Member IMC Group

IMCO

Power. Precision. Performance.

[METALMORPHOSIS]

BREAKING BARRIERS IN MACHINING

POW•R•PATH
POW•R•FEED
POW•R•ARC
enDURO
STREAKERS
OMEGA-6
INCONEX
truCORE

THE METALMORPHOSIS IS UNDERWAY.

The evidence: New possibilities in metalworking are emerging faster than ever. Continuous improvements in tooling and machining techniques are cutting away yesterday's limitations. Uniquely optimized designs are turning yesterday's challenges into today's achievements and tomorrow's opportunities.

The metalcutting industry is evolving – a metalmorphosis – driven by the same spirit of exploration and innovation that drives us. At IMCO, we design and redesign tools to achieve what once seemed impossible. True to our mission, everything we do is to provide the tools you need to get even more from your operation than you ever thought possible . . . and give your future the Class A finish you deserve.

Member IMC Group

IMCO

Power. Precision. Performance.

WHAT'S NEW?

TOOLBOT AT YOUR SERVICE

PAGE 7

An outstanding tool developed for your bottom line. In four easy steps, this online tool – available 24/7/365 – calculates accurate speed and feed recommendations. It's fast. It's free. It's Toolbot, the easiest way to save tools, time and money. *Check it before you wreck it.*

A NEW ERA AT IMCO

PAGE 13

Big ideas can begin anywhere, but they need room to grow. IMCO's HQ expansion and renovation gives us the room we need to continue developing your cutting tools of the future. More equipment means better production efficiency. And with additional space for future growth!

3RD GENERATION POW•R•FEED

PAGE 36

Ramp, slot and helically enter your parts at fantastic feed rates with the POW•R•FEED M936 series. Designed for *very* aggressive traditional tool paths, the M936 allows for increased step-overs, deeper cuts and faster cycle times to increase your productivity.

POW•R•ARC A1 IS HERE

PAGE 46

Designed for 3D contouring and chamfering at the fastest possible speeds and feeds, POW•R•ARC A1 ball-nose end mills rough and finish in hardened metals up to 62 HRc. No need to stock separate finishing tools – ideal for 5-axis machining. This is the game-changer you've been waiting for.

MADE IN THE USA

PICTORIAL INDEX

POW•R•PATH®

Designed specifically for high-efficiency machining in a wide variety of materials. It's the "go-to" tool when using today's advanced machining techniques. Comes in 7-, 9-, 11- and 13-flute options for ferrous materials, and a 5-flute option for non-ferrous materials.

POW•R•PATH IP Series Information 14

POW•R•PATH IPT7 | 7-Flute • AlCrNX • Square end and corner radius for HEM in a wide range of materials 16

POW•R•PATH IPC7 | 7-Flute • AlCrNX • CMS • Corner radius for HEM in a wide range of materials 18

POW•R•PATH IPT9 | 9-Flute • AlCrNX • Corner radius for HEM in a wide range of materials 20

POW•R•PATH IPC9 | 9-Flute • AlCrNX • CMS • Corner radius for HEM in a wide range of materials 22

POW•R•PATH IPT11 | 11-Flute • AlCrNX • Corner radius for HEM in a wide range of materials 24

POW•R•PATH IPC11 | 11-Flute • AlCrNX • CMS • Corner radius for HEM in a wide range of materials 25

POW•R•PATH IPT13 | 13-Flute • AlCrNX • Corner radius for HEM in a wide range of materials 26

POW•R•PATH IPC13 | 13-Flute • AlCrNX • CMS • Corner radius for HEM in a wide range of materials 27

POW•R•PATH APT5 | 5-Flute • taC • Square end and corner radius for HEM in aluminum 28

POW•R•PATH APT5N | 5-Flute • taC • Square end and corner radius w/neck relief for HEM in aluminum 30

POW•R•PATH APC5 | 5-Flute • taC • CMS • Square end and corner radius for HEM in aluminum 31

POW•R•PATH AFC5 | 5-Flute • taC • Corner radius for deep-wall finishing in aluminum 32

POW•R•PATH IFC5 | 5-Flute • taC • Corner radius for deep-wall finishing in a wide range of materials 32

POW•R•FEED® M9

Brings high performance to 4- and 6-flute end mills with a vibration-dampening design for roughing, pocketing and slotting in many materials in traditional cuts.

POW•R•FEED M9 Series Information 34

POW•R•FEED M936 | 6-Flute • AlTiSN • Square end and corner radius for machining in a wide range of materials 36

POW•R•FEED M936C | 6-Flute • AlTiSN • CMS • Corner radius for machining in a wide range of materials 38

POW•R•FEED M924 | 4-Flute • AlCrNX • Square end, corner radius and ball nose for machining in a wide range of materials 40

POW•R•FEED M924N | 4-Flute • AlCrNX • Corner radius and ball nose w/neck relief for machining in a wide range of materials 42

POW•R•FEED M924C | 4-Flute • AlCrNX • CMS • Square end and corner radius for machining in a wide range of materials 44

POW•R•FEED M904 | 4-Flute • AlTiNX • Square end, corner radius and ball nose for machining in a wide range of materials 45

POW•R•ARC A1

Designed for 3D contouring and chamfer milling at the fastest possible speeds and feeds, POW•R•ARC cuts and finishes in hardened metals up to 62 HRc. No need to stop and change tools for finishing. No need to stock separate finishing tools.

POW•R•ARC A1 Series Information 46

POW•R•ARC A106 | 6-Flute • AlTiSN • Ball nose for machining in a wide range of materials 48

POW•R•ARC A106N | 6-Flute • AlTiSN • Ball nose w/neck relief for machining in a wide range of materials 49

POW•R•ARC A108 | 8-Flute • AlTiSN • Ball nose for machining in a wide range of materials 50

POW•R•ARC A108N | 8-Flute • AlTiSN • Ball nose w/neck relief for machining in a wide range of materials 51

enDURO® M5

A super versatile tool that machines in both traditional and HEM tool paths. 5- and 7-flute designs for roughing and finishing in a wide range of materials.

enDURO M5 Series Information 52

enDURO M525 | 5-Flute • AlCrNX • Square end, corner radius and ball nose for machining in titanium and stainless steels 54

enDURO M525N | 5-Flute • AlCrNX • Square end, corner radius and ball nose w/neck relief for machining in titanium and stainless steels 56

enDURO M525C | 5-Flute • AlCrNX • CMS • Square end and corner radius for machining in titanium and stainless steels 57

enDURO M527 | 7-Flute • AlCrNX • Square end and corner radius for machining in titanium and stainless steels 58

enDURO M527N | 7-Flute • AlCrNX • Corner radius w/neck relief for machining in titanium and stainless steels 58

enDURO M527C | 7-Flute • AlCrNX • CMS • Square end and corner radius for machining in titanium and stainless steels 59

STREAKERS® M2

The most complete family of 2- and 3-flute end mills for high-performance machining in aluminum. Choose from legacy M202 and M203 mills, the rugged second-generation M223 mills and M233 roughers, or the premium performance of the M213, the newest cutter in the series.

STREAKERS M2 Series Information 60

STREAKERS M213 | 3-Flute • High polish • Square end, corner radius and ball nose for high-performance machining in aluminum 62

STREAKERS M213N | 3-Flute • High polish • Square end, corner radius and ball nose w/neck relief for machining in aluminum 64

STREAKERS M213C | 3-Flute • High polish • CMS • Square end, corner radius and ball nose for high-performance machining in aluminum 65

STREAKERS M223 | 3-Flute • ZrN • Square end, corner radius and ball nose for high-performance machining in aluminum 66

STREAKERS M223N | 3-Flute • Square end, corner radius and ball nose w/neck relief for high-performance machining in aluminum 68

STREAKERS M233 | 3-Flute • ZrN • Corn cob rougher • Corner radius for high-performance machining in aluminum 70

STREAKERS M203 | 3-Flute • Non-coated • Square end and corner radius for machining in aluminum 72

STREAKERS M203N | 3-Flute • Non-coated • Square end w/neck relief for machining in aluminum 73

STREAKERS M202 | 2-Flute • Non-coated • Square end, corner radius and ball nose for machining in aluminum 74

STREAKERS M202N | 2-Flute • Non-coated • Square end w/neck relief for machining in aluminum 75

OMEGA-6® M7

Advanced geometry and coating for hard milling applications. High-helix 5- and 6-flute end mills, great for machining materials > 48 HRc and for finish milling in a wide range of materials.

OMEGA-6 M7 Series Information 76

OMEGA-6 M725/M726 | 5- or 6-Flute • AlTiNX • Square end and corner radius for machining in hardened materials 78

OMEGA-6 M725N/M726N | 5- or 6-Flute • AlTiNX • Corner radius w/neck relief for machining in hardened materials 80

OMEGA-6 M706 | 6-Flute • AlTiN • Square end and corner radius for machining in hardened materials 82

PICTORIAL INDEX

OMEGA-6 M706N | 6-Flute • AlTiN • Square end and corner radius w/neck relief for machining in hardened materials 83

INCONEX® M8

Unique design for long tool life when machining high-temp alloys. 6 flutes for longer tool life in traditional cuts in difficult-to-machine materials.

INCONEX M8 Series Information 84

INCONEX M806 | 6-Flute • AlCrNX • Corner radius for machining in high-temp alloys 86

INCONEX M806N | 6-Flute • AlCrNX • Corner radius w/neck relief for machining in high-temp alloys 88

truCORE® E

Traditional 2-, 3- and 4-flute end mills for reliable and consistent performance in general machining.

truCORE E Series Information 90

truCORE E14 AlTiN | 4-Flute • AlTiN • Square end, corner radius and ball nose for general machining 92

truCORE E14 TiCN | 4-Flute • TiCN • Square end and ball nose for general machining 95

truCORE E14 TiN | 4-Flute • TiN • Square end for general machining 96

truCORE E14 Non-coated | 4-Flute • Non-coated • Square end and ball nose for general machining 97

truCORE E24 AlTiN | 4-Flute • AlTiN • Square end and ball nose for general machining 99

truCORE E13 AlTiN | 3-Flute • AlTiN • Square end and ball nose for general machining 100

truCORE E13 Non-coated | 3-Flute • Non-coated • Square end for general machining 102

truCORE E12 AlTiN | 2-Flute • AlTiN • Square end and ball nose for general machining 104

truCORE E12 Non-coated | 2-Flute • Non-coated • Square end and ball nose for general machining 106

Tech Resources 108

Choose the Right Tool for Your Job 110

HEM Slotting 112

Facing 112

Straight-Line Ramp Adjustments 113

Creating an Entry Hole Using a Helical Ramp 114

Adjustments for Long-Reach Applications 116

Eliminating Wall Taper When Finishing 116

Choosing a Tool Holder for HEM 117

Determining Power Requirements 117

Chip Thinning and Light Cuts 117

Adjustments for Ball-Nose End Mills 118

Adding a Weldon Flat 120

Conversions for Fractional and Metric Units 120

Common Machining Formulas 120

POW•R•PATH IP Series Speeds and Feeds

- **POW•R•PATH IP7** 122
- **POW•R•PATH IP9** 124
- **POW•R•PATH IP11** 126
- **POW•R•PATH IP13** 128
- **POW•R•PATH APT5/APC5** 130
- **POW•R•PATH AFC5/IFC5** 131

POW•R•FEED M9 Series Speeds and Feeds

- **POW•R•FEED M936** 132
- **POW•R•FEED M924** 136
- **POW•R•FEED M904** 138

POW•R•ARC A1 Series Speeds and Feeds

- **POW•R•ARC A106 / A108** 140

enDURO M5 Series Speeds and Feeds

- **enDURO M525** 144
- **enDURO M527** 146

STREAKERS M2 Series Speeds and Feeds

- **STREAKERS M213** 148
- **STREAKERS M213N** 149
- **STREAKERS M223** 150
- **STREAKERS M233** 152
- **STREAKERS M203 / M202** 154

OMEGA-6 M7 Series Speeds and Feeds

- **OMEGA-6 M725 / M726** 156
- **OMEGA-6 M706** 157

INCONEX M8 Series Speeds and Feeds

- **INCONEX M806** 158

truCORE E Series Speeds and Feeds

- **truCORE E Series** 160

Part Number Conversions 162

Decimal Equivalent Chart 178

Member IMC Group

IMCO

Power. Precision. Performance.

Toolbot

CHECK IT BEFORE YOU WRECK IT.

How do you make the most of your operation?

Ask Toolbot – the FREE, easy-to-use online tool from IMCO.

With Toolbot, the answers are at your fingertips!

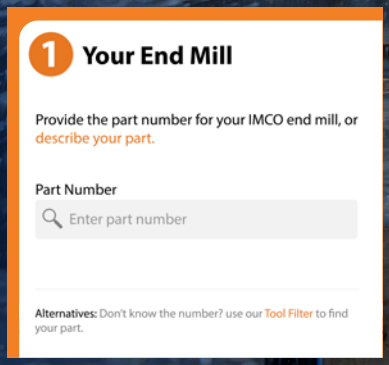
Get accurate dynamic speed and feed recommendations based on your specific operation. Toolbot walks you through it: **Four easy steps** and you're there.

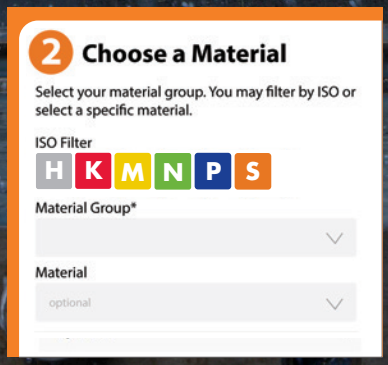
Go to imcousa.com/toolbot and sign in.

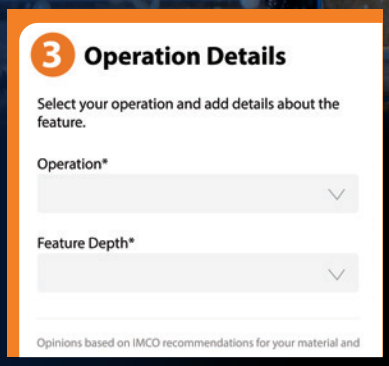
1. Input your end mill part number or, if you don't know it, just answer the filter questions.
2. Input the material group and/or specific material of your workpiece.
3. Add select details about your operation and feature depths.
4. Input your machine capabilities (maximum spindle power, maximum feed rate, maximum rpm).

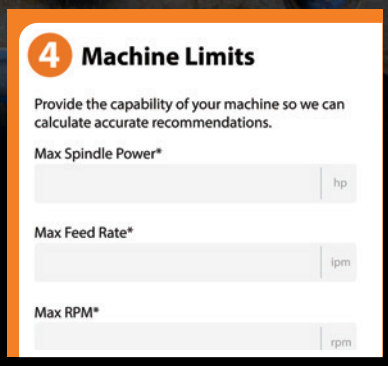
Now, hit "calculate." Toolbot generates exact speed and feed recommendations for your specific operation, material, workpiece and machining center. You're ready to rock and roll!

Toolbot:
Real-time answers for optimum machining and best results.









Scan the QR code to try Toolbot today.

TOOL SELECTION GUIDE

Our tool selection guide helps you pick the best tool for the material and the programming – high-efficiency machining or traditional. Detailed speed, feed and tool engagement information can be found in the Tech Resources section starting on page 108.

ISO CODE	WORK MATERIAL	TYPE OF CUT	POW•R•PATH IPT7	IPC7	IPT9	IPC9	IPT11	IPC11	IPT13	IPC13
K	Cast Iron - Gray	Traditional Roughing								
		Traditional Finishing								
		HEM	●●●●	●●●	●●●●	●●●	●●●●	●●●	●●●●	●●●
	Cast Iron - Malleable	Traditional Roughing								
		Traditional Finishing	●●●		●●●					
		HEM	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
P	Low Carbon Steels < 48 HRc	Traditional Roughing								
		Traditional Finishing	●●●		●●●					
		HEM	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
	Medium Carbon Steels < 48 HRc	Traditional Roughing								
		Traditional Finishing	●●●		●●●					
		HEM	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
	Tool & Die Steels < 48 HRc	Traditional Roughing								
		Traditional Finishing	●●●		●●●					
		HEM	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
H	Tool & Die Steels 48 - 62 HRc	Traditional Roughing								
		Traditional Finishing								
M	Austenitic Stainless Steels	Traditional Roughing								
		Traditional Finishing	●●●		●●●					
		HEM	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
	Martensitic Stainless Steels	Traditional Roughing								
		Traditional Finishing	●●●		●●●					
		HEM	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
	PH Stainless Steels	Traditional Roughing								
		Traditional Finishing	●●●		●●●					
		HEM	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
S	Titanium Alloys	Traditional Roughing								
		Traditional Finishing	●●●		●●●					
		HEM	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
	Hi-Temperature Alloys	Traditional Roughing								
		Traditional Finishing	●●●		●●●					
		HEM	●●●●		●●●		●●		●	
N	Aluminum Alloys	Traditional Roughing								
		Traditional Finishing								
		HEM								
	Copper Alloys, Brass, Bronze	Traditional Roughing								
		Traditional Finishing								
	Composites, Plastics, Fiberglass	Traditional Roughing								
		Traditional Finishing								

PERFORMANCE LEVELS: ●●●● **Maximum** ●●● **Superior** ●● **Excellent** ● **Good**

POW•R•PATH				POW•R•FEED				
APT5	APC5	AFC5	IFC5	M936	M936C	M924	M924C	M904
				●●●●	●●●	●●●		●●
			●●●●	●●●●	●●●	●		●
				●●●	●●●			
				●●●●	●●●●	●●●		●●
			●●●●	●●●●	●●●●	●		●
				●●●	●●●			
				●●●●	●●●●	●●●	●●	●●
			●●●●	●●●●	●●●●	●●	●●	●
				●●●	●●●			
				●●●●	●●●●	●●●	●●	●
			●●●●	●●●●	●●●●	●●	●●	●
				●●●	●●●			
				●●●●	●●●	●●●	●●	●
			●●●●	●●●●	●●●	●●	●●	●
				●●●	●●●			
				●●●●	●●●●	●●●	●●	●
			●●●●	●●●●	●●●●	●	●	●
				●●●	●●●			
				●●●●	●●●●	●●●	●●	●
			●●●●	●●●●	●●●●	●	●	●
				●●●	●●●			
				●●●●	●●●●	●●	●	●
			●●●●	●●●●	●●●	●	●	●
				●●●	●●●			
				●●●	●●●			
			●●●●	●●●●	●●●			
				●●●	●●			
●●●	●●●			●●●	●●●			
●●●●		●●●●		●●●●	●●●●			
●●●●	●●●●			●●●	●●●			
				●●●●	●●●●			
		●●●●		●●●●	●●●●	●		●
				●●●	●●●	●●		●●
		●●●●		●●●	●●●	●●		●●

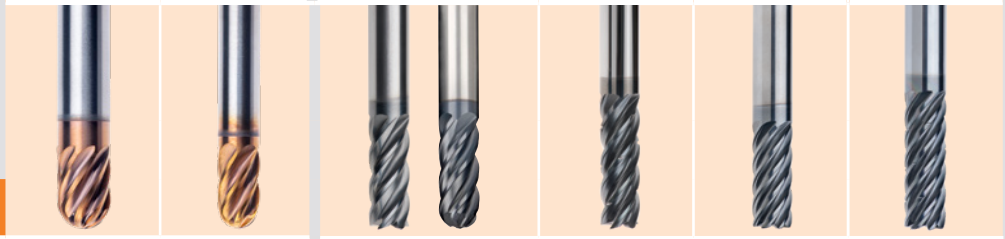
PERFORMANCE LEVELS: ●●●● **Maximum** ●●● **Superior** ●● **Excellent** ● **Good**

TOOL SELECTION GUIDE

Member IMC Group

IMCO

Power. Precision. Performance.



ISO CODE	WORK MATERIAL	TYPE OF CUT	POW•R•ARC A108	POW•R•ARC A106	enDURO M525	enDURO M525C	enDURO M527	enDURO M527C
K	Cast Iron - Gray	Traditional Roughing	●●	●●●	●●●●		●●●	
		Traditional Finishing	●●●●	●●●●	●●		●●●	
		HEM	●●●●	●●●●	●●		●●	
	Cast Iron - Malleable	Traditional Roughing	●●	●●●	●●●●		●●●	
		Traditional Finishing	●●●●	●●●●	●●		●●●	
		HEM	●●●●	●●●●	●●		●●●	
P	Low Carbon Steels < 48 HRc	Traditional Roughing	●●	●●●	●●●●	●●●●	●●●	●●●
		Traditional Finishing	●●●●	●●●●	●●●		●●●	
		HEM	●●●●	●●●●	●●	●●	●●●	●●●
	Medium Carbon Steels < 48 HRc	Traditional Roughing	●●	●●●	●●●●	●●●	●●●	●●●
		Traditional Finishing	●●●●	●●●●	●●		●●●	
		HEM	●●●●	●●●●	●●	●●	●●●	●●●
	Tool & Die Steels < 48 HRc	Traditional Roughing	●●	●●●	●●●●	●●	●●●	●●
		Traditional Finishing	●●●●	●●●●	●●		●●●	
		HEM	●●●●	●●●●	●●	●●	●●●	●●●
H	Tool & Die Steels 48 - 62 HRc	Traditional Roughing	●●●	●●●				
		Traditional Finishing	●●●●	●●●				
M	Austenitic Stainless Steels	Traditional Roughing	●●	●●●	●●●●	●●●●	●●●	●●●
		Traditional Finishing	●●●●	●●●●	●●		●●●	
		HEM	●●●●	●●●●	●●	●●	●●●	●●●
	Martensitic Stainless Steels	Traditional Roughing	●●	●●●	●●●●	●●●●	●●●	●●●
		Traditional Finishing	●●●●	●●●●	●●		●●●	
		HEM	●●●●	●●●●	●●	●●	●●●	●●●
	PH Stainless Steels	Traditional Roughing	●●	●●●	●●●	●●●	●●●	●●●
		Traditional Finishing	●●●●	●●●●	●●●		●●●	
		HEM	●●●●	●●●●	●●	●●	●●●	●●●
S	Titanium Alloys	Traditional Roughing	●●	●●●	●●●●	●●●●	●●●	●●●
		Traditional Finishing	●●●●	●●●●	●●		●●●	
		HEM	●●●●	●●●●	●●	●●	●●●	●●●
	Hi-Temp Alloys	Traditional Roughing	●●	●●●	●●		●●	
		Traditional Finishing	●●●●	●●●	●●		●●	
		HEM	●●●●	●●●●	●●		●●	
N	Aluminum Alloys	Traditional Roughing	●	●●				
		Traditional Finishing	●●●●	●●●●				
		HEM	●●●	●●●●				
	Copper Alloys, Brass, Bronze	Traditional Roughing	●●	●●●				
		Traditional Finishing	●●●●	●●●●				
	Composites, Plastics, Fiberglass	Traditional Roughing	●●	●●●				
		Traditional Finishing	●●●●	●●●●				

PERFORMANCE LEVELS: ●●●● **Maximum** ●●● **Superior** ●● **Excellent** ● **Good**

	STREAKERS						OMEGA-6	
	M213	M213C	M223	M233	M203	M202	M725/726	M706
							●●●●	●●
							●●●●	●●
							●●●●	●●
							●●●●	●●
							●●●●	●●
							●●●●	●●
							●●●●	●●
							●●●●	●●
							●●●●	●●
							●●●●	●●
							●●●●	●●
							●●●●	●●
	●●●●	●●●●	●●●	●●●	●●	●●		
	●●●●	●●●●	●●●		●●	●●		
	●●●	●●●	●●●	●●	●●	●		
	●●●	●●●	●●●●	●●●	●●	●●		
	●●●	●●●	●●●●		●●	●●		
	●●●●	●●●	●●●●	●●●	●●	●●		
	●●●●	●●●	●●●●		●●	●●		

PERFORMANCE LEVELS: ●●●● **Maximum** ●●● **Superior** ●● **Excellent** ● **Good**

Member IMC Group

IMCO

Power. Precision. Performance.

ISO CODE	WORK MATERIAL	TYPE OF CUT	INCONEX M806	truCORE E12	truCORE E13	truCORE E14	truCORE E24
K	Cast iron - Gray	Traditional Roughing			●	●	●
		Traditional Finishing				●	●
		HEM					
	Cast iron - Malleable	Traditional Roughing			●	●	●
		Traditional Finishing				●	●
		HEM					
P	Low carbon steels < 48 HRc	Traditional Roughing		●	●	●	●
		Traditional Finishing				●	●
		HEM					
	Medium carbon steels < 48 HRc	Traditional Roughing			●	●	●
		Traditional Finishing				●	●
		HEM					
	Tool & die steels < 48 HRc	Traditional Roughing				●	●
		Traditional Finishing				●	●
		HEM					
H	Tool & die steels 48 - 62 HRc	Traditional Roughing					
		Traditional Finishing					
M	Austenitic stainless steels	Traditional Roughing				●	●
		Traditional Finishing				●	●
		HEM					
	Martensitic stainless steels	Traditional Roughing		●		●	●
		Traditional Finishing				●	●
		HEM					
	PH stainless steels	Traditional Roughing				●	●
		Traditional Finishing				●	●
		HEM					
S	Titanium alloys	Traditional Roughing				●	●
		Traditional Finishing				●	●
		HEM					
	Hi-temp alloys	Traditional Roughing	●●●●				
		Traditional Finishing					
		HEM					
N	Aluminum alloys	Traditional Roughing		●			
		Traditional Finishing			●		
		HEM					
	Copper alloys, brass, bronze	Traditional Roughing		●	●		
		Traditional Finishing				●	●
	Composites, plastics, fiberglass	Traditional Roughing		●	●	●	●
		Traditional Finishing			●	●	●

PERFORMANCE LEVELS: ●●●● **Maximum** ●●● **Superior** ●● **Excellent** ● **Good**

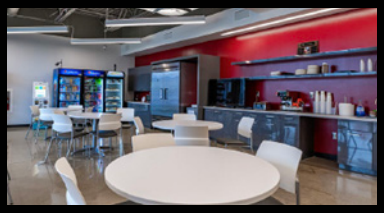
A NEW ERA

Power. Precision. Performance.

IMCO has begun a new era of exploration, innovation and solutions!

We've expanded and updated our facility to align with our advanced technology. his immediately provides a significant increase in our capacity while also allowing space for future growth. Other additions include:

- More than three times the floorspace dedicated to production
- Space to triple the size of our own in-house coating capacity
- Improved production flow for faster order turnaround and increased built-in safety features



- A new Tech Center where we'll conduct product demonstrations for IMCO reps, distributors and end users
- An expanded and updated auditorium/training center with seating for 50, theater-grade screen, complete online access and wi-fi

Learn more by visiting **imcousa.com**, contacting **your IMCO rep/distributor**, or calling us at **800-765-4626**.

MACHINING REBOOTED. PRODUCTIVITY RELOADED.

IMCO's POW•R•PATH IP series end mills will put you on the path of higher productivity. Designed specifically for high-efficiency machining (HEM), this synthesis of unique tool features with HEM tool paths **is sure to increase your metal removal rates while decreasing wear on your tool.**

	IPT7	IPC7	IPT9 IPC9	IPT11 IPC11	IPT13 IPC13	APT5	APT5N	APC5	AFC5	IFC5
NUMBER OF FLUTES	Z7	Z7	Z9	Z11	Z13	Z5	Z5	Z5	Z5	Z5
END TYPES	SQ CR	CR	CR	CR	CR	SQ CR	SQ CR	CR	CR	CR
HELIX ANGLE	40°	40°	36°	34°	30°	35°	35°	35°	35°	35°
COATING	AlCrNX	AlCrNX	AlCrNX	AlCrNX	AlCrNX	taC	taC	taC	taC	AlCrNX
SHANK TYPES	PLAIN WELDON	PLAIN WELDON	PLAIN	PLAIN	PLAIN	PLAIN	PLAIN	PLAIN	PLAIN	PLAIN
APPLICATIONS	HEM, FINISH			HEM		HEM, ROUGH, FINISH			FINISH	FINISH
MATERIAL(S)	K P M S					N				K P M S

Get faster, deeper cuts, higher metal removal rates, longer tool life and the productivity you need with POW•R•PATH IP/AP Series end mills from IMCO. Used as directed, you can expect productivity increases that eclipse anything you've seen before.

POW•R•PATH's unique features are designed specifically for high-efficiency machining (HEM). Working together – POW•R•PATH end mills and HEM methods – each optimizes the other for a quantum leap in performance.

Use Toolbot to calculate dynamic speeds and feed rates for the POW•R•PATH Series by scanning the QR code.

The POW•R•PATH Series provides amazing results for all industries, in any metal and in all HEM machining operations.

POW•R•PATH IP/AP Series mills amplify the benefits of high-efficiency machining:

- Variable geometries for exquisite balance
- Optimized rake and relief angles for superior sharpness and protection against premature wear
- Special flute design for reliable chip evacuation in any material, making it the ultimate cutting tool with universal application
- Five-, seven-, nine-, 11- and 13-flute options for maximum productivity and tool life

POW•R•PATH IPT7

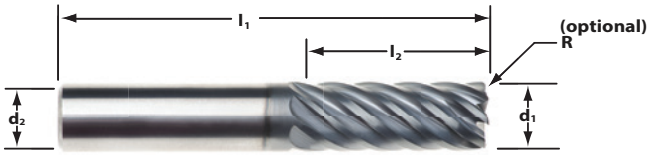
K P M S

For high-efficiency machining in materials from low carbon steels to high-temp alloys.

- 7-flute
- AlCrNX
- Corner radius for HEM in a wide range of materials

The IPT7 is the most versatile POW•R•PATH end mill. It's the "go-to" tool for advanced machining techniques. Engineered specifically for HEM tool paths, the IPT7's unique design runs up to 4.5 x the tool diameter deep at elevated feed rates to maximize metal removal.

NOTE: Not recommended for use with ER collets.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

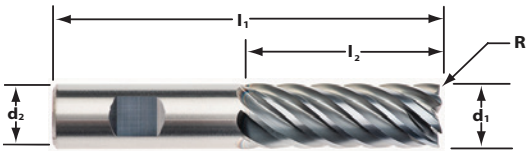
Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.090 CR	.125 CR	.187 CR	.250 CR
3/16	3/16	2	3/8	2	0340036	0340037	0340038	-	-	-	-	-
		3	9/16	2	0340039	0340040	0340041	-	-	-	-	-
		4	3/4	2-1/2	0340042	0340043	0340044	-	-	-	-	-
1/4	1/4	2	1/2	2	0340045	0340046	0340047	0340048	-	-	-	-
		3	3/4	2-1/2	0340049	0340050	0340051	0340052	-	-	-	-
		4	1	3	0340053	0340054	0340055	0340056	-	-	-	-
3/8	3/8	2	3/4	2-1/2	0340057	0340058	0340059	0340060	0340061	-	-	-
		2.5	15/16	2-1/2	0340062	0340063	0340064	0340065	0340066	-	-	-
		3	1-1/8	3	0340067	0340068	0340069	0340070	0340071	-	-	-
		4	1-1/2	3-1/2	0340072	0340073	0340074	0340075	-	-	-	-
1/2	1/2	2	1	3	0340076	-	0340077	0340078	0340079	0340080	-	-
		2.5	1-1/4	3-1/4	0339969	-	0339970	0339971	0339972	0339973	-	-
		3	1-1/2	3-1/2	0340086	-	0340087	0340088	0340089	0340090	-	-
		3.5	1-3/4	4	0339974	-	0339975	0339976	0339977	0339978	-	-
		4	2	4	0340096	-	0340097	0340098	0340099	0340100	-	-
		4.5	2-1/4	4	0340101	-	0340102	0340103	0340104	0340105	-	-
5/8	5/8	2	1-1/4	3-1/2	0340106	-	0340107	0340108	0340109	0340110	0340111	-
		2.5	1-9/16	4	0339979	-	0339980	0339981	0339982	0339983	0339984	-
		3	1-7/8	4	0340118	-	0340119	0340120	0340121	0340122	0340123	-
		3.5	2-3/16	4-1/2	0339985	-	0339986	0339987	-	0339988	-	-
		4	2-1/2	5	0340128	-	0340129	0340130	-	0340131	-	-
3/4	3/4	2	1-1/2	4	0340132	-	0340133	0340134	-	0340135	0340136	0340137
		2.5	1-7/8	4-1/2	0339989	-	0339990	0339991	0339992	0339993	0339994	0339995
		3	2-1/4	5	0340145	-	0340146	0340147	0340148	0340149	0340150	0340151
		3.5	2-5/8	5	0340152	-	0340153	0340154	0340155	0340156	-	-
		4	3	6	0340157	-	0340158	0340159	-	0340160	-	-
1	1	2	2	5	0339996	-	0339997	0339998	0339999	0340000	0340001	0340002
		2.5	2-1/2	5-1/2	0340003	-	0340004	0340005	0340006	0340007	0340008	0340009
		3	3	6	0340175	-	0340176	0340177	-	0340178	-	-
		3.5	3-1/2	6-1/2	0340010	-	0340011	0340012	-	0340013	-	-
		4	4	7	0340183	-	0340184	0340185	-	0340186	-	-

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.5 CR	1.0 CR	1.5 CR	2.0 CR	3.0 CR
6	6	2	12	57	0340230	0340231	-	-	-	-
		3	18	63	0340232	0340233	-	-	-	-
		4	24	75	0340234	0340235	-	-	-	-
8	8	2	16	58	0340556	0340557	-	-	-	-
		3	24	63	0340238	0340239	-	-	-	-
		4	32	75	0340240	0340241	-	-	-	-
10	10	2	20	66	0340242	0340243	0340244	-	-	-
		2.5	25	72	0340245	0340246	0340247	-	-	-
		3	30	75	0340248	0340249	0340250	-	-	-
		4	40	88	0340251	0340252	0340253	-	-	-
12	12	2	24	75	0340558	-	0340559	0340560	0340561	0340562
		2.5	30	83	0340259	-	0340260	0340261	0340262	0340263
		3	36	88	0340563	-	0340564	0340566	0340567	0340568
		3.5	42	93	0340569	-	0340570	0340572	0340573	0340574
		4	48	100	0340274	-	0340275	0340276	0340277	0340278
16	16	2	32	92	0340575	-	0340576	0340578	0340579	0340580
		2.5	40	100	0340581	-	0340582	0340584	0340585	0340586
		3	48	110	0340587	-	0340588	0340590	0340591	0340592
		3.5	56	110	0340294	-	0340295	0340296	0340297	0340298
		4	64	125	0340299	-	0340300	0340301	0340302	0340303
20	20	2	40	104	0340304	-	0340305	0340306	0340307	0340308
		2.5	50	115	0340593	-	0340594	0340596	0340597	0340598
		3	60	125	0340314	-	0340315	0340316	0340317	0340318
		3.5	70	135	0340599	-	0340600	0340602	0340603	0340604
		4	80	150	0340324	-	0340325	0340326	0340327	0340328
25	25	2	50	120	0340329	-	0340330	0340331	0340332	0340333
		2.5	63	135	0340014	-	0340031	0340033	0340034	0340187
		3	75	150	0340339	-	0340340	0340341	0340342	0340343
		3.5	88	165	0340188	-	0340189	0340370	0340371	0340372

D = Tool diameter

IPT7 w/WELDON



mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 1.0 CR	1.5 CR	3.0 CR
12	12	3	36	88	0853437	-	0853438
		3.5	42	93	0853439	-	0853440
		4	48	100	0853441	-	0853445
16	16	3	48	110	-	0853450	0853451
		3.5	56	110	-	0853453	0853454
		4	64	125	-	0853455	0853457
20	20	3	60	125	-	0853458	0853459
		3.5	70	135	-	0853461	0853462
		4	80	150	-	0853464	0853465

Scan to calculate speeds and feed rates with Toolbot

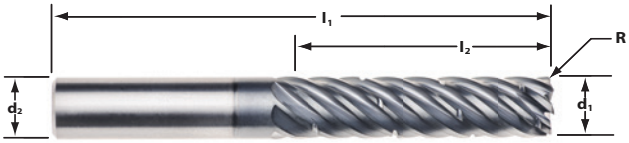
POW•R•PATH IPC7

K P M S

For high-efficiency machining in materials from low carbon steels to hi-temp alloys.

The IPC7 end mill adds the benefits of the unique Chip Management System to the versatility of the seven-flute design. The CMS breaks up long, stringy chips, eliminating chip packing and recutting, and allowing deep, free cutting tool movement in a variety of materials.

Seven flutes provide higher cutting-edge engagement for critical finish quality. The AlCrNX coating protects cutting edges against heat failure and deflects heat from the cutting zone.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .030 CR	.060 CR
3/8	3/8	3	1-1/8	3	0340190	-
		4	1-1/2	3-1/2	0340191	-
1/2	1/2	2.5	1-1/4	3-1/4	0340015	0340016
		3	1-1/2	3-1/2	0340194	0340195
		3.5	1-3/4	4	0340017	0340018
		4	2	4	0340198	0340199
5/8	5/8	2	1-1/4	3-1/2	0340200	0340201
		2.5	1-9/16	4	0340019	0340020
		3	1-7/8	4	0340204	0340205
		3.5	2-3/16	4-1/2	0340021	0340022
		4	2-1/2	5	0340208	0340209
3/4	3/4	2	1-1/2	4	0340210	0340211
		2.5	1-7/8	4-1/2	0340023	0340024
		3	2-1/4	5	0340214	0340215
		3.5	2-5/8	5	0340216	0340217
		4	3	6	0340218	0340219
1	1	2	2	5	0340025	0340027
		2.5	2-1/2	5-1/2	0340028	0340029
		3	3	6	0340224	0340225
		3.5	3-1/2	6-1/2	0340030	0340035
		4	4	7	0340228	0340229

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code 1.0 CR
10	10	3	30	75	0340350
		4	40	88	0340351
12	12	2.5	30	83	0340352
		3	36	88	0340565
		3.5	42	93	0340571
		4	48	100	0340355
16	16	2	32	92	0340577
		2.5	40	100	0340583
		3	48	110	0340589
		3.5	56	110	0340359
		4	64	125	0340360
20	20	2	40	104	0340361
		2.5	50	115	0340595
		3	60	125	0340363
		3.5	70	135	0340601
		4	80	150	0340365
25	25	2	50	120	0340366
		2.5	63	135	0340032
		3	75	150	0340368
		3.5	88	165	0340349

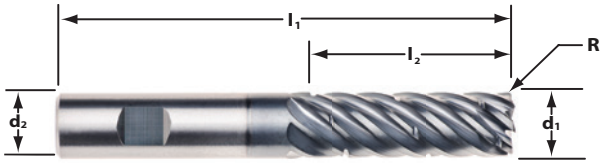
Scan to calculate speeds and feed rates with Toolbot

IPC7 w/WELDON

For high-efficiency machining in materials ranging from low carbon steels to hi-temp alloys.

This model adds the benefits of the Chip Management System to the seven-flute design. The CMS breaks up long, stringy chips, eliminating chip packing and recutting, and allowing deep, free cutting tool movement in a variety of materials.

Order with flat for Weldon-style tool holders.



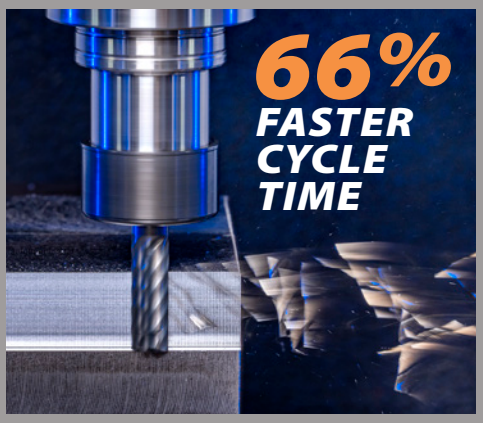
mm: *d1: +0.000 / -0.050 d2: -0.0025 / -0.0100*

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code 1.0 CR
12	12	3	36	88	0853466
		3.5	42	93	0853468
		4	48	100	0853469
16	16	3	48	110	0853472
		3.5	56	110	0853486
		4	64	125	0853489
20	20	3	60	125	0853490
		3.5	70	135	0853498
		4	80	150	0853500

D = Tool diameter

CASE STUDY | *POW•R•PATH IPT7*



In this comparison machining in 4140 (30 HRc) Carbon steel, **the POW•R•PATH IPT7 mill with HEM tool paths cut machining time 66%** vs. a high-performance Brand X 4-flute end mill running traditional paths.

That's three parts with IMCO's IPT7 tool and just one with the Brand X 4-flute.

