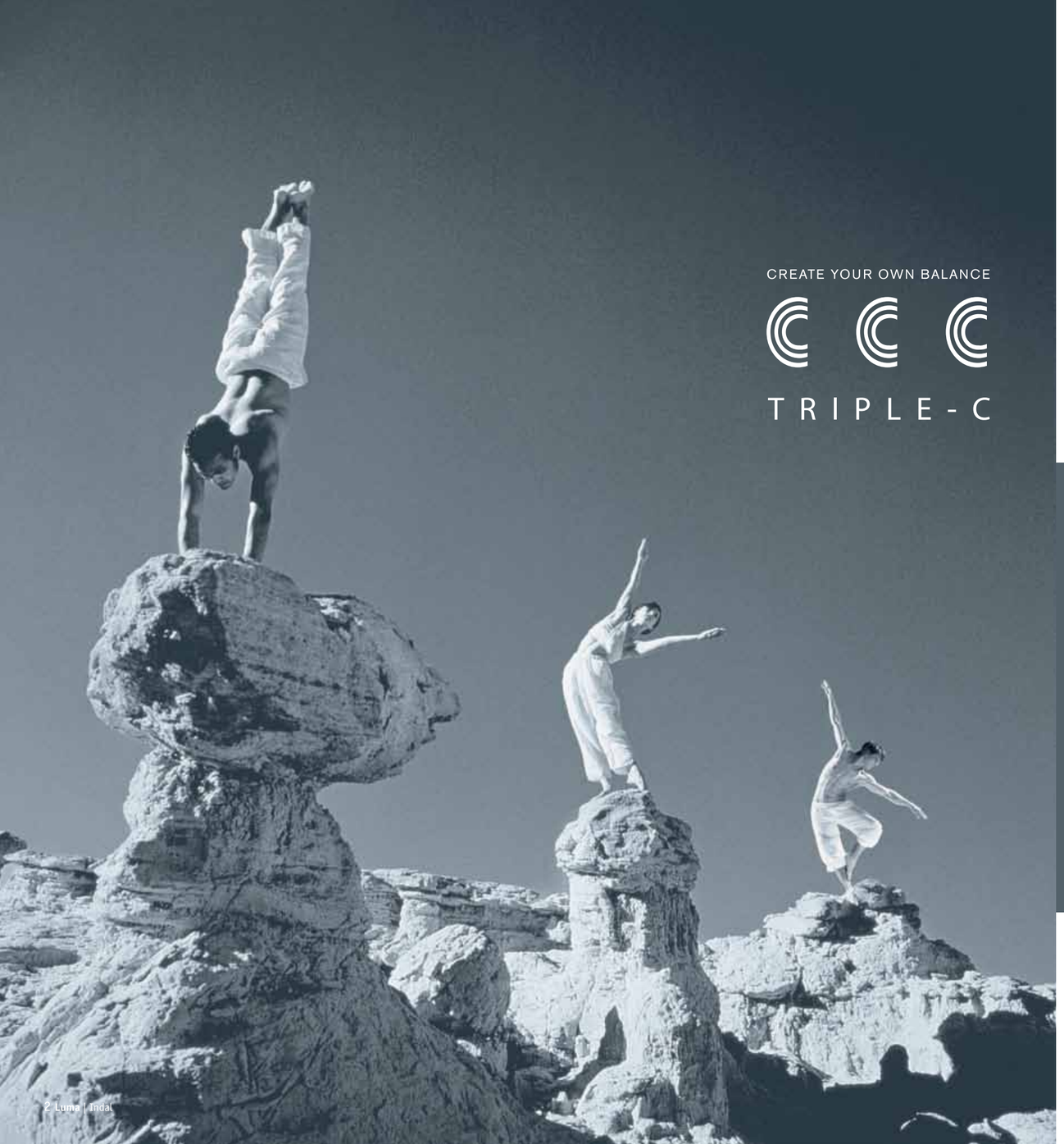
Luma

Traffic Route | Residential Street/Area | Tunnel & Underpass | City Centre | Architectural & Landscape
Sports Lighting | Large Outdoor Industrial Area | Agricultural Area | City Planning+

LEDS INSPIRE YOU

Indal

Indal is a Philips company



Luma & L-Tune: TRIPLE-C in Optima Forma!

With the Luma range Indal's TRIPLE-C philosophy is taken one step further by using Indal's unique L-Tune tool. For each project and together with you, we can create your own perfect match between Comfort, Costs and Care. Weighing all your requirements into a dedicated lighting solution. Indal's REVOLED™ technology has really created lighting systems, not only by integrating luminaire and light source, but even by tuning the system to the exact client's needs for all traffic routes, urban streets and areas. We can really say that our "Vision is Reality".

COSTS
Choice between very attractive TCO or limited investment costs:

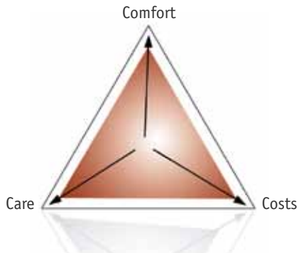
- COO-LED™ thermal management: more lumens / Watt and less energy costs.
- High lumen packages at low power: 100,000 operating hours "fit and forget" solutions up to 400W replacement for reduced energy and maintenance costs and a higher road availability.
- Effective OPTIFLUX™ optics: less energy and luminaire installation costs.
- Tuning lumens to specific service life and cost requirements: lower energy and / or investment costs.
- Tuning the energy consumption profile: if less LEDs or smaller luminaire is preferred, resulting in lower initial investment.
- Significant reduction of operating costs by using lighting controls or Philips CityTouch lighting management solution.

COMFORT
Different white light solutions for different outdoor applications:

- Various OPTIFLUX™ light distributions to cover all ME / CE / S lighting classes and geometries at very attractive column spacing.
- Very good optical control to prevent undesired glare and obtrusive light.
- From cool to warm white colour temperature to suit any desired ambiance.
- Elegant modern luminaire design.

