OTT HydroMet

KIPP & ZONEN
an OTT HydroMet brand

NR Lite2 Net Radiometer

Operational Manual

0344231 | 01-0724

OTT HydroMet B.V.
Delftechpark 36
2628 XH Delft
The Netherlands

+31 15 2755 210
solar-info@otthydromet.com
www.otthydromet.com

Table of contents

1 Scope of supply

The following items are included with delivery:

- Radiometer
- Signal cable 15 m
- Bird stick
- Test reports
- Instruction sheet

2 Order numbers and variant code

2.1 Product variants

Variant	Order number
NR Lite2	0344920-003

2.2 Accessories and spare parts

Item	Order number
CMB1 Mounting bracket	0369701
METEON Data Logger	0365910
AMPBOX	0365900

3 About this manual

3.1 General signs and symbols

The signs and symbols used in the operational manual have the following meaning:

Practical tip

This symbol indicates important and useful information.

Action

✓ Prerequisite that must be met before performing an action.

▸ Step 1

⇨ Intermediate result of an action

▸ Step 2

⇨ Result of a completed action

List

– List item, 1st level

– List item, 2nd level

3.2 Explanation of warnings

To avoid personal injury and material damage, you must observe the safety information and warnings in the operating manual. The warnings use the following danger levels:

WARNING

WARNING

This indicates a potentially hazardous situation. If the hazardous situation is not avoided, it may result in death or serious injuries.

CAUTION

CAUTION

This indicates a potentially hazardous situation. If the hazardous situation is not avoided, it may result in moderately serious or minor injuries.

NOTICE

NOTE

This indicates a situation from which damage may arise. If the situation is not avoided, products may be damaged.

4 General safety instructions

4.1 Intended use
The net radiometer is used to measure the net radiation balance between incoming and outgoing solar radiation.

4.2 Potential misuse
Any use of the product that does not comply with the intended use, be this intentional or negligent, is forbidden by the manufacturer.

- Use the product only as described in the operational manual.

4.3 Personnel qualification
The equipment described in this manual must be installed, operated, maintained and repaired by qualified personnel only.

- Obtain training from OTT HydroMet if necessary.

4.4 Personnel obligations
To avoid equipment damage and injury when handling the product, personnel are obliged to the following:

- Read the operational manual carefully before using the product for the first time.
- Pay attention to all safety information and warnings.
- If you do not understand the information and procedure explanations in this manual, stop the action and contact the service provider for assistance.
- Wear the necessary personal protective equipment.

4.5 Risk of burns due to hot surfaces
If the ambient temperature is too high, the metal parts of the housing may heat up (> 60 °C). Touching the housing can cause burns.

- Do not touch the housing.
- Wear protective gloves during installation and maintenance.

4.6 Correct handling
If the product is not installed, used and maintained correctly, there is a risk of injury. The manufacturer does not accept any liability for personal injury or material damage resulting from incorrect handling.

- Install and operate the product under the technical conditions described in the operational manual.
- Do not change or convert the product in any way.
- Do not perform any repairs yourself.
- Get OTT HydroMet to examine and repair any defects.
- Ensure that the product is correctly disposed of. Do not dispose of it in household waste.

4.7 Installation and maintenance at high places

When the product is installed and maintained at high places, special safety measures must be taken to avoid personal injury.

- Observe and follow the local safety regulations.
- Use suitable safety equipment.
- Inspect the safety equipment before use.
- Secure the person installing the product and the device used against falling down.
- Secure the instrument against falling down.

4.8 Certification

CE (EU)

The equipment meets the essential requirements of EMC Directive 2014/30/EU.

