

SCHRÉDER TUNNEL LIGHTING SOLUTIONS

Schröder





## TUNNEL LIGHTING SOLUTIONS FOR TUNNEL ENVIRONMENTS



### SAFETY

An efficient lighting that provides the right light at the right time in the right place allows people to avoid obstacles, to see and be seen, prevents accidents and eases travel for emergency services. An interactive monitoring system can detect failures to isolate repairs and facilitate maintenance operations to ensure a performing lighting network at all times.



### SUSTAINABILITY

Preserving the environment is a collective obligation. Schröder uses recyclable materials for its efficient solutions. Our tunnel solutions incorporate the most efficient high-quality LEDs and control systems to dim the light when the tunnel is not used. They generate huge energy savings and an impressive reduction in CO<sub>2</sub> emissions.



### WELL-BEING

Adjusting the luminosity at the entrance according to the outside ambient light brings comfort for users. It decreases the needed adaptation time of the human eye to go from daylight to artificial light. Flat glass LED solutions combined with control systems ensure reliability and reduce maintenance operations and the frequency of tunnel closures.



### SAVINGS

Schröder's comprehensive approach for lighting tunnel environments incorporates the most efficient high-quality LED luminaires with lighting control systems. They are designed to meet the rigorous day to day demands whilst delivering the ultimate tunnel lighting experience with a minimum total cost of ownership. They reduce energy and maintenance costs and can be quickly installed thanks to their mechanical design and wide range of mounting options available.



		
1.	ALL STAR .....	10
		
2.	CONTILED .....	12
		
1 2.	FV 32 LED .....	14
		
1 2.	GL2 COMPACT .....	16
		
3.	BEACONS .....	18
		
4.	L20 + PLC	
	The Luminance Meter measures the luminance provided by natural light in the access zone from a stopping distance. It sends the data to a computer that adjusts the lighting levels to avoid any visual adaptation problems.	

## TUNNELS FOR IMPROVED MOBILITY

Sustainable urban mobility is a priority for town planners and decision makers as they work to solve traffic congestion, improve air quality and preserve green space. More and more towns and cities planners are opting to build tunnels to solve these problems and protect precious urban space and countryside.

Tunnels can “re-conquer” degraded surface streets in towns and cities. Tunnels can free local roads, reducing traffic congestion, boost public transport services, make walking and cycling safer to improve living conditions in urban areas.

Lighting plays an essential role in maximising user safety in these tunnels. A pioneer in the luminance concept for road and tunnel lighting, Schröder has built a worldwide reputation in tunnel lighting.

# TUNNELS LIT BY SCHRÉDER: THE SAFEST IN THE WORLD!

A SAFE TUNNEL IS FIRST AND FOREMOST A WELL-LIT TUNNEL.

Schröder is your trusted partner to manage your tunnel projects in the most efficient way. From the photometrical study to commissioning and compliance checks, from design to luminaire and control system set-up, our teams of tunnel lighting engineers provide a complete solution to rise to your challenges in tunnel and underpass lighting. All Schröder specified tunnel lighting solutions ensure perfectly safe areas with a minimised total cost of ownership and long lasting performance.

Schröder's complete range of LED luminaires for tunnel lighting provides customers with a comprehensive solution for the entrance, threshold and interior zones.

All our LED fixtures are highly resistant to corrosion (extruded aluminium luminaires are protected by electrolytic oxidation - class 15 while die-casted aluminium parts are hot painted with polyester powder), shocks and vibrations. They are designed to perfectly resist the extremely harsh conditions in tunnels.



# TUNNEL LIGHTING PRINCIPLES

THE TUNNEL LIGHTING MUST ALWAYS GUARANTEE THAT THE VISUAL PERCEPTIONS OF DRIVERS ARE MAINTAINED, BOTH DAY AND NIGHT, BY AVOIDING SUDDEN VARIATIONS IN LIGHTING LEVELS WHEN ENTERING AND EXITING A TUNNEL.

At night, the level of luminance in a tunnel should be constant and equivalent to the level on the road leading into the tunnel.

By day however, since there is a high level of external light, it is necessary to increase the level of luminance at the entrance of the tunnel mainly to avoid a black hole effect and thus a reduction in visual perception. At the tunnel exit, the level of luminance should also be increased to avoid drivers being subjected to glare effects by the light outside.

