SOLAR SENSOR
SOLUTIONS

SEVEN
SENSOR SOLUTIONS

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ABOUT US

SEVEN Sensor Solutions is a trade mark of ArGesim Makina, located in the Industrial Area of Corum in Türkiye. It is specialized in producing, installing and commissioning high-quality meteorological sensors used for monitoring solar PV plants. SEVEN weather stations are compatible with many well known datalogger brands.

In 2018, the company moved to Corum Technopark and focused more on R&D activities. These activities were fruitful and resulted in international patents for ArGesim.

SEVEN Sensor products are used in more than 85 countries all over the world, from Japan to USA. High quality, Fast delivery and on time after sales service are the basics of our good reputation in the market.

ArGesim carries out R&D activities with young engineers and continue to work in line with this mission by serving the industrialization goals of our country in the field of high technology.

WEATHER STATIONS
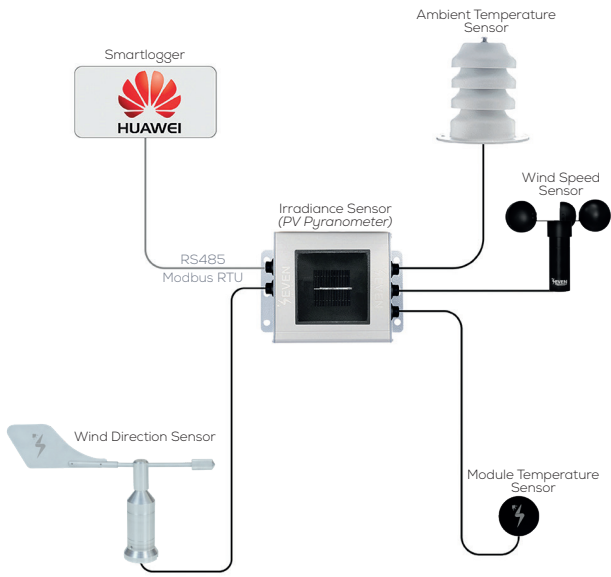
Huawei

Weather Station.
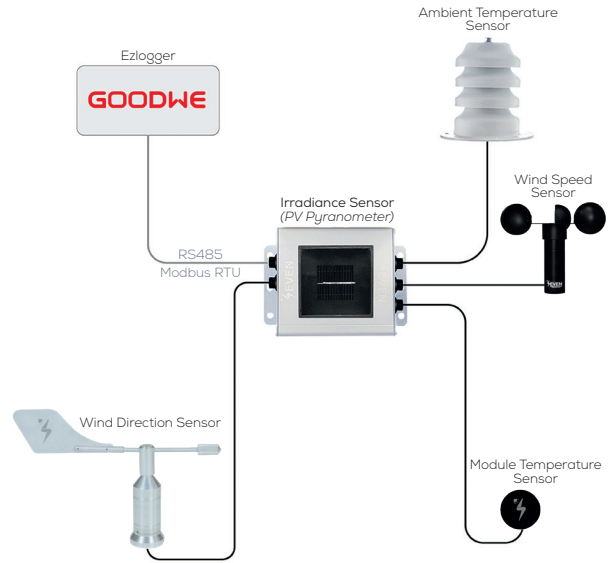
Goodwe

Weather Station.
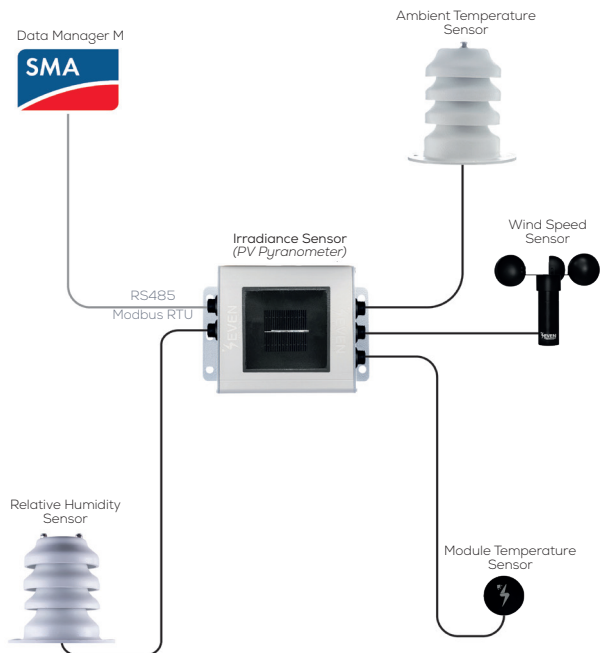
SMA

Weather Station.
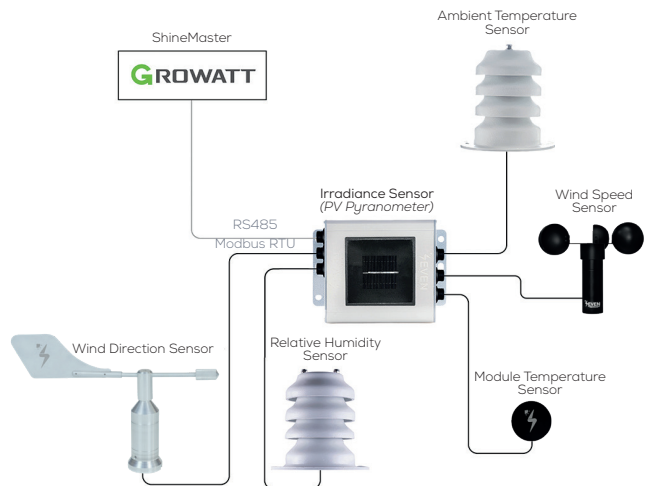
Growatt

Weather Station.

WEATHER STATIONS

Sungrow

Weather Station.
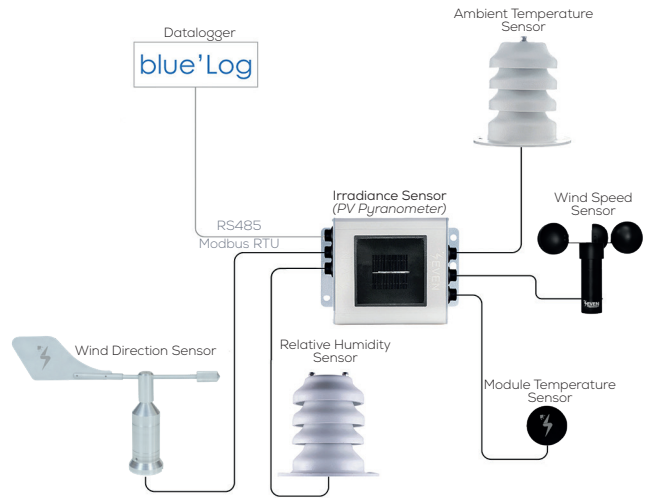
Bluelog

Weather Station.
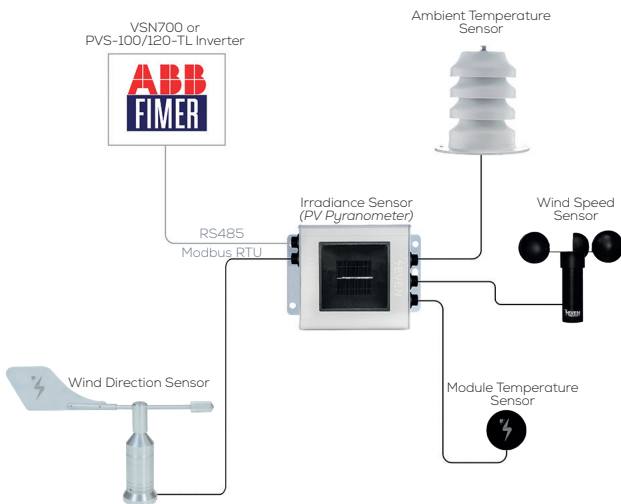
ABB/FIMER

Weather Station.
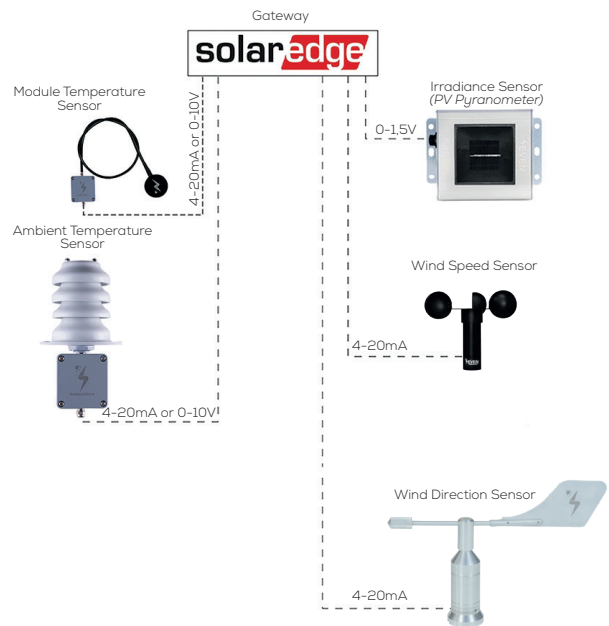
SolarEdge

Weather Station.

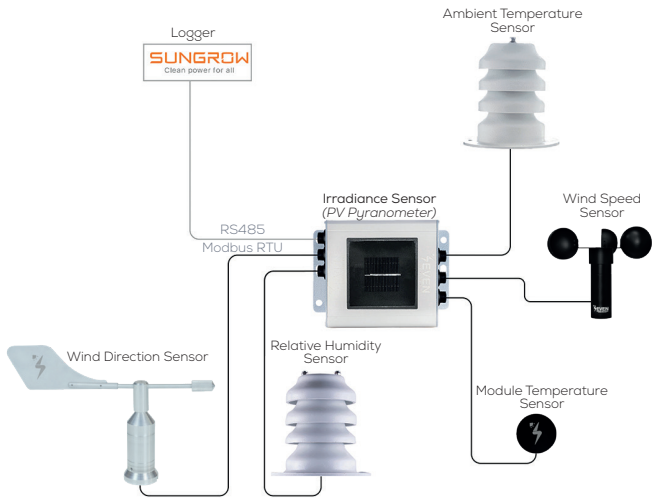# WEATHER STATIONS

E-Manager Pro

KEHUA TECH

Ambient Temperature Sensor

Irradiance Sensor
(PV Pyranometer)

RS485
Modbus RTU

Wind Speed Sensor

Wind Direction Sensor

Relative Humidity Sensor

Module Temperature Sensor
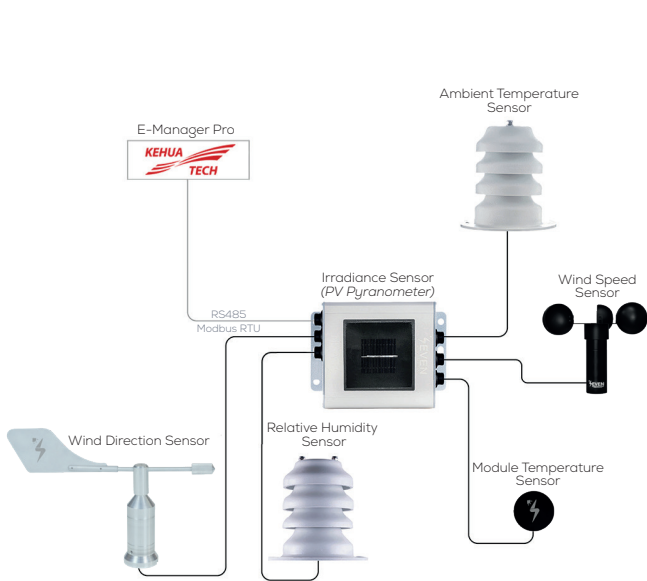
Kehua Tech

Weather Station.

