

Thanks to their extraordinary features combining compact sizes, **high efficiency and long life**, leds are widely used in many professional applications, such as traffic lights, automotive field, back-lightening systems for video-telephony displays, general lightening, road and effect lightening.

In the field of traditional lightning, leds are successfully used for orientation and decorative lighting.

Recently, thanks to a rapid performance improvement it is also possible to realize solutions for functional inside and outside lighting.

Leds also have other important features:

- They don't release heat.
- They produce a white and clean light.
- Unlike energy saving lamps, when they are turned off, they immediately produce light, you don't have to wait not even one minute for their maximum efficiency.

Moreover the LED-technology offers the following advantages:

Environmental-friendly:

in order to produce LEDs, no heavy metals are used and the total control of the light flow guarantees a very efficient system, without any waste.

Ergonomic: as the light flow can be oriented exclusively where it is needed, without light or energy losses.



LED



LED



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Disano Group

FOSNOVA S.r.l., located in Rozzano (Milan), near the Disano S.p.A. plant, boasts decade long expertise in architectural lighting design. Currently, Fosnova's production specializes mostly in fixtures utilising the most recently developed light sources. The Fosnova product range offers a variety of solutions to indoor lighting problems, including:

- Downlights and spotlights
- Interior floodlights
- Free standing, wall and ceiling mounted fixtures,
- Fluorescent light modular systems,
- Electrified tracks.

France-based **DISANO FRANCE** s.a., established in 1993, equipped with a warehouse and customer support offices, is responsible for distributing the Group's products in the French territory.

Spain-based **ILUMINACION DISANO** s.a., established in 1992, is now located in new headquarters situated in Roda de Barà (Tarragona), and is responsible for distributing the Group's products in the Spanish territory. Additionally, Iluminación Disano has a productive area of approximately 11,850 sqm totally covered, equipped with advanced systems and highly automated. Iluminación Disano's logistics operate on a fully automated area, with an overall capacity of 6360 pallets. Lastly, the site is home to an office area, including sales, technical and customer support offices.

DISANO is also present in **PORTUGAL, IRELAND, POLAND, CZECH REPUBLIC, SLOVAKIA, MIDDLE EAST, RUSSIA, and INDIA** with its own technical support and sales offices.



The Disano Group considers service to the market and continuity in relations with customers as key elements in company policy in which it has continuously invested in Italy and Europe. Improvements in manufacturing technology, excellent innovation, rigorous controls throughout the entire corporate process system, high product quality control standards, as well as the development of advanced computer systems for lighting design calculations. The photometric measurements certified by the CSQ mark are entirely conducted in our research laboratories, in compliance with the European Lighting Design Committee's guidelines.

For DISANO Illuminazione, **Quality System Certification (CSQ-IQNET)** in compliance with UNI EN ISO 9001:2008 standard (design, production and sale of lighting fixtures and accessories) is a further step towards improvement of the company processes aimed at achieving customer satisfaction.

...from 1957...

Disano illuminazione S.p.A., founded in 1957, located in Rozzano (Milan), has a total production area of 15,000 sqm. The factory is located in Dorno (PV) and covers a floor surface of 100,196 sqm. This area includes the logistics department and the automatic warehouse (16,396 sqm), with an overall capacity of 22,500 pallets.

"DISANO" is a leading manufacturer of lighting fixtures, covering all the main market areas:

- Commercial service sector (ceiling fixtures, recessed fixtures for false ceilings, integrated modular systems)
- Industrial applications (watertight fixtures and high bays)
- Outdoor applications (lawn fixtures, urban decoration compositions, floodlights for lighting large areas, and street lanterns).



Production

On a surface area of 66,645 sqm, production is highly automated and ensures high quality standard in terms of reliability and long product life.

PLASTIC MATERIALS AND METALS

The unit is equipped with injection moulding machines (up to 2500 tons each), extrusion machines, equipment to make sheet metals and profiles also used for electrified tracks.

MACHINING OF SHEET METALS AND OPTICAL SYSTEMS

Computer controlled, high-precision manufacturing tools include mechanical and hydraulic presses; all systems are specially designed for controlled quality production and competitive pricing.

PAINTING PLANT

Product pre-treatment units are equipped with anti-pollution purifying systems as required by regulations.

- before painting, the parts are chemically treated to ensure that coating adheres better;
- white, UV-stabilised, acrylic anionic electrocoating;

1 epoxy cationic electrocoating, corrosion-resistant, recommended for outdoor fixtures, with UV stabilised fluid paint finish;

2 acrylic paint or polyester resin powder

3 finish with acrylic paint.

4 acrylic paint spray water-based and polymers

MANUFACTURING/PRODUCTION OFFICES

The offices in charge of production and shipping are located close to the factory. Arranged on several levels, they cover a surface area of approximately 2,660 sqm. The covered car park extends on a floor surface of 1,450 sqm.



Laboratories

LABORATORIES

Laboratories, identical to the ones available to the Italian Body for Quality Marking (IMQ), perform:

- Heat and mechanical resistance tests
- Glow wire test electromagnetic compatibility test
- chemical tests on paint quality.
- protection IP tests for stated fixtures

PHOTOMETRIC MEASUREMENTS

Were performed in our research laboratories, in compliance with the requirements of the European Committee for Lighting Design, according to the following standards: UNI EN 13032-1-2012.

Underwriters Laboratories

Disano's Photometric Lab is fully accredited and is supervised by UL International Italy, an approved third-party institution for the following standards.
UNI EN 13032-1-2012
 Measurement and presentation of photometric data of lamps and luminaires.
UNI 11356-2010
 Photometric measurement of LED luminaires



Distribution service

DISTRIBUTION SERVICE

Italy: a large 144,000 m³ warehouse for a total of 22,500 pallets has the purpose of optimising the delivery and shipping service to the customers' local warehouses, for a faster response to the end market. Spain: a fully automated warehouse with an overall capacity of approximately 6360 pallets.

