Recommended Cutting Conditions

Recommended cutting conditions for GEN3

Work material	Hardness	Recommended material grade	Cutting speed (m/min)		Cutting feed rate (mm/rev)								
			AM200	AM300	ϕ11.00 ~ ϕ11.99	ϕ12.00 ~ ϕ12.99	ϕ13.00 ~ ϕ13.99	ϕ14.00 ~ ϕ14.99	ϕ15.00 ~ ϕ15.99	ϕ16.00 ~ ϕ16.99	ϕ17.00 ~ ϕ17.99	ϕ18.00 ~ ϕ19.99	ϕ20.00 ~ ϕ21.99
Free-cutting steel	100 ~ 150	K35	146	168	0.28	0.30	0.33	0.36	0.38	0.41	0.43	0.48	0.53
	150 ~ 200	K35	127	145	0.25	0.28	0.30	0.33	0.36	0.38	0.41	0.43	0.48
	200 ~ 250	K35	119	130	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.41	0.46
Low carbon steel S10C ~ S25C	85 ~ 125	K35	137	158	0.28	0.30	0.33	0.36	0.38	0.41	0.43	0.48	0.53
	125 ~ 175	K35	119	137	0.25	0.28	0.30	0.33	0.36	0.38	0.41	0.46	0.48
	175 ~ 225	K35	108	125	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.46
	225 ~ 275	K35	95	107	0.18	0.20	0.23	0.25	0.28	0.30	0.33	0.38	0.41
Medium carbon steel S30C ~ S50C	125 ~ 175	K35	119	137	0.25	0.28	0.30	0.33	0.36	0.38	0.41	0.46	0.51
	175 ~ 225	K35	108	125	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.48
	225 ~ 275	K35	95	107	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.41	0.46
	275 ~ 325	K35	81	91	0.18	0.20	0.23	0.25	0.28	0.30	0.33	0.38	0.41
Alloy steel SCr, SCM	125 ~ 175	K35	114	126	0.25	0.28	0.30	0.33	0.36	0.38	0.41	0.46	0.51
	175 ~ 225	K35	105	116	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.48
	225 ~ 275	K35	95	104	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.41	0.46
	275 ~ 325	K35	87	94	0.15	0.18	0.20	0.23	0.25	0.28	0.30	0.36	0.38
	325 ~ 375	K35	78	85	0.15	0.15	0.18	0.20	0.23	0.25	0.28	0.33	0.36
Alloy steel SNCM	225 ~ 300	K35	70	76	0.20	0.23	0.25	0.28	0.28	0.30	0.33	0.36	0.38
	300 ~ 350	K35	63	69	0.15	0.18	0.20	0.23	0.25	0.28	0.28	0.30	0.33
	350 ~ 400	K35	56	61	0.13	0.15	0.18	0.20	0.23	0.25	0.25	0.28	0.30
Structural steel SS, SM	100 ~ 150	K35	108	125	0.25	0.28	0.30	0.33	0.33	0.38	0.38	0.43	0.48
	150 ~ 250	K35	87	101	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.43
	250 ~ 350	K35	81	93	0.18	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.38
Heat-resistant alloy Hastelloy, Inconel	140 ~ 220	K20	37	40	0.15	0.18	0.18	0.20	0.20	0.23	0.23	0.25	0.28
	220 ~ 310	K20	29	30	0.13	0.15	0.15	0.18	0.18	0.20	0.20	0.23	0.25
Stainless steel SUS	135 ~ 185	K35	64	67	0.10	0.13	0.13	0.15	0.15	0.18	0.18	0.20	0.20
	185 ~ 275	K35	47	49	0.08	0.10	0.10	0.13	0.13	0.15	0.15	0.18	0.18
Tool steel SKD	150 ~ 200	K35	78	81	0.15	0.18	0.18	0.20	0.20	0.23	0.23	0.25	0.28
	200 ~ 250	K35	59	62	0.13	0.15	0.15	0.18	0.18	0.20	0.20	0.23	0.25
Cast iron FC, FCD	120 ~ 150	K20	152	175	0.30	0.33	0.36	0.38	0.41	0.43	0.48	0.53	0.56
	150 ~ 200	K20	146	168	0.28	0.30	0.33	0.36	0.38	0.41	0.46	0.51	0.53
	200 ~ 220	K20	131	151	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.48	0.51
	220 ~ 260	K20	113	130	0.23	0.25	0.28	0.30	0.33	0.36	0.41	0.46	0.48
	260 ~ 320	K20	102	116	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.46
Forging aluminum	30	K20	425	488	0.33	0.38	0.40	0.43	0.45	0.48	0.50	0.55	0.58
	180	K20	300	351	0.30	0.35	0.38	0.40	0.43	0.45	0.48	0.50	0.55
Cast alminum	30	K20	300	351	0.30	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.50
	180	K20	225	262	0.28	0.30	0.33	0.35	0.38	0.40	0.43	0.45	0.48
Titanium alloy	140 ~ 220	K20	42	43	0.13	0.15	0.17	0.20	0.20	0.22	0.22	0.25	0.28
	220 ~ 310	K20	33	34	0.10	0.12	0.15	0.17	0.17	0.20	0.20	0.22	0.25

Recommended cutting conditions by holder length

Holder type	1D ~ 5D	7D
Cutting speed	Recommended value	Recommended value × 0.8
Cutting feed rate	Recommended value	Recommended value × 0.8

⚠ If non-water soluble oil coolant is used, there may be risks of flashing or fire due to heat resulting from the chips or tool breakage (heat generated from friction between the broken tool and work piece being cut) during machining.

Cutting feed rate (mm/rev)				
φ22.00 ~ φ23.99	φ24.00 ~ φ25.99	φ26.00 ~ φ28.99	φ29.00 ~ φ31.99	φ32.00 ~ φ35.00
0.56	0.58	0.61	0.64	0.66
0.51	0.53	0.56	0.58	0.61
0.48	0.51	0.53	0.56	0.58
0.56	0.58	0.61	0.64	0.66
0.51	0.53	0.56	0.58	0.61
0.48	0.51	0.53	0.56	0.58
0.43	0.46	0.48	0.51	0.53
0.53	0.56	0.58	0.61	0.64
0.51	0.53	0.56	0.58	0.61
0.48	0.51	0.53	0.56	0.58
0.43	0.46	0.48	0.51	0.53
0.53	0.56	0.58	0.61	0.64
0.51	0.53	0.56	0.58	0.61
0.48	0.51	0.53	0.56	0.58
0.41	0.43	0.46	0.48	0.51
0.38	0.41	0.43	0.46	0.48
0.41	0.43	0.46	0.48	0.51
0.36	0.38	0.41	0.43	0.46
0.33	0.36	0.38	0.41	0.43
0.53	0.56	0.58	0.61	0.64
0.48	0.51	0.53	0.56	0.58
0.43	0.48	0.51	0.52	0.56
0.28	0.30	0.30	0.33	0.36
0.25	0.28	0.28	0.30	0.33
0.23	0.23	0.25	0.25	0.28
0.20	0.20	0.23	0.23	0.25
0.30	0.33	0.36	0.38	0.41
0.28	0.30	0.33	0.36	0.38
0.58	0.61	0.64	0.66	0.69
0.56	0.58	0.61	0.64	0.66
0.53	0.56	0.58	0.61	0.64
0.51	0.53	0.56	0.58	0.61
0.48	0.51	0.53	0.56	0.58
0.61	0.66	0.68	0.74	0.76
0.58	0.63	0.66	0.71	0.74
0.53	0.56	0.58	0.61	0.64
0.51	0.53	0.56	0.58	0.58
0.28	0.30	0.30	0.33	0.33
0.25	0.28	0.28	0.30	0.30

Recommended coolant pressure and supply

● ~ 5D Holder

Insert cutting edge dia. (mm)	Coolant pressure (MPa)	Coolant supply rate (L/min)
11.00 ~ 13.99	3.5	19
14.00 ~ 15.99	3.1	23
16.00 ~ 17.99	2.8	30
18.00 ~ 19.99	2.5	34
20.00 ~ 21.99	2.1	38
22.00 ~ 25.99	2.1	42
26.00 ~ 35.00	2.1	46

Note) Please multiply above by 1.5 when using 7D holder.

Clamping screws and the corresponding screwdrivers

Size Series	Insert cutting edge dia. (mm)	Allowable tightening torque for clamping screws (N・cm)	Clamping screw	Stock	Screw driver	Stock
11	11.00 ~ 11.99	50	71843-IP6-10	●	8IP-6	●
12 ~ 15	12.00 ~ 15.99	84	7247-IP7-10	●	8IP-7	●
16	16.00 ~ 16.99	175	72556-IP8-10	●	8IP-8	●
17	17.00 ~ 17.99	175	72567-IP8-10	●		
18	18.00 ~ 21.99	305	7375-IP9-10	●	8IP-9	●
22 ~ 24	22.00 ~ 25.99	305	739-IP9-10	●		
26 ~ 32	26.00 ~ 35.00	690	7495-IP15-10	●	8IP-15	●

Note) *The tightening torque is calculated by using 0.14 as the coefficient of friction (μ = 0.14) and 90% of the yield point.
Ten clamping screws are supplied in a case. Please order by the case.

Troubleshooting Guide for GEN3

Q1 Drill under the recommended cutting parameters, but the chip comes long.
A1 Increase the cutting speed by 10% ~ 30% (Max.)

Q2 Re-grinding and Re-coating are possible ?
A2 NTK doesn' t recommend it because the performance will go down.

Q3 What is the accuracy of the machined hole ?
A3 Around 0 ~ +0.05mm vs. the insert diameter.

Q4 Insert broke in early stage.
A4 Low coolant pressure, long chip, runout of spinde, etc may be the reasons.
Please check the factors above.

Q5 Is it possible to make deep holes more than 7D ?
A5 As a made-to-order, we can provide long holders until 12D Max.
Long holder more than 7D require pre hole as a guide role.

Q6 External coolant supply is acceptable ?
A6 Recommend Max.1D for vertical machine, 2D for horizontal machine. Reduce cutting speed by 30%.

Q7 Core (spot) drill is necessary ?
A7 No need when the surface is pre machined. If the surface is scale, need core (spot) drill with angle over 140 degrees.

Setup condition	Potentional problem: Accelerated corner wear	Barbar pole	Bell mouth hole	Blade chipping	Blue chips	Build up edge	Chatter	Chip packing	Chipping of point	Damaged or broken tools	Excessive margin wear	High flank wear	Hole lead off	Hole out of position	Hole out of round	Oversize hole	Poor hole finish	Poor tool life	Power spikes - Load meter	Retract spiral	Action required
Worn is mis-aligned spindle	●		●				●		●	●	●		●			●	●			●	・Repair and Align spindle.
Use of low rigidity machine tools		●	●	●			●		●	●			●	●						●	・Reduce machining speed or feed to fall within physical limits of machine or setup (Do not reduce feed below threshold of good chip formation).
Poor workpiece support		●		●			●			●	●				●		●			●	・Provide additional support for workpiece. ・Reduce machining speed or feed rate to fall within physical limits of machine or setup.
Low coolant pressure or volume	●				●	●		●		●		●				●	●	●	●		・Increase coolant pressure and volume. ・Reduce machining speed or feed rate to fall within physical limits of machine or setup.
Interrupted cuts. Entry or exit surfaces are not perpendecular to the spindle.				●			●		●	●	●		●	●	●	●	●	●			・Pre-mill (spot face) entry or exit surface to remove interruption. ・Decrease feed as much as 50% through entry or exit interruption. ・Use short holders in low impact entry cuts.
Material harder than expected	●				●	●				●		●						●			・Reduce speed. ・Increase coolant pressure and volume.
Poor material micro-structure of foreign particle				●		●				●		●	●					●			・Check the material micro-structure. ・Reduce feed.
Poor chip control								●		●	●		●			●	●	●	●		・Increase feed to recommended levels. ・Increase coolant pressure and volume.
Spot drilled holes with included angle less than GEN3 insert	●			●			●						●					●			・Spot hole with short tool of same angle. ・Reduce feed.