

**technical
DATA**

Latrobe Plant
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CARBORUNDUM

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Sheet 1 of 2

KOVAR® ALLOY - LOW TEMPERATURE CHARACTERISTICS

GENERAL

Kovar®, an alloy of iron, nickel and cobalt like other alloys of this general type, is subject to transformation at depressed temperatures. This phenomenon represents either a partial or total change from gamma to alpha crystalline structure, and is accompanied by a permanent increase in expansivity that may be sufficient to crack a glass seal.

*unit of magnetic field - enter
sig - 100,000 gauss
Possibly changed nucleus*

SPECIFICATIONS

The specifications regarding transformation for standard Kovar® Alloy are as follows:

The temperature of the gamma-to-alpha transformation shall be below minus 78.5°C. However, for material whose smallest dimension is over 7/8" (0.875), some localized transformation acceptable to the purchaser may be tolerated.

Further details of test procedure and illustration of transformed material are presented in 1961 A.S.T.M. Pre-print No. 68, Committee F-1 "Tentative Specifications Iron-Nickel-Cobalt Sealing Alloy."

ACTUAL TEMPERATURE OF TRANSFORMATION

The temperature of minus 78.5° has been selected for convenience, since this is the temperature resulting from an excess of dry ice in acetone. Production testing does not involve determination of the actual temperature of transformation of each heat.

Tests of a large number of production heats, however, indicate that the actual temperature of transformation is considerably below minus 78.5°C. On a special test of fourteen production heats, actual determination of transformation was as follows:

1. Six heats showed no transformation at minus 269°C.
2. Five heats showed partial transformation at minus 196°C.
3. Three heats showed partial transformation at minus 120°C.

ACTUAL TEMPERATURE OF TRANSFORMATION (Cont.)

The above indicates that for experimental purposes there is a good probability of making serviceable seals from stock Kovar® to operate at depressed temperatures without the costly and time consuming procedure of using specially selected heats.

For production requirements, special lots of Kovar® can be supplied by either selection or special production to insure meeting customers' specifications of lower transformation points than the standard guaranteed value (-78.5°C).

CONTRACTION AT DEPRESSED TEMPERATURES

Fig. I shows the contraction of one particular heat of Kovar® which partially transformed at minus 120°C. Fig. II shows the contraction of one particular heat which showed no transformation at minus 196°C.

No limits of contraction values have been established, nor do we know of any published data on stress values for Kovar® Glass Seals at depressed temperatures. However, there are indications that for low temperature application serviceable seals may be made with thin sections of Kovar® even though the alloy might be partially transformed.

GENERAL

There is obviously a need for further basic studies on the behavior of Kovar®-Glass Seals at depressed temperatures due to the increasing applications in this area. In the meantime, The Carborundum Company offers its services on specific customer problems.