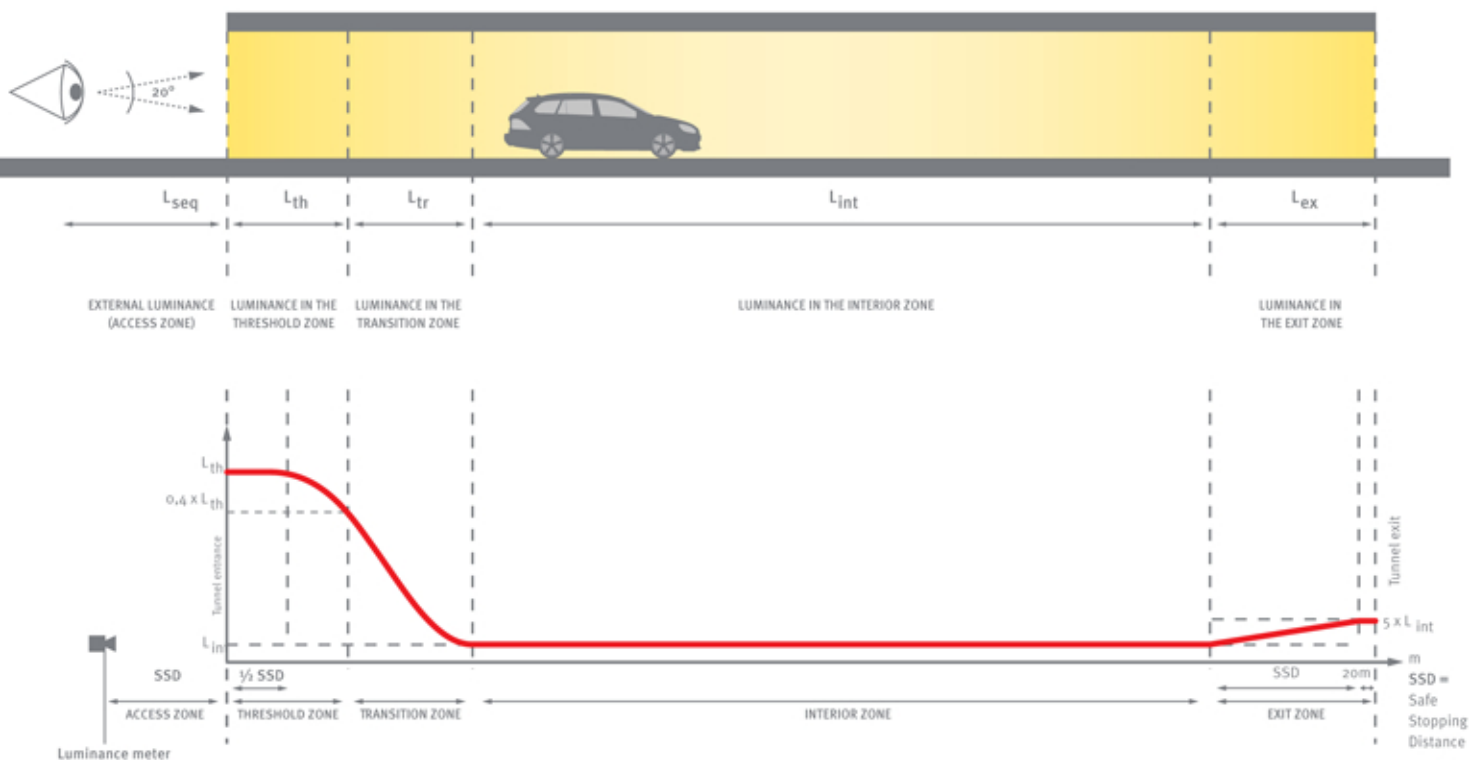
To help drivers eyes adapt easily and quickly, the first part of the tunnel, called the threshold zone, is strongly lit over a distance equal to the safe stopping distance. The higher the speed limit, the longer the safe stopping distance. A luminance meter measures the luminance created by natural light in the access zone from the safe stopping distance. It sends data to a computer that controls the lighting systems.

Thanks to this powerful lighting in the threshold zone of the tunnel, a driver can see a possible obstacle situated inside the tunnel from outside the tunnel.

The threshold zone is followed by a transition zone in which the level of luminance is gradually reduced over a distance that is always determined by the authorised speed limit. This serves to support the curve of acceptability for the reduction in luminance perceived by the eye and thus control the temporal adaptation. Furthermore, the problem of visual adaptation disappears once the threshold zone has been crossed.

At the end of the transition zone, luminance is reduced to the value chosen for the lighting of the interior zone of the tunnel.

The exit zone - less critical in terms of visual perception - is lit in such a way as to prepare drivers for the return to external luminance and the perception of obstacles in the exit zone.



# SCHRÉDER INTELLIGENT TUNNEL LIGHTING SOLUTIONS

A WELL SPECIFIED TUNNEL LIGHTING SOLUTION MUST HELP A DRIVER'S EYES ADJUST EASILY AND QUICKLY, PROVIDE A HIGH QUALITY OF LIGHT FOR EXCELLENT UNIFORMITY AND VISIBILITY, KEEP DISRUPTIVE MAINTENANCE TO A MINIMUM WHILE REDUCING ENERGY AND MAINTENANCE COSTS.

While standards have been set out by the C.I.E., most countries tend to adapt these norms to suit local recommendations. With many years of experience in tunnel lighting solutions, Schröder specialists are on hand to help the contracting authority and tunnel project manager deliver the perfect solution.

