

# Certificate of Calibration



ANSI/NCSL Z540.1-1994 (R2002)

Certificate Number 1-7542126049-1

<b>Model Number</b>	34401A	<b>Customer</b>	Keysight Technologies Taiwan Ltd
<b>Manufacturer</b>	Keysight Technologies Inc		324 PINGZHEN
<b>Description</b>	Digital multimeter, 6.5 digit		20 Kao Shuang Rd
<b>Serial Number</b>	US36021450		D400 Service Center
<b>Customer Asset No.</b>	34401A1450		Taiwan
<b>Date of Calibration</b>	17 Dec 2015	<b>Location of Calibration</b>	Keysight Technologies Taiwan Ltd.
<b>Procedure</b>	STE-50111013-D.01.01		Taiwan 32450 Ping-Chen
<b>Temperature</b>	(23 ± 3) °C		Support Solution Unit
<b>Humidity</b>	(50 ± 20) %RH		No.20,Kao-Shuang Road
			Taiwan

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ANSI/NCSL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2008.

This calibration report is composed of a certificate of calibration, performance test results and/or certificate appendices. Each report section is numbered separately.

#### 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.

Reported uncertainties are calculated at a 95% confidence interval with a coverage factor of 2 (k=2). When not specifically called out in the measurement report, a Test Uncertainty Ratio (TUR) of 4:1 can be assumed.

#### Remarks or Special Requirements

This calibration certificate may reference instruments manufactured by HP, Agilent and Keysight as being manufactured by Keysight Technologies, Inc.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Based on the customer's request, the next calibration is due on 17 Dec 2016.

Keysight Technologies Taiwan Ltd.  
Taiwan 32450 Ping-Chen  
Support Solution Unit  
No.20,Kao-Shuang Road  
Taiwan

A handwritten signature in black ink, appearing to read "Chen Chin-Ming".

Chen Chin-Ming Approved - LAB Head

# Certificate of Calibration



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## Traceability Information

Technician ID Number 00808778

Measurements are traceable to the International System of Units (SI) via national metrology institutes (e.g., NIST, NPL, PTB, NMIJ, NRC, KRISS, SIRIM, etc.) that are signatories to the CIPM Mutual Recognition Arrangement.

This certificate shall not be reproduced, except in full, without prior written approval of the laboratory.

## Calibration Equipment Used

<u>Model Number</u>	<u>Model Description</u>	<u>Equipment ID</u>	<u>Cal Due Date</u>	<u>Certificate Number</u>
33250A	Function/Arbitrary Waveform Generator, 80 MHz	33250A14005	17 Sep 2016	1-7225595906-1
5720A	Calibrator	FLU5720A204	12 Feb 2016	1-6294771762-1
5725A	Amplifier	FLU5725A002	12 Feb 2016	1-6294963653-1

**Model Number** 34401A (HWP 34401A)  
**Manufacturer** Hewlett Packard Co  
**Serial Number** US36021450  
**Customer Asset No.** 34401A1450

**Test Date** 17 Dec 2015  
**Temperature** (23±3) °C  
**Humidity** (30 to 70) %RH

**Test Program Name** HP34401A, 5011-1013  
**Test Program Version** D.01.01  
**Test Executive** STE/9000, C.08.90W  
**Test Subsystem** MENDOR, B.06.34

**Customer**  
Keysight Technologies Taiwan Ltd

**Location of Calibration**  
KEYSIGHT TECHNOLOGIES SINGAPORE  
(SALES) PTE. LTD.  
Registration Number : 201400782D  
NO. 1 Yishun Ave 7, Singapore 768923.  
FAX : 68228216

**Note:** Traceability information can be found on the calibration certificate.

## Compliance with Specification

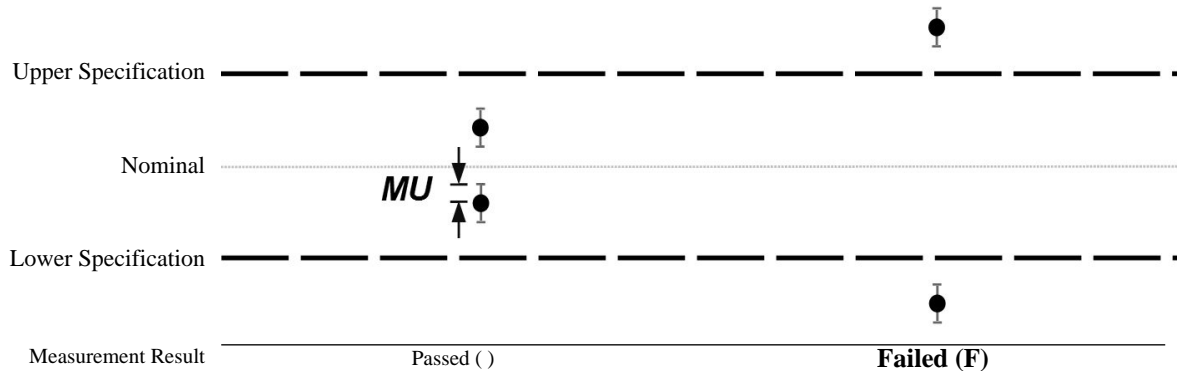
Measured values of the equipment that were observed in specification at the points tested are determined to have Passed ( ). Measured values of the equipment that were observed out of specification at the points tested are determined to have Failed (F).

