

ALLOY DATA SHEET HC

HEAT RESISTANT ALLOY

REVISION : 09/94

DESCRIPTION

HC alloy is a ferritic Fe-Cr-Ni alloy with sufficient chromium for good oxidation resistance at temperatures up to 2000 °F. Nickel is also low enough to maintain superior resistance to sulphur bearing environments at 2000 °F. Room temperature ductility is low, as also is elevated temperature strength. Ductility and strength are optimized by maintaining nickel and nitrogen above minimum levels of 2% and 0.15% but there is some loss of sulphidation resistance.

COMPOSITION

	<u>C</u>	<u>Mn</u>	<u>Si</u>	<u>Cr</u>	<u>Ni</u>	<u>Mo</u>	<u>P</u>	<u>S</u>
Min %	-	0.3	0.35	26	-	-	-	-
Max %	0.5	1.0	2.0	29	4	0.5	0.03	0.03

APPLICATIONS

Grate bars, dampers, recuperators, molten salt pots , furnace skids, rabble blades, injector tubes, tuyeres, slag tapping blocks, carbon disulphide reformer coils.

PRODUCT FORMS

Horizontal and vertical centrifugal castings; static castings.

PHYSICAL PROPERTIES

Density (lbs/in ³)	0.272
Melting Point(°F)	2730
Thermal Conductivity (Btu/h/ft ² /ft/°F)	12.6 @ 212°F 17.9 @ 1000°F 20.3 @ 1500°F 24.2 @ 2000°F
Thermal Expansion (10 ⁻⁶ in/in °F)	6.3 @ 70-1000°F 6.4 @ 70-1200°F 6.6 @ 70-1400°F 7.0 @ 70-1600°F 7.4 @ 70-1800°F 8.7 @ 1200-1600°F 9.3 @ 1200-1800°F
Magnetic Permeability:	Ferromagnetic

CARBURIZATION RESISTANCE

(Gas-1064 hours @ 1760 °F)	
ALLOY	WEIGHT GAIN
GRADE	mg/mm ²
H C	0.69
H D	0.60
H E	0.54
H F	0.81

MECHANICAL PROPERTIES (Typical Values)

		70	70*	1400	°F	ASTM Spec.A297
U.T.S.	K.S.I.	100	115	24		55.0 Min.
Y.S.	K.S.I.	83	73	14		
Elong.	%	7	16	60		
R.A.	%		13			
Hard.	HB	220				

* Centrifugally cast tubes with over 2% Ni and 0.15% N₂

SERVICE TEMPERATURE

The alloy is suitable for service at temperatures up to approximately 2000 °F.

COMPARATIVE OXIDATION RATES (mm / year)
(500 hour cyclic tests)

GRADE	1832	1922	2012	2102	°F
H C	<0.1	0.25	1.05	5.0	
H D	<0.1	0.25	1.3	5.2	
H E	<0.1	0.26	1.05	4.3	

WELDABILITY

HC alloy may be welded by the SMAW, and GTAW processes but is a very difficult material to weld. Kubota Metal Corporation can supply additional information.

CREEP-RUPTURE PROPERTIES

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

		<u>RUPTURE-STRESS-KSI*</u>							
<u>HOURS</u>		<u>1200</u>	<u>1300</u>	<u>1400</u>	<u>1500</u>	<u>1600</u>	<u>1700</u>	<u>1800</u>	°F
100	AVG.	15.62	10.75	7.41	5.10	3.51	2.42	1.66	
1,000	AVG.	10.08	6.70	4.49	3.04	2.04	1.37	0.92	
10,000	AVG.	6.51	4.25	2.78	1.81	1.19	0.77	0.51	
100,000	AVG.	4.20	2.67	1.70	1.08	0.69	0.44		
	MIN	3.29	2.08	1.31	0.83	0.52	0.33		

		<u>CREEP-STRESS-KSI*</u>					
<u>%/HOUR</u>		<u>1400</u>	<u>1500</u>	<u>1600</u>	<u>1700</u>	<u>1800</u>	°F
0.0001	AVG.	1.3	0.99	0.75	0.52	0.36	

Notes * Heats with over 2% Ni and 0.15% N₂

Creep and rupture stresses are subject to periodic revisions as longer term tests become available.

RELATED SPECIFICATIONS

ASTM: A 297 (HC); A 743 (CC 50); A608 (HC 30). UNS J92605; J92613. SAE 70446

Nearest wrought grade: AISI 446-The composition of the wrought grade differs from that of the cast alloy and has different properties. The cast alloy designation should always be used to identify castings.

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