

Figure 1 Dimensions of the HD2021T7 probe

SPECTRAL RESPONSE

The probe is fitted with a silicon photodiode and a set of filters in order to match the spectral response curve to that of the human eye (photopic vision). Figure 2 shows relative spectral response versus wavelength. $f^*1 < 9\%$ in accordance with the photopic curve to $V(\lambda)$.

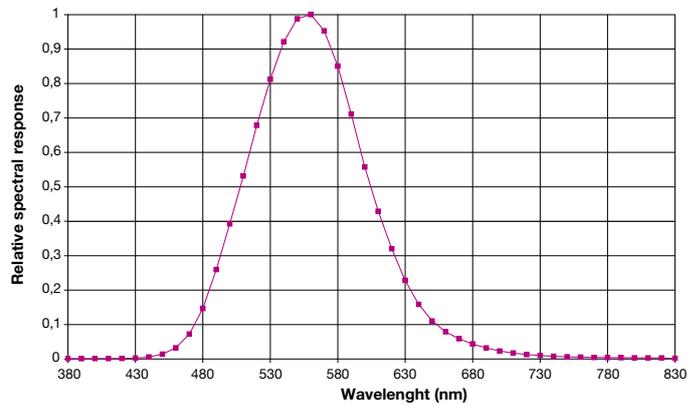


Figure 2. HD2021T7 Relative spectral response

**HD 2021T7, HD 2021T6
EQUIVALENT VEILING LUMINANCE PROBE,
LUMINANCE PROBE**

The HD2021T7 probe allows converting a photometric quantity such as the "equivalent veiling luminance" (cd/m^2) into a current (4-20 mA) or a voltage signal (0-10 V) according to the version that you choose.

If the acquisition station is far from the probe ($>50\text{m}$), the current output version is required.

The HD2021T7 probe has IP67 protection. In order to grant high accuracy, it is important to keep the outer lens clean. You can wash them using only water and standard papers for lens. The transmitter full scale can be chosen (when ordering) between two different values: $2000\text{cd}/\text{m}^2$ or $20000\text{cd}/\text{m}^2$. The full scale can be customized for orders greater than 5 pcs.

The field of application of the transmitter includes road lighting. In particular the equivalent veiling luminance is necessary to calculate the threshold luminance at tunnel entrances (UNI 11095).

INSTRUMENT TECHNICAL SPECIFICATIONS

Dimensions

(Length x Width x Height) 147mm x 58 mm x 65mm

ANGULAR RESPONSE

The equivalent veiling luminance (L_v) is estimated by the following formula:

$$L_v = 10 \sum_{\beta=1^\circ}^{\beta=90^\circ} \frac{L(\beta) \cdot \cos(\beta)}{\beta \cdot (\beta + 1.5)} \cdot \Omega \quad \text{A}$$

where:

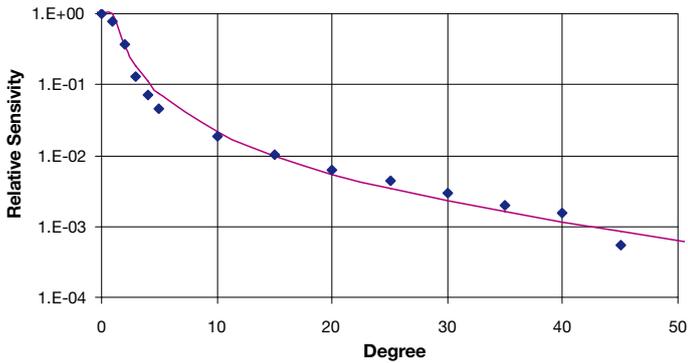
$L(\beta)$ is the luminance of the disturbing source at angle β ,

β is the angle between the disturbing source and the observing direction,

Ω is the solid angle

Figure 3 shows the relative sensitivity versus angle. In the CIE88:2004 standard the equivalent veiling luminance is calculated considering contributions up to 28.4° angles. Therefore the DeltaOhm HD 2021T7 probe allows estimating contributions also to greater angles (up to 40°).

Figure 3. HD2021T7 Relative angular response



WORKING TEMPERATURE

The probe can operate in a temperature range from -20 ° to +60° C. If the probe is placed in watertight containers, you should prevent the exit window from misting up or being covered with condensation. In this case the reading would be altered.

CALIBRATION

The calibration of the HD2021T7 probe is carried out by measuring the luminance on the output port of an integrating sphere with a known luminance. The equivalent veiling luminance veil is calculated by the formula A with a total field of view for the HD2021T7 probe of ±40°. The probe calibration uncertainty, with fixed full scale is 10% (at a 95% level of confidence).

TRANSMITTER INSTALLATION

To calculate the *threshold luminance* at the tunnel entrance the probe must be installed in compliance with UNI 11095.

To connect the transmitter, unscrew the lid which covers the terminal board. Figure 4 refers to the 4-20mA version, while figure 5 relates to the 0-10 V version.

