

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 Threshold
 - 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.



| 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. | 10 nF | 11,999 pF | 1 pF | 2.1 ± 5 pF [2] |
| | 100 nF | 119.99 nF | 10 pF | 1 |
| [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. | 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. | 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 |
| [2] Accuracy is specified for values greater than 5% of the selected range. | 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 |
| [3] Minimum measureable 500 nH. | 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.

Software Compatability

The Signametrics products are designed to be compatible with most Windows® S/W including VisualBasic®, “C++”, HPVee®, ATEasy®, Matlab®, TestPoint®, LabWindows®, LabView® and other packages. Also provided is a VisualBasic® panel with sources and plug-and-play setup.


AC/DC Voltage Source and Current Source (TE4200)

| DC Voltage Source | Parameter | Closed Loop | Open Loop |
|--------------------------------------|----------------------------------|----------------------|---------------|
| [1] Accuracy is % of reading + Volts | Output Voltage range | -10.000V to +10.000V | |
| | Maximum Current source/sink | 10 mA | |
| | DAC resolution | 16 bits | 12 bits |
| | Accuracy 23°C ± 5°C One Year [1] | 0.015% ± 250 µV | 0.13% ± 35 mV |
| | Typical settling time | 3S | 2 mS |
| | Typical source resistance | 250 Ω | |

| AC Voltage Source | Parameter | Closed Loop | Open Loop |
|--------------------------------------|----------------------------------|---|------------------------|
| [1] Accuracy is % of reading + Volts | Output Voltage | 0 to 20 V peak-to-peak (0 to 7.071068V RMS) | |
| | DAC resolution | 16 bits | 12 bit |
| | Peak Current | 10 mA | |
| | Accuracy 23°C ± 5°C One Year [1] | ACV spec ± 2 mV | ACV spec + 0.8% ± 8 mV |
| | Typical settling time | 10 S | 1.5 S |
| | Typical source resistance | 250 Ω | |
| | Frequency range / resolution | 2 Hz to 75 kHz / 2 Hz | |
| | Frequency stability | 100 ppm ± 1 Hz | |

| DC Current Source | Range | Compliance Voltage | Resolution | Minimum level | Accuracy 23°C ± 5°C One Year [1] |
|-------------------------------------|---------|--------------------|------------|---------------|----------------------------------|
| [1] Accuracy is % of reading + Amps | 1.25 µA | 4.2 V | 400 pA | 1 nA | 0.2% + 1 nA |
| | 12.5 µA | 4.2 V | 4 nA | 10 nA | 0.1% + 10 nA |
| | 125 µA | 4.2 V | 40 nA | 100 nA | 0.1% + 100 nA |
| | 1.25 mA | 4.2 V | 400 nA | 1 µA | 0.1% + 1 µA |
| | 12.5 mA | 4.0 V | 4 µA | 10 µA | 0.1% + 10 µA |

Other specifications

| | |
|------------------------------|---|
| Temperature Coefficient | All Functions Less than 0.1 x accuracy specification per °C at 23°C ± 5°C. Specifications assume a zero operation performed within an hour of measurement, and Self Cal within four hours. |
| Reading Rate | (user selectable) 0.5 to 1,000 rps up to 10 rps, 6-1/2 digits up to 30 rps, 5-1/2 digits |
| Hardware Interface | PCI Bus |
| Overload Protection | (voltage inputs) 300 VDC, 250 VAC (DIN Connector) 50 VAC |
| Isolation | 300 VDC, 250 VAC from Earth Ground |
| Maximum Input (Volt x Hertz) | 8x10 ⁶ Volt x Hz Common Mode input (across Voltage HI & LO). 1x10 ⁶ Volt x Hz Common Mode input (across Voltage HI & LO relative to Earth Ground). |
| Safety | Designed to IEC 1010-1 guidelines, for IEC 664 Installation Category II. All DMM inputs are to be used in protected, low energy circuits only.  |
| Calibration | Calibrations are performed by Signametrics in a computer with a 10°C internal temperature rise. All calibration constants are stored in a text file. Calibration can be performed by any calibration laboratory having the appropriate equipment. |
| Temperature Range | 0°C to 50°C, operating |
| Power | +5 VDC, 300 mA maximum |
| Size | 8.2" X 4.4" |

Input Characteristics

| | |
|---|---|
| DC Volts | |
| Input Resistance | >10 GΩ |
| 330 mV & 3.3 V Ranges | >10 GΩ |
| 33 V & 330 V Ranges | 10 MΩ |
| Noice Rejection | |
| NMRR | 50, 60, 400Hz >95 dB |
| CMRR | @ ≤10 rps with 1 kΩ lead imbalance >120 dB |
| DC Current | |
| Burden Voltage | < 350 mV for all ranges |
| Over Current Protected | fuse, top accessible |
| AC Volts | |
| Input Resistance | 1 MΩ, shunted by < 100 pF, all ranges |
| Crest Factor | 3 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 |
| CMRR @ ≤10 rps with 1 kΩ lead imbalance | >60 dB. |
| AC Current | |
| Burden Voltage | 350 mV RMS all Ranges |
| Crest Factor | 3 at Full Scale, increasing to 7 at Lowest Specified Current |
| Over Current Protected | 2.5 A fuse. top accessible |
| Trigger Input | |
| Input active voltage level range | +3 V to +15 V |
| Minimum input current | 1 mA |
| Timing Characteristics | Trigger occurs within 1/reading rate |
| Isolation | ±35 V from analog DMM inputs, and from computer chassis earth ground. |

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

Warranty

TSI products are warranted for a period of one years from date of delivery against defects in material or workmanship. Returned products will either be repaired or replaced at TSI's discretion.

Guarantee

If, for whatever reason, you are not satisfied with your TSI purchase, please return it within 30 days for a refund.



Precision Instruments for the PC

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