KOSTAL

SOLAR ELECTRIC



Smart connections. Installation and Operating Manual

PIKO Sensor

LEGAL NOTICE

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General note on gender equality

KOSTAL is aware of how language impacts on gender equality and always make an effort to reflect this in documentation. Nevertheless, for the sake of readability we are unable to use non-gender-specific terms throughout and use the masculine form instead.

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Thank you for choosing a PIKO Sensor from KOSTAL Solar Electric GmbH!

If you have any technical questions, please call our service hotline: +49 (0)761 47744-222

1. Notes on this manual

Read this manual carefully in its entirety. It contains important information on the installation and operation of the PIKO Sensor. Pay particular attention to the instructions regarding safe usage.

KOSTAL Solar Electric GmbH assumes no liability for damages arising from the non-observance of this manual. This manual is an integral part of the product. It applies exclusively to the PIKO Sensor from KOSTAL Solar Electric GmbH. Keep this manual and give it to the new owner should you pass it onto a new operator.

The installer as well as the user must always have access to this manual and must be familiar with its contents, particularly the safety instructions.

Target group

This manual is intended for specialist tradespersons.

2. Proper use

The PIKO Sensor is a measuring device for monitoring the temperature, irradiation and module temperature of photovoltaic solar systems. This sensor is designed for use on PIKO inverters with communication boards I & II.

The device may only be used under the permitted ambient conditions. Inappropriate use can be hazardous and lead to injury or even death of the user or third parties. Material damage to the unit and other equipment can also occur. The PIKO Sensor may therefore only be used for its intended purpose.

Any use that differs from or goes beyond the stated intended purpose is considered inappropriate. The manufacturer accepts no liability for any damage resulting from this. Modifications to the PIKO Sensor are prohibited. The PIKO Sensor may only be used if in a perfect technical condition. Exclusion of liability

All names, trademarks, product names or other designations given in this manual may be legally protected even if this is not labelled as such (e.g.as a trademark). KOSTAL assumes no liability for their free usage. The illustrations and texts have been compiled with great care. However, the possibility of errors cannot be ruled out. The compilation is made without any guarantee.

Any instance of misuse of the PIKO Sensor will result in termination of the warranty, guarantee and general liability of the manufacturer. Only a qualified electrician may open the unit. The PIKO Sensor must be installed by an electrician who is responsible for observing the applicable norms and regulations.

3. Symbols and safety instructions

3.1 Warning instructions



General warning instructions are indicated by a warning triangle and exclamation mark.



A warning triangle and lightning indicates hazards associated with electricity.

Signal words in warning instructions indicate the type and severity of the consequences of not observing actions to avoid hazards.

- DANGER means that life-threatening injuries may occur.
- WARNING means that serious injuries may occur.
- **CAUTION** means that minor to moderately severe injuries may occur.
- ATTENTION means that damage to property may occur.

Important information



Other symbols

Symbol	Meaning
•	Handling instructions

4. EU Declaration of Conformity

EU Declaration of Conformity

KOSTAL Solar Electric GmbH Hanferstrasse 6 79108 Freiburg i. Br., Deutschland

KOSTAL Solar Electric GmbH hereby declares that the

PIKO Sensor

with which this declaration is concerned, is in accordance with the following guidelines and standards.

- EN61010-1 (2011), EN61010-31 (2008) (Safety)
- EN61326-1 (2006), EN61326-2-1 (2006), EN61326-2-2 (2006), EN 61326-2-3 (2007) (EMC) 2006 / 95 / EC + 2004 / 108 / EC

This declaration applies to all identical specimens of the product. This declaration becomes invalid if a change is made to the unit or the unit is improperly installed.

KOSTAL Solar Electric GmbH - 2012-07-03

Durnes Pal

Werner Palm (CEO)

Dr. Armin von Preetzmann (Head of Development)

Observe the safety instructions in the enclosed product documentation!

