PV MASTER I-V Measurement Report

Basic Information :

Operator/Contact	Andre Dimbokovits	andre.dimbokovits@neo-messtechnik.com
Signature/Seal		
Inspector/Contact	Bernhard Grasel	bernhard.grasel@neo-messtechnik.com
Signature/Seal		
Client	NEO PV MASTER Client	
Date of Inspection (YMD)	2023/99/99	
Time of Inspection	99:99:99	
Name of Site	NEO Messtechnik Office	
Location of Site	Sonnweg 4, 2871 Zobern, Austria	47° 30' 51.984" N, 16° 7' 52.896" E
Module Setup	18 series x 20 parallel	
PV Station Size	131 400 W	
Installation Degree	11 °	
Instrument Name	PV MASTER 10	
Version of Software	1.0.0	
Calibration Date	Virtual Calibrated	

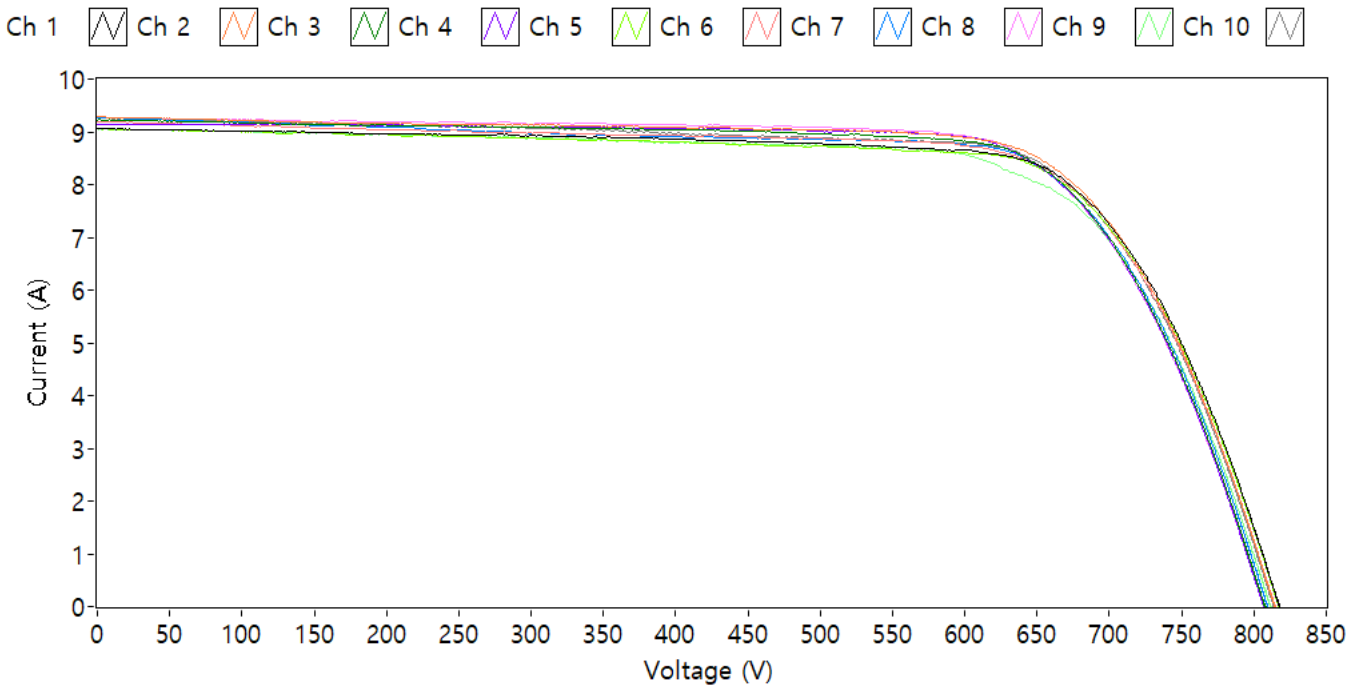
PV Module Specification :

