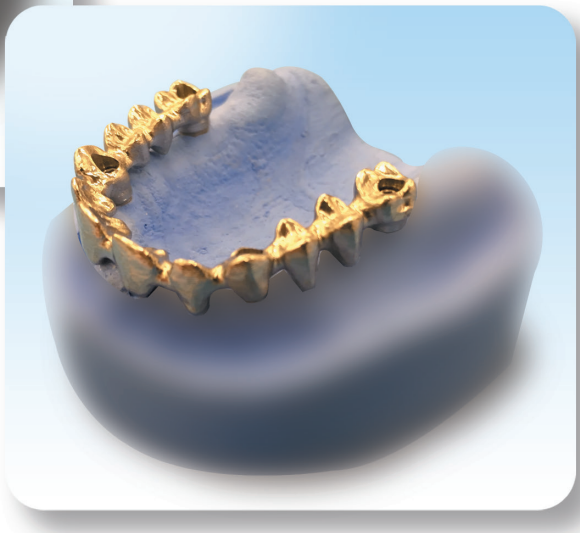
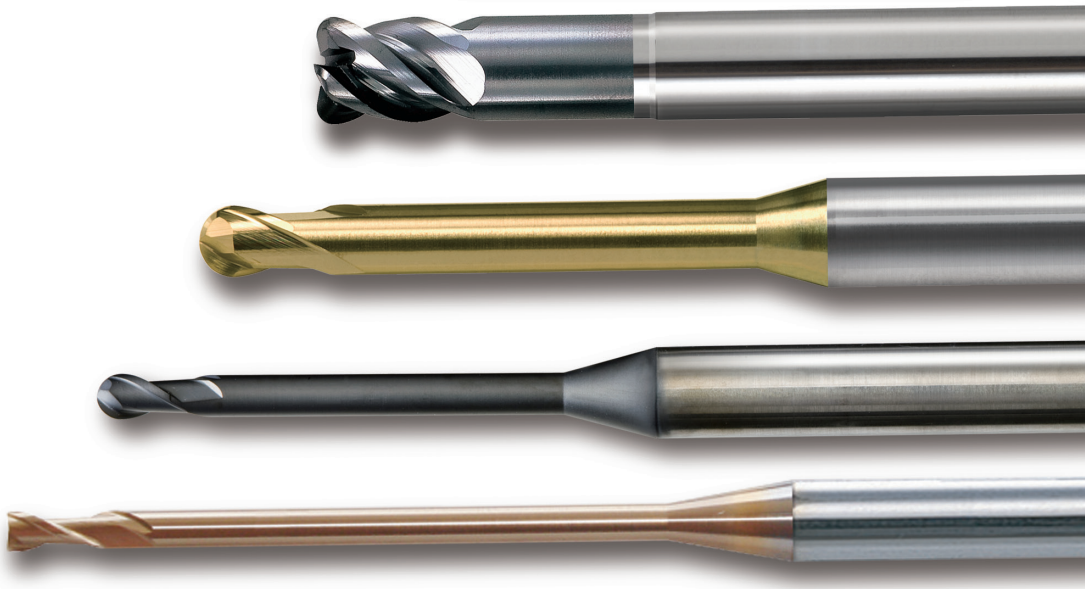
UNION TOOL

Tungsten Carbide End Mills UNIMAX Series

Dental applications





UNION TOOL CO.

For Hybrid composite resin & For Zirconium

For Hybrid composite resin

DCLB

DIA COAT 2 flute Long Neck Ball End Mills.
Long life due to highly adhesive diamond coating layer.
Coating Hardness : 9000 Hv

For Zirconium disc

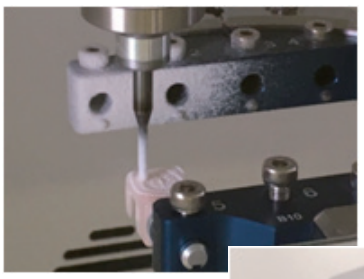
DCLB

HSLB

HSLB has high wear resistance due to HARDMAX coating.
Coating Hardness is about 3,500 HV
HSLB coating thickness is thinner than DCLB.
Sharp cutting edge prevents edge chipping.

Hybrid composite resin with DCLB

Hybrid composite resin



We recommend DCLB for Hybrid composite resin milling.

