

**UNION TOOL**

# Tungsten Carbide End Mills UNIMAX Series

## Medical Applications



**UNION TOOL CO.**

# End mills for medical solutions



## Artificial hip joint



## Artificial knee joint



## Bone plate



## Dental



Machined Parts	Work Material	Coating	Tool Geometry	Recommended Series
Artificial knee joint	Titanium alloys Cobalt chrome Stainless steel		Ball & Long Neck Ball (2 & 3 Flutes)	CWLB/CFB/CFLB
			Barrel	COVB/CSTB
			Radius (4 & 5 Flutes)	CXERS/CXRS
			Square (2 & 4 Flutes)	CSS/CZS/CEHS/CESUS
Artificial hip joint	Titanium alloys Cobalt chrome		Ball & Long Neck Ball (2 & 3 Flutes)	CWLB/CFB/CFLB
			Radius & Long Neck Ball (4 & 5 Flutes)	CXERS/CXRS/HLRS
Bone Plate	Titanium alloys Stainless steel		Radius (4 & 5 Flutes)	CXERS/CXRS
			Ball & Long Neck Ball (2 & 3 Flutes)	CWLB/CFB/CFLB
			Flat Drill	UTDF
Dental	Zirconium Hybrid composite resin		Ball (Long Neck 2 & 3 Flutes)	HWLB/DCLB
			Radius (Long Neck 2 & 4 Flutes)	HLRS/DCLRS

## UNIMAX End Mills Tool Finder

- Our catalogue PDF data and DXF files can be downloaded.
- Products that meet your needs can be searched by tool types, sizes, series names and work materials.

▼ View from here ▼



For smart devices



For computers

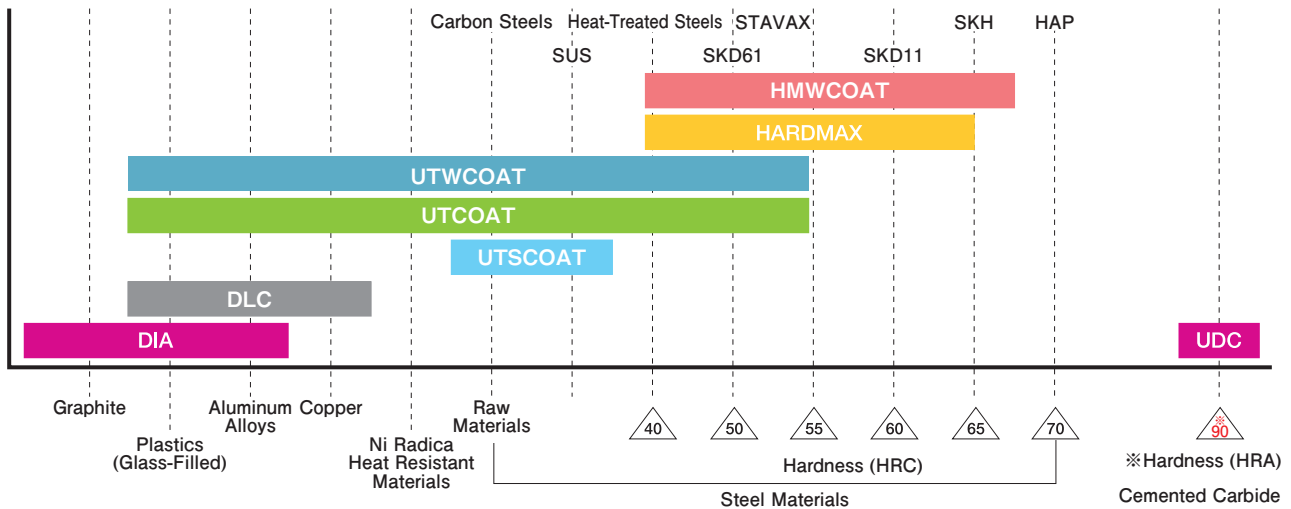
UNIMAX end mill tool finder

Search



# Coating

Find the best coating for your material applications



Coating Series	Hardness (HV)	Heat Resistance	Toughness	Lubricant Efficiency	Recommended Use	
Ceramics based	HMW COAT	3700 ~ 4000	★	●	For Steels	
	HARD MAX	3500 ~ 4000	★	○		
	UTW COAT	2800 ~ 3300	●	★	For Copper/Raw Materials up to 55HRC	
	UT COAT	3000 ~ 3500	●	★		
	UTS COAT	3000 ~ 3500	●	★		
DLC	DLC	4000 ~ 6000	△	△	★	For Copper/Aluminum/Plastics
Diamond	DIA COAT	around 9000	△	△	●	For Graphite
	UDC	around 9000	△	○	●	For Cemented Carbide/ Hard Brittle Materials

## UTCOAT & UTWCOAT

For materials up to 55HRC

General purpose coating with improved lubricity and toughness. Suitable for copper, stainless steels, raw materials up to 55HRC.



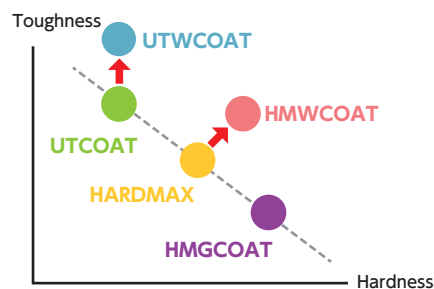
**UTCOAT & HARDMAX have been upgraded!**

The new nano-composite structure has further improved abrasion resistance and toughness, respectively.

## HARDMAX & HMWCOAT

For high-hardness materials

High-hardness coating with high levels of heat resistance, toughness and lubricity. Best for steels over 40HRC.



# Artificial hip joint Titanium alloy milling examples

## 1. Artificial hip joint cup & liner model

Work Material : Titanium Ti-4Al-5V  
 Coolant : Water Soluble  
 Work size :  $\varnothing 52 \times$  height 29.5  
 5-Axis Machining Center  
 Tools used : 5pcs



Work	Tool	Process	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Allowance (mm)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)	Cycle time (min)
Back	CNRS $\varnothing 12 \times$ CR2	Roughing Work perimeter slot milling	2,150	550	0.1	1	-	8.09
		Roughing Inside pocket			0.2	23	0.72	9.31
		Semi-finishing Inside bottom			0.2	0.5	6	2.1
	Radius SP $\varnothing 10 \times$ CR2	Finishing Inside pocket taper side	2,600	1500	-	0.25	0.15	4
		Finishing Inside pocket taper bottom	1200	-	0.2	0.4	4.31	
HLRS4 $\varnothing 4 \times$ CR0.1 $\times$ EL8	Roughing Inside notch slot milling	4,800	350	-	2.95	-	0.24	
Surface	CNRS $\varnothing 12 \times$ CR2	Roughing Outside slot milling (block cutting)	2,150	340	0.2	1	-	10.25
		Roughing Convex shapes			0.2	2	1.2	10.62
		Roughing Convex shapes			550	0.2	0.5	6
	HFB4 R1 $\times$ L3	Roughing Convex shapes triangular pyramid	14,700	1000	-	0.35	0.2	6.25
	CFB3 R0.5 $\times$ L1.5	Finishing Convex shapes triangular pyramid	18,000	1200	-	0.1	0.1	17.84
HFB4 R1 $\times$ L3	Finishing Convex shapes Dome part	14,000	800	-	0.1	0.1	12.46	
1 piece is processed from a 100 $\times$ 60 $\times$ 50 block workpiece.								100

## 2. Artificial hip joint stem model

Work Material : Titanium Ti6Al4V  
 Coolant : Oil  
 Work Size :  $\varnothing 90 \times$  Height 120 mm  
 Cycle Time : 9:30 h:m  
 5-Axis Machining Center

### Cutting tools:

- CSELB** (2 FL Long Neck Ball)
- CFB** (3 FL Ball)
- CNRS** (4 FL Radius)

※This work uses "CSELB".  
 Currently new "CWLB" is recommended.



Milling Video



## Dental Zirconia milling examples

Cutting tools:

**HWLB** (HMWCOAT/ 2 FL Long Neck Ball)



Process	Tool size	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)
Rouing	R1 $\times$ 20	25,000	2,500	1.2	0.8
Finishing	R1 $\times$ 14		2,500	0.15	0.2
Rest Roughing	R0.5 $\times$ 20		2,500	0.5	0.35
Rest Finishing	R0.5 $\times$ 14		2,500	0.15	0.2
Prep-line-Finishing	R0.5 $\times$ 14		1,200	0.05	0.2
Inside-prep-Finishing	R0.5 $\times$ 14		1,200	0.13	0.2

## Ball Series

SUS304



### 3 Flutes • **UTCOAT**

Highly efficient machining and finishing on difficult-to-machine materials.

#### **CFB**



R0.3~R6 14 models  
All flute



#### **CFLB**



R0.3~R3 47 models  
Long neck



CFB3060-0900(R3 × 9) Pocket Size 55 × 50 × 23 mm

Process	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Cycle time (min)
Roughing	9,000	3,000	0.6	3	9.5
Semi-finishing	9,000	3,000	0.7	0.7	4
Finishing	20,000	2,500	0.12	0.12	20.5

Coolant : Water Soluble

34

### 2 Flutes • **UTWCOAT**

Longer life and better mirror finish than conventional products.

#### **CWLB**



R0.05~R3 190 models  
Long neck



Artificial hip joint parts

## Barrel Series

### 4 Flutes • **UTCOAT**

Barrel shape is ideal for highly efficient finishing of vertical walls and inclined surfaces.

#### **COVB**



Oval barrel 4 models

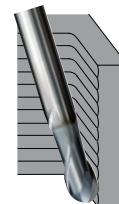


#### **CSTB**



Standard taper barrel 5 models

Standard Ball End Mills



Barrel End Mills



Larger a<sub>p</sub>

※Special sizes can be recommended according to the work piece shape.

## Square Series

### 4 Flutes • **UTCOAT**

Offers stable milling even with long overhang milling.

#### **CEHS**



Ø1~Ø12 41 models  
All flute



### 4 Flutes • **UTCOAT**

Drilling and milling with a single tool.

#### **CZS**



Ø1~Ø20 89 models  
All flute



Artificial knee joint parts

## Radius Series

**4 Flutes • UTCOAT** Suitable for exotic materials such as titanium alloys and stainless steels.

**CXERS**  Ø1~Ø12 56 models  
All flute



**CNRS**  Ø6~Ø12 12models  
All flute



**CRRS**  Ø1~Ø12 24 models  
Long neck



**5 Flutes • UTCOAT** 5 flute highly efficient long neck radius with variable pitch and helix design

**CXRS**  Ø3~Ø12 30 models  
All flute



**CXLRS**  Ø3~Ø12 30 models  
Long neck

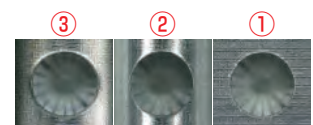
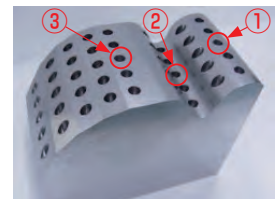
## Drill Series/Flat Drills

**2 Flutes • UTCOAT** Excellent drilling performance on inclined and curved surfaces.

**UTDF**  Ø2~Ø12 21 models



Drilling Example



Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Depth (mm)
7,000	450	7

## Bone plate model

Material : G-STAR (Before hardened)  
Coolant : Water soluble  
Cycle Time : 34.5 (min)

Cutting tool:

CFB (3 FL Ball) / CSEB (2 FL Ball)

CSELB (2 FL Long neck Ball)

UTDF (Flat Drill) / CSS (Square)

※This work uses "CSELB". Currently new "CWLB" is recommended.



## Special End Mills/Drills

Ideal for 5-axis machining such as deburring and undercutting of workpieces both top and back side.

### Spherical ball end mills



※We offer special products that are not available as standard catalogue models. Please contact us for special products suitable for the shape of your workpieces.

Ball Series

2 Flutes DIA COAT

Long life is achieved by our inhouse developed diamond coating with excellent adhesion.



**DCLB**



R0.2~R3 68 models  
Long neck



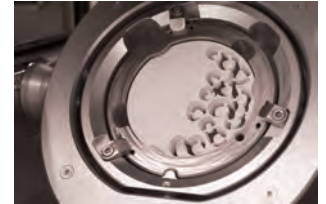
**DCTNB**



R0.5~R1 15 models  
Taper neck



※Special sizes can be offered according to workpiece shape.



2 Flutes HMW/UTWCOAT

Upgraded coating for even longer tool life.

**HWLB**



R0.05~R3 344 models  
Long neck



**CWLB**



R0.05~R3 190 models  
Long neck



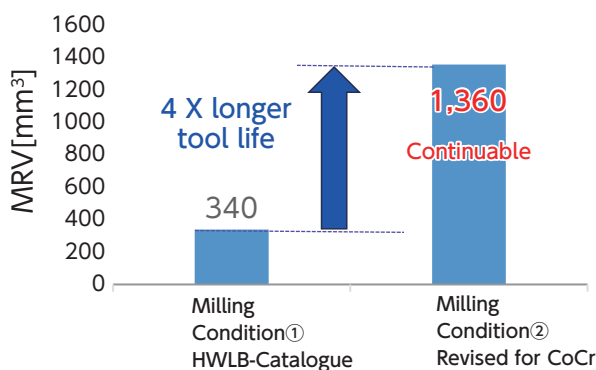
CoCr (Cobalt chrome 27HRC) Milling example  
Tool life comparison with different parameters

Milling method : Pocket milling  
Pocket size : 5 × 68 × D1.0  
Coolant : Nozzle airflow



	Tool Size R×Effective Length	Spindle Speed (min <sup>-1</sup> )	XY Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Efficiency (mm <sup>3</sup> /min)	Material Removal Volume (mm <sup>3</sup> )	Time (min)	Result
① HWLB Catalogue ~ 55HRC	R0.5 × 5	30,000	1,750	0.1	0.3	52.5	340	8	Chipping occurs on the cutting edge when catalogue conditions are applied.
② Revised for CoCr	R0.5 × 5	30,000	1,000	0.1	0.2	20.0	1,360	60	The condition for CoCr achieved more than 4 times longer life than the catalogue condition.

Tool life comparison



Proper condition setting is necessary for CoCr. Stable processing is possible depending on the milling conditions.



## 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 UNIMAX Tungsten Carbide End Mills

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



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Price & Specifications are subject to change without notice.