



Certificate of Calibration

Certificate Number 1-12507910961-1

Model Number 236
Manufacturer Keithley Instruments Inc
Description Multimeter
Serial Number 0549819

Date of Calibration 20 Apr 2020
Procedure DOC-50320033-A.01.01-T119Q8Q
Temperature (23 ± 5) °C
Humidity (50 ± 20) %RH

Customer
GES Singapore Pte Ltd
28 Marsiling Ln
GES Bldg
SINGAPORE 739152
Singapore

Location of Calibration
Keysight Technologies Singapore (Sales) Pte. Ltd.
1 Yishun Avenue 7
Registration No:201400782D
Singapore 768923
SINGAPORE

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures in compliance with a quality management system registered to ISO 9001:2015.

This calibration report is composed of a certificate of calibration and measurement report.

As Received Conditions

The measured values of the equipment were observed in specification at the points tested.

Action Taken

- No corrective actions were necessary.

As Completed Conditions

The measured values of the equipment were observed in specification at the points tested.

Keysight considers the uncertainties of measurements during the development of performance tests. In this report, conformance statements of "Passed" or "Failed" are determined by simple comparison of observed measurements to the warranted specifications.

Remarks or Special Requirements

This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.
This calibration report may refer to equipment manufactured by HP, Agilent and Keysight as being manufactured by Keysight Technologies.

Based on the customer's request, the next calibration is due on 20 Apr 2021.

Keysight Technologies Singapore (Sales)
Pte. Ltd.
1 Yishun Avenue 7
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Low Kwee Seah, Service Centre Manager

Issue Date 20 Apr 2020

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Traceability Information

Technician ID Number N5249752

Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Calibration Equipment Used

Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
16353A	Standard resistor set for calibrating 4155/56/4070	16353A00105	8 Apr 2021	1-11093775545-1
3458A	Digital multimeter, 8.5 digit	3458A12095	2 Apr 2021	1-12398448475-1
5730A	High Performance Multifunction Calibrator	5730A75501	30 Aug 2020	1-11339725328-1

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COMMON MODE VERIFICATION

Measure Range	Minimum	Measured	Maximum	
1.1 V	-	0.00 uV	150.00 uV	Pass

VOLTAGE SOURCE VERIFICATION

Source Range	Output Voltage	Minimum	Measured	Maximum	
1.1 V	0 V	-0.6500 mV	-0.1926 mV	0.6500 mV	Pass
11 V	0 V	-2.4000 mV	0.0967 mV	2.4000 mV	Pass
110 V	0 V	-24.0000 mV	0.3593 mV	24.0000 mV	Pass
1.1 V	1 V	0.999020 V	0.999754 V	1.000980 V	Pass
1.1 V	-1 V	-1.000980 V	-1.000077 V	-0.999020 V	Pass
11 V	10 V	9.99430 V	9.99995 V	10.00570 V	Pass
11 V	-10 V	-10.00570 V	-10.00034 V	-9.99430 V	Pass
110 V	100 V	99.9430 V	100.0010 V	100.0570 V	Pass
110 V	-100 V	-100.0570 V	-100.0004 V	-99.9430 V	Pass

VOLTAGE MEASURE VERIFICATION

Measure Range	Input Voltage	Minimum	Measured	Maximum	
1.1 V	0 V	-0.000650 V	-0.000020 V	0.000650 V	Pass
11 V	0 V	-0.00240 V	0.00000 V	0.00240 V	Pass
110 V	0 V	-0.0240 V	0.0000 V	0.0240 V	Pass
1.1 V	1 V	0.999020 V	0.999930 V	1.000980 V	Pass
1.1 V	-1 V	-1.000980 V	-0.999990 V	-0.999020 V	Pass
11 V	10 V	9.99430 V	9.99980 V	10.00570 V	Pass
11 V	-10 V	-10.00570 V	-9.99970 V	-9.99430 V	Pass
110 V	100 V	99.9430 V	99.9960 V	100.0570 V	Pass
110 V	-100 V	-100.0570 V	-99.9950 V	-99.9430 V	Pass

REMOTE SENSE VERIFICATION

Source Range	Output Voltage	Minimum	Measured	Maximum	
11 V	10 V	9.995000 V	9.999774 V	10.005000 V	Pass

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RICKY CORREZ
24/04/20

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CURRENT SOURCE (1nA to 100uA Range) VERIFICATION