France: Semi-Automatic warehouse for the entire French Market.

SEMI-FINISHED PRODUCT WAREHOUSE

The warehouse covers a surface area of approximately 12,000 sqm. With an overall capacity of 13,650 pallets, and is entirely automated for semi-finished products.

POLE WAREHOUSE

The warehouse where poles are stored develops on a floor surface of approximately 2,100 sqm and is operated in a semi-automatic way.



Customer services

The Disano group offers designers, installers and distributors a series of free services that are able to completely satisfy technical, lighting design and commercial needs.

CATALOGUE

The paper catalogues produced by the Disano Group are a consolidated tradition that is repeated every year, not only in Italian, but also in Spanish, French and English.

CONSULTING CENTRE

From the Lighting Technology Consulting Centre, you can request any type of support for the correct use of light fixtures. In fact, the Disano Group guarantees total flexibility in implementing projects using non standard fixtures. The Group's aim is to keep an open-door policy with its customers, and to be at their service at all times.

OUR PROMOTERS

Promoters are present in every region and are at the complete disposal of wholesalers, installers and designers to immediately solve any technical, commercial or lighting design problem and to promote the Disano product nationwide.

They also supply estimates and develop lighting design projects, ensuring continuous support.

MARKETING

The Marketing Department has been set up to assist wholesalers by implementing marketing and promotional support actions at the point of sale, advertising their trademarks to make them become reference point for end users.

LIGHTING MAGAZINE

Has been made a regular information editorial about light. The latter aims to make the culture of light, targeted communication and continuous information to designers and architects, and describe their projects and thoughts.



A narrative of light on the Web

The Disano Group has created an innovative **WEBSITE**, periodically updated, which provides detailed data and information about the company, its products, representative projects, designs, new products. Want to browse Disano and Fosnova catalogues easily and quickly, view technical specifications at a glance or retrieve design information with just a few clicks? Now you can thanks to our application for **IPAD AND IPHONE** available in four languages (Italian, English, French and Spanish)! A close-up of a Disano product against a dark background and the words 'Turn On': this is the homepage that users see when they log into our virtual world. May the journey begin!





What is LED?

LED is the acronym for **LIGHT EMITTING DIODE**, a component that emits monochromatic light with the flow of electric current. LEDs are providing lighting designers with a whole new range of exciting tools to help them achieve the best results and develop creative lighting solutions with amazing effects that were once technically impossible to achieve.

A high-quality LED with an RA 90 index rated at 3200K - 6500K has also appeared on the market over the last year. The brightness, homogeneity, and colour rendering of LED lights have been improved to the extent that they are now being used for a wide range of lighting applications. **LED** modules consist of a certain number of light emitting diodes mounted on a printed circuit board (rigid and flexible) with active or passive current regulating devices. Optics or light guiding devices can also be added depending on the field of application to obtain different beams and light.

The variety of colours, the compact size and the flexibility of the modules ensure a broad range of creative possibilities in many applications.

LEDs: how do they work?

LEDs are semiconductor devices which convert electricity into visible light.

When powered (direct polarization), the electrons move through the semiconductor, and some of them fall in a lower energy band. Throughout the process, the energy "saved" is emitted as light.

Technological research has allowed to achieve 161 lm/W for each high voltage LED. Although not currently in production, the current level of development shows that LED technology has not yet reached its full potential.

Photobiological safety

Crystal layers treated by chemical vapour deposition (wafer)

A number of layers are then selected based on their luminosity and colour temperature (chip)

The chip is mounted on a support to dissipate heat and add current continuity to the system (package)

Electrical connection

Lens support

Protection against external stress

The rear side of the package emits heat, the front emits light



Technical specifications

We often read about photobiological safety in lighting design. This very important factor is determined by the amount of radiations emitted by all the sources with a wave length ranging between 200 nm and 3000 nm. Excessive radiation exposure can be harmful for human health. The EN62471 standard classifies light sources into risk groups.

RG0: the lighting source is exempt from photobiological risks in compliance with EN62471 Standard.

RG1 (low risk): the lighting source does not pose hazards during normal operating circumstances.

RG2 (moderate risk): the lighting source does not pose hazards because of our aversion response to very bright light sources, or due to the fact that we would experience thermal discomfort.



Environmental advantages

Extremely long working life (50.000 h)

Reduced maintenance costs
Growing efficiency

Instant switch-on mode

Dimming option with no colour temperature variations

Filter-free direct coloured light emission

Complete colour spectrum
Dynamic colour control mode (DMX, DALI)

Can be switched on also at low temperature rates (-35°C)
Low-voltage DC power supply

Unidirectional light emission (light is shed only upon the desired object or area)

Photobiological safety.



