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## Solar Irradiation Sensor (Analog 4-20mA Current Output) - Operation and Installation Manual Models –MBMet-500AA, MBMet-500BA, MBMet-500CA and MBMet-500DA

**Document Number: M4 050 020 020 01 (R2)**  
**(Suitable for HW Version-101)**

### Contents

Contents .....	1
1. Warnings.....	2
2. Technical Specifications Solar Irradiation Sensor .....	3
3. Parts of Solar Irradiation Transducer.....	5
4. Solar Irradiation Transducer– Installation .....	6
5. Solar Irradiation Sensor – Connections .....	8
6. General Maintenance .....	9

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## 1. Warnings

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- Installation at site should be done by skilled and qualified personal after taking required approvals.
- Use proper protection gear and tool while installing the device.
- Be aware of your surroundings while doing the installation work.
- Serious injury can occur if proper safety norms are not followed.
- Compliance with all utility and electrical safety codes regulations are mandatory.
- Read the manual and get acquainted with the sensor connections and terminals before commencing installation activity.
- Before connecting the sensor system, read its label to confirm power supply requirements.
- All connections should be done only when power to the sensor is switched off.
- Improper installation and connections may damage the device and sensor connected to the same.
- Protect from overvoltage and static electricity.
- Physically damaged sensors should not be used or connected to main power.
- Use proper earth connection.
- **Use proper size screwdriver (tools) and cable for connection else the terminals might get damaged.**
- **Output Cable OD is to be maintained as per the below specification for proper waterproofing. Otherwise water will seep into the junction box and will damage electronics.**
  - **Cable Type:** cable unitronic robust c (tp) 2x2x0.14 screened halogen free cable.
  - **Cable dimensions:** Twisted Pair, Number of Conductors: 2 x 2, Conductor Diameter: 0.14mm<sup>2</sup>, Outer Cable Diameter: 5.3mm,
  - Lapp Article No. 1032100

## 2. Technical Specifications Solar Irradiation Sensor

Technical specifications for the Solar Irradiation sensor are provided in table-2.1 below.

Model/ Parameters	MBMet-500AA	MBMet-500BA	MBMet-500CA	MBMet-500DA
Output signal	4-20mA			
Sensor	Silicon			
Power Supply	9-32 VDC			
Power Consumption	50mW			
Solar Irradiation				
Range	0-1500 W/m2			
Accuracy	±5 W/m2 ±3 % of reading			
Resolution	1			
Response Time	2-3 seconds			
Stability	0.5% per annum			
Cell Temperature				
Range	-40 to 90 <sup>0</sup> C			
Accuracy	±0.3% FS			
Resolution	0.1			
Response Time	2-3 seconds			
Ambient Air Temperature (Integrated Sensor)				
Sensor Type	-	RTD- PT1000	-	-
Range	-	-40 to 90 <sup>0</sup> C	-	-
Accuracy	-	±0.3% FS	-	-
Resolution	-	0.1	-	-
Response Time	-	3-5 seconds	-	-
Ambient Air Temperature (External Sensor with three meters silicon cable)				
Sensor Type	-	-	RTD- PT1000	-
Range	-	-	-40 to 90 <sup>0</sup> C	-
Accuracy	-	-	±0.3% FS	-
Resolution	-	-	0.1	-
Response Time	-	-	3-5 seconds	-
PV Module Temperature (External Sensor with three meters silicon cable)				
Sensor Type	-	-	-	RTD- PT1000
Range	-	-	-	-40 to 90 <sup>0</sup> C
Accuracy	-	-	-	±0.3% FS
Resolution	-	-	-	0.1
Response Time	-	-	-	4-6 seconds

Table-2.1: Technical specifications

General specifications are provided in table 2.2 below:

Parameter	Specification
<b>Irradiation Sensor Enclosure</b>	Cast Aluminum
<b>Ingress Protection</b>	IP65
<b>Irradiation Sensor Enclosure Size</b>	120 (L) x 76 (W) x 65 (H) mm
<b>Weight</b>	350 grams (approx.)
<b>Mounting clamp (suitable for mounting on PV module side)</b>	SS 304
<b>Cable terminals</b>	1.5 sq. mm. copper
<b>Integrated Ambient Temperature Sensor</b>	40mm x 4mm (SS304)
<b>Cable glands (EMC protected)</b>	M12x1.5mm
<b>Ambient operating temperature</b>	-30 to 70 <sup>0</sup> C
<b>Ambient operating humidity</b>	0 to 99% RH

Table -2.2: General specifications

### 3. Parts of Solar Irradiation Transducer

Details of parts shipped along with Solar Irradiation Transducer are provided in table 3.1 below.

