Specifications Sheet

Model SMU2055 6½ Digit USB Digital Multimeter

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1.0 Specifications

The following specifications are based on both verification of large number of units as well as mathematical evaluation. They should be considered under the environment specified.

It is important to note that a DMM specified range is expressed as a numeric value indicating the highest absolute voltage that can be measured. The lowest value that can be detected is expressed by the corresponding resolution for the range.

1.1 DC Voltage Measurement

Input Characteristics

- **Input Resistance 240 mV, 2.4 V Ranges:** >10 GΩ, with typical leakage of 50pA
- **Input Resistance 24 V, 240V Ranges:** 10.00 MΩ

Accuracy ± (% of reading + Volts) [1]

Range	Full Scale 6-½ Digits	Resolution	24 hours 23°C ± 1°C	90 Days 23°C ± 5°C	One Year 23°C ± 5°C
240 mV	240.0000 mV	100 ηV	0.005 + 2 μV	0.007 + 3 μV	0.009 + 3.5 μV
2.4 V	2.400000 V	1 μV	0.003 + 3 μV	0.005 + 4 μV	0.007 + 10 μV
24 V	24.00000 V	10 μV	0.004 + 200 μV	0.006 + 250 μV	0.008 + 300 μV
240 V	240.0000 V	100 μV	0.005 + 600 μV	0.007 + 800 μV	0.009 + 1 mV

[1] With reading rate set to ≤ 2/Sec, and within one hour from Self Calibration (S-Cal).

For resolution at higher reading rates, see the following table. Use this table for DC Volts, DC current and Resistance measurements.

Maximum reading rate	Digits of Resolution	
1 / second	6-1/2	22 bits
27/second	6	20 bits
250 / second	5-1/2	18 bits

DCV Noise Rejection Normal Mode Rejection, at 50, 60, or 400 Hz ± 0.5%, is better than 95 dB for apertures of 0.160s and higher. Common Mode Rejection (with 1 kΩ lead imbalance) is better than 120 dB for these conditions.

1.2 DC Current Measurement

Input Characteristics

- **Number of shunts** 2
- **Protected** with 2.5A Fast blow fuse

Accuracy ± (% of reading + Amps) [1]

Range	Full Scale Reading	Resolution	Max Burden Voltage	24 hours 23°C ± 5°C	90 Days 23°C ± 5°C	One Year 23°C ± 5°C
2.4 mA	2.40000 mA	10 ηA	25mV	0.05 + 300 ηA	0.06 + 700 ηA	0.07 + 1 μA
24 mA	24.0000 mA	100 ηA	250mV	0.05 + 350 ηA	0.065 + 800 ηA	0.08 + 1 μA
240 mA	240.000 mA	1 μA	55mV	0.05 + 50 μA	0.055 + 60 μA	0.065 + 80 μA
2.4 A	2.40000 A	10 μA	520mV	0.3 + 60 μA	0.4 + 70 μA	0.45 + 90 μA

[1] With reading rate set to ≤ 2/Sec, and within one hour from Zero (Relative control).

1.3 Resistance Measurements

1.3.1 2-wire

Accuracy ± (% of reading + Ω) [1]

Range [4]	Full Scale 6 ½ Digits	Resolution	Source current	24 hours 23°C ± 1°C	90 Days 23°C ± 5°C	One Year 23°C ± 5°C
240 Ω	240.0000 Ω	100 μΩ	1 mA	0.005 + 4.5 mΩ [2]	0.008 + 5 mΩ [2]	0.011 + 6 mΩ [2]
2.4 kΩ	2.400000 kΩ	1 mΩ	1 mA	0.005 + 28 mΩ	0.007 + 32 mΩ	0.01 + 33 mΩ
24 kΩ	24.00000 kΩ	10 mΩ	100 μA	0.005 + 300 mΩ	0.007 + 330 mΩ	0.01 + 350 mΩ
240 kΩ	240.0000 kΩ	100 mΩ	10 μA	0.01 + 3.2 Ω	0.015 + 4 Ω	0.02 + 5 Ω
2.4 MΩ	2.400000 MΩ	1 Ω	1 μA	0.02 + 40 Ω	0.03 + 50 Ω	0.04 + 70 Ω
24 MΩ	24.0000 MΩ	100 Ω	100 nA	0.2 + 400 Ω	0. 3 + 500 Ω	0.4 + 600 Ω

