

emazys

The troubleshooter for solar energy



- PV string: voltage V_{oc} , current I_{sc} , isolation resistance R_{iso} , series resistance R_s & impedance curves (overall degradation check)
- Position of: ground (R_{iso}) faults in PV strings & disconnect in PV strings
- Tone generator and acoustic pickup for cable tracing
- Module voltage check
- State machine algorithm to help the user analyse fault scenarios
- Built in PDF report generator
- Operate over WiFi using any device and WEB browser





EmaZys was founded in 2011 under the name EmaZys Technologies. We are a Denmark based manufacturer of electrical solar test equipment. During the first years 2011-2017 EmaZys had a focus on R&D, and the company was owned by VC's and the founder

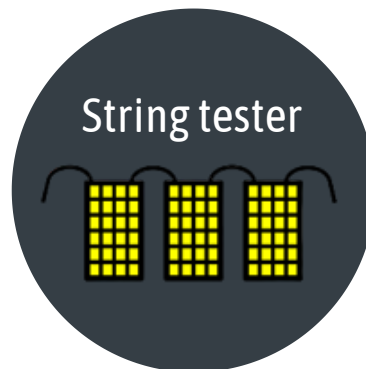
Since early 2018 the company has been 100% owned by the original team and the founder, but in mid 2020 the founder team started a collaboration with Reffo invest and TPC Management, to further scale the company.

We work closely with Converdán A/S and ETK EMS on sourcing, production and box build assembly. The activities at the EmaZys hq. mainly involves new developments, sales and technical support.

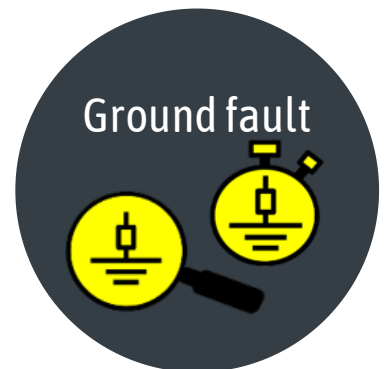


The Z200 PV Analyzer

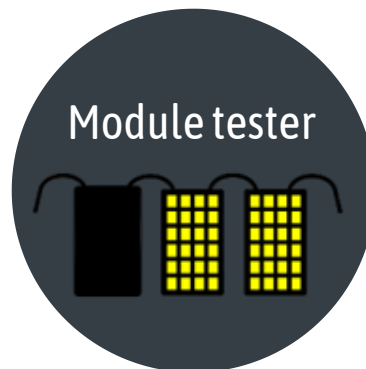
Just not your ordinary tool for troubleshooting and testing



String tester



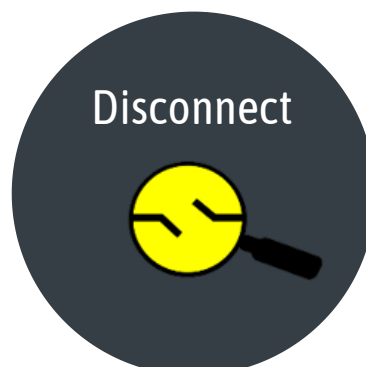
Ground fault



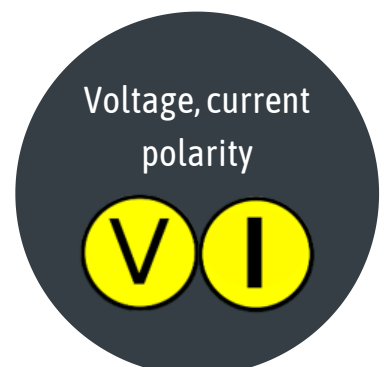
Module tester



Tone generator



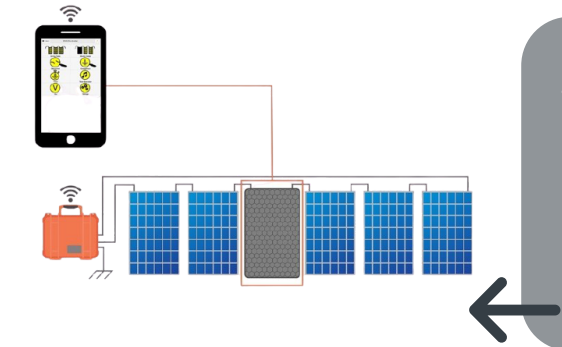
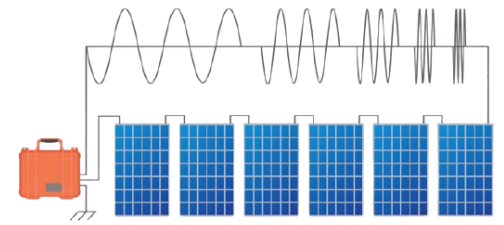
Disconnect



Voltage, current
polarity

String tester

- Open circuit voltage – VOC.
- Short circuit current – ISC.
- Isolation resistance RISO.
- PV system series resistance RS.
- Impedance curve – measured at VOC in a broad frequency range.
- Low frequency impedance norm – measured at VOC.
- Low frequency impedance norm – measured during flow of PV system current.
- This test sequence was the first method developed by EmaZys Technologies.

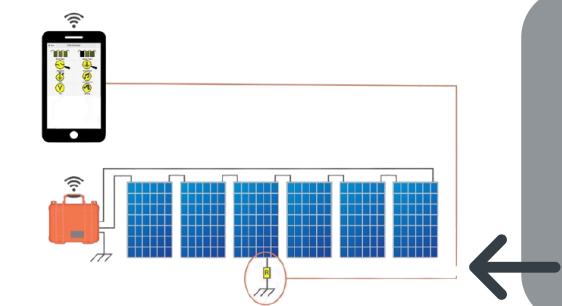
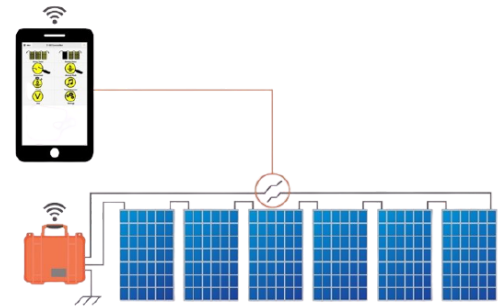


- Individual PV module test and measurements, even when the instrument is connected to the string terminals.
- The module voltage drop caused by shading modules, one by one is measured.
- The result is a containing individual module voltages.

Module tester

Disconnect

- The instrument will measure the low frequency impedance of the PV string connected.
- Very easy to carry out, and within 30 seconds any PV module circuit disconnection is found.

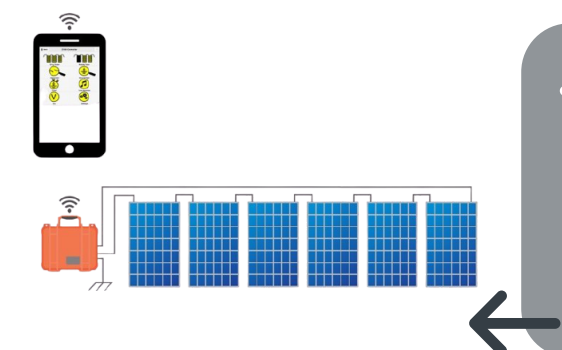
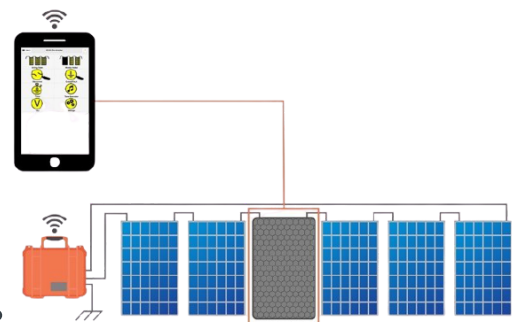


- The test algorithm is based on voltage testing i.e. the inverter method.
- The Z200 PV Analyzer has proved that the faults may be found in less than 2 minutes.
- The ground fault test can also be used with a Z200 integrated TIMER function. This allows monitoring for periodic and difficult ground faults.

Ground fault

Tone generator and pick-up

- It allows the user to distinguish, and sort out the right string within a bundle in a matter of seconds
- I can also be used to trace disconnection faults found either on the cable side, or within individual PV modules in a string
- Emit different frequencies on PV +, PV- and PV GND respectively.



- The Z200 PV Analyzer has a build in voltage testing procedure that determines the open circuit voltage VOC the solar panel system connected to the instrument.
- The reading of the Z200 voltmeter also shows the polarity of the connected terminals.

Voltage, current and polarity test

Reports



Module test

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PV Analyzer Z200 Module Test Report

Basic information

Test carried out by: LHW Partnership LLP
 Instrument operator: JAMES BOARE
 PV site address: Great Testick CC
 PV string: 3
 Date: 17-02-2019
 Time: 10:25:46
 Number of PV modules in string: 16
 Instrument Name: Z200-R2E00018009
 Installed software version: 3.6.7

Baseline:

Baseline voltage: 584.0 V
 Total voltage drop measured: 563.5 V
 Low freq norm with load: 15.0
 Low frequency norm: 14.0
 Invalid measurements: 14.0

Module results:

Module nr	MRF:	Voltage:	Rp	Invalid measurements:
1	0	37.2 V	4.9 kΩ	
2	0	36.9 V	5.5 kΩ	
3	0	35.1 V	6.0 kΩ	
4	0	35.5 V	4.7 kΩ	
5	0	35.3 V	5.3 kΩ	
6	0	34.9 V	5.1 kΩ	
7	0	34.7 V	4.4 kΩ	
8	0	34.6 V	5.9 kΩ	
9	0	35.1 V	5.1 kΩ	
10	0	34.6 V	4.1 kΩ	
11	0	34.5 V	2.8 kΩ	
12	0	34.5 V	2.7 kΩ	
13	0	34.6 V	5.0 kΩ	
14	0	34.2 V	2.4 kΩ	
15	0	34.9 V	2.2 kΩ	
16	0	34.2 V	2.9 kΩ	

Ground fault test

22-10-2018 14:47:04 page:1

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PV Analyzer Z200 Ground Fault Report

Basic information

Test carried out by: emaZys
 Instrument operator: TEAM
 PV site address: Odense
 PV string: Top si
 Date: 22-10-2018
 Time: 14:47:04
 Number of PV modules in string: 12
 Instrument Name: Z200-R2E00018004
 Installed software version: 3.6.1

Results

Open circuit voltage: 427.4 V
 Low frequency norm: 10.2 kΩ
 Low freq norm with load: 4.6 kΩ
 Isolation Resistance (R_{ISO}): 1.1 MΩ
 Estimated position of R_{ISO}: 4.2

Ground Fault Test Conclusion:

This function searches for the position of a potential ground fault. The result is given as a position counting from the PV₊ terminal.

There is low isolation in or between modules no. 3 and 5.

Field Notes:

Final Comments:

Disconnect

22-10-2018 14:36:46 page:1

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PV Analyzer Z200 Disconnect Report

Basic information

Test carried out by: emaZys
 Instrument operator: TEAM
 PV site address: Odense
 PV string: Top si
 Date: 22-10-2018
 Time: 14:36:46
 Number of PV modules in string: 8
 Instrument Name: Z200-R2E00018003
 Installed software version: 3.6.1

Results

Entered cable capacitance: 80.0 pF/m
 Length of cable to positive terminal: 12.0 m
 Length of cable to negative terminal: 25.0 m
 Capacitance measured from the positive terminal: 2.6 nF
 Capacitance measured from the negative terminal: 5.2 nF
 Low frequency norm (+ terminal): 924.0 kΩ
 Low frequency norm (- terminal): 910.0 kΩ
 Position: 4.1

Disconnect Test:

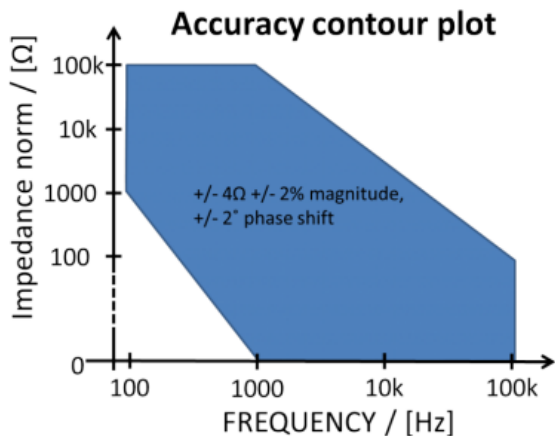
This function searches for the position of a disconnect in the cables connected to the PV string. The result is given as a position counting from the PV₊ terminal.

Fault in modules between 3 and 5.

Field Notes:

Final Comments:

Technical data and specification



Measurement feature	Z200 PV Analyzer
Frequency coverage	100 Hz to 100 kHz
Frequency accuracy	+/- 2%
Measurement feature	Z200 PV Analyzer
Frequency drift with temperature (° C to 35 ° C)	>0.1
Measurement of short circuit current I _{sc}	Z200 PV Analyzer
DC current range	0-15 A
Measurement of open circuit voltage V _{OC}	Z200 PV Analyzer
Analysis	Checks for correct polarity and voltage in-range.
Range	0-1000V
Measurement of resistance towards ground R _{ISO}	Z200 PV Analyzer
Range	0 Ω - 40 MΩ
Measurement time	about 60 sec.
Conditions	Irradiation > 100 $\frac{mW}{m^2}$ and string V _{OC} > 100V
Precision (stable light conditions)	+/- 50 kΩ +/- 10%
Analysis	Above 40M Ω, R _{ISO} is returned as R _{ISO} > 40M Ω. Below 100kΩ, R _{ISO} is returned as R _{ISO} < 100kΩ
Detection and localization of ground isolation fault R _{ISO}	Z200 PV Analyzer
Threshold for localization of a ground fault	3 MΩ
Localization precision (stable light conditions)	+/- 0.5 PV module
Localization resolution	0.1 PV modules
Conditions	Irradiation > 100 $\frac{mW}{m^2}$ String V _{OC} > 100V
Analysis	Fault indicated (with text in user interface) if R _{ISO} < 1 MΩ
Detection and localization of series resistance fault external to the PV modules	Z200 PV Analyzer
Localization of singular series fault > 10 kΩ e.g. disconnect	✓ (when external to module/solar cells)
Localization precision	+/- 1 PV module
Localization resolution	0.1 PV modules
Conditions	Irradiation > 100 $\frac{mW}{m^2}$
Mechanical	
Enclosure	HPRC 2300
External dimensions	external dimension 335x289x155(mm)
Connectors for DUT	3 x case-side mounted shrouded 4mm banana sockets. Rated: 1kV CAT III - 24A
Environmental	
Storage Temperature	-10° C to 55 °C (limited by battery)
Operating Temperature	0 °C to 35 °C (limited by battery)
Operating Altitude	up to 3000 meters
Battery	
Battery model	RCC2054
Technology	Li-Ion, DC 15 V, 3200 mAh, 48.0 Wh
Operating time	8-10 hours
Standby/Sleep time	max. 150 hours in sleep mode
Recharge time	

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