General advantages

Mercury-free

No IR or UV components can be found in the visible light spectrum

Reduced use of renewable and non-renewable energy sources

Environment enhancement

No light pollution

Less power

Less power installed in each lighting point

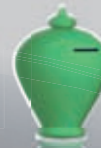


Design-related advantages

Wide choice of design solutions

Bright, saturated colours

Vibration resistant lights

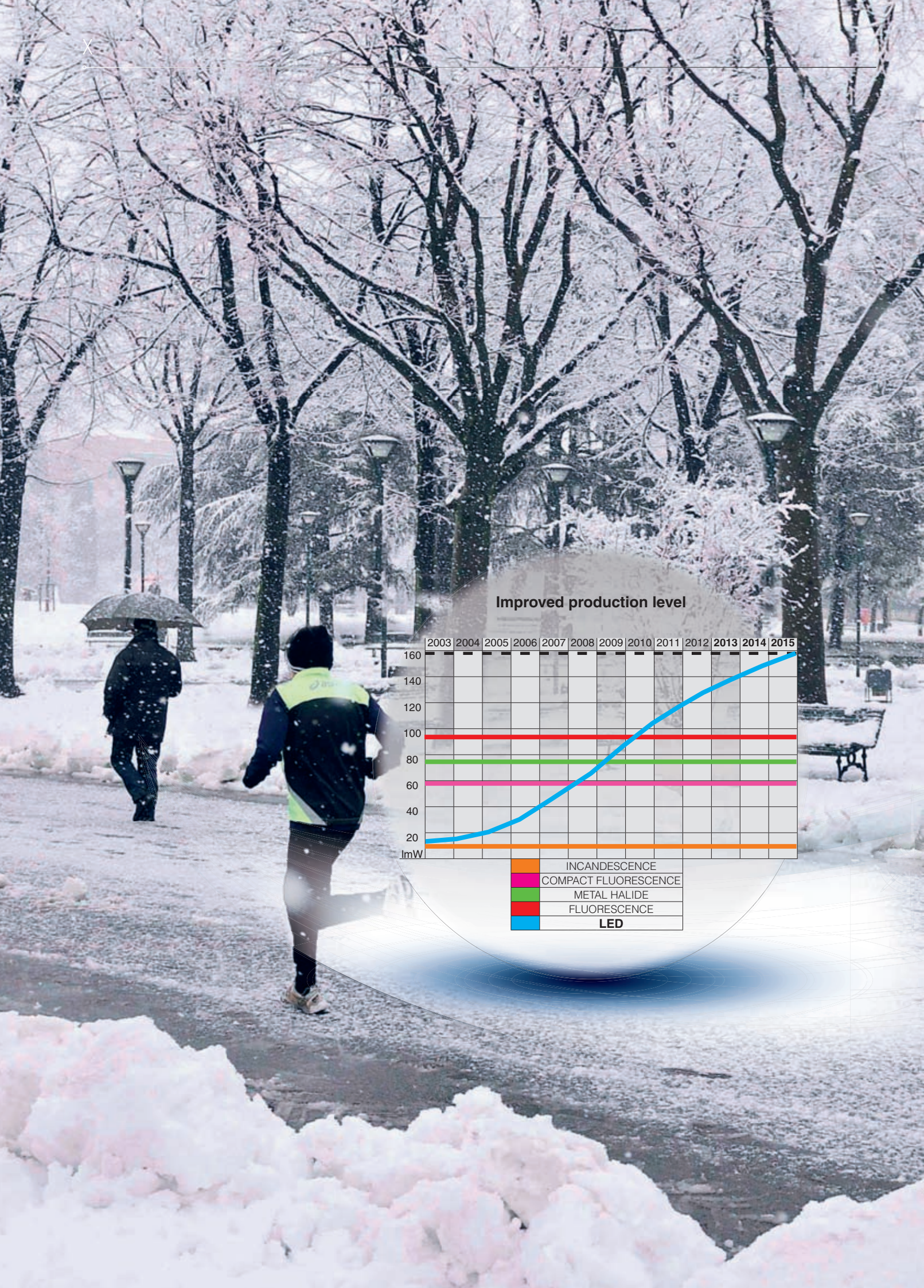


Advantages for users

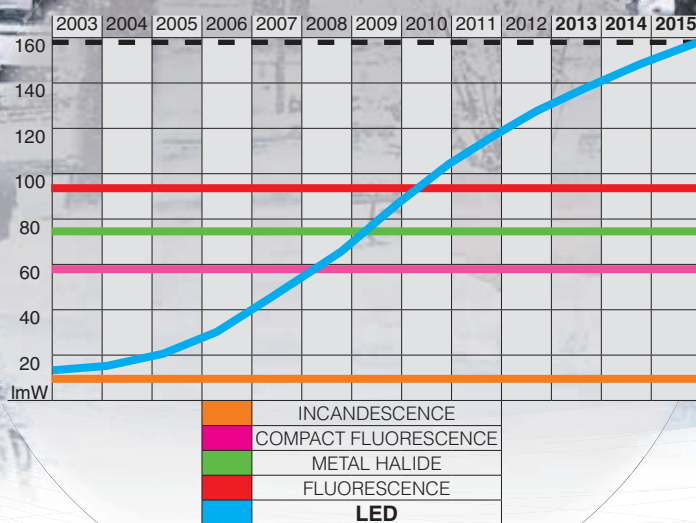
A wide range of different colours together with compact and flexible modules enable many creative and innovative design solutions.

Lower energy consumption, longer working life and reduced maintenance facilitate the creation of interesting applications.

Excellent reliability guarantees safety even in difficult operating conditions



Improved production level



LED and traditional lamps

LEDs have a nominal light output of 150 Lumens and can bring remarkable energy savings compared to conventional sources: Discharge lamps with high colour rendering ($R_a > 60$). They can save up to 30-40% in energy costs. When comparing a LED lighting system with a conventional system we need to take into account the fixture's actual Lm/W ratio rather than the source's initial lumens. The Lm/W ratio of any lighting fixture depends on different factors, such as power loss or power variations due to temperature. In discharge lamps these variations cut by half the initial luminous efficiency (expressed in lumen per watt) of sodium or metal halide sources. The products designed by Disano, instead, minimize losses and operate efficiently even with traditional technology.

The wavelength of light (colour) is adjusted using semiconductor materials and different production processes.

