

# ALLOY DATA SHEET KHR S2

## HEAT RESISTANT ALLOY

REVISION: 09/94

### DESCRIPTION

KHRS2 is an Fe-Cr-Ni-Co alloy which is additionally strengthened by tungsten. The material has high oxidation and creep resistance and was specifically developed for radiant heater tubes intended for service up to 2100 °F.

### COMPOSITION

	<u>C</u>	<u>Mn</u>	<u>Si</u>	<u>Cr</u>	<u>Ni</u>	<u>Co</u>	<u>W</u>	<u>P</u>	<u>S</u>
Min %	0.35			24	22	14	1.8	-	-
Max %	0.45	1.5	1.5	27	25	18	2.0	<.03	<.03

### APPLICATIONS

Radiant heater components

### PRODUCT FORMS

Horizontal and vertical centrifugal castings; static castings.

### PHYSICAL PROPERTIES

Density (lbs/in <sup>3</sup> )	0.290
Melting Solidus	2370 °F
Thermal Conductivity (Btu/h/ft <sup>2</sup> /ft/°F)	8.03 @ 392 °F 13.87 @ 1472 °F
Thermal Expansion (10 <sup>-6</sup> in/in °F)	8.27 @ 100-1500 °F 9.38 @ 100-1800 °F

### MECHANICAL PROPERTIES (Typical Values)

		Centrifugal Castings			Statics	
		70	1600	1800	2000 °F	70 °F
U.T.S.	K.S.I.	84	34	23	12.8	72
Y.S.	K.S.I.	50				40
El.	%	15	35	43	55	10

### SERVICE TEMPERATURE

The alloy is suitable for service temperatures up to 2100 °F.

#### OXIDATION RATES (mm / year)

1832	1922	2012	2102 °F
0.26	-	0.37	-

**WELDABILITY**

KHRS2 may be welded by the SMAW and TIG processes, using matching electrode WEL-HS from Nippon Welding Co.

**CREEP-RUPTURE PROPERTIES**

Long term creep-rupture properties were extrapolated from Larson-Miller Parameter versus stress plots.

<u>HOURS</u>		<u>RUPTURE-STRESS-KSI</u>								°F
		<u>1400</u>	<u>1500</u>	<u>1600</u>	<u>1700</u>	<u>1800</u>	<u>1900</u>	<u>2000</u>	<u>2100</u>	
10,000.	AVG.			7.11	5.00	3.19	1.89	1.04	0.55	
	MIN.			6.24	4.28	2.76	1.63	0.91	0.48	
100,000	AVG.		7.76	5.29	3.34	1.96	1.06	0.54	0.25	
	MIN.		6.67	4.57	2.87	1.67	0.90	0.46	0.22	

<u>%/HOUR</u>		<u>CREEP-STRESS-KSI</u>								°F
		<u>1400</u>	<u>1500</u>	<u>1600</u>	<u>1700</u>	<u>1800</u>	<u>1900</u>	<u>2000</u>	<u>2100</u>	
0.0001	AVG.				4.60	3.12	2.35	1.56	0.85	

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

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