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: 18596

| | | | |
|---|---|---|---|
| **Manufacturer:** | Tektronix | **Description:** | Oscilloscope |
| **Model No:** | TDS3034C | | |
| **Serial No:** | C020181 | **Options Installed:** | nil |
| **Customer:** | Enphase Energy New Zealand Limited<br><br>1 Treffers Road<br>Wigram<br>Christchurch | **Customer Asset No:**<br>**Location of Calibration:** | SAF-OSC-01<br>RF Test Solutions Ltd<br>409 Cuba St<br>Alicetown<br>Lower Hutt<br>New Zealand |
| **Date of Calibration:** | 08-Mar-2022 | **Received Date:** | 04-Mar-2022 |
| **Temperature:** | 23°C ± 2°C | **Humidity:** | 30 - 60 % RH |
| **Procedure:** | STE/9000 B.00.02 | | |

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: 08-Mar-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 does not include the associated measurement uncertainties.



**Calibration Equipment Used:**

| Model Number: | Model Description: | Trace Number: | Cal due date: |
|---|---|---|---|
| N5183B | MXG-B MW Analog Signal Generator | RFT21004 | 05-Oct-2022 |
| E4418A | Power Meter | RFT2107 | 05-Jul-2023 |
| 11667A | DC-18GHz Power Splitter, Type N, 50 Ohm | RFT2807 | 04-Feb-2023 |
| 5700A | Calibrator | RFT4050 | 14-Jun-2022 |
| E9304A | Power Sensor | RFT4082 | 27-Mar-2022 |

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## Uncertainty Annex

| Test Parameter | Range | Expanded Uncertainty | k |
|---|---|---|---|
| DC Voltage Measurement | | | |
| Range | Applied | | |
| 1 mV | 100 mV | 7 uV | 2.0 |
| 2 mV | - 7 mV | 1 uV | 2.0 |
| 5 mV | - 100 mV | 7 uV | 2.0 |
| 50 mV | 1000 mV | 71 uV | 2.0 |
| 50 mV | 650 mV | 71 uV | 2.0 |
| 90 mV | - 315 mV | 71 uV | 2.0 |
| 200 mV | 10 V | 714 uV | 2.0 |
| 1 V | 10 V | 714 uV | 2.0 |
| Bandwidth | | | |
| | 600 mVpp | 13 mV p-p | 2.0 |
| Revision 1.00 | | | |

**For a confidence level of 95 %**

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# IANZ Endorsed Certificate of Calibration

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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:** 18596
**Customer:** ENPHASE ENERGY NEW ZEALAND LIMITED
**Model Number:** TDS3034C **Serial Number:** C020181
**Tested Options:**

**Test Date:** 8 Mar 2022 **Tested By:** M Taylor
**Temperature:** (23.0±2)°C **Humidity:** (30 to 60)% RH

**Test Program Name:** TEK_TDS30XX Part No. 5011-4179
**Test Program Version:** B.00.02
**Test Executive:** STE/9000 C.09.12W (MENDOR B.06.34)

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

**Traceability Information is on the Certificate**

**Report Number:** 18596 **Test Date:** 8 Mar 2022
**Model Number:** TDS3034C **Serial Number:** C020181

**PERFORMANCE TEST RESULTS SUMMARY**

| Test Name | Status |
|---|---|
| Initial Setup | DONE |
| Self Tests | PASSED |
| DC Voltage Measurement Accuracy | PASSED |
| DC Voltage Measurement Accuracy 50 mV Delta | PASSED |
| Bandwidth | PASSED |
| Edge Trigger Sensitivity | PASSED |
| Sample Rate and Delay Time Accuracy | PASSED |

**Report Number:** 18596 **Test Date:** 8 Mar 2022
**Model Number:** TDS3034C **Serial Number:** C020181

## Self Tests PASSED

| TEST COND. | STATUS |
|---|---|
| CAL | PASSED |
| DIAG | PASSED |

## DC Voltage Measurement Accuracy PASSED

| TEST CONDITIONS | MINIMUM | MEASURED | MAXIMUM |
|---|---|---|---|
| Channel1 | | | |
| 1 mV/Div,100 mV | 99.25 | 99.49 mV | 100.75 |
| 2 mV/Div, -7 mV | -7.54 | -6.87 mV | -6.46 |
| 5 mV/Div,-100 mV | -101.76 | -99.76 mV | -98.24 |
| 50 mV/Div, 1 V | 0.9824 | 0.9972 V | 1.0176 |
| 50 mV/Div,650 mV | 632.4 | 653.0 mV | 667.6 |
| 90 mV/Div,-315 mV | -339.3 | -309.4 mV | -290.7 |
| Channel1 | | | |
| 200 mV/Div, 10 V | 9.900 | 10.007 V | 10.100 |
| 1 V/Div, 10 V | -10.303 | -10.048 V | -9.697 |
| Channel2 | | | |
| 1 mV/Div,100 mV | 99.25 | 100.36 mV | 100.75 |
| 2 mV/Div, -7 mV | -7.54 | -6.73 mV | -6.46 |
| 5 mV/Div,-100 mV | -101.76 | -99.81 mV | -98.24 |
| 50 mV/Div, 1 V | 0.9824 | 0.9978 V | 1.0176 |
| 50 mV/Div,650 mV | 632.4 | 651.0 mV | 667.6 |
| 90 mV/Div,-315 mV | -339.3 | -309.6 mV | -290.7 |
| Channel2 | | | |
| 200 mV/Div, 10 V | 9.900 | 9.993 V | 10.100 |
| 1 V/Div, 10 V | -10.303 | -10.052 V | -9.697 |
| Channel3 | | | |
| 1 mV/Div,100 mV | 99.25 | 100.23 mV | 100.75 |
| 2 mV/Div, -7 mV | -7.54 | -6.85 mV | -6.46 |
| 5 mV/Div,-100 mV | -101.76 | -99.73 mV | -98.24 |
| 50 mV/Div, 1 V | 0.9824 | 0.9978 V | 1.0176 |
| 50 mV/Div,650 mV | 632.4 | 653.6 mV | 667.6 |
| 90 mV/Div,-315 mV | -339.3 | -311.2 mV | -290.7 |
| Channel3 | | | |
| 200 mV/Div, 10 V | 9.900 | 9.999 V | 10.100 |
| 1 V/Div, 10 V | -10.303 | -10.019 V | -9.697 |
| Channel4 | | | |
| 1 mV/Div,100 mV | 99.25 | 100.42 mV | 100.75 |
| 2 mV/Div, -7 mV | -7.54 | -6.80 mV | -6.46 |
| 5 mV/Div,-100 mV | -101.76 | -100.03 mV | -98.24 |
| 50 mV/Div, 1 V | 0.9824 | 0.9992 V | 1.0176 |
| 50 mV/Div,650 mV | 632.4 | 652.2 mV | 667.6 |
| 90 mV/Div,-315 mV | -339.3 | -310.4 mV | -290.7 |
| Channel4 | | | |
| 200 mV/Div, 10 V | 9.900 | 10.010 V | 10.100 |

**Report Number:** 18596 **Test Date:** 8 Mar 2022
**Model Number:** TDS3034C **Serial Number:** C020181

## DC Voltage Measurement Accuracy CONTINUED

| TEST CONDITIONS | MINIMUM | MEASURED | MAXIMUM |
|---|---|---|---|
| 1 V/Div, 10 V | -10.303 | -10.076 V | -9.697 |

## DC Voltage Measurement Accuracy 50 mV Delta PASSED

| TEST COND. | MINIMUM | MEASURED | MAXIMUM |
|---|---|---|---|
| Channel1 | | | |
| 50 mV Delta | 340.5 | 344.2 mV | 359.5 |
| Channel2 | | | |
| 50 mV Delta | 340.5 | 346.8 mV | 359.5 |
| Channel3 | | | |
| 50 mV Delta | 340.5 | 344.2 mV | 359.5 |
| Channel4 | | | |
| 50 mV Delta | 340.5 | 347.0 mV | 359.5 |

## Bandwidth PASSED

| TEST CONDITIONS | | MINIMUM | MEASURED |
|---|---|---|---|
| Channel1 | | | |
| Vertical | Scale=100 mV/Div | -3.00 | -1.38 dB |
| Channel2 | | | |
| Vertical | Scale=100 mV/Div | -3.00 | -1.54 dB |
| Channel3 | | | |
| Vertical | Scale=100 mV/Div | -3.00 | -1.31 dB |
| Channel4 | | | |
| Vertical | Scale=100 mV/Div | -3.00 | -1.35 dB |

## Edge Trigger Sensitivity PASSED

| TEST CONDITIONS | STATUS |
|---|---|
| Channel1 | |
| Main,300 MHz | PASS |
| Channel1 | |
| Main,50 MHz | PASS |
| Channel2 | |
| Main,300 MHz | PASS |
| Channel2 | |
| Main,50 MHz | PASS |
| Channel3 | |

**Report Number:** 18596 **Test Date:** 8 Mar 2022
**Model Number:** TDS3034C **Serial Number:** C020181

## Edge Trigger Sensitivity CONTINUED

| TEST CONDITIONS | STATUS |
|---|---|
| Main,300 MHz Channel3 | PASS |
| Main,50 MHz Channel4 | PASS |
| Main,300 MHz Channel4 | PASS |
| Main,50 MHz | PASS |

## Sample Rate and Delay Time Accuracy PASSED

| TEST COND. | MINIMUM | MEASURED | MAXIMUM |
|---|---|---|---|
| Channel1 400 ns/Div | 9.99980 | 10.00014 ms | 10.00020 |