

10.8 Resistance to earth

10.8.1 Standard earthing resistance measurement – 3-wire measurement

Measuring range according to EN61557-5 is 2.00 Ω ÷ 1999 Ω .

Measuring range (Ω)	Resolution (Ω)	Accuracy
0.00 ÷ 19.99	0.01	±(5% of reading + 5 digits)
20.0 ÷ 199.9	0.1	
200 ÷ 9999	1	

Max. auxiliary earth electrode resistance R_C 100× R_E or 50 k Ω (whichever is lower)

Max. probe resistance R_P 100× R_E or 50 k Ω (whichever is lower)

Additional probe resistance error at R_{Cmax} or R_{Pmax} . ±(10 % of reading + 10 digits)

Additional error at 3 V voltage noise (50 Hz) ±(5 % of reading + 10 digits)

Open circuit voltage <30 VAC

Short circuit current < 30 mA

Test voltage frequency 125 Hz

Test voltage shape sine wave

Noise voltage indication threshold 1 V (< 50 Ω , worst case)

Automatic measurement of auxiliary electrode resistance and probe resistance.

Automatic measurement of voltage noise.

10.8.2 Contactless earthing resistance measurement using two current clamps

Measuring range (Ω)	Resolution (Ω)	Accuracy ^{*)}
0.00 ÷ 19.99	0.01	±(10% of reading + 10 digits)
20.0 ÷ 30.0	0.1	±(20% of reading)
30.1 ÷ 39.9	0.1	±(30% of reading)

^{*)} Distance between test clamps > 30 cm.

Additional error at 3 V voltage noise (50 Hz) ±10 % of reading

Test voltage frequency 125 Hz

Noise current indication yes

Low clamp current indication yes

Additional clamp error has to be considered.

10.8.3 Specific earth resistance measurements

Measuring range (Ωm)	Resolution (Ωm)	Accuracy
0.0 ÷ 99.9	0.1	See accuracy note
100 ÷ 999	1	
1.00 k ÷ 9.99 k	0.01 k	
10.0 k ÷ 99.9 k	0.1 k	
100 k ÷ 9999 k	1 k	

Measuring range (Ωft)	Resolution (Ωft)	Accuracy
0.0 ÷ 99.9	0.1	See accuracy note
100 ÷ 999	1	
1.00 k ÷ 9.99 k	0.01 k	
10.0 k ÷ 99.9 k	0.1 k	
100 k ÷ 9999 k	1 k	

Principle:

$$\rho = 2 \cdot \pi \cdot \text{distance} \cdot R_e,$$

with R_e as measured resistance in 4-wire method.

Accuracy note:

- Accuracy of the specific earth resistance result depends on measured resistance R_e and is as follows:

Measuring range (Ω)	Accuracy
1.00 ÷ 1999	±5 % of measured
2000 ÷ 19.99k	±10 % of measured
>20k	±20 % of measured

Additional error:

See *Earth resistance three-wire method*.

10.9 Voltage, frequency, and phase rotation

10.9.1 Phase rotation

Nominal system voltage range 100 V_{AC} ÷ 550 V_{AC}
 Nominal frequency range..... 14 Hz ÷ 500 Hz
 Result displayed 1.2.3 or 3.2.1

10.9.2 Voltage

Measuring range (V)	Resolution (V)	Accuracy
0 ÷ 550	1	±(2 % of reading + 2 digits)

Result type..... True r.m.s. (TRMS)
 Nominal frequency range..... 0 Hz, 14 Hz ÷ 500 Hz

10.9.3 Frequency

Measuring range (Hz)	Resolution (Hz)	Accuracy
0.00 ÷ 9.99	0.01	±(0.2 % of reading + 1 digit)
10.0 ÷ 499.9	0.1	

Nominal voltage range..... 10 V ÷ 550 V

10.9.4 Online terminal voltage monitor

Measuring range (V)	Resolution (V)	Accuracy
10 ÷ 550	1	±(2 % of reading + 2 digits)