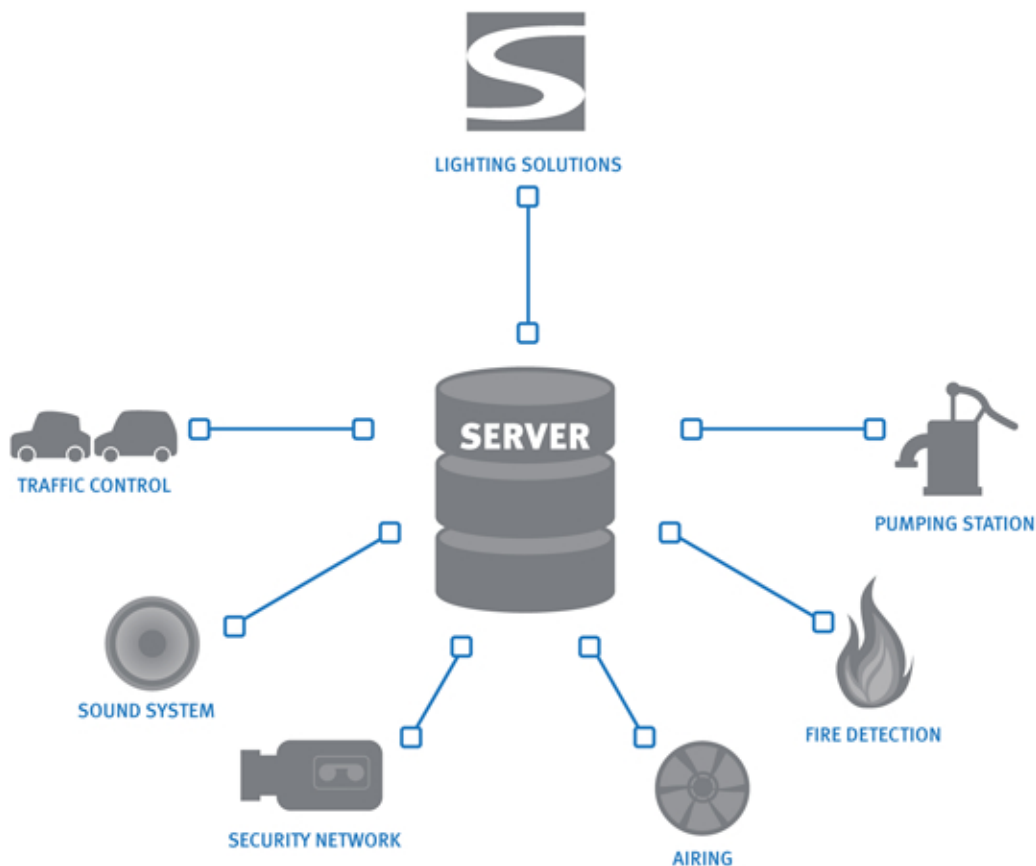
Our engineering department provides comprehensive tunnel lighting studies in accordance with the standard in force (CIE 88:2004) and with the requirements of the local project.

Schröder's tunnel lighting solutions go beyond simply adapting the light levels with a luminance meter. We provide intelligent control systems that can be easily integrated into the main tunnel network.

These solutions deliver optimum lighting conditions by constantly capturing and analysing data for factors such as outside luminosity, air quality, speed, weather conditions, lane accessibility and emergency situations. By adapting the light levels according to the real conditions in the tunnel, they guarantee safety for motorists at all times.

The monitoring and reporting features provide a full diagnostic analysis of the luminaires within the tunnel from a remote control room and can detail operational and statistical information to ensure efficient management and to optimise routine maintenance interventions.

Scenarios can be programmed into the system to deal with traffic accidents or emergency situations such as a crash or a fire. Automatic detection systems will ensure that the necessary steps are taken to activate the most appropriate response plan (emergency services will be notified, lighting levels will be increased to maximum, traffic lights will turn red on tunnel approaches, barriers at the entrance will close...).



SCHRÉDER HAS FULLY EMBRACED THE LED LIGHTING REVOLUTION TO EXTEND ITS COMPREHENSIVE RANGE OF TUNNEL LUMINAIRES TO INCORPORATE THE ADVANTAGES OF THIS TECHNOLOGICAL BREAKTHROUGH. SCHRÉDER LED TUNNEL LUMINAIRES AND DEDICATED CONTROL SYSTEMS PROVIDE COMPELLING SOLUTIONS THAT ARE APPEALING FROM BOTH THE PUBLIC AND OPERATIONAL PERSPECTIVES.

## TUNNEL USERS - SAFER AND MORE COMFORTABLE ENVIRONMENTS

Schröder LED luminaires incorporate precisely controlled and varied light distributions with the bright white light of LEDs to offer superior colour rendering, a better contrast and an improved quality of light compared to traditional high-intensity discharge (HID) lighting systems. Control systems enable the lighting levels to be adapted perfectly. Together, our LED luminaires and control systems increase the comfort, safety and visual guidance throughout the entire tunnel, which is highly valued by users.

## TUNNEL MAINTENANCE COMPANIES - MORE EFFICIENT MANAGEMENT

LEDs offer a significantly longer lifespan, which can be prolonged through the optimal use of a control system to dim the light.

