

# 4 Flutes UTCOAT



Size  $\phi 1 \sim \phi 20$

# CZS

Super  
MG

UT  
COAT

40°

Flatland

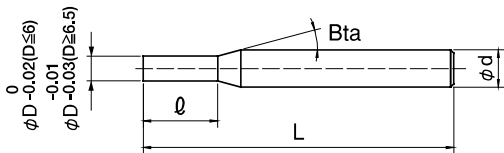
Shank Dia  
0/-0.005

Variable  
Pitch

Patented in Japan, China, Taiwan, Korea, Germany, Switzerland, and Liechtenstein

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
			~50HRC	~55HRC	~60HRC	~65HRC	~70HRC										
●	●	●	●	○				○	○		●			○	○		



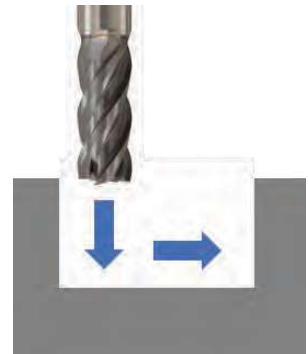
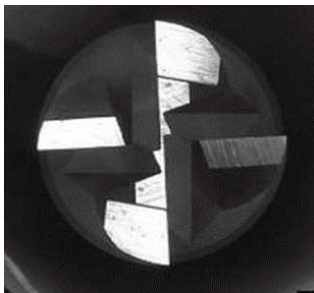
The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece. Actual measurement is necessary when using longer length of cut than the written length.

## Drilling and Milling in a Single Tool! 1/2 Cycle Time!



Drilling and Milling in a Single Tool

## The unique design of the bottom edge offers the drilling process with 4 flutes



Total 89 models

Unit (mm)

Model Number	Outside Diameter $\phi D$	Length of Cut $\ell$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥
CZS 4010-0150	1	1.5	16°	50	4	6,900
CZS 4010-0250		2.5		50	4	6,900
CZS 4011-0250	1.1	2.5	16°	50	4	8,630
CZS 4012-0250	1.2	2.5	16°	50	4	8,630
CZS 4013-0300	1.3	3	16°	50	4	8,630
CZS 4014-0300	1.4	3	16°	50	4	8,630
CZS 4015-0225	1.5	2.25	16°	50	4	6,900
CZS 4015-0400		4		50	4	6,900
CZS 4016-0400	1.6	4	16°	50	4	8,630
CZS 4017-0400	1.7	4	16°	50	4	8,630
CZS 4018-0400	1.8	4	16°	50	4	8,630
CZS 4019-0400	1.9	4	16°	50	4	8,630
CZS 4020-0300	2	3	16°	50	4	6,300
CZS 4020-0600		6		50	4	6,300
CZS 4021-0600	2.1	6	16°	50	4	7,870
CZS 4022-0600	2.2	6	16°	50	4	7,870
CZS 4023-0600	2.3	6	16°	50	4	7,870
CZS 4024-0600	2.4	6	16°	50	4	7,870
CZS 4025-0375	2.5	3.75	16°	50	4	6,300
CZS 4025-0800		8		50	4	6,300
CZS 4026-0800	2.6	8	16°	50	4	7,870
CZS 4027-0800	2.7	8	16°	50	4	7,870
CZS 4028-0800	2.8	8	16°	50	4	7,870
CZS 4029-0800	2.9	8	16°	50	4	7,870
CZS 4030-0450	3	4.5	16°	60	6	7,500
CZS 4030-0800		8		60	6	7,500
CZS 4031-0800	3.1	8	16°	60	6	9,400
CZS 4032-0800	3.2	8	16°	60	6	9,400
CZS 4033-0800	3.3	8	16°	60	6	9,400
CZS 4034-0800	3.4	8	16°	60	6	9,400
CZS 4035-1000	3.5	10	16°	60	6	8,700
CZS 4036-1000	3.6	10	16°	60	6	9,400
CZS 4037-1000	3.7	10	16°	60	6	9,400
CZS 4038-1000	3.8	10	16°	60	6	9,400

4 Flutes

$\phi 3$ mm Shank V Series

UDC-PCD Series

CBN Series

Square  
Long Neck Square

Radius  
Long Neck Radius

Taper Neck Radius

Ball / Long Shank Ball  
Long Neck Ball

Taper Neck Ball

Taper

Barrel

Spiral V Cutter  
Drill  
Technical Data

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# 4 Flutes UTCOAT

Unit (mm)