Ezlogger

General Electric

Ambient Temperature Sensor

Irradiance Sensor
(PV Pyranometer)

RS485
Modbus RTU

Wind Speed Sensor

Wind Direction Sensor

Module Temperature Sensor
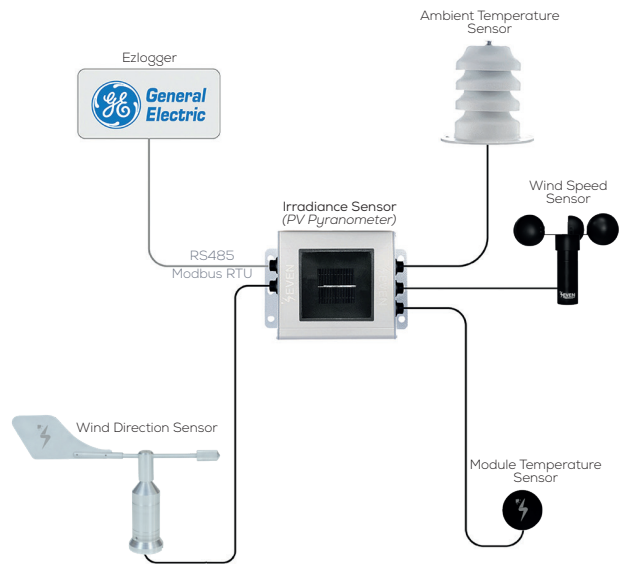
General Electric

Weather Station.

ePowerLog DL

ELUM ENERGY

Ambient Temperature Sensor

Irradiance Sensor
(PV Pyranometer)

RS485
Modbus RTU

Wind Speed Sensor

Wind Direction Sensor

Relative Humidity Sensor

Module Temperature Sensor

Elum

Weather Station.

S3-Logger

solis

Ambient Temperature Sensor

Irradiance Sensor
(PV Pyranometer)

RS485
Modbus RTU

Wind Speed Sensor

Wind Direction Sensor

Relative Humidity Sensor

Module Temperature Sensor

Solis

Weather Station.
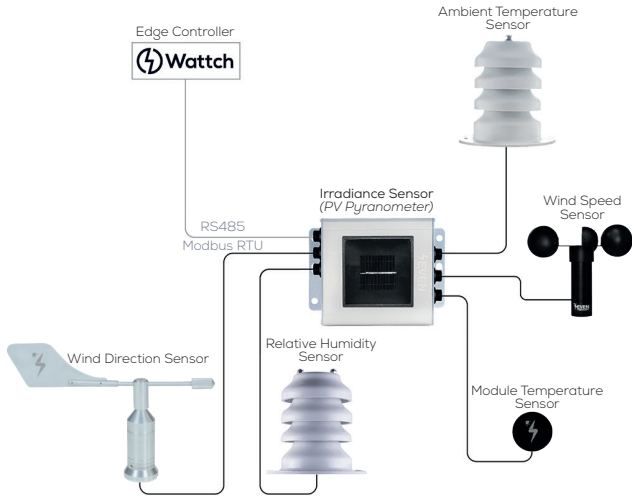
WEATHER STATIONS

Wattch

Weather Station.

Solplanet

Weather Station.

SolaX Power

Weather Station.

Sico

Weather Station.

Hopewind

Weather Station.

DEIF

Weather Station.
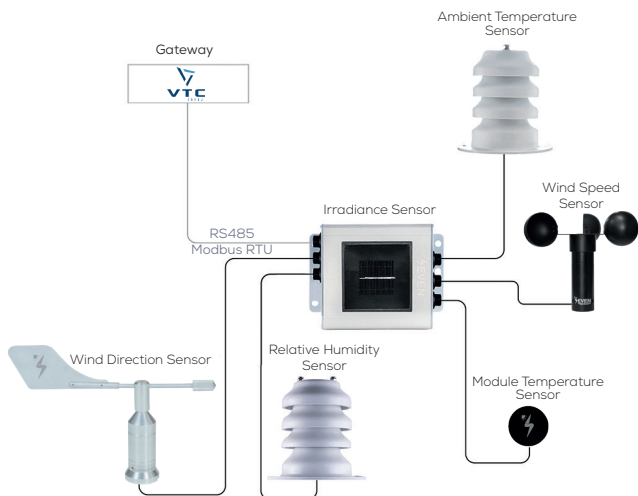
VTC

Weather Station.
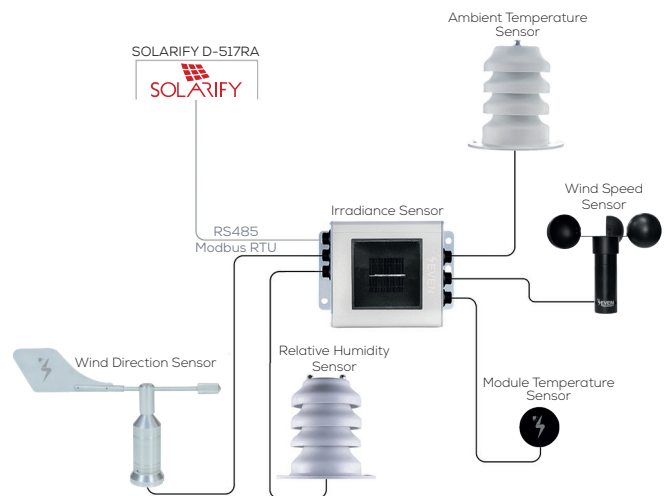
Solarify

Weather Station.

IRRADIANCE
SENSOR
(PV Pyranometer)
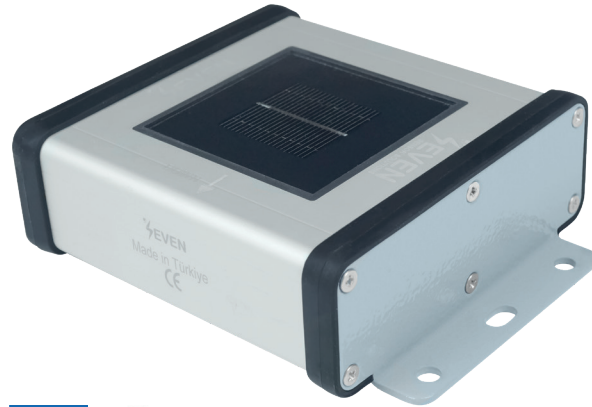
TECHNICAL DATA