Unlike lamps emitting a continuous spectrum, **LED lights emit monochromatic light of one particular colour to guarantee the emission.**

Light sources (colour temperature)	K
Blue sky	12-20.000
Summer daylight (sunshine and sky)	6500
"Daylight" fluorescent tube	6300
White light LEDs	5600
Sunlight (midday, summer, mid-latitude)	5400
"Cool white" fluorescent tube	3400
"Warm white" LED	3250
100W halogen lamp	3000
"Warm white" fluorescent tube	2950
Sodium lamp	2100
Sunlight (dawn, dusk)	2000
Candle light	1850-1900

Light sources (colour rendering)	CRI
Sodium lamp	0-25
White light mercury lamp	45
"Warm white" fluorescent tube	55-73
"Cool white" fluorescent tube	65-86
LED	80
Metal halide lamps	85-93
100W incandescent lamp	100

Life expectancy

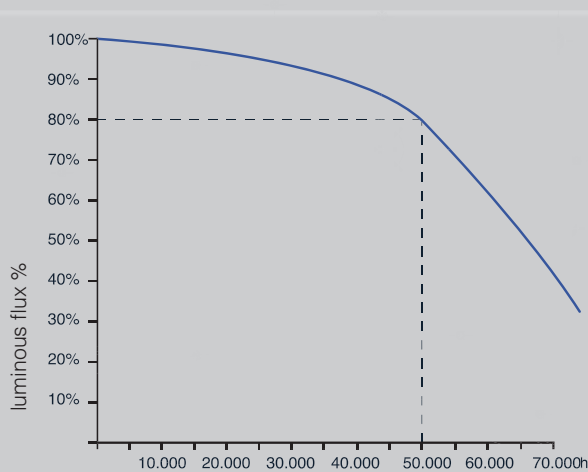
Firstly, it should be noted that LEDs, unlike traditional sources, will not turn off suddenly when their working life ends, but will slowly fade their initial luminous flux until they turn off completely. In fact, LEDs do not break (except for manufacturing damages) but decay gradually and constantly.

The decrease of LED flux, normally after 50,000 hrs, is defined by the working life and is represented by the L80 mark (see charts), which means that the flux is kept up to 80% after 50,000 hrs.

The "B" letter followed by a number ranging between 10 and 50 indicates the quality of the fixture and defines the LED percentage that doesn't keep the declared characteristics when it reaches 50,000 working hours.

EXAMPLE: LED declared L80/B10 = 50,000 hrs

This means that when the LED reaches 50,000 hours of operation, 90% (B10) of the LED will have a luminous flux corresponding to 80% of the initial flux (L80).



The influence of heat

The working life of LEDs largely depends on their inner temperature. Any statement about the working life of a LED light is considered reliable after assessing the influence of temperature. Excessive temperature affects the correct functioning of LED lights and reduces their working life.

The values concerning lamp life are regarded as reliable after determining the effect of heat on LED sources. In fact, overheated LEDs are more likely to be affected by malfunction and have a shorter life cycle. Therefore, for LEDs to operate properly, guarantee long life (e.g. 50,000 hrs) and a natural degradation of the luminous flux (e.g. L70), they must be designed to evenly dissipate the heat they produce. The nominal performance of LEDs is respected only if their working temperature is not exceeded (T_j)

Disano is a competent and responsible company that takes these factors into account and measures real values.

Thermal Resistance (C°/W): it indicates the difficulty of LED lights to expel heat, which causes the light sources to deteriorate. TR should be very low to guarantee energy efficiency and durability (LM70). A range of products characterized by even lower values will be launched shortly to guarantee improved light levels and longer working life (at present, a minimum of 50,000 hours in certain conditions).

Luminous flux and power

Luminous flux and power

The data regarding luminous fluxes reported for each fixture are generally measured based on minimal, nominal or maximum values. Values are set by LED manufacturers. Disano considers these nominal values and reports them in its catalogues

W. All data refer to the nominal Wattages supplied by the manufacturer ($T_a = 25^\circ C$).

Power consumption: $W_{tot. system} = \text{power Supply} + \text{LED}$.

LED lamps emit omnidirectional light, i.e. the light beam is angled 120° . They may also be equipped with supplementary lenses to focus the beam or with performance optics to orient the beam.

Luminous flux: this value indicates the amount of light emitted by the LED (lm).

Luminous efficacy: this parameter is the most useful indicator for determining the right fixture because it represents the ratio between the luminous flux (lm) and the amount of power consumed by the lamp to produce it.



Power supply

Based on the type of LED, they can be powered: - with a 24V power supply- signalling/semi-power/power LED - with a 1050mA power supply – power LED

- The latter can be powered with a higher current to increase its luminous flux and power. In this case it is fundamental to ensure that LEDs have excellent air circulation and a good heat sink to dissipate heat. - the LED power supply has the purpose to maintain and control the exact current circuiting through the circuit; excessive current would damage the LEDs in a few seconds while a weak current would impair performance. -To guarantee constant current, all LEDs of a circuit must be connected in series; if they are connected in parallel (like the one usually used for halogen bulbs) this will deteriorate LEDs very quickly. Power supplies have an isolated output and the maximum input voltage never reaches dangerous levels.

Example:

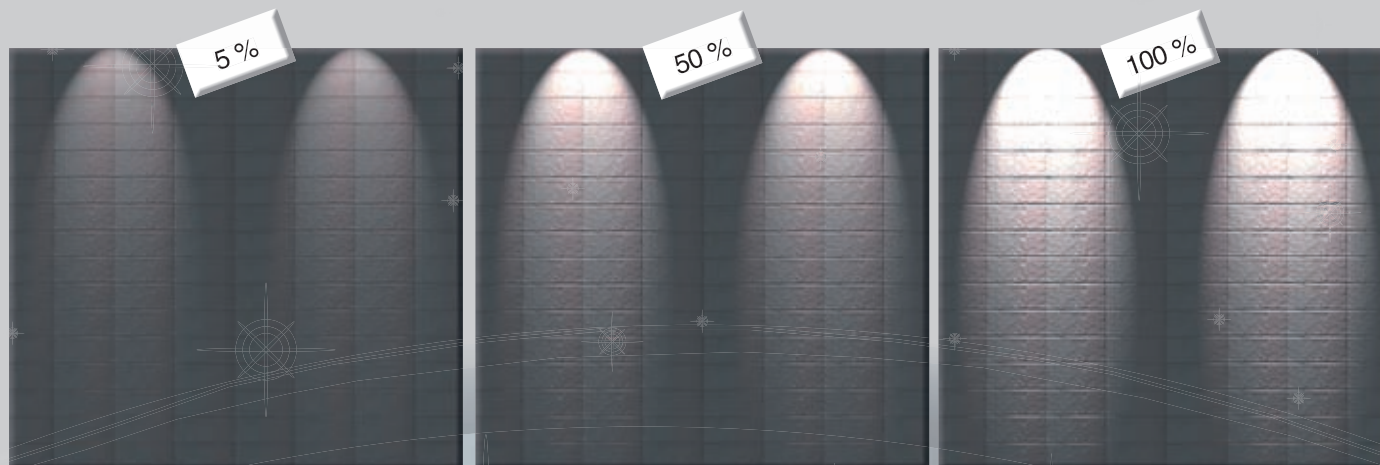
Electrical Power	n.LED	W	ølm
350mA	36	34	5148 lm
	48	46	6864 lm
530mA	36	54	7668 lm
	48	72	10224 lm

LED regulation

The opportunity to check each channel to which LED lights of the same colour are connected enables to obtain a range of colours based on different shades of red, green and blue. Colour emission is regulated using specific dimmer switches. In other words, **these accessories switch the LED lights on and off with a constant frequency and at**

variable switch-on intervals (the slowness of the human eye ensures that the on-off mode is integrated and regulated, giving the impression of regulation).

The LED lights can be dimmed: this means energy savings and reduced CO2 emissions.



DRIVERS for dimming LED lights

Owing to the large number of different methods, it is up to the manufacturer of the driver to specify the type of control signal. Even though commonly accepted control standards do not exist, the most popular are:

IGBT: lamps are turned on and off by a rapid touch; light intensity is regulated by keeping pressure on the pushbuttons.

1 - 10V

1-10V: a 1-10 voltage rate is applied to the driver to produce variable light levels, which are proportionate to the light emitted by a LED lamp.

DALI

DALI: digital transmission protocol for sending light levels information to the LED drivers.

Temperature controller

Our products are equipped with an automatic temperature control device. In the event of an unexpected temperature rise caused by anomalous weather conditions, the system will reduce the drive current or turn off the system as the LED gets warmer, guaranteeing proper operation.

Moreover they are equipped with an overvoltage protection device as required by EN 61547.

In short:

- fixtures that are powered at up to 530mA have a smart current limiting device;
- fixtures that are powered at 700mA have an On/Off device.

White LED

Several distinctions are made during the production process of the LED lights selected. The chromatic areas called 'bin' are horizontal contours along the BBL line. **Colour uniformity depends on the manufacturer's know-how and quality standards.** A larger selection means higher quality, but also higher costs.

Cold white

5000 ÷ 7000K
CRI 70



Typical colour temperature: 5600K
Outdoor applications (e.g., parks, gardens)

Natural white

3700 ÷ 4300K
CRI 75



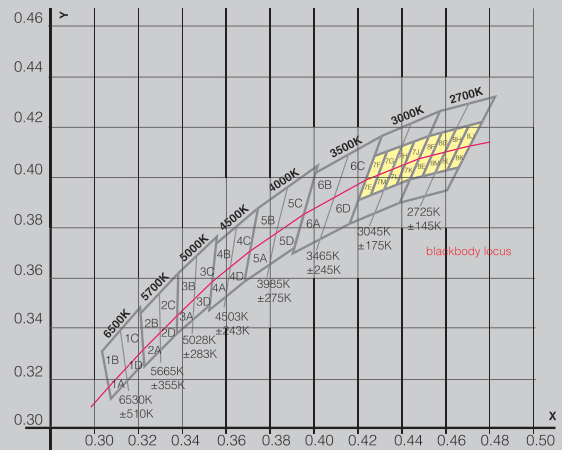
Typical colour temperature: 4100K
Combinations with existing light sources (e.g., shopping centres)

Warm white

2800 ÷ 3400K
CRI 80



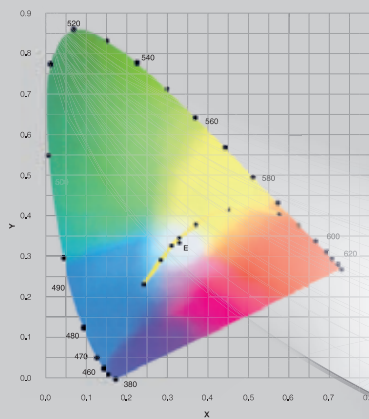
Typical colour temperature: 3200K
For indoor applications, to enhance colours



Graphic representation of BINNING: choice of LEDs to use in relation to their colour temperature. Source: Lumileds, 2011.

MacAdam Ellipses

Refer to the area on a chromaticity diagram that contains all the colours which are indistinguishable, to the average human eye, from the colour at the centre of an ellipse. The contour of the ellipse represents the just-noticeable difference of chromaticity. MacAdam shows the difference between two light sources through ellipses, which are described as having 'steps' that indicate the standard deviation of colour. In applications where light sources are visible, this phenomenon should be taken into account because a 3-step ellipse has a lower colour variation than a 5-step.



Coloured LEDs

The CIE chromatic diagram is based on the physiological peculiarity of the human eye to assess colours by breaking them down into three fundamental chromatic components (three-colour process): red, blue and green, positioned at the top of the diagram curve. The CIE chromatic diagram can be obtained by calculating x and y for each pure colour.

The spectrum colours (or pure colours) can be found on the contour curve, while the colours inside the diagram are real colours. It should be noted that the colour white (and other colours in the central area - achromatic colours or shades of grey) are not pure colours, and can not be associated to a specific wavelength.