5. Scope of delivery

- 1 PIKO Sensor
- 1 adapter circuit board
- 1 operating manual

6. Device and system description



Fig. 1 PV system with PIKO Sensor

- (1) PIKO inverter
- (2) Solar modules
- (3) Module temperature sensor (on rear of module)
- (4) Irradiation and ambient temperature sensor

7. Overview of components



Fig. 2 Overview of components

- (1) Irradiation and ambient temperature sensor
- (2) Module temperature sensor
- (3) Connection cable
- (4) Adapter circuit board (for communication board II)
- (5) Mounting plate with hole

7.1 Function description of PIKO Sensor

The PIKO Sensor measures the following parameters:

- Irradiation
- Ambient temperature
- Module temperature

The silicon sensors on the sensor housing cover measure irradiation. The sensors supply a voltage proportional to the level of irradiation.

The sensor for ambient temperature is fitted directly in the sensor housing and measures the mounting plate temperature.

The module temperature sensor is connected to the sensor and measures the module temperature. This sensor must be stuck on the rear of the module.

8. Installation





Fig. 3 Installing sensor on solar module

- (1) Solar module
- (2) Irradiation and ambient temperature sensor
- (3) Module temperature sensor



The irradiation and ambient temperature sensor (Fig. 3 (2)) must be aligned to the same angle as the solar module (Fig. 3 (1)) so that correct measurements can be obtained.

8.1 Fitting irradiation and ambient temperature sensor

A mounting plate with an M10 hole (Fig. 2 (4)) is attached to the sensor housing to secure the sensor directly to the module substructure.

8.2 Fitting module temperature sensor

The module temperature sensor sits in a foam adhesive pad so it can be stuck directly on to the rear of the module.

Procedure

- ▶ Remove protective film from sensor's adhesive pad
- ► Apply sufficient pressure to stick module temperature sensor (Fig. 3 (3)) onto rear of module.
- ► Use cable clips to fix sensor cables without voltage.

9. Electrical connection

9.1 Connecting PIKO Sensor to PIKO inverter with communication board I

PIKO inverters with communication board I have just one operating element (contact sensor) on their control panel.



Fig. 4 Control panel of PIKO inverter with communication board I



Procedure

4	Electric current represents a danger to life There are deadly voltages in the inverter during operation.
	► De-energise the inverter.
	Lock to prevent it being switched back on.
	 Wait five minutes until the capacitors have discharged.

- ► Unscrew inverter cover.
- ► Guide connection cable through PG screw connection and seal.
- Connect connection cable to inverter terminal (see Fig. 5).



Fig. 5 Connecting PIKO Sensor's connection cable to analogue outputs of communication board I

PIKO inverter terminal	Cable	Assignment
+5V	white	Supply voltage
AGND	grey	Ground
Aln1	yellow	Irradiation
Aln2	green	Module temperature
Aln3	brown	Ambient temperature

Tab. 1: PIKO inverter terminal connection assignment

- Screw down inverter cover.
- Start up inverter.

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9.2 Connecting PIKO Sensor to PIKO inverter with communication board II

PIKO inverters with communication board II have three operating elements ("UP" arrow key, "DOWN" arrow key and Enter key) on their control panel.



Fig. 6 Control panel of PIKO inverter with communication board II



For more information, consult chapter "6.9 Installing accessories with communication board II" in the operating manual for the PIKO inverter.

Since communication board II delivers a supply voltage of 12 V, an adapter circuit board is used. The contacts for RS485 A/B, GND, S0-in and Ain4 are directly connected to the inputs.



It is essential that the lines to the adapter circuit board are connected first, then this board connected to the communication board.

Procedure

/4	Electric current represents a danger to life There are deadly voltages in the inverter during operation.		
	► De-energise the inverter.		
	► Lock to prevent it being switched back on.		
	 Wait five minutes until the capacitors have discharged. 		

- ► Unscrew inverter cover.
- ▶ Guide connection cable through PG screw connection and seal.
- Connect connection cable of PIKO Sensor to adapter circuit board (see Fig. 7 and Table 2).



