

Calibration Certificate

Keithley Instruments, Inc.

28775 Aurora Road • Cleveland, OH 44139

KEITHLEY

UUT: Keithley 2002
Multimeter
Serial No: 1398

Result: **PASS**

Performed on: 7/ 5/12 at 16:07:00

Performed by: 9479

Environment: Temp. 23.0°C Humid. 40 %

Procedure Completed: YES

Procedure: MS-1601

Report Number 1398692:1341504420

Notes:

Standards Used

Asset	Mfg	Model	Description	Due Date
1194	Fluke	5700A	Calibrator	20-Sep-12
5089	Fluke	5725A	Amplifier	20-Sep-12
6858	Keithley	3930A	Multifunction Synthesizer	31-Aug-12
5077	Keithley	775A	Programmable Counter/Timer	3-Nov-12
8864	Keithley	2001-758	900 MOhm Resistor (Rev D)	16-Sep-12

- Keithley Instruments, Inc. certifies that the above instrument meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or other national standards, and meets the technical requirements of ANSI/NCSL Z540-1-1994.

- The quality system used by Keithley Instruments, Inc. is registered to ISO 9001:2008.

- This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

- The test uncertainty ratio (TUR) is above 4:1 unless otherwise noted.

- This calibration certificate shall not be reproduced except in full without the written approval of Keithley Instruments, Inc.

Helga A. Alexander

Helga A. Alexander - Metrology Services Manager

TEST	UUT RANGE	SYSTEM ACTUAL	MODIFIER	UUT INDICATED	ERROR	ERROR (% of Tol)
RESISTANCE ACCURACY TEST						
	20	00hm		-2.93e 50hm	-0.000029	24 PASS
	20	18.9986790hm		18.99867180hm	-0.379 ppm	2 PASS
	SYSTEM	TOL:494uOhm	TUR: 0.9	TEST TOL:442.977uOhm		
	200	189.9960hm		189.9960870hm	0.458 ppm	2 PASS
	SYSTEM	TOL:3.23mOhm	TUR: 1.2	TEST TOL:4.02993mOhm		
	2000	1.900018kOhm		1.90001693kOhm	-0.563 ppm	6 PASS
	SYSTEM	TOL:22.8mOhm	TUR: 0.8	TEST TOL:17.9002mOhm		
	20000	00hm		-0.0030hm	-0.00300	37 PASS
	20000	18.99938kOhm		18.9993697kOhm	-0.542 ppm	6 PASS
	SYSTEM	TOL:209mOhm	TUR: 0.9	TEST TOL:178.994mOhm		
	200e3	190.0135kOhm		190.012726kOhm	-4.07 ppm	9 PASS
	SYSTEM	TOL:2.470hm	TUR: 3.3	TEST TOL:8.217540hm		
	2e6	1.8999499MOhm		1.89997165MOhm	11.4 ppm	14 PASS
	SYSTEM	TOL:36.10hm		TEST TOL:152.8080hm		
	2.0e7	18.999135MOhm		18.9989779MOhm	-8.26 ppm	3 PASS
	SYSTEM	TOL:8930hm		TEST TOL:5.04483kOhm		
	200e6	100.0218MOhm		100.020465MOhm	-13.3 ppm	2 PASS
	SYSTEM	TOL:12kOhm		TEST TOL:57.1016kOhm		
DC VOLTAGE ACCURACY TEST						
	0.2	0V		-2.94e-7V	0.00	16 PASS
	0.200	-189.9998mV		-190.000131mV	1.74 ppm	6 PASS
	SYSTEM	TOL:2.08uV	TUR: 2.9	TEST TOL:6.018uV		
	0.200	99.99978mV		100.000462mV	6.82 ppm	17 PASS
	SYSTEM	TOL:1.45uV	TUR: 2.8	TEST TOL:4.02001uV		
	0.200	189.9994mV		190.000413mV	5.33 ppm	17 PASS
	SYSTEM	TOL:2.08uV	TUR: 2.9	TEST TOL:6.01801uV		
	2	0V		-5.7e-7V	-0.000001	32 PASS
	2	-1.9V		-1.90000505V	2.65 ppm	19 PASS
	SYSTEM	TOL:12.6uV	TUR: 2.1	TEST TOL:26.8801uV		
	2	1.899999V		1.89999887V	-0.068 ppm	1 PASS
	SYSTEM	TOL:12.6uV	TUR: 1.7	TEST TOL:20.8uV		
	20	0V		5e-7V	0.000001	17 PASS
	20	-18.99999V		-19.0000184V	1.49 ppm	12 PASS
	SYSTEM	TOL:103uV	TUR: 2.4	TEST TOL:242.4uV		
	20	9.999994V		9.9999948V	0.080 ppm	1 PASS
	SYSTEM	TOL:54uV	TUR: 2.4	TEST TOL:129uV		
	20	18.99999V		18.9999832V	-0.358 ppm	4 PASS
	SYSTEM	TOL:103uV	TUR: 1.9	TEST TOL:193uV		