An overall statement of compliance for all tests performed as received, and as completed (if any adjustments / repairs were performed) is included at the beginning of this report. Statements of compliance apply only to warranted specifications. When functional verification tests are performed, results are reported in the “Functional Test” section, and do not affect these statements of compliance.

The status summaries relate to the tested item only. A final decision about whether the item's performance actually satisfies requirements of the user can only be made by the user.

### Measurement results are reported as:

- Passed ( ) - The measured values of the equipment were observed in specification at the points tested.
- Failed (F) - One or more measured values of the equipment were observed out of specification at the points tested.



( ) This result is indicated on the measurement report as a blank space in the column labeled “Status” or “Sts”.  
 MU = 95% expanded measurement uncertainty.

## Uncertainty of Measurement

Uncertainties are calculated at a 95% confidence interval with a coverage factor of 2 (k=2). When not specifically called out in the measurement report, a Test Uncertainty Ratio (TUR) of 4:1 can be assumed.

## Performance Test Results Summary

<u>Test Name</u>	<u>As Received Status</u>
ZERO OFFSET - FRONT TERMINALS	Passed
ZERO OFFSET - REAR TERMINALS	Passed
DC VOLTS	Passed
AC VOLTS	Passed
FREQUENCY	Passed
OHMS	Passed
DC CURRENT	Passed
AC CURRENT	Passed

## ZERO OFFSET - FRONT TERMINALS

## Passed

TEST CONDITIONS		MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
Range	Input					
-----	(Front)					
DC Volts Zero Offset						
100 mV	0 V	-3.5 uV	0.8 uV	3.5 uV	1.1 uV	
1 V	0 V	-7 uV	1 uV	7 uV	1.2 uV	
10 V	0 V	-0.05 mV	0.01 mV	0.05 mV	6.6 uV	
100 V	0 V	-0.6 mV	0.0 mV	0.6 mV	0.17 mV	
1000 V	0 V	-10 mV	0 mV	10 mV	0.74 mV	
Range	Input					
-----	(Front)					
4-Wire Ohms Zero Offset						
100 Ohm	0 Ohm	-4.0 mOhm	-0.1 mOhm	4.0 mOhm	1.2 mOhm	
1 kOhm	0 Ohm	-10 mOhm	0 mOhm	10 mOhm	1.2 mOhm	
10 kOhm	0 Ohm	-0.10 Ohm	0.00 Ohm	0.10 Ohm	0.014 Ohm	
100 kOhm	0 Ohm	-1.0 Ohm	0.0 Ohm	1.0 Ohm	0.13 Ohm	
1 MOhm	0 Ohm	-10 Ohm	0 Ohm	10 Ohm	0.68 Ohm	
10 MOhm	0 Ohm	-0.10 kOhm	0.01 kOhm	0.10 kOhm	0.011 kOhm	
100 MOhm	0 Ohm	-10.0 kOhm	0.0 kOhm	10.0 kOhm	0.058 kOhm	
Range	Input					
-----	(Front)					
2-Wire Ohms Zero Offset						
100 Ohm	0 Ohm	-204.0 mOhm	-17.2 mOhm	204.0 mOhm	3.0 mOhm	
1 kOhm	0 Ohm	-210 mOhm	-17 mOhm	210 mOhm	3.3 mOhm	
10 kOhm	0 Ohm	-0.30 Ohm	-0.01 Ohm	0.30 Ohm	8.4 mOhm	
100 kOhm	0 Ohm	-1.2 Ohm	0.1 Ohm	1.2 Ohm	0.068 Ohm	
1 MOhm	0 Ohm	-10 Ohm	0 Ohm	10 Ohm	1.3 Ohm	
10 MOhm	0 Ohm	-0.10 kOhm	0.01 kOhm	0.10 kOhm	7.8 Ohm	
100 MOhm	0 Ohm	-10.0 kOhm	0.0 kOhm	10.0 kOhm	0.058 kOhm	
Range	Input					
-----	(Front)					
DC Current Zero Offset						
10 mA	0 A	-2.00 uA	-0.07 uA	2.00 uA	0.16 uA	
100 mA	0 A	-5.0 uA	0.0 uA	5.0 uA	0.21 uA	
1 A	0 A	-100 uA	-2 uA	100 uA	7.0 uA	
3 A	0 A	-600 uA	2 uA	600 uA	11 uA	