DCLB

DWX-51D

Milling machine for dental

Cooperator

Roland

Process	tool	tool size	Spindle speed (min^{-1})	XY Feed (mm/min)	a_p (mm)	a_e (mm)
Roughing	DCLB 2020-120	R1×12	25,000	2,500	1.2	0.8
Finishing	DCLB 2020-120	R1×12		2,500	0.15	0.2
Prep -line-Finishing	DCLB 2010-0100-08	R0.5×10		1,200	0.05	0.2
Inside-prep-Finishing	DCLB 2010-0100-08	R0.5×10		1,200	0.13	0.2

2 Flute Long Neck Ball

DCLB

Diamond coated 2Flute Long Neck Ball

DIA | R ±0.01 | 35°

Unit (mm)

Model Number	Radius of Ball Nose	Effective Length	Length of Cut	Neck Diameter	Shank Taper Angle	Overall Length	Shank Diameter
DCLB2006-0060	R0.3	6	0.48	0.57	16°	45	4
DCLB2006-0100		10				45	
DCLB2006-0120		12				45	
DCLB2008-0100	R0.4	10	0.64	0.77	16°	45	4
DCLB2008-0120		12				50	
DCLB2008-0160		16				50	
DCLB2010-0100-08	R0.5	10	0.8	0.96	16°	45	4
DCLB2010-0120		12				50	
DCLB2010-0160		16				50	
DCLB2020-0100	R1	10	1.6	1.9	16°	45	4
DCLB2020-0120		12				45	
DCLB2020-0160		16				50	

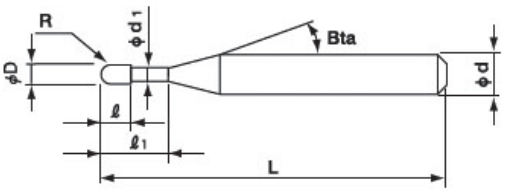
HSLB

Hard MAX coated 2Flute Long Neck Ball

HARD MAX | R ±0.005 | 30°

Unit (mm)

Model Number	Radius of Ball Nose	Effective Length	Length of Cut	Neck Diameter	Shank Taper Angle	Overall Length	Shank Diameter
HSLB 2006-060	R0.3	6	0.48	0.59	16°	45	4
HSLB 2006-080		8				45	
HSLB 2006-100		10				50	
HSLB 2006-120		12				50	
HSLB 2008-100	R0.4	10	0.64	0.79	16°	50	4
HSLB 2008-120		12				50	
HSLB 2008-160		16				50	
HSLB 2010-100	R0.5	10	0.8	0.98	16°	45	4
HSLB 2010-120		12				45	
HSLB 2010-160		16				50	
HSLB 2020-100	R1	10	1.6	1.98	16°	45	4
HSLB 2020-120		12				45	
HSLB 2020-160		16				50	



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 of UNIMAX Coating

The Hard Max Coating offers an amazing tool life on hard materials such as Cobalt-chrome alloys.
The UT COAT offers an amazing tool life on hard material such as Titanium.
The DIA COAT offers an amazing tool life on Zirconium.

Coating Type	Color	Hardness (HV)	Heat Resistance	Toughness	Lubricant Efficiency
HARD MAX	Yellow ~ Gold	3500 ~ 4000	★★★ Highly Recommended	★ Suggested	★★ Recommended
UT COAT	Purple ~ Black	3000 ~ 3500	★★ Recommended	★★ Recommended	★★★ Highly Recommended
DIA	Black	around 9000	△ Satisfactory	△ Satisfactory	★★★ Highly Recommended

How to choose

Long Neck Ball

Flutes	Series	Cobalt-chrome	Zirconium	Titanium
2Flutes	HSLB	Hard Max Coating Negative Rake angle		
2Flutes	CSELB			UT coating Positive Rake angle
3Flutes	CFLB			UT coating Positive Rake angle
2Flutes	DCLB		DIA coating Only use for Zirconium	

Long Neck Square

Flutes	Series	Cobalt-chrome	Zirconium	Titanium
2Flutes	HLS2000	Hard Max Coating Negative Rake angle		
2Flutes	C-CER			UT coating Positive Rake angle
2Flutes	DCLS		DIA coating Only use for Zirconium	

Long Neck Radius

Flutes	Series	Cobalt-chrome	Zirconium	Titanium
2Flutes	HLRS2000	Hard Max Coating Negative Rake angle		
4Flutes	HRRS-S	Hard Max Coating Negative Rake angle		
4Flutes	CRRS			UT coating Positive Rake angle
4Flutes	DCLRS		DIA coating Only use for Zirconium	

