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MITSUBISHI MATERIALS

TOOLS NEWS

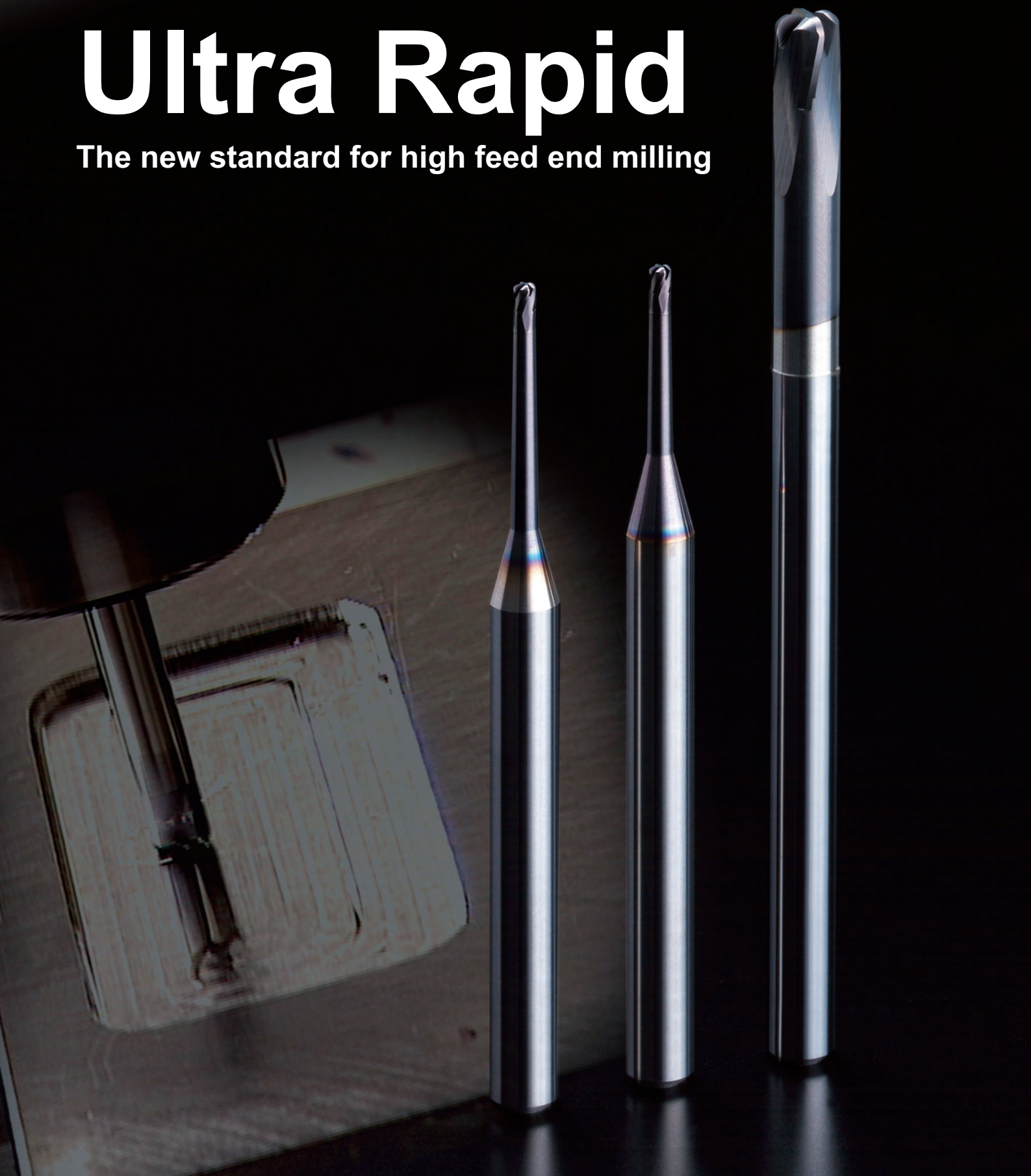
B080G

MIRACLE high feed corner radius end mills

VC-HFRB

Ultra Rapid

The new standard for high feed end milling



MIRACLE END MILL SERIES

VC-HFRB

MIRACLE high feed corner radius end mills

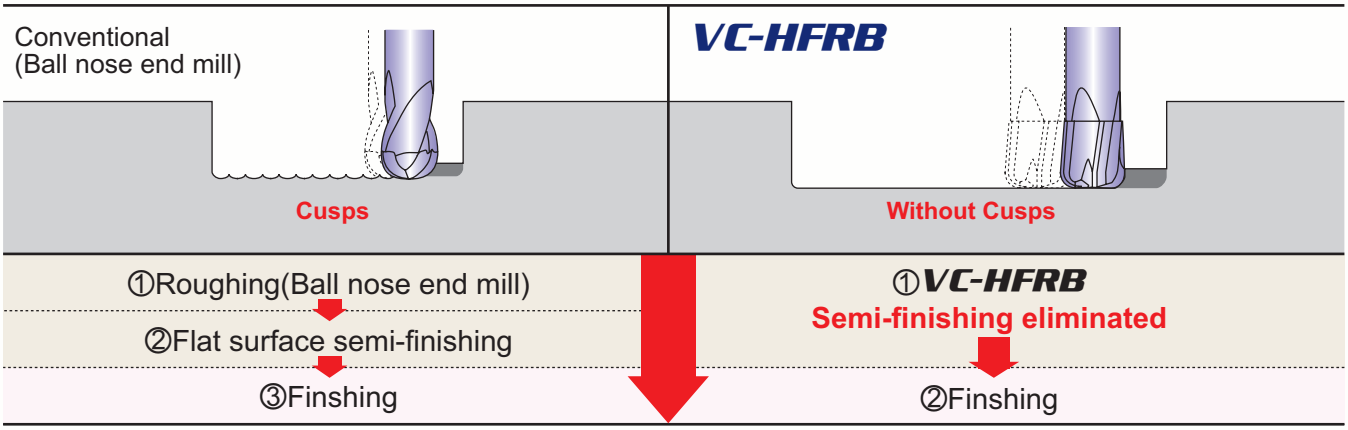
Ultra Rapid ! The new standard for high feed, long overhang end milling.

Features

- Newly developed cutting edge with exellent chipping resistance. Possible to cut at over 10,000 mm/min feed rate.
- High efficiency cutting is possible even in the corners of pockets or with an overhang of L/D = 7.
- Wide range of end mills, short type, long neck type, taper neck type, and long shank type, 43 sizes available in total.

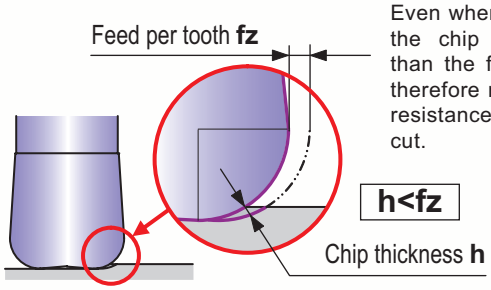
1.High Efficiency

●VC-HFRB is able to machine a flat surface and therefore eliminate the semi-finishing process.
●A much larger pick feed than conventional ball nose end mills leads to higher efficiency.



2.High feed milling

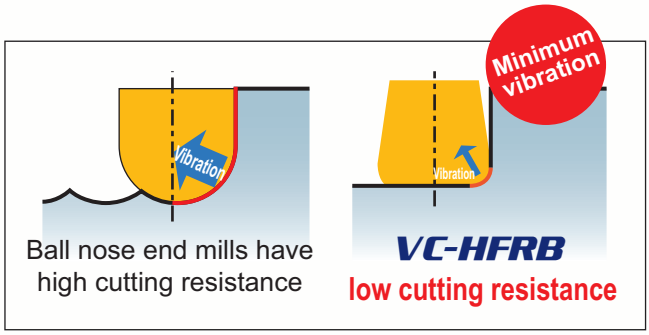
VC-HFRB (Ø10)
High feed - 0.3~0.7mm/tooth
Conventional : (Ø10)
Ball nose end mill 0.05mm/tooth



Even when high feed milling, the chip thickness is less than the feed per tooth and therefore reduces the cutting resistance at low depths of cut.

3.Cutting resistance

Compared to ball nose end mills, VC-HFRB has low cutting resistance.



VC-HFRB

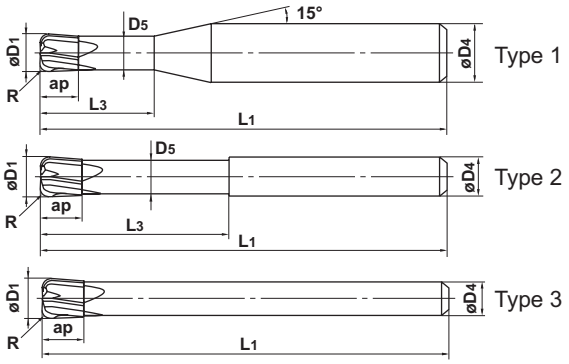
Corner radius, Short flute length, 4 flute, High feed machining

R ±0.015

D1≤12 0 — -0.02
13≤D1 0 — -0.03

UWC VC 20° (D1≤5) 10° (6≤D1)

- Suitable for high feed and efficient machining of moulds and dies.



Unit : mm

Order Number	Dia. D1	Radius of Ball Nose R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VCHFRBD0200R050N06	2	0.5	2	6	1.9	50	6	4	●	1
D0200R050N10	2	0.5	2	10	1.9	70	6	4	●	1
D0300R075N09	3	0.75	3	9	2.9	50	6	4	●	1
D0300R075N15	3	0.75	3	15	2.9	70	6	4	●	1
D0400R100N12	4	1	4	12	3.9	50	6	4	●	1
D0400R100N20	4	1	4	20	3.9	70	6	4	●	1
D0500R120N15	5	1.2	5	15	4.9	70	6	4	●	1
D0600R150N18	6	1.5	6	18	5.85	50	6	4	●	2
D0600R150N30	6	1.5	6	30	5.85	90	6	4	●	2
D0700R150A050	7	1.5	7	—	—	50	6	4	●	3
D0700R150A080	7	1.5	7	—	—	80	6	4	●	3
D0800R200N24	8	2	8	24	7.85	60	8	4	●	2
D0800R200N40	8	2	8	40	7.85	90	8	4	●	2
D0900R200A065	9	2	9	—	—	65	8	4	●	3
D0900R200A100	9	2	9	—	—	100	8	4	●	3
D1000R200N30	10	2	10	30	9.7	70	10	4	●	2
D1000R200N50	10	2	10	50	9.7	100	10	4	●	2
D1100R200A070	11	2	11	—	—	70	10	4	●	3
D1100R200A110	11	2	11	—	—	110	10	4	●	3
D1200R300N36	12	3	12	36	11.7	75	12	4	●	2
D1200R300N60	12	3	12	60	11.7	110	12	4	●	2
D1300R300A075	13	3	13	—	—	75	12	4	●	3
D1300R300A120	13	3	13	—	—	120	12	4	●	3
D1600R300N80	16	3	16	80	15.5	140	16	4	●	2

● : Inventory maintained.

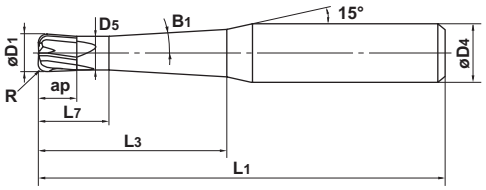
VC-HFRB

Corner radius, Short flute length, 4 flute, High feed machining

R ±0.015

D1≤12 0 — -0.02
13≤D1 0 — -0.03

(Taper neck type)



Type 4

UWC VC 20° 10°

D1≤5 6≤D1

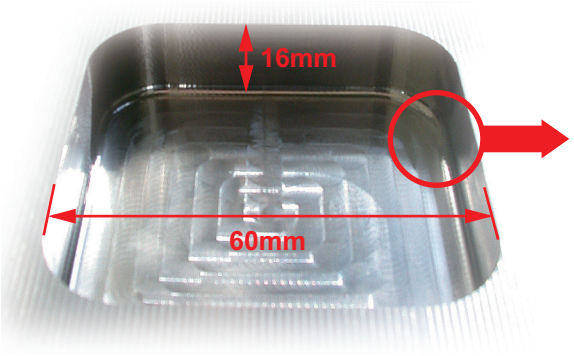
- Suitable for high feed and efficient machining of moulds and dies.

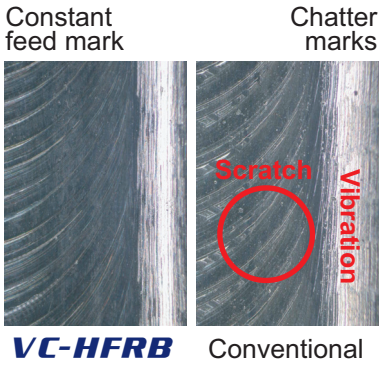
Unit : mm

Order Number	Dia. D1	Radius of Ball Nose R	Length of Cut ap	Taper Angle One Side B1	L7	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VCHFRBD0200R050N12	2	0.5	2	1°	4	12	1.9	70	6	4	●	4
D0200R050N16	2	0.5	2	1°	4	16	1.9	70	6	4	●	4
D0200R050N20	2	0.5	2	1°	4	20	1.9	70	6	4	●	4
D0300R075N18	3	0.75	3	1°	6	18	2.9	80	6	4	●	4
D0300R075N24	3	0.75	3	1°	6	24	2.9	80	6	4	●	4
D0300R075N30	3	0.75	3	1°	6	30	2.9	80	6	4	●	4
D0400R100N24	4	1	4	1°	8	24	3.9	90	6	4	●	4
D0400R100N32	4	1	4	1°	8	32	3.9	90	6	4	●	4
D0400R100N40	4	1	4	1°	8	40	3.9	90	6	4	●	4
D0500R120N30	5	1.2	5	1°	8	30	4.9	90	6	4	●	4
D0500R120N40	5	1.2	5	1°	8	40	4.9	90	8	4	●	4
D0500R120N50	5	1.2	5	1°	8	50	4.9	110	8	4	●	4
D0600R150N50	6	1.5	6	1°	16	50	5.85	110	8	4	●	4
D0600R150N67	6	1.5	6	1°	16	67	5.85	130	8	4	●	4
D0800R200N70	8	2	8	1°	18	70	7.85	120	10	4	●	4
D0800R200N90	8	2	8	1°	18	90	7.85	150	12	4	●	4
D1000R200N80	10	2	10	1°	20	80	9.7	140	16	4	●	4
D1000R200N110	10	2	10	1°	20	110	9.7	160	16	4	●	4
D1200R300N110	12	3	12	1°	24	110	11.7	160	16	4	●	4

Cutting Example 1

Superior surface finish without chatter or vibration



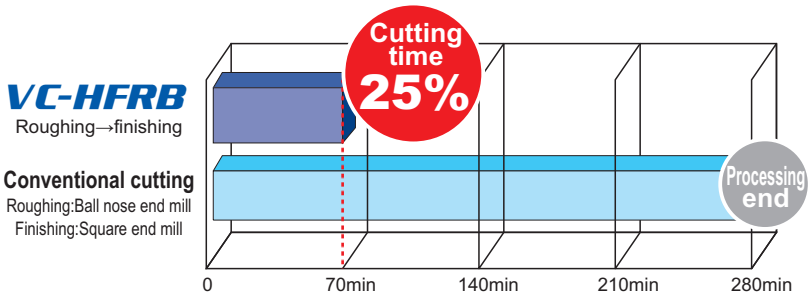


End mill	VC-HFRB ø10×R2
Work material	SKD61 (52HRC)
Overhang	50mm
Revolution	5,000min^{-1} (157m/min)
Feed rate	10,000mm/min (0.5mm/tooth)
Depth of cut	ap:0.3mm, ae:4mm
Cutting method	Air blowing

Cutting Example 2

75% reduction in machining time with high feed cutting!

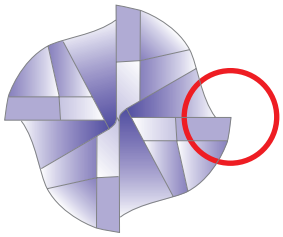
(Cutting time 280min→70min)

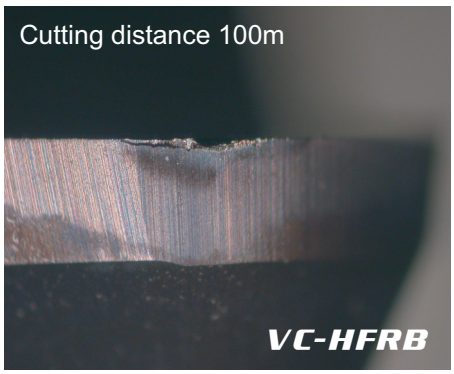


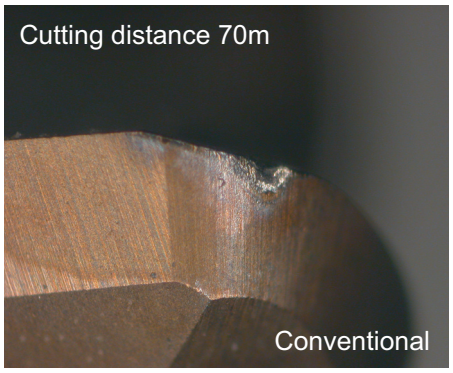
End mill	VC-HFRB ø2×R0.5
Work material	SKD61 (50HRC)
Mold	For plastics
Revolution	24,000min^{-1} (150m/min)
Feed rate	6,700mm/min (0.07mm/tooth)
Depth of cut	ap:0.04mm, ae:0.5mm
Cutting method	Air blowing
Machining time	70 min

Cutting Example 3

Superior chipping resistance! High feed cutting and long tool life



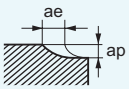


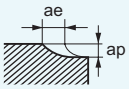


End mill	VC-HFRB ø10×R2
Work material	SKD61 (50HRC)
Revolution	5,000min^{-1} (157m/min)
Feed rate	6,000mm/min (0.3mm/tooth)
Depth of cut	ap:0.3mm, ae:4mm
Cutting method	Air blowing

VC-HFRB

Corner radius, Short flute length, 4 flute, High feed machining

Work material		Carbon steel, Alloy steel, Cast iron (—30HRC) Ck55, 41CrMo				Alloy steel, Tool steel, Pre-hardened steel (30—45HRC) W.Nr. 1.2344(H13), X210Cr12			
Dia. (mm)	R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)
2	**R 0.5**	33,000	10,000	0.8	0.08	27,000	8,400	0.8	0.05
3	**R 0.75**	22,000	11,000	1.2	0.12	18,000	9,000	1.2	0.08
4	**R 1**	17,000	12,000	1.5	0.15	14,000	9,500	1.5	0.12
5	**R 1.2**	13,000	13,000	2.0	0.20	11,000	11,000	2.0	0.15
6	**R 1.5**	11,000	13,000	2.5	0.25	9,000	11,000	2.5	0.15
7	**R 1.5**	9,400	13,000	3.0	0.25	7,800	11,000	3.0	0.15
8	**R 2**	8,200	13,000	3.0	0.30	7,000	11,000	3.0	0.20
9	**R 2**	7,300	13,000	4.0	0.30	6,000	11,000	4.0	0.20
10	**R 2**	6,500	13,000	4.5	0.30	5,500	11,000	4.5	0.20
11	**R 2**	6,000	12,000	5.5	0.30	5,000	10,000	5.5	0.20
12	**R 3**	5,500	12,000	4.5	0.45	4,600	10,000	4.5	0.30
13	**R 3**	5,000	12,000	5.5	0.45	4,200	10,000	5.5	0.30
16	**R 3**	4,100	10,000	7.5	0.45	3,400	8,800	7.5	0.30
Depth of cut									

Work material		Hardened steel (45—55HRC) W.Nr. 1.2344(H13)				Hardened steel (55—60HRC) X210Cr12, S6-5-2 etc.			
Dia. (mm)	R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)
2	**R 0.5**	24,000	7,500	0.8	0.04	16,000	3,000	0.8	0.03
3	**R 0.75**	16,000	8,500	1.2	0.06	11,000	3,300	1.2	0.05
4	**R 1**	12,000	8,800	1.5	0.08	8,000	3,500	1.5	0.07
5	**R 1.2**	9,600	9,500	2.0	0.10	6,400	3,800	2.0	0.08
6	**R 1.5**	8,000	9,600	2.5	0.10	5,300	3,800	2.5	0.10
7	**R 1.5**	6,900	9,600	3.0	0.10	4,600	3,800	3.0	0.10
8	**R 2**	6,000	9,600	3.0	0.15	4,000	3,800	3.0	0.13
9	**R 2**	5,300	9,500	4.0	0.15	3,800	3,800	4.0	0.13
10	**R 2**	4,800	9,500	4.5	0.15	3,200	3,800	4.5	0.13
11	**R 2**	4,500	9,000	5.5	0.15	2,900	3,500	5.5	0.13
12	**R 3**	4,100	9,000	4.5	0.25	2,700	3,500	4.5	0.20
13	**R 3**	3,700	8,900	5.5	0.25	2,500	3,500	5.5	0.20
16	**R 3**	3,000	7,800	7.5	0.25	2,000	3,200	7.5	0.20
Depth of cut									

1) The above table shows cutting conditions when machining with the corner radius cutting edge.
2) This table shows the cutting conditions with less than 5D overhang length.
   In the case of longer overhangs, the revolution and the feed rate should be reduced proportionately.
3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
4) Air blow or oil mist is recommended for good chip evacuation.

JQA-2522
JQA-EM0941

MITSUBISHI MATERIALS KOBE TOOLS

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