RF Test Solutions Ltd
409 Cuba Street
Alicetown
Lower Hutt 5010
NEW ZEALAND
Phone: +64 4 570 2483

IANZ Endorsed Certificate of Calibration

Certificate Number: 18826

Manufacturer:	Tektronix	**Description:**	Digital Phosphor Oscilloscope
Model No:	DPO2004B		
Serial No:	C020151	**Options Installed:**	nil
Customer:	Enphase Energy New Zealand Limited 1 Treffers Road Wigram Christchurch	**Customer Asset No:** **Location of Calibration:**	SAF-OSC-08 RF Test Solutions Ltd 409 Cuba St Alicetown Lower Hutt New Zealand
Date of Calibration:	22-Apr-2022	**Received Date:**	08-Apr-2022
Temperature:	23°C ± 2°C	**Humidity:**	30 - 60 % RH
Procedure:	STE/9000A.00.04		

This calibration certificate documents that the instrument was calibrated for the parameters and at the points specified in the relevant RF Test Solutions calibration procedure as defined for this instrument, in accordance with the manufacturer's current recommended procedure. **Note:** This calibration certificate may reference instruments manufactured by HP, Agilent and Keysight as being manufactured by Keysight Technologies, Inc.

Based on the manufacturer recommended calibration interval or user defined calibration interval, the next calibration is due on: 22-Apr-2023. The user should determine the suitability of this instrument for its intended use.

This certificate contains a summary of calibration information and the measurement uncertainty values attributed to the performance test results. The results of the performance test results are retained for a period of six years and are included in Appendix A of this report.

No adjustment were performed on this instrument.

Remarks or Special Requirements:

Michael Taylor

Authorised IANZ Signatory

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Traceability Information:

Technician ID: M Taylor

The measurements made in support of this certificate are traceable to the SI via one or more of the following National Metrology Institutes: Measurement Standards Laboratory New Zealand, National Measurements Institute (Australia), National Institute of Standards and Technology (USA) and the National Physical Laboratory (UK).

At planned intervals, our measurement standards are calibrated by comparison to, or measurement against national or international standards, natural physical constants, consensus standards or by ratio type measurements using self calibrating techniques.

Endorsement: The tests, calibrations or measurements covered by this document have been performed in accordance with IANZ (International Accreditation New Zealand) requirements which include the requirements of ISO/IEC 17025 and are traceable to national standards of measurement.

The statement of compliance to manufacturers specifications includes the associated measurement uncertainties.

Calibration Equipment Used:

Model Number:	Model Description:	Trace Number:	Cal due date:
E4418A	Power Meter	RFT2107	05-Jul-2023
E8257D	PSG Analogue Signal Generator	RFT2711	21-Mar-2024
11667A	DC-18GHz Power Splitter, Type N, 50 Ohm	RFT2807	04-Feb-2023
5700A	Calibrator	RFT4050	14-Jun-2022
E9304A	Power Sensor	RFT4082	28-Mar-2024

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Uncertainty Annex

Test Parameter	Range	Expanded Uncertainty	k
Associated Measurement Uncertainties are included in the Measurement Report (Appendix A) with a Coverage Factor K=2			
Revision 1.01			
			0.0
			0.0
			0.0
Measurement Report (Appendix A)			

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	0.0
	0.0
Revision 1.01	

For a confidence level of 95 %

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Appendix A
Performance Test Results

Measurement Report

RF Test Solutions Limited
409 Cuba Street Alicetown
Lower Hutt
New Zealand

Report Number: 18826 **Test Date:** 22 Apr 2022
Customer: ENPHASE ENERGY NEW ZEALAND LIMITED

Model Number: DPO2004B **Serial Number:** C020151
Installed Options:

Temperature: (23.0 ± 2) °C **Humidity:** 30 to 60 % RH
Tested By: M Taylor

Test Program Name: TEK_DPO_MSO_2XXX, 5011-4870
Test Program Version: A.00.04
Test Executive: STE/9000, C.09.12W
Test Subsytem: MENDOR, B.06.34
MUT SYSTEM, Digital Scope System: Version B.00.71

Specification Limits:

Unless otherwise indicated, the units for minimum and/or maximum specification limits are the same as the units stated for the measured value.

Uncertainties:

Unless otherwise indicated, the uncertainties shown are calculated using the process defined in the Guide to the expression of Uncertainty in Measurement (GUM).

Uncertainties are evaluated at the specification limits and may not be accurate expressions of the uncertainty for the stated measured result.

Unless otherwise indicated, expanded uncertainties are stated with a coverage factor of 2 (k=2). This represents a coverage probability of approximately 95% for a normal distribution.

Unless otherwise indicated, uncertainty value units are the same as the measured value units. Uncertainties stated with units of parts per million (ppm) are given relative to fundamental units.

Result Status Flags:

Within each section of the measurement report, measurement results are printed with a status flag in the last column on the page. The status flag gives an indication of the status for each measurement point.

PASS	The reported value is within specification.
PASS #	The value falls within the measurement uncertainty guardband.
FAIL	The reported value is outside the specification.
DONE	The reported value is a functional test only.

