Outdoor Pyranometer Calibration (OPC) Service

February 2024

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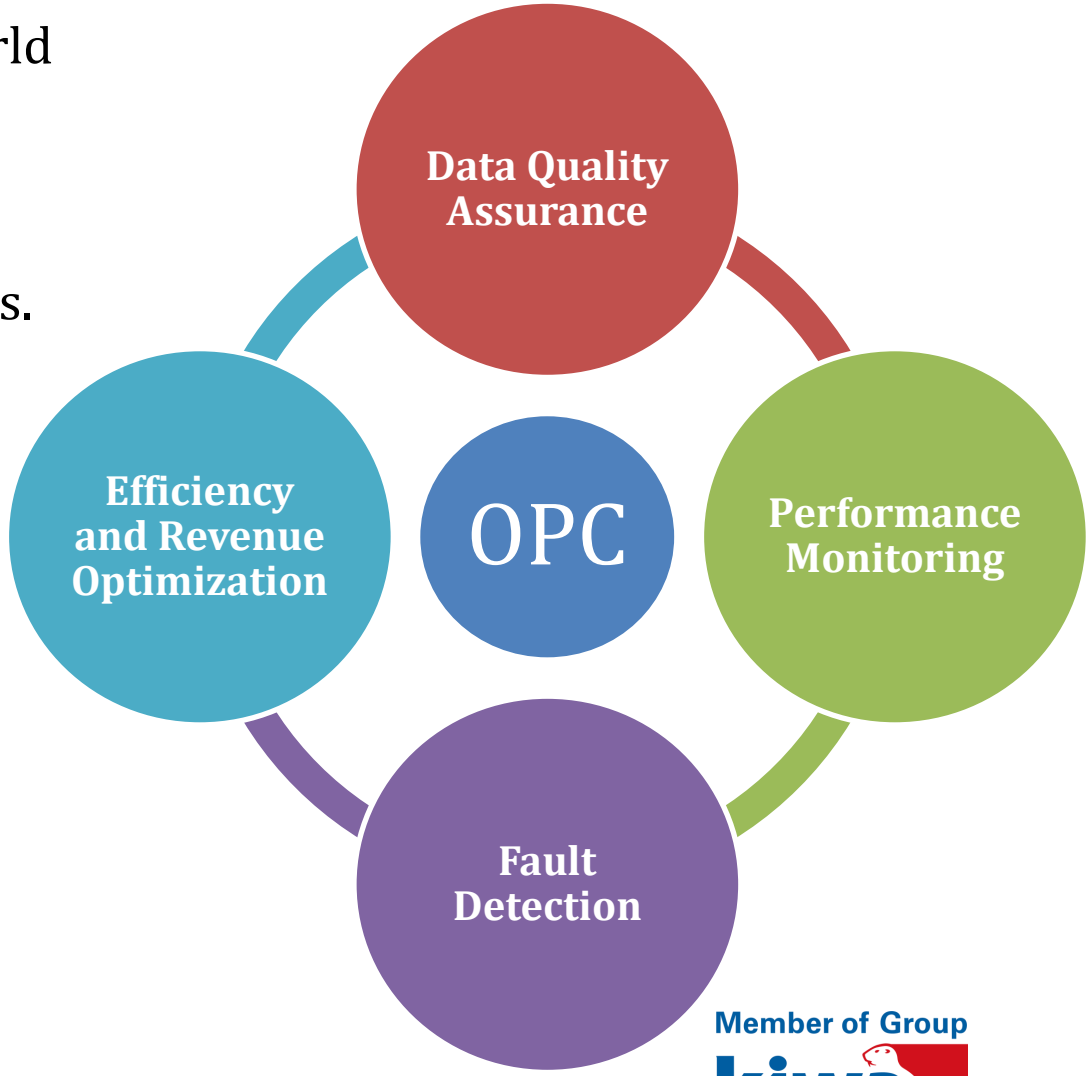
Introduction- Outdoor Pyranometer Calibration

- Calibrating pyranometers in real-world conditions helps account for environmental factors that can affect their accuracy, such as temperature, humidity, and atmospheric conditions.
- Outdoor Pyranometer Calibration (OPC) helps to shorten the time to delivering sensors to lab.
- This work is essential in the solar energy industry to maintain the precision of solar irradiance measurements, which are critical for system performance assessment, energy forecasting, and research purposes.



