

ALLOY DATA SHEET KHRS3

HEAT RESISTANT ALLOY

REVISION: 02/03

DESCRIPTION

KHRS3 is a highly modified HP alloy with substantial additions of cobalt and tungsten to provide great strength at elevated temperatures. The combination of high strength and excellent resistance to oxidation and carburization make this alloy suitable for long term service at temperatures up to 2100 °F and for shorter times and less critical loading for temperatures up to 2200 °F.

COMPOSITION

	<u>C</u>	<u>Mn</u>	<u>Si</u>	<u>Cr</u>	<u>Ni</u>	<u>W</u>	<u>Co</u>	<u>P</u>	<u>S</u>
Min %	0.45			24	33	4.0	14	-	-
Max %	0.55	2.0	2.0	28	37	6.0	16	0.03	0.03

APPLICATIONS

Radiant heater tubes and fittings, hangers and tube supports, hydrogen reformer assemblies, catalyst tubes, furnace rolls, steel mill skids and rails, heat treatment furnace fixtures

PHYSICAL PROPERTIES

Density (lbs/in ³)	0.297
Melting Solidus	2372 °F
Thermal Conductivity (Btu/h/ft ² /ft/ °F)	6.07 @ 68 °F
	10.98 @ 932 °F
	13.92 @ 1472 °F
	15.03 @ 1692 °F
Thermal Expansion (10 ⁻⁶ in/in °F)	8.28 @ 70-1472 °F
	8.55 @ 70-1652 °F
	9.11 @ 70-1832 °F

MECHANICAL PROPERTIES (Typical Values)

		Centrifugal Castings				Min Value
		1652	1832	2012	2192 °F	70 °F
U.T.S.	K.S.I.	32	21	12	5	71
Y.S.	K.S.I.	25	16	10	4	35
El.	%	20	20	25	45	8 (cc), 6 (static)

CREEP-RUPTURE PROPERTIES

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

		<u>RUPTURE-STRESS-KSI</u>							°F
<u>HOURS</u>		<u>1600</u>	<u>1700</u>	<u>1800</u>	<u>1900</u>	<u>2000</u>	<u>2100</u>	<u>2200</u>	
100,000	AVG.	5.73	3.63	2.22	1.28	0.75	0.40		

		<u>CREEP-STRESS-KSI</u>							°F
<u>%/HOUR</u>		<u>1600</u>	<u>1700</u>	<u>1800</u>	<u>1900</u>	<u>2000</u>	<u>2100</u>	<u>2200</u>	
0.0001	AVG.			5.0	3.3	2.15	1.08		

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