

## DN5-B, DN5-BE, DN5-BE-I PYRHELIOMETER

ISO Spectrally Flat Pyrheliometer of Class B for Solar DNI measurement



The Middleton Solar DN5-B is a precision pyrheliometer for measuring solar Direct Normal Irradiance (DNI) when aimed at the sun. It exceeds the International Organization for Standardization (ISO) specifications for a Spectrally Flat Pyrheliometer of Class B. The sensor has twin coupled thermopiles to cancel any common-mode response due to temperature transients. The DN5-B has a passive microvolt output. The DN5-BE version has an in-built amplifier to give a millivolt output for easy signal measurement, and the DN5-BE-I version has a 4-20mA current output.

Performance Specification	ISO 9060:2018 <sup>1</sup> Spectrally Flat Class B <sup>2</sup>	DN5-B all versions
Response time (to 95%)	< 15 sec	5.5 ± 0.5 sec
Zero off-set a) response to 5°C/hour	± 3 W.m <sup>-2</sup>	< ± 1 W.m <sup>-2</sup>
Zero off-set b) total response	± 4 W.m <sup>-2</sup>	< ± 2.5 W.m <sup>-2</sup>
Non-stability (1 year interval)	± 1%	< 0.2%
Non-linearity (100 - 1000 W.m <sup>-2</sup> )	± 0.5%	< ± 0.3%
Spectral error (280 to 4,000nm)	± 1%	< ± 0.5%
Spectral selectivity (350 to 1,500nm) <sup>3</sup>	< 3%	< 2%
Temperature response (-10 to +40°C)	± 1%	< ± 1%
Tilt response (@ 1000 W.m <sup>-2</sup> )	± 0.5%	± 0.3%
Additional signal processing errors	± 5 W.m <sup>-2</sup>	DN5-B, not applicable DN5-BE&I < ± 3 W.m <sup>-2</sup>

### EXCELLENT PERFORMANCE, USER FRIENDLY, DURABLE

Optical sapphire window for broad bandwidth and superior durability

Flush-mount window to prevent obstruction by rain or debris.

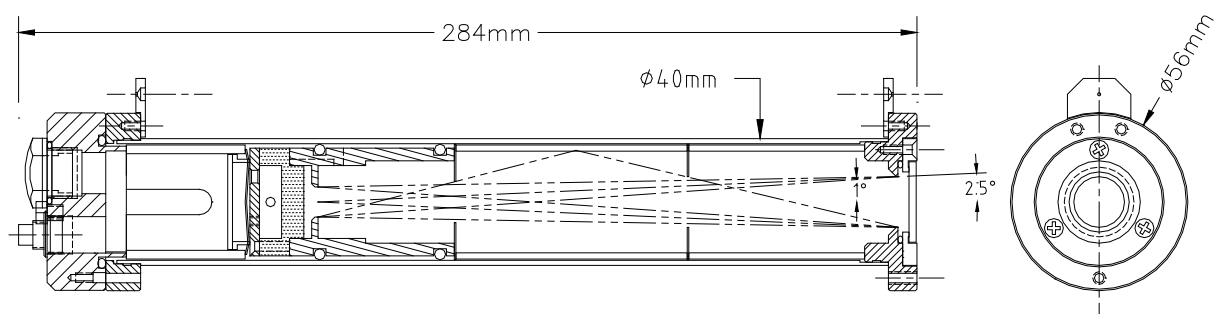
Optional Pyrheliometer Mount, and Trackers are also available.

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

<sup>2</sup> ISO 9060:2018 'Class B' roughly corresponds to superseded ISO 9060:1990 'First Class'

<sup>3</sup> This requirement designates a Pyrheliometer as 'spectrally flat' in ISO 9060:2018

## Middleton Solar DN5-B, DN5-BE, DN5-BE-I Pyrheliometer Detailed Specification



Black carbon nanotube (CNT) sensor surface has flat spectral response and excellent stability.
Can be operated with all Middleton Solar Trackers: APT-02, AST-02, AST-03/T
Aiming diopter conveniently located on top of instrument.
Temperature compensated sensor assembly is thermally isolated from the instrument body.
Optical geometry, and baffling, is set by four precisely located apertures.
Supplied with User Manual and Calibration Certificate.

### General Specification

full opening angle	5.0°
slope angle	1.0°
limit angle	4.0°
irradiance	0 – 4,000 W.m <sup>-2</sup>
spectral range (nominal)	200 – 5,000nm
sensitivity (typical)	DN5-B: 7.5 ± 0.5 μV/W.m <sup>-2</sup> DN5-BE: 1 mV/W.m <sup>-2</sup> DN5-BE-I: 100±5 W.m <sup>-2</sup> /mA, 0-1,600 W.m <sup>-2</sup>
calibration	outdoors to ISO 9059, traceable to WRR
achievable uncertainty (minute totals)	U <sub>95</sub> = 2.5% (RSS of instrument, calibration, measurement)
operating temperature	-40 to +80°C
operating humidity	0-100% RH
output impedance	20Ω (DN5-B); 65Ω (DN5-BE)
measurement input impedance	>1MΩ
power supply (not DN5-B)	7 to 15VDC, 6mA (DN5-BE), 15-20mA (DN5-BE-I)
window material	optical sapphire, 2mm thick
construction	anodised marine-grade aluminium & stainless steel
desiccant	silica gel (orange, non-toxic), externally accessible
IP rating	sealed to IP67
output lead	6m, with connector at instrument end
net weight	0.75kg (excluding lead)
shipping size & weight	310 x 225 x 110mm, 1kg
warranty	2 years (standard) / 5 years (conditional)

### Available Options

- Temperature output (DN5-B only), YSI 44031 thermistor (10KΩ @ 25°C)
- D5H Hood
- PM02 Pyrheliometer Mount (for Ø25mm Tracker axle)
- Additional output lead length, up to 20m