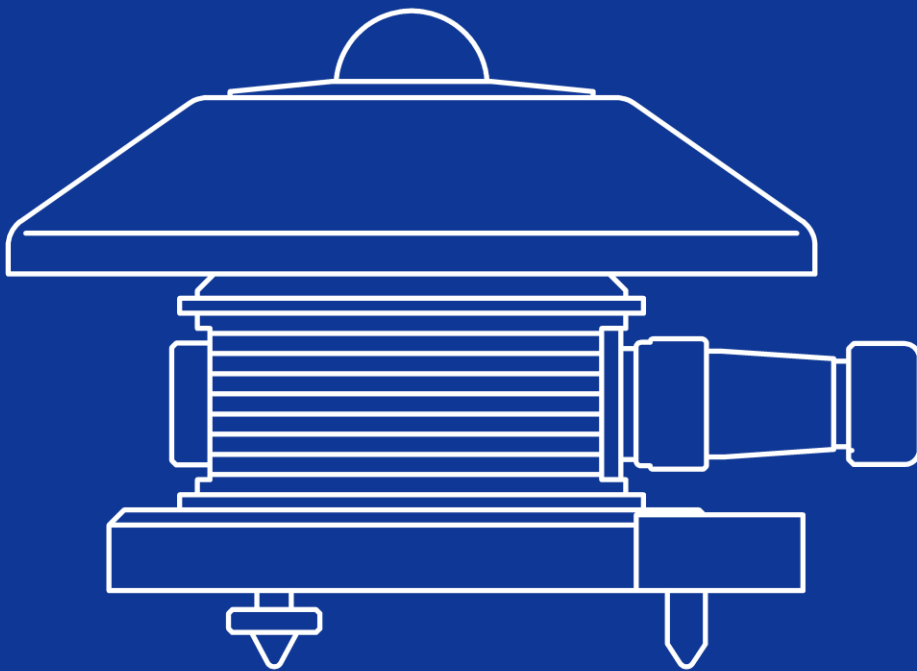


INSTRUCTION MANUAL

UV-A Radiometer

MS-212A



EKO

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2. Important User Information

Thank you for using EKO Products

Make sure to read this instruction manual thoroughly and to understand the contents before starting to operate the instrument. Keep this manual at safe and handy place for whenever it is needed.

For any questions, please contact us at one of the EKO offices given below:

2-1. Contact Information

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2-2. Warranty and Liability

For warranty terms and conditions, contact EKO or your distributor for further details.

EKO guarantees that the product delivered to customer has been verified, checked and tested to ensure that the product meets the appropriate specifications. The product warranty is valid only if the product has been installed and used according to the directives provided in this instruction manual.

In case of any manufacturing defect, the product will be repaired or replaced under warranty. However, the warranty does not apply if:

- Any modification or repair was done by any person or organization other than EKO service personnel.
- The damage or defect is caused by not respecting the instructions of use as given on the product brochure or the instruction manual.

2-3. About Instruction Manual

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Version Number: 4

2-4. Environment

1. WEEE Directive 2002/96/EC (Waste Electrical and Electronic Equipment)

This product is not subjected to WEEE Directive 2002/96/EC however it should not be mixed with general household waste. For proper treatment, recovery and recycling, please take this product(s) to designated collection points.

Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

2. RoHS Directive 2002/95/EC

EKO Instruments has completed a comprehensive evaluation of its product range to ensure compliance with RoHS Directive 2002/95/EC regarding maximum concentration values for substances. As a result all products are manufactured using raw materials that do not contain any of the restricted substances referred to in the RoHS Directive 2002/95/EC at concentration levels in excess of those permitted under the RoHS Directive 2002/95/EC, or up to levels allowed in excess of these concentrations by the Annex to the RoHS Directive 2002/95/EC.

3. Safety Information

EKO Products are designed and manufactured with consideration for safety; however, please make sure to read and understand this instruction manual thoroughly to be able to operate the instrument safely in the correct manner.



WARNING CAUTION

Attention to user; pay attention to the instructions given on the instruction manual with this sign.



3-1. WARNING/CAUTION

1. Setup

- Fix the MS-212A with bolts and nuts on the mounting base, or MS-212A may drop by gale or earthquake and lead to unexpected accidents.
- Avoid high temperature and humidity environment for the Converter installation.

2. Grounding

Always connect to grounding when MS-212A is newly installed or reinstalled in a different location. Improper grounding may cause electric shock and leakage.

3. Power Supply

Make sure the power supply voltage and types (AC, DC) are appropriate for MS-212A before connecting the power supply.

