

Speeds and Feeds



- 1) Select your material in the ISO colored chart with respect to material description and hardness (HRC).
- 2) Start with a middle/average value for spindle speed, n (RPM) and feed rate, V_f (mm/min). Adjust the spindle speed and/or feed rate based on your cutting conditions.

Insert Grade – **HTM1**

Material			Recommended Cutting Values									
Group	Description	Width of Cut, a _e	Depth of Cut, a _p	Parameter	Tool Diameter (mm)							
					8 Ø	10, 11 Ø	12, 13 Ø	16, 17 Ø	20, 21 Ø	25, 26 Ø	30, 32, 33 Ø	
ISO	VDI 3323			Number of Flutes	2	2	2	2	2	2	2	
P	1-4 < HRc 30	Non-Alloyed Steel		V _c	160 - 320	160 - 360	160 - 380	160 - 480	160 - 580	160 - 600	160 - 700	
				f _z	0.20 - 0.20	0.20 - 0.20	0.20 - 0.20	0.25 - 0.30	0.25 - 0.40	0.25 - 0.50	0.25 - 0.60	
				n	6370 - 12730	5090 - 11460	4240 - 10080	3180 - 9550	2550 - 9230	2040 - 7640	1700 - 7430	
				V _f	2550 - 5090	2040 - 4580	1700 - 4030	1590 - 5730	1270 - 7380	1020 - 7640	850 - 8910	
	5 > HRc 30	Non-Alloyed Steel			V _c	120 - 280	120 - 300	120 - 350	120 - 380	120 - 420	120 - 480	120 - 550
					f _z	0.20 - 0.20	0.20 - 0.20	0.20 - 0.20	0.25 - 0.30	0.25 - 0.40	0.25 - 0.50	0.25 - 0.60
					n	4770 - 11140	3820 - 9550	3180 - 9280	2390 - 7560	1910 - 6680	1530 - 6110	1270 - 5840
					V _f	1910 - 4460	1530 - 3820	1270 - 3710	1190 - 4540	950 - 5350	760 - 6110	640 - 7000
	6-7 < HRc 30	Low-Alloyed Steel			V _c	160 - 320	160 - 360	160 - 380	160 - 480	160 - 580	160 - 600	160 - 700
					f _z	0.20 - 0.20	0.20 - 0.20	0.20 - 0.20	0.25 - 0.30	0.25 - 0.40	0.25 - 0.50	0.25 - 0.60
					n	6370 - 12730	5090 - 11460	4240 - 10080	3180 - 9550	2550 - 9230	2040 - 7640	1700 - 7430
					V _f	2550 - 5090	2040 - 4580	1700 - 4030	1590 - 5730	1270 - 7380	1020 - 7640	850 - 8910
8 > HRc 30	Low-Alloyed Steel			V _c	120 - 280	120 - 300	120 - 350	120 - 380	120 - 420	120 - 480	120 - 550	
				f _z	0.20 - 0.20	0.20 - 0.20	0.20 - 0.20	0.25 - 0.30	0.25 - 0.40	0.25 - 0.50	0.25 - 0.60	
				n	4770 - 11140	3820 - 9550	3180 - 9280	2390 - 7560	1910 - 6680	1530 - 6110	1270 - 5840	
				V _f	1910 - 4460	1530 - 3820	1270 - 3710	1190 - 4540	950 - 5350	760 - 6110	640 - 7000	
M	12-14	Stainless Steel		V _c	100 - 300	100 - 320	100 - 350	100 - 400	100 - 400	100 - 450	100 - 450	
				f _z	0.102 - 0.152	0.152 - 0.203	0.152 - 0.203	0.254 - 0.305	0.305 - 0.356	0.305 - 0.356	0.305 - 0.356	
				n	4009 - 12028	3341 - 10696	2506 - 8771	2005 - 8019	1671 - 6682	1253 - 5638	1002 - 4511	
				V _f	815 - 3666	1018 - 4347	764 - 3564	1018 - 4888	1018 - 4753	764 - 4010	611 - 3208	

NOTE: It is recommended to use a carbide shank holder when the length of overhang exceeds 4XD.

It is recommended to reduce feed rates by 70% to 85% of the values in the chart when the length to diameter ratio exceeds 3 to 1.

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Feed Rate, Per Revolution (mm/min)
$v_f = f_n \cdot n$

Feed Rate, Per Tooth (mm/min)
$v_f = f_z \cdot n \cdot Z$

Feed Per Revolution (mm/rev)
$f_n = \frac{v_f}{n}$

Feed Per Tooth (mm)
$f_z = \frac{v_f}{n \cdot Z}$

Cutting Speed (m/min)
$v_c = \frac{\pi \cdot D_{tool} \cdot n}{1000}$

Spindle Speed (rev/min)
$n = \frac{v_c \cdot 1000}{\pi \cdot D_{tool}}$

Material Removal Rate (mm ³ /min)
$MMR = \frac{a_p \cdot a_e \cdot v_f}{1000}$

Metric

Symbol	Definition	Unit
v_f	Feed rate	mm/min
f_n	Feed per revolution	mm/rev
f_z	Feed per tooth	mm
v_c	Cutting speed	m/min (SMM)
n	Spindle speed	rev/min (RPM)
D_{tool}	Tool cutting diameter	mm
MMR	Material removal rate	(mm ³ /min)
a_e	Radial depth of cut	mm
a_p	Axial depth of cut	mm
Z	Number of teeth/flutes	