Source Range	Output Current	Minimum	Measured	Maximum	
1 nA	0 nA	-0.45000 pA	-0.06850 pA	0.45000 pA	Pass
10 nA	0 nA	-2.0000 pA	0.2051 pA	2.0000 pA	Pass
100 nA	0 nA	-20.000 pA	-5.070 pA	20.000 pA	Pass
1 uA	0 nA	-200.00 pA	-53.36 pA	200.00 pA	Pass
10 uA	0 nA	-2.0000 nA	-0.5619 nA	2.0000 nA	Pass
100 uA	0 nA	-20.000 nA	-6.051 nA	20.000 nA	Pass
1 nA	0.9 nA	0.8969 nA	0.9000 nA	0.9032 nA	Pass
1 nA	-0.9 nA	-0.9032 nA	-0.9000 nA	-0.8969 nA	Pass
10 nA	9 nA	8.971 nA	8.999 nA	9.029 nA	Pass
10 nA	-9 nA	-9.029 nA	-8.999 nA	-8.971 nA	Pass
100 nA	90 nA	89.79 nA	90.01 nA	90.21 nA	Pass
100 nA	-90 nA	-90.21 nA	-90.02 nA	-89.79 nA	Pass
1 uA	0.9 uA	0.8993 uA	0.9000 uA	0.9007 uA	Pass
1 uA	-0.9 uA	-0.9007 uA	-0.9001 uA	-0.8993 uA	Pass
10 uA	9 uA	8.993 uA	9.000 uA	9.007 uA	Pass
10 uA	-9 uA	-9.007 uA	-9.001 uA	-8.993 uA	Pass
100 uA	90 uA	89.94 uA	90.00 uA	90.06 uA	Pass
100 uA	-90 uA	-90.06 uA	-90.00 uA	-89.94 uA	Pass

CURRENT SOURCE (1mA to 100mA Range) VERIFICATION

Source Range	Output Current	Minimum	Measured	Maximum	
1 mA	0 mA	-200.00 nA	-61.25 nA	200.00 nA	Pass
10 mA	0 mA	-2.0000 uA	-0.6738 uA	2.0000 uA	Pass
100 mA	0 mA	-20.000 uA	-4.990 uA	20.000 uA	Pass
1 mA	0.9 mA	899.35 uA	900.03 uA	900.65 uA	Pass
1 mA	-0.9 mA	-0.9007 mA	-0.9001 mA	-0.8993 mA	Pass
10 mA	9 mA	8.9935 mA	9.0001 mA	9.0065 mA	Pass
10 mA	-9 mA	-9.007 mA	-9.001 mA	-8.994 mA	Pass
100 mA	90 mA	89.890 mA	89.997 mA	90.110 mA	Pass
100 mA	-90 mA	-90.11 mA	-90.00 mA	-89.89 mA	Pass

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CURRENT MEASURE (1nA to 100uA Range) VERIFICATION

Measure Range	Input Current	Minimum	Measured	Maximum	
1 nA	0.0000 nA	-0.00010 nA	0.00002 nA	0.00010 nA	Pass
10 nA	0.000 nA	-0.0010 nA	0.0000 nA	0.0010 nA	Pass
100 nA	0.00 nA	-0.006 nA	0.000 nA	0.006 nA	Pass
1 uA	0.0000 uA	-0.00006 uA	0.00000 uA	0.00006 uA	Pass
10 uA	0.000 uA	-0.0007 uA	0.0000 uA	0.0007 uA	Pass
100 uA	0.00 uA	-0.006 uA	0.000 uA	0.006 uA	Pass
1 nA	0.9000 nA	0.89720 nA	0.89980 nA	0.90280 nA	Pass
1 nA	-0.9000 nA	-0.90280 nA	-0.90010 nA	-0.89720 nA	Pass
10 nA	9.000 nA	8.9720 nA	9.0011 nA	9.0280 nA	Pass
10 nA	-9.000 nA	-9.0280 nA	-9.0043 nA	-8.9720 nA	Pass
100 nA	90.00 nA	89.805 nA	89.965 nA	90.195 nA	Pass
100 nA	-90.00 nA	-90.195 nA	-90.007 nA	-89.805 nA	Pass
1 uA	0.9000 uA	0.89958 uA	0.89974 uA	0.90042 uA	Pass
1 uA	-0.9000 uA	-0.90042 uA	-0.90015 uA	-0.89958 uA	Pass
10 uA	9.000 uA	8.9962 uA	8.9977 uA	9.0038 uA	Pass
10 uA	-9.000 uA	-9.0038 uA	-9.0018 uA	-8.9962 uA	Pass
100 uA	90.00 uA	89.963 uA	89.996 uA	90.037 uA	Pass
100 uA	-90.00 uA	-90.037 uA	-90.003 uA	-89.963 uA	Pass

CURRENT MEASURE (1mA to 100mA Range) VERIFICATION

Measure Range	Input Current	Minimum	Measured	Maximum	
1 mA	0.00000 mA	-0.000060 mA	0.000000 mA	0.000060 mA	Pass
10 mA	0.0000 mA	-0.00060 mA	0.000000 mA	0.00060 mA	Pass
100 mA	0.000 mA	-0.0060 mA	0.000000 mA	0.0060 mA	Pass
1 mA	0.90000 mA	0.899625 mA	0.899920 mA	0.900375 mA	Pass
1 mA	-0.90000 mA	-0.900375 mA	-0.899960 mA	-0.899625 mA	Pass
10 mA	9.0000 mA	8.99598 mA	8.99940 mA	9.00402 mA	Pass
10 mA	-9.0000 mA	-9.00402 mA	-8.99960 mA	-8.99598 mA	Pass
100 mA	90.000 mA	89.9040 mA	89.9980 mA	90.0960 mA	Pass
100 mA	-90.000 mA	-90.0960 mA	-90.0000 mA	-89.9040 mA	Pass

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24/04/20