Report Number: 18826 **Test Date:** 22 Apr 2022
Model Number: DPO2004B
Serial Number: C020151

Calibration Standards Used for this Calibration

Model (Serial)	Trace Number	Cal Due Date
AGT E4418A (GB38272956)	RFT2107	05 Jul 2023
AGT E8257D (MY51111355)	RFT2711	12 May 2022
AGT E9304A (MY41499014)	RFT4082	28 Mar 2023
FLU 5700A (5585003)	RFT4050	14 Jun 2022
HP 11667A (MY51358184)	RFT2807	04 Feb 2023

Report Number: 18826 **Test Date:** 22 Apr 2022
Model Number: DPO2004B
Serial Number: C020151

PERFORMANCE TEST RESULTS SUMMARY

Test Name	Status
INITIAL SETUP	DONE
SELF TEST VERIFICATION	DONE
ANALOG BANDWIDTH	PASSED
SAMPLE RATE AND DELAY TIME ACC	PASSED
DC BALANCE	PASSED
VERTICAL POSITION RANGE	PASSED
DC GAIN ACCURACY	PASSED

Measurement Report

Report Number: 18826 **Test Date:** 22 Apr 2022
Model Number: DPO2004B
Serial Number: C020151

SELF TEST VERIFICATION — DONE

TEST CONDITIONS	STATUS	
Self Diagnostics	DONE	PASS
Self Calibration	DONE	PASS

ANALOG BANDWIDTH — PASSED

TEST CONDITIONS	MINIMUM	MEASURED	UNCERT.	
500 mV/div, 70 MHz BW				
Channel1	-3.00	-1.23 dB	0.49 dB	PASS
Channel2	-3.00	-1.24 dB	0.49 dB	PASS
Channel3	-3.00	-1.47 dB	0.49 dB	PASS
Channel4	-3.00	-1.23 dB	0.49 dB	PASS

SAMPLE RATE AND DELAY TIME ACC — PASSED

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	UNCERT.	
Delay Time @10ms	9.999750	10.000058 ms	10.000250	5.7 ns	PASS

DC BALANCE — PASSED

TEST COND.	MINIMUM	MEASURED	MAXIMUM	UNCERT.	
Channel 1					
DC	-21.00	1.10 mV	21.00	4.1 mV	PASS
GND	-21.00	0.86 mV	21.00	4.1 mV	PASS
Channel 2					
DC	-21.00	2.96 mV	21.00	4.1 mV	PASS
GND	-21.00	1.37 mV	21.00	4.1 mV	PASS
Channel 3					
DC	-21.00	0.59 mV	21.00	4.2 mV	PASS
GND	-21.00	-0.07 mV	21.00	4.2 mV	PASS
Channel 4					
DC	-21.00	1.21 mV	21.00	4.2 mV	PASS
GND	-21.00	0.14 mV	21.00	4.2 mV	PASS

Measurement Report

Report Number: 18826 **Test Date:** 22 Apr 2022
Model Number: DPO2004B
Serial Number: C020151

VERTICAL POSITION RANGE — PASSED

TEST CONDITIONS			STATUS	
Vertical Scale, Position, Offset				
Channel 1				
200mV,	TOP,	−1 V	DONE	PASS
200mV,	BOTTOM,	1 V	DONE	PASS
5V,	TOP,	−25 V	DONE	PASS
5V,	BOTTOM,	25 V	DONE	PASS
Channel 2				
200mV,	TOP,	−1 V	DONE	PASS
200mV,	BOTTOM,	1 V	DONE	PASS
5V,	TOP,	−25 V	DONE	PASS
5V,	BOTTOM,	25 V	DONE	PASS
Channel 3				
200mV,	TOP,	−1 V	DONE	PASS
200mV,	BOTTOM,	1 V	DONE	PASS
5V,	TOP,	−25 V	DONE	PASS
5V,	BOTTOM,	25 V	DONE	PASS
Channel 4				
200mV,	TOP,	−1 V	DONE	PASS
200mV,	BOTTOM,	1 V	DONE	PASS
5V,	TOP,	−25 V	DONE	PASS
5V,	BOTTOM,	25 V	DONE	PASS

DC GAIN ACCURACY — PASSED

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	UNCERT.	
Channel 1					
Range 5 mV	33.60	35.51 mV	36.40	0.17 mV	PASS
Range 200 mV	1.358	1.405 V	1.442	6.4 mV	PASS
Range 2 V	13.58	14.06 V	14.42	64 mV	PASS
Channel 2					
Range 5 mV	33.60	34.93 mV	36.40	0.17 mV	PASS
Range 200 mV	1.358	1.400 V	1.442	6.4 mV	PASS
Range 2 V	13.58	13.92 V	14.42	64 mV	PASS
Channel 3					
Range 5 mV	33.60	34.86 mV	36.40	0.17 mV	PASS
Range 200 mV	1.358	1.400 V	1.442	6.4 mV	PASS
Range 2 V	13.58	14.02 V	14.42	64 mV	PASS
Channel 4					
Range 5 mV	33.60	34.91 mV	36.40	0.17 mV	PASS
Range 200 mV	1.358	1.399 V	1.442	6.4 mV	PASS
Range 2 V	13.58	13.91 V	14.42	64 mV	PASS