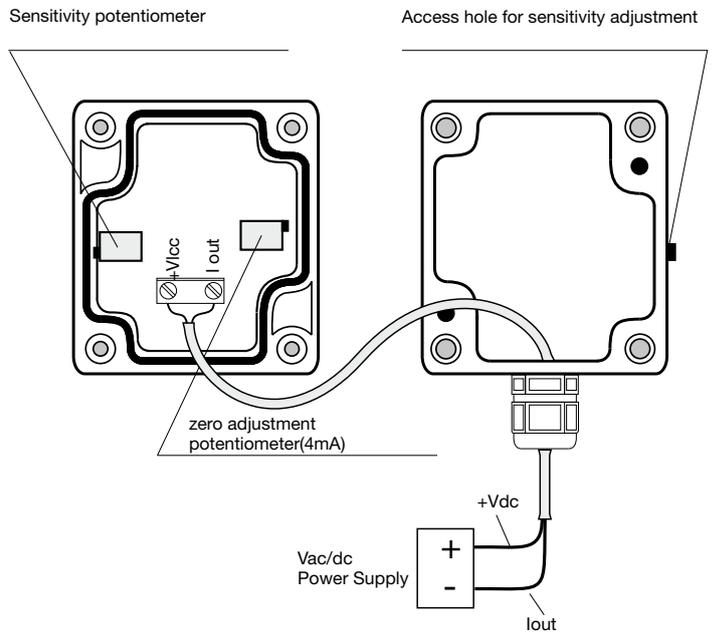


Figure 5. Connection diagram for HD2021T... with voltage output

PURCHASING CODES:

	Output	Measurement range	Power supply	Spectral response
HD2021T7A.V	0-10 V	0-2000 cd/m ²	16-40 Vac/dc	V(λ)
HD2021T7B.V		0-20 kcd/m ²		
HD2021T7X.V		On request *		
HD2021T7A.A	4-20 mA	0-2000 cd/m ²		
HD2021T7B.A		0-20 kcd/m ²		
HD2021T7X.A		On request *		

*minimum order 5 pcs

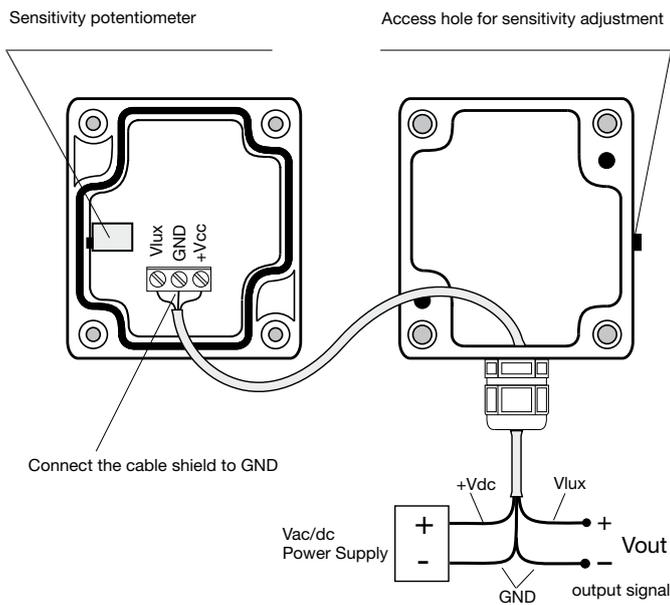


Figure 4. Connection diagram for HD2021T... with current output

HD2021T6

The HD 2021T6 probe allows converting a photometric quantity such as Luminance (cd/m^2) into a current (4-20 mA) or voltage (0-10 V) signal according to the version. If the acquisition station is far from the probe ($>50\text{m}$), the current version is required.

The protection class of the HD2021T6 transmitter is IP67. To ensure correct measurements, the outer surface of the lens must be kept clean. If necessary, clean the lens with water and lens cleaning paper.

The transmitter sensitivity can be chosen from three previously set values when placing the order: $2 \text{ kcd}/\text{m}^2$, $20 \text{ kcd}/\text{m}^2$ or $200 \text{ kcd}/\text{m}^2$. For orders of more than 5 pieces the full scale can be customized.

The probe is used for road lighting control. In particular, the measurement of luminance at a 20 degree angle (L_{20}) is necessary to estimate *threshold luminance* at a tunnel entrance (CIE standard 88:2004. This standard foresees the measurement of equivalent veiling luminance in future).

Besides, the probe can be used for calculating vertical illuminance (E_v) as prescribed in the above-mentioned standard.

Finally, the probe can be used for any application where the measurement of luminance is required, for example projector screens, diaphanoscopes etc..