4. Handling

- Quartz Dome
Do not give impact to the exposed quartz dome part or it will break. Scattered broken glasses may cause accidents and injury.
- Plastic Parts: Sun Screen
The Sun Screen part of the MS-212A is made of plastic, and it does not have sufficient strength to hold the sensor body.
When carrying the MS-212A, hold the body part instead of just the Sun Screen part. Sun Screen may come off and drop the sensor itself.

4. Introduction

UV-A Radiometer MS-212A is an all-weather type UV radiometer which can continuously measure the irradiance in the UV-A range (315 to 400nm).

Ozone layer takes an important role in protecting the living organisms such as human by absorbing the harmful ultraviolet radiation from the sun.

UV radiations are usually categorized into 3 types: UV-A irradiance (315 to 400nm), UV-B irradiance (280 to 315nm), and UV-C irradiance (below 280nm). Only little UV-A irradiance is absorbed by the ozone, thus it does not get much effects from the changes with ozone layer; on the other hand, the UV-C irradiance is completely absorbed by the ozone, thus it does not reach the earth ground. However, the UV-B irradiance varies significantly by the ozone amount and is harmful to the living organisms, it is also called "hazardous UV ray" generally.

4-1. Main Functions

1. Measures UV-A Range Irradiance
2. Measures Highly Accurate and Stable UV Irradiance
3. Traceable to NIST Standard Lamp
4. Waterproof Design Allowing Constant Measurements

4-2. Package Contents

Check the package contents first; if any missing item or damage is noticed, please contact EKO immediately.

Table 4-1 Package Contents

Standard Items	Qty.	Remarks
MS-212A Sensor	1	
Converter	1	
Sensor Cable	1	10m (20m, 30m cables available by option)
Signal Cable	1	1.5m
Power Supply Cable	1	2.5m
Fixing Bolts, Nuts, and Washer	2 Sets	M6 x 75mm
Fuse	2	φ5.2 x 20, 250V, 2A for replacements
Inspection Report	1	
Instruction Manual	1	

5. Getting Started

5-1. Parts Name and Descriptions

Each part name and its main functions are described below.