CARE
Energy saving and tuneable REVOLED™ technology with a positive contribution to the environment:

- Highly reduced energy consumption and CO_2 emissions by creating real dedicated lumen packages, giving energy savings of more than 50%.
- No undesired spill of light due to precise aiming of OPTIFLUX™ optics.
- Flat luminaire bottom profile: to prevent upward light pollution (up to G4).
- Luminaire manufactured from recyclable materials.
- Significant reduction of energy consumption by using lighting controls or Philips CityTouch lighting management solution.



Luma's perfect balance

Luma,
the Vision is Reality

To replace all road, street and area lighting up to 400W by energy saving 100,000 hours “fit and forget” LED solutions, Luma is a dream come true. Thanks to Indal’s REVOLED™ design approach: very energy efficient COO-LED™ thermal management, with CONSTAFLUX avoiding over-lighting, and highly effective OPTIFLUX™ optics. Every solution is tuneable to specific project requirements and all are integrated into a modern elegant design.

“The large scale use of Stela in residential areas has really developed acceptance and trust in our LED technology and therefore paved the way.”

“We developed Luma building on the same valued principles of thermal management and optical control in a good luminaire design, a real integrated approach. The real challenge for Luma (~LUmens to the MAx~) was to incorporate up to big lumen packages needed for traffic route lighting within acceptable luminaire dimensions, but still up to “fit and forget” 100,000 LED operating hours and to enable users to customise their solutions exactly to their requirements and preferences: our L-Tune tool supports this perfectly.”

Wim Visser, Product Manager Road Lighting

Complete LED solution from traffic routes to residential areas:

Luma is Indal’s range of dedicated REVOLED™ road and street lighting luminaires: an LED lighting solution without compromise, offering the professional world of lighting of motorways, (inter)urban main roads, residential and urban streets and areas a real energy efficient, high performance and affordable alternative to existing conventional lighting solutions. Luma covers the complete field of illuminance (S) and luminance (ME) lighting classifications up to ME1. Luma includes perfect glare control and prevention of light pollution according glare classifications up to G4, thanks to the complete flat design and Indal’s new OPTIFLUX™ lens optics. Luma fulfills its lighting job in a very effective way and brings wide scale LED public lighting in practice.

MiniLuma - 12 to 40 LEDs - 850 to 10,350 lm

Luma 1 - 20 to 80 LEDs - 1,400 to 20,400 lm

Luma 2 - 60 to 120 LEDs - 4,200 to 30,300 lm

Luma 3 - 100 to 200 LEDs - 7,000 to 49,600 lm

LUMA... an integral approach to identity

The modern Luma shapes have serene, recognisable lines and will therefore be at home in various road and street lighting environments. This makes Luma extremely suitable as the standard LED luminaire from a multi lane motorway to an urban street or residential area.

The Luma is the perfect example of a real integrated design approach. Light technically the bottom side of the luminaire is really flat, in order to prevent upward light. Therefore, the electronic gear is positioned on top of that flat profile at the backside of the luminaire. As the length of the luminaire must be within acceptable size and the thermal management asks for sufficient heat dissipation, the cooling surface is extended by vertical curves on top of the luminaire housing.

The height of these curves and their interdistance follow a logical line from the back to the front of the luminaire, giving it its continuously fluent attractive appearance. Besides, the interdistance and height are also designed in such way that each LED has the optimal dissipation area, which is an important factor for the life time and flux of the total system. The curved shapes of both top surface of the luminaire housing and the vertical curves on top emphasize this elegant design and also contribute to an optimal drainage.

Advanced REVOLED™ technology

In today's LED application for traffic route and residential street / area lighting the aim is to light a certain area to the relevant lighting standard, at the lowest possible energy consumption and operation costs, with an acceptable lighting comfort and appearance. The LED choice itself, the thermal integration into the luminaire, the optical system and the overall design will define the outcome. REVOLED™ is an integral design approach to come to the optimal balance between those corner stones for each luminaire.

OPTICAL MANAGEMENT

Concerns aspects like light output ratio, light distributions and tilt options as well as distribution reliability after incidental individual LED failure.

LED QUALITY

Concerns aspects like lumen packages, colour temperatures, power consumption, life time expectancy and lumen depreciation.

THERMAL MANAGEMENT

Concerns aspects like thermal resistance of the LEDs, interdistance of the LEDs in the luminaire and heat dissipation from the LEDs.

DESIGN APPROACH

The design of the luminaire for optimal use of technical LED characteristics in a dedicated new design concept (REVOLED™) or by backward engineering where LED engines are installed in existing luminaires (RETROLED™).

As luminaire functions vary, the weighing of those characteristics can be different per luminaire concept. For Luma the REVOLED™ technology consists of the proven innovative and efficient COO-LED™ cooling principle and the very effective OPTIFLUX™ lens technology, in order to respond to the high social priority attached to energy saving and CO_2 reduction, but also to counter the ever growing road lighting maintenance and management costs.

OPTICAL MANAGEMENT

One of the main challenges for LED in road and street lighting is to create and control the high lumen packages needed in this application field within acceptable luminaire life time and dimensions. With the OPTIFLUX™ system used in Luma, representing this "flux optimisation", this becomes reality.

To fulfill these conditions, in Luma the many LEDs required to build these lumen packages are placed at relatively close interdistance on the printed circuit board (PCB). To match this short LED interdistance, special compact lenses have been developed.

In order to secure a precise positioning of the lenses on the LEDs, all LEDs are on one PCB and multiple lens blocks of a limited number of 20 lenses are used.

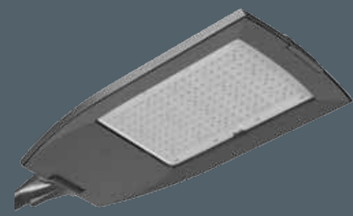
- **High performance lenses to match varying lighting classes and geometries.**
- **Lens distribution and flat luminaire design, preventing light pollution according glare classifications up to G4.**
- **LED lumen output exactly tuneable to create required lumen packages within preferred LED service life and Luma LED configuration.**

Lumen tuning
As different lighting classes ask for different lighting levels, varying lumen packages are needed. This can be done in two ways:

- By varying the quantity of LEDs.
  In Luma this is done in steps of 20 LEDs.
- By tuning the lumen output per LED by adapting the operating current, to exactly match the total lumen package required within the preferred LED service life.