	4-Flute Mill	**IPT7 Mill**
Roughing:		
Tool dia.	½"	½"
Speed	2674 rpm (350 sfm)	3438 rpm (450 sfm)
Feed	32 ipm (.003 ipt)	154 ipm (.0064 ipt)
Axial DOC	.500"	1.500" (deeper cut)
Radial DOC	.250"	.040" (light step-over)
Slotting:		
Tool dia.	½"	½"
Speed	2292 rpm (300 sfm)	3438 rpm (450 sfm)
Feed	22 ipm (.0024 ipt)	154 ipm (.0064 ipt)
Axial DOC	.500"	1.500" (deeper cut)
Radial DOC	.500"	.040" (light step-over)
Cycle Time	**18.5 min.**	**6.5 min.**

POW•R•PATH IPT9

Z9 | CR | 36° | AlCrNX | PLAIN

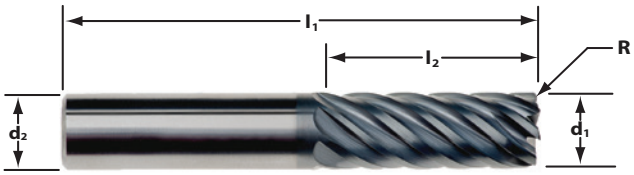
K P M S

For high-efficiency machining in materials from low carbon steels to hi-temp alloys.

The IPT9 POW•R•PATH end mill is engineered specifically for HEM tool paths, with great core strength and nine flutes for increased feed rates and excellent surface finishes. The unique design runs as deep as 3.5 x the tool diameter, generating high metal removal rates.

Nine flutes maximize cutting-edge engagement and enable faster metal removal while leaving a superior finish. AlCrNX coating protects cutting edges against heat failure and deflects heat from the cutting zone.

Also available with IMCO's unique Chip Management System.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.125 CR
1/4	1/4	2	1/2	2	0340488	0340489	-	-
		2.5	5/8	2-1/2	0340490	0340491	-	-
		3	3/4	2-1/2	0340492	0340493	-	-
		3.5	7/8	3	0340494	0340495	-	-
3/8	3/8	2	3/4	2-1/2	0340496	0340497	-	-
		2.5	15/16	2-1/2	0340498	0340499	-	-
		3	1-1/8	3	0340500	0340501	-	-
		3.5	1-5/16	3-1/2	0340502	0340503	-	-
1/2	1/2	2	1	3	-	0340504	0340505	-
		2.5	1-1/4	3-1/4	-	0340506	0340507	-
		3	1-1/2	3-1/2	-	0340508	0340509	-
		3.5	1-3/4	4	-	0340510	0340511	-
5/8	5/8	2	1-1/4	3-1/2	-	0340512	0340513	-
		2.5	1-9/16	4	-	0340514	0340515	-
		3	1-7/8	4	-	0340516	0340517	-
		3.5	2-3/16	4-1/2	-	0340518	0340519	-
3/4	3/4	2	1-1/2	4	-	0340520	0340521	0340522
		2.5	1-7/8	4-1/2	-	0340523	0340524	0340525
		3	2-1/4	5	-	0340526	0340527	0340528
		3.5	2-5/8	5	-	0340529	0340530	0340531
1	1	2	2	5	-	0340532	0340533	0340534
		2.5	2-1/2	5-1/2	-	0340535	0340536	0340537
		3	3	6	-	0340538	0340539	0340540
		3.5	3-1/2	6-1/2	-	0340541	0340542	0340543

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 0.5 CR	1.0 CR	1.5 CR	3.0 CR
6	6	2	12	57	0340787	0340788	-	-
		2.5	15	57	0340789	0340790	-	-
		3	18	63	0340791	0340792	-	-
		3.5	21	75	0340793	0340794	-	-
8	8	2.5	20	63	0340795	0340796	-	-
		3	24	63	0340797	0340798	-	-
		3.5	28	75	0340799	0340800	-	-
10	10	2	20	66	0340801	0340802	-	-
		2.5	25	72	0340803	0340804	-	-
		3	30	75	0340805	0340806	-	-
		3.5	35	88	0340807	0340808	-	-
12	12	2	24	75	-	0340809	0340810	-
		2.5	30	83	-	0340811	0340812	-
		3	36	88	-	0340813	0340814	-
		3.5	42	93	-	0340815	0340816	-
16	16	2	32	92	-	0340817	0340818	-
		2.5	40	100	-	0340819	0340820	-
		3	48	110	-	0340821	0340822	-
		3.5	56	110	-	0340823	0340824	-
20	20	2	40	104	-	0340825	0340826	0340827
		2.5	50	115	-	0340828	0340829	0340830
		3	60	125	-	0340831	0340832	0340833
		3.5	70	135	-	0340834	0340835	0340836
25	25	2	50	120	-	0340837	-	0340838
		2.5	63	135	-	0340839	-	0340840
		3	75	150	-	0340841	-	0340842
		3.5	88	165	-	0340843	-	0340844

D = Tool diameter

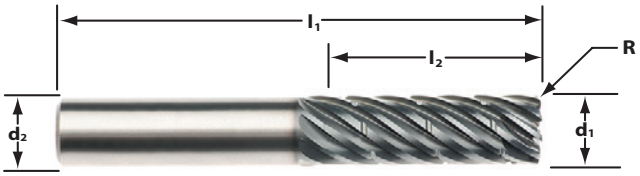
POW•R•PATH IPC9

K P M S

For high-efficiency machining in materials from low carbon steels to hi-temp alloys.

The IPC9 adds the unique Chip Management System to this design. The CMS breaks up long, stringy chips, so they're easily evacuated. No chip packing or recutting; just deep, free cutting tool movement in a variety of materials. AlCrNX coating protects cutting edges against heat failure and deflects heat from the cutting zone.

High-strength flutes provide higher cutting-edge engagement, more metal removal and longer tool life.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .030 CR	.060 CR	.125 CR
1/2	1/2	2	1	3	0340389	-	-
		2.5	1-1/4	3-1/4	0340555	-	-
		3	1-1/2	3-1/2	0340393	0340475	-
		3.5	1-3/4	4	0340544	0340476	-
5/8	5/8	2	1-1/4	3-1/2	0340397	-	-
		2.5	1-9/16	4	0340545	0340477	-
		3	1-7/8	4	0340401	0340478	-
		3.5	2-3/16	4-1/2	0340546	0340479	-
3/4	3/4	2	1-1/2	4	0340405	0340480	0340406
		2.5	1-7/8	4-1/2	0340547	0340481	0340548
		3	2-1/4	5	0340409	0340482	0340410
		3.5	2-5/8	5	0340411	0340483	0340412
1	1	2	2	5	0340549	0340484	0340550
		2.5	2-1/2	5-1/2	0340551	0340485	0340552
		3	3	6	0340417	0340486	0340418
		3.5	3-1/2	6-1/2	0340553	0340487	0340554

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 1.0 CR	1.5 CR	3.0 CR
12	12	2	24	75	0340605	-	-
		2.5	30	83	0340445	-	-
		3	36	88	0340606	0340845	-
		3.5	42	93	0340607	0340846	-
16	16	2	32	92	0340608	-	-
		2.5	40	100	0340609	0340847	-
		3	48	110	0340610	0340848	-
		3.5	56	110	0340457	0340849	-
20	20	2	40	104	0340459	0340850	0340460
		2.5	50	115	0340611	0340851	0340612
		3	60	125	0340463	0340852	0340464
		3.5	70	135	0340613	0340853	0340614
25	25	2	50	120	0340467	-	0340468
		2.5	63	135	0853501	-	0853502
		3	75	150	0340471	-	0340472
		3.5	88	165	0853505	-	0853507

Scan to calculate speeds and feed rates with Toolbot

Member IMC Group

IMCO

Power. Precision. Performance.

WHAT'S IN IT FOR ME?

A lot! IMCO's website was developed especially for end users like you and arranged for the way you think. You get:

- **Everything you need to proceed on each individual tool page**
  - > Model number
  - > Availability
  - > Cost
  - > Detailed specifications and requirements
  - > Speed and feed charts in inches or metric
  - > Toolbot link for running with confidence
  - > Contact information for expert answers
  - > Link to find a distributor
- **24/7 access to Toolbot for easy, precise speed and feed calculations, any time, day or night**
  - > Registered users can share Toolbot results and save securely for future use and documentation
- **Easy online ordering anytime on your account dashboard**
  - > Set up easy reorders
- **Immediate access to product catalogs and IMCO's video gallery, whenever it's convenient for you**
- **One-click entry to IMCO's social media platforms for videos of tools in action, viewer comments and the most up-to-date announcements**
- **Information and forms for quotes, returns, Tech Support and money-saving tool reconditioning services**
- **Current company news, events, trade shows and career opportunities**
- **Contact information for general inquiries and more**

We specialize in making solutions that work **for you.** Visit imcousa.com today by scanning the QR code:

Then contact us and let us know how the website works for you.

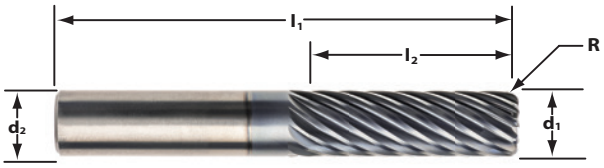
POW•R•PATH IPT11

K P M S

For high-efficiency machining in materials from low carbon steels to hi-temp alloys.

Designed with 11 flutes to yield incredible feed rates. Engineered specifically for HEM tool paths, the IPT11 has a very thick core for extra stability when machining materials as deep as 3.5 x the tool diameter.

NOTE: The IPT11 is not designed for light-duty machines and should only be run in machines with adequate spindle torque and horsepower. Not recommended for use with ER collets.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .030 CR	.060 CR	.125 CR
1/2	1/2	2	1	3	0340615	0340616	-
		2.5	1-1/4	3-1/4	0340617	0340618	-
		3	1-1/2	3-1/2	0340619	0340620	-
		3.5	1-3/4	4	0340621	0340622	-
5/8	5/8	2	1-1/4	3-1/2	0340623	0340624	-
		2.5	1-9/16	4	0340625	0340626	-
		3	1-7/8	4	0340627	0340628	-
		3.5	2-3/16	4-1/2	0340629	0340630	-
3/4	3/4	2	1-1/2	4	0340631	0340632	0340633
		2.5	1-7/8	4-1/2	0340634	0340635	0340636
		3	2-1/4	5	0340637	0340638	0340639
		3.5	2-5/8	5	0340640	0340641	0340642
1	1	2	2	5	0340643	0340644	0340645
		2.5	2-1/2	5-1/2	0340646	0340647	0340648
		3	3	6	0340649	0340650	0340651
		3.5	3-1/2	6-1/2	0340652	0340653	0340654
1-1/4	1-1/4	2	2-1/2	5-1/2	0340655	0340656	0340657
		2.5	3-1/8	6-1/2	0340658	0340659	0340660

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 1.0 CR	1.5 CR	3.0 CR
12	12	2	24	75	0340854	0340855	-
		2.5	30	83	0340856	0340857	-
		3	36	88	0340858	0340859	-
		3.5	42	93	0340860	0340861	-
16	16	2	32	92	0340862	0340863	-
		2.5	40	100	0340864	0340865	-
		3	48	110	0340866	0340867	-
		3.5	56	110	0340868	0340869	-
20	20	2	40	104	0340870	0340871	0340872
		2.5	50	115	0340873	0340874	0340875
		3	60	125	0340876	0340877	0340878
		3.5	70	135	0340879	0340880	0340881

D = Tool diameter

POW•R•PATH IPC11

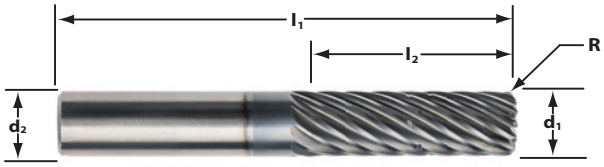
Z11 | CR | 34° | CMS | AlCrNX | PLAIN

K P M S

For high-efficiency machining in materials from low carbon steels to hi-temp alloys.

Add the benefits of the unique Chip Management System to the versatility of the IPT11 design, and the results are great chip control and very high metal removal rates. The CMS breaks up long, stringy chips, which eliminates chip packing and recutting, and allows deep, free cutting tool movement in a variety of materials.

NOTE: The IPT11 is not designed for light-duty machines and should only be run in machines with adequate spindle torque and horsepower.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .030 CR	.060 CR	.125 CR
1/2	1/2	3	1-1/2	3-1/2	0340661	0340662	-
		3.5	1-3/4	4	0340663	0340664	-
5/8	5/8	2.5	1-9/16	4	0340665	0340666	-
		3	1-7/8	4	0340667	0340668	-
		3.5	2-3/16	4-1/2	0340669	0340670	-
3/4	3/4	2	1-1/2	4	0340671	0340672	0340673
		2.5	1-7/8	4-1/2	0340674	0340675	0340676
		3	2-1/4	5	0340677	0340678	0340679
		3.5	2-5/8	5	0340680	0340681	0340682
1	1	2	2	5	0340683	0340684	0340685
		2.5	2-1/2	5-1/2	0340686	0340687	0340688
		3	3	6	0340689	0340690	0340691
		3.5	3-1/2	6-1/2	0340692	0340693	0340694
1-1/4	1-1/4	2	2-1/2	5-1/2	0340695	0340696	0340697
		2.5	3-1/8	6-1/2	0340698	0340699	0340700

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 1.0 CR	1.5 CR	3.0 CR
12	12	3	36	88	0340882	0340883	-
		3.5	42	93	0340884	0340885	-
16	16	2.5	40	100	0340886	0340887	-
		3	48	110	0340888	0340889	-
		3.5	56	110	0340890	0340891	-
20	20	2	40	104	0340892	0340893	0340894
		2.5	50	115	0340895	0340896	0340897
		3	60	125	0340898	0340899	0340900
		3.5	70	135	0340901	0340902	0340903

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

POW•R•PATH IPT13

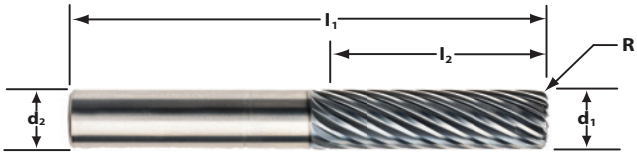
Z13 | CR | 30° | AlCrNX | PLAIN

K P M S

For high-efficiency machining in materials from low carbon steels to hi-temp alloys.

The IPT13 offers the most cutting edges of all POW•R•PATH cutters. The 13 flutes yield incredible metal removal rates and tool life. Engineered specifically for HEM tool paths, the IPT13 has a very thick core for extra stability when machining materials as deep as 3.5 x the tool diameter.

NOTE: The IPT13 is not designed for light-duty machines and should only be run in machines with adequate spindle torque and horsepower.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .030 CR	.060 CR	.125 CR
1/2	1/2	2	1	3	0340701	0340702	-
		2.5	1-1/4	3-1/4	0340703	0340704	-
		3	1-1/2	3-1/2	0340705	0340706	-
		3.5	1-3/4	4	0340707	0340708	-
5/8	5/8	2	1-1/4	3-1/2	0340709	0340710	-
		2.5	1-9/16	4	0340711	0340712	-
		3	1-7/8	4	0340713	0340714	-
		3.5	2-3/16	4-1/2	0340715	0340716	-
3/4	3/4	2	1-1/2	4	0340717	0340718	0340719
		2.5	1-7/8	4-1/2	0340720	0340721	0340722
		3	2-1/4	5	0340723	0340724	0340725
		3.5	2-5/8	5	0340726	0340727	0340728
1	1	2	2	5	0340729	0340730	0340731
		2.5	2-1/2	5-1/2	0340732	0340733	0340734
		3	3	6	0340735	0340736	0340737
		3.5	3-1/2	6-1/2	0340738	0340739	0340740
1-1/4	1-1/4	2	2-1/2	5-1/2	0340741	0340742	0340743
		2.5	3-1/8	6-1/2	0340744	0340745	0340746

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 1.0 CR	1.5 CR	3.0 CR
12	12	2	24	75	0340904	0340905	-
		2.5	30	83	0340906	0340907	-
		3	36	88	0340908	0340909	-
		3.5	42	93	0340910	0340911	-
16	16	2	32	92	0340912	0340913	-
		2.5	40	100	0340914	0340915	-
		3	48	110	0340916	0340917	-
		3.5	56	110	0340918	0340919	-
20	20	2	40	104	0340920	0340921	0340922
		2.5	50	115	0340923	0340924	0340925
		3	60	125	0340926	0340927	0340928
		3.5	70	135	0340929	0340930	0340931

D = Tool diameter

POW•R•PATH IPC13

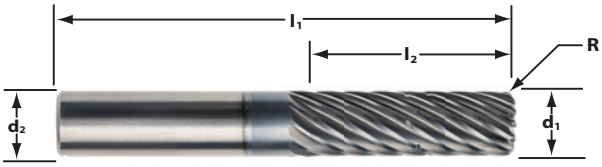
Z13 | CR | 30° | CMS | AlCrNX | PLAIN

K P M S

For high-efficiency machining in materials from low carbon steels to hi-temp alloys.

The unique Chip Management System produces great chip control and very high metal removal rates to make this even more versatile than the IPT13 cutter. The CMS breaks up long, stringy chips, eliminating chip packing and recutting. This allows deep, free cutting tool movement in many different materials.

NOTE: The IPT13 is not designed for light-duty machines and should only be run in machines with adequate spindle torque and horsepower.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .030 CR	.060 CR	.125 CR
1/2	1/2	3	1-1/2	3-1/2	0340747	0340748	-
		3.5	1-3/4	4	0340749	0340750	-
5/8	5/8	2.5	1-9/16	4	0340751	0340752	-
		3	1-7/8	4	0340753	0340754	-
		3.5	2-3/16	4-1/2	0340755	0340756	-
3/4	3/4	2	1-1/2	4	0340757	0340758	0340759
		2.5	1-7/8	4-1/2	0340760	0340761	0340762
		3	2-1/4	5	0340763	0340764	0340765
		3.5	2-5/8	5	0340766	0340767	0340768
1	1	2	2	5	0340769	0340770	0340771
		2.5	2-1/2	5-1/2	0340772	0340773	0340774
		3	3	6	0340775	0340776	0340777
		3.5	3-1/2	6-1/2	0340778	0340779	0340780
1-1/4	1-1/4	2	2-1/2	5-1/2	0340781	0340782	0340783
		2.5	3-1/8	6-1/2	0340784	0340785	0340786

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 1.0 CR	1.5 CR	3.0 CR
12	12	3	36	88	0340932	0340933	-
		3.5	42	93	0340934	0340935	-
16	16	2.5	40	100	0340936	0340937	-
		3	48	110	0340938	0340939	-
		3.5	56	110	0340940	0340941	-
20	20	2	40	104	0340942	0340943	0340944
		2.5	50	115	0340945	0340946	0340947
		3	60	125	0340948	0340949	0340950
		3.5	70	135	0340951	0340952	0340953

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

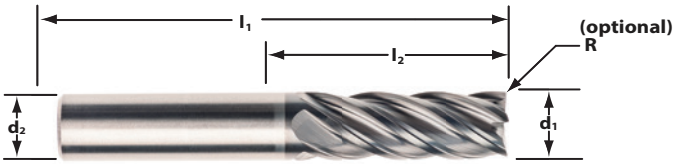
Z5 | SQ | CR | 35° | taC | PLAIN

N

For high-efficiency machining in aluminum alloys.

- 5-flute
- taC coating
- Square end and corner radius for HEM in aluminum

This innovative five-flute design with unique coating actually makes HEM possible in aluminum. It's engineered with a solid core for stability and chip evacuation space for high feed rates. It's designed to avoid chip packing while maximizing your output and tool life. Its unique cutting-edge design, combined with five flutes and the extra-durable taC coating, generates incredibly high metal removal rates.



in: *d1: -0.0001 / -0.0004 d2: -0.0001 / -0.0004*
mm: *d1: -0.0025 / -0.0100 d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.090 CR	.125 CR	.187 CR	.250 CR
1/4	1/4	2	1/2	2	0339588	0339589	0339590	0339591	-	-	-	-
		3	3/4	2-1/2	0339592	0339593	0339594	0339595	-	-	-	-
		4	1	3	0339596	0339597	0339598	-	-	-	-	-
3/8	3/8	2	3/4	2-1/2	0339599	0339600	0339601	0339602	0339603	-	-	-
		3	1-1/8	3	0339604	0339605	0339606	0339607	0339608	-	-	-
		4	1-1/2	3-1/2	0339609	0339610	0339611	-	-	-	-	-
1/2	1/2	2	1	3	0339612	0339613	0339614	0339615	0339616	0339617	-	-
		2.5	1-1/4	3-1/4	0339618	0339619	0339620	0339621	0339622	0339623	-	-
		3	1-1/2	3-1/2	0339624	0339625	0339626	0339627	0339628	0339629	-	-
		3.5	1-3/4	4	0339630	0339631	0339632	0339633	-	0339634	-	-
		4	2	4	0339635	0339636	0339637	0339638	-	0339639	-	-
5/8	5/8	2	1-1/4	3-1/2	0339640	-	0339641	0339642	0339643	0339644	0339645	-
		3	1-7/8	4	0339646	-	0339647	0339648	0339649	0339650	0339651	-
		4	2-1/2	5	0339652	-	0339653	-	-	0339654	-	-
3/4	3/4	2	1-1/2	4	0339655	-	0339656	0339657	0339658	0339659	0339660	0339661
		2.5	1-7/8	4-1/2	0339662	-	0339663	0339664	-	0339665	-	-
		3	2-1/4	5	0339666	-	0339667	0339668	0339669	0339670	0339671	0339672
		3.5	2-5/8	5	0339673	-	0339674	0339675	-	0339676	-	-
		4	3	6	0339677	-	0339678	0339679	0339680	0339681	-	0339682
1	1	2	2	5	0339683	-	0339684	-	-	0339685	0339686	0339687
		3	3	6	0339688	-	0339689	-	-	0339690	0339691	0339692
		4	4	7	0339693	-	0339694	-	-	0339695	-	0339696

D = Tool diameter

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.5 CR	1.0 CR	1.5 CR	2.0 CR	2.5 CR	3.0 CR	4.0 CR
6	6	2	12	57	0339786	0339787	0339788	0339789	-	-	-	-
		3	18	63	0339790	0339791	0339792	0339793	-	-	-	-
		4	24	75	0339794	0339795	0339796	0339797	-	-	-	-
8	8	2	16	58	0339798	0339799	0339800	0339801	-	-	-	-
		3	24	63	0339802	0339803	0339804	0339805	-	-	-	-
		4	32	75	0339806	0339807	0339808	0339809	-	-	-	-
10	10	2	20	66	0339810	0339811	0339812	0339813	0339814	-	-	-
		3	30	75	0339815	0339816	0339817	0339818	0339819	-	-	-
		4	40	88	0339820	0339821	0339822	0339823	0339824	-	-	-
12	12	2	24	75	0339825	0339826	0339827	0339828	0339829	0339830	0339831	-
		2.5	30	83	0339832	0339833	0339834	0339835	0339836	0339837	0339838	-
		3	36	88	0339839	0339840	0339841	0339842	0339843	0339844	0339845	-
		3.5	42	93	0339846	0339847	0339848	0339849	-	-	0339850	-
		4	48	100	0339851	0339852	0339853	0339854	0339855	0339856	0339857	-
16	16	2	32	92	0339858	-	0339859	0339860	0339861	0339862	0339863	0339864
		3	48	110	0339865	-	0339866	0339867	0339868	0339869	0339870	-
		4	64	125	0339871	-	0339872	0339873	0339874	0339875	0339876	0339877
20	20	2	40	104	0339878	-	0339879	0339880	0339881	0339882	0339883	0339884
		2.5	50	115	0339885	-	0339886	0339887	-	-	0339888	-
		3	60	125	0339889	-	0339890	0339891	0339892	0339893	0339894	0339895
		3.5	70	135	0339896	-	0339897	0339898	-	-	0339899	-
		4	80	150	0339900	-	0339901	0339902	0339903	0339904	0339905	0339906

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

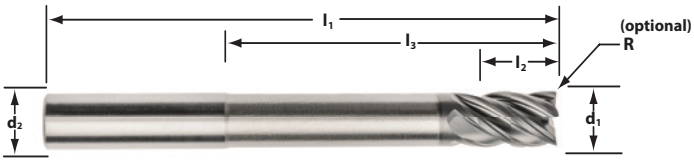
POW•R•PATH APT5N

N

For high-efficiency machining in aluminum alloys.

- 5-flute
- taC coating
- Square end and corner radius w/neck relief for HEM in aluminum

The neck offers the clearance needed for easier work in deeper cavities and machining against tight walls. Great for work in pockets.



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*
mm: *d1: -0.0025 / -0.0100* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.090 CR	.125 CR	.250 CR
1/4	1/4	3/8	7/8	2-1/2	0339697	0339698	0339699	0339700	-	-	-
			1-3/8	3	0339701	0339702	0339703	0339704	-	-	-
			2-1/4	4	0339705	0339706	0339707	-	-	-	-
3/8	3/8	9/16	1-1/16	2-1/2	0339708	0339709	0339710	0339711	0339712	-	-
			1-1/8	3	0339713	0339714	0339715	0339716	0339717	-	-
			2-3/16	4	0339718	0339719	0339720	-	-	-	-
1/2	1/2	3/4	1-1/4	3	0339721	0339722	0339723	0339724	0339725	0339726	-
			2-1/8	4	0339727	0339728	0339729	0339730	0339731	0339732	-
			3-1/8	5	0339733	0339734	0339735	0339736	0339737	0339738	-
			4-1/8	6	0339739	0339740	0339741	0339742	-	0339743	-
5/8	5/8	15/16	1-9/16	4	0339744	-	0339745	0339746	0339747	0339748	-
			2-3/16	5	0339749	-	0339750	0339751	0339752	0339753	-
			3-3/16	6	0339754	-	0339755	-	-	0339756	-
3/4	3/4	1-1/8	1-5/8	4	0339757	-	0339758	0339759	0339760	0339761	0339762
			2-1/4	5	0339763	-	0339764	0339765	0339766	0339767	0339768
			3-1/4	6	0339769	-	0339770	0339771	-	0339772	0339773
1	1	1-1/2	2-3/8	5	0339774	-	0339775	-	-	0339776	0339777
			3-1/8	6	0339778	-	0339779	-	-	0339780	0339781
			4-1/8	7	0339782	-	0339783	-	-	0339784	0339785

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.5 CR	1.0 CR	1.5 CR	2.0 CR	2.5 CR	3.0 CR	4.0 CR
6	6	9	26	63	0339907	0339908	0339909	0339910	-	-	-	-
			32	75	0339911	0339912	0339913	0339914	-	-	-	-
8	8	12	34	75	0339915	0339916	0339917	0339918	-	-	-	-
10	10	15	32	75	0856027	0853402	0853403	0853404	0853405	-	-	-
			42	88	0339919	0339920	0339921	0339922	0339923	-	-	-
			52	100	0339924	0339925	0339926	0339927	0339928	-	-	-
12	12	18	38	88	0339929	0339930	0339931	0339932	0339933	0339934	0339935	-
			50	100	0339936	0339937	0339938	0339939	0339940	0339941	0339942	-
			62	125	0856028	0853406	0853407	0853408	0853409	0853410	0853411	-
16	16	24	50	110	0339943	-	0339944	0339945	0339946	0339947	0339948	-
			66	125	0339949	-	0339950	0339951	0339952	0339953	0339954	-
			82	150	0856029	-	0853413	0853415	0853416	0853417	0853419	-
20	20	30	62	125	0339955	-	0339956	0339957	0339958	0339959	0339960	0339961
			82	135	0853421	-	0853422	0853426	0853428	0853431	0853432	0853433
			102	150	0339962	-	0339963	0339964	0339965	0339966	0339967	0339968

D = Tool diameter

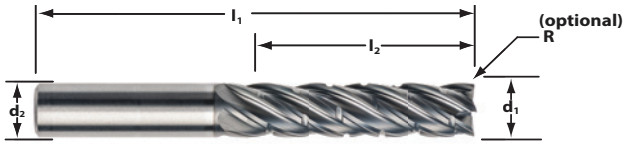
POW•R•PATH APC5

N

For high-efficiency machining in aluminum alloys.

- 5-flute
- CMS
- taC coating
- Square end and corner radius for HEM in aluminum

The APC5 cutter puts the benefits of IMCO's unique Chip Management System (CMS) in your hands. The CMS breaks up long, stringy chips, eliminating chip packing and recutting, and allowing deep, free cutting tool movement in aluminum. The results are great chip control and very high metal removal rates.



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*
mm: *d1: -0.0025 / -0.0100* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR
3/8	3/8	3	1-1/8	3	0339528	0339529	-
		4	1-1/2	3-1/2	0339530	0339531	-
1/2	1/2	2.5	1-1/4	3-1/4	0339532	-	0339533
		3	1-1/2	3-1/2	0339534	-	0339535
		3.5	1-3/4	4	0339536	-	0339537
		4	2	4	0339538	-	0339539
5/8	5/8	2	1-1/4	3-1/2	0339540	-	0339541
		3	1-7/8	4	0339542	-	0339543
		4	2-1/2	5	0339544	-	0339545
3/4	3/4	2.5	1-7/8	4-1/2	0339546	-	0339547
		3	2-1/4	5	0339548	-	0339549
		3.5	2-5/8	5	0339550	-	0339551
		4	3	6	0339552	-	0339553
1	1	2	2	5	0339554	-	0339555
		3	3	6	0339556	-	0339557
		4	4	7	0339558	-	0339559

METRIC

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.5 CR	1.0 CR
10	10	3	30	75	0339560	0339561	-
		4	40	88	0339562	0339563	-
12	12	2.5	30	83	0339564	-	0339565
		3	36	88	0339566	-	0339567
		3.5	42	93	0339568	-	0339569
		4	48	100	0339570	-	0339571
16	16	2	32	92	0339572	-	0339573
		3	48	110	0339574	-	0339575
		4	64	125	0339576	-	0339577
20	20	2	40	104	0339578	-	0339579
		2.5	50	115	0339580	-	0339581
		3	60	125	0339582	-	0339583
		3.5	70	135	0339584	-	0339585
		4	80	150	0339586	-	0339587

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

POW•R•PATH AFC5/IFC5 – Deep Wall Finisher

Z5 | CR | 35° | PLAIN

Corner radius for deep wall finishing in a wide range of materials.

Unique cutting-edge geometry and thick core combine to minimize wall taper in deep cuts.

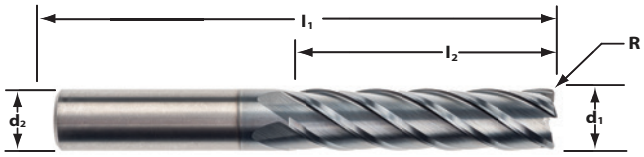
AFC5

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .030 CR	.060 CR
1/2	1/2	4	2	4	0335265	-
		6	3	6	0335266	-
5/8	5/8	4	2-1/2	5	-	0335267
		6	3-3/4	6-1/2	-	0335268
3/4	3/4	4	3	6	-	0335269
		6	4-1/2	7	-	0335270
1	1	4	4	8	-	0335271
		6	6	12	-	0335272

D = Tool diameter

taC | N



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

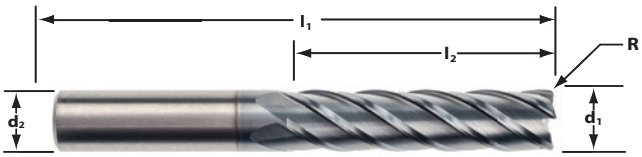
IFC5

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Max Axial Depth xD	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .030 CR	.060 CR
1/2	1/2	4	2	4	0335273	-
		6	3	6	0335274	-
5/8	5/8	4	2-1/2	5	-	0335275
		6	3-3/4	6-1/2	-	0335276
3/4	3/4	4	3	6	-	0335277
		6	4-1/2	7	-	0335278
1	1	4	4	8	-	0335279
		6	6	12	-	0335280

D = Tool diameter

AlCrNX | K | P | M | S



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

TOOL TIP | *POW•R•PATH AFC5/IFC5 (FOR FINISHING ONLY)*

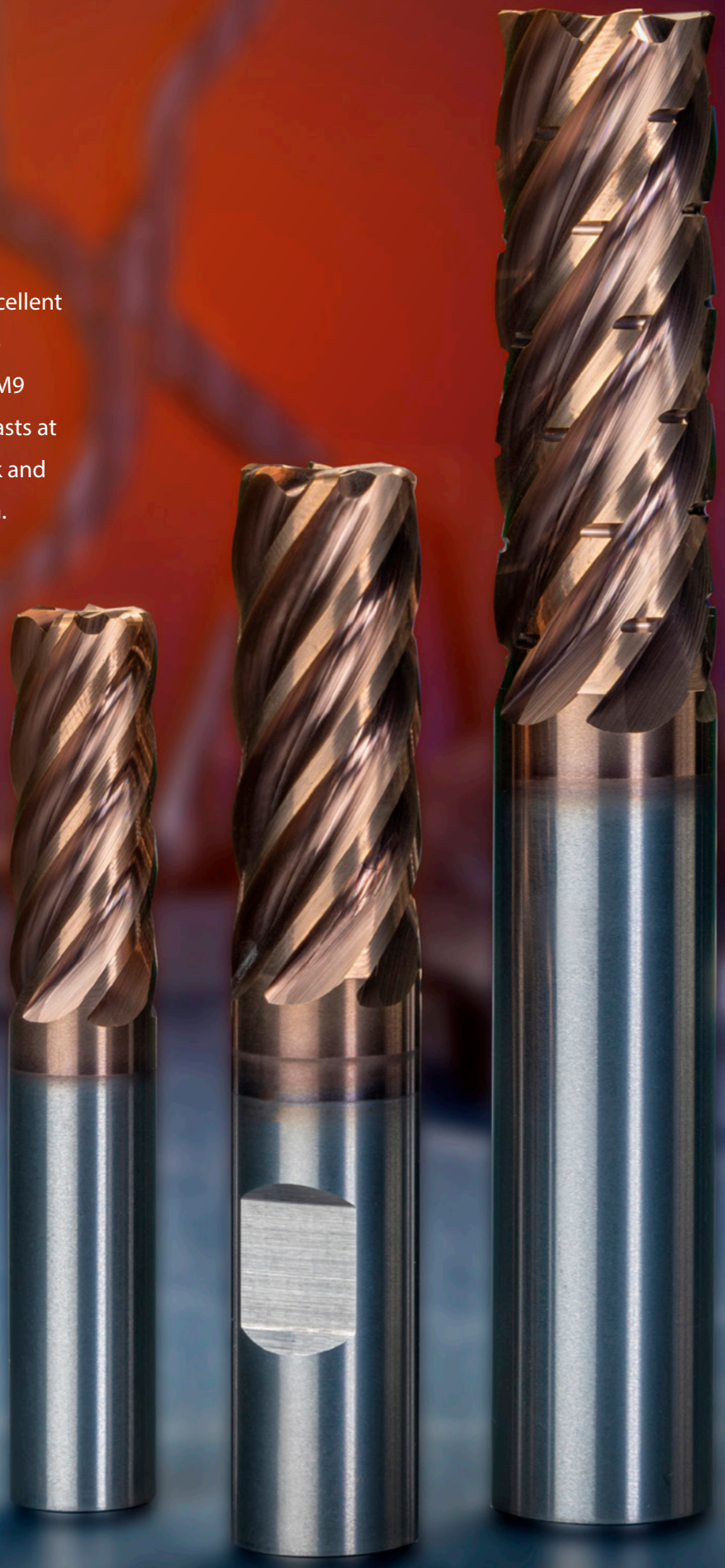
Ordering Custom Tools

Standard dimensions are shown above, but IMCO knows all machine parts are unique and require unique tools to finish mill.

Different flute lengths and overall lengths can be provided with AFC and IFC end mills. **Contact IMCO at 1-800-765-4626** for quotations with the specifications needed to finish your application.

THE UNIVERSAL POWERHOUSE.

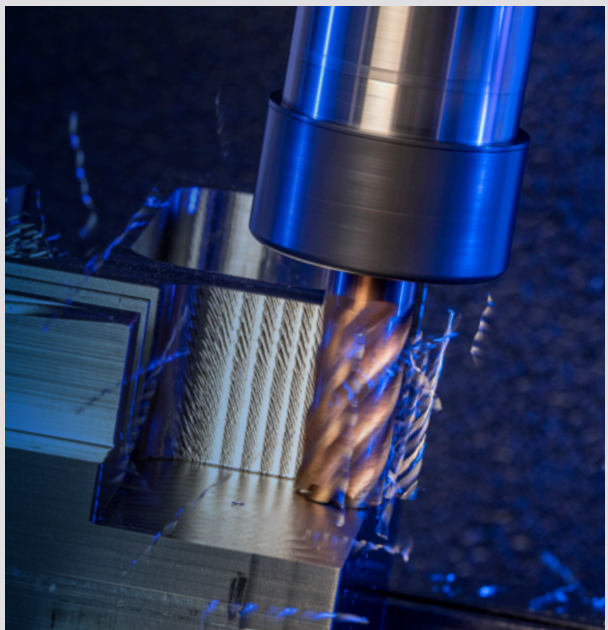
Get chatter-free machining, excellent surface finishes and incredible feed rates with POW•R•FEED M9 Series end mills. They are beasts at virtually any machining task and material you throw at them.



	M936	M936C	M924	M924N	M924C	M904
NUMBER OF FLUTES	Z6	Z6	Z4	Z4	Z4	Z4
END TYPES	SQ, CR	CR	SQ, CR, BN	CR, BN	SQ, CR	SQ, CR, BN
HELIX ANGLE	VARIABLE	VARIABLE	38°	38°	38°	38°
COATING	AlTiSN	AlTiSN	AlCrNX	AlCrNX	AlCrNX	AlTiN
SHANK TYPES	PLAIN, WELDON	PLAIN, WELDON	PLAIN, WELDON	PLAIN	PLAIN	PLAIN, WELDON
APPLICATIONS	ROUGH, FINISH					
MATERIAL(S)	N K P S M H		K P M S			

Get fantastic feed rates for peripheral milling, helical entry, ramping and slotting with this workhorse M936 end mill. **Check with Toolbot online*** for accurate speed and feed rates – they may surprise you!

- Make tool path moves without slowing down.
- Virtually impossible to clog
- Extremely aggressive cutting parameters
- Super-stable running
- Free-est cutting action in the toughest metals
- Extra-extended tool life



* Use Toolbot to calculate dynamic speeds and feed rates for the POW•R•FEED M9 Series by scanning the QR code.

POW•R•FEED M936

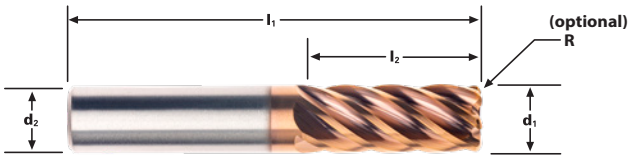
Z6 | SQ | CR | VARIABLE | AlTiSN | PLAIN

N K P M S H

For maximum metal removal rates in traditional or HEM tool paths in a wide variety of materials.

The POW•R•FEED M936 end mill can machine a slot for wire channels, helically enter an insert pocket, rough the pocket with a traditional or HEM tool path and face off the rough block to square it up – without a single tool change.

Maximize the output of your machines. The M936 is designed for very aggressive traditional tool paths, step-overs and depths beyond the abilities of legacy tools. It's IMCO's free-est cutting end mill to date. And with that amazing performance, you also get long, long tool life.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .010 CR	.015 CR	.030 CR	.060 CR	.090 CR	.125 CR	.190 CR	.250 CR
1/4	1/4	3/8	2	9174611	9175817	9175136	9175137	9175138	-	-	-	-
		1/2	2 - 1/2	9175639	9175818	9175140	9175141	9175142	-	-	-	-
		3/4	2 - 1/2	9175640	9175819	9175143	9175144	9175145	-	-	-	-
		1	3	9175641	9175820	9175146	9175147	9175148	-	-	-	-
5/16	5/16	7/16	2	9175642	-	9175149	9175150	9175159	-	-	-	-
		13/16	2 - 1/2	9175643	-	9175160	9175161	9175162	-	-	-	-
		1 - 1/4	3	9175644	-	9175163	9175164	9175165	-	-	-	-
3/8	3/8	1/2	2	9175645	9175821	9175166	9175167	9175168	9175169	9175170	-	-
		1	2 - 1/2	9175646	9175822	9175171	9175172	9175173	9175174	9175175	-	-
		1 - 1/4	3	9175647	9175831	9175176	9175177	9175178	9175179	9175180	-	-
		1 - 1/2	3 - 1/2	9175648	9175832	9175181	9175182	9175183	9175184	9175185	-	-
1/2	1/2	5/8	2 - 1/2	9175649	9175833	9175186	9175187	9175188	9175189	9175190	-	-
		1	3	9175650	9175834	9175191	9175192	9175193	9175194	9175195	-	-
		1 - 1/4	3	9175651	9175835	9175196	9174264	9175197	9175198	9175199	9175200	-
		1 - 1/2	3 - 1/2	9175652	9175836	9175201	9175202	9175203	9175204	9175205	9175206	-
		1 - 3/4	4	9175653	9175837	9175207	9175208	9175209	9175210	9175211	-	-
		2	4	9175654	9175838	9175212	9175213	9175214	9175215	9175216	9175217	-
5/8	5/8	3/4	3	9175655	-	9175218	9175219	9175220	-	-	-	-
		1 - 1/4	3 - 1/2	9175656	-	9175221	9175222	9175223	9175224	9175225	-	-
		1 - 5/8	3 - 1/2	9175657	-	9175226	9175227	9173877	9175228	9175229	9175230	-
		2 - 3/16	4	9175658	-	9175231	9175232	9175233	-	-	-	-
3/4	3/4	1	3	9175659	-	9175234	9175235	9175236	9175237	9175238	9175239	9175240
		1 - 5/8	4	9175660	-	9175241	9175242	9175243	9175244	9175245	9175246	9175247
		2 - 1/4	5	9175661	-	9175248	9175249	9175250	9175251	9175252	9175255	9175256
1	1	1 - 5/8	4	9175662	-	9175257	9175258	9175259	-	9175260	-	9175261
		2	4 - 1/2	9175663	-	9175262	9175263	9175264	-	9175265	-	9175266
		2 - 5/8	5	9175664	-	9175267	9175268	9175269	-	9175270	-	9175271

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

POW•R•FEED M936 w/WELDON

Z6 | SQ | CR | VARIABLE | AlTiSN | WELDON

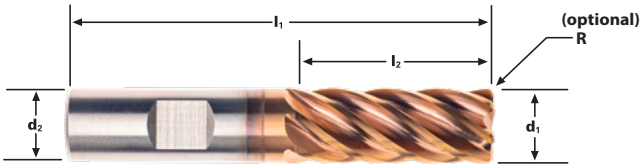
N K P M S H

In today's market, the M936 cutting tool's versatility saves you time and money at every turn.

- Make tool path moves without slowing down.
- Swing an M936 end mill on a 5-axis machine in all directions without clogging.
- Complete the operation with one chucking.
- With conventional low-horsepower machines, M936 end mills can maximize the output of your machines and save lots of time.

Free cutting action lets you run to the machine's upper capacity limits, with less heat transfer to the workpiece and less worry about warpage. In steels, the M936 is IMCO's free-est cutting end mill ever, putting fantastic feeds and metal removal rates within reach.

Order with flat for Weldon-style tool holders.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .010 CR	.015 CR	.030 CR	.060 CR	.090 CR	.125 CR	.190 CR	.250 CR
3/8	3/8	1/2	2	9175796	9175839	9175849	9175869	9175889	9175909	9175924	-	-
		1	2 - 1/2	9175797	9175840	9175850	9175870	9175890	9175910	9175925	-	-
		1 - 1/4	3	9175798	9175841	9175851	9175871	9175891	9175911	9175926	-	-
		1 - 1/2	3 - 1/2	9175799	9175842	9175852	9175872	9175892	9175912	9175927	-	-
1/2	1/2	5/8	2 - 1/2	9175800	9175843	9175853	9175873	9175893	9175913	9175928	-	-
		1	3	9175801	9175844	9175854	9175874	9175894	9175914	9175929	-	-
		1 - 1/4	3	9175802	9175845	9175855	9175875	9175895	9175915	9175930	9175942	-
		1 - 1/2	3 - 1/2	9175803	9175846	9175856	9175876	9175896	9175916	9175931	9175943	-
		1 - 3/4	4	9175804	9175847	9175857	9175877	9175897	9175917	9175932	-	-
		2	4	9175805	9175848	9175858	9175878	9175898	9175918	9175933	9175944	-
5/8	5/8	3/4	3	9175806	-	9175859	9175879	9175899	-	-	-	-
		1 - 1/4	3 - 1/2	9175807	-	9175860	9175880	9175900	9175919	9175934	-	-
		1 - 5/8	3 - 1/2	9175808	-	9175861	9175881	9175901	9175920	9175935	9175945	-
		2 - 3/16	4	9175810	-	9175862	9175882	9175902	-	-	-	-
3/4	3/4	1	3	9175811	-	9175863	9175883	9175903	9175921	9175936	9175946	9175949
		1 - 5/8	4	9175812	-	9175864	9175884	9175904	9175922	9175937	9175947	9175950
		2 - 1/4	5	9175813	-	9175865	9175885	9175905	9175923	9175938	9175948	9175951
1	1	1 - 5/8	4	9175814	-	9175866	9175886	9175906	-	9175939	-	9175952
		2	4 - 1/2	9175815	-	9175867	9175887	9175907	-	9175940	-	9175953
		2 - 5/8	5	9175816	-	9175868	9175888	9175908	-	9175941	-	9175954

D = Tool diameter

TECH TALK | *AMAZING SPEEDS*

Create forms, pockets, slots and other irregular shapes with the M936 end mill. Perform ramping, helical entry or peripheral milling. It's all executed at astounding speeds with smooth walls and floors.

*Price-to-performance ratio = **exceptional.***

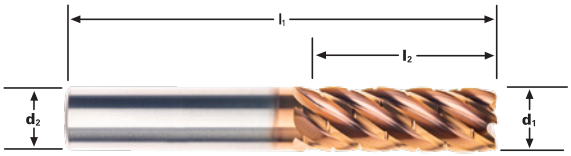
POW•R•FEED M936C

Z6 | CR | VARIABLE | CMS | AlTiSN | PLAIN

N K P M S H

Say goodbye to frequent chip pollution, even with extremely aggressive cutting parameters.

Optimized cutting edges and flute geometries remove material with amazing speed. IMCO's second-generation Chip Management System eliminates the long chips that create work-stopping clogs. Our ultramodern AlTiSN slippery-smooth coating helps keep chips flying out of the cutting zone.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .015 CR	.030 CR	.060 CR
1/4	1/4	3/8	2	9175955	-	-
		1/2	2-1/2	9175956	-	-
		3/4	2-1/2	9175957	-	-
		1	3	9175958	-	-
3/8	3/8	1/2	2	9175959	9175969	-
		1	2-1/2	9175960	9175970	-
		1-1/4	3	9175961	9175971	-
		1-1/2	3-1/2	9175962	9175972	-
1/2	1/2	5/8	2-1/2	9175963	9175973	9175988
		1	3	9175964	9175974	9175989
		1-1/4	3	9175965	9175975	9175990
		1-1/2	3-1/2	9175966	9175976	9175991
		1-3/4	4	9175967	9175977	9175992
		2	4	9175968	9175978	9175993
5/8	5/8	3/4	3	-	9175979	9175994
		1-1/4	3-1/2	-	9175980	9175995
		1-5/8	3-1/2	-	9175981	9175996
		2-3/16	4	-	9175982	9175997
3/4	3/4	1	3	-	9175983	9175998
		1-5/8	4	-	9175984	9175999
		2-1/4	5	-	9175418	9176000
1	1	1-5/8	4	-	9175985	9176001
		2	4-1/2	-	9175986	9176002
		2-5/8	5	-	9175987	9176003

D = Tool diameter

POW•R•FEED M936C w/WELDON

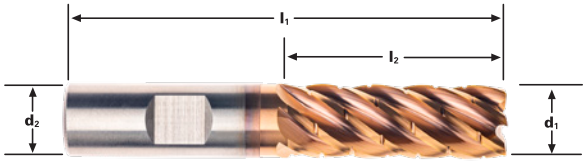
Z6 | CR | VARIABLE | CMS | AlTiSN | WELDON

N K P M S H

- Make tool path moves without slowing down.
- Swing an M936 end mill on a 5-axis machine in all directions without clogging.
- Complete the operation with one chucking.
- With conventional low-horsepower machines, M936C end mills can maximize the output of your machines and save lots of time.

Free cutting action lets you run to your machine's upper capacity limits. In steels, the M936C is IMCO's free-est cutting end mill ever, putting fantastic feeds and metal removal rates within reach. And with CMS, you get the same amazing performance with M936C as with M936, but with the extra benefit of an end mill that's virtually impossible to clog.

Order with flat for Weldon-style tool holders.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .015 CR	.030 CR	.060 CR
3/8	3/8	1/2	2	9176004	9176014	-
		1	2 - 1/2	9176005	9176015	-
		1 - 1/4	3	9176006	9176016	-
		1 - 1/2	3 - 1/2	9176007	9176017	-
1/2	1/2	5/8	2 - 1/2	9176008	9176018	9176034
		1	3	9176009	9176019	9176035
		1 - 1/4	3	9176010	9176020	9176036
		1 - 1/2	3 - 1/2	9176011	9176021	9176037
		1 - 3/4	4	9176012	9176022	9176038
		2	4	9176013	9176023	9176039
5/8	5/8	3/4	3	-	9176024	9176040
		1 - 1/4	3 - 1/2	-	9176025	9176041
		1 - 5/8	3 - 1/2	-	9176026	9176042
		2 - 3/16	4	-	9176027	9176043
3/4	3/4	1	3	-	9176028	9176044
		1 - 5/8	4	-	9176029	9176045
		2 - 1/4	5	-	9176030	9176046
1	1	1 - 5/8	4	-	9176031	9176047
		2	4 - 1/2	-	9176032	9176048
		2 - 5/8	5	-	9176033	9176049

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

POW•R•FEED M924

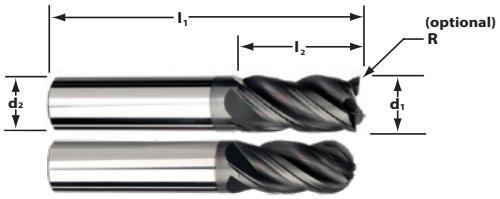
Z4 | SQ | CR | BN | 38° | AlCrNX | PLAIN | WELDON

Scan to calculate speeds and feed rates with Toolbot

K P M S

For high-performance machining in materials from low carbon steels to titanium.

This is one versatile tool, effective at roughing, slotting and finishing in traditional tool paths in a variety of materials. You get longer tool life due to reinforced cutting edges and corner radii. You also get higher metal removal rates, provided by variable cutting-edge indexing and our advanced coating. Square end, corner radius and ball nose for traditional machining in a wide range of materials.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.090 CR	.120 CR	Order Code BN
1/8	1/8	1/4	1-1/2	0338245	0338246	-	-	-	-	-
		1/2	1-1/2	0338247	0338248	-	-	-	-	0338249
		3/4	2-1/4	0338250	0338251	-	-	-	-	-
5/32	3/16	5/16	2	0338273	0338275	-	-	-	-	-
		9/16	2	0338274	0338276	-	-	-	-	0338277
3/16	3/16	5/16	2	0338252	0338253	0338254	-	-	-	-
		9/16	2	0338255	0338256	0338257	-	-	-	0338258
		3/4	2-1/2	0338259	0338260	0338261	-	-	-	-
7/32	1/4	3/8	2	0338278	0338280	-	-	-	-	-
		3/4	2-1/2	0338279	0338281	-	-	-	-	-
1/4	1/4	3/8	2	0338262	0338263	0338264	-	-	-	-
		3/4	2-1/2	0338265	0338266	0338267	0338268	-	-	0338269
		1-1/4	3	0338270	0338271	0338272	-	-	-	-
		1-3/4	4	0338283	0338284	0338285	-	-	-	-
9/32	5/16	3/4	2-1/2	0338286	0338287	0338288	-	-	-	-
5/16	5/16	7/16	2	0338103	0338104	0338105	-	-	-	-
		13/16	2-1/2	0338106	0338107	0338108	0338109	-	-	0338110
		1-1/4	3	0338111	0338112	0338113	-	-	-	-
		2-1/8	4	0338114	0338115	0338116	-	-	-	-
11/32	3/8	7/8	2-1/2	0338289	-	0338290	-	-	-	-
3/8	3/8	1/2	2	0338117	0338118	0338119	-	-	-	-
		7/8	2-1/2	0338120	0338121	0338122	0338123	0338124	-	0338125
		1-1/4	3	0338126	0338127	0338128	0338129	-	-	-
		1-5/8	4	0338130	0338131	0338132	0338133	-	-	-
		2	4	0338134	0338135	0338136	0338137	-	-	-
		2-1/2	5	0338291	0338292	0338293	-	-	-	-
13/32	7/16	1	2-3/4	0338294	-	0338295	-	-	-	-
7/16	7/16	5/8	2-1/2	0338138	-	0338139	-	-	-	-
		1	2-3/4	0338140	-	0338141	-	-	-	0338142
		2	4	0338143	-	0338144	-	-	-	-
1/2	1/2	5/8	2-1/2	0338145	-	0338146	0338147	-	-	-
		1	3	0338148	0338149	0338150	0338151	0338152	0338153	0338154
		1-1/4	3	0338155	0338156	0338157	0338158	0338159	0338160	0338161
		1-5/8	4	0338162	-	0338163	0338164	0338165	0338166	-
		2-1/8	4	0338167	-	0338168	0338169	0338170	0338171	-
		2-5/8	5	0338172	-	0338173	0338174	-	-	-
		3-1/4	6	0338175	-	0338176	0338177	-	-	-
9/16	9/16	1-1/4	3-1/2	0338296	-	0338297	-	-	-	-
5/8	5/8	3/4	3	0338178	-	0338179	0338180	-	-	-
		1-3/8	3-1/2	0338181	-	0338182	0338183	-	-	0338186
		2-1/8	4	0338187	-	0338188	0338189	0338190	0338191	-
		2-5/8	5	0338192	-	0338193	0338194	-	-	-
		3-1/4	6	0338195	-	-	-	-	-	-
3/4	3/4	1	3	0338198	-	0338199	0338200	-	-	-
		1-5/8	4	0338201	-	0338202	0338203	0338204	0338205	0338206
		2-3/8	5	0338207	-	0338208	0338209	0338210	0338211	-
		3-1/4	6	0338212	-	0338213	0338214	-	-	-
		4-1/8	7	0338215	-	0338216	0338217	-	-	-
1	1	1-3/4	4	0338218	-	0338219	0338220	-	-	-
		2-1/4	5	0338223	-	0338224	-	-	-	-
		3-1/4	6	0338227	-	0338228	-	-	-	-
		4-1/4	7	0338230	-	0338231	-	-	-	-

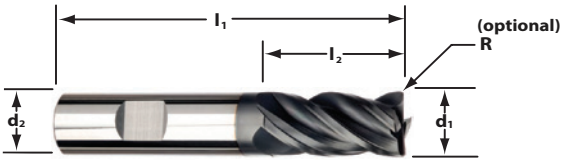
D = Tool diameter

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.3 CR	0.5 CR	0.75 CR	1.0 CR	1.5 CR	2.0 CR	3.0 CR	4.0 CR	Order Code BN
3	3	9	38	0338628	-	-	-	-	-	-	-	-	-
		12	38	0338630	0340976	-	-	-	-	-	-	-	0856229
	6	8	57	0340977	0340980	0855957	-	-	-	-	-	-	0340985
		12	57	0340978	0340979	-	-	-	-	-	-	-	-
3.5	6	10	57	0440706	-	-	-	-	-	-	-	-	-
4	6	11	57	0340981	0340982	0855958	-	-	-	-	-	-	0340986
4.5	6	11	57	0855959	-	-	-	-	-	-	-	-	-
5	6	13	57	0340983	0340984	0855960	-	-	-	-	-	-	0340987
6	6	10	54	-	-	0340954	-	-	-	-	-	-	-
		13	57	0338646	0338647	0338648	-	0340955	0340956	-	-	-	0338731
		25	75	0338654	0338655	-	-	-	-	-	-	-	-
8	8	12	58	-	-	0340957	-	-	-	-	-	-	-
		19	63	0338660	-	0338661	-	0340958	0340959	0855961	-	-	0338732
		32	75	0338663	-	0338664	-	-	-	-	-	-	-
10	10	14	66	-	-	0340960	-	-	-	-	-	-	-
		22	72	0338668	-	0338669	-	0338670	0340961	0340962	-	-	0338733
		40	88	0338673	-	0338674	-	-	-	-	-	-	-
12	12	16	73	-	-	-	0340963	-	-	-	-	-	-
		26	83	0338679	-	0338680	0340964	0338681	0340965	0340966	0340967	-	0338734
		50	100	0338684	-	0338685	-	-	-	-	-	-	-
		75	150	0338687	-	0338688	-	-	-	-	-	-	-
14	14	32	83	0338690	-	-	-	0338692	-	-	-	-	-
16	16	22	82	-	-	-	-	0340968	-	-	-	-	-
		34	92	0338693	-	0338694	-	0338695	0340969	0340970	0340971	0853639	0338735
		55	110	0338698	-	0338699	-	-	-	-	-	-	-
		75	150	0338701	-	0338702	-	-	-	-	-	-	-
18	18	32	92	0436095	-	-	-	0853642	-	-	-	-	-
20	20	26	92	-	-	-	-	0340972	-	-	-	-	-
		38	104	0338704	-	-	-	0338706	0340973	0340974	0340975	0853643	0338736
		65	125	0338714	-	-	-	0853645	-	-	-	-	-
		85	150	0338717	-	-	-	0853648	-	-	-	-	-
25	25	38	104	0856030	-	-	-	0853653	-	-	-	-	-
		52	120	0338720	-	-	-	0853656	-	-	-	-	-
		85	150	0338725	-	-	-	0853657	-	-	-	-	-

D = Tool diameter

M924 w/WELDON



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR
3/8	3/8	7/8	2-1/2	0338885	0338824	0338825
		1-1/4	3	0338886	0338827	0338828
1/2	1/2	1	3	0339036	0339037	0339038
		1-1/4	3	0338891	0338836	0338837
		1-5/8	4	0338892	-	0338840
		2-1/8	4	0338893	-	0338842
5/8	5/8	1-3/8	3-1/2	0338896	-	0338848
		2-1/8	4	0338897	-	0338850
3/4	3/4	1-5/8	4	0338900	-	0338856
		2-3/8	5	0338901	-	0338859
1	1	1-3/4	4	0338904	-	0338866
		2-1/4	5	0338905	-	0338869

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 0.5 CR	1.0 CR	1.5 CR	2.0 CR	3.0 CR	4.0 CR
10	10	22	72	0853658	0853664	0853671	0853684	-	-
12	12	26	83	0853688	0853691	0853692	0853707	0853709	-
16	16	34	92	0853717	0853718	0853734	0853736	0853744	0853749
20	20	38	104	-	0853751	0853757	0853758	0853763	0853764

POW•R•FEED M924N

Z4 | CR | BN | 38° | NECK | AlCrNX | PLAIN

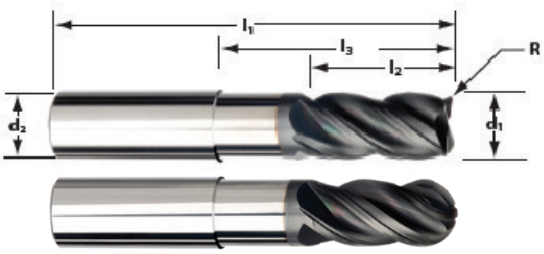
K P M S

For high-performance machining in materials from low carbon steels to titanium.

- 4-flute
- AlCrNX
- Corner radius and ball nose w/neck relief for machining in a wide range of materials

The necked shank of the M924 design provides the clearance you need to work in deeper cavities and make machining against tight walls a lot easier. Neck relief and short flute length give you more end mill stability in the cut for more precise tolerances.

It's an exceptional tool that makes it much easier to work in pockets.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	Order Code BN
1/8	1/8	1/4	1-1/8	2-1/2	0338463	-	-	0338464
3/16	3/16	3/8	1-3/8	3	0338465	0338466	-	0338467
1/4	1/4	1/2	1-3/8	3	0338468	0338469	0338470	0338471
			2-3/8	4	0338472	0338473	0338474	0338475
3/8	3/8	1/2	1-3/8	3	0338476	0338477	0338478	0338480
			2-3/8	4	0338481	0338482	0338483	0338485
			3-3/8	5	0338486	0338487	0338488	0338490
			4-3/8	6	0338491	0338492	0338493	0338495
		3/4	2-3/8	4	0338931	0338932	0338933	-
			3-3/8	5	0338934	0338935	0338936	-
			4-3/8	6	0338937	0338938	0338939	-
1/2	1/2	5/8	1-3/8	3	-	0338496	0338497	0338500
			2-1/4	4	-	0338501	0338502	0338505
			3-1/4	5	-	0338506	0338507	0338510
			4-1/4	6	-	0338511	0338512	0338515
		1	2-1/4	4	-	0338586	0338587	-
			3-1/4	5	-	0338589	0338590	-
			4-1/4	6	-	0338592	0338593	-
5/8	5/8	3/4	2-1/8	4	-	0338516	0338517	0338520
			3-1/8	5	-	0338521	0338522	0338525
			4-1/8	6	-	0338526	0338527	0338530
3/4	3/4	1	2	4	-	0338531	0338532	0338535
			2-7/8	5	-	0338536	0338537	0338540
			3-7/8	6	-	0338541	0338542	0338545
			4-7/8	7	-	0338546	0338547	0338550
		1-1/2	2-7/8	5	-	0338604	0338605	-
			3-7/8	6	-	0338607	0338608	-
			4-7/8	7	-	0338610	0338611	-
1	1	1-1/4	2-1/4	4	-	0338551	0338552	0338555
			2-5/8	5	-	0338556	0338557	0338560
			3-5/8	6	-	0338561	0338562	0338565
			4-5/8	7	-	0338566	0338567	0338570

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code by Corner Radius 0.5 CR	1.0 CR	1.5 CR	Order Code BN
6	6	12	39	75	0338737	-	-	0338806
			64	100	0338738	-	-	0338807
8	8	16	39	75	0338739	-	-	0338808
			64	100	0338740	-	-	0338809
10	10	12	32	72	0338741	0338742	-	0338810
			60	100	0338743	0338744	-	0338811
			110	150	0338745	0338746	-	0338812
12	12	15	38	83	0338747	0338748	0338749	0338813
			55	100	0338750	0338751	0338752	0338814
			80	125	0338753	0338754	0338755	0338815
			105	150	0338756	0338757	0338758	0338816
16	16	20	62	110	0338759	0338760	0338761	0338817
			102	150	0338762	0338763	0338764	0338818
20	20	25	50	100	0338765	0338766	0338767	0338819
			75	125	0338768	0338769	0338770	0338820
			100	150	0338771	0338772	0338773	0338821
25	25	32	64	120	0338774	0338775	0338776	0338822
			94	150	0338777	0338778	0338779	0338823

D = Tool diameter

SOLUTION | *END MILL RECONDITIONING*

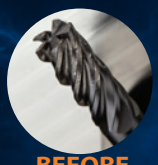
GIVE YOUR USED TOOLS NEW LIFE FOR A FRACTION OF THE COST!

Cost Effective IMCO reconditioning service saves you more than 40% on tool costs compared to new tool prices. And we re-tool competitors' products too.

Regrinding From "overall diameter" options to "end only" options, we work with you to ensure your tools are reground to your specifications. Need a length taken off the flute or a corner radius added? Done, no extra charge.

Edge Prep High performance demands high maintenance. We edge prep all high-performance tools to restore optimal quality.

Recoating The right coating is critical for optimal performance.


BEFORE

AFTER

No Job Too Small No minimum quantities for reconditioning.

Shipping Tote We make transporting your IMCO end mills as painless as possible. For select orders we offer a reusable shipping container that can hold up to 75 pounds of end mills.

Resharpen. Restore. Recharge.

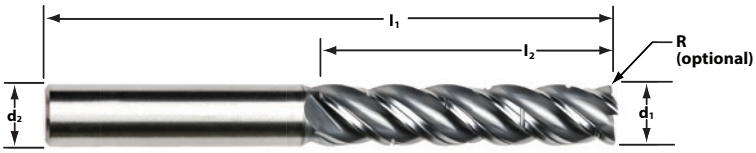
POW•R•FEED M924C

K P M S

For high-performance machining in materials from low carbon steels to titanium.

- 4-flute
- CMS
- AlCrNX
- Square end and corner radius for machining in a wide range of materials

Add the benefits of our unique Chip Management System to the M924 design and you have this highly versatile tool that's virtually impossible to clog. The CMS breaks up long, stringy chips, eliminating chip packing and recutting, and allowing free cutting tool movement.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .030 CR	.060 CR
1/2	1/2	2-1/8	4	9164826	9164827	9164828
		2-5/8	5	9164829	9164830	9164831
		3-1/4	6	9164832	9164833	9164834
5/8	5/8	2-1/8	4	9164835	9164836	9164837
		2-5/8	5	9164838	9164839	9164840
		3-1/4	6	9164841	-	-
3/4	3/4	2-3/8	5	9164842	9164843	9164844
		3-1/4	6	9164845	9164846	9164847
		4-1/8	7	9164848	9164849	9164850
1	1	2-1/4	5	9164851	9164852	-
		3-1/4	6	9164853	9164854	-
		4-1/4	7	9164855	9164856	-

D = Tool diameter

CASE STUDY | *POW•R•FEED M924*

Putting the "POW" in POW•R•FEED!

The features on the M924 make it an incredibly durable tool, extending the tool life in many applications. One IMCO customer was using the original M904 mill and a leading competitor's mill in a tough chrome application. **By changing to the M924 the customer cut five times the parts per tool** – without lowering the metal removal rate. **That's a double savings – more parts per tool and fewer tool changes.** Combine the great tool life with the aggressive feed rates and the M924 is a very Pow·R·Full tool.

POW•R•FEED M904

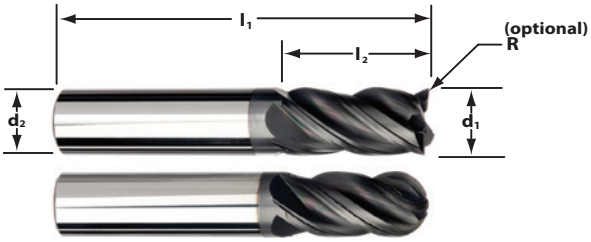
Z4 | SQ | CR | BN | 38° | AlTiN | PLAIN | WELDON

K P M S

For high-performance machining in materials from low carbon steels to titanium.

- 4-flute
- AlTiN
- Square end, corner radius and ball nose for machining in a wide range of materials

The M904 end mill is our first-generation POW•R•FEED design, using variable cutting-edge indexing and a legacy coating. You get improved tool life and higher feed rates than with general-purpose end mills.

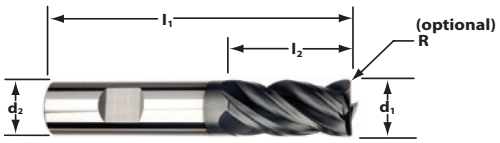


in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.020 CR	.030 CR	.060 CR	.125 CR	Order Code BN
1/8	1/8	1/4	1-1/2	-	0335668	-	-	-	-	-
		1/2	1-1/2	0335526	0335564	-	-	-	-	0335613
5/32	3/16	9/16	2	0335527	0335605	-	-	-	-	-
3/16	3/16	5/16	2	-	0335669	-	-	-	-	-
		5/8	2	0335528	0335565	-	-	-	-	0335615
7/32	1/4	5/8	2-1/2	0335529	-	0335606	-	-	-	-
1/4	1/4	3/8	2	0335521	-	0335559	-	-	-	-
		3/4	2-1/2	0335530	-	0335566	0335801	-	-	0335617
		1-1/8	3	-	-	0335774	-	-	-	-
		1-1/2	4	-	-	0335779	-	-	-	-
5/16	5/16	13/16	2-1/2	0335531	-	0335567	-	-	-	-
3/8	3/8	1/2	2	0335522	-	0335560	-	-	-	-
		7/8	2-1/2	0335532	-	0335568	0335756	-	-	0335619
		1-1/8	3	-	-	0335775	-	-	-	-
		1-3/4	4	-	-	0335780	-	-	-	-
7/16	7/16	1	2-3/4	0335533	-	0335569	-	-	-	-
1/2	1/2	5/8	2-1/2	0335523	-	-	0335561	-	-	-
		1	3	0335534	-	-	0335570	-	-	0335621
		1-1/4	3	0335594	-	-	0335592	0335757	0335759	0335622
		2	4	-	-	-	0335776	-	-	-
		2-1/2	5	-	-	-	0335781	-	-	-
5/8	5/8	1-1/4	3-1/2	0335535	-	-	0335571	-	-	-
3/4	3/4	1-1/2	4	0335536	-	-	0335572	0335761	0335763	0335624
		2-1/4	5	-	-	-	0335777	-	-	-
		3	6	-	-	-	0335782	-	-	-
1	1	1-1/2	4	0335537	-	-	0335573	-	-	-
		3	6	-	-	-	0335783	-	-	-
		4-1/8	7	-	-	-	0335786	-	-	-

M904 w/WELDON



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

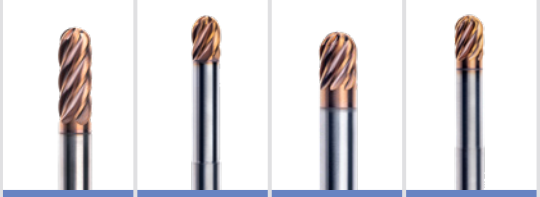
Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .020 CR	.030 CR	.060 CR	.125 CR	Order Code BN
3/8	3/8	7/8	2-1/2	0335547	0335580	0335765	-	-	0335635
1/2	1/2	1	3	0335549	-	0335582	-	-	0335637
		1-1/4	3	0335595	-	0335593	0335766	0335768	0335638
5/8	5/8	1-1/4	3-1/2	0335550	-	0335583	-	-	-
3/4	3/4	1-1/2	4	0335551	-	0335584	0335770	0335772	-

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

MAXIMUM SPEED. MAXIMUM RESULTS.

Speed, speed and more speed in hardened metals up to 62 HRc. With POW•R•ARC ball-nose cutters, you get super-fast, smooth metal removal, much shorter cycle times and excellent finishes with every 3D contour and chamfer.



	A106	A106N	A108	A108N
NUMBER OF FLUTES	Z8	Z8	Z6	Z6
END TYPES	BN	BN	BN	BN
HELIX ANGLE	35°	35°	35°	35°
COATING	AlTiSN	AlTiSN	AlTiSN	AlTiSN
SHANK TYPES	PLAIN	PLAIN	PLAIN	PLAIN
APPLICATIONS	ROUGH, FINISH			
MATERIAL(S)	K, P, M, S, N, H			

CASE STUDY

POW•R•ARC: NEARLY 5X FASTER!

One mold maker was cutting both P20 steel and 4140 low alloy steel using a competitor's 4-flute tool running at 88 ipm. That tool roughed for eight hours before it became unusable. A second tool semi-roughed and finished for 16 hours (also a competitor's) before it was discarded too.

Then they tried a POW•R•ARC cutter, running at 450 ipm – nearly five times the speed – and completed roughing and finishing using the same tool. POW•R•ARC **cut cycle time by half**, from 24 hours (roughing to finishing) to 12 hours, and it **more than doubled the tool life**; it was still going strong after 32 hours. Just one POW•R•ARC tool did all the work and kept on going.

	4-Flute Mill	**POW•R•ARC 8-Flute**
ROUGHING		
SPEED	88 ipm	**450 ipm**
TOOL LIFE	16 hours	**32+ hours**
CYCLE TIME	24 hours	**12 hours**

- Much faster speeds and feeds, shorter cycle times
- Rough and finish with the same tool. No need to change tools for finishing. No need to stock separate finishing tools.
- Cutting across dissimilar materials? With POW•R•ARC cutters, there's no stopping, no slowing. No digs where edges meet, so no handwork.
- Just as effective in low-speed or high-speed machines
- Long, long, long tool life

Use Toolbot to calculate dynamic speeds and feed rates for the POW•R•ARC Series by scanning the QR code.

POW•R•ARC A106 | 6-Flute

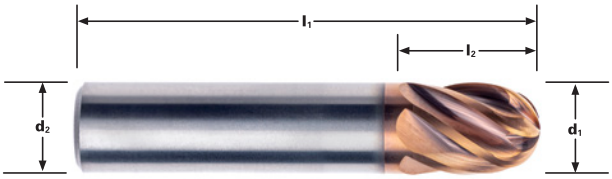
Z6 | BN | 35° | AlTiSN | PLAIN

K P M S N H

POW•R•ARC 6-flute cutters give you great results faster in machines with lower-max-speed spindles and high rpm machines.

You get faster speeds and feed rates (compared with four-flute tools) in most materials, up to 62 HRc. Cut smoothly through dissimilar materials, often without finishing handwork.

Get great roughing and finishing, no matter what your machines' rpm capabilities; unique geometry reduces the chance of chip buildup even at lower rpms.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050 d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Diameter d1	Shank Diameter d2	Length of Cut l2	Overall Length l1	No. of Flutes	Order Code
1/4	1/4	3/8	2	6	9174317
		3/8	2-1/2	6	9174369
		3/4	2-1/2	6	9174370
3/8	3/8	1/2	2-1/2	6	9174384
		1/2	3	6	9174385
		1	2-1/2	6	9174386
1/2	1/2	5/8	2-1/2	6	9174399
		5/8	3	6	9174403
		1-1/4	3	6	9174409
5/8	5/8	3/4	3-1/2	6	9174426
		1-5/8	3-1/2	6	9174427
3/4	3/4	1	4	6	9174437
		1-5/8	4	6	9174438

METRIC

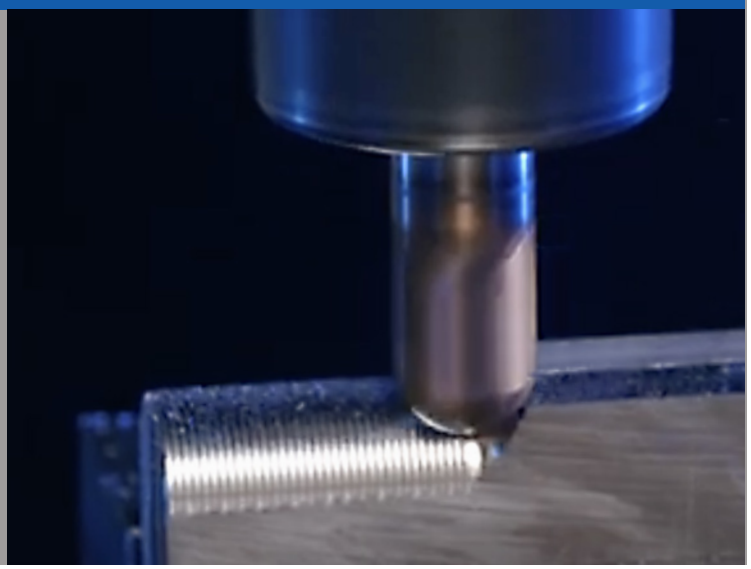
Cutter Diameter d1	Shank Diameter d2	Length of Cut l2	Overall Length l1	No. of Flutes	Order Code
6	6	8	57	6	9174823
		13	57	6	9174819
10	10	12	72	6	9174832
		22	72	6	9174831
12	12	16	83	6	9174842
		26	83	6	9174841
16	16	20	92	6	9174853
		32	92	6	9174852
20	20	25	104	6	9174865
		38	104	6	9174864

CASE STUDY | *POW•R•ARC A106*

Bimetal Contours, No Dig Marks

We performance tested our POW•R•ARC A106 ball-nose tool on a bimetal tool die in 6061 AL and A2 tool steel, 60 HRc. **The A106 entered and roughed the tool die smoothly and contoured the bimetal part with no dig marks in 7.2 minutes.**

Scan the QR code to see for yourself on IMCO's YouTube page.



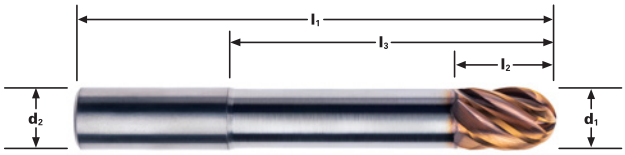
POW•R•ARC A106N | 6-Flute

Z6 | BN | 35° | NECK | AlTiSN | PLAIN

K P M S N H

Complete more parts per shift at higher speeds and feed rates with easier access to deep pockets and around mold guide pins.

Necked cutters give you the extra reach that eliminates barriers and secondary handwork. Unique geometries and high-strength solid carbide keep these tools balanced and running much longer.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050 d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Diameter d1	Shank Diameter d2	Length of Cut l2	Overall Length l1	No. of Flutes	Reach LBS l3	Order Code
1/4	1/4	3/8	2-1/2	6	3/4	9174371
		3/8	3	6	1	9174372
		3/8	3	6	1-1/2	9174373
		3/8	4	6	1-1/8	9174374
		3/8	4	6	2-1/4	9174375
3/8	3/8	1/2	3	6	1-1/8	9174387
		1/2	3-1/2	6	1-1/2	9174388
		1/2	4	6	2-1/4	9174389
		1/2	6	6	3-1/8	9174390
1/2	1/2	5/8	3	6	1-1/4	9174410
		5/8	3-1/2	6	1-1/2	9174411
		5/8	4	6	2-1/4	9174412
		5/8	5	6	2-1/2	9174413
		5/8	5	6	3-1/4	9174414
		5/8	6	6	4-1/4	9174415
5/8	5/8	3/4	4	6	1-7/8	9174428
		3/4	5	6	3-1/8	9174429
		3/4	6	6	3-3/4	9174430
3/4	3/4	1	4	6	1-7/8	9174439
		1	4-1/2	6	2-1/4	9174440
		1	5	6	3	9174441
		1	6	6	3-3/4	9174442
		1	7	6	4-1/2	9174443

D = Tool diameter

METRIC

Cutter Diameter d1	Shank Diameter d2	Length of Cut l2	Overall Length l1	No. of Flutes	Reach LBS l3	Order Code
6	6	8	63	6	18	9174824
		8	63	6	24	9174825
		8	75	6	36	9174826
10	10	12	72	6	30	9174833
		12	88	6	40	9174834
		12	100	6	60	9174835
12	12	16	83	6	36	9174843
		16	93	6	48	9174844
		16	100	6	60	9174845
		16	125	6	72	9174846
16	16	20	100	6	48	9174854
		20	110	6	64	9174855
		20	125	6	80	9174856
		20	150	6	96	9174857
20	20	25	115	6	60	9174866
		25	135	6	80	9174867
		25	150	6	100	9174868

Scan to calculate speeds and feed rates with Toolbot

POW•R•ARC A108 | 8-Flute

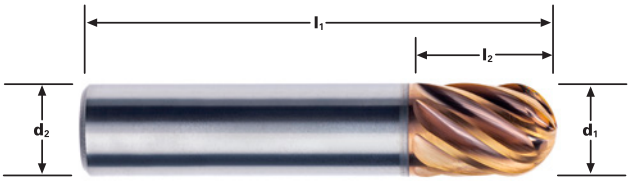
Z8 | BN | 35° | AlTiSN | PLAIN

K P M S N H

POW•R•ARC eight-flute cutters deliver the fastest possible speed and feed rates in most materials up to 62 HRc.

From roughing to finishing, even in hardened metals, advanced geometries and OD-to-tip flutes make work ultrafast with no tool changes.

Unique geometry reduces the chance of chip buildup, even at lower rpm. Great for 5-axis machines, too.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050 d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Diameter d1	Shank Diameter d2	Length of Cut l2	Overall Length l1	No. of Flutes	Order Code
1/4	1/4	3/8	2	8	9174376
		3/8	2-1/2	8	9174377
		3/4	2-1/2	8	9174378
3/8	3/8	1/2	2-1/2	8	9174392
		1/2	3	8	9174393
		1	2-1/2	8	9174394
1/2	1/2	5/8	2-1/2	8	9174416
		5/8	3	8	9174419
		1-1/4	3	8	9174418
5/8	5/8	3/4	3-1/2	8	9174431
		1-5/8	3-1/2	8	9174432
3/4	3/4	1	4	8	9174444
		1-5/8	4	8	9174445

D = Tool diameter

METRIC

Cutter Diameter d1	Shank Diameter d2	Length of Cut l2	Overall Length l1	No. of Flutes	Order Code
6	6	8	57	8	9174828
		13	57	8	9174827
10	10	12	72	8	9174837
		22	72	8	9174836
12	12	16	83	8	9174848
		26	83	8	9174847
16	16	20	92	8	9174859
		32	92	8	9174858
20	20	25	104	8	9174871
		38	104	8	9174870

CASE STUDY

IMCO Cutters Go Head-to-Head.

THE TOOLS: The POW•R•FEED M924B (left, 3/4 in. dia., four-flute ball nose, 1 in. LOC) v. the POW•R•ARC A108 (right, 3/4 in. dia., eight-flute ball nose, 1 in. LOC)

MATERIAL: A2 at 60 HRc.

Using the same step-over value, the new POW•R•ARC eight-flute tool provides a superior 3D contour cut **5x faster**, with barely visible ridges (far right) and very little finish work.

POW•R•FEED 4-Flute	**POW•R•ARC 8-Flute**
36.3 ipm at 2292 rpm	**215 ipm at 9155 rpm**

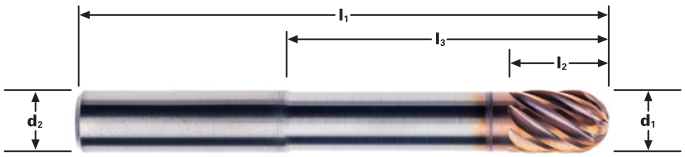
POW•R•ARC A108N | 8-Flute

Z8 | BN | 35° | NECK | AlTiSN | PLAIN

K P M S N H

These longer-neck eight-flute cutters give you easier access to deeper pockets and around mold guide pins.

You get not only the fastest possible speeds and feed rates; you also get smooth, continuous cutting around what used to be barriers, making handwork a thing of the past.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050 d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Diameter d1	Shank Diameter d2	Length of Cut l2	Overall Length l1	No. of Flutes	Reach LBS l3	Order Code
1/4	1/4	3/8	2-1/2	8	3/4	9174379
		3/8	3	8	1	9174380
		3/8	3	8	1-1/2	9174381
		3/8	4	8	1-1/8	9174382
		3/8	4	8	2-1/4	9174383
3/8	3/8	1/2	3	8	1-1/8	9174395
		1/2	3-1/2	8	1-1/2	9174396
		1/2	4	8	2-1/4	9174397
		1/2	6	8	3-1/8	9174398
1/2	1/2	5/8	3	8	1-1/4	9174420
		5/8	3-1/2	8	1-1/2	9174421
		5/8	4	8	2-1/4	9174422
		5/8	5	8	2-1/2	9174423
		5/8	5	8	3-1/4	9174424
		5/8	6	8	4-1/4	9174425
5/8	5/8	3/4	4	8	1-7/8	9174433
		3/4	5	8	3-1/8	9174435
		3/4	6	8	3-3/4	9174436
3/4	3/4	1	4	8	1-7/8	9174446
		1	4-1/2	8	2-1/4	9174447
		1	5	8	3	9174448
		1	6	8	3-3/4	9174449
		1	7	8	4-1/2	9174450

D = Tool diameter

METRIC

Cutter Diameter d1	Shank Diameter d2	Length of Cut l2	Overall Length l1	No. of Flutes	Reach LBS l3	Order Code
6	6	8	63	8	18	9174829
		8	63	8	24	9174830
		8	75	8	36	9173939
10	10	12	72	8	30	9174838
		12	88	8	40	9174839
		12	100	8	60	9174840
12	12	16	83	8	36	9174849
		16	93	8	48	9174850
		16	100	8	60	9173938
		16	125	8	72	9174851
16	16	20	100	8	48	9174860
		20	110	8	64	9174861
		20	125	8	80	9174862
		20	150	8	96	9174863
20	20	25	115	8	60	9174872
		25	135	8	80	9174873
		25	150	8	100	9174874

Scan to calculate speeds and feed rates with Toolbot

MUSCLE TO HUSTLE, ANY WAY YOU CUT IT.

Turn thin walls, deep pockets and titanium-specific challenges into opportunities with enDURO M5 mills. Choose from more than 2,000 enDURO solutions for cutting stainless steel and titanium using HEM or traditional tool paths.

Advanced high-shear cutting edges and amazing corner strength make enDURO M5 cutters the best choice for milling hard-to-machine materials, whether you use high-efficiency machining or traditional techniques.

	M525	M525N	M525C	M527	M527N	M527C
NUMBER OF FLUTES	Z5	Z5	Z5	Z7	Z7	Z7
END TYPES	SQ, CR, BN	SQ, CR, BN	SQ, CR	SQ, CR	CR	SQ, CR
HELIX ANGLE	40°	40°	40°	40°	40°	40°
COATING	AlCrNX	AlCrNX	AlCrNX	AlCrNX	AlCrNX	AlCrNX
SHANK TYPES	PLAIN	PLAIN	PLAIN	PLAIN	PLAIN	PLAIN
APPLICATIONS	HEM, ROUGH, FINISH	ROUGH, FINISH	HEM, ROUGH	HEM, ROUGH, FINISH	ROUGH, FINISH	HEM, ROUGH
MATERIAL(S)	K P M S					

Truly the "go-to" tool for a wide range of applications, enDURO end mills are the ultimate combination of strength and flexibility. A solid core, reinforced cutting edges, variable indexed flutes and an advanced coating all come together in the M525 and M527 series to create high-performance end mills that excel in both traditional and high-efficiency milling tool paths.

- Advanced high-shear cutting edges and amazing corner strength
- Solid core, variable indexing for reduced harmonics and superior balance
- High-strength square end or radius corner geometries
- Advanced heat-resistant coating
- Available with IMCO's unique Chip Management System

Use Toolbot to get dynamic speed and feed information for the enDURO M5 Series by scanning the QR code.

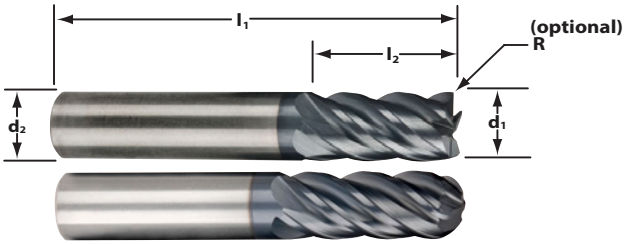
enDURO M525

Z5 | SQ | CR | BN | 40° | AlCrNX | PLAIN

K P M S

For high-performance machining in materials from low carbon steels to titanium.

Engineered for both speed and tool life, the M525 series is extremely versatile. It optimizes tool performance in many materials and in many application environments, from short runs in job shops to long production runs.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.090 CR	.120 CR	.190 CR	.250 CR	Order Code BN
1/8	1/8	1/4	1-1/2	0335808	0335809	0335810	-	-	-	-	-	0335811
		1/2	1-1/2	0335812	0335813	0335814	-	-	-	-	-	0335815
		3/4	2-1/2	0335816	0335817	0335818	-	-	-	-	-	0335819
3/16	3/16	5/16	2	0335820	0335821	0335822	-	-	-	-	-	0335823
		9/16	2	0335824	0335825	0335826	-	-	-	-	-	0335827
		3/4	2-1/2	0335828	0335829	0335830	-	-	-	-	-	0335831
1/4	1/4	3/8	2	0335832	0335833	0335834	0335835	0335836	-	-	-	0335837
		3/4	2-1/2	0335856	0335857	0335858	0335859	0335860	-	-	-	0335861
		1-1/8	3	0335862	0335863	0335864	0335865	0335866	-	-	-	0335867
5/16	5/16	7/16	2	0335868	0335869	0335870	0335871	0335872	-	-	-	0335873
		13/16	2-1/2	0335874	0335875	0335876	0335877	0335878	-	-	-	0335879
		1-1/4	3	0335880	0335881	0335882	0335883	0335884	-	-	-	0335885
		2-1/8	4	0335886	0335887	0335888	0335889	0335890	-	-	-	0335891
3/8	3/8	1/2	2	0335892	0335893	0335894	0335895	0335896	0335897	-	-	0335899
		1	2-1/2	0335940	0335941	0335942	0335943	0335944	0335945	-	-	0335947
		1-1/4	3	0335948	0335949	0335950	0335951	0335952	0335953	-	-	0335955
		1-5/8	3-1/2	0335956	0335957	0335958	0335959	0335960	0335961	-	-	0335963
		1-5/8	4	0335964	0335965	0335966	0335967	0335968	0335969	-	-	0335971
		2	4	0335980	0335981	0335982	0335983	0335984	0335985	-	-	0335987
7/16	7/16	5/8	2-1/2	0335996	0335997	0335998	-	-	-	-	-	0336003
		1	2-3/4	0336004	0336005	0336006	-	-	-	-	-	0336011
		2	4	0336012	0336013	0336014	-	-	-	-	-	0336019
1/2	1/2	5/8	2-1/2	0336020	0336021	0336022	0336023	0336024	0336025	-	-	0336028
		1	3	0336065	0336066	0336067	0336068	0336069	0336070	-	-	0336073
		1-1/4	3	0336074	0336075	0336076	0336077	0336078	0336079	0336081	-	0336082
		1-5/8	4	0336083	0336084	0336085	0336086	0336087	0336088	-	-	0336091
		1-5/8	6	0336092	0336093	0336094	0336095	0336096	0336097	-	-	0336100
		2-1/8	4	0336101	0336102	0336103	0336104	0336105	0336106	0336108	-	0336109
		2-5/8	5	0336110	0336111	0336112	0336113	0336114	0336115	-	-	0336118
		3-1/4	6	0336119	0336120	0336121	0336122	0336123	0336124	-	-	0336127
5/8	5/8	3/4	3	0336128	0336129	0336130	0336131	-	0336133	-	-	0336137
		1-5/8	3-1/2	0336168	0336169	0336170	0336171	0336172	0336173	0336175	-	0336177
		2-1/8	4	0336178	0336179	0336180	0336181	-	0336183	-	-	0336187
		2-1/8	6	0336188	0336189	0336190	0336191	-	0336193	-	-	0336197
		2-5/8	5	0336198	0336199	0336200	0336201	0336202	0336203	0336205	-	0336207
		3-1/4	6	0336208	0336209	0336210	0336211	-	0336213	-	-	0336217
		4	6	0336218	0336219	0336220	0336221	-	0336223	-	-	0336227
3/4	3/4	1	3	0336228	0336229	0336230	0336231	-	0336233	-	0336236	0336237
		1-5/8	4	0336268	0336269	0336270	0336271	0336272	0336273	0336275	0336276	0336277
		2-3/8	5	0336278	0336279	0336280	0336281	0336282	0336283	0336285	0336286	0336287
		2-3/8	6	0336288	0336289	0336290	0336291	-	0336293	-	0336296	0336297
		3-1/4	6	0336298	0336299	0336300	0336301	-	0336303	-	0336306	0336307
		4-1/8	7	0336308	0336309	0336310	0336311	-	0336313	-	0336316	0336317
1	1	1-3/4	4	0336362	0336363	0336364	0336365	0336366	0336367	0336369	0336370	0336372
		2-5/8	5	0336373	0336374	0336375	0336376	0336377	0336378	0336380	0336381	0336383
		3-1/4	6	0336384	0336385	0336386	0336387	-	0336389	-	0336392	0336394
		4-1/4	7	0336395	0336396	0336397	0336398	-	0336400	-	0336403	0336405

D = Tool diameter

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.5 CR	0.75 CR	1.0 CR	1.5 CR	2.0 CR	3.0 CR	4.0 CR	5.0 CR
6	6	10	54	-	0337088	-	-	-	-	-	-	-
		13	57	0336918	0336919	-	0336921	0336922	-	-	-	-
		25	75	0337089	0337091	-	0337092	-	-	-	-	-
8	8	12	58	-	0337093	-	-	-	-	-	-	-
		19	63	0336923	0336924	-	0336926	0336927	-	-	-	-
		32	75	0337094	0337095	-	0337096	-	-	-	-	-
10	10	14	66	-	-	-	0337097	-	-	-	-	-
		22	72	0336928	0336929	-	0336931	0336932	0336933	-	-	-
		40	88	0337099	0337100	-	0337101	0337102	0337103	-	-	-
12	12	16	73	-	-	-	0337104	-	-	-	-	-
		26	83	0336934	0336935	0336936	0336937	0336938	0336939	0336940	-	-
		50	100	0337122	-	0337123	0337124	0337125	0337106	0337107	-	-
		75	150	0337126	-	0337127	0337128	0337129	-	-	-	-
16	16	22	82	-	-	-	0337108	-	-	-	-	-
		32	92	0336941	-	0336942	0336943	0336944	0336945	0336946	0336947	-
		55	110	0337130	-	0337131	0337132	0337133	0337109	0337110	-	-
		75	150	0337134	-	0337135	0337136	0337137	-	-	-	-
20	20	26	92	-	-	-	0337111	-	-	-	-	-
		38	104	0336948	-	-	0336950	0336951	0336952	0336953	0336954	0336955
		65	125	0337138	-	-	0337140	0337141	0337112	0337114	-	-
		85	150	0337142	-	-	0337144	0337145	0337115	0337116	-	-
25	25	45	120	0336956	-	-	0336958	0336959	0336960	0336961	0336962	0336963
		85	150	0337146	-	-	0337148	0337149	0337117	0337118	0337119	-

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

CASE STUDY | *enDURO M525*

Proof of Performance

We shot a performance test with a 1/2 in. enDURO M525 tool on a complex contoured part in titanium 6Al-4V. You can watch it on our YouTube channel or the Video Gallery on our website. In titanium 6Al-4V, the same tool was used – no changes.

PERIPHERAL ROUGHING			
300 sfm at 2292 rpm	.0025 ipt for 28.6 imp	Axial .625	Radial .150
PERIPHERAL FINISHING			
300 sfm at 2292 rpm	.0026 ipt for 29.8 imp	Axial 1.00	Radial .0075
FINISH FACING			
300 sfm at 2292 rpm	.0026 ipt for 29.8 imp	Axial .008	Radial .338

From roughing to finishing with a single tool – think what it could do for you.

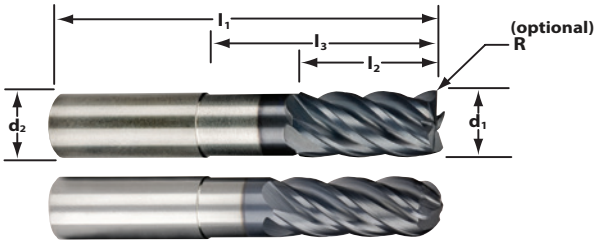
enDURO M525N

Z5 | SQ | CR | BN | 40° | NECK | AlCrNX | PLAIN

K P M S

For high-performance machining in materials from low carbon steels to titanium.

Adding a neck to the M525 design gives you a high-performance tool with easy clearance in deeper cavities and easier machining against tight walls. Neck relief and short flute length combine to increase end mill stability in the cut for more precise tolerances. Great for work in pockets.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.120 CR	.250 CR	Order Code BN
1/4	1/4	3/8	1-1/8	2-1/2	0336472	0336474	0336476	0336478	-	-	0336482
			1-3/8	3	0336484	0336486	0336488	0336490	-	-	0336494
			2-3/8	4	0336496	0336498	0336500	0336502	-	-	0336506
3/8	3/8	1/2	1-3/8	3	0336508	0336510	0336512	0336514	-	-	0336522
			2-3/8	4	0336524	0336526	0336528	0336530	-	-	0336538
			3-3/8	5	0336540	0336542	0336544	0336546	-	-	0336554
1/2	1/2	5/8	1-3/8	3	0336572	0336574	0336576	0336578	0336582	-	0336588
			2-1/4	4	0336590	0336592	0336594	0336596	0336600	-	0336606
			3-1/4	5	0336608	0336610	0336612	0336614	0336618	-	0336624
			4-1/4	6	0336626	0336628	0336630	0336632	0336636	-	0336642
5/8	5/8	3/4	2-1/8	4	0336644	-	0336648	0336650	0336654	-	0336662
			3-1/8	5	0336664	-	0336668	0336670	0336674	-	0336682
			4-1/8	6	0336684	-	0336688	0336690	0336694	-	0336702
3/4	3/4	1	2	4	0336704	-	0336708	0336710	0336714	0336720	0336722
			2-7/8	5	0336724	-	0336728	0336730	0336734	0336740	0336742
			3-7/8	6	0336744	-	0336748	0336750	0336754	0336760	0336762
			4-7/8	7	0337276	-	0337280	0337282	0337286	0337292	0337294
1	1	1-1/4	2-5/8	5	0336786	-	0336790	0336792	0336796	0336802	-
			3-5/8	6	0336808	-	0336812	0336814	0336818	0336824	-
			4-5/8	7	0336830	-	0336834	0336836	0336840	0336846	-

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.5 CR	1.0 CR	1.5 CR	2.0 CR	3.0 CR	Order Code BN
6	6	8	27	63	0336964	0337098	0337105	0337113	-	-	0337065
			39	75	0336969	0337120	0337121	0336965	-	-	0337067
			64	100	0336974	0336966	0336967	0336968	-	-	0337068
8	8	10	27	63	0336979	0336970	0336971	0336972	-	-	0337069
			39	75	0336984	0336973	0336975	0336976	-	-	0337070
			64	100	0336990	0336977	0336978	0336980	-	-	0337071
10	10	12	32	72	0336996	0336981	0336982	0336983	-	-	0337072
			60	100	0337003	0336986	0336987	0336988	-	-	0337073
12	12	15	38	83	0337017	0336995	0336997	0336998	0336999	0337000	0337076
			55	100	0337024	0337001	0337002	0337004	0337005	0337006	0337077
			80	125	0337031	0337007	0337008	0337009	0337011	0337012	0337078
			105	150	0337038	0337013	0337014	0337015	0337016	0337018	0337079
16	16	20	62	110	0337045	-	0337019	0337020	0337021	0337022	0337080
			102	150	0337052	-	0337025	0337026	0337027	0337028	0337081
20	20	25	75	125	0337066	-	0337037	0337039	0337040	0337041	0337084
			100	150	0337074	-	0337044	0337046	0337047	0337048	0337085
25	25	32	64	120	0337082	-	0337051	0337053	0337054	0337055	-
			94	150	0337090	-	0337058	0337060	0337061	0337062	-

D = Tool diameter

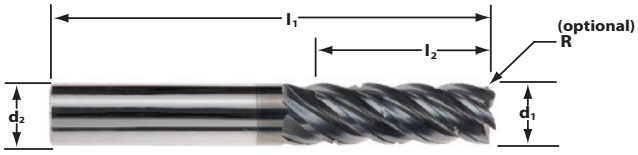
enDURO M525C

Z5 | SQ | CR | 40° | CMS | AlCrNX | PLAIN

K P M S

For high-performance machining in materials from low carbon steels to titanium.

Add the benefits of the unique Chip Management System to the versatility of the M525 design. The CMS breaks up long, stringy chips, so say goodbye to chip packing and recutting chips, and hello to free cutting tool movement in a variety of materials.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.120 CR
1/2	1/2	2-1/8	4	0337309	0337310	0337311	0337312	-
		2-5/8	5	0337314	0337315	0337316	0337317	-
		3-1/4	6	0337319	0337320	0337321	0337322	-
5/8	5/8	2-1/8	4	0337324	-	0337326	0337327	-
		2-5/8	5	0337329	-	0337331	0337332	-
		3-1/4	6	0337334	-	0337336	0337337	-
3/4	3/4	2-3/8	5	0337339	-	0337341	-	0337343
		3-1/4	6	0337344	-	0337346	-	0337348
		4-1/8	7	0337349	-	0337351	-	0337353
1	1	2-5/8	5	0337354	-	0337356	-	0337358
		3-1/4	6	0337359	-	0337361	-	0337363
		4-1/4	7	0337364	-	0337366	-	0337368

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.75 CR	1.0 CR	1.5 CR
12	12	50	100	0337150	0337151	0337152	0337153
		75	150	0337154	0337155	0337156	0337157
16	16	55	110	0337158	0337159	0337160	0337161
		75	150	0337162	0337163	0337164	0337165
20	20	65	125	0337166	-	0337168	0337169
		85	150	0337170	-	0337172	0337173
25	25	55	120	0337174	-	0337176	0337177
		85	150	0337178	-	0337180	0337181

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

enDURO M527

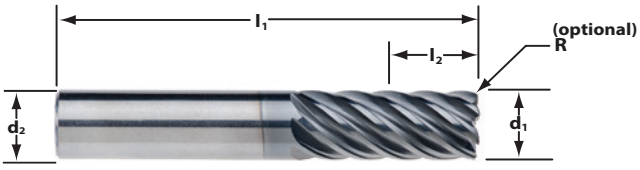
Z7 | SQ | CR | 40° | AlCrNX | PLAIN

K P M S

For high-performance machining in materials from low carbon steels to titanium.

- 7-flute
- AlCrNX
- Square end and corner radius for machining in titanium and stainless steels

The M527 retains the best features of the M525 and adds two more cutting edges to improve metal removal rates – especially in HEM tool paths – without losing versatility. The seven cutting edges also make the M527 an excellent choice for finishing applications.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

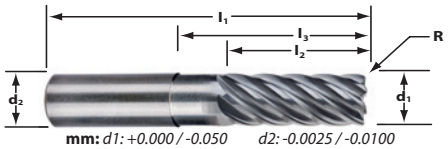
Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.125 CR
3/8	3/8	1/2	2	0339048	0339049	0339050	0339051	-
		7/8	2-1/2	0339054	0339055	0339056	0339057	-
		1-1/4	3	0339060	0339061	0339062	0339063	-
1/2	1/2	5/8	2-1/2	0339066	0339067	0339068	0339069	0339071
		1-1/4	3	0339072	0339073	0339074	0339075	0339077
		1-5/8	3-1/2	0339078	0339079	0339080	0339081	0339083
		2-1/8	4	0339084	0339085	0339086	0339087	0339089
		2-5/8	5	0339090	0339091	0339092	0339093	0339095
5/8	5/8	3/4	3	0339096	-	0339098	0339099	0339101
		1-3/8	3-1/2	0339102	-	0339104	0339105	0339107
		2-1/8	4	0339108	-	0339110	0339111	0339113
		2-5/8	5	0339114	-	0339116	0339117	0339119
		3-1/4	6	0339120	-	0339122	0339123	0339125
3/4	3/4	1	3	0339126	-	0339128	0339129	0339131
		1-5/8	4	0339132	-	0339134	0339135	0339137
		2-3/8	5	0339138	-	0339140	0339141	0339143
		3-1/4	6	0339144	-	0339146	0339147	0339149
		4-1/8	7	0339150	-	0339152	0339153	0339155
1	1	1-3/4	4	0339156	-	0339158	0339159	0339161
		2-1/4	5	0339162	-	0339164	0339165	0339167
		3-1/4	6	0339168	-	0339170	0339171	0339173
		4-1/8	7	0339174	-	0339176	0339177	0339179

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.5 CR	1.0 CR	1.5 CR	2.0 CR	3.0 CR	4.0 CR
10	10	22	72	0339198	0339199	0339200	0339201	-	-	-
12	12	26	83	0339206	0339207	0339208	0339209	-	-	-
		32	83	-	0853512	0853513	0853516	0853532	0853540	0853543
16	16	34	92	0339218	0339219	0339220	0339221	-	-	-
		42	92	-	0440705	0853544	-	0853550	0853551	0853563
20	20	42	104	0339230	0339231	0339232	0339233	-	-	-
		52	104	-	0853571	0853579	-	0853584	0853600	0853601

enDURO M527N

NECK



mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code by Corner Radius 0.5 CR	1.0 CR	3.0 CR
12	12	26	55	100	0853602	0853603	0853604
16	16	34	75	125	0853607	0853609	0853633
20	20	42	100	150	0853635	0853637	0853638

D = Tool diameter

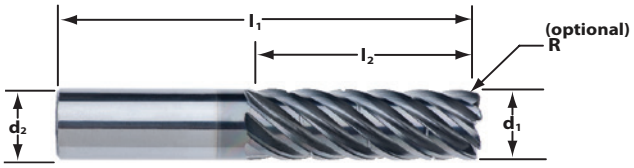
enDURO M527C

Z7 | SQ | CR | 40° | CMS | AlCrNX | PLAIN

K P M S

For high-performance machining in materials from low carbon steels to titanium.

- 7-flute
- CMS
- AlCrNX
- Square end and corner radius for machining in titanium and stainless steels



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*

Add the benefits of IMCO's unique Chip Management System to the versatile M527 design. The CMS breaks up long, stringy chips to avoid chip packing and recutting, and allows free cutting tool movement in a variety of materials. The results are great chip control and very high metal removal rates.

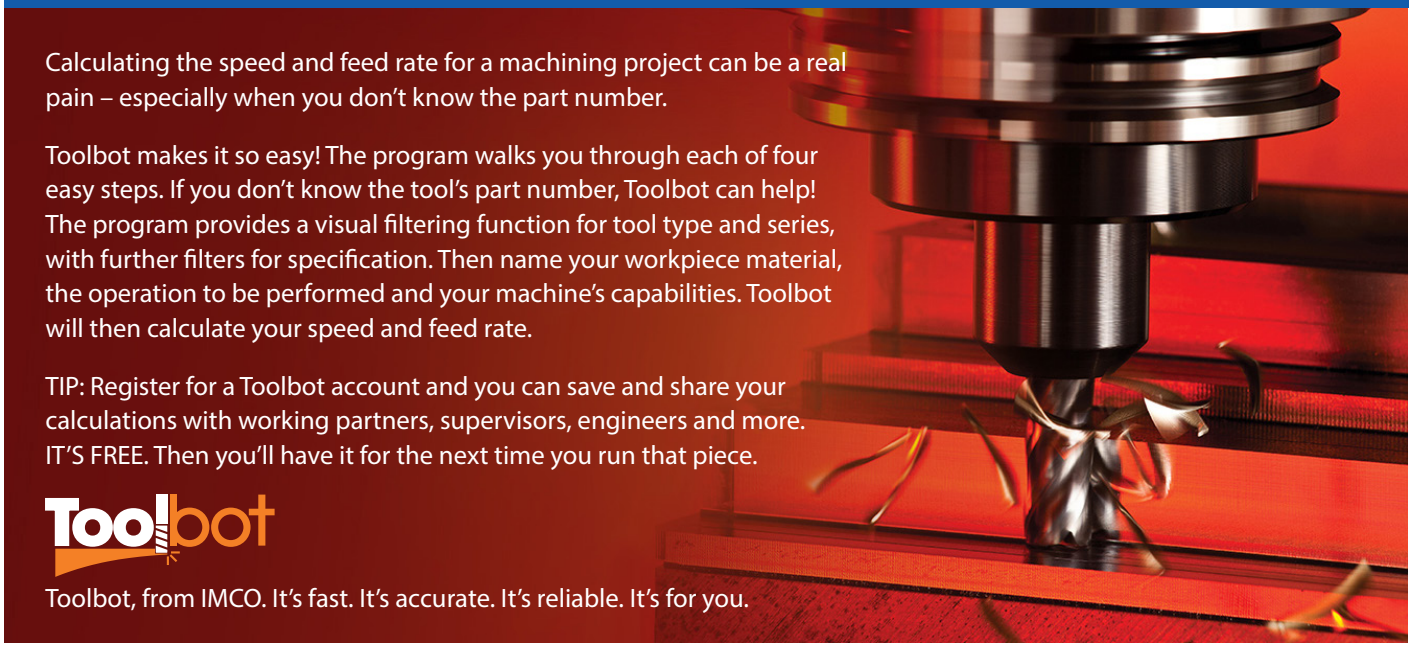
FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR
1/2	1/2	2-1/8	4	0339250	0339251	0339252	-
		2-5/8	5	0339255	0339256	0339257	-
5/8	5/8	2-1/8	4	0339260	-	0339262	0339263
		2-5/8	5	0339265	-	0339267	0339268
		3-1/4	6	0339270	-	0339272	0339273
3/4	3/4	2-3/8	5	0339275	-	0339277	0339278
		3-1/4	6	0339280	-	0339282	0339283
		4-1/8	7	0339285	-	0339287	0339288
1	1	2-1/4	5	0339290	-	0339292	0339293
		3-1/4	6	0339295	-	0339297	0339298
		4-1/8	7	0339300	-	0339302	0339303

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

SOLUTIONS | *Toolbot*



Calculating the speed and feed rate for a machining project can be a real pain – especially when you don't know the part number.

Toolbot makes it so easy! The program walks you through each of four easy steps. If you don't know the tool's part number, Toolbot can help! The program provides a visual filtering function for tool type and series, with further filters for specification. Then name your workpiece material, the operation to be performed and your machine's capabilities. Toolbot will then calculate your speed and feed rate.

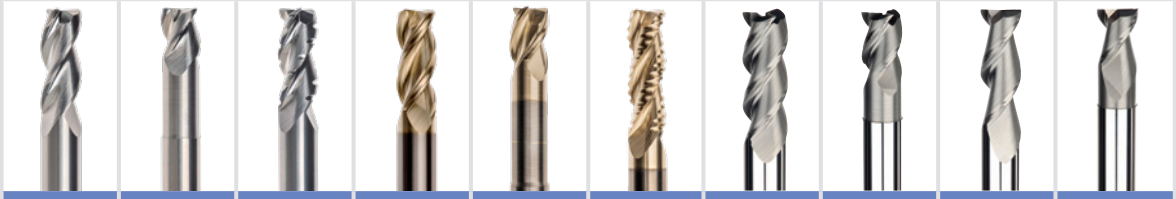
TIP: Register for a Toolbot account and you can save and share your calculations with working partners, supervisors, engineers and more. IT'S FREE. Then you'll have it for the next time you run that piece.

Toolbot

Toolbot, from IMCO. It's fast. It's accurate. It's reliable. It's for you.

SHEAR IT AND CLEAR IT.

Break the chains of aluminum chip packing for good. STREAKERS are the champions in aluminum alloys, specially designed for free cutting movement every single time. Even better, you get impressively high metal removal rates without maxing out your horsepower.



	M213	M213N	M213C	M223	M223N	M233	M203	M203N	M202	M202N
NUMBER OF FLUTES	Z3	Z3	Z3	Z3	Z3	Z3	Z3	Z3	Z2	Z2
END TYPES	SQ, CR, BN	SQ, CR, BN	CR	SQ, CR, BN	SQ, CR, BN	CR	SQ, CR	SQ	SQ, CR, BN	SQ
HELIX ANGLE	37°	37°	37°	37°	37°	37°	45°	45°	45°	45°
COATING	HIGH POLISH	HIGH POLISH	HIGH POLISH	ZrN	ZrN	ZrN	NON COATED	NON COATED	NON COATED	NON COATED
SHANK TYPES	PLAIN	PLAIN	PLAIN	PLAIN, WELDON	PLAIN	PLAIN	PLAIN, WELDON	PLAIN	PLAIN, WELDON	PLAIN
APPLICATIONS			ROUGH, FINISH			ROUGH		ROUGH, FINISH		ROUGH
MATERIAL(S)	N									

STREAKERS make up the most complete family of high-performance aluminum end mills. Choose from legacy M202 and M203 mills, the rugged second-generation M223 mills and M233 roughers, or the premium performance of the M213, the newest cutter in the series.

- Extremely large flute cavities
- Improved corner strength
- Neck option allows work in deep cavities, minimizes tool deflection. Great for work in pockets
- Fine cutting edges, unique grinds

Use Toolbot to calculate dynamic speeds and feed rates for the STREAKERS M2 Series by scanning the QR code.

STREAKERS M213

Z3 | SQ | CR | BN | 37° | HIGH POLISH | PLAIN

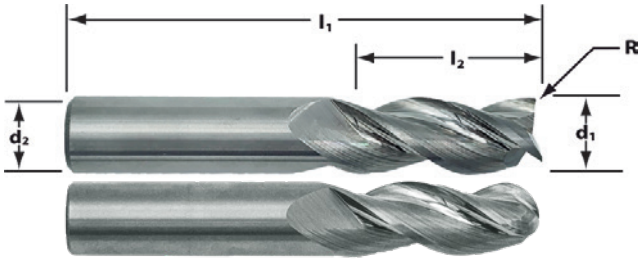
N

Designed to handle extreme tool paths in aluminum alloys

- 3-flute
- Square end, corner radius and ball nose for high-performance machining in aluminum

STREAKERS M213 mill cutters are designed specifically for the extreme tool paths often used in high-performance machining of aluminum alloys. The M213 allows free cutting action for more aggressive moves, such as plunging, without using a peck cycle and ramping at high feed rates on entry moves.

M213 mills provide superior surface finishes and are engineered to meet the demands of today's aerospace industry.



in: *d1: -0.0001 / -0.0004 d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.031 CR	.062 CR	.093 CR	.125 CR	.187 CR	.250 CR	Order Code BN
1/8	1/8	3/16	1-1/2	9163464	-	-	-	-	-	-	-	-
		1/4	1-1/2	9163465	9163466	-	-	-	-	-	-	-
		1/4	2	9163467	-	-	-	-	-	-	-	-
		3/8	1-1/2	9163468	9163469	-	-	-	-	-	-	9163658
		3/8	2	9163470	9163471	-	-	-	-	-	-	9163659
		1/2	2	9163472	-	-	-	-	-	-	-	9163660
		5/8	2	9163473	-	-	-	-	-	-	-	-
		3/4	2	9163474	-	-	-	-	-	-	-	-
		1	2	9163475	-	-	-	-	-	-	-	-
3/16	3/16	1/4	2	9163476	9163676	9163677	-	-	-	-	-	-
		3/8	2	9163477	-	-	-	-	-	-	-	9163661
		1/2	2	9163478	9163479	9163480	-	-	-	-	-	-
		5/8	2-1/2	9163481	9163482	9163483	-	-	-	-	-	9163662
		3/4	2-1/2	9163484	-	-	-	-	-	-	-	-
		1	2-1/2	9163485	-	-	-	-	-	-	-	-
1/4	1/4	3/8	2	9163486	9163487	9163488	-	-	-	-	-	-
		3/8	2-1/2	9163489	9163490	9163491	-	-	-	-	-	-
		1/2	2-1/2	9163492	-	-	-	-	-	-	-	9163663
		5/8	2-1/2	9163493	9163494	9163495	9163496	-	-	-	-	-
		3/4	2-1/2	9163497	9163498	9163499	9163500	-	-	-	-	9163664
		1	3	9163501	9163502	9163503	-	-	-	-	-	-
		1-1/4	3	9163504	-	9163505	-	-	-	-	-	-
		1-1/2	3	9163506	-	-	-	-	-	-	-	-
		1-3/4	4	9163507	-	-	-	-	-	-	-	-
		2	4	9163508	-	-	-	-	-	-	-	-
5/16	5/16	5/8	2-1/2	9163509	-	-	-	-	-	-	-	-
		13/16	2-1/2	9163510	9163511	9163512	-	-	-	-	-	9163665
		15/16	2-1/2	9163513	-	-	-	-	-	-	-	-
		1-1/4	3	9163514	-	-	-	-	-	-	-	-
		1-1/2	4	9163515	-	-	-	-	-	-	-	-

D = Tool diameter

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.031 CR	.062 CR	.093 CR	.125 CR	.187 CR	.250 CR	Order Code BN
3/8	3/8	1/2	2	9163516	9163517	9163518	-	-	-	-	-	-
		1/2	2-1/2	9163519	9163520	9163521	-	-	-	-	-	-
		5/8	2-1/2	9163522	9163523	9163524	9163678	9163680	-	-	-	9163666
		3/4	2-1/2	9163525	-	-	-	-	-	-	-	-
		1	2-1/2	9163526	9163527	9163528	9163529	9163681	-	-	-	9163667
		1-1/4	3	9163530	9163531	9163532	9163533	9163682	9163534	-	-	9163673
		1-1/2	3-1/2	9163535	-	9163536	9163537	9163683	-	-	-	9163674
		2	4	9163538	-	-	-	-	-	-	-	-
		2-1/2	4-1/2	9163539	-	-	-	-	-	-	-	-
7/16	7/16	1	2-3/4	9163540	-	-	-	-	-	-	-	-
1/2	1/2	5/8	2-1/2	9163541	9163542	9163543	-	-	-	-	-	-
		5/8	3	9163544	9163545	9163546	9163547	9163548	9163549	-	-	9163668
		3/4	3	9163550	-	-	-	-	-	-	-	-
		1	3	9163551	9163552	9163553	9163554	9163555	9163556	-	-	9163669
		1-1/4	3	9163557	9163558	9163559	9163561	9163562	9163563	-	-	9163670
		1-5/8	4	9163564	9163565	9163566	9163567	9163568	9163569	-	-	-
		2	4	9163570	9163571	9163572	9163573	9163574	9163575	-	-	-
		2-1/4	4	9163576	-	-	-	-	-	-	-	-
		2-1/2	5	9163577	-	9163578	9163679	9163684	9163685	-	-	9163675
		2-1/2	6	9163579	-	-	-	-	-	-	-	-
		3-1/4	6	9163580	-	-	-	-	-	-	-	-
		4	8	9163581	-	-	-	-	-	-	-	-
5/8	5/8	3/4	3-1/2	9163582	-	9163583	-	-	9163584	-	-	-
		1-1/4	3-1/2	9163585	-	9163586	-	-	9163587	-	-	-
		1-5/8	4	9163588	9163589	9163590	-	-	9163591	-	-	9163671
		1-7/8	4	9163592	-	9163593	-	-	9163594	-	-	-
		2-1/8	5	9163595	-	-	-	-	-	-	-	-
		2-1/2	5	9163596	-	9163597	-	-	-	-	-	-
		3-1/4	6	9163598	-	-	-	-	-	-	-	-
3/4	3/4	1	4	9163599	-	9163600	9163601	9163602	9163603	9163604	9163605	-
		1-5/8	4	9163606	-	9163607	9163608	9163609	9163610	9163611	9163612	9163672
		2	5	9163613	-	-	-	-	9163614	-	-	-
		2-1/4	5	9163615	-	9163616	9163617	9163618	9163619	-	9163620	-
		2-1/2	5	9163621	-	9163622	9163623	-	9163624	9163625	9163626	-
		3	6	9163627	-	-	-	-	-	-	-	-
		3-1/4	6	9163628	-	9163629	-	-	9163630	-	-	-
		3-1/2	6	9163631	-	-	-	-	9163632	-	-	-
		4	7	9163633	-	-	-	-	-	-	-	-
		5	8	9163634	-	-	-	-	-	-	-	-
1	1	1-1/4	4	9163635	-	-	-	-	-	-	-	-
		1-1/2	4	9163636	-	9163637	9163638	9163639	9163640	-	9163641	-
		2	5	9163642	-	-	-	-	-	-	-	-
		2-1/2	5	9163643	-	9163644	9163645	9163646	9163647	-	9163648	-
		3-1/2	6	9163649	-	9163650	9163651	9163652	9163653	-	9163654	-
		4-1/4	7	9163655	-	9163656	-	-	-	-	-	-
		5-1/2	8	9163657	-	-	-	-	-	-	-	-

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

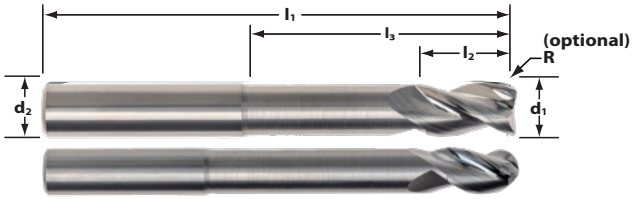
STREAKERS M213N

N

For high-performance machining in aluminum alloys

- 3-flute
- Square end, corner radius and ball nose w/neck relief for machining in aluminum

Designed to handle extreme tool paths in aluminum alloys, STREAKERS M213 end mills provide superior surface finishes and are engineered to meet the demands of today's aerospace industry. The M213N with reduced neck allows milling in deep cavities while minimizing tool deflection.



d1: *-0.0001 / -0.0004* **d2:** *-0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.031 CR	.062 CR	.093 CR	.125 CR	.187 CR	.250 CR	Order Code BN
1/8	1/8	3/16	3/4	2-1/2	9163686	9163718	-	-	-	-	-	-	9163815
			5/8	3	9163687	9163719	-	-	-	-	-	-	9163816
			1	3	9163688	9163720	-	-	-	-	-	-	9163817
3/16	3/16	1/4	3/4	2-1/2	9163689	9163721	9163736	-	-	-	-	-	9163818
			1	3	9163690	9163722	9163737	-	-	-	-	-	9163819
1/4	1/4	3/8	7/8	2-1/2	9163691	9163723	9163738	9163765	-	-	-	-	9163820
			1-3/8	3	9163692	9163724	9163739	-	-	-	-	-	9163821
			1-5/8	3	9163693	9163725	9163740	9163766	-	-	-	-	9163822
			2-1/4	4	9163694	9163726	9163741	-	-	-	-	-	9163823
3/8	3/8	5/8	1-1/8	2-1/2	9163695	9163727	9163742	9163767	9163784	-	-	-	9163824
			1-1/4	3	9163696	9163728	9163743	9163768	-	-	-	-	9163825
			1-5/8	3	9163697	9163729	9163744	9163769	-	-	-	-	9163826
			2-1/4	4	9163698	9163730	9163745	-	-	-	-	-	9163827
			2-1/2	5	9163699	-	9163746	9163770	-	-	-	-	9163828
			3-1/8	6	9163700	9163731	9163747	-	-	-	-	-	9163829
1/2	1/2	5/8	1-3/8	3	9163701	9163732	9163748	9163771	9163785	9163791	-	-	9163830
			1-3/4	3-1/2	9163702	-	9163749	9163772	-	9163792	-	-	9163831
		3/4	2-1/4	4	9163703	9163733	9163750	9163773	9163786	9163793	-	-	9163832
			2-3/4	4-1/2	9163704	-	9163751	9163774	-	9163794	-	-	9163833
			3-1/4	5	9163705	9163734	9163752	9163775	-	9163795	-	-	9163834
			3-3/4	5	9163706	-	9163753	-	-	-	-	-	9163835
			4-1/4	6	9163707	9163735	9163754	9163776	9163787	9163796	-	-	9163836
5/8	5/8	3/4	1-3/4	4	9163708	-	9163755	-	-	9163797	-	-	9163837
			2-3/8	5	9163709	-	9163756	9163777	9163788	9163798	-	-	9163838
			3-3/8	6	9163710	-	9163757	-	-	9163799	-	-	9163839
3/4	3/4	1	1-3/4	4	9163711	-	9163758	9163778	9163789	9163800	9163807	9163809	9163840
			2-3/8	5	9163712	-	9163759	9163779	-	9163801	-	-	9163841
			3-3/8	6	9163713	-	9163760	9163780	9163790	9163802	9163808	9163810	9163842
			5	7	9163714	-	9163761	9163781	-	9163803	-	9163811	9163843
1	1	1-1/4	2-5/8	5	9163715	-	9163762	9163782	-	9163804	-	9163812	9163844
			3-3/8	6	9163716	-	9163763	-	-	9163805	-	9163813	9163845
			4-3/8	7	9163717	-	9163764	9163783	-	9163806	-	9163814	9163846

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

STREAKERS M213C

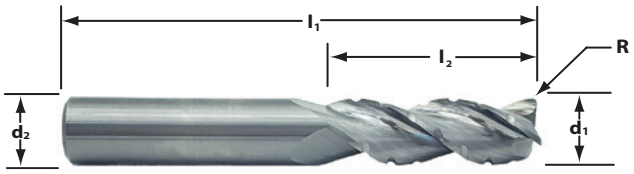
Z3 | CR | CMS | 37° | HIGH POLISH | PLAIN

N

For high-performance machining in aluminum alloys.

- 3-flute
- CMS
- Corner radius for high-performance machining in aluminum

Designed to handle extreme tool paths in aluminum alloys, STREAKERS M213 end mills provide a superior surface finish and are engineered to meet the demands of today's aerospace industry. The M213C adds the benefits of our unique Chip Management System for maximum chip control.



in: *d1: -0.0001 / -0.0004 d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .015 CR	.031 CR	.062 CR	.093 CR	.125 CR
1/4	1/4	1/2	2-1/2	9163847		-	-	-
		3/4	2-1/2	9163848	-	-	-	-
		1	3	9163849	-	-	-	-
3/8	3/8	15/16	2-1/2	9163850	-	-	-	-
		1-1/8	3	9163851	-	-	-	-
		1-1/2	3-1/2	9163852	-	-	-	-
1/2	1/2	1-1/4	3	-	9163853	9163863	9163867	-
		1-1/2	3-1/2	-	9163854	-	-	-
		2	4	-	9163855	-	-	-
5/8	5/8	1-1/4	3-1/2	-	9163856	9163864	9163868	9163871
		1-7/8	4	-	9163857	-	-	-
3/4	3/4	1-5/8	4	-	9163859	9163865	9163869	9163872
		2-1/4	5	-	9163860	-	-	-
1	1	1-1/2	4	-	9163861	9163866	9163870	9163873
		2-1/4	5	-	9163862	-	-	-

D = Tool diameter

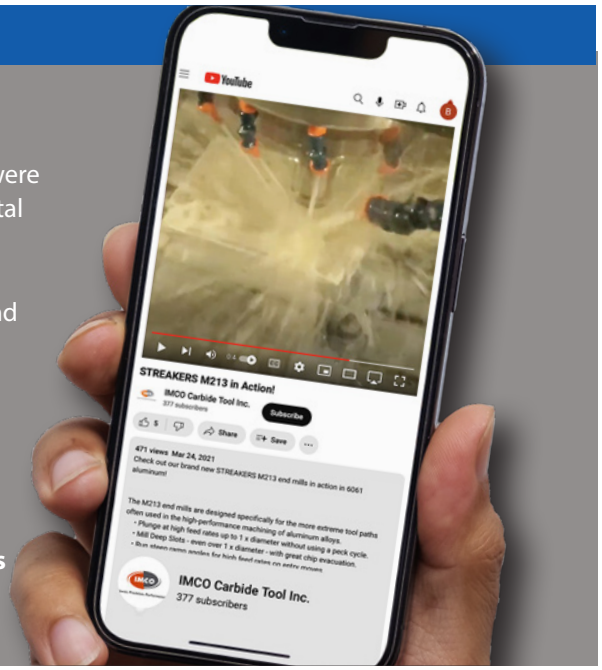
TOOL TIP | *STREAKERS M213C*

STREAKERS: Caught on Video

Proving their power in 6061 aluminum, STREAKERS M213 end mills were captured by our crew cutting through this typically troublesome metal like butter. We designed M213s to solve a specific problem: frequent chip pollution and downtime while machining aluminum alloys. These STREAKERS with CMS cruise along more extreme tool paths and provide even more timesavers like:

- **Plunging at high feed rates up to 1 x diameter without using a peck cycle**
- **Milling deep slots – even over 1 x diameter – with great chip evacuation**
- **Running steep ramp angles for high feed rates on entry moves**

Scan the QR code to see the video for yourself.



STREAKERS M223

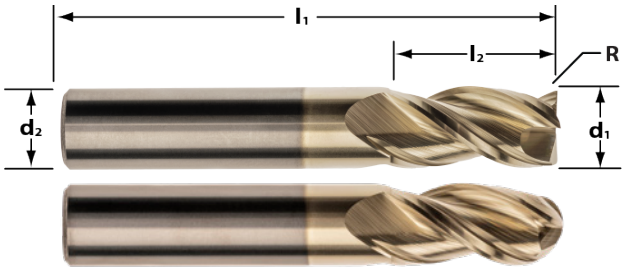
Z3 | SQ | CR | BN | 37° | ZrN | PLAIN | WELDON

N

For high-performance machining in aluminum alloys

- 3-flute
- ZrN
- Square end, corner radius and ball nose for machining in aluminum

Improved floor and wall finishes, better ramping ability and longer tool life – all part of the new STREAKERS M223 end mill design. The unique grinds curl and evacuate gummy aluminum chips, allowing high feed rates without chip packing. Excellent for roughing and finishing.



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*
mm: *d1: -0.025 / -0.0100* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.125 CR	Order Code BN
1/8	1/8	1/4	1-1/2	0334692	-	-	-	-	-
		3/8	1-1/2	0334693	0334694	-	-	-	0334695
		1/2	2	0334696	-	-	-	-	-
3/16	3/16	5/16	2	0334697	-	-	-	-	-
		9/16	2	0334698	0334699	-	-	-	0334700
		3/4	2-1/2	0334701	-	-	-	-	-
1/4	1/4	1/2	2	0334702	0334703	-	-	-	-
		3/4	2-1/2	0334704	0334705	0334706	-	-	0334707
		1	3	0334708	0334709	0334710	-	-	-
5/16	5/16	15/16	2-1/2	0334711	0334712	0334713	-	-	-
		1-3/8	3	0334714	-	-	-	-	-
3/8	3/8	1/2	2	0334715	0334716	-	-	-	-
		15/16	2-1/2	0334717	0334718	0334719	0334720	-	0334721
		1-1/8	3	0334722	0334723	0334724	0334725	-	-
		1-1/2	3-1/2	0334726	0334727	0334728	0334729	-	-
		2	4	0334730	-	-	-	-	-
1/2	1/2	5/8	2-1/2	0334731	-	0334732	-	-	-
		5/8	3	0334733	-	0334734	-	0334735	-
		1	3	0334736	0334737	0334738	0334739	0334740	0334741
		1-1/4	3	0334742	0334743	0334744	0334745	0334746	-
		1-1/2	3-1/2	0334747	-	0334748	0334749	0334750	-
		2	4	0334751	0334752	0334753	0334754	0334755	-
		2-1/2	5	0334756	-	0334757	-	-	-
5/8	5/8	1-1/4	3-1/2	0334758	-	0334759	-	0334760	-
		1-7/8	4	0334761	-	0334762	-	0334763	0334764
		2-1/2	5	0334765	-	0334766	-	-	-
3/4	3/4	1-5/8	4	0334767	-	0334768	0334769	0334770	0334771
		2-1/4	5	0334772	-	0334773	0334774	0334775	-
		3-1/4	6	0334776	-	0334777	-	0334778	-
1	1	1-1/4	4	0334779	-	0334780	-	-	-
		2	5	0334781	-	0334782	-	-	-
		3-1/4	6	0334783	-	0334784	-	-	-
		4-1/4	7	0334785	-	0334786	-	-	-

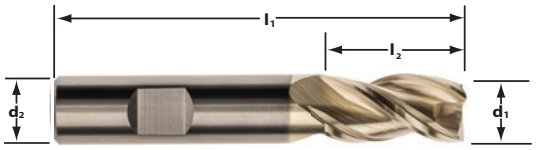
D = Tool diameter

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.3 CR	0.5 CR	1.0 CR	1.5 CR	2.0 CR	3.0 CR	Order Code BN
3	3	9	38	0334910	0334911	-	-	-	-	-	0334912
4	4	12	50	0334913	0334914	-	-	-	-	-	0334915
5	5	15	50	0334916	0334917	-	-	-	-	-	0334918
6	6	13	57	0334919	0334920	0334921	0334922	-	-	-	0334923
		18	63	0334924	-	0334925	0334926	-	-	-	-
		24	75	0334927	-	0334928	0334929	-	-	-	-
8	8	20	63	0334930	-	0334931	0334932	-	-	-	0334933
		32	75	0334934	-	0334935	0334936	-	-	-	-
10	10	20	66	0334937	0334938	-	-	-	-	-	-
		22	72	0334939	0334940	-	-	-	-	-	-
		25	72	0334941	0334942	0334943	0334944	0334945	-	-	0334946
		30	75	0334947	-	0334948	0334949	0334950	-	-	-
		40	88	0334951	-	0334952	0334953	0334954	-	-	-
12	12	24	73	0334955	0334956	-	-	-	-	-	-
		26	83	0334957	0334958	0334959	0334960	0334961	0334962	0334963	-
		30	83	0334964	-	0334965	0334966	0334967	0334968	0334969	0334970
		36	88	0334971	-	0334972	0334973	0334974	-	0334975	-
		48	100	0334976	-	0334977	0334978	0334979	0334980	0334981	-
16	16	32	92	0334982	-	0334983	0334984	0334985	0334986	0334987	0334988
		48	110	0334989	-	-	0334990	0334991	0334992	0334993	-
		64	125	0334994	-	-	0334995	0334996	0334997	0334998	-
20	20	40	104	0334999	-	-	0335000	0335001	0335002	0335003	0335004
		60	125	0335005	-	-	0335006	0335007	0335008	0335009	-
		80	150	0335010	-	-	0335011	0335012	0335013	0335014	-
25	25	50	125	0335015	-	-	-	-	-	-	-

D = Tool diameter

M223 w/WELDON



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ
3/8	3/8	15/16	2-1/2	0334787
		1-1/2	3-1/2	0334788
1/2	1/2	1	3	0334789
		1-1/2	3-1/2	0334790
		2	4	0334791
5/8	5/8	1-7/8	4	0334792
3/4	3/4	1-5/8	4	0334793
		2-1/4	5	0334794
		3-1/4	6	0334795
1	1	2	5	0334796
		3-1/4	6	0334797

Scan to calculate speeds and feed rates with Toolbot

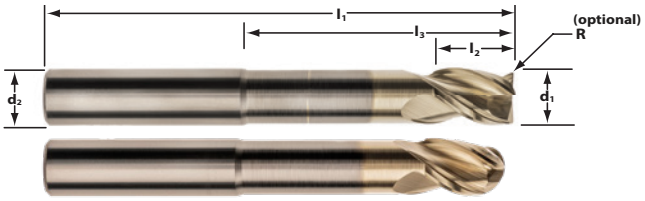
STREAKERS M223N

N

For high-performance machining in aluminum alloys

- 3-flute
- ZrN
- Square end, corner radius and ball nose w/ neck relief for machining in aluminum

Adding a necked shank to the M223 design offers a high-performance tool that can reach into deep cavities while minimizing tool deflection. Great for work in pockets.



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*
mm: *d1: -0.025 / -0.0100* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.125 CR	Order Code BN
1/8	1/8	1/4	3/4	2-1/2	0334812	0334813	-	-	-	0334814
			1	3	0334815	0334816	-	-	-	0334817
3/16	3/16	1/4	3/4	2-1/2	0334818	0334819	-	-	-	0334820
			1	3	0334821	0334822	-	-	-	0334823
1/4	1/4	3/8	7/8	2-1/2	0334824	0334825	0334826	-	-	0334827
			1-3/8	3	0334828	0334829	0334830	-	-	0334831
			2-1/4	4	0334832	0334833	0334834	-	-	0334835
3/8	3/8	1/2	1-1/8	2-1/2	0334836	0334837	0334838	0334839	-	0334840
			1-1/4	3	0334841	0334842	0334843	0334844	-	0334845
			2-1/4	4	0334846	0334847	0334848	-	-	0334849
1/2	1/2	5/8	1-3/8	3	0334850	0334851	0334852	0334853	0334854	0334855
			2-1/4	4	0334856	0334857	0334858	0334859	0334860	0334861
			3-1/4	5	0334862	0334863	0334864	0334865	0334866	0334867
			4-1/4	6	0334868	0334869	0334870	0334871	0334872	0334873
5/8	5/8	3/4	1-3/4	4	0334874	-	0334875	-	0334876	0334877
			2-3/8	5	0334878	-	0334879	-	0334880	0334881
			3-3/8	6	0334882	-	0334883	-	0334884	0334885
3/4	3/4	1	1-3/4	4	0334886	-	0334887	0334888	0334889	0334890
			2-3/8	5	0334891	-	0334892	0334893	0334894	0334895
			3-3/8	6	0334896	-	0334897	0334898	0334899	0334900
1	1	1-1/4	2-5/8	5	0334901	-	0334902	-	-	0334903
			3-3/8	6	0334904	-	0334905	-	-	0334906
			4-3/8	7	0334907	-	0334908	-	-	0334909

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ	Order Code by Corner Radius 0.3 CR	0.5 CR	1.0 CR	1.5 CR	2.0 CR	3.0 CR	Order Code BN
6	6	9	26	63	0335029	0335030	0335031	0335032	-	-	-	0335033
			32	75	0335034	0335035	0335036	0335037	-	-	-	0335038
8	8	12	34	75	0335039	0335040	0335041	0335042	-	-	-	0335043
10	10	15	32	75	0856023	0853374	0853375	0853376	-	-	-	0856031
			42	88	0335044	0335045	0335046	0335047	0335048	-	-	0335049
			52	100	0335050	0335051	0335052	0335053	0335054	-	-	0335055
12	12	18	38	88	0335056	0335057	0335058	0335059	0335060	-	0335061	0335062
			50	100	0335063	0335064	0335065	0335066	0335067	0335068	0335069	0335070
			62	125	0856024	0853377	0853378	0853379	0853380	0853381	0853382	0856032
16	16	24	50	110	0335071	-	0335072	0335073	0335074	0335075	0335076	0335077
			66	125	0335078	-	0335079	0853387	0335080	0335081	0335082	0335083
			82	150	0856025	-	0853390	0853391	0853392	0853393	0853394	0856033
20	20	30	62	125	0335084	-	0335085	0853395	0335086	0853396	0335087	0335088
			82	135	0856026	-	0853397	0853398	0853399	0853400	0853401	0855962
			102	150	0335089	-	0335090	0853434	0335091	0335092	0335093	0335094

D = Tool diameter

TOOL TIP | *STREAKERS M223/M233*

Get Higher MRR in Aluminum.

STREAKERS 3-flute cutters have wider flute space for aggressive chip evacuation under extremely heavy chip loads. And you get higher metal removal rates whether you're running at 3,000 rpm or over 10,000 rpm. Plus you get easier ramping, better wall and floor finishes and longer tool life. Bonus times three!

Watch STREAKERS M223/M233 cutters in action at imcousa.com in the Video Gallery.

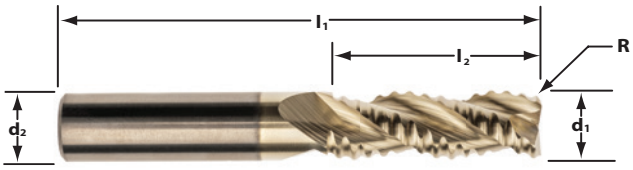
STREAKERS M233 ROUGHER

N

For high-performance roughing in aluminum alloys

- 3-flute
- ZrN
- Corner radius for machining in aluminum
- Roughers for maximum chip control

Special cutting-edge serrations reduce the pull on your power, because it requires less horsepower to plow through aluminum alloys at high metal removal rates. The ZrN coating helps reduce chip packing even in heavy tool engagement cuts.



in: *d1: +0.0000 / -0.003* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.076* *d2: 0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .015 CR	.030 CR
1/4	1/4	3/4	2-1/2	0334798	-
		1	3	0334799	-
3/8	3/8	15/16	2-1/2	0334800	-
		1-1/8	3	0334801	-
		1-1/2	3-1/2	0334802	-
1/2	1/2	1-1/4	3	-	0334803
		1-1/2	3-1/2	-	0334804
		2	4	-	0334805
5/8	5/8	1-1/4	3-1/2	-	0334806
		1-7/8	4	-	0334807
3/4	3/4	1-5/8	4	-	0334808
		2-1/4	5	-	0334809
1	1	1-1/4	4	-	0334810
		2	5	-	0334811

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 0.5 CR	1.0 CR
6	6	13	57	0335016	-
		18	63	0335017	-
		24	75	0335018	-
10	10	25	72	0335019	-
		30	75	0335020	-
		40	88	0335021	-
12	12	30	83	-	0335022
		36	88	-	0335023
		48	100	-	0335024
16	16	32	92	-	0335025
		48	110	-	0335026
20	20	40	104	-	0335027
		60	125	-	0335028

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

THE NEW FRONTIER IS HERE

Member IMC Group

IMCO

Power. Precision. Performance.

This is the dawn of a new age in metalworking. The old ways still work. But the new ways deliver amazing results. And IMCO is right at the cusp, driving innovation, continuing to push productivity forward.

Every innovation in each IMCO end mill series is the result of our continually advancing technology and our relentless drive for greater productivity. For you.

We are leaders in pushing boundaries and exploring technology to its outer edges. That's how we work. And that's why IMCO tools run smarter, smoother, longer and with incredible precision, so our solutions work. For you.

What makes IMCO a leader in this rapidly changing industry? Not just tools. Not just answers. *Solutions*. Because our first priority in designing tools is that they solve a real problem. Meet the challenge head-on. Forge a new path forward into this new frontier and show proof of the possibilities we see ahead.

That's what leaders do.

STREAKERS M203

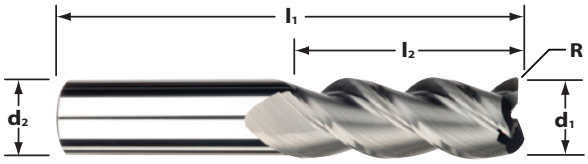
Z3 | SQ | CR | 45° | NON COATED | PLAIN

N

For high-performance machining in aluminum alloys

- 3-flute
- Non-coated

Unique grinds curl and evacuate gummy aluminum chips, allowing high feed rates without clogging. Excellent tool life. The three-flute design yields a superior finish.



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*
mm: *d1: -0.0025 / -0.0100* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.125 CR
1/8	1/8	1/4	1-1/2	0332884	-	-	-	-
		3/8	1-1/2	0333152	0333504	-	-	-
3/16	3/16	5/16	2	0332885	-	-	-	-
		9/16	2	0333153	0333505	-	-	-
1/4	1/4	3/8	2-1/2	0333017	0333206	-	-	-
		3/4	2-1/2	0333023	0333506	0333508	-	-
		1-1/4	3	0333038	0333534	0333537	-	-
5/16	5/16	13/16	2-1/2	0333154	-	-	-	-
		1-3/8	3	0333550	-	-	-	-
3/8	3/8	1/2	2-1/2	0333019	-	-	-	-
		1	2-1/2	0333024	0333553	0333555	0334249	-
		1-1/2	3-1/4	0333029	0333557	0333560	0334250	-
		2	4	0333033	-	-	-	-
1/2	1/2	5/8	3	0333020	-	0333216	-	0333219
		1-1/4	3	0333025	0333566	0333584	0333587	0334037
		2	4	0333030	0333590	0333593	0333596	0334044
		2-1/2	5	0333034	-	-	-	-
		3-1/8	6	0333042	-	-	-	-
5/8	5/8	1-5/8	3-1/2	0333026	-	0333604	-	-
		2-1/2	5	0333035	-	0333607	-	-
3/4	3/4	1	4	0333022	-	0333220	-	0333225
		1-5/8	4	0333027	-	0333611	-	0334039
		2-1/2	5	0333031	-	0333616	-	0334047
		3-1/4	6	0333036	-	0333618	-	-
1	1	1-1/4	4	0333115	-	-	-	-
		2	4	0333028	-	-	-	-
		2-5/8	5	0333032	-	-	-	-
		3-1/4	6	0333037	-	-	-	-
		4-1/8	7	0333041	-	-	-	-

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ
3	3	5	38	0332886
4	4	11	50	0333137
5	5	13	50	0333138
6	6	16	57	0333139
		29	75	0333454
8	8	19	63	0333140
		29	75	0333455
10	10	22	72	0333141
		40	88	0333462
12	12	26	83	0333142
		50	100	0333456
16	16	32	92	0333144
		57	125	0333457
20	20	38	104	0333145
		57	125	0333458

D = Tool diameter

STREAKERS M203 w/WELDON

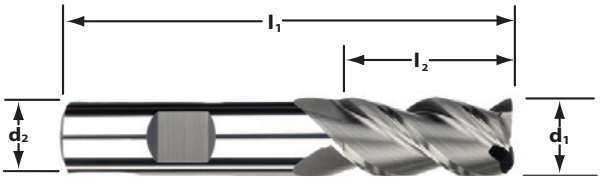
SQ | 45° | NON COATED | WELDON

N

For high-performance machining in aluminum alloys

Unique grinds curl and evacuate gummy aluminum chips, allowing high feed rates without clogging. Excellent tool life. The 3-flute design yields a superior finish.

Weldon flat tool holders are ideal when rough machining and removing large amounts of material. Weldon flats provide extra stability in the cutting zone to prevent tool pullout and offset extreme forces when cutting at extreme metal removal rates.



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*

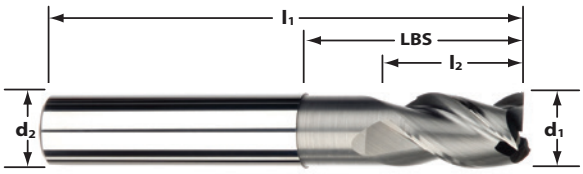
FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ
1/4	1/4	3/4	2-1/2	0332928
		1-1/4	3	0333040
3/8	3/8	7/8	2-1/2	0332929
		1-1/2	3-1/4	0332936
1/2	1/2	1-1/4	3-1/4	0332930
		2	4	0332937
5/8	5/8	1-1/4	3-1/2	0332931
		2-1/2	5	0332946
3/4	3/4	1-5/8	4	0332932
		2-1/2	5	0332938
1	1	2	4-1/2	0332935
		2-5/8	5	0332943
		3-1/4	6	0332948

D = Tool diameter

STREAKERS M203N

NECK



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ
1/4	1/4	3/8	1-1/8	2-1/2	0333061
			1-5/8	3	0333102
			2-1/4	4	0333094
3/8	3/8	1/2	1-1/8	2-1/2	0333062
			1-3/4	3	0333103
			2-1/4	4	0333095
1/2	1/2	5/8	1-3/8	3	0333063
			2-1/4	4	0333104
			2-3/8	5	0333097
			3-3/8	6	0333073
5/8	5/8	3/4	1-1/2	3-1/2	0333064
			2-1/4	5	0333105
			3-3/8	6	0333099
3/4	3/4	1	1-3/4	4	0333065
			2-1/4	5	0333106
			3-3/8	6	0333100

Scan to calculate speeds and feed rates with Toolbot

STREAKERS M202

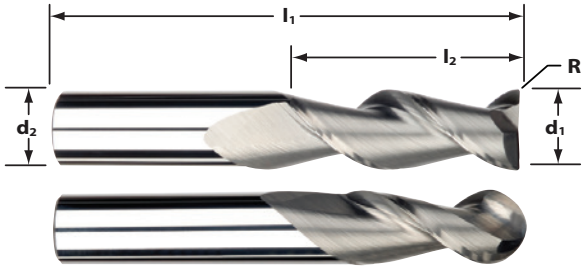
Z2 | SQ | CR | BN | 45° | NON COATED | PLAIN

N

For high-performance machining in aluminum alloys

- 2-flute
- Non-coated
- Square end, corner radius and ball nose for machining in aluminum

Unique grinds curl and evacuate gummy aluminum chips, allowing high feed rates without clogging. The two-flute design increases tool engagement angle, allowing more aggressive cuts. Excellent tool life.



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	.125 CR	Order Code BN
1/8	1/8	1/4	1-1/2	0332975	-	-	-	-	-
		3/8	1-1/2	0332983	0333183	-	-	-	0333175
3/16	3/16	5/16	2	0332976	-	-	-	-	-
		9/16	2	0332984	0333186	-	-	-	0333176
1/4	1/4	3/8	2-1/2	0332977	-	-	-	-	-
		3/4	2-1/2	0332985	0333187	0333189	-	-	0333011
		1-1/4	3	0332991	0333191	0333502	-	-	-
5/16	5/16	13/16	2-1/2	0332986	-	-	-	-	0333012
		1-3/8	3	0332992	-	-	-	-	-
3/8	3/8	1/2	2-1/2	0332979	-	-	-	-	-
		1	2-1/2	0332987	0333238	0333240	-	-	0333013
		1-1/2	3-1/4	0332993	0333243	0333283	-	-	-
		2	4	0332997	0333344	0333378	-	-	-
1/2	1/2	5/8	3	0332980	-	-	-	-	-
		1-1/4	3	0338030	0333380	0333387	0333401	0334087	0333014
		2	4	0332994	0333403	0333405	0333407	0334092	-
		2-1/2	5	0332998	-	0333428	-	-	-
5/8	5/8	1-5/8	3-1/2	0332988	-	0333430	0334347	0334349	0333015
		2-1/2	5	0332999	-	0333433	-	-	-
		3-3/4	6	0334356	-	0334358	-	-	-
3/4	3/4	1-5/8	4	0332989	-	0333435	0333438	0334089	0333016
		2-1/2	5	0332995	-	0333482	0334093	0334095	-
		3-1/4	6	0333000	-	0333484	-	0334101	-

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
3	3	5	38	0333002	-
		8	38	-	0335237
4	4	11	50	0333775	0335238
5	5	13	50	0333777	0335246
6	6	16	57	0335239	0335247
8	8	19	63	0335240	0335248
10	10	22	72	0335241	0335249
12	12	26	83	0335242	0335251
16	16	32	92	0335244	0335252
20	20	38	104	0335245	0335253

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

STREAKERS M202 w/WELDON

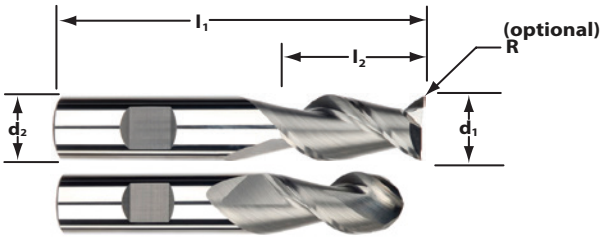
Z2 | SQ | CR | BN | 45° | NON COATED | WELDON

N

For high-performance machining in aluminum alloys

- 2-flute
- Non-coated
- Square end, corner radius and ball nose for machining in aluminum

Unique grinds curl and evacuate gummy aluminum chips, allowing high feed rates without clogging. The two-flute design increases chip evacuation area, allowing more tool engagement. Excellent tool life.



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR	Order Code BN
1/4	1/4	3/4	2-1/2	0332864	0333188	0333190	-	0332913
		1-1/4	3	0332869	-	-	-	-
5/16	5/16	13/16	2-1/2	0332865	-	-	-	0332914
		1-3/8	3	0332870	-	-	-	-
3/8	3/8	7/8	2-1/2	0332866	0333239	0333241	0333242	0332915
		1-1/2	3-1/4	0332871	-	-	-	-
		2	4	0332879	-	-	-	-
1/2	1/2	1	3	0332867	-	-	-	-
		1-1/4	3-1/4	0332924	0333381	0333388	0333402	0332916
		2	4	0332872	0333404	0333406	0333408	-
		2-1/2	5	0332880	-	-	-	-
5/8	5/8	1-1/4	3-1/2	0332868	-	-	-	0332917
		2-1/2	5	0332881	-	-	-	-
3/4	3/4	1-5/8	4	0332876	-	0333436	-	0332925
		2-1/2	5	0332877	-	0333483	-	-
		3-1/4	6	0332882	-	-	-	-

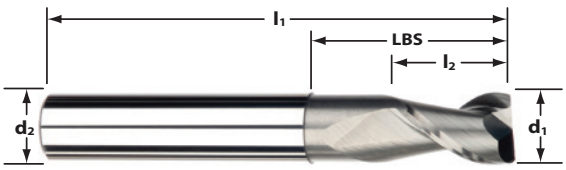
D = Tool diameter

STREAKERS M202N

NECK

For high-performance machining in aluminum alloys

Adding a necked shank to the M202 design offers a high-performance tool that provides extra clearance in deeper cavities and easier machining against tight walls. Neck relief and short flute length combine to increase end mill stability in the cut for more precise tolerances. Great for work in pockets.



in: *d1: -0.0001 / -0.0004* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ
1/4	1/4	3/8	1-1/8	2-1/2	0332969
			1-5/8	3	0333044
			2-1/4	4	0333050
3/8	3/8	1/2	1-1/8	2-1/2	0332970
			1-3/4	3	0333045
			2-1/4	4	0333051
1/2	1/2	5/8	1-3/8	3	0332971
			2-1/4	4	0333046
			2-3/8	5	0333052
			3-3/8	6	0333059
5/8	5/8	3/4	1-1/2	3-1/2	0856228
			2-1/4	5	0333047
			3-3/8	6	0333053
3/4	3/4	1	1-3/4	4	0332973
			2-1/4	5	0333048
			3-3/8	6	0333054

PERFORMANCE TO THE SIXTH POWER.

Omega-6 M7 end mills offer remarkably long tool life in hardened steels, even up to 58-62 HRc, running wet or dry. They excel in hardened materials, and they provide superior finishes in a wide range of non-hardened materials.

	M725	M726	M725N	M726N	M706	M706N
NUMBER OF FLUTES	Z5	Z6	Z5	Z6	Z6	Z6
END TYPES	SQ, CR	SQ, CR	CR	CR	SQ, CR	SQ, CR
HELIX ANGLE	50°	50°	50°	50°	40°	40°
COATING	AlTiNX	AlTiNX	AlTiNX	AlTiNX	AlTiN	AlTiN
SHANK TYPES	PLAIN	PLAIN, WELDON	PLAIN	PLAIN	PLAIN, WELDON	PLAIN, WELDON
APPLICATIONS	ROUGH, FINISH					
MATERIAL(S)	K, P, M, H					

Omega-6 cutters are purpose-driven end mills for machining in hard metal applications.

- Advanced geometry and coating for hard milling applications
- High-helix five- and six-flute end mills, great for machining materials > 48 HRc and for finish milling in a wide range of materials
- Strong cutting edges and a thick core for long tool life when machining steels up to 62 HRc
- Cutting edges protected with advanced heat-resistant coating
- Machine wet or dry – Heat-resistant coating yields great tool performance in both wet and dry machining conditions.

Use Toolbot to calculate dynamic speeds and feed rates for the Omega-6 M7 Series by scanning the QR code.

OMEGA-6 M725/M726

Z5 | Z6 | SQ | CR | 50° | AlTiNX | PLAIN | WELDON

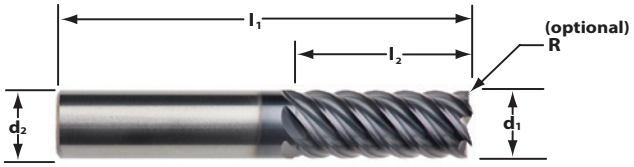
K P M H

For hardened steels and general finishing applications

- 5- or 6-flute
- AlTiNX
- Square end and corner radius for machining in hardened materials

The second generation of Omega-6 end mills, the M725/M726 series uses a high-strength core, reinforced cutting edges and a heat-resistant coating to yield long tool life in difficult machining conditions.

Best when hard milling in materials up to 62 HRc and when finishing in a wide range of materials.



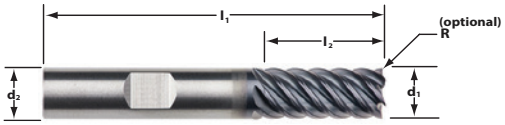
in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Number of Flutes	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR
1/8	1/8	1/4	1-1/2	5	0337576	0337577	-	-
		1/2	1-1/2	5	0337578	0337579	-	-
3/16	3/16	5/16	2	5	0337580	0337581	-	-
		9/16	2	5	0337582	0337583	-	-
1/4	1/4	3/4	2-1/2	6	0337584	0337585	0337586	-
		1-1/4	3	6	0337587	0337588	0337589	-
3/8	3/8	7/8	2-1/2	6	0337590	0337591	0337592	-
		1-1/4	3	6	0337593	0337594	0337595	-
		2	4	6	0337596	0337597	0337598	-
1/2	1/2	1	3	6	0337599	0337600	0337601	0337602
		1-1/4	3	6	0337603	0337604	0337605	0337606
		1-5/8	3-1/2	6	0337607	0337608	0337609	0337610
		2-1/8	4	6	0337611	0337612	0337613	0337614
		2-5/8	5	6	0337615	0337616	0337617	0337618
5/8	5/8	1-3/8	3-1/2	6	0337619	-	0337620	0337621
		1-7/8	4	6	0337622	-	0337623	0337624
		2-5/8	5	6	0337625	-	0337626	0337627
3/4	3/4	1-5/8	4	6	0337628	-	0337629	0337630
		2-5/8	5	6	0337631	-	0337632	0337633
		3-3/8	6	6	0337634	-	0337635	0337636

D = Tool diameter

M726 w/WELDON



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Number of Flutes	Order Code SQ	Order Code by Corner Radius .015 CR	.030 CR	.060 CR
3/8	3/8	7/8	2-1/2	6	0337696	0337697	0337698	-
		1-1/4	3	6	0337699	0337700	0337701	-
		2	4	6	0337702	0337703	0337704	-
1/2	1/2	1	3	6	0337705	0337706	0337707	0337708
		1-1/4	3	6	0337709	0337710	0337711	0337712
		1-5/8	3-1/2	6	0337713	0337714	0337715	0337716
		2-1/8	4	6	0337717	0337718	0337719	0337720
		2-5/8	5	6	0337721	0337722	0337723	0337724
5/8	5/8	1-3/8	3-1/2	6	0337725	-	0337726	0337727
		1-7/8	4	6	0337728	-	0337729	0337730
		2-5/8	5	6	0337731	-	0337732	0337733
3/4	3/4	1-5/8	4	6	0337734	-	0337735	0337736
		2-5/8	5	6	0337737	-	0337738	0337739
		3-3/8	6	6	0337740	-	0337741	0337742

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Number of Flutes	Order Code SQ	Order Code by Corner Radius 0.3 CR	0.5 CR	1.0 CR	1.5 CR
3	3	6	38	5	0337637	0337638	-	-	-
		8	38	5	0337639	0337640	-	-	-
4	4	7	50	5	0337641	0337642	-	-	-
		11	50	5	0337643	0337644	-	-	-
5	5	8	50	5	0337645	0337646	-	-	-
		13	50	5	0337647	0337648	-	-	-
6	6	13	57	6	0337649	-	0337650	-	-
		25	75	6	0337651	-	0337652	-	-
8	8	19	63	6	0337653	-	0337654	-	-
		32	75	6	0337655	-	0337656	-	-
10	10	22	72	6	0337657	-	0337658	0337659	-
		40	88	6	0337660	-	0337661	0337662	-
		46	100	6	0337663	-	0337664	0337665	-
12	12	26	83	6	0337666	-	0337667	0337668	0337669
		50	100	6	0337670	-	0337671	0337672	0337673
		65	125	6	0337674	-	0337675	0337676	0337677
16	16	32	92	6	0337678	-	-	0337679	0337680
		55	110	6	0337681	-	-	0337682	0337683
		65	125	6	0337684	-	-	0337685	0337686
20	20	38	104	6	0337687	-	-	0337688	0337689
		65	125	6	0337690	-	-	0337691	0337692
		85	150	6	0337693	-	-	0337694	0337695

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

CASE STUDY | *OMEGA-6 M726*

Proof of Performance

One M726 tool really can take you from a chunk of H13 tool steel, HRc 50, to finished part. As the chart below shows, this versital tool handles the peripheral roughing and finishing, and the finish facing, without the need to change tools.

PERIPHERAL ROUGHING			
375 sfm at 2867 rpm	.0021 ipt for 35.9 imp	Axial .500	Radial .035
PERIPHERAL FINISHING			
285 sfm at 2177 rpm	.0009 ipt for 12.4 imp	Axial 1.00	Radial .006
FINISH FACING			
450 sfm at 3440 rpm	.0016 ipt for 32.4 imp	Axial .010	Radial .338

OMEGA-6 M725N/M726N

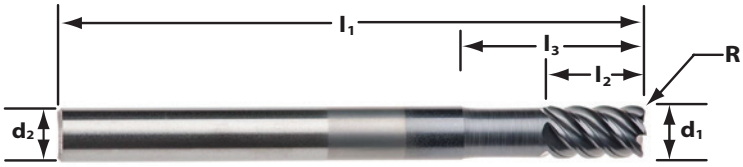
Z5 | Z6 | CR | 50° | NECK | AlTiNX | PLAIN

K P M H

For hardened steels and general finishing applications

- 5- or 6-flute
- AlTiNX
- Corner radius w/neck relief for machining in hardened materials

Adding a necked shank to the M725/M726 design offers a high-performance tool that permits greater clearance in deeper cavities and easier machining against tight walls. Neck relief and short flute length combine to increase end mill stability in the cut for more precise tolerances. Great for work in pockets.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Number of Flutes	Order Code by Corner Radius .015 CR	.030 CR
1/8	1/8	1/4	1/2	1-1/2	5	0337791	-
		1/4	1-1/8	2-1/2	5	0337902	-
3/16	3/16	5/16	9/16	2	5	0337795	-
		3/8	1-3/8	3	5	0337904	-
1/4	1/4	3/8	5/8	2-1/2	6	0337799	-
		5/8	1-3/8	3	6	0337906	-
		5/8	2-3/8	4	6	0337909	-
3/8	3/8	1/2	3/4	2-1/2	6	-	0337809
		7/8	1-3/8	3	6	-	0337913
		7/8	2-3/8	4	6	-	0337916
1/2	1/2	5/8	1-3/8	3	6	-	0337919
		1-1/8	1-3/4	3-1/2	6	-	0337923
		1-1/8	2-1/4	4	6	-	0337927
		1-1/8	3-1/4	5	6	-	0337931
5/8	5/8	1-1/8	2-1/8	4	6	-	0337937
		1-3/8	3-1/8	5	6	-	0337940
3/4	3/4	1-1/8	2	4	6	-	0337943
		1-5/8	2-7/8	5	6	-	0337946
		1-5/8	3-7/8	6	6	-	0337949

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

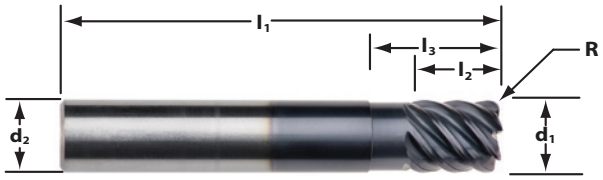
OMEGA-6 M726N

Z6 | CR | 50° | NECK | AlTiNX | PLAIN

K P M H

For hardened steels and general finishing applications

Adding a necked shank to the M726 design completes a high-performance tool that adds clearance to work in deeper cavities and easier machining against tight walls. Neck relief and short flute length combine to increase end mill stability in the cut for more precise tolerances. Great for work in pockets.



mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Number of Flutes	Order Code by Corner Radius 0.5 CR	1.0 CR
6	6	9	15	57	6	0337851	-
		15	39	75	6	0337952	-
		15	64	100	6	0337954	-
8	8	11	17	63	6	0337857	-
		19	39	75	6	0337956	-
		19	64	100	6	0337958	-
10	10	13	32	72	6	0337960	-
		23	48	88	6	0337963	-
		23	60	100	6	0337966	-
12	12	15	38	83	6	-	0337970
		27	55	100	6	-	0337974
		27	80	125	6	-	0337978
16	16	20	44	92	6	-	0337981
		35	62	110	6	-	0337984
		35	77	125	6	-	0337987
20	20	24	54	104	6	-	0337990
		43	75	125	6	-	0337993
		43	100	150	6	-	0337996

D = Tool diameter

CASE STUDY

Bring It On ...

Hundreds of tests in the machining lab prove time and time again that, when it comes to nasty-hard metals, M725 and M726 tools can stand up to the challenge and deliver 3x the tool life in hardened materials. IMCO's multi-flute monster is built to last when machining the toughest metals on the planet.

In one performance test, we put the M726 up against our own M706 as well as a six-flute Brand X tool. The material: A2 steel, HRc 60. The tools: ¼" diameter six-flute end mills. The approach: at 0.25" axial DOC and 0.015" radial DOC.

The results say it all.

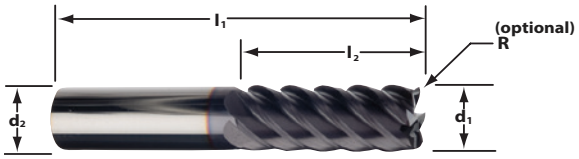
OMEGA-6 M706

K P M H

For hardened steels and general finishing applications

- 6-flute
- AlTiN
- Square end and corner radius for machining in hardened materials

The first-generation Omega-6 design offers reliable tool life in hardened steels. The M706 is a proven winner in wet or dry machining of materials up to 62 HRc.



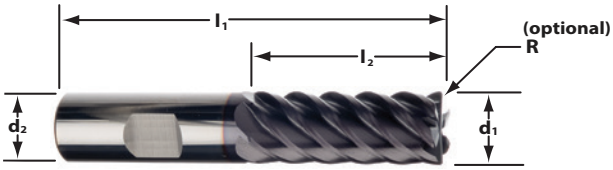
in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.020 CR	.030 CR
1/8	1/8	1/4	1-1/2	0335642	0335502	-	-
		1/2	1-1/2	0335360	0335370	-	-
3/16	3/16	5/16	2	0335643	0335503	-	-
		9/16	2	0335361	0335371	-	-
1/4	1/4	3/8	2-1/2	0335644	-	0335504	-
		3/4	2-1/2	0335362	-	0335372	0335417
5/16	5/16	13/16	2-1/2	0335363	-	-	0335373
3/8	3/8	1/2	2-1/2	0335645	-	-	0335505
		1	2-1/2	0335364	-	-	0335374
1/2	1/2	5/8	3	0335646	-	-	0335506
		1-1/4	3	0335366	-	-	0335376
5/8	5/8	3/4	3-1/2	0335647	-	-	0335507
		1-5/8	3-1/2	0335367	-	-	0335377
3/4	3/4	1	4	0335648	-	-	0335508
		1-5/8	4	0335368	-	-	0335378
1	1	2	4	0335369	-	-	0335379

D = Tool diameter

M706 w/WELDON



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .020 CR	.030 CR
1/4	1/4	3/4	2-1/2	0332137	0332187	0335422
3/8	3/8	1	2-1/2	0332139	-	0332189
1/2	1/2	1-1/4	3	0332141	-	0332191
5/8	5/8	1-5/8	3-1/2	0332142	-	0332193
3/4	3/4	1-5/8	4	0332143	-	0332194
1	1	2	4	0332144	-	0335380

OMEGA-6 M706N

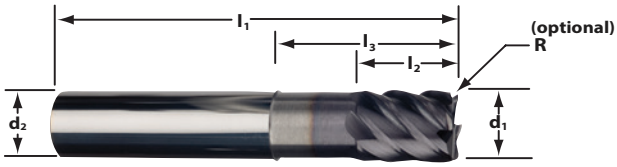
Z6 | SQ | CR | 40° | NECK | AlTiN | PLAIN | WELDON

K P M H

For hardened steels and general finishing applications

- 6-flute
- AlTiN
- Square end and corner radius w/neck relief for machining in hardened materials

Adding a necked shank to the M706 design creates a high-performance tool that adds clearance in deeper cavities and easier machining against tight walls. Neck relief and short flute length combine to increase end mill stability in the cut for more precise tolerances. Great for work in pockets.



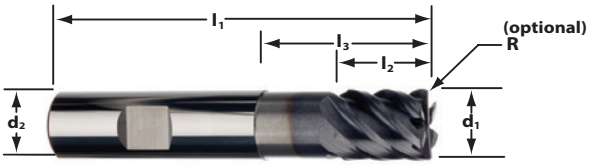
in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.020 CR	.030 CR	.060 CR
1/8	1/8	1/4	1/2	1-1/2	0335399	0335445	-	-	-
3/16	3/16	5/16	9/16	2	0335400	0335446	-	-	-
1/4	1/4	3/8	1-1/8	2-1/2	0335401	-	0335447	0335448	-
5/16	5/16	7/16	1-1/8	2-1/2	0335402	-	0335449	0335450	-
3/8	3/8	1/2	1-1/8	2-1/2	0335403	-	0335451	0335452	0335453
1/2	1/2	5/8	1-3/8	3	0335404	-	0335454	0335455	0335456
3/4	3/4	1	1-3/4	4	0335406	-	-	0335458	0335459

D = Tool diameter

M706N w/WELDON



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code SQ	Order Code by Corner Radius .020 CR	.030 CR	.060 CR
3/8	3/8	1/2	1-1/8	2-1/2	0332413	0332422	0332423	-
1/2	1/2	5/8	1-3/8	3	0332414	0332434	0332435	0332436
3/4	3/4	1	1-3/4	4	0332416	-	0332438	0332439

Scan to calculate speeds and feed rates with Toolbot

WORK EXTRA-LONG IN EXTRA-DIFFICULT MATERIALS

Machining in "crazy-strong" metals? INCONEX M8 series end mills open a whole new world of possibilities. It's a true breakthrough in productivity for machining in Inconel, Hastalloy, Waspalloy and other hi-temp alloys. Performance tests showed Inconex tools lasted two to three times longer than competing tools.

	M806	M806N
NUMBER OF FLUTES	Z6	Z6
END TYPES	CR	CR
HELIX ANGLE	30°	30°
COATING	AlCrNX	AlCrNX
SHANK TYPES	PLAIN WELDON	PLAIN
APPLICATIONS	ROUGH	
MATERIAL(S)	S	

TECH TALK | *INCONEX M8*

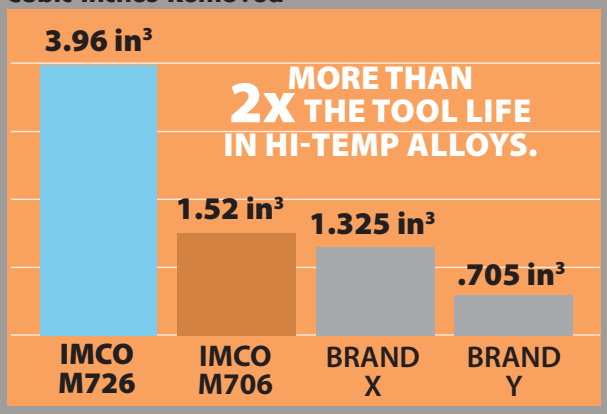
EXtreme Calls for EXtreme.

Hi-temp alloys are engineered to go through it and back and come out like nothing happened. So, when it's time to machine Inconel, Hastalloy, Waspalloy and all other hi-temp alloys, you have to go EXtreme – INCONEX M8 end mills.

INCONEX M8 Series tools are designed only for hi-temp alloys, with their own high-strength properties and cutting edges specially shaped to reduce edge wear. IMCO's special chip creation design keeps chips smaller. Smaller chips keep everything moving.

We tested INCONEX M8s against our Omega-6 M706 end mill and two competitors' tools in Inconel 718 using the same parameters. INCONEX M8 end mills **beat them all**, running longer, working harder and **lasting more than twice as long**.

Cubic Inches Removed



M8 INCONEX end mills are designed specifically for higher productivity in all hi-temp alloys. Optimized geometries, advanced chip management and proven performance: INCONEX M8 end mills are the best choice for success in difficult-to-machine metals.

- Unique design for long tool life when machining hi-temp alloys.
- Six flutes for longer tool life in traditional cuts in difficult-to-machine materials.
- Six flutes for maximum cutting-edge engagement
- High-performance rougher using traditional tool paths
- Special chip creation design reduces edge wear while enhancing chip control
- AlCrNX coating protects engineered cutting edges.
- All made with corner radius to prevent chipping in "crazy-strong" metals.
- Optimized rake and relief angle, with premium eccentric grind and edge treatment for prolonged wear.

Use Toolbot to calculate dynamic speeds and feed rates for the INCONEX M8 Series by scanning the QR code.

INCONEX M806

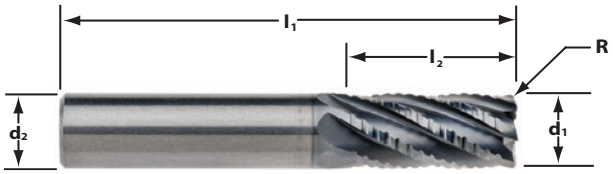
Z6 | CR | 30° | AlCrNX | PLAIN

S

For high-performance roughing in hi-temp alloys

- 6-flute
- AlCrNX
- Corner radius for machining in hi-temp alloys

The unique cutting-edge design for chip control and the advanced coating reduce heat build-up in the cutting zone for optimized tool performance. The M806 is built for extended tool life when using traditional tool paths in very difficult-to-machine materials.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code by Corner Radius .015 CR	.030 CR
1/4	1/4	3/8	2	0339333	-
		3/4	2-1/2	0339334	-
5/16	5/16	7/16	2	0339335	-
		13/16	2-1/2	0339336	-
3/8	3/8	1/2	2	-	0339337
		7/8	2-1/2	-	0339338
		1-1/4	3	-	0339340
1/2	1/2	5/8	2-1/2	-	0339342
		1	3	-	0339493
		1-1/4	3	-	0339343
		1-5/8	3-1/2	-	0339345
5/8	5/8	1-3/8	3-1/2	-	0339348
		2	4	-	0339350
3/4	3/4	1-5/8	4	-	0339353
		2-3/8	5	-	0339355
1	1	1-1/2	4	-	0339357
		2-1/2	5	-	0339359

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 0.5 CR	1.0 CR
6	6	13	57	0339361	-
		19	63	0339363	-
8	8	19	63	0339365	-
		25	75	0339367	-
10	10	22	72	-	0339369
		32	80	-	0339371
12	12	26	83	-	0339373
		38	93	-	0339375
16	16	34	92	-	0339377
		50	108	-	0339379
20	20	42	104	-	0339381
		62	125	-	0339383
25	25	52	120	-	0339385

D = Tool diameter

INCONEX M806 w/WELDON

Z6 | CR | 30° | AlCrNX | WELDON

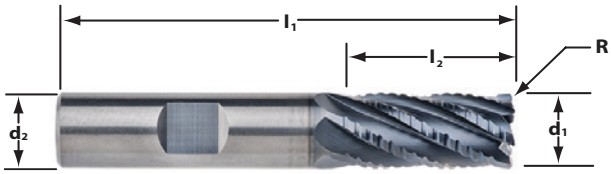
S

For high-performance roughing in hi-temp alloys

- 6-flute
- AlCrNX
- Corner radius for machining in hi-temp alloys

The unique cutting-edge design for chip control and the advanced coating reduce heat build-up in the cutting zone for optimized tool performance. The M806 is built for tool life when using traditional tool paths in very difficult-to-machine materials.

Weldon flats provide extra stability in the cutting zone to prevent tool pullout and offset extreme forces when cutting crazy-tough materials.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code .030 CR
3/8	3/8	7/8	2-1/2	0339339
		1-1/4	3	0339341
1/2	1/2	1	3	0339494
		1-1/4	3	0339344
		1-5/8	3-1/2	0339346
5/8	5/8	1-3/8	3-1/2	0339349
		2	4	0339351
3/4	3/4	1-5/8	4	0339354
		2-3/8	5	0339356
1	1	1-1/2	4	0339358
		2-1/2	5	0339360

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code by Corner Radius 0.5 CR	1.0 CR
6	6	13	57	0339362	-
		19	63	0339364	-
8	8	19	63	0339366	-
		25	75	0339368	-
10	10	22	72	-	0339370
		32	80	-	0339372
12	12	26	83	-	0339374
		38	93	-	0339376
16	16	34	92	-	0339378
		50	108	-	0339380
20	20	42	104	-	0339382
		62	125	-	0339384
25	25	52	120	-	0339386

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

INCONEX M806N

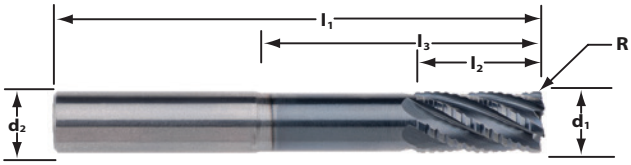
Z6 | CR | 30° | NECK | AlCrNX | PLAIN

S

For high-performance roughing in hi-temp alloys

- 6-flute
- AlCrNX
- Corner radius w/neck relief for machining in hi-temp alloys

Adding a necked shank to the M806 design offers a high-performance tool that permits clearance in deeper cavities and easier machining against tight walls. Neck relief and short flute length combine to increase end mill stability in the cut. Great for work in pockets.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050* *d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code by Corner Radius .015 CR	.030 CR
1/4	1/4	1/2	1-3/8	3	0339388	-
			2-3/8	4	0339390	-
3/8	3/8	3/4	1-3/8	3	-	0339393
			2-3/8	4	-	0339397
1/2	1/2	1	2-1/4	4	-	0339401
			3-1/4	5	-	0339405
5/8	5/8	1-1/4	2-1/8	4	-	0339413
			3-1/8	5	-	0339417
3/4	3/4	1-1/2	2-7/8	5	-	0339421
			3-7/8	6	-	0339425

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Reach LBS l3	Overall Length l1	Order Code by Corner Radius 0.5 CR	1.0 CR
6	6	12	39	75	0339435	-
			64	100	0339439	-
8	8	16	39	75	0339443	-
10	10	20	48	88	-	0339451
			60	100	-	0339455
12	12	24	55	100	-	0339459
			80	125	-	0339463
16	16	32	62	110	-	0339471
			102	150	-	0339475
20	20	40	75	125	-	0339479
			100	150	-	0339483

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

THE BENEFITS OF GETTING SOCIAL

Yes, there are benefits to following IMCO on social media!

Networking

Social media is made for networking. Follow IMCO on Facebook, Instagram, YouTube, LinkedIn or X (formerly Twitter). You'll know what's happening with us, and you'll be a member of our social network. Jump in from the icons in the bottom right corner of our home page (www.imcousa.com), follow us and see what's happening.

Tool Tips

Tool tips are based on user questions and ideas, as well as technical information we pick up in our research. You never know what's going to pop up on our Instagram or Facebook threads. Even better, our social feeds offer photos, videos and links to more information.

How-to features

Do you know the name of your IMCO distributor? Do you know how to find it? Do you know where to find the Toolbot link? Follow IMCO on Instagram, Facebook or our other social media feeds, and you'll know.

Show and tell

We always love to hear from our users, whether it's a photo of your team, a review of tool performance or a video of an IMCO tool in action. You can shoot a very short video on your smartphone and upload it in seconds. For example, if you discover that an IMCO end mill can do something a whole lot faster than your previous end mill, record it or photograph it and share it with us on one of our social media platforms!

Member IMC Group

IMCO

Power. Precision. Performance.

Follow us!

Follow IMCO on our social media feeds. We'd love to hear from you!

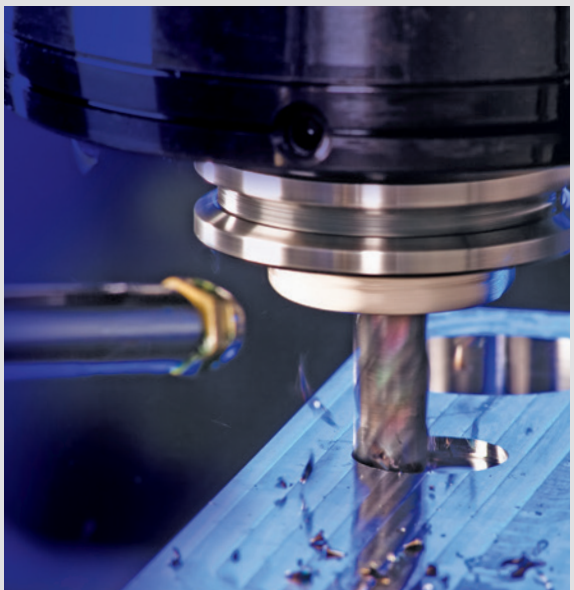
WHERE TRUE HARD-CORE PERFORMANCE BEGINS.

First-rate cutting tools start with a truly high-strength, high-grade core, CNC ground to IMCO's higher standards to maximize cutting edges, optimize flute designs and run and run and run. Got general-purpose metalworking? It's GO time. Coated or non-coated, truCORE cutting tools are the elite squad in general-purpose machining.

	E14	E14	E14	E14	E24	E13	E13	E12	E12
NUMBER OF FLUTES	Z4	Z4	Z4	Z4	Z4	Z3	Z3	Z2	Z2
END TYPES	SQ, CR, BN	SQ, BN	SQ	SQ, BN	SQ, BN	SQ, BN	SQ	SQ, BN	SQ, BN
HELIX ANGLE	30°	30°	30°	30°	30°	30°	30°	30°	30°
COATING	AlTiN	TiCN	TiN	NON COATED	AlTiN	AlTiN	NON COATED	AlTiN	NON COATED
SHANK TYPES	PLAIN, WELDON	PLAIN, WELDON	PLAIN	PLAIN, WELDON	PLAIN	PLAIN	PLAIN	PLAIN	PLAIN
APPLICATIONS				ROUGH, FINISH				ROUGH	ROUGH
MATERIAL(S)	K P M S N								

Whatever the job, there's a truCORE mill designed to work long and hard, stay on task and Get. It. Done.

- Excellent performance roughing and finishing in a range of materials
- Available uncoated or with AlTiN, TiCN, or TiN,for superior heat resistance and longer tool life
- Choose longer length tools for work in deep cavities



Use Toolbot to calculate dynamic speeds and feed rates for truCORE end mills by scanning the QR code.

truCORE E14 AlTiN

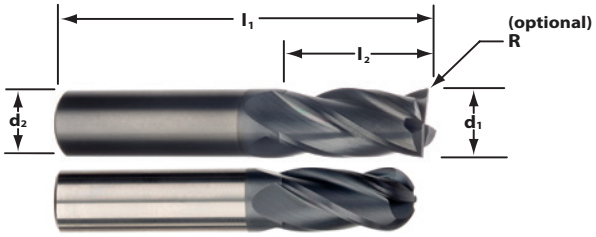
Z4 | SQ | CR | BN | 30° | AlTiN | PLAIN | WELDON

K P M S

For general machining in a wide range of materials.

- 4-flute
- AlTiN
- Square end, corner radius and ball nose for general machining

Best for roughing and finishing in a broad range of machining environments. The AlTiN coating offers superior heat resistance and hardness for increased tool life.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.020 CR	.030 CR	.045 CR	.060 CR	Order Code BN
1/32	1/8	3/32	1-1/2	0338094	-	-	-	-	-	0332180
3/64	1/8	9/64	1-1/2	0332170	-	-	-	-	-	0332171
1/16	1/8	1/8	1-1/2	0332165	-	-	-	-	-	0332166
		3/16	1-1/2	0332300	-	-	-	-	-	0338066
		1/4	1-1/2	0338039	-	-	-	-	-	-
5/64	1/8	1/4	1-1/2	0332150	-	-	-	-	-	0332131
3/32	1/8	3/16	1-1/2	0332548	-	-	-	-	-	0332570
		3/8	1-1/2	0332167	-	-	-	-	-	0332386
7/64	1/8	3/8	1-1/2	0332117	-	-	-	-	-	-
1/8	1/8	1/4	1-1/2	0338067	-	-	-	-	-	0332603
		1/2	1-1/2	0332159	0338057	0338032	-	-	-	0332391
		5/8	2	0335145	-	-	-	-	-	0333984
		3/4	2-1/4	0332111	-	-	-	-	-	0333992
		1	3	0338064	-	-	-	-	-	0338060
9/64	3/16	9/16	2	0332145	-	-	-	-	-	
5/32	3/16	5/16	2	0334619	-	-	-	-	-	0332122
		9/16	2	0332146	-	-	-	-	-	0332123
11/64	3/16	5/8	2	0332151	-	-	-	-	-	
3/16	3/16	3/8	2	0332550	-	-	-	-	-	0332602
		5/8	2	0332158	0334594	0334595	0334555	-	-	0332161
		3/4	2-1/2	0333948	-	-	-	-	-	0333996
		1	4	0335147	-	-	-	-	-	0333985
		1-1/8	3	0333355	-	-	-	-	-	0334016
13/64	1/4	5/8	2-1/2	0332124	-	-	-	-	-	-
7/32	1/4	5/8	2-1/2	0332172	-	-	-	-	-	0332405
15/64	1/4	3/4	2-1/2	0332379	-	-	-	-	-	-
1/4	1/4	1/2	2	0332552	-	-	-	-	-	0332601
		3/4	2-1/2	0338077	0332157	0334528	0334557	0334596	-	0332392
		1	4	0335148	-	-	-	-	-	0333986
		1-1/8	3	0338093	-	-	-	-	-	0334000
		1-1/2	4	0338081	-	-	-	-	-	0338049
		1-1/2	6	0334628	-	-	-	-	-	0338061
17/64	5/16	3/4	2-1/2	0332381	-	-	-	-	-	-
9/32	5/16	3/4	2-1/2	0338046	-	-	-	-	-	0332121
19/64	5/16	13/16	2-1/2	0332384	-	-	-	-	-	-
5/16	5/16	1/2	2	0332169	-	-	-	-	-	0332600
		13/16	2-1/2	0332339	0334597	0334598	0334599	0334600	-	0332162
		1-1/8	3	0332118	-	-	-	-	-	0333471
		1-5/8	4	0333362	-	-	-	-	-	0333496
21/64	3/8	1	2-1/2	0332393	-	-	-	-	-	-
11/32	3/8	1	2-1/2	0332120	-	-	-	-	-	0332108
23/64	3/8	1	2-1/2	0332394	-	-	-	-	-	-
3/8	3/8	5/8	2	0332551	-	-	-	-	-	0332604
		1	2-1/2	0338073	0333854	0333855	0333856	0333857	0333858	0338075
		1-1/8	3	0333930	-	-	-	-	-	0334007
		1-1/2	6	0338065	-	-	-	-	-	-
		1-3/4	4	0333373	-	-	-	-	-	0333479

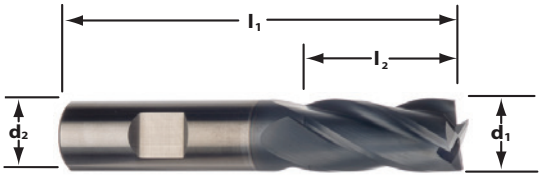
D = Tool diameter

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code by Corner Radius .015 CR	.020 CR	.030 CR	.045 CR	.060 CR	Order Code BN
25/64	7/16	1	2-3/4	0332395	-	-	-	-	-	-
13/32	7/16	1	2-3/4	0332396	-	-	-	-	-	-
27/64	7/16	1	2-3/4	0332397	-	-	-	-	-	-
7/16	7/16	1	2-3/4	0332403	-	-	-	-	-	0332408
		2	4	0333933	-	-	-	-	-	-
29/64	1/2	1	3	0332128	-	-	-	-	-	-
15/32	1/2	1	3	0332398	-	-	-	-	-	-
31/64	1/2	1	3	0338089	-	-	-	-	-	-
1/2	1/2	5/8	2-1/2	0332549	-	-	-	-	-	0332599
		1	3	0338074	0333860	0333861	0333862	0333863	0333864	0338071
		1-1/2	6	0332430	-	-	-	-	-	-
		2	4	0333937	-	-	-	-	-	0334014
		3	6	0333372	-	-	-	-	-	0332126
9/16	9/16	1-1/4	3-1/2	0332390	-	-	-	-	-	0332109
5/8	5/8	1-1/4	3-1/2	0332177	-	-	-	-	-	0332385
		2-1/4	5	0332182	-	-	-	-	-	-
		3	6	0333377	-	-	-	-	-	-
11/16	3/4	1-1/2	4	0332399	-	-	-	-	-	0332407
3/4	3/4	1-1/2	4	0338078	-	-	-	-	-	0338045
		2-1/4	5	0333944	-	-	-	-	-	-
		3	6	0333385	-	-	-	-	-	-
13/16	7/8	1-1/2	4	0332400	-	-	-	-	-	-
7/8	7/8	1-1/2	4	0332160	-	-	-	-	-	-
15/16	1	1-1/2	4	0332402	-	-	-	-	-	-
1	1	1-1/2	4	0338079	-	-	-	-	-	-
		2-1/4	5	0333947	-	-	-	-	-	-
		3	6	0333392	-	-	-	-	-	-

D = Tool diameter

E14 AlTiN w/WELDON



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ
3/8	3/8	1	2-1/2	0334638
		1-1/8	3	0334494
1/2	1/2	1	3	0334639
		2	4	0334495
5/8	5/8	1-1/4	3-1/2	0334641
		2-1/4	5	0334496
		3	6	0334502
3/4	3/4	1-1/2	4	0334642
		2-1/4	5	0334497
		3	6	0334503
1	1	1-1/2	4	0334644
		2-1/4	5	0334498
		3	6	0334513

Scan to calculate speeds and feed rates with Toolbot

truCORE E14 AlTiN

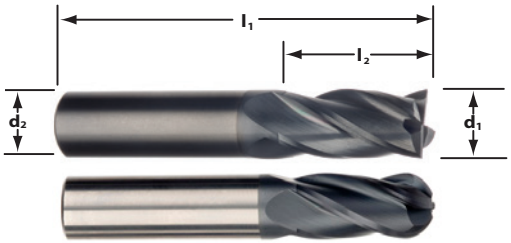
Z4 | SQ | BN | 30° | AlTiN | PLAIN

K P M S

For general machining in a wide range of materials.

- 4-flute
- AlTiN
- Square end and ball nose for general machining

Best for roughing and finishing in a broad range of machining environments. The AlTiN coating offers superior heat resistance and hardness for increased tool life.



mm: *d1: +0.000 / -0.050 d2: -0.0025 / 0.0100*

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
1	3	2	38	0334611	-
		3	38	0332815	0334653
1.5	3	4,5	38	0332816	0334654
		6	38	0332062	0335308
2	3	6,3	38	0332817	0334655
		9	38	0332063	0335309
2.5	3	5	38	0334612	-
		9,5	38	0332818	0334656
3	3	9	38	0338091	-
		12	38	0332819	0334657
		19	57	0334645	-
		25	75	0332840	0334670
3.5	4	14	50	0332820	-
4	4	14	50	0332821	0334658
		19	63	0334646	-
		31	75	0332841	0334671
5	5	16	50	0332823	0334659
		19	63	0334647	-
		31	75	0332842	-
6	6	13	57	0333742	-
		19	63	0332824	0334660
		29	75	0334648	0334666
		38	100	0332843	0334672
8	8	20	63	0332826	0334661
		29	75	0334649	-
		41	100	0332844	0334673
10	10	25	72	0332828	0334662
		40	88	0333772	-
		45	100	0332845	0334674
12	12	25	76	0332829	0334663
		26	83	0333743	0333830
		50	100	0334650	0334667
		75	150	0332846	-
16	16	32	92	0333744	0334665
		57	125	0334651	0334668
		75	150	0332847	-
20	20	38	104	0333745	0332933
		57	125	0334652	0334669
		75	150	0332848	-
25	25	45	120	0333773	-
		75	150	0332849	-

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

truCORE E14 TiCN

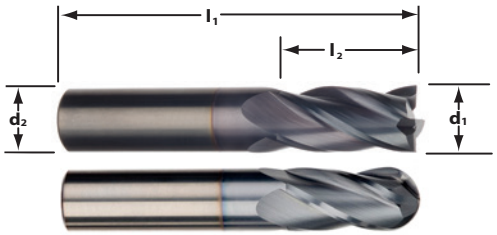
Z4 | SQ | BN | 30° | TiCN | PLAIN | WELDON

K P M S

For general machining in a wide range of materials.

- 4-flute
- TiCN
- Square end and ball nose for general machining

Best for roughing and finishing in a broad range of machining environments. The TiCN coating protects the cutting edge and increases tool life over non-coated end mills.



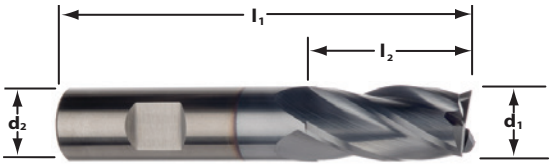
in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
1/32	1/8	3/32	1-1/2	0333510	-
3/64	1/8	9/64	1-1/2	0333511	-
1/16	1/8	3/16	1-1/2	0333512	0333571
3/32	1/8	3/8	1-1/2	0333514	0333573
1/8	1/8	1/4	1-1/2	0332537	-
		1/2	1-1/2	0333516	0333575
		3/4	2-1/4	0333917	-
		1	3	0333351	-
5/32	3/16	9/16	2	0333518	-
3/16	3/16	3/8	2	0332539	-
		5/8	2	0333520	0333579
		1-1/8	3	0333354	-
1/4	1/4	1/2	2	0332541	-
		3/4	2-1/2	0333524	0333581
		1-1/8	3	0333923	-
		1-1/2	4	0333358	-
5/16	5/16	13/16	2-1/2	0333527	-
3/8	3/8	1	2-1/2	0333530	0333586
		1-1/8	3	0333929	-
		1-3/4	4	0333365	-
7/16	7/16	1	2-3/4	0333532	-
1/2	1/2	1	3	0333533	0333591
		2	4	0333936	-
		3	6	0333371	-
5/8	5/8	1-1/4	3-1/2	0333539	0333599
		2-1/4	5	0333940	-
		3	6	0333376	-
3/4	3/4	1-1/2	4	0333544	0333606
		2-1/4	5	0333943	-
		3	6	0333384	-
1	1	1-1/2	4	0333559	-
		2-1/4	5	0333946	-
		3	6	0333391	-

D = Tool diameter

E14 TiCN w/WELDON



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ
3/8	3/8	1	2-1/2	0334632
1/2	1/2	1	3	0334633
5/8	5/8	1-1/4	3-1/2	0334634
3/4	3/4	1-1/2	4	0334635

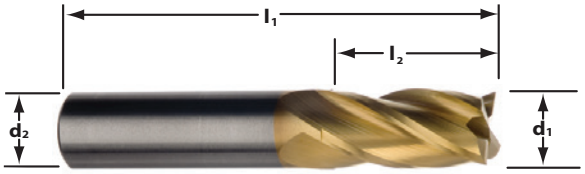
truCORE E14 TiN

Z4 | SQ | 30° | TiN | PLAIN

K P M S N

For general machining in a wide range of materials

Best for roughing and finishing in a broad range of machining environments. The TiN coating protects the cutting edge and increases tool life over non-coated end mills.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ
1/16	1/8	3/16	1-1/2	0332253
3/32	1/8	3/8	1-1/2	0332257
1/8	1/8	1/2	1-1/2	0332260
3/16	3/16	5/8	2	0332266
1/4	1/4	3/4	2-1/2	0332272
5/16	5/16	13/16	2-1/2	0332277
3/8	3/8	1	2-1/2	0332279
1/2	1/2	1	3	0332286
5/8	5/8	1-1/4	3-1/2	0332290
3/4	3/4	1-1/2	4	0332294

D = Tool diameter

CASE STUDY | *truCORE E14*

Use a General-Purpose Tool in Stainless Steel?

When it's an IMCO truCORE end mill, absolutely!

Our truCORE E14 did all the work on this part in 304 stainless steel, from roughing to finishing. It may be a "general-purpose" tool, but some general-purpose tools are just a LOT better.

PERIPHERAL ROUGHING			
300 sfm at 2292 rpm	.002 ipt for 18.3 ipm	Axial .500	Radial .200
PERIPHERAL FINISHING			
350 sfm at 2674 rpm	.0025 ipt for 26.7 ipm	Axial .500	Radial .005
FINISH FACING			
359 sfm at 2743 rpm	.0021 ipt for 23.3 ipm	Axial .006	Radial .342

One end mill took this job from start to finish ... and kept on working. Think about what truCORE E Series end mills could help you do in your operation.

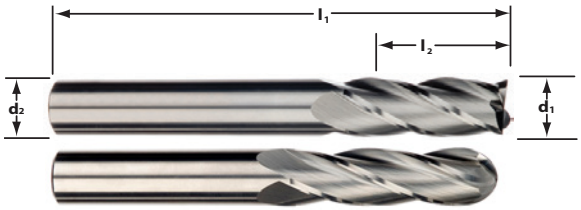
truCORE E14 NON-COATED

Z4 | SQ | BN | 30° | NON COATED | PLAIN | WELDON

K P M S

For general machining in a wide range of materials

Best for roughing and finishing in a broad range of machining environments.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050 d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
1/32	1/8	3/32	1-1/2	0332249	0332342
3/64	1/8	9/64	1-1/2	0332251	-
1/16	1/8	3/16	1-1/2	0332252	0332346
5/64	1/8	1/4	1-1/2	0332254	-
3/32	1/8	3/8	1-1/2	0332256	0332350
7/64	1/8	3/8	1-1/2	0332258	-
1/8	1/8	1/4	1-1/2	0332516	-
		1/2	1-1/2	0332259	0332354
		3/4	2-1/4	0333915	-
		1	3	0333349	-
5/32	3/16	9/16	2	0332262	-
3/16	3/16	3/8	2	0332519	-
		5/8	2	0332265	0332359
		3/4	2-1/2	0333918	-
		1-1/8	3	0333352	-
7/32	1/4	5/8	2-1/2	0332268	-
1/4	1/4	1/2	2	0332522	-
		3/4	2-1/2	0332271	0332363
		1-1/8	3	0333921	-
		1-1/2	4	0333356	-
5/16	5/16	13/16	2-1/2	0332276	-
		1-1/8	3	0333924	-
		1-5/8	4	0333359	-
3/8	3/8	5/8	2	0332526	-
		1	2-1/2	0332278	0332368
		1-1/8	3	0333927	-
		1-3/4	4	0333363	-
7/16	7/16	1	2-3/4	0332295	-
1/2	1/2	5/8	2-1/2	0332530	-
		1	3	0332285	0332371
		2	4	0333934	-
		3	6	0333369	-
5/8	5/8	1-1/4	3-1/2	0332289	0332374
		2-1/4	5	0333938	-
		3	6	0333374	-
3/4	3/4	1-1/2	4	0332293	0332377
		2-1/4	5	0333941	-
		3	6	0333382	-
1	1	1-1/2	4	0332297	-
		2-1/4	5	0856267	-
		3	6	0856263	-

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

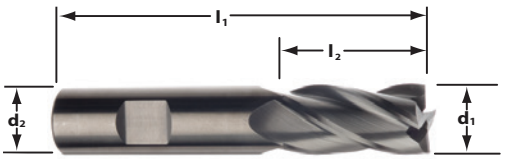
Z4 | SQ | BN | 30° | NON COATED | PLAIN | WELDON

K P M S

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ
1	3	3	38	0332495
1.5	3	6	38	0334410
2	3	6,3	38	0332496
		9	38	0334411
2.5	3	9,5	38	0332497
3	3	12	38	0332498
		19	57	0332044
		25	75	0332025
4	4	14	50	0332500
		19	63	0332045
		31	75	0332026
5	5	16	50	0332502
		19	63	0332046
		31	100	0332049
6	6	19	63	0332503
		29	75	0332027
		38	100	0332050
8	8	20	63	0332505
		29	75	0332028
		41	100	0332051
10	10	25	72	0332507
		40	88	0332034
		45	100	0332029
12	12	25	75	0332508
		50	100	0332030
		75	150	0332031
16	16	32	92	0333739
		57	125	0332047
		75	150	0332032
20	20	38	104	0333740
		57	125	0332048
		75	150	0332033

D = Tool diameter



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

truCORE E14 NON-COATED w/WELDON

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ
3/8	3/8	1	2-1/2	0334617
1/2	1/2	1	3	0334621
5/8	5/8	1-1/4	3-1/2	0334623
3/4	3/4	1-1/2	4	0334626

truCORE E24 AlTiN

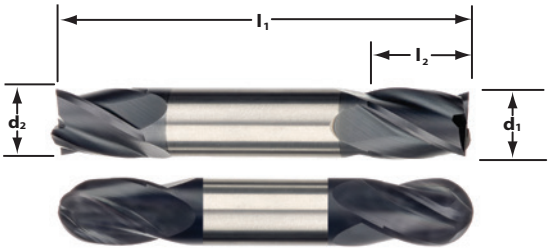
Z4 | SQ | BN | 30° | AlTiN | PLAIN

K P M S

For general machining in a wide range of materials

- 4-flute, double-ended tool
- AlTiN
- Square end and ball nose for general machining

The E24 offers the reliability of our general-purpose tool design in a double-ended form. Best for roughing and finishing in a broad range of machining environments. The AlTiN coating offers superior heat resistance and hardness for increased tool life.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
1/32	1/8	3/32	2	9178578	9178579
3/64	1/8	1/8	2	9178580	9178581
1/16	1/8	3/16	2	9178582	9178583
3/32	1/8	1/4	2	9178584	9178585
1/8	1/8	3/8	2	9178586	9178587
5/32	3/16	7/16	2-1/2	9178588	9178589
3/16	3/16	1/2	2-1/2	9178590	9178591
7/32	1/4	9/16	2-1/2	9178592	-
1/4	1/4	5/8	2-1/2	9178593	9178594
5/16	5/16	3/4	3-1/2	9178595	-
3/8	3/8	3/4	3-1/2	9178596	9178597
1/2	1/2	1	4	9178598	9178599

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

truCORE E13 AlTiN

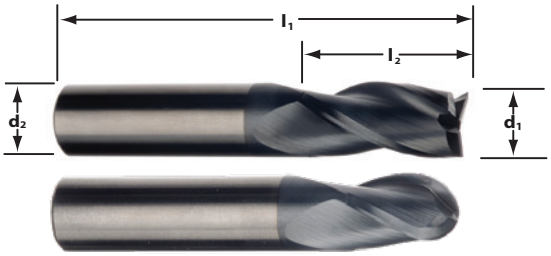
Z3 | SQ | BN | 30° | AlTiN | PLAIN

P M N

For general machining in a wide range of materials

- 3-flute
- AlTiN
- Square end and ball nose for general machining

The E13 offers a combination of strong cutting edges with the most flute spacing in a general-purpose tool design. Best for roughing and finishing in slots and pockets and in gummy materials. The AlTiN coating offers superior heat resistance and hardness for increased tool life.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050 d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
1/32	1/8	3/32	1-1/2	0333257	-
3/64	1/8	9/64	1-1/2	0333263	-
1/16	1/8	1/8	1-1/2	0333337	0335123
		3/16	1-1/2	0333266	0335117
3/32	1/8	3/16	1-1/2	0333304	0335124
		3/8	1-1/2	0333267	0335118
1/8	1/8	1/4	1-1/2	0333256	0335125
		1/2	1-1/2	0333259	0335119
		3/4	2-1/4	0333288	0335128
		1	3	0333333	-
5/32	3/16	9/16	2	0333261	-
3/16	3/16	3/8	2	0333338	0335126
		5/8	2	0333271	0335120
		3/4	2-1/2	0333290	0335129
		1-1/8	3	0333334	-
1/4	1/4	1/2	2	0333339	0335127
		3/4	2-1/2	0333272	0335121
		1-1/8	3	0333296	0335130
		1-1/2	4	0333336	0335133
5/16	5/16	13/16	2-1/2	0333273	-
3/8	3/8	1	2-1/2	0333274	0338101
		1-1/8	3	0333297	0335131
1/2	1/2	1	3	0338027	0335122
		2	4	0333300	0335132
5/8	5/8	1-1/4	3-1/2	0333275	-
3/4	3/4	1-1/2	4	0333276	-
		2-1/4	5	0333341	-

D = Tool diameter

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
1	3	2	38	0332338	-
		3	38	0335255	-
1.5	3	4,5	38	0335256	-
		6	38	0333783	-
2	3	6,3	38	0335257	-
		9	38	0333784	-
2.5	3	9,5	38	0333785	-
3	3	12	38	0332060	0335321
		19	57	0335212	-
		25	75	0335175	-
4	4	14	50	0333786	0335322
		19	63	0335213	-
		31	75	0335176	-
5	5	16	50	0333787	0335323
		19	63	0335214	-
		31	75	0333791	-
6	6	13	57	0333763	-
		19	63	0333788	0332910
		29	75	0335215	-
8	8	20	63	0333789	0332911
		29	75	0335216	-
		41	100	0335177	-
10	10	25	72	0333790	0332912
		40	88	0333800	-
		45	100	0335178	-
12	12	25	75	0333792	-
		26	83	0333764	0333832
		50	100	0335217	-
		75	150	0335179	-
16	16	32	92	0333765	-
		57	125	0335218	-
		75	150	0335180	-
20	20	38	104	0333766	-
		57	125	0335219	-
		75	150	0335181	-

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

truCORE E13 NON-COATED

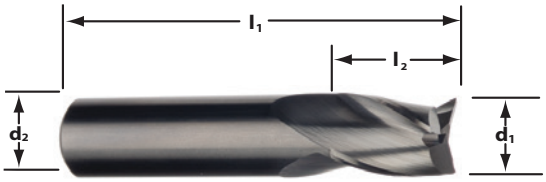
Z3 | SQ | 30° | NON COATED | PLAIN

P M N

For general machining in a wide range of materials

- 3-flute
- Non-coated
- Square end for general machining

The E13 offers a combination of strong cutting edges with generous flute spacing in a general-purpose tool design. Best for roughing and finishing in slots and pockets and in gummy materials.



in: *d1: +0.000 / -0.002* *d2: -0.0001 / -0.0004*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ
1/8	1/8	1/4	1-1/2	0333245
		1/2	1-1/2	0333258
		3/4	2-1/4	0333248
		1	3	0333254
3/16	3/16	3/8	2	0333246
		5/8	2	0333260
		3/4	2-1/2	0333249
		1-1/8	3	0333255
1/4	1/4	1/2	2	0333247
		3/4	2-1/2	0333262
		1-1/8	3	0333250
5/16	5/16	13/16	2-1/2	0333264
3/8	3/8	1	2-1/2	0333265
		1-1/8	3	0333251
1/2	1/2	1	3	0333268
		2	4	0333252
5/8	5/8	1-1/4	3-1/2	0333269
3/4	3/4	1-1/2	4	0333270
		2-1/4	5	0333253

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

truCORE E12 AlTiN

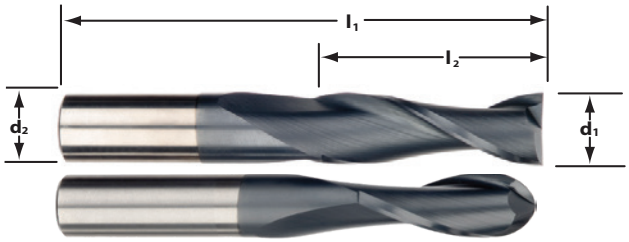
Z2 | SQ | BN | 30° | AlTiN | PLAIN

P M N

For general machining in a wide range of materials

- 2-flute
- AlTiN
- Square end and ball nose for general machining

The E12 offers the maximum flute spacing in a general-purpose tool design. Best for roughing, slotting and pocketing in materials and in applications in which chip evacuation is a challenge. The AlTiN coating offers superior heat resistance and hardness for increased tool life.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050 d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
1/32	1/8	1/16	1-1/2	0334422	0332090
		3/32	1-1/2	0332152	0332070
3/64	1/8	3/32	1-1/2	0334465	0332091
		9/64	1-1/2	0333738	0332069
1/16	1/8	1/8	1-1/2	0334466	0332092
		3/16	1-1/2	0332072	0332114
5/64	1/8	1/4	1-1/2	0332073	0332079
3/32	1/8	3/16	1-1/2	0334467	0332093
		3/8	1-1/2	0332074	0332080
7/64	1/8	3/8	1-1/2	0332075	-
1/8	1/8	1/4	1-1/2	0338026	0332701
		1/2	1-1/2	0338048	0332387
		3/4	2-1/4	0333748	0332096
		1	3	0333307	0332446
9/64	3/16	9/16	2	0332076	-
5/32	3/16	9/16	2	0332147	0332082
11/64	3/16	5/8	2	0332077	-
3/16	3/16	3/8	2	0334479	0332094
		5/8	2	0332176	0338025
		3/4	2-1/2	0333749	0332097
		1-1/8	3	0333313	0338023
13/64	1/4	5/8	2-1/2	0338069	-
7/32	1/4	5/8	2-1/2	0332078	0332083
15/64	1/4	3/4	2-1/2	0332153	-
1/4	1/4	1/2	2	0334484	0332184
		3/4	2-1/2	0332175	0332388
		1-1/8	3	0333751	0332098
		1-1/2	4	0333323	0338024
5/16	5/16	13/16	2-1/2	0332179	0332183
		1-1/8	3	0333750	0332017
		1-5/8	4	0333324	-
3/8	3/8	1	2-1/2	0332178	0332389
		1-1/8	3	0333752	0332099
		1-3/4	4	0333325	0332448
1/2	1/2	1	3	0332174	0338070
		2	4	0333753	0332101
		3	6	0333327	-
5/8	5/8	1-1/4	3-1/2	0332168	-
		2-1/4	5	0333754	-
3/4	3/4	1-1/2	4	0332248	-
		2-1/4	5	0333755	-

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
1	3	2	38	0335220	-
		3	38	0338083	0338084
1.5	3	4,5	38	0335254	0335258
		6	38	0334026	0335310
2	3	6,3	38	0338085	0338086
		9	38	0334027	0335311
2.5	3	9,5	38	0334028	-
3	3	12	38	0332919	0332918
		19	57	0335188	0335324
		25	75	0335182	0335332
4	4	14	50	0338096	0332920
		19	63	0335189	0335325
		31	75	0335183	0335333
5	5	16	50	0332922	0338087
		19	63	0335190	0335326
		31	75	0332927	-
6	6	13	57	0333760	-
		19	63	0334030	0335315
		29	75	0335191	0335327
		38	100	0335184	0335335
8	8	20	63	0332511	0338088
		29	75	0335192	0335328
		41	100	0335185	-
10	10	25	72	0338097	0335318
		40	88	0333802	0333878
		45	100	0335186	-
12	12	25	75	0338098	0338095
		26	83	0333761	-
		50	100	0335193	0335329
		75	150	0335187	-

D = Tool diameter

TOOL TIP | *truCORE E12*

Ball-Nose Milling:
Cut Cycle Time

If your axial depth of cut (Z axis depth) is less than the radius of your ball-nose mill, adjusting your spindle speed will help you cut cycle times, including finishing work.

Calculate your optimal spindle speed using the effective cutting diameter (De) in two easy steps.

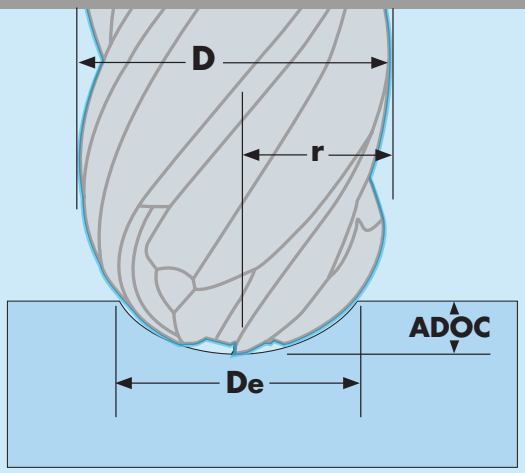
Step 1 Calculate the effective cutting diameter (De):

$$De = 2x\sqrt{r^2 - (r - ADOC)^2}$$

Step 2 Calculate the optimum spindle speed:

Optimum spindle speed = (SFM x 3.82)÷De

NOTE: Formula only works on tools with no tilt.



r = 1/2 x D

truCORE E12 NON-COATED

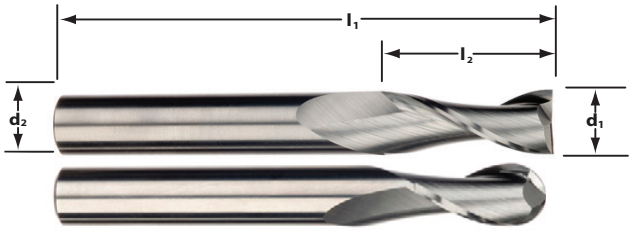
Z2 | SQ | BN | 30° | NON COATED | PLAIN

P M N

For general machining in a wide range of materials

- 2-flute
- Non-coated
- Square end and ball nose for general machining

The E12 offers the maximum flute spacing in a general-purpose tool design. Best for roughing, slotting and pocketing in materials and in applications in which chip evacuation is a challenge.



in: *d1: +0.000 / -0.002 d2: -0.0001 / -0.0004*
mm: *d1: +0.000 / -0.050 d2: -0.0025 / -0.0100*

FRACTIONAL / in

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
1/32	1/8	3/32	1-1/2	0332199	0332301
3/64	1/8	9/64	1-1/2	0332201	0332303
1/16	1/8	3/16	1-1/2	0332203	0332304
5/64	1/8	1/4	1-1/2	0332205	0332306
3/32	1/8	3/8	1-1/2	0332207	0332308
7/64	1/8	3/8	1-1/2	0332209	0332310
1/8	1/8	1/4	1-1/2	0332464	0332558
		1/2	1-1/2	0332211	0332311
		3/4	2-1/4	0333894	0333949
		1	3	0333301	0333409
5/32	3/16	9/16	2	0332214	0332314
3/16	3/16	3/8	2	0332466	-
		5/8	2	0332217	0332316
		3/4	2-1/2	0333897	0333952
		1-1/8	3	0333305	0333412
1/4	1/4	1/2	2	0332468	-
		3/4	2-1/2	0332223	0332319
		1-1/8	3	0333899	0333955
		1-1/2	4	0333308	0333415
		1-1/2	6	0332409	0332445
5/16	5/16	1/2	2	0332470	-
		13/16	2-1/2	0332228	0332322
		1-1/8	3	0333902	0333958
		1-5/8	4	0333311	-
3/8	3/8	1	2-1/2	0332229	0332324
		1-1/8	3	0333904	0333960
		1-1/2	6	0332401	0332442
		1-3/4	4	0333314	0333420
1/2	1/2	1	3	0332233	0332326
		1-1/2	6	0332406	0332443
		2	4	0333909	0333964
		3	6	0333321	-
5/8	5/8	1-1/4	3-1/2	0332236	-
		2-1/4	5	0333911	-
3/4	3/4	1-1/2	4	0332239	-
		2-1/4	5	0333912	-

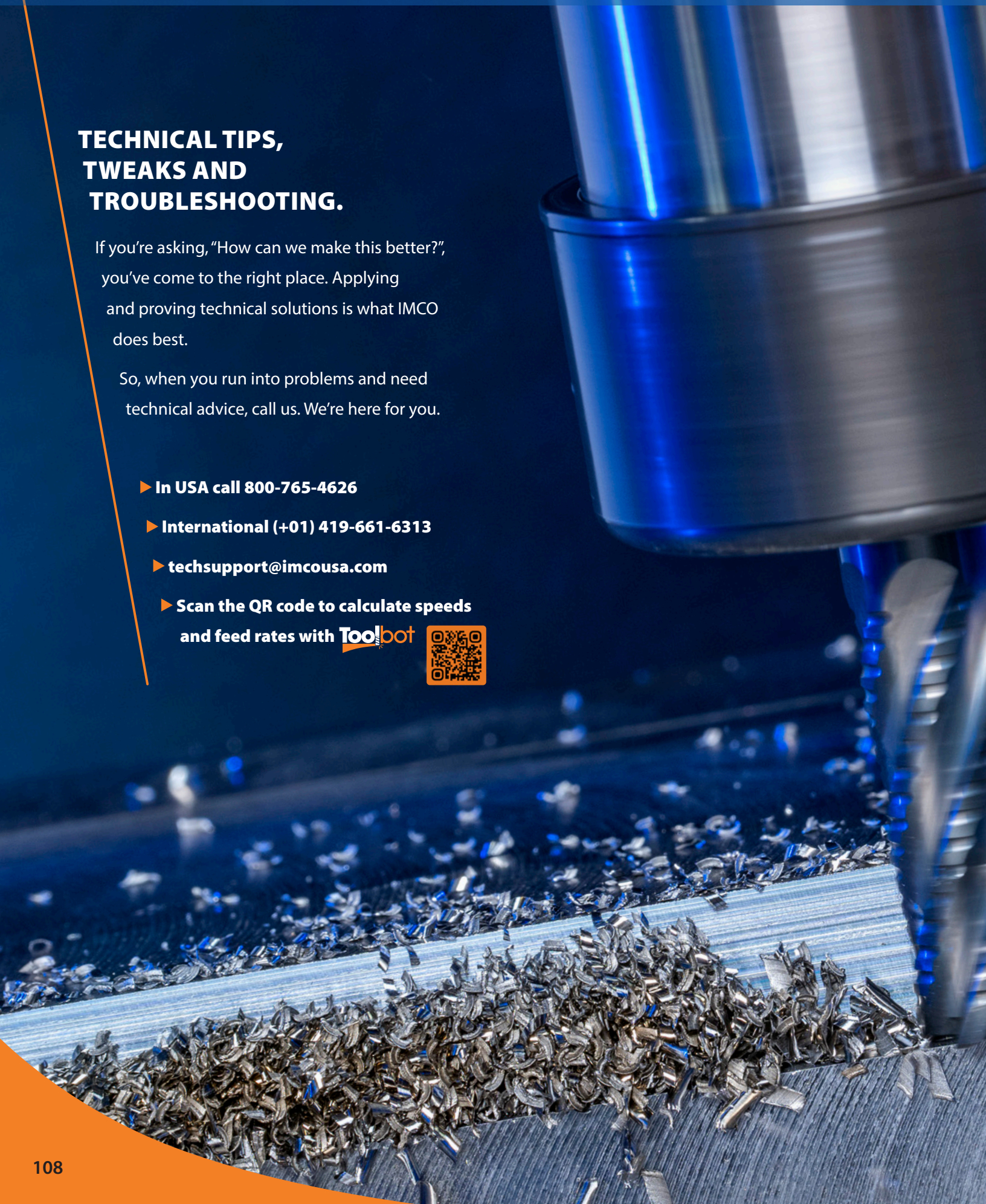
D = Tool diameter

METRIC

Cutter Dia d1	Shank Dia d2	Length of Cut l2	Overall Length l1	Order Code SQ	Order Code BN
1	3	3	38	0332478	0332894
1.5	3	6	38	0334408	0334412
2	3	9	38	0334409	0334413
2.5	3	9,5	38	0332480	-
3	3	12	38	0332481	0332898
		19	57	0332052	0334468
		25	75	0332018	0332850
4	4	14	50	0332483	0332900
		19	63	0332053	0334469
		31	75	0332019	0332851
5	5	16	50	0332485	0332902
		19	63	0332054	0334470
		31	100	0332057	0334473
6	6	19	63	0332486	0332903
		29	75	0332020	0332852
		38	100	0332058	0334475
8	8	20	63	0332488	0332905
		29	75	0332021	0332853
		41	100	0332059	-
10	10	25	72	0332490	0332907
		40	88	0332056	0334518
		45	100	0332022	-
12	12	25	76	0332491	0332908
		50	100	0332023	0332855
		75	150	0332024	-

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot



TECHNICAL TIPS, TWEAKS AND TROUBLESHOOTING.

If you're asking, "How can we make this better?", you've come to the right place. Applying and proving technical solutions is what IMCO does best.

So, when you run into problems and need technical advice, call us. We're here for you.

- **In USA call 800-765-4626**
- **International (+01) 419-661-6313**
- **techsupport@imcousa.com**
- **Scan the QR code to calculate speeds and feed rates with Toolbot**

Use the guidelines in this section when machining a variety of tool paths. At times, adjustments refer to specific end mill speed and feed charts that begin on page 122.

Choose the Right Tool for Your Job	110
HEM Slotting	112
Facing	112
Straight-Line Ramp Adjustments	113
Creating an Entry Hole Using a Helical Ramp	114
Adjustments for Long-Reach Applications	116
Adjusting Speed and Feed for Long Tool Projections	116
Eliminating Wall Taper When Finishing	116
Choosing a Tool Holder for HEM	117
Determining Power Requirements	117
Chip Thinning and Light Cuts	117
Adjusting for Ball-Nose End Mills	118
Adding a Weldon Flat	120
Conversions for Fractional and Metric Units	120
Common Machining Formulas	120
Decimal Equivalent Chart	178

Index for Speed and Feed Charts:

TOOL	PAGE	TOOL	PAGE
IPT7, IPC7	122	M525, M525C	144
IPT9, IPC9	124	M527, M527C	146
IPT11, IPC11	126	M213, M213N	148
IPT13, IPC13	128	M223, M223N	150
APT5, APC5	129	M233, M233N	152
AFC5, IFC5	130	M203, 202	154
M936, M936C	132	M725, M726	156
M924, M924C	136	M706	157
M904, M904C	138	M806, M806C	158
A106, A108	140	E Series	160

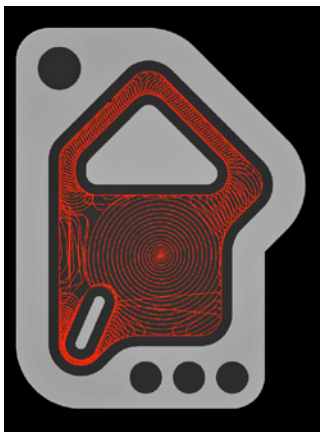
Index for Part Number Conversions:

TOOL LINE	PAGE
IPT7	162
IPC7, IPT9, IPC9	163
IPT11, IPC11, IPT13, IPC13	164
APT5	165
APT5N, APC5	166
APT5, AFC5, IFC5	167
M924	167
M924N, M924C, M904	168
M525	169
M525N, M525C	170
M527, M527C	171
M213	171
M213N, M213C, M223	172
M223N	173
M233, M203, M202	174
M725/M726	174
M725N/M726N	175
M706, M706N	175
M806	176
M806N	176
E14	176

HERE'S HOW! CHOOSE THE RIGHT TOOL FOR YOUR JOB.

Deciding which end mill to use in an application now goes beyond matching the end mill to the material. The programming style of high-efficiency machining or traditional plays a key role in determining which tool will decrease cycle time and maximize tool life.

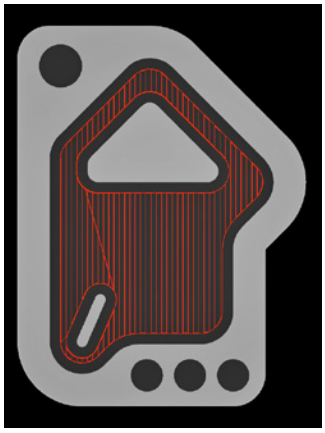
HEM vs. Traditional: Which is best?



HEM TOOL PATH

High-efficiency machining (HEM) can greatly reduce the cycle time of a job AND improve tool life. HEM uses advanced tool paths that maintain consistent pressure on cutting tools and the machine spindle. Common characteristics of these tool paths are:

- **Light radial cuts (step-overs)**
- **Deep axial cuts**
- **Elliptical tool paths when slotting and pocketing**



TRADITIONAL TOOL PATH

Traditional tool paths use straight-line moves that generate heavy tool engagement, intense pressure in the corners, and the potential for the tool to break. That means the machine "looks ahead" and slows down the tool or requires programming speeds and feeds that allow the end mill to survive sharp turns.

With HEM, the potential for reduced costs through faster cycle times and increased tool life is huge.

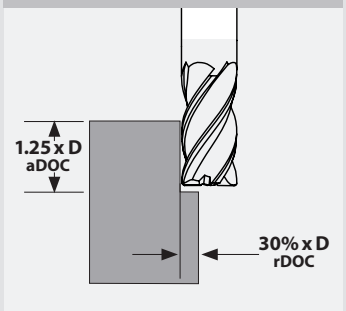
See example: ▶

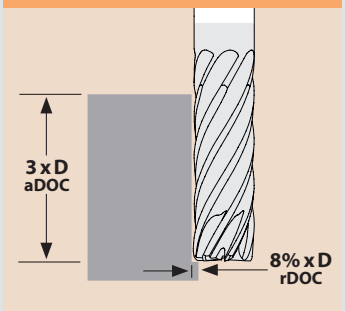
MACHINING 316 STAINLESS STEEL

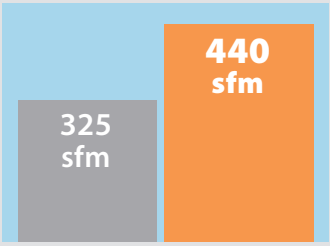
Must remove .150" from a wall 1.5" tall

Traditional method using IMCO M924 Series ½"OD four-flute end mill, taking a radial DOC of 30% of the diameter and an axial DOC of 1.25x D (.625" in this example).

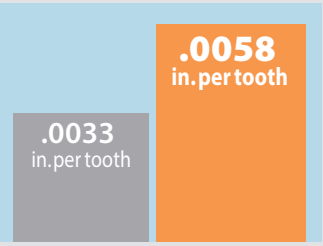
HEM method roughing out the same part using the IPT seven-flute end mill, taking a radial DOC of 8% of the diameter and an axial DOC of 3 x D (the full 1.5" of the wall in this example).

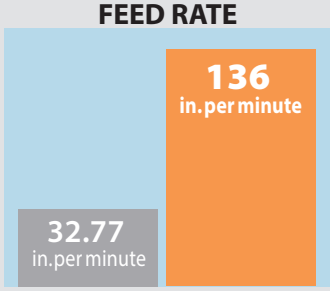




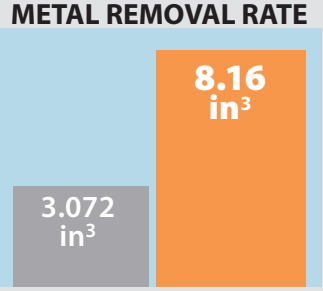


2483 rpm | **3361rpm**





2483 rpm x [.0033 ipt x 4 flutes] | **3361 rpm x [.0058 ipt x 7 flutes]**



32.77 ipm x .150" radial cut per pass x .625" axial cut per pass | **136 ipm x .040" radial cut per pass x 1.5" axial cut per pass**

In this example using a IPT7 end mill, material is removed 2.5 x faster using the HEM path versus a traditional tool path.The metal removal rate is measured in cubic inches: at IMCO, "It's all about the cubes."

Do all end mills run well in HEM tool paths?

All end mills are **not** created equal when it comes to HEM. End mills with multiple flutes, thick cores and strong corner radii are much more effective than traditional 4-flute tools. IMCO has created end mills specifically for HEM tool paths and others that can run both HEM and traditional cuts. It's all indicated in our tool selection guide.

Is HEM the best method to run on every job?

No. In general, **HEM does show significant savings** in most applications, but it really shines when you can run an axial depth of cut that is 1.25 x the tool diameter or greater. Traditional tool paths run well on very short runs and simple, shallow cuts.

An easy way to check if HEM will run a job faster is to calculate the metal removal rate, or mrr. The mrr multiplies the tool feed rate by the tool engagement to determine how many cubic inches or centimeters the tool removes per minute.

mrr = Feed rate of the tool x width of cut x depth of cut

OR

mrr = (rpm x (ipt x # of flutes) x radial DOC x axial DOC

Plug in the numbers for the feed rate, step-over (rDOC) and the axial depth of cut (aDOC) the tool manufacturer recommends to compare the mrrs of both programming techniques. **On parts that require cutting at least 1.25 x the tool diameter deep, you will find that HEM is outstanding.** Use the chart below to determine the best tool and path to use based on the axial depths (aDOC).

mrr ranking	1.25 x D axial depths	1.5 - 2 x D axial depths	2.5 x D axial depths	3 x D axial depths
1	M936 HEM	M936 HEM	IPT 9	IPT 9
2	M936 Trad	M936 Trad	M936 HEM	M936 HEM
3	IPT 9	IPT 9	IPT 11	IPT 11
4	IPT 11	IPT 11	IPT 7	IPT 7
5	M525 Trad	IPT 7	IPT 13	M936 Trad
6	M527 Trad	IPT 13	M936 Trad	IPT 13
7	IPT 7	M527 HEM	M527 HEM	M527 HEM
8	IPT 13	M525 HEM	M525 HEM	M525 HEM
9	M527 HEM	M525 Trad	M525 Trad	M525 Trad
10	M525 HEM	M527 Trad	M527 Trad	M527 Trad

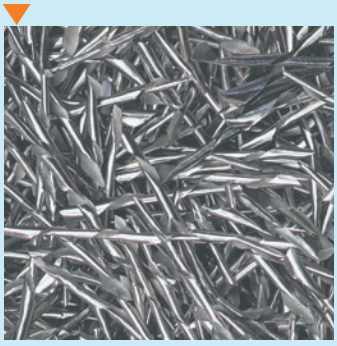
1= highest mrr, 8 = lowest mrr
Chart assumes adequate coolant and no chip pollution in the cut. Chart is typical for most ferrous materials and high-temp alloys.

Will the deep cuts used in HEM create chip pollution?

Yes, HEM can generate long chips based on the light step-over and deep cuts. The chips of some materials tend to break easily, and the coolant is effective in taking them out of the cutting zone. Other materials can cause issues. IMCO has developed special grinds that break the chips for easy removal without reducing tool life. Our **Chip Management System** is available as a standard feature on many of our high-performance end mill designs. Look for the "C" in the series number to find them.

Short chips created with CMS.

Long chips made without CMS.



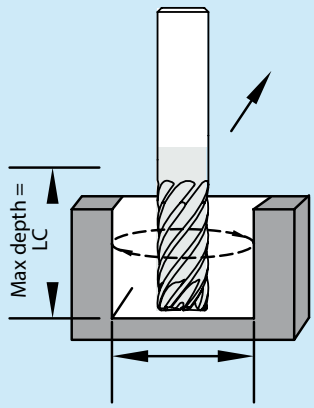
HERE'S HOW! HEM SLOTTING

To create a slot, the end mill you choose (diameter and number of flutes) is dictated by the width of your slot. Use this chart to find the minimum slot width for each end mill series.

Tool	Minimum Slot Width	Maximum Slot Depth
IPT/C 7	2 x end mill diameter	Full length of cut
IPT/C 9	2 x end mill diameter	Full length of cut
IPT/C11	2.25 x end mill diameter	Full length of cut
IPT/C 13	2.5 x end mill diameter	Full length of cut
M936	1.75 x end mill diameter	Full length of cut up to 3xD
M525/C	1.75 x end mill diameter	.8 x length of cut
M527/C	2 x end mill diameter	.8 x length of cut

NOTE: Speed and feed parameters for HEM slotting can be found marked as "Peripheral-HEM" for POW•R•PATH and as "HEM" for enDURO tools in the speed and feed charts for those series.

Trochoidal Slot – use peripheral HEM data

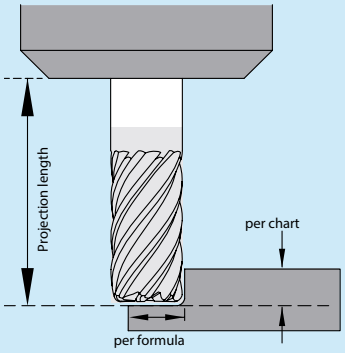


HERE'S HOW! FACING

When facing, IMCO recommends using an end mill with a corner radius to get the best finish. Locate the application guide for the end mill being used, then adjust the peripheral rough values using the formula below.

RDOC formula:

Step-over = [D - (2 x corner radius)] x .75



	NON-IP END MILLS					
	Rough Facing			Finish Facing		
Projection Length	sfm or m/min	ipt or mm/tooth	ADOC	sfm or m/min	ipt or mm/tooth	ADOC
0 to 3 x D	1.2 x chart value	.85 x chart value	.25 x D Maximum	1.2 x chart value	.75 x chart value	.07 x D Maximum
> 3 to 4 x D	1.1 x chart value	.75 x chart value	.25 x D Maximum	1.1 x chart value	.65 x chart value	.07 x D Maximum
> 4 to 5 x D	1.0 x chart value	.65 x chart value	.25 x D Maximum	1.0 x chart value	.55 x chart value	.06 x D Maximum
> 5 to 6 x D	.9 x chart value	.55 x chart value	.25 x D Maximum	.9 x chart value	.45 x chart value	.05 x D Maximum

	IP END MILLS					
	Rough Facing			Finish Facing		
Projection Length	sfm or m/min	ipt or mm/tooth	ADOC	sfm or m/min	ipt or mm/tooth	ADOC
0 to 3 x D	1.0 x chart value	.40 x chart value	.25 x D Maximum	1.0 x chart value	.70 x chart value	.07 x D Maximum
> 3 to 4 x D	1.0 x chart value	.40 x chart value	.25 x D Maximum	1.0 x chart value	.70 x chart value	.07 x D Maximum
> 4 to 5 x D	1.0 x chart value	.40 x chart value	.20 x D Maximum	1.0 x chart value	.70 x chart value	.05 x D Maximum
> 5 to 6 x D	1.0 x chart value	.40 x chart value	.20 x D Maximum	1.0 x chart value	.70 x chart value	.05 x D Maximum

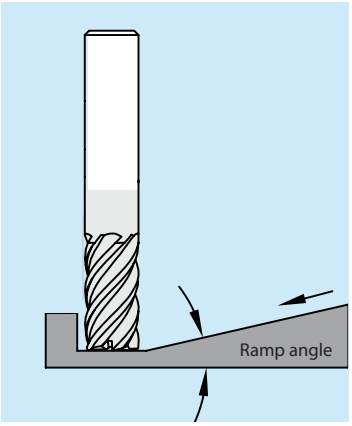
D = Tool diameter

HERE'S HOW! STRAIGHT-LINE RAMP ADJUSTMENTS

Straight-line ramp moves are alternatives to enter the middle of a part. The following guide shows speed, feed and ramp angle data for different IMCO end mills.

NOTE: *"Same as chart," "Slotting speed in chart," "Slotting feed in chart," and "ipt" and "mmpt" refer to data In the speed and feed charts for each tool series.*

NOTE: *Not all tools are designed to provide the chip clearance required for straight-line ramping, as seen in the chart.*

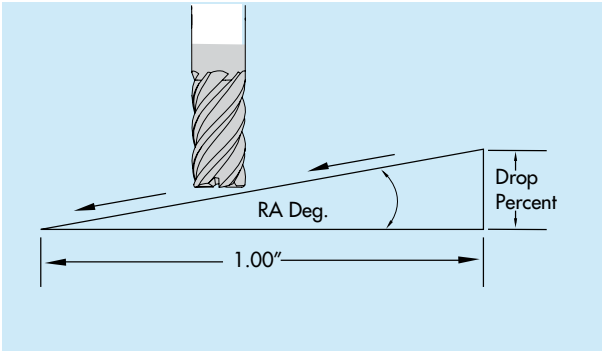


Tool	Max Ramp Angle	sfm/mmpm	Feed	Max Ramp Depth	Max Ramp Length
IPT/C 7	Not recommended	-	-	-	-
IPT/C 9	Not recommended	-	-	-	-
IPT/C 11	Not recommended	-	-	-	-
IPT/C 13	Not recommended	-	-	-	-
M936	5°	Slotting speed	Slotting IPT x .75	75% of D	(.75 x D)/drop per inch or mm
M924	2.5°	Slotting speed	Slotting ipt or mmpt x .75	50% of D	(.5 x D)/drop per inch or mm
M904	2.5°	Slotting speed	Slotting IPT x .75	50% of D	(.5 xD)/drop per inch
M525	2.5°	Slotting speed	Slotting ipt or mmpt x .75	50% of D	(.5 x D)/drop per inch or mm
M527	2.5°	Slotting speed	Slotting ipt or mmpt x .75	50% of D	(.5 x D) / drop per inch or mm
M726	Not recommended	-	-	-	-
M706	Not recommended	-	-	-	-
M806	Not recommended	-	-	-	-
M223	Helical ramp x 5	Same as chart	Same as chart	100% of D	(.75 x D)/drop per inch or mm
M233	Helical ramp x 5	Same as chart	Same as chart	100% of D	(.75 x D)/drop per inch or mm
M203	15°	Slotting speed	Slotting ipt or mmpt x .70	50% of D	(.5 x D)/drop per inch or mm
M202	15°	Slotting speed	Slotting ipt or mmpt x .70	50% of D	(.5 x D)/drop per inch or mm
E14	2.5°	Slotting speed	Slotting ipt or mmpt x .75	50% of D	(.5 x D)/drop per inch or mm
E13	2.5°	Slotting speed	Slotting ipt or mmpt x .75	50% of D	(.5 x D)/drop per inch or mm
E12	2.5°	Slotting ipt or mmpt	Slotting ipt or mmpt x .75	50% of D	(.5 x D)/drop per inch or mm

D = Tool diameter

Ramp Angle	Drop (per inch)	Drop (per mm)
0.5°	0.0088	0.224
1°	0.0175	0.445
2°	0.0375	0.953
2.5°	0.0438	1.113
3°	0.0525	1.334
5°	0.0875	2.223
10°	0.1750	4.445
15°	0.2625	6.668

Use this guide to determine the maximum ramp length.



HERE'S HOW! CREATING AN ENTRY HOLE USING A HELICAL RAMP

The preferred method to enter the middle of a part is to create an entry hole using a helical ramp move. Creating an entry hole can be a one-step or two-step process; it depends on how many flutes are on the end mill. Tools having up to and including seven flutes require just one step; tools with more than seven require two.

STEP 1 Create a helical ramp entry hole.

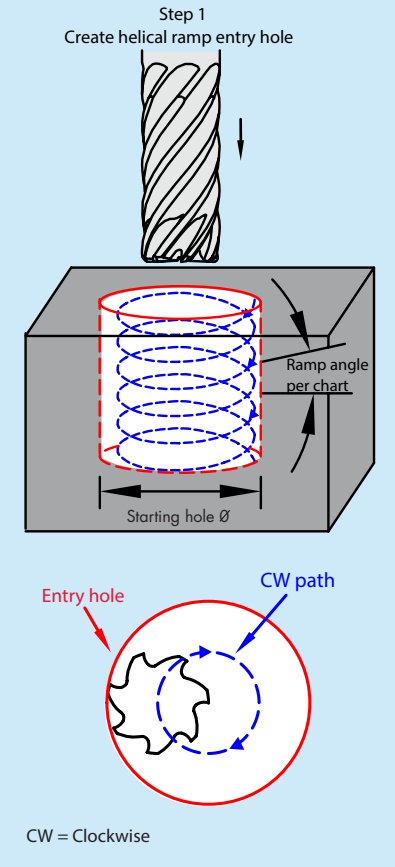
Step-over = (D1 x 2) - (corner radius x 2)

Use the following chart for speed, feed and ramp angle parameters.

NOTE: *"Same as chart," "Slotting speed in chart," Slotting feed in chart" and "ipt" and "mmpt" refer to data In the speed and feed charts for each tool series.*

Tool	Speed	Feed Adjustment – with high-pressure coolant	Feed Adjustment – with standard flood coolant	Ramp Angle
IPT/C 7	Same as chart	ipt or mmpt x 1.6	ipt or mmpt x 1.25	0.5°
IPT/C 9	Same as chart	ipt or mmpt x 1.6	lipt or mmpt x 1.25	0.5°
IPT/C 11	Same as chart	ipt or mmpt x 1.6	ipt or mmpt x 1.25	0.5°
IPT/C 13	Same as chart	ipt or mmpt x 1.6	ipt or mmpt x 1.25	0.5°
M936	Slotting speed x 1.2	Slotting feed x .7	Slotting feed x .6	7°
M924	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	1° - 2.5°
M904	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	1° - 2.5°
M525	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	1° - 2.5°
M527	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	1° - 2.5°
M726	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	1° - 2.5°
M706	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	1° - 2.5°
M806	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	1° - 2.5°
M223	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	3° - 5°
M233	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	3° - 5°
M203	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	3° - 5°
M202	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	3° - 5°
E14	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	1° - 2.5°
E13	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	1° - 2.5°
E12	Slotting speed in chart	Slotting feed in chart	Slotting feed in chart	1° - 2.5°

ipt = Inch per tooth from the speed and feed charts
mmpt = Millimeter per tooth from the speed and feed charts
Speed = Surface feet per minute (sfm) or meters per min (m/min)



STEP 2 Two common methods for opening a starter hole.

METHOD A – Expand the entry hole from the inside out.
(For seven-, nine-, 11- and 13-flute tools)

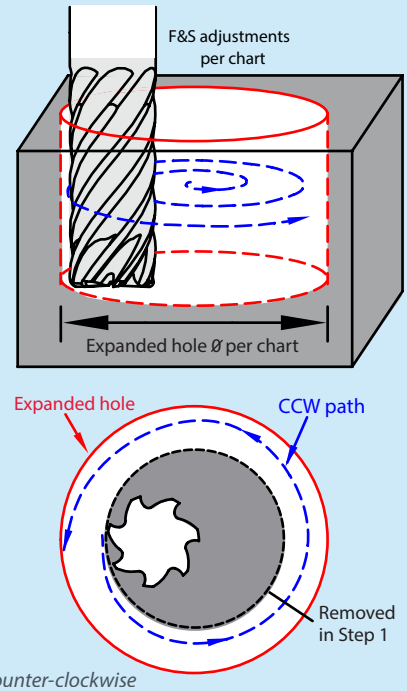
After reaching the desired entry hole depth in Step 1, and with the end mill still at depth, expand the hole outward using the feed rate adjustment found in the chart below. Continue until the entry hole is enlarged to the expanded diameter as shown below.

Tool	Expanded Hole Ø	Feed Rate Adjustment	Step-Over Adjustment
IPT/C 7,9	3 x D	ipt or mmpt x .75	RDOC x .5
IPT/C 11	3.75 x D	ipt or mmpt x .75	RDOC x .5
IPT/C 13	3.75 x D	ipt or mmpt x .75	RDOC x .5

D = Tool diameter

Once the expanded entry hole diameter is achieved, climb cut machining can begin at 100% of the peripheral-HEM values in the feed and speed chart for the tool series you're using.

Step 2 Method A
With end mill at depth,
expand the entry hole from inside out



CCW = Counter-clockwise

METHOD B – Expand the entry hole with a second helical ramp move.

Method B will expand the entry hole by doing a second helical ramp entry hole of a larger diameter than in Step 1. After completing Step 1, retract the end mill from the hole and machine the second helical ramp entry hole using the same speed, feed and location as the first hole.

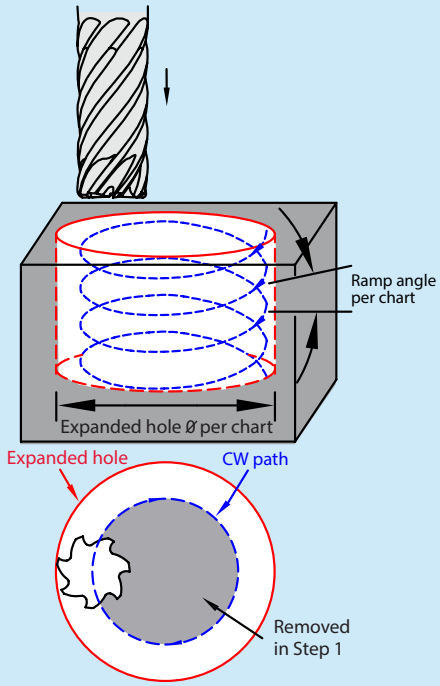
Tool	Expanded Hole Ø	Feed Rate Adjustment	Ramp Angle
IPT/C 9	3 x D	ipt or mmpt x 1.6	0.5°
IPT/C 11	3.75 x D	ipt or mmpt x 1.6	0.5°
IPT/C 13	3.75 x D	ipt or mmpt x 1.6	0.5°

D = Tool diameter

Once the expanded entry hole diameter is achieved, climb-cut machining can begin at 100% of the peripheral-HEM values in the feed and speed chart for the tool series you're using.

NOTE: To simplify this process, please visit Toolbot *by scanning the QR code:*

Step 2 Method B
Expand the entry hole with a second
helical ramp move of bigger Ø



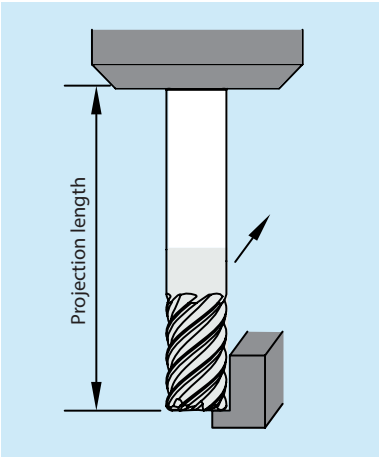
CW = Clockwise

HERE'S HOW! ADJUSTMENTS FOR LONG-REACH APPLICATIONS

Using long-length tools increases the amount of tool projection from the tool holder and spindle. As tool projection increases, so does the amount of tool deflection. Tool deflection causes chatter, which causes poor surface finish and reduces tool life.

These tool options help minimize tool deflection in long projection applications:

- Use a larger diameter tool for the operation; longer tools have larger cores, which reduces deflection.
- Use a tool with a necked shank, which shortens the flute length and increases the core strength of the end mill.



Adjustments must be made to reduce chatter and maximize tool life when using long-length tools. The adjustments below are based on the total amount of tool projection and use the speed and feed data found in the application charts for each tool series.

Projection	SFM / MMPM	Feed
> 1.25 to 3 x D	sfm or m/min x .95	ipt or mmpt x .95
> 3 to 4 x D	sfm or m/min x .90	ipt or mmpt x .90
> 4 to 5 x D	sfm or m/min x .80	ipt or mmp x .80
> 5 to 6 x D	sfm or m/min x .70	ipt or mmp x .70

D = Tool diameter
ipt = Inch per tooth
mmpt = Millimeter per tooth
sfm = Surface feet per minute
mpm = Millimeters per minute

IMPORTANT NOTES:

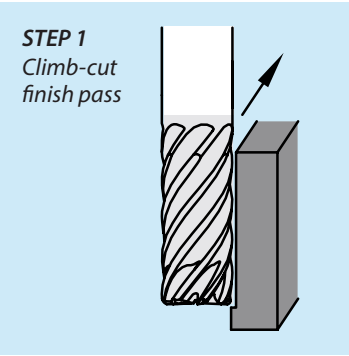
No adjustments are necessary when using the speed and feed data for HEM tool paths found in the charts for any of the POW•R•PATH and enDURO end mills. Use the data directly from the charts. This applies only when using HEM tool paths.

The M223 and M233 have the long projections adjustments already incorporated into the speed and feed charts for those series. Use the data directly from the charts with no adjustments for long projections.

HERE'S HOW! ELIMINATING WALL TAPER WHEN FINISHING

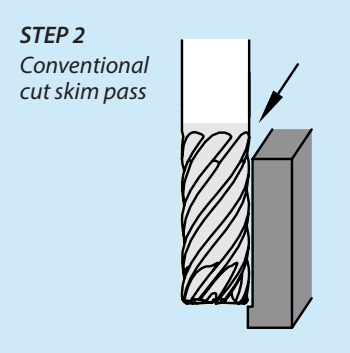
STEP 1

Run a climb-cut finish pass using speed, feed and step-over values (RDOC) from the appropriate speed and feed charts. Adjust for tool projection, if needed.



STEP 2

Rerun the path using the same speed and feed, but in the conventional cut direction. Just retrace the first finish pass; do not program to remove more stock. This skim pass in the opposite direction will help eliminate any wall taper caused by tool deflection during the first pass.



HERE'S HOW! CHOOSING A TOOL HOLDER FOR HEM

HEM tool paths reduce the amount of radial cutting forces exerted on the end mill, allowing more aggressive speeds and feeds and higher metal removal rates (mrr). With higher mrrs come higher axial cutting forces, which work to pull the end mill out of the holder and into the part.

Using a holder with high enough gripping power to overcome these higher axial forces is critical for successful machining in HEM tool paths. For better tool life, it is also important to choose a holder that minimizes the run-out of the tool assembly. This chart helps you select the most appropriate holder for the work.

Holder Type	Use in HEM Programming?
Press fit	Recommended
Shrink fit	Recommended
Mechanical chuck	Recommended
Hydraulic chuck	Only if ADOC < 3 x D
Advanced ER collet	Only if ADOC < 3 x D
Standard ER collet	Not recommended
Side lock holder	MUST keep run-out minimized

HERE'S HOW! DETERMINING POWER REQUIREMENTS

It can be helpful to understand the power requirements for an adjustment. The following formulas calculate spindle and motor horsepower and spindle torque.

STEP 1 **Metal removal rate (mrr) = Total feed rate x RDOC x ADOC**

STEP 2 **Spindle hp = mrr x uhp**

STEP 3 **Motor hp = Spindle hp/efficiency**

STEP 4 **Spindle torque (ft. lbs.) = (Spindle hp x 63,030)/rpm**

UHP FACTORS RATINGS

Material	Factor
Aluminum	0.3
Cast iron	0.8
Carbon steel	1
Alloy steel	1.1
Mold steel	1.2
Tool steel	1.2
Stainless steel	1.5
Titanium	1.8
Hi-temp alloys	2

EFFICIENCY RATINGS

Spindle Type	%
Direct drive	90%
Gear drive	85%
2 Belt	70%
1 Belt	50%
Average	80%

HERE'S HOW! CHIP THINNING AND LIGHT CUTS

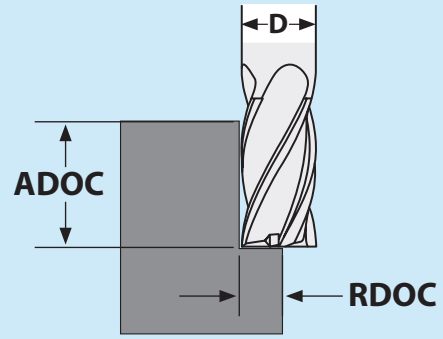
When using a light radial step-over, the chip created will be thinner than what is entered into the program. Thinning occurs when the radial step-over is less than 50% of the tool diameter.

When chips are too thin, the cutting edges of the tool tend to "rub" or scrape against the workpiece, causing premature wear. To avoid this, use the radial chip-thinning formula below to calculate an adjusted feed per tooth for optimal chip thickness.

Radial chip-thinning adjustment formula:

$$ipt_{adj} = \frac{ipt \times (D/2)}{\sqrt{(D \times RDOC) - RDOC^2}}$$

RADIAL CHIP THINNING ADJUSTMENT



Apply chip thinning adjustment when RDOC<D

NOTE: *This adjustment has been applied in the speed and feed charts in this catalog.*

HERE'S HOW! ADJUSTING FOR BALL-NOSE END MILLS

The speeds and feeds of ball-nose end mills must be adjusted to ensure proper tool life. Adjustments are based on the amount of tool engagement.

If the depth of cut (ADOC) is <50% of the tool diameter:

Adjustments are needed to determine the effective cutting diameter and adjust for axial chip thinning. Follow these steps:

STEP 1

Use speed and feed values for slot cuts from the charts for the appropriate material and tool diameter.

NOTE: *If the tool projection exceeds 2.5 x the tool diameter, make an additional adjustment using the chart at right.*

Step 1

Projection	Speed Adj	Feed Adj
> 2.5 to 3 x D	sfm or mmpm x .95	ipt or mmpt x .95
> 3 to 4 x D	sfm or mmpm x .90	ipt or mmpt x .90
> 4 to 5 x D	sfm or mmpm x .80	ipt or mmpt x .80
> 5 to 6 x D	sfm or mmpm x .70	ipt or mmpt x .70

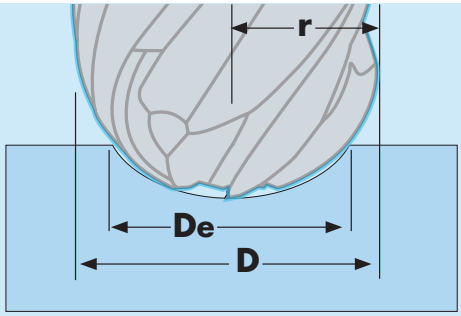
STEP 2

Determine the effective cutting diameter (De) of the cutter based on the axial depth of cut. The effective cutting diameter will be used to make both speed and feed adjustments.

Ball-nose effective diameter formula with no tilt:

$$De = 2 x \sqrt{r^2 - (r - ADOC)^2}$$

Step 2



Use D when making shallow cuts with full radius

For easy reference, use the charts below.

FRACTIONAL

Depth of Cut (ADOC)	1/8		1/4		3/8		1/2		3/4		1	
	Depth	De	Depth	De	Depth	De	Depth	De	Depth	De	Depth	De
10% of tool diameter	.013	.075	.025	.150	.038	.225	.050	.300	.075	.450	.100	.600
20% of tool diameter	.025	.100	.050	.200	.075	.300	.100	.400	.150	.600	.200	.800
30% of tool diameter	.038	.115	.075	.229	.113	.344	.150	.458	.225	.687	.300	.917
40% of tool diameter	.050	.123	.100	.245	.150	.367	.200	.490	.300	.73	.400	.980
50% of tool diameter	.063	.125	.125	.250	.186	.375	.250	.500	.375	.7500	.500	1.000

METRIC

Depth of Cut (ADOC)	3.0		6.0		10.0		12.0		20.0		25.0	
	Depth	De	Depth	De	Depth	De	Depth	De	Depth	De	Depth	De
10% of tool diameter	.300	1.800	.600	3.600	1.000	6.000	1.200	7.200	2.000	12.000	2.500	15.000
20% of tool diameter	.600	2.400	1.200	4.800	2.000	8.000	2.400	9.600	4.000	16.000	5.00	20.000
30% of tool diameter	.900	2.750	1.800	5.500	3.000	9.165	3.600	10.998	6.000	18.330	7.500	22.913
40% of tool diameter	1.200	2.940	2.400	5.880	4.000	9.800	4.800	11.760	8.000	19.600	10.000	24.500
50% of tool diameter	1.500	3.000	3.000	6.000	5.000	10.000	6.000	12.000	10.000	20.000	12.500	25.000

STEP 3

Calculate speed using the effective cutting diameter. Use the standard sfm or m/min, to rpm conversion formula (below). Substitute the effective cutting diameter (De) for the actual tool diameter (D).

Fractional: **rpm = (sfm x 3.82) / De**

Metric: **rpm = (m/min x 318.3) / De**

STEP 4

Calculate the chip load for the effective diameter using the formula below.

Fractional: **ipt_{adj} = (ipt / D) x De**

Metric: **$mmpt_{adj}$ = (mmpt / D) x De**

STEP 5

Calculate the feed rate using the adjusted chip load from Step 4.

Fractional: **ipm = rpm x Z x ipt_{adj}**

Metric: **mmpm = rpm x Z x $mmpt_{adj}$**

D = Actual tool diameter | ipt = Feed rate from chart for slot milling
De = Effective cutting diameter | ipm = Inches per minute | Z = # of flutes
ipt_{adj} = Adjusted chip load per tooth fractional | mmpm = Millimeters per minute
$mmpt_{adj}$ = Adjusted chip load per tooth metric

If the axial depth of cut (ADOC) is ≥50% of the tool diameter:

- Use the speed and feed values for slotting from the chart for the end mill series being used.
- If the tool projection exceeds 2.5 x the tool diameter, adjust the slotting speeds and feeds according to the chart for long-reach tool adjustments on page 116.

Surface finish

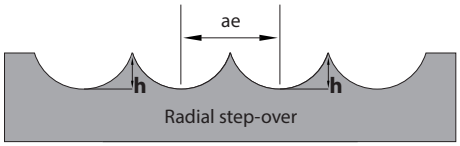
Radial depth of cut (RDOC), or step-over, is based on the finish desired. The lighter the step-over, the lower the scallop height (material left uncut by the tool radius) and the better the finish.

These charts calculate approximate scallop height using this formula:

Approximate scallop height formula:

$$h = (ae^2) / (8r)$$

h = Scallop height
ae = Radial step-over
r = Radius of end mill (tool diameter x .5)



FRACTIONAL

Tool Diameter	Step-over % of OD	Step-over Actual	Approx Scallop Height
1/8	10%	.013	.0003
	20%	.025	.0013
	30%	.038	.0028
1/4	10%	.025	.0006
	20%	.050	.0025
	30%	.075	.0056
3/8	10%	.038	.0009
	20%	.075	.0038
	.30%	.113	.0084
1/2	10%	.050	.0013
	20%	.100	.0050
	30%	.150	.0113
3/4	10%	.075	.0019
	20%	.150	.0075
	30%	.225	.0169
1	10%	.100	.0025
	20%	.200	.0100
	30%	.300	.0225

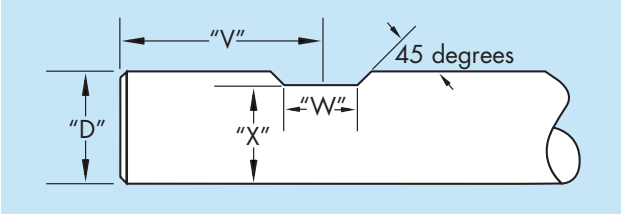
METRIC

Tool Diameter	Step-over % of OD	Step-over Actual	Approx Scallop Height
3.0 mm	10%	.300	.0075
	20%	.600	.0300
	30%	.900	.0675
6.0 mm	10%	.600	.0150
	20%	1.200	.0600
	30%	1.800	.1350
10.0 mm	10%	1.000	.0250
	20%	2.000	.1000
	.30%	3.000	.2250
12.0 mm	10%	1.200	.0300
	20%	2.400	.1200
	30%	3.600	.2700
20.0 mm	10%	2.000	.0500
	20%	4.000	.2000
	30%	6.000	.4500
25.0 mm	10%	2.500	.0625
	20%	5.000	.2500
	30%	7.500	.5625

HERE'S HOW! ADDING A WELDON FLAT

When adding a Weldon flat to an end mill, IMCO uses the location and dimensions specified in the ANSI B94.19-1985 standard.

All requests for locations and/or dimensions not matching the ANSI standard must be communicated in writing to IMCO.



FRACTIONAL

"D"	"W"	"X"	"V"
Shank Diameter	+.015 -0	'+0 -.010	+.015 -015
.375	.281	.325	.781
.5	.330	.440	.890
.625	.406	.560	.953
.75	.455	.675	1.016
1	.516	.925	1.140
1.25	.516	1.156	1.140

METRIC

"D"	"W"	"X"	"V"
Shank Diameter	+.015 -0	'+0 -.010	+.015 -015
10 mm (.3937)	.276	.335	.787
12 mm (.4724)	.315	.409	.886
16 mm (.6299)	.394	.559	.945
20 mm (.7874)	.433	.716	.984
25 mm (.9843)	.472	.905	1.260
1.25	.516	1.156	1.140

NOTE: All dimensions are shown in fractional decimal equivalents.

CONVERSIONS FOR FRACTIONAL AND METRIC UNITS

MULTIPLY	BY	TO GET
Millimeters	0.03937	Inches
Centimeters	0.3937	Inches
Meters	3.2808	Feet
Millimeters per minute (mm/min)	0.03937	Inches per minute (ipm)
Cubic centimeters per minute (cm^3)	0.061	Cubic inches per minute (in^3)
Meters per minute (m/min)	3.2808	Surface feet per minute (sfm)
Inches	25.4	Millimeters
Inches	2.54	Centimeters
Feet	0.3048	Meters
Inches per minute (ipm)	25.4	Millimeters per minute (mm/min)
Cubic inches per minute (in^3)	16.387	Cubic centimeters per minute (cm^3)
Surface feet per minute (sfm)	0.3048	Meters per minute (m/min)

COMMON MACHINING FORMULAS

$$rpm = \frac{sfm \times 3.82}{D}$$

$$sfm = rpm \times D \times .262$$

$$ipm = rpm \times ipt \times Z$$

$$mrr = RDOC \times ADOC \times ipm$$

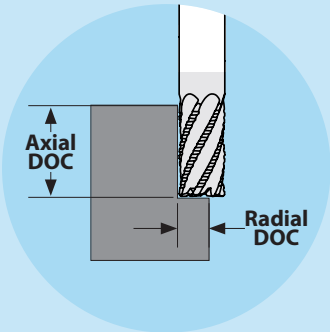
$$rpm = \frac{m/min \times 318.3}{D}$$

$$m/min = rpm \times D \times .00314$$

$$mmpm = rpm \times mmpt \times Z$$

$$mrr = RDOC \times ADOC \times mmpm$$

D Tool diameter
Z Number of flutes
rpm Revolutions per minute
sfm Surface feet per minute
m/min Surface meters per minute
ipm Inches per minute
mmpm Millimeters per minute
ipt Inch per tooth
mmpt Millimeters per tooth
mrr Metal removal rate
RDOC Radial depth of cut
ADOC Axial depth of cut



Member IMC Group

IMCO

Power. Precision. Performance.

Toolbot

CHECK IT BEFORE YOU WRECK IT.

How do you make the most of your operation?

Ask Toolbot – the FREE, easy-to-use online tool from IMCO.

With Toolbot, the answers are at your fingertips!

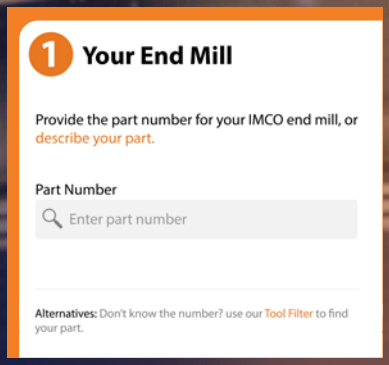
Get accurate dynamic speed and feed recommendations based on your specific operation. Toolbot walks you through it: **Four easy steps** and you're there.

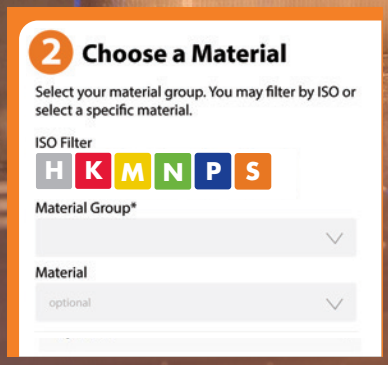
Go to imcousa.com/toolbot and sign in.

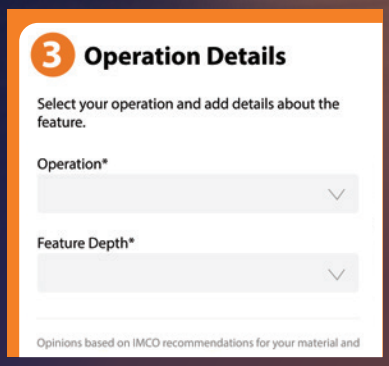
1. Input your end mill part number or, if you don't know it, just answeer the filter questions.
2. Input the material group and/or specific material of your workpiece.
3. Add select details about your operation and feature depths.
4. Input your machine capabilities (maximum spindle power, maximum feed rate, maximum rpm).

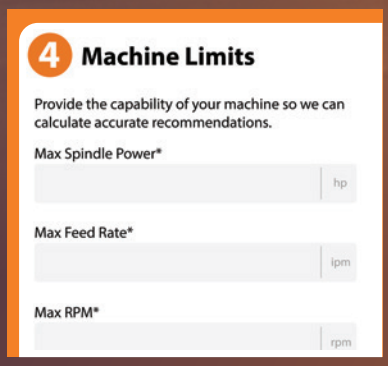
Now, hit "calculate." Toolbot generates exact speed and feed recommendations for your specific operation, material, workpiece and machining center. You're ready to rock and roll!

Toolbot:
Real-time answers for optimum machining and best results.









Scan the QR code to try Toolbot today.

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inches per Tooth) 3/16	1/4	3/8	1/2	5/8	3/4	1
K	Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Peripheral - HEM	≤ 3 x D	.1 x D	7	400	.0027	.0036	.0054	.0072	.0090	.0108	.0144
		Peripheral - HEM	> 3 x D - 4 x D	.08 x D	7	400	.0024	.0032	.0049	.0065	.0081	.0097	.0130
		Peripheral - HEM	> 4 x D - 5 x D	.08 x D	7	390	.0022	.0029	.0043	.0058	.0072	.0086	.0115
		Finish	3 x D	.015 x D	7	450	.0010	.0013	.0020	.0026	.0033	.0039	.0052
	Cast iron malleable	Peripheral - HEM	≤ 3 x D	.08 x D	7	390	.0022	.0029	.0044	.0058	.0073	.0087	.0116
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	390	.0020	.0026	.0039	.0052	.0065	.0078	.0104
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	375	.0017	.0023	.0035	.0046	.0058	.0070	.0093
		Finish	3 x D	.015 x D	7	350	.0008	.0011	.0016	.0021	.0026	.0032	.0042
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Peripheral - HEM	≤ 3 x D	.08 x D	7	485	.0028	.0038	.0056	.0075	.0094	.0113	.0150
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	485	.0025	.0034	.0051	.0068	.0084	.0101	.0135
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	465	.0023	.0030	.0045	.0060	.0075	.0090	.0120
		Finish	3 x D	.015 x D	7	420	.0011	.0014	.0021	.0028	.0035	.0042	.0056
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Peripheral - HEM	≤ 3 x D	.08 x D	7	450	.0027	.0036	.0053	.0071	.0089	.0107	.0142
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	450	.0024	.0032	.0048	.0064	.0080	.0096	.0128
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	425	.0021	.0028	.0043	.0057	.0071	.0085	.0114
		Finish	3 x D	.015 x D	7	390	.0009	.0013	.0019	.0025	.0031	.0038	.0050
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Peripheral - HEM	≤ 3 x D	.08 x D	7	420	.0024	.0032	.0048	.0064	.0080	.0096	.0128
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	420	.0022	.0029	.0043	.0058	.0072	.0086	.0115
		Peripheral - HEM	> 4 - 5 xD	.08 x D	7	395	.0019	.0026	.0038	.0051	.0064	.0077	.0102
		Finish	3 x D	.015 x D	7	365	.0008	.0011	.0016	.0021	.0026	.0032	.0042
M	Martensitic & ferritic stainless steels 410, 416, 440	Peripheral - HEM	≤ 3 x D	.08 x D	7	450	.0028	.0038	.0056	.0075	.0094	.0113	.0150
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	450	.0025	.0034	.0051	.0068	.0084	.0101	.0135
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	425	.0023	.0030	.0045	.0060	.0075	.0090	.0120
		Finish	3 x D	.015 x D	7	390	.0009	.0013	.0019	.0025	.0031	.0038	.0050
	Austenitic stainless steels, fFeNi alloys 303, 304, 316, Invar, Kovar	Peripheral - HEM	≤ 3 x D	.08 x D	7	450	.0024	.0032	.0048	.0064	.0080	.0096	.0128
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	440	.0022	.0029	.0043	.0058	.0072	.0086	.0115
		Peripheral - HEM	> 4 - 5 x D	.07 x D	7	425	.0019	.0026	.0038	.0051	.0064	.0077	.0102
		Finish	3 x D	.015 x D	7	390	.0009	.0012	.0018	.0024	.0030	.0036	.0048
	Precipitation hardening stainless steels 17-4, 15-5	Peripheral - HEM	≤ 3 x D	.08 x D	7	440	.0023	.0031	.0047	.0062	.0078	.0093	.0124
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	440	.0021	.0028	.0042	.0056	.0070	.0084	.0112
		Peripheral - HEM	> 4 - 5 x D	.07 x D	7	415	.0019	.0025	.0037	.0050	.0062	.0074	.0099
		Finish	3 x D	.015 x D	7	380	.0008	.0010	.0015	.0020	.0025	.0030	.0040
S	Titanium alloys 6Al-4V, 6-2-4	Peripheral - HEM	≤ 3 x D	.1 x D	7	405	.0015	.0021	.0031	.0041	.0051	.0062	.0082
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	405	.0014	.0018	.0028	.0037	.0046	.0055	.0074
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	390	.0012	.0016	.0025	.0033	.0041	.0049	.0066
		Finish	3 x D	.015 x D	7	350	.0006	.0008	.0012	.0016	.0020	.0024	.0032
	Difficult-to-machine titanium alloys 10-2-3 Precipitation Hardening Stainless Steel M 13-8	Peripheral - HEM	≤ 2.5 x D	.08 x D	7	335	.0015	.0020	.0030	.0040	.0050	.0060	.0080
		Peripheral - HEM	> 2.5 - 3.5 x D	.07 x D	7	325	.0014	.0018	.0027	.0036	.0045	.0054	.0072
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	7	305	.0012	.0016	.0024	.0032	.0040	.0048	.0064
		Finish	3 x D	.01 x D	7	290	.0005	.0007	.0011	.0014	.0018	.0021	.0028
	Hastalloy, Waspalloy	Peripheral - HEM	≤ 1.5 x D	.08 x D	7	100	.0035	.0047	.0071	.0094	.0118	.0141	.0188
		Peripheral - HEM	> 1.5 - 2.5 x D	.08 x D	7	95	.0032	.0042	.0063	.0085	.0106	.0127	.0169
		Peripheral - HEM	> 2.5 - 3.5 x D	.06 x D	7	85	.0028	.0038	.0056	.0075	.0094	.0113	.0150
		Finish	2 x D	.01 x D	7	90	.0019	.0025	.0038	.0050	.0063	.0075	.0100
	Inconel 718, Rene 88	Peripheral - HEM	≤ 1.5 x D	.07 x D	7	95	.0035	.0047	.0070	.0093	.0116	.0140	.0186
		Peripheral - HEM	> 1.5 - 2.5 x D	.06 x D	7	90	.0031	.0042	.0063	.0084	.0105	.0126	.0167
		Peripheral - HEM	> 2.5 - 3 x D	.06 x D	7	85	.0028	.0037	.0056	.0074	.0093	.0112	.0149
		Finish	2 x D	.01 x D	7	85	.0018	.0024	.0036	.0048	.0060	.0072	.0096

D = Tool diameter HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (M/min)	Feed (MM per Tooth) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
K	Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Peripheral - HEM	≤ 3 x D	.1 x D	7	122	.0864	.1152	.1434	.1728	.2298	.2868	.3456
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	122	.0778	.1037	.1291	.1555	.2068	.2581	.3110
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	119	.0691	.0922	.1147	.1382	.1838	.2295	.2765
		Finish	3 x D	.015 x D	7	137	.0312	.0416	.0518	.0624	.0830	.1036	.1248
	Cast iron Malleable	Peripheral - HEM	≤ 3 x D	.08 x D	7	119	.0696	.0928	.1155	.1392	.1851	.2311	.2784
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	119	.0626	.0835	.1040	.1253	.1666	.2079	.2505
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	114	.0557	.0742	.0924	.1114	.1481	.1848	.2227
		Finish	3 x D	.015 x D	7	107	.0252	.0336	.0418	.0504	.0670	.0837	.1008
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Peripheral - HEM	≤ 3 x D	.08 x D	7	148	.0900	.1200	.1494	.1800	.2394	.2988	.3600
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	148	.0810	.1080	.1344	.1620	.2154	.2689	.3240
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	142	.0720	.0960	.1195	.1440	.1915	.2390	.2880
		Finish	3 x D	.015 x D	7	128	.0336	.0448	.0558	.0672	.0894	.1115	.1344
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Peripheral - HEM	≤ 3 x D	.08 x D	7	137	.0852	.1136	.1414	.1704	.2266	.2828	.3408
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	137	.0767	.1022	.1273	.1533	.2040	.2546	.3067
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	130	.0682	.0909	.1131	.1363	.1813	.2263	.2726
		Finish	3 x D	.015 x D	7	119	.0300	.0400	.0498	.0600	.0798	.0996	.1200
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Peripheral - HEM	≤ 3 x D	.08 x D	7	128	.0768	.1024	.1275	.1536	.2043	.2550	.3072
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	128	.0691	.0922	.1147	.1382	.1838	.2295	.2765
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	120	.0614	.0819	.1020	.1229	.1634	.2040	.2457
		Finish	3 x D	.015 x D	7	111	.0252	.0336	.0418	.0504	.0670	.0837	.1008
M	Martensitic & ferritic stainless steels 410, 416, 440	Peripheral - HEM	≤ 3 x D	.08 x D	7	137	.0900	.1200	.1494	.1800	.2394	.2988	.3600
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	137	.0810	.1080	.1344	.1620	.2154	.2689	.3240
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	130	.0720	.0960	.1195	.1440	.1915	.2390	.2880
		Finish	3 x D	.015 x D	7	119	.0300	.0400	.0498	.0600	.0798	.0996	.1200
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Peripheral - HEM	≤ 3 x D	.08 x D	7	137	.0768	.1024	.1275	.1536	.2043	.2550	.3072
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	134	.0691	.0922	.1147	.1382	.1838	.2295	.2765
		Peripheral - HEM	> 4 - 5 x D	.07 x D	7	130	.0614	.0819	.1020	.1229	.1634	.2040	.2457
		Finish	3 x D	.015 x D	7	119	.0288	.0384	.0478	.0576	.0766	.0956	.1152
	Precipitation hardening stainless steels 17-4, 15-5	Peripheral - HEM	≤ 3 x D	.08 x D	7	134	.0744	.0992	.1235	.1488	.1979	.2470	.2976
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	134	.0670	.0893	.1111	.1339	.1781	.2223	.2678
		Peripheral - HEM	> 4 - 5 x D	.07 x D	7	126	.0595	.0794	.0988	.1190	.1583	.1976	.2381
		Finish	3 x D	.015 x D	7	116	.0240	.0320	.0398	.0480	.0638	.0797	.0960
S	Titanium alloys 6Al-4V, 6-2-4	Peripheral - HEM	≤ 3 x D	.1 x D	7	123	.0492	.0656	.0817	.0984	.1309	.1633	.1968
		Peripheral - HEM	> 3 - 4 x D	.08 x D	7	123	.0443	.0590	.0735	.0886	.1178	.1470	.1771
		Peripheral - HEM	> 4 - 5 x D	.08 x D	7	119	.0394	.0525	.0653	.0787	.1047	.1307	.1574
		Finish	3 x D	.015 x D	7	107	.0192	.0256	.0319	.0384	.0511	.0637	.0768
	Difficult-to-machine titanium alloys 10-2-3 Precipitation hardening stainless steel M 13-8	Peripheral - HEM	≤ 2.5 x D	.08 x D	7	102	.0480	.0640	.0797	.0960	.1277	.1593	.1920
		Peripheral - HEM	> 2.5 - 3.5 x D	.07 x D	7	99	.0432	.0576	.0717	.0864	.1149	.1434	.1728
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	7	93	.0384	.0512	.0637	.0768	.1021	.1275	.1536
		Finish	3 x D	.01 x D	7	88	.0168	.0224	.0279	.0336	.0447	.0558	.0672
	Hastalloy, Waspalloy	Peripheral - HEM	≤ 1.5 x D	.08 x D	7	30	.1128	.1504	.1872	.2256	.3000	.3745	.4512
		Peripheral - HEM	> 1.5 - 2.5 x D	.08 x D	7	29	.1015	.1353	.1685	.2030	.2700	.3370	.4060
		Peripheral - HEM	> 2.5 - 3.5 x D	.06 x D	7	26	.0902	.1203	.1498	.1805	.2400	.2996	.3609
		Finish	2 x D	.01 x D	7	27	.0600	.0800	.0996	.1200	.1596	.1992	.2400
	Inconel 718, Rene 88	Peripheral - HEM	≤ 1.5 x D	.07 x D	7	29	.1116	.1488	.1852	.2232	.2968	.3705	.4464
		Peripheral - HEM	> 1.5 - 2.5 x D	.06 x D	7	27	.1004	.1339	.1667	.2009	.2671	.3334	.4017
		Peripheral - HEM	> 2.5 - 3 x D	.06 x D	7	26	.0893	.1190	.1482	.1785	.2375	.2964	.3571
		Finish	2 x D	.01 x D	7	26	.0576	.0768	.0956	.1152	.1532	.1912	.2304

D = Tool diameter
HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters shown)

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inches per Tooth) 1/4	3/8	1/2	5/8	3/4	1
K	Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Peripheral - HEM	≤ 3 x D	.1 x D	9	400	.0036	.0054	.0072	.0090	.0108	.0144
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	400	.0032	.0049	.0065	.0081	.0097	.0130
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	390	.0029	.0043	.0058	.0072	.0086	.0115
		Finish	3 x D	.015 x D	9	450	.0013	.0020	.0026	.0033	.0039	.0052
	Cast iron Malleable	Peripheral - HEM	≤ 3 x D	.08 x D	9	390	.0029	.0044	.0058	.0073	.0087	.0116
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	390	.0026	.0039	.0052	.0065	.0078	.0104
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	375	.0023	.0035	.0046	.0058	.0070	.0093
		Finish	3 x D	.015 x D	9	350	.0011	.0016	.0021	.0026	.0032	.0042
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Peripheral - HEM	≤ 3 x D	.08 x D	9	485	.0038	.0056	.0075	.0094	.0113	.0150
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	485	.0034	.0051	.0068	.0084	.0101	.0135
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	465	.0030	.0045	.0060	.0075	.0090	.0120
		Finish	3 x D	.015 x D	9	420	.0014	.0021	.0028	.0035	.0042	.0056
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Peripheral - HEM	≤ 3 x D	.08 x D	9	450	.0036	.0053	.0071	.0089	.0107	.0142
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	450	.0032	.0048	.0064	.0080	.0096	.0128
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	425	.0028	.0043	.0057	.0071	.0085	.0114
		Finish	3 x D	.015 x D	9	390	.0013	.0019	.0025	.0031	.0038	.0050
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Peripheral - HEM	≤ 3 x D	.08 x D	9	420	.0032	.0048	.0064	.0080	.0096	.0128
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	420	.0029	.0043	.0058	.0072	.0086	.0115
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	395	.0026	.0038	.0051	.0064	.0077	.0102
		Finish	3 x D	.015 x D	9	365	.0011	.0016	.0021	.0026	.0032	.0042
M	Martensitic & ferritic stainless steels 410, 416, 440	Peripheral - HEM	≤ 3 x D	.08 x D	9	450	.0038	.0056	.0075	.0094	.0113	.0150
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	450	.0034	.0051	.0068	.0084	.0101	.0135
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	425	.0030	.0045	.0060	.0075	.0090	.0120
		Finish	3 x D	.015 x D	9	390	.0013	.0019	.0025	.0031	.0038	.0050
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Peripheral - HEM	≤ 3 x D	.08 x D	9	450	.0032	.0048	.0064	.0080	.0096	.0128
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	440	.0029	.0043	.0058	.0072	.0086	.0115
		Peripheral - HEM	> 4 - 5 x D	.07 x D	9	425	.0026	.0038	.0051	.0064	.0077	.0102
		Finish	3 x D	.015 x D	9	390	.0012	.0018	.0024	.0030	.0036	.0048
	Precipitation hardening stainless steels 17-4, 15-5	Peripheral - HEM	≤ 3 x D	.08 x D	9	440	.0031	.0047	.0062	.0078	.0093	.0124
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	440	.0028	.0042	.0056	.0070	.0084	.0112
		Peripheral - HEM	> 4 - 5 x D	.07 x D	9	415	.0025	.0037	.0050	.0062	.0074	.0099
		Finish	3 x D	.015 x D	9	380	.0010	.0015	.0020	.0025	.0030	.0040
S	Titanium alloys 6Al-4V, 6-2-4	Peripheral - HEM	≤ 3 x D	.1 x D	9	405	.0021	.0031	.0041	.0051	.0062	.0082
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	405	.0018	.0028	.0037	.0046	.0055	.0074
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	390	.0016	.0025	.0033	.0041	.0049	.0066
		Finish	3 x D	.015 x D	9	350	.0008	.0012	.0016	.0020	.0024	.0032
	Difficult-to-machine titanium alloys 10-2-3	Peripheral - HEM	≤ 2.5 x D	.08 x D	9	335	.0020	.0030	.0040	.0050	.0060	.0080
		Peripheral - HEM	> 2.5 - 3.5 x D	.07 x D	9	325	.0018	.0027	.0036	.0045	.0054	.0072
	Precipitation hardening stainless steel M 13-8	Peripheral - HEM	> 3.5 - 4 x D	.06 x D	9	305	.0016	.0024	.0032	.0040	.0048	.0064
		Finish	3 x D	.01 x D	9	290	.0007	.0011	.0014	.0018	.0021	.0028
	Hastalloy, Waspalloy	Peripheral - HEM	≤ 1.5 x D	.08 x D	9	100	.0045	.0068	.0090	.0113	.0135	.0180
		Peripheral - HEM	> 1.5 - 2.5 x D	.08 x D	9	95	.0041	.0061	.0081	.0101	.0122	.0162
		Peripheral - HEM	> 2.5 - 3.5 x D	.06 x D	9	85	.0036	.0054	.0072	.0090	.0108	.0144
		Finish	2 x D	.01 x D	9	90	.0024	.0036	.0048	.0060	.0072	.0096
	Inconel 718, Rene 88	Peripheral - HEM	≤ 1.5 x D	.07 x D	9	95	.0046	.0068	.0091	.0114	.0137	.0182
		Peripheral - HEM	> 1.5 - 2.5 x D	.06 x D	9	90	.0041	.0061	.0082	.0102	.0123	.0164
		Peripheral - HEM	> 2.5 - 3 x D	.06 x D	9	85	.0036	.0055	.0073	.0091	.0109	.0146
		Finish	2 x D	.01 x D	9	85	.0023	.0035	.0046	.0058	.0069	.0092

D = Tool diameter *HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)*

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (M/min)	Feed (MM per Tooth) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
K	Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Peripheral - HEM	≤ 3 x D	.1 x D	9	122	.0864	.1152	.1434	.1728	.2298	.2868	.3456
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	122	.0778	.1037	.1291	.1555	.2068	.2581	.3110
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	119	.0691	.0922	.1147	.1382	.1838	.2295	.2765
		Finish	3 x D	.015 x D	9	137	.0312	.0416	.0518	.0624	.0830	.1036	.1248
	Cast iron Malleable	Peripheral - HEM	≤ 3 x D	.08 x D	9	119	.0696	.0928	.1155	.1392	.1851	.2311	.2784
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	119	.0626	.0835	.1040	.1253	.1666	.2079	.2505
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	114	.0557	.0742	.0924	.1114	.1481	.1848	.2227
		Finish	3 x D	.015 x D	9	107	.0252	.0336	.0418	.0504	.0670	.0837	.1008
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Peripheral - HEM	≤ 3 x D	.08 x D	9	148	.0900	.1200	.1494	.1800	.2394	.2988	.3600
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	148	.0810	.1080	.1344	.1620	.2154	.2689	.3240
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	142	.0720	.0960	.1195	.1440	.1915	.2390	.2880
		Finish	3 x D	.015 x D	9	128	.0336	.0448	.0558	.0672	.0894	.1115	.1344
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Peripheral - HEM	≤ 3 x D	.08 x D	9	137	.0852	.1136	.1414	.1704	.2266	.2828	.3408
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	137	.0767	.1022	.1273	.1533	.2040	.2546	.3067
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	130	.0682	.0909	.1131	.1363	.1813	.2263	.2726
		Finish	3 x D	.015 x D	9	119	.0300	.0400	.0498	.0600	.0798	.0996	.1200
	Tool and die Steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Peripheral - HEM	≤ 3 x D	.08 x D	9	128	.0768	.1024	.1275	.1536	.2043	.2550	.3072
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	128	.0691	.0922	.1147	.1382	.1838	.2295	.2765
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	120	.0614	.0819	.1020	.1229	.1634	.2040	.2457
		Finish	3 x D	.015 x D	9	111	.0252	.0336	.0418	.0504	.0670	.0837	.1008
M	Martensitic & ferritic stainless steels 410, 416, 440	Peripheral - HEM	≤ 3 x D	.08 x D	9	137	.0900	.1200	.1494	.1800	.2394	.2988	.3600
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	134	.0810	.1080	.1344	.1620	.2154	.2689	.3240
		Peripheral - HEM	> 4 - 5 x D	.07 x D	9	130	.0720	.0960	.1195	.1440	.1915	.2390	.2880
		Finish	3 x D	.015 x D	9	119	.0300	.0400	.0498	.0600	.0798	.0996	.1200
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Peripheral - HEM	≤ 3 x D	.08 x D	9	137	.0768	.1024	.1275	.1536	.2043	.2550	.3072
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	137	.0691	.0922	.1147	.1382	.1838	.2295	.2765
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	130	.0614	.0819	.1020	.1229	.1634	.2040	.2457
		Finish	3 x D	.015 x D	9	119	.0288	.0384	.0478	.0576	.0766	.0956	.1152
	Precipitation hardening stainless steels 17-4, 15-5	Peripheral - HEM	≤ 3 x D	.08 x D	9	134	.0744	.0992	.1235	.1488	.1979	.2470	.2976
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	134	.0670	.0893	.1111	.1339	.1781	.2223	.2678
		Peripheral - HEM	> 4 - 5 x D	.07 x D	9	126	.0595	.0794	.0988	.1190	.1583	.1976	.2381
		Finish	3 x D	.015 x D	9	116	.0240	.0320	.0398	.0480	.0638	.0797	.0960
S	Titanium alloys 6Al-4V, 6-2-4	Peripheral - HEM	≤ 3 x D	.1 x D	9	123	.0492	.0656	.0817	.0984	.1309	.1633	.1968
		Peripheral - HEM	> 3 - 4 x D	.08 x D	9	123	.0443	.0590	.0735	.0886	.1178	.1470	.1771
		Peripheral - HEM	> 4 - 5 x D	.08 x D	9	119	.0394	.0525	.0653	.0787	.1047	.1307	.1574
		Finish	3 x D	.015 x D	9	107	.0192	.0256	.0319	.0384	.0511	.0637	.0768
	Difficult-to-machine titanium alloys 10-2-3	Peripheral - HEM	≤ 2.5 x D	.08 x D	9	102	.0480	.0640	.0797	.0960	.1277	.1593	.1920
		Peripheral - HEM	> 2.5 - 3.5 x D	.07 x D	9	99	.0432	.0576	.0717	.0864	.1149	.1434	.1728
	Precipitation hardening stainless steel M 13-8	Peripheral - HEM	> 3.5 - 4 x D	.06 x D	9	93	.0384	.0512	.0637	.0768	.1021	.1275	.1536
		Finish	3 x D	.01 x D	9	88	.0168	.0224	.0279	.0336	.0447	.0558	.0672
	Hastalloy, Waspalloy	Peripheral - HEM	≤ 1.5 x D	.08 x D	9	30	.1080	.1440	.1793	.2160	.2873	.3585	.4320
		Peripheral - HEM	> 1.5 - 2.5 x D	.08 x D	9	29	.0972	.1296	.1613	.1944	.2585	.3227	.3888
		Peripheral - HEM	> 2.5 - 3.5 x D	.06 x D	9	26	.0864	.1152	.1434	.1728	.2298	.2868	.3456
		Finish	2 x D	.01 x D	9	27	.0576	.0768	.0956	.1152	.1532	.1912	.2304
	Inconel 718, Rene 88	Peripheral - HEM	≤ 1.5 x D	.07 x D	9	29	.1092	.1456	.1813	.2184	.2904	.3625	.4368
		Peripheral - HEM	> 1.5 - 2.5 x D	.06 x D	9	27	.0983	.1310	.1631	.1965	.2614	.3263	.3931
		Peripheral - HEM	> 2.5 - 3 x D	.06 x D