

Tungsten Carbide End Mills UNIMAX Series

Vol. 4

4 Flutes Highly Efficient End Mills with Variable Pitch and Helix

Total 36 Models

Add 6

CXES

UTCOCAT Square End Mills

Total 33 Models

Add 11

CXS

UTCOCAT Long Neck Square End Mills

Total 30 Models

NEW

CXERS

UTCOCAT Radius End Mills



UNION TOOL CO.



Size $\varnothing 1 \sim \varnothing 16$

CXES



Additional 6 Models

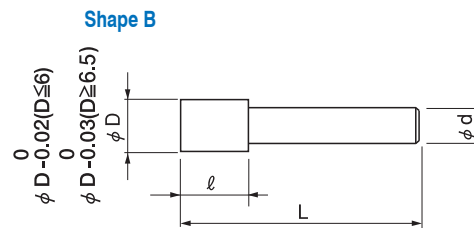
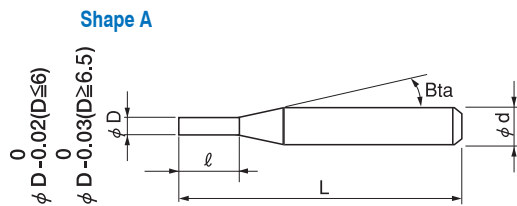
Material Applications (☆ Highly Recommended ◎ Recommended ○ Suggested)

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

- Variable Division & Helix design minimizes vibration and chattering.
- Selected high toughness and chip resistant carbide material.
- Optimized flute design offers outstanding high efficiency milling and fine finishing.
- Low friction coating resulting in excellent chip evacuation and resistance to wear.

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.



Total 36 models

Unit (mm)

Model Number	Outside Diameter $\varnothing D$	Length of Cut ℓ	Shank Taper Angle B_{ta}	Overall Length L	Shank Diameter $\varnothing d$	Shape	Price ¥
CXES 4010-0250	1	2.5	16°	50	4	A	6,520
CXES 4015-0375	1.5	3.75	16°	50	4	A	6,520
CXES 4020-0500	2	5	16°	50	4	A	6,100
CXES 4025-0625	2.5	6.25	16°	50	4	A	6,100
CXES 4030-0750	3	7.5	16°	50	6	A	7,000
CXES 4030-0900		9		60	6	A	7,700
CXES 4035-0900	3.5	9	16°	60	6	A	8,270
CXES 4040-1000	4	10	16°	50	6	A	7,350
CXES 4040-1200		12		60	6	A	8,090
CXES 4040-1600		16		60	6	A	8,900
CXES 4045-1150	4.5	11.5	16°	60	6	A	8,840

* Additional model

UTCOAT 4 Flutes Highly Efficient Square End Mills with Variable Pitch and Helix

Model Number	Outside Diameter Ø D	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter Ø d	Shape	Price ¥
CXES 4050-1250	5	12.5	16°	50	6	A	7,900
CXES 4050-1500		15		60	6	A	8,690
CXES 4050-2000		20		60	6	A	9,560
CXES 4055-1400	5.5	14	16°	60	6	A	9,120
CXES 4060-1500	6	15	-	50	6	A	8,500
CXES 4060-1800		18		60	6	A	9,350
CXES 4060-2400		24		70	6	A	10,760
CXES 4065-1650	6.5	16.5	16°	60	8	A	11,970
CXES 4070-1050	7	10.5	-	100	6	B	14,880
CXES 4075-1900	7.5	19	16°	60	8	A	11,970
CXES 4080-2000	8	20	-	60	8	A	10,500
CXES 4080-2400		24		70	8	A	11,550
CXES 4080-3200		32		80	8	A	15,600
CXES 4085-2150	8.5	21.5	16°	70	10	A	13,870
CXES 4090-1350	9	13.5	-	140	8	B	19,390
CXES 4095-2400	9.5	24	16°	70	10	A	13,870
CXES 4100-2500	10	25	-	70	10	A	12,500
CXES 4100-3000		30		80	10	A	13,750
CXES 4100-4000		40		90	10	A	18,570
CXES 4110-1650	11	16.5	-	150	10	B	24,200
CXES 4120-3000	12	30	-	90	12	A	17,800
CXES 4120-3600		36		100	12	A	19,580
CXES 4120-4800		48		110	12	A	26,440
CXES 4130-1950	13	19.5	-	160	12	B	30,390
CXES 4160-4000	16	40	-	110	16	A	54,150

* Additional model

CXES Milling Conditions

Side Milling

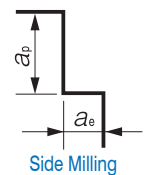
WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)				ALLOY STEELS SK / SCM Annealed Materials (225~325HB)				STAINLESS STEELS SUS304 Use water soluble or oil coolant.			
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)
4010-0250	1	2.5	18,000	620	2.5	0.2	18,000	460	2.5	0.2	14,500	320	2.5	0.1
4015-0375	1.5	3.75	13,500	770	3.75	0.3	13,500	570	3.75	0.3	13,300	340	3.75	0.15
4020-0500	2	5	11,000	930	5	0.4	11,000	690	5	0.4	12,200	360	5	0.2
4025-0625	2.5	6.25	9,500	1,060	6.25	0.5	9,500	800	6.25	0.5	11,000	490	6.25	0.25
4030-0750	3	7.5	8,500	1,200	7.5	0.6	8,500	900	7.5	0.6	10,000	640	7.5	0.3
4030-0900		9	8,500	1,200* 1	9	0.3	8,500	900* 1	9	0.3	9,100	580* 1	9	0.15
4035-0900	3.5	9	7,800	1,250	9	0.7	7,500	950	9	0.7	8,600	680	9	0.35
4040-1000	4	10	7,200	1,350	10	0.8	6,700	1,000	10	0.8	7,500	730	10	0.4
4040-1200		12	7,200	1,350* 1	12	0.4	6,700	1,000* 1	12	0.4	6,600	640* 1	12	0.2
4040-1600		16	7,200	1,350* 2	16	0.08	6,700	1,000* 2	16	0.08	4,800	460* 2	16	0.08
4045-1150	4.5	11.5	6,550	1,400	11.5	0.9	6,000	1,050	11.5	0.9	6,300	770	11.5	0.45
4050-1250	5	12.5	6,000	1,500	12.5	1	5,400	1,100	12.5	1	5,400	810	12.5	0.5
4050-1500		15	6,000	1,500* 1	15	0.5	5,400	1,100* 1	15	0.5	4,600	690* 1	15	0.25
4050-2000		20	6,000	1,500* 2	20	0.1	5,400	1,100* 2	20	0.1	3,700	450* 2	20	0.1
4055-1400	5.5	14	5,450	1,550	14	1.1	4,900	1,150	14	1.1	4,900	810	14	0.55
4060-1500	6	15	5,000	1,600	15	1.2	4,500	1,200	15	1.2	4,500	810	15	0.6
4060-1800		18	5,000	1,600* 1	18	0.6	4,500	1,200* 1	18	0.6	3,700	660* 1	18	0.3
4060-2400		24	5,000	1,400* 2	24	0.12	4,500	1,050* 2	24	0.12	2,900	360* 2	24	0.12
4065-1650	6.5	16.5	4,400	1,500	16.5	1.3	3,950	1,150	16.5	1.3	3,950	780	16.5	0.65
4070-1050	7	10.5	3,900	1,450* 1	10.5	0.7	3,550	1,120* 1	10.5	0.7	3,550	760* 1	10.5	0.35
4075-1900	7.5	19	3,500	1,400	19	1.5	3,250	1,100	19	1.5	3,250	750	19	0.75
4080-2000	8	20	3,000	1,300	20	1.6	2,900	1,050	20	1.6	2,900	720	20	0.8
4080-2400		24	2,800	1,230* 1	24	0.8	2,600	1,050* 1	24	0.8	2,600	600* 1	24	0.4
4080-3200		32	2,400	1,090* 2	32	0.16	2,000	800* 2	32	0.16	2,100	360* 2	32	0.16
4085-2150	8.5	21.5	2,550	1,200	21.5	1.7	2,450	1,000	21.5	1.7	2,450	680	21.5	0.85
4090-1350	9	13.5	2,250	1,150* 1	13.5	0.9	2,150	980* 1	13.5	0.9	2,150	650* 1	13.5	0.45
4095-2400	9.5	24	1,950	1,050	24	1.9	1,900	950	24	1.9	1,900	620	24	0.95
4100-2500	10	25	1,600	1,000	25	2	1,500	900	25	2	1,500	580	25	1
4100-3000		30	1,500	900* 1	30	1	1,500	850* 1	30	1	1,500	580* 1	30	0.5
4100-4000		40	1,300	800* 2	40	0.2	1,500	750* 2	40	0.2	1,500	580* 2	40	0.2
4110-1650	11	16.5	1,400	900* 1	16.5	1.1	1,350	830* 1	16.5	1.1	1,350	560* 1	16.5	0.55
4120-3000	12	30	1,200	800	30	2.4	1,200	750	30	2.4	1,200	540	30	1.2
4120-3600		36	1,150	750* 1	36	1.2	1,150	720* 1	36	1.2	1,150	540* 1	36	0.6
4120-4800		48	1,050	700* 2	48	0.24	1,050	660* 2	48	0.24	1,050	500* 2	48	0.24
4130-1950	13	19.5	1,100	650* 1	19.5	1.3	1,100	600* 1	19.5	1.3	1,000	460* 1	19.5	0.65
4160-4000	16	40	1,000	500	40	3.2	1,000	440	40	3.2	720	340	40	1.6
Milling Amount (mm)			a _p : All Flute a _e : 0.2D * 1 a _e : 0.1D * 2 a _e : 0.02D				a _p : All Flute a _e : 0.2D * 1 a _e : 0.1D * 2 a _e : 0.02D				a _p : All Flute a _e : 0.1D * 1 a _e : 0.05D * 2 a _e : 0.02D			

