Nickel Base Single Crystal

Nickel Base Single Crystal	C	Cr	Ni	Co	Mo	W	Nb/Cb	Ta	Ti	Al	B	Zr	Hf	Fe	Re	Other	Density gm/cm^3	Density lb/in^3	Approximate Melting Range °F	Approximate Melting Range °C
PWA 1480	-	10	Bal	5	-	4	-	12	1.5	5	0.003	-	-			-	8.7	0.314	2350-2450	1290-1340
PWA 1484	-	5	Bal	10	1.9	5.9	-	8.7	-	5.65	-	-	0.1		3		8.95	0.323	-	
PWA 1487	-	5	Bal	10	1.9	5.9		8.4		5.65			0.25		3	Y 0.013	8.95	0.323		
Rene' N4	-	10	Bal	8	2	6	0.5	5	3.5	4.2	-	-	0.2				8.56	0.309	-	
Rene' N5	-	7	Bal	8	2	5	-	6	-	6.2	-	-	0.2		3		8.63	0.312	-	
Rene' N6	-	4	Bal	12	1	6	-	7	-	5.8	-	-	0.2		5		8.97	0.324	-	
CMSX-2	-	8	Bal	5	0.6	8	-	6	1	5.6	-	-	-				8.56	0.309	2415-2500	1320-1370
CMSX-3	-	8	Bal	5	0.6	8	-	6	1	5.6	-	-	0.1				8.56	0.309	2420-2510	1325-1375
CMSX-4	-	6.5	Bal	9	0.6	6	-	6.5	1	5.6	-	-	0.1		3		8.7	0.314	2415-2515	1320-1380
CMSX-4 [ULS][La+Y]	-	6.5	Bal	9	0.6	6	-	6.5	1	5.6	-	-	0.1		3	La+Y 0.002	8.7	0.314		
CMSX-4 (B/C)[MK4]	0.04	6.5	Bal	9	0.6	6	-	6.5	1	5.6	0.006	-	0.2		3		8.7	0.314		
CMSX-6	-	10	Bal	5	3	-	-	2	4.7	4.8	-	-	0.1				7.98	0.288	-	
CMSX-10K	-	2	Bal	3	0.4	5	0.1	8	0.2	5.7	-	-	0.03		6		9.05	0.327	2480-2575	1360-1410
CMSX-10N	-	1.5	Bal	3	0.4	5	0.05	8	0.1	5.8	-	-	0.03		7				2480-2575	1360-1410
CMSX 486	0.07	5	Bal	9	0.7	9	-	4.5	0.7	5.7	0.015	0.005	1		3		8.85	0.319	-	
SRR 99	-	8	Bal	5	-	10	-	3	2.2	5.5	-	-	-			-	8.56	0.309	-	
RR 2000	-	10	Bal	15	3	-	-	-	4	5.5	-	-	-			1 V	7.87	0.284	-	
AM 1	-	8	Bal	6	2	6	-	9	1.2	5.2	-	-	-			-	8.59	0.31	-	
AM 3	-	8	Bal	6	2	5	-	4	2	6	-	-	-			-	8.25	0.298	-	
SC 180	-	5	Bal	10	2	5	-	8.5	1	5.2	-	-	0.1		3		8.84	0.319	-	

Cobalt Base

Cobalt Base	C	Cr	Ni	Co	Mo	W	Nb/Cb	Ta	Ti	Al	B	Zr	Hf	Fe	Re	Other	Density gm/cn	Density lb/ir	Approximate Melti Range °F	Approximate Melting Range °C
FSX-414	0.3	29	10	Bal	-	7.5	-	-	-	-	0.01	-	-			-	8.3	0.3	-	-
Mar-M-302	0.9	22	-	Bal	-	10	-	9	-	-	0.01	0.2	-			-	9.21	0.332	-	-
Mar-M-509	0.6	23	10	Bal	-	7	-	3.5	0.2	-	-	0.5	-			-	8.85	0.319	2415-2525	1320-1385
Mar-M-918	0.1	20	20	Bal	-	-	-	7.5	-	-	-	0.1	-			-	-		-	
HS 21	0.3	27	3	Bal	5	-	-	-	-	-	-	-	-	1		0.6 Mn, 0.6	-		-	
HS 31 (X-40)	0.5	25	10	Bal	-	7.5	-	-	-	-	-	-	-	1.5		0.5 Mn, 0.5 S	8.6	0.31	-	
X-45	0.3	26	11	Bal	-	7	-	-	-	-	0.01	-	-			-	8.6	0.31	-	
HS 25 (L-605	0.1	20	10	Bal	-	15	-	-	-	-	-	-	-			-	9.13	0.33	-	
Haynes 188	0.1	22	22	Bal	-	14	-	-	-	-	-	-	-			0.04 La	9.13	0.33	-	
AiResist 13	0.5	21	-	Bal	-	11	2	-	-	3.5	-	-	-			0.1 Y	-		-	
AiResist 213	0.2	19	-	Bal	-	4.7	-	6.5	-	3.5	-	0.2	-			0.1 Y	-		-	
AiResist 215	0.4	19	-	Bal	-	4.5	-	7.5	-	4.3	-	0.1	-			0.17 Y	-		-	
F-75	0.3	28	-	Bal	5.5	-	-	-	-	-	-	-	-			-	8.29	0.299	-	
WI-52	0.5	21	-	Bal	-	11	2	-	-	-	-	-	-	2			8.88	0.321	-	
ECY 768	0.6	23	10	Bal	-	7	-	3.5	0.2	-	-	-	-			-	-		-	

