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ALLOY DATA SHEET
HX

HEAT RESISTANT ALLOY

REVISION: 04/91

DESCRIPTION

HX is an Ni-Cr-Fe alloy with moderate creep-rupture strength, good ductility and exceptional carburization resistance. Properties and applications are not unlike those of HW alloy, but the presence of additional chromium and nickel raise the oxidation resistance, making this composition suitable for extended service at a higher temperature of 2125°F.

COMPOSITION

	C	Mn	Si	Cr	Ni	Mo	P	S
Min %	0.35			15	64	-	-	-
Max %	0.75	2.0	2.5	19	68	0.5	0.04	0.04

APPLICATIONS

Furnace components, trays, hangers, carburizing retorts, heat treatment pots, heating elements, lead pots, enameling tools.

PRODUCT FORMS

Horizontal and vertical centrifugal castings; static castings.

PHYSICAL PROPERTIES

Density (lbs/in^3)	0.294	
Melting Point(°F)	2350	
Thermal Conductivity	7.2	@ 212°F*
(Btu/h/ft^2/ft/°F)	14.5	@ 1600°F*
	15.7	@ 1800°F*
Thermal Expansion	7.8	@ 70-1000°F
(10^{-6}in/in °F)	8.1	@ 70-1200°F
	8.5	@ 70-1400°F
	8.8	@ 70-1600°F
	9.2	@ 70-1800°F
	9.5	@ 70-2000°F
	10.7	@ 1200-1600°F
	11.3	@ 1200-1800°F
Magnetic Permeability	2	

*Estimated value

CARBURIZATION RESISTANCE

(Gas-1064 hours @ 1760°F)

ALLOY GRADE	WEIGHT GAIN mg/mm^2
H H	0.58
H T	0.38
H U	0.24
H W	0.14*
H X	**0.16**

*Intrapolated value.

MECHANICAL PROPERTIES (Typical Values)

		70	1400	1600	1800 °F	ASTM Spec A297
U.T.S.	K.S.I.	65		21	11	60 Min.
Y.S.	K.S.I.	36		18	7	
El.	%	9		48	40	

SERVICE TEMPERATURE

The alloy is suitable for service at temperatures up to approximately 2125 °F.

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

GRADE	1832	1922	2012	2102	2204 °F
H T	0.20	0.54	1.4	3.2	7.2
H U	0.10	0.24	0.54	1.1	2.2
H W		0.35		1.5	
H X	**0.11**	**0.23**	**0.47**	**0.89**	**1.6**

WELDABILITY

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

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	°F
100	AVG.	12.0	8.8	6.3	4.6	3.3	2.35	1.7	1.2	
1,000	AVG.	8.3	5.9	4.2	3.0	2.1	1.45	1.0		
10,000	AVG.	5.8	4.0	2.7	1.9	1.3	0.89			
100,000	AVG	4.0	2.7	1.8	1.2					

CREEP-STRESS-KSI

%/HOUR		1400	1500	1600	1700	1800	1900	2000	2100	°F
0.0001	AVG	6.4	4.5	3.2	2.3	1.6	0.95	0.62		

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

RELATED SPECIFICATIONS

ASTM: A 297 (HX); A608 (HX 50)
Nearest wrought grade: None

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