

15B+/17B+/18B+

Digital Multimeters

Users Manual

PN 4372130

February 2014

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Introduction

The Fluke 15B+/17B+/18B+ Multimeters (the Product) are 4000 count instruments. The Product is battery powered with a digital display.

Except where noted, the descriptions and instructions in this Users Manual apply to all of 15B+/17B+/18B+.

Unless otherwise identified, all illustrations show the 17B+.

How to Contact Fluke

To contact Fluke, call one of the following telephone numbers:

- Technical Support USA: 1-800-44-FLUKE (1-800-443-5853)
- Calibration/Repair USA: 1-888-99-FLUKE (1-888-993-5853)
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31 402-675-200
- Japan: +81-03-6714-3114
- Singapore: +65-6799-5566
- Mainland China: +86-400-810-3435
- Anywhere in the world: +1-425-446-5500

Or, visit Fluke's website at www.fluke.com.

To register your product, visit <http://register.fluke.com>.

To see, print, or download the latest manual supplement, visit <http://us.fluke.com/usen/support/manuals>.

Safety Information

A **Warning** identifies conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that could cause damage to the Product or the equipment under test.

International electrical symbols used on the Product and in this manual are explained in Table 1.

Review the safety information and comply with the safe working practices.

Warning















To prevent possible electrical shock, fire, or personal injury:

- Carefully read all instructions.
- Read all safety information before you use the Product.
- Use the Product only as specified, or the protection supplied by the Product can be compromised.
- Do not use the Product around explosive gas, vapor, or in damp or wet environments.

- Examine the case before you use the Product. Look for cracks or missing plastic. Carefully look at the insulation around the terminals.
- Do not use the Product if it is damaged.
- Do not use the Product if it operates incorrectly.
- Comply with local and national safety codes. Use personal protective equipment (approved rubber gloves, face protection, and flame-resistant clothes) to prevent shock and arc blast injury where hazardous live conductors are exposed.
- Use only correct measurement category (CAT), voltage, and amperage rated probes, test leads, and adapters for the measurement.
- Do not use test probes in CAT III environments without the protective cap installed. The protective cap decreases the exposed probe metal to <4mm. This decreases the possibility of arc flash from short circuits.
- Measure a known voltage first to make sure that the Product operates correctly.
- Limit operation to the specified measurement category, voltage, or amperage ratings.

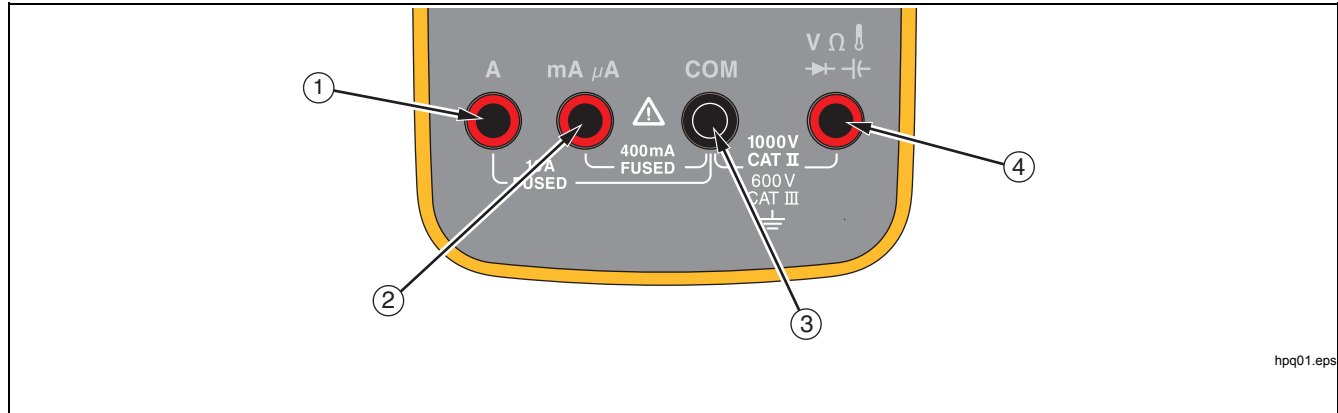
- Do not apply more than the rated voltage, between the terminals or between each terminal and earth ground.
- Do not touch voltages > 30 V ac rms, 42 V ac peak, or 60 V dc.
- Do not use test leads if they are damaged. Examine the test leads for damaged insulation and measure a known voltage.
- Connect the common test lead before the live test lead and remove the live test lead before the common test lead.
- Keep fingers behind the finger guards on the probes.
- Remove all probes, test leads, and accessories before the battery door is opened.
- Do not exceed the Measurement Category (CAT) rating of the lowest rated individual component of a Product, probe, or accessory.
- Remove the batteries if the Product is not used for an extended period of time, or if stored in temperatures above 50 °C. If the batteries are not removed, battery leakage can damage the Product.
- Replace the batteries when the low battery indicator (⚡) shows to prevent incorrect measurements.
- Use the correct terminals, function, and range for measurements.
- Disconnect all test leads from any hazardous voltage before switching to the LED TEST function. Refer to the LED TEST section for proper measurement technique and interpretation of results (for 18B+ only).

Table 1. International Electrical Symbols

	AC (Alternating Current)		Earth Ground
	DC (Direct Current)		Fuse
	Diode		Capacitance
	Hazardous voltage. Risk of electrical shock.		Battery
	Risk of Danger. Important information. See Manual.	CAT II	MEASUREMENT CATEGORY II is applicable to test and measuring circuits connected directly to utilization points (socket outlets and similar points) of the low voltage MAINS installation.
CAT III	MEASUREMENT CATEGORY III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation.	CAT IV	MEASUREMENT CATEGORY IV is applicable to test and measuring circuits connected at the source of the building's low voltage MAINS installation.
	Conforms to European Union directives.		Conforms to relevant North American Safety Standards.
	Conforms to relevant South Korean EMC Standards		Conforms to relevant Australian Standards.
	This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 "Monitoring and Control Instrumentation" product. Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.		

Instrument Overview

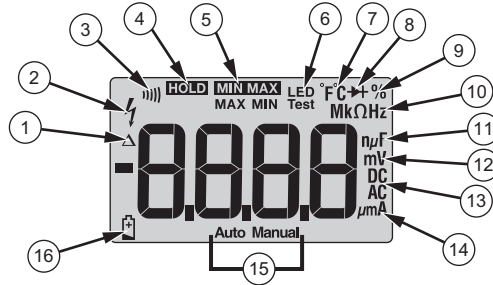
Terminals



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Item	Description
①	Input terminal for ac and dc current measurement to 10 A and frequency (17B+/18B+) measurements.
②	Input terminal for ac and dc microamp and milliamp measurements to 400 mA and frequency (17B+/18B+) measurements.
③	Common (return) terminal for all measurements.
④	Input terminal for voltage, resistance, continuity, diode, capacitance, frequency (17B+/18B+), duty cycle (17B+/18B+), temperature (17B+ only), and LED test (18B+ only) measurements.

Display



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Item	Description	Item	Description
①	Relative measurement is enabled (17B+ only).	⑨	Duty cycle is selected (17B+/18B+).
②	High voltage	⑩	Resistance or Frequency (17B+/18B+) is selected.
③	Continuity is selected.	⑪	Farads for capacitance.
④	Display Hold is enabled.	⑫	millivolts or volts
⑤	MIN or MAX mode is enabled (17B+ only).	⑬	dc or ac voltage or current
⑥	LED test is enabled (18B+ only).	⑭	microamp, milliamp, or amp
⑦	Fahrenheit or Celsius is selected (17B+ only).	⑮	Auto range mode or Manual range mode is enabled.
⑧	Diode test is selected.	⑯	Battery is low and should be replaced.

Auto Power Off

The Product automatically powers off after 20 minutes of inactivity.

To restart the Product, turn the rotary switch back to the OFF position and then to a necessary position.

To disable the Auto Power Off function, hold down when turning on the Product, until PoFF shows on the display.

Note

When you disable the Auto Power Off function, LoFF also shows on the display. The Auto Backlight Off function is also disabled.

Auto Backlight Off

The backlight automatically turns off after 2 minutes of inactivity.

To disable the Auto Backlight Off function, hold down when turning on the Product, until LoFF shows on the display.

Measurements

Warning

To prevent possible electrical shock, fire, or personal injury, disconnect power and discharge all high-voltage capacitors before you measure resistance, continuity, capacitance, or a diode junction.

Manual and Auto Range Selection

The Product has both manual and auto range options. In the auto range mode, the Product selects the best range for the input detected. This allows you to switch test points without having to reset the range. You can override auto ranging by selecting the range manually.

By default, the Product uses the auto range mode in measurement functions that have more than one range and shows **Auto Range** on the display.

To enter the manual range mode, push .

Note



Each push of increments the range. When the highest range is reached, the Meter wraps to the lowest range.

To exit the manual range mode, push and hold for two seconds.

Data Hold




To prevent possible electrical shock, fire or personal injury, do not use the HOLD function to measure unknown potentials. When HOLD is turned on, the display does not change when a different potential is measured.

To hold the present reading, push . Push  again to resume normal operation.

Relative Measurements (17B+ only)

The Product allows relative measurements for all functions except frequency, resistance, continuity, duty cycle, and diode.

To do relative measurements:




1. With the Product in the desired function, touch the test leads to the circuit on which you want future measurements to be based.
2. Push  to store the measured reading as the reference value and activate the relative measurement mode.

The difference between the reference value and subsequent reading shows on the display.

3. Push  for to return to normal operation.

MIN MAX Mode (17B+ Only)

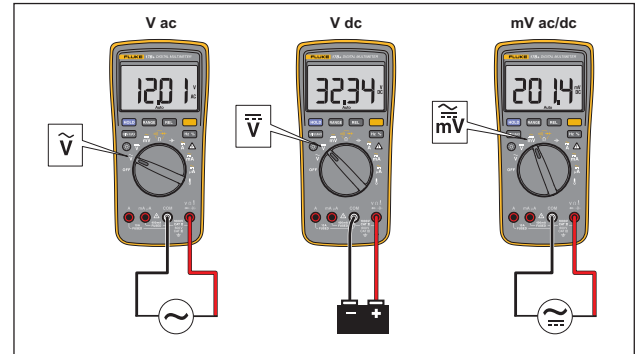
To set the Product to MIN MAX mode (available for all functions except resistance, capacitance, frequency, duty cycle, and diode):

1. Push  once to set the Product to MAX mode.
2. Push  again to set the Product to MIN mode.
3. Push  for 2 seconds to return to normal operation.

Measure AC and DC Voltage

To measure ac and dc voltage:

1. Turn the rotary switch to \tilde{V} , \bar{V} , or $\approx mV$ to choose ac or dc.
2. Push \square to toggle between mVac or mVdc voltage measurement.
3. Connect the red test lead to the $\overset{V}{\Omega} \uparrow$ terminal and the black test lead to the **COM** terminal.
4. Touch the probes to the correct test points of the circuit to measure the voltage, as shown in Figure 1.
5. Read the measured voltage on the display.



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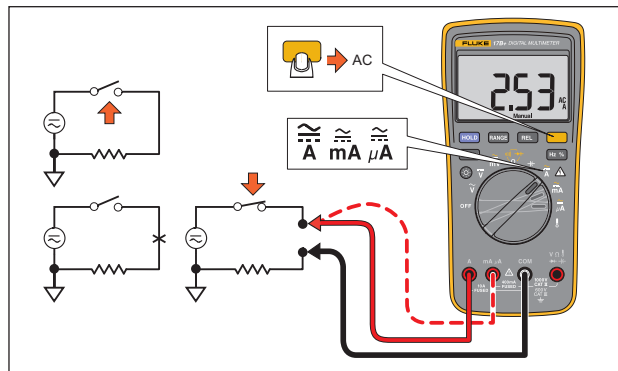
Figure 1. Measure AC and DC Voltage

Measure AC or DC Current**⚠ ⚠ Warning**

To prevent possible electrical shock, fire, or personal injury, remove circuit power before you connect the Product in the circuit when you measure current. Connect the Product in series with the circuit.

To measure ac or dc current:

1. Turn the rotary switch to $\tilde{\text{A}}$, mA , or μA .
2. Push \square to toggle between ac or dc current measurement.
3. Connect the red test lead to the **A or mA μA** terminal based on the current to be measured and connect the black test lead to the **COM** terminal. See Figure 2.
4. Break the circuit path to be measured. Then connect the test leads across the break and apply power.
5. Read the measured current on the display.



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Figure 2. Measure AC and DC Current

Measure Resistance

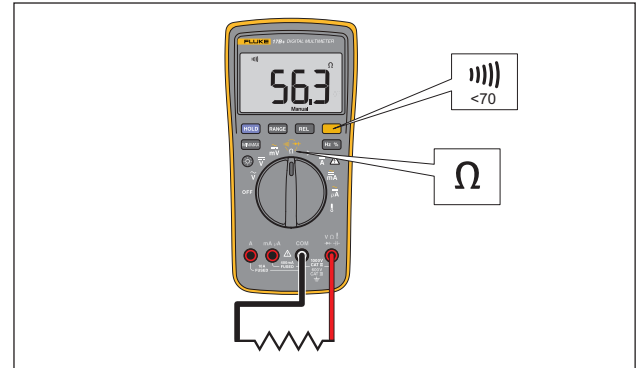
To measure resistance:

1. Turn the rotary switch to Ω . Make sure power is disconnected from the circuit to be measured.
2. Connect the red test lead to the $V \Omega \frac{+}{-}$ terminal and the black test lead to the **COM** terminal, as shown in Figure 3.
3. Measure the resistance by touching the probes to the desired test points of the circuit.
4. Read the measured resistance on the display.

Test for Continuity

To test for continuity:

With the resistance mode selected, push once to activate the continuity beeper. If the resistance is $<70 \Omega$, the beeper will sound continuously, designating a short circuit. See Figure 3.





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Figure 3. Measure Resistance/Continuity

Test Diodes

Caution


To prevent possible damage to the Product or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before you test diodes.

1. Turn the rotary switch to .
2. Push  twice to activate Diode Test.
3. Connect the red test lead to the V_{Ω} terminal and the black test lead to the **COM** terminal.
4. Connect the red probe to the anode side and the black test lead to the cathode side of the diode being tested.
5. Read the forward bias voltage value on the display.
6. If the polarity of the test leads is reversed with diode polarity, the display reading shows Ω . This can be used to distinguish the anode and cathode sides of a diode.

Measure Capacitance



Caution

To prevent damage to the Product, disconnect circuit power and discharge all high-voltage capacitors before you measure capacitance.


1. Turn the rotary switch to .
2. Connect the red test lead to the V_{Ω} terminal and the black test lead to the **COM** terminal.
3. Touch the probes to the capacitor leads.
4. After allowing the reading to stabilize (up to 18 seconds), read the capacitance value on the display.



Measure Temperature (17B+ only)

To measure temperature:

1. Turn the rotary switch to .
2. Plug the thermocouple into the V_{Ω} and **COM** terminals of the Product.
Ensure that the thermocouple plug marked with “+” is inserted into the V_{Ω} terminal on the Product.
3. Read the temperature on the display.
4. Push  to switch between °C and °F.

Measure Frequency and Duty Cycle (17B+/18B+ Only)

The Product can measure frequency or duty cycle while making either a voltage or a current measurement. Push  to change the Product to frequency or duty cycle.

1. When the Product is in the required function (ac voltage or ac current), push .
2. Read the frequency of the signal on the display.
3. To make a duty cycle measurement, push  again.
4. Read the percent of duty cycle on the display.

Test LEDs (18B+ Only)

⚠ Caution

To prevent possible damage to the Product or to the equipment under test, disconnect all test leads from any hazardous voltage before you switch to the LED TEST function.

The Product tests Light Emitting Diodes (LEDs) either through the LED test socket on the Meter or through the test leads.

Note

Do not use the LED Test mode to do LED aging tests.

To test an LED mounted in the test socket:

1. Turn the rotary switch to LED TEST.
2. Place the leads of the LED into the holes of the LED test socket on the front of the Meter as shown in Figure 4.

If the LED is good, the Product will illuminate the LED under test and an anode indicator will illuminate to indicate the (+) pin. If the LED is broken, the LED will not illuminate and neither of the anode indicators will illuminate. If the LED is a short circuit, the LED will not illuminate, and both anode indicators will illuminate.

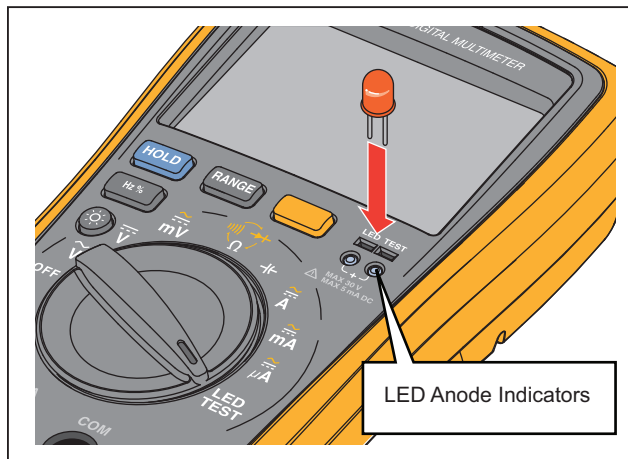


Figure 4. LED Test Sockets

Maintenance

Beyond replacing batteries and fuses, do not attempt to repair or service the Product unless you are qualified to do so and have the relevant calibration, performance test, and service instructions. The recommended calibration cycle is 12 months.

Warning

To prevent possible electrical shock, fire, or personal injury:

- Remove the input signals before you clean the Product.
- Use only specified replacement fuses.
- Have an approved technician repair the Product.

For safe operation and maintenance of the Product:

- Repair the Product before use if the batteries leak.
- Batteries contain hazardous chemicals that can cause burns or explode. If exposure to chemicals occurs, clean with water and get medical aid.

General Maintenance

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents. Dirt or moisture in the terminals can affect readings.

To clean the terminals:

1. Turn the Product off and remove the test leads.
2. Shake out any dirt that may be in the terminals.
3. Soak a new swab with isopropyl alcohol and work around the inside of each input terminal.

Test Fuses

Warning

To prevent electric shock or injury, remove the test leads and any input signals before replacing the fuses.

1. Turn the rotary switch to $\overline{\Omega}$.
2. Plug a test lead into the $\frac{V}{\Omega}$ terminal and touch the probe to the **A** or **mA/μA** terminal.
 - A good **A** terminal fuse reads approximately 0.1 Ω. A good **mA/μA** terminal fuse reads less than 10 kΩ.
 - If the display reads Ω , replace the fuse and test again.
 - If the display shows any other value, have the Product serviced. See “Service and Parts”.

Replace Batteries and Fuses

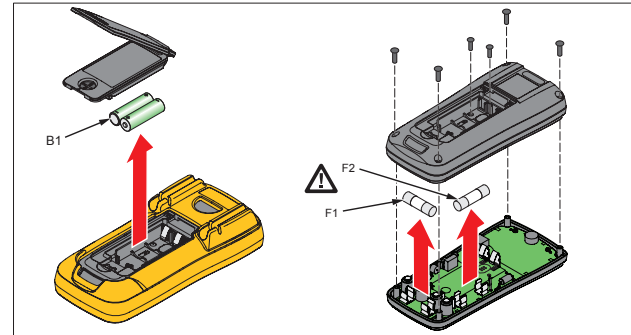
Warning

To prevent false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the battery indicator (🔋) appears.

To prevent damage or injury, install **ONLY** replacement fuses with the specified amperage, voltage, and interrupt ratings.

Disconnect test leads before opening the case or the battery door.

To replace the batteries or the fuses, see Figure 5.



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Figure 5. Replace Batteries and Fuses

Service and Parts

If the Product fails, first check the batteries and fuse, and then review this manual to make sure that you are operating the Product correctly.

Replacement parts are listed in Table 2.

Table 2. Replacement Parts

Item Description	Part No.
Battery, NEDA 15A, IEC LR6	376756
Battery door assembly, English	4413666
Battery door assembly, Chinese	4413653
TL75-4201, test leads with two caps	4306653
Fuse, 0.440 A, 1000 V, FAST	943121
Fuse, 11A, 1000 V, FAST	803293
Holster	4368113

To contact Fluke, call one of the following telephone numbers:

- Technical Support USA: 1-800-44-FLUKE
(1-800-443-5853)
- Calibration/Repair USA: 1-888-99-FLUKE
(1-888-993-5853)
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- China: +86-10-6512-3435 or +86-400-810-3435
- Europe: +31 402-675-200
- Japan: +81-03-6714-3114
- Singapore: +65-6799-5566
- Anywhere in the world: +1-425-446-5500

Visit Fluke's Web site at www.fluke.com.

General Specifications

Maximum voltage between any Terminal and Earth Ground: 1000 V

Display (LCD).....4000 counts, updates 3/sec

Battery Type2 AA, NEDA 15A, IEC LR6

Battery Life500 hours minimum (50 hours in LED Test mode without load. The hours with load depends on the type of LED under test.)

Temperature

Operating0 °C to 40 °C

Storage.....-30 °C to 60 °C

Relative Humidity

Operating HumidityNon-condensing ≤90 % at 10 °C to 30 °C; ≤75 % at 30 °C to 40 °C

Operating Humidity, 40 MΩ Range≤80 % at 10 °C to 30 °C; ≤70 % at 30 °C to 40 °C

Altitude

Operating2000 m

Storage.....12,000 m

Temperature Coefficient.....0.1 X (specified accuracy) /°C (<18 °C or >28 °C)

Fuse protection for current inputs440 mA, 1000 V Fast Fuse, Fluke specified part only.

11A, 1000V Fast Fuse, Fluke specified part only.

Size (HxWxL)183 x 91 x 49.5 (mm)

Weight455 g

IP Rating.....IP 40

SafetyIEC 61010-1, IEC61010-2-030 600 V CAT III, 1000 V CAT II, Pollution Degree 2

Electromagnetic EnvironmentIEC 61326-1: Portable

Electromagnetic CompatibilityApplies to use in Korea only.

Class A Equipment (Industrial Broadcasting & Communication Equipment)^[1]

[1] This product meets requirements for industrial (Class A) electromagnetic wave equipment and seller or user should take notice of it. This equipment is intended for use in business environments and is not to be used in homes.

Accuracy Specifications

Accuracy is specified for 1 year after calibration, at operating temperatures of 18 °C to 28 °C, relative humidity at 0 % to 75 %. Accuracy specifications take the form of: \pm ([% of Reading] + [Number of Least Significant Digits]).

AC and DC Voltage

Function	Range	Resolution	Accuracy		
			15B+	17B+	18B+
AC Volts (40 Hz – 500 Hz) ^[1] \tilde{V}	4.000 V 40.00 V 400.0 V 1000 V	0.001 V 0.01 V 0.1 V 1 V	1.0 % + 3	1.0 % + 3	1.0 % + 3
AC Millivolts \tilde{mV}	400.0 mV	0.1 mV	3.0 % + 3	3.0 % + 3	3.0 % + 3
DC Millivolts $\overline{\overline{mV}}$	400.0 mV	0.1 mV	1.0 % + 10	1.0 % + 10	1.0 % + 10
DC Volts $\overline{\overline{V}}$	4.000 V 40.00 V 400.0 V 1000 V	0.001 V 0.01 V 0.1 V 1 V	0.5 % + 3	0.5 % + 3	0.5 % + 3


[1] All ac, Hz, and duty cycle are specified from 1 % to 100 % of range. Inputs below 1 % of range are not specified.

AC and DC Current

Function	Range	Resolution	Accuracy		
			15B+	17B+	18B+
AC Current μA (40 Hz – 400 Hz) $\tilde{\mu\text{A}}$	400.0 μA 4000 μA	0.1 μA 1 μA	1.5 % + 3	1.5 % + 3	1.5 % + 3
AC current mA (40 Hz – 400 Hz) $\tilde{\text{mA}}$	40.00 mA 400.0 mA	0.01 mA 0.1 mA	1.5 % + 3	1.5 % + 3	1.5 % + 3
AC current A ^[1] (40 Hz – 400 Hz) $\tilde{\text{A}}$	4.000 A 10.00 A	0.001 A 0.01 A	1.5 % + 3	1.5 % + 3	1.5 % + 3
DC current μA $\overline{\mu\text{A}}$	400.0 μA 4000 μA	0.1 μA 1 μA	1.5 % + 3	1.5 % + 3	1.5 % + 3
DC current mA $\overline{\text{mA}}$	40.00 mA 400.0 mA	0.01 mA 0.1 mA	1.5 % + 3	1.5 % + 3	1.5 % + 3
DC current A ^[1] $\overline{\text{A}}$	4.000 A 10.00 A	0.001 A 0.01 A	1.5 % + 3	1.5 % + 3	1.5 % + 3
[1] 10 A duty cycle <7 minutes on, 20 minutes off.					

Diode Test, Temperature, Resistance, Capacitance, Frequency, and Duty Cycle

Function	Range	Resolution	Accuracy		
			15B+	17B+	18B+
Diode Test ⁽¹⁾ ➔	2.000 V	0.001 V	10 %		
Temperature ⌄	50.0 °C – 400.0 °C 0 °C – 50.0 °C -55.0 °C – 0 °C	0.1 °C	NA	2 % +1 °C 2 °C 9 % +2 °C	NA
Resistance (Ohms) Ω	400.0 Ω 4.000 kΩ 40.00 kΩ 400.0 kΩ 4.000 MΩ 40.00 MΩ	0.1 Ω 0.001 kΩ 0.01 kΩ 0.1 kΩ 0.001 MΩ 0.01 MΩ	0.5 % + 3 0.5 % + 2 0.5 % + 2 0.5 % + 2 0.5 % + 2 1.5% + 3	0.5 % + 3 0.5 % + 2 0.5 % + 2 0.5 % + 2 0.5 % + 2 1.5% + 3	0.5 % + 3 0.5 % + 2 0.5 % + 2 0.5 % + 2 0.5 % + 2 1.5% + 3

Function	Range	Resolution	Accuracy		
			15B+	17B+	18B+
Capacitance ^[2] 	40.00 nF	0.01 nF	2 % + 5	2 % + 5	2 % + 5
	400.0 nF	0.1 nF	2 % + 5	2 % + 5	2 % + 5
	4.000 μF	0.001 μF	5 % + 5	5 % + 5	5 % + 5
	40.00 μF	0.01 μF	5 % + 5	5 % + 5	5 % + 5
	400.0 μF	0.1 μF	5 % + 5	5 % + 5	5 % + 5
	1000 μF	1 μF	5 % + 5	5 % + 5	5 % + 5
Frequency ^[3] (10 Hz – 100 kHz) Hz	50.00 Hz	0.01 Hz	NA	0.1 % + 3	0.1 % + 3
	500.0 Hz	0.1 Hz			
	5.000 kHz	0.001 kHz			
	50.00 kHz	0.01 kHz			
	100.0 kHz	0.1 kHz			
Duty Cycle ^[2]	1 % to 99 %	0.1 %	NA	1 % typical ^[4]	1 % typical ^[4]

[1] Typically, open circuit test voltage is 2.0 V and short circuit current is <0.6 mA.

[2] Specifications do not include errors due to test lead capacitance and capacitance floor (may be up to 1.5 nF in the 40 nF range).

[3] All ac, Hz, and duty cycle are specified from 1 % to 100 % of range. Inputs below 1 % of range are not specified.

[4] Typical means when the frequency is at 50 Hz or 60 Hz and the duty cycle is between 10 % and 90 %.

LED Test and Continuity Threshold

Function	Lighting Range	Measurement Range	Resolution	Accuracy
LED V_F Test ^[1] (LED Test Socket)	1.00 to 6.00 V	NA	NA	NA
LED V_F Test ^[2] (Test Leads)	1.00 to 6.00 V	1.00 to 6.00 V	0.01 V	10 % ^[3]
Continuity Threshold	NA	NA	NA	70 Ω

[1] Open circuit test voltage is ± 12 V and short-circuit current is $< \pm 5$ mA (typical).
 [2] Open circuit test voltage is ± 12 V and short-circuit current is $< \pm 3$ mA (typical).
 [3] V_F measurement with driving current under 2.2 ± 0.4 mA.

Input Characteristics

Function	Overload Protection	Input Impedance (Nominal)	Common Mode Rejection Ratio	Normal Mode Rejection Ratio
AC Volts	1000 V ^[1]	> 10 M Ω , < 100 pF	> 60 dB at dc, 50 Hz or 60 Hz	–
AC Millivolts	400 mV	> 1 M Ω , < 100 pF	> 80 dB at dc, 50 Hz or 60 Hz	–
DC Volts	1000 V ^[1]	> 10 M Ω , < 100 pF	> 100 dB at dc, 50 Hz or 60 Hz	> 60 dB at 50 Hz or 60 Hz
DC Millivolts	400 mV	> 1 M Ω , < 100 pF	> 80 dB at dc, 50 Hz or 60 Hz	–

[1] 10^6 V Hz Max

