UNION TOOL

Tungsten Carbide End Mills
UNIMAX Series

For Cemented Carbide and Hard Brittle Materials

UDC

6 Flutes / 10 Flutes　Diamond Coated UDC Series

UDCRRS

NEW
Published July 2022

Long Neck Radius End Mills for Roughing Process

UNION TOOL CO.

6 Flute / 10 Flute Long Neck Radius End Mills for Roughing Cemented Carbide and Hard Brittle Materials

Size φ2～φ6

UDCRRS

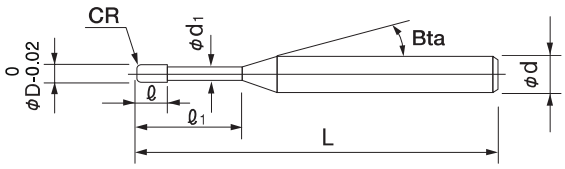
MG | UDC | 40° | R | R ±0.01 | Shank Dia 0/-0.005

NEW

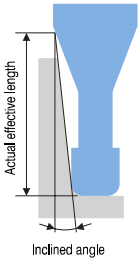
Material Applications（☆ Highly Recommended ◎ Recommended ○ Suggested）

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

※ Hard Brittle (Non-Metallic) Materials: Ceramics (Alumina, Zirconia, etc.), Glass, etc.



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 4 models

Unit (mm)

Model Number	Outside Diameter φD	Corner Radius CR	Effective Length ℓ1	Length of Cut ℓ	Neck Diameter φd1	Shank Taper Angle Bta	Overall Length L	Shank Diameter φd	Number of Flutes	Suggested Retail Price	Effective Length by Inclined Angles 30°	1°	1°30′	2°	3°
UDCRRS 6020-020-050	2	R0.2	5	1.6	1.77	16	50	4	6	42,800	5.52	5.70	5.88	6.08	6.52
UDCRRS 6030-020-075	3	R0.2	7.5	2.4	2.77	16	60	6	6	45,960	8.10	8.36	8.63	8.92	9.58
UDCRRS 6040-020-100	4	R0.2	10	3.2	3.77	16	60	6	6	45,960	10.68	11.02	11.38	11.77	12.64
UDCRRS 10060-020150	6	R0.2	15	4.8	5.77	16	60	6	10	48,370	No Interference	No Interference	No Interference	No Interference	No Interference

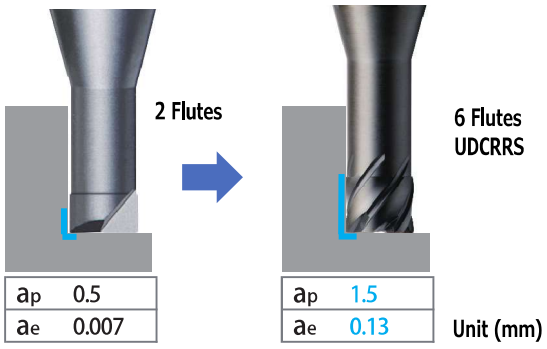
High Efficiency

6 Flutes, 10 Flutes with a 40° helix angle help to reduce cutting load allowing for deep milling on axial depth.

φ2～φ4
6 Flutes

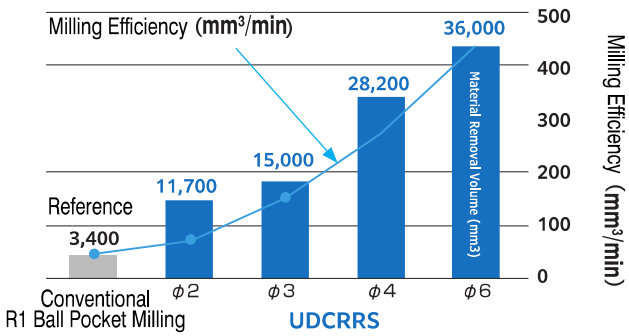
φ6
10 Flutes

Milling amount compared with 2 Flutes (φ2 x EL 6)



Compared to a tool with 2 flutes, the ap is 3 times and the ae 18 times higher in comparison.
This shows a significant efficiency improvement.

Cutting material removal volume for each size

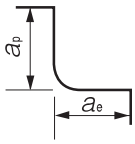


Milling efficiency and material removal volume exceeds the conventional tool.

