

**HUKX**

Sensor  
Technology

Brochure  
Albedometer mounting  
and leveling fixtures

**AMF / ALF**  
**series**

# AMF / ALF series

## Albedometer mounting and leveling fixtures

Combine two pyranometers into one albedometer

Hukx offers a practical range of mounting and leveling fixtures to construct albedometers from its popular pyranometers and make installation and leveling easy. Albedometers are increasingly popular in bifacial PV module monitoring. AMF03 allows you to combine pyranometers with housings like those of models SR30-M2-D1 and SR300-D1 into one albedometer.

AMF02 does so for two SR11 or two SR20 series pyranometers. The modular design facilitates maintenance and calibration of the pyranometers. Both albedometer kits include a mounting fixture and a glare screen. ALF01 is a leveling fixture that may be combined with AMF03, AMF02 or SRA series albedometers, and helps leveling the instrument.

With the AMF03 or AMF02 mounting fixture, you may construct albedometers from popular Hukx [pyranometers](#) yourself. AMF03, AMF02 and SRA series albedometers can be leveled with the ALF01 leveling fixture

Figure 1 AMF02 or AMF03 albedometer kits are used to mount both an up- and a downfacing pyranometer and construct an albedometer. The image shows the AMF02 mounting fixture and its rod. A glare screen for the downfacing sensor is also included.



## Albedo and Albedometers

Albedo, also called solar reflectance, is defined as the ratio of the reflected to the global radiation. It is a dimensionless number smaller than 1. It is a property of the ground surface.

An albedometer is an instrument that measures both global and reflected solar radiation and, by calculation, the solar albedo, or solar reflectance for a particular ground surface. An albedometer is composed of two pyranometers, both installed horizontally, the downfacing one measuring reflected solar radiation.

In the open field, the solar albedo depends on the directional distribution of incoming radiation and on surface properties at ground level. It is usually expressed as a single number, determined by taking an average over a day with solar elevation  $> 10^\circ$ .

Changes of albedo are typically slow and seasonal, except when it snows. Albedos of typical surfaces range from about 4 % for fresh asphalt and 15 % for green grass to 90 % for fresh snow.

Albedometers are increasingly popular in bifacial PV module performance monitoring.

You may use one [AMF03](#) albedometer kit and two pyranometers with housings similar to those of models SR30-M2-D1 and SR300-D1 to construct an albedometer. Likewise, the [AMF02](#) albedometer kit may be used to construct an albedometer out of two SR20 pyranometers.

Depending on the pyranometer used, the albedometer will either be Class A, the highest accuracy class, or the lower accuracy Class B. The modular design facilitates the maintenance and calibration of the pyranometers. By taking the instrument apart you can use normal indoor calibration facilities for instrument calibration. The Class A models SR300-D1, SR200-D1 and SR30-M2-D1 and Class B models SR100-D1 and SR15 are supplied with several outputs; analog millivolts, 4 to 20 mA current loop and Modbus over RS-485 are the most used.

Figure 2 ALF01 albedometer leveling tool, can be rotated around the axis of the crossarm to which it is connected, and tilted over  $\pm 2^\circ$ .

## Glare screen

AMF02 and AMF03 are supplied with glare screens. A glare screen is a metal ring, mounted on the downfacing sensor. At solar elevations of  $< 5^\circ$ , when the sun is just above the horizon, the glare screen prevents that direct solar radiation is measured by the downfacing sensor. This is important because it would otherwise lead to unrealistic albedo measurements. Modern data quality assurance can also attain the data quality by calculating solar elevation and rejecting any data at solar elevations below a certain value, for example  $< 10^\circ$ . You may decide to mount the glare screen after transport and on-site installation, so that the dome protector can remain on the dome until the albedometer is firmly installed.

### AMF03

[AMF03](#) is easy to use. It allows you to combine two separate pyranometers, creating an albedometer. All you need are two mechanically compatible pyranometers and the AMF03 kit. Mounting instructions and a set of hex keys are delivered with AMF03.

### AMF02

[AMF02](#) is easy to use as well. It allows you to combine two separate SR20 pyranometers into one albedometer. Mounting instructions and a set of hex keys are delivered with AMF02.

### ALF01

[ALF01](#) is a leveling tool that can be used with AMF02, AMF03 or SRA series albedometers to easily level the instrument. ALF01 is mounted on a 1-inch outer diameter crossarm and can be rotated around the tube axis for  $360^\circ$  as well as tilted over  $\pm 2^\circ$ .



## ALF01

instrument compatibility	AMF02, AMF03 and SRA series
tilt angle adjustment range	$\pm 2^\circ$
rotation angle adjustment range	360 °
required crossarm outer diameter	1 inch
required rod diameter	$15 \times 10^{-3} \text{ m}$

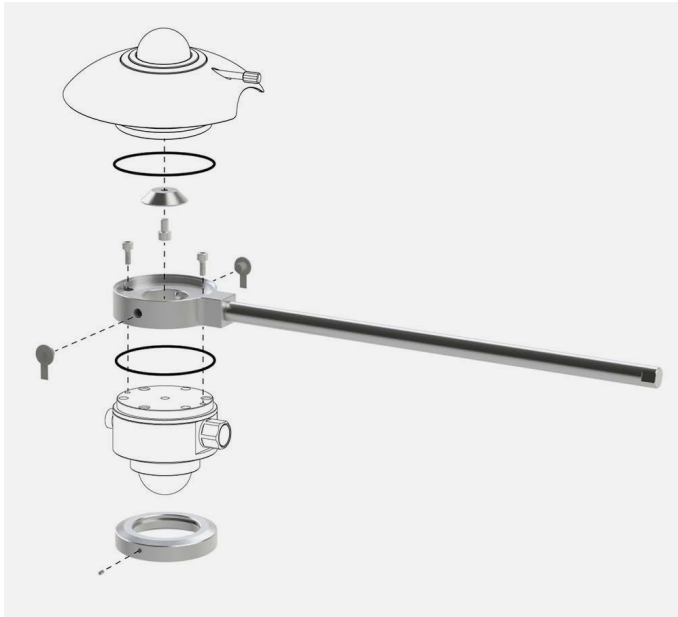


Figure 3 Clear instructions are included with AMF series.

