

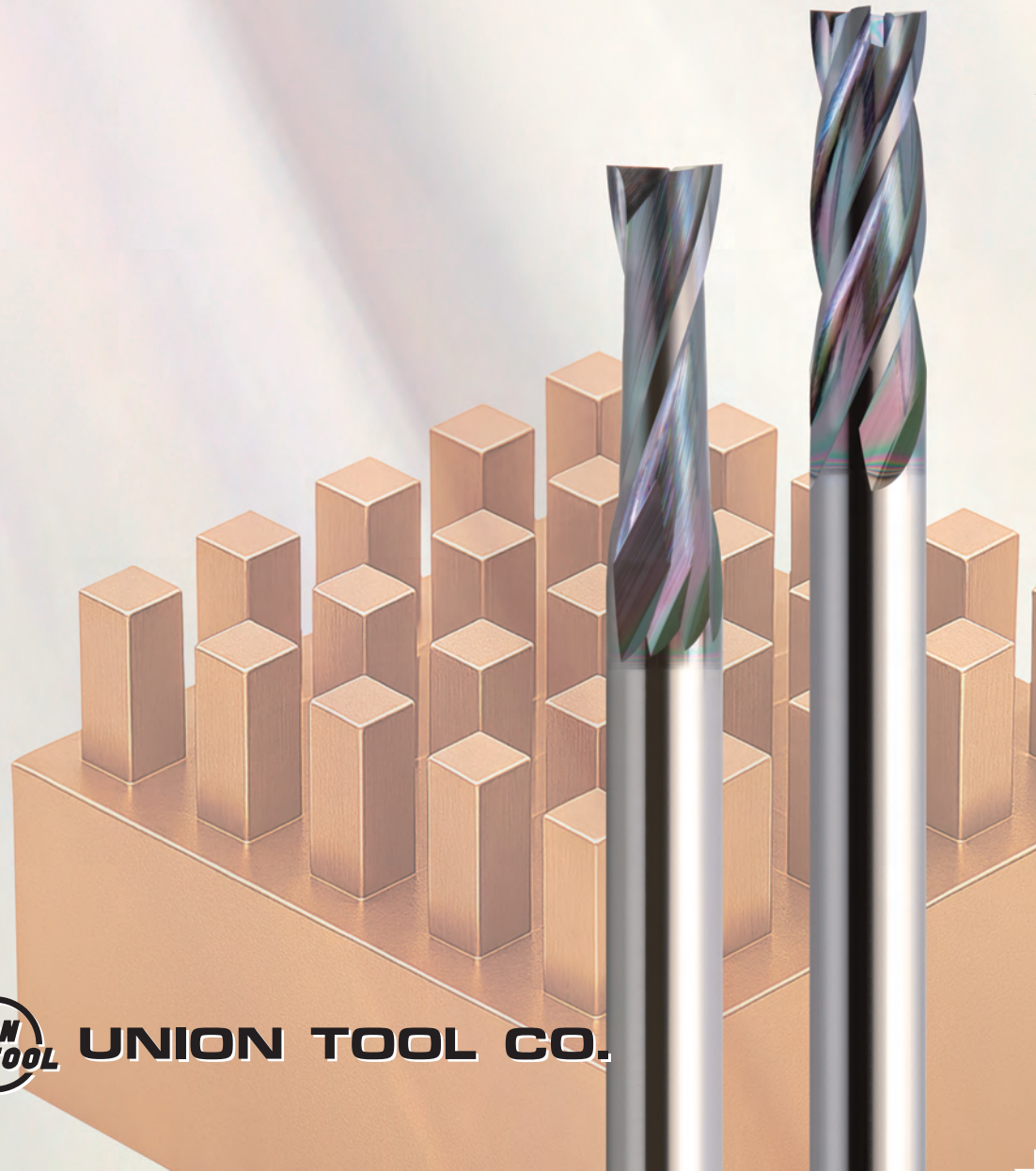
**UNION
TOOL**

Tungsten Carbide End Mills UNIMAX Series

NEW
Launched November 2025

DLCCOAT 2Flute / 4Flute Square End Mills for Copper Electrode Milling

DLCES 2000 / 4000



UNION TOOL CO.

DLCES2000

NEW



DLCCOAT 2 Flute Square End Mills for Copper Electrode Milling

Ø0.5~Ø6

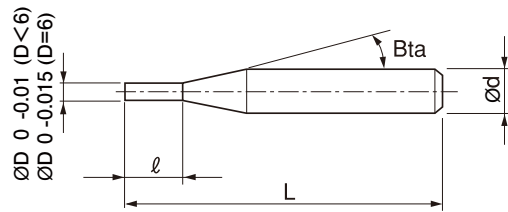


Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

Work Material																	
CARBON STEELS S45C S55C	ALLOY STEELS SK / SCM SUS	PREHARDENED STEELS NAK HPM	HARDENED STEELS					CAST IRON	ALUMINUM ALLOYS	GRAPHITE	COPPER	PLASTICS	GLASS FILLED PLASTICS	TITANIUM ALLOYS	HEAT RESISTANT ALLOYS	CEMENTED CARBIDE	HARD BRITTLE (NON-METALLIC) MATERIALS
			~50 HRC	~55 HRC	~60 HRC	~65 HRC	~70 HRC										
								○		★	○						

Features

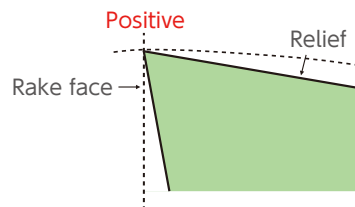
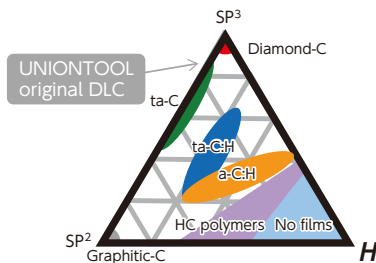
Long tool life for copper milling by DLC coating.
Sharp cutting edge reduces burrs.



The shank taper angle shown is not an exact value.

DLC COAT has diamond-like hardness.
(around 4,000 - 6,000HV)

Rake and relief angle are designed for copper milling.
Sharp cutting edge reduces burrs on milling surface.



Total 11 models

Unit (mm)

Model Number	Diameter ØD	Length of Cut l	Shank Taper Angle Bta	Overall Length L	Shank Diameter Ød	Series
DLCES 2005-0150	0.5	1.5	11°	40	4	DLCES
DLCES 2010-0300	1	3	11°	45	4	DLCES
DLCES 2010-0400		4		50		DLCES
DLCES 2015-0450	1.5	4.5	11°	45	4	DLCES
DLCES 2015-0600		6		50		DLCES
DLCES 2020-0600	2	6	11°	45	4	DLCES
DLCES 2020-0800		8		50		DLCES
DLCES 2030-0900	3	9	11°	50	6	DLCES
DLCES 2040-1200	4	12	11°	50	6	DLCES
DLCES 2050-1500	5	15	11°	55	6	DLCES
DLCES 2060-1800	6	18	—	60	6	DLCES

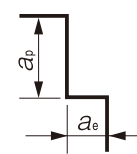
DLCES2000 Milling Conditions for DLCES2000 (2 Flutes)

WORK MATERIAL			COPPER / ALUMINUM ALLOYS							TUNGSTEN COPPER						
			Side Milling				Slotting			Side Milling				Slotting		
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)
2005-0150	0.5	1.5	32,000	120	0.75	0.01	32,000	100	0.025	28,800	110	0.375	0.01	28,800	90	0.012
2010-0300	1	3	18,000	180	1.5	0.02	16,000	150	0.05	16,200	160	0.75	0.02	14,400	140	0.025
2010-0400		4	10,800	110	2.5	0.01	8,000	75	0.05	9,700	100	1.25	0.01	7,200	70	0.025
2015-0450	1.5	4.5	17,500	250	2.25	0.15	11,000	150	0.15	15,800	230	1.125	0.15	9,900	140	0.075
2015-0600		6	10,500	150	3.75	0.075	8,000	130	0.15	9,500	140	1.875	0.075	7,200	120	0.075
2020-0600	2	6	17,000	340	3	0.2	7,500	150	0.2	15,300	310	1.5	0.2	6,800	140	0.1
2020-0800		8	10,200	200	5	0.1	4,500	120	0.2	9,200	180	2.5	0.1	4,100	110	0.1
2030-0900	3	9	16,000	630	4.5	0.3	5,000	170	0.3	14,400	570	2.25	0.3	4,500	150	0.15
2040-1200	4	12	12,000	650	6	0.4	5,000	200	0.4	10,800	590	3	0.4	4,500	180	0.2
2050-1500	5	15	10,000	750	7.5	0.5	5,000	250	0.5	9,000	680	3.75	0.5	4,500	230	0.25
2060-1800	6	18	8,000	800	9	0.6	4,500	250	0.6	7,200	720	4.5	0.6	4,100	230	0.3

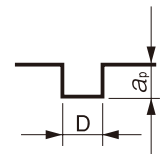
Note :

- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed, or when chattering occurs.
- Recommend wet coolant for Copper and Tungsten-Copper.

Side Milling



Slotting

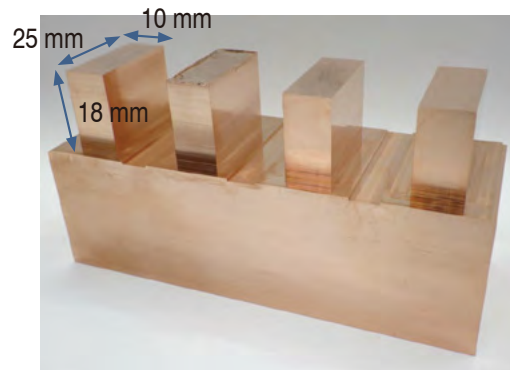


D : (mm)
Outside Diameter

Copper Milling Example - Comparison with conventional tool for steels Ø6 × L18

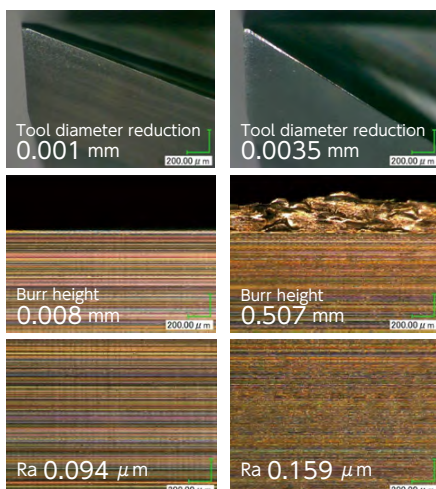
C1100
Tough Pitch Copper

Spindle Speed	8,000 min ⁻¹
Feed Rate	400 mm/min
a _p Axial Depth	18 mm
a _e Radial Depth	0.02 mm
Coolant	Oil mist
Cycle Time	216 min

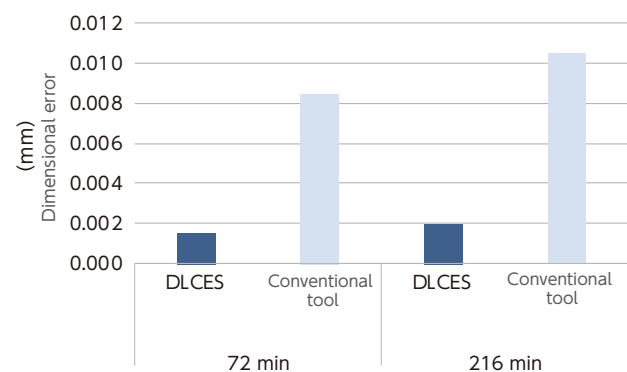


DLCES

Conventional tool



Dimensional error when side milling
Width target : 25 mm Measurement position: Top surface



DLCES shows better results in copper milling compared to the conventional tool for steels.

DLCES4000

NEW



DLCCOAT 4 Flute Square End Mills for Copper Electrode Milling

Ø3~Ø10

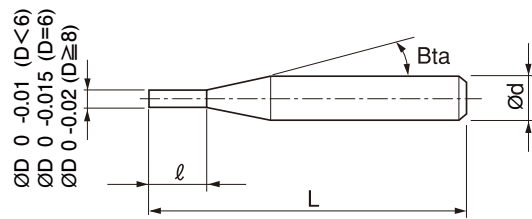


Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

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			~50 HRC	~55 HRC	~60 HRC	~65 HRC	~70 HRC										
								○		★	○						

Features

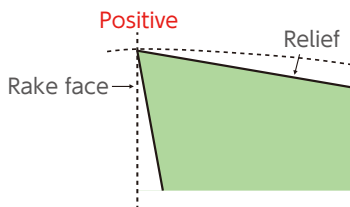
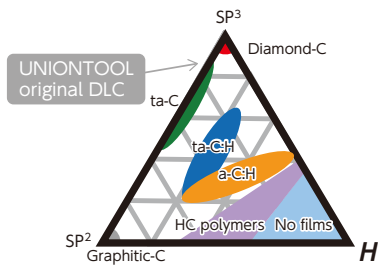
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Sharp cutting edge reduces burrs.



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Rake and relief angle are designed for copper milling.
Sharp cutting edge reduces burrs on milling surface.



Total 7 models

Unit (mm)

Model Number	Outside Diameter ØD	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter Ød	Series
DLCES 4030-0900	3	9	11°	50	6	DLCES
DLCES 4030-1200		12		55		DLCES
DLCES 4040-1200	4	12	11°	50	6	DLCES
DLCES 4060-1800	6	18	—	60	6	DLCES
DLCES 4060-2400		24		65	6	DLCES
DLCES 4080-2400	8	24	—	80	8	DLCES
DLCES 4100-3000	10	30	—	100	10	DLCES

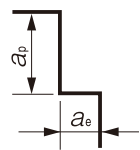
DLCES4000 Milling Conditions for DLCES4000 (4 Flutes)

WORK MATERIAL			COPPER / ALUMINUM ALLOYS				TUNGSTEN COPPER			
			Side Milling				Side Milling			
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)
4030-0900	3	9	10,000	780	4.5	0.3	9,000	700	2.25	0.3
4030-1200		12	6,000	470	7.5	0.15	5,400	420	3.75	0.15
4040-1200	4	12	8,000	850	6	0.4	7,200	770	3	0.4
4060-1800	6	18	5,500	980	9	0.6	5,000	880	4.5	0.6
4060-2400		24	3,300	590	15	0.3	3,000	530	7.5	0.3
4080-2400	8	24	4,200	910	12	0.8	3,800	820	6	0.8
4100-3000	10	30	3,500	910	15	1	3,200	820	7.5	1

Note :

- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed, or when chattering occurs.
- Recommend wet coolant for Copper and Tungsten-Copper.

Side Milling



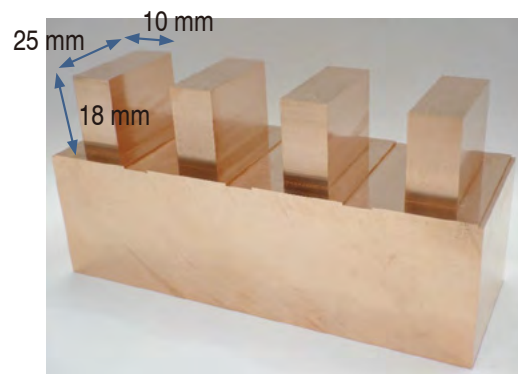
Copper Milling Example - Comparison with conventional tool for steels

C1100

∅6 × L18

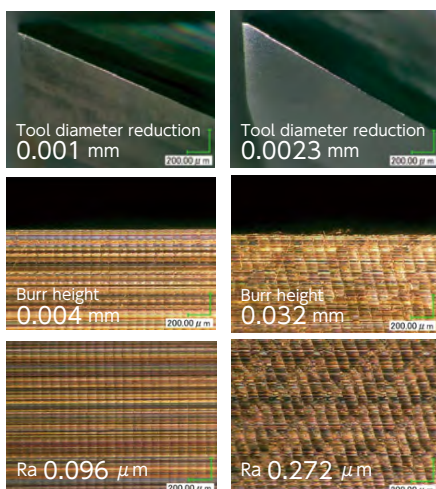
Tough Pitch Copper

Spindle Speed	5,500 min ⁻¹
Feed Rate	440 mm/min
a _p Axial Depth	18 mm
a _e Radial Depth	0.02 mm
Coolant	Oil mist
Cycle Time	132 min

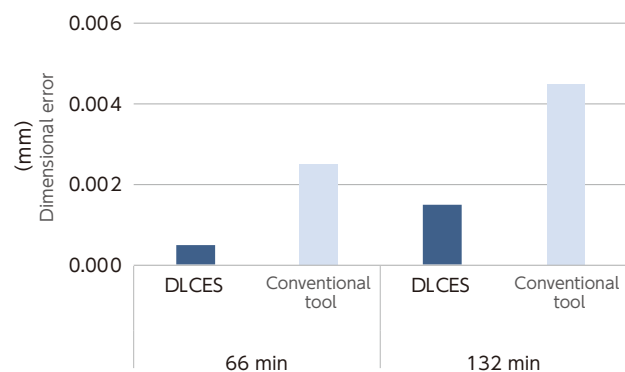


DLCES

Conventional tool



Dimensional error when side milling
Width target : 25 mm Measurement position: Top surface



DLCES shows better results in copper milling compared to the conventional tool for steels.



Advisory for Safe Use of End Mills

Correct application and operation is strongly advised to avoid clogging, abrasion, etc, that could cause serious accidents or injuries. Ignition or sparks generated during milling could lead to fire or extreme damage to the work piece. End Mills are made with very sharp cutting edges and must be handled with extra care.

- Never touch the cutting edge with your bare hands, as this could cause serious injury. Special caution is required when opening the package.
- Dropping the tool could cause breakage or flying debris, leading to serious injury.
- During milling, unexpected impact or shock on the tool could cause breakage or flying debris. Ensure to use protective items such as safety glasses and a face guard.
- For best results, fine parameter adjustment may be required, depending on the materials; milling shape and strategy; machine rigidity and spindle capability.
- Use a machine that has high rigidity and generates a low level of vibration. Recommend setting the runout control value at $5\mu\text{m}$ or below for the small diameter tools $\phi 1$ or below.
- Do not use flammable cutting oils.

Advisory for Regrinding End Mills

- Never regrind the tool without wearing safety glasses and a face guard.

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55/73 Moo 15 Bangsaothong Sub-District, Bangsaothong District,
Samutprakarn 10570 THAILAND
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<https://www.uniontool.co.jp>



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Price & Specifications are subject to change without notice.

