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ALLOY DATA SHEET
HL

HEAT RESISTANT ALLOY

REVISION: 04/91

DESCRIPTION

HL alloy is an austenitic Fe-Cr-Ni alloy with similar mechanical properties to those of HK40. The higher chromium in the alloy conferes better resistance to scaling by oxidizing and sulphur bearing gases, while also increasing the resistance to carburization.

COMPOSITION

	C	Mn	Si	Cr	Ni	Mo	P	S
Min %	0.2	-	-	28	18	-	-	-
Max %	0.6	2.0	2.0	32	22	0.5	0.03	0.03

APPLICATIONS

Furnace skids; furnace rolls; rabble arms, radiant heaters, enameling furnace fixtures

PRODUCT FORMS

Horizontal and vertical centrifugal castings; static castings.

PHYSICAL PROPERTIES

Density (lbs/in^3)	0.279	
Melting Point(^{o}F)	2600	
Thermal Conductivity	8.2	@ 212^{o}F
(Btu/h/ft^2/ft/^{o}F)	12.2	@ 1000^{o}F
	13.4	@ 1200^{o}F
	14.7	@ 1400^{o}F
	16.3	@ 1600^{o}F
	17.7	@ 1800^{o}F
	19.3	@ 2000^{o}F
Thermal Expansion	9.6	@ 70-1400^{o}F
(10^{-6}in/in ^{o}F)	9.7	@ 70-1600^{o}F
	9.9	@ 70-1800^{o}F
	10.1	@ 70-2000^{o}F
	10.5	@ 1200-1600^{o}F
	10.7	@ 1200-1800^{o}F
Magnetic Permeability	1.01	

CARBURIZATION RESISTANCE

(Gas-1064 hours @ 1760 ^{o}F)

ALLOY GRADE	WEIGHT GAIN mg/mm^2
H F	0.81
H H	0.58
H K	0.56
H L	**0.46**

MECHANICAL PROPERTIES (Typical Values)

		70	1400	1600	1800	^{o}F	ASTM Spec.A297	
U.T.S.	K.S.I.	82	50	30	19		65	Min.
Y.S.	K.S.I.	52					35	Min.
El.	%	19					10	Min

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
H H	<0.1	0.22	0.92	3.9	
H K	<0.1	0.22	0.95	3.5	12.7
H L	**0.10**	**0.29**	**0.85**	**2.2**	**5.5**

WELDABILITY

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

CREEP-RUPTURE PROPERTIES

RUPTURE-STRESS-KSI

HOURS		1400	1500	1600	1700	1800	°F
100.	AVG.	15		9.2		5.2	

CREEP-STRESS-KSI

%/HOUR		1400	1500	1600	1700	1800	°F
0.0001	AVG.	7.7	5.5	4.3	3.1	2.2	

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

RELATED SPECIFICATIONS

ASTM: A 297 (HL); A608 (HL30 and HL40)
Nearest wrought grade: None.

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