

APPENDIX II

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The following list of super-strength alloys was made available to the Data and Publications Panel of the ASTM-ASME Joint Committee on Effect of Temperature on the Properties of Metals by ASTM Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys. The list was prepared by Subcommittee XII of A-10 for Committee use.

SUPERALLOYS

Alloy	Chemical Composition, per cent												
	Carbon	Man-ganese	Silicon	Chro-mium	Nickel	Cobalt	Molyb-denum	Tung-sten	Colum-bium	Titani-um	Alumi-num	Iron	Other
GROUP I. CHROMIUM, NICKEL, IRON ALLOYS													
19-9WMo.....	0.10	0.50	0.60	19.0	9.0	—	0.40	1.3	0.44	0.40	—	68	—
19-9DL.....	0.30	1.10	0.60	19.0	9.0	—	1.25	1.2	0.40	0.30	—	66	—
19-9DX.....	0.30	1.00	0.55	19.2	9.0	—	1.50	1.2	—	0.55	—	66	—
19-9WX.....	0.11	—	—	20.5	8.5	—	0.50	1.5	1.30	0.20	—	—	—
Inco 425.....	0.06	1.2	0.7	5.3	25	—	—	—	—	2.3	0.7	65	—
Croloy 15-15N.....	0.15*	2.0*	0.75*	16	15	—	1.55	1.40	1.05	—	—	—	0.15N*
17-14Cu Mo.....	0.12	0.75	0.50	15.9	14.1	—	2.5	—	0.45	0.25	—	Balance	3.0Cu
Timken 16-25-6.....	0.10	1.35	0.70	16.0	25.0	—	6.0	—	—	—	—	50	0.15N
Discaloy 24.....	0.04	1.38	1.00	13.5	26.2	—	3.9	—	—	1.61	0.11	Balance	—
HS-88.....	0.07	1.50	0.50	12.5	15.0	—	2.0	0.6	—	0.6	—	Balance	0.15B
A-286.....	0.05	1.35	0.95	15.0	26.0	—	1.25	—	—	2.00	0.20	Balance	0.3V
S-495.....	0.40	1.0	1.0	14	20	—	4.0	4.0	4.0	—	—	51	—
S-588.....	0.42	1.5	0.8	18.4	20	—	4.0	4.0	4.0	—	—	Balance	—
CSA.....	0.25	4.0	0.4	18	5	—	1.3	1.3	1.0	—	—	68	—
EME.....	0.10	0.5	0.7	19	12	—	—	3.2	1.2	—	—	63	0.15N
Incoloy.....	0.10	1.0	0.6	20.5	32	—	—	—	—	—	—	Balance	—
Incoloy T.....	0.10	1.0	0.4	20.5	32	—	—	—	—	1.0	—	Balance	—
ATV-3.....	0.35	1.36	1.17	14.9	27.4	—	—	4.0	—	—	—	Balance	—
Gamma Columbium.....	0.40	0.54	0.62	15.2	24.6	—	4.1	—	2.2	—	—	Balance	—
Turbaloy 13.....	0.13	1.68	0.75	17.8	23.6	—	2.5	1.0	—	1.4	1.4	Balance	—
M-813.....	0.08	—	—	18	35	—	4.0	—	—	2.25	1.4	Balance	—
GROUP II. CHROMIUM, NICKEL, COBALT ± IRON ALLOYS													
N-153.....	0.32	1.5	0.5	17	15	12	3.0	2.0	1.0	—	—	Balance	—
N-154.....	0.32	1.5	0.5	17	24	21	3.0	2.0	1.0	—	—	Balance	—
N-155, HS-95.....	0.15	1.5	0.5	21	20	20	3.0	2.5	1.0	—	—	Balance	0.15N
HS-96.....	0.10	1.5	0.5	20	20	20	3.0	2.0	—	—	—	Balance	—
N-156.....	0.33	1.5	0.5	17	33	24	3.0	2.0	1.0	—	—	Balance	—
S-497.....	0.42	0.47	0.61	14	19.5	19	4.0	4.0	4.0	—	—	Balance	—
S-590.....	0.40	1.5	0.7	20	20	20	4.0	4.0	4.0	—	—	24	—
S-816.....	0.38	1.5	0.7	20	20	43	4.0	4.0	4.0	—	—	3	—
V-36.....	0.31	0.9	0.5	25	20	42	4.0	2.0	2.2	—	—	3	—
K-42-B.....	0.05	0.7	0.7	18	43	22	—	—	—	2.5	0.2	13	—
Refractaloy 26.....	0.05	0.7	0.7	18	37	20	3.0	—	—	2.8	0.2	18	—
Refractaloy 70.....	0.05	2.0	0.2	20	20	30	8.0	4.0	—	—	—	15	—
Refractaloy 80.....	0.10	0.6	0.7	20	20	30	10.0	5.0	—	—	—	14	—
Haynes No. 99.....	0.10	1.5	0.7	21	18	12	4.0	2.5	—	—	—	Balance	0.05B
Timken X.....	0.13	1.44	0.75	16.8	28.6	30.7	10.5	—	—	—	—	Balance	0.10N
Ticonium.....	0.01	0.80	0.27	23	35	31	6	—	—	—	—	Balance	—
M-203.....	0.07	—	—	19.5	24.5	36.5	—	12	1.5	2.15	0.75	1.6	—
M-204.....	0.07	—	—	18.5	24.5	40.5	—	12	1.2	—	—	1.6	0.22B
M-205.....	0.07	—	—	18.5	24.5	37.5	—	12	1.2	—	2.75	1.6	0.22B
25Ni.....	0.17	—	—	19	24.5	42.5	—	10	1.5	—	—	1.0	—

* Maximum.

NOTE.—(C) — Cast.

NOTE.—Cb + Ta contents are shown under Cb.

SUPERALLOYS (cont'd.)

Alloy	Chemical Composition, per cent												
	Carbon	Man-ganese	Silicon	Chro-mium	Nickel	Cobalt	Molyb-denum	Tung-sten	Colum-binum	Titani-um	Alumi-num	Iron	Other
GROUP III. NICKEL-BASE ALLOYS													
Inconel.....	0.04	0.35	0.20	15.5	76	—	—	—	—	—	—	7	—
Inconel W.....	0.04	0.60	0.25	15	75	—	—	—	—	2.5	0.6	7	—
Inconel "X".....	0.04	0.7	0.3	15	73	—	—	—	0.9	2.5	0.9	7	—
Inconel "X" Type 550.....	0.04	0.7	0.4	15	73	—	—	—	0.9	2.3	1.2	7	—
Hastelloy A.....	0.10	2.0	0.7	—	59	—	20	—	—	—	—	20	—
Hastelloy B(C).....	0.10	0.8	0.7	1.0	65	—	28	—	—	—	—	5	—
Hastelloy C(C).....	0.10	0.8	0.7	16	57	—	17	4	—	—	—	5	—
Hastelloy D(C).....	0.10	1.0	10.0	—	85	—	—	—	—	—	—	1	4.0Cu
Hastelloy X.....	0.15	—	—	22	45	—	9	—	—	—	—	Balance	—
Waspaloy.....	0.05	0.7	0.4	19	58	14	3	—	—	2.5	1.2	2	—
Thetalloy(C).....	—	2.5	—	25	Balance	12.5	3	7	—	—	—	—	—
M-252.....	0.10	1.0	0.7	19	54	10	10	—	—	2.5	0.75	2	—
GE-B-129(C).....	0.06	0.40	0.40	5	65	—	15	—	2	—	6.0	4	0.5B
M-600.....	0.08	—	—	19	55.5	—	7	—	—	2.3	1.1	13	—
I-1360(C).....	0.10	—	—	10	70.5	—	5	—	2	—	6	4.5	0.3B
Hastelloy R.....	0.10	0.25	0.6	15	66	2.5*	5	—	—	2.5	2.25	7	—
Inco 546.....	0.03	—	—	16	71.5	—	—	—	—	3.0	—	7	—
Inco 739.....	0.07	0.5	0.15	15.5	77	—	—	—	—	1.7	2.7	0.5	—
Kinsalloy.....	—	—	—	—	70	—	22	—	—	—	8	—	—
GROUP IV. COBALT-BASE ALLOYS													
HS-21, Vitallium(C).....	0.25	0.60	0.60	27	3	62	5	—	—	—	—	1	—
HS-23, 61(C).....	0.40	0.30	0.60	24	2	66	—	6	—	—	—	1	—
HS-25, L605.....	0.12	1.50	1.0	20	10	51	—	15	—	—	—	1	—
HS-27, 6059(C).....	0.40	0.30	0.60	25	32	34	6	—	—	—	—	1	—
HS-30, 422-19(C).....	0.40	0.60	0.60	24	16	51	6	—	—	—	—	1	—
HS-31, X-40(C).....	0.40	0.60	0.60	25	10	55	—	8	—	—	—	1	—
HS-36, L 251(C).....	0.40	1.2	0.50	19	10	54	—	14.5	—	—	—	1	0.03B
X-50(C).....	0.76	0.60	0.50	22.5	20	40	—	12	—	—	—	2.5	—
X-63(C).....	0.40	—	—	23	10	58	6	—	—	—	—	1	—
WF-31.....	0.15	1.42	0.42	20.3	9.9	Balance	2.6	10.7	—	1.0	—	4	—
I-336.....	0.19	—	—	19.2	15.5	50	—	12	0.9	—	—	1.3	—
HE-1049(C).....	0.40	0.8	0.8	26	10	Balance	—	15	—	—	—	3.0*	0.40B

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SUPERALLOYS (cont'd.)

Alloy	Chemical Composition, per cent												Other
	Carbon	Man- ganese	Silicon	Chro- mium	Nickel	Cobalt	Molyb- denum	Tung- sten	Colum- bium	Titani- um	Alumi- num	Iron	
GROUP V. FOREIGN ALLOYS													
<i>British Alloys:</i>													
Rex 78.....	0.01	0.8	0.7	14	18	—	4.0	—	—	0.6	—	Balance	4.0Cu
326.....	0.25	3.0	—	17	17	7.0	2.5	—	1.8	—	—	Balance	—
337.....	0.20	—	—	17	17	7.0	3.0	—	—	0.8	—	Balance	3.0Cu
Rex 326D....	0.43	0.90	1.25	14.3	14.6	9.5	2.0	2.2	2.8	—	—	Balance	—
Rex 400.....	0.09	0.12	0.62	19.2	76.0	—	—	—	—	2.1	0.6	Balance	—
Rex 467.....	0.20	—	—	14	10	—	2.0	—	—	0.8	—	Balance	2.5Cu
F.C.B.(T)....	0.12	—	—	17.5	12	—	—	—	1.0	—	—	Balance	—
H. R. Crown													
Max.....	0.23	0.65	1.16	23.2	12.3	—	—	3.0	—	—	—	Balance	—
R-20.....	0.15	0.8	0.3	19	14	—	—	—	1.7	—	—	Balance	—
R-22.....	0.25	1.0	1.0	23	14	—	—	2.5	—	—	—	Balance	—
G-21.....	0.4	0.9	1.4	13	13	—	—	2.3	0.9	—	—	Balance	—
G-18B.....	0.4	0.8	1.0	13	13	10	2.0	2.5	3.0	—	—	Balance	—
G-32.....	0.27	0.8	0.5	19	10.5	46.6	2.2	—	1.4	—	—	Balance	3.0V
Multi-Alloy..	0.25	1.6	1.0	20.5	46.5	3.3	2.7	3.5	2.9	1.2	—	Balance	—
Red Fox 33..	0.08	0.7	0.8	20	30	—	—	—	—	1.5	—	Balance	—
Nimonic 75..	0.12	0.4	0.6	20	76	—	—	—	—	0.4	0.06	2.4	—
Nimonic 80..	0.05	0.70	0.50	20	76	—	—	—	—	2.3	1.0	0.5	—
Nimonic 80A	0.05	0.70	0.50	20	76	—	—	—	—	2.3	1.0	0.5	—
Nimonic 90..	0.08	0.50	0.40	20	58	16	—	—	—	2.3	1.4	0.5	—
Nimonic 95..	0.08	0.50	0.40	20	58	16	—	—	—	2.5	1.6	0.5	—
<i>German Alloys:</i>													
WF 100D....	0.38	0.52	1.84	14.8	12.9	—	0.23	2.5	—	—	—	Balance	—
Tinidur.....	0.04	1.00	0.73	14.7	26.1	—	—	—	—	2.26	0.15	Balance	—
(a).....	0.1	—	1.0	17	15	—	2.0	—	—	—	—	Balance	0.15N
(b).....	—	—	—	18	10	—	—	0.5	1.3	—	—	Balance	—
(c).....	0.1	0.5	0.5	18	9	—	—	1.0	—	0.4	—	Balance	—
(d).....	0.1	18.0	0.7	12	—	—	—	—	—	—	—	Balance	0.7V
(e).....	—	—	—	18	10	—	—	—	—	0.6	—	Balance	0.2N
(f).....	0.1	0.9	0.6	18	8	—	—	—	—	1.0	—	Balance	1.0V
<i>Russian Alloys:^b</i>													
EI-72.....	0.25 to 0.35	<0.6	2 to 3.0	11.5 to 14	6.5 to 7.5	—	—	—	—	—	—	Balance	—
EI-211.....	<0.20	0.7 to 1.2	2 to 3.0	18 to 20	13 to 15	—	—	—	—	—	—	Balance	—
EI-332.....	<0.25	2.0	<1.0	24 to 27	19 to 22	—	—	—	—	—	—	Balance	—
EYa-3S.....	0.30 to 0.40	2.0	2 to 3.0	16 to 20	23 to 27	—	—	—	—	—	—	Balance	—
EI-69.....	0.40 to 0.50	<0.7	0.3 to 0.8	13 to 15	13 to 15	—	0.25 to 0.40	2.0 to 2.8	—	—	—	Balance	—
EI-240.....	0.40 to 0.50	<0.7	2.7 to 3.3	13 to 15	13 to 15	—	<0.5	2.0 to 2.8	—	—	—	Balance	—
EI-203.....	0.35 to 0.45	3 to 5	1.4 to 1.8	13 to 15	—	—	—	2.0 to 2.8	—	—	—	Balance	—
EI-310.....	0.35 to 0.45	4 to 6	1.0 to 1.6	17 to 20	3.0 to 7.0	—	—	0.8 to 1.0	—	—	—	Balance	—
EI-312.....	0.35 to 0.45	3 to 5	1.4 to 2.2	17 to 20	5.0 to 7.0	—	—	—	—	—	—	Balance	—

^b From IRON AGE, March 19, 1953, p. 138.