Source: Standard Chromaticity Region Plotted on the 1931 CIE Curve.

LED RGB

Power supply:

Local control (ex. Master + Slave system with remote control)

Remote control (DMX systems)

The range of RGB products is operated by a DMX signal and a special interface, which converts the DMX signals into PWN (code 986565)

The DMX signal is generated by a special electronic control, supplied by the customer or by DISANO.

Source: Standard Chromaticity
Region Plotted
on the 1931 CIE Curve.

RGB functions

Light can create stimulating luminous designs capable of increasing the prestige of important architectural structures, while also giving an incredible aesthetic value to otherwise unattractive buildings. Today, the possibilities offered by coloured light can be combined with a further feature: dynamism. Colours and light intensity can be changed using dynamic moving floodlights to create a truly spectacular change of scene. The system uses software which can programme colour sequences using an internal control unit, or a DMX control unit. MUTANT LED lights offer a broad range of solutions to achieve special effects in any space and produce amazing light shows.

The functions available are:

- Product on/off function (stand by).
- Independent control of luminosity of the three channels.
- Show function (colour sequences with 4 preset cycles)
- Cycle duration setting at 30sec, 2min or 10 min
- Recall of last colour at startup
- Automatic master/slave recognition through IR receiver connection
- Input and output for synchronization of slaves (max 19).

DMX technology for RGB LEDs

The DMX specifications require an appropriate termination resistance (100-120 ohm).

The termination resistance must be positioned between the **DATA+** and **DATA-** wires of the last floodlight on the DMX line.

The floodlight must have the relative dip-switch set to the OFF position to operate in the **DMX/SLAVE** mode.

All the floodlights which receive a digital signal from a control unit must have their address set correctly in accordance with the following table.

Each floodlight occupies 4 channels. The first 9 dip-switches are used to set the address.

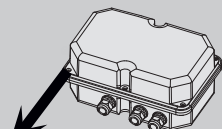
Dip-switch no.11 groups together the 3 colour channels in a single channel.

User Interface

DOP Controller 986563-00



IP65 DMX Box 986557-00



Fullcolor
ELFO - FLOOR - SICURA

Software DMX 986562-00



acc. 62 Amplifier/remodulator DMX

20W 986513-00

DMX signal regenerator with 20W power supply, 24V. Equipped with DMX terminal entry cable and 4-pin output connector. To be used after the twentieth acc. 61 or for distances over 200m.

acc. 63 Box with power supply LED RGB and DMX interface

60W 986511-00

IP 67 watertight box with power supply 48V 60W for Power LED lights – max 9 Microfloor Fullcolor. Supplied with printed circuit board and DMX controller/interface.

DOP Controller

986563-00

DMX controller for installation in standard recessed box, 503. One dmX channel + 4 channels, 1-10V. Option to save settings internally. Monochrome display screen and on-board operation without the use of a PC.

DMX Controller

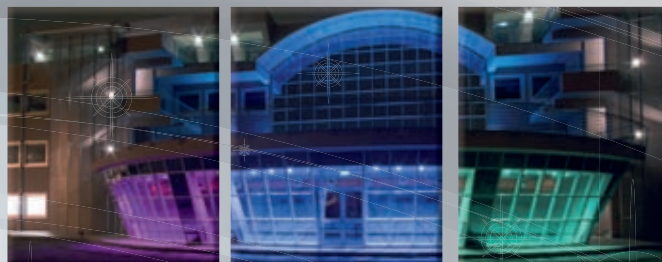
white 986562-00

DMX controller with internal memory (stand-alone function). It enables to operate DMX interfaces and integrated DMX controlled lighting fixtures. Option to save settings internally. PC connection through USB port during the programming phase through a dedicated software (included in the kit).

