

UNION TOOL

Tungsten Carbide End Mills UNIMAX Series

HARDMAX 4 Flute Taper Neck Radius End Mills

HTNRS

NEW

Total 44 Models



UNION TOOL CO.



Size $\varnothing 1 \sim \varnothing 6$

HTNRS



Launching in May 2016

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										
		◎	◎	◎	○										

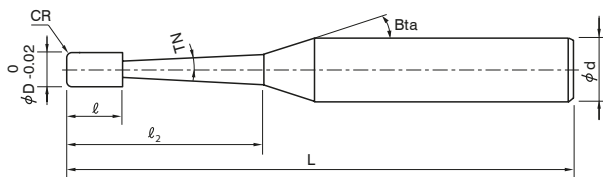
Features

4 flute taper neck radius end mills for milling hard materials.

Corner radius design from the edge to the periphery ensures less cutting resistance, and the variable pitch design minimizes chattering and vibration.

Can achieve stable milling and excellent surface finish on deep milling.

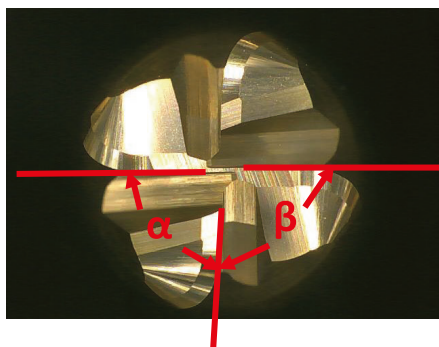
HARDMAX coating offers longer tool life when milling hard materials. Recommended to use with any type of coolant.



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.

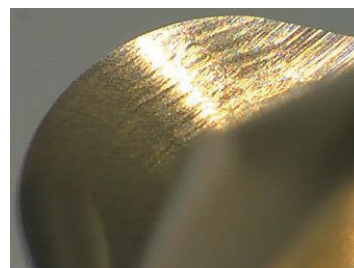


Features ② Variable Pitch design
Minimizing vibration and chattering !



Variable Pitch : $\alpha \neq \beta$

Features ① Seamless Corner Radius
High rigidity! Less cutting resistance!



Features ③ Useful Taper Neck Angle 0.9°

HARDMAX 4 Flutes Taper Neck Radius End Mills

Total 44 models

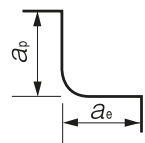
Unit (mm)

Model Number	Outside Diameter Ø D	Corner Radius CR	Neck Taper Angle TN	Neck Length ℓ ₂	Length of Cut ℓ	Shank Taper Angle B _{ta}	Overall Length L	Shank Diameter Ø d
HTNRS 4010-020618	1	R0.2	0.9°	6	1	16°	50	4
HTNRS 4010-021018				10			50	
HTNRS 4010-022018				20			60	
HTNRS 4010-023018				30			70	
HTNRS 4010-024018				40			80	
HTNRS 4010-025018				50			90	
HTNRS 40125-020618	1.25	R0.2	0.9°	6	1.25	16°	50	4
HTNRS 40125-021018				10			50	
HTNRS 40125-022018				20			60	
HTNRS 40125-023018				30			70	
HTNRS 40125-024018				40			80	
HTNRS 40125-025018				50			90	
HTNRS 4015-030618	1.5	R0.3	0.9°	6	1.5	16°	50	4
HTNRS 4015-031018				10			50	
HTNRS 4015-032018				20			60	
HTNRS 4015-033018				30			70	
HTNRS 4015-034018				40			80	
HTNRS 4015-035018				50			90	
HTNRS 40175-030618	1.75	R0.3	0.9°	6	1.75	16°	50	4
HTNRS 40175-031018				10			50	
HTNRS 40175-032018				20			60	
HTNRS 40175-033018				30			70	
HTNRS 40175-034018				40			80	
HTNRS 40175-035018				50			90	
HTNRS 4020-051018	2	R0.5	0.9°	10	2	16°	60	4
HTNRS 4020-052018				20			60	
HTNRS 4020-053018				30			70	
HTNRS 4020-054018				40			80	
HTNRS 4020-055018				50			90	
HTNRS 4030-082018				3			R0.8	
HTNRS 4030-083018	30	70						
HTNRS 4030-084018	40	80						
HTNRS 4030-085018	50	90						
HTNRS 4030-086018	60	100						
HTNRS 4040-102018	4	R1	0.9°		20	4		16°
HTNRS 4040-103018				30	70			
HTNRS 4040-104018				40	80			
HTNRS 4040-105018				50	90			
HTNRS 4040-106018				60	100			
HTNRS 4060-152018				6	R1.5		0.9°	
HTNRS 4060-153018	30	70						
HTNRS 4060-154018	40	80						
HTNRS 4060-155018	50	90						
HTNRS 4060-156018	60	100						

