

8 flutes  
type  
addition!

IMPACT MIRACLE end mill with multiple internal through coolant holes

## **CoolStar** Series

**VF-MHV-CH**

**VF-MHV-CH**

**VF-5FPR-CH**

**VF-6MHV-CH**

**VF-6MHV-CH**

**VF-65VR-CH**

**VF-8MHV-CH**

**VF-8MHV-CH**

# CoolStar series a breakthrough in machining of difficult-to-cut materials

■ Effective for machining titanium and other super alloys used in Aerospace components.



IMPACT MIRACLE end mill with multiple internal through coolant holes

# CoolStar Series

**VF-MHV-CH**

**VF-MHV-CH**

**VF-SFPR-CH**

**VF-6MHV-CH**

**VF-6MHV-CH**

**VF-6SVR-CH**

**VF-8MHV-CH** NEW

**VF-8MHV-CH** NEW

## Features

### Multiple internal coolant holes

The spiral arrangement of the coolant holes enables a wide range of machining applications. Especially suitable for machining difficult-to-cut materials, offering stable machining.

### Unique flute geometry

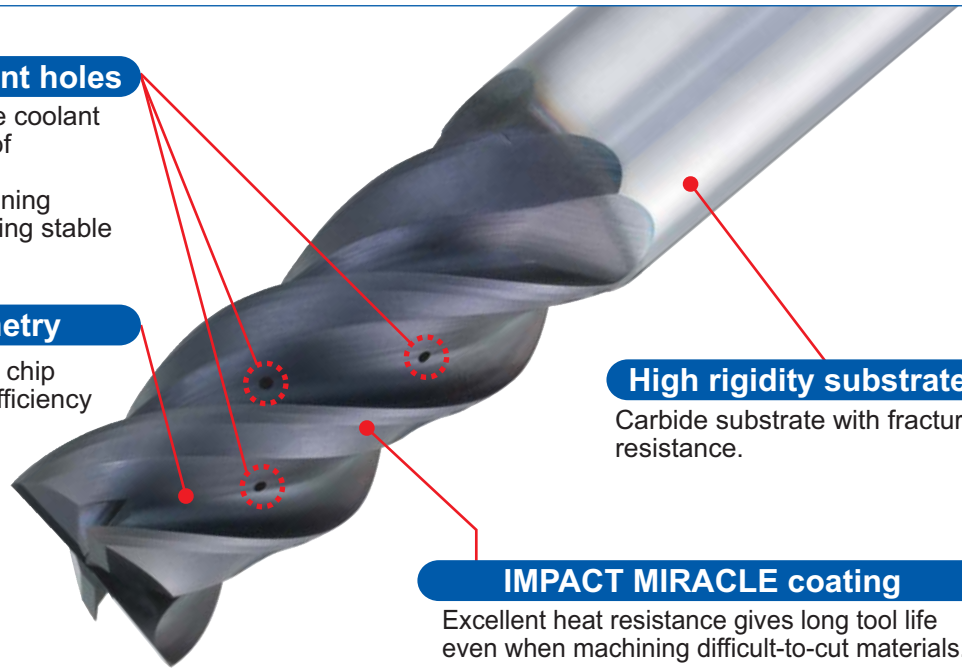
Flute geometry with excellent chip disposal properties for high efficiency machining.

### High rigidity substrate

Carbide substrate with fracture resistance.

### IMPACT MIRACLE coating

Excellent heat resistance gives long tool life even when machining difficult-to-cut materials.



## Wide selection

### VF-MHV-CH

2 sizes available.

End mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant



ø16, ø20

### VF-MHV-CH

4 sizes available.

Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant



ø16 (2 size) , ø20 (2 size )

### VF-6MHV-CH

2 sizes available.

End mill, Medium cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant



ø16, ø20

### VF-6MHV-CH

4 sizes available.

Corner radius end mill, Medium cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant



ø16 (2 size) , ø20 (2 size )

### VF-8MHV-CH NEW

2 sizes available.

End mill, Medium cut length, 8 flute, Irregular helix flutes, with multiple internal through coolant



ø16, ø20

### VF-8MHV-CH NEW

4 sizes available.

Corner radius end mill, Medium cut length, 8 flute, Irregular helix flutes, with multiple internal through coolant



ø16 (2 size) , ø20 (2 size )

### VF-SFPR-CH

2 sizes available.

Roughing end mill, Short cut length, 4 flute, with multiple internal through coolant



ø16, ø20

### VF-6SVR-CH

2 sizes available.

Roughing end mill, Short cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant

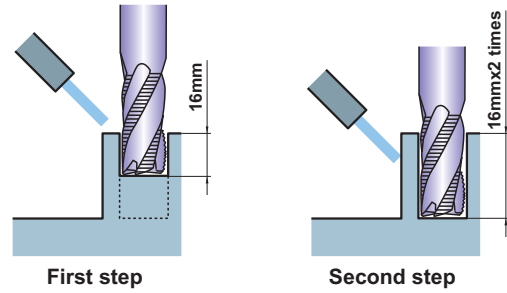


ø16, ø20

\*Please consult Mitsubishi Materials for any geometry that is not in this literature (e.g. different diameters and lengths can be made to order).

# Cutting Performance

## ● Stable coolant supply is possible for various applications!



Welding occurred during the second stage of machining (machining stopped).

### Deep slotting

End mill	VFSFPRCHD1600 (ø16)
Work material	JIS Ti-6Al-4V
Revolution	2000min <sup>-1</sup> (100m/min)
Feed rate	400mm/min (0.05mm/tooth)
Cutting fluid	Emulsion (0.7MPa)

## ● Tool life comparison when machining stainless steel and titanium alloy.



Feed rate: 1,800mm/min (0.1mm/tooth)

Conventional product (External coolant)

Chip packing

Stainless steel

End mill	VF6MHVCHD1600 (ø16)
Work material	JIS SUS304
Revolution	3000min <sup>-1</sup> (150m/min)
Feed rate	1800mm/min (0.1mm/tooth)
Cutting fluid	Emulsion (0.7MPa)

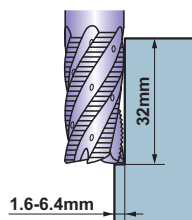
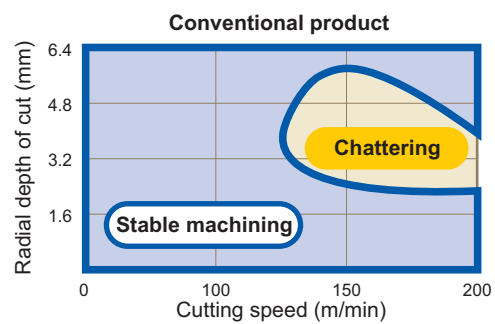
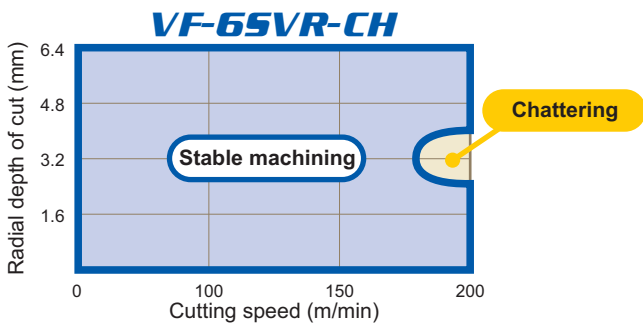
Conventional product (External coolant)

Adhesion

Titanium alloy

End mill	VF6MHVCHD1600 (ø16)
Work material	JIS Ti-6Al-4V
Revolution	3000min <sup>-1</sup> (150m/min)
Feed rate	1800mm/min (0.1mm/tooth)
Cutting fluid	Emulsion (0.7MPa)

## ● Stable cutting area comparison when machining stainless steel.



End mill	VF65VRCH1600 (ø16)
Work material	JIS SUS304
Revolution	2000-4000min <sup>-1</sup> (100-200m/min)
Feed rate	600-1200mm/min (0.05mm/tooth)
Cutting fluid	Emulsion (0.7MPa)

# IMPACT MIRACLE END MILLS

## VF-MHV-CH

End mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant



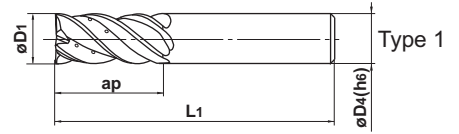
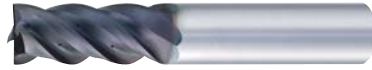
0 - -0.03



D4 = 16 0 - -0.011  
D4 = 20 0 - -0.013

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

**CoolStar**  
end mills



Helix angle Gash land

- Vibration control end mill with multiple internal through coolant hole ensures stable machining of difficult-to-cut materials and applications requiring long overhangs.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flute N	Stock	Type
VFMHVCHD1600	16	35	90	16	4	●	1
D2000	20	45	110	20	4	●	1

- : Inventory maintained.

## Recommended Cutting Conditions

### Shoulder milling

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		Heat Resistant Alloys Inconel		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
16	2000	560	800	110	
20	1600	510	600	100	
Depth of cut					

D:Dia.

### Slitting

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
16	1400	170	
20	1100	130	
Depth of cut			

D:Dia.

- 1) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 2) The irregular helix flute end mill has a large 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.
- 3) For shoulder milling, climb cutting is recommended.

# VF-MHVRB-CH

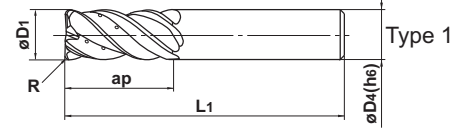
Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant



D4 = 16 0 - -0.011  
D4 = 20 0 - -0.013

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
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**CoolStar**  
end mills



Helix angle

- Vibration control corner radius end mill with multiple internal through coolant hole ensures stable machining of difficult-to-cut materials and applications requiring long overhangs.

Unit : mm

Order Number	Dia. D1	Corner Radius R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flute N	Stock	Type
VFMHVRBCHD1600R100	16	1	35	90	16	4	●	1
D1600R300	16	3	35	90	16	4	●	1
D2000R100	20	1	45	110	20	4	●	1
D2000R300	20	3	45	110	20	4	●	1

- : Inventory maintained.

## Recommended Cutting Conditions

### Shoulder milling

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		Heat resistant alloys Inconel, etc.		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
16	2000	560	800	110	
20	1600	510	600	100	
Depth of cut					

D:Dia.

### Slotting

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
16	1400	170	
20	1100	130	
Depth of cut			

D:Dia.

- 1) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 2) The irregular helix flute end mill has a large 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.
- 3) For shoulder milling, climb cutting is recommended.

# IMPACT MIRACLE END MILLS

## VF-6MHV-CH

End mill, Medium cut length, 6 flute, Irregular helix flutes with multiple internal through coolant



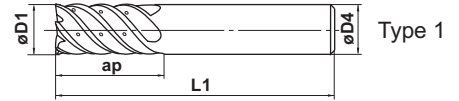
0 - -0.03



D4 = 16 0 - -0.011  
D4 = 20 0 - -0.013

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

**CoolStar**  
end mills



Helix angle



Gash land



- Vibration control 6 flute end mill with multiple internal through coolant hole ensures efficient machining of difficult-to-cut materials such as stainless steels, titanium and inconel alloys.

Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flute	Stock	Type
	D1	ap	L1	D4	N		
<b>VF6MHVCHD1600</b>	16	32	90	16	6	●	1
<b>D2000</b>	20	38	100	20	6	●	1

- : Inventory maintained.

## Recommended Cutting Conditions

### Shoulder milling

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		Heat resistant alloys Inconel, etc.		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
<b>16</b>		3000	1600	800	180
<b>20</b>		2400	1400	640	150
Depth of cut					

D:Dia.

- 1) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 2) The irregular helix flute end mill has a large 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.
- 3) Climb cutting is recommended.

# VF-6MHVRB-CH

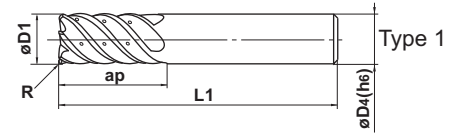
Corner radius end mill, Medium cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant



D4 = 16 0 - -0.011  
D4 = 20 0 - -0.013

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
				⊙	⊙		

**CoolStar**  
end mills



Helix angle

- Vibration control 6 flute corner radius end mill with multiple internal through coolant hole ensures efficient machining of difficult-to-cut materials such as stainless steels, titanium and inconel alloys.

Unit : mm

Order Number	Dia. D1	Corner Radius R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flute N	Stock	Type
VF6MHVRBCHD1600R100	16	1	32	90	16	6	●	1
D1600R300	16	3	32	90	16	6	●	1
D2000R100	20	1	38	100	20	6	●	1
D2000R300	20	3	38	100	20	6	●	1

- : Inventory maintained.

## Recommended Cutting Conditions

### Shoulder milling

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		Heat resistant alloys Inconel, etc.	
	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
16	3000	1600	800	180
20	2400	1400	640	150
Depth of cut				

D:Dia.

- 1) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 2) The irregular helix flute end mill has a large 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.
- 3) Climb cutting is recommended.

# IMPACT MIRACLE END MILLS

## VF-8MHV-CH NEW

End mill, Medium cut length, 8 flute, Irregular helix flutes, with multiple internal through coolant



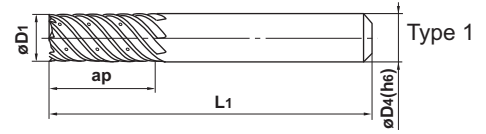
0 - -0.03



D4 = 16 0 - -0.011  
D4 = 20 0 - -0.013

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
				⊙	⊙		

**CoolStar**  
end mills



Helix angle Gash land

- Vibration control 8 flute end mill with multiple internal through coolant hole ensures efficient side finishing of difficult-to-cut materials such as stainless steels, titanium and inconel alloys.

Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flute	Stock	Type
	D1	ap	L1	D4	N		
VF8MHVCHD1600	16	32	90	16	8	●	1
D2000	20	38	100	20	8	●	1

- : Inventory maintained.

## Recommended Cutting Conditions

### Shoulder milling

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		Heat resistant alloys Inconel, etc.		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
16	3000	2100	800	240	
20	2400	1900	640	200	
Depth of cut					

D: Dia.

- 1) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 2) The irregular helix flute end mill has a large 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.
- 3) For shoulder milling, climb cutting is recommended.



# VF-8MHVRB-CH NEW

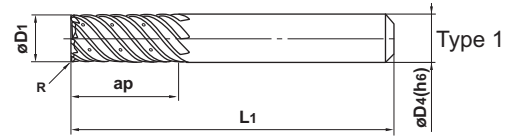
Corner radius end mill, Medium cut length, 8 flute, Irregular helix flutes, with multiple internal through coolant



D4 = 16 0 - -0.011  
D4 = 20 0 - -0.013

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
				⊙	⊙		

**CoolStar**  
end mills



Helix angle

- Vibration control 8 flute corner radius end mill with multiple internal through coolant hole ensures efficient side finishing of difficult-to-cut materials such as stainless steels, titanium and inconel alloys.

Unit : mm

Order Number	Dia. D1	Corner Radius R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flute N	Stock	Type
VF8MHVRBCHD1600R100	16	1	32	90	16	8	●	1
D1600R300	16	3	32	90	16	8	●	1
D2000R100	20	1	38	100	20	8	●	1
D2000R300	20	3	38	100	20	8	●	1

- : Inventory maintained.

## Recommended Cutting Conditions

### Shoulder milling

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		Heat resistant alloys Inconel, etc.	
	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
16	3000	2100	800	240
20	2400	1900	640	200
Depth of cut				

D:Dia.

- 1) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 2) The irregular helix flute end mill has a large 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.
- 3) For shoulder milling, climb cutting is recommended.

# IMPACT MIRACLE END MILLS

## VF-SFPR-CH

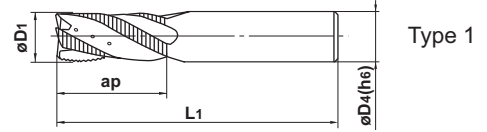
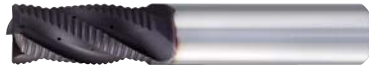
Roughing end mill, Short cut length, 4 flute, with multiple internal through coolant



D4 = 16 0 - -0.011  
D4 = 20 0 - -0.013

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

**CoolStar**  
end mills



Helix angle

- Roughing end mill with multiple internal through coolant holes suitable for difficult-to-cut materials.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flute N	Stock	Type
VFSFPRCHD1600	16	33	90	16	4	●	1
D2000	20	38	100	20	4	●	1

- : Inventory maintained.

### Recommended Cutting Conditions

#### Shoulder milling

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		Heat resistant alloys Inconel, etc.		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
Depth of cut	16	1200	300	800	110
	20	1000	300	600	100

D: Dia.

#### Slotting

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
Depth of cut	16	800	100
	20	600	80

D: Dia.

- 1) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 2) 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.
- 3) For shoulder milling, climb cutting is recommended.

# VF-65VR-CH

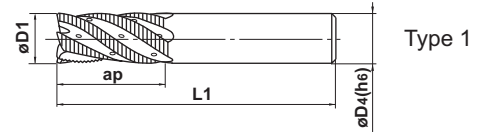
Roughing end mill, Short cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant



D4 = 16 0 - -0.011  
D4 = 20 0 - -0.013

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

**CoolStar**  
end mills



Helix angle

- 6 flute roughing end mill with multiple internal through coolant hole ensures efficient side finishing of difficult-to-cut materials such as stainless steels, titanium and inconel alloys.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flute N	Stock	Type
VF6SVRCHD1600	16	33	90	16	6	●	1
D2000	20	38	100	20	6	●	1

● : Inventory maintained.

## Recommended Cutting Conditions

### Shoulder milling

Work material	Austenitic Stainless Steel JIS SUS304, JIS SUS316 Titanium Alloy JIS Ti-6Al-4V		Heat resistant alloys Inconel, etc.		
	Dia. (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
16	2400	1200	800	160	
20	2000	1000	640	140	
Depth of cut					

D:Dia.

- If the depth of cut is shallow, the revolution and feed rate can be increased.
- The irregular helix flute end mill has a large 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.
- Climb cutting is recommended.

IMPACT MIRACLE end mill with multiple internal through coolant holes

# CoolStar

VF-MHV-CH  
VF-MHVRB-CH  
VF-6MHV-CH  
VF-6MHVRB-CH  
VF-8MHV-CH  
VF-8MHVRB-CH  
VF-5FPR-CH  
VF-65VR-CH



**For Your Safety**

●Don't handle tools and chips without gloves. ●Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage. ●Please use safety covers and wear safety glasses. ●When using compounded cutting oils, please take fire precautions. ●When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

## MITSUBISHI MATERIALS CORPORATION

**MITSUBISHI MATERIALS CORPORATION**

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(Tools specifications subject to change without notice.)