WE CREATE YOUR TOMORROW!

Endmill series for general cutting

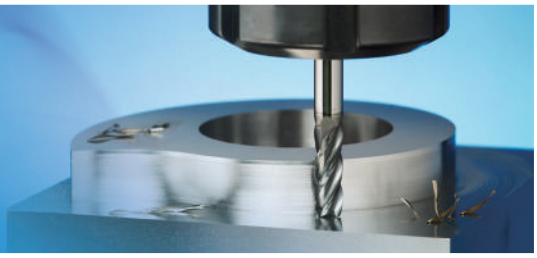
Z Endmill

Universal endmill for cutting various workpieces under HRC45

- Universal endmill for cutting carbon steel, alloy steel, cast iron, pre hardened steel, etc.
- New shape and coating improves performance and tool life
- Optimized blade design for less chipping and stable machining

KORLOY

Z Endmill

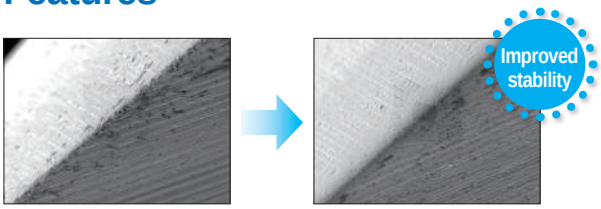


Endmill series for general cutting

Z Endmill

■ Endmill for general cutting of various workpieces under HRC45(carbon steel, alloy steel, cast iron, pre hardened steel, etc.)

Features



before

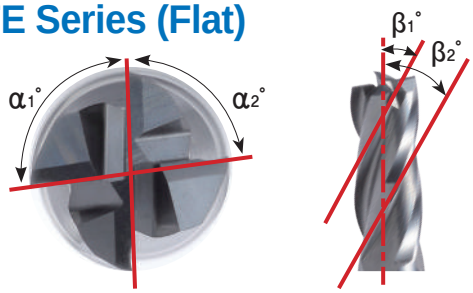
After special edge treatment

■ **New grade(PC315E)**
- Fine substrate and lubricative coating guarantee excellent performance at high speed and high temperature.

■ **Special edge treatment**
- Special cutting edge design was applied for less chipping and longer tool life

■ **High accuracy with tolerance-h5**
- High quality production system enables tolerance-h5 throughout the whole series.

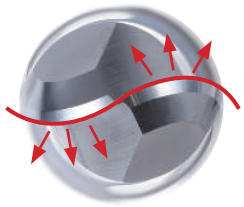
ZFE Series (Flat)



$\alpha_1° \neq \alpha_2°$, $\beta_1° \neq \beta_2°$ Irregular indexing & helix

■ Irregular indexing & helix prevent chattering and improve surface

ZBE Series (Ball)



Cutting load is dispersed

S shape of ball

■ The S shape of ball disperses cutting loads
■ The tolerance of ball R is under ±0.005mm

Z Endmill! Universal endmill

Generally, Operators have had to change tools when work material is changed. As a result, it was inevitable to stop production. Z Endmill can be used not only to carbon steel but also to stainless system materials, and from roughing to finishing, which leads to saving tool change time and increasing productivity.

Newly applied irregular flute spacing and 'S' shape curved edge decrease cutting loads. Special edge treatment was designed to prevent chipping problem and tool breakage.

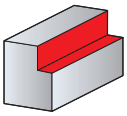
New AlCrN coating layer guarantees better coating lubrication and wear resistance. When machining mild steel or sticky steel materials, you can see the best surface finish and longer tool life.

Z Endmill contributes to increasing productivity and tool life up to 30% by machining various kinds of workpieces with just one tool.

Cutting performance

P Carbon steel [1045(AISI) / C45(DIN) / S45C(JIS), HRC20)]

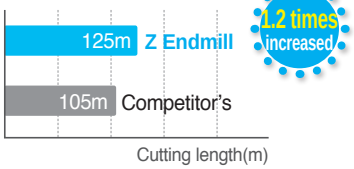
■ **Cutting conditions**



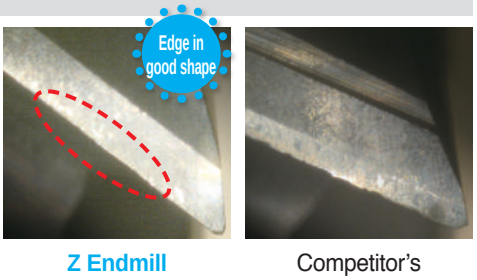
Diameter = Ø8.0
n(min^{-1}) = 7,165
vc(m/min) = 180
vf(mm/min) = 1,433
fz(mm/t) = 0.05
ap(mm) = 8
ae(mm) = 0.8
dry