Long Neck Ball

HSLB Hard MAX coated 2Flute Long Neck Ball

HARD MAX | 30° | R ±0.005 R0.1~R3

Work Material					
Zirconium	◎	Titanium	○	Cobalt Chrome	◎

Model Number	Radius of Ball Nose	Effective Length	Length of Cut	Shank Taper Angle	Overall Length	Shank Diameter
HSLB 2010-100	R0.5	10	0.8	16°	45	4
HSLB 2010-160		16			50	4
HSLB 2010-200		20			55	4
HSLB 2020-100	R1	10	1.6	16°	45	4
HSLB 2020-160		16			50	4
HSLB 2020-200		20			55	4
HSLB 2040-100	R2	10	3.2	16°	70	6
HSLB 2040-160		16			70	6
HSLB 2040-200		20			70	6
HSLB 2060-100	R3	10	4.8	—	80	6
HSLB 2060-150		15			80	6
HSLB 2060-200		20			80	6

CSELB UT coated 2Flute Long Neck Ball

UT COAT | 30° | R ±0.005 R0.1~R3

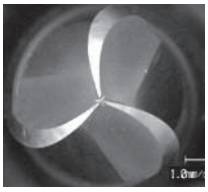
Work Material					
Zirconium	○	Titanium	◎	Cobalt Chrome	◎

Model Number	Radius of Ball Nose	Effective Length	Length of Cut	Shank Taper Angle	Overall Length	Shank Diameter
CSELB 2010-100	R0.5	10	0.8	11°	45	4
CSELB 2010-160		16			50	4
CSELB 2010-200		20			55	4
CSELB 2020-100	R1	10	1.6	11°	45	4
CSELB 2020-160		16			50	4
CSELB 2020-200		20			55	4
CSELB 2040-100	R2	10	3.2	11°	70	6
CSELB 2040-160		16			70	6
CSELB 2040-200		20			70	6
CSELB 2060-100	R3	10	4.8	—	80	6
CSELB 2060-150		15			80	6
CSELB 2060-200		20			80	6

CFLB UT coated 3Flute Long Neck Ball

UT COAT | 30° | R ±0.005 R0.3~R1.5 | R ±0.007 R2~R3

Work Material					
Zirconium	○	Titanium	◎	Cobalt Chrome	◎



Model Number	Radius of Ball Nose	Effective Length	Length of Cut	Shank Taper Angle	Overall Length	Shank Diameter
CFLB 3015-100	R0.75	10	1.2	16°	50	4
CFLB 3020-100	R1	10	1.6	16°	50	4
CFLB 3020-160		16			50	4
CFLB 3030-100	R1.5	10	2.4	16°	60	6
CFLB 3030-160		16			60	6
CFLB 3030-200		20			70	6
CFLB 3040-120	R2	12	3.2	16°	70	6
CFLB 3040-160		16			70	6
CFLB 3040-200		20			70	6

HLS2000 Hard MAX coated 2Flute Long Neck Square

HARD MAX 30°

Work Material					
Zirconium	◎	Titanium	○	Cobalt Chrome	◎

Model Number	Outside Diameter	Effective Length	Length of Cut	Shank Taper Angle	Overall Length	Shank Diameter
HLS 2005-100	φ0.5	10	0.7	16°	50	4
HLS 2005-150		15			50	4
HLS 2010-100	φ1	10	1.5	16°	45	4
HLS 2010-160		16			50	4
HLS 2010-200		20			55	4
HLS 2020-100	φ2	10	3	16°	45	4
HLS 2020-160		16			50	4
HLS 2020-200		20			55	4
HLS 2030-100	φ3	10	4.5	16°	45	6
HLS 2030-160		16			60	6
HLS 2030-200		20			60	6

C-CER UT coated 2Flute Long Neck Square

UT COAT 30°

Work Material					
Zirconium	○	Titanium	◎	Cobalt Chrome	◎

Model Number	Outside Diameter	Effective Length	Length of Cut	Shank Taper Angle	Overall Length	Shank Diameter
C-CER 2005-6	φ0.5	6	0.7	16°	45	4
C-CER 2005-8		8			45	4
C-CER 2010-10	φ1	10	1.5	16°	45	4
C-CER 2010-16		16			50	4
C-CER 2010-20		20			55	4
C-CER 2020-10	φ2	10	3	11°	45	4
C-CER 2020-16		16			50	4
C-CER 2020-20		20			55	4
C-CER 2030-10	φ3	10	4.5	11°	45	6
C-CER 2030-16		16			60	6
C-CER 2030-20		20			60	6