Model Number	Outside Diameter $\phi D$	Length of Cut $\ell$	Shank Taper Angle $B\alpha$	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥
<b>CZS 4039-1000</b>	3.9	10	16°	60	6	9,400
<b>CZS 4040-0600</b>	4	6	16°	60	6	7,800
<b>CZS 4040-1100</b>		11		60	6	7,800
<b>CZS 4041-1100</b>	4.1	11	16°	60	6	9,750
<b>CZS 4042-1100</b>	4.2	11	16°	60	6	9,750
<b>CZS 4043-1100</b>	4.3	11	16°	60	6	9,750
<b>CZS 4044-1100</b>	4.4	11	16°	60	6	9,750
<b>CZS 4045-1100</b>	4.5	11	16°	60	6	9,300
<b>CZS 4046-1100</b>	4.6	11	16°	60	6	9,750
<b>CZS 4047-1100</b>	4.7	11	16°	60	6	9,750
<b>CZS 4048-1100</b>	4.8	11	16°	60	6	9,750
<b>CZS 4049-1100</b>	4.9	11	16°	60	6	9,750
<b>CZS 4050-0750</b>	5	7.5	16°	60	6	8,400
<b>CZS 4050-1300</b>		13		60	6	8,400
<b>CZS 4051-1300</b>	5.1	13	16°	60	6	10,500
<b>CZS 4052-1300</b>	5.2	13	16°	60	6	10,500
<b>CZS 4053-1300</b>	5.3	13	16°	60	6	10,500
<b>CZS 4054-1300</b>	5.4	13	16°	60	6	10,500
<b>CZS 4055-1300</b>	5.5	13	16°	60	6	9,600
<b>CZS 4056-1300</b>	5.6	13	16°	60	6	10,500
<b>CZS 4057-1300</b>	5.7	13	16°	60	6	10,500
<b>CZS 4058-1300</b>	5.8	13	16°	60	6	10,500
<b>CZS 4059-1300</b>	5.9	13	16°	60	6	10,500
<b>CZS 4060-0900</b>	6	9	—	60	6	8,700
<b>CZS 4060-1300</b>		13		60	6	8,700
<b>CZS 4060-1800</b>		18		60	6	9,600
<b>CZS 4065-1600</b>	6.5	16	16°	70	8	12,600
<b>CZS 4070-1050</b>	7	10.5	16°	70	8	11,300
<b>CZS 4070-1600</b>		16		70	8	11,300
<b>CZS 4070-2100</b>		21		70	8	12,500
<b>CZS 4075-1600</b>	7.5	16	16°	70	8	12,600
<b>CZS 4080-1200</b>	8	12	—	70	8	11,300
<b>CZS 4080-1900</b>		19		70	8	11,300
<b>CZS 4080-2400</b>		24		70	8	12,500

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- φ3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

Unit (mm)

Model Number	Outside Diameter $\phi D$	Length of Cut $\ell$	Shank Taper Angle $B\alpha$	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥
CZS 4085-1900	8.5	19	16°	80	10	14,600
CZS 4090-1350	9	13.5	16°	80	10	13,200
CZS 4090-1900		19		80	10	13,200
CZS 4090-2700		27		80	10	16,700
CZS 4095-1900	9.5	19	16°	80	10	14,600
CZS 4100-1500	10	15	—	80	10	13,200
CZS 4100-2200		22		80	10	13,200
CZS 4100-3000		30		80	10	14,600
CZS 4105-2200	10.5	22	16°	100	12	21,000
CZS 4110-1650	11	16.5	16°	100	12	19,300
CZS 4110-2200		22		100	12	19,300
CZS 4110-3300		33		100	12	23,000
CZS 4115-2200	11.5	22	16°	100	12	21,000
CZS 4120-1800	12	18	—	100	12	19,300
CZS 4120-2600		26		100	12	19,300
CZS 4120-3600		36		100	12	21,300
CZS 4130-2600	13	26	—	110	12	26,500
CZS 4160-2400	16	24	—	110	16	54,200
CZS 4160-3200		32		110	16	57,000
CZS 4200-3000	20	30	—	125	20	79,800
CZS 4200-4000		40		125	20	84,000

4 Flutes

 $\phi 3$ mm Shank  
V SeriesUDC-PCD  
SeriesCBN  
SeriesSquare  
Long Neck  
SquareRadius  
Long Neck  
RadiusBall / Long  
Shank BallLong Neck  
BallTaper Neck  
Ball

Taper

Barrel

Spiral  
V Cutter

Drill

Technical Data

CZS Series  
S50C  
Milling Video

Milling Conditions for CZS

◆1.5D flute length type

WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)
4010-0150	1	1.5	18,000	150	1	200	1	1,200	1.5	0.1※
4015-0225	1.5	2.25	16,000	200	1.5	550	1.5	1,800	2.25	0.15※
4020-0300	2	3	12,000	200	2	550	2	1,800	3	0.2※
4025-0375	2.5	3.75	10,000	300	2.5	950	2.5	2,400	3.75	0.25※
4030-0450	3	4.5	8,500	300	3	950	3	2,400	4.5	0.3※
4040-0600	4	6	7,200	300	4	950	4	1,350	6	0.8
4050-0750	5	7.5	6,000	300	5	1,000	5	1,500	7.5	1
4060-0900	6	9	5,000	300	6	1,000	6	1,600	9	1.2
4070-1050	7	10.5	4,200	300	7	1,000	7	1,500	10.5	1.4
4080-1200	8	12	3,500	300	8	950	8	1,400	12	1.6
4090-1350	9	13.5	2,900	300	9	950	9	1,300	13.5	1.8
4100-1500	10	15	2,300	300	10	900	10	1,200	15	2
4110-1650	11	16.5	2,050	280	11	900	11	1,150	16.5	2.2
4120-1800	12	18	1,850	260	12	850	12	1,100	18	2.4
4160-2400	16	24	1,380	150	Step Amount: 1.6 Max depth 10※	830	8※	550	24	3.2
4200-3000	20	30	1,000	150	Step Amount: 2 Max depth 10※	830	10※	500	30	4
Milling Amount (mm)				※ Depth: 1D ※ Depth: 0.1D (Max 10 mm)		※ $a_p$ : 1D ※ $a_p$ : 0.5D		※ $a_p$ : Length of Cut ※ $a_e$ : 0.2D ※ $a_e$ : 0.1D		