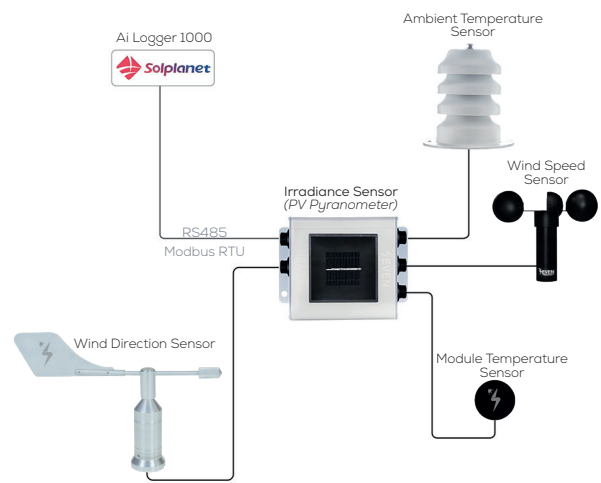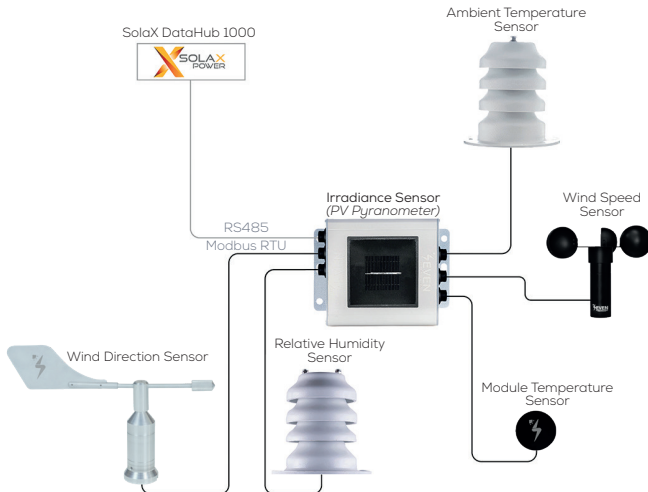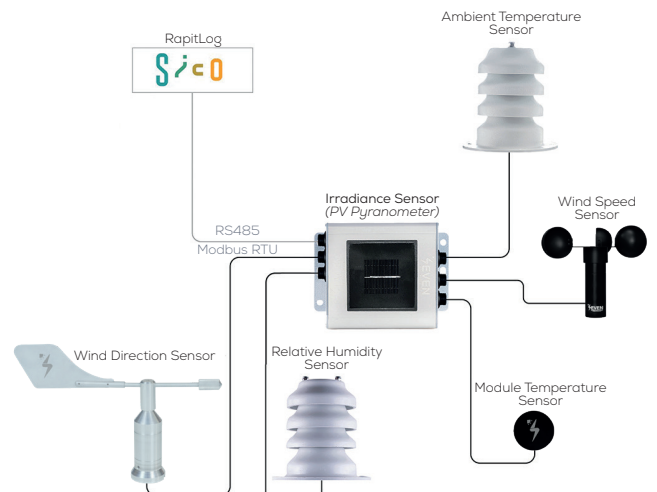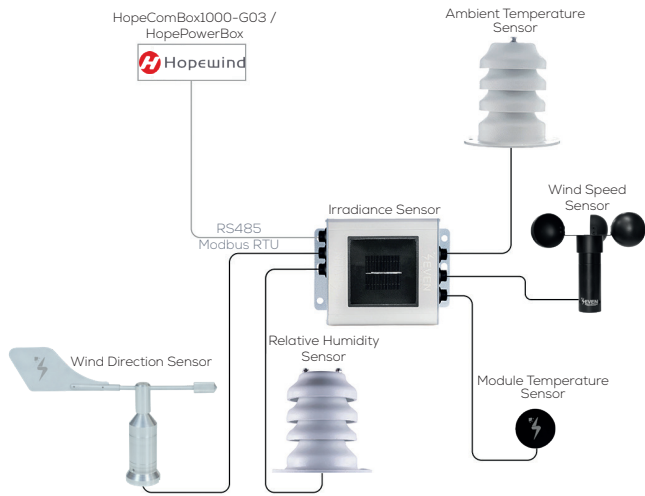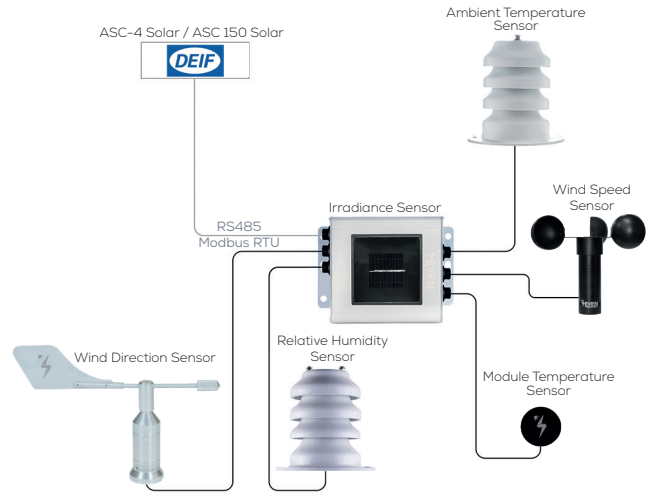|	3S-IS	3S-IS-T-I	3S-IS-T-V
Sensor Type	Silicon Reference Cell (31 mm x 31 mm)		
Meassured Data	Irradiance, Cell & Module & Ambient Temperature, Wind Speed & Direction and Relative Humidity	Irradiance and Cell Temp.	Irradiance and Cell Temp.
Irradiance Range	0 - 1600 W/m²		
Uncertainty	≤2% (Less than 2%; as per IEC 61724-1 standard Class A)		
Resolution	0.1 W/m² (Less than 1W/m²; as per IEC 61724-1 standard Class A)		
Response Time	1 sec. (Less than 3 sec; as per IEC 61724-1 standard Class A)		
Drift	<0.3% / year		
Field of View	170° (Larger than 160° as per IEC 61724-1 standard Class A)		
Tilt-Azimuthal Angle	0°- 0° (≤1°; as per IEC 61724-1 standard Class A)		
Output Rate	1/s	-	-
Data Output	RS485 up to 38400 Baud	Analog 4-20 mA	Analog 0-1,5 V
Communication Protocol	Modbus RTU	-	-
Power Supply	12 to 30 V DC		
Power Consumption	30 mA max @24 VDC	50 mA max @24 VDC	15 mA max @24 VDC
Electrical Connection	3 m LIYYC11Y PUR Cable, UV and Weather Resistant		
Galvanic Isolation	1000 V between power supply and RS485 bus	-	-
Cell Temperature Sensor Type	PT1000 Class A as per EN 60751		
Operating Temperature Range	-40°C to +85°C		
Operating Humidity Range	0 to 100 % RH		
Box Dimensions	140 mm x 110 mm x 42 mm (W x L x H)		
Weight	0.3 kg		
IP Rating	IP 54 (Optional IP 65, IP 68)		
Sensor Housing Material	Aluminum		
Compliant Standard	IEC 61724-1:2021 and IEC 60904		
Calibration	Each sensor is calibrated under Class AAA Sun Simulator as per IEC 60904-2 and IEC 60904-4 by using a reference cell calibrated by ISFH-Germany		
Test	Each sensor is tested in natural sunlight using a reference cell calibrated by the Fraunhofer ISE Institute in Germany.		

DUAL ORIENTATIONS
IRRADIANCE SENSOR (3S-2IS)
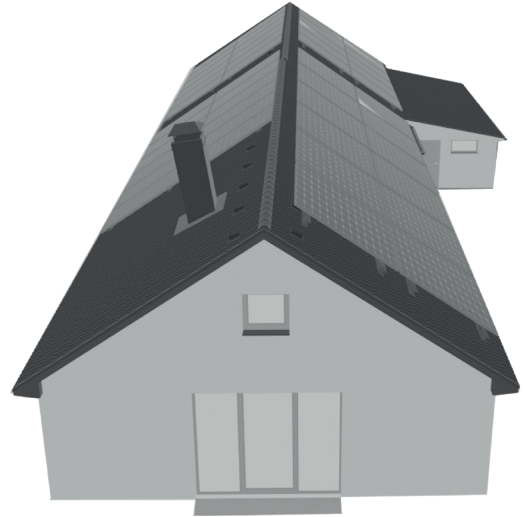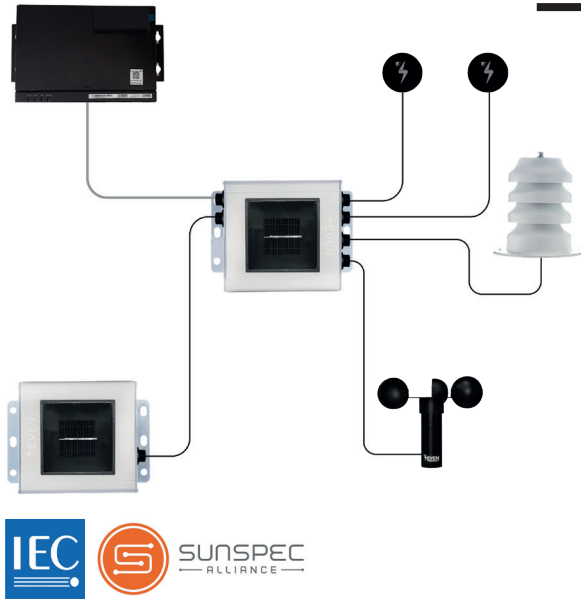
Special Solution for dual orientation plants:

3S-2IS model is specially developed to calculate the Performance Ratio (PR) for the dual orientation PV plants, as it calculates the average irradiance value as per the number of panels in each direction. Installation directions of panels in PV power plants and the number of panels in these directions may be different. The user will be able to set the number of panels in each orientation for the correct calculations. 3S-2IS special design allows simultaneous connection of two Irradiance Sensors, two Module Temperature Sensors, Ambient Temperature Sensor and Wind Speed Sensor.

The number of panels in both directions, to which the sensors are connected to, is entered into the electronic card via 3S-2IS Configuration Interface. The total effective irradiance and total effective module temperature can be calculated and communicated to the datalogger via Modbus RTU protocol. By using these values, the accurate Performance Ratio can be calculated in the monitoring systems.

MULTI-ORIENTATION IRRADIANCE SENSOR (3S-4IS) / (3S-3IS)

TECHNICAL DATA

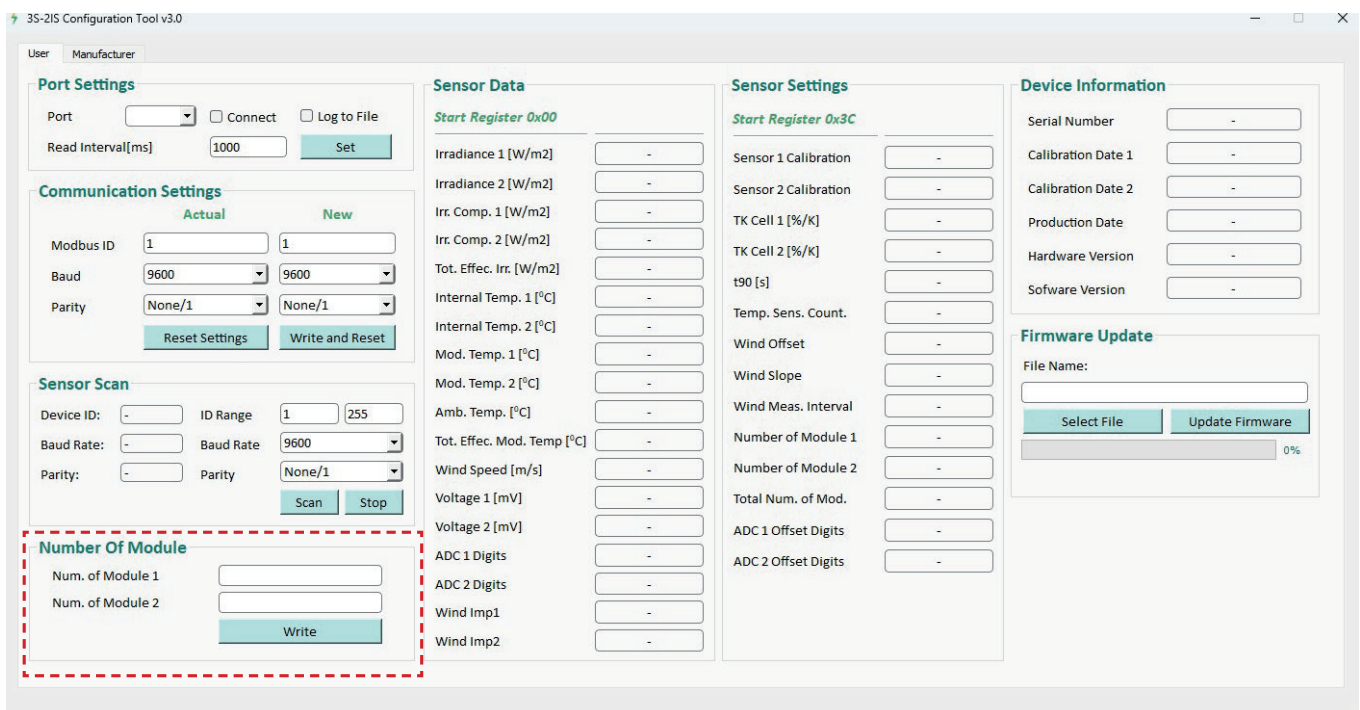|	3S-4IS / 3S-3IS
Measured Data	Total Effective Irradiance, Total Effective Module Temperature, 4 nos. POA Irradiance, 4 nos. Cell Temperature, 4 nos. Module Temperature, Ambient Temperature, Wind Speed and Wind Direction
Output Rate	1/s
Data Output	RS485 up to 38400 Baud
Communication Protocol	Modbus RTU
Power Supply	12 to 30 V DC
Power Consumption	40 mA max @ 24 V DC
Electrical Connection	3 m LIYYC11Y PUR Cable, UV and Weather Resistant
Galvanic Isolation	1000 V between power supply and RS485 bus
Operating Temperature Range	-40°C to +85°C
Operating Humidity Range	0 to 100 %RH
Dimensions (Connection Box / Sensor)	1123 mm x 1000 mm x 633 mm / 140 mm x 110 mm x 42 mm (W x L x H)
Weight (Mounting Structure / Sensor)	5.8 kg / 0.5 kg
IP Rating (Connection Box / Sensor)	IP 67 / IP 54 (Optional IP 65, IP 68)
Material (Connection Box / Sensor)	ABS / Aluminum
Standard	IEC 61724-1:2021 and IEC 60904
Calibration	Each sensor is calibrated under a Class AAA Sun Simulator according to IEC 60904-2 and IEC 60904-4 standards using a reference cell calibrated by the ISFH Institute in Germany.Germany.
Test	Each sensor is tested in natural sunlight using a reference cell calibrated by the Fraunhofer ISE Institute in Germany.