The leading philosophy behind Luma is, by using above tuning variables, **to create a full LED life time "fit and forget" Luma solution**, without having to replace the light source during the service life of the installation.

Optical control
An important light technical requirement in today's road and street lighting is to prevent light pollution, by taking away upward light from the luminaires, incorporated in the light intensity G-classes.



The Luma has a complete flat bottom profile in order to really meet the upward light restrictions of these G-classes.

LED QUALITY & THERMAL MANAGEMENT

To create a high lumen package from many LEDs at close interdistance requires an excellent thermal management. COO-LED™ in Luma does just that.

REVOLED™ stands for an integrated approach to LED luminaire design. As heat management is one of the key aspects in developing LED luminaires, many luminaire parts contribute to get the coolest and most efficient luminaire.

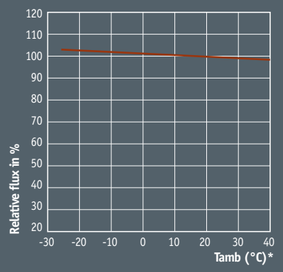
HQ LED

1. **LEDs are at relatively close interdistance, so a lot of heat must be controlled. State of the art LED selection is continuously done, weighing various LED characteristics to suit the specific luminaire application.**
2. **The lens plates are of a controllable size, shaped and fixed to the PCB in a special construction, that puts equal pressure on the PCB, in order to maximise heat conduction.**
3. **Lower quantities of LEDs are placed on the printed circuit board (PCB) in such configuration patterns to further optimise the heat control.**
4. **The die-cast aluminium luminaire housing has capacity to spread the heat from the LEDs into the aluminium material before dissipating it to the air.**
5. **On top of the aluminium luminaire housing there are vertical curved surfaces to enlarge the heat dissipation capacity of the luminaire.**

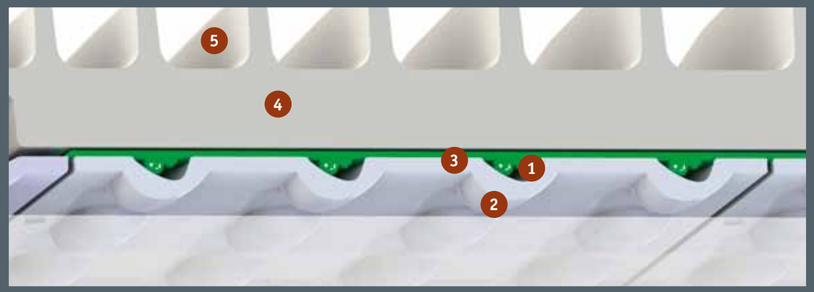
The result is:
Outstanding energy efficiency of the lighting system for a full 100,000 hours operating life
>125 lm / Wsystem CONSTAFLUX
>135 lm / Wsystem L80F10

TEMPERATURE-FLUX CURVE LUMA

Typical Temperature-flux curve for Luma.



*Average ambient (outdoor operating) temperature.



1 = LED - 2 = Lens plate - 3 = PCB - 4 = Aluminium housing-heatsink - 5 = Vertical heat dissipation curves

INTEGRAL NEW DESIGN

The Luma is the perfect example of a real integral design approach. The concepts needed to optimise the optical control (OPTIFLUX™) and thermal management (COO-LED™) are integrated into one evident and elegant shape that fits into almost any environment and ambiance.

The high lumen packages needed for traffic routes are realised within acceptable luminaire dimensions. For urban streets and residential area applications relatively more compact sizes are available. Together the four versions in the Luma family form a complete LED offer, with a certain overlap in possibilities, in order to get the right proportion of the luminaire to the mounting height and the environment.

As all lenses are always present, the view of the luminaire at daytime is independent of the flux package and number of LEDs chosen, which gives a constant impression.

DESIGN

- **Modern elegant design that fits into any environment.**
- **Light technical and thermal functionality integrated into one evident shape.**
- **Four sizes for optimal proportion to mounting height.**

Luma bottom
The real flat bottom view of the Luma is required to prevent any upward light. With the electronics based on top of that line at the back of the luminaire, the required extension of the heat dissipation surface (given size limitations) is perfectly integrated into a logical design profile of the luminaire, by putting vertical curves on top of the housing that get lower and with less interdistance towards the front of the luminaire. The curved lines of the luminaire together with the integrated closing clip and the post top and side entry spigots create a modern, robust though elegant character.

Luma top
The top of the luminaire is an essential part of the thermal management concept, and at the same time is key to the attractive appearance of the luminaire. Moreover, the horizontal top surface of the luminaire is slightly rounded and the vertical curves are rounded at their top and bottom details. Together with their deliberately chosen interdistance relative to their height, the drainage and cleaning of the luminaire is optimised.

Luma bottom

Luma top

Luma - The luminaire

The system performance of Luma is well protected over the service life of an installation, within a solid and reliable luminaire construction.

Impact Resistance
- IK 09 for the complete luminaire.

Ingress Protection
- IP 66 for the complete luminaire, by silicon gaskets between frame and canopy and between frame and glass.
- Double breathing of the luminaire (cable gland).
- Extra ingress protection by a silicon gasket around the LED module (XIP).

Control Gear
- Aluminium gear tray, downward hingeable for easy access to the components.
- Tool-less removable gear tray after disconnecting the plug.
- Class I and II (safety switch standard).
- Programmed electronic LED drivers:
  - Tuneable flux to match required lighting level within service life and luminaire configuration preferences.
  - CONSTAFLUX constant lumen output throughout service life, avoiding over-lighting from the start of the installation, giving extra energy savings.
  - DIM options (all LEDs stay on):
    - Dynadim stand-alone scenarios (various dim percentages and time settings).
    - 1-10V DIM with dim switch for extra incoming pilot line, for one step dimming with programmable dim percentage.
    - 1-10V or DALI DIM prepared for incoming communication.
- Replacement drivers are pre-mounted on a gear tray and correctly programmed.

