

## **General Description**

The dual-starpyranometer is used for determination of reflectivity ("albedo") of the ground-surface and the short-wave net radiation. It consists of 2 complete units of starpyranometer oriented 180° opposite to each other in a cylindrical housing, which includes a support arm with two mounting holes.

### **Measuring principle**

The pyranometer facing up measures global radiation G coming from the sphere, the pyranometer facing down the reflected short-wave radiation R.

Albedo R is the value of reflectivity of a surface in percents and can be calculated as follows:

$$A = (R \cdot 100) / G$$

The short-wave net radiation KS (this is the available short-wave radiation of a horizontal surface) can be calculated as follows:

$$KS = G - R \text{ (Joule, Watt)}$$

### **Installation**

For mounting the instrument there are 2 holes provided in the arm.

The dual-pyranometer can be mounted horizontally (by means of the incorporated bull's eye level) or parallel to a reference surface.

### **Output**

Side 1: green - white

Cable: green + (pos.), white - (neg.)

Side 2: yellow - brown

Cable: yellow + (pos.), brown - (neg.)

## **1. Introduction**

The Dual-pyranometer in the present design has been developed by Dirmhirn. Among the meteorological solar radiation instrumentation it ranges in the category of "Black and White Pyranometers" and is used for measuring global and reflected global radiation and solar radiation on surfaces inclined to the horizontal.

The solar radiation coming from the whole sphere and received on a horizontal surface in the spectral range from 0,3 - 3 µm is called global radiation. This includes radiation received directly from the sun (direct solar irradiance) and also diffuse sky radiation that has been scattered in traversing the atmosphere.

At electric pyranometers the intensity of radiation is not directly determined, but indirectly by temperature differences which are converted to a proportional electromotive force (EMF) by means of a highly sensitive thermopile. Thus, the complex measurement of the radiation flux is reduced to the simple measurement of electric voltage.

Global radiation is an important parameter in the meteorological research and has to be determined at all conditions. Only a sturdy and weather-proof instrument can supply continuous and reliable measurements.

## **2. Description**

The sensing elements of the instrument consist each of a 12 sector star, the sections of which are painted with a special white reflective paint and an absorbing black paint. When exposed to solar radiation the black sectors are heated more than the white ones and this temperature difference is determined by the thermocouples embedded below the star. The voltage supplied is approximately  $15 \mu\text{V}/\text{Wm}^2$  at an internal resistance of about 35 ohms.

Two precisely cut domes made of optical "SCHOTT"-glas shield the sensing elements from wind and moisture. One threaded ring and two O-rings each clamp the glass of the instrument base providing a watertight seal.

Two desiccators screwed on the housing with silica gel prevent condensation within the casing.

A watertight cable outlet (screw-type fitting) prevents intrusion of ambient air.

For levelling the instrument is equipped with a spirit level.

## **3. Care of the instrument**

When pyranometers are in continuous operation the glass domes of the instrument should be wiped clear and dry at least once a day. If frozen snow, glazed frost, hoar frost or rime is present, an attempt should be made to remove the deposit very gently (at least temporarily) with the sparing use of a de-icing fluid, and subsequently wipe the glass clean.

A daily check should ensure that the instrument is levelled and that the sensing surfaces are still black and white. If there should be defects on the sensing elements, the instrument has to be checked in our company.

If local pollution or sand forms a deposit on the domes, the wiping process should be carried out very gently, preferably after blowing off most of the loose material or after wetting it a little, in order to prevent scratching the surface.

About every 2 weeks the drying agent in the desiccators should be replaced or reactivated. The colour of the agent should be blue, if not, please exchange. The containers are easily removed and a new charge of silica gel can be added. If no fresh silica gel is available, the contents of the containers may be reactivated by heating at a temperature of 80°C.

## **4. Calibration**

It is recommended that pyranometers being in continuous operation have to be standardised at least every six months, better every three months by comparison with a secondary standard. If you have any questions about calibration please contact our company.

## **5. Warranty**

All instruments are checked carefully during production and before delivery. Our company warrants them to be free from defects in material and workmanship under normal use and service for 12 months from date of delivery. The obligation is limited to repairing or replacing parts which have been returned to the Company and which were defective in material or workmanship at time of manufacture. Costs of shipping are not subject of the warranty.