All Schröder LEDs luminaires have been designed to optimise their placement, distribution and operating temperatures so that these maximum possible lifetimes are achieved. This design, coupled with the high tightness level of the luminaires, dramatically reduces maintenance costs.

FutureProof, the LED modules can be easily removed on-site at the end of their service life to take advantage of future technological developments.

Traffic disruption due to closures for maintenance is avoided and tunnel operators are free to carefully plan routine interventions.

## TUNNEL INSTALLATION COMPANIES - OPTIMAL INSTALLATIONS

All Schröder LED luminaires and control systems are designed for a quick, easy installation and commissioning to considerably reduce time and labour costs.

## TUNNEL OPERATORS - LOWER TOTAL COST OF OWNERSHIP

Schröder LED luminaires offer an unparalleled solution in energy efficiency thanks to their directional light output delivered exactly and precisely where it is needed, significantly reducing power consumption. Instant switching and dimming systems enable the light levels to be adapted to the real needs of the tunnel at specific times, extending maintenance periods and further reducing energy and operating costs compared to traditional tunnel lighting systems.

# SCHRÉDER EXPERTISE FOR YOUR SPECIFIC NEEDS

## ROBUST MECHANICAL DESIGN

TUNNELS ARE OFTEN AN AGGRESSIVE ENVIRONMENT FOR LUMINAIRES AS THE TRAFFIC GENERATES A PARTICULARLY HIGH LEVEL OF POLLUTION AND THE ATMOSPHERE INSIDE THEM IS HIGHLY CORROSIVE (HUMIDITY, EXHAUST FUMES, ALKALINE OR ACID PH, GALVANIC COUPLE, DIFFERENCES IN TEMPERATURE).

Extensive innovative product development as well as laboratory and on-site testing ensure that the Schröder luminaires have a rigorous mechanical design to resist these extremely harsh conditions and maintain a constant quality of light.



### CORROSION TESTS

All Schröder tunnel luminaires undergo corrosion tests performed in laboratories and on-site to provide technical answers to these different problems.



### WIND TUNNEL TESTS

All Schröder luminaires are tested for their specific environment. For the Channel Tunnel, for example, the luminaires were subjected to wind tunnel tests to measure their resistance to the passage of air with variations.



### FIRE RESISTANCE TESTS

Schröder luminaires are composed of non-flammable materials to comply with these requirements (M1, Vo, etc) and do not give off toxic fumes (0% halogen, F1, etc.).



### TIGHTNESS LEVEL TESTS

The level of protection must be sufficiently high to ensure tightness against dust and water in order to avoid the effects of air pollution and the penetration of water splashes, particularly during cleaning with high-pressure jets.



### VIBRATION TESTS

Each time vehicles pass, especially trucks, the luminaires are subjected to intense vibrations. In its laboratory and in collaboration with universities, Schröder has developed rigorous tests for tunnel luminaires as well as their mountings.



### SHOCK RESISTANCE TESTS

Stones projected by vehicles, shocks by unsecured truck loads (such as scrap metal) must be taken into account when designing and testing tunnel luminaires.

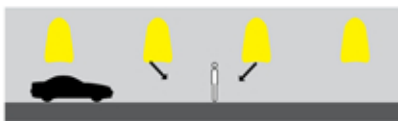


# LIGHT DISTRIBUTION

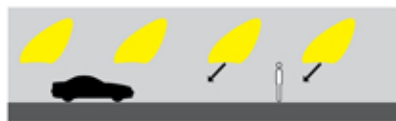
NO TWO TUNNELS ARE IDENTICAL. EACH TUNNEL HAS ITS OWN CRITERIA IN TERMS OF LIGHTING DESIGN AND GEOMETRY. TO OBTAIN THE OPTIMUM LIGHT DISTRIBUTION, THE SCHRÉDER LABORATORY EXAMINES THE MOST SUITABLE PHOTOMETRY FOR EACH INDIVIDUAL PROJECT AND THE ENGINEERING DEPARTMENT TAKES INTO ACCOUNT THE SPECIFIC ELEMENTS OF EACH TYPE OF APPLICATION IN ORDER TO MAXIMISE PERFORMANCE AND SAFETY.

Schröder tunnel lighting solutions provide a range of lighting distributions (symmetrical and asymmetrical counter beam) that are specified according to geometry of the tunnel to provide excellent visibility.

All Schröder LED luminaires are fitted with a glass protector as tests have proven that a protector guarantees the quality and quantity of light during the installation lifetime.



Symmetrical lighting



Asymmetric counter beam lighting

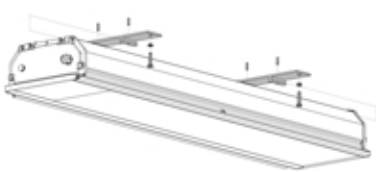


# MOUNTINGS

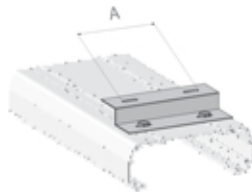
SCHRÉDER HAS A RANGE OF FIXATION DEVICES FOR ALL SORTS OF FUNCTIONALITIES: HIGH RESISTANCE TO VIBRATIONS, DROP-DOWN ACCESS, ADJUSTABLE INCLINATION, PRE-INCLINED, ETC.