Cable connection
- M20 cable gland with strain relief, for cable Ø 10-14mm.
- Neutral / Phase are connected to safety switch, earth wire to earth stud in housing.
- 1-10V or DALI incoming wiring can be connected to a separate termination block.

Mounting
- Mounting to column by two stainless steel bolts.
- Universal post top / side entry spigot Ø 42-62mm or Ø 32-60mm (only MiniLuma and Luma 1) or separate post top Ø 76mm spigot (the Ø 32mm and Ø 34mm side entry spigot for MiniLuma and Luma 1 is only possible on a steel column).

Temperature protection
- In case of temperature reaching defined critical levels, both LEDs and drivers in Luma have a built-in protection which initially dims down and eventually switches off the light.

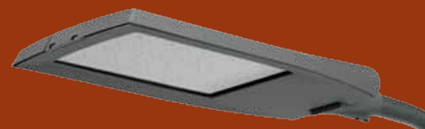
Opening
- Die-cast aluminium clip for tool-less opening or closing, fixed to the frame with stainless steel spring for easy maintenance.
- Canopy with LED module and gear tray hinges upwards and is secured by a stainless steel locking bar (two positions possible).
- LED module and gear tray accessible from below, after opening of the luminaire.
- Safe Maintenance Technology (SMT): safety switch disconnects power on opening.

LED module
- High quality LEDs with optimal thermal resistance and energy consumption characteristics, for high (hot) lumen output / Watt (> 125 lm / Wsys CONSTAFLUX) and long expected life time.
- Different colour temperatures available: Cool White, Neutral White and Warm White.
- The PCB has always the same size independent of the quantity of LEDs and therefore carry always all lenses; PCBs with lower quantities of LEDs, come in steps of 20, in different configurations optimised for thermal management.
- The lenses have an optimal light transmission, in multiple blocks of 20 lenses, fixed to the PCB with two screws per lens block; fixation of the lens blocks secures equal pressure over the PCB to optimise heat spreading.
- The PCB and lenses are integrated in a high reflecting white frame to maximise light output ratio (up to 92% depending on lens type).
- In case of incidental LED / PCB failure, the PCB with reflector frame can easily be replaced after disconnecting the plug and removal of the lens blocks.

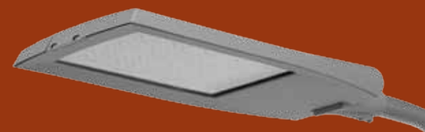
Glass
- Flat glass to support the prevention of upward light, according glare classifications up to G4.
- Toughened glass with very high light transmission, to optimise the light output ratio.
- Glass is fixed to die-cast aluminium frame with metal clips and can easily be replaced.

Colours
- Futura Gris 900 Sablé (anthracite) or Futura Gris 150 Sablé (light grey).
- Other RAL or Futura colours or duo-colours (spigot as frame and closing clip as cover) are available on request.

Futura Gris 900 Sablé

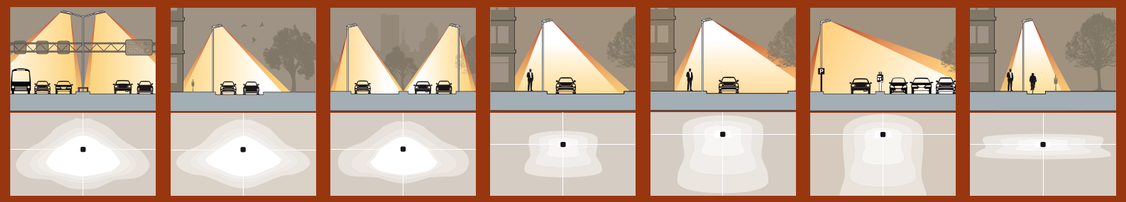


Futura Gris 150 Sablé



Luma - OPTIFLUX™

For a good lighting solution “to hit the road” means to really match a project’s specific situation and requirements, without unnecessary spill of light, energy and costs. To support this, OPTIFLUX™ technology in Luma therefore offers different light distributions, a perfect light control and tuneable lumen packages.



R1 - Medium distribution for ME1-2 and lower, typical width / height ratio ~0.9.

R2 - Typical distribution for relatively narrow ME geometries with width / height ratio ~0.5.

R3 - Medium distribution for ME3 and lower, typical width / height ratio ~0.7.

R4 - Medium distribution for S-class, typical width / height ratio ~1 - 1.5.

R5 - Wide distribution for S-class, typical width / height ratio ~2 - 2.5.

R6 - Extra wide distribution for S-class, typical width / height ratio ~2.5 - 3.

R7 - Narrow distribution for S-class, typical width / height ratio ~0.5 - 0.75.

For the latest lens developments please check the most recent Luma photometrics.

Variable light distributions

The OPTIFLUX™ lenses in Luma come in a number of different light distributions to especially cover the range of ME / CE / S lighting classes and applications.

As internationally the variety of geometries per lighting class is very diverse, these distributions offer optimisation opportunities depending on the road width / mounting height ratio of an installation. **These high performance lens-optics** are within **a high reflecting frame**. Together with the **high transmission glass quality**, this brings **very high light output ratios up to 92%.**

The standard lens distributions can be further optimised by making use of the **tilt adjustment options** in the Luma spigot, in order to meet the varying project geometries and / or required glare control.

The tilt settings in the available spigots are:

Post top: 0, +5 and +10 degrees.

Side entry: -10, -5, 0, +5 and +10 degrees.

The required setting can easily be done on installation, by positioning the two spigot adjustment bolts in the right position (clearly indicated on the spigot).

Perfect optical control

An important light technical requirement in today’s road and street lighting is to prevent light pollution by taking away upward light from luminaires, incorporated in the light intensity G-classes. The Luma has a complete flat bottom profile in order to really meet the upward light restrictions of these classes up to G4.