1. MS-212A Sensor

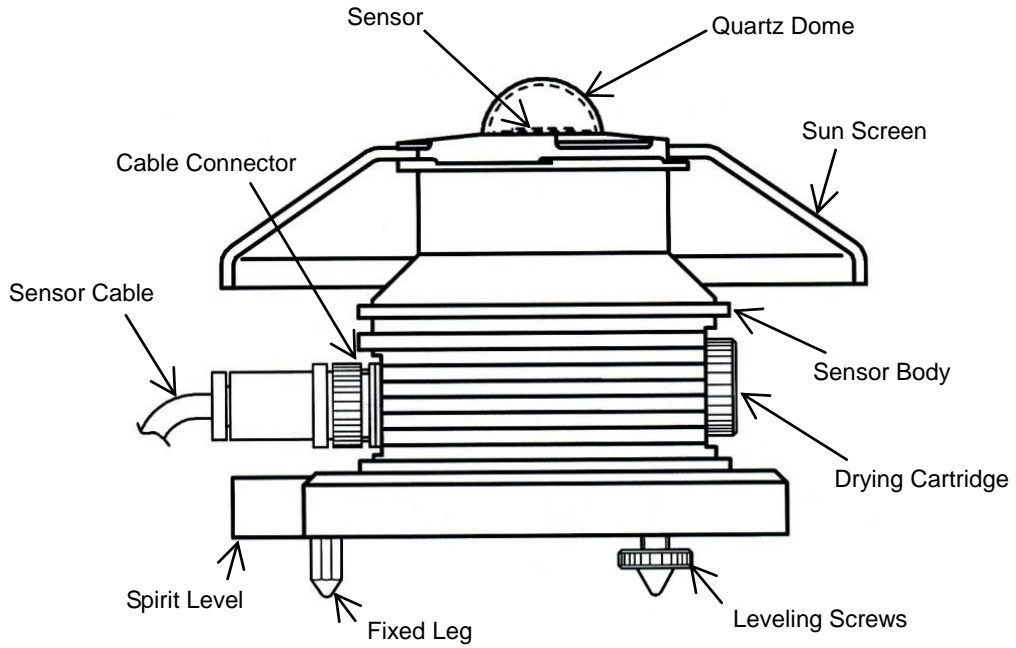


Figure 5-1. MS-212A Sensor Parts Name

2. MS-212A Converter

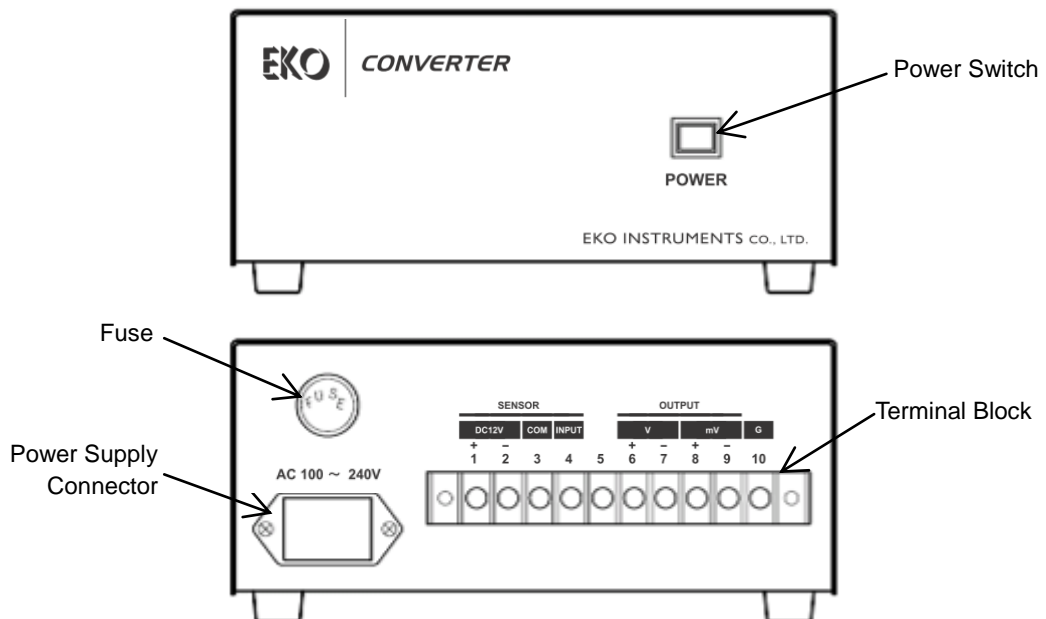


Figure 5-2. MS-212A Converter Parts Name

5-2. Setup

1. Installation Location

In order to obtain representative measurements from the UV Radiometer several criteria with respect to setup and mounting of the instruments have to be considered:

- Select a mounting position which it is free from obstructions at 5° above horizon.
- Avoid surrounding towers, poles, walls or billboards with bright colors that can reflect solar radiation onto the spectroradiometer.
- The setup location should be easily accessible for periodic maintenance (quartz dome cleaning, desiccant replacement, etc.).

2. Installation Procedure

MS-212A Sensor Installation

- 1) Make sure the fixing holes are already prepared on the mounting base for the MS-212A. Refer to the image on the right for the fixing holes pitch.
- 2) Place the MS-212A with drying cartridge facing towards South (connector facing towards North). (In case of installation in southern hemisphere, drying cartridge should face towards North and connector towards South)

If the connector is exposed to the sun direction, the connector temperature will increase and will lead to output error by thermoelectric power.

- 3) Remove the Sun Screen.

When removing the Sun Screen, always turn about 60 degrees angle in the Sun Screen in clockwise direction. Turning in anti-clockwise direction may loosen the quartz dome holder.

When lifting up the MS-212W, always hold the metal part of the body instead of just the Sun Screen part. Holding just the Sun Screen part may lead to breaking the Sun Screen and drop the instrument.

- 4) In order to properly install the MS-212A sensor surface in horizontal position, adjust the level by using the 2 leveling screws.
- 5) Put the 2 bolts (M6 x 75mm) through the fixing holes (see drawing) on the MS-212A and tighten the MS-212A with these 2 screws equally.
Make sure the MS-212A is securely fixed or it may lead to unexpected accidents by the instruments dropping in case of earthquake and so on.
- 6) Place the Sun Screen, which was removed in Step 3, back on the MS-212A in clockwise direction again.

Installing Converter

Avoid installing the Converter in an environment which is high temperature and high humidity.

The Converter should be installed indoor as it is not designed with waterproof function.