There is one constant objective: to facilitate the task of the installer by reducing the installation time and reducing maintenance costs. A few examples of mounting systems:

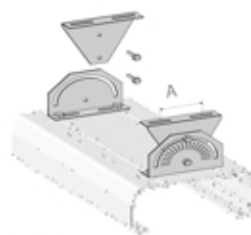
## I. FIXED SUSPENDED MOUNTINGS



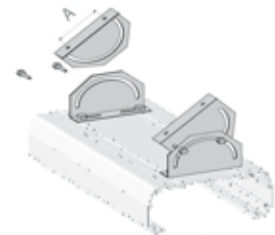
DIRECT



WITH 'Z'-SHAPED BRACKETS

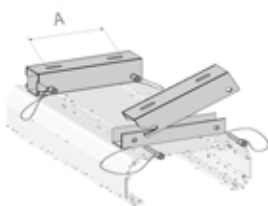


SWIVELLING

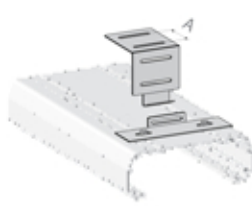


SWIVELLING AND ADJUSTABLE (LUMINAIRE/WALL DISTANCE)

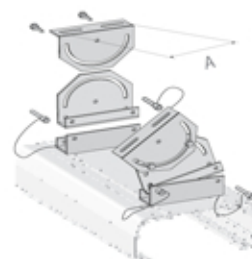
## II. PULL-OUT SUSPENDED MOUNTINGS



TILTING



HORIZONTAL ( $\pm 5^\circ$ )



SWIVELLING AND ADJUSTABLE (3 DIRECTIONS)

A = 90mm with  $\pm 10$ mm transversal adjustment

# OMNISTAR

## »» KEY ADVANTAGES

- High-power LED solution to replace HID solutions for the entrance zone
- Wide range of lighting distributions
- Easy to dim:
  - can adapt to the different lighting regimes required
  - reduces the quantity of luminaires to be installed
- Various mounting options and inclination possibilities on-site for optimal photometry
- Compact size: for tunnels with restrictive heights and to avoid any damage
- Control system can be integrated into the full backbone system

# A POWERFUL TOOL TO PROVIDE A COMPLETE SOLUTION FOR YOUR TUNNEL LIGHTING NEEDS

THE OMNISTAR IS A REAL ALTERNATIVE TO HIGH-INTENSITY DISCHARGE (HID) LAMPS FOR PROVIDING THE REQUIRED LIGHTING LEVELS FOR THE CRITICAL ENTRANCE AREA OF A TUNNEL.

The OMNIstar is designed to meet the different light requirements of a tunnel entrance with easy eye adaptation and excellent visibility for safety while offering a low total cost of ownership.

The design of the LensoFlex®2 photometric engine and the flexibility of the photometric distributions ensure that road users can enter the tunnel in safe and pleasant conditions.

In addition, the OMNIstar can be fitted with a reflector to provide a counter beam lighting solution.

Composed of robust materials, the OMNIstar is highly resistant to shocks and corrosion within harsh tunnel environments.



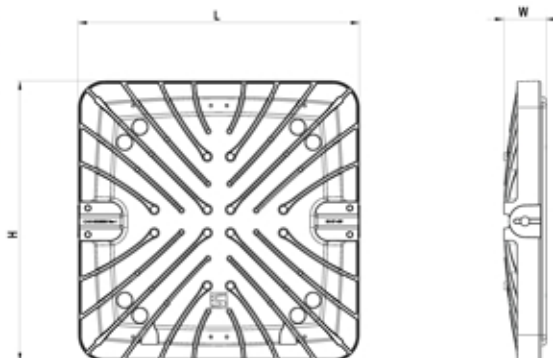
## CHARACTERISTICS

Lumen package range (nominal flux)	30,000 - 40,000lm	
Colour temperature	Neutral white	
Tightness level	IP 66 (*)	
Impact resistance (glass)	IK 08 (**)	
Nominal voltage	120 - 277V - 50 - 60Hz	
Electrical class	US 1	EU I or II (*)
<b>MATERIALS</b>		
Body	High-pressure die-cast aluminium	
Protector	Glass	
Colour	AKZO grey 900 sanded Any other RAL or AKZO colour upon request	

