





2020 to dla LED line[®] rok wyjątkowy. Dokładnie 10 lat temu produkty z naszym logo pojawiły się na świecie. Od tego czasu wielu z Was - naszych partnerów, szeroko rozwinęło swoje skrzydła zdobywając znaczny udział w rynku. To dla nas ogromna satysfakcja, że we współpracy z Wami możemy rozwijać naszą ofertę produktową. Każda oferowana przez nas oprawa znajduje w sobie pierwiastek Waszych cennych opinii i sugestii za co ogromnie dziękujemy.

Druga dekada XXI w. niesie ze sobą kolejną rewolucję w oświetleniu, w której rozpoczynamy swój udział. Nadchodzące trendy związane z podejściem do jakości światła, jego wpływu na zdrowie, komfort, funkcjonowanie oraz wydajność człowieka wprowadzają konieczność stosowania rozwiązań zebranych pod jednym wspólnym hasłem tj. Human Centric Lighting. Trend HCL zainspirował nas do ewolucji wybranych produktów z oferty LED line[®] o funkcje ściemniania, regulacji temperatury barwowej oraz sterowania programowanego przez użytkownika.

Mam nadzieję, że wśród wszystkich kategorii produktowych, które zamieściliśmy w tegorocznej edycji katalogu znajdziecie Państwo te, które spełnią oczekiwania i wpiszą się na stałe do Waszej oferty. Jestem pewien, że współpraca z marką LED line[®] przyniesie Wam wymierne korzyści w nadchodzących latach, a Waszym Klientom szybkie zwroty z inwestycji. Ze swojej strony gwarantuję, że we wdrożenie każdego z produktów włożyliśmy mnóstwo sił, serca i rzetelnej inżynierskiej pracy, aby świeciły przez lata dobrym i zdrowym światłem.

The year 2020 is a truly exceptional year for LED line[®]. Exactly 10 years ago, products with our logo reached their first customers across the world. Since then many of you have spread your business wings as our business partners, gaining significant market share. It is a great satisfaction for us that we can develop our product range in cooperation with you. Every luminaire we offer finds an element of your valuable opinion and suggestions, which is something we are very grateful for.

The second decade of the 21st century brings another revolution in lighting technology, and this is the revolution which we begin to participate in. We observe that the future trends related to the approach to lighting are: lighting quality, its impact on health, comfort, functioning and human performance. These trends make it necessary to introduce lighting solutions under Human Centric Lighting. The HCL trend has inspired us to introduce a selection of LED line[®] products with dimming, colour temperature control and user-programmed control functions.

I hope that among all product categories we have included in this year's catalogue edition, you will find those that will meet your expectations and that these will become an integral part of your product portfolio. I am sure that cooperation with LED line[®] will bring you measurable benefits in the coming years and quick returns on investment for your customers. For my part, I guarantee that we have put a lot of energy, heart and reliable engineering work into the implementation of each of the products, so that they provide you with a "good and healthy" light for years to come.

Przemysław Kowalczyk CEO 1- zemy dru 1 Josehn 2

We are in control of quality

The main objective pursued by our laboratory is to professionalise the quality of LED line[®] products by ensuring continuous control of photometric and electromagnetic parameters.

The LED line[®] Lighting Research and Measurement Centre is a place where rigid quality tests of our products are carried out on a continuous basis. The prerequisite for the release of each batch of products for the sale purposes is a positive quality test performed by our team of experts in accordance with current directives and standards.



Quality testing

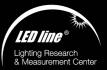
An important advantage of our LED line[®] Lighting Research and Measurement Centre is our highly qualified team of experts and a professional research and measurement equipment. We carry out a broad scope of research including determination of electromagnetic and photometric properties of products.

• High level of support for Industry Professionals – using our Goniospectrometer, we create professional and reliable IES and EULUMDAT files – we support designers in creating precise lighting designs, which are the basis for successful lighting projects and investments. We create high quality photometric files which are subsequently imported to Dialux or Relux software, on the basis of which we can then advise and recommend the right type of luminaire and its required quantity for each project.

• We take care of visual comfort and eye's health - with the GL Spectis + Flicker device we examine the optical parameters of our products: ripple frequency, Flicker index, Flicker percent, SVM (stroboscopic effect visibility measure), PstLM (short-time flicker index) which can have highly negative impact on human's eyes.

• We guarantee failure-free operation of our products – all of our luminaires and LED lamps are subject to thorough quality testing, using our Aging Test device. Each product is prone to several hundred cycles of work in extreme ranges of input voltage. Thanks to this, we have full confidence and trust in our products and we can assure the products will prove to work reliably in the full range of declared power supply parameters.

• Temperature is under our control – we picture and record the temperature distribution in LED systems using a thermal imaging camera and a multi-channel temperature gauge. The correct operating temperature of a LED is the basic factor determining its lifetime.



• We publish parameters that are genuinely tested - with the help of our Goniospectrometer located in a darkroom, photometric sphere and Ulbricht's integrating sphere, we take measurements in C-coordinates and γ angles (gamma), photometric and electrical values, luminous flux measurements, light distribution curves and light output. Each product parameter published by us is confirmed by earlier tests.

• We look after the quality and colour of the light - we create polar and cone diagrams, determine the colour rendering indicators (Ra, CRI), colour temperature (CCT and Duv), as well as we take control of the colour temperature for McAdam's ellipse purposes.

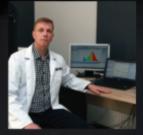
• We ensure the electromagnetic compatibility of products - with the Spectrum Analyser we test products for electromagnetic compatibility of products in accordance with the PN-55015 standard in order not to exceed the applicable conductive interference values.



We share our knowledge

The years of our experience in the lighting industry together with highly qualified engineering experts and cooperation with research workers are a huge asset for us, which allows for continuous development and the supply of most innovative lighting solutions. We are happy to share our knowledge during regular meetings with our partners during their visits in our laboratory.

The LED line[®] Light Research and Measurement Centre is the place where we organise various trainings in the field of photometry, photometric measurements and quality control. We perform such trainings for our strategic business partners, distributors, customers and employees. We are also open to share our expertise in the sphere of photometry with engineering students.



In order to improve research processes, we have established cooperation with research workers of the leading Polish Technical Universities. As part of this cooperation, we test new as well as already known solutions. We create our own prototypes, which, thanks to our extensive laboratory equipment, we can test thoroughly. We do experiments with various light sources, we test the best solutions in terms of light output and lifetime. Scientific cooperation provides us with a new perspective, thanks to which we are able to meet any challenge and provide our customers with only the best quality products.

Head of Technical Department of LED line® Norbert Chrzanowski

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Universal lighting dedicated for passageways (both, indoor and outdoor use), as well as for production and storage halls, social and office areas or residential buildings. The luminaires work efficiently even in the most difficult conditions. These products are featured with a high level of protection against the ingress of dust and water and are resistant to mechanical impact. New models are equipped with a motion sensor and an automatic switch-off function; its control panel is located outside the luminaire. The "Stand by-DIMM" function allows the user to set the luminaire's switch on time, and set the luminaire to dim to 20% brightness when no movement is detected within its detection area. The quality of components, which this luminaire is equipped with, guarantees a failure-free operation and resistance to UV radiation, thanks to which the luminaires is fully protected against yellow degeneration, thanks to which it retains its white colour and aesthetics for many years.

FLOOD LIGHTS

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Lights designed and manufactured for the illumination of production plants and storage buildings.

The IP65 protection rating and the very wide range of operating temperature ensure reliable operation of these luminaires even in the harshest conditions, both inside and outside buildings. The densely ribbed aluminium housing performs a important function of highly efficient heat sink that effectively dissipates the heat generated by the LEDs to the outside of the luminaire. Additionally, the use of high quality thermal paste is used to eliminate air gaps (thermal insulation) in order to maximise heat exchange. Such an effective cooling system extends the life of the LEDs.

HIGH BAY LIGHTS

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HIGH BAY luminaires are dedicated for the professional illumination of warehouses, production plants and any space where exceptionally long and trouble-free operation of the luminaire is required. The casing is made of cold forged 100% aluminium, which provides more efficient heat dissipation to the outside and thus extends the life of LEDs. The use of a polycarbonate lens ensures excellent light transmission. A choice of lenses with different beam angles (60°, 90° and 120°) as well as a choice of different powers (100 W, 150 W, 200 W) will provide a full range of solutions for every lighting project. For demanding applications we recommend our new solution equipped with CREE LEDs, Mean Well power supply and 1-10 V dimming function.

TRI-PROOF LIGHTS

page 29

These HERMETIC LUMINAIRES are certified by the Polish National Institute of Hygiene. They have been designed for installation in medical care buildings, industrial facilities and warehouses intended for food storage, grocery stores, multi-storey car parks as well as home garages and farm buildings. High resistance to mechanical damage (IK08) and protection against dust and water ingress (IP65) guarantee efficient operation in a wide temperature range ($-25 \circ C - +45 \circ C$). Thanks to adjustable mounting clamps, the lamp will fit into most existing mounting holes.

The Easy-Link version offers truly quick installation of the luminaires in "long light strings" (no need for the use of tools; installation performed comfortably and quickly thanks to the specially designed couplings).

LED PANELS

D200

page <u>35-45</u>

The EXPERT series is our innovative solution designed for professional lighting projects and investments. A choice from a wide range of colours makes it possible to use these panels as decorative lighting in schools, pre-schools (kindergartens) as well as in shopping salons or shops where the colour identifies the brand. Our LED EXPERT panels offer a unique and interesting design, high luminous efficiency and extremely low glare rating (UGR). The warranty is granted for up to 5 years

EASY FIX

page 4 FD nanel

The main advantage of these LED panels is: extremely easy installation. The luminaires are suitable for both, recessed and surface installation. Thanks to the adjustable mounting clamps, the panels will fit into most existing mounting holes. All panels with an output of 6W, 12W, 18W are equipped with LGP (light guide plate) glass which ensures even and smooth distribution of light over the entire surface. 24W version is equipped with PMMA (acrylic glass) LGP. All diffusers used in the panels are UV-resistant, so that the panels do not turn yellow and maintain their original white color, aesthetic appearance and high light parameters for many years.

LED LIGHTS

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With its insulating properties, the GLASS series provides a high level of safety for the user. This solution is very attractive not only in terms of safety, but also for visual and economic reasons.

This is a great combination of a retro-style EDISON bulb with the most advanced and modern LED technology. The use of graphene in the construction of FILAMENT LIGHTS allows to achieve exceptional lighting parameters and at the same time extends the life of LEDs.

page 57

Ceramic housing guarantees optimal thermal conductivity, which results in effective heat dissipation. CERAMIC series has proven to be a highly reliable light source, providing exceptional performance, durability and safety for users.

_{ge} 67

Energy-saving light sources which reduce energy consumption. Long life and high efficiency are the features of the LEDs used in the construction of these lights.

FIXTURES

CLASSIC

page 69-101

page 71 The variety of colours, shapes and materials makes them suitable for any application. Depending on its intended use, adjustable or fixed models are available for installation. Aluminium, which the downlight fixtures are made of, performs an additional heat sink function for the lamps installed in the fixtures. This solution extends the life of the light source.

GLASS

page 89

The unique design gives our fixtures their exceptional appearance and character. Due to its insulating properties, glass ensures high safety for the users.

WATERPROOF

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Waterproof (aluminium) downlights are designed for spaces of high moisture levels. The design and the use of dedicated gaskets ensures protection at IP44 / IP20 level. The fixtures are ideal for places with high level of humidity.

TURF

page 98

Modern spotlights designed for surface installation with an aesthetic appearance and high quality. These spotlights not only offer a beautiful and stylish decoration, but also provide protection for the LED lights placed inside the tube. Fixtures are made of aluminium, which performs an additional heatsink function, providing extra protection for the light source placed inside; this extends the life of the LEDs.

LED STRIPS

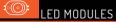
page 103-115

EXPERT

LED strips from EXPERT series are designed for professional use. These products have various functions, various diode density and high efficiency. These LED strips are designed to be installed in customised locations and to create a unique effect. Most models are available in two voltage options, 12V and 24V.

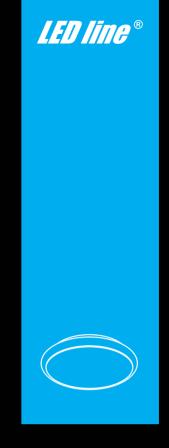
WATERPROOF strips are placed inside a flexible transparent silicone cover (IP67) or coated with a PU glue (adhesive layer) (IP65) with strong resistance to yellow degeneration. They have full protection against dust and water ingress. Most models are available in two voltage options, 12V and 24V.

LED strips designed to be an impressive addition to interior design. Available in different colour temperatures, different colours and in RGB palette. Most models are available in two voltage options: 12V and 24V.



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LED line® OPTO modules are a wide beam angle solution designed for the illumination of advertising cassettes and spatial letters. This solution ensures reliable operation in the temperature range from -40°C to + 55°C, both inside and outside. Its highest quality is evidenced by 7 years warranty and IP65 protection.