Tuneable lumen packages

The idea behind Luma is to customise the lighting solution of the Luma “system” to the specific requirements of a project. The photometries for Luma don’t contain fixed output data, but there is a basic photometric file for each combination of:

- **Luma version (MiniLuma, Luma 1, Luma 2 or Luma 3)**
- **Colour temperature (CW, NW or WW)**
- **Lens type (R1 to R7 optic)**

Each combination file shows the minimum to maximum lumen package possible to create within the limits of this combination (quantity of LEDs, lumen output per colour temperature, and minimum and maximum operating current).

Example Luma photometry notation

Luma 2 R1 60-120 DS-NW 1 5000-28000 NW LED

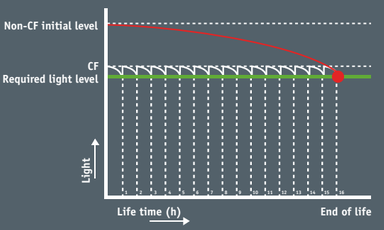
Luma 2	= Luminaire type	1	= LED power undefined (depends on final solution)
R1	= Lens type		
60-120	= Min. and max. LED quantity	5000-28000	= Min. and max. lumen package
DS-NW	= Neutral White LED (Ilcos code)	NW	= Neutral White colour temperature
		LED	= Light source

When using the file in a light calculation program, the lumen output can be put on a value anywhere between this minimum and maximum, to suit the application.

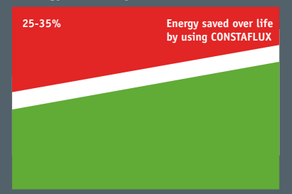
Using above instruments you can optimise your lighting solution to the best performance in terms of column spacing, energy consumption and costs. Ask your Indal contact for the performance results for your project.

CONSTAFLUX

The luminaire can be programmed to keep the flux of the LEDs at a constant pre-defined level over the total expected LED life (so L-value = L100). This is done by starting at a lower operating current and by increasing the current over time to compensate for the LED lumen depreciation. Within each current adaptation step, lumen depreciation is taken into account: real CONSTAFLUX (CF). In this way the over-lighting from the start to the end of the operating period is taken away and an extra energy saving can be realised (up to 35% extra versus solutions based on L70F10).



Energy needed by Constant Current



L-Tune: Fine tuning your lighting solution to your preferences

More and more lighting solutions are judged on the basis of some kind of energy efficiency “label” (e.g. system Watts / target lux or cd / target area to be lit in m²). In order to get this maximum energy efficiency for a lighting scheme and where “over-lighting” is not rewarded, the objective should be to light a target area with just enough light at the lowest energy consumption possible.
This is possible in Luma by using L-Tune.

With L-Tune Indal can help you to define the possible solutions in Luma, based on your project requirements and preferences.
The following steps have to be followed to come to a preferred solution for a project.

STEP 1
Information coming from the light technical calculation

- The luminaire type used in the light technical calculation.
- Lens type needed to meet the requirements (needed to define luminaire hardware).
- Preferred colour temperature.
- Initial nominal flux (optimised from photometry to meet light technical quality demands).
- Maintenance Factor (MF) information as used in calculation.
- The initial nominal flux and MF used will define the lumens needed to fulfil the light technical demands over the life of the installation.

STEP 2
Define the acceptable lumen depreciation and required expected life for the solution

- The L-value representing the remaining percentage of the initial LED lumens (see step 1) at the end of the required life: L80F10 means 80% of the original initial flux. A higher L-value chosen means that less lumen degradation over time is allowed, which means a higher quality demand to the possible solutions.

STEP 3
Define the anticipated dimming regime

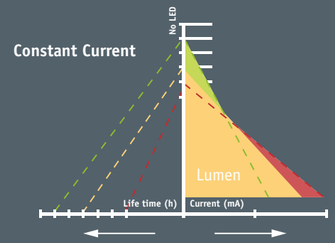
- The degree of dimming will influence the energy consumption over the total life of the installation. Moreover at the same time the expected LED life time will increase, which will be used to generate more and better solutions within the required life time (see step 2).

Solution drivers

The defined lumen package (step 1) within the lumen depreciation and LED life time demands (step 2) and anticipated dimming regimes (step 3) can be created by using various solution drivers:

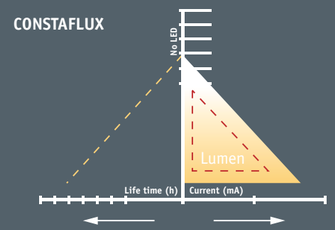
- Quantity of LEDs
- Operating current
- Increased expected LED life time resulting from dimming and / or the use of CONSTAFLUX

As these instruments are interrelating, L-Tune uses all the possible combinations to define all solutions within the requirements set. To give an impression of the possible solutions see the graph below.



Typical lumen package using Constant Current.
Same lumens by higher current and less LEDs, giving a shorter life time.
Same lumens by more LEDs and lower current, giving a longer life time.

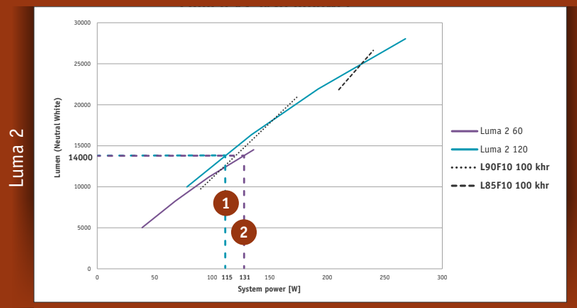
By manipulating the driving forces to build a required lumen package the same lumen package can be built in different ways based on the project’s preferences.

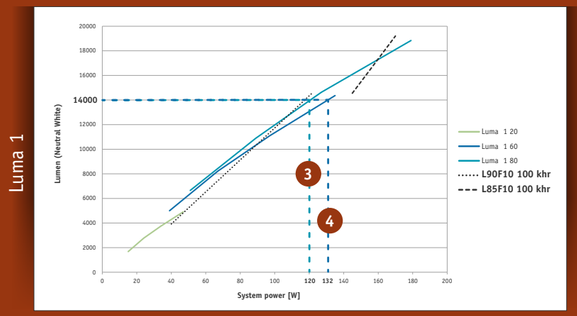


By using CONSTAFLUX less initial lumens are needed for the same light technical performance, as lumen depreciation is compensated by increasing the current over life.