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Outdoor Pyranometer Calibration (OPC)

ExTEL In-house

Traceable & calibrated Reference Pyranometer

Calibrated & Traceable Certificate

- Trace to PMOD/WRC
- Refer to Secondary Standard Pyranometer (CMP22)
- Follow ISO 9847:1992(E) calibration procedure

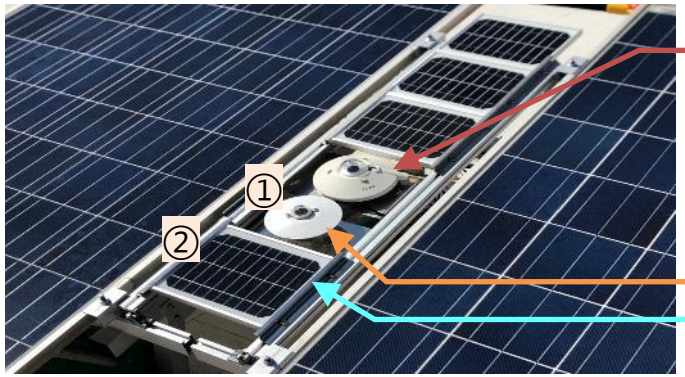
Indoor Verification

- Class AAA Sun Simulator
- Follow IEC 60891 standard
- Uncertainty <0.9% (0.07uV/W/m2)

ExTEL On-Site Service (OPC)

Outdoor Calibration

ISO 9847



Traceable & calibrated Reference Pyranometer (CMP22)

Calibration Targets:
① Other Standard Pyranometer
② Reference Radiation crystal silicon cell

OPC - ISO 9847 Outdoor Calibration Standard

CMP22 Traceable and Calibrated

KIPP & ZONEN

CALIBRATION CERTIFICATE

CERTIFICATE NUMBER	019765100165
PYRANOMETER MODEL	CMP 22
SERIAL NUMBER	100165
SENSITIVITY	8.72 µV/W/m² at normal incidence on horizontal pyranometer
IMPEDANCE	30 Ω
REFERENCE PYRANOMETER	Kipp & Zonen CM 22 sn 107 active from 01 January 2017
CALIBRATION DATE	06 February 2018
CLASSIFICATION	ISO 9060, Secondary Standard

Calibration procedure

Hierarchy of traceability

Justification of total instrument calibration uncertainty

Notice

Delft, The Netherlands, 08 February 2018

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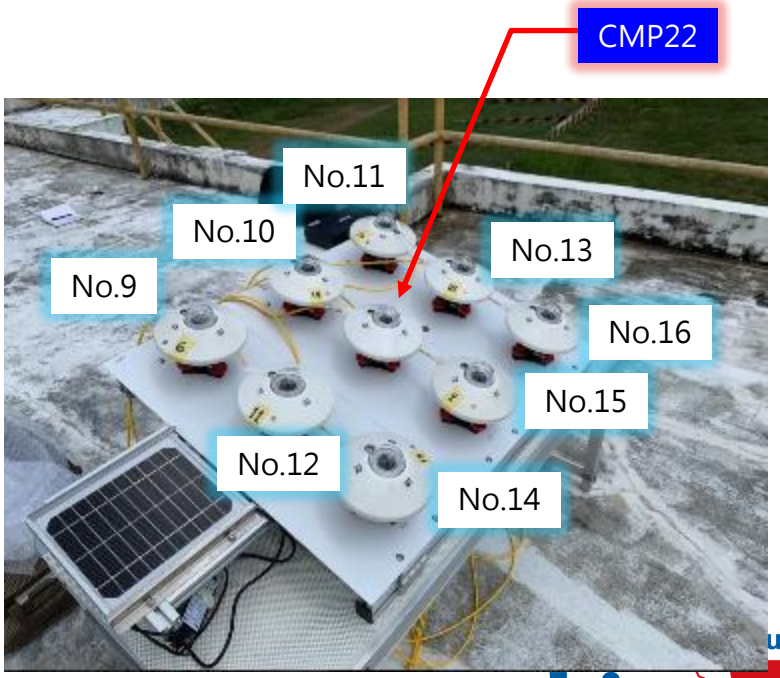
OPC field calibration – high throughput; 8+ units/day

