

The Philips logo, featuring the brand name in blue capital letters.

White paper

# Getting indoor LED lighting right – a guide for installers



The lighting industry is evolving rapidly. New generations of LED luminaires are being introduced all the time, increasing the choices and the challenges. How can you be sure you are selecting the right luminaires, and getting the right light quality for each project? Sure, long lifetimes and big energy savings are important advantages of LED lighting for your customers, but are you confident they will still get the right amount of light, in the right place, for each different application?

Next to the time it takes to specify the right lighting, the work pressure in the installation business is severe too: as part of keeping customers happy, you need to finish each project on time and within budget. To win new customers you need to set short deadlines and offer exactly the lighting that the customer needs. But to retain them you need to deliver on time and avoid re-work and repeat visits to replace failed lights. Any problems and delays cost money and reputation.

It should be the lighting manufacturers' objective to provide the products and support to help installers like you do things 'right first time'. This promise should be realized by high-quality and reliable products, trouble-free installation, guidance in choosing the right lighting for the end customer, and also ensuring that the end customer is fully happy with the end result.

This white paper highlights some of the important factors that need to be taken into account when choosing a LED luminaire for lighting refurbishment or renovation.

# What is the right light?

Although a luminaire is often seen as just a light source, the impact of lighting on a space and how people experience it can be very significant. Every luminaire has a certain light effect, created by amongst others the beam shape, light intensity and light color. It's important to understand the application and what it means for the intended light effect. A restroom, for example, is a small, confined space, in which it is important for people to feel comfortable. In an office space, very bright areas across the desk may be distracting. These considerations are important for your choice of luminaires and where you place them.

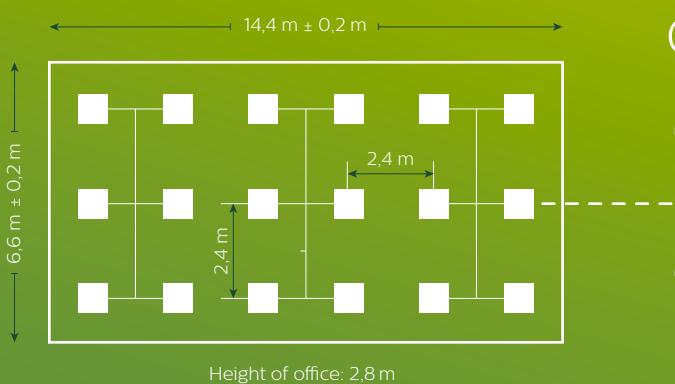
## The right amount of light

When installing a luminaire, it is important to take care that the actual light output is in line with the requirements. A clear example is office work place regulations, which prescribe 500 lux on the task area. However, the light

output of luminaires (also called luminous flux) is specified in lumens, so how do you know if a luminaire provides the right amount of light?

We also have to make the distinction between lamp lumens and luminaire lumens. Conventional luminaires use standalone lamps which are specified by lamp flux (e.g. 1350 lm for an 18W TL-D lamp). However, due to the luminaire's construction, some light is lost. This is represented by the 'Light Output Ratio' (LOR). The total light coming from the luminaire is the lamp lumens multiplied by the LOR value.

LED luminaires such as CoreLine only specify luminaire lumens so you can be certain that you are always making calculations using the right output. Moreover, CoreLine office luminaires are designed in such a way that replacing conventional with LED is easy. In a standard office environment, for example, the office compliant versions will result in 500 lux on the task area (see below).



Luminaire types	# Lum.	Em (lux)
Conventional 4xTLD 18 W	18	539
CoreLine Recessed LED34S VAR-PC	18	515

## Typical lighting design for offices



In a standard office environment CoreLine can directly replace conventional luminaires. You can achieve 515 lux with the same number of luminaires, while saving more than 55% energy.