EST	UUT RANGE	SYSTEM ACTUAL	MODIFIER	UUT INDICATED	ERROR	ERROR (% of Tol)
	200	0V		5.4e-5V	0.000054	13 PASS
	200	-189.9998V		-190.000212V	2.16 ppm	8 PASS
	SYSTEM	TOL:1.24mV	TEST	TOL:5.07401mV		
	200	189.9998V		189.999822V	0.116 ppm	0 PASS
	SYSTEM	TOL:1.24mV	TEST	TOL:5.074mV		
	1000	0V		-1e-5V	-0.000010	2 PASS
	1000	-999.9995V		-1.00000462kV	5.12 ppm	19 PASS
	SYSTEM	TOL:8.6mV	TUR: 3.2 TEST	TOL:27.5001mV		
	1000	999.9991V		1.00000349kV	4.39 ppm	16 PASS
	SYSTEM	TOL:8.6mV	TUR: 3.2 TEST	TOL:27.5001mV		
AC VOLTAGE ACCURACY TEST						
	0.2	190mV	10Hz	190.045mV	236 ppm	36 PASS
	SYSTEM	TOL:120.5uV	TUR: 1.0 TEST	TOL:125uV		
	0.2	19mV	20Hz	19.001mV	52.6 ppm	3 PASS
	SYSTEM	TOL:10.18uV	TUR: 3.9 TEST	TOL:39.5005uV		
	0.2	268.7mV	20Hz	269.5mV	2970 ppm	50 PASS
	SYSTEM	TOL:51.8uV	TEST	TOL:1.6156mV		
	0.2	190mV	2MHz	196.902mV	35000 ppm	67 PASS
	SYSTEM	TOL:768uV	TEST	TOL:10.2451mV		
	2	1.9V	100KHz	1.89765V	-1240 ppm	39 PASS
	SYSTEM	TOL:555uV	TEST	TOL:5.99295mV		
	2	1.9V	2MHz	1.94462V	22900 ppm	44 PASS
	SYSTEM	TOL:6.203mV	TEST	TOL:101.231mV		
	20	19V	10Hz	19.0059V	310 ppm	41 PASS
	SYSTEM	TOL:11.45mV	TUR: 1.3 TEST	TOL:14.4mV		
	20	19V	10KHz	18.9989V	-57.8 ppm	10 PASS
	SYSTEM	TOL:1.495mV	TEST	TOL:10.5996mV		
	20	19V	1MHz	19.4893V	25100 ppm	60 PASS
	SYSTEM	TOL:62.2mV	TEST	TOL:819.572mV		
	200	190V	100KHz	189.911V	-468 ppm	15 PASS
	SYSTEM	TOL:114.5mV	TEST	TOL:606.57mV		
	750	750V	5KHz	749.99V	-13.3 ppm	1 PASS
	SYSTEM	TOL:99.75mV	TEST	TOL:984.363mV		
AC VOLTAGE LINEARITY TEST						
	0.2	20mV	5KHz	19.998mV	-100 ppm	5 PASS
	SYSTEM	TOL:8.2uV	TEST	TOL:43.9996uV		
	0.2	60mV	5KHz	59.978mV	-366 ppm	42 PASS
	SYSTEM	TOL:16uV	TUR: 3.2 TEST	TOL:51.9956uV		
	0.2	100mV	5KHz	99.975mV	-250 ppm	42 PASS
	SYSTEM	TOL:20uV	TUR: 3.0 TEST	TOL:59.995uV		
	0.2	140mV	5KHz	139.979mV	-150 ppm	31

