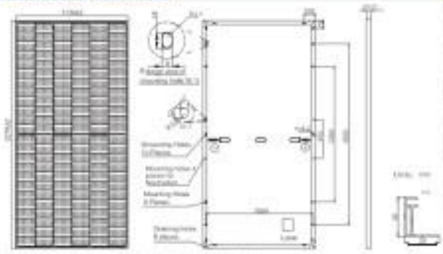
Lampiran 1 *Datasheet* Modul Surya JA Solar

JA SOLAR JAM72S30 525-550/MR/1500V Series

MECHANICAL DIAGRAMS



Remark: customized frame color and cable length available upon request

SPECIFICATIONS

Cell	Mono
Weight	28.6kg±3%
Dimensions	2279±2mm×1134±2mm×35±1mm
Cable Cross Section Size	4mm² (IEC), 12 AWG(UL)
No. of cells	144(6×24)
Junction Box	IP68, 3 diodes
Connector	Genuine MC4-EVO2 QC 4.10-35/45
Cable Length (Including Connector)	Portrait: 300mm(+)/400mm(-); Landscape: 1300mm(+)/1300mm(-)
Country of Manufacturer	China/Vietnam

ELECTRICAL PARAMETERS AT STC

TYPE	JAM72S30-525/MR/1500V	JAM72S30-530/MR/1500V	JAM72S30-535/MR/1500V	JAM72S30-540/MR/1500V	JAM72S30-545/MR/1500V	JAM72S30-550/MR/1500V
Rated Maximum Power(Pmax) [W]	525	530	535	540	545	550
Open Circuit Voltage(Voc) [V]	49.15	49.30	49.45	49.60	49.75	49.90
Maximum Power Voltage(Vmp) [V]	41.15	41.31	41.47	41.64	41.80	41.96
Short Circuit Current(Isc) [A]	13.65	13.72	13.79	13.86	13.93	14.00
Maximum Power Current(Imp) [A]	12.76	12.83	12.90	12.97	13.04	13.11
Module Efficiency [%]	20.3	20.5	20.7	20.9	21.1	21.3
Power Tolerance	0~+5W					
Temperature Coefficient of Isc(α_Isc)	+0.045%/℃					
Temperature Coefficient of Voc(β_Voc)	-0.275%/℃					
Temperature Coefficient of Pmax(γ_Pmp)	-0.350%/℃					
STC	Irradiance 1000W/m², cell temperature 25℃, AM1.5G					

Remark: [illegible]
Measurement tolerance at STC: [illegible]

ELECTRICAL PARAMETERS AT NOCT

TYPE	JAM72S30-525/MR/1500V	JAM72S30-530/MR/1500V	JAM72S30-535/MR/1500V	JAM72S30-540/MR/1500V	JAM72S30-545/MR/1500V	JAM72S30-550/MR/1500V
Rated Max Power(Pmax) [W]	397	401	405	408	412	416
Open Circuit Voltage(Voc) [V]	46.25	46.18	46.31	46.43	46.55	46.68
Max Power Voltage(Vmp) [V]	38.38	38.57	38.70	38.86	39.02	39.13
Short Circuit Current(Isc) [A]	10.97	11.01	11.06	11.10	11.13	11.17
Max Power Current(Imp) [A]	10.35	10.39	10.43	10.47	10.51	10.55
NOCT	Irradiance 800W/m², ambient temperature 20℃, wind speed 1m/s, AM1.5G					

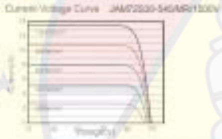
*For NexTracker installations, Maximum Static Load, Front is [illegible] while Maximum Static Load, Back is [illegible]

OPERATING CONDITIONS

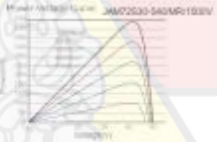
Maximum System Voltage	1500V DC (IEC)
Operating Temperature	-40℃~+85℃
Maximum Series Fuse Rating	25A
Maximum Static Load, Front* / Maximum Static Load, Back*	5400Pa, 1.5 / 2400Pa, 1.5
NOCT	45±2℃
Safety Class	Class Ⅱ
Fire Performance	UL Type 1

