# DC Voltage

**Instrument Uncertainty Relative to Calibration Standards**

| Range | Full Scale | Resolution | Input Impedance | 90 Day | | | 180 Day | | | 1 Year | | | 2 Year | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ± (ppm Reading + ppm Range) | | | | | | | | | | | |
| **100mV** | 120,000,000 | 1nV | > 10 GOhms | 3.8 | + | 1.7 | 4.3 | + | 1.7 | 4.8 | + | 1.7 | 7.0 | + | 1.7 |
| **1V** | 1.200,000,00 | 10nV | > 10 GOhms | 3.0 | + | 0.6 | 3.5 | + | 0.6 | 3.9 | + | 0.6 | 5.5 | + | 0.6 |
| **10V** | 12.000,000,0 | 100nV | > 10 GOhms | 3.0 | + | 0.6 | 3.5 | + | 0.6 | 3.9 | + | 0.6 | 5.5 | + | 0.6 |
| **100V** | 120.000,000 | 1uV | 10 MOhms, 1% | 4.6 | + | 0.8 | 5.2 | + | 0.8 | 5.8 | + | 0.8 | 8.0 | + | 0.8 |
| **1000V** | 1.050,000,00 | 10uV | 10 MOhms, 1% | 4.6 | + | 1.2 | 5.2 | + | 1.2 | 5.8 | + | 1.2 | 8.0 | + | 1.2 |

**Absolute Uncertainty (95% Confidence)**

| Range | 1 Year | | | | | |
|---|---|---|---|---|---|---|
| | Tcal ± 1°C | | | Tcal ± 3°C | | |
| | ± (ppm Reading + ppm Range) | | | | | |
| **100mV** | 7.5 | + | 1.7 | 9.0 | + | 1.7 |
| **1V** | 4.9 | + | 0.6 | 6.4 | + | 0.6 |
| **10V** | 5.4 | + | 0.6 | 6.8 | + | 0.6 |
| **100V** | 7.3 | + | 0.8 | 9.5 | + | 0.8 |
| **1000V** | 7.3 | + | 1.2 | 9.5 | + | 1.2 |

**Input Protection : 1100Volts**

**Ratio Uncertainty**
**Same Range : Apply 90 Day Accuracy**
**Different Ranges : ± (Front Terminal Range Accuracy + Rear Terminal Range Accuracy)**

# DC Current

**Instrument Uncertainty Relative to Calibration Standards**

| Range | Full Scale | Resolution | Input Impedance | 90 Day | | | 180 Day | | | 1 Year | | | 2 Year | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ± (ppm Reading + ppm Range) | | | | | | | | | | | |
| **10nA** | 12.000,00 | 0.01pA | Virtual Ground | 4000 | + | 80 | 4500 | + | 80 | 5000 | + | 80 | 7000 | + | 80 |
| **100nA** | 120.000,0 | 0.1pA | Virtual Ground | 1440 | + | 34 | 1620 | + | 34 | 1800 | + | 34 | 2520 | + | 34 |
| **1uA** | 1.200,000 | 1pA | Virtual Ground | 160 | + | 17 | 180 | + | 17 | 200 | + | 17 | 280 | + | 17 |
| **10uA** | 12,000,00 | 10pA | Virtual Ground | 24 | + | 10 | 27 | + | 10 | 30 | + | 10 | 42 | + | 10 |
| **100uA** | 120,000,00 | 10pA | 10 kOhms | 5.5 | + | 4 | 6 | + | 4 | 7 | + | 4 | 10 | + | 4 |
| **1mA** | 1.200,000,0 | 100pA | 1 kOhms | 5.5 | + | 4 | 6 | + | 4 | 7 | + | 4 | 10 | + | 4 |
| **10mA** | 12.000,000 | 1nA | 100 Ohms | 7.2 | + | 4 | 8.1 | + | 4 | 9 | + | 4 | 13 | + | 4 |
| **100mA** | 120,000,00 | 10nA | 10 Ohms | 24 | + | 6 | 27 | + | 6 | 30 | + | 6 | 42 | + | 6 |
| **1A** | 1.200,000,0 | 100nA | 0.5 Ohms | 120 | + | 13 | 135 | + | 13 | 150 | + | 13 | 210 | + | 13 |
| **10A** | 12.000,000 | 1uA | 10 mOhms | 290 | + | 35 | 320 | + | 35 | 360 | + | 35 | 500 | + | 35 |
| **30A** | 30.500,00 | 10uA | 10 mOhms | 390 | + | 145 | 440 | + | 145 | 490 | + | 145 | 690 | + | 145 |

**Absolute Uncertainty (95% Confidence)**

| Range | 1 Year | | | | | |
|---|---|---|---|---|---|---|
| | Tcal ± 1°C | | | Tcal ± 3°C | | |
| | ± (ppm Reading + ppm Range) | | | | | |
| **10nA** | 14227 | + | 80 | 15148 | + | 80 |
| **100nA** | 2454 | + | 34 | 3087 | + | 34 |
| **1uA** | 268 | + | 17 | 339 | + | 17 |
| **10uA** | 40 | + | 10 | 50 | + | 10 |
| **100uA** | 11 | + | 4 | 14 | + | 4 |
| **1mA** | 11 | + | 4 | 14 | + | 4 |
| **10mA** | 13 | + | 4 | 16 | + | 4 |
| **100mA** | 36 | + | 6 | 47 | + | 6 |
| **1A** | 174 | + | 13 | 234 | + | 13 |
| **10A** | 418 | + | 35 | 561 | + | 35 |
| **30A** | 569 | + | 145 | 764 | + | 145 |

**Input Protection**

| | |
|---|---|
| Front/Rear Current Terminals | 1A QB Fuse |
| Front Hi Current Terminal | 30A |

Due to continuous development specifications may be subject to change.

# AC Voltage

**Instrument Uncertainty Relative to Calibration Standards**

| Range | Full Scale | Resolution | Input Impedence | Frequency | 90 Day | | | 180 Day | | | 1 Year | | | 2 Year | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ± (% Reading + % Range) | | | | | | | | | | | |
| **100mV** | 105,000,0 | 0.1uV | >1 GOhm / 90pF | 10Hz to 40Hz | 0.040 | + | 0.015 | 0.045 | + | 0.015 | 0.05 | + | 0.015 | 0.070 | + | 0.015 |
| | | | | 40Hz to 200Hz | 0.017 | + | 0.009 | 0.019 | + | 0.009 | 0.021 | + | 0.009 | 0.029 | + | 0.009 |
| | | | | 200Hz to 1KHz | 0.014 | + | 0.008 | 0.015 | + | 0.008 | 0.017 | + | 0.008 | 0.024 | + | 0.008 |
| | | | | 1kHz to 2kHz | 0.014 | + | 0.008 | 0.015 | + | 0.008 | 0.017 | + | 0.008 | 0.024 | + | 0.008 |
| | | | | 2kHz to 20kHz | 0.020 | + | 0.01 | 0.023 | + | 0.01 | 0.025 | + | 0.010 | 0.035 | + | 0.010 |
| | | | | 20kHz to 100kHz | 0.048 | + | 0.05 | 0.054 | + | 0.05 | 0.06 | + | 0.050 | 0.080 | + | 0.050 |
| **1V** | 1.050,000 | 1uV | >1 GOhm / 90pF | 10Hz to 40Hz | 0.030 | + | 0.015 | 0.036 | + | 0.015 | 0.04 | + | 0.015 | 0.060 | + | 0.015 |
| **10V *** | 10.500,00 | 10uV | >1 GOhm / 90pF | 40Hz to 200Hz | 0.015 | + | 0.006 | 0.017 | + | 0.006 | 0.019 | + | 0.006 | 0.027 | + | 0.006 |
| | | | | 200Hz to 1KHz | 0.012 | + | 0.006 | 0.014 | + | 0.006 | 0.015 | + | 0.006 | 0.021 | + | 0.006 |
| | | | | 1KHz to 2KHz | 0.012 | + | 0.006 | 0.014 | + | 0.006 | 0.015 | + | 0.006 | 0.021 | + | 0.006 |
| | | | | 2kHz to 20kHz | 0.020 | + | 0.01 | 0.023 | + | 0.01 | 0.025 | + | 0.010 | 0.035 | + | 0.010 |
| | | | | 20kHz to 100kHz | 0.048 | + | 0.05 | 0.054 | + | 0.05 | 0.06 | + | 0.050 | 0.084 | + | 0.050 |
| | | | | 100kHz to 1MHz* | 0.800 | + | 2.5 | 0.900 | + | 2.5 | 1 | + | 2.5 | 1.400 | + | 2.5 |
| **100V** | 105.000,0 | 100uV | 1 MOhm / 130pF | 10Hz to 40Hz | 0.040 | + | 0.015 | 0.045 | + | 0.015 | 0.05 | + | 0.015 | 0.070 | + | 0.015 |
| **1000V** [+] | 1050.000 | 1mV | 1 MOhm / 130pF | 40Hz to 200Hz | 0.016 | + | 0.009 | 0.018 | + | 0.009 | 0.02 | + | 0.009 | 0.028 | + | 0.009 |
| | | | | 200Hz to 1kHz | 0.014 | + | 0.007 | 0.016 | + | 0.007 | 0.018 | + | 0.007 | 0.025 | + | 0.007 |
| | | | | 1kHz to 2kHz | 0.014 | + | 0.007 | 0.016 | + | 0.007 | 0.018 | + | 0.007 | 0.025 | + | 0.007 |
| | | | | 2kHz to 20kHz | 0.024 | + | 0.01 | 0.027 | + | 0.01 | 0.03 | + | 0.010 | 0.042 | + | 0.010 |
| | | | | 20kHz to 50kHz | 0.064 | + | 0.05 | 0.072 | + | 0.05 | 0.08 | + | 0.050 | 0.112 | + | 0.050 |

**Absolute Uncertainty (95% Confidence)**

| Range | Frequency | 1 Year | | | | | |
|---|---|---|---|---|---|---|---|
| | | Tcal ± 1°C | | | Tcal ± 3°C | | |
| | | ± (% Reading + % Range) | | | | | |
| **100mV** | 10Hz to 40Hz | 0.04 | + | 0.009 | 0.08 | + | 0.009 |
| | 40Hz to 200Hz | 0.03 | + | 0.008 | 0.03 | + | 0.008 |
| | 200Hz to 1kHz | 0.03 | + | 0.008 | 0.03 | + | 0.008 |
| | 1kHz to 2kHz | 0.04 | + | 0.008 | 0.03 | + | 0.008 |
| | 2kHz to 20kHz | 0.04 | + | 0.01 | 0.04 | + | 0.01 |
| | 20kHz to 100kHz | 0.08 | + | 0.050 | 0.09 | + | 0.05 |
| **1V** | 10Hz to 40Hz | 0.05 | + | 0.015 | 0.06 | + | 0.015 |
| **10V *** | 40Hz to 200Hz | 0.03 | + | 0.006 | 0.03 | + | 0.006 |
| | 200Hz to 1kHz | 0.02 | + | 0.006 | 0.02 | + | 0.006 |
| | 1kHz to 2kHz | 0.02 | + | 0.006 | 0.02 | + | 0.006 |
| | 2kHz to 20kHz | 0.04 | + | 0.01 | 0.04 | + | 0.01 |
| | 20kHz to 100kHz | 0.08 | + | 0.050 | 0.09 | + | 0.05 |
| | 100kHz to 1MHz* | 1.16 | + | 2.5 | 1.56 | + | 2.5 |
| **100V** | 10Hz to 40Hz | 0.07 | + | 0.015 | 0.08 | + | 0.015 |
| **1000V** [+] | 40Hz to 200Hz | 0.03 | + | 0.009 | 0.03 | + | 0.009 |
| | 200Hz to 1kHz | 0.02 | + | 0.007 | 0.03 | + | 0.007 |
| | 1kHz to 2kHz | 0.04 | + | 0.007 | 0.03 | + | 0.007 |
| | 2kHz to 20kHz | 0.05 | + | 0.010 | 0.05 | + | 0.01 |
| | 20kHz to 50kHz | 0.10 | + | 0.05 | 0.12 | + | 0.05 |

*1V Range to 1MHz : 10V Range to 200kHz

[+] 100V Range to 50kHz :1000V Range to 10kHz

# AC Current

**Instrument Uncertainty Relative to Calibration Standards**

| Range | Full Scale | Resolution | Input Impedance | Frequency | 90 Day | | | 180 Day | | | 1 Year | | | 2 Year | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ± (% Reading + % Range) | | | | | | | | | | | |
| **100uA** | 100.500,0 | 0.1nA | 10 kOhms | 10Hz to 40Hz | 0.040 | + | 0.015 | 0.045 | + | 0.015 | 0.05 | + | 0.015 | 0.07 | + | 0.015 |
| **1mA** | 1.050,000 | 1nA | 1 kOhm | 40Hz to 1kHz | 0.024 | + | 0.012 | 0.027 | + | 0.012 | 0.03 | + | 0.012 | 0.042 | + | 0.012 |
| **10mA** | 10.500,00 | 10nA | 100 Ohms | 1KHz to 10kHz | 0.056 | + | 0.030 | 0.063 | + | 0.030 | 0.07 | + | 0.030 | 0.098 | + | 0.030 |
| **100mA** | 105.000,0 | 100nA | 10 Ohms | | | | | | | | | | | | | |
| **1A** | 1.050,000 | 1uA | 0.5 Ohms | 10Hz to 40Hz | 0.048 | + | 0.020 | 0.054 | + | 0.020 | 0.06 | + | 0.020 | 0.084 | + | 0.020 |
| | | | | 40Hz to 1kHz | 0.032 | + | 0.015 | 0.036 | + | 0.015 | 0.04 | + | 0.015 | 0.056 | + | 0.015 |
| | | | | 1KHz to 10kHz | 0.056 | + | 0.050 | 0.063 | + | 0.050 | 0.07 | + | 0.050 | 0.098 | + | 0.050 |
| **10A** | 10.500,00 | 10uA | 10 mOhms | 10Hz to 40Hz | 0.064 | + | 0.040 | 0.072 | + | 0.040 | 0.08 | + | 0.040 | 0.112 | + | 0.040 |
| **30A** | 30.500,0 | 100uA | 10 mOhms | 40Hz to 1kHz | 0.056 | + | 0.030 | 0.063 | + | 0.030 | 0.07 | + | 0.030 | 0.098 | + | 0.030 |

**Absolute Uncertainty (95% Confidence)**

| Range | Frequency | 1 Year | | | | | |
|---|---|---|---|---|---|---|---|
| | | Tcal ± 1°C | | | Tcal ± 3°C | | |
| | | ± (% Reading + % Range) | | | | | |
| **100uA** | 10Hz to 40Hz | 0.07 | + | 0.015 | 0.09 | + | 0.015 |
| **1mA** | 40Hz to 1kHz | 0.04 | + | 0.012 | 0.05 | + | 0.012 |
| **10mA** | 1kHz to 10kHz | 0.09 | + | 0.03 | 0.12 | + | 0.03 |
| **100mA** | | | | | | | |
| **1A** | 10Hz to 40Hz | 0.09 | + | 0.02 | 0.11 | + | 0.02 |
| | 40Hz to 1kHz | 0.06 | + | 0.015 | 0.07 | + | 0.015 |
| | 1kHz to 10kHz | 0.10 | + | 0.05 | 0.13 | + | 0.05 |
| **10A** | 10Hz to 40Hz | 0.14 | + | 0.04 | 0.16 | + | 0.04 |
| **30A** | 40Hz to 1kHz | 0.10 | + | 0.03 | 0.12 | + | 0.03 |

# Resistance

**Instrument Uncertainty Relative to Calibration Standards**

| Range | Full Scale | Resolution | Measurment Current | 90 Day | | | 180 Day | | | 1 Year | | | 2 Year | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ± (ppm Reading + ppm Range) | | | | | | | | | | | |
| **1 Ohm** | 1.200,000,00 | 0.01 uOhm | 100mA | 12.0 | + | 6.0 | 13.0 | + | 6.0 | 15.0 | + | 6.0 | 21.0 | + | 6.0 |
| **10 Ohm** | 12.000,000,0 | 0.1 uOhm | 10mA | 8.0 | + | 3.0 | 9.0 | + | 3.0 | 10.0 | + | 3.0 | 14.0 | + | 3.0 |
| **100 Ohm** | 120.000,000 | 1 uOhm | 10mA | 7.0 | + | 1.0 | 8.0 | + | 1.0 | 9.0 | + | 1.0 | 13.0 | + | 1.0 |
| **100 Ohm Low Current** | 120.000,000 | 1 uOhm | 1mA | 8.0 | + | 7.0 | 9.0 | + | 7.0 | 10.0 | + | 7.0 | 14.0 | + | 7.0 |
| **1 kOhm** | 1.200,000,00 | 10 uOhms | 10mA | 6.5 | + | 0.8 | 7.0 | + | 0.8 | 8.0 | + | 0.8 | 11.0 | + | 0.8 |
| **1 kOhm Low Current** | 1.200,000,00 | 10 uOhms | 1mA | 7.5 | + | 3.0 | 8.0 | + | 3.0 | 9.0 | + | 3.0 | 12.0 | + | 3.0 |
| **10 kOhm** | 12.000,000,0 | 100 uOhms | 1mA | 7.5 | + | 0.8 | 8.5 | + | 0.8 | 9.5 | + | 0.8 | 13.0 | + | 0.8 |
| **10 kOhm Low Current** | 12.000,000,0 | 100 uOhms | 100uA | 8.5 | + | 8.0 | 9.5 | + | 8.0 | 10.5 | + | 8.0 | 14.0 | + | 8.0 |
| **100 kOhm** | 120.000,000 | 1 mOhms | 100uA | 8.0 | + | 0.8 | 9.0 | + | 0.8 | 10.0 | + | 0.8 | 14.0 | + | 0.8 |
| **1 MOhm*** | 1.200,000,00 | 10 mOhms | 10uA | 9.0 | + | 2.0 | 10.0 | + | 2.0 | 11.0 | + | 2.0 | 15.0 | + | 2.0 |
| **10 MOhm*** | 12.000,000,0 | 100 mOhms | 1uA | 12.0 | + | 8.0 | 13.5 | + | 8.0 | 15.0 | + | 8.0 | 21.0 | + | 8.0 |

**Absolute Uncertainty (95% Confidence)**

| Range | 1 Year | | | | | |
|---|---|---|---|---|---|---|
| | Tcal ± 1°C | | | Tcal ± 3°C | | |
| | ± (ppm Reading + ppm Range) | | | | | |
| **1 Ohm** | 17.6 | + | 6 | 23.5 | + | 6 |
| **10 Ohm** | 11.9 | + | 3 | 15.8 | + | 3 |
| **100 Ohm** | 10.6 | + | 1.0 | 14.1 | + | 1 |
| **100 Ohm Low Current** | 11.7 | + | 7 | 15.7 | + | 7 |
| **1 kOhm** | 9.4 | + | 0.8 | 12.5 | + | 0.8 |
| **1 kOhm Low Current** | 10.5 | + | 3 | 14.1 | + | 3 |
| **10 kOhm** | 11.1 | + | 0.8 | 14.9 | + | 0.8 |
| **10 kOhm Low Current** | 12.2 | + | 8 | 16.4 | + | 8 |
| **100 kOhm** | 11.8 | + | 8 | 15.7 | + | 8 |
| **1 MOhm *** | 14.1 | + | 2 | 18.2 | + | 2 |
| **10 MOhm*** | 18.0 | + | 8 | 23.9 | + | 8 |

* 2 Wire measurement only

# Electrometer Resistance

**Instrument Uncertainty Relative to Calibration Standards**

| Voltage Setting | Current Range | Resistance Range | Resolution | 1 Year ± ppm Reading |
|---|---|---|---|---|
| **50V** | 10uA | 5M Ohm - 45 MOhm | 10 Ohm | 140 |
| | 1uA | 40M Ohm - 450 Mohm | 100 Ohm | 450 |
| | 100nA | 400 Mohm - 4.5GOhm | 1kOhm | 1800 |
| | 10nA | 4 Gohm - 1TOhm | 100kOhm | 23000 |
| **100V** | 10uA | 8M Ohm - 90 Mohm | 10 Ohm | 140 |
| | 1uA | 80 Mohm - 900 Mohm | 100 Ohm | 416 |
| | 10nA | 800Mohm - 9GOhm | 1kOhm | 1810 |
| | 1nA | 8GOhm - 2TOhm | 100kOhm | 23000 |
| **150V** | 10uA | 12M Ohm - 135 MOhm | 10 Ohm | 135 |
| | 1uA | 120M Ohm - 1350 Mohm | 100 Ohm | 460 |
| | 10nA | 1200 Mohm - 13.5GOhm | 1kOhm | 1900 |
| | 1nA | 12 Gohm - 2TOhm | 100kOhm | 17667 |
| **200V** | 10uA | 20M Ohm - 180 MOhm | 10 Ohm | 135 |
| | 1uA | 160M Ohm - 1800 Mohm | 100 Ohm | 430 |
| | 10nA | 1600 Mohm - 18GOhm | 1kOhm | 1810 |
| | 1nA | 16 Gohm - 2TOhm | 100kOhm | 15000 |
| **250V** | 10uA | 25M Ohm - 225 MOhm | 10 Ohm | 132 |
| | 1uA | 200M Ohm - 2250 Mohm | 100 Ohm | 430 |
| | 10nA | 2000 Mohm - 22.5GOhm | 1kOhm | 1810 |
| | 1nA | 20 Gohm - 2TOhm | 100kOhm | 13400 |
| **300V** | 10uA | 30M Ohm - 270 MOhm | 10 Ohm | 132 |
| | 1uA | 240M Ohm - 2700 Mohm | 100 Ohm | 415 |
| | 10nA | 2400 Mohm - 27GOhm | 1kOhm | 1810 |
| | 1nA | 24 Gohm - 2TOhm | 100kOhm | 12300 |

# Temperature

| Thermocouple Type | Range | 1 Year Accuracy *To Cal Standards |
|---|---|---|
| **K** | -140°C to 1340°C | 0.08°C |
| **J** | -210°C to 1200°C | 0.08°C |
| **B** | 300°C to 500°C | 0.25°C |
| | 500°C to 1820°C | 0.15°C |
| **E** | 0°C to 800°C | 0.05°C |
| **R** | -50°C to 600°C | 0.25°C |
| | 600°C to 1760°C | 0.15°C |
| **S** | 0°C to 1760°C | 0.15°C |
| **N** | -200°C to 1300°C | 0.09°C |
| **T** | -200°C to 400°C | 0.08°C |

***Cold Junction Compensation***
Using calibrated PT100 probe in rear terminal connections = 0.05°C
Using TCLEAD = 0.1°C

**PRT**

Refer to 100 and 1kOhm resistance ranges

# Frequency

| | |
|---|---|
| **Signal Amplitude Range** | 5% of range to full scale |
| **Resolution** | 0.1Hz (after 5 samples) |
| **Frequency Range** | 1Hz to 1MHz |
| **Accuracy (1 Year)*** | 2ppm ± 2 Digits |
| **Sample Interval** | 1s |

# Phase Specifications (Option)

| Phase Angle | Resolution | Accuracy |
|---|---|---|
| 0° to 359.9° | 0.1° | 0.5° + 6us* |

*6us represents 0.109° at 50Hz or 0.87° at 400Hz

Note : Phase accuracy specification applies for levels above 5V/0.2A

Reading Speed* (Default setting highlighted in Bold)

| | |
|---|---|
| 4.5 Digit | **125ms**, 250ms, 500ms, 1s, 2s, 4s, 8s, 16s, 32s, 64s |
| 5.5 Digit | 125ms, **250ms**, 500ms, 1s, 2s, 4s, 8s, 16s, 32s, 64s |
| 6.5 Digit | 125ms, 250ms, **500ms**, 1s, 2s, 4s, 8s, 16s, 32s, 64s |
| 7.5 Digit | **1s**, 2s, 4s, 8s, 16s, 32s, 64s |
| 8.5 Digit | **4s**, 8s, 16s, 32s, 64s |

*Dynamic filter available for all resolutions