



MICRO PRECISION CALIBRATION PTE LTD
BLOCK 5008 ANG MO KIO AVENUE 5 #07-04
TECHPLACE II SINGAPORE 569874
65 67484384



Certificate of Calibration

Date: March 05, 2019

Cert No. 551220082845599

Customer:

GES SINGAPORE PTE LTD
28 MARSILING LANE
SINGAPORE 739152

Work Order #: SG-11010131

MPC Control #: 97014
Asset ID: NA
Gage Type: PROG. RESISTANCE CARD
Manufacturer: GEOTEST
Model Number: GX1164-01
Size: N/A
Temp/RH: 22.5°C / 45 %
Location: Calibration performed at Customer's facility

Serial Number: 97014
Department: N/A
Performed By: JOEL DE VERA
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: March 05, 2019
Cal. Interval: 24 MONTHS
Cal. Due Date: March 05, 2021

Calibration Notes:

Performance test passed. See attached data (3 pages).

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
DC8376	DIGITAL MULTIMETER	PXI-4071	19148F-02	NATIONAL INSTRUMENTS	Mar 15, 2019	512200813300879

Procedures Used in this Event

Procedure Name	Description
MPC-00015	Resistors and Decade Resistors, General, Sept-27-2016 rev03

Calibrating Technician:


JOEL DE VERA

QC Approval:


JULES PHILIPPE AGPANGAN

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO/IEC 17025:2017, ANSI/NCCL Z540-1-1994, ANSI/NCCL Z540.3-2006, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.



Calibration Report of Geotest GX1164-01 Prog. Resistance Card

MPC Control #:	97014	Serial Number:	97014
Asset ID:	NA	Calibration Date:	March 5, 2019

Resistance Accuracy

Channel 1

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
1 Ω	1.000 Ω	0.245 Ω	1.510 Ω	1.510 Ω	51.0000%	1.755 Ω	PASS	0.000014 Ω
2 Ω	2.000 Ω	1.240 Ω	2.508 Ω	2.508 Ω	25.4000%	2.760 Ω	PASS	0.000028 Ω
4 Ω	4.000 Ω	3.230 Ω	4.501 Ω	4.501 Ω	12.5250%	4.770 Ω	PASS	0.000056 Ω
8 Ω	8.000 Ω	7.210 Ω	8.512 Ω	8.512 Ω	6.4000%	8.790 Ω	PASS	0.00012 Ω
16 Ω	16.000 Ω	15.170 Ω	16.530 Ω	16.530 Ω	3.3125%	16.830 Ω	PASS	0.00023 Ω
32 Ω	32.000 Ω	31.090 Ω	32.485 Ω	32.485 Ω	1.5156%	32.910 Ω	PASS	0.00045 Ω
64 Ω	64.000 Ω	62.930 Ω	64.522 Ω	64.522 Ω	0.8156%	65.070 Ω	PASS	0.00090 Ω
128 Ω	128.000 Ω	126.610 Ω	128.617 Ω	128.617 Ω	0.4820%	129.390 Ω	PASS	0.0016 Ω

Channel 2

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
256 Ω	256.000 Ω	253.970 Ω	256.626 Ω	256.626 Ω	0.2445%	258.030 Ω	PASS	0.0031 Ω
512 Ω	512.000 Ω	508.690 Ω	512.601 Ω	512.601 Ω	0.1174%	515.310 Ω	PASS	0.0062 Ω
1024 Ω	1024.000 Ω	1018.130 Ω	1024.447 Ω	1024.447 Ω	0.0437%	1029.870 Ω	PASS	0.019 Ω
2048 Ω	2048.000 Ω	2037.010 Ω	2048.717 Ω	2048.717 Ω	0.0350%	2058.990 Ω	PASS	0.037 Ω
4096 Ω	4096.000 Ω	4074.770 Ω	4098.543 Ω	4098.543 Ω	0.0621%	4117.230 Ω	PASS	0.074 Ω
8192 Ω	8192.000 Ω	8150.290 Ω	8193.784 Ω	8193.784 Ω	0.0218%	8233.710 Ω	PASS	0.15 Ω
16384 Ω	16384.000 Ω	16300.000 Ω	16388.077 Ω	16388.077 Ω	0.0249%	16470.000 Ω	PASS	0.30 Ω
32768 Ω	32768.000 Ω	32600.000 Ω	32778.527 Ω	32778.527 Ω	0.0321%	32930.000 Ω	PASS	0.59 Ω

Channel 3

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
1 Ω	1.000 Ω	0.245 Ω	1.697 Ω	1.697 Ω	69.7000%	1.755 Ω	PASS	0.000014 Ω
2 Ω	2.000 Ω	1.240 Ω	2.687 Ω	2.687 Ω	34.3500%	2.760 Ω	PASS	0.000028 Ω
4 Ω	4.000 Ω	3.230 Ω	4.689 Ω	4.689 Ω	17.2250%	4.770 Ω	PASS	0.000056 Ω
8 Ω	8.000 Ω	7.210 Ω	8.735 Ω	8.735 Ω	9.1875%	8.790 Ω	PASS	0.00012 Ω
16 Ω	16.000 Ω	15.170 Ω	16.682 Ω	16.682 Ω	4.2625%	16.830 Ω	PASS	0.00023 Ω
32 Ω	32.000 Ω	31.090 Ω	32.694 Ω	32.694 Ω	2.1688%	32.910 Ω	PASS	0.00045 Ω
64 Ω	64.000 Ω	62.930 Ω	64.754 Ω	64.754 Ω	1.1781%	65.070 Ω	PASS	0.00090 Ω
128 Ω	128.000 Ω	126.610 Ω	128.929 Ω	128.929 Ω	0.7258%	129.390 Ω	PASS	0.0016 Ω

Jeff 12-MAR-19
JASON AGAR/ASNI



Calibration Report of Geotest GX1164-01 Prog. Resistance Card

MPC Control #:	97014	Serial Number:	97014
Asset ID:	NA	Calibration Date:	March 5, 2019

Channel 4

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
256 Ω	256.000 Ω	253.970 Ω	256.668 Ω	256.668 Ω	0.2609%	258.030 Ω	PASS	0.0031 Ω
512 Ω	512.000 Ω	508.690 Ω	512.762 Ω	512.762 Ω	0.1488%	515.310 Ω	PASS	0.0062 Ω
1024 Ω	1024.000 Ω	1018.130 Ω	1024.665 Ω	1024.665 Ω	0.0649%	1029.870 Ω	PASS	0.019 Ω
2048 Ω	2048.000 Ω	2037.010 Ω	2050.343 Ω	2050.343 Ω	0.1144%	2058.990 Ω	PASS	0.037 Ω
4096 Ω	4096.000 Ω	4074.770 Ω	4099.064 Ω	4099.064 Ω	0.0748%	4117.230 Ω	PASS	0.074 Ω
8192 Ω	8192.000 Ω	8150.290 Ω	8193.532 Ω	8193.532 Ω	0.0187%	8233.710 Ω	PASS	0.15 Ω
16384 Ω	16384.000 Ω	16300.000 Ω	16382.988 Ω	16382.988 Ω	0.0062%	16470.000 Ω	PASS	0.30 Ω
32768 Ω	32768.000 Ω	32600.000 Ω	32783.894 Ω	32783.894 Ω	0.0485%	32930.000 Ω	PASS	0.59 Ω

Channel 5

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
1 Ω	1.000 Ω	0.245 Ω	1.549 Ω	1.549 Ω	54.9000%	1.755 Ω	PASS	0.000014 Ω
2 Ω	2.000 Ω	1.240 Ω	2.538 Ω	2.538 Ω	26.9000%	2.760 Ω	PASS	0.000028 Ω
4 Ω	4.000 Ω	3.230 Ω	4.555 Ω	4.555 Ω	13.8750%	4.770 Ω	PASS	0.000056 Ω
8 Ω	8.000 Ω	7.210 Ω	8.577 Ω	8.577 Ω	7.2125%	8.790 Ω	PASS	0.00012 Ω
16 Ω	16.000 Ω	15.170 Ω	16.544 Ω	16.544 Ω	3.4000%	16.830 Ω	PASS	0.00023 Ω
32 Ω	32.000 Ω	31.090 Ω	32.500 Ω	32.500 Ω	1.5625%	32.910 Ω	PASS	0.00045 Ω
64 Ω	64.000 Ω	62.930 Ω	64.330 Ω	64.330 Ω	0.5156%	65.070 Ω	PASS	0.00090 Ω
128 Ω	128.000 Ω	126.610 Ω	128.666 Ω	128.666 Ω	0.5203%	129.390 Ω	PASS	0.0016 Ω

Channel 6

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
256 Ω	256.000 Ω	253.970 Ω	256.615 Ω	256.615 Ω	0.2402%	258.030 Ω	PASS	0.0031 Ω
512 Ω	512.000 Ω	508.690 Ω	512.952 Ω	512.952 Ω	0.1859%	515.310 Ω	PASS	0.0062 Ω
1024 Ω	1024.000 Ω	1018.130 Ω	1024.816 Ω	1024.816 Ω	0.0797%	1029.870 Ω	PASS	0.019 Ω
2048 Ω	2048.000 Ω	2037.010 Ω	2048.918 Ω	2048.918 Ω	0.0448%	2058.990 Ω	PASS	0.037 Ω
4096 Ω	4096.000 Ω	4074.770 Ω	4099.403 Ω	4099.403 Ω	0.0831%	4117.230 Ω	PASS	0.074 Ω
8192 Ω	8192.000 Ω	8150.290 Ω	8192.392 Ω	8192.392 Ω	0.0048%	8233.710 Ω	PASS	0.15 Ω
16384 Ω	16384.000 Ω	16300.000 Ω	16391.369 Ω	16391.369 Ω	0.0450%	16470.000 Ω	PASS	0.30 Ω
32768 Ω	32768.000 Ω	32600.000 Ω	32760.150 Ω	32760.150 Ω	0.0240%	32930.000 Ω	PASS	0.59 Ω

Jaf 12-Mar-19
JAFON AKBAYANI



Calibration Report of Geotest GX1164-01 Prog. Resistance Card

MPC Control #:	97014	Serial Number:	97014
Asset ID:	NA	Calibration Date:	March 5, 2019

Channel 7

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
1 Ω	1.000 Ω	0.245 Ω	1.687 Ω	1.687 Ω	68.7000%	1.755 Ω	PASS	0.000014 Ω
2 Ω	2.000 Ω	1.240 Ω	2.689 Ω	2.689 Ω	34.4500%	2.760 Ω	PASS	0.000028 Ω
4 Ω	4.000 Ω	3.230 Ω	4.686 Ω	4.686 Ω	17.1500%	4.770 Ω	PASS	0.000056 Ω
8 Ω	8.000 Ω	7.210 Ω	8.701 Ω	8.701 Ω	8.7625%	8.790 Ω	PASS	0.00012 Ω
16 Ω	16.000 Ω	15.170 Ω	16.688 Ω	16.688 Ω	4.3000%	16.830 Ω	PASS	0.00023 Ω
32 Ω	32.000 Ω	31.090 Ω	32.657 Ω	32.657 Ω	2.0531%	32.910 Ω	PASS	0.00045 Ω
64 Ω	64.000 Ω	62.930 Ω	64.666 Ω	64.666 Ω	1.0406%	65.070 Ω	PASS	0.00090 Ω
128 Ω	128.000 Ω	126.610 Ω	128.822 Ω	128.822 Ω	0.6422%	129.390 Ω	PASS	0.0016 Ω

Channel 8

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
256 Ω	256.000 Ω	253.970 Ω	256.587 Ω	256.587 Ω	0.2293%	258.030 Ω	PASS	0.0031 Ω
512 Ω	512.000 Ω	508.690 Ω	512.812 Ω	512.812 Ω	0.1586%	515.310 Ω	PASS	0.0062 Ω
1024 Ω	1024.000 Ω	1018.130 Ω	1024.797 Ω	1024.797 Ω	0.0778%	1029.870 Ω	PASS	0.019 Ω
2048 Ω	2048.000 Ω	2037.010 Ω	2048.439 Ω	2048.439 Ω	0.0214%	2058.990 Ω	PASS	0.037 Ω
4096 Ω	4096.000 Ω	4074.770 Ω	4097.690 Ω	4097.690 Ω	0.0413%	4117.230 Ω	PASS	0.074 Ω
8192 Ω	8192.000 Ω	8150.290 Ω	8195.431 Ω	8195.431 Ω	0.0419%	8233.710 Ω	PASS	0.15 Ω
16384 Ω	16384.000 Ω	16300.000 Ω	16385.793 Ω	16385.793 Ω	0.0109%	16470.000 Ω	PASS	0.30 Ω
32768 Ω	32768.000 Ω	32600.000 Ω	32765.863 Ω	32765.863 Ω	0.0545%	32930.000 Ω	PASS	0.59 Ω

Statements of Pass or Fail Conformance

The uncertainty of measurement has been taken into account when determining compliance with specification, as per ILAC-G8:03/2009.

All measurements and test results guard banded to ensure the probability of false-accept does not exceed 2% in compliance with ANSI/NCCL Z540.3-2006.

The status of compliance with the acceptance criteria is reported as:

- PASS** - Compliant with specification
- FAIL** - Not compliant with specification.
- FAIL²** - The measured value is not within the acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% is within the specified tolerance.
- PASS²** - The measured value is within acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% exceeds the specified tolerance.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

This calibration report complies with ISO/IEC 17025:2017 and ANSI/NCCL Z540.3 Method 6-Guard Bands based on Test Uncertainty Ratio.

- End of Calibration Report -

12-MAR-19
JASON AGRAN