Mirus

Square End Mills for Ultra-High Efficiency Roughing and Semi-Finishing

FEATURES

New TH Coating for long tool life in both dry and wet machining

Double gash guarantees high performance in both vertical and horizontal feed applications.

Type R: Wave peripheral form for reduced cutting force

Type N: Chip-breaker peripheral form for enhanced chipping resistance

Mirus

INTRODUCTION

The Mirus Series Square End Mills are designed to outperform conventional end mills in roughing and semi-finishing applications across a wide variety of materials including carbon and alloy steels, stainless steels, titanium alloys, pre-hardened steels and hardened steels.

The Mirus Type R End Mills feature a wave peripheral form for reduced cutting force, making them ideal for roughing applications in die & mold materials. The Mirus Type N End Mills feature a chip-breaker peripheral form for enhanced chipping resistance, making them well suited for semi-finishing in gummy materials such as stainless steels and titanium alloys.

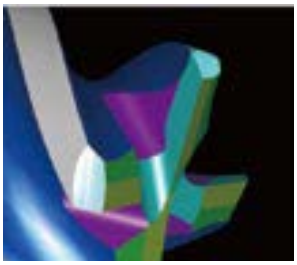
FEATURES

1. Double Gash Guarantees High Performance in Both Vertical and Horizontal Feed Applications

Double Gash achieves perfect balance in rigidity and chip evacuation!

First gash around tip of cutter for high rigidity. Secondary gash near peripheral for enhanced chip-evacuation.

Conventional gash



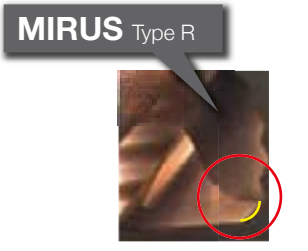
Double gash

2. New TH Coating for Long Tool Life

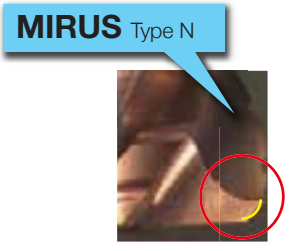
The hardness and oxidation resistance of our popular TH Coating has been further improved, enabling longer tool life and higher efficiency when cutting high-hardness materials. With a hardness of 3800HV and oxidation temperature of 1200°C, long tool life is possible in both dry and wet machining applications.

3. Programming Radius

To increase chipping resistance, a special geometry is adopted on the tip of the square type tools. Please set up the tool corner R with approximate radius as listed in the following table.

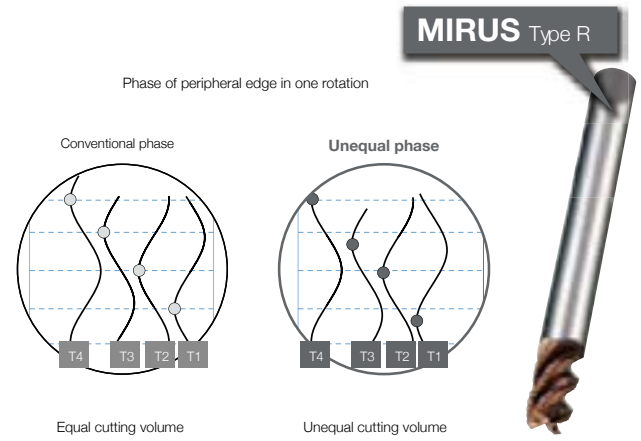


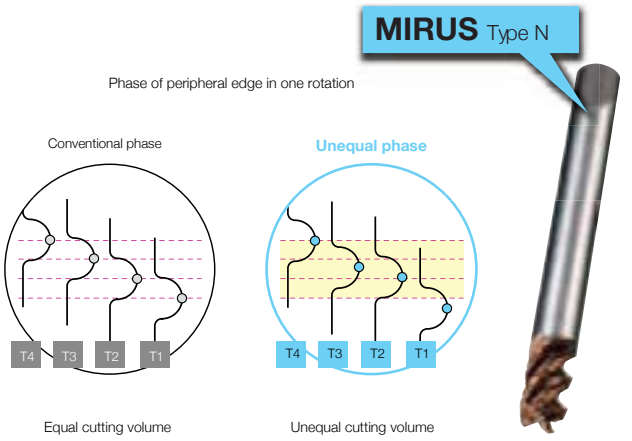
MIRUS Type R	Approx radius
Ø6	0.4mm
Ø8 ~ Ø12	0.5mm

