KIPP & ZONEN
SINCE 1830



Net Radiometers

FOR MEASUREMENT OF THE ENERGY BALANCE

One-component and four-component instruments
Reliable all-weather performance
Light weight and robust
Unique ventilation system

Introduction

Net radiation is the balance between incoming radiation from the sun and sky and outgoing radiation from the ground. Short-wave radiation of 0.3 to 3 µm wavelength reaches the Earth's surface, where some is reflected and the rest of the energy is absorbed by the surface. Incoming long-wave Far Infrared (FIR) radiation from 4.5 to more than 40 µm is also absorbed by the surface, which heats up and emits FIR back to the sky.

The four components of net radiation are the incoming and reflected solar radiation, from which the Albedo can be calculated; and the downward and upward infrared radiation. These parameters can be measured using a pair of pyranometers and a pair of pyrgeometers, but more commonly a net radiometer is used that conveniently combines four sensors into one compact instrument.

The simplest type of net radiometer uses a single sensor to measure the sum of the four net radiation components. This type of instrument is sometimes referred to as a net pyrradiometer.

Applications

The main applications for net radiometers are in agro-meteorology, in particular for the study of evapo-transpiration and in climatology, meteorology and hydrology for the measurement of the radiation balance. Monitoring over glaciers and ice fields is of particular interest to global warming studies. Net radiometers are often used in conjunction with a small automatic weather station and need to be easily portable.

Choice of Net Radiometer

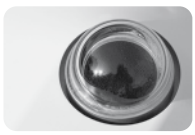
Kipp & Zonen offers a range of robust, lightweight, net radiometers that do not require power to operate. A mounting rod, bubble level and calibration certificate are always included.

NR Lite2 has a single output for total net radiation. CNR 4 measures all four components separately. Whatever the application, Kipp & Zonen can supply a suitable net radiometer.

NR Lite2 is a single-component net radiometer widely used in agriculture and hydrology. The thermopile detector is fitted with a black conical absorber on each side that has a very wide spectral response from the Ultraviolet (UV) to the far infrared (FIR). The black surface is protected by an environmentally resistant anti-stick coating. The signal output is the difference between the sun and sky radiation and the ground radiation and can be positive or negative, depending upon the conditions.

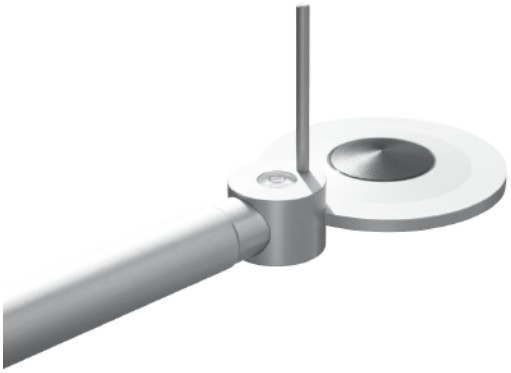
There is an integral mounting rod for fitting to masts and poles, a bubble level, 15 m long signal cable, and a stick to prevent birds settling on the instrument. The single output means that the short-wave and long-wave components and the upwards and downwards components cannot be separated. For this, use our four-component CNR 4 net radiometer.





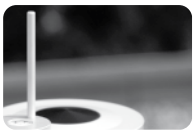






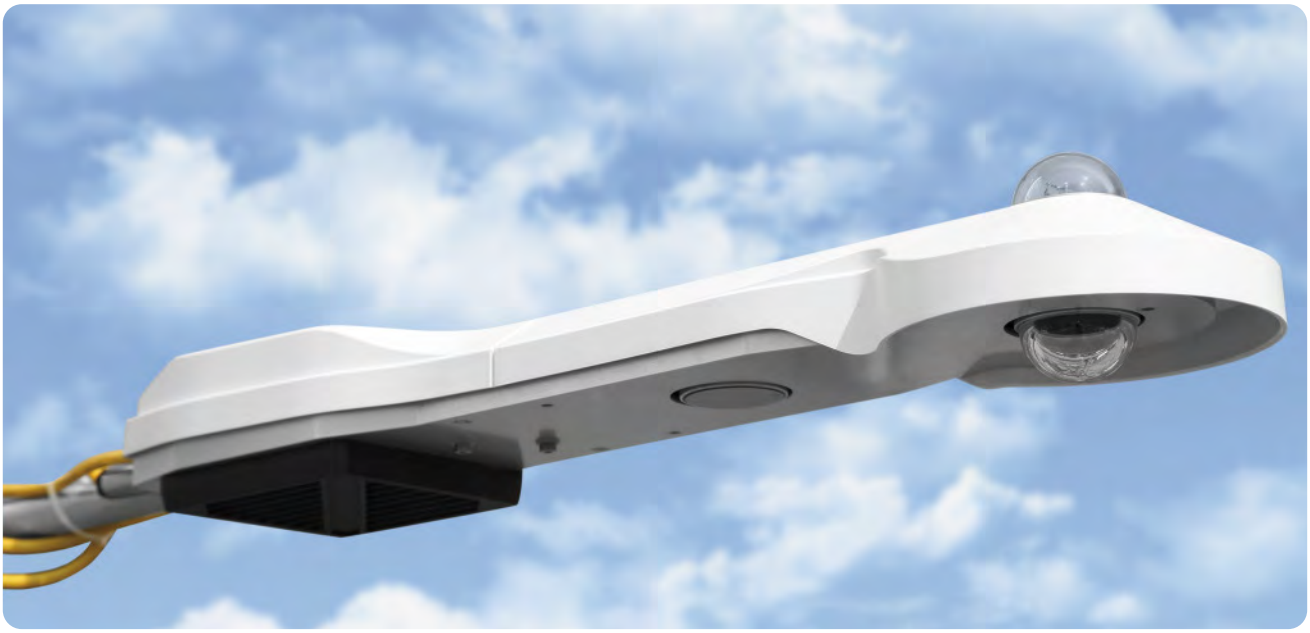






CNR 4 is a four-component net radiometer for accurate and reliable measurements and can be used as the reference instrument for a network of lower performance net radiometers. There are four separate signal outputs and the integrated temperature sensors can be used to calculate the FIR radiation. The screw-in mounting rod, bubble level, and cables with waterproof connectors, make installation easy. The white sun shield reduces solar heating of the instrument body.

CNR 4 combines two ISO 9060 Second Class pyranometers for solar radiation with two pyrgeometers for infrared measurements, all integrated into the instrument body. The upper pyrgeometer has a silicon meniscus dome so that water rolls off and the field of view is 180 °. The design is very light weight and includes a mounting rod as standard. An optional heated ventilation unit, the CNF 4, is available to minimise offsets, maximize stability and remove precipitation.



Accessories

CNF 4 Ventilation Unit

The Kipp & Zonen CNR 4 net radiometer is produced as the standard instrument or with an integrated ventilation unit and heater. The CNF 4 ventilation unit can also be bought as a kit for retro-fitting to a CNR 4 that was purchased without it.

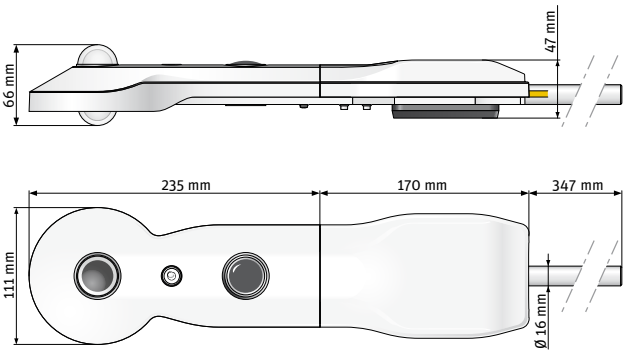
CNF 4 provides a clean air flow over all four of the CNR 4 radiometer domes and windows and is designed to operate under all weather conditions. The only part that needs maintenance is the air inlet filter, which should be checked at regular intervals and cleaned or replaced when necessary.

The integrated 10 W heating can be switched on by the operator when required. This raises the temperature of the domes and windows slightly above ambient to prevent the formation of dew and frost and to disperse precipitation. The ventilation fan and heater run from 12 VDC and can be operated by the accessory CVP 2 universal AC-DC power adaptor.

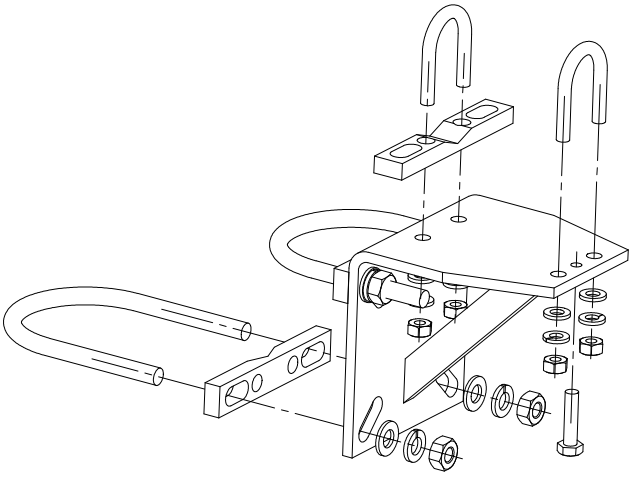
CMB 1 Mounting Bracket

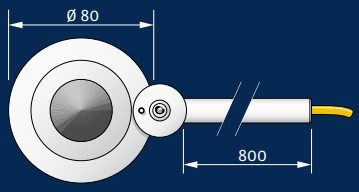
For attaching mounting rods of 12 to 20 mm diameter to poles, masts or walls. The radiometer can be levelled by rotating and tilting the rod. The bracket includes u-bolts for fixing to poles and masts from 22 to 60 mm diameter.

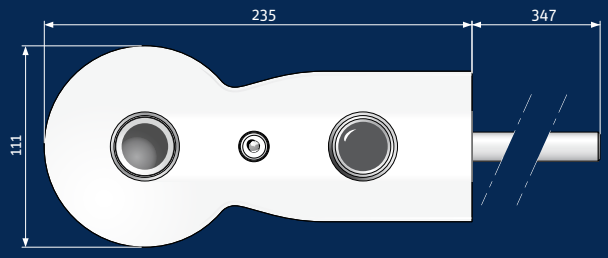




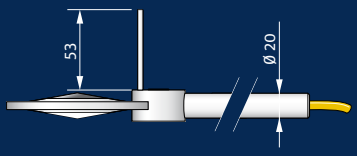
Specifications CNF 4	
Ventilator fan power	5 W continuously
Heater power	10 W
Operating temperature	-40 °C to +70 °C
Cable voltage drop	0.07 V/m (with heater)
Power required	12 Volt DC, 1.3 A (with heater)
Weight	500 g



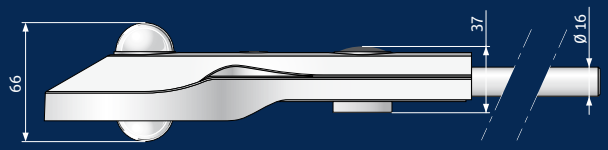




NR Lite2



CNR 4



All dimensions in mm

Specifications	NR Lite2	CNR 4
Number of signal outputs	1 - net total radiation	4 - incoming and reflected short-wave radiation downward and upward long-wave radiation
Pyrgeometer temperature sensors	N/A	10 K thermistor and Pt-100
Response time (95 %)	< 60 s	< 18 s
Non-linearity (over full range)	< 1 %	< 1 %
Temperature dependence of sensitivity	- 0.1 % / °C (typical)	< 5 % from -10 °C to +40 °C
Sensitivity	10 µV/W/m² (nominal)	7 to 20 µV/W/m² short-wave 5 to 10 µV/W/m² long-wave
Operating temperature	-40 °C to +80 °C	-40 °C to +80 °C
Spectral range (50 % points)	200 nm to 100 µm	300 to 2800 nm short-wave 4.5 to 42 µm long-wave
Field of view	180 ° upper and lower sensor	180 ° short-wave upper sensor 170 ° short-wave lower sensor 180 ° long-wave upper sensor 150 ° long-wave lower sensor
Mounting rod	Fixed, 800 mm long x 20 mm Ø	Screw-in, 350 mm long x 16 mm Ø
Standard cable	15 m fixed cable	10 m with connector
Cable lenght options	N/A	25 m, 50 m
Weight with rod (excluding cable(s))	490 g	850 g
Note: The performance specifications quoted are worst-case and/or maximum values		

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Go to www.kippzonen.com for your local distributor

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Kipp & Zonen B.V. reserve the right to alter specifications of the equipment described in this documentation without prior notice