INDUSTRIAL LIGHTS

Advanced LED technology for business and industry

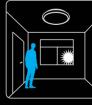




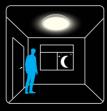




daylight sensor

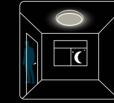


1. The lamp remains inactive with daylight level above the LUX setting even if movement is detected.

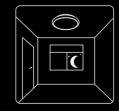


2. The lamp activates with daylight level below the LUX setting when the movement is detected.

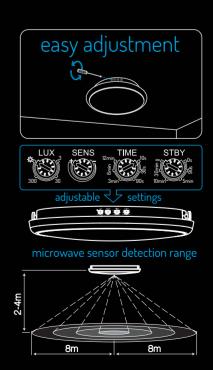
stand-by mode



1. The lamp dims to 20% for the duration of STBY time setting when no movement is detected.



2. The lamp deactivates automatically after the STBY time setting has elapsed.



CEILING









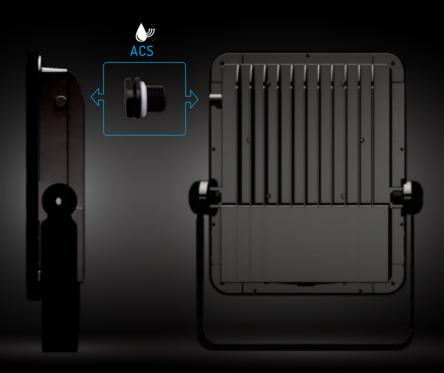
FLOOD

LIGHTS

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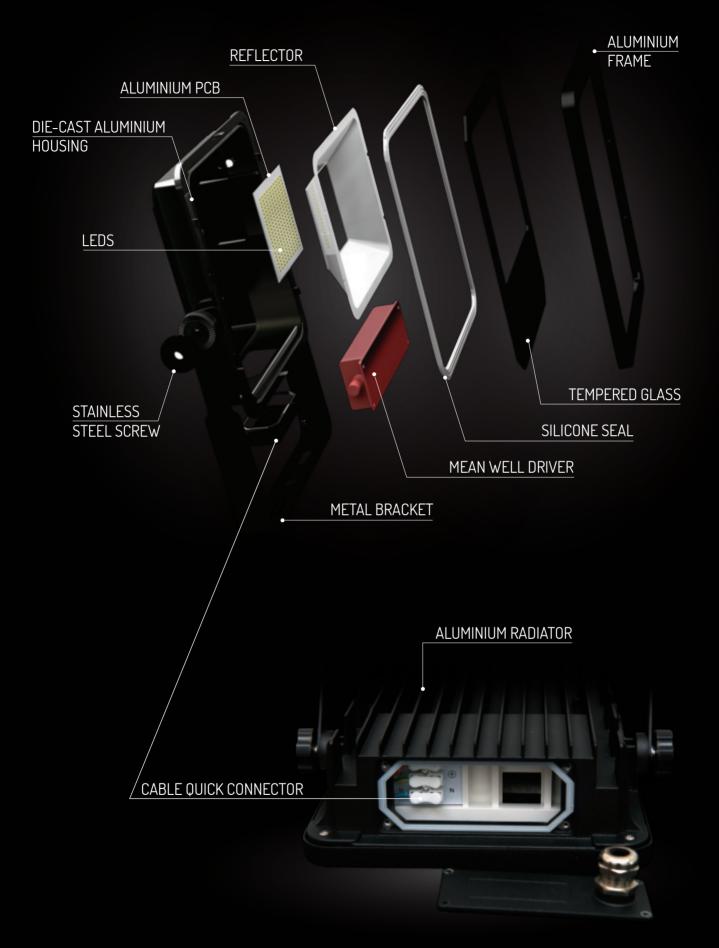




FLOOD

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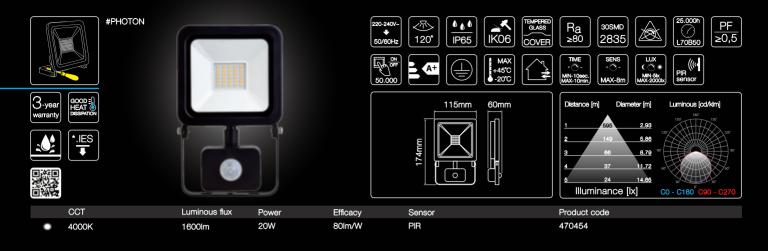




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FLOOD LIGHTS

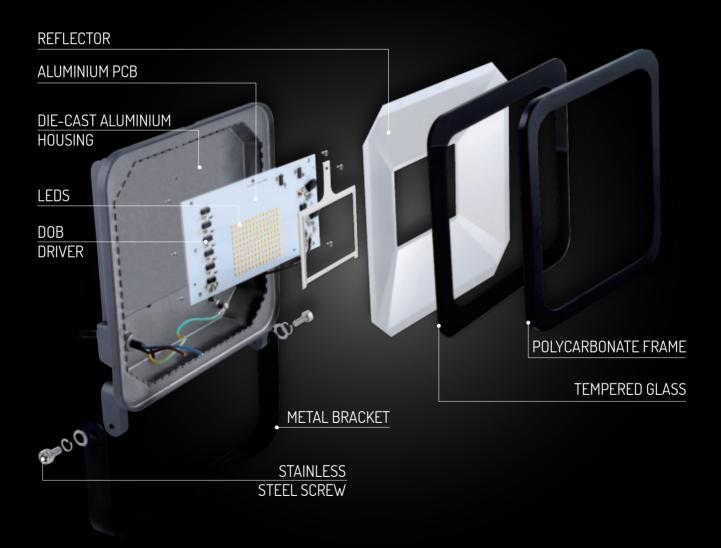












FLOOD

LIGHTS

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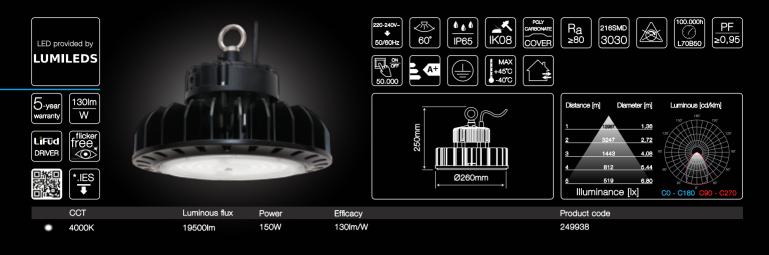








HIGH BAY

























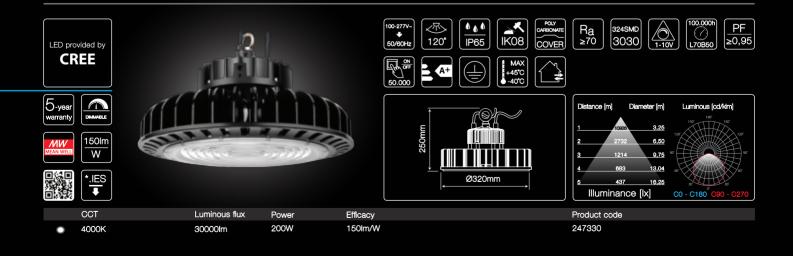








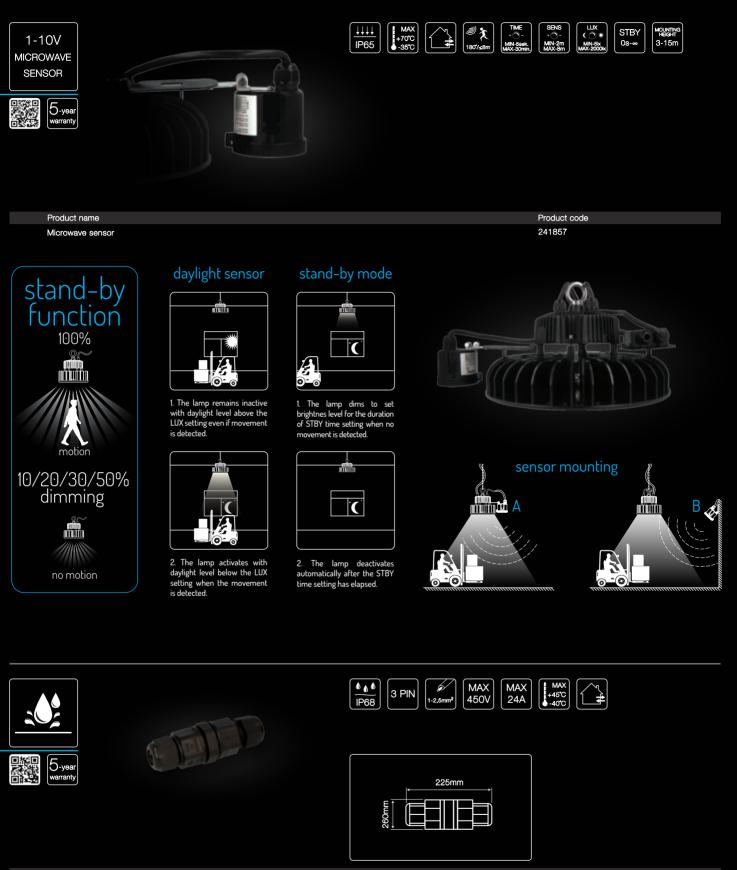




HIGH BAY

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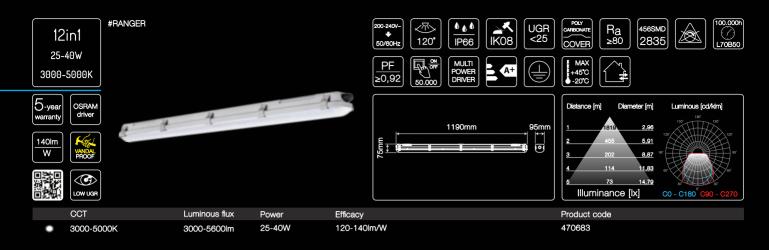




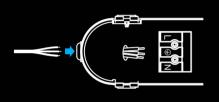
FLOOD LIGHTS / HIGH BAY LIGHTS / TRI-PROOF LIGHTS / CEILING LIGHTS