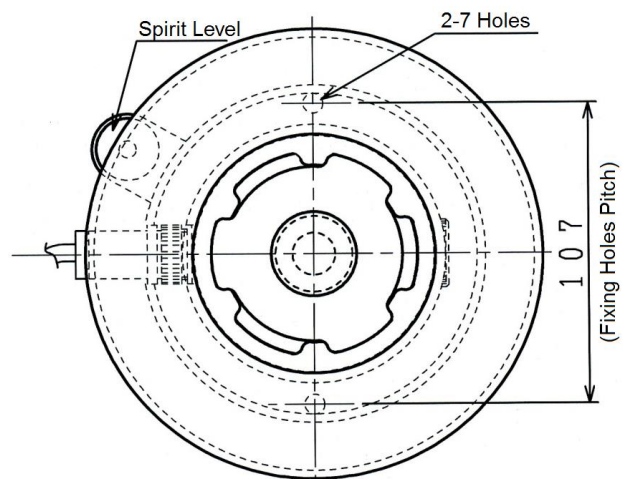


Figure 5-3. MS-212A Fixing Holes Pitch

5-3. Cable Connections

1. Sensor Cable

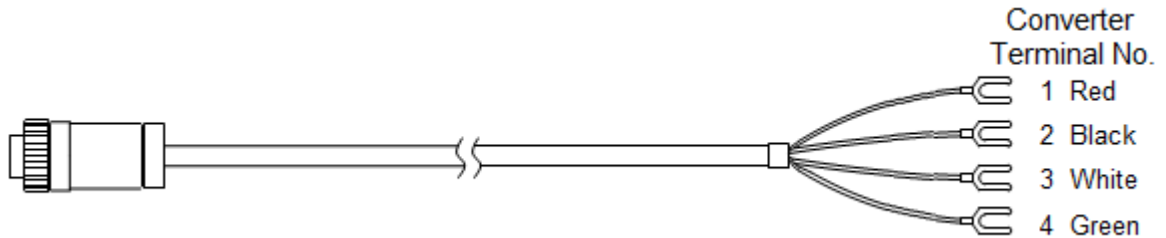


Figure 5-4. MS-212A Sensor Cable

1) Connecting the Plug

Insert the Sensor Cable connector to the MS-212A receptacle and tighten the fixing screw securely while pushing the cable connector into the receptacle.

If the Sensor Cable connector is not sufficiently pushed in and then tightened, water may leak inside and cause damages inside.

2) Connecting the Terminals

Connect the wires with terminals to the SENSOR side terminal block on the rear panel of the Converter. Match the numbers on the wires and the Converter terminal block for connection. If connection made with different numbers, it may lead to damaging the MS-212A and/or Converter or malfunction.

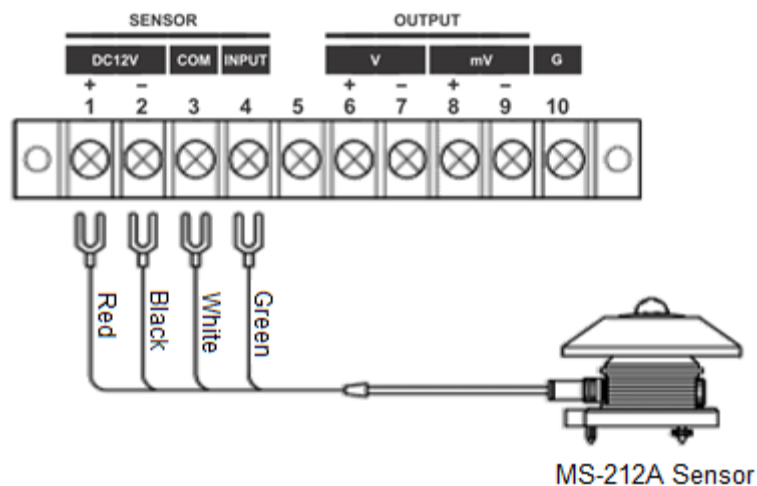


Figure 5-5. MS-212A Terminal Connection

2. Signal Cable

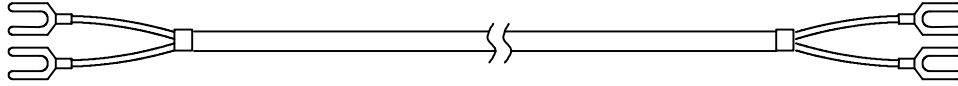


Figure 5-6. MS-212A Signal Cable

There are 2 types of outputs (V, mV) from the OUTPUT side of the Converter rear panel.

V and mV are the outputs proportional to the A range UV irradiance, and these are the voltage outputs in $0.01 \pm 0.001 \text{V/W} \cdot \text{m}^{-2}$ and $0.1 \pm 0.01 \text{mV/W} \cdot \text{m}^{-2}$. (See the section 5-4 for the A range UV irradiance conversion)

Connect the attached Signal Cable to either V or mV (select either one which is appropriate for the input level on the data logger or data recording device).

Connect the other end of the Signal Cable to data logger or data recording device. If the connection is short circuited, it may damage the MS-212A and/or Converter.

