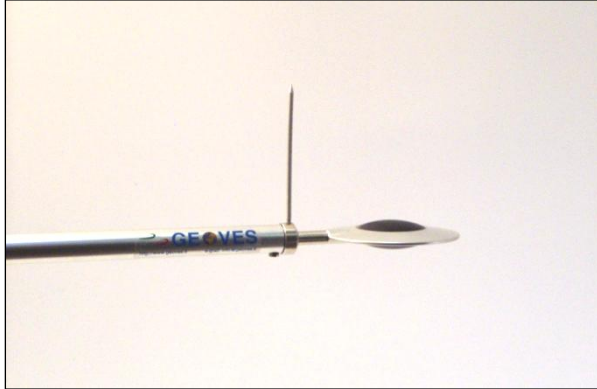


NSR – Net radiometer

(Rev.2 011016)



Description

NSR measures the net radiation between a surface, from the near ultraviolet to the far infrared. The net radiation is the difference from the irradiance that arrives on the upper surface and the irradiance on the lower surface of the instrument.

From one side the upper receiving surface measures the direct and diffuse solar irradiance and the irradiance with long wavelength emitted from the sky (clouds); to the other side the lower receiving surface measures the solar radiation reflected from the soil (Albedo) and the irradiance with long wavelength emitted from the earth.

The sensor is available with 0...5Vdc and 4...20 mA (two wires link) outputs.

Measuring principle

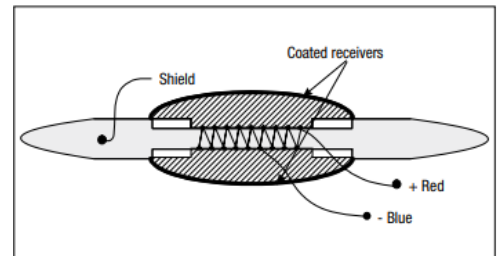
The NSR net-radiometer measuring principle is based on a thermopile sensor where his own hot junctions are in thermic touch with the upper receiver and, to the opposite side, the cold junctions are in thermic contact with the lower receiver. The difference of temperature from the two receivers is proportional to the net solar irradiance. The temperature difference from the hot junction and the cold one is converted in a Potential Difference thanks to the Seebeck effect. The two receivers consist of a portion of spherical dome covered by teflon®. The particular shape of two receivers ensures a response based on to the cosine optimal law. The teflon® coating as well as allowing outdoor installation for long periods without risk or damage, can have a constant spectral response from ultraviolet (200nm) up to the far infrared (100µm).

Advantages

- ✓ **Excellent value for money**
- ✓ **Long life span, reliability and minimum maintenance**
- ✓ **Weather resistant**

Main applications

- ✓ Environmental monitoring
- ✓ Meteorology
- ✓ Radiant temperature measurements (ISO7726).
- ✓ Agriculture
- ✓ Evapotranspiration measurements (FAO-WMO Penman Monteith method)



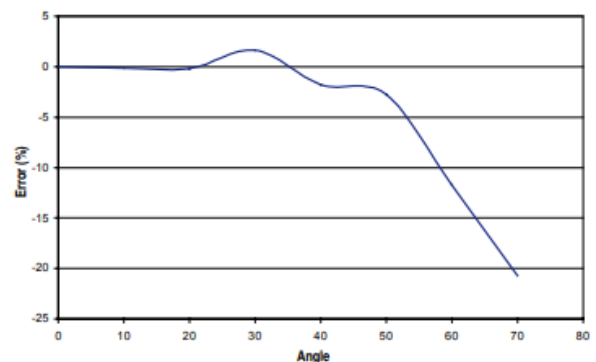
Cosine response/Directional error:

The radiation falling on a surface should be measured with a sensor, whose response related to the light incidence angle, has to be a Lambertian Response. A receiver is known as Lambertian when its sensibility ($S\theta$), related to the incidence angle between the light and the detector surface, has the following behavior:

$$S\theta = S_0 \cos(\theta)$$

Where:

- S_0 is the sensitivity when light strikes perpendicular to the surface
- θ is the angle between the incident light beam and the line which is normal to the surface.

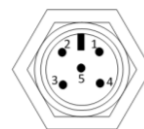


Technical features

Model	NSR
Typical measurement range	$\pm 2.000 \text{ W/m}^2$ (other range on request)
Spectral range	0,2...100 μm
Typical Sensitivity	10 $\mu\text{V}/(\text{W/m}^2)$
Cosine response error	$< \pm 1,5\%$ average (up to 50°)
Response time (95%)	$< 75\text{s}$
Transducer	Thermopile
Output and Power supply	Vers. -V: 0...5Vdc. Power supply: 9...24Vdc $\pm 10\%$ Vers. -I: 4...20mA. Power supply: 9...24Vdc $\pm 10\%$
Working Temperature	-40...+80°C
Housing	Anodized Aluminium, teflon and stainless steel screws
Dimensions and weight	650 x 80 x 120 mm (universal bracket cod. STF-UNI included), 500g

Layout of wiring

Radiometer version	-I (outdoor amplifier cod.CmV/I)	-V (outdoor amplifier cod.CmV/V)
Output	4...20mA (4mA: -2000 W/m^2 ; 20mA: +2000 W/m^2)	0...5Vdc (0Vdc: -2000 W/m^2 ; 5Vdc: +2000 W/m^2)
Resistance shunt load	25...440 Ω (tip.100 Ω)	25...440 Ω (tip.100 Ω)
IP68 Connector on the sensor	Pin1: +Vdc; Pin2: Out+ signal; Pin3: Gnd Pin4: Pin5:	



Installation and mounting

Application	Installation height	Orienting and Localization
Meteorology (ref. Annex 8 - WMO)	1,5...2m above the ground	<p>Above a 5cm cut grassy surface, South oriented. The instrument must be mounted about 1.5-2m height from the ground.</p> <p>It must be taken into account that the flow on the lower receiver is representative of a circular surface with a radius of 10 times the height. When mounting the net-radiometer, avoid, as far as possible, touching the receiving surfaces of the net-radiometer.</p> <p>In order to facilitate the installation of the radiometer, the sensor is always equipped with the universal bracket cod. STF-UNI (see figure to the side) which allows mounting on vertical and horizontal poles ($\varnothing 25 \dots 43\text{mm}$)</p>



STF-UNI

Maintenance

In order to guarantee the characteristics of the instrument it is necessary that the two receiving surfaces are clean, therefore the greater the frequency of cleaning of the instrument the better the precision of the measurements will be. Cleaning can be performed with normal maps for cleaning photographic objectives and with water, if it were not enough to use pure ethyl alcohol. After cleaning with alcohol it is necessary to clean the domes again with water only.