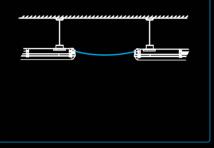


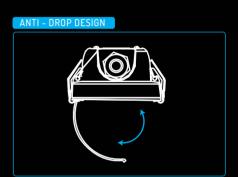








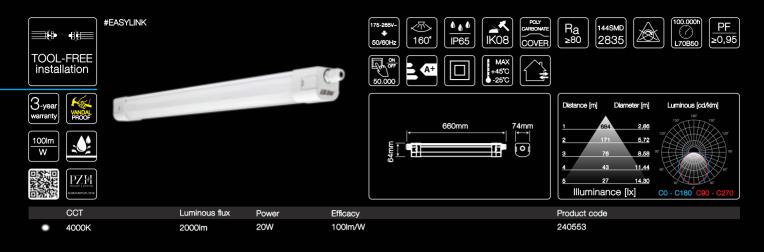


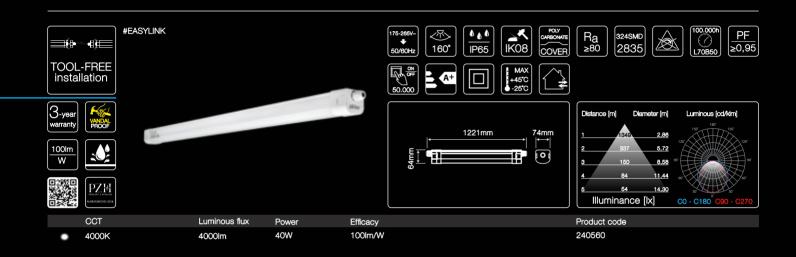


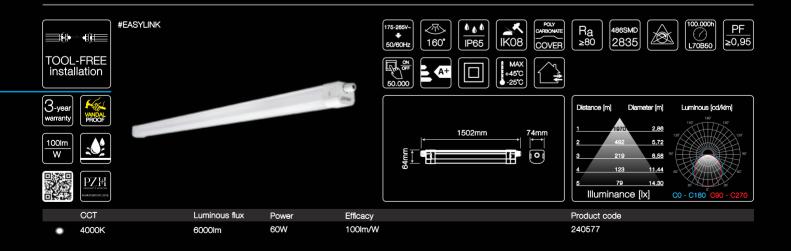


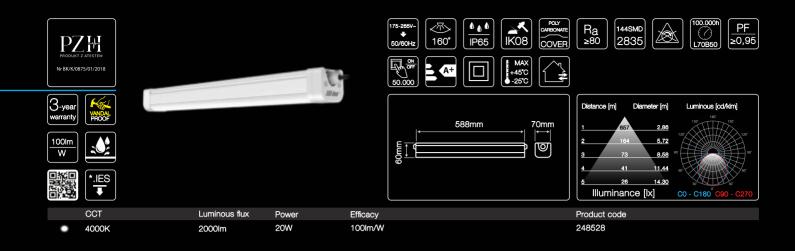


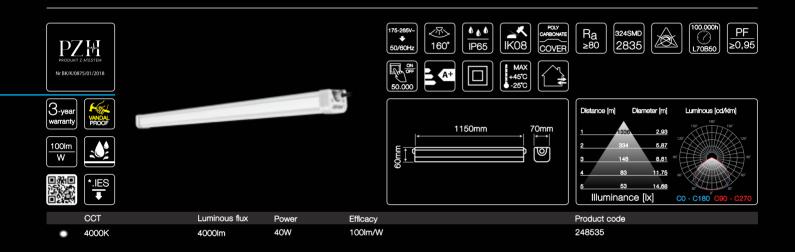


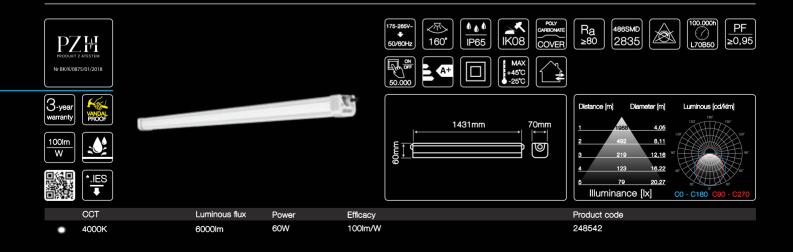










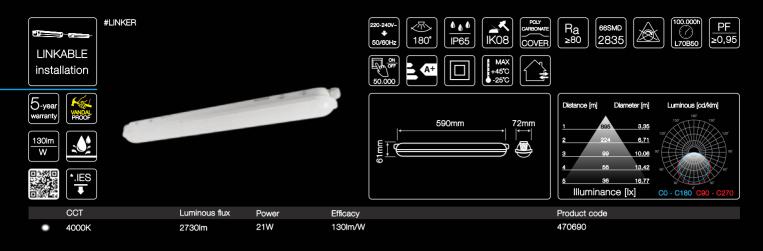


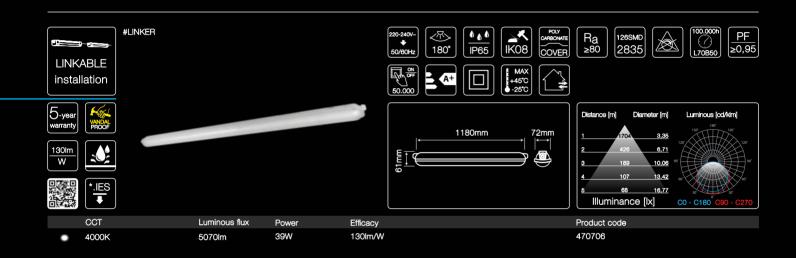
TRI-PROOF

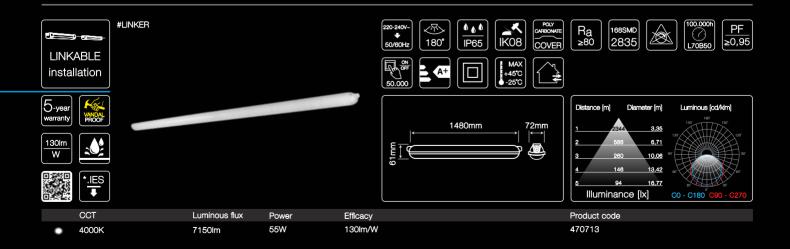
LIGHTS

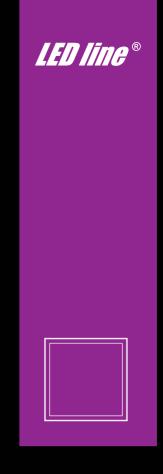
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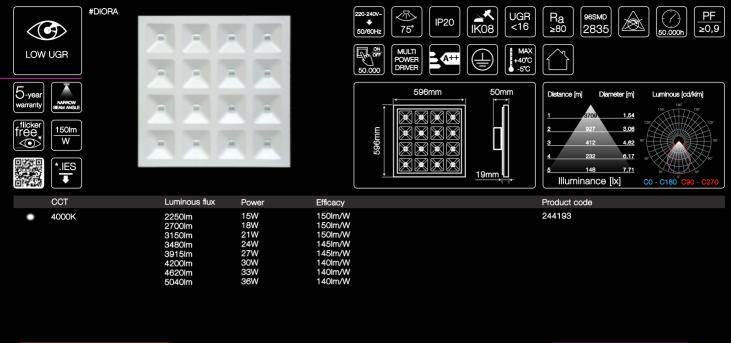


LED PANELS

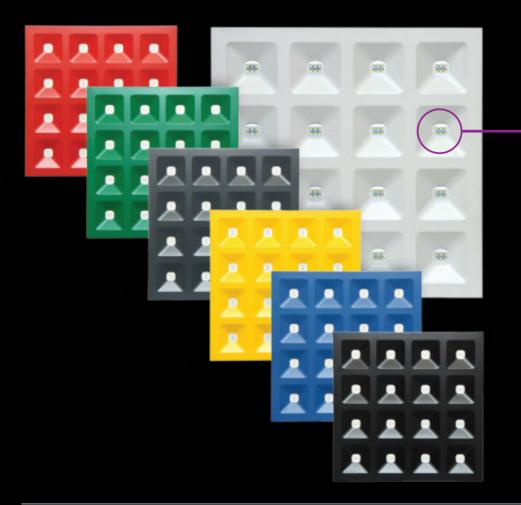
Setting the right mood and atmosphere for home and offices









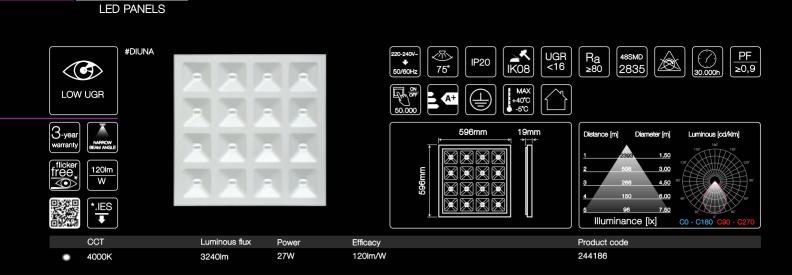


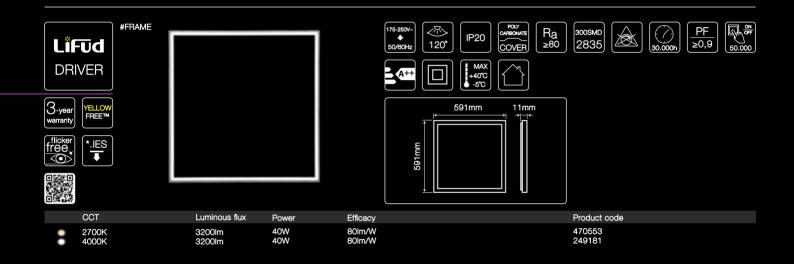


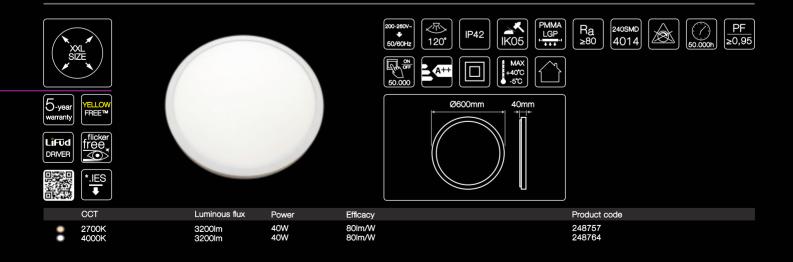
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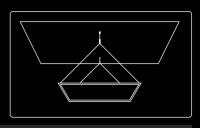