3. Power Supply Cable

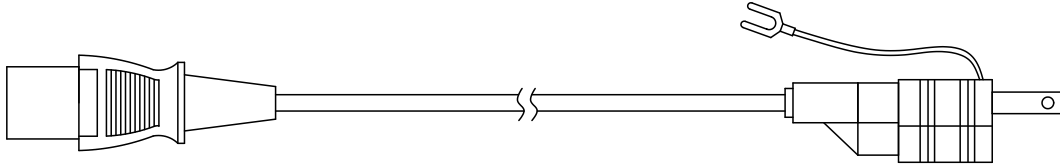


Figure 5-7. MS-212A Power Supply

Make sure the supplied power is within the range of AC85 to 264V and 47 to 440Hz first then connect the Power Supply Cable.

4. Grounding Wire

To avoid electric shocks and electric leakage, connect the No.10 (Terminal G) on the Converter rear panel or grounding cable attached to the power supply cable top to ground

5-4. Measurement

1. Power ON the Converter

Turn ON the POWER SW. of the Converter. (To turn ON the power, lift up the plastic cover and press the green button; the lamp comes on when the power is ON.)

2. Measure

Start the measurements using the measuring device such as data logger.

3. Calculate UV Irradiance

There are 2 types (V, mV) of OUTPUT terminal on the Converter for UV irradiance output; the sensitivity value is different depending on the output connection. Verify the inspection report for the subjected sensitivity and calculate the UV irradiance using following formula.

$$\text{UV-A Irradiance(W/m}^2\text{)} = \frac{\text{Output Voltage (V)}}{\text{Sensitivity (V/W} \cdot \text{m}^{-2}\text{)}}$$

OR

$$= \frac{\text{Output Voltage (mV)}}{\text{Sensitivity (mV/W} \cdot \text{m}^{-2}\text{)}}$$

6. Measurement Principle

6-1. UV-A Radiometer Measurement Principle

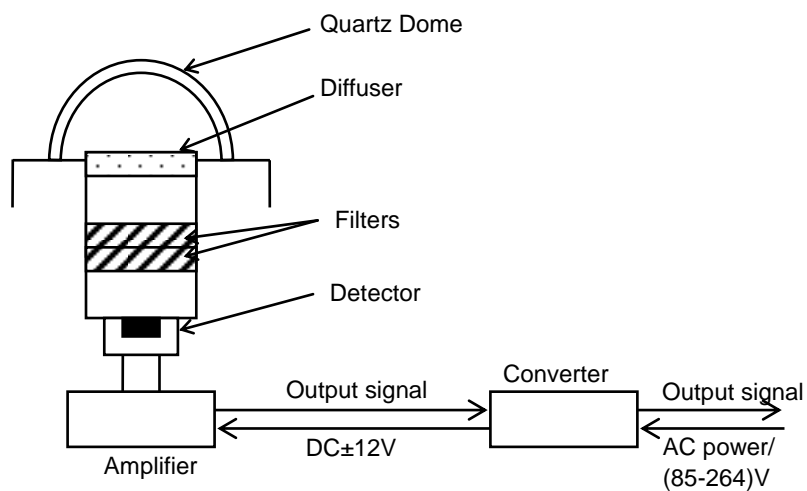
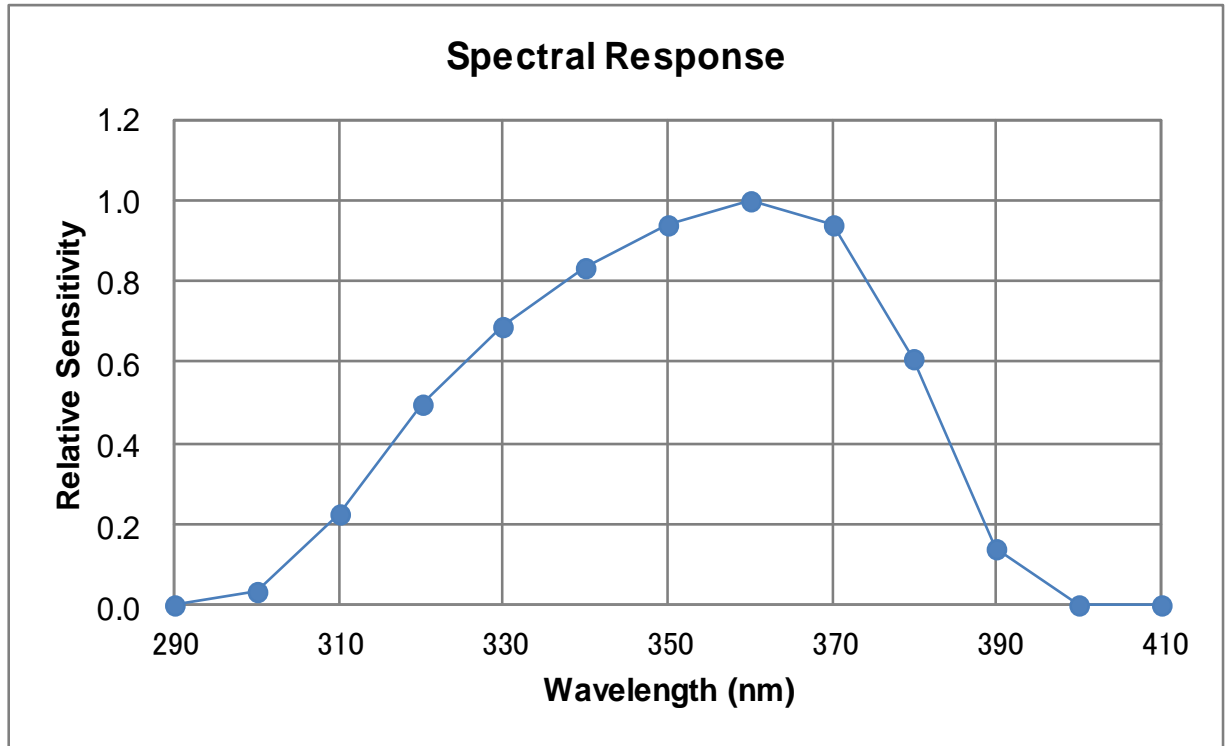