ISO 9847

Allows for calibration of a pyranometer indoors (as at the factory in Delft) against a reference pyranometer of similar type, or outdoors. Outdoors a field pyranometer can be calibrated over several days against a 'reference' pyranometer of similar or (ideally) higher quality with a reliable, recent, and traceable calibration.



OPC Procedure [1/5]

Disassembly/ Disconnect
- Photo, S/N & Sensitivity record
- Remove pyranometer

Handled by Customer local team

Record → Removal

Serial Number (S/N)

Sensitivity

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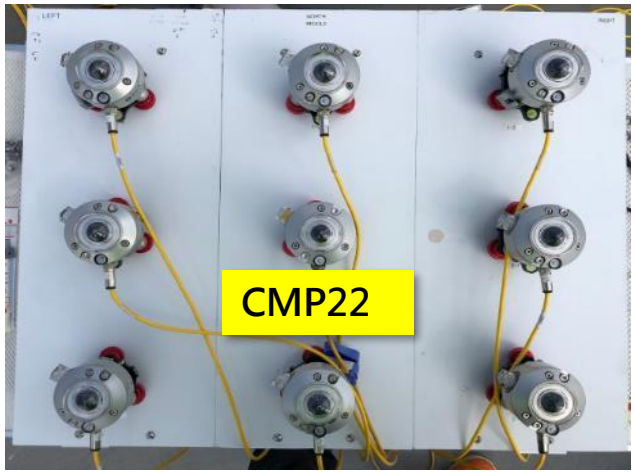
OPC Procedure [2/5]

Calibration Preparation
- Appearance Check
- Basic clean (Desiccant prepare by Customer)
- Setup next to CMP22 leveling

Handled by ExTEL Energy Engineers

Setup on plate

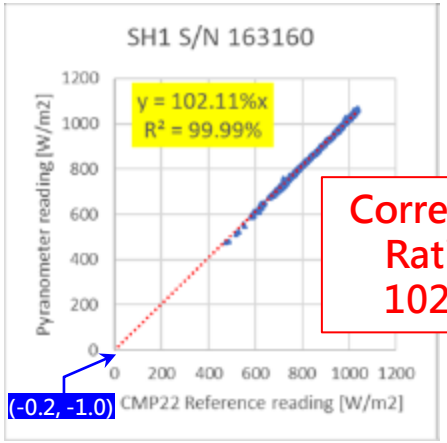


Leveling

Bubble is in center

OPC Procedure [5/5]

① **Each individual Pyranometer is correlated to Reference CMP22 from real-time on-site outdoor measurement**



Correlation Ratio = 102.1%

② **Confirm Zero Point reading if close to 0 W/m2 (within +/-3W/m2)**

Dark Room Condition

③ **Calculate Correction Factor for each individual CMP11**

$If\ |Correlation\ Ratio - 1| \leq 1.0\%$
No correction needed

$If\ |Correlation\ Ratio - 1| > 1.0\%$
Suggest to implement Correction Factor to SCADA

Corrected Irradiance [W/m2] = Old Irradiance reading (SCADA) x Correction Factor

For Example -
① Analyzing correlation ratio to CMP22 reference → 102.1%
② Confirming Zero Point reading → -1.0W/m2 (within +/-3W/m2)
③ $|Correlation$ Ratio $102.1\% - 1| > 1.0\%$, Correction Factor = 1/102.1% = 0.979

