Special External Detectors

How to use the detectors

The Hagner Universal Photometer is supplied with a standard external detector (a light sensitive silicone diode) for the measurement of illuminance. This detector is cosine corrected and filtered to the spectral response of the average human eye (CIE standard observer). The current generated by the detector differs from other detectors in accordance with its own particular geometrical and electrical qualities. A reference figure is printed on the metal rim of each detector showing the detector's sensitivity in pA/lux (i.e., the current generated when the surface of the detector is subjected to an illuminance of 1 lux). The Hagner Universal Photometer is calibrated directly to this detector and, for normal operation of the meter, the pA/lux reference figure may be ignored.

However, when using any of the special external detectors the pA/lux reference figure of the standard external detector supplied with the photometer should be noted and used in conjunction with the pA/unit or mA/unit reference shown on the special detector being used (e.g. pA/lux or mA/W/m²). This may be described as follows:

The standard external detector has an Absolute Sensitivity of α pA/lux. The standard detector is then replaced with a special detector on which is printed the Absolute Sensitivity of β pA/unit. The reading obtained with this special detector is γ . Correct measurement is:

$$\frac{\alpha}{\beta} \times \gamma = \text{Correct measured value}$$

Here are two typical examples: Suppose the standard external detector supplied with a particular Hagner photometer has an Absolute Sensitivity of 70.2 pA/lux. A very low level of illuminance requires to be measured beyond the range of the standard detector. The latter may then be replaced with an extra sensitive detector, filtered to the CIE spectral response and showing an Absolute Sensitivity of say 950 pA/lux.

The extra sensitive detector is exposed to the low light level requiring measurement and the reading obtained is 15 x 0.01 = 0.15.

$$\text{Correct measurement is thus } \frac{70.2}{950} \times 0.15 = 0.011 \text{ lux.}$$

For the second example, in a different situation but using the same Hagner Photometer, the requirement is to measure the variations of luminance of an exceptionally small bright surface - an X-ray image converter screen, for instance. Here the fiber optic lightguide detector would be used and this detector might show an Absolute Sensitivity of 33 pA/cd/m². On a particular spot of the bright surface the reading obtained is 1.4 x 10 = 14.

$$\text{Correct measurement is thus } \frac{70.2}{33} \times 14 = 29.8 \text{ cd/m}^2.$$

It should be noted that the lightguide detector measures luminance whereas the standard detector measures illuminance. Despite of this, when using any External Detector the Luminance/Illuminance switch on the Photometer must always be switched to illuminance.

To facilitate easy and rapid measurements to be made with any of the special external detectors, the operator is advised to calculate the respective conversion factor in advance. In the first example given above the conversion factor is

$$\frac{70.2}{950} = 0.074$$

This would be the correction factor for each reading.

It should be noted that the models S2 and S3 Hagner Universal Photometer has an output terminal for connection to an external volt meter. The signal from the output is adjustable and it is therefore a simple matter when using any of the special detectors to adjust the volt meter to direct true readings.

Model E4-X

The information given above is also valid for Hagner Digital Luxmeter, model E4-X, except that the E4-X is supplied with a SD15 as standard detector.

Special external detectors

A range of Supplementary Special External Detectors for use with the Models S2 and S3 Hagner Universal Photometer and Models E2X and E4-X Hagner Digital Luxmeter is available when measurements are required beyond the range and sensitivity of the Standard External Detector supplied with each meter. Items currently available from the range are listed below but new detectors are being additionally developed.

Item No.	Type	Order of absolute sensitivity	Spectral response
SD1	Standard detektor for S2 Cosine corrected	10 pA/lux	V_λ
SD2	Standard for E2X Cosine corrected	120 pA/lux	V_λ
SD3	Extra sensitive Non cosine corrected	1000 pA/lux	V_λ
SD4	Non filtered and non cosine corrected	----	375-1100 nm (Silicon)
SD6	Light guide detector 500 mm length fiber optic tube. Ø = 1 mm	10 pA/cd/m²	V_λ
SD7	I R-detector Type N, cosine corr. Type ES, non cosine corrected	 2 nA/W/m² 3000 nA/W/m²	 700-1150 nm 700-1150 nm
SD8-A	UV-A detector	120 nA/W/m²	315-385 nm
SD8-B	UV-B detector	100 nA/W/m²	265-370 nm (UV-B = 280-315)
SD8-C	UV-C detector	35 nA/W/m²	253,7 nm
SD9	Phototherapy detector (Bilirubin)	20 nA/W/m²	400-500 nm
SD10	Hemi-spherical detector	150 pA/lux_{sf}	V_λ
SD11	Hemi-cylindrical detector	100 pA/lux_{cyl}	V_λ
SD14	Light guide detector		350-1000 nm

The detectors SDI to SD4, inclusive, can be supplied in a watertight submersible case (WP-case) for taking measurements in very wet or soiled environments. The case cannot be supplied separately since the detector must be assembled at the factory.

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