WORK MATERIAL			ALLOY STEELS SK / SCM Annealed Materials (225~325HB)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)
4010-0150	1	1.5	14,500	50	1	150	1	900	1.5	0.1※
4015-0225	1.5	2.25	13,000	80	1.5	400	1.5	1,200	2.25	0.15※
4020-0300	2	3	10,000	80	2	400	2	1,200	3	0.2※
4025-0375	2.5	3.75	8,000	100	2.5	650	2.5	1,800	3.75	0.25※
4030-0450	3	4.5	6,800	100	3	650	3	1,800	4.5	0.3※
4040-0600	4	6	5,700	110	4	650	4	1,000	6	0.8
4050-0750	5	7.5	4,800	110	5	700	5	1,100	7.5	1
4060-0900	6	9	4,000	120	6	700	6	1,200	9	1.2
4070-1050	7	10.5	3,400	110	6※1	700	7	1,150	10.5	1.4
4080-1200	8	12	2,700	110	6※1	700	8	1,050	12	1.6
4090-1350	9	13.5	2,300	100	6※1	700	9	1,000	13.5	1.8
4100-1500	10	15	1,900	100	6※1	650	10	900	15	2
4110-1650	11	16.5	1,700	90	6※1	650	11	850	16.5	2.2
4120-1800	12	18	1,550	80	6※1	600	12	800	18	2.4
4160-2400	16	24	1,100	150	Step Amount: 1.6 Max 10 depth※2	400	8※	440	24	3.2
4200-3000	20	30	880	150	Step Amount: 2 Max 10 depth※2	400	10※	440	30	4
Milling Amount (mm)				※1 Depth: 1D ※2 Max 6 mm ※2 0.1D depth (Max 10 mm)		※ $a_p$ : 1D ※ $a_p$ : 0.5D		※ $a_p$ : Length of Cut ※ $a_e$ : 0.2D ※ $a_e$ : 0.1D		

- 3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

## Milling Conditions for CZS

WORK MATERIAL			STRUCTURAL STEELS SS400 Recommend water soluble or oil coolant. (Use cutting oils for vertical milling.)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4010-0150	1	1.5	18,000	100	0.25**1	400	0.25**1	1,200	1.5	0.1**
4015-0225	1.5	2.25	16,000	100	0.375**1	600	0.375**1	1,800	2.25	0.15**
4020-0300	2	3	12,000	200	0.5**1	600	0.5**1	1,800	3	0.2**
4025-0375	2.5	3.75	10,000	300	1.25	950	2.5	2,400	3.75	0.25**
4030-0450	3	4.5	8,500	300	1.5	950	3	2,400	4.5	0.3**
4040-0600	4	6	7,200	300	2	950	4	1,350	6	0.8
4050-0750	5	7.5	6,000	300	2.5	1,000	5	1,500	7.5	1
4060-0900	6	9	5,000	300	3	1,000	6	1,600	9	1.2
4070-1050	7	10.5	4,200	300	3.5	900	7	1,500	10.5	1.4
4080-1200	8	12	3,500	250	4	850	8	1,400	12	1.6
4090-1350	9	13.5	2,900	250	4.5	800	9	1,300	13.5	1.8
4100-1500	10	15	2,300	200	5	750	10	1,200	15	2
4110-1650	11	16.5	2,050	200	5.5	750	11	1,150	16.5	2.2
4120-1800	12	18	1,850	180	6	700	12	1,100	18	2.4
4160-2400	16	24	1,380	150	Step Amount: 1.6 Max 10 depth**2	830	8**2	550	24	3.2
4200-3000	20	30	1,000	150	Step Amount: 2 Max 10 depth**2	830	10**2	500	30	4
Milling Amount (mm)				Depth: 0.5D **1 Depth: 0.25D **2 Depth: 0.1D (Max 10 mm)		a <sub>p</sub> :1D **1 a <sub>p</sub> :0.25D **2 a <sub>p</sub> :0.5D		a <sub>p</sub> :Length of Cut a <sub>e</sub> :0.2D ** a <sub>e</sub> :0.1D		

