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Fluke 1623-2 and 1625-2

GEO Earth Ground Testers

Technical Data

The new Fluke 1623-2 and 1625-2 GEO Earth Ground Testers offer data storage and download capabilities via USB port. World class accessories will simplify and speed up testing time.

Product features:

- 3- and 4-pole Fall of Potential, earth resistance loop testing
- 4-pole Soil Resistivity testing
- Selective earth ground rod testing using 1 clamp
- Stakeless earth ground rod testing using 2 clamps
- IP56 rated for outdoor use
- Professional carrying case
- USB data storage and transfer

In addition, the Fluke 1625-2 offers these advanced features:

- Automatic Frequency Control (AFC)—identifies existing interference and chooses a measurement frequency to minimize its effect, providing more accurate earth ground value
- R* measurement—calculates earth ground impedance at 55 Hz to more accurately reflect the earth ground resistance that a fault-to-earth ground would see
- Adjustable limits—for quicker testing

Stakeless testing

The Fluke 1623-2 and 1625-2 earth ground testers are able to measure earth ground loop resistances using only clamps. With this test method, two clamps are placed around the earth ground rod and each are connected to the tester. No earth ground stakes are used at all. A known, fixed voltage is induced by one clamp and the current is measured using the second clamp. Then the tester automatically determines the resistance of the earth ground rod.

This test method only works if a bonded earth ground system exists for the building or structure under test, but most are. If there is only one path to ground, like at many residential applications, the Stakeless method will not provide an acceptable value and the Fall of Potential test method must be used.

With Stakeless testing, the earth ground rod does not need to be disconnected—leaving the bonded earth ground system intact during test. Gone are the days of spending time placing and connecting stakes for each earth ground rod on your system—a major time saver. You can also perform earth ground tests in places you've not considered before: inside buildings, power pylons, or anywhere you don't have access to soil.

The most complete testers

The Fluke 1623-2 and 1625-2 are distinctive earth ground testers that can perform all four types of earth ground measurement:

- 3- and 4-Pole Fall of Potential (using stakes)
- 4-Pole Soil Resistivity testing (using stakes)
- Selective testing (using 1 clamp and stakes)
- Stakeless testing (using 2 clamps only)

The testers are also easy to use. For each test, the testers inform you which stakes or clamps need to be connected and the large rotary switch can be used even with a gloved hand.

The complete model kit comes with the 1623-2 or 1625-2 tester, test leads, 4 earth ground stakes, 3 cable reels with wire, 2 clamps, batteries, and manual—all inside a professional Fluke carrying case.

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1623-2 Specifications

General

Display:1999 digit LCD	Display with special symbols, digit height 25 mm
User interface	Instant measurement through TURN and START one button concept. The only operating elements are rotary switch and START button
Robust, water and dust resistant	Instrument is designed for tough environmental conditions (rubber protective cover, IP56)
Memory	Internal memory storage up to 1500 records accessible via USB port

Temperature ranges

Operating temperature	–10 °C to 50 °C (14 °F to 122 °F)
Storage temperature	–30 °C to +60 °C (–22 °F to +140 °F)

Temperature coefficient	± 0.1 % of reading/°C <18 °C >28 °C
Intrinsic error	Refers to the reference temperature range and is guaranteed for 1 year
Operating error	Refers to the operating temperature range and is guaranteed for 1 year
Climatic class	C1 (IEC 654–1), –5 °C to +45 °C (23° to +115° F), 5 % to 95 % RH
Protective type	IP56 for case, IP40 for battery door according to EN60529
Safety	Protection by double and/or reinforced insulation. max. 50 V to earth. IEC61010–1: CAT none, Pollution degree 2
EMC (Emission Immunity)	IEC61326–1: Portable
Quality system	Developed, designed and manufactured according to DIN ISO 9001
External voltage	V ext, max = 24 V (dc, ac < 400 Hz), measurement inhibited for higher values
V ext rejection	> 120 dB ($16^2/3$, 50, 60, 400 Hz)
Measuring time	Typical 6 sec.
Max. overload	250 V rms (pertains to misuse)
Auxiliary power	6 x 1.5 V alkaline (type AA LR6)
Battery life span	Typical > 3,000 measurements
Dimensions (WxHxD)	250 mm x 133 mm x 187 mm (9.75 in x 5.25 in x 7.35 in)
Weight	1.1 kg (2.43 lb) including batteries 7.6 kg (16.8 lb) including accessories and batteries in carrying case

RA 3-pole ground resistance measurement (IEC 1557-5)

Switch position	Resolution	Measuring range	Accuracy	Operating error
R_A 3-pole	0.001 Ω to 10 Ω	0.020 Ω to 19.99 kΩ	± (2 % rdg + 3 d)	± (5 % rdg + 3 d)

For 2-pole measurements connect terminals H and S with the supplied connector cable.

Measuring principle: Current and voltage measurement

Measuring voltage	Vm = 48 V ac
Short-circuit current	> 50 mA
Measure frequency	128 Hz
Probe resistance (R_S)	Max 100 kΩ
Auxiliary earth electrode resistance (R_H)	Max. 100 kΩ
Additional error from R_H and R_S	$R_H[k\Omega]\cdots R_S[k\Omega]/R_A[\Omega]\cdots 0.2$ %
Monitoring of R_S and R_H with error indicator	
Automatic range selection	
Measurement is not performed if the current through the current clamp is too low	

R_A 4-pole ground resistance measurement (IEC 1557-5)

Switch position	Resolution	Measuring range	Accuracy	Operating error
R_A 4-pole	0.001 Ω to 10 Ω	0.020 Ω to 19.99 kΩ	± (2 % rdg + 3 d)	± (5 % rdg + 3 d)

Measuring principle: Current/voltage measurement

Measuring voltage	Vm = 48 V ac
Short-circuit current	> 50 mA
Measuring frequency	128 Hz
Probe resistance (R_S+ R_{ES})	Max. 100 kΩ
Auxiliary earth electrode resistance (R_H)	Max. 100 kΩ
Additional error from R_H and R_S	$R_H[k\Omega]\cdots R_S[k\Omega/R_A[\Omega]\cdots 0.2$ %
Monitoring of R_S, and R_H with error indicator	
Automatic range selection	

R_A 3-pole selective ground resistance measurement with current clamp (R_A ⊃C)

Switch position	Resolution	Measuring range	Accuracy	Operating error
R_A 3-pole ⊃C	0.001 Ω to 10 Ω	0.020 Ω to 19.99 kΩ	± (7 % rdg + 3 d)	± (10 % rdg + 5 d)

Measuring principle: Current/voltage measurement (with external current clamp)

Measuring voltage	Vm = 48 V ac
Short-circuit current	> 50 mA
Measuring frequency	128 Hz
Probe resistance (R_S)	Max. 100 kΩ
Auxiliary earth electrode resistance (R_H)	Max. 100 kΩ
Monitoring of R_S, and R_H with error indicator	
Automatic range selection	
Measurement is not performed if the current through the current clamp is too low	

R_A 4-pole selective ground resistance measurement with current clamp (R_A ⊃C)

Switch position	Resolution	Measuring range	Accuracy	Operating error
R_A 4-pole ⊃C	0.001 Ω to 10 Ω	0.020 Ω to 19.99 kΩ	± (7 % rdg + 3 d)	± (10 % rdg + 5 d)

Measuring principle: Current/voltage measurement (with external current clamp)

Measuring voltage	Vm = 48 V ac
Short-circuit current	> 50 mA
Measuring frequency	128 Hz
Probe resistance (R_S)	Max. 100 kΩ
Auxiliary earth electrode resistance (R_H)	Max. 100 kΩ
Monitoring of R_S, and R_H with error indicator	
Automatic range selection	
Measurement is not performed if the current through the current clamp is too low	

Stakeless ground loop measurement

Switch position	Resolution	Measuring range	Accuracy	Operating error
R_A 4-pole	0.001 Ω to 0.1 Ω	0.020 Ω to 199.9 Ω	± (7 % rdg + 3 d)	± (10 % rdg + 5 d)

Measuring principle: Stakeless measurement of resistance in closed loops using two current transformers

Measuring voltage	Vm = 48 V ac (primary)
Measuring frequency	128 Hz
Noise current (I_{EXT})	Max. I_{EXT} = 10 A (ac) (R_A < 20 Ω)
	Max. I_{EXT} = 2 A (ac) (R_A > 20 Ω)

Automatic range selection

The information regarding stakeless ground loop measurements is only valid when used in conjunction with the recommended current clamps at the minimum distance specified.

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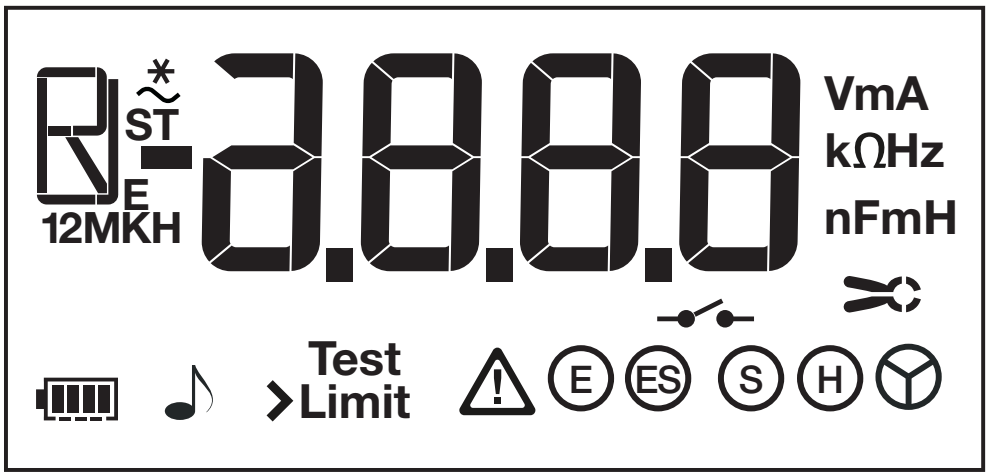
1625-2 Specifications

General

Memory	Internal memory storage up to 1500 records accessible via USB port
Measuring function	Interference voltage and frequency, earthing resistance 3- and 4-pole with/without clip-on current transformer, resistance 2-pole with ac, 2- and 4-pole with dc
Display	4 digit (2999 Digit) - 7 segment liquid crystal display, with improved visibility
Operation	Central rotary switch and function keys



Temperature ranges

Operating temperature range	-10 °C to 50 °C (14° F to 122° F)
Storage temperature range	-30 °C to 60 °C (-22° F to 140° F)

Temperature coefficient	± 0.1 % of range/± 0.1 % of reading/°C <18 °C >28 °C

Type of protection	IP56 for case, IP40 for battery door according to EN60529
Max voltage	⚠ socket to socket Ⓔ Ⓔ Ⓢ Ⓗ
	U_{rms} = 0 V
	Sockets " Ⓔ Ⓔ Ⓢ Ⓗ " to each other in any combination, max. U_{rms} = 250 V (pertains to misuse)
Safety:	Protection by double and/or reinforced insulation. Max. 50 V to earth per IEC61010-1. CAT none, Pollution degree 2
EMC (Emission Immunity)	IEC61326-1: Portable
Quality standard	Developed, designed and manufactured to comply with DIN ISO 9001
External field influence	Complies with DIN 43780 (8/76)
Auxiliary power	6 x 1.5 V alkaline (IEC LR6 or type AA)
Battery life span	With IEC LR6/type AA: typ. 3,000 measurements (R_E+R_H ≤ 1 kΩ)
	With IEC LR6/type AA : typ. 6,000 measurements (R_E + R_H > 10 kΩ)
Dimensions (WxHxD)	250 mm x 133 mm x 187 mm (9.75 in x 5.25 in x 7.35 in)
Weight	≤ 1.1 kg (2.43 lb) without accessories 7.6 kg (16.8 lb) including accessories and batteries in carrying case
Case material	Polyester

Measurement of interference voltage dc + ac (U_{ST})

Measuring Limits of error: method	Fullwave rectification

Measuring Range	Display Range	Resolution	Frequency Range	Limits of Error
1 V to 50 V	0.0 V to 50 V	0.1 V	dc/ac 45 Hz to 400 Hz sine	± (5 % of rdg + 5 digit)

Measuring sequence	approx. 4 measurements/s
Internal resistance	approx. 1.5 MΩ
Max. overload	U_{rms} = 250 V

Measurement of interference frequency (F)

Measuring method	Measurement of oscillation period of the interference voltage

Measuring Range	Display Range	Resolution	Range	Accuracy
6.0 Hz to 400 Hz	16.0 Hz to 299.9 Hz to 999 Hz	0.1 Hz to 1 Hz	1 V to 50 V	± (1 % of rdg + 2 digit)

Earthing resistance (R_E)

Measuring method	Current and voltage measurement with probe as IEC61557-5
Open circuit voltage	20/48 V, ac
Short circuit current	250 mA ac
Measuring frequency	94, 105, 111, 128 Hz selected manually or automatic. (AFC) 55 Hz in function R*
Noise rejection	120 dB ($16^2/_3$, 50 , 60, 400 Hz)
Max. overload	U_{rms} = 250 V

Electrical measurement specifications

Intrinsic error or influence quantity	Reference conditions or specified operating range	Designation code	Requirements or test in accordance with the relevant parts of IEC 1557	Type of test
Intrinsic error	Reference conditions	A	Part 5, 6.1	R
Position	Reference position ± 90°	E1	Part 1, 4.2	R
Supply voltage	At the limits stated by the manufacturer	E2	Part 1, 4.2, 4.3	R
Temperature	0 °C and 35 °C	E3	Part 1, 4.2	T
Series interference voltage	See 4.2 and 4.3	E4	Part 5, 4.2, 4.3	T
Resistance of the probes and auxiliary earth electrodes	0 to 100 x R_A but ≤ 50 kΩ	E5	Part 5, 4.3	T
System frequency	99 % to 101 % of the nominal frequency	E7	Part 5, 4.3	T
System voltage	85 % to 110 % of the nominal voltage	E8	Part 5, 4.3	T
Operating error	$B = \pm(\lvert A\rvert + 1{,}15\sqrt{E_1^2 E_2^2 E_3^2 E_4^2 E_5^2 E_6^2 E_7^2 E_8^2}$		Part 5, 4.3	R

A = intrinsic error
En = variations
R = routine test
T = type test

$$B[\%] = \pm \frac{B}{\textit{fiducial value}} \text{ x } 100\ \%$$

Measuring Range	Display Range	Resolution	Accuracy	Operating Error
0.020 Ω to 300 kΩ	0.001 Ω to 2.999 Ω	0.001 Ω	± (2 % of rdg + 2 digit)	± (5 % of rdg + 5 digit)
	3.00 Ω to 29.99 Ω	0.01 Ω		
	30.0 Ω to 299.9 Ω	0.1 Ω		
	0.300 kΩ to 2.999 kΩ	1 Ω		
	3.00 kΩ to 29.99 kΩ	10 Ω		
	30.0 kΩ to 299.9 kΩ	100 Ω		

Measuring time	typ. 8 sec. with a fixed frequency 30 sec. max. with AFC and complete cycle of all measuring frequencies
Additional error because of probe-and auxiliary earth electrode resistance	$\frac{R_H\,(R_S + 2000\ \Omega)}{R_E}$ x 1.25 x 10^{-6} % + *5 digits*
Measuring error of RH and RS	typ. 10 % of $R_E + R_S + R_H$
Max. probe resistance	≤ 1 MΩ
Max. auxiliary earth electrode resistance	≤ 1 MΩ

Automatic check if error is kept within the limits required by IEC61557-5.

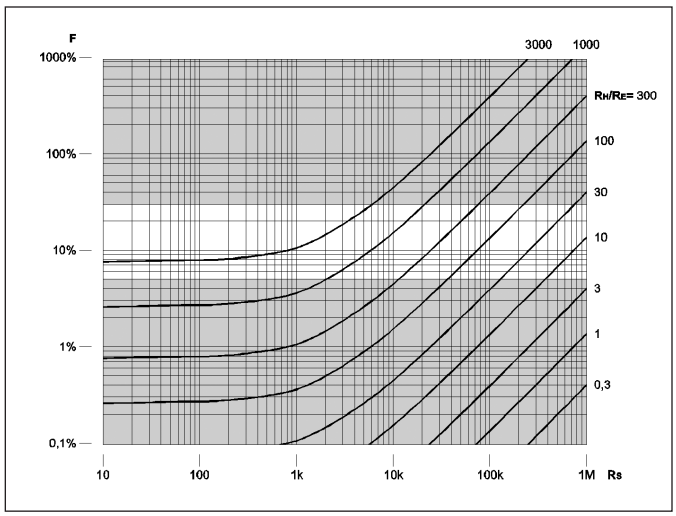
If after a measurement of probe-, auxiliary earth electrode- and earthing resistance, a measurement error of higher than 30 % is assumed because of the influencing conditions (see diagram), the display shows a warning symbol ⚠ and a notice that R_S or R_H are too high.

Automatic switchover of measuring resolution in dependence to auxiliary earth electrode resistance R_H

RH with U_{meas} = 48 V	RH with U_{meas} = 20 V	Resolution
< 300 Ω	< 250 Ω	1 mΩ
< 6 kΩ	< 2.5 kΩ	10 mΩ
< 60 kΩ	< 25 kΩ	100 mΩ
< 600 kΩ	< 250 kΩ	1 Ω

Selective measurement of the earthing resistance (R_E >C)

Measuring method	Current and voltage measurement with probe as per EN61557-5 and current measurement in the individual branch with additional current transformer (patent applied for).
Open circuit voltage	20/48 V ac
Short circuit current	250 mA ac
Measuring frequency	94, 105, 111, 128 Hz selected manually or automatically (AFC), 55 Hz (R*)
Noise rejection	120 dB ($16^2/_3$, 50, 60, 400 Hz)
Max. overload	Max. U_{rms} = 250 V (measurement will not be started)



Measuring Range	Display range	Resolution	Intrinsic error*	Operating error*
0.020 Ω to 30 kΩ	0.001 to 2.999 Ω	0.001 Ω	± (7 % of rdg + 2 digit)	± (10 % of rdg + 5 digit)
	3.00 to 29.99 Ω	0.01 Ω		
	30.0 to 299.9 Ω	0.1 Ω		
	0.300 to 2.999 kΩ	1 Ω		
	3.00 to 29.99 kΩ	10 Ω		

* With recommended current clamps/transformers.

Additonal error because of probe- and auxiliary earth typ. electrode resistance	$\frac{R_H\ (R_S + 2000\ \Omega)}{R_{ETOTAL}}$ x 1.25 x 10^{-6} % + *5 digits*	
Measuring error of R_H and R_S	Typ. of 10 % of $R_{ETOTAL} + R_S + R_H$	
Measuring time	Typ. 8 sec. with a fixed frequency 30 sec. max. with AFC and complete cycle of all measuring frequencies	
Minimal current in single branch to be measured	0.5 mA	With transformer (1000:1)
	0.1 mA	With transformer (200:1)
Max. interference current through transformer	3 A	With a transformer (1000:1)

Resistance measurement (R~)

Measuring method	Current and voltage measurement
Measuring voltage	20 V ac, square pulse
Short circuit current	> 250 mA ac
Measuring frequency	94, 105, 111, 128 Hz selected manually or automatically (AFC)

Measuring range	Display range	Resolution	Accuracy	Operating errors
0.020 Ω to 300 kΩ	0.001 Ω to 2.999 Ω	0.001 Ω	± (2 % of rdg + 2 digit)	± (5 % of rdg + 5 digit)
	3.0 Ω to 29.99 Ω	0.01 Ω		
	30 Ω to 299.9 Ω	0.1 Ω		
	300 Ω to 2999 Ω	1 Ω		
	3.0 kΩ to 29.99 kΩ	10 Ω		
	30.0 kΩ to 299.9 kΩ	100 Ω		

Measuring time	typ. 6 sec.
Max. interference voltage	24 V, with higher voltages measurement will not be started
Max overload	U_{rms} max. = 250 V

Resistance measurement (R⎓)

Measuring method	current- voltage measurement as per IEC61557-4 possible
Open circuit voltage	20 V dc
Short circuit current	200 mA dc
Formation of measured value	with 4-pole measurement wires on H, S, ES can be extended without additional error. Resistances > 1 Ω in wire E can cause additional error of 5m Ω/Ω.

Measuring range	Display range	Resolution	Accuracy	Operating error
0.020 Ω to 3 kΩ	0.001 Ω to 2.999 Ω	0.001 Ω	± (2 % of rdg + 2 digit)	± (5 % of rdg + 5 digit)
	3.0 Ω to 29.99 Ω	0.01 Ω		
	30.0 Ω to 299.9 Ω	0.1 Ω		
	300 Ω to 2999 Ω	1 Ω		

Measuring sequence	Approx. 2 measurements/s
Measuring time	Typ. 4 sec. incl. reversal of polarity (2-pole or 4-pole)
Max. interference voltage	≤ 3 V ac or dc, with higher voltages measurement will not be started
Max inductivity	2 Henry
Max. overload	U_{rms} = 250 V

Compensation of lead resistance (R_K)

Compensation of lead resistance (R_K) can be switched on in functions R_E 3-pole, R_E 4-pole ⋗⋖, R~ , and R⎓ 2-pole	
Formation of measured value	$R_{display} = R_{measured} - R_{compensated}$*

* Value of setpoint entry R_K = 0.000 Ω, variable from 0.000 to 29.99 Ω by means of measuring adjustment.

Stakeless ground loop measurement (⏚)

Switch position	Resolution	Measuring range	Accuracy	Operating error
R_A 4-pole	0.001 Ω to 0.1 Ω	0.02 Ω to 199.9 Ω	± (7 % rdg + 3 d)	± (10 % rdg + 5 d)

Measuring principle: Stakeless measurement of resistance in closed loops using two current transformers

Measuring voltage	Vm = 48 V ac (primary)
Measuring frequency	128 Hz
Noise current (I_{EXT})	Max. I_{EXT} = 10 A (ac) (R_A < 20 Ω)
	Max. I_{EXT} = 2 A (ac) (R_A > 20 Ω)

Automatic range selection

The information regarding stakeless ground loop measurements is only valid when used in conjunction with the recommended current clamps at the minimum distance specified.

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Selection guide by user

	Field Service Technician	Industrial Maintenance Technician	Power Utilities and Telecom
Fluke 1623-2	•	•	
Fluke 1625-2		•	•

Standard earth ground test methods

	Fall of Potential		Selective	Stakeless
	3-pole	4-pole/soil	1 clamp	2 clamps
Fluke 1623-2	•	•	•	•
Fluke 1625-2	•	•	•	•

Ordering information

Fluke-1623-2 Kit	Basic GEO Earth Ground Tester Kit
Fluke-1623-2	Basic GEO Earth Ground Tester
EI-1623	Selective/Stakeless Clamp Set for 1623
Fluke-1625-2 Kit	Advanced GEO Earth Ground Tester Kit
Fluke-1625-2	Advanced GEO Earth Ground Tester
EI-1625	Selective/Stakeless Clamp Set for 1625

Optional accessories

ES-162P3-2	Stake Set for 3-Pole Measurement
ES-162P4-2	Stake Set for 4-Pole Measurement
EARTH STAKE	Ground/Earth Stake
CABLE REEL 25M BL	Ground/Earth Cable Reel 25 m (81.25 ft)
CABLE REEL 25M GR	Ground/Earth Cable Reel 25 m (81.25 ft)
CABLE REEL 50M RD	Ground/Earth Cable Reel 50 m (162.5 ft)
EI-162BN	320 mm (12.6 in) Split Core Transformer
EI-162X	Clip-on Current Transformer (Sensing) with Shielded Cable Set
EI-162AC	Clip-on Current Transformer (Inducing)

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Printed in U.S.A. 3/2017 2634980d-en

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