DCLS DIA coated 2Flute Long Neck Square

DIA 30°

Work Material					
Zirconium	◎	Titanium	—	Cobalt Chrome	—

Model Number	Outside Diameter	Effective Length	Length of Cut	Shank Taper Angle	Overall Length	Shank Diameter
DCLS 2006-100	φ0.6	10	1.2	16°	45	4
DCLS 2010-100	φ1	10	2	16°	45	4
DCLS 2010-160		16			50	4
DCLS 2010-210		21			55	4
DCLS 2015-100	φ1.5	10	3	16°	45	4
DCLS 2015-160		16			50	4
DCLS 2015-210		21			55	4
DCLS 2020-100	φ2	10	4	16°	50	4
DCLS 2020-160		16			50	4
DCLS 2020-210		21			55	4
DCLS 2030-160	φ3	16	6	16°	70	6
DCLS 2030-320		32			80	6

HRRS-S

Hard MAX coated 4Flute Long Neck Radius

HARD MAX | 45° | R | R ±0.01 φ2～φ6

Work Material					
Zirconium	◎	Titanium	○	Cobalt Chrome	◎

Model Number	Outside Diameter	Corner Radius	Effective Length	Length of Cut	Neck Diameter	Shank Taper Angle	Overall Length	Shank Diameter
HRRS 4020-03-06S	φ2	R0.3	6	2	1.91	16°	45	4
HRRS 4020-05-06S		R0.5					45	4
HRRS 4030-08-09-3S	φ3	R0.8	9	3	2.92	—	50	3
HRRS 4040-05-12S	φ4	R0.5	12	4	3.82	—	50	4
HRRS 4040-10-12S		R1					50	4

CRRS

UT coated 4Flute Long Neck Radius

UT COAT | 45° | R | R ±0.01 φ2～φ6

Work Material					
Zirconium	○	Titanium	◎	Cobalt Chrome	◎

Model Number	Outside Diameter	Corner Radius	Effective Length	Length of Cut	Neck Diameter	Shank Taper Angle	Overall Length	Shank Diameter
CRRS 4020-05-06	φ2	R0.5	6	2	1.91	16°	70	4
CRRS 4030-08-09	φ3	R0.8	9	3	2.92	16°	70	6
CRRS 4040-05-12	φ4	R0.5	12	4	3.82	16°	60	6
CRRS 4040-10-12		R1					70	6

HLRS2000

Hard MAX coated 2Flute Long Neck Radius

HARD MAX | 30° | R | R ±0.005

Work Material					
Zirconium	◎	Titanium	○	Cobalt Chrome	◎

Model Number	Outside Diameter	Corner Radius	Effective Length	Length of Cut	Shank Taper Angle	Overall Length	Shank Diameter
HLRS 2008-005-060	φ0.8	R0.05	6	0.8	16°	50	4
HLRS 2008-005-080			8			50	4
HLRS 2010-005-100	φ1	R0.05	10	1	16°	50	4
HLRS 2010-005-160			16			60	4
HLRS 2010-005-200			20			60	4
HLRS 2010-01-100		R0.1	10	1	16°	50	4
HLRS 2010-01-160			16			60	4
HLRS 2010-01-200			20			60	4
HLRS 2012-02-120	φ1.2	R0.2	12	1.2	16°	55	4
HLRS 2012-02-200			20			60	4
HLRS 2015-005-100	φ1.5	R0.05	10	1.5	16°	50	4
HLRS 2015-01-100		R0.1	10			50	4
HLRS 2015-01-160			16			55	4
HLRS 2015-01-200			20			60	4

Long Neck Radius

Model Number	Outside Diameter	Corner Radius	Effective Length	Length of Cut	Shank Taper Angle	Overall Length	Shank Diameter
HLRS 2020-005-100	φ2	R0.05	10	2	16°	50	4
HLRS 2020-01-100		R0.1	10			50	4
HLRS 2020-01-160			16			60	4
HLRS 2020-01-200			20			60	4
HLRS 2025-01-100	φ2.5	R0.1	10	2.5	16°	50	4
HLRS 2025-01-200			20			60	4
HLRS 2030-01-120	φ3	R0.1	12	3	16°	55	6
HLRS 2030-01-160			16			60	6
HLRS 2030-01-200			20			60	6
HLRS 2030-02-120		R0.2	12	3	16°	55	6
HLRS 2030-02-160			16			60	6
HLRS 2030-02-200			20			60	6

