



Tunnel entrance photometer



TLS-420/SW

**For automatic regulation of the illumination inside
road tunnels**

Introduction

The aim of road tunnel lighting is to ensure that traffic, both during daytime and nighttime, can approach, pass through and leave a tunnel, at the designated speed, with a degree of safety and comfort not less than along the adjacent stretches of open road.

In daytime it is essential that appropriate luminance has been provided in the threshold zone (the first stretch of the entrance) of the tunnel to avoid the driver experiencing "the black hole effect". A hazardous situation is created if a lack of visibility suddenly causes the driver to reduce speed. The required luminance depends on the luminance to which the approaching car driver's eyes are adapted. Studies show that to a large extent this adaptation depends on the luminance in and around the tunnel entrance.

According to CIE (Commission Internationale de l'Eclairage) recommendations this luminance can be measured as the luminances contained in a conical field of view, subtending an angle of 20°. It is normally recommended that the measurement is made at a distance from the tunnel entrance which is equivalent to the stopping distance for a vehicle approaching the tunnel. (I.e. the distance depends on factors such as the speed on the road, its slope, its condition etc). Other factors can also influence the measuring distance. (For further information see CIE publications No 61 (1984) and No 88 (1990).)

Hagner TLS-420 Tunnel Entrance Photometer

The Hagner TLS-420 Tunnel Entrance Photometer is designed to measure the average luminance of a tunnel entrance and its surroundings as to CIE recommendations. The photometer measures the average luminance within a cone with a top angle of 20° (other measuring angles can be provided on request), by means of a detector carefully filtered to give a spectral response close to that of the human eye, as defined in CIE standards.

The photometer has an output of 4 - 20 mA DC for a luminance range 0 - L cd/m² where "L" is chosen by the customer when ordering the photometer. A common value of "L" is 6,500 cd/m². The 4 - 20 mA output makes the TLS-420 suitable for computerized systems and also makes it possible for the output signal to be transmitted over great distances. (Max external resistance is 800 ohm.)

As an important part of the system B Hagner AB offers a ready programmed PLC computer for regulating the tunnel lighting, with switching levels (up to 10 levels each for 2 separate Tunnel Photometers plus 2 alarm levels) and time delays set according to the customers requirements. When delivered with a Display Panel the customer can easily change the preset values, if required.

The Photometer is mounted in a waterproof, thermostated housing made in stainless steel (or aluminium). The front glass can be provided with automatic cleaning equipment. The power supply is 220 - 240V AC.

Calibration

When delivered the photometers are carefully calibrated to the measuring range specified with the order.

The basic light sensitive component in the Tunnel Photometers is a very long time stable silicon photo diode. Under normal use a calibration interval of several years should be quite sufficient. (Please see also "Maintenance" below.)

Calibration can be made by the manufacturer, B Hagner AB in Sweden, or by official test laboratories, equipped for calibration of luminance meters.

Maintenance

When provided *without* washer and wiper:

- As measurements are taken through the front window of the photometer, the outside of the window should be regularly cleaned. How often this must be done depends on the position of the photometer and the surrounding environment, i.e. how soon the window becomes dirty. Empiric studies at sight are recommended.

When provided with washer and wiper:

- The water tank shall be filled at regular intervals. The length of the intervals depends on how often the washer is used and for how long each time.
- The wiper blade (the rubber) should be regularly checked so that it is not worn out. Control intervals depend on climate and environment but even in fairly rough environments an initial interval of 2-3 years is normally sufficient. Eventually the length of the intervals may be reduced until the wiper blade has been exchanged.

Overvoltage protection

In certain areas where the Hagner Tunnel Entrance Photometers are mounted there is risks from overvoltage and/or transients on the power net and transients on the signal cable; Overvoltage, for instance due to an unstable power supply and transients, mostly due to lightning strikes in the surrounding area. Both incidents can, if they are powerful, damage the electronics in a Photometer. (The instruments are provided with VDRs but these give only a very limited protection.) It is therefore recommended that Photometers, mounted in such areas, are connected to overvoltage protection which will greatly reduce the risk for damage. For further information, see separate leaflet "Hagner OVP-01 Overvoltage Protection".

Technical data

Detector	Silicon photo diode, V_{λ} -filtered.	
Measuring angle	20° (as standard), Special angles on request.	
Measuring range	Specified with order, e.g. 0 - 6,500 cd/m ²	
Accuracy	Better than $\pm 3\%$	
Output signal	4 - 20 mA DC	
Max external resistance	800 ohm	
Temperature range	-30°C -+70°C	
IP	65	
Power supply	220 - 240V AC	
Heater	6 W (PTC heating)	
Dimensions	460 x 155 x 170 (220) mm	
Weight	6.0 kgs 6,6 kgs with built-in wiper	
Mounting	On adjustable mount or wall bracket.	
Models	TLS-420EH4	Without wiper.
	TLS-420EH4/W	With built-in wiper.
	WW1/5	Windscreen washer.
	SW/S	Adjustable mount.
	CSS-1	Wall bracket.
	EH-150	PLC computer inclusive of program.
	Sight 400	Sight for TLS-400.

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