Figure 6-1. MS-212A Structure and Wavelength Characteristics

The incident solar irradiance transmits the quartz dome and is diffused by the diffuser inside the dome then through the transmitting UV filter, only the UV irradiance in the range of 315 to 400nm enters the detector. The output from the detector is amplified by the integrated amplifier and output to the converter.

7. Maintenance & Troubleshooting

7-1. Maintenance

To maintain accurate measurement, it is recommended to check and do the following:

Table 7-1. Maintenance Items

Check Items	Frequency	How To	Effect of Neglecting the Maintenance
Cleaning Quartz Dome	Few times per week (At least once per week)	Keep the quartz dome / window clean by wiping it with a soft cloth and alcohol.	If the quartz dome gets soiled (by such as dirt, dew, and dusts), it will lead to inaccurate UV-A irradiance measurements.
Replacing Silica Gel	Monthly	Verify that the color of the silica gel is dark blue (dark blue = okay). If the color of the silica gel turns into a reddish color then replace it with new silica gel. 2 to 4mm size silica gels are suitable. <u>When reattaching the drying cartridge, make sure to sufficiently tighten the lid so that the packing (O-ring) is completely sealed. Incomplete sealing will allow water to enter and causes damages inside.</u>	With moisture saturated silica gel gives condensation inside the dome which leads to a lower detector output or damage.
Cleaning MS-212A Body	Monthly	The body of the UV-A Radiometer is designed with ridges for giving better efficiency for thermal exchange. Use brush to clean the ridges regularly.	The efficiency of the thermal exchange will decrease if the ridges are soiled with dusts and dirt.

7-2. Calibration and Recalibration

1. Calibration Procedure

MS-212A is calibrated by the following procedure.

First, calibrate the spectroradiometer specified for UV using the standard lamp which is traceable to the NIST (National Institute of Standards and Technology) in the U.S. Next, take the comparison measurements between this spectroradiometer and the product UV-A Radiometer for reference instrument using solar simulator. Integrate the spectral irradiance to make this value as the UV-A irradiance and obtain the calibration constant value by dividing the reference instrument output by this irradiance. Then take the comparison measurements between the reference instrument and the product UV-A Radiometer to determine the sensitivity of the product UV-A Radiometer. This sensitivity (calibration value) is guaranteed for one year from the time of delivery.

Traceability of UV Radiometers

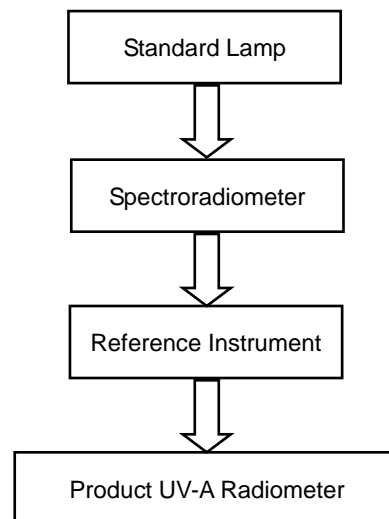


Figure 7-1. Traceability of UV Radiometers

2. Recalibration

Although the components used in the UV-A Radiometer are well selected, there are risks of deterioration in a long term due to the UV radiation, heat, humidity and so on; therefore, it is important to check and recalibrate the sensor.

In order to acquire highly accurate data, it is recommended to recalibrate the sensor once a year.

7-3. Troubleshooting

Check the following items in case of trouble with the instrument. If any questions should remain, contact EKO for further technical support.

