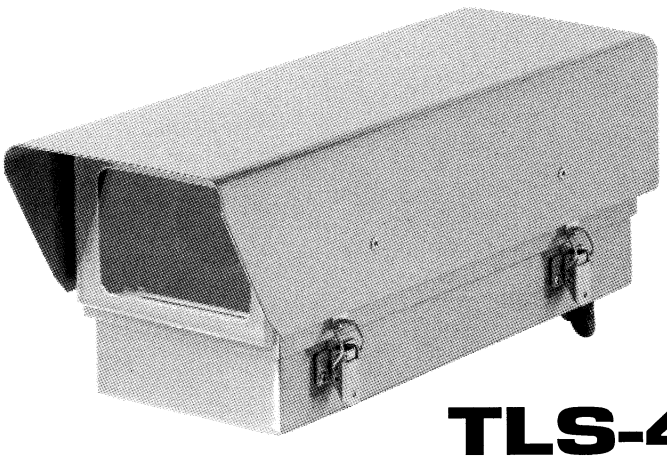
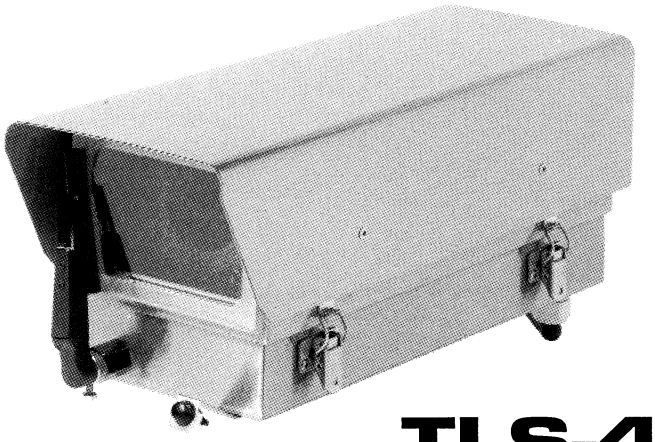
Hagner
MEASURES LIGHT

Tunnel entrance photometer



TLS-420/S



TLS-420/SW

For automatic regulation of the illumination inside road tunnels

Contents

Introduction

The aim of road tunnel lighting is to ensure that traffic, both during daytime and night time, 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.

Description

The Hagner TLS-420 Tunnel Entrance Photometer is designed to measure the average luminance of a tunnel entrance and its surroundings 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 (Hitachi EH-150) 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 housing made in stainless steel (or aluminium), provided with a thermostatically controlled heater. The front glass can be provided with automatic cleaning equipment.

Positioning the Tunnel Photometer

According to CIE (Commission Internationale de l'Eclairage) recommendations the luminance can be measured as the luminance 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). If for some reason a photometer can't be placed at the "ideal" distance (the stopping distance), e.g. because there is a bridge in the way of the viewing field of the photometer, but has to be placed closer to or further away

from the tunnel, one can to a certain extent compensate for this by ordering a photometer with a special measuring angle.

With the standard 20° angle at the "ideal" distance a certain area of the tunnel entrance and its surroundings is measured. If the photometer has to be placed closer to the tunnel entrance than preferred, one can cover the same measured area by increasing the measuring angle. Conversely, if the photometer has to be placed further away, then the measuring angle should be reduced. Please note that the measuring angle has to be determined before the photometer is built.

The theoretical height above the road for a Tunnel Photometer is between 1-1.5 metre, i.e. the same as the eyes of an approaching car driver. However, as the photometer would become dirty very quickly at this position and could easily be vandalized, it is common to mount the photometer at 5-6 metres height. The washer tank, when this is used, is placed at a lower level so that the tank can be easily filled. Max pressure height of the water is 5 metres.

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 5 years should be quite sufficient.

The photometer can be calibrated 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 must 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.

Over voltage protection

There are some areas where the Hagner Tunnel Entrance Photometers are at risk from over voltage and/or transients on the power net and transients on the signal cable, which may be caused by an unstable power supply or 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 over voltage protection, i.e. Hagner OVP-01, which will greatly reduce the risk of damage. Please note that 100% protection can never be guaranteed.

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/m²)	
Accuracy	Better than ± 3%	
Output signal	4 - 20 mA DC	
Max external resistance	800 ohm	
Temperature range	-30°C - +70°C	
Power supply	220 - 240 VAC	
Heater	6 W (PTC heating)	
Dimensions	460 x 155 x 170 (220) mm	
Material	Housing, mounts and holder for washer: stainless steel	
Protection rate (Housing)	IP65	
Weight	6.0 kgs 6.6 kgs with built-in wiper	
Mounting	Adjustable mount or wall bracket.	
Models	TLS-420/S	Without wiper.
	TLS-420/SW	With built-in wiper
Accessoris	WW1/5	Windscreen washer
	SW/S	Adjustable mount
	CSS-1	Wall bracket
	OVP-01	Over voltage protection
	EH-150	PLC computer inclusive of program

Connection Instruction

TLS-420/S

Photometer

Power supply 230-240 VAC 3 x 1,5 mm²

Yellow/Green	earth
Blue	neutral
Brown	live

Output 4 - 20 mA 2 x 0,75 mm²

Brown	+ plus
Blue	- minus

TLS-420/SW

Photometer/Wiper

Power supply 230 - 240 VAC 4 x 1,5 mm²

Yellow/Green	earth
Grey	neutral
Brown	live
Black	start wiper

Output 4 - 20 mA 2 x 0,75 mm²

Brown	+ plus
Blue	- minus

Washer

230 - 240 VAC 3 x 0,75 mm²

Yellow/Green	earth
Blue	neutral
Brown	live

For synchronized wash/wipe operation connect washer's brown (live) to wiper's black (start wiper)