Maintenance and Re-calibration

CMP / SMP pyranometers and CMA albedometers are simple to maintain and do not require any special tools or training. There are no service items requiring scheduled replacement.

Recommended Maintenance

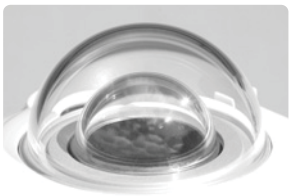
On clear windless nights the outer dome temperature of horizontally placed radiometers will decrease, even to the dew point temperature of the air, due to infrared radiation exchange with the cold sky. The effective sky temperature can be 30 °C lower than the ground temperature.

Depending upon the weather conditions; dew, glazed frost or hoar frost can be precipitated on the top of the dome and can stay there for several hours in the morning. An ice cap on the dome is a strong diffuser and decreases the pyranometer signal drastically, up to 50% in the first hours after sunrise. Snow may completely cover the dome.

The frequency of cleaning is highly dependending on the conditions at the location of the sensor, for example central Europe, deserts or desert climate, tropical climates, regions with salt-laden air, and so on. Additionally, the seasonal weather conditions come along with this.

Therefore, it is almost impossible to define a certain time interval for the dome cleaning. Ideally, the dome of the pyranometer should be cleaned every morning before sunrise. In some cases, cleaning of the domes every three or four weeks is sufficient, sometimes shorter or longer cleaning intervals can be appropriate. However, this is the user's personal decision in view of his requirements and the sensor location.

To check if a three or four-week cleaning cycle is sufficient, one can take a white cloth and wipe the dome with it. The dirtiness of the cloth is an indicator if the cleaning interval is sufficient or not and the cleaning periods can subsequently be adjusted accordingly. The frequency of cleaning can also be reduced by the use of a ventilation unit (not available for the CMP3, SMP3, CMA6 and CMA11), with the heaters switched on when necessary.



Note Cleaning of the domes should always be done with a soft and lint-free cloth (included in the delivery) which may be drenched in alcohol for strong dirt. Ensure that no smears or deposits are left on the dome.

At least once a month

Check the desiccant in the external drying cartridge. This is a non-toxic self-indicating silica-gel. When it requires replacement the colour changes from orange to clear (transparent).

To replace the desiccant, unscrew the cartridge from the radiometer housing. Should it be too tight, a 16 mm or 5/8" open-ended wrench/spanner may be used to loosen it. Remove the cap from the end of the cartridge and safely dispose of the used silica-gel. Refill with fresh desiccant (can be ordered from us with article reference number 2643951), and refit the end cap to the cartridge.

Gengenbach Messtechnik e.K.
Dipl.-Ing. (FH) Rolf Gengenbach
Heinrich-Otto-Straße 3, D-73262 Reichenbach / Fils
Postfach 1229, D-73259 Reichenbach / Fils
USt-IdNr. DE145294921

Telefon: +49 (0)7153 9258-0
Telefax: +49 (0)7153 9258-160
E-mail: info@rg-messtechnik.de
Handelsregister:
Amtsgericht Stuttgart, HRA 728946

Internet:
www.rg-messtechnik.de
www.kippzonen.de
www.dataforth.de
www.ir-filter.de

Make sure that the o-ring seal and its seat in the housing are clean and grease the seal with Vaseline if it is dry.

Note Screw in the drying cartridge hand-tight only, to avoid distorting the o-ring seal.

Desiccant refill packs are available from Kipp & Zonen. One pack is sufficient for one complete refill.
Check that the pyranometer is level and adjust if necessary.
Check that the sun shield is firmly clipped on.

Yearly maintenance

Check all the electrical connections. Unscrew the cable, clean the connectors and plugs if necessary and then reconnect it. Check if the cable shows any damages and if the instrument mountigs and base supports are secure.

Calibration

An ideal radiometer provides an output signal proportional to the absolute irradiance level. This relationship can be expressed as a constant ratio called 'sensitivity'. CMP / SMP and CMA series radiometers are very stable instruments but with time they change very slightly. This is mainly due to exposure of the black detector coating to UV solar radiation. Therefore, re-calibration is recommended every two years, which is normally carried out at the Kipp & Zonen factory.

Calibration principle

Pyranometers are calibrated or re-calibrated in accordance with ISO 9847:1992 'Solar energy - Calibration of field pyranometers by comparison to a reference pyranometer', Annex A 'Calibration devices using artificial sources'. The method is specified in Annex A.3.1 and is described in the standard as the 'Kipp & Zonen (calibration) device and procedure'.

This is based on a side-by-side comparison of the test pyranometer with a reference pyranometer of the same type underneath a stable artificial sun. A Metal-Halide high-pressure gas discharge lamp with precise voltage stabilisation is used. The irradiance at the radiometers is approximately 500 W/m².

The reference pyranometers are regularly calibrated outdoors at the World Radiation Centre (WRC) in Davos, Switzerland. The spectral content of the laboratory calibration lamp differs from the outdoor solar spectrum at the World Radiation Centre. However, this has no consequences for the transfer of calibration, because the reference and test radiometers have the same characteristics.

To minimise stray light from the walls and the operator, the light is restricted to a small cone around the two radiometers. The test radiometer and the reference radiometer are placed side by side on a small rotating table. The lamp is centred on the axis

of this table. The table is used to interchange the positions of the pyranometers to allow for inhomogeneity of the light field.

The pyranometers are illuminated and after time for the output to stabilise, the readings of both radiometers are integrated over a measurement period. The lamp housing and beam restrictors heat up and emit long-wave infrared radiation which warms up the pyranometer dome(s) slightly. This causes a small offset that is embodied in the pyranometer response under illumination. To determine this offset both radiometers are shaded, and after time to stabilise, the signals of both radiometers are integrated over a period.

The radiometer positions are interchanged by rotating the table and the whole procedure is repeated.

The sensitivity of the test pyranometer is calculated by comparison to the reference pyranometer readings and the calibration certificate is produced. The complete process is automated under computer control.

Calibration traceability to the WRR

Our reference pyranometers are calibrated at the World Radiation Centre (WRC) in Davos, Switzerland by comparison to the World Radiometric Reference (WRR). They are also fully characterized for linearity, temperature dependence and directional response to enable transfer of the sensitivity under the measurement conditions in Davos to our calibration laboratory conditions.

We keep at least two reference instruments for each pyranometer model. These reference instruments are sent alternate years to the WRC for calibration, so that production and calibration can continue without any interruption.

The calibration certificates include an overview of the calibration method, details of the reference pyranometer used, traceability to the WRR, and the uncertainty in the calibration chain from the WRR to the pyranometer being calibrated.

Gengenbach Messtechnik e.K.
Dipl.-Ing. (FH) Rolf Gengenbach
Heinrich-Otto-Straße 3, D-73262 Reichenbach / Fils
Postfach 1229, D-73259 Reichenbach / Fils
USt-IdNr. DE145294921

Telefon: +49 (0)7153 9258-0
Telefax: +49 (0)7153 9258-160
E-mail: info@rg-messtechnik.de
Handelsregister:
Amtsgericht Stuttgart, HRA 728946

Internet:
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www.ir-filter.de