

## 2 Flutes CrN COAT for Copper Electrode Milling



Size  $\phi 0.2 \sim \phi 12$

# CRN-ES2000



Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

Work Material																	
Carbon Steels	Alloy Steels	Prehardened Steels	Hardened Steels					Cast Iron	Aluminum Alloys	Graphite	Copper	Plastics	Glass Filled Plastics	Titanium Alloys	Heat Resistant Alloys	Cemented Carbide	Hard Brittle (Non-Metallic) Materials
			~50HRC	~55HRC	~60HRC	~65HRC	~70HRC										
S45C S55C	SK / SCM SUS	NAK HPM									★	○					

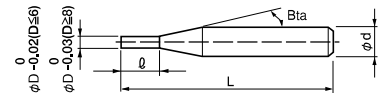
### Features

CrN COAT offers longer tool life.

Special geometry designed for Copper offers excellent milling performance.

Refer to page 232 for 4 flute CRN-ES.

Diameter Tolerance:  $0/-0.02$  ( $D \leq 6$ ),  $0/-0.03$  ( $D \geq 8$ )



The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.

Total 26 models

Unit (mm)

Model Number	Outside Diameter $\phi D$	Length of Cut $l$	Shank Taper Angle $Bta$	Overall Length $L$	Shank Diameter $\phi d$	Suggested Retail Price $\yen$
CRN-ES 2002-0060	0.2	0.6	11°	40	4	6,100
CRN-ES 2003-0090	0.3	0.9	11°	40	4	6,100
CRN-ES 2004-0120	0.4	1.2	11°	40	4	6,100
CRN-ES 2005-0150	0.5	1.5	11°	40	4	3,200
CRN-ES 2005-0200		2		45	4	5,500
CRN-ES 2006-0180	0.6	1.8	11°	40	4	5,060
CRN-ES 2006-0240		2.4		45	4	5,500
CRN-ES 2008-0240	0.8	2.4	11°	40	4	3,200
CRN-ES 2010-0300	1	3	11°	45	4	3,200
CRN-ES 2010-0400		4		50	4	4,950
CRN-ES 2015-0450	1.5	4.5	11°	45	4	3,200
CRN-ES 2015-0600		6		50	4	4,950
CRN-ES 2020-0600	2	6	11°	45	4	3,200
CRN-ES 2020-0800		8		50	4	4,950
CRN-ES 2025-0750	2.5	7.5	11°	45	4	3,200
CRN-ES 2030-0900	3	9	11°	50	6	3,740
CRN-ES 2030-1200		12		55	6	6,050
CRN-ES 2040-1200	4	12	11°	50	6	3,960
CRN-ES 2040-1600		16		55	6	6,600
CRN-ES 2050-1500	5	15	11°	55	6	4,200
CRN-ES 2060-1800	6	18	—	60	6	4,620
CRN-ES 2060-2400		24		65	6	7,480
CRN-ES 2080-2400	8	24	—	80	8	8,760
CRN-ES 2100-3000	10	30	—	100	10	10,900
CRN-ES 2100-4000		40		100	10	17,280
CRN-ES 2120-3600	12	36	—	100	12	15,000

## Milling Conditions for CRN-ES (2 Flutes)

### ◆3D flute length type

WORK MATERIAL		COPPER C1100						
Model Number	Outside Diameter (mm)	Side Milling				Slotting		
		Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)
2002-0060	0.2	40,000	100	0.3	0.004	40,000	85	0.01
2003-0090	0.3	38,000	100	0.45	0.006	38,000	85	0.015
2004-0120	0.4	35,000	100	0.6	0.008	35,000	85	0.02
2005-0150	0.5	32,000	120	0.75	0.01	32,000	100	0.025
2006-0180	0.6	29,000	150	0.9	0.012	26,000	120	0.03
2008-0240	0.8	22,000	180	1.2	0.016	21,000	150	0.04
2010-0300	1	18,000	180	1.5	0.02	16,000	150	0.05
2015-0450	1.5	17,500	250	2.25	0.15	11,000	150	0.15
2020-0600	2	17,000	340	3	0.2	7,500	150	0.2
2025-0750	2.5	16,500	450	3.75	0.25	6,000	150	0.25
2030-0900	3	16,000	630	4.5	0.3	5,000	170	0.3
2040-1200	4	12,000	650	6	0.4	5,000	200	0.4
2050-1500	5	10,000	750	7.5	0.5	5,000	250	0.5
2060-1800	6	8,000	800	9	0.6	4,500	250	0.6
2080-2400	8	6,000	700	12	0.8	4,000	250	0.8
2100-3000	10	5,000	600	15	1	4,000	350	1
2120-3600	12	4,000	500	18	1.2	4,000	450	1.2

### ◆4D flute length type

WORK MATERIAL		COPPER C1100						
Model Number	Outside Diameter (mm)	Side Milling				Slotting		
		Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)
2005-0200	0.5	16,000	60	1.25	0.005	16,000	50	0.025
2006-0240	0.6	14,500	75	1.5	0.006	14,500	65	0.03
2010-0400	1	9,000	90	2.5	0.01	8,000	75	0.05
2015-0600	1.5	9,000	150	3.75	0.075	8,000	130	0.15
2020-0800	2	5,000	140	5	0.1	4,500	120	0.2
2030-1200	3	3,500	140	7.5	0.15	2,500	85	0.3
2040-1600	4	3,500	200	10	0.2	2,500	100	0.4
2060-2400	6	3,000	200	15	0.3	2,500	150	0.6
2100-4000	10	2,500	230	25	0.5	2,000	175	1

Milling	Length of Cut	
	3D Flute Length Type	4D Flute Length Type
Side Milling	$a_p$ 1.5D $a_e$ 0.02D ( $D \leq \phi 1.0$ ) $a_e$ 0.1D ( $D > \phi 1.0$ )	$a_p$ 2.5D $a_e$ 0.01D ( $D \leq \phi 1.0$ ) $a_e$ 0.05D ( $D > \phi 1.0$ )
Slotting	$a_p$ 0.05D ( $D \leq \phi 1.0$ ) $a_p$ 0.1D ( $D > \phi 1.0$ )	$a_p$ 0.05D ( $D \leq \phi 1.0$ ) $a_p$ 0.1D ( $D > \phi 1.0$ )

#### Note:

- Decrease both spindle speed and feed rate proportionally in case of chattering.
- Adjust the milling amount and feed rate in accordance with required precision.
- Recommend water soluble or oil coolant.
- Recommended for Pure Copper. Not suitable for Tungsten Copper.

