



MICRO PRECISION CALIBRATION PTE LTD
BLOCK 5008 ANG MO KIO AVENUE 5 #07-02/03
TECHPLACE II SINGAPORE 569874
65 67484384



Certificate of Calibration

Date: April 29, 2020

Cert No. 551220083588369

Customer:

WATERS PACIFIC PTE LTD

1 SCIENCE PARK ROAD, #02-08 THE CAPRICORN
SINGAPORE SCIENCE PARK II
SINGAPORE 117528

Work Order #: SG-11014134

MPC Control #: IZ-BK-BA-000

Asset ID: 93181

Gage Type: PROG RESISTANCE CARD

Manufacturer: GEOTEST

Model Number: GX1164-01

Size: N/A

Temp/RH: 22°C / 50 %

Location: Calibration performed at MPC facility

Serial Number: IZ-BK-BA-000

Department: N/A

Performed By: DIVIEERNRAJ CHANDRAN

Received Condition: IN TOLERANCE

Returned Condition: IN TOLERANCE

Cal. Date: April 29, 2020

Cal. Interval: 24 MONTHS

Cal. Due Date: April 29, 2022

Calibration Notes:

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

Calibration performed for PT Surya Teknologi.

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
CA8284	MULTIMETER	3458A	2823A20603	HEWLETT PACKARD	Dec 27, 2020	551220083395109

Procedures Used in this Event

Procedure Name	Description
MPC-00015 Rev. 03	Resistors and Decade Resistors, General, rev03, Sep-27-2016

Calibrating Technician:

DIVIEERNRAJ CHANDRAN

QC Approval:

JUN CALIMAG

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/NCISL Z540.3-2006 and in case without guard banded the probability of false-accept depending on test uncertainty ratio.

THE CALIBRATION REPORT STATUS:

PASS- Term used when compliance statement is given, and the measurement result is PASS.

PASS²- Term used when compliance statement is given, and the measurement result is conditional passed or PASS².

FAIL- Term used when compliance statement is given, and the measurement result is FAIL.

FAIL²- Term used when compliance statement is given, and the measurement result is conditional failed or FAIL².

REPORT OF VALUE - Term used when reported measurement is not requiring compliance statement in report.

ADJUSTED- When adjustments are made to an instrument which changes the value of measurement from what was measured as found to new value as left.

LIMITED - When an instrument fails calibration but is still functional in a limited manner.

The expanded uncertainty of measurement is stated as the standard uncertainty 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/NCISL Z540.3. 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. 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. The information on this report pertains only to the instrument identified, this may not be reproduced in part or in a whole without the prior written approval of the issuing MP Calibration Laboratory.



Calibration Report of Geotest GX1164-01 Prog. Resistance Card

MPC Control #:	IZ-BK-BA-000	Serial Number:	IZ-BK-BA-000
Asset ID:	93181	Calibration Date:	April 29, 2020

Resistance Accuracy

Channel 1

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty ($\pm$)
1 Ω	1.000 Ω	0.245 Ω	1.008 Ω	1.008 Ω	76.2000%	1.755 Ω	PASS	0.000035 Ω
2 Ω	2.000 Ω	1.240 Ω	1.986 Ω	1.986 Ω	69.1000%	2.760 Ω	PASS	0.000018 Ω
4 Ω	4.000 Ω	3.230 Ω	4.019 Ω	4.019 Ω	46.5500%	4.770 Ω	PASS	0.000046 Ω
8 Ω	8.000 Ω	7.210 Ω	8.009 Ω	8.009 Ω	11.4500%	8.790 Ω	PASS	0.00011 Ω
16 Ω	16.000 Ω	15.170 Ω	16.063 Ω	16.063 Ω	39.2062%	16.830 Ω	PASS	0.00022 Ω
32 Ω	32.000 Ω	31.090 Ω	32.024 Ω	32.024 Ω	7.4281%	32.910 Ω	PASS	0.00044 Ω
64 Ω	64.000 Ω	62.930 Ω	63.868 Ω	63.868 Ω	20.5687%	65.070 Ω	PASS	0.00089 Ω
128 Ω	128.000 Ω	126.610 Ω	127.967 Ω	127.967 Ω	2.5469%	129.390 Ω	PASS	0.0016 Ω

Channel 2

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty ($\pm$)
256 Ω	256.000 Ω	253.970 Ω	256.154 Ω	256.154 Ω	6.0234%	258.030 Ω	PASS	0.0031 Ω
512 Ω	512.000 Ω	508.690 Ω	513.245 Ω	513.245 Ω	24.3105%	515.310 Ω	PASS	0.0062 Ω
1024 Ω	1024.000 Ω	1018.130 Ω	1023.933 Ω	1023.933 Ω	0.6543%	1029.870 Ω	PASS	0.013 Ω
2048 Ω	2048.000 Ω	2037.010 Ω	2048.006 Ω	2048.006 Ω	0.0293%	2058.990 Ω	PASS	0.025 Ω
4096 Ω	4096.000 Ω	4074.770 Ω	4097.704 Ω	4097.704 Ω	4.1602%	4117.230 Ω	PASS	0.049 Ω
8192 Ω	8192.000 Ω	8150.290 Ω	8196.254 Ω	8196.254 Ω	5.1929%	8233.710 Ω	PASS	0.098 Ω
16384 Ω	16384.000 Ω	16300.000 Ω	16399.470 Ω	16399.470 Ω	9.4421%	16470.000 Ω	PASS	0.20 Ω
32768 Ω	32768.000 Ω	32600.000 Ω	32767.850 Ω	32767.850 Ω	0.0458%	32930.000 Ω	PASS	0.40 Ω

