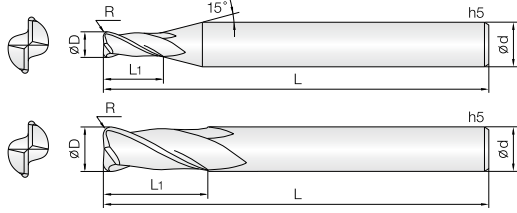


2NCR 2 Flutes Corner Radius End Mills

2날 코너 레디우스 엔드밀

HARD series



- 고경도강(HRc50~62), 프리하드강 계열의 고속 가공 엔드밀
- 실리콘계 코팅(Si) 처리하여 내마모성이 우수합니다.
- 고정밀 공차 적용으로 초정밀 가공에 적합합니다.
- 코너R 형상을 날부치핑이 적도록 설계하였습니다.
- 다양한 코너R과 유효장으로 맞춤 가공이 가능합니다.
- 초미립자 초경합금(0.2 μ m)을 채택, 고속절삭시 뛰어난 성능을 발휘합니다.
- Endmills for pre-hardened and hardened steels(HRc50~62)
- Good wear resistance by Si-based PVD coating.
- High precise edge tolerance.
- Designed for minimizing edge chipping by corner R shape.
- Various corner R and flute length for wide range application.
- Outstanding performance at high speed machining by ultra fine (0.2 μ m) WC grade.

Condition	D Size	D Tolerance	Condition	D Size	D Tolerance
$\varnothing D \neq \varnothing d$	$\varnothing 0.2 \sim 16$	$+0 \sim -0.01\text{mm}$	$\varnothing D = \varnothing d$	$\varnothing 4 \sim 12$	$-0.005 \sim -0.015\text{mm}$
				$\varnothing 14 \sim 16$	$-0.01 \sim -0.02\text{mm}$

단위 : mm

Order Number	날경 Diameter D×R	날장 Length of cut L1	전장 Overall Length L	샙크 Shank Dia d	비고	Order Number	날경 Diameter D×R	날장 Length of cut L1	전장 Overall Length L	샙크 Shank Dia d	비고
2NCR 002 0002 S04	0.2 X R0.02	0.6	45	4		2NCR 025 002 S04	2.5 X R0.2	6	50	4	
2NCR 002 0005 S04	0.2 X R0.05	0.6	45	4		2NCR 025 003 S04	2.5 X R0.3	6	50	4	
2NCR 003 0002 S04	0.3 X R0.02	0.6	45	4		2NCR 025 004 S04	2.5 X R0.4	6	50	4	
2NCR 003 0005 S04	0.3 X R0.05	0.6	45	4		2NCR 025 005 S04	2.5 X R0.5	6	50	4	
2NCR 003 001 S04	0.3 X R0.1	0.6	45	4		2NCR 030 0005 S06	3 X R0.05	8	60	6	
2NCR 004 0002 S04	0.4 X R0.02	0.8	45	4		2NCR 030 001 S06	3 X R0.1	8	60	6	
2NCR 004 0005 S04	0.4 X R0.05	0.8	45	4		2NCR 030 002 S06	3 X R0.2	8	60	6	
2NCR 004 001 S04	0.4 X R0.1	0.8	45	4		2NCR 030 003 S06	3 X R0.3	8	60	6	
2NCR 005 0002 S04	0.5 X R0.02	1	45	4		2NCR 030 004 S06	3 X R0.4	8	60	6	
2NCR 005 0005 S04	0.5 X R0.05	1	45	4		2NCR 030 005 S06	3 X R0.5	8	60	6	
2NCR 005 001 S04	0.5 X R0.1	1	45	4		2NCR 030 010 S06	3 X R1	8	60	6	
2NCR 006 0002 S04	0.6 X R0.02	1.2	45	4		2NCR 035 001 S06	3.5 X R0.1	9	70	6	
2NCR 006 0005 S04	0.6 X R0.05	1.2	45	4		2NCR 035 002 S06	3.5 X R0.2	9	70	6	
2NCR 006 001 S04	0.6 X R0.1	1.2	45	4		2NCR 035 003 S06	3.5 X R0.3	9	70	6	
2NCR 006 002 S04	0.6 X R0.2	1.2	45	4		2NCR 035 005 S06	3.5 X R0.5	9	70	6	
2NCR 007 0005 S04	0.7 X R0.05	1.4	45	4		2NCR 035 010 S06	3.5 X R1	9	70	6	
2NCR 007 001 S04	0.7 X R0.1	1.4	45	4		2NCR 040 0005 060	4 X R0.05	9	60	4	
2NCR 007 002 S04	0.7 X R0.2	1.4	45	4		2NCR 040 0005 080	4 X R0.05	9	80	4	
2NCR 008 0002 S04	0.8 X R0.02	1.6	45	4		2NCR 040 0005 S06	4 X R0.05	9	70	6	
2NCR 008 0005 S04	0.8 X R0.05	1.6	45	4		2NCR 040 001 060	4 X R0.1	9	60	4	
2NCR 008 001 S04	0.8 X R0.1	1.6	45	4		2NCR 040 001 080	4 X R0.1	9	80	4	
2NCR 008 002 S04	0.8 X R0.2	1.6	45	4		2NCR 040 001 S06	4 X R0.1	10	70	6	
2NCR 009 0005 S04	0.9 X R0.05	1.8	45	4		2NCR 040 002 060	4 X R0.2	9	60	4	
2NCR 009 001 S04	0.9 X R0.1	1.8	45	4		2NCR 040 002 080	4 X R0.2	9	80	4	
2NCR 010 0002 S04	1 X R0.02	2.5	45	4		2NCR 040 002 S06	4 X R0.2	10	70	6	
2NCR 010 0005 S04	1 X R0.05	2.5	45	4		2NCR 040 003 060	4 X R0.3	9	60	4	
2NCR 010 001 S04	1 X R0.1	2.5	45	4		2NCR 040 003 080	4 X R0.3	9	80	4	
2NCR 010 002 S04	1 X R0.2	2.5	45	4		2NCR 040 003 S06	4 X R0.3	10	70	6	
2NCR 010 003 S04	1 X R0.3	2.5	45	4		2NCR 040 004 060	4 X R0.4	9	60	4	
2NCR 010 004 S04	1 X R0.4	2.5	45	4		2NCR 040 004 080	4 X R0.4	9	80	4	
2NCR 012 0005 S04	1.2 X R0.05	3.2	45	4		2NCR 040 004 S06	4 X R0.4	10	70	6	
2NCR 012 001 S04	1.2 X R0.1	3.2	45	4		2NCR 040 005 060	4 X R0.5	9	60	4	
2NCR 012 002 S04	1.2 X R0.2	3.2	45	4		2NCR 040 005 080	4 X R0.5	9	80	4	
2NCR 012 003 S04	1.2 X R0.3	3.2	45	4		2NCR 040 005 S06	4 X R0.5	10	70	6	
2NCR 015 0002 S04	1.5 X R0.02	4	45	4		2NCR 040 010 060	4 X R1	9	60	4	
2NCR 015 0005 S04	1.5 X R0.05	4	45	4		2NCR 040 010 080	4 X R1	9	80	4	
2NCR 015 001 S04	1.5 X R0.1	4	45	4		2NCR 040 010 S06	4 X R1	10	70	6	
2NCR 015 002 S04	1.5 X R0.2	4	45	4		2NCR 045 001 S06	4.5 X R0.1	11	75	6	
2NCR 015 003 S04	1.5 X R0.3	4	45	4		2NCR 045 002 S06	4.5 X R0.2	11	75	6	
2NCR 015 004 S04	1.5 X R0.4	4	45	4		2NCR 045 003 S06	4.5 X R0.3	11	75	6	
2NCR 015 005 S04	1.5 X R0.5	4	45	4		2NCR 045 005 S06	4.5 X R0.5	11	75	6	
2NCR 020 0002 S04	2 X R0.02	6	45	4		2NCR 045 010 S06	4.5 X R1	11	75	6	
2NCR 020 0005 S04	2 X R0.05	6	45	4		2NCR 050001 S06	5 X R0.1	13	75	6	
2NCR 020 001 S04	2 X R0.1	6	45	4		2NCR 050 002 S06	5 X R0.2	13	75	6	
2NCR 020 002 S04	2 X R0.2	6	45	4		2NCR 050 003 S06	5 X R0.3	13	75	6	
2NCR 020 003 S04	2 X R0.3	6	45	4		2NCR 050 004 S06	5 X R0.4	13	75	6	
2NCR 020 004 S04	2 X R0.4	6	45	4		2NCR 050 005 S06	5 X R0.5	13	75	6	
2NCR 020 005 S04	2 X R0.5	6	45	4		2NCR 050 010 S06	5 X R1	13	75	6	
2NCR 025 0005 S04	2.5 X R0.05	6	50	4		2NCR 055 002 S06	5.5 X R0.2	13	75	6	
2NCR 025 001 S04	2.5 X R0.1	6	50	4		2NCR 055 003 S06	5.5 X R0.3	13	75	6	

단위 : mm

Order Number	날경 Diameter D×R	날장 Length of cut L1	전장 Overall Length L	샙크 Dia d	비고	Order Number	날경 Diameter D×R	날장 Length of cut L1	전장 Overall Length L	샙크 Dia d	비고
2NCR 055 005 S06	5.5 X R0.5	13	75	6		2NCR 100 010 100	10 X R1	22	100	10	
2NCR 055 010 S06	5.5 X R1	13	75	6		2NCR 100 010 130	10 X R1	22	130	10	
2NCR 060 0005 060	6 X R0.05	11	60	6		2NCR 100 015 075	10 X R1.5	19	75	10	
2NCR 060 0005 090	6 X R0.05	13	90	6		2NCR 100 015 100	10 X R1.5	22	100	10	
2NCR 060 001 060	6 X R0.1	11	60	6		2NCR 100 015 130	10 X R1.5	22	130	10	
2NCR 060 001 090	6 X R0.1	13	90	6		2NCR 100 020 075	10 X R2	19	75	10	
2NCR 060 002 060	6 X R0.2	11	60	6		2NCR 100 020 100	10 X R2	22	100	10	
2NCR 060 002 090	6 X R0.2	13	90	6		2NCR 100 025 100	10 X R2.5	22	100	10	
2NCR 060 003 060	6 X R0.3	11	60	6		2NCR 100 030 100	10 X R3	22	100	10	
2NCR 060 003 090	6 X R0.3	13	90	6		2NCR 100 040 100	10 X R4	22	100	10	
2NCR 060 004 060	6 X R0.4	11	60	6		2NCR 120 001 080	12 X R0.1	22	80	12	
2NCR 060 004 090	6 X R0.4	13	90	6		2NCR 120 001 110	12 X R0.1	26	110	12	
2NCR 060 005 060	6 X R0.5	11	60	6		2NCR 120 002 080	12 X R0.2	22	80	12	
2NCR 060 005 090	6 X R0.5	13	90	6		2NCR 120 002 110	12 X R0.2	26	110	12	
2NCR 060 010 060	6 X R1	11	60	6		2NCR 120 003 080	12 X R0.3	22	80	12	
2NCR 060 010 090	6 X R1	13	90	6		2NCR 120 003 110	12 X R0.3	26	110	12	
2NCR 060 015 060	6 X R1.5	11	60	6		2NCR 120 005 080	12 X R0.5	22	80	12	
2NCR 060 015 090	6 X R1.5	13	90	6		2NCR 120 005 110	12 X R0.5	26	110	12	
2NCR 060 020 060	6 X R2	11	60	6		2NCR 120 005 130	12 X R0.5	26	130	12	
2NCR 060 020 090	6 X R2	13	90	6		2NCR 120 010 080	12 X R1	22	80	12	
2NCR 060 025 090	6 X R2.5	13	90	6		2NCR 120 010 110	12 X R1	26	110	12	
2NCR 080 001 070	8 X R0.1	16	70	8		2NCR 120 010 130	12 X R1	26	130	12	
2NCR 080 001 100	8 X R0.1	19	100	8		2NCR 120 015 080	12 X R1.5	22	80	12	
2NCR 080 002 070	8 X R0.2	16	70	8		2NCR 120 015 110	12 X R1.5	26	110	12	
2NCR 080 002 100	8 X R0.2	19	100	8		2NCR 120 015 130	12 X R1.5	26	130	12	
2NCR 080 003 070	8 X R0.3	16	70	8		2NCR 120 020 080	12 X R2	22	80	12	
2NCR 080 003 100	8 X R0.3	19	100	8		2NCR 120 020 110	12 X R2	26	110	12	
2NCR 080 005 070	8 X R0.5	16	70	8		2NCR 120 020 130	12 X R2	26	130	12	
2NCR 080 005 100	8 X R0.5	19	100	8		2NCR 120 025 110	12 X R2.5	26	110	12	
2NCR 080 005 120	8 X R0.5	19	120	8		2NCR 120 030 110	12 X R3	26	110	12	
2NCR 080 010 070	8 X R1	16	70	8		2NCR 120 040 110	12 X R4	26	110	12	
2NCR 080 010 100	8 X R1	19	100	8		2NCR 120 050 110	12 X R5	26	110	12	
2NCR 080 010 120	8 X R1	19	120	8		2NCR 140 005 110	14 X R0.5	30	110	14	
2NCR 080 015 070	8 X R1.5	16	70	8		2NCR 140 010 110	14 X R1	30	110	14	
2NCR 080 015 100	8 X R1.5	19	100	8		2NCR 140 020 110	14 X R2	30	110	14	
2NCR 080 020 070	8 X R2	16	70	8		2NCR 160 005 160	16 X R0.5	32	160	16	
2NCR 080 020 100	8 X R2	19	100	8		2NCR 160 010 160	16 X R1	32	160	16	
2NCR 080 025 100	8 X R2.5	19	100	8							
2NCR 080 030 100	8 X R3	19	100	8							
2NCR 080 035 100	8 X R3.5	19	100	8							
2NCR 100 001 075	10 X R0.1	19	75	10							
2NCR 100 001 100	10 X R0.1	22	100	10							
2NCR 100 002 075	10 X R0.2	19	75	10							
2NCR 100 002 100	10 X R0.2	22	100	10							
2NCR 100 003 075	10 X R0.3	19	75	10							
2NCR 100 003 100	10 X R0.3	22	100	10							
2NCR 100 005 075	10 X R0.5	19	75	10							
2NCR 100 005 100	10 X R0.5	22	100	10							
2NCR 100 005 130	10 X R0.5	22	130	10							
2NCR 100 010 075	10 X R1	19	75	10							

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	Ae	RPM	FEED	Ap	Ae	RPM	FEED	Ap	Ae	RPM	FEED	Ap	Ae			
			Axial Depth	Radial Depth			Axial Depth	Radial Depth			Axial Depth	Radial Depth			Axial Depth	Radial Depth			
ø 0.4	50,000	1,065	0.020	0.32	45,000	507	0.020	0.32	40,000	221	0.008	0.20	33,000	187	0.008	0.20			
ø 0.5	50,000	1,217	0.025	0.4	45,000	580	0.025	0.4	40,000	252	0.01	0.25	33,000	214	0.01	0.25			
ø 0.6	50,000	1,369	0.03	0.48	45,000	652	0.03	0.48	40,000	284	0.012	0.3	30,000	241	0.012	0.3			
ø 0.8	50,000	1,521	0.04	0.64	45,000	725	0.04	0.64	30,000	315	0.016	0.4	25,000	268	0.016	0.4			
ø 1	48,000	3,773	0.05	0.8	38,000	1,797	0.05	0.8	25,500	781	0.02	0.5	20,500	664	0.02	0.5			
ø 2	33,300	4,503	0.1	1.6	26,000	2,145	0.1	1.6	17,500	932	0.04	1	14,500	793	0.04	1			
ø 3	21,800	4,564	0.15	2.4	17,300	2,174	0.15	2.4	11,500	945	0.06	1.5	9,500	803	0.06	1.5			
ø 4	16,700	4,686	0.2	3.2	13,200	2,231	0.2	3.2	8,800	970	0.08	2	7,200	825	0.08	2			
ø 5	15,700	4,990	0.25	4	12,500	2,376	0.25	4	8,300	1,033	0.1	2.5	6,400	878	0.1	2.5			
ø 6	13,100	4,869	0.3	4.8	10,350	2,318	0.3	4.8	6,900	1,008	0.12	3	5,300	857	0.12	3			
ø 8	9,880	4,443	0.4	6.4	7,800	2,116	0.4	6.4	5,200	920	0.16	4	4,000	782	0.16	4			
ø 10	7,800	4,138	0.5	8	6,150	1,971	0.5	8	4,100	857	0.2	5	3,200	728	0.2	5			
ø 12	6,650	4,138	0.6	9.6	5,250	1,971	0.6	9.6	3,500	857	0.24	6	2,650	728	0.24	6			
ø 16	6,150	2,400	0.8	12.8	5,500	1,811	0.8	12.8	3,210	788	0.32	8	2,420	669	0.32	8			

절입량
Depth of Cut

~ 45HRC

절입량
Depth of Cut

45HRC ~

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 ~ 45Hrc				45 ~ 55Hrc				55 ~ 62Hrc		
외경 Outside Diameter	RPM	FEED	Ap	Ae	RPM	FEED	Ap	Ae	RPM	FEED	Ap	Ae	RPM	FEED	Ap	Ae			
			Axial Depth	Radial Depth			Axial Depth	Radial Depth			Axial Depth	Radial Depth			Axial Depth	Radial Depth			
ø 0.4	50,000	1,438	0.4	0.012	45,000	735	0.4	0.012	40,000	265	0.20	0.008	33,000	252	0.20	0.008			
ø 0.5	50,000	1,643	0.5	0.015	45,000	841	0.5	0.015	40,000	302	0.25	0.01	33,000	289	0.25	0.01			
ø 0.6	50,000	1,848	0.6	0.018	45,000	945	0.6	0.018	40,000	341	0.30	0.012	30,000	325	0.30	0.012			
ø 0.8	50,000	2,053	0.8	0.024	40,000	1,051	0.8	0.024	30,000	378	0.40	0.016	25,000	362	0.40	0.016			
ø 1	48,000	5,094	1	0.03	38,000	2,606	1	0.03	25,500	937	0.50	0.02	20,500	896	0.50	0.02			
ø 2	33,300	6,079	2	0.06	26,000	3,110	2	0.06	17,500	1,118	1.00	0.04	14,500	1,071	1.00	0.04			
ø 3	21,800	6,161	3	0.09	17,300	3,152	3	0.09	11,500	1,134	1.50	0.06	9,500	1,804	1.50	0.06			
ø 4	16,700	6,326	4	0.12	13,200	3,235	4	0.12	8,800	1,164	2.00	0.08	7,200	1,114	2.00	0.08			
ø 5	15,700	6,737	5	0.15	12,500	3,445	5	0.15	8,300	1,240	2.50	0.1	6,400	1,185	2.50	0.1			
ø 6	13,100	6,573	6	0.18	10,350	3,361	6	0.18	6,900	1,210	3.00	0.12	5,300	1,157	3.00	0.12			
ø 8	9,880	5,998	8	0.24	7,800	3,068	8	0.24	5,200	1,104	4.00	0.16	4,000	1,056	4.00	0.16			
ø 10	7,800	5,586	10	0.3	6,150	2,858	10	0.3	4,100	1,028	5.00	0.2	3,200	983	5.00	0.2			
ø 12	6,650	5,586	12	0.36	5,250	2,858	12	0.36	3,500	1,028	6.00	0.24	2,650	983	6.00	0.24			
ø 16	6,280	3,240	16	0.48	5,100	2,626	16	0.48	3,410	946	8.00	0.32	2,440	903	8.00	0.32			

절입량
Depth of Cut

~ 45HRC

절입량
Depth of Cut

45HRC ~

- HRC62 이상인 경우 같은 직경의 같은 비율로 20% DOWN 시켜 주십시오.
- 유효장이 긴 경우에는 회전수와 이송 속도를 최대 30% 이하로 줄이십시오.
- 곡면 절삭시 날경의 코너R 보다 낮은 이동 PITCH를 설정 하십시오.
- 곡면 절삭시 안정적인 속도 내에서 피드를 최대 30% 까지 UP 해주십시오.
- 상기 절삭 조건표는 2날 기준이며, 4날시 회전수는 유지하고, 피드는 안정적인 속도 내에서 최대 30%까지 UP 해주십시오.
- 홈 절삭시 날경의 코너R 대비 Ae 값을 설정 하십시오.
- 상기 절삭조건은 참고 수치이므로 실 가공시 가공 형상, 가공 목적, 적용 기계에 따라 조건변경 요망 합니다.
- 피삭재와 절삭 형상을 위한 적절한 클러트 사용과 가공시 발열, 발화에 주의 하십시오.

- When milling workpiece HRC over 62, reduce 20% of the RPM and feed with the same diameter.
- If the effective length is long, reduce the RPM and feed maximum 30%.
- For curved milling, set up the lower value of the pitch than the corner radius value of tool diameter.
- For curved milling, raise up the feed up to 30% in stable milling condition.
- The parameters on the table is based on 2flutes. For using 4flutes, use the same RPM and raise up the feed up to 50% in stable milling condition.
- For groove milling, set up the Ae value by considering of corner radius value.
- Use this table for your reference. Adjust the parameters depending on your machining geometry, machining purpose and CNC.
- Air blow or mist coolants are recommended and note for chip emission, heat, or ignition.