

**technical
DATA**

Latrobe Plant
Electronics Division
Latrobe, Pennsylvania

CARBORUNDUM

100EB4
Issue No. 3

CLEANING OF OXIDIZED KOVAR[®] ALLOY

1. VAPOR DEGREASE

- (a) Trichlorethylene or equivalent (if parts are greasy)

2. PICKLE

- (a) Solution Composition:

Concentrated Hydrochloric Acid	100%
Preferably with Inhibitor (such as Rodine #50, made by Amchem Products Inc., Ambler, Pa.)	Plus 1%
(b) Temperature	80 - 85° C
(c) Time	
Light Scale	1/2 - 1 min. immer-
Heavy Scale	1 - 5 " sion

3. RINSE

- | | |
|---|-----------------|
| (a) Running Hot Water | 30 Seconds |
| (b) Cold Concentrated Hydrochloric Acid | 5 to 10 Seconds |
| (c) Running Cold Water | 30 Seconds |

4. BRIGHT DIP (Omit steps 3 (b) and 3 (c))

- | | |
|--------------------------|-----------------------|
| (a) Solution Composition | |
| Acetic Acid | 750 cc |
| Nitric Acid | 250 cc |
| Hydrochloric Acid | 15 cc |
| (b) Temperature | Room |
| (c) Time | 3 - 10 sec. immersion |

5. RINSE

- (a) Running Cold Water

NOTE: If the degree of brilliance is not achieved in the first immersion, bright dipping may be repeated.

CAUTION: The action of the bright dip on Kovar Alloy is very rapid. Hence, only cleaned Kovar Alloy should be bright dipped to minimize immersion time in brightening solution.

- (b) Alcohol
(c) Air Dry

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100EB5
Issue No. 2

THERMAL CONDUCTIVITY OF KOVAR[®] ALLOY

One of the notable properties of Kovar is its low thermal conductivity... 0395 calories per second per square centimeter per °C. per centimeter at 30°C.

This value is the result of careful measurement. Although actual measurements have not been made at elevated temperatures, such values may be calculated with reasonable assurance. Kovar is similar to iron and nickel with respect to resistance-temperature relationships. Therefore, in applying the Wiedemann-Franz-Lorenz law for the relation of thermal conductivity, temperature and electrical resistivity, it is entirely reasonable to use as a Lorenz factor for Kovar the average values for iron and nickel. When this is done, the following values are obtained:

	<u>Temp. °C.</u>	<u>Thermal Conductivity</u>
Determined	30°	.0395 ± .001 cal. per sec. per cm ² per °C per cm
Calculated	100°	.042 "
"	200°	.045 "
"	300°	.0485 "
"	400°	.053 "
"	500°	.0585 "

A plot of the above values yields a curve which is almost parallel to the curve for stainless steel.

In the manufacture of standard Kovar "A" exacting control is maintained to insure keeping the thermal expansion within close limits. Although close tolerances are not guaranteed on the electrical properties, these are expected to be fairly uniform due to the close limits set on chemical composition.

Listed below are results of a typical test.

<u>°C</u>	<u>Relative Resistance</u>
25	1.00
100	1.28
200	1.64
300	1.97
400	2.19
500	2.31
600	2.38

(Typical specific resistance at 25°C - 49 microhm cm.)