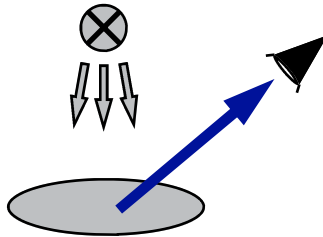


## Luminance &amp; Radiance

**Radiance L** is described as the intensity of optical radiation from an irradiated or irradiating surface in a particular direction measured with a specified solid angle.

The units of radiance are  $W/(m^2 \cdot sr)$ . Light detectors with a defined angle of view are used to measure radiance.



**Luminance L** is described as the measurable photometric brightness of an illuminated or illuminating surface. In many cases luminance describes the quality of illumination much better than illuminance. The units of luminance are candela per unit area ( $cd/m^2$ ) or nit and foot-lamberts (fL). Detector heads

with a defined angle of view are used to measure luminance so that a small area within a larger uniform field is sampled.

$$\begin{aligned} cd/m^2 &= nit = lm/(m^2 \cdot sr) \\ fL &= lm/(ft^2 \cdot sr) \\ 1 cd/m^2 &= 2.919 \times 10^{-1} fL \end{aligned}$$

## LDM-9810 &amp; LDM-9811: Luminance &amp; Radiance Detectors

LDM-9810 and LDM-9811 are modularly designed viewer modules that are combined with PD-16 detectors to form luminance and radiance measurement heads offering flexible spot size diameter selection. Both units are built with stable aluminium housings to ensure precise measurement in laboratory or field use.

The unit's wide aperture focusing objective is achromatically corrected, and satisfies the tightest requirements for the suppression of stray light and image formation.

Both viewer modules offer three selectable fields of view:

- **LDM-9810:**  
20', 1° and 6°
- **LDM-9811:**  
1.7, 11 and 100 mrad

A f.o.v. selector knob is located on the rear of the device. The resultant size measurement spot is visible through the ocular viewfinder. In combination with the cross-hair targeting aid alignment of the LDM-98 to the zone of interest is simple.

Focussing is achieved by adjusting the sharpness of the image on the viewfinder screen.

The useable measurement distance of the LDM-98 spans from 0.3m to ∞. The area of the measured surface depends on the distance to the target and on the angle chosen for the field of

view.

**Photometric and Radiometric detectors** from the PD-16 series combine with the LDM-9810 and LDM-9811 viewing module to set up a luminance or radiance measurement device.

## Luminance Measurement:

The **PD-16VL01** photometric detector has been adapted with great care to the ideal  $V(\lambda)$  function, and in combination with the LDM-98 meets the DIN class A specification for the adaptation error of  $f_1$ , less than or equal to 3%. Typical applications of the luminance detector LDM-98/PD-16VL01 include photometric brightness measurement of:

- Luminous surfaces such as monitor screens, alphanumeric displays, information signs, emergency lighting and illuminated control panels
- Reflecting surfaces such as walls and workplace equipment, projection screens, traffic and information signs, roadways and roller tracks
- Light emission in accordance with Federal Emissions Statutes
- Fluorescent pigments with long afterglow decay
- In lighting design stage of workplace and office design

## Radiance Measurement:

The **PD-16RW05** radiometric detectors with spectral sensitivity within the wavelength range from 400 to 1000 nm are the right choice for radiance measurement in the visible and near infrared wavelength region.

## Light Hazard Protection:

The quantity used for determination of blue light hazard and retinal thermal hazard to the human eye is radiance, measured in the radiometric unit of  $W/m^2 \cdot sr$ .

Three different spectral response functions are typically used for light hazard protection radiance measurements:

- **Blue-light Hazard**  
(400-520 nm)
- **Retinal Thermal Hazard**  
(520-1400 nm)
- **Retinal Thermal Hazard IR-A**  
(780-1400 nm)

Gigahertz-Optik offers three different PD-16 detectors to be combined with the **LDM-9811** viewer module for this application.

- **PD-16BLH:**  
Blue light hazard detector
- **PD-16RTH:** Retinal thermal hazard detector
- **PD-16RTHA:** Retinal thermal hazard IR-A detector

## Optional Accessories:

The **LDM-98NL** narrow lens provides a variable 1:1 to 2:1 near field magnification for measurement of spot diameters down to 0.1 mm.

The **LDM-98FC** enables coupling a flexible **fibre bundle** instead of a PD-16 detector to the LDM-98 to allow connection and use with spectral radiometers.

The **BHO-01** hard carrying case holds the LDM-98/PD16 with P-



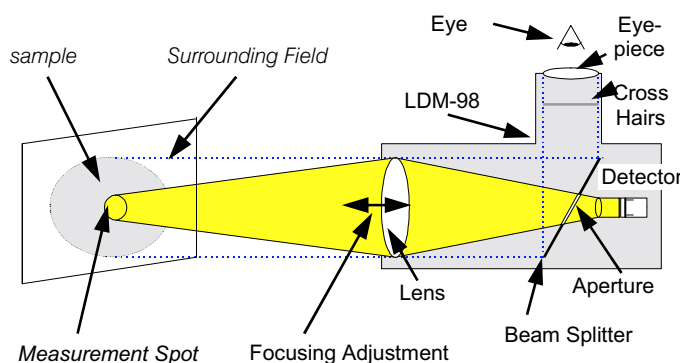
9710 optometer for mobile applications.

## Calibration in Light Measurement Units:

Calibration of the detector is carried out by Gigahertz-Optik's Calibration Laboratory for Optical Radiation Quantities, traceable to international standards.

Calibration in the units related to the selected PD-16 detector is supplied for each viewing angle with and without optional narrow lens.

For best handling of the multiple calibration factors the P-9710 and P-2000 optometers are recommended for use with the LDM-98/PD16 luminance and radiance detector heads outfitted with (-2) programmable data connectors.

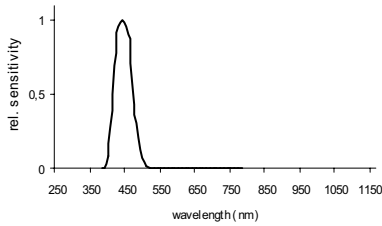


PD-16 Light Detector

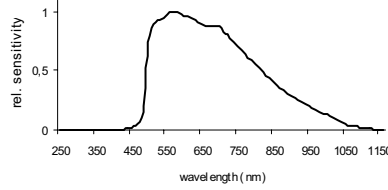


## Luminance & Radiance

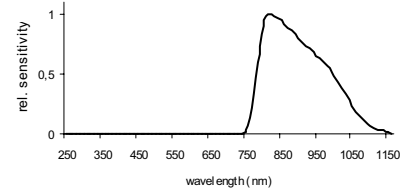
### LDM-9810 & LDM-9811: Luminance & Radiance Detectors



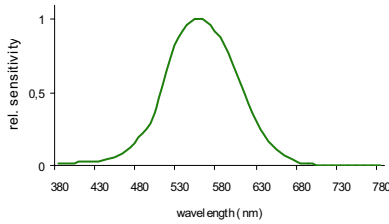
PD-16BLH



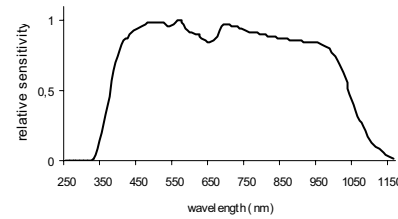
PD-16RTH



PD-16RTHA



PD-16VL01



PD-16RW05



#### Measurement Spot Diameters (mm)

F.O.V. Distance	LDM-9810			LDM-9811		
	6°	1°	20'	100 mrad	11 mrad	1.7 mrad
0.3 m	21	3.5	1.2	19.9	2.2	0.4
0.5 m	41.9	7	2.3	39.8	4.4	0.8
1 m	94.3	15.8	5.2	89.6	9.9	1.8
2 m	199	33.2	11	189.2	20.9	3.8
10 m	1037	173	57	986	109	19.8
With LDM-98NL Narrow Lens (Optional)						
100 mm / f=∞	10.5	1.8	0.6	10	1.1	0.2
75 mm / f=0.3m	5.2	0.9	0.3	5	0.6	0.1

#### Ordering Information & typical Specifications

Model	$\lambda_{\text{resp}}$	Wavelength Range	f1	Typical Sensitivity			I <sub>max</sub>	Sensing Area	cable	Operation	plug	package
			≤ %	*) nA/cd*m² or **) nA/W/m²sr			mA	Lens	m	Temp.		page
LDM-9810				20'	1°	6°		50 mm Ø		5-40°C		92
PD-16VL01	V(λ)	380-400	3	0.0035 *)	0.033 *)	0.9 *)	1	5.8 x 5.8	2	5-40°C	1,2,4	92
LDM-9811				1.7 mrad	11 mrad	100 mrad		50 mm Ø		5-40°C		92
PD-16BLH	BLH	400-520	-	0.2 **)	5.7 **)	380 **)	1	5.8 x 5.8	2	5-40°C	1,2,4	92
PD-16RTH	RTH	500-1200	-	0.3 **)	11 **)	780 **)	1	5.8 x 5.8	2	5-40°C	1,2,4	92
PD-16RTHA	RTHA	800-1200	-	0.2 **)	5 **)	360 **)	1	5.8 x 5.8	2	5-40°C	1,2,4	92
PD-16RW05	RW05	400-1000	-	0.38 **)	12 **)	840 **)	1	5.8 x 5.8	2	5-40°C	1,2,4	92
PD-16VL01	V(λ)	380-400	3	0.00004 *)	0.00015 *)	1.1 *)	1	5.8 x 5.8	2	5-40°C	1,2,4	92
LDM-98Z-NL	Narrow Lens for use with LDM-9810 and LDM-9811											
LDM-98Z-FC	Fiber Coupler to adapt flexible light guide bundles to the LDM-9810 and LDM-9811											
K-LDM98BLH	Calibration of effective BLH radiance sensitivity with <b>or</b> without LDM-98NL in A/W/m²*sr (at 3 f.o.v. angles). 1)											
K-LDM98RTH	Calibration of effective RTH radiance sensitivity with <b>or</b> without LDM-98NL in A/W/m²*sr (at 3 viewing angles). 1)											
K-LDM98RTHA	Calibration of effective RTHA radiance sensitivity with <b>or</b> without LDM-98NL in A/W/m²*sr (at 3 viewing angles). 1)											
K-LDM98RW05	Calibration of 400-1000 nm radiance sensitivity with <b>or</b> without LDM-98NL in A/W/m²*sr (at 3 viewing angles). 1)											
K-LDM98VL01	Calibration of luminance sensitivity with <b>or</b> without LDM-98NL in A/cd/m² (at 3 viewing angles). 1)											
K-LDM98NL	Additional calibration of luminance or radiance sensitivity for LDM-98 with LDM-98NL narrow lens											
KDW-S	Calibration of spectral sensitivity at one or multiple wavelengths without or in combination with accessory components											

1) Includes K-SR with new detector order