



## Professional solution

Four-way, research-quality radiometer, with built-in thermistor and PT-100

### Overview

The CNR4\* is a research-grade net radiometer that measures the energy balance between incoming and outgoing radiation. Our

dataloggers measure the CNR4's output. This net radiometer offers a professional solution for scientific-grade energy balance studies.

### Benefits and Features

- › Research-grade performance
- › Meniscus dome on upper long-wave detector allows water droplets to easily roll off of it and increases field of view to nearly 180°
- › Internal temperature sensors provide temperature compensation of measurements
- › Drying cartridge helps keep the electronics dry
- › Compatible with the CNF4\* ventilation unit with heater that reduces formation of dew and melts frost
- › Separate outputs of short wave and long wave infrared radiation for better accuracy and more thorough quality assurance
- › Solar shield reduces thermal effects on the sensors
- › Compatible with our CR6, CR1000, CR3000, and CR5000 loggers

### Technical Description

The CNR4 consists of a pyranometer and pyrgeometer pair that faces upward and a complementary pair that faces downward. The pyranometers and pyrgeometers measure short-wave and long-wave infrared radiation, respectively.

The CNR4 contains both an internal thermistor and an internal PT-100 RTD. Typically, the thermistor makes the instrument housing temperature measurements used to compensate the infrared readings. The RTD also provides these measurements if a CR6, CR3000 or CR5000 datalogger is used.

\*The CNR4 and CNF4 are manufactured by Kipp and Zonen but cabled for use with Campbell Scientific dataloggers.

## Ventilator Unit with Heater

The CNF4, an optional ventilation unit with heater, fits onto the CNR4 Radiometer. It provides efficient air-flow over the radiometer's domes and windows, which minimizes the formation of dew and reduces the frequency of cleaning. The CNF4's integrated heater melts frost.

## Mounting

To avoid shading or reflections and to promote spatial averaging, the CNR4 should be mounted at least 1.5 m above the ground and away from obstructions. It can be attached to a vertical pipe or horizontal crossarm such as CM202, CM204 or CM206. To do this, first connect the radiometer to its mounting rod which then attaches to the pipe or crossarm via the 010759 Net Radiation Sensor Mounting Kit. The kit includes adjustment screws for levelling the CNR4.

## Specifications

- › Spectral Response  
Pyranometer: 305 to 2800 nm  
Pyrgeometer: 4.5 to 42  $\mu\text{m}$
- › Response Time: < 18 s
- › Temperature Dependence of Sensitivity: < 4% (-10° to +40°C)
- › Sensitivity Range: 5 to 20  $\mu\text{V W}^{-1} \text{m}^2$
- › Output Range (typical for atmospheric applications)  
Pyranometer: 0 to 15 mV  
Pyrgeometer:  $\pm 5$  mV
- › Non-Linearity: < 1%
- › Tilt Error: < 1%
- › Uncertainty in Daily Total (95% confidence level)  
Pyranometer: < 5%  
Pyrgeometer: < 10%
- › Linearity: 0.25%
- › Directional Error: < 20  $\text{W m}^{-2}$  (pyranometer); angles up to 80° with 1000  $\text{W/m}^2$  beam radiation

## Ordering Information

### Net Radiometer and Ventilation Unit

**CNR4** Kipp & Zonen Net Radiometer with 10 m cables as standard. Longer cables available in multiples of 5 m. Must choose a cable termination option (see below).

**CNF4** Optional ventilation unit with heater. Must choose a cable termination option (see below).

### Cable Termination Options for the CNR4 & CNF4 (choose one)

- PT** Cable terminates in stripped and tinned leads for direct connection to a datalogger's terminals.
- PW** Cable terminates in connector for attachment to a prewired enclosure.

### Mounting Kit and Replacement Parts

**010759** Net Radiation Sensor Mounting Kit.

**010736** Heater/Fan option

**#26006** CNR4 Replacement Drying Cartridge (limited shelf life); should be replaced every 6 to 12 months.

**#26010** CNF4 Replacement Fan Filters (set of 5).

- › CE Compliance: Conforms to the CE guideline 89/336/EEC 73/23/EEC
- › Operating Temperature Range: -40° to 80°C
- › Weight without cable: 850 g (30.0 oz)
- › Height, dome-to-dome: 6.6 cm (2.6 in)
- › Length: 23.5 cm (9.3 in)
- › Width: 11.1 cm (4.4 in)

### CNF4 Ventilation Unit w/Heater

- › Heater Power Consumption: 10 W @ 12 Vdc (15  $\Omega$ )
- › Ventilator Power consumption: 5 W @ 12 Vdc
- › Ventilator Supply Voltage: 8 to 13.5 Vdc
- › Weight without cable: 0.5 kg (1.1 lb)
- › Height: 4.7 cm (1.9 in)
- › Length: 16.8 cm (6.6 in)
- › Operating Temperature Range: -40° to 80°C



Above is a CNR4 net radiometer fitted with a CNF4 ventilator unit with heater. The CNF4 provides efficient air-flow over the domes.