Mark in Fig	Description	MBMet-500AA (Fig 3.1)	MBMet-500BA (Fig 3.2)	MBMet-500CA (Fig 3.3)	MBMet-500DA (Fig 3.4)
1	Transducer	01	01	01	01
2	Temperature sensor	NA	Integrated PT1000	External Ambient PT1000	External PV Module PT1000
3	SS Spring Clip for Temperature sensor mount	NA	NA	01	NA
4	Mounting Plate (SS-304)	01	01	01	01
5	M5 X 32mm SS Hex Screw	02	02	02	02
6	M5 SS Washer	04	04	04	04
7	M5 Spring Washer	04	04	04	04
8	M5 SS Nut	04	04	04	04
9	M5 X 20mm SS Round Screw	02	02	02	02

Table-3.1: Parts shipped with MBMet-500.

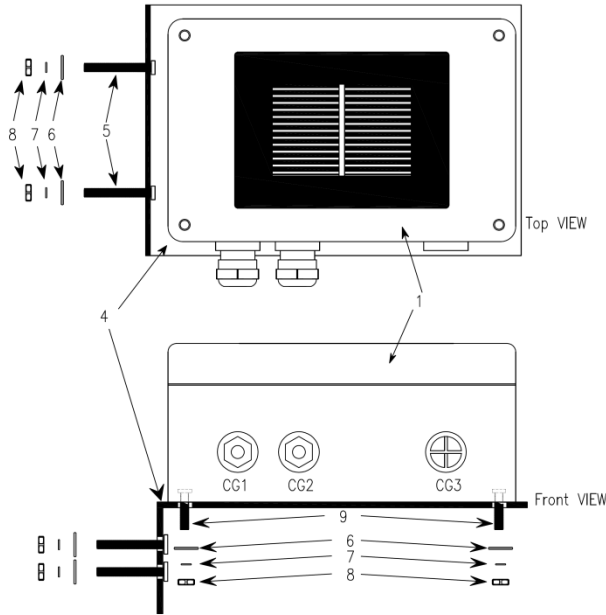


Fig-3.1: MBMet-500AA Parts

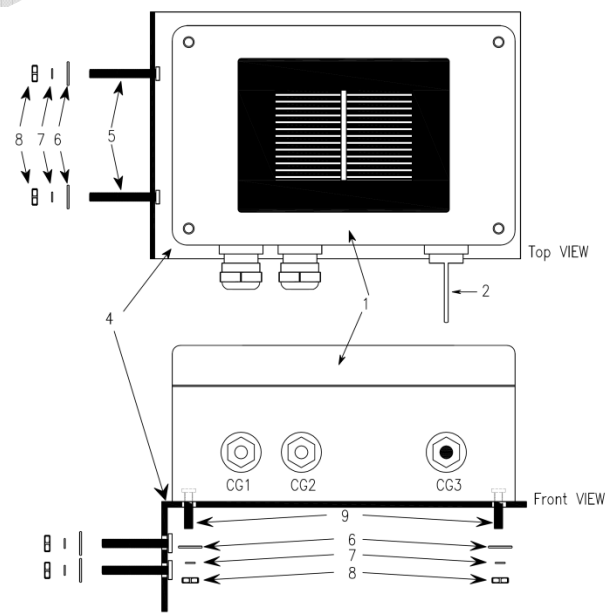


Fig-3.2: MBMet-500BA Parts

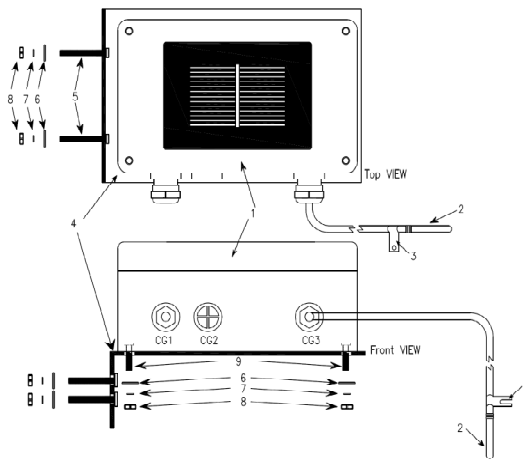


Fig-3.3: MBMet-500CA Parts

