

# Easy and quick performance check of installed solar modules

## User-friendly display

The TRI-KA is operated via a 3.2-inch colour LCD display. Thanks to the completely overhauled menu navigation, the TRI-KA can be operated easily and intuitively. Just a few touches, and the current values can be measured and compared with the target.

## Large input range for current and voltage

The TRI-KA measures current from 0.1-15 Ampere and voltage from 1-1000 Volt. Due to this large input range, the characteristic curves of individual modules, but also complete strings can be determined. For each measurement the measuring range and sample rate is optimally set automatically. The TRI-KA can even be used with future greater outputs of the strings.

## Pleasantly handy

The new TRI-KA with its ergonomically shaped case fits your hand even better. With a weight of only 500 grams and its sturdy case, the TRI-KA is perfectly suited for use on the roof too.

## Wireless connection to the sensor

The wireless connection between measuring device and sensor makes the annoying – because expensive and time-consuming – wiring superfluous. As soon as the connection between the two devices is established, data are transmitted safely.

## Measuring process in 5 steps



**1.** Measure the surface temperature of modules with TRI-SEN



**2.** Install the TRI-SEN at the same level as the modules and measure the irradiation.



**3.** Measure the off-load voltage and the short-circuit current with TRI-KA and determine the current/voltage characteristic curve of the system



**4.** Wireless transmission of the data from the TRI-SEN to the TRI-KA.



**5.** Import the measuring results from the SD card of the TRI-KA to the PC and analyse them using the software.



## How does the TRI-KA characteristic curve analyser work

The demands on performance and quality control of installed PV modules and systems are increasing. The client wants to ensure his firmly planned yields over 20 years. But clients have become more responsible too: Often they precisely know the target output of their PV systems. If deviations, errors or defects occur, they expect that these are easily identified and quickly remedied.

The STC characteristic curve analyser TRI-KA enables such a quick error analysis directly on site, measuring the actual output of the PV system and comparing it with the nominal output under standard test conditions, the STC ideal characteristic curve.

## Typical applications of the TRI-KA

- Simple identification of errors and defects in PV systems and modules in case of malfunction messages
- Support in verifying the optimal PV system site
- Acceptance protocols to verify the correct nominal output of the PV system without restrictions, handover of the system to the client
- Quality-assuring maintenance protocols of the PV system with output target adjustment of the PV system during customer service
- Output comparison of a system over several years

More information about application and training you will find on [www.tri-ka.com](http://www.tri-ka.com)

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As efficient as it gets

## TRI-KA case study

### Partial shading of a module

Looking at the data logger the client notices that his PV system is generating less energy than the previous day, in spite of the sky being cloudless again. The summoned solar installer tests the PV system using the TRI-KA and sees in the characteristic curve that the voltage of one string is significantly lower than normal.

The solar installer inspects the system visually and finds a module heavily soiled by bird droppings. This soiling has resulted in the reduced output of the PV system.

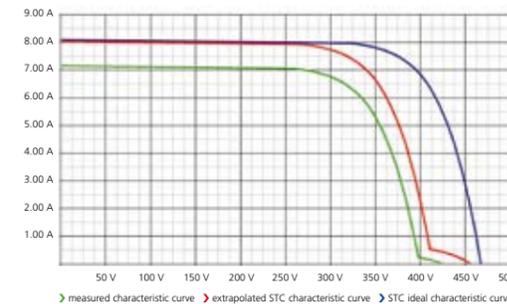
So, what happened? If a larger area or complete cells are shaded, the circuit in the partial string is interrupted. Now one or more bypass diodes are activating. A characteristic curve analysis with the TRI-KA shows this as a typical bend in the voltage and output curve.

Since the bird droppings are partially shading several cells, the current travelling through the solar cell is reduced. If the shaded area is very large, no current is travelling through this solar cell and one or more bypass diodes are activated. The current is diverted via the bypass diode, and the solar module loses output. This becomes visible in the string voltage, while the current remains almost constant. The graph shows this output loss as the bend in the measured green (or the extrapolated red) curve.

After cleaning the concerned modules the system runs perfectly again.



The solar module soiled by bird droppings



Characteristic curve graph of a partially shaded module



## Technical specifications

### TRI-KA characteristics analyser

Modell	TRI-KA	TRI-SEN
Measuring	I / U characteristic curve, short-circuit current, open-circuit voltage, MPP current, MPP voltage	Global irradiation, module temperature, angle of inclination
Calculated values	STC values (short-circuit current, open-circuit voltage, MPP current, MPP voltage), fill factor, MPP output, ideal characteristic curve of module manufacturer	-
Voltage measuring range	1.0 - 1000 V (<math>\pm 1\%</math>)	-
Current measuring range	0.1 - 15.0 A (<math>\pm 1\%</math>)	-
Temperature measuring range	-	0 - 100 °C (<math>\pm 3\%</math> in relation to a black body)
Irradiation measuring range	-	100 - 1200 W/m <sup>2</sup> (<math>\pm 5\%</math>)
Measuring connection	Measuring cable	Non-contact measurement
Characteristic curve measuring duration	15 - 30 seconds	-
Save slots for measured curves	Depending on size of SD memory card (> 1000 measured curves with 1 GB)	-
Reference cells	-	1x monocrystalline cell, 1x polycrystalline cell
Display	3.2 inch colour LCD touch screen (240 x 320 pixels, RGB)	B/W LC display (2-line, 16 characters)
Power supply	Lithium polymer accumulator, run-time app. 6 hours	Lithium polymer accumulator, run-time app. 6 hours
Auto power-off	Adjustable (1 - 15 minutes)	-
Interface	2 measuring cables to PV string, wireless connection to TRI-SEN, SD/SDHC memory card for PC	Wireless connection to TRI-KA
Ambient temperature	0 to +50 °C	0 to +70 °C
Protection mode	IP20	IP20
Insulation	Protection class II	-
Measuring category	CAT II 1000 V, CAT III 600 V	-
Dimensions (L / W / H)	210 mm / 105 mm / 41 mm	160 mm / 82 mm / 41 mm
Weight	500 g	200 g
Warranty	2 years	2 years
Norms	IEC/EN 61010-1, CE mark	CE mark

1) System requirements user software: Microsoft® Windows XP / Vista / 7; Pentium processor with a minimum of 600 MHz or similar; minimum of 256 MB memory or more; VGA graphics card with at least 16 bit colour depth (High Color) and a resolution of 1024 x 768 pixels; free hard disc memory of at least 500 MB; CD/DVD disc drive; keyboard; mouse; USB interface

## TRI-KA characteristics analyser complete set

### Included in delivery

- 1 TRI-KA,
- 1 TRI-SEN,
- 1 rugged case with rubber foam padding,
- TRI-KA measurement cable sets (MC3, MC4, Huber+Suhner, Tyco, SunClix and without connectors)
- 1 TRI-SEN mounting
- 1 USB SD/SDHC card reader
- 2 power supply units (chargeable)
- 1 operating instructions
- 1 PC user software<sup>1)</sup> with user guide

## Contact and further information

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