

## ER09-AE & ER09-AI PYRANOMETER

**ISO Fast Response Spectrally Flat Pyranometer of Class B/A for solar GHI**



The Middleton Solar ER09-A\* is for measuring solar Global Horizontal Irradiance (GHI). It exceeds the ISO requirements for a **Fast Response Spectrally Flat Pyranometer, Class B or Class A**. A hybrid glass diffuser, and proprietary Integrating Cavity Thermopile, is used to achieve very low zero off-sets, even when internally heated. The ER09-AE version has a precision signal amplifier to give a millivolt output for easy measurement. The ER09-AI has the signal amplifier configured for a 4-20mA output.

Performance Specification	ISO 9060:2018 <sup>1</sup> Spectrally Flat Class A	ER09-AE and ER09-AI
Response time (to 95%) <sup>2</sup>	< 0.5 sec	0.3 sec
Zero off-set a) -200 W.m <sup>-2</sup> thermal rad.	± 7 W.m <sup>-2</sup>	< ± 0.2 W.m <sup>-2</sup> (unventilated)
Zero off-set b) 5 K.h <sup>-1</sup> ambient temp.	± 2 W.m <sup>-2</sup>	< ± 0.2 W.m <sup>-2</sup> (heater off) < ± 1.0 W.m <sup>-2</sup> (heater on)
Zero off-set c) total response	± 10 W.m <sup>-2</sup>	< ± 5 W.m <sup>-2</sup>
Non-stability (1 year interval)	± 0.8 %	< 0.1 %
Non-linearity (100-1000 W.m <sup>-2</sup> )	± 0.5 %	< ± 0.2 %
Directional response (w.r.t. 1000 W.m <sup>-2</sup> ) <sup>3</sup>	± 10 W.m <sup>-2</sup>	< ± 10 W.m <sup>-2</sup>
Spectral error (280 to 4,000 nm)	± 0.5 %	< ± 0.5 %
Spectral selectivity (350 to 1,500 nm) <sup>4</sup>	< 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 <sup>-2</sup>	< ± 2 W.m <sup>-2</sup>

**ALMOST NO ZERO OFF-SET**

**VERY FAST RESPONSE**

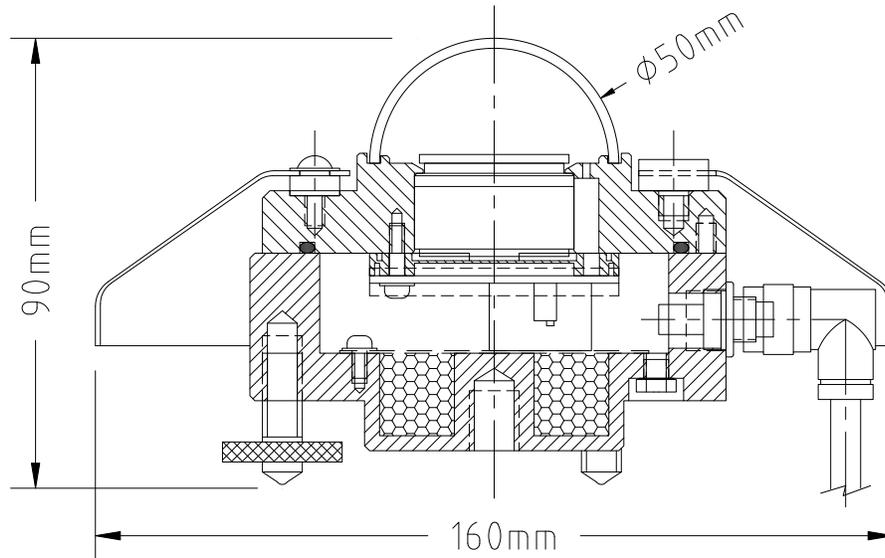
<sup>1</sup> ISO 9060:2018 Specification and classification of instruments for measuring hemispherical solar and direct solar radiation

<sup>2</sup> This requirement designates a Pyranometer as 'fast response' in ISO 9060:2018

<sup>3</sup> ISO 9060:2018 requires that a 'Class A' pyranometer be individually tested for Directional & Temperature Response

<sup>4</sup> This requirement designates a Pyranometer as 'spectrally flat' in ISO 9060:2018

## Middleton Solar ER09-AE & ER09-AI Pyranometer Detailed Specification



### General Specification

viewing angle	$2\pi$ steradians
irradiance (max)	ER09-AE: 0 - 4,000 W.m <sup>-2</sup> ; ER09-AI: 0 - 1,600 W.m <sup>-2</sup>
spectral range	300 – 3,000nm (nominal); 305 - 2,700nm (50% points)
sensitivity	ER09-AE: 1.0 mV/W.m <sup>-2</sup> ER09-AI: 0.01 mA/W.m <sup>-2</sup>
output signal range (typical)	ER09-AE: 0 - 2V                      ER09-AI: 4 - 20mA
calibration (factory)	outdoors, based on ISO 9847; SI traceable
achievable uncertainty (minute totals)	$U_{95} = 3\%$ (RSS of instrument, calibration, measurement)
operating temperature	-35 to +60°C
operating humidity	0-100% RH
measurement input impedance	ER09-AE: >1 M $\Omega$
power requirement	12VDC $\pm$ 1V, < 20mA
available internal heater	12VDC, 3W
bubble level resolution	0.1°
level adjustment	one fixed foot, two adjustable feet
detector type	miniature encapsulated thermopile
dome window	ground from solid optical glass
construction	anodized marine-grade aluminium & stainless steel
desiccant	orange silica gel (non-toxic); up to 5-year life
IP rating	sealed to IP67
mounting method	central M10 hole in base (mounting knob supplied)
output lead	6m, with connector at instrument end
User's Guide & Calibration Certificate	included
net weight	0.8Kg
shipping size & weight	230 x 230 x 180mm, 2Kg
warranty	2 years (standard) / 5 years (conditional)

The ER09-AE/AI is supplied standard as a Class B Pyranometer. It is available as a Class A Pyranometer when individually tested for Directional & Temperature Response.

### Available Options

- internal 3W heater to keep dome window clear of moisture
- temperature output, YSI 44031 thermistor (10K $\Omega$  @ 25°C)
- 24VDC input power
- expanded operating temperature, -40 to +80°C