(\*) according to IEC - EN 60598 | (\*\*) according to IEC - EN 62262

## DIMENSIONS

L	532mm
H	530mm
W	80mm



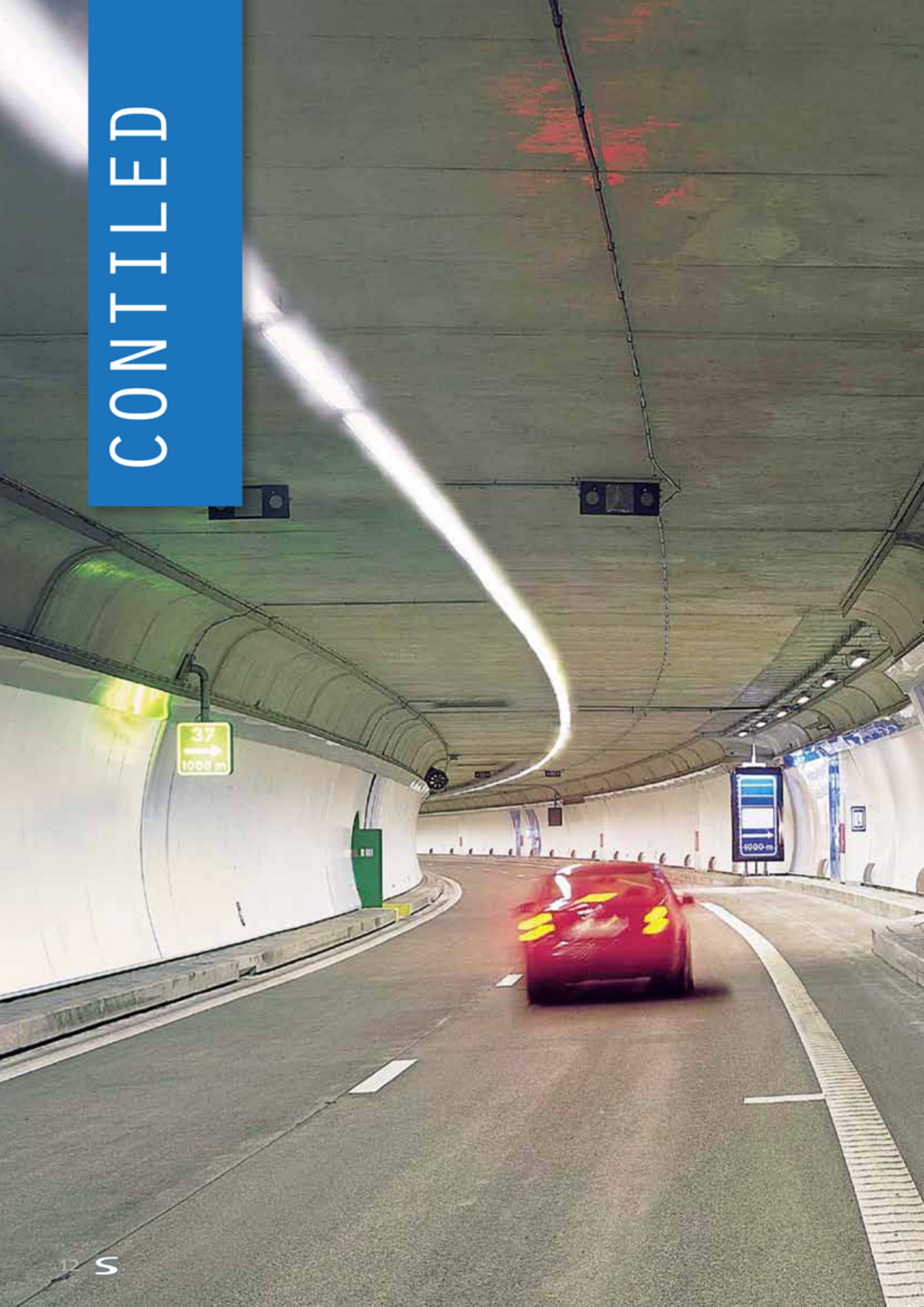
## OPTIONS

- Various types of mounting systems can be accommodated with tilting mechanism
- IP 66 driver box with all the cables and fast connectors for an easy installation

## MOUNTING



CONTILLED



# CONTINUOUS LED LINE IN TUNNEL LIGHTING



THE CONTILED IS DESIGNED TO REPLACE LUMINAIRES FITTED WITH FLUORESCENT LAMPS FOR CONTINUOUS LINE LIGHTING IN TUNNELS AND UNDERPASSES.

The ContiLED not only provides the required lighting levels with significant energy savings but also great visual comfort to guide motorists safely.

The ContiLED is an IP 66 sealed luminaire offering variable combinations of modules equipped with 4 LEDs (up to 64 LEDs) and optics to fully meet the specific needs of many different tunnel applications.

The LED modules are located on an internal slider which can be easily removed, allowing replacement at the end of its service life in order to take advantage of future technological improvements.