Table 7-2. Troubleshooting

Failure	Action
There is no output.	<ul style="list-style-type: none">• Check the power is switched ON.• Check whether the fuse is blown. If the fuse is blown, replace with a new fuse. ($\phi 5.2 \times 20$ 250V 2A)• Check the cable connection between the MS-212A Sensor and the Converter (See Figure 5-5)
Output value is significantly low.	<ul style="list-style-type: none">• Check whether the quartz dome; if it is soiled, clean with soft cloth and alcohol.• There are 2 types of terminals on the converter: Output in V ($0.01 \pm 0.001 \text{V/W} \cdot \text{m}^{-2}$) and output in mV ($0.1 \pm 0.01 \text{mV/W} \cdot \text{m}^{-2}$). Check the signal cable connection.

8. Specification

8-1. Specifications

Table 8-1. Sensor Specification

Characteristics	Details
Measurement Range	0 to 100W·m ⁻²
Output	0 to 1V 0 to 10mV
Sensitivity	0.01±0.001V/W·m ⁻² 0.1±0.01mV/W·m ⁻²
Temperature Response	< ±1.5% (@ ambient temperature -10 to +50°C)
Wavelength Range	315 to 400nm
Traceability	Traceable to NIST Standard Lamp
Cosine Response	< 10% (Incident Angle 0° to 70°)
Directional Response	< 10% (Incident Angle 0° to 70°)
Response Time	1sec (@90%)
Non-Linearity	< 2%
Impedance	500Ω (V) 100Ω (mV)
Operating Temperature	-10 to +50°C
Weight	1.0kg

Table 8-2. Converter Specification

Characteristics	Details
Power Supply	AC85 to 264V, 47 to 440Hz
Power Consumption	< 10W
Output Voltage	±12.0V
Operating Temperature	0 to 40°C
Operating Humidity	10 to 90%RH (No condensation)
Weight	0.8kg

