



Service License N°:DK283

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Cert.#: AC-1868



CERTIFICATE OF CALIBRATION

Certificate Number

TSG-374854



Customer: PEPPERL + FUCHS (VIETNAM) CO., LTD
LOT S12-16A, STREET 20 TAN THUAN EPZ, TAN THUAN DONG WARD, DISTRICT 7, HO CHI MINH CITY, VIETNAM

Manufacturer:	KEITHLEY	Calibrated by:	HUNG HUYNH HAI
Description:	Digital Multimeter	Calibration Date:	20/Nov/2023
Model Number:	DMM7510	Recommended Due:	20/Nov/2024
Size / Range:	Multi Range	Calibration Location:	On-Site
Serial #:	4606282	Condition Received:	IN TOLERANCE
Asset Number:	DMM-0655	Condition Returned:	IN TOLERANCE
P.O. Number:	TEV-PF 231020	Procedure:	Manufacturer's Manual
Accessories:		Environment:	26 ± 2 °C / 58 ± 3 %RH

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are traceable to SI units; their source of traceability derives from a National Metrology Institute such as NIST, CENAM, NPL, DIN, VMI..., from natural physical constants, consensus standards procedures or derived by the ratio type of calibrations. Estimated statements of uncertainty are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2), no sampling plan or other process was used for this calibration, the results reported herein apply only to the calibration of the item describe above. All calibrations are performed to manufacturer's specifications, unless otherwise noted. Customer has been contacted concerning re-certification interval and documentation has been received and is on file. This form shall not be reproduced, except in full, without the expressed written consent of Techmaster Electronics. If the manufacturer has a specified tolerance for this item, then the calibration results, with our uncertainty value added, are compared to this tolerance, and the combined value.

Calibration Accuracy: Base on Manufacturer's Specifications or Customer's Specifications.

Remark:

Standards Utilized

Standard Number	Manufacturer	Model	Due Date	Report Number	Traceability
EL0040	AGILENT	3458A	29/Mar/2024	TSG-0-313809-R2	TSD
EL0089	AGILENT	33250A	19/Apr/2024	TSG-0-288654-R3	TSD
EL0263	FLUKE	5522A	30/Mar/2025	TSG-0-311902	TSD

Quality Assurance:
(Đảm bảo chất lượng)


Nguyễn Văn Tiến

Technical Manager:
(Giám sát kỹ thuật)


Lê Nguyễn Vũ Nghiệp

Issued on: 2023-12-03 23:49:34.8700000 -08:00

540.1/Certificate.VE Rev 08

Certificate Number: TSG-374854

Manufacturer : KEITHLEY

Model : DMM7510

Asset No.: / Serial No.: DMM-0655 / 4606282

Front -Panel Verification

1. Zero Offset Verification .

Function	Range	Nominal Value	Unit	Measured Value	Tolerance Limits		Result
					Min	Max	
DCV	1 V	0.0000000	V	0.0000001	-0.0000020	0.0000020	PASS
	10 V	0.000000	V	0.000000	-0.000012	0.000012	PASS
	100 V	0.00000	V	0.00002	-0.00050	0.00050	PASS
	1000 V	0.0000	V	0.0002	-0.0050	0.0050	PASS
Ohm - 4 Wire	1 Ω	0.0000000	Ω	0.0000000	-0.0000500	0.0000500	PASS
	10 Ω	0.000000	Ω	0.000002	-0.000050	0.000050	PASS
	100 Ω	0.00000	Ω	0.00003	-0.00040	0.00040	PASS
	1 kΩ	0.0000000	kΩ	0.0000002	-0.0000030	0.0000030	PASS
	10 kΩ	0.000000	kΩ	0.000002	-0.000030	0.000030	PASS
	100 kΩ	0.00000	kΩ	0.00001	-0.00030	0.00030	PASS

2. DC Voltage Gain Verification .

(Performed "Rel Value" to zero system prior to starting calibration on each ranges)

