



# VACUUM CAST ALLOYS

## Main Alloys Cast and Chemical Composition

### Nickel Based Alloys

MATERIAL	C	Cr	Ni	Co	Mo	W	Nb/Cb	Ta	Ti	Al	B	Zr	Hf	Fe	OTHERS	DENSITY GM/CM <sup>3</sup> LB/IN <sup>3</sup>	APPROXIMATE MELTING RANGE °F °C
MORE 2	0.15	34.5	47		0.5	15								<3.1	Mn, Si≤0.5, P, S≤0.3		
Hastelloy X	0.10	22.0	Bal	1.50	9.0	0.60								18.5	Mn≤0.65, Si≤0.6		
B1900	0.10	8	Bal	10	6			4.25	1	6	0.015	0.07				8.22 0.297	2325-2375 1274-1302
B 1900+HF	0.10	8	Bal	10	6			4.25	1	6	0.015	0.1	1.1			8.25 0.298	
B 1910	0.15	10	Bal	10	3			7.25	1.25	6	0.015	0.1					2400 1316
CM 681LG	0.10	5.5	Bal	9		8.5		6	0.15			0.01	1.5		Re : 3		
Ni-X	0.10	21.75	Bal	1.5	9	0.6								18.5	1.0xMn 1.0xSi	8.21 0.296	2300-2470 1260-1354
IN100	0.16	10	Bal	15	3				4.75	5.5	0.015	0.04			0.8V	7.75 0.280	2350-2435 1288-1335
IN 625	0.20	21.6	Bal		8.7		3.9		0.2	0.2						8.44 0.305	2350-2460 1288-1349
IN 713 C	0.10	13.5	Bal		4.5		2		0.8	6	0.010	0.06				7.91 0.286	2300-2350 1260-1288
IN 713 LC	0.06	12	Bal		4.3		2		0.7	5.8	0.007	0.06				8.00 0.289	2350-2410 1288-1321
IN 718	0.05	19	52.5		3		5		0.9	0.55	0.005			Bal		8.22 0.297	2300-2450 1260-1343
IN 738 LC	0.09	16	Bal	8.5	1.7	2.5	0.8	1.7	3.5	3.5	0.010	0.05				8.11 0.293	2250-2400 1231-1316
IN 738 C	0.17	16	Bal	8.5	1.7	2.5	0.8	1.7	3.5	3.5	0.010	0.10				8.11 0.293	
IN 792 MOD 5A	0.12	12.4	Bal	9	1.9	3.8		3.9	4.5	3.1	0.020	0.1				8.25 0.298	
IN 792+Hf	0.11	12.2	Bal	9	2	3.8		4	4	3.5	0.015	0.1	0.50- 0.85				2270-2400 1240-1315
IN 939	0.15	22.4	Bal	19		1.6	1	1.4	3.7	1.9	0.010	0.1				8.17 0.295	2255-2440 1235-1338

## Nickel Based Alloys

MATERIAL	C	Cr	Ni	Co	Mo	W	Nb/C b	Ta	Ti	Ai	B	Zr	Hf	Fe	OTHERS	DENSITY GM/CM <sup>2</sup> LB/IN <sup>2</sup>	APPROXIMATE MELTING RANGE °F °C
Mar M 002	0.15	9	Bal	10		10		2.5	1.5	5.5	0.015	0.05	1.5			8.53 0.308	
Mar M 004	0.05	12	Bal		4.5		2		0.6	5.9	0.015	0.05	1.3			8.02 0.290	2425 1329
Mar M 200	0.15	12	Bal	10		12.5	1.8		2	5	0.015	0.05				8.53 0.308	2400-2500 1315-1370
Mar M 246	0.15	9	Bal	10	2.5	10		1.5	1.5	5.5	0.015	0.05				8.44 0.305	2400-2450 1315-1343
Mar M 247	0.16	8.2	Bal	10	0.6	10		3	1	5.5	0.015	0.05	1.5			8.54 0.308	2380-2490 1305-1365
Mar M 247LC	0.07	8	Bal	9	0.5	10		3.2	0.7	5.6	0.015	0.01	1.4			8.54 0.308	
Mar M 421	0.15	15.5	Bal	9.5	2	3.8	2		1.8	4.3	0.015	0.05				8.08 0.292	2350-2450 1288-1343
Rene'41	0.09	19	Bal	11	9.75				3.15	1.65	0.005					8.25 0.298	2400-2500 1315-1371
Rene'77	0.07	14.6	Bal	15	4.2				3.3	4.3	0.015	0.04				7.91 0.286	2200-2550 1204-1400
Rene'80	0.16	14	Bal	9.5	4	4			5	3	0.015	0.03				8.16 0.295	
Rene'95	0.15	14	Bal	8	3.5	3.5	3.5		2.5	3.5	0.010	0.05				8.19 0.296	
Rene'125	0.11	9	Bal	10	2	7		3.8	2.5	1.4	0.017	0.05	1.5			8.53 0.308	
Rene'220	0.02	18	Bal	12	3		5	3	1	0.5	0.010						2280-2455 1250-1350
U 500	0.07	15	Bal	18	4				3	3	0.007					8.02 0.292	
U 700	0.07	15	Bal	18.5	5				3.5	4.4	0.025					7.91 0.286	2200-2550 1204-1400
Waspaloy	0.07	19.5	Bal	13.5	4.25				3	1.35	0.005					8.19 0.296	2425-2475 1329-1357
Weldable Waspaloy	0.06	12.1	Bal	12.3	3.7				3	1.15							

## Cobalt Based Alloys

MATERIAL	C	Cr	Ni	Co	Mo	W	Nb/C b	Ta	Ti	Ai	B	Zr	Hf	Fe	OTHERS	DENSITY GM/CM <sup>2</sup> LB/IN <sup>2</sup>	APPROXIMATE MELTING RANGE °F °C
UMCo50	0.1-0.2	26.0- 30.0		46-49											Si , Mn≤1.50		

## High Temperature Alloy (Russia)

STANDARD SPECIFICATION	MATERIAL	C	Si	Mn	P	S	Cr	Ni	Mo	OTHERS
В/НУ521-2004	10Cr30Ni50WMoAlTiNb(Эл648)	≤.1	≤.40	≤.50	≤.015	≤.010	32-35	residue	2.3-3.3	W:4.3-5.3,Al:0.50-1.10,Ti:0.50-1.10,Fe≤4.0,B≤0.008,Ce≤0.03, Nb:0.50-1.10
ИЖАКИ105.015-89	ЧС88У-ВМ	.04-.09	≤.3	≤.3	≤.008	≤.008	15.4-16.3	residue	1.6-2.3	W:4.7-5.9,Al:2.8-3.3,Ti:4.2-5.0,Fe≤0.5, Nb:0.10-0.3,Co:10.0-11.5

## High Temperature Alloy (China)

STANDARD SPECIFICATION	MATERIAL	C	Si	Mn	P	S	Cr	Ni	Mo	OTHERS
GB/T 14992-2005	GH3039	≤.08	≤.80	≤.4	≤.02	≤.012	19~22	residue	1.80~2.30	Al:0.35-0.75,Ti:0.35-0.75,Fe≤3.0,Nb:0.9-1.3
GB/T 14992-2005	GH3044	≤.1	≤.80	≤.5	≤.013	≤.013	23.5~26.5	residue	≤1.50	W:13-16,Al≤0.5,Ti:0.3-0.7,Fe≤4.0
GB/T 14992-2005	GH4049	≤.1	≤.50	≤.5	≤.01	≤.010	9.5~11	residue	4.50~5.50	W:5-6,Al:3.7-4.4,Ti:1.4-1.9,Fe≤1.50,V:0.2-0.5,B≤0.015,Ce≤0.02,Co:14.0~16.0
GB/T 14992-2005	GH5188	0.05-0.15	0.20-0.50	≤1.25	≤0.020	≤0.015	20.00-24.00	20.00-24.00		Co: residue, W :13.00-16.00, Fe≤3.00,La :0.030-0.120, B≤0.015,Cu≤0.070
GB/T 14992-2005	GH6159	≤0.04	≤0.20	≤0.20	≤0.020	≤0.010	18.00-20.00	residue	6.00-8.00	Co:34.00-38.00, Fe :8.00-10.00,, B≤0.030,Al:0.10-0.30,Ti:2.50-3.25, Nb:0.25-0.75
GB/T 14992	K213	<0.10	≤0.50	≤0.50	≤0.015	≤0.015	14.00-16.00	34.00-38.00		W:4.00-7.00, Al :1.50-2.00, Ti:3.00-4.00,Fe:residue,B :0.050-0.100
GB/T 14992	K401	≤0.10	≤0.80	≤0.80	≤0.015	≤0.010	14.00-17.00	residue	≤0.30	W :7.00-10.00, Al:4.50-5.50,Ti :1.50-2.00, Fe≤0.20,B:0.030-0.100
GB/T 14992	K403	0.11-0.18	≤0.50	≤0.50	≤0.020	≤0.010	10.00-12.00	residue	3.80-4.50	W :4.80-5.50, Co:4.50-6.00, Fe≤2.00,B:0.012-0.022,Al:5.30-5.90,Ti:2.30-2.90,Zr:0.030-0.080,Ce≤0.010
GB/T 14992	K408	0.10-0.20	≤0.60	≤0.60	≤0.015	≤0.020	14.90-17.00	residue	4.50-6.00	Al:2.50-3.50,Ti:1.80-2.50,Fe:8.00-12.50,B:0.060-0.080,Ce≤0.010
GB/T 14992	K430	≤0.12	≤1.20	≤1.20	≤0.030	≤0.020	19.00-22.00	≥75.00		Al≤0.15,Fe≤1.50,Cu≤0.200
GB/T 14992	K4169	0.02-0.08	≤0.35	≤0.35	≤0.015	≤0.015	17.00-21.00	50.00-55.00	2.80-3.30	Co≤1.00,Al:0.30-0.70,Ti:0.65-1.15,Fe: residue, Nb:4.40-5.40,Ta≤0.10,B≤0.006,Zr≤0.050,Cu≤0.300

The above lists give details of the main alloys cast, and whilst many other materials are also regularly cast, it is not practical to include them all in this brochure. However, we will be pleased to discuss any other material with you. As the list is only intended as a guide, for full information, the relevant standard specifications should be referred to. The comparable specifications have been compiled on the basis of chemical analysis ranges and it is important for other relevant factors to be taken into account.