



Size  $\phi 0.3 \sim \phi 2$

# UDCLRS



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	
			~55HRC	~60HRC	~70HRC											
														○	☆	◎

\* Hard Brittle (Non-Metallic) Materials: Ceramics (Alumina, Zirconia, etc.), Glasses and etc.

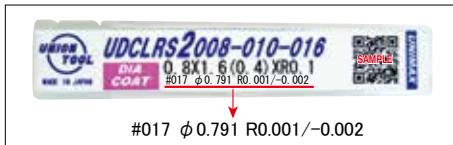
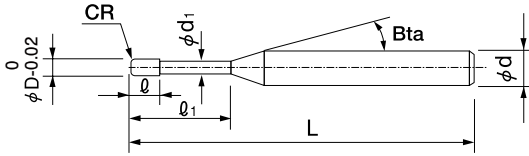
Total 30 models

Unit (mm)

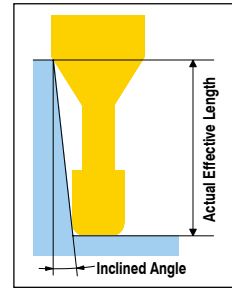
Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Price (¥)
UDCLRS 2003-003-006	0.3	RO.03	0.6	0.15	0.28	16°	50	4	45,500
UDCLRS 2003-005-006		RO.05	0.6				50	4	45,500
UDCLRS 2005-003-005	0.5	RO.03	0.5	0.25	0.46	16°	50	4	43,300
UDCLRS 2005-003-010			1				50	4	43,300
UDCLRS 2005-005-005		RO.05	0.5				50	4	43,300
UDCLRS 2005-005-010			1				50	4	43,300
UDCLRS 2008-003-008	0.8	RO.03	0.8	0.4	0.76	16°	50	4	38,900
UDCLRS 2008-003-016			1.6				50	4	38,900
UDCLRS 2008-005-008		RO.05	0.8				50	4	38,900
UDCLRS 2008-005-016			1.6				50	4	38,900
UDCLRS 2008-010-008		RO.1	0.8				50	4	38,900
UDCLRS 2008-010-016			1.6				50	4	38,900
UDCLRS 2010-003-010	1	RO.03	1	0.5	0.96	16°	50	4	38,900
UDCLRS 2010-003-020			2				50	4	38,900
UDCLRS 2010-005-010		RO.05	1				50	4	38,900
UDCLRS 2010-005-020			2				50	4	38,900
UDCLRS 2010-010-010		RO.1	1				50	4	38,900
UDCLRS 2010-010-020			2				50	4	38,900
UDCLRS 2015-003-015	1.5	RO.03	1.5	0.75	1.44	16°	50	4	38,900
UDCLRS 2015-003-030			3				50	4	38,900
UDCLRS 2015-005-015		RO.05	1.5				50	4	38,900
UDCLRS 2015-005-030			3				50	4	38,900
UDCLRS 2015-010-015		RO.1	1.5				50	4	38,900
UDCLRS 2015-010-030			3				50	4	38,900
UDCLRS 2020-003-020	2	RO.03	2	1	1.9	16°	50	4	38,900
UDCLRS 2020-003-040			4				50	4	38,900
UDCLRS 2020-005-020		RO.05	2				50	4	38,900
UDCLRS 2020-005-040			4				50	4	38,900
UDCLRS 2020-010-020		RO.1	2				50	4	38,900
UDCLRS 2020-010-040			4				50	4	38,900

## Features

UDC offers excellent drilling performance on Cemented Carbide and Hard Brittle (Non-Metallic) Materials. Developed to give improved hardness and durability, the new UDC also has outstanding adhesion to the cutting tool. By combining the new coating with optimum cutting geometries, the tool literally "cuts" the work piece. Leaves a burr and pit free surface finish whether roughing, semi-finishing or finishing.



Diameter and ball R accuracy measurements are printed on the label to support High Precision milling.



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.

