

UNION TOOL

# Tungsten Carbide End Mills UNIMAX Series



UTCOAT 4 Flutes Highly Efficient Square End Mills

Total 41 Models

## CEHS



Higher efficiency and less chattering than conventional tools.



UNION TOOL CO.

# CEHS

NEW



UTCOAT

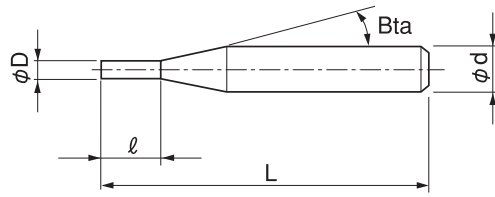
4 Flute Highly Efficient Square End Mills

Ø1 ~ Ø12



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										
●	●	○						○			○			○	○		

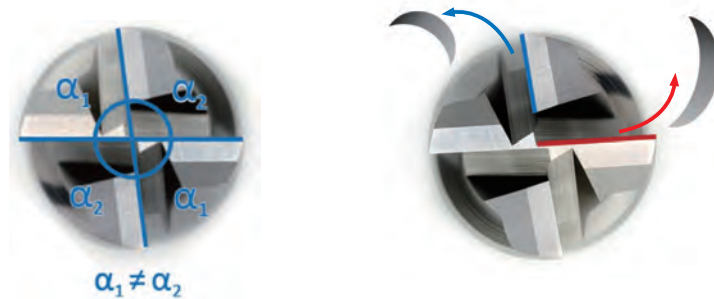


The shank taper angle shown is not an exact value.

Outside Diameter	Diameter Tolerance	Shank Diameter Tolerance
Ø1~Ø6	0/-0.015	0/-0.004 (h4)
Ø7~Ø12	0/-0.02	0/-0.005

## Variable Pitch

Variable division design is very suitable for bottom surface milling.

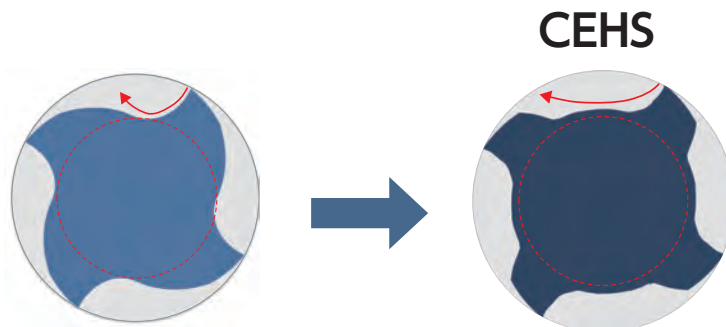


The large pocket design of the main flute (red line) promotes better chip evacuation when compared to a conventional design.

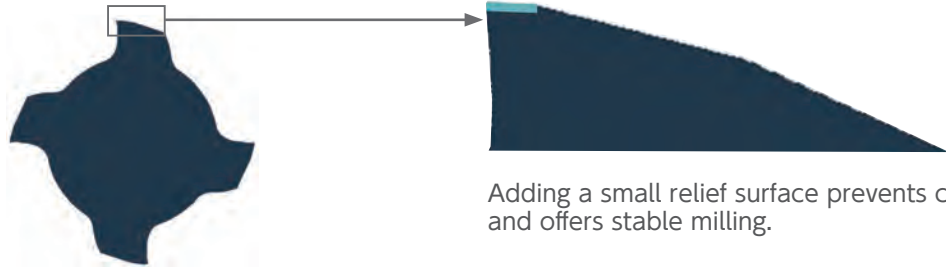
## Excellent chip evacuation

Both chip evacuation and tool rigidity are made possible by the redesigned chip pocket.

Typical chip pocket shape



Small relief surface



Adding a small relief surface prevents chattering and offers stable milling.

Comparison with conventional tool: Milling example for slotting  
CEHS Ø6 X L13

SCM440

① Comparison of milling surface and cutting chips

Offers stable milling even with long overhang milling. CEHS provides excellent bottom surface finish, while conventional tools display an uneven milling pattern.