WORK MATERIAL			STAINLESS STEELS SUS304 Use water soluble or oil coolant.							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4010-0150	1	1.5	14,500	150	0.25	250	1	1,000	1.5	0.05**
4015-0225	1.5	2.25	13,000	150	0.375	270	1.5	1,500	2.25	0.075**
4020-0300	2	3	10,000	100	0.5	270	2	1,500	3	0.1**
4025-0375	2.5	3.75	8,000	100	0.625	300	2.5	2,000	3.75	0.125**
4030-0450	3	4.5	6,800	80	0.75	300	3	2,000	4.5	0.15**
4040-0600	4	6	5,700	90	1	350	4	1,150	6	0.4
4050-0750	5	7.5	4,800	100	1.25	400	5	1,300	7.5	0.5
4060-0900	6	9	4,000	100	1.5	400	6	1,300	9	0.6
4070-1050	7	10.5	3,200	100	1.75	350	7	1,300	10.5	0.7
4080-1200	8	12	2,400	90	2**	300	8	1,200	12	0.8
4090-1350	9	13.5	1,800	90	2**	250	9	1,100	13.5	0.9
4100-1500	10	15	1,400	80	2**	200	10	1,000	15	1
4110-1650	11	16.5	1,250	80	2**	200	11	900	16.5	1.1
4120-1800	12	18	1,250	70	2**	180	12	900	18	1.2
4160-2400	16	24	1,250	70	2**	450	6.4**	440	24	1.6
4200-3000	20	30	1,000	70	2**	450	8**	440	30	2
Milling Amount (mm)				Depth: 0.25D ** Max 2 mm depth		a <sub>p</sub> :1D ** a <sub>p</sub> :0.4D		a <sub>p</sub> :Length of Cut a <sub>e</sub> :0.1D ** a <sub>e</sub> :0.05D		

- φ3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
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- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

Milling Conditions for CZS

WORK MATERIAL			PREHARDENED STEELS HPM / NAK (30~45HRC)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4010-0150	1	1.5	14,500	100	0.5	120	1	600	1.5	0.05*
4015-0225	1.5	2.25	12,000	150	0.75	320	1.5	900	2.25	0.075**
4020-0300	2	3	9,000	150	1	320	2	900	3	0.1*
4025-0375	2.5	3.75	7,500	200	1.25	520	2.5	1,200	3.75	0.125**
4030-0450	3	4.5	6,800	200	1.5	520	3	1,200	4.5	0.15**
4040-0600	4	6	5,100	220	2	520	4	700	6	0.4
4050-0750	5	7.5	4,050	240	2.5	520	5	850	7.5	0.5
4060-0900	6	9	3,300	240	3	520	6	1,000	9	0.6
4070-1050	7	10.5	2,900	240	3**	500	6**1	1,000	10.5	0.7
4080-1200	8	12	2,300	220	3**	470	6**1	900	12	0.8
4090-1350	9	13.5	1,900	220	3**	470	6**1	900	13.5	0.9
4100-1500	10	15	1,500	200	3**	450	6**1	900	15	1
4110-1650	11	16.5	1,350	200	3**	450	6**1	850	16.5	1.1
4120-1800	12	18	1,200	180	3**	420	6**1	800	18	1.2
4160-2400	16	24	1,110	150	3**	400	4~8**2	440	24	0.8**
4200-3000	20	30	880	150	3**	400	5~10**2	440	30	1**
Milling Amount (mm)				Depth: 0.5D ** Max 3 mm depth		a <sub>p</sub> : 1D **1 a <sub>p</sub> : Max 6 mm **2 a <sub>p</sub> : 0.25~0.5D		a <sub>p</sub> : Length of Cut a <sub>e</sub> : 0.1D ** a <sub>e</sub> : 0.05D		

WORK MATERIAL			HARDENED STEELS SKD / SKT / STAVAX (45~55HRC)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4010-0150	1	1.5	12,900	80	0.25	50	0.25**1	300	1.5	0.05**
4015-0225	1.5	2.25	10,000	150	0.375	100	0.375**1	650	2.25	0.075**
4020-0300	2	3	8,200	150	0.5	150	0.5**1	650	3	0.1**
4025-0375	2.5	3.75	7,000	250	0.625	300	2.5	1,000	3.75	0.125**
4030-0450	3	4.5	6,120	250	0.75	300	3	1,000	4.5	0.15**
4040-0600	4	6	5,000	220	1	320	4	600	6	0.4
4050-0750	5	7.5	4,300	180	1.25	340	5	800	7.5	0.5
4060-0900	6	9	3,600	160	1.5	360	6	1,000	9	0.6
4070-1050	7	10.5	2,800	160	1.5**	320	7	1,000	10.5	0.7
4080-1200	8	12	2,100	150	1.5**	280	8	1,000	12	0.8
4090-1350	9	13.5	1,600	130	1.5**	240	9	950	13.5	0.9
4100-1500	10	15	1,250	120	1.5**	200	10	750	15	1
4110-1650	11	16.5	1,150	110	1.5**	190	11	720	16.5	1.1
4120-1800	12	18	1,050	110	1.5**	180	12	700	18	1.2
4160-2400	16	24	800	50	1.5**	300	1.6**2	320	24	0.8**
4200-3000	20	30	630	50	1.5**	300	2**2	320	30	1**
Milling Amount (mm)				Depth: 0.25D ** Max 1.5 mm		a <sub>p</sub> : 1D **1 a <sub>p</sub> : 0.25D **2 a <sub>p</sub> : 0.1D		a <sub>p</sub> : Length of Cut a <sub>e</sub> : 0.1D ** a <sub>e</sub> : 0.05D		