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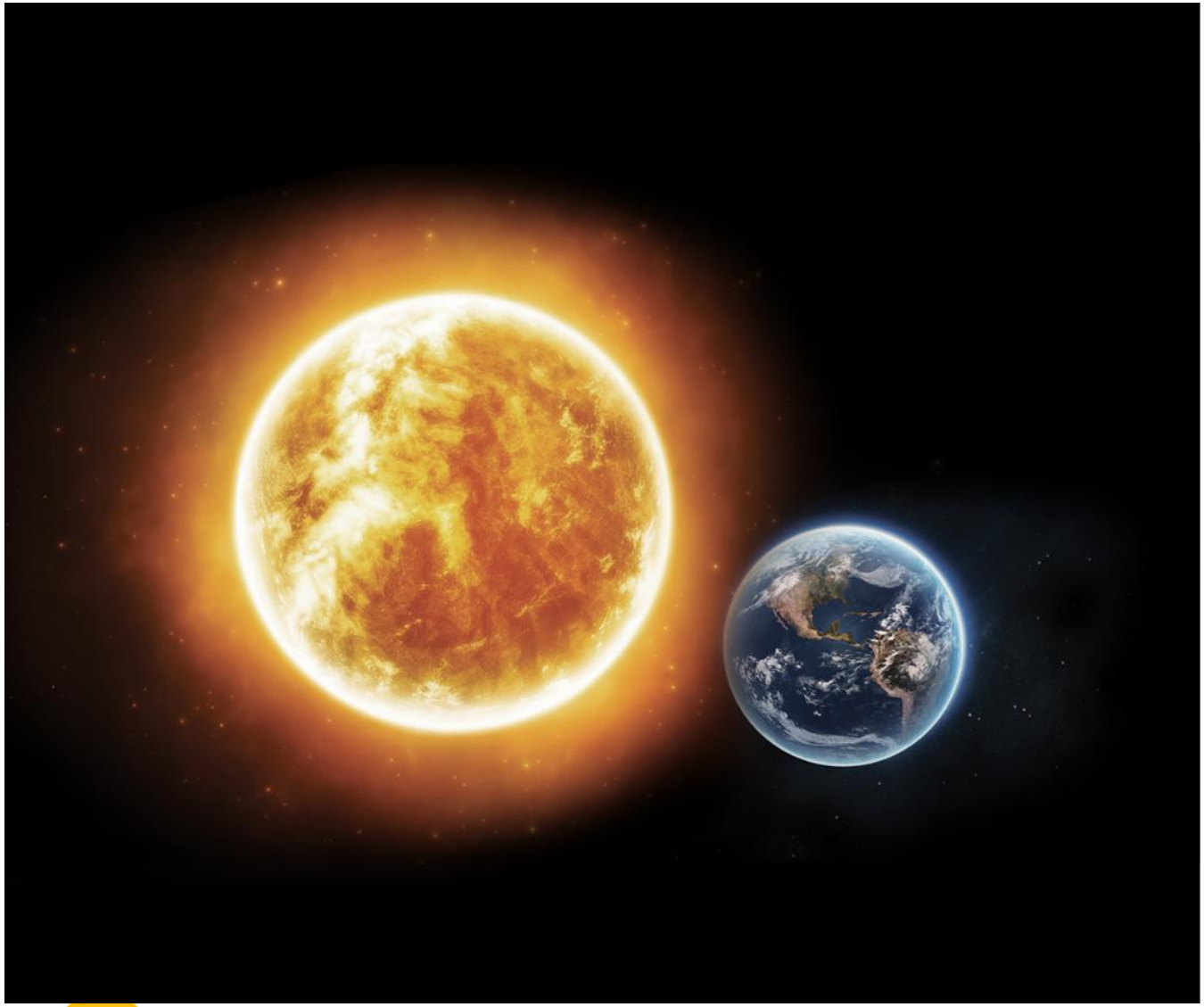

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