Range	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
100 mV	100	mV	100.00003	99.99730	100.00270	PASS	0.0019
	50	mV	49.99975	49.99820	50.00180	PASS	0.0014
	-50	mV	-49.99984	-50.00180	-49.99820	PASS	0.0014
	-100	mV	-100.00049	-100.00270	-99.99730	PASS	0.0019
1 V	1	V	1.0000031	0.9999830	1.0000170	PASS	0.0000094
	0.5	V	0.4999991	0.4999905	0.5000095	PASS	0.0000053
	-0.5	V	-0.4999989	-0.5000095	-0.4999905	PASS	0.0000053
	-1	V	-1.0000009	-1.0000170	-0.9999830	PASS	0.0000094
10 V	10	V	10.000029	9.999848	10.000152	PASS	0.000098
	5	V	4.999990	4.999918	5.000082	PASS	0.000051
	-5	V	-4.999986	-5.000082	-4.999918	PASS	0.000051
	-10	V	-10.000015	-10.000152	-9.999848	PASS	0.000098
100 V	100	V	100.00032	99.99730	100.00270	PASS	0.00103
	50	V	49.99979	49.99840	50.00160	PASS	0.00056
	-50	V	-49.99987	-50.00160	-49.99840	PASS	0.00056
	-100	V	-100.00024	-100.00270	-99.99730	PASS	0.00103
1000 V	1000	V	1000.0022	999.9720	1000.0280	PASS	0.013
	500	V	499.9987	499.9835	500.0165	PASS	0.006
	-500	V	-499.9987	-500.0165	-499.9835	PASS	0.006
	-1000	V	-1000.0020	-1000.0280	-999.9720	PASS	0.013

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Manufacturer : KEITHLEY

Model : DMM7510

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3. AC Voltage Gain Verification .

Range	Freq.	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
					Min	Max		
100 mV	30 Hz	100	mV	99.9946	99.9100	100.0900	PASS	0.0290
	1 kHz	100	mV	99.9875	99.9100	100.0900	PASS	0.0190
	50 kHz	100	mV	99.9754	99.8100	100.1900	PASS	0.0450
	100 kHz	100	mV	99.9525	99.3200	100.6800	PASS	0.1100
1 V	30 Hz	1	V	0.999823	0.999100	1.000900	PASS	0.00019
	1 kHz	1	V	0.999821	0.999100	1.000900	PASS	0.000086
	50 kHz	1	V	0.999737	0.998100	1.001900	PASS	0.00015
	100 kHz	1	V	0.999185	0.993200	1.006800	PASS	0.00033
10 V	30 Hz	10	V	9.99821	9.99100	10.00900	PASS	0.0019
	1 kHz	10	V	9.99940	9.99100	10.00900	PASS	0.0008
	50 kHz	10	V	9.99831	9.98100	10.01900	PASS	0.0015
	100 kHz	1	V	0.99904	0.98600	1.01400	PASS	0.0006
100 V	30 Hz	100	V	99.9848	99.9100	100.0900	PASS	0.0088
	1 kHz	100	V	99.9922	99.9100	100.0900	PASS	0.0088
	50 kHz	100	V	99.9812	99.8100	100.1900	PASS	0.026
	100 kHz	100	V	99.9323	99.3200	100.6800	PASS	0.058
700 V	50 Hz	700	V	699.888	699.370	700.630	PASS	0.30
	1 kHz	700	V	699.934	699.370	700.630	PASS	0.06
	50 kHz	210	V	209.938	209.356	210.644	PASS	0.10
	100 kHz	210	V	209.911	208.180	211.820	PASS	0.02

Certificate Number: TSG-374854

Manufacturer : KEITHLEY

Model : DMM7510

Asset No.:/ Serial No.: DMM-0655 / 4606282

4. Digitize DC Voltage Verification .

(Performed "Rel Value" to zero system prior to starting calibration on each ranges)

Range	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
100 mV	100	mV	100.000	99.968	100.032	PASS	0.002
	50	mV	49.998	49.979	50.021	PASS	0.002
	-50	mV	-49.996	-50.021	-49.979	PASS	0.002
	-100	mV	-100.004	-100.032	-99.968	PASS	0.002
1 V	1	V	1.00003	0.99981	1.00020	PASS	0.00001
	0.5	V	0.49998	0.49987	0.50014	PASS	0.00001
	-0.5	V	-0.49998	-0.50014	-0.49987	PASS	0.00001
	-1	V	-1.00004	-1.00020	-0.99981	PASS	0.00001
10 V	10	V	10.0001	9.9981	10.0020	PASS	0.0001
	5	V	4.9999	4.9987	5.0014	PASS	0.0001
	-5	V	-4.9998	-5.0014	-4.9987	PASS	0.0001
	-10	V	-10.0002	-10.0020	-9.9981	PASS	0.0001
100 V	100	V	100.001	99.981	100.020	PASS	0.001
	50	V	49.998	49.987	50.014	PASS	0.001
	-50	V	-49.998	-50.014	-49.987	PASS	0.001
	-100	V	-100.004	-100.020	-99.981	PASS	0.001
1000 V	1000	V	1000.01	999.81	1000.20	PASS	0.01
	500	V	499.98	499.87	500.14	PASS	0.01
	-500	V	-499.99	-500.14	-499.87	PASS	0.01
	-1000	V	-1000.03	-1000.20	-999.81	PASS	0.01