TEST	UUT RANGE	SYSTEM ACTUAL	MODIFIER	UUT INDICATED	ERROR	ERROR (% of Tol)
		SYSTEM TOL:24uV	TUR: 2.8	TEST TOL:67.9958uV		PASS
	0.2	180mV	5KHz	179.992mV	-44.4 ppm	11
		SYSTEM TOL:28uV	TUR: 2.7	TEST TOL:75.9984uV		PASS
AVG AND DC COUPLING TEST						
2		1.7106V	100KHz	1.70965V	-555 ppm	16
		SYSTEM TOL:555uV		TEST TOL:5.92895mV		PASS
2		1.9V		1.90033V	173 ppm	16
		SYSTEM TOL:12.6uV		TEST TOL:2.1103mV		PASS
DC CURRENT ACCURACY TEST						
	.0002	0A		0A	0.00	0
						PASS
	.0002	189.9991uA	TUR: 3.7	189.9987uA	-2.10 ppm	1
		SYSTEM TOL:19.5nA		TEST TOL:71.4995nA		PASS
	2e-3	1.899999mA		1.899998mA	-0.526 ppm	0
		SYSTEM TOL:105nA		TEST TOL:704.999nA		PASS
	20e-3	18.99995mA		18.99992mA	-1.57 ppm	0
		SYSTEM TOL:1.05uA		TEST TOL:7.04997uA		PASS
	0.2	190mA		189.9989mA	-5.79 ppm	1
		SYSTEM TOL:12.4uA		TEST TOL:75.2496uA		PASS
	2	-1A		-1.000028A	27.9 ppm	5
		SYSTEM TOL:110uA		TEST TOL:544.014uA		PASS
	2	1A		1.000002A	2.00 ppm	0
		SYSTEM TOL:110uA		TEST TOL:790.001uA		PASS
AC CURRENT ACCURACY TEST						
	.0002	190uA	20Hz	189.427uA	-3020 ppm	33
		SYSTEM TOL:97.2nA		TEST TOL:1.73484uA		PASS
	0.002	1.9mA	200Hz	1.90003mA	15.7 ppm	1
		SYSTEM TOL:306nA		TEST TOL:2.58004uA		PASS
	0.02	19mA	200Hz	19.0014mA	73.6 ppm	5
		SYSTEM TOL:3.06uA		TEST TOL:25.8017uA		PASS
	0.2	190mA	20Hz	189.841mA	-837 ppm	27
		SYSTEM TOL:76.2uA		TEST TOL:599.523uA		PASS
	2	1.9A	100Hz	1.89982A	-94.7 ppm	4
		SYSTEM TOL:1.275mA	TUR: 3.3	TEST TOL:4.19964mA		PASS
	2	1.9A	5KHz	1.8998A	-105 ppm	2
		SYSTEM TOL:1.525mA		TEST TOL:8.9491mA		PASS
FREQUENCY ACCURACY TEST						
	100	99.99905Hz	TUR: 3.0	100Hz	9.50 ppm	3
		SYSTEM TOL:10mHz		TEST TOL:30mHz		PASS
	1.5e7	14.99984MHz	TUR: 3.0	15MHz	10.6 ppm	4
		SYSTEM TOL:1.5kHz		TEST TOL:4.5kHz		PASS
	1e9	912009000Ohm		911810900Ohm	-217 ppm	10
						PASS

UUT RANGE	SYSTEM ACTUAL	MODIFIER	UUT INDICATED	ERROR	ERROR (% of Tol)
End of Test Data					