In order to make optimal use of all possible solutions L-Tune can support.

Example solution drivers





Example*:
A solution is needed to build 14,000 lumen in Neutral White, within a fit & forget operating life demand of 100,000 hours at a lumen depreciation of max L85F10. This solution can be built in different ways within the Luma range:

1. When we search for the **maximum energy efficiency**, it can be built in a Luma 2 with 120LEDs, driving the LEDs at low current @ a system power of 115W.

2. When we want to **limit the initial cost within the same luminaire**, there is the option to build it in a Luma 2 with 60LEDs, using an increased drive current, increasing the system power to 131W.

3. When we allow ourselves to accept **a solution in a smaller luminaire type at a slightly higher energy consumption, but lower initial cost** as in our option 1, the Luma 1 with 80LEDs is an option @ a system power of 120W. Of course, the smaller size of the chosen luminaire must be acceptable in proportion to the mounting height and for the preferred appearance in the application area.

4. When we accept a higher energy consumption in the smaller luminaire type, in order to **minimise the initial luminaire cost**, the Luma 1 with 60LEDs can be used, driving the LEDs at a relatively high current, increasing the energy consumption to 132W equivalent to option 2.

* Examples are based on constant current during life time. With CONSTAFLUX you can realise lower system powers.

As the decision on a lighting installation is taken for a long operating life, it is important to weigh the effects of all solution drivers, in order to find our preferred lighting solution.

Luma and CityTouch

BRING CITY LIGHTING TO LIFE TOWARDS INTELLIGENT CITIES.

Philips CityTouch gives you the power to make the lighting in your city dynamic, intelligent and totally flexible. The only non-stop lighting management solution for an entire city, CityTouch makes planning, controlling and managing lighting infrastructures simplicity itself. An energy-efficient solution bringing every part of the city to life.

CityTouch offers you the ultimate flexibility. The standard, integrated service is designed to work with lamps, luminaires and controls from multiple brands and suppliers, not just Philips. What's more, because it includes asset management and workflow support, CityTouch takes lighting automation to an unprecedented new level. An end-to-end secure service that provides best-in-class payback times for your investment enabled by maintenance and energy savings.

STEP 4
Solution generation
Based on the inputs from step 1 to 3, L-Tune defines what Luma versions (in terms of LED quantity) at what system power can meet the minimum targets set. And in case of CONSTAFLUX the starting and end system power needed to fix the flux.
For each possible solution the system power and the total energy consumption over the total selected life time are calculated.

STEP 5
Solution selection
From the presented solutions a choice can be made depending on project priorities:
- Lowest energy consumption over total life time.
- Lowest initial investment.
- Preferred Luma version.

The selected solution specification from L-Tune ("software program code") is linked to the Luma product specification ("hardware product code") in the ordering process. In this way the Luma products can be built exactly according to the selected requirements and will remain traceable by the clear product labels. The right Luma with the exact lumen package in the preferred colour temperature, with the required LED life time expectancy and acceptable lumen depreciation, to meet your energy saving targets and cost budgets: it is clear why the new Indal solution tool is called L-Tune!

Ask your Indal contact to explain the benefits of L-Tune.

The tuning options in Luma go hand in hand with the benefits of Control & Monitoring Systems like Philips Starsense. The CityTouch software platform brings this unique combination to real Intelligent City Lighting.

CityTouch

MiniLuma

12 LEDs | 20 LEDs | 30 LEDs | 40 LEDs

MiniLuma has a very elegant and compact appearance. This design character, the lumen packages up to 10,000 lumen (100,000 hours), combined with a range of optics, makes it very suitable for relatively lower mounting heights on streets and paths in residential areas.

With the help of L-Tune different solutions can be generated meeting the same basic light technical demands and replacing conventional equivalents. The table below gives some typical examples replacing conventional light source solutions by Luma solutions:

Typical MiniLuma energy savings vs. conventional

Conventional solution		Typical MiniLuma solutions (Neutral White colour temperature) (results depending on present luminaire / optic & lighting class in place)					
Lamp	**Psys (W)**	**Low initial cost 100,000h life time[1] L80F10 solutions**	**Psys (W)**	**Savings (W in %)**	**Max. energy efficiency 100,000h life time[1] CONSTAFLUX**	**Psys (W)**	**Savings (W in %)**
Compact Fluo 36	37W	MiniLuma-12-1600lm	15W	59%	MiniLuma-12-1300lm	12.5W	66%
High Pressure Sodium 70	84W	MiniLuma-30-5600lm	50W	40%	MiniLuma-30-4500lm	42W	50%
					MiniLuma-40-4500lm	38W	55%
High Pressure Mercury 125	142W	MiniLuma-20-4800lm	47W	67%	MiniLuma-30-3850lm	35W	75%
					MiniLuma-40-3850lm	32W	77%

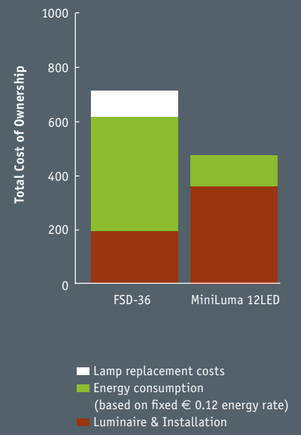
[1] Data @ average ambient (outdoor operating) temperature of 25°C.

MiniLuma

TYPE		WEIGHT IN KG.	WINDAGE (m^2)
MiniLuma	No drivers	9.0	0.055
MiniLuma	12-40 LED	9,5	

With Luma using the constant current method already interesting energy and cost savings can be made. It is obvious that through the use of the CONSTAFLUX approach considerable extra savings can be realised.