HTNRS Milling Conditions

WORK MATERIAL					PREHARDENED STEELS / HARDENED STEELS NAK / SKD (30~45HRC)				HARDENED STEELS SKD / SKT (45~55HRC)				HARDENED STEELS SKD / SKH (55~65HRC)			
Model Number	Outside Diameter (mm)	Corner Radius (mm)	Neck Length (mm)	L/D	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)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)
4010-020618	1	R0.2	6	6.0	20,000	2,600	0.06	0.45	11,600	980	0.029	0.24	8,900	530	0.012	0.1
4010-021018			10	10.0	19,000	2,450	0.03	0.43	11,000	920	0.015	0.22	8,500	480	0.008	0.075
4010-022018			20	20.0	18,000	2,300	0.01	0.4	10,400	850	0.006	0.2	8,000	430	0.005	0.05
4010-023018			30	30.0	16,000	2,000	0.007	0.35	9,400	750	0.004	0.18	7,400	390	0.004	0.05
4010-024018			40	40.0	14,000	1,750	0.005	0.3	8,300	660	0.003	0.15	6,700	350	0.003	0.05
4010-025018			50	50.0	12,000	1,500	0.003	0.28	7,200	570	0.002	0.14	6,000	310	0.002	0.05
40125-020618	1.25	R0.2	6	4.8	16,000	2,600	0.075	0.56	9,200	990	0.036	0.3	7,100	540	0.015	0.12
40125-021018			10	8.0	16,000	2,600	0.057	0.55	9,200	990	0.027	0.29	7,100	540	0.012	0.1
40125-022018			20	16.0	15,000	2,400	0.022	0.51	8,700	900	0.011	0.26	6,700	470	0.007	0.07
40125-023018			30	24.0	14,400	2,300	0.011	0.47	8,300	860	0.006	0.23	6,400	440	0.005	0.06
40125-024018			40	32.0	12,800	2,000	0.008	0.42	7,500	750	0.004	0.21	5,900	390	0.004	0.06
40125-025018			50	40.0	11,000	1,700	0.006	0.37	6,500	650	0.003	0.19	5,300	350	0.003	0.06
4015-030618	1.5	R0.3	6	4.0	13,500	2,600	0.09	0.67	7,800	990	0.043	0.36	6,000	540	0.018	0.15
4015-031018			10	6.7	13,500	2,600	0.083	0.67	7,800	990	0.04	0.36	6,000	540	0.017	0.14
4015-032018			20	13.3	12,500	2,400	0.035	0.63	7,200	900	0.018	0.32	5,600	470	0.01	0.1
4015-033018			30	20.0	12,000	2,300	0.015	0.6	6,900	860	0.008	0.3	5,350	440	0.007	0.07
4015-034018			40	26.7	12,000	2,300	0.012	0.55	6,900	860	0.007	0.27	5,350	440	0.006	0.07
4015-035018			50	33.3	10,500	2,000	0.009	0.5	6,100	740	0.005	0.25	4,850	380	0.005	0.07
40175-030618	1.75	R0.3	6	3.4	11,500	2,600	0.105	0.78	6,600	990	0.05	0.42	5,100	540	0.021	0.17
40175-031018			10	5.7	11,500	2,600	0.105	0.78	6,600	990	0.05	0.42	5,100	540	0.021	0.17
40175-032018			20	11.4	11,000	2,450	0.047	0.74	6,400	920	0.024	0.38	4,900	480	0.013	0.12
