

ALLOY DATA SHEET

HF

HEAT RESISTANT ALLOY

REVISION: 03/91

DESCRIPTION

HF alloy is a borderline austenitic Fe-Cr-Ni alloy with high strength and corrosion resistance in the temperature range from 1000 to 1600°F. It is frequently used as an alternative to the 2.25%Cr-1%Mo steels due to greater ease of fabrication.

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 %	-	0.5	0.35	18	8	-	-	-
Max %	0.40	1.5	2.0	23	12	0.5	0.04	0.04

APPLICATIONS

Cement kiln chain, shackles and hangers; furnace rails, hearth plates, conveyor belts, furnace rolls, and tube sheets.

PRODUCT FORMS

Horizontal and vertical centrifugal castings; static castings.

PHYSICAL PROPERTIES

Density (lbs/in ³)	0.280
Melting Point(°F)	2550
Thermal Conductivity (Btu/h/ft ² /ft/°F)	8.3 @ 212°F
	12.3 @ 1000°F
	15.9 @ 1600°F
Thermal Expansion (10 ⁻⁶ in/in °F)	9.9 @ 70-1000°F
	10.1 @ 70-1200°F
	10.5 @ 70-1600°F
Magnetic Permeability	1.00

CARBURIZATION

RESISTANCE

(Gas-1064 hours @ 1760°F)

ALLOY	WEIGHT GAIN
GRADE	mg/mm ²
H D	0.60
H E	0.54
H F	0.81
H H	0.58

MECHANICAL PROPERTIES (Typical Values)

		70	1200	1400	1600°F	ASTM Spec A297
U.T.S.	K.S.I.	92	60	38	21	70 Min.
Y.S.	K.S.I.	45	32	25	16	35 Min.
El.	%	38	10	16	16	25 Min.

SERVICE TEMPERATURE

The alloy is suitable for service at temperatures up to approximately 1850°F.

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

GRADE	1832	1922	2012	2102 °F
H E	<0.1	0.26	1.1	4.3
H F	0.86	1.8	3.6	6.7
H H	<0.1	0.22	0.95	3.5

WELDABILITY

HF alloy has good weldability by the SMAW, GTAW and GMAW processes.

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>1000</u>	<u>1100</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.	-	-	-	21.0	14.8	10.4	7.2	5.0	3.58	
	MIN.	-	-	-	18.6	12.9	9.0	6.2	4.3	3.0	
1,000	AVG.	-	-	20.1	13.8	9.5	6.4	4.42	3.0	2.03	
	MIN.	-	-	17.8	12.0	8.2	5.5	3.75	2.55	1.7	
10,000	AVG.	-	20.4	13.6	9.1	6.0	4.0	2.68	1.78	1.17	
	MIN.	-	18.0	11.8	7.9	5.2	3.4	2.25	1.48	0.98	
100,000	AVG.	21.5	14.0	9.1	5.95	3.85	2.48	1.61	1.05		
	MIN.	19	12.2	7.9	5.1	3.3	2.1	1.34	0.87		

		<u>CREEP-STRESS-KSI</u>									
<u>%/HOUR</u>		<u>1000</u>	<u>1100</u>	<u>1200</u>	<u>1300</u>	<u>1400</u>	<u>1500</u>	<u>1600</u>	<u>1700</u>	<u>1800</u>	°F
0.01	AVG.	-	-	-	25	16.7	11.1	7.5	5.05	3.5	
0.001	AVG.	-	-	27	15.7	9.9	7.8	5.25	3.43	2.29	
0.0001	AVG.	-	30	20	12.9	8.4	5.45	3.55	2.38	1.54	

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

RELATED SPECIFICATIONS

ASTM: A 297 (HF); A608 (HF 30).

Nearest wrought grade: AISI 302 and 302B - 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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