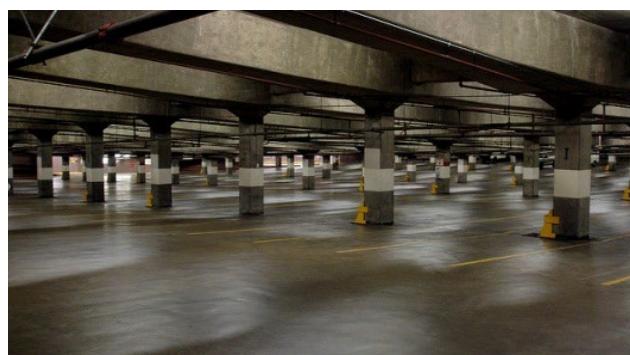
# The right beam

Why is the light beam important? Think about parking garages. People need to be able to park their car conveniently and safely. This means it's important that luminaires distribute the light, creating equal light levels throughout the parking lot – avoiding the dark or dim spots that occur with many luminaires that have a lambertian beam (where the luminous intensity falls away according to the cosine of the angle between incident light and the surface normal).



Luminaires tend to concentrate their light immediately below them. **This means that without good optics design you'll end up producing pools of intense light immediately below the luminaires, while creating dark spots outside that area.** Conventional luminaire design takes this into account by using beam shaping to provide light uniformly across the beam angle and so further away from the luminaire. This is more of a challenge with LED luminaires because LEDs are point sources. The prismatic structure of the transparent cover

has to be redesigned to give LED luminaires exactly the same light output and beam angle. Few companies have this expertise in house, but it is key to giving a natural 'blanket of light' effect to meet lighting standards and increase the comfort of the environment. The CoreLine Waterproof, for example, has been designed with this in mind and contains a wide beam that perfectly distributes the light. It will look the same and meet the same lighting norms that were designed into the original lighting system.

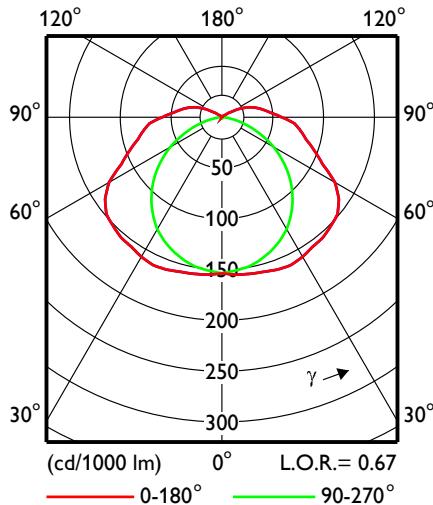


Left picture: CoreLine 'blanket of light' in a parking garage by the wide beam. Right picture: Insufficient light and dark spots as a result of replacing conventional luminaires by luminaires with a lambertian beam.

As a result, CoreLine lets you replace a conventional luminaire without having to make complicated calculations.

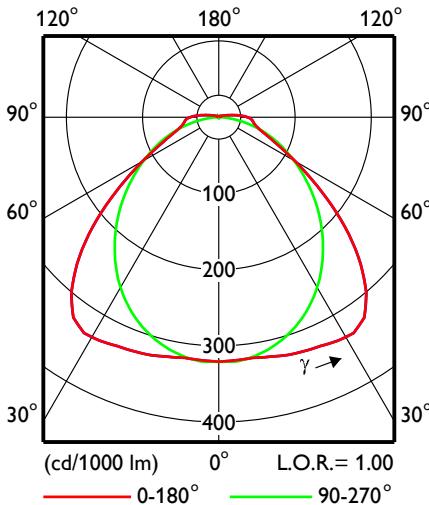
# Different luminaires, different light beams

Conventional waterproof luminaire



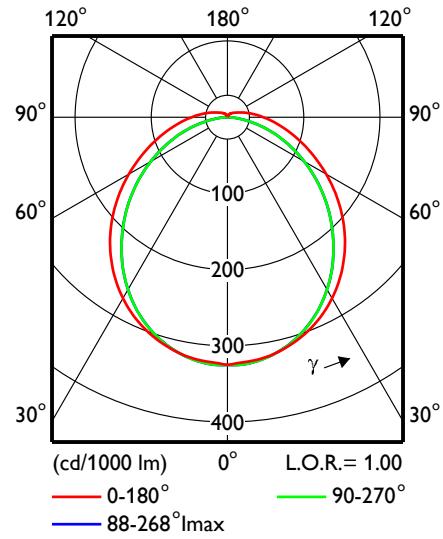
Wide lambertian beam means equal light distribution. Loss of efficiency as light is emitted upwards

CoreLine waterproof luminaire



Wide lambertian beam means equal light distribution. Most efficient option, as all light is emitted downwards.

