ACE Hardware Zimbabwe

Cutting Speeds, Feeds & Insert Guide

Starting cutting speeds and feeds for turning, drilling and milling, an rpm table and how to read ISO insert codes.

Workshop Reference Charts
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Cutting speeds

Cutting speed Vc in metres per minute (starting values)

Material	Hardness	Turning HSS	Turning carbide	Drilling HSS	Milling carbide
Free-cutting / mild steel	< 200 HB	30 - 40	180 - 280	25 - 35	150 - 250
Medium carbon & alloy steel	200 - 300 HB	18 - 25	120 - 200	15 - 22	100 - 180
Tool steel, pre-hardened	300 - 400 HB	8 - 12	60 - 120	8 - 12 (HSS-Co)	60 - 110
Stainless, austenitic (304/316)	< 250 HB	12 - 20	100 - 180	8 - 12 (HSS-Co)	90 - 160
Grey cast iron	150 - 250 HB	18 - 30	90 - 160	18 - 25	90 - 180
Aluminium alloys	-	100 - 250	300 - 800	60 - 100	300 - 1000
Brass, bronze	-	50 - 90	150 - 300	40 - 60	150 - 300
Copper	-	40 - 70	150 - 250	30 - 50	150 - 250
Plastics (nylon, acetal)	-	60 - 150	150 - 400	30 - 60	150 - 400

Start at the lower value and increase if the tool and finish allow. Reduce speed for interrupted cuts, long overhangs, weak set-ups or no coolant. HSS-Co = cobalt HSS.

Spindle speed table

Spindle speed (rev/min) for diameter and cutting speed Vc (m/min)

Ø mm	10	15	20	25	30	40	60	80	100	150	200	300
3	1060	1590	2120	2650	3180	4240	6370	8490	10610	15920	21220	31830
5	640	950	1270	1590	1910	2550	3820	5090	6370	9550	12730	19100
6	530	800	1060	1330	1590	2120	3180	4240	5310	7960	10610	15920
8	400	600	800	990	1190	1590	2390	3180	3980	5970	7960	11940
10	320	480	640	800	950	1270	1910	2550	3180	4770	6370	9550
12	270	400	530	660	800	1060	1590	2120	2650	3980	5310	7960
16	200	300	400	500	600	800	1190	1590	1990	2980	3980	5970
20	160	240	320	400	480	640	950	1270	1590	2390	3180	4770
25	130	190	250	320	380	510	760	1020	1270	1910	2550	3820
32	99	150	200	250	300	400	600	800	990	1490	1990	2980
40	80	120	160	200	240	320	480	640	800	1190	1590	2390
50	64	95	130	160	190	250	380	510	640	950	1270	1910
63	51	76	100	130	150	200	300	400	510	760	1010	1520
80	40	60	80	99	120	160	240	320	400	600	800	1190
100	32	48	64	80	95	130	190	250	320	480	640	950
125	25	38	51	64	76	100	150	200	250	380	510	760

- `n = 1000 × Vc ÷ (π × D)` spindle speed, rev/min
- `Vc = π × D × n ÷ 1000` cutting speed, m/min
- `Vf = fz × z × n` milling table feed, mm/min (z = number of teeth)
- `Vf = f × n` drilling / turning feed rate, mm/min

Feeds

Drilling feed (mm/rev, HSS)

Drill Ø mm	Steel, cast iron	Aluminium, brass
1 - 3	0.02 - 0.06	0.04 - 0.10
3 - 6	0.06 - 0.12	0.08 - 0.18
6 - 10	0.10 - 0.18	0.15 - 0.25
10 - 16	0.15 - 0.25	0.20 - 0.35
16 - 25	0.20 - 0.32	0.30 - 0.45

Turning feed (carbide, steel)

Operation	Feed mm/rev	Depth of cut mm
Roughing	0.25 - 0.50	2 - 6
General	0.15 - 0.30	1 - 3
Finishing	0.05 - 0.15	0.2 - 1

Milling feed per tooth fz (mm, carbide)

End mill Ø mm	fz steel	fz aluminium
3	0.010 - 0.020	0.02 - 0.04
6	0.020 - 0.040	0.04 - 0.07
10	0.030 - 0.060	0.06 - 0.10
16	0.050 - 0.080	0.08 - 0.14
20	0.060 - 0.100	0.10 - 0.18

Indexable inserts

ISO 1832 turning insert code

Position	Example C N M G 12 04 08	Meaning
1	C	Shape: C 80° rhombic, D 55° rhombic, R round, S square, T triangle, V 35° rhombic, W 80° trigon
2	N	Clearance angle: N 0° (negative insert), B 5°, C 7°, P 11°, E 20°
3	M	Tolerance class: G precision ground, M moulded (most common)
4	G	Hole and chipbreaker: N none, R chipbreaker one side, M hole + one side, G hole + both sides, A hole only
5	12	Cutting edge length in mm (12 = 12.7 mm inscribed circle on C/S/T)
6	04	Thickness: 02 = 2.38, 03 = 3.18, 04 = 4.76, 06 = 6.35 mm
7	08	Corner radius: 04 = 0.4, 08 = 0.8, 12 = 1.2 mm
8 +	e.g. -PM	Maker's chipbreaker and grade code

ISO material groups

Group	Colour	Materials
P	Blue	Steel, cast steel
M	Yellow	Stainless steel
K	Red	Cast iron
N	Green	Aluminium, copper, non-ferrous
S	Brown	Heat-resistant alloys, titanium
H	Grey	Hardened steel

Guide values for general workshop use. Always follow the equipment or fastener maker's figure where one is given, and check critical work against the relevant standard.

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