■ **Tools** ZFE4080-070

■ **Result**



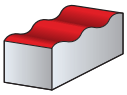
→ **Cutting edge treatment for less chipping**



Z Endmill | Competitor's

P Carbon steel [1045(AISI) / C45(DIN) / S45C(JIS), HRC20)]

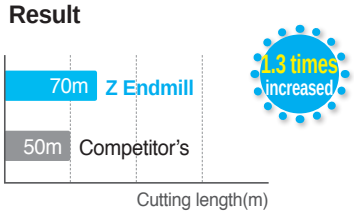
■ **Cutting conditions**



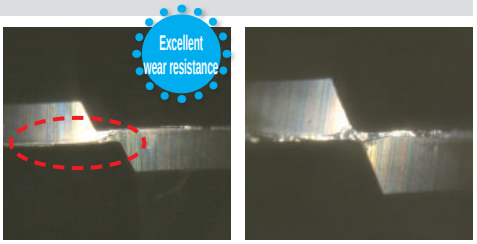
Diameter = Ø8.0
n(min^{-1}) = 5,175
vc(m/min) = 130
vf(mm/min) = 1,035
fz(mm/t) = 0.1
ap(mm) = 0.5
ae(mm) = 1.6
dry

■ **Tools** ZBE2080-100

■ **Result**



→ **New grade improves wear resistance**

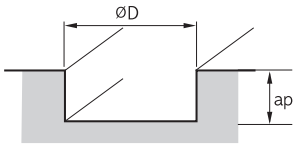


Z Endmill | Competitor's

Recommended cutting conditions (ZFE2000 / ZSFE2000 Flat)

Workpiece / Condition / Diameter(Ø)	Alloy steel and carbon steel (under HRC30)		Pre hardened steel (HRC30~45)		Stainless steel	
	R.P.M n(min^{-1})	Feed vf(mm/min)	R.P.M n(min^{-1})	Feed vf(mm/min)	R.P.M n(min^{-1})	Feed vf(mm/min)
1	19,745	175	13,057	100	10,500	70
2	11,560	190	7,560	120	6,300	90
3	8,920	210	5,560	140	4,620	120
4	7,560	300	4,620	180	3,880	150
5	6,300	320	3,780	190	3,160	160
6	5,560	350	3,360	220	2,840	180
8	4,200	380	2,520	200	2,100	180
10	3,260	330	2,000	160	1,680	160
12	2,740	280	1,680	130	1,360	130
16	2,200	220	1,360	110	1,060	110

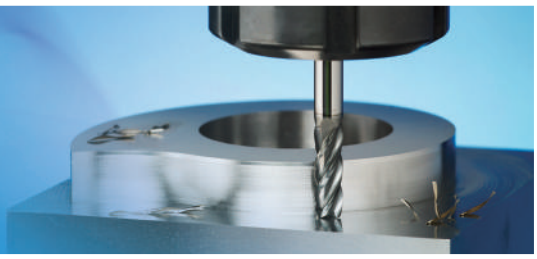
■ **Application tip**



■ **Slotting depth(ap)**

- Ø3 ≥ D (ap 0.2D)
- D > Ø3 (ap 0.5D)
- Workpiece should be clamped rigidly. In case of vibration, reduce R.P.M and feed rate by the same ratio

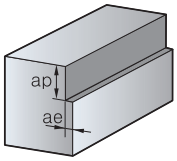
Z Endmill



Recommended cutting conditions (ZFE4000 / ZSFE4000 Flat)

Workpiece / Condition / Diameter(Ø)	Alloy steel and carbon steel (under HRC30)		Pre hardened steel (HRC30~45)		Stainless steel	
	R.P.M n(min^{-1})	Feed vf(mm/min)	R.P.M n(min^{-1})	Feed vf(mm/min)	R.P.M n(min^{-1})	Feed vf(mm/min)
2	11,560	280	7,560	170	6,300	140
3	8,920	320	5,560	200	4,620	170
4	7,560	570	4,620	350	3,880	280
5	6,300	600	3,780	360	3,160	300
6	5,560	660	3,360	410	2,840	330
8	4,200	710	2,520	380	2,100	350
10	3,260	610	2,000	300	1,680	300
12	2,740	520	1,680	250	1,360	240
16	2,200	410	1,360	200	1,100	200