Competitor's LED waterproof luminaire

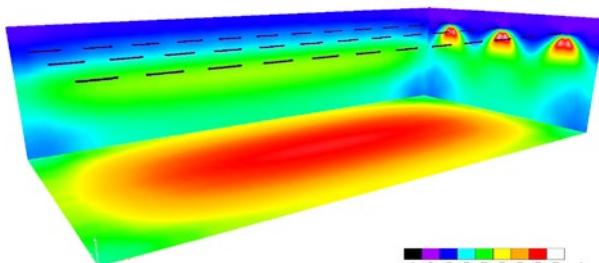


Lambertian beam results in less uniform lighting and too much light directly under the luminaire.

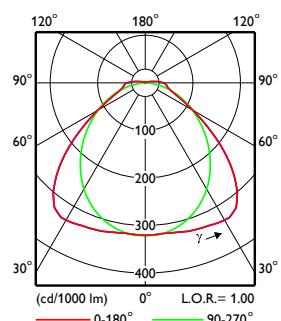
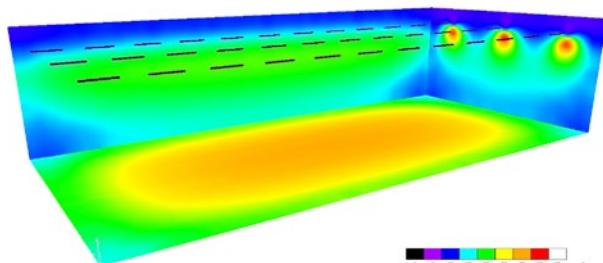
## 3D renderings of an industry building: 300 lux is required

The red area has a light level above 300 lux

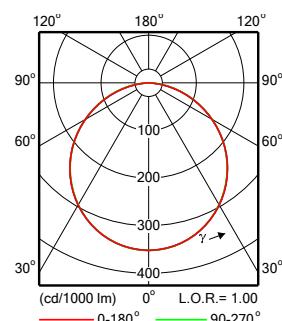
CoreLine waterproof luminaire (6000 lm)



Competitor's LED luminaire (5500 lm)



The CoreLine waterproof luminaire has a wide lambertian beam and directs all the light downwards. The red area has an overall light level above 300 lux.

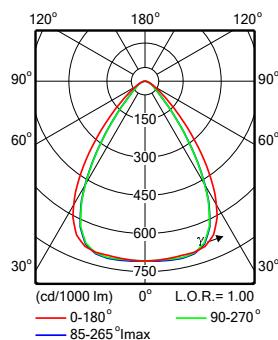
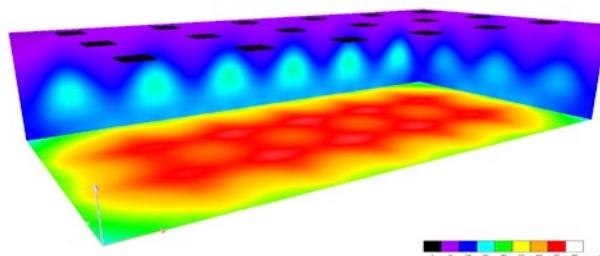


The competitor's LED luminaire has a lambertian beam resulting in less uniform lighting. The yellow area has an overall illuminance less than the required 300 lux.

# 3D renderings of an open office space: 500 lux on the task area is required

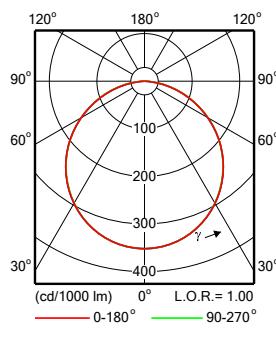
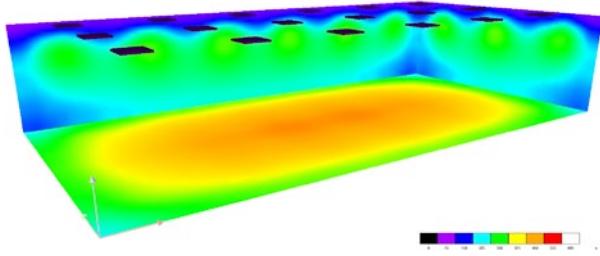
The red color shows  
that the light level is above 500 lux

## CoreLine recessed luminaire (3.400 lm)



The CoreLine recessed luminaire has a medium-wide beam and directs all the light efficiently downwards, reducing discomfort glare. The red area has an overall illuminance above 500 lux

## Competitor's LED luminaire (3.400 lm)



The competitor's LED luminaire has a pure lambertian beam, resulting in glare for the office employee. The yellow area has an overall illuminance lower than the required 500 lux.