## Standards

The applicable instrument classification standards are ISO 9060 and WMO-No. 8. Calibration is according to ISO 9847 and ASTM G207. The use of albedometers for performance monitoring of bifacial PV systems is covered by IEC 61724-1. The use for meteorological observations is covered by WMO-No 8.

## Suggested use

- PV monitoring with bifacial solar modules
- high-accuracy meteorological observations
- building physics, roof reflectance studies

## Example: AMF03 combined with SR30's

The SRA30-M2-D1 albedometer consists of two identical pyranometers model SR30-M2-D1, one facing up, one facing down. The two sensors are delivered with one AMF03 fixture with rod for mounting purposes. A glare screen is part of the AMF03 delivery, too. The user assembles these modular components into an SRA30-M2-D1 albedometer. A mounting instruction is included with AMF03. Leveling and mounting may be completed by using the ALF01 leveling fixture and [CMF01](#) crossarm mounting fixture to mount the crossarm to a mast.

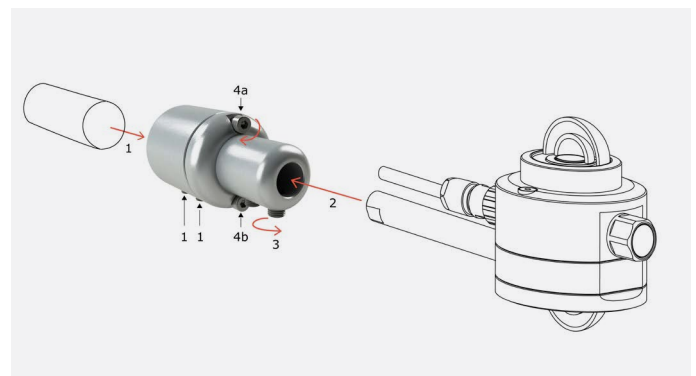


Figure 4 ALF01 allows leveling when mounting an albedometer rod onto a crossarm.

Table 2 Overview of versions in AMF / ALF series.

## Versions of AMF / ALF series

**AMF03** Albedometer mounting fixture for combining an upward- and a downward-facing pyranometer, to construct an albedometer for 2 x SR300, SR200, SR100, SR30 or SR15 pyranometers.

**AMF02** Albedometer mounting fixture for combining an upward- and a downward-facing pyranometer, to construct an albedometer for 2 x SR20 pyranometers.

**ALF01** Albedometer leveling fixture for AMF02, AMF03 and SRA series albedometers.

## See also:

- [SRA300-D1](#) industrial Class A albedometer with heating and tilt sensor
- [SRA200-D1](#) industrial Class A albedometer
- [SRA100-D1](#) industrial Class B albedometer
- [SRA01](#) spectrally flat Class C albedometer
- [SR30-M2-D1](#) digital spectrally flat Class A pyranometer with heating and tilt sensor
- [SR15 series](#) analog and digital spectrally flat Class B pyranometers
- alternative instrument: [NR01](#) 4-component net-radiometer for solar and longwave radiation balance
- [PMF01](#) and [PMF02](#) pyranometer mounting fixtures
- [CMF01](#) crossarm mounting fixture



Figure 5 The end result using AMF03 and two SR300-D1 pyranometers: the SRA300-D1 albedometer.



Figure 6 Installation of AMF02 albedometer mounting kit and two SR20 pyranometers, mounted with ALF01 leveling fixture on a crossarm with crossarm bracket CMF01.

# AMF / ALF series specifications

## AMF03 and AMF02

purpose construction of an albedometer when combined with two pyranometers

rod diameter  $15 \times 10^{-3} \text{ m}$

## Albedometer

measurand global solar radiation and reflection solar radiation

optional measurand albedo or solar reflectance

optional measurand net solar radiation

## AMF03

instrument compatibility 2 x SR300, SR200, SR100, SR30, SR15

included in AMF03:

- 1 x glare screen
- 1 x AMF03 fixture with rod
- 1 x conical positioner
- 2 x M5x12 socket head cap screw
- 1 x M6x8 socket head cap screw
- 2 x M8x12 set screw
- 1 x mounting instruction sheet

## AMF02

instrument compatibility 2 x SR20

included in AMF02:

- 1 x glare screen
- 1 x AMF02 fixture with rod
- 2 x o-ring
- 1 x conical positioner
- 2 x plug
- 2 x M5x12 socket head cap screw
- 1 x M6x10 socket head cap screw
- 2 x M6x12 set screw
- 1 x mounting instruction sheet

## About Hukx

Hukx is the leading innovator in solar radiation and heat flux sensor technology. We are proud to set the standard in high-accuracy measurement, and to be working at the heart of the energy transition.

Customers worldwide rely on our bestselling pyranometers and heat flux sensors. From sensor design and selection to supply and recalibration, we support you across the entire lifecycle.

Hukx is headquartered in the Netherlands, with locally owned representative sales offices in the USA, Brazil, India, China, Southeast Asia, and Japan.

Let us help you select the best sensor for your application. Get in touch with our experts today via: [info@hukx.com](mailto:info@hukx.com)

© Hukx

Version 2521

We reserve the right to change specifications without prior notice.

[www.hukx.com](http://www.hukx.com)

**HUKX**