



# PV Power Analyzer

Type VK-PA-Pico  
(Ver. 5)

For Pico Ampere Range I-V Tracing and  
Pico Watt Range Maximum Power Point Tracking (MPPT)



## Specifications

Measurement Range	Voltage: $\pm 10$ V Current: Max. $\pm 5$ mA, Min. 10 pA	
Current Measuring Ranges	$\pm 5$ mA (resolution 160 nA) $\pm 2.5$ mA (resolution 80 nA) $\pm 1.25$ mA (resolution 40 nA) $\pm 600$ $\mu$ A (resolution 20 nA) $\pm 300$ $\mu$ A (resolution 10 nA) $\pm 120$ $\mu$ A (resolution 4 nA) $\pm 60$ $\mu$ A (resolution 2 nA) $\pm 30$ $\mu$ A (resolution 1 nA) $\pm 15$ $\mu$ A (resolution 500 pA) $\pm 7$ $\mu$ A (resolution 250 pA) $\pm 3.5$ $\mu$ A (resolution 100 pA) $\pm 1.8$ $\mu$ A (resolution 60 pA)	$\pm 900$ nA (resolution 30 pA) $\pm 450$ nA (resolution 15 pA) $\pm 230$ nA (resolution 7 pA) $\pm 115$ nA (resolution 4 pA) $\pm 55$ nA (resolution 2 pA) $\pm 35$ nA (resolution 1 pA) $\pm 18$ nA (resolution 0.6 pA) $\pm 9$ nA (resolution 0.3 pA) $\pm 4$ nA (resolution 0.1 pA) $\pm 2$ nA (resolution 70 fA) $\pm 1$ nA (resolution 35 fA) $\pm 600$ pA (resolution 17 fA)
User Interface and Data Collection	Computer software is provided for control of all the functions and data logging. Measurement data can be saved as a text file and directly plotted on <sup>®</sup> Microsoft Excel graph. (Windows based PC required)	
Communication	USB	
Power Requirement	100 VAC (50-60 Hz)	
Dimensions, Weight	210 mm (W) x 350 mm (D) x 88 mm (H) , 3.0 kg	

## Pico Ammeter

In this mode, analyzer works as an Ideal ammeter (voltage drop  $< 5 \mu$ V) to measure short circuit current of solar cell.

## Potentiostat

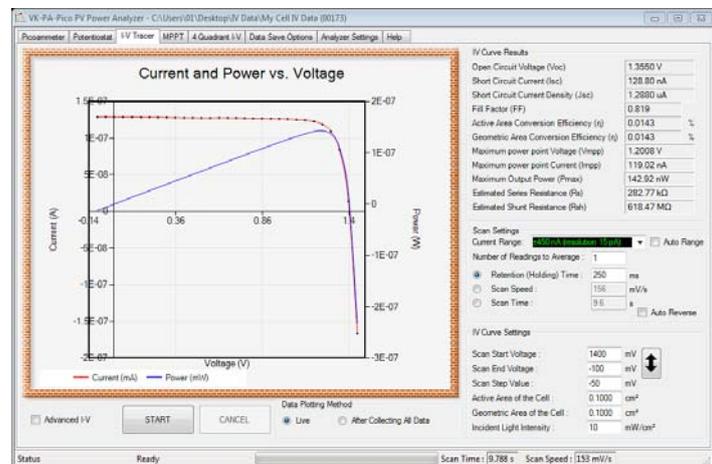
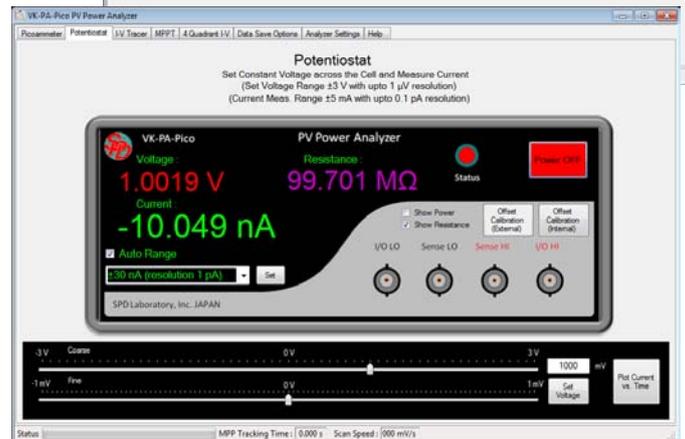
In this mode, analyzer measures current under a constant voltage given by user. Voltage, Current, Power or Resistance is displayed onscreen. It is also possible to plot those parameters against time.