FXPFR





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Product code 245701

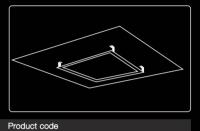




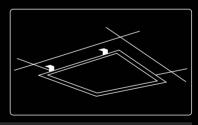
Product name HOOKS SURFACE KIT



Product name SPRINGS RECESSED KIT



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Product code 245725

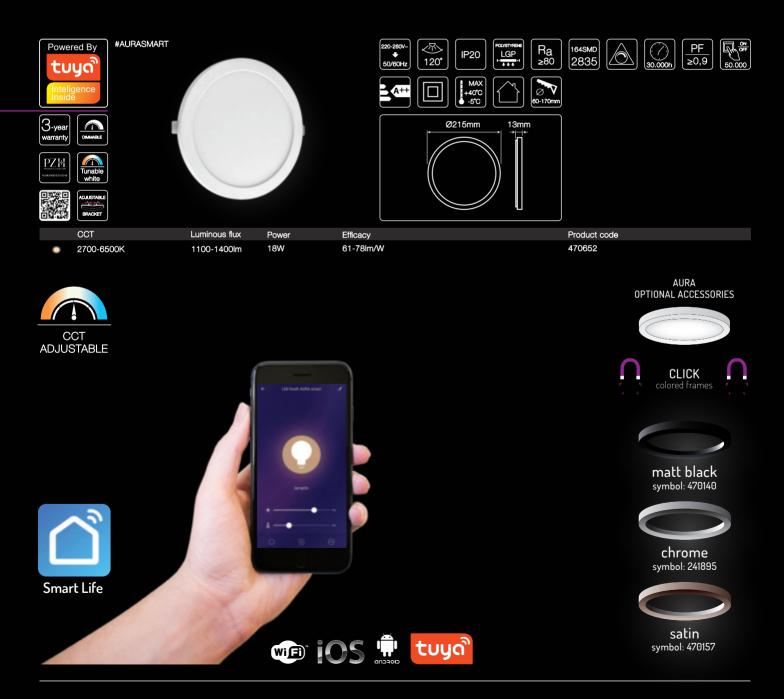


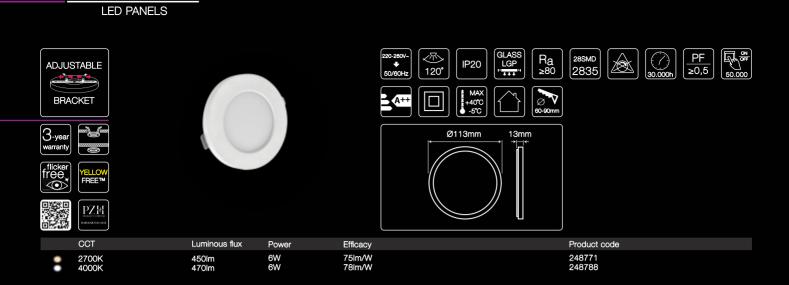


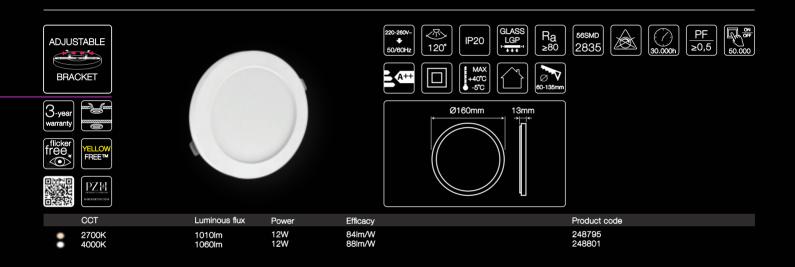










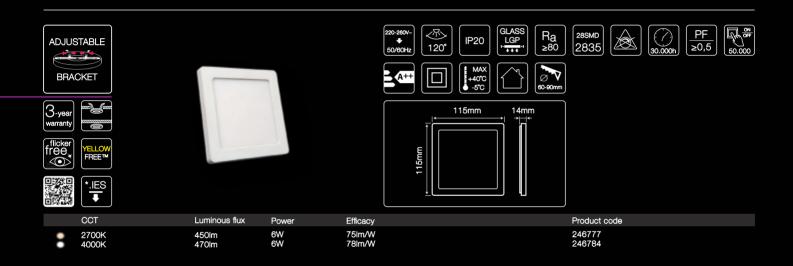


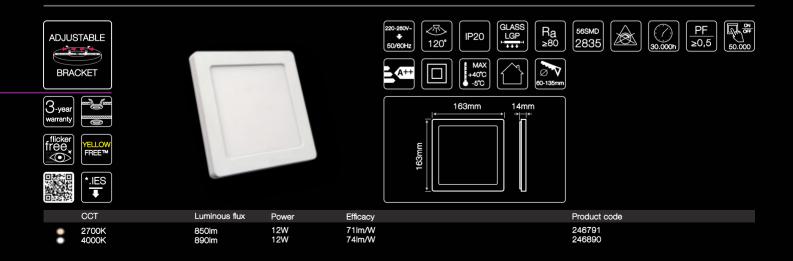


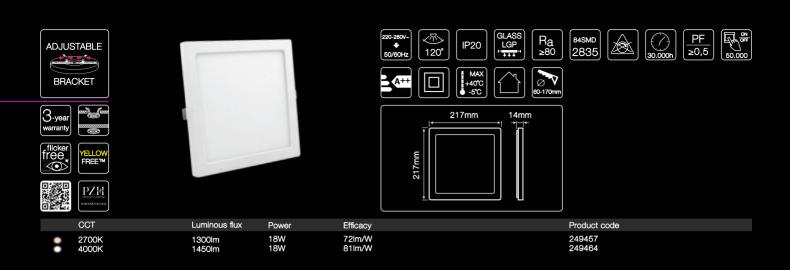
EASY FIX

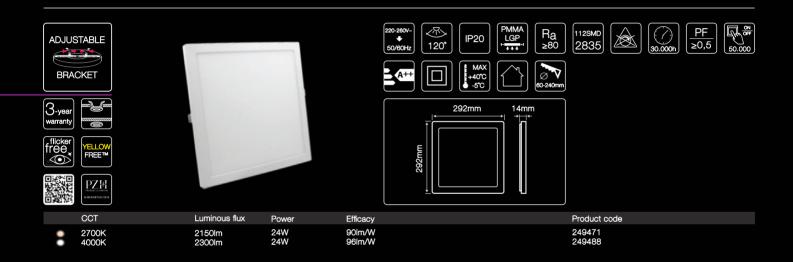












EASY INSTALLATION

Adjustable clips

EASY FIX



Surface



Recessed

















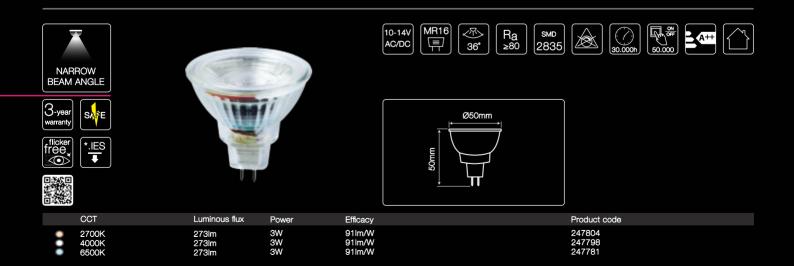












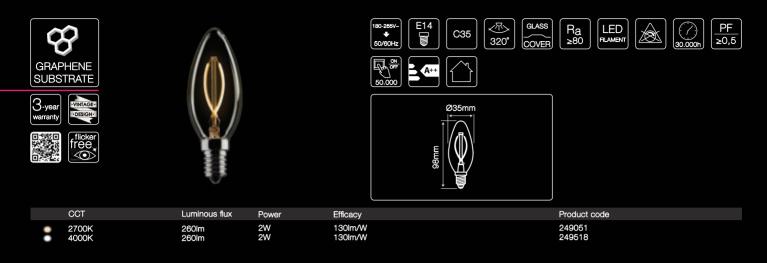


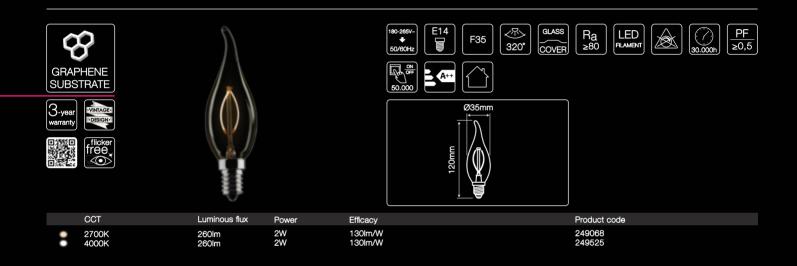


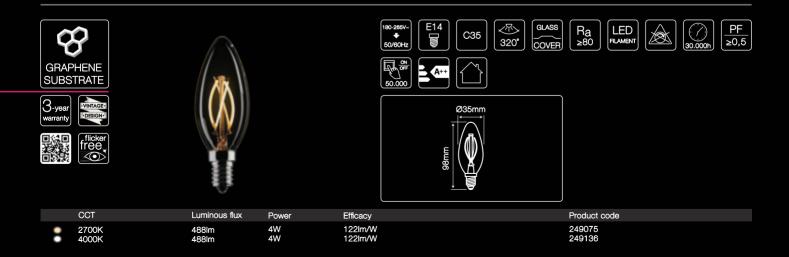


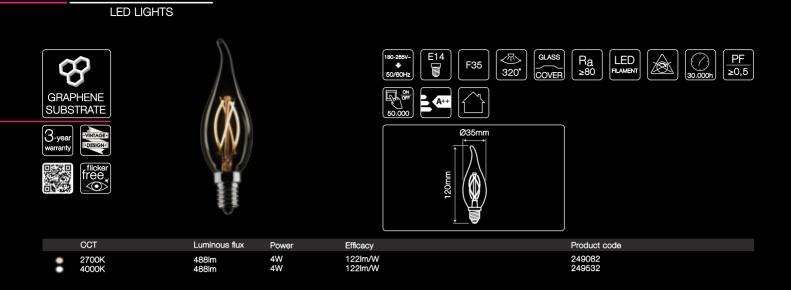


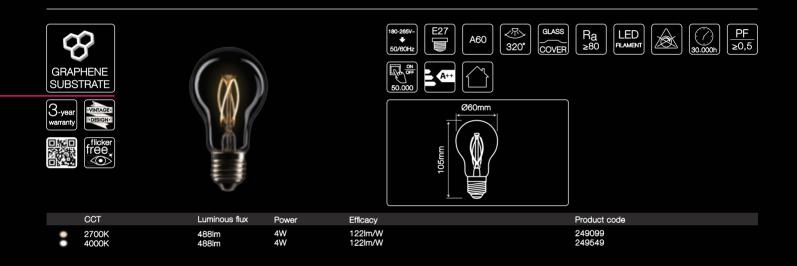


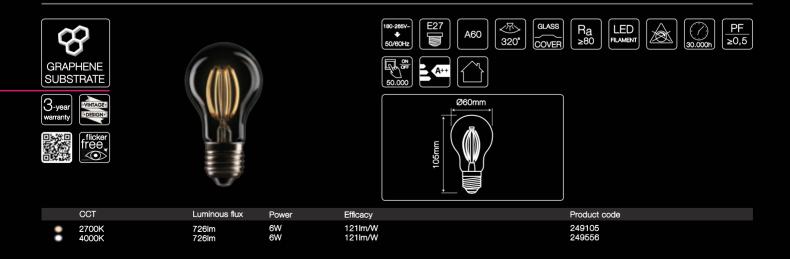






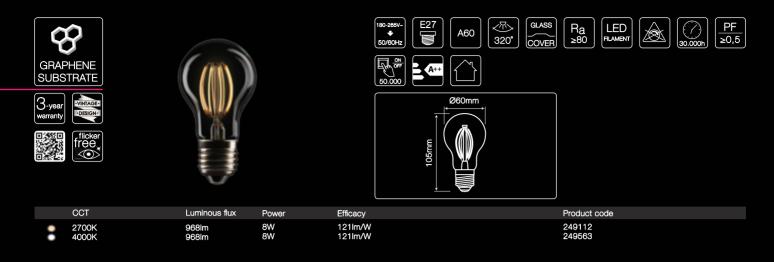


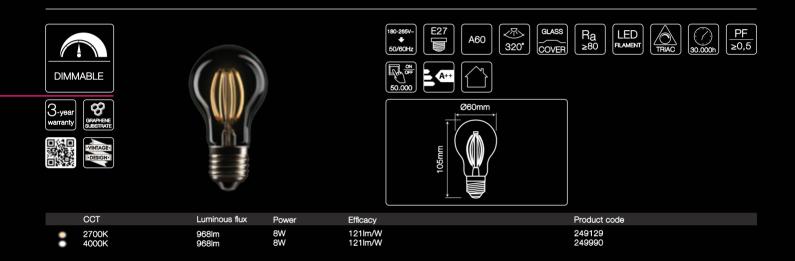




FILAMENT





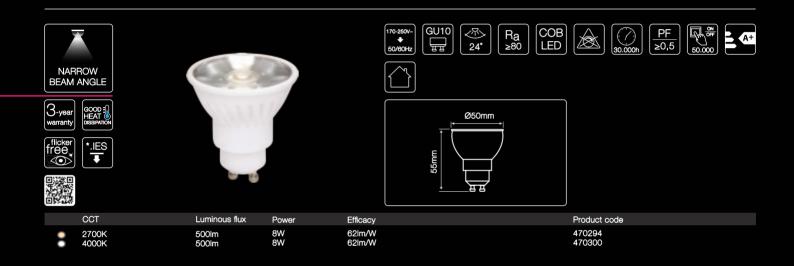






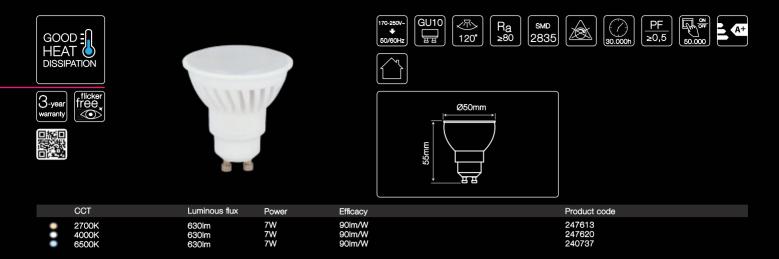




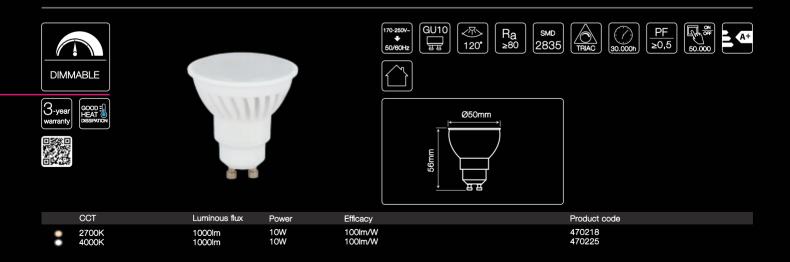






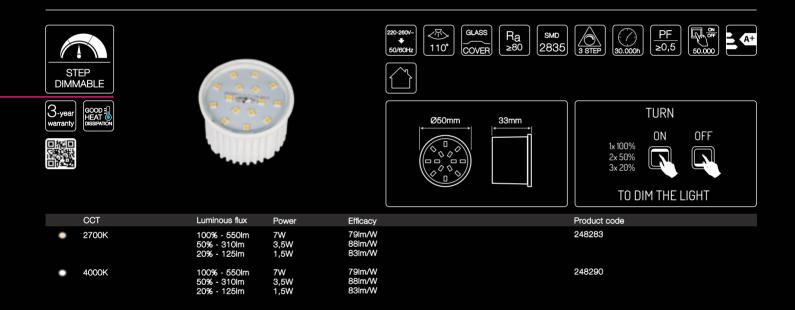


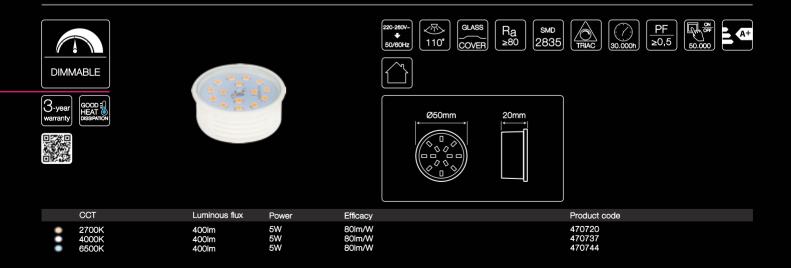




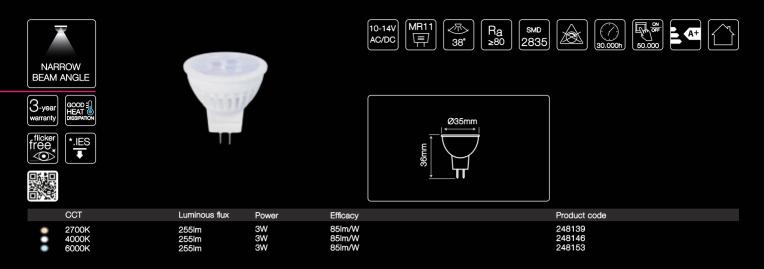




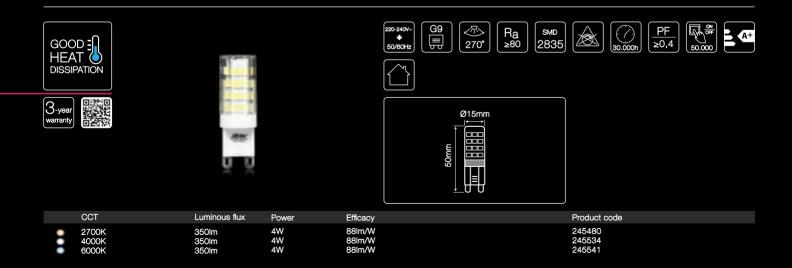




