

GOLEDO TUNNEL LIGHTING





OPTIMIZED LIGHTING DISTRIBUTION FOR TUNNELS

GOLEDO T is HEPER's latest LED tunnel lighting luminaire. It rises above years of experience in the field and R&D work. Combining high quality materials with exceptional optics, GOLEDO T is a product that can meet the needs for wide range of tunnel projects.

IT'S TECHNICALLY SUPERIOR!

Tunnel Lighting is the most technical and fundamentally broad one of all lighting applications. Beam directions, lux levels, luminance and illuminance levels, thresholds etc. becomes exceptionally important when it comes to tunnels. Due to the fact that optimum tunnel lighting is directly related to driver's safety, from project to product design, many criteria have to be handled carefully to light up tunnels in the most adequate way.

WE'RE EXPERIENCED!

As Heper, we have a proud history over a dacade working in tunnel lighting applications. In the course of time, we have completed many significant tunnel projects successfully all around the world. In recent years, we have worked constantly to carry our success in conventional light source tunnel products to latest technology LEDs.

DESIGNED TO RESIST TOUGH CONDITIONS!

It is a fact that tunnels host a corrosive atmospheric condition and limited access. Therefore, high quality, low copper die-cast aluminum is used and all the developments have been made to make the product with the longest life possible. Also; Installation, dismantle and maintenance processes are as easy as it gets.

IT'S ALL ABOUT SAFETY!

GOLEDO T is a product that meets the latest technology requirements and fundamentals in tunnel lighting for which the objective is to allow traffic to safely enter, pass through and exit the tunnel and do so without needing to reduce speed to identify objects and obstacles. It can also meet the different illumination needs for different zones in tunnels. Finally, it can be easily implemented with different type of control options to make sure the safety requirements are met for different times of the day.

TUNNEL LIGHTING PRINCIPLES ZONES TYPES

1 - Access zone

The part of the open road in front of the tunnel portal in the approach direction, covering the distance over which an approaching driver is able to see tunnel entrance. The access zone begins at the stopping distance before of the entrance portal and it ends at the tunnel entrance portal.

2 - Threshold zone

The first part of the tunnel, just after the entrance portal. The threshold zone starts either at the beginning of the tunnel or at the beginning of the daylight sunscreens when occurring. The length of the threshold zone is at least equal to the stopping distance.

3 - Transition zone

The part of the tunnel starts from just after the threshold zone and ends at the beginning of interior zone. The lighting level in the transition zone is decreasing from the level at the end of the threshold zone to the level of the interior zone. Interior zone: the part of the tunnel after the transition zone till to the beginning of the exit zone.

4 - Interior zone

The part of the tunnel after the transition zone till to the beginning of the exit zone.

5 - Exit zone

The exit zone begins at the end of the interior zone, ends at the exit portal of the tunnel.



02 **TUNNEL LIGHTING PRINCIPLES DESIGN CRITERIA**





Tunnel

Tunnel is the structure over a roadway that restricts the normal daytime natural illumination of a roadway section such that the driver's visual sensation is diminished. In order to classify changing lighting requirements along with the tunnel length, tunnel is evaluated in the form of sub interior zones: the access zone, the threshold zone, the transition zone, the interior zone, the exit zone and parting zone.

Traffic Flow

The number of vehicles passing a specific point in a stated time in stated direction(s). In tunnel design, peak hour traffic, vehicles per hour per lane, will be used.

Design Speed tunnel.

Reference Point

Stopping Distance

Stopping distance is the distance necessary to stop the vehicle moving at the speed in question in total safety. It comprises the distance covered during the reaction time and during the braking time.







The design speed is the speed for which the tunnel is laid out. It is generally accepted that this speed is the maximum speed allowed on the access roads to the

The reference point is in principle the point located in the centre of the approaching lanes, at a height of 1,5 m and at a distance from the entrance of the tunnel equal to the stopping distance (SD) at the design speed.