## I-V Tracer

In this mode, user can select START, END, and STEP voltages and scan condition (desired scan speed, scan time, or holding time). Analyzer plots current and power vs. voltage curves. Calculated results include  $V_{OC}$ ,  $I_{SC}$ ,  $J_{SC}$ ,  $P_{max}$ ,  $V_{mpp}$ ,  $I_{mpp}$ , FF,  $R_{Sf}$ ,  $R_{SH}$ ,  $\eta_{activeA}$ , and  $\eta_{geoA}$ . Advanced I-V option allows to set initial, middle, and end point holding times. Also plots I vs. t transient curve for all data points and/or under a selected fixed voltage.

## Maximum Power Point Tracking (MPPT)

In this mode, analyzer acts like the best load for solar cell to extract maximum power and keep tracking MPP continuously. Plots the  $P_{max}$ ,  $V_{mpp}$ ,  $I_{mpp}$  and Efficiency vs. time curves and also displays current/power vs. voltage plots.



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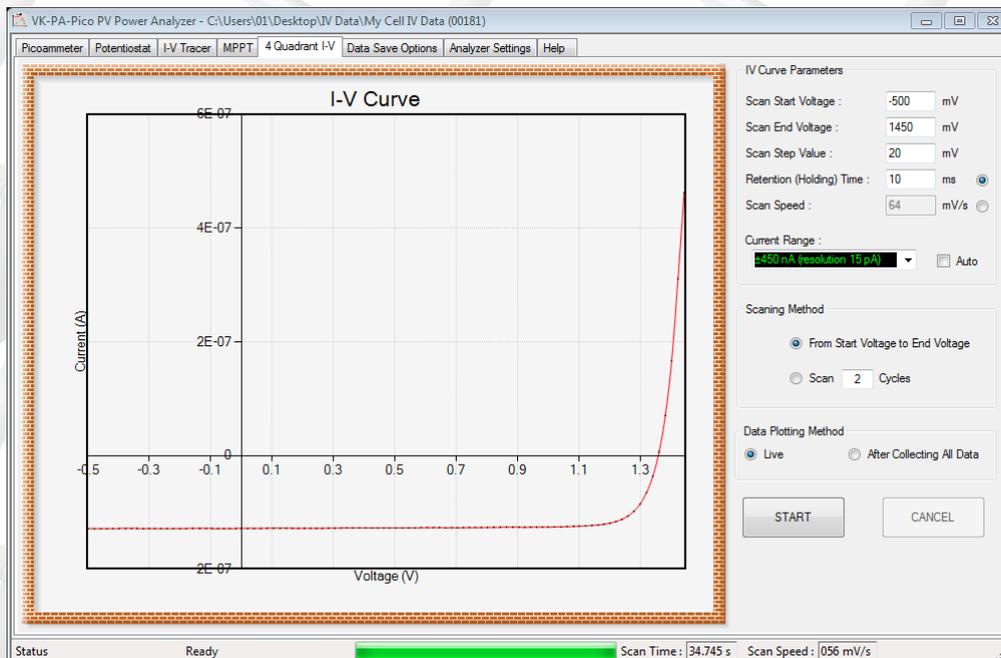
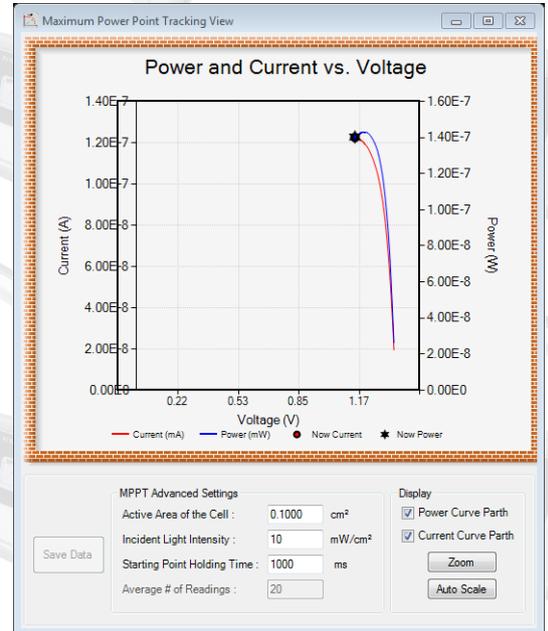
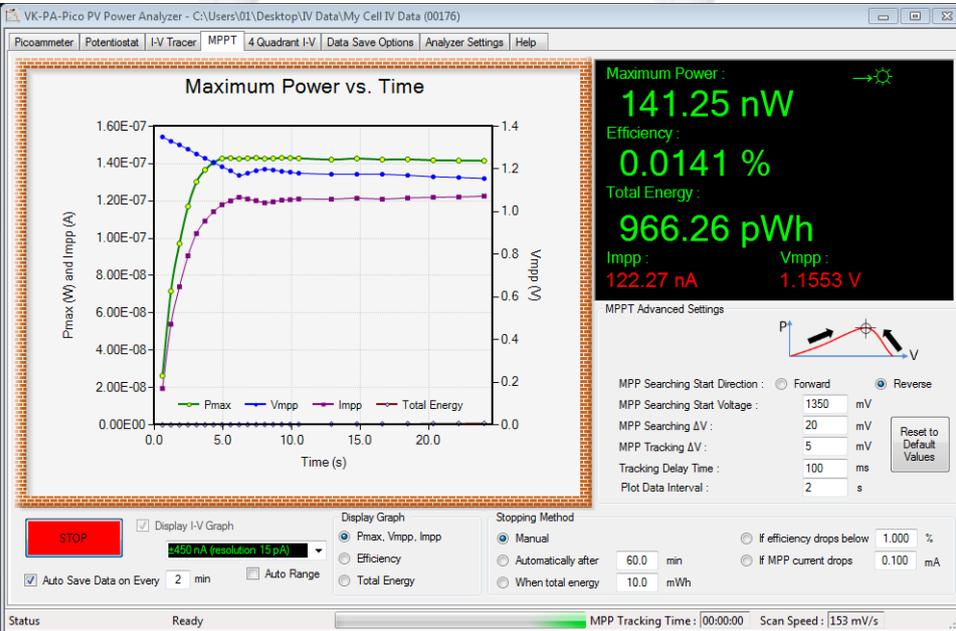
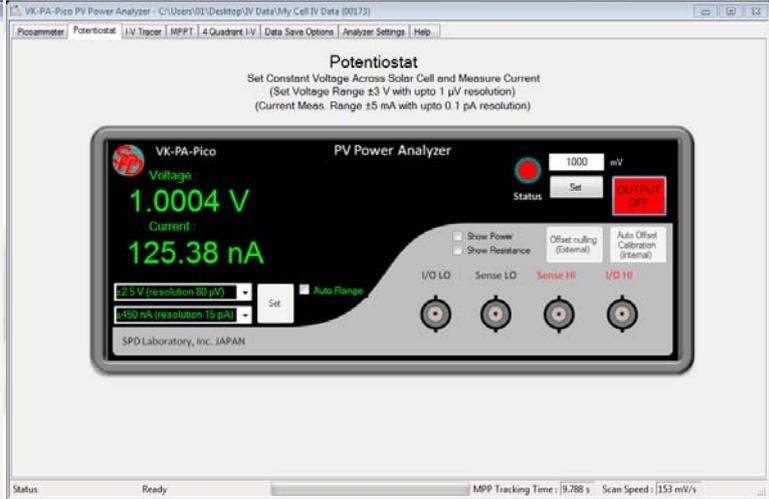
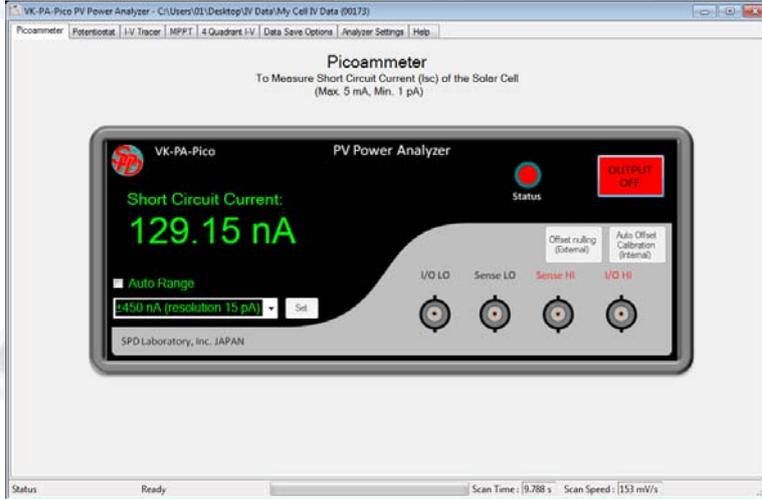
Web: <http://www.spdlab.com/English/Home.html>



