

Measurement of Electrical Resistance

The contacting joint surfaces were cleaned with alcohol before all tests were carried out. The digital micro-Ohmmeter allows the direction of the injection current to be reversed giving two readings R_{FWD} and R_{REV} which are then combined with their appropriate sign to eliminate the effects of thermal EMF's at junctions. i.e. $R = (R_{FWD} - R_{REV})/2$.

The load on each lever arm was increased up to a maximum of 6 kg which is equivalent to a pressure of 3.8 N/mm^2 . Since the voltage tabs are located 5 mm above and below the joint the resistance of the copper on each side of the joint was subtracted to leave the resistance of only the joint. The resistance values are presented in the form of an area resistance in $\mu\Omega\text{cm}^2$ i.e. resistance x area and the average resistance at a pressure of 3 N/mm^2 is given with 95% confidence limits based on small sample statistics.

6.1 Electrical Resistance of Metal/Metal Joint

The electrical resistance of the joint between the two silver plated copper blocks was measured as a function of joint pressure at room temperature. This test was repeated 4 times. The results of the four tests are shown in figure 9 together with the average of these tests. These results show good consistency and an average value of about $7.5 \pm 1.6 \mu\Omega\text{cm}^2$ at a pressure of 3 N/mm^2 .

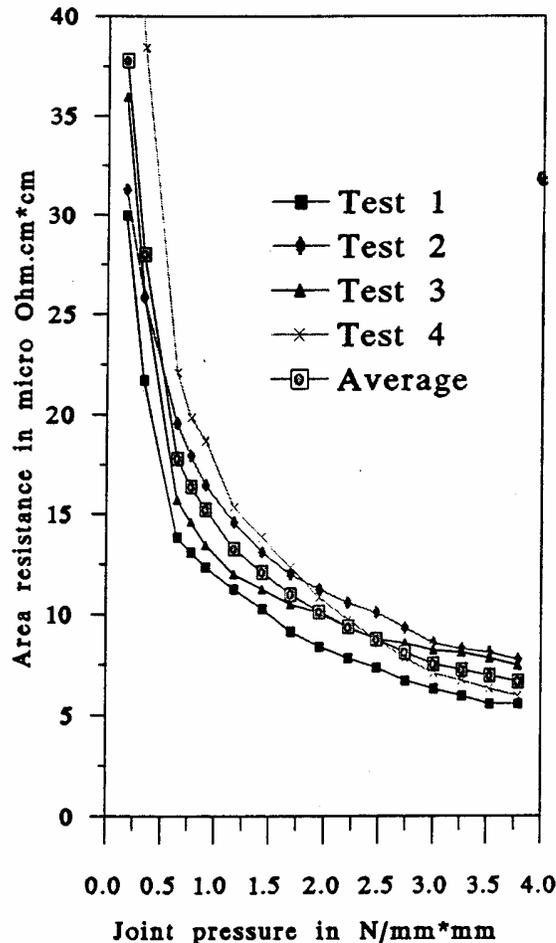


Figure 9 Metal/Metal Contact Resistance

6.2 Electrical Resistance of Feltmetal at Room Temperature

A sample of the Feltmetal was soldered to the silver plated copper block using the technique described in section 3 and the electrical resistance was measured as a function of pressure a total of 6 times. The joint was separated and wiped with alcohol between each test. The results of each test and the average of these tests is shown in figure 10. These results are less consistent than the metal/metal joint resistance and give an average value of $21 \pm 4.2 \mu\Omega\text{cm}^2$ at a pressure of 3 N/mm^2 .

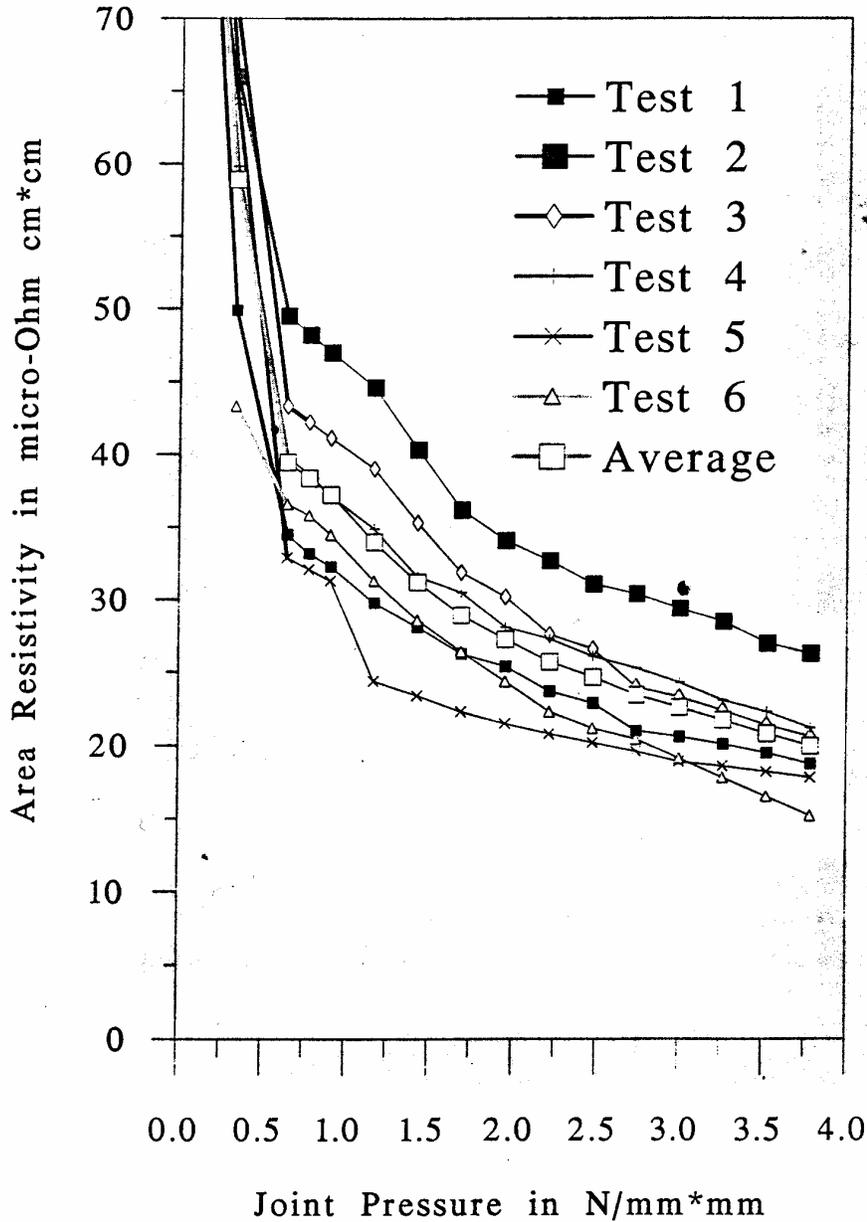


Figure 10 Static Feltmetal Joint Resistance at Room Temperature

6.3 Electrical Resistance of Feltmetal after Sliding at Room Temperature

The resistance of the Feltmetal sample soldered to the copper block was measured after some sliding operations as a function of pressure and at room temperature. The sample was loaded to give a pressure of 3 N/mm² and the joint faces were forced to slide over each other by about ± 2 mm using the jacking bolts. The load was reduced to the minimum pressure before taking resistance measurements with increasing load. The test was repeated 4 times with the joint being separated between each test. The test results are shown in figure 11 together with the average values. This shows that after a few sliding operations (typically 5) the joint resistance falls to about half its initial value and the results become more consistent. The average resistance at a pressure of 3 N/mm² was found to be 8.4 ± 0.4 μΩcm² .

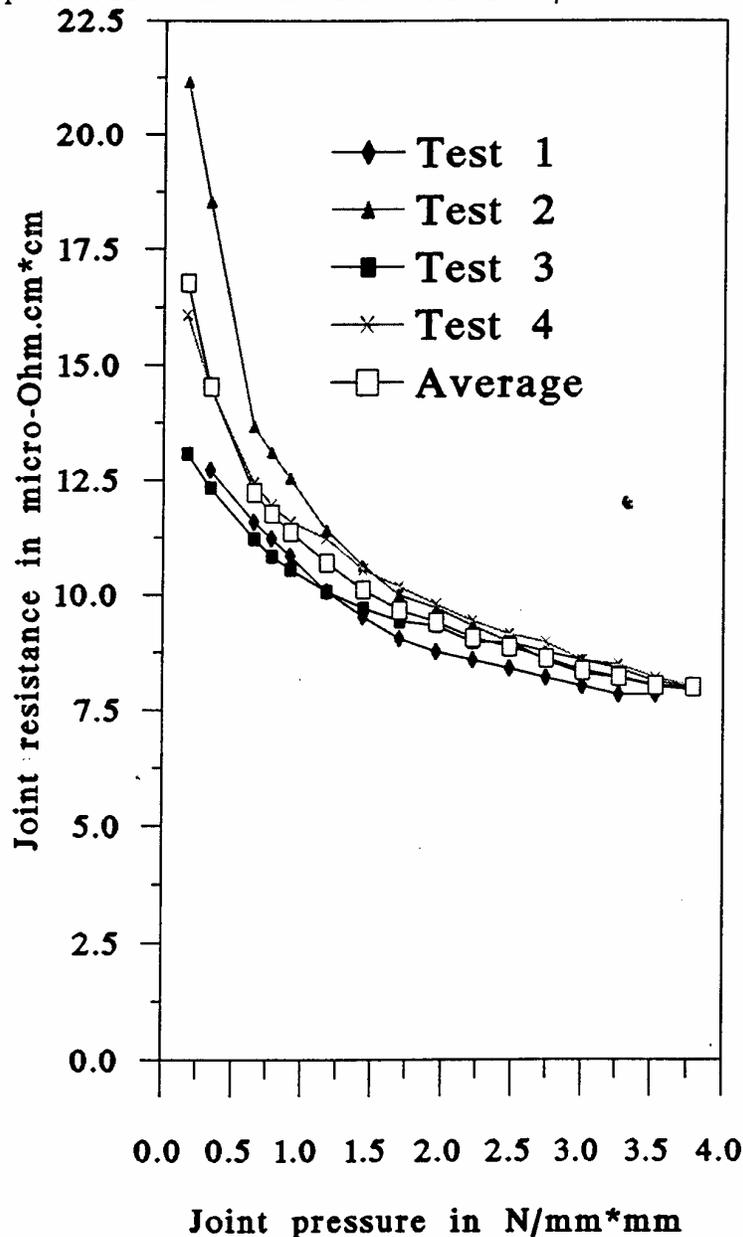


Figure 11 Feltmetal Joint Resistance after Sliding at Room Temperature

6.4 Electrical Resistance of Feltmetal after Sliding at 100 Deg.C

The previous test was repeated with the joint assembly heated to give an average joint temperature of 100 deg.C under steady state conditions. This test was carried out 5 times and the results are shown in figure 12 together with the average values. These results show that with the previous tests the results are consistent and give an average value of $11.1 \pm 0.2 \mu\text{cm}^2$ at a pressure of 3 N/mm^2 .

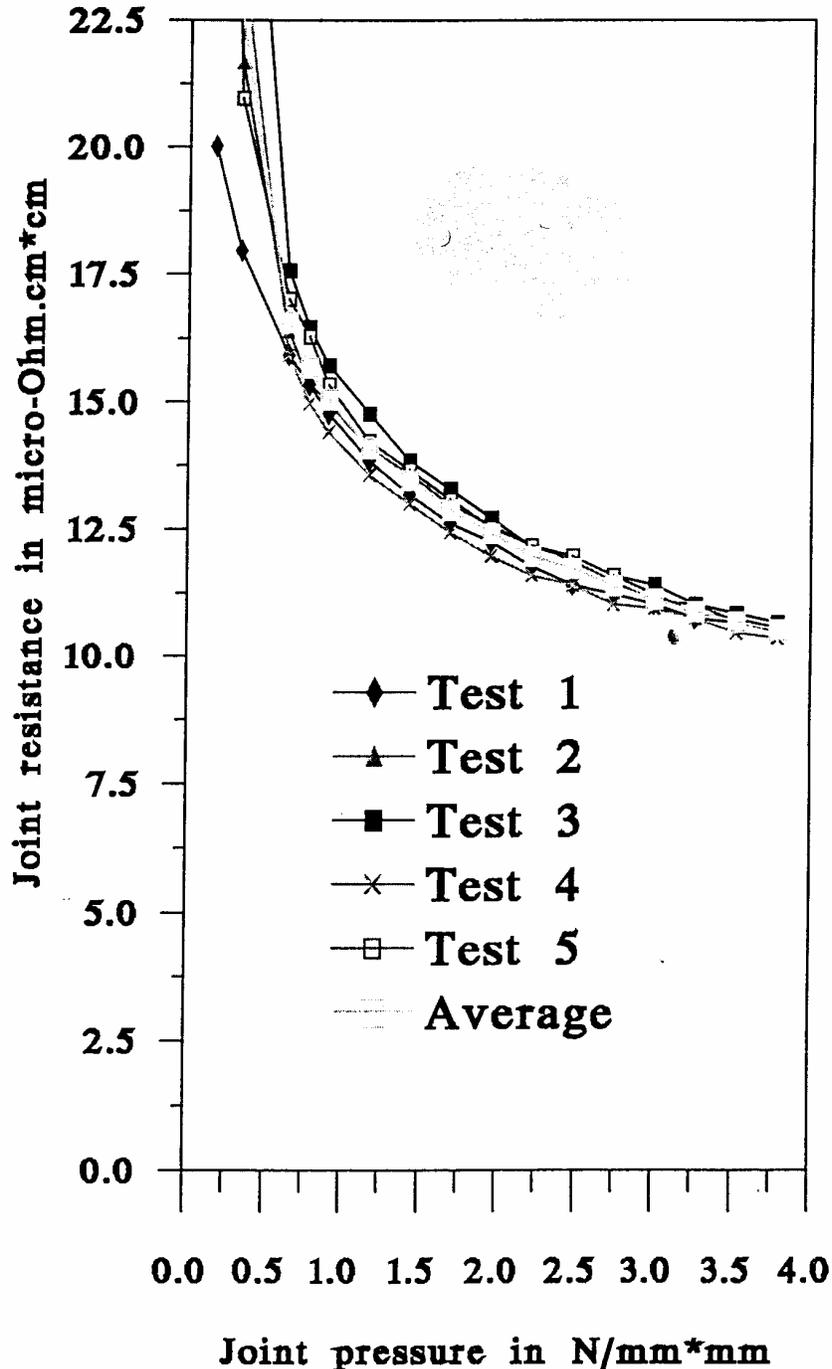


Figure 12 Feltmetal Joint Resistance after Sliding at 100 deg.C

6.5 Electrical Resistance of Multilam (LAI 0.15) at Room Temperature

Multilam is a commercially available material consisting of a sheet of silver plated beryllium copper which is stamped to form a large number of louvers. When loaded between two metal surfaces these louvers act as torsional springs which form line contacts. The Multilam sample and the two silver plated copper blocks were first cleaned with alcohol and a total of 8 resistance tests were performed. The joint was separated between each test. The test results and the average values are shown in figure 13. The pressure was adjusted to account for slightly smaller area of the Multilam compared to the Feltmetal sample. These test results are reasonably consistent with an average value of $18.1 \pm 2.1 \mu\Omega\text{cm}^2$ at a pressure of 3 N/mm^2

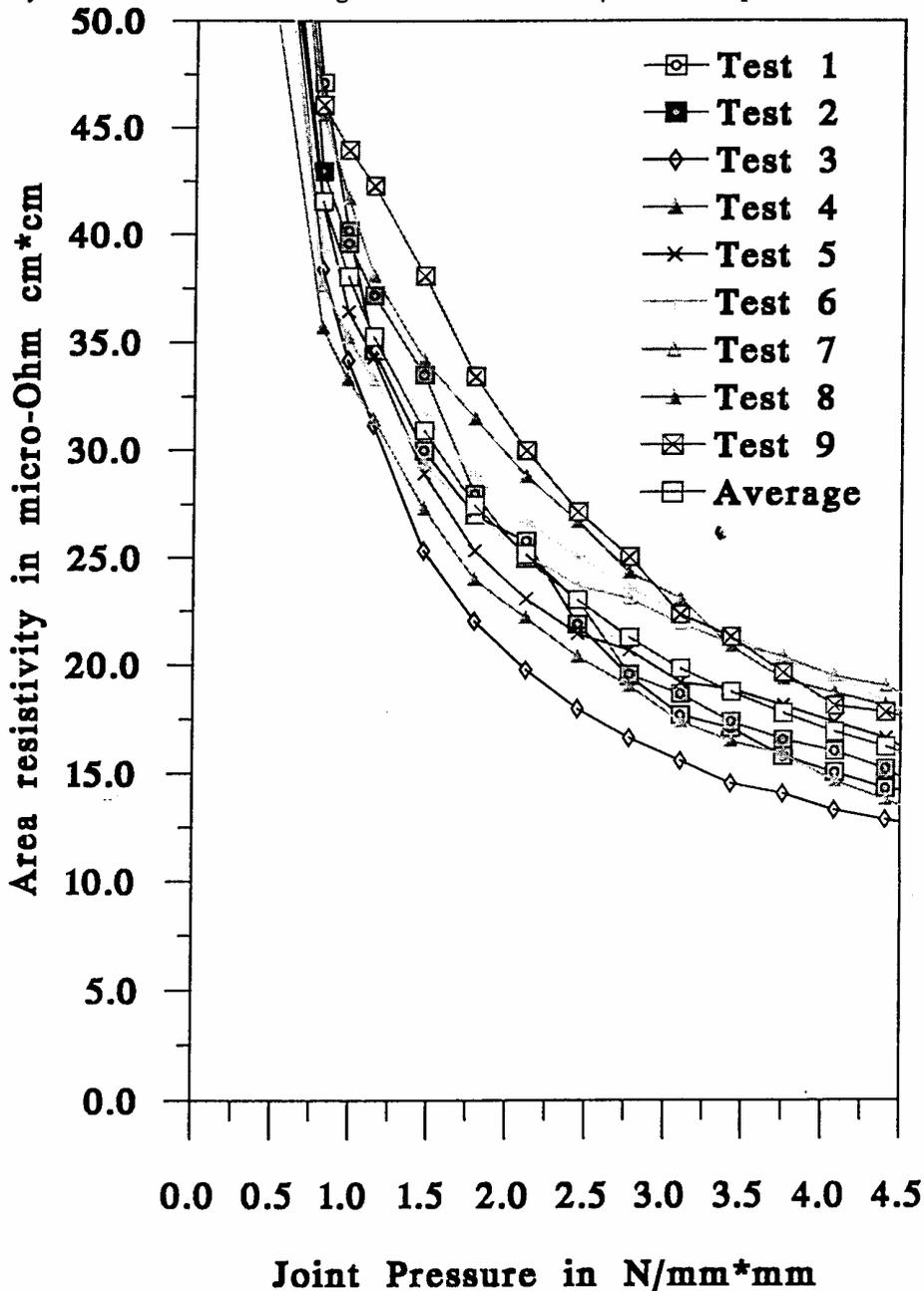


Figure 13 Multilam (LAII 0.15) Joint Resistance at Room Temperature