[1] With reading rate set to ≤ 2/Sec, and within one hour from Self Calibration (S-Cal).
[2] Use of S-Cal and Relative to improve measurement floor.
[3] Test voltages are 2.4V max with the exception of the 240 Ω range 240 mV.

1.3.2 4-wire

Accuracy ± (% of reading + Ω) [1]

Range [4]	Full Scale 6 ½ Digits	Resolution	Source current	24 hours 23°C ± 1°C	90 Days 23°C ± 5°C	One Year 23°C ± 5°C
240 Ω	240.0000 Ω	100 μΩ	1 mA	0.005 + 3 mΩ [2]	0.008 + 4 mΩ [2]	0.01 + 5 mΩ [2]
2.4 kΩ	2.400000 kΩ	1 mΩ	1 mA	0.005 + 28 mΩ	0.007 + 32 mΩ	0.01 + 33 mΩ
24 kΩ	24.00000 kΩ	10 mΩ	100 μA	0.005 + 300 mΩ	0.007 + 330 mΩ	0.01 + 350 mΩ
240 kΩ	240.0000 kΩ	100 mΩ	10 μA	0.01 + 3.2 Ω	0.015 + 4 Ω	0.02 + 5 Ω
2.4 MΩ	2.400000 MΩ	1 Ω	1 μA	0.02 + 40 Ω	0.03 + 50 Ω	0.04 + 70 Ω
24 MΩ	24.0000 MΩ	100 Ω	100 nA	0.2 + 400 Ω	0.3 + 500 Ω	0.4 + 600 Ω

[1] With reading rate set to ≤ 2/Sec, and within one hour from Self Calibration (S-Cal).
[2] Use of Relative to facilitate indicated floor (adder part of spec).
[3] Test voltages are 2.4V max with the exception of the 240 Ω range 240 mV.

1.4 AC Voltage Measurements

Input Characteristics

- **Input Resistance** 1 MΩ, shunted by < 300 pF, all ranges
- **Max. Crest Factor** 4 at Full Scale, increasing to 7 at Lowest Specified Voltage
- **AC coupled** Specified range: 10 Hz to 100 kHz
- **Typical Settling time** < 0.5 sec to within 0.1% of final value
- **Typical Settling time Fast RMS** < 0.05 sec to within 0.1% of final value

AC Voltage True RMS Measurement

Range	Full Scale 6-½ Digits	Lowest specified Voltage	Resolution
240 mV	240.0000 mV	5 mV [1]	100 ηV
2.4 V	2.400000 V	10 mV	1 μV
24 V	24.00000 V	100 mV	10 μV
240 V	240.0000 V	1 V	100 μV

[1] Between 5 mV and 10 mV, add 100 μV additional errors to the accuracy table below.
[2] Signal is limited to $8x10^6$ Volt Hz Product. For example, the largest frequency input at 250 V is 32 kHz, or $8x10^6$ Volt x Hz.

AC Volts Accuracy

Settles to rated accuracy within 0.5 seconds for signals >50% of scale.
May take up to 5 seconds to settle to rated accuracy for signals < 5% of scale.