UDCRRS Roughing Conditions

WORK MATERIAL		CEMENTED CARBIDE(≧87HRA) / HARD BRITTLE MATERIALS							CEMENTED CARBIDE(<87HRA)						
Model Number	Outside Diameter	Spindle Speed	Flat milling			Side milling			Spindle Speed	Flat milling			Side milling		
			Feed Rate	a_p Axial Depth	a_e Radial Depth	Feed Rate	a_p Axial Depth	a_e Radial Depth		Feed Rate	a_p Axial Depth	a_e Radial Depth	Feed Rate	a_p Axial Depth	a_e Radial Depth
	(mm)	(min^{-1})	(mm/min)	(mm)	(mm)	(mm/min)	(mm)	(mm)	(min^{-1})	(mm/min)	(mm)	(mm)	(mm/min)	(mm)	(mm)
6020-020-050	2	20,000	375	0.1	0.8	375	1.5	0.13	10,000	375	0.1	0.8	1,440	1.5	0.02
6030-020-075	3	17,500	375	0.1	1.2	375	2.2	0.19	6,700	375	0.1	1.2	1,610	2.2	0.02
6040-020-100	4	15,000	375	0.1	1.6	375	3	0.25	5,000	375	0.1	1.6	1,780	3	0.02
10060-020150	6	10,000	375	0.2	1	375	4	0.3	3,300	375	0.2	1	2,000	4	0.02

Roughing with UDCRRS  Finishing with UDC 2 Flutes 



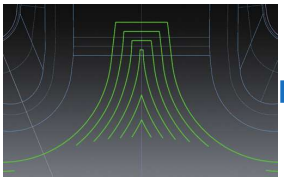
*UDCRRS is designed for roughing, use other UDC 2 flutes when finishing.

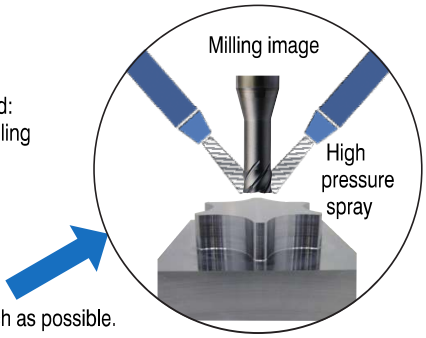
These milling parameters are based on VF-20, VM-40, VC-70, VU-70 (TAS standard) for Cemented Carbide, and Alumina for Hard Brittle Materials. These are for reference only.
Tool life may differ depending on the type of Cemented Carbide / Hard Brittle Materials.
For best result, fine parameter adjustments may be required, depending on the materials of Cemented Carbide / Hard Brittle Materials; milling shape and strategy; machine rigidity and spindle capability.

The best way to use UDCRRS for high efficency and long tool life

Point 1 Circular arc milling

Circular arc milling is recommended so the returning point is not an acute angle. This reduces cutting load on the peripheral cutting edge.

No adjustments  Recommended: Circular arc milling



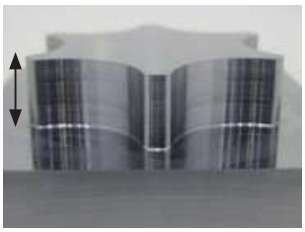
Point 2 Chip evacuation

Air blow coolant is recommended. Recommended spraying from multiple directions at high pressure as much as possible.

Cemented Carbide Milling example of punching die
UDCRRS ϕ4 x CR0.2 x EL10 VM-40 (90HRA)

Spindle Speed	15,000 min^{-1}
Feed Rate	375 mm/min
a_p Axial Depth	3 mm
a_e Radial Depth	0.25 mm
Coolant	Air Blow
Cycle Time	93 min

Depth 9mm
a_p 3mm × 3 times



Tool after milling

Milling volume 15,953 mm3 with a single tool in 93 min.
Tool damage is limited and continuous cutting is possible !

Note

Note:
- This application requires a high cutting force. A machine with poor rigidity and high vibration is not recommended.
- Allow sufficient machine and spindle warm-up time for stability and to remove any expansion of the main spindle before running the program.
- Tool setting length should achieve the least possible overhang.
- Avoid contact with the coated area of the shank. This will prevent tip vibration and tool jamming in the collet / holder.
- Run-out and vibration should be checked dynamically at the tool point while mounted in the machine and both should achieve the lowest level possible.
- Decrease both spindle speed and feed rate proportionally.
- Air blow is highly recommended for longer tool life. Both oil mist and oil coolant are alternatives.
- Recommend water soluble coolant for Hard Brittle (Non-Metallic) Materials.
- When milling some work pieces, heavier chips may be created. To evacuate these chips it is important to accurately position the coolant nozzle on the milling part.
- Remove chips to prevent heat generation and ignition during milling process.
- Protective gear, such as safety glasses and face guards are required when milling.
- Chips / dust generated while milling can have adverse affects on the machine parts if they are not properly evacuated. Take steps to assure proper evacuation.
- The tool life may shorten due to a large difference between the commanded feed speed and the actual machining speed caused by factors as machining model and machining machine.
- Tool damage may progress rapidly near the end of the tool life.

Advisory for Safe Use of UNIMAX Tungsten Carbide 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.
- Do not use flammable cutting oils.

Advisory for regrinding UNIMAX Tungsten Carbide End Mills

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

0120-60-2620

https://www.uniontool.co.jp

202206 UDCRRS_8KA