CHARACTERISTICS

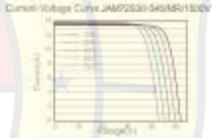
Current-Voltage Curve JAM72S30-545/MR/1500V



Power-Voltage Curve JAM72S30-545/MR/1500V



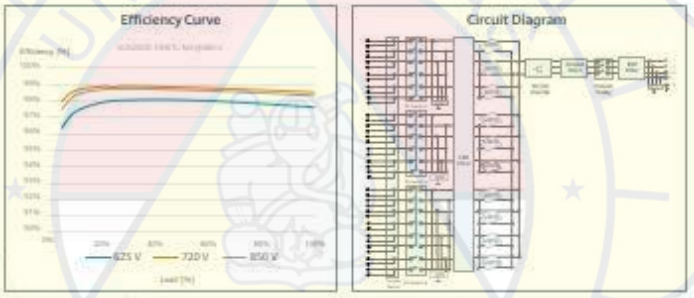
Current-Voltage Curve JAM72S30-545/MR/1500V



Lampiran 2 *Datasheet* SUN2000-100-KTL-M2

SUN2000-100KTL-M2

Smart PV Controller



SUN2000-100KTL-M2

Technical Specification

Technical Specification	SUN2000-100KTL-M2
Efficiency	
Max. efficiency	98.6% @ 480 V, 98.8% @ 680 V
European efficiency	98.4% @ 480 V, 98.6% @ 680 V
Input	
Max. Input Voltage [1]	1,100 V
Max. Current per MPPT	30 A
Max. Current per Input	30 A
Max. Short Circuit Current per MPPT	40 A
Start Voltage	200 V
MPPT Operating Voltage Range [2]	200 V – 1,000 V
Nominal Input Voltage	600 V @ 480 Vac, 720 V @ 680 Vac
Number of MPP trackers	10
Max. input number per MPP tracker	2
Output	
Nominal AC Active Power	100,000 W
Max. AC Apparent Power	110,000 VA
Max. AC Active Power (cosφ=1)	110,000 W
Nominal Output Voltage	480 V/ 480 V, 3W+(N)+PE
Rated AC Grid Frequency	50 Hz / 60 Hz
Nominal Output Current	144.4 A @ 400 V, 120.3 A @ 480 V
Max. Output Current	160.4 A @ 400 V, 133.7 A @ 480 V
Adjustable Power Factor Range	0.8 leading ... 0.8 lagging
Max. Total Harmonic Distortion	< 3%
Protection	
Input-side Disconnection Device	Yes
Anti-Islanding Protection	Yes
AC Overcurrent Protection	Yes
DC Reverse-polarity Protection	Yes
PV-array String Fault Monitoring	Yes
DC Surge Arrester	Type II
AC Surge Arrester	Type II
DC Insulation Resistance Detection	Yes
Residual Current Monitoring Unit	Yes
Arc Fault Protection	Yes
Smart String-Level Disconnector	Yes
Communication	
Display	LED Indicators, WLAN+app + FusionSolar APP
RS485	Yes
USB	Yes
Smart Dongle-4G	4G / 3G (3G via Smart Dongle-4G (Optional)
Monitoring BUS (USB2)	Yes (Isolated transformer inboard)
General Data	
Dimensions (W x H x D)	1,035 x 700 x 365 mm
Weight (with mounting plate)	83 kg
Operating Temperature Range	-25°C – 60°C
Cooling Method	Smart Air Cooling
Max. Operating Altitude	4,000 m (13,123 ft.)
Relative Humidity	0 – 100%
DC Connector	Amphenol H4/6
AC Connector	Waterproof Connector + OT/DT Terminal
Protection Degree	IP66
Topology	Transformerless
Nighttime Power Consumption	< 3.5 W
Standard Compliance (more available upon request)	
Certificate	EN 62109-1/-2, IEC 62109-1/-2, EN 50530, IEC 62116, IEC 61727, IEC 60068, IEC 61683
Grid Connection Standards	VDE-AR-N4105, EN 50549-1, EN 50549-2, AS/NZS 4777.2:2020, C10/11

