



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



Certificate of Calibration

Date: Nov 15, 2017

Cert No. 512200813117345

Customer:

GES SINGAPORE PTE LTD
28 MARSILING LANE
SINGAPORE 739152

Work Order #: SG-11006755

MPC Control #: 7312754
Asset ID: N/A
Gage Type: ELECTRICAL SAFETY ANALYZER
Manufacturer: QUADTECH
Model Number: GUARDIAN 6000
Size: N/A
Temp/RH: 21.2°C / 42.0%
Location: Calibration performed at MPC facility

Serial Number: 7312754
Department: N/A
Performed By: STEVEN CHOO
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: November 15, 2017
Cal. Interval: 12 MONTHS
Cal. Due Date: November 15, 2018

Calibration Notes:

Please refer to the attached calibration data. (3 pages)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AP4205	MULTIMETER	3458A	2823A17096	HEWLETT PACKARD	Aug 10, 2018	512200812551609
CH2324	CURRENT SHUNT	34330A	0804	AGILENT	Sep 7, 2018	512200813018499
CH4975	HIGH RESISTANCE DECADE BOX	N/A	N/A	N/A	Aug 24, 2018	512200812995468
CH2775	SYNTHESIZED FUNCTION GENERATOR	3325B	2847A09652	HEWLETT PACKARD	Nov 28, 2017	1-8355234963-1
CN2593	UNIVERSAL COUNTER	53132A	KR91200136	HEWLETT PACKARD	Mar 7, 2018	512200812749000
CA8100	DECADE RESISTANCE BOX	2793	00060U	YOKOGAWA	May 26, 2018	512200812859599
DD2799	PRECISION HV METER	4700	019419	VITREK	Dec 4, 2017	222008122796840

Procedures Used in this Event

Procedure Name
QUADTECH 6000

Description
Electrical Safety Analyzer Instruction Manual, Form 150354A

Calibrating Technician:

STEVEN CHOO

QC Approval:

GARLO DOMINGO

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 17025:2005, ANSI/NCSL Z540-1-1994, ANSI/NCSL 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.

TAN H.C.
24/NOV/17

Quadtech Guardian 6000 Electrical Safety Analyzer

Procedure: QUADTECH 6000
ID Number: 7312754
Asset Number: N/A

Order Number: SG-11006755
Serial Number: 7312754
Calibration Date: Nov 15, 2017

AC Voltage Accuracy (@60 Hz)

Range	Nominal Value	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
0.5 to 5 kV	1.000 kV	0.985 kV	0.996 kV	0.996 kV	0.40 %	1.015 kV	PASS	0.0012 kV
0.5 to 5 kV	2.000 kV	1.975 kV	1.993 kV	1.993 kV	0.35 %	2.025 kV	PASS	0.00060 kV
0.5 to 5 kV	3.000 kV	2.965 kV	2.989 kV	2.989 kV	0.37 %	3.035 kV	PASS	0.00060 kV
0.5 to 5 kV	4.000 kV	3.955 kV	3.986 kV	3.986 kV	0.35 %	4.045 kV	PASS	0.00060 kV
0.5 to 5 kV	5.000 kV	4.945 kV	4.985 kV	4.985 kV	0.30 %	5.055 kV	PASS	0.00060 kV

DC Voltage Accuracy

Range	Nominal Value	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
0.5 to 6 kV	1.000 kV	0.985 kV	0.993 kV	0.993 kV	0.70 %	1.015 kV	PASS	0.0025 kV
0.5 to 6 kV	2.000 kV	1.975 kV	1.989 kV	1.989 kV	0.55 %	2.025 kV	PASS	0.0048 kV
0.5 to 6 kV	3.000 kV	2.965 kV	2.989 kV	2.989 kV	0.37 %	3.035 kV	PASS	0.0072 kV
0.5 to 6 kV	4.000 kV	3.955 kV	3.984 kV	3.984 kV	0.40 %	4.045 kV	PASS	0.010 kV
0.5 to 6 kV	5.000 kV	4.945 kV	4.985 kV	4.985 kV	0.30 %	5.055 kV	PASS	0.012 kV
0.5 to 6 kV	6.000 kV	5.935 kV	5.983 kV	5.983 kV	0.28 %	6.065 kV	PASS	0.014 kV

