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		L92

Solid end mill identification system

1

4 F E S M 020 - 060 - 04 XXXXXXXX											
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)			
(1) No. of flutes	(2) Applications			(3) Helix angle	(4) Series	(5) Length of cut	(6) Outside dia.	(7) Length of cut	(8) Shank dia.	(9) Others	
2	F	: Surface finish oriented			D : 20-29°	B : Ball-nose	S : Short	020	060	04	Corner-R, C width etc ...
3	Z	: Multi-functional, High efficiency			E : 30-39°	R : Radius	M: Medium	↓	↓	↓	
4	R	: Roughing			F : 40-49°	S,K : Square	L : Long	2.0mm	6.0mm	4.0mm	
5	H	: Hard materials			G : 50-59°	C : With corner chamfering	W: For automatic lathes				
6	N	: Aluminum & Non-ferrous metals									
7											
8											

2

4 T F R 030 - 080 - R02							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	
(1) No. of flutes	(2) Applications		(3) Helix angle	(4) Series	(5) Outside dia.	(6) Length of cut	(7) Others
3	M : High feed rate, High efficiency		C : 10-19° E : 30-39° F : 40-49°	K : Tough corner edge	030 ↓ 3.0mm	080 ↓ 8.0mm	R02 : Corner-R 0.2mm
4	P : Shouldering, High feed rate, Finishing			R : Radius			090 : Under neck length 9mm
5	T : High efficiency (Difficult-to-cut materials)			H : Radius (with coolant hole)			KCD : Diamond coating
6	A : Aluminum & Non-ferrous metals						
8	R : Roughing			X : Special			

L

Icon glossary

Coating

MEGACOAT
NANOMEGACOAT
HARD

MEGACOAT

TIA&N
CoatingA&TIN
CoatingCVD
Diamond
Coating

Uncoated

Corner Form



Radius

Sharp corner
edge

With corner land

With corner
chamfering

Shank dia. tolerance

Shank dia. tolerance is
h5.Shank dia. tolerance is
h6.

Ball-nose radius tolerance

The R tolerance of ball-nose
end mill is 0—0.02mm.

No. of flutes



3 flutes design

Helix angle



Helix angle 30°

Cutting edge shape



Roughing

Carbide substrate

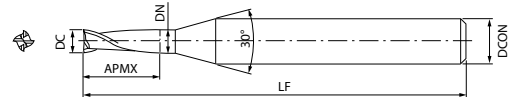
Substrate of all solid end mills and drills are carbide.

4FESM



Recommended workpiece materials

★ 1st choice



4FESM (Medium, Sharp corner edge)

Shouldering

Description	Availability	Dimension (mm)							ZEP
		DC	Dia. tolerance		APMX	DN	DCON	LF	
			min.	max.					
4FESM	010-025-04	● 1	-0.015	0	2.5	1.1	4	45	4
	015-040-04	● 1.5			4	1.6			
	020-060-04	● 2			6	2.1			
	025-080-04	● 2.5			8	2.6			
	030-100-06	● 3			10	3.2			
	035-100-06	● 3.5			10	3.7			
	040-110-06	● 4			11	4.2			
	045-110-06	● 4.5			11	4.7			
	050-130-06	● 5			13	5.2			
	055-130-06	● 5.5			13	5.7			
	060-130-06	● 6	-0.02		15	-			
	060-150-06	● 7			16	7.2			
	070-160-08	● 8		19	-				
	080-190-08	● 8	-0.025	-0.005	20	-	8	60	
	080-200-08	● 9			22	-			
	090-190-10	● 10			25	-			
	100-220-10	● 12	-0.03	-0.01	26	-	12	75	
	100-250-10	● 14			26	14.2	16		
120-260-12	● 15	30			15.2				
140-260-16	● 16	32			-	90			
150-300-16	● 16	32			-				
160-320-16	● 16	32			-				

Recommended cutting conditions ➡ L26

● : Standard item

L



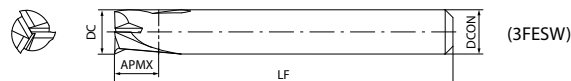
Solid tools

3FESW, 4FESW

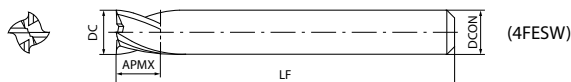


Recommended workpiece materials

★ 1st choice



(3FESW)



(4FESW)

3FESW

Shouldering

Slotting

Description		Availability	Dimension (mm)						ZEP
			DC	Dia. tolerance		APMX	DCON	LF	
				min.	max.				
3FESW	030-030-04	●	3	-0.02	0	3			3
	035-035-04	●	3.5			3.5	4	45	
	040-040-04	●	4			4			
	050-050-05A	●	5			5	5	35	
	050-050-06	●	5			6	45		
	060-060-05A	●	6	6	5	35			
	060-060-06	●		6					
	070-070-07	●	7	7	7		45	3	
	080-080-07	●	8	8	8				
	080-080-08	●			7				
	100-080-07	●			10				
	100-080-10	●	12		12				
	120-080-10	●	12		-0.03	12			
	120-080-12	●		13					
	130-080-13	●	13	13					

Recommended cutting conditions ➡ L27

4FESW

Shouldering

Slotting

Description		Availability	Dimension (mm)						7FFP
			DC	Dia. tolerance		APMX	DCON	LF	
				min.	max.				
4FESW	030-030-04	●	3	-0.02	0	3	4	45	4
	035-035-04	●	3.5			3.5			
	040-040-04	●	4			4			
	050-050-06	●	5			5			
	060-060-06	●	6			6			
	070-070-07	●	7	-0.025	0	7	8	10	12
	080-080-07	●	8			7			
	080-080-08	●	8			8			
	100-080-07	●	10			7			
	100-080-10	●	10			10			
	120-080-10	●	12			12			
	120-080-12	●	12			12			
	130-080-13	●	13			13			

Recommended cutting conditions ➡ L27

● : Standard item

High feed and high efficiency solid end mill

4MFK / 4MFR

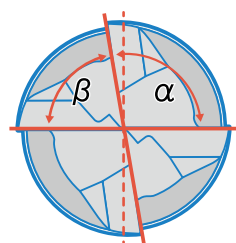
New standard of steel machining

Applicable for high feed machining by anti-chattering structure

1 Chattering control by varied interval flute and variable lead design

Excellent surface finish with reduced chattering

Varied interval flute design

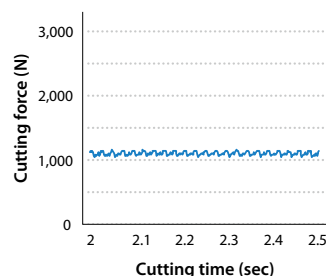


Cutting force distribution varies due to variable flute width, which prevents periodical vibration during machining.

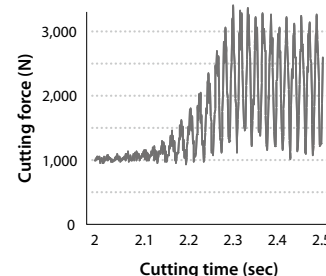
$$\alpha \neq \beta$$

Cutting force comparison (Internal evaluation)

4MFK



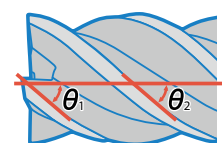
Competitor A (Equal lead)



Drastically reduced vibration for stable machining

Cutting conditions : $n = 2,650 \text{ min}^{-1}$, $V_f = 300 \text{ mm/min}$, $a_p \times a_e = 10 \times 8 \text{ mm}$, end mill dia. $\phi 8$, lotting, Wet, Workpiece material : SCM440

Variable lead



Each flute contains optimized helix angle (lead angle θ), which prevents vibration and achieves a clean surface finish. Chattering control, good surface finish.

$$\theta_1 \neq \theta_2$$

Surface comparison (Internal evaluation)

4MFK



Competitor A

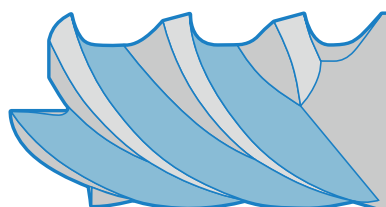


Cutting conditions : $n = 6,000 \text{ min}^{-1}$, $V_f = 1,500 \text{ mm/min}$, $a_p \times a_e = 8 \times 2 \text{ mm}$, end mill dia. $\phi 8$, shouldering, wet, workpiece material : S45C

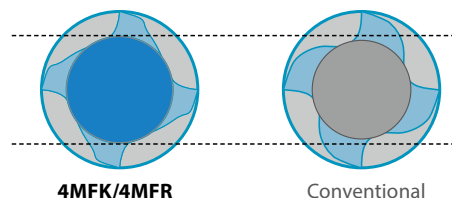
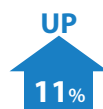
2 Good chip evacuation

Unique flute design for smooth chip evacuation even in slotting and high feed machining applications

Large chip pocket



Core diameter comparison (Internal evaluation)



4MFK/4MFR

Conventional

L



Solid tools

4MFK



Recommended workpiece materials

★ 1st choice

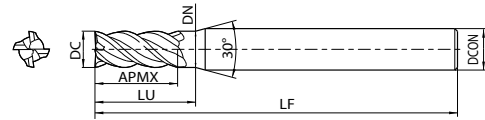


Fig. 1

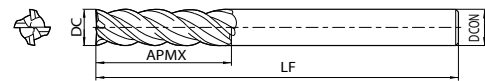


Fig. 2

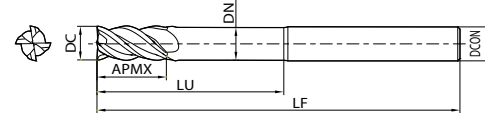


Fig. 3

4MFK (With corner land)

Description		Availability	Dimension (mm)								ZEFP	Fig.	
			DC	Dia. tolerance		APMX *Cutting edge length	DN	LU	DCON	LF			
				min.	max.								
4MFK	030-045	●	3	-0.015	0	4.5	S	3.15	5.4	6	60	4	1
	030-080	●				8	M		9.6				
	030-120	●				12	L		14.4				
	035-050	●	3.5		5	S	6						
	035-095	●			9.5	M	3.7	11.4					
	035-140	●			14	L	16.8						
	040-060	●	4		6	S	7.2						
	040-110	●			11	M	4.2	13.2					
	040-120	●			12	M	14.4						
	040-160	●			16	L	19.2						
4MFK	045-065	●	4.5	-0.015	0	6.5	S	4.7	7.8	6	60	4	1
	045-120	●				12	M		14.4				
	045-180	●				18	L		21.6				
	050-075	●	5		7.5	S	9						
	050-130	●			13	M	5.2	15.6					
	050-200	●			20	L	24						
	055-080	●	5.5		8	S	9.6						
	055-130	●			13	M	5.7	15.6					
	055-210	●			21	L	25.2						
	4MFK	060-090	●		6	-0.02	0	9	S	-	-	6	60
060-090-180		●	S'	5.8					18	70	3		
060-090-300		●	S'	30									
060-130		●	13	M	-		-	60	2				
060-150		●	15	M									
060-220		●	22	L									
065-160		●	6.5	16	M		6.7	19.2	8	70	1		
070-105		●	10.5	S	12.6								
070-160		●	16	M	7.2		19.2						
070-250		●	25	L	30								

Description		Availability	Dimension (mm)								ZEFP	Fig.					
			DC	Dia. tolerance		APMX	* Cutting edge length	DN	LU	DCON			LF				
				min.	max.												
4MFK	075-190	●	7.5	-0.02	0	19	M	7.7	22.8				1				
	080-120	●	8	-0.025	-0.005		S	-	-		70		2				
	080-120-240	●				12	S'	7.7	24		80	4	3				
	080-120-400	●					S'		40								
	080-190	●				19	M										
	080-200	●				20	M	-	-		70		2				
	080-280	●				28	L										
	085-190	●	8.5			19	M	8.7	22.8				1				
	090-135	●	9			13.5	S	9.2	16.2		10	80					
	090-205	●				20.5	M		24.6								
4MFK	095-220	●	9.5	-0.025	-0.005	22	M	9.7	26.4				1				
	100-150	●				S	-	-		80		2					
	100-150-300	●	15			S'	9.7	30	10	100	4	3					
	100-150-500	●											S'		50		
	100-220	●											22	M			
	100-250	●	25			M	-	-		80		2					
	100-330	●	33			L											
	110-260	●	11	-0.03	-0.01	26	M	11.2	31.2	12	100		1				
	4MFK	120-180	●	12	-0.03	-0.01		S	-	-		100		2			
120-180-360		●	18				S'	11.7	36	12	110	4	3				
120-180-600		●												S'		60	
120-260		●												26	M		
120-360		●	36				L										
160-240		●	16						24	S	-	-			2		
160-350		●				35	M			16	110						
160-480		●				48	L										

* Applications for each cutting edge length

S : Short, M : Medium

S' : Short (Long neck), L : Long



Recommended cutting conditions ● L28

● : Standard item

4MFR



Recommended workpiece materials

★ 1st choice

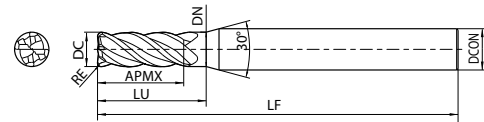


Fig. 1

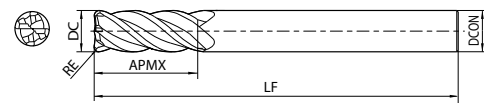


Fig. 2

4MFR (Radius)

Shouldering

Slotting

Description	Availability	Dimension (mm)								ZEPP	Fig.	
		DC	Dia. tolerance		RE	APMX	DN	LU	DCON			LF
			min.	max.								
4MFR 030-080-R02	●	3			0.2	8	3.15	9.6				
030-080-R03	●				0.3							
030-080-R05	●				0.5							
035-095-R02	●	3.5			0.2	9.5	3.7	11.4				
035-095-R03	●				0.3							
035-095-R05	●				0.5							
040-110-R02	●	4			0.2	11	4.2	13.2				
040-110-R03	●				0.3							
040-110-R05	●				0.5							
040-110-R10	●	4.5			1	12	4.7	14.4		6	60	
045-120-R02	●				0.2							
045-120-R03	●				0.3							
045-120-R05	●	5			0.5	13	5.7					
045-120-R10	●				1							
050-130-R02	●				0.2							
050-130-R03	●	5.5			0.3	13	5.7					
050-130-R05	●				0.5							
050-130-R10	●				1							
055-130-R02	●	6			0.2							
055-130-R03	●				0.3							
055-130-R05	●				0.5							
055-130-R10	●	6			1							
060-130-R02	●				1.5							
060-130-R03	●				0.2							
060-130-R05	●	6			0.3							
060-130-R10	●				0.5							
060-130-R15	●				1							

Description	Availability	DC	Dia. tolerance		RE	APMX	DN	LU	DCON	LF	ZEFP	Fig.
			min.	max.								
4MFR 080-190-R02	●	8			0.2	19				70		
080-190-R03	●				0.3							
080-190-R05	●				0.5							
080-190-R10	●	10			1	22			10	80	4	2
080-190-R15	●				1.5							
080-190-R20	●				2							
080-190-R30	●	12			3	26						
100-220-R02	●				0.2							
100-220-R03	●				0.3							
100-220-R05	●	16			0.5	35				110		
100-220-R10	●				1							
100-220-R15	●				1.5							
100-220-R20	●	16			2							
100-220-R30	●				3							
120-260-R03	●				0.3							
120-260-R05	●	12			0.5							
120-260-R10	●				1							
120-260-R15	●	16			1.5							
120-260-R20	●				2							
120-260-R30	●				3							
160-350-R10	●	16			1							
160-350-R15	●				1.5							
160-350-R20	●				2							
160-350-R30	●	16			3							

Recommended cutting conditions L28

● : Standard item

L



Solid tools

High efficiency and difficult-to-cut materials processing

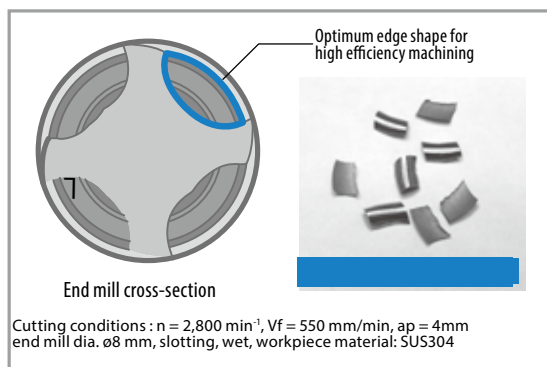
4TFK / 4TFR

High feed and high efficiency machining of difficult-to-cut materials
Resistant to chattering and suppresses burr formation

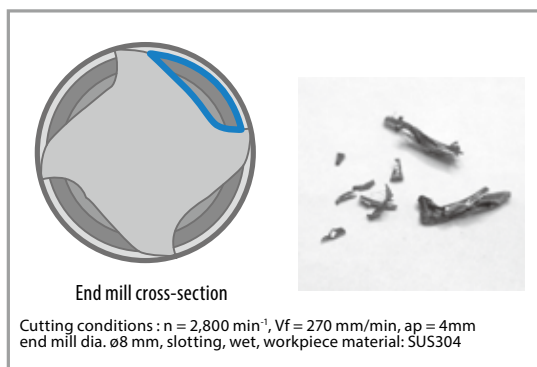
1 Better chip evacuation at high feed machining

Excellent chip evacuation at high feed by large chip pocket and rake angle

4TFK / 4TFR



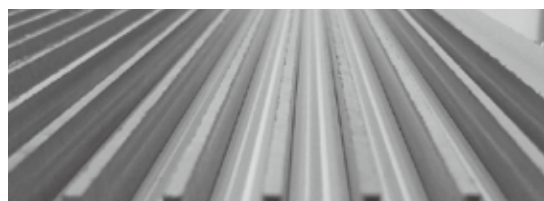
Conventional



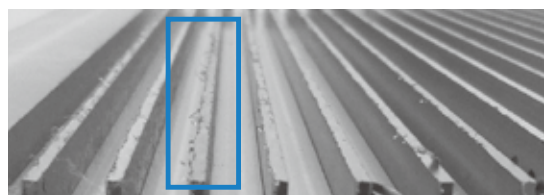
2 Decreased burr

Deep slotting (1xD) by low cutting force design and good chip evacuation

4TFK / 4TFR

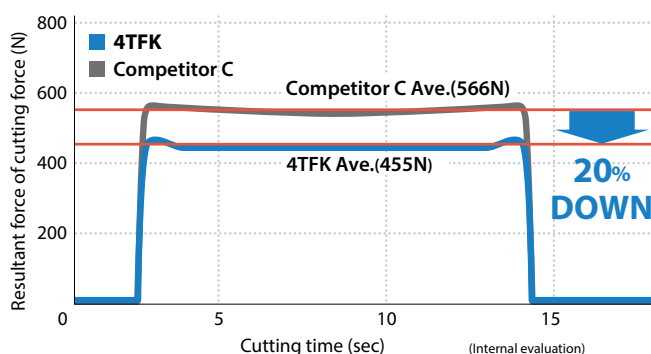


Competitor C



Cutting conditions : $n = 3,200 \text{ min}^{-1}$, $V_f = 150 \text{ mm/min}$, $a_p = 6 \text{ mm}$
end mill dia. $\phi 6 \text{ mm}$, slotting, wet, workpiece material : SUS304

Cutting force comparison (Cutting force at machining 100mm)



Cutting conditions : $n = 4,800 \text{ min}^{-1}$, $V_f = 500 \text{ mm/min}$, $a_p = 6 \text{ mm}$
end mill dia. $\phi 6 \text{ mm}$, slotting, wet, workpiece material : SCM440

3 Chattering control by varied interval flute and variable lead design

4TFK, 4TFR



Recommended workpiece materials

★ 1st choice



(4TFK) (4TFR)

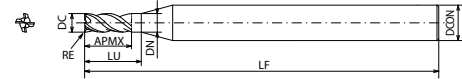


Fig. 1



Fig. 2

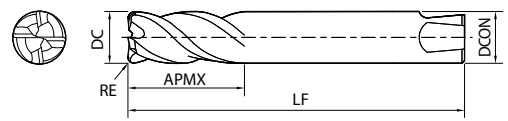


Fig. 3 (X-Treme Shank)

4TFK (With corner land)

Description	Availability	DC	Dimension (mm)							ZEPF	Fig.		
			Dia. tolerance		APMX * Cutting edge length	DN	LU	DCON	LF				
			min.	max.									
4TFK 030-045	●	3	-0.015	0	4.5	S	5.4	6	60	4	1		
030-080	●				8	M	3.15					9.6	
030-120	●				12	L						14.4	
040-060	●	4			6	S	7.2						
040-120	●				12	M	4.2					14.4	
040-160	●				16	L						19.2	
050-075	●	5	7.5	S	9	8	70						
050-130	●		13	M	5.2			15.6					
050-200	●		20	L				24					
060-090	●	6	-0.02	0	9	S		10	80	2			
060-150	●				15	M	-				-		
060-220	●				22	L							
070-105	●	7			10.5	S	12.6				8	70	
070-160	●				16	M	7.2						19.2
070-250	●				25	L							30
080-120	●	8	-0.025	-0.005	12	S		10	80	1			
080-200	●				20	M	-				-		
080-280	●				28	L							
090-135	●	9			13.5	S	9.2				16.2	12	100
090-205	●				20.5	M					24.6		
100-150	●				10	15	S						
100-250	●	25	M										
100-330	●	33	L										
120-180	●	12	-0.03	-0.01	18	S		16	110	2			
120-260	●				26	M							
120-360	●				36	L	-				-		
160-240	●	16			24	S							
160-350	●				35	M							
160-480	●				48	L							
200-300	●	20	30	S			20	125					
200-450	●		45	M									

Recommended cutting conditions ➡ L29

* Applications for each cutting edge length

S : Short

M : Medium

L : Long



● : Standard item

4TFR (Radius)

Description		Availability	Dimension (mm)								ZEFP	Fig.	
			DC	Dia. tolerance		RE	APMX	DN	LU	DCON			LF
				min.	max.								
4TFR	030-080-R02	●	3	-0.015	0	0.2	8	3.15	9.6	6	60	1	
	030-080-R05	●				0.5							
	040-120-R02	●	4			0.2	12	4.2	14.4				2
	040-120-R05	●				0.5							
	050-130-R02	●	5			0.2	13	5.2	15.6				
	050-130-R05	●				0.5							
	050-130-R10	●	1										
	060-150-R03	●	6			0.3	15						
	060-150-R05	●				0.5							
	060-150-R10	●				1							
	080-200-R03	●	8	-0.025	-0.005	0.3	20	8	70				
	080-200-R05	●				0.5							
	080-200-R10	●				1							
	080-200-R20	●				2							
	100-250-R03	●	10			0.3	25	10	80				
	100-250-R05	●				0.5							
	100-250-R10	●				1							
	100-250-R15	●				1.5							
	100-250-R20	●				2							
	100-250-R30	●				3							
	120-260-R05	●	12	-0.03	-0.01	0.5	26	12	100				
	120-260-R10	●				1							
	120-260-R15	●				1.5							
	120-260-R20	●				2							
120-260-R30	●	3	-			-							
160-350-R10	●	1					16	110					
160-350-R20	●	2											
160-350-R30	●	3											
200-450-R10	●	1	20			125							
200-450-R20	●	2											
200-450-R30	●	3											
4TFR	120-260-R10-XT	●		12	1		26	12	94				
	120-260-R20-XT	●	2										
	120-260-R30-XT	●	3	35	16	116							
	160-350-R10-XT	●	1										
	160-350-R20-XT	●	2										
	160-350-R30-XT	●	3	45	20	130							
	200-450-R10-XT	●	1										
	200-450-R20-XT	●	2										
200-450-R30-XT	●	3											

*4TFR...XT Shank (X-Treme Shank) is for NIKKEN X-Treme chuck

Recommended cutting conditions ➡ L29

L

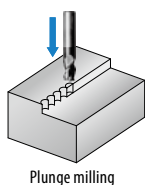


Solid tools

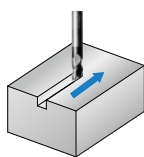
Multi functional, high efficiency end mill

3ZFK

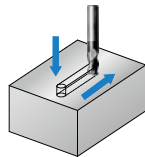
Applicable for plunge milling, slotting and finishing with one end mill



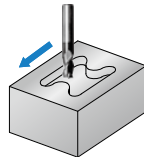
Plunge milling



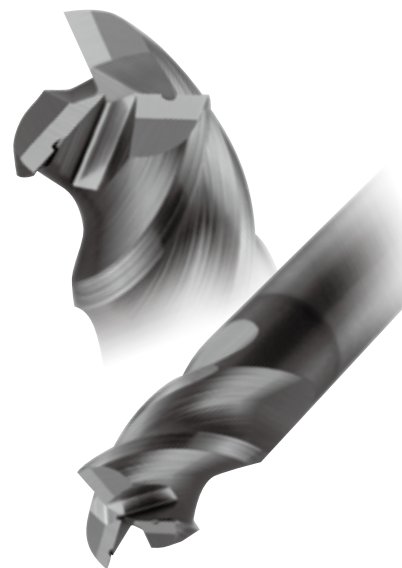
Slotting



Plunge milling + Slotting



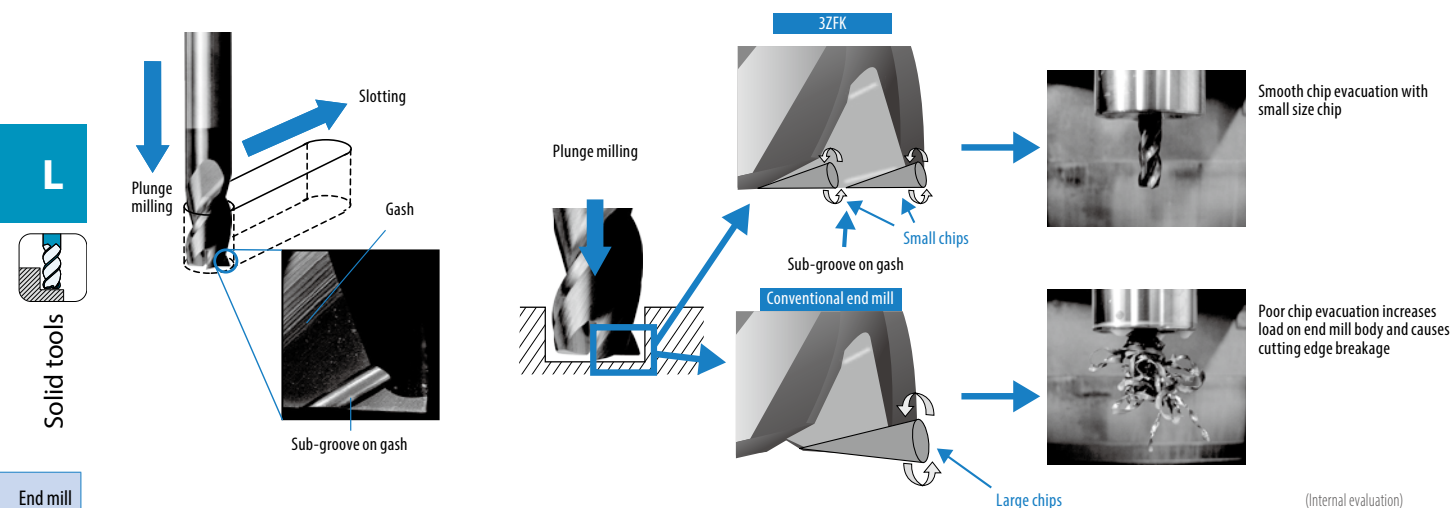
Pocketing



High efficiency machining with new design

Smooth chip evacuation because sub-groove on gash breaks chips during plunge milling

Effect of sub-groove on gash



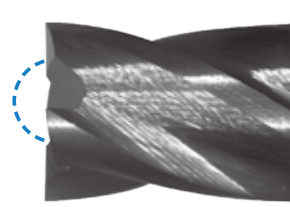
Prevents chip clogging owing to deep flute and gash design



Bottom surface of 3ZFK cutting edge



3ZFK



Conventional

3ZFKS, 3ZFKM



3

Recommended workpiece materials ★ 1st choice

★ **P**
~30HRC

P
30~40HRC

★ **M**
Stainless steel

S
Titanium Alloy

K
Cast Iron

N
Aluminum & Non Ferrous Material

MEGACUT

Land

h5
Shank Dia.

40°

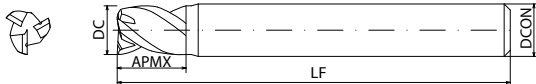


Fig. 1

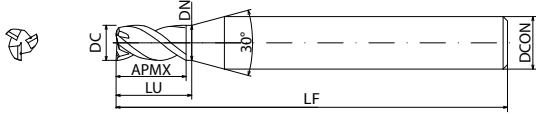


Fig. 2

3ZFKS (Short)

Shouldering

Slotting

Plunge milling

Description	Availability	Dimension (mm)							ZEEP	Fig.	
		DC	Dia. tolerance		APMX	DN	LU	DCON			LF
			min.	max.							
3ZFKS 060-090-06 070-105-08 080-120-08 100-150-10 120-180-12	● 6	-0.02	0	9	-	-	6	50	3	1	
	● 7			10.5	7.2	11.3				2	
	● 8	-0.025	-0.005	12			8	60		1	
	● 10			15	-	-	10	70			
	● 12	-0.03	-0.01	18			12	75			

Recommended cutting conditions ➔ L30

3ZFKM (Medium)

Shouldering

Slotting

Plunge milling

Description	Availability	DC	Dia. tolerance		APMX	DN	LU	DCON	LF	ZFP	Fig.
			min.	max.							
3ZFKM 030-060-06	●	3			6	3.2	6.5				2
030-080-06	●				8		8.6				
040-080-06	●	4	-0.015	0	12	4.2	13	6	50		
040-120-06	●				10	5.2	10.8			3	1
050-100-06	●	5			13		14				
050-130-06	●				13	-	-				
060-130-06	●	6	-0.02		16	7.2	17.3			8	60
070-160-08	●	7			19						
080-190-08	●	8	-0.025	-0.005	22			10	70		
100-220-10	●	10			26			12	75	1	
120-260-12	●	12	-0.03	-0.01	35			16	90		
160-350-16	●	16									

Recommended cutting conditions ➔ L30

High efficiency, high feed rate finishing end mill

6PFK/8PFK

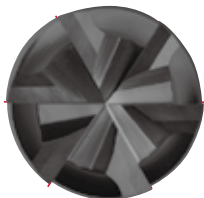
High efficiency machining and superior surface finish with new special flute design

1

Varied interval flute design / Variable lead

Superior chattering resistance performance with Kyocera's unique varied interval flute design / variable lead

Varied interval flute design



$\alpha \neq \beta \neq \gamma$

Cutting force varies due to varied interval flute, which prevents periodical vibration during machining.

Variable Lead



$\theta_1 \neq \theta_2 \neq \theta_3$

Every flute has its optimum helix angle (lead angle θ), which enables excellent anti vibration effect and good surface finish.

Surface finish comparison (side surface)

End mill dia. $\phi 12$ (Internal evaluation)

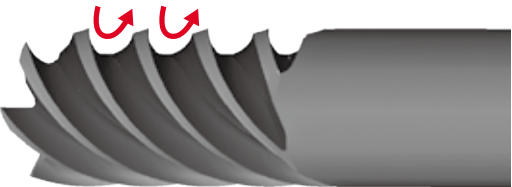
Workpiece material	SCM440	SUS304	Ti-6Al-4V
Cutting conditions	$n=3,300\text{min}^{-1}$ ($V_c=124\text{m/min}$) $V_f=2,000\text{mm/min}$ ($f_z=0.1\text{mm/t}$) $ap \times ae=30 \times 1.5\text{mm}$	$n=2,500\text{min}^{-1}$ ($V_c=94\text{m/min}$) $V_f=1,130\text{mm/min}$ ($f_z=0.08\text{mm/t}$) $ap \times ae=30 \times 0.6\text{mm}$	$n=2,500\text{min}^{-1}$ ($V_c=94\text{m/min}$) $V_f=1,130\text{mm/min}$ ($f_z=0.08\text{mm/t}$) $ap \times ae=30 \times 0.6\text{mm}$
Results			

High feed rate and high efficiency shouldering with Multi-edge design (6 flutes / 8 flutes)
Varied interval flute design and variable lead to minimize chattering
Good surface finish

2

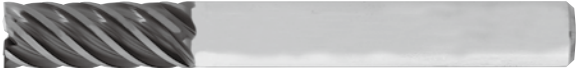
Special flute design

New special flute design enables stable chip evacuation



Good chip evacuation with wide chip pocket
Good performance at high feed rate machining

6PFK, 8PFK



6

8

Recommended workpiece materials ★ 1st choice

★ **P**
~30HRC

P
30~40HRC

H
~55HRC

★ **M**
Stainless steel

★ **S**
Titanium Alloy

K
Cast Iron

N
Aluminum & Non Ferrous Material

MEGAACUT
NAK10

h5
Shank Dia.

42°
44°

Land

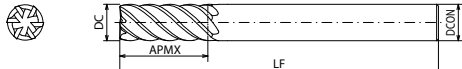


Fig. 1

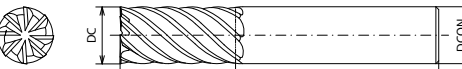


Fig. 2

6PFK, 8PFK (Medium)

Shouldering

Description		Availability	Dimension (mm)						ZEFP	Fig.
			DC	Dia. tolerance		APMX	DCON	LF		
				min.	max.					
6PFK	060-150	●	6	-0.02	0	15	6	60	6	1
	080-200	●	8	-0.025	-0.005	20	8	70		
	100-250	●	10			25	10	80		
	120-300	●	12	-0.03	-0.01	30	12	100		
	160-400	●	16			40	16	110		
	200-450	●	20			45	20	125		
8PFK	250-500	●	25			50	25	140	8	2

Recommended cutting conditions ➡ L31

6PFK, 8PFK (Long)

Shouldering

Description		Availability	Dimension (mm)						ZEFP	Fig.
			DC	Dia. tolerance		APMX	DCON	LF		
				min.	max.					
6PFK	060-250	●	6	-0.02	0	25	6	70	6	1
	080-350	●	8	-0.025	-0.005	35	8	90		
	100-450	●	10			45	10	100		
	120-550	●	12	-0.03	-0.01	55	12	120		
	160-650	●	16			65	16	135		
	200-750	●	20			75	20	155		
	200-1000	●				100	20	180		
	8PFK	250-1000	●			25				

Recommended cutting conditions ➡ L31

High efficiency roughing end mill for difficult-to-cut materials

4 / 5 / 6RFH

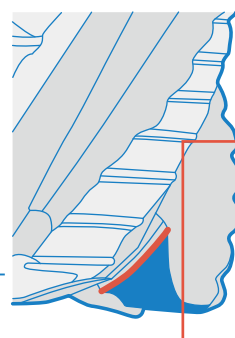
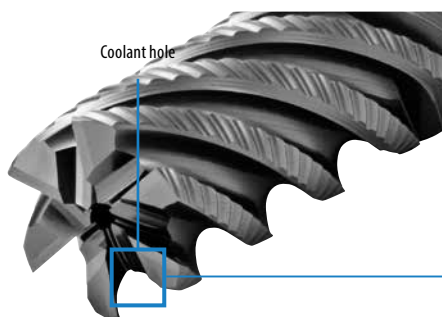
High efficiency and stable machining with multi-edge design and coolant hole
Deep slotting for stainless steel and titanium alloy

1 High efficiency machining with multi-edge design

Multi-edge design with coolant hole. Good chip evacuation with original gash shape

Multi-edge design (ø16 - 6 flutes)

Original gash shape



Radius gash creates better chip flow and evacuation

Good chip evacuation

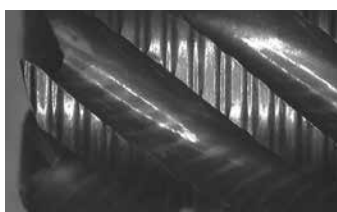
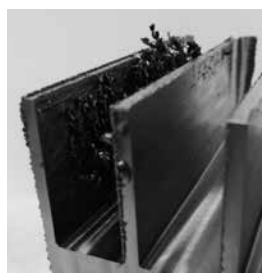
Deep slotting ($a_p = 2 \times DC$) for stainless steel and titanium alloy

Slotting performance comparison (Internal evaluation)

After machining 1 pass

5RFH (Internal and external coolant)

Competitor A (External coolant)



Cutting conditions : $n = 2,550 \text{ min}^{-1}$, $V_f = 336 \text{ mm/min}$, $a_p = 20 \text{ mm}$
end mill dia. ø10, wet, slotting, workpiece material : SUS304

No defects when deep slotting

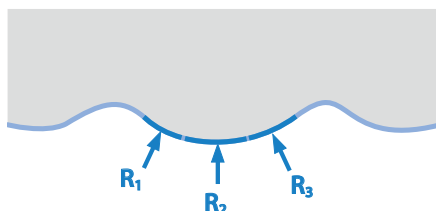
Competitor A

5RFH

2 Defect resistant

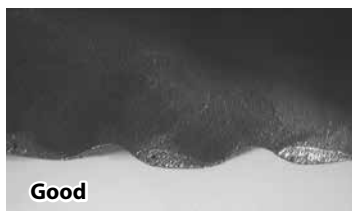
Reduces cutting pressure and defect with special curved radius serrated edge.
Enables stable machining

Special curved radius serrated edge



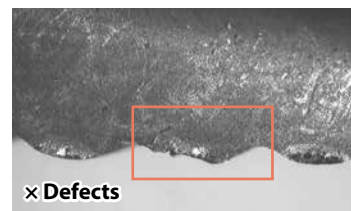
Serrated curved edge with different radii (Compound radius shape)
Distributes cutting pressure and increase defect resistance

Blade edge after machining 12 m (Internal evaluation)



Good

5RFH



× Defects

Competitor B

Cutting conditions : $n = 2,900 \text{ min}^{-1}$, $V_f = 712 \text{ mm/min}$, $a_p \times a_e = 5 \times 3 \text{ mm}$
end mill dia. ø10, wet, shouldering, workpiece material : Ti-6Al-4V

3 Achieves long tool life and stable machining

The MEGACOAT HARD coating technology delivers the highest hardness
and heat resistance in Kyocera's PVD coating

4 / 5 / 6RFH



4

5

6

Recommended workpiece materials ★ 1st choice

★ **P**
~30HRC

★ **P**
30~40HRC

★ **M**
Stainless steel

★ **S**
Titanium Alloy

S
Heat-resistant Alloy

K
Cast Iron

MEGACOAT
HARD

Cutting shape

Radius
R

h6
Shank Dia.

40°

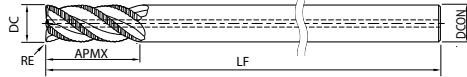



Fig. 1




Fig. 2

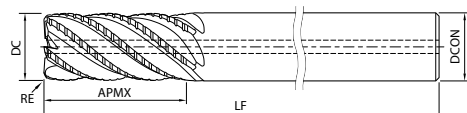



Fig. 3

4 / 5 / 6RFH (Medium)

Shouldering Slotting

Description		Availability	Dimension (mm)							ZEFP	Fig.
			DC	Dia. tolerance		RE	APMX	DCON	LF		
				min.	max.						
4RFH	060-150	●	6	-0.05	0	0.3	15	6	60	4	1
	080-200	●	8				20	8	70		
5RFH	100-250	●	10	0.5		25	10	80	5	2	
	120-260	●	12			26	12	100			
6RFH	160-350	●	16	-0.06		35	16	110	6	3	
	200-450	●	20			45	20	125			

Recommended cutting conditions  L32

4 / 5 / 6RFH (Long)

Shouldering

Description		Availability	DC	Dia. tolerance		RE	APMX	DCON	LF	ZEFP	Fig.
				min.	max.						
				min.	max.						
4RFH	060-300	●	6	-0.05	0	0.3	30	6	80	4	1
	080-400	●	8				40	8	100		
5RFH	100-500	●	10	0	0.5	0.5	50	10	110	5	2
	120-600	●	12				60	12	130		
6RFH	160-800	●	16	-0.06	0	0.5	80	16	160	6	3
	200-1000	●	20				100	20	180		

Recommended cutting conditions  L33

Corner-R(RE) dimension is reference only.

● : Standard item

3 / 4 / 5RDS



3

4

5

Recommended workpiece materials ★ 1st choice

★ **P**
~30HRC

★ **P**
30~40HRC

★ **M**
Stainless steel

★ **K**
Cast Iron

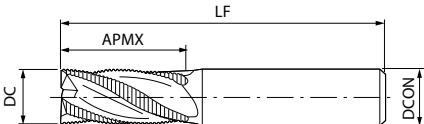
TiAlN

Cutting shape

C

h6
Shank Dia.

20°



3 / 4 / 5RDS (Medium)

Shouldering

Slotting

Description		Availability	Dimension (mm)							ZEFP
			DC	Dia. tolerance		APMX	DCON	LF	CHW	
				min.	max.					
3RDSM	040-110-06	●	4	-0.105	-0.03	11		55	0.3	3
	050-130-06	●	5				6			
	060-130-06	●	6		13		57			
	080-160-08	●	8		16	8	63			
4RDSM	100-220-10	●	10	-0.13	-0.04	22	10	72	0.5	4
	120-260-12	●	12				26	12		
	160-320-16	●	16	-0.16	-0.05	32	16	92		
	200-380-20	●	20				38	20		
5RDSM	250-450-25	●	25	-0.195	-0.065	45	25	121		5

Recommended cutting conditions ➡ L34

3 / 4 / 5RDS (Long)

Shouldering

Description	Availability	Dimension (mm)							ZEFP
		DC	Dia. tolerance		APMX	DCON	LF	CHW	
			min.	max.					
3RDSL 060-240-06 080-280-08	●	6	-0.105	-0.03	24	6	76	0.3	3
	●	8	-0.13	-0.04	28	8			
4RDSL 100-340-10 120-450-12 160-560-16 200-600-20	●	10			34	10	89	0.5	4
	●	12	-0.16	-0.05	45	12	100		
	●	16			56	16	125		
	●	20	-0.195	-0.065	60	20			
5RDSL 250-800-25	●	25			80	25	150		5

Recommended cutting conditions ➡ L34

Three, four and five flutes types are available for roughing. Their edge design with sine-curve pattern reduce cutting force.