## Can you rely on the quality?

How often do you receive a complaint about lights failing within a short period after installation or well within the specified lifetime of the luminaire?

For a reliable installation you need high quality components. LED lifetime is determined by the weakest link in the chain of individual components and any one of them can fail or degrade over time.

The CoreLine range comes with Philips LED drivers and high quality LEDs to ensure product reliability. All our products meet the high quality standards Philips is renowned for. It's one of the reasons for the strong reputation that the CoreLine family has built up over the past five years, with millions of units sold in Europe and throughout the world.

To achieve this, stringent processes are in place:

- Philips LEDs are put through 9,000 hours of reliability and lumen maintenance testing according to the LM80 standard. Additionally, the extrapolation standard TM21 is used to obtain a reliable lumen maintenance lifetime claim.

By using the TM21 standard the typical 'over claiming' of specifications is avoided.

- With the introduction of new LED boards in our luminaires a burn-in test is performed to guarantee reliable behavior of the LED board inside the luminaire.
- New LED luminaires undergo long-term reliability tests that run for years.
- Philips LED drivers are subject to a long list of reliability tests in order to achieve the reliability for which they are known.
- New luminaires are tested and approved according to the European safety norms (CE) by recognized external test agencies or by Philips certified labs.
- A 100% electrical and functionality test is performed after assembly of the luminaire
- Very strict Electrostatic Discharge (ESD) control is in place during assembly to avoid electrical damage to the product, which may lead to early failures in the field.
- These processes are the reason why we can say that every CoreLine product consistently comes with a guaranteed lumen maintenance lifetime of 50,000 hours. Additionally, Philips communicates about the expected driver failure rates, which for CoreLine are < 1% per 5,000 hours.



## Has **easy installation** been taken into account for luminaire design?

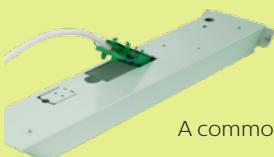
Many installers are seeing their margins being squeezed. That makes it even more important to minimize the time needed during and after installation.

CoreLine was developed with installers in mind, and installers were consulted at each design step. This has resulted in important insights on design decisions and installation specifics.

Several key installation features were built in as a result:

Two-hand installation

- Light-weight luminaires, making it easier to install overhead
- Same length as conventional for easy retrofitting
- Good fit for different power cable diameters
- Consistent installation across the range: the same steps and tools are used to install each CoreLine product, with clear and consistent mounting instructions
- Protective packaging that is easy to open, and leaves a minimum of waste material when you are done



A common 'green' electrical Push-In connector to eliminate the need for tools

## How to choose the right luminaire for the right application?



Different aspects need to be taken into account when choosing the right luminaire for the job: light level, color temperature, dimmability, dimensions, and so on.

CoreLine is the widest range of high-quality and affordable LED luminaires available. All of the luminaires have a consistent design, to create one look and feel for every space in the building.

On the packaging you will find the right information to select the right product for the right applications. There is also a QR code on the packaging that directly links to the Philips ecatalog where you can find detailed product information.