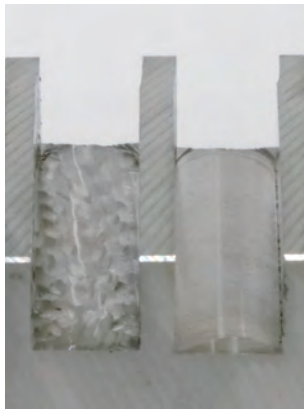


Work overhang: 130 mm

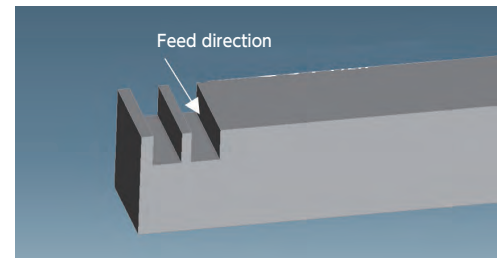
Conventional tool    **CEHS**



Jagged chip caused by uneven milling amount

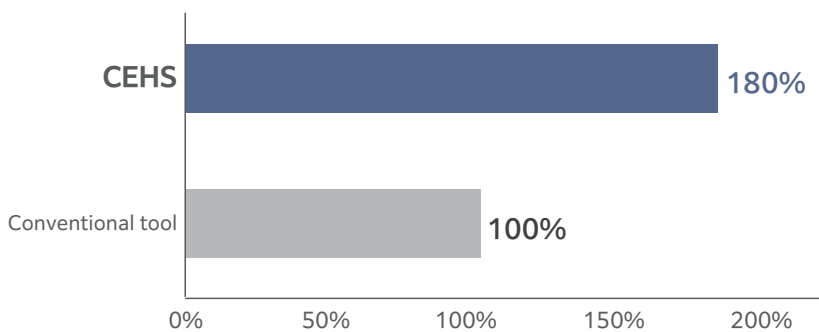


Stable milling with even chips



Work Size : 20 × 20 × 300 mm

② Ø 6 × L13    Comparison of milling efficiency



Spindle Speed	5,000 min <sup>-1</sup>
Feed Rate	900 mm/min
Feed per tooth	0.045 mm/t
$a_p$ Axial Depth	6 mm
Coolant	Water Soluble

The slot design for chip evacuation and the small relief surface offer more stable and efficient milling.

UTCOAT

4 Flute Highly Efficient Square End Mills

Total 41 models

Model Number	Outside Diameter ØD	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter Ød	NEW Promotional Price
CEHS 4010-0150	1	1.5	16°	50	4	£21.74
CEHS 4010-0220		2.2		50	4	£21.74
CEHS 4010-0300		3		50	4	£22.56
CEHS 4015-0350	1.5	3.5	16°	50	4	£21.95
CEHS 4020-0300	2	3	16°	50	4	£20.51
CEHS 4020-0450		4.5		50	4	£20.51
CEHS 4020-0600		6		50	4	£22.56
CEHS 4025-0550	2.5	5.5	16°	50	4	£20.51
CEHS 4030-0450	3	4.5	16°	60	6	£23.59
CEHS 4030-0650		6.5		60	6	£23.59
CEHS 4030-0900		9		60	6	£25.84
CEHS 4035-0800	3.5	8	16°	60	6	£27.89
CEHS 4040-0600	4	6	16°	60	6	£24.81
CEHS 4040-0900		9		60	6	£24.81
CEHS 4040-1200		12		60	6	£27.28
CEHS 4045-1000	4.5	10	16°	60	6	£29.74
CEHS 4050-0750	5	7.5	16°	60	6	£26.67
CEHS 4050-1100		11		60	6	£26.67
CEHS 4050-1500		15		60	6	£29.33
CEHS 4055-1250	5.5	12.5	16°	60	6	£30.77
CEHS 4060-0900	6	9	—	60	6	£28.72
CEHS 4060-1300		13		60	6	£28.72
CEHS 4060-1800		18		60	6	£31.38
CEHS 4070-1050	7	10.5	16°	70	8	£37.53
CEHS 4070-1600		16		70	8	£37.53
CEHS 4070-2100		21		70	8	£41.22
CEHS 4080-1200	8	12	—	70	8	£37.53
CEHS 4080-1900		19		70	8	£37.53
CEHS 4080-2400		24		70	8	£41.22
CEHS 4090-1350	9	13.5	16°	80	10	£44.71
CEHS 4090-1900		19		80	10	£44.71
CEHS 4090-2700		27		80	10	£49.03