5. Frequency Gain Verification.

Applied Voltage	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
5 V	10	Hz	10.000000	9.999197	10.00080	PASS	0.000058
5 V	1	kHz	0.9999999	0.9999197	1.000080	PASS	0.0000058
5 V	10	kHz	10.000001	9.999197	10.00080	PASS	0.000058
5 V	100	kHz	99.99999	99.99197	100.0080	PASS	0.00058
5 V	250	kHz	250.0001	249.9799	250.0201	PASS	0.0014
5 V	500	kHz	500.0001	499.9598	500.0402	PASS	0.0029

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Manufacturer : KEITHLEY

Model : DMM7510

Asset No.:/ Serial No.: DMM-0655 / 4606282

6. Simulated Temperature Verification .

Function	Applied Value	Nominal Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
					Min	Max		
Type J Thermocouple	-7.659 mV	-190	°C	-190.0	-190.2	-189.8	PASS	0.4
	0.000 mV	0	°C	0.1	-0.2	0.2	PASS	0.2
	42.281 mV	750	°C	750.2	749.8	750.2	PASS	0.3
4-Wire RTD	19.00 Ω	-198.88	°C	-198.88	-198.94	-198.82	PASS	0.06
	100.00 Ω	0.00	°C	0.00	-0.06	0.06	PASS	0.06
	190.00 Ω	238.69	°C	238.71	238.63	238.75	PASS	0.12

7. Dry Circuit Resistance Verification .

Range	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
1 Ω	0.000000	Ω	0.000007	-0.000080	0.000080	PASS	0.0092
	1.000000	Ω	1.000023	0.999870	1.000130	PASS	0.0094
10 Ω	0.000000	Ω	0.00012	-0.00080	0.00080	PASS	0.00003
	10.000000	Ω	9.99987	9.99870	10.00130	PASS	0.00032
100 Ω	0.0000	Ω	0.0011	-0.0080	0.0080	PASS	0.0001
	100.0000	Ω	100.0024	99.9830	100.0170	PASS	0.0020
1 kΩ	0.000000	kΩ	0.000001	-0.000080	0.000080	PASS	0.000023
	1.000000	kΩ	1.000034	0.999740	1.000260	PASS	0.000023
10 kΩ	0.000000	kΩ	0.00014	-0.00080	0.00080	PASS	0.00002
	10.000000	kΩ	10.00024	9.99600	10.00400	PASS	0.00021

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Manufacturer : KEITHLEY

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8. 4-Wire Ohm Gain Verification .

Range	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
1 Ω	0.000000	Ω	0.0000005	-0.0000500	0.0000500	PASS	0.0092
	1.0000000	Ω	0.9999904	0.9999200	1.0000800	PASS	0.0094
10 Ω	0.000000	Ω	0.000010	-0.000050	0.000050	PASS	0.00003
	10.000000	Ω	10.000070	9.999650	10.000350	PASS	0.00032
100 Ω	0.00000	Ω	0.00007	-0.00040	0.00040	PASS	0.00002
	100.00000	Ω	100.00062	99.99690	100.00310	PASS	0.0020
1 k Ω	0.0000000	k Ω	0.0000000	-0.0000030	0.0000030	PASS	0.000023
	1.0000000	k Ω	0.9999946	0.9999730	1.0000270	PASS	0.000023
10 k Ω	0.000000	k Ω	0.000004	-0.000030	0.000030	PASS	0.000021
	10.000000	k Ω	10.000033	9.999670	10.000330	PASS	0.000208
100 k Ω	0.00000	k Ω	0.00002	-0.00030	0.00030	PASS	0.00002
	100.00000	k Ω	99.99957	99.99670	100.00330	PASS	0.00219
1 M Ω	0.0000000	M Ω	0.0000006	-0.0000040	0.0000040	PASS	0.000030
	1.0000000	M Ω	0.9999936	0.9999360	1.0000640	PASS	0.000030
10 M Ω	0.000000	M Ω	0.000002	-0.000100	0.000100	PASS	0.000058
	10.000000	M Ω	10.000000	9.997900	10.002100	PASS	0.00058

9. 2-Wire Ohm Gain Verification .