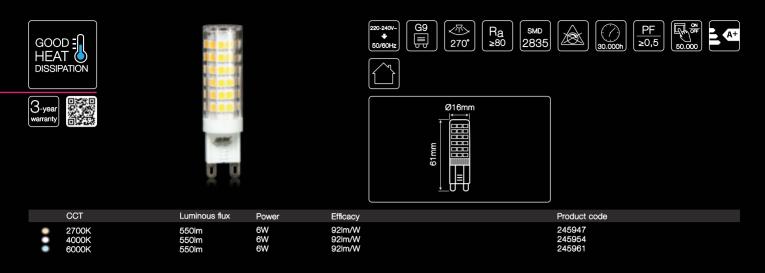


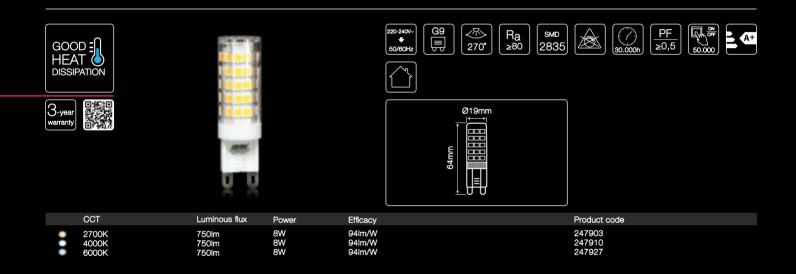


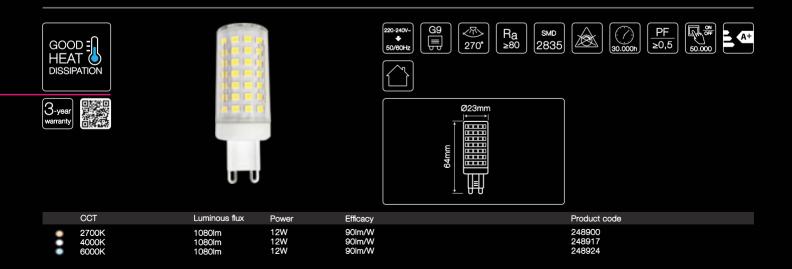




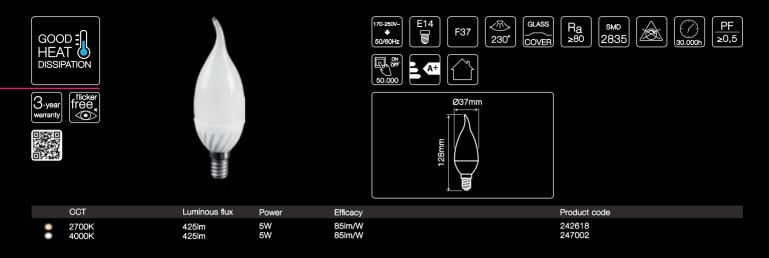


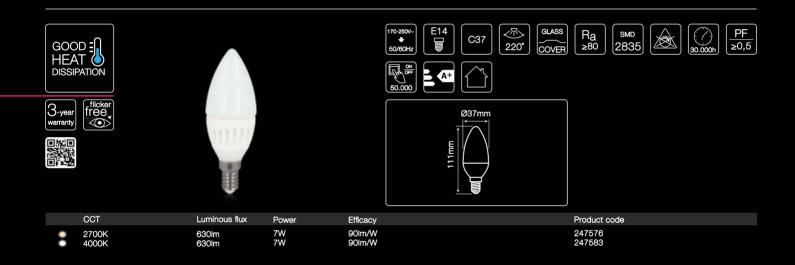


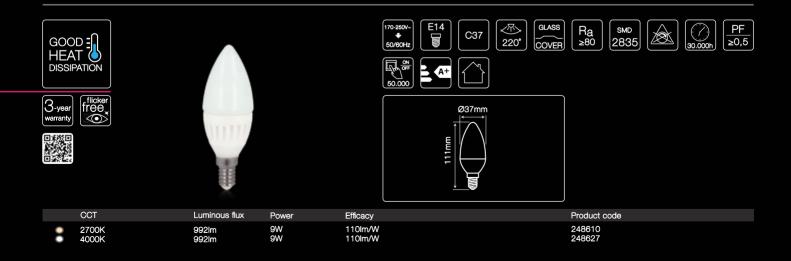




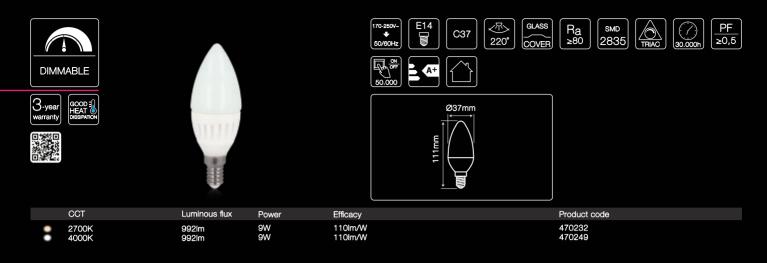


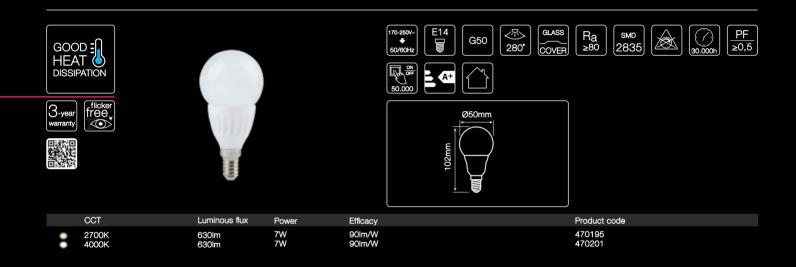


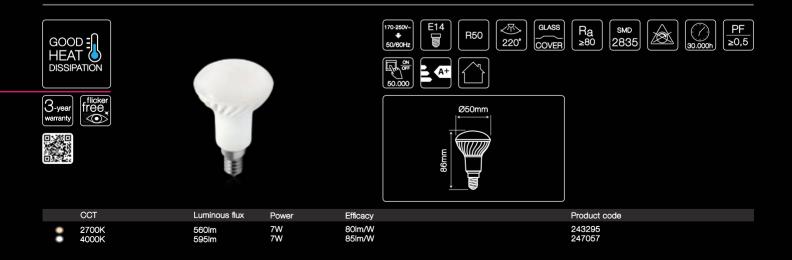




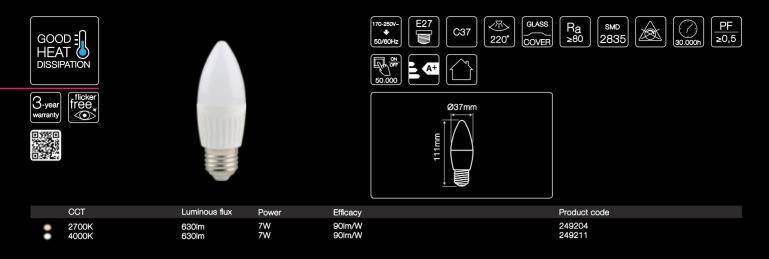


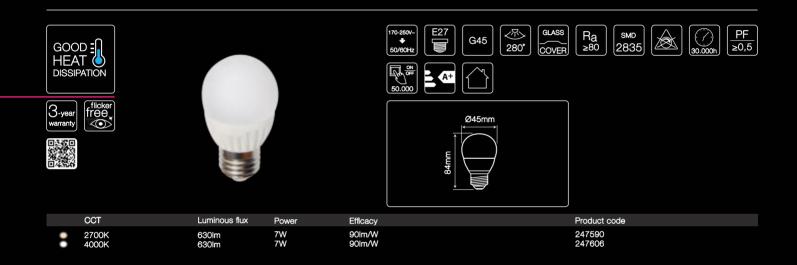


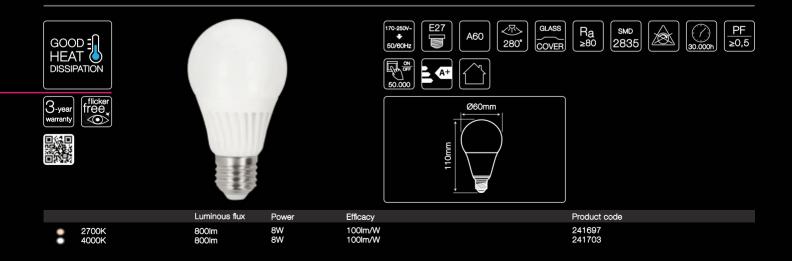




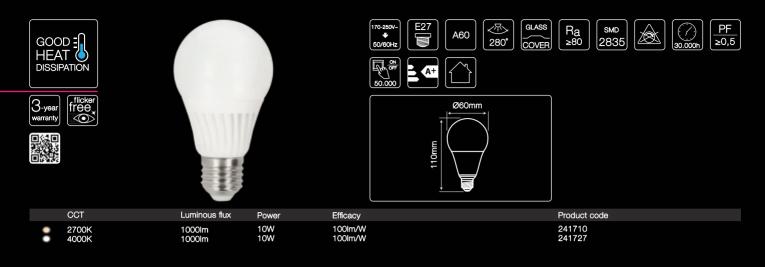


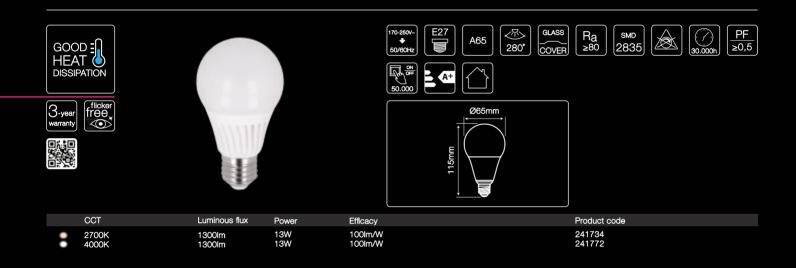


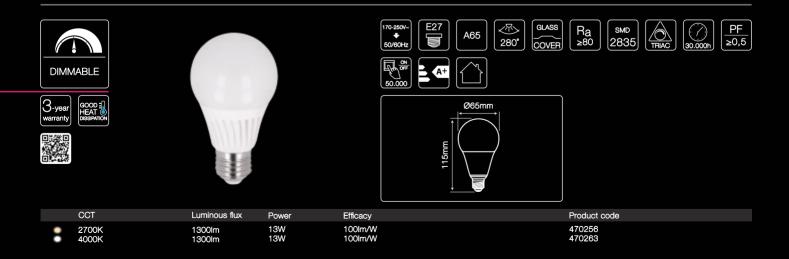




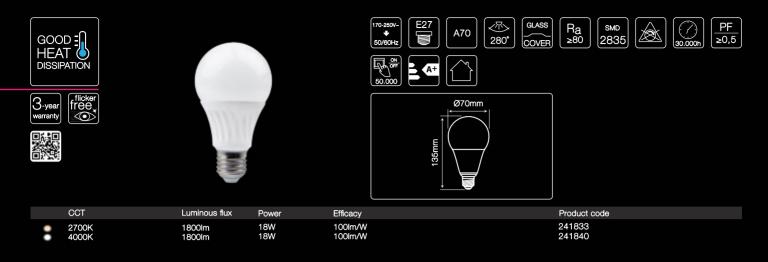


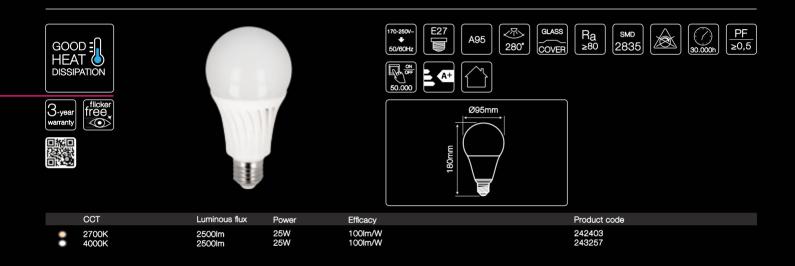


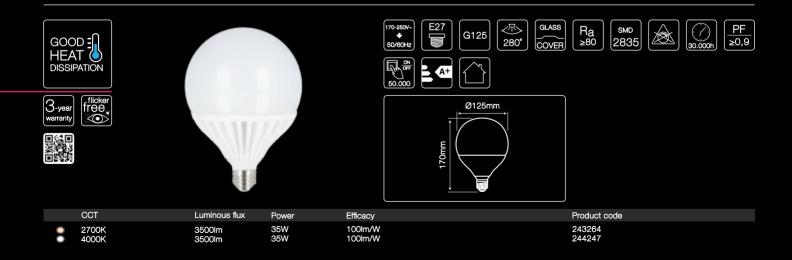




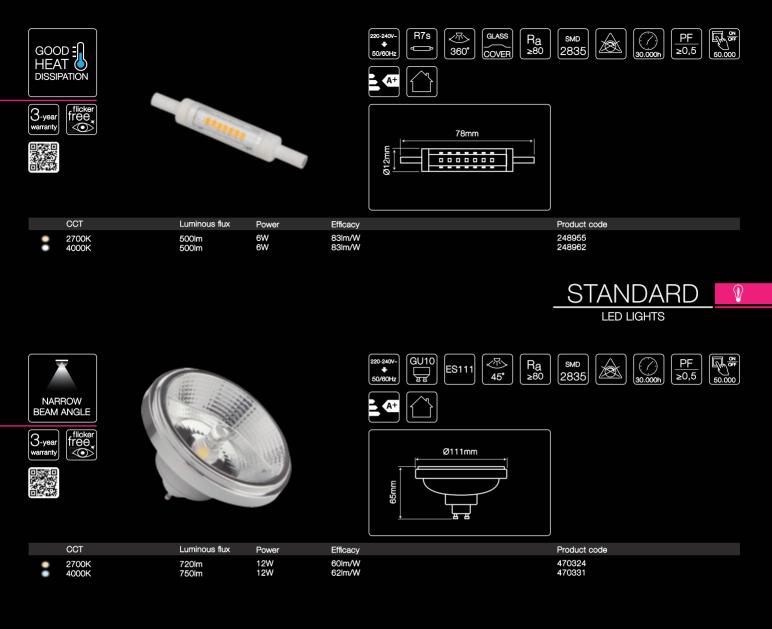


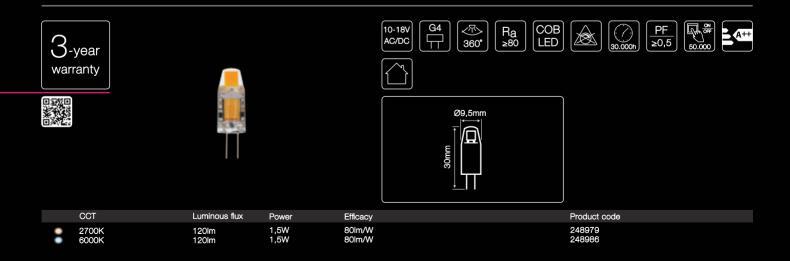
















$\label{eq:FIXTURES} FIXTURES$ The right direction for LED light



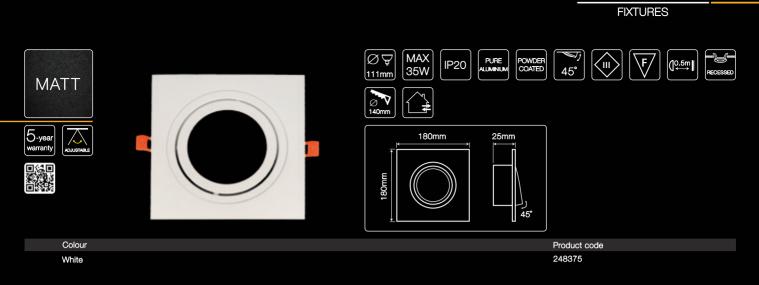




















































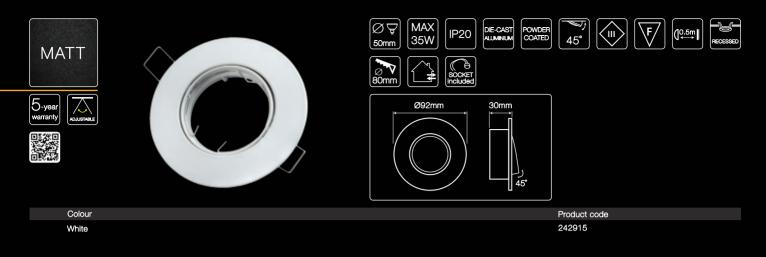
CLASSIC FIXTURES



























CLASSIC FIXTURES































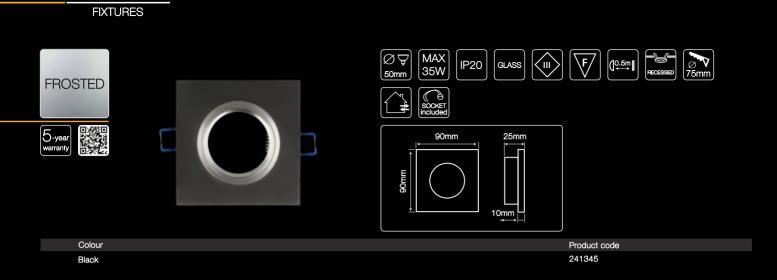










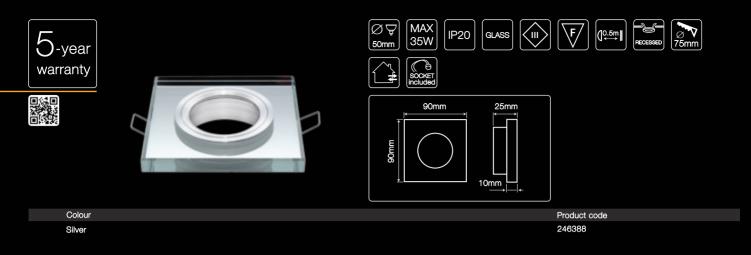






GLASS

















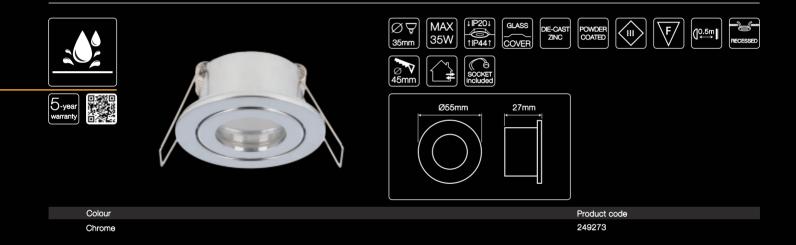




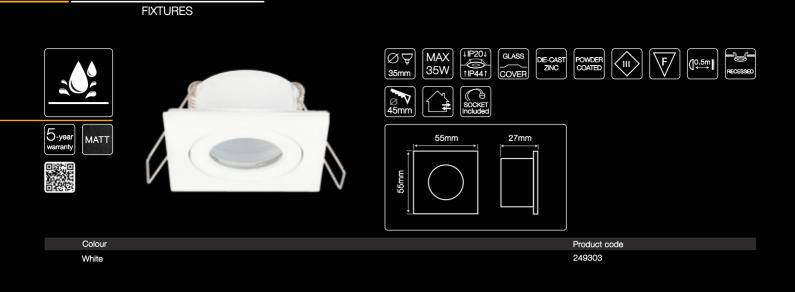


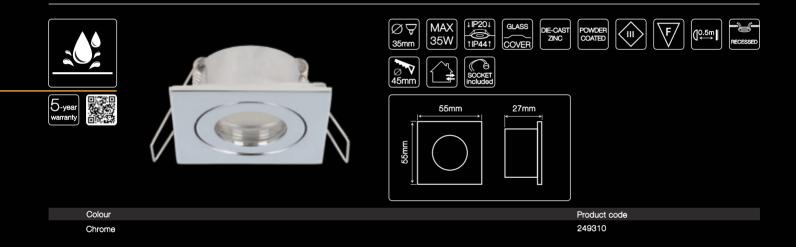
