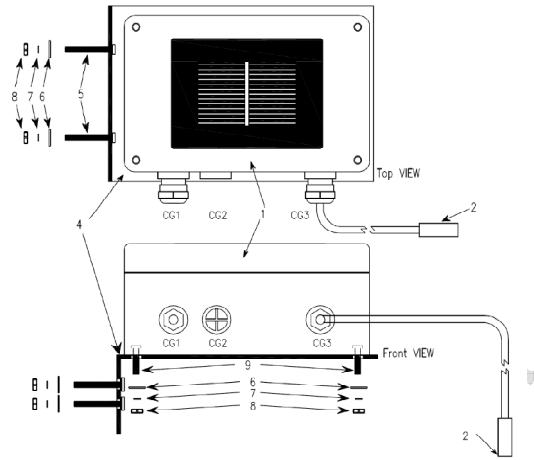


Fig-3.4: MBMet-500DA Parts

#### 4. Solar Irradiation Transducer– Installation

Use the sensor mounting clamp provided along with the sensor to install it at side of the PV module (or any other location). Care must be taken that the sensor inclination is same as PV Module.

**Step – 1:** Drill two holes (M6) at site where the Solar Irradiation sensor is intended to be installed according to the following figure 4.1.

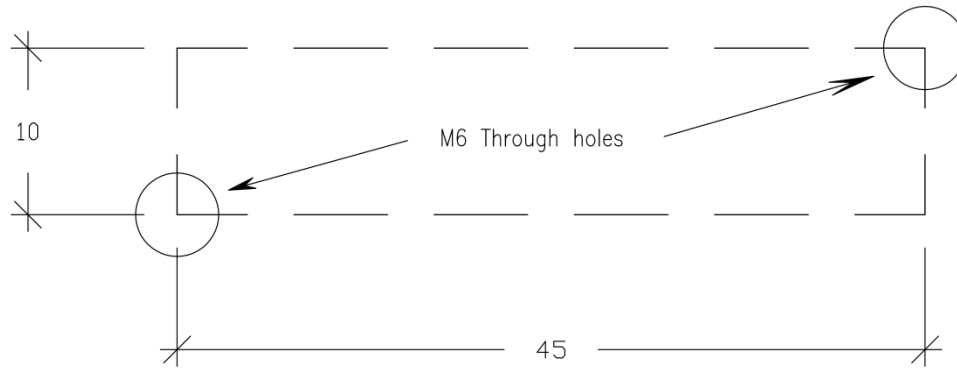


Fig – 4.1: Mounting holes' dimension

**Step – 2:** Install the sensor Mounting Clamp alongside the solar panel with the M5 x 32mm screws, nut, spring washer and washer provided as shown in the figure 4.2.

