

IMPACT MIRACLE vibration control end mill series

**VF-HVRB**

Taper neck  
type addition

**Increased feed rates and larger depths of cut are possible with VF-HVRB end mills, giving higher efficiency machining.**

- Vibration control geometry for stable machining and a smooth cutting action.
- VF-HVRB makes easy finishing !



# IMPACT MIRACLE<sup>END MILLS</sup>

## IMPACT MIRACLE vibration control end mill series

# VF-HVRB

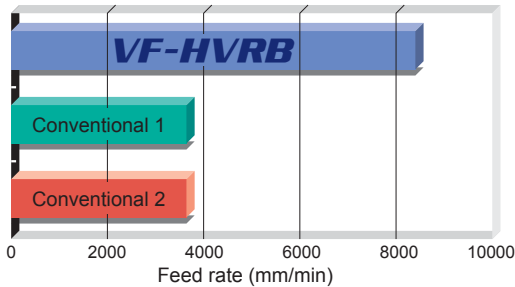
### Features

#### 1 Special gash + high toughness carbide

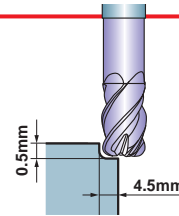
##### Improved resistance to chipping!

Special gash with high rigidity and good chip disposal enables both increased feed rates and larger depth of cut machining.

##### High feed rate machining



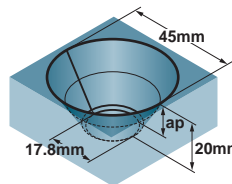
End mill	VFHVRBD1000R20N030 (ø10)
Work material	JIS SKD61 (52HRC)
Revolution	3000min <sup>-1</sup> (94m/min)
Feed rate	3600-8400mm/min (0.3-0.7mm/tooth)
Cutting fluid	Air blow



##### Large depth of cut machining

End mill	ap=2mm	ap=2.5mm	ap=3mm
VF-HVRB			
Conventional			

End mill	VFHVRBD1000R20N030 (ø10)
Work material	JIS S55C
Revolution	2880min <sup>-1</sup> (90m/min)
Feed rate	3900mm/min (0.34mm/tooth)
Cutting fluid	Air blow

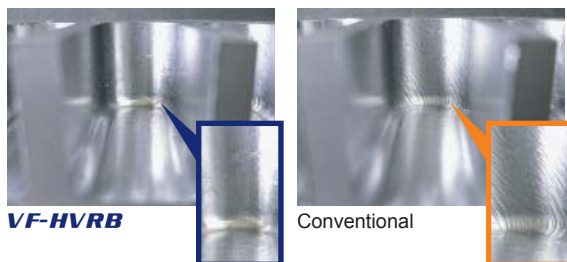


#### 2 Variable helix

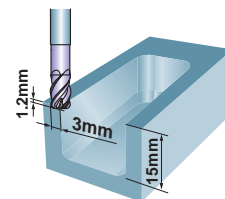
##### No vibration!

##### Stable machining

Vibration control geometry for stable machining and smooth cutting.



End mill	VFHVRBD1000R20N030 (ø10)
Work material	JIS S55C
Revolution	4800min <sup>-1</sup> (150m/min)
Feed rate	2280mm/min (0.12mm/tooth)
Cutting fluid	Air blow

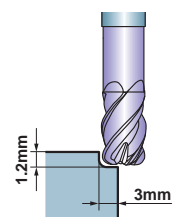


#### 3 Special curved surface gash corner radius

##### Low cutting force and reduced heat!

End mill	Cutting force profile	Chip color
VF-HVRB		
Conventional A		

End mill	VFHVRBD1000R20N030 (ø10)
Work material	JIS S55C
Revolution	2400min <sup>-1</sup> (75m/min)
Feed rate	3000mm/min (0.31mm/tooth)
Cutting fluid	Air blow



# IMPACT MIRACLE END MILLS

## VF-HVRB

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

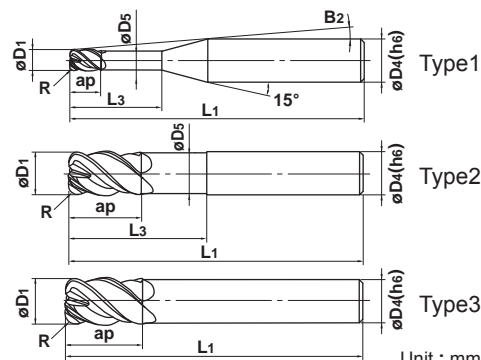
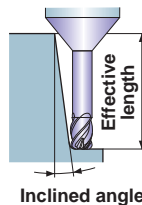


D4 = 6 0 - -0.008  
8 ≤ D4 ≤ 10 0 - -0.009  
12 ≤ D4 ≤ 16 0 - -0.011

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



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

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°
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	*
D0400R10N030	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	*	*	*	*

\* No interference

● : Inventory maintained.

# IMPACT MIRACLE END MILLS

## VF-HVRB

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

Unit : mm

Order Number	Dia.	Corner R	Length of Cut	Neck Length	Neck Dia.	Cutting Edge to Shank Angle	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective length for inclined angle			
	D1	R	ap	L3	D5	B2	L1	D4	N			30°	1°	2°	3°
VFHVRBD0600R05N030	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	*	*	*	*

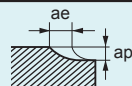
\* No interference

● : Inventory maintained.

## High speed milling

Work material			Carbon steel, Cast iron, Alloy steel (–30HRC)				Alloy steel, Tool steel, Pre-hardened steel				Hardened steel (45–55HRC)				Hardened steel (55–62HRC)			
			JIS S50C, FC250, SCM				JIS SKD61, SK, NAK				JIS SKD61				JIS SKD11			
Dia. (mm)	CornerR (mm)	Neck length (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	0.2	4	40000	7200	0.04	0.45	33000	5100	0.03	0.45	27000	4100	0.025	0.45	20000	1800	0.013	0.45
1	0.2	6	40000	6500	0.03	0.45	33000	4600	0.022	0.45	27000	3700	0.018	0.45	20000	1600	0.01	0.45
1	0.2	8	32000	4500	0.022	0.45	27000	3200	0.018	0.45	21000	2600	0.012	0.45	16000	1100	0.008	0.45
1	0.2	10	24000	2700	0.015	0.45	20000	1900	0.01	0.45	16000	1500	0.008	0.45	12000	700	0.006	0.45
1	0.2	15	16000	1200	0.008	0.45	14000	700	0.005	0.45	12000	500	0.003	0.45	10000	400	0.003	0.45
1	0.2	20	14000	1000	0.005	0.45	12000	600	0.004	0.45	10000	400	0.002	0.45	9000	300	0.002	0.45
1.5	0.3	4	32000	10000	0.1	0.65	27000	7100	0.08	0.65	21000	5700	0.06	0.65	16000	2500	0.03	0.65
1.5	0.3	6	32000	7800	0.08	0.65	27000	5500	0.06	0.65	21000	4200	0.05	0.65	16000	2000	0.025	0.65
1.5	0.3	10	27000	5700	0.05	0.65	22000	4000	0.035	0.65	18000	3000	0.03	0.65	14000	1400	0.014	0.65
1.5	0.3	15	22000	3200	0.03	0.65	18000	2300	0.025	0.65	15000	1700	0.018	0.65	11000	1000	0.009	0.65
1.5	0.3	20	16000	1400	0.02	0.65	14000	1200	0.016	0.65	13000	1000	0.012	0.65	9000	700	0.007	0.65
1.5	0.3	25	13000	1000	0.015	0.65	11000	800	0.012	0.65	10000	700	0.009	0.65	7500	500	0.005	0.65
1.5	0.3	30	13000	900	0.01	0.65	11000	700	0.008	0.65	10000	600	0.006	0.65	7500	400	0.004	0.65
2	0.5	6	24000	10000	0.1	0.75	20000	7100	0.08	0.75	16000	5700	0.06	0.75	12000	2500	0.03	0.75
2	0.5	10	24000	10000	0.08	0.75	20000	7100	0.06	0.75	16000	5700	0.05	0.75	12000	2500	0.025	0.75
2	0.5	15	20000	7000	0.05	0.75	17000	5000	0.04	0.75	13000	3200	0.03	0.75	10000	1800	0.016	0.75
2	0.5	20	20000	3600	0.04	0.75	17000	2600	0.03	0.75	13000	1800	0.025	0.75	10000	900	0.012	0.75
2	0.5	25	16000	1800	0.03	0.75	14000	1400	0.025	0.75	12000	1100	0.02	0.75	9000	720	0.01	0.75
2	0.5	30	16000	1400	0.025	0.75	14000	1200	0.02	0.75	12000	900	0.016	0.75	9000	650	0.008	0.75
2	0.5	35	13000	1100	0.02	0.75	11000	800	0.018	0.75	10000	700	0.014	0.75	7000	500	0.007	0.75
2	0.5	40	13000	1000	0.02	0.75	11000	700	0.015	0.75	10000	600	0.012	0.75	7000	400	0.006	0.75
3	0.5	10	16000	11000	0.12	1.5	13000	7800	0.09	1.5	11000	6300	0.07	1.5	8000	2800	0.04	1.5
3	0.5	15	16000	9000	0.11	1.5	13000	6400	0.08	1.5	11000	5100	0.06	1.5	8000	2300	0.04	1.5
3	0.5	20	13000	7200	0.09	1.5	11000	5100	0.07	1.5	8700	4000	0.05	1.5	6500	1800	0.03	1.5
3	0.5	30	13000	5700	0.06	1.5	11000	4000	0.05	1.5	8700	3000	0.04	1.5	6500	1400	0.02	1.5
3	0.8	10	16000	11000	0.24	1	13000	7800	0.19	1	11000	6300	0.14	1	8000	2800	0.07	1
3	0.8	15	16000	9000	0.22	1	13000	6400	0.17	1	11000	5100	0.13	1	8000	2300	0.07	1
3	0.8	20	13000	7200	0.19	1	11000	5100	0.15	1	8700	4000	0.11	1	6500	1800	0.06	1
3	0.8	30	13000	5700	0.12	1	11000	4000	0.09	1	8700	3000	0.07	1	6500	1400	0.04	1
3	0.8	40	11000	3600	0.08	1	9100	2600	0.06	1	7400	2000	0.05	1	5500	1000	0.025	1
3	0.8	50	8000	2600	0.07	1	6600	1800	0.05	1	5800	1500	0.04	1	4600	800	0.02	1
4	0.5	12	8400	6000	0.15	2	7000	4300	0.12	2	5600	3400	0.09	2	4200	1500	0.05	2
4	0.5	20	8400	6000	0.14	2	7000	4300	0.11	2	5600	3400	0.08	2	4200	1500	0.04	2
4	0.5	30	6900	4900	0.12	2	5700	3500	0.09	2	4600	2800	0.07	2	3500	1200	0.03	2
4	0.5	48	5600	2000	0.07	2	4600	1400	0.05	2	3800	1100	0.04	2	2800	500	0.02	2
4	1	12	12000	12000	0.3	1.5	10000	8500	0.23	1.5	8000	6800	0.18	1.5	6000	3000	0.1	1.5
4	1	20	12000	12000	0.27	1.5	10000	8500	0.21	1.5	8000	6800	0.16	1.5	6000	3000	0.08	1.5
4	1	30	10000	9900	0.24	1.5	8300	7000	0.19	1.5	6700	5600	0.14	1.5	5000	2500	0.07	1.5
6	0.5	18	4000	3900	0.15	3.5	3300	2800	0.12	3.5	2700	2200	0.09	3.5	2000	1000	0.05	3.5
6	0.5	30	4000	3900	0.14	3.5	3300	2800	0.11	3.5	2700	2200	0.08	3.5	2000	1000	0.04	3.5
6	1	18	8000	13000	0.5	3	6600	9200	0.4	3	5400	7400	0.3	3	4000	3300	0.15	3
6	1	30	8000	13000	0.45	3	6600	9200	0.35	3	5400	7400	0.27	3	4000	3300	0.14	3
6	1	54	6600	11000	0.25	3	5500	7800	0.2	3	4400	6300	0.15	3	3300	2800	0.08	3
6	1.5	18	8000	13000	0.5	2	6600	9200	0.4	2	5400	7400	0.3	2	4000	3300	0.15	2
6	1.5	30	8000	13000	0.45	2	6600	9200	0.35	2	5400	7400	0.27	2	4000	3300	0.14	2
6	1.5	42	6600	11000	0.4	2	5500	7800	0.3	2	4400	6300	0.24	2	3300	2800	0.12	2
6	1.5	54	6600	11000	0.25	2	5500	7800	0.2	2	4400	6300	0.15	2	3300	2800	0.08	2
6	2	18	8000	13000	0.5	1.5	6600	9200	0.4	1.5	5400	7400	0.3	1.5	4000	3300	0.15	1.5
6	2	30	8000	13000	0.45	1.5	6600	9200	0.35	1.5	5400	7400	0.27	1.5	4000	3300	0.14	1.5

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 END MILLS

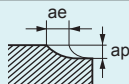
## VF-HVRB

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

### High speed milling

Work material			Carbon steel, Cast iron, Alloy steel (-30HRC)				Alloy steel, Tool steel, Pre-hardened steel				Hardened steel (45-55HRC)				Hardened steel (55-62HRC)			
			JIS S50C, FC250, SCM				JIS SKD61, SK, NAK				JIS SKD61				JIS SKD11			
Dia. (mm)	Corner R (mm)	Neck length (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
7	1.5	—	6800	13000	0.5	3	5600	9200	0.4	3	4600	7400	0.3	3	3400	3300	0.15	3
8	0.5	24	3000	3900	0.18	5	2500	2800	0.14	5	2000	2200	0.11	5	1500	1000	0.05	5
8	0.5	40	3000	3900	0.16	5	2500	2800	0.12	5	2000	2200	0.1	5	1500	1000	0.05	5
8	1	24	4200	6500	0.3	4.5	3500	4600	0.23	4.5	2800	3700	0.18	4.5	2100	1600	0.09	4.5
8	1	40	4200	6500	0.27	4.5	3500	4600	0.21	4.5	2800	3700	0.16	4.5	2100	1600	0.08	4.5
8	2	24	6000	13000	0.6	3	5000	9200	0.46	3	4000	7400	0.36	3	3000	3300	0.18	3
8	2	40	6000	13000	0.54	3	5000	9200	0.42	3	4000	7400	0.32	3	3000	3300	0.16	3
8	2	56	5000	11000	0.48	3	4200	7800	0.37	3	3400	6300	0.3	3	2500	2800	0.14	3
8	2	72	5000	11000	0.3	3	4200	7800	0.23	3	3400	6300	0.2	3	2500	2800	0.09	3
9	2	—	5300	13000	0.6	3.5	4400	9200	0.46	3.5	3600	7400	0.36	3.5	2700	3300	0.18	3.5
10	0.5	30	2400	3900	0.18	6.5	2000	2800	0.14	6.5	1600	2200	0.11	6.5	1200	1000	0.05	6.5
10	0.5	50	2400	3900	0.16	6.5	2000	2800	0.12	6.5	1600	2200	0.1	6.5	1200	1000	0.05	6.5
10	1	30	3300	6500	0.3	6	2700	4600	0.23	6	2200	3700	0.18	6	1700	1600	0.09	6
10	1	50	3300	6500	0.27	6	2700	4600	0.21	6	2200	3700	0.16	6	1700	1600	0.08	6
10	2	30	4800	13000	0.6	4.5	4000	9200	0.46	4.5	3200	7400	0.36	4.5	2400	3300	0.18	4.5
10	2	50	4800	13000	0.54	4.5	4000	9200	0.42	4.5	3200	7400	0.32	4.5	2400	3300	0.16	4.5
10	2	70	4000	11000	0.48	4.5	3300	7800	0.37	4.5	2700	6300	0.3	4.5	2000	2800	0.14	4.5
10	2	90	4000	11000	0.48	4.5	3300	7800	0.37	4.5	2700	6300	0.3	4.5	2000	2800	0.14	4.5
11	2	—	4300	12000	0.6	5	3600	8500	0.46	5	2900	6800	0.36	5	2200	3000	0.18	5
12	0.5	36	2000	3600	0.27	8	1700	2600	0.21	8	1300	2100	0.14	8	1000	900	0.07	8
12	0.5	60	2000	3600	0.24	8	1700	2600	0.18	8	1300	2100	0.12	8	1000	900	0.06	8
12	1	36	2400	4800	0.36	7.5	2000	3400	0.28	7.5	1600	2700	0.18	7.5	1200	1200	0.09	7.5
12	1	60	2400	4800	0.32	7.5	2000	3400	0.25	7.5	1600	2700	0.16	7.5	1200	1200	0.08	7.5
12	2	36	4000	12000	0.9	6	3300	8500	0.7	6	2700	6800	0.45	6	2000	3000	0.23	6
12	2	60	4000	12000	0.8	6	3300	8500	0.6	6	2700	6800	0.4	6	2000	3000	0.2	6
12	2	84	3300	9900	0.7	6	2700	7000	0.55	6	2200	5600	0.36	6	1700	2500	0.18	6
12	2	108	3300	9900	0.45	6	2700	7000	0.35	6	2200	5600	0.23	6	1700	2500	0.11	6
12	3	36	4000	12000	0.9	4.5	3300	8500	0.7	4.5	2700	6800	0.45	4.5	2000	3000	0.23	4.5
12	3	60	4000	12000	0.8	4.5	3300	8500	0.6	4.5	2700	6800	0.4	4.5	2000	3000	0.2	4.5
13	3	—	3700	12000	0.9	5	3100	8500	0.7	5	2500	6800	0.45	5	1900	3000	0.23	5
16	0.5	42	1500	3000	0.27	11	1200	2100	0.21	11	1000	1700	0.12	11	750	750	0.05	11
16	2	42	2100	5000	0.45	9	1700	3600	0.35	9	1400	2900	0.2	9	1100	1300	0.08	9
16	3	42	3000	10000	0.9	7.5	2500	7100	0.7	7.5	2000	5700	0.4	7.5	1500	2500	0.15	7.5
16	3	80	3000	10000	0.8	7.5	2500	7100	0.6	7.5	2000	5700	0.37	7.5	1500	2500	0.14	7.5
16	3	120	2500	8300	0.7	7.5	2100	5900	0.55	7.5	1700	4700	0.32	7.5	1300	2100	0.12	7.5

Depth of cut



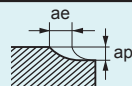
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## High depth of cut conditions

Please refer to high speed conditions in case of " —".

Work material			Carbon steel, Cast iron, Alloy steel (—30HRC)				Alloy steel, Tool steel, Pre-hardened steel				Hardened steel (45—55HRC)				Hardened steel (55—62HRC)			
			JIS S50C, FC250 ,SCM				JIS SKD61, SK, NAK				JIS SKD61				JIS SKD11			
Dia. (mm)	Corner R (mm)	Neck length (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	0.2	4	24000	2200	0.08	0.45	20000	1500	0.07	0.45	16000	1200	0.05	0.45	12000	550	0.025	0.45
1	0.2	6	24000	2000	0.07	0.45	20000	1400	0.05	0.45	16000	1100	0.04	0.45	12000	500	0.02	0.45
1	0.2	8	19000	1400	0.05	0.45	16000	1000	0.04	0.45	13000	800	0.03	0.45	9500	350	0.016	0.45
1	0.2	10	14000	800	0.04	0.45	12000	600	0.03	0.45	9000	400	0.025	0.45	7000	200	0.012	0.45
1	0.2	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1	0.2	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.5	0.3	4	19000	3000	0.2	0.65	16000	2100	0.16	0.65	13000	1700	0.12	0.65	9500	750	0.06	0.65
1.5	0.3	6	19000	2300	0.16	0.65	16000	1600	0.13	0.65	13000	1300	0.1	0.65	9500	580	0.05	0.65
1.5	0.3	10	16000	1700	0.1	0.65	13000	1200	0.07	0.65	11000	1000	0.05	0.65	8000	430	0.03	0.65
1.5	0.3	15	13000	1000	0.06	0.65	11000	700	0.05	0.65	9000	600	0.04	0.65	6500	250	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	0.2	0.75	12000	2100	0.16	0.75	9400	1700	0.12	0.75	7000	750	0.06	0.75
2	0.5	10	14000	3000	0.16	0.75	12000	2100	0.13	0.75	9400	1700	0.1	0.75	7000	750	0.05	0.75
2	0.5	15	12000	2100	0.1	0.75	10000	1500	0.08	0.75	8000	1200	0.06	0.75	6000	530	0.03	0.75
2	0.5	20	12000	1100	0.08	0.75	10000	800	0.06	0.75	8000	600	0.05	0.75	6000	280	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	0.24	1.5	8000	2300	0.2	1.5	6400	1800	0.14	1.5	4800	830	0.07	1.5
3	0.5	15	9600	2700	0.22	1.5	8000	1900	0.17	1.5	6400	1500	0.13	1.5	4800	680	0.06	1.5
3	0.5	20	7800	2200	0.18	1.5	6500	1500	0.14	1.5	5200	1200	0.11	1.5	3900	550	0.05	1.5
3	0.5	30	7800	1700	0.12	1.5	6500	1200	0.1	1.5	5200	1000	0.07	1.5	3900	430	0.04	1.5
3	0.8	10	9600	3300	0.5	1	8000	2300	0.4	1	6400	1800	0.3	1	4800	830	0.14	1
3	0.8	15	9600	2700	0.5	1	8000	1900	0.35	1	6400	1500	0.25	1	4800	680	0.13	1
3	0.8	20	7800	2200	0.4	1	6500	1500	0.3	1	5200	1200	0.23	1	3900	550	0.11	1
3	0.8	30	7800	1700	0.24	1	6500	1200	0.2	1	5200	1000	0.14	1	3900	430	0.05	1
3	0.8	40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	0.8	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	0.5	12	5000	1800	0.3	2	4200	1300	0.24	2	3400	1000	0.18	2	2500	450	0.06	2
4	0.5	20	5000	1800	0.3	2	4200	1300	0.22	2	3400	1000	0.17	2	2500	450	0.06	2
4	0.5	30	4100	1500	0.24	2	3400	1100	0.19	2	2700	840	0.14	2	2100	380	0.05	2
4	0.5	48	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	1	12	7200	3600	0.6	1.5	6000	2500	0.5	1.5	4800	2000	0.36	1.5	3600	900	0.12	1.5
4	1	20	7200	3600	0.6	1.5	6000	2500	0.4	1.5	4800	2000	0.32	1.5	3600	900	0.11	1.5
4	1	30	6000	3000	0.5	1.5	5000	2100	0.4	1.5	4000	1700	0.3	1.5	3000	750	0.1	1.5
6	0.5	18	2400	1200	0.3	3.5	2000	840	0.24	3.5	1600	670	0.18	3.5	1200	300	0.06	3.5
6	0.5	30	2400	1200	0.3	3.5	2000	840	0.22	3.5	1600	670	0.17	3.5	1200	300	0.06	3.5
6	1	18	4800	3900	1	3	4000	2700	0.8	3	3200	2200	0.6	3	2400	980	0.2	3
6	1	30	4800	3900	0.9	3	4000	2700	0.7	3	3200	2200	0.5	3	2400	980	0.18	3
6	1	54	4000	3300	0.5	3	3300	2300	0.4	3	2700	1800	0.3	3	2000	830	0.1	3
6	1.5	18	4800	3900	1	2	4000	2700	0.8	2	3200	2200	0.6	2	2400	980	0.2	2
6	1.5	30	4800	3900	0.9	2	4000	2700	0.7	2	3200	2200	0.5	2	2400	980	0.18	2
6	1.5	42	4000	3300	0.8	2	3300	2300	0.6	2	2700	1800	0.5	2	2000	830	0.16	2
6	1.5	54	4000	3300	0.5	2	3300	2300	0.4	2	2700	1800	0.3	2	2000	830	0.1	2
6	2	18	4800	3900	1	1.5	4000	2700	0.8	1.5	3200	2200	0.6	1.5	2400	980	0.2	1.5
6	2	30	4800	3900	0.9	1.5	4000	2700	0.7	1.5	3200	2200	0.5	1.5	2400	980	0.18	1.5

Depth of cut



- 1) If the depth of cut is shallow, the revolution and feed rate can be increased.
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- 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 END MILLS

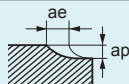
## VF-HVRB

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)			
			JIS S50C, FC250, SCM				JIS SKD61, SK, NAK				JIS SKD61				JIS SKD11			
Dia. (mm)	Corner R (mm)	Neck length (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
7	1.5	—	4100	3900	1	3	3400	2700	0.8	3	2700	2200	0.6	3	2100	980	0.2	3
8	0.5	24	1800	1200	0.35	5	1500	840	0.3	5	1200	670	0.2	5	900	300	0.07	5
8	0.5	40	1800	1200	0.3	5	1500	840	0.25	5	1200	670	0.2	5	900	300	0.06	5
8	1	24	2500	2000	0.6	4.5	2100	1400	0.5	4.5	1700	1100	0.4	4.5	1300	500	0.12	4.5
8	1	40	2500	2000	0.5	4.5	2100	1400	0.4	4.5	1700	1100	0.3	4.5	1300	500	0.11	4.5
8	2	24	3600	3900	1.2	3	3000	2700	1	3	2400	2200	0.7	3	1800	980	0.24	3
8	2	40	3600	3900	1.1	3	3000	2700	0.9	3	2400	2200	0.7	3	1800	980	0.22	3
8	2	56	3000	3300	1	3	2500	2300	0.8	3	2000	1800	0.6	3	1500	830	0.2	3
8	2	72	3000	3300	0.6	3	2500	2300	0.5	3	2000	1800	0.4	3	1500	830	0.12	3
9	2	—	3200	3900	1.2	3.5	2700	2700	1	3.5	2100	2200	0.7	3.5	1600	980	0.24	3.5
10	0.5	30	1400	1200	0.35	6.5	1200	840	0.3	6.5	940	670	0.2	6.5	700	300	0.07	6.5
10	0.5	50	1400	1200	0.3	6.5	1200	840	0.25	6.5	940	670	0.2	6.5	700	300	0.06	6.5
10	1	30	2000	2000	0.6	6	1700	1400	0.5	6	1300	1100	0.4	6	1000	500	0.12	6
10	1	50	2000	2000	0.5	6	1700	1400	0.4	6	1300	1100	0.3	6	1000	500	0.11	6
10	2	30	2900	3900	1.2	4.5	2400	2700	1	4.5	1900	2200	0.7	4.5	1500	980	0.24	4.5
10	2	50	2900	3900	1.1	4.5	2400	2700	0.9	4.5	1900	2200	0.7	4.5	1500	980	0.22	4.5
10	2	70	2400	3300	1	4.5	2000	2300	0.8	4.5	1600	1800	0.6	4.5	1200	830	0.2	4.5
10	2	90	2400	3300	1	4.5	2000	2300	0.8	4.5	1600	1800	0.6	4.5	1200	830	0.2	4.5
11	2	—	2600	3600	1.2	5	2200	2500	1	5	1700	2000	0.7	5	1300	900	0.24	5
12	0.5	36	1200	1100	0.5	8	1000	770	0.4	8	800	620	0.3	8	600	280	0.11	8
12	0.5	60	1200	1100	0.5	8	1000	770	0.4	8	800	620	0.3	8	600	280	0.1	8
12	1	36	1400	1400	0.7	7.5	1200	1000	0.6	7.5	940	780	0.4	7.5	700	350	0.14	7.5
12	1	60	1400	1400	0.6	7.5	1200	1000	0.5	7.5	940	780	0.4	7.5	700	350	0.13	7.5
12	2	36	2400	3600	1.8	6	2000	2500	1.4	6	1600	2000	1.1	6	1200	900	0.4	6
12	2	60	2400	3600	1.6	6	2000	2500	1.3	6	1600	2000	1	6	1200	900	0.3	6
12	2	84	2000	3000	1.4	6	1700	2100	1.1	6	1300	1700	0.8	6	1000	750	0.3	6
12	2	108	2000	3000	0.9	6	1700	2100	0.7	6	1300	1700	0.5	6	1000	750	0.2	6
12	3	36	2400	3600	1.8	4.5	2000	2500	1.4	4.5	1600	2000	1.1	4.5	1200	900	0.4	4.5
12	3	60	2400	3600	1.6	4.5	2000	2500	1.3	4.5	1600	2000	1	4.5	1200	900	0.3	4.5
13	3	—	2200	3600	1.8	5	1800	2500	1.4	5	1500	2000	1.1	5	1100	900	0.4	5
16	0.5	42	900	900	0.5	11	750	630	0.4	11	600	500	0.3	11	450	230	0.1	11
16	2	42	1300	1500	0.9	9	1100	1100	0.7	9	870	840	0.5	9	650	380	0.2	9
16	3	42	1800	3000	1.8	7.5	1500	2100	1.4	7.5	1200	1700	0.9	7.5	900	750	0.4	7.5
16	3	80	1800	3000	1.6	7.5	1500	2100	1.3	7.5	1200	1700	0.8	7.5	900	750	0.3	7.5
16	3	120	1500	2500	1.4	7.5	1200	1800	1.1	7.5	1000	1400	0.7	7.5	750	630	0.3	7.5

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.



# VF-HVRB NEW

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

D1 ≤ 10 ±0.007  
D1 > 10 ±0.01

D1 ≤ 12 0 - -0.02

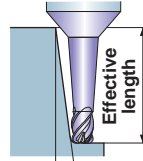
D4 = 6 0 - -0.008  
8 ≤ D4 ≤ 10 0 - -0.009  
12 ≤ D4 ≤ 16 0 - -0.011

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

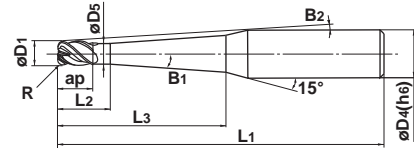
Taper neck type



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	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.

# IMPACT MIRACLE END MILLS

## VF-HVRB (Taper neck type)

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

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

● : Inventory maintained.

Work material				Carbon steel, Cast iron, Alloy steel (–30HRC)				Alloy steel, Tool steel, Pre-hardened steel				Hardened steel (45–55HRC)				Hardened steel (55–62HRC)			
				JIS S50C, FC250, SCM				JIS SKD61, SK, NAK				JIS SKD61				JIS SKD11			
Dia. (mm)	Corner R (mm)	Taper angle one side	Neck length (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	0.2	0.9°	6	40000	6500	0.03	0.45	33000	4600	0.022	0.45	27000	3700	0.018	0.45	20000	1600	0.01	0.45
1	0.2	0.9°	10	24000	2700	0.015	0.45	20000	1900	0.01	0.45	16000	1500	0.008	0.45	12000	700	0.006	0.45
1	0.2	0.9°	15	16000	1200	0.013	0.45	14000	700	0.008	0.45	12000	500	0.007	0.45	10000	400	0.003	0.45
1	0.2	0.9°	20	14000	1000	0.01	0.45	12000	600	0.006	0.45	10000	400	0.005	0.45	9000	300	0.002	0.45
1	0.2	0.9°	25	9500	610	0.008	0.45	8000	440	0.005	0.45	6000	320	0.004	0.45	4800	160	0.002	0.45
1	0.2	0.9°	30	4900	320	0.007	0.45	4100	220	0.004	0.45	3000	160	0.003	0.45	2500	80	0.002	0.45
1	0.2	0.9°	35	4000	260	0.006	0.45	3400	190	0.003	0.45	3000	160	0.003	0.45	2000	70	0.001	0.45
1	0.2	0.9°	40	3500	180	0.005	0.45	2900	130	0.003	0.45	2000	90	0.003	0.45	1700	50	0.001	0.45
1	0.2	0.9°	45	2900	150	0.004	0.45	2400	100	0.002	0.45	2000	90	0.002	0.45	1400	40	0.001	0.45
1	0.2	0.9°	50	2900	110	0.003	0.45	2400	80	0.002	0.45	2000	60	0.002	0.45	1400	30	0.001	0.45
1.5	0.3	0.9°	10	27000	5700	0.05	0.65	22000	4000	0.035	0.65	18000	3000	0.03	0.65	14000	1400	0.014	0.65
1.5	0.3	0.9°	15	22000	3200	0.03	0.65	18000	2300	0.025	0.65	15000	1700	0.018	0.65	11000	1000	0.009	0.65
1.5	0.3	0.9°	20	16000	1400	0.02	0.65	14000	1200	0.016	0.65	13000	1000	0.012	0.65	9000	700	0.007	0.65
1.5	0.3	0.9°	30	13000	900	0.01	0.65	11000	700	0.008	0.65	10000	600	0.006	0.65	7500	400	0.004	0.65
1.5	0.3	0.9°	40	4500	230	0.008	0.65	3700	160	0.007	0.65	3000	120	0.005	0.65	2300	70	0.003	0.65
1.5	0.3	0.9°	50	3700	190	0.007	0.65	3000	130	0.006	0.65	3000	120	0.004	0.65	1900	60	0.002	0.65
2	0.5	0.4°	15	20000	7000	0.05	0.75	17000	5000	0.04	0.75	13000	3200	0.03	0.75	10000	1800	0.016	0.75
2	0.5	0.4°	20	20000	3600	0.04	0.75	17000	2600	0.03	0.75	13000	1800	0.025	0.75	10000	900	0.012	0.75
2	0.5	0.4°	25	16000	1800	0.03	0.75	14000	1400	0.025	0.75	12000	1100	0.02	0.75	9000	720	0.01	0.75
2	0.5	0.4°	30	16000	1400	0.025	0.75	14000	1200	0.02	0.75	12000	900	0.016	0.75	9000	650	0.008	0.75
2	0.5	0.4°	35	13000	1100	0.02	0.75	11000	800	0.018	0.75	10000	700	0.014	0.75	7000	500	0.007	0.75
2	0.5	0.4°	40	13000	1000	0.02	0.75	11000	700	0.015	0.75	10000	600	0.012	0.75	7000	400	0.006	0.75
2	0.5	0.9°	20	20000	3600	0.04	0.75	17000	2600	0.03	0.75	13000	1800	0.025	0.75	10000	900	0.012	0.75
2	0.5	0.9°	25	16000	1800	0.03	0.75	14000	1400	0.025	0.75	12000	1100	0.02	0.75	9000	720	0.01	0.75
2	0.5	0.9°	30	16000	1400	0.025	0.75	14000	1200	0.02	0.75	12000	900	0.016	0.75	9000	650	0.008	0.75
2	0.5	0.9°	35	13000	1100	0.02	0.75	11000	800	0.018	0.75	10000	700	0.014	0.75	7000	500	0.007	0.75
2	0.5	0.9°	40	13000	1000	0.02	0.75	11000	700	0.015	0.75	10000	600	0.012	0.75	7000	400	0.006	0.75
2	0.5	0.9°	45	8000	500	0.016	0.75	6800	360	0.012	0.75	5200	250	0.01	0.75	4000	120	0.005	0.75
2	0.5	0.9°	50	8000	500	0.016	0.75	6800	360	0.012	0.75	5200	250	0.01	0.75	4000	120	0.005	0.75
2	0.5	0.9°	55	4100	230	0.012	0.75	3500	170	0.009	0.75	2700	120	0.008	0.75	2000	60	0.004	0.75
2	0.5	0.9°	60	4100	230	0.012	0.75	3500	170	0.009	0.75	2700	120	0.008	0.75	2000	60	0.004	0.75
3	0.8	0.9°	20	13000	7200	0.19	1	11000	5100	0.15	1	8700	4000	0.11	1	6500	1800	0.06	1
3	0.8	0.9°	25	13000	7200	0.19	1	11000	5100	0.15	1	8700	4000	0.11	1	6500	1800	0.06	1
3	0.8	0.9°	30	13000	5700	0.12	1	11000	4000	0.09	1	8700	3000	0.07	1	6500	1400	0.04	1
3	0.8	0.9°	40	11000	3600	0.08	1	9100	2600	0.06	1	7400	2000	0.05	1	5500	1000	0.025	1
3	0.8	0.9°	50	8000	2600	0.07	1	6600	1800	0.05	1	5800	1500	0.04	1	4600	800	0.02	1
3	0.8	0.9°	60	7800	2480	0.06	1	6600	1740	0.05	1	5000	1250	0.04	1	3900	610	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.

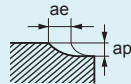
# IMPACT MIRACLE END MILLS

## VF-HVRB (Taper neck type)

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)			
				JIS S50C, FC250, SCM				JIS SKD61, SK, NAK				JIS SKD61				JIS SKD11			
Dia. (mm)	Corner R (mm)	Taper angle one side	Neck length (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
4	1	0.4°	25	10000	9900	0.24	1.5	8300	7000	0.19	1.5	6700	5600	0.14	1.5	5000	2500	0.07	1.5
4	1	0.4°	30	10000	9900	0.24	1.5	8300	7000	0.19	1.5	6700	5600	0.14	1.5	5000	2500	0.07	1.5
4	1	0.4°	35	10000	9900	0.15	1.5	8300	7000	0.12	1.5	6700	5600	0.09	1.5	5000	2500	0.04	1.5
4	1	0.4°	40	10000	9900	0.15	1.5	8300	7000	0.12	1.5	6700	5600	0.09	1.5	5000	2500	0.04	1.5
4	1	0.4°	45	10000	9900	0.15	1.5	8300	7000	0.12	1.5	6700	5600	0.09	1.5	5000	2500	0.04	1.5
4	1	0.4°	50	8100	6300	0.14	1.5	6700	4420	0.11	1.5	5400	3500	0.08	1.5	4000	1600	0.04	1.5
4	1	0.9°	25	10000	9900	0.24	1.5	8300	7000	0.19	1.5	6700	5600	0.14	1.5	5000	2500	0.07	1.5
4	1	0.9°	30	10000	9900	0.15	1.5	8300	7000	0.12	1.5	6700	5600	0.09	1.5	5000	2500	0.04	1.5
4	1	0.9°	40	10000	9900	0.15	1.5	8300	7000	0.12	1.5	6700	5600	0.09	1.5	5000	2500	0.04	1.5
4	1	0.9°	50	8100	6300	0.14	1.5	6700	4420	0.11	1.5	5400	3500	0.08	1.5	4000	1600	0.04	1.5
4	1	0.9°	60	8100	6300	0.11	1.5	6700	4420	0.08	1.5	5400	3500	0.06	1.5	4000	1600	0.03	1.5
6	1.5	0.9°	40	6600	11000	0.4	2	5500	7600	0.32	2	4500	6100	0.24	2	3300	2700	0.12	2
6	1.5	0.9°	50	6600	11000	0.4	2	5500	7600	0.32	2	4500	6100	0.24	2	3300	2700	0.12	2
6	1.5	0.9°	60	6600	11000	0.25	2	5500	7600	0.2	2	4500	6100	0.15	2	3300	2700	0.08	2
6	1.5	0.9°	70	5400	8700	0.23	2	4400	6200	0.18	2	3600	5000	0.14	2	2700	2200	0.07	2
8	2	0.9°	60	5000	11000	0.48	3	4200	7600	0.37	3	3300	6100	0.29	3	2500	2700	0.14	3
8	2	0.9°	80	5000	11000	0.3	3	4200	7600	0.23	3	3300	6100	0.18	3	2500	2700	0.09	3
10	2	0.9°	80	4000	11000	0.48	4.5	3300	7600	0.37	4.5	2700	6100	0.29	4.5	2000	2700	0.14	4.5
10	2	0.9°	120	3200	8700	0.27	4.5	2700	6200	0.21	4.5	2100	5000	0.16	4.5	1600	2200	0.08	4.5
12	2	0.9°	80	3300	10000	0.72	6	2700	7100	0.56	6	2200	5600	0.36	6	1700	2500	0.18	6
12	2	0.9°	120	3300	10000	0.45	6	2700	7100	0.35	6	2200	5600	0.23	6	1700	2500	0.12	6

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.

#### For Your Safety

●Don't handle inserts and chips without gloves. ●Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage. ●Please use safety covers and wear safety glasses. ●When using compounded cutting oils, please take fire precautions. ●When attaching inserts or spare parts, please use only the correct wrench or spanner. ●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.)