■ **Application tip**



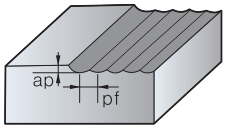
■ **Shouldering depth(ap) and radial depth(ae)**

- ap = 1.0D
- ae = 0.05D
- Workpiece should be clamped rigidly. In case of vibration, reduce R.P.M and feed rate by the same ratio

Recommended cutting conditions (ZBE2000 Ball)

Workpiece / Condition / Diameter(Ø)	Alloy steel and carbon steel (under HRC30)		Pre hardened steel (HRC30~45)	
	R.P.M n(min^{-1})	Feed vf(mm/min)	R.P.M n(min^{-1})	Feed vf(mm/min)
1	30,000	2,880	30,000	2,520
1.2	30,000	3,060	28,800	2,580
1.5	30,000	3,240	28,800	2,700
2	29,820	3,420	28,680	2,880
3	19,860	3,600	19,080	3,180
4	14,940	3,600	14,340	3,180
5	11,160	3,480	10,680	2,940
6	8,340	2,910	8,040	2,460
8	6,660	2,520	6,420	2,100
10	5,580	2,220	5,340	1,860
12	4,170	1,770	4,008	1,500

■ **Application tip**

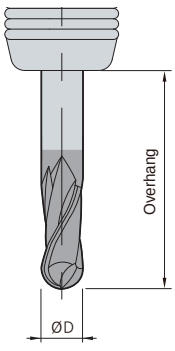


- ap = 0.03D
- pf = 0.05D
- Workpiece should be clamped rigidly. In case of vibration, reduce R.P.M and feed rate by the same ratio

∗ Cutting condition by overhang

■ Cutting conditions of the shank taper type in case of being clamped at neck.
➞ When the overhang is increased by 1D, decrease R.P.M and feed 10%.

■ In case of the straight type adjust conditions according to the overhang.
➞ Ex) When the overhang is 3D and is increased by 1D, decrease R.P.M and feed 10%.

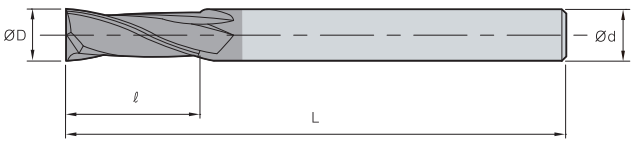


∗ Notice

■ Cutting conditions are up to the machine's condition and the shape of cutting.

■ Use cutting fluid that is proper to the workpiece and produces few temperature reaction.

ZFE2000 (Standard flat)



2	Helix Angle 35°	Grade PC315E	h5 shank

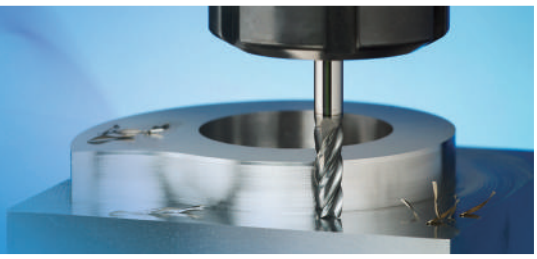
ØD	Tolerance
~ Ø5.9	0.00 ~ -0.015
Ø6.0 ~	0.00 ~ -0.025

Hardness of workpiece			Workpiece				
~HRC45	~HRC55	~HRC65	Carbon steel Alloy steel Pre hardened steel	Stainless steel	Cast iron	Aluminum	Heat resisting alloy
◎	○		◎	○	◎		○

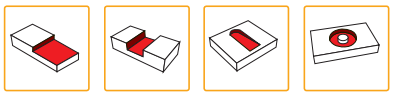
(mm)