[1] The maximum input voltage in the upper limit of the DC voltage. Any higher input DC voltage may cause damage to the inverter.
[2] If the DC input voltage is beyond the operating voltage range, the inverter may not work properly.

Lampiran 3 *Datasheet* Huawei Smartlogger 3000A

SmartLogger3000A

Smart
Smart zero export control design

Simple
Easy to install on site

Reliable
Safety by lightning protection module

Technical Specification	SmartLogger3000A
	Device Management
Max. Number of Connected Devices	80
	Communication Interface
WAN	WAN x 1, 10 / 100 / 1000 Mbps
LAN	LAN x 1, 10 / 100 / 1000 Mbps
RS485	COM x 3, 1200 / 2400 / 4800 / 9600 / 19200 / 115200 bps, 1000 m
MBUS	MBUS x 1, 115.2 kbps, Compatible with PLC
2G / 3G / 4G [1]	LTE(FDD) : B1,B2,B3,B4,B5,B7,B8,B20 DC-HSPA+/HSPA/UMTS : 850/900/1900/2100 MHz GSM/GPRS/EDGE: 850/900/1800/1900 MHz [2]
Digital / Analog Input / Output	DI x 4, DO x 2, AI x 4
Active DO	12V, 100mA (connection with relay, sensor)
	Communication Protocol
Ethernet	Modbus-TCP, IEC 60870-5-104
RS485	Modbus-RTU, IEC 60870-5-103 (standard), DL / T645
	Interaction
LED	LED Indicator x 3 - RUN, ALM, 4G
WEB	Embedded Web
USB	USB 2.0 x 1
APP	Communication by WLAN for Commissioning
	Environment
Operating Temperature Range	-40°C ~ 60°C (-40°F ~ 140°F)
Storage Temperature	-40°C ~ 70°C (-40°F ~ 158°F)
Relative Humidity (Non-condensing)	5% ~ 95%
Max. Operating Altitude	4,000 m (13,123 ft.)
	Electrical
AC Power Supply	100 V ~ 240 V, 50 Hz / 60 Hz
DC Power Supply	12 V / 24 V
Power Consumption	Typical 8 W, Max. 15 W
	Mechanical
Dimensions (W x H x D)	225 x 160 x 44 mm (8.9 x 6.3 x 1.7 inch, without mounting ears and antenna)
Weight	2 kg (4.4 lb.)
Protection Degree	IP20
Installation Options	Wall Mounting, DIN Rail Mounting, Tabletop Mounting

*1: When putting inside metal box, extended antenna will be needed.
*2: For recommended carriers list and details on supported frequencies, please contact local distributors.

Lampiran 4 *Datasheet Pyranometer*

KIPP & ZONEN

CMP3 | SMP3

Applications

Solar Monitoring for PV
Weather Services
Agriculture
Horticulture
Industry

Pyranometer

For reliable entry-level measurement of solar irradiance

IEC61724 Class C
ISO 9060 Spectrally Flat Class C
Internal desiccant
Analog and digital outputs
5 year warranty

ISO 9060 & IEC 61724 Class C

If you are looking for reliable solar radiation measurement to comply with ISO 9060 Spectrally Flat Class C and IEC 61724-1 Class C the CMP3 or SMP3 are the right pyranometers to choose. They are compact, light and provide reliable and good quality data in a wide range of operational environments. SMP3 is ideal for efficiency monitoring in small commercial PV installations.

