

IMPACT MIRACLE vibration control end mill series

VFHV RB

Series
Expansions

VFHV RB enables high efficiency machining because high feed rates or large depths of cut can be utilized.

■ Vibration control geometry for stable machining and a smooth cutting action.



IMPACT MIRACLE^{END MILLS}

IMPACT MIRACLE vibration control end mill series

VFHVRB

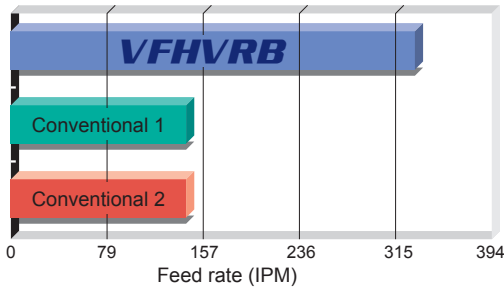
Features

1 Special gash + high toughness carbide

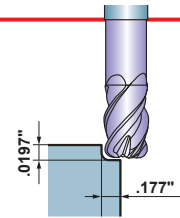
Improved high resistance to chipping!

Special gash with high rigidity and good chip disposal enables both high feed rate and large depth of cut machining.

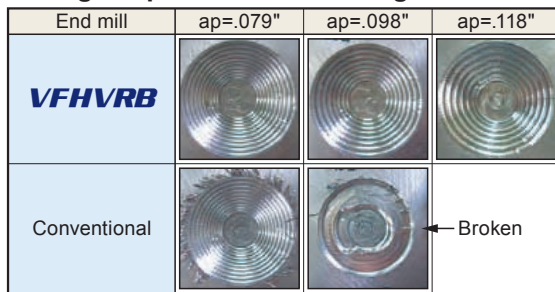
High feed rate machining



End mill	VFHVRBD3/8N3DR0.08
Work material	AISI H13 (52HRC)
Revolution	3000min ⁻¹ (310SFM)
Feed rate	142-331IPM (.012-.028IPT)
Coolant	Air blow



Large depth of cut machining



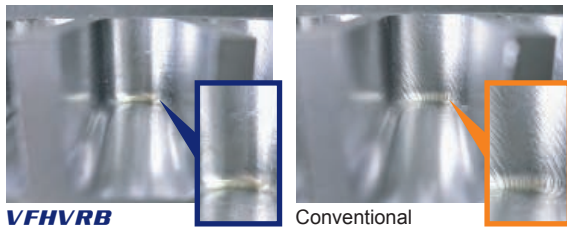
End mill	VFHVRBD3/8N3DR0.08
Work material	AISI 1049
Revolution	2880min ⁻¹ (295SFM)
Feed rate	154IPM (.013IPT)
Coolant	Air blow

2 Variable helix

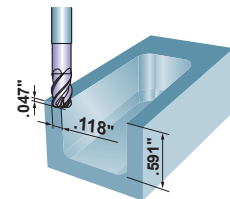
No vibration!

Stable machining

Vibration control geometry for stable machining and smooth cutting.

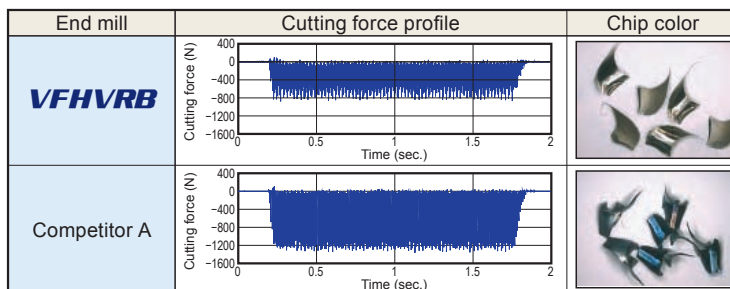


End mill	VFHVRBD3/8N3DR0.08
Work material	AISI 1049
Revolution	4800min ⁻¹ (490SFM)
Feed rate	90IPM (.005IPT)
Coolant	Air blow

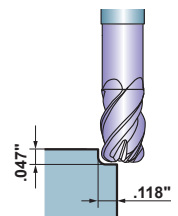


3 Special curved surface gash corner radius

Low cutting force and heat!



End mill	VFHVRBD3/8N3DR0.08
Work material	AISI 1049
Revolution	2400min ⁻¹ (245SFM)
Feed rate	118IPM (.012IPT)
Coolant	Air blow



IMPACT MIRACLE vibration control end mills

VFHVRB - Inch sizes

4 flute, Corner radius, Short cut length, Irregular helix flutes



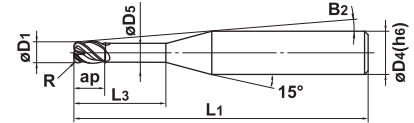
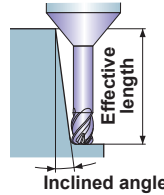
.250" ≤ D4 ≤ .375"
D4 = .500"

0 - .00035
0 - .00043

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	Aluminum Alloy
○	○	○	○	○	○		



Effective length for inclined angle



- Impact Miracle corner radius end mill for high feed and efficient machining.

Unit : inch

Order Number	Dia. D1	Corner Radius R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes	Stock	Effective length for inclined angle			
											30'	1°	2°	3°
VFHVRBD1/8N3DR0.03	.125	.030	.125	.375	.1211	6.1°	2.25	.250	4	●	9.9	10.3	11	11.9
D1/8N5DR0.03	.125	.030	.125	.625	.1211	4.3°	2.25	.250	4	●	16.5	17.1	18.3	19.8
D3/16N3DR0.05	.188	.050	.188	.563	.1835	2.9°	2.25	.250	4	●	14.9	15.4	16.4	*
D3/16N5DR0.05	.188	.050	.188	.938	.1835	1.8°	2.25	.250	4	●	24.7	25.6	*	*
D1/4N3DR0.06	.250	.060	.375	.750	.2441	-	2.25	.250	4	●	*	*	*	*
D1/4N5DR0.06	.250	.060	.375	1.250	.2441	-	3.00	.250	4	●	*	*	*	*
D5/16N3DR0.08	.313	.080	.469	.938	.3066	-	3.00	.313	4	●	*	*	*	*
D5/16N5DR0.08	.313	.080	.469	1.563	.3066	-	4.00	.313	4	●	*	*	*	*
D3/8N3DR0.08	.375	.080	.563	1.125	.3691	-	3.00	.375	4	●	*	*	*	*
D3/8N5DR0.08	.375	.080	.563	1.875	.3691	-	4.00	.375	4	●	*	*	*	*
D1/2N3DR0.12	.500	.120	.750	1.500	.4882	-	4.00	.500	4	●	*	*	*	*
D1/2N5DR0.12	.500	.120	.750	2.500	.4822	-	5.00	.500	4	●	*	*	*	*

* No interference

IMPACT MIRACLE vibration control end mills

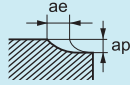
VFHVRB – Inch sizes

4 flute, Corner radius, Short cut length, Irregular helix flutes

High feed conditions

Work material			Carbon Steel, Cast Iron, Alloy Steel (–30HRC) AISI 1049, AISI 30, AISI P20				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21				Hardened Steel (45–55HRC) AISI H13				Hardened Steel (55–62HRC) AISI D2							
Dia. (inch)	R (inch)	Neck Length (inch)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (inch)	Depth of cut ae (inch)					
				(mm/min)	(IPM)				(mm/min)	(IPM)				(mm/min)	(IPM)			(mm/min)	(IPM)			
0.125	0.03	0.375	16000	11000	433.1	.009	.039	13000	7800	307.1	.007	.039	11000	6300	248	.006	.039	8000	2800	110.2	.003	.039
0.125	0.03	0.625	16000	9000	354.3	.009	.039	13000	6400	252	.007	.039	11000	5100	200.8	.006	.039	8000	2300	90.6	.003	.039
0.188	0.05	0.563	12000	12000	472.4	.012	.059	10000	8500	334.6	.009	.059	8000	6800	267.7	.007	.059	6000	3000	118.1	.004	.059
0.188	0.05	0.938	12000	12000	472.4	.011	.059	10000	8500	334.6	.008	.059	8000	6800	267.7	.006	.059	6000	3000	118.1	.003	.059
0.250	0.06	0.750	8000	13000	511.8	.020	.078	6600	9200	362.2	.016	.078	5400	7400	291.3	.012	.078	4000	3300	129.9	.006	.078
0.250	0.06	1.250	8000	13000	511.8	.018	.078	6600	9200	362.2	.014	.078	5400	7400	291.3	.011	.078	4000	3300	129.9	.006	.078
0.313	0.08	0.938	6000	13000	511.8	.024	.118	5000	9200	362.2	.018	.118	4000	7400	291.3	.014	.118	3000	3300	129.9	.007	.118
0.313	0.08	1.563	6000	13000	511.8	.021	.118	5000	9200	362.2	.017	.118	4000	7400	291.3	.013	.118	3000	3300	129.9	.006	.118
0.375	0.08	1.125	4800	13000	511.8	.024	.177	4000	9200	362.2	.018	.177	3200	7400	291.3	.014	.177	2400	3300	129.9	.007	.177
0.375	0.08	1.875	4800	13000	511.8	.021	.177	4000	9200	362.2	.017	.177	3200	7400	291.3	.013	.177	2400	3300	129.9	.006	.177
0.500	0.12	1.500	4000	12000	472.4	.035	.177	3300	8500	334.6	.028	.177	2700	6800	267.7	.018	.177	2000	3000	118.1	.009	.177
0.500	0.12	2.500	4000	12000	472.4	.031	.177	3300	8500	334.6	.024	.177	2700	6800	267.7	.016	.177	2000	3000	118.1	.008	.177

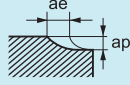
Depth of cut



High depth of cut conditions

Work material			Carbon Steel, Cast Iron, Alloy Steel (–30HRC) AISI 1049, AISI 30, AISI P20				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21				Hardened Steel (45–55HRC) AISI H13				Hardened Steel (55–62HRC) AISI D2							
Dia. (inch)	R (inch)	Neck Length (inch)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (inch)	Depth of cut ae (inch)					
				(mm/min)	(IPM)				(mm/min)	(IPM)				(mm/min)	(IPM)			(mm/min)	(IPM)			
0.125	0.03	0.375	9600	3300	129.9	.020	.039	8000	2300	90.6	.016	.039	6400	1800	70.9	.012	.039	4800	830	32.7	.006	.039
0.125	0.03	0.625	9600	2700	106.3	.020	.039	8000	1900	74.8	.014	.039	6400	1500	59.1	.010	.039	4800	680	26.8	.005	.039
0.188	0.05	0.563	7200	3600	141.7	.024	.059	6000	2500	98.4	.020	.059	4800	2000	78.7	.014	.059	3600	900	35.4	.005	.059
0.188	0.05	0.938	7200	3600	141.7	.024	.059	6000	2500	98.4	.016	.059	4800	2000	78.7	.013	.059	3600	900	35.4	.004	.059
0.250	0.06	0.750	4000	3300	129.9	.020	.118	3300	2300	90.6	.016	.118	2700	1800	70.9	.012	.118	2000	830	32.7	.004	.118
0.250	0.06	1.250	4800	3900	153.5	.040	.079	4000	2700	106.3	.031	.079	3200	2200	86.6	.024	.079	2400	980	38.6	.008	.079
0.313	0.08	0.938	3600	3900	153.5	.047	.118	3000	2700	106.3	.040	.118	2400	2200	86.6	.028	.118	1800	980	38.6	.009	.118
0.313	0.08	1.563	3600	3900	153.5	.043	.118	3000	2700	106.3	.035	.118	2400	2200	86.6	.028	.118	1800	980	38.6	.009	.118
0.375	0.08	1.125	2900	3900	153.5	.047	.177	2400	2700	106.3	.040	.177	1900	2200	86.6	.028	.177	1500	980	38.6	.009	.177
0.375	0.08	1.875	2900	3900	153.5	.043	.177	2400	2700	106.3	.035	.177	1900	2200	86.6	.028	.177	1500	980	38.6	.009	.177
0.500	0.12	1.500	2400	3600	141.7	.071	.177	2000	2500	98.4	.055	.177	1600	2000	78.7	.043	.177	1200	900	35.4	.016	.177
0.500	0.12	2.500	2400	3600	141.7	.063	.177	2000	2500	98.4	.051	.177	1600	2000	78.7	.040	.177	1200	900	35.4	.012	.177

Depth of cut



- 1) If the depth of cut is smaller than this table, feed rate can be increased.
- 2) Using air blow or mist is recommended.
- 3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
- 4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes



$D1 \leq 10 \pm 0.007$
 $D1 > 10 \pm 0.01$



$D1 \leq 12 \ 0 - -0.02$
 $D1 > 12 \ 0 - -0.03$

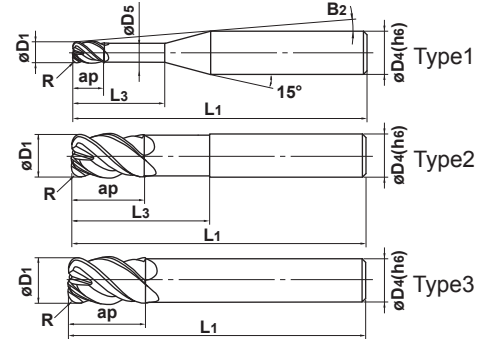
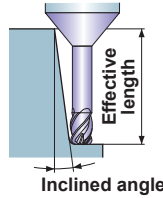


$D4 = 6 \ 0 - -0.008$
 $8 \leq D4 \leq 10 \ 0 - -0.009$
 $12 \leq D4 \leq 16 \ 0 - -0.011$

Carbon Steel, Alloy Steel (<30HRC)	Pre-Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
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Effective length for inclined angle



- Impact Miracle corner radius end mill for high feed and efficient machining.

Unit : mm

Order Number	Dia. D1	Corner R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle			
												30°	1°	2°	3°
VFHVRBD0100R02N004	1	0.2	1	4	0.94	10.6°	60	6	4	★	1	4.2	4.5	4.7	5.3
D0100R02N006	1	0.2	1	6	0.94	9.2°	60	6	4	★	1	6.4	6.7	7.2	7.7
D0100R02N008	1	0.2	1	8	0.94	8.2°	60	6	4	★	1	8.5	8.8	9.5	10.2
D0100R02N010	1	0.2	1	10	0.94	7.4°	60	6	4	★	1	10.5	11	11.8	12.7
D0100R02N015	1	0.2	1	15	0.94	5.9°	60	6	4	★	1	15.8	16.3	17.5	18.9
D0100R02N020	1	0.2	1	20	0.94	4.9°	80	6	4	★	1	20.9	21.7	23.3	25.1
D0150R03N004	1.5	0.3	1.5	4	1.44	10.3°	60	6	4	★	1	4.2	4.5	4.6	5.2
D0150R03N006	1.5	0.3	1.5	6	1.44	8.9°	60	6	4	★	1	6.3	6.6	7.2	7.7
D0150R03N010	1.5	0.3	1.5	10	1.44	7°	60	6	4	★	1	10.5	10.9	11.8	12.7
D0150R03N015	1.5	0.3	1.5	15	1.44	5.5°	60	6	4	★	1	15.7	16.3	17.5	18.9
D0150R03N020	1.5	0.3	1.5	20	1.44	4.6°	80	6	4	★	1	20.9	21.6	23.3	25.1
D0150R03N025	1.5	0.3	1.5	25	1.44	3.9°	80	6	4	★	1	26.1	27	29	31.3
D0150R03N030	1.5	0.3	1.5	30	1.44	3.4°	80	6	4	★	1	31.3	32.3	34.7	37.5
D0200R05N006	2	0.5	2	6	1.9	8.7°	60	6	4	●	1	6.3	6.5	7	7.5
D0200R05N010	2	0.5	2	10	1.9	6.7°	60	6	4	●	1	10.5	10.8	11.6	12.5
D0200R05N015	2	0.5	2	15	1.9	5.2°	60	6	4	★	1	15.6	16.2	17.4	18.7
D0200R05N020	2	0.5	2	20	1.9	4.3°	80	6	4	★	1	20.8	21.5	23.1	24.9
D0200R05N025	2	0.5	2	25	1.9	3.6°	80	6	4	★	1	26	26.9	28.9	31.2
D0200R05N030	2	0.5	2	30	1.9	3.1°	80	6	4	★	1	31.2	32.2	34.6	37.4
D0200R05N035	2	0.5	2	35	1.9	2.8°	90	6	4	★	1	36.3	37.6	40.4	*
D0200R05N040	2	0.5	2	40	1.9	2.5°	90	6	4	★	1	41.5	42.9	46.1	*
D0300R05N010	3	0.5	3	10	2.9	5.6°	60	6	4	★	1	10.5	10.8	11.6	12.5
D0300R05N015	3	0.5	3	15	2.9	4.3°	60	6	4	★	1	15.6	16.2	17.4	18.7
D0300R05N020	3	0.5	3	20	2.9	3.4°	80	6	4	★	1	20.8	21.5	23.1	24.9
D0300R05N030	3	0.5	3	30	2.9	2.5°	80	6	4	★	1	31.2	32.2	34.6	*
D0300R08N010	3	0.8	3	10	2.9	5.7°	60	6	4	●	1	10.4	10.8	11.6	12.4
D0300R08N015	3	0.8	3	15	2.9	4.3°	60	6	4	●	1	15.6	16.2	17.3	18.7
D0300R08N020	3	0.8	3	20	2.9	3.5°	80	6	4	★	1	20.8	21.5	23.1	24.9
D0300R08N030	3	0.8	3	30	2.9	2.5°	80	6	4	●	1	31.1	32.2	34.6	*
D0300R08N040	3	0.8	3	40	2.9	2°	90	6	4	★	1	41.5	42.9	*	*
D0300R08N050	3	0.8	3	50	2.9	1.6°	90	6	4	★	1	51.8	53.6	*	*
D0400R05N012	4	0.5	4	12	3.9	3.8°	60	6	4	★	1	12.5	13	13.9	15
D0400R05N020	4	0.5	4	20	3.9	2.5°	80	6	4	★	1	20.8	21.5	23.1	*
D0400R05N030	4	0.5	4	30	3.9	1.8°	80	6	4	★	1	31.2	32.2	*	*
D0400R05N048	4	0.5	4	48	3.9	1.2°	90	6	4	★	1	49.8	51.5	*	*
D0400R10N012	4	1	4	12	3.9	3.9°	60	6	4	●	1	12.5	12.9	13.8	14.9
D0400R10N020	4	1	4	20	3.9	2.5°	80	6	4	●	1	20.8	21.5	23	*

* No interference

IMPACT MIRACLE vibration control end mills

VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes



D1 ≤ 10 ±0.007
D1 > 10 ±0.01



D1 ≤ 12 0° - -0.02
D1 > 12 0° - -0.03



D4 = 6 0° - -0.008
8 ≤ D4 ≤ 10 0° - -0.009
12 ≤ D4 ≤ 16 0° - -0.011

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle			
												30°	1°	2°	3°
VFHVRBD0400R10N030	4	1	4	30	3.9	1.8°	80	6	4	★	1	31.1	32.2	*	*
D0600R05N018	6	0.5	9	18	5.85	—	60	6	4	★	2	*	*	*	*
D0600R05N030	6	0.5	9	30	5.85	—	80	6	4	★	2	*	*	*	*
D0600R10N018	6	1	9	18	5.85	—	60	6	4	★	2	*	*	*	*
D0600R10N030	6	1	9	30	5.85	—	80	6	4	★	2	*	*	*	*
D0600R10N054	6	1	9	54	5.85	—	90	6	4	★	2	*	*	*	*
D0600R15N018	6	1.5	9	18	5.85	—	60	6	4	★	2	*	*	*	*
D0600R15N030	6	1.5	9	30	5.85	—	80	6	4	●	2	*	*	*	*
D0600R15N042	6	1.5	9	42	5.85	—	90	6	4	●	2	*	*	*	*
D0600R15N054	6	1.5	9	54	5.85	—	90	6	4	★	2	*	*	*	*
D0600R20N018	6	2	9	18	5.85	—	60	6	4	★	2	*	*	*	*
D0600R20N030	6	2	9	30	5.85	—	80	6	4	★	2	*	*	*	*
D0700R15	7	1.5	11	—	—	—	80	6	4	★	3	*	*	*	*
D0800R05N024	8	0.5	12	24	7.85	—	60	8	4	★	2	*	*	*	*
D0800R05N040	8	0.5	12	40	7.85	—	100	8	4	★	2	*	*	*	*
D0800R10N024	8	1	12	24	7.85	—	60	8	4	★	2	*	*	*	*
D0800R10N040	8	1	12	40	7.85	—	100	8	4	★	2	*	*	*	*
D0800R20N024	8	2	12	24	7.85	—	60	8	4	●	2	*	*	*	*
D0800R20N040	8	2	12	40	7.85	—	100	8	4	●	2	*	*	*	*
D0800R20N056	8	2	12	56	7.85	—	120	8	4	●	2	*	*	*	*
D0800R20N072	8	2	12	72	7.85	—	120	8	4	●	2	*	*	*	*
D0900R20	9	2	13.5	—	—	—	100	8	4	★	3	*	*	*	*
D1000R05N030	10	0.5	15	30	9.7	—	70	10	4	★	2	*	*	*	*
D1000R05N050	10	0.5	15	50	9.7	—	110	10	4	★	2	*	*	*	*
D1000R10N030	10	1	15	30	9.7	—	70	10	4	★	2	*	*	*	*
D1000R10N050	10	1	15	50	9.7	—	110	10	4	★	2	*	*	*	*
D1000R20N030	10	2	15	30	9.7	—	70	10	4	★	2	*	*	*	*
D1000R20N050	10	2	15	50	9.7	—	110	10	4	★	2	*	*	*	*
D1000R20N070	10	2	15	70	9.7	—	150	10	4	★	2	*	*	*	*
D1000R20N090	10	2	15	90	9.7	—	150	10	4	★	2	*	*	*	*
D1100R20	11	2	16.5	—	—	—	110	10	4	★	3	*	*	*	*
D1200R05N036	12	0.5	18	36	11.7	—	80	12	4	★	2	*	*	*	*
D1200R05N060	12	0.5	18	60	11.7	—	120	12	4	★	2	*	*	*	*
D1200R10N036	12	1	18	36	11.7	—	80	12	4	★	2	*	*	*	*
D1200R10N060	12	1	18	60	11.7	—	120	12	4	★	2	*	*	*	*
D1200R20N036	12	2	18	36	11.7	—	80	12	4	★	2	*	*	*	*
D1200R20N060	12	2	18	60	11.7	—	120	12	4	★	2	*	*	*	*
D1200R20N084	12	2	18	84	11.7	—	160	12	4	★	2	*	*	*	*
D1200R20N108	12	2	18	108	11.7	—	160	12	4	★	2	*	*	*	*
D1200R30N036	12	3	18	36	11.7	—	80	12	4	★	2	*	*	*	*
D1200R30N060	12	3	18	60	11.7	—	120	12	4	●	2	*	*	*	*
D1300R30	13	3	19.5	—	—	—	120	12	4	★	3	*	*	*	*
D1600R05N042	16	0.5	24	42	15.5	—	100	16	4	★	2	*	*	*	*
D1600R20N042	16	2	24	42	15.5	—	100	16	4	★	2	*	*	*	*
D1600R30N042	16	3	24	42	15.5	—	100	16	4	★	2	*	*	*	*
D1600R30N080	16	3	24	80	15.5	—	140	16	4	★	2	*	*	*	*
D1600R30N120	16	3	24	120	15.5	—	175	16	4	★	2	*	*	*	*

* No interference

IMPACT MIRACLE vibration control end mills

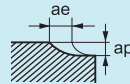
VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes

High feed conditions

Work material			Carbon steel, Cast iron, Alloy steel (-30HRC)					Alloy steel, Tool steel, Pre-hardened steel					Hardened steel (45-55HRC)					Hardened steel (55-62HRC)				
			AISI 1050, AISI 35, AISI P20 etc.					AISI H13, AISI W1-10, AISI P21 etc.					AISI H13 etc.					AISI D2 etc.				
Dia. (mm)	R (mm)	Neck length (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)
				(mm/min)	(IPM)				(mm/min)	(IPM)				(mm/min)	(IPM)				(mm/min)	(IPM)		
7	1.5	—	6800	13000	511.8	0.5	3	5600	9200	362.2	0.4	3	4600	7400	291.3	0.3	3	3400	3300	129.9	0.15	3
8	0.5	24	3000	3900	153.5	0.18	5	2500	2800	110.2	0.14	5	2000	2200	86.6	0.11	5	1500	1000	39.4	0.05	5
8	0.5	40	3000	3900	153.5	0.16	5	2500	2800	110.2	0.12	5	2000	2200	86.6	0.1	5	1500	1000	39.4	0.05	5
8	1	24	4200	6500	255.9	0.3	4.5	3500	4600	181.1	0.23	4.5	2800	3700	145.7	0.18	4.5	2100	1600	63.0	0.09	4.5
8	1	40	4200	6500	255.9	0.27	4.5	3500	4600	181.1	0.21	4.5	2800	3700	145.7	0.16	4.5	2100	1600	63.0	0.08	4.5
8	2	24	6000	13000	511.8	0.6	3	5000	9200	362.2	0.46	3	4000	7400	291.3	0.36	3	3000	3300	129.9	0.18	3
8	2	40	6000	13000	511.8	0.54	3	5000	9200	362.2	0.42	3	4000	7400	291.3	0.32	3	3000	3300	129.9	0.16	3
8	2	56	5000	11000	433.1	0.48	3	4200	7800	307.1	0.37	3	3400	6300	248.0	0.3	3	2500	2800	110.2	0.14	3
8	2	72	5000	11000	433.1	0.3	3	4200	7800	307.1	0.23	3	3400	6300	248.0	0.2	3	2500	2800	110.2	0.09	3
9	2	—	5300	13000	511.8	0.6	3.5	4400	9200	362.2	0.46	3.5	3600	7400	291.3	0.36	3.5	2700	3300	129.9	0.18	3.5
10	0.5	30	2400	3900	153.5	0.18	6.5	2000	2800	110.2	0.14	6.5	1600	2200	86.6	0.11	6.5	1200	1000	39.4	0.05	6.5
10	0.5	50	2400	3900	153.5	0.16	6.5	2000	2800	110.2	0.12	6.5	1600	2200	86.6	0.1	6.5	1200	1000	39.4	0.05	6.5
10	1	30	3300	6500	255.9	0.3	6	2700	4600	181.1	0.23	6	2200	3700	145.7	0.18	6	1700	1600	63.0	0.09	6
10	1	50	3300	6500	255.9	0.27	6	2700	4600	181.1	0.21	6	2200	3700	145.7	0.16	6	1700	1600	63.0	0.08	6
10	2	30	4800	13000	511.8	0.6	4.5	4000	9200	362.2	0.46	4.5	3200	7400	291.3	0.36	4.5	2400	3300	129.9	0.18	4.5
10	2	50	4800	13000	511.8	0.54	4.5	4000	9200	362.2	0.42	4.5	3200	7400	291.3	0.32	4.5	2400	3300	129.9	0.16	4.5
10	2	70	4000	11000	433.1	0.48	4.5	3300	7800	307.1	0.37	4.5	2700	6300	248.0	0.3	4.5	2000	2800	110.2	0.14	4.5
10	2	90	4000	11000	433.1	0.48	4.5	3300	7800	307.1	0.37	4.5	2700	6300	248.0	0.3	4.5	2000	2800	110.2	0.14	4.5
11	2	—	4300	12000	472.4	0.6	5	3600	8500	334.6	0.46	5	2900	6800	267.7	0.36	5	2200	3000	118.1	0.18	5
12	0.5	36	2000	3600	141.7	0.27	8	1700	2600	102.4	0.21	8	1300	2100	82.7	0.14	8	1000	900	35.4	0.07	8
12	0.5	60	2000	3600	141.7	0.24	8	1700	2600	102.4	0.18	8	1300	2100	82.7	0.12	8	1000	900	35.4	0.06	8
12	1	36	2400	4800	189.0	0.36	7.5	2000	3400	133.9	0.28	7.5	1600	2700	106.3	0.18	7.5	1200	1200	47.2	0.09	7.5
12	1	60	2400	4800	189.0	0.32	7.5	2000	3400	133.9	0.25	7.5	1600	2700	106.3	0.16	7.5	1200	1200	47.2	0.08	7.5
12	2	36	4000	12000	472.4	0.9	6	3300	8500	334.6	0.7	6	2700	6800	267.7	0.45	6	2000	3000	118.1	0.23	6
12	2	60	4000	12000	472.4	0.8	6	3300	8500	334.6	0.6	6	2700	6800	267.7	0.4	6	2000	3000	118.1	0.2	6
12	2	84	3300	9900	389.8	0.7	6	2700	7000	275.6	0.55	6	2200	5600	220.5	0.36	6	1700	2500	98.4	0.18	6
12	2	108	3300	9900	389.8	0.45	6	2700	7000	275.6	0.35	6	2200	5600	220.5	0.23	6	1700	2500	98.4	0.11	6
12	3	36	4000	12000	472.4	0.9	4.5	3300	8500	334.6	0.7	4.5	2700	6800	267.7	0.45	4.5	2000	3000	118.1	0.23	4.5
12	3	60	4000	12000	472.4	0.8	4.5	3300	8500	334.6	0.6	4.5	2700	6800	267.7	0.4	4.5	2000	3000	118.1	0.2	4.5
13	3	—	3700	12000	472.4	0.9	5	3100	8500	334.6	0.7	5	2500	6800	267.7	0.45	5	1900	3000	118.1	0.23	5
16	0.5	42	1500	3000	118.1	0.27	11	1200	2100	82.7	0.21	11	1000	1700	66.9	0.12	11	750	750	29.5	0.05	11
16	2	42	2100	5000	196.9	0.45	9	1700	3600	141.7	0.35	9	1400	2900	114.2	0.2	9	1100	1300	51.2	0.08	9
16	3	42	3000	10000	393.7	0.9	7.5	2500	7100	279.5	0.7	7.5	2000	5700	224.4	0.4	7.5	1500	2500	98.4	0.15	7.5
16	3	80	3000	10000	393.7	0.8	7.5	2500	7100	279.5	0.6	7.5	2000	5700	224.4	0.37	7.5	1500	2500	98.4	0.14	7.5
16	3	120	2500	8300	326.8	0.7	7.5	2100	5900	232.3	0.55	7.5	1700	4700	185.0	0.32	7.5	1300	2100	82.7	0.12	7.5

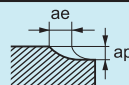
Depth of cut



- 1) If the depth of cut is smaller than this table, feed rate can be increased.
- 2) Using air blow or mist is recommended.
- 3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
- 4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

High depth of cut conditions

Work material			Carbon steel, Cast iron, Alloy steel (–30HRC)					Alloy steel, Tool steel, Pre-hardened steel					Hardened steel (45–55HRC)				Hardened steel (55–62HRC)					
			AISI 1050, AISI 35, AISI P20 etc.					AISI H13, AISI W1–10, AISI P21 etc.					AISI H13 etc.				AISI D2 etc.					
Dia. (mm)	R (mm)	Neck length (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)
				(mm/min)	(IPM)				(mm/min)	(IPM)				(mm/min)	(IPM)				(mm/min)	(IPM)		
1	0.2	4	24000	2200	86.6	0.08	0.45	20000	1500	59.1	0.07	0.45	16000	1200	47.2	0.05	0.45	12000	550	21.7	0.025	0.45
1	0.2	6	24000	2000	78.7	0.07	0.45	20000	1400	55.1	0.05	0.45	16000	1100	43.3	0.04	0.45	12000	500	19.7	0.02	0.45
1	0.2	8	19000	1400	55.1	0.05	0.45	16000	1000	39.4	0.04	0.45	13000	800	31.5	0.03	0.45	9500	350	13.8	0.016	0.45
1	0.2	10	14000	800	31.5	0.04	0.45	12000	600	23.6	0.03	0.45	9000	400	15.7	0.025	0.45	7000	200	7.9	0.012	0.45
1	0.2	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1	0.2	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1.5	0.3	4	19000	3000	118.1	0.2	0.65	16000	2100	82.7	0.16	0.65	13000	1700	66.9	0.12	0.65	9500	750	29.5	0.06	0.65
1.5	0.3	6	19000	2300	90.6	0.16	0.65	16000	1600	63.0	0.13	0.65	13000	1300	51.2	0.1	0.65	9500	580	22.8	0.05	0.65
1.5	0.3	10	16000	1700	66.9	0.1	0.65	13000	1200	47.2	0.07	0.65	11000	1000	39.4	0.05	0.65	8000	430	16.9	0.03	0.65
1.5	0.3	15	13000	1000	39.4	0.06	0.65	11000	700	27.6	0.05	0.65	9000	600	23.6	0.04	0.65	6500	250	9.8	0.018	0.65
1.5	0.3	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1.5	0.3	25	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1.5	0.3	30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2	0.5	6	14000	3000	118.1	0.2	0.75	12000	2100	82.7	0.16	0.75	9400	1700	66.9	0.12	0.75	7000	750	29.5	0.06	0.75
2	0.5	10	14000	3000	118.1	0.16	0.75	12000	2100	82.7	0.13	0.75	9400	1700	66.9	0.1	0.75	7000	750	29.5	0.05	0.75
2	0.5	15	12000	2100	82.7	0.1	0.75	10000	1500	59.1	0.08	0.75	8000	1200	47.2	0.06	0.75	6000	530	20.9	0.03	0.75
2	0.5	20	12000	1100	43.3	0.08	0.75	10000	800	31.5	0.06	0.75	8000	600	23.6	0.05	0.75	6000	280	11.0	0.025	0.75
2	0.5	25	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2	0.5	30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2	0.5	35	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2	0.5	40	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3	0.5	10	9600	3300	129.9	0.24	1.5	8000	2300	90.6	0.2	1.5	6400	1800	70.9	0.14	1.5	4800	830	32.7	0.07	1.5
3	0.5	15	9600	2700	106.3	0.22	1.5	8000	1900	74.8	0.17	1.5	6400	1500	59.1	0.13	1.5	4800	680	26.8	0.06	1.5
3	0.5	20	7800	2200	86.6	0.18	1.5	6500	1500	59.1	0.14	1.5	5200	1200	47.2	0.11	1.5	3900	550	21.7	0.05	1.5
3	0.5	30	7800	1700	66.9	0.12	1.5	6500	1200	47.2	0.1	1.5	5200	1000	39.4	0.07	1.5	3900	430	16.9	0.04	1.5
3	0.8	10	9600	3300	129.9	0.5	1	8000	2300	90.6	0.4	1	6400	1800	70.9	0.3	1	4800	830	32.7	0.14	1
3	0.8	15	9600	2700	106.3	0.5	1	8000	1900	74.8	0.35	1	6400	1500	59.1	0.25	1	4800	680	26.8	0.13	1
3	0.8	20	7800	2200	86.6	0.4	1	6500	1500	59.1	0.3	1	5200	1200	47.2	0.23	1	3900	550	21.7	0.11	1
3	0.8	30	7800	1700	66.9	0.24	1	6500	1200	47.2	0.2	1	5200	1000	39.4	0.14	1	3900	430	16.9	0.05	1
3	0.8	40	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3	0.8	50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
4	0.5	12	5000	1800	70.9	0.3	2	4200	1300	51.2	0.24	2	3400	1000	39.4	0.18	2	2500	450	17.7	0.06	2
4	0.5	20	5000	1800	70.9	0.3	2	4200	1300	51.2	0.22	2	3400	1000	39.4	0.17	2	2500	450	17.7	0.06	2
4	0.5	30	4100	1500	59.1	0.24	2	3400	1100	43.3	0.19	2	2700	840	33.1	0.14	2	2100	380	15.0	0.05	2
4	0.5	48	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
4	1	12	7200	3600	141.7	0.6	1.5	6000	2500	98.4	0.5	1.5	4800	2000	78.7	0.36	1.5	3600	900	35.4	0.12	1.5
4	1	20	7200	3600	141.7	0.6	1.5	6000	2500	98.4	0.4	1.5	4800	2000	78.7	0.32	1.5	3600	900	35.4	0.11	1.5
4	1	30	6000	3000	118.1	0.5	1.5	5000	2100	82.7	0.4	1.5	4000	1700	66.9	0.3	1.5	3000	750	29.5	0.1	1.5
6	0.5	18	2400	1200	47.2	0.3	3.5	2000	840	33.1	0.24	3.5	1600	670	26.4	0.18	3.5	1200	300	11.8	0.06	3.5
6	0.5	30	2400	1200	47.2	0.3	3.5	2000	840	33.1	0.22	3.5	1600	670	26.4	0.17	3.5	1200	300	11.8	0.06	3.5
6	1	18	4800	3900	153.5	1	3	4000	2700	106.3	0.8	3	3200	2200	86.6	0.6	3	2400	980	38.6	0.2	3
6	1	30	4800	3900	153.5	0.9	3	4000	2700	106.3	0.7	3	3200	2200	86.6	0.5	3	2400	980	38.6	0.18	3
6	1	54	4000	3300	129.9	0.5	3	3300	2300	90.6	0.4	3	2700	1800	70.9	0.3	3	2000	830	32.7	0.1	3
6	1.5	18	4800	3900	153.5	1	2	4000	2700	106.3	0.8	2	3200	2200	86.6	0.6	2	2400	980	38.6	0.2	2
6	1.5	30	4800	3900	153.5	0.9	2	4000	2700	106.3	0.7	2	3200	2200	86.6	0.5	2	2400	980	38.6	0.18	2
6	1.5	42	4000	3300	129.9	0.8	2	3300	2300	90.6	0.6	2	2700	1800	70.9	0.5	2	2000	830	32.7	0.16	2
6	1.5	54	4000	3300	129.9	0.5	2	3300	2300	90.6	0.4	2	2700	1800	70.9	0.3	2	2000	830	32.7	0.1	2
6	2	18	4800	3900	153.5	1	1.5	4000	2700	106.3	0.8	1.5	3200	2200	86.6	0.6	1.5	2400	980	38.6	0.2	1.5
6	2	30	4800	3900	153.5	0.9	1.5	4000	2700	106.3	0.7	1.5	3200	2200	86.6	0.5	1.5	2400	980	38.6	0.18	1.5



- 1) If the depth of cut is smaller than this table, feed rate can be increased.
- 2) Using air blow or mist is recommended.
- 3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
- 4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

IMPACT MIRACLE vibration control end mills

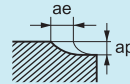
VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes

High depth of cut conditions

Work material			Carbon steel, Cast iron, Alloy steel (-30HRC)						Alloy steel, Tool steel, Pre-hardened steel						Hardened steel (45-55HRC)						Hardened steel (55-62HRC)					
			AISI 1050, AISI 35, AISI P20 etc.						AISI H13, AISI W1-10, AISI P21 etc.						AISI H13 etc.						AISI D2 etc.					
Dia. (mm)	R (mm)	Neck length (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min ⁻¹)	Table feed		Depth of cut ap (mm)	Depth of cut ae (mm)				
				(mm/min)	(IPM)				(mm/min)	(IPM)				(mm/min)	(IPM)				(mm/min)	(IPM)			(mm/min)	(IPM)		
7	1.5	—	4100	3900	153.5	1	3	3400	2700	106.3	0.8	3	2700	2200	86.6	0.6	3	2100	980	38.6	0.2	3				
8	0.5	24	1800	1200	47.2	0.35	5	1500	840	33.1	0.3	5	1200	670	26.4	0.2	5	900	300	11.8	0.07	5				
8	0.5	40	1800	1200	47.2	0.3	5	1500	840	33.1	0.25	5	1200	670	26.4	0.2	5	900	300	11.8	0.06	5				
8	1	24	2500	2000	78.7	0.6	4.5	2100	1400	55.1	0.5	4.5	1700	1100	43.3	0.4	4.5	1300	500	19.7	0.12	4.5				
8	1	40	2500	2000	78.7	0.5	4.5	2100	1400	55.1	0.4	4.5	1700	1100	43.3	0.3	4.5	1300	500	19.7	0.11	4.5				
8	2	24	3600	3900	153.5	1.2	3	3000	2700	106.3	1	3	2400	2200	86.6	0.7	3	1800	980	38.6	0.24	3				
8	2	40	3600	3900	153.5	1.1	3	3000	2700	106.3	0.9	3	2400	2200	86.6	0.7	3	1800	980	38.6	0.22	3				
8	2	56	3000	3300	129.9	1	3	2500	2300	90.6	0.8	3	2000	1800	70.9	0.6	3	1500	830	32.7	0.2	3				
8	2	72	3000	3300	129.9	0.6	3	2500	2300	90.6	0.5	3	2000	1800	70.9	0.4	3	1500	830	32.7	0.12	3				
9	2	—	3200	3900	153.5	1.2	3.5	2700	2700	106.3	1	3.5	2100	2200	86.6	0.7	3.5	1600	980	38.6	0.24	3.5				
10	0.5	30	1400	1200	47.2	0.35	6.5	1200	840	33.1	0.3	6.5	940	670	26.4	0.2	6.5	700	300	11.8	0.07	6.5				
10	0.5	50	1400	1200	47.2	0.3	6.5	1200	840	33.1	0.25	6.5	940	670	26.4	0.2	6.5	700	300	11.8	0.06	6.5				
10	1	30	2000	2000	78.7	0.6	6	1700	1400	55.1	0.5	6	1300	1100	43.3	0.4	6	1000	500	19.7	0.12	6				
10	1	50	2000	2000	78.7	0.5	6	1700	1400	55.1	0.4	6	1300	1100	43.3	0.3	6	1000	500	19.7	0.11	6				
10	2	30	2900	3900	153.5	1.2	4.5	2400	2700	106.3	1	4.5	1900	2200	86.6	0.7	4.5	1500	980	38.6	0.24	4.5				
10	2	50	2900	3900	153.5	1.1	4.5	2400	2700	106.3	0.9	4.5	1900	2200	86.6	0.7	4.5	1500	980	38.6	0.22	4.5				
10	2	70	2400	3300	129.9	1	4.5	2000	2300	90.6	0.8	4.5	1600	1800	70.9	0.6	4.5	1200	830	32.7	0.2	4.5				
10	2	90	2400	3300	129.9	1	4.5	2000	2300	90.6	0.8	4.5	1600	1800	70.9	0.6	4.5	1200	830	32.7	0.2	4.5				
11	2	—	2600	3600	141.7	1.2	5	2200	2500	98.4	1	5	1700	2000	78.7	0.7	5	1300	900	35.4	0.24	5				
12	0.5	36	1200	1100	43.3	0.5	8	1000	770	30.3	0.4	8	800	620	24.4	0.3	8	600	280	11.0	0.11	8				
12	0.5	60	1200	1100	43.3	0.5	8	1000	770	30.3	0.4	8	800	620	24.4	0.3	8	600	280	11.0	0.1	8				
12	1	36	1400	1400	55.1	0.7	7.5	1200	1000	39.4	0.6	7.5	940	780	30.7	0.4	7.5	700	350	13.8	0.14	7.5				
12	1	60	1400	1400	55.1	0.6	7.5	1200	1000	39.4	0.5	7.5	940	780	30.7	0.4	7.5	700	350	13.8	0.13	7.5				
12	2	36	2400	3600	141.7	1.8	6	2000	2500	98.4	1.4	6	1600	2000	78.7	1.1	6	1200	900	35.4	0.4	6				
12	2	60	2400	3600	141.7	1.6	6	2000	2500	98.4	1.3	6	1600	2000	78.7	1	6	1200	900	35.4	0.3	6				
12	2	84	2000	3000	118.1	1.4	6	1700	2100	82.7	1.1	6	1300	1700	66.9	0.8	6	1000	750	29.5	0.3	6				
12	2	108	2000	3000	118.1	0.9	6	1700	2100	82.7	0.7	6	1300	1700	66.9	0.5	6	1000	750	29.5	0.2	6				
12	3	36	2400	3600	141.7	1.8	4.5	2000	2500	98.4	1.4	4.5	1600	2000	78.7	1.1	4.5	1200	900	35.4	0.4	4.5				
12	3	60	2400	3600	141.7	1.6	4.5	2000	2500	98.4	1.3	4.5	1600	2000	78.7	1	4.5	1200	900	35.4	0.3	4.5				
13	3	—	2200	3600	141.7	1.8	5	1800	2500	98.4	1.4	5	1500	2000	78.7	1.1	5	1100	900	35.4	0.4	5				
16	0.5	42	900	900	35.4	0.5	11	750	630	24.8	0.4	11	600	500	19.7	0.3	11	450	230	9.1	0.1	11				
16	2	42	1300	1500	59.1	0.9	9	1100	1100	43.3	0.7	9	870	840	33.1	0.5	9	650	380	15.0	0.2	9				
16	3	42	1800	3000	118.1	1.8	7.5	1500	2100	82.7	1.4	7.5	1200	1700	66.9	0.9	7.5	900	750	29.5	0.4	7.5				
16	3	80	1800	3000	118.1	1.6	7.5	1500	2100	82.7	1.3	7.5	1200	1700	66.9	0.8	7.5	900	750	29.5	0.3	7.5				
16	3	120	1500	2500	98.4	1.4	7.5	1200	1800	70.9	1.1	7.5	1000	1400	55.1	0.7	7.5	750	630	24.8	0.3	7.5				

Depth of cut



- 1) If the depth of cut is smaller than this table, feed rate can be increased.
- 2) Using air blow or mist is recommended.
- 3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
- 4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes



$D1 \leq 10 \pm 0.007$
 $D1 > 10 \pm 0.01$



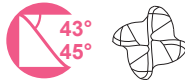
$D1 \leq 12 \quad 0 - -0.02$



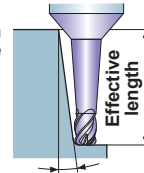
$D4 = 6 \quad 0 - -0.008$
 $8 \leq D4 \leq 10 \quad 0 - -0.009$
 $12 \leq D4 \leq 16 \quad 0 - -0.011$

Carbon Steel, Alloy Steel (<30HRC)	Pre-Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
○	○	○	○	○	○		

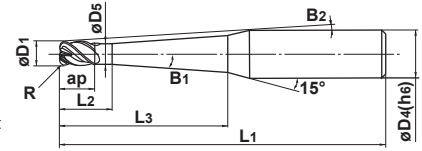
Taper neck type



Effective length for inclined angle



Inclined angle



- Impact Miracle corner radius end mill for high feed and efficient machining.

Unit : mm

Order Number	Dia. D1	Corner R R	Taper Angle One Side B1	Length of Cut ap	Neck Length L3	Length of Straight Neck L2	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Effective length for inclined angle			
													30°	1°	2°	3°
VFHVRBD010R02N006T09	1	0.2	0.9°	1	6	2.5	0.94	9.3°	60	6	4	★	—	6.6	7.1	7.6
D010R02N010T09	1	0.2	0.9°	1	10	2.5	0.94	7.5°	60	6	4	★	—	10.6	11.4	12.3
D010R02N015T09	1	0.2	0.9°	1	15	2.5	0.94	6.1°	60	6	4	★	—	15.6	16.8	18.1
D010R02N020T09	1	0.2	0.9°	1	20	2.5	0.94	5.1°	80	6	4	★	—	20.6	22.1	23.9
D010R02N025T09	1	0.2	0.9°	1	25	2.5	0.94	4.4°	80	6	4	★	—	25.6	27.5	29.7
D010R02N030T09	1	0.2	0.9°	1	30	2.5	0.94	3.8°	80	6	4	★	—	30.6	32.9	35.5
D010R02N035T09	1	0.2	0.9°	1	35	2.5	0.94	3.4°	90	6	4	★	—	35.6	38.3	41.3
D010R02N040T09	1	0.2	0.9°	1	40	2.5	0.94	3.1°	90	6	4	★	—	40.6	43.6	47.2
D010R02N045T09	1	0.2	0.9°	1	45	2.5	0.94	2.8°	90	6	4	★	—	45.6	49	*
D010R02N050T09	1	0.2	0.9°	1	50	2.5	0.94	2.6°	90	6	4	★	—	50.6	54.4	*
D015R03N010T09	1.5	0.3	0.9°	1.5	10	3	1.44	7.1°	60	6	4	★	—	10.6	11.4	12.3
D015R03N015T09	1.5	0.3	0.9°	1.5	15	3	1.44	5.7°	60	6	4	★	—	15.6	16.8	18.1
D015R03N020T09	1.5	0.3	0.9°	1.5	20	3	1.44	4.7°	80	6	4	★	—	20.6	22.2	23.9
D015R03N030T09	1.5	0.3	0.9°	1.5	30	3	1.44	3.5°	80	6	4	★	—	30.6	32.9	35.6
D015R03N040T09	1.5	0.3	0.9°	1.5	40	3	1.44	2.8°	90	6	4	★	—	40.6	43.7	*
D015R03N050T09	1.5	0.3	0.9°	1.5	50	3	1.44	2.4°	90	6	4	★	—	50.6	54.4	*
D020R05N015T04	2	0.5	0.4°	2	15	4	1.9	5.2°	60	6	4	★	15.6	16.2	17.4	18.7
D020R05N020T04	2	0.5	0.4°	2	20	4	1.9	4.3°	80	6	4	★	20.6	21.3	22.9	24.7
D020R05N025T04	2	0.5	0.4°	2	25	4	1.9	3.6°	80	6	4	★	25.6	26.5	28.5	30.8
D020R05N030T04	2	0.5	0.4°	2	30	4	1.9	3.2°	80	6	4	★	30.6	31.7	34	36.8
D020R05N035T04	2	0.5	0.4°	2	35	4	1.9	2.8°	80	6	4	★	35.6	36.9	39.6	*
D020R05N040T04	2	0.5	0.4°	2	40	4	1.9	2.5°	80	6	4	★	40.6	42	45.2	*
D020R05N020T09	2	0.5	0.9°	2	20	4	1.9	4.4°	80	6	4	★	—	20.8	22.3	24.1
D020R05N025T09	2	0.5	0.9°	2	25	4	1.9	3.7°	90	6	4	★	—	25.8	27.7	29.9
D020R05N030T09	2	0.5	0.9°	2	30	4	1.9	3.2°	90	6	4	★	—	30.8	33	35.7
D020R05N035T09	2	0.5	0.9°	2	35	4	1.9	2.9°	90	6	4	★	—	35.8	38.4	*
D020R05N040T09	2	0.5	0.9°	2	40	4	1.9	2.6°	90	6	4	★	—	40.8	43.8	*
D020R05N045T09	2	0.5	0.9°	2	45	4	1.9	2.3°	90	6	4	★	—	45.8	49.2	*
D020R05N050T09	2	0.5	0.9°	2	50	4	1.9	2.2°	100	6	4	★	—	50.8	54.5	*
D020R05N055T09	2	0.5	0.9°	2	55	4	1.9	2°	100	6	4	★	—	55.8	59.9	*
D020R05N060T09	2	0.5	0.9°	2	60	4	1.9	1.8°	100	6	4	★	—	60.8	*	*
D030R08N020T09	3	0.8	0.9°	3	20	6	2.9	3.6°	80	6	4	★	—	20.9	22.4	24.1
D030R08N025T09	3	0.8	0.9°	3	25	6	2.9	3°	80	6	4	★	—	25.9	27.8	30
D030R08N030T09	3	0.8	0.9°	3	30	6	2.9	2.6°	80	6	4	★	—	30.9	33.1	*
D030R08N040T09	3	0.8	0.9°	3	40	6	2.9	2°	90	6	4	★	—	40.9	43.9	*
D030R08N050T09	3	0.8	0.9°	3	50	6	2.9	1.7°	90	6	4	★	—	50.9	*	*
D030R08N060T09	3	0.8	0.9°	3	60	6	2.9	1.4°	100	6	4	★	—	60.9	*	*
D040R10N025T04	4	1	0.4°	4	25	7	3.9	2.1°	80	6	4	★	25.7	26.6	28.5	*
D040R10N030T04	4	1	0.4°	4	30	7	3.9	1.8°	80	6	4	★	30.7	31.8	*	*

* No interference

★ : Inventory maintained in Japan.

IMPACT MIRACLE vibration control end mills

VFHVRB

4 flute, Corner radius, Short cut length,
Irregular helix flutes



D1 ≤ 10 ±0.007
D1 > 10 ±0.01



D1 ≤ 12 0 - -0.02



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

Unit : mm

Order Number	Dia. D1	Corner R R	Taper Angle One Side B1	Length of Cut ap	Neck Length L3	Length of Straight Neck L2	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Effective length for inclined angle			
													30°	1°	2°	3°
VFHVRBD040R10N035T04	4	1	0.4°	4	35	7	3.9	1.6°	80	6	4	★	35.7	36.9	*	*
D040R10N040T04	4	1	0.4°	4	40	7	3.9	1.4°	80	6	4	★	40.7	42.1	*	*
D040R10N045T04	4	1	0.4°	4	45	7	3.9	1.3°	90	6	4	★	45.7	47.3	*	*
D040R10N050T04	4	1	0.4°	4	50	7	3.9	1.2°	90	6	4	★	50.7	52.5	*	*
D040R10N025T09	4	1	0.9°	4	25	7	3.9	2.2°	90	6	4	★	—	25.9	27.8	*
D040R10N030T09	4	1	0.9°	4	30	7	3.9	1.9°	90	6	4	★	—	30.9	*	*
D040R10N040T09	4	1	0.9°	4	40	7	3.9	1.4°	100	6	4	★	—	40.9	*	*
D040R10N050T09	4	1	0.9°	4	50	7	3.9	1.2°	100	6	4	★	—	50.9	*	*
D040R10N060T09	4	1	0.9°	4	60	7	3.9	1°	100	6	4	★	—	60.9	*	*
D060R15N040T09	6	1.5	0.9°	9	40	12	5.85	1.4°	110	8	4	★	—	41.4	*	*
D060R15N050T09	6	1.5	0.9°	9	50	12	5.85	1.2°	110	8	4	★	—	51.4	*	*
D060R15N060T09	6	1.5	0.9°	9	60	12	5.85	1°	110	8	4	★	—	61.4	*	*
D060R15N070T09	6	1.5	0.9°	9	70	12	5.85	0.9°	110	8	4	★	—	*	*	*
D080R20N060T09	8	2	0.9°	12	60	15	7.85	1°	150	10	4	★	—	61.5	*	*
D080R20N080T09	8	2	0.9°	12	80	15	7.85	0.8°	150	10	4	★	—	*	*	*
D100R20N080T09	10	2	0.9°	15	80	18	9.7	2°	130	16	4	★	—	82	88	*
D100R20N120T09	10	2	0.9°	15	120	18	9.7	1.4°	180	16	4	★	—	122	*	*
D120R20N080T09	12	2	0.9°	18	80	21	11.7	1.4°	130	16	4	★	—	82.2	*	*
D120R20N120T09	12	2	0.9°	18	120	21	11.7	1°	180	16	4	★	—	122.2	*	*

* No interference

Work material				Carbon Steel, Cast Iron, Alloy Steel (–30HRC)					Alloy steel, Tool steel, Pre-hardened steel					Hardened Steel (45–55HRC)				Hardened Steel (55–62HRC)					
				AISI 1050, AISI No 35 B, AISI P20					AISI H13, AISI W1-10, AISI P21					AISI H13				AISI D2					
Dia. (inch)	R (inch)	Taper angle one side	Neck Length (inch)	Revolution (min ⁻¹)	Table feed (mm/min) (IPM)	Depth of cut ap(mm)	Depth of cut ae(mm)	Revolution (min ⁻¹)	Table feed (mm/min) (IPM)	Depth of cut ap(mm)	Depth of cut ae(mm)	Revolution (min ⁻¹)	Table feed (mm/min) (IPM)	Depth of cut ap(mm)	Depth of cut ae(mm)	Revolution (min ⁻¹)	Table feed (mm/min) (IPM)	Depth of cut ap(mm)	Depth of cut ae(mm)				
1	0.2	0.9°	6	40000	6500	255.9	0.03	0.45	33000	4600	181.1	0.022	0.45	27000	3700	145.7	0.018	0.45	20000	1600	63.0	0.01	0.45
1	0.2	0.9°	10	24000	2700	106.3	0.015	0.45	20000	1900	74.8	0.01	0.45	16000	1500	59.1	0.008	0.45	12000	700	27.6	0.006	0.45
1	0.2	0.9°	15	16000	1200	47.2	0.013	0.45	14000	700	27.6	0.008	0.45	12000	500	19.7	0.007	0.45	10000	400	15.7	0.003	0.45
1	0.2	0.9°	20	14000	1000	39.4	0.01	0.45	12000	600	23.6	0.006	0.45	10000	400	15.7	0.005	0.45	9000	300	11.8	0.002	0.45
1	0.2	0.9°	25	9500	610	24.0	0.008	0.45	8000	440	17.3	0.005	0.45	6000	320	12.6	0.004	0.45	4800	160	6.3	0.002	0.45
1	0.2	0.9°	30	4900	320	12.6	0.007	0.45	4100	220	8.7	0.004	0.45	3000	160	6.3	0.003	0.45	2500	80	3.1	0.002	0.45
1	0.2	0.9°	35	4000	260	10.2	0.006	0.45	3400	190	7.5	0.003	0.45	3000	160	6.3	0.003	0.45	2000	70	2.8	0.001	0.45
1	0.2	0.9°	40	3500	180	7.1	0.005	0.45	2900	130	5.1	0.003	0.45	2000	90	3.5	0.003	0.45	1700	50	2.0	0.001	0.45
1	0.2	0.9°	45	2900	150	5.9	0.004	0.45	2400	100	3.9	0.002	0.45	2000	90	3.5	0.002	0.45	1400	40	1.6	0.001	0.45
1	0.2	0.9°	50	2900	110	4.3	0.003	0.45	2400	80	3.1	0.002	0.45	2000	60	2.4	0.002	0.45	1400	30	1.2	0.001	0.45
1.5	0.3	0.9°	10	27000	5700	224.4	0.05	0.65	22000	4000	157.5	0.035	0.65	18000	3000	118.1	0.03	0.65	14000	1400	55.1	0.014	0.65
1.5	0.3	0.9°	15	22000	3200	126.0	0.03	0.65	18000	2300	90.6	0.025	0.65	15000	1700	66.9	0.018	0.65	11000	1000	39.4	0.009	0.65
1.5	0.3	0.9°	20	16000	1400	55.1	0.02	0.65	14000	1200	47.2	0.016	0.65	13000	1000	39.4	0.012	0.65	9000	700	27.6	0.007	0.65
1.5	0.3	0.9°	30	13000	900	35.4	0.01	0.65	11000	700	27.6	0.008	0.65	10000	600	23.6	0.006	0.65	7500	400	15.7	0.004	0.65
1.5	0.3	0.9°	40	4500	230	9.1	0.008	0.65	3700	160	6.3	0.007	0.65	3000	120	4.7	0.005	0.65	2300	70	2.8	0.003	0.65
1.5	0.3	0.9°	50	3700	190	7.5	0.007	0.65	3000	130	5.1	0.006	0.65	3000	120	4.7	0.004	0.65	1900	60	2.4	0.002	0.65
2	0.5	0.4°	15	20000	7000	275.6	0.05	0.75	17000	5000	196.9	0.04	0.75	13000	3200	126.0	0.03	0.75	10000	1800	70.9	0.016	0.75
2	0.5	0.4°	20	20000	3600	141.7	0.04	0.75	17000	2600	102.4	0.03	0.75	13000	1800	70.9	0.025	0.75	10000	900	35.4	0.012	0.75
2	0.5	0.4°	25	16000	1800	70.9	0.03	0.75	14000	1400	55.1	0.025	0.75	12000	1100	43.3	0.02	0.75	9000	720	28.3	0.01	0.75
2	0.5	0.4°	30	16000	1400	55.1	0.025	0.75	14000	1200	47.2	0.02	0.75	12000	900	35.4	0.016	0.75	9000	650	25.6	0.008	0.75
2	0.5	0.4°	35	13000	1100	43.3	0.02	0.75	11000	800	31.5	0.018	0.75	10000	700	27.6	0.014	0.75	7000	500	19.7	0.007	0.75
2	0.5	0.4°	40	13000	1000	39.4	0.02	0.75	11000	700	27.6	0.015	0.75	10000	600	23.6	0.012	0.75	7000	400	15.7	0.006	0.75
2	0.5	0.9°	20	20000	3600	141.7	0.04	0.75	17000	2600	102.4	0.03	0.75	13000	1800	70.9	0.025	0.75	10000	900	35.4	0.012	0.75
2	0.5	0.9°	25	16000	1800	70.9	0.03	0.75	14000	1400	55.1	0.025	0.75	12000	1100	43.3	0.02	0.75	9000	720	28.3	0.01	0.75
2	0.5	0.9°	30	16000	1400	55.1	0.025	0.75	14000	1200	47.2	0.02	0.75	12000	900	35.4	0.016	0.75	9000	650	25.6	0.008	0.75
2	0.5	0.9°	35	13000	1100	43.3	0.02	0.75	11000	800	31.5	0.018	0.75	10000	700	27.6	0.014	0.75	7000	500	19.7	0.007	0.75
2	0.5	0.9°	40	13000	1000	39.4	0.02	0.75	11000	700	27.6	0.015	0.75	10000	600	23.6	0.012	0.75	7000	400	15.7	0.006	0.75
2	0.5	0.9°	45	8000	500	19.7	0.016	0.75	6800	360	14.2	0.012	0.75	5200	250	9.8	0.01	0.75	4000	120	4.7	0.005	0.75
2	0.5	0.9°	50	8000	500	19.7	0.016	0.75	6800	360	14.2	0.012	0.75	5200	250	9.8	0.01	0.75	4000	120	4.7	0.005	0.75
2	0.5	0.9°	55	4100	230	9.1	0.012	0.75	3500	170	6.7	0.009	0.75	2700	120	4.7	0.008	0.75	2000	60	2.4	0.004	0.75
2	0.5	0.9°	60	4100	230	9.1	0.012	0.75	3500	170	6.7	0.009	0.75	2700	120	4.7	0.008	0.75	2000	60	2.4	0.004	0.75
3	0.8	0.9°	20	13000	7200	283.5	0.19	1	11000	5100	200.8	0.15	1	8700	4000	157.5	0.11	1	6500	1800	70.9	0.06	1
3	0.8	0.9°	25	13000	7200	283.5	0.19	1	11000	5100	200.8	0.15	1	8700	4000	157.5	0.11	1	6500	1800	70.9	0.06	1
3	0.8	0.9°	30	13000	5700	224.4	0.12	1	11000	4000	157.5	0.09	1	8700	3000	118.1	0.07	1	6500	1400	55.1	0.04	1
3	0.8	0.9°	40	11000	3600	141.7	0.08	1	9100	2600	102.4	0.06	1	7400	2000	78.7	0.05	1	5500	1000	39.4	0.025	1
3	0.8	0.9°	50	8000	2600	102.4	0.07	1	6600	1800	70.9	0.05	1	5800	1500	59.1	0.04	1	4600	800	31.5	0.02	1
3	0.8	0.9°	60	7800	2480	97.6	0.06	1	6600	1740	68.5	0.05	1	5000	1250	49.2	0.04	1	3900	610	24.0	0.02	1
Depth of cut																							

- 1) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 2) Air blow or oil mist is recommended for good chip evacuation.
- 3) For profile machining such as moulds, machining conditions may differ considerably depending on the workpiece geometry, machining methods and depth of cut. Reduce the feed rate especially when machining the corner sections of a workpiece.
- 4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is poor, vibration or abnormal sound can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

IMPACT MIRACLE vibration control end mills

VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes

Work material				Carbon Steel, Cast Iron, Alloy Steel (–30HRC)					Alloy steel, Tool steel, Pre-hardened steel					Hardened Steel (45–55HRC)				Hardened Steel (55–62HRC)					
				AISI 1050, AISI No 35 B, AISI P20					AISI H13, AISI W1-10, AISI P21					AISI H13				AISI D2					
Dia. (mm)	R (mm)	Taper angle one side	Neck Length (mm)	Revolution (min ⁻¹)	Table feed (mm/min) (IPM)		Depth of cut ap(mm)	Depth of cut ae(mm)	Revolution (min ⁻¹)	Table feed (mm/min) (IPM)		Depth of cut ap(mm)	Depth of cut ae(mm)	Revolution (min ⁻¹)	Table feed (mm/min) (IPM)		Depth of cut ap(mm)	Depth of cut ae(mm)	Revolution (min ⁻¹)	Table feed (mm/min) (IPM)		Depth of cut ap(mm)	Depth of cut ae(mm)
4	1	0.4°	25	10000	9900	389.8	0.24	1.5	8300	7000	275.6	0.19	1.5	6700	5600	220.5	0.14	1.5	5000	2500	98.4	0.07	1.5
4	1	0.4°	30	10000	9900	389.8	0.24	1.5	8300	7000	275.6	0.19	1.5	6700	5600	220.5	0.14	1.5	5000	2500	98.4	0.07	1.5
4	1	0.4°	35	10000	9900	389.8	0.15	1.5	8300	7000	275.6	0.12	1.5	6700	5600	220.5	0.09	1.5	5000	2500	98.4	0.04	1.5
4	1	0.4°	40	10000	9900	389.8	0.15	1.5	8300	7000	275.6	0.12	1.5	6700	5600	220.5	0.09	1.5	5000	2500	98.4	0.04	1.5
4	1	0.4°	45	10000	9900	389.8	0.15	1.5	8300	7000	275.6	0.12	1.5	6700	5600	220.5	0.09	1.5	5000	2500	98.4	0.04	1.5
4	1	0.4°	50	8100	6300	248.0	0.14	1.5	6700	4420	174.0	0.11	1.5	5400	3500	137.8	0.08	1.5	4000	1600	63.0	0.04	1.5
4	1	0.9°	25	10000	9900	389.8	0.24	1.5	8300	7000	275.6	0.19	1.5	6700	5600	220.5	0.14	1.5	5000	2500	98.4	0.07	1.5
4	1	0.9°	30	10000	9900	389.8	0.15	1.5	8300	7000	275.6	0.12	1.5	6700	5600	220.5	0.09	1.5	5000	2500	98.4	0.04	1.5
4	1	0.9°	40	10000	9900	389.8	0.15	1.5	8300	7000	275.6	0.12	1.5	6700	5600	220.5	0.09	1.5	5000	2500	98.4	0.04	1.5
4	1	0.9°	50	8100	6300	248.0	0.14	1.5	6700	4420	174.0	0.11	1.5	5400	3500	137.8	0.08	1.5	4000	1600	63.0	0.04	1.5
4	1	0.9°	60	8100	6300	248.0	0.11	1.5	6700	4420	174.0	0.08	1.5	5400	3500	137.8	0.06	1.5	4000	1600	63.0	0.03	1.5
6	1.5	0.9°	40	6600	11000	433.1	0.4	2	5500	7600	299.2	0.32	2	4500	6100	240.2	0.24	2	3300	2700	106.3	0.12	2
6	1.5	0.9°	50	6600	11000	433.1	0.4	2	5500	7600	299.2	0.32	2	4500	6100	240.2	0.24	2	3300	2700	106.3	0.12	2
6	1.5	0.9°	60	6600	11000	433.1	0.25	2	5500	7600	299.2	0.2	2	4500	6100	240.2	0.15	2	3300	2700	106.3	0.08	2
6	1.5	0.9°	70	5400	8700	342.5	0.23	2	4400	6200	244.1	0.18	2	3600	5000	196.9	0.14	2	2700	2200	86.6	0.07	2
8	2	0.9°	60	5000	11000	433.1	0.48	3	4200	7600	299.2	0.37	3	3300	6100	240.2	0.29	3	2500	2700	106.3	0.14	3
8	2	0.9°	80	5000	11000	433.1	0.3	3	4200	7600	299.2	0.23	3	3300	6100	240.2	0.18	3	2500	2700	106.3	0.09	3
10	2	0.9°	80	4000	11000	433.1	0.48	4.5	3300	7600	299.2	0.37	4.5	2700	6100	240.2	0.29	4.5	2000	2700	106.3	0.14	4.5
10	2	0.9°	120	3200	8700	342.5	0.27	4.5	2700	6200	244.1	0.21	4.5	2100	5000	196.9	0.16	4.5	1600	2200	86.6	0.08	4.5
12	2	0.9°	80	3300	10000	393.7	0.72	6	2700	7100	279.5	0.56	6	2200	5600	220.5	0.36	6	1700	2500	98.4	0.18	6
12	2	0.9°	120	3300	10000	393.7	0.45	6	2700	7100	279.5	0.35	6	2200	5600	220.5	0.23	6	1700	2500	98.4	0.12	6
Depth of cut																							

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Memo

A series of horizontal dotted lines for writing, spanning the width of the page.

For your safety

●Don't touch breakers and chips without gloves. ●Please machine within recommended application range, and exchange expired tools with new parts in advance. ●Please use safety cover and wear safety glasses. ●When using compounded cutting oils, please take fire prevention. ●When attaching chips or spare parts, please use the attached wrench or spanner. ●When using tools in revolution machining, please make a trial run to check run-out, vibration, abnormal sounds etc.

MITSUBISHI MATERIALS CORPORATION

MITSUBISHI MATERIALS U.S.A. CORPORATION

Customer Service : 800-523-0800
Technical Service : 800-486-2341

LOS ANGELES HEAD OFFICE
11250 Slater Avenue, Fountain Valley, CA 92708
TEL : 714-352-6100 FAX : 714-668-1320

CHICAGO OFFICE
1314B North Plum Grove Road, Schaumburg, IL 60173
TEL : 847-252-6300 FAX : 847-519-1732

TORONTO OFFICE
6535, Millcreek Drive, Units, 63&64, Mississauga, Ontario L5N 2M2, Canada
TEL : 905-814-0240 FAX : 905-814-0245

MMC METAL DE MEXICO, S.A. DE C.V.
Av. La Cañada No.16, Parque Industrial Bernardo Quintana,
El Marques, Queretaro, CP76246, Mexico
TEL : +52-442-221-6136 FAX : +52-442-221-6134