CXES Milling Conditions

Side Milling

WORK MATERIAL			PREHARDENED STEELS HPM / NAK (30~45HRC)				HARDENED STEELS SKD / SKT / STAVAX (45~55HRC)			
Model Number	Outside Diameter (mm)	Length of Cut (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)
4010-0250	1	2.5	12,900	320	2.5	0.2	12,900	180* 1	2.5	0.05
4015-0375	1.5	3.75	10,500	390	3.75	0.3	9,300	280* 1	3.75	0.08
4020-0500	2	5	9,350	450	5	0.4	7,600	390* 1	5	0.1
4025-0625	2.5	6.25	8,300	540	6.25	0.5	6,500	510* 1	6.25	0.13
4030-0750	3	7.5	7,400	630	7.5	0.6	5,900	500	7.5	0.3
4030-0900		9	7,050	630* 1	9	0.3	5,900	500* 1	9	0.15
4035-0900	3.5	9	6,500	640	9	0.7	5,200	510	9	0.35
4040-1000	4	10	5,900	650	10	0.8	4,700	520	10	0.4
4040-1200		12	5,500	650* 1	12	0.4	4,700	520* 1	12	0.2
4040-1600		16	4,700	580* 2	16	0.08	4,700	520* 2	16	0.04
4045-1150	4.5	11.5	5,300	660	11.5	0.9	4,250	520	11.5	0.45
4050-1250	5	12.5	4,800	680	12.5	1	3,850	530	12.5	0.5
4050-1500		15	4,400	680* 1	15	0.5	3,850	530* 1	15	0.25
4050-2000		20	3,600	580* 2	20	0.1	3,850	530* 2	20	0.05
4055-1400	5.5	14	4,350	680	14	1.1	3,500	530	14	0.55
4060-1500	6	15	4,000	680	15	1.2	3,200	540	15	0.6
4060-1800		18	3,600	680* 1	18	0.6	3,200	540* 1	18	0.3
4060-2400		24	2,800	560* 2	24	0.12	3,200	540* 2	24	0.06
4065-1650	6.5	16.5	3,500	660	16.5	1.3	2,850	530	16.5	0.65
4070-1050	7	10.5	3,150	640* 1	10.5	0.7	2,550	520* 1	10.5	0.35
4075-1900	7.5	19	2,850	620	19	1.5	2,250	510	19	0.75
4080-2000	8	20	2,500	600	20	1.6	2,000	500	20	0.8
4080-2400		24	2,350	600* 1	24	0.8	2,150	500* 1	24	0.4
4080-3200		32	2,050	530* 2	32	0.16	2,150	400* 2	32	0.08
4085-2150	8.5	21.5	2,150	550	21.5	1.7	1,700	490	21.5	0.85
4090-1350	9	13.5	1,950	520* 1	13.5	0.9	1,500	480* 1	13.5	0.45
4095-2400	9.5	24	1,750	480	24	1.9	1,350	470	24	0.95
4100-2500	10	25	1,500	430	25	2	1,200	450	25	1
4100-3000		30	1,500	430* 1	30	1	1,200	450* 1	30	0.5
4100-4000		40	1,500	430* 2	40	0.2	1,200	450* 2	40	0.1
4110-1650	11	16.5	1,250	380* 1	16.5	1.1	1,060	430* 1	16.5	0.55
4120-3000	12	30	1,000	320	30	2.4	960	420	30	1.2
4120-3600		36	1,000	320* 1	36	1.2	930	400* 1	36	0.6
4120-4800		48	1,000	320* 2	48	0.24	870	360* 2	48	0.12
4130-1950	13	19.5	1,000	260* 1	19.5	1.3	890	350* 1	19.5	0.65
4160-4000	16	40	1,000	220	40	3.2	720	280	40	1.6

Milling Amount (mm)	a_p : All Flute	a_p : All Flute
	a_e : 0.2D ☒ 1 a_e : 0.1D ☒ 2 a_e : 0.02D	a_e : 0.1D ☒ 1 a_e : 0.05D ☒ 2 a_e : 0.01D



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

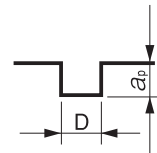
CXES Milling Conditions

Slotting

WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)			ALLOY STEELS SK / SCM Annealed Materials (225~325HB)			STAINLESS STEELS SUS304 Use water soluble or oil coolant.		
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)
4010-0250	1	2.5	18,000	200	1	18,000	200	1	14,500	220	0.5
4015-0375	1.5	3.75	13,500	320	1.5	13,500	280	1.5	13,300	240	0.75
4020-0500	2	5	11,000	460	2	11,000	320	2	12,200	260	1
4025-0625	2.5	6.25	9,500	540	2.5	9,500	360	2.5	11,000	310	1.25
4030-0750	3	7.5	8,500	600	3	8,500	400	3	10,000	360	1.5
4030-0900		9	8,500	550	3	8,500	360	3	9,100	310	1.5
4035-0900	3.5	9	7,800	620	3.5	7,500	420	3.5	8,600	380	1.75
4040-1000	4	10	7,200	650	4	6,700	450	4	7,500	400	2
4040-1200		12	7,200	580	4	6,700	400	4	6,600	320	2
4040-1600		16	7,200	440*	2	6,700	300*	2	4,800	200*	1
4045-1150	4.5	11.5	6,550	670	4.5	6,000	470	4.5	6,300	430	2.25
4050-1250	5	12.5	6,000	700	5	5,400	500	5	5,400	460	2.5
4050-1500		15	6,000	600	5	5,400	430	5	4,600	350	2.5
4050-2000		20	6,000	400*	2.5	5,400	290*	2.5	3,000	170*	1.25
4055-1400	5.5	14	5,450	700	5.5	4,900	500	5.5	4,900	460	2.75
4060-1500	6	15	5,000	700	6	4,500	500	6	4,500	460	3
4060-1800		18	5,000	560	6	4,500	410	6	3,700	320	3
4060-2400		24	5,000	280*	3	4,500	230*	3	2,100	150*	1.5
4065-1650	6.5	16.5	4,400	650	6.5	3,950	450	6.5	3,950	420	3.25
4070-1050	7	10.5	3,900	300	7	3,550	200	7	3,550	200	3.5
4075-1900	7.5	19	3,500	550	7.5	3,250	380	7.5	3,250	380	3.75
4080-2000	8	20	3,000	500	8	2,900	360	8	2,900	360	4
4080-2400		24	2,800	330	8	2,600	260	8	2,600	240	4
4080-3200		32	2,400	230*	4	2,000	180*	4	2,000	130*	2
4085-2150	8.5	21.5	2,550	450	8.5	2,450	330	8.5	2,450	310	4.25
4090-1350	9	13.5	2,250	210	9	2,150	160	9	2,150	140	4.5
4095-2400	9.5	24	1,950	400	9.5	1,900	300	9.5	1,900	250	4.75
4100-2500	10	25	1,600	380	10	1,500	270	10	1,500	220	5
4100-3000		30	1,500	250	10	1,500	180	10	1,500	190	5
4100-4000		40	1,300	180*	5	1,500	150*	5	1,500	130*	2.5
4110-1650	11	16.5	1,400	170	11	1,350	120	11	1,350	100	5.5
4120-3000	12	30	1,200	300	12	1,200	210	12	1,200	180	6
4120-3600		36	1,150	200	12	1,150	140	12	1,150	150	6
4120-4800		48	1,050	160*	6	1,050	120*	6	1,050	100*	3
4130-1950	13	19.5	1,100	190	13	1,100	90	13	1,000	80	6.5
4160-4000	16	40	1,000	400*	8	1,000	280*	8	720	240*	4
Milling Amount (mm)			a _p : 1D * a _p : 0.5D			a _p : 1D * a _p : 0.5D			a _p : 0.5D * a _p : 0.25D		

