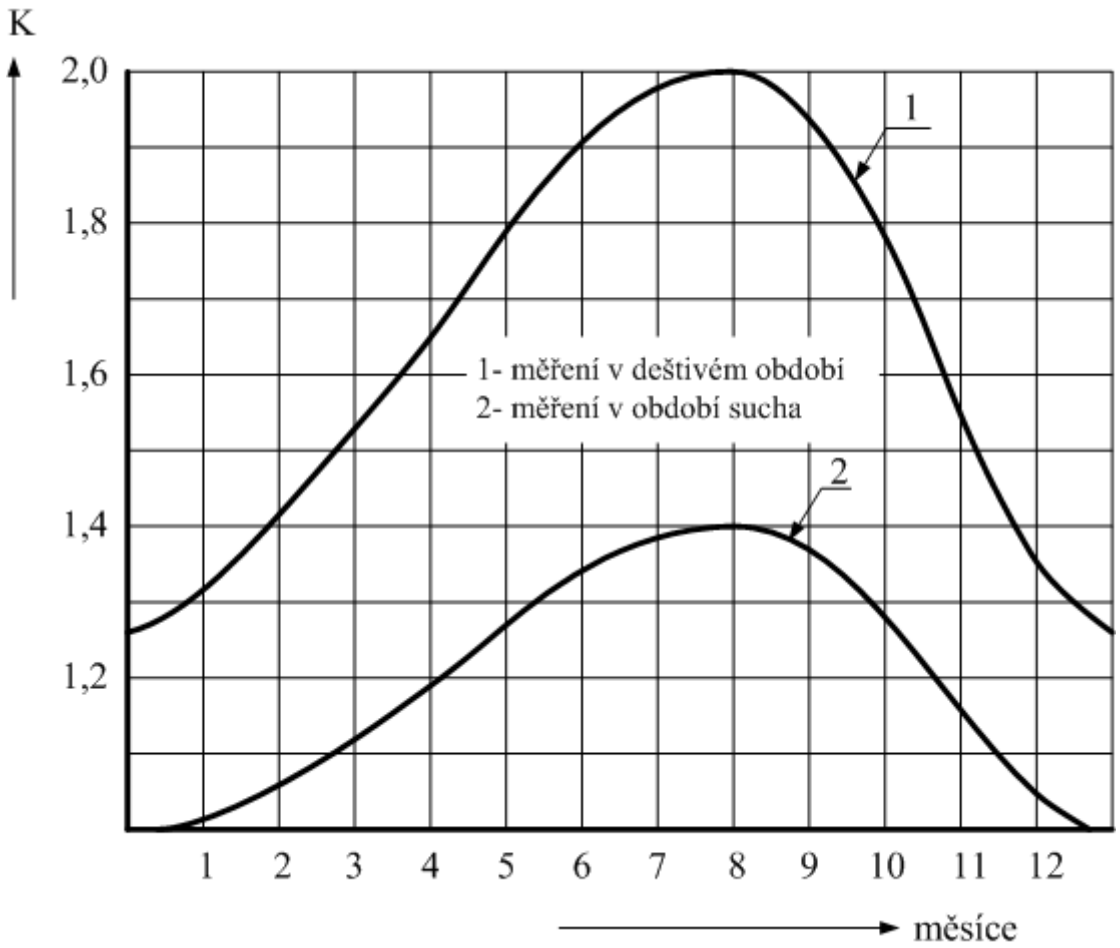
Geoelectrical measurements

Soil resistivity measurement – for proper grounding design

ρ ~ soil composition, humidity, temperature, climatic conditions (season)



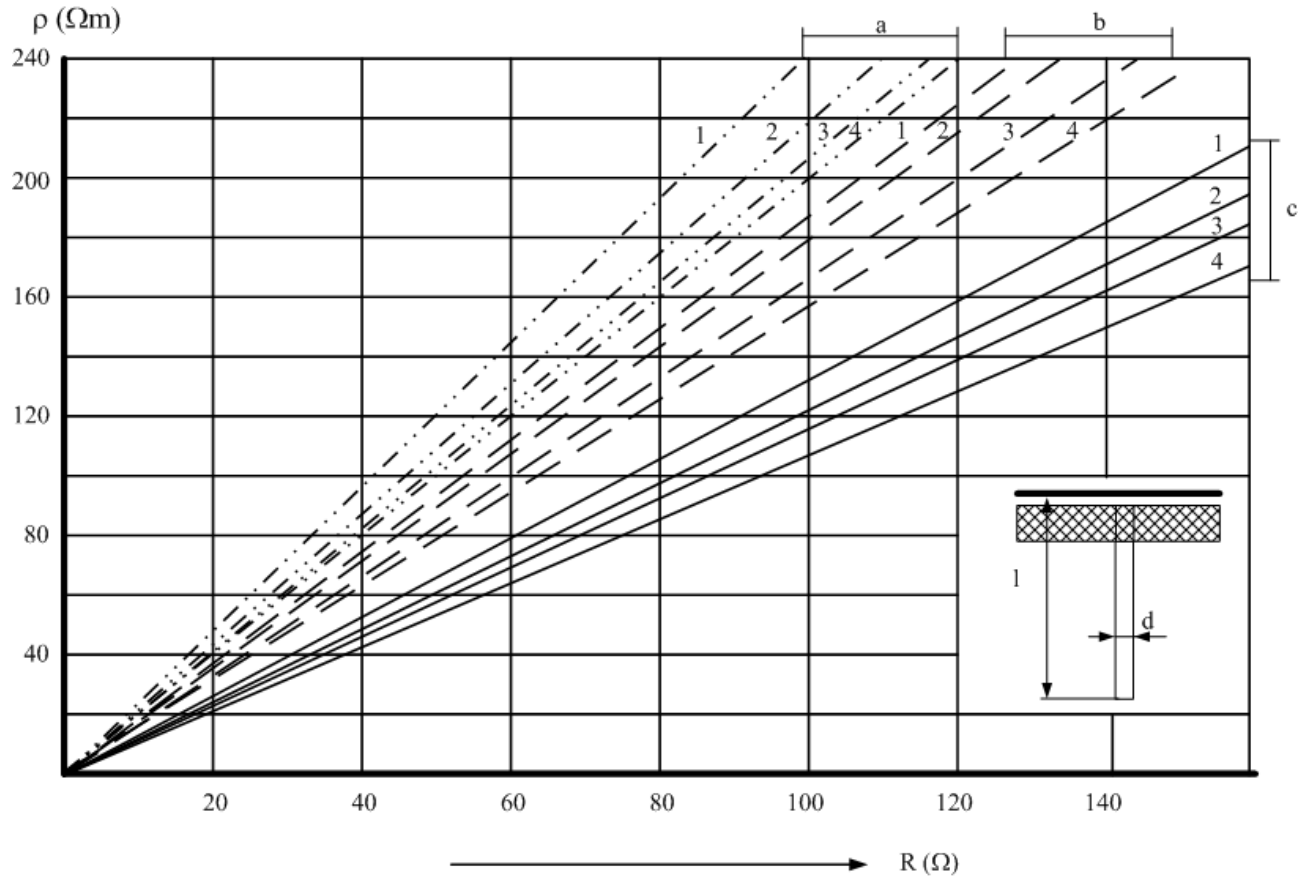
ρ measurement by rod ground electrode

We know l, d, measure R (see further).

Vertical rod gr. electrode

$$R = \frac{\rho}{2\pi l} \ln \frac{4l}{d} = k_r \cdot \rho$$

$$\rho = \frac{R}{k_r}$$

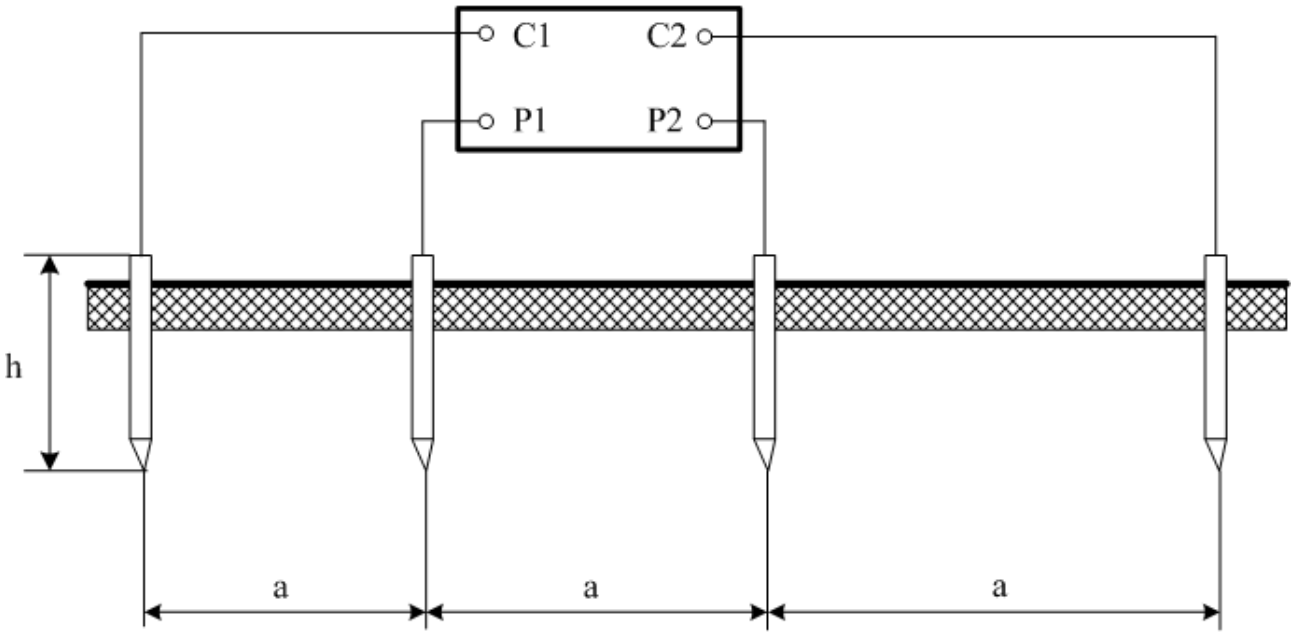


Legenda : a) l = 2m
b) l = 1,5m
c) l = 1m

1) d = 0,05m
2) d = 0,04m
3) d = 0,03m
4) d = 0,02m

ρ measurement – Wenner method

Current source C1, C2, voltage measurement P1, P2 → R = U/I → ρ = K·R



Contact resistance measurement (between an artificial gr. electrode and the ground) – design correctness and real R value verification

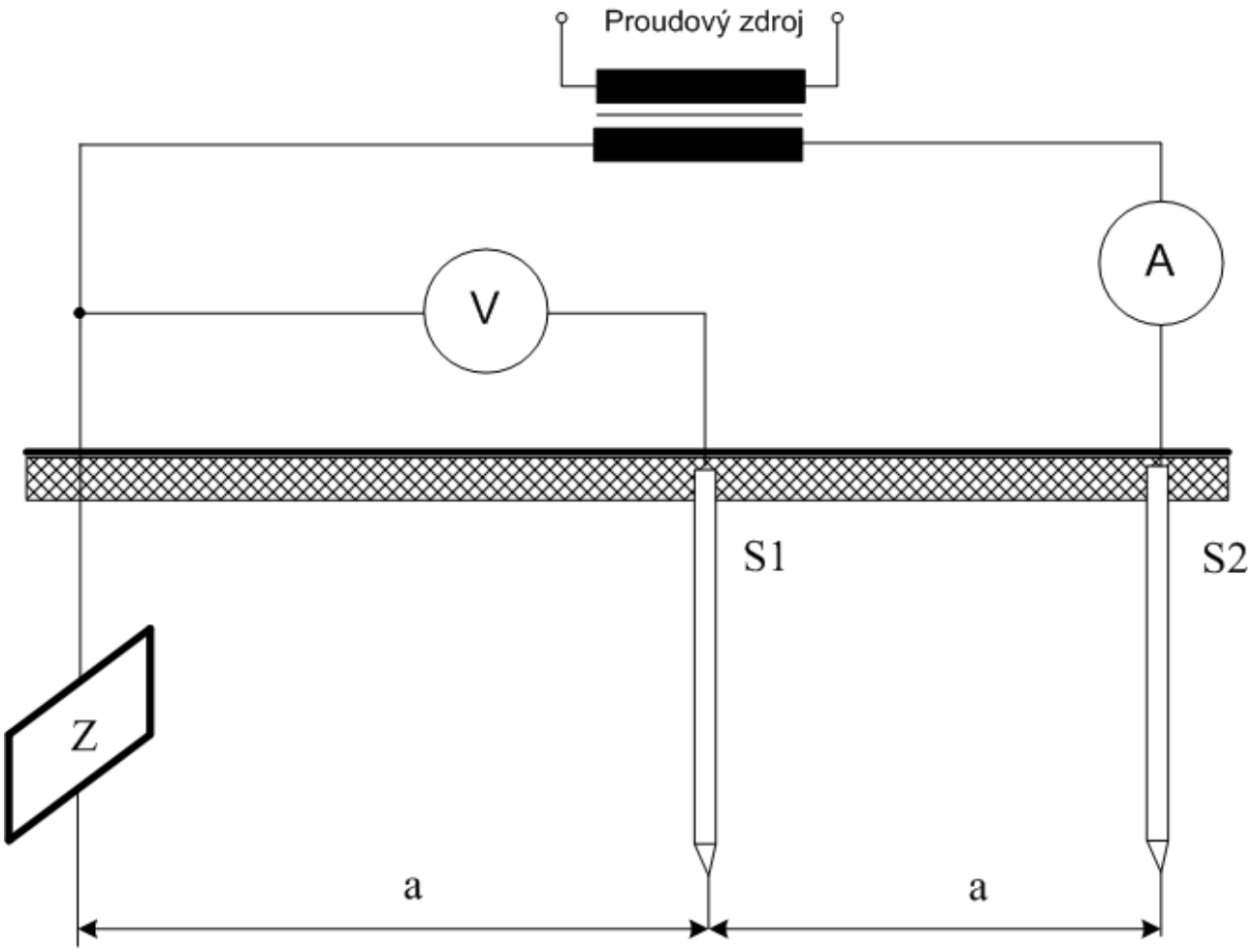
Measurement principles

- current source f ~ 40 Hz (70 Hz) – not to influence by accidental currents
- device close to gr. electrode – no to affect precision by feeding conductors
- to keep minimal distances of auxiliary electrodes (voltage el. – to be on the zero potential)
- repeated measurements

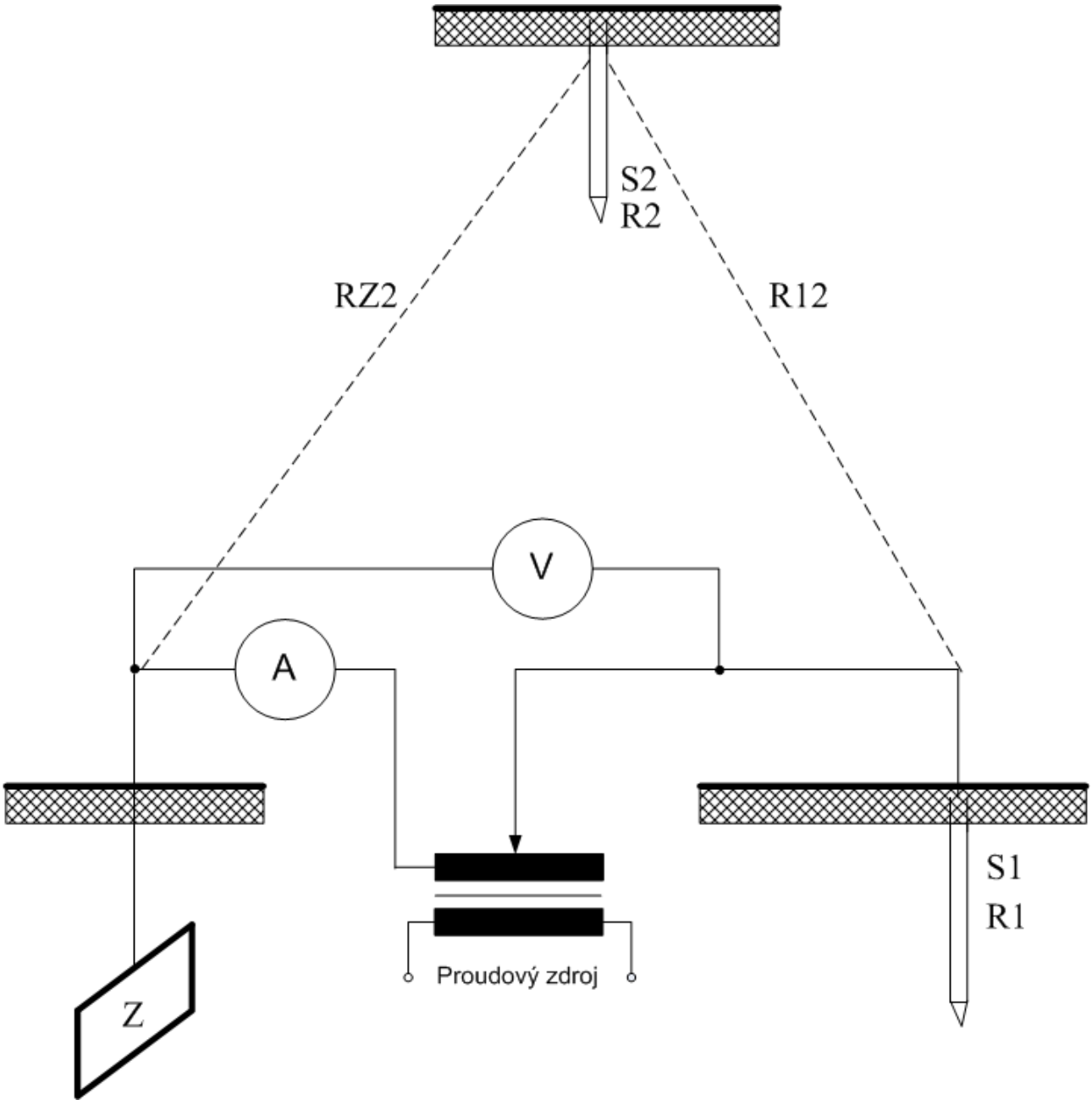
Electrodes – smooth steel rods, d = 20÷25 mm, l = 600÷700 mm, to drive perpendicularly to the biggest gr electrode dimension

Volt-ampere method – a ~ 20÷40 m

$$R = \frac{U}{I}$$



Volt-ampere triangle method – equilateral triangle Z, S1, S2

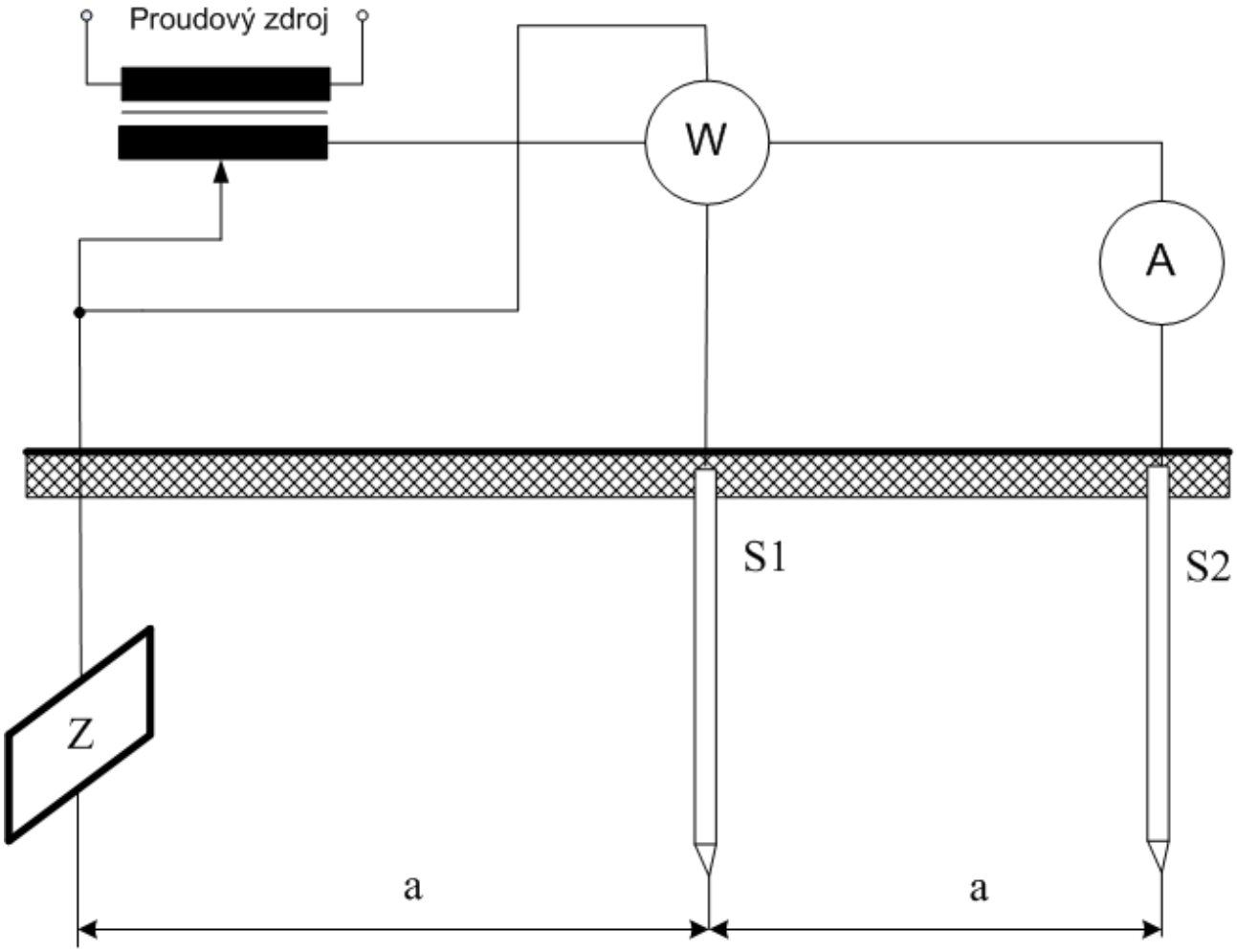


3 measurements on all triangle sides:

$$R_{Z1} = R_Z + R_1 \,,\; R_{Z2} = R_Z + R_2 \,,\; R_{12} = R_1 + R_2$$

$$R_Z = \frac{R_{Z1} + R_{Z2} - R_{12}}{2}$$

Wattmeter and amperemeter measurement



$$R = \frac{P}{I^2}$$

Terromet measurement – special device with own inductor source