## UTCOAT

### 4 Flute Highly Efficient Square End Mills

Model Number	Outside Diameter ØD	Length of Cut $l$	Shank Taper Angle Bta	Overall Length L	Shank Diameter Ød	NEW Promotional Price
CEHS 4100-1500	10	15	—	80	10	£44.71
CEHS 4100-2200		22		80	10	£44.71
CEHS 4100-3000		30		80	10	£49.03
CEHS 4110-1650	11	16.5	16°	100	12	£63.39
CEHS 4110-2400		24		100	12	£63.39
CEHS 4110-3300		33		100	12	£69.74
CEHS 4120-1800	12	18	—	100	12	£63.39
CEHS 4120-2600		26		100	12	£63.39
CEHS 4120-3600		36		100	12	£69.74

CEHS Ø6 Overhang slotting



Side Milling

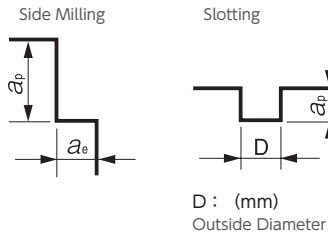
WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)				ALLOY STEELS SK / SCM Annealed Materials (225~325HB)				SUS304 STAINLESS STEELS Use water soluble or oil coolant.			
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4010-0150	1	1.5	20,000	760	1.5	0.3	20,000	460	1.5	0.3	20,000	270	1.5	0.15
4010-0220		2.2	20,000	760	2.2	0.3	20,000	460	2.2	0.3	20,000	270	2.2	0.15
4010-0300		3	20,000	760	3	0.1 <sup>*2</sup>	20,000	460	3	0.1 <sup>*2</sup>	20,000	270	3	0.05 <sup>*2</sup>
4015-0350	1.5	3.5	15,000	830	3.5	0.45	15,000	570	3.5	0.45	15,000	340	3.5	0.225
4020-0300	2	3	12,200	910	3	0.6	12,200	690	3	0.6	12,200	410	3	0.3
4020-0450		4.5	12,200	910	4.5	0.6	12,200	690	4.5	0.6	12,200	410	4.5	0.3
4020-0600		6	12,200	910	6	0.2 <sup>*2</sup>	12,200	690	6	0.2 <sup>*2</sup>	12,200	410	6	0.1 <sup>*2</sup>
4025-0550	2.5	5.5	10,500	920	5.5	0.75	10,500	800	5.5	0.75	10,500	480	5.5	0.375
4030-0450	3	4.5	9,400	930	4.5	0.9	9,400	900	4.5	0.9	9,400	540	4.5	0.45
4030-0650		6.5	9,400	930	6.5	0.9	9,400	900	6.5	0.9	9,400	540	6.5	0.45
4030-0900		9	9,400	930	9	0.6 <sup>*1</sup>	9,400	900	9	0.6 <sup>*1</sup>	9,400	540	9	0.3 <sup>*1</sup>
4035-0800	3.5	8	8,300	950	8	1.05	8,300	950	8	1.05	8,300	570	8	0.525
4040-0600	4	6	7,400	1,010	6	1.2	7,400	1,000	6	1.2	7,400	600	6	0.6
4040-0900		9	7,400	1,010	9	1.2	7,400	1,000	9	1.2	7,400	600	9	0.6
4040-1200		12	7,400	1,010	12	0.8 <sup>*1</sup>	7,400	1,000	12	0.8 <sup>*1</sup>	7,400	600	12	0.4 <sup>*1</sup>
4045-1000	4.5	10	6,700	1,080	10	1.35	6,700	1,050	10	1.35	6,700	630	10	0.675
4050-0750	5	7.5	6,000	1,140	7.5	1.5	6,000	1,100	7.5	1.5	6,000	660	7.5	0.75
4050-1100		11	6,000	1,140	11	1.5	6,000	1,100	11	1.5	6,000	660	11	0.75