40175-033018			30	17.1	11,000	2,450	0.027	0.71	6,400	920	0.014	0.36	4,900	480	0.01	0.1
40175-034018			40	22.9	10,000	2,200	0.016	0.67	5,800	820	0.009	0.33	4,450	420	0.008	0.08
40175-035018			50	28.6	10,000	2,200	0.013	0.62	5,800	820	0.008	0.31	4,450	420	0.007	0.08
4020-051018	2	R0.5	10	5.0	10,000	2,600	0.12	0.9	5,800	990	0.057	0.49	4,450	540	0.024	0.2
4020-052018			20	10.0	9,500	2,450	0.06	0.86	5,500	920	0.03	0.45	4,250	480	0.016	0.15
4020-053018			30	15.0	9,500	2,450	0.04	0.83	5,500	920	0.021	0.42	4,250	480	0.013	0.12
4020-054018			40	20.0	9,000	2,300	0.02	0.8	5,200	850	0.012	0.4	4,000	430	0.01	0.1
4020-055018			50	25.0	9,000	2,300	0.017	0.75	5,200	850	0.01	0.38	4,000	430	0.009	0.1
4030-082018			3	R0.8	20	6.7	6,700	2,600	0.13	1.07	4,000	1,000	0.065	0.6	3,300	590
4030-083018	30	10.0			6,300	2,400	0.072	1.03	3,800	920	0.038	0.56	3,100	510	0.024	0.22
4030-084018	40	13.3			6,300	2,400	0.056	1	3,800	920	0.03	0.54	3,100	510	0.021	0.2
4030-085018	50	16.7			6,300	2,400	0.04	0.98	3,800	920	0.023	0.51	3,100	510	0.018	0.17
4030-086018	60	20.0			6,000	2,300	0.024	0.96	3,600	870	0.015	0.49	2,900	470	0.015	0.15
4040-102018	4	R1			20	5.0	5,000	2,600	0.19	1.44	3,000	1,000	0.095	0.82	2,450	600
4040-103018			30	7.5	5,000	2,600	0.15	1.41	3,000	1,000	0.076	0.79	2,450	600	0.042	0.36
4040-104018			40	10.0	4,800	2,450	0.09	1.37	2,900	920	0.048	0.75	2,350	480	0.032	0.3
4040-105018			50	12.5	4,800	2,450	0.08	1.35	2,900	920	0.043	0.72	2,350	480	0.029	0.27
4040-106018			60	15.0	4,800	2,450	0.06	1.32	2,900	920	0.034	0.7	2,350	480	0.026	0.25
4060-152018			6	R1.5	20	3.3	3,350	2,600	0.28	2.16	2,000	1,000	0.14	1.24	1,650	600
4060-153018	30	5.0			3,350	2,600	0.28	2.16	2,000	1,000	0.14	1.24	1,650	600	0.072	0.6
4060-154018	40	6.7			3,350	2,600	0.26	2.14	2,000	1,000	0.131	1.21	1,650	600	0.068	0.57
4060-155018	50	8.3			3,350	2,600	0.2	2.1	2,000	1,000	0.103	1.17	1,650	600	0.058	0.51
4060-156018	60	10.0			3,150	2,400	0.14	2.06	1,900	920	0.075	1.12	1,550	510	0.048	0.45

Side Milling
a_p : Axial Depth (mm)
a_e : Radial Depth (mm)



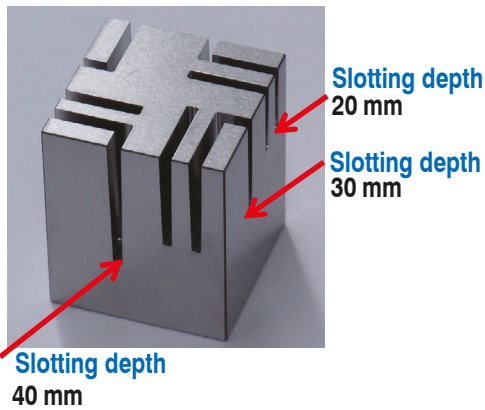
Note:

- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed.
- Every coolant offers stable milling.

