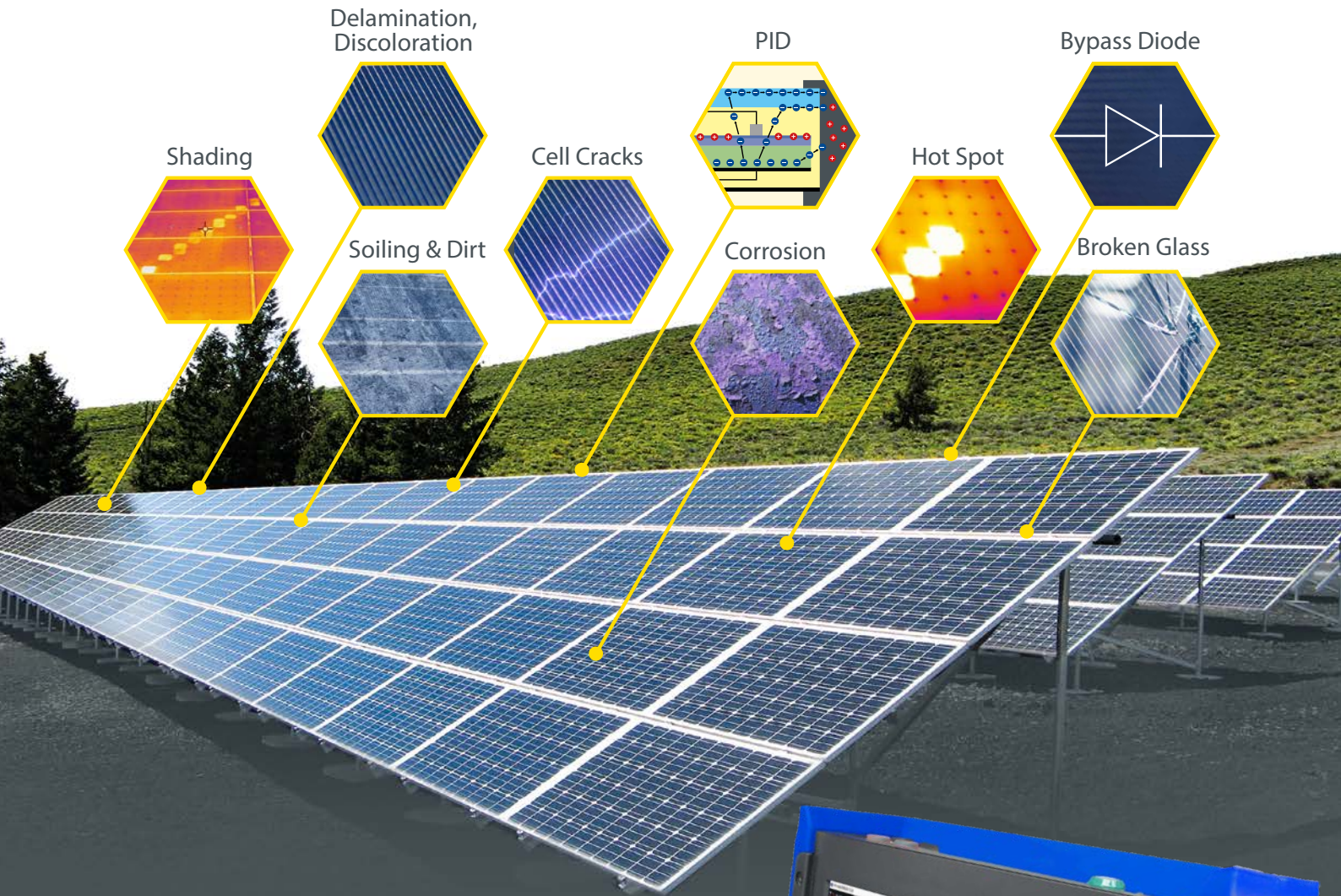




MULTI-CHANNEL IV CURVE TRACER

MESSTECHNIK

World's most versatile Solar Power Plant diagnostic system

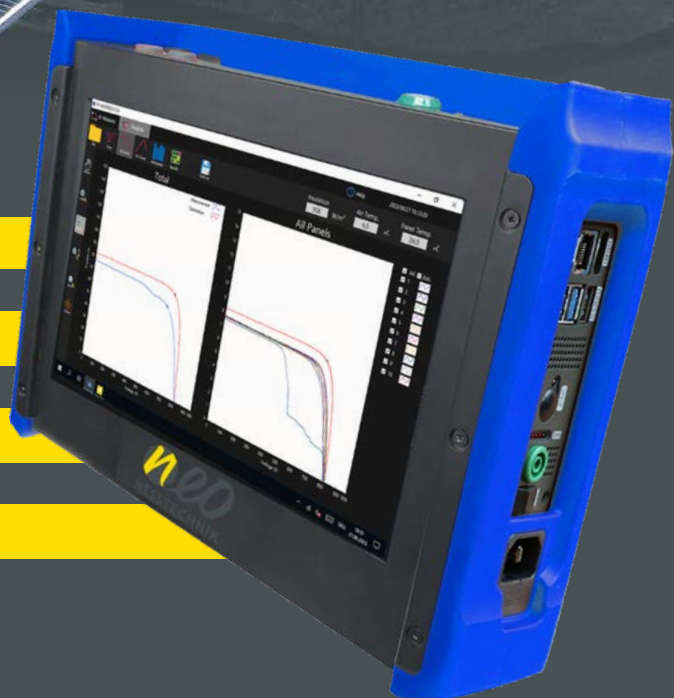


POWER PERFORMANCE

IV-CURVE-TRACING

DISTANCE-TO-FAULT

LEAKAGE MEASUREMENT



How does the PV Master unleash your solar power potential?

Performance: Testing ensures that PV modules, and other components perform as expected under various conditions. The PV Master assesses their efficiency, power output, and reliability.

Safety Compliance: Early fault detection through a combination of leakage current measurement and IV curve tracing.

Inspection methods

There are already a few methods to carry out PV inspections. The ones mainly used in the field are thermal imaging and electroluminescence but since they often need a lot of time and know-how to use, they aren't flawless.

Diagnosis Faults	Optical Inspection	Thermal Imaging	Electro-luminescence	1-Channel IV-Curve Tracing	Multichannel IV-Curve Tracing
PID	×	△	✓	✓	✓
Bypass open	×	×	×	✓	✓
Bypass shorted	×	✓	✓	✓	✓
Hot Spots	×	✓	△	✓	✓
Cell Crack	×	△	✓	△	△
Disconnection	×	✓	-	✓	✓
Snail Trail	✓	△	-	✓	✓
parallel Mismatch	×	×	×	×	✓
Needed Time	-	Low	High	High	Low

× no detection △ partly detection ✓ full detection

World's only instrument to detect parallel Mismatch-Losses

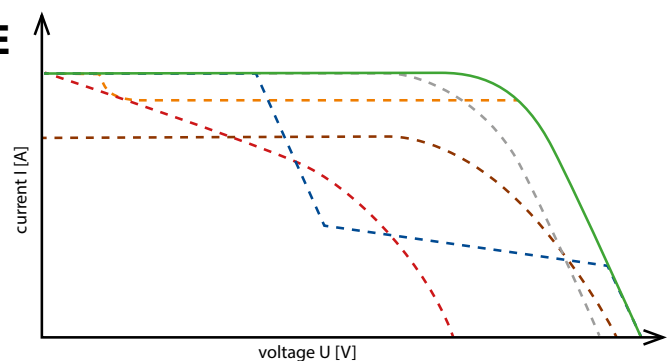
Exemplary faults detected by IV – CURVE

■ Standard Test Conditions
Expected curve when no damage or aging is present.

■ Hotspots
When solar cells within a module no longer supply current due to partial shading they heat up strongly due to the current of the other cells connected in series. In the worst case, a hot spot can lead to fires, but in any case, it results in a power reduction.

■ PID – Potential Induced Degradation
PID occurs when a voltage difference prevails between panel and ground. The primary circuit thereby produces a partial voltage discharge which then results in an output power reduction.

■ LID - Light Induced Degradation
The degradation of photovoltaic modules describes the reduction in performance due to aging effects. This mainly includes browning, cell bleaching blistering or cell corrosion.



■ Bypass-Diode Breakage
Bypass-Diodes can break due to production faults, thunderstorms, overheating, mechanical damage or continuous shading. When that happens the system voltage will be reduced leading to output power reduction.

■ Shading
Shaded modules do not only reduce the power output but also lead to bigger problems like Hotspots or breakage of the bypass diode.

The world's most versatile Solar Power Plant diagnostic system



ADAPTIVE SWITCHING
Precise (accuracy of 0.05%) IV-Curve tracing for both single PV modules or full strings up to 1500 V starting at 400 W/m² solar radiation.

IV CURVE TRACING
1500 V / 40 A
High Power Rating

LEAKAGE DETECTION & DISTANCE TO FAULT FUNCTION

DIAGNOSIS
Automatic detection of many types of performance-reducing faults, such as Mismatch, PID, Hotspots, Cell Cracks, BPD breakage and others.

EXTENSION BOX
For measuring up to 20 strings simultaneously - IV and Leakage measurement.

SENSOR BOX EXPERT
Bifacial PV module support. Exact temperature and irradiance measurement.

- Multimeter Mode (U, I, P)
- Mobile Operation up to 4 hours
- Easy Remote Connection (LAN, WLAN, UMTS)
- Direct Analysis on the Instrument using the 10.1 inch Multi-Touch-Screen

Save Time

Measure up to 20 strings simultaneously and directly compare individual strings, while others do one at a time.

Measure Anywhere

WLAN, touch display, up to 5 temperature inputs and 2 pyranometers, works even when the inverter is far from the modules.

See everything

Automatically detect mismatch, wiring faults, hotspots, PID, soiling, bypass diode failures and many more.

Support Every Module

IV Curve tracing up to 1500V / 40A, adaptive switching for single modules or full strings, incl. bifacial modules.

Find Faults Fast

PV Master helps you locate insulation faults quickly and accurately without guesswork.

Direct On-Site Analysis

On a large 10.1" multi-touch display, no laptop needed, and fully IEC 62446-2 compliant.

PV MASTER 10



Measurement range	current	40 A
	voltage	1500 V
Measurement accuracy	0.05 %	
Safety category	CAT III 1000 V	
Data points per IV curve	2280	
Measurement time per string	~ 200 ms	
max. Inrush current	200 A	
min. Irradiation	400 W/m ²	
Battery	4 h	
Internal SSD	2 x 256 GB	
Interfaces	LAN/WLAN/USB/HDMI optional LTE	
Size	298 x 225 x 95 mm	
Weight	4.3 kg	
Total Channels	up to 20 strings	



Safety

Measurement system for safety and performance check.



Leakage

Detection of leakage currents. Distance-to-fault-function.



Diagnosis

Automatic detection of Mismatch, Hotspot, PID, Shading, Bypass Diode, etc.



Efficiency

Power & efficiency according to IEC62446-2

PV MASTER 70



Measurement range	current	40 A
	voltage	1500 V
Measurement accuracy	0.05 %	
Safety category	CAT III 1000 V	
Data points per IV curve	2280	
Measurement time per string	~ 200 ms	
max. Inrush current	200 A	
min. Irradiation	400 W/m ²	
Battery	4 h	
Internal SSD	2 x 256 GB	
Interfaces	LAN/WLAN/USB/HDMI optional LTE	
Size	298 x 225 x 95 mm	
Weight	5.3 kg	
Total Channels	up to 28 strings	
Support for high efficiency cell technology	N-Type, P-Type, HJT, TOPCON	
Highest accuracy for latest generation modules	<1% in MPP point	

Modular concept

1-8 channels integrated
extendable up to 20 more

Extension Boxes

up to 20 strings simultaneously

The modular system of the PV-Master series offers you the greatest possible flexibility.

4 Channel Extension:
~80 kW per measurement (PM10-EXT-4CH)

8 Channel Extension:
~160 kW per measurement (PM10-EXT-8CH)

20 Channel Extension:
~400 kW per measurement (PM10-EXT-20CH)



Sensorbox Basic



- 1x Module Temperature PT100
- 1x Ambient Temperature PT100
- 1x Irradiance (Pyranometer or Reference Cell)

Sensorbox Expert

Temperature measurement

- Up to 5 sensors
- PT100/PT1000/Thermocouple

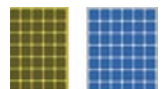
Connectivity

- WIFI up to 100 m
- Cable connection
- Live values on the display



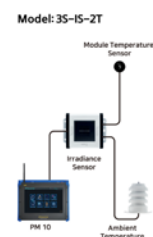
Solar Irradiance measurement

- Pyranometer Class A, B or C
- Reference cell
- „Golden String Measurement“
- Up to 3 pyranometers for bifacial modules
- Additional inclination measurement



Class A Reference Cell powered by Seven Sensor

- Irradiance measurement (Class A, industry-leading accuracy)
- Ambient temperature
- Module temperature
- All data transmitted to the PV Master via RS485
- Optional Wind Speed
- Humidity



Automated Performance Monitoring for your PV Plant

The NEO PV Master series operates fully autonomously. In a single measurement cycle, the system traces the IV curve of up to 28 strings, performs a leakage safety check, automatically diagnoses faults and generates a complete PDF report.



Automatic Report

Channel	V Positive [V]	V Negative [V]	Difference [V]	Safety	Location
Ch 1	418.2	398.1	20.1	O	
Ch 2	418.4	404.7	13.7	O	
Ch 3	417.1	397.3	19.8	O	
Ch 4	412.9	395.6	17.5	O	
Ch 5	410.1	407.3	2.8	O	
Ch 6	407.6	407.1	0.5	O	
Ch 7	409.4	400.2	9.2	O	
Ch 8	408.1	399.9	8.0	O	
Ch 9	408.4	402.3	6.0	O	
Ch 10	413.8	400.3	13.4	O	
Ch 11	416.5	394.8	21.7	O	
Ch 12	410.0	395.6	14.4	O	
Ch 13	411.1	403.8	7.3	O	
Ch 14	411.9	402.8	11.1	O	
Ch 15	418.7	403.9	14.8	O	
Ch 16	418.8	398.1	20.7	O	
Ch 17	408.0	402.7	5.2	O	
Ch 18	418.3	397.2	21.1	O	
Ch 19	412.9	406.8	6.0	O	
Ch 20	271.3	542.8	271.5	X	6

With the automatic report function, fault reports can be created in seconds. These are saved as PDF files. The report can be customized with various customization options.

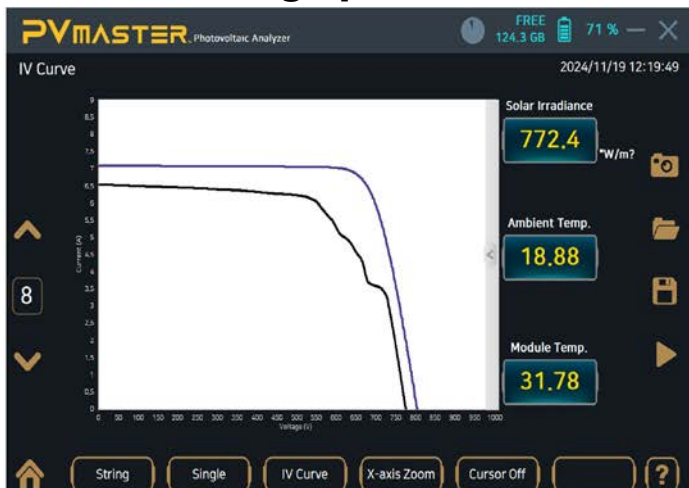
The fastest way to perform PV measurements

- Find mismatch losses within seconds
- Golden String comparison possible
- Clean one string and measure the performance increase
- Automatic PDF Report generation after measurement in 5 seconds

Measurement and Report

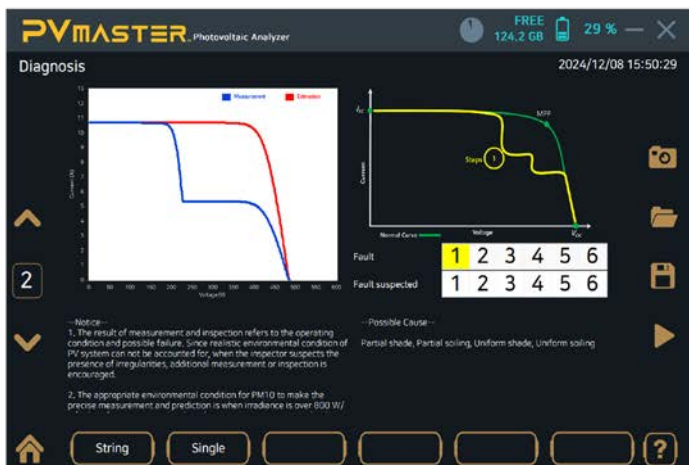


IV-curve tracing up to 40A



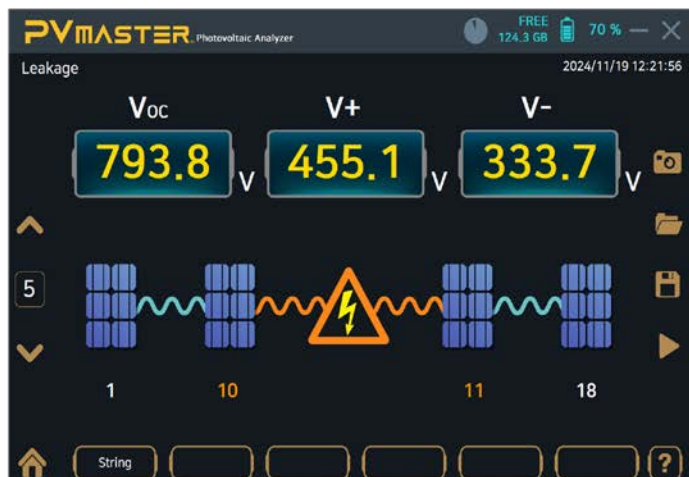
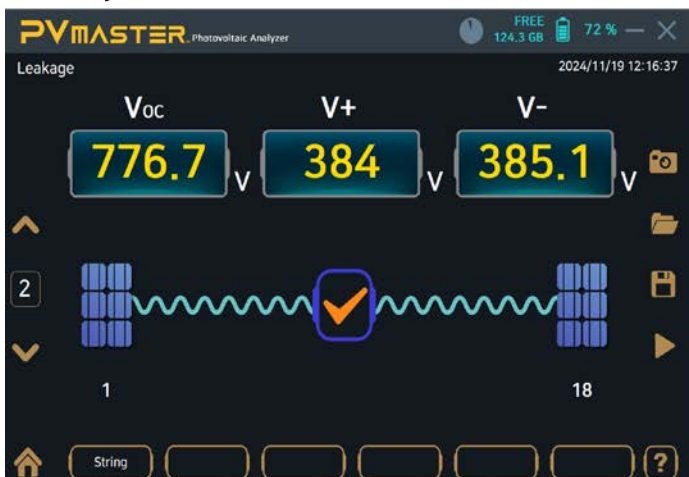
The measured IV (up to 2280 data points) curve is compared with the reference curve. The differences between the two indicate different errors. A total of up to 20 strings are measured per measurement. The analysis can then be carried out using the various software tools. This measurement can be carried out on **any type of module**, such as **N-type**, **P-type** and even **high-capacitance modules** with **inrush currents up to >200A**.

Automatic Analysis



In the automatic fault analysis, the measured curves are analyzed and divided into fault groups. This step makes it easier for technicians to identify faults and subsequently correct them.

Safety measurement & Distance-to-Fault



The safety measurement is used to determine whether leakage currents occur on the string. This measurement provides protection for both the measuring device and the technician. The benefit of this measurement is that the location of the fault is displayed as well.

World's Best IV Curve tracer

for P-Type and N-Type (high inrush) PV panels



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