Range	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
100 M Ω	0.00000	M Ω	0.00042	-0.00300	0.00300	PASS	0.00006
	100.00000	M Ω	100.01827	99.79700	100.20300	PASS	0.070
1 G Ω	1.000000	G Ω	1.000455	0.990900	1.009100	PASS	0.0068

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Manufacturer : KEITHLEY

Model : DMM7510

Asset No.:/ Serial No.: DMM-0655 / 4606282

10. DC Current Verification .

(Performed "Rel Value" to zero system prior to starting calibration on each ranges)

Range	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
10 μ A	10	μ A	9.999916	9.998950	10.001050	PASS	0.0014
	5	μ A	5.000061	4.999325	5.000675	PASS	0.0012
	-5	μ A	-5.000095	-5.000675	-4.999325	PASS	0.0012
	-10	μ A	-9.999801	-10.001050	-9.998950	PASS	0.0014
100 μ A	100	μ A	100.00028	99.99310	100.00690	PASS	0.0039
	50	μ A	49.99930	49.99610	50.00390	PASS	0.0025
	-50	μ A	-49.99922	-50.00390	-49.99610	PASS	0.0025
	-100	μ A	-100.00104	-100.00690	-99.99310	PASS	0.0039
1 mA	1	mA	1.0000097	0.9999310	1.0000690	PASS	0.000035
	0.5	mA	0.4999949	0.4999610	0.5000390	PASS	0.000021
	-0.5	mA	-0.4999977	-0.5000390	-0.4999610	PASS	0.000021
	-1	mA	-1.0000097	-1.0000690	-0.9999310	PASS	0.000035
10 mA	10	mA	10.000069	9.999310	10.000690	PASS	0.00028
	5	mA	4.999977	4.999610	5.000390	PASS	0.00015
	-5	mA	-4.999981	-5.000390	-4.999610	PASS	0.00015
	-10	mA	-10.000083	-10.000690	-9.999310	PASS	0.00028
100 mA	100	mA	99.99712	99.98200	100.01800	PASS	0.0047
	50	mA	50.00095	49.98950	50.01050	PASS	0.0024
	-50	mA	-50.00105	-50.01050	-49.98950	PASS	0.0024
	-100	mA	-99.99640	-100.01800	-99.98200	PASS	0.0047
1 A	1	A	0.9999100	0.9995500	1.0004500	PASS	0.000070
	0.5	A	0.5000500	0.4997500	0.5002500	PASS	0.000036
	-0.5	A	-0.5000425	-0.5002500	-0.4997500	PASS	0.000036
	-1	A	-0.9999550	-1.0004500	-0.9995500	PASS	0.000070
3 A	2	A	1.999844	1.999080	2.000920	PASS	0.00014
	1.5	A	1.500101	1.499280	1.500720	PASS	0.00010
	-1.5	A	-1.500101	-1.500720	-1.499280	PASS	0.00010
	-2	A	-1.999945	-2.000920	-1.999080	PASS	0.00014

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Model : DMM7510

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11. Digitize DC Current Verification .

(Performed "Rel Value" to zero system prior to starting calibration on each ranges)

Range	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
10 μ A	10	μ A	9.9999	9.9977	10.0024	PASS	0.0014
	5	μ A	5.0003	4.9985	5.0016	PASS	0.0012
	-5	μ A	-5.0002	-5.0016	-4.9985	PASS	0.0012
	-10	μ A	-9.9997	-10.0024	-9.9977	PASS	0.0014
100 μ A	100	μ A	99.997	99.977	100.024	PASS	0.004
	50	μ A	50.002	49.985	50.016	PASS	0.003
	-50	μ A	-50.001	-50.016	-49.985	PASS	0.003
	-100	μ A	-100.000	-100.024	-99.977	PASS	0.004
1 mA	1	mA	0.99998	0.99977	1.00024	PASS	0.00004
	0.5	mA	0.50003	0.49985	0.50016	PASS	0.00003
	-0.5	mA	-0.50003	-0.50016	-0.49985	PASS	0.00003
	-1	mA	-1.00003	-1.00024	-0.99977	PASS	0.00004
10 mA	10	mA	10.0002	9.9977	10.0024	PASS	0.0003
	5	mA	4.9997	4.9985	5.0016	PASS	0.0002
	-5	mA	-4.9998	-5.0016	-4.9985	PASS	0.0002
	-10	mA	-9.9996	-10.0024	-9.9977	PASS	0.0003
100 mA	100	mA	99.992	99.945	100.055	PASS	0.005
	50	mA	50.005	49.968	50.033	PASS	0.003
	-50	mA	-50.002	-50.033	-49.968	PASS	0.003
	-100	mA	-100.002	-100.055	-99.945	PASS	0.005
1 A	1	A	1.00007	0.99939	1.00061	PASS	0.00007
	0.5	A	0.49994	0.49964	0.50036	PASS	0.00004
	-0.5	A	-0.49993	-0.50036	-0.49964	PASS	0.00004
	-1	A	-1.00006	-1.00061	-0.99939	PASS	0.00007
3 A	2	A	2.0001	1.9978	2.0023	PASS	0.0002
	1.5	A	1.4996	1.4982	1.5018	PASS	0.0001
	-1.5	A	-1.4997	-1.5018	-1.4982	PASS	0.0001
	-2	A	-2.0002	-2.0023	-1.9978	PASS	0.0002

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Manufacturer : KEITHLEY

Model : DMM7510

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12. AC Current Gain Verification .