Highly efficient in deep taper slot milling.



SKD61 (45HRC)

[Work Shape (50 × 50 × 60mm)]



- Taper Slotting**
- Work Material : SKD61 (45HRC)
 - Inclined Angle : 1°
 - Slot Length : 27 mm (L Shape Slot)、
21 mm (Straight Slot)
 - Slot Width : 2.6 mm (Bottom)
 - Slot Depth : 20, 30, 40 mm
 - Coolant : Water Soluble Coolant

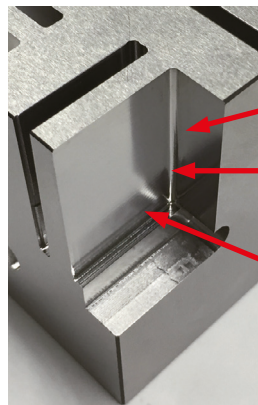
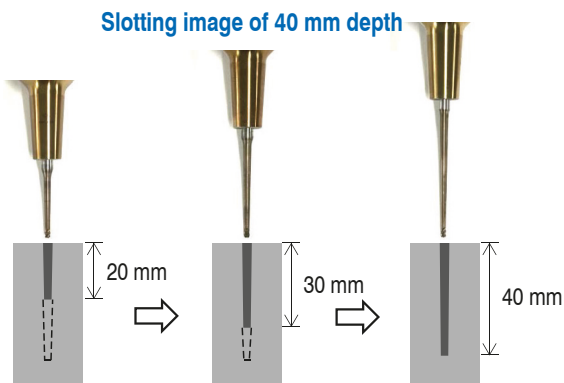
① Performance compared with straight-neck type...Depth 20 mm L shape slotting

Tool	Neck Shape Helix Angle	Tool Size (mm)	Process	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	Ap Axial Depth (mm)	Cycle Time
HTNRS Taper Neck 4 Flute Radius 	Taper Neck 0.9° 45° Helix Angle	∅ 2 × CR0.5 × Neck Length 20	Roughing	9,500	2,450	0.064	20 min 18 sec
HLRS Straight Neck 4 Flute Radius 	Straight Neck 30° Helix Angle	∅ 2 × CR0.5 × Effective Length 20	Roughing	7,000	800	0.025	1 h 30 min 9 sec

Taper-neck completed 7 times more efficient in 20 mm depth slotting !

② 40 mm Depth L shape slotting

Tool	Neck Shape Helix Angle	Tool Size (mm)	Process	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	Ap Axial Depth (mm)	Cycle Time
HTNRS Taper Neck 4 Flute Radius HTNRS 4020-052018	Taper Neck 0.9° 45° Helix Angle	∅ 2 × CR0.5 × Neck Length 20	Roughing	9,500	2,450	0.064	27 min 8 sec
HTNRS Taper Neck 4 Flute Radius HTNRS 4020-053018		∅ 2 × CR0.5 × Neck Length 30	Roughing	9,500	2,450	0.047	15 min 32 sec
HTNRS Taper Neck 4 Flute Radius HTNRS 4020-054018		∅ 2 × CR0.5 × Neck Length 40	Roughing Finishing	9,000 4,500	2,300 500	0.02 0.0001	40 min 26 sec 4 h 28 min 50 sec



- Depth 20 mm**
Ra : 0.287 μm
- Depth 30 mm**
Ra : 0.241 μm
- Depth 40 mm**
Ra : 0.274 μm

40 mm slot depth roughing process completed in 1h 23 min! Excellent surface finishing!



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 grind the tool without wearing safety glasses and a face guard.



U.S. HEADQUARTERS

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Prices & Specifications are subject to change without notice.



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