MACHINABILITY RATINGS			MACHINABILITY RATINGS		
Material	Speed Surface ft/min	Speed % of B1112	Material	Speed Surface ft/min	Speed % of B1112
AISI B1112	165	100	Nitronic 50 Annealed	35	21
Hast X	30	18	Nitronic 50 HS Lvl 1	34	21
C-276	40	18	Nitronic 50 HS Lvl 2	32	19
B-2	35	21	Nitronic 50 HS Lvl 3	30	18
C-22 TM	50	30	Nitronic 50 HS Lvl 4	28	17
HR-120 TM	40	25	Nitronic 50 HS Lvl 5	25	15
20Cb-3 TM	65	40	Nitronic 60 Annealed	40	24
AL6XN TM	65	40	Nitronic 60 HS Lvl 1	38	23
A-286 Annealed	54	32	Nitronic 60 HS Lvl 2	36	22
A-286 Aged	30	18	Nitronic 60 HS Lvl 3	32	19
Nickel 200 Annealed	65	40	Nitronic 60 HS Lvl 4	28	17
Nickel 200 Cold Drawn	110	66	Nitronic 60 HS Lvl 5	25	15
Monel 400 Annealed/SR	60	36	Nitronic 30	30	18
Monel 400 Cold Drawn	80	48	Nitronic 40	40	24
Monel R405 Annealed/SR	60	36	Ti 6Al-4V soln annealed	40	25
Monel R405 Cold Drawn	80	48	Ti 6Al-4V aged	30	18
Monel K500 CW/HW	50	30	309	70	42
Monel K500 Annealed	60	36	310	70	42
Monel K500 Aged	40	25	304	75	45
600 Annealed	50	22	316	75	36
600 Cold Drawn	65	39	321	75	45
625	40	24	446	75	45
718 Annealed	40	24	303	100	60
718 Aged	20	12	416	145	88
825	20	12	17-4 PH soln treated	75	45
X-750 Equalized	40	24	17-4 PH aged	60	36
X-750 Aged	20	12	Rene 41	12	7
25 (L-605)	35	21	HAYNES TM 188	15	9
L605 Cold Worked	15	9	Waspaloy Annealed	45	20
MP 35N CW	45	20	Waspaloy Aged	20	12
MP 35N CW & Aged	20	12	MP 159	45	20

These machinability ratios must be recognized as approximate values. They are a reasonable guide to relative tool life and lower required for cutting. It is obvious, however, that variables of speed, cutting oil, feed and depth of cut will significantly affect these ratios.

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NITRONIC is a Trademark of AK Steel
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RENE is a Trademark of
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The speeds are for single point turning operations using high speed steel tools. This information is provided as a guide to relative machinability. Higher speeds are used with carbide tooling.

The alloys described here work harden rapidly during machining and require more power to cut than do the plain carbon steels. The metal is ‘gummy,’ with chips that tend to be stringy and tough. Machine tools should be rigid and used to no more than 75% of their rated capacity. Both work piece and tool should be held rigidly; tool overhang should be minimized. Rigidity is particularly important when machining titanium, as titanium has a much lower modulus of elasticity than either steel or nickel alloys. Slender work pieces of titanium tend to deflect under tool pressures causing chatter, tool rubbing and tolerance problems.

Make sure that tools are always sharp. Change to sharpened tools at regular intervals rather than out of necessity. Titanium chips in particular tend to gall and weld to the tool cutting edges, speeding up tool wear and failure. Remember- cutting edges, particularly throw-away inserts, are expendable. Don't trade dollars in machine time for pennies in tool cost.

Feed rate should be high enough to ensure that the tool cutting edge is getting under the previous cut thus avoiding work-hardened zones. Slow speeds are generally required with heavy cuts. Sulfur chlorinated petroleum oil lubricants are suggested for all alloys but titanium. Such lubricants may be thinned with paraffin oil for finish cuts at higher speeds. The tool should not ride on the work piece as this will work harden the material and result in early tool dulling or breakage. Use an air jet directed on the tool when dry cutting, to significantly increase tool life.

Lubricants or cutting fluids for titanium should be carefully selected. Do not use fluids containing chlorine or other halogens (fluorine, bromine or iodine) in order to avoid risk of corrosion problems and contamination.