EQ09-A & EQ09-AE PYRANOMETER

Class A Spectrally Flat Pyranometer for Solar GHI measurement

The Middleton Solar EQ09-A is a precision Pyranometer for measuring solar Global Horizontal Irradiance (GHI). It exceeds the International Organization for Standardization (ISO) specifications for a **Spectrally Flat Pyranometer of Class A**. Class A is the highest accuracy Class. The EQ09-A has a proprietary thermoelectric sensor with a black carbon nanotube surface and a passive microvolt output. The EQ09-AE version has an in-built signal amplifier to give a millivolt output for easy signal measurement.

Performance Specification	**ISO 9060:2018[1] Spectrally Flat Class A[2]**	**EQ09-A & EQ09-AE**
Response time (to 95%)	< 10 sec	8 ±1 sec
Zero off-set a) -200 W.m^{-2} thermal rad.	± 7 W.m^{-2}	< 3 W.m^{-2} (unventilated)
Zero off-set b) 5 K.h^{-1} ambient temp.	± 2 W.m^{-2}	< ± 1.5 W.m^{-2}
Zero off-set c) total response	± 10 W.m^{-2}	< ± 5 W.m^{-2}
Non-stability (1 year interval)	± 0.8 %	< ± 0.5 %
Non-linearity (100-1000 W.m^{-2})	± 0.5 %	< ± 0.5 %
Directional response (w.r.t. 1000 W.m^{-2})[3]	± 10 W.m^{-2}	< ± 10 W.m^{-2}
Spectral error (280 to 4,000 nm)	± 0.5 W.m^{-2}	< ± 0.4 W.m^{-2}
Spectral selectivity (350 to 1,500 nm)[4]	< 3 %	< 3 %
Temperature response (-10 to +40 °C)	± 1 %	< ± 1 %
Tilt response (0-90°)	± 0.5 %	< ± 0.2 %
Additional signal processing errors	± 2 W.m^{-2}	EQ09-A, not applicable EQ09-AE < ± 2 W.m^{-2}

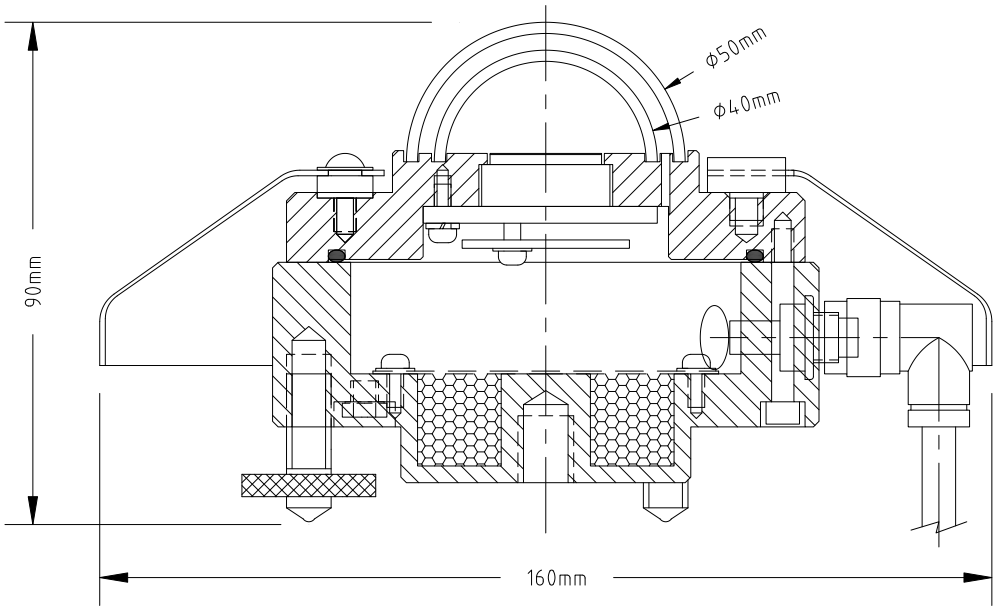
[1] ISO 9060:2018 Specification and classification of instruments for measuring hemispherical solar and direct solar radiation

[2] ISO 9060:2018 'Class A' roughly corresponds to superseded ISO 9060:1990 'Secondary Standard'

[3] ISO 9060:2018 requires that a 'Class A' pyranometer be individually tested for Directional & Temperature Response

[4] This requirement designates a Pyranometer as 'spectrally flat' in ISO 9060:2018

Middleton Solar EQ09-A & EQ09-AE Pyranometer Detailed Specification



Black carbon nanotube (CNT) sensor surface has flat spectral response, exceptional stability, and excellent BRDF characteristics to give stable directional response.
Large diameter inner glass dome to circumvent optical caustic illumination of the sensor surface
User's Guide and Calibration Certificate included.

General Specification

viewing angle	2π steradians
irradiance	0 – 4,000 W/m^2
spectral range	300 - 3000nm (nominal); 305 – 2,700nm (50% points)
sensitivity (typical)	EQ09-A: 16.5 ±1.5 μV/W.m^{-2} ; EQ09-AE: 1.0 mV/W.m^{-2}
calibration	outdoors to ISO 9847, traceable to WRR
achievable uncertainty (minute totals)	U_{95} = 2% (RSS of instrument, calibration, measurement)
operating temperature	-40 to +80°C
operating humidity	0-100% RH
output impedance	20 Ω (EQ09-A); 65 Ω (EQ09-AE)
measurement input impedance	>1 MΩ
power requirement (EQ09-AE only)	5 to15 VDC, 6mA
bubble level resolution	0.1°
level adjustment	one fixed foot, two adjustable feet
construction	anodised marine-grade aluminium & stainless steel
desiccant	orange silica gel (non-toxic); large capacity, in base
IP rating	sealed to IP67
mounting method	central M10 hole in base (mounting fastener included)
output lead	6m, with connector at instrument end
net weight	0.8Kg (excluding lead)
shipping size & weight	230 x 230 x 180mm, 2Kg
warranty	2 years (standard) / 5 years (conditional)

Available Options

- temperature output (EQ09-A only), YSI 44031 thermistor (10KΩ @ 25°C)
- additional output lead length, up to 20m
- EQ09-A & EQ09-AE Secondary Standard Pyranometer (no directional & temperature test)
- EQ09-AI version, configured for inverted mounting (bubble level under body, not on top)