

# Fluke 8845A/8846A

## Digital Multimeters

### Extended Specifications

The Fluke 8845A and 8846A 6.5 digit precision multimeters have the precision and versatility to handle your most demanding measurements, on the bench or in a system. These meters are both high performance and feature rich, yet also remarkably easy to use.



### Features at a glance

- 6.5 digit resolution
- Basic V dc accuracy of up to 0.0024 % (1 yr.)
- Dual display
- 100  $\mu$ A to 10 A current range, with up to 100 pA resolution
- Wide ohms ranges from 10  $\Omega$  to 1 G $\Omega$  with up to 10  $\mu\Omega$  resolution
- 2 x 4 ohms 4-wire measurement technique
- Both models measure frequency and period
- 8846A also measures capacitance and temperature
- USB memory drive port (8846A)
- Fluke 45 and Agilent 34401A emulation
- Graphical display
- Trendplot™ paperless recorder mode, statistics, histogram
- CAT I 1000 V, CAT II 600 V

These digital multimeters perform the functions you would expect to see in a multifunction DMM, including measuring volts, ohms, and amps, with performance that exceeds expectations. Basic V dc accuracy of up to 0.0024 %, 10 A current range, and a wide ohms range from 10  $\Omega$  to 1 G $\Omega$  with up to 10  $\mu\Omega$  resolution give you an unbeatable combination of measurement capability.

You can also use the 8845A and 8846A to measure temperature, capacitance, period, and frequency—the functions of a counter, capacitance meter, and thermometer are built in for unparalleled versatility. Extend the meters' utility even more with their graphical display modes, including Trendplot™ paperless recorder mode, statistics and histograms—features you won't find on other multimeters.

Of course, these meters are also durable and dependable, features you expect from any Fluke meter. This unique combination of features and performance makes the 8845A and 8846A an unbeatable value for a wide variety of applications, including manufacturing test, research and development, and service.

# General Specifications

## Power

### Voltage

|                    |                |
|--------------------|----------------|
| 100 V Setting..... | 90 V to 110 V  |
| 120 V Setting..... | 108 V to 132 V |
| 220 V Setting..... | 198 V to 242 V |
| 240 V Setting..... | 216 V to 264 V |

Frequency..... 47 Hz to 440 Hz. Automatically sensed at power-on.

Power Consumption..... 28 VA peak (12 Watt average)

## Dimensions

|                       |                   |
|-----------------------|-------------------|
| Height .....          | 88 mm (3.46 in.)  |
| Width .....           | 217 mm (8.56 in.) |
| Depth.....            | 297 mm (11.7 in.) |
| Weight .....          | 3.6 kg (8.0 lb)   |
| Shipping Weight ..... | 5.0 kg (11.0 lb)  |

## Display

Vacuum Fluorescent Display, dot matrix

## Environment

### Temperature

|                 |                                           |
|-----------------|-------------------------------------------|
| Operating ..... | 0 °C to 55 °C                             |
| Storage.....    | -40 °C to 70 °C                           |
| Warm Up .....   | 1 hour to full uncertainty specifications |

### Relative Humidity (non-condensing)

|                 |                       |
|-----------------|-----------------------|
| Operating ..... | 0 °C to 28 °C <90 %   |
|                 | 28 °C to 40 °C <80 %  |
|                 | 40 °C to 55 °C <50 %  |
| Storage.....    | -40 °C to 70 °C <95 % |

### Altitude

|                 |               |
|-----------------|---------------|
| Operating ..... | 2,000 Meters  |
| Storage.....    | 12,000 Meters |

Vibration and Shock.....Complies with Mil-T-28800F Type III, Class 5 (Sine only)

## Safety

Designed to comply with IEC 61010-1:2000-1, UL 61010-1A1, CAN/CSA-C22.2 No. 61010.1, CAT I 1000V/CAT II 600V

## EMC

Designed to comply with IEC 61326-1:2000-11 (EMC) when used with shielded communications cables. This Meter has shown susceptibility to radiated frequencies greater than 1 V/m from 250 to 450 MHz.

## Triggering

|                               |                                    |
|-------------------------------|------------------------------------|
| Samples per Trigger.....      | 1 to 50,000                        |
| Trigger Delay.....            | 0 s to 3600 s; in 10 µS increments |
| External Trigger Delay.....   | <1 mS                              |
| External Trigger Jitter ..... | <500 µS                            |
| Trigger Input .....           | TTL Levels                         |
| Trigger Output.....           | 5 V maximum (open collector)       |

## Memory

|             |                                                                                                                                                            |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8845A ..... | 10,000 measurements, internal only                                                                                                                         |
| 8846A ..... | 10,000 measurements, internal, and up to 2 Gigabyte capacity with USB memory module (available separately, see “Accessories”) through front-panel USB port |

## Math Functions

Zero, dBm, dB, MX+B, Offset, DCV ratio and TrendPlot, Histogram, Statistics (min/max/average/standard deviation), and Limit Test

## Electrical

|                               |                                                                                                     |
|-------------------------------|-----------------------------------------------------------------------------------------------------|
| <b>Input Protection</b> ..... | 1000 V all ranges                                                                                   |
| <b>Overrange</b> .....        | 20 % on all ranges except 1000 V dc, 1000 V ac (8846A),<br>750 V ac (8845A), Diode, and 10 A ranges |

## Remote Interfaces

RS-232C, DTE 9-pin, 1200 to 230400 baud (RS-232C to USB cable available to connect the Meter to a PC USB port. See Accessories)  
IEEE 488.2  
LAN and “Ethernet 10/100 base T with DHCP (for IP\_ADDRESS) option”

## Warranty

One year

# Electrical Specifications

Accuracy specifications are valid for 6½ digit resolution mode after at least a 1-hour warm-up with Auto Zero enabled.

24-hour specifications are relative to calibration standards and assume a controlled electromagnetic environment per EN 61326-1:2000-11

## DC Voltage Specifications

|                                      |                                                                                                                                                                                                                                                                            |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Maximum Input</b> .....           | 1000 V on any range                                                                                                                                                                                                                                                        |
| <b>Common Mode Rejection</b> .....   | 140 dB at 50 or 60 Hz $\pm 0.1$ % (1 k $\Omega$ unbalance)                                                                                                                                                                                                                 |
| <b>Normal Mode Rejection</b> .....   | 60 dB for NPLC of 1 or greater with analog filter off and power line frequency $\pm 0.1$ %<br>100 dB for NPLC of 1 or greater with analog filter on and power line frequency $\pm 0.1$ %                                                                                   |
| <b>Measurement Method</b> .....      | Multi-ramp A/D                                                                                                                                                                                                                                                             |
| <b>A/D Linearity</b> .....           | 0.0002 % of measurement + 0.0001 % of range                                                                                                                                                                                                                                |
| <b>Input Bias Current</b> .....      | <30 pA at 25 °C                                                                                                                                                                                                                                                            |
| <b>Autozero Off Operation</b> .....  | Following instrument warm-up at calibration temperature $\pm 1$ °C and less than 10 minutes, add error: 0.0002 % range additional error + 5 $\mu$ V.                                                                                                                       |
| <b>Analog Filter</b> .....           | When using the analog filter, specifications are relative to within one hour of using the ZERO function for that range and NPLC setting.                                                                                                                                   |
| <b>DC Ratio</b> .....                | Accuracy is +/- (Input accuracy + Reference accuracy), where Input accuracy = DC Voltage accuracy for the HI to LO Input (in ppm of the Input voltage), and Reference accuracy = DC Voltage accuracy for the HI to LO (Sense) Reference (in ppm of the Reference voltage). |
| <b>Settling Considerations</b> ..... | Measurement settling times are affected by source impedance, cable dielectric characteristics, and input signal changes.                                                                                                                                                   |

## Input Characteristics

| Range                                                                                                              | Resolution  | Resolution  |             |             | Input Impedance                                |
|--------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|------------------------------------------------|
|                                                                                                                    |             | 4½ Digits   | 5½ Digits   | 6½ Digits   |                                                |
| 100 mV                                                                                                             | 100.0000 mV | 10 $\mu$ V  | 1 $\mu$ V   | 100 nV      | 10 M $\Omega$ or >10 G $\Omega$ <sup>[1]</sup> |
| 1 V                                                                                                                | 1.000000 V  | 100 $\mu$ V | 10 $\mu$ V  | 1 $\mu$ V   | 10 M $\Omega$ or >10 G $\Omega$ <sup>[1]</sup> |
| 10 V                                                                                                               | 10.00000 V  | 1 mV        | 100 $\mu$ V | 10 $\mu$ V  | 10 M $\Omega$ or >10 G $\Omega$ <sup>[1]</sup> |
| 100 V                                                                                                              | 100.0000 V  | 10 mV       | 1 mV        | 100 $\mu$ V | 10 M $\Omega$ $\pm 1$ %                        |
| 1000 V                                                                                                             | 1,000.000 V | 100 mV      | 10 mV       | 1 mV        | 10 M $\Omega$ $\pm 1$ %                        |
| [1] Inputs beyond $\pm 14$ V are clamped through 200 k $\Omega$ typical. 10 M $\Omega$ is default input impedance. |             |             |             |             |                                                |

## 8846A Accuracy

Accuracy is given as  $\pm$  (% measurement + % of range)

| Range  | 24 Hour<br>(23 $\pm 1$ °C) | 90 Days<br>(23 $\pm 5$ °C) | 1 Year<br>(23 $\pm 5$ °C) | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|--------|----------------------------|----------------------------|---------------------------|-------------------------------------------------------|
| 100 mV | 0.0025 + 0.003             | 0.0025 + 0.0035            | 0.0037 + 0.0035           | 0.0005 + 0.0005                                       |
| 1 V    | 0.0018 + 0.0006            | 0.0018 + 0.0007            | 0.0025 + 0.0007           | 0.0005 + 0.0001                                       |
| 10 V   | 0.0013 + 0.0004            | 0.0018 + 0.0005            | 0.0024 + 0.0005           | 0.0005 + 0.0001                                       |
| 100 V  | 0.0018 + 0.0006            | 0.0027 + 0.0006            | 0.0038 + 0.0006           | 0.0005 + 0.0001                                       |
| 1000 V | 0.0018 + 0.0006            | 0.0031 + 0.001             | 0.0041 + 0.001            | 0.0005 + 0.0001                                       |

## 8845A Accuracy

Accuracy is given as  $\pm$  (% measurement + % of range)

| Range  | 24 Hour<br>(23 $\pm$ 1 °C) | 90 Days<br>(23 $\pm$ 5 °C) | 1 Year<br>(23 $\pm$ 5 °C) | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|--------|----------------------------|----------------------------|---------------------------|-------------------------------------------------------|
| 100 mV | 0.003 + 0.003              | 0.004 + 0.0035             | 0.005 + 0.0035            | 0.0005 + 0.0005                                       |
| 1 V    | 0.002 + 0.0006             | 0.003 + 0.0007             | 0.004 + 0.0007            | 0.0005 + 0.0001                                       |
| 10 V   | 0.0015 + 0.0004            | 0.002 + 0.0005             | 0.0035 + 0.0005           | 0.0005 + 0.0001                                       |
| 100 V  | 0.002 + 0.0006             | 0.0035 + 0.0006            | 0.0045 + 0.0006           | 0.0005 + 0.0001                                       |
| 1000 V | 0.002 + 0.0006             | 0.0035 + 0.0010            | 0.0045 + 0.0010           | 0.0005 + 0.0001                                       |

## Additional Errors

| Digits | NPLC | Additional NPLC Noise Error   |
|--------|------|-------------------------------|
| 6½     | 100  | 0 % of range                  |
| 6½     | 10   | 0 % of range                  |
| 5½     | 1    | 0.001 % of range              |
| 5½     | .2   | 0.0025 % of range +12 $\mu$ V |
| 4½     | 0.02 | 0.017 % of range +17 $\mu$ V  |

## AC Voltage Specifications

AC Voltage specifications are for ac sinewave signals  $>5$  % of range. For inputs from 1 % to 5 % of range and  $<50$  kHz, add an additional error of 0.1 % of range, and for 50 kHz to 100 kHz, add 0.13 % of range.

**Maximum Input**.....750 V rms or 1000 V peak (8845A), 1000 V rms or 1414 V peak (8846A) or  $8 \times 10^7$  volts-Hertz product (whichever is less) for any range.

**Measurement Method**.....AC-coupled true-rms. Measures the ac component of input with up to 1000 V dc bias on any range.

## AC Filter Bandwidth:

Slow.....3 Hz – 300 kHz  
 Medium.....20 Hz – 300 kHz  
 Fast.....200 Hz – 300 kHz

**Common Mode Rejection**.....70 dB at 50 Hz or 60 Hz  $\pm 0.1$  % (1 k $\Omega$  unbalance)

## Crest Factor Error (applies to non-sinusoidal waveforms only)

Maximum Crest Factor.....5:1 at Full Scale  
 Additional Crest Factor Errors ( $<100$  Hz).....Crest factor 1-2, 0.05 % of full scale  
 Crest factor 2-3, 0.2 % of full scale  
 Crest factor 3-4, 0.4 % of full scale  
 Crest factor 4-5, 0.5 % of full scale

## Input Characteristics

| Range  | Resolution  | Resolution  |             |             | Input Impedance                             |
|--------|-------------|-------------|-------------|-------------|---------------------------------------------|
|        |             | 4½ Digits   | 5½ Digits   | 6½ Digits   |                                             |
| 100 mV | 100.0000 mV | 10 $\mu$ V  | 1 $\mu$ V   | 100 nV      | 1 M $\Omega$ $\pm 2$ % shunted by $<100$ pf |
| 1 V    | 1.000000 V  | 100 $\mu$ V | 10 $\mu$ V  | 1 $\mu$ V   |                                             |
| 10 V   | 10.00000 V  | 1 mV        | 100 $\mu$ V | 10 $\mu$ V  |                                             |
| 100 V  | 100.0000 V  | 10 mV       | 1 mV        | 100 $\mu$ V |                                             |
| 1000 V | 1,000.000 V | 100 mV      | 10 mV       | 1 mV        |                                             |

## 8846A Accuracy

Accuracy is given as  $\pm$  (% measurement + % of range)

| Range  | Frequency                    | 24 Hour<br>(23 $\pm$ 1 °C) | 90 Days<br>(23 $\pm$ 5 °C) | 1 Year<br>(23 $\pm$ 5 °C) | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|--------|------------------------------|----------------------------|----------------------------|---------------------------|-------------------------------------------------------|
| 100 mV | 3 – 5 Hz                     | 1.0 + 0.03                 | 1.0 + 0.04                 | 1.0 + 0.04                | 0.1 + 0.004                                           |
|        | 5 – 10 Hz                    | 0.35 + 0.03                | 0.35 + 0.04                | 0.35 + 0.04               | 0.035 + 0.004                                         |
|        | 10 Hz – 20 kHz               | 0.04 + 0.03                | 0.05 + 0.04                | 0.06 + 0.04               | 0.005 + 0.004                                         |
|        | 20 – 50 kHz                  | 0.1 + 0.05                 | 0.11 + 0.05                | 0.12 + 0.05               | 0.011 + 0.005                                         |
|        | 50 – 100 kHz                 | 0.55 + 0.08                | 0.6 + 0.08                 | 0.6 + 0.08                | 0.06 + 0.008                                          |
|        | 100 – 300 kHz <sup>(1)</sup> | 4.0 + 0.50                 | 4.0 + 0.50                 | 4.0 + 0.50                | 0.20 + 0.02                                           |
| 1 V    | 3 – 5 Hz                     | 1.0 + 0.02                 | 1.0 + 0.03                 | 1.0 + 0.03                | 0.1 + 0.003                                           |
|        | 5 – 10 Hz                    | 0.35 + 0.02                | 0.35 + 0.03                | 0.35 + 0.03               | 0.035 + 0.003                                         |
|        | 10 Hz – 20 kHz               | 0.04 + 0.02                | 0.05 + 0.03                | 0.06 + 0.03               | 0.005 + 0.003                                         |
|        | 20 – 50 kHz                  | 0.1 + 0.04                 | 0.11 + 0.05                | 0.12 + 0.05               | 0.011 + 0.005                                         |
|        | 50 – 100 kHz                 | 0.55 + 0.08                | 0.6 + 0.08                 | 0.6 + 0.08                | 0.06 + 0.008                                          |
|        | 100 – 300 kHz <sup>(1)</sup> | 4.0 + 0.50                 | 4.0 + 0.50                 | 4.0 + 0.50                | 0.2 + 0.02                                            |

| <b>Range</b>                                                     | <b>Frequency</b>                | <b>24 Hour<br/>(23 ±1 °C)</b> | <b>90 Days<br/>(23 ±5 °C)</b> | <b>1 Year<br/>(23 ±5 °C)</b> | <b>Temperature<br/>Coefficient/ °C<br/>Outside 18 to 28 °C</b> |
|------------------------------------------------------------------|---------------------------------|-------------------------------|-------------------------------|------------------------------|----------------------------------------------------------------|
| 10 V                                                             | 3 – 5 Hz                        | 1.0 + 0.02                    | 1.0 + 0.03                    | 1.0 + 0.03                   | 0.1 + 0.003                                                    |
|                                                                  | 5 – 10 Hz                       | 0.35 + 0.02                   | 0.35 + 0.03                   | 0.35 + 0.03                  | 0.035 + 0.003                                                  |
|                                                                  | 10 Hz – 20 kHz                  | 0.04 + 0.02                   | 0.05 + 0.03                   | 0.06 + 0.03                  | 0.005 + 0.003                                                  |
|                                                                  | 20 – 50 kHz                     | 0.1 + 0.04                    | 0.11 + 0.05                   | 0.12 + 0.05                  | 0.011 + 0.005                                                  |
|                                                                  | 50 – 100 kHz                    | 0.55 + 0.08                   | 0.6 + 0.08                    | 0.6 + 0.08                   | 0.06 + 0.008                                                   |
|                                                                  | 100 – 300 kHz <sup>[1]</sup>    | 4.0 + 0.50                    | 4.0 + 0.50                    | 4.0 + 0.50                   | 0.2 + 0.02                                                     |
| 100 V                                                            | 3 – 5 Hz                        | 1.0 + 0.02                    | 1.0 + 0.03                    | 1.0 + 0.03                   | 0.1 + 0.003                                                    |
|                                                                  | 5 – 10 Hz                       | 0.35 + 0.02                   | 0.35 + 0.03                   | 0.35 + 0.03                  | 0.035 + 0.003                                                  |
|                                                                  | 10 Hz – 20 kHz                  | 0.04 + 0.02                   | 0.05 + 0.03                   | 0.06 + 0.03                  | 0.005 + 0.003                                                  |
|                                                                  | 20 – 50 kHz                     | 0.1 + 0.04                    | 0.11 + 0.05                   | 0.12 + 0.05                  | 0.011 + 0.005                                                  |
|                                                                  | 50 – 100 kHz                    | 0.55 + 0.08                   | 0.6 + 0.08                    | 0.6 + 0.08                   | 0.06 + 0.008                                                   |
|                                                                  | 100 – 300 kHz <sup>[1]</sup>    | 4.0 + 0.50                    | 4.0 + 0.50                    | 4.0 + 0.50                   | 0.2 + 0.02                                                     |
| 1000 V                                                           | 3 – 5 Hz                        | 1.0 + 0.015                   | 1.0 + 0.0225                  | 1.0 + 0.0225                 | 0.1 + 0.00225                                                  |
|                                                                  | 5 – 10 Hz                       | 0.35 + 0.015                  | 0.35 + 0.0225                 | 0.35 + 0.0225                | 0.035 + 0.00225                                                |
|                                                                  | 10 Hz – 20 kHz                  | 0.04 + 0.015                  | 0.05 + 0.0225                 | 0.06 + 0.0225                | 0.005 + 0.00225                                                |
|                                                                  | 20 – 50 kHz                     | 0.1 + 0.03                    | 0.11 + 0.0375                 | 0.12 + 0.0375                | 0.011 + 0.00375                                                |
|                                                                  | 50 – 100 kHz <sup>[2]</sup>     | 0.55 + 0.06                   | 0.6 + 0.06                    | 0.6 + 0.06                   | 0.06 + 0.006                                                   |
|                                                                  | 100 – 300 kHz <sup>[1][2]</sup> | 4.0 + 0.375                   | 4.0 + 0.375                   | 4.0 + 0.375                  | 0.2 + 0.015                                                    |
| [1] Typically 30 % reading error at 1 MHz                        |                                 |                               |                               |                              |                                                                |
| [2] 1000 Volt range is limited to 8 X 10 <sup>7</sup> volt-Hertz |                                 |                               |                               |                              |                                                                |

### 8845A Accuracy

Accuracy is given as ± (% measurement + % of range)

| <b>Range</b>                                                    | <b>Frequency<br/>(Hz)</b>       | <b>24 Hour<br/>(23 ±1 °C)</b> | <b>90 Days<br/>(23 ±5 °C)</b> | <b>1 Year<br/>(23 ±5 °C)</b> | <b>Temperature<br/>Coefficient/ °C<br/>Outside 18 to 28 °C</b> |
|-----------------------------------------------------------------|---------------------------------|-------------------------------|-------------------------------|------------------------------|----------------------------------------------------------------|
| 100 mV                                                          | 3 – 5 Hz                        | 1.0 + 0.03                    | 1.0 + 0.04                    | 1.0 + 0.04                   | 0.10 + 0.004                                                   |
|                                                                 | 5 – 10 Hz                       | 0.35 + 0.03                   | 0.35 + 0.04                   | 0.35 + 0.04                  | 0.035 + 0.004                                                  |
|                                                                 | 10 Hz – 20 kHz                  | 0.04 + 0.03                   | 0.05 + 0.04                   | 0.06 + 0.04                  | 0.005 + 0.004                                                  |
|                                                                 | 20 – 50 kHz                     | 0.1 + 0.05                    | 0.11 + 0.05                   | 0.12 + 0.05                  | 0.011 + 0.005                                                  |
|                                                                 | 50 – 100 kHz                    | 0.55 + 0.08                   | 0.6 + 0.08                    | 0.6 + 0.08                   | 0.06 + 0.008                                                   |
|                                                                 | 100 – 300 kHz <sup>[1]</sup>    | 4.0 + 0.50                    | 4.0 + 0.50                    | 4.0 + 0.50                   | 0.2 + 0.02                                                     |
| 1 V                                                             | 3 – 5 Hz                        | 1.0 + 0.02                    | 1.0 + 0.03                    | 1.0 + 0.03                   | 0.1 + 0.003                                                    |
|                                                                 | 5 – 10 Hz                       | 0.35 + 0.02                   | 0.35 + 0.03                   | 0.35 + 0.03                  | 0.035 + 0.003                                                  |
|                                                                 | 10 Hz – 20 kHz                  | 0.04 + 0.02                   | 0.05 + 0.03                   | 0.06 + 0.03                  | 0.005 + 0.003                                                  |
|                                                                 | 20 – 50 kHz                     | 0.1 + 0.04                    | 0.11 + 0.05                   | 0.12 + 0.05                  | 0.011 + 0.005                                                  |
|                                                                 | 50 – 100 kHz                    | 0.55 + 0.08                   | 0.6 + 0.08                    | 0.6 + 0.08                   | 0.06 + 0.008                                                   |
|                                                                 | 100 – 300 kHz <sup>[1]</sup>    | 4.0 + 0.50                    | 4.0 + 0.50                    | 4.0 + 0.50                   | 0.2 + 0.02                                                     |
| 10 V                                                            | 3 – 5 Hz                        | 1.0 + 0.02                    | 1.0 + 0.03                    | 1.0 + 0.03                   | 0.1 + 0.003                                                    |
|                                                                 | 5 – 10 Hz                       | 0.35 + 0.02                   | 0.35 + 0.03                   | 0.35 + 0.03                  | 0.035 + 0.003                                                  |
|                                                                 | 10 Hz – 20 kHz                  | 0.04 + 0.02                   | 0.05 + 0.03                   | 0.06 + 0.03                  | 0.005 + 0.003                                                  |
|                                                                 | 20 – 50 kHz                     | 0.1 + 0.04                    | 0.11 + 0.05                   | 0.12 + 0.05                  | 0.011 + 0.005                                                  |
|                                                                 | 50 – 100 kHz                    | 0.55 + 0.08                   | 0.6 + 0.08                    | 0.6 + 0.08                   | 0.06 + 0.008                                                   |
|                                                                 | 100 – 300 kHz <sup>[1]</sup>    | 4.0 + 0.50                    | 4.0 + 0.50                    | 4.0 + 0.50                   | 0.2 + 0.02                                                     |
| 100 V                                                           | 3 – 5 Hz                        | 1.0 + 0.02                    | 1.0 + 0.03                    | 1.0 + 0.03                   | 0.1 + 0.003                                                    |
|                                                                 | 5 – 10 Hz                       | 0.35 + 0.02                   | 0.35 + 0.03                   | 0.35 + 0.03                  | 0.035 + 0.003                                                  |
|                                                                 | 10 Hz – 20 kHz                  | 0.04 + 0.02                   | 0.05 + 0.03                   | 0.06 + 0.03                  | 0.005 + 0.003                                                  |
|                                                                 | 20 – 50 kHz                     | 0.1 + 0.04                    | 0.11 + 0.05                   | 0.12 + 0.05                  | 0.011 + 0.005                                                  |
|                                                                 | 50 – 100 kHz                    | 0.55 + 0.08                   | 0.6 + 0.08                    | 0.6 + 0.08                   | 0.06 + 0.008                                                   |
|                                                                 | 100 – 300 kHz <sup>[1]</sup>    | 4.0 + 0.50                    | 4.0 + 0.50                    | 4.0 + 0.50                   | 0.2 + 0.02                                                     |
| 750 V                                                           | 3 – 5 Hz                        | 1.0 + 0.02                    | 1.0 + 0.03                    | 1.0 + 0.03                   | 0.1 + 0.003                                                    |
|                                                                 | 5 – 10 Hz                       | 0.35 + 0.02                   | 0.35 + 0.03                   | 0.35 + 0.03                  | 0.035 + 0.003                                                  |
|                                                                 | 10 Hz – 20 kHz                  | 0.04 + 0.02                   | 0.05 + 0.03                   | 0.06 + 0.03                  | 0.005 + 0.003                                                  |
|                                                                 | 20 – 50 kHz                     | 0.1 + 0.04                    | 0.11 + 0.05                   | 0.12 + 0.05                  | 0.011 + 0.005                                                  |
|                                                                 | 50 – 100 kHz <sup>[2]</sup>     | 0.55 + 0.08                   | 0.6 + 0.08                    | 0.6 + 0.08                   | 0.06 + 0.008                                                   |
|                                                                 | 100 – 300 kHz <sup>[1][2]</sup> | 4.0 + 0.5                     | 4.0 + 0.5                     | 4.0 + 0.5                    | 0.2 + 0.02                                                     |
| [1] Typically 30 % reading error at 1 MHz                       |                                 |                               |                               |                              |                                                                |
| [2] 750 Volt range is limited to 8 X 10 <sup>7</sup> volt-Hertz |                                 |                               |                               |                              |                                                                |

### Additional Low Frequency Errors

Error is stated as % of reading.

| Frequency      | AC Filter  |               |              |
|----------------|------------|---------------|--------------|
|                | 3HZ (slow) | 20HZ (medium) | 200HZ (fast) |
| 10 – 20 Hz     | 0          | 0.25          | –            |
| 20 – 40 Hz     | 0          | 0.02          | –            |
| 40 – 100 Hz    | 0          | 0.01          | 0.55         |
| 100 – 200 Hz   | 0          | 0             | 0.2          |
| 200 Hz – 1 kHz | 0          | 0             | 0.02         |
| >1 kHz         | 0          | 0             | 0            |

### Resistance

Specifications are for 4-wire resistance function, 2 x 4-wire resistance, or 2-wire resistance with zero. If zero is not used, add 0.2  $\Omega$  for 2-wire resistance plus lead resistance, and add 20 m $\Omega$  for 2 x 4-wire resistance function.

**Measurement Method**.....Current source referenced to LO input

**Max. Lead Resistance (4-wire ohms)**.....10 % of range per lead for 10  $\Omega$ , 100  $\Omega$ , 1 k $\Omega$  ranges. 1 k $\Omega$  per lead on all other ranges

**Input Protection**.....1000 V on all ranges

**Common Mode Rejection**.....140 dB at 50 or 60 Hz  $\pm$  0.1 % (1 k $\Omega$  unbalance)

**Normal Mode Rejection** .....60 dB for NPLC of 1 or greater with analog filter off and power line frequency  $\pm$ 0.1 %  
100 dB for NPLC of 1 or greater with analog filter on and power line frequency  $\pm$ 0.1 %

**Analog Filter**.....When using the analog filter, specifications are relative to within one hour of using the ZERO function for that range and NPLC setting.

### Input Characteristics

| Range                         | Resolution          | Resolution     |                 |                 | Source Current                   |
|-------------------------------|---------------------|----------------|-----------------|-----------------|----------------------------------|
|                               |                     | 4½ Digits      | 5½ Digits       | 6½ Digits       |                                  |
| 10 $\Omega$ <sup>[1]</sup>    | 10.00000 $\Omega$   | 1 m $\Omega$   | 100 $\mu\Omega$ | 10 $\mu\Omega$  | 5 mA/13 V                        |
| 100 $\Omega$                  | 100.0000 $\Omega$   | 10 m $\Omega$  | 1 m $\Omega$    | 100 $\mu\Omega$ | 1 mA/6 V                         |
| 1 k $\Omega$                  | 1.000000 k $\Omega$ | 100 m $\Omega$ | 10 m $\Omega$   | 1 m $\Omega$    | 1 mA/6 V                         |
| 10 k $\Omega$                 | 10.00000 k $\Omega$ | 1 $\Omega$     | 100 m $\Omega$  | 10 m $\Omega$   | 100 $\mu$ A/6 V                  |
| 100 k $\Omega$                | 100.0000 k $\Omega$ | 10 $\Omega$    | 1 $\Omega$      | 100 m $\Omega$  | 100 $\mu$ A/13 V                 |
| 1 M $\Omega$                  | 1.000000 M $\Omega$ | 100 $\Omega$   | 10 $\Omega$     | 1 $\Omega$      | 10 $\mu$ A/13 V                  |
| 10 M $\Omega$                 | 10.00000 M $\Omega$ | 1 k $\Omega$   | 100 $\Omega$    | 10 $\Omega$     | 1 $\mu$ A/13 V                   |
| 100 M $\Omega$                | 100.0000 M $\Omega$ | 10 k $\Omega$  | 1 k $\Omega$    | 100 $\Omega$    | 1 $\mu$ A    10 M $\Omega$ /10 V |
| 1.0 G $\Omega$ <sup>[1]</sup> | 1.000000 G $\Omega$ | 100 k $\Omega$ | 10 k $\Omega$   | 1 k $\Omega$    | 1 $\mu$ A    10 M $\Omega$ /10 V |

[1] 8846A Only

### 8846A Accuracy

Accuracy is given as  $\pm$  (% measurement + % of range)

| Range          | 24 Hour<br>(23 $\pm$ 1 $^{\circ}$ C) | 90 Days<br>(23 $\pm$ 5 $^{\circ}$ C) | 1 Year<br>(23 $\pm$ 5 $^{\circ}$ C) | Temperature<br>Coefficient/ $^{\circ}$ C<br>Outside 18 to 28 $^{\circ}$ C |
|----------------|--------------------------------------|--------------------------------------|-------------------------------------|---------------------------------------------------------------------------|
| 10 $\Omega$    | 0.003 + 0.01                         | 0.008 + 0.03                         | 0.01 + 0.03                         | 0.0006 + 0.0005                                                           |
| 100 $\Omega$   | 0.003 + 0.003                        | 0.008 + 0.004                        | 0.01 + 0.004                        | 0.0006 + 0.0005                                                           |
| 1 k $\Omega$   | 0.002 + 0.0005                       | 0.008 + 0.001                        | 0.01 + 0.001                        | 0.0006 + 0.0001                                                           |
| 10 k $\Omega$  | 0.002 + 0.0005                       | 0.008 + 0.001                        | 0.01 + 0.001                        | 0.0006 + 0.0001                                                           |
| 100 k $\Omega$ | 0.002 + 0.0005                       | 0.008 + 0.001                        | 0.01 + 0.001                        | 0.0006 + 0.0001                                                           |
| 1 M $\Omega$   | 0.002 + 0.001                        | 0.008 + 0.001                        | 0.01 + 0.001                        | 0.001 + 0.0002                                                            |
| 10 M $\Omega$  | 0.015 + 0.001                        | 0.02 + 0.001                         | 0.04 + 0.001                        | 0.003 + 0.0004                                                            |
| 100 M $\Omega$ | 0.3 + 0.01                           | 0.8 + 0.01                           | 0.8 + 0.01                          | 0.15 + 0.0002                                                             |
| 1 G $\Omega$   | 1.0 + 0.01                           | 1.5 + 0.01                           | 2.0 + 0.01                          | 0.6 + 0.0002                                                              |

### 8845A Accuracy

Accuracy is given as  $\pm$  (% measurement + % of range)

| Range          | 24 Hour<br>(23 $\pm$ 1 $^{\circ}$ C) | 90 Days<br>(23 $\pm$ 5 $^{\circ}$ C) | 1 Year<br>(23 $\pm$ 5 $^{\circ}$ C) | Temperature<br>Coefficient/ $^{\circ}$ C<br>Outside 18 to 28 $^{\circ}$ C |
|----------------|--------------------------------------|--------------------------------------|-------------------------------------|---------------------------------------------------------------------------|
| 100 $\Omega$   | 0.003 + 0.003                        | 0.008 + 0.004                        | 0.01 + 0.004                        | 0.0006 + 0.0005                                                           |
| 1 k $\Omega$   | 0.002 + 0.0005                       | 0.008 + 0.001                        | 0.01 + 0.001                        | 0.0006 + 0.0001                                                           |
| 10 k $\Omega$  | 0.002 + 0.0005                       | 0.008 + 0.001                        | 0.01 + 0.001                        | 0.0006 + 0.0001                                                           |
| 100 k $\Omega$ | 0.002 + 0.0005                       | 0.008 + 0.001                        | 0.01 + 0.001                        | 0.0006 + 0.0001                                                           |
| 1 M $\Omega$   | 0.002 + 0.001                        | 0.008 + 0.001                        | 0.01 + 0.001                        | 0.0010 + 0.0002                                                           |
| 10 M $\Omega$  | 0.015 + 0.001                        | 0.02 + 0.001                         | 0.04 + 0.001                        | 0.0030 + 0.0004                                                           |
| 100 M $\Omega$ | 0.3 + 0.01                           | 0.8 + 0.01                           | 0.8 + 0.01                          | 0.1500 + 0.0002                                                           |

### Additional Ohms Errors

| Digits | NPLC | Additional NPLC Noise Error |
|--------|------|-----------------------------|
| 6½     | 100  | 0 % of range                |
| 6½     | 10   | 0 % of range                |
| 5½     | 1    | 0.001 % of range            |
| 5½     | 0.2  | 0.003 % of range ±7 mΩ      |
| 4½     | 0.02 | 0.017 % of range ±15 mΩ     |

### DC Current

**Input Protection**.....Tool-accessible 11 A/1000 V and 440 mA/1000 V fuses, limits of 400 mA continuous 550 mA for 2 minutes on, 1 minute off.

**Common Mode Rejection**.....140 dB at 50 or 60 Hz ±0.1 % (1 kΩ unbalance)

**Normal Mode Rejection** .....60 dB for NPLC of 1 or greater with analog filter off and power line frequency ±0.1 %  
100 dB for NPLC of 1 or greater with analog filter on and power line frequency ±0.1 %

**Analog Filter**.....When using the analog filter, specifications are relative to within one hour of using the ZERO function for that range and NPLC setting.

### Input Characteristics

| Range                                                                                                                                                                                                                  | Resolution  | Resolution |           |           | Shunt Resistance (Ohms) | Burden Voltage |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------|-----------|-----------|-------------------------|----------------|
|                                                                                                                                                                                                                        |             | 4½ Digits  | 5½ Digits | 6½ Digits |                         |                |
| 100 µA                                                                                                                                                                                                                 | 100.0000 µA | 10 nA      | 1 nA      | 100 pA    | 100 Ω                   | <0.015 V       |
| 1 mA                                                                                                                                                                                                                   | 1.000000 mA | 100 nA     | 10 nA     | 1 nA      | 100 Ω                   | <0.15 V        |
| 10 mA                                                                                                                                                                                                                  | 10.00000 mA | 1 µA       | 100 nA    | 10 nA     | 1 Ω                     | <0.025 V       |
| 100 mA                                                                                                                                                                                                                 | 100.0000 mA | 10 µA      | 1 µA      | 100 nA    | 1 Ω                     | <0.25 V        |
| 400 mA <sup>[3]</sup>                                                                                                                                                                                                  | 400.000 mA  | 100 µA     | 10 µA     | 1 µA      | 1 Ω                     | <0.50 V        |
| 1 A <sup>[2]</sup>                                                                                                                                                                                                     | 1.000000 A  | 100 µA     | 10 µA     | 1 µA      | 0.01 Ω                  | <0.05 V        |
| 3 A <sup>[1]</sup>                                                                                                                                                                                                     | 3.000000 A  | 1 mA       | 100 µA    | 10 µA     | 0.01 Ω                  | <0.15 V        |
| 10 A                                                                                                                                                                                                                   | 10.00000 A  | 1 mA       | 100 µA    | 10 µA     | 0.01 Ω                  | <0.5 V         |
| <p>[1] Part of 10 A range.</p> <p>[2] Available on the front panel terminal only.</p> <p>[3] 400 mA available in software version 2.0 or greater only. 400 mA continuously; 550 mA for 2 minutes on, 1 minute off.</p> |             |            |           |           |                         |                |

### Accuracy (8846A)

Accuracy is given as ± (% measurement + % of range)

| Range                                                                                                                                                                                                              | 24 Hour (23 ±1 °C) | 90 Days (23 ±5 °C) | 1 Year (23 ±5 °C) | Temperature Coefficient/ °C Outside 18 to 28 °C |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|-------------------|-------------------------------------------------|
| 100 µA                                                                                                                                                                                                             | 0.01 + 0.02        | 0.04 + 0.025       | 0.05 + 0.025      | 0.002 + 0.003                                   |
| 1 mA                                                                                                                                                                                                               | 0.007 + 0.005      | 0.030 + 0.005      | 0.05 + 0.005      | 0.002 + 0.0005                                  |
| 10 mA                                                                                                                                                                                                              | 0.007 + 0.02       | 0.03 + 0.02        | 0.05 + 0.02       | 0.002 + 0.002                                   |
| 100 mA                                                                                                                                                                                                             | 0.01 + 0.004       | 0.03 + 0.005       | 0.05 + 0.005      | 0.002 + 0.0005                                  |
| 400 mA <sup>[3]</sup>                                                                                                                                                                                              | 0.03 + 0.004       | 0.04 + 0.005       | 0.05 + 0.005      | 0.005 + 0.0005                                  |
| 1 A <sup>[2]</sup>                                                                                                                                                                                                 | 0.03 + 0.02        | 0.04 + 0.02        | 0.05 + 0.02       | 0.005 + 0.001                                   |
| 3 A <sup>[1][2]</sup>                                                                                                                                                                                              | 0.05 + 0.02        | 0.08 + 0.02        | 0.1 + 0.02        | 0.005 + 0.002                                   |
| 10 A <sup>[2]</sup>                                                                                                                                                                                                | 0.1 + 0.008        | 0.12 + 0.008       | 0.15 + 0.008      | 0.005 + 0.0008                                  |
| <p>[1] Part of 10 A range</p> <p>[2] Available at front panel connectors only</p> <p>[3] 400 mA available in software version 2.0 or greater only. 400 mA continuously; 550 mA for 2 minutes on, 1 minute off.</p> |                    |                    |                   |                                                 |

## Accuracy (8845A)

Accuracy is given as  $\pm$  (% measurement + % of range)

| Range                                                                                                                                                                                                              | 24 Hour<br>(23 $\pm$ 1 °C) | 90 Days<br>(23 $\pm$ 5 °C) | 1 Year<br>(23 $\pm$ 5 °C) | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|---------------------------|-------------------------------------------------------|
| 100 $\mu$ A                                                                                                                                                                                                        | 0.01 + 0.02                | 0.04 + 0.025               | 0.05 + 0.025              | 0.002 + 0.003                                         |
| 1 mA                                                                                                                                                                                                               | 0.007 + 0.005              | 0.030 + 0.005              | 0.05 + 0.005              | 0.002 + 0.0005                                        |
| 10 mA                                                                                                                                                                                                              | 0.007 + 0.02               | 0.03 + 0.02                | 0.05 + 0.02               | 0.002 + 0.002                                         |
| 100 mA                                                                                                                                                                                                             | 0.01 + 0.004               | 0.03 + 0.005               | 0.05 + 0.005              | 0.002 + 0.0005                                        |
| 400 mA <sup>[3]</sup>                                                                                                                                                                                              | 0.03 + 0.004               | 0.04 + 0.005               | 0.05 + 0.005              | 0.005 + 0.0005                                        |
| 1 A <sup>[2]</sup>                                                                                                                                                                                                 | 0.03 + 0.02                | 0.04 + 0.02                | 0.05 + 0.02               | 0.005 + 0.001                                         |
| 3 A <sup>[1][2]</sup>                                                                                                                                                                                              | 0.05 + 0.02                | 0.08 + 0.02                | 0.10 + 0.02               | 0.005 + 0.002                                         |
| 10 A <sup>[2]</sup>                                                                                                                                                                                                | 0.10 + 0.008               | 0.12 + 0.008               | 0.15 + 0.008              | 0.005 + 0.0008                                        |
| <p>[1] Part of 10 A range</p> <p>[2] Available at front panel connectors only</p> <p>[3] 400 mA available in software version 2.0 or greater only. 400 mA continuously; 550 mA for 2 minutes on, 1 minute off.</p> |                            |                            |                           |                                                       |

## Additional Current Errors

| Digits | NPLC | Additional NPLC Noise Error for 1<br>mA, 100 mA, 400 mA, 3A and 10A | Additional NPLC Noise Error<br>for 100 $\mu$ A, 10 mA, 1A |
|--------|------|---------------------------------------------------------------------|-----------------------------------------------------------|
| 6½     | 100  | 0 % of range                                                        | 0 % of range                                              |
| 6½     | 10   | 0 % of range                                                        | 0 % of range                                              |
| 5½     | 1    | 0.001 % of range                                                    | 0.01 % of range                                           |
| 5½     | 0.2  | 0.011 % of range $\pm$ 4 $\mu$ A                                    | 0.11 % of range $\pm$ 4 $\mu$ A                           |
| 4½     | 0.02 | 0.04 % of range $\pm$ 4 $\mu$ A                                     | 0.28 % of range $\pm$ 4 $\mu$ A                           |

## AC Current

The following ac current specifications are for sinusoidal signals with amplitudes greater than 5 % of range. For inputs from 1 % to 5 % of range, add an additional error of 0.1 % of range.

**Input Protection** ..... Tool accessible 11 A/1000 V and 440 mA/1000 V fuses, limits of 400 mA continuous 550 mA for 2 minutes on, 1 minute off.

**Measurement Method** ..... ac-coupled true-rms, dc-coupled to the fuse and shunt (no blocking capacitor)

### AC Filter Bandwidth

Slow ..... 3 Hz to 10 kHz  
 Medium ..... 20 Hz to 10 kHz  
 Fast ..... 200 Hz to 10 kHz

### Crest Factor Error (applies to non-sinusoidal waveforms only)

**Maximum Crest Factor** ..... 5:1 at full scale

**Additional Crest Factor Errors (<100 Hz)** ..... Crest factor 1-2, 0.05 % of full scale  
 Crest factor 2-3, 0.2 % of full scale  
 Crest factor 3-4, 0.4 % of full scale  
 Crest factor 4-5, 0.5 % of full scale

## Input Characteristics

| Range                                                                                                                                                                                                                                                                             | Resolution       | Resolution  |             |            | Shunt Resistance<br>(Ohms) | Burden Voltage |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|-------------|------------|----------------------------|----------------|
|                                                                                                                                                                                                                                                                                   |                  | 4½ Digits   | 5½ Digits   | 6½ Digits  |                            |                |
| 100 $\mu$ A <sup>[1]</sup>                                                                                                                                                                                                                                                        | 100.0000 $\mu$ A | 10 nA       | 1 nA        | 100 pA     | 100 $\Omega$               | <0.015 V       |
| 1 mA <sup>[1]</sup>                                                                                                                                                                                                                                                               | 1.000000 mA      | 100 nA      | 10 nA       | 1 nA       | 100 $\Omega$               | <0.15 V        |
| 10 mA                                                                                                                                                                                                                                                                             | 10.00000 mA      | 1 $\mu$ A   | 100 nA      | 10 nA      | 1 $\Omega$                 | <0.025 V       |
| 100 mA                                                                                                                                                                                                                                                                            | 100.0000 mA      | 10 $\mu$ A  | 1 $\mu$ A   | 100 nA     | 1 $\Omega$                 | <0.25 V        |
| 400 mA <sup>[4]</sup>                                                                                                                                                                                                                                                             | 400.000 mA       | 100 $\mu$ A | 10 $\mu$ A  | 1 $\mu$ A  | 1 $\Omega$                 | <0.50 V        |
| 1 A <sup>[3]</sup>                                                                                                                                                                                                                                                                | 1.000000 A       | 100 $\mu$ A | 10 $\mu$ A  | 1 $\mu$ A  | 0.01 $\Omega$              | <0.05 V        |
| 3 A <sup>[2][3]</sup>                                                                                                                                                                                                                                                             | 3.00000 A        | 1 mA        | 100 $\mu$ A | 10 $\mu$ A | 0.01 $\Omega$              | <0.05 V        |
| 10 A <sup>[3]</sup>                                                                                                                                                                                                                                                               | 10.00000 A       | 1 mA        | 100 $\mu$ A | 10 $\mu$ A | 0.01 $\Omega$              | <0.5 V         |
| <p>[1] 8846A Only</p> <p>[2] Part of 10 A range</p> <p>[3] Available at front panel connectors only</p> <p>[4] 400 mA available in software version 1.0.700.18 or greater only. 400 mA continuously; 550 mA for 2 minutes on, 1 minute off; maximum crest factor 3:1 at 400mA</p> |                  |             |             |            |                            |                |



### 8846A Accuracy

Accuracy is given as  $\pm$  (% measurement + % of range)

| Range                                                                                                                                                                                                                  | Frequency (Hz) | 24 Hour<br>(23 $\pm$ 1 °C) | 90 Days<br>(23 $\pm$ 5 °C) | 1 Year<br>(23 $\pm$ 5 °C) | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------|----------------------------|---------------------------|-------------------------------------------------------|
| 100 $\mu$ A                                                                                                                                                                                                            | 3 – 5 Hz       | 1.1 + 0.06                 | 1.1 + 0.06                 | 1.1 + 0.06                | 0.2 + 0.006                                           |
|                                                                                                                                                                                                                        | 5 – 10 Hz      | 0.35 + 0.06                | 0.35 + 0.06                | 0.35 + 0.06               | 0.1 + 0.006                                           |
|                                                                                                                                                                                                                        | 10 Hz – 5 kHz  | 0.15 + 0.06                | 0.15 + 0.06                | 0.15 + 0.06               | 0.015 + 0.006                                         |
|                                                                                                                                                                                                                        | 5 – 10 kHz     | 0.35 + 0.7                 | 0.35 + 0.7                 | 0.35 + 0.7                | 0.03 + 0.006                                          |
| 1 mA                                                                                                                                                                                                                   | 3 – 5 Hz       | 1.0 + 0.04                 | 1.0 + 0.04                 | 1.0 + 0.04                | 0.1 + 0.006                                           |
|                                                                                                                                                                                                                        | 5 – 10 Hz      | 0.3 + 0.04                 | 0.3 + 0.04                 | 0.3 + 0.04                | 0.035 + 0.006                                         |
|                                                                                                                                                                                                                        | 10 Hz – 5 kHz  | 0.1 + 0.04                 | 0.1 + 0.04                 | 0.1 + 0.04                | 0.015 + 0.006                                         |
|                                                                                                                                                                                                                        | 5 – 10 kHz     | 0.2 + 0.25                 | 0.2 + 0.25                 | 0.2 + 0.25                | 0.03 + 0.006                                          |
| 10 mA                                                                                                                                                                                                                  | 3 – 5 Hz       | 1.1 + 0.06                 | 1.1 + 0.06                 | 1.1 + 0.06                | 0.2 + 0.006                                           |
|                                                                                                                                                                                                                        | 5 – 10 Hz      | 0.35 + 0.06                | 0.35 + 0.06                | 0.35 + 0.06               | 0.1 + 0.006                                           |
|                                                                                                                                                                                                                        | 10 Hz – 5 kHz  | 0.15 + 0.06                | 0.15 + 0.06                | 0.15 + 0.06               | 0.015 + 0.006                                         |
|                                                                                                                                                                                                                        | 5 – 10 kHz     | 0.35 + 0.7                 | 0.35 + 0.7                 | 0.35 + 0.7                | 0.03 + 0.006                                          |
| 100 mA                                                                                                                                                                                                                 | 3 – 5 Hz       | 1.0 + 0.04                 | 1.0 + 0.04                 | 1.0 + 0.04                | 0.1 + 0.006                                           |
|                                                                                                                                                                                                                        | 5 – 10 Hz      | 0.3 + 0.04                 | 0.3 + 0.04                 | 0.3 + 0.04                | 0.035 + 0.006                                         |
|                                                                                                                                                                                                                        | 10 Hz – 5 kHz  | 0.1 + 0.04                 | 0.1 + 0.04                 | 0.1 + 0.04                | 0.015 + 0.006                                         |
|                                                                                                                                                                                                                        | 5 – 10 kHz     | 0.2 + 0.25                 | 0.2 + 0.25                 | 0.2 + 0.25                | 0.03 + 0.006                                          |
| 400 mA <sup>[3]</sup>                                                                                                                                                                                                  | 3 – 5 Hz       | 1.0 + 0.1                  | 1.0 + 0.1                  | 1.0 + 0.1                 | 0.1 + 0.006                                           |
|                                                                                                                                                                                                                        | 5 – 10 Hz      | 0.3 + 0.1                  | 0.3 + 0.1                  | 0.3 + 0.1                 | 0.035 + 0.006                                         |
|                                                                                                                                                                                                                        | 10 Hz – 1 kHz  | 0.1 + 0.1                  | 0.1 + 0.1                  | 0.1 + 0.1                 | 0.015 + 0.006                                         |
|                                                                                                                                                                                                                        | 1 kHz – 10 kHz | 0.2 + 0.7                  | 0.2 + 0.7                  | 0.2 + 0.7                 | 0.03 + 0.006                                          |
| 1 A <sup>[2]</sup>                                                                                                                                                                                                     | 3 – 5 Hz       | 1.0 + 0.04                 | 1.0 + 0.04                 | 1.0 + 0.04                | 0.1 + 0.006                                           |
|                                                                                                                                                                                                                        | 5 – 10 Hz      | 0.3 + 0.04                 | 0.3 + 0.04                 | 0.3 + 0.04                | 0.035 + 0.006                                         |
|                                                                                                                                                                                                                        | 10 Hz – 5 kHz  | 0.1 + 0.04                 | 0.1 + 0.04                 | 0.1 + 0.04                | 0.015 + 0.006                                         |
|                                                                                                                                                                                                                        | 5 – 10 kHz     | 0.35 + 0.7                 | 0.35 + 0.7                 | 0.35 + 0.7                | 0.03 + 0.006                                          |
| 3 A <sup>[1][2]</sup>                                                                                                                                                                                                  | 3 – 5 Hz       | 1.1 + 0.06                 | 1.1 + 0.06                 | 1.1 + 0.06                | 0.1 + 0.006                                           |
|                                                                                                                                                                                                                        | 5 – 10 Hz      | 0.35 + 0.06                | 0.35 + 0.06                | 0.35 + 0.06               | 0.035 + 0.006                                         |
|                                                                                                                                                                                                                        | 10 Hz – 5 kHz  | 0.15 + 0.06                | 0.15 + 0.06                | 0.15 + 0.06               | 0.015 + 0.006                                         |
|                                                                                                                                                                                                                        | 5 – 10 kHz     | 0.35 + 0.7                 | 0.35 + 0.7                 | 0.35 + 0.7                | 0.03 + 0.006                                          |
| 10 A <sup>[2]</sup>                                                                                                                                                                                                    | 3 – 5 Hz       | 1.1 + 0.06                 | 1.1 + 0.06                 | 1.1 + 0.06                | 0.1 + 0.006                                           |
|                                                                                                                                                                                                                        | 5 – 10 Hz      | 0.35 + 0.06                | 0.35 + 0.06                | 0.35 + 0.06               | 0.035 + 0.006                                         |
|                                                                                                                                                                                                                        | 10 Hz – 5 kHz  | 0.15 + 0.06                | 0.15 + 0.06                | 0.15 + 0.06               | 0.015 + 0.006                                         |
|                                                                                                                                                                                                                        | 5 – 10 kHz     | 0.35 + 0.7                 | 0.35 + 0.7                 | 0.35 + 0.7                | 0.03 + 0.006                                          |
| [1] Part of 10 A range                                                                                                                                                                                                 |                |                            |                            |                           |                                                       |
| [2] Available only on front panel connectors                                                                                                                                                                           |                |                            |                            |                           |                                                       |
| [3] 400 mA available in software version 1.0.700.18 or greater only. 400 mA continuously; 550 mA for 2 minutes on, 1 minute off; maximum crest factor 3:1 at 400mA; specification for current above 329 mA is typical. |                |                            |                            |                           |                                                       |

### 8845A Accuracy

Accuracy is given as  $\pm$  (% measurement + % of range)

| Range                 | Frequency (Hz) | 24 Hour<br>(23 $\pm$ 1 °C) | 90 Days<br>(23 $\pm$ 5 °C) | 1 Year<br>(23 $\pm$ 5 °C) | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|-----------------------|----------------|----------------------------|----------------------------|---------------------------|-------------------------------------------------------|
| 10 mA                 | 3 – 5 Hz       | 1.1 + 0.06                 | 1.1 + 0.06                 | 1.1 + 0.06                | 0.2 + 0.006                                           |
|                       | 5 – 10 Hz      | 0.35 + 0.06                | 0.35 + 0.06                | 0.35 + 0.06               | 0.1 + 0.006                                           |
|                       | 10 Hz – 5 kHz  | 0.15 + 0.06                | 0.15 + 0.06                | 0.15 + 0.06               | 0.015 + 0.006                                         |
|                       | 5 – 10 kHz     | 0.35 + 0.7                 | 0.35 + 0.7                 | 0.35 + 0.7                | 0.03 + 0.006                                          |
| 100 mA                | 3 – 5 Hz       | 1.0 + 0.04                 | 1.0 + 0.04                 | 1.0 + 0.04                | 0.1 + 0.006                                           |
|                       | 5 – 10 Hz      | 0.3 + 0.04                 | 0.3 + 0.04                 | 0.3 + 0.04                | 0.035 + 0.006                                         |
|                       | 10 Hz – 5 kHz  | 0.1 + 0.04                 | 0.1 + 0.04                 | 0.1 + 0.04                | 0.015 + 0.006                                         |
|                       | 5 – 10 kHz     | 0.2 + 0.25                 | 0.2 + 0.25                 | 0.2 + 0.25                | 0.03 + 0.006                                          |
| 400 mA <sup>[3]</sup> | 3 – 5 Hz       | 1.0 + 0.1                  | 1.0 + 0.1                  | 1.0 + 0.1                 | 0.1 + 0.006                                           |
|                       | 5 – 10 Hz      | 0.3 + 0.1                  | 0.3 + 0.1                  | 0.3 + 0.1                 | 0.035 + 0.006                                         |
|                       | 10 Hz – 1 kHz  | 0.1 + 0.1                  | 0.1 + 0.1                  | 0.1 + 0.1                 | 0.015 + 0.006                                         |
|                       | 1 kHz – 10 kHz | 0.2 + 0.7                  | 0.2 + 0.7                  | 0.2 + 0.7                 | 0.03 + 0.006                                          |
| 1 A <sup>[2]</sup>    | 3 – 5 Hz       | 1.0 + 0.04                 | 1.0 + 0.04                 | 1.0 + 0.04                | 0.1 + 0.006                                           |
|                       | 5 – 10 Hz      | 0.3 + 0.04                 | 0.3 + 0.04                 | 0.3 + 0.04                | 0.035 + 0.006                                         |
|                       | 10 Hz – 5 kHz  | 0.1 + 0.04                 | 0.1 + 0.04                 | 0.1 + 0.04                | 0.015 + 0.006                                         |
|                       | 5 – 10 kHz     | 0.35 + 0.7                 | 0.35 + 0.7                 | 0.35 + 0.7                | 0.03 + 0.006                                          |

| Range                                                                                                                                                                                                                                                                                               | Frequency (Hz) | 24 Hour<br>(23 ±1 °C) | 90 Days<br>(23 ±5 °C) | 1 Year<br>(23 ±5 °C) | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------|-----------------------|----------------------|-------------------------------------------------------|
| 3 A <sup>[1][2]</sup>                                                                                                                                                                                                                                                                               | 3 – 5 Hz       | 1.1 + 0.06            | 1.1 + 0.06            | 1.1 + 0.06           | 0.1 + 0.006                                           |
|                                                                                                                                                                                                                                                                                                     | 5 – 10 Hz      | 0.35 + 0.06           | 0.35 + 0.06           | 0.35 + 0.06          | 0.035 + 0.006                                         |
|                                                                                                                                                                                                                                                                                                     | 10 Hz – 5 kHz  | 0.15 + 0.06           | 0.15 + 0.06           | 0.15 + 0.06          | 0.015 + 0.006                                         |
|                                                                                                                                                                                                                                                                                                     | 5 – 10 kHz     | 0.35 + 0.7            | 0.35 + 0.7            | 0.35 + 0.7           | 0.03 + 0.006                                          |
| 10 A <sup>[2]</sup>                                                                                                                                                                                                                                                                                 | 3 – 5 Hz       | 1.1 + 0.06            | 1.1 + 0.06            | 1.1 + 0.06           | 0.2 + 0.006                                           |
|                                                                                                                                                                                                                                                                                                     | 5 – 10 Hz      | 0.35 + 0.06           | 0.35 + 0.06           | 0.35 + 0.06          | 0.035 + 0.006                                         |
|                                                                                                                                                                                                                                                                                                     | 10 Hz – 5 kHz  | 0.15 + 0.06           | 0.15 + 0.06           | 0.15 + 0.06          | 0.015 + 0.006                                         |
|                                                                                                                                                                                                                                                                                                     | 5 – 10 kHz     | 0.35 + 0.7            | 0.35 + 0.7            | 0.35 + 0.7           | 0.03 + 0.006                                          |
| [1] Part of the 10 A range<br>[2] Available only at front panel connectors<br>[3] 400 m available in software version 1.0.700.18 or greater only. 400 mA continuously; 550 mA for 2 minutes on, 1 minute off; maximum crest factor 3:1 at 400mA; specification for current above 329 mA is typical. |                |                       |                       |                      |                                                       |

### Additional Low Frequency Errors

Error is stated as % of reading.

| Frequency      | AC Filter  |               |              |
|----------------|------------|---------------|--------------|
|                | 3HZ (slow) | 20HZ (medium) | 200HZ (fast) |
| 10 – 20 Hz     | 0          | 0.25          | –            |
| 20 – 40 Hz     | 0          | 0.02          | –            |
| 40 – 100 Hz    | 0          | 0.01          | 0.55         |
| 100 – 200 Hz   | 0          | 0             | 0.2          |
| 200 Hz – 1 kHz | 0          | 0             | 0.02         |
| > 1 kHz        | 0          | 0             | 0            |

### Frequency

**Gate Times** ..... Programmable to 1 s, 100 ms, and 10 ms

**Measurement Method** ..... Flexible counting technique. AC-coupled input using the ac voltage measurement function.

**Settling Considerations** ..... When measuring frequency or period after a dc offset voltage change, errors may occur. For the most accurate measurement, wait up to 1 second for the input blocking capacitor to settle.

**Measurement Considerations** ..... To minimize measurement errors, shield inputs from external noise when measuring low-voltage, low-frequency signals.

### 8846A Accuracy

Accuracy is given as ± % measurement

| Range                                                                                                                          | Frequency       | 24 Hour<br>(23 ±1 °C) | 90 Days<br>(23 ±5 °C) | 1 Year<br>(23 ±5 °C) | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|--------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------|-----------------------|----------------------|-------------------------------------------------------|
| 100 mV to<br>1000 V <sup>[1][2]</sup>                                                                                          | 3 – 5 Hz        | 0.1                   | 0.1                   | 0.1                  | 0.005                                                 |
|                                                                                                                                | 5 – 10 Hz       | 0.05                  | 0.05                  | 0.05                 | 0.005                                                 |
|                                                                                                                                | 10 – 40 Hz      | 0.03                  | 0.03                  | 0.03                 | 0.001                                                 |
|                                                                                                                                | 40 Hz – 300 kHz | 0.006                 | 0.01                  | 0.01                 | 0.001                                                 |
|                                                                                                                                | 300 kHz – 1 MHz | 0.006                 | 0.01                  | 0.01                 | 0.001                                                 |
| [1] Input >100 mV. For 10 – 100 mV, multiply percent measurement error by 10.<br>[2] Limited to 8 X 10 <sup>7</sup> volt-Hertz |                 |                       |                       |                      |                                                       |

## 8845A Accuracy

Accuracy is given as  $\pm$  % measurement

| Range                                                                         | Frequency       | 24 Hour<br>(23 $\pm$ 1 °C) | 90 Days<br>(23 $\pm$ 5 °C) | 1 Year<br>(23 $\pm$ 5 °C) | Temperature<br>Compensation/ °C<br>Outside 18 to 28 °C |
|-------------------------------------------------------------------------------|-----------------|----------------------------|----------------------------|---------------------------|--------------------------------------------------------|
| 100 mV to<br>750 V <sup>[1][2]</sup>                                          | 3 – 5 Hz        | 0.1                        | 0.1                        | 0.1                       | 0.005                                                  |
|                                                                               | 5 – 10 Hz       | 0.05                       | 0.05                       | 0.05                      | 0.005                                                  |
|                                                                               | 10 – 40 Hz      | 0.03                       | 0.03                       | 0.03                      | 0.001                                                  |
|                                                                               | 40 Hz – 300 kHz | 0.006                      | 0.01                       | 0.01                      | 0.001                                                  |
| [1] Input >100 mV. For 10 – 100 mV, multiply percent measurement error by 10. |                 |                            |                            |                           |                                                        |
| [2] Limited to 8 X 10 <sup>7</sup> volt-Hertz                                 |                 |                            |                            |                           |                                                        |

## Gate Time vs. Resolution

| Gate Time | Resolution |
|-----------|------------|
| 0.01      | 5½         |
| 0.1       | 6½         |
| 1.0       | 6½         |

## Additional Low Frequency Errors

Error stated as percent of measurement for inputs >100 mV. For 10 – 100 mV, multiply percent by 10.

| Frequency      | Resolution |      |      |
|----------------|------------|------|------|
|                | 6½         | 5½   | 4½   |
| 3 – 5 Hz       | 0          | 0.12 | 0.12 |
| 5 – 10 Hz      | 0          | 0.17 | 0.17 |
| 10 – 40 Hz     | 0          | 0.2  | 0.2  |
| 40 – 100 Hz    | 0          | 0.06 | 0.21 |
| 100 – 300 Hz   | 0          | 0.03 | 0.21 |
| 300 Hz – 1 kHz | 0          | 0.01 | 0.07 |
| > 1 kHz        | 0          | 0    | 0.02 |

## Capacitance (8846A Only)

Accuracy is stated as  $\pm$ (% of measurement + % of range)

| Range                                                       | Resolution  | 1 Year Accuracy <sup>[1]</sup><br>(23 $\pm$ 5 °C) | Temperature Coefficient/ °C<br>Outside 18 to 28 °C |
|-------------------------------------------------------------|-------------|---------------------------------------------------|----------------------------------------------------|
| 1 nF                                                        | 1 pF        | 2% $\pm$ 2.5 %                                    | 0.05 + 0.05                                        |
| 10 nF                                                       | 10 pF       | 1% $\pm$ 0.5 %                                    | 0.05 + 0.01                                        |
| 100 nF                                                      | 100 pF      | 1% $\pm$ 0.5 %                                    | 0.01 + 0.01                                        |
| 1 $\mu$ F                                                   | 1 nF        | 1% $\pm$ 0.5 %                                    | 0.01 + 0.01                                        |
| 10 $\mu$ F                                                  | 10 nF       | 1% $\pm$ 0.5 %                                    | 0.01 + 0.01                                        |
| 100 $\mu$ F                                                 | 100 nF      | 1% $\pm$ 0.5 %                                    | 0.01 + 0.01                                        |
| 1 mF                                                        | 1 $\mu$ F   | 1% $\pm$ 0.5 %                                    | 0.01 + 0.01                                        |
| 10 mF                                                       | 10 $\mu$ F  | 1% $\pm$ 0.5 %                                    | 0.01 + 0.01                                        |
| 100 mF                                                      | 100 $\mu$ F | 4% $\pm$ 0.2 %                                    | 0.05 + 0.05                                        |
| [1] Stated accuracy is attained when Zero function is used. |             |                                                   |                                                    |

## Temperature (8846A only)

Test Current..... 1 mA

Accuracy is stated as  $\pm$  °C and is based on a Platinum RT100 (DIN IEC 751, 385 type) RTD with less than 10 ohms lead resistance. The accuracy listed in the table below are valid only when using the 4-wire RTD measurement function. Specifications do not include probe accuracy, which must be added.

| Range   | Resolution | Accuracy                   |                           | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|---------|------------|----------------------------|---------------------------|-------------------------------------------------------|
|         |            | 90 Days<br>(23 $\pm$ 5 °C) | 1 Year<br>(23 $\pm$ 5 °C) |                                                       |
| -200 °C | 0.001 °C   | 0.06                       | 0.09                      | 0.0025                                                |
| -100 °C | 0.001 °C   | 0.05                       | 0.08                      | 0.002                                                 |
| 0 °C    | 0.001 °C   | 0.04                       | 0.06                      | 0.002                                                 |
| 100 °C  | 0.001 °C   | 0.05                       | 0.08                      | 0.002                                                 |
| 300 °C  | 0.001 °C   | 0.1                        | 0.12                      | 0.002                                                 |
| 600 °C  | 0.001 °C   | 0.18                       | 0.22                      | 0.002                                                 |

## Additional Errors

| Digits | NPLC | Additional NPLC Noise Error |
|--------|------|-----------------------------|
| 6 1/2  | 100  | 0 °C                        |
| 6 1/2  | 10   | 0 °C                        |
| 5 1/2  | 1    | 0.03 °C                     |
| 5 1/2  | 0.2  | 0.12 °C                     |
| 4 1/2  | 0.02 | 0.6 °C                      |

## Continuity

**Continuity Threshold** .....Selectable between 1 Ω and 1000 Ω

**Test Current**.....1 mA

**Response Time**.....300 samples/sec with audible tone

Accuracy is given as ± (% measurements + % of range)

| Range    | 24 Hour<br>(23 ±1 °C) | 90 Days<br>(23 ±5 °C) | 1 Year<br>(23 ±5 °C) | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|----------|-----------------------|-----------------------|----------------------|-------------------------------------------------------|
| 1000.0 Ω | 0.002 + 0.01          | 0.008 + 0.02          | 0.01 + 0.02          | 0.001 + 0.002                                         |

## Diode Test

**Test Current**.....100 µA or 1 mA

**Response Time**.....300 samples/sec with audible tone.

Accuracy is given as ± (% measurements + % of range)

| Range     | 24 Hour<br>(23 ±1 °C) | 90 Days<br>(23 ±5 °C) | 1 Year<br>(23 ±5 °C) | Temperature<br>Coefficient/ °C<br>Outside 18 to 28 °C |
|-----------|-----------------------|-----------------------|----------------------|-------------------------------------------------------|
| 5.0000 V  | 0.002 + 0.002         | 0.008 + 0.002         | 0.01 + 0.002         | 0.001 + 0.002                                         |
| 10.0000 V | 0.002 + 0.001         | 0.008 + 0.002         | 0.01 + 0.002         | 0.001 + 0.002                                         |

## Measurement Rates (IEEE488[4])

| Function                                 | Digits | Setting               | Integration Time<br>60 Hz (50 Hz) | Measurements/Second <sup>[1]</sup> |           |
|------------------------------------------|--------|-----------------------|-----------------------------------|------------------------------------|-----------|
|                                          |        |                       |                                   | 8845A                              | 8846A     |
| DC Volts, DC Current, and Resistance     | 6 1/2  | 100 NPLC              | 1.67 (2) s                        | 0.6 (0.5)                          | 0.6 (0.5) |
|                                          | 6 1/2  | 10 NPLC               | 167 (200) ms                      | 6 (5)                              | 6 (5)     |
|                                          | 5 1/2  | 1 NPLC                | 16.7 (20) ms                      | 60 (50)                            | 60 (50)   |
|                                          | 5 1/2  | 0.2 NPLC              | 3.3 ms                            | 270                                | 270       |
|                                          | 4 1/2  | 0.02 NPLC             | 500 us                            | 995                                | 995       |
| AC Voltage and AC Current <sup>[2]</sup> | 6 1/2  | 3 Hz                  |                                   | 0.47                               | 0.47      |
|                                          | 6 1/2  | 20 Hz                 |                                   | 1.64                               | 1.64      |
|                                          | 6 1/2  | 200 Hz <sup>[3]</sup> |                                   | 4.5                                | 4.5       |
| Frequency and Period                     | 6 1/2  | 1 s                   |                                   | 1                                  | 1         |
|                                          | 5 1/2  | 100 ms                |                                   | 9.8                                | 9.8       |
|                                          | 4 1/2  | 10 ms                 |                                   | 80                                 | 80        |
| Capacitance                              | 6 1/2  |                       |                                   | NA                                 | 2         |

[1] Typical measurement rates with auto-zero off, delay = 0, display off, auto range off and math off.

[2] Maximum measurement rates for 0.01 % of ac step. When dc input varies, additional settling delay is required.

[3] For remote operation or external trigger using default settling delay

[4] Speeds available in OutG SW 1.0.700.18 or higher. Note that the measurements rates for RS232 can vary depending on the baud rate chosen. If the baud rate selected is 115,200, the maximum measurement rate is 711 measurement/s. The LAN bus has a maximum measurement rate of 963 measurement/s.

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**Fluke Corporation**  
PO Box 9090, Everett, WA 98206 U.S.A.

**Fluke Europe B.V.**  
PO Box 1186, 5602 BD  
Eindhoven, The Netherlands

**For more information call:**

In the U.S.A. (800) 443-5853 or

Fax (425) 446-5116

In Europe/M-East/Africa +31 (0) 40 2675 200 or

Fax +31 (0) 40 2675 222

In Canada (800)-36-FLUKE or

Fax (905) 890-6866

From other countries +1 (425) 446-5500 or

Fax +1 (425) 446-5116

Web access: <http://www.fluke.com>

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