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Effective Length by Inclined Angles					
				30'	1°	1° 30'	2°	3°	
UDCLRS 2003-003-006	0.3	RO.03	0.6	0.61	0.63	0.65	0.67	0.72	
UDCLRS 2003-005-006		RO.05	0.6	0.61	0.63	0.65	0.67	0.72	
UDCLRS 2005-003-005	0.5	RO.03	0.5	0.55	0.56	0.58	0.60	0.64	
UDCLRS 2005-003-010			1	1.06	1.10	1.13	1.17	1.25	
UDCLRS 2005-005-005		RO.05	0.5	0.55	0.56	0.58	0.60	0.64	
UDCLRS 2005-005-010			1	1.06	1.09	1.13	1.17	1.25	
UDCLRS 2008-003-008	0.8	RO.03	0.8	0.86	0.88	0.91	0.94	1.01	
UDCLRS 2008-003-016			1.6	1.68	1.73	1.79	1.85	1.99	
UDCLRS 2008-005-008		RO.05	0.8	0.85	0.88	0.91	0.94	1.01	
UDCLRS 2008-005-016			1.6	1.68	1.73	1.79	1.85	1.98	
UDCLRS 2008-010-008		RO.1	0.8	0.85	0.88	0.90	0.93	0.99	
UDCLRS 2008-010-016			1.6	1.68	1.73	1.78	1.84	1.97	
UDCLRS 2010-003-010	1	RO.03	1	1.06	1.10	1.13	1.17	1.25	
UDCLRS 2010-003-020			2	2.09	2.16	2.23	2.31	2.48	
UDCLRS 2010-005-010		RO.05	1	1.06	1.09	1.13	1.17	1.25	
UDCLRS 2010-005-020			2	2.09	2.16	2.23	2.31	2.47	
UDCLRS 2010-010-010		RO.1	1	1.06	1.09	1.12	1.16	1.24	
UDCLRS 2010-010-020			2	2.09	2.16	2.22	2.30	2.46	
UDCLRS 2015-003-015		1.5	RO.03	1.5	1.61	1.66	1.72	1.78	1.91
UDCLRS 2015-003-030				3	3.16	3.26	3.37	3.49	3.74
UDCLRS 2015-005-015	RO.05		1.5	1.61	1.66	1.72	1.78	1.90	
UDCLRS 2015-005-030			3	3.16	3.26	3.37	3.48	3.74	
UDCLRS 2015-010-015	RO.1		1.5	1.61	1.66	1.71	1.77	1.89	
UDCLRS 2015-010-030			3	3.16	3.26	3.36	3.48	3.73	
UDCLRS 2020-003-020	2	RO.03	2	2.20	2.27	2.35	2.43	2.61	
UDCLRS 2020-003-040			4	4.26	4.40	4.55	4.70	5.05	
UDCLRS 2020-005-020		RO.05	2	2.20	2.27	2.34	2.42	2.60	
UDCLRS 2020-005-040			4	4.26	4.40	4.55	4.70	5.05	
UDCLRS 2020-010-020		RO.1	2	2.20	2.27	2.34	2.42	2.59	
UDCLRS 2020-010-040			4	4.26	4.40	4.54	4.69	5.04	

Square

Square

Long Neck Square

Square

Radius

Radius

Long Neck Radius

Radius

Ball / Long Shank Ball

Ball

Long Neck Ball

Ball

Taper Neck Ball

Ball

Taper

Taper

Taper

Taper

Taper

Taper

Taper

Spiral V Cutter

Spiral V Cutter

Spiral V Cutter

Spiral V Cutter

Spiral V Cutter

Spiral V Cutter

Spiral V Cutter

Spiral V Cutter

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Spiral V Cutter

Spiral V Cutter

Spiral V Cutter

Spiral V Cutter

Spiral V Cutter

Spiral V Cutter

## Milling Conditions for UDCLRS

Model Number	Spindle Speed (min <sup>-1</sup> )	Z-Level Milling				Flat Milling			Side Milling			Slotting	
		Feed Rate (mm/min)	Feed Rate2 (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)
2003-003-006	30,000	220	50	0.010	0.200	220	0.010	0.200	110	0.050	0.001	110	0.010
2003-005-006	30,000	220	50	0.010	0.200	220	0.010	0.200	110	0.050	0.001	110	0.010
2005-003-005	30,000	185	90	0.010	0.400	185	0.010	0.400	375	0.250	0.005	375	0.010
2005-003-010	30,000	185	90	0.010	0.400	185	0.010	0.400	180	0.125	0.005	375	0.010
2005-005-005	30,000	375	125	0.010	0.400	375	0.010	0.400	375	0.250	0.005	375	0.010
2005-005-010	30,000	375	125	0.010	0.400	375	0.010	0.400	180	0.125	0.005	375	0.010
2008-003-008	30,000	185	90	0.010	0.600	185	0.010	0.600	600	0.400	0.008	375	0.010
2008-003-016	30,000	185	90	0.010	0.600	185	0.010	0.600	300	0.200	0.008	375	0.010
2008-005-008	30,000	375	150	0.010	0.600	375	0.010	0.600	600	0.400	0.008	375	0.010
2008-005-016	30,000	375	150	0.010	0.600	375	0.010	0.600	300	0.200	0.008	375	0.010
2008-010-008	30,000	375	150	0.010	0.600	375	0.010	0.600	600	0.400	0.008	375	0.010
2008-010-016	30,000	375	150	0.010	0.600	375	0.010	0.600	300	0.200	0.008	375	0.010
2010-003-010	30,000	185	90	0.010	0.800	185	0.010	0.800	750	0.500	0.010	375	0.010
2010-003-020	30,000	185	90	0.010	0.800	185	0.010	0.800	375	0.250	0.010	375	0.010
2010-005-010	30,000	375	185	0.010	0.800	375	0.010	0.800	750	0.500	0.010	375	0.010
2010-005-020	30,000	375	185	0.010	0.800	375	0.010	0.800	375	0.250	0.010	375	0.010
2010-010-010	30,000	375	185	0.010	0.800	375	0.010	0.800	750	0.500	0.010	375	0.010
2010-010-020	30,000	375	185	0.010	0.800	375	0.010	0.800	375	0.250	0.010	375	0.010
2015-003-015	25,000	185	90	0.010	1.300	185	0.010	1.300	750	0.750	0.010	375	0.015
2015-003-030	25,000	185	90	0.010	1.300	185	0.010	1.300	375	0.375	0.010	375	0.015
2015-005-015	25,000	375	125	0.015	1.300	375	0.015	1.300	750	0.750	0.010	375	0.015
2015-005-030	25,000	375	125	0.015	1.300	375	0.015	1.300	375	0.375	0.010	375	0.015
2015-010-015	25,000	375	150	0.015	1.300	375	0.015	1.300	750	0.750	0.010	375	0.015
2015-010-030	25,000	375	150	0.015	1.300	375	0.015	1.300	375	0.375	0.010	375	0.015
2020-003-020	20,000	185	90	0.010	1.800	185	0.010	1.800	750	1.000	0.010	375	0.020
2020-003-040	20,000	185	90	0.010	1.800	185	0.010	1.800	375	0.500	0.010	375	0.020
2020-005-020	20,000	375	90	0.020	1.800	375	0.020	1.800	750	1.000	0.010	375	0.020
2020-005-040	20,000	375	90	0.020	1.800	375	0.020	1.800	375	0.500	0.010	375	0.020
2020-010-020	20,000	375	125	0.020	1.800	375	0.020	1.800	750	1.000	0.010	375	0.020
2020-010-040	20,000	375	125	0.020	1.800	375	0.020	1.800	375	0.500	0.010	375	0.020