Range	Freq.	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
					Min	Max		
1 mA	40 Hz	1	mA	0.999846	0.998900	1.001100	PASS	0.00070
	1 kHz	1	mA	0.999781	0.998900	1.001100	PASS	0.00035
	5 kHz	1	mA	0.999810	0.998800	1.001200	PASS	0.00093
10 mA	40 Hz	10	mA	9.99926	9.98900	10.01100	PASS	0.023
	1 kHz	10	mA	9.99847	9.98900	10.01100	PASS	0.021
	5 kHz	10	mA	9.99943	9.98800	10.01200	PASS	0.22
100 mA	40 Hz	100	mA	99.9849	99.8900	100.1100	PASS	0.046
	1 kHz	100	mA	99.9814	99.8900	100.1100	PASS	0.023
	5 kHz	100	mA	99.9919	99.8800	100.1200	PASS	0.092
1 A	40 Hz	1	A	0.999834	0.997600	1.002400	PASS	0.00092
	1 kHz	1	A	0.999809	0.997600	1.002400	PASS	0.00092
	5 kHz	1	A	0.998437	0.990800	1.009200	PASS	0.0013
3 A	40 Hz	2	A	1.999398	1.994500	2.005500	PASS	0.0018
	1 kHz	2	A	1.999673	1.994500	2.005500	PASS	0.0018
	5 kHz	2	A	1.997327	1.980900	2.019100	PASS	0.0025

13. Capacitance Gain Verification .

(Performed "Rel Value" to zero system prior to starting calibration on each ranges)

Range	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
1 nF	0.1	nF	0.0998	0.0970	0.1030	PASS	0.0002
	0.7	nF	0.6990	0.6910	0.7090	PASS	0.0185
10 nF	1	nF	0.999	0.980	1.020	PASS	0.020
	10	nF	9.984	9.890	10.110	PASS	0.057
100 nF	10	nF	9.99	9.86	10.14	PASS	0.06
	100	nF	99.97	99.50	100.50	PASS	0.49
1 µF	0.1	µF	0.0999	0.0986	0.1014	PASS	0.0005
	1	µF	0.9993	0.9950	1.0050	PASS	0.0050
10 µF	1	µF	0.998	0.986	1.014	PASS	0.005
	10	µF	9.996	9.950	10.050	PASS	0.035
100 µF	10	µF	9.99	9.86	10.14	PASS	0.04
	100	µF	99.95	99.50	100.50	PASS	0.75

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Manufacturer : KEITHLEY

Model : DMM7510

Asset No.:/ Serial No.: DMM-0655 / 4606282

Rear -Panel Verification

14. DC Current 10 A Range Verification .

(Performed "Rel Value" to zero system prior to starting calibration)

Range	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
10 A	10	A	9.998580	9.982250	10.017750	PASS	0.00094
	5.0	A	5.001743	4.989750	5.010250	PASS	0.00094
	-5.0	A	-4.998463	-5.010250	-4.989750	PASS	0.00094
	-10	A	-10.003018	-10.017750	-9.982250	PASS	0.00094

15. Digitize Current 10 A Range Verification .

(Performed "Rel Value" to zero system prior to starting calibration)

Range	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
				Min	Max		
10 A	10	A	9.9976	9.9815	10.0185	PASS	0.0009
	5.0	A	5.0021	4.9890	5.0110	PASS	0.0009
	-5.0	A	-5.0019	-5.0110	-4.9890	PASS	0.0009
	-10	A	-9.9989	-10.0185	-9.9815	PASS	0.0009

16. AC Current 10 A Range Verification .

Range	Freq.	Standard Value	Unit	Measured Value	Tolerance Limits		Result	Expanded Uncertainty
					Min	Max		
10 A	45 Hz	10	A	10.0000	9.9550	10.0450	PASS	0.012
	1 kHz	10	A	10.0072	9.9550	10.0450	PASS	0.017
	5 kHz	10	A	10.0065	9.9070	10.0930	PASS	0.046

*** Notes :**

- The tolerances limit on table above are based on manufacturer's specification .
- No Adjustment

Certified By Technician:


 Huynh Hai Hung

Inspected By Auditor:


 Nguyen Van Tien