MOLDINO
The Edge To Innovation

Chamfering Tool for Hardened Steels

DN2HC-ATH

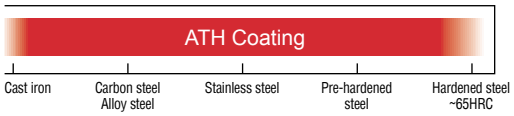
MOLDINO Tool Engineering, Ltd.
New Product News | No.1904E-8 | 2023-11

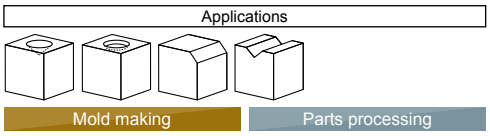
Allows numerically controlled (NC) automated centering and chamfering. Long tool life even when machining hardened steel

Features of DN2HC-ATH

01 Thinning provides good biting properties.
High chipping resistance due to the blunt-angled tip
Optimized edge shape for outstanding cutting capabilities and high chipping resistance

02 ATH Coating provides long tool life, even with hardened steel.





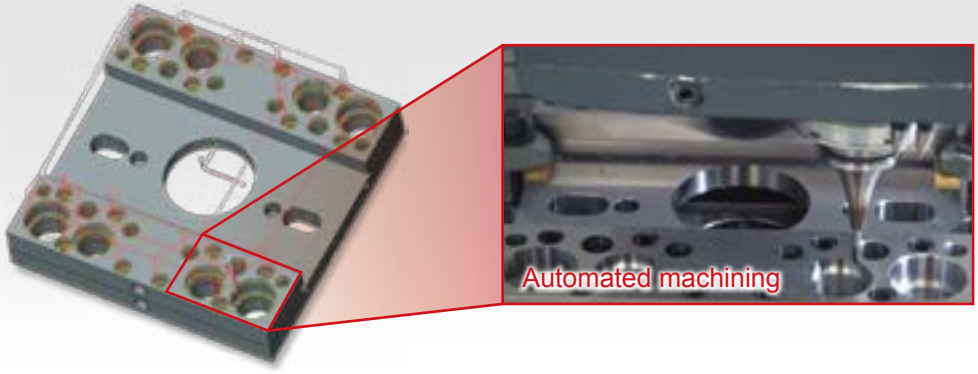
DN2HC-ATH
ϕ3～ϕ16 [72 Items]

Task

A wide range of chamfering is required for molds and parts, which are often processed manually.
In addition, few chamfering tools are available for hardened steel.

Proposal

Using DN2HC allows NC automated machining, reducing manual processing time.
Compatible with a wide range of steel types ranging from soft steel to hardened steel; provides long tool life and quality processed surfaces.

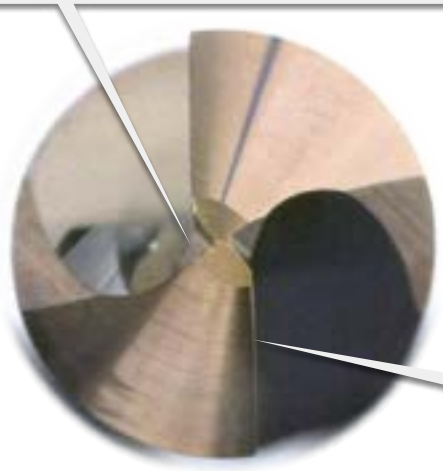


This is Point!

Edge shape offers high chipping resistance and outstanding cutting capabilities to suppress burr generation and achieve automated and stable machining.

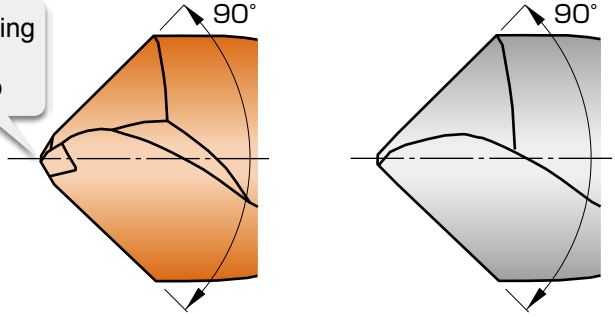
Features 01 Employs blunt-angled tip and thinning for optimized edge shape.

Good biting properties by thinning



Resistant to chipping due to the blunt-angled tip

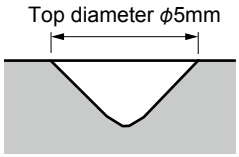
DN2HC-ATH | Conventional chamfering tool



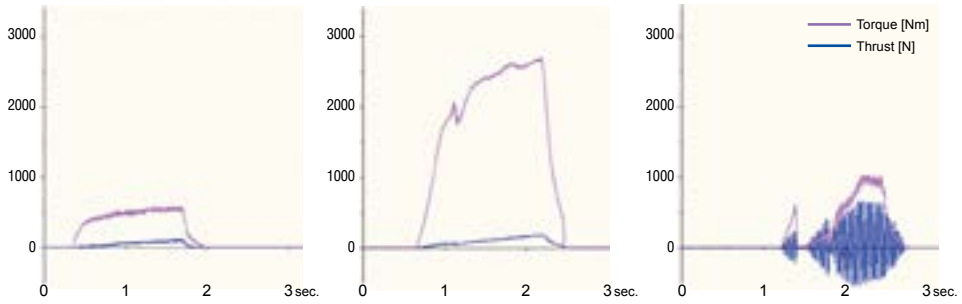
Optimized edge shape for outstanding cutting capabilities and high chipping resistance

Cutting conditions

Tool：DN2HC0600-ATH (ϕ6)
Work material : Steel for plastic molds (53HRC)
Machine : Vertical MC (HSK-A63)
vc=30m/min *n*=1,592min^{-1}
f=0.06mm/rev *vf*=95mm/min
Coolant : Water base coolant (External)



DN2HC-ATH | Conventional A | Conventional B



Low torque and thrust | Torque rising | Waveform disturbance caused by defect

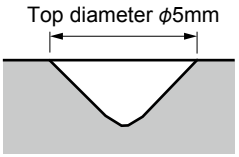
Features 02 Adopts ATH Coating

Long tool life even with hardened steel

- Hardness and oxidation resistance of TH Coating is further improved. Enables longer life and higher efficient when cutting high-hardness materials. (Si nano composite coating with finer crystal particles)
- Exhibits amazing performance when cutting high-hardness materials (55HRC or higher)
- Long life for both dry cutting and wet cutting

Cutting conditions

Tool：DN2HC0600-ATH (ϕ6) Work material：SKD11 (60HRC)
Machine：Horizontal MC (HSK-A63)
vc=30m/min *n*=1,592min^{-1} *f*=0.06mm/rev *vf*=95mm/min
Coolant：Water base coolant (External)



Tool tip

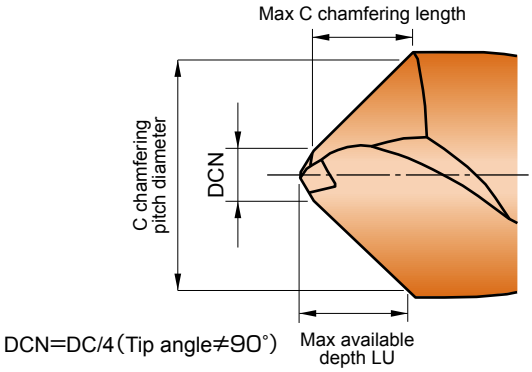
DN2HC-ATH	Conventional A	Conventional B
		
Tool life extends beyond 576th hole.	Damaged on 384th hole	Damaged on 384th hole

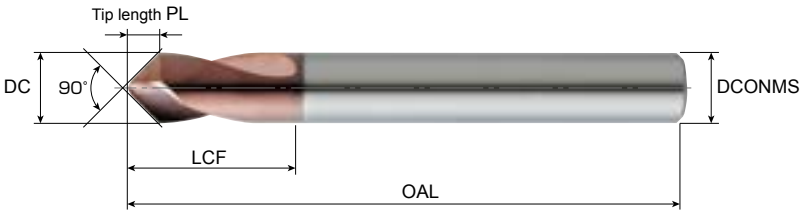
Top of hole

DN2HC-ATH	Conventional A	Conventional B
		
Good surface without tears	Tear caused by defect on edge	

Resistant to chipping; provides long life compared to conventional tools.

Line Up





DN2HC○○○○-ATH

Item code	Stock	Size (mm)						Usable length (mm)		
		Tool dia.	Tip dia.	Tip length	Flute length	Overall length	Shank dia.	Max available depth	Max C chamfering length	C chamfering pitch diameter
		DC	DCN	PL	LCF	OAL	DCONMS	LU		
DN2HC0300-ATH	●	**3**	0.7	1.3	9	45	3	1.2	1.1	More than 0.75 but less than 3
DN2HC0400-ATH	●	**4**	0.95	1.7	12	50	4	1.6	1.5	More than 1 but less than 4
DN2HC0600-ATH	●	**6**	1.4	2.6	15	66	6	2.4	2.2	More than 1.5 but less than 6
DN2HC0800-ATH	●	**8**	1.9	3.4	20	74	8	3.2	3.0	More than 2 but less than 8
DN2HC1000-ATH	●	**10**	2.4	4.3	24	84	10	4.1	3.7	More than 2.5 but less than 10
DN2HC1200-ATH	●	**12**	2.9	5.1	28	95	12	4.9	4.5	More than 3 but less than 12
DN2HC1600-ATH	●	**16**	3.9	6.8	35	113	16	6.6	6.0	More than 4 but less than 16

● : Stocked items.

Re-grinding compatibility range table

Item code	Product name	Tool dia. (mm)	Shape	Re-grinding compatibility range(mm) End
DN2HC-ATH	Chamfering Tool for Hardened Steels	3～16		3～16

Reference sizes of tool tip

Use it for creating machining programs and defining tool shapes in CAM as needed.

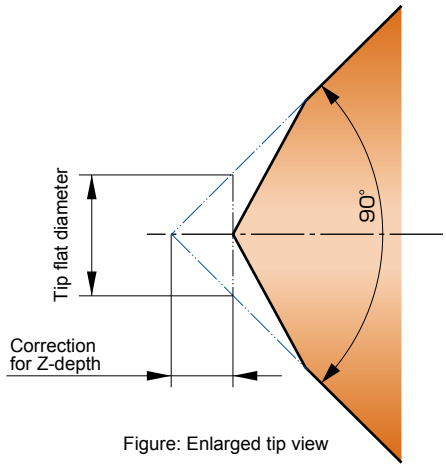


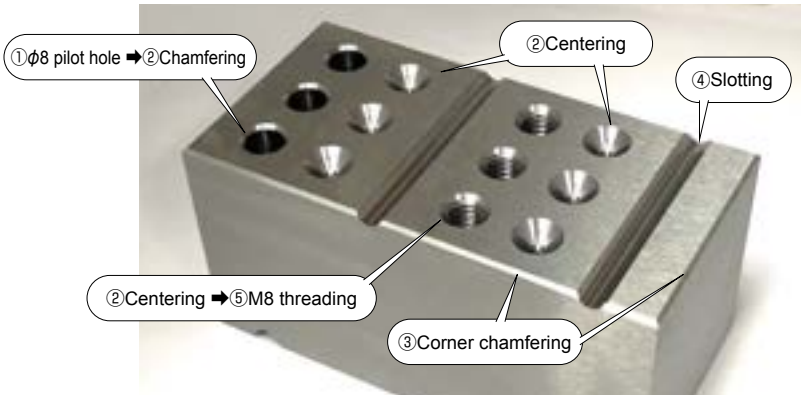
Figure: Enlarged tip view

Item code	Tool dia. DC	Reference size (mm)	
		Tip flat diameter	Correction for Z-depth
DN2HC0300-ATH	**3**	0.4	0.2
DN2HC0400-ATH	**4**	0.6	0.3
DN2HC0600-ATH	**6**	0.8	0.4
DN2HC0800-ATH	**8**	1.2	0.6
DN2HC1000-ATH	**10**	1.4	0.7
DN2HC1200-ATH	**12**	1.8	0.9
DN2HC1600-ATH	**16**	2.4	1.2

Field data

SKD11 (60HRC) chamfering field data

Cutting conditions
Tool：DN2HC1200-ATH (ϕ12)
Work material：SKD11 (60HRC)
Machine：Vertical MC (HSK-A63)



Allows various types of hardened steel chamfering

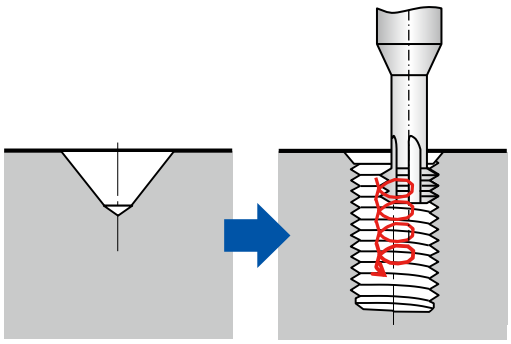
No.	Process	Tool	*Vc* (m/min)	*n* (min⁻¹)	*f*	*Vf* (mm/min)	*ap* (mm)	*ae* (mm)	Hole depth (mm)	Coolant
①	ϕ8 pilot hole	NSBH0800-40-ATH (ϕ8)	10	400	0.05 (mm/rev)	20	–	–	20	Internal, Wet
②	Hole chamfering/centering top diameter ϕ10	DN2HC1200-ATH (ϕ12)	30	800	0.06 (mm/rev)	48	–	–	4.1	External, Air
③	Corner chamfering C1	DN2HC1200-ATH (ϕ12)	301	8000	0.03 (mm/t)	480	1	1	–	External, Air
④	Slotting top width 3 mm	DN2HC1200-ATH (ϕ12)	120	3200	0.03 (mm/t)	192	2.1	–	–	External, Air
⑤	M8 threading	EDT-1.25-16-TH (M8×P1.25)	35	1800	0.031 (mm/t)	50	–	–	12	External, Air

Steel for plastic molds (53HRC) chamfering/threading field data

Generally, a tapped hole entrance requires chamfering. Combination of DN2HC and Epoch D Thread Mill allows deformation-free threading.

Cutting conditions
Centering
Tool：DN2HC1200-ATH (ϕ12)
Work material：Steel for plastic molds (53HRC)
Machine：Vertical MC (HSK-F63)
vc=30m/min *n*=800min⁻¹ *f*=0.06mm/rev *vf*=48mm/min
Coolant：Water base coolant (External)

Proposal process



Centering

D Thread Mill, threading

Centering ➡ M8 threading

No thread deformation

Allows smooth thread fastening.

Features of Epoch D Thread Mill

・This single tool can perform both drilling and threading simultaneously.

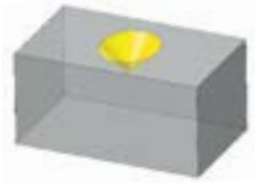
Size M2～M20

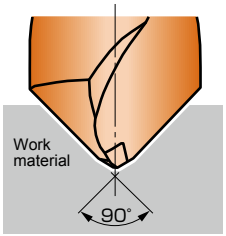
No pilot hole needed

EDT-TH

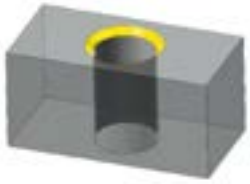
Recommended Cutting Conditions

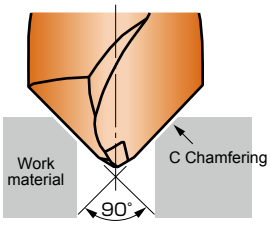
Centering





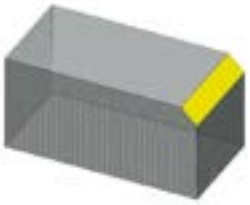
C Chamfering (Bore)

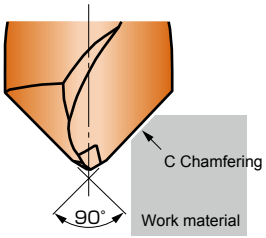




Work material (Hardness)	Structural steels, Carbon steels, Alloy steels (~30HRC) SS S○○C SCM			Pre-hardened steels (30~40HRC) SKD61		
Cutting speed *vc* (m/min)	50~80~120			40~60~80		
Tool dia. (mm)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per rev *f* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per rev *f* (mm/rev)
ϕ3	8500	510	0.06 0.04~0.08	6400	320	0.05 0.03~0.07
ϕ4	6400	384	0.06 0.04~0.08	4800	240	0.05 0.03~0.07
ϕ6	4200	294	0.07 0.05~0.09	3200	192	0.06 0.04~0.08
ϕ8	3200	240	0.075 0.05~0.10	2400	144	0.06 0.04~0.08
ϕ10	2500	200	0.08 0.05~0.11	1900	124	0.065 0.04~0.09
ϕ12	2100	168	0.08 0.05~0.11	1600	104	0.065 0.04~0.09
ϕ16	1600	192	0.12 0.10~0.14	1200	96	0.08 0.06~0.10

C Chamfering (Corner)

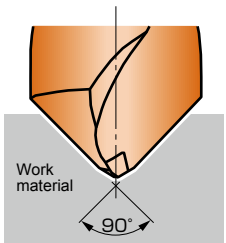




Work material (Hardness)	Structural steels, Carbon steels, Alloy steels (~30HRC) SS S○○C SCM			Pre-hardened steels (30~40HRC) SKD61		
Cutting speed *vc* (m/min)	150~225~300			100~165~250		
Tool dia. (mm)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)
ϕ3	24,000	1,440	0.03 0.020~0.040	17,500	875	0.025 0.015~0.035
ϕ4	18,000	1,080	0.03 0.020~0.040	13,100	655	0.025 0.015~0.035
ϕ6	12,000	840	0.035 0.025~0.045	8,800	528	0.03 0.020~0.040
ϕ8	9,000	675	0.0375 0.025~0.050	6,600	396	0.03 0.020~0.040
ϕ10	7,200	576	0.04 0.025~0.055	5,300	345	0.0325 0.020~0.045
ϕ12	6,000	480	0.04 0.025~0.055	4,400	286	0.0325 0.020~0.045
ϕ16	4,500	540	0.06 0.050~0.070	3,300	264	0.04 0.030~0.050

・C = DC x 20% is used as a general guideline for cutting conditions. Adjust by decreasing the rotation speed and feed rate if C > *D*c x 20%.

Slotting



Work material (Hardness)	Structural steels, Carbon steels, Alloy steels (~30HRC) SS S○○C SCM			Pre-hardened steels (30~40HRC) SKD61		
Max available depth ratio	100%			100%		
Cutting speed *vc* (m/min)	100~180~260			100~165~230		
Tool dia. (mm)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)
ϕ3	19100	1146	0.03 0.020~0.040	17500	875	0.025 0.015~0.035
ϕ4	14300	858	0.03 0.020~0.040	13100	655	0.025 0.015~0.035
ϕ6	9600	672	0.035 0.025~0.045	8800	528	0.03 0.020~0.040
ϕ8	7200	540	0.0375 0.025~0.050	6600	396	0.03 0.020~0.040
ϕ10	5700	456	0.04 0.025~0.055	5300	345	0.0325 0.020~0.045
ϕ12	4800	384	0.04 0.025~0.055	4400	286	0.0325 0.020~0.045
ϕ16	3600	432	0.06 0.050~0.070	3300	264	0.04 0.030~0.050

・For hardened steel, large cutting loads may prevent machining of max available depths in a single operation. Make adjustments: for example, machining the groove depth in two operations, referring to max available depth ratios.

【Setting of cutting conditions】

・Coolant is recommended for work materials of 40HRC or harder, stainless steel, and aluminium.
・These recommended cutting conditions are for general guidelines. Adjust cutting parameters for actual machining based on machining shape, purpose, machine used, and other factors.
・When attaching the tool, use a collet free of scratches or dirt. Keep tool runout to 0.02 mm or less.
・Secure the work material firmly to prevent deformation, deflection, and vibration.
・Watch for smoke and fire hazards posed by heated chips or tools.

	Pre-hardened steels (40~50HRC) SKD61			Cold working tool steels (50~60HRC) SKD11			High-speed tool steels (60~65HRC) SKH		Stainless steels SUS	Cast irons, Ductile cast irons FC FCD			Aluminium, Coppers Al, Cu		
	30~40~50			20~30~40			10~20~30			40~60~100			50~100~150		
	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per rev *f* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per rev *f* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per rev *f* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per rev *f* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per rev *f* (mm/rev)
	4200	168	0.04 0.02~0.06	3200	128	0.04 0.02~0.06	2100	84	0.04 0.02~0.06	6400	384	0.06 0.04~0.08	11000	660	0.06 0.04~0.08
	3200	128	0.04 0.02~0.06	2400	96	0.04 0.02~0.06	1600	64	0.04 0.02~0.06	4800	288	0.06 0.04~0.08	8000	480	0.06 0.04~0.08
	2100	126	0.06 0.04~0.08	1600	96	0.06 0.04~0.08	1100	66	0.06 0.04~0.08	3200	224	0.07 0.05~0.09	5300	371	0.07 0.05~0.09
	1600	96	0.06 0.04~0.08	1200	72	0.06 0.04~0.08	800	48	0.06 0.04~0.08	2400	180	0.075 0.05~0.10	4000	300	0.075 0.05~0.10
	1300	78	0.06 0.04~0.08	960	58	0.06 0.04~0.08	640	38	0.06 0.04~0.08	1900	152	0.08 0.05~0.11	3200	256	0.08 0.05~0.11
	1100	66	0.06 0.04~0.08	800	48	0.06 0.04~0.08	530	32	0.06 0.04~0.08	1600	128	0.08 0.05~0.11	2700	216	0.08 0.05~0.11
	800	64	0.08 0.06~0.10	600	48	0.08 0.06~0.10	400	32	0.08 0.06~0.10	1200	144	0.12 0.10~0.14	2000	240	0.12 0.10~0.14

	Cold working tool steels (50~60HRC) SKD11			High-speed tool steels (60~65HRC) SKH			Stainless steels SUS			Cast irons, Ductile cast irons FC FCD			Aluminium, Coppers Al, Cu		
	50~110~180			40~75~120			50~90~160			100~180~260			200~300~400		
	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)
	12,000	480	0.02 0.010~0.030	8,000	320	0.02 0.010~0.030	9,600	384	0.02 0.010~0.030	19,100	1,146	0.03 0.020~0.040	32,000	1,920	0.03 0.020~0.040
	8,800	352	0.02 0.010~0.030	6,000	240	0.02 0.010~0.030	7,200	288	0.02 0.010~0.030	14,300	858	0.03 0.020~0.040	24,000	1,440	0.03 0.020~0.040
	5,800	348	0.03 0.020~0.040	4,000	240	0.03 0.020~0.040	4,800	288	0.03 0.020~0.040	9,600	672	0.035 0.025~0.045	16,000	1,120	0.035 0.025~0.045
	4,400	264	0.03 0.020~0.040	3,000	180	0.03 0.020~0.040	3,600	216	0.03 0.020~0.040	7,200	540	0.0375 0.025~0.050	12,000	900	0.0375 0.025~0.050
	3,500	210	0.03 0.020~0.040	2,400	144	0.03 0.020~0.040	2,900	174	0.03 0.020~0.040	5,700	456	0.04 0.025~0.055	9,600	768	0.04 0.025~0.055
	2,900	174	0.03 0.020~0.040	2,000	120	0.03 0.020~0.040	2,400	144	0.03 0.020~0.040	4,800	384	0.04 0.025~0.055	8,000	640	0.04 0.025~0.055
	2,200	176	0.04 0.030~0.050	1,500	120	0.04 0.030~0.050	1,800	144	0.04 0.030~0.050	3,600	432	0.06 0.050~0.070	6,000	720	0.06 0.050~0.070

	Pre-hardened steels (40~50HRC) SKD61			Cold working tool steels (50~60HRC) SKD11			High-speed tool steels (60~65HRC) SKH		Stainless steels SUS	Cast irons, Ductile cast irons FC FCD			Aluminium, Coppers Al, Cu		
	90%			70%			50%			100%					
	100~150~200			50~115~150			30~75~120			100~180~260					
	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)	Revolution *n* (min^{-1})	Feed rate *vf* (mm/min)	Feed per tooth *fz* (mm/rev)			
	16000	640	0.02 0.010~0.030	12000	480	0.02 0.010~0.030	8000	320	0.02 0.010~0.030	19100	1146	0.03 0.020~0.040			
	12000	480	0.02 0.010~0.030	9200	368	0.02 0.010~0.030	6000	240	0.02 0.010~0.030	14300	858	0.03 0.020~0.040			
	8000	480	0.03 0.020~0.040	6100	366	0.03 0.020~0.040	4000	240	0.03 0.020~0.040	9600	672	0.035 0.025~0.045			
	6000	360	0.03 0.020~0.040	4600	276	0.03 0.020~0.040	3000	180	0.03 0.020~0.040	7200	540	0.0375 0.025~0.050			
	4800	288	0.03 0.020~0.040	3700	222	0.03 0.020~0.040	2400	144	0.03 0.020~0.040	5700	456	0.04 0.025~0.055			
	4000	240	0.03 0.020~0.040	3100	186	0.03 0.020~0.040	2000	120	0.03 0.020~0.040	4800	384	0.04 0.025~0.055			
	3000	240	0.04 0.030~0.050	2300	184	0.04 0.030~0.050	1500	120	0.04 0.030~0.050	3600	432	0.06 0.050~0.070			

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The diagrams and table data are examples of test results, and are not guaranteed values.

⚠ Attentions on Safety

1. Cautions regarding handling

(1) When removing the tool from its case (packaging), be careful that the tool does not pop out or is dropped. Be particularly careful regarding contact with the tool flutes.
(2) When handling tools with sharp cutting flutes, be careful not to touch the cutting flutes directly with your bare hands.

2. Cautions regarding mounting

(1) Before use, check the outside appearance of the tool for scratches, cracks, etc. and that it is firmly mounted in the collet chuck, etc.
(2) If abnormal chattering, etc. occurs during use, stop the machine immediately and remove the cause of the chattering.

3. Cautions during use

(1) Before use, confirm the dimensions and direction of rotation of the tool and milling work material.
(2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.
(3) Cutting tools are made of a hard material. During use, they may break and fly off. In addition, cutting chips may also fly off. Since there is a danger of injury to workers, fire, or eye damage from such flying pieces, a safety cover should be attached when work is performed and safety equipment such as safety goggles should be worn to create a safe environment for work.
(4) There is a risk of fire or inflammation due to sparks, heat due to breakage, and cutting chips. Do not use where there is a risk of fire or explosion. **Please caution of fire while using oil base coolant, fire prevention is necessary.**
(5) Do not use the tool for any purpose other than that for which it is intended.

4. Cautions regarding regrinding

(1) If regrinding is not performed at the proper time, there is a risk of the tool breaking. Replace the tool with one in good condition, or perform regrinding.
(2) Grinding dust will be created when regrinding a tool. When regrinding, be sure to attach a safety cover over the work area and wear safety clothes such as safety goggles, etc.
(3) This product contains the specified chemical substance cobalt and its inorganic compounds. When performing regrinding or similar processing, be sure to handle the processing in accordance with thelocal laws and regulations regarding prevention of hazards due to specified chemical substances.

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