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A New Dimension in Monitoring:

accurate fault finding, revenue growth and earnings forecasts - thanks to more accurate module-specific measurement and simulation engine

The revolution in photovoltaics: thanks to module-specific measurements, intelligent software and integration of artificial intelligence, not only does that which was up until now invisible become visible, but also the yield of a PV plant can be increased by 7% and more.

What is the biggest problem facing PV plants? (Too) Low productivity, especially **undetected** poor performance and **undetected** performance-reducing factors. An ordinary PV plant is as transparent as a black box: somehow it works, but without complex (on-site) measurements it can be hard to figure out how well - and what can be improved. Conventional monitoring systems provide little data, and thus marginal insight into the operations of a PV plant.

And yet the solution is so simple: measurements at each module, string and inverter and intelligent software which evaluates these data. With module-specific measurements a whole range of factors can be, remotely and without delay, detected, analyzed and corrected. Without module-specific monitoring these invariably result in expensive specialists and high loss of earnings - if a reduction in performance and its cause are detected in the first place, such as in the event of PID, earnings losses can accumulate over a long period before the problem is noticed.

The unique SunSniffer system measures the voltage at the module and at the string, as well as the module temperature and the current in the string. In addition, the inverter data is read. All data are finally analyzed in an intelligent web portal, now also with artificial intelligence and a simulation engine - result: easy-to-understand yield evaluations, clear recommendations for action and reliable revenue forecasts.

But what exactly do these measurements achieve anyway? Our portal now provides the following information:

I-V characteristic measurements: display of I-V characteristic.
I-V characteristic measurement is now used as one of the most important methods for determining the actual performance of a string and also the modules. But so far this has not been possible without a plant inspection and walking along the entire length of the modules with a mobile measurement device. With SunSniffer this procedure is now unnecessary: The SunSniffer portal shows the I-V characteristic measurements for each individual string; they can even be measured several times a day. Precise statements on the quality of the plant can be made by interpreting the serial and parallel resistors - information that previously did not exist in one continuous measurement. Changes in these values are important indicators of quality, which have hitherto gone unrecognized.

Diode diagnosis: Here we show which diode is defective
In the event of failure of a diode the voltage of the module is immediately reduced. Without voltage measurement this is not detectable. Without voltage measurements, defective diodes will only

become apparent through, for example, burn marks on the module or infrared photographs. Defective diodes are a safety hazard as they may cause fire.

PID detection: Identifiable in the portal: PID yes or no.
PID is manifested by minor voltage reductions. Initially these reductions are so small that they remain undetected for a long period. SunSniffer recognizes PID due to its extremely high-precision voltage measurement (accuracy 1%) immediately after occurrence. The voltage reduction on the modules is matched with a known voltage drop pattern which is lodged in the SunSniffer portal. This pattern is constantly being sought in the voltage waveforms and the user is alarmed upon detection.

Cell Crack Detection: cell cracks are manifested by a spontaneous voltage loss in many modules. This can be very small, but an internal review process is immediately initiated which isolates the events from the indices against other voltage losses, thus indicating cell cracks.
A cell can quickly develop cracks caused, for example, by hailstones. Even fine cracks can be a risk, as this damage can result in the cells becoming oxidized and eventually delaminated. But a specific voltage reduction pattern, which SunSniffer recognizes immediately, also enables the detection even of fine cracks. After a hailstorm several cells may be affected and exhibit various cracks, all of which show up in the corresponding reduction in voltage.

Shade calculator: indication of the degree of shading and its localization.
Systemic and temporary shading are differentiated. Systemic shading is planned for in the construction plans, therefore only changes due to temporary shading are important: plants etc. Without module-specific voltage measurements, how is it possible to recognize a shadow, or can you distinguish temporary shading from a systematically recurring one (trees, lamppost, etc.)? SunSniffer detects different voltage reduction patterns individual to varying shade types.

Contamination indicator: degree of soiling is displayed.
It is not only the voltage or, more precisely, drop in voltage that reveals errors and faults, but also changes in the current. The ampere-measuring accuracy of 1% facilitates precise conclusions regarding contamination and its type. According to the International Energy Agency contamination is responsible for 70% of all reductions in performance! SunSniffer determines by means of an irradiation probe a set value which calculates in an internal simulation how the current in the string should be. A slow deterioration of the current is evidence of contamination. A targeted and cost-saving cleaning process can now go ahead.

Degradation indicator: degree of degradation is displayed.
Degradations are also manifested through current reductions. Because our SunSniffer monitors the strings with its simulation engine and radiation sensor, module degradations can be calculated.

Inverter loss Indicator: displays the amperage changes by the WR.
Inverter losses are also easily detected with SunSniffer. Our simulation engine calculates the desired values and compares them with the actual values. Any deviation is a loss, incurred by inverter failure. In addition, voltage and current curves are offset, to show whether open circuit voltage was present and no feeding took place.

Module Temperature Measurement: displays the module temperature.
SunSniffer also measures the temperature of the module. The temperature is an important factor influencing the performance of the entire plant and is essential for our simulation calculations; since each individual module is measured, it becomes clear what impact wind (speed, temperature), for example, has on the yield of different parts of the plant. Through the precise determination of the module temperatures, the simulation software can draw on excellent base values in order to render extremely realistic simulations.

Due to its unique specifications, SunSniffer offers countless other analysis, display and also forecasting possibilities, not mentioned here.
For example, with the standardized performance ratio it is possible to compare different plants with each other - similar to the European level of efficiency for inverters. Our **PV system performance indicator**, however, is able to compare complete PV plants with one another.
By the way: with SunSniffer it is also possible to reduce the annual or biannual maintenance procedures to an absolute minimum, since most measurements are automatically taken by SunSniffer.

Quite simply, SunSniffer takes your PV plant to a higher level: transparency at module level, at least 7% higher yield, reliable and verifiable services, and last but not least: safety. The all-round, carefree package for your PV plant.

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Press material and photos:

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