Size φ0.3～φ2 UDC

UDCLRS

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

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
S45C S55C	SK / SCM SUS	NAK HPM	～50HRC	～55HRC	～60HRC	～65HRC	～70HRC										
													○ *1			★	● *2

*1 UDCLRSF series are highly recommended for Glass Filled Plastic milling.
*2 Hard Brittle (Non-Metallic) Materials: Ceramics (Alumina, Zirconia, etc.), Glasses and etc.

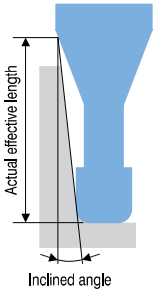
Total 30 models

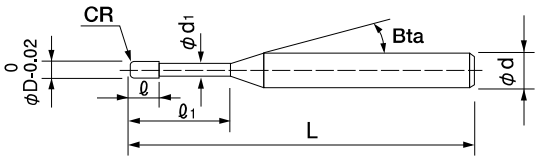
Unit（mm）

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	Suggested Retail Price ¥
UDCLRS 2003-003-006	0.3	R0.03	0.6	0.15	0.28	16°	50	4	45,500
UDCLRS 2003-005-006		R0.05	0.6				50	4	45,500
UDCLRS 2005-003-005	0.5	R0.03	0.5	0.25	0.46	16°	50	4	43,300
UDCLRS 2005-003-010			1				50	4	43,300
UDCLRS 2005-005-005		R0.05	0.5				50	4	43,300
UDCLRS 2005-005-010			1				50	4	43,300
UDCLRS 2008-003-008	0.8	R0.03	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		R0.05	0.8				50	4	38,900
UDCLRS 2008-005-016			1.6				50	4	38,900
UDCLRS 2008-010-008		R0.1	0.8				50	4	38,900
UDCLRS 2008-010-016			1.6				50	4	38,900
UDCLRS 2010-003-010	1	R0.03	1	0.5	0.96	16°	50	4	38,900
UDCLRS 2010-003-020			2				50	4	38,900
UDCLRS 2010-005-010		R0.05	1				50	4	38,900
UDCLRS 2010-005-020			2				50	4	38,900
UDCLRS 2010-010-010		R0.1	1				50	4	38,900
UDCLRS 2010-010-020			2				50	4	38,900
UDCLRS 2015-003-015	1.5	R0.03	1.5	0.75	1.44	16°	50	4	38,900
UDCLRS 2015-003-030			3				50	4	38,900
UDCLRS 2015-005-015		R0.05	1.5				50	4	38,900
UDCLRS 2015-005-030			3				50	4	38,900
UDCLRS 2015-010-015		R0.1	1.5				50	4	38,900
UDCLRS 2015-010-030			3				50	4	38,900
UDCLRS 2020-003-020	2	R0.03	2	1	1.9	16°	50	4	38,900
UDCLRS 2020-003-040			4				50	4	38,900
UDCLRS 2020-005-020		R0.05	2				50	4	38,900
UDCLRS 2020-005-040			4				50	4	38,900
UDCLRS 2020-010-020		R0.1	2				50	4	38,900
UDCLRS 2020-010-040			4				50	4	38,900

Features

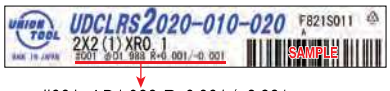
UDC offers excellent drilling performance on Cemented Carbide and Hard Brittle (Non-Metallic) Materials.
Developed to give improved hardness and durability, the new Diamond coating also has outstanding adhesion to the cutting tool.
By combining the new coating with optimum cutting geometries, the tool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





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.

Label Sample



#001 φD1.988 R+0.001/−0.001

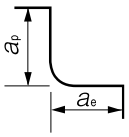
Diameter and Corner R accuracy measurements are printed on the label to support High Precision milling.