FCC (US)

FCC Part 15, Class "B" Limits

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

IC (CA)

Canadian Radio Interference-Causing Equipment Regulation, ICES-003, "Class B"

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

5 Product description

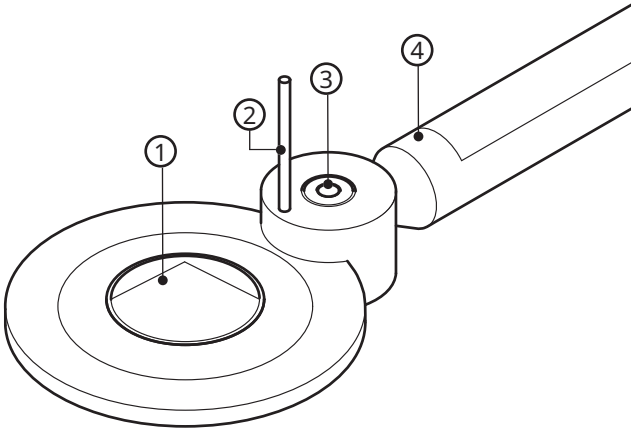
5.1 Design and function

The NR Lite2 is a single-component net radiometer designed to measure the net radiation balance between incoming short-wave (UV) and far infrared (FIR) radiation from the sun and sky and the outgoing radiation from the ground.

As the NR Lite2 is a single-component net radiometer, the short-wave (UV) and long-wave (FIR) components and the upwards and downwards components cannot be separated. Instead, the instrument directly measures the sum of the four net radiation components via the temperature differential. The result is converted to a single output signal.

The instrument has an integral mounting rod for attachment to masts and poles, and a bubble level to ensure accurate installation. It includes a 15 metre long, high quality yellow signal cable. The instrument can be connected directly to a voltmeter or data logger with an mV input. An external power source is not needed.

5.2 Product overview



1	Absorber surface	3	Bubble level
2	Bird stick	4	Mounting rod

6 Transport, storage, and unpacking

6.1 Unpacking

- Carefully remove the product from the packaging.
- Check that the delivery is complete and undamaged.
- If you find any damage or if the delivery is incomplete, then immediately contact your supplier or manufacturer.
- Keep the original packaging for any further transportation.

6.2 Storage

- Store within specified temperature ranges.
- Store in dry area.
- Store in original box where possible.

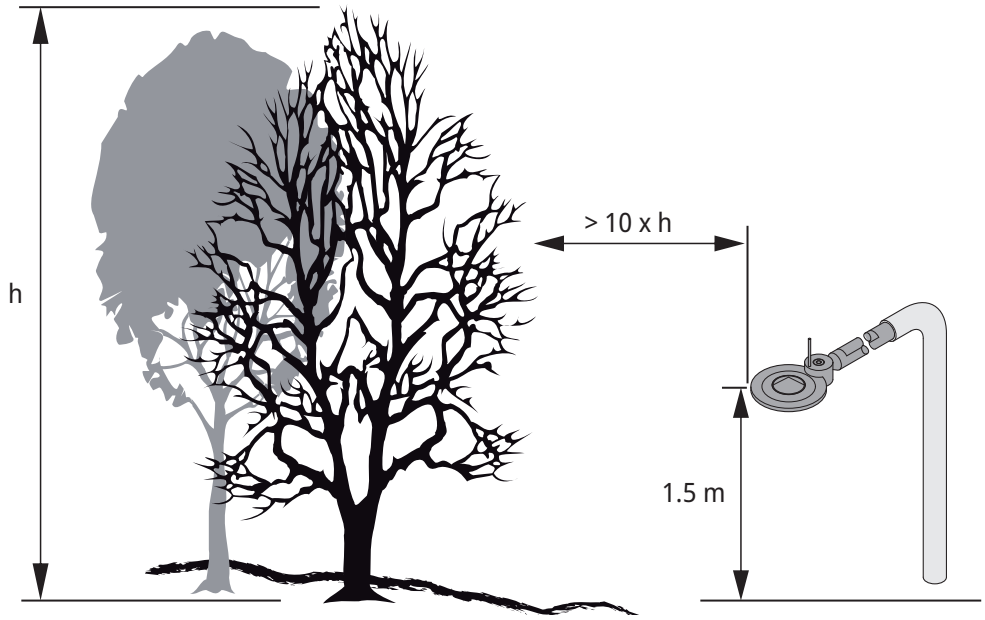
7 Installation

7.1 Mechanical installation

7.1.1 Choosing a site

There should be no obstructions to the field of vision above the instrument's sensor element. If this is not possible, the location of the instrument must be chosen to ensure that obstacles do not rise by more than 5 degrees above the azimuth range between sunrise after the shortest night and sunset on the longest day.

