

Expand

High Efficiency Machining for Aluminium Alloys

# ALIMASTER



**An undercut type now available.**

## High efficiency machining for aluminium alloys

- High speed milling over 6000cc/min  
(Roughing type)
- Complete line-up from roughing to finishing.
- Undercut type used to reduce steps on deep wall faces.

# High Efficiency Machining for Aluminium Alloys

# ALIMASTER

## C-3SARB

Corner radius end mill,  
Short cut length, 3 flute

## C-2MHA

2 flute, Medium cut length,  
High helix

## C-2SA

2 flute, Short cut length,  
Relieved neck

## C-3SA Expand

3 flute, Short cut length,  
Relieved neck

## C-SRA

Roughing end mill,  
Short cut length, 3 flute

## C-MRA

Roughing end mill,  
Medium cut length, 3 flute

## C-SRARB

Corner radius roughing end mill,  
Short cut length, 3 flute

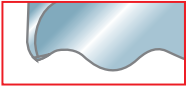
Possible to achieve high efficiency machining of aluminium alloys, chip removal volumes over 6000cc/min.

## Features

- Special flute geometry for improved chip disposal!
- Improved vibration resistance due to the use of a special cutting edge geometry.
- Complete line-up from roughing to finishing.

### Roughing Type

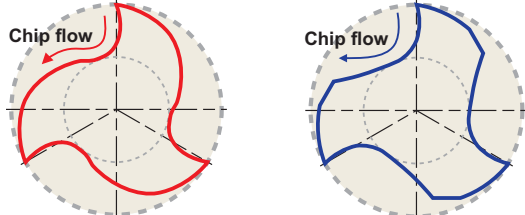
● Special roughing geometry is used for superior chipping resistance.



Special roughing geometry Improved chipping resistance  
Special cross-section flute geometry Improved chip disposal

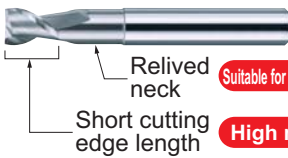
● Cross sectional geometry comparison

Competitor Instability in chip separation    Mitsubishi Smooth chip separation




### Square / Radius Type

**Short cutting edge length**  
(2 flute, 3 flute, 3 flute corner radius)



Relieved neck Suitable for deep slotting  
Short cutting edge length High rigidity

**Medium cutting edge length**  
(2 flute)

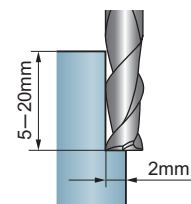
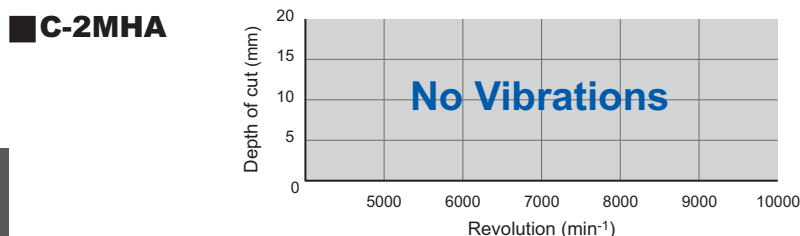
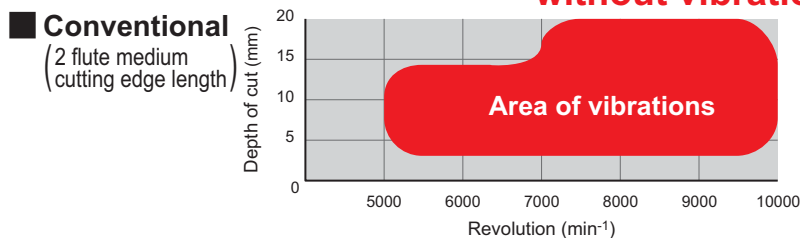


Special cross-section flute geometry Improved vibration resistance  
Improved chipping resistance

Achieves high efficiency deep machining

## Machining Example 1

**Vibration Resistance Comparison** Can be used under a wide range of conditions without vibrations occurring.



End mill	C2MHAD1000 (φ10)
Workpiece	Aluminium (JIS A7075)
Revolution	5000—10000min <sup>-1</sup>
Feed rate	500—1000mm/min (0.05mm/tooth)
Machining method	Down cut, Emulsion

# CARBIDE END MILLS

## C-2MHA

2 flute, Medium cut length, High helix

## C-2SA

2 flute, Short cut length, Relieved neck

## C-3SA Expand

3 flute, Short cut length, Relieved neck

## C-3SARB

Corner radius end mill, Short cut length, 3 flute

## C-SRA

Roughing end mill, Short cut length, 3 flute

## C-MRA

Roughing end mill, Medium cut length, 3 flute

## C-SRARB

Corner radius roughing end mill, Short cut length, 3 flute

11 different sizes available

**ø3-ø25mm**



15 different sizes available

**ø3-ø20mm**



21 different sizes available

**ø10-ø26mm**



22 different sizes available

**ø12×R1-ø25×R5mm**



7 different sizes available

**ø10-ø25mm**



10 different sizes available

**ø3-ø25mm**



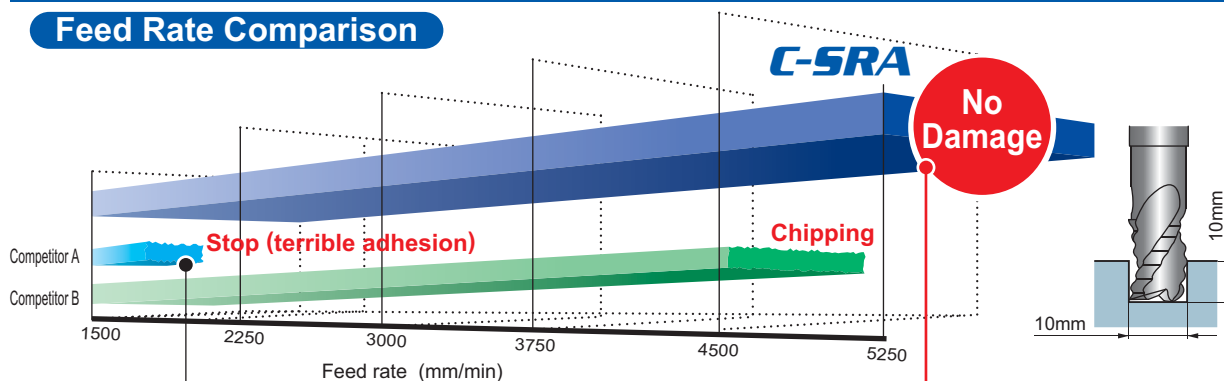
11 different sizes available

**ø10×R1-ø25×R5mm**

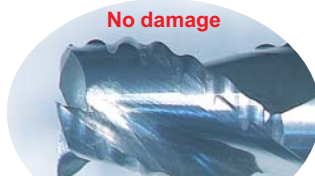


## Machining Example 2

### Feed Rate Comparison



Feed rate 2250mm/min



No damage

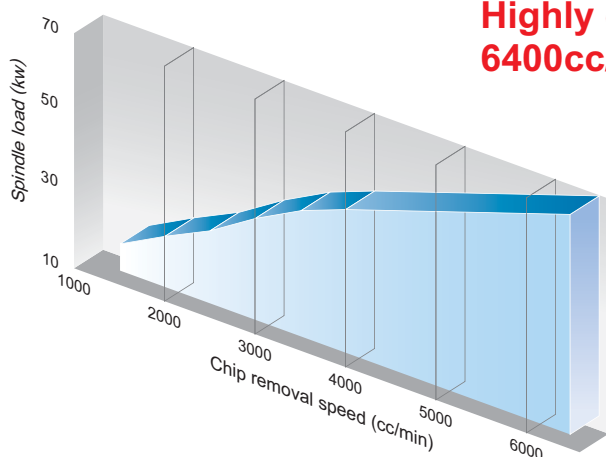
**No Damage**

End mill	CSRAD1000 (ø10)
Workpiece	Aluminium (JIS A7075)
Revolution	10000min <sup>-1</sup> (314m/min)
Feed rate	1500–5250mm/min
Coolant	Emulsion

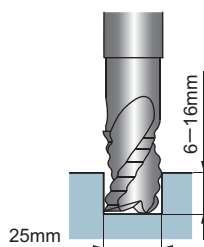
## Machining Example 3

Feed rate 5250mm/min

### Chip Volume Comparison



**Highly efficient milling with 6400cc/min on chip removal!**



End mill	CSRARB2500R500 (ø25 x R5)
Workpiece	Aluminium (DIN7050)
Revolution	24000min <sup>-1</sup> (1885m/min)
Feed rate	10000–16000mm/min
Coolant	Emulsion

# CARBIDE END MILLS

## C-2MHA

2 flute, Medium cut length, High helix



$D_1 \leq 12$  0 - -0.020  
 $D_1 > 12$  0 - -0.030

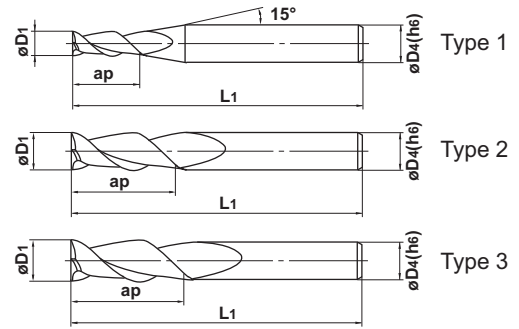


$D_4 = 6$  0 - -0.008  
 $8 \leq D_4 \leq 10$  0 - -0.009  
 $12 \leq D_4 \leq 16$  0 - -0.011  
 $20 \leq D_4 \leq 25$  0 - -0.013



Helix angle Gash land

● High efficiency machining for aluminium alloys.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2MHAD0300	3	9	60	6	2	●	1
D0400	4	12	60	6	2	●	1
D0500	5	15	60	6	2	●	1
D0600	6	18	60	6	2	●	2
D0800	8	20	75	8	2	●	2
D1000	10	25	75	10	2	●	2
D1200	12	25	75	12	2	●	2
D1400	14	32	75	12	2	●	3
D1600	16	32	100	16	2	●	2
D2000	20	38	125	20	2	●	2
D2500	25	38	125	25	2	●	2

## C-2SA

2 flute, Short cut length, Relieved neck



$D_1 \leq 12$  0 - -0.020  
 $D_1 > 12$  0 - -0.030

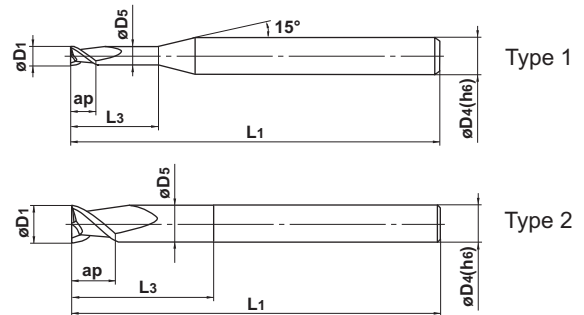


$D_4 = 6$  0 - -0.008  
 $8 \leq D_4 \leq 10$  0 - -0.009  
 $12 \leq D_4 \leq 16$  0 - -0.011  
 $D_4 = 20$  0 - -0.013



Helix angle Gash land

● High efficiency machining for aluminium alloys.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2SAD0300N120	3	6	12	2.7	60	6	2	●	1
D0400N120	4	6	12	3.7	60	6	2	●	1
D0500N150	5	8	15	4.7	60	6	2	●	1
D0600N160	6	8	16	5.7	75	6	2	●	2
D0800N200	8	10	20	7.4	75	8	2	●	2
D1000N300	10	12	30	9.4	75	10	2	●	2
D1000N350	10	12	35	9.4	100	10	2	●	2
D1200N300	12	15	30	11.4	75	12	2	●	2
D1200N350	12	15	35	11.4	100	12	2	●	2
D1200N400	12	15	40	11.4	125	12	2	●	2
D1600N300	16	15	30	15.4	75	16	2	●	2
D1600N400	16	15	40	15.4	100	16	2	●	2
D1600N450	16	15	45	15.4	125	16	2	●	2
D2000N400	20	20	40	19	100	20	2	●	2
D2000N500	20	20	50	19	125	20	2	●	2

# C-35A

3 flute, Short cut length, Relieved neck



$D1 \leq 12$  0 - -0.020  
 $D1 > 12$  0 - -0.030

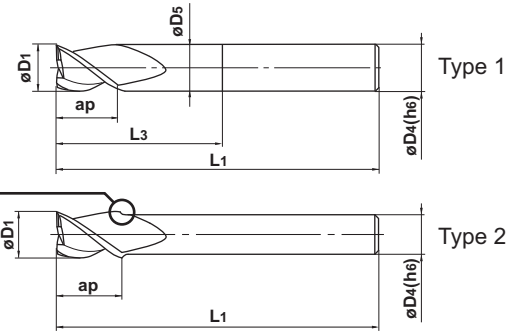
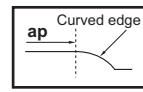


$8 \leq D4 \leq 10$  0 - -0.009  
 $12 \leq D4 \leq 16$  0 - -0.011  
 $20 \leq D4 \leq 25$  0 - -0.013



Helix angle Gash land

● High efficiency machining for aluminium alloys.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
<b>NEW</b> C3SAD1000A100S08	10	12	—	—	100	8	3	●	2
D1000N300	10	12	30	9.4	75	10	3	●	1
D1000N350	10	12	35	9.4	100	10	3	●	1
<b>NEW</b> D1200A150S10	12	15	—	—	150	10	3	●	2
D1200N300	12	15	30	11.4	75	12	3	●	1
D1200N350	12	15	35	11.4	100	12	3	●	1
D1200N400	12	15	40	11.4	125	12	3	●	1
<b>NEW</b> D1600A200S14	16	15	—	—	200	14	3	●	2
D1600N300	16	15	30	15.4	75	16	3	●	1
D1600N400	16	15	40	15.4	100	16	3	●	1
D1600N450	16	15	45	15.4	125	16	3	●	1
<b>NEW</b> D1700A150S16	17	18	—	—	150	16	3	●	2
<b>NEW</b> D1800A200S16	18	18	—	—	200	16	3	●	2
<b>NEW</b> D2000A200S18	20	20	—	—	200	18	3	●	2
D2000N400	20	20	40	19	100	20	3	●	1
D2000N600	20	20	60	19	125	20	3	●	1
D2000N850	20	20	85	19	150	20	3	●	1
D2500N500	25	20	50	24	100	25	3	●	1
D2500N650	25	20	65	24	125	25	3	●	1
D2500N900	25	20	90	24	150	25	3	●	1
<b>NEW</b> D2600A200S25	26	20	—	—	200	25	3	●	2

# CARBIDE END MILLS

## C-3SARB

Corner radius end mill, Short cut length, 3 flute



$D1 \leq 12$  0 - -0.020  
 $D1 > 12$  0 - -0.030

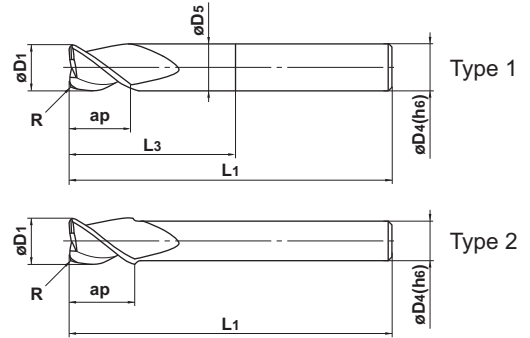


$12 \leq D4 \leq 16$  0 - -0.011  
 $20 \leq D4 \leq 25$  0 - -0.013



Helix angle

● High efficiency machining for aluminium alloys.



Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C3SARBD1200N0300R100	12	1	15	30	11.4	75	12	3	●	1
D1200N0300R320	12	3.2	15	30	11.4	75	12	3	●	1
D1200N0400R100	12	1	15	40	11.4	125	12	3	●	1
D1200N0400R320	12	3.2	15	40	11.4	125	12	3	●	1
D1600N0450R100	16	1	15	45	15.4	125	16	3	●	1
D1600N0450R320	16	3.2	15	45	15.4	125	16	3	●	1
D1600N0700R100	16	1	15	70	15.4	150	16	3	●	1
D1600N0700R320	16	3.2	15	70	15.4	150	16	3	●	1
D1800R100	18	1	18	—	—	150	16	3	●	2
D1800R320	18	3.2	18	—	—	150	16	3	●	2
D2000N0600R100	20	1	20	60	18.0	125	20	3	●	1
D2000N0600R320	20	3.2	20	60	18.0	125	20	3	●	1
D2000N0600R400	20	4	20	60	18.0	125	20	3	●	1
D2000N0850R100	20	1	20	85	18.0	150	20	3	●	1
D2000N0850R320	20	3.2	20	85	18.0	150	20	3	●	1
D2000N0850R400	20	4	20	85	18.0	150	20	3	●	1
D2500N0650R320	25	3.2	20	65	23.0	125	25	3	●	1
D2500N0650R400	25	4	20	65	23.0	125	25	3	●	1
D2500N0650R500	25	5	20	65	23.0	125	25	3	●	1
D2500N0900R320	25	3.2	20	90	23.0	150	25	3	●	1
D2500N0900R400	25	4	20	90	23.0	150	25	3	●	1
D2500N0900R500	25	5	20	90	23.0	150	25	3	●	1

# C-SRA

Roughing end mill, Short cut length, 3 flute

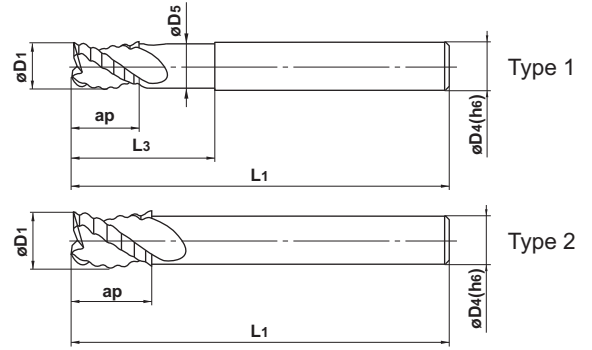


D4 = 10 0 - -0.009  
 12 ≤ D4 ≤ 16 0 - -0.011  
 20 ≤ D4 ≤ 25 0 - -0.013



Helix angle

● 3 flute uncoated end mill for roughing aluminium alloy.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CSRAD1000	10	12	25	9.4	75	10	3	●	1
D1200	12	15	30	11.4	75	12	3	●	1
D1600	16	18	35	15.4	100	16	3	●	1
D1800	18	22	—	—	100	16	3	●	2
D2000	20	25	50	18.0	125	20	3	●	1
D2200	22	25	—	—	125	20	3	●	2
D2500	25	30	60	23.0	125	25	3	●	1

# C-MRA

Roughing end mill, Medium cut length, 3 flute

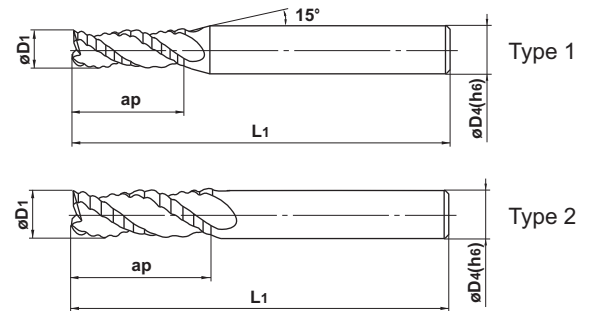


D4 = 6 0 - -0.008  
 8 ≤ D4 ≤ 10 0 - -0.009  
 12 ≤ D4 ≤ 16 0 - -0.011  
 20 ≤ D4 ≤ 25 0 - -0.013



Helix angle

● 3 flute uncoated end mill for roughing aluminium alloy.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CMRAD0300	3	8	50	6	3	●	1
D0400	4	11	50	6	3	●	1
D0500	5	13	50	6	3	●	1
D0600	6	13	50	6	3	●	2
D0800	8	19	60	8	3	●	2
D1000	10	22	75	10	3	●	2
D1200	12	26	75	12	3	●	2
D1600	16	32	100	16	3	●	2
D2000	20	38	125	20	3	●	2
D2500	25	45	125	25	3	●	2

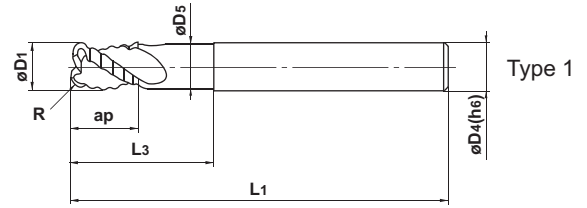
# CARBIDE END MILLS

## C-SRARB

Corner radius roughing end mill, Short cut length, 3 flute



D4 = 10 0 - -0.009  
 12 ≤ D4 ≤ 16 0 - -0.011  
 20 ≤ D4 ≤ 25 0 - -0.013



Helix angle

- 3 flute uncoated corner radius end mill for roughing aluminium alloy.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CSRARBD1000R100	10	1	12	25	9.4	75	10	3	●	1
D1000R200	10	2	12	25	9.4	75	10	3	●	1
D1200R100	12	1	15	30	11.4	75	12	3	●	1
D1200R200	12	2	15	30	11.4	75	12	3	●	1
D1600R200	16	2	18	35	15.4	100	16	3	●	1
D1600R300	16	3	18	35	15.4	100	16	3	●	1
D2000R200	20	2	25	50	18.0	125	20	3	●	1
D2000R300	20	3	25	50	18.0	125	20	3	●	1
D2500R300	25	3	30	60	23.0	125	25	3	●	1
D2500R400	25	4	30	60	23.0	125	25	3	●	1
D2500R500	25	5	30	60	23.0	125	25	3	●	1

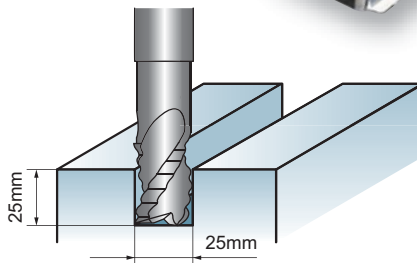
## Performance Report

### Machining of a Rib.

**Chip removal volume of up to 6250cc/min were achieved. Leading to increased machining efficiency.**



End mill	CSRARBD2500R300 (φ25xR3)
Workpiece	Aluminium (JIS A7075)
Revolution	15000min <sup>-1</sup> (1178m/min)
Feed rate	10000mm/min (0.222mm/tooth)
Machining method	Emulsion
Machine	MAX 15000min <sup>-1</sup> , BT50 shank (Max. 75kw spindle)





# C-2MHA

2 flute, Medium cut length, High helix

## Shoulder milling

Work Material	Aluminium Alloy JIS A7075 (excluding low hardness materials such as A1000)	
Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)
3	40000	2400
4	36000	2600
5	30000	4000
6	27000	4000
8	20000	4000
10	16000	4500
12	13000	4500
16	10000	4500
20	8000	4300
25	6000	3600

Depth of Cut		
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## Slotting

Work Material	Aluminium Alloy JIS A7075 (excluding low hardness materials such as A1000)	
Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)
3	40000	1500
4	36000	1800
5	30000	2800
6	27000	2800
8	20000	2800
10	16000	3200
12	13000	3200
16	10000	3200
20	8000	3000
25	6000	2500

Depth of Cut		
--------------	--	--

- 1) Water-soluble cutting fluid is recommended.
- 2) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately.
- 3) Climb cutting is recommended for shoulder milling.
- 4) If tool clamping is poor, the tool can be pulled out of the holder. Ensure that the tool is sufficiently clamped.

# C-2SA

2 flute, Short cut length, Relieved neck

## Shoulder milling

Work Material	Aluminium Alloy JIS A7075	
Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)
3	40000	1800
4	36000	2400
5	30000	3000
6	27000	3200
8	20000	3400
10	16000	3600
12	13000	3600
16	10000	3600
20	8000	3300

Depth of Cut		
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## Slotting

Work Material	Aluminium Alloy JIS A7075	
Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)
3	40000	1600
4	36000	2100
5	30000	2700
6	27000	2800
8	20000	3000
10	16000	3200
12	13000	3200
16	10000	3200
20	8000	3000

Depth of Cut		
--------------	--	--

- 1) Water-soluble cutting fluid is recommended.
- 2) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately.
- 3) Climb cutting is recommended for shoulder milling.
- 4) If tool clamping is poor, the tool can be pulled out of the holder. Ensure that the tool is sufficiently clamped.
- 5) 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.

## C-3SA

3 flute, Short cut length, Relieved neck

## C-3SARB

Corner radius end mill, Short cut length, 3 flute

### Shoulder milling

Work Material	Aluminium Alloy JIS A7075	
Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)
<b>12</b>	13000	5400
<b>16</b>	10000	5400
<b>18</b>	9000	5000
<b>20</b>	8000	5000
<b>25</b>	6000	4500

Depth of Cut		
	D:Dia.	

### Slotting

Work Material	Aluminium Alloy JIS A7075	
Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)
<b>12</b>	13000	3200
<b>16</b>	10000	3200
<b>18</b>	9000	3000
<b>20</b>	8000	3000
<b>25</b>	6000	2800

Depth of Cut		
	D:Dia.	

- 1) Water-soluble cutting fluid is recommended.
- 2) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately, or set a smaller depth of cut.
- 3) Climb cutting is recommended for shoulder milling.
- 4) 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.
- 5) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.

# C-SRA

Roughing end mill, Short cut length, 3 flute

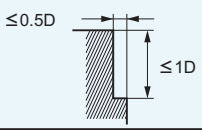
# C-SRARB

Corner radius roughing end mill, Short cut length, 3 flute

## Shoulder milling

Work Material	Aluminium Alloy JIS A7075		Aluminium Cast JIS AC4B		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)
<b>10</b>	19000	8600	9500	3400	
<b>12</b>	16000	8200	8000	3200	
<b>16</b>	12000	7600	6000	3100	
<b>18</b>	10500	7200	5300	2900	
<b>20</b>	9500	7100	4800	2900	
<b>22</b>	8500	6900	4300	2800	
<b>25</b>	7500	6800	3800	2700	

Depth of Cut

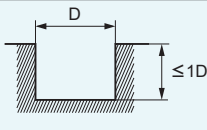


D:Dia.

## Slotting

Work Material	Aluminium Alloy JIS A7075		Aluminium Cast JIS AC4B		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)
<b>10</b>	19000	6800	9500	2700	
<b>12</b>	16000	6500	8000	2600	
<b>16</b>	12000	6100	6000	2400	
<b>18</b>	10500	5800	5300	2400	
<b>20</b>	9500	5700	4800	2300	
<b>22</b>	8500	5500	4300	2200	
<b>25</b>	7500	5400	3800	2200	

Depth of Cut



D:Dia.

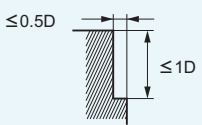
- 1) Water-soluble cutting fluid is recommended.
- 2) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately, or set a smaller depth of cut.
- 3) Climb cutting is recommended for shoulder milling.
- 4) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 5) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.

## Using a high-speed and high-rigidity machining center

### Shoulder milling

Work Material	Aluminium Alloy JIS A7075		Aluminium Cast JIS AC4B		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)
<b>10</b>	30000	11000	19000	5400	
<b>12</b>	30000	12000	16000	5300	
<b>16</b>	24000	12000	12000	4900	
<b>18</b>	21000	12000	10500	4700	
<b>20</b>	19000	11000	9500	4600	
<b>22</b>	17000	11000	8500	4300	
<b>25</b>	15000	11000	7500	4300	

Depth of Cut

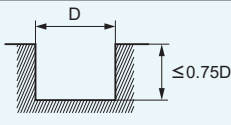


D:Dia.

### Slotting

Work Material	Aluminium Alloy JIS A7075		Aluminium Cast JIS AC4B		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)
<b>10</b>	30000	8600	19000	4300	
<b>12</b>	30000	9900	16000	4300	
<b>16</b>	24000	9700	12000	4000	
<b>18</b>	21000	9500	10500	3800	
<b>20</b>	19000	9100	9500	3700	
<b>22</b>	17000	8700	8500	3400	
<b>25</b>	15000	8600	7500	3400	

Depth of Cut



D:Dia.

- 1) Water-soluble cutting fluid is recommended.
- 2) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately, or set a smaller depth of cut.
- 3) Climb cutting is recommended for shoulder milling.
- 4) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 5) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.

### Shoulder milling

Work Material	Aluminium Alloy JIS A7075		Aluminium Cast JIS AC4B	
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)	Revolution (min <sup>-1</sup> )
<b>3</b>	40000	2700	25000	1100
<b>4</b>	36000	2700	20000	1100
<b>5</b>	30000	5400	16000	2200
<b>6</b>	27000	6100	13000	2300
<b>8</b>	20000	6000	10000	2400
<b>10</b>	16000	5800	8000	2300
<b>12</b>	13000	5300	6500	2100
<b>16</b>	10000	5100	5000	2000
<b>20</b>	8000	4800	4000	1900
<b>25</b>	6400	4600	3200	1800

Depth of Cut		
	D: Dia.	

### Slotting

Work Material	Aluminium Alloy JIS A7075		Aluminium Cast JIS AC4B	
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed Rate (mm/min)	Revolution (min <sup>-1</sup> )
<b>3</b>	30000	1800	16000	700
<b>4</b>	24000	2200	12000	900
<b>5</b>	19000	2300	10000	900
<b>6</b>	16000	2400	8000	1000
<b>8</b>	12000	2500	6000	1000
<b>10</b>	9500	2600	5000	1100
<b>12</b>	8000	2300	4000	900
<b>16</b>	6000	2100	3000	800
<b>20</b>	4800	2000	2400	800
<b>25</b>	3800	2000	1900	700

Depth of Cut		
	D: Dia.	

- 1) Water-soluble cutting fluid is recommended.
- 3) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately, or set a smaller depth of cut.
- 4) Climb cutting is recommended for shoulder milling.
- 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 5) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.

**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 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.)