## Milling Conditions for CZS

◆Standard flute length type

WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)								
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling			
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	
4010-0250	1	2.5	18,000	100	1	200	0.5※	1,200	1.5	0.1※	
4020-0600	2	6	12,000	150	2	400	1※	1,800	3	0.2※	
4030-0800	3	8	8,500	250	3	600	3	2,400	4.5	0.3※	
4040-1100	4	11	7,200	270	4	650	4	1,350	6	0.8	
4050-1300	5	13	6,000	300	5	700	5	1,500	7.5	1	
4060-1300	6	13	5,000	300	6	700	6	1,600	9	1.2	
4070-1600	7	16	4,200	300	7	700	7	1,500	10.5	1.4	
4080-1900	8	19	3,500	300	8	700	8	1,400	12	1.6	
4090-1900	9	19	2,900	300	9	700	9	1,300	13.5	1.8	
4100-2200	10	22	2,300	300	10	700	10	1,200	15	2	
4110-2200	11	22	2,050	280	11	670	11	1,150	16.5	2.2	
4120-2600	12	26	1,850	260	12	650	12	1,100	18	2.4	
4130-2600	13	26	1,400	80	13	300	13	700	19.5	1.3※	
4160-3200	16	32	1,380	150	Step Amount: 1.6 Max 10 depth※	830	8※	550	24	3.2	
4200-4000	20	40	1,000	150	Step Amount: 2 Max 10 depth※	830	10※	500	30	4	
Milling Amount (mm)				※ Depth: 1D Depth: 0.1D (Max 10 mm)		※ a <sub>p</sub> :1D ※ a <sub>p</sub> :0.5D		a <sub>p</sub> :1.5D a <sub>e</sub> :0.2D ※ a <sub>e</sub> :0.1D			

WORK MATERIAL			ALLOY STEELS SK / SCM Annealed Materials (225~325HB)								
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling			
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	
4010-0250	1	2.5	14,500	50	1	150	0.5※	900	1.5	0.1※	
4020-0600	2	6	10,000	80	2	300	1※	1,200	3	0.2※	
4030-0800	3	8	6,800	100	3	400	3	1,800	4.5	0.3※	
4040-1100	4	11	5,700	110	4	450	4	1,000	6	0.8	
4050-1300	5	13	4,800	110	5	500	5	1,100	7.5	1	
4060-1300	6	13	4,000	120	6	500	6	1,200	9	1.2	
4070-1600	7	16	3,400	110	6※1	500	7	1,150	10.5	1.4	
4080-1900	8	19	2,700	110	6※1	500	8	1,050	12	1.6	
4090-1900	9	19	2,300	100	6※1	500	9	1,000	13.5	1.8	
4100-2200	10	22	1,900	100	6※1	500	10	900	15	2	
4110-2200	11	22	1,700	90	6※1	450	11	850	16.5	2.2	
4120-2600	12	26	1,550	80	6※1	450	12	800	18	2.4	
4130-2600	13	26	1,100	25	6※1	180	13	550	19.5	1.3※	
4160-3200	16	32	1,100	150	Step Amount: 1.6 Max 10 depth※2	300	8※	440	24	3.2	
4200-4000	20	40	880	150	Step Amount: 2 Max 10 depth※2	300	10※	440	30	4	
Milling Amount (mm)				※1 Depth: 1D ※2 Max 6 mm Depth: 0.1D (Max 10 mm)		※ a <sub>p</sub> :1D ※ a <sub>p</sub> :0.5D		a <sub>p</sub> :1.5D a <sub>e</sub> :0.2D ※ a <sub>e</sub> :0.1D			

- φ3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data



Milling Conditions for CZS

WORK MATERIAL			STRUCTURAL STEELS SS400 Recommend water soluble or oil coolant. (Use cutting oils for vertical milling.)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4010-0250	1	2.5	18,000	100	0.25※1	400	0.25※1	1,200	1.5	0.1※
4020-0600	2	6	12,000	200	0.5※1	600	0.5※1	1,800	3	0.2※
4030-0800	3	8	8,500	300	1.5	600	3	2,400	4.5	0.3※
4040-1100	4	11	7,200	300	2	650	4	1,350	6	0.8
4050-1300	5	13	6,000	300	2.5	700	5	1,500	7.5	1
4060-1300	6	13	5,000	300	3	700	6	1,600	9	1.2
4070-1600	7	16	4,200	270	3.5	700	7	1,500	10.5	1.4
4080-1900	8	19	3,500	250	4	700	8	1,400	12	1.6
4090-1900	9	19	2,900	220	4.5	700	9	1,300	13.5	1.8
4100-2200	10	22	2,300	200	5	700	10	1,200	15	2
4110-2200	11	22	2,050	190	5.5	680	11	1,150	16.5	2.2
4120-2600	12	26	1,850	180	6	650	12	1,100	18	2.4
4130-2600	13	26	1,100	55	6.5	180	13	550	19.5	1.3※
4160-3200	16	32	1,380	150	Step Amount: 1.6 Max 10 depth※2	830	8※2	550	24	3.2
4200-4000	20	40	1,000	150	Step Amount: 2 Max 10 depth※2	830	10※2	500	30	4
Milling Amount (mm)				Depth: 0.5D ※1 Depth: 0.25D ※2 Depth: 0.1D (Max 10 mm)		a <sub>p</sub> : 1D ※1 a <sub>p</sub> : 0.25D ※2 a <sub>p</sub> : 0.5D		a <sub>p</sub> : 1.5D a <sub>e</sub> : 0.2D ※ a <sub>e</sub> : 0.1D		

