

# Sprawozdanie 1

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U(V)	u(U)[V]	I[mA]	u(I)[mA]	R[Ω]	$u_c(R)$ [Ω]	$\bar{R}$ [Ω]	$u(\bar{R})$ [Ω]	$R_w$ [Ω]	$u_c(R_w)$ [Ω]
3.29	±0.02	18.7	±0.2	175.94	± 2.16	175	±0.62	175.75	
4.78	±0.02	27.8	0.3	171.94	± 1.99				
6.35	±0.02	36.1	±0.3	175.90	± 1.70				
7.89	±0.03	44.9	±0.4	175.72	± 1.41				
9.50	±0.03	54.2	±0.4	175.28	± 1.51				
12.44	±0.04	71.0	±0.6	175.21	± 1.58				

Przykładowe obliczenia:

Delta niepewności napięcia:

$$\Delta u(U) = 0.5\% \cdot rdg + 1 \cdot dgt = \frac{0.5}{100} \cdot 3.29 + 0.01 = 0.0264 \approx 0.03$$

Niepewność napięcia:

$$u(U) = \frac{\Delta u(U)}{\sqrt{3}} = 0.015 \approx 0.02$$

Delta niepewności natężenia:

$$\Delta u(I) = 1.2\% \cdot rdg + 1 \cdot dgt = \frac{1.2}{100} \cdot 18.7 + 0.1 = 0.3244$$

Niepewność natężenia:

$$u(I) = \frac{\Delta u(I)}{\sqrt{3}} \approx 0.2$$

Opór:

$$R = \frac{U}{I} = \frac{3.29}{0.0187} \approx 175.94 \Omega$$

Niepewność całkowita R:

$$u_c(R) = \sqrt{\sum_{j=1}^k \left( \frac{\partial f}{\partial x_j} \right)^2 u^2(x_j)} = \sqrt{\frac{u^2(U)}{I^2} + \frac{U^2 \cdot u^2(I)}{I^4}} = \sqrt{\frac{\left( \frac{0.02}{1000} \right)^2}{0.0187^2} + \frac{3.29^2 \cdot \left( \frac{0.2}{1000} \right)^2}{0.0187^4}} \approx 2.16$$

Wartość średnia R:

$$\bar{R} = \frac{\sum_{i=1}^n x_i}{n} = 174.9983333 \approx 175 \Omega$$

Niepewność wartości średniej R:

$$* u(\bar{R}) = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n(n-1)}} \approx 0.62$$

Opór wewnętrzny:

$$R_w = \frac{1}{A} = \frac{1}{0.00569} \approx 175.75 \Omega$$

Niepewność