MK Solar and Electrical

31 John St
Strathfield NSW 2135

Emona Instruments
78 Parramatta Road
Camperdown 2050

Instrument data:

Model: PV Analyser MI 3115 Serial Number: 22282521 Calibration date: 30/11/2022

User:

Node/Metrel PV DEMO/Inverter SMA/Combiner box1/String 1.1/I/U curve		Fail
Results		
Uoc_m	795 V	
Isc_m	5.41 A	
Umpp_m	665 V	
Impp_m	4.82 A	
Pmpp_m	3.21 kW	
Uoc	818 V	
Isc	6.58 A	
Umpp	683 V	
Impp	5.86 A	
Pmpp	4.00 kW	
Uoc_n	1366 V	
Isc_n	8.89 A	
Pmpp_n	9.66 kW	
Impp_n	8.40 A	
Umpp_n	1150 V	
Irr	820 W/m2	
Tcell	32.0 °C	
SubResults		
Tcell (5 min)		
Tcell (10 min)		
Tcell (15 min)		
Tamb	25.0 °C	
ΔPmpp	-58.55 %	Fail
ΔUmpp	-40.61 %	
ΔImpp	-30.22 %	
ΔUoc	-40.14 %	
ΔIsc	-25.99 %	
FF_n	79.54 %	
FF_m	74.53 %	

Signature: Created date: 01/05/2024

Limits			
	ΔPmpp limit (ΔPmpp)	10 %	
Parameters			
	Module	REC420	
	Name	REC420	
	Manufacturer	REC	
	Pmax	420 W	
	Umpp	50 V	
	Impp	8.4 A	
	Uoc	59.4 V	
	Isc	8.89 A	
	NOCT	44 °C	
	alpha	0.003556 A/°C	
	beta	-0.14256 V/°C	
	gamma	-0.26 %/°C	
	Rs	0.2 Ω	
	DateTime	04/01/2024 13:33:02	
	Number of modules in PV string	23	
	Number of PV strings	1	
	Irr min	500 W/m2	
	Environmental data	Manual	
	Irr	820 W/m2	
	Tcell	32 °C	
	Tamb	25.0 °C	
	ΔUoc warning	Off	
Graphs			
	I/U curve		
	P/U curve		
	Node/Metrel PV DEMO/Inverter SMA/Combiner box1/String 1.2/I/U curve		Fail
Results			
	Uoc_m	787 V	
	Isc_m	5.34 A	
	Umpp_m	658 V	
	Impp_m	4.75 A	
	Pmpp_m	3.13 kW	
	Uoc	825 V	
	Isc	6.03 A	
	Umpp	693 V	
	Impp	5.36 A	
	Pmpp	3.72 kW	
	Uoc_n	1366 V	
	Isc_n	8.89 A	
	Pmpp_n	9.66 kW	
	Impp_n	8.40 A	
	Umpp_n	1150 V	

Irr	880 W/m2	
Tcell	42.0 °C	
SubResults		
Tcell (5 min)		
Tcell (10 min)		
Tcell (15 min)		
Tamb	25.0 °C	
ΔPmpp	-61.52 %	Fail
ΔUmpp	-39.71 %	
ΔImpp	-36.18 %	
ΔUoc	-39.60 %	
ΔIsc	-32.21 %	
FF_n	79.54 %	
FF_m	74.37 %	
Limits		
ΔPmpp limit (ΔPmpp)	10 %	
Parameters		
Module		
Name	REC420	
Manufacturer	REC	
Pmax	420 W	
Umpp	50 V	
Impp	8.4 A	
Uoc	59.4 V	
Isc	8.89 A	
NOCT	44 °C	
alpha	0.003556 A/°C	
beta	-0.14256 V/°C	
gamma	-0.26 %/°C	
Rs	0.2 Ω	
DateTime	04/01/2024 13:52:40	
Number of modules in PV string	23	
Number of PV strings	1	
Irr min	500 W/m2	
Environmental data	Manual	
Irr	880 W/m2	
Tcell	42 °C	
Tamb	25.0 °C	
ΔUoc warning	Off	
Graphs		
I/U curve		
P/U curve		
Node/Metrel PV DEMO/Inverter SMA/Combiner box1/String 1.3/I/U curve	Fail	
Results		
Uoc_m	793 V	
Isc_m	5.39 A	

Umpp_m	664 V	
Impp_m	4.79 A	
Pmpp_m	3.18 kW	
Uoc	816 V	
Isc	6.55 A	
Umpp	682 V	
Impp	5.83 A	
Pmpp	3.97 kW	
Uoc_n	1366 V	
Isc_n	8.89 A	
Pmpp_n	9.66 kW	
Impp_n	8.40 A	
Umpp_n	1150 V	
Irr	820 W/m2	
Tcell	32.0 °C	
SubResults		
Tcell (5 min)		
Tcell (10 min)		
Tcell (15 min)		
Tamb	25.0 °C	
ΔPmpp	-58.87 %	Fail
ΔUmpp	-40.70 %	
ΔImpp	-30.65 %	
ΔUoc	-40.29 %	
ΔIsc	-26.27 %	
FF_n	79.54 %	
FF_m	74.41 %	
Limits		
ΔPmpp limit (ΔPmpp)	10 %	
Parameters		
Module		
Name	REC420	
Manufacturer	REC	
Pmax	420 W	
Umpp	50 V	
Impp	8.4 A	
Uoc	59.4 V	
Isc	8.89 A	
NOCT	44 °C	
alpha	0.003556 A/°C	
beta	-0.14256 V/°C	
gamma	-0.26 %/°C	
Rs	0.2 Ω	
DateTime	04/01/2024 13:35:08	
Number of modules in PV string	23	

Number of PV strings	1	
Irr min	500 W/m2	
Environmental data	Manual	
Irr	820 W/m2	
Tcell	32 °C	
Tamb	25.0 °C	
ΔUoc warning	Off	

Graphs

I/U curve		
P/U curve		

Node/Metrel PV DEMO/Inverter SMA/Combiner box1/String 1.4/I/U curve — Fail

Results

Uoc_m	789 V	
Isc_m	5.36 A	
Umpp_m	659 V	
Impp_m	4.78 A	
Pmpp_m	3.15 kW	
Uoc	808 V	
Isc	6.07 A	
Umpp	675 V	
Impp	5.42 A	
Pmpp	3.66 kW	
Uoc_n	1366 V	
Isc_n	8.89 A	
Pmpp_n	9.66 kW	
Impp_n	8.40 A	
Umpp_n	1150 V	
Irr	880 W/m2	
Tcell	32.0 °C	

SubResults

Tcell (5 min)		
Tcell (10 min)		
Tcell (15 min)		
Tamb	25.0 °C	
ΔPmpp	-62.13 %	Fail
ΔUmpp	-41.27 %	
ΔImpp	-35.52 %	
ΔUoc	-40.84 %	
ΔIsc	-31.68 %	
FF_n	79.54 %	
FF_m	74.49 %	

Limits

ΔPmpp limit (ΔPmpp)	10 %	

Parameters

Module		
Name	REC420	

Manufacturer	REC	
Pmax	420 W	
Umpp	50 V	
Impp	8.4 A	
Uoc	59.4 V	
Isc	8.89 A	
NOCT	44 °C	
alpha	0.003556 A/°C	
beta	-0.14256 V/°C	
gamma	-0.26 %/°C	
Rs	0.2 Ω	
DateTime	04/01/2024 13:50:27	
Number of modules in PV string	23	
Number of PV strings	1	
Irr min	500 W/m2	
Environmental data	Manual	
Irr	880 W/m2	
Tcell	32 °C	
Tamb	25.0 °C	
ΔUoc warning	Off	

Graphs

I/U curve		
P/U curve		

Node/Metrel PV DEMO/Inverter SMA/Combiner box1/String 1.5/I/U curve	Fail

Results

Uoc_m	789 V	
Isc_m	5.36 A	
Umpp_m	656 V	
Impp_m	4.78 A	
Pmpp_m	3.14 kW	
Uoc	808 V	
Isc	6.07 A	
Umpp	672 V	
Impp	5.42 A	
Pmpp	3.64 kW	
Uoc_n	1366 V	
Isc_n	8.89 A	
Pmpp_n	9.66 kW	
Impp_n	8.40 A	
Umpp_n	1150 V	
Irr	880 W/m2	
Tcell	32.0 °C	

SubResults

Tcell (5 min)		
Tcell (10 min)		

Tcell (15 min)		
Tamb	25.0 °C	
ΔPmpp	-62.30 %	Fail
ΔUmpp	-41.53 %	
ΔImpp	-35.52 %	
ΔUoc	-40.84 %	
ΔIsc	-31.68 %	
FF_n	79.54 %	
FF_m	74.15 %	
Limits		
ΔPmpp limit (ΔPmpp)	10 %	
Parameters		
Module		
Name	REC420	
Manufacturer	REC	
Pmax	420 W	
Umpp	50 V	
Impp	8.4 A	
Uoc	59.4 V	
Isc	8.89 A	
NOCT	44 °C	
alpha	0.003556 A/°C	
beta	-0.14256 V/°C	
gamma	-0.26 %/°C	
Rs	0.2 Ω	
DateTime	04/01/2024 13:51:11	
Number of modules in PV string	23	
Number of PV strings	1	
Irr min	500 W/m2	
Environmental data	Manual	
Irr	880 W/m2	
Tcell	32 °C	
Tamb	25.0 °C	
ΔUoc warning	Off	
Graphs		
I/U curve		
P/U curve		

METREL® **STC**

Module and Instrument data

Short module name	REC420
Manufacturer	#
Module name	#
Instrument	MI 3115 PV Analyser
Test object	Metrel PV DEMO\Inverter SMA\TCB1 \String 2.1
Measurement Date	15.11.2023
Measurement time	12:30:51

Measurement results

Uoc	164.4 V
Isc	8.41 A
Umpp	134.5 V
Impp	7.83 A
Pmpp	1053 W
FF	0.762
Rs	0.39 Ω

Measurement conditions

AMBIENT DATA

Irradiance [W/m²]	966	
Module temp [°C]	53.1	
Module temp. correction [°C]	2	

PV ARRAY STRUCTURE

# of modules in string	3	
# of parallel strings	1	

Manufacturer data

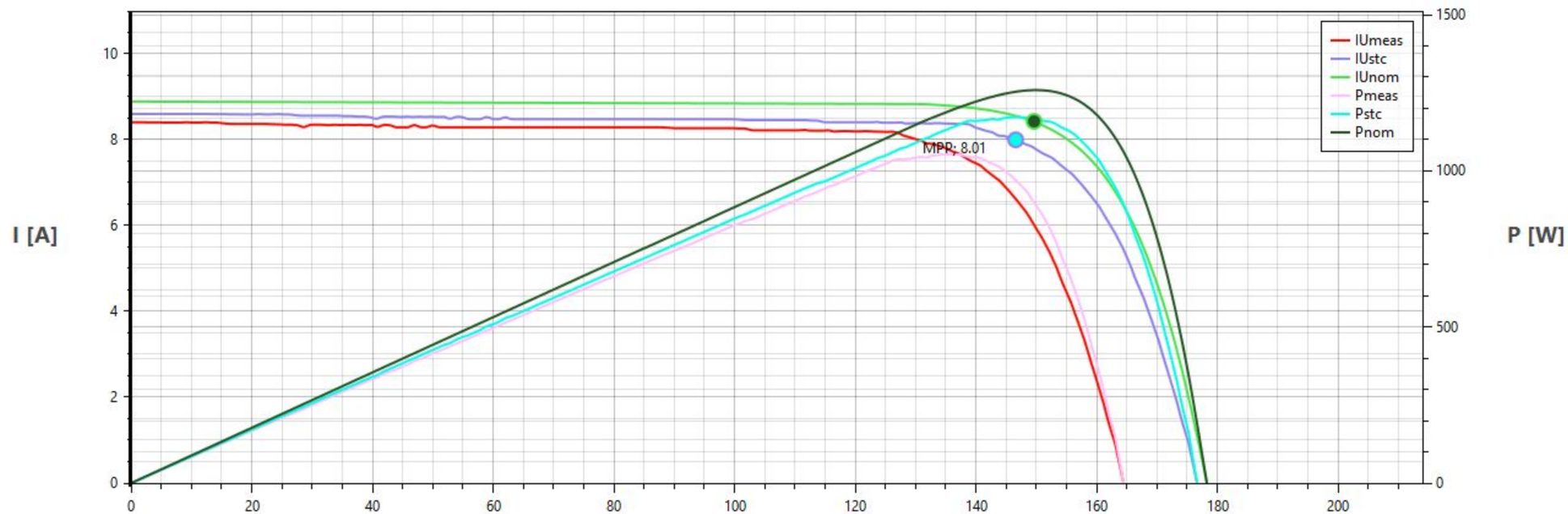
COEFFICIENTS

alfa (ABS) [mA/°C]	3.556	
alfa (REL) [%/°C]	0.040	
beta (ABS) [V/°C]	-0.143	
beta (REL) [%/°C]	-0.240	
gama (REL) [%/°C]	-0.260	
Rs [Ω]	0.20	

Values used for STC calculation

Irradiance [W/m²]	966
Module temp [°C]	55.1
# of modules in string	3
# of parallel strings	1
alfa (ABS) [mA/°C]	3.556
beta (ABS) [V/°C]	-0.143
gama (REL) [%/°C]	-0.260
Rs [Ω]	0.39

I/U characteristic and power graph



U [V] = 0

IUnom IUmeas IUstc

Pnom Pmeas Pstc

STC (Standard Test Conditions) Irradiance = 1000 W/m2 Module Temp = 25 °C AM =1,5	STC						
	Manufacturer data		Calculated values		Deviation	PASS/FAIL criteria	
	1 module	3 module(s) 1 string(s)	1 module	3 module(s) 1 string(s)	%	10 %	5 %
Uoc [V] =	59.4	178.2	58.87	176.62	-0.9 %	•	•
Isc [A] =	8.89	8.89	8.6	8.6	-3.2 %	•	•
Umpp [V] =	50	150	48.84	146.51	-2.3 %	•	•
Impp [A] =	8.4	8.4	8.01	8.01	-4.7 %	•	•
FF [%] =	79.5		77.2				
Pmpp [W] =	**420**	**1260**	**391.1**	**1173.2**	**-6.9 %**	•	▼

- Node
  - Metrel PV DEMO
    - Inverter SMA
      - Combiner box1
        - String 1.1
          - I/U curve
        - String 1.2
          - I/U curve
        - String 1.3
          - I/U curve
        - String 1.4
          - I/U curve
        - String 1.5
          - I/U curve
      - TCB1
        - String 2.1
          - Uoc/Isc
          - I/U curve
          - I/U curve
        - TS1
          - IEC 62446 Autotest
          - Uoc/Isc
          - IEC 62446 Autotest
        - TS2
          - IEC 62446 Autotest
          - R ISO PV
          - R ISO PV
    - PV Inspections
      - General
      - Protection against electric shock
      - Insulation faults protection
      - Overcurrent protection
      - Earthing and bonding arrangements
      - Lightning and overvoltage protection
      - El. equipment selection and erection
      - AC system
      - Labelling and identification