DCLRS

DIA coated 4Flutes Long Neck Radius

DIA | 30° | R | R ±0.01

Work Material					
Zirconium	◎	Titanium	—	Cobalt Chrome	—

Model Number	Outside Diameter	Corner Radius	Effective Length	Length of Cut	Shank Taper Angle	Overall Length	Shank Diameter
DCLRS 4010-002-100	φ1	R0.02	10	2	16°	50	4
DCLRS 4010-002-200			20			60	4
DCLRS 4010-005-100		R0.05	10			50	4
DCLRS 4010-005-200			20			60	4
DCLRS 4015-002-120	φ1.5	R0.02	12	3	16°	55	4
DCLRS 4015-002-200			20			60	4
DCLRS 4015-005-120		R0.05	12			55	4
DCLRS 4015-005-200			20			60	4
DCLRS 4020-005-100	φ2	R0.05	10	4	16°	50	4
DCLRS 4020-005-200			20			60	4
DCLRS 4020-02-100		R0.2	10			50	4
DCLRS 4020-02-200			20			60	4
DCLRS 4020-05-100		R0.5	10			50	4
DCLRS 4020-05-200			20			60	4
DCLRS 4030-005-160	φ3	R0.05	16	6	16°	60	4
DCLRS 4030-005-200			20			60	4
DCLRS 4030-02-160		R0.2	16			60	4
DCLRS 4030-02-200			20			60	4
DCLRS 4030-05-160		R0.5	16			60	4
DCLRS 4030-05-200			20			60	4
DCLRS 4040-02-200	φ4	R0.2	20	8	16°	60	6
DCLRS 4040-02-300			30			80	6
DCLRS 4040-05-200		R0.5	20			60	6
DCLRS 4040-05-300			30			80	6

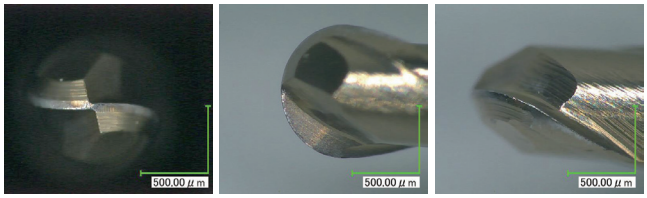
CoCr（Cobalt chrome 27HRC）milling example
Efficiency comparison with different Effective Length

Milling method：Pocket milling
Pocket size：5 x 68 x D1.0
Coolant：Nozzle airblow

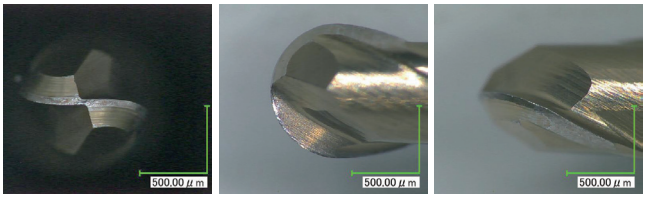
HSLB

tool	Tool size R×Effective Length	Spindle speed (min^{-1})	XY Feed (mm/min)	a_p (mm)	a_e (mm)	Efficiency (mm^3/min)	MRV (mm^3)	Time (min)
HSLB 2010-050	R0.5×5	30,000	1,000	0.1	0.2	20.0	1,360	60
HSLB 2010-100	R0.5×10	21,000	800	0.07	0.2	11.2	1,020	120
HSLB 2010-140	R0.5×14	19,000	650	0.05	0.08	2.6	340	109