INSTRUMENT TECHNICAL SPECIFICATIONS

Dimensions

(Length x Width x Height) 145mm x 58 mm x 65mm

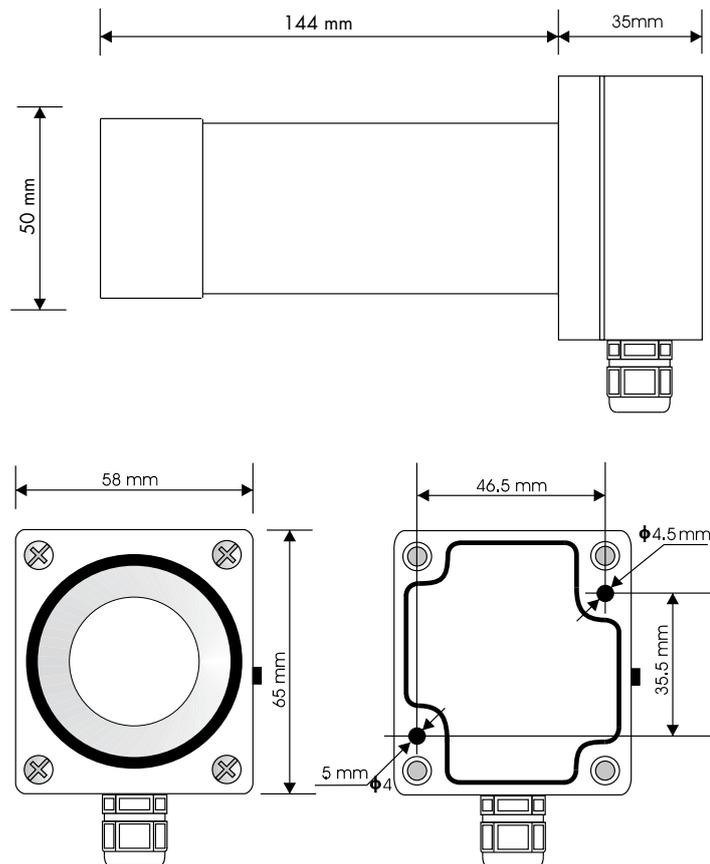


Figure 1. HD2021T6 probe dimensions

SPECTRAL RESPONSE

The probe is fitted with a silicon photodiode and a set of filters to match the spectral response curve to that of the human eye (photopic response). Figure 2 shows the relative spectral response depending on wavelength.

$f'1 < 9\%$ in accordance with the standard photopic curve $V(\lambda)$.

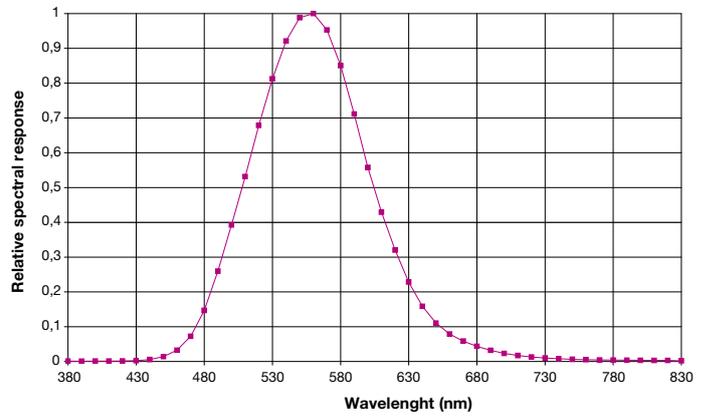


Figure 2. HD2021T6 probe relative spectral response

FIELD OF VIEW

The total field of view of HD2021T6 probe is 20° .

WORKING TEMPERATURE

The probe can work in the temperature range -20° to $+60^\circ \text{C}$.

If the probe is placed inside watertight containers, you should prevent the window from misting up or being covered with condensation. In this case, the equivalent veiling luminance reading would be altered.

CALIBRATION

The HD2021T6 probe is calibrated by measuring luminance on the output port of an integrating sphere with a known luminance. The probe calibration uncertainty with fixed full scale is 5%, if demanded (95% confidence level).

TRANSMITTER INSTALLATION

To measure Threshold luminance at a tunnel entrance, the probe must be installed in compliance with CIE standard 88:2004.

To connect the transmitter, unscrew the lid which covers the terminal board. Figure 4 refers to the 4-20mA version, while figure 5 of HD2021T7, page 188 relates to the 0-1V version.

PURCHASING CODES:

Model	Output	Measurement range	Power supply	Spectral Response
HD2021T6A.V	0-10 V	0-2000 cd/m^2	16-40 Vac/dc	$V(\lambda)$
HD2021T6B.V		0-20 kcd/m^2		
HD2021T6C.V		0-200 kcd/m^2		
HD2021T6X.V		On request *		
HD2021T6A.A	4-20 mA	0-2000 cd/m^2		
HD2021T6B.A		0-20 kcd/m^2		
HD2021T6C.A		0-200 kcd/m^2		
HD2021T6X.A		On request *		

*minimum order 5 pieces