WATERPROOF FIXTURES















TUBE

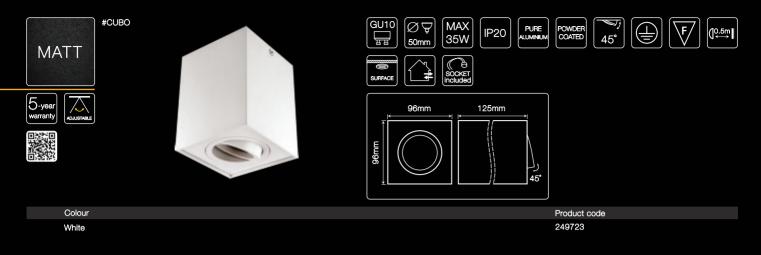


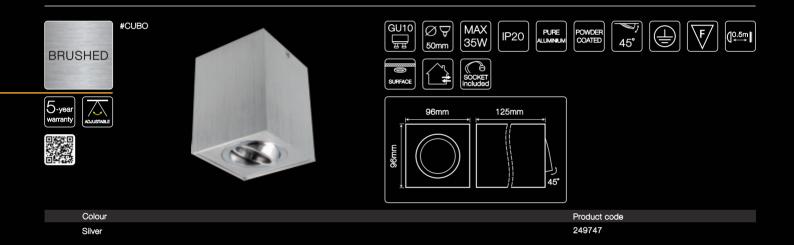


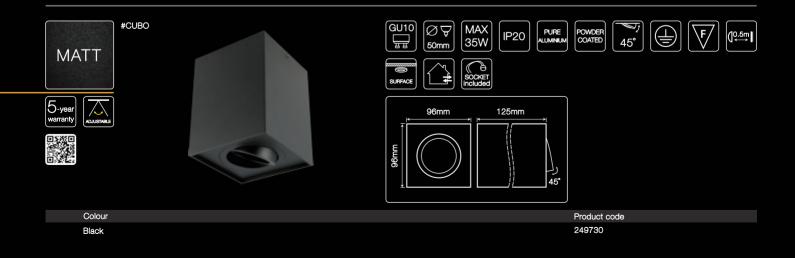


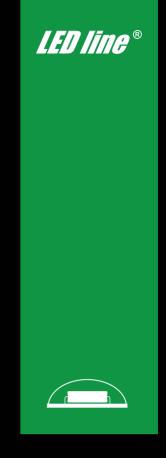










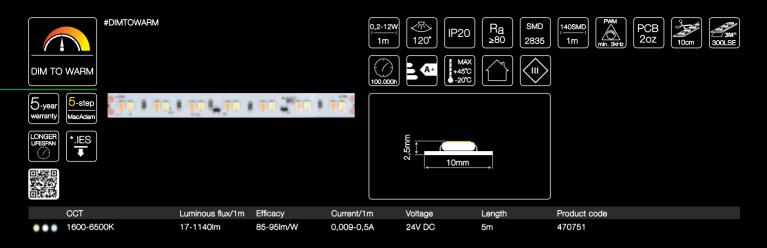


LED STRIPS

The only limits to creating illumination are the limits of your imagination







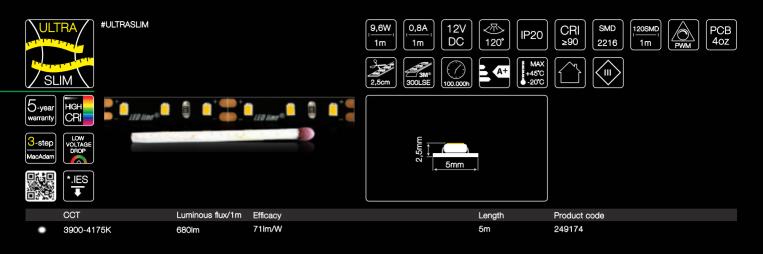


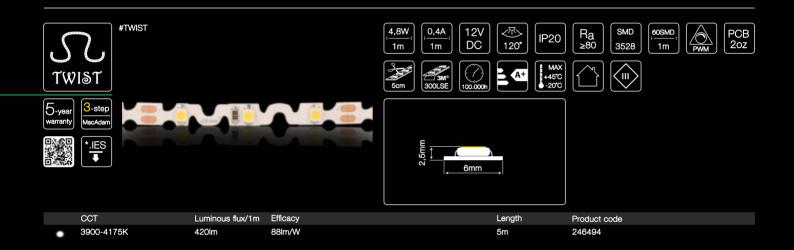


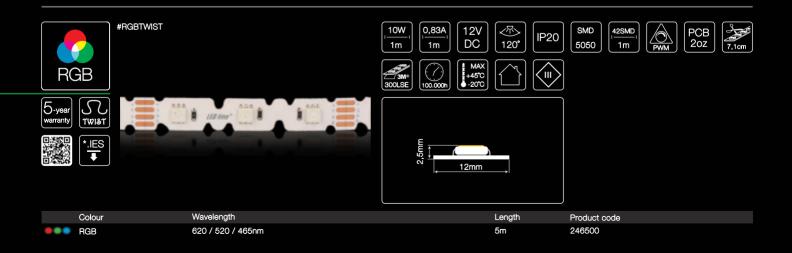




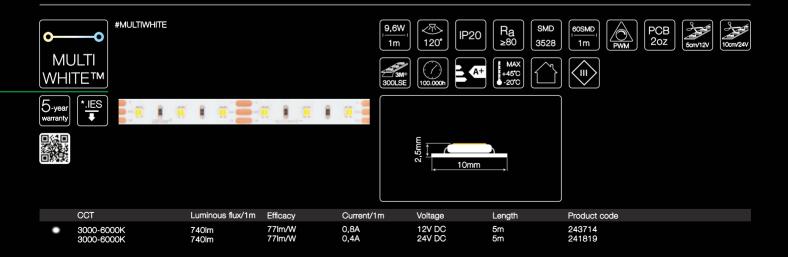








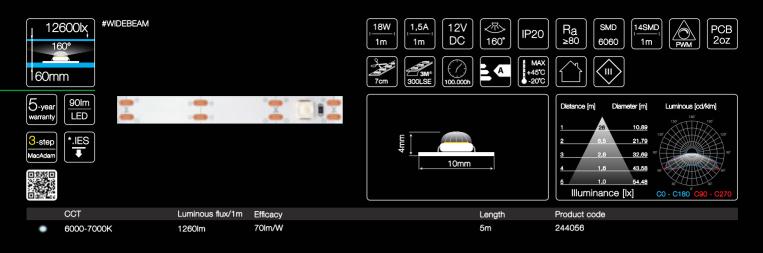
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	+				19,2W 1m 120°	P20 SMD 5060 1m	PCB BOD	50m/12V	300LSE
RG	BW					MAX +45°C -20°C			
5-year warranty		I II 🚺		0					
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	CCT 2600-2868K	Luminous flux/1m 400lm	Efficacy 83lm/W	R _a ≥80	Current/1m 1,6A	Voltage 12V DC	Product code 247071		
-	6100-6800K	400lm	83lm/W	≥80	1,6A	12V DC	245657		
-	2600-2868K 6100-6800K	400lm 400lm	83lm/W 83lm/W	≥80 ≥80	0,8A 0,8A	24V DC 24V DC	241673 241680		
	Colour	Wavelength							
•••	RGB	620 / 520 / 465nm							
•••	RGB								
•••	RGB #DIGITAL				1.2A 1m	2V 0C 120 ⁻ IP20	SMD 605MD 5050 1m	P943 C	PCB 2oz
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DIGI 5-yeart warranty	RGB #DIGITAL TAL *.IES	620 / 520 / 465nm					5050 [<u>1m</u>]	P943 IC	PCB 2oz
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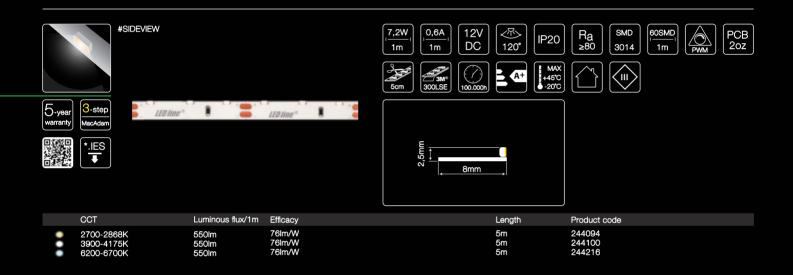