PV Module	L-G4.1 365
Pmp [W]	365
Vmp [V]	39,10
Imp [A]	9,330
Voc [V]	48,00
Isc [A]	9,830
FF	0,773

PV Plant Leakage Check Result

Channel	V Positive [V]	V Negative [V]	Difference [V]	Safety	Location
Ch 1	419,2	399,1	20,1	O	-
Ch 2	410,4	404,7	5,7	O	-
Ch 3	411,1	397,3	13,8	O	-
Ch 4	412,0	395,6	16,5	O	-
Ch 5	410,1	407,3	2,9	O	-
Ch 6	407,6	407,1	0,5	O	-
Ch 7	409,4	400,2	9,2	O	-
Ch 8	408,1	399,0	9,0	O	-
Ch 9	406,4	405,3	1,0	O	-
Ch 10	413,6	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	400,8	11,1	O	-
Ch 15	418,7	403,9	14,8	O	-
Ch 16	415,8	398,1	17,7	O	-
Ch 17	408,0	407,7	0,2	O	-
Ch 18	416,3	397,2	19,1	O	-
Ch 19	412,9	406,0	6,9	O	-
Ch 20	271,3	542,6	271,3	X	6

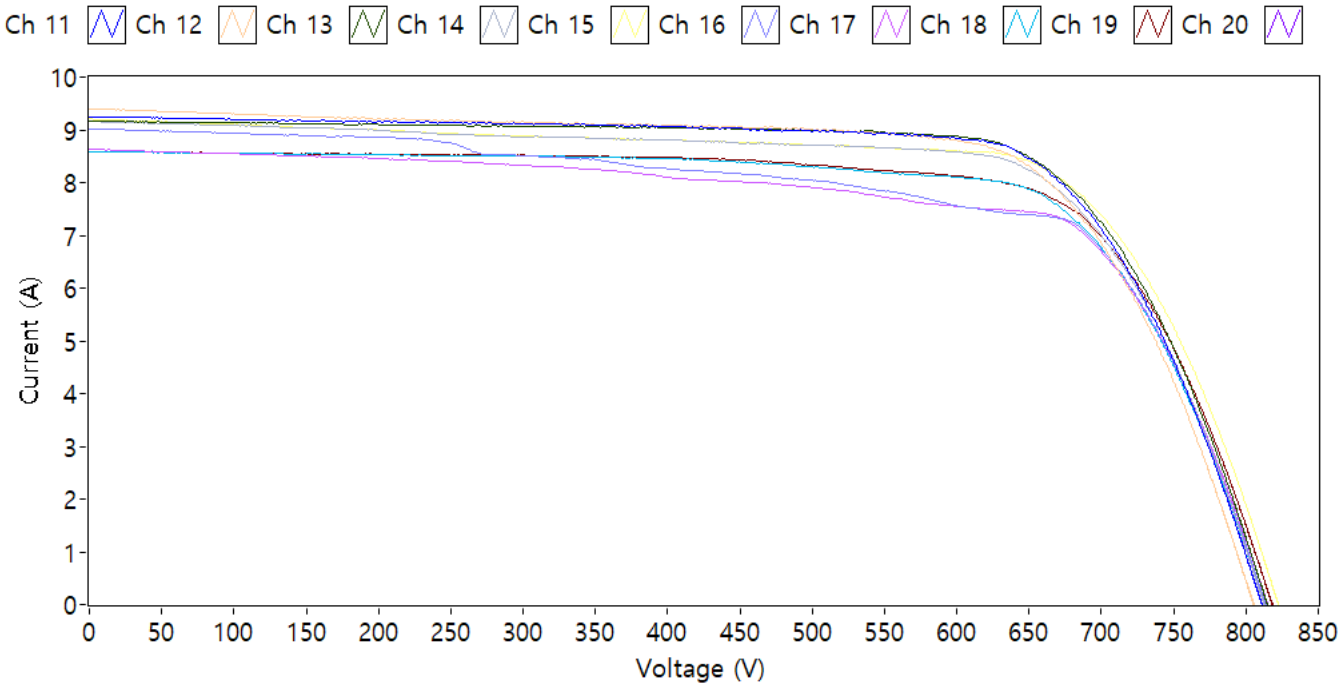
Results (Ch. 1~10)



