

# ALLOY DATA SHEET KHR24C

## HEAT RESISTANT ALLOY

REVISION: 12/96

### DESCRIPTION

KHR24C is an Fe-Cr-Ni-Nb alloy with creep-rupture strength which is intermediate between that of HK 40 and HP alloys. The higher strength, relative to that of HK40, is achieved by a moderate increase in nickel content and an addition of niobium. The carbon content is reduced to raise rupture ductility, without impairing the alloy's resistance to embrittlement by sigma phase formation.

### COMPOSITION

	<u>C</u>	<u>Mn</u>	<u>Si</u>	<u>Cr</u>	<u>Ni</u>	<u>Nb</u>	<u>P</u>	<u>S</u>	<u>Mo</u>
Min %	0.25			23	23	1.0	-	-	-
Max %	0.35	1.5	1.0	26	26	2.0	0.035	0.035	0.5

### APPLICATIONS

This alloy is commonly used in furnace components including, trays, hangers, carburizing retorts, heat treatment pots, heating elements, lead pots, enameling tools, reformer furnace tubes and fittings.

### PRODUCT FORMS

Horizontal and vertical centrifugal castings; static castings.

### PHYSICAL PROPERTIES

Density (lbs/in <sup>3</sup> )	0.286
Melting Solidus	2426 °F
Thermal Conductivity (Btu ft/ ft <sup>2</sup> hr °F)	7.3 @ 212°F
	14.8 @ 1472°F
	15.5 @ 1652°F
	16.5 @ 1832 °F
Thermal Expansion (x 10 <sup>-6</sup> in/in °F)	7.2 @ 68-212 °F
	9.1 @ 68-932 °F
	9.4 @ 68-1292 °F
	9.4 @ 68-1652 °F
	9.5 @ 68-1832 °F

### CARBURIZATION

#### RESISTANCE

(Gas-100 hours @ 1922°F)

ALLOY	WEIGHT GAIN
GRADE	mg/mm <sup>2</sup>
H H	0.36
H K	0.33
<b>KHR24C</b>	<b>0.30*</b>
KHR32C	0.27
KHR35CL	0.23

\*Interpolated value.

### MECHANICAL PROPERTIES

		Typical Values				Minimum Values	
		70	1400	1600	1800	°F	70 °F
U.T.S.	(ksi)	76	46	26	15		64
Y.S.	(ksi)	37	20	15	13		35.5
El.	%	20	27	32	35		15 (centrifugal castings) 12 (static castings)

**MODULUS OF ELASTICITY**

<u>R.T.</u>	<u>1112</u>	<u>1472</u>		°F
24.3	18.5	16.2	X 10 <sup>3</sup>	ksi

**SERVICE TEMPERATURE**

The alloy is particularly suited for long term service at temperatures in the range from 1300 to 1700 °F, or for shorter term service up to 1850 °F.

**WELDABILITY**

KHR24C has good weldability by the SMAW, GTAW and GMAW processes using electrodes and wire of matching composition

**CREEP-RUPTURE PROPERTIES**

Long term creep-rupture data was taken from Larson-Miller Parameter versus stress plots published by Kubota.

		<b><u>RUPTURE-STRESS-KSI</u></b>					
<u>HOURS</u>		<u>1300</u>	<u>1400</u>	<u>1500</u>	<u>1600</u>	<u>1700</u>	<u>1800</u> °F
1000	AVG.	15.36	12.66	10.09	7.68	5.83	3.98
	MIN.	12.08	10.16	8.18	6.19	4.55	
10,000	AVG.	12.66	9.88	7.47	5.40	3.56	2.28
	MIN.	10.09	8.05	5.90	4.27	2.79	
100,000	AVG.	9.96	7.40	5.19	3.34	1.99	1.21
	MIN.	7.82	5.76	4.12	2.63	1.59	

Note: Creep and rupture stresses are subject to periodic revisions as the results from long term tests become available.

**HEAD OFFICE, FOUNDRY & INTERNATIONAL SALES**  
**Kubota Metal Corporation, Fahramet Division**

25 Commerce Road, P.O. Box 1700,  
 Orillia, Ontario, Canada, L3V 6L6.  
 Phone (705) 325-2781  
 Fax (705) 325 5887