

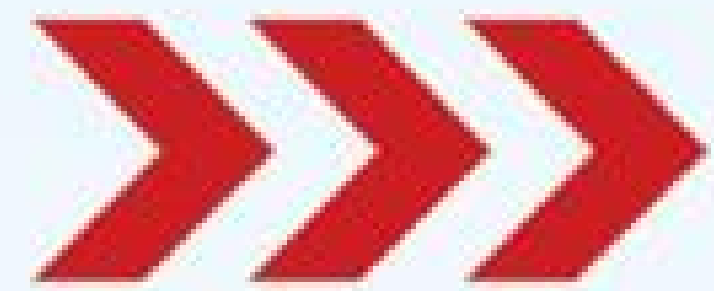
***Changzhou  
QiTian Machinery  
Manufacturer Co., Ltd***



Professional Cutter



# COMPANY PROFILE



## Introduction

Changzhou QiTian Machinery Manufacturer Co., Ltd is a professional company which focus on cutting tool research、development、production、 sales and technical services. Our company use advanced Germany equipments,first-class tungsten steel rod materials with imported coating technology,creating a good market reputation of QT milling cutter.

The products of our company have been widely used in die making, automobile, 3C, graphite and other processing and manufactreing fields. We will try our best to product every tool, and service our customers with professional attitude.

To be our partner, we will give you our strongest support!



Perfect quality Trustworthy

MATERIALS



Micro Grain Carbide



UltraMicro Grain Carbide

COATING



Black Coating



Fuchsia Coating



Bronze Coating



Blue Coating

BALL RADIUS TOLERANCE



CORNER RADIUS TOLERANCE



HELIX ANGLE



NUMBER OF FIUTES



2 flute



3 flute



4 flute

WORKING HARDNESS



MACHINING DIRECTOR



Side



Side,Profile



Side,Profile,Slot

SHANK TYPE

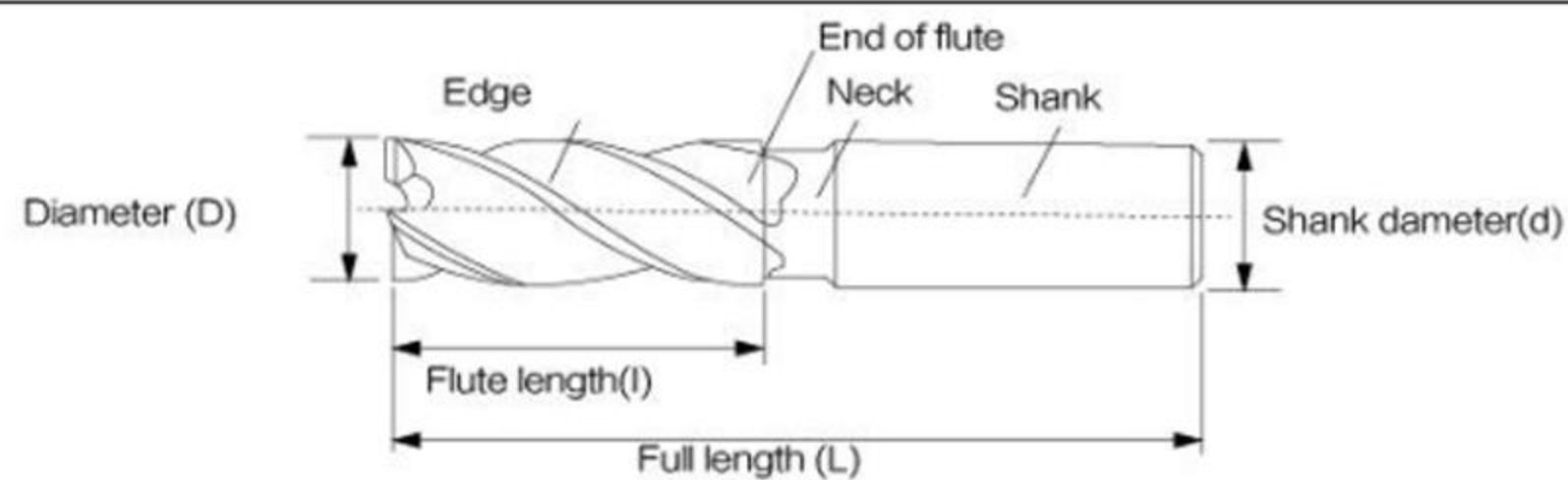


PLAIN Shank

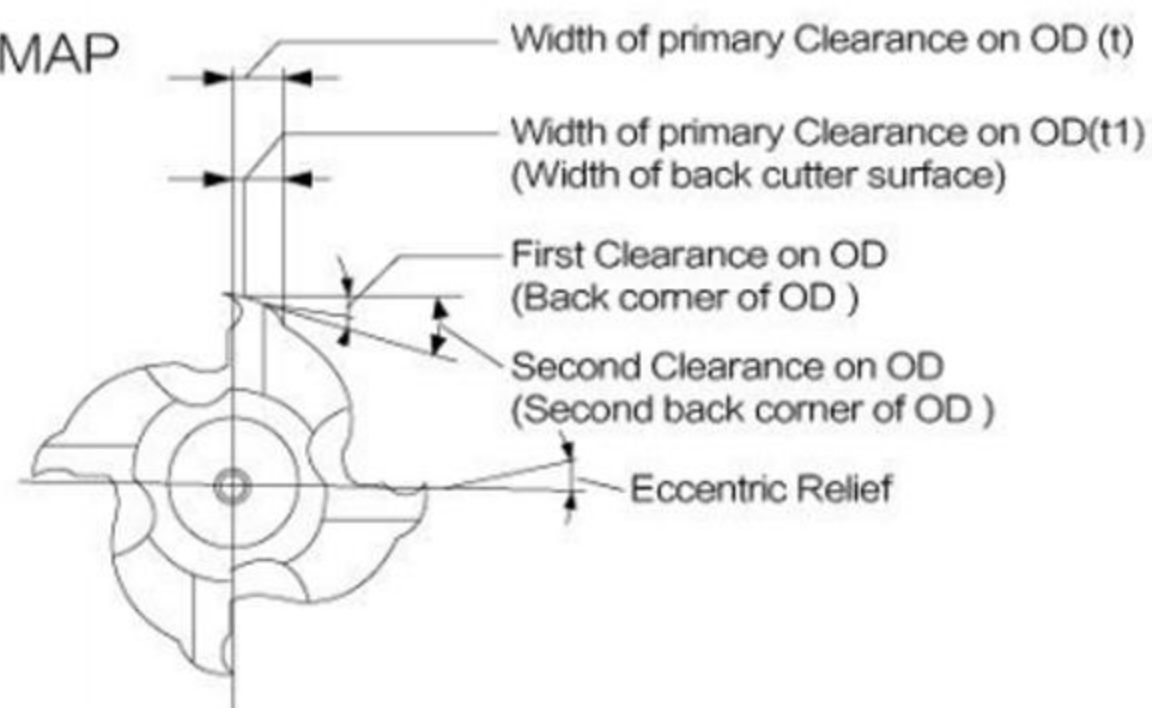


FLAT Shank

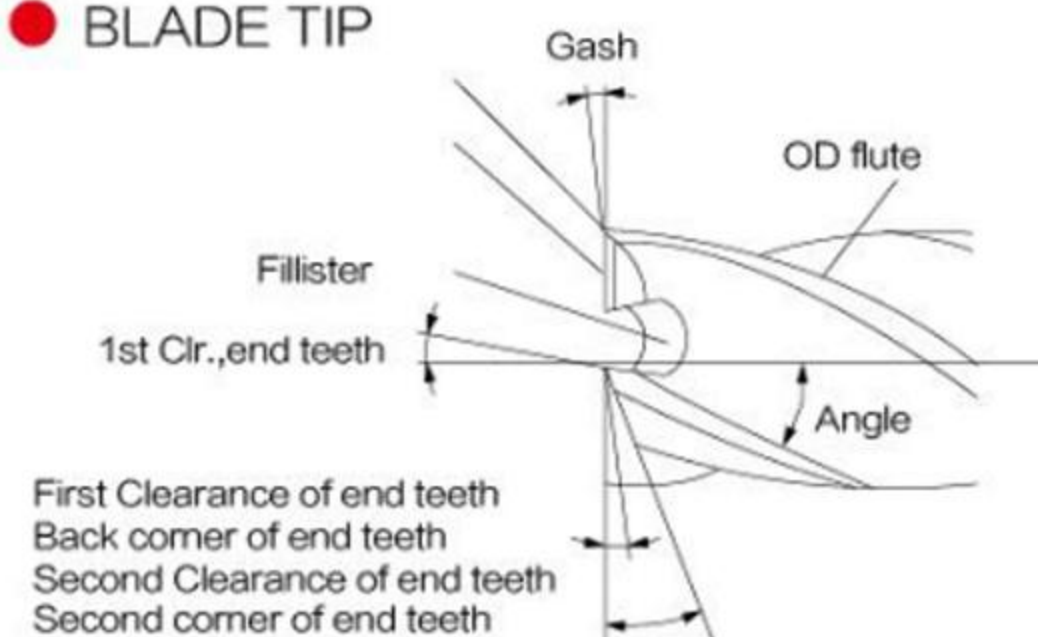
### ● SIDE VIEW



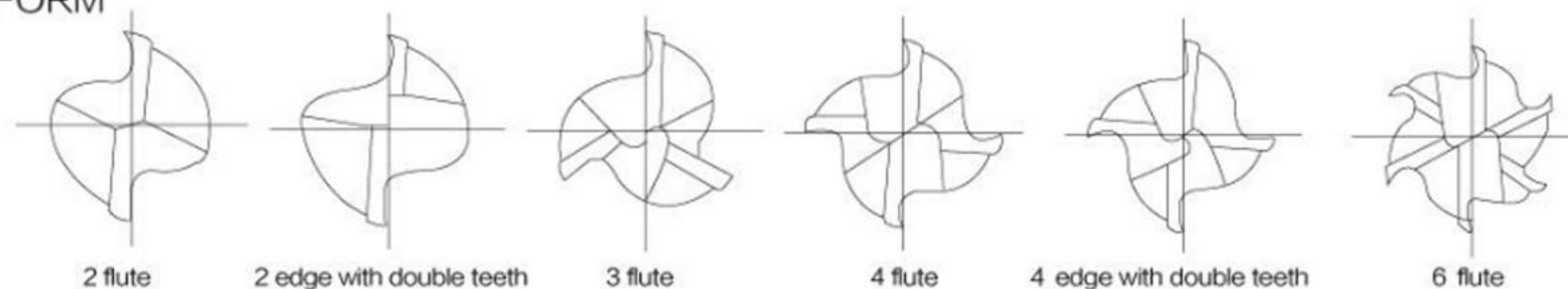
### ● OVERLOOK MAP



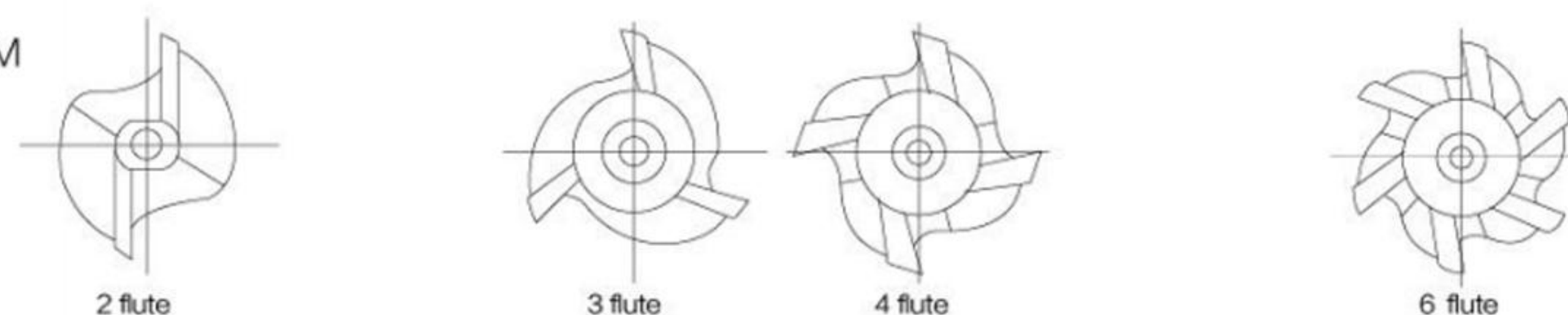
### ● BLADE TIP



### ● BLADE FORM



### ● BLADE FORM



Shape in end teeth of the end mill

### ● Tip protection



### ● Tip



End mill working condition calculation method

● Cutting speed (line speed)

Calculation VC  
The distance of 1 points on the circumferential surface of a vertical milling cutter moving in every minute can be obtained by the following formula

$$V = \frac{\pi \times D \times N}{1000}$$

V=Cutting speed(m/min)  
π=3.14  
D=Diameter L(mm)  
N=Rotating speed(mm<sup>-1</sup>)

● Rotation speed

Calculation of Rotation speed  
The rotation number of the mechanical spindle of a vertical milling cutter in every minute can be obtained by the following formula

$$N = \frac{1000 \times V}{\pi \times D}$$

N=Rotating speed(mm<sup>-1</sup>)  
V=Cutting speed(m/min)  
π=3.14  
D=Diameter L(mm)

● Feed rate

Calculation of feed rate  
The feed rate of the worktable in every minute can be obtained by the following formula

$$F = N \times Z \times f$$

F=Feed rate(mm/min)  
N=Rotating speed(mm<sup>-1</sup>)  
Z=Number of flute  
f=Feed rate of the flute(mm/1blade)

● Feed for teeth

Calculation of the Feed of teeth  
The distance of 1 points on the circumferential surface of a vertical milling cutter moving in every minute can be obtained by the following formula

$$f = \frac{F}{N \times Z}$$

f=Feed rate of the flute(mm/1blade)  
F=Feed rate(mm/min)  
N=Rotating speed(mm<sup>-1</sup>)  
Z=Number of flute

● Working time

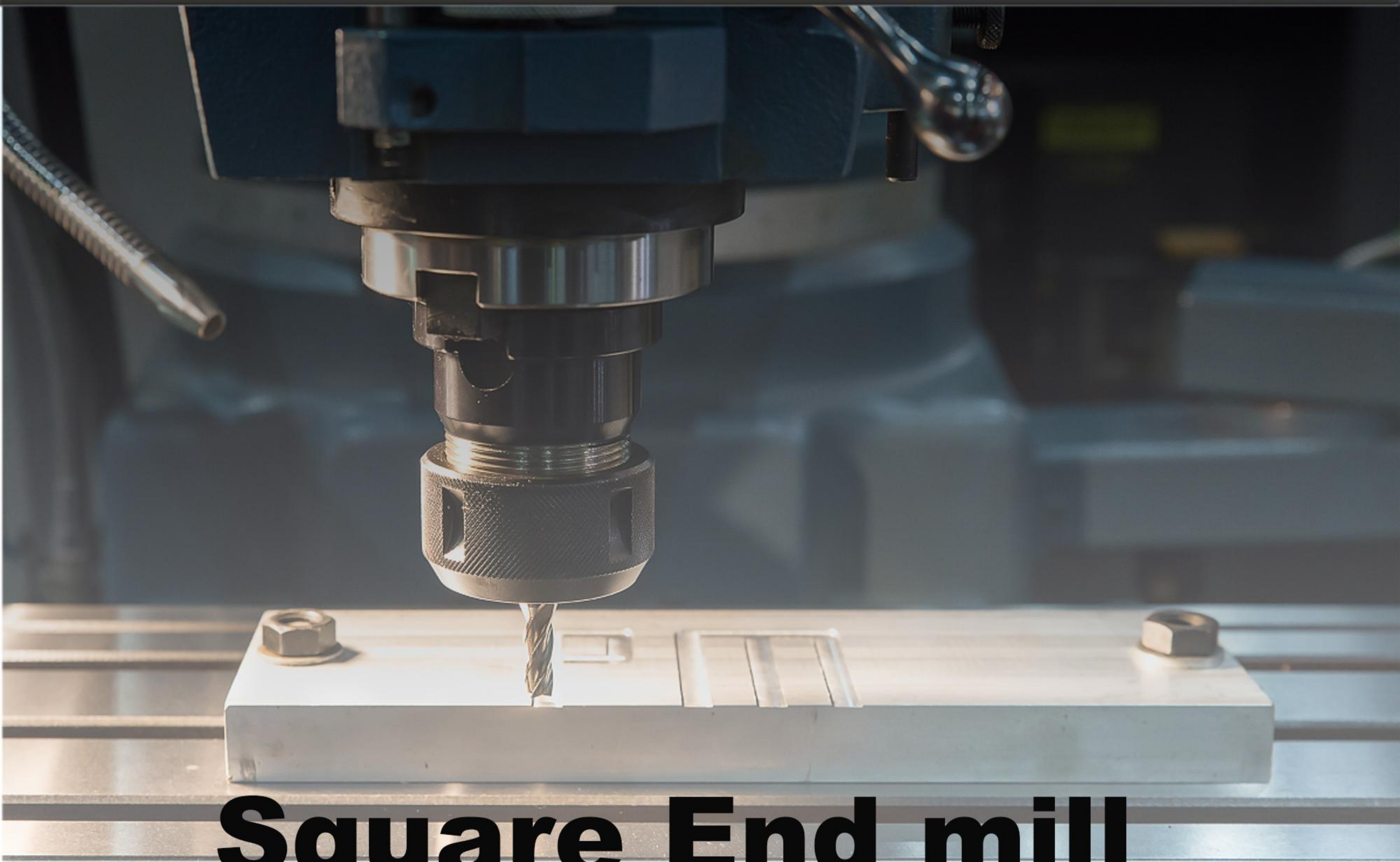
Calculation of the Working time  
The time required to cut the material of a workpiece can be obtained by the following formula

$$T_c = \frac{L}{F}$$

Tc=Working time ( min )  
L=Total working length  
(length of working material + D of vertical milling cutter blade)  
F=Feed rate(mm/min)

### Failure analyzed and solvent

| Item                         | Fault                                       | Reason                                               | Solution                                                                                                                                                                                                                                         |
|------------------------------|---------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Precision of cutting surface | Rough surface                               | Vibration                                            | <ul style="list-style-type: none"> <li>▲ Fix the working material as well as possible</li> <li>▲ Adjust the failed part of machine</li> <li>▲ Reduce rotating speed</li> <li>▲ Downcut</li> <li>▲ Tools minimum length out of fixture</li> </ul> |
|                              |                                             | The heterogeneity in hardness                        | <ul style="list-style-type: none"> <li>▲ Measuring the hardness of working material</li> </ul>                                                                                                                                                   |
|                              |                                             | The tip was unsuitable                               | <ul style="list-style-type: none"> <li>▲ Tool rake angle and clearance angle</li> <li>▲ Improve cutting roughness</li> </ul>                                                                                                                     |
|                              |                                             | Chip lump and fuse attach material                   | <ul style="list-style-type: none"> <li>▲ Remove chip lump and clearance angle</li> <li>▲ Improve cutting roughness</li> </ul>                                                                                                                    |
|                              |                                             | Passivation of cutting edge                          | <ul style="list-style-type: none"> <li>▲ Determine the adequate time to regrinding</li> </ul>                                                                                                                                                    |
|                              |                                             | Cutting rate(speed)too fast                          | <ul style="list-style-type: none"> <li>▲ Reduce the cutting rate(speed)</li> </ul>                                                                                                                                                               |
|                              |                                             | Misfit cutting fluids or deficient of cutting fluids | <ul style="list-style-type: none"> <li>▲ Change cutting fluids</li> </ul>                                                                                                                                                                        |
|                              | Bucking cracking of the of machined surface | Unbalance friction of cutting edge                   | <ul style="list-style-type: none"> <li>▲ Regrinding ro reduce friction</li> </ul>                                                                                                                                                                |
|                              |                                             | Fuse attach material on the cutting edge             | <ul style="list-style-type: none"> <li>▲ Remove fuse attach material</li> <li>▲ Change cutting fluids</li> </ul>                                                                                                                                 |
|                              |                                             | Cutting edge deformation                             | <ul style="list-style-type: none"> <li>▲ To pay attention to use and safekeeping</li> </ul>                                                                                                                                                      |
|                              | The corrugation of machined surface         | Lesser cutting flute                                 | <ul style="list-style-type: none"> <li>▲ Increase the number of flutes from 2 flues to 4 flutes and then 6 flutes</li> </ul>                                                                                                                     |
|                              |                                             | Bigger cutting depth and feed rate                   | <ul style="list-style-type: none"> <li>▲ To reduce the feed rate of machine</li> </ul>                                                                                                                                                           |
|                              |                                             | A large helix angle                                  | <ul style="list-style-type: none"> <li>▲ Decrease the helix angle</li> </ul>                                                                                                                                                                     |
| Shape precision              | Perpendicularitr                            | Cutting depth and feed rate is too large             | <ul style="list-style-type: none"> <li>▲ Reduce the depth of cutting and feed rate</li> </ul>                                                                                                                                                    |
|                              |                                             | Tool stretches out over longer                       | <ul style="list-style-type: none"> <li>▲ Use the end mill stretches out shaortest from chuck</li> </ul>                                                                                                                                          |
|                              |                                             | Perpendicularity of holder not resch                 | <ul style="list-style-type: none"> <li>▲ Improve the perpendicularity of holder</li> </ul>                                                                                                                                                       |
| End mill life                | Shorter life for regrinding end mill        | Work material hardness too high                      | <ul style="list-style-type: none"> <li>▲ Improve to suitable hardness by heat treatment process</li> <li>▲ Reduce the feed rate for high hardness work material or change more hardness tool</li> </ul>                                          |
|                              |                                             | Unsuitable feed rate                                 | <ul style="list-style-type: none"> <li>▲ Adjust to suitable feed rate</li> </ul>                                                                                                                                                                 |
|                              |                                             | Chip lumo and fuse attach material                   | <ul style="list-style-type: none"> <li>▲ Remove chip lump and fuse attach material</li> <li>▲ Use suitable cutting liquid</li> </ul>                                                                                                             |
|                              |                                             | Unsuitable cutting liquid                            | <ul style="list-style-type: none"> <li>▲ Use suitable cutting liquid</li> <li>▲ Use enough cutting liquid</li> </ul>                                                                                                                             |
|                              | Huge friction of cutting edge               | The fault of work material                           | <ul style="list-style-type: none"> <li>▲ Uchieve the average of inside form of work material</li> <li>▲ Clear up unbalance hardness</li> </ul>                                                                                                   |
|                              |                                             | Unsuitable edge angle                                | <ul style="list-style-type: none"> <li>▲ Regrind to suitable angle</li> </ul>                                                                                                                                                                    |
|                              |                                             | End mill cutting function go down                    | <ul style="list-style-type: none"> <li>▲ Surface treatment</li> </ul>                                                                                                                                                                            |
|                              |                                             | Unsuitable cutting liquid                            | <ul style="list-style-type: none"> <li>▲ Adjust to suitable cutting liquid</li> <li>▲ Adjust offer method of liquid</li> </ul>                                                                                                                   |
|                              |                                             | Unsuitable regrind schedule                          | <ul style="list-style-type: none"> <li>▲ Manage the regrind schedule</li> </ul>                                                                                                                                                                  |
|                              | Flute damage                                | Vibration                                            | <ul style="list-style-type: none"> <li>▲ Strengthen the install tool of work material</li> </ul>                                                                                                                                                 |
|                              |                                             | The fault of work material                           | <ul style="list-style-type: none"> <li>▲ Achieve the average of working material structure</li> <li>▲ Use suitable hardness,clear up unbalance hardness</li> <li>▲ Check the material may mix other hardness substance or gravel</li> </ul>      |
|                              |                                             | Unsuitable feed rate                                 | <ul style="list-style-type: none"> <li>▲ Reduce the feed rate</li> </ul>                                                                                                                                                                         |
|                              |                                             | Cutter become dull                                   | <ul style="list-style-type: none"> <li>▲ Regrind the tools</li> </ul>                                                                                                                                                                            |
|                              |                                             | Cutting liquid go off                                | <ul style="list-style-type: none"> <li>▲ Change the cutting liquid</li> </ul>                                                                                                                                                                    |
|                              | Break                                       | Work material unsuitable fixed                       | <ul style="list-style-type: none"> <li>▲ Indeed fix the work material</li> <li>▲ Improve install tool</li> </ul>                                                                                                                                 |
|                              |                                             | Cutter become dull                                   | <ul style="list-style-type: none"> <li>▲ Regrind process</li> </ul>                                                                                                                                                                              |
|                              |                                             | End mill with uncorrect operation                    | <ul style="list-style-type: none"> <li>▲ Be careful of keep and operate</li> </ul>                                                                                                                                                               |
|                              |                                             | Chip jam                                             | <ul style="list-style-type: none"> <li>▲ Use cutting liquid in large,during dry milling use air blow to remove chips</li> </ul>                                                                                                                  |

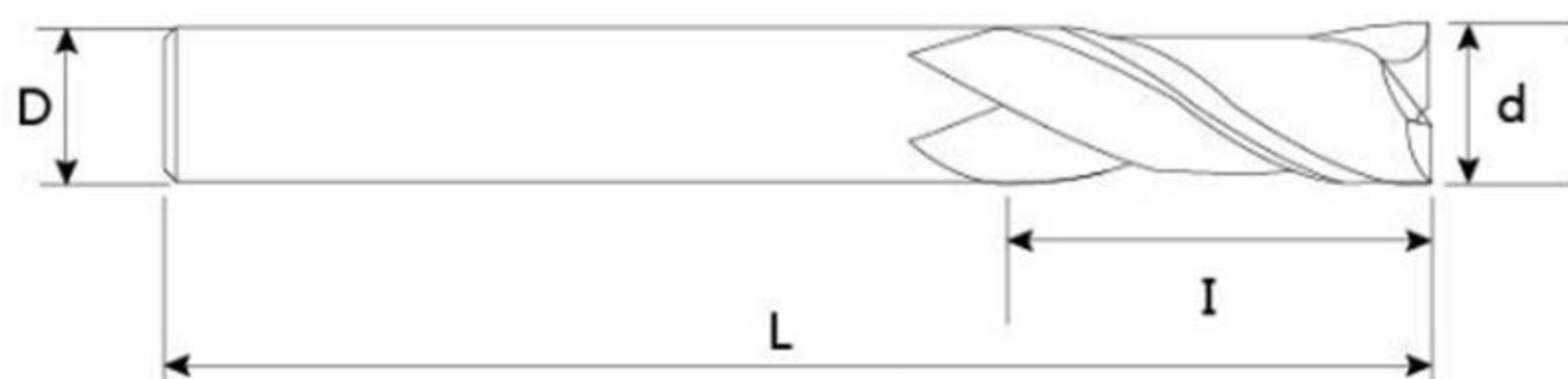


# Square End mill



# HRC 45 Carbide Square End MILL 2 Flutes

WC=90 Co=10 HV30=1591 Bending=3750N/mm<sup>2</sup> Hardness 91.3 Particle=0.8  $\mu$ m



2 flute

|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |



## Workpiece Material

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron |          | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|----------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| <35HRC                                | 35-48HRC | 46-55HRC           | 55-60HRC              |                       |                        |                      |                        |                                     |                        |
| ●                                     | ●        | ◎                  |                       | ◎                     |                        |                      |                        |                                     |                        |

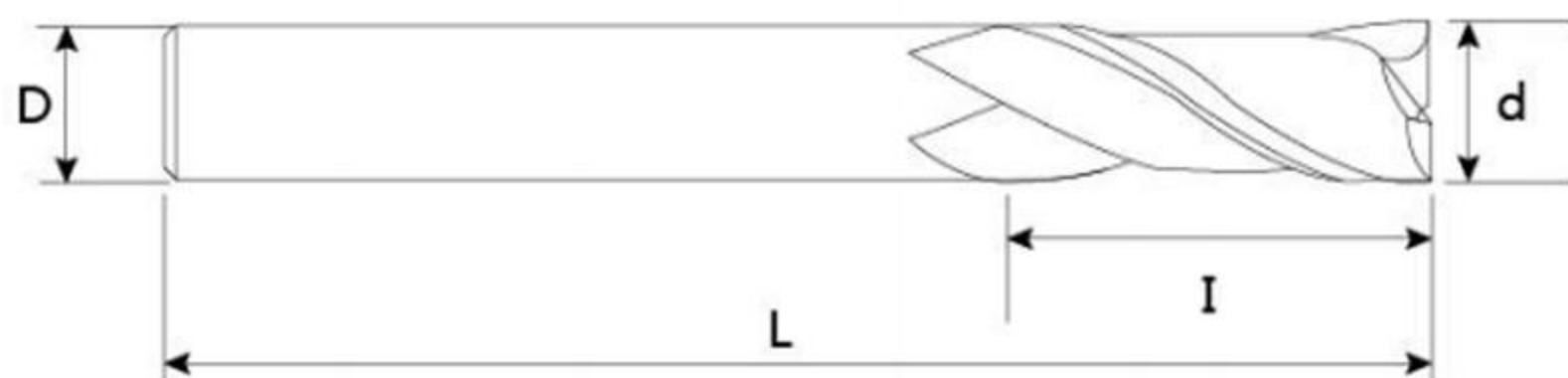
● Most Suitable ◎ Suitable

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
| ●                                     | ●                  | ◎                     |                       | ◎                      |                      |                        |                                     |                        |

● Most Suitable ◎ Suitable

# HRC 55 Carbide Square End MILL 2 Flutes

WC=88 Co=12 HV30=1760 Bending=4000N/mm<sup>2</sup> Hardness 92.8 Particle=0.6  $\mu$ m



2 flute

|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |



## Workpiece Material

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| <35HRC                                | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
| ●                                     | ●                  | ●                     |                       | ○                      |                      |                        | ○                                   | ○                      |

● Most Suitable ○ Suitable

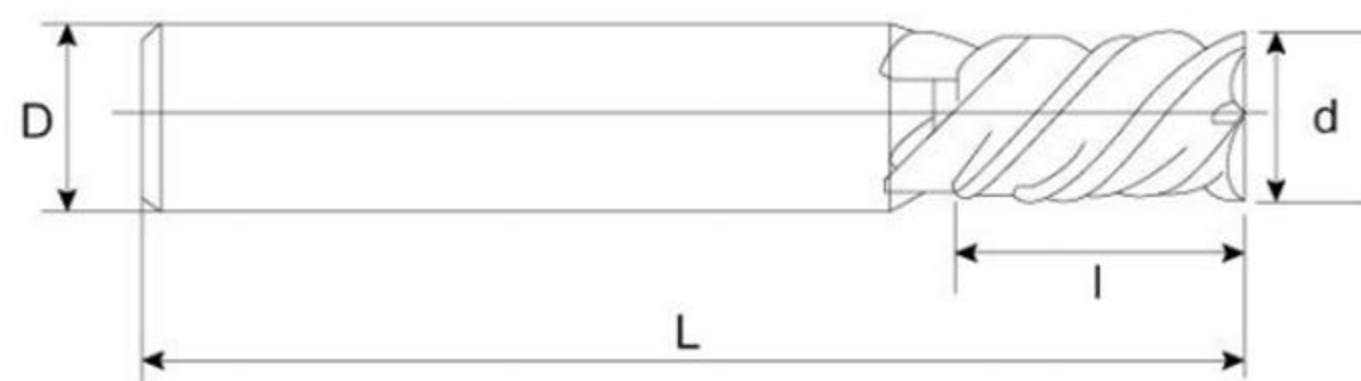
● Most Suitable ○ Suitable

|                                       |                    |                       |                       |                        |                      |                        |                                     |                        |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
| ●                                     | ●                  | ●                     |                       | ⊙                      |                      |                        | ⊙                                   | ⊙                      |

● Most Suitable ⊙ Suitable

# HRC 60 Carbide Square End MILL 4 Flutes

WC=88 Co=12 HV30=1780 Bending=4000N/mm<sup>2</sup> Hardness 92.3 Particle=0.4 μm



4 flute

|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |



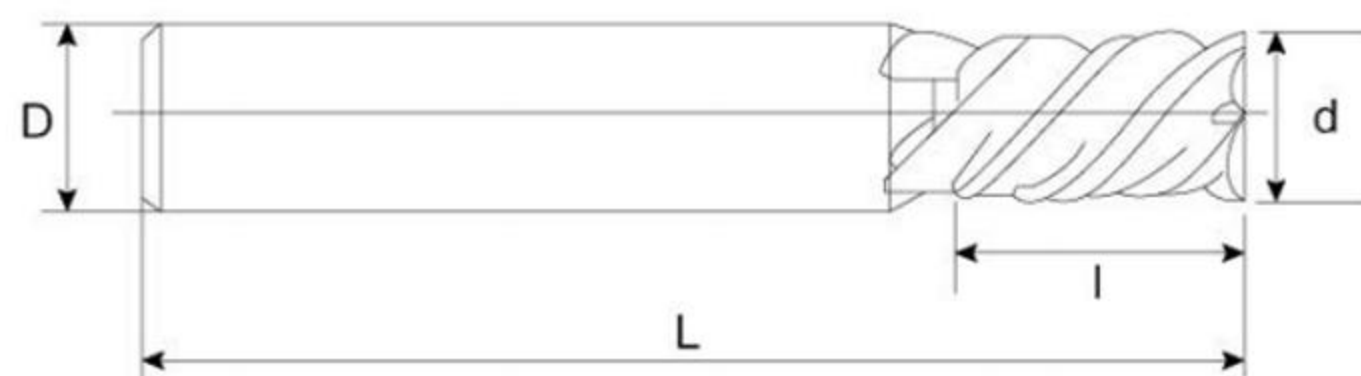
## Workpiece Material

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
|                                       | ○                  | ●                     | ●                     | ○                      |                      |                        | ●                                   | ●                      |

● Most Suitable ○ Suitable

# HRC 65 Carbide Square End MILL 4 Flutes

WC=88 Co=12 HV30=1800 Bending=4200N/mm<sup>2</sup> Hardness 92.6 Particle=0.4  $\eta$ m



4 flute

|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |



## Workpiece Material

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
|                                       |                    | ○                     | ●                     | ○                      |                      |                        | ●                                   | ●                      |

● Most Suitable ○ Suitable

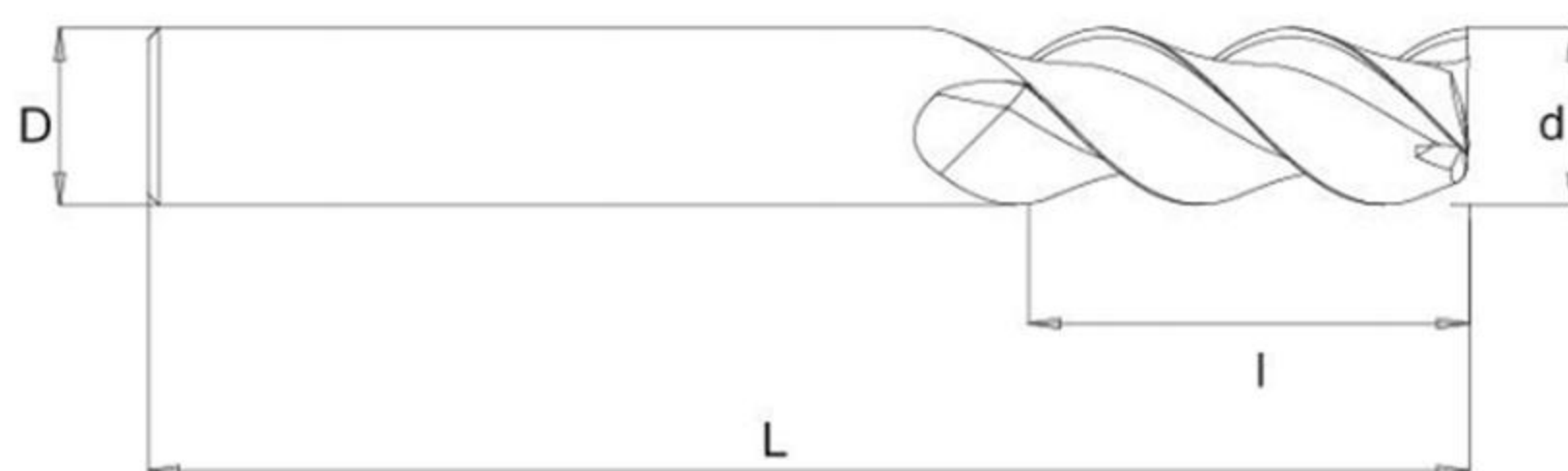


# Aluminum End mill



# HRC 45 Carbide Aluminum End MILL 2 Flutes

WC=90 Co=10 HV30=1591 Bending=3750N/mm<sup>2</sup> Hardness 91.3 Particle=0.8  $\mu$ m



2 flute



|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |

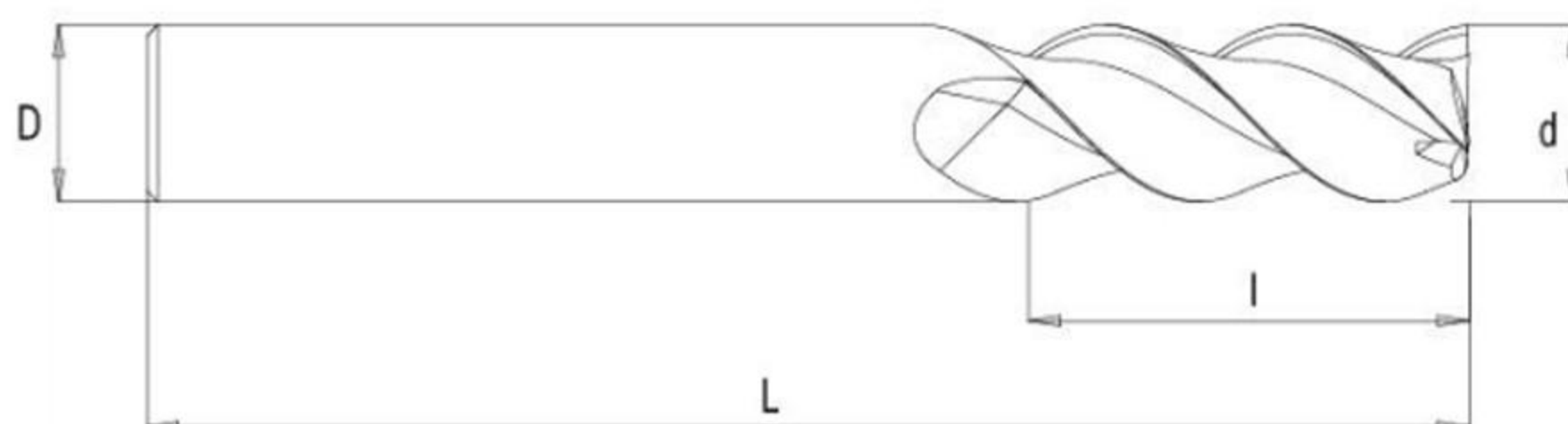
## Workpiece Material

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
|                                       |                    |                       |                       |                        | ○                    | ●                      |                                     |                        |

● Most Suitable ○ Suitable

# HRC 55 Carbide Aluminum End MILL 3 Flutes

WC=88 Co=12 HV30=1760 Bending=4000N/mm<sup>2</sup> Hardness 92.8 Particle=0.6  $\mu$ m



3 flute

|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |



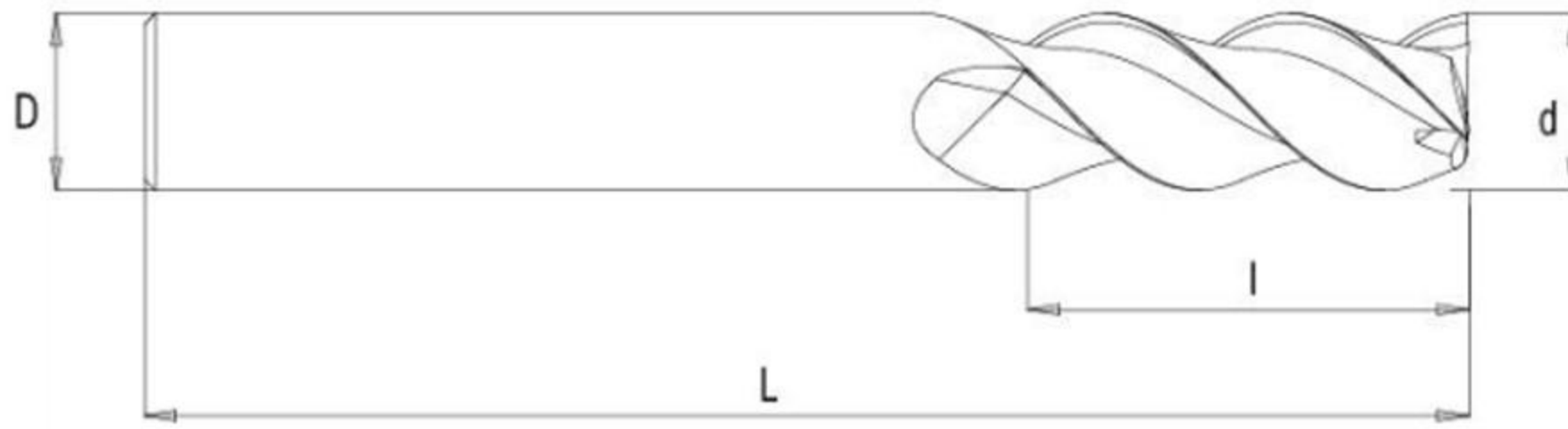
## Workpiece Material

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        | ◎                    | ●                      |                                     |                        |

● Most Suitable ◎ Suitable

# HRC 60 U Shape Carbide Aluminum End MILL 3 Flutes

WC=88 Co=12 HV30=1760 Bending=4000N/mm<sup>2</sup> Hardness 92.8 Particle=0.6  $\mu$ m



3 flute

|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |



U Shape: big feed machining

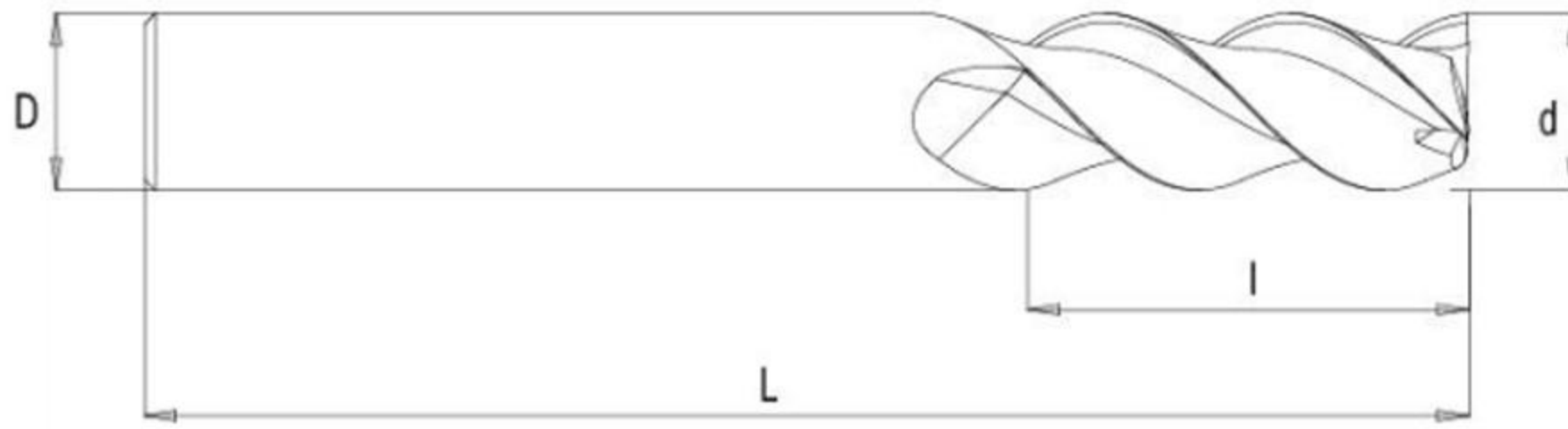
## Workpiece Material

| 碳钢,合金钢,铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|-------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                             | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
|                                     |                    |                       |                       |                        | ○                    | ●                      |                                     |                        |

● Most Suitable ○ Suitable

# HRC 65 U Shape Carbide Aluminum End MILL 3 Flutes

WC=88 Co=12 HV30=1760 Bending=4000N/mm<sup>2</sup> Hardness 92.8 Particle=0.6  $\mu$ m



3 flute

|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |



U Shape: big feed machining

DLC Coated: increase lifetime

2-3 times longer

### Workpiece Material

| 碳钢,合金钢,铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|-------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                             | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
|                                     |                    |                       |                       |                        | ○                    | ●                      |                                     |                        |

● Most Suitable ○ Suitable

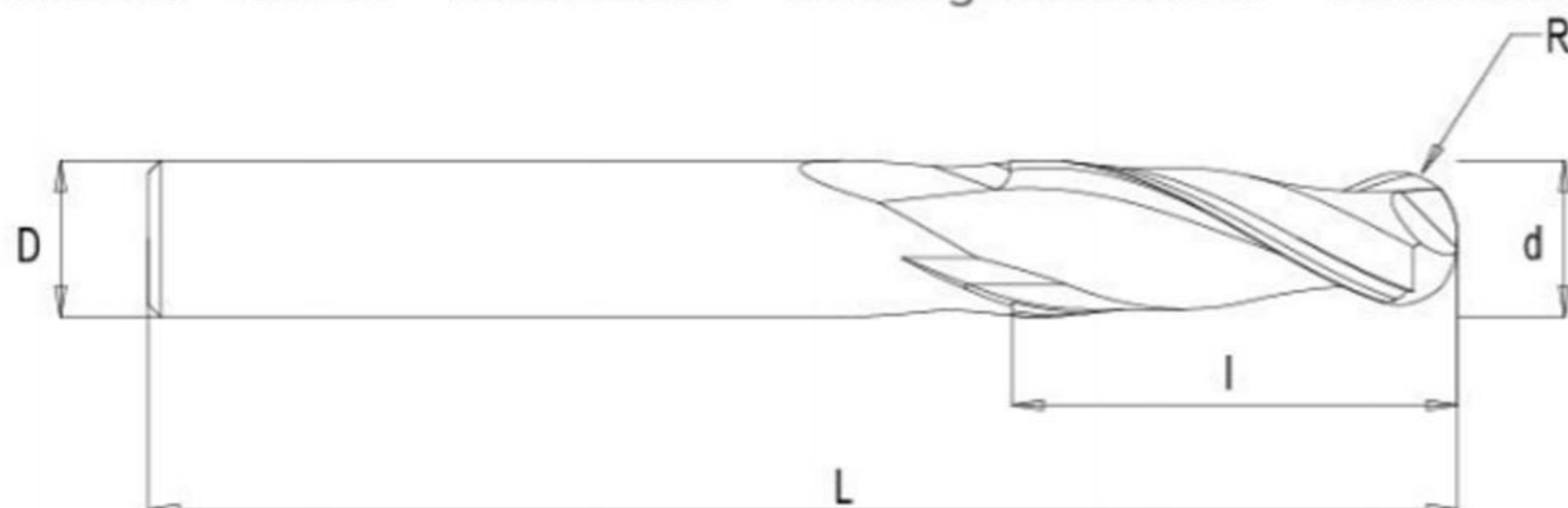


# Ball Nose End mill



# HRC 45 Carbide Ball Nose End MILL 2 Flutes

WC=90 Co=10 HV30=1591 Bending=3750N/mm<sup>2</sup> Hardness 91.3 Particle=0.8  $\mu$ m



2 flute

|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |



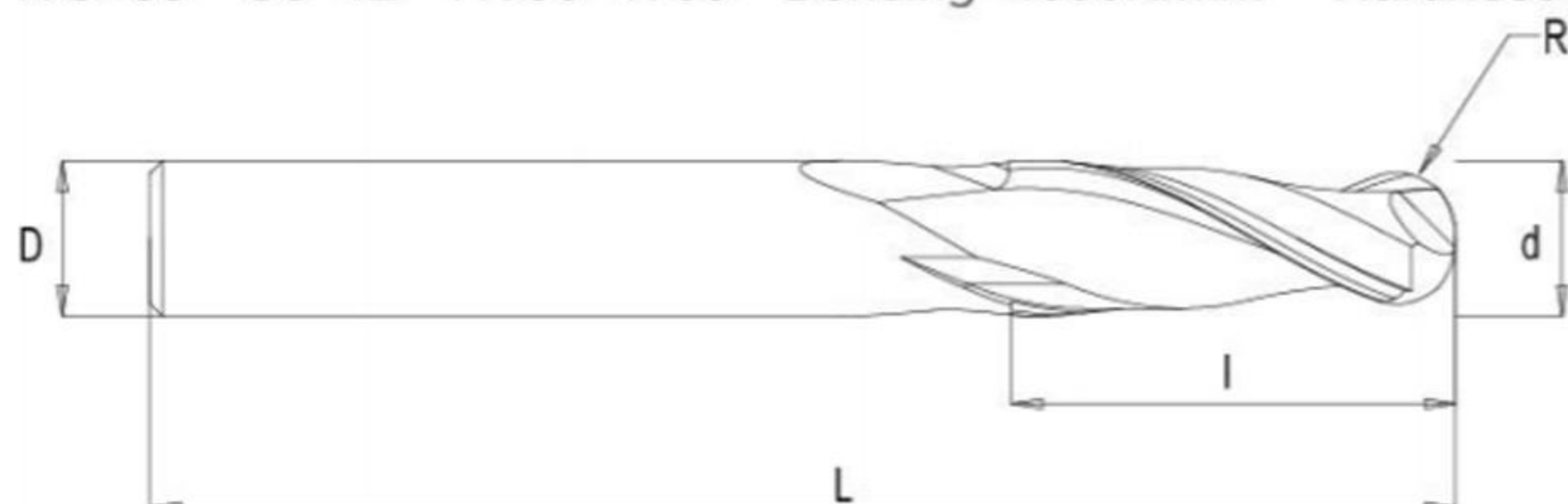
## Workpiece Material

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
| ●                                     | ●                  | ◎                     |                       | ◎                      |                      |                        |                                     |                        |

● Most Suitable ◎ Suitable

# HRC 55 Carbide Ball Nose End MILL 2 Flutes

WC=88 Co=12 HV30=1760 Bending=4000N/mm<sup>2</sup> Hardness 92.8 Particle=0.6  $\mu$ m



2 flute

|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |

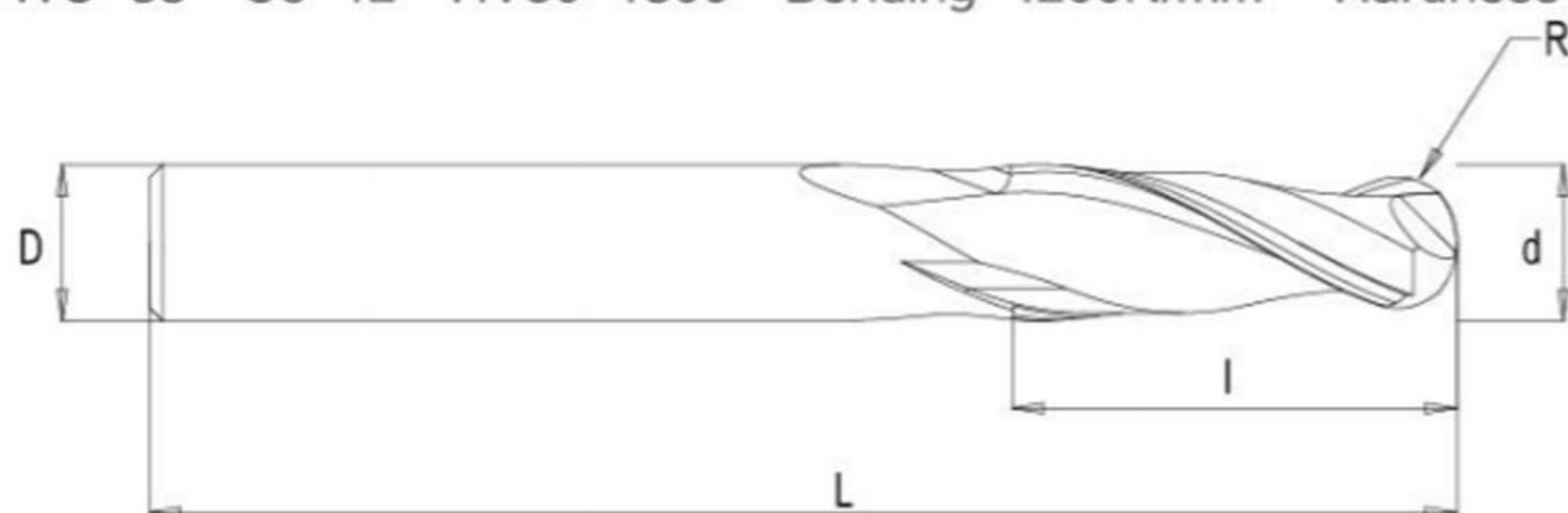


### Workpiece Material

|                                     |                    |                       |                       |                        |                      |                        |                                     |                        |
|-------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| 碳钢,合金钢,铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
| <35HRC                              | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
| ●                                   | ●                  | ●                     |                       | ○                      |                      |                        | ○                                   | ○                      |
| ● Most Suitable ○ Suitable          |                    |                       |                       |                        |                      |                        |                                     |                        |

# HRC 65 Carbide Ball Nose End MILL 2 Flutes

WC=88 Co=12 HV30=1800 Bending=4200N/mm<sup>2</sup> Hardness 92.6 Particle=0.4  $\mu$ m



2 flute

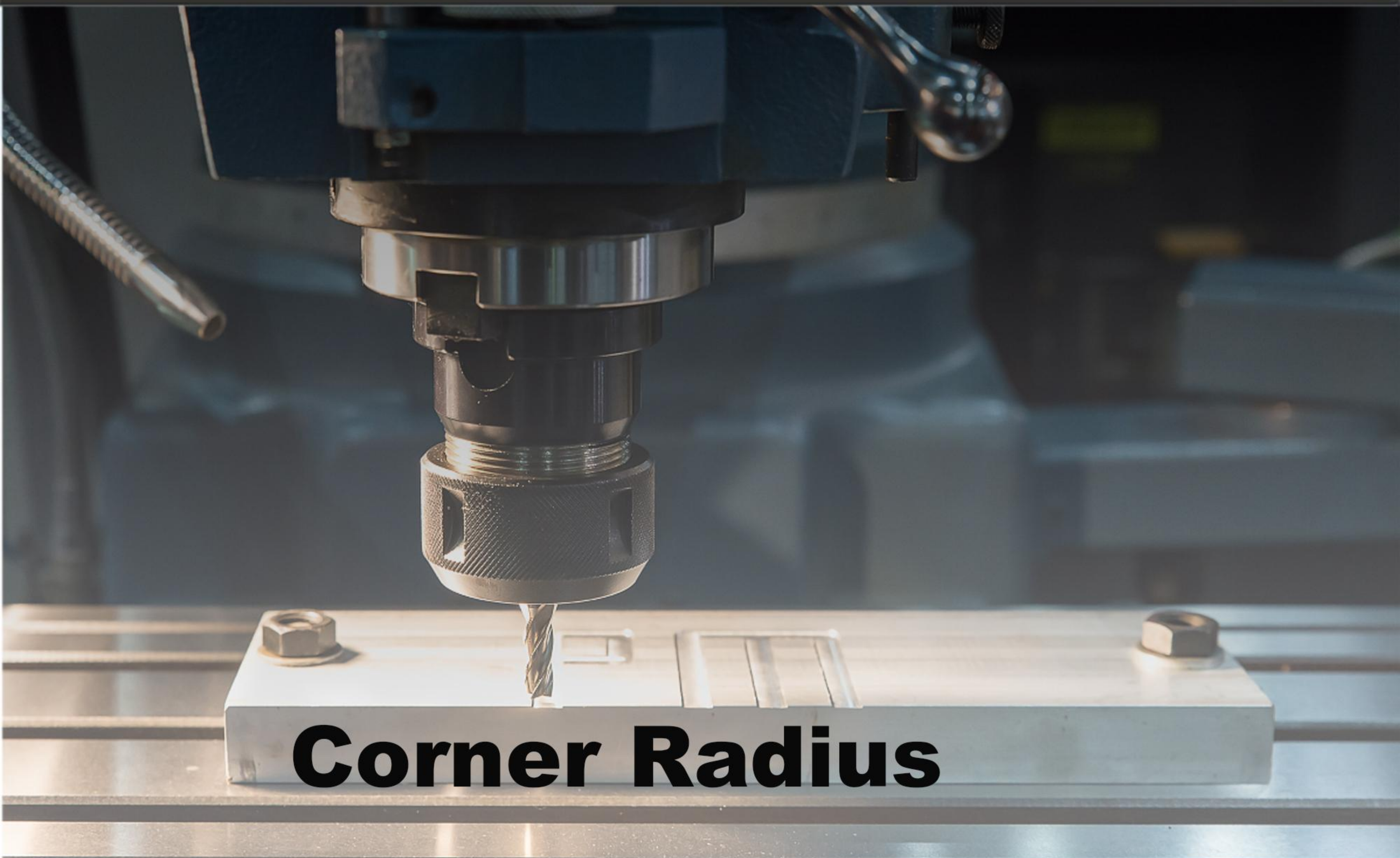
|            | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length |
|------------|------------------|----------------|---------------|----------------|
| Stub       | 1/8              | 1/8            | 0.25          | 1.5            |
|            | 3/16             | 3/16           | 0.375         | 2              |
|            | 1/4              | 1/4            | 0.5           | 2              |
|            | 5/16             | 5/16           | 0.5           | 2              |
|            | 3/8              | 3/8            | 0.625         | 2              |
|            | 1/2              | 1/2            | 0.625         | 2.5            |
|            | 5/8              | 5/8            | 0.75          | 3              |
|            | 3/4              | 3/4            | 0.875         | 3              |
| Standard   | 1/8              | 1/8            | 0.5           | 1.5            |
|            | 3/16             | 3/16           | 0.625         | 2              |
|            | 1/4              | 1/4            | 0.75          | 2.5            |
|            | 5/16             | 5/16           | 0.813         | 2.5            |
|            | 3/8              | 3/8            | 0.875         | 2.5            |
|            | 1/2              | 1/2            | 1             | 3              |
|            | 5/8              | 5/8            | 1.25          | 3.5            |
|            | 3/4              | 3/4            | 1.5           | 4              |
| Long       | 1/8              | 1/8            | 0.75          | 2              |
|            | 3/16             | 3/16           | 0.75          | 2              |
|            | 1/4              | 1/4            | 1.125         | 3              |
|            | 5/16             | 5/16           | 1.125         | 3              |
|            | 3/8              | 3/8            | 1.125         | 3              |
|            | 1/2              | 1/2            | 2             | 4              |
|            | 5/8              | 5/8            | 2.25          | 5              |
|            | 3/4              | 3/4            | 2.25          | 5              |
| Extra Long | 1/8              | 1/8            | 1.125         | 3              |
|            | 3/16             | 3/16           | 1.125         | 3              |
|            | 1/4              | 1/4            | 1.5           | 4              |
|            | 5/16             | 5/16           | 1.625         | 4              |
|            | 3/8              | 3/8            | 1.75          | 4              |
|            | 1/2              | 1/2            | 3             | 6              |
|            | 5/8              | 5/8            | 3             | 6              |
|            | 3/4              | 3/4            | 3             | 6              |



## Workpiece Material

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
|                                       |                    | ○                     | ●                     | ○                      |                      |                        | ●                                   | ●                      |

● Most Suitable ○ Suitable



**Corner Radius**



**End mill**

# HRC 50 Carbide Corner Radius End MILL 4 Flutes

WC=90 Co=10 HV30=1591 Bending=3750N/mm<sup>2</sup> Hardness 91.3 Particle=0.8  $\mu$ m



4 flute

| Cutting Diameter | Shank Diameter | Length of Cut | Overall Length | Radius Size |
|------------------|----------------|---------------|----------------|-------------|
| 1/8              | 1/8            | 0.5           | 1.5            | 0.01        |
| 1/8              | 1/8            | 0.5           | 1.5            | 0.02        |
| 1/8              | 1/8            | 0.5           | 1.5            | 0.03        |
| 3/16             | 3/16           | 0.625         | 2              | 0.01        |
| 3/16             | 3/16           | 0.625         | 2              | 0.02        |
| 3/16             | 3/16           | 0.625         | 2              | 0.03        |
| 3/16             | 3/16           | 0.625         | 2              | 0.06        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.01        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.02        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.03        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.06        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.09        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.01        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.02        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.03        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.06        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.09        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.125       |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.01        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.02        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.03        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.06        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.09        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.125       |
| 1/2              | 1/2            | 1             | 3              | 0.01        |
| 1/2              | 1/2            | 1             | 3              | 0.02        |
| 1/2              | 1/2            | 1             | 3              | 0.03        |
| 1/2              | 1/2            | 1             | 3              | 0.06        |
| 1/2              | 1/2            | 1             | 3              | 0.09        |
| 1/2              | 1/2            | 1             | 3              | 0.125       |
| 1/2              | 1/2            | 1             | 3              | 0.187       |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.01        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.02        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.03        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.06        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.09        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.125       |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.187       |
| 3/4              | 3/4            | 1.5           | 4              | 0.01        |
| 3/4              | 3/4            | 1.5           | 4              | 0.02        |
| 3/4              | 3/4            | 1.5           | 4              | 0.03        |
| 3/4              | 3/4            | 1.5           | 4              | 0.06        |
| 3/4              | 3/4            | 1.5           | 4              | 0.09        |
| 3/4              | 3/4            | 1.5           | 4              | 0.125       |
| 3/4              | 3/4            | 1.5           | 4              | 0.187       |



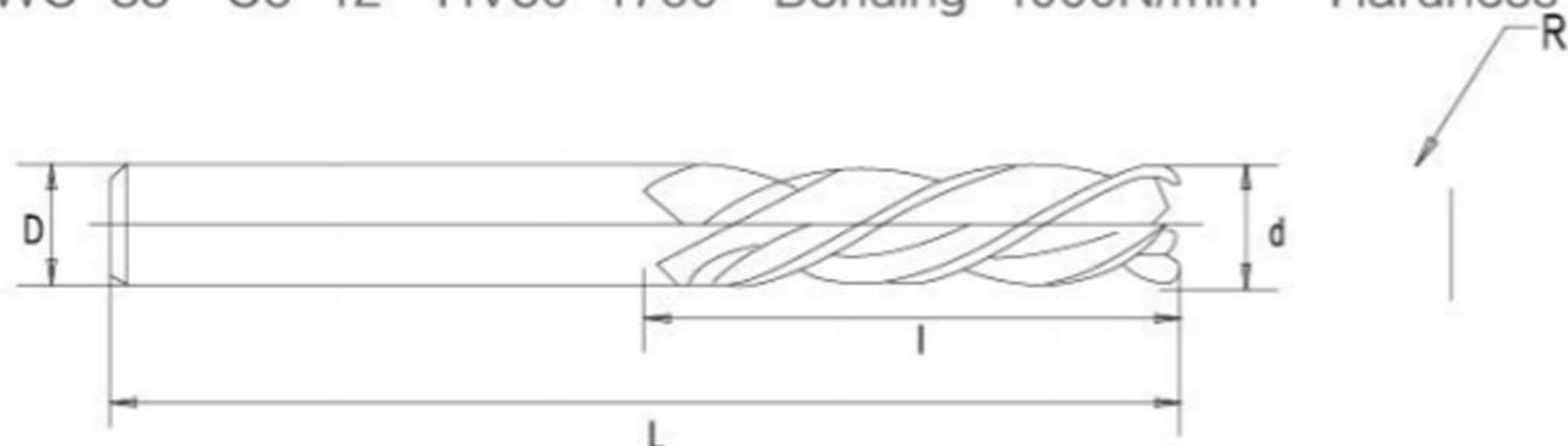
### Workpiece Material

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
| ●                                     | ●                  | ○                     |                       | ○                      |                      |                        |                                     |                        |

● Most Suitable ○ Suitable

# HRC 55 Carbide Corner Radius End Mill 4 Flutes

WC=88 Co=12 HV30=1760 Bending=4000N/mm<sup>2</sup> Hardness 92.8 Particle=0.6  $\mu$ m



4 flute

| Cutting Diameter | Shank Diameter | Length of Cut | Overall Length | Radius Size |
|------------------|----------------|---------------|----------------|-------------|
| 1/8              | 1/8            | 0.5           | 1.5            | 0.01        |
| 1/8              | 1/8            | 0.5           | 1.5            | 0.02        |
| 1/8              | 1/8            | 0.5           | 1.5            | 0.03        |
| 3/16             | 3/16           | 0.625         | 2              | 0.01        |
| 3/16             | 3/16           | 0.625         | 2              | 0.02        |
| 3/16             | 3/16           | 0.625         | 2              | 0.03        |
| 3/16             | 3/16           | 0.625         | 2              | 0.06        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.01        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.02        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.03        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.06        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.09        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.01        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.02        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.03        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.06        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.09        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.125       |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.01        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.02        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.03        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.06        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.09        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.125       |
| 1/2              | 1/2            | 1             | 3              | 0.01        |
| 1/2              | 1/2            | 1             | 3              | 0.02        |
| 1/2              | 1/2            | 1             | 3              | 0.03        |
| 1/2              | 1/2            | 1             | 3              | 0.06        |
| 1/2              | 1/2            | 1             | 3              | 0.09        |
| 1/2              | 1/2            | 1             | 3              | 0.125       |
| 1/2              | 1/2            | 1             | 3              | 0.187       |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.01        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.02        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.03        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.06        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.09        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.125       |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.187       |
| 3/4              | 3/4            | 1.5           | 4              | 0.01        |
| 3/4              | 3/4            | 1.5           | 4              | 0.02        |
| 3/4              | 3/4            | 1.5           | 4              | 0.03        |
| 3/4              | 3/4            | 1.5           | 4              | 0.06        |
| 3/4              | 3/4            | 1.5           | 4              | 0.09        |
| 3/4              | 3/4            | 1.5           | 4              | 0.125       |
| 3/4              | 3/4            | 1.5           | 4              | 0.187       |



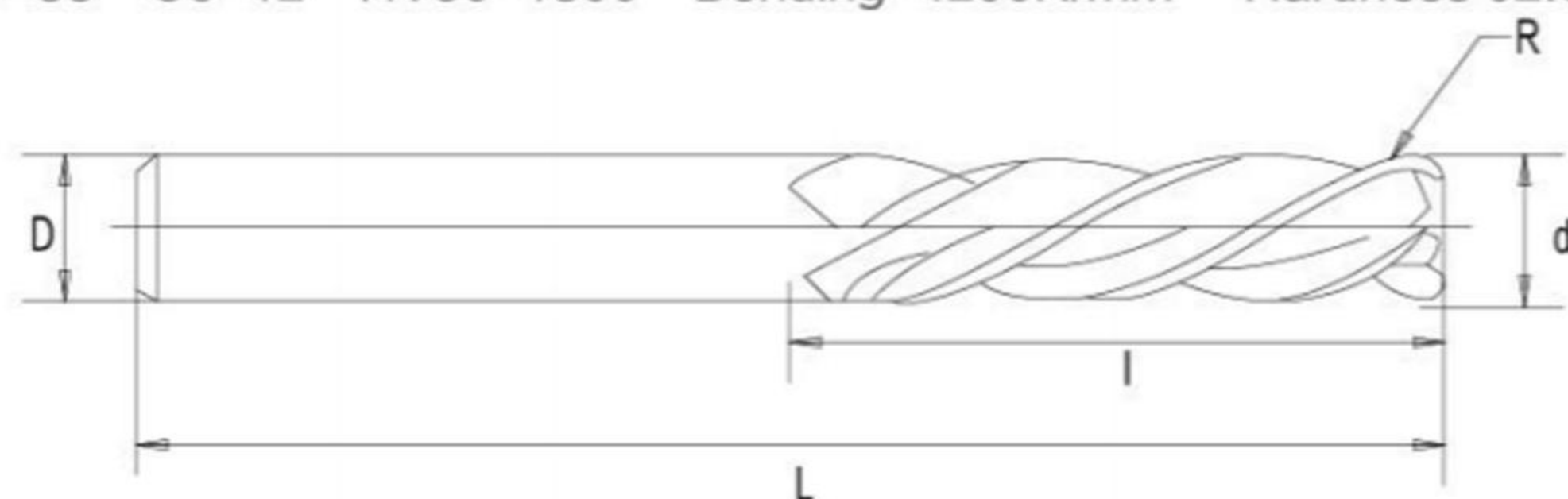
### Workpiece Material

|                                       |                    |                       |                       |                        |                      |                        |                                     |                        |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
| ●                                     | ●                  | ●                     |                       | ○                      |                      |                        | ○                                   | ○                      |

● Most Suitable ○ Suitable

# HRC 65 Carbide Corner Radius End Mill 4 Flutes

WC=88 Co=12 HV30=1800 Bending=4200N/mm<sup>2</sup> Hardness 92.6 Particle=0.4  $\mu$ m



4 flute



| Cutting Diameter | Shank Diameter | Length of Cut | Overall Length | Radius Size |
|------------------|----------------|---------------|----------------|-------------|
| 1/8              | 1/8            | 0.5           | 1.5            | 0.01        |
| 1/8              | 1/8            | 0.5           | 1.5            | 0.02        |
| 1/8              | 1/8            | 0.5           | 1.5            | 0.03        |
| 3/16             | 3/16           | 0.625         | 2              | 0.01        |
| 3/16             | 3/16           | 0.625         | 2              | 0.02        |
| 3/16             | 3/16           | 0.625         | 2              | 0.03        |
| 3/16             | 3/16           | 0.625         | 2              | 0.06        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.01        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.02        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.03        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.06        |
| 1/4              | 1/4            | 0.75          | 2.5            | 0.09        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.01        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.02        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.03        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.06        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.09        |
| 5/16             | 5/16           | 0.813         | 2.5            | 0.125       |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.01        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.02        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.03        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.06        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.09        |
| 3/8              | 3/8            | 0.875         | 2.5            | 0.125       |
| 1/2              | 1/2            | 1             | 3              | 0.01        |
| 1/2              | 1/2            | 1             | 3              | 0.02        |
| 1/2              | 1/2            | 1             | 3              | 0.03        |
| 1/2              | 1/2            | 1             | 3              | 0.06        |
| 1/2              | 1/2            | 1             | 3              | 0.09        |
| 1/2              | 1/2            | 1             | 3              | 0.125       |
| 1/2              | 1/2            | 1             | 3              | 0.187       |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.01        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.02        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.03        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.06        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.09        |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.125       |
| 5/8              | 5/8            | 1.25          | 3.5            | 0.187       |
| 3/4              | 3/4            | 1.5           | 4              | 0.01        |
| 3/4              | 3/4            | 1.5           | 4              | 0.02        |
| 3/4              | 3/4            | 1.5           | 4              | 0.03        |
| 3/4              | 3/4            | 1.5           | 4              | 0.06        |
| 3/4              | 3/4            | 1.5           | 4              | 0.09        |
| 3/4              | 3/4            | 1.5           | 4              | 0.125       |
| 3/4              | 3/4            | 1.5           | 4              | 0.187       |



### Workpiece Material

| 碳钢, 合金钢, 铸铁<br>Carbon Steel Cast Iron | 合金钢<br>Alloy Steel | 高硬钢<br>Hardened Steel | 高硬钢<br>Hardened Steel | 不锈钢<br>Stainless Steel | 铜合金<br>Copper Alloys | 铝合金<br>Aluminum Alloys | 高温合金<br>Heat Resistant Super Alloys | 钛合金<br>Titanium Alloys |
|---------------------------------------|--------------------|-----------------------|-----------------------|------------------------|----------------------|------------------------|-------------------------------------|------------------------|
| < 35HRC                               | 35-48HRC           | 46-55HRC              | 55-60HRC              |                        |                      |                        |                                     |                        |
| ●                                     | ●                  | ●                     |                       | ○                      |                      |                        | ○                                   | ○                      |

● Most Suitable ○ Suitable

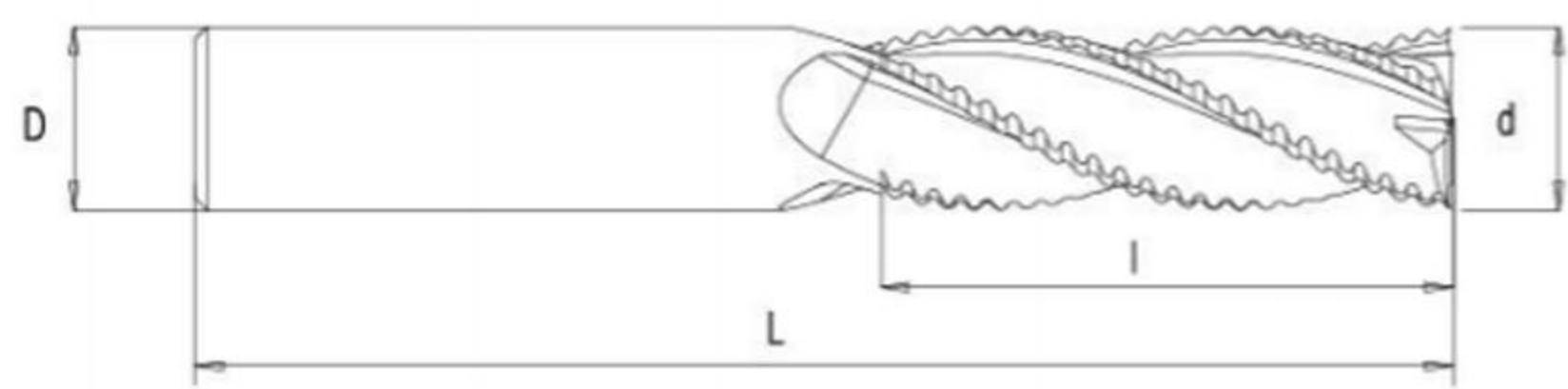


# **Roughing End mill**



# HRC 55 Carbide Roughing End Mill For Aluminum 3 Flutes

WC=88 Co=12 HV30=1760 Bending=4000N/mm<sup>2</sup> Hardness 92.8 Particle=0.6  $\eta$ m



3 flute

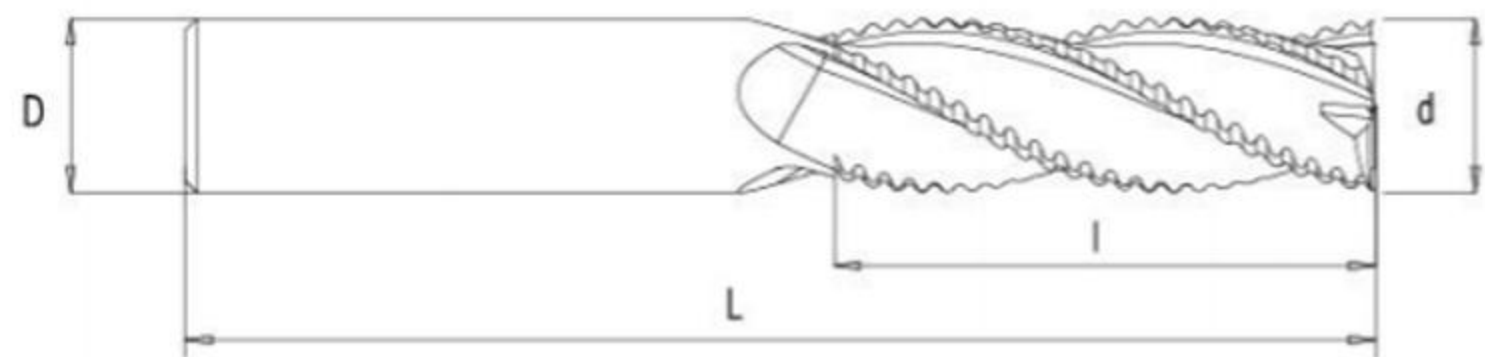


|          | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length | Price   |
|----------|------------------|----------------|---------------|----------------|---------|
| Standard | 1/8              | 1/8            | 0.5           | 1.5            | \$3.51  |
|          | 3/16             | 3/16           | 0.625         | 2              | \$6.54  |
|          | 1/4              | 1/4            | 0.75          | 2.5            | \$10.99 |
|          | 5/16             | 5/16           | 0.813         | 2.5            | \$15.51 |
|          | 3/8              | 3/8            | 0.875         | 2.5            | \$20.74 |
|          | 1/2              | 1/2            | 1             | 3              | \$37.88 |
|          | 5/8              | 5/8            | 1.25          | 3.5            | \$62.98 |
|          | 3/4              | 3/4            | 1.5           | 4              | \$97.73 |



# HRC 55 Carbide Roughing End Mill For Steel 4 Flutes

WC=88 Co=12 HV30=1700 Bending=4000N/mm<sup>2</sup> Hardness 91.8 Particle=0.6  $\eta$ m



4 flute



|          | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length | Price    |
|----------|------------------|----------------|---------------|----------------|----------|
| Standard | 1/8              | 1/8            | 0.5           | 1.5            | \$4.21   |
|          | 3/16             | 3/16           | 0.625         | 2              | \$7.84   |
|          | 1/4              | 1/4            | 0.75          | 2.5            | \$13.19  |
|          | 5/16             | 5/16           | 0.813         | 2.5            | \$18.61  |
|          | 3/8              | 3/8            | 0.875         | 2.5            | \$24.89  |
|          | 1/2              | 1/2            | 1             | 3              | \$45.46  |
|          | 5/8              | 5/8            | 1.25          | 3.5            | \$75.57  |
|          | 3/4              | 3/4            | 1.5           | 4              | \$117.28 |



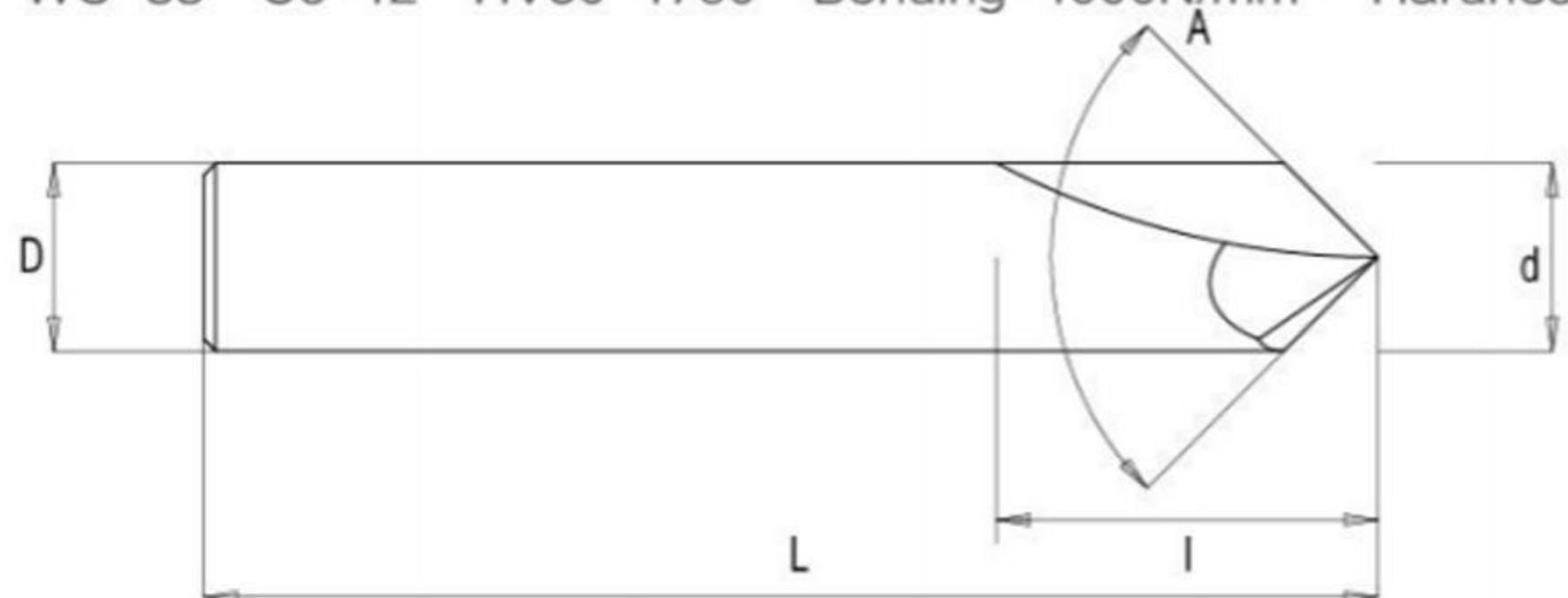


# Spot Drills



# HRC 55 Carbide Spot Drills For Aluminum 2 Flutes

WC=88 Co=12 HV30=1760 Bending=4000N/mm<sup>2</sup> Hardness 92.8 Particle=0.6 μm



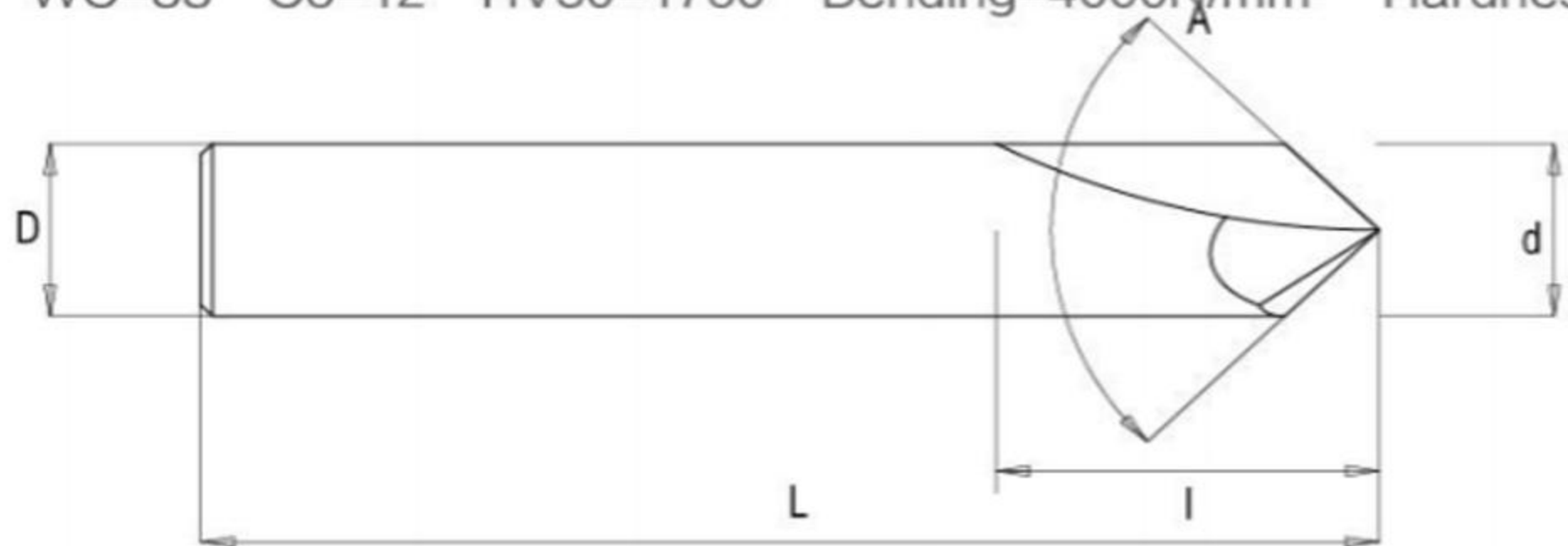
2 flute

|          | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length | Price   |
|----------|------------------|----------------|---------------|----------------|---------|
| Standard | 1/8              | 1/8            | 0.5           | 1.5            | \$2.80  |
|          | 3/16             | 3/16           | 0.625         | 2              | \$5.23  |
|          | 1/4              | 1/4            | 0.75          | 2.5            | \$8.79  |
|          | 5/16             | 5/16           | 0.813         | 2.5            | \$12.41 |
|          | 3/8              | 3/8            | 0.875         | 2.5            | \$16.59 |
|          | 1/2              | 1/2            | 1             | 3              | \$30.31 |
|          | 5/8              | 5/8            | 1.25          | 3.5            | \$50.38 |
|          | 3/4              | 3/4            | 1.5           | 4              | \$78.18 |



# HRC 55 Carbide Spot Drills For Steel 2 Flutes

WC=88 Co=12 HV30=1760 Bending=4000N/mm<sup>2</sup> Hardness 92.8 Particle=0.6 μm



2 flute

|          | Cutting Diameter | Shank Diameter | Length of Cut | Overall Length | Price   |
|----------|------------------|----------------|---------------|----------------|---------|
| Standard | 1/8              | 1/8            | 0.5           | 1.5            | \$3.08  |
|          | 3/16             | 3/16           | 0.625         | 2              | \$5.75  |
|          | 1/4              | 1/4            | 0.75          | 2.5            | \$9.67  |
|          | 5/16             | 5/16           | 0.813         | 2.5            | \$13.65 |
|          | 3/8              | 3/8            | 0.875         | 2.5            | \$18.25 |
|          | 1/2              | 1/2            | 1             | 3              | \$33.34 |
|          | 5/8              | 5/8            | 1.25          | 3.5            | \$55.42 |
|          | 3/4              | 3/4            | 1.5           | 4              | \$86.00 |



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Phone Number: +86 13915092693

Whats APP: +86 13915092693

Email: [Linda@czqttools.com](mailto:Linda@czqttools.com)

Website: [www.czqttools.com](http://www.czqttools.com)