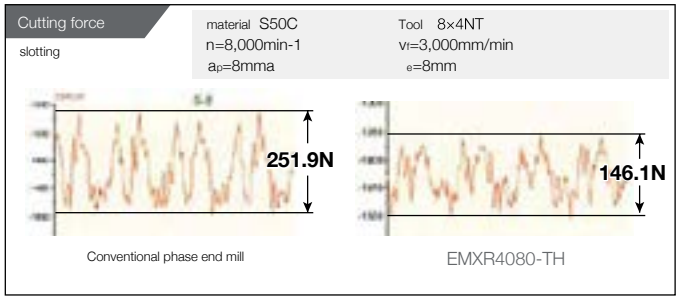


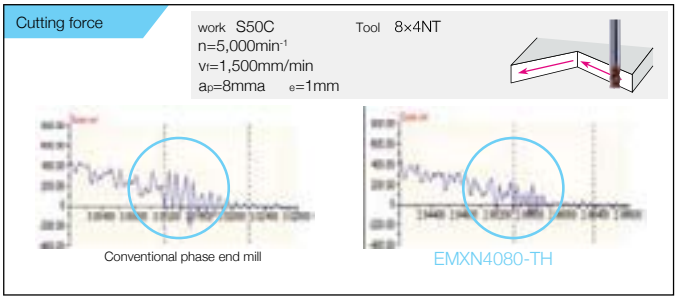
MIRUS Type N	Approx radius
Ø6	0.4mm
Ø8 ~ Ø12	0.5mm