Channel 3

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty ($\pm$)
1 Ω	1.000 Ω	0.245 Ω	0.999 Ω	0.999 Ω	5.4000%	1.755 Ω	PASS	0.000035 Ω
2 Ω	2.000 Ω	1.240 Ω	1.983 Ω	1.983 Ω	83.9000%	2.760 Ω	PASS	0.000018 Ω
4 Ω	4.000 Ω	3.230 Ω	4.000 Ω	4.000 Ω	0.3500%	4.770 Ω	PASS	0.000046 Ω
8 Ω	8.000 Ω	7.210 Ω	8.008 Ω	8.008 Ω	10.5250%	8.790 Ω	PASS	0.00011 Ω
16 Ω	16.000 Ω	15.170 Ω	16.047 Ω	16.047 Ω	29.6625%	16.830 Ω	PASS	0.00022 Ω
32 Ω	32.000 Ω	31.090 Ω	32.034 Ω	32.034 Ω	10.7031%	32.910 Ω	PASS	0.00044 Ω
64 Ω	64.000 Ω	62.930 Ω	63.855 Ω	63.855 Ω	22.6328%	65.070 Ω	PASS	0.00089 Ω
128 Ω	128.000 Ω	126.610 Ω	128.230 Ω	128.230 Ω	17.9922%	129.390 Ω	PASS	0.0016 Ω



Calibration Report of Geotest GX1164-01 Prog. Resistance Card

MPC Control #: <u>IZ-BK-BA-000</u>	Serial Number: <u>IZ-BK-BA-000</u>
Asset ID: <u>93181</u>	Calibration Date: <u>April 29, 2020</u>

Channel 4

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
256 Ω	256.000 Ω	253.970 Ω	256.468 Ω	256.468 Ω	18.2891%	258.030 Ω	PASS	0.0031 Ω
512 Ω	512.000 Ω	508.690 Ω	513.405 Ω	513.405 Ω	27.4375%	515.310 Ω	PASS	0.0062 Ω
1024 Ω	1024.000 Ω	1018.130 Ω	1023.767 Ω	1023.767 Ω	2.2754%	1029.870 Ω	PASS	0.013 Ω
2048 Ω	2048.000 Ω	2037.010 Ω	2048.431 Ω	2048.431 Ω	2.1045%	2058.990 Ω	PASS	0.025 Ω
4096 Ω	4096.000 Ω	4074.770 Ω	4096.156 Ω	4096.156 Ω	0.3809%	4117.230 Ω	PASS	0.049 Ω
8192 Ω	8192.000 Ω	8150.290 Ω	8197.787 Ω	8197.787 Ω	7.0642%	8233.710 Ω	PASS	0.098 Ω
16384 Ω	16384.000 Ω	16300.000 Ω	16387.730 Ω	16387.730 Ω	2.2766%	16470.000 Ω	PASS	0.20 Ω
32768 Ω	32768.000 Ω	32600.000 Ω	32774.560 Ω	32774.560 Ω	2.0020%	32930.000 Ω	PASS	0.40 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	1.000 Ω	1.000 Ω	3.6000%	1.755 Ω	PASS	0.000035 Ω
2 Ω	2.000 Ω	1.240 Ω	1.983 Ω	1.983 Ω	83.5000%	2.760 Ω	PASS	0.000018 Ω
4 Ω	4.000 Ω	3.230 Ω	4.018 Ω	4.018 Ω	44.8500%	4.770 Ω	PASS	0.000046 Ω
8 Ω	8.000 Ω	7.210 Ω	8.009 Ω	8.009 Ω	11.2250%	8.790 Ω	PASS	0.00011 Ω
16 Ω	16.000 Ω	15.170 Ω	16.035 Ω	16.035 Ω	21.8875%	16.830 Ω	PASS	0.00022 Ω
32 Ω	32.000 Ω	31.090 Ω	32.042 Ω	32.042 Ω	12.9906%	32.910 Ω	PASS	0.00044 Ω
64 Ω	64.000 Ω	62.930 Ω	64.110 Ω	64.110 Ω	17.1953%	65.070 Ω	PASS	0.00089 Ω
128 Ω	128.000 Ω	126.610 Ω	127.937 Ω	127.937 Ω	4.9062%	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	256.025 Ω	256.025 Ω	0.9766%	258.030 Ω	PASS	0.0031 Ω
512 Ω	512.000 Ω	508.690 Ω	513.404 Ω	513.404 Ω	27.4258%	515.310 Ω	PASS	0.0062 Ω
1024 Ω	1024.000 Ω	1018.130 Ω	1023.658 Ω	1023.658 Ω	3.3398%	1029.870 Ω	PASS	0.013 Ω
2048 Ω	2048.000 Ω	2037.010 Ω	2048.040 Ω	2048.040 Ω	0.1953%	2058.990 Ω	PASS	0.025 Ω
4096 Ω	4096.000 Ω	4074.770 Ω	4098.744 Ω	4098.744 Ω	6.6992%	4117.230 Ω	PASS	0.049 Ω
8192 Ω	8192.000 Ω	8150.290 Ω	8192.951 Ω	8192.951 Ω	1.1609%	8233.710 Ω	PASS	0.098 Ω
16384 Ω	16384.000 Ω	16300.000 Ω	16384.580 Ω	16384.580 Ω	0.3540%	16470.000 Ω	PASS	0.20 Ω
32768 Ω	32768.000 Ω	32600.000 Ω	32799.350 Ω	32799.350 Ω	9.5673%	32930.000 Ω	PASS	0.40 Ω