WORK MATERIAL			STAINLESS STEELS SUS304 Use water soluble or oil coolant.							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4010-0250	1	2.5	14,500	150	0.25	250	0.5	1,000	1.5	0.05※
4020-0600	2	6	10,000	100	0.5	270	1	1,500	3	0.1※
4030-0800	3	8	6,800	80	0.75	300	1.5	2,000	4.5	0.15※
4040-1100	4	11	5,700	90	1	350	2	1,150	6	0.4
4050-1300	5	13	4,800	100	1.25	400	2.5	1,300	7.5	0.5
4060-1300	6	13	4,000	100	1.5	400	3	1,300	9	0.6
4070-1600	7	16	3,200	100	1.75	350	3.5	1,300	10.5	0.7
4080-1900	8	19	2,400	90	2※1	300	4	1,200	12	0.8
4090-1900	9	19	1,800	90	2※1	250	4.5	1,100	13.5	0.9
4100-2200	10	22	1,400	80	2※1	200	5	1,000	15	1
4110-2200	11	22	1,250	80	2※1	200	5.5	900	16.5	1.1
4120-2600	12	26	1,250	70	2※1	180	6	900	18	1.2
4130-2600	13	26	1,050	20	1.5※2	120	6.5	900	19.5	0.65※
4160-3200	16	32	1,250	70	2※1	450	1.6※	440	24	1.6
4200-4000	20	40	1,000	70	2※1	450	2※	440	30	2
Milling Amount (mm)				Depth: 0.25D ※1 Max 2 mm depth ※2 Max 1.5 mm depth		a <sub>p</sub> : 0.5D ※ a <sub>p</sub> : 0.1D		a <sub>p</sub> : 1.5D a <sub>e</sub> : 0.1D ※ a <sub>e</sub> : 0.05D		

- φ3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

## Milling Conditions for CZS

WORK MATERIAL			PREHARDENED STEELS HPM / NAK (30~45HRC)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)
4010-0250	1	2.5	12,900	80	0.5	140	1	270	1.5	0.2
4020-0600	2	6	9,350	110	1	230	2	400	3	0.4
4030-0800	3	8	6,120	120	1.5	270	3	450	4.5	0.6
4040-1100	4	11	5,250	130	2	320	4	500	6	0.8
4050-1300	5	13	4,460	150	2.5	360	5	540	7.5	1
4060-1300	6	13	3,600	160	3	360	6	540	9	1.2
4070-1600	7	16	2,850	140	2**	340	7	540	10.5	1.4
4080-1900	8	19	2,320	90	2**	320	8	480	12	1.6
4090-1900	9	19	1,700	80	2**	250	9	410	13.5	1.8
4100-2200	10	22	1,250	60	2**	180	10	340	15	2
4110-2200	11	22	1,100	55	2**	170	11	320	16.5	2.2
4120-2600	12	26	1,050	50	2**	160	12	320	18	2.4
4130-2600	13	26	1,000	N/A	N/A	100	6.5**	300	19.5	1.3**
4160-3200	16	32	960	40	2**	350	8**	380	24	1.6**
4200-4000	20	40	770	40	2**	350	10**	380	30	2**
Milling Amount (mm)				Depth: 0.5D ** Max 2 mm depth		$a_p$ :1D ** $a_p$ :0.5D		$a_p$ :1.5D $a_e$ :0.2D ** $a_e$ :0.1D		

WORK MATERIAL			HARDENED STEELS SKD / SKT / STAVAX (45~55HRC)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)
4010-0250	1	2.5	12,900	80	0.25	50	0.25**1	300	1.5	0.05**
4020-0600	2	6	8,200	150	0.5	150	0.5**1	650	3	0.1**
4030-0800	3	8	6,120	250	0.75	300	1.5	1,000	4.5	0.15**
4040-1100	4	11	5,000	220	1	320	2	500	6	0.4
4050-1300	5	13	4,300	180	1.25	340	2.5	520	7.5	0.5
4060-1300	6	13	3,600	160	1.5	360	3	540	9	0.6
4070-1600	7	16	2,800	160	1.5**1	320	3.5	520	10.5	0.7
4080-1900	8	19	2,100	150	1.5**1	280	4	500	12	0.8
4090-1900	9	19	1,600	130	1.5**1	240	4.5	470	13.5	0.9
4100-2200	10	22	1,250	120	1.5**1	200	5	450	15	1
4110-2200	11	22	1,150	110	1.5**1	190	5.5	440	16.5	1.1
4120-2600	12	26	1,050	110	1.5**1	180	6	420	18	1.2
4130-2600	13	26	900	N/A	N/A	N/A	N/A	370	19.5	0.65**
4160-3200	16	32	800	50	Step Amount: 1.6 Max 10 depth**2	300	1.6**2	320	24	0.8**
4200-4000	20	40	630	50	Step Amount: 2 Max 10 depth**2	300	2**2	320	30	1**
Milling Amount (mm)				Depth: 0.25D **1 Max 1.5 mm **2 Depth: 0.1D (Max 10 mm)		$a_p$ :0.5D **1 $a_p$ :0.25D **2 $a_p$ :0.1D		$a_p$ :1.5D $a_e$ :0.1D ** $a_e$ :0.05D		