ALBEDOMETER

TECHNICAL DATA

3S- ALBEDOMETER	
Sensor Type	Silicon Reference Cell (31 x 31 mm)
Measured Data	POA Irradiance, Reflected Irradiance and Solar Albedo
Irradiance Range	0 - 1600 W/m²
Uncertainty	1.2 %(less than 2%; as per IEC 61724-1 standard Class A)
Resolution	0.1 W/m²(less than 1 W/m²; as per IEC 61724-1 standard Class A)
Response Time	1 sec (less than 3 sec; as per IEC 61724-1 standard Class A)
Field of View	170° (Larger than 160° as per IEC 61724-1 standard Class A)
Tilt-Azimuthal Angle	0°- 0° (≤1°; as per IEC 61724-1 standard Class A)
Output Rate	1/sec
Data Output	RS485 up to 38400 Baud
Communication Protocol	Modbus RTU
Power Supply	12 to 30 V DC
Power Consumption	20 mA max @24 VDC
Electrical Connection	3 m LIYYC11Y PUR Cable, UV and Weather Resistant
Galvanic Isolation	1000 V between power supply and RS485 bus
Operating Temperature Range	-40°C to + 85°C
Operating Humidity Range	0 to 100 %
Box Dimensions	210 mm x 155 mm x 85 mm (L x W x H)
Weight	0.67 kg
IP Rating	IP54 (Optional IP 65, IP 68)
Sensor Housing Material	Aluminum
Standard	IEC 61724-1:2021 and IEC 60904
Calibration	Each sensor is calibrated under Class AAA Sun Simulator as per IEC 60904-2 and IEC 60904-4 by using a reference cell calibrated by ISFH-Germany

THERMOPILE
PYRANOMETER

TECHNICAL DATA

	3S-TP-MB	**3S-TP-MB-B**	**3S-TP-MB-C**
Sensor Type	Thermopile		
Classification as per ISO 9060:2018	Spectrally Flat Class A	Spectrally Flat Class B	Spectrally Flat Class C
Measuring Range	- 200 ... 4000 W/m2		
Spectral range (50%)	283 - 2800 nm		300 - 2800 nm
Response time (95%)	< 2 s	< 10 s	< 18 s
Zero offsets: a) Thermal radiation (at 200 W/m²) b) Temperature change (5 K/h)	< |±7| W/m2 < |±2| W/m2	< |±10| W/m2 < |±4| W/m2	< |±15| W/m2 < |±4| W/m2
Non-stability (change/year)	< |±0,5| %	< |±1| %	
Non-linearity	< |±0,2| %	< |±1| %	
Response according to the cosine law	< |±10| W/m2	< |±18| W/m2	< |±20| W/m2
Spectral error	< |±0,2| %	< |±0,5| %	< |±1| %
Temperature response (-10…+40 °C)	< |+0,5| %	< |±1,5| %	< |±2| %
Tilt response	< |±0,2| %	< |±1| %	< |±1,5| %
Accuracy of levelling device	< 0.2°		
Output	Digital RS485-Modbus RTU (Analog options available)		
Power Supply	7 to 30 VDC		
Electrical Connection	3 m LIYYC11Y PUR Cable, UV and weather resistant		
Operating Temperature Range	-40°C to +80°C		
Dimensions	Ø 160 x 101 mm		Ø 59 x 60 mm
IP Rating	IP 67		
Shade Disk	Included		On Request

Analog output options available.

MODULE
TEMPERATURE
SENSOR

TECHNICAL DATA

	3S-MT-PT1000	3S-MT-PT1000-MB	3S-MT-PT1000-I	3S-MT-PT1000-U
Sensor Type	PT1000			
Measuring Range	-40°C ... +85°C			
Accuracy	±0.1°C			
Resolution	0.1°C			
Data Output	PT1000	RS485 up to 38400 Baud	Analog 4-20 mA	Analog 0-10 V
Communication Protocol	-	Modbus RTU	-	
Power Supply	-	12...30 V DC		
Power Consumption	-	15 mA @ 24 V DC	30 mA @ 24 V DC	15 mA @24 V DC
Electrical Connection	1.5 m LIYYC11Y PUR Cable, UV and Weather Resistant	0.5 m 4x0.15 LIYYC11Y PUR Cable and 2.5 m 3x2x0.22 mm² LI2Y(SE)GRP PUR Cable, UV and Weather Resistant		3 m LIYYC11Y PUR Cable, UV and Weather Resistant
Operating Temperature Range	-40°C ... +85°C			
Box Dimensions	-	82 x 80 x 55 mm (W x L x H)		115 x 65 x 55 (WxLxH)
Sensor Cover Dimensions	Ø 35 x 3 mm			
Weight	77 gr	417 gr		297 gr
IP Rating	IP 67			
Box Material	-	*ABS		
Sensor Cover	Laminated Backsheet (EVA - Tedlar)			
Mounting Method	3M®Sticker to Back of Panel			
Standard	Class A according to IEC 60751:2022			
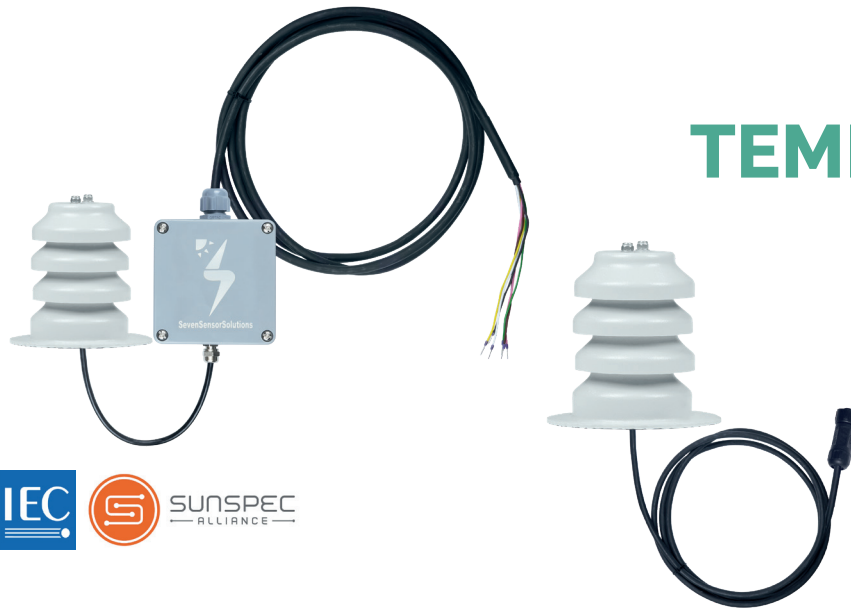
AMBIENT
TEMPERATURE
SENSOR

TECHNICAL DATA

	3S-AT-PT1000	3S-AT-PT1000-MB	3S-AT-PT1000-I	3S-AT-PT1000-U
Sensor Type	PT1000			
Measuring Range	-40°C to +85°C			
Accuracy	±0.1°C			
Resolution	0.1°C			
Data Output	PT1000	RS485 up to 38400 Baud	Analog 4-20 mA	Analog 0-10 V
Communication Protocol	-	Modbus RTU	-	
Power Supply	-	12 ... 30 V DC		
Power Consumption	-	15 mA @ 24 V DC	30 mA @ 24 V DC	15 mA @ 24 V DC
Electrical Connection	1.5 m LIYYC11Y PUR Cable, UV and Weather Resistant	0.5 m 4x0.15 LIYYC11Y PUR Cable and 2.5 m 3x2x0.22 mm² LI2Y(SE)GRP PUR Cable, UV and Weather Resistant		3 m LIYYC11Y PUR Cable, UV and Weather Resistant
Operating Temperature Range	-40°C to +85°C			
Box Dimensions	-	82 x 80 x 55 mm (W x L x H)		115 x 65 x 55 (WxLxH)
Shield Dimensions	Ø 105 x 100 mm			
Weight	127 gr	467 gr		347 gr
IP Rating	IP 67			
Box Material	-	ABS		
Sensor Housing Material	Stainless Steel Tube			
Shield Material	ABS			
Mounting Method	Ground Mounting			
Standard	Class A according to IEC 60751:2022			

WIND
SPEED
SENSOR

TECHNICAL DATA

	3S-WS-PLS	3S-WS-MB	3S-WS-I	3S-WS-I-H
Sensor Type	Cup Star Anemometer (Reed Switch)			
Measuring Range	0,9 to 40 m/s	0,9 to 50 m/s		
Accuracy	Below 5m/s 0.5 m/s and 10% of reading above 5m/s			
Resolution	0,1 m/s			
Threshold	0,9 m/s			
Survival Speed	60 m/s	80 m/s		
Data Output	Read Relay	RS485 up to 38400 Baud	Analog 4-20 mA	
Communication Protocol	-	Modbus RTU	-	
Power Supply	-	12 to 30 V DC		
Heating	-	-	-	Available
Electrical Connection	3 m LIYY Cable, UV and Weather Resistant	3m LIYYC11Y PUR Cable, UV and Weather Resistant		
Operating Temperature Range	-40°C to +85°C (Ice Free)			-40°C to +85°C
Dimensions	Ø 180 x 145 mm	Ø 170 x 266 mm		
Weight	0,2 kg	0,6 kg		
IP Rating	IP 54 (Optional IP 65)			
Housing Material	Anodized Aluminum			
Cup Material	ABS			
Mounting Method	Pipe or Ground Mounting			
Standard	Compliant to IEC 61724-1:2021			