Unit (mm)

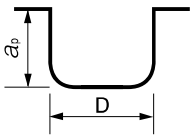
Model Number	Outside Diameter φD	Corner Radius CR	Effective Length ℓ1	Effective Length by Inclined Angles				
				30'	1°	1° 30'	2°	3°
UDCLRS 2003-003-006	0.3	R0.03	0.6	0.61	0.63	0.65	0.67	0.72
UDCLRS 2003-005-006		R0.05	0.6	0.61	0.63	0.65	0.67	0.72
UDCLRS 2005-003-005	0.5	R0.03	0.5	0.55	0.56	0.58	0.60	0.64
UDCLRS 2005-003-010			1	1.06	1.10	1.13	1.17	1.25
UDCLRS 2005-005-005		R0.05	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	R0.03	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		R0.05	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		R0.1	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	R0.03	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		R0.05	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		R0.1	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	R0.03	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		R0.05	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		R0.1	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	R0.03	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		R0.05	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		R0.1	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

Milling Conditions for UDCLRS

WORK MATERIAL	CEMENTED CARBIDE(≧87HRA) / HARD BRITTLE MATERIALS												
Model Number	Spindle Speed (min⁻¹)	Z-Level Milling				Flat Milling			Side Milling			Slotting	
		Feed Rate (mm/min)	※Feed Rate 2 (mm/min)	a_p (mm)	a_e (mm)	Feed Rate (mm/min)	a_p (mm)	a_e (mm)	Feed Rate (mm/min)	a_p (mm)	a_e (mm)	Feed Rate (mm/min)	a_p (mm)
2003-003-006	30,000	220	50	0.01	0.2	220	0.01	0.2	110	0.05	0.001	110	0.01
2003-005-006	30,000	220	50	0.01	0.2	220	0.01	0.2	110	0.05	0.001	110	0.01
2005-003-005	30,000	185	90	0.01	0.4	185	0.01	0.4	375	0.25	0.005	375	0.01
2005-003-010	30,000	185	90	0.01	0.4	185	0.01	0.4	180	0.125	0.005	375	0.01
2005-005-005	30,000	375	125	0.01	0.4	375	0.01	0.4	375	0.25	0.005	375	0.01
2005-005-010	30,000	375	125	0.01	0.4	375	0.01	0.4	180	0.125	0.005	375	0.01
2008-003-008	30,000	185	90	0.01	0.6	185	0.01	0.6	600	0.4	0.008	375	0.01
2008-003-016	30,000	185	90	0.01	0.6	185	0.01	0.6	300	0.2	0.008	375	0.01
2008-005-008	30,000	375	150	0.01	0.6	375	0.01	0.6	600	0.4	0.008	375	0.01
2008-005-016	30,000	375	150	0.01	0.6	375	0.01	0.6	300	0.2	0.008	375	0.01
2008-010-008	30,000	375	150	0.01	0.6	375	0.01	0.6	600	0.4	0.008	375	0.01
2008-010-016	30,000	375	150	0.01	0.6	375	0.01	0.6	300	0.2	0.008	375	0.01
2010-003-010	30,000	185	90	0.01	0.8	185	0.01	0.8	750	0.5	0.01	375	0.01
2010-003-020	30,000	185	90	0.01	0.8	185	0.01	0.8	375	0.25	0.01	375	0.01
2010-005-010	30,000	375	185	0.01	0.8	375	0.01	0.8	750	0.5	0.01	375	0.01
2010-005-020	30,000	375	185	0.01	0.8	375	0.01	0.8	375	0.25	0.01	375	0.01
2010-010-010	30,000	375	185	0.01	0.8	375	0.01	0.8	750	0.5	0.01	375	0.01
2010-010-020	30,000	375	185	0.01	0.8	375	0.01	0.8	375	0.25	0.01	375	0.01
2015-003-015	25,000	185	90	0.01	1.3	185	0.01	1.3	750	0.75	0.01	375	0.015
2015-003-030	25,000	185	90	0.01	1.3	185	0.01	1.3	375	0.375	0.01	375	0.015
2015-005-015	25,000	375	125	0.015	1.3	375	0.015	1.3	750	0.75	0.01	375	0.015
2015-005-030	25,000	375	125	0.015	1.3	375	0.015	1.3	375	0.375	0.01	375	0.015
2015-010-015	25,000	375	150	0.015	1.3	375	0.015	1.3	750	0.75	0.01	375	0.015
2015-010-030	25,000	375	150	0.015	1.3	375	0.015	1.3	375	0.375	0.01	375	0.015
2020-003-020	20,000	185	90	0.01	1.8	185	0.01	1.8	750	1	0.01	375	0.02
2020-003-040	20,000	185	90	0.01	1.8	185	0.01	1.8	375	0.5	0.01	375	0.02
2020-005-020	20,000	375	90	0.02	1.8	375	0.02	1.8	750	1	0.01	375	0.02
2020-005-040	20,000	375	90	0.02	1.8	375	0.02	1.8	375	0.5	0.01	375	0.02
2020-010-020	20,000	375	125	0.02	1.8	375	0.02	1.8	750	1	0.01	375	0.02
2020-010-040	20,000	375	125	0.02	1.8	375	0.02	1.8	375	0.5	0.01	375	0.02