Internal desiccant

Both models are fitted with a maintenance-free internal drying cartridge to provide stable measurements and have an IP67 ingress protection rating. The pyranometers feature a snap-on white sun shield, integrated leveling and a high quality connector which is supplied pre-wired with 10 m of signal cable for simple installation.

Analog or digital outputs

CMP3 does not require any power. Incoming solar radiation generates a continuous millivolt output, which is converted in a data logger to irradiance in W/m2 using the calibrated sensitivity. For easy integration into SCADA systems SMP3 has Modbus® RTU RS-485 serial communication, plus an amplified analog output. The sensitivity is stored inside for standardized outputs and it features improved response time and digital temperature compensation.

5 Year Warranty

All pyranometers from Kipp & Zonen come with a 5 year warranty and we have service and calibration centers around the world.

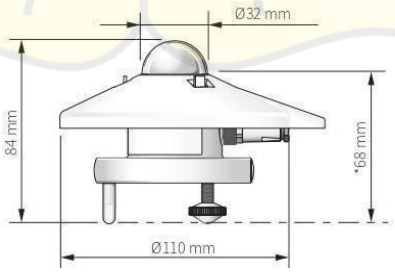
Meteorology Division of OTT HydroMet

Technical Specifications

	CMP3	SMP3
Classification to ISO 9060:2018	Spectrally Flat Class C	Spectrally Flat Class C
Sensitivity	5 to 20 µV/W/m²	-
Impedance	20 to 200 Ω	-
Expected output range (0 to 1500 W/m²)	0 to 30 mV	-
Maximum operational irradiance	2000 W/m²	2000 W/m²
Analogue output • V-version	-	0 to 1 V
Analogue output range*	-	-200 to 2000 W/m²
Analogue output • A-version	-	4 to 20mA
Analogue output range*	-	0 to 1600 W/m²
Serial output	-	RS-485 Modbus® RTU
Serial output range	-	-400 to 2000 W/m²
Response time (63 %)	< 6 s	< 1,5 s
Response time (95 %)	< 18 s	< 12 s
Spectral range (20 % points)	285 to 3000 nm	285 to 3000 nm
Spectral range (50 % points)	300 to 2800 nm	300 to 2800 nm
Zero offsets (unventilated)		
(a) thermal radiation (at 200 W/m²)	< 15 W/m²	< 15 W/m²
(b) temperature change (5 K/h)	< 5 W/m²	< 5 W/m²
Non-stability (change/year)	< 1%	< 1%
Non-linearity (100 to 1000 W/m²)	< 1.5%	< 1.5%
Directional response (up to 80 ° with 1000 W/m² beam)	< 20 W/m²	< 20 W/m²
Spectral selectivity (350 to 1500 nm)	< 3%	< 3%
Tilt response (0 ° to 90 ° at 1000 W/m²)	< 1%	< 1%
Temperature response	< 5% (-10 °C to +40 °C)	< 2% (-20 °C to +50 °C) < 4% (-40 °C to +70 °C)
Field of view	180 °	180 °
Accuracy of bubble level	< 0.2 °	< 0.2 °
Power consumption (at 12 VDC)	-	V-version: 55mW A-version: 100mW
Supply voltage	-	5 to 30VDC
Software, Windows™	-	SmartExplorer Software, for configuration, test and data logging
Detector type	Thermopile	Thermopile
Operating and storage temperature range	-40 °C to +80 °C	-40 °C to +80 °C
Humidity range	0 to 100 %	0 to 100 %
MTBF (Mean Time Between Failures)	> 10 years	> 10 years**
Ingress Protection (IP) rating	67	67
Recommended applications	Economical solution for routine measurements in weather stations, field testing, agriculture, horticulture and hydrology	Economical solution for efficiency and maintenance monitoring of PV power installations, routine measurements in weather stations

** adjustable with SmartExplorer Software ** extrapolated after introduction in January 2012*
Note: The performance specifications quoted are worst-case and/or maximum values