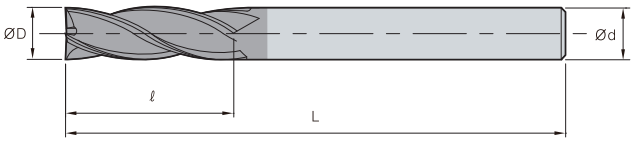
Designation		ØD	Ød	ℓ	L
ZFE 2	ZFE2010-050-S4	1	4	2.5	50
	ZFE2010-050-S6	1	6	2.5	50
	ZFE2012-050-S4	1.2	4	3	50
	ZFE2012-050-S6	1.2	6	3	50
	ZFE2015-050-S4	1.5	4	4	50
	ZFE2015-050-S6	1.5	6	4	50
	ZFE2020-050-S4	2	4	6	50
	ZFE2020-050-S6	2	6	6	50
	ZFE2025-050-S4	2.5	4	7.5	50
	ZFE2025-050-S6	2.5	6	7.5	50
	ZFE2030-050-S4	3	4	9	50
	ZFE2030-050-S6	3	6	9	50
	ZFE2035-050	3.5	6	10	50
	ZFE2040-050-S4	4	4	11	50
	ZFE2040-050-S6	4	6	11	50
	ZFE2045-050	4.5	6	14	50
	ZFE2050-060	5	6	15	60
	ZFE2055-060	5.5	6	15	60
	ZFE2060-060	6	6	15	60
	ZFE2065-060	6.5	8	18	60
	ZFE2070-060	7	8	20	60
	ZFE2075-060	7.5	8	20	60
	ZFE2080-070	8	8	20	70
	ZFE2085-070	8.5	10	22	70
	ZFE2090-070	9	10	22	70
	ZFE2095-070	9.5	10	24	70
	ZFE2100-075	10	10	25	75
	ZFE2120-080	12	12	30	80
	ZFE2140-100	14	14	35	100
	ZFE2160-100	16	16	40	100

Z Endmill



ZFE4000 (Standard flat)





4	Multiple Helix Angle	Grade PC315E	h5 shank

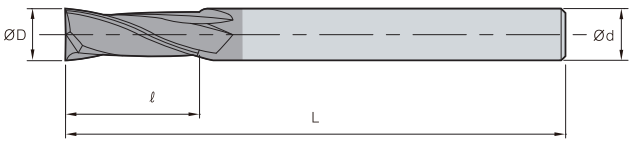
ØD	Tolerance
~ Ø5.9	0.00 ~ -0.015
Ø6.0 ~	0.00 ~ -0.025

Hardness of workpiece			Workpiece				
~HRC45	~HRC55	~HRC65	Carbon steel Alloy steel Pre hardened steel	Stainless steel	Cast iron	Aluminum	Heat resisting alloy
◎	○		◎	○	◎		○

(mm)

Designation		ØD	Ød	ℓ	L
ZFE 4	ZFE4010-050-S4	1	4	2.5	50
	ZFE4010-050-S6	1	6	2.5	50
	ZFE4012-050-S4	1.2	4	3	50
	ZFE4012-050-S6	1.2	6	3	50
	ZFE4015-050-S4	1.5	4	4	50
	ZFE4015-050-S6	1.5	6	4	50
	ZFE4020-050-S4	2	4	6	50
	ZFE4020-050-S6	2	6	6	50
	ZFE4025-050-S4	2.5	4	7.5	50
	ZFE4025-050-S6	2.5	6	7.5	50
	ZFE4030-050-S4	3	4	9	50
	ZFE4030-050-S6	3	6	9	50
	ZFE4035-050	3.5	6	10	50
	ZFE4040-050-S4	4	4	11	50
	ZFE4040-050-S6	4	6	11	50
	ZFE4045-050	4.5	6	14	50
	ZFE4050-060	5	6	15	60
	ZFE4055-060	5.5	6	15	60
	ZFE4060-060	6	6	15	60
	ZFE4065-060	6.5	8	18	60
	ZFE4070-060	7	8	20	60
	ZFE4075-060	7.5	8	20	60
	ZFE4080-070	8	8	20	70
	ZFE4085-070	8.5	10	22	70
	ZFE4090-070	9	10	22	70
	ZFE4095-070	9.5	10	24	70
	ZFE4100-075	10	10	25	75
	ZFE4120-080	12	12	30	80
	ZFE4140-100	14	14	35	100
	ZFE4160-100	16	16	40	100

ZSFE2000 / ZSFE4000 (Short flat)



2	4	Helix Angle 35°	Grade PC315E	h5 shank

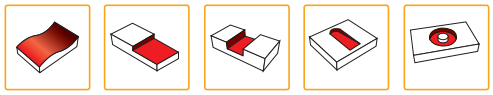
ØD	Tolerance
~ Ø5.9	0.00 ~ -0.015
Ø6.0 ~	0.00 ~ -0.025

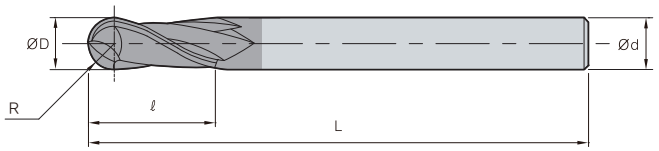
Hardness of workpiece			Workpiece				
~H_RC45	~H_RC55	~H_RC65	Carbon steel Alloy steel Pre hardened steel	Stainless steel	Cast iron	Aluminum	Heat resisting alloy
◎	○		◎	○	◎		○

