To Determine the Resistivity of an Alloy Resistance Wire

Date

Equipment and procedure as per the lab manual.
Wire is labelled 28 swg

Rheostat resistance is not known. - It allows current to be set at 0.30 A when L = 10 cm.

L / m ±0.002 m	V / V ±0.01 V	I / A ±0.01 A	R / Ω
0.100	0.14	0.30	0.47
0.200	0.27	0.28	0.96
0.300	0.38	0.28	1.36
0.400	0.46	0.26	1.77
0.500	0.59	0.26	2.27
0.600	0.68	0.25	2.72
0.700	0.74	0.23	3.22
0.800	0.84	0.23	3.65

Readings entered into spreadsheet and graph plotted as we went along. None far from straight line so no repeats.

Diameter of wire measured in 5 places :-

$(37, 37, 37, 37, 37) \times 10^{-5}$ m

Diameter = 37×10^{-5} m $\pm$ 1×10^{-5} m
($\pm$ 2.7 %)

$$r = 18.5 \times 10^{-5}\ m \pm 2.7\%$$

$$A = \pi r^2 = \underline{1.07 \times 10^{-7}\ m^2 \pm 5.4\%}$$

$$\text{Gradient (Hand drawn)} = \frac{3.65 - 0.25}{0.80 - 0.05} = 4.53\ \Omega\ m^{-1}$$

$$\rho = \text{gradient} \times A = \underline{4.8 \times 10^{-7}\ \Omega m}$$

'Error' bars on graph:

Uncertainty in L ($\pm 1mm$) too small to show on graph.

Uncertainty in R = % uncertainty in V + % uncertainty in I

Spreadsheet used:

L / m	V / V	I / A	R / Ohms	delta v %	delta I %	delta R %	delta R / ohms
0.100	0.14	0.30	0.47	7.14	3.33	10.48	0.05
0.200	0.27	0.28	0.96	3.70	3.57	7.28	0.1
0.300	0.38	0.28	1.36	2.63	3.57	6.20	0.1
0.400	0.46	0.26	1.77	2.17	3.85	6.02	0.1
0.500	0.59	0.26	2.27	1.69	3.85	5.54	0.1
0.600	0.68	0.25	2.72	1.47	4.00	5.47	0.1
0.700	0.74	0.23	3.22	1.35	4.35	5.70	0.2
0.800	0.84	0.23	3.65	1.19	4.35	5.54	0.2

'Error' bars added

$$\text{Max gradient} = \frac{3.45 - 0.25}{0.80 - 0.04} = 4.21\ \Omega\ m^{-1}$$