Dimensions



OTT HydroMet GmbH | euinfo@otthydromet.com | www.otthydromet.com

Lampiran 5 *Datasheet Ambient & Module Temperature Sensor*

Ta-ext-V-4090 and Ta-ext-I-4090

Ambient Temperature Sensor with external Sensor and analog Output

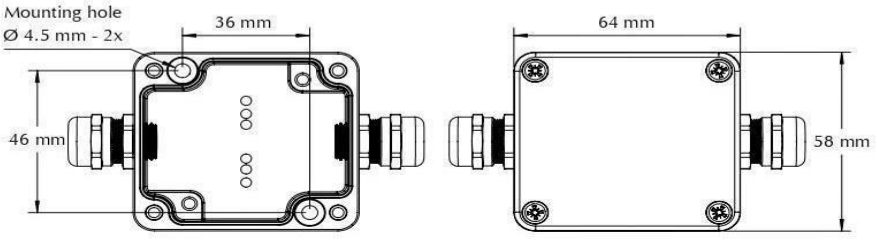
Short Description

Our ambient temperature sensors come equipped with a stable aluminium housing and a robust weatherproof cable. Thanks to the use of top quality components the sensors achieve very high accuracy and are ideal for use in industrial and field environments (PV plant or monitoring of engineering room).
All sensors are shipped with a calibration protocol for the measuring amplifier.
If required, the sensors can be ordered with an inspection certificate 3.1 as per DIN EN 10204.
Furthermore the disturbance of the measurement accuracy can be reduced with the optional weather protection (Shield Tamb-Si).

Technical Data

Types	Ta-ext-V-4090	Ta-ext-I-4090
Output Signal	0 to 10 V at -40 to +90 °C	4 to 20 mA at -40 to +90 °C
Uncertainty (-40 to +80°C)	1 K	1 K*
Load	min. 100 kΩ	max. 400 Ω
Current	appr. 2 mA	max. 25 mA
Voltage Supply	12 to 28 VDC	
Sensor Element	Pt1000 1/3 Class B as per EN 60751	
Sensor Housing	INOX steel tube, 6 mm diameter, 50 mm length	
Sensor Cable	3 m LiYC11Y, 4 x AWG 26, black, weather and uv-resistant	
Case Material	Powder Coated Aluminium	
Case Dimension / Protection Level	64 mm x 58 mm x 34 mm / IP 67	
Weight	appr. 370 g	
Operating Condition	-40 to +80 °C	
Connection Cable	Length: 3 m, PUR coated, shielded (LiYC11Y, 4 x 0.14 mm²)	
Customs Number	90 25 19 20	

Drawing



Ingenieurbüro Mencke & Tegtmeyer GmbH • Schwarzer Weg 43A • 31789 Hameln • Germany
Tel. +49-5151-403699-0 • Fax: +49-5151-403699-19 • www.ib-mut.de • info@ib-mut.de

INGENIEURBÜRO
MENCKE & TEGTMEYER GMBH

Ta-ext-V-4090 and Ta-ext-I-4090
Ambient Temperature Sensor

Safety Instructions

The installation and assembly of electrical equipment must be carried out by electrically qualified persons.

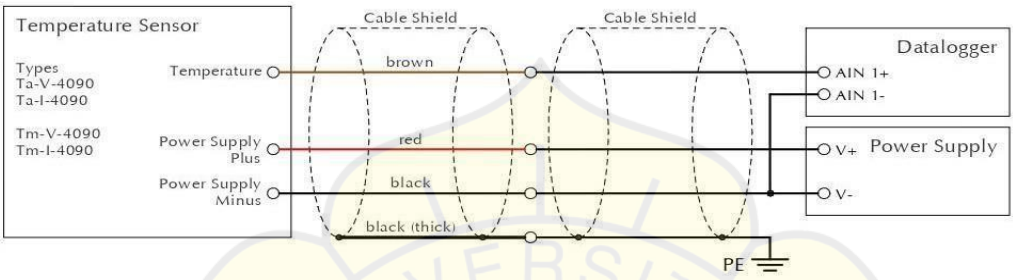
The sensor may not be used with equipment whose direct or indirect purpose is to prevent human death or injury, or whose operation poses a risk to humans, animals or property.