Z-Level / Side / Flat Milling



Slotting
D : Outside Diameter (mm)

Milling Conditions for UDCLRS

WORK MATERIAL	CEMENTED CARBIDE (<87HRA)												
Model Number	Spindle Speed (min^{-1})	Z-Level Milling				Flat Milling			Side Milling			Slotting	
		Feed Rate (mm/min)	※Feed Rate 2 (mm/min)	a_p (mm)	a_e (mm)	Feed Rate (mm/min)	a_p (mm)	a_e (mm)	Feed Rate (mm/min)	a_p (mm)	a_e (mm)	Feed Rate (mm/min)	a_p (mm)
2003-003-006	21,000	220	50	0.01	0.2	220	0.01	0.2	200	0.075	0.003	200	0.01
2003-005-006	21,000	220	50	0.01	0.2	220	0.01	0.2	200	0.075	0.003	200	0.01
2005-003-005	20,000	275	135	0.02	0.4	275	0.02	0.4	800	0.25	0.005	550	0.02
2005-003-010	20,000	275	135	0.02	0.4	275	0.02	0.4	400	0.125	0.005	550	0.02
2005-005-005	20,000	550	180	0.02	0.4	550	0.02	0.4	800	0.25	0.005	550	0.02
2005-005-010	20,000	550	180	0.02	0.4	550	0.02	0.4	400	0.125	0.005	550	0.02
2008-003-008	19,000	290	145	0.02	0.6	290	0.02	0.6	1,200	0.4	0.008	580	0.025
2008-003-016	19,000	290	145	0.02	0.6	290	0.02	0.6	600	0.2	0.008	580	0.025
2008-005-008	19,000	580	190	0.025	0.6	580	0.025	0.6	1,200	0.4	0.008	580	0.025
2008-005-016	19,000	580	190	0.025	0.6	580	0.025	0.6	600	0.2	0.008	580	0.025
2008-010-008	19,000	580	190	0.025	0.6	580	0.025	0.6	1,200	0.4	0.008	580	0.025
2008-010-016	19,000	580	190	0.025	0.6	580	0.025	0.6	600	0.2	0.008	580	0.025
2010-003-010	18,250	300	150	0.02	0.8	300	0.02	0.8	1,440	0.5	0.01	600	0.025
2010-003-020	18,250	300	150	0.02	0.8	300	0.02	0.8	720	0.25	0.01	600	0.025
2010-005-010	18,250	600	200	0.025	0.8	600	0.025	0.8	1,440	0.5	0.01	600	0.025
2010-005-020	18,250	600	200	0.025	0.8	600	0.025	0.8	720	0.25	0.01	600	0.025
2010-010-010	18,250	600	200	0.025	0.8	600	0.025	0.8	1,440	0.5	0.01	600	0.025
2010-010-020	18,250	600	200	0.025	0.8	600	0.025	0.8	720	0.25	0.01	600	0.025
2015-003-015	16,500	325	160	0.02	1.3	325	0.02	1.3	1,440	0.75	0.01	650	0.035
2015-003-030	16,500	325	160	0.02	1.3	325	0.02	1.3	720	0.375	0.01	650	0.035
2015-005-015	16,500	650	210	0.035	1.3	650	0.035	1.3	1,440	0.75	0.01	650	0.035
2015-005-030	16,500	650	210	0.035	1.3	650	0.035	1.3	720	0.375	0.01	650	0.035
2015-010-015	16,500	650	210	0.035	1.3	650	0.035	1.3	1,440	0.75	0.01	650	0.035
2015-010-030	16,500	650	210	0.035	1.3	650	0.035	1.3	720	0.375	0.01	650	0.035
2020-003-020	15,000	360	180	0.02	1.8	360	0.02	1.8	1,440	1	0.01	720	0.05
2020-003-040	15,000	360	180	0.02	1.8	360	0.02	1.8	1,440	1	0.01	720	0.05
2020-005-020	15,000	720	240	0.05	1.8	720	0.05	1.8	1,440	1	0.01	720	0.05
2020-005-040	15,000	720	240	0.05	1.8	720	0.05	1.8	1,440	1	0.01	720	0.05
2020-010-020	15,000	720	240	0.05	1.8	720	0.05	1.8	1,440	1	0.01	720	0.05
2020-010-040	15,000	720	240	0.05	1.8	720	0.05	1.8	1,440	1	0.01	720	0.05