PV I-V Curve main features:

Channel	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8	Ch 9	Ch 10
Pmp [W]	5 453	5 542	5 473	5 468	5 412	5 447	5 452	5 477	5 232	5 494
Vmp [V]	653,9	643,5	634,9	638,9	651,5	654,6	638,3	627,9	653,2	648,0
Imp [A]	8,339	8,612	8,621	8,559	8,307	8,321	8,542	8,723	8,009	8,479
Voc [V]	817,7	814,6	808,3	806,9	817,4	814,7	809,7	807,1	811,7	813,9
Isc [A]	9,061	9,286	9,231	9,157	9,057	9,196	9,271	9,271	9,052	9,263
FF	0,736	0,733	0,734	0,740	0,731	0,727	0,726	0,732	0,712	0,729
Irrad [W/m²]	1 023	1 023	1 024	1 023	1 023	1 023	1 024	1 023	1 023	1 023
Tmod [°C]	18,8	18,9	19,0	18,8	18,8	18,9	19,0	18,8	18,8	18,9
Tamb [°C]	12,2	12,0	11,7	12,0	12,2	12,0	11,7	12,0	12,2	12,0

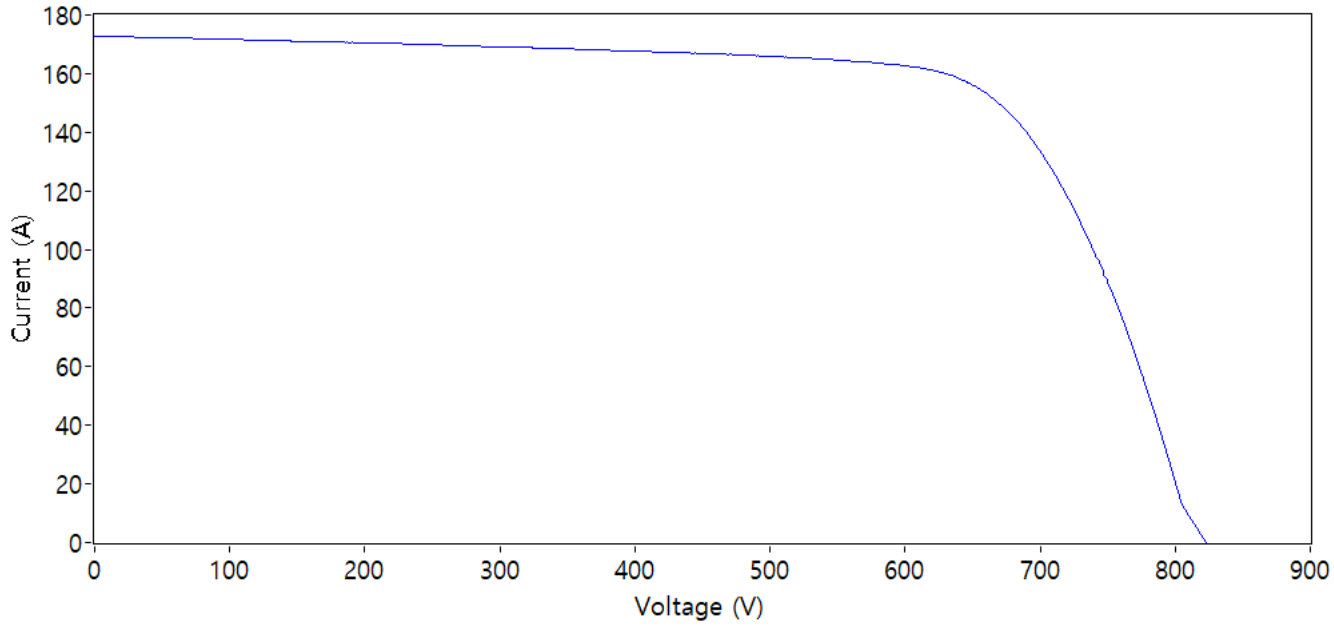
Results (Ch. 11~20)



