

Endmill for HRSA machining

Super Endmill For HRSA

KORLOY
TECH-NEWS



- Aerospace and generator industries - Endmill for parts such as engines and turbines made into hard-to-cut materials.
- Optimal endmill for Ni Based super alloy HRSA; Inconel718, Hastelloy, Waspaloy and etc.

Endmill for HRSA (Inconel718, Hastelloy, Waspaloy and etc.) machining

Super Endmill For HRSA

HRSA, a material with higher strength at high temperature and corrosion resistance than general alloy, is commonly used for aerospace engine and parts of generator turbine.

HRSA is divided into Ni Based, Ni-Fe Based, and Co Based heat resistant super alloy by elements and Ni Based heat resistant super alloy such as Inconel718, Hastelloy, Waspaloy and etc. is most generally used.

HRSA is a representative of hard-to-cut materials causing short tool life due to work hardening, low thermal conductivity and high-temperature strength.

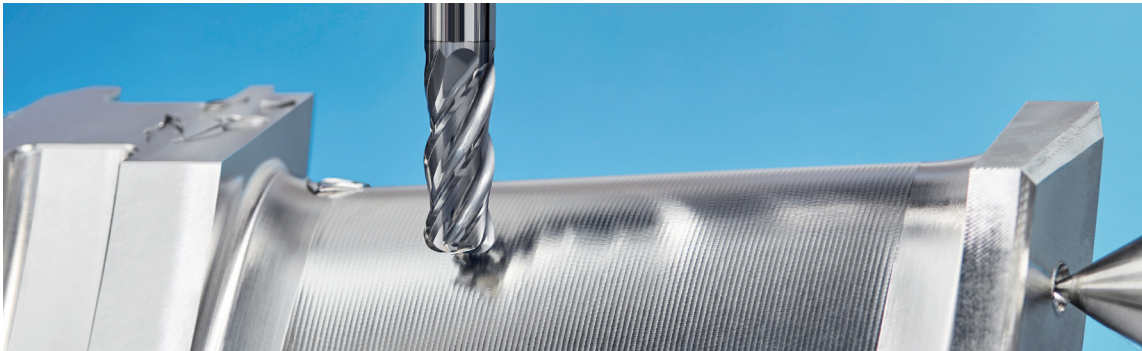
Low thermal conductivity makes increasing cutting speed impossible due to generating high temperature while machining at the edge.

Maintaining high strength at high temperature and work hardening also cause rapid wear, breakage, and severe damage on the edge of cutting tools.

KORLOY launches Super Endmill, the most effective tool for hard-to-cut material in HRSA machining.

Super Endmill increases machinability and stability in machining due to positive rake angle and irregular flute spacing shape.

In addition, Super Endmill ensures excellent tool life preventing fracture on cutting edge and increasing wear resistance in machining due to high toughness carbide substrate and new coating with high temperature hardness and oxidation resistance.



Increased machining stability

- Irregular flute spacing and helix angle design increase machining stability.
- Unique core design with good chip evacuation and high rigidity

Increased tool life

- Applied high toughness substrate and new coating with good wear resistance and oxidation resistance

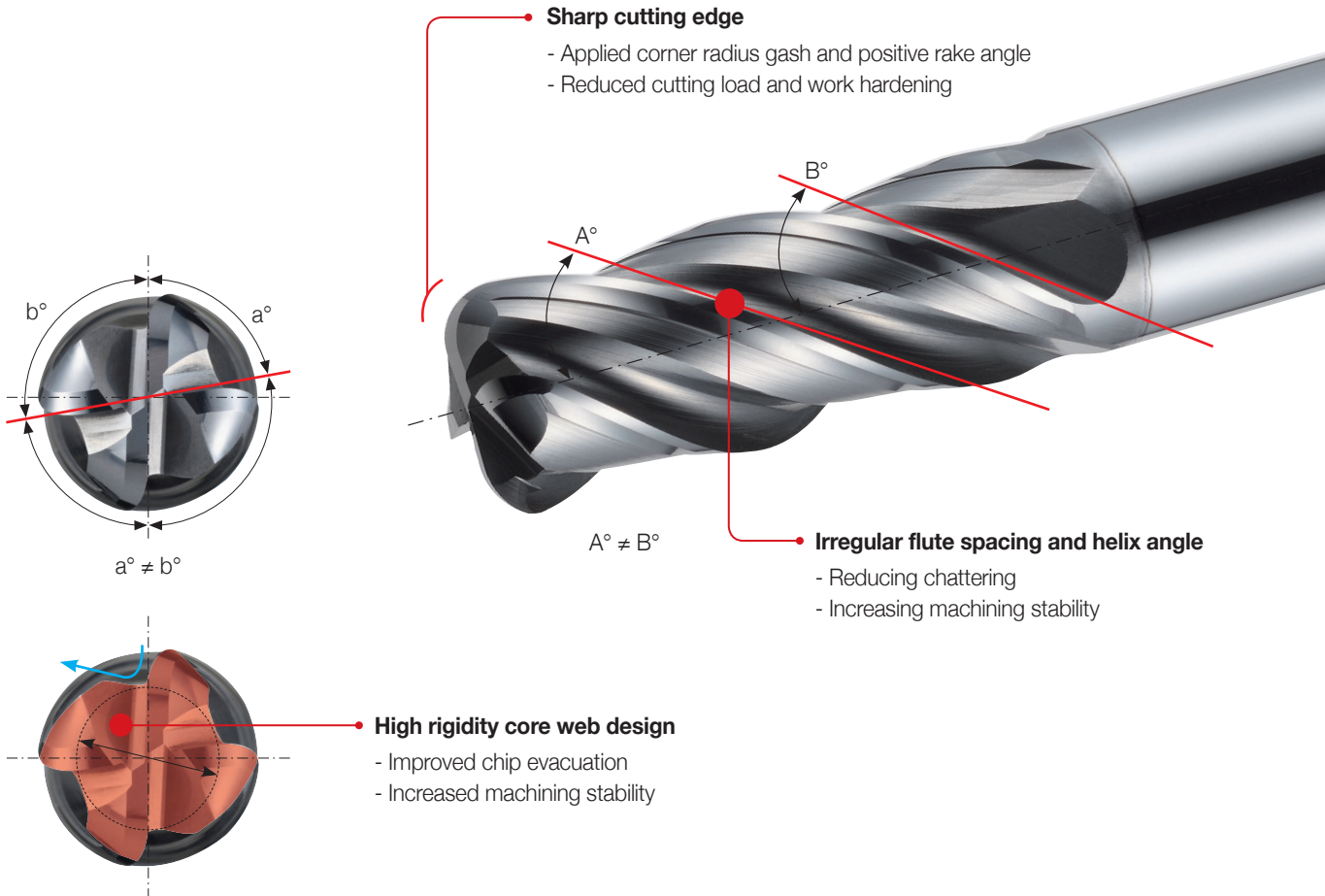
Code system

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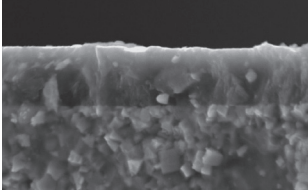
S	RE	S	4	120	-	080	-	R30
Super Endmill	Type R: Radius Endmill	Workpiece S: Super alloy T: Titanium/STS	No. of flute 4: 4 flute	Tool diameter 120: Ø12.0 mm		Overall length 080: 80 mm		Corner R 30: 3.0 mm

Features

- **Aerospace and generator industries:** Exclusive endmill for HRSA and machining parts of engine and turbine
- **Irregular flute spacing and helix angle design:** Reducing chattering and improving stability in machining
- **High rigidity core web design:** Improving chip evacuation and stability in machining
- **Sharp cutting edge:** Reducing cutting load and work hardening
- **Excellent tool life:** New grade with excellent wear resistance coating and high toughness substrate



Grade features



SL Coating (Super Lubrication Coating)

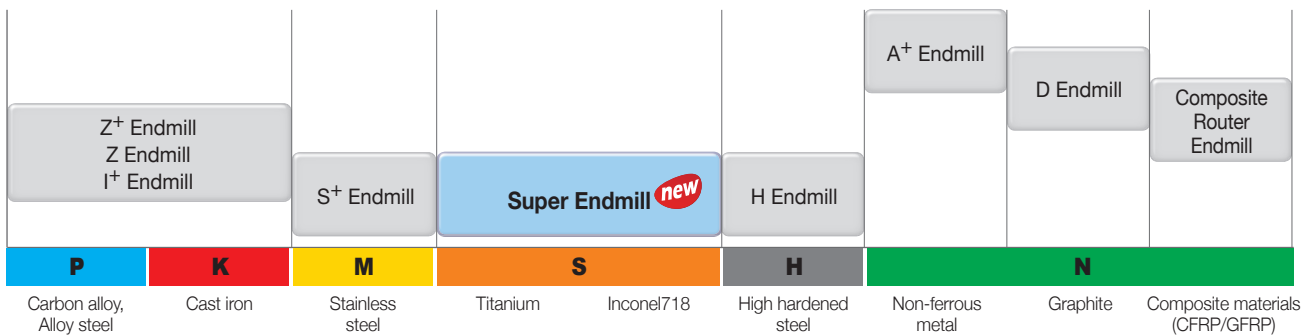
- High lubricative coating and special surface treatment technology
- Surface treatment technology improves welding resistance and machining stability.

Coating application range

◎: Best ○: Very Good △: Good X: Bad

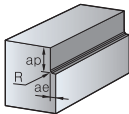
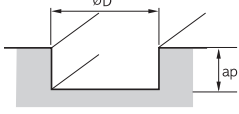
Workpiece	P			K	M	S		H	N
	Carbon alloy	Alloy steel	Pre-hardened steel	Cast iron	Stainless steel	Inconel 718	Titanium	High hardened steel	Non-ferrous metal
SL Coating	◎	◎	○	○	◎	◎	◎	△	X

Tool selection guide



Recommended cutting conditions (SRES4000 Radius)

Workpiece	Ni based heat resistant super alloy (Inconel718, 625)				
	Cutting conditions	RPM n (min ⁻¹)	Feed vf (mm/min)	RPM n (min ⁻¹)	Feed vf (mm/min)
Tool diameter (Ø)					
3		3,800	220	2,500	125
4		3,000	240	1,900	135
5		2,450	245	1,500	145
6		2,100	250	1,250	145
8		1,600	225	945	155
10		1,250	215	760	145
12		1,050	210	630	145
16		765	210	475	110
20		635	200	380	110

Application tip		Shouldering depth ap: ≤ 1.5D ae: ≤ 0.05D		Slotting depth ap: ≤ 0.2D

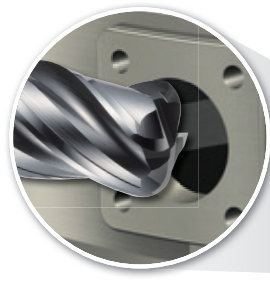
※ Notice

- Please adjust the recommended cutting conditions properly, according to the condition of your machines, the target shapes, and your purpose for machining.
- Please set the machine with high rigidity and check the workpiece clamping.
- Please select proper coolant for workpiece materials and check the pressure and amount of coolant enough for machining.
- In case of chattering, reduce RPM and feed rate by the same ratio.

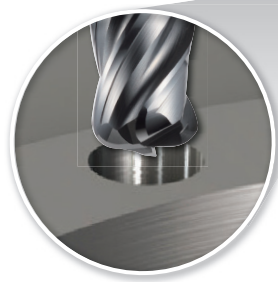
Industries

• **Aerospace and generator industries** - Endmill for parts such as engines and turbines made into hard-to-cut material

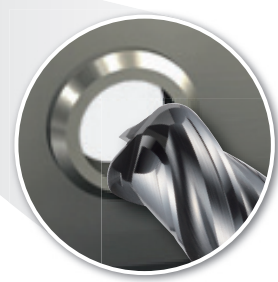
Parts of aerospace engine (turbine case)



- Tool: SRES4120-080-R30
- Machining: Circular interpolation



- Tool: SRES4080-075-R05
- Machining: Internal finishing



- Tool: SRES4120-080-R30
- Machining: Circular interpolation

Ni based HRSA (Inconel718)

- **Workpiece** Turbine case (Ni based super heat resisting alloy)
- **Cutting conditions** vc (m/min) = 60, fz (mm/t) = 0.04, ap (mm) = 5, ae (mm) = 0.3, wet (emulsion)
- **Tool** SRES4120-080-R20 (Tool diameter = $\varnothing 12$, SL Coating)



Super Endmill



Competitor



20% increased chipping resistance

► High quality due to high toughness substrate and improved machining stability

Performance evaluation

Ni based HRSA [Inconel718 (HRC43 - 46)]

- **Cutting conditions** vc (m/min) = 40, fz (mm/t) = 0.05, ap (mm) = 18, ae (mm) = 0.6, wet (emulsion)
- **Tool** SRES4120-080-R10 (Tool diameter = \varnothing 12, SL Coating)



▶ High quality due to high toughness substrate and improved machining stability

Ni based HRSA [Inconel718 (HRC43 - 46)]

- **Cutting conditions** vc (m/min) = 40, fz (mm/t) = 0.05, ap (mm) = 18, ae (mm) = 0.6, wet (soluble)
- **Tool** SRES4120-080-R10 (Tool diameter = \varnothing 12, SL Coating)



▶ High quality due to high toughness substrate and improved machining stability

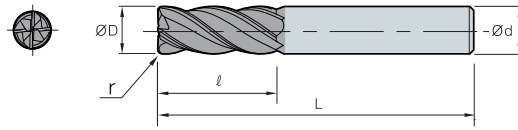
Ni based HRSA [Waspaloy (HRC36 - 38)]

- **Cutting conditions** vc (m/min) = 30, fz (mm/t) = 0.04, ap (mm) = 6, ae (mm) = 18, Trochoidal cutting, wet (soluble)
- **Tool** SRES4120-080-R10 (Tool diameter = \varnothing 12, SL Coating)



▶ High quality due to high toughness substrate and improved machining stability

SRES4000 (Radius)



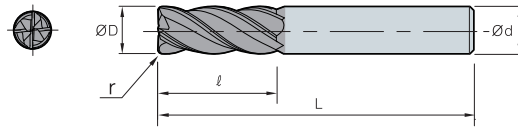
ØD	Tolerance of diameter
Ø1 ~ Ø6	0.00 ~ -0.015
Ø6.1 ~ Ø20	0.00 ~ -0.020



(mm)

Designation		ØD	Ød	ℓ	L	r
SRES	4030-055-R02	3	6	8	55	0.2
	4030-055-R03	3	6	8	55	0.3
	4030-055-R05	3	6	8	55	0.5
	4040-055-R02	4	6	10	55	0.2
	4040-055-R03	4	6	10	55	0.3
	4040-055-R05	4	6	10	55	0.5
	4040-070-R02	4	6	10	70	0.2
	4040-070-R03	4	6	10	70	0.3
	4040-070-R05	4	6	10	70	0.5
	4050-055-R02	5	6	15	55	0.2
	4050-055-R03	5	6	15	55	0.3
	4050-055-R05	5	6	15	55	0.5
	4050-090-R02	5	6	15	90	0.2
	4050-090-R03	5	6	15	90	0.3
	4050-090-R05	5	6	15	90	0.5
	4060-060-R03	6	6	15	60	0.3
	4060-060-R05	6	6	15	60	0.5
	4060-060-R08	6	6	15	60	0.8
	4060-060-R10	6	6	15	60	1.0
	4060-060-R15	6	6	15	60	1.5
4060-060-R20	6	6	15	60	2.0	
4060-090-R03	6	6	15	90	0.3	
4060-090-R05	6	6	15	90	0.5	
4060-090-R08	6	6	15	90	0.8	
4060-090-R10	6	6	15	90	1.0	
4060-090-R15	6	6	15	90	1.5	
4060-090-R20	6	6	15	90	2.0	


SRES4000 (Radius)



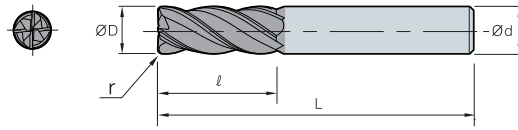
ØD	Tolerance of diameter
Ø1 ~ Ø6	0.00 ~ -0.015
Ø6.1 ~ Ø20	0.00 ~ -0.020



(mm)

Designation	ØD	Ød	ℓ	L	r	
SRES 	4080-070-R03	8	8	20	70	0.3
	4080-070-R05	8	8	20	70	0.5
	4080-070-R08	8	8	20	70	0.8
	4080-070-R10	8	8	20	70	1.0
	4080-070-R15	8	8	20	70	1.5
	4080-070-R20	8	8	20	70	2.0
	4080-070-R25	8	8	20	70	2.5
	4080-070-R30	8	8	20	70	3.0
	4080-100-R03	8	8	20	100	0.3
	4080-100-R05	8	8	20	100	0.5
	4080-100-R08	8	8	20	100	0.8
	4080-100-R10	8	8	20	100	1.0
	4080-100-R15	8	8	20	100	1.5
	4080-100-R20	8	8	20	100	2.0
	4080-100-R25	8	8	20	100	2.5
	4080-100-R30	8	8	20	100	3.0
	4100-075-R03	10	10	25	75	0.3
	4100-075-R05	10	10	25	75	0.5
	4100-075-R08	10	10	25	75	0.8
	4100-075-R10	10	10	25	75	1.0
	4100-075-R15	10	10	25	75	1.5
	4100-075-R20	10	10	25	75	2.0
	4100-075-R25	10	10	25	75	2.5
	4100-075-R30	10	10	25	75	3.0
	4100-100-R03	10	10	25	100	0.3
	4100-100-R05	10	10	25	100	0.5
	4100-100-R08	10	10	25	100	0.8
	4100-100-R10	10	10	25	100	1.0
	4100-100-R15	10	10	25	100	1.5
	4100-100-R20	10	10	25	100	2.0
	4100-100-R25	10	10	25	100	2.5
	4100-100-R30	10	10	25	100	3.0


SRES4000 (Radius)



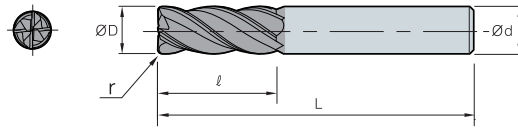
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Ø6.1 ~ Ø20	0.00 ~ -0.020



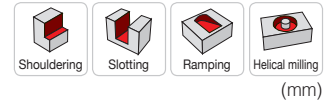
(mm)


Designation		ØD	Ød	ℓ	L	r
SRES 	4120-080-R05	12	12	30	80	0.5
	4120-080-R08	12	12	30	80	0.8
	4120-080-R10	12	12	30	80	1.0
	4120-080-R15	12	12	30	80	1.5
	4120-080-R20	12	12	30	80	2.0
	4120-080-R25	12	12	30	80	2.5
	4120-080-R30	12	12	30	80	3.0
	4120-080-R35	12	12	30	80	3.5
	4120-080-R40	12	12	30	80	4.0
	4120-110-R05	12	12	30	110	0.5
	4120-110-R08	12	12	30	110	0.8
	4120-110-R10	12	12	30	110	1.0
	4120-110-R15	12	12	30	110	1.5
	4120-110-R20	12	12	30	110	2.0
	4120-110-R25	12	12	30	110	2.5
	4120-110-R30	12	12	30	110	3.0
	4120-110-R35	12	12	30	110	3.5
	4120-110-R40	12	12	30	110	4.0
	4140-090-R05	14	14	35	90	0.5
	4140-090-R08	14	14	35	90	0.8
	4140-090-R10	14	14	35	90	1.0
	4140-090-R15	14	14	35	90	1.5
	4140-090-R20	14	14	35	90	2.0
	4140-090-R30	14	14	35	90	3.0
	4140-150-R05	14	14	35	150	0.5
	4140-150-R08	14	14	35	150	0.8
	4140-150-R10	14	14	35	150	1.0
	4140-150-R15	14	14	35	150	1.5
	4140-150-R20	14	14	35	150	2.0
	4140-150-R30	14	14	35	150	3.0

SRES4000 (Radius)

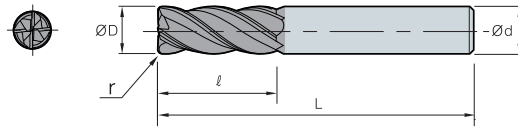


ØD	Tolerance of diameter
Ø1 ~ Ø6	0.00 ~ -0.015
Ø6.1 ~ Ø20	0.00 ~ -0.020



Designation		ØD	Ød	l	L	r
SRES 	4160-100-R05	16	16	42	100	0.5
	4160-100-R08	16	16	42	100	0.8
	4160-100-R10	16	16	42	100	1.0
	4160-100-R15	16	16	42	100	1.5
	4160-100-R20	16	16	42	100	2.0
	4160-100-R25	16	16	42	100	2.5
	4160-100-R30	16	16	42	100	3.0
	4160-100-R35	16	16	42	100	3.5
	4160-100-R40	16	16	42	100	4.0
	4160-100-R50	16	16	42	100	5.0
	4160-100-R60	16	16	42	100	6.0
	4160-150-R05	16	16	42	150	0.5
	4160-150-R08	16	16	42	150	0.8
	4160-150-R10	16	16	42	150	1.0
	4160-150-R15	16	16	42	150	1.5
	4160-150-R20	16	16	42	150	2.0
	4160-150-R25	16	16	42	150	2.5
	4160-150-R30	16	16	42	150	3.0
	4160-150-R35	16	16	42	150	3.5
	4160-150-R40	16	16	42	150	4.0
	4160-150-R50	16	16	42	150	5.0
	4160-150-R60	16	16	42	150	6.0
	4180-100-R05	18	20	45	100	0.5
	4180-100-R08	18	20	45	100	0.8
	4180-100-R10	18	20	45	100	1.0
	4180-100-R15	18	20	45	100	1.5
	4180-100-R20	18	20	45	100	2.0
	4180-100-R30	18	20	45	100	3.0
	4180-150-R05	18	20	45	150	0.5
	4180-150-R08	18	20	45	150	0.8
4180-150-R10	18	20	45	150	1.0	
4180-150-R15	18	20	45	150	1.5	
4180-150-R20	18	20	45	150	2.0	
4180-150-R30	18	20	45	150	3.0	


SRES4000 (Radius)



ØD	Tolerance of diameter
Ø1 ~ Ø6	0.00 ~ -0.015
Ø6.1 ~ Ø20	0.00 ~ -0.020



(mm)

Designation		ØD	Ød	ℓ	L	r
SRES 	4200-100-R05	20	20	48	100	0.5
	4200-100-R10	20	20	48	100	1.0
	4200-100-R15	20	20	48	100	1.5
	4200-100-R20	20	20	48	100	2.0
	4200-100-R25	20	20	48	100	2.5
	4200-100-R30	20	20	48	100	3.0
	4200-100-R35	20	20	48	100	3.5
	4200-100-R40	20	20	48	100	4.0
	4200-100-R50	20	20	48	100	5.0
	4200-100-R60	20	20	48	100	6.0
	4200-150-R05	20	20	48	150	0.5
	4200-150-R10	20	20	48	150	1.0
	4200-150-R15	20	20	48	150	1.5
	4200-150-R20	20	20	48	150	2.0
	4200-150-R25	20	20	48	150	2.5
	4200-150-R30	20	20	48	150	3.0
	4200-150-R35	20	20	48	150	3.5
	4200-150-R40	20	20	48	150	4.0
	4200-150-R50	20	20	48	150	5.0
	4200-150-R60	20	20	48	150	6.0

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