Specification Sheet

Model SMX2055 5½ Digit Digital PXI Multimeter

1.0 SPECIFICATIONS 1

1.1 DC VOLTAGE MEASUREMENT 1
1.2 DC CURRENT MEASUREMENT 2
1.3 RESISTANCE MEASUREMENTS 2
1.3.1 2-wire 2
1.3.2 4-wire 2
1.4 AC VOLTAGE MEASUREMENTS 2
1.4.1 AC Voltage True RMS Measurement 3
1.4.2 Additional Errors Due To Signal Frequency 3
1.5 AC CURRENT MEASUREMENT, TRUE RMS 3
1.5.1 AC Current True RMS Measurement 3
1.5.2 Additional Errors Due To Current Frequency 3
1.6 DIODE TEST FUNCTION 4
1.7 MEASUREMENT RATES CONTROL 4
1.8 ACCURACY NOTES 4
1.9 OTHER SPECIFICATIONS 5

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 measurement that can be displayed using the range. 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, 240 V Ranges:** 10.00 MΩ

Accuracy ± (% of reading + Volts) [1]

Range	Full Scale 5-½ Digits	Resolution	One Year 23°C ± 10°C
240 mV	240.000 mV	1 μV	0.015 + 4 μV
2.4 V	2.40000 V	10 μV	0.014 + 8 μV
24 V	24.0000 V	100 μV	0.02 + 500 μV
240 V	240.000 V	1 mV	0.02 + 800 μV

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

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

Maximum reading rate	Resolution	
2 / second	5-1/2 digits	19 bits
8 / second	5 digits	18 bits
50 / second	4-1/2 digits	17 bits
115 / second	4 digits	16 bits

DCV Noise Rejection Normal Mode Rejection, at 50, 60, or 400 Hz ± 0.5%, is better than 95 dB for Rates of 6rps and lower. 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 built-in shunts** Two
- **Currents greater than 2.4A** require external shunt
- **Protected** with 2.5A Fast blow fuse

Accuracy ± (% of reading + Amps) [1]

Range	Full Scale 5-½ Digits	Resolution	Max Burden Voltage	One Year 23°C ± 10°C
2.4 mA	2.40000 mA	10 ηA	25mV	0.04 + 7 μA
24 mA	24.0000 mA	100 ηA	250mV	0.04 + 9 μA
240 mA	240.000 mA	1 μA	55mV	0.04 + 10 μA
2.4 A	2.40000 A	10 μA	520mV	0.06 + 100 μA

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

1.3 Resistance Measurements

1.3.1 2-wire

Accuracy ± (% of reading + Ω) [1]

Range [2]	Full Scale 5-½ Digits	Resolution	Test current	One Year 23°C ± 10°C
240 Ω	240.000 Ω	1 mΩ	1 mA	0.02 + 100 mΩ
2.4 kΩ	2.40000 kΩ	10 mΩ	1 mA	0.02 + 200 mΩ
24 kΩ	24.0000 kΩ	100 mΩ	100 μA	0.02 + 200 mΩ
240 kΩ	240.000 kΩ	1 Ω	10 μA	0.06 + 10 Ω
2.4 MΩ	2.40000 MΩ	10 Ω	1 μA	0.06 + 25 Ω
24 MΩ	24.0000 MΩ	100 Ω	100 nA	0.07 + 25 kΩ

[1] With rate set to ≤ 2/s, and within one hour from Zero (Relative control).
[2] Test voltages are 2.4V max with the exception of the 240 Ω ranges 240 mV.

1.3.2 4-wire

Accuracy ± (% of reading + Ω) [1]

Range [2]	Full Scale 5-½ Digits	Resolution	Source current	One Year 23°C ± 10°C
240 Ω	240.000 Ω	1 mΩ	1 mA	0.02 + 50 mΩ
2.4 kΩ	2.40000 kΩ	10 mΩ	1 mA	0.02 + 100 mΩ
24 kΩ	24.0000 kΩ	100 mΩ	100 μA	0.02 + 200 mΩ
240 kΩ	240.000 kΩ	1 Ω	10 μA	0.06 + 9 Ω
2.4 MΩ	2.40000 MΩ	10 Ω	1 μA	0.06 + 26 Ω
24 MΩ	24.0000 MΩ	100 Ω	100 nA	0.07 + 25 kΩ

[1] With rate set to ≤ 2/s, and within one hour from Zero (Relative control).
[2] Test voltages are 2.4V max with the exception of the 240 Ω ranges 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

1.4.1 AC Voltage True RMS Measurement

Accuracy ± (% of reading + Volts) [1]

Range	Full Scale 5-½ Digits [3]	Resolution	Lowest specified Input Voltage	One Year [2] 23°C ± 10°C
240 mV	240.000 mV	1 µV	5 mV	0.15 + 150µV
2.4 V	2.40000 V	10 µV	50 mV	0.25 + 10mV
24 V	24.0000 V	100 µV	0.5 mV	0.15 + 100mV
240 V	240.000 V	1 mV	5 V	0.25 + 400mV

[1] With rate set to ≤ 2/s
[2] Input frequency 47Hz to 10kHz. For other frequencies, see tabel below
[3] Signal is limited to $8x10^6$ Volt Hz Product

1.4.2 Additional Errors Due To Signal Frequency

Range	Signal Frequency	% of reading + Volts
240 mV	20 Hz - 47 Hz	0.8 + 50µV
	10 kHz - 50 kHz	0.48 + 80µV
2.4 V	20 Hz - 47 Hz	0.75 + 1mV
	10 kHz - 50 kHz	0.45 + 2mV
24V	20 Hz - 47 Hz	0.85 + 20mV
	10 kHz - 50 kHz	0.2 + 15mV
240V	20 Hz - 47 Hz	0.85 + 200mV
	10 kHz - 50 kHz	0.15 + 100mV

ACV Noise Rejection Common Mode rejection, for 50 Hz or 60 Hz with 1 kΩ imbalance in either lead, is better than 80 dB.

1.5 AC Current Measurement, True RMS

Input Characteristics

- **Crest Factor** 4 at Full Scale
- **Number of built-in shunts** Two
- **Currents greater 2.4A** require external shunt
- **Protected** with 2.5A Fast blow fuse

1.5.1 AC Current True RMS Measurement

Accuracy ± (% of reading + Amps) [1]

Range	Full Scale 5-½ Digits	Resolution	Lowest Secified Current	Max Burden Voltage	One Year 23°C ± 10°C [2]
2.4 mA	2.40000 mA	10 ηA	60 µA	25mV	0.3 + 20 µA
24 mA	24.0000 mA	100 ηA	300 µA	250mV	0.2 + 100 µA
240 mA	240.000 mA	1 µA	3 mA	55mV	0.17 + 1 mA
2.4 A	2.40000 A	10 µA	30 mA	520mV	0.31 + 100 mA

[1] With rate set to ≤ 2/s
[2] Input frequency 47Hz to 1kHz. For other frequencies, see tabel below

1.5.2 Additional Errors Due To Current Frequency

Range	Signal Frequency [1]	% of reading
2.4 mA	20 Hz - 47 Hz	0.88
	1 kHz - 10 kHz	0.12
24 mA	20 Hz - 47 Hz	0.84

	1 kHz - 10 kHz	0.24
240 mA	20 Hz - 47 Hz	0.8
	1 kHz - 10 kHz	0.2
2.4 A	20 Hz - 47 Hz	0.55
	1 kHz - 10 kHz	0.2

[1] All AC Current ranges have typical measurement capability of at least 20 kHz

1.6 Diode Test Function

- **Test Currents** Five
- **Current sources voltage compliance** 4 V

Accuracy ± (% of reading + Volts) [1]

Range	Full Scale 5-½ Digits	Resolution	One Year 23°C ± 10°C
0.1 µA	2.40000 V	10 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/s

1.7 Measurement Rates Control

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

Rate (Readings/sec)	Symbol	Code	Power line Rejection		
			50Hz	60Hz	400Hz
1	RATE_1R60	4		√	
1	RATE_1R50	5	√		√
2	RATE_2R60	6		√	
2	RATE_2R50	7	√		√
4	RATE_4R60	8		√	
6	RATE_6R50	9	√		√
8	RATE_8R60	10		√	
12	RATE_12R50	11	√		√
15	RATE_15R60	12		√	
25	RATE_25R50	13	√		√
30	RATE_30R60	14		√	
50	RATE_50R50	15	√		√
60	RATE_60R60	16		√	
97	RATE_100	17			√
115	RATE_120	18			

1.8 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.

These products are capable of continuous measurement as well as data transfer rates of up to 115 readings per second (rps). In general, to achieve 5-1/2 Digits of resolution, the rate should be set to 2rps or lower.

1.9 Other Specifications

Temperature Coefficient over 0°C to 50°C Range

- Less than 0.1 x accuracy specification per °C At 23C ± 10°C

Hardware Interface	Single PXI/cPCI 3U slot
Overload Protection (voltage inputs)	300 VDC, 250 VAC
Isolation	300 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 IEC 1010-1, Installation Category II.
Calibration	Calibrations are performed by ***Signametrics*** in a computer at 23°C internal temperature rise. 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
Size	Single 3U PXI or CompactPCI slot
Power	+5 volts, 200 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 SM2060 series DMM's, 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 ($15.70)
- DMM probe kit SM-PRK ($38.50)
- Deluxe probe kit SM-PRD ($95.00).
- Shielded SMT Tweezers Probes SM-PRSMT ($24.90).
- Multi Stacking Double Banana shielded cable 36" SM-CBL36 ($39.00).
- Multi Stacking Double Banana shielded cable 48" SM-CBL48 ($43.00).
- Mini DIN Trigger, 6-Wire Ohms connector SM2060-CON7 ($14.00).
- Lab View VI's library SM204x.llb (free).
- Extended 3 Year warrantee (does not include calibration) $120.00 for SM2055.