Electrical Connection

The sensors are designed for safety extra-low voltage (SELV) operation.

The cable shield shall be connected to the PE during installation.

WARNING: Connecting the supply voltage to the signal lines will damage the device.



Maximum Additional Cable Length of Temperature Sensors with 3 m Connection Cable

Sensor type	Cable diameter						
	0.14 mm²	0.25 mm²	0.34 mm²	0.5 mm²	0.75 mm²	1.0 mm²	1.5 mm²
Ta-ext-V-4090	30 m	50 m	70 m	100 m	100 m	100 m	100 m
Ta-ext-I-4090	200 m	200 m	200 m	200 m	200 m	200 m	200 m

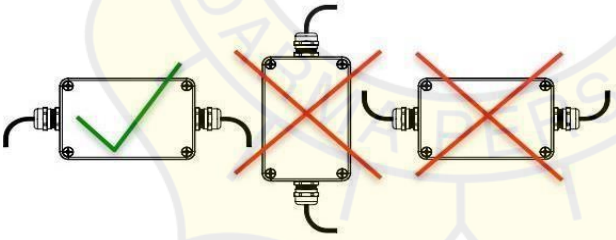
Note: For Ta-ext-I-4090 maximum internal resistance of data logger 200 Ω.

Installation Instructions

If mounted outdoors, avoid direct exposure to sunlight and rain to the sensor housing (INOX steel tube). If necessary, provide protection from the sun and rain with the optional Shield Tamb-Si.

The through holes used to fix the sensor to a stable and suitable surface shall be accessible when the housing is opened.

The tightening torque of the case cover is 180 Ncm.



Optional weather protection
Shield Tamb-Si

Maintenance

The sensors should be checked once a year for damage, contamination and correct fitting.

Tm-V-4090 and Tm-I-4090

Module Temperature Sensor with analog Output

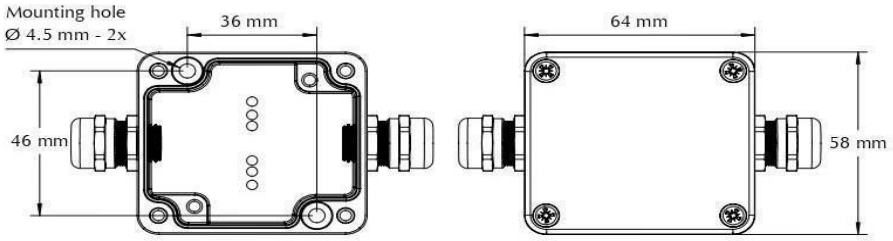
Short Description

Our module and surface temperature sensors come equipped with a stable Aluminium housing and a robust weatherproof cable. Thanks to the use of top quality components the sensors achieve very high accuracy and are ideal for use in industrial and field environments (PV module temperature).
All sensors are shipped with a calibration protocol for the measuring amplifier.
If required, the sensors can be ordered with an inspection certificate 3.1 as per DIN EN 10204.

Technical Data

Type	Tm-V-4090	Tm-I-4090
Output Signal	0 to 10 V at -40 to +90°C	4 to 20 mA at -40 to +90°C
Uncertainty (-40 to +80°C)	1 K	1 K
Load	min. 100 kΩ	max. 400 Ω
Current	approx. 2 mA	max. 25 mA
Supply Voltage	12 to 28 VDC	
Sensor Element	Pt1000 Class A as per EN 60751	
Sensor Housing	Self adhesive Aluminium Block, 35 mm x 12 mm x 6 mm	
Sensor Cable	Length: 3 m, PUR coated, shielded (LiHC11Y, 2 x 0.25 mm²)	
Case Material	Powder Coated Aluminium	
Case Dimension / Protection Level	64 mm x 58 mm x 34 mm / IP 67	
Weight	approx. 350 g	
Operating Condition	Sensor Element -40 to +90°C (see below Installation Instruction) Case -40 to + 80°C	
Connection Cable	Length: 3 m, PUR coated, shielded (LiYC11Y, 4 x 0.14 mm²)	
Customs Number	90 25 19 00	