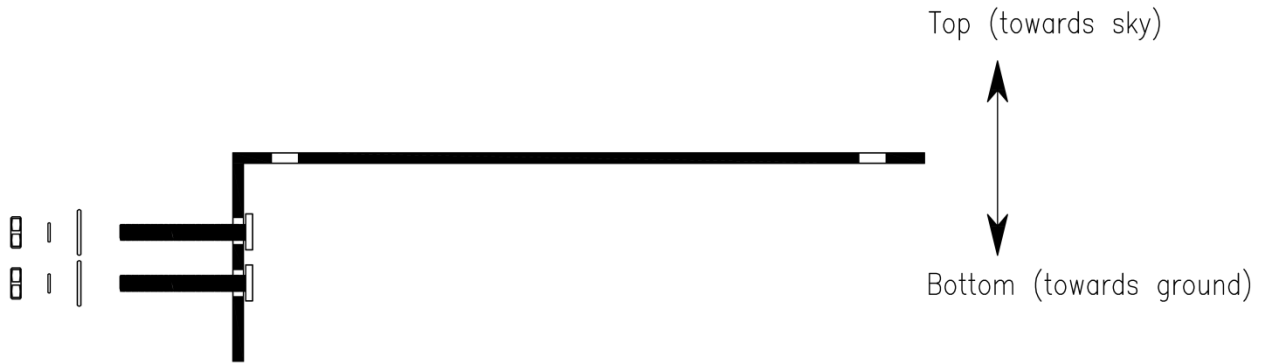


Fig – 4.2: Mounting clamp position

**Step – 3:** Open the cover of the sensor and mount the sensor to the clamp with the M5X20mm SS Round Head screws provided along with the sensor. The holes for mounting the sensor are shown in the figure 4.3.

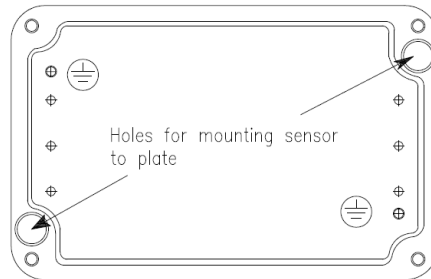


Fig – 4.3: Holes for fixing sensor to mounting plate.

**Note:** Keep the sensor cover with solar cell safely. Ensure that there is no scratch on the solar cell and it is not soiled.

**Step – 4:** Connect the interface cable according to the sensor specification. Connection details are given in Section 5 of this manual. After connection is done, close the cover and tighten the screws fully for retaining the IP protection.

**Note:** Cable should be matching the specification stated below for maintaining proper waterproofing. Otherwise Gable gland will remain loose and water will seep and damage the electronics inside.

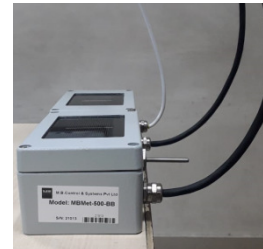
**Cable Type:** cable unitronic robust c (tp) 2x2x0.14 screened halogen free cable.

**Cable dimensions:** Twisted Pair, Number of Conductors: 2 x 2, Conductor Diameter: 0.14mm<sup>2</sup>, Outer Cable Diameter: 5.3mm,

**Lapp Article No:** 1032100



**RIGHT WAY** (the cables to be downwards)



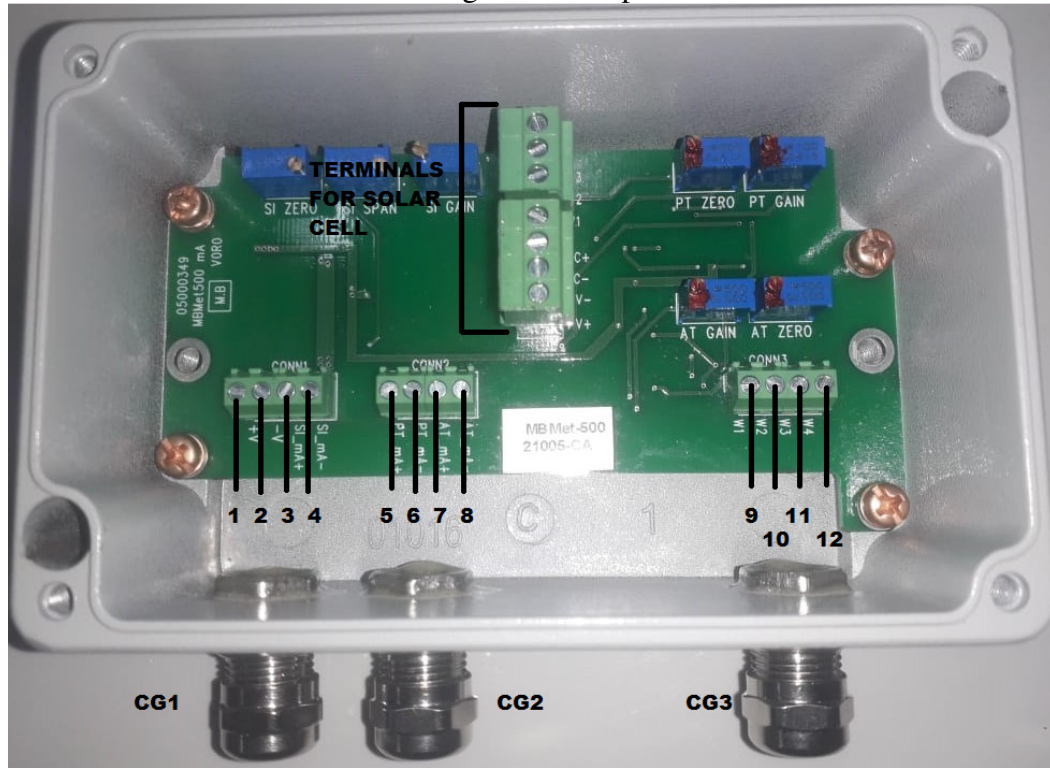
**WRONG WAY** (water can seep inside)