4. Unequal Phase Effectively Reduces Vibration and Achieves High Efficiency

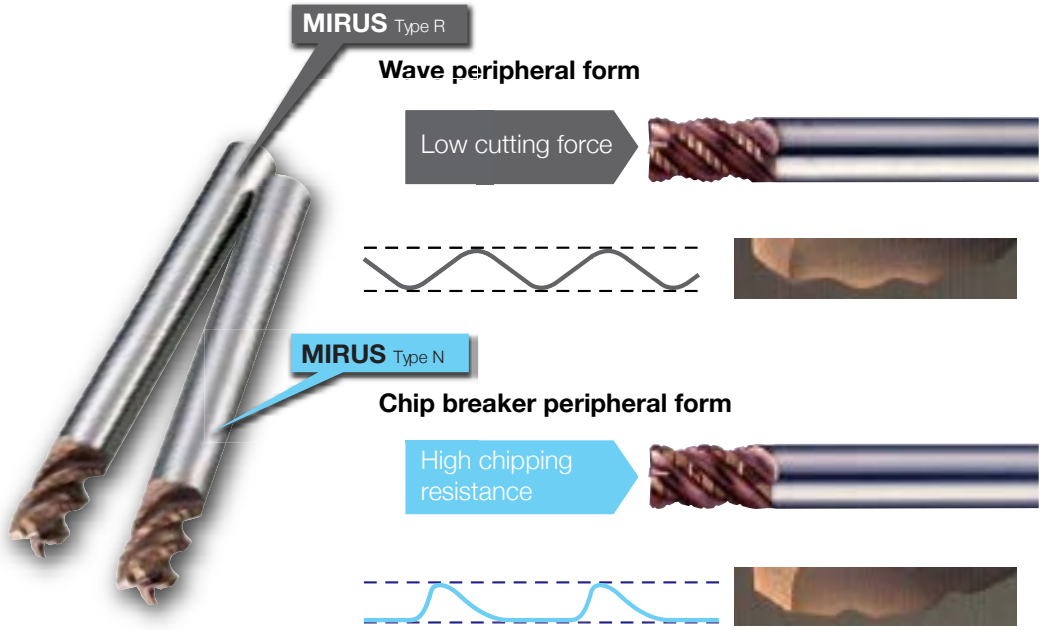




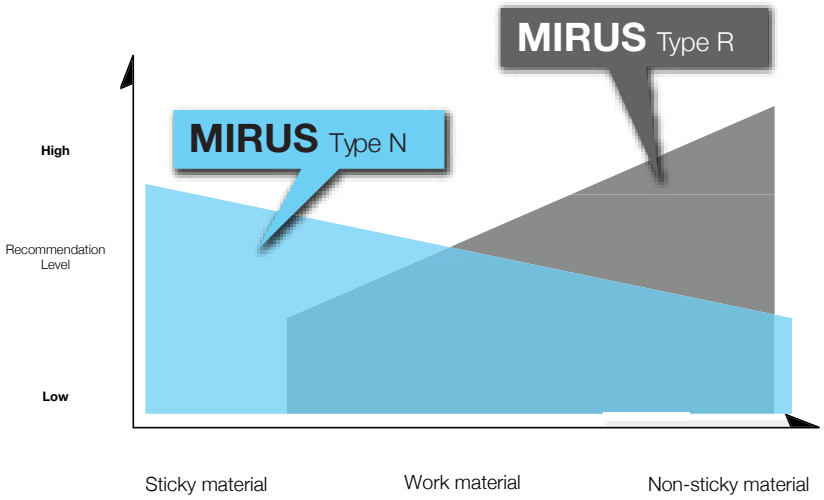




5. Different Peripheral Forms for Different Applications



6. Work Material Recommendations

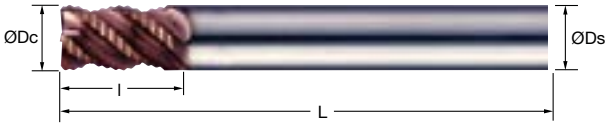


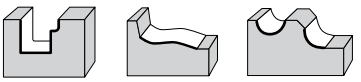
◎ Best ○ Better △ Acceptable ▭ Most recommended application

Work material	Recommendation items	Type R		Type N	
Cast iron, Carbon steel Alloy steel (150-250HB)	Suitability	◎		◎	
	Process	roughing	semi-finishing	roughing	semi-finishing
	Slotting	○		○	
	Side milling	○		○	
	Z plunging	○		○	
	Max ramping angle	30° or less		20° or less	
Stainless steels (25-35HRC)	Suitability	×		○	
	Process	roughing	semi-finishing	roughing	semi-finishing
	Slotting	—		△	
	Side milling	—		○	
	Z plunging	—		×	
	Max ramping angle	—		5° or less	
Titanium alloy	Suitability	×		○	
	Process	roughing	semi-finishing	roughing	semi-finishing
	Slotting	—		○	
	Side milling	—		○	
	Z plunging	—		△	
	Max ramping angle	—		10° or less	
Pre-hardened steels (32-45HRC)	Suitability	◎		○	
	Process	roughing	semi-finishing	roughing	semi-finishing
	Slotting	○		○	
	Side milling	○		○	
	Z plunging	△		○	
	Max ramping angle	15° or less		10° or less	
Hardened steels (45-55HRC)	Suitability	◎		○	
	Process	roughing	semi-finishing	roughing	semi-finishing
	Slotting	△		△	
	Side milling	○		○	
	Z plunging	×		×	
	Max ramping angle	5° or less		5° or less	

Mirus

Mirus
Square End Mill





Helix Angle	45°
Dc (Ø6)	0/-0.015
Dc (Ø8-12)	0/-0.02
Ds	h5

EMXR-TH (Type R)

		Size (mm)				
Part No.	Stock	Dc	l	L	Ds	Approx Radius
EMXR4060-TH	●	**6**	9	60	6	0.4*
EMXR4080-TH	●	**8**	12	75	8	0.5*
EMXR4100-TH	●	**10**	15	80	10	0.5*
EMXR4120-TH	●	**12**	18	100	12	0.5*

EMXN-TH (Type N)

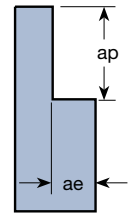
		Size (mm)				
Part No.	Stock	Dc	l	L	Ds	Approx Radius
EMXN4060-TH	●	**6**	9	60	6	0.4*
EMXN4080-TH	●	**8**	12	75	8	0.5*
EMXN4100-TH	●	**10**	15	80	10	0.5*
EMXN4120-TH	●	**12**	18	100	12	0.5*

EMXR-TH Inch (Type R)

Part No.	Stock	Dc	l	L	Ds	Approx Radius
IEMXR4080-TH	●	1/4"	3/8"	2.953"	1/4"	.0157"
IEMXR4120-TH	●	3/8"	9/16"	3.150"	3/8"	.0196"
IEMXR4160-TH	●	1/2"	3/4"	3.937"	1/2"	.0275"

