

NR01 4-component net radiometer

NR01 is a market leading 4-component net radiation sensor, mostly used in scientific-grade energy balance and surface flux studies. It offers 4 separate measurements of solar and longwave radiation, facing both up and down. NR01 owes its popularity to its excellent price / performance ratio and major improvements relative to comparable instruments. These advantages include weight, ease of levelling, solar offsets in the longwave measurement and pyrgeometer heating, reducing measurement errors caused by dew deposition.



Figure 1 *NR01* 4-component net radiometer, including two pyranometers, two pyrgeometers, heater and 2-axis levelling assembly (mounting tube not included)



Figure 2 NR01 4-component net radiometer in use in a meteorological station

Introduction

NR01 measures the 4 separate components of the surface radiation balance: downward and upward solar and longwave radiation. The solar radiation sensors are called pyranometers and the longwave sensors are called pyrgeometers. NR01 offers the separate measurands from which net radiation is derived. For calculation of skyand surface temperatures, it is necessary to compensate for irradiated heat by the pyrgeometers themselves (Stefan-Boltzmann law). A Pt100 temperature sensor is included in NR01's body for that purpose.

NR01 benefits

In order to prevent condensation of water on the pyrgeometer windows the NR01 has internal heating close to the pyrgeometers. This keeps the instrument above dew point. As water blocks longwave radiation, heating will improve the reliability of longwave radiation measurement, in particular at night, when the risk of condensation is highest. NR01 has reduced solar offsets in longwave radiation measurement. NR01 net radiometer is practical to mount; it is much lighter than competing models and a 2-axis levelling assembly is included. Features like these have made NR01 net radiometers popular in energy balance and surface flux studies.

Operation

Using NR01 net radiometer is easy. It can be connected directly to commonly used data logging systems. The irradiance levels in W/m² are calculated by dividing the NR01 outputs, small voltages, by the sensitivities. The longwave irradiance should be corrected using the instrument body temperature. The sensitivities of all sensors are provided with NR01 on its product certificate.



NR01 design

NR01 net radiometer has a modular design: it is possible to take the instrument apart and replace or re-calibrate individual sensors. For this reason it is often selected for use in large monitoring networks.



Figure 3 NR01 4-component net radiometer



Figure 4 overview of NR01:

(1) upfacing pyrgeometer, (2) sun screens, (3,4,7) levelling assembly for x- and y-axis, (5) upfacing pyranometer, (6) downfacing pyranometer, (8) downfacing pyrgeometer

Suggested use

- energy balance studies
- surface flux measurements
- climatological networks

See also

- RA01 radiometer, a single side version of NR01. Combined with estimates of albedo and surface temperature, this instrument can also be used for estimation of net radiation
- stand-alone pyranometer: LP02
- stand-alone pyrgeometer: IR02
- view our complete product range of solar sensors

NR01 specifications

Measurand	net radiation
Measurand	hemispherical solar
	radiation
Measurand	reflected solar radiation
Measurand	downward longwave
	radiation*
Measurand	upward longwave
	radiation*
Optional measurand	surface temperature*
Optional measurand	sky temperature*
Optional measurand	albedo or solar
	reflectance
Required readout	4 x DC voltage,
	1 x Pt100
Calibration traceability	to WRR
solar	
Calibration traceability	to WISG
ongwave	
Spectral range solar	285 to 3000 x 10 ⁻⁹ m
Spectral range longwave	4.5 to 40 x 10 ⁻⁶ m
Rated operating temperature	-40 to +80 °C
ange	
Temperature sensor	Pt100
Heater	12 VDC, 1.5 W
Standard cable length	5 m (see options)
* Required measurand	instrument body
	temperature

Options

• longer cable, in multiples of 5 m

Standards

Applicable instrument-classification standards are ISO 9060 and WMO-No. 8; Guide to Meteorological Instruments and Methods of Observation.

About Hukseflux

Hukseflux Thermal Sensors, founded in 1993, aims to advance thermal measurement. We offer a complete range of sensors and systems for measuring heat flux, solar radiation and thermal conductivity. We also provide consultancy and services such as performing measurements and designing instrumentation according to customer requirements. Customers are served through the main office in Delft in the Netherlands, and locally owned representations in the USA, China and Japan.

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