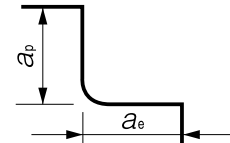
\* These milling parameters are based on VF-20, VM-40(CIS standard) and are for reference only. Tool life may differ depending on the type of Cemented Carbide material.

For best results, fine parameter adjustments may be required, depending on the Carbide material; milling shape and strategy; machine rigidity and spindle capability.

\* Feed Rate2: Approach Feed and contact time on the surface

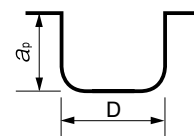
**Note:**

- 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.
- Does not require to be slowed down in the approach sequence when slotting and side milling.
- Use an inclined or helical approach when Z-level milling (Recommended inclination angle: <1 degree).
- For flat and side milling, set the axial depth (ap) and radial depth (ae) to allow for the uncut material of the corner radius.
- 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 effects on the machine parts if they are not properly evacuated. Take steps to assure proper evacuation.



Z-Level / Flat / Side Milling

a<sub>p</sub> : Axial Depth (mm)  
a<sub>e</sub> : Radial Depth (mm) = P<sub>i</sub>



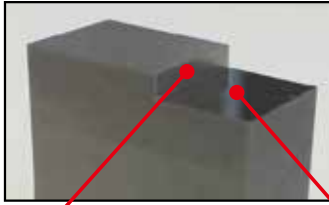
Slotting

a<sub>p</sub> : Axial Depth (mm)  
D : Tool Outside Diameter

## Milling Example: UDCLRS 2020-005-020 ( $\phi 2 \times CR0.05 \times 2$ )

Cemented Carbide  
VM-40 (90HRA)

Work sample after finishing process



Ra :  $0.069\mu\text{m}$   
Rz :  $0.535\mu\text{m}$   
Cut-off length : 0.25mm

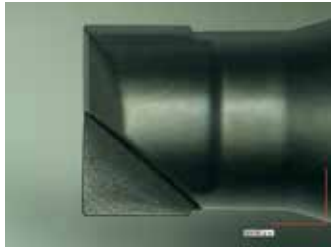
Ra :  $0.010\mu\text{m}$  (10nm)  
Rz :  $0.078\mu\text{m}$  (78nm)  
Cut-off length: 0.08mm

Surface Quality



Mirror surface finish  
with zero pits!

After Finishing



Milling Video



Milling Conditions	Roughing Parameter	Finishing Parameter
Work Material	Cemented Carbide VM-40 (90HRA)	
Spindle Speed	$20,000\text{min}^{-1}$	$20,000\text{min}^{-1}$
XY Feed Rate	$750\text{mm}/\text{min}$	$100\text{mm}/\text{min}$
Axial Depth $a_p$	0.9mm	0.01mm Surface 0.9mm Side
Radial Depth $a_e$	0.01mm	0.01mm
Coolant	Air Blow	Oil mist
Milling Size	$10\text{mm} \times 8\text{mm} \times 1.8\text{mm}$	0.01mm Surface 0.05mm Side (0.01mm $\times$ 5 Times)
Milling Distance	16m	—
Material Removal Volume	$144\text{mm}^3$	—

\* One End Mill was used for both the roughing and finishing processes.

Overhang : 15mm

Square

Square

Long Neck  
Square

Radius

Radius

Long Neck  
RadiusBall / Long  
Shank Ball

Ball

Long Neck  
BallTaper Neck  
Ball

Taper

Taper

Spiral  
V CutterDrill  
Thread Mill

EURO Series

Technical Data