



PXIe-4080

Specifications



Provided by:

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Authorized
Distributor



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These specifications apply to the PXIe-4080, a PXIe, 6½-Digit, ± 300 V, Onboard 1.8 MS/s Isolated Digitizer, PXI Digital Multimeter.

Definitions

Warranted specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

Characteristics describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- **Typical** specifications describe the performance met by a majority of models.
- **Nominal** specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are **Warranted** unless otherwise noted.

T_{extcal} is the device temperature at last external calibration.

T_{selfcal} is the device temperature at last self-calibration.

Conditions

Specifications are valid under the following conditions unless otherwise noted. Refer to each section for additional conditions that apply.

- Self-calibration performed within the last 24 hours
- Calibration interval of 2 years
- Warm-up time of 60 minutes

- Resolution set to 6.5 digits or higher for specifications requiring an aperture greater than or equal to 100 ms

DC Voltage Specifications

DC Voltage Accuracy Specifications

All DC voltage accuracy specifications apply to apertures of ≥ 100 ms, with Auto Zero and ADC calibration enabled. Assumes offset nulling. Otherwise, add 2 μV to the specifications.

Table 1. DC Voltage \pm (ppm of reading + ppm of range)

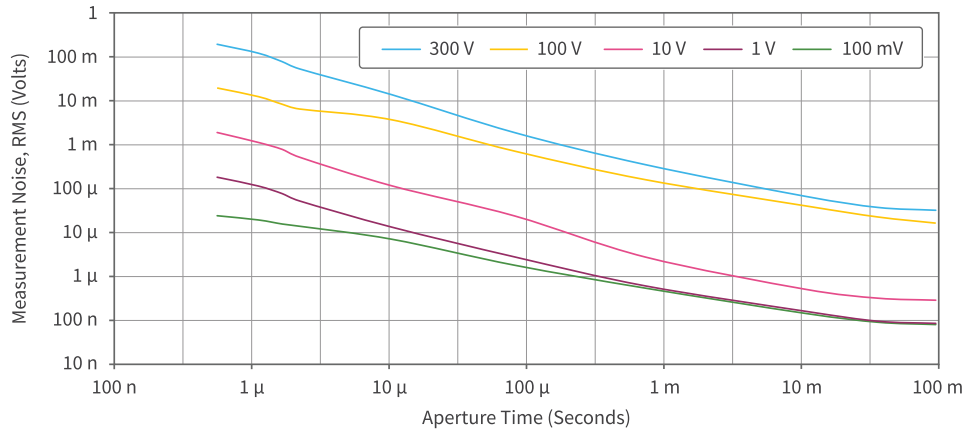
| Range | Input resistance ¹ | 24 hour ² $T_{\text{selfcal}} \pm 1^\circ\text{C}$ | 90 day $T_{\text{selfcal}} \pm 5^\circ\text{C}$ | 2 year $T_{\text{selfcal}} \pm 5^\circ\text{C}$ | Tempco/ $^\circ\text{C}$ | |
|--------|---|--|--|--|--------------------------|---------------|
| | | | | | Without Self-Cal | With Self-Cal |
| 100 mV | 10 M Ω \pm 2%, >10 G Ω | 10 + 10 | 40 + 20 | 45 + 20 | 4 + 5 | 0.3 + 0.3 |
| 1 V | | 6 + 2 | 20 + 6 | 25 + 6 | 2 + 1 | 0.3 + 0.3 |
| 10 V | | 4 + 2 | 20 + 6 | 25 + 6 | 1 + 1 | 0.3 + 0.3 |
| 100 V | 10 M Ω \pm 2% | 6 + 2 | 30 + 6 | 35 + 6 | 4 + 1 | 0.3 + 0.3 |
| 300 V | | 6 + 6 | 30 + 20 | 35 + 20 | 4 + 1 | 0.3 + 0.3 |

DC Voltage Noise



Note The following graph represents DC voltage noise with input shorted, Normal DC Noise Rejection, and Auto Zero ON. For apertures less than 100 ms, add five times the typical rms noise to the accuracy specification.

1. In parallel with 150 pF, typical.
2. Relative to external calibration source.

Figure 1. DC Voltage Noise, Typical

DC Voltage General Specifications

| | |
|--|--|
| ADC linearity | 0.5 ppm of reading + 1 ppm of range |
| Effective common-mode rejection ratio (CMRR) (1 kΩ resistance in LO lead) | >140 dB (DC), 100 ms aperture; >170 dB (>46 Hz) with high-order DC noise rejection, 100 ms aperture, typical |
| Overrange | 105% of range except 300 V |
| DC voltage input bias current | <30 pA at 23 °C, typical |

Resistance Specifications

Resistance Accuracy Specifications

All resistance accuracy specifications apply to apertures of ≥ 100 ms, with Offset Compensated Ohms (for ranges ≤ 10 kΩ) or Auto Zero (for ranges ≥ 100 kΩ) and ADC calibration enabled.

Table 2. Resistance (4-Wire and 2-Wire) \pm (ppm of reading + ppm of range)

| Range | Test current ³ | Max test voltage ⁴ | Open circuit voltage ⁵ | 90 day $T_{\text{selfcal}} \pm 5^\circ\text{C}$ | 2 year $T_{\text{selfcal}} \pm 5^\circ\text{C}$ | Tempco/ $^\circ\text{C}$ | |
|-------|---------------------------|-------------------------------|-----------------------------------|--|--|--------------------------|---------------|
| | | | | | | Without Self-Cal | With Self-Cal |
| 100 Ω | 1 mA | 100 mV | 11.3 | 50 + 15 | 80 + 15 | 5 + 1 | 0.8 + 1 |

3. -13% to 0% tolerance, typical.

4. Highest nominal voltage present with highest range resistance applied.

5. Nominal voltage present at output with no resistance load.

| Range | Test current | Max test voltage | Open circuit voltage | 90 day $T_{\text{selfcal}} \pm 5^\circ\text{C}$ | 2 year $T_{\text{selfcal}} \pm 5^\circ\text{C}$ | Tempco/ $^\circ\text{C}$ | |
|-----------------------------|---|------------------|----------------------|---|---|--------------------------|---------------|
| | | | | | | Without Self-Cal | With Self-Cal |
| 1 k Ω | 1 mA | 1 V | 11.3 | 50 + 3 | 80 + 3 | 5 + 0.1 | 0.8 + 0.1 |
| 10 k Ω | 100 μA | 1 V | 11.7 | 50 + 3 | 80 + 3 | 5 + 0.1 | 0.8 + 0.1 |
| 100 k Ω ⁶ | 10 μA | 1 V | 11.7 | 90 + 6 | 95 + 6 | 5 + 0.5 | 2 + 0.5 |
| 1 M Ω | 10 μA | 10 V | 11.7 | 90 + 10 | 95 + 10 | 5 + 1 | 2 + 1 |
| 10 M Ω | 1 μA | 10 V | 11.6 | 800 + 10 | 800 + 10 | 20 + 3 | 20 + 3 |
| 100 M Ω ⁷ | 1 $\mu\text{A} \parallel$ 10 M Ω | 10 V | 9.7 | 3000 + 10 | 3000 + 10 | 300 + 10 | 300 + 10 |



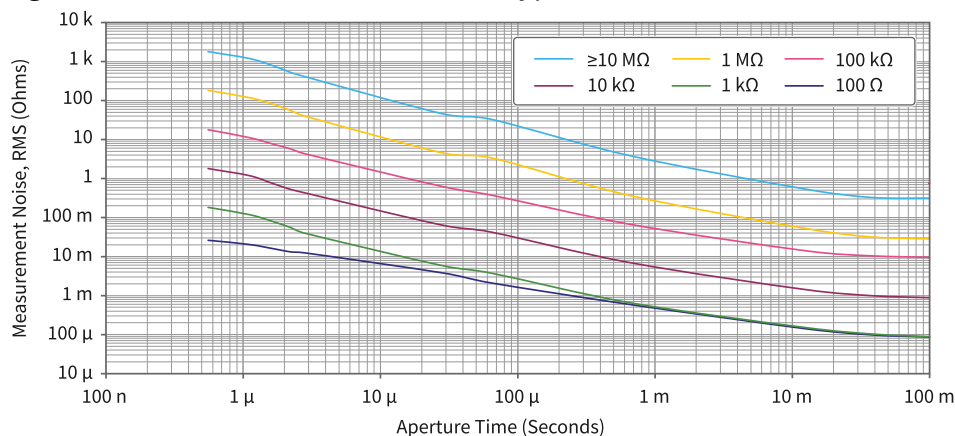
Note For 2-wire resistance measurements, perform offset nulling or add 200 m Ω to reading.

Resistance Noise



Note The following graph represents resistance noise with input shorted, Normal DC Noise Rejection, and Auto Zero ON. For apertures less than 100 ms, add five times the typical rms noise to the accuracy specification.

Figure 2. PXIe-4080 Resistance Noise, Typical



- Perform offset nulling or add 2 ppm of range to the specifications.
- 2-wire resistance measurement only. Use tempco outside $T_{\text{extcal}} \pm 10^\circ\text{C}$. Typical accuracy is 5% between 105 M Ω and 1.05 G Ω .

Resistance General Specifications

| | |
|--------------------------------|--|
| Maximum 4-wire lead resistance | Use the lesser of 10% of range or 1 k Ω |
|--------------------------------|--|

DC Current Specifications

DC Current Accuracy Specifications

All DC current accuracy specifications apply for apertures ≥ 100 ms, with Auto Zero and ADC calibration enabled.

Table 3. DC Current \pm (ppm of reading + ppm of range)

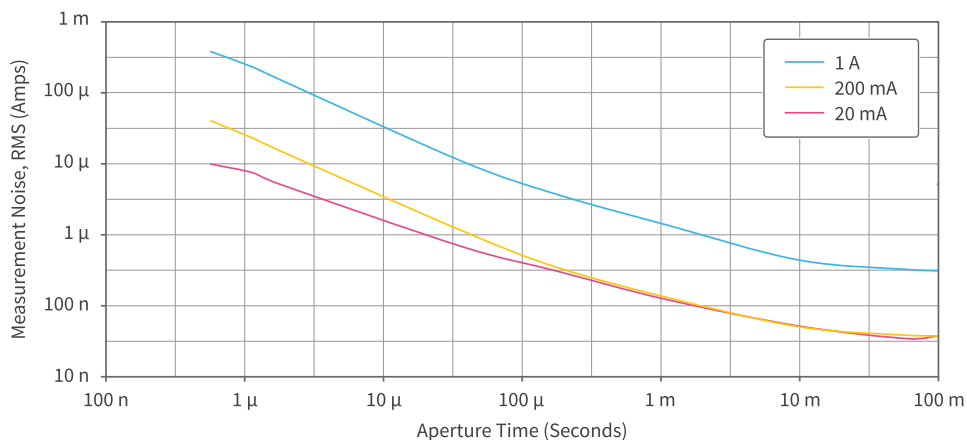
| Range | Burden voltage, typical | 24 hour ⁸ $T_{\text{selfcal}} \pm 1^\circ\text{C}$ | 2 year $T_{\text{selfcal}} \pm 5^\circ\text{C}$ | Tempco/ $^\circ\text{C}$ |
|--------|-------------------------|---|---|--------------------------|
| 20 mA | <20 mV | 20 + 15 | 450 + 200 | 8 + 10 |
| 200 mA | <200 mV | 20 + 15 | 550 + 20 | 8 + 1 |
| 1 A | <800 mV | 20 + 15 | 700 + 50 | 8 + 2 |

DC Current Noise



Note The following graph represents DC current noise with input open, Normal DC Noise Rejection, and Auto Zero ON. For apertures less than 100 ms, add five times the typical rms noise to accuracy specification.

Figure 3. PXIe-4080 DC Current Noise, Typical



8. Relative to external calibration source.

DC Current General Specifications

| | |
|-----------|--------------------------------|
| Overrange | 105% of range except 1 A range |
|-----------|--------------------------------|

AC Voltage Specifications

AC Voltage Accuracy Specifications



Note Measurement aperture greater than $4/f_L$ where f_L is the lowest frequency component of the signal being measured. Signal amplitudes greater than 1% of range.

Table 4. AC Voltage Accuracy \pm (% of reading + % of range), 2 Years, $T_{\text{extcal}} \pm 10^\circ\text{C}$, $T_{\text{selfcal}} \pm 5^\circ\text{C}$

| Range (RMS) | Peak voltage | 1 Hz to 40 Hz ⁹ | >40 Hz to 20 kHz | >20 kHz to 50 kHz | >50 kHz to 100 kHz | >100 kHz to 300 kHz |
|--------------------------|--------------|----------------------------|------------------|-------------------|--------------------|---------------------|
| 50 mV ¹⁰ | ± 105 mV | $0.1 + 0.04$ | $0.05 + 0.04$ | $0.09 + 0.04$ | $0.5 + 0.08$ | $3 + 0.1$ |
| 500 mV | ± 1.05 V | $0.1 + 0.01$ | $0.05 + 0.02$ | $0.09 + 0.02$ | $0.5 + 0.02$ | $3 + 0.05$ |
| 5 V | ± 10.5 V | | | | | |
| 50 V | ± 105 V | | | | | |
| 300 V | ± 450 V | | | | | |
| Tempco/ $^\circ\text{C}$ | | $0.001 + 0.001$ | $0.001 + 0.001$ | $0.001 + 0.001$ | $0.001 + 0.001$ | $0.01 + 0.01$ |

AC Voltage General Specifications

| | |
|------------------------------|---|
| Input impedance | $1\text{ M}\Omega \pm 2\%$ in parallel with 150 pF, typical |
| Input coupling | AC or DC coupled |
| Overrange | 105% of range except 300 V |
| Maximum Volt-Hertz product | Verified to 2.2×10^7 V-Hz |
| Maximum DC voltage component | 250 V |

9. Applies to DC coupled only.

10. Applies to signals >2 mV.

| | |
|--|-------------------------------|
| Common mode rejection ratio (CMRR), 1 k Ω resistance in LO lead | >70 dB (DC to 60 Hz), typical |
|--|-------------------------------|

AC Current Specifications

AC Current Accuracy Specifications



Note Measurement aperture greater than $4/f_L$, where f_L is the lowest frequency component of the signal being measured. Signal amplitudes greater than 1% of range.

Table 5. AC Current Specifications \pm (% of reading + % of range), 2 Years, Full operating temperature range

| Range (RMS) | Peak current | Burden voltage (RMS), typical | 1 Hz to 20 kHz ¹¹ | Tempco/ $^{\circ}$ C |
|-------------|--------------|-------------------------------|------------------------------|----------------------|
| 10 mA | ± 20 mA | <10 mV | 0.04 + 0.02 | 0.001 + 0.0001 |
| 100 mA | ± 200 mA | <100 mV | 0.04 + 0.02 | 0.001 + 0.0001 |
| 1 A | ± 2 A | <800 mV | 0.1 + 0.02 | 0.001 + 0.0001 |

AC Current General Specifications

| | |
|-----------|--------------------------|
| Overrange | 105% of range except 1 A |
|-----------|--------------------------|

Diode Test Specifications

| | |
|----------------------------|---|
| Range | 10 V |
| Test current ¹² | 1 μ A, 10 μ A, 100 μ A, 1 mA ¹³ |
| Accuracy | Add 20 ppm of reading to 10 VDC voltage specifications. |

11. Specification is typical above 5 kHz.

12. -13% to 0% tolerance, typical.

13. Up to 4.5 V measurement for 1 mA test current.

Frequency and Period Specifications



Note Aperture time set to 150 ms.

| | |
|-----------------------------|-----------------------|
| Frequency measurement range | 15 Hz to 500 kHz |
| Period measurement range | 2 μ s to 66.67 ms |

| AC input voltage range | Corresponding isolated digitizer range | Minimum peak-to-peak signal amplitude ¹⁴ | Maximum peak-to-peak signal amplitude | Accuracy |
|------------------------|--|---|---------------------------------------|---|
| 50 mV | 100 mV | 5 mV | 200 mV | Refer to the PXIe_CLK100 accuracy of the chassis. |
| 500 mV | 1 V | 50 mV | 2 V | |
| 5 V | 10 V | 500 mV | 20 V | |
| 50 V | 100 V | 5 V | 200 V | |
| 300 V | 300 V | 50 V | 450 V | |

Temperature Specifications

All temperature accuracy specifications apply to apertures ≥ 100 ms, Auto Zero, and ADC calibration enabled. Use the lowest possible resistance or voltage range for each temperature. Add probe accuracy and cold junction accuracy where applicable.

| Sensor type | Temperature range | Accuracy |
|--------------------------|--------------------|----------|
| RTD ¹⁵ | -200 °C to 600 °C | 0.1 °C |
| Thermistor ¹⁶ | -80 °C to 150 °C | 0.08 °C |
| J Thermocouple | -210 °C to 1200 °C | 0.2 °C |
| K Thermocouple | -200 °C to 1200 °C | 0.3 °C |

14. Square wave input. Minimum required peak-to-peak signal level is valid only for frequencies up to the -3 dB bandwidth. For higher frequencies, the signal amplitude must be increased. Refer to the Digitizer Voltage Mode for bandwidths.

15. Based on Pt3851 RTD in a 4-wire configuration.

16. Based on 44004, 44006, and 44007 interchangeable thermistors.

| Sensor type | Temperature range | Accuracy |
|----------------|--------------------|----------|
| N Thermocouple | -200 °C to 1300 °C | 0.4 °C |
| T Thermocouple | -200 °C to 400 °C | 0.3 °C |
| E Thermocouple | -200 °C to 1000 °C | 0.2 °C |
| R Thermocouple | -50 °C to 1760 °C | 0.8 °C |
| S Thermocouple | -50 °C to 1760 °C | 0.8 °C |
| B Thermocouple | 400 °C to 1820 °C | 0.8 °C |

Isolated Digitizer Specifications

| | |
|-------------------------|--|
| Available functions | Voltage and current |
| Voltage ranges | ±100 mV to ±300 V (DC or AC coupled) |
| Current ranges | ±20 mA to ±1 A |
| Sample rate range | 10 S/s to 1.8 MS/s |
| Available sample rates | $r = (1.8 \text{ MS/s}) / y$, where $y = 1, 2, 3, \dots, 1.8 \times 10^5$ |
| Timebase accuracy | Equal to the PXIe_CLK100 accuracy of the chassis |
| Digitizer record length | 2 samples minimum, unlimited maximum |

Table 6. Voltage Mode

| Range | Input resistance ¹⁷ | DC accuracy, (ppm/reading + ppm/range) 2 year, $T_{\text{selfcal}} \pm 5^\circ\text{C}$ | Analog bandwidth ¹⁸ , typical | |
|--------|--------------------------------|--|--|---------|
| | | | ±0.1 dB | -3 dB |
| 100 mV | 1 MΩ ± 2%, >10 GΩ | 125 + 175 | 40 kHz | 240 kHz |
| 1 V | | 125 + 75 | 40 kHz | 240 kHz |
| 10 V | | 125 + 75 | 40 kHz | 240 kHz |
| 100 V | 1 MΩ ± 2% | 125 + 75 | 30 kHz | 240 kHz |
| 300 V | | 125 + 75 | 30 kHz | 240 kHz |

17. Input impedance in parallel with 150 pF, typical. When AC coupled, only 1 MΩ available.

18. Typical AC coupled frequency is 6 Hz (±0.1 dB) and 0.8 Hz (-3 dB).

Figure 4. PXIe-4080 Voltage Waveform Noise with Input Shorted, Typical

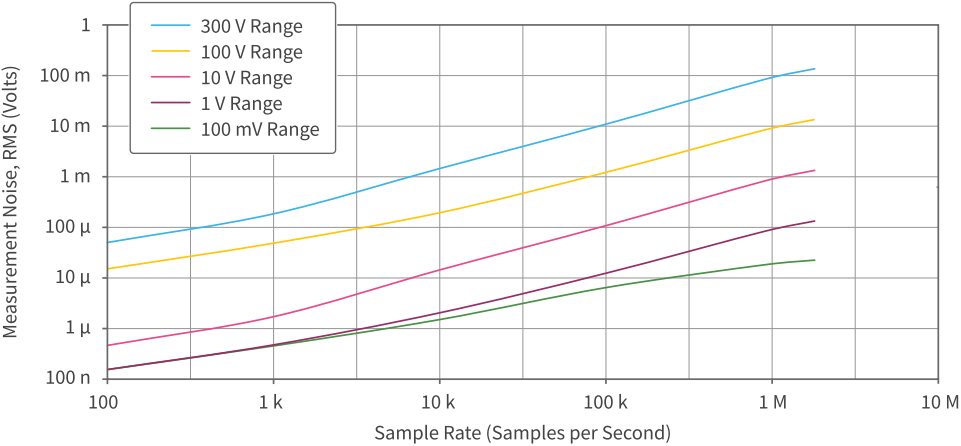
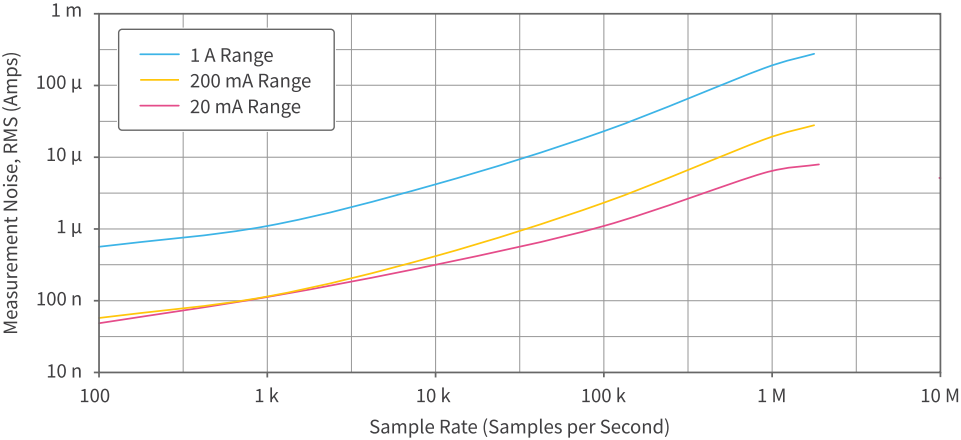


Table 7. Current Mode

| Range | Burden voltage, typical | DC accuracy, (ppm/reading + ppm/range) 2 year, T _{selfcal} ±5 °C | Analog bandwidth, typical | |
|--------|-------------------------|---|---------------------------|---------|
| | | | ±0.1 dB | -3 dB |
| 20 mA | <20 mV | 450 + 200 | 60 kHz | 300 kHz |
| 200 mA | <200 mV | 550 + 80 | 60 kHz | 300 kHz |
| 1 A | <800 mV | 700 + 75 | 60 kHz | 300 kHz |

Figure 5. PXIe-4080 Current Waveform Noise with Input Open, Typical



General Specifications

| | |
|-------------------------------|---------|
| External calibration interval | 2 years |
|-------------------------------|---------|

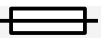
| | |
|----------------------|--|
| Warm-up | 60 minutes to rated accuracy |
| Measurement Category | I (up to 300 V) II (up to 250 VAC _{rms} , 220 VDC) |



Caution Do not connect the product to signals or use for measurements within Measurement Categories III or IV.

| | |
|--|--|
| Input protection (between terminals or terminal to ground) | 300 VDC or VAC _{rms} |
| Current mode fuse | T 1 A400 V, time-lag user-replaceable Minimum interrupt rating: 500 A Littelfuse 0477001.MXP |
| Maximum common-mode voltage | 300 VDC or VAC _{rms} |

| | |
|---------------------------------|-------------------------------|
| Maximum Voltage to Earth Ground | |
| HI | 300 VDC or VAC _{rms} |
| LO | 300 VDC or VAC _{rms} |
| HI SENSE | 300 VDC or VAC _{rms} |
| LO SENSE | 300 VDC or VAC _{rms} |



Fuse When this fuse symbol is marked on a device, take proper precautions.



Caution Take precautions to avoid electrical shock.

Timing

| Mode | Trigger latency | | Maximum reading rate ¹⁹ |
|----------------------------------|-----------------|---|------------------------------------|
| | AC voltage | All functions except AC voltage ²⁰ | |
| Voltage, current, and resistance | 15 μ s | <0 μ s | 20 kS/s |
| Voltage and current digitizer | | | 1.8 MS/s |

Power

| | |
|-------------------|---------------------------------|
| Power consumption | <9 W from PXI Express backplane |
| +12 V load | 0.55 A max |
| +3.3 V load | 0.55 A max |

Physical Characteristics

| | |
|------------|---|
| Dimensions | 3U, one-slot, PXI/cPCI module |
| | 2.0 cm x 13.0 cm x 21.6 cm (0.8 in. x 5.1 in. x 8.5 in.), nominal |
| Weight | 340 g (12 oz), nominal |



Note If you need to clean the device, wipe it with a dry towel.

19. Maximum Reading Rate assumes minimum aperture time, Auto Zero is OFF, Offset Compensated Ohms is OFF, ADC Calibration is OFF, Number of Averages is 1, and Settle Time is 0 seconds. Varying these settings affects the reading rate.
20. Trigger latency for all functions except AC Voltage assumes Auto Zero, Offset Compensated Ohms, and ADC Calibration are OFF.

Environment

| | |
|------------------|---|
| Maximum altitude | 2,000 m (800 mbar) (at 25 °C ambient temperature) |
| Pollution Degree | 2 |

Indoor use only.

Operating Environment

| | |
|---------------------------|---------------------------|
| Ambient temperature range | 0 °C to 55 °C |
| Relative humidity range | 10% to 90%, noncondensing |

Storage Environment

| | |
|---------------------------|--------------------------|
| Ambient temperature range | -40 °C to 71 °C |
| Relative humidity range | 5% to 95%, noncondensing |

Shock and Vibration

| | |
|-------------------------|-----------------------------------|
| Operating shock | 30 g peak, half-sine, 11 ms pulse |
| Random vibration | |
| Operating | 5 Hz to 500 Hz, 0.3 g RMS |

| | |
|--------------|---------------------------|
| Nonoperating | 5 Hz to 500 Hz, 2.4 g RMS |
|--------------|---------------------------|