Fig. 7 Connecting connection cable of PIKO Sensor to adapter circuit board

Adapter circuit board terminal	Cable	Assignment
+9,7V	white	Supply voltage
AGND	grey	Ground
Aln1	yellow	Irradiation
Aln2	green	Module temperature
Aln3	brown	Ambient temperature

Tab. 2: Adapter circuit board for PIKO inverter terminal

- ► Turn adapter circuit board so that its underside is facing up
- Connect adapter circuit board to inverter terminal (see Fig. 8)



Fig. 8 Connecting adapter circuit board to terminal

10. Technical data

Item number	10237517		
Measurement param- eters	Irradiation Ambient temperature Module temperature		
Supply voltage	5 - 30 V DC		
Power consumption	Approx. 30 mW		
Connection cable	3 m, 5 x 0.25 mm ²		
Housing	Polycarbonate, UV-resistant with PG screw connection		
Dimensions (L / W / H) PIKO Sensor	Housing 80 mm / 80 mm / 60 mm Mounting plate 131 mm / 78 mm / 2 mm		
Installation	Hole for securing with M10 screw		
Weight	Approx. 300 g		
Type of protection	IP65		
Warranty	2 years		
Standards	CE symbol (for more standards, see "EU Declaration of Conformity" on page 7)		
Irradiation sensor			
Measuring range	0 -1500 W/m²		
Sensor type	Monocrystalline cell (33 mm / 50 mm)		
Sensor precision	±5 % annual average		
Electric output	0 - 3.125 V		
Calibration	Solar Constant 1200 sun simulator with a reference sensor calibrated at ISE		
Sensor structure	Measurement cell encapsulated in glass		
Ambient temperature	sensor		
Measuring range	-35 +125°C		
Measuring principle	Platinum resistance wire		

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Module temperature sensor		
Measuring range	-35 +125°C	
Measuring principle	Platinum resistance wire	
Dimensions	50 mm / 50 mm / 8 mm	
Installation	Secured to rear of module with adhesive pad	

Tab. 3: Technical data for PIKO Sensor

Measurements / measuring ranges

Measurement parameter	Irradiation (terminal: Aln1)	Module temperature (terminal: Aln2) Ambient temperature (terminal: Aln3)		
		Communication board I	Communication board II	
Range of values	0 3.125 V	0 4.7	0 9.4	
Measuring range	0 1500 W	-35	125 °C	
Factor	480	22.6*	11.3*	
Offset	0	-20*	-14*	

Tab. 4: Measurements / measuring ranges

* The dependence is not linear. For precise trend, see Tab. 5 & 6. Factor and offset were optimised using the tables for a temperature range of between approx. -10 $^{\circ}$ C and 80 $^{\circ}$ C.

You need this data to set up the PIKO Sensor in the PIKO Solar Portal and PIKO Master Control.

i	If you read the inverter's log data via the web browser, the analogue input values are stated in digital units (digits). These must be converted into volts using the following formula:
	U analogue [V] = Ain [digit] * 10 / 1023

Designation of temperature for communication board I

0.1 V / -35.1°C	2.5 V / 34.8°C
0.2 V / -24.8°C	2.6 V / 36.7°C
0.3 V / -18.2°C	2.7 V / 38.6°C
0.4 V / -13.2°C	2.8 V / 40.6°C
0.5 V / -9.1°C	2.9 V / 42.6°C
0.6 V / -5.5°C	3.0 V / 44.7°C
0.7 V / -2.4°C	3.1 V / 46.8°C
0.8 V / 0.4°C	3.2 V / 49.1°C
0.9 V / 3.1°C	3.3 V / 51.4°C
1.0 V / 5.5°C	3.4 V / 53.8°C
1.1 V / 7.8°C	3.5 V / 56.4°C
1.2 V / 10.0°C	3.6 V / 59.1°C
1.3 V / 12.1°C	3.7 V / 62.0°C
1.4 V / 14.2°C	3.8 V / 65.1°C
1.5 V / 16.2°C	3.9 V / 68.5°C
1.6 V / 18.1°C	4.0 V / 72.3°C
1.7 V / 20.0°C	4.1 V / 76.4°C
1.8 V / 21.9°C	4.2 V / 81.1°C
1.9 V / 23.7°C	4.3 V / 86.6°C
2.0 V / 25.6°C	4.4 V / 93.1°C
2.1 V / 27.4°C	4.5 V / 101.2°C
2.2 V / 29.2°C	4.6 V / 111.8°C
2.3 V / 31.1°C	4.7 V / 127.4°C
2.4 V / 32.9°C	

Tab. 6: Designation of temperature for communication board I (typical trend)

Designation of temperature for communication board II

0.1 V / -38.0°C	2.5 V / 16.9°C	4.9 V / 41.2°C	7.3 V / 67.4°C
0.2 V / -33.0°C	2.6 V / 17.9°C	5.0 V / 42.3°C	7.4 V / 68.8°C
0.3 V / -28.4°C	2.7 V / 18.9°C	5.1 V / 43.4°C	7.5 V / 70.2°C
0.4 V / -24.2°C	2.8 V / 19.8°C	5.2 V / 44.5°C	7.6 V / 71.7°C
0.5 V / -20.3°C	2.9 V / 20.8°C	5.3 V / 45.6°C	7.7 V / 73.3°C
0.6 V / -16.8°C	3.0 V / 21.7°C	5.4 V / 46.6°C	7.8 V / 75.1°C
0.7 V / -13.5°C	3.1 V / 22.7°C	5.5 V / 47.7°C	7.9 V / 76.9°C
0.8 V / -10.5°C	3.2 V / 23.6°C	5.6 V / 48.8°C	8.0 V / 78.9°C
0.9 V / -7.8°C	3.3 V / 24.6°C	5.7 V / 49.8°C	8.1 V / 81.0°C
1.0 V / -5.3°C	3.4 V / 25.6°C	5.8 V / 50.9°C	8.2 V / 83.3°C
1.1 V / -2.9°C	3.5 V / 26.6°C	5.9 V / 51.9°C	8.3 V / 85.8°C
1.2 V / -0.8°C	3.6 V / 27.6°C	6.0 V / 53.0°C	8.4 V / 88.5°C
1.3 V / 1.2°C	3.7 V / 28.6°C	6.1 V / 54.0°C	8.5 V / 91.4°C
1.4 V / 3.0°C	3.8 V / 29.6°C	6.2 V / 55.0°C	8.6 V / 94.6°C
1.5 V / 4.7°C	3.9 V / 30.6°C	6.3 V / 56.1°C	8.7 V / 98.0°C
1.6 V / 6.2°C	4.0 V / 31.6°C	6.4 V / 57.1°C	8.8 V / 101.8°C
1.7 V / 7.7°C	4.1 V / 32.7°C	6.5 V / 58.2°C	8.9 V / 105.8°C
1.8 V / 9.0°C	4.2 V / 33.7°C	6.6 V / 59.2°C	9.0 V / 110.2°C
1.9 V / 10.3°C	4.3 V / 34.8°C	6.7 V / 60.3°C	9.1 V / 114.9°C
2.0 V / 11.5°C	4.4 V / 35.8°C	6.8 V / 61.4°C	9.2 V / 120.0°C
2.1 V / 12.7°C	4.5 V / 36.9°C	6.9 V / 62.5°C	9.3 V / 125.6°C
2.2 V / 13.8°C	4.6 V / 38.0°C	7.0 V / 63.7°C	9.4 V / 131.6°C
2.3 V / 14.9°C	4.7 V / 39.1°C	7.1 V / 64.9°C	
2.4 V / 15.9°C	4.8 V / 40.2°C	7.2 V / 66.1°C	

Tab. 7: Designation of temperature for communication board II (typical trend)

Service information

Do you have any technical questions regarding your PIKO Sensor? Our hotline +49 (0)761 47744-222 is available to assist you.

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