Drawing



Ingenieurbüro Mencke & Tegtmeyer GmbH • Schwarzer Weg 43A • 31789 Hameln • Germany
Tel. +49-5151-403699-0 • Fax: +49-5151-403699-19 • www.ib-mut.de • info@ib-mut.de

INGENIEURBÜRO
MENCKE & TEGTMEYER GMBH

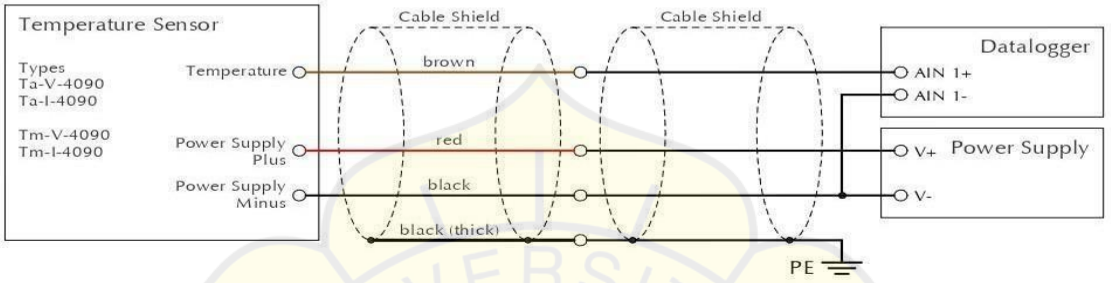
Tm-V-4090 and Tm-I-4090
Module Temperature Sensor

Safety Instructions

The installation and assembly of electrical equipment must be carried out by electrically qualified persons.
The sensor may not be used with equipment whose direct or indirect purpose is to prevent human death or injury, or whose operation poses a risk to humans, animals or property.

Electrical Connection

The sensors are designed for safety extra-low voltage (SELV) operation.
The cable shield shall be connected to the PE during installation.
WARNING: Connecting the supply voltage to the signal lines will damage the device.



Maximum Additional Cable Length for Temperature Sensors with 3 m Connection Cable

Sensor Type	Cable Cross Section						
	0.14 mm²	0.25 mm²	0.34 mm²	0.5 mm²	0.75 mm²	1.0 mm²	1.5 mm²
Tm-V-4090	30 m	50 m	70 m	100 m	100 m	100 m	100 m
Tm-I-4090	200 m	200 m	200 m	200 m	200 m	200 m	200 m

Note: For Tm-I-4090 maximum internal resistance of data logger 200 Ω.

Installation Instructions

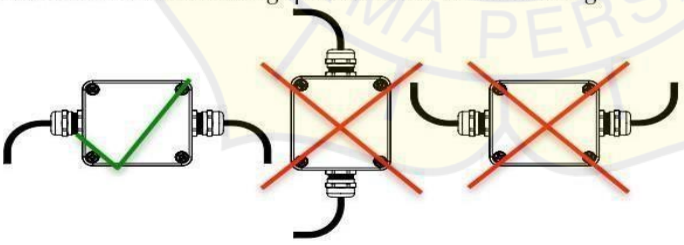
If mounted outdoors, avoid direct exposure to sunlight and rain to the sensor housing (Aluminium block) and sensor case. If necessary, provide protection from the sun and rain.

The through holes can be used to fix the sensor to a stable and suitable surface shall be accessible when the housing is opened. The tightening torque of the case cover is 180 Ncm.