## ZERO OFFSET - REAR TERMINALS

## Passed

TEST CONDITIONS		MINIMUM	MEASURED	MAXIMUM	UNCERT.	Sts
Range	Input					
-----	-----					
DC Volts Zero Offset						
100 mV	0 V	-3.5 uV	0.6 uV	3.5 uV	0.88 uV	
1 V	0 V	-7 uV	1 uV	7 uV	0.91 uV	
10 V	0 V	-0.05 mV	0.01 mV	0.05 mV	6.1 uV	
100 V	0 V	-0.6 mV	0.0 mV	0.6 mV	0.074 mV	
1000 V	0 V	-10 mV	0 mV	10 mV	0.61 mV	
Range	Input					
-----	-----					
4-Wire Ohms Zero Offset						
100 Ohm	0 Ohm	-4.0 mOhm	-1.0 mOhm	4.0 mOhm	1.1 mOhm	
1 kOhm	0 Ohm	-10 mOhm	0 mOhm	10 mOhm	0.82 mOhm	
10 kOhm	0 Ohm	-0.10 Ohm	-0.01 Ohm	0.10 Ohm	8.3 mOhm	
100 kOhm	0 Ohm	-1.0 Ohm	0.0 Ohm	1.0 Ohm	0.16 Ohm	
1 MOhm	0 Ohm	-10 Ohm	0 Ohm	10 Ohm	0.98 Ohm	
10 MOhm	0 Ohm	-0.10 kOhm	0.01 kOhm	0.10 kOhm	6.3 Ohm	
100 MOhm	0 Ohm	-10.0 kOhm	0.5 kOhm	10.0 kOhm	0.058 kOhm	
Range	Input					
-----	-----					
2-Wire Ohms Zero Offset						
100 Ohm	0 Ohm	-204.0 mOhm	-19.2 mOhm	204.0 mOhm	6.1 mOhm	
1 kOhm	0 Ohm	-210 mOhm	-19 mOhm	210 mOhm	5.8 mOhm	
10 kOhm	0 Ohm	-0.30 Ohm	-0.01 Ohm	0.30 Ohm	7.2 mOhm	
100 kOhm	0 Ohm	-1.2 Ohm	0.0 Ohm	1.2 Ohm	0.068 Ohm	
1 MOhm	0 Ohm	-10 Ohm	1 Ohm	10 Ohm	0.60 Ohm	
10 MOhm	0 Ohm	-0.10 kOhm	0.01 kOhm	0.10 kOhm	0.0097 kOhm	
100 MOhm	0 Ohm	-10.0 kOhm	0.3 kOhm	10.0 kOhm	0.058 kOhm	
Range	Input					
-----	-----					
DC Current Zero Offset						
10 mA	0 A	-2.00 uA	-0.01 uA	2.00 uA	5.8 nA	
100 mA	0 A	-5.0 uA	0.1 uA	5.0 uA	0.21 uA	
1 A	0 A	-100 uA	-1 uA	100 uA	4.7 uA	
3 A	0 A	-600 uA	3 uA	600 uA	8.7 uA	

## DC VOLTS

## Passed

TEST CONDITIONS		MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
Range	Input(Front)					
100 mV	100 mV	99.9915 mV	100.0029 mV	100.0085 mV	0.0029 mV	
1 V	1 V	0.999953 V	1.000024 V	1.000047 V	0.000070 V	
10 V	10 V	9.99960 V	10.00004 V	10.00040 V	0.000043 V	
10 V	-10 V	-10.00040 V	-10.00005 V	-9.99960 V	0.000041 V	
100 V	100 V	99.9949 V	100.0006 V	100.0051 V	0.00058 V	
1000 V	1000 V	999.945 V	999.983 V	1000.055 V	0.0084 V	