## »»KEY AVANTAGES

- High visual comfort through continuous line lighting
- Proven photometry with LensoFlex®2
- Flexible number of LED modules and photometry
- Easy to dim
- Savings in energy and maintenance costs
- ThermiX® to maintain performance over time
- FutureProof

## CHARACTERISTICS

Lumen package range (nominal flux)	ContiLED 1 1,100 to 7,700lm	ContiLED 2 5,700 to 15,500lm
Colour temperature	Neutral or warm white	
Tightness level	IP 66 (*)	
Impact resistance (glass)	IK 08 (**)	
Nominal voltage	230V - 50Hz	
Electrical class	II (**)	
Weight	7kg	
MATERIALS		
Body	Anodised extruded aluminium	
Protector	Glass	
End caps	Painted die-cast aluminium	

(\*) according to IEC - EN 60598 - note: class I, connection via external earth | (\*\*) according to IEC - EN 62262

## OPTIONS

- External power supply - driver box
- Assembly kit for luminaire lateral clamping
- Female counter plug for connecting an external driver
- Interconnection cable of 30 or 90cm

## DIMENSIONS

	ContiLED 1	ContiLED 2
H	67mm	67mm
W	124mm	124mm
L	602mm	1,202mm



# FV32 LED

## »»KEY AVANTAGES

- Adapted to a wide range of different tunnel applications to provide safety in all driving conditions
- High level of protection against corrosion, impact and vibrations
- FutureProof: easy replacement of photometric engine and power supply
- ThermiX®: maintains high performance over time
- Easy to dim
- Various inclination possibilities on-site for optimal photometry
- Control system: can be adapted to customer requirements or integrated into the backbone system

# A FLEXIBLE TOOL TO LIGHT ALL AREAS OF THE TUNNEL ENVIRONMENT

THE FV32 LED PROVIDES A FLEXIBLE SOLUTION TO COVER DIFFERENT ENCLOSED AREAS AND MEET TUNNEL LIGHTING REQUIREMENTS.



The design of the LensoFlex<sup>®2</sup> photometric engine and the flexibility of the photometric distributions makes the FV32 LED range an ideal instrument for lighting town and motorway tunnels or underpasses.

The extruded aluminium profile enables the number of LEDs to be adjusted in multiples of 16, starting with 64 up to a maximum of 240 LEDs.

Drivers, remote control systems and electrical connections are integrated into the luminaire. The front opening door allows access to the components when the luminaires are installed.

## CHARACTERISTICS

Lumen package range (nominal flux)	FV32 LED 1 9,100 to 17,100lm	FV32 LED 2 22,800 to 34,300lm
Colour temperature	Neutral or warm white	
Tightness level	IP 66 <sup>(*)</sup>	
Impact resistance (glass)	IK 08 <sup>(**)</sup>	
Nominal voltage	230V - 50Hz	
Electrical class	1-US and I-EU	
<b>MATERIALS</b>		
Body	Extruded aluminium profile	
Side plates	Die-cast aluminium	
Colour	Anodised aluminium	

<sup>(\*)</sup> according to IEC - EN 60598 | <sup>(\*\*)</sup> according to IEC - EN 62262

## OPTIONS

- All types of mounting systems can be accommodated: suspension with through-bolting system or suspension with through-bolting system and tilting mechanism
- Flexibility for cable gland installation: location, type, quantity
- IP 69 possible in tunnels with high-pressure cleaning

## DIMENSIONS

	FV32 LED 1	FV32 LED 2
L	731mm	1,265mm
H	135mm	135mm
W1	272mm	272mm
W2	110mm	110mm



# GL2 COMPACT

## »» KEY AVANTAGES

- Maximised savings in energy and maintenance costs
- High tightness level and excellent heat extraction for long lasting performance
- High level of protection against corrosion, impact and vibrations
- LensoFlex®2 engines providing performance, comfort and safety
- Wide range of lumen packages
- Excellent luminance uniformity
- On-site adjustment for optimal photometry
- Surge protection 10kV



# COMPACT, POWERFUL AND EFFICIENT LED SOLUTION

THE GL2 COMPACT OFFERS A UNIQUE COMBINATION OF FEATURES IN A SLENDER HOUSING FOR LIGHTING THE ENTRANCE, THRESHOLD AND INTERIOR ZONES.

The GL2 Compact is an IP 66 luminaire providing a flexible solution to cover the lighting requirements of different areas. The design of the LensoFlex®2 photometric engine combined with the counter beam (CBL) reflector offers maximum versatility for lighting town and motorway tunnels, underpasses, sport facilities and industrial buildings. The photometry of the GL2 Compact can be either symmetrical or asymmetrical to adapt to the place to be lit. The luminaire offers several mounting possibilities. For example, it can be fixed directly onto a cable rack.

The photometry can be adjusted on-site thanks to a tiltable bracket (from -30° to +30°). The GL2 Compact guarantees long lasting performance with minimum maintenance. A door on one of the covers provides access to the electronic compartment.



