

- 고경도강(HRc50~60), 프리하든강 계열의 고정밀 가공 엔드밀
- 실리콘계 코팅(Si) 처리하여 내마모성이 우수합니다.
- 고정밀 공차 적용으로 초정밀 가공에 적합합니다.
- 인선부 강성을 보강하여 날부치핑을 최소화 하였습니다.
- 항절력이 높은 미립자 초경합금(0.5 $\mu$ m)을 채택, 엔드밀의 파손을 최소화 하였습니다.

#### • Endmills for pre-hardened and hardened steels(HRc50~60)

- Good wear resistance by Si-based PVD coating.
- High precise edge tolerance.
- Reinforced edge design for preventing edge chipping.
- Minimize fracturing by high TRS fine(0.5 $\mu$ m) WC grade.



Shield Edge 430P

Condition	D Size	D Tolerance	Condition	D Size	D Tolerance
$\varnothing D \neq \varnothing d$	$\varnothing 0.3 \sim 6$	$+0 \sim -0.01\text{mm}$	$\varnothing D = \varnothing d$	$\varnothing 3 \sim 6$	$-0.005 \sim -0.015\text{mm}$
	$\varnothing 8 \sim 20$	$+0 \sim -0.015\text{mm}$		$\varnothing 8 \sim 12$	$-0.01 \sim -0.025\text{mm}$
		$\varnothing 14 \sim 20$		$-0.015 \sim -0.03\text{mm}$	

단위 : mm

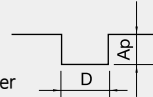
Order Number	날경 Diameter D	날장 Length of cut L1	전장 Overall Length L	샙크 Shank Dia d	비고
4HCE 003 006 S04	0.3	0.6	40	4	
4HCE 004 008 S04	0.4	0.8	40	4	
4HCE 005 010 S04	0.5	1	40	4	
4HCE 006 012 S04	0.6	1.2	40	4	
4HCE 007 014 S04	0.7	1.4	40	4	
4HCE 008 020 S04	0.8	2	40	4	
4HCE 009 018 S04	0.9	1.8	40	4	
4HCE 010 025 S03	1	2.5	40	3	
4HCE 010 025 S04	1	2.5	40	4	
4HCE 010 025 S06	1	2.5	40	6	
4HCE 010 025 060	1	2.5	60	6	
4HCE 010 025 080	1	2.5	80	6	
4HCE 012 030 S03	1.2	3	40	3	
4HCE 012 030 S04	1.2	3	40	4	
4HCE 012 030 S06	1.2	3	40	6	
4HCE 012 030 060	1.2	3	60	6	
4HCE 015 040 S03	1.5	4	40	3	
4HCE 015 040 S04	1.5	4	40	4	
4HCE 015 040 S06	1.5	4	40	6	
4HCE 015 040 060	1.5	4	60	6	
4HCE 015 040 080	1.5	4	80	6	
4HCE 020 060 S03	2	6	40	3	
4HCE 020 060 S04	2	6	40	4	
4HCE 020 060 S06	2	6	40	6	
4HCE 020 060 060	2	6	60	6	
4HCE 020 060 100	2	6	100	6	
4HCE 025 080 S03	2.5	8	45	3	
4HCE 025 080 S04	2.5	8	45	4	
4HCE 025 080 S06	2.5	8	45	6	
4HCE 025 080 070	2.5	8	70	6	
4HCE 025 080 100	2.5	8	100	6	
4HCE 030 080 S03	3	8	45	3	
4HCE 030 080 S04	3	8	45	4	
4HCE 030 080 S06	3	8	45	6	
4HCE 030 080 070	3	8	70	6	
4HCE 030 080 100	3	8	100	6	
4HCE 035 100 S06	3.5	10	45	6	
4HCE 040 110 S04	4	11	45	4	
4HCE 040 110 S06	4	11	45	6	
4HCE 040 110 070	4	11	70	6	
4HCE 040 110 100	4	11	100	6	
4HCE 045 110 S06	4.5	11	45	6	
4HCE 050 130 S06	5	13	50	6	
4HCE 050 130 080	5	13	80	6	
4HCE 050 130 100	5	13	100	6	
4HCE 055 130 S06	5.5	13	50	6	
4HCE 060 130 S06	6	13	50	6	
4HCE 060 130 080	6	13	80	6	
4HCE 060 130 100	6	13	100	6	
4HCE 065 160 S08	6.5	16	60	8	

Order Number	날경 Diameter D	날장 Length of cut L1	전장 Overall Length L	샙크 Shank Dia d	비고
4HCE 070 160 S08	7	16	60	8	
4HCE 075 160 S08	7.5	16	60	8	
4HCE 080 190 S08	8	19	60	8	
4HCE 085 190 S10	8.5	19	70	10	
4HCE 090 190 S10	9	19	70	10	
4HCE 095 190 S10	9.5	19	70	10	
4HCE 100 220 S10	10	22	70	10	
4HCE 105 220 S12	10.5	22	75	12	
4HCE 110 220 S12	11	22	75	12	
4HCE 115 220 S12	11.5	22	75	12	
4HCE 120 260 S12	12	26	75	12	
4HCE 130 260 S14	13	26	80	14	
4HCE 140 260 S14	14	26	80	14	
4HCE 140 260 S16	14	26	90	16	
4HCE 150 350 S16	15	35	100	16	
4HCE 160 350 S16	16	35	100	16	
4HCE 170 350 S18	17	35	100	18	
4HCE 180 350 S18	18	35	100	18	
4HCE 200 400 S20	20	40	100	20	

홈절삭 Slotting																
피삭재 Material	공구강 / 금형강 Tool steels / Mold steels SCM/HPM				합금강/프리하든강 Alloy Steels / Pre-hardened Steels NAK80 / KP4M				고경도강 Hardened Steels STAVAX / SKD11				열처리 / 고경도강 Heat-treated steels / Hardened Steels SKD11 / SKD61			
	경도 Hardness		30 ~ 40HRC		40 ~ 45HRC		45 ~ 55HRC		55 ~ 62HRC							
외경 Outside Diameter	RPM	FEED	Ap Axial Depth	Ae Radial Depth	RPM	FEED	Ap Axial Depth	Ae Radial Depth	RPM	FEED	Ap Axial Depth	Ae Radial Depth	RPM	FEED	Ap Axial Depth	Ae Radial Depth
Ø 0.4	50,000	294	0.04	0.4	45,000	225	0.04	0.4	40,000	175	0.02	0.200	33,000	113	0.01	0.100
Ø 0.5	50,000	463	0.05	0.5	45,000	350	0.05	0.5	40,000	275	0.03	0.250	33,000	175	0.01	0.125
Ø 0.6	50,000	588	0.06	0.6	45,000	450	0.06	0.6	40,000	356	0.03	0.300	30,000	200	0.02	0.150
Ø 0.8	50,000	750	0.08	0.8	40,000	550	0.08	0.8	30,000	369	0.04	0.400	25,000	231	0.02	0.200
Ø 0.9	49,000	819	0.09	0.9	39,000	650	0.09	0.9	27,800	413	0.05	0.450	22,700	256	0.02	0.225
Ø 1	48,000	1,313	0.1	1.0	38,000	855	0.1	1.0	25,500	538	0.05	0.500	20,500	325	0.03	0.250
Ø 2	33,300	1,488	0.2	2.0	26,000	1,020	0.2	2.0	17,500	625	0.10	1.000	14,500	388	0.05	0.500
Ø 3	21,800	1,488	0.3	3.0	17,300	1,020	0.3	3.0	11,500	625	0.15	1.500	9,500	388	0.08	0.750
Ø 4	16,700	1,540	0.4	4.0	13,200	1,050	0.4	4.0	8,800	663	0.20	2.000	7,200	406	0.10	1.000
Ø 5	15,700	1,750	0.5	5.0	12,500	1,208	0.5	5.0	8,300	750	0.25	2.500	6,400	425	0.13	1.250
Ø 6	13,100	1,663	0.6	6.0	10,350	1,155	0.6	6.0	6,900	719	0.30	3.000	5,300	419	0.15	1.500
Ø 8	9,880	1,625	0.8	8.0	7,800	1,080	0.8	8.0	5,200	669	0.40	4.000	4,000	375	0.20	2.000
Ø 10	7,800	1,488	1.0	10.0	6,150	1,020	1.0	10.0	4,100	625	0.50	5.000	3,200	363	0.25	2.500
Ø 12	6,650	1,488	1.2	12.0	5,250	1,020	1.2	12.0	3,500	625	0.60	6.000	2,650	363	0.30	3.000
Ø 16	5,540	1,363	1.6	16.0	4,340	915	1.6	16.0	2,600	538	0.80	8.000	1,840	269	0.40	4.000
Ø 18	5,540	1,363	1.8	18.0	4,340	913	1.8	18.0	2,600	538	0.90	9.000	1,840	269	0.45	4.500
Ø 20	4,640	1,260	2.0	20.0	4,340	912	2.0	20.0	2,600	538	1.00	10.000	1,840	269	0.50	5.000

절입량  
Depth of Cut

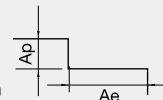
Slotting  
• Ap : Axial Depth  
• D : Outside Diameter



측면절삭 Side Cutting																
피삭재 Material	공구강 / 금형강 Tool steels / Mold steels SCM/HPM				합금강/프리하든강 Alloy Steels / Pre-hardened Steels NAK80 / KP4M				고경도강 Hardened Steels STAVAX / SKD11				열처리 / 고경도강 Heat-treated steels / Hardened Steels SKD11 / SKD61			
	경도 Hardness		30 ~ 40HRC		40 ~ 50HRC		45 ~ 55HRC		55 ~ 62HRC							
외경 Outside Diameter	RPM	FEED	Ap Axial Depth	Ae Radial Depth	RPM	FEED	Ap Axial Depth	Ae Radial Depth	RPM	FEED	Ap Axial Depth	Ae Radial Depth	RPM	FEED	Ap Axial Depth	Ae Radial Depth
Ø 0.4	50,000	264	0.4	0.012	45,000	203	0.4	0.012	40,000	158	0.20	0.008	33,000	101	0.10	0.004
Ø 0.5	50,000	416	0.5	0.015	45,000	315	0.5	0.015	40,000	248	0.25	0.010	33,000	158	0.13	0.005
Ø 0.6	50,000	529	0.6	0.018	45,000	405	0.6	0.018	40,000	321	0.30	0.012	30,000	180	0.15	0.006
Ø 0.8	50,000	675	0.8	0.024	40,000	495	0.8	0.024	30,000	332	0.40	0.016	25,000	208	0.20	0.008
Ø 0.9	49,000	737	0.9	0.027	39,000	585	0.9	0.027	27,800	371	0.45	0.018	22,700	231	0.23	0.009
Ø 1	48,000	1,181	1.0	0.030	38,000	770	1.0	0.030	25,500	484	0.50	0.020	20,500	293	0.25	0.010
Ø 2	33,300	1,339	2.0	0.060	26,000	918	2.0	0.060	17,500	563	1.00	0.040	14,500	349	0.50	0.020
Ø 3	21,800	1,339	3.0	0.090	17,300	918	3.0	0.090	11,500	563	1.50	0.060	9,500	349	0.75	0.030
Ø 4	16,700	1,386	4.0	0.120	13,200	945	4.0	0.120	8,800	596	2.00	0.080	7,200	366	1.00	0.040
Ø 5	15,700	1,575	5.0	0.150	12,500	1,087	5.0	0.150	8,300	675	2.50	0.100	6,400	383	1.25	0.050
Ø 6	13,100	1,496	6.0	0.180	10,350	1,040	6.0	0.180	6,900	647	3.00	0.120	5,300	377	1.50	0.060
Ø 8	9,880	1,463	8.0	0.240	7,800	972	8.0	0.240	5,200	602	4.00	0.160	4,000	338	2.00	0.080
Ø 10	7,800	1,339	10.0	0.300	6,150	918	10.0	0.300	4,100	563	5.00	0.200	3,200	326	2.50	0.100
Ø 12	6,650	1,339	12.0	0.360	5,250	918	12.0	0.360	3,500	563	6.00	0.240	2,650	326	3.00	0.120
Ø 16	5,540	1,226	16.0	0.480	4,340	824	16.0	0.480	2,600	484	8.00	0.320	1,840	242	4.00	0.160
Ø 18	5,540	1,226	18.0	0.540	4,340	821	18.0	0.540	2,600	484	9.00	0.360	1,840	242	4.50	0.180
Ø 20	4,640	1,134	20.0	0.600	4,340	821	20.0	0.600	2,600	484	10.00	0.400	1,840	242	5.00	0.200

절입량  
Depth of Cut

Side Milling  
• Ap : Axial Depth  
• Ae : Radial Depth



- 날 끝이 정밀하게 연삭되어 있습니다. 파손을 피하기 위해 가능하면 비접촉 방식으로 측정하십시오.
- HRC60 이상 고경도강 가공 시 같은 직경의 같은 비율로 20% DOWN 시켜주십시오.
- 상기 절삭조건은 참고 수치이므로 실 가공시 가공 형상, 가공 목적, 적용 기계에 따라 조건 변경 요망합니다.
- 조건표가 기계의 최대 스피들 속도를 초과하거나 버 및 적열 현상이 발생할 때 스피들 속도와 이송속도를 비례하여 조정하십시오.
- 진동이 적고 강성이 좋은 공작기계 사용 요망 합니다.(Ø1이하 사용자 진동 허용 관리 5µm 이내 일것.)
- 에어브로, 절삭유, 오일미스트쿨러를추천하며, 칩을 잘 제거하고 가공시 발열과 발화에 주의 하십시오

- The edge of the flute precisely grinded. If you want to measure the tool, and to avoid damaging on the flutes, use non-contact measuring method.
- When milling workpiece, HRC over 60 hardened steel , reduce 20% of the RPM and feed compared to the same diameter.
- Use this table for your reference. Adjust the parameters depending on your machining geometry, machining purpose and CNC.
- Use a machine with low vibration and good rigidity (Ø1 or less, the vibration tolerance management should be within 5µm).
- Air blow or mist coolants are recommended and note for chip emission, heat, or ignition.