

High Efficiency Machining for Aluminium Alloys

ALIMASTER

Expand



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

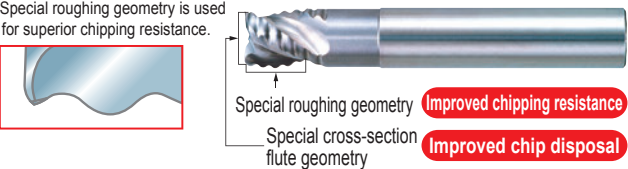
Possible to achieve high efficiency machining of aluminium alloys, chip removal volumes over 6000cc/min.

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

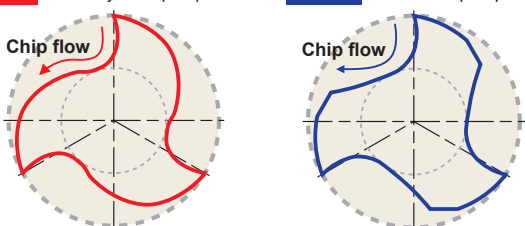
● Special roughing geometry is used for superior chipping resistance.



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

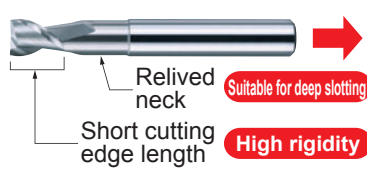
● Cross sectional geometry comparison

Competitor Instability in chip separation **Mitsubishi** Smooth chip separation



Square / Radius Type

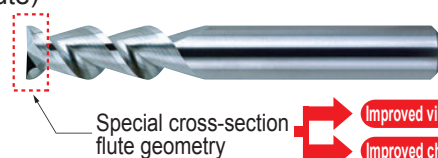
Short cutting edge length (2 flute, 3 flute, 3 flute corner radius)



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

Achieves high efficiency deep machining

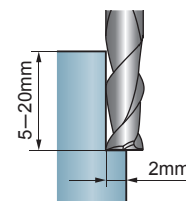
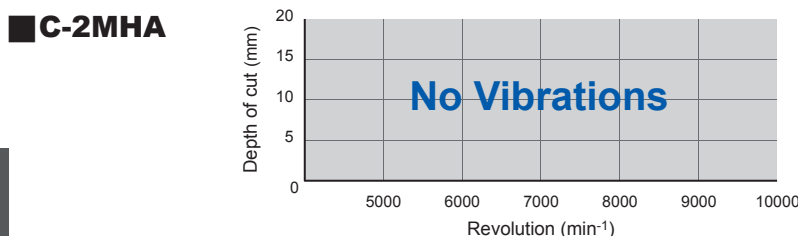
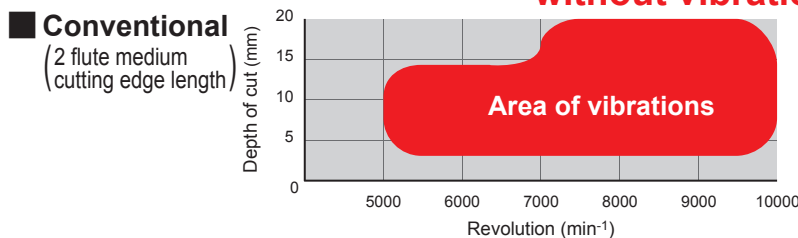
Medium cutting edge length (2 flute)



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

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 ⁻¹
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

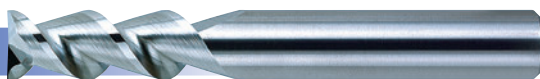
Roughing end mill, Medium cut length, 3 flute

C-SRARB

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

11 different sizes available

ø3-ø25mm



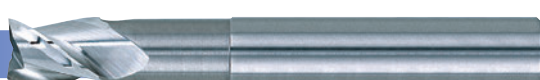
15 different sizes available

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



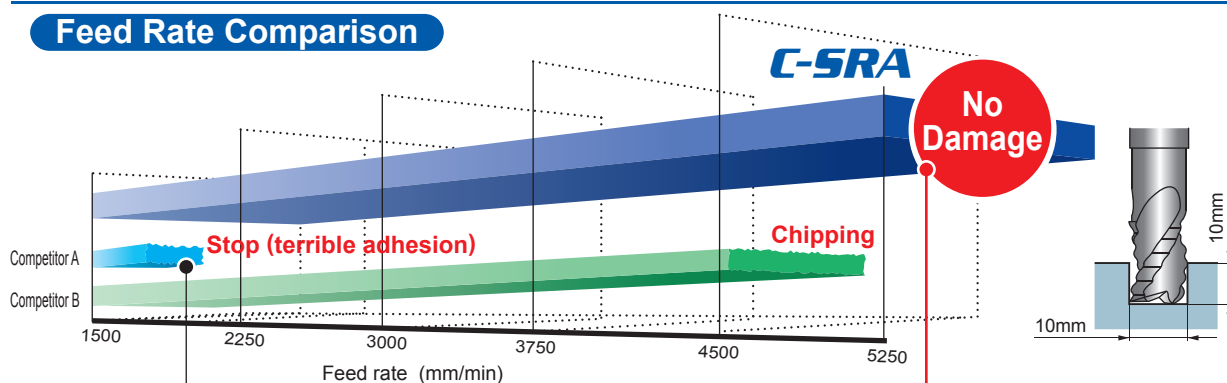
11 different sizes available

ø10×R1-ø25×R5mm



Machining Example 2

Feed Rate Comparison



Feed rate 2250mm/min

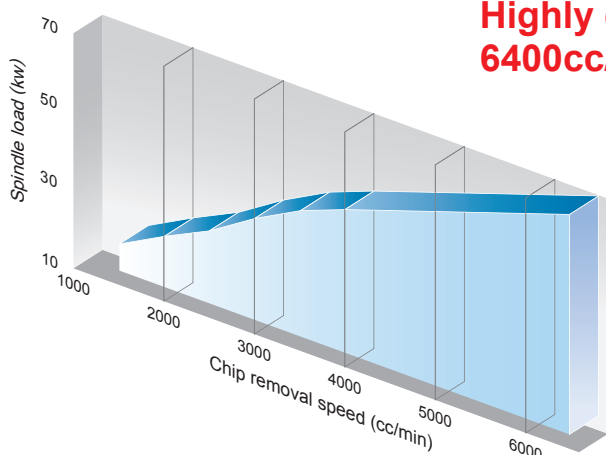


Feed rate 5250mm/min

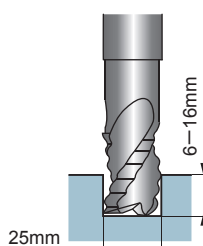
End mill	CSRAD1000 (ø10)
Workpiece	Aluminium (JIS A7075)
Revolution	10000min ⁻¹ (314m/min)
Feed rate	1500—5250mm/min
Coolant	Emulsion

Machining Example 3

Chip Volume Comparison



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



End mill	CSRARBD2500R500 (ø25 x R5)
Workpiece	Aluminium (DIN7050)
Revolution	24000min ⁻¹ (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



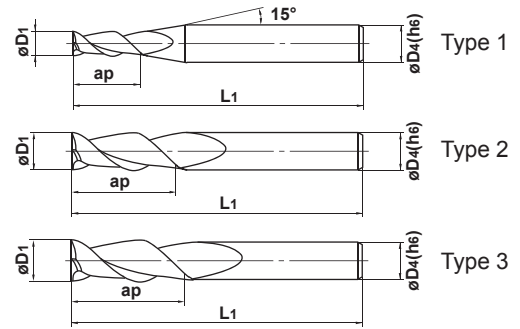
Helix angle



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



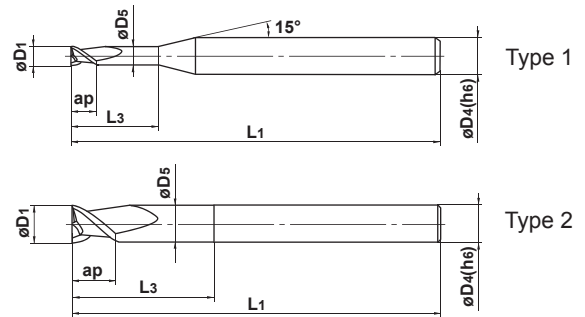
Helix angle



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



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

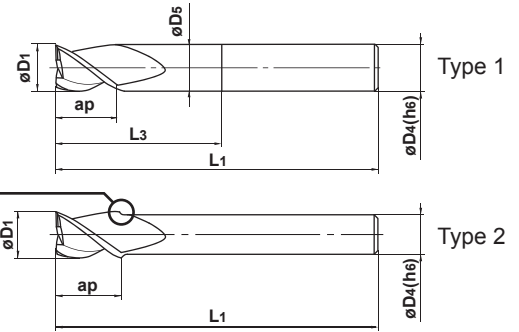
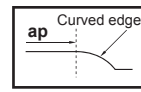


$8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013



Helix angle Gash land

● High efficiency machining for aluminium alloys.



Unit : mm

Order Number	Dia.	Length of Cut	Neck Length	Neck Dia.	Overall Length	Shank Dia.	No. of Flutes	Stock	Type
	D1	ap	L3	D5	L1	D4	N		
NEW 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
NEW 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
NEW 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
NEW D1700A150S16	17	18	—	—	150	16	3	●	2
NEW D1800A200S16	18	18	—	—	200	16	3	●	2
NEW 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
NEW 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

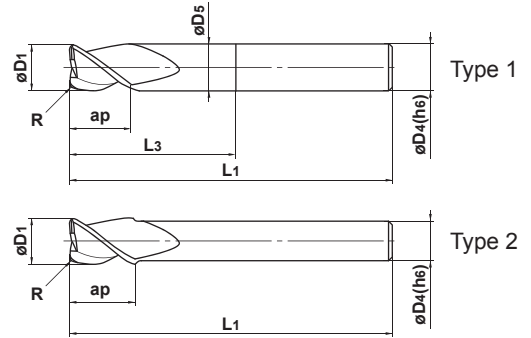


$12 \leq D4 \leq 16$ 0 - -0.011
 $20 \leq D4 \leq 25$ 0 - -0.013



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

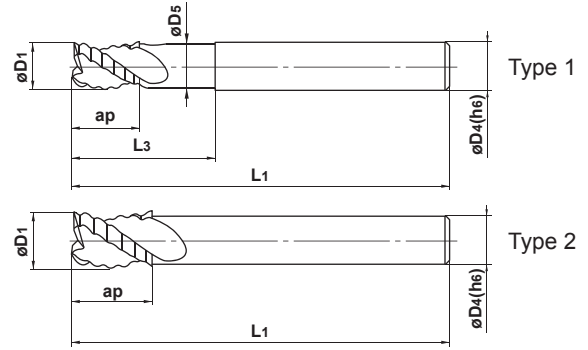


D4 = 10 0 - -0.009
 12 ≤ D4 ≤ 16 0 - -0.011
 20 ≤ D4 ≤ 25 0 - -0.013



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

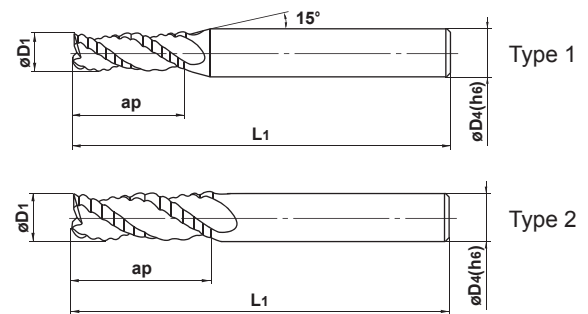


D4 = 6 0 - -0.008
 8 ≤ D4 ≤ 10 0 - -0.009
 12 ≤ D4 ≤ 16 0 - -0.011
 20 ≤ D4 ≤ 25 0 - -0.013



Helix angle

● 3 flute uncoated end mill for roughing aluminium alloy.

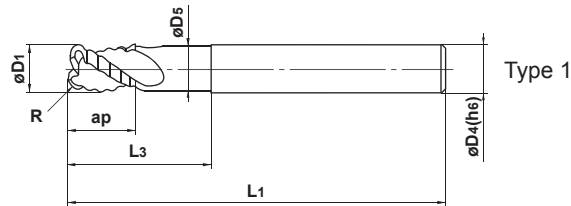


Unit : mm

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



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.

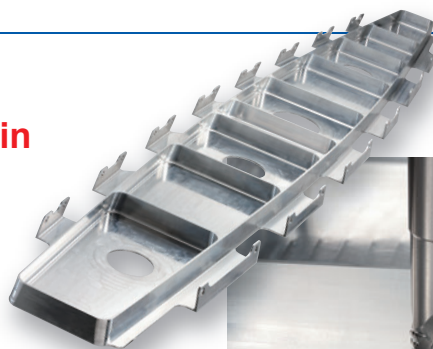
Unit : mm

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

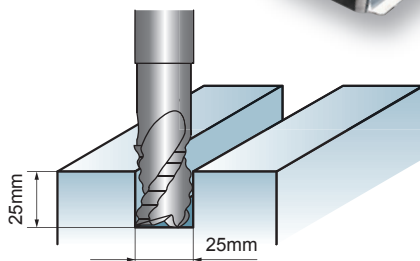
Performance Report

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 ⁻¹ (1178m/min)
Feed rate	10000mm/min (0.222mm/tooth)
Machining method	Emulsion
Machine	MAX 15000min ⁻¹ , 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 ⁻¹)	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		
	D: Dia.	

Slotting

Work Material	Aluminium Alloy JIS A7075 (excluding low hardness materials such as A1000)	
Dia. (mm)	Revolution (min ⁻¹)	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		
	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.
- 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-25A

2 flute, Short cut length, Relieved neck

Shoulder milling

Work Material	Aluminium Alloy JIS A7075	
Dia. (mm)	Revolution (min ⁻¹)	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		
	D: Dia.	

Slotting

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

Depth of Cut		
	D:Dia.	

Slotting

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

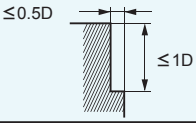
Depth of Cut		
	D:Dia.	

- 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.

Shoulder milling

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

Depth of Cut

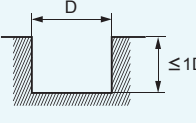


D: Dia.

Slotting

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

Depth of Cut



D: Dia.

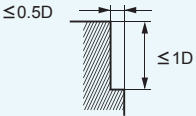
- 1) Water-soluble cutting fluid is recommended.
- 2) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately, or set a smaller depth of cut.
- 3) Climb cutting is recommended for shoulder 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 ⁻¹)	Feed Rate (mm/min)	Revolution (min ⁻¹)
10	30000	11000	19000	5400
12	30000	12000	16000	5300
16	24000	12000	12000	4900
18	21000	12000	10500	4700
20	19000	11000	9500	4600
22	17000	11000	8500	4300
25	15000	11000	7500	4300

Depth of Cut

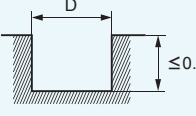


D: Dia.

Slotting

Work Material	Aluminium Alloy JIS A7075		Aluminium Cast JIS AC4B	
	Dia. (mm)	Revolution (min ⁻¹)	Feed Rate (mm/min)	Revolution (min ⁻¹)
10	30000	8600	19000	4300
12	30000	9900	16000	4300
16	24000	9700	12000	4000
18	21000	9500	10500	3800
20	19000	9100	9500	3700
22	17000	8700	8500	3400
25	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 ⁻¹)	Feed Rate (mm/min)	Revolution (min ⁻¹)
3	40000	2700	25000	1100
4	36000	2700	20000	1100
5	30000	5400	16000	2200
6	27000	6100	13000	2300
8	20000	6000	10000	2400
10	16000	5800	8000	2300
12	13000	5300	6500	2100
16	10000	5100	5000	2000
20	8000	4800	4000	1900
25	6400	4600	3200	1800

Depth of Cut		
	D: Dia.	

Slotting

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

●Cutting flutes and chips have sharp edges. Never touch these with your bare hands. ●Use these products within their recommended range of conditions, and make sure to replace tools before excessive wear occurs. ●Lathes may scatter hot chips or eject long chips. Make sure to use protective equipment such as safety cover and protective eye wear to prevent injury. ●Always take appropriate fire protection measures if non-water-soluble cutting fluid is used. ●If the tool is to be rotated for use, always make sure to perform a test run to check for shaking, vibrations, and unusual sounds.

MITSUBISHI MATERIALS CORPORATION

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 (Tools specifications subject to change without notice.)