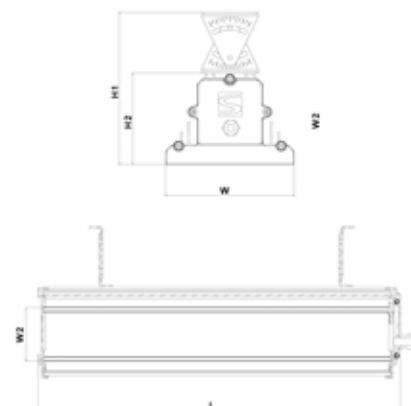
## CHARACTERISTICS

Lumen package range (nominal flux)	GL2 COMPACT 1 2,200 to 7,700lm	GL2 COMPACT 2 6,800 to 11,600lm	GL2 COMPACT 3 9,100 to 15,500lm	GL2 COMPACT 4 11,400 to 23,300lm
Colour temperature	Neutral white (4,250K)			
Optical compartment tightness level	IP 66 <sup>(*)</sup>			
Impact resistance (glass)	IK 08 <sup>(**)</sup>			
Nominal voltage	220V - 50 Hz			
Electrical class	I <sup>(*)</sup>			
Weight	6.2kg			
MATERIALS				
Housing	Extruded aluminium			
Protector	Glass			
Colour	RAL 7035 light grey			

<sup>(\*)</sup> according to IEC - EN 60598 | <sup>(\*\*)</sup> according to IEC - EN 62262

## DIMENSIONS

	GL2 Compact 1	GL2 Compact 2	GL2 Compact 3	GL2 Compact 4
H1	228mm	228mm	228mm	228mm
H2	137mm	137mm	137mm	137mm
W1	193mm	193mm	193mm	193mm
W2	60mm	60mm	60mm	60mm
L	468mm	538mm	748mm	1,058mm



# BEACONS

## »» KEY AVANTAGES

- Highly resistant to corrosion, shocks and vibrations - ideal for harsh tunnel environments
- Flexible mounting: on the ground, tunnel walls or a handrail system
- Complies with standards EN 60598-1, EN 60598-2-22 and flammability UL94
- Maintenance free

# GUIDING MOTORISTS SAFELY THROUGH TUNNELS

THE SCHRÉDER RANGE OF BEACONS GUIDE MOTORISTS SAFELY THROUGH TUNNELS. THEY PROVIDE VISUAL GUIDANCE WITHOUT GLARE AND ACT AS REFERENCE POINTS FOR THE SAFETY DISTANCE BETWEEN VEHICLES. IN CASE OF A FIRE WITH DENSE SMOKE, THESE LED BEACONS CLEARLY SHOW DRIVERS, PASSENGERS AND THE EMERGENCY SERVICES THE WAY TO THE EXIT AND THE SHELTERED AREAS.

Due to the particularly humid and corrosive atmosphere of tunnels, the BalPlast and BalJal are composed of robust materials that have a high resistance to shocks and vibrations.

They fully comply with the most severe fire resistance requirements and the nature of the smoke produced in case of fire.

Thanks to its modular design, the BalPast can be rapidly mounted on the ground, walls or on a handrail using two M6 screws.

The BalJal is attached by using 2 stainless steel screws.



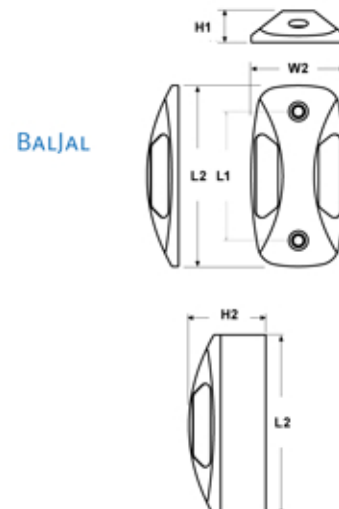
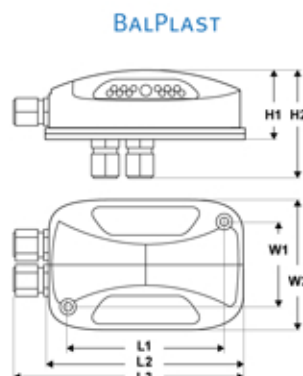
## CHARACTERISTICS

	BalPlast	BalJal
Optical compartment tightness level	IP 67 <sup>(*)</sup>	IP 67 <sup>(*)</sup>
Impact resistance		
polycarbonate	IK 09 <sup>(**)</sup>	IK 10 <sup>(**)</sup>
glass	-	IK 08 <sup>(**)</sup>
Nominal voltage - Electrical class	230V - I / 24V - III	230V - I / 24V - III
Light engine	12 amber or blue LEDs	12 amber or blue LEDs
Weight (total)	0.5kg	1.1kg (24V) 2.1kg (230V)
MATERIALS		
Body	Polycarbonate	Die-cast aluminium
Protector	Polycarbonate	Polycarbonate or glass

<sup>(\*)</sup> according to IEC - EN 60598 | <sup>(\*\*)</sup> according to IEC - EN 62262

## DIMENSIONS

	BalPlast	BalJal
H1	56mm	33mm
H2	88mm	82mm
W1	69mm	N/A
W2	106mm	98mm
L1	128mm	135mm
L2	163mm	188mm
L3	189mm	N/A





SAFETY



WELL-BEING



SUSTAINABILITY



SAVINGS



SOLUTIONS