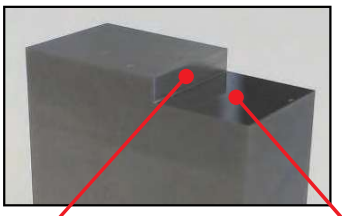
These milling parameters are based on VF-20, VM-40, VC-70, VU-70 (TAS standard) for Cemented Carbide, and Alumina for Hard Brittle Materials. These are for reference only.
Tool life may differ depending on the type of Cemented Carbide / Hard Brittle Materials.
For best result, fine parameter adjustments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

※Feed Rate2: Feed rate of approach and *connection moves.
*Changing from one engagement point to the next.

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 affects on the machine parts if they are not properly evacuated. Take steps to assure proper evacuation.

Cemented Carbide Milling Example UDCLRS 2020-005-020 (ϕ 2 × CR0.05 × 2) VM-40 (90HRA)

Work sample after finishing



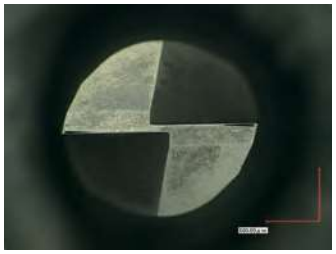
Ra : 0.069 μm
Rz : 0.535 μm
Cut-off length : 0.25 mm

Ra : 0.010 μm (10 nm)
Rz : 0.078 μm (78 nm)
Cut-off length: 0.08 mm

Bottom Surface Quality

Mirror surface finish
with zero pits!

After Finishing



UDCLRS
Side Milling Video

Milling Conditions	Roughing Parameter	Finishing Parameter
Spindle Speed	20,000 min^{-1}	20,000 min^{-1}
XY Feed Rate	750 mm/min	100 mm/min
a_p	0.9 mm	0.01 mm Bottom Surface 0.9 mm Side
a_e	0.01 mm	0.01 mm
Coolant	Air Blow	Oil Mist
Milling Size	10 × 8 × 1.8 mm	0.01 mm Bottom Surface 0.05 mm Side (0.01 mm × 5 times)
Milling Distance	16 m	—
Material Removal Volume	144 mm^3	—

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

Overhang : 15 mm