KORLOY TECH-NEWS

Super Endmill for HRSA

Endmill for HRSA machining

- Machining HRSA components like engine, turbine and etc. used in aerospace and power generation industries
- Optimal endmill for Ni Based super alloy HRSA; Inconel718, Hastelloy, Waspaloy and etc.

6F

KORLOY

Endmill for HRSA 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 and Ni based heat resistant super alloy, such as Inconel718, Hastelloy, Waspaloy, etc., is most common material used in the industry.

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 launched Super Endmill for HRSA 6F, the most effective tool for hard-to-cut material in HRSA machining.

Super Endmill for HRSA 6F increases machinability and stability in machining due to positive rake angle and irregular flute spacing shape. In addition, 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

- High rigidity core web design and unequal helix design
- Applied optimal flute shape for excellent chip evacuation and high lubricated coating layer

» Increased tool life

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

Code system

S RE S 6 120 - 080 - R30

- **Super Endmill**
- **Type**
  - FE: Flat Endmill
  - RE: Radius Endmill
- **Workpiece**
  - S: Super alloy
    - Inconel718
    - Waspaloy
    - Hastelloy
- **No. of flute**
  - 6: 6 flutes
- **Tool diameter**
  - 120: Ø12mm
- **Overall length**
  - 080: 80mm
- **Corner R**
  - R30: 3mm

Tool selection guide

★: 1st recommendation

P	K	M	S		H	N		
U-Star Endmill ★		S-Star ★ Endmill	Super Endmill for HRSA	Super Endmill for Ti ★	H-Star Endmill	A-Star Endmill	D Endmill	Composite Router Endmill
G-Star Endmill		Super Endmill for Ti		S-Star Endmill				
Carbon steel, Alloy steel	Cast iron	Stainless steel	Inconel718, Waspaloy, Hastelloy	Titanium	High hardened alloy	Non-ferrous	Graphite	Composite materials (CFRP/GFRP)

Line-up

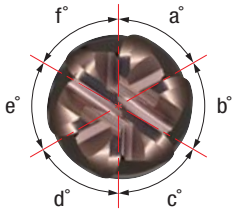
Type	Designation	Grade	Picture	Product name	No. of flute	Size (Ø)	
						Min.	Max.
Flat	SFES4000 ★	SL1		4 flutes flat Endmill	4	3	20
	SFES6000 New	ST2		6 flutes flat Endmill	6	6	20
Radius	SRES4000 ★	SL1		4 flutes radius Endmill	4	3	20
	SRES6000 New	ST2		6 flutes radius Endmill	6	6	20

★ : 4 flutes Endmill Product information QR Code

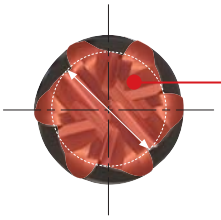
Features

- **Aerospace and generator industries** - Exclusive endmill for HRSA and machining parts of engine and turbine
- **Excellent tool life** - New grade with excellent wear resistance coating and high toughness substrate

SFES6000(Flat) / SRES6000(Radius)



a°≠ b°≠ c°, d°≠ e°≠ f°

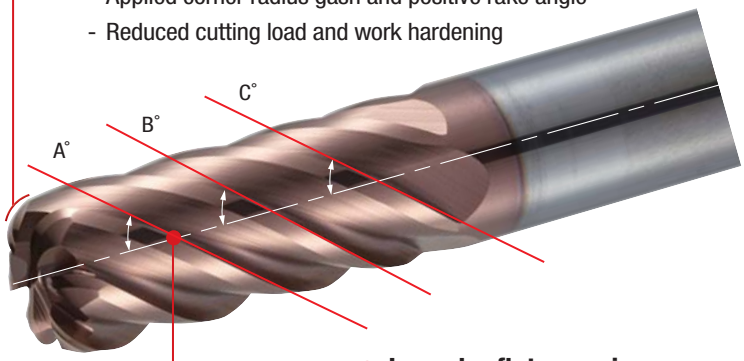


High rigidity core web design

- Improved chip evacuation
- Increased machining stability

Sharp cutting edge

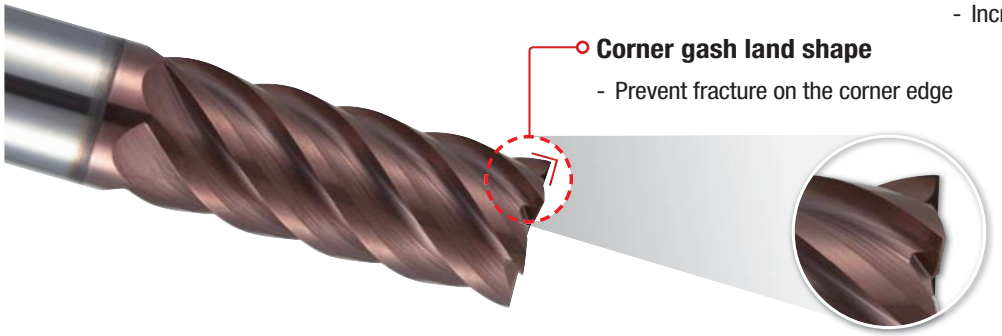
- Applied corner radius gash and positive rake angle
- Reduced cutting load and work hardening



A°≠B°≠C°

Irregular flute spacing and helix angle

- Reduces chattering
- Increases machining stability

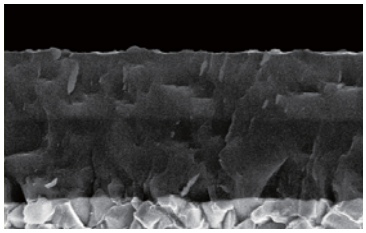


Corner gash land shape

- Prevent fracture on the corner edge

Grade features

ST coating(Super Thermal resistance coating) New



- Excellent tool life when machining heat resistant alloys due to high hardness and excellent heat shielding layers
- Excellent surface finish of the coating layer increases lubricity which reduces friction and enhances chip evacuation

[ST coating application range]

◎: Excellent ○: Good

Workpiece	P					K	M	S		H	N
	Carbon Steel	Alloy steel	Pre-hardened steel	Hardened steel		Cast iron	Stainless Steel	HRSA		High hardened alloy	Non-ferrous
	Below HB225	HB225 ~325	HRC30 ~40	HRC40 ~45	HRC45 ~55	-	-	Inconel718, Waspaloy, Hastelloy	Ti, Ti Alloy	HRC55 ~70	Cupper, AL, Graphite, Acryl, CFRP
ST coating								◎			

Recommended cutting conditions _ SFES6000 (Flat) / SRES6000 (Radius)

Workpiece				Brinell hard-ness (HB)	Specific cutting force (N/mm²)	Tensile strength at high temp. (N/mm²)	ap (mm)	ae (mm)	Machining	Diameter (mm)	6	8	10	12	14	16	20
ISO	Workpiece materials	ISO	AISI							Cutting length (mm)	15	20	25	30	35	42	48
S	Fe series	A286	A286	275	74	750	1.5D	0.05D	Shouldering	vc	40	40	39	40	40	39	40
		Inconel909	Inconel909	270	100	680				fz	0.031	0.034	0.038	0.041	0.050	0.069	0.080
		Inconel718	Inconel718	360	100	720				rpm	2,120	1,580	1,250	1,050	900	770	635
										feed	400	320	285	260	270	320	305
	Ni series	Hastelloy C276	Hastelloy C276	220	86	720	1D	0.3D		vc	25	25	25	25	25	25	25
		Inconel625	Inconel625	210	66	720				fz	0.013	0.015	0.017	0.023	0.027	0.035	0.042
										rpm	1,310	990	790	660	565	500	400
										feed	100	90	80	90	90	105	100
	Ni-Co series	Haynes282	Haynes282	230	100	900	1.5D	0.05D	Shouldering	vc	34	34	33	34	34	33	34
		ME16	ME16	325	100	880				fz	0.031	0.034	0.038	0.041	0.050	0.069	0.080
		Waspaloy	Waspaloy	350	143	650				rpm	1,800	1,340	1,060	890	765	655	540
		RENE60	RENE60	385	100	660				feed	335	275	245	220	230	270	260
	Co series	Haynes25	Haynes25	285	114	670	1D	0.3D		vc	21	21	21	21	22	22	22
		Stellite31	Stellite31	475	143	700				fz	0.014	0.016	0.017	0.023	0.027	0.035	0.042
										rpm	1,060	840	680	580	500	445	360
										feed	90	80	70	80	80	95	90

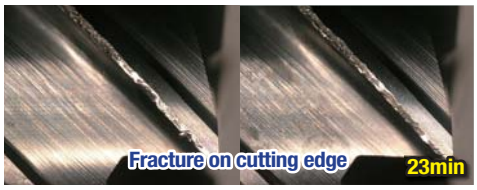
Performance evaluation

Inconel718(HRC40-43)

Cutting condition vc (m/min) = 40, fz (mm/t) = 0.04, ap (mm) = 12, ae (mm) = 0.6, wet (emulsion)

Tool SFES6120-080 (Diameter = ∅12mm, ST coating)

[Super Endmill]



[Competitor]

» High quality performance from high toughness substrate and cutting stability

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[Super Endmill]

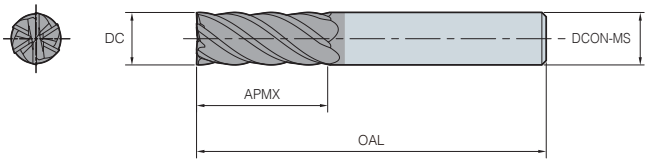
[Competitor]

» High quality performance from high toughness substrate and cutting stability

SFES6000 (Flat)

6 | H·A Multi | h6 shank | ST coating

DC	Tolerance
Ø6	0.000 ~ -0.025
Ø8 ~ Ø20	0.000 ~ -0.030



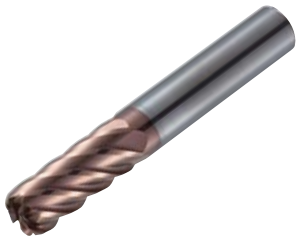
(mm)

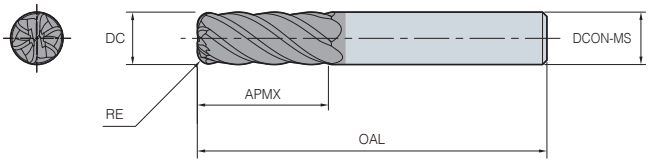
Designation		DC	APMX	OAL	DCON-MS
SFES 6	6060-060	6	15	60	6
	6080-070	8	20	70	8
	6100-075	10	25	75	10
	6120-080	12	30	80	12
	6140-090	14	35	90	14
	6160-100	16	42	100	16
	6200-100	20	48	100	20

SRES6000 (Radius)

6 | H·A Multi | h6 shank | ST coating | RE ±0.02

DC	Tolerance
Ø6	0.000 ~ -0.025
Ø8 ~ Ø20	0.000 ~ -0.030





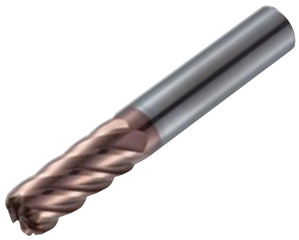
(mm)

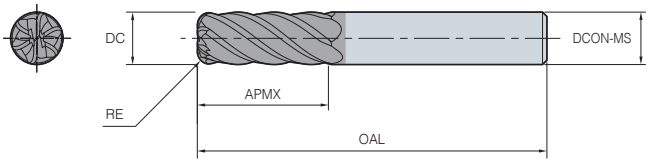
	Designation	DC	APMX	OAL	DCON-MS	RE
SRES 6	6060-060-R03	6	15	60	6	0.3
	6060-060-R05	6	15	60	6	0.5
	6060-060-R10	6	15	60	6	1
	6060-090-R03	6	15	90	6	0.3
	6060-090-R05	6	15	90	6	0.5
	6060-090-R10	6	15	90	6	1
	6080-070-R03	8	20	70	8	0.3
	6080-070-R05	8	20	70	8	0.5
	6080-070-R10	8	20	70	8	1
	6080-070-R15	8	20	70	8	1.5
	6080-100-R03	8	20	100	8	0.3
	6080-100-R05	8	20	100	8	0.5
	6080-100-R10	8	20	100	8	1
	6080-100-R15	8	20	100	8	1.5
	6100-075-R03	10	25	75	10	0.3
	6100-075-R05	10	25	75	10	0.5
	6100-075-R10	10	25	75	10	1
	6100-075-R15	10	25	75	10	1.5
	6100-075-R20	10	25	75	10	2
	6100-100-R03	10	25	100	10	0.3
	6100-100-R05	10	25	100	10	0.5
	6100-100-R10	10	25	100	10	1
	6100-100-R15	10	25	100	10	1.5
	6100-100-R20	10	25	100	10	2
	6120-080-R05	12	30	80	12	0.5
	6120-080-R10	12	30	80	12	1
	6120-080-R15	12	30	80	12	1.5
	6120-080-R20	12	30	80	12	2
	6120-080-R30	12	30	80	12	3
	6120-110-R05	12	30	110	12	0.5
	6120-110-R10	12	30	110	12	1
	6120-110-R15	12	30	110	12	1.5
	6120-110-R20	12	30	110	12	2
	6120-110-R30	12	30	110	12	3

SRES6000 (Radius)

6 | H·A Multi | h6 shank | ST coating | RE ±0.02

DC	Tolerance
Ø6	0.000 ~ -0.025
Ø8 ~ Ø20	0.000 ~ -0.030





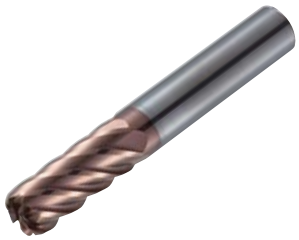
(mm)

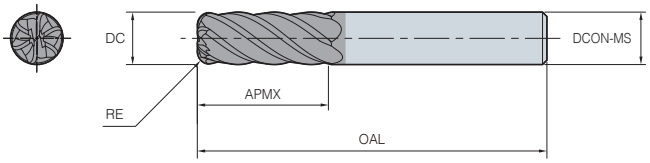
Designation		DC	APMX	OAL	DCON-MS	RE
SRES 6	6140-090-R05	14	35	90	14	0.5
	6140-090-R10	14	35	90	14	1
	6140-090-R15	14	35	90	14	1.5
	6140-090-R20	14	35	90	14	2
	6140-090-R30	14	35	90	14	3
	6140-090-R40	14	35	90	14	4
	6140-090-R50	14	35	90	14	5
	6140-090-R60	14	35	90	14	6
	6140-150-R05	14	35	150	14	0.5
	6140-150-R10	14	35	150	14	1
	6140-150-R15	14	35	150	14	1.5
	6140-150-R20	14	35	150	14	2
	6140-150-R30	14	35	150	14	3
	6140-150-R40	14	35	150	14	4
	6140-150-R50	14	35	150	14	5
	6140-150-R60	14	35	150	14	6
	6160-100-R05	16	42	100	16	0.5
	6160-100-R10	16	42	100	16	1
	6160-100-R15	16	42	100	16	1.5
	6160-100-R20	16	42	100	16	2
	6160-100-R30	16	42	100	16	3
	6160-100-R40	16	42	100	16	4
	6160-100-R50	16	42	100	16	5
	6160-100-R60	16	42	100	16	6
	6160-150-R05	16	42	150	16	0.5
	6160-150-R10	16	42	150	16	1
	6160-150-R15	16	42	150	16	1.5
	6160-150-R20	16	42	150	16	2
	6160-150-R30	16	42	150	16	3
	6160-150-R40	16	42	150	16	4
	6160-150-R50	16	42	150	16	5
	6160-150-R60	16	42	150	16	6

SRES6000 (Radius)

6 | H·A Multi | h6 shank | ST coating | RE ±0.02

DC	Tolerance
Ø6	0.000 ~ -0.025
Ø8 ~ Ø20	0.000 ~ -0.030



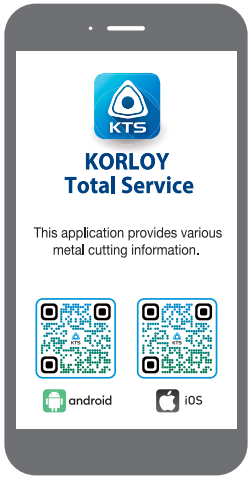


(mm)

Designation		DC	APMX	OAL	DCON-MS	RE
SRES 6	6200-100-R05	20	48	100	20	0.5
	6200-100-R10	20	48	100	20	1
	6200-100-R15	20	48	100	20	1.5
	6200-100-R20	20	48	100	20	2
	6200-100-R30	20	48	100	20	3
	6200-100-R40	20	48	100	20	4
	6200-100-R50	20	48	100	20	5
	6200-100-R60	20	48	100	20	6
	6200-150-R05	20	48	150	20	0.5
	6200-150-R10	20	48	150	20	1
	6200-150-R15	20	48	150	20	1.5
	6200-150-R20	20	48	150	20	2
	6200-150-R30	20	48	150	20	3
	6200-150-R40	20	48	150	20	4
	6200-150-R50	20	48	150	20	5
	6200-150-R60	20	48	150	20	6

⚠ For the safe metalcutting

- Use safety supplies such as protective gloves to prevent possible injury while touching the edge of tools.
- Use safety glasses or safety cover to hedge possible dangers. Inappropriate usage or excessive cutting condition may lead tool's breakage or even the fragment's scattering.
- Clamp the workpiece tightly enough to prevent its movement while its machining.
- Properly manage the tool change phase because the inordinately used tool can be easily broken under the excessive cutting load or severe wear, and it may threat the operator's safety.
- Use safety cover because chips evacuated during cutting are hot and sharp and may cause burns and cuts. To remove chips safely, stop machining, put on protective gloves, and use a hook or other tools.
- Prepare for fire prevention measures as the use of the non-water soluble cutting oil may cause fire.
- Use safety cover and other safety supplies because the spare parts or the tools can be pulled out due to centrifugal force while high speed machining.



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