MARKETING TEAM

Test. Measure. Acquire. Control

TE4100 Series
6-1/2 Digit PXI Multimeters

- **TE4100**
  6-1/2 Digit Digital Multimeter
- **TE4200**
  6-1/2 Digit Multi-Function Digital Multimeter
- **TE4200**
  6-1/2 LCR Sourcing Digital Multimeter

Hardware features

- DC Voltage and Current
- AC Voltage and Current
  - True RMS
  - Peak-to-Peak
  - Crest Factor
  - Median
- Resistance
  - 2-wire
  - 4-wire
  - 6-wire Guarded Meas.
  - Extended Meas. to 1GΩ
- RTD Temperature Meas.
- Diode V/I Characterization
- Capacitance Measurement
- Inductance Measurement
- Leakage Measurement
- Time Measurements
  - Variable Threashold
  - Frequency and Period
  - Duty Cycle
  - Pulse Width
  - Totalizer, Event counter
- Source & Measure Functions
  - DC Voltage
  - AC Voltage
  - DC Current
- Internal Temperature
- Environment Friendly
  - Low Power & Heat
  - Minimal Materials Usage

Quality you can measure

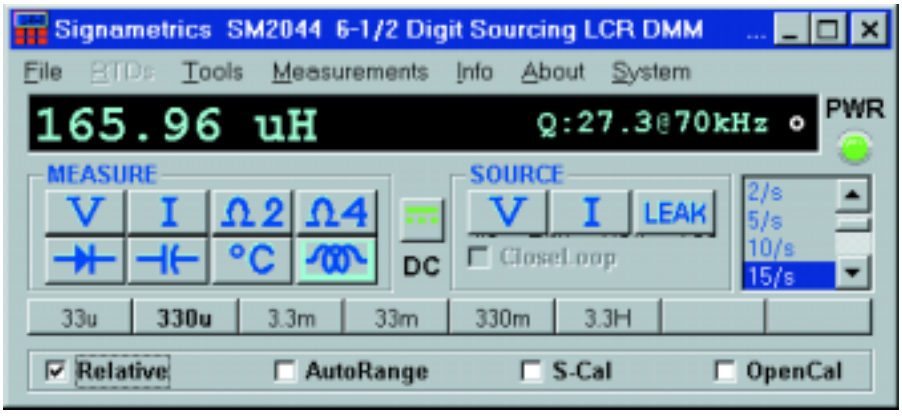
Uncompromising Performance

The TE4100/4200 provides a combination of resolution, accuracy and speed that surpasses rivals. A 6-1/2 digit display, 0.006% basic DCV accuracy and 1,000 rps assure you of measurements that are accurate, fast and repeatable. The SM2042 adds a comprehensive repertoire of measurements, and the TE4200 adds more measurements and source functions, packed into a 3U PXI plug-in module. Both measurements and sourcing functions are isolated from the PC and are therefore truly differential. An on board controller responds to high level commands from the PC, minimizing overhead.

All in one

The TE4X00 series is designed as a universal, multifunction DMM. Measurements commonly associated with “high-end” system DMMs are standard features with the TE4X00 family. Functions such as 4-wire and 6-wire guarded resistance measurements, inductance and capacitance, leakage and temperature, RMS and peak-to-peak, frequency and timing, sourcing of voltage and current, and much more. The TE4200 is best suited for applications demanding precision sources with simultaneous measurements such as in Parametric testing, while the TE4100 fits the bill where basic DMM functions are required.

The TE4100 series’ unique “Relative” function allows you to remove lead resistance or other fixed offsets in your measurement and to perform percent deviation and dB measurements. An external, level controlled trigger can be used for capturing single-shot events, and store up to 64 measurements on board.



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Easy to install and use

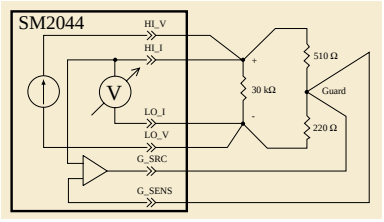
The TE4100 series supports Plug-and-Play operating systems. Once installed, your computer will automatically detect and allocate I/O space, without having to set address switches.

Add to this the intuitive Graphical User Interface (GUI), and you are up and making measurements within minutes of installation. Just point and click to perform a wide range of complex measurements.

To further increase productivity and to automate the measurement process, the TE4100 series examples are provided with comprehensive Windows98/95 and NT support for both textual programming languages such as “C”, ATEasy, LabWindows/CVI, TestPoint, MatLab and more, or for graphical environments such as VisualBasic, LabView, HPVee etc.

6-wire Guarded Resistance Measurement (TE4200)

The TE4200 provides a guarded 6-wire resistance measurement method. It is used to make resistance measurements when the resistor-under-test has other shunting paths which can cause inaccurate readings. This method isolates the resistor-under-test by maintaining a guard voltage at a user defined node. Applications include in circuit test, Resistor Networks, etc.



Example: Assume a 30kΩ resistor is in parallel with two resistors (510 Ω and 220 Ω), that are connected in series. By sensing the voltage at the top of the 30 kΩ, and then applying this same voltage to the junction of the 510 Ω and 220 Ω there is no current flow through the shunting path. With this “guarding”, the SM2044 accurately measures the 30kΩ resistor.

Extended Resistance (TE4200)

When utilizing the Leakage Measurement configuration, Use the following equation to derive the resistance being measured: $R_x = V_s/I$, where V_s is the DC voltage source, and I is the leakage current being measured. For example, if you set the leakage test voltage to 9.0V and measure 9 nA of leakage current, this corresponds to 1,000 MΩ of resistance. This application is useful for testing cables, printed circuit boards, connectors and semiconductors.

Voltage, Current and Resistance

DC Volt	Range	Full Scale Reading	Resolution	Accuracy 90 Days 23°C ± 5°C [1]	Accuracy 1 Year 23°C ± 5°C [1]
[1] Accuracy is % of reading + Volts.	330mV	330.0000 mV	100 nV	0.004 + 5.5 µV	0.007 + 8 µV
	3.3 V	3.300000 V	1 µV	0.0025 + 12 µV	0.0045 + 17 µV
	33 V	33.00000 V	10 µV	0.004 + 280 µV	0.007 + 330 µV
	330 V	330.0000 V	100 µV	0.005 + 1.2 mV	0.008 + 1.5 mV

DC Current					
	3.3 mA	3.30000 mA	10 nA	0.07 + 350 nA	0.085 + 400 nA
	33 mA	33.0000 mA	100 nA	0.06 + 2 µA	0.075 + 3 µA
[1] Accuracy is % of reading + Amps.	330 mA	330.000 mA	1 µA	0.055 + 40 µA	0.075 + 60 µA
	2.5A	2.50000 A	10 µA	0.1 + 200 µA	0.14 + 350 µA

AC Volts (RMS)	Range	Full Scale Reading	Resolution	Frequency	Accuracy 90 Days 23°C ± 5°C [1]	Accuracy 1 Year 23°C ± 5°C [1]
[1] Accuracy is % of reading + Volts. [2] Signal is limited to 8x10^6 Volt Hz Product..	330 mV (Signal >5 mV)	330.000 mV	100 nV	10 Hz - 20 Hz	3.1 + 380 µV	3.2 + 430 µV
				20 Hz - 47 Hz	0.93 + 170 µV	0.95 + 200 µV
				47 Hz - 10 kHz	0.14 + 110 µV	0.15 + 120 µV
				10 kHz - 50 kHz	0.6 + 200 µV	0.63 + 230 µV
				50 kHz - 100 kHz	5.4 + 370 µV	5.6 + 400 µV
	3.3 V (Signal >10 mV)	3.300000 V	1 µV	10 Hz - 20 Hz	3.1 + 2.2 mV	3.2 + 2.5 mV
				20 Hz - 47 Hz	0.96 + 1.5 mV	1.0 + 1.7 mV
				47 Hz - 10 kHz	0.055 + 1.1 mV	0.065 + 1.2 mV
				10 kHz - 50 kHz	0.65 + 1.3 mV	0.7 + 1.5 mV
				50 kHz - 100 kHz	5.2 + 1.7 mV	5.3 + 2 mV
	33 V (Signal >100 mV)	33.00000 V	10 µV	10 Hz - 20 Hz	3.1 + 16 mV	3.3 + 20 mV
				20 Hz - 47 Hz	0.96 + 14 mV	1.0 + 16 mV
				47 Hz - 10 kHz	0.065 + 11 mV	0.073 + 13 mV
				10 kHz - 50 kHz	0.095 + 18 mV	0.12 + 20 mV
				50 kHz - 100 kHz	1.6 + 22 mV	1.8 + 30 mV
	250 V [2] (Signal >1 V)	250.0000 V	100 µV	10 Hz - 20 Hz	3.1 + 160 mV	3.3 + 200 mV
				20 Hz - 47 Hz	0.96 + 130 mV	1.0 + 150 mV
				47 Hz - 10 kHz	0.045 + 110 mV	0.06 + 130 mV
				10 kHz - 50 kHz	0.4 + 170 mV	0.45 + 200 mV
				50 kHz - 100 kHz	1.8 + 240 mV	2.1 + 300 mV

AC Current (RMS)						
[1]Accuracy is % of reading + Amps.	3.3 mA (Signal >50 uA)	3.30000 mA	1 nA	10 Hz - 20 Hz	2.7 + 4 µA [1]	2.9 + 4 µA [1]
				20 Hz - 47 Hz	0.9 + 4 µA	1.0 + 4 µA
				47 Hz - 1 kHz	0.08 + 3 µA	0.12 + 4 µA
				1 kHz - 10 kHz	0.14 + 4 µA	0.22 + 4 µA
	33 mA (Signal >500 uA)	33.0000 mA	10 nA	10 Hz - 20 Hz	2.6 + 30 µA	2.8 + 30 µA
				20 Hz - 47 Hz	0.9 + 30 µA	1.0 + 30 µA
				47 Hz - 1 kHz	0.15 + 20 µA	0.16 + 30 µA
				1 kHz - 10 kHz	0.3 + 40 µA	0.4 + 40 µA
	330 mA (Signal >5 mA)	330.000 mA	100 nA	10 Hz - 20 Hz	2.7 + 400 µA	2.8 + 400 µA
				20 Hz - 47 Hz	0.9 + 400 µA	1.0 + 400 µA
				47 Hz - 1 kHz	0.17 + 180 µA	0.22 + 220 µA
				1 kHz - 10 kHz	0.4 + 350 µA	0.6 + 400 µA
	2.5 A (Signal >50 mA)	2.50000 A	1 µA	10 Hz - 20 Hz	2.5 + 3 mA	2.7 + 3 mA
				20 Hz - 47 Hz	0.8 + 3 mA	0.9 + 3 mA
				47 Hz - 1 kHz	0.2 + 2 mA	0.21 + 3 mA
				1 kHz - 10 kHz	0.4 + 3 mA	0.44 + 4 mA

Resistance 2-wire and 4-wire Ohms	Range	Full Scale Reading	Current Source	Resolution	Accuracy 90 Days 23°± 5°C [1] [2]	Accuracy 1 Year 23°± 5°C [1] [2]
[1] Accuracy is % of reading + Ohms. [2] With reading rate set to 2 rps, within one hour of Ohms zero, using Relative control. [3] 4-wire ohms is available to 330 kΩ range. [4] only available with the SM2042/44.	33 Ω [4]	33.00000 Ω	10 mA	10 µΩ	0.005 + 1.5 mΩ	0.008 + 2 mΩ
	330 Ω	330.0000 Ω	1 mA	100 µΩ	0.0046 + 5 mΩ	0.007 + 6 mΩ
	3.3 kΩ	3.300000 kΩ	1 mA	1 mΩ	0.003 + 32 mΩ	0.005 + 33 mΩ
	33 kΩ	33.00000 kΩ	100 µA	10 mΩ	0.0033 + 330 mΩ	0.006 + 350 mΩ
	330 kΩ [3]	330.0000 kΩ	10 µA	100 mΩ	0.007 + 4 Ω	0.009 + 5 Ω
	3.3 MΩ	3.300000 MΩ	1 µA	1 Ω	0.03 + 50 Ω	0.04 + 70 Ω
	33 MΩ	33.0000 MΩ	100 nA	100 Ω	0.13 + 500 Ω	0.2 + 600 Ω
	330 MΩ [4]	330.00 MΩ	10 nA	10 kΩ	1.4 + 60 kΩ	2.0 + 80 kΩ

Temperature (TE4200)

Temperature	RTD Type [1]	Ro (Ω)	Resolution	Temperature range	Accuracy 23°C ± 5°C One Year [1]
[1] These specifications are valid for 4-wire type RTD.	pt385, pt3911, pt3916, pt3926	100 Ω, 200 Ω	0.01 °C	-150 to 650 °C	±0.06 °C
	pt385, pt3911, pt3916, pt3926	500 Ω, 1 kΩ	0.01 °C	-150 to 650 °C	±0.03 °C
	Cu (Copper)	Less than 12 Ω	0.01 °C	-100 to 200 °C	±0.18 °C for temp. ≤ 20°C, otherwise ±0.05 °C
	Cu (Copper)	Higher than 90 Ω	0.01 °C	-100 to 200 °C	±0.10 °C for temp. ≤ 20°C, otherwise ±0.05 °C

Leakage (TE4200)

Leakage	Leakage reading	Voltage range	Accuracy 23°C ± 5°C One Year [1]
[1] Accuracy is % of reading + Amp. Error does not include external shunt resistor’s tolerance.	1.00 nA to 100.00 nA	-10 V to + 10 V	2 + 350 pA
	100.00 nA to 1000.00 nA	-9 V to + 9 V	1.2 + 2 nA
	1000.00 nA to 3300.00 nA	-7 V to + 7 V	1.5 + 20 nA

Peak to Peak, Crest and Median (TE4200)

ACV P-P [2]	ACV Range	Full Scale reading (Vp-p)	Resolution	Lowest specified input voltage (Vp-p)	Accuracy 23°C ± 5°C One Year [1]
[1] Accuracy is % of reading + Volts [2] Specified from 30Hz to 10kHz.	330 mV	1.85 V	1 mV	0.1 V	1.5 ± 10 mV
	3.3 V	18.5 V	10 mV	1 V	1.4 ± 70 mV
	33 V	185 V	100 mV	10 V	1 ± 700 mV
	250 V	850 V	1 V	100 V	1 ± .6 V

AC Crest Factor [2]	ACV Range	Resolution	Lowest specified input voltage (Vp-p)	Highest specified input voltage (Vp-p)	Accuracy 23°C ± 5°C One Year [1]
[1] Accuracy is % of reading + Constant. [2] Specified from 30Hz to 10kHz.	330 mV	0.01	0.1 V	1.8 V	2.2 ± 0.3
	3.3 V	0.01	1 V	18 V	2.1 ± 0.1
	33 V	0.01	10 V	180 V	2 ± 0.1
	250 V	0.01	100 V	700 V	2 ± 0.1

AC Median [2]	ACV Range	Full Scale reading	Resolution	Lowest specified input voltage (Vp-p)	Accuracy 23°C ± 5°C One Year [1]
[1] Accuracy is % of reading + Volts. [2] Specified from 30Hz to 10kHz.	330 mV	± 0.950 V	1 mV	0.08 V	3.3 ± 17 mV
	3.3 V	± 9.50 V	10 mV	0.8 V	3 ±160 mV
	33 V	± 95.0 V	100 mV	8 V	3 ±1.4V
	250 V	± 425 V	1 V	80 V	3% ± 12V

Timing Function (TE4200)

Timing Threshold DAC	Selected VAC range	Threshold Range	Threshold DAC Resolution	Typical one year setting uncertainty [1]
[1] Accuracy ± (% of setting + volts).	330mV	-1.0V to +1.0V	0.5 mV	0.2% + 4mV
	3.3 V	-10.0V to +10.0V	5.0 mV	0.2% + 40mV
	33 V	-100.0V to +100.0V	50 mV	0.2% + 0.4mV
	250 V	-500V to +500V	500 mV	0.2% + 4V

ACV Frequency	Frequency Range	1 Hz - 100 Hz	100 Hz- 1 kHz	1 kHz- 10 kHz	10 kHz- 100 kHz	100 kHz- 300 kHz
[1] Input RMS voltage required for a valid reading. For example, 10% - 200% of range indicates that in the 330 mVAC range, the input voltage should be 33 mV to 660 mV.	Resolution	1 mHz	10 mHz	100 mHz	1 Hz	1 Hz
	Uncertainty is ±0.002% of reading ± adder shown	4 mHz	20 mHz	200 mHz	2 Hz	5 Hz
	Input Signal Range [1]	10 - 200% of range	10 - 200% of range	10 - 200% of range	10 - 200% of range	25 - 200% of range

ACI Frequency	Frequency Range	1 Hz-100 Hz	100 Hz-1 kHz	1 kHz-10 kHz	10 kHz-500 kHz
	Resolution	1 mHz	10 mHz	100 mHz	1 Hz
	Uncertainty	0.01% ±4 mHz	0.01% ±20 mHz	0.01% ±200 mHz	0.01% ±2 Hz
	Input Signal Range, 3.3 mA Range	10% -500%	10% - 500%	10% -500%	10% - 500%
	Input Signal Range, 33 mA Range	50% - 100%	50% - 100%	50% -100%	50% -100%
	Input Signal Range, 330 mA, 2.5A ranges	50% -110%	50% - 100%	50% - 100%	50% - 100%

Duty Cycle	Frequency Range	1Hz to 100Hz	100Hz to 1kHz	1kHz to 10kHz	10kHz to 100kHz
	Resolution	0.02%	0.2%	2%	20%
	Typical Uncertainty is ±0.03% of reading ± adder shown	0.03%	0.3%	3%	20%
	Full scale reading	100.00 %	100.00 %	100.00 %	100.00 %

Pulse Width	Polarity	Frequency range	Resolution	Width range	Uncertainty
	Positive and Negative pulse	1 Hz to 100 kHz	2 µS	2 µS to 1S	0.01% ± 4 µS

Capacitance Measurements (TE4200)

Capacitance	Range	Full Scale Reading	Resolution	Accuracy One Year 23°C ± 5°C [1]
[1] Accuracy is % of reading + Farads. [2] Within one hour of zero, using Relative control. Accuracy is specified for values higher than 5% of the selected range with the exception of the 10 nF range, which is capable of measuring down to 0 pF.	10 nF	11,999 pF	1 pF	2.1 ± 5 pF [2]
	100 nF	119.99 nF	10 pF	1
	1 µF	1.1999 µF	100 pF	1
	10 µF	11.999 µF	1 nF	1
	100 µF	119.99 nF	10 nF	1
	1 mF	1.1999 mF	100 nF	1
	10 mF	11.999 mF	1 µF	2

Inductance Measurements (TE4200)

Inductance	Range	Full Scale Reading	Resolution	Default Frequency	Accuracy One Year 23°C ± 5°C [1]
[1] Accuracy is % of reading + Henry. [2] Accuracy is specified for values greater than 5% of the selected range. [3] Minimum measureable 500 nH.	33 µH	33.00 µH	1 nH	75 kHz	3 + 500 nH [2]
	330 µH	330.0 µH	10 nH	50 kHz	2 + 3 µH
	3.3 mH [3]	3.300 mH	100 nH	4 kHz	1.5 + 25 µH
	33 mH	33.00 mH	1 µH	1.5 kHz	1.5 + 200 µH
	330 mH	330.0 mH	10 µH	1 kHz	2.5 + 3 mH
	3.3 H	3.300 H	100 µH	100 Hz	3 + 35 mH

Internal Temperature (TE4200)

A special on-board temperature sensor allows monitoring of the DMM's internal temperature. This provides the means to determine when to run the self-calibration function (S-Cal) for the DMM, as well as predicting the performance of the DMM under different operating conditions. When used properly, this measurement can enhance the accuracy and stability of the DMM. It also allows monitoring of the PC internal temperature.

Capacitance Measurement (TE4200)

The TE4200 measures capacitance using a differential charge slew method, usable down to a few pF. With the exception of the 10 nF range, each of the ranges has a reading span from 5% of range to full scale. For testing surface mount parts, use the optional Signametrics SMT Tweezer probes.

Inductance Measurement (TE4200)

The TE4200 measures inductance using a precision AC source with a frequency range of 20 Hz to 75 kHz. Since inductors can vary greatly with frequency, you should choose the appropriate generator frequency. In addition to inductance, the inductor's Q factor is measured.

Sourcing Functions (TE4200)

The TE4200 adds a number of sourcing functions, giving great versatility for a variety of applications. All of the available sources, VDC, VAC, and IDC are isolated. This allows sourcing with a significant common mode voltage as well as the ability to connect several TE4200 units in parallel for increased DC current, or in series for increased DC voltage.

Two D/A converters (DACs) are used for the source functions, a 12 bit DAC, and a Trim DAC. The last augments the 12 bit DAC to form a 16 bit composite DAC. For functions requiring high precision, use both DACs by selecting the ClosedLoop mode, otherwise only the 12 bit DAC is engaged.