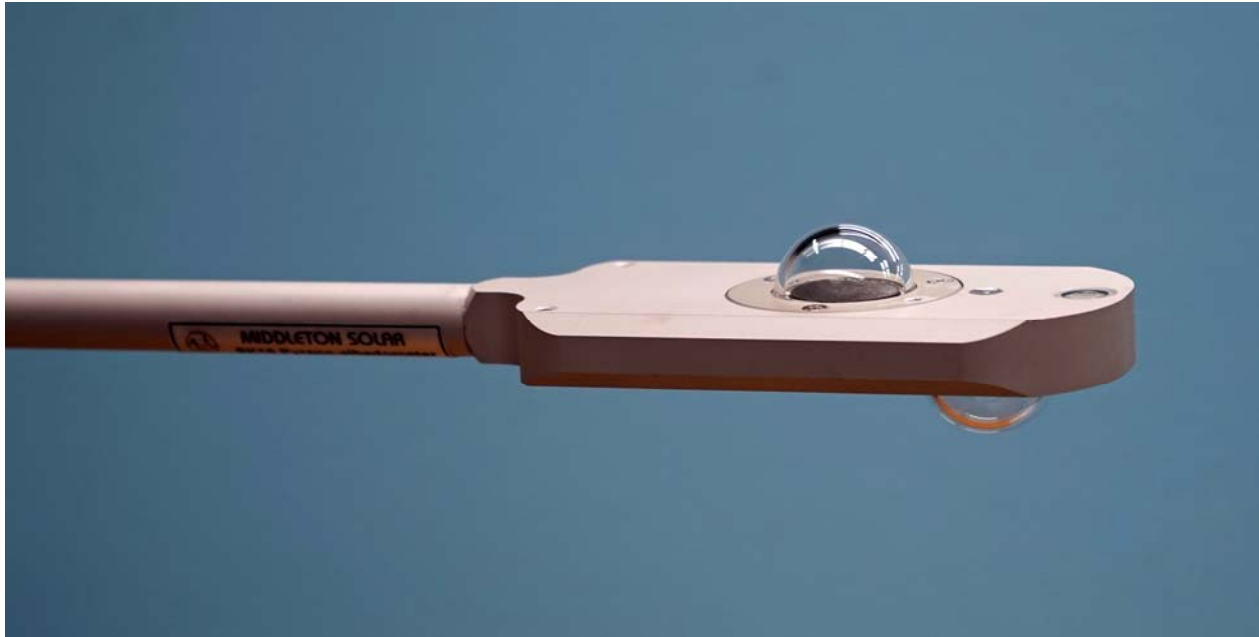




**MIDDLETON SOLAR**  
**SK16-E PYRANO-ALBEDOMETER**  
**APPLICATION NOTE**

CE 2018



The Middleton Solar SK16-E Pyrano-albedometer is for measuring albedo, the ratio of upward to downward solar radiation through a horizontal plane. The SK16-E has separate top and bottom thermoelectric sensors and dual inbuilt signal amplifiers. Each sensor is shielded by a glass dome window. The domes are transparent to shortwave solar radiation from the sun (top sensor), and shortwave reflected from the Earth surface (bottom sensor). The sensors are matched for sensitivity and response time, and their collector surfaces are parallel.

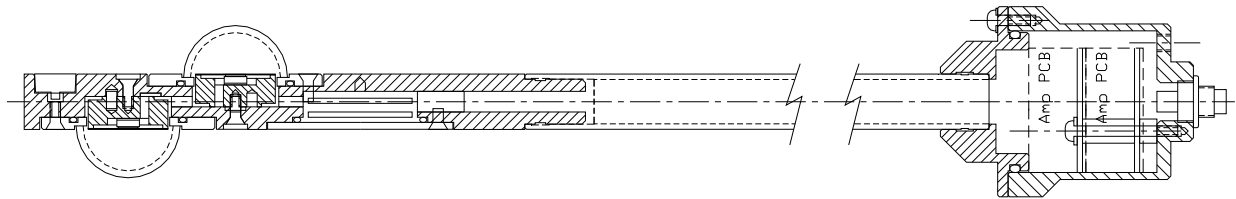
**Installation.** Select a site that is level with an unobstructed view of the sky and the ground. The directional nature of the solar beam means that a surface that slopes toward the sun will receive more radiation than a level surface and thus make the albedo appear too high. Secure the handle and adjust so the instrument is horizontal, approximately 1-2m above the ground, with the bubble level (top side) facing upwards. If the ground is rough or non-uniform then mount the SK16-E as high as possible to integrate the effect of the surface features. The available *3-Axis Clamp* can facilitate mounting to a flat plate.

Connect the SK16-E outputs to a data acquisition system; use differential inputs.

output lead cores	top signal +ve	white
	top signal -ve	blue
power supply cores	bottom signal +ve	yellow
	bottom signal -ve	green
power supply cores	supply +ve (5 to 15VDC)	red
	supply 0V	black

Connect a power supply to the instrument; keep the supply 0V separate from the -ve signal connections. Each output signal is an analogue voltage, less than 5 VDC.

**Maintenance.** Keep the domes clean and free from debris; use only water and mild detergent. Bi-annual calibration is recommended, at which time the desiccant should be replaced.



### Technical Specification

sensitivity (typical), two outputs	18 - 21 $\mu\text{V}/\text{W}\cdot\text{m}^{-2}$ , before amplification 1.5 - 2.0 $\text{mV}/\text{W}\cdot\text{m}^{-2}$ , after amplification
viewing angle	$4\pi$ steradians
spectral range (nominal)	0.3 to 3 $\mu\text{m}$
maximum irradiance	2,000 $\text{W}\cdot\text{m}^{-2}$
resolution	$\pm 2 \text{ W}\cdot\text{m}^{-2}$
calibration traceability	WRR (World Radiometric Reference)
spectral selectivity	$< \pm 3\%$
response time (95%)	11s (typical)
impedance, two outputs	65 $\Omega$
power requirement	5 – 15 VDC; $< 12\text{mA}$
operating temperature	-40 to +60°C
non-linearity	$< \pm 1\%$
non-stability (change/year)	$< -0.5\%$
temperature dependence of sensitivity	$< 2\%$ (-10 to +40°C)
thermal radiation offset (200 $\text{W}\cdot\text{m}^{-2}$ )	$< 4 \text{ W}\cdot\text{m}^{-2}$
temperature gradient offset (5°C /hr)	$< 4 \text{ W}\cdot\text{m}^{-2}$
directional response (w.r.t 1,000 $\text{W}\cdot\text{m}^{-2}$ )	$< \pm 20 \text{ W}\cdot\text{m}^{-2}$ (0-80°)
tilt response	$< \pm 1\%$
uncertainty in daily total (95% level)	$< 5\%$
level accuracy	0.4°
desiccant (in handle)	orange silica gel (non-toxic)
sensors	thermopile, flat black receiver
windows	glass dome, $\text{Ø}30\text{mm}$
output lead	6m, with connector at handle
construction	anodized aluminium; stainless steel
IP rating	sealed to IP66
dimensions & weight	head 66x40x130mm; handle $\text{Ø}16\text{x}690$ ; 0.6kg
shipping size & weight	$\text{Ø}90 \times 850\text{mm}$ ; 1kg

### Available Options

- 3-Axis Clamp, for mounting to a flat plate, P/N 123.9100 (pictured)
- Extended temperature output lead, Teflon or PU