This warranty shall not apply to instruments which have been subject to misuse, negligence or accident. Costs incurred in removing or reinstalling parts by the customer or others are not reimbursed by the Company as well.

## **6. Options. Spareparts**

- \* Glass dome (B1810107)
- \* 1 set of O-rings (6 ea.) (B1810402)
- \* Silica gel container with filling (B1810403)

# DUAL-PYRANOMETER

Dual-pyranometer for determination of reflectivity of the ground surface ("albedo") in percent and the short-wave net radiation.

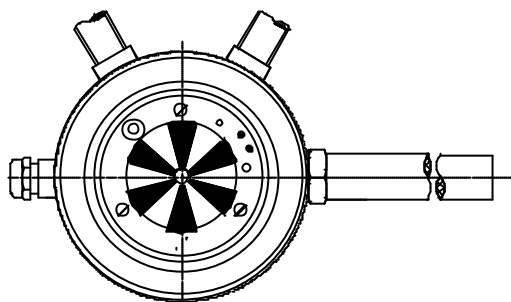
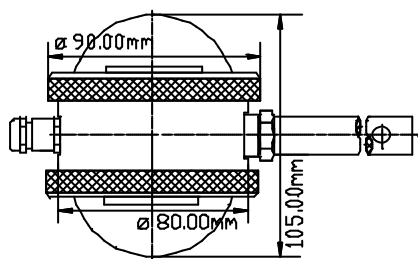
- \* "First class" according to WMO and ISO 9060
- \* world-wide market-leader
- \* independent from ambient temperature
- \* all-season measurements

The measuring principle of the dual-pyranometer is the measurement of the temperature difference between white and black painted sectors. By that means the measuring result is not affected from ambient temperature. Two precisely cut domes shield the sensing elements from environmental factors.

Two drying cartridges keep the interior free from humidity.

The dual-pyranometer is supplied with a spirit level.

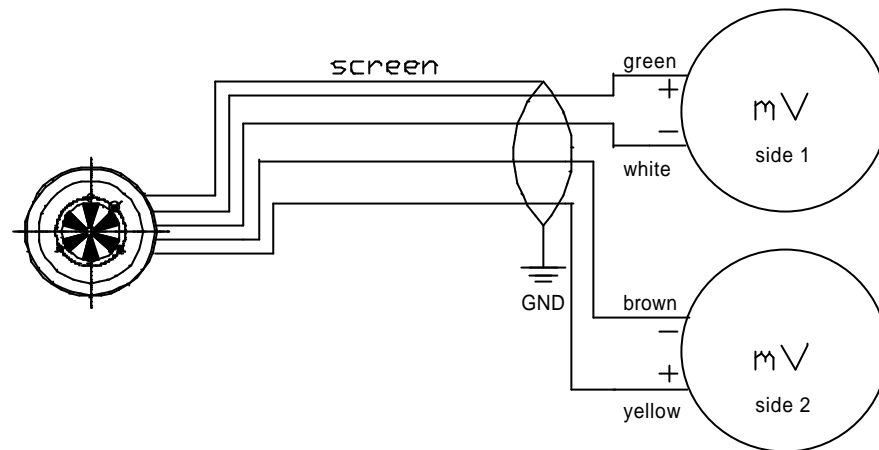
All dual-pyranometers are supplied with a calibration certificate.



## Technical Data:

Measuring range:	0 ... 1500 Wm <sup>-2</sup>
Spectral sensitivity:	0.3 ... 3 μm
Output:	about 15 μV/Wm <sup>-2</sup>
Impedance:	about 35 Ohm
Ambient temperature:	- 40°C ... - 60°C
Resolution:	< 1 Wm <sup>-2</sup>
Stability:	< 1 % per year (temporary operation)
Cosine response:	< 3 % of the value, zenith angle 0° - 80°
Azimuth response:	< 3 % of the value
Temperature effect:	< 3 % of the value between - 20°C ... + 40°C
Linearity:	< 0.5% in the range 0.5 ... 1330 Wm <sup>-2</sup>
Response time:	< 25 sec. (95%) < 45 sec. (99%)
Weight:	1.4 kg
Cable:	4-polar shielded, 3 m length
Order code:	461121: B1810400

# Wiring - diagrams



**Specification:**    **model**                    **461121**  
                          **measuring range**       **0-1500 W/m<sup>2</sup>**  
                          **output**                     **approx. 15  $\mu$ V/W/m<sup>2</sup>**