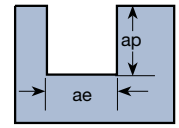
Type R – Side Milling

	Cast iron, Carbon steels, Alloy steels (150-250HB)		Tool steels (25-35HRC)		Pre-hardened steels (35-45HRC)		Hardened steels (45-55HRC)	
Depth of cut (mm)	ae	ap	ae	ap	ae	ap	ae	ap
	0.5Dc	1.0Dc	0.375Dc	1.0Dc	0.25Dc	1.0Dc	0.125Dc	1.0Dc
Mill dia. (mm)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)
6	8,000	1,730	7,200	1,240	6,400	970	5,600	730
8	6,000	1,820	5,400	1,310	4,800	1,020	4,200	770
10	4,800	1,820	4,300	1,310	3,800	1,010	3,300	750
12	4,000	1,730	3,600	1,240	3,200	970	2,800	730



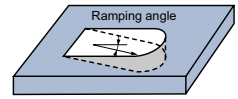
Type R – Slotting

	Cast iron, Carbon steels, Alloy steels (150-250HB)		Tool steels (25-35HRC)		Pre-hardened steels (35-45HRC)		Hardened steels (45-55HRC)	
Depth of cut (mm)	ae	ap	ae	ap	ae	ap	ae	ap
	1.0Dc	1.0Dc	1.0Dc	0.8Dc	1.0Dc	0.5Dc	1.0Dc	0.2Dc
Mill dia. (mm)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)
6	6,900	1,190	6,100	840	5,300	640	4,500	470
8	5,200	1,260	4,600	890	4,000	680	3,400	500
10	4,100	1,250	3,700	900	3,200	680	2,700	490
12	3,400	1,180	3,100	860	2,700	650	2,300	480



Type R – Ramping

	Cast iron, Carbon steels, Alloy steels (150-250HB)		Tool steels (25-35HRC)		Pre-hardened steels (35-45HRC)		Hardened steels (45-55HRC)	
Max. ramping angle	30° or less		15° or less		15° or less		5° or less	
Mill dia. (mm)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)
6	6,900	890	6,100	790	5,300	570	4,500	490
8	5,200	950	4,600	840	4,000	610	3,400	520
10	4,100	930	3,700	840	3,200	610	2,700	510
12	3,400	880	3,100	800	2,700	580	2,300	500



Type R – Two-way profiling

	Cast iron, Carbon steels, Alloy steels (150-250HB)		Tool steels (25-35HRC)		Pre-hardened steels (35-45HRC)		Hardened steels (45-55HRC)	
Depth of cut (mm)	Max. ae		Max. ae		Max. ae		Max. ae	
	0.5Dc		0.375Dc		0.25Dc		0.125Dc	
Mill dia. (mm)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)
6	8,000	2,070	7,200	1,560	6,400	1,240	5,600	970
8	6,000	2,190	5,400	1,640	4,800	1,310	4,200	1,020
10	4,800	2,190	4,300	1,630	3,800	1,300	3,300	1,000
12	4,000	2,070	3,600	1,560	3,200	1,240	2,800	970

Side Milling (Cat-40)

Inch	Mild Steel & Cast Iron				P20-PX5 (25-35HRc)				Pre-Hardened Steel (35-45HRc)				45-52HRc			
Diameter	*RPM*	*Feed*	*Step Down*	*Step Over*	*RPM*	*Feed*	*Step Down*	*Step Over*	*RPM*	*Feed*	*Step Down*	*Step Over*	*RPM*	*Feed*	*Step Down*	*Step Over*
1/4"	7500	50 ipm	.250"	.125"	6750	36 ipm	.250"	.094"	6000	25 ipm	.250"	.063"	5250	18 ipm	.250"	.031"
3/8"	5000	60 ipm	.281"	.188"	4500	43 ipm	.281"	.141"	4000	30 ipm	.281"	.094"	3500	22 ipm	.281"	.047"
1/2"	3750	50 ipm	.250"	.250"	3375	36 ipm	.250"	.188"	3000	25 ipm	.250"	.125"	2625	18 ipm	.250"	.063"

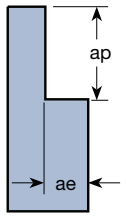
Slotting (Cat-40)

Inch	Mild Steel & Cast Iron				P20-PX5 (25-35HRc)				Pre-Hardened Steel (35-45HRc)				45-52HRc			
Diameter	*RPM*	*Feed*	*Step Down*	*Step Over*	*RPM*	*Feed*	*Step Down*	*Step Over*	*RPM*	*Feed*	*Step Down*	*Step Over*	*RPM*	*Feed*	*Step Down*	*Step Over*
1/4"	6500	35 ipm	.250"	.250"	5850	25 ipm	.200"	.250"	5200	18 ipm	.125"	.250"	4550	12 ipm	.050"	.250"
3/8"	4350	40 ipm	.281"	.375"	3915	29 ipm	.225"	.375"	3480	20 ipm	.141"	.375"	3045	13 ipm	.056"	.375"
1/2"	3250	35 ipm	.250"	.500"	2925	25 ipm	.200"	.500"	2600	18 ipm	.125"	.500"	2275	12 ipm	.050"	.500"

Max Ramp Angle
-20HRc = less 30deg
25-30HRc = less 15deg
35-45HRc = less 15deg
45-55HRc = less 5deg

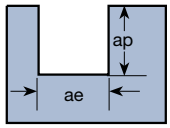
Type N – Side Milling

	Cast iron, Carbon steels, Alloy steels (150-250HB)		Tool steels , Stainless steels (25-35HRC)		Pre-hardened steels (35-45HRC)		Hardened steels (45-55HRC)	
Depth of cut (mm)	ae	ap	ae	ap	ae	ap	ae	ap
	0.5Dc	1.0Dc	0.375Dc	1.0Dc	0.25Dc	1.0Dc	0.125Dc	1.0Dc
Mill dia. (mm)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)
6	7,400	1,600	6,600	1,140	5,800	880	5,000	650
8	5,600	1,700	5,000	1,220	4,400	940	3,800	690
10	4,500	1,710	4,000	1,220	3,500	930	3,000	680
12	3,700	1,600	3,300	1,140	2,900	880	2,500	650



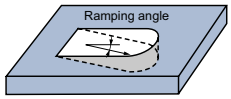
Type N – Slotting

	Cast iron, Carbon steels, Alloy steels (150-250HB)		Tool steels , Stainless steels (25-35HRC)		Pre-hardened steels (35-45HRC)		Hardened steels (45-55HRC)	
Depth of cut (mm)	ae	ap	ae	ap	ae	ap	ae	ap
	1.0Dc	1.0Dc	1.0Dc	0.8Dc	1.0Dc	0.5Dc	1.0Dc	0.2Dc
Mill dia. (mm)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)
6	6,400	1,110	5,600	770	4,800	580	4,000	4.1
8	4,800	1,170	4,200	820	3,600	610	3,000	440
10	3,800	1,160	3,300	800	2,900	620	2,400	440
12	3,200	1,110	2,800	770	2,400	580	2,000	410



Type N – Ramping

	Cast iron, Carbon steels, Alloy steels (150-250HB)		Tool steels , Stainless steels (25-35HRC)		Pre-hardened steels (35-45HRC)		Hardened steels (45-55HRC)	
Max. ramping angle	20° or less		15° or less (5° or less for Sainless Steels)		10° or less		5° or less	
Mill dia. (mm)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)
6	6,400	830	5,600	730	4,800	520	4,000	430
8	4,800	880	4,200	770	3,600	550	3,000	460
10	3,800	870	3,300	750	2,900	550	2,400	460
12	3,200	830	2,800	730	2,400	520	2,000	430



Type N – Two-way profiling

	Cast iron, Carbon steels, Alloy steels (150-250HB)		Tool steels , Stainless steels (25-35HRC)		Pre-hardened steels (35-45HRC)		Hardened steels (45-55HRC)	
Depth of cut (mm)	Max. ae		Max. ae		Max. ae		Max. ae	
	0.5Dc		0.375Dc		0.25Dc		0.125Dc	
Mill dia. (mm)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)	N (RPM)	Vf (mm/min)
6	7,400	1,920	6,600	1,430	5,800	1,130	5,000	860
8	5,600	2,040	5,000	1,520	4,400	1,200	3,800	920
10	4,500	2,050	4,000	1,520	3,500	1,200	3,000	910
12	3,700	1,920	3,300	1,430	2,900	1,130	2,500	860

Please use Type N for Stainless Steel applications and reduce the feed rate 30-50% from the values shown in the table above.