Slotting

WORK MATERIAL			PREHARDENED STEELS HPM / NAK (30~45HRC)			HARDENED STEELS SKD / SKT / STAVAX (45~55HRC)		
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)
4010-0250	1	2.5	12,900	130	1	12,900	50*	0.3
4015-0375	1.5	3.75	10,500	180	1.5	10,500	100*	0.45
4020-0500	2	5	9,350	220	2	9,350	150*	0.6
4025-0625	2.5	6.25	8,300	270	2.5	8,300	240*	0.75
4030-0750	3	7.5	7,400	320	3	7,400	360	1.5
4030-0900		9	7,050	270	3	N/A	N/A	N/A
4035-0900	3.5	9	6,500	350	3.5	6,500	370	1.75
4040-1000	4	10	5,900	390	4	5,900	380	2
4040-1200		12	5,500	300	4	N/A	N/A	N/A
4040-1600		16	4,700	160* 2	2	N/A	N/A	N/A
4045-1150	4.5	11.5	5,300	410	4.5	5,300	390	2.25
4050-1250	5	12.5	4,800	440	5	4,800	410	2.5
4050-1500		15	4,400	320	5	N/A	N/A	N/A
4050-2000		20	3,600	160* 2	2.5	N/A	N/A	N/A
4055-1400	5.5	14	4,350	440	5.5	4,350	420	2.75
4060-1500	6	15	4,000	440	6	4,000	440	3
4060-1800		18	3,600	290	6	N/A	N/A	N/A
4060-2400		24	2,800	140* 2	3	N/A	N/A	N/A
4065-1650	6.5	16.5	3,500	420	6.5	3,500	400	3.25
4070-1050	7	10.5	3,150	190	7	3,150	190	3.5
4075-1900	7.5	19	2,850	400	7.5	2,850	370	3.75
4080-2000	8	20	2,500	390	8	2,500	340	4
4080-2400		24	2,350	200	8	N/A	N/A	N/A
4080-3200		32	2,050	110* 2	4	N/A	N/A	N/A
4085-2150	8.5	21.5	2,150	330	8.5	2,150	300	4.25
4090-1350	9	13.5	1,950	150	9	1,950	140	4.5
4095-2400	9.5	24	1,750	270	9.5	1,750	270	4.75
4100-2500	10	25	1,500	220	10	1,500	240	5
4100-3000		30	1,500	180* 1	8	N/A	N/A	N/A
4100-4000		40	1,200	90* 2	5	N/A	N/A	N/A
4110-1650	11	16.5	1,250	100	11	1,350	110	5.5
4120-3000	12	30	1,000	180	12	1,200	220	6
4120-3600		36	1,000	140* 1	9.6	N/A	N/A	N/A
4120-4800		48	800	70* 2	6	N/A	N/A	N/A
4130-1950	13	19.5	1,000	80	13	1,100	90	6.5
4160-4000	16	40	1,000	240* 2	8	1,000	220*	4.8
Milling Amount (mm)			a _p : 1D * 1 a _p : 0.8D * 2 a _p : 0.5D			* a _p : 0.5D * a _p : 0.3D		



Slotting
a_p : Axial Depth (mm)
D : Outside Diameter (mm)

Note:

- Decrease both spindle speed and feed rate proportionally in case of chattering.
- These milling parameters are calculated based on the shortest overhang length. Longer overhangs may require an adjustment to the milling parameters.
- Reduce the milling amount and feed rate in accordance with required milling precision.
- Every coolant offers stable milling.
- Recommend water soluble or oil coolant for Stainless Steels and Copper.

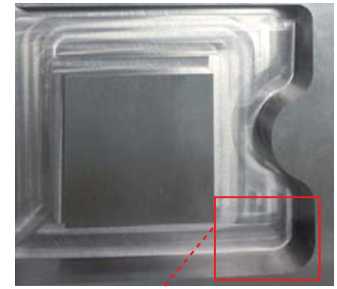
Milling Example CXES Ø10

S55C

Roughing and finishing with a single tool

Size : 105 × 92 × 20 mm

Tool	Roughing		Finishing	
	Conventional 4 Flutes	CXES 4100-2500	CXES 4100-2500	
Milling Part	Side / Groove		Bottom	Side
Spindle Speed	2,600 min ⁻¹	2,500 min ⁻¹	1,600 min ⁻¹	
Feed Rate	525 mm/min	1,500 mm/min	380 mm/min	1,000 mm/min
Axial Depth a_p	20 mm	19.9 mm	0.1 mm	0.1 mm
Radial Depth a_e	0.7 mm	1.2 mm	0.4 mm	0.1 mm
Coolant	Oil		Oil	
Milling Distance	*	11.5 m	1.5 m	0.7 m
Efficiency *	1	4.8	*	



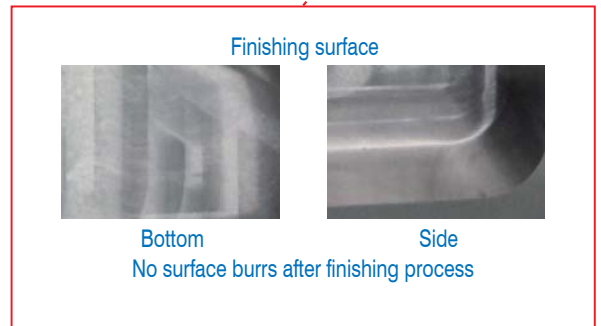
Enlarged view

Efficiency : Feed Rate Axial Depth × Radial Depth

4.8 times milling efficiency compared to conventional 4 flutes when roughing



Total Milling Distance 21m



Finishing surface



Bottom



Side

No surface burrs after finishing process

Milling Example CXES Ø6

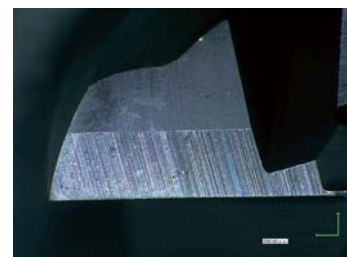
SUS304

Tool	CXES 4060-1500	
Milling Method	Roughing	Finishing
Spindle Speed	4,500 min ⁻¹	4,500 min ⁻¹
Feed Rate	810 mm/min	400 mm/min
Axial Depth a_p	15 mm	15 mm
Radial Depth a_e	0.6 mm	2.5 mm (0.1 mm Standing Wall Finishing Allowance)
Overhang Length	20 mm	20 mm
Coolant	Water Soluble(Through Spindle)	Water Soluble(Through Spindle)
Cycle Time	1:11:29	0:18:43