Nickel Base Equiax

Nickel Base Equiax	C	Cr	Ni	Co	Mo	W	Nb / Cb	Ta	Ti	Al	B	Zr	Hf	Fe	Re	Other	Density gm/cm^3	Density lb/in^3	Approximate Melting Range °F	Approximate Melting Range °C
B 1900	0.1	8	Bal	10	6	-	-	4.25	1	6	0.015	0.07	-			-	8.22	0.297	2325-2375	1274-1302
B 1900 +HF	0.1	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 681 LC®	0.1	5.5	Bal	9	-	8.5	-	6	0.15	-	-	0.01	1.5	5.75	3	-	8.91	0.322	-	-
NI - X	0.1	21.75	Bal	1.5	9	0.6	-	-	-	-	-	-	-	18.5		1.0xMn 1.0xSi	8.21	0.296	2300-2470	1260-1354
IN 100	0.16	10	Bal	15	3	-	-	-	4.75	5.5	0.015	0.04	-			.8V	7.75	0.28	2350-2435	1288-1335
IN 625	0.2	21.6	BAl	-	8.7	-	3.9	-	0.2	0.2	-	-	-			-	8.44	0.305	2350-2460	1288-1349
IN 713 C	0.1	13.5	BAl	-	4.5	-	2	-	0.8	6	0.01	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	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	0.01	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	0.01	0.1	-			-	8.11	0.293	-	
IN 792	0.12	12.4	Bal	9	1.9	3.8	-	3.9	4.5	3.1	0.02	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	.50 - .85			-	-		2270-2400	1240-1315
IN 939	0.15	22.4	BAl	19	-	1.6	1	1.4	3.7	1.9	0.01	0.1	-			-	8.17	0.295	2255-2440	1235-1338
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	0.29	2425	1329
Mar M 200	0.15	9	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 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
CM 247 LC*	0.07	8	Bal	9	0.5	10	-	3.2	0.7	5.6	0.015	0.01	1.4			-	8.54	0.308	-	
CM 681 LC																	8.91	0.322		
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	0.01	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	-			-	8.53	0.308	-	
Rene' 220	0.02	18	Bal	12	3	-	5	3	1	0.5	0.01	-	-			-	-		2280-2455	1250-1350
U 500	0.07	19	Bal	18	4	-	-	-	3	3	0.007	-	-			-	8.02	0.29	-	
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
C263	0.06	20	Bal	20	5.9	-	-	-	2.15	0.45	0.001	-	-			-	8.36	0.302	-	
C 1023	0.16	15.5	Bal	10	8.5	-	-	-	3.6	4.2	0.006	-	-			-	-		-	
GMR 235	0.15	15.5	Bal	-	5.3	-	-	-	2	3	0.06	-	-	10		.3 Mn, .6 Si	8	0.289	-	
GTD 111	0.1	14	Bal	9.5	1.6	3.8	-	2.8	4.9	3	0.012	0.02	-			-	8.17	0.295	-	
GTD 222	0.1	22.5	Bal	19	-	2	0.8	1	2.3	1.2	0.005	0.012	-			-	-		2355-2500	1290-1370
* Also used as DS																				

Nickel Base Directionally Solidified

Nickel Base DS	C	Cr	Ni	Co	Mo	W	Nb/Cb	Ta	Ti	Al	B	Zr	Hf	Fe	Re	Other	Density gm/cm^3	Density lb/in^3	Approximate Melting Range °F	Approximate Melting Range °C
Mar M 200+Hf	0.14	9	Bal	10	-	12	1	-	2	5	0.015	-	0.8-1.9			-	8.61	0.311	-	
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 247	0.16	8.2	Bal	10	0.6	10	-	3	1	5.5	0.015	0.05	1.5			-	8.54	0.308	-	
PWA 1426	0.1	6.5	Bal	12	2	6	-	4	-	6	0.015	0.03	1.5		3		8.6	0.31	-	
Rene' 142	0.12	6.8	Bal	12	2	5	-	6	-	6.2	0.015	0.02	1.5		3		8.6	0.31	-	
CM 186 LC*	0.07	6	Bal	9	0.5	8	-	3	0.7	5.7	0.015	0.005	1.4		3		8.7	0.314	2400-2520	1315-1380
CM 247 LC	0.07	8	Bal	9	0.5	10	-	3.2	0.7	5.6	0.015	0.01	1.4			-	8.54	0.308	2385-2510	1310-1375
Rene' 80 H	0.16	14	Bal	9	4	4	-	-	4.7	3	0.015	0.01	0.8							
GTD 111 M	0.1	14	Bal	9.5	1.6	3.8	-	2.8	4.9	3	0.012	-	-							

*Also used as single crystal