Fig-4.4: Proper way of securing the cables

## 5. Solar Irradiation Sensor – Connections

Care should be taken so that no components on the PCB are touched.

Terminal numbers on the sensor PCB are given in the picture 5.1 below.



Picture – 5.1: Terminal Numbers of PCB

Connections for the transducer terminals are given in the table 5.1 below.

Terminal	MBMet-500AA	MBMet-500BA	MBMet-500CA	MBMet-500DA
1	9-32 V DC +	9-32 V DC +	9-32 V DC +	9-32 V DC +
2	GND	GND	GND	GND
3	Irradiance 4-20mA (+)	Irradiance 4-20mA (+)	Irradiance 4-20mA (+)	Irradiance 4-20mA (+)
4	Irradiance 4-20mA (-)	Irradiance 4-20mA (-)	Irradiance 4-20mA (-)	Irradiance 4-20mA (-)
5	Sensor Solar Cell Temperature 4-20mA (+)	Sensor Solar Cell Temperature 4-20mA (+)	Sensor Solar Cell Temperature 4-20mA (+)	Sensor Solar Cell Temperature 4-20mA (+)
6	Sensor Solar Cell Temperature 4-20mA (-)	Sensor Solar Cell Temperature 4-20mA (-)	Sensor Solar Cell Temperature 4-20mA (-)	Sensor Solar Cell Temperature 4-20mA (-)
7	NA	Integrated RTD Temperature 4-20mA (+)	External RTD Temperature 4-20mA (+)	External RTD Temperature 4-20mA (+)
8	NA	Integrated RTD Temperature 4-20mA (-)	External RTD Temperature 4-20mA (-)	External RTD Temperature 4-20mA (-)



9	NA	Integrated Ambient Temperature RTD (A)	External Ambient Temperature RTD (A)	External PV Module Temperature RTD (A)
10	NA	Integrated Ambient Temperature RTD (A)	External Ambient Temperature RTD (A)	External PV Module Temperature RTD (A)
11	NA	Integrated Ambient Temperature RTD (B)	External Ambient Temperature RTD (B)	External PV Module Temperature RTD (B)
12	NA	Integrated Ambient Temperature RTD (B)	External Ambient Temperature RTD (B)	External PV Module Temperature RTD (B)

Table-5.1: MBMet-500 connections

4-20mA Connection scaling values are given below

Sl No	Parameter	Value at 4mA	Value at 20mA
01	Solar Irradiance	0 W/m <sup>2</sup>	1500 W/m <sup>2</sup>
02	Sensor Cell Temperature	-40 °C	90 °C
03	Integrated Ambient Temperature (PT1000)	-40 °C	90 °C
04	External Ambient Temperature (PT1000)	-40 °C	90 °C
05	External PV Module Temperature (PT1000)	-40 °C	90 °C

Table-5.2: MBMet-500 mA Scaling Values

## 6. General Maintenance

General maintenance procedures are described below:

- i) Keep the solar cell glass clean of any dust.
- ii) Use soft cloth to clean the solar panel glass. Do not make any scratches on the glass. This will produce wrong results.