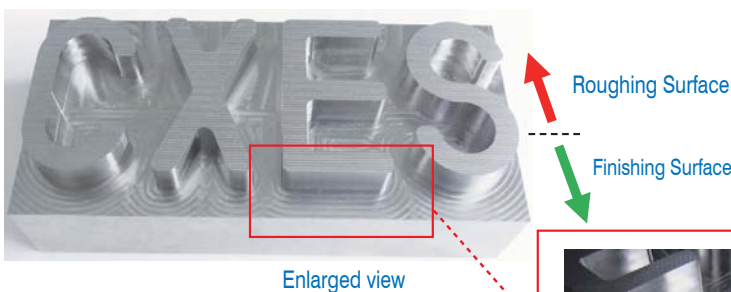
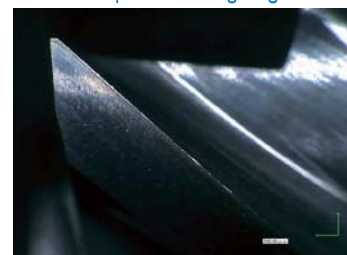
CXES milling video



Tool Wearing after Roughing Process
End Profile



Peripheral Cutting Edge



Enlarged view



Smooth Side Finishing



Size $\phi 1 \sim \phi 12$

CXS



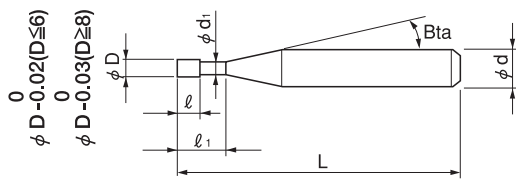
Additional 11 Models

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

- Variable Division & Helix design minimizes vibration and chattering.
- Selected high toughness and chip resistant carbide material.
- Optimized flute design offers outstanding high efficiency milling and fine finishing.
- Low friction coating resulting in excellent chip evacuation and resistance to wear.



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.

Total 33 models

Unit (mm)

Model Number	Outside Diameter ØD	Effective Length ℓ ₁	Length of Cut ℓ	Neck Diameter Ød ₁	Shank Taper Angle Bta	Overall Length L	Shank Diameter Ød	Price ¥	Effective Length by Inclined Angles				
									30'	1°	1°30'	2°	3°
CXS4010-030	1	3	1.5	0.96	16°	50	4	6,520	3.25	3.35	3.47	3.59	3.86
* CXS4010-050		5				70	4	6,920	5.31	5.48	5.67	5.87	6.31
CXS4010-060		6				70	4	7,110	6.34	6.55	6.77	7.00	7.53
CXS4015-045	1.5	4.5	2.25	1.46	16°	50	4	6,520	4.66	4.81	4.97	5.15	5.53
* CXS4015-070		7				70	4	6,920	7.23	7.47	7.72	7.99	8.59
CXS4015-085		8.5				70	4	7,110	8.78	9.07	9.37	9.70	10.43
CXS4020-060	2	6	3	1.94	16°	50	4	6,100	6.24	6.44	6.66	6.89	7.41
* CXS4020-090		9				70	4	6,480	9.33	9.64	9.96	10.31	11.08
CXS4020-110		11				70	4	6,650	11.40	11.77	12.16	12.59	13.53
CXS4025-075	2.5	7.5	3.75	2.44	16°	50	4	6,100	7.79	8.04	8.31	8.60	9.25
* CXS4025-110		11				70	4	6,480	11.40	11.77	12.16	12.59	13.53
CXS4025-135		13.5				70	4	6,650	13.97	14.43	14.91	15.43	No Interference
CXS4030-090	3	9	4.5	2.95	16°	50	6	7,000	9.34	9.64	9.97	10.31	11.09
* CXS4030-130		13				70	6	7,430	13.46	13.90	14.37	14.87	15.98
CXS4030-160		16				70	6	7,630	16.56	17.10	17.67	18.28	19.65

* Additional model

UTCOAT 4 Flutes Highly Efficient Long Neck Square End Mills with Variable Pitch and Helix

Model Number	Outside Diameter ØD	Effective Length l_1	Length of Cut l	Neck Diameter Ød ₁	Shank Taper Angle Beta	Overall Length L	Shank Diameter Ød	Price ¥	Effective Length by Inclined Angles				
									30'	1°	1°30'	2°	3°
* CXS4040-120	4	12	6	3.86	16°	50	6	7,350	12.61	13.02	13.46	13.92	14.97
CXS4040-170		17				70	6	7,800	17.76	18.34	18.96	19.62	No Interference
CXS4040-210		21				70	6	8,010	21.89	22.60	23.36	24.17	No Interference
* CXS4050-150	5	15	7.5	4.86	16°	50	6	7,900	15.70	16.21	16.76	No Interference	No Interference
CXS4050-210		21				70	6	8,380	21.89	22.60	No Interference	No Interference	No Interference
CXS4050-260		26				70	6	8,610	27.05	27.93	No Interference	No Interference	No Interference
* CXS4060-180	6	18	9	5.86	8°	50	6	8,500	No Interference	No Interference	No Interference	No Interference	No Interference
CXS4060-260		26				70	6	9,020	No Interference	No Interference	No Interference	No Interference	No Interference
CXS4060-320		32				70	6	9,270	No Interference	No Interference	No Interference	No Interference	No Interference
* CXS4080-240	8	24	12	7.82	8°	60	8	10,500	No Interference	No Interference	No Interference	No Interference	No Interference
CXS4080-340		34				90	8	11,140	No Interference	No Interference	No Interference	No Interference	No Interference
CXS4080-420		42				90	8	11,450	No Interference	No Interference	No Interference	No Interference	No Interference
* CXS4100-300	10	30	15	9.82	8°	70	10	12,500	No Interference	No Interference	No Interference	No Interference	No Interference
CXS4100-420		42				100	10	13,270	No Interference	No Interference	No Interference	No Interference	No Interference
CXS4100-520		52				100	10	13,630	No Interference	No Interference	No Interference	No Interference	No Interference
* CXS4120-360	12	36	18	11.82	8°	90	12	17,800	No Interference	No Interference	No Interference	No Interference	No Interference
CXS4120-520		52				110	12	18,880	No Interference	No Interference	No Interference	No Interference	No Interference
CXS4120-620		62				110	12	19,400	No Interference	No Interference	No Interference	No Interference	No Interference