AC Current Accuracy (@60 Hz)

Range	Nominal Value	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
1 µA to 40 mA	0.500 mA	0.490 mA	0.495 mA	0.495 mA	1.00 %	0.510 mA	PASS	0.00059 mA
1 µA to 40 mA	1.000 mA	0.985 mA	0.992 mA	0.992 mA	0.80 %	1.015 mA	PASS	0.00063 mA
1 µA to 40 mA	2.000 mA	1.975 mA	1.987 mA	1.987 mA	0.65 %	2.025 mA	PASS	0.00074 mA
1 µA to 40 mA	5.000 mA	4.945 mA	4.984 mA	4.984 mA	0.32 %	5.055 mA	PASS	0.0017 mA
1 µA to 40 mA	10.000 mA	9.895 mA	9.968 mA	9.968 mA	0.32 %	10.105 mA	PASS	0.0027 mA
1 µA to 40 mA	20.00 mA	19.75 mA	19.83 mA	19.83 mA	0.85 %	20.25 mA	PASS	0.0074 mA
1 µA to 40 mA	35.00 mA	34.60 mA	34.81 mA	34.81 mA	0.54 %	35.40 mA	PASS	0.014 mA



Quadtech Guardian 6000 Electrical Safety Analyzer

Procedure: QUADTECH 6000
 ID Number: 7312754
 Asset Number: N/A

Order Number: SG-11006755
 Serial Number: 7312754
 Calibration Date: Nov 15, 2017

DC Current Accuracy

Range	Nominal Value	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
0.1 µA to 20 mA	0.200 mA	0.193 mA	0.198 mA	0.198 mA	1.00 %	0.207 mA	PASS	0.00057 mA
0.1 µA to 20 mA	0.500 mA	0.490 mA	0.497 mA	0.497 mA	0.60 %	0.510 mA	PASS	0.00057 mA
0.1 µA to 20 mA	1.000 mA	0.985 mA	0.998 mA	0.998 mA	0.20 %	1.015 mA	PASS	0.00057 mA
0.1 µA to 20 mA	2.000 mA	1.975 mA	2.007 mA	2.007 mA	0.35 %	2.025 mA	PASS	0.00058 mA
0.1 µA to 20 mA	5.000 mA	4.945 mA	5.011 mA	5.011 mA	0.22 %	5.055 mA	PASS	0.00065 mA
0.1 µA to 20 mA	10.000 mA	9.895 mA	10.014 mA	10.014 mA	0.14 %	10.105 mA	PASS	0.00082 mA
0.1 µA to 20 mA	15.00 mA	14.80 mA	15.07 mA	15.07 mA	0.47 %	15.20 mA	PASS	0.0057 mA

Insulation DC Voltage Accuracy

Function Tested	Nominal Value	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
0.500 kV	0.500 kV	0.490 kV	0.495 kV	0.495 kV	1.00 %	0.510 kV	PASS	0.0013 kV
1.000 kV	1.000 kV	0.985 kV	0.989 kV	0.989 kV	1.10 %	1.015 kV	PASS	0.0025 kV