CoreLine luminaire	Replaces	Wattage (w)	Energy savings (%)	Light level (lumens)	Lifetime (hours)	Application
Downlight	CFL EM 54 W 66 W	11 W 22 W	Up to 75%	1100 lm 2100 lm	50,000	General lighting in corridors / Retail stores / Reception areas / Indoor circulation areas
SlimDownlight	CFL EM 54 W 66 W	13 W 28 W	Up to 70%	1000 lm 2000 lm	50,000	General lighting in corridors / Retail stores / Reception areas / Indoor circulation areas
Recessed luminaire	TL-D/T5 63 W 72 W 63 W 72 W	40.5 W none -office compliant 40.5 W none -office compliant 33 W office compliant 33 W office compliant	Up to 55%	3700 lm 3700 lm 3700 lm 3700 lm	50,000	General lighting
Panel	TL-D/T5 63 W 72 W	41 W (none -)office compliant 41 W (none -)office compliant	Up to 43%	3400 lm 3400 lm	50,000	General lighting
Recessed spot	Halogen / CDM-T Standard 54 W 30 W	10 W 16 W	Up to 80%	650 lm 700/1200 lm	50,000	Reception areas / Decorative applications / Retail stores / Corridor
Projector	Halogen / CDM-T Standard 54 W 46 W	11 W 13 W	Up to 80%	800 lm 2400 lm	50,000	Independent Bakery / Independent Butcher / Small Grocery store / Small Fashion shops
Surface mounted	TL-D/T5 63 W 72 W 63 W 72 W	40.5 W none -office compliant 40.5 W none -office compliant 33 W office compliant 33 W office compliant	Up to 55%	3700 lm 3700 lm 3700 lm 3700 lm	50,000	General lighting
Wall-mounted	Electronic PL-C 2 x 18 W 2 x 18 W 2 x 26 W	8 W 18 W 24 W	Up to 55%	500 lm 1200 lm 1600 lm	50,000	Corridors / Staircases / Public entrance areas / Bathrooms / Emergency exits / Parking garages / Outdoor safety lighting
Batten	TL-D 2 x 18 W 2 x 36 W	20 W 40 W	Up to 40%	2000 lm 3500-3800 lm	50,000	General lighting / Assembly lines / Cove lighting
Waterproof	TL-D 2 x 18 W 1 x 36 W 2 x 36 W 1 x 58 W 2 x 58 W	17 W 20 W 38 W 29 W 57 W	Up to 50%	1800 lm 22000 lm 4000 lm 3400 lm 6000 lm	50,000	Parking garages / Warehouses / General lighting
High-bay	HPI 250 W 400 W	85 W 155 W	Up to 69%	10500 lm 20500 lm	50,000	Warehouses / Industry / Major halls / Supermarkets
Trunking	TL-D EM 133W	58W (available: 116 W (3.4 m), 68 W (3.4 m), 58 W (1.7 m), 34 W (1.7 m))	Up to 62%	4000 – 7000 lm (per 1.5 m)	50,000	Supermarkets / Warehouses / Assembly areas
Tempo	HID 150 W 250 W	80 W 120 W	Up to 52%	8800 lm 13200 lm	50,000	General outdoor / area lighting / industrial areas / billboards / parking lots / building facades
Tempo small	HID 70 W	38 W	Up to 45%	4200 lm	50,000	General outdoor / Billboards / Building facades
Tempo large	HID 250 W 400 W	140 W 178 W 245 W	Up to 55%	16,000 lm 21,000 lm 26,000 lm	50,000	General outdoor / area lighting / industrial areas / parking lots / recreational sports facilities / Building facades

To provide quick access to product information such as the product range, ordering codes, mounting instructions and installation videos, a special CoreLine app has been created.

# What are the cost savings for the end customer?

Energy savings are one of the main reasons end users will want to upgrade to LEDs. With lighting being a major energy consumer in buildings, reducing the energy consumed by lighting is essential. Consumption using LED lighting is up to 55% lower than for fluorescents and even 80% lower when compared to halogens.

Energy savings, longer lifetimes and lower maintenance costs all contribute to minimizing the total cost of ownership (TCO). Calculations are an excellent way to help customers decide on the best solution for them. Installers can make these savings easily transparent using the on-line TCO tool that is available via the CoreLine app and [www.philips.com/coreline](http://www.philips.com/coreline).