WIND DIRECTION SENSOR

TECHNICAL DATA

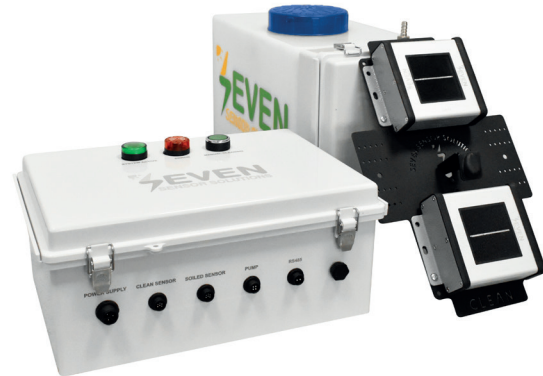|	3S-WD	3S-WD-MB	3S-WD-I
Sensor Type	Vane-Driven Hall Effect Position Sensor		
Measuring Range	0-359°		
Accuracy	±1% of Measuring Value		
Resolution	1°		
Start Speed	1 m/s		
Data Output	Analog (0 V – 3.3 V)	Modbus RTU - RS485	Analog 4-20 mA
Communication Protocol	-	Modbus RTU	-
Power Supply	-	12 to 30 V DC	
Power Consumption	-	20 mA typically at 24 VDC	30 mA typically at 24 VDC
Electrical Connection	3 m LIYY Cable, UV and Weather Resistant	3m LIYYC11Y PUR Cable, UV and Weather Resistant	
Operating Temperature Range	-40°C to +85°C (Ice Free)		
Dimensions	Ø: 290x195 mm		
Box Dimensions	-	L x W x H : 55x80x82 mm	
Weight	0,25 kg		
Box Weight	-	0,25 kg	
IP Rating	IP 54 (IP67 Optional)		
Housing Material	Aluminum		
Vane Material	Aluminum		
Box Material	-	ABS (Color may change when exposed to sunlight.)	
Mounting Method	Pipe or Ground Mounting		
Standard	Compliant to IEC 61724-1:2021		

RELATIVE HUMIDITY & AMBIENT TEMPERATURE SENSOR

TECHNICAL DATA

	3S-RH&AT	3S-RH&AT&PS	3S-RH&AT-MB	3S-RH&AT&PS-MB	3S-RH-I
Measured Data	Relative Humidity and Ambient Temperature	Relative Humidity, Ambient Temperature and Pressure	Relative Humidity and Ambient Temperature	Relative Humidity, Ambient Temperature and Pressure	Relative Humidity
Sensor Type	Capacitive				
RH Range	0% to 100%				
RH Accuracy	±1% RH (20 ... 70%) at 25 °C				
RH Resolution	0.1%				
T Range	-40°C to +85°C				-
T Accuracy	±0.1% °C at (5 ... 60 °C)				-
T Resolution	0.1°C				-
Pressure Range	-	260 to 1260 hPa	-	260 to 1260 hPa	-
Pressure Accuracy	-	0.5 hPa	-	0.5 hPa	-
Pressure Resolution	-	0.1 hPa	-	0.1 hPa	-
Data Output	I²C		RS485 up to 38400 Baud		Analog 4-20 mA
Communication Protocol	-		Modbus RTU		-
Power Supply	3 V DC		12 to 30 V DC		
Power Consumption	-		20 mA max @ 24 VDC		30 mA @ 24 V DC
Electrical Connection	3 m LIYYC11Y PUR Cable, UV and Weather Resistant		0,3 m 4x0,15 mm 2,5 m 3x2x0,22 mm		
Operating Temperature Range	-40°C to +85°C				
Box Dimensions	-		82 x 80 x 55 mm (W x L x H)		
Shield Dimensions	Ø 105 x 100 mm				
Weight	0,2 kg		0,55 kg		
IP Rating	IP 65				
Box Material	-		ABS*		
Sensor Housing Material	Stainless Steel Tube - Membran Filter				
Shield Material	ABS*				
Standard	Class A according to IEC 60751:2022 (Temperature) Class A according to IEC 61724-1:2021 (Relative Humidity)				

*Since this product contains plastic parts, color changes may occur when exposed to direct sunlight.

SOILING SENSOR
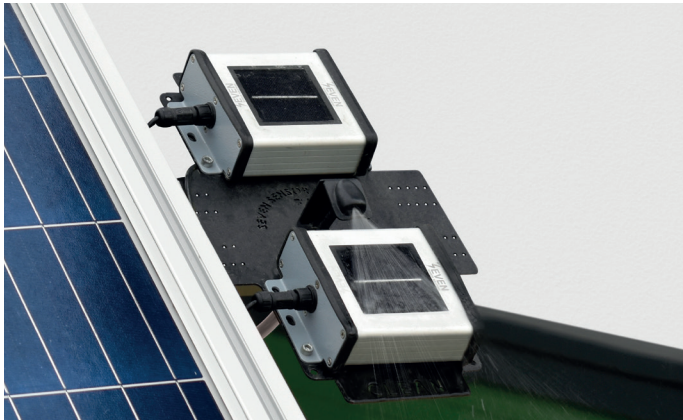
TECHNICAL DATA

	3S-SMS-MB	3S-SMS-MB-M
Soiling Ratio	0% - 100%	
Resolution	0,1%	
Uncertainty	≤1%	
Followed Standard	IEC61724-1 (Annex C)	
Interface	RS485 up to 38400 Baud	
Communication Protocol	Modbus RTU	
Protection	IP65	IP65 (IP68 Optional)
Power Supply	100-240 V AC or 24 V DC 5 A	12 to 30 V DC
Irradiance	0…1600 w/m²	
Calibration	Each sensor is calibrated under Class AAA Sun Similator as per IEC 60904-2 by using a reference cell calibrated by ISFH-Germany.	
Test	Each sensor is tested under natural sunlight by using a calibrated reference cell from Fraunhofer ISE, Germany.	
Operating Temperature	-20°C / +85°C	-40°C / +85°C
Water Tank Capacity	18 Liter	-
Water Consumption	36lt./year (2 times filling per year)	-
Cleaning Fluid	Pure Water	-
Antifreeze Ratio	%65 Pure Water + %35 Antifreeze (Weather conditions ≤ 0°)	-
*Max. Water Line Length	25 Meter	-
*Max. Water Line Height	5 Meter	-

SEVEN offers the Manually Cleaned Soiling Sensor when the cost of the system matters. It has the same features like automatic one. The difference is cleaning of the sensor which is manually.

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PORTABLE
SOILING
SENSOR

TECHNICAL DATA

Soiling Rate	0% - 100%
Resolution	0.1%
Sensor Uncertainty	≤ 2%
Software Update	RS485
Operating Temperature	-10°C to +50°C
Operating Humidity Range	0 ... 90 % RH
Power Supply	12 V 24 Ah Lithium Battery
Operating Time	3 hours
Charging Time	3 hours
Dimensions	318 mm x 386 mm x182 mm (W x L x H)
Weight	8.6 kg

LOW-COST
IRRADIANCE
SENSOR

TECHNICAL DATA

	3S-IS-LR
Measured Data	Plane of Array Irradiance
Sensor Type	Silicon Reference Cell (31 x 31 mm)
Measuring Range	0 ... 1600 W/m^2
Uncertainty	≤ 3 %
Resolution	0.1 W/m²
Response Time	1 s
Drift	<0.3% / year
Field of View	170°
Tilt-Azimuthal Angle	0°- 0°
Output Rate	1/s
Data Output	RS485 up to 38400 Baud
Communication Protocol	Modbus RTU
Power Supply	12 to 30 V DC
Power Consumption	10 mA max @ 24 V DC
Electrical Connection	3 m LIYYC11Y PUR Cable, UV and Weather Resistant
Galvanic Isolation	1000 V Between Power Supply and RS485 Bus
Operating Temperature Range	-40°C to +85°C
Operating Humidity Range	0 to 100 % RH
Box Dimensions	118 mm x 84 mm x 55 mm (W x L x H)
Weight	0.2 kg
IP Rating	IP 67
Sensor Housing Material	ABS*
Test	Each sensor is tested in natural sunlight using a reference cell calibrated by the Fraunhofer ISE Institute in Germany.

RAIN
GAUGE

TECHNICAL DATA

	3S-RG-MB	3S-RG-PLS
Sensor Type	Tipping Bucket Rain Gauge	
Measuring Range	600 mm/h	
Accuracy	±%1 (0 mm/h - 30mm/h) ±%2 (30mm/h - 100mm/h) ±%5 (100mm/h-600mm/h)	
Resolution	0.2 mm	
Collecting Area	200 cm²	
Data Output	RS485 up to 38400 Baud	Reed Relay
Communication Protocol	Modbus RTU	-
Power Supply	12 to 30 V DC	-
Power Consumption	35 mA @ 24 V DC	-
Electrical Connection	3 m LIYYC11Y Cable, UV and Weather Resistant	3 m LIYY Cable, UV and Weather Resistant
Operating Temperature Range	0°C to +85°C	
Dimensions	Ø 160 x 257 mm	
Connection Box Dimensions	70.2 x 82 x 55 (W x L x H)	
Weight	1.4 kg	1,2 kg
IP Rating	IP 65	
Housing Material	Plexiglass	
Connection Box Material	ABS*	

COMPACT
WEATHER
STATION

TECHNICAL DATA

	3S-CWS
Measured Data	Global & Plane of Array Irradiance, Module & Ambient Temperature, Wind Speed & Direction, Relative Humidity, Air Pressure and Precipitation.
Standards	Compliant to IEC 61724-1:2021
Digital Outputs	RS485 up to 38400 Baud
Communication Protocol	Modbus RTU (Optional Modbus TCP/IP)
Output Rate	1/s
Operating Temperature Range	-40°C to +85°C
Operating Humidity Range	0 to 100 %RH
Mounting Structure	Aluminum & Stainless Steel
Dimensions	720 x 1370 x 855 mm (W x L x H) (Height can be changed as per request)
Weight	4.8 kg
IP Rating	IP 54 (Optional IP 67)
Power Supply	12 to 30 V DC
Power Consumption	25 mA @ 24 V DC
Electrical Connection	3 m LIYYC11Y PUR Cable, UV and weather resistant
Connection Box Material	ABS*
Galvanic Isolation	1000 V between power supply and RS485 Bus

SNOW
SENSOR
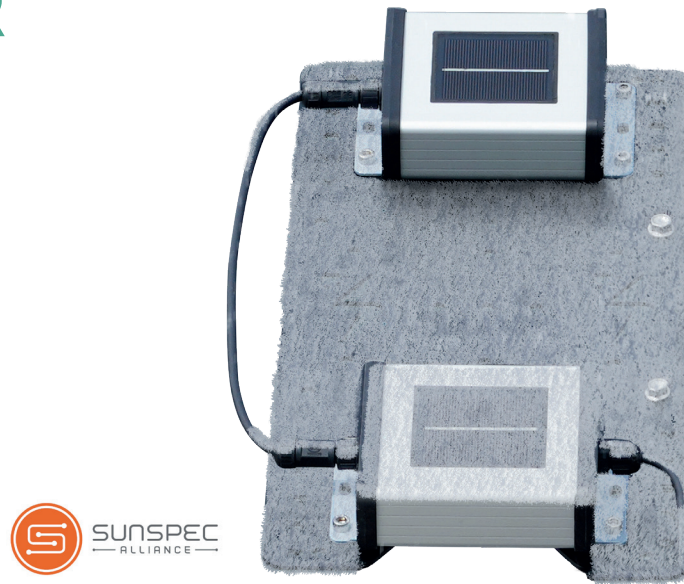
TECHNICAL DATA

	3S-SS-MB
Snow Ratio	%5 - %100
Resolution	%0.1
Uncertainty	≤ 2 %
Irradiance Range	0…1600 W/m²
Data Output	RS485 up to 38400 Baud
Communication Protocol	Modbus RTU
Output Rate	1/s
Operating Temperature Range	-40°C to +85°C
Operating Humidity Range	0 to 100 %RH
Power Supply	22 to 30 V DC
Power Consumption	0.82 A max @ 24VDC (While heating off 0.02 A max @24 VDC)
Electrical Consumption	3m LIYYC11Y PUR Cable, UV and weather resistant
Galvanic Isolation	1000 V Between Power Supply and RS485 Bus
IP Rating	IP 65
Dimensions	200 x 412 x 44 mm
Weight	1845 g
Calibration	Each sensor is calibrated and normalized under Class AAA Sun Similator as per IEC 60904-2 by Using a reference cell calibrated by ISFH-Germany
Test	Each sensor is tested under natural sunlight by using a calibrated reference cell from Fraunhofer ISE, Germany.

Mounting
Systems

SEVEN produces custom designed mounting systems for easy sensor installation in site, especially for Rooftop projects. It is a tower combining different sensors as per the installation requirements.

SEVEN Mounting System is a custom product designed as per the site conditions and the sensors to be mounted. It is made of Chrome as it is strong and has a high resistance against the Weather conditions.

TECHNICAL DATA

	3S-MS
Material	Coated Steel
Length	1123 mm
Width	635 mm
Height	1048 mm (it can be changed as per request)

IRRADIANCE
SENSOR
BOX

Model: 3S-IS-mV

Datalogger

mV
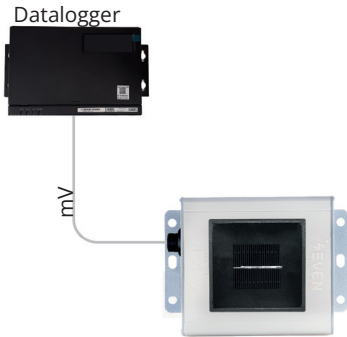
Irradiance Sensor with mV output

Model: 3S-IS-T-I

Datalogger
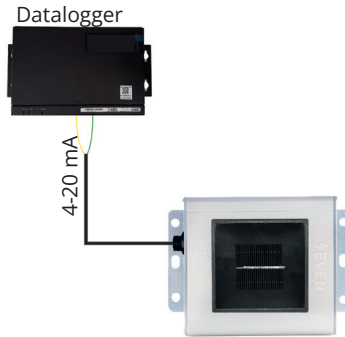
4-20 mA

4-20 mA analog output for Irradiance Value

Model: 3S-IS-T-V

Datalogger
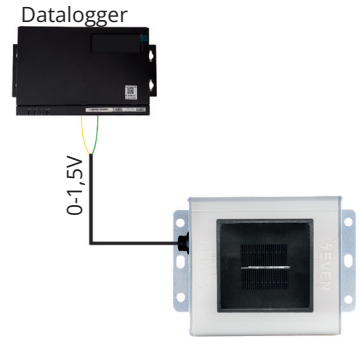
0-1,5V

0-1,5 V analog output for Irradiance Value

Model: 3S-IS

Datalogger

RS485
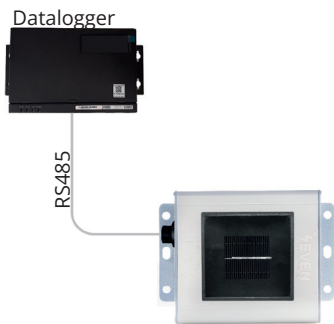
Modbus RTU output for Irradiance Value Cell Temperature Sensor Included
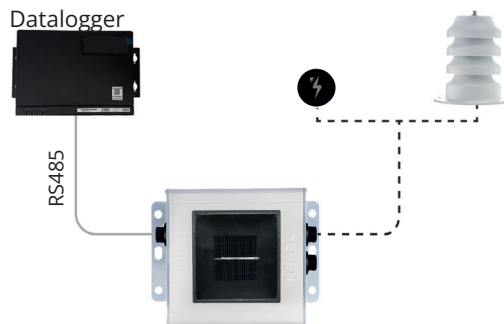
Model: 3S-IS-1

Datalogger

RS485

Irradiance Sensor with an external temperature sensor (Module Temperature Sensor or Ambient Temperature Sensor)

Model: 3S-IS-2

Datalogger

RS485
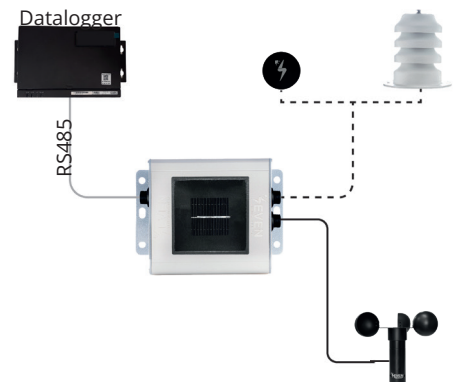
Irradiance Sensor with an external Temperature Sensor (Module Temperature Sensor or Ambient Temperature Sensor), and Wind Speed Sensor
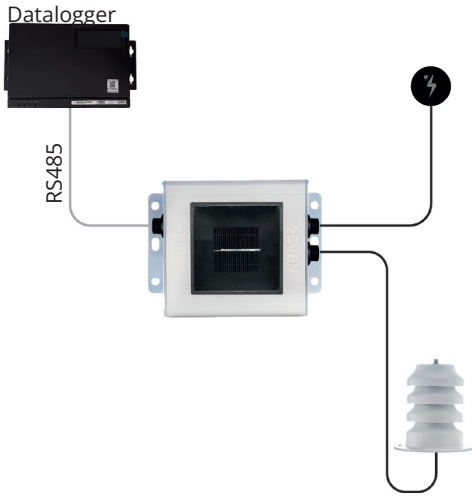
Model: 3S-IS-2T

Irradiance Sensor with external two temperature sensors; Module Temperature Sensor, and Ambient Temperature Sensor

Model: 3S-IS-3
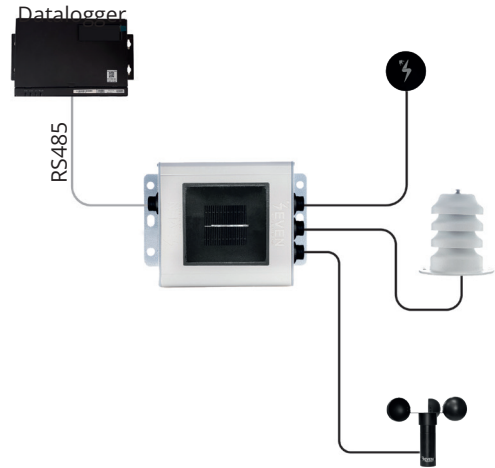
Sensors can be connected to Irradiance Sensor; Module Temperature Sensor, Ambient Temperature Sensor, and Wind Speed Sensor

Model: 3S-IS-4
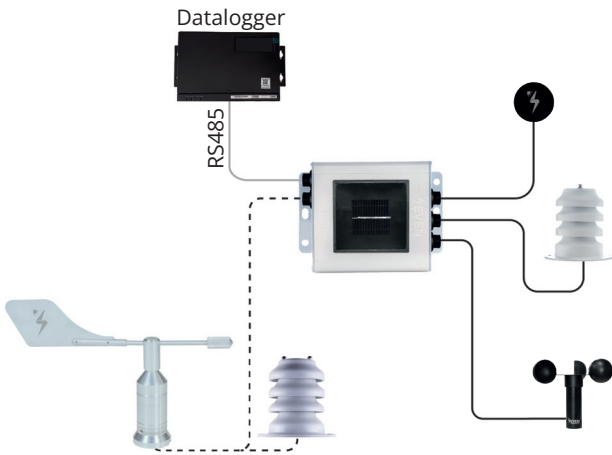
Following sensors can be connected to Irradiance Sensor; Module Temperature Sensor, Ambient Temperature Sensor, Wind Speed Sensor, and Wind Direction Sensor or Relative Humidity Sensor

Model: 3S-IS-5
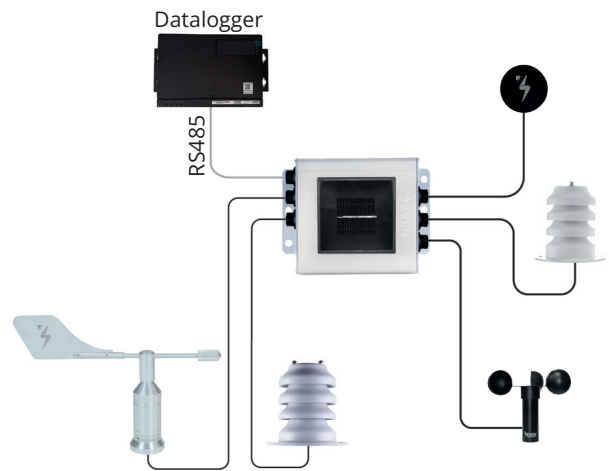
Following sensors can be connected to Irradiance Sensor; Module Temperature Sensor, Ambient Temperature Sensor, Wind Speed Sensor, Wind Direction Sensor, and Relative Humidity Sensor

Model: 3S-2IS
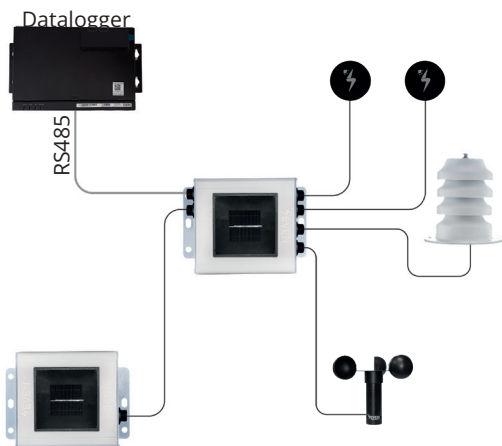
Two Irradiance Sensors, Two Module Temperature Sensors, Ambient Temperature Sensor, and Wind Speed Sensor can be connected. Special Solution when it's a dual orientation plant.

Model: 3S-4IS
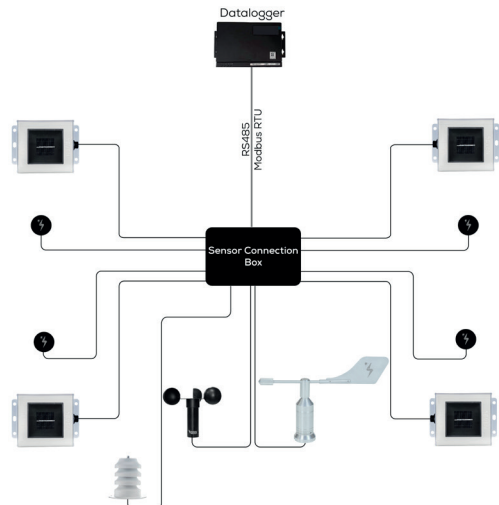
4 Irradiance Sensors, 4 Module Temperature Sensors, Ambient Temperature Sensor, Wind Direction Sensor, and Wind Speed Sensor can be connected.

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3S-C2

SELECTION OF SENSOR BOX

Ambient Temperature Sensor

or

Module Temperature Sensor

Ambient Temperature Sensor

or

Module Temperature Sensor

Ambient Temperature Sensor

or

Module Temperature Sensor

Wind Speed Sensor

Datalogger

Seven Sensor Box

Wind Direction Sensor

Relative Humidity Sensor
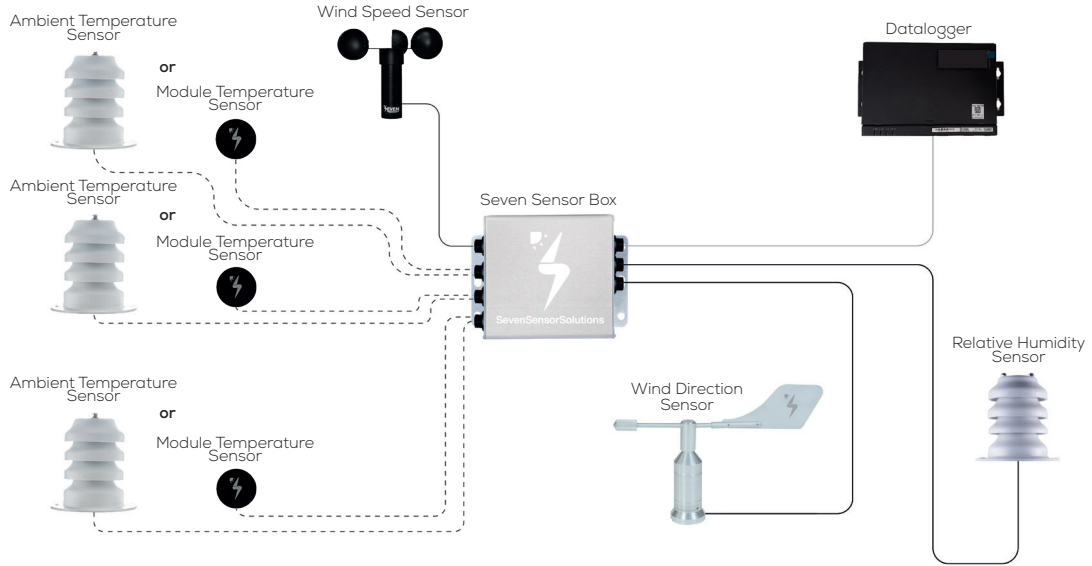
Model: 3S-C2-2

Model: 3S-C2-3

Model: 3S-C2-4

Sensor Box with two sensor connections *Sensor Box with three sensor connections* *Sensor Box with four sensor connections*

Model: 3S-C2-5

Model: 3S-C2-6

Sensor Box with five sensor connections *Sensor Box with six sensor connections*

Technical Specifications
Modbus RTU

Common Modbus Register Map

A common input register map has been created for all SEVEN Modbus devices.

SEVEN Modbus devices can be configured to operate in different communication parameters. The table that follows describes each supported bus protocol.

Baud Rate	4800, 9600, 19200, 38400
Parity	None, Even, Odd
Stop Bit	1, 2 (only at None parity)
Factory Default	9600 Baud, 8N1, address: 1

The following Modbus data can be read individually or in blocks:
Read carefully the notes at the bottom of the table about the parameters.
You can find which parameter is included in which sensors in the matching matrix after the table.

COMMON MODBUS REGISTER MAP					
ID-Dec	**ID-Hex**	**Parameter**	**Range**	**Resolution**	**Description**
30000	0x00	Irradiance [1]	0-1600 W/m²	0.1 W/m²	Irradiance value in W/m² of the reference cell without temperature compensation.
		Irradiance 1 [2]			Irradiance value in W/m² of one of the reference cells without temperature compensation in solutions developed for PV plants with two or more orientations.
					Irradiance value of the **clean** reference cell for the Soil Monitoring System in W/m² without temperature compensation.
					The **downwelling** irradiance value from the sky in W/m² without temperature compensation in solution developed for bifacial PV plants.
30001	0x01	Irradiance 2	0 - 1600 W/m²	0.1 W/m²	Irradiance value in W/m² of one of the reference cells without temperature compensation in solutions developed for PV plants with two or more orientations.
					Irradiance value of the **soiled** reference cell for the Soil Monitoring System in W/m² without temperature compensation.
					The **upwelling** ground-reflected irradiance value in W/m² without temperature compensation in solution developed for bifacial PV plants.
30002	0x02	Irradiance 3	0 - 1600 W/m²	0.1 W/m²	Irradiance value in W/m² of one of the reference cells without temperature compensation in solution developed for PV plants with multi orientations.
30003	0x03	Irradiance 4	0 - 1600 W/m²	0.1 W/m²	Irradiance value in W/m² of one of the reference cells without temperature compensation in solution developed for PV plants with multi orientations.

COMMON MODBUS REGISTER MAP					
ID-Dec	ID-Hex	Parameter	Range	Resolution	Description
30006	0x06	Temperature Compensated Irradiance [3]	0 - 1600 W/m²	0.1 W/m²	Irradiance value in W/m² of the reference cell. Is a temperature compensated and calibrated value.
		Temperature Compensated Irradiance 1 [2]			Irradiance value in W/m² of one of the reference cells in solutions developed for PV plants with two or more orientations. Is a temperature compensated and calibrated value.
					Irradiance value of the **clean** reference cell for the Soil Monitoring System in W/m². Is a temperature compensated and calibrated value.
					The **downwelling** irradiance value from the sky in W/m² in solution developed for bifacial PV plants. Is a temperature compensated and calibrated value.
30007	0x07	Temperature Compensated Irradiance 2	0-1600 W/m²	0.1 W/m²	Irradiance value in W/m² of one of the reference cells in solutions developed for PV plants with two or more orientations. Is a temperature compensated and calibrated value.
					Irradiance value of the **soiled** reference cell for the Soil Monitoring System in W/m². Is a temperature compensated and calibrated value.
					The **upwelling** ground-reflected irradiance value in W/m² in solution developed for bifacial PV plants. Is a temperature compensated and calibrated value.
30008	0x08	Temperature Compensated Irradiance 3	0 - 1600 W/m²	0.1 W/m²	Irradiance value in W/m² of one of the reference cells in solution developed for PV plants with multi orientations. Is a temperature compensated and calibrated value.
					Irradiance value in W/m² of one of the reference cells in solution developed for PV plants with multi orientations. Is a temperature compensated and calibrated value.
30009	0x09	Temperature Compensated Irradiance 4	0 - 1600 W/m²	0.1 W/m²	Irradiance value in W/m² of one of the reference cells in solution developed for PV plants with multi orientations. Is a temperature compensated and calibrated value.
30012	0x0C	Irradiance [4]	0 - 1600 W/m²	0.1 W/m²	Irradiance value in W/m² of the reference cell without temperature compensation.
		Temperature Compensated Irradiance [3]			Irradiance value in W/m² of the reference cell. Is a temperature compensated and calibrated value.
		Total Effective Temperature Compansated Irradiance [5]			Irradiance value in W/m² calculated proportionally from the irradiance values of eac h of the reference cells in solutions developed for PV plants with two or more orientations. It is a temperature compensated and calibrated value.
30014	0x0E	Albedo	0-1	0.01	Ratio of upwelling irradiance to downwelling irradiance in solution developed for bifacial PV plants.

COMMON MODBUS REGISTER MAP					
ID-Dec	ID-Hex	Parameter	Range	Resolution	Description
30015	0x0F	Internal Temperature (3)	(-40) - (+85)°C	0.1°C	Internal cell temperature value of the reference cell.
		Internal Temperature 1 (2)			Internal cell temperature value of one of the reference cells in solutions developed for PV plants with two or more orientations.
					Internal cell temperature value of the **clean** reference cell for the Soil Monitoring System.
					Internal cell temperature value of **facing upwelling** reference cell in solution developed for bifacial PV plants.
30016	0x10	Internal Temperature 2	(-40) - (+85) °C	0.1°C	Internal cell temperature value of one of the reference cells in solutions developed for PV plants with two or more orientations.
					Internal cell temperature value of the **soiled** reference cell for the Soil Monitoring System.
					Internal cell temperature value of **facing downwelling** reference cell in solution developed for bifacial PV plants.
30017	0x11	Internal Temperature 3	(-40) - (+85) °C	0.1°C	Internal cell temperature value of one of the reference cells in solution developed for PV plants with multi orientations.
30018	0x12	Internal Temperature 4	(-40) - (+85) °	0.1°C	Internal cell temperature value of one of the reference cells in solution developed for PV plants with multi orientations.
30021	0x15	Total Effective Module Temperature (5)	-40) - (+85) °C	0.1°C	Module temperature value calculated proportionally from the values of each of the module temperature sensors in solutions developed for PV plants with two or more orientations.
30022	0x16	Module Temperature (3)	(-40) - (+85) °C	0.1°C	The value of the module temperature sensor attachment back of the modules in PV plants.
		Module Temperature 1 (5)			Module temperature value of one of the module temperature sensors in different orientations in solutions developed for PV plants with two or more orientations.
		External Temperature 1 (7)			Temperature value of the external temperature sensor connected on **channel 1** of the Multi PT1000 Modbus Converter.
30023	0x17	Module Temperature 2 (5)	(-40) - (+85) °C	0.1°C	Module temperature value of one of the module temperature sensors in different orientations in solutions developed for PV plants with two or more orientations.
		External Temperature 2 (7)			Temperature value of the external temperature sensor connected on **channel 2** of the Multi PT1000 Modbus Converter.

COMMON MODBUS REGISTER MAP					
ID-Dec	ID-Hex	Parameter	Range	Resolution	Description
30024	0x18	Module Temperature 3 [5]	(-40) - (+85)°C	0.1°C	Module temperature value of one of the module temperature sensors in different orientations in solution developed for PV plants with multi orientations.
		External Temperature 3 [7]			Temperature value of the external temperature sensor connected on **channel 3** of the Multi PT1000 Modbus Converter.
30025	0x19	Module Temperature 4 [5]	(-40) - (+85) °C	0.1°C	Module temperature value of one of the module temperature sensors in different orientations in solution developed for PV plants with multi orientations.
		External Temperature 4 [7]			Temperature value of the external temperature sensor connected on **channel 4** of the Multi PT1000 Modbus Converter.
30026	0x1A	External Temperature 5	(-40) - (+85) °C	0.1°C	Temperature value of the external temperature sensor connected on **channel 5** of the Multi PT1000 Modbus Converter.
30027	0x1B	External Temperature 6	(-40) - (+85) °C	0.1°C	Temperature value of the external temperature sensor connected on **channel 6** of the Multi PT1000 Modbus Converter.
30028	0x1C	External Temperature 7	(-40) - (+85) °C	0.1°C	Temperature value of the external temperature sensor connected on **channel 7** of the Multi PT1000 Modbus Converter.
30029	0x1D	Ambient Temperature [8]	(-40) - (+85) °C	0.1°C	Air temperature value of the ambient temperature sensor.
		External Temperature 8 [7]			Temperature value of the external temperature sensor connected on **channel 8** of the Multi PT1000 Modbus Converter.
30032	0x20	Ambient Temperature (SHT)	(-40) - (+85) °C	0.1°C	Air temperature value of the compact relative humidity and ambient temperature sensor.
30033	0x21	Relative Humidity (SHT)	0 - 100 %	0.1 %	Relative humidity value of the compact relative humidity and ambient temperature sensor.
30035	0x23	Air Pressure	260 - 1260 hPa	0.1 hPa	Air pressure value of the absolute pressure sensor.
30036	0x24	Rainfall Intensity (Hour)	0 - 900 mm/hr	mm/hr	Rain intensity value **per hour** of the tipping bucket rain gauge.
30037	0x25	Rainfall Intensity (Minute)	0 - 15 mm/min	mm/min	Rain intensity value **per minute** of the tipping bucket rain gauge.
30038	0x26	Rainfall Intensity (Second)	0 - 0.25 mm/sec	mm/sec	Rain intensity value **per second** of the tipping bucket rain gauge.

COMMON MODBUS REGISTER MAP					
ID-Dec	ID-Hex	Parameter	Range	Resolution	Description
30042	0x2A	Instant Soiling Ratio	0 - 1	0.01	Instantaneous value of the ratio of the temperature compensated irradiance value of the soiled reference cell to that of the clean reference cell, in the Soil Monitoring System.
30043	0x2B	Daily Average Soiling Ratio	0 - 1	0.01	Daily average value of the ratio of the temperature compensated irradiance value of the soiled reference cell to that of the clean reference cell, in the Soil Monitoring System.
30044	0x2C	Instant Soiling Level	0 - 1	0.01	Instantaneous value of fractional power loss due to soiling, given by 1 – Instant Soiling Ratio.
30045	0x2D	Daily Average Soiling Level	0 - 1	0.01	Daily average value of fractional power loss due to soiling, given by 1 – Daily Average Soiling Ratio.
30046	0x2E	Instant Soiling Level Percentage	0 - 100 %	0.1 %	Instantaneous Soiling Level value in %. Computed as the percent.
30047	0x2F	Daily Average Soiling Level Percentage	0 - 100 %	0.1 %	Daily average Soiling Level value in %. Computed as the percent.
30048	0x30	Soiling Rate	(-100) - (+100) %	0.1 %	The rate of change of the daily average soiling level percentage. It is calculated by comparing it with the previous day's value and is usually expressed as a daily percentage.
30050	0x32	Wash Tank Status	0 - 1	-	Automatic cleaning unit wash tank status. (1: full or 0: empty)
30052	0x34	Wind Direction	0 - 359°	1°	Horizontal wind direction value of the wind vane.
				0.1°	Wind direction value of the ultrasonic anemometer.
30053	0x35	Wind Speed (m/s)	0 - 40 m/s	0.1 m/s	Horizontal wind velocity value in m/s of the cup star anemometer.
			0 - 60 m/s	0.01 m/s	Wind velocity value in m/s of the ultrasonic anemometer.
30054	0x36	Wind Speed (knots)	0 - 120 knots	0.01 knots	Wind velocity value in knots of the ultrasonic anemometer.
30055	0x37	Wind Speed (knots)	0 - 216 km/h	0.01 km/h	Wind velocity value in km/hr of the ultrasonic anemometer.

SunSpec and Modbus

Serial/ General
Baud Rate: 9600
Parity: None   RS-485   Modbus
Stop Bits: 1   Interface Mode: 2-Wire Half Duplex   Device ID: 1

Register Map:

Start	End	#	Name	Type	Units	Scale Factor	Contents	Description
0001	0002	2	C_SunSpec_ID	uint32	N/A	N/A	"SunS"	Well-known value. Uniquely identifies this as a SunSpec Modbus Map
0003	0003	1	C_SunSpec_DID	uint16	N/A	N/A	0x0001	Well-known value. Uniquely identifies this as a SunSpec Common Model block
0004	0004	1	C_SunSpec_Length	uint16	registers	N/A	65	Length of common model block
0005	0020	16	C-Manufacturer	String(32)	N/A	N/A	"SEVEN"	Well-known value
0021	0036	16	C-Model	String(32)	N/A	N/A	"3S-IS"	Manuf specific value
0037	0044	8	C-Options	String(16)	N/A	N/A	"0"	Manuf specific value
0045	0052	8	C-Version	String(16)	N/A	N/A	"1"	Manuf specific value
0053	0068	16	C_Serial Number	String(32)	N/A	N/A	"Serial"	Manuf specific value
0069	0069	1	C_DeviceAddress	unint16	N/A	N/A	60	Modbus Id
0070	0070	1	C_SunSpec_DID	int16	N/A	N/A	307	Start of next Device
0071	0071	1	C_SunSpec_Length	int16	N/A	N/A	11	Device Model Block Size
0072	0072	1	E_BaseMet_Air Temperature	int16	°C	-1	Measured	Ambient Air Temperature
0073	0073	1	E_BaseMet_Relative	int16	%	0	Measured	Relative Humidity
0075	0075	1	E_BaseMet_Wind _Speed	int16	m/s	0	Measured	Wind Speed
0076	0076	1	E_BaseMet_Wind	int16	Degrees	0	Measured	Wind Direction
0083	0083	1	C_SunSpec_DID	int16	N/A	0	302	Well-known value. Uniquely identifies this as a SunSpec Irradiance Model
0084	0084	1	C_Sunspec_Length	int16	N/A	0	5	Variable length model block =(5*n), where n=number of sensors blocks
0086	0086	1	E_Irradiance _Plane-of-Array_1	uint16	W/m²	0	Measured	Plane-of-Array Irradiance
0090	0090	1	C_SunSpec_DID	int16	N/A	0	303	Well-known value. Uniquely identifies this as a SunSpec Back of Module Temperature Model
0091	0091	1	C_Sunspec_Length	int16	N/A	0	2	Variable length model block =(5*n), where n=number of sensors blocks
0092	0092	1	E_BOM_Temp_1	int16	°C	-1	Measured	Back of module temperature
0094	0094	1	EndOfSunspecBlock	uint16	N/A	N/A	0xFFFF	End of SunSpec Block
0095	0095	1	C_Sunspec_Length	uint16	N/A	0	0	Terminate length, zero
0200	0200	1	Modbus Id - Write Register	int16	N/A	N/A	60	Modbus device address, write register
0205	0205	1	Baud Rate	uint16	N/A	N/A	9600	Baud Rate, write register

MODEL SELECTION TABLE

Sensor Box Model	Irradiance Sensor	Cell Temperature Sensor	Connections: The following external sensors can be connected to the sensor box	Communication / Protocol
3S-IS-T-V	✓	✓	NA	0-1,5V
3S-IS-T-I	✓	✓	NA	4-20 mA
3S-IS-LR	✓	✗	NA	RS485 - Modbus RTU
3S-IS	✓	✓	NA	RS485 - Modbus RTU
3S-IS-1	✓	✓	Module Temperature Sensor (3S-MT-PT1000) **or** Ambient Temperature Sensor (3S-AT-PT1000)	RS485 - Modbus RTU
3S-IS-2	✓	✓	Module Temperature Sensor (3S-MT-PT1000) **or** Ambient Temperature Sensor(3S-AT-PT1000) **+** Wind Speed Sensor (3S-WS-PLS)	RS485 - Modbus RTU
3S-IS-2T	✓	✓	Module Temperature Sensor (3S-MT-PT1000) **+** Ambient Temperature Sensor (3S-AT-PT1000)	RS485 - Modbus RTU
3S-IS-3	✓	✓	Module Temperature Sensor (3S-MT-PT1000) **+** Ambient Temperature Sensor (3S-AT-PT1000) **+** Wind Speed Sensor (3S-WS-PLS)	RS485 - Modbus RTU
3S-IS-4	✓	✓	Module Temperature Sensor (3S-MT-PT1000) **+** Ambient Temperature Sensor (3S-AT-PT1000) **+** Wind Speed Sensor (3S-WS-PLS) **+** Wind Direction Sensor (3S-WD) **or** Relative Humidity & Ambient Temperature Sensor (3S-RH & AT)	RS485 - Modbus RTU
3S-IS-5	✓	✓	Module Temperature Sensors (3S-MT-PT1000) **+** Ambient Temperature Sensor (3S-AT-PT1000) **+** Wind Speed Sensor (3S-WS-PLS) **+** Wind Direction Sensor (3S-WD) **+** Relative Humidity & Ambient Temperature Sensor (3S-RH & AT)	RS485 - Modbus RTU
3S-2IS	✓	✓	2 pcs. Module Temperature Sensor (3S-MT-PT1000) **+** Ambient Temperature Sensor (3S-AT-PT1000) **+** Wind Speed Sensor (3S-WS-PLS) **+**	RS485 - Modbus RTU
3S-4IS	✓	✓	4 pcs. Module Temperature Sensor (3S-MT-PT1000) **+** Ambient Temperature Sensor (3S-AT-PT1000) **+** Wind Direction Sensor (3S-WD) **+** Wind Speed Sensor (3S-WS-PLS)	RS485 - Modbus RTU
3S-CWS	✓	✓	Irradiance Sensor (3S-IS-mV) **+** Module Temperature Sensor (3S-MT-PT1000) **+** Relative Humidity & Ambient Temperature Sensor (3S-RH & AT) **+** Wind Speed Sensor (3S-WS-PLS) **+** Wind Direction Sensor(3S-WD) **+** Rain Gauge (3S-RG-PLS) **+** Air Pressure Sensor	RS485 - Modbus RTU
3S-C2-2	✗	✗	2 Sensors can be connected	RS485 - Modbus RTU
3S-C2-3	✗	✗	3 Sensors can be connected	RS485 - Modbus RTU
3S-C2-4	✗	✗	4 Sensors can be connected	RS485 - Modbus RTU
3S-C2-5	✗	✗	5 Sensors can be connected	RS485 - Modbus RTU
3S-C2-6	✗	✗	6 Sensors can be connected	RS485 - Modbus RTU

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