IP65 box for DMX control

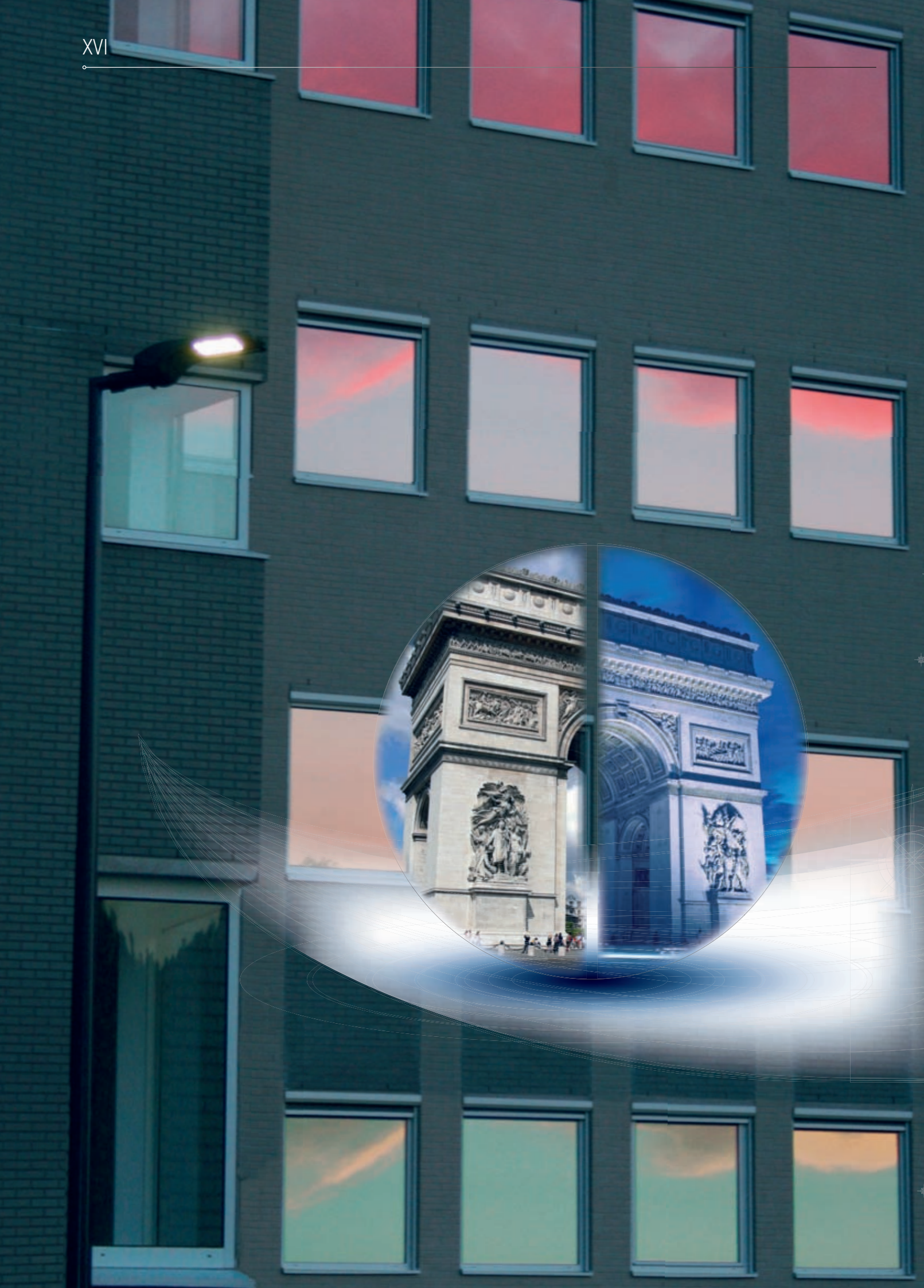
white 986557-00

DMX controller with internal memory IP 65 VERSION (stand-alone function). It enables to operate DMX interfaces and integrated DMX controlled lighting fixtures. Option to save settings internally. PC connection through USB port during the programming phase using a dedicated software (included in the kit).



Software programme

The software readily enables full control of the luminous design. This new software combines absolute control with user-friendliness, providing an overview of the colour changes, duration of fading and intervals in a visible and simple way. The programs can be downloaded from the central system to the local units and stored in an IP65 rated box (USB compatible) which can be installed externally to provide independent control of all the functions without requiring a computer. The software disk includes the complete libraries of the DMX Disano light fittings. First of all it is necessary to configure single floodlights in the management software, which will identify the floodlights based on the address they have been assigned. A Windows screen shows a real console similar to the consoles used in the theatre, with buttons to control the various channels corresponding to the various floodlights. The system enables all the characteristics of the light to be controlled (dimming, colour, etc...). The colour can be selected on a palette in a graphics program. Furthermore, the system enables single scenes to be defined, and to programme the timing interval between one scene and the next and various effects such as fading. The sequences defined at the computer are transferred to the control unit with a **USB** cable included, the control unit is the DMX interface that will then transfer the sequences to the single floodlights.



Dynamic light

In order to exploit the energy efficiency of LED technology, the lighting fixtures integrate an electronic system that is based on the use of a microprocessor which controls the luminous flux from 0% to 100% with proportional energy savings.

This enables to operate the lighting fixture at reduced power for some installations, according to programmable periods using dedicated sensors, such as light sensors or presence detectors.

In particular, according to the UNI-11248:2007 road standard, it is possible to classify roads dynamically into two categories, and reduce the luminous flux at night when traffic is low.

Dynamic light is also recommended for less crowded places like covered car parks and underground stations.

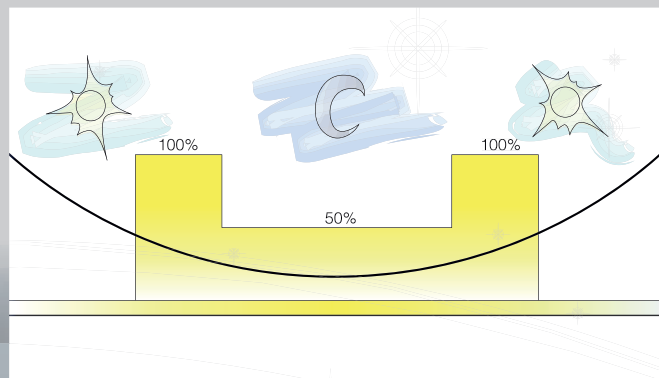
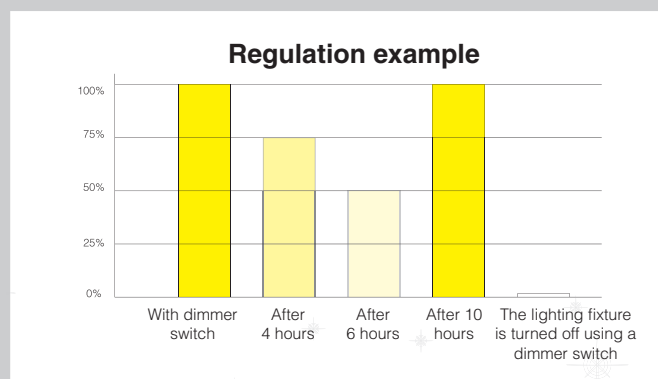
Example: two-level dimming system for LED fixtures.

In order to simplify the application of dynamic light, the device can be programmed during the installation process according to a number of settings, which can be activated from the time they are switched on, or at set times, or when the light sensor reaches a certain threshold.

A simple application ensures that the devices are controlled by an external dimmer switch, which powers the mains; for instance, the lighting fixtures operate at full rate when they are turned on, at 75% after 4 hours, at 50% after 6 hours and at 100% after 10 hours. The lighting fixtures are then turned off when the line is interrupted.

