



## **CONTROLLED EXPANSION ALLOYS**

### **F15 ALLOY (KOVAR)**

#### **RODAR MIL-I-23011C CLASS 1**

NICKEL IRON COBALT / GLASS & CERAMIC SEALING ALLOY  
FOR HIGH INTEGRITY GLASS & CERAMIC TO METAL SEALS

#### **TYPICAL NOMINAL CHEMISTRY**

NICKEL (NI)	29.0
MAGNESIUM (MG)	0.10
MANGANESE (MN)	0.50
SILICON (SI)	0.20
CARBON (C)	0.06
ALUMINUM (AL)	0.10
COBALT (CO)	17.0
ZIRCONIUM (ZR)	0.10
TITANIUM (TI)	0.10
PHOSPHORUS (P)	0.025
SULFUR (S)	0.025
IRON (FE)	BALANCE

#### **TYPICAL TENSILE STRENGTH**

ANNEALED	85,000 MAX.
¼ HARD	90,000 to 115,000
½ HARD	105,000 to 125,000
HARD	120,000 MIN.

#### **TYPICAL HARDNESS, ROCKWELL B**

ANNEALED	85 MAX.
¼ HARD	90 to 93
½ HARD	94 to 96

**TYPICAL LINEAR COEFFICIENT OF THERMAL EXPANSION**

(CM. PER CM. C x 10 – 6)

30 TO 100	n/a
30 to 200	5.5
30 to 300	5.1
30 to 350	N/A
30 to 400	4.9
30 to 425	N/A
30 to 450	5.3
30 to 500	6.2
30 to 550	N/A
30 to 600	7.9
30 to 700	9.3
30 to 800	10.4
30 to 900	11.5
30 to 1000	N/A