Calibration Report of Geotest GX1164-01 Prog. Resistance Card

MPC Control #:	IZ-BK-BA-000	Serial Number:	IZ-BK-BA-000
Asset ID:	93181	Calibration Date:	April 29, 2020

Channel 7

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty ($\pm$)
1 Ω	1.000 Ω	0.245 Ω	0.992 Ω	0.992 Ω	77.2000%	1.755 Ω	PASS	0.0000035 Ω
2 Ω	2.000 Ω	1.240 Ω	1.988 Ω	1.988 Ω	62.3500%	2.760 Ω	PASS	0.000018 Ω
4 Ω	4.000 Ω	3.230 Ω	4.000 Ω	4.000 Ω	0.1500%	4.770 Ω	PASS	0.000046 Ω
8 Ω	8.000 Ω	7.210 Ω	8.005 Ω	8.005 Ω	6.5250%	8.790 Ω	PASS	0.00011 Ω
16 Ω	16.000 Ω	15.170 Ω	16.045 Ω	16.045 Ω	28.0938%	16.830 Ω	PASS	0.00022 Ω
32 Ω	32.000 Ω	31.090 Ω	32.044 Ω	32.044 Ω	13.8125%	32.910 Ω	PASS	0.00044 Ω
64 Ω	64.000 Ω	62.930 Ω	63.953 Ω	63.953 Ω	7.3703%	65.070 Ω	PASS	0.00089 Ω
128 Ω	128.000 Ω	126.610 Ω	128.001 Ω	128.001 Ω	0.0391%	129.390 Ω	PASS	0.0016 Ω

Channel 8

Function Tested	Nominal	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty ($\pm$)
256 Ω	256.000 Ω	253.970 Ω	256.281 Ω	256.281 Ω	10.9805%	258.030 Ω	PASS	0.0031 Ω
512 Ω	512.000 Ω	508.690 Ω	512.385 Ω	512.385 Ω	7.5215%	515.310 Ω	PASS	0.0062 Ω
1024 Ω	1024.000 Ω	1018.130 Ω	1023.740 Ω	1023.740 Ω	2.5391%	1029.870 Ω	PASS	0.013 Ω
2048 Ω	2048.000 Ω	2037.010 Ω	2048.512 Ω	2048.512 Ω	2.5000%	2058.990 Ω	PASS	0.025 Ω
4096 Ω	4096.000 Ω	4074.770 Ω	4098.982 Ω	4098.982 Ω	7.2803%	4117.230 Ω	PASS	0.049 Ω
8192 Ω	8192.000 Ω	8150.290 Ω	8192.536 Ω	8192.536 Ω	0.6543%	8233.710 Ω	PASS	0.098 Ω
16384 Ω	16384.000 Ω	16300.000 Ω	16381.260 Ω	16381.260 Ω	1.6724%	16470.000 Ω	PASS	0.20 Ω
32768 Ω	32768.000 Ω	32600.000 Ω	32792.220 Ω	32792.220 Ω	7.3914%	32930.000 Ω	PASS	0.40 Ω

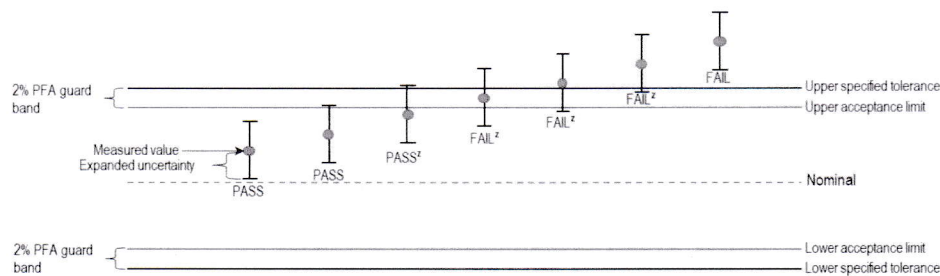
Statements of Pass or Fail Conformance

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.
- FAIL^z** - 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.
- PASS^z** - The measured value is within acceptance limits. However, a portion of the expanded uncertainty of measurement at 95% exceeds the specified tolerance.



Acceptance limits for $\leq 2\%$ probability of false accept (PFA) guard band

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 -