Accuracy ± (% of reading + Volts) [1]

Range	Frequency	24 hours 23°C ± 1°C	90 Days 23°C ± 5°C	One Year 23°C ± 5°C
240 mV	0.5 Hz - 10 Hz	0.25 + 100 μV	0.3 + 200 μV	0.35 + 300 μV
	10 Hz - 20 Hz	0.3 + 150 μV	0.35 + 170 μV	0.4 + 200 μV
	20 Hz - 60 Hz	0.13 + 100 μV	0.14 + 110 μV	0.15 + 120 μV
	60 kHz - 200 Hz	0.55 + 160 μV	0.6 + 200 μV	0.63 + 230 μV
2.4 V	0.5 Hz - 10 Hz	0.2 + 2 mV	0.25 + 2.2 mV	0.3 + 2.5 mV
	10 Hz - 20 Hz	0.3 + 1.3 mV	0.35 + 1.5 mV	1.0 + 1.7 mV
	20 Hz - 60 Hz	0.5 + 1 mV	0.55 + 1.1 mV	0.65 + 1.2 mV
	60 kHz - 200 Hz	0.62 + 1.2 mV	0.65 + 1.3 mV	0.70 + 1.5 mV
24 V	0.5 Hz - 10 Hz	3.0 + 14 mV	3.1 + 16 mV	3.3 + 20 mV
	10 Hz - 20 Hz	0.93 + 12 mV	0.96 + 14 mV	1.0 + 16 mV
	20 Hz - 60 Hz	0.06 + 10 mV	0.065 + 11 mV	0.073 + 13 mV
	60 kHz - 200 Hz	0.31 + 18 mV	0.33 + 21 mV	0.35 + 25 mV
240 V	0.5 Hz - 10 Hz	3.0 + 140 mV	3.1 + 160 mV	3.3 + 200 mV
	10 Hz - 20 Hz	0.93 + 120 mV	0.96 + 130 mV	1.0 + 150 mV
	20 Hz - 60 Hz	0.04 + 100 mV	0.045 + 110 mV	0.06 + 130 mV
	60 kHz - 200 Hz	0.32 + 150 mV	0.4 + 170 mV	0.45 + 200 mV

[1] With reading rate set to ≤ 2/Sec

ACV Noise Rejection Common Mode rejection, for 50 Hz or 60 Hz with 1 kΩ imbalance in either lead, is better than 60 dB.

1.5 AC Current Measurement, True RMS

Input Characteristics

- **Crest Factor** 4 at Full Scale, increasing to 10 at Lowest Specified Current
- **Protected** with 2.5 A Fast Blow fuse

Range	Full Scale 6 1/2 Digits	Lowest Specified Current	Maximum Burden Voltage (RMS)	Resolution
2.4 mA	2.400000 mA	60 µA	25mV	1 nA
24 mA	24.00000 mA	300 µA	250mV	10 nA
240 mA	240.0000 mA	3 mA	55mV	100 nA
2.4 A	2.400000 A	30 mA	520mV	1 uA

Accuracy ± (% of reading + Amps)

Range	Frequency [1]	24 hours 23°C ± 1°C	90 Days 23°C ± 10°C	One Year 23°C ± 10°C
2.4 mA	10 Hz - 20 Hz	3.8 + 4 µA	2.7 + 4 µA	2.9 + 4 µA
	20 Hz - 47 Hz	0.9 + 4 µA	0.9 + 4 µA	1.0 + 4 µA
	47 Hz - 1 kHz	0.04 + 1.5 µA	0.08 + 3 µA	0.12 + 4 µA
	1 kHz - 10 kHz	0.12 + 4 µA	0.14 + 4 µA	0.22 + 4 µA
24 mA	10 Hz - 20 Hz	1.8 + 30 µA	2.6 + 30 µA	2.8 + 30 µA
	20 Hz - 47 Hz	0.6 + 30 µA	0.9 + 30 µA	1.0 + 30 µA
	47 Hz - 1 kHz	0.07 + 10 µA	0.15 + 20 µA	0.16 + 30 µA
	1 kHz - 10 kHz	0.21 + 30 µA	0.3 + 40 µA	0.4 + 40 µA
240 mA	10 Hz - 20 Hz	1.8 + 400 µA	2.7 + 400 µA	2.8 + 400 µA
	20 Hz - 47 Hz	0.6 + 400 µA	0.9 + 400 µA	1.0 + 400 µA
	47 Hz - 1 kHz	0.1 + 100 µA	0.17 + 180 µA	0.2 + 220 µA
	1 kHz - 10 kHz	0.3 + 300 µA	0.35 + 350 µA	0.4 + 400 µA
2.4 A	10 Hz - 20 Hz	1.8 + 4 mA	2.5 + 4.5 mA	2.7 + 5 mA
	20 Hz - 47 Hz	0.66 + 4 mA	0.8 + 6 mA	0.9 + 6 mA
	47 Hz - 1 kHz	0.3 + 3.8mA	0.33 + 3.8 mA	0.35 + 4 mA
	1 kHz - 10 kHz	0.4 + 4mA	0.45 + 4.5 mA	0.5 + 5 mA