Insulation Resistance Accuracy

Voltage Setting	Nominal Value	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
500 V	1.00 MΩ	0.85 MΩ	1.02 MΩ	1.02 MΩ	2.00 %	1.15 MΩ	PASS	0.0057 MΩ
500 V	10.00 MΩ	9.45 MΩ	10.12 MΩ	10.12 MΩ	1.20 %	10.55 MΩ	PASS	0.0057 MΩ
500 V	100.0 MΩ	94.5 MΩ	100.1 MΩ	100.1 MΩ	0.10 %	105.5 MΩ	PASS	0.059 MΩ
500 V	1000 MΩ	895 MΩ	990 MΩ	990 MΩ	1.00 %	1105 MΩ	PASS	0.59 MΩ
500 V	10.00 GΩ	8.45 GΩ	9.77 GΩ	9.77 GΩ	2.30 %	11.55 GΩ	PASS	0.013 GΩ
1000 V	1.00 MΩ	0.85 MΩ	0.98 MΩ	0.98 MΩ	2.00 %	1.15 MΩ	PASS	0.0057 MΩ
1000 V	10.00 MΩ	9.45 MΩ	10.11 MΩ	10.11 MΩ	1.10 %	10.55 MΩ	PASS	0.0057 MΩ
1000 V	100.0 MΩ	94.5 MΩ	100.8 MΩ	100.8 MΩ	0.80 %	105.5 MΩ	PASS	0.059 MΩ
1000 V	1000 MΩ	895 MΩ	994 MΩ	994 MΩ	0.60 %	1105 MΩ	PASS	0.59 MΩ
1000 V	10.00 GΩ	8.45 GΩ	9.85 GΩ	9.85 GΩ	1.50 %	11.55 GΩ	PASS	0.013 GΩ

Ground Bond AC Current Accuracy

Function Tested	Nominal Value	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
5.000 A	5.000 A	4.947 A	5.014 A	5.014 A	0.28 %	5.053 A	PASS	0.0073 A
10.000 A	10.000 A	9.897 A	10.013 A	10.013 A	0.13 %	10.103 A	PASS	0.014 A
15.00 A	15.00 A	14.82 A	14.98 A	14.98 A	0.13 %	15.18 A	PASS	0.022 A
20.00 A	20.00 A	19.77 A	19.97 A	19.97 A	0.15 %	20.23 A	PASS	0.029 A
25.00 A	25.00 A	24.72 A	24.94 A	24.94 A	0.24 %	25.28 A	PASS	0.036 A
30.00 A	30.00 A	29.67 A	29.93 A	29.93 A	0.23 %	30.33 A	PASS	0.043 A



Quadtech Guardian 6000 Electrical Safety Analyzer

Procedure: QUADTECH 6000
ID Number: 7312754
Asset Number: N/A

Order Number: SG-11006755
Serial Number: 7312754
Calibration Date: Nov 15, 2017

Resistance Accuracy

Function Tested	Nominal Value	Lower Limit	As Found	As Left	Error	Upper Limit	Result	Uncertainty (±)
@ 25 A	100.0 mΩ	98.7 mΩ	99.5 mΩ	99.5 mΩ	0.50 %	101.3 mΩ	PASS	0.15 mΩ

Timer Accuracy Check

Nominal Value	As Found	As Left	Error	Uncertainty (±)
5.00 s	5.00 s	5.00 s	0.00 %	0.14 s
10.00 s	10.00 s	10.00 s	0.00 %	0.14 s

QUADTECH GUARDIAN 6000 SETUP RECORD

ID Number: 91356 (7312754)

Performed By: Chua Chong Keong

Date: Nov 28, 2017

Memory 1: 12345678			
	PARAMETER	VALUE	SETTING
Step 1	Mode	GR	GR
	Current	20.00A	20.00A
	High Limit	100.0mΩ	100.0mΩ
	Low Limit	Disable	Disable
	Test Time	3.0s	3.0s
Step 2	Mode	WDC	WDC
	Voltage	2.121 kV	2.121kV
	High Limit	5.00mA	5.00mA
	Low Limit	Disable	Disable
	Arc Limit	Disable	Disable
	Test Time	3.0s	3.0s
	Ramp Time	2.0s	2.0s

Key Lock locked ☒ (Key Lock LED illuminated)

Program displayed: M01 (M01)

Approved by:

Performer: Chua Chong Keong

Date: Nov 28, 2017

Verified By: Test Engineering

Name: Loo Kok Leong

Title: Section Manager

Signature: [Signature]

Date: Nov 28, 2017

End User Approval: Manufacturing Technician

Name: Goh Siew T. n

Title: Technician

Signature: [Signature]

Date: Nov 28, 2017