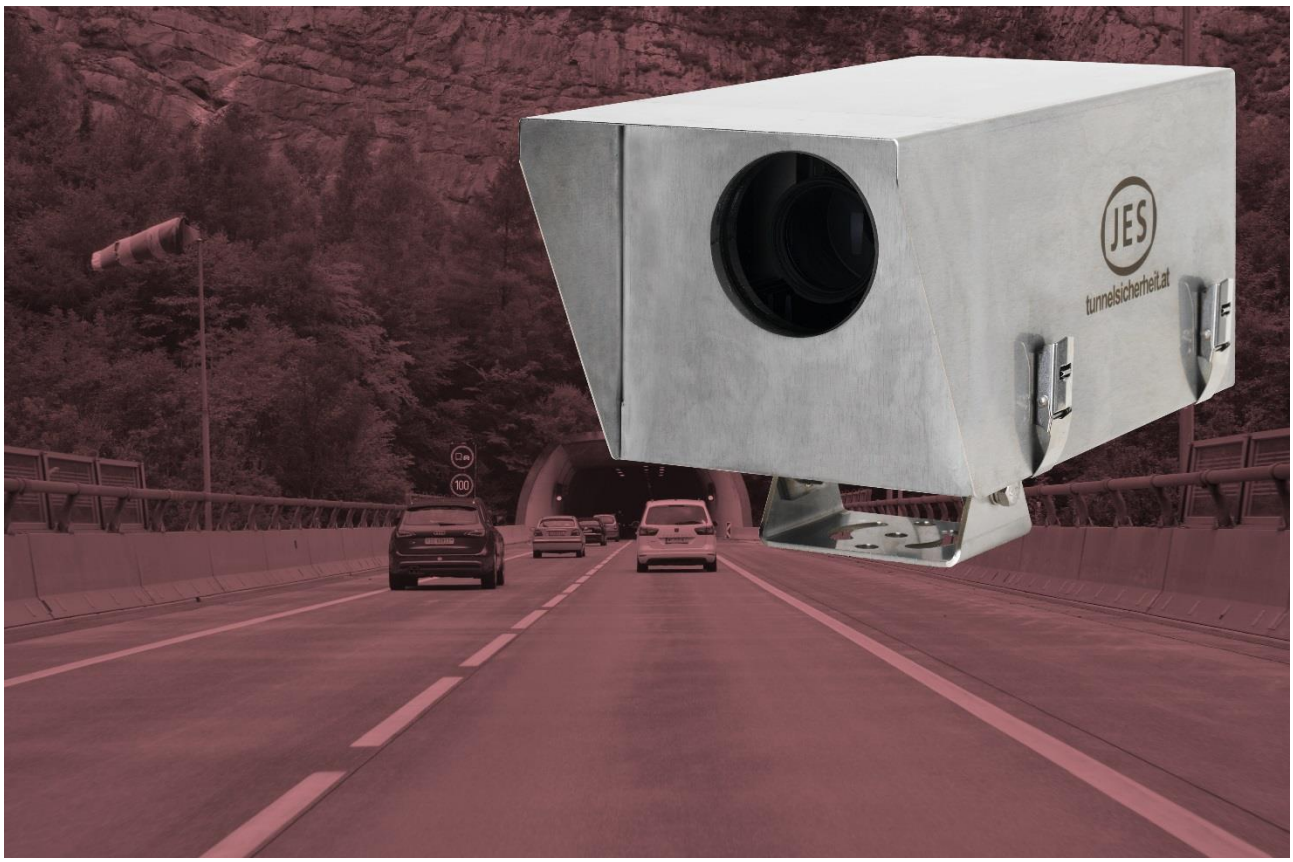


Luminance measurement

Adaptation of tunnel lighting to environmental lighting conditions

Luminance

Features

- Photometer to measure the luminance in the
  - Access zone L_{20} (acc. CIE 88:2004)
  - Threshold zone L_{th}
  - Interior zone L_{in}
- Zoom lens to adjust the focus areas
- Sensor with V(λ) filter and silicon photo element
- Temperature compensated and long term stable amplifier for the photoelectric current using live zero
- Heated housing with protection class IP65 either made of polycarbonate or stainless steel 1.4571
- Electronically controlled heating and temperature monitoring
- Mounting flange to adjust horizontal and vertical angle
- Fault indication by relay isolated contact (NC)
- Optional second output channel for increased resolution at low lighting levels
- Surge protection

System setup

- Photometer in camera housing (Luminance camera) mounted on the tunnel wall or a pole in front of the tunnel portal
- Power supply (230 or 115 VAC)
- Signal outputs connected to lighting control system or tunnel control system

Operation

The requirements for tunnel lighting are determined by the nature of the human eye. How well the eye recognises vehicles and other obstacles in a tunnel depends on the lighting and visibility as well as the reflexion characteristics of the road surface and the tunnel walls. Tunnel lighting needs to be adapted to these environmental conditions.

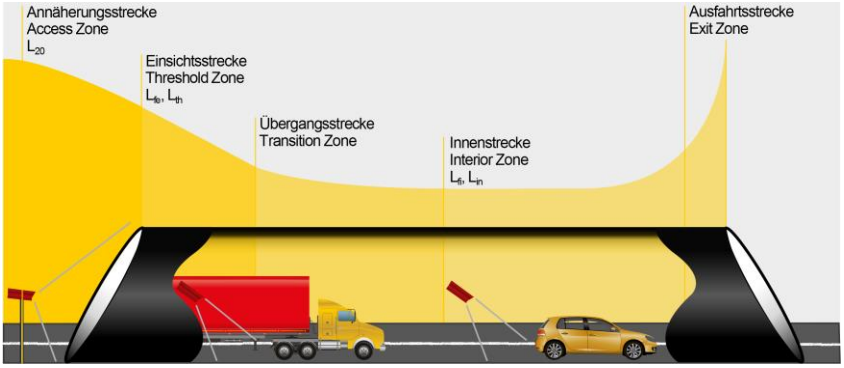
The tunnel lighting must be controlled such that users, both during the day and by night, can approach, pass through and exit the tunnel without changing direction or speed with a degree of safety equal to that on the approach road. Especially the lighting of a tunnel entrance should be adequate to avoid the “black hole effect” when a driver enters the tunnel.

Luminance is the measure representing what a human being perceives as brightness and as such is the main control variable for the tunnel lighting.

The luminance photometer comes with a zoom lens that is focussed to measure the relevant area. Light from this area through the lens is directed to the photo element detecting its intensity. The integrated evaluation unit then calculates the luminance and provides it through the analogue output(s).

Advantages

- Specifically designed for tunnel applications
- Customisable measuring ranges
- No moving parts
- Sensor can be replaced easily without tools
- Housing resistant against corrosion, UV, oil und acid



Measured luminances in a tunnel and locations of photometers

Application

Tunnels are important infrastructure elements in road networks and facilitate the connection of regions.

Environmental conditions in tunnels are influenced by fog, particles and emissions and need to be monitored to protect people on their passage through the tunnel from danger and impacts on their health. Accidents in tunnels, and particularly fires, can have dramatic consequences and can prove extremely costly in terms of human life, increased congestion, pollution and repair costs.

At every time people in the tunnel need to be supplied with breathable air and sufficient visibility.

Since 1990 JES Elektrotechnik GmbH develops, installs and maintains systems to monitor air quality and lighting conditions in tunnels. Our systems are robust, durable and resistant against the corrosive atmosphere in a tunnel. They operate reliably and have a high accuracy in measurement.

All systems fulfil the requirements of the EC guideline 2004/54/EC (Minimum safety requirements for tunnels in the trans-European road network) and the more precise national guidelines and provisions:

- Austria: RVS 09.02 Tunnelausrüstung
- Germany: RABT Richtlinien für die Ausstattung und den Betrieb von Straßentunneln
- Switzerland: ASTRA Richtlinien und Fachhandbuch Betriebs- und Sicherheitsausrüstungen (BSA)

Our range of products for tunnel covers systems for monitoring of

- Toxic gases like CO, NO, NO_2 (extractive or in-situ)
- Visibility (extractive or in-situ)
- Air speed, direction and temperature
- Luminance (access, threshold and interior zone)
- Illuminance

Luminance

Technical Specifications

Luminance meter with 1 output channel	
Model	t/LUM-A1
Measured value	Luminance
Measuring range 1	Customisable typically 0 .. 10.000 cd/m² or 0 .. 6.000 cd/m²
Field angle	8° .. 34°
Precision	≤ ± 1 %
Analogue output(s)	1 x 4 – 20 mA
Relay contact	1 x operation/fault (NC)

Luminance meter with 2 output channels	
Model	t/LUM-A2
Measured value	Luminance
Measuring range 1	Customisable, typically 0 .. 500 cd/m² or 0 .. 10 cd/m²
Measuring range 2	Customisable, typically 0 .. 50 cd/m²
Field angle	8° .. 34°
Precision	≤ ± 1 %
Analogue output(s)	2 x 4 – 20 mA (1 per measuring range)
Relay contact	1 x operation/fault (NC)

Power supply and operating conditions	
Operating voltage	230 VAC / 50 Hz ± 10 % (or 115 VAC / 60 Hz ± 10 %)
Power consumption	approx. 50 W
Temperature range	-40 .. +70 °C

Dimensions & Mounting	
Dimensions	245 x 180 x 485 mm (polycarbonate) 200 x 180 x 450 mm (stainless steel) (without mounting flange)
Weight	6.2kg (polycarbonate) 9.6kg (stainless steel)
Protection class	IP 67
Material	Polycarbonate MAKROTECH UV® or Stainless steel 1.4571 (AISI 316Ti) (both ZTV-ING requirement category I)
Mounting accesso-ries (optionally)	Adjustable wall mounting console, Pole mounting console with pole clamps

Conformities	
Electrical standards	2014/35/EU Low Voltage Directive (LVD) 2014/30/EU Electromagnetic compatibility(EMC) IEC 61326-1:2012 IEC 61010-1:2010
Road safety standards	RVS 09.02.41 2009 RABT 2006 ASTRA RL
Lighting standards	CIE 88:2004 CEN report CR 14380:2003

Polycarbonate housing

Stainless steel housing

Adjustable wall mounting console

Pole mounting console

Contact

JES Elektrotechnik GmbH
Wiestal-Landesstraße 37
5400 Hallein
Austria

Phone +43 (6245) 81785
Fax +43 (6245) 81785-600
Email info@tunnelsafety.at
Web www.tunnelsafety.at