## AC VOLTS

## Passed

TEST CONDITIONS		MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
Input	Freq.					
(Front)						
-----						
100 mV Range						
10 mV	1 kHz	9.9540 mV	9.9947 mV	10.0460 mV	0.0056 mV	
100 mV	1 kHz	99.9000 mV	99.9801 mV	100.1000 mV	0.021 mV	
100 mV	50 kHz	99.8300 mV	100.0010 mV	100.1700 mV	0.035 mV	
-----						
Input	Freq.					
(Front)						
-----						
1 V Range						
1 V	20 Hz	0.999100 V	0.999760 V	1.000900 V	0.00012 V	
1 V	1 kHz	0.999100 V	0.999924 V	1.000900 V	0.000063 V	
1 V	20 kHz	0.999100 V	1.000073 V	1.000900 V	0.000065 V	
1 V	50 kHz	0.998300 V	1.000483 V	1.001700 V	0.00016 V	
1 V	100 kHz	0.993200 V	1.001377 V	1.006800 V	0.00030 V	
1 V	300 kHz	0.955000 V	1.006900 V	1.045000 V	0.00063 V	
-----						
Input	Freq.					
(Front)						
-----						
10 V Range						
100 mV	1 kHz	86.94 mV	100.88 mV	113.06 mV	0.20 mV	
1 V	1 kHz	0.99640 V	1.00003 V	1.00360 V	0.00019 V	
10 V	10 Hz	9.99100 V	9.99999 V	10.00900 V	0.0029 V	
10 V	1 kHz	9.99100 V	9.99897 V	10.00900 V	0.00059 V	
10 V	50 kHz	9.98300 V	9.99946 V	10.01700 V	0.0016 V	



## AC VOLTS (cont.)

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
Input Freq. (Front)					
-----					
100 V Range					
100 V 1 kHz	99.9100 V	99.9786 V	100.0900 V	0.0079 V	
100 V 50 kHz	99.8300 V	100.0006 V	100.1700 V	0.015 V	
Input Freq. (Front)					
-----					
750 V Range					
700 V 1 kHz	699.355 V	699.870 V	700.645 V	0.073 V	
700 V 50 kHz	698.785 V	700.053 V	701.215 V	0.45 V	
700 V 45 Hz	699.355 V	699.785 V	700.645 V	0.12 V	

## FREQUENCY

**Passed**

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
Input Freq. (Front)					
-----					
100 mV Range					
10 mV 100 Hz	99.9000 Hz	100.0020 Hz	100.1000 Hz	0.0048 Hz	
1 V Range					
1 V 100 kHz	99.9900 kHz	100.0001 kHz	100.0100 kHz	0.00065 kHz	

## OHMS

**Passed**

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM	UNCERT.	Sts
4-Wire Ohms					
Range Input(Front)					
100 Ohm 100 Ohm	99.9860 Ohm	100.0055 Ohm	100.0140 Ohm	0.0028 Ohm	
1 kOhm 1 kOhm	0.999890 kOhm	1.000036 kOhm	1.000110 kOhm	0.000012 kOhm	
10 kOhm 10 kOhm	9.99890 kOhm	10.00031 kOhm	10.00110 kOhm	0.00011 kOhm	
100 kOhm 100 kOhm	99.9890 kOhm	100.0051 kOhm	100.0110 kOhm	0.0014 kOhm	
1 MOhm 1 MOhm	0.999890 MOhm	1.000019 MOhm	1.000110 MOhm	0.000022 MOhm	
10 MOhm 10 MOhm	9.99590 MOhm	9.99926 MOhm	10.00410 MOhm	0.00043 MOhm	
100 MOhm 100 MOhm	99.1900 MOhm	100.4741 MOhm	100.8100 MOhm	0.14 MOhm	

## DC CURRENT

**Passed**

TEST CONDITIONS		MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
Range	Input(Front)					
10 mA	10 mA	9.99300 mA	10.00212 mA	10.00700 mA	0.00042 mA	
100 mA	100 mA	99.9450 mA	100.0240 mA	100.0550 mA	0.0054 mA	
1 A	1 A	0.998900 A	1.000138 A	1.001100 A	0.000097 A	
3 A	2 A	1.99700 A	2.00023 A	2.00300 A	0.00026 A	

## AC CURRENT

**Passed**

TEST CONDITIONS		MINIMUM	MEASURED	MAXIMUM	UNCERT.	Status
Input	Freq.					
(Front)						
-----	-----					
1 Amp Range						
10 mA	1 kHz	8.590 mA	9.994 mA	11.410 mA	0.032 mA	
1 A	1 kHz	0.998600 A	0.999996 A	1.001400 A	0.00033 A	
3 Amp Range						
2 A	1 kHz	1.99520 A	1.99956 A	2.00480 A	0.00065 A	