8-2. Dimensions

1. MS-212A Sensor

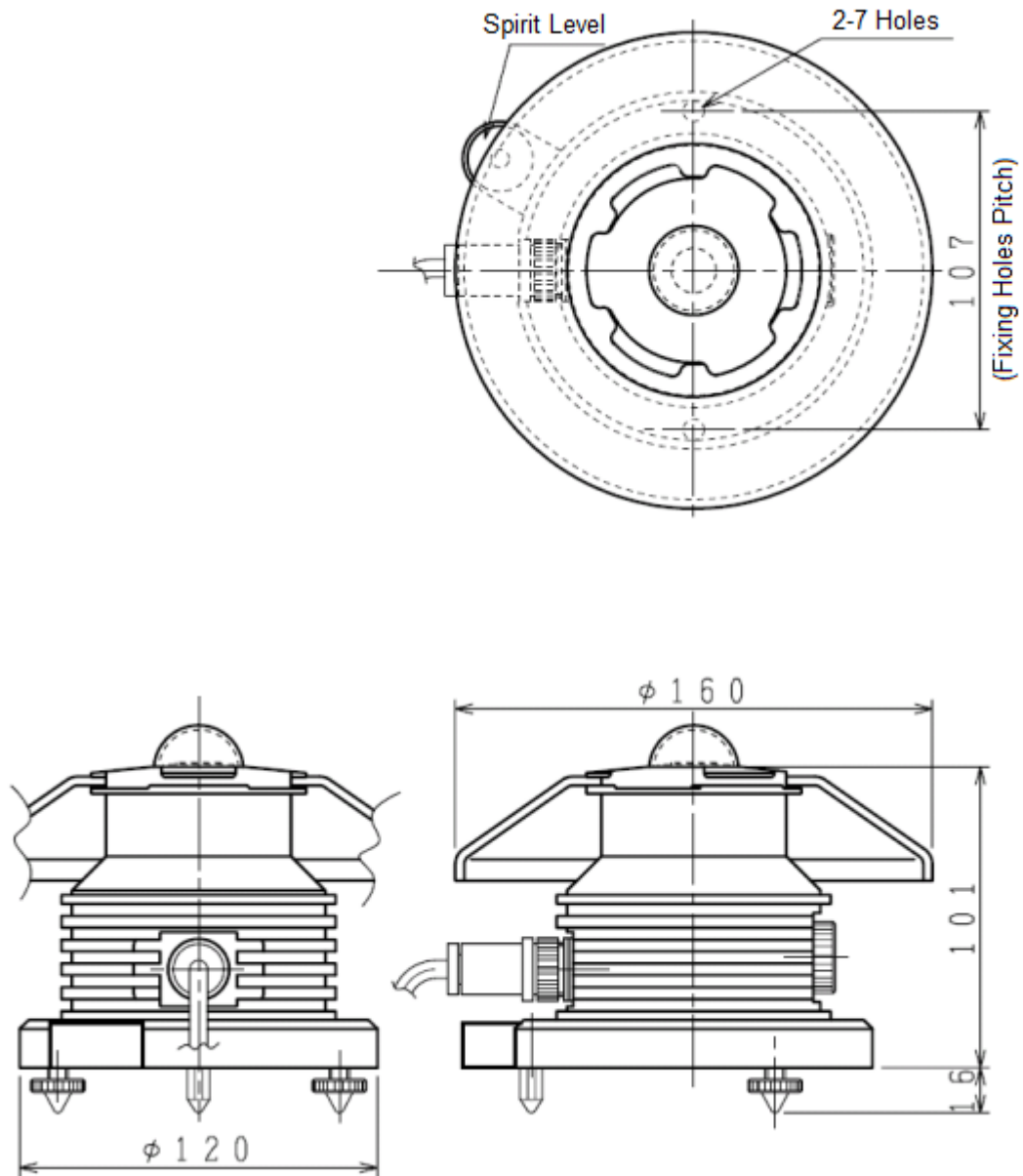


Figure 8-1. MS-212A Sensor Dimensions

2. MS-212A Converter

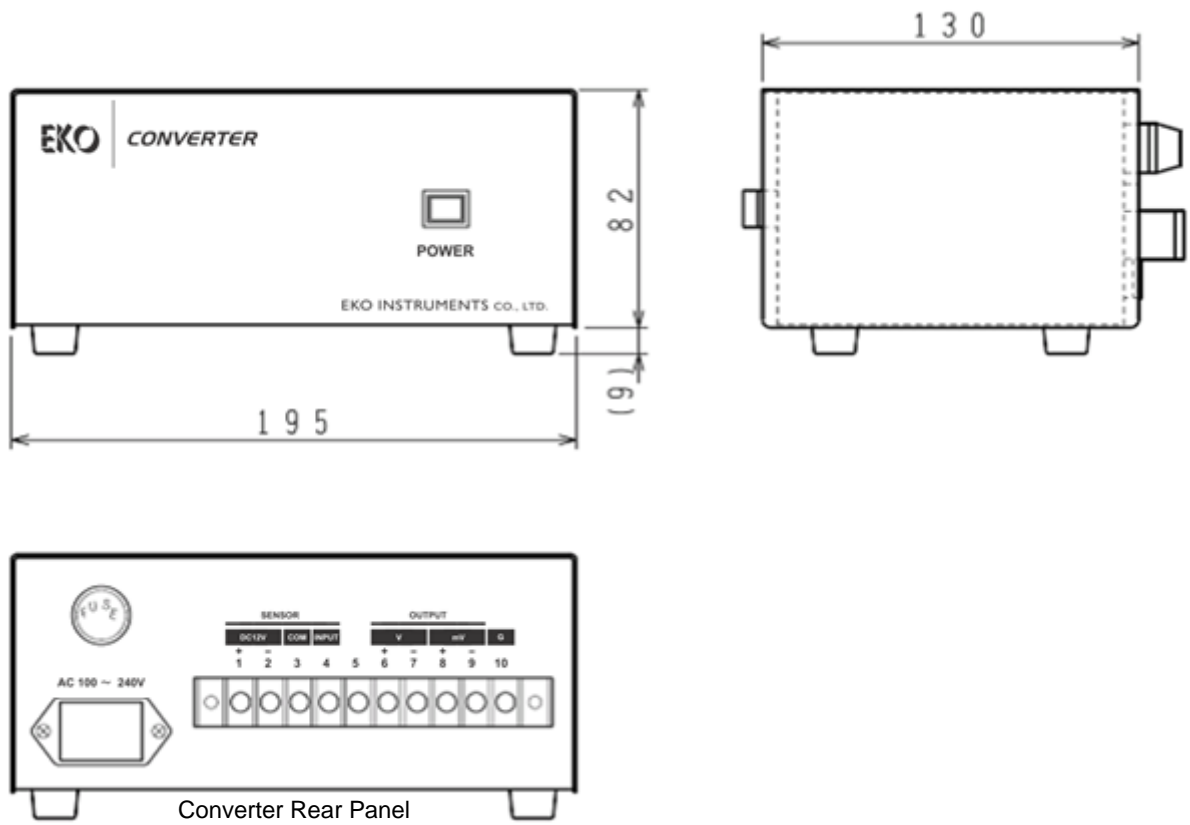


Figure 8-2. MS-212A Converter Dimensions

8-3. Accessories List

Table 8-3. Accessories List

Option Items	Remarks
Sensor Cable	20m, 30m (for more than 30m long cable, please contact EKO)



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