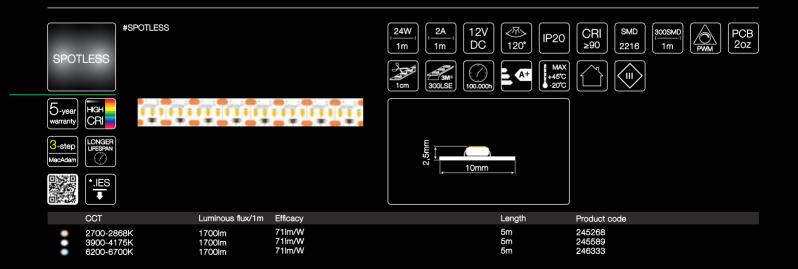
EXPERT

LED STRIPS



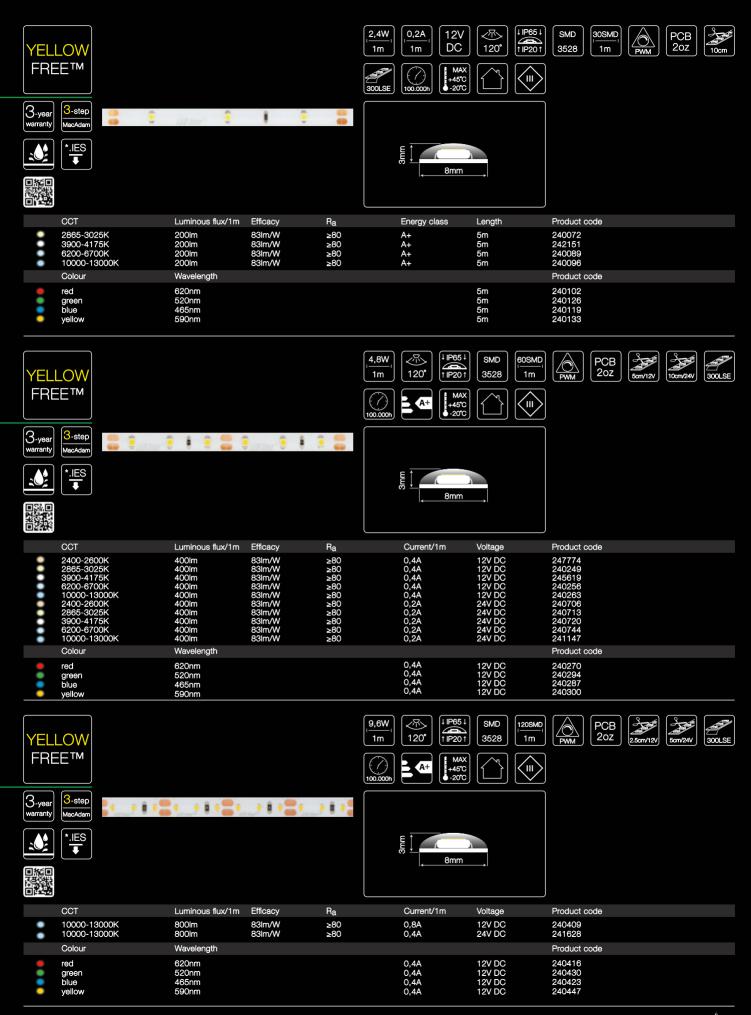


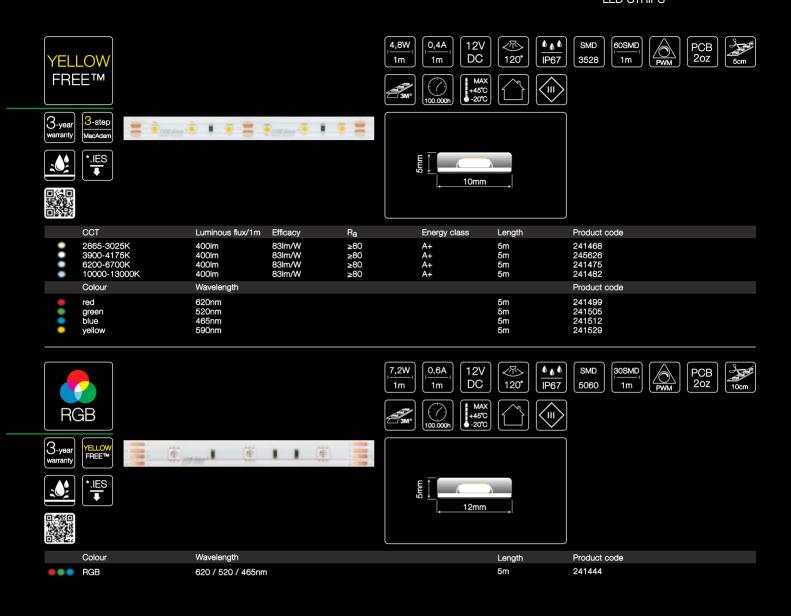


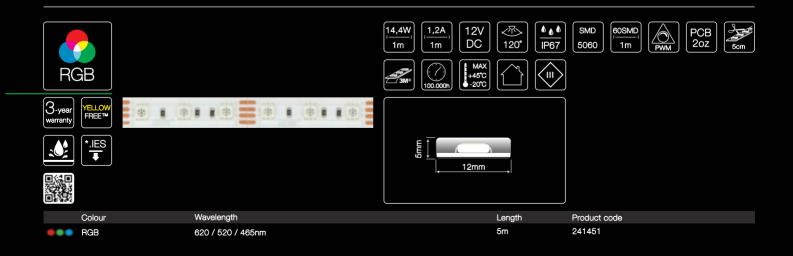


LED STRIPS

WATERPROOF



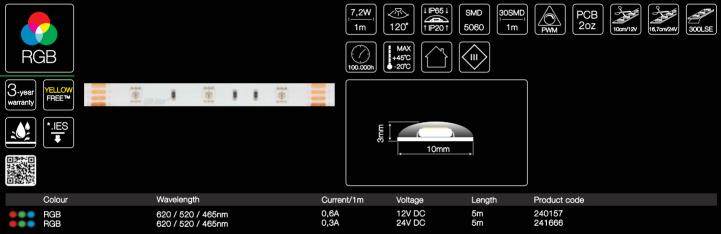


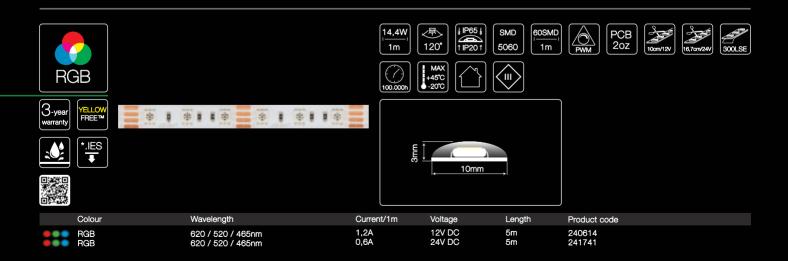


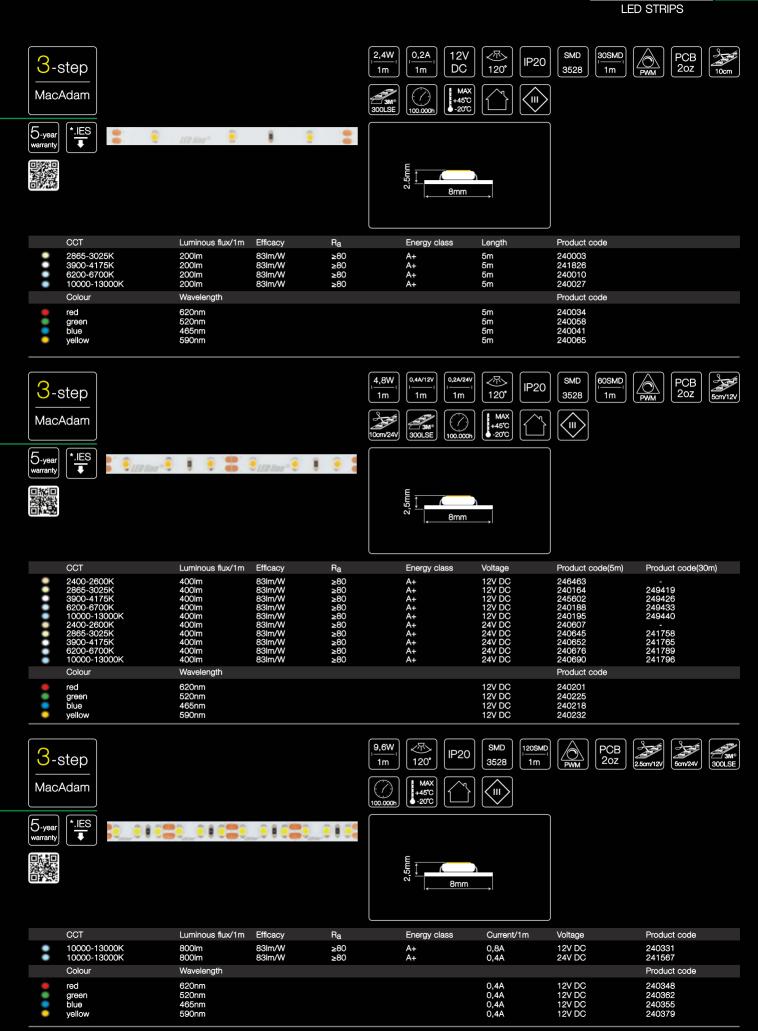
LED STRIPS

WATERPROOF





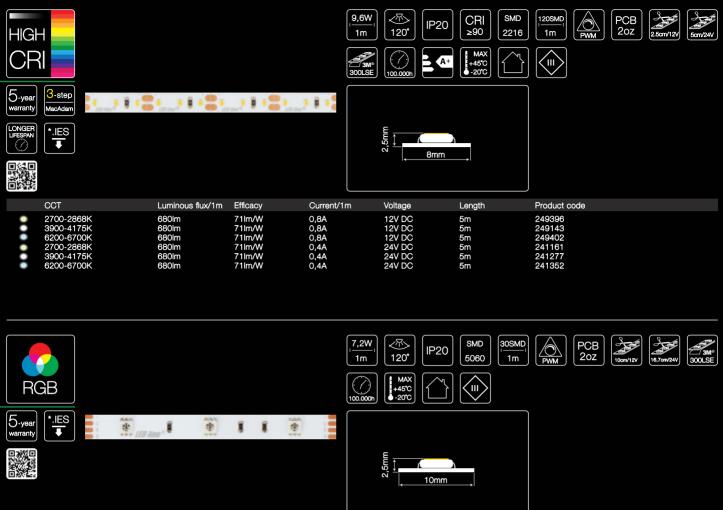




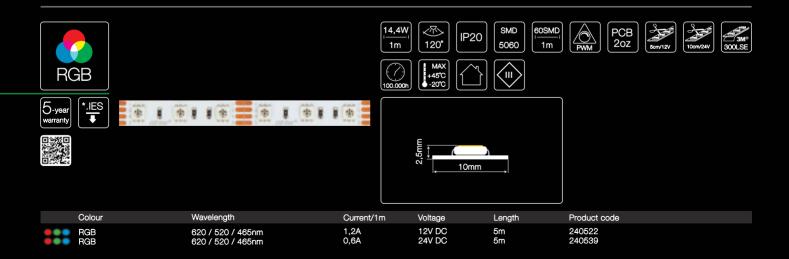
CLASSIC



CLASSIC













Product name

CLICK corner connector for 12mm LED line® strips 5 pin type +



4 PIN



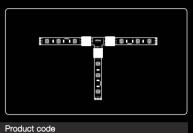
Product name

PCB 10mm

CLICK corner connector for 10mm LED line® strips 4 pin type T



Product code 247859



246524

Q Q.



Product name

CLICK corner connector for 10mm LED line® strips 4 pin type L





Product name

CLICK corner connector for 8mm LED line® strips 2 pin type +





Product name

CLICK corner connector for 8mm LED line® strips 2 pin type T





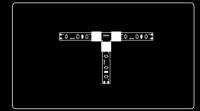
Accessories

CLICK corner connector for 8mm LED line® strips 2 pin type L

Product code 246548

Product code

246517



Product code 246555

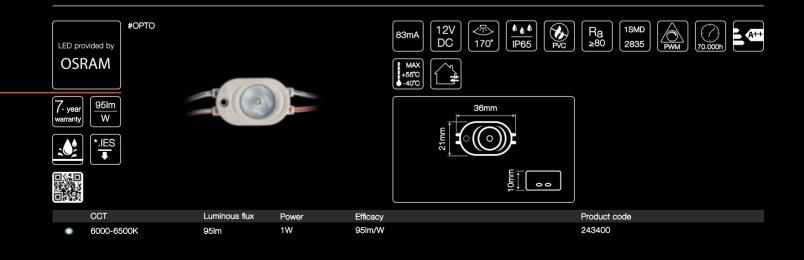






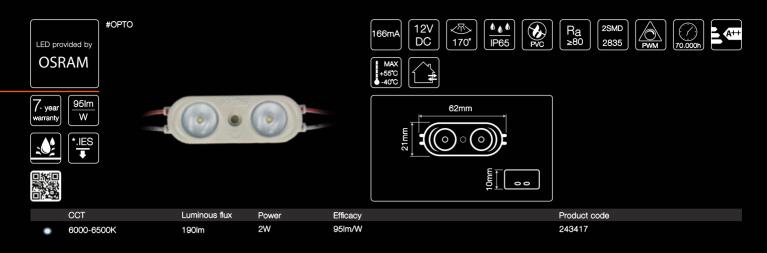
LED MODULES Perfect choice for the advertising industry



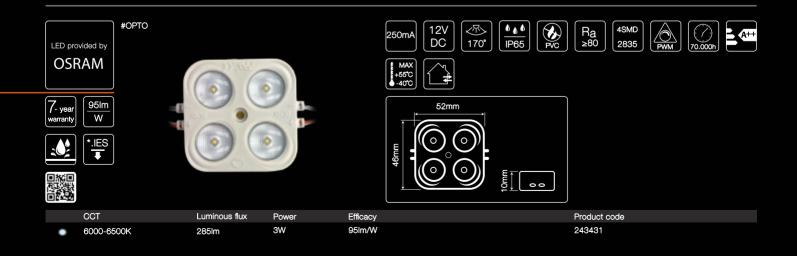


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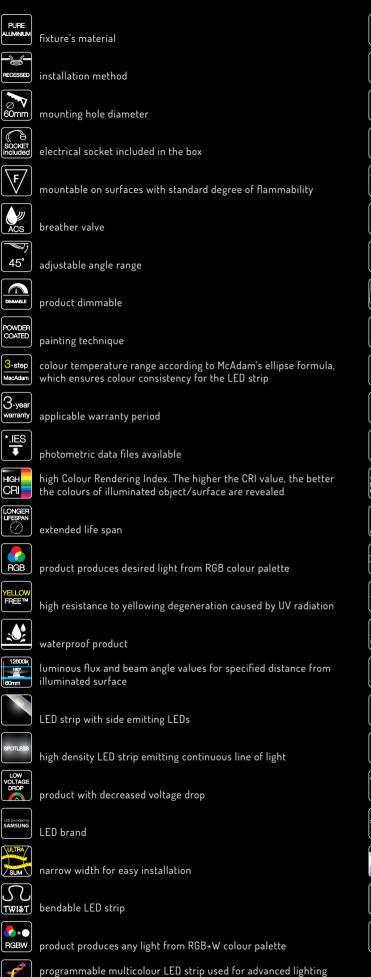