# PV Power Analyzer

Screenshots of Control Software

VK-PA-Pico  
(Ver. 5)



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All the graphs and data can be saved in a Microsoft Excel Workbook.

# PV Power Analyzer

Screenshots of Control Software

VK-PA-Pico  
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**VK-PA-Pico PV Power Analyzer - C:\Users\01\Desktop\IV Data\My Cell IV Data (00181)**

Navigation: Picoammeter | Potentiostat | I-V Tracer | MPPT | 4 Quadrant I-V | **Data Save Options** | Analyzer Settings | Help

**PV Analyzer Data Saving Folder :**  
C:\Users\01\Desktop\IV Data [Brows]

**Data File Name :**  Generate Automatically  
My Cell IV Data

**File name suffix**  
(00182) [Reset]

**Comment :**  
-

Save as .txt file (This text file can be opened with Notepad or WordPad)  
 Save as .csv file (This comma separated values file can be open with Excel)  
 Save as Microsoft Excel file

Save each curve in a separate Excel file  
 Save curves in a same Excel file until I close the file  
 Live Update Excel Graph

**User Settings**  
 [Save My Settings]  
 [Load My Settings]  
 [Save User Settings]

Status: Ready | Scan Time: 34.745 s | Scan Speed: 056 mV/s

**VK-PA-Pico PV Power Analyzer**

Navigation: Picoammeter | Potentiostat | I-V Tracer | MPPT | 4 Quadrant I-V | Data Save Options | **Analyzer Settings** | Help

**Communication Port**  
COM27 [Search]  
Connected to PV Power Analyzer

**Measuring Range**  
 Automatically Select The Best Range  
 Voltage : ±2.5 V (resolution 80 μV)  
 Current : ±450 nA (resolution 15 pA)  
 [Read] [Set]  
 Auto correct set point offset when taking I-V

**Averaging**  
 Number of Readings for Average : 50 [Set]  
 ADC Conversion Time : 20 ms [Read] [Set]

Allow Calibration Modification

**Calibration Constants**  
 R10 : 470 [Read]  
 R11 : 676190 [Read]  
 R13 : 029.960 [Write]  
 R14 : 100680 [Write]  
 R31 : 10006 [Save to EEPROM]  
 R32 : 100650 [Save to EEPROM]  
 R33 : 997 [Save to EEPROM]

ADC I 0 offset : 0.00000 A  
 ADC Vref : 2.5000 V  
 Vref 5V : 5.0000 V  
 ADC V 0 offset : 0.0000 V  
 DAC Vref : 4105.8 mV  
 DAC1 0 offset code : -2  
 DAC2 0 offset code : 0  
 [-2.5V] [2.5V] [0]

Serial Number : 320160002  
 Firmware Version : 20.18.12.12  
 Scan Speed Correction: 0

[Read Zero Codes and Effective R]  Auto Correct Offset

**Set V to Read I Timing Diagram**  
 Filter Settling Time: 250 ms  
 User Given Retention (Holding) Time: 250 ms  
 ADC Settling Time: 60 ms  
 V1 (t=0) Set New V → V2 → V3 (t=T) Read I and V  
 ADC Start  
 Set V to Read Time (T) : 161 ms

**Error Reporting :**

[Read Port]

Status: Ready | Scan Time: 0.000 s | Scan Speed: 000 mV/s

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## VK-PA-Pico (Ver. 5)

### VK-PA-Pico Detailed Electrical Specifications

Measuring Range	Voltage: $\pm 10$ V Current: $\pm 5$ mA	
Specifications of A/D Converters	Resolution: 16 Bit Integral Nonlinearity: $\pm 0.0003\%$ Utilize on-chip digital calibration to eliminate offset and gain errors.	
Voltage Measuring Ranges	$\pm 10$ V (resolution 0.3 mV) $\pm 5$ V (resolution 0.15 mV) $\pm 2.5$ V (resolution 80 $\mu$ V) $\pm 1.25$ V (resolution 40 $\mu$ V) $\pm 0.625$ V (resolution 20 $\mu$ V) $\pm 300$ mV (resolution 10 $\mu$ V) $\pm 150$ mV (resolution 5 $\mu$ V) $\pm 80$ mV (resolution 2 $\mu$ V)	
Current Measuring Ranges	$\pm 5$ mA (resolution 160 nA) $\pm 2.5$ mA (resolution 80 nA) $\pm 1.25$ mA (resolution 40 nA) $\pm 600$ $\mu$ A (resolution 20 nA) $\pm 300$ $\mu$ A (resolution 10 nA) $\pm 120$ $\mu$ A (resolution 4 nA) $\pm 60$ $\mu$ A (resolution 2 nA) $\pm 30$ $\mu$ A (resolution 1 nA) $\pm 15$ $\mu$ A (resolution 500 pA) $\pm 7$ $\mu$ A (resolution 250 pA) $\pm 3.5$ $\mu$ A (resolution 100 pA) $\pm 1.8$ $\mu$ A (resolution 60 pA)	$\pm 900$ nA (resolution 30 pA) $\pm 450$ nA (resolution 15 pA) $\pm 230$ nA (resolution 7 pA) $\pm 115$ nA (resolution 4 pA) $\pm 55$ nA (resolution 2 pA) $\pm 35$ nA (resolution 1 pA) $\pm 18$ nA (resolution 0.6 pA) $\pm 9$ nA (resolution 0.3 pA) $\pm 4$ nA (resolution 0.1 pA) $\pm 2$ nA (resolution 70 fA) $\pm 1$ nA (resolution 35 fA) $\pm 600$ pA (resolution 17 fA)



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