Ø3mm Shank  
V SeriesUDC-PCD  
SeriesCBN  
SeriesSquare  
Long Neck  
Square

Radius

Long Neck  
RadiusTaper Neck  
RadiusBall / Long  
Shank BallLong Neck  
BallTaper Neck  
Ball

Taper

Barrel

Spiral  
V Cutter

Drill

Technical Data

Milling Conditions for CZS

◆3D flute length type

WORK MATERIAL			CARBON STEELS S45C / S50C Annealed Materials (~225HB)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4060-1800	6	18	5,000	200	6	500	6	1,600	18	0.6
4070-2100	7	21	4,100	200	7	450	7	1,450	21	0.7
4080-2400	8	24	3,200	150	8	400	8	1,300	24	0.8
4090-2700	9	27	2,400	140	9	350	9	1,150	27	0.9
4100-3000	10	30	1,850	120	10	320	10	1,000	30	1
4110-3300	11	33	1,650	100	11	300	11	900	33	1.1
4120-3600	12	36	1,500	90	12	300	12	800	36	1.2
Milling Amount (mm)				Depth: 1D		a <sub>p</sub> : 1D		a <sub>p</sub> : Length of Cut a <sub>e</sub> : 0.1D		

WORK MATERIAL			ALLOY STEELS SK / SCM Annealed Materials (225~325HB)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4060-1800	6	18	4,000	60	6	350	6	1,200	18	0.6
4070-2100	7	21	3,400	60	6	330	7	1,150	21	0.7
4080-2400	8	24	2,700	50	6	300	8	1,050	24	0.8
4090-2700	9	27	2,050	50	6	270	9	1,000	27	0.9
4100-3000	10	30	1,500	40	6	240	10	900	30	1
4110-3300	11	33	1,350	40	6	220	11	850	33	1.1
4120-3600	12	36	1,200	30	6	200	12	750	36	1.2
Milling Amount (mm)				Max 6 mm depth		a <sub>p</sub> : 1D		a <sub>p</sub> : Length of Cut a <sub>e</sub> : 0.1D		

WORK MATERIAL			STRUCTURAL STEELS SS400 Recommend water soluble or oil coolant. (Use cutting oils for vertical milling.)							
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling		
				Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4060-1800	6	18	4,000	120	3	300	6	1,300	18	0.6
4070-2100	7	21	3,400	110	3.5	280	7	1,200	21	0.7
4080-2400	8	24	2,700	90	4	250	8	1,150	24	0.8
4090-2700	9	27	2,100	80	4.5	230	9	1,050	27	0.9
4100-3000	10	30	1,500	70	5	200	10	1,000	30	1
4110-3300	11	33	1,350	65	5.5	190	11	950	33	1.1
4120-3600	12	36	1,200	60	6	190	12	900	36	1.2
Milling Amount (mm)				Depth: 0.5D		a <sub>p</sub> : 1D		a <sub>p</sub> : Length of Cut a <sub>e</sub> : 0.1D		

- 3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

## Milling Conditions for CZS

WORK MATERIAL			STAINLESS STEELS SUS304 Use water soluble or oil coolant.								
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling			
				Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)	
4060-1800	6	18	2,800	40	1.5	200	3	900	18	0.3	
4070-2100	7	21	2,450	40	1.5	190	3.5	950	21	0.35	
4080-2400	8	24	2,100	40	1.5	180	4	950	24	0.4	
4090-2700	9	27	1,700	30	1.5	170	4.5	1,000	27	0.45	
4100-3000	10	30	1,400	30	1.5	150	5	1,000	30	0.5	
4110-3300	11	33	1,250	30	1.5	140	5.5	1,000	33	0.55	
4120-3600	12	36	1,150	25	1.5	130	6	950	36	0.6	
Milling Amount (mm)				Max 1.5 mm depth		$a_p$ : 0.5D		$a_p$ : Length of Cut $a_e$ : 0.05D			

WORK MATERIAL			PREHARDENED STEELS HPM / NAK (30~45HRC)								
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling			
				Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)	
4060-1800	6	18	3,000	—	—	160	6	600	18	0.3	
4070-2100	7	21	2,500	—	—	160	6	700	21	0.35	
4080-2400	8	24	2,150	—	—	150	6	750	24	0.4	
4090-2700	9	27	1,850	—	—	150	6	800	27	0.45	
4100-3000	10	30	1,500	—	—	140	6	900	30	0.5	
4110-3300	11	33	1,350	—	—	130	6	850	33	0.55	
4120-3600	12	36	1,200	—	—	120	6	800	36	0.6	
Milling Amount (mm)				N/A		$a_p$ : Max 6 mm		$a_p$ : Length of Cut $a_e$ : 0.05D			