PV I-V Curve main features:

Channel	Ch 11	Ch 12	Ch 13	Ch 14	Ch 15	Ch 16	Ch 17	Ch 18	Ch 19	Ch 20
Pmp [W]	5 520	5 433	5 523	5 365	5 468	4 931	4 927	5 123	5 139	0
Vmp [V]	638,8	639,1	636,0	641,3	656,1	680,0	671,2	655,4	658,4	0,0
Imp [A]	8,641	8,502	8,684	8,365	8,334	7,251	7,340	7,816	7,805	0,000
Voc [V]	811,2	805,5	814,9	812,7	822,6	813,9	815,2	813,0	818,9	0,0
Isc [A]	9,252	9,401	9,164	9,161	9,208	9,022	8,631	8,584	8,590	0,000
FF	0,735	0,718	0,740	0,721	0,722	0,671	0,700	0,734	0,730	0,000
Irrad [W/m²]	1 024	1 023	1 023	1 023	1 024	1 023	1 023	1 023	1 024	1 023
Tmod [°C]	19,0	18,8	18,8	18,9	19,0	18,8	18,8	18,9	19,0	18,8
Tamb [°C]	11,7	12,0	12,2	12,0	11,7	12,0	12,2	12,0	11,7	12,0

Results (Combined)



PV I-V Curve main features:

Pmp	101 878
Vmp [V]	616,1
Imp [A]	157,2
Voc [V]	772,5
Isc [A]	172,9
FF	0,725
Irrad [W/m²]	1 023
Tmod [°C]	18,9
Tamb [°C]	12,0

Remarks :

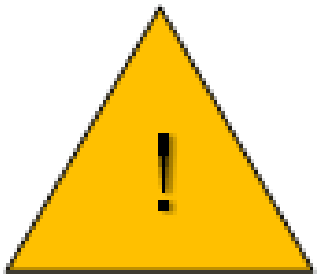
- Given the decrease in open-circuit voltage (Voc), Photovoltaic (PV) modules in general is suspected of degradation or bypass diode short-circuit fault. Replacement thorough precise diagnosis is recommended

-Due to the installation degree of Photovoltaic (PV) array being approximately 11 °, continuous soiling loss is expected since natural cleaning effect of rain on the surface of the PV module is feeble. Artificial cleaning is required periodically, especially at the lower part of PV modules.

- Characteristics traits due to operation of bypass diode has been confirmed. Partial shading taken place at right side of the photovoltaic (PV) array seems to be the reason. Periodical partial shading of PV module causes stress to bypass diode which can lead to failure. Redesign of electrical connection between PV modules is recommended.

This Test Report shall not be reproduced except in full, without the written approval of the "Bernhard Grasel"
This test report presents information about the tested PV system via Leakage test and I-V curve.

The Accuracy of PV MASTER 10 used to process this report is +/- 5%
Since the outdoor real-time measurement process is not repeatable, it is impossible to determine the accuracy of the input value itself, therefore it is notified that a value beyond the above accuracy may exist.



Reference Standards

IEC 60904-1 Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics

IEC 60891 Photovoltaic devices - Procedures for temperature and irradiance corrections to measured I-V characteristics

Terminology

Pmp	Max Power
Vmp	Voltage at Pmp
Imp	Current at Pmp
Voc	Open Circuit Voltage
Isc	Short Circuit Current
FF	Fill Factor
Irrad	Solar Irradiance
Tmod	Module Temperature
Tamb	Ambient Temperature