

**FLUKE®**

**The future of installation testing is here**

**The Fluke 1650 Series Multifunction Testers**



# Fluke 1650 Series

## Safer, easier installation testing.

The 1650 Series testers verify the safety of electrical installations in domestic, commercial and industrial applications. They can ensure that fixed wiring is safe and correctly installed to meet the requirements of IEC 60364, HD 384 and all relevant local standards.

The unique ergonomic design, low weight, and padded neck-strap to free your hands, make operating a Fluke 1650 multifunction tester a pleasure. With easy-to-operate controls and a large display with exceptionally wide viewing angle, it's also comfortable and safe to use.

### Select from three models

1651: Performs all basic installation tests including continuity/insulation/loop impedance and RCD tripping time

1652: Also provides RCD tripping current level and RCD auto-testing

1653: As 1652 but with earth resistance and phase sequence measurement. Has internal memory and a PC interface for documentation and reporting

*(see back page for a comparison chart)*



1651

1652



1653

- 1 Phase/Earth Voltage warning indicator
- 2 On/off button
- 3 Press to test button
- 4 Function buttons to assist easy navigation
- 5 Memory mode button
- 6 Scroll memory locations button
- 7 Backlight button
- 8 Test lead resistance zero button





## Learn in minutes, test in seconds. Save time on every installation.

- **Easy:** simply turn the knob, press the button and see the results
- **Efficient:** measure loop impedance without tripping RCDs, eliminating the need to bypass them
- **Rugged:** withstands a one-meter drop for demanding field use.
- **Safe:** slim probe with test button keeps your eyes on the panel while probing hard to reach points
- **Comfortable:** compact and lightweight (less than 1.2 kg) for all day testing
- **Compliant:** meets all relevant standards including EN 61557 and VDE 0413



*The unique curved shape, ergonomic control layout and padded neck-strap ensure comfort in use.*

## Performs all electrical installation tests including



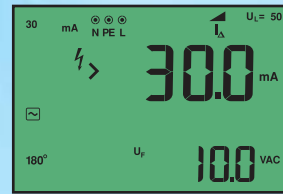
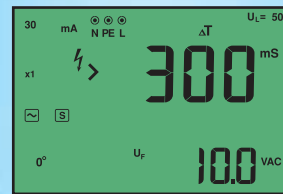
- 1 Voltage and frequency
- 2 Insulation resistance
- 3 Continuity
- 4 Loop impedance
- 5 RCD tripping time
- 6 RCD tripping current (models 1652, 1653)
- 7 Earth resistance (model 1653)
- 8 Phase sequence (model 1653)



### Continuity ( $R_{L0}$ )

Test continuity of live and protective conductors

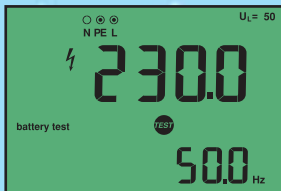
- Time-saving 'auto-null' feature subtracts lead resistance from measurements (and stores it in memory even after power-down)
- Wiring connection check indication and live circuit detection for added safety
- High-resolution measurements down to 0.01  $\Omega$



### RCD

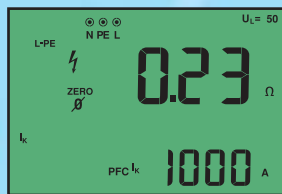
Carry out functional trip testing and current tripping level tests

- Test wide range of RCDs (all models)
- Test DC-sensitive and delayed-response RCDs (1652 and 1653)
- Automated test sequence function for rapid RCD testing (1652 and 1653)
- RCD Tripping Current Test (ramp test) (1652 and 1653)
- Wiring connection check indication for added safety
- Phase selector switch



### Voltage and frequency (V)

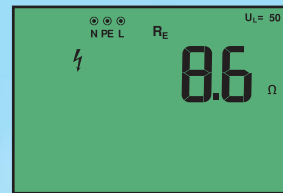
- Dual display gives simultaneous readout of mains voltage and frequency



### Loop impedance ( $Z_1$ )

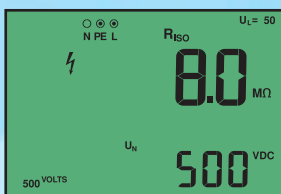
Measure earth-loop or line impedance

- Advanced and patented loop measurement technology prevents RCD tripping and guarantees consistent readings after multiple tests
- 0.01  $\Omega$  resolution on loop measurements
- Auto-null to remove test-lead resistance from measurement



### Earth resistance ( $R_E$ ) (1653 only)

- Measure resistance to earth of electrodes, stakes and earthing mats
- Test with auxiliary earth spikes in the ground
  - Three-wire tests for accurate measurement
  - User selectable safety voltage level of 50 or 25 V



### Insulation resistance ( $R_{ISO}$ )

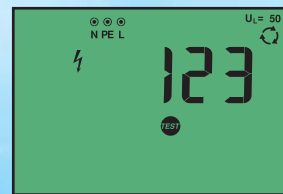
Test the insulation resistance of live and protective conductors

- Insulation test voltages of 50, 100, 250, 500 and 1000 V cover all applications including telecom (depending on model)
- Clear indication of applied voltage
- Auto discharge allows fast and safe discharge of electrical energy in capacitive circuits
- Added safety through live circuit detection, to check and inhibit test if circuit under test is live

### Prospective short-circuit/fault current (PSC/PFC)

Measure the potential fault current between phase/neutral and earth/neutral conductors

- Simultaneous read-out with loop impedance
- 1 A resolution on measurements



### Phase sequence (1653 only)

- Test phase sequence rapidly on three phase systems





### Panel graphics

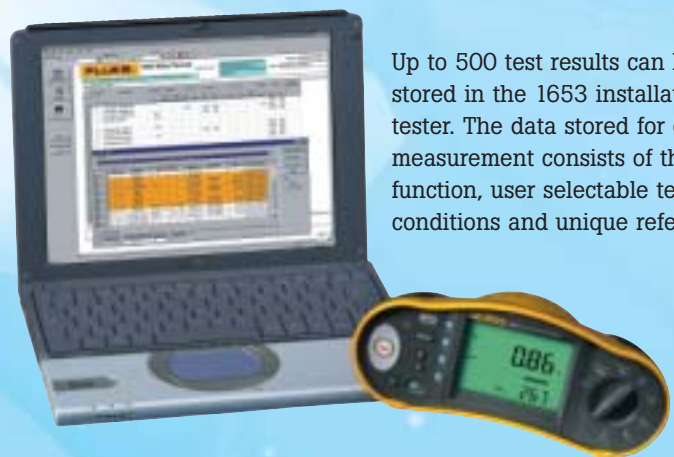
Rotary knob labeling is available in six versions. Select from English, French, German, Italian, Spanish or a user-friendly Symbols version.



### Slim probe design

Thanks to its slim probe with integral test button, you can safely make one-handed measurements on hard to reach points, while keeping your eyes on the panel.

## Professional reports



Up to 500 test results can be stored in the 1653 installation tester. The data stored for each measurement consists of the test function, user selectable test conditions and unique references.

Model 1653 has an IR port and adaptor to enable the results to be uploaded to a computer for preparing professional reports using (optional) FlukeView™ Forms software. Reports can easily be customized to suit individual requirements. Standard formats are also available.



# More functions in one tool

## AC Voltage Measurement

Range	Resolution	Accuracy 50 Hz - 60 Hz	Input Impedance	Overload Protection
500 V	0,1 V	0,8% + 3	3,3 M $\Omega$	660 Vrms

## Continuity Testing

Range (autoranging)	Resolution	Test Current	Open Circuit Voltage	Accuracy
20 $\Omega$	0,01 $\Omega$	> 200 mA	> 4 V	$\pm$ (1,5%+3 dgt.)
200 $\Omega$	0,1 $\Omega$			
2000 $\Omega$	1 $\Omega$			

## Insulation Resistance Measurement

Model	Test Voltages	Accuracy of Test Voltage (at rated test current)
1651	500 - 1000 V	+10%, -0%
1652	250 - 500 - 1000 V	+10%, -0%
1653	50 - 100 - 250 - 500 - 1000 V	+10%, -0%

Test Voltage	Insulation	Resolution Resistance Range	Test Current	Accuracy
50 V	10 k $\Omega$ to 50 M $\Omega$	0,01 M $\Omega$	1 mA @ 50 k $\Omega$	$\pm$ (3%+3 dgt.)
100 V	100 k $\Omega$ to 20 M $\Omega$ 20 M $\Omega$ to 100 M $\Omega$	0,01 M $\Omega$ 0,1 M $\Omega$	1 mA @ 100 k $\Omega$	$\pm$ (3%+3 dgt.) $\pm$ (3%+3 dgt.)
250 V	100 k $\Omega$ to 200 M $\Omega$	0,1 M $\Omega$	1 mA @ 250 k $\Omega$	$\pm$ (1,5%+3 dgt.)
500 V	100 k $\Omega$ to 200 M $\Omega$ 200 M $\Omega$ to 500 M $\Omega$	0,1 M $\Omega$ 1 M $\Omega$	1 mA @ 500 k $\Omega$	$\pm$ (1,5%+3 dgt.) + 10%
1000 V	100 k $\Omega$ to 200 M $\Omega$ 200 M $\Omega$ to 1000 M $\Omega$	0,1 M $\Omega$ 1 M $\Omega$	1 mA @ 1 M $\Omega$	$\pm$ (1,5%+3 dgt.) + 10%

Auto Discharge	Discharge time constant, 0.5 second for C = 1 $\mu$ F or less.
Live Circuit Detection	Inhibits test if terminal voltage > 30 V prior to initiation of test.
Maximum Capacitive Load	Operable with the 5 $\mu$ F load

## Loop Impedance Measurement

<b>Measuring Range</b>	100 - 500 V AC (50/60 Hz)
<b>Input connection</b> (soft key selection)	Loop Impedance: phase to earth Line impedance: phase to neutral
<b>Limit on consecutive tests</b>	Automatic thermal shutdown after 50 consecutive tests at 10 second intervals (typical)

Range	Resolution	Accuracy
20 $\Omega$	0,01 $\Omega$	$\pm$ (3%+10 digits)
200 $\Omega$	0,1 $\Omega$	
2000 $\Omega$	1 $\Omega$	

## PFC, PSC Test

Computation	PFC or PSC determined by dividing measured mains voltage by measured loop (L-PE) resistance or line (L-N) resistance	
Range	0 to 10 kA	
Resolution and Units	Resolution	Units
	1 <sub>k</sub> < 1000 A	1 A
	1 <sub>k</sub> < 1000 A	0.1 kA
Accuracy	Determined by accuracy of loop resistance and mains voltage measurements.	







## RCD Testing

RCD Type		Model 1651	Model 1652	Model 1653
<sup>1</sup> AC	<sup>2</sup> G	✓	✓	✓
AC	<sup>3</sup> S	✓	✓	✓
<sup>4</sup> A	G		✓	✓
A	S		✓	✓

<sup>1</sup>AC – Responds to AC  
<sup>2</sup>G – General, no delay  
<sup>3</sup>S – Time delay  
<sup>4</sup>A – Responds to pulsed signal

## Tripping Time Test ( $\Delta T$ )

### Model 1651

Current Settings	Multiplier	Current Accuracy	*RCD Type	Maximum Test Time
10, 30, 100, 300, 500, 1000 mA	x 1	+10% -0%	G	310 ms
10, 30, 100, 300, 500, 1000 mA	x 1	+10% -0%	S	510 ms

\*G – General, no delay  
 \*S – Time delay

## Tripping Time Test ( $\Delta T$ )

### Models 1652 and 1653

Current Settings	Multiplier	Current Accuracy
10, 30, 100, 300, 500, 1000 mA	x 1/2	+0% - 10% of test current
10, 30, 100, 300, 500, 1000 mA	x 1	+10% -0%
10, 30 mA	x 5	±10%

Current Multiplier	*RCD Type	Measurement Range		Trip Time Accuracy
		Europe	UK	
x 1/2	G	310 ms	2000 ms	±(1% Reading + 1 digit)
x 1/2	S	510 ms	2000 ms	±(1% Reading + 1 digit)
x 1	G	310 ms	310 ms	±(1% Reading + 1 digit)
x 1	S	510 ms	510 ms	±(1% Reading + 1 digit)
x 5	G	50 ms	50 ms	±(1% Reading + 1 digit)
x 5	S	160 ms	160 ms	±(1% Reading + 1 digit)

\*G – General, no delay  
 \*S – Time delay

## Tripping current (ramp) test (models 1652 and 1653)

Current Range	Step size	Dwell time		Trip Current Measurement Accuracy
		Type G	Type S	
50% to 110% of RCD's rated current	10% of $I_{\Delta N}$	300 ms/step	500 ms/step	± 5%

## Earth Resistance Test ( $R_E$ )

### Model 1653 Only

Range	Resolution	Accuracy
200 $\Omega$	0,1 $\Omega$	±(2% + 5 digits)
2000 $\Omega$	1 $\Omega$	±(3,5% + 10 digits)

Frequency	Compliance Voltage
128 Hz	+ 25 V

## Phase Sequence Indication

### Model 1653 Only

<b>Icon</b>	○ Icon Phase Sequence indicator is active
<b>Display of Phase Sequence</b>	Displays '1-2-3' in digital display field for correct sequence. Displays '3-2-1' for incorrect phase. Dashes in place of a number indicate a valid determination could not be made.

## General Specifications

Operating Range	-10 °C to 40 °C
Operating Humidity	• Noncondensing <10 °C • 95% 10 to 30 °C; 75% 30 to 40 °C
Safety Rating	EN 61010-1, CAT III 500 V
Battery size, quantity	Type AA,6
Battery type	Alkaline supplied, usable with 1.2V NiCD or NiMH rechargeable batteries
Dimensions (L x W x H)	10 x 25 x 12,5 cm.
Weight (with batteries)	1.17 kg

## Fluke 1650 Series



Measurement functions	Fluke 1651	Fluke 1652	Fluke 1653
Voltage & Frequency	•	•	•
Wiring polarity checker	•	•	•
Insulation Resistance	500, 1000 V	250, 500, 1000 V	50, 100, 250, 500, 1000 V
Continuity	•	•	•
Loop & Line Resistance	•	•	•
PFC/PSC (fault/short-circuit current)	•	•	•
RCD tripping time	•	•	•
RCD tripping current level		•	•
		ramp test	ramp test
Automatic RCD test sequence		•	•
Test DC-sensitive RCD's		•	•
Earth Resistance			•
Phase Sequence Indicator			•
<b>Other features</b>			
Self-test	•	•	•
EN 61557*/VDE 0413 compliant	•	•	•
Illuminated Display	•	•	•
Live voltage indicator	•	•	•
Battery indicator and battery test function	•	•	•
<b>Memory, Interface</b>			
Memory (500 measurements)			•
Computer interface			•
Time stamp (with FlukeView® Forms)			•
Software			Option

\* 1651: sections 1,2,3,4,6,10  
 1652: sections 1,2,3,4,6,10  
 1653: sections 1,2,3,4,5,6,7,10



### Complete kit

All 1650 models are equipped with detachable leads that can be replaced in case of damage or loss. A durable hard carrying case will protect your instrument in tough field conditions. A probe with built-in test button comes with every instrument.

Included accessories	1651	1652	1653
Hard carrying case	•	•	•
Mains test cord	•	•	•
Remote control probe and lead	•	•	•
Other test leads	2	3	3
Other test probes	2	2	3
Large crocodile clips	2	3	3
Quick reference guide	•	•	•
User guide on CD-ROM	•	•	•
6 AA Cell batteries	•	•	•
Padded carrying strap	•	•	•
<b>Optional accessories</b>			
FlukeView Forms software and cable			•
Fused test leads	•	•	•
Auxiliary earth spikes and test leads			•



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