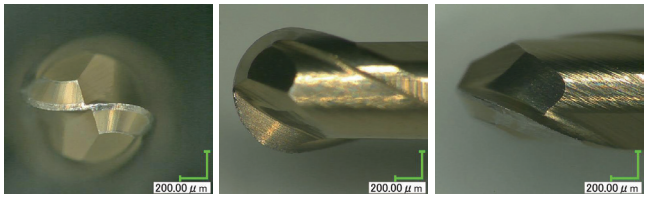
EFL 5 mm after 60 min



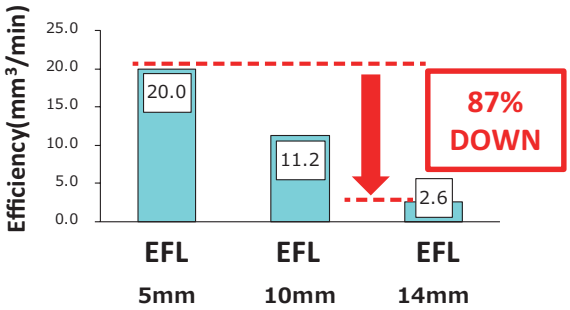
EFL 10 mm after 120 min



EFL 14 mm after 109 min



Efficiency HSLB R0.5

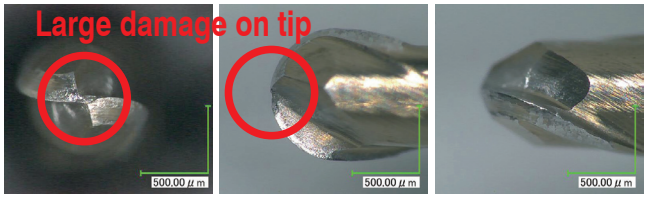


Use a shorter effective length tool you can when milling CoCr.
Efficiency drops greatly with longer EFL tools.

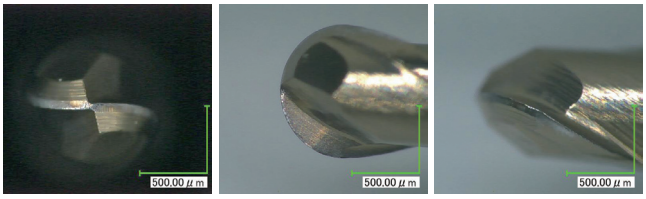
CoCr（Cobalt chrome 27HRC）milling example
Tool life comparison with different parameters

	Tool size R×Effective Length	Spindle speed (min^{-1})	XY Feed (mm/min)	a_p (mm)	a_e (mm)	Efficiency (mm^3/min)	MRV (mm^3)	Time (min)
① HSLB Catalog ～55HRC	R0.5×5	30,000	1,750	0.1	0.3	53	340	8
② **Revised for CoCr**	**R0.5×5**	**30,000**	**1,000**	**0.1**	**0.2**	**20**	**1,360**	**60**

① HSLB Catalog ～55HRC parameter – after 8 min

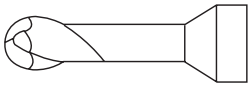


② Revised parameter – after 60 min



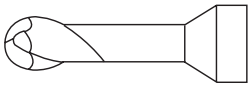
Short tool life when using catalog parameter for CoCr material.
More tool life left after milling 4 pockets – 1,360mm^3 with revised parameter.

Basic Milling Conditions of 2 Flute Long Neck ball（HSLB、DCLB）



Work Material			Zirconium				Titanium			
Radius of Ball Nose	Effective Length	L/D	Spindle Speed	Feed Rate	a_p	a_e	Spindle Speed	Feed Rate	a_p	a_e
R0.5	10	10	33,500	1,500	0.16	0.10	20,000	250	0.015	0.016
	16	16	33,500	1,500	0.12	0.10	14,000	220	0.007	0.015
	20	20	33,500	1,500	0.10	0.10	13,000	200	0.005	0.015
R1	10	5	27,000	1,500	0.46	0.20	30,000	400	0.012	0.024
	16	8	27,000	1,500	0.38	0.20	15,000	350	0.008	0.024
	20	10	27,000	1,500	0.24	0.20	12,000	300	0.007	0.021
R2	10	2.5	13,500	1,750	0.90	0.60	24,000	1,000	0.020	0.040
	16	4	13,500	1,750	0.70	0.60	18,000	700	0.016	0.033
	20	5	13,500	1,750	0.65	0.60	15,000	500	0.011	0.033
R3	10	1.7	9,000	1,400	1.80	0.90	16,000	900	0.025	0.050
	15	2.5	9,000	1,400	1.20	0.90	16,000	700	0.230	0.046
	20	3.3	9,000	1,400	0.90	0.90	16,000	600	0.015	0.045

Basic Milling Conditions of 3 Flute Long Neck ball（CFLB）



Work Material			Zirconium				Titanium			
Radius of Ball Nose	Effective Length	L/D	Spindle Speed	Feed Rate	a_p	a_e	Spindle Speed	Feed Rate	a_p	a_e
R0.5	4	4	—	—	—	—	20,000	1,500	0.025	0.15
	6	6	—	—	—	—	20,000	1,500	0.020	0.14
	8	8	—	—	—	—	16,800	1,200	0.015	0.12
R1	10	5	—	—	—	—	18,000	3,000	0.10	0.43
	14	7	—	—	—	—	10,800	1,600	0.06	0.34
	16	8	—	—	—	—	8,400	1,200	0.05	0.34
R2	12	3	—	—	—	—	12,000	4,000	0.20	0.87
	16	4	—	—	—	—	10,800	3,600	0.20	0.87
	20	5	—	—	—	—	9,000	3,000	0.20	0.87
R3	20	3.3	—	—	—	—	8,000	4,000	0.30	1.30
	30	5	—	—	—	—	6,000	3,000	0.30	1.30
	40	6.6	—	—	—	—	4,000	2,000	0.20	1.05

※ This milling conditions is for reference.
Please coordinate it by a tool model type and cutting conditions.