* Additional model

CXS Milling Conditions

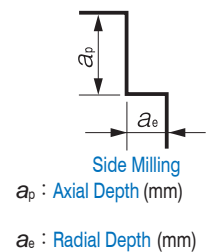
Side Milling

WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)				ALLOY STEELS SK / SCM Annealed Materials (225~325HB)				STAINLESS STEELS SUS304 Use water soluble or oil coolant.			
Model Number	Outside Diameter (mm)	Effective Length (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)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)
4010-030	1	3	18,000	780	1	0.3	18,000	600	1	0.3	14,500	400	1	0.3
4010-050		5	18,000	780	1	0.23	15,330	520	1	0.23	12,570	350	1	0.23
4010-060		6	18,000	780	1	0.2	14,000	480	1	0.2	11,600	320	1	0.2
4015-045	1.5	4.5	13,500	970	1.5	0.45	13,500	750	1.5	0.45	13,300	420	1.5	0.45
4015-070		7	13,500	970	1.5	0.36	11,810	660	1.5	0.36	11,610	360	1.5	0.36
4015-085		8.5	13,500	970	1.5	0.3	10,800	600	1.5	0.3	10,600	330	1.5	0.3
4020-060	2	6	11,000	1,170	2	0.6	11,000	900	2	0.6	12,200	450	2	0.6
4020-090		9	11,000	1,170	2	0.48	9,680	790	2	0.48	10,730	400	2	0.48
4020-110		11	11,000	1,170	2	0.4	8,800	720	2	0.4	9,750	360	2	0.4
4025-075	2.5	7.5	9,500	1,180	2.5	0.75	9,500	900	2.5	0.75	11,000	550	2.5	0.75
4025-110		11	9,500	1,180	2.5	0.6	8,390	800	2.5	0.6	9,720	490	2.5	0.6
4025-135		13.5	9,500	1,180	2.5	0.5	7,600	720	2.5	0.5	8,800	440	2.5	0.5
4030-090	3	9	8,500	1,200	3	0.9	8,500	900	3	0.9	10,000	640	3	0.9
4030-130		13	8,500	1,200	3	0.73	7,530	800	3	0.73	8,860	570	3	0.73
4030-160		16	8,500	1,200	3	0.6	6,800	720	3	0.6	8,000	510	3	0.6
4040-120	4	12	7,200	1,350	4	1.2	6,700	1,000	4	1.2	7,500	730	4	1.2
4040-170		17	7,200	1,350	4	0.98	5,920	890	4	0.98	6,670	650	4	0.98
4040-210		21	7,200	1,350	4	0.8	5,300	800	4	0.8	6,000	580	4	0.8
4050-150	5	15	6,000	1,500	5	1.5	5,400	1,100	5	1.5	5,400	810	5	1.5
4050-210		21	6,000	1,500	5	1.23	4,800	980	5	1.23	4,800	720	5	1.23
4050-260		26	6,000	1,500	5	1	4,300	880	5	1	4,300	640	5	1
4060-180	6	18	5,000	1,600	6	1.8	4,500	1,200	6	1.8	4,500	810	6	1.8
4060-260		26	5,000	1,600	6	1.46	3,990	1,060	6	1.46	3,990	710	6	1.46
4060-320		32	5,000	1,600	6	1.2	3,600	960	6	1.2	3,600	640	6	1.2
4080-240	8	24	3,000	1,300	8	2.4	2,900	1,050	8	2.4	2,900	720	8	2.4
4080-340		34	3,000	1,300	8	1.96	2,570	930	8	1.96	2,570	640	8	1.96
4080-420		42	3,000	1,300	8	1.6	2,300	840	8	1.6	2,300	570	8	1.6
4100-300	10	30	1,600	1,000	10	3	1,500	900	10	3	1,500	580	10	3
4100-420		42	1,600	1,000	10	2.45	1,340	800	10	2.45	1,340	510	10	2.45
4100-520		52	1,600	1,000	10	2	1,200	720	10	2	1,200	460	10	2
4120-360	12	36	1,200	800	12	3.6	1,200	750	12	3.6	1,200	540	12	3.6
4120-520		52	1,200	800	12	2.86	1,050	660	12	2.86	1,050	470	12	2.86
4120-620		62	1,200	800	12	2.4	950	600	12	2.4	950	430	12	2.4

CXS Milling Conditions

Side Milling

WORK MATERIAL			PREHARDENED STEELS HPM / NAK (30~45HRC)				HARDENED STEELS SKD / SKT / STAVAX (45~55HRC)			
Model Number	Outside Diameter (mm)	Effective Length (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)
4010-030	1	3	12,900	400	1	0.3	12,900	180	1	0.15
4010-050		5	11,170	350	1	0.23	12,900	180	1	0.12
4010-060		6	10,300	320	1	0.2	12,900	180	1	0.1
4015-045	1.5	4.5	10,500	500	1.5	0.45	9,500	280	1.5	0.23
4015-070		7	9,190	440	1.5	0.36	9,500	280	1.5	0.18
4015-085		8.5	8,400	400	1.5	0.3	9,500	280	1.5	0.15
4020-060	2	6	9,350	560	2	0.6	8,200	390	2	0.3
4020-090		9	8,210	490	2	0.48	8,200	390	2	0.24
4020-110		11	7,450	440	2	0.4	8,200	390	2	0.2
4025-075	2.5	7.5	8,300	610	2.5	0.75	7,800	510	2.5	0.38
4025-110		11	7,340	530	2.5	0.6	7,800	510	2.5	0.3
4025-135		13.5	6,650	480	2.5	0.5	7,800	510	2.5	0.25
4030-090	3	9	7,400	630	3	0.9	7,400	630	3	0.45
4030-130		13	6,540	560	3	0.73	7,400	630	3	0.36
4030-160		16	5,900	500	3	0.6	7,400	630	3	0.3
4040-120	4	12	5,900	650	4	1.2	5,900	650	4	0.6
4040-170		17	5,230	580	4	0.98	5,900	650	4	0.49
4040-210		21	4,700	520	4	0.8	5,900	650	4	0.4
4050-150	5	15	4,800	680	5	1.5	4,800	670	5	0.75
4050-210		21	4,250	600	5	1.23	4,800	670	5	0.61
4050-260		26	3,800	540	5	1	4,800	670	5	0.5
4060-180	6	18	4,000	680	6	1.8	4,000	680	6	0.9
4060-260		26	3,540	600	6	1.46	4,000	680	6	0.73
4060-320		32	3,200	540	6	1.2	4,000	680	6	0.6
4080-240	8	24	2,500	600	8	2.4	2,500	630	8	1.2
4080-340		34	2,220	530	8	1.96	2,500	630	8	0.98
4080-420		42	2,000	480	8	1.6	2,500	630	8	0.8
4100-300	10	30	1,500	430	10	3	1,500	570	10	1.5
4100-420		42	1,340	380	10	2.45	1,500	570	10	1.23
4100-520		52	1,200	340	10	2	1,500	570	10	1
4120-360	12	36	1,000	320	12	3.6	1,200	530	12	1.8
4120-520		52	880	280	12	2.86	1,200	500	12	1.43
4120-620		62	800	250	12	2.4	1,200	480	12	1.2



CXS Milling Conditions

Slotting

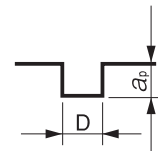
WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)			ALLOY STEELS SK / SCM Annealed Materials (225~325HB)			STAINLESS STEELS SUS304 Use water soluble or oil coolant.		
Model Number	Outside Diameter (mm)	Effective Length (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)
4010-030	1	3	18,000	300	1	18,000	300	1	14,500	280	0.5
4010-050		5	18,000	300	0.67	15,330	260	0.67	12,570	240	0.37
4010-060		6	18,000	300	0.5	14,000	240	0.5	11,600	220	0.3
4015-045	1.5	4.5	13,500	450	1.5	13,500	400	1.5	13,300	300	0.75
4015-070		7	13,500	450	1.03	11,810	350	1.03	11,610	260	0.56
4015-085		8.5	13,500	450	0.75	10,800	320	0.75	10,600	240	0.45
4020-060	2	6	11,000	600	2	11,000	400	2	12,200	320	1
4020-090		9	11,000	600	1.4	9,680	350	1.4	10,730	280	0.76
4020-110		11	11,000	600	1	8,800	320	1	9,750	250	0.6
4025-075	2.5	7.5	9,500	600	2.5	9,500	400	2.5	11,000	340	1.25
4025-110		11	9,500	600	1.77	8,390	350	1.77	9,720	300	0.96
4025-135		13.5	9,500	600	1.25	7,600	320	1.25	8,800	270	0.75
4030-090	3	9	8,500	600	3	8,500	400	3	10,000	360	1.5
4030-130		13	8,500	600	2.57	7,530	350	2.14	8,860	310	1.16
4030-160		16	8,500	600	2.25	6,800	320	1.5	8,000	280	0.9
4040-120	4	12	7,200	650	4	6,700	450	4	7,500	400	2
4040-170		17	7,200	650	3.44	5,920	400	2.89	6,670	360	1.56
4040-210		21	7,200	650	3	5,300	360	2	6,000	320	1.2
4050-150	5	15	6,000	700	5	5,400	500	5	5,400	460	2.5
4050-210		21	6,000	700	4.32	4,800	450	3.64	4,800	410	1.95
4050-260		26	6,000	700	3.75	4,300	400	2.5	4,300	360	1.5
4060-180	6	18	5,000	700	6	4,500	500	6	4,500	460	3
4060-260		26	5,000	700	5.14	3,990	440	4.29	3,990	400	2.31
4060-320		32	5,000	700	4.5	3,600	400	3	3,600	360	1.8
4080-240	8	24	3,000	500	8	2,900	360	8	2,900	360	4
4080-340		34	3,000	500	6.89	2,570	320	5.78	2,570	320	3.11
4080-420		42	3,000	500	6	2,300	280	4	2,300	280	2.4
4100-300	10	30	1,600	380	10	1,500	270	10	1,500	220	5
4100-420		42	1,600	380	8.64	1,340	240	7.27	1,340	190	3.91
4100-520		52	1,600	380	7.5	1,200	210	5	1,200	170	3
4120-360	12	36	1,200	300	12	1,200	210	12	1,200	180	6
4120-520		52	1,200	300	10.15	1,050	180	8.31	1,050	160	4.52
4120-620		62	1,200	300	9	950	160	6	950	140	3.6