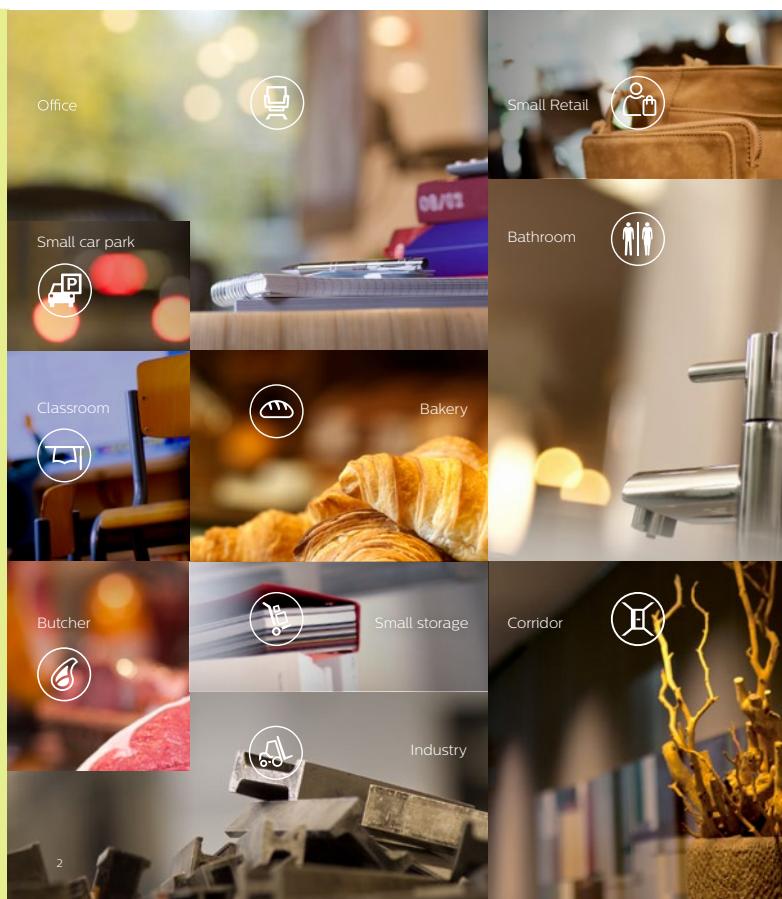
	Halogen/ CDM-T standard	CoreLine Recessed spot
<b>Wattage</b>	54 W 30 W	10 W 16 W
<b>Lifetime</b>	2.000 hrs 10.000 hrs	50.000 hrs 50.000 hrs
<b>Savings over life*</b>	650lm	€ 378,-

## How to get the combination right for extra energy savings

Next to energy savings, an increasingly important requirement for building occupants is greater lighting control. Presence and movement detection mean that lights need only be on where and when needed, and this increases energy savings by up to 80%.

Each CoreLine product comes with matching controls – making your life easier. Compatibility is guaranteed and installation is hassle-free.

For more information, go to [www.philips.com/applicationbundles](http://www.philips.com/applicationbundles) or the CoreLine app



# About the Philips CoreLine range

When introduced in 2012, Philips CoreLine was the first to make true 1-to-1 replacements for conventional lighting available at an affordable price. Same quality of light, same light output, same optical characteristics, but with the added benefits of LED in terms of energy savings and lifetime. In this way, the end customer is sure to enjoy the optimum lighting for their particular situation.

Over the past 5 years, the CoreLine family has grown to be the broadest family of luminaires available, consisting of 13 different luminaire types including a range of features such as different flux levels, DALI dimming and built-in emergency lighting to match every application.

The secret of the success? A complete family of LED luminaires with a consistent specification level. This ensures that your end customer will enjoy a uniform quality in terms of light quality, lifetime, energy saving and a design that perfectly blends in the space. including a range

of features such as different flux levels, DALI dimming and built-in emergency lighting to match every application. The consistent construction allows for easy and fast installation, without the need to keep referring to installation instructions.

To help you make the most of the technical and commercial potential of LED, Philips has created special virtual packages called 'application bundles'. These bundles are based on real-life applications that will benefit from having the right combination of LED luminaires, or luminaires combined with controls. There are different bundles for offices, classrooms, small stores, industry, corridors, small storage areas, small car parks and classrooms. For each application bundle, a special lighting design has been created that meets the European requirements for that application. The designs are very functional and are solid, ready-made solutions for real-life situations.



Philips helps installers like you get it right first time with the CoreLine range of affordable and easy-to-install luminaires, without compromising on the quality of light.

[www.philips.com/rightfirsttime](http://www.philips.com/rightfirsttime)



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