TCO example MiniLuma 12LED CONSTAFLUX in NW versus conventional Compact Fluo 36W luminaire (100,000h)



Luma 1

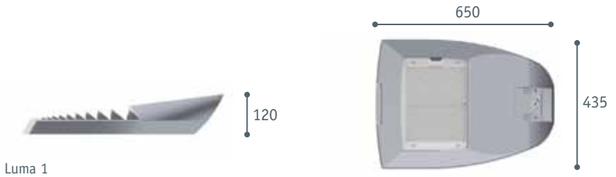
Luma 1 combines the evident modern design of the Luma range with a relatively compact size. This design character makes it possible to extend the appearance of Luma 2 and 3 on the bigger traffic routes into the urban roads and streets, and into the major residential areas using its elegance and compactness. The lumen packages up to 20,000 lumen (100,000 hours), combined with a range of optics, supports both these traffic route, city centre and residential area applications.

With the help of L-Tune different solutions can be generated meeting the same basic light technical demands and replacing conventional equivalents. The table below gives some typical examples replacing conventional light source solutions by Luma solutions:

Typical Luma 1 energy savings vs. conventional

Conventional solution		Typical Luma 1 solutions (Neutral White colour temperature) (results depending on present luminaire / optic & lighting class in place)					
Lamp	**Psys (W)**	**Low initial cost 100,000h life time[1] L80F10 solutions**	**Psys (W)**	**Savings (W in %)**	**Max. energy efficiency 100,000h life time[1] CONSTAFLUX**	**Psys (W)**	**Savings (W in %)**
High Pressure Sodium 70	84W	Luma 1-28-5600lm *MiniLuma-30-5600lm**	51W *50W*	39% *40%*	Luma 1-48-4500lm	39W	53%
High Pressure Sodium 100	111W	Luma 1-40-9000lm	85W	23%	Luma 1-80-7200lm	59W	47%
High Pressure Sodium 150	166W	Luma 1-68-14800lm	136W	18%	Luma 1-80-11850lm *Luma 2-120-11850lm**	106W *102W*	36% *39%*
High Pressure Mercury 250	283W	Luma 1-40-9600lm	93W	67%	Luma 1-80-7700lm	64W	77%

[1] Data @ average ambient (outdoor operating) temperature of 25°C.
* Alternative solutions in other Luma types.

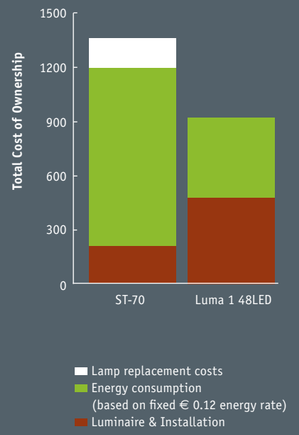


Luma 1

TYPE		WEIGHT IN KG.	WINDAGE (m²)
Luma 1	No drivers	10.0	0.057
Luma 1	20-68 LED	11.0	
Luma 1	80 LED	11.5	

With Luma using the constant current method already interesting energy and cost savings can be made. It is obvious that through the use of the CONSTAFLUX approach considerable extra savings can be realised.

TCO example Luma 1 48LED CONSTAFLUX in NW versus conventional High Pressure Sodium 70W luminaire (100,000h)



Luma 2

60 LEDs | 80 LEDs | 100 LEDs | 120 LEDs

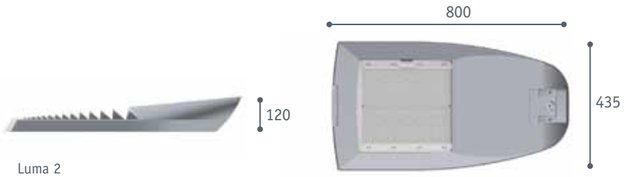
Luma 2 is clearly the modern LED alternative for all major traffic routes. The functional though elegant design of the Luma range matches the relatively higher mounting heights and realises the big lumen packages needed for these major traffic routes. The lumen packages up to 30,000 lumen (100,000 hours), combined with a range of optics, support these (inter) urban applications including motorways.

With the help of L-Tune different solutions can be generated meeting the same basic light technical demands and replacing conventional equivalents. The table below gives some typical examples replacing conventional light source solutions by Luma solutions:

Typical Luma 2 energy savings vs. conventional

Conventional solution		Typical Luma 2 solutions (Neutral White colour temperature) (results depending on present luminaire / optic & lighting class in place)					
Lamp	**Psys (W)**	**Low initial cost 100,000h life time[1] L80F10 solutions**	**Psys (W)**	**Savings (W in %)**	**Max. energy efficiency 100,000h life time[1] CONSTAFLUX**	**Psys (W)**	**Savings (W in %)**
High Pressure Sodium 100	111W	Luma 2-60-9000lm *Luma 1-40-9000lm**	76W *85W*	31% *23%*	Luma 2-80-7200lm	59W	47%
High Pressure Sodium 150	166W	Luma 2-80-14800lm	128W	23%	Luma 2-120-11850lm *Luma 3-140-11850lm**	102W *97W*	39% *42%*
High Pressure Sodium 250	274W	Luma 2-120-28000lm	271W	1%	Luma 2-120-22400lm *Luma 3-200-22400lm**	224W *193W*	18% *30%*

[1] Data @ average ambient (outdoor operating) temperature of 25°C.
* Alternative solutions in other Luma types.

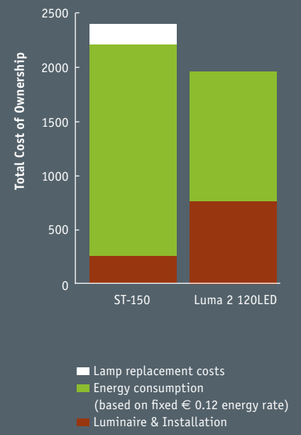


Luma 2

TYPE		WEIGHT IN KG.	WINDAGE (m²)
Luma 2	No drivers	13.5	0.067
Luma 2	60 LED	14.5	
Luma 2	80-120 LED	15.5	

With Luma using the constant current method already interesting energy and cost savings can be made. It is obvious that through the use of the CONSTAFLUX approach considerable extra savings can be realised.

TCO example Luma 2 120LED CONSTAFLUX in NW versus conventional High Pressure Sodium 150W luminaire (100,000h)



Luma 3

100 LEDs | 120 LEDs | 140 LEDs | 160 LEDs | 180 LEDs | 200 LEDs

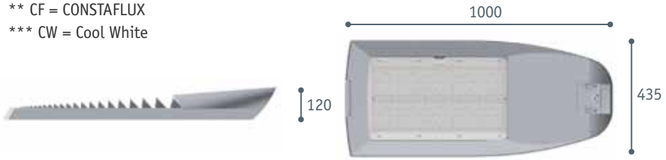
As the largest size, Luma 3 completes the Luma range. By using state of the art LED technology it is the most energy and maintenance efficient motorway lighting solution available. The range of lumen packages up to 48,000 lm (100,000h), combined with the CONSTAFLUX option and a range of high performance optics, support these major traffic route applications.

With the help of L-Tune different solutions can be generated meeting the same basic light technical demands and replacing conventional equivalents. The table below gives some typical examples replacing conventional light source solutions by Luma solutions:

Typical Luma 3 energy savings vs. conventional

Conventional solution		Typical Luma 3 solutions (Neutral White colour temperature) (results depending on present luminaire / optic & lighting class in place)					
Lamp	**Psys (W)**	**Low initial cost 100,000h life time[1] L80F10 solutions**	**Psys (W)**	**Savings (W in %)**	**Max. energy efficiency 100,000h life time[1] CONSTAFLUX**	**Psys (W)**	**Savings (W in %)**
High Pressure Sodium 150	166W	Luma 3-100-14800lm *Luma 1-68-14800lm**	126W *136W*	24% *18%*	Luma 3-140-11850lm	97W	42%
High Pressure Sodium 250	274W	Luma 3-120-28000lm *Luma 2-120-22400lm CF***	265W *224W*	3% *18%*	Luma 3-200-22400lm Luma 3-200-22400lm CW	193W 177W	30% 35%
High Pressure Sodium 400	431W	Luma 3-200-48000lm CW*** Luma 3-200-38400lm CF	425W 400W	1% 7%	Luma 3-200-38400lm CW	349W	19%

[1] Data @ average ambient (outdoor operating) temperature of 25°C.
* Alternative solutions in other Luma types.
** CF = CONSTAFLUX
*** CW = Cool White

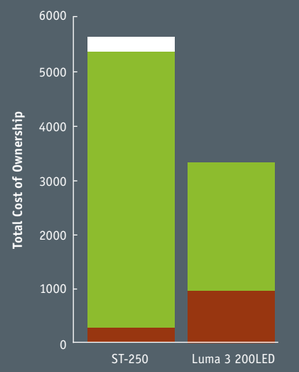


Luma 3

TYPE		WEIGHT IN KG.	WINDAGE (m²)
Luma 3	No drivers	17.5	0.079
Luma 3	100-160 LED	19.5	
Luma 3	180-200 LED	20.5	

With Luma using the constant current method already interesting energy and cost savings can be made. It is obvious that through the use of the CONSTAFLUX approach considerable extra savings can be realised.

TCO example Luma 3 200LED CONSTAFLUX in NW versus conventional High Pressure Sodium 250W luminaire (100,000h)



LED Warranty Plan

Thanks to our REVOLED™ technology, we can maximise the cooling of LEDs and offer optimal thermal management resulting in a guaranteed long life time of the LED luminaire. As a result Indal offers a special LED Warranty Plan for their LED luminaire range to limit the risks of the relatively higher investments in LED lighting.

Apart from the general conditions on product warranty written in the Indal general sales conditions, we qualified the Indal LED luminaires into different warranty classes depending on their performances.

With the Luma range the LED warranty classifications are depending on the Luma solutions, tuned to the specific project and client conditions and preferences.

For each individual Luma solution (defined with L-Tune) the LED warranty class is defined (to maximum the required life time in the solution).

For a further description of these warranty classes and LED Warranty Plan conditions please visit www.indal-lighting.com or ask your Indal contact.

Luma - In perspective

The Luma range has been designed to offer perfect solutions for each project, also in terms of the proportion of the luminaire to its mounting height or a specific environment.

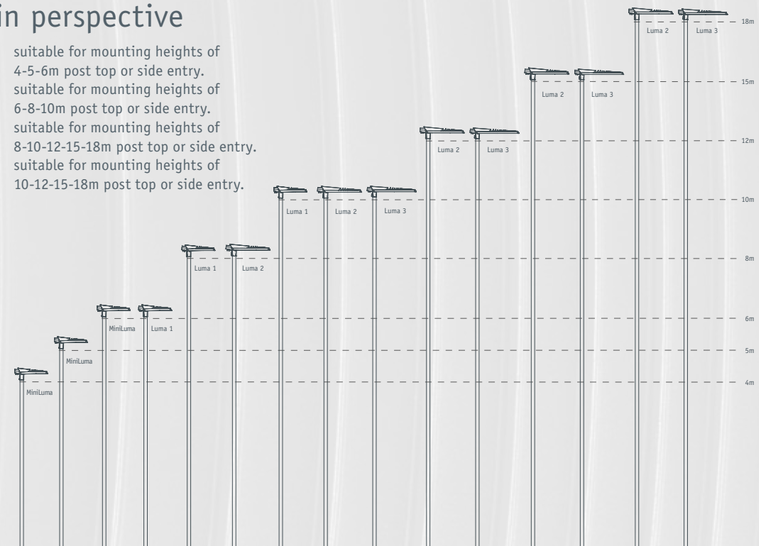
Luma in perspective

MiniLuma suitable for mounting heights of 4-5-6m post top or side entry.

Luma 1 suitable for mounting heights of 6-8-10m post top or side entry.

Luma 2 suitable for mounting heights of 8-10-12-15-18m post top or side entry.

Luma 3 suitable for mounting heights of 10-12-15-18m post top or side entry.



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