The 5 degrees correspond to a minimum distance from the instrument to the obstacle of 10 times the height of the obstacle:



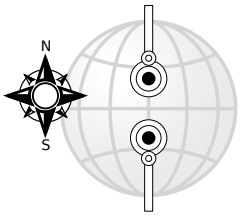
Minimum distance from instrument to obstacle

The minimum distance is important for measuring the direct radiation. The diffuse solar radiation is not so affected by obstacles near the horizon. An obstacle to the field of vision that rises 5 degrees over the entire azimuth range of 360 degrees reduces the diffuse radiation directed downwards by only 0.8 %.

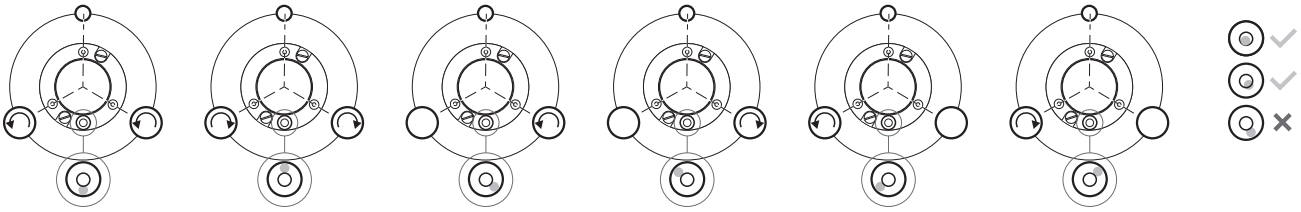
- Position the instrument in such a way that no shadows fall on it, for instance from masts.
- Avoid hot exhaust gases with a temperature of over 100 °C in the proximity of the instrument. The radiation can cause measurement deviations.
- Do not position the instrument in front of light-colored walls or any other objects that reflect the sunlight or emit short-wave radiation.

7.1.2 Mounting instrument

- Screw in the bird repellent stick.
- Attach the mounting rod at the chosen installation site or use the CMB1 mounting bracket to fix the mounting rod to a mast, pole or wall.
- Ensure that the instrument is approximately 1.5 m above the ground
- Align the mounting rod with the next pole.



- To align the instrument horizontally, rotate and tilt the instrument until at least half of the spirit level bubble is in the inner ring.



7.2 Electrical connections

- Connect the instrument to a data logger or voltmeter.
- If using a data logger, connect the red wire with data logger terminal configured for the differential high and the blue cable with the terminal configured for the differential low.
- If using a voltmeter, connect the red wire to the wire to the + pole and the blue wire to the - pole.
- If the instrument has not been grounded, connect the black shield cable to the ground.

i The readout equipment must have an input impedance greater than 1 MΩ to keep measurement errors below 0.1 %.

8 Maintenance

8.1 Maintenance schedule

The frequency of cleaning is dependent upon the local weather and environmental conditions.

The following maintenance intervals are recommended:

Interval	Acitivity	Performed by
At least after 6 months	▸ Clean the absorber surfaces carefully with a lint-free cloth and mild detergent or alcohol. Avoid abrasive materials and harsh chemicals. ▸ Check if the sensor is properly leveled. ▸ Check the conditions of the bubble level and ensure if its functional. ▸ Conduct a thorough visual inspection to detect any physical damage or signs of wear. ▸ Inspect all mechanical connections for tightness and security. ▸ Ensure there are no signs of loosening or wear. ▸ Loosen, lubricate and retighten fixings, connectors, etc. ▸ Examine the entire instrument, especially the body and absorber, for any signs of corrosion.	Operator
2 years	▸ Have a recalibration performed.	OTT HydroMet

