

110/113/114/115/117

True-rms Multimeter

Users Manual

LIMITED WARRANTY AND LIMITATION OF LIABILITY

This Fluke product will be free from defects in material and workmanship for three years from the date of purchase. This warranty does not cover fuses, disposable batteries, or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Fluke's behalf. To obtain service during the warranty period, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that Service Center with a description of the problem.

THIS WARRANTY IS YOUR ONLY REMEDY. NO OTHER WARRANTIES, SUCH AS FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSED OR IMPLIED. FLUKE IS NOT LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM ANY CAUSE OR THEORY. Since some states or countries do not allow the exclusion or limitation of an implied warranty or of incidental or consequential damages, this limitation of liability may not apply to you. Vision.

Fluke Corporation P.O. Box 9090 Everett, WA 98206-9090 U.S.A. Fluke Europe B.V. P.O. Box 1186 5602 BD Eindhoven The Netherlands ООО «Флюк СИАЙЭС» 125167, г. Москва, Ленинградский проспект дом 37, корпус 9, подъезд 4, 1 этаж

11/99

Table of Contents

Title	Page
Introduction	. 1
How to Contact Fluke	
Safety Information	
Unsafe Voltage	. 1
Test Lead Alert	
Product Familiarization	. 2
Features	
Display	. 3
Terminals	. 4
Error Messages	
Battery Saver™ (Sleep Mode)	. 5
MIN MAX AVG Recording Mode	. 5
Display HOLD	
Backlight	
Manual and Autoranging	. 6
Power-Up Options	
Making Basic Measurements	
Measuring Resistance	
Testing for Continuity	
Measuring AC and DC Voltage	
Using Auto Volts Selection (114, 117)	
Measuring AC and DC Millivolts (110, 114, 115, 117)	
Measuring AC or DC Current (115, 117)	
Measuring Current above 10 Amps (110, 114, 115, 117)	
Measuring Capacitance (113, 115, 117)	
Measuring Frequency (115, 117)	
Detecting AC Voltage Presence (117)	
Making Low Impedance Capacitance Measurements (115, 117)	
Testing Diodes (113, 115, 117)	
Using the Bargraph	
Maintenance	
Testing the Fuse (115, 117)	
Replacing the Battery and Fuse	
Cleaning	
Specifications	. 15

110/113/114/115/117

Users Manual

Introduction

The Fluke Model 110, Model 113, Model 114, Model 115, and Model 117 (the Meter or Product) are battery-powered, true-rms multimeters with a 6000-count display and a bar graph. This manual applies to all models. All figures show the Model 117 unless indicated.

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: +81-3-6714-3114
- Singapore: +65-6799-5566
- China: +86-400-921-0835
- Brazil: +55-11-3530-8901
- 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 view, print, or download the latest manual supplement, visit http://us.fluke.com/usen/support/manuals.

To request a printed manual, visit www.fluke.com/productinfo.

Safety Information

For Product safety information, see the printed 110/113/114/115/117 Safety Information included with the Product or located on the Fluke website.

Unsafe Voltage

To alert you to the presence of a potentially hazardous voltage, the $\frac{1}{4}$ symbol is displayed when the Meter measures a voltage \geq 30 V or a voltage overload (**OL**) condition. When making frequency measurements >1 kHz, the $\frac{1}{4}$ symbol is unspecified.

Test Lead Alert

∧ M Warning

Personal injury or damage to the Meter can occur if you attempt to make a measurement with a lead in an incorrect terminal.

To remind you to check that the test leads are in the correct terminals, LERd is briefly displayed and an audible beep sounds when you move the rotary switch to or from any A (Amps) position.

Product Familiarization

The manual explains features for multiple models. Because models have different features, not all of the information in the manual may apply to your Meter. Use Table 1 to identify the features of your Meter.

Features

Table 1 is a list of the features for each Meter.

Table 1. Features

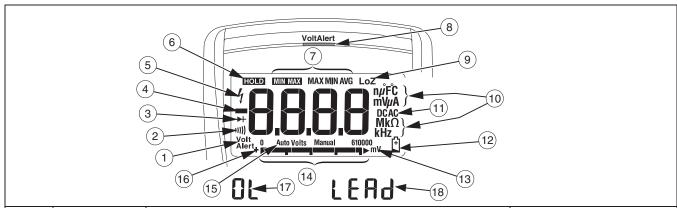
Switch Position	Measurement Function	110	113	114	115	117
OFF	The Meter is turned off.	•	•	•	•	•
AUTO-V LoZ	Automatically selects ac or dc volts based on the sensed input with a low impedance input.			•		•
∼ Hz	AC voltage from 0.06 V to 600 V. Frequency from 5 Hz to 100 kHz.	•		•	•	•
Ÿ	DC voltage from 0.001 V to 600 V.	•		•	•	•
$m\widetilde{\widetilde{V}}=$	AC voltage from 6.0 to 600 mV, dc-coupled. DC voltage from 0.1 to 600 mV.	•		•	•	•
Ω	Ohms from 0.1 Ω to 40 M Ω .	•	•	•	•	•
11)))	Continuity beeper turns on at <20 Ω and turns off at >250 Ω .	•	•	•	•	•
⊘ CHEK	LoZ low impedance measurement function to simultaneously test for voltage or continuity.		•			
→	Diode Test. Displays OL above 2.0 V.		•		•	•
- (-	Farads from 1 nF to 9999 μF.		•		•	•
$\overline{\widetilde{\mathbf{A}}}_{Hz}$	AC current from 0.1 A to 10 A (>10 to 20 A, 30 seconds on, 10 minutes off). >10.00 A display flashes. >20 A, OL is displayed. DC-coupled. Frequency from 45 Hz to 5 kHz.				•	•
Ä	DC current from 0.001 A to 10 A (>10 A to 20 A, 30 seconds on, 10 minutes off). >10.00 A display flashes. >20 A, OL is displayed.				•	•
Volt Alert	Non-contact sensing of ac voltage.					•

Note: All ac functions and Auto-V LoZ are true-rms. AC voltage is ac-coupled. Auto-V LoZ, AC mV and AC amps are dc-coupled.

Display

Table 2 is a list of the features for each display.

Table 2. Display



No.	Symbol	Meaning	Model
1	Volt Alert	The Meter is in the VoltAlert™ non-contact voltage detect mode.	117
2	11))	The Meter function is set to Continuity.	110, 113, 114, 115, 117
3	→ I-	The Meter function is set to Diode Test	113, 115, 117
4	-	Input is a negative value.	110, 113, 114, 115, 117
5	4		110, 113, 114, 115, 117
6	HOLD	Display hold enabled. Display freezes present reading.	110, 113, 114, 115, 117
7	MIN MAX MAX MIN AVG	MIN MAX AVG mode enabled. Maximum, minimum, average or present reading displays	110, 113, 114, 115, 117
8	(Red LED)	Voltage presence through the non-contact VoltAlert sensor	117
9	LoZ	The Meter is measuring voltage or capacitance with a low input impedance.	113,114, 115, 117
10	nμF mV μA MkΩ kHz	Measurement units.	110, 114, 115, 117
(11)	DC AC	Direct current or alternating current	110, 113, 114, 115, 117
12	Û	Battery low warning.	110, 113, 114, 115, 117
13	610000 mV	Indicates the Meter's range selection.	110, 114, 115, 117
(14)	(Bar graph)	Analog display.	110, 113, 114, 115, 117

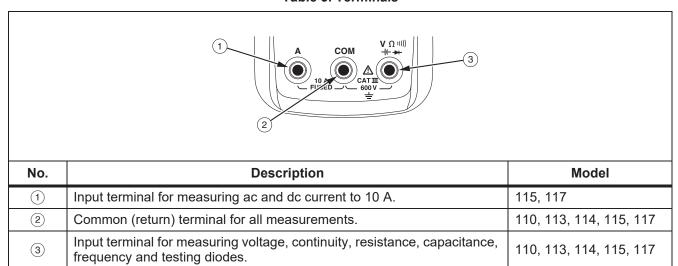
Table 2. Display (cont.)

No.	Symbol Meaning		Model
	Auto Volts	The Meter is in the Auto Volts function.	114, 117
15	Auto	Autoranging. The Meter selects the range for best resolution.	110, 113, 114, 115, 117
	Manual	Manual ranging. User sets the Meter's range.	110, 113, 114, 115, 117
16	+	Bar graph polarity	110, 113, 114, 115, 117
17)	OL	⚠ The input is too large for the selected range.	110, 113, 114, 115, 117
(18)	LEAd	⚠ Test lead alert. Briefly displayed whenever the Meter's function switch is rotated to or from any A position.	115, 117

Terminals

Table 3 is a list of terminals on the Meter.

Table 3. Terminals



Error Messages

Table 4 is a list of error messages for the Meter.

Table 4. Error Messages

Error Messages		
6Att	Battery must be replaced before the Meter will operate.	
CAL Err	Calibration required. Meter calibration is required before the Meter will operate.	
EEPr Err	Internal error. The Meter must be repaired before it will operate.	
FII- Err	Internal error. The Meter must be repaired before it will operate.	

Battery Saver™ (Sleep Mode)

If the Meter is ON, but inactive and not connected to voltage for more than 20 minutes, the display goes blank to save battery life. To use the Meter, press any button or turn the rotary switch. To disable the Sleep mode, see *Power-Up Options*. The Sleep mode is always disabled in the MIN MAX AVG mode.

MIN MAX AVG Recording Mode

The MIN MAX AVG recording mode captures the minimum and maximum input values (ignoring overloads), and calculates a running average of all readings. When the Meter detects a new high or low, the Meter beeps.

Note

Autoranging and Battery Saver™ are disabled in MIN MAX AVG mode.

- 1. Select the measurement function and range.
- 2. Push MIN MAX AVG mode.

MIN MAX and MAX show on the display. The highest reading detected since entering MIN MAX AVG shows on the display.

- 3. Push MINMAX to step through the low (MIN), average (AVG), and present readings.
- 4. To pause MIN MAX AVG recording without erasing stored values, push [HOLD]. (HOLD] shows on the display.)
- 5. To resume MIN MAX AVG recording, push [HOLD] again.
- 6. To exit and erase stored readings, push [MIN MAX] for at least one second, or turn the rotary switch.

Display HOLD

∧ Marning

To avoid electric shock, when Display HOLD is activated, be aware that the display will not change when you apply a different voltage.

In the Display HOLD mode, the Meter freezes the display.

- 1. Push HOLD to activate Display HOLD. (HOLD shows on the display.)
- 2. To exit and return to normal operation, push [HOLD] or turn the rotary switch.

Backlight

Push () to toggle the backlight on and off.

The backlight automatically turns off after 40 seconds. To disable backlight auto-off, see *Power-Up Options*.

Manual and Autoranging

The Meter has both Manual and Autorange modes. The Meter defaults to Autorange. To toggle between Manual and Autorange, push [RANGE] for 1 second.

- In the Autorange mode, the Meter selects the range with the best resolution.
- In the Manual Range mode, you override Autorange and select the range yourself. Push [RANGE] for 1 second to enter Manual range. (Manual shows on the display.) Push [RANGE] to increment the range. After the highest range, the Meter wraps to the lowest range.

Note

You cannot manually change the range in the MIN MAX AVG or Display HOLD modes. If you push while in MIN MAX AVG or Display Hold, the Meter beeps twice, indicating an invalid operation and the range does not change.

Power-Up Options

To select a Power-Up Option, hold down the button indicated in Table 5 while turning the Meter from OFF to any other function. Power-Up Options are canceled when you turn off the Meter and when sleep mode is activated.

Table 5. Power-Up Options

Button	Power-Up Options
HOLD	Turns on all display segments until button is released.
MIN MAX	Disables beeper. beep shows when enabled.
RANGE	113 - Turns on all display segments until button is released.
HANGE	115, 117 - Enables low impedance capacitance measurements. LERP shows when enabled.
	Disables Battery Saver™ (Sleep mode). PoFF shows when enabled.
③	Disables auto backlight off. LoFF is displayed when enabled.

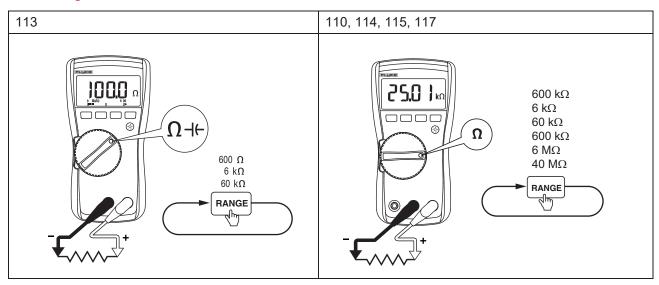
Making Basic Measurements

When connecting the test leads to the circuit or device, connect the common (**COM**) test lead before connecting the live lead; when removing the test leads, remove the live lead before removing the common test lead.

∧ Marning

To avoid electric shock, injury, or damage to the Meter, disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.

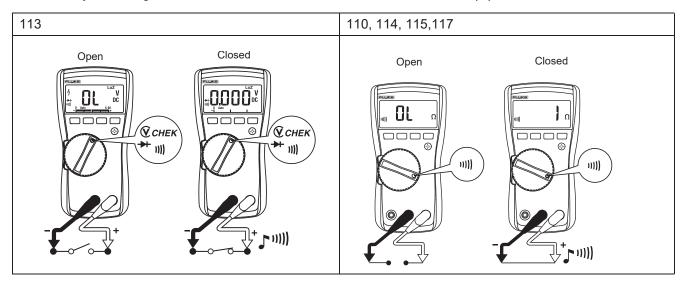
Measuring Resistance



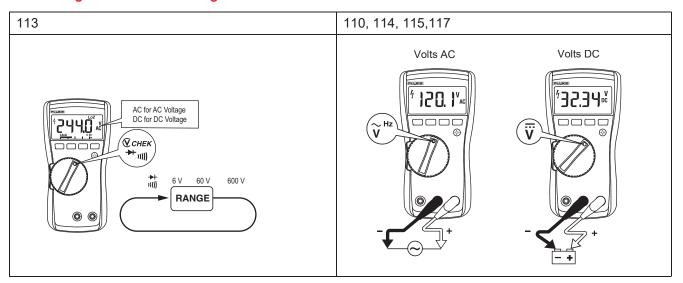
Testing for Continuity

Note

Use the continuity function as a fast, convenient method to check for opens and shorts. For maximum accuracy in making resistance measurements, use the Meter's resistance (Ω) function.



Measuring AC and DC Voltage



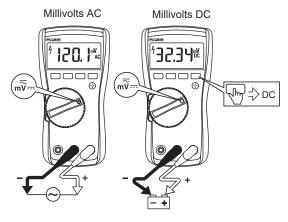
Using Auto Volts Selection (114, 117)

With the function switch in the $^{\text{AUTO-V}}_{\text{LoZ}}$ position, the Meter automatically selects a dc or ac voltage measurement based on the input applied between the **V** or **+** and **COM** jacks.

This function also sets the Meter's input impedance to approximately 3 $k\Omega$ to reduce the possibility of false readings due to ghost voltages.

Measuring AC and DC Millivolts (110, 114, 115, 117)

With the function switch in the $\overline{m_{V}^{\sim}}$ position, the Meter measures ac plus dc millivolts. Press ____ to set the Meter to dc millivolts.



Measuring AC or DC Current (115, 117)

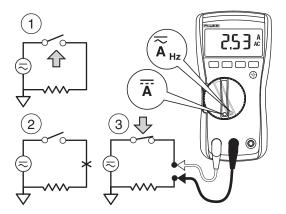
∧ Marning

To avoid personal injury or damage to the Meter:

- Never attempt to make an in-circuit current measurement when the open-circuit potential to earth is >600 V.
- Check the Meter's fuse before testing. See Testing the Fuse (115, 117).
- Use the proper terminals, switch position, and range for your measurement.
- Never place the probes in parallel with a circuit or component when the leads are plugged into the A (Amps) terminals.

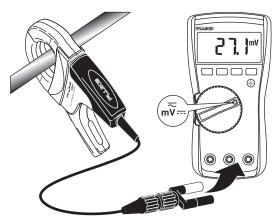
To measure current:

- 1. Turn circuit power off.
- 2. Break the circuit
- 3. Insert the Meter in series with the circuit, and then turn circuit power on.

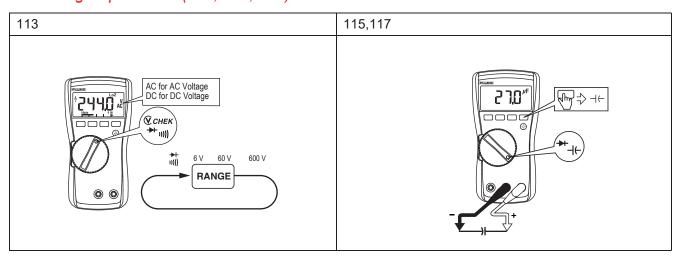


Measuring Current above 10 Amps (110, 114, 115, 117)

The millivolt and voltage function of the Meter can be used with an optional mV/A output Current Probe to measure currents that exceed the rating of the Meter. Make sure the Meter has the correct function selected, AC or DC, for your current probe. Refer to a Fluke catalog or contact your local Fluke representative for compatible current clamps.



Measuring Capacitance (113, 115, 117)



Measuring Frequency (115, 117)

∧ Marning

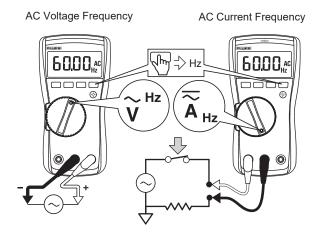
To avoid electrical shock, disregard the bar graph for frequencies >1 kHz. If the frequency of the measured signal is >1 kHz, the bar graph and $\frac{1}{2}$ are unspecified.

The Meter measures the frequency of a signal by counting the number of times the signal crosses a trigger level each second. The trigger level is 0 V, 0 A for all ranges.

Press ____ to turn on or turn off the frequency measurement function on and off. Frequency works with ac functions only.

In frequency, the bar graph and range annunciator indicate the ac voltage or current present.

Select progressively lower ranges using manual ranging for a stable reading.



Detecting AC Voltage Presence (117)

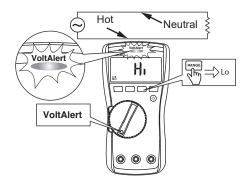
To detect the presence of ac voltage, place the top of the Meter close to a conductor. The Meter gives an audible as well as visual indication when voltage is detected. The sensitivity settings are:

- Lo: use on flush mounted wall sockets, power strips, flush mounted industrial outlets and various power cords.
- H_i: for ac voltage detection on other styles of recessed power connectors or sockets where the actual ac voltage is recessed within the connector itself.

The VoltAlert detector works in bare wire applications with voltages as low as 24 V in the H setting.

∧ Marning

If there is no indication, voltage could still be present. Do not rely on the VoltAlert detector with shielded wire. Operation may be effected by differences in socket design, insulation thickness and type.



Making Low Impedance Capacitance Measurements (115, 117)

For making capacitance measurements on cables with ghost voltage:

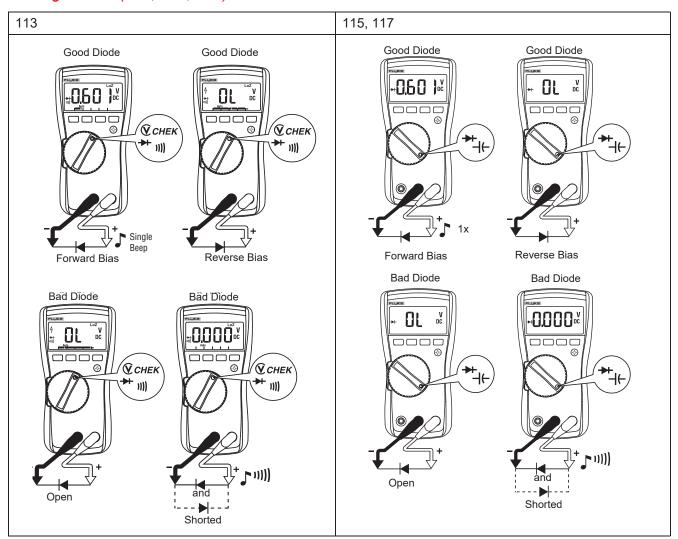
- 1. Hold RANGE as you turn on the Meter to enable the low-input impedance Capacitance mode.
- 2. Wait until **LEAP** shows on the display.

In this mode, capacitance measurements will have a lower accuracy and lower dynamic range.

Note

This setting is not saved when the Meter is turned off or goes into sleep mode.

Testing Diodes (113, 115, 117)



Using the Bargraph

The bar graph is like the needle on an analog meter. It has an overload indicator (\triangleright) to the right and a polarity indicator (\dagger) to the left.

Because the bar graph is much faster than the digital display, the bar graph is useful for making peak and null adjustments.

The bar graph is disabled when measuring capacitance. In frequency, the bar graph and range annunciator indicates the underlying voltage or current up to 1 kHz.

The number of segments indicates the measured value and is relative to the full-scale value of the selected range.

In the 60 V range, for example (see below), the major divisions on the scale represent 0, 15, 30, 45, and 60 V. An input of -30 V turns on the negative sign and the segments up to the middle of the scale.



Maintenance

Maintenance of the Meter consists of battery and fuse replacement, as well as case cleaning.

Testing the Fuse (115, 117)

Test fuse as shown in Figure 1.

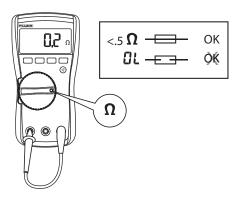


Figure 1. Test the Fuse

Replacing the Battery and Fuse

∧ Marning

To avoid shock, injury, or damage to the Meter:

- · Remove test leads from the Meter before opening the case or battery door.
- Use ONLY a fuse with the amperage, interrupt voltage, and speed ratings specified.

See Figure 2 for disassembly.

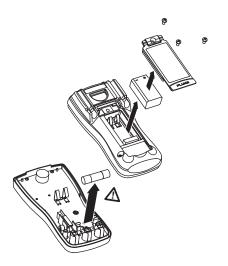


Figure 2. Disassembly

110/113/114/115/117

Users Manual

To remove the battery door for battery replacement:

- 1. Remove the test leads from the Meter.
- 2. Remove the battery door screw.
- 3. Use the finger recess to lift the door slightly.
- 4. Lift the door straight up to separate it from the case.
- 5. The battery fits inside the battery door, which is then inserted into the case, bottom edge first, until it is fully seated. Do not attempt to install the battery directly into the case.
- 6. Install and tighten battery door screw.

To open the case for fuse replacement:

- 1. Remove the test leads from the Meter.
- 2. Remove the Meter from its holster.
- 3. Remove two screws from the case bottom.
- 4. Separate the case bottom from the case top.
- 5. Remove the fuse from its holder and replace it with an 11 A, 1000 V, FAST fuse having a minimum interrupt rating of 17,000 A. Use only Fluke PN 803293.
- To re-assemble the Meter, first attach the case bottom to the case top, then install the two screws. Finally, insert the Meter into its holster.

Cleaning

Wipe the case with a damp cloth and mild detergent. Dirt or moisture in the terminals can affect readings.

Specifications

Accuracy is specified for 1 year after calibration, at operating temperatures of 18 °C to 28 °C, with relative humidity at 0 % to 90 %. Extended specifications are available at www.Fluke.com.

Maximum voltage between any terminal and earth ground	600 \/
⚠ Fuse for A input (115 & 117 only)	
Display	
Digital	6000 counts undates 4/s
Bar Graph	· 1
Temperature	
Operating	-10 °C to 50 °C
Storage	
•	
Altitude	
Operating	
Storage	
•	
Battery	•
Battery Life	
113	Alkaline: 300 hours typical, without backlight
	Alkaline: 400 hours typical, without backlight
Safety	
113	
110, 114	
115, 117	
Ingress Protection	IEC 60529: IP42 (non-operating)
Electromagnetic Compatibility (EMC)	
International	IEC 61326-1: Portable Electromagnetic Environment CISPR 11: Group 1, Class A
Group 1: Equipment has intentionall internal function of the equipment its	y generated and/or uses conductively-coupled radio frequency energy that self.
Class A: Equipment is suitable for u	se in all establishments other than domestic and those directly connected

at is necessary for the

d to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances.

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

Emissions that exceed the levels required by CISPR 11 can occur when the equipment is connected to a test object.

Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.

Table 6. Accuracy Specifications

Function	Range	Resolution	Accuracy ± ([% of Reading] + [Counts])		Model	
DC Millivolts	600.0 mV	0.1 mV	0.5 % + 2		110, 114, 115, 117	
	6.000 V	0.001 V				
DC Volts	60.00 V	0.01 V	0.5 % + 2		110, 114, 115, 117	
	600.0 V	0.1 V				
			DC, 45 to 500 Hz	500 Hz to 1 kHz		
Auto-V LoZ[1] True-rms	600.0 V	0.1 V	2.0 % + 3	4.0 % + 3	114, 117	
	6.000 V	0.001 V				
ⓒ CHEK ^[4]	60.00 V	0.01 V	2.0 % + 3	4.0 % + 3	113	
	600.0 V	0.1 V				
	-	-	45 to 500 Hz	500 Hz to 1 kHz		
AC millivolts ^[1] True-rms	600.0 mV	0.1 mV	1.0 % + 3	2.0 % + 3	110, 114, 115, 117	
	6.000 V	0.001 V				
AC Volts[1] True-rms	60.00 V	0.01 V	1.0 % + 3	2.0 % + 3	110, 114, 115, 117	
	600.0 V	0.1 V				
0 15 5	600 Ω	1 Ω	Beeper on <20 Ω , off >250 Ω . Detects opens or shorts of 500 μs or longer.		110, 114, 115, 117	
Continuity ^[5]					113	
	600.0 Ω	0.1 Ω	0.9 % + 2 0.9 % + 1 0.9 % + 1 0.9 % + 1 0.9 % + 1		110, 113, 114, 115, 117	
	6.000 kΩ	0.001 kΩ				
Ohms ^[5]	60.00 kΩ	0.01 kΩ			7'''	
Onns ¹⁻⁷	600.0 kΩ	0.1 kΩ				
	6.000 MΩ	0.001 MΩ			110, 114, 115, 117	
	40.00 ΜΩ	0.01 MΩ	5.0 % + 2			
Diode Test ^[5]	2.000 V	0.001 V	0.9 % + 2		115, 117	
Diode Test ^{es}	2.000 V	0.001 V	2.0 % + 3		113	
	1000 nF	1 nF	1.9 % + 2			
	10.00 μF	0.01 μF	1.9 % + 2			
Capacitance ^[5]	100.0 μF	0.1 μF	1.9 % + 2		113, 115, 117	
	9999 μF	1 μF	100 μF - 1000 μF: 1.9 % +2 >1000 μF: 5 % + 20			
Lo-Z Capacitance (Power-up option)	1 nF to 500 μF		10 % + 2 typical		115, 117	
AC Amps True-rms ^[1]	6.000 A	0.001 A	150/ + 2		115 117	
(45 Hz to 500 Hz)	10.00 A ^[3]	0.01 A	1.5 % + 3		115, 117	
DO 4	6 000 A 0 001 A		400/		115 117	
DC Amps	10.00 A ^[3]	0.01 A	1.0 % + 3		115, 117	

Table 6. Accuracy Specifications (cont.)

Function	Range	Resolution	Accuracy ± ([% of Reading] + [Counts])	Model
	99.99 Hz	0.01 Hz		
	999.9 Hz	0.1 Hz		
Hz (V or A input)[2]	9.999 kHz	0.001 kHz	0.1 % + 2	115, 117
	50.00 kHz	0.01 kHz		
	99.99 kHz	0.01 kHz		

Notes:

- [1] All ac ranges except Auto-V LoZ are specified from 1 % to 100 % of range. Auto-V LoZ is specified from 0.0 V. Because inputs below 1 % of range are not specified, it is normal for this and other true-rms meters to display non-zero readings when the test leads are disconnected from a circuit or are shorted together. For volts, crest factor of ≤3 at 4000 counts, decreasing linearly to 1.5 at full scale. For amps, crest factor of ≤3. AC volts is ac-coupled. Auto-V LoZ, AC mV, and AC amps are dc-coupled.
- [2] AC Volts Hz is ac-coupled and specified from 5 Hz to 99.99 kHz. Minimum input required above 50.00 kHz typically is >1.1 vac sine. Minimum input typical and not specified. AC Amps Hz is dc-coupled and specified from 45 Hz to 5 kHz.
- [3] Δ >10 A unspecified.Duty cycle: >10 A to 20 A, 30 seconds on, 10 minutes off.
- [4] 113 only: All **②** CHEK voltage ranges are specified from 60 counts to 100 % of range. Because inputs <60 counts are not specified, it is possible and normal for this and other true-rms meters to display non-zero readings when the test leads are disconnected from a circuit or are shorted together. Crest factor of ≤3 at 4000 counts, decreasing linearly to 1.5 at full scale.
- [5] 113 only. After measuring voltage, a wait time of 1 minute is required to maintain accuracy of ohms, capacitance, diode test, and continuity.

Table 7. Input Characteristics (110, 114, 115, 117)

Function	Input Impedance (Nominal)	Common Mode Rejection Ratio (1 kΩ Unbalanced)		Normal Mode Rejection
Volts AC	>5 MΩ <100 pF	>60 dB at dc, 50 or 60 Hz	0.5 % + 2	
Volts DC	>10 MΩ <100 pF	>100 dB at dc, 50 or 60 Hz	0.5 % + 2	
Auto-V LoZ	~3 kΩ <500 pF	>60 dB at dc, 50 or 60 Hz		
	Open Circuit Test Voltage	age Full Scale Voltage		Short Circuit Current
Ohms	<2.7 V dc	to 6.0 M Ω	40 ΜΩ	- <350 μA
Offilis	~2.7 v uc	<0.7 V dc	<0.9 V dc	_ \330 μΛ
Diode Test	<2.7 V dc	2.000 V dc		<1.2 mA

Table 8. Input Characteristics (113)

Function	Input Impedance (Nominal)	Common Mode Rejection Ratio	
	~3 kΩ <300 pF	>60 dB at dc, 50 or 60 Hz	
	Open Circuit Test Voltage	Full Scale Voltage	
Ohms	<2.7 V dc	<0.7 V dc	
Diode Test	<2.7 V dc	<2.000 V dc	
		Short Circuit Current	
Ohms		<350 μΑ	
Diode Test		<1.0 mA	

MIN MAX Recording Accuracy and Response Time (113)

Specified accuracy of the measurement function ± 40 counts in \bigcirc CHEK for changes >500 ms in duration, ± 12 counts in Ω for changes >325 ms in duration. Typical 100 ms response to 80 %. Response time not specified for capacitance.



323/324/325

Clamp Meter

Users Manual

LIMITED WARRANTY AND LIMITATION OF LIABILITY

This Fluke product will be free from defects in material and workmanship for two years from the date of purchase. This warranty does not cover fuses, disposable batteries, or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Fluke's behalf. To obtain service during the warranty period, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that Service Center with a description of the problem.

THIS WARRANTY IS YOUR ONLY REMEDY. NO OTHER WARRANTIES, SUCH AS FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSED OR IMPLIED. FLUKE IS NOT LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM ANY CAUSE OR THEORY. Since some states or countries do not allow the exclusion or limitation of an implied warranty or of incidental or consequential damages, this limitation of liability may not apply to you.

Fluke Corporation P.O. Box 9090 Everett, WA 98206-9090 U.S.A. Fluke Europe B.V. P.O. Box 1186 5602 BD Eindhoven The Netherlands

Table of Contents

Title	Pag
Introduction	1
How to Contact Fluke	
Safety Information	
How to Clean the Product	
Specifications	
Electrical Specifications	10
Mechanical Specifications	12
Environmental Specifications	12
The Meter	14

323/324/325

Users Manual

Introduction

The Fluke 323/324/325 Clamp Meter (the Product) measures ac and dc voltage, ac current, resistance, and continuity. The 324 and 325 can also measure capacitance and contact temperature. The 325 can also measure dc current and frequency. Note that the 325 is shown in all of the illustrations. For temperature measurement, you must use the included K-Type Thermocouple.

∧∧Warning

Read "Safety Information" before you use the Product.

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

323/324/325

Users Manual

Japan: +81-03-6714-3114

• Singapore: +65-6799-5566

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 can cause damage to the Product or the equipment under test.

Table 1 tells you about symbols used on the Product and in this manual.

<u>∧</u> Warning

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

- Use the Product only as specified, or the protection supplied by the Product can be compromised.
- Use only correct measurement category (CAT), voltage, and amperage rated probes, test leads, and adapters for the measurement.
- Do not touch voltages > 30 V ac rms, 42 V ac peak, or 60 V dc.
- Carefully read all instructions.
- Hold the Product behind the tactile barrier. See Clamp Meter, item 1.
- Do not exceed the Measurement Category (CAT) rating of the lowest rated individual component of a Product, probe, or accessory.
- Do not measure current while the test leads are in the input jacks.
- Do not use the Product around explosive gas, vapor, or in damp or wet environments.
- Limit operation to the specified measurement category, voltage, or amperage ratings.
- Do not work alone.

- Do not apply more than the rated voltage, between the terminals or between each terminal and earth ground.
- Comply with local and national safety codes. Use personal protective equipment (approved rubber gloves, face protection, and flameresistant clothes) to prevent shock and arc blast injury where hazardous live conductors are exposed.
- Replace the batteries when the low battery indicator shows to prevent incorrect measurements.
- The battery door must be closed and locked before you operate the Product.
- Measure a known voltage first to make sure that the Product operates correctly.
- Remove all probes, test leads, and accessories that are not necessary for the measurement.
- Only use probes, test leads, and accessories that have the same measurement category and voltage rating as the Product.
- Keep fingers behind the finger guards on the probes.

- Connect the common test lead before the live test lead and remove the live test lead before the common test lead.
- Remove all probes, test leads, and accessories before the battery door is opened.
- Do not use the Product if it is damaged.
- Disable the Product if it is damaged.
- Do not use the Product if it operates incorrectly.
- Do not use test leads if they are damaged. Examine the test leads for damaged insulation, exposed metal. Check test lead continuity.
- Before each use, examine the Product. Look for cracks or missing pieces of the clamp housing. Also look for loose or weakened components. Carefully examine the insulation around the jaws. See Clamp Meter, item ②.
- Examine the case before you use the Product. Look for cracks or missing plastic. Carefully look at the insulation around the terminals.
- Read all safety Information before you use the Product.

- Remove batteries to prevent battery leakage and damage to the Product if it is not used for an extended period.
- Remove batteries to prevent battery leakage and damage to the Product if is to be stored above its operating temperature.
- Do not use a current measurement as an indication that a circuit is safe to touch. A voltage measurement is necessary to know if a circuit is hazardous.

∆ Caution

To avoid possible damage to the Product or to equipment under test, use a thermocouple rated for the temperatures to be measured. The Product is rated for -10.0 $^{\circ}$ C to +400.0 $^{\circ}$ C and 14 $^{\circ}$ F to 752 $^{\circ}$ F. The included type-K thermocouple is rated to 260 $^{\circ}$ C.

Symbols

Table 1. Symbols

Symbol	Meaning	Symbol	Meaning
~	AC (Alternating Current)	=	Earth
=	DC (Direct Current)	~	AC and DC Current
C€	Conforms to European Union directives.	\triangle	WARNING. RISK OF DANGER.
	Battery	[]i	Consult user documentation.
	Double insulated	A	WARNING. HAZARDOUS VOLTAGE. Risk of electric shock.
6 °	Certified by CSA Group to North American safety standards.	<u>&</u>	Conforms to relevant Australian standards.
	Certified by TÜV SÜD Product Service.	4	Application around and removal from uninsulated hazardous live conductors is permitted.

Table 1. Symbols (cont.)

Symbol	Meaning	Symbol	Meaning
CATI	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 II	MEASUREMENT CATEGORY IV is applicable to test and measuring circuits connected at the source of the building's low voltage MAINS installation.	K	Conforms to relevant South Korean EMC Standards.
Ā	This product complies with the WEEE Directive 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.		

Note

The Measurement Category (CAT) and voltage rating of combinations of test probes, test probe accessories, current clamp accessories, and the Product is the LOWEST rating of individual components.

How to Clean the Product

Regularly wipe the case with a damp cloth and weak detergent.

↑ Caution

To prevent damage to the Product, do not use abrasives or solvents to clean the Product case.

To clean the Product Jaw:

- Examine the jaw mating surface to make sure it is clean. If there is unwanted material (including rust), jaw closure will not be correct and there will be measurement errors.
- 2. Open the jaws and clean the clamp metal ends with a lightly oiled cloth.

Specifications

Maximum voltage between any Terminal and Earth Ground	600 V
Range	
323	400.0 A
324, 325	(40.00, 400.0) A
Batteries	2 AAA, NEDA 24A, IEC LR03
Operating Temperature	10 °C to +50 °C
Storage Temperature	30 °C to +60 °C
Operating Humidity	Non Condensing (≤10 °C)
	≤90 % RH (at 10 °C to 30 °C)
	≤75 % RH (at 30 °C to 40 °C)
	≤45 % RH (at 40 °C to 50 °C)
	(Without Condensation)
Operating Altitude	2000 meters
Storage Altitude	12,000 meters
Size (L x W x H)	(207 x 75 x 34) mm

323	265 g
324	208 g
325	283 g
Safety	IEC 61010-1, Pollution Degree 2
	IEC 61010-2-032: CATIV 300V / CATIII 600V
	IEC 61010-2-033:CAT IV 300V / CAT III 600V
IP Rating	IEC 60529: IP30, non-operating
Electromagnetic Compatibility (E	EMC)

International

IEC 61326-1: Portable, Electromagnetic Environment, IEC 61326-2-2

CISPR 11: Group 1, Class A

Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself.

Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances.

	Emissions that exceed the levels required by CISPR 11 can occur when the equipment is connected to a test object.
Korea (KCC)	Class A Equipment (Industrial Broadcasting & Communication Equipment
	Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.
USA (FCC)	47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103.
Temperature Co	efficientsAdd 0.1 x specified accuracy for each degree C above 28 °C or below 18 °C
Resolution	
323	0.1 A
324, 325	(0.01, 0.1) A
Accuracy	
323, 325	2.0 % ±5 digits (45 – 65 Hz)
	2.5 % ±5 digits (65 – 400 Hz)
324	1.5 % ±5 digits (45 Hz to 400 Hz)
	Note
	Add 2 % for position sensitivity.

DC Current with Jaw (325)

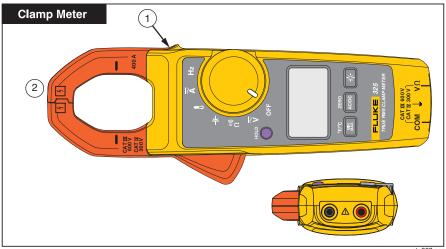
Range	(40.00, 400.0) A
Resolution	(0.01, 0.1) A
Accuracy	2.0 % ± 5 digits
AC Voltage	
Range	600.0 V
Resolution	0.1 V
Accuracy (45 Hz- 400 Hz)	1.5 % ± 5 digits
DC Voltage	
Range	600.0 V
Resolution	0.1 V
Accuracy	1 % ± 5 digits
Resistance	
Range	
323, 324	(400.0, 4000) Ω
325	(400.0, 4000, 40000) Ω
Resolution	(0.1, 1, 10) Ω
Accuracy	1 % ±5 digits

323/324/325

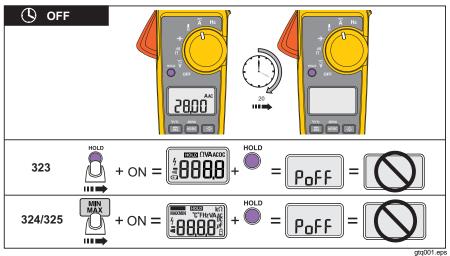
Users Manual

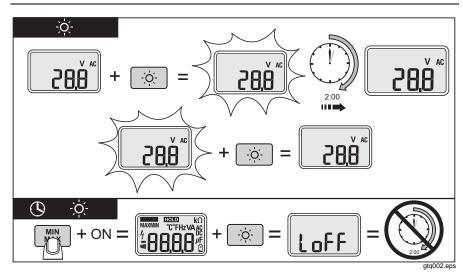
Continuity Beeper		
323≤70 Ω		
324/325≤30 Ω		
Capacitance (324, 325)		
Range(100.0, 1000) μF		
Resolution(0.1, 1) μF		
Accuracy1 % ±4 digits		
Frequency with Jaw (325)		
Range5.0 to 500.0 Hz		
Resolution0.1 Hz		
Accuracy0.5 % ±4 digits		
Trigger Level5 to 10 Hz, ≥10 A		
10 to 100 Hz, ≥5 A		
100 to 500 Hz, ≥10 A		
Contact Temperature (324, 325)		
Range10.0 °C to 400.0 °C		
Resolution0.1 °C		
Accuracy1 % ±8 digits		
Note: Temperature uncertainty (accuracy) does not include error of the thermocouple probe.		

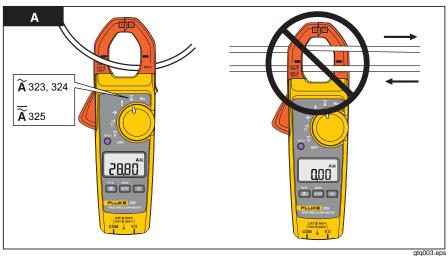
The Meter

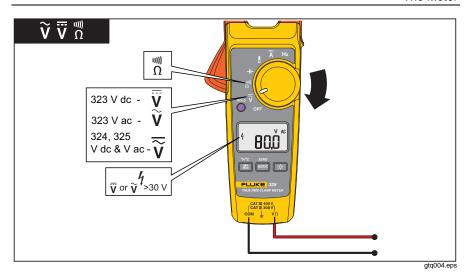


gtq008.eps

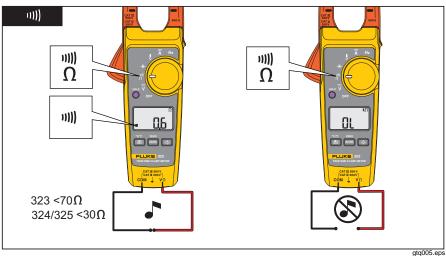


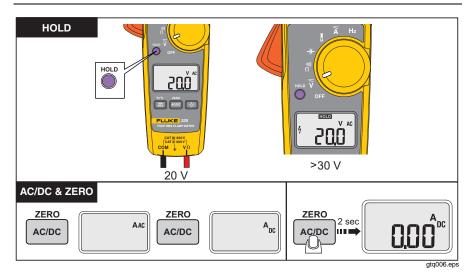




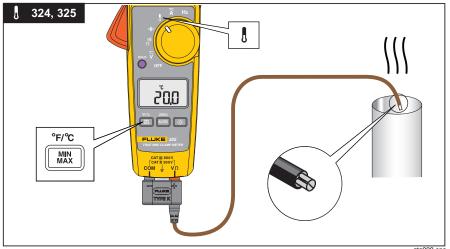


19

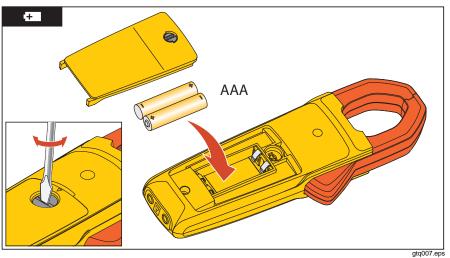




21



gtq009.eps



323/324/325

Users Manual