DIA EDGE
TOOL NEWS
2021.9 Update
B264B

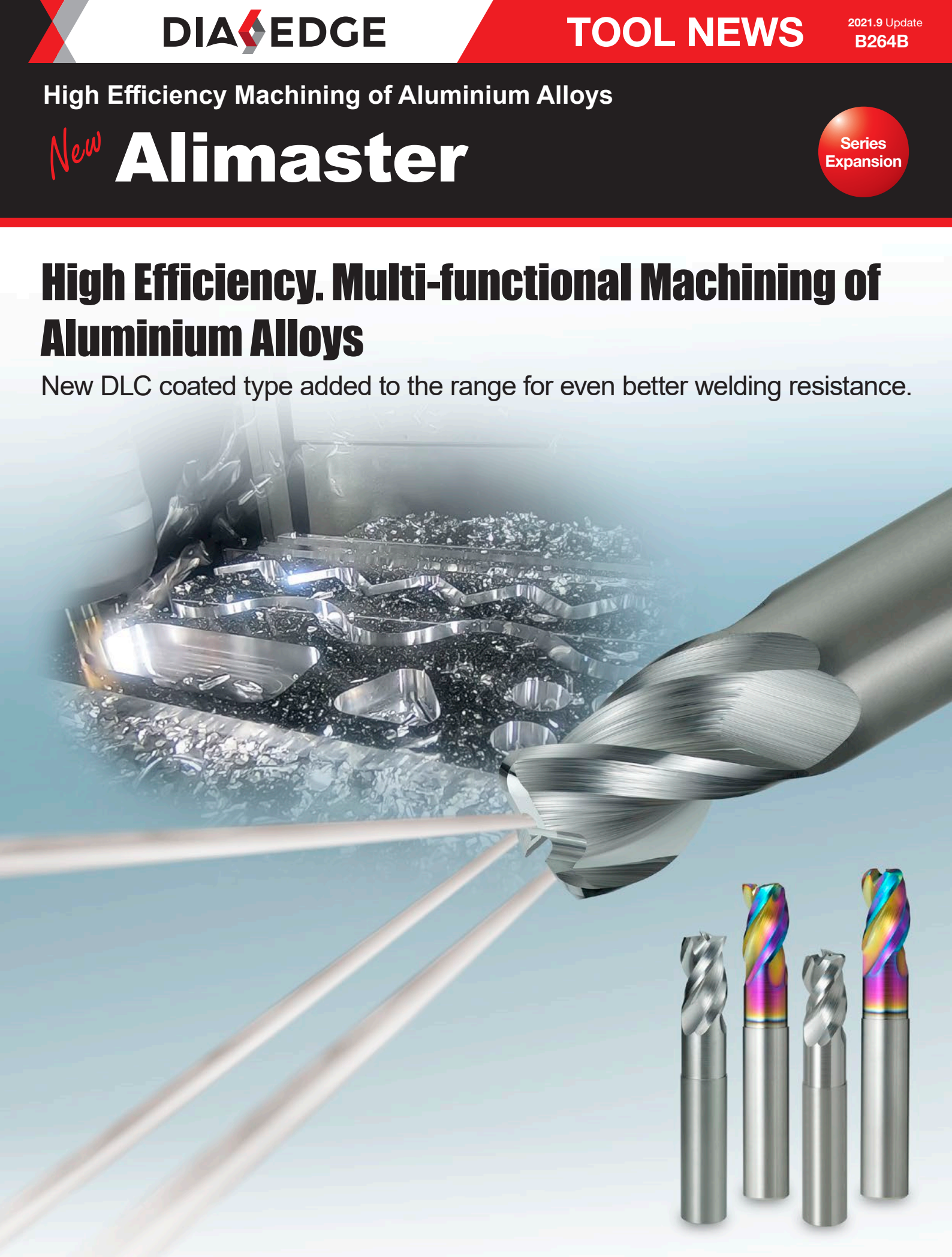
High Efficiency Machining of Aluminium Alloys

New Alimaster

Series Expansion

High Efficiency. Multi-functional Machining of Aluminium Alloys

New DLC coated type added to the range for even better welding resistance.



MITSUBISHI MATERIALS CORPORATION

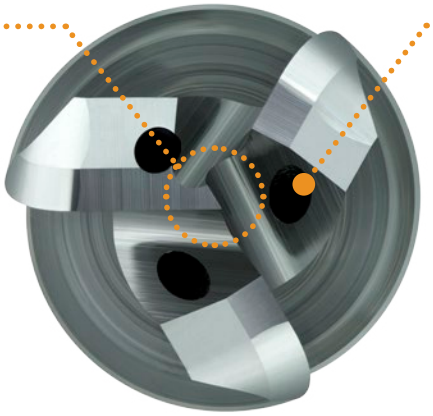
High Efficiency Machining of Aluminium Alloys

New Alimaster

Helical internal through coolant holes, together with an optimised cutting edge geometry enables highly efficient machining.

Strengthened Centre Cutting Edges

Optimised centre cutting edges provide strength and reliability even during plunging.



Helical Through Coolant Holes

Chip discharge during plunging, ramping and grooving have been significantly improved, for stable, high efficiency cutting.
Helical holes maintain a stable coolant supply even after re-grinding.

Ideal Flute Geometry

The cross sectional geometry of the flutes is perfect for efficient chip discharge and prevents chip jamming commonly associated with high feed machining of aluminium.

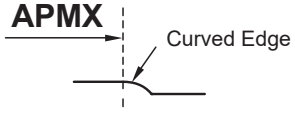
Square End Mill, 3 Flute

A3SA

Iregular Helix and Curved Flute Exit Geometry

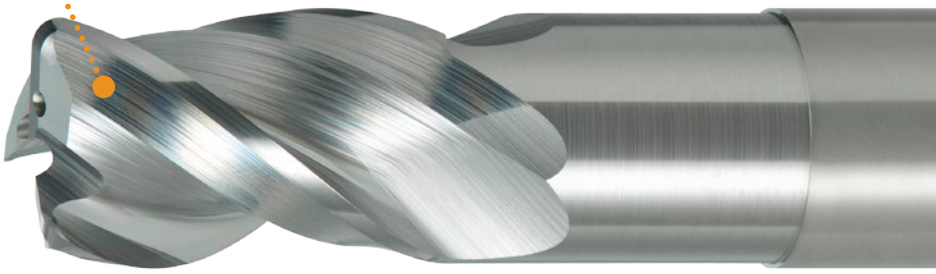
Suppresses chatter to enable excellent surface finishes.

Radius Flute Exit Geometry



Radius End Mill, 3 Flute

A3SARB



High Efficiency & Economy

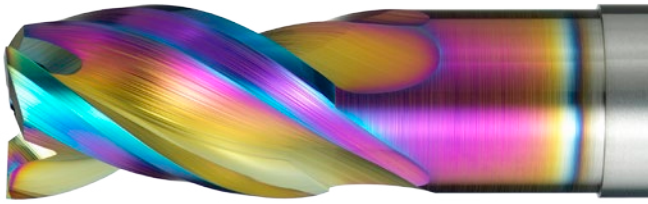
DLC Coating

By adopting a unique DLC coating with excellent adhesion and welding resistance, cutting friction is reduced thereby provides extra stability and efficiency. Additionally wet or dry cutting is possible for slot milling and contouring.

NEW

Square End Mill, 3 Flute

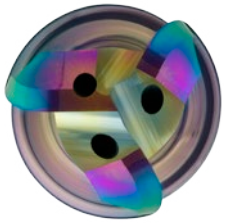
DLC3SA

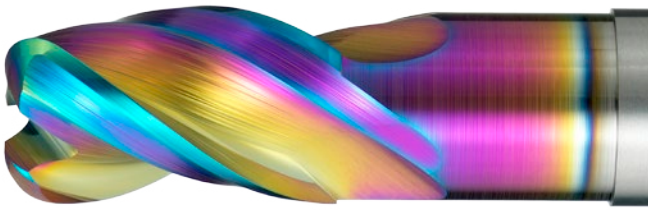


NEW

Radius End Mill, 3 Flute

DLC3SARB

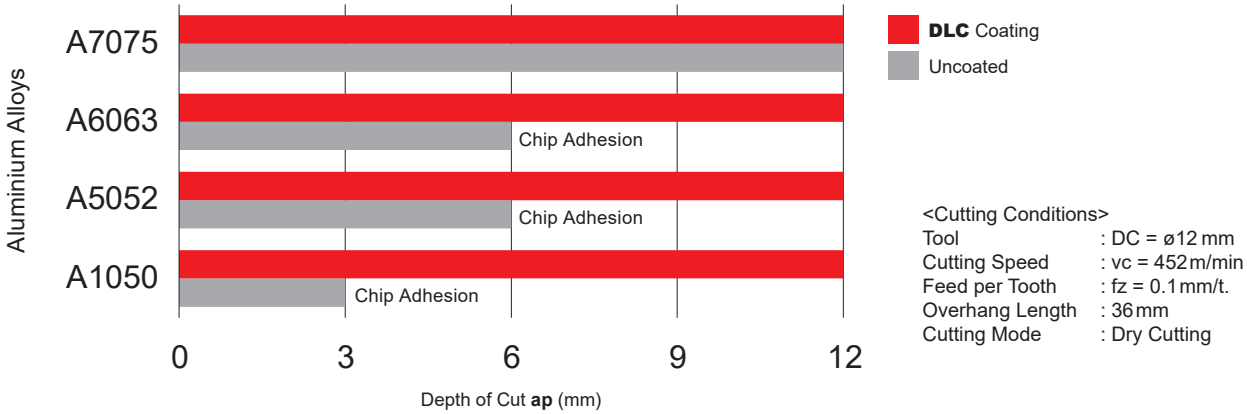




DLC coatings may differ naturally in colour. This has no effect on quality or performance.

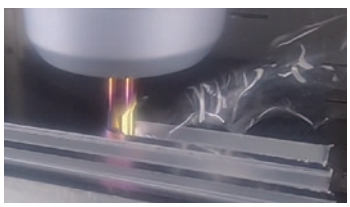
Dry Slot Milling - Comparison when Machining Different Materials

The excellent welding resistance and chip evacuation properties enables high efficiency slot milling even at large depths of cut.



<Cutting Conditions>

Tool	: DC = ø12 mm
Cutting Speed	: vc = 452 m/min
Feed per Tooth	: fz = 0.1 mm/t.
Overhang Length	: 36 mm
Cutting Mode	: Dry Cutting



DLC Coating ap = 12 mm

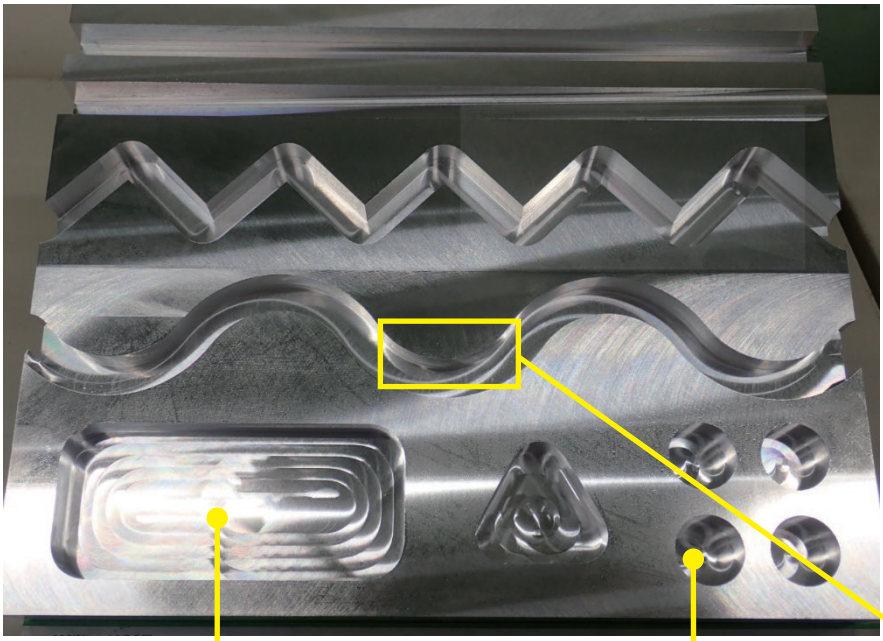
Uncoated ap = 3 mm

* Air blow both internal and external is used to effectively evacuate chips.

Cutting Performance

With DLC Coating - Example of Dry Machining A7075 Material

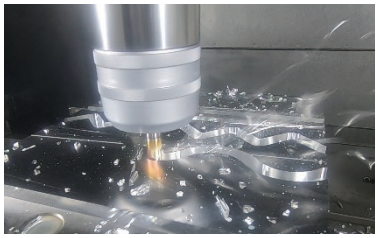
Multi-functional dry machining is possible.

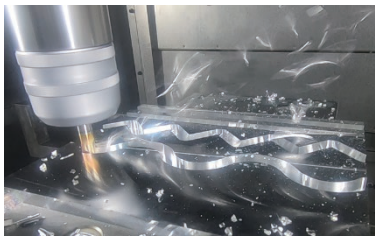


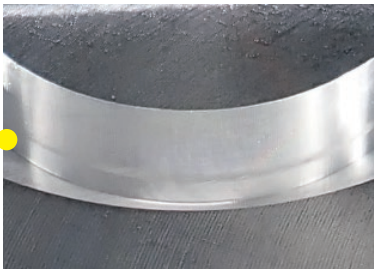
Pocket Milling
100 x 45mm (ap=12mm)

Helical Milling
ø20mm, Hole Depth 12mm

Excellent Chip Evacuation







Wall Surface

<Cutting Conditions>
Workpiece Material : A7050
Tool : DLC3SA120N36C
Cutting Mode : Dry Cutting
Machine : Vertical M/C

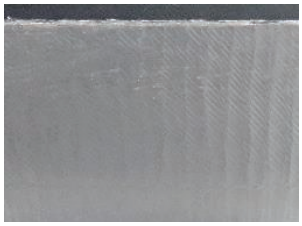
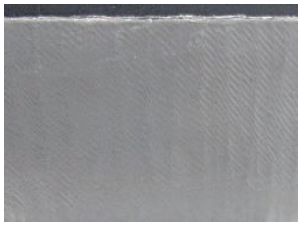
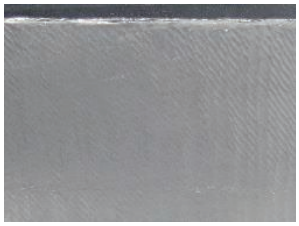
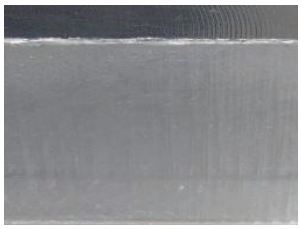
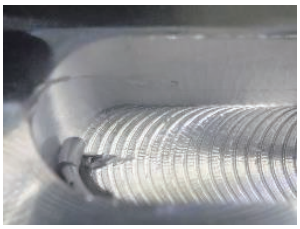
(mm)

Cutting Mode	Revolution **n** (min^{-1})	Cutting Speed **vc** (m/min)	Feed Rate **vf** (mm/min)	Feed per Tooth **fz** (mm/t.)	Depth of Cut **ap**	Width of Cut **ae**
Slot Milling	12000	452	3600	0.1	12	12
Ramping : 3°	12000	452	1800	0.05	12	12
Helical Milling	12000	452	1800	0.05	Pitch 2	–
Pocket Milling	12000	452	3600	0.1	12	3.6

* Air blow both internal and external is used to effectively evacuate chips.

Uncoated Type - Slot Machining A7050 Material

Utilising internal coolant and an optimised cutting edge geometry enables double the efficiency levels of conventional products.

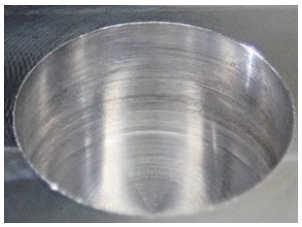
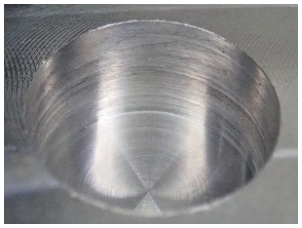
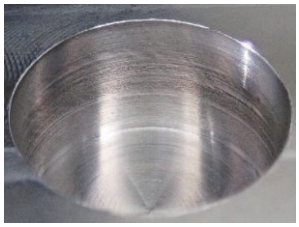
Feed Rate (mm/min)	**2550**	**3020**	**3500**
Feed per Tooth (mm/t.)	**0.32**	**0.38**	**0.44**
New Alimaster			
	✓ Good Wall Surface	✓ Good Wall Surface	✓ Good Wall Surface
Conventional A			
	✓ Good Wall Surface	✗ Breakage due to chip clogging	
Conventional B			
	✗ Breakage due to chip clogging		

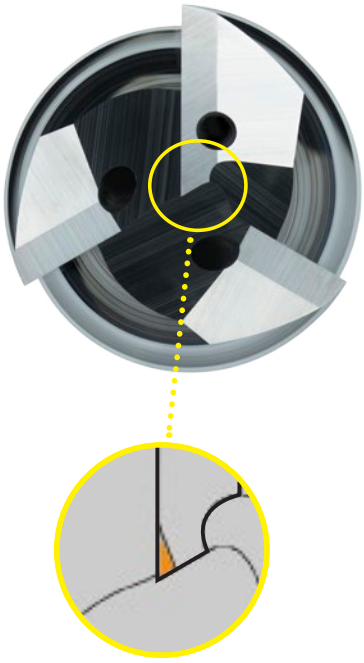
<Cutting Conditions>
Workpiece Material : A7050
Tool : A3SA120N36C
DC = ø12 mm
Cutting Speed : vc = 100 m/min
Depth of Cut : ap = 12 mm
Overhang Length : 36 mm
Cutting Mode : Internal Coolant
(Water-soluble Coolants)

Cutting Performance

Uncoated Type - Plunge Machining A7050 Material

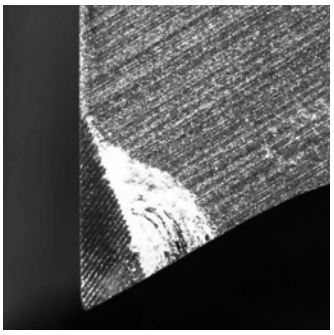
Higher feed rates than conventional products brings greater machining efficiencies.

Feed Rate (mm/min)	1040	1280	1520
Feed per Rev. (mm/rev)	0.13	0.16	0.19
New Alimaster	 ✓	 ✓	 ✓

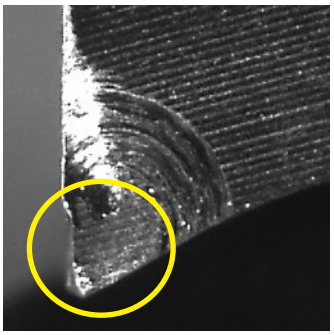


Strengthened Centre Cutting Edges

After F=1520 mm/min, fz=0.19 mm/rev Plunging



New Alimaster ✓



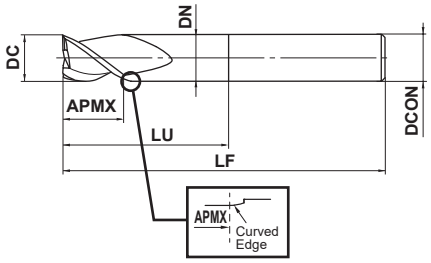
Conventional Fracture ✗

<Cutting Conditions>
Workpiece Material : A7050
Tool : A3SA120N36C
DC = ø12 mm
Cutting Speed : vc = 300 m/min
Depth of Cut : ap = 12 mm
Overhang Length : 36 mm
Cutting Mode : Internal Coolant
(Water-soluble Coolants)

DLC3SA NEW

End mill, Short cut length, 3 flute, with multiple internal through coolant holes

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
							◎



DC=12	DC>12			
0 - 0.020	0 - 0.030			
12≤DCON≤16	20≤DCON≤25			
0 - 0.011	0 - 0.013			

- Stability and reliability even when slotting, ramping and plunging.
- DLC coating aids in providing excellent chip evacuation.

Order Number	DC	APMX	LU	DN	LF	DCON	* No.F	Stock
DLC3SA120N36C	12	18	36	11.4	80	12	3	●
DLC3SA160N48C	16	24	48	15.4	90	16	3	●
DLC3SA200N55C	20	30	55	18	100	20	3	●
DLC3SA250N55C	25	37.5	55	23	100	25	3	●

* Number of Flutes

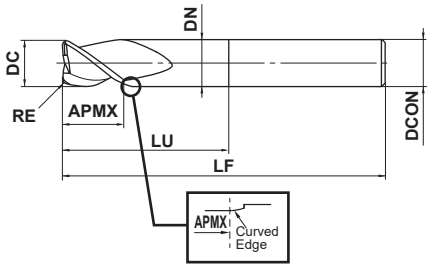
DC = Cutting Dia.
APMX = Depth of Cut Max.
LU = Usable Length
DN = Neck Dia.
LF = Functional Length
DCON = Connection Dia.

● : **Inventory maintained in Japan.**

DLC3SARB NEW

Corner radius end mill, Short cut length, 3 flute, with multiple internal through coolant holes

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
							◎



DC=12	DC>12			
0 - 0.020	0 - 0.030			
12≤DCON≤16	20≤DCON≤25			
0 - 0.011	0 - 0.013			

- Stability and reliability even when slotting, ramping and plunging.
- DLC coating aids in providing excellent chip evacuation.

(mm)

Order Number	DC	RE	APMX	LU	DN	LF	DCON	* No.F	Stock
DLC3SARB120R100N36C	12	1	18	36	11.4	80	12	3	●
DLC3SARB120R200N36C	12	2	18	36	11.4	80	12	3	●
DLC3SARB120R300N36C	12	3	18	36	11.4	80	12	3	●
DLC3SARB160R200N48C	16	2	24	48	15.4	90	16	3	●
DLC3SARB160R300N48C	16	3	24	48	15.4	90	16	3	●
DLC3SARB160R400N48C	16	4	24	48	15.4	90	16	3	●
DLC3SARB200R200N55C	20	2	30	55	18	100	20	3	●
DLC3SARB200R300N55C	20	3	30	55	18	100	20	3	●
DLC3SARB200R400N55C	20	4	30	55	18	100	20	3	●
DLC3SARB250R200N55C	25	2	37.5	55	23	100	25	3	●
DLC3SARB250R300N55C	25	3	37.5	55	23	100	25	3	●
DLC3SARB250R400N55C	25	4	37.5	55	23	100	25	3	●
DLC3SARB250R500N55C	25	5	37.5	55	23	100	25	3	●

* Number of Flutes

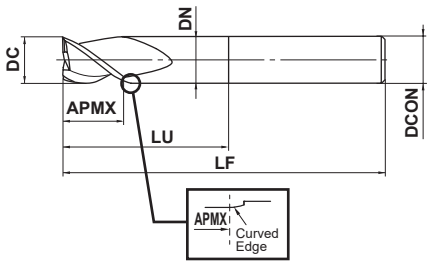
DC = Cutting Dia.
RE = Corner Radius
APMX = Depth of Cut Max.
LU = Usable Length
DN = Neck Dia.
LF = Functional Length
DCON = Connection Dia.

● : **Inventory maintained in Japan.**

A3SA

End mill, Short cut length, 3 flute, with multiple internal through coolant holes

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
							◎



DC=12	DC>12			
0 - 0.020	0 - 0.030			
12≤DCON≤16	20≤DCON≤25			
0 - 0.011	0 - 0.013			

- Stability and reliability even when slotting, ramping and plunging.
- The cross sectional geometry of the flutes is perfect for efficient chip discharge.

Order Number	DC	APMX	LU	DN	LF	DCON	* No.F	Stock
A3SA120N36C	12	18	36	11.4	80	12	3	●
A3SA160N48C	16	24	48	15.4	90	16	3	●
A3SA200N55C	20	30	55	18	100	20	3	●
A3SA250N55C	25	37.5	55	23	100	25	3	●

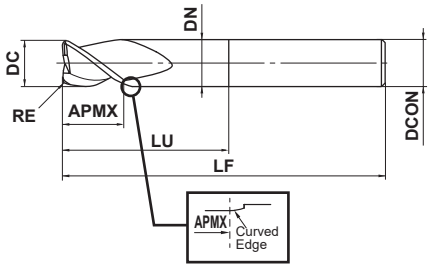
* Number of Flutes

DC = Cutting Dia.
APMX = Depth of Cut Max.
LU = Usable Length
DN = Neck Dia.
LF = Functional Length
DCON = Connection Dia.

A3SARB

Corner radius end mill, Short cut length, 3 flute, with multiple internal through coolant holes

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
							◎



DC=12	DC>12			
0 - 0.020	0 - 0.030			
12≤DCON≤16	20≤DCON≤25			
0 - 0.011	0 - 0.013			

- Stability and reliability even when slotting, ramping and plunging.
- The cross sectional geometry of the flutes is perfect for efficient chip discharge.

(mm)

Order Number	DC	RE	APMX	LU	DN	LF	DCON	* No.F	Stock
A3SARB120R100N36C	12	1	18	36	11.4	80	12	3	●
A3SARB120R200N36C	12	2	18	36	11.4	80	12	3	●
A3SARB120R300N36C	12	3	18	36	11.4	80	12	3	●
A3SARB160R200N48C	16	2	24	48	15.4	90	16	3	●
A3SARB160R300N48C	16	3	24	48	15.4	90	16	3	●
A3SARB160R400N48C	16	4	24	48	15.4	90	16	3	●
A3SARB200R200N55C	20	2	30	55	18	100	20	3	●
A3SARB200R300N55C	20	3	30	55	18	100	20	3	●
A3SARB200R400N55C	20	4	30	55	18	100	20	3	●
A3SARB250R200N55C	25	2	37.5	55	23	100	25	3	●
A3SARB250R300N55C	25	3	37.5	55	23	100	25	3	●
A3SARB250R400N55C	25	4	37.5	55	23	100	25	3	●
A3SARB250R500N55C	25	5	37.5	55	23	100	25	3	●

* Number of Flutes

DC = Cutting Dia.
RE = Corner Radius
APMX = Depth of Cut Max.
LU = Usable Length
DN = Neck Dia.
LF = Functional Length
DCON = Connection Dia.

● : **Inventory maintained in Japan.**

A3SA/A3SARB, DLC3SA/DLC3SARB

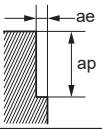
Recommended Cutting Conditions

Use high efficiency cutting conditions when the machine and workpiece rigidity, and chip evacuation properties are sufficient. Use lower, general-purpose cutting conditions when the mechanical or workpiece rigidity or chip evacuation porperties are insufficient.

High Efficiency Conditions

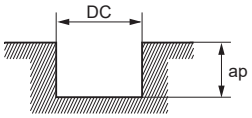
■Side Milling

(mm)

Workpiece Material	Aluminium Alloys				
Dia. **DC**	Cutting Speed (m/min)	Revolution (min^{-1})	Feed Rate (mm/min)	Depth of Cut ae(mm)	Depth of cut ap(mm)
12	1240	33000	15000	6	12
16	1660	33000	20000	8	16
20	2070	33000	26000	10	20
25	2590	33000	32000	12.5	25
Depth of Cut					

■Slot Milling

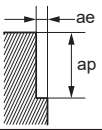
(mm)

Workpiece Material	Aluminium Alloys			
Dia. **DC**	Cutting Speed (m/min)	Revolution (min^{-1})	Feed Rate (mm/min)	Depth of Cut ap(mm)
12	1240	33000	15000	6
16	1660	33000	20000	8
20	2070	33000	26000	10
25	2590	33000	32000	12.5
Depth of Cut	 DC:Cutting Dia.			

General-purpose Conditions

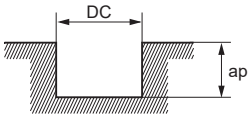
■Side Milling

(mm)

Workpiece Material	Aluminium Alloys				
Dia. **DC**	Cutting Speed (m/min)	Revolution (min^{-1})	Feed Rate (mm/min)	Depth of Cut ae(mm)	Depth of cut ap(mm)
12	600	16000	7200	6	12
16	600	12000	7200	8	16
20	600	9500	7400	10	20
25	600	7600	7300	12.5	25
Depth of Cut					

■Slot Milling

(mm)

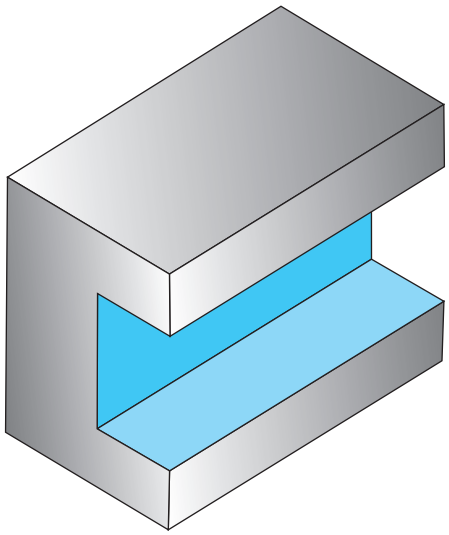
Workpiece Material	Aluminium Alloys			
Dia. **DC**	Cutting Speed (m/min)	Revolution (min^{-1})	Feed Rate (mm/min)	Depth of Cut ap(mm)
12	600	16000	7200	6
16	600	12000	7200	8
20	600	9500	7400	10
25	600	7600	7300	12.5
Depth of Cut	 DC:Cutting Dia.			

Note 1) It is recommended to use a water-soluble coolant. It is also possible to use air blow (external/internal) for DLC coated types.
Note 2) Climb milling is recommended for side cutting.
Note 3) This table shows the cutting condition with less than 4D overhang length. If more than 4D, spindle speed, feed rate and depth of cut should be reduced.
Note 4) When ramping, consider the chip discharge and use a feed rate 50% lower than the slotting conditions above and also use a ramping angle of 5º or less.
Note 5) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately within the range described in the above table, or reduce the depth and width of cut.

Cutting Example

Machining with a High-speed, High-output Horizontal 5-axis Machining Centre

Ultra-high efficiency processing was achieved with a stable chip discharge and no chattering.
Metal Removal Rate of 10,000 cm^3/min.



<Cutting Conditions>

Workpiece Material	: A7050
Tool	: A3SARB250R300N55C DC = ø25 mm, RE=3.0 mm
Spindle Revolution	: 33000 min^{-1}
Cutting Speed	: vc = 2600 m/min
Feed Rate	: f = 25000 mm/min
Feed	: fz = 0.25 mm/t.
Depth of Cut	: ap = 16 mm, ae=25 mm
Cutting Mode	: Internal Coolant (Water-soluble Coolants)
Machine	: For machining aluminium structural parts for aircraft High-speed, high-output horizontal 5-axis M/C

For Your Safety
●Don't handle inserts and chips without gloves. ●Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage. ●Please use safety covers and wear safety glasses. ●When using compounded cutting oils, please take fire precautions. ●When attaching inserts or spare parts, please use only the correct wrench or driver. ●When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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(Tools specifications subject to change without notice.)

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