

ALLOY DATA SHEET HW

HEAT RESISTANT ALLOY

REVISION: 02/91

DESCRIPTION

HW is an Ni-Fe-Cr alloy with moderate creep-rupture strength, good ductility and exceptional carburization resistance for service up to 2050 °F. The alloy's resistance to thermal fatigue and shock make it particularly suited furnace components operating in carburizing environments.

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 %	0.35			10	58	-	-	-
Max %	0.75	2.0	2.5	14	62	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)	0.29
Melting Point(°F)	2350
Thermal Conductivity (Btu/h/ft ² /ft/°F)	7.2 @ 212°F
	14.5 @ 1600°F
	15.7 @ 1800°F
Thermal Expansion (10 ⁻⁶ in/in °F)	8.0 @ 70-1000°F
	8.2 @ 70-1200°F
	8.5 @ 70-1400°F
	8.7 @ 70-1600°F
	9.0 @ 70-1800°F
	9.3 @ 70-2000°F
	10.0 @ 1200-1600°F
	10.3 @ 1200-1800°F
Magnetic Permeability	16

CARBURIZATION

RESISTANCE

(Gas-1064 hours @ 1760°F)

ALLOY	WEIGHT GAIN
GRADE	mg/mm ²
H H	0.58
HT	0.38
H U	0.24
HW	0.14*
H X	0.16

*Intrapolated value.

MECHANICAL PROPERTIES (Typical Values)

		70	1400	1600	1800	2000 °F	ASTM Spec A297
U.T.S.	K.S.I.	68	32	19	10		60 Min.
Y.S.	K.S.I.	36	23	15	8		
El.	%	4			40		

SERVICE TEMPERATURE

The alloy is suitable for service at temperatures up to approximately 2050°F.

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

GRADE	1832	1922	2012	2102	2204 °F
HT	0.20	0.54	1.4	3.2	7.2
HU	0.10	0.24	0.54	1.1	2.2
HW		0.35		1.5	
HX	0.11	0.23	0.47	0.89	1.6

WELDABILITY

HW alloy has good weldability by the SMAW process.

CREEP-RUPTURE PROPERTIES

Long term creep-rupture properties were extrapolated from Larson-Miller Parameter versus stress plots, using a rupture-stress and creep-stress constant of 13.46.

		<u>RUPTURE-STRESS-KSI</u>								
<u>HOURS</u>		<u>1400</u>	<u>1500</u>	<u>1600</u>	<u>1700</u>	<u>1800</u>	<u>1900</u>	<u>2000</u>	<u>2100</u>	°F
100.	AVG.	10	7.8	6.1	4.7	3.7	2.9	2.25		
1,000.	AVG.	7.4	5.7	4.4	3.3	2.6	2.0			
10,000.	AVG.	5.5	4.2	3.1	2.4					
100,000	AVG.	4.0	3.0	2.25	1.6					

		<u>CREEP-STRESS-KSI</u>								
<u>%/HOUR</u>		<u>1400</u>	<u>1500</u>	<u>1600</u>	<u>1700</u>	<u>1800</u>	<u>1900</u>	<u>2000</u>	<u>2100</u>	°F
0.0001	AVG.	6.0	4.3	3.0	2.0	1.4				

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

RELATED SPECIFICATIONS

ASTM: A 297 (HW); A608 (HW 50)

Nearest wrought grade: None

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