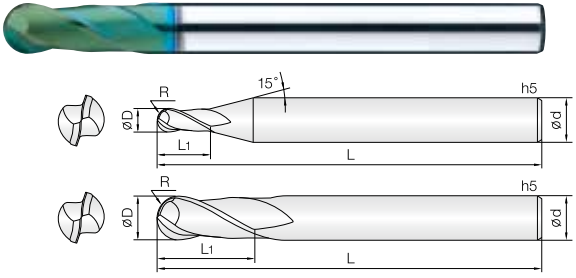


2PHCB 2 Flutes Ultra Precision Standard Length Ball End Mills

2날 초정밀 표준 길이 볼 엔드밀

HARD series



- 고경도강(HRc52~62), 프리하든강 계열의 고정밀(±2µm)가공용
 - 실리콘계 코팅(Si) 처리하여 내마모성이 우수합니다.
 - 초정밀 공차 적용으로 초정밀 가공에 적합합니다.
 - 날부인선의 조도가 뛰어나 피삭재의 면조도가 우수합니다.
 - 초미립자 초경합금(0.2µm)을 채택, 고속절삭시 뛰어난 성능을 발휘합니다.
- Endmills for pre-hardened and hardened steels(HRc52~62)
 - Good wear resistance by Si-based PVD coating.
 - Ultra high precise edge tolerance.
 - Very nice work surface finish.
 - Outstanding performance at high speed machining by ultra fine (0.2µm) WC grade.

2

UWC
초미립자

TISIN-S
Coating

R
±0.002

R
±0.003

R
±0.005

30°
Helix Angle

CUTTING
DATA
423P

Condition	D Size	D Tolerance	Condition	D Size	D Tolerance
ØD ≠ Ød	Ø0.2 ~ 12	+0 ~ -0.01mm	ØD = Ød	Ø4 ~ 12	-0.005 ~ -0.015mm

단위 : mm

Order Number	날경 Diameter R × D	날장 Length of cut L1	전장 Overall Length L	생크 Shank Dia d	비고	Order Number	날경 Diameter R × D	날장 Length of cut L1	전장 Overall Length L	생크 Shank Dia d	비고
2PHCB 002 004 S04	0.1R X 0.2	0.4	40	4							
2PHCB 003 006 S04	0.15R X 0.3	0.6	40	4							
2PHCB 004 008 S04	0.2R X 0.4	0.8	40	4							
2PHCB 005 010 S04	0.25R X 0.5	1	45	4							
2PHCB 006 012 S04	0.3R X 0.6	1.2	45	4							
2PHCB 007 015 S04	0.35R X 0.7	1.5	45	4							
2PHCB 008 020 S04	0.4R X 0.8	2	45	4							
2PHCB 009 020 S04	0.45R X 0.9	2	45	4							
2PHCB 010 025 S04	0.5R X 1	2.5	50	4							
2PHCB 010 025 S06	0.5R X 1	2.5	50	6							
2PHCB 012 030 S04	0.6R X 1.2	3	50	4							
2PHCB 015 040 S04	0.75R X 1.5	4	50	4							
2PHCB 015 040 S06	0.75R X 1.5	4	50	6							
2PHCB 020 050 S04	1R X 2	5	50	4							
2PHCB 020 050 S06	1R X 2	5	50	6							
2PHCB 025 060 S04	1.25R X 2.5	6	50	4							
2PHCB 030 080 S04	1.5R X 3	8	50	4							
2PHCB 030 080 S06	1.5R X 3	8	60	6							
2PHCB 035 080 S06	1.75R X 3.5	8	60	6							
2PHCB 040 080 S04	2R X 4	8	60	4							
2PHCB 040 080 S06	2R X 4	8	70	6							
2PHCB 045 080 S06	2.25R X 4.5	8	70	6							
2PHCB 050 100 S06	2.5R X 5	10	75	6							
2PHCB 055 100 S06	2.75R X 5.5	10	75	6							
2PHCB 060 120 080	3R X 6	12	80	6							
2PHCB 070 140 S08	3.5R X 7	14	80	8							
2PHCB 080 140 090	4R X 8	14	90	8							
2PHCB 100 180 100	5R X 10	18	100	10							
2PHCB 120 220 110	6R X 12	22	110	12							

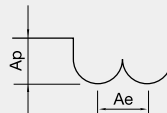
2PHCB/2HSB/2HCB Cutting Condition

• RPM : rev./min • Feed : mm/min

피삭재 Material		동 Copper C1100				합금강 / 프리하든강 Alloy Steels / Prehardened Steels NAK80/KP4M				고경도강 Hardened Steels STAVAX/SKD11				열처리 / 고경도강 Heat-treated steels / Hardened Steels SKD11 / SKD61			
경도 Hardness		40 ~ 45HRC								45 ~ 55HRC				55 ~ 62HRC			
반경 Radius	날장 Cutting Length	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
R0.05	0.2	40,000	300	0.005	0.040	40,000	300	0.004	0.004	30,000	200	0.004	0.040	Cutting is not possible.			
R0.1	0.2	54,000	430	0.020	0.060	54,000	630	0.016	0.012	44,300	450	0.023	0.008	30,000	300	0.012	0.008
"	0.4	54,000	430	0.020	0.051	54,000	430	0.016	0.040	44,300	345	0.010	0.023	32,800	260	0.007	0.008
R0.15	0.3	54,000	720	0.030	0.090	54,000	750	0.024	0.072	44,300	600	0.015	0.042	32,800	450	0.020	0.013
"	0.6	54,000	720	0.030	0.075	54,000	715	0.024	0.060	44,300	575	0.015	0.035	32,800	430	0.012	0.013
R0.2	0.4	54,000	870	0.040	0.120	54,000	1,000	0.032	0.096	44,300	800	0.020	0.056	32,800	600	0.028	0.016
"	0.8	54,000	870	0.040	0.105	54,000	880	0.032	0.084	44,300	700	0.020	0.049	32,800	525	0.016	0.016
R0.25	0.5	56,000	1,250	0.050	0.150	53,000	1,250	0.040	0.120	43,500	1,000	0.025	0.070	32,200	750	0.035	0.022
"	1	56,000	1,380	0.050	0.125	50,000	1,000	0.040	0.100	41,350	800	0.025	0.058	30,600	600	0.021	0.022
R0.3	0.6	58,000	1,510	0.060	0.180	52,000	1,380	0.048	0.144	42,650	1,100	0.030	0.084	31,500	825	0.042	0.026
"	1.2	58,000	1,710	0.060	0.155	48,500	1,020	0.048	0.124	40,500	810	0.030	0.072	30,000	610	0.025	0.026
R0.4	0.8	52,000	1,870	0.080	0.240	48,000	1,500	0.064	0.192	39,500	1,200	0.040	0.112	29,250	900	0.056	0.036
"	2	52,000	1,970	0.080	0.200	45,000	1,085	0.064	0.160	37,500	870	0.040	0.093	27,800	650	0.033	0.036
R0.5	1	41,000	1,660	0.100	0.300	38,540	1,560	0.080	0.240	36,900	1,250	0.050	0.140	27,300	940	0.063	0.040
"	2.5	41,000	1,880	0.100	0.200	38,540	1,000	0.080	0.160	31,500	800	0.050	0.090	23,000	600	0.022	0.040
R0.6	3	34,000	2,120	0.120	0.360	31,960	1,550	0.096	0.288	32,800	1,250	0.060	0.168	24,400	940	0.072	0.051
R0.75	1.5	27,000	2,280	0.150	0.450	25,380	1,600	0.120	0.360	28,700	1,280	0.075	0.210	21,500	960	0.087	0.068
"	4	27,000	1,830	0.150	0.325	25,380	1,000	0.120	0.260	26,000	800	0.075	0.152	19,250	600	0.052	0.068
R1	2	32,700	3,560	0.200	0.600	30,738	1,850	0.160	0.480	24,600	1,480	0.100	0.280	18,250	1,110	0.112	0.089
"	5	32,700	2,980	0.200	0.435	30,738	1,350	0.160	0.348	22,000	1,080	0.100	0.203	16,250	810	0.067	0.089
R1.25	6	30,600	3,680	0.250	0.542	28,764	1,600	0.200	0.430	27,901	1,280	0.125	0.251	15,500	960	0.067	0.115
R1.5	3	26,100	4,400	0.300	0.957	24,534	2,520	0.240	0.766	23,798	2,050	0.150	0.447	15,500	1,530	0.197	0.171
"	8	26,100	4,110	0.300	0.765	24,534	2,350	0.240	0.612	23,798	1,880	0.150	0.357	15,500	1,410	0.100	0.171
R2	4	18,800	4,160	0.400	1.380	17,672	2,450	0.320	1.100	17,142	1,960	0.200	0.644	12,800	1,470	0.266	0.208
"	8	18,800	3,920	0.400	1.020	17,672	2,350	0.320	0.816	17,142	1,880	0.200	0.476	12,800	1,410	0.134	0.208
R2.5	5	17,300	3,980	0.500	1.660	16,262	2,560	0.400	1.330	15,774	2,050	0.250	0.770	11,000	1,530	0.215	0.240
"	10	17,300	3,660	0.500	1.275	16,262	2,300	0.400	1.020	15,774	1,840	0.250	0.595	11,000	1,380	0.180	0.240
R3	6	16,500	3,880	0.600	2.340	15,510	2,700	0.480	1.870	15,045	2,160	0.300	1.090	9,600	1,620	0.290	0.281
"	12	16,500	3,500	0.600	1.530	15,510	2,400	0.480	1.225	15,045	1,920	0.300	0.715	9,600	1,440	0.230	0.281
R4	8	11,660	4,000	0.800	3.100	10,960	2,300	0.640	2.480	10,632	1,840	0.400	1.446	7,600	1,380	0.400	0.175
"	14	11,660	3,850	0.800	2.050	10,960	2,000	0.640	1.640	10,632	1,600	0.400	0.957	7,600	1,200	0.400	0.175
R5	10	9,560	4,100	1.000	3.750	8,986	2,200	0.800	3.000	8,717	1,780	0.500	1.750	6,400	1,340	0.500	0.154
"	18	9,560	3,720	1.000	2.550	8,986	1,700	0.800	2.040	8,717	1,360	0.500	1.190	6,400	1,020	0.500	0.154
R6	12	7,100	4,000	1.200	4.420	6,674	1,850	0.960	3.540	6,474	1,480	0.600	2.060	5,450	1,110	0.600	0.159
"	22	7,100	3,250	1.200	3.050	6,674	1,600	0.960	2,440	6,474	1,280	0.600	1.423	5,450	960	0.600	0.159
R8	30	4,650	2,000	1.120	3.870	4,371	1,630	0.790	2,350	4,240	1,100	0.500	1.742	4,000	810	0.450	1.150
R10	38	3,200	2,200	1.100	4.120	3,008	1,450	0.840	2,530	2,918	1,100	0.520	1.866	3,100	800	0.400	1.000

절입량
Depth of Cut

- Ap : Axial Depth
- Ae : Radial Depth
- D : Outside Diameter
- n : Speed
- Vf : Feed



- 유효장 길이가 긴 경우, RPM과 FEED를 동일 비율로 낮춰주세요.
- 상기 절삭조건은 참고 수치이므로 실 가공시 가공 형상, 가공 목적, 적용 기계에 따라 조건 변경 요망합니다.
- 적용 기계의 회전 속도가 부족한 경우에는 회전 속도와 이송 속도를 같은 비율로 줄여서 적용 합니다.
- 진동이 적고 강성이 좋은 공작기계 사용 요망 합니다.($\phi 1$ 이하 사용시 진동 허용 관리 $5\mu\text{m}$ 이내 일것.)
- 원활한 칩배출을 위하여 에어브로 혹은 미스트 쿨런트 사용을 추천하며, 동 가공시 습식 쿨런트를 추천 합니다.
- If the effective length is long, reduce the RPM and feed in the same proportion.
- Use this table for your reference. Adjust the parameters depending on your machining geometry, machining purpose and CNC.
- If the table over the maximum RPM and feed of your machine, adjust RPM and feed in the same proportion.
- Use a machine with low vibration and good rigidity ($\phi 1$ or less, the vibration tolerance management should be within $5\mu\text{m}$).
- Air blow or oil mist is recommended for smooth chip emission, and wet coolant milling is recommended for copper material.