(mm)

Designation		ØD	Ød	ℓ	L
ZSFE 2	ZSFE2010-040-S4	1	4	1.5	40
	ZSFE2010-040-S6	1	6	1.5	40
	ZSFE2012-040-S4	1.2	4	1.5	40
	ZSFE2012-040-S6	1.2	6	1.5	40
	ZSFE2015-040-S4	1.5	4	2.2	40
	ZSFE2015-040-S6	1.5	6	2.2	40
	ZSFE2020-040-S4	2	4	3	40
	ZSFE2020-040-S6	2	6	3	40
	ZSFE2025-040-S4	2.5	4	4	40
	ZSFE2025-040-S6	2.5	6	4	40
	ZSFE2030-045-S4	3	4	4.5	45
	ZSFE2030-045-S6	3	6	4.5	45
	ZSFE2040-045-S4	4	4	6	45
	ZSFE2040-045-S6	4	6	6	45
	ZSFE2060-050	6	6	9	50
	ZSFE2080-060	8	8	12	60
	ZSFE2100-065	10	10	15	65
	ZSFE2120-070	12	12	18	70
ZSFE 4	ZSFE4010-040-S4	1	4	1.5	40
	ZSFE4010-040-S6	1	6	1.5	40
	ZSFE4012-040-S4	1.2	4	1.5	40
	ZSFE4012-040-S6	1.2	6	1.5	40
	ZSFE4015-040-S4	1.5	4	2.2	40
	ZSFE4015-040-S6	1.5	6	2.2	40
	ZSFE4020-040-S4	2	4	3	40
	ZSFE4020-040-S6	2	6	3	40
	ZSFE4025-040-S4	2.5	4	4	40
	ZSFE4025-040-S6	2.5	6	4	40
	ZSFE4030-045-S4	3	4	4.5	45
	ZSFE4030-045-S6	3	6	4.5	45
	ZSFE4040-045-S4	4	4	6	45
	ZSFE4040-045-S6	4	6	6	45
	ZSFE4060-050	6	6	9	50
	ZSFE4080-060	8	8	12	60
	ZSFE4100-065	10	10	15	65
	ZSFE4120-070	12	12	18	70

ZBE2000 (Standard ball)





2	Helix Angle 30°	Grade PC315E	h5 shank

ØD	Tolerance
~ Ø5.9	0.00 ~ -0.015
Ø6.0 ~	0.00 ~ -0.025

Hardness of workpiece			Workpiece				
~HRC45	~HRC55	~HRC65	Carbon steel Alloy steel Pre hardened steel	Stainless steel	Cast iron	Aluminum	Heat resisting alloy
◎	○		◎	○	◎		○

(mm)

Designation		R	ØD	Ød	ℓ	L
ZBE 2	ZBE2010-050-S4	0.5	1	4	2.5	50
	ZBE2010-050-S6	0.5	1	6	2.5	50
	ZBE2012-050-S4	0.6	1.2	4	3	50
	ZBE2012-050-S6	0.6	1.2	6	3	50
	ZBE2015-050-S4	0.75	1.5	4	4	50
	ZBE2015-050-S6	0.75	1.5	6	4	50
	ZBE2020-050-S4	1	2	4	5	50
	ZBE2020-050-S6	1	2	6	5	50
	ZBE2025-060-S4	1.25	2.5	4	6	60
	ZBE2025-060-S6	1.25	2.5	6	6	60
	ZBE2030-060-S4	1.5	3	4	8	60
	ZBE2030-060-S6	1.5	3	6	8	60
	ZBE2035-070	1.75	3.5	6	8	70
	ZBE2040-070-S4	2	4	4	8	70
	ZBE2040-070-S6	2	4	6	8	70
	ZBE2045-080	2.25	4.5	6	9	80
	ZBE2050-080	2.5	5	6	10	80
	ZBE2055-090	2.75	5.5	6	11	90
	ZBE2060-090	3	6	6	12	90
	ZBE2065-090	3.25	6.5	8	13	90
	ZBE2070-090	3.5	7	8	14	90
	ZBE2080-100	4	8	8	14	100
	ZBE2085-100	4.25	8.5	10	16	100
	ZBE2090-100	4.5	9	10	18	100
	ZBE2100-100	5	10	10	18	100
	ZBE2120-110	6	12	12	22	110

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