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ISO 9001:2000 SGS

ALLOY DATA SHEET
KHR48N

HEAT RESISTANT ALLOY

REVISION : 06/99

DESCRIPTION

KHR48N is a nickel-chromium-iron alloy with an addition of 5% tungsten, designed for high strength at elevated service temperatures. The alloy is produced in two types, KHR48N in which the composition is balanced to optimize creep-rupture strength; and KHR48N Hi Si which is adjusted to maximize carburization resistance.

COMPOSITION

	C	Mn	Si	Cr	Ni	W	P	S
Min %	0.4	0.0	0.0	25	45	4.0	-	-
Max %	0.6	1.5	1.5	30	50	6.0	0.03	0.03

APPLICATIONS

Radiant heater tubes and fittings, hangers and tube supports, hydrogen reformer assemblies, catalyst tubes; furnace rolls, steel mill skid conveyor systems, heat treatment furnace fixtures.

PRODUCT FORMS

Horizontal and vertical centrifugal castings; static castings.

PHYSICAL PROPERTIES

Density (lbs/in^3)	0.296	
Melting Solidus	2390	^oF
Thermal Conductivity	5.98	@ 212 ^oF
(Btu ft/ft^2 hr ^oF)	16.9	@ 2012 ^oF
Thermal Expansion	7.92	@ 100-800 ^oF
(x 10^{-6}in/in ^oF)	8.33	@ 100-1100 ^oF
	8.61	@ 100-1600 ^oF
	8.75	@ 100-1800 ^oF

CARBURIZATION RESISTANCE

(Gas-100 hours @ 1922^oF)

ALLOY GRADE	WEIGHT GAIN mg/mm^2
H K	0.33
KHR35C	0.23
KHR48N	0.21*
KHR48N HiSi	0.18

*Calculated value

OXIDATION LOSS (mm/yr)

	KHR 35H	**KHR 48N**	KHR SA	KHR S2	KHR S3
1832 °F	0.30	**0.22**	0.06	0.26	
2012 °F	0.81	**0.77**	0.10	0.37	0.23

MECHANICAL PROPERTIES (Typical Values)

		Centrifugal Castings					Static Castings
		70	1600	1800	2000	2100 ^oF	70 ^oF
U.T.S.	K.S.I.	75	30	19	11	8	66
Y.S.	K.S.I.	42	16	11	7	5	36
El.	%	10	27	46	55	47	10

SERVICE TEMPERATURE

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 ^oF and for shorter times and less critical loading for temperatures of 2200 ^oF

WELDABILITY

KHR48N is welded by the GTAW process using filler metal of matching composition.

CREEP-RUPTURE PROPERTIES

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

RUPTURE-STRESS-KSI

HOURS		1400	1500	1600	1700	1800	1900	2000	2100	2200	°F
100	AVG.	-	-	12.03	8.93	6.45	4.51	3.06	2.00	1.27	
	MIN.	-	-	9.93	7.39	5.36	3.93	2.58	1.70	1.09	
1,000	AVG.	-	12.41	9.11	6.49	4.47	2.97	1.90	1.18	0.72	
	MIN.	-	10.24	7.54	5.40	3.74	2.50	1.61	1.01	0.62	
10,000	AVG	13.13	9.55	6.73	4.58	2.99	1.88	1.14	0.68	0.39	
	MIN	10.82	7.90	5.58	3.83	2.53	1.60	0.98	0.58	0.34	
100,000	AVG.	10.28	7.19	4.84	3.13	1.93	1.15	0.67	0.38	-	
	MIN.	8.50	5.98	4.05	2.63	1.64	0.98	0.58	0.33	-	

CREEP-STRESS-KSI

%/HOUR		1400	1500	1600	1700	1800	1900	2000	2100	2200	°F
0.0001	AVG.	-	-	-	4.35	3.15	2.07	1.29	0.67	0.31	

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

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