

- Measurement of solar irradiance
- Specifications to ISO 9060 and WMO standards
- MS-802 - ISO 9060 Secondary Standard

Description

EKO MS-series pyranometers comply with the ISO 9060 and WMO standards and are very reliable. The MS-802 highest class ISO Secondary Standard is used for the most demanding applications in PV, Meteorology, field research and solar radiation monitoring of global, tilted and diffuse irradiance.

Those are all thermopile type pyranometers which have a 180 degree field-of-view for measuring the hemispheric solar radiation with a cosine-weighting function. Depending on the model either one or two transparent glass domes protect the sensor efficiently from thermal effects.



Measurement Principle



MS-802 - ISO 9060 "Secondary Standard"

Thermopile, which has a flat spectral response at all wavelengths, is integrated as a sensor. Thermopiles generate electricity by thermo-electric effect, which is caused by the temperature difference between hot and cold junctions. Solar irradiance is obtained by measuring voltage from the thermopile sensor.

Glass dome to reject infrared radiation of wavelength above 3µm is necessary for thermopile-type sensors. Otherwise, these sensors would detect all infrared radiation as well as solar radiation. Double-dome construction is designed to eliminate secondary thermal radiation effects caused by cooling of the outer dome.



MS-410 - ISO 9060 "First Class"

The MS-410 is perfectly suited for sampling 10-minute averages of the solar radiative flux in horizontal or tilted configurations. The flat sensor surface, coated with a special, highly absorbing black paint, is protected by two transparent hemispheric glass domes.

MS-410 has a 180° field-of-view for measuring the hemispheric solar radiation with a cosine-weighting function. The two transparent glass domes protect the sensor efficiently from negative thermal effects. MS-410 has a practical light-weight anodized aluminium housing and a highly efficient sensor coating.



MS-602 - ISO 9060 "Second Class"

MS-602 detector consists of a special polymer film with the advantage of having very small temperature response and long-term durability. Thermopile detects temperature difference between the center- and the peripherally mounted hot and cold junctions, respectively. Hot and cold junctions are positioned radially. Detector is coated by special black paint, which has independent wavelength.

Calculation of Irradiance

$$E = U / S$$

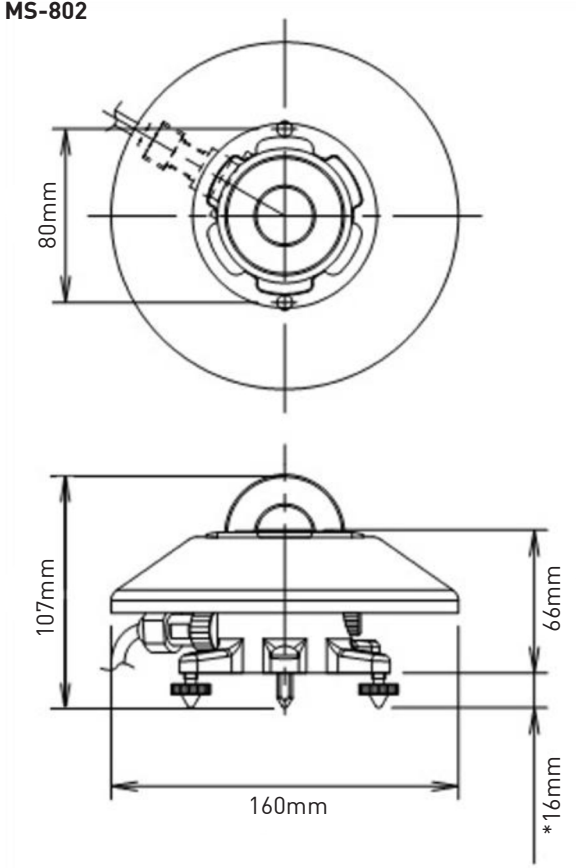
E [W/m²] = Irradiance

U [µV] = Output Voltage

S [µV/W/m²] = Sensitivity

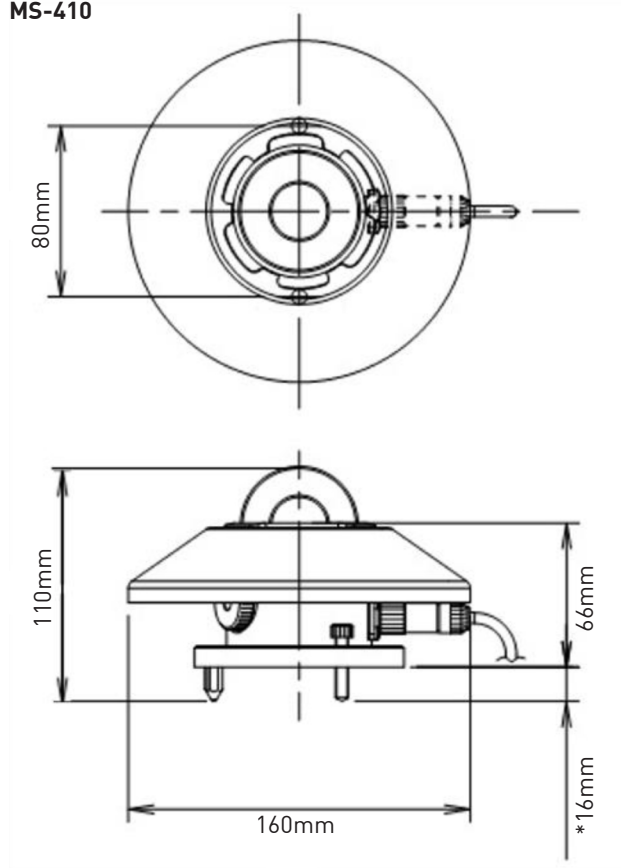
Schematic

MS-802



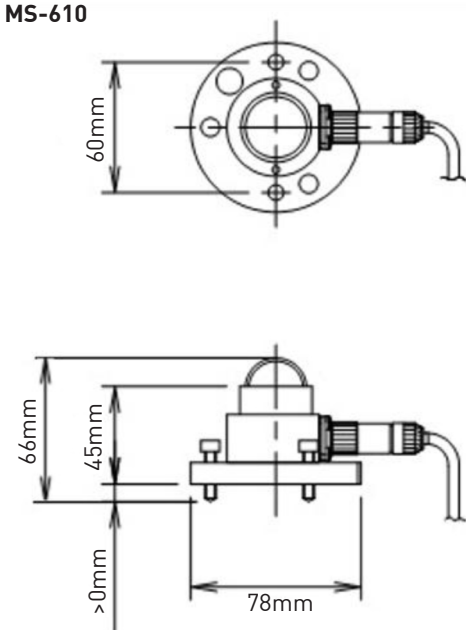
*Length of fixed leg is indicated

MS-410



*Length of fixed leg is indicated

MS-610





Specifications

	Pyranometer MS-802	Pyranometer MS-410	Pyranometer MS-602
Order No.	S64120	S64130	S64110
Classification	ISO 9060 Secondary Standard	ISO 9060 First Class	ISO 9060 Second Class
Sensitivity	~ 7 $\mu\text{V}/\text{W}/\text{m}^2$ (see calibration protocol)	~ 7 $\mu\text{V}/\text{W}/\text{m}^2$ (see calibration protocol)	~ 7 $\mu\text{V}/\text{W}/\text{m}^2$ (see calibration protocol)
Spectral range (50% points)	285 ... 2800 nm	285 ... 2800 nm	285 ... 2800 nm
Max. irradiance	2000 W/m^2	2000 W/m^2	2000 W/m^2
Typical signal output for atmospheric applications	0 ... 10 mV	0 ... 10 mV	0 ... 10 mV
Response time (95%)	<5s	<18s	<17s
Zero offset (a) thermal radiation (200 W/m^2) (b) temperature change (5k/hr)	+6 W/m^2 <2 W/m^2	+6 W/m^2 <2 W/m^2	+10 W/m^2 <6 W/m^2
Non-linearity (0 ... 1000 W/m^2)	<0.2%	<1%	<1.5%
Temperature dependence of sensitivity (-10 ... +40 °C)	$\pm 1\%$	$\pm 2\%$	$\pm 2\%$
Operating temperature	-40 ... +80 °C	-40 ... +80 °C	-40 ... +80 °C
Cable length	10m	10m	10m

Delivery includes calibration certificate.

Sensor Connection

MS-802

Sensor	Plug PIN No.	Wire Colour (EKO)	Meteo-40 Analog Voltage
Solar irradiance	1	white (+)	Ax
Output voltage	2	black (-)	Bx
		shield	Main Ground (GND)

MS-410 / MS-602

Sensor	Plug M12 PIN No.	Wire Colour (EKO)	Meteo-40 Analog Voltage
Solar irradiance	1	white (+)	Ax
Output voltage	2	black (-)	Bx
	3	not connected	not connected
	4	not connected	not connected
		shield	Main Ground (GND)