O3 DESIGN CRITERIA **TUNNEL LIGHTING DISTRIBUTION TYPES**



Symmetric lighting

The lighting where the light equally falls on objects in directions with and against the traffic. Symmetric lighting is characterized by using luminaries that show a luminous intensity distribution that is symmetric in relation to the plane normal to the direction of the traffic.



Counter-beam lighting

The lighting where the light falls on objects from an opposite direction to the traffic. Counter-beam lighting is characterized by using luminaries that show a luminous intensity distribution that is asymmetric in relation to the plane normal to the direction of the traffic, where the maximum luminous intensity is aimed against the direction of the traffic The term refers only to the direction of normal travel.



Pro-beam lighting

The lighting where the light falls on objects in the same direction as the traffic. Pro-beam lighting is characterized by using luminaries that show a luminous intensity distribution that is asymmetric in relation to the where the maximum luminous intensity is aimed in the same direction as the direction of the traffic.



O4 GOLEDO T **ADAPTIVE LIGHTING**

Changing the light distribution pattern as per traffic needs improves the traffic safety throughtout the tunnel. As easy as switching "on" and "off" is a new feature.



Symmetrical Light Distribution



Counter-Beam Light Distribution



Pro-Beam Light Distribution





05 GOLEDO T SYMMETRIC - GOLEDO T ASYMMETRIC TECHNICAL SPECIFICATIONS

APPLICATION AREAS

- Tunnels
- Underpasses

GENERAL HIGHLIGHTS

- Various optics for different tunnel applications
- Operating temperature: -40°C / +55°C
- Easy installation and maintenance
- Exceptional thermal characteristics
- In compliance with EN 60598, EN 62722
- CE, ENEC and UL certified

ELECTRICAL PROPERTIES

- Drive current: 350mA, 525mA, 700mA
- Optimized PCB design
- Insulation class: CLASS I, CLASS II
- Energy class: A+
- Power factor > 0.95
- Input Voltage: 220V-240V / 110V-120V at 50Hz /60Hz
- Control Type: 1-10V, DALI, StepDIM,
- AstroDIM
- Constant Light Output (optional)
- Halogen free cabling (optional)

OPTICAL PROPERTIES

- Various lens arrangements for different zones and different installation areas
- Homogenous light distribution
- Reduced glare with special lenses with transmission > 95%
- Power Chips
- MacAdam Ellipse 3
- Lumen Output: 7200lm 21500lm
- Color Temperature: 3000K, 3500K, 4000K
- CRI > 70(4000K), CRI > 70(3500K) CRI> 80(3000K)
- Lumen depreciation: L90B10 > 100000h (calculated) Photobiological safety: Risk Group 0
- Efficacy: 121 lm/W for 4000K at 700mA

BODY HOUSING & FINISH

- Corrosion resistant die-cast aluminum housing
- Electrostatic powder coating
- HM1 to HM5 standard colors with optional RAL codes
- Ingress protection: IP66
- Impact protection: IK08







GOLEDO ASYMMETRIC ENTRANCE LIGHTING

Asymmetric counter-beam optic symmetric on cross plane. This optic optimises the lighting distribution according to the tunnel and pavements width.

Typical applications:

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- 1. Single ot twin row arrangements
- 2. Rows in the corners for rectengular crosssections.
- 3- Single or muti lane traffic tunnels.























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GOLEDO ASYMMETRIC ENTRANCE LIGHTING

CODE	DESCRIPTION	ССТ	DRIVE CURRENT	LUMEN OUTPUT	POWER
LT2037.671-Asym	Goledo T Asm	3000K	350mA	4050 lm	36W
	32 LED	3000K	525mA	5550 lm	54W
		3000K	700mA	7150 lm	70W
		3500K	350mA	4500 lm	36W
		3500K	525mA	6150 lm	54W
		3500K	700mA	7950 lm	70W
		4000K	350mA	4750 lm	36W
		4000K	525mA	6550 lm	54W
		4000K	700mA	8450 lm	70W

CODE	DESCRIPTION	ССТ	DRIVE CURRENT	LUMEN OUTPUT	POWER
LT2037.767-Asym	Goledo T Asym	3000K	350mA	8200 lm	70W
	64 LED	3000K	525mA	11200 lm	105W
		3000K	700mA	14400 lm	136W
		3500K	350mA	9200 lm	70W
		3500K	525mA	12500 lm	105W
		3500K	700mA	16000 lm	136W
		4000K	350mA	9600 lm	70W
		4000K	525mA	13300 lm	105W
		4000K	700mA	17000 lm	136W

CODE	DESCRIPTION	ССТ	DRIVE CURRENT	LUMEN OUTPUT	POWER
LT2037.766-Asym	Goledo T Asym	3000K	350mA	10300 lm	90W
	80 LED	3000K	525mA	14000 lm	131W
		3000K	700mA	18100 lm	170W
		3500K	350mA	11600 lm	90W
		3500K	525mA	15800 lm	131W
		3500K	700mA	20200 lm	170W
		4000K	350mA	12100 lm	90W
		4000K	525mA	16800 lm	131W
		4000K	700mA	21500 lm	170W













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GOLDEO SYMMETRIC INTERIOR LIGHTING

Symmetric optic on cross plane for:

1. Single ot twin row arrangements

2. Rows in the corners for rectengular crosssections.

3- Single or muti lane traffic tunnels.





















GOLDEO SYMMETRIC INTERIOR LIGHTING

CODE	DESCRIPTION	ССТ	DRIVE CURRENT	LUMEN OUTPUT	POWER
LT2037.671-Sym	Goledo T Sym 32 LED	3000K	350mA	4100 lm	36W
		3000K	525mA	5600 lm	54W
		3000K	700mA	7200 lm	70W
		3500K	350mA	4550 lm	36W
		3500K	525mA	6200 lm	54W
		3500K	700mA	8000 lm	70W
		4000K	350mA	4800 lm	36W
		4000K	525mA	6600 lm	54W
		4000K	700mA	8500 lm	70W

Goledo 32 Sym Weight: 9 kg

CODE	DESCRIPTION	ССТ	DRIVE CURRENT	LUMEN OUTPUT	POWER
LT2037.765-Sym Goledo T 40 LED	Goledo T Sym 40 LED	3000K	350mA	4900 lm	46W
		3000K	525mA	6700 lm	70W
		3000K	700mA	8600 lm	90W
		3500K	350mA	5500 lm	46W
		3500K	525mA	7500 lm	70W
		3500K	700mA	9600 lm	90W
		4000K	350mA	5800 lm	46W
		4000K	525mA	8000 lm	70W
		4000K	700mA	10250 lm	90W

Goledo 40 Sym Weight: 9 kg

CODE	DESCRIPTION	ССТ	DRIVE CURRENT	LUMEN OUTPUT	POWER
LT2037.767-Sym	Goledo T Sym 64 LED	3000K	350mA	8200 lm	70W
		3000K	525mA	11200 lm	105W
		3000K	700mA	14400 lm	136W
		3500K	350mA	9200 lm	70W
		3500K	525mA	12500 lm	105W
		3500K	700mA	16000 lm	136W
		4000K	350mA	9600 lm	70W
		4000K	525mA	13300 lm	105W
		4000K	700mA	17000 lm	136W

CODE	DESCRIPTION	ССТ	DRIVE CURRENT	LUMEN OUTPUT	POWER
LT2037.766-Sym Goledo T Sym 80 LED	Goledo T Sym 80 LED	3000K	350mA	10300 lm	90W
		3000K	525mA	14000 lm	131W
		3000K	700mA	18100 lm	170W
		3500K	350mA	11600 lm	90W
		3500K	525mA	15800 lm	131W
		3500K	700mA	20200 lm	170W
		4000K	350mA	12100 lm	90W
		4000K	525mA	16800 lm	131W
		4000K	700mA	21500 lm	170W

Goledo 64 Sym Weight: 10 kg

Goledo 80 Sym Weight: 10,5 kg

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