1.6 Diode Characterization

• **Test Currents** Five

• **Current sources voltage compliance** 4 V

Accuracy ± (% of reading + Volts) [1]

Range	Full Scale 6-½ Digits	Resolution	One Year 23°C ± 10°C
0.1 µA	2.400000 V	1 µV	0.022 + 15 µV
1 µA			0.018 + 12 µV
10 µA			0.015 + 10 µV
100 µA			0.014 + 8 µV
1 mA			0.014 + 8 µV

[1] With rate set to < 2/Second

1.7 Accuracy Notes

Important: all accuracy specifications for DCV, Resistance, DCI, ACV, and ACI apply for the time periods shown in the respective specification tables. To meet these specifications, Self Calibration must be performed once a day or as indicated in the specification table. This is a simple software operation that takes a few seconds. It can be performed by calling Windows command DMMCal(), or selecting S-Cal in the control panel.

1.8 Measurement Rates Control

• **Use DMMSetRate() using the following codes.**

Rate (Readings/sec)	Symbol	Code	Noise Rejection		
			50Hz	60Hz	400Hz
0.5	RATE_p5	0	√	√	√
1	RATE_1	1	√	√	√
2	RATE_2	2	√	√	√
3	RATE_3	3	√	√	√
7	RATE_7	7	√	√	√
14	RATE_14	14			√
27	RATE_27	27			√
50	RATE_50	50			√
90	RATE_90	90			
170	RATE_170	170			
250	RATE_250	250			

1.9 Other Specifications

Temperature Coefficient over 0°C to 50°C Range	Less than 0.1 x accuracy specification per °C At 23C ± 5°C
Hardware Interface	USB connection, powered by the USB
Overload Protection (voltage inputs)	330 VDC, 250 VAC
Isolation	330 VDC, 250 VAC from Earth Ground
Maximum Input (Volt x Hertz)	$8x10^6$ Volt x Hz normal mode input (across Voltage HI & LO). $1x10^6$ Volt x Hz Common Mode input (from Voltage HI or LO relative to Earth Ground).
Safety	Designed to EN 61010-1, Installation Category II.
Calibration	Calibrations are performed by ***Signametrics*** at 23°C. All calibration constants are stored in a text file.
Temperature Range Operating	-10°C to 65°C
Temperature Range Storage	-40°C to 85°C
Relative Humidity	80% at 37°C
Size	7 inches X 5 inches X 1.3 inches
Power	+5 volts, 300 mA maximum

Note: Signametrics reserves the right to make changes in materials, specifications, product functionality, or accessories without notice.

Accessories

Several accessories are available for the SMU2055 DMM, which can be purchased directly from Signametrics, or one of its approved distributors or representatives. These are some of the accessories available:

- DMM probes SM-PRB
- DMM probe kit SM-PRK
- Deluxe probe kit SM-PRD
- Shielded SMT Tweezers Probes SM-PRSMT
- Multi Stacking Double Banana shielded cable 36” SM-CBL36
- Multi Stacking Double Banana shielded cable 48” SM-CBL48
- Mini DIN Trigger, 6-Wire Ohms connector SM2060-CON7
- Lab View VI’s library SM206X.llb (free).
- Extended 3 Year warrantee (does not include calibration).