Solid tools

End mill

Micro solid tools

Drill

● : Standard item

4 / 6RFS





Recommended workpiece materials ★ 1st choice

P
~30HRC

P
30~40HRC

H
~55HRC

H
~68HRC

M
Stainless steel

S
Titanium Alloy

S
Heat-resistant Alloy

K
Cast Iron

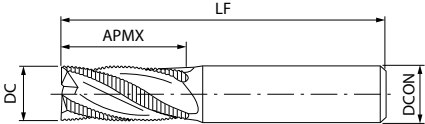
TIA2N

Cutting shape

C

h6
Shank Dia.

45°



4 / 6RFSM

Shouldering Slotting

Description		Availability	Dimension (mm)							ZEP
			DC	Dia. tolerance		APMX	DCON	LF	CHW	
				min.	max.					
4RFSM	060-130-06	●	6	-0.105	-0.03	13	6	57	0.3	4
	080-160-08	●	8	-0.13	-0.04	16	8	63	0.4	
	100-220-10	●	10			22	10	72	0.5	
	120-260-12	●	12	-0.16	-0.05	26	12	83	0.6	
	160-320-16	●	16			32	16	92		
	200-380-20	●	20	-0.195	-0.065	38	20	104	1	
6RFSM	160-320-16	●	16	-0.16	-0.05	32	16	92	0.6	6
	200-380-20	●	20	-0.195	-0.065	38	20	104	1	
	250-450-25	●	25			45	25	121	1.1	

Recommended cutting conditions  L35

RFS has notched surface edge of 45° helix angle. It is applicable for hard materials and titanium alloys due to strong cutting edge.

● : Standard item

4/5/6/7/8HFS



4

5

6

7

8

HFSM

Recommended workpiece materials ★ 1st choice

★ **P**
~30HRC

★ **P**
30~40HRC

★ **H**
~55HRC

★ **H**
~68HRC

MEGACOAT
HARD

Land

h5
Shank Dia.

45°

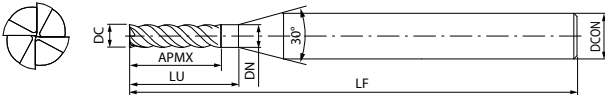


Fig. 1

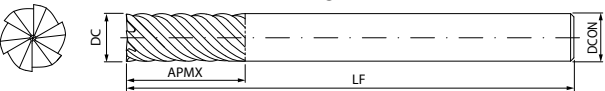


Fig. 2

4/5/6/7/8HFSS (Short)

Shouldering

Description	Availability	Dimension (mm)							ZEEP	Fig.			
		DC	Dia. tolerance		APMX	DN	LU	DCON			LF		
			min.	max.									
4HFSS 010-040-06	● 1	-0.015	0	4	1.05	4.8	6	60	4	1			
020-060-06	● 2			6	2.1	7.2							
030-080-06	● 3			8	3.15	9.6							
040-100-06	● 4			10	4.2	12							
050-120-06	● 5			12	5.2	14.4							
5HFSS 040-100-06	● 4	-0.02	-0.005	10	4.2	12	8	70	5	2			
6HFSS 060-140-06	● 6			14									
080-180-08	● 8			18									
100-220-10	● 10			22									
120-260-12	● 12			26									
7HFSS 060-140-06	● 6	-0.03	-0.01	-0.025	22	10	80	7	7	2			
080-180-08	● 8										18		
100-220-10	● 10										22		
120-260-12	● 12										26		

Recommended cutting conditions ➡ L36

4/5/6/7/8HFSM (Medium)

Shouldering

Description	Availability	Dimension (mm)							ZEEP	Fig.		
		DC	Dia. tolerance		APMX	DN	LU	DCON			LF	
			min.	max.								
4HFSM 010-050-06	● 1	-0.015	0	5	1.05	6	6	60	4	1		
020-090-06	● 2			9	2.1	10.8						
030-120-06	● 3			12	3.15	14.4						
040-140-06	● 4			14	4.2	16.8						
050-170-06	● 5			17	5.2	20.4						
5HFSM 040-140-06	● 4	-0.02	-0.005	14	4.2	16.8	8	70	5	2		
6HFSM 060-170-06	● 6			17	-	-						
070-200-08	● 7			20	7.2	24						
080-230-08	● 8			23	-	-			10		80	
100-280-10	● 10			28								
120-330-12	● 12	33	12	90								
140-370-16	● 14	-0.03	-0.01	37	14.2	44.4	16	105	6	1		
150-420-16	● 15			42	15.2	50.4						
160-420-16	● 16			48							20	110
200-480-20	● 20											
7HFSM 060-170-06	● 6			-0.02	0	17					-	-
080-230-08	● 8	-0.025	-0.005	23	8	70						
100-280-10	● 10			28	10	80						
120-330-12	● 12			33	12	90						
160-420-16	● 16	-0.03	-0.01	42	16	105						
8HFSM 250-530-25	● 25			53	25	125	8					

Recommended cutting conditions ➡ L36

PVD coating „MEGACOAT HARD“ for hard materials is applied.

Achieves high rigidity by ensuring a large core diameter, longer tool life and stable machining.

Also increases cutting edge strength and chip evacuation with a negative rake angle.

● : Standard item

6PDR



Recommended workpiece materials ★ 1st choice







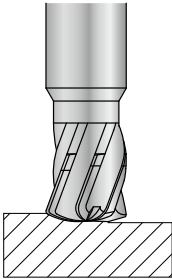
6PDR

Copying

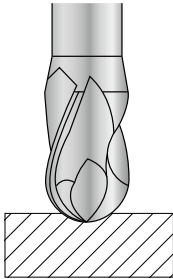
Description		Availability	Dimension (mm)							ZEP
			DC	Dia. tolerance		APMX	LU	DCON	LF	
				min.	max.					
6PDRS	060-045-06	●	6	-0.038	-0.02	4.5	9	6	57	6
	080-060-08	●	8			6	12	8	63	
	100-075-10	●	10	-0.047	-0.025	7.5	15	10	72	
	120-090-12	●	12	-0.059	-0.032	9	18	12	83	

* Cutting edge of over 6mm øDC has margin.
Recommended cutting conditions ➡ **L20**

Increased rigidity with large core diameter. 6 flutes design enables high feed rate machining. Achieves large cutting allowance and high efficiency machining with special corner-R shaped. Ramping and arc cutting are possible.



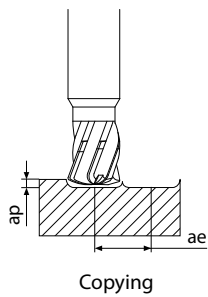
PDR



General Purpose
Ball-nose End Mill

● : Standard item

Recommended cutting conditions



Workpiece material		Depth of cut (ap x ae) (mm)	Outside dia.DC (mm)	ø6	ø8	ø10	ø12
Prehardened steel	52HRC	ø6 : 0.32 x 3.3mm (0.32 x 0.55DC)	Spindle revolution (min ⁻¹)	6,400	4,800	3,800	3,200
		ø8 : 0.42 x 4.4mm (0.42 x 0.55DC)	Feed rate (mm/min)	7,600	7,200	6,900	7,600
Carbon steel / Alloy steel	< 45HRC	ø10: 0.53 x 5.5mm (0.53 x 0.55DC)	Spindle revolution (min ⁻¹)	8,500	6,400	5,100	4,200
		ø12: 0.63 x 6.6mm (0.63 x 0.55DC)	Feed rate (mm/min)	15,300	15,300	15,300	12,700



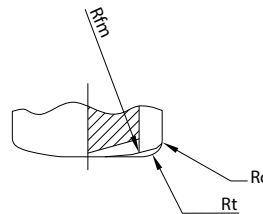
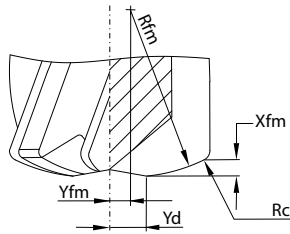
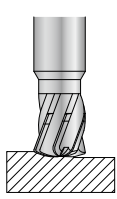
Solid tools

End mill

Micro solid
tools

Drill

Details of 6PDRS cutting edge shape



Xfm	: Maximum Depth of Cut
Yfm	: Distance between the center line of tool and the center of Rfm
Yd	: Distance between the center line of tool and the start position of cutting edge
Rfm	: Radius of tool tip
Rc	: Corner-R
Rt	: Virtual radius in program

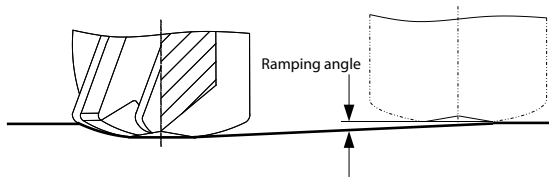
(Unit : mm)

Description	Outside Dia.	Maximum Depth of Cut	Radius of tool tip	Corner-R	Distance between the center line of tool and the center of Rfm	Distance between the center line of tool and the start position of cutting edge	Virtual radius in program
	DC	Xfm	Rfm	Rc	Yfm	Yd	Rt
6PDRS060-045-06	6	0.32	6	0.62	0.75	1.32	0.62
6PDRS080-060-08	8	0.42	8	0.83	1.00	1.76	0.83
6PDRS100-075-10	10	0.53	10	1.04	1.25	2.20	1.04
6PDRS120-090-12	12	0.63	12	1.24	1.50	2.64	1.24

Cutting with cut amount exceeding the Xfm value is not recommended.

Ramping

During ramping, lower the feed rate to the ratio in the chart on the right.



Ramping angle	1°	2°	3°	4°	5°
Ratio of feed rate	100%	70%	50%	30%	10%

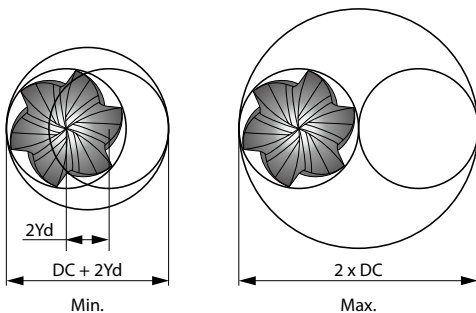
During pocket machining, set the ramping angle at 0.5°.

Plunge milling is not recommended.

Arc cutting

For arc cutting, hole diameter of each machining should be within the range in the chart on the right.

(Unit : mm)



Description	Min.	Max.
6PDRS060-045-06	8.64	12.00
6PDRS080-060-08	11.52	16.00
6PDRS100-075-10	14.40	20.00
6PDRS120-090-12	17.28	24.00

For aluminum & non-ferrous metals machining

3AFK

High efficiency and excellent precision machining with 3 flutes

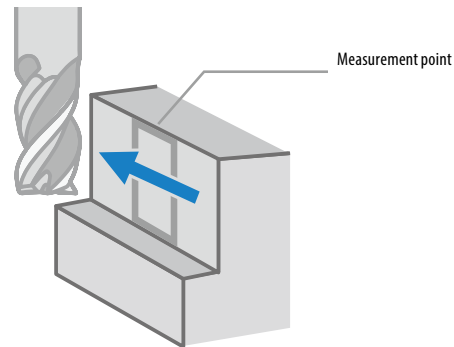
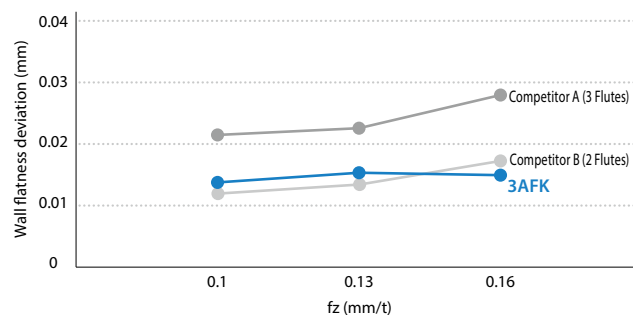
Stable machining with sharp edge for anti-chattering performance

Wide range of applications including slotting, shouldering, ramping, and plunge milling

1 High-efficiency and high-precision machining

High efficiency with 3 flutes. Excellent machining precision

Comparison of wall flatness (Internal evaluation)



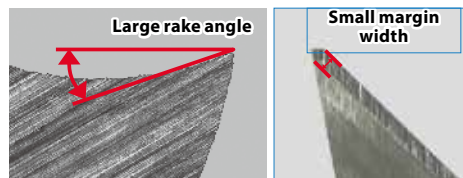
Cutting conditions : $n = 11,700 \text{ min}^{-1}$, $V_f = 3,500 - 5,600 \text{ mm/min}$, $a_p \times a_e = 15 \times 1 \text{ mm}$
End mill dia. $\phi 10$, shouldering, down-cut, wet, HSK A63, workpiece material : A5052

2 Decreased burr

Excellent sharpness with large rake angle and small margin width

Comparison of the rake angle and margin width (Internal evaluation)

3AFK



Burr comparison after machining (Internal evaluation)

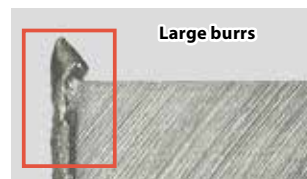
3AFK



Competitor C

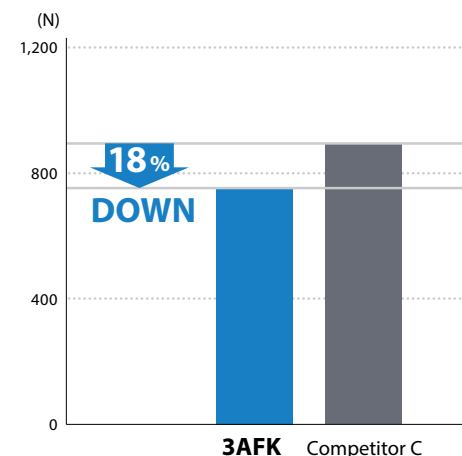


Competitor C



Burr comparison after machining cutting conditions : $n = 11,700 \text{ min}^{-1}$, $V_f = 4,600 \text{ mm/min}$, $a_p \times a_e = 10 \times 1 \text{ mm}$
End mill dia. $\phi 10$, Shouldering, Down-cut, Wet, HSK A63 Workpiece material : A7075

Cutting force comparison (Internal evaluation)



Cutting conditions : $n = 11,700 \text{ min}^{-1}$, $V_f = 3,400 \text{ mm/min}$
 $a_p \times a_e = 10 \times 10 \text{ mm}$
End mill dia. $\phi 10$, Slotting, Wet, BT50 Workpiece material : A5052

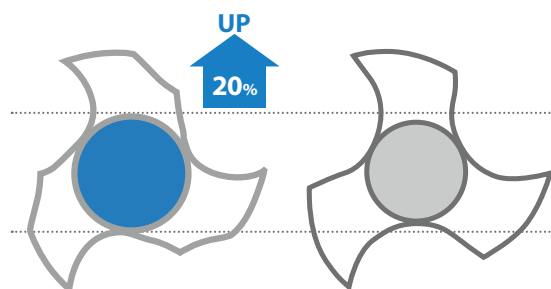
3 Resistance to chattering

Larger core thickness to reduce chattering

Core thickness comparison (Internal evaluation)

3AFK

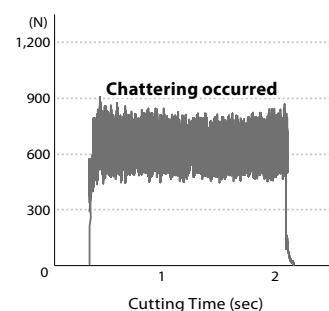
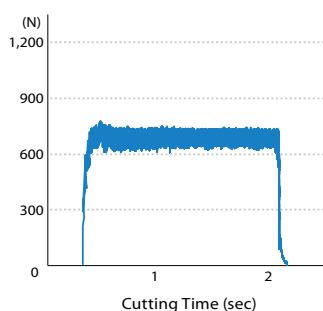
Competitor D



Cutting force comparison (Internal evaluation)

3AFK

Competitor D



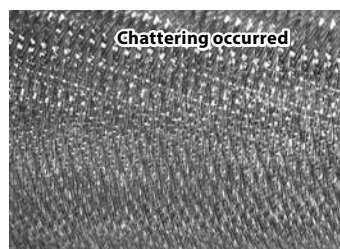
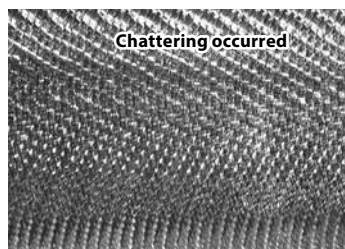
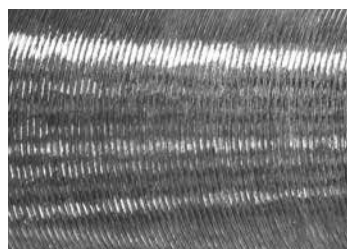
Cutting conditions : $n = 11,700 \text{ min}^{-1}$, $V_f = 3,400 \text{ mm/min}$, $a_p \times a_e = 10 \times 10 \text{ mm}$, End mill dia. $\phi 10$, Slotting, Wet, BT50 Workpiece material : A5052

Comparison of bottom surface at slotting (Internal evaluation)

3AFK

Competitor E

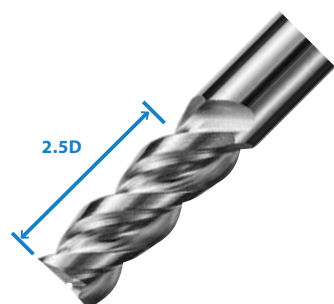
Competitor F



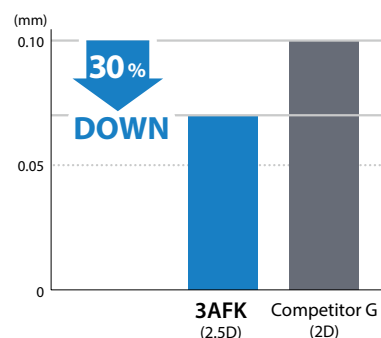
Cutting conditions : $n = 11,100 \text{ min}^{-1}$, $V_f = 2,600 \text{ mm/min}$, $a_p = 10 \text{ mm}$, Wet Workpiece material : A5052

4 Flute length 2.5 D (medium type) added to the lineup

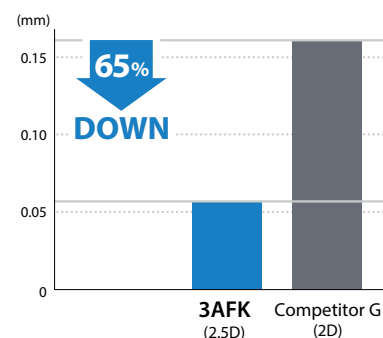
Stable machining even while deep slotting



Comparison of wall flatness (Internal evaluation)



Burr height comparison (Internal evaluation)



Cutting conditions : $n = 11,100 \text{ min}^{-1}$, $V_f = 3,800 \text{ mm/min}$, $a_p \times a_e = 20 \times 1 \text{ mm}$ end mill dia. $\phi 10$, Shouldering, Down-cut, Wet, HSK A63 Workpiece material : A7075

3AFK



Recommended workpiece materials ★ 1st choice

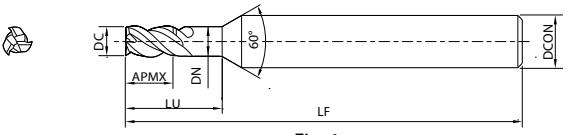
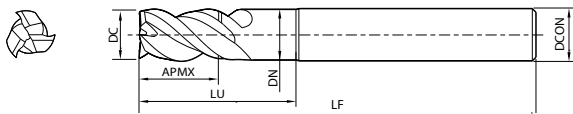
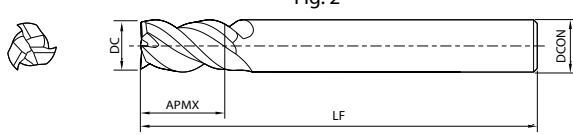


Uncoated

Land

h5
Shank Dia.

45°

3AFK (Short, 1.5D)

Shouldering

Slotting

Plunge milling

Description		Availability	Dimension (mm)							ZEFP	Fig.					
			DC	Dia. tolerance		APMX	DN	LU	DCON			LF				
				min.	max.											
3AFK	030-045-090	●	3	0	4.5	2.7	9	6	70	3	1					
	040-060-120	●	4		-0.015	6	3.7					12				
	050-075-150	●	5			7.5	4.7				15	9	-	-	3	
	060-090	●	6		-0.005		5.7	18	10.5		6.7					21
	060-090-180	●	7		-0.015		10.5	6.7				21	8	80	1	
	070-105-210	●	8		-0.006		12	-	-		7.7	24				3
	080-120	●	9		-0.015		13.5	8.7	27							
	080-120-240	●	10		-0.006		15	-	-		16.5	10.7	33	1		
	090-135-270	●	11		-0.015		16.5	10.7	33						12	110
	100-150	●	12		-0.008		18	-	-		11.7	36	2			
	100-150-300	●	16				24	-	-					15.7		
	110-165-330	●														
	120-180	●														
	120-180-360	●														
	160-240	●														
	160-240-480	●														

Recommended cutting conditions ➡ L37

3AFK (Medium, 2.5D)

Shouldering

Slotting

Plunge milling

Description		Availability	Dimension (mm)							ZEFP	Fig.	
			DC	Dia. tolerance		APMX	DN	LU	DCON			LF
				min.	max.							
3AFK	030-075-150	●	3	-0.015	0	7.5	2.7	15	6	70	3	1
	040-100-200	●	4			10	3.7	20				
	050-125-250	●	5			12.5	4.7	25				
	060-150	●	6	-0.005		15	-	-	8	80		3
	060-150-300	●					5.7	30				2
	070-175-350	●	7	-0.015		17.5	6.7	35	1			
	080-200	●	8	-0.006		20	-	-	3			
	080-200-400	●					7.7	40	2			
	090-225-450	●	9	-0.015		22.5	8.7	45	1			
	100-250	●	10	-0.006		25	-	-	10	90		3
	100-250-500	●					9.7	50	2			
	110-275-550	●	11	-0.015		27.5	10.7	55	1			
	120-300	●	12			30	-	-	12	110		3
	120-300-600	●					11.7	60	2			
	160-400	●	16	-0.008		40	-	-	16	120		3
	160-400-800	●					15.7	80	2			

Recommended cutting conditions ➡ L37

● : Standard item

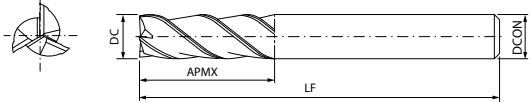
3NESM




Recommended workpiece materials ★ 1st choice







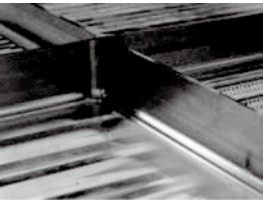
3NESM

Shouldering Slotting

Description		Availability	Dimension (mm)							ZEP
			DC	Dia. tolerance		APMX	DCON	LF		
				min.	max.					
3NESM	030-120-06	●	3	-0.028	-0.014	12	6	50	3	
	040-120-06	●	4	-0.038	-0.02					
	050-140-06	●	5			14				
	060-160-06	●	6	-0.008	0	16				
	080-200-08	●	8	-0.009		20	8	63		
	100-220-10	●	10			22	10	76		
	120-250-12	●	12			25	12			
	160-320-16	●	16	-0.011		32	16	89		
	200-380-20	●	20	-0.013	38	20	104			

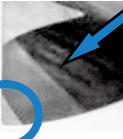
Recommended cutting conditions ➡ L37

A wiper is attached at the lower edge for improving the bottom surface finish.
Chattering is controlled with cutting edge slots at varied intervals, and finishing of lateral surfaces is improved.



Finished surface of aluminum alloy at high speed machining.
Reached 0.25μmRa
(Bottom face / side face / corner)



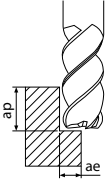


Varied interval flute design (3 flutes)

with wiper edge

● : Standard item

4FESM (Shouldering)

Applications	Workpiece material	Outside dia. DC (mm)	ø1	ø2	ø4	ø6	ø8	ø12	ø16
 Shouldering Depth of cut (ap x ae) (mm) 1.5DC x 0.05DC (DC < ø3) 1.5DC x 0.1DC (DC ≥ ø3)	Carbon steel, Cast iron	Spindle revolution (min ⁻¹)	25,500	13,000	6,600	4,400	3,300	2,200	1,700
		Feed rate (mm/min)	335	345	580	620	625	630	600
	Alloy steel	Spindle revolution (min ⁻¹)	22,000	11,000	5,600	3,700	2,800	1,900	1,400
		Feed rate (mm/min)	290	290	395	455	455	470	460
	Prehardened steel (30 ~ 45HRC)	Spindle revolution (min ⁻¹)	12,000	7,200	4,200	3,000	2,200	1,500	1,100
		Feed rate (mm/min)	105	125	150	160	160	165	140
	Stainless steel	Spindle revolution (min ⁻¹)	22,000	11,000	5,600	3,700	2,800	1,900	1,400
		Feed rate (mm/min)	130	145	165	165	170	175	155

* Machining with water soluble coolant is recommended for stainless steel.

Slotting is not recommended.



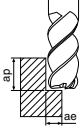
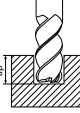
Solid tools

End mill

Micro solid tools

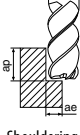
Drill

3FESW

Applications	Workpiece material	Application	Outside dia. DC (mm)	ø3	ø4	ø5	ø6	ø8	ø10	ø12	ø13
 Shouldering Depth of cut (ap x ae) (mm) 1DC x 0.2DC	Carbon steel, Cast iron	Shouldering	Spindle revolution (min ⁻¹)	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,500
			Feed rate (mm/min)	810	800	800	800	650	560	510	450
		Slotting	Spindle revolution (min ⁻¹)	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,500
			Feed rate (mm/min)	810	800	800	800	650	560	510	450
	Alloy steel	Shouldering	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	530	530	530	530	430	370	340	300
		Slotting	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	530	530	530	530	430	370	340	300
	Prehardened steel (30 ~ 45HRC)	Shouldering	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	200	200	200	200	180	180	180	180
		Slotting	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	140	140	150	150	150	150	150	150
 Slotting Depth of cut (ap) (mm) 0.2DC	Stainless steel	Shouldering	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	300	300	300	300	240	210	200	200
		Slotting	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	150	150	160	160	160	160	160	160

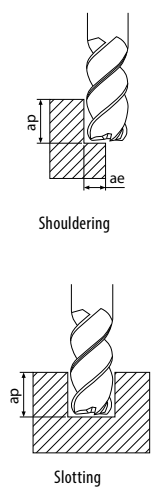
* Machining with water soluble coolant is recommended for stainless steel.

4FESW

Applications	Workpiece material	Application	Outside dia. DC (mm)	ø3	ø4	ø5	ø6	ø8	ø10	ø12	ø13
 Shouldering Depth of cut (ap x ae) (mm) 1DC x 0.2DC	Carbon steel, Cast iron	Shouldering	Spindle revolution (min ⁻¹)	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,500
			Feed rate (mm/min)	960	960	960	960	780	680	620	570
		Slotting	Spindle revolution (min ⁻¹)	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,500
			Feed rate (mm/min)	960	960	960	960	780	680	620	570
	Alloy steel	Shouldering	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	640	640	640	640	520	450	410	370
		Slotting	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	640	640	640	640	520	450	410	370
	Prehardened steel (30 ~ 45HRC)	Shouldering	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	240	240	240	240	210	210	210	210
		Slotting	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	160	160	180	180	180	180	180	180
 Slotting Depth of cut (ap) (mm) 0.2DC	Stainless steel	Shouldering	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	360	360	360	360	300	260	240	240
		Slotting	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,800
			Feed rate (mm/min)	180	180	200	200	200	200	200	200

* Machining with water soluble coolant is recommended for stainless steel.

4MFK (Short, Medium), 4MFR (Medium)

Applications	Workpiece material	Application	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø3	ø4	ø5	ø6	ø8	ø10	ø12	ø16
 Shouldering Slotting	Carbon steel	Shouldering	Short 1.2DC x 0.15DC Medium 1.5DC x 0.15DC	Spindle revolution (min ⁻¹)	13,800	10,700	8,800	7,500	6,000	4,800	4,000	3,300
				Feed rate (mm/min)	1,400	1,400	1,400	1,500	1,500	1,400	1,400	1,300
		Slotting	ap ≤ 1DC	Spindle revolution (min ⁻¹)	13,800	10,700	8,800	7,500	6,000	4,800	4,000	3,300
				Feed rate (mm/min)	620	700	750	780	830	850	800	750
	Alloy steel	Shouldering	Short 1.2DC x 0.1DC Medium 1.5DC x 0.1DC	Spindle revolution (min ⁻¹)	10,600	9,300	8,300	7,400	6,000	4,700	3,800	2,800
				Feed rate (mm/min)	1,000	1,000	1,000	1,100	1,100	1,000	1,000	900
		Slotting	ap ≤ 1DC	Spindle revolution (min ⁻¹)	10,600	9,300	8,300	7,400	6,000	4,700	3,800	2,800
				Feed rate (mm/min)	500	510	520	530	550	570	530	450
	Prehardened steel (30 ~ 45HRC)	Shouldering	Short 1.2DC x 0.07DC Medium 1.5DC x 0.07DC	Spindle revolution (min ⁻¹)	8,700	6,800	5,500	4,600	3,500	2,800	2,300	1,700
				Feed rate (mm/min)	670	730	790	840	900	810	770	630
		Slotting	ap ≤ 1DC	Spindle revolution (min ⁻¹)	6,700	5,800	4,800	4,000	3,000	2,300	1,900	1,400
				Feed rate (mm/min)	320	330	360	370	400	420	380	300
	Stainless steel Titanium Alloys	Shouldering	Short 1.2DC x 0.1DC Medium 1.5DC x 0.1DC	Spindle revolution (min ⁻¹)	8,700	7,000	6,000	5,200	4,000	3,000	2,500	1,700
				Feed rate (mm/min)	670	720	780	830	840	760	710	520
		Slotting	ap ≤ 0.3DC	Spindle revolution (min ⁻¹)	6,800	6,000	5,100	4,300	3,400	2,600	2,000	1,400
				Feed rate (mm/min)	190	220	240	250	250	240	230	190

* Machining with water soluble coolant is recommended for stainless steel and titanium alloys.

4MFK (Long)

Applications	Workpiece material	Application	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø3	ø4	ø5	ø6	ø8	ø10	ø12	ø16
 Shouldering	Carbon steel	Shouldering	3DC x 0.02DC	Spindle revolution (min ⁻¹)	11,000	8,500	7,000	6,000	4,800	3,800	3,200	2,600
				Feed rate (mm/min)	910	910	910	970	970	910	910	840
	Alloy steel	Shouldering		Spindle revolution (min ⁻¹)	6,500	5,700	5,100	4,500	3,700	2,900	2,300	1,700
				Feed rate (mm/min)	540	540	540	600	600	540	540	490
	Prehardened steel (30 ~ 45HRC)	Shouldering		Spindle revolution (min ⁻¹)	4,900	3,900	3,100	2,600	2,000	1,600	1,300	1,000
				Feed rate (mm/min)	330	360	400	420	450	400	380	310
	Stainless steel Titanium alloys	Shouldering		Spindle revolution (min ⁻¹)	4,300	3,500	3,000	2,600	2,000	1,500	1,300	900
				Feed rate (mm/min)	330	360	390	410	420	380	350	260

* Machining with water soluble coolant is recommended for stainless steel and titanium alloys.

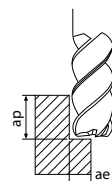
Slotting is not recommended.

4TFK (Short, Medium), 4TFR (Medium)

Applications	Workpiece material	Application	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø3	ø4	ø5	ø6	ø8	ø10	ø12	ø16	ø20
 Shouldering Slotting	Carbon steel Cast iron	Shouldering	1.5DC x 0.2DC	Spindle revolution (min ⁻¹)	13,800	10,300	8,300	6,900	5,200	4,100	3,400	2,600	2,100
				Feed rate (mm/min)	1,490	1,570	1,590	1,660	1,630	1,490	1,410	1,240	1,080
		Slotting	DC ≤ ø12 : ap ≤ 1.0DC DC > ø12 : ap ≤ 12	Spindle revolution (min ⁻¹)	11,100	8,400	6,700	5,600	4,200	3,300	2,800	2,100	1,700
				Feed rate (mm/min)	770	790	790	800	750	690	600	540	410
	Alloy steel	Shouldering	1.5DC x 0.2DC	Spindle revolution (min ⁻¹)	10,600	8,000	6,400	5,300	4,000	3,200	2,700	2,000	1,600
				Feed rate (mm/min)	900	1,020	1,020	1,020	920	870	800	720	640
		Slotting	DC ≤ ø12 : ap ≤ 1.0DC DC > ø12 : ap ≤ 12	Spindle revolution (min ⁻¹)	8,500	6,400	5,100	4,200	3,200	2,500	2,100	1,600	1,300
				Feed rate (mm/min)	540	530	550	590	570	530	500	450	410
	Prehardened steel (30 ~ 45HRC)	Shouldering	1.5DC x 0.05DC	Spindle revolution (min ⁻¹)	9,500	7,200	5,700	4,800	3,600	2,900	2,400	1,800	1,400
				Feed rate (mm/min)	690	760	810	850	830	800	770	640	590
		Slotting	ap ≤ 0.5 x DC	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,400	1,100
				Feed rate (mm/min)	480	540	570	600	550	490	460	380	340
	Stainless steel	Shouldering	1.5DC x 0.05DC	Spindle revolution (min ⁻¹)	9,500	7,200	5,700	4,800	3,600	2,900	2,400	1,800	1,400
				Feed rate (mm/min)	690	760	810	850	830	800	770	640	590
		Slotting	ap ≤ 0.5 x DC	Spindle revolution (min ⁻¹)	5,500	4,200	3,800	3,500	2,800	2,200	1,900	1,400	1,100
				Feed rate (mm/min)	120	130	180	360	420	370	340	280	250
	Titanium alloys	Shouldering	1.5DC x 0.1DC	Spindle revolution (min ⁻¹)	8,500	6,400	5,100	4,200	3,200	2,500	2,100	1,600	1,300
				Feed rate (mm/min)	500	520	520	640	700	730	670	560	450
		Slotting	DC ≤ ø12 : ap ≤ 1.0DC DC > ø12 : ap ≤ 12	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,400	1,100
				Feed rate (mm/min)	290	330	330	350	370	410	380	290	230
	Superalloy	Shouldering	1.5DC x 0.05DC	Spindle revolution (min ⁻¹)	4,200	3,200	2,500	2,100	1,600	1,300	1,100	800	640
				Feed rate (mm/min)	250	250	250	250	240	230	220	210	200
		Slotting	ap ≤ 0.3 x DC	Spindle revolution (min ⁻¹)	3,000	2,200	1,800	1,500	1,100	900	700	600	400
				Feed rate (mm/min)	90	100	100	100	110	130	120	90	70

* Machining with water soluble coolant is recommended for stainless steel, titanium alloys and superalloy.

4TFK (Long)

Applications	Workpiece material	Application	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø3	ø4	ø5	ø6	ø8	ø10	ø12	ø16	ø20
 Shouldering	Carbon steel Cast iron	Shouldering	2.5DC x 0.1DC	Spindle revolution (min ⁻¹)	11,000	8,200	6,600	5,500	4,200	3,300	2,700	2,100	1,700
				Feed rate (mm/min)	970	1,020	1,030	1,080	1,060	970	920	810	700
	Alloy steel	Shouldering	2.5DC x 0.1DC	Spindle revolution (min ⁻¹)	6,000	4,600	3,600	3,000	2,300	1,800	1,500	1,100	910
				Feed rate (mm/min)	490	550	550	550	500	470	430	390	350
	Prehardened steel (30 ~ 45HRC)	Shouldering	2.5DC x 0.05DC	Spindle revolution (min ⁻¹)	6,000	4,600	3,600	3,000	2,300	1,800	1,500	1,100	910
				Feed rate (mm/min)	490	550	550	550	500	470	430	390	350
	Stainless steel	Shouldering	2.5DC x 0.05DC	Spindle revolution (min ⁻¹)	4,800	3,600	2,900	2,400	1,800	1,500	1,200	900	700
				Feed rate (mm/min)	350	380	410	430	420	400	390	320	300
	Titanium alloys	Shouldering	2.5DC x 0.05DC	Spindle revolution (min ⁻¹)	4,300	3,200	2,600	2,100	1,600	1,300	1,100	800	700
				Feed rate (mm/min)	250	260	260	320	350	370	340	280	230
	Superalloy	Shouldering	2.5DC x 0.02DC	Spindle revolution (min ⁻¹)	2,100	1,600	1,300	1,100	800	650	550	400	320
				Feed rate (mm/min)	125	125	125	125	120	115	110	105	100

* Machining with water soluble coolant is recommended for stainless steel, titanium alloys and superalloy.

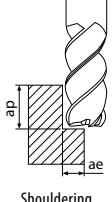
Slotting is not recommended.

3ZFKS (Short), 3ZFKM (Medium)

Applications	Workpiece material	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)		ø3	ø4	ø5	ø6	ø7	ø8	ø10	ø12	ø16
 Shouldering Plunge milling Slotting	Carbon steel	Shouldering Short 1.2DC x 0.3DC Medium 1.5DC x 0.3DC Plunge milling Slotting 1DC	Spindle revolution (min ⁻¹)		13,800	10,700	8,800	7,500	6,600	6,000	4,800	4,000	3,000
			Feed rate (mm/min)	Shouldering	850	950	1,100	1,200	1,100	1,000	910	850	800
				Plunge milling	180	170	170	170	160	150	120	100	70
				Slotting	570	650	700	730	750	780	800	750	650
	Alloy steel	Shouldering Short 1.2DC x 0.3DC Medium 1.5DC x 0.3DC Plunge milling Slotting 0.5DC	Spindle revolution (min ⁻¹)		10,600	9,300	8,300	7,400	6,500	6,000	4,700	3,500	1,900
			Feed rate (mm/min)	Shouldering	700	780	900	980	900	850	750	700	560
				Plunge milling	120	120	130	140	130	130	120	100	70
				Slotting	500	540	570	590	610	600	580	500	340
	Prehardened steel (30 ~ 45HRC)	Shouldering Short 1.2DC x 0.3DC Medium 1.5DC x 0.3DC Plunge milling Slotting 0.5DC	Spindle revolution (min ⁻¹)		5,200	4,000	3,200	2,600	2,300	2,000	1,600	1,400	1,000
			Feed rate (mm/min)	Shouldering	440	440	490	490	490	440	400	370	300
				Plunge milling	90	110	110	130	110	100	80	70	50
				Slotting	220	270	270	320	330	330	230	200	140
Stainless steel	Shouldering Short 1.2DC x 0.2DC Medium 1.5DC x 0.2DC Plunge milling Slotting 0.5DC	Spindle revolution (min ⁻¹)		3,300	2,500	2,000	1,700	1,400	1,300	1,100	900	750	
		Feed rate (mm/min)	Shouldering	280	270	330	340	330	330	350	320	300	
			Plunge milling	20	30	40	40	40	30	20	20	20	
			Slotting	110	110	130	140	130	130	120	120	120	
Titanium Alloys	Shouldering Short 1.2DC x 0.2DC Medium 1.5DC x 0.2DC Plunge milling Slotting 0.5DC	Spindle revolution (min ⁻¹)		3,300	2,500	2,000	1,700	1,400	1,300	1,100	900	750	
		Feed rate (mm/min)	Shouldering	280	270	330	340	330	330	350	320	300	
			Plunge milling	20	30	40	40	40	30	20	20	20	
			Slotting	110	110	130	140	130	130	120	120	120	

* Machining with water soluble coolant is recommended for stainless steel and titanium alloys.

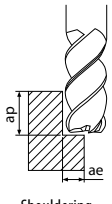
6PFK, 8PFK (Medium)

Applications	Workpiece material	Application	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø6	ø8	ø10	ø12	ø16	ø20	ø25
	Carbon steel Cast iron	Shouldering	DC < ø20 : 1.5DC x 0.2DC DC ≥ ø20 : 1.5DC x 0.1DC	Spindle revolution (min ⁻¹)	7,400	5,600	4,500	3,700	2,800	2,200	1,800
				Feed rate (mm/min)	2,650	2,640	2,410	2,250	2,010	1,700	1,500
	Alloy steel	Shouldering	DC < ø20 : 1.5DC x 0.2DC DC ≥ ø20 : 1.5DC x 0.1DC	Spindle revolution (min ⁻¹)	6,400	4,800	3,800	3,200	2,400	1,900	1,500
				Feed rate (mm/min)	2,250	2,090	1,950	1,910	1,720	1,450	1,220
	Prehardened steel (30 ~ 38HRC)	Shouldering	1.5DC x 0.1DC	Spindle revolution (min ⁻¹)	5,600	4,200	3,300	2,800	2,100	1,700	1,300
				Feed rate (mm/min)	1,780	1,710	1,520	1,400	1,220	1,120	980
	Stainless steel Titanium alloys	Shouldering	1.5DC x 0.05DC	Spindle revolution (min ⁻¹)	5,000	3,800	3,000	2,500	1,900	1,500	1,200
				Feed rate (mm/min)	1,350	1,320	1,200	1,130	970	850	720

* Machining with water soluble coolant is recommended for stainless steel and titanium alloys.

Slotting is not recommended.

6PFK, 8PFK (Long)

Applications	Workpiece material	Application	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø6	ø8	ø10	ø12	ø16	ø20	ø25
	Carbon steel, Cast iron	Shouldering	3.0DC x 0.01DC	Spindle revolution (min ⁻¹)	4,600	3,500	2,800	2,300	1,700	1,400	1,100
				Feed rate (mm/min)	1,830	1,730	1,530	1,380	1,120	880	660
	Alloy steel	Shouldering	3.0DC x 0.01DC	Spindle revolution (min ⁻¹)	3,700	2,800	2,200	1,800	1,400	1,100	900
				Feed rate (mm/min)	1,490	1,340	1,220	1,120	940	720	540
	Prehardened steel (30 ~ 38HRC)	Shouldering	3.0DC x 0.01DC	Spindle revolution (min ⁻¹)	2,800	2,100	1,700	1,400	1,100	850	650
				Feed rate (mm/min)	920	680	750	670	550	480	390
	Stainless steel Titanium alloys	Shouldering	3.0DC x 0.01DC	Spindle revolution (min ⁻¹)	2,500	1,900	1,500	1,300	950	750	600
				Feed rate (mm/min)	700	670	590	540	440	370	290

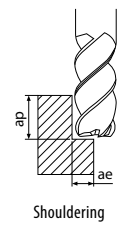
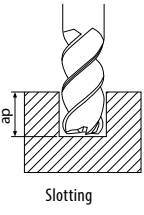
* Machining with water soluble coolant is recommended for stainless steel and titanium alloys.

Slotting is not recommended.



Solid tools

4 / 5 / 6RFH (Medium)

Applications	Workpiece material	Application	Depth of Cut (ap x ae) (mm)	Outside dia. DC (mm)	ø6	ø8	ø10	ø12	ø16	ø20
 	Carbon steel, Alloy steel, Cast iron	Shouldering	1.5DC x 0.3DC	Spindle revolution (min ⁻¹)	6,400	4,800	3,800	3,200	2,400	1,900
				Feed rate (mm/min)	1,040	1,050	1,100	1,000	980	920
		Slotting	1DC	Spindle revolution (min ⁻¹)	5,300	4,000	3,200	2,700	2,000	1,600
				Feed rate (mm/min)	790	790	830	740	700	640
			2DC	Spindle revolution (min ⁻¹)	5,300	4,000	3,200	2,700	2,000	1,600
				Feed rate (mm/min)	550	550	580	510	490	450
	Prehardened steel (30 ~ 45HRC)	Shouldering	1.5DC x 0.3DC	Spindle revolution (min ⁻¹)	4,200	3,200	2,500	2,100	1,600	1,300
				Feed rate (mm/min)	490	620	580	540	490	460
		Slotting	1DC	Spindle revolution (min ⁻¹)	3,700	2,800	2,200	1,900	1,400	1,100
				Feed rate (mm/min)	410	410	430	400	370	360
			2DC	Spindle revolution (min ⁻¹)	3,700	2,800	2,200	1,900	1,400	1,100
				Feed rate (mm/min)	290	290	300	280	260	250
	Stainless steel	Shouldering	1.5DC x 0.3DC	Spindle revolution (min ⁻¹)	6,400	4,800	3,800	3,200	2,400	1,900
				Feed rate (mm/min)	410	410	410	400	380	380
		Slotting	1DC	Spindle revolution (min ⁻¹)	5,300	4,000	3,200	2,700	2,000	1,600
				Feed rate (mm/min)	280	260	310	240	250	250
			2DC	Spindle revolution (min ⁻¹)	5,300	4,000	3,200	2,700	2,000	1,600
				Feed rate (mm/min)	220	210	250	190	200	200
	Titanium alloys	Shouldering	1.5DC x 0.3DC	Spindle revolution (min ⁻¹)	4,200	3,200	2,500	2,100	1,600	1,300
				Feed rate (mm/min)	330	420	410	390	380	370
		Slotting	1DC	Spindle revolution (min ⁻¹)	3,700	2,800	2,200	1,900	1,400	1,100
				Feed rate (mm/min)	220	240	240	240	250	250
			2DC	Spindle revolution (min ⁻¹)	3,700	2,800	2,200	1,900	1,400	1,100
				Feed rate (mm/min)	180	190	190	190	200	200
	Superalloy	Shouldering	1.5DC x 0.2DC	Spindle revolution (min ⁻¹)	800	600	480	400	300	240
				Feed rate (mm/min)	60	60	60	60	60	60
		Slotting	1DC	Spindle revolution (min ⁻¹)	530	400	320	270	200	160
				Feed rate (mm/min)	28	28	28	28	28	28
			2DC	Spindle revolution (min ⁻¹)	530	400	320	270	200	160
				Feed rate (mm/min)	20	20	20	20	20	20

* Machining with water soluble coolant is recommended for stainless steel, titanium alloys and superalloy.

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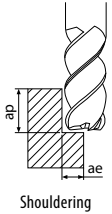
Solid tools

End mill

Micro solid
tools

Drill

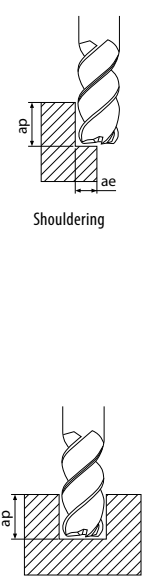
4 / 5 / 6RFH (Long)

Applications	Workpiece material	Application	Depth of cut ($a_p \times a_e$) (mm)	Outside dia. DC (mm)	ø6	ø8	ø10	ø12	ø16	ø20
	Carbon steel, Alloy steel, Cast iron	Shouldering	$a_p : 4.0DC$ $a_e : 0.1DC \ (DC \leq \phi 12)$ $a_e : 1.2mm \ (DC > \phi 12)$	Spindle revolution (min^{-1})	5,100	3,800	3,100	2,500	1,900	1,500
				Feed rate (mm/min)	620	630	660	600	590	550
	Prehardened steel (30 ~ 45HRC)	Shouldering	$a_p : 4.0DC$ $a_e : 0.1DC \ (DC \leq \phi 12)$ $a_e : 1.2mm \ (DC > \phi 12)$	Spindle revolution (min^{-1})	3,400	2,500	2,000	1,700	1,300	1,000
				Feed rate (mm/min)	340	430	410	380	340	320
	Stainless steel	Shouldering	$a_p : 4.0DC$ $a_e : 0.1DC \ (DC \leq \phi 12)$ $a_e : 1.2mm \ (DC > \phi 12)$	Spindle revolution (min^{-1})	5,100	3,800	3,100	2,500	1,900	1,500
				Feed rate (mm/min)	290	290	290	280	270	270
	Titanium alloys	Shouldering	$a_p : 4.0DC$ $a_e : 0.1DC \ (DC \leq \phi 12)$ $a_e : 1.2mm \ (DC > \phi 12)$	Spindle revolution (min^{-1})	3,400	2,500	2,000	1,700	1,300	1,000
				Feed rate (mm/min)	230	290	290	270	270	260
	Superalloy	Shouldering	$a_p : 4.0DC$ $a_e : 0.1DC \ (DC \leq \phi 12)$ $a_e : 1.0mm \ (DC > \phi 12)$	Spindle revolution (min^{-1})	640	480	380	320	240	190
				Feed rate (mm/min)	20	20	20	20	20	20

* Machining with water soluble coolant is recommended for stainless steel, titanium alloys and superalloy.

Slotting is not recommended.

3RDSM, 4RDSM, 5RDSM

Applications	Workpiece material	Application	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø6	ø8	ø10	ø12	ø16	ø20	ø25
	Steel	< 22HRC	Shouldering 1.5DC x 0.5DC	Spindle revolution(min ⁻¹)	11,100	8,400	6,700	5,600	4,200	3,300	2,700
				Feed rate (mm/min)	1,000	1,000	1,320	1,340	1,340	1,340	1,380
		Slotting	1DC	Spindle revolution(min ⁻¹)	9,300	6,900	5,600	4,600	3,500	2,800	2,200
				Feed rate (mm/min)	800	800	1,000	1,030	1,040	1,050	1,110
		22 ~ 32HRC	Shouldering 1.5DC x 0.4DC	Spindle revolution(min ⁻¹)	9,600	7,200	5,700	4,800	3,600	2,900	2,300
				Feed rate (mm/min)	720	720	860	860	860	920	1,030
		Slotting	0.75DC	Spindle revolution(min ⁻¹)	7,900	5,900	4,800	4,000	3,000	2,400	1,900
				Feed rate (mm/min)	550	550	740	740	740	760	860
		32 ~ 40HRC	Shouldering 1.5DC x 0.4DC	Spindle revolution(min ⁻¹)	6,400	4,800	3,800	3,200	2,400	1,900	1,500
				Feed rate (mm/min)	320	320	410	410	400	400	400
		Slotting	0.6DC	Spindle revolution(min ⁻¹)	5,300	4,000	3,200	2,600	2,000	1,600	1,300
				Feed rate (mm/min)	260	260	340	340	330	330	330
		40 ~ 45HRC	Shouldering 1DC x 0.4DC	Spindle revolution(min ⁻¹)	4,800	3,600	2,900	2,400	1,800	1,400	1,100
				Feed rate (mm/min)	220	220	260	260	250	250	250
		Slotting	0.5DC	Spindle revolution(min ⁻¹)	4,300	3,200	2,600	2,200	1,600	1,300	1,000
				Feed rate (mm/min)	180	180	240	230	230	220	220
		45 ~ 50HRC	Shouldering 1DC x 0.3DC	Spindle revolution(min ⁻¹)	4,200	3,200	2,500	2,100	1,600	1,300	1,000
				Feed rate (mm/min)	150	150	180	180	170	170	170
		Slotting	0.4DC	Spindle revolution(min ⁻¹)	3,800	2,900	2,300	1,900	1,400	1,100	900
				Feed rate (mm/min)	140	140	170	160	160	150	150
	Stainless steel	Shouldering	1.5DC x 0.4DC	Spindle revolution(min ⁻¹)	3,700	2,800	2,200	1,900	1,400	1,100	900
				Feed rate (mm/min)	190	230	310	300	340	310	360
	Cast Iron	Slotting	0.5DC	Spindle revolution(min ⁻¹)	2,700	2,000	1,600	1,300	1,000	800	600
				Feed rate (mm/min)	110	130	180	170	190	180	190
		Shouldering	1.5DC x 0.5DC	Spindle revolution(min ⁻¹)	9,600	7,200	5,700	4,800	3,600	2,900	2,300
				Feed rate (mm/min)	850	850	1,030	1,030	1,030	1,100	1,380
		Slotting	1DC	Spindle revolution(min ⁻¹)	7,900	5,900	4,800	4,000	3,000	2,400	1,900
				Feed rate (mm/min)	700	700	900	900	900	910	1,140

* Machining with water soluble coolant is recommended for stainless steel.

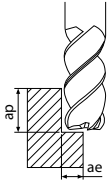
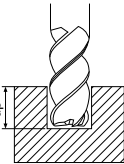
3RDSL, 4RDSL, 5RDSL (shouldering)

Applications	Workpiece material		Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø6	ø8	ø10	ø12	ø16	ø20	ø25
 Shouldering	Steel	< 22HRC	2.5DC x 0.5DC	Spindle revolution (min ⁻¹)	7,800	5,900	4,700	3,900	2,900	2,300	1,900
				Feed rate (mm/min)	700	700	770	780	840	840	940
		22 ~ 32HRC	2.5DC x 0.4DC	Spindle revolution(min ⁻¹)	6,700	5,000	4,000	3,400	2,500	2,000	1,600
				Feed rate (mm/min)	500	500	600	600	600	640	720
		32 ~ 40HRC	2.5DC x 0.4DC	Spindle revolution(min ⁻¹)	4,500	3,400	2,700	2,200	1,700	1,300	1,100
				Feed rate (mm/min)	220	220	290	290	280	280	280
		40 ~ 45HRC	2.5DC x 0.4DC	Spindle revolution(min ⁻¹)	3,400	2,500	2,000	1,700	1,300	1,000	800
				Feed rate (mm/min)	150	150	180	180	180	180	180
		45 ~ 50HRC	2.5DC x 0.3DC	Spindle revolution(min ⁻¹)	2,900	2,200	1,800	1,500	1,100	900	700
				Feed rate (mm/min)	110	110	130	130	120	120	120
		Stainless steel	1.5DC x 0.1DC	Spindle revolution(min ⁻¹)	3,700	2,800	2,200	1,900	1,400	1,100	900
				Feed rate (mm/min)	120	150	200	200	220	200	230
		Cast iron	2.5DC x 0.5DC	Spindle revolution(min ⁻¹)	6,700	5,000	4,000	3,400	2,500	2,000	1,600
				Feed rate (mm/min)	600	600	720	720	720	770	970

* Machining with water soluble coolant is recommended for stainless steel.

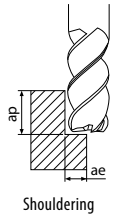
Slotting is not recommended.

4RFSM, 6RFSM

Applications	Workpiece material		Application	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø6	ø8	ø10	ø12	ø16		ø20		ø25
										4flutes	6flutes	4flutes	6flutes	
 Shouldering	Steel	35 ~ 45HRC	Shouldering	1.5DC x 0.4DC	Spindle revolution (min ⁻¹)	8,000	6,000	4,800	4,000	3,000	3,000	2,400	2,400	1,900
					Feed rate (mm/min)	630	630	630	640	640	900	640	930	800
			Slotting	0.5DC	Spindle revolution (min ⁻¹)	6,400	4,800	3,800	3,200	2,400	2,400	1,900	1,900	1,500
					Feed rate (mm/min)	480	480	490	500	500	720	500	750	640
		45 ~ 55HRC	Shouldering	1.5DC x 0.33DC	Spindle revolution (min ⁻¹)	5,800	4,400	3,500	2,900	2,200	2,200	1,800	1,800	1,400
					Feed rate (mm/min)	350	350	350	350	350	530	350	530	460
			Slotting	0.5DC	Spindle revolution (min ⁻¹)	4,700	3,500	2,800	2,300	1,800	1,800	1,400	1,400	1,100
					Feed rate (mm/min)	280	280	280	280	280	420	280	420	370
		55 ~ 60HRC	Shouldering	1.5DC x 0.25DC	Spindle revolution (min ⁻¹)	4,800	3,600	2,900	2,400	1,800	1,800	1,400	1,400	1,100
					Feed rate (mm/min)	190	220	230	240	220	320	230	340	310
			Slotting	0.3DC	Spindle revolution (min ⁻¹)	3,800	2,900	2,300	1,900	1,400	1,400	1,100	1,100	900
					Feed rate (mm/min)	150	170	180	180	180	260	180	280	250
	Stainless steel	Shouldering	1.5DC x 0.4DC		Spindle revolution (min ⁻¹)	3,700	2,800	2,200	1,900	1,400	1,400	1,100	1,100	900
					Feed rate (mm/min)	300	280	260	300	280	420	290	430	380
		Slotting	0.5DC		Spindle revolution (min ⁻¹)	3,200	2,400	1,900	1,600	1,200	1,200	1,000	1,000	800
					Feed rate (mm/min)	200	190	180	200	190	290	210	310	270
 Slotting	Titanium alloys	< 40HRC	Shouldering	2DC x 0.4DC	Spindle revolution (min ⁻¹)	3,700	2,800	2,200	1,900	1,400	1,400	1,100	1,100	900
					Feed rate (mm/min)	390	390	390	390	390	590	390	540	450
			Slotting	0.5DC	Spindle revolution (min ⁻¹)	3,000	2,200	1,800	1,500	1,100	1,100	900	900	700
					Feed rate (mm/min)	310	310	310	310	310	470	310	430	360
		> 40HRC	Shouldering	1.5DC x 0.25DC	Spindle revolution (min ⁻¹)	3,200	2,400	1,900	1,600	1,200	1,200	1,000	1,000	800
					Feed rate (mm/min)	300	300	300	300	300	430	300	430	370
			Slotting	0.3DC	Spindle revolution (min ⁻¹)	2,500	1,900	1,500	1,300	1,000	1,000	800	800	600
					Feed rate (mm/min)	230	230	230	230	230	340	230	340	290
	Heat-resistant alloys (Ni-base heat-resistant alloys)	Shouldering	1DC x 0.2DC		Spindle revolution (min ⁻¹)	1,600	1,200	1,000	800	600	600	500	500	400
					Feed rate (mm/min)	100	100	100	100	100	140	100	140	130
		Slotting	0.25DC		Spindle revolution (min ⁻¹)	1,300	1,000	800	600	500	500	400	400	300
					Feed rate (mm/min)	80	80	80	80	80	120	80	120	100

* Machining with water soluble coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

4HFSS, 5HFSS, 6HFSS, 7HFSS (Shouldering)**4HFSSM, 5HFSSM, 6HFSSM, 7HFSSM, 8HFSSM (Shouldering)**

Applications	Workpiece material		Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø1	ø2	ø4	ø6	ø8	ø12
 Shouldering	Tool steel (< 40HRC) Prehardened steel		1.5DC x 0.05DC (DC < ø3) 1.5DC x 0.1DC (ø3 ≤ DC)	Spindle revolution (min ⁻¹)	20,700	20,000	11,100	7,400	5,600	3,700
				Feed rate (mm/min)	910	1,750	2,000	2,900	2,930	2,930
				Spindle revolution (min ⁻¹)	20,700	20,000	9,900	6,600	5,000	3,300
				Feed rate (mm/min)	910	1,750	1,800	2,630	2,650	2,650
	Heat treated steel	45 ~ 55HRC	1.5DC x 0.05DC	Spindle revolution (min ⁻¹)	20,700	16,000	8,000	5,300	4,000	2,700
				Feed rate (mm/min)	910	1,400	1,400	2,100	2,100	2,100
		55 ~ 60HRC	1.5DC x 0.02DC	Spindle revolution (min ⁻¹)	20,700	12,000	6,000	4,000	3,000	2,000
				Feed rate (mm/min)	640	730	740	1,100	1,100	1,100
		60 ~ 65HRC		Spindle revolution (min ⁻¹)	20,700	11,100	5,600	3,700	2,800	1,900
				Feed rate (mm/min)	550	600	600	880	880	880
		65 ~ 70HRC		Spindle revolution (min ⁻¹)	15,900	8,000	4,000	2,700	2,000	1,330
				Feed rate (mm/min)	370	370	370	560	560	550

* Above is even number flute condition. In case of Odd number flute, please take standard with increasing feed rate 15 ~ 20% condition.

Slotting is not recommended.

L



Solid tools

End mill

Micro solid
tools

Drill

3AFK (Short)

Workpiece material	Applications	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø3	ø4	ø5	ø6	ø7	ø8	ø9	ø10	ø11	ø12	ø16
			Spindle revolution (min ⁻¹)	20,000	20,000	20,000	19,500	16,800	14,700	13,000	11,700	10,700	9,800	7,300
Aluminum alloys	Shouldering	1.5DC x 0.3DC	Feed rate (mm/min)	2,400	2,800	3,500	4,200	4,300	4,400	4,500	4,600	4,700	4,700	3,500
	Slotting	1DC		1,600	2,000	2,500	3,000	3,100	3,200	3,300	3,400	3,500	3,500	2,200
	Plunge milling	1DC		350	350	350	350	350	350	350	350	350	350	350
Workpiece material	Applications	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø3	ø4	ø5	ø6	ø7	ø8	ø9	ø10	ø11	ø12	ø16
			Spindle revolution (min ⁻¹)	20,000	19,900	15,900	13,200	11,300	9,900	8,800	7,900	7,200	6,600	4,900
Aluminum alloy casting	Shouldering	1.5DC x 0.3DC	Feed rate (mm/min)	2,400	2,500	2,500	2,500	2,500	2,600	2,600	2,600	2,600	2,600	1,900
	Slotting	1DC		1,300	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,800	1,300
	Plunge milling	1DC		300	250	200	200	190	150	150	100	100	80	60

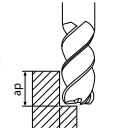
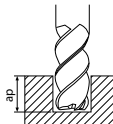
- Water soluble coolant is recommended.
- The cutting conditions should be adjusted based on the overhang of the tool and the machine or workpiece rigidity.
- Spindle revolution and feed rate should be adjusted by the same percentage.
- Pecking may be necessary if chips become clogged while plunge milling.

3AFK (Medium)

Workpiece material	Applications	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø3	ø4	ø5	ø6	ø7	ø8	ø9	ø10	ø11	ø12	ø16
			Spindle revolution (min ⁻¹)	20,000	20,000	19,000	16,000	13,500	12,000	10,500	9,500	8,500	8,000	6,000
Aluminum alloys	Shouldering	2.5DC x 0.3DC	Feed rate (mm/min)	2,300	2,600	3,200	3,600	3,600	3,600	3,700	3,900	4,000	4,000	2,800
	Slotting	0.5DC		1,500	1,900	2,300	2,600	2,600	2,700	2,700	2,800	2,900	2,900	1,600
	Plunge milling	0.5DC		300	300	300	300	300	300	300	300	300	300	300
Workpiece material	Applications	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø3	ø4	ø5	ø6	ø7	ø8	ø9	ø10	ø11	ø12	ø16
			Spindle revolution (min ⁻¹)	20,000	15,900	12,700	10,600	9,100	7,900	7,000	6,300	5,800	5,300	3,950
Aluminum alloy casting	Shouldering	2.5DC x 0.3DC	Feed rate (mm/min)	2,300	2,200	2,000	2,000	2,000	2,000	2,000	2,000	2,100	2,100	1,500
	Slotting	0.5DC		1,300	1,300	1,300	1,400	1,400	1,400	1,400	1,400	1,400	1,500	1,100
	Plunge milling	0.5DC		300	200	150	160	160	120	120	80	80	60	50

- Water soluble coolant is recommended.
- The cutting conditions should be adjusted based on the overhang of the tool and the machine or workpiece rigidity.
- Spindle revolution and feed rate should be adjusted by the same percentage.
- Pecking may be necessary if chips become clogged while plunge milling.

3NESM

Applications	Workpiece material	Application	Depth of cut (ap x ae) (mm)	Outside dia. DC (mm)	ø3	ø6	ø8	ø10	ø12	ø16	ø20
Shouldering 	Aluminum alloys	Shouldering	1.5DC x 0.5DC	Spindle revolution (min ⁻¹)	34,000	17,000	13,000	10,200	8,500	6,400	5,100
				Feed rate (mm/min)	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Slotting 		Slotting	1DC	Spindle revolution (min ⁻¹)	26,500	13,000	9,800	8,000	6,600	5,000	4,000
				Feed rate (mm/min)	1,100	1,100	1,100	1,100	1,100	1,100	1,100



Solid ball nose end mill for machining hardened material (Micro solid tools)

2KMB

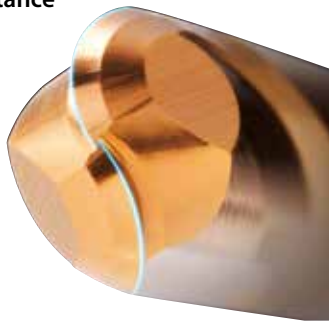
Solving new challenges in solid tool machining

MEGACOAT HARD EX provides long tool life, high quality and stable machining

Unique shape controls hardened material

1 High quality with an S-shaped flute design

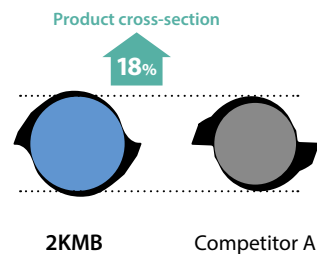
Excellent sharpness
High quality finish and high abrasion resistance



2 High rigidity with a large core thickness

Ensures high rigidity and stable machining

Ball section comparison
(Internal evaluation)
Outer diameter $\phi 1$



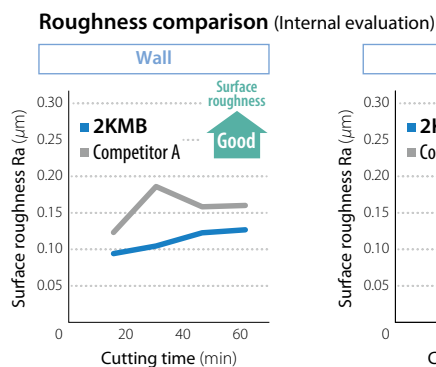
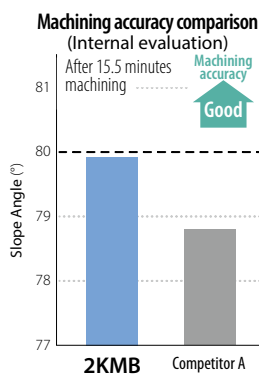
3 Low cutting force with a strong back taper

Chatter resistant point design
Improves finished surface quality and reduction of inclination

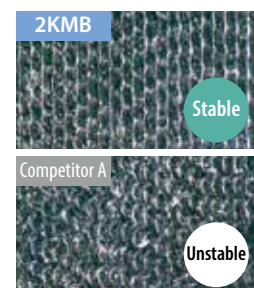


4 Stable machining with a unique cutting edge shape

Simultaneous cutting edge strength and low cutting force
Achieves stable machining and high-quality finished surfaces



Bottom condition
(After 62 minutes machining)



L

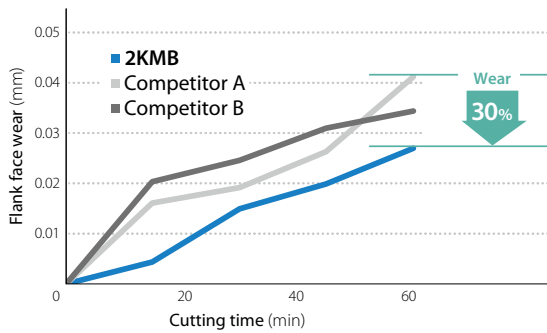
Solid tools

End mill

Micro solid tools

Drill

Wear resistance comparison (Internal evaluation)



Cutting edge condition (After 62 minutes machining)



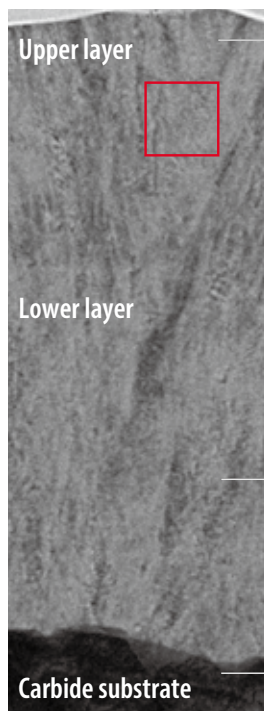
New PVD coating

MEGACOAT HARD EX

Kyocera's original new coating MEGACOAT HARD enables long tool life for various hardened materials.

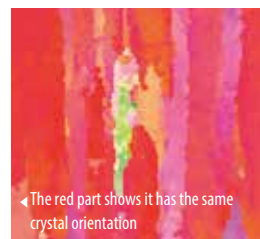
Advanced technology from Kyocera uses a special two-layer structure with both chipping resistance and abrasion resistance

Section view



Chipping suppression

High-toughness crystalline layer



◀ The red part shows it has the same crystal orientation

- Unique structure for high shock resistance
- Toughness improvement by controlling internal stress and crystal growth direction

Suppresses the progression of high-temperature wear

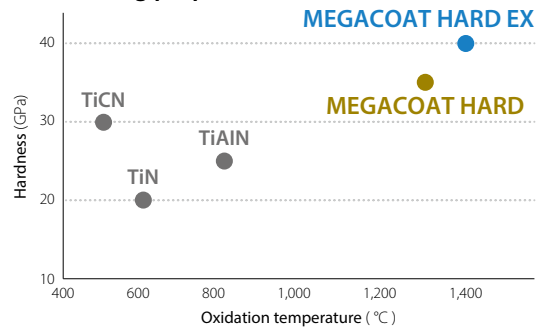
Special laminated structural layer

- High hardness
- Excellent oxidation resistance and unique composition design with high lubricity

Suppresses hard film peeling

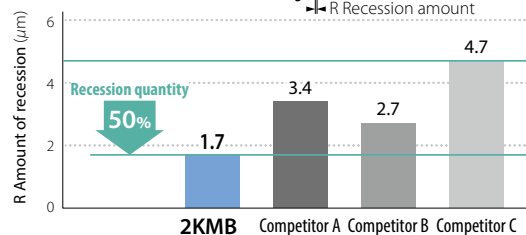
Special interface treatment

Coating properties



Wear resistance comparison (Internal evaluation)

R Recession after 500 mm machining



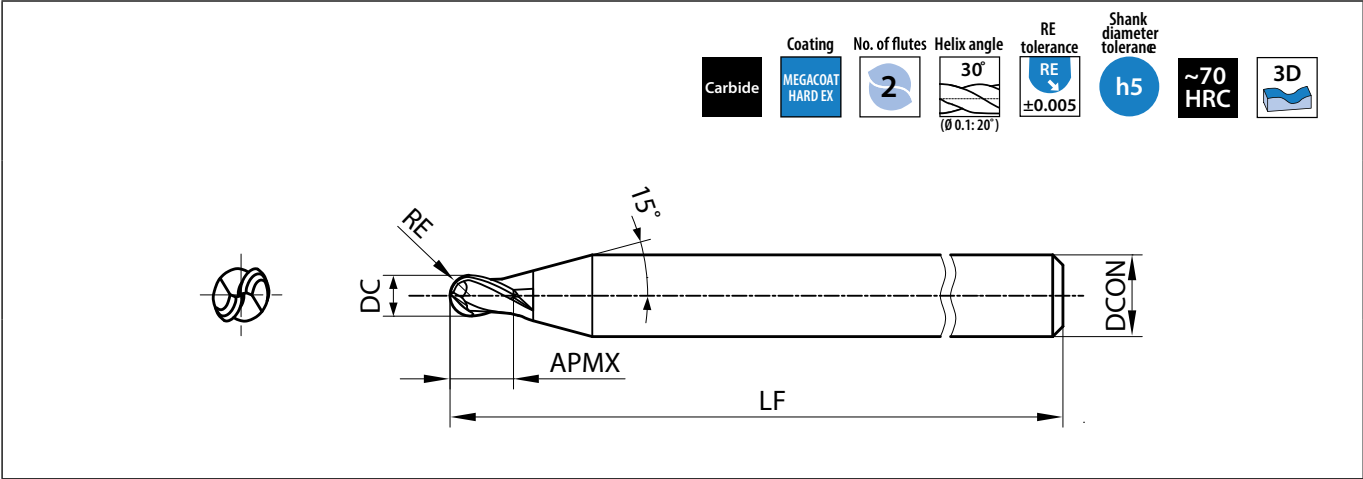
Cutting conditions: $n = 40,000 \text{ min}^{-1}$, $V_f = 70 \text{ mm/min}$, $a_p \times a_e = 0.003 \times 0.005 \text{ mm}$, Wet (Oil-based) Shouldering SKD11 (60HRC) $\phi 0.1$ (Long neck type)

L



Solid tools

2KMB (Standard type)



2KMB (Standard type)

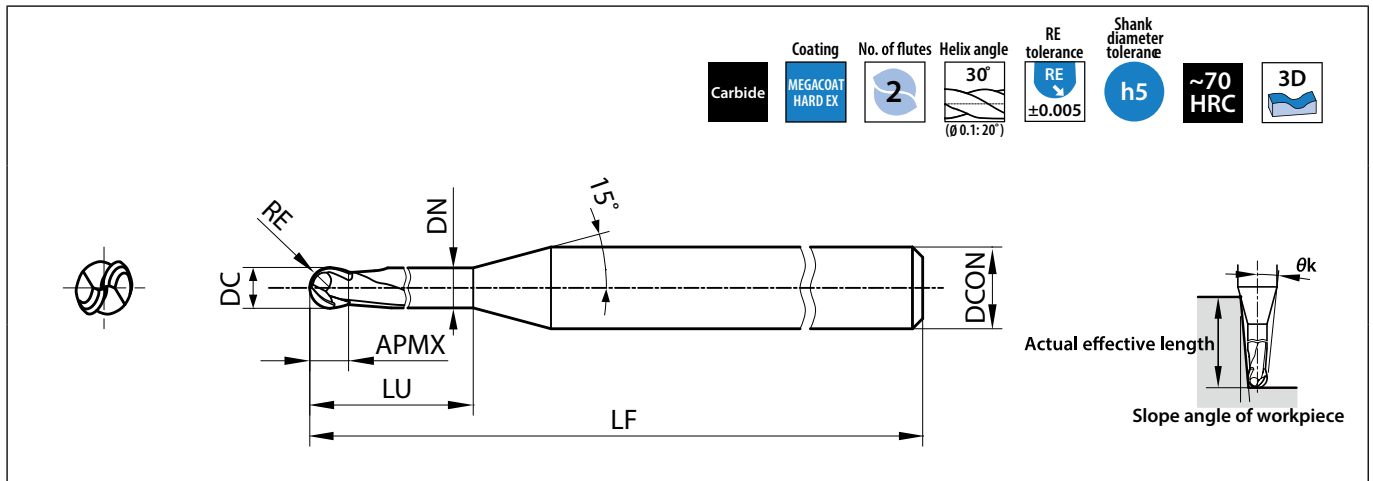
Description		Availability	Dimension (mm)							ZEP
			RE	Radius of ball-nose tolerance		DC	APMX	DCON	LF	
				min.	max.					
2KMB	0010-0010-S4	●	0.05	-0.005	+0.005	0.1	0.1	4	50	2
	0015-0015-S4	●	0.075			0.15	0.15			
	0020-0020-S4	●	0.1			0.2	0.2			
	0030-0030-S4	●	0.15			0.3	0.3			
	0040-0060-S4	●	0.2			0.4	0.6			
	0050-0080-S4	●	0.25			0.5	0.8			
	0060-0090-S4	●	0.3			0.6	0.9			
	0080-0120-S4	●	0.4			0.8	1.2			
	0100-0150-S4	●	0.5			1	1.5			
	0150-0230-S4	●	0.75			1.5	2.3			
	0200-0300-S4	●	1			2	3		60	
	0400-0600-S4	●	2			4	6		70	
2KMB	0250-0380-S6	●	1.25	-0.005	+0.005	2.5	3.8	6	60	2
	0300-0500-S6	●	1.5			3	5		70	
	0400-0600-S6	●	2			4	6		80	
	0500-0800-S6	●	2.5			5	8			
	0600-1000-S6	●	3			6	10			

Recommended cutting conditions ➡ L45

● : Standard item

L40

2KMBL (Long neck type)



2KMBL (Long neck type)

Description		Availability	Dimension (mm)								ZFP	Interference angle (°)	Actual effective length for slope angle of workpiece (mm)						
			RE	Radius of ball-nose tolerance		DC	APMX	DN	LU	DCON			LF	θk	0.5°	1°	1.5°	2°	3°
				min.	max.														
2KMBL	0010-0020-S4	●	0.05	+0.005	0.1	0.07	0.09	0.2			14.68	0.22	0.23	0.23	0.24	0.25			
	0010-0030-S4	●						14.49			0.32	0.33	0.34	0.35	0.38				
	0010-0050-S4	●						14.13			0.53	0.55	0.56	0.58	0.63				
	0015-0030-S4	●	0.075		0.15	0.1	0.14	0.3	14.53	0.32	0.33	0.34	0.35	0.37					
0015-0050-S4	●	14.17						0.53	0.54	0.56	0.58	0.62							
0015-0100-S4	●	13.33						1.05	1.08	1.12	1.16	1.24							
0020-0030-S4	●	0.1						0.3	14.58	0.32	0.33	0.34	0.35	0.37					
0020-0050-S4	●							0.5	14.2	0.53	0.54	0.56	0.58	0.62					
0020-0075-S4	●							0.75	13.76	0.79	0.81	0.84	0.86	0.93					
0020-0100-S4	●							1	13.35	1.04	1.08	1.11	1.15	1.24					
0020-0125-S4	●							1.25	12.96	1.3	1.35	1.39	1.44	1.55					
0020-0150-S4	●							1.5	12.59	1.56	1.61	1.67	1.73	1.86					
0020-0175-S4	●			1.75				12.24	1.82	1.88	1.94	2.01	2.17						
0020-0200-S4	●			2				11.91	2.08	2.15	2.22	2.3	2.48						
0020-0250-S4	●			2.5				11.3	2.6	2.68	2.78	2.88	3.1						
0030-0050-S4	●	0.15	-0.005				0.5	14.28	0.53	0.54	0.55	0.57	0.6						
0030-0060-S4	●						0.6	14.09	0.63	0.65	0.66	0.68	0.73						
0030-0075-S4	●						0.75	13.82	0.78	0.81	0.83	0.86	0.91						
0030-0100-S4	●						1	13.39	1.04	1.07	1.11	1.14	1.22						
0030-0125-S4	●						1.25	12.99	1.3	1.34	1.38	1.43	1.54						
0030-0150-S4	●						1.5	12.61	1.56	1.61	1.66	1.72	1.85						
0030-0175-S4	●						1.75	12.25	1.82	1.88	1.94	2.01	2.16						
0030-0200-S4	●						2	11.91	2.08	2.14	2.22	2.29	2.47						
0030-0225-S4	●						2.25	11.59	2.33	2.41	2.49	2.58	2.78						
0030-0250-S4	●						2.5	11.29	2.59	2.68	2.77	2.87	3.09						
0030-0300-S4	●	0.2					3	10.72	3.11	3.21	3.32	3.44	3.71						
0030-0350-S4	●						3.5	10.21	3.63	3.75	3.88	4.02	4.33						
0030-0400-S4	●						4	9.75	4.14	4.28	4.43	4.59	4.95						
0040-0050-S4	●						0.5	14.35	0.52	0.54	0.55	0.56	0.59						
0040-0080-S4	●						0.8	13.79	0.83	0.86	0.88	0.91	0.96						
0040-0100-S4	●						1	13.44	1.04	1.07	1.1	1.14	1.21						
0040-0150-S4	●	0.2					1.5	12.63	1.56	1.61	1.66	1.71	1.83						
0040-0200-S4	●						2	11.91	2.07	2.14	2.21	2.29	2.46						
0040-0250-S4	●						2.5	11.27	2.59	2.68	2.76	2.86	3.08						
0040-0300-S4	●						3	10.69	3.11	3.21	3.32	3.44	3.7						
0040-0350-S4	●						3.5	10.17	3.63	3.74	3.87	4.01	4.32						
0040-0400-S4	●						4	9.7	4.14	4.28	4.43	4.59	4.94						
0040-0450-S4	●						4.5	9.27	4.66	4.81	4.98	5.16	5.56						
0040-0500-S4	●						5	8.87	5.18	5.35	5.54	5.74	6.19						

● : Standard item

Recommended cutting conditions ● L46, L47

L



Solid tools

2KMBL (Long neck type)

Description		Availability	Dimension (mm)								ZEFP	Interference angle (°)	Actual effective length for slope angle of workpiece (mm)											
			RE	Radius of ball-nose tolerance		DC	APMX	DN	LU	DCON			LF	θk	0.5°	1°	1.5°	2°	3°					
				min.	max.																			
2KMBL	0050-0100-S4	●	0.25		0.5	0.35	0.49	1			13.49	1.04	1.07	1.1	1.13	1.2								
	0050-0150-S4	●						1.5			12.65	1.56	1.6	1.65	1.7	1.82								
	0050-0200-S4	●						2			11.91	2.07	2.14	2.21	2.28	2.44								
	0050-0250-S4	●						2.5			11.25	2.59	2.67	2.76	2.85	3.07								
	0050-0300-S4	●						3			10.66	3.11	3.21	3.31	3.43	3.69								
	0050-0350-S4	●						3.5			10.13	3.62	3.74	3.87	4	4.31								
	0050-0400-S4	●						4			9.65	4.14	4.28	4.42	4.58	4.93								
	0050-0450-S4	●						4.5			9.21	4.66	4.81	4.98	5.15	5.55								
	0050-0500-S4	●						5			8.81	5.17	5.35	5.53	5.73	6.17								
	0050-0550-S4	●						5.5			8.44	5.69	5.88	6.08	6.3	6.79								
	0050-0600-S4	●						6			8.1	6.21	6.42	6.64	6.88	7.42								
	0060-0100-S4	●	0.3		0.6	0.45	0.59	1			13.54	1.04	1.06	1.09	1.12	1.19								
	0060-0150-S4	●						1.5			12.67	1.55	1.6	1.65	1.7	1.81								
0060-0200-S4	●	2						11.91			2.07	2.13	2.2	2.27	2.43									
0060-0250-S4	●	2.5						11.23			2.59	2.67	2.75	2.85	3.05									
0060-0300-S4	●	3						10.63			3.11	3.2	3.31	3.42	3.67									
0060-0350-S4	●	3.5						10.08			3.62	3.74	3.86	4	4.3									
0060-0400-S4	●	4						9.59			4.14	4.27	4.42	4.57	4.92									
0060-0450-S4	●	4.5						9.15			4.66	4.81	4.97	5.15	5.54									
0060-0500-S4	●	5						8.74			5.17	5.34	5.52	5.72	6.16									
0060-0550-S4	●	5.5						8.37			5.69	5.88	6.08	6.3	6.78									
0060-0600-S4	●	6						8.03			6.21	6.41	6.63	6.87	7.4									
0060-0700-S4	●	0.35	-0.005	+0.005	0.7	0.5	0.69	7	4	45	2	7.42	7.24	7.48	7.74	8.02	8.65							
0060-0800-S4	●							8				6.9	8.27	8.55	8.85	9.17	9.89							
0070-0200-S4	●							2				11.91	2.07	2.13	2.19	2.26	2.42							
0070-0400-S4	●							4				9.54	4.14	4.27	4.41	4.56	4.91							
0080-0200-S4	●							0.4					0.8	0.6	0.78	2			11.88	2.09	2.15	2.21	2.28	2.43
0080-0300-S4	●															3			10.53	3.12	3.22	3.32	3.43	3.67
0080-0400-S4	●															4			9.46	4.15	4.29	4.43	4.58	4.92
0080-0500-S4	●															5			8.58	5.19	5.36	5.53	5.73	6.16
0080-0600-S4	●															6			7.85	6.22	6.43	6.64	6.88	7.4
0080-0700-S4	●															7			7.24	7.26	7.49	7.75	8.03	8.65
0080-0800-S4	●															8			6.71	8.29	8.56	8.86	9.18	9.89
0080-1000-S4	●	10	5.86	10.36	10.7	11.08	11.48		12.38															
0090-0200-S4	●	0.45			0.9	0.65	0.88	2			11.88	2.09	2.14	2.2	2.27	2.42								
0090-0400-S4	●							4			9.4	4.15	4.28	4.42	4.57	4.9								
0090-0600-S4	●							6			7.77	6.22	6.42	6.64	6.87	7.39								
0100-0200-S4	●	0.5		1	0.75	0.98	2			11.88	2.08	2.14	2.2	2.26	2.41									
0100-0250-S4	●						2.5			11.12	2.6	2.67	2.75	2.84	3.03									
0100-0300-S4	●						3			10.45	3.12	3.21	3.31	3.41	3.65									
0100-0400-S4	●						4			9.33	4.15	4.28	4.42	4.56	4.89									
0100-0500-S4	●						5			8.42	5.19	5.35	5.52	5.71	6.14									
0100-0600-S4	●						6			7.68	6.22	6.42	6.63	6.86	7.38									
0100-0700-S4	●						7			7.05	7.25	7.49	7.74	8.01	8.62									
0100-0800-S4	●						8			6.52	8.29	8.56	8.85	9.16	9.86									
0100-0900-S4	●						9			6.06	9.32	9.63	9.96	10.31	11.11									
0100-1000-S4	●						10			5.66	10.35	10.7	11.07	11.46	12.35									
0100-1200-S4	●						12			5.01	12.42	12.84	13.28	13.76	14.84									
0100-1300-S4	●						13			4.73	13.45	13.91	14.39	14.91	16.08									

Recommended cutting conditions ● L47, L48

● : Standard item

L42

L

Solid tools

End mill

Micro solid tools

Drill

2KMBL (Long neck type)

Description		Availability	Dimension (mm)								ZEFP	Interference angle (°)	Actual effective length for slope angle of workpiece (mm)						
			RE	Radius of ball-nose tolerance		DC	APMX	DN	LU	DCON			LF	Øk	0.5°	1°	1.5°	2°	3°
				min.	max.														
2KMBL	0120-0240-S4	●	0.6	-0.005	+0.005	1.2	0.9	1.18	2.4	45	2	11.22	2.49	2.56	2.63	2.71	2.88		
	0120-0400-S4	●							4			9.19	4.15	4.27	4.4	4.55	4.87		
	0120-0600-S4	●							6			7.49	6.22	6.41	6.62	6.85	7.35		
	0120-0800-S4	●							8			6.31	8.28	8.55	8.84	9.15	9.84		
	0120-1000-S4	●							10			5.46	10.35	10.69	11.05	11.45	12.33		
	0120-1200-S4	●							12			4.81	12.42	12.83	13.27	13.75	14.81		
	0120-1400-S4	●							14			4.3	14.48	14.97	15.49	16.05	17.3		
	0120-1600-S4	●							16			3.88	16.55	17.11	17.7	18.35	19.79		
	0140-0800-S4	●	0.7			1.4	1	1.37	8	45		6.08	8.3	8.56	8.85	9.15	9.84		
	0140-1200-S4	●							12	50		4.59	12.43	12.84	13.28	13.75	14.81		
	0150-0300-S4	●	0.75			1.5	1.1	1.47	3	45		10.17	3.13	3.21	3.3	3.4	3.61		
	0150-0400-S4	●							4			8.92	4.16	4.28	4.41	4.55	4.85		
	0150-0600-S4	●							6			7.15	6.23	6.42	6.63	6.85	7.34		
	0150-0800-S4	●							8			5.97	8.3	8.56	8.84	9.15	9.83		
	0150-1000-S4	●							10			5.12	10.36	10.7	11.06	11.45	12.31		
	0150-1200-S4	●							12			4.48	12.43	12.84	13.28	13.75	14.8		
	0150-1400-S4	●							14			3.98	14.5	14.98	15.49	16.04	17.29		
	0150-1600-S4	●							16			3.59	16.57	17.12	17.71	18.34	19.77		
	0150-1800-S4	●							18			3.26	18.63	19.26	19.93	20.64	22.26		
	0150-2000-S4	●							20			2.99	20.7	21.4	22.14	22.94	-		
	0160-0800-S4	●	0.8			1.6	1.2	1.57	8	45		5.84	8.3	8.56	8.84	9.14	9.82		
	0160-1200-S4	●							12			4.37	12.43	12.84	13.27	13.74	14.79		
	0200-0300-S4	●	1			2	1.5	1.97	3	45		9.81	3.12	3.19	3.27	3.36	3.55		
	0200-0400-S4	●							4			8.39	4.15	4.26	4.38	4.51	4.79		
	0200-0600-S4	●							6			6.5	6.22	6.4	6.6	6.81	7.28		
	0200-0800-S4	●							8			5.3	8.29	8.54	8.82	9.11	9.77		
	0200-1000-S4	●							10			4.48	10.36	10.68	11.03	11.41	12.25		
	0200-1200-S4	●							12			3.87	12.42	12.82	13.25	13.71	14.74		
	0200-1300-S4	●							13			3.63	13.46	13.89	14.36	14.86	15.98		
	0200-1400-S4	●							14			3.41	14.49	14.96	15.47	16.01	17.23		
	0200-1600-S4	●							16			3.05	16.56	17.1	17.68	18.31	19.71		
	0200-1800-S4	●							18			2.76	18.63	19.24	19.9	20.61	-		
	0200-2000-S4	●							20			2.52	20.69	21.38	22.11	22.91	-		
0200-2200-S4	●	22		2.32	22.76				23.52		24.33	25.21	-						
0200-2500-S4	●	25		2.07	25.86				26.73		27.66	28.66	-						
0250-0600-S4	●	1.25	2.5	2.3	2.45	6	45	5.61	6.25	6.43	6.61	6.81	7.27						
0250-0800-S4	●					8		4.45	8.32	8.57	8.83	9.11	9.75						
0250-1000-S4	●					10		3.69	10.39	10.7	11.05	11.41	12.24						
0250-1500-S4	●					15		2.59	15.55	16.05	16.59	17.16	-						
0250-2000-S4	●					20		1.99	20.72	21.4	22.13	-	-						
0250-2500-S4	●					25		1.62	25.89	26.75	27.67	-	-						
0250-3000-S4	●					30		1.36	31.06	32.1	-	-	-						

Recommended cutting conditions ● L49, L50

● : Standard item

2KMBL (Long neck type)

Description		Availability	Dimension (mm)							ZEFP	Interference angle (°)	Actual effective length for slope angle of workpiece (mm)							
			RE	Radius of ball-nose tolerance		DC	APMX	DN	LU			DCON	LF	θk	0.5°	1°	1.5°	2°	3°
				min.	max.														
2KMBL	0300-0600-S6	●	1.5	-0.005	+0.005	3	2.5	2.9	6	60	2	8.3	6.34	6.51	6.69	6.88	7.32		
	0300-0800-S6	●							8			6.97	8.41	8.65	8.91	9.18	9.81		
	0300-1000-S6	●							10			6	10.47	10.79	11.12	11.48	12.29		
	0300-1200-S6	●							12			5.27	12.54	12.93	13.34	13.78	14.78		
	0300-1400-S6	●							14			4.69	14.61	15.07	15.56	16.08	17.27		
	0300-1600-S6	●							16			4.23	16.68	17.21	17.77	18.38	19.75		
	0300-2000-S6	●							20			65	3.54	20.81	21.48	22.21	22.98	24.73	
	0300-2500-S6	●	1.75			3.5	2.8	3.4	25	70		2.94	25.98	26.83	27.75	28.73	-		
	0350-1500-S6	●							15	60		3.96	15.63	16.12	16.64	17.2	18.45		
	0350-2000-S6	●							20	65		3.1	20.8	21.47	22.18	22.94	24.66		
	0350-2500-S6	●							25	70		2.55	25.97	26.81	27.72	28.69	-		
	0350-3000-S6	●							30	75		2.17	31.14	32.16	33.26	34.44	-		
	0400-0800-S6	●	2			4	3	3.9	8	65		5.76	8.39	8.61	8.85	9.11	9.69		
	0400-1000-S6	●							10			4.8	10.46	10.75	11.07	11.41	12.17		
	0400-1200-S6	●							12			4.11	12.52	12.89	13.28	13.71	14.66		
	0400-1400-S6	●							14			3.6	14.59	15.03	15.5	16.01	17.14		
	0400-1500-S6	●							15			3.39	15.63	16.1	16.61	17.16	18.39		
	0400-2000-S6	●							20			2.62	20.79	21.45	22.15	22.91	-		
	0400-2500-S6	●							25			70	2.13	25.96	26.8	27.69	28.66	-	
	0400-3000-S6	●							30			75	1.8	31.13	32.15	33.23	-	-	
	0400-3500-S6	●							35			80	1.56	36.3	37.49	38.78	-	-	
	0500-1000-S6	●	2.5			5	3.5	4.8	10	70		2.94	10.63	10.92	11.22	11.55	-		
	0500-1500-S6	●							15			1.95	15.8	16.27	16.76	-	-		
	0500-2000-S6	●							20			1.46	20.97	21.61	-	-	-		
	0500-2500-S6	●							25			1.16	26.14	26.96	-	-	-		
	0500-3000-S6	●							30			80	0.97	31.31	-	-	-	-	
	0500-4000-S6	●	3			6	6	5.7	40	90		0.73	41.64	-	-	-	-		
	0600-1000-S6	●							10			-	-	-	-	-			
	0600-1500-S6	●							15										
	0600-2000-S6	●							20										
0600-2500-S6	●	25																	
0600-3000-S6	●	30							80										
0600-3500-S6	●	35							85										
0600-4000-S6	●	40							90										
0600-5000-S6	●	50	120																
0600-6000-S6	●	60																	

Recommended cutting conditions ➡ L50, L51

● : Standard item

L44

Solid tools

L

End mill

Micro solid tools

Drill

Recommended cutting condition

2KMB Standard type

		Prehardened steel NAK(35-45HRC)				Prehardened steel/Hardened steel STAVAX · SKD61(45-55HRC)				Hardened steel SKD11(55-62HRC)				Hardened steel Powder high-speed steel · SKH (62-66HRC)				Hardened steel Powder high-speed steel (66-70HRC)			
Ball radius RE (mm)	Flute length APMX (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)
0.05	0.1	50,000	200	0.008	0.008	40,000	170	0.006	0.006	40,000	110	0.003	0.006	40,000	70	0.002	0.006	40,000	60	0.002	0.003
0.075	0.15	50,000	240	0.008	0.008	40,000	200	0.006	0.006	40,000	170	0.003	0.006	40,000	110	0.002	0.006	40,000	90	0.002	0.003
0.1	0.2	50,000	480	0.015	0.031	40,000	400	0.011	0.022	40,000	350	0.011	0.011	40,000	260	0.003	0.006	40,000	170	0.003	0.003
0.15	0.3	50,000	550	0.015	0.046	40,000	460	0.011	0.033	40,000	400	0.011	0.022	40,000	330	0.006	0.011	40,000	250	0.003	0.006
0.2	0.6	50,000	1,320	0.031	0.092	40,000	1,100	0.022	0.066	40,000	900	0.022	0.055	40,000	530	0.011	0.022	36,000	480	0.01	0.022
0.25	0.8	50,000	1,580	0.046	0.108	40,000	1,320	0.033	0.077	40,000	1,100	0.028	0.055	40,000	660	0.017	0.033	32,000	500	0.011	0.022
0.3	0.9	50,000	2,110	0.077	0.154	40,000	1,760	0.055	0.11	40,000	1,320	0.033	0.066	30,000	790	0.022	0.055	27,000	590	0.022	0.055
0.4	1.2	50,000	2,900	0.154	0.231	40,000	2,420	0.11	0.165	40,000	1,980	0.077	0.11	30,000	1,320	0.055	0.11	25,500	990	0.033	0.11
0.5	1.5	45,000	3,300	0.154	0.462	40,000	2,750	0.11	0.33	30,000	2,200	0.11	0.22	25,000	1,540	0.088	0.11	21,500	1,160	0.055	0.11
0.75	2.3	35,000	3,960	0.231	0.462	30,000	3,300	0.165	0.33	30,000	2,750	0.11	0.33	25,000	2,200	0.11	0.22	20,000	1,650	0.066	0.22
1	3	25,000	3,960	0.308	0.77	25,000	3,300	0.22	0.55	25,000	2,750	0.22	0.55	20,000	2,200	0.165	0.33	16,000	1,650	0.11	0.33
1.25	3.8	25,000	3,960	0.462	0.924	25,000	3,300	0.33	0.66	20,000	2,750	0.22	0.55	18,000	2,200	0.165	0.44	15,500	1,650	0.11	0.44
1.5	5	22,000	3,960	0.308	0.968	20,000	3,300	0.22	0.88	18,000	2,750	0.22	0.66	14,000	2,200	0.22	0.55	13,000	1,650	0.132	0.55
2	6	22,000	3,960	0.462	1.815	20,000	3,300	0.33	1.65	16,000	2,750	0.22	0.88	12,000	2,200	0.22	0.66	10,500	1,650	0.165	0.66
2.5	8	20,000	3,960	0.462	1.815	18,000	3,300	0.33	1.65	12,000	2,750	0.22	1.32	9,500	2,200	0.22	0.77	8,500	1,650	0.176	0.77
3	10	18,000	3,960	0.462	2.42	16,000	3,300	0.33	2.2	8,000	2,750	0.33	1.32	7,000	2,200	0.22	1.1	6,000	1,650	0.176	1.1

If chatter occurs, adjust cutting conditions as necessary.

Pay particular attention to cutting condition settings and tool passes in areas where cutting load is high, such as corners.

Adjust the number of revolutions and feed rate at the same rate.

Oil mist coolant is recommended.

If ø1mm or L/D (aspect ratio) exceeds 8, adjust cutting conditions as needed.

Recommended cutting condition

2KMB Long neck type

		Prehardened steel NAK(35-45HRC)				Prehardened steel/Hardened steel STAVAX · SKD61(45-55HRC)				Hardened steel SKD11(55-62HRC)				Hardened steel Powder high-speed steel · SKH (62-66HRC)				Hardened steel Powder high-speed steel (66-70HRC)			
Ball radius RE (mm)	Usable length LU (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)
0.05	0.2	50,000	170	0.005	0.008	40,000	140	0.003	0.006	40,000	110	0.002	0.006	40,000	80	0.002	0.003	40,000	60	0.002	0.003
	0.3	50,000	130	0.005	0.008	40,000	110	0.003	0.006	40,000	80	0.002	0.006	40,000	60	0.002	0.003	40,000	50	0.002	0.003
	0.5	50,000	100	0.003	0.005	40,000	80	0.002	0.003	40,000	60	0.001	0.003	40,000	30	0.001	0.002	40,000	20	0.001	0.002
0.075	0.3	50,000	240	0.005	0.008	40,000	200	0.003	0.006	40,000	170	0.002	0.006	40,000	110	0.002	0.003	40,000	80	0.002	0.003
	0.5	50,000	200	0.005	0.008	40,000	170	0.003	0.006	40,000	130	0.002	0.006	40,000	80	0.002	0.003	40,000	60	0.002	0.003
	1	46,000	100	0.003	0.005	40,000	80	0.002	0.003	40,000	60	0.001	0.003	40,000	30	0.001	0.002	40,000	20	0.001	0.002
0.1	0.3	50,000	470	0.015	0.015	40,000	390	0.011	0.011	40,000	330	0.007	0.006	40,000	220	0.003	0.003	40,000	170	0.003	0.003
	0.5	50,000	420	0.012	0.015	40,000	350	0.009	0.011	40,000	310	0.006	0.006	40,000	200	0.003	0.003	40,000	150	0.003	0.003
	0.75	50,000	370	0.008	0.015	40,000	310	0.006	0.011	40,000	220	0.003	0.006	40,000	170	0.002	0.003	40,000	130	0.002	0.003
	1	50,000	340	0.005	0.008	40,000	280	0.003	0.006	40,000	180	0.002	0.003	40,000	130	0.001	0.002	40,000	100	0.001	0.002
	1.25	46,000	240	0.005	0.008	40,000	200	0.003	0.006	40,000	150	0.002	0.003	40,000	110	0.001	0.002	40,000	80	0.001	0.002
	1.5	46,000	200	0.005	0.008	40,000	170	0.003	0.006	40,000	130	0.002	0.003	40,000	90	0.001	0.002	40,000	70	0.001	0.002
	1.75	46,000	160	0.003	0.004	40,000	130	0.002	0.003	40,000	110	0.001	0.002	40,000	70	0.001	0.002	40,000	50	0.001	0.001
	2	46,000	130	0.003	0.004	40,000	110	0.002	0.003	40,000	90	0.001	0.002	40,000	60	0.001	0.001	40,000	40	0.001	0.001
	2.5	41,000	100	0.001	0.003	40,000	80	0.001	0.002	40,000	70	0.001	0.001	40,000	50	0.001	0.001	40,000	30	0.001	0.001
0.15	0.5	50,000	470	0.015	0.023	40,000	390	0.011	0.017	40,000	330	0.008	0.011	40,000	310	0.003	0.006	40,000	230	0.003	0.006
	0.6	50,000	470	0.011	0.015	40,000	390	0.008	0.011	40,000	330	0.006	0.008	40,000	280	0.003	0.006	40,000	210	0.003	0.006
	0.75	50,000	430	0.011	0.015	40,000	360	0.008	0.011	40,000	310	0.006	0.008	40,000	250	0.003	0.006	40,000	190	0.003	0.006
	1	50,000	420	0.011	0.015	40,000	350	0.008	0.011	40,000	280	0.006	0.008	40,000	220	0.003	0.006	40,000	170	0.003	0.006
	1.25	50,000	410	0.008	0.011	40,000	340	0.006	0.008	40,000	220	0.003	0.006	40,000	180	0.002	0.003	40,000	140	0.002	0.003
	1.5	50,000	370	0.008	0.011	40,000	310	0.006	0.008	40,000	200	0.003	0.006	40,000	130	0.002	0.003	40,000	100	0.002	0.003
	1.75	46,000	260	0.005	0.008	40,000	220	0.003	0.006	40,000	170	0.002	0.003	40,000	110	0.002	0.002	40,000	80	0.002	0.002
	2	46,000	230	0.005	0.008	40,000	190	0.003	0.006	40,000	130	0.002	0.003	40,000	100	0.002	0.002	40,000	80	0.002	0.002
	2.25	46,000	230	0.003	0.004	40,000	190	0.002	0.003	40,000	110	0.001	0.002	40,000	90	0.001	0.001	40,000	70	0.001	0.001
	2.5	46,000	170	0.003	0.004	40,000	140	0.002	0.003	40,000	90	0.001	0.002	40,000	80	0.001	0.001	40,000	60	0.001	0.001
	3	46,000	140	0.001	0.004	40,000	120	0.001	0.003	40,000	80	0.001	0.002	40,000	70	0.001	0.001	40,000	50	0.001	0.001
	3.5	44,000	110	0.001	0.003	40,000	90	0.001	0.002	40,000	70	0.001	0.001	40,000	60	0.001	0.001	40,000	50	0.001	0.001
	4	37,000	100	0.001	0.003	40,000	80	0.001	0.002	40,000	60	0.001	0.001	40,000	50	0.001	0.001	40,000	40	0.001	0.001
0.2	0.5	50,000	1,060	0.046	0.077	40,000	880	0.033	0.055	40,000	790	0.033	0.033	40,000	640	0.01	0.022	36,000	480	0.01	0.022
	0.8	50,000	1,060	0.031	0.077	40,000	880	0.022	0.055	40,000	790	0.022	0.033	40,000	640	0.009	0.022	36,000	480	0.009	0.022
	1	50,000	1,060	0.031	0.077	40,000	880	0.022	0.055	40,000	790	0.022	0.033	40,000	640	0.009	0.022	36,000	480	0.009	0.022
	1.5	50,000	820	0.015	0.046	40,000	680	0.011	0.033	40,000	550	0.011	0.022	40,000	440	0.006	0.011	35,000	330	0.006	0.011

L

Solid tools

End mill

Micro solid
tools

Drill

2KMB Long neck type

		Prehardened steel NAK(35-45HRC)				Prehardened steel/Hardened steel STAVAX · SKD61(45-55HRC)				Hardened steel SKD11(55-62HRC)				Hardened steel Powder high-speed steel · SKH (62-66HRC)				Hardened steel Powder high-speed steel (66-70HRC)			
Ball radius RE (mm)	Usable length LU (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)
0.2	2	50,000	660	0.015	0.031	40,000	550	0.011	0.022	40,000	420	0.011	0.011	40,000	330	0.006	0.008	36,000	250	0.006	0.008
	2.5	44,000	550	0.011	0.015	40,000	460	0.008	0.011	40,000	330	0.006	0.008	40,000	290	0.003	0.006	36,000	220	0.003	0.006
	3	37,000	400	0.011	0.015	40,000	330	0.008	0.011	40,000	260	0.006	0.008	40,000	220	0.003	0.006	36,000	170	0.002	0.003
	3.5	37,000	300	0.008	0.011	40,000	250	0.006	0.008	40,000	180	0.003	0.006	40,000	130	0.002	0.003	36,000	100	0.001	0.002
	4	37,000	220	0.008	0.008	30,000	180	0.006	0.006	30,000	130	0.003	0.003	30,000	100	0.002	0.003	27,000	80	0.001	0.001
	4.5	33,000	130	0.004	0.008	30,000	110	0.003	0.006	30,000	90	0.002	0.003	30,000	70	0.001	0.002	27,000	50	0.001	0.001
	5	33,000	100	0.003	0.004	30,000	80	0.002	0.003	30,000	60	0.001	0.002	30,000	40	0.001	0.002	27,000	30	0.001	0.001
0.25	1	50,000	1,320	0.046	0.077	40,000	1,100	0.033	0.055	40,000	950	0.022	0.033	40,000	720	0.011	0.022	32,000	500	0.011	0.022
	1.5	50,000	1,130	0.031	0.077	40,000	940	0.022	0.055	40,000	790	0.011	0.033	40,000	570	0.008	0.022	32,000	400	0.008	0.022
	2	50,000	950	0.031	0.046	40,000	790	0.022	0.033	40,000	720	0.011	0.022	40,000	440	0.008	0.011	32,000	310	0.008	0.011
	2.5	45,500	790	0.015	0.031	40,000	660	0.011	0.022	40,000	580	0.008	0.011	40,000	400	0.006	0.008	32,000	280	0.006	0.008
	3	45,500	660	0.015	0.031	40,000	550	0.011	0.022	40,000	460	0.008	0.011	40,000	350	0.006	0.008	32,000	250	0.006	0.008
	3.5	45,000	550	0.011	0.015	40,000	460	0.008	0.011	40,000	400	0.006	0.008	40,000	310	0.003	0.006	32,000	220	0.003	0.006
	4	39,000	470	0.011	0.015	40,000	390	0.008	0.011	40,000	330	0.006	0.008	40,000	290	0.003	0.006	32,000	200	0.003	0.006
	4.5	35,000	400	0.008	0.008	40,000	330	0.006	0.006	40,000	290	0.003	0.003	40,000	240	0.002	0.003	32,000	170	0.001	0.002
	5	35,000	310	0.008	0.008	33,000	260	0.006	0.006	33,000	220	0.003	0.003	33,000	200	0.002	0.003	26,500	140	0.001	0.001
	5.5	31,500	260	0.004	0.008	30,000	220	0.003	0.006	30,000	180	0.002	0.003	30,000	130	0.001	0.002	24,000	90	0.001	0.001
	6	31,500	160	0.003	0.004	30,000	130	0.002	0.003	30,000	90	0.001	0.002	30,000	80	0.001	0.002	24,000	60	0.001	0.001
0.3	1	50,000	1,850	0.077	0.154	40,000	1,540	0.055	0.11	40,000	1,100	0.033	0.066	30,000	790	0.022	0.055	27,000	590	0.022	0.055
	1.5	50,000	1,850	0.077	0.154	40,000	1,540	0.055	0.11	40,000	1,100	0.033	0.066	30,000	790	0.022	0.055	27,000	590	0.022	0.055
	2	50,000	1,850	0.077	0.154	40,000	1,540	0.055	0.11	40,000	1,100	0.033	0.066	30,000	790	0.022	0.055	27,000	590	0.022	0.055
	2.5	50,000	1,580	0.046	0.077	40,000	1,320	0.033	0.055	40,000	920	0.022	0.044	30,000	700	0.022	0.033	27,000	530	0.022	0.033
	3	50,000	1,580	0.046	0.077	40,000	1,320	0.033	0.055	40,000	920	0.022	0.044	30,000	700	0.022	0.033	27,000	530	0.022	0.033
	3.5	49,000	1,320	0.031	0.046	40,000	1,100	0.022	0.033	40,000	680	0.011	0.033	30,000	530	0.011	0.022	27,000	340	0.011	0.022
	4	49,000	1,320	0.031	0.046	40,000	1,100	0.022	0.033	40,000	680	0.011	0.033	30,000	530	0.011	0.022	27,000	340	0.011	0.022
	4.5	46,000	1,190	0.031	0.046	35,000	990	0.022	0.033	35,000	640	0.011	0.022	30,000	470	0.009	0.017	27,000	260	0.009	0.017
	5	40,000	950	0.015	0.031	30,000	790	0.011	0.022	30,000	550	0.008	0.017	30,000	440	0.008	0.011	27,000	240	0.008	0.011
	5.5	40,000	920	0.015	0.024	30,000	770	0.011	0.017	30,000	500	0.008	0.011	30,000	400	0.006	0.009	27,000	220	0.005	0.008
	6	40,000	660	0.011	0.015	30,000	550	0.008	0.011	30,000	420	0.006	0.008	30,000	350	0.004	0.007	27,000	190	0.003	0.006
	7	33,000	530	0.008	0.011	25,000	440	0.006	0.008	25,000	330	0.003	0.006	20,000	290	0.003	0.003	18,000	160	0.002	0.002
	8	27,500	420	0.004	0.008	25,000	350	0.003	0.006	25,000	290	0.003	0.003	20,000	240	0.002	0.003	18,000	130	0.001	0.002

Recommended cutting condition

2KMB Long neck type

		Prehardened steel NAK(35-45HRC)				Prehardened steel/Hardened steel STAVAX · SKD61(45-55HRC)				Hardened steel SKD11(55-62HRC)				Hardened steel Powder high-speed steel · SKH (62-66HRC)				Hardened steel Powder high-speed steel (66-70HRC)			
Ball radius RE (mm)	Usable length LU (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)
0.35	2	50,000	2,110	0.108	0.154	40,000	1,760	0.077	0.11	40,000	1,430	0.055	0.088	30,000	1,100	0.033	0.077	27,000	770	0.022	0.055
	4	49,000	1,720	0.062	0.092	40,000	1,430	0.044	0.066	40,000	900	0.033	0.044	30,000	660	0.017	0.022	27,000	360	0.011	0.022
0.4	2	50,000	2,640	0.154	0.231	40,000	2,200	0.11	0.165	40,000	1,760	0.077	0.11	30,000	1,320	0.055	0.11	25,500	990	0.033	0.11
	3	50,000	2,640	0.154	0.231	40,000	2,200	0.11	0.165	40,000	1,760	0.077	0.11	30,000	1,320	0.055	0.055	25,500	990	0.033	0.055
	4	50,000	2,110	0.077	0.154	40,000	1,760	0.055	0.11	40,000	1,320	0.055	0.055	30,000	950	0.033	0.055	25,500	710	0.022	0.055
	5	50,000	2,110	0.077	0.077	40,000	1,760	0.055	0.055	40,000	1,100	0.033	0.055	30,000	680	0.022	0.033	25,500	510	0.017	0.033
	6	43,000	1,580	0.046	0.077	30,000	1,320	0.033	0.055	30,000	840	0.022	0.033	25,000	620	0.011	0.022	21,500	370	0.011	0.022
	7	40,000	1,320	0.031	0.046	30,000	1,100	0.022	0.033	30,000	750	0.011	0.022	25,000	570	0.008	0.011	21,500	340	0.006	0.01
	8	35,500	1,080	0.015	0.031	30,000	900	0.011	0.022	30,000	660	0.008	0.011	25,000	530	0.006	0.011	21,500	320	0.005	0.008
	9	27,500	600	0.008	0.008	25,000	500	0.006	0.006	25,000	420	0.003	0.003	20,000	350	0.002	0.003	17,000	210	0.002	0.002
0.45	2	50,000	2,900	0.154	0.308	40,000	2,420	0.11	0.22	30,000	1,980	0.088	0.165	30,000	1,430	0.066	0.11	27,000	1,000	0.033	0.11
	4	48,500	2,380	0.077	0.185	40,000	1,980	0.055	0.132	30,000	1,540	0.044	0.088	25,000	990	0.033	0.055	22,500	740	0.022	0.055
	6	41,000	1,580	0.054	0.077	30,000	1,320	0.039	0.055	25,000	880	0.028	0.039	20,000	660	0.017	0.028	18,000	430	0.011	0.022
0.5	2	46,000	3,300	0.154	0.462	40,000	2,750	0.11	0.33	30,000	2,200	0.11	0.22	25,000	1,540	0.088	0.11	21,500	1,160	0.055	0.11
	2.5	46,000	3,300	0.154	0.462	40,000	2,750	0.11	0.33	30,000	2,200	0.11	0.22	25,000	1,540	0.088	0.11	21,500	1,160	0.055	0.11
	3	46,000	3,300	0.154	0.462	40,000	2,750	0.11	0.33	30,000	2,200	0.11	0.22	25,000	1,540	0.088	0.11	21,500	1,160	0.055	0.11
	4	46,000	3,300	0.154	0.308	40,000	2,750	0.11	0.22	30,000	1,980	0.055	0.165	25,000	1,320	0.055	0.11	21,500	990	0.033	0.11
	5	40,000	2,640	0.077	0.231	30,000	2,200	0.055	0.165	25,000	1,760	0.044	0.11	20,000	1,010	0.033	0.055	17,000	760	0.022	0.055
	6	39,000	2,380	0.077	0.154	30,000	1,980	0.055	0.11	25,000	1,320	0.044	0.055	20,000	810	0.022	0.055	17,000	610	0.017	0.055
	7	33,500	1,580	0.062	0.092	30,000	1,320	0.044	0.066	25,000	1,050	0.033	0.044	20,000	750	0.022	0.033	17,000	560	0.011	0.033
	8	33,500	1,320	0.062	0.092	30,000	1,100	0.044	0.066	25,000	950	0.033	0.044	20,000	620	0.022	0.033	17,000	430	0.01	0.02
	9	33,500	1,080	0.046	0.077	25,000	900	0.033	0.055	20,000	830	0.022	0.033	18,000	550	0.011	0.022	15,500	390	0.008	0.01
	10	33,500	1,000	0.046	0.077	25,000	830	0.033	0.055	20,000	680	0.022	0.033	18,000	500	0.011	0.022	15,500	330	0.008	0.008
	12	28,500	790	0.015	0.046	20,000	660	0.011	0.033	18,000	570	0.008	0.022	16,000	440	0.006	0.011	14,000	290	0.004	0.006
	13	24,500	660	0.013	0.031	20,000	550	0.009	0.022	18,000	460	0.006	0.011	16,000	390	0.003	0.007	14,000	250	0.002	0.004

L

Solid tools

End mill

Micro solid
tools

Drill

2KMB Long neck type

Ball radius RE (mm)	Usable length LU (mm)	Prehardened steel NAK(35-45HRC)				Prehardened steel/Hardened steel STAVAX · SKD61(45-55HRC)				Hardened steel SKD11(55-62HRC)				Hardened steel Powder high-speed steel · SKH (62-66HRC)				Hardened steel Powder high-speed steel (66-70HRC)			
		No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)
0.6	2.4	39,500	3,300	0.154	0.462	30,000	2,750	0.11	0.33	30,000	2,200	0.11	0.22	25,000	1,760	0.088	0.11	21,500	1,320	0.055	0.11
	4	39,500	3,300	0.154	0.308	30,000	2,750	0.11	0.22	30,000	2,200	0.077	0.22	25,000	1,760	0.088	0.11	21,500	1,320	0.055	0.11
	6	39,500	2,640	0.108	0.154	30,000	2,200	0.077	0.11	25,000	1,760	0.055	0.11	20,000	1,320	0.033	0.077	17,000	860	0.022	0.077
	8	32,000	2,110	0.077	0.154	30,000	1,760	0.055	0.11	25,000	1,320	0.033	0.077	20,000	1,010	0.022	0.055	17,000	760	0.017	0.055
	10	29,500	1,580	0.046	0.108	20,000	1,320	0.033	0.077	20,000	950	0.022	0.055	18,000	750	0.011	0.033	15,500	560	0.01	0.03
	12	29,500	1,140	0.031	0.077	20,000	950	0.022	0.055	20,000	680	0.011	0.033	18,000	530	0.008	0.022	15,500	400	0.008	0.02
	14	25,000	790	0.031	0.046	18,000	660	0.022	0.033	18,000	440	0.011	0.022	16,000	330	0.006	0.011	14,000	250	0.005	0.01
	16	21,000	470	0.015	0.031	16,000	390	0.011	0.022	16,000	280	0.006	0.011	14,000	140	0.003	0.008	12,000	110	0.002	0.005
0.7	8	28,000	3,300	0.123	0.246	30,000	2,750	0.088	0.176	20,000	1,980	0.055	0.123	20,000	1,100	0.033	0.088	17,000	830	0.022	0.055
	12	26,000	1,850	0.108	0.185	20,000	1,540	0.077	0.132	18,000	1,210	0.044	0.088	18,000	770	0.017	0.055	15,500	620	0.017	0.055
0.75	3	36,000	3,960	0.231	0.462	30,000	3,300	0.165	0.33	30,000	2,750	0.11	0.33	25,000	2,200	0.11	0.22	20,000	1,650	0.066	0.22
	4	36,000	3,960	0.231	0.462	30,000	3,300	0.165	0.33	30,000	2,750	0.11	0.33	25,000	2,200	0.11	0.22	20,000	1,320	0.066	0.22
	6	36,000	3,960	0.231	0.308	30,000	3,300	0.165	0.22	30,000	2,200	0.11	0.22	25,000	1,760	0.11	0.11	20,000	990	0.066	0.11
	8	34,000	3,300	0.154	0.308	25,000	2,750	0.11	0.22	25,000	1,760	0.055	0.22	20,000	1,320	0.055	0.11	16,000	790	0.033	0.11
	10	34,000	3,300	0.154	0.154	25,000	2,750	0.11	0.11	25,000	1,320	0.055	0.11	20,000	950	0.055	0.055	16,000	570	0.033	0.055
	12	26,000	2,380	0.077	0.154	20,000	1,980	0.055	0.11	20,000	1,010	0.033	0.11	18,000	860	0.022	0.055	14,500	520	0.017	0.055
	14	23,000	1,580	0.077	0.108	20,000	1,320	0.055	0.077	20,000	900	0.033	0.055	18,000	720	0.022	0.033	14,500	430	0.012	0.016
	16	19,500	950	0.046	0.077	18,000	790	0.033	0.055	18,000	720	0.022	0.033	16,000	640	0.011	0.022	13,000	380	0.01	0.012
	18	19,500	730	0.031	0.062	16,000	610	0.022	0.044	16,000	440	0.013	0.028	14,000	440	0.009	0.017	11,500	260	0.007	0.01
	20	19,500	600	0.015	0.046	16,000	500	0.011	0.033	16,000	400	0.011	0.022	14,000	330	0.008	0.011	11,500	200	0.006	0.008
0.8	8	31,000	3,300	0.154	0.308	25,000	2,750	0.11	0.22	20,000	2,200	0.077	0.165	18,000	1,760	0.055	0.11	14,500	790	0.033	0.11
	12	28,000	2,380	0.108	0.154	20,000	1,980	0.077	0.11	16,000	1,650	0.055	0.077	14,000	1,320	0.033	0.055	11,500	590	0.022	0.055



Solid tools

Recommended cutting condition

2KMB Long neck type

		Prehardened steel NAK(35-45HRC)				Prehardened steel/Hardened steel STAVAX · SKD61(45-55HRC)				Hardened steel SKD11(55-62HRC)				Hardened steel Powder high-speed steel · SKH (62-66HRC)				Hardened steel Powder high-speed steel (66-70HRC)			
Ball radius RE (mm)	Usable length LU (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)
1	3	27,000	3,960	0.308	0.77	25,000	3,300	0.22	0.55	25,000	2,750	0.22	0.55	20,000	2,200	0.165	0.33	16,000	1,650	0.11	0.33
	4	27,000	3,960	0.308	0.77	25,000	3,300	0.22	0.55	25,000	2,750	0.22	0.55	20,000	2,200	0.165	0.33	16,000	1,650	0.11	0.33
	6	27,000	3,300	0.308	0.77	25,000	2,750	0.22	0.55	25,000	2,200	0.22	0.33	20,000	1,760	0.165	0.33	16,000	1,320	0.11	0.33
	8	27,000	2,640	0.308	0.462	20,000	2,200	0.22	0.33	18,000	1,760	0.11	0.22	16,000	1,320	0.11	0.22	13,000	990	0.066	0.165
	10	27,000	2,640	0.154	0.462	18,000	2,200	0.11	0.33	16,000	1,760	0.11	0.22	14,000	1,320	0.11	0.11	11,500	860	0.066	0.11
	12	22,500	2,110	0.154	0.308	16,000	1,760	0.11	0.22	14,000	1,320	0.11	0.11	12,000	1,030	0.055	0.11	10,000	670	0.033	0.11
	13	22,500	2,110	0.123	0.308	16,000	1,760	0.088	0.22	14,000	1,320	0.066	0.11	12,000	1,030	0.044	0.088	10,000	620	0.033	0.055
	14	22,500	2,110	0.108	0.231	16,000	1,760	0.077	0.165	14,000	1,320	0.055	0.088	12,000	1,030	0.033	0.077	10,000	520	0.033	0.055
	16	22,500	2,110	0.108	0.231	16,000	1,760	0.077	0.165	14,000	1,320	0.055	0.088	12,000	1,030	0.033	0.077	10,000	410	0.033	0.055
	18	21,500	1,850	0.077	0.154	14,000	1,540	0.055	0.11	12,000	1,100	0.033	0.055	10,000	940	0.022	0.033	8,000	380	0.02	0.025
	20	19,500	1,320	0.077	0.154	14,000	1,100	0.055	0.11	12,000	900	0.033	0.055	10,000	790	0.022	0.033	8,000	320	0.015	0.02
	22	17,500	1,130	0.046	0.123	14,000	940	0.033	0.088	12,000	770	0.022	0.066	10,000	660	0.022	0.022	8,000	260	0.012	0.015
	25	14,500	900	0.046	0.077	12,000	750	0.033	0.055	10,000	620	0.022	0.033	8,500	460	0.011	0.022	7,000	180	0.008	0.012
1.25	6	24,000	3,700	0.462	0.77	20,000	3,080	0.33	0.55	20,000	2,530	0.22	0.55	18,000	2,200	0.165	0.44	15,500	1,650	0.11	0.44
	8	24,000	3,430	0.385	0.462	20,000	2,860	0.275	0.33	20,000	2,310	0.165	0.33	18,000	1,980	0.132	0.275	15,500	1,490	0.11	0.275
	10	24,000	3,300	0.308	0.462	20,000	2,750	0.22	0.33	20,000	2,200	0.165	0.22	18,000	1,760	0.11	0.165	15,500	1,230	0.066	0.165
	15	18,500	2,640	0.154	0.308	18,000	2,200	0.11	0.22	16,000	1,760	0.077	0.165	14,000	1,320	0.055	0.11	12,000	790	0.033	0.11
	20	17,000	1,980	0.108	0.231	16,000	1,650	0.077	0.165	14,000	1,320	0.055	0.11	10,000	1,100	0.033	0.055	8,500	660	0.033	0.055
	25	17,000	1,320	0.077	0.154	14,000	1,100	0.055	0.11	12,000	940	0.033	0.077	8,000	790	0.022	0.033	7,000	470	0.015	0.02
1.5	30	13,000	950	0.046	0.108	12,000	790	0.033	0.077	10,000	700	0.022	0.055	7,000	640	0.011	0.022	6,000	380	0.008	0.012
	6	22,000	3,960	0.462	0.968	20,000	3,300	0.33	0.88	18,000	2,750	0.22	0.66	14,000	2,200	0.22	0.55	13,000	1,650	0.132	0.55
	8	22,000	3,960	0.462	0.968	20,000	3,300	0.33	0.88	18,000	2,750	0.22	0.66	14,000	2,200	0.22	0.55	13,000	1,650	0.132	0.55
	10	22,000	3,300	0.308	0.726	20,000	2,750	0.22	0.66	18,000	2,200	0.22	0.44	14,000	1,820	0.11	0.33	13,000	1,400	0.11	0.33
	12	22,000	3,300	0.308	0.726	20,000	2,750	0.22	0.66	18,000	2,200	0.22	0.44	14,000	1,820	0.11	0.33	13,000	1,240	0.066	0.33
	14	20,000	2,640	0.154	0.484	18,000	2,200	0.11	0.44	16,000	1,760	0.11	0.33	12,000	1,450	0.11	0.22	11,000	990	0.066	0.22
	16	20,000	2,640	0.154	0.484	18,000	2,200	0.11	0.44	16,000	1,760	0.11	0.33	12,000	1,450	0.11	0.22	11,000	990	0.066	0.22
	20	20,000	2,120	0.154	0.363	18,000	1,760	0.11	0.33	16,000	1,320	0.11	0.22	12,000	1,060	0.11	0.11	11,000	740	0.066	0.11
	25	18,000	1,590	0.154	0.242	16,000	1,320	0.11	0.22	14,000	1,010	0.077	0.165	10,000	880	0.055	0.077	9,000	620	0.053	0.077

L

Solid tools

End mill

Micro solid
tools

Drill

2KMB Long neck type

		Prehardened steel NAK(35-45HRC)				Prehardened steel/Hardened steel STAVAX · SKD61(45-55HRC)				Hardened steel SKD11(55-62HRC)				Hardened steel Powder high-speed steel · SKH (62-66HRC)				Hardened steel Powder high-speed steel (66-70HRC)			
Ball radius RE (mm)	Usable length LU (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)	No. of revolutions n (min ⁻¹)	Feed Vf (mm/min)	Depth of cut ap (mm)	Cutting width ae (mm)
1.75	15	22,000	3,960	0.385	1.21	20,000	3,300	0.275	1.1	16,000	2,530	0.165	0.55	14,000	1,650	0.143	0.44	13,000	990	0.143	0.422
	20	20,000	3,300	0.278	0.726	18,000	2,750	0.198	0.66	15,000	1,980	0.11	0.33	12,000	1,320	0.11	0.22	11,000	790	0.11	0.22
	25	18,000	2,380	0.186	0.424	16,000	1,980	0.132	0.385	14,000	1,760	0.11	0.22	10,000	1,100	0.066	0.132	9,000	660	0.066	0.132
	30	15,500	1,980	0.154	0.303	14,000	1,650	0.11	0.275	11,000	1,050	0.077	0.165	9,000	880	0.055	0.088	8,500	530	0.055	0.088
2	8	22,000	3,960	0.462	1.815	20,000	3,300	0.33	1.65	16,000	2,750	0.22	0.88	12,000	2,200	0.22	0.66	10,500	1,650	0.165	0.66
	10	22,000	3,960	0.462	1.815	20,000	3,300	0.33	1.65	16,000	2,750	0.22	0.88	12,000	2,200	0.22	0.66	10,500	1,650	0.165	0.66
	12	22,000	3,960	0.462	1.815	20,000	3,300	0.33	1.65	16,000	2,750	0.22	0.88	12,000	2,200	0.22	0.66	10,500	1,650	0.165	0.66
	14	22,000	3,960	0.462	1.815	20,000	3,300	0.33	1.65	16,000	2,200	0.22	0.88	12,000	1,760	0.22	0.66	10,500	1,320	0.132	0.66
	15	22,000	3,960	0.462	1.815	20,000	3,300	0.33	1.65	16,000	2,200	0.22	0.88	12,000	1,760	0.22	0.66	10,500	1,320	0.132	0.66
	20	18,000	3,170	0.308	1.21	16,000	2,640	0.22	1.1	14,000	1,980	0.11	0.66	10,000	1,540	0.11	0.44	8,500	1,000	0.088	0.44
	25	18,000	2,120	0.308	0.968	16,000	1,760	0.22	0.88	14,000	1,320	0.11	0.44	10,000	1,100	0.11	0.22	8,500	720	0.088	0.22
	30	15,500	2,120	0.154	0.363	14,000	1,760	0.11	0.33	10,000	1,320	0.077	0.22	10,000	1,100	0.055	0.165	8,500	720	0.055	0.165
	35	15,500	1,590	0.154	0.242	14,000	1,320	0.11	0.22	10,000	1,100	0.077	0.165	10,000	900	0.055	0.11	8,500	590	0.055	0.11
2.5	10	20,000	3,960	0.462	1.815	18,000	3,300	0.33	1.65	12,000	2,750	0.22	1.32	9,500	2,200	0.22	0.77	8,500	1,650	0.176	0.77
	15	20,000	3,960	0.462	1.815	18,000	3,300	0.33	1.65	12,000	2,750	0.22	1.32	9,500	2,200	0.22	0.77	8,500	1,650	0.176	0.77
	20	20,000	3,960	0.462	1.452	15,000	3,300	0.33	1.32	10,000	2,200	0.22	1.1	8,000	1,760	0.165	0.66	7,000	1,320	0.132	0.66
	25	16,500	3,300	0.308	1.21	15,000	2,750	0.22	1.1	9,000	1,980	0.165	0.88	7,500	1,540	0.11	0.55	6,500	1,160	0.088	0.44
	30	13,500	2,640	0.308	0.968	12,000	2,200	0.22	0.88	8,000	1,650	0.165	0.55	6,500	1,100	0.11	0.33	6,000	830	0.088	0.264
	40	11,000	1,590	0.154	0.242	10,000	1,320	0.11	0.22	7,000	1,100	0.077	0.165	5,500	900	0.055	0.22	5,000	680	0.044	0.176
3	10	18,000	3,960	0.462	2.42	16,000	3,300	0.33	2.2	8,000	2,750	0.33	1.32	7,000	2,200	0.22	1.1	6,000	1,650	0.176	0.88
	15	18,000	3,960	0.462	2.42	16,000	3,300	0.33	2.2	8,000	2,750	0.33	1.32	7,000	2,200	0.22	1.1	6,000	1,650	0.176	0.88
	20	18,000	3,960	0.462	2.42	16,000	3,300	0.33	2.2	8,000	2,750	0.33	1.32	7,000	2,200	0.22	1.1	6,000	1,650	0.176	0.88
	25	18,000	3,960	0.462	1.815	16,000	3,300	0.33	1.65	8,000	2,200	0.22	1.1	7,000	1,650	0.165	0.77	6,000	1,240	0.132	0.77
	30	18,000	3,960	0.308	1.815	14,000	3,300	0.22	1.65	7,500	2,200	0.22	1.1	6,500	1,650	0.165	0.77	6,000	1,070	0.132	0.77
	35	14,500	3,170	0.308	1.452	13,000	2,640	0.22	1.32	7,000	1,760	0.187	0.88	6,000	1,320	0.132	0.55	5,500	860	0.106	0.44
	40	13,500	2,380	0.308	1.21	12,000	1,980	0.22	1.1	6,500	1,320	0.165	0.66	5,500	1,100	0.11	0.44	5,000	720	0.088	0.352
	50	9,500	1,590	0.154	0.726	8,500	1,320	0.11	0.66	5,000	950	0.11	0.33	4,000	680	0.055	0.22	3,500	450	0.044	0.176
	60	7,000	800	0.108	0.363	6,000	660	0.077	0.33	3,500	500	0.055	0.165	2,500	330	0.033	0.077	2,500	210	0.026	0.062

If chatter occurs, adjust cutting conditions as necessary.

Pay particular attention to cutting condition settings and tool passes in areas where cutting load is high, such as corners.

Adjust the number of revolutions and feed rate at the same rate.

Oil mist coolant is recommended.

If $\phi 1\text{mm}$ or L/D (aspect ratio) exceeds 8, adjust cutting conditions as needed.



Solid tools

High efficiency coated solid carbide drill

KDA

Highly efficient and cost effective

New general purpose solid carbide drill

1

General purpose design and lineup applicable to a wide range of machining applications

Type N: Without coolant holes Type C: With coolant holes
3D and 5D depths available



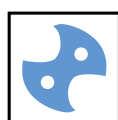
Type N
Normal type

General purpose design without coolant holes
Economical style for machining with external coolant

Diameter range



Cutting diameters available in 0.1 mm increments



Type C
with Coolant hole

Coolant-through design provides higher efficiency and stable machining with stainless steel, etc.

Diameter range



Cutting diameters available in 0.1 mm increments

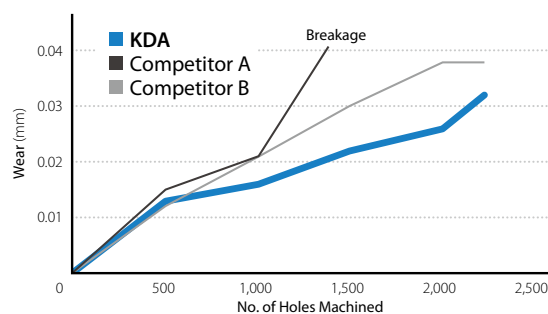


2

High-performance coating maintains long tool life

Excellent wear and heat resistance aluminum chrome (AlCr) coating

Wear resistance comparison (Internal evaluation)



Cutting conditions: $V_c = 120$ m/min, $f = 0.23$ mm/rev, $H = 24$ mm,
Wet (Internal coolant) S50C BT50 ø 6 (5D) Type C



KDA



Competitor B

L

Solid tools

End mill

Micro solid tools

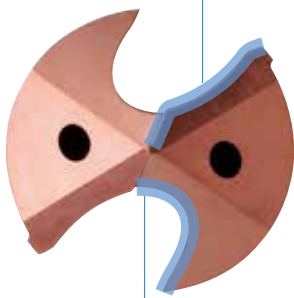
Drill

3 Stable machining with unique shape

Curved cutting-edge design and special flute shape

Curved cutting-edge design

Excellent sharpness and cutting edge-strength



Special flute shape

Excellent chip control and high rigidity

Chip condition (Internal evaluation)



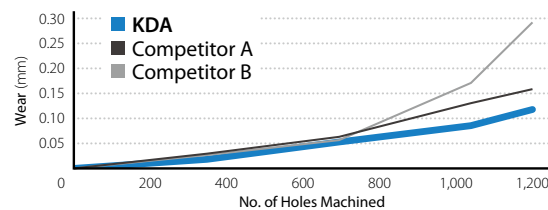
KDA

Cutting conditions:
Vc = 80 m/min, f = 0.14 mm/rev,
H = 24 mm, Wet (Internal coolant)
BT50 ø 6 (5D) Type C

4 Supports a variety of workpieces

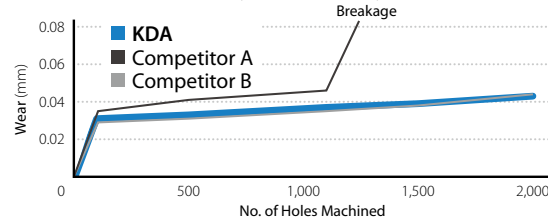
Compatible not only with carbon steel, but also mold steel, stainless steel, cast iron machining, etc.

Alloy steel SCM440 (32HRC) (Internal evaluation)



Cutting conditions: Vc = 100 m/min, f = 0.15 mm/rev, H = 24 mm,
Wet (Internal coolant) BT50 ø 6 (5D) Type C

Stainless steel SUS304 (Internal evaluation)



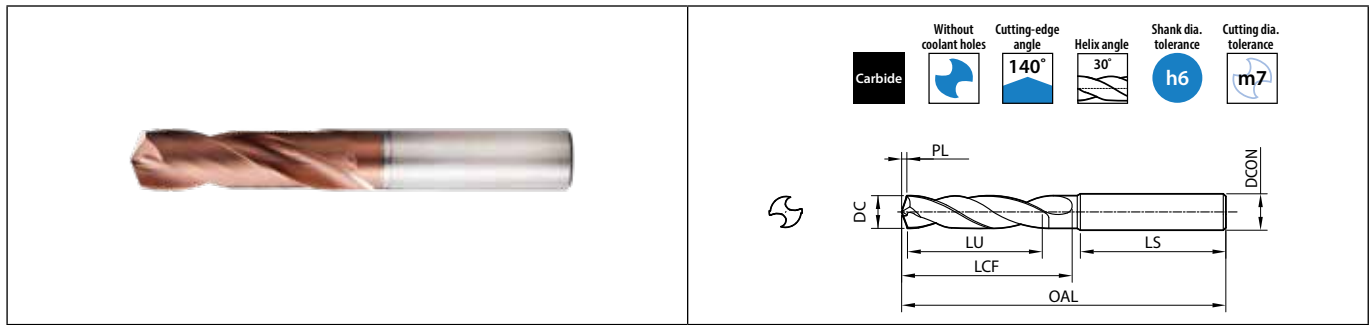
Cutting conditions: Vc = 80 m/min, f = 0.14 mm/rev, H = 24 mm,
Wet (Internal coolant) BT50 ø 6 (5D) Type C

L



Solid tools

KDA (3D, Type N, Without coolant holes)



Dimensions

Description		Availability	Dimension (mm)									
			DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL	
				min.	max.							
KDA	0300X03S060N	●	3	0.002	0.012	6	62	15.5	20	36	0.5	
	0310X03S060N	●	3.1	0.004	0.016			15.3				24
	0320X03S060N	●	3.2					15.2				
	0330X03S060N	●	3.3					15				
	0340X03S060N	●	3.4					14.9				
	0350X03S060N	●	3.5					14.7				
	0360X03S060N	●	3.6				14.6					
	0370X03S060N	●	3.7				14.4					
	0380X03S060N	●	3.8				66	18.3	28			
	0390X03S060N	●	3.9					18.1				
	0400X03S060N	●	4					18				
	0410X03S060N	●	4.1					17.8				
	0420X03S060N	●	4.2			17.7						
	0430X03S060N	●	4.3			17.5						
	0440X03S060N	●	4.4			17.4						
	0450X03S060N	●	4.5			17.2						
	0460X03S060N	●	4.6			17.1						
	0470X03S060N	●	4.7			16.9						
	0480X03S060N	●	4.8			20.8						
	0490X03S060N	●	4.9	20.6								
	0500X03S060N	●	5	20.5								
	0510X03S060N	●	5.1	20.3								
	0520X03S060N	●	5.2	20.2								
	0530X03S060N	●	5.3	20								
	0540X03S060N	●	5.4	19.9								
	0550X03S060N	●	5.5	19.7								
	0560X03S060N	●	5.6	19.6								
	0570X03S060N	●	5.7	19.4								
	0580X03S060N	●	5.8	19.3								
0590X03S060N	●	5.9	19.1									
0600X03S060N	●	6	19	8	79	34	1.1					
0610X03S080N	●	6.1	0.006					0.021	24.8			
0620X03S080N	●	6.2							24.7			
0630X03S080N	●	6.3							24.5			
0640X03S080N	●	6.4							24.4			
0650X03S080N	●	6.5							24.2			
0660X03S080N	●	6.6							24.1			
0670X03S080N	●	6.7							23.9			
0680X03S080N	●	6.8							23.8			
0690X03S080N	●	6.9		23.6	1.2							

Description	Availability	DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
			min.	max.						
KDA 0700X03S080N	●	7					23.5	34		1.2
0710X03S080N	●	7.1					30.3			
0720X03S080N	●	7.2					30.2			
0730X03S080N	●	7.3					30			
0740X03S080N	●	7.4					29.9			1.3
0750X03S080N	●	7.5			8	79	29.7	41	36	
0760X03S080N	●	7.6					29.6			
0770X03S080N	●	7.7					29.4			
0780X03S080N	●	7.8					29.3			
0790X03S080N	●	7.9					29.1			1.4
0800X03S080N	●	8					29			
0810X03S100N	●	8.1					34.8			
0820X03S100N	●	8.2					34.7			
0830X03S100N	●	8.3					34.5			
0840X03S100N	●	8.4	0.006	0.021			34.4			
0850X03S100N	●	8.5					34.2			1.5
0860X03S100N	●	8.6					34.1			
0870X03S100N	●	8.7					33.9			
0880X03S100N	●	8.8					33.8			
0890X03S100N	●	8.9					33.6			
0900X03S100N	●	9			10	89	33.5	47	40	1.6
0910X03S100N	●	9.1					33.3			
0920X03S100N	●	9.2					33.2			
0930X03S100N	●	9.3					33			
0940X03S100N	●	9.4					32.9			
0950X03S100N	●	9.5					32.7			1.7
0960X03S100N	●	9.6					32.6			
0970X03S100N	●	9.7					32.4			
0980X03S100N	●	9.8					32.3			
0990X03S100N	●	9.9					32.1			1.8

Recommended cutting conditions ➔ L62

● : Standard item

Identification system

KDA	0950	X	03	S100	C
Product name High efficiency Coated solid carbide drill	Cutting dia. DC ø9.5		Drilling depth* (L/D) 03 : 3D 05 : 5D	Shank dia. DCON ø10.0	Type N: Without coolant holes C: With coolant holes

* Drilling depth is an approximate indication of L/D and depends on the size.
Depending on the size, the size may be smaller than the L/D indicated. Check the dimension table.

Dimensions

Description		Availability	Dimension (mm)								
			DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
				min.	max.						
KDA	1000X03S100N	●	10	0.006	0.021	10	89	32	47	40	1.8
	1010X03S120N	●	10.1	0.025	12	102	39.8	55	40		
	1020X03S120N	●	10.2				39.7				
	1030X03S120N	●	10.3				39.5				
	1040X03S120N	●	10.4				39.4				
	1050X03S120N	●	10.5				39.2				
	1060X03S120N	●	10.6				39.1				
	1070X03S120N	●	10.7				38.9			1.9	
	1080X03S120N	●	10.8				38.8				
	1090X03S120N	●	10.9				38.6				
	1100X03S120N	●	11				38.5				2.0
	1110X03S120N	●	11.1	38.3							
	1120X03S120N	●	11.2	38.2							
	1130X03S120N	●	11.3	38							
	1140X03S120N	●	11.4	37.9							
	1150X03S120N	●	11.5	37.7							
	1160X03S120N	●	11.6	37.6	2.1						
	1170X03S120N	●	11.7	37.4							
	1180X03S120N	●	11.8	37.3							
	1190X03S120N	●	11.9	37.1							
	1200X03S120N	●	12	0.007		0.025	37	45			
	1210X03S140N	●	12.1	14		107	41.8		2.2		
	1220X03S140N	●	12.2		41.7						
	1230X03S140N	●	12.3		41.5						
	1240X03S140N	●	12.4		41.4						
	1250X03S140N	●	12.5		41.2						
	1260X03S140N	●	12.6		41.1						
	1270X03S140N	●	12.7		40.9		2.3				
	1280X03S140N	●	12.8		40.8						
	1290X03S140N	●	12.9		40.6						
1300X03S140N	●	13	40.5		60						
1310X03S140N	●	13.1	40.3								
1320X03S140N	●	13.2	40.2								
1330X03S140N	●	13.3	40								
1340X03S140N	●	13.4	39.9	2.4							
1350X03S140N	●	13.5	39.7								
1360X03S140N	●	13.6	39.6								
1370X03S140N	●	13.7	39.4								
1380X03S140N	●	13.8	39.3		2.5						
1390X03S140N	●	13.9	39.1								

Description		Availability	DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
				min.	max.						
KDA	1400X03S140N	●	14			14	107	39	60	45	
	1410X03S160N	●	14.1					43.8			2.5
	1420X03S160N	●	14.2					43.7			
	1430X03S160N	●	14.3					43.5			
	1440X03S160N	●	14.4					43.4			
	1450X03S160N	●	14.5					43.2			2.6
	1460X03S160N	●	14.6					43.1			
	1470X03S160N	●	14.7					42.9			
	1480X03S160N	●	14.8					42.8			
	1490X03S160N	●	14.9					42.6			
	1500X03S160N	●	15	0.007	0.025			42.5			
	1510X03S160N	●	15.1			16	115	42.3	65	48	2.7
	1520X03S160N	●	15.2					42.2			
	1530X03S160N	●	15.3					42			
	1540X03S160N	●	15.4					41.9			
	1550X03S160N	●	15.5					41.7			
	1560X03S160N	●	15.6					41.6			2.8
	1570X03S160N	●	15.7					41.4			
	1580X03S160N	●	15.8					41.3			
	1590X03S160N	●	15.9					41.1			
	1600X03S160N	●	16					41			2.9

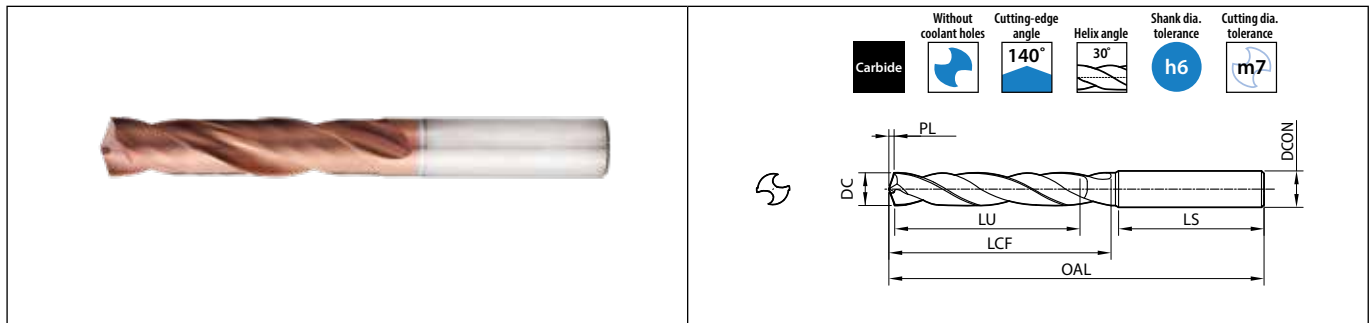


Solid tools

Recommended cutting conditions ➡ L62

● : Standard item

KDA (5D, Type N, Without coolant holes)



Dimensions

Description		Availability	Dimension (mm)								
			DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
				min.	max.						
KDA	0300X05S060N	●	3	0.002	0.012	66		23.5	28		0.5
	0310X05S060N	●	3.1					23.3			
	0320X05S060N	●	3.2					23.2			
	0330X05S060N	●	3.3					23			
	0340X05S060N	●	3.4					22.9			
	0350X05S060N	●	3.5					22.7			
	0360X05S060N	●	3.6					22.6			
	0370X05S060N	●	3.7					22.4			
	0380X05S060N	●	3.8				74	30.3			
	0390X05S060N	●	3.9					30.1			
	0400X05S060N	●	4					30			
	0410X05S060N	●	4.1					29.8			
	0420X05S060N	●	4.2					29.7			
	0430X05S060N	●	4.3					29.5			
	0440X05S060N	●	4.4					29.4			
	0450X05S060N	●	4.5					29.2			
	0460X05S060N	●	4.6					29.1			
	0470X05S060N	●	4.7				28.9				
	0480X05S060N	●	4.8			82	36.8	44		0.7	
	0490X05S060N	●	4.9								36.6
	0500X05S060N	●	5								36.5
	0510X05S060N	●	5.1								36.3
	0520X05S060N	●	5.2								36.2
	0530X05S060N	●	5.3								36
	0540X05S060N	●	5.4								35.9
	0550X05S060N	●	5.5								35.7
	0560X05S060N	●	5.6								35.6
	0570X05S060N	●	5.7				35.4				
	0580X05S060N	●	5.8				35.3				
	0590X05S060N	●	5.9				35.1				
0600X05S060N	●	6				35	53		0.8		
0610X05S080N	●	6.1				43.8					
0620X05S080N	●	6.2				43.7					
0630X05S080N	●	6.3				43.5					
0640X05S080N	●	6.4				43.4					
0650X05S080N	●	6.5				43.2					
0660X05S080N	●	6.6				43.1					
0670X05S080N	●	6.7				42.9					
0680X05S080N	●	6.8				42.8					
0690X05S080N	●	6.9				42.6					

Description	Availability	DC	Dimension (mm)							
			Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
			min.	max.						
KDA 0700X05S080N	●	7					42.5			
0710X05S080N	●	7.1					42.3			1.2
0720X05S080N	●	7.2					42.2			
0730X05S080N	●	7.3					42			
0740X05S080N	●	7.4					41.9			
0750X05S080N	●	7.5					41.7			
0760X05S080N	●	7.6					41.6			
0770X05S080N	●	7.7					41.4			
0780X05S080N	●	7.8					41.3			
0790X05S080N	●	7.9					41.1			
0800X05S080N	●	8					41			
0810X05S100N	●	8.1					48.8			
0820X05S100N	●	8.2					48.7			
0830X05S100N	●	8.3					48.5			
0840X05S100N	●	8.4					48.4			
0850X05S100N	●	8.5					48.2			
0860X05S100N	●	8.6					48.1			
0870X05S100N	●	8.7					47.9			
0880X05S100N	●	8.8					47.8			
0890X05S100N	●	8.9					47.6			
0900X05S100N	●	9					47.5			
0910X05S100N	●	9.1					47.3			
0920X05S100N	●	9.2					47.2			
0930X05S100N	●	9.3					47			
0940X05S100N	●	9.4					46.9			
0950X05S100N	●	9.5					46.7			
0960X05S100N	●	9.6					46.6			
0970X05S100N	●	9.7					46.4			
0980X05S100N	●	9.8					46.3			
0990X05S100N	●	9.9					46.1			

Recommended cutting conditions ➔ L62

● : Standard item

Dimensions

Description		Availability	Dimension (mm)								
			DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
				min.	max.						
KDA	1000X05S100N	●	10	0.006	0.021	10	103	46	61	40	1.8
	1010X05S120N	●	10.1					55.8			
	1020X05S120N	●	10.2					55.7			
	1030X05S120N	●	10.3					55.5			
	1040X05S120N	●	10.4					55.4			
	1050X05S120N	●	10.5					55.2			
	1060X05S120N	●	10.6					55.1			1.9
	1070X05S120N	●	10.7					54.9			
	1080X05S120N	●	10.8					54.8			
	1090X05S120N	●	10.9					54.6			
	1100X05S120N	●	11			12	118	54.5	71		2.0
	1110X05S120N	●	11.1					54.3			
	1120X05S120N	●	11.2					54.2			
	1130X05S120N	●	11.3					54			
	1140X05S120N	●	11.4					53.9			
	1150X05S120N	●	11.5					53.7			
	1160X05S120N	●	11.6					53.6			2.1
	1170X05S120N	●	11.7					53.4			
	1180X05S120N	●	11.8					53.3			
	1190X05S120N	●	11.9					53.1			
	1200X05S120N	●	12	0.007	0.025			53		45	
	1210X05S140N	●	12.1					58.8			2.2
	1220X05S140N	●	12.2					58.7			
	1230X05S140N	●	12.3					58.5			
	1240X05S140N	●	12.4					58.4			
	1250X05S140N	●	12.5					58.2			
	1260X05S140N	●	12.6					58.1			2.3
	1270X05S140N	●	12.7					57.9			
	1280X05S140N	●	12.8					57.8			
	1290X05S140N	●	12.9					57.6			
	1300X05S140N	●	13			14	124	57.5	77		
	1310X05S140N	●	13.1					57.3			2.4
	1320X05S140N	●	13.2					57.2			
	1330X05S140N	●	13.3					57			
	1340X05S140N	●	13.4					56.9			
	1350X05S140N	●	13.5					56.7			
	1360X05S140N	●	13.6					56.6			2.5
	1370X05S140N	●	13.7					56.4			
	1380X05S140N	●	13.8					56.3			
	1390X05S140N	●	13.9					56.1			

Description		Availability	Dimension (mm)									
			DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL	
				min.	max.							
KDA	1400X05S140N	●	14	0.007	0.025	14	124	56	77	45	2.5	
	1410X05S160N	●	14.1					61.8	83	48		2.5
	1420X05S160N	●	14.2					61.7				
	1430X05S160N	●	14.3					61.5				
	1440X05S160N	●	14.4					61.4			2.6	
	1450X05S160N	●	14.5					61.2				
	1460X05S160N	●	14.6					61.1				
	1470X05S160N	●	14.7					60.9				
	1480X05S160N	●	14.8					60.8				
	1490X05S160N	●	14.9					60.6	2.7			
	1500X05S160N	●	15			16	133	60.5		83	48	
	1510X05S160N	●	15.1					60.3				
	1520X05S160N	●	15.2					60.2				
	1530X05S160N	●	15.3					60				
	1540X05S160N	●	15.4					59.9	2.8			
	1550X05S160N	●	15.5			59.7						
	1560X05S160N	●	15.6			59.6						
	1570X05S160N	●	15.7			59.4						
	1580X05S160N	●	15.8			59.3						
	1590X05S160N	●	15.9			59.1	2.9					
	1600X05S160N	●	16			59						

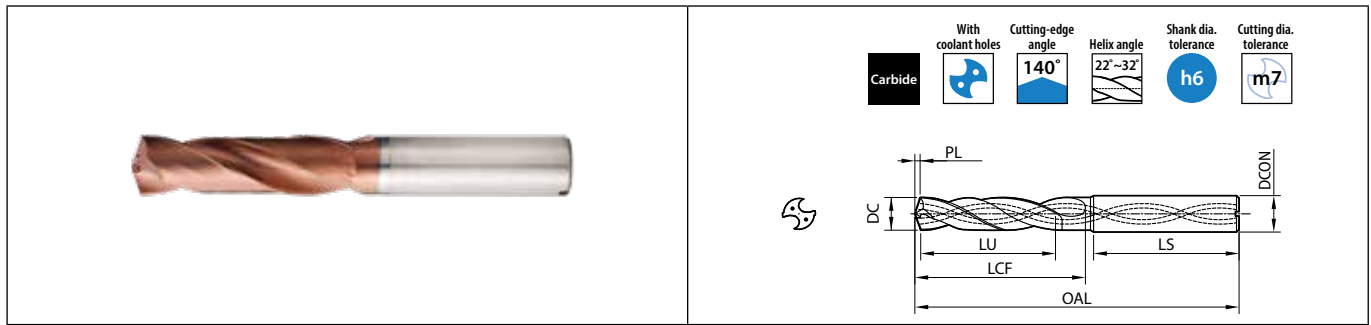
Recommended cutting conditions ➡ L62

● : Standard item



Solid tools

KDA (3D, Type C, With coolant holes)



Dimensions

Description		Availability	Dimension (mm)									
			DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL	
				min.	max.							
KDA	0300X03S060C	●	3	0.002	0.012	62	66	15.5	20	36	0.5	
	0310X03S060C	●	3.1	0.004	0.016			15.3				
	0320X03S060C	●	3.2					15.2				
	0330X03S060C	●	3.3					15				
	0340X03S060C	●	3.4					14.9				
	0350X03S060C	●	3.5					14.7				
	0360X03S060C	●	3.6					14.6				
	0370X03S060C	●	3.7					14.4				
	0380X03S060C	●	3.8					24				18.3
	0390X03S060C	●	3.9									18.1
	0400X03S060C	●	4									18
	0410X03S060C	●	4.1									17.8
	0420X03S060C	●	4.2			17.7						
	0430X03S060C	●	4.3	17.5								
	0440X03S060C	●	4.4	17.4								
	0450X03S060C	●	4.5	17.2								
	0460X03S060C	●	4.6	17.1								
	0470X03S060C	●	4.7	16.9								
	0480X03S060C	●	4.8	20.8								
	0490X03S060C	●	4.9	20.6								
	0500X03S060C	●	5	20.5								
	0510X03S060C	●	5.1	20.3								
	0520X03S060C	●	5.2	20.2								
	0530X03S060C	●	5.3	20								
	0540X03S060C	●	5.4	19.9								
	0550X03S060C	●	5.5	19.7								
	0560X03S060C	●	5.6	19.6								
	0570X03S060C	●	5.7	19.4								
	0580X03S060C	●	5.8	19.3								
	0590X03S060C	●	5.9	19.1								
0600X03S060C	●	6	19									
0610X03S080C	●	6.1	0.006	0.021	8	79	24.8	34	1.1			
0620X03S080C	●	6.2					24.7					
0630X03S080C	●	6.3					24.5					
0640X03S080C	●	6.4					24.4					
0650X03S080C	●	6.5					24.2					
0660X03S080C	●	6.6					24.1					
0670X03S080C	●	6.7					23.9					
0680X03S080C	●	6.8					23.8					
0690X03S080C	●	6.9					23.6					

Description	Availability	DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
			min.	max.						
KDA 0700X03S080C	●	7					23.5	34		1.2
0710X03S080C	●	7.1					30.3			
0720X03S080C	●	7.2					30.2			
0730X03S080C	●	7.3					30			
0740X03S080C	●	7.4					29.9			1.3
0750X03S080C	●	7.5			8	79	29.7	41	36	
0760X03S080C	●	7.6					29.6			
0770X03S080C	●	7.7					29.4			
0780X03S080C	●	7.8					29.3			
0790X03S080C	●	7.9					29.1			1.4
0800X03S080C	●	8					29			
0810X03S100C	●	8.1					34.8			
0820X03S100C	●	8.2					34.7			
0830X03S100C	●	8.3					34.5			
0840X03S100C	●	8.4	0.006	0.021			34.4			
0850X03S100C	●	8.5					34.2			1.5
0860X03S100C	●	8.6					34.1			
0870X03S100C	●	8.7					33.9			
0880X03S100C	●	8.8					33.8			
0890X03S100C	●	8.9					33.6			
0900X03S100C	●	9			10	89	33.5	47	40	1.6
0910X03S100C	●	9.1					33.3			
0920X03S100C	●	9.2					33.2			
0930X03S100C	●	9.3					33			
0940X03S100C	●	9.4					32.9			
0950X03S100C	●	9.5					32.7			1.7
0960X03S100C	●	9.6					32.6			
0970X03S100C	●	9.7					32.4			
0980X03S100C	●	9.8					32.3			
0990X03S100C	●	9.9					32.1			1.8

Recommended cutting conditions ➡ L62

● : Standard item

Dimensions

Description	Availability	Dimension (mm)								
		DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
			min.	max.						
KDA 1000X03S100C	●	10	0.006	0.021	10	89	32	47	40	1.8
1010X03S120C	●	10.1					39.8			
1020X03S120C	●	10.2					39.7			
1030X03S120C	●	10.3					39.5			1.9
1040X03S120C	●	10.4					39.4			
1050X03S120C	●	10.5					39.2			
1060X03S120C	●	10.6					39.1			2.0
1070X03S120C	●	10.7					38.9			
1080X03S120C	●	10.8					38.8			
1090X03S120C	●	10.9					38.6			2.1
1100X03S120C	●	11			12	102	38.5	55		
1110X03S120C	●	11.1					38.3			
1120X03S120C	●	11.2					38.2			2.2
1130X03S120C	●	11.3					38			
1140X03S120C	●	11.4					37.9			
1150X03S120C	●	11.5					37.7			2.3
1160X03S120C	●	11.6					37.6			
1170X03S120C	●	11.7					37.4			
1180X03S120C	●	11.8					37.3			2.4
1190X03S120C	●	11.9					37.1			
1200X03S120C	●	12	0.007	0.025			37		45	
1210X03S140C	●	12.1					41.8			2.5
1220X03S140C	●	12.2					41.7			
1230X03S140C	●	12.3					41.5			
1240X03S140C	●	12.4					41.4			2.6
1250X03S140C	●	12.5					41.2			
1260X03S140C	●	12.6					41.1			
1270X03S140C	●	12.7					40.9			2.7
1280X03S140C	●	12.8					40.8			
1290X03S140C	●	12.9					40.6			
1300X03S140C	●	13			14	107	40.5	60		2.8
1310X03S140C	●	13.1					40.3			
1320X03S140C	●	13.2					40.2			
1330X03S140C	●	13.3					40			2.9
1340X03S140C	●	13.4					39.9			
1350X03S140C	●	13.5					39.7			
1360X03S140C	●	13.6					39.6			3.0
1370X03S140C	●	13.7					39.4			
1380X03S140C	●	13.8					39.3			
1390X03S140C	●	13.9					39.1			

Description		Availability	Dimension (mm)								
			DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
				min.	max.						
KDA	1400X03S140C	●	14	0.007	0.025	14	107	39	60	45	2.5
	1410X03S160C	●	14.1					43.8			
	1420X03S160C	●	14.2					43.7			
	1430X03S160C	●	14.3					43.5			2.6
	1440X03S160C	●	14.4					43.4			
	1450X03S160C	●	14.5					43.2			
	1460X03S160C	●	14.6					43.1			
	1470X03S160C	●	14.7					42.9			2.7
	1480X03S160C	●	14.8					42.8			
	1490X03S160C	●	14.9					42.6			
1500X03S160C	●	15	0.007	0.025	16	115	42.5	65	48	2.7	
1510X03S160C	●	15.1					42.3				
1520X03S160C	●	15.2					42.2				
1530X03S160C	●	15.3					42			2.8	
1540X03S160C	●	15.4					41.9				
1550X03S160C	●	15.5					41.7				
1560X03S160C	●	15.6					41.6				
1570X03S160C	●	15.7					41.4			2.9	
1580X03S160C	●	15.8					41.3				
1590X03S160C	●	15.9					41.1				
	1600X03S160C	●	16					41			

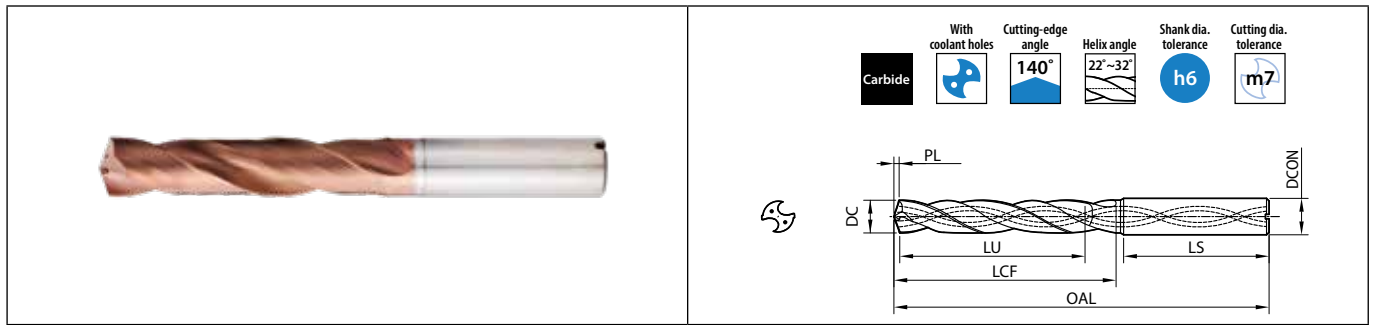
Recommended cutting conditions ➔ L62

● : Standard item



Solid tools

KDA (5D, Type C, With coolant holes)



Dimensions

Description		Availability	Dimension (mm)									
			DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL	
				min.	max.							
KDA	0300X05S060C	●	3	0.002	0.012	66		23.5	28		0.5	
	0310X05S060C	●	3.1	0.004	0.016			23.3				
	0320X05S060C	●	3.2					23.2				
	0330X05S060C	●	3.3					23				
	0340X05S060C	●	3.4					22.9				
	0350X05S060C	●	3.5					22.7				
	0360X05S060C	●	3.6					22.6				
	0370X05S060C	●	3.7					22.4				
	0380X05S060C	●	3.8				74					30.3
	0390X05S060C	●	3.9									30.1
	0400X05S060C	●	4									30
	0410X05S060C	●	4.1									29.8
	0420X05S060C	●	4.2					29.7				
	0430X05S060C	●	4.3		29.5							
	0440X05S060C	●	4.4		29.4							
	0450X05S060C	●	4.5	6		29.2						
	0460X05S060C	●	4.6			29.1						
	0470X05S060C	●	4.7			28.9						
	0480X05S060C	●	4.8		82			36.8				
	0490X05S060C	●	4.9					36.6				
	0500X05S060C	●	5				36.5					
	0510X05S060C	●	5.1				36.3					
	0520X05S060C	●	5.2				36.2					
	0530X05S060C	●	5.3				36					
	0540X05S060C	●	5.4				35.9					
	0550X05S060C	●	5.5			44		35.7				
	0560X05S060C	●	5.6					35.6				
	0570X05S060C	●	5.7				35.4					
	0580X05S060C	●	5.8				35.3					
	0590X05S060C	●	5.9				35.1					
0600X05S060C	●	6		35								
0610X05S080C	●	6.1	0.006	0.021	8		91		43.8			
0620X05S080C	●	6.2							43.7			
0630X05S080C	●	6.3							43.5			
0640X05S080C	●	6.4							43.4			
0650X05S080C	●	6.5							43.2			
0660X05S080C	●	6.6							43.1			
0670X05S080C	●	6.7						42.9				
0680X05S080C	●	6.8						42.8				
0690X05S080C	●	6.9						42.6				

Description	Availability	DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
			min.	max.						
KDA 0700X05S080C	●	7					42.5			
0710X05S080C	●	7.1					42.3			1.2
0720X05S080C	●	7.2					42.2			
0730X05S080C	●	7.3					42			
0740X05S080C	●	7.4					41.9			1.3
0750X05S080C	●	7.5			8	91	41.7	53	36	
0760X05S080C	●	7.6					41.6			
0770X05S080C	●	7.7					41.4			
0780X05S080C	●	7.8					41.3			
0790X05S080C	●	7.9					41.1			1.4
0800X05S080C	●	8					41			
0810X05S100C	●	8.1					48.8			
0820X05S100C	●	8.2					48.7			
0830X05S100C	●	8.3					48.5			
0840X05S100C	●	8.4	0.006	0.021			48.4			
0850X05S100C	●	8.5					48.2			1.5
0860X05S100C	●	8.6					48.1			
0870X05S100C	●	8.7					47.9			
0880X05S100C	●	8.8					47.8			
0890X05S100C	●	8.9					47.6			
0900X05S100C	●	9			10	103	47.5	61	40	1.6
0910X05S100C	●	9.1					47.3			
0920X05S100C	●	9.2					47.2			
0930X05S100C	●	9.3					47			
0940X05S100C	●	9.4					46.9			
0950X05S100C	●	9.5					46.7			1.7
0960X05S100C	●	9.6					46.6			
0970X05S100C	●	9.7					46.4			
0980X05S100C	●	9.8					46.3			
0990X05S100C	●	9.9					46.1			1.8

Recommended cutting conditions ➔ L62

● : Standard item

Dimensions

Description	Availability	Dimension (mm)								
		DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL
			min.	max.						
KDA 1000X05S100C	●	10	0.006	0.021	10	103	46	61	40	
1010X05S120C	●	10.1					55.8			
1020X05S120C	●	10.2					55.7			1.8
1030X05S120C	●	10.3					55.5			
1040X05S120C	●	10.4					55.4			
1050X05S120C	●	10.5					55.2			
1060X05S120C	●	10.6					55.1			
1070X05S120C	●	10.7					54.9			1.9
1080X05S120C	●	10.8					54.8			
1090X05S120C	●	10.9					54.6			
1100X05S120C	●	11			12	118	54.5	71		
1110X05S120C	●	11.1					54.3			
1120X05S120C	●	11.2					54.2			2.0
1130X05S120C	●	11.3					54			
1140X05S120C	●	11.4					53.9			
1150X05S120C	●	11.5					53.7			
1160X05S120C	●	11.6					53.6			
1170X05S120C	●	11.7					53.4			
1180X05S120C	●	11.8					53.3			2.1
1190X05S120C	●	11.9					53.1			
1200X05S120C	●	12	0.007	0.025			53		45	
1210X05S140C	●	12.1					58.8			
1220X05S140C	●	12.2					58.7			
1230X05S140C	●	12.3					58.5			2.2
1240X05S140C	●	12.4					58.4			
1250X05S140C	●	12.5					58.2			
1260X05S140C	●	12.6					58.1			
1270X05S140C	●	12.7					57.9			
1280X05S140C	●	12.8					57.8			
1290X05S140C	●	12.9					57.6			2.3
1300X05S140C	●	13			14	124	57.5	77		
1310X05S140C	●	13.1					57.3			
1320X05S140C	●	13.2					57.2			
1330X05S140C	●	13.3					57			
1340X05S140C	●	13.4					56.9			2.4
1350X05S140C	●	13.5					56.7			
1360X05S140C	●	13.6					56.6			
1370X05S140C	●	13.7					56.4			
1380X05S140C	●	13.8					56.3			
1390X05S140C	●	13.9					56.1			2.5

Description		Availability	Dimension (mm)										
			DC	Dia. tolerance		DCON	OAL	LU	LCF	LS	PL		
				min.	max.								
KDA	1400X05S140C	●	14	0.007	0.025	14	124	56	77	45			
	1410X05S160C	●	14.1					61.8			2.5		
	1420X05S160C	●	14.2					61.7					
	1430X05S160C	●	14.3					61.5					
	1440X05S160C	●	14.4					61.4					
	1450X05S160C	●	14.5					61.2			2.6		
	1460X05S160C	●	14.6					61.1					
	1470X05S160C	●	14.7					60.9					
	1480X05S160C	●	14.8					60.8					
	1490X05S160C	●	14.9					60.6					
	1500X05S160C	●	15					16	133	60.5	83	48	
	1510X05S160C	●	15.1							60.3			2.7
	1520X05S160C	●	15.2							60.2			
	1530X05S160C	●	15.3							60			
	1540X05S160C	●	15.4							59.9			
	1550X05S160C	●	15.5							59.7			
	1560X05S160C	●	15.6							59.6			2.8
	1570X05S160C	●	15.7							59.4			
	1580X05S160C	●	15.8							59.3			
1590X05S160C	●	15.9					59.1						
1600X05S160C	●	16					59			2.9			



Solid tools

Recommended cutting conditions ➡ L62

● : Standard item

Recommended cutting conditions

Workpiece material	Vc (m/min)		f (mm/rev)							
	Type N 	Type C 	ø3	ø4	ø6	ø8	ø10	ø12	ø14	ø16
Mild steel/Low carbon steel SS400/S10 C (< 125 HB)	50-100	60-140	0.09-0.16	0.11-0.19	0.14-0.23	0.19-0.31	0.23-0.38	0.24-0.41	0.28-0.45	0.30-0.50
Carbon steel S35C/S50C (< 25 HRC)	45-90	60-120	0.09-0.16	0.11-0.19	0.14-0.23	0.19-0.31	0.23-0.38	0.24-0.41	0.28-0.45	0.30-0.50
Alloy steel/Tool steel SCM/SCr/SNCM (< 35 HRC)	45-90	50-110	0.09-0.16	0.11-0.19	0.14-0.23	0.19-0.31	0.23-0.38	0.24-0.41	0.28-0.45	0.30-0.50
Alloy steel/Tool steel SCM/SCr/SNCM (35 -48 HRC)	40-80	40-90	0.09-0.14	0.10-0.17	0.13-0.22	0.17-0.29	0.21-0.35	0.22-0.37	0.26-0.41	0.28-0.44
Austenitic stainless steel SUS304 (130 -200 HB)	20-40	40-80	0.05-0.10	0.06-0.12	0.07-0.14	0.08-0.18	0.09-0.20	0.10-0.22	0.11-0.24	0.12-0.24
High strength austenitic stainless steel and Stainless cast steel (< 25 HRC)	20-40	40-80	0.03-0.08	0.04-0.10	0.05-0.10	0.06-0.12	0.07-0.14	0.08-0.16	0.09-0.18	0.10-0.18
Austenitic-ferritic stainless steel (< 30 HRC)	20-35	30-60	0.03-0.08	0.04-0.10	0.05-0.10	0.06-0.12	0.07-0.14	0.08-0.16	0.09-0.18	0.10-0.18
Gray cast iron FC250 (< 32 HRC)	60-100	60-140	0.13-0.20	0.15-0.23	0.17-0.30	0.20-0.35	0.23-0.40	0.25-0.45	0.28-0.48	0.30-0.50
Alloy cast iron/Nodular cast iron FCD450 (< 28 HRC)	60-100	60-140	0.11-0.18	0.13-0.20	0.15-0.25	0.17-0.32	0.20-0.36	0.22-0.42	0.24-0.45	0.25-0.48
High alloy cast iron and Nodular cast iron (< 45 HRC)	60-90	60-100	0.06-0.11	0.08-0.13	0.10-0.16	0.12-0.20	0.14-0.26	0.16-0.28	0.18-0.30	0.20-0.32

Precautions

1. Make sure the workpiece is fixed firmly to the machine.
Use of precision holders, hydro chucks, and high-quality collet chucks is recommended.
2. Use a drill with a run-out of less than 0.02 mm when mounting.
3. Standard cutting conditions is when water-soluble coolant is applied.
4. If the tool diameter you want to use is not listed in the table, please refer to the closest tool diameter value in the table.
Adjust the cutting parameters according to your working environment in machining.

L

Solid tools

End mill

Micro solid tools

Drill

Case studies

(User evaluation)



Type C

KDA extends 20% longer than the current set life.
The condition of the cutting edge was good, and the wear of the shoulder was less than competitor.



Body SCM440
ø6.9, Drilling

Tool life

KDA 2,400 holes or more/1pc

Competitor C 2,000 holes/1pc
Competitor D

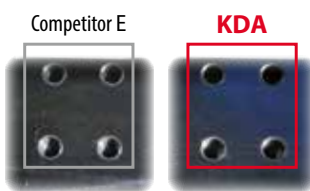
Cutting conditions:

Hole 1: $V_c = 50$ m/min, $f = 0.1$ mm/rev, $H = 25$ mm
Hole 2: $V_c = 40$ m/min, $f = 0.1$ mm/rev, $H = 15$ mm
Wet (Internal coolant) Combined cutting machine



Type N

KDA showed less variation in hole diameter compared to competitor and achieved high efficiency machining. Machining sound was quiet and chip condition was good.

Hole diameter variation ($H = 7.5$ mm)

KDA 0.022 mm

Competitor E 0.042 mm

Cutting conditions:

$V_c = 80$ m/min, $f = 0.15$ mm/rev, $H = 15$ mm
Wet (External coolant) BT 50



Type C

KDA was stable in stainless steel machining, and the tool life was more than 2.3 times longer than the competitor.
Machining by competitor was unstable due to sudden fracture.



Nozzle SUS304
ø5.5 (3D) Drilling
(Final drill diameter: ø6.0)

KDA Cutting edge condition: Good
(After drilling 5,600 holes)



Tool life

KDA 5,600 holes or more /1pc

Competitor F 2,400 holes /1pc

Cutting conditions:

$V_c = 30$ m/min, $f = 0.06$ mm/rev, $H = 9$ mm
Wet (Internal coolant) KDA0550X03S060C



Type N

Achieved stable machining with a tool life of 1.2 times.
Competitor's machining was unstable and required two tools per work lot.
One KDA was sufficient.



Shaft SUS630
ø5.1 (3D) Drilling

Tool life

KDA 1,000 holes/1pc

Competitor G 500 ~ 800 holes/1pc (Unstable)

Cutting conditions:

$V_c = 50$ m/min, $f = 0.1$ mm/rev, $H = 10$ mm
Wet (External coolant) KDA0510X03S060N



Type N

KDA was possible to machining well up to the same tool life as the competitor.
KDA was able to reduce costs.



Valve Stainless steel
ø3.5 (3D) Drilling

Tool life

KDA 2,400 holes/1pc

Competitor H 2,400 holes/1pc

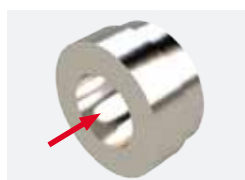
Cutting conditions:

$V_c = 30$ m/min, $f = 0.1$ mm/rev, $H = 10$ mm (3mm Step)
Wet (External coolant) Automatic lathe KDA0350X03S060N



Type N

KDA maintained stable machining.
Achieved tool life 1.3 times longer than the competitor.



Pedestal for tool S45C
ø11.6 (3D) Drilling

Tool life

KDA 6,800 holes/1pc

Competitor I 5,000 holes/1pc

Cutting conditions:

$V_c = 54$ m/min, $f = 0.22$ mm/rev, $H = 30$ mm
Wet (External coolant) Combined cutting machine KDA1160X03S120N

L



Solid tools

High precision small diameter solid drill

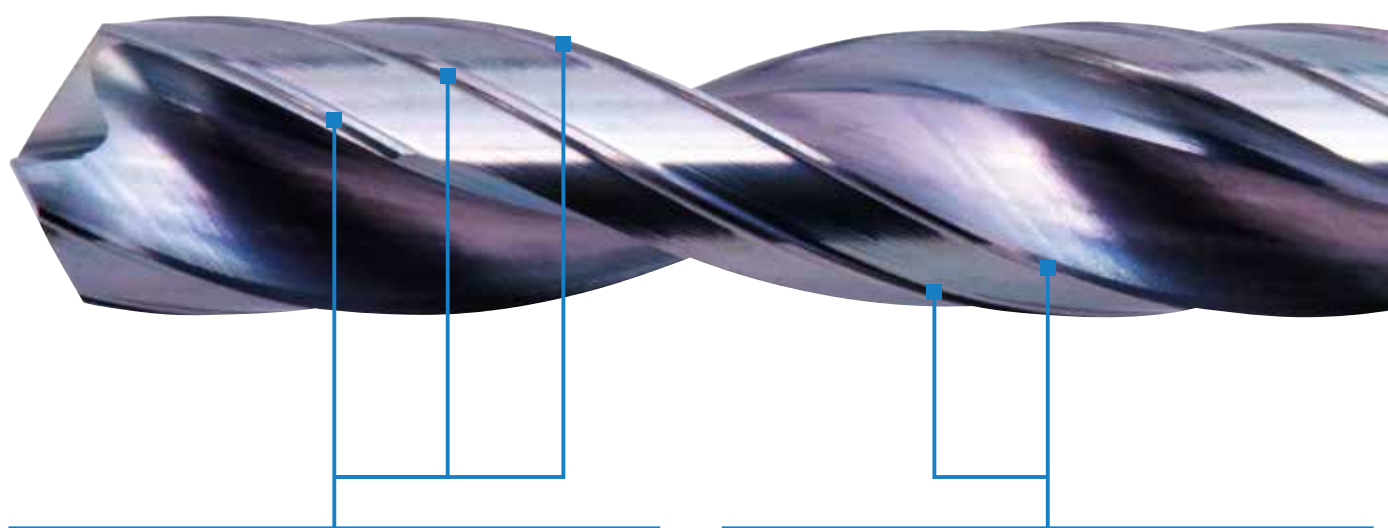
KDA Mini

Newly developed Triple & Double margin designs

New coating MEGACOAT NANO EX

High precision, long tool life, and stable machining

1 Unique shape for stable machining



L

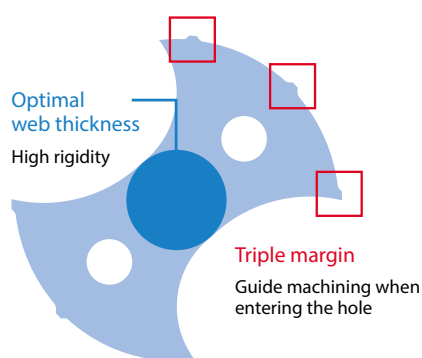
Solid tools

Tip

Triple margin
Excellent machining accuracy

Three sets of margins support the hole and guide machining for improved stability
High rigidity with optimal web thickness

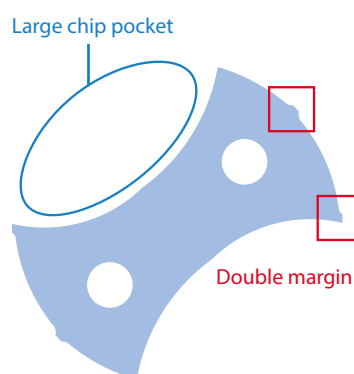
Cross-section image


Middle

Double margin
Tip Excellent chip control

Excellent chip evacuation with large chip pocket

Cross-section image



Chip shape (Internal evaluation)



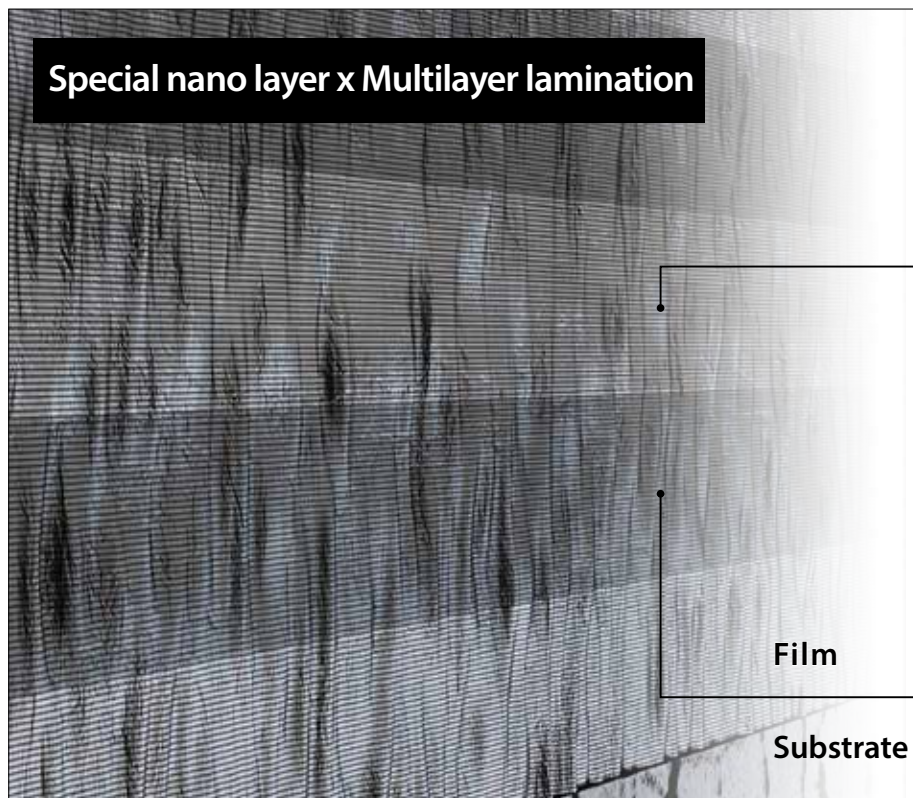
Cutting conditions :
 $n = 9,000 \text{ min}^{-1}$ ($V_c = 60 \text{ m/min}$)
 $V_f = 540 \text{ mm/min}$ ($f = 0.06 \text{ mm/rev}$)
 Cutting dia. $\phi 2.1$ Drilling depth 5 mm
 Wet (Internal coolant)
 Workpiece material : S50C

2 Unique coating for longer tool life



Double lamination technology

Multi-layer structure with two unique nano layers
Provides wear resistance, adhesion resistance, and chipping resistance



Special nano layer x Multilayer lamination

Nano-layer

AlCrN based coating

Optimized Cr content
Excellent lubricity and adhesion resistance



Nano-layer

TiAlN based coating

Excellent wear resistance with high hardness
Increases toughness by optimization of internal stress



CG image

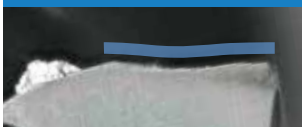


Multi-layering of high-performance nano layers
Suppressed crack growth
Excellent chipping resistance

Wear resistance comparison (Internal evaluation)

Cutting edge conditions (Corner)

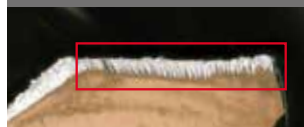
KDA Mini (After drilling 660 holes)



Less damage to the cutting edge provides continuous drilling operations

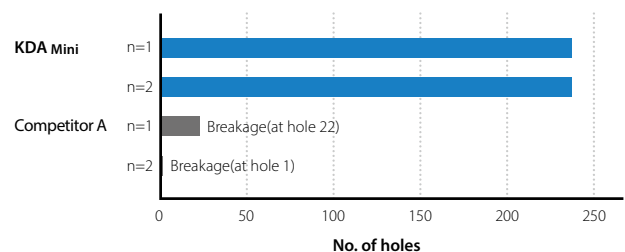
Cutting conditions : $n = 8,000 \text{ min}^{-1}$ ($V_c = 73 \text{ m/min}$), $V_f = 400 \text{ mm/min}$ ($f = 0.05 \text{ mm/rev}$)
Cutting dia. $\phi 2.9$ Drilling depth 10 mm Wet (Internal coolant) Workpiece material : S50C

Competitor C (After drilling 455 holes)



Adhesion and wear progresses
Chip clinging occurs

Fracture resistance comparison (Internal evaluation)



Cutting conditions : $n = 9,500 \text{ min}^{-1}$ ($V_c = 30 \text{ m/min}$), $V_f = 285 \text{ mm/min}$ ($f = 0.03 \text{ mm/rev}$)
Cutting dia. $\phi 1.0$ Drilling depth 8 mm Wet (Internal coolant) Workpiece material : SUS304

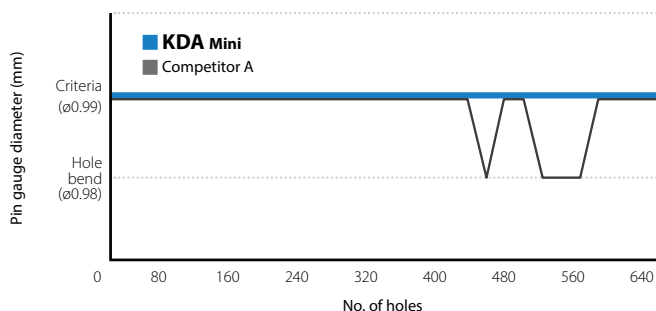
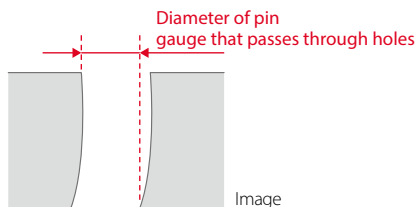
Cutting performance (Internal evaluation)

Case 1 High precision in drilling at depths of 8D with excellent hole straightness and cylindricity

S50C Drilling accuracy comparison

Straightness of the hole

Compare max diameter of pin gauge that passes through holes
Type C
Criteria : $\phi 0.99$



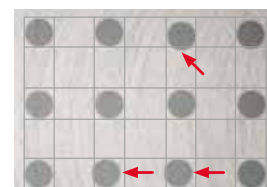
Hole position accuracy Measure the hole position near the center of the workpiece

KDA Mini



Good

Competitor A



Hole misalignment occurred

Cutting edge condition (After drilling approx. 630 holes)

KDA Mini



Competitor A



Cutting conditions : $n = 12,000 \text{ min}^{-1}$ ($V_c = 38 \text{ m/min}$), $V_f = 420 \text{ mm/min}$ ($f = 0.035 \text{ mm/rev}$), Cutting dia. $\phi 1$ Drilling depth 8 mm Wet (Internal coolant)

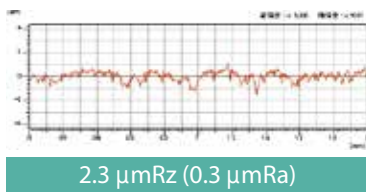
Case 2 Excellent surface finish in stainless steel machining

SUS304 Surface finish comparison

KDA Mini



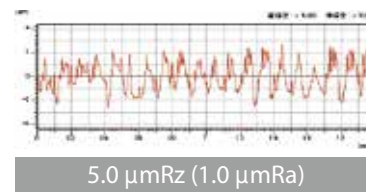
Good



Competitor B



Rifling & dullness occurred



Cutting conditions : $n = 8,500 \text{ min}^{-1}$ ($V_c = 77 \text{ m/min}$), $V_f = 850 \text{ mm/min}$ ($f = 0.1 \text{ mm/rev}$), Cutting dia. $\phi 2.9$ Drilling depth 23 mm Wet (Internal coolant)

Type N (without coolant hole) is also available
Provides stable machining results



Type N
Normal type

2D

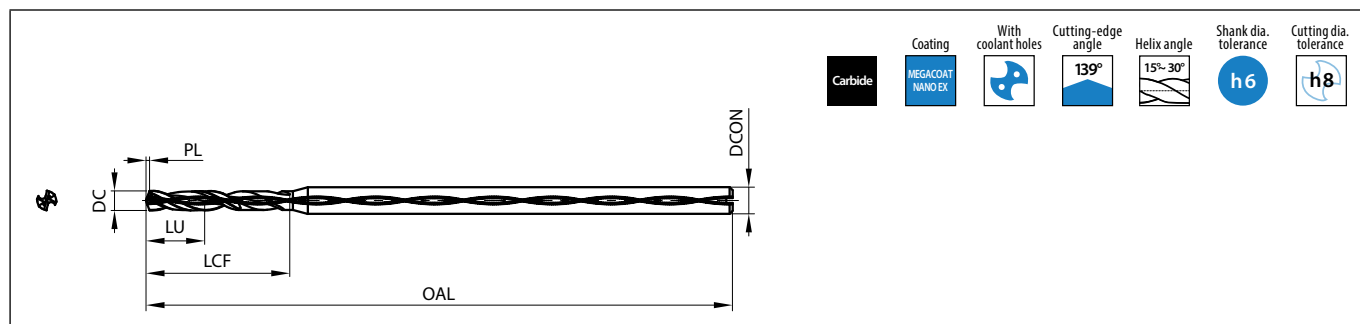
4D

	Cutting dia. DC Tolerance (mm)
2D	+0.012 +0.002
4D	0 -0.014

Excellent machining accuracy and quality with double margin
MEGACOAT NANO EX provides longer tool life
2D can also be used as a pilot drill



KDA Mini (3D, Type C, With coolant holes)



Dimensions

Description		Availability	Dimension (mm)							
			DC	Dia. tolerance		DCON	OAL	LU	LCF	PL
				min.	max.					
KDA	0100X03S030C	● 1	-0.014	0	3	54	3	8	0.19	
	0110X03S030C	● 1.1					3.3	8.7	0.21	
	0120X03S030C	● 1.2					3.6	9.4	0.22	
	0130X03S030C	● 1.3					3.9	10	0.24	
	0140X03S030C	● 1.4					4.2	10.6	0.26	
	0150X03S030C	● 1.5					4.5	11.3	0.28	
	0160X03S030C	● 1.6					4.8	11.8	0.3	
	0170X03S030C	● 1.7					5.1	12.4	0.32	
	0180X03S030C	● 1.8					5.4	13	0.34	
	0190X03S030C	● 1.9					5.7	13.5	0.36	
	0200X03S030C	● 2				60	6	14	0.37	
	0210X03S030C	● 2.1					6.3	14.5	0.39	
	0220X03S030C	● 2.2					6.6	15	0.41	
	0230X03S030C	● 2.3					6.9	15.4	0.43	
	0240X03S030C	● 2.4					7.2	15.8	0.45	
	0250X03S030C	● 2.5					7.5	16.3	0.47	
	0260X03S030C	● 2.6					65	7.8	16.6	0.49
	0270X03S030C	● 2.7						8.1	17	0.5
	0280X03S030C	● 2.8						8.4	17.4	0.52
	0290X03S030C	● 2.9						8.7	17.7	0.54

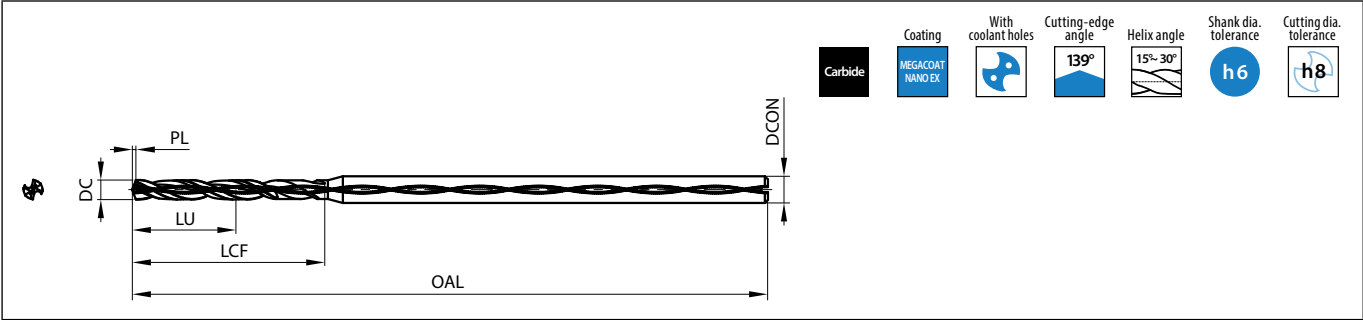
Recommended cutting conditions ➡ L72



Identification system

KDA	0120	X	03	S030	C
Product name High efficiency Coated solid carbide drill	Cutting dia. DC ø1.2		Drilling depth* (L/D) 03 : 3D	Shank dia. DCON ø3.0	Type C: With coolant holes N: Without coolant holes

KDA Mini (5D, Type C, With coolant holes)



Dimensions

Description		Availability	Dimension (mm)							
			DC	Dia. tolerance		DCON	OAL	LU	LCF	PL
				min.	max.					
KDA	0100X05S030C	● 1	-0.014	0	3	54	5	10	0.19	
	0110X05S030C	● 1.1					5.5	10.9	0.21	
	0120X05S030C	● 1.2					6	11.9	0.22	
	0130X05S030C	● 1.3					6.5	12.8	0.24	
	0140X05S030C	● 1.4					7	13.7	0.26	
	0150X05S030C	● 1.5					7.5	14.6	0.28	
	0160X05S030C	● 1.6					8	15.5	0.3	
	0170X05S030C	● 1.7					8.5	16.4	0.32	
	0180X05S030C	● 1.8					9	17.3	0.34	
	0190X05S030C	● 1.9					9.5	18.1	0.36	
	0200X05S030C	● 2				65	10	19	0.37	
	0210X05S030C	● 2.1					10.5	19.8	0.39	
	0220X05S030C	● 2.2					11	20.7	0.41	
	0230X05S030C	● 2.3					11.5	21.5	0.43	
	0240X05S030C	● 2.4					12	22.3	0.45	
	0250X05S030C	● 2.5					12.5	23.1	0.47	
	0260X05S030C	● 2.6					80	13	23.9	0.49
	0270X05S030C	● 2.7						13.5	24.7	0.5
	0280X05S030C	● 2.8						14	25.5	0.52
	0290X05S030C	● 2.9						14.5	26.2	0.54

Recommended cutting conditions ➡ L72

L

Solid tools

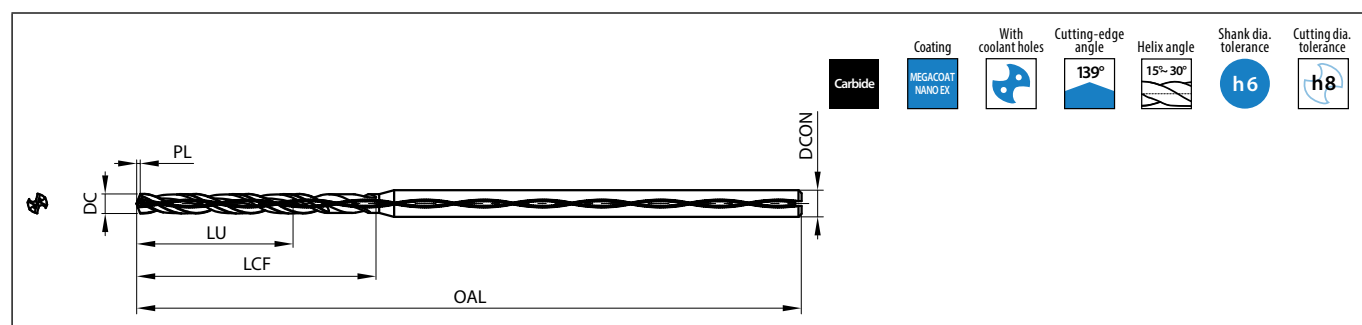
End mill

Micro solid tools

Drill

● : Standard item

KDA Mini (8D, Type C, With coolant holes)

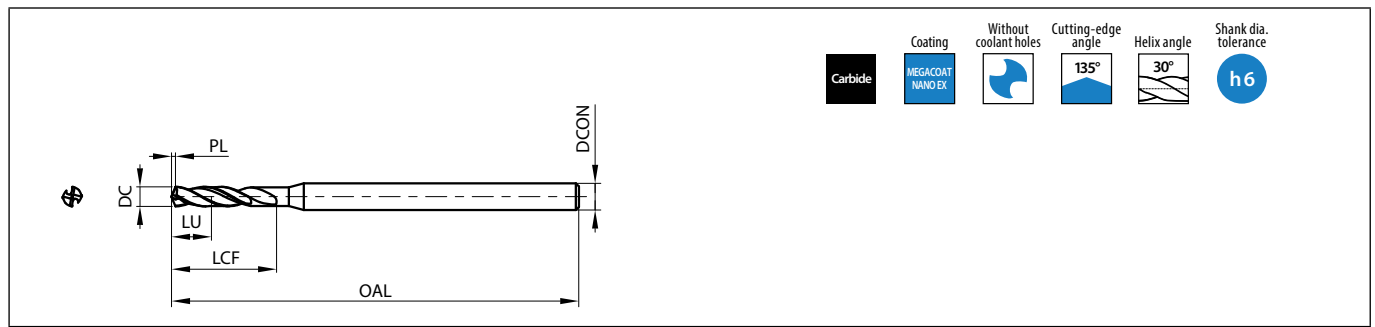


Dimensions

Description		Availability	Dimension (mm)							
			DC	Dia. tolerance		DCON	OAL	LU	LCF	PL
				min.	max.					
KDA	0100X08S030C	● 1	-0.014	0	3	65	8	12.8	0.19	
	0110X08S030C	● 1.1					8.8	13.9	0.21	
	0120X08S030C	● 1.2					9.6	15.2	0.22	
	0130X08S030C	● 1.3					10.4	16.3	0.24	
	0140X08S030C	● 1.4					11.2	17.4	0.26	
	0150X08S030C	● 1.5					12	18.6	0.28	
	0160X08S030C	● 1.6					12.8	19.6	0.3	
	0170X08S030C	● 1.7					13.6	20.8	0.32	
	0180X08S030C	● 1.8					14.4	21.8	0.34	
	0190X08S030C	● 1.9					15.2	22.8	0.36	
	0200X08S030C	● 2				68	16	23.8	0.37	
	0210X08S030C	● 2.1					16.8	24.5	0.39	
	0220X08S030C	● 2.2					17.6	25.5	0.41	
	0230X08S030C	● 2.3					18.4	26.4	0.43	
	0240X08S030C	● 2.4					19.2	27.3	0.45	
	0250X08S030C	● 2.5					20	28.3	0.47	
	0260X08S030C	● 2.6					81	20.8	29.1	0.49
	0270X08S030C	● 2.7						21.6	30	0.5
	0280X08S030C	● 2.8						22.4	30.9	0.52
	0290X08S030C	● 2.9						23.2	31.7	0.54

Recommended cutting conditions ➡ L72

KDA Mini (2D, Type N, Without coolant holes)



Dimensions

Description		Availability	Dimension (mm)							
			DC	Dia. tolerance		DCON	OAL	LU	LCf	PL
				min.	max.					
KDA	0100X02S030N	● 1				3	45	2	6.5	0.21
	0110X02S030N	● 1.1						2.2	7	0.23
	0120X02S030N	● 1.2						2.4	7.6	0.25
	0130X02S030N	● 1.3						2.6	8.1	0.27
	0140X02S030N	● 1.4						2.8	8.5	0.29
	0150X02S030N	● 1.5						3	9	0.31
	0160X02S030N	● 1.6						3.2	9.4	0.33
	0170X02S030N	● 1.7						3.4	9.9	0.35
	0180X02S030N	● 1.8						3.6	10.3	0.37
0190X02S030N	● 1.9	+0.002	+0.012	3	45	3.8	10.6	0.39		
0200X02S030N	● 2					4	11	0.41		
0210X02S030N	● 2.1					4.2	11.3	0.43		
0220X02S030N	● 2.2					4.4	11.7	0.46		
0230X02S030N	● 2.3					4.6	12	0.48		
0240X02S030N	● 2.4					4.8	12.2	0.5		
0250X02S030N	● 2.5					5	12.5	0.52		
0260X02S030N	● 2.6					5.2	12.7	0.54		
0270X02S030N	● 2.7					5.4	13	0.56		
0280X02S030N	● 2.8	5.6	13.2	0.58						
0290X02S030N	● 2.9	5.8	13.3	0.6						

Recommended cutting conditions ➡ L73

Solid tools



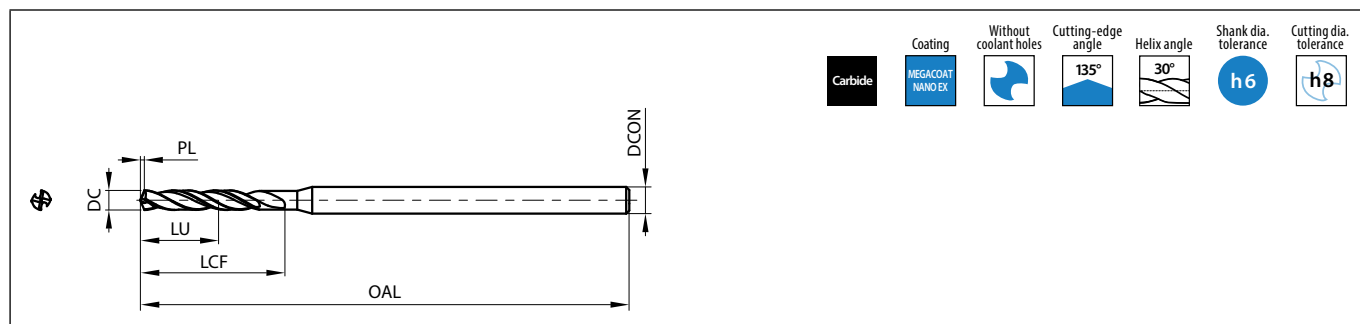
L



● : Standard item

L70

KDA Mini (4D, Type N, Without coolant holes)



Dimensions

Description		Availability	Dimension (mm)							
			DC	Dia. tolerance		DCON	OAL	LU	LCF	PL
				min.	max.					
KDA	0100X04S030N	● 1	-0.014	0	3	50		4	8	0.21
	0110X04S030N	● 1.1						4.4	8.8	0.23
	0120X04S030N	● 1.2						4.8	9.5	0.25
	0130X04S030N	● 1.3						5.2	10.3	0.27
	0140X04S030N	● 1.4						5.6	10.9	0.29
	0150X04S030N	● 1.5						6	11.7	0.31
	0160X04S030N	● 1.6						6.4	12.3	0.33
	0170X04S030N	● 1.7						6.8	12.9	0.35
	0180X04S030N	● 1.8						7.2	13.7	0.37
	0190X04S030N	● 1.9						7.6	14.3	0.39
0200X04S030N	● 2					8	15	0.41		
0210X04S030N	● 2.1					8.4	15.5	0.43		
0220X04S030N	● 2.2					8.8	16.3	0.46		
0230X04S030N	● 2.3					9.2	16.8	0.48		
0240X04S030N	● 2.4					9.6	17.5	0.5		
0250X04S030N	● 2.5					10	18	0.52		
0260X04S030N	● 2.6					10.4	18.7	0.54		
0270X04S030N	● 2.7					10.8	19.2	0.56		
0280X04S030N	● 2.8					11.2	19.3	0.58		
0290X04S030N	● 2.9					11.6		0.6		

Recommended cutting conditions ➡ L73

Recommended cutting conditions (Type C, With coolant hole)

Workpiece material	Cutting speed Vc (m/min)	Cutting dia. DC (mm)	ø1	ø1.5	ø2	ø2.5	ø2.9
Mild steel(< 180HB) Low carbon steel(< 160HB) SS400 · S10C	40-80	Spindle revolution n (min ⁻¹)	12,700	10,600	9,500	7,600	6,600
		Feed rate f (mm/rev)	0.03-0.05	0.04-0.08	0.04-0.10	0.05-0.11	0.06-0.12
Carbon steel / Alloy steel S50C · SCM · SCr (20-30HRC)	40-80	Spindle revolution n (min ⁻¹)	12,700	10,600	9,500	7,600	6,600
		Feed rate f (mm/rev)	0.02-0.05	0.03-0.06	0.04-0.08	0.05-0.09	0.06-0.11
Alloy steel SCM · SCr (30-38HRC)	30-60	Spindle revolution n (min ⁻¹)	9,500	9,500	8,000	7,000	6,600
		Feed rate f (mm/rev)	0.02-0.04	0.03-0.06	0.05-0.08	0.06-0.10	0.06-0.12
Special steel / Pre-hardened steel SKS2 · SKD61 (30-38HRC)	25-50	Spindle revolution n (min ⁻¹)	8,000	8,500	7,200	6,400	5,500
		Feed rate f (mm/rev)	0.02-0.03	0.03-0.05	0.03-0.06	0.03-0.06	0.05-0.10
Stainless steel SUS304 · SUS410 (< 200HB)	30-60	Spindle revolution n (min ⁻¹)	9,500	9,500	8,000	7,000	6,600
		Feed rate f (mm/rev)	0.02-0.03	0.03-0.05	0.03-0.06	0.03-0.08	0.04-0.10
Gray cast iron FC250 (< 29HRC)	40-80	Spindle revolution n (min ⁻¹)	12,700	10,600	9,500	7,600	6,600
		Feed rate f (mm/rev)	0.02-0.04	0.03-0.06	0.04-0.08	0.05-0.10	0.07-0.12
Nodular cast iron FCD450 · FCD600 (< 28HRC)	30-60	Spindle revolution n (min ⁻¹)	9,500	9,500	8,000	7,000	6,600
		Feed rate f (mm/rev)	0.02-0.04	0.03-0.06	0.04-0.08	0.05-0.09	0.06-0.11

Precautions

1. This table shows general starting conditions. Adjust cutting conditions according to the actual workpiece shape and machine used.
2. Above cutting conditions is when water-soluble coolant is applied.
3. If the above revolution exceeds the machine specification, lower the revolution.
4. Use a drill with a run-out of less than 0.02 mm when mounting
5. Be careful not to allow the grooves to enter the holder when installing the drill.

L

Solid tools

End mill

Micro solid
tools

Drill

Recommended cutting conditions (Type N, No coolant hole)

Workpiece material	Cutting speed Vc (m/min)	Cutting dia. DC (mm)	ø1	ø1.5	ø2	ø2.5	ø2.9
Mild steel(< 180HB) Low carbon steel(< 160HB) SS400・S10C	30-80	Spindle revolution n (min ⁻¹)	10,200	8,900	9,500	9,500	8,500
		Feed rate f (mm/rev)	0.03-0.05	0.04-0.08	0.04-0.10	0.05-0.11	0.06-0.12
Carbon steel / Alloy steel S50C・SCM・SCr (20-30HRC)	30-80	Spindle revolution n (min ⁻¹)	10,200	8,900	8,700	8,900	7,900
		Feed rate f (mm/rev)	0.02-0.05	0.03-0.06	0.04-0.08	0.05-0.09	0.06-0.11
Alloy steel SCM・SCr (30-38HRC)	30-80	Spindle revolution n (min ⁻¹)	10,200	8,900	8,700	8,900	7,900
		Feed rate f (mm/rev)	0.02-0.04	0.03-0.06	0.05-0.08	0.06-0.10	0.06-0.12
Special steel / Pre-hardened steel SKS2・SKD61 (30-38HRC)	30-60	Spindle revolution n (min ⁻¹)	10,200	8,900	7,900	6,400	5,800
		Feed rate f (mm/rev)	0.02-0.03	0.03-0.05	0.03-0.06	0.03-0.06	0.05-0.10
Gray cast iron FC250(< 29HRC)	30-80	Spindle revolution n (min ⁻¹)	10,200	8,900	8,700	9,500	8,500
		Feed rate f (mm/rev)	0.02-0.04	0.03-0.06	0.04-0.08	0.05-0.10	0.07-0.12
Nodular cast iron FCD450・FCD600(< 28HRC)	30-80	Spindle revolution n (min ⁻¹)	10,200	8,900	8,700	8,900	8,000
		Feed rate f (mm/rev)	0.02-0.04	0.03-0.06	0.04-0.08	0.05-0.09	0.06-0.11

Precautions

1. This table shows general starting conditions. Adjust cutting conditions according to the actual workpiece shape and machine used.
2. Above cutting conditions is when water-soluble coolant is applied.
3. If the above revolution exceeds the machine specification, lower the revolution.
4. Use a drill with a run-out of less than 0.02 mm when mounting
5. Be careful not to allow the grooves to enter the holder when installing the drill.



Solid tools

High performance flat bottom drill

KDZ

K-series
Let your potential shine

2 Styles available

Stability-oriented

KDZ

Standard type

Tough edge

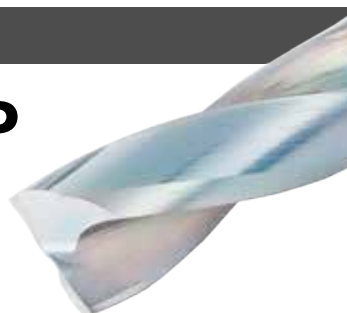


Sharp edge

KDZ-HP

High precision machining

Low cutting force



Standard type for various machining applications

- Flat land specifications on corners
- Excellent chip evacuation with special flute shape
- Long tool life with MEGACOAT NANO EX coating technology

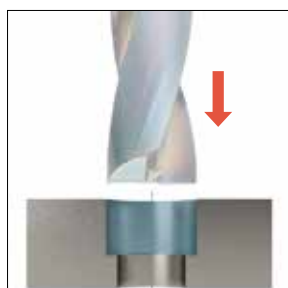
High-precision and stable machining with special chip thinning shape

- Improved machining accuracy when entering the workpiece
- Long tool life with MEGACOAT NANO EX coating technology

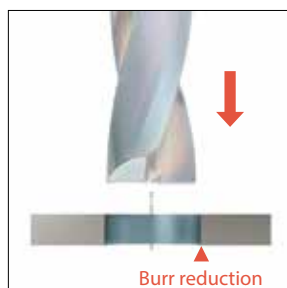


Stable machining accuracy even when drilling into cylindrical or curved surfaces.
(KDZ-HP is recommended for cylindrical and curved surfaces.)

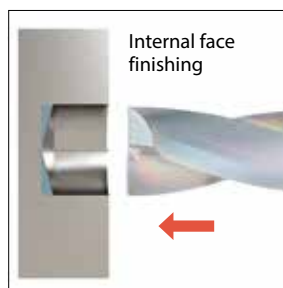
1 Excellent for drilling in many different applications



Counterboring



Plunging of Thin Plate



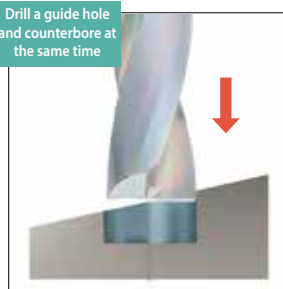
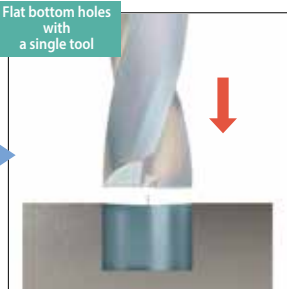
Turning in automatic lathes



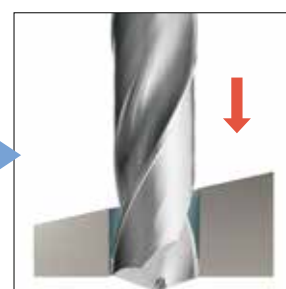
Hole expanding



Flat bottom finishing after drilling



Counterboring on slant surface/Spotting for secondary process



L

Solid tools

End mill

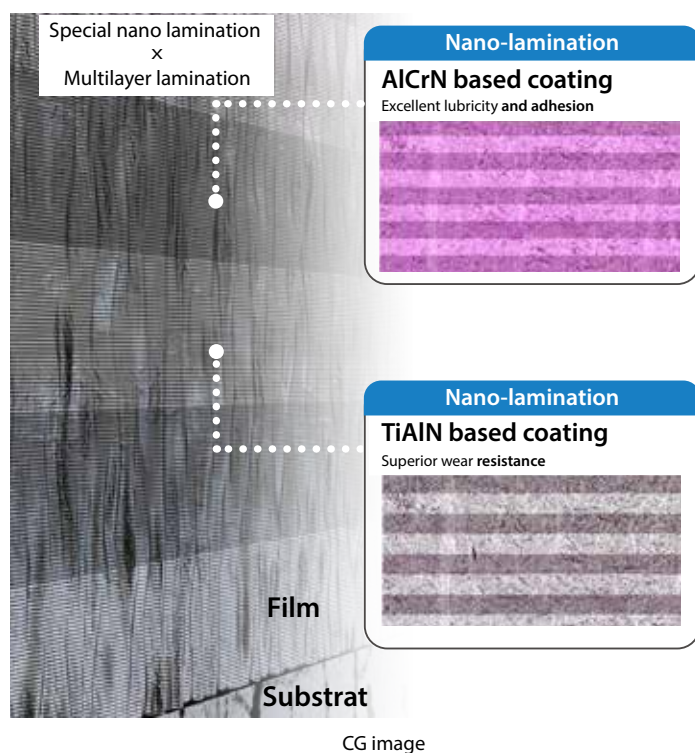
Micro solid tools

Drill



2 Excellent wear resistance and fracture resistance

A unique coating designed to optimize drilling performance **MEGACOAT® NANO EX**



Point

1. Improved toughness by optimizing the lamination period of the film
2. Increased Cr content for excellent lubricity and with adhesion resistance to suppress wear and chipping

Solution

Cutting edge conditions comparison when drilling (Internal evaluation)

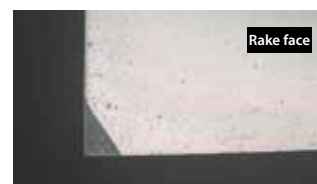
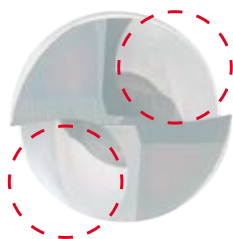
	KDZ (MEGACOAT NANO EX)	Competitor A
Corner		
Center		

Cutting conditions: $V_c = 80$ m/min, $f = 0.06$ mm/rev,
Cutting Dia. $\phi 3$, Drilling depth: 6 mm Wet (External coolant)
Workpiece material: S50C

3 Unique shape for excellent machining performance

KDZ **Stability-oriented**

A large chip pocket
Excellent chip evacuation



Flat land specifications to improve fracture resistance

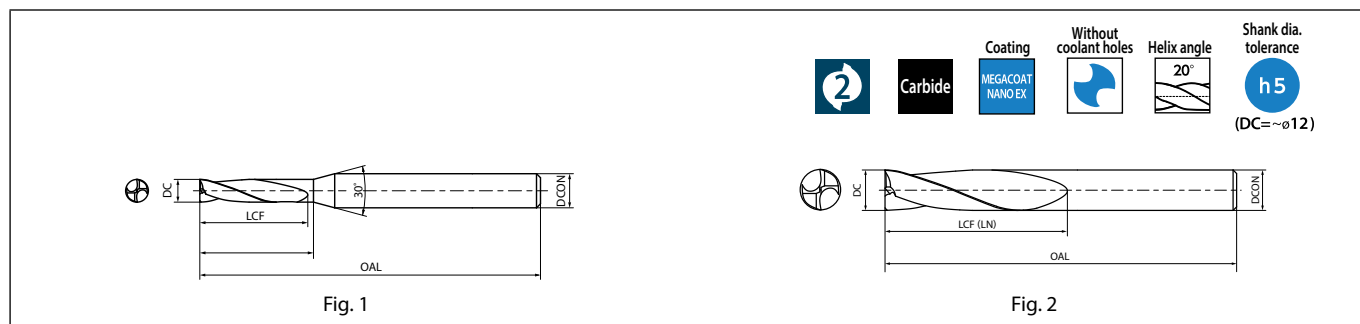
KDZ-HP **Sharp edge**

Special design improves
chip thinning and discharge
Reducing the load on the
center of the cutting edge



There is no land and a rake face is formed from the cutting edge
Reduced impact forces when entering provides high-precision
and stable machining ($\sim \phi 12$)

KDZ (Short)



Dimensions

Description		Availability	Dimension (mm)							Fig.
			DC	Dia. tolerance		DCON	OAL	LCF	LN	
				min.	max.					
KDZ	0100X1.5S040N	● 1	-0.01	0	4	50		3	4	1
	0110X1.5S040N	● 1.1						3.5	4.5	
	0120X1.5S040N	● 1.2								
	0130X1.5S040N	● 1.3						4	5	
	0140X1.5S040N	● 1.4						4.5	5.5	
	0150X1.5S040N	● 1.5						5	6	
	0160X1.5S040N	● 1.6								
	0170X1.5S040N	● 1.7						5.5	6.5	
	0180X1.5S040N	● 1.8						6	7	
	0190X1.5S040N	● 1.9								
KDZ	0200X1.5S040N	● 2	-0.01	0	4	50		6	7	1
	0210X1.5S040N	● 2.1								
	0220X1.5S040N	● 2.2						7	8	
	0230X1.5S040N	● 2.3								
	0240X1.5S040N	● 2.4								
	0250X1.5S040N	● 2.5						8	9	
	0260X1.5S040N	● 2.6								
	0270X1.5S040N	● 2.7								
	0280X1.5S040N	● 2.8						9	10	
	0290X1.5S040N	● 2.9								
KDZ	0300X1.5S060N	● 3	-0.012	0	6	60		9	10	1
	0310X1.5S060N	● 3.1								
	0320X1.5S060N	● 3.2						10	11	
	0330X1.5S060N	● 3.3								
	0340X1.5S060N	● 3.4								
	0350X1.5S060N	● 3.5						11	12	
	0360X1.5S060N	● 3.6								
	0370X1.5S060N	● 3.7								
	0380X1.5S060N	● 3.8						12	13	
	0390X1.5S060N	● 3.9								

Description	Availability	Dimension (mm)							Fig.	
		DC	Dia. tolerance		DCON	OAL	LCF	LN		
			min.	max.						
KDZ 0400X1.5S060N 0410X1.5S060N 0420X1.5S060N 0430X1.5S060N 0440X1.5S060N 0450X1.5S060N 0460X1.5S060N 0470X1.5S060N 0480X1.5S060N 0490X1.5S060N	● 4	-0.012	0	6	60	12	13	1		
	● 4.1					13	14			
	● 4.2									
	● 4.3									
	● 4.4									
	● 4.5								14	15
	● 4.6									
	● 4.7									
	● 4.8								15	16
	● 4.9									
KDZ 0500X1.5S060N 0510X1.5S060N 0520X1.5S060N 0530X1.5S060N 0540X1.5S060N 0550X1.5S060N 0560X1.5S060N 0570X1.5S060N 0580X1.5S060N 0590X1.5S060N	● 5	-0.012	0	6	60	16	17	1		
	● 5.1									
	● 5.2									
	● 5.3									
	● 5.4					17	18			
	● 5.5									
	● 5.6									
	● 5.7					18	19			
	● 5.8									
	● 5.9									
KDZ 0600X1.5S060N 0610X1.5S080N 0620X1.5S080N 0630X1.5S080N 0640X1.5S080N 0650X1.5S080N 0660X1.5S080N 0670X1.5S080N 0680X1.5S080N 0690X1.5S080N	● 6	-0.012	0	6	60	19	21	2		
	● 6.1									
	● 6.2									
	● 6.3									
	● 6.4					20	22			
	● 6.5									
	● 6.6									
	● 6.7					21	23			
	● 6.8									
	● 6.9									

Recommended cutting conditions ➡ L88

● : Standard item

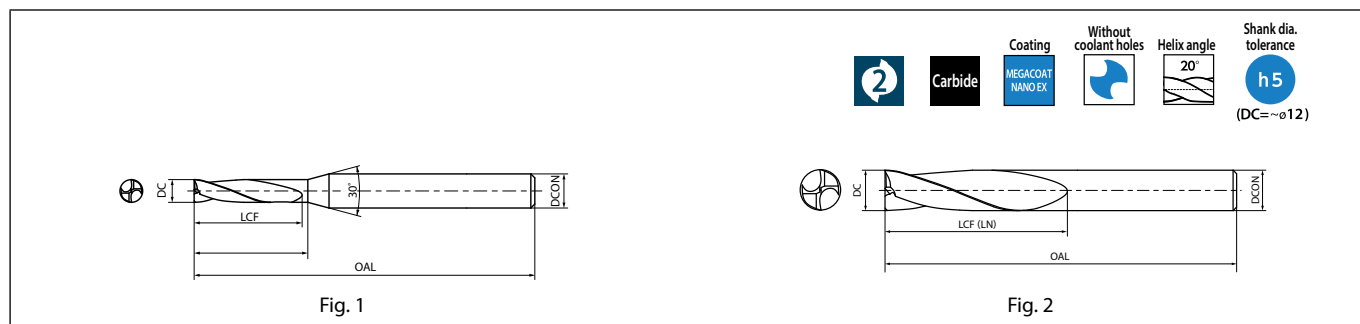
Dimensions

Description		Availability	Dimension (mm)							Fig.
			DC	Dia. tolerance		DCON	OAL	LCF	LN	
				min.	max.					
KDZ	0700X1.5S080N	● 7	-0.015	0	8	70	22	24	1	
	0710X1.5S080N	● 7.1								
	0720X1.5S080N	● 7.2								
	0730X1.5S080N	● 7.3								
	0740X1.5S080N	● 7.4					23			
	0750X1.5S080N	● 7.5								
	0760X1.5S080N	● 7.6						25		
	0770X1.5S080N	● 7.7					24			
	0780X1.5S080N	● 7.8								
	0790X1.5S080N	● 7.9								
KDZ	0800X1.5S080N	● 8	-0.015	0	8	70	25	27	1	
	0810X1.5S100N	● 8.1								
	0820X1.5S100N	● 8.2			10	80	26	28		
	0830X1.5S100N	● 8.3								
	0840X1.5S100N	● 8.4								
	0850X1.5S100N	● 8.5								
	0860X1.5S100N	● 8.6					27	29		
	0870X1.5S100N	● 8.7								
	0880X1.5S100N	● 8.8								
	0890X1.5S100N	● 8.9								28
KDZ	0900X1.5S100N	● 9	-0.015	0	10	80	28	30	1	
	0910X1.5S100N	● 9.1								
	0920X1.5S100N	● 9.2								
	0930X1.5S100N	● 9.3								
	0940X1.5S100N	● 9.4					29	31		
	0950X1.5S100N	● 9.5								
	0960X1.5S100N	● 9.6								
	0970X1.5S100N	● 9.7					30	32		
	0980X1.5S100N	● 9.8								
	0990X1.5S100N	● 9.9								31

Description	Availability	Dimension (mm)								Fig.	
		DC	Dia. tolerance		DCON	OAL	LCF	LN			
			min.	max.							
KDZ 1000X1.5S100N 1010X1.5S120N 1020X1.5S120N 1030X1.5S120N 1040X1.5S120N 1050X1.5S120N 1060X1.5S120N 1070X1.5S120N 1080X1.5S120N 1090X1.5S120N	● 10	10	-0.015	0	10	80		31	33	1	
	● 10.1								32		34
	● 10.2										
	● 10.3								32		34
	● 10.4										
	● 10.5		-0.018		12	100					
	● 10.6							33	35		
	● 10.7										
	● 10.8										
	● 10.9							34	36		
KDZ 1100X1.5S120N 1110X1.5S120N 1120X1.5S120N 1130X1.5S120N 1140X1.5S120N 1150X1.5S120N 1160X1.5S120N 1170X1.5S120N 1180X1.5S120N 1190X1.5S120N 1200X1.5S120N	● 11	11		0				34	36	1	
	● 11.1	11.1									
	● 11.2	11.2									
	● 11.3	11.3						35	37		
	● 11.4	11.4									
	● 11.5	11.5	-0.018		12	100					
	● 11.6	11.6									
	● 11.7	11.7						36	38		
	● 11.8	11.8									
	● 11.9	11.9									
	● 12	12						37	39		2

Recommended cutting conditions ➡ L88

KDZ (Regular)



Dimensions

Description		Availability	Dimension (mm)							Fig.
			DC	Dia. tolerance		DCON	OAL	LCF	LN	
				min.	max.					
KDZ	0300X3.0S060N	● 3	-0.01	0	6	60			1	
	0310X3.0S060N	● 3.1					14	15		
	0320X3.0S060N	● 3.2								
	0330X3.0S060N	● 3.3					15	16		
	0340X3.0S060N	● 3.4								
	0350X3.0S060N	● 3.5	-0.012							
	0360X3.0S060N	● 3.6								
	0370X3.0S060N	● 3.7					17	18		
	0380X3.0S060N	● 3.8								
	0390X3.0S060N	● 3.9								
KDZ	0400X3.0S060N	● 4	0	6	60		19	20	1	
	0410X3.0S060N	● 4.1								
	0420X3.0S060N	● 4.2								
	0430X3.0S060N	● 4.3					20	21		
	0440X3.0S060N	● 4.4				-0.012				
	0450X3.0S060N	● 4.5								
	0460X3.0S060N	● 4.6								
	0470X3.0S060N	● 4.7					21	22		
	0480X3.0S060N	● 4.8								
	0490X3.0S060N	● 4.9								
KDZ	0500X3.0S060N	● 5	0	6	60		23	24	1	
	0510X3.0S060N	● 5.1								
	0520X3.0S060N	● 5.2								
	0530X3.0S060N	● 5.3					24	25		
	0540X3.0S060N	● 5.4				-0.012				
	0550X3.0S060N	● 5.5					25	26		
	0560X3.0S060N	● 5.6								
	0570X3.0S060N	● 5.7								
	0580X3.0S060N	● 5.8					26	27		
	0590X3.0S060N	● 5.9								

Description	Availability	Dimension (mm)								Fig.
		DC	Dia. tolerance		DCON	OAL	LCF	LN		
			min.	max.						
KDZ 0600X3.0S060N 0610X3.0S080N 0620X3.0S080N 0630X3.0S080N 0640X3.0S080N 0650X3.0S080N 0660X3.0S080N 0670X3.0S080N 0680X3.0S080N 0690X3.0S080N	●	6	-0.012		6	60		28	2	
	●	6.1								
	●	6.2					28			
	●	6.3						29		
	●	6.4								
	●	6.5	-0.015	0	8	70				1
	●	6.6					30	31		
	●	6.7								
	●	6.8					31	32		
	●	6.9								
KDZ 0700X3.0S080N 0710X3.0S080N 0720X3.0S080N 0730X3.0S080N 0740X3.0S080N 0750X3.0S080N 0760X3.0S080N 0770X3.0S080N 0780X3.0S080N 0790X3.0S080N	●	7							1	
	●	7.1								
	●	7.2					32	33		
	●	7.3								
	●	7.4	-0.015	0	8	70				
	●	7.5								
	●	7.6								
	●	7.7					34	35		
	●	7.78								
	●	7.9								
KDZ 0800X3.0S080N 0810X3.0S100N 0820X3.0S100N 0830X3.0S100N 0840X3.0S100N 0850X3.0S100N 0860X3.0S100N 0870X3.0S100N 0880X3.0S100N 0890X3.0S100N	●	8			8	70		36	2	
	●	8.1								
	●	8.2					36			
	●	8.3						37		
	●	8.4	-0.015	0						
	●	8.5			10	80				
	●	8.6					38	39		
	●	8.7								
	●	8.8								
	●	8.9					39	40		

Recommended cutting conditions ➡ L88

● : Standard item

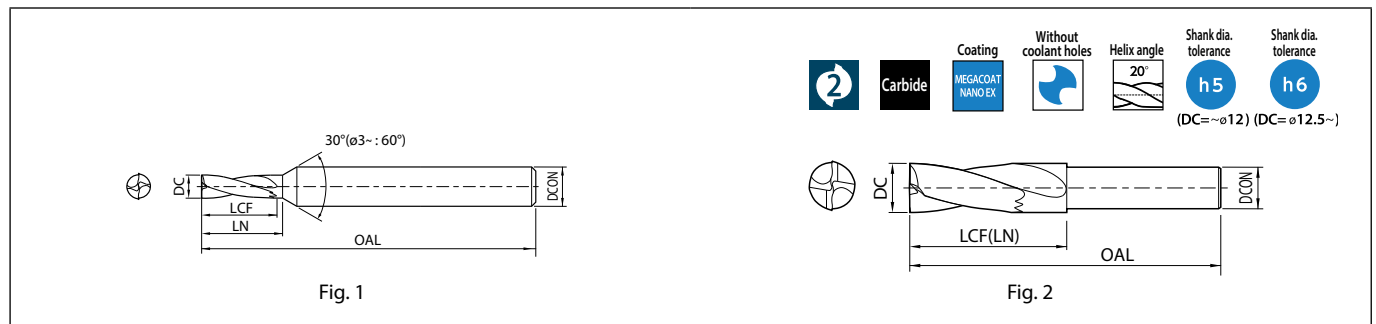
Dimensions

Description		Availability	Dimension (mm)							Fig.		
			DC	Dia. tolerance		DCON	OAL	LCF	LN			
				min.	max.							
KDZ	0900X3.0S100N	●	9	-0.015	0	10	80	40	41	1		
	0910X3.0S100N	●	9.1									
	0920X3.0S100N	●	9.2									
	0930X3.0S100N	●	9.3									
	0940X3.0S100N	●	9.4									
	0950X3.0S100N	●	9.5					42	43			
	0960X3.0S100N	●	9.6									
	0970X3.0S100N	●	9.7									
	0980X3.0S100N	●	9.8									
	0990X3.0S100N	●	9.9									
KDZ	1000X3.0S100N	●	10	-0.015	0	10	80	45	46	2		
	1010X3.0S120N	●	10.1									
	1020X3.0S120N	●	10.2					46	47			
	1030X3.0S120N	●	10.3									
	1040X3.0S120N	●	10.4					12	100		47	48
	1050X3.0S120N	●	10.5									
	1060X3.0S120N	●	10.6									
	1070X3.0S120N	●	10.7									
	1080X3.0S120N	●	10.8									
	1090X3.0S120N	●	10.9									
KDZ	1100X3.0S120N	●	11	-0.018	0	12	100	51	52	1		
	1110X3.0S120N	●	11.1									
	1120X3.0S120N	●	11.2									
	1130X3.0S120N	●	11.3									
	1140X3.0S120N	●	11.4					53	54			
	1150X3.0S120N	●	11.5									
	1160X3.0S120N	●	11.6									
	1170X3.0S120N	●	11.7									
	1180X3.0S120N	●	11.8									
	1190X3.0S120N	●	11.9									
	1200X3.0S120N	●	12					54	54			

Recommended cutting conditions ➡ L88



KDZ-HP (Short)



Dimensions

Description	Availability	Dimension (mm)							Fig.
		DC	Dia. tolerance		DCON	OAL	LCF	LN	
			min.	max.					
KDZ 0100X1.5S040N-HP	● 1	-0.01	0	4	50	3.5	4.3	1	
0110X1.5S040N-HP	● 1.1					3.9	4.7		
0120X1.5S040N-HP	● 1.2					4.3	5.1		
0130X1.5S040N-HP	● 1.3					4.7	5.5		
0140X1.5S040N-HP	● 1.4					5.1	5.9		
0150X1.5S040N-HP	● 1.5					5.5	6.3		
0160X1.5S040N-HP	● 1.6					5.7	6.5		
0170X1.5S040N-HP	● 1.7					5.9	6.7		
0180X1.5S040N-HP	● 1.8					6.1	6.9		
0190X1.5S040N-HP	● 1.9					6.3	7.1		
KDZ 0200X1.5S040N-HP	● 2	-0.01	0	4	50	6.5	7.3	1	
0210X1.5S040N-HP	● 2.1					6.9	7.7		
0220X1.5S040N-HP	● 2.2					7.3	8.1		
0230X1.5S040N-HP	● 2.3					7.7	8.5		
0240X1.5S040N-HP	● 2.4					8.1	8.9		
0250X1.5S040N-HP	● 2.5					8.5	9.3		
0260X1.5S040N-HP	● 2.6					8.8	9.5		
0270X1.5S040N-HP	● 2.7					9.1	9.8		
0280X1.5S040N-HP	● 2.8					9.3	10		
0290X1.5S040N-HP	● 2.9					9.5	10.3		
KDZ 0300X1.5S060N-HP	● 3	-0.012	0	6	60	9	10	1	
0310X1.5S060N-HP	● 3.1								
0320X1.5S060N-HP	● 3.2					10	11		
0330X1.5S060N-HP	● 3.3								
0340X1.5S060N-HP	● 3.4								
0350X1.5S060N-HP	● 3.5					11	12		
0360X1.5S060N-HP	● 3.6								
0370X1.5S060N-HP	● 3.7								
0380X1.5S060N-HP	● 3.8					12	13		
0390X1.5S060N-HP	● 3.9								
KDZ 0400X1.5S060N-HP	● 4	0.012	0	6	60	12	13	1	
0410X1.5S060N-HP	● 4.1								
0420X1.5S060N-HP	● 4.2					13	14		
0430X1.5S060N-HP	● 4.3								
0440X1.5S060N-HP	● 4.4								
0450X1.5S060N-HP	● 4.5					14	15		
0460X1.5S060N-HP	● 4.6								
0470X1.5S060N-HP	● 4.7								
0480X1.5S060N-HP	● 4.8					15	16		
0490X1.5S060N-HP	● 4.9								

Description		Availability	Dimension (mm)							Fig.
			DC	Dia. tolerance		DCON	OAL	LCF	LN	
				min.	max.					
KDZ	0500X1.5S060N-HP	● 5	-0.012	0	6	60	16	17	1	
	0510X1.5S060N-HP	● 5.1								
	0520X1.5S060N-HP	● 5.2								
	0530X1.5S060N-HP	● 5.3								
	0540X1.5S060N-HP	● 5.4					17	18		
	0550X1.5S060N-HP	● 5.5								
	0560X1.5S060N-HP	● 5.6								
	0570X1.5S060N-HP	● 5.7					18	19		
	0580X1.5S060N-HP	● 5.8								
	0590X1.5S060N-HP	● 5.9								
KDZ	0600X1.5S060N-HP	● 6	-0.012	0	6	60	19	21	2	
	0610X1.5S080N-HP	● 6.1								
	0620X1.5S080N-HP	● 6.2								
	0630X1.5S080N-HP	● 6.3								
	0640X1.5S080N-HP	● 6.4					20	22		
	0650X1.5S080N-HP	● 6.5								
	0660X1.5S080N-HP	● 6.6								
	0670X1.5S080N-HP	● 6.7					21	23		
	0680X1.5S080N-HP	● 6.8								
	0690X1.5S080N-HP	● 6.9								
KDZ	0700X1.5S080N-HP	● 7	-0.015	0	8	70	22	24	1	
	0710X1.5S080N-HP	● 7.1								
	0720X1.5S080N-HP	● 7.2								
	0730X1.5S080N-HP	● 7.3								
	0740X1.5S080N-HP	● 7.4					23	25		
	0750X1.5S080N-HP	● 7.5								
	0760X1.5S080N-HP	● 7.6								
	0770X1.5S080N-HP	● 7.7					24			
	0780X1.5S080N-HP	● 7.8								
	0790X1.5S080N-HP	● 7.9								

Recommended cutting conditions ➡ L89

● : Standard item

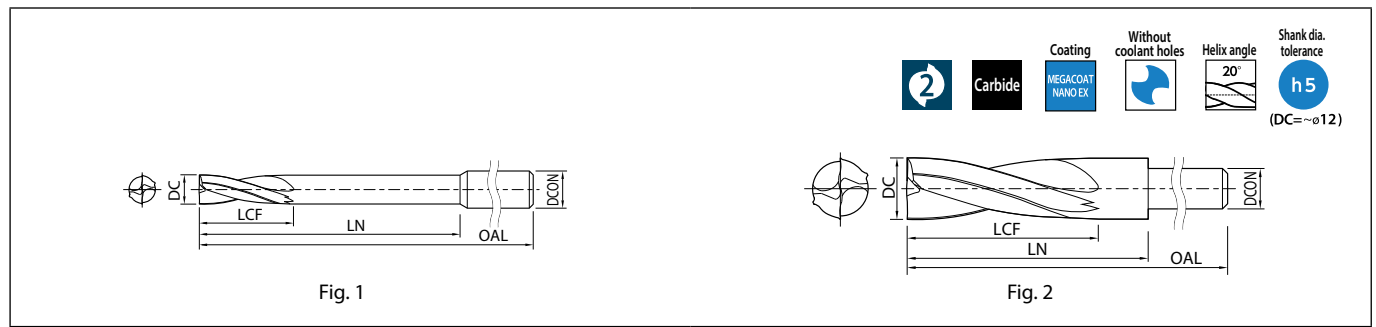
Dimensions

Description	Availability	Dimension (mm)							Fig.				
		DC	Dia. tolerance		DCON	OAL	LCF	LN					
			min.	max.									
KDZ 0800X1.5S080N-HP 0810X1.5S100N-HP 0820X1.5S100N-HP 0830X1.5S100N-HP 0840X1.5S100N-HP 0850X1.5S100N-HP 0860X1.5S100N-HP 0870X1.5S100N-HP 0880X1.5S100N-HP 0890X1.5S100N-HP	●	8	-0.015	0	8	70			2				
	●	8.1					25	27	1				
	●	8.2											
	●	8.3											
	●	8.4					26	28					
	●	8.5			10	80							
	●	8.6											
	●	8.7					27	29					
	●	8.8											
	●	8.9					28	30					
KDZ 0900X1.5S100N-HP 0910X1.5S100N-HP 0920X1.5S100N-HP 0930X1.5S100N-HP 0940X1.5S100N-HP 0950X1.5S100N-HP 0960X1.5S100N-HP 0970X1.5S100N-HP 0980X1.5S100N-HP 0990X1.5S100N-HP	●	9	-0.015	0	10	80		28	30	1			
	●	9.1											
	●	9.2											
	●	9.3							29		31		
	●	9.4											
	●	9.5											
	●	9.6											
	●	9.7							30		32		
	●	9.8											
	●	9.9							31		33		
KDZ 1000X1.5S100N-HP 1010X1.5S120N-HP 1020X1.5S120N-HP 1030X1.5S120N-HP 1040X1.5S120N-HP 1050X1.5S120N-HP 1060X1.5S120N-HP 1070X1.5S120N-HP 1080X1.5S120N-HP 1090X1.5S120N-HP	●	10	-0.015	0	10	80				2			
	●	10.1									1		
	●	10.2											
	●	10.3							32	34			
	●	10.4											
	●	10.5					-0.018	0	12	100			
	●	10.6											
	●	10.7										33	35
	●	10.8											
	●	10.9											34

Description		Availability	Dimension (mm)							Fig.	
			DC	Dia. tolerance		DCON	OAL	LCF	LN		
				min.	max.						
KDZ	1100X1.5S120N-HP	● 11	-0.018	0	12	100		34	36	1	
	1110X1.5S120N-HP	● 11.1									
	1120X1.5S120N-HP	● 11.2									
	1130X1.5S120N-HP	● 11.3						35	37		
	1140X1.5S120N-HP	● 11.4									
	1150X1.5S120N-HP	● 11.5									
	1160X1.5S120N-HP	● 11.6									
	1170X1.5S120N-HP	● 11.7						36	38		
	1180X1.5S120N-HP	● 11.8									
	1190X1.5S120N-HP	● 11.9									
KDZ	1200X1.5S120N-HP	● 12	-0.018	0	12	100		37	39	2	
	1250X1.5S120N-HP	● 12.5						41	41		
	1300X1.5S120N-HP	● 13						43	43		
	1350X1.5S120N-HP	● 13.5						44	44		
	1400X1.5S120N-HP	● 14						45	45		
	1450X1.5S120N-HP	● 14.5				115		47	47		
	1500X1.5S120N-HP	● 15						48	48		
	1550X1.5S120N-HP	● 15.5						50	50		
	1600X1.5S160N-HP	● 16					16		52		52
	1650X1.5S160N-HP	● 16.5							53		53
KDZ	1700X1.5S160N-HP	● 17	-0.018	0	16	115		54	54	2	
	1750X1.5S160N-HP	● 17.5						56	56		
	1800X1.5S160N-HP	● 18						57	57		
	1850X1.5S160N-HP	● 18.5						59	59		
	1900X1.5S160N-HP	● 19	-0.021		125		60	60			
	1950X1.5S160N-HP	● 19.5					62	62			
	2000X1.5S200N-HP	● 20					63	63			

Recommended cutting conditions ➡ L89

KDZ-HP (Short, Long shank)



Dimensions

Description		Availability	Dimension (mm)								Fig.
			DC	Dia. tolerance		DCON	OAL	LCF	LN		
				min.	max.						
KDZ	0300X1.5S060N-HPL	●	3	-0.01	0	6	100	9	30	1	
	0310X1.5S060N-HPL	MTD	3.1						31		
	0320X1.5S060N-HPL	MTD	3.2						10		32
	0330X1.5S060N-HPL	MTD	3.3						33		
	0340X1.5S060N-HPL	MTD	3.4						34		
	0350X1.5S060N-HPL	●	3.5	-0.012				11	35		
	0360X1.5S060N-HPL	MTD	3.6						36		
	0370X1.5S060N-HPL	MTD	3.7						37		
	0380X1.5S060N-HPL	MTD	3.8					12	38		
	0390X1.5S060N-HPL	MTD	3.9						39		
KDZ	0400X1.5S060N-HPL	●	4	-0.012	0	6	100	12	40	1	
	0410X1.5S060N-HPL	MTD	4.1						41		
	0420X1.5S060N-HPL	MTD	4.2						13		42
	0430X1.5S060N-HPL	MTD	4.3						43		
	0440X1.5S060N-HPL	MTD	4.4						44		
	0450X1.5S060N-HPL	●	4.5					14	45		
	0460X1.5S060N-HPL	MTD	4.6						46		
	0470X1.5S060N-HPL	MTD	4.7						47		
	0480X1.5S060N-HPL	MTD	4.8						15		48
	0490X1.5S060N-HPL	MTD	4.9						49		
KDZ	0500X1.5S060N-HPL	●	5	-0.012	0	6	110		50	1	
	0510X1.5S060N-HPL	MTD	5.1						16		51
	0520X1.5S060N-HPL	MTD	5.2						52		
	0530X1.5S060N-HPL	MTD	5.3						53		
	0540X1.5S060N-HPL	MTD	5.4						54		
	0550X1.5S060N-HPL	●	5.5					17	55		
	0560X1.5S060N-HPL	MTD	5.6						56		
	0570X1.5S060N-HPL	MTD	5.7						57		
	0580X1.5S060N-HPL	MTD	5.8						18		58
	0590X1.5S060N-HPL	MTD	5.9						59		

Description	Availability	DC	Dia. tolerance		DCON	OAL	LCF	LN	Fig.
			min.	max.					
KDZ 0600X1.5S060N-HPL	●	6	-0.012					60	1
0610X1.5S060N-HPL	MTD	6.1					19	29	2
0620X1.5S060N-HPL	MTD	6.2							
0630X1.5S060N-HPL	MTD	6.3							
0640X1.5S060N-HPL	MTD	6.4							
0650X1.5S060N-HPL	●	6.5	-0.015	0	6	120	20	29.5	
0660X1.5S060N-HPL	MTD	6.6							
0670X1.5S060N-HPL	MTD	6.7							
0680X1.5S060N-HPL	MTD	6.8					21	30	
0690X1.5S060N-HPL	MTD	6.9							
KDZ 0700X1.5S060N-HPL	●	7						30	2
0710X1.5S060N-HPL	MTD	7.1					22		
0720X1.5S060N-HPL	MTD	7.2							
0730X1.5S060N-HPL	MTD	7.3						30.5	
0740X1.5S060N-HPL	MTD	7.4					23		
0750X1.5S060N-HPL	●	7.5	-0.015	0	6	120			
0760X1.5S060N-HPL	MTD	7.6							
0770X1.5S060N-HPL	MTD	7.7					24	31	
0780X1.5S060N-HPL	MTD	7.8							
0790X1.5S060N-HPL	MTD	7.9							
KDZ 0800X1.5S080N-HPL	●	8						80	1
0810X1.5S080N-HPL	MTD	8.1					25		2
0820X1.5S080N-HPL	MTD	8.2						31.5	
0830X1.5S080N-HPL	MTD	8.3							
0840X1.5S080N-HPL	MTD	8.4					26		
0850X1.5S080N-HPL	●	8.5	-0.015	0	8	130		32	
0860X1.5S080N-HPL	MTD	8.6							
0870X1.5S080N-HPL	MTD	8.7					27		
0880X1.5S080N-HPL	MTD	8.8						32.5	
0890X1.5S080N-HPL	MTD	8.9					28		

Recommended cutting conditions L90

● : Standard item MTD : Made to order

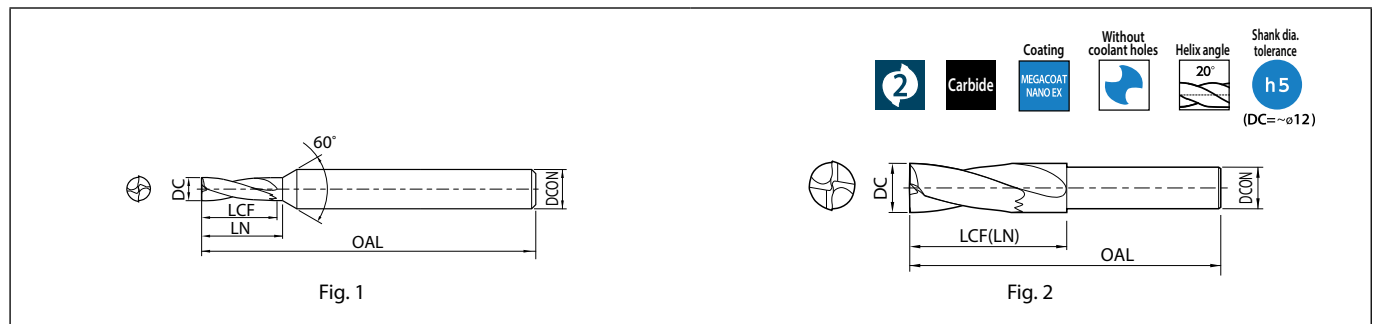
Dimensions

Description		Availability	Dimension (mm)							Fig.		
			DC	Dia. tolerance		DCON	OAL	LCF	LN			
				min.	max.							
KDZ	0900X1.5S080N-HPL	●	9	-0.015	0	8	130	28	32.5	2		
	0910X1.5S080N-HPL	MTD	9.1									
	0920X1.5S080N-HPL	MTD	9.2									
	0930X1.5S080N-HPL	MTD	9.3					29	33.5			
	0940X1.5S080N-HPL	MTD	9.4									
	0950X1.5S080N-HPL	●	9.5					30	33.5			
	0960X1.5S080N-HPL	MTD	9.6									
	0970X1.5S080N-HPL	MTD	9.7									
	0980X1.5S080N-HPL	MTD	9.8					31	34.5			
	0990X1.5S080N-HPL	MTD	9.9									
KDZ	1000X1.5S100N-HPL	●	10	-0.015	0	10	150	31	100	1		
	1010X1.5S100N-HPL	MTD	10.1					32	36			
	1020X1.5S100N-HPL	MTD	10.2								33	36.5
	1030X1.5S100N-HPL	MTD	10.3									
	1040X1.5S100N-HPL	MTD	10.4									
	1050X1.5S100N-HPL	●	10.5					34	37.5			
	1060X1.5S100N-HPL	MTD	10.6									
	1070X1.5S100N-HPL	MTD	10.7									
	1080X1.5S100N-HPL	MTD	10.8									
	1090X1.5S100N-HPL	MTD	10.9									
KDZ	1100X1.5S100N-HPL	●	11	-0.018	0	10	150	34	37.5	2		
	1110X1.5S100N-HPL	MTD	11.1									
	1120X1.5S100N-HPL	MTD	11.2					35	38.5			
	1130X1.5S100N-HPL	MTD	11.3									
	1140X1.5S100N-HPL	MTD	11.4					36	39.5			
	1150X1.5S100N-HPL	●	11.5									
	1160X1.5S100N-HPL	MTD	11.6									
	1170X1.5S100N-HPL	MTD	11.7					37	120			
	1180X1.5S100N-HPL	MTD	11.8									
	1190X1.5S100N-HPL	MTD	11.9									
	1200X1.5S120N-HPL	●	12					12	170		120	1

Recommended cutting conditions  L90

● : Standard item MTD : Made to order

KDZ-HP (Regular)



Dimensions

Description		Availability	Dimension (mm)							Fig.		
			DC	Dia. tolerance		DCON	OAL	LCF	LN			
				min.	max.							
KDZ	0300X3.0S060N-HP	●	3	-0.01	0	6	60	14	15	1		
	0310X3.0S060N-HP	●	3.1									
	0320X3.0S060N-HP	●	3.2									
	0330X3.0S060N-HP	●	3.3									
	0340X3.0S060N-HP	●	3.4	-0.012				15	16			
	0350X3.0S060N-HP	●	3.5									
	0360X3.0S060N-HP	●	3.6									
	0370X3.0S060N-HP	●	3.7								17	18
	0380X3.0S060N-HP	●	3.8									
	0390X3.0S060N-HP	●	3.9									
KDZ	0400X3.0S060N-HP	●	4	-0.012	0	6	60	19	20	1		
	0410X3.0S060N-HP	●	4.1									
	0420X3.0S060N-HP	●	4.2									
	0430X3.0S060N-HP	●	4.3									
	0440X3.0S060N-HP	●	4.4					20	21			
	0450X3.0S060N-HP	●	4.5									
	0460X3.0S060N-HP	●	4.6									
	0470X3.0S060N-HP	●	4.7								21	22
	0480X3.0S060N-HP	●	4.8									
	0490X3.0S060N-HP	●	4.9									
KDZ	0500X3.0S060N-HP	●	5	-0.012	0	6	60	23	24	1		
	0510X3.0S060N-HP	●	5.1									
	0520X3.0S060N-HP	●	5.2									
	0530X3.0S060N-HP	●	5.3									
	0540X3.0S060N-HP	●	5.4					24	25			
	0550X3.0S060N-HP	●	5.5									
	0560X3.0S060N-HP	●	5.6									
	0570X3.0S060N-HP	●	5.7								26	27
	0580X3.0S060N-HP	●	5.8									
	0590X3.0S060N-HP	●	5.9									

Description	Availability	DC	Dia. tolerance		DCON	OAL	LCF	LN	Fig.
			min.	max.					
KDZ 0600X3.0S060N-HP	●	6	-0.012		6	60		28	2
0610X3.0S080N-HP	●	6.1					28	29	1
0620X3.0S080N-HP	●	6.2							
0630X3.0S080N-HP	●	6.3							
0640X3.0S080N-HP	●	6.4	-0.015	0	8	70	30	31	
0650X3.0S080N-HP	●	6.5							
0660X3.0S080N-HP	●	6.6					31	32	
0670X3.0S080N-HP	●	6.7							
0680X3.0S080N-HP	●	6.8							
0690X3.0S080N-HP	●	6.9							
KDZ 0700X3.0S080N-HP	●	7							1
0710X3.0S080N-HP	●	7.1					32	33	
0720X3.0S080N-HP	●	7.2							
0730X3.0S080N-HP	●	7.3	-0.015	0	8	70			
0740X3.0S080N-HP	●	7.4					34	35	
0750X3.0S080N-HP	●	7.5							
0760X3.0S080N-HP	●	7.6							
0770X3.0S080N-HP	●	7.7							
0780X3.0S080N-HP	●	7.8							
0790X3.0S080N-HP	●	7.9							
KDZ 0800X3.0S080N-HP	●	8			8	70		36	2
0810X3.0S100N-HP	●	8.1					36	37	1
0820X3.0S100N-HP	●	8.2							
0830X3.0S100N-HP	●	8.3	-0.015	0	10	80	38	39	
0840X3.0S100N-HP	●	8.4							
0850X3.0S100N-HP	●	8.5							
0860X3.0S100N-HP	●	8.6					39	40	
0870X3.0S100N-HP	●	8.7							
0880X3.0S100N-HP	●	8.8							
0890X3.0S100N-HP	●	8.9							

Recommended cutting conditions ➡ L89

● : Standard item

Dimensions

Description		Availability	Dimension (mm)							Fig.			
			DC	Dia. tolerance		DCON	OAL	LCF	LN				
				min.	max.								
KDZ	0900X3.05100N-HP	●	9	-0.015	0	10	80		40	41	1		
	0910X3.05100N-HP	●	9.1										
	0920X3.05100N-HP	●	9.2										
	0930X3.05100N-HP	●	9.3										
	0940X3.05100N-HP	●	9.4										
	0950X3.05100N-HP	●	9.5										
	0960X3.05100N-HP	●	9.6										
	0970X3.05100N-HP	●	9.7							42		43	
	0980X3.05100N-HP	●	9.8										
	0990X3.05100N-HP	●	9.9										
KDZ	1000X3.05100N-HP	●	10	-0.015	0	10	80		45	46	1		
	1010X3.05120N-HP	●	10.1										
	1020X3.05120N-HP	●	10.2										
	1030X3.05120N-HP	●	10.3										
	1040X3.05120N-HP	●	10.4										
	1050X3.05120N-HP	●	10.5					12	100			47	48
	1060X3.05120N-HP	●	10.6										
	1070X3.05120N-HP	●	10.7										
	1080X3.05120N-HP	●	10.8										
	1090X3.05120N-HP	●	10.9										
KDZ	1100X3.05120N-HP	●	11	-0.018	0	12	100	51	52		1		
	1110X3.05120N-HP	●	11.1										
	1120X3.05120N-HP	●	11.2										
	1130X3.05120N-HP	●	11.3										
	1140X3.05120N-HP	●	11.4										
	1150X3.05120N-HP	●	11.5										
	1160X3.05120N-HP	●	11.6					53	54				
	1170X3.05120N-HP	●	11.7										
	1180X3.05120N-HP	●	11.8										
	1190X3.05120N-HP	●	11.9										
	1200X3.05120N-HP	●	12							54	54	2	

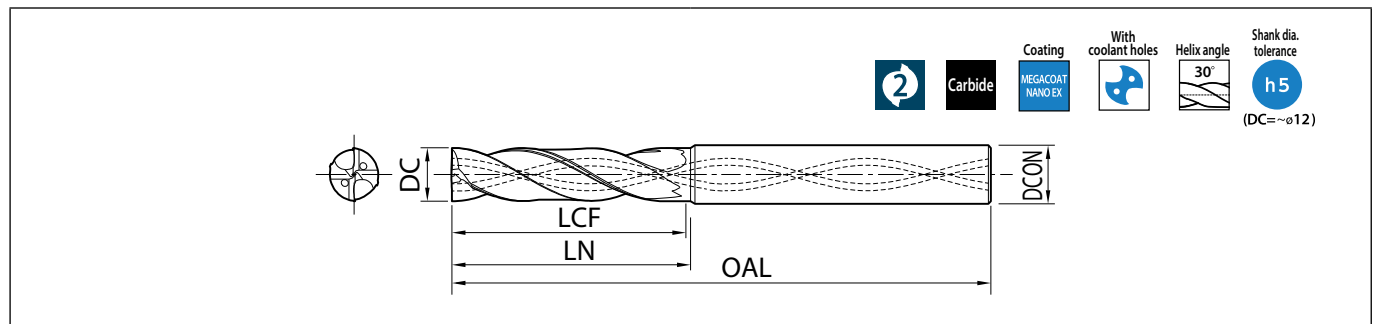
Recommended cutting conditions  L89

● : Standard item



Solid tools

KDZ-HP (Regular, With coolant holes, Type C)



Dimensions

Description	Availability	Dimension (mm)						
		DC	Dia. tolerance		DCON	OAL	LCF	LN
			min.	max.				
KDZ 0300X3.0S030C-HP	●	3	-0.01		3	68	13.5	15.5
0310X3.0S040C-HP	●	3.1					14	16
0320X3.0S040C-HP	●	3.2					14.4	16.4
0330X3.0S040C-HP	●	3.3					14.9	16.9
0340X3.0S040C-HP	●	3.4					15.3	17.3
0350X3.0S040C-HP	●	3.5	-0.012	0	4	72	15.8	17.8
0360X3.0S040C-HP	●	3.6					16.2	18.2
0370X3.0S040C-HP	●	3.7					16.7	18.7
0380X3.0S040C-HP	●	3.8					17.1	19.1
0390X3.0S040C-HP	●	3.9					17.6	19.6
KDZ 0400X3.0S040C-HP	●	4			4	72	18	20
0410X3.0S050C-HP	●	4.1					18.5	20.5
0420X3.0S050C-HP	●	4.2					18.9	20.9
0430X3.0S050C-HP	●	4.3					19.4	21.4
0440X3.0S050C-HP	●	4.4					19.8	21.8
0450X3.0S050C-HP	●	4.5	-0.012	0	5	80	20.3	22.3
0460X3.0S050C-HP	●	4.6					20.7	22.7
0470X3.0S050C-HP	●	4.7					21.2	23.2
0480X3.0S050C-HP	●	4.8					21.6	23.6
0490X3.0S050C-HP	●	4.9					22.1	24.1
KDZ 0500X3.0S050C-HP	●	5			5	80	22.5	24.5
0510X3.0S060C-HP	●	5.1					23	25
0520X3.0S060C-HP	●	5.2					23.4	25.4
0530X3.0S060C-HP	●	5.3					23.9	25.9
0540X3.0S060C-HP	●	5.4					24.3	26.3
0550X3.0S060C-HP	●	5.5	-0.012	0	6	82	24.8	26.8
0560X3.0S060C-HP	●	5.6					25.2	27.2
0570X3.0S060C-HP	●	5.7					25.7	27.7
0580X3.0S060C-HP	●	5.8					26.1	28.1
0590X3.0S060C-HP	●	5.9					26.6	28.6

Description	Availability	DC	Dia. tolerance		DCON	OAL	LCF	LN
			min.	max.				
KDZ 0600X3.0S060C-HP	●	6	-0.012		6	82	27	29
0610X3.0S070C-HP	●	6.1					27.5	29.5
0620X3.0S070C-HP	●	6.2					27.9	29.9
0630X3.0S070C-HP	●	6.3					28.4	30.4
0640X3.0S070C-HP	●	6.4					28.8	30.8
0650X3.0S070C-HP	●	6.5	-0.015	0	7	88	29.3	31.3
0660X3.0S070C-HP	●	6.6					29.7	31.7
0670X3.0S070C-HP	●	6.7					30.2	32.2
0680X3.0S070C-HP	●	6.8					30.6	32.6
0690X3.0S070C-HP	●	6.9					31.1	33.1
KDZ 0700X3.0S070C-HP	●	7			7	88	31.5	33.5
0710X3.0S080C-HP	●	7.1					32	34
0720X3.0S080C-HP	●	7.2					32.4	34.4
0730X3.0S080C-HP	●	7.3					32.9	34.9
0740X3.0S080C-HP	●	7.4					33.3	35.3
0750X3.0S080C-HP	●	7.5	-0.015	0	8	94	33.8	35.8
0760X3.0S080C-HP	●	7.6					34.2	36.2
0770X3.0S080C-HP	●	7.7					34.7	36.7
0780X3.0S080C-HP	●	7.8					35.1	37.1
0790X3.0S080C-HP	●	7.9					35.6	37.6
KDZ 0800X3.0S080C-HP	●	8			8	94	36	38
0810X3.0S090C-HP	●	8.1					36.5	38.5
0820X3.0S090C-HP	●	8.2					36.9	38.9
0830X3.0S090C-HP	●	8.3					37.4	39.4
0840X3.0S090C-HP	●	8.4					37.8	39.8
0850X3.0S090C-HP	●	8.5	-0.015	0	9	100	38.3	40.3
0860X3.0S090C-HP	●	8.6					38.7	40.7
0870X3.0S090C-HP	●	8.7					39.2	41.2
0880X3.0S090C-HP	●	8.8					39.6	41.6
0890X3.0S090C-HP	●	8.9					40.1	42.1

Recommended cutting conditions ➔ L91

● : Standard item

Dimensions

Description		Availability	Dimension (mm)						
			DC	Dia. tolerance		DCON	OAL	LCF	LN
				min.	max.				
KDZ	0900X3.0S090C-HP	●	9	-0.015	0	9	100	40.5	42.5
	0910X3.0S100C-HP	●	9.1					41	43
	0920X3.0S100C-HP	●	9.2					41.4	43.4
	0930X3.0S100C-HP	●	9.3					41.9	43.9
	0940X3.0S100C-HP	●	9.4					42.3	44.3
	0950X3.0S100C-HP	●	9.5			10	106	42.8	44.8
	0960X3.0S100C-HP	●	9.6					43.2	45.2
	0970X3.0S100C-HP	●	9.7					43.7	45.7
	0980X3.0S100C-HP	●	9.8					44.1	46.1
	0990X3.0S100C-HP	●	9.9					44.6	46.6
KDZ	1000X3.0S100C-HP	●	10	-0.015	0	10	106	45	47
	1010X3.0S110C-HP	●	10.1				45.5	47.5	
	1020X3.0S110C-HP	●	10.2				45.9	47.9	
	1030X3.0S110C-HP	●	10.3				46.4	48.4	
	1040X3.0S110C-HP	●	10.4				46.8	48.8	
	1050X3.0S110C-HP	●	10.5	-0.018		11	116	47.3	49.3
	1060X3.0S110C-HP	●	10.6				47.7	49.7	
	1070X3.0S110C-HP	●	10.7				48.2	50.2	
	1080X3.0S110C-HP	●	10.8				48.6	50.6	
	1090X3.0S110C-HP	●	10.9				49.1	51.1	
KDZ	1100X3.0S110C-HP	●	11	-0.018	0	11	116	49.5	51.5
	1110X3.0S120C-HP	●	11.1					50	52
	1120X3.0S120C-HP	●	11.2					50.4	52.4
	1130X3.0S120C-HP	●	11.3					50.9	52.9
	1140X3.0S120C-HP	●	11.4					51.3	53.3
	1150X3.0S120C-HP	●	11.5			12	122	51.8	53.8
	1160X3.0S120C-HP	●	11.6					52.2	54.2
	1170X3.0S120C-HP	●	11.7					52.7	54.7
	1180X3.0S120C-HP	●	11.8					53.1	55.1
	1190X3.0S120C-HP	●	11.9					53.6	55.6
	1200X3.0S120C-HP	●	12					54	56

Recommended cutting conditions ➡ L91

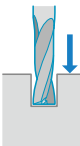
● : Standard item



Solid tools

Recommended cutting conditions

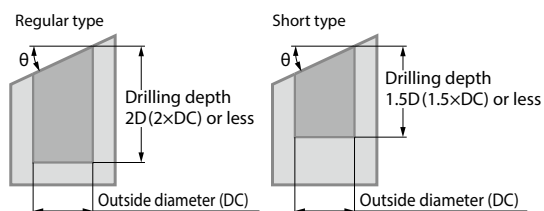
KDZ

Workpiece material	Application	Outside diameter DC (mm)	ø1	ø2	ø3	ø4	ø5	ø6	ø8	ø10	ø12
Structural steel Carbon steel SS400, S45C	 Plunging	Spindle revolution (min ⁻¹)	19,500	11,200	8,300	6,200	5,000	4,200	3,200	2,500	2,100
		Feed rate (mm/min)	300	380	520	520	520	520	520	520	450
Alloy steel SCM, SNCM		Spindle revolution (min ⁻¹)	19,000	10,000	7,200	5,400	4,400	3,600	2,700	2,200	1,800
		Feed rate (mm/min)	300	320	450	450	450	450	450	450	400
Pre-hardened steel (30~45HRC)		Spindle revolution (min ⁻¹)	16,000	8,000	3,900	2,900	2,300	1,900	1,500	1,200	1,000
		Feed rate (mm/min)	210	210	210	210	210	210	210	210	190
Nodular cast iron FCD400		Spindle revolution (min ⁻¹)	16,000	10,000	7,200	5,400	4,400	3,600	2,700	2,200	1,800
		Feed rate (mm/min)	200	300	390	390	390	390	390	390	340
Aluminum alloy A7075		Spindle revolution (min ⁻¹)	20,000	20,000	17,800	13,100	10,500	8,900	6,700	5,400	4,500
		Feed rate (mm/min)	500	850	1,270	1,270	1,270	1,270	1,270	1,270	1,270
Aluminum alloy casting AC, ADC		Spindle revolution (min ⁻¹)	20,000	20,000	13,100	10,000	8,000	6,700	5,000	4,000	3,400
		Feed rate (mm/min)	450	750	820	820	820	820	820	820	820

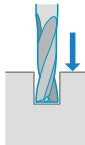
Precautions

• **This tool is specially designed for plunging and NOT recommended for traversing**

- Coolant is recommended
 - Adjust ap to suit machine rigidity and overhang length
 - Pecking is recommended when drilling depth is 2D or over
 - Use chuck and machine with the highest rigidity possible
 - Drilling stainless steel (SUS 304, SUS 316) is not recommended
 - Cutting condition modifications may be needed when cutting a slant surface, depending on the slant angle (Right figure)
- When workpiece slant is 30° or less, reduce the feed rate by 50%
- When workpiece slant is 30° or more, reduce the revolution by 70% and the feed rate by 30%

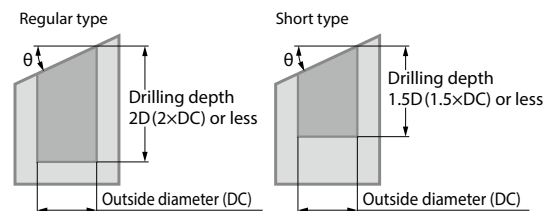


KDZ-HP

Workpiece material	Application	Outside diameter DC (mm)	ø1	ø1.5	ø2	ø2.5	ø3	ø3.5	ø4	ø4.5	ø5	ø6	ø8	ø10	ø12	ø14	ø16	ø18	ø20
Structural steel Carbon steel SS400, S45C	 Plunging	Spindle revolution (min ⁻¹)	20,700	13,800	11,150	9,200	9,100	7,800	6,800	6,100	5,500	4,600	3,500	2,800	2,300	1,800	1,600	1,400	1,300
		Feed rate (mm/min)	350	350	430	430	520	520	520	520	520	520	520	520	520	520	480	480	480
Alloy steel SCM, SNCM		Spindle revolution (min ⁻¹)	17,500	11,700	9,600	7,650	7,200	6,200	5,400	4,800	4,400	3,600	2,700	2,200	1,800	1,500	1,350	1,200	1,100
		Feed rate (mm/min)	290	290	380	380	450	450	450	450	450	450	450	450	450	450	420	420	420
Pre-hardened steel (30~45HRC)		Spindle revolution (min ⁻¹)	9,600	6,400	5,570	4,460	3,900	3,400	2,900	2,600	2,300	1,900	1,500	1,200	1,000	850	750	650	600
		Feed rate (mm/min)	120	120	170	170	210	210	210	210	210	210	210	210	210	210	200	200	200
Nodular cast iron FCD400		Spindle revolution (min ⁻¹)	15,900	10,600	10,360	8,290	7,200	6,200	5,400	4,800	4,400	3,600	2,700	2,200	1,800	1,550	1,350	1,200	1,100
		Feed rate (mm/min)	220	250	390	390	390	390	390	390	390	390	390	390	390	390	360	360	360
Aluminum alloy A7075		Spindle revolution (min ⁻¹)	39,800	26,600	23,000	18,500	17,800	15,200	13,100	11,800	10,500	8,900	6,700	5,400	4,500	3,800	3,400	3,000	2,700
		Feed rate (mm/min)	900	1,000	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1,270
Aluminum alloy casting AC, ADC		Spindle revolution (min ⁻¹)	29,000	19,200	17,500	14,000	13,100	11,500	10,000	8,800	8,000	6,700	5,000	4,000	3,400	2,900	2,500	2,200	2,000
		Feed rate (mm/min)	550	550	820	820	820	820	820	820	820	820	820	820	820	820	820	820	820

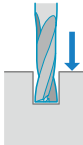
Precautions

- **This tool is specially designed for plunging and NOT recommended for traversing**
- Coolant is recommended
- Adjust ap to suit machine rigidity and overhang length
- Pecking is recommended when Drilling Depth is 2D or over
- Use chuck and machine with the highest rigidity possible
- Drilling stainless steel (SUS304, SUS316) is not recommended
- Cutting condition modifications may be needed when cutting a slant surface, depending on the slant angle (Right Figure)
- When workpiece slant is 30° or less, reduce the feed rate by 50%
- When workpiece slant is 30° or more, reduce the revolution by 70% and the feed rate by 30%



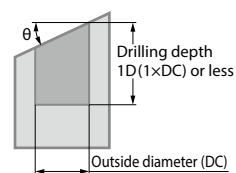
Recommended cutting conditions

KDZ-HP Short (Long shank type)

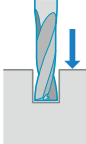
Workpiece material	Application	Outside diameter DC (mm)	ø3	ø3.5	ø4	ø4.5	ø5	ø6	ø8	ø10	ø12
Structural steel Carbon steel SS400, S45C	 Plunging	Spindle revolution (min ⁻¹)	10,600	9,100	8,000	7,100	6,400	5,300	4,000	3,200	2,700
		Feed rate (mm/min)	830	830	830	830	830	830	830	830	830
Alloy steel SCM, SNCM		Spindle revolution (min ⁻¹)	9,500	8,200	7,200	6,400	5,700	4,800	3,600	2,900	2,400
		Feed rate (mm/min)	630	630	630	630	630	630	630	630	630
Pre-hardened steel (30~45HRC)		Spindle revolution (min ⁻¹)	7,400	6,400	5,600	5,000	4,500	3,700	2,800	2,200	1,900
		Feed rate (mm/min)	365	365	365	365	365	365	365	365	365
Nodular cast iron FCD400		Spindle revolution (min ⁻¹)	9,600	8,200	7,200	6,400	5,700	4,800	3,600	2,900	2,400
		Feed rate (mm/min)	475	475	475	475	475	475	475	475	475
Aluminum alloy A7075		Spindle revolution (min ⁻¹)	12,700	10,900	9,600	8,500	7,600	6,400	4,800	3,800	3,200
		Feed rate (mm/min)	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050
Aluminum alloy casting AC, ADC		Spindle revolution (min ⁻¹)	9,500	8,200	7,200	6,400	5,700	4,800	3,600	2,900	2,400
		Feed rate (mm/min)	675	675	675	675	675	675	675	675	675

Precautions

- **This tool is specially designed for plunging and NOT recommended for traversing**
 - Coolant is recommended
 - Adjust ap to suit machine rigidity and overhang length
 - Use chuck and machine with the highest rigidity possible
 - Drilling stainless steel (SUS304, SUS316) is not recommended
 - Cutting condition modifications may be needed when cutting a slant surface, depending on the slant angle (Right figure)
- When workpiece slant is 30° or less, reduce the feed rate by 50%
- When workpiece slant is 30° or more, reduce the revolution by 70% and the feed rate by 30%

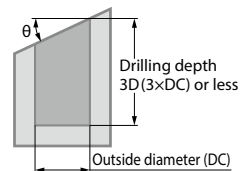


KDZ-HP (Type C)

Workpiece material	Application	Outside diameter DC (mm)	ø3	ø4	ø5	ø6	ø8	ø10	ø12
Structural steel Carbon steel SS400, S45C	 Plunging	Spindle revolution (min ⁻¹)	10,600	7,950	6,350	5,300	3,980	3,180	2,650
		Feed rate (mm/min)	750	750	750	750	750	750	750
Alloy steel SCM, SNCM		Spindle revolution (min ⁻¹)	9,550	7,160	5,730	4,770	3,580	2,860	2,390
		Feed rate (mm/min)	700	680	630	600	600	600	600
Pre-hardened steel (30~45HRC)		Spindle revolution (min ⁻¹)	5,300	3,980	3,180	2,650	1,990	1,590	1,330
		Feed rate (mm/min)	300	300	300	300	300	280	280
Stainless steel SUS304		Spindle revolution (min ⁻¹)	7,430	5,570	5,100	4,240	3,180	2,550	2,120
		Feed rate (mm/min)	400	400	400	500	500	500	500
Nodular cast iron FCD400		Spindle revolution (min ⁻¹)	9,550	7,160	5,730	4,770	3,580	2,860	2,390
		Feed rate (mm/min)	580	580	500	500	500	450	450
Aluminum alloy A7075		Spindle revolution (min ⁻¹)	18,000	13,500	10,800	9,000	6,800	5,400	4,500
		Feed rate (mm/min)	1,270	1,270	1,270	1,270	1,270	1,270	1,270
Aluminum alloy casting AC, ADC		Spindle revolution (min ⁻¹)	13,100	10,000	8,000	6,700	5,000	4,000	3,400
		Feed rate (mm/min)	900	900	850	850	850	850	850

Precautions

- **This tool is specially designed for plunging and NOT recommended for traversing**
- Coolant is recommended
- Adjust ap to suit machine rigidity and overhang length
- Use chuck and machine with the highest rigidity possible
- Pecking is recommended when drilling depth is 2D or over
- Cutting condition modifications may be needed when cutting a slant surface, depending on the slant angle (Right figure)
- When workpiece slant is 30° or less, reduce the feed rate by 50%
- When workpiece slant is 30° or more, reduce the revolution by 70% and the feed rate by 30%
- If there is insufficient chip evacuation at the specified drill depth, it is recommended to peck or change cutting conditions
- Pre-drilling is recommended if cutting is unstable
- Pre-drilling and pecking are recommended for stainless steel machining

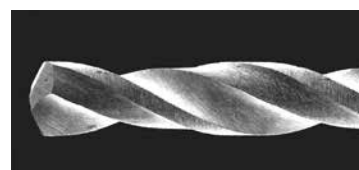
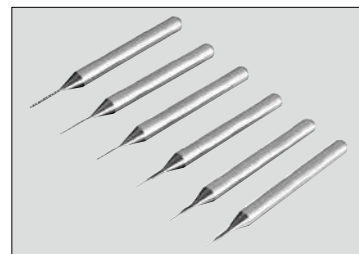


Fine Micro Drill

Features

1. High-grade cutting edge is realized by Kyocera prominent minute grind technology
2. Enables stable cutting edge strength and fracture resistance with tough super micro-grain carbide
3. More high efficiency and long tool life drilling is possible due to high performance special thin coating (FS coat)

* FS coat is abbreviation of fine surface. FS coat have superior surface smoothness and low wear coefficient. With its high wear resistance, FS coat is effective to improve sharp cutting and superior chip evacuation



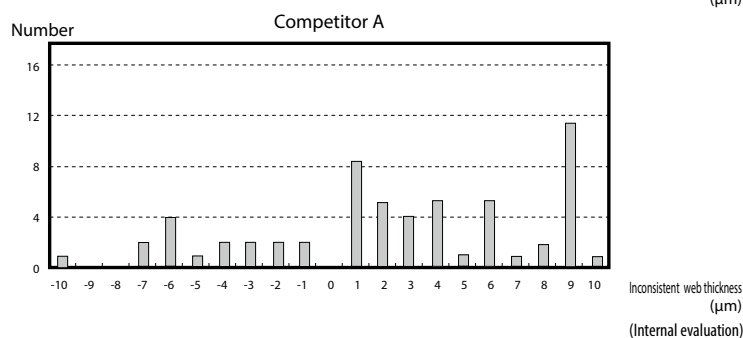
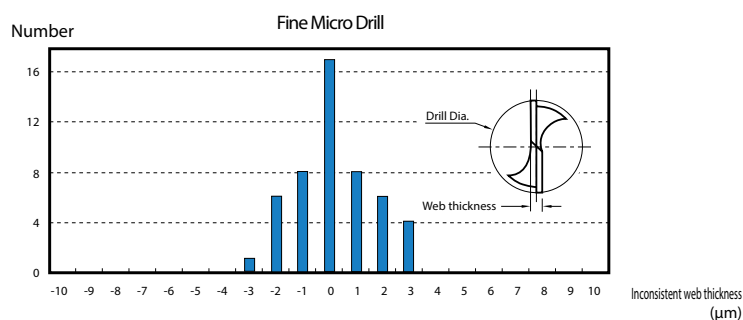
ø0.1(FDM-010M A)

Drilling quality

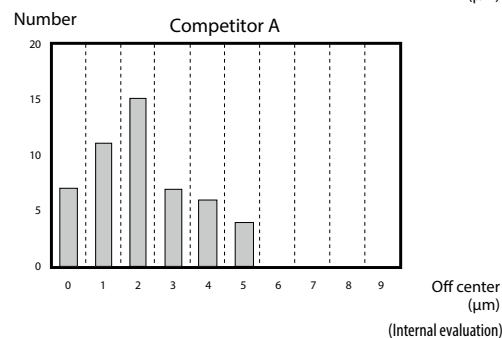
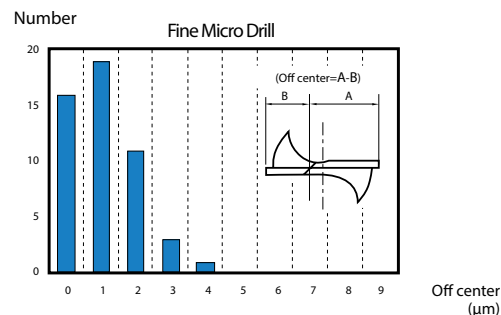
	Cutting edge condition		Burr condition on the exit side		Cutting conditions
	Fine Micro Drill	Competitor A (Coated)	Fine Micro Drill	Competitor A (Coated)	
After drilling condition					Workpiece material : SUS304 (t=0.5mm) Drill dia. : ø0.3mm FDM-030 (FSA) Cutting speed : Vc=10m/min (n=10,600min ⁻¹) Feed : f=0.001mm/rev Coolant : Wet (Water soluble coolant) Drilling depth : 0.5mm (Through hole) Step feeding depth : 0.025 mm/time Number of holes : 200 holes (Internal evaluation)

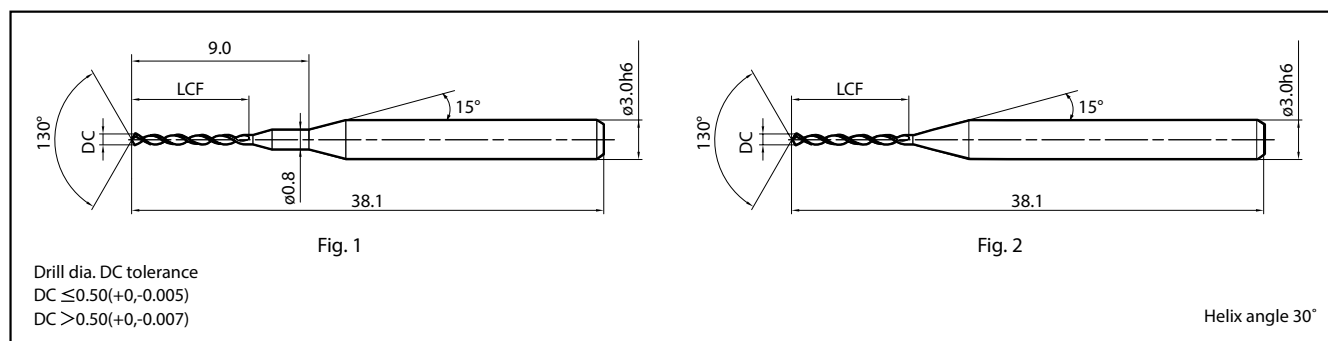
Comparison of cutting edge quality

Comparison of inconsistent web thickness
(Drill Dia. ø0.3)



Comparison of inconsistent cutting edge center
(Drill Dia. ø0.3)



FDM-M (Shank dia. $\phi 3$, Coated)

Description	Dimension (mm)		Drawing	Grades
	Drill dia.	Flute length		Coated
				FSA
FDM-010M(1)	0.10	1.3	Fig. 1	●
FDM-011M(1)	0.11			●
FDM-012M(1)	0.12	1.5		●
FDM-013M(1)	0.13			●
FDM-014M(1)	0.14	1.7		●
FDM-015M(1)	0.15			●
FDM-016M(1)	0.16	1.9		●
FDM-017M(1)	0.17			●
FDM-018M(1)	0.18	2.2		●
FDM-019M(1)	0.19			●
FDM-020M(1)	0.20	2.4		●
FDM-021M(1)	0.21			●
FDM-022M(1)	0.22	2.7		●
FDM-023M(1)	0.23			●
FDM-024M(1)	0.24	2.9		●
FDM-025M(1)	0.25			●
FDM-026M(1)	0.26	3.1		●
FDM-027M(1)	0.27			●
FDM-028M(1)	0.28	3.3		●
FDM-029M(1)	0.29			●
FDM-030M(1)	0.30	5.0		●
FDM-031M(1)	0.31			●

Description	Dimension (mm)		Drawing	Grades
	Drill dia.	Flute length		Coated
				FSA
FDM-032M(1)	0.32	5.0	Fig. 1	●
FDM-033M(1)	0.33			●
FDM-034M(1)	0.34			●
FDM-035M(1)	0.35			●
FDM-036M(1)	0.36	6.0		●
FDM-037M(1)	0.37			●
FDM-038M(1)	0.38	6.0		●
FDM-039M(1)	0.39			●
FDM-040M(1)	0.40	7.0	Fig. 2	●
FDM-041M(1)	0.41			●
FDM-042M(1)	0.42			●
FDM-043M(1)	0.43			●
FDM-044M(1)	0.44			●
FDM-045M(1)	0.45			●
FDM-046M(1)	0.46			●
FDM-047M(1)	0.47			●
FDM-048M(1)	0.48			●
FDM-049M(1)	0.49			●
FDM-050M(1)	0.50	●		
FDM-060M(1)	0.60	8.0		●
FDM-070M(1)	0.70			●
FDM-080M(1)	0.80		10.0	●

Identification system

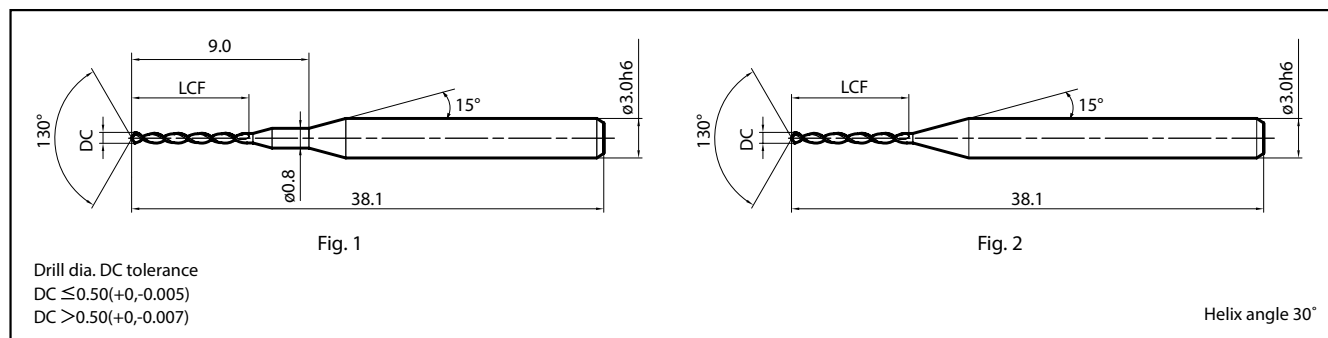
FDM - ○ ○ ○ M (1) FSA

Drill dia.

M : Shank dia. 3.0mm

(1) : 1 piece boxes

Grades

FDM-M (Shank dia. $\phi 3$, Uncoated)

Description	Dimension (mm)		Drawing	Grades
	Drill dia.	Flute length		Uncoated
				A
FDM-010M(1)	0.10	1.3	Fig. 1	●
FDM-011M(1)	0.11			●
FDM-012M(1)	0.12	1.5		●
FDM-013M(1)	0.13			●
FDM-014M(1)	0.14	1.7		●
FDM-015M(1)	0.15			●
FDM-016M(1)	0.16	1.9		●
FDM-017M(1)	0.17			●
FDM-018M(1)	0.18	2.2		●
FDM-019M(1)	0.19			●
FDM-020M(1)	0.20	2.4		●
FDM-021M(1)	0.21			●
FDM-022M(1)	0.22	2.7		●
FDM-023M(1)	0.23			●
FDM-024M(1)	0.24	2.9		●
FDM-025M(1)	0.25			●
FDM-026M(1)	0.26	3.1		●
FDM-027M(1)	0.27			●
FDM-028M(1)	0.28	3.3		●
FDM-029M(1)	0.29			●
FDM-030M(1)	0.30	5.0		●
FDM-031M(1)	0.31			●

Description	Dimension (mm)		Drawing	Grades
	Drill dia.	Flute length		Uncoated
				A
FDM-032M(1)	0.32	5.0	Fig. 1	●
FDM-033M(1)	0.33			●
FDM-034M(1)	0.34			●
FDM-035M(1)	0.35	6.0		●
FDM-036M(1)	0.36			●
FDM-037M(1)	0.37			●
FDM-038M(1)	0.38	6.0		Fig. 2
FDM-039M(1)	0.39		●	
FDM-040M(1)	0.40	7.0	●	
FDM-041M(1)	0.41		●	
FDM-042M(1)	0.42		●	
FDM-043M(1)	0.43		●	
FDM-044M(1)	0.44		●	
FDM-045M(1)	0.45		●	
FDM-046M(1)	0.46		●	
FDM-047M(1)	0.47		●	
FDM-048M(1)	0.48		●	
FDM-049M(1)	0.49		●	
FDM-050M(1)	0.50	8.0	●	
FDM-060M(1)	0.60		●	
FDM-070M(1)	0.70		●	
FDM-080M(1)	0.80	10.0	●	

Identification system

FDM - ○○○ M (1) A

Drill dia. M : Shank dia. 3.0mm (1) : 1 piece boxes Grades

● : Standard item

Custom-order item

Non stock size are also available

- (1) Drill dia.

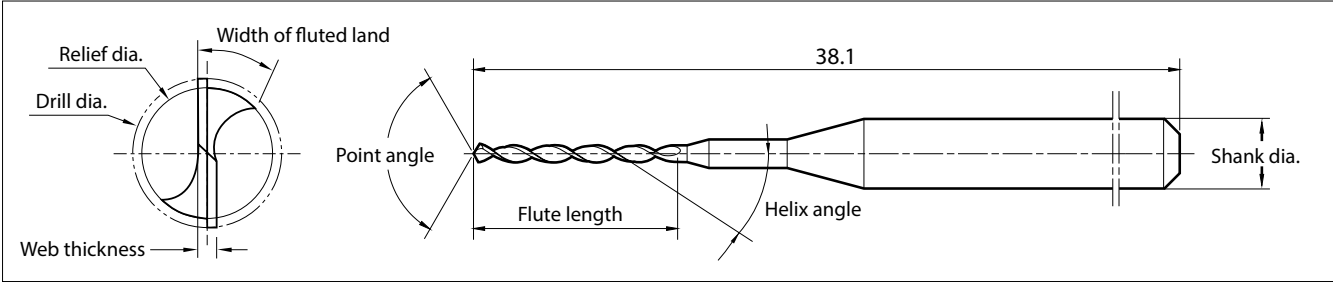
(2) Drill dia. tolerance

(3) Flute length

(4) Shank dia.

(5) Please inform us about FSA (coated) or A (uncoated) and so on
- Small change such as changing only flute length is available in short read time.

Ask us for the change such as point angle, helix angle, and so on.

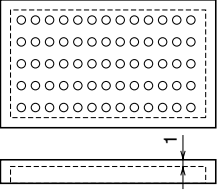
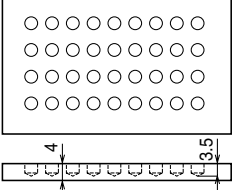
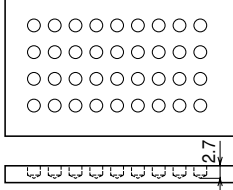


Recommended cutting conditions

Drill dia. (mm)	Carbon steel / Alloy steel		Stainless steel		Cast iron		Aluminum / Copper	
	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)
0.10~0.19	2~6	0.0005~0.002	2~6	0.0003~0.001	2~10	0.0005~0.003	4~15	0.0005~0.003
0.20~0.29	4~10	0.001~0.004	4~10	0.0005~0.002	5~15	0.001~0.005	10~20	0.001~0.005
0.30~0.50	6~15	0.002~0.010	6~10	0.001~0.005	10~20	0.004~0.015	15~30	0.004~0.015
0.60~0.80	8~24	0.004~0.015	8~15	0.002~0.007	10~30	0.005~0.020	20~45	0.005~0.020

- Cautions
- The above is guide. It may change depending on hardness of workpiece and machine condition.
 - Apply coolant. Water-insoluble cutting oil is recommended.
 - Use high precision chuck and use as short overhang length as possible.
 - When drilling depth is more than 3D, utilize the step machining process.
 - Step depth is 10%~50% of drill diameter. When hole depth is deeper , shorten the step depth.

Case Studies

Free cutting prehardened steel		SK3		SUS316L	
· Plate · n=16,000min⁻¹ · H=1mm (Through hole) · Vf=22mm/min · Wet (Oil-base) · FDM-010M (A) (ø0.10mm) 	Fine Micro Drill 600 holes / pc	· Gauge · n=10,000min⁻¹ · H=3.5mm · Vf=100mm/min · Wet (Oil-base) · FDM-036M (FSA) (ø0.36mm) 	Fine Micro Drill 5,200 holes / pc	· Plate · n=8,000min⁻¹ · H=2.7mm · Vf=45mm/min · Wet (Oil-base) · XFDM-040 (FSA) (ø0.40mm) 	Fine Micro Drill 2,400 holes / pc
Competitor B (Coated) 200 holes / pc (Broken)		Competitor C (Coated) 4,000 holes / pc		Competitor D (Coated High-speed steel) 300 holes / pc	
· Competitor B is broken at 200 holes / pc · Regardless of uncoated(A), Fine micro drill achieved 3 times longer tool life compared with Competitor B (User Evaluation)		· Fine micro drill achieved 30% longer tool life compared with Competitor C (User Evaluation)		· Fine micro drill achieved 8 times longer tool life compared with Competitor D (User Evaluation)	