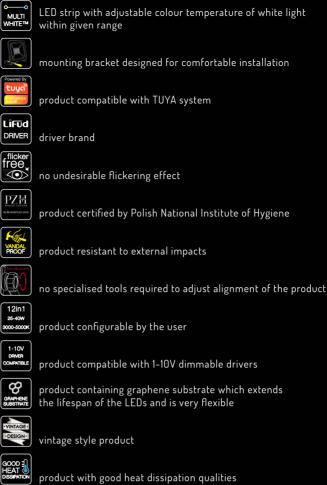
ICONOGRAPHY



ICONOGRAPHY

?







product with good heat dissipation qualities



of the light

product equipped with optics focusing the beam angle



product featured with slim housing



step dimmable product. Dimming is achieved by quickly turning the light on and off



product with dim to warm function changes colour temperature to more warm light while dimming



high user-safety thanks to the housing material





product offered in the choice of 7 colours

product with low glare factor

mounting clips can be moved along the mounting bracket allowing the product to fit into most existing mounting holes

no specialised tools required



IOOL-FREE

product designed for quick installation



type of paint finish

adjustable fixture

CE 🕍

projections

Ilightopedia

Luminous flux [(lm)] - is the measure of brightness of a light source in terms of energy being emitted. It is a measurement of energy released in the form of visible light from a light-producing source.

Illuminance [(|x)] – is a measure of the intensity, as perceived by the human eye, of light that hits or passes through a surface. It is equal to one lumen per square metre.

Luminous efficacy [(Im / W]] – is a measure of how well a light source produces visible light. It is the ratio of luminous flux to power, measured in lumens per watt in the International System of Units.

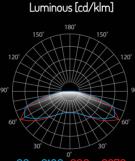
CRI / **Ra** (**Colour rendering index**) – is a quantitative measure of the ability of a light source to reveal the colours of various objects faithfully in comparison with an ideal or natural light source. Numerically, the highest possible CRI value is 100 and would only be given to a source identical to standardised daylight (sunlight with a colour temperature of 6670K). The higher the CRI value, the better the colours of illuminated object/surface are revealed. Ra is the average value of 8 colour samples, whereas CRI uses a palette of 14 colours and tends to be more accurate.

CCT (Correlated Colour Temperature or Colour Temperature) - is expressed in Kelvins [K]. It is a measure of the colour appearance of a given light source. CCT values are intended by the lighting industry to give a general indication of the apparent "warmth" or "coolness" of the light emitted by the source. According to lighting industry convention, lamps with low CCT values provide light that appears "warm," while lamps having high CCT values provide light that appears "cool."

Fixture efficiency – is the ratio of light output emitted by the luminaire to the light output emitted by its lamps $\eta = \Phi$ opr./ Φ

Light distribution curve – provides information on how light is emitted from a lamp or a light fixture. It is a diagram that represents a section cut through the fixture and shows the intensity of light emitted in each direction. The portion of the graph above the horizontal 90°-270° line indicates light that shines above the fixture (indirect), while the portion of the graph below represents light shining down (direct). The straight lines radiating from the centre point identify the angle of the light emitted while the circles represent the intensity

Fig. A – Light distribution curve diagram



CO - C180 C90 - C270

The graph shows the distribution of light in two planes:

• In the vertical plane passing through the longitudinal axis of the fitting, plane C90-C270,

• In the plane perpendicular to the axis of the luminaire, plane CO-C180.

If the luminaire is rotational-symmetrical, the light distribution is given only in one plane C. If the light distribution is asymmetrical, the luminous intensity distribution is given in planes C at angles of 30° or even 15°. The light distribution diagram provides basic information about the shape of the luminaire's light distribution.

FLICKER - flickering is a constant fluctuation of the luminous flux from on to off. The Lighting

Engineering Society (IES) has developed two parameters of quantitative flickering.

Percent Flicker - indicates the average amount of modulation or reduction in the luminous flux in one turn on and off cycle. A source of light with 100% flickering would indicate that at some point in the above on/off cycle the luminaire does not produce light, while a completely stable light would have zero percent flickering.

light would have zero percent flickering. Flicker Index - it is the percentage of flickering and two other variables: the shape of the light wave or the output curve and the work cycle, which refers to the percentage time in which the light source is switched on in a single on and off cycle. The lower the flicker percentage and the flicker indicator, the less the source fluctuates.

UGR (glare) – is a method of calculating glare, bright light sources, from luminaires. The UGR rating helps to determine how likely a luminaire is to cause discomfort to those around it. UGR is not a standalone technical parameter of the luminaire – it rather indicates what UGR rating is to be achieved in a lighting project with given parameters using a given luminaire.

Protection against mechanical impact (IK rating) – are an international numeric classification to indicate the degrees of protection provided by light fixtures against external mechanical impacts. It provides a means of specifying the capacity of a fixture (luminaire) to protect its parts (components) from external impacts. The range of protection is measured on the scale from 00 (no protection) up to 10 (impact resistance against 20J). The higher the numerical value of the IK parameter, the greater the mechanical protection of the given device.

IIGHTOPFDIA ?

IK rate 00	lmpact energy 0 J	Impact equivalent no protection
01	0.15 J	impact of a 200g mass dropping from 7.5 cm height
02	0.20 J	impact of a 200g mass dropping from 10 cm height
03	0.35 J	impact of a 200g mass dropping from 17.5 cm height
04	0.50 J	impact of a 200g mass dropping from 25 cm height
05	0.70 J	impact of a 200g mass dropping from 35 cm height
06	1J	impact of a 500g mass dropping from 20 cm height
07	2 J	impact of a 500g mass dropping from 40 cm height
08	5 J	impact of a 1700g mass dropping from 29.5 cm height
09	10 J	impact of a 5000g mass dropping from 20 cm height
10	20 J	impact of a 5000g mass dropping from 40 cm height

IEC protection class - this is an international standard set up by the International Electrotechnical Commission defining the protective-earth connection requirements for electronic devices. In other words, the protection class defines the means that should be adopted to ensure protection against electric shock. However, it is not in any extent a measure relating to the safety of the given product. The classification is set out in the PN-EN 61140: 2005 regulations. In summary, there are four classes of protection: 0, I, II, III. Protection classes are illustrated with symbols, except for protection class 0, which has no symbol and therefore no protective-earth connection whatsoever. The symbols are shown in the below picture.



IES (photometric file) - A file with the IES file extension is an IES Photometric file that stands for Illuminating Engineering Society. They are plain text files that contain data on light for architectural software (e.g. DIALUX, RELUX) that can simulate light. These files describe how various structures are affected by the product and illustrate how to display the correct lighting patterns on the chosen area.

Ingress Protection (IP) - IP protection class classifies and rates the degree of protection provided against ingress of body parts, solid objects, dust, water or other liquids to the inside of the luminaire. Depending on the degree of protection, the device may be dedicated to work in various conditions. This table below shows what each digit or part of the IP code represents.

screws, etc.

l not have a harmful effect on the

29: 2003)

First digil	t: protection against the ingress of solid objects laccording to PN-LN 60529
Number	Protection level
•	no protection
1	protection against contact with hazardous parts with a back of a hand protection against solid objects with a diameter of 50mm or more
2	protection against contact with hazardous parts with a finger protection against solid objects with a diameter of 12.5mm or more
3	protection against contact with hazardous parts with tools, tick wires, etc. protection against solid objects with a diameter of 2.5mm or more
4	protection against contact with hazardous parts with most wires, slender s protection against solid objects with a diameter of 1mm or more
5	protection against contact with hazardous parts with wires dust protected – ingress of dust not entirely prevented (some ingress shall
6	operation of the luminaire) protection against contact with hazardous parts with wires dust tight – full protection against ingress of dust

Second digit: protection against the ingress of liquids (according to PN-EN 60529: 2003)

- ŀ no protection
- protection against water drops
- protection against water drops when tilted at 15° (vertical dropping shall have no harmful effect on the operation of the luminaire)
- protection against spraying water at any angle up to 60° from the vertical
- protection against splashes of water from any direction
- 3 4 5 6 protection against a water jet (12.5 litre per minute) poured onto the housing from any direction
- protection against a powerful water jet (100 litre per minute) poured into the housing from any direction
- protection against the short immersion in water (30 minutes up to 1m of submersion)
- 8 protection against the continuous immersion in water (housing permanently submerged in water as per the conditions agreed between the producer and the user, but the depth should be greater than at IP7 above)
- 9 protection against powerful high temperature and high pressure water jets (80-100 bar and temperature + 80° C) in accordance with DIN 40050



Additional letters (according to PN-EN 60529: 2003)

Letter	Degree of protection
Δ	protection against access to dangerous parts with the front

- f hand В
- protection against access to dangerous parts with a finger С protection against access to dangerous parts with a tool
- D protection against access to dangerous parts with a wire

Supplementary letters (according to PN-EN 60529: 2003)

Letter Meaning

- high voltage equipment
- Μ device moving during water test
- device standing still during water test S
- W Device is suitable for use under certain weather conditio

PWM (pulse-width modulation) - a method of controlling and regulating electric current or voltage signal of constant amplitude and frequency by changing the value of the current or voltage fed to the load. The average value of voltage (and current) fed to the load is controlled by turning the switch between supply and load on and off at a fast rate. The longer the switch is on compared to the off periods, the higher the total power supplied to the load.

1-10V (analogue control) - this is a system in which by controlling input voltage the user adjusts the output power level of the device. The control voltage is independent of the device power supply voltage. The value of 10V corresponds to 100% of the output power. The value of 1V corresponds to 5-10% of the output power.

Oz (ounce) - amount of Cu (copper) used in the production of PCB laminate. Copper is a very good conductor of heat and electricity. The greater amount of copper used on the laminate guarantees higher voltage and current stability as well as thermal resistance, which allows for the longer life span of LED light sources.

PMMA (poly methyl methacrylate) known as acrylic glass - material used for the production of lamps' covers and diffusers. This material is highly resistant to UV radiation which prevents the diffusor from yellowing (the diffusor remains pure white for many years of use). It also has a very good visible light transmission of 92%. The material is also easily recyclable.

PC (polycarbonate) - material used in the construction of LED luminaires. It has an excellent mechanical properties and is particularly resistant to mechanical impact. Compressive strength is similar to aluminium. Visible light transmission is at 90%.

Tempered glass - type of safety glass processed by controlled thermal or chemical treatments to increase its strength compared with normal glass. It is used in the production of lampshades and diaphragms in LED fittings. It has three times greater resistance to mechanical damage compared to ordinary glass. Tempered glass has much higher thermal resistance than standard glass and, when broken, the glass crumble into small granular chunks instead of splintering into jagged shards as plate glass.

LGP (LIGHT GUIDE PLATE) - material with a matrix of lines reflecting the light into the diffuser. This solution is dedicated for edge-lit luminaires.

PF (power factor) - the power factor of an AC electrical power system is defined as the ratio of the real power absorbed by the load to the apparent power flowing in the circuit. In simple terms, it determines what part of the energy taken from the electrical network will be used effectively by the device. A power factor of less than one indicates the voltage and current are not in phase, reducing the instantaneous product of the two (reactive power). This causes undesirable heat emission.

Functionality parameter	Requirement as from stage 1, except where indicated otherwise
Lama power factor (DE) for lamas	P ≤ 2 W: no requirement
Lamp power factor (PF) for lamps with integrated control gear	2 W < P ≤ 5 W: PF > 0,4 5 W < P ≤ 25 W: PF > 0,5
	P > 25 W: PF > 0,9



L70B50 - This parameter indicates the time in hours after which 50% of a population of LEDs parametrically reduced their lumen output, in a gradual way, and provides less than 70% of lumen output compared to the initial (original) luminous flux. A luminous flux lower than the lumen maintenance factor (expressed by Lx value) is called a "parametric failure" because the product produces less light, but remains working. By way of illustration, the life span marked as L70B50 50000h tells us that after a period of 50000 hours, 50% (B50) of a population of LEDs (which a given LED lamp is equipped with) provide up to 70% (L70) of the initial light output. Due to the fact that the temperature has a significant influence on the Lumen Maintenance Factor(Lx) it is necessary to give indication for the ambient temperature at which the life span of LxBy was determined.

SVM - The SVM is a method used to quantify the stroboscopic effect visibility in general illumination application. SVM is defined by measuring the visibility threshold of light waveforms modulated at several frequencies and uses Fourier analysis to convert the wavelength shape of the light intensity. The stroboscopic effect can cause an impression of slowness, stopping or even reversal of the direction of movement of an object, which can lead to various accidents.

PstLM - This is a short-term flicker perceptibility measurement and is used to measure visible light caused by modulation in the frequency range from 0.3 Hz to 80 Hz.

A value of PstLM = 1 means that the average observer has a 50% probability of detecting flickering (flickering = variations in light output over time from a light source).