9 Troubleshooting

9.1 Error elimination

If the instrument does not work properly and the problem is not clear, perform an "upside-down test" as follows:

- ✓ Indoor:
  A lamp is available as a source of solar and far infrared radiation.
- ✓ Outdoor:
  - The elevation of the sun is more than 45 degrees above the horizon.
  - Weather conditions are stable and cloudless.
- ▸ Measure the output in the normal position.
- ▸ Record the measured values when the signals have stabilized, i.e. after about 3 minutes.
- ▸ Rotate the instrument 180 degrees, so that the upper and the lower sensors are now in the reverse orientation as to the previous position.
- ▸ Measure the output again.
- ▸ Record the measured values when the instrument has stabilized.
- ⇨ The calculated radiation for the sensors in the rotated position must be equal in magnitude, differing only in sign. In a rough test such as this, deviations of ±10 % can be tolerated.

10 Repair

10.1 Customer support

- Have repairs carried out by OTT HydroMet service personnel.
- Only carry out repairs yourself, if you have first consulted OTT HydroMet.
- Contact your local representative: www.otthydromet.com/en/contact-us
- Include the following information:

– instrument model
– instrument serial number
– details of the fault or problem
– examples of data files
– readout device or data acquistion system
– interfaces and power supplies
– history of any previous repairs or modifications
– pictures of the installation
– overview of the local environment conditions

11 Notes on disposing of old devices

Member States of the European Union

In accordance with the German Electrical and Electronic Equipment Act (ElektroG; national implementation of EU Directive 2012/19/EU), OTT HydroMet takes back old devices in the Member States of the European Union and disposes of them in the proper manner. The devices that this concerns are labeled with the following symbol:

- For further information on the take-back procedure contact OTT HydroMet:

OTT HydroMet B.V.
Service & Technical Support
Delftechpark 36
2628 XH Delft
The Netherlands
phone: +31 15 2755 210
email: solar-info@otthydromet.com

All other countries

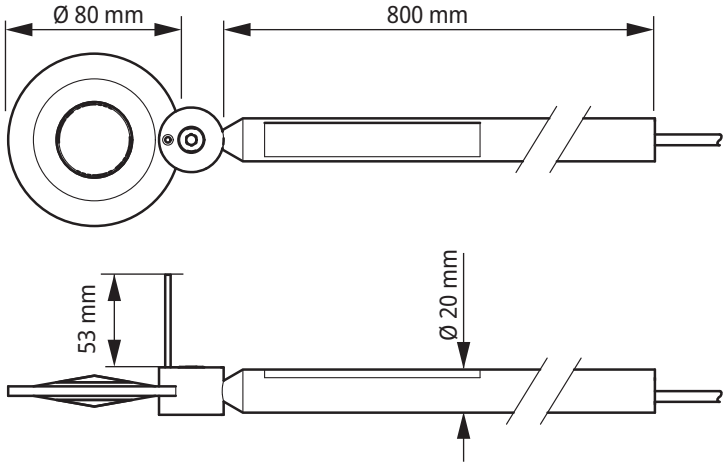
- Dispose of the product in the proper manner following decommissioning.
- Observe the country-specific regulations on disposing of electronic equipment.
- Do NOT dispose of the product in household waste.

12 Technical data

12.1 Optical and electrical data

Specification	Value
Number of signal outputs	1 - net total radiation
Response time (95 %)	< 60 s
Non-linearity (over full range)	< 1 %
Temperature dependence of sensitivity	-0.1 % / °C (typical)
Sensitivity	10 µV/W/m² (nominal)
Operating temperature	-40 °C to +80 °C
Spectral range (50 % points)	200 nm to 100 µm
Field of view	180° upper and lower sensor

12.2 Dimensions and weight



Specification	Value
Instrument weight with rod (excluding cable)	390 g
Dimensions unpacked with rod (length x height)	880 x 73 mm
Mounting rod	Fixed, 800 mm long x 20 mm Ø
Standard cable	15 m fixed cable

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Contact Information