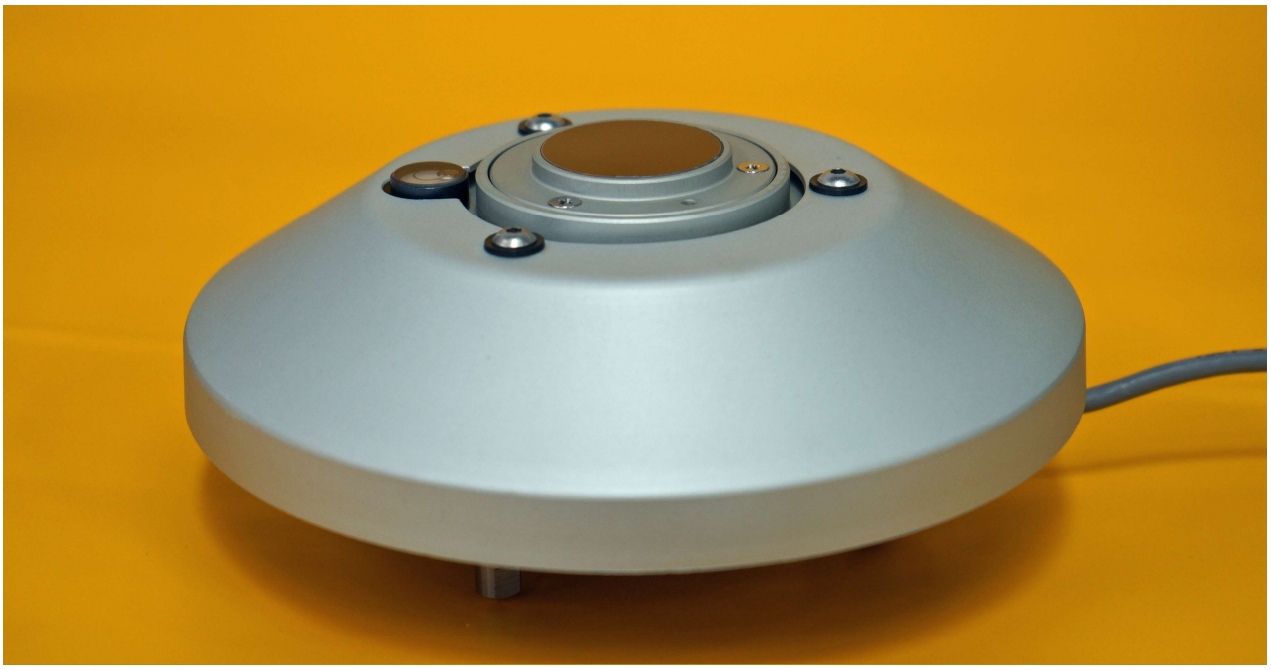
MIDDLETON SOLAR
PG01 PYRGEOMETER
APPLICATION NOTE

CE 2013



The Middleton Solar PG01 Pyrgeometer is for measuring long wave radiation emitted by the atmosphere (downwelling) or the Earth surface (upwelling). It uses a passive thermoelectric sensor shielded by a flat silicon window. The window is coated to exclude radiation below 4.5 µm. The PG01 is sealed and fully weatherproof.

Installation. Select a site that has an unobstructed view of the sky. Place the instrument on a flat horizontal platform and adjust the feet until the circular level is centered. Secure the instrument to the platform with the M10 mount knob provided. It is recommended that the sensor be shaded to minimize any window heating offset. Water on the window (rain or dew) is a strong absorber of near IR radiation.

Connect the PG01 output lead to a data acquisition system; use differential inputs.

output lead cores	signal +ve	orange
	signal –ve	white/black
	body temperature; Pt100, 3-wire	
	+ve	green
	-ve	red, blue
	window temperature; Pt100, 3-wire	
	+ve	red/black
	-ve	white, black
	screen	N/A

The lead screen is floating at the instrument end; it is recommended that the screen be grounded at the measurement end. The output signal is a passive analogue voltage and represents the net longwave radiation (downwelling – upwelling).

The nominal fullscale range is -3mV (negative). Use a 3-wire connection for the two temperature sensors in order to compensate for voltage drop.

Longwave net irradiance, N = $U/C - k_3\sigma(T_D^4 - T_B^4)$, in W.m^{-2}
Where U is the output in µV, and is typically negative; C is the sensitivity in µV/W.m^{-2}; T_B is body temperature in K; T_D is window temperature in K; k_3 = 3.8 is the window heating coefficient; σ = 5.6704 · 10^{-8} is the Stephan-Boltzmann constant.

Longwave downwelling irradiance, $E = N + \sigma T_B^4$, in W.m^{-2}.
N is typically negative, and σT_B^4 is the longwave upwelling irradiance.

Maintenance. Keep the window of the PG01 clean and free from debris; use water and mild detergent only.

PG01 Technical Specification

sensitivity	C = 13 µV/W.m^{-2} (nominal)
pyrgeometer coefficients	k_1 = 0, k_2 = 1, k_3 = 3.8
calibration traceability	WISG (World Infrared Standard Group)
spectral range (50% point)	4.5 to 42 µm
spectral selectivity (8 to 14 µm)	< 5%
field of view	170°
response time (95%)	11s (typical)
irradiance	-250 to +250 W.m^{-2}
impedance	40 Ω
operating temperature	-35 to +60°C
non-linearity (-250 to +250 W.m^{-2})	< 1%
temperature dependence of sensitivity	< 2% (-20 to +50°C)
tilt response	< 1%
window heating offset (shaded)	negligible, if T_D measured < 10 W.m^{-2}, if T_D not measured
temperature gradient offset (5°C /hr)	< 3 W.m^{-2}
directional response	not relevant to isotropic IR
uncertaintity in daily total (95% level)	not specified
level accuracy	0.1°
desiccant	orange silica gel (non-toxic)
IP rating	sealed to IP67
sensor	thermopile, flat white receiver
window	silicon, 1mm
window coating	diamond like carbon (external) solar blind (internal)
temperature sensor (body & window)	Pt100 platinum thin film resistor DIN IEC 751, Class A
output lead	6m, 8-core, with connector at instrument end
mounting method	central M10 hole; adjustable feet
construction	anodized aluminium; stainless steel
size & weight	160mm diameter x 71mm high; 0.8kg

Available options: PG01-E version (with in-built signal amplifier)