CXS Milling Conditions

Slotting

WORK MATERIAL			PREHARDENED STEELS HPM / NAK (30~45HRC)			HARDENED STEELS SKD / SKT / STAVAX (45~55HRC)		
Model Number	Outside Diameter (mm)	Effective Length (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)
4010-030	1	3	12,900	170	1	12,900	60	0.25
4010-050		5	11,170	140	0.67	N/A	N/A	N/A
4010-060		6	10,300	130	0.5	N/A	N/A	N/A
4015-045	1.5	4.5	10,500	230	1.5	9,500	120	0.38
4015-070		7	9,190	200	1.03	N/A	N/A	N/A
4015-085		8.5	8,400	180	0.75	N/A	N/A	N/A
4020-060	2	6	9,350	280	2	8,200	180	0.5
4020-090		9	8,210	240	1.4	N/A	N/A	N/A
4020-110		11	7,450	220	1	N/A	N/A	N/A
4025-075	2.5	7.5	8,300	300	2.5	7,800	270	0.63
4025-110		11	7,340	270	1.77	N/A	N/A	N/A
4025-135		13.5	6,650	240	1.25	N/A	N/A	N/A
4030-090	3	9	7,400	320	3	7,400	360	1.5
4030-130		13	6,540	280	2.14	N/A	N/A	N/A
4030-160		16	5,900	250	1.5	N/A	N/A	N/A
4040-120	4	12	5,900	390	4	5,900	380	2
4040-170		17	5,230	350	2.89	N/A	N/A	N/A
4040-210		21	4,700	310	2	N/A	N/A	N/A
4050-150	5	15	4,800	440	5	4,800	410	2.5
4050-210		21	4,250	390	3.64	N/A	N/A	N/A
4050-260		26	3,800	350	2.5	N/A	N/A	N/A
4060-180	6	18	4,000	440	6	4,000	440	3
4060-260		26	3,540	390	4.29	N/A	N/A	N/A
4060-320		32	3,200	350	3	N/A	N/A	N/A
4080-240	8	24	2,500	390	8	2,500	340	4
4080-340		34	2,220	350	5.78	N/A	N/A	N/A
4080-420		42	2,000	310	4	N/A	N/A	N/A
4100-300	10	30	1,500	220	10	1,500	240	5
4100-420		42	1,340	190	7.27	N/A	N/A	N/A
4100-520		52	1,200	170	5	N/A	N/A	N/A
4120-360	12	36	1,000	180	12	1,200	220	6
4120-520		52	880	160	8.31	N/A	N/A	N/A
4120-620		62	800	140	6	N/A	N/A	N/A

Contact our sales when milling hardened steels with L/D=5 or longer effective length tools.



Slotting

a_p : Axial Depth (mm)

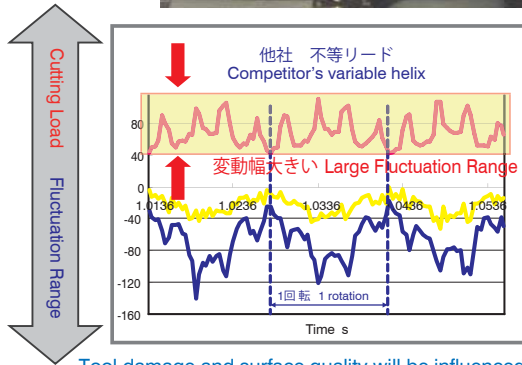
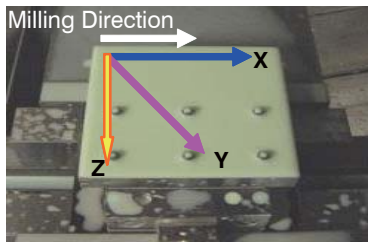
D : Outside Diameter (mm)

CXS Note

Note:

- Decrease both spindle speed and feed rate proportionally in case of chattering.
- These milling parameters are calculated based on the shortest overhang length. Longer overhangs may require an adjustment to the
- Reduce the milling amount and feed rate in accordance with required milling precision.
- Every coolant offers stable milling.
- Recommend water soluble or oil coolant for Stainless Steels and Copper.

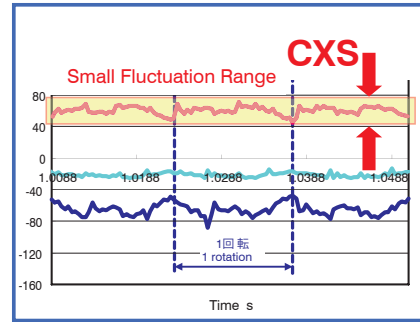
e milling parameters.



Tool damage and surface quality will be influenced by the cutting load fluctuation range.

Milling Condition

Spindle Speed	4,200 min ⁻¹
Feed Rate	770 mm/min
Axial Depth a_p	8 mm
Radial Depth a_e	0.3 mm
Coolant	Water Soluble



CXS has a small fluctuation range and the tool is hard to chatter.

CXS	Company A: Roughing	Company B: Roughing



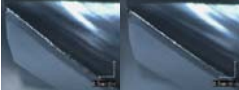






Milling Condition

Spindle Speed	5,000 min ⁻¹
Feed Rate	600 mm/min
Axial Depth a_p	8 mm
Radial Depth a_e	3 mm
Coolant	Water Soluble
Milling Distance	5.4 m

Using company B' s milling condition



Designed for a heavy roughing cut, even up to 50HRC

<p>CXS</p>   	<p>Company A: Variable Helix</p>   	<p>Company B: Variable Helix</p>   	
	<p>Milling Distance 77 m</p>	<p>Milling Distance 44 m</p>	<p>Milling Distance 22 m</p>

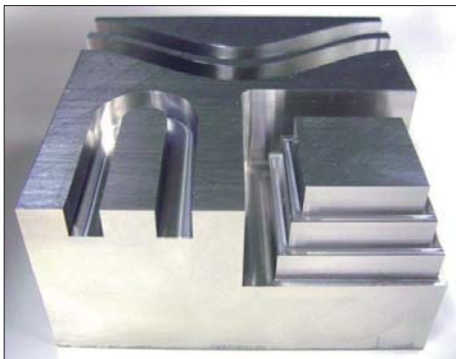
Milling Condition

Spindle Speed	4,200 min ⁻¹
Feed Rate	770 mm/min
Axial Depth a_p	8 mm
Radial Depth a_e	1 mm
Coolant	Water Soluble

Using company B's milling condition.



Designed for high efficiency milling without chipping.



Size : 100 × 100 × 50 mm

Milling Condition

Milling Method	Side milling, Slotting (One direction)
Spindle Speed	2,900 min ⁻¹
Feed Rate	360 mm/min Slotting 720 mm/min Side milling
Axial Depth a_p	8 mm (1D)
Radial Depth a_e	2.4 mm
Coolant	Water Soluble
Cycle Time	5 min

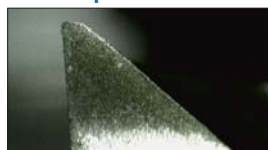
High efficiency milling of difficult-to-cut material (SUS304).

Flatland



Tool after Milling

Tool tip relief surface



8mm from tip point
(a_p : 8 mm)



Excellent tool life recommended for high efficiency milling and finishing process.

