

t055 TPIR-E

Global Solar Radiation Transducer



SIAP+MICROS

User Manual and maintenance

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1 Introduction

TPIR measures the global solar radiation, calculated as sum of the direct sun radiation, and the radiation diffused by the sky and scattered clouds. Thanks to its standards of accuracy the sensor is a very suitable device for various applications in the field of meteorology. TPIR is equipped with a thermopile element, specifically designed and developed for SIAP+MICROS. The sensing element generates a tension proportional to the captured radiation, which is acquired by a signal conditioning electronics that normalizes the output in a standard tension, current, Modbus or SDI-12 signal. Performance features are significantly improved thanks to a double dome made of special optical glass (Schott K5), which allows a wide range of solar radiation frequency measurement ($0.3 \div 3 \mu\text{m}$). The production process is fulfilled by a calibration in a climatic chamber with an artificial light source, in order to obtain high accuracy even when the temperature varies. The sensor is supplied with power and signal cable (4m).

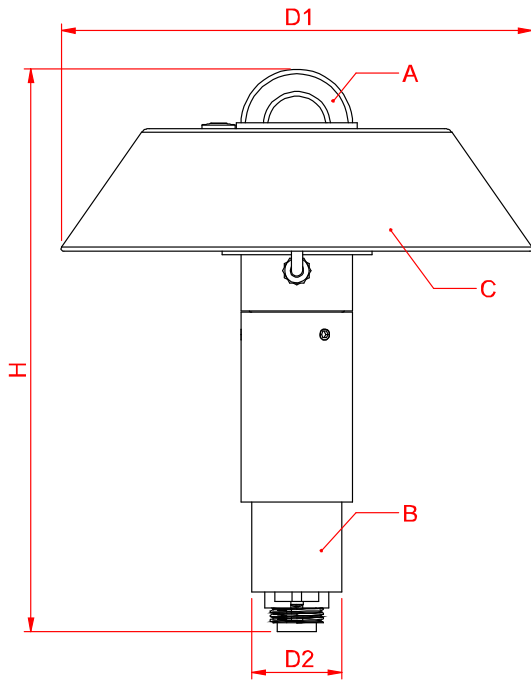
Ordering Codes:

Current, tension, RS485 Modbus serial Output:.....t055d TPIR-IVS

SDI-12 serial output:.....t055i TPIR-12

2 Technical specificaion

Measurement performance			
Transducer	Thermopile		
Measurement range	0 ÷ 2000 W/m ²		
Accuracy	± 10 W/m ²		
Resolution	1 W/m ²		
Directional response	< ± 20 W/m ²		
Non linearity	± 1 %		
Spectral range	0.3 ÷ 3 µm		
Inclination response	± 2 %		
Sensitivity	< 100 µV/Wm ²		
T.C. of sensitivity	+/- 0.15% / °C		
Operating conditions			
Temperature	-30 ÷ 70 °C		
Humidity	0 ÷ 100 RH%		
Outputs			
Current	4 ÷ 20 mA ↔ -30 ÷ 70 °C		
Tension	0 ÷ 2 V ↔ -30 ÷ 70 °C		
RS485 MODBUS	Temperature		
SDI-12	Temperature		
Power supply and Consumption			
Supply voltage (non-natural output versions)	7 ÷ 30 Vdc		
Power consumption	Min	Typical	Max
	4 ÷ 20 mA	5	25
0 ÷ 2 V / RS485 MODBUS / SDI-12			
		1	3
0 ÷ 2 V / RS485 MODBUS / SDI-12			
Mechanical specifications			
	Plastic material, aluminium alloy, brass, stainless steel screws		
Protective body	IP67 / 7 pole male connector		



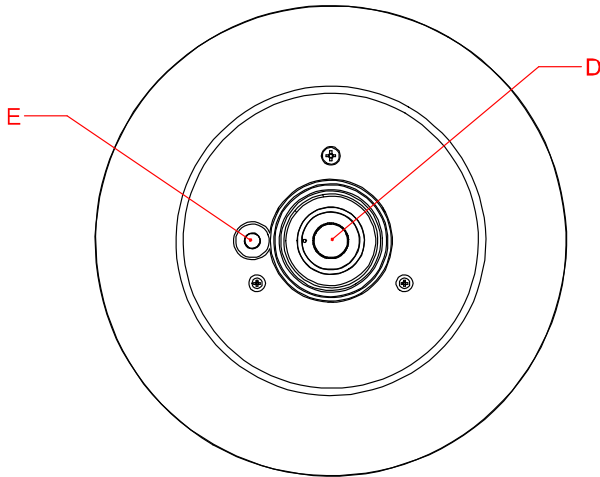
Dimension:

- H** – maximum height: 250 mm
- D1** – maximum diameter: 210 mm
- D2** – fixing diameter: 40 mm

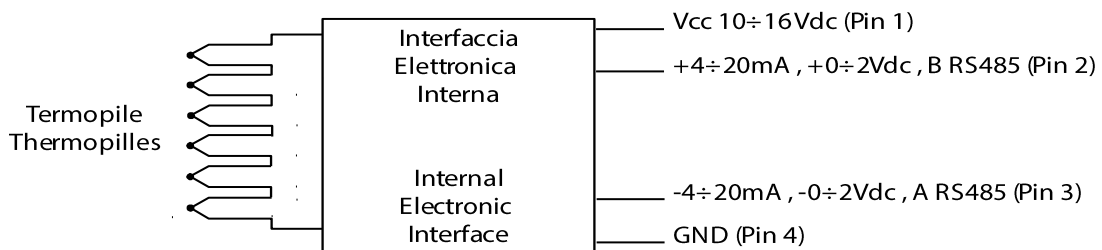
Element:

- A** – glass domes
- B** – fixing shank
- C** – cover plate
- D** – thermopile
- E** - level

Weight: 1,1 kg



2.1 Operation scheme

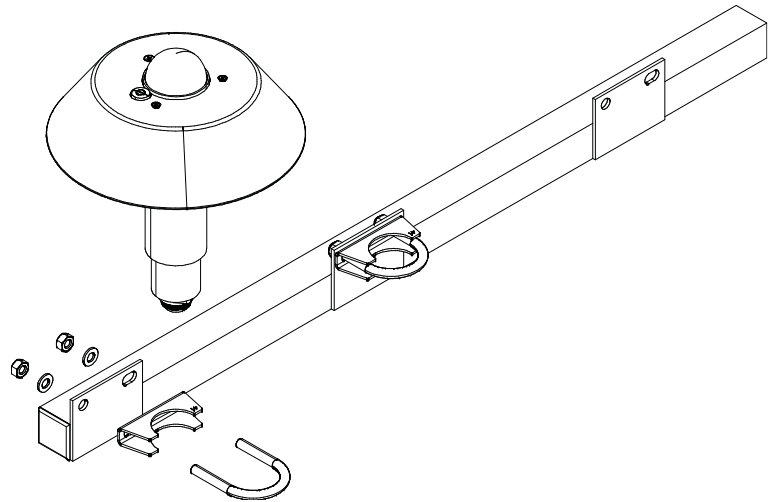


3 Installation and maintenance

3.1 Installation

The sensor must be installed on special brackets which distance it sufficiently from reflected heat sources (for example the same support pole of the station) which could influence its correct measurement.

For correct installation, the sensor should be placed at a distance from the closest obstacle (pylons, trees, buildings) equal to 10 times the height of the obstacle itself, this to minimize the effects of alteration of the normal air flow.



The TPIR transducer is normally positioned (according to WMO standards) at a height of about 2 meters from the ground level. Normally, in Siap+Micros meteorological stations, it is installed with special brackets (see drawing) present on the poles. On these brackets the sensor must be installed with special muffler collars fixed to the stem of the sensor itself (part with $\varnothing 40\text{mm}$).

It is important that the transducer is installed so that no obstacle can generate a darkened area from the sun (shadow) making correct measurement impossible. In order not even the pole of the monitoring station can generate this shadow, the transducer must be positioned in the "direction of the sun". For this reason, the TPIR must be placed in a SOUTH direction if it is installed in the NORTHERN hemisphere, vice versa in the NORTH direction if it is installed in the SOUTH hemisphere.

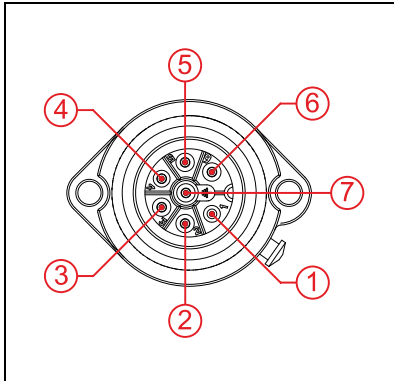
3.2 Maintenance

In cases of heavy dirt due to atmospheric pollutants, dust, etc., the glass dome placed on top of the TPIR transducer must be kept clean with the use of non-abrasive materials and non-corrosive detergents.

Furthermore, the dehumidification salts must be checked periodically. In a "normal" situation, the salts are light blue/blue, otherwise they become white/pink and must be replaced to guarantee a good response from the instrument.

4 Electrical connection

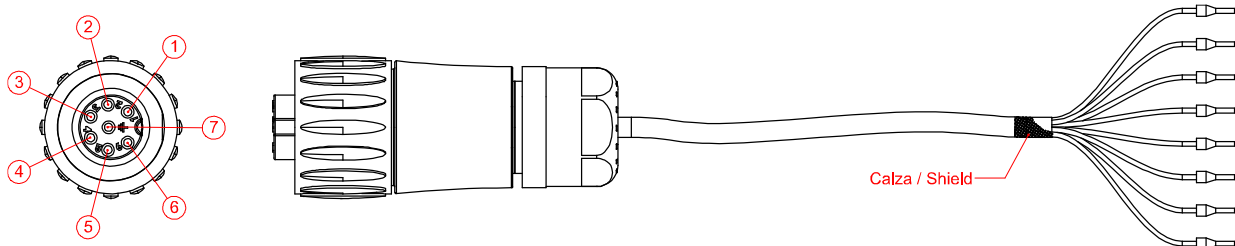
4.1 Connector output



Pin	TPIR-IVS	TPIR-12
1	A-RS485	A-RS485
2	B-RS485	B-RS485
3	+0÷2 Vdc	SDI-12 (data)
4	+4÷20 mA	+4÷20 mA
5	-0÷2 Vdc -0÷20 mA	-4÷20 mA
6	Vcc	SDI-12 (Vcc)
7	GND	GND

4.2 Connection cable

The connection cable supplied with the sensor is made with circular connectors with housing, 8x0.22 mm² shielded cable and ferrules for connection to the data logger terminals. The sock is connected to the black cable.



Pin	1	2	3	4	5	6	7	7
Cable	Red	White	Green	Black	Orange	Yellow	Blue	Brown
TPIR-IVS	A-RS485	B-RS485	+0÷2 Vdc	+4÷20 mA	-0÷2 Vdc -4÷20 mA	Vcc	GND	GND
TPIR-12	A-RS485	B-RS485	SDI-12 (data)	+4÷20 mA	-4÷20 mA	SDI-12 (Vcc)	GND	GND

4.3 Data reading in serial (RS485 Modbus and SDI-12)

Sensors with RS485 Modbus or SDI-12 output send data only upon specific request from the PC, data logger or PLC.

Below are the correct communication parameters of the device performing the interrogation.

4.3.1 RS485 Modbus mode

Serial port settings: 9600 baud, no parity, 8 data bit, 1 bit di stop

Compatible with ModBus RTU protocol, functions supported: "03 – read Holding Registers" e "04 – Read Input Registers".

Data type: "2 registers swapped float IEEE 754 in the form CDAB where A is the most significant byte of the float and D is the less significant byte of the float (swapped float)".

ID	Registers	Units	Reg. 1-2	Reg. 3-4	Reg. 5-6	Reg. 7-8	Reg. 9-10	Reg. 11-12	Reg. 13-14
7	7	Wm ²	-	-	-	Solar Radiation	-	Diagnostic	Supply Voltage

4.3.2 SDI-12 mode

Serial port settings: 1200 baud, even parity, 7 data bit, 1 bit di stop

Supported commands (a = 3, sensor address)

?! Address Query

a! Send Identification

aM! Start Measurement

aC! Start Concurrent Measurement

aD0! Send Data

a	Position	Units	Decimals	Position 1	Position 2	Position 3	Position 4	Position 5	Position 6	Position 7
7	1	Wm ²	1	Solar Radiation	Diagnostic	Supply Voltage	-	-	-	-

5 Generic information

The qualitative level of our instruments is the result of a continuous evolution of the product. This may cause differences between what is reported in the manual and the instrument you have purchased.

Siap+Micros S.p.A. reserves the right to modify without notice technical specifications and dimensions to adapt them to the needs of the product.

5.1 Safety

Please read these safety instructions carefully before using this product:

- The warranty will be void if the product is used differently from the instructions described in this manual.
- Any sign of tampering will void the warranty
- Use the devices only according to the instructions (environmental management, operation, wiring, installation, etc.) provided in this manual
- The correct and safe operation of the device can only be guaranteed if the transport, storage, operation and management of the device are compliant. This also applies to product maintenance.
- The device shall not be exposed to aggressive chemicals or solvents that could damage the plastic casing and/or corrode the metal parts.
- Maintenance should only be performed by qualified and well trained personnel.

It is appropriate to carry out a careful risk assessment in relation to the context of installation and use of the device by the installer considering the possible meteorological station in its complexity without being limited to the sensor.

The instruments must be installed according to the rules of the trade, with equipment that complies with applicable regulations and using supports correctly sized by qualified technicians and designed for the specific purpose.

During installation operations, check the suitability of the surrounding environment and compliance with local safety regulations.

The manufacturer declines all responsibility in case of failure due to negligence of the instructions, tampering, uses not described in this manual, improper use, use by operators not trained.

Read the instructions and intended use carefully and be sure you understand before installing the device

Before starting the activities, check the integrity of the instrument to be installed, prepare the equipment necessary for the work and wear the necessary PPE.

Take adequate measures to prevent the access of foreign personnel (untrained and uninformed) during the installation, maintenance or replacement of the instrument.

Take precautions to avoid falling objects, both during the installation phases and during the operation of the instrument.

Do not perform any activity in bad weather conditions.

During maintenance, particularly if the station is not frequented, visually check for the absence of dangerous insects and, if not, use suitable insecticides.

Consider the presence of any animals near the station, if so, pay attention to them.

Use only SIAP+MICROS original spare parts

The instrument is not classified suitable (according to Directive 2014/34/EU) for use in atmospheres with potential explosion risk pursuant to Directive 99/92/EC.

SIAP+MICROS strives to minimize health and safety risks in all phases of the instrument's life, including installation, use, maintenance, decommissioning and disposal.

5.2 Appropriate use of the equipment

Use the instrument for its intended purpose, do not use it for any other purpose or cause malfunctions and/or damage.

5.3 Storage

If you do not plan to use the equipment for an extended period of time (at least one year) disconnect all cables from the equipment, place it in a clear plastic bag along with a bag of desiccant salts and seal the bag with tape. Put appropriate indication on the bag of the contents and weight of the equipment by inserting the wording "HANDLE WITH CARE".

Store the instrument in an environment with a temperature between 0°C and 60°C with a humidity not exceeding 80%. Make sure that the instrument is stored in a stable position and that it cannot be damaged or moved by inexperience or carelessness. Do not stack other tools or weights. Do not place the instrument on top of other instruments and in any case ensure the solidity and stability of the underlying support.

Non esporre, stoccare lo strumento in ambienti con presenza di vapori e/o gas corrosivi.

5.4 Moving

In order to avoid any damage to the device during transportation, please keep it in upright position without shaking.

5.5 Disposal information



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.

6 Revision history

The following table shows the description of the changes made to this document.

Version	Date	Updates
1.0	05/06/2023	Current version of the document.

All the information content in this document are the current available at the printing phase. Siap+Micros S.p.A. reserve the rights to change the specifications without any advance notice

7 Declaración de conformidad



MD 751.1 rev. 03

EU Declaration of Conformity (DoC)

Manufacturer: SIAP+MICROS S.p.A.
 Via del Lavoro, 1 – 31020 S. Fior (TV) – Italy
<https://www.siapmicros.com/en/>

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration:

Description	Product Code/Model
TPIR - IVS Solar Radiation Transducer, with current, voltage or serial RS485-Modbus output	PSM-t055d-TPIR-IVS

The object of the declaration described above is in conformity with the relevant Union harmonization legislation:

- 2014/30/EU Electromagnetic Compatibility (EMC)
- 2011/65/EU The Restriction of Hazardous Substances Directive (RoHSD)

The following harmonised standards and technical specifications have been applied:

EMC references:

EN 61326-1 2021-06	Electrical equipment for measurement, control and laboratory use - EMC requirements - General requirements
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RoHSD references:

EN 63000 2016+AMD1:2022	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
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Date
 31-01-2023

CEO
 Alex Stevanin