The sensor element is mounted by gluing the Aluminium block directly to the measurement surface. The surface must be dry, clean and degreased. It is also recommended using an extra fixing with silicon or Sikaflex, particularly for module temperature above 75°C.

Note: The module temperature measurement can be optimised by completely covering the sensor element.

The sensor cable needs a cable grip close to the sensor housing.



Maintenance

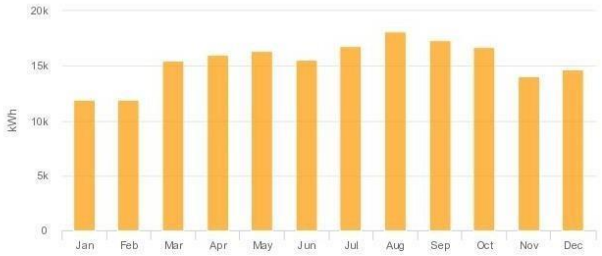
The sensors should be checked once a year for damage, contamination and correct fitting.

Lampiran 6 *Datasheet Fusion Solar*

Statistical Period	Total String Capacity (kWp)	Global Irradiation (kWh/㎡)	Theoretical Yield (kWh)	PV Yield (kWh)	Inverter Yield (kWh)	Peak Power (kW)	CO_2 Avoided (t)	Standard Coal Saved (t)
2024-01	150,040	127,620	19.148,063	14.952,020	14.952,020	132,000	7,102	5,981
2024-02	150,040	123,871	18.782,072	14.227,200	14.227,200	132,000	6,758	5,691
2024-03	163,680	133,683	21.881,288	14.925,280	14.925,280	131,183	7,090	5,970
2024-04	163,680	146,320	23.949,658	13.245,180	13.245,180	128,119	6,291	5,298
2024-05	163,680	144,552	23.660,262	15.344,020	15.344,020	111,566	7,288	6,138
2024-06	163,680	136,716	22.377,648	15.529,730	15.529,730	118,045	7,377	6,212
2024-07	163,680	149,457	24.463,158	16.594,560	16.594,560	112,265	7,882	6,638
2024-08	163,680	171,556	28.080,213	18.585,220	18.585,220	117,248	8,828	7,434
2024-09	163,680	171,608	28.088,852	18.520,720	18.520,720	130,463	8,797	7,408
2024-10	163,680	173,273	28.361,334	19.157,090	19.157,090	124,431	9,100	7,663
2024-11	163,680	139,086	22.765,615	15.898,230	15.898,230	132,000	7,552	6,359
2024-12	163,680	116,287	19.033,847	13.855,440	13.855,440	132,000	6,581	5,542

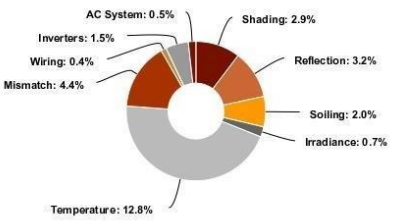
Lampiran 7 *Datasheet* Helioscope

Monthly Production



Month	GHI (kWh/m²)	POA (kWh/m²)	Shaded (kWh/m²)	Nameplate (kWh)	Grid (kWh)
January	107.5	107.5	104.0	14,793.2	11,937.8
February	107.6	106.9	103.6	14,741.2	11,954.2
March	138.0	138.1	133.9	19,070.8	15,442.5
April	142.8	143.0	138.6	19,735.0	15,959.9
May	147.2	147.1	142.7	20,311.6	16,378.2
June	138.9	138.0	134.2	19,073.5	15,561.2
July	150.0	149.4	145.4	20,687.8	16,808.7
August	162.7	162.0	157.8	22,507.0	18,102.4
September	156.2	155.9	151.5	21,634.9	17,297.5
October	150.2	150.6	146.3	20,849.5	16,708.8
November	126.0	125.6	121.8	17,326.4	14,067.6
December	130.7	130.6	126.4	17,963.7	14,646.1

Sources of System Loss



Lampiran 9 *Single Line Diagram* PLTS Industri