CXS SUS304
CXS milling video





Size $\varnothing 4 \sim \varnothing 12$

CXERS

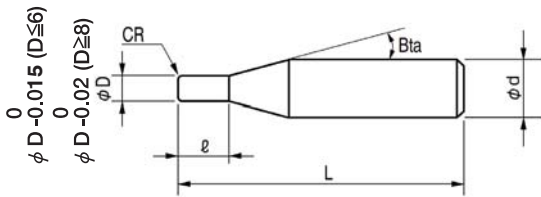


Material Applications (☆ Highly Recommended ◎ Recommended ○ Suggested)

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

- Variable Division & Variable Helix design minimizes vibration and chattering.
- Selected carbide material with high toughness & high chip resistance.
- Excellent wear-resistance for the wide range of milling applications, from highly efficient milling to finishing.
- Low friction coating resulting in excellent chip evacuation and resistance to wear.
- Decreasing cutting resistance and offering stable milling by the original corner R design.



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.

Total 30 models

Unit (mm)

Model Number	Outside Diameter $\varnothing D$	Corner Radius CR	Length of Cut l	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\varnothing d$	Price ¥
CXERS 4040-02-100	4	R0.2	10	16°	60	6	7,720
CXERS 4040-03-100		R0.3			60	6	8,250
CXERS 4040-05-100		R0.5			60	6	8,250
CXERS 4040-10-100		R1			60	6	8,250
CXERS 4050-02-125	5	R0.2	12.5	16°	60	6	8,300
CXERS 4050-03-125		R0.3			60	6	8,850
CXERS 4050-05-125		R0.5			60	6	8,850
CXERS 4050-10-125		R1			60	6	8,850
CXERS 4060-02-150	6	R0.2	15	16°	60	6	8,640
CXERS 4060-03-150		R0.3			60	6	8,640
CXERS 4060-05-150		R0.5			60	6	9,500
CXERS 4060-10-150		R1			60	6	9,500

UTCOAT 4 Flutes Highly Efficient Radius End Mills with Variable Pitch and Helix

Model Number	Outside Diameter ØD	Corner Radius CR	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter Ød	Price ¥
CXERS 4080-02-200	8	R0.2	20	⊠	70	8	11,000
CXERS 4080-03-200		R0.3			70	8	11,000
CXERS 4080-05-200		R0.5			70	8	11,800
CXERS 4080-10-200		R1			70	8	11,800
CXERS 4080-15-200		R1.5			70	8	11,800
CXERS 4080-20-200		R2			70	8	11,800
CXERS 4100-02-250	10	R0.2	25	⊠	80	10	13,100
CXERS 4100-03-250		R0.3			80	10	13,100
CXERS 4100-05-250		R0.5			80	10	14,000
CXERS 4100-10-250		R1			80	10	14,000
CXERS 4100-15-250		R1.5			80	10	14,000
CXERS 4100-20-250		R2			80	10	14,000
CXERS 4120-02-300	12	R0.2	30	⊠	100	12	18,750
CXERS 4120-05-300		R0.5			100	12	20,000
CXERS 4120-10-300		R1			100	12	20,000
CXERS 4120-15-300		R1.5			100	12	20,000
CXERS 4120-20-300		R2			100	12	20,000
CXERS 4120-30-300		R3			100	12	20,000

CXERS Milling Conditions

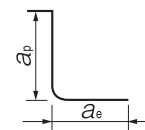
Side Milling

WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)				ALLOY STEELS SK / SCM Annealed Materials (225~325HB)				STAINLESS STEELS SUS304 Use water soluble or oil coolant.			
Model Number	Outside Diameter (mm)	Corner Radius (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)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)
4040-02-100	4	R0.2	8,640	1,350	10	0.8	8,040	1,000	10	0.8	9,000	730	10	0.4
4040-03-100		R0.3	8,640	1,350	10	0.8	8,040	1,000	10	0.8	9,000	730	10	0.4
4040-05-100		R0.5	8,640	1,350	10	0.8	8,040	1,000	10	0.8	9,000	730	10	0.4
4040-10-100		R1	8,640	1,350	10	0.8	8,040	1,000	10	0.8	9,000	730	10	0.4
4050-02-125	5	R0.2	7,200	1,500	12.5	1	6,480	1,100	12.5	1	6,480	810	12.5	0.5
4050-03-125		R0.3	7,200	1,500	12.5	1	6,480	1,100	12.5	1	6,480	810	12.5	0.5
4050-05-125		R0.5	7,200	1,500	12.5	1	6,480	1,100	12.5	1	6,480	810	12.5	0.5
4050-10-125		R1	7,200	1,500	12.5	1	6,480	1,100	12.5	1	6,480	810	12.5	0.5
4060-02-150	6	R0.2	6,000	1,600	15	1.2	5,400	1,200	15	1.2	5,400	810	15	0.6
4060-03-150		R0.3	6,000	1,600	15	1.2	5,400	1,200	15	1.2	5,400	810	15	0.6
4060-05-150		R0.5	6,000	1,600	15	1.2	5,400	1,200	15	1.2	5,400	810	15	0.6
4060-10-150		R1	6,000	1,600	15	1.2	5,400	1,200	15	1.2	5,400	810	15	0.6
4080-02-200	8	R0.2	3,600	1,300	20	1.6	3,480	1,050	20	1.6	3,480	720	20	0.8
4080-03-200		R0.3	3,600	1,300	20	1.6	3,480	1,050	20	1.6	3,480	720	20	0.8
4080-05-200		R0.5	3,600	1,300	20	1.6	3,480	1,050	20	1.6	3,480	720	20	0.8
4080-10-200		R1	3,600	1,300	20	1.6	3,480	1,050	20	1.6	3,480	720	20	0.8
4080-15-200		R1.5	3,600	1,300	20	1.6	3,480	1,050	20	1.6	3,480	720	20	0.8
4080-20-200		R2	3,600	1,300	20	1.6	3,480	1,050	20	1.6	3,480	720	20	0.8
4100-02-250	10	R0.2	1,920	1,000	25	2	1,800	900	25	2	1,800	580	25	1
4100-03-250		R0.3	1,920	1,000	25	2	1,800	900	25	2	1,800	580	25	1
4100-05-250		R0.5	1,920	1,000	25	2	1,800	900	25	2	1,800	580	25	1
4100-10-250		R1	1,920	1,000	25	2	1,800	900	25	2	1,800	580	25	1
4100-15-250		R1.5	1,920	1,000	25	2	1,800	900	25	2	1,800	580	25	1
4100-20-250		R2	1,920	1,000	25	2	1,800	900	25	2	1,800	580	25	1
4120-02-300	12	R0.2	1,440	800	30	2.4	1,440	750	30	2.4	1,440	540	30	1.2
4120-05-300		R0.5	1,440	800	30	2.4	1,440	750	30	2.4	1,440	540	30	1.2
4120-10-300		R1	1,440	800	30	2.4	1,440	750	30	2.4	1,440	540	30	1.2
4120-15-300		R1.5	1,440	800	30	2.4	1,440	750	30	2.4	1,440	540	30	1.2
4120-20-300		R2	1,440	800	30	2.4	1,440	750	30	2.4	1,440	540	30	1.2
4120-30-300		R3	1,440	800	30	2.4	1,440	750	30	2.4	1,440	540	30	1.2
Milling Amount (mm)			a _p : All Flute a _e : 0.2D				a _p : All Flute a _e : 0.2D				a _p : All Flute a _e : 0.1D			

CXERS Milling Conditions

Side Milling

WORK MATERIAL			PREHARDENED STEELS HPM / NAK (30~45HRC)				HARDENED STEELS SKD / SKT / STAVAX (45~55HRC)			
Model Number	Outside Diameter (mm)	Corner Radius (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)
4040-02-100	4	R0.2	7,080	650	10	0.8	4,700	520	10	0.4
4040-03-100		R0.3	7,080	650	10	0.8	4,700	520	10	0.4
4040-05-100		R0.5	7,080	650	10	0.8	4,700	520	10	0.4
4040-10-100		R1	7,080	650	10	0.8	4,700	520	10	0.4
4050-02-125	5	R0.2	5,760	680	12.5	1	3,850	530	12.5	0.5
4050-03-125		R0.3	5,760	680	12.5	1	3,850	530	12.5	0.5
4050-05-125		R0.5	5,760	680	12.5	1	3,850	530	12.5	0.5
4050-10-125		R1	5,760	680	12.5	1	3,850	530	12.5	0.5
4060-02-150	6	R0.2	4,800	680	15	1.2	3,200	540	15	0.6
4060-03-150		R0.3	4,800	680	15	1.2	3,200	540	15	0.6
4060-05-150		R0.5	4,800	680	15	1.2	3,200	540	15	0.6
4060-10-150		R1	4,800	680	15	1.2	3,200	540	15	0.6
4080-02-200	8	R0.2	3,000	600	20	1.6	2,000	500	20	0.8
4080-03-200		R0.3	3,000	600	20	1.6	2,000	500	20	0.8
4080-05-200		R0.5	3,000	600	20	1.6	2,000	500	20	0.8
4080-10-200		R1	3,000	600	20	1.6	2,000	500	20	0.8
4080-15-200		R1.5	3,000	600	20	1.6	2,000	500	20	0.8
4080-20-200		R2	3,000	600	20	1.6	2,000	500	20	0.8
4100-02-250	10	R0.2	1,800	430	25	2	1,200	450	25	1
4100-03-250		R0.3	1,800	430	25	2	1,200	450	25	1
4100-05-250		R0.5	1,800	430	25	2	1,200	450	25	1
4100-10-250		R1	1,800	430	25	2	1,200	450	25	1
4100-15-250		R1.5	1,800	430	25	2	1,200	450	25	1
4100-20-250		R2	1,800	430	25	2	1,200	450	25	1
4120-02-300	12	R0.2	1,200	320	30	2.4	960	420	30	1.2
4120-05-300		R0.5	1,200	320	30	2.4	960	420	30	1.2
4120-10-300		R1	1,200	320	30	2.4	960	420	30	1.2
4120-15-300		R1.5	1,200	320	30	2.4	960	420	30	1.2
4120-20-300		R2	1,200	320	30	2.4	960	420	30	1.2
4120-30-300		R3	1,200	320	30	2.4	960	420	30	1.2
Milling Amount (mm)			a _p : All Flute a _e : 0.2D				a _p : All Flute a _e : 0.1D			



Side Milling

a_p Axial Depth (mm)

a_e Radial Depth (mm)

CXERS Milling Conditions

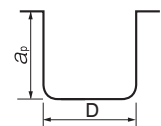
Slotting

WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)			ALLOY STEELS SK / SCM Annealed Materials (225~325HB)			STAINLESS STEELS SUS304 Use water soluble or oil coolant.		
Model Number	Outside Diameter (mm)	Corner Radius (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)
4040-02-100	4	R0.2	8,640	650	4	8,040	450	4	9,000	400	2
4040-03-100		R0.3	8,640	650	4	8,040	450	4	9,000	400	2
4040-05-100		R0.5	8,640	650	4	8,040	450	4	9,000	400	2
4040-10-100		R1	8,640	650	4	8,040	450	4	9,000	400	2
4050-02-125	5	R0.2	7,200	700	5	6,480	500	5	6,480	460	2.5
4050-03-125		R0.3	7,200	700	5	6,480	500	5	6,480	460	2.5
4050-05-125		R0.5	7,200	700	5	6,480	500	5	6,480	460	2.5
4050-10-125		R1	7,200	700	5	6,480	500	5	6,480	460	2.5
4060-02-150	6	R0.2	6,000	700	6	5,400	500	6	5,400	460	3
4060-03-150		R0.3	6,000	700	6	5,400	500	6	5,400	460	3
4060-05-150		R0.5	6,000	700	6	5,400	500	6	5,400	460	3
4060-10-150		R1	6,000	700	6	5,400	500	6	5,400	460	3
4080-02-200	8	R0.2	3,600	500	8	3,480	360	8	3,480	340	4
4080-03-200		R0.3	3,600	500	8	3,480	360	8	3,480	340	4
4080-05-200		R0.5	3,600	500	8	3,480	360	8	3,480	340	4
4080-10-200		R1	3,600	500	8	3,480	360	8	3,480	340	4
4080-15-200		R1.5	3,600	500	8	3,480	360	8	3,480	340	4
4080-20-200		R2	3,600	500	8	3,480	360	8	3,480	340	4
4100-02-250	10	R0.2	1,920	380	10	1,800	270	10	1,800	220	5
4100-03-250		R0.3	1,920	380	10	1,800	270	10	1,800	220	5
4100-05-250		R0.5	1,920	380	10	1,800	270	10	1,800	220	5
4100-10-250		R1	1,920	380	10	1,800	270	10	1,800	220	5
4100-15-250		R1.5	1,920	380	10	1,800	270	10	1,800	220	5
4100-20-250		R2	1,920	380	10	1,800	270	10	1,800	220	5
4120-02-300	12	R0.2	1,440	300	12	1,440	210	12	1,440	180	6
4120-05-300		R0.5	1,440	300	12	1,440	210	12	1,440	180	6
4120-10-300		R1	1,440	300	12	1,440	210	12	1,440	180	6
4120-15-300		R1.5	1,440	300	12	1,440	210	12	1,440	180	6
4120-20-300		R2	1,440	300	12	1,440	210	12	1,440	180	6
4120-30-300		R3	1,440	300	12	1,440	210	12	1,440	180	6
Milling Amount (mm)			a _p : 1D			a _p : 1D			a _p : 0.5D		

CXERS Milling Conditions

Slotting

WORK MATERIAL			PREHARDENED STEELS HPM / NAK (30~45HRC)			HARDENED STEELS SKD / SKT / STAVAX (45~55HRC)		
Model Number	Outside Diameter (mm)	Corner Radius (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)
4040-02-100	4	R0.2	7,080	390	4	5,900	380	2
4040-03-100		R0.3	7,080	390	4	5,900	380	2
4040-05-100		R0.5	7,080	390	4	5,900	380	2
4040-10-100		R1	7,080	390	4	5,900	380	2
4050-02-125	5	R0.2	5,760	440	5	4,800	410	2.5
4050-03-125		R0.3	5,760	440	5	4,800	410	2.5
4050-05-125		R0.5	5,760	440	5	4,800	410	2.5
4050-10-125		R1	5,760	440	5	4,800	410	2.5
4060-02-150	6	R0.2	4,800	440	6	4,000	440	3
4060-03-150		R0.3	4,800	440	6	4,000	440	3
4060-05-150		R0.5	4,800	440	6	4,000	440	3
4060-10-150		R1	4,800	440	6	4,000	440	3
4080-02-200	8	R0.2	3,000	340	8	2,500	340	4
4080-03-200		R0.3	3,000	340	8	2,500	340	4
4080-05-200		R0.5	3,000	340	8	2,500	340	4
4080-10-200		R1	3,000	340	8	2,500	340	4
4080-15-200		R1.5	3,000	340	8	2,500	340	4
4080-20-200		R2	3,000	340	8	2,500	340	4
4100-02-250	10	R0.2	1,800	220	10	1,500	240	5
4100-03-250		R0.3	1,800	220	10	1,500	240	5
4100-05-250		R0.5	1,800	220	10	1,500	240	5
4100-10-250		R1	1,800	220	10	1,500	240	5
4100-15-250		R1.5	1,800	220	10	1,500	240	5
4100-20-250		R2	1,800	220	10	1,500	240	5
4120-02-300	12	R0.2	1,200	180	12	1,200	220	6
4120-05-300		R0.5	1,200	180	12	1,200	220	6
4120-10-300		R1	1,200	180	12	1,200	220	6
4120-15-300		R1.5	1,200	180	12	1,200	220	6
4120-20-300		R2	1,200	180	12	1,200	220	6
4120-30-300		R3	1,200	180	12	1,200	220	6
Milling Amount (mm)			a _p : 1D			a _p : 0.5D		



Slotting

a_p : Axial Depth (mm)

D : Outside Diameter (mm)

CXERS Note

Note:

- Decrease both spindle speed and feed rate proportionally in case of chattering.
- These milling parameters are calculated based on the shortest overhang length. Longer overhangs may require an adjustment to the milling parameters.
- Reduce the milling amount and feed rate in accordance with required milling precision.
- Every coolant offers stable milling.
- Recommend water soluble or oil coolant for Stainless Steels and Copper.



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.



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