WORK MATERIAL			HARDENED STEELS SKD / SKT / STAVAX (45~55HRC)								
Model Number	Outside Diameter (mm)	Length of Cut (mm)	Spindle Speed (min <sup>-1</sup> )	Vertical		Slotting		Side Milling			
				Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	Feed Rate (mm/min)	$a_p$ Axial Depth (mm)	$a_e$ Radial Depth (mm)	
4060-1800	6	18	3,600	—	—	—	—	540	18	0.3	
4070-2100	7	21	2,900	—	—	—	—	520	21	0.35	
4080-2400	8	24	2,300	—	—	—	—	500	24	0.4	
4090-2700	9	27	1,700	—	—	—	—	470	27	0.45	
4100-3000	10	30	1,250	—	—	—	—	450	30	0.5	
4110-3300	11	33	1,100	—	—	—	—	420	33	0.55	
4120-3600	12	36	1,000	—	—	—	—	400	36	0.6	
Milling Amount (mm)				N/A		N/A		$a_p$ : Length of Cut $a_e$ : 0.05D			

φ3mm Shank  
V Series

UDC-PCD  
Series

CBN  
Series

Square

Long Neck  
Square

Radius

Long Neck  
Radius

Taper Neck  
Radius

Ball / Long  
Shank Ball

Long Neck  
Ball

Taper Neck  
Ball

Taper

Barrel

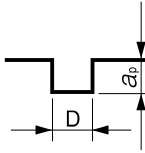
Spiral  
V Cutter

Drill

Technical Data

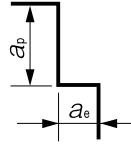
## Milling Conditions for CZS

Slotting



D : Outside Diameter (mm)

Side Milling



**Note:**

- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machines maximum speed, or when the tool is chattering and heats up to a red color.
- 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.
- Spindle rigidity should be considered when setting milling parameters, especially for Z-Axis drilling.
- When slotting, using Z-Axis drilling, the milling parameters should promote good chip evacuation.
- Reduce the milling amount when chips clog on the tool during Z-Axis drilling.
- The milling parameter of outside diameter 16 and 20 is calculated based on BT50 spindle type. Decrease 50% milling amount for BT40 spindle type.
- Recommend water soluble or oil coolant.
- Recommend water soluble coolant (through spindle type) for Stainless Steels and Aluminum Alloys.
- Recommend oil coolant for Titanium Alloys and Heat Resistant Alloys.

- g3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square**
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

**Pocket Milling Example**  
CZS  $\phi 8 \times L12$

SCM420H



Pocket Size : 9 × 15 × Depth 4 mm

Spindle Speed	2,700 min <sup>-1</sup>
Z-Drilling Feed Rate	220 mm/min
X-Y Milling Feed Rate	500 mm/min
Number of holes	864 holes
Coolant	Water Soluble

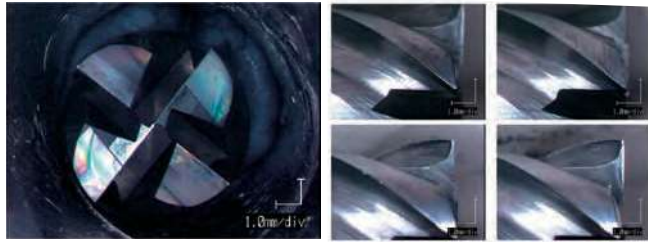
Z-drilling Depth 1 mm × 4 times Dwell 0.1 sec

Drilling and Milling → 144 min

**CZS → 72 min**

**1/2  
Cycle Time!**

After milling 864 holes (32 pieces)



**Less cycle time! More tool life left after milling 864 holes!**

**Comparison with Conventional Model**  
CZS  $\phi 6.5 \times L16$

S45C

**CZS**



**Conventional 4 Flute Square**



**Cantilevered  
work piece**

Spindle Speed	2,200 min <sup>-1</sup>
Z-Drilling Feed Rate	100 mm/min
Slotting Feed Rate	400 mm/min
$a_p$	3 mm
Overhang Length	25 mm
Coolant	Air Blow (Through Spindle)
Milled Size	Slitting 6.5 × 24.5 × 3 mm Spot Facing 6.5 × 3 mm

**Variable Pitch Prevents Chattering!**

4 Flutes

$\phi 3$ mm Shank  
V Series

UDC-PCD  
Series

CBN  
Series

Square

Square

Long Neck  
Square

Radius

Radius

Radius

Long Neck  
Radius

Taper Neck  
Radius

Ball

Ball / Long  
Shank Ball

Long Neck  
Ball

Taper Neck  
Ball

Taper

Taper

Barrel

Barrel

Spiral  
V Cutter

Spiral  
V Cutter

Drill

Drill

Technical Data

Technical Data