Alternatively, some fixtures can be equipped with a two-level dimming system that can be preset and pre-programmed by the customer based on the calculation of the virtual midnight. The device is embedded directly into the device and does not require the installer to update the system. The dimming system should be normally wired in either bipolar mode (phase+neutral) or tri-polar mode in case of fixtures with an insulation class I (phase+neutral+neutral).

The switching of the relay occurs between 2 change-over contacts enabling the driver to start or stop operation based on the wiring configuration. The dimming of the luminous flux is set at 7 hours (default value) and this occurs without a drive cable or a control phase. The average value between the time the lighting fixture is turned on (sunset) and turned off (dawn) is the reference point for the device, and is called "natural midnight". A microprocessor will calculate the desired switching time starting from this base value. Factory settings are 3 hours before the "natural midnight" (approximately 10 pm) and 4 hours after it (approximately 5 am). The duration can be easily changed by the end user at any moment.



**Montecarlo
Lanterna
Sforza
Modoled**

**Clima
Brera
Monza
Pordoi**

**Volo
Musa
Stelvio
Visconti**

**Disco
Astro
Loto
Garda**

These lighting fixtures can be supplied with an individual control panel or with a power line carrier remote control systems, Wi-Fi or PC control panel. The models can be operated with an automatic or manual clock.

Table for the various options for managing the supply point

Our articles (Upon request):

- with power supply 1-10 V dimmable with subcode **12**.
- with power supply DIG dimmable with subcode **0041**.
- with virtual midnight subcode **30**.
- power line carrier remote control systems subcode **0078**.

1-10V dimming	Virtual midnight	PLC remote control	Wi-Fi remote control (to be agreed upon)
Adjustment range from 10%-100% with 1-10V	Stand alone system with reduction of luminous flux	Point-to-point and system management and diagnosis system	Point-to-point and system management and diagnosis system with Wi-Fi system
Ordered with sub-code -12	Ordered with sub-code -30	Ordered with sub-code -0078	on request

To improve lighting output, save energy

The constantly growing amount of information regarding the possibilities and opportunities offered by the use of LED sources in street lighting led DISANO to provide clarifications in this short text where it explains why Disano fixtures are suitable for these kinds of installations, while complying with street lighting standards (EN13201 and UNI11248) and Regional regulations required to fight lighting pollution and

**SAVE
ENERGY
COSTS.**

Regulations regarding street lighting and light quality

The luminance levels used for street lighting fall within the levels ranging between 0.01cd/m² and 3.00cd/m².



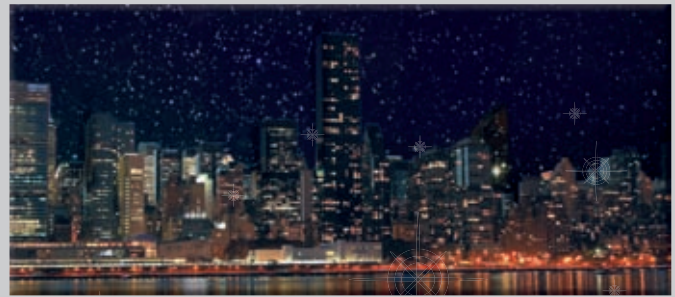
Numerous studies and trials have tested drivers' reaction times both in the presence of fixed obstacles and on streets illuminated with different light sources. On streets with luminance levels ranging between 0.01 – 3.00, tests proved that reaction time is remarkably slower when white light bulbs are used. This means that, in order to have the same reaction time, it is necessary to have higher luminance levels when sodium lamps are used and lower levels if metal iodide or LED lamps are used. Moreover, with low luminance levels and light sources emitting predominantly blue/green lights, there are 7% fewer accidents per km compared to predominantly yellow/red lights. (Source: Anie) The UNI11248 standard introduces new safety parameters. One of these

parameters concerns the quality of light. The UNI standard states that when sources with a colour rendering below 30 are used, the lighting category of the reference road must be increased. In other words, it is necessary to increase the amount of light so that the lighting system is compliant with requirements. Sources with a colour rendering above 60, instead, must reduce the reference road category and therefore the required luminance levels.

This involves that a road's lighting system varies depending on the colour rendering of the lighting sources being installed: if sources have high colour renderings then the average luminance levels imposed by the Standard will be lower, therefore reducing the installed power

Light pollution

LEDs, just like any other light source, require optics or lenses to orient the light beam and prevent it from directing light upwards, and meeting anti light pollution requirements. Disano has designed a series of reflectors and optics that can effectively prevent light pollution. These reflectors orient the light beam in such a way as to obtain photometric distributions, which can be installed not only in road lighting systems, but in many other applications, even improving performance if compared with the optics of traditional lamps. Each single LED is controlled and equipped with a reflector that models the light beam, optimizing performance and obtaining sharp light distribution. Optics guarantee performance rates ranging from 80% to 95%, which are much higher than the values compared to the reflectors of discharge lamps.



Installation examples for LED street lighting

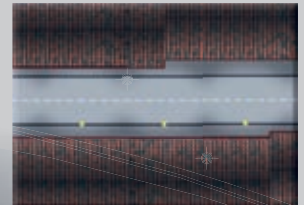
Illumination of roundabouts

Installation of products along the inner perimeter of the roundabout and along the nearby streets.



Local urban roads

With vehicle traffic and maximum speed limit of 50Km/h, excellent luminance uniformity.



District urban roads

Mounting height (m)	Road width (m)	Distance between poles	Average luminance (cd/m ²)	Average uniformity	Longitudinal uniformity
6	6	23	0.80	0.5	0.7

Installation examples

Mounting height (m)	Road width (m)	Distance between poles	Average luminance in lux	Minimum luminance in lux
8	7	6	30lux	50

LED technology and traditional devices: efficiency and luminous flux compared