4050-1500		15	6,000	1,140	15	1 <sup>*1</sup>	6,000	1,100	15	1 <sup>*1</sup>	6,000	660	15	0.5 <sup>*1</sup>
4055-1250	5.5	12.5	5,400	1,160	12.5	1.65	5,400	1,150	12.5	1.65	5,400	690	12.5	0.825
4060-0900	6	9	5,000	1,240	9	1.8	5,000	1,100	9	1.8	5,000	660	9	0.9
4060-1300		13	5,000	1,240	13	1.8	5,000	1,100	13	1.8	5,000	660	13	0.9
4060-1800		18	5,000	1,240	18	1.2 <sup>*1</sup>	5,000	1,100	18	1.2 <sup>*1</sup>	5,000	660	18	0.6 <sup>*1</sup>
4070-1050	7	10.5	4,600	1,160	10.5	2.1	4,600	1,030	10.5	2.1	4,600	610	10.5	1.05
4070-1600		16	4,600	1,160	16	2.1	4,600	1,030	16	2.1	4,600	610	16	1.05
4070-2100		21	4,600	1,160	21	1.4 <sup>*1</sup>	4,600	1,030	21	1.4 <sup>*1</sup>	4,600	610	21	0.7 <sup>*1</sup>
4080-1200	8	12	4,100	1,030	12	2.4	4,100	1,000	12	2.4	4,100	600	12	1.2
4080-1900		19	4,100	1,030	19	2.4	4,100	1,000	19	2.4	4,100	600	19	1.2
4080-2400		24	4,100	1,030	24	1.6 <sup>*1</sup>	4,100	950	24	1.6 <sup>*1</sup>	4,100	570	24	0.8 <sup>*1</sup>
4090-1350	9	13.5	3,500	980	13.5	2.7	3,500	980	13.5	2.7	3,500	580	13.5	1.35
4090-1900		19	3,500	980	19	2.7	3,500	980	19	2.7	3,500	580	19	1.35
4090-2700		27	3,500	980	27	1.8 <sup>*1</sup>	3,500	880	27	1.8 <sup>*1</sup>	3,500	520	27	0.9 <sup>*1</sup>
4100-1500	10	15	3,000	940	15	3	3,000	940	15	3	3,000	560	15	1.5
4100-2200		22	3,000	940	22	3	3,000	940	22	3	3,000	560	22	1.5
4100-3000		30	3,000	940	30	2 <sup>*1</sup>	3,000	800	30	2 <sup>*1</sup>	3,000	480	30	1 <sup>*1</sup>
4110-1650	11	16.5	2,700	910	16.5	3.3	2,700	910	16.5	3.3	2,700	540	16.5	1.65
4110-2400		24	2,700	910	24	3.3	2,700	910	24	3.3	2,700	540	24	1.65
4110-3300		33	2,700	910	33	2.2 <sup>*1</sup>	2,700	730	33	2.2 <sup>*1</sup>	2,700	430	33	1.1 <sup>*1</sup>
4120-1800	12	18	2,400	850	18	3.6	2,400	850	18	3.6	2,400	510	18	1.8
4120-2600		26	2,400	850	26	3.6	2,400	850	26	3.6	2,400	510	26	1.8
4120-3600		36	2,400	850	36	2.4 <sup>*1</sup>	2,400	650	36	2.4 <sup>*1</sup>	2,400	390	36	1.2 <sup>*1</sup>
Milling Amount (mm)			a <sub>p</sub> : Length of Cut a <sub>e</sub> : 0.3D ※1a <sub>e</sub> : 0.2D ※2a <sub>e</sub> : 0.1D				a <sub>p</sub> : Length of Cut a <sub>e</sub> : 0.3D ※1a <sub>e</sub> : 0.2D ※2a <sub>e</sub> : 0.1D				a <sub>p</sub> : Length of Cut a <sub>e</sub> : 0.15D ※1a <sub>e</sub> : 0.1D ※2a <sub>e</sub> : 0.05D			

Slotting

WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)			ALLOY STEELS SK / SCM Annealed Materials (225~325HB)			SUS304 STAINLESS STEELS Use water soluble or oil coolant.		
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)
4010-0150	1	1.5	20,000	460	1	20,000	360	1	20,000	320	0.5
4010-0220		2.2	20,000	460	1	20,000	360	1	20,000	320	0.5
4010-0300		3	20,000	360	1	20,000	260	1	20,000	230	0.5
4015-0350	1.5	3.5	15,000	570	1.5	15,000	500	1.5	15,000	450	0.75
4020-0300	2	3	12,200	660	2	12,200	580	2	12,200	520	1
4020-0450		4.5	12,200	660	2	12,200	580	2	12,200	520	1
4020-0600		6	12,200	510	2	12,200	420	2	12,200	370	1
4025-0550	2.5	5.5	10,500	860	2.5	10,500	650	2.5	10,500	580	1.25
4030-0450	3	4.5	9,400	1,010	3	9,400	720	3	9,400	640	1.5
4030-0650		6.5	9,400	1,010	3	9,400	720	3	9,400	640	1.5
4030-0900		9	9,400	740	3	9,400	520	3	9,400	460	1.5
4035-0800	3.5	8	8,300	1,060	3.5	8,300	760	3.5	8,300	680	1.75
4040-0600	4	6	7,400	1,110	4	7,400	810	4	7,400	720	2
4040-0900		9	7,400	1,110	4	7,400	810	4	7,400	720	2
4040-1200		12	7,400	860	4	7,400	590	4	7,400	530	2
4045-1000	4.5	10	6,700	1,110	4.5	6,700	850	4.5	6,700	760	2.25
4050-0750	5	7.5	6,000	1,110	5	6,000	900	5	6,000	810	2.5
4050-1100		11	6,000	1,110	5	6,000	900	5	6,000	810	2.5
4050-1500		15	6,000	910	5	6,000	650	5	6,000	580	2.5
4055-1250	5.5	12.5	5,400	1,110	5.5	5,400	900	5.5	5,400	810	2.75
4060-0900	6	9	5,000	1,110	6	5,000	900	6	5,000	810	3
4060-1300		13	5,000	1,110	6	5,000	900	6	5,000	810	3
4060-1800		18	5,000	910	6	5,000	650	6	5,000	580	3
4070-1050	7	10.5	4,600	1,040	7	4,600	810	7	4,600	720	3.5
4070-1600		16	4,600	1,040	7	4,600	810	7	4,600	720	3.5
4070-2100		21	4,600	880	7	4,600	670	7	4,600	600	3.5
4080-1200	8	12	4,100	960	8	4,100	770	8	4,100	690	4
4080-1900		19	4,100	960	8	4,100	770	8	4,100	690	4
4080-2400		24	4,100	830	8	4,100	690	8	4,100	620	4
4090-1350	9	13.5	3,500	960	9	3,500	730	9	3,500	650	4.5
4090-1900		19	3,500	960	9	3,500	730	9	3,500	650	4.5
4090-2700		27	3,500	780	9	3,500	710	9	3,500	630	4.5
4100-1500	10	15	3,000	910	10	3,000	730	10	3,000	650	5
4100-2200		22	3,000	910	10	3,000	730	10	3,000	650	5
4100-3000		30	3,000	730	10	3,000	730	10	3,000	650	5
4110-1650	11	16.5	2,700	910	11	2,700	680	11	2,700	610	5.5
4110-2400		24	2,700	910	11	2,700	680	11	2,700	610	5.5
4110-3300		33	2,700	680	11	2,700	680	11	2,700	610	5.5
4120-1800	12	18	2,400	860	12	2,400	670	12	2,400	600	6
4120-2600		26	2,400	860	12	2,400	670	12	2,400	600	6
4120-3600		36	2,400	670	12	2,400	670	12	2,400	600	6
Milling Amount (mm)			a <sub>p</sub> : 1D			a <sub>p</sub> : 1D			a <sub>p</sub> : 0.5D		

Note:

- Decrease both spindle speed and feed rate proportionally in case of chattering.
- These milling parameters are calculated based on the shortest overhang length. Longer overhangs may require an adjustment to the milling parameters.
- Reduce the milling amount and feed rate in accordance with required milling precision.
- Recommend water soluble or oil coolant.
- Recommend oil coolant for Titanium Alloys and Heat Resistant Alloys.



### 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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