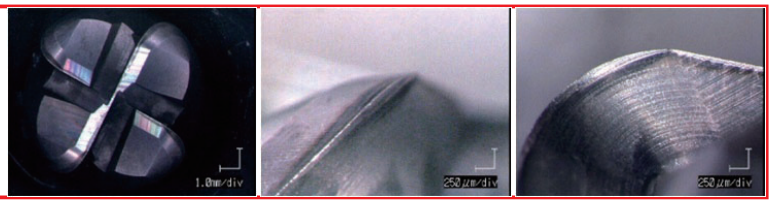
Titanium（Ti-6AL-4V）milling example 4 Flute Radius CRRS

Milling method：Pocket milling
Pocket size：70x 44 x 13
Coolant：Water soluble

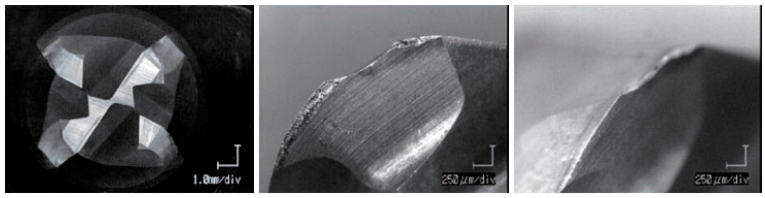
S=1,820 min^{-1}
Vf=700 mm/min
Sz=0.096 mm/t
a_p=0.5 mm a_e=5mm

CRRS ϕ10×CR2

CRRS
60 min

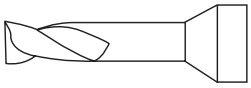


Competitor
30 min



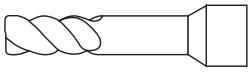
CRRS tool life is longer than competitor.

Basic Milling Conditions of 2 Flute Long Neck Square（HLS、C-CER）



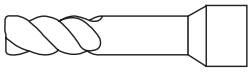
Work Material			Zirconium				Titanium			
Outside Diameter	Effective Length	L/D	Spindle Speed	Feed Rate	a_p	a_e	Spindle Speed	Feed Rate	a_p	a_e
φ0.5	10	20	34,000	200	0.002～0.003	0.005	32,300	180	0.001～0.002	0.005
	15	30	34,000	150	0.001～0.002	0.003	24,100	80	0.001	0.003
φ1	10	10	22,100	530	0.005～0.008	0.013	16,200	400	0.009～0.014	0.013
	16	16	14,300	300	0.002～0.003	0.003	12,100	230	0.003～0.006	0.003
	20	20	12,500	200	0.001～0.002	0.002	10,600	160	0.003～0.004	0.002
φ2	10	5	21,000	1,680	0.013～0.022	0.200	12,600	700	0.040～0.067	0.200
	16	8	19,500	1,230	0.007～0.013	0.049	9,400	470	0.024～0.039	0.049
	20	10	16,500	750	0.004～0.007	0.025	8,100	380	0.016～0.027	0.025
φ3	10	3.3	23,000	2,500	0.027～0.046	1.013	9,600	930	0.083～0.138	1.013
	16	5	22,000	2,200	0.019～0.032	0.247	7,400	670	0.058～0.096	0.247
	20	6.7	17,000	1,800	0.015～0.025	0.127	6,600	560	0.045～0.075	0.127

Basic Milling Conditions of 2 Flute Long Neck Radius（HLRS）



Work Material			Zirconium				Titanium			
Outside Diameter	Effective Length	L/D	Spindle Speed	Feed Rate	a_p	a_e	Spindle Speed	Feed Rate	a_p	a_e
φ0.8	6	7.5	8,500	300	0.004	0.108	23,000	250	0.02	0.108
	8	10	7,600	200	0.002	0.090	22,000	200	0.018	0.090
φ1	10	10	5,400	320	0.006	0.126	19,500	250	0.030	0.126
	16	16	4,300	190	0.002	0.027	16,000	200	0.025	0.027
	20	20	3,900	130	0.001	0.018	15,000	180	0.020	0.018
φ1.2	12	10	4,500	638	0.004	0.072	15,000	300	0.030	0.072
	20	16.6	3,500	220	0.002	0.018	13,000	200	0.020	0.018
φ1.5	10	6.6	6,000	850	0.023	0.288	13,000	300	0.040	0.288
	16	10.6	4,700	580	0.011	0.180	12,300	250	0.035	0.180
	20	13.3	4,200	460	0.003	0.108	11,600	200	0.030	0.108
φ2	10	5	7,600	1,130	0.028	0.585	10,000	350	0.060	0.585
	16	8	5,900	900	0.023	0.315	9,000	300	0.050	0.315
	20	10	5,300	840	0.014	0.198	8,000	250	0.040	0.198
φ2.5	10	4	8,400	1,540	0.048	0.540	7,500	350	0.070	0.540
	20	8	6,300	910	0.022	0.225	7,000	250	0.060	0.225
φ3	12	4	9,000	2,000	0.075	0.670	6,500	400	0.070	0.670
	16	5.3	7,900	1,730	0.054	0.630	6,000	350	0.060	0.630
	20	6.6	7,100	1,500	0.044	0.600	5,000	300	0.050	0.600

Basic Milling Conditions of 4 Flute Long Neck Radius（HRRS-S、CRRS）



Work Material			Zirconium				Titanium			
Outside Diameter	Effective Length	Corner Radius	Spindle Speed	Feed Rate	a_p	a_e	Spindle Speed	Feed Rate	a_p	a_e
φ2	6	R0.3	30,000	7,200	0.04	0.66	30,000	7,200	0.08	0.80
	6	R0.5	30,000	7,200	0.04	0.66	30,000	8,400	0.09	1.20
φ3	9	R0.8	20,000	7,200	0.04	1.08	20,000	8,400	0.09	1.20
φ4	12	R0.5	15,000	7,200	0.05	1.32	15,000	9,600	0.10	1.60
	12	R1	15,000	7,200	0.05	1.53	15,000	9,600	0.11	1.60

Zirconium disc（Zirconium t14 non-sintered）milled with HSLB

Work Size ϕ95mm

HSLB

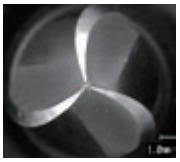
Process	Tool	Tool size	Spindle speed (min^{-1})	XY Feed (mm/min)	a_p (mm)	a_e (mm)
Roughing	HSLB 2020-200	R1×20	25,000	2,500	1.2	0.8
Finishing	HSLB 2020-140	R1×14		2,500	0.15	0.2
Rest Roughing	HSLB 2010-200	R0.5×20		2,500	0.5	0.35
Rest Finishing	HSLB 2010-140	R0.5×14		2,500	0.15	0.2
Prep-line-Finishing	HSLB 2010-140	R0.5×14		1,200	0.05	0.2
Inside-prep-Finishing	HSLB 2010-140	R0.5×14		1,200	0.13	0.2

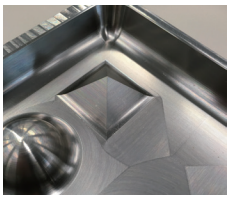
Titanium（Ti-6AL-4V）milling example 3 Flute Long Neck Ball CFLB

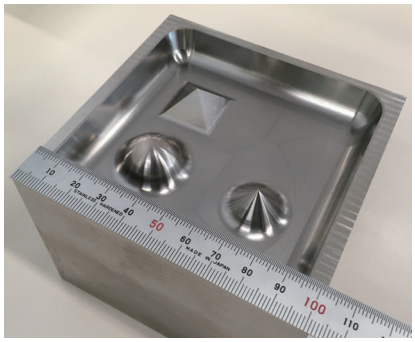
Pocket size：90 x 90 x 12
Coolant：Water soluble

CFLB R3

	Spindle speed (min^{-1})	XY Feed (mm/min)	a_p (mm)	a_e (mm)	Time (min)
Roughing	9,600	3,200	0.1	2.4	15.0
Semi Finishing	20,000	2,000	0.1	0.2	43.0
Finishing	20,000	2,000	0.1	0.2	43.0







Smooth cutting surface

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.

UNION TOOL CO.
http://www.uniontool.co.jp

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