RECOMMENDED CUTTING CONDITIONS

CUTTING SPEED

	Work Material	Hardness	Insert Grade 1st Recommenedation	Insert Grade 2nd Recommenedation	Breaker		Cutting Width **ae** (inch) ≤.25DC	.25—.5DC	.5—.75DC	DC (Slot)
							Cutting Speed **vc** (SFM)			
P	Mild Steel	≤180HB	MP6120	VP15TF	M	H	755(590—885)	720(560—850)	590(460—690)	590(460—690)
			MP6130	VP20RT	M	H	655(490—785)	620(460—755)	490(360—590)	490(360—590)
	Carbon Steel Alloy Steel	180—350HB	MP6120	VP15TF	M	H	590(460—690)	560(430—655)	460(360—525)	460(360—590)
			MP6130	VP20RT	M	H	490(360—590)	460(330—560)	360(260—425)	360(260—425)
M	Stainless Steel	≤270HB	MP7130	VP20RT	M	H	590(460—690)	560(425—655)	460(360—525)	460(360—525)
K	Gray Cast Iron	≤350MPa	MC5020	VP15TF	H		820(655—985)	785(620—950)	690(525—850)	460(360—525)
	Ductile, Cast Iron	≤800MPa	MC5020	VP15TF	H		425(330—490)	395(295—460)	330(260—395)	330(260—395)
S	Titanium Alloy	≤350HB	MP9120	VP15TF	H	M	165(130—230)			165(130—230)
			MP9130	VP20RT	H	M	130(100—195)			130(100—195)
	Heat-resistant Alloy	—	MP9120	VP15TF	H	M	130(100—195)			130(100—195)
			MP9130	VP20RT	H	M	100(65—130)			100(65—130)
H	Hardened Steel	40—55HRC	VP15TF		H		295(230—330)	280(195—330)	230(165—260)	230(165—260)

DEPTH OF CUT / FEED PER TOOTH

	Work Material	Hardness	Cutting Width **ae** (inch)	Depth of Cut **ap** (inch)	Feed per Tooth **fz** (IPT) Cutter Diameter (inch) ϕ.750"—ϕ1.500"(ϕ25—ϕ40mm)	ϕ2.000"—ϕ3.000"(ϕ50—ϕ80mm)	ϕ4.000"(ϕ100—ϕ160mm)
P	Mild Steel Carbon Steel Alloy Steel	≤180HB 180—350HB	≤.5DC	≤.197	.012	.012	.010
				.197—.295	.010	.010	.008
				.295—.394	.008	.008	.006
				.394—.492	.006	.006	.004
				.492—.591	.004	.004	.003
			.5—.75DC	≤.197	.008	.008	.006
				.295—.394	.006	.006	.004
				.394—.591	.004	.004	.003
			DC (Slot)	≤.197	.006	.006	.006
				.197—.295	.004	.004	.004
				.295—.394	.003	.003	.003
M	Stainless Steel	≤270HB	≤.5DC	≤.197	.012	.010	.010
				.197—.295	.010	.008	.008
				.295—.394	.008	.006	.006
				.394—.492	.006	.004	.004
				.492—.591	.004	.003	.003
			.5—.75DC	≤.197	.008	.006	.006
				.295—.394	.006	.004	.004
				.394—.591	.004	.003	.003
			DC (Slot)	≤.197	.006	.006	.006
				.197—.295	.004	.004	.004
				.295—.394	.003	.003	.003
K	Gray Cast Iron	Tensile Strength ≤350MPa	≤.5DC	≤.197	.012	.012	.010
				.197—.295	.010	.010	.008
				.295—.394	.008	.008	.006
				.394—.492	.006	.006	.004
				.492—.591	.004	.004	.003
			.5—.75DC	≤.197	.008	.008	.006
				.197—.394	.006	.006	.004
				.394—.591	.004	.004	.003
			DC (Slot)	≤.197	.006	.006	.006
				.197—.295	.004	.004	.004
				.295—.394	.003	.003	.003
	Ductile, Cast Iron	Tensile Strength ≤800MPa	≤.5DC	≤.197	.010	.010	.010
				.197—.295	.008	.008	.008
				.295—.394	.006	.006	.006
				.394—.492	.004	.004	.004
				.492—.591	.003	.003	.003
			.5—.75DC	≤.197	.008	.008	.006
				.197—.394	.006	.006	.004
				.394—.591	.004	.004	.003
			DC (Slot)	≤.197	.006	.006	.006
				.197—.295	.004	.004	.004
				.295—.394	.003	.003	.003

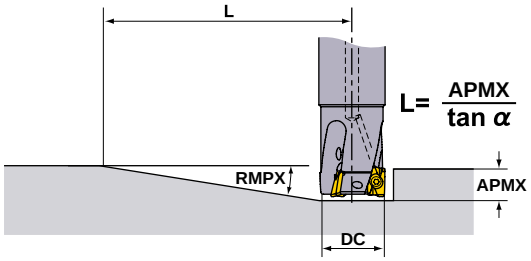
	Work Material	Hardness	Cutting Width **ae** (inch)	Depth of Cut **ap** (inch)	Feed per Tooth **fz** (IPT) Cutter Diameter (inch)		
					ϕ.750"–ϕ1.500"(ϕ25–ϕ40mm)	ϕ2.000"–ϕ3.000"(ϕ50–ϕ80mm)	ϕ4.000"(ϕ100–ϕ160mm)
S	Titanium Alloy	≤350HB	≤.25DC	≤.197	.006	.004	.004
				.197–.295	.004	.002	.002
				.295–.394	.002	–	–
			DC (Slot)	≤.197	.002	.002	.002
	Heat-resistant Alloy	–	≤.25DC	≤.079	.004	.002	.002
			DC (Slot)	≤.039	.002	.002	.002
H	Hardened Steel	40–55HRC	≤.25DC	≤.197	.006	.006	.006
				.197–.295	.004	.004	.004
				.295–.394	.003	.003	.003
			.25–.5DC	≤.197	.004	.004	.004
				.197–.295	.003	.003	.003
			.5–.75DC	≤.197	.003	.003	.003
			DC (Slot)	≤.197	.003	.003	.003

(Note 1) These cutting conditions are a guide to the standard shank type and the arbor type.
Please make adjustments according to the machining conditions.
(Note 2) Vibration is liable to occur in certain cases. Please reduce the depth of cut and / or reduce cutting conditions in the following cases.
- When using the long shank type and extra long shank type.
- When using long tool overhang with the standard or arbor type.
- When the application has poor clamping rigidity or when using a low rigidity machine.

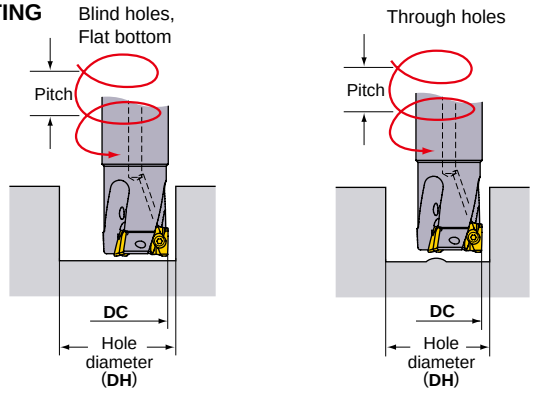
(Note 3) In case of coarse and fine pitch cutters, the coarse pitch type is recommended to prevent vibration.
(Note 4) For heavy interrupted and unstable cutting, the H breaker is first recommendation.

RAMPING/HELICAL CUTTING

RAMPING



HELICAL CUTTING



Refer to the table below when using .031 inch radius for maximum ramping angle, pitch and minimum/maximum hole diameter. Use cutting conditions for slotting to calculate speed and feed when ramping / helical cutting.

Cutting Edge Diameter **DC** (inch)	Ramping		Helical Cutting (Blind Hole, Flat Bottom)				Helical Cutting (Through Hole)	
	Maximum Ramping Angle **RMPX**	Minimum Distance [1] **L** (inch)	Maximum Hole Diameter [2] **DH max.** (inch)	Maximum Pitch **P max.** (inch)	Minimum Hole Diameter **DH min.** (inch)	Maximum Pitch **P max.** (inch)	Minimum Hole Diameter **DH min.** (inch)	Maximum Pitch **P max.** (inch)
.750	14°	2.7	1.42	.51	1.31	.43	.80	.019
1.000	11°	3.4	1.92	.55	1.81	.47	1.30	.157
1.250	7°	5.4	2.42	.43	2.31	.39	1.80	.196
1.500	7°	5.4	2.92	.51	2.81	.47	2.30	.275
2.000	4°	9.4	3.92	.39	3.81	.39	3.30	.275
2.500	2°	18.8	4.92	.23	4.81	.23	4.30	.157
3.000	2°	18.8	5.92	.31	5.81	.27	5.30	.236
4.000	1.5°	25.1	7.92	.31	7.81	.27	7.30	.236

(Note 1) L(=.591"/tanα). Cutters' moving distance until depth of cut reaches .591" at a maximum ramping angle.
(Note 2) In case corner radius of .031". Other than that, find with the below formula.
{(cutting edge diameter DC) - (corner radius) - .008"} x 2
(Note 3) When machining highly ductile materials with ramping angles above, chips could be continuous.
In this case, decrease the ramping angle or feed per tooth.