MISTRAL
STREET LIGHTING

Open design
Modularity
Serviceability
Diverse optics

GOOD DESIGN

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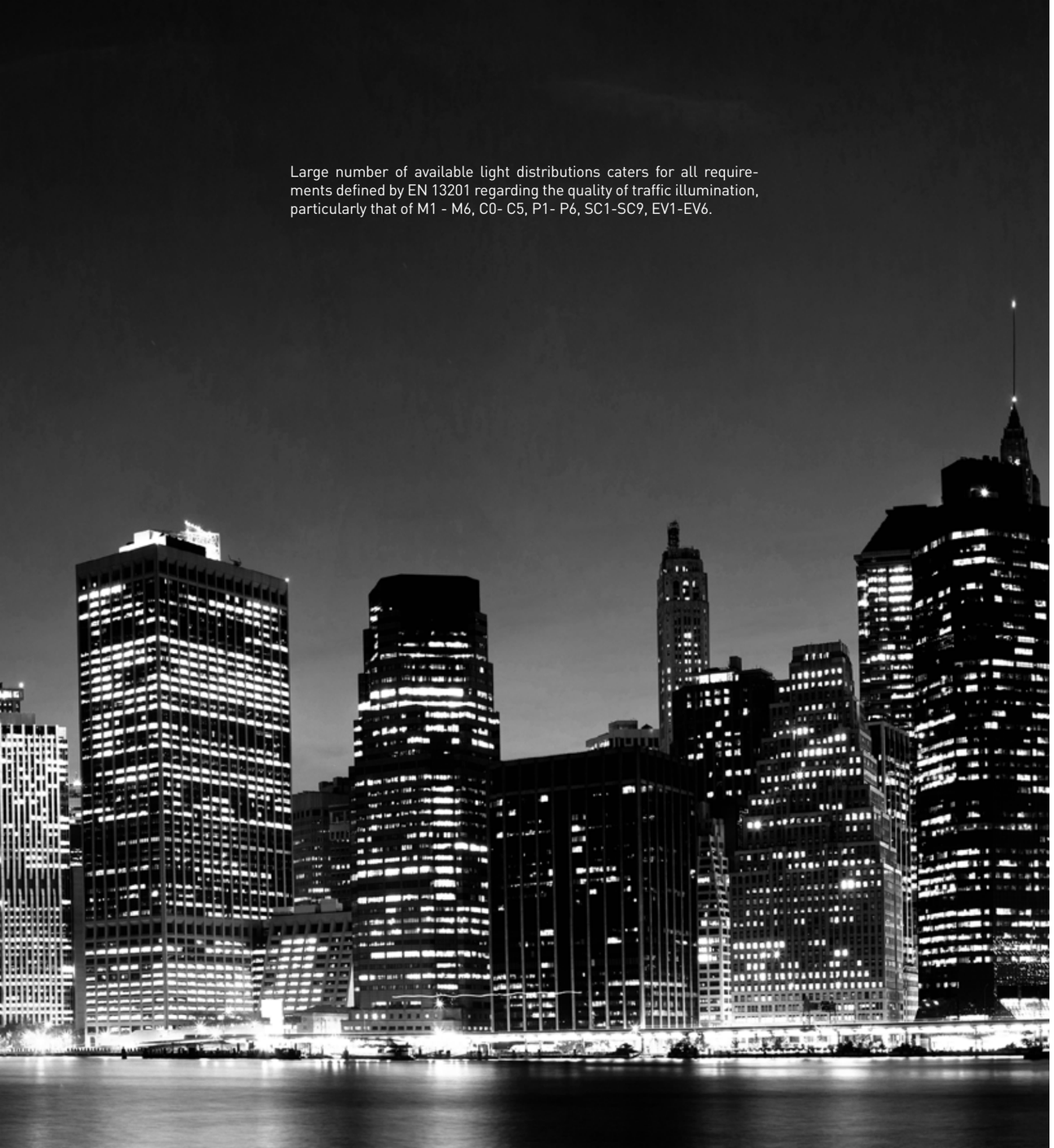


Large number of available light distributions caters for all requirements defined by EN 13201 regarding the quality of traffic illumination, particularly that of M1 - M6, C0- C5, P1- P6, SC1-SC9, EV1-EV6.

LED street luminaire of high energy efficiency. Modularity, choice of 28 different lenses and different nominal powers enable continuous adjustment of power from 34W to 441W and flux adjustment from 4910lm to 52400 lm. Lighting management and communication for smart energy consumption.

Ambient temperatures up to 55°C

ENERGY EFFICIENCY By choosing appropriate light distribution, depending on pole height and distance between poles, there are significant reductions in required installed power (compared to standard light sources).

Considering longevity of all components (>100,000h), the need for maintenance is reduced, leading to additional savings.

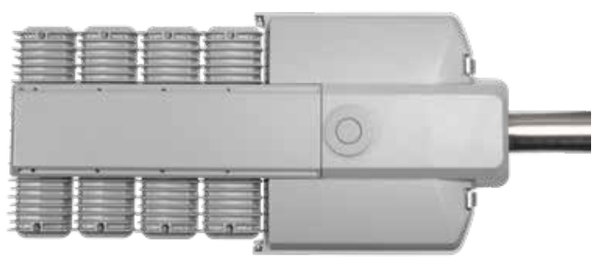
OPEN DESIGN

Open design concept enables the use of the LED's to their full potential. The power of luminaire is determined by the number of installed LED modules. Each module consists of a heatsink with vertical ribs of tilted surfaces and sealed LED sources with protective glass.

Experience in designing and producing open design luminaires confirmed reliability and durability of such luminaires in extreme outdoor conditions, such as high humidity, high temperatures and big temperature oscillations, as in desert conditions.

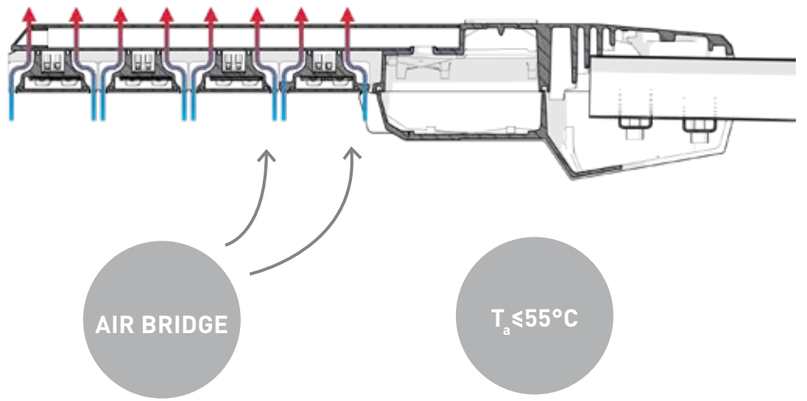
THERMAL MANAGEMENT

Excellent thermal management is obtained with specially shaped cooling fins of modular heatsink, which promote convective heat dissipation and prevent dirt deposition. Control gear compartment and light modules are separated, preventing heat transfer to the gear, ensuring longevity and reliability of the luminaire.

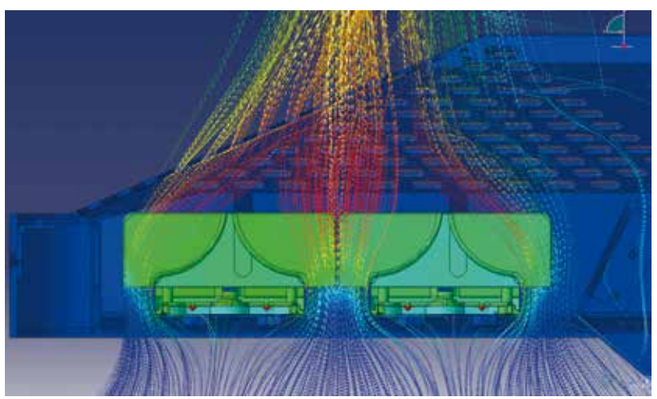


THERMAL
MANAGEMENT

The shape of cooling fins was inspired by natural shape of sand dune slopes.



Click here for case study of thermal management simulation



MODYLARITY

This approach enables to use only one family of luminaires for illumination the whole range different types of street, regardless the speed limit, traffic volume and composition, junction density, etc. This give us an opportunity to uniform street lamps in whole city area.

	DIMENSIONS A / B / H	LED LUMEN (4000K/CRI 70) MIN/NOM/MAX.	TOTAL POWER (W) MIN/NOM/MAX.	NUMBER OF LEDS	WEIGHT
MISTRAL 2	531×350×153	4910 / 9280 / 13100	34 / 71 / 110	32	9
MISTRAL 3	627×350×153	7365 / 13153 / 19650	51 / 105 / 165	48	11
MISTRAL 4	718×350×153	9820 / 17537 / 26200	68 / 140 / 220	64	12
MISTRAL 5	809×350×153	12275 / 21922 / 32750	85 / 175 / 276	80	13.50
MISTRAL 6	900×350×153	14730 / 26306 / 39300	102 / 210 / 331	96	14.50
MISTRAL 7	991×350×153	17185 / 30690 / 45850	119 / 245 / 386	112	15.50
MISTRAL 8	1082×350×153	19640 / 35074 / 52400	136 / 279 / 441	128	16.50

OPTICS

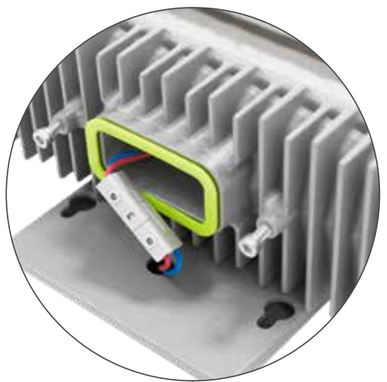
PMMA lenses of high light transmission (95%) and a tempered, 4mm thick glass protector. Vast range of different powers and lenses cater for wide application in all types of outdoor illumination.

The distribution of light is defined by lenses made of optical grade PMMA with high UV and temperature resistance, appropriate for high current and temperature conditions. These lenses allow better targeting of light rays so that the light scattering to adjacent buildings and light pollution is minimized. Numerous light distributions are available due to use of standardized lenses. The lighting requirements that may occur in outdoor spaces such as roads, pedestrian zones, parking lots and squares can be met by choosing appropriate light distribution.

- Optics efficiently prevents light above horizontal surface of luminaire (ULOR=0), eliminating light pollution.
- 4 standardized optics and additional 24 available on request.

5 000lm
to
50 000lm

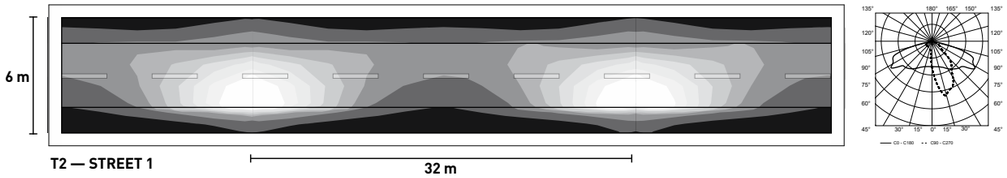
PMMA LENSES
95% LOR



T2 OPTICS - BUCK 7016 MISTRAL 2 T2

Application of MISTRAL with fewer number of modules and T2 lenses enables excellent uniformity of illumination of narrow streets or pedestrian lanes. Additional savings are obtained by reduced height of poles and greater spacing between them.
Hight: 8m, Overhang: 0m, Boom Angle: 10.0°

Lighting Class: M4	L_{av} (cd/m2)	U0	UI	TI (%)	SR
Calculated values	1.01	0.45	0.64	11	0.51
Required values according to class	≥0.75	≥0.40	≥0.60	≤15	≥0.30
Fulfilled/Not fulfilled	✓	✓	✓	✓	✓

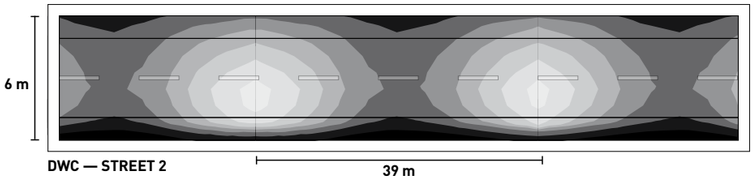


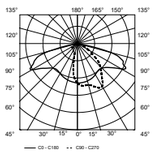
DWC OPTICS - BUCK 7017 MISTRAL 3 DWC

Application of MISTRAL with DWC lenses and incrementation in number of its modules maximizes the spacing between poles. The illuminated area extends to two- way street and pedestrian zones on both sides.
Height: 10m, Overhang: 1m, Boom Angle: 0°

Lighting Class: P2	E_{av} (lx)	E_{min} (lx)
Calculated values	10.17	6.13
Required values according to class	≥10.00	≥2.00
Fulfilled/Not fulfilled	✓	✓

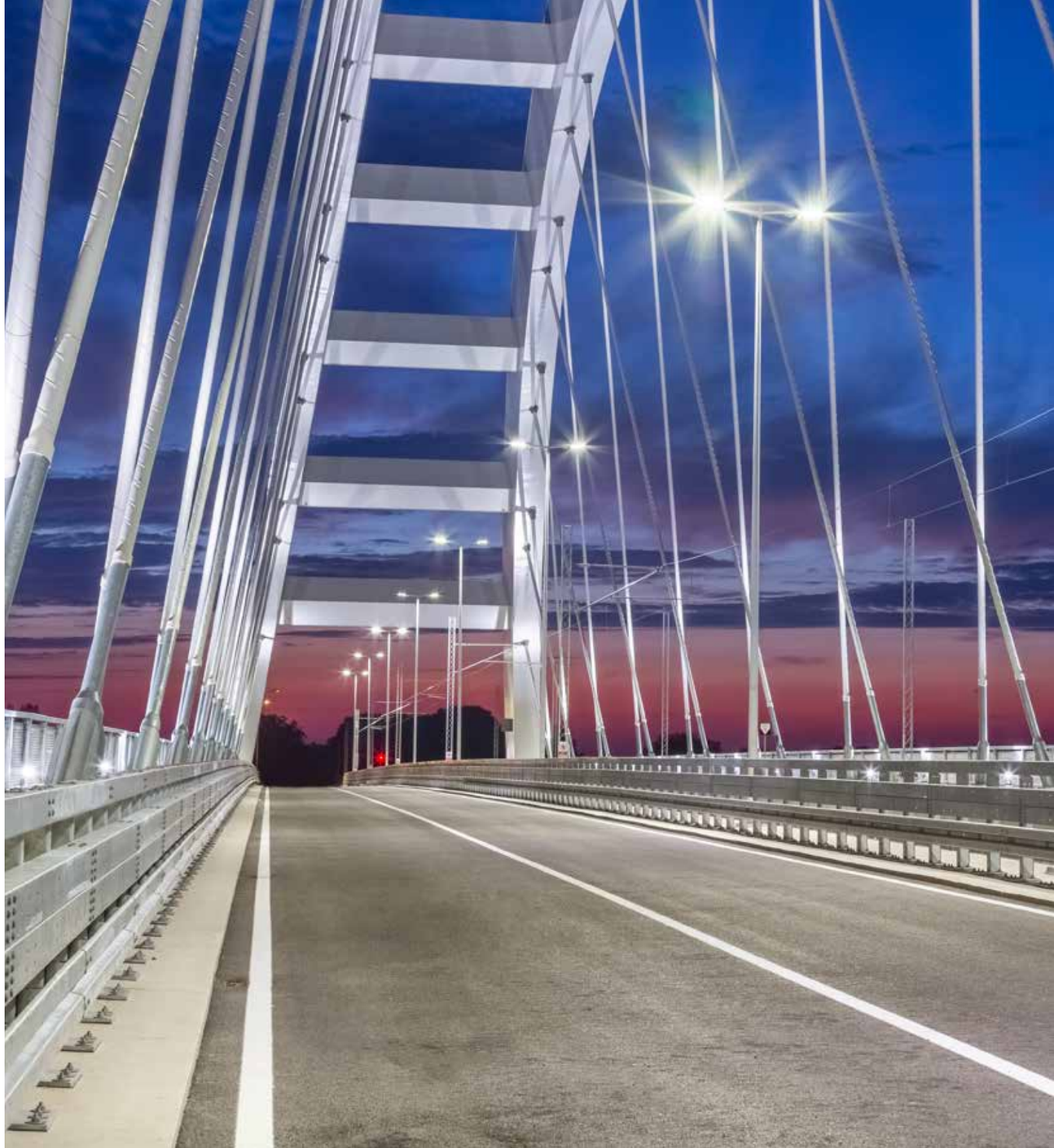
Lighting Class: M3	L_{av} (cd/m2)	U0	UI	TI (%)	SR
Calculated values	1.08	0.53	0.70	8	0.60
Required values according to class	≥1.00	≥0.40	≥0.60	≤15	≥0.30
Fulfilled/Not fulfilled	✓	✓	✓	✓	✓





Lighting Class: P2	E_{av} (lx)	E_{min} (lx)
Calculated values	12.98	7.57
Required values according to class	≥10.00	≥2.00
Fulfilled/Not fulfilled	✓	✓

(All lighting performance requirements are met)

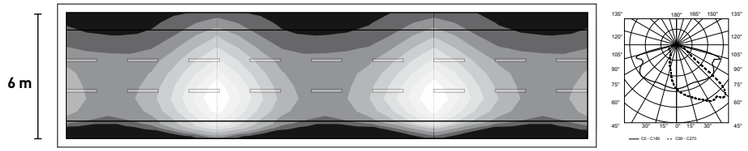


ME OPTICS - BUCK 7018 MISTRAL 4 ME

Application of MISTRAL with ME optics and large number of modules provides illumination for regional roads, highways and access roads, containing several lanes in both directions. Meets the requirements regarding high levels of luminance and uniformity (as for classes M1 and M2).
Hight: 12 m, Overhang: 1.5 m, Boom Angle: 0°

Lighting Class: P1	E_{av} (lx)	E_{min} (lx)
Calculated values	22.00	17.01
Required values according to class	⩾15.00	⩾3.00
Fulfilled / Not fulfilled	✓	✓

Lighting Class: M2	L_{av} (cd/m2)	U0	UI	TI (%)	SR
Calculated values	1.82	0.53	0.90	7	0.94
Required values according to class	⩾1.50	⩾0.40	⩾0.70	⩽10	⩾0.35
Fulfilled/Not fulfilled	✓	✓	✓	✓	✓



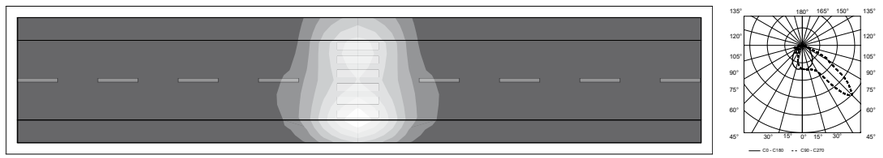
ME — STREET 3

FN OPTICS - BUCK 7016 MISTRAL 2 FN

Specially designed for illumination of pedestrian crossing, MISTRAL with FN lens meets the requirements for horizontal illumination to C0, with vertical illumination to EV1.

	E_{av} (lx)	E_{min} (lx)	u0	E_{min}/E_{max}
(C0, EV1)/ class EV1	61	31	0.514	0.251

	E_{av} (lx)	E_{min} (lx)	E_{max} (lx)	u0	E_{min}/E_{max}
(C0, EV1)/ class C0	60	50	69	0.837	0.724



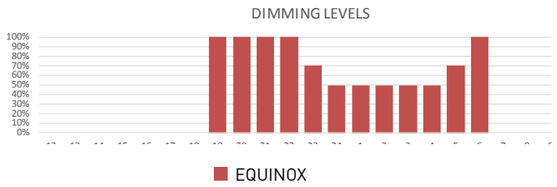
FN — CROSSWALK

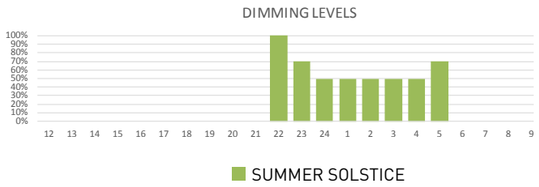
EFFICIENCY

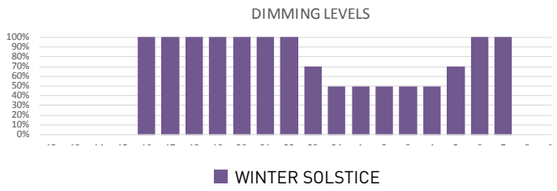
The table compares the solution with existing luminaire using HPS 250 W and the solution with MISTRAL 4 with standard tuning without optimization and smart function and with standard tuning including all additional functions such as AOC, autonomous dimming, CLO.

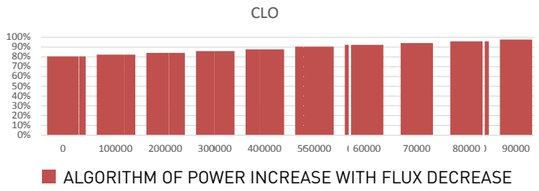
Type	Installed power	Yearly energy consumption	Yearly energy consumption	Maintenance cost	Power savings	Energy savings	ROI period
	W	kWh/y	€/y	€/y	%	%	year
Existing: Street luminaire HPS 250 W	275	1.104	199	50			
New: Mistral 4- without optimisation	144	578	104	26	48%	48%	2.68
Mistral 4 – with optimisation	144	374	67	17	48%	66%	2.14

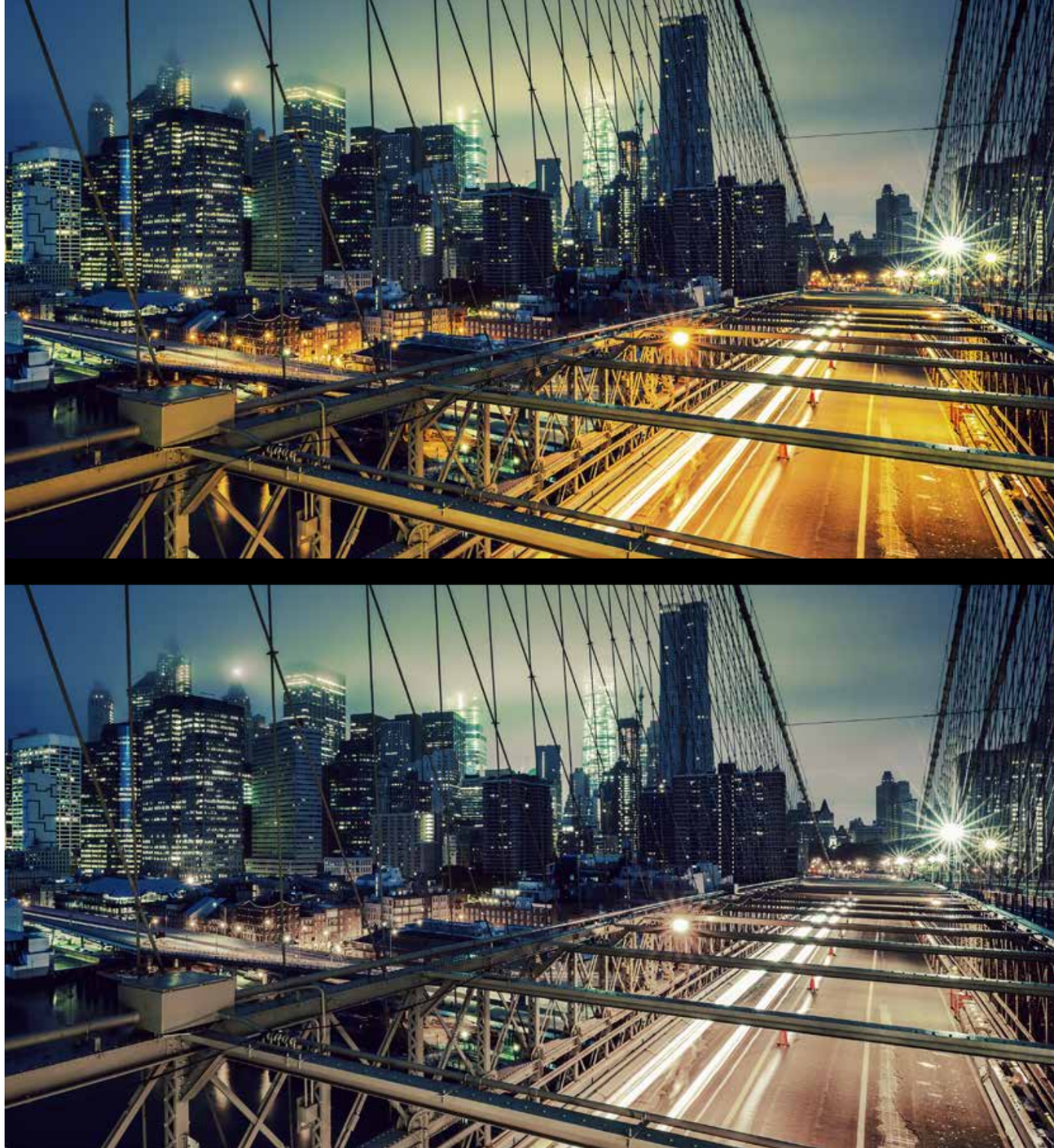
The table compares the solution with existing luminaire using HPS 250 W and the solution with MISTRAL 4 with standard tuning, including all functions such as AOC, autonomous dimming, CLO.



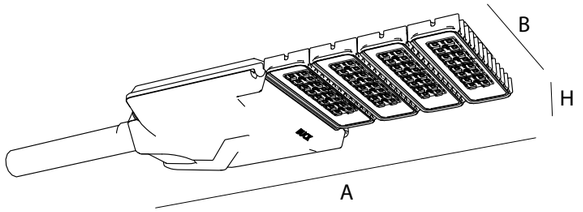








TECHNICAL DATA



Dimensions A/B/H	531–1082 / 350 / 153 mm
Ingress protection rating	IP66
Impact resistance rating	IK08 / IK09
Finish	black, gray, upon request
Weight	9kg–16,50kg
T_a	≤55°C
LENS LOR	>90%
Luminaire luminous flux (t_a=25°)	4910 lm–52400 lm
Total power	34W–441W
LED EF.	119-159 lm/W
Luminaire EF.	92-123 lm/W
Luminaire LOR	>85%
Light colour temperature /CRI	3000K–5000K / 70–80
LED service life	UP TO 100,000h(L80B10)
Power supply	220-240V (198-264V), 50-60Hz
Const.current range	350-1050mA, 700mA NOM.
Control gear	ECG, DALI

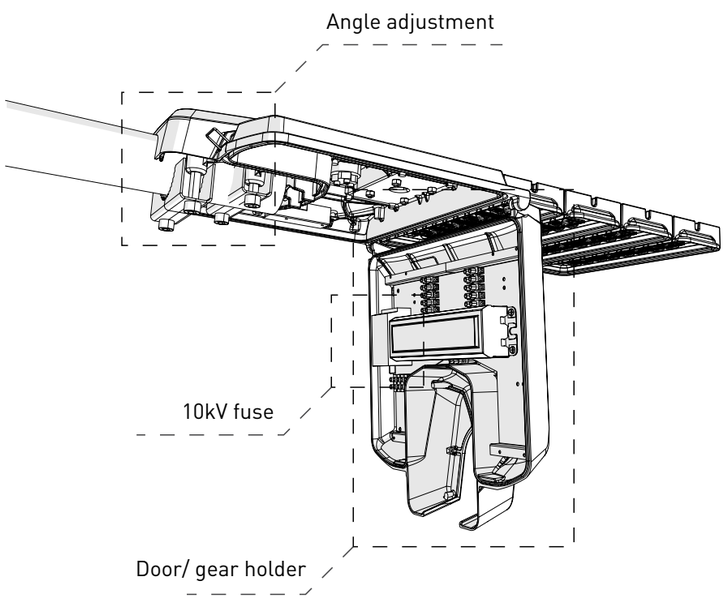
The housing of the luminaire is made of die cast aluminium, protected by epoxy powder coating resistant to UV radiation. Conversion coating provides better top coating adhesion and superior corrosion resistance.

Housing is modular, with exchangeable modules consisting of LED PCB integrated into a self-cleaning aluminum heatsink and protected with 4mm thick tempered glass.

Complete control gear is mounted on a carrier which can easily be replaced in the field.

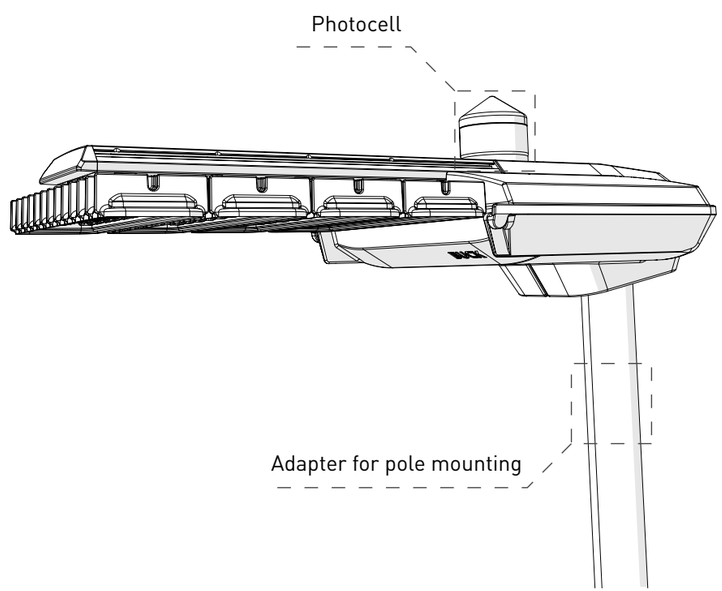
STANDARD EQUIPMENT

- Wireless interface communication
- Programmable
- AOC - Adjustable Output Current
- CLO - Constant light output
- Virtual midnight
- Protection against transient main peaks up 6 kV
- Electronic short-circuit protection
- Overload protection
- Termal protection
- Voltage range 198-264VAC
- Safety swich
- 1-10V analogue management



ADDITIONAL EQUIPMENT

- Power line communication
- Central management
- DALI communication
- Protection against transient main peaks up 10 kV
- Voltage range 150-264VAC
- Photocell and master sensor communication
- RF antenna



SERVICEABILITY

Tool- free access to electrical components. Inspection door serves as control gear holder, for quick replacement or upgrade to new generation. LED modules are serviced using standard tools.

Possibility to perform maintenance by merely replacing the door with another spare one, using quick connectors, without interruption in illumination level or operating of the whole lighting installation.

SIMPLE UPGRADE

EASY ACCESS

MOUNTING

Mounting directly on arm Ø60 mm (side entry 42- 60 mm) with possibility to adjust the angle ±10° in 5° increments.

Mounting on pole Ø76 mm (top entry Ø60– Ø76 mm with adapter).

SMART CITY

A smart city is an urban development vision integrating multiple information and communication technology (ICT) and Internet of Things (IoT) solutions in order to manage city assets (such as local departments' information systems, schools, libraries, transportation systems, hospitals, power plants, water supply networks, waste management, law enforcement and other community services).

The goal of building a smart city is to improve the quality of life by increasing efficiency of city services and meeting the citizen needs. Using sensors integrated with real-time monitoring systems, data are collected for processing and analysis. The information and knowledge gathered are keys to tackling inefficiency.

INTERNET OF THINGS

Internet of things (IoT) is a term denominating general connection between electronical devices that are able to collect, generate and send various types of information. This enables the analysis and cross-reference of the data acquired and prompt actions in real time.

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Information and communication technology (ICT) is used to enhance quality, performance and interactivity of urban services, to reduce costs and resource consumption and to improve connection between citizens and local government.

Smart city applications are developed with the goal to improve the management of urban flows, allowing real time responses to challenges.

Illustration of Smart City components and the way technology can integrate with many sectors for service enhancing.

STREET LIGHTING OF SMART CITIES

Street lighting represents an important component of Smart Cities. In addition to the basic function of the control and regulation of the brightness of street lights, it may include:

1. Smart traffic management

Street lights can be equipped with cameras or sensors, allowing detection of movement. Additional technology enables the street lights to communicate with one another. When a passer-by is detected by a camera or sensor, this information will be communicated to neighboring street lights, which will brighten so that people are always surrounded by a safe circle of light.

2. Lighting Control and Energy Optimization

Energy savings and lighting optimization are primary drivers for lighting upgrades, focusing on improving management of lighting, energy and maintenance for all light fixtures on the network.

3. Public Safety and Security

The solution includes video, sound and motion-capture capabilities that enable security services management (parking lots and garages, city streets in need of enhanced security, asset protection and perimeter detection). It is possible to stream video and provide edge-based intelligence for analyzing data at the capture point. It is also possible to transmit the analytics, along with alerts to a central cloud database and to the appropriate agencies based on system rules.

These edge-based, real-time analytics can include:
- Configurable events and alerts that can trigger lighting conditions and other actions.
- Cost-effective extension of the security perimeter.
- License plate or facial recognition, etc.

4. Smart Parking

Gathering real-time parking availability data, the solution makes this information available to parking-application providers. These data enable real-time wayfinding, dynamic pricing and parking management. By using common infrastructure, cities can reduce the hardware cost and service fees associated with traditional smart-parking deployment.

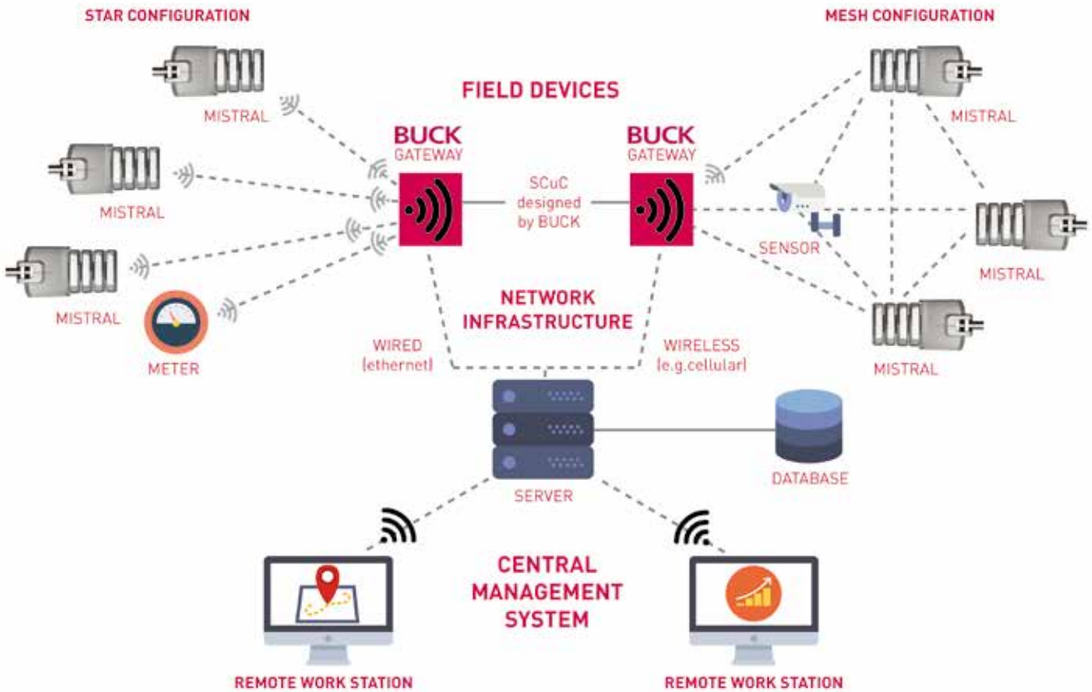
- Lower vehicle miles traveled and carbon emissions
- Improve the parking utilization
- Optimize parking revenue through dynamic pricing

5. Location Analytics

This denomination includes traffic counts by location or time of day, number of visitors and visit duration, offering key information to managers of airports, malls or business districts.

The data collected by the platform allows location analytics to generate:
- A deeper understanding of populations served;
- Detailed reports comparing traffic over time;
- Traffic counts by visit frequency and duration.

STREET LIGHTING ENHANCED WITH SMART CITY FUNCTIONS



HIGHLIGHTS

Functions of street lighting enhanced with smart city functions:

- Drastically reduce city energy consumption, costs and maintenance using LED technology combined with dynamic, per-unit or group controls;
- Improve citizen vehicle compliance and increase violation capture and city revenues;
- Enhance situational awareness, real-time collaboration and decision making across city agencies, helping optimize urban planning;
- Add intelligent, sensor-based Internet-of-Everything (IoE) innovations to transportation, utilities, public safety and environmental monitoring without adding significantly more physical infrastructure.