (max.6000h)	Luminous flux after 25% of the life-time (max.6000h)
7 70 – 79				Code Luminous flux
8 80 – 89				7 ≥ 70 %
9 ≥90				8 ≥ 80 %
				9 ≥ 90 %

Energy classification

Type	Forward current	Energy classification
P211-5 DL	350 mA	A++
	700 mA	A++
P211-5 NW	350 mA	A++
	700 mA	A+
P211-5 WW	350 mA	A++
	700 mA	A+
P211-5 PM	350 mA	A++
	700 mA	A+
P211-5 GOLD	350 mA	A++
	700 mA	A+

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 P211-5 will be greatly reduced or the P211-5 may be destroyed.

Therefore the P211-5 needs to be mounted onto a heat sink heat sink which does not exceed the value for $R_{th,max}$.

Tridonic's excellent thermal design for the P211-5 products provides the lowest thermal resistance and therefore allowing new compact designs without sacrificing quality, safety and life-time.

tp point, ambient temperature and life-time

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

The operating temperature of a LED product is crucial for the light output, the product life-time but also for the product safety.

The thermal limits can be checked at the tp/tc point and at tr.

On page 5 the lumen maintenance is shown in relation to the temperature at tp. tp, rated shows the temperature at which the rated values are reached.

tc shows the thermal limit for safety reason und must never be exceeded under normal conditions.

For the interchangeability with other Zhaga products, $t_{r,max}$ is specified directly at the thermal interface to the heatsink of the luminaire.

For P211-5 a tp temperature of 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 tp 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.

Mounting instruction

LED modules from Tridonic which have to be installed on a heat sink are equipped as standard with thermally conductive adhesive tape on the back of the pc board.

These LED products must be installed with this adhesive tape. To ensure permanent adhesion the fixing/cooling surface must be cleaned before installing the LED modules to remove all dirt, dust and grease.

The contact adhesion surface must have a surface energy of at least 38 mNm. The contact pressure must be at least 10 kg/cm² (ideally: 40 kg/cm²) for at least 3 seconds.

Processing must take place at an ambient temperature of 23 +/- 5°C. A dwell time of 24 hours is required after adhesion.

To avoid damaging the modules during processing you must not touch the components or the glob top. A suitable tool must be used.

For more information please call or email your Tridonic contact.



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.

**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 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 ESD guidelines (Guideline_EOS_ESD.pdf) at: <http://www.tridonic.com/esd-protection>

Recommended heat sink surface

P211-5, 350 mA

ta	tc	R _{th, hs-a}
25 °C	75 °C	14.41 K/W
30 °C	75 °C	12.60 K/W
40 °C	75 °C	9.00 K/W
50 °C	75 °C	5.37 K/W

P211-5, 700 mA

ta	tc	R _{th, hs-a}
25 °C	75 °C	13.31 K/W
30 °C	75 °C	11.64 K/W
40 °C	75 °C	8.30 K/W
50 °C	75 °C	4.96 K/W

Notes

Values valid for: natural convection, R_{th, hs-a} = required thermal resistance of heat sink

The actual cooling surface can differ because of the material, the structural shape, outside influences and the installation situation. A thermal connection between LED modules and heat sink with heat-conducting paste or heat conducting adhesive film is absolutely necessary. Additionally the LED has to be fixed on the heat sink with M3 screws with plastic washer to optimise the thermal connection.

Electrical supply/choice of LED Driver

LEDmodules 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 LED module guarantees the necessary protection for safe and reliable operation. The LED modules are only for the operation with SELV < 60 V. The operation at LED Drivers with outputvoltage > 60 V is with an additional preparations possible. Further information on request.

If a LED Driver other than Tridonic is used, it must provide the following protection:

- Short-circuit protection
- Overload protection



P211-5 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. The P211-5 are protected against reversed polarity.

Storage and humidity

storage temperature	-30... +80 °C
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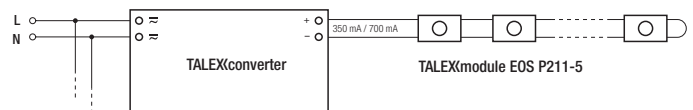
Operation only in non condensing environment. Humidity during processing of the module should be between 30 to 70 %.

Wiring

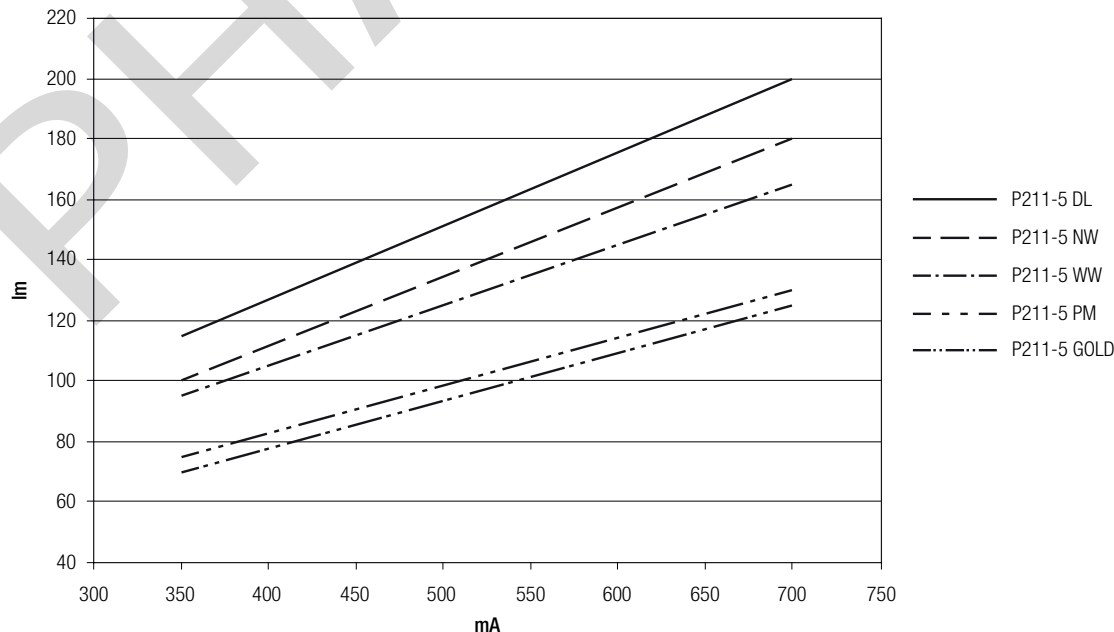
Cable: AWG24; length 200 mm

Colour	white-red	white-black
Function	+	-

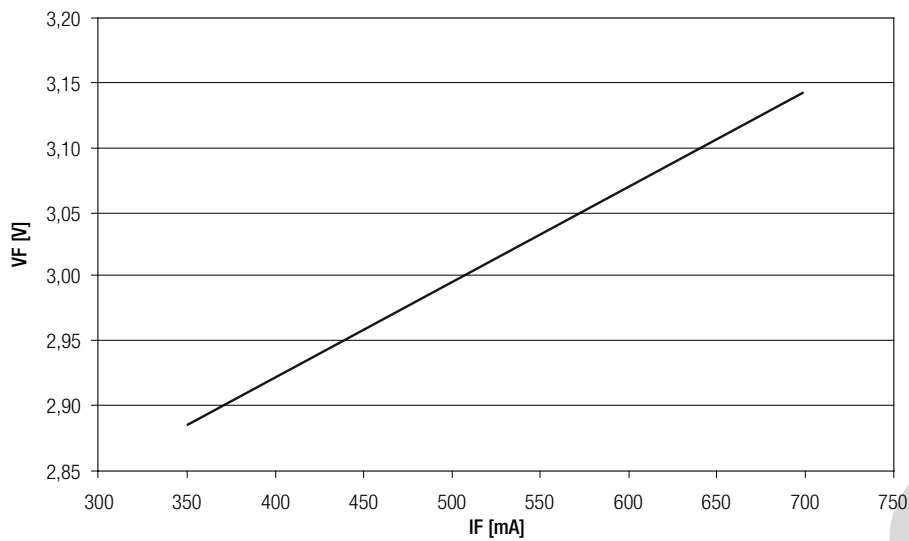
Wiring example < 60 V



Luminous flux and operating current at tp = 65 °C



Forward current vs. forward voltage

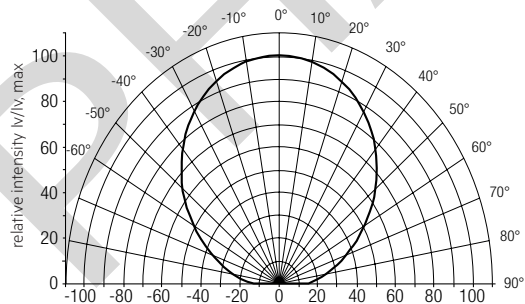
Lumen maintenance at $t_p = 65\text{ }^\circ\text{C}$

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

Operating mode	Type	L90 / F10	L90 / F50	L80 / F10	L80 / F50	L70 / F10	L70 / F50
HE	P211-5 DL	38,000 h	57,000 h	60,000 h	60,000 h	60,000 h	60,000 h
	P211-5 NW	38,000 h	57,000 h	60,000 h	60,000 h	60,000 h	60,000 h
	P211-5 WW	38,000 h	57,000 h	60,000 h	60,000 h	60,000 h	60,000 h
	P211-5 GOLD	38,000 h	57,000 h	60,000 h	60,000 h	60,000 h	60,000 h
	P211-5 PM	-	-	20,000 h	-	32,000 h	-
HO	P211-5 DL	24,000 h	36,000 h	50,000 h	60,000 h	60,000 h	60,000 h
	P211-5 NW	24,000 h	36,000 h	50,000 h	60,000 h	60,000 h	60,000 h
	P211-5 WW	24,000 h	36,000 h	50,000 h	60,000 h	60,000 h	60,000 h
	P211-5 GOLD	24,000 h	36,000 h	50,000 h	60,000 h	60,000 h	60,000 h
	P211-5 PM	-	-	30,000 h	-	49,000 h	-

Optical characteristics P211-5

The optical design of the lens system ensures an optimum of homogeneity for the light distribution.

Light distribution $I_v/I_{v,max}$.

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 1964

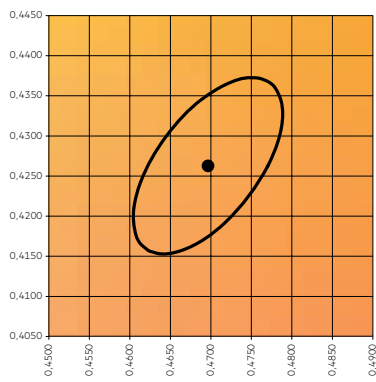
The specified colour coordinates are measured at a current impuls of 350 mA integral after a settling time of 100 ms.

The ambient temperature of the measurement is $t_a = 25\text{ }^\circ\text{C}$.

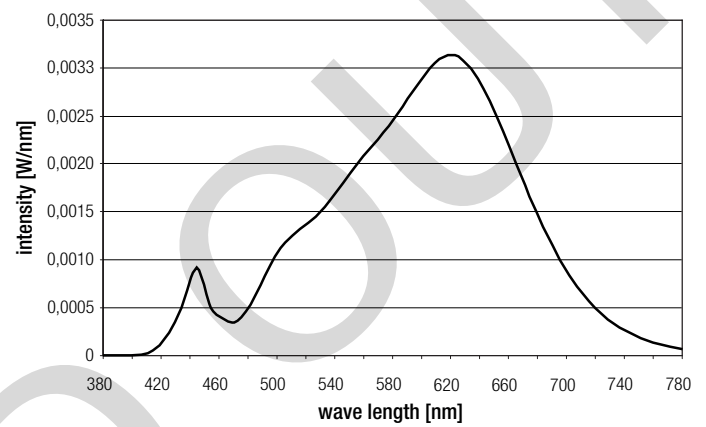
The measurement tolerance of the colour coordinates are ± 0.01 .

2,700 K

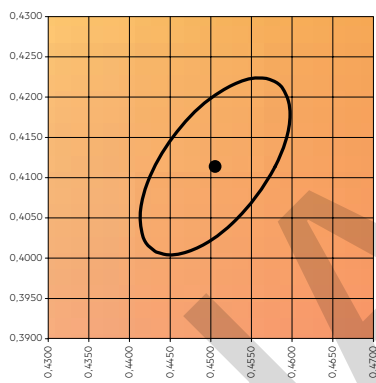
	x0	y0
Centre	0.4696	0.4262



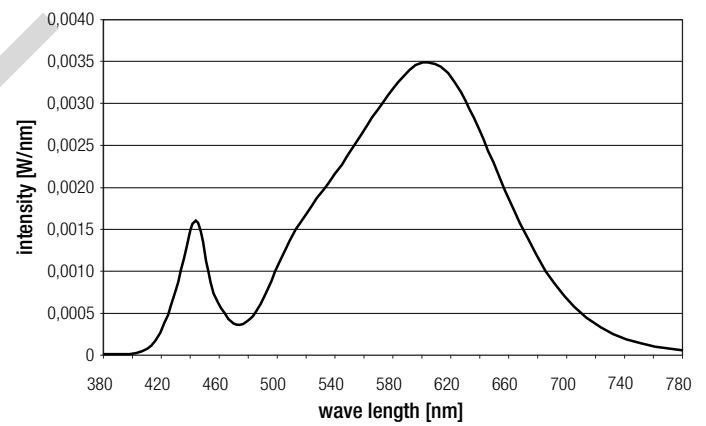
MacAdam ellipse: 4SDCM

**3,000 K**

	x0	y0
Centre	0.4506	0.4144

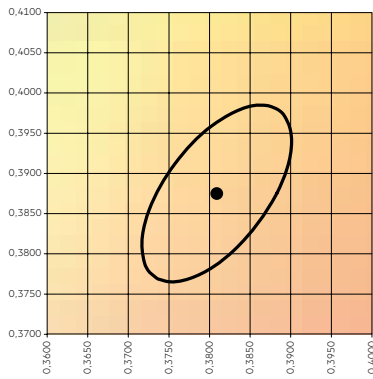


MacAdam ellipse: 4SDCM

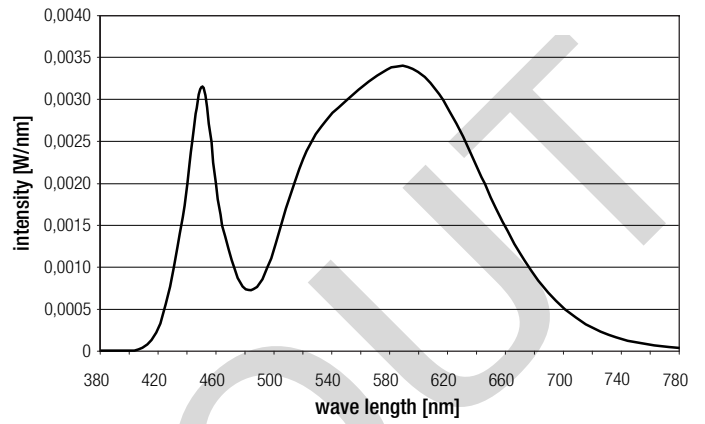


4,200 K

	x0	y0
Centre	0.3809	0.3874

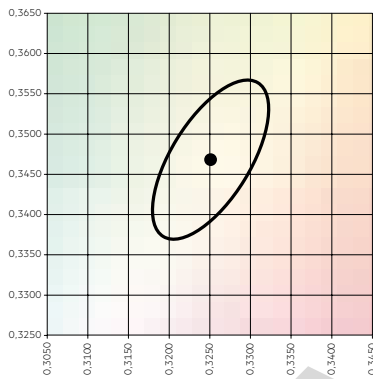


MacAdam ellipse: 4SDCM

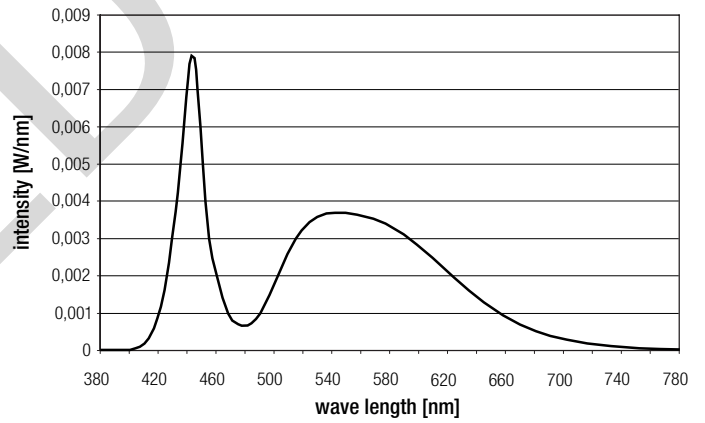


6,500 K

	x0	y0
Centre	0.3251	0.3459

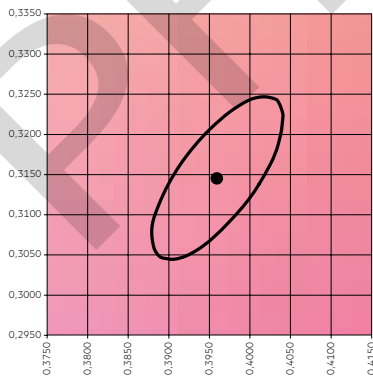


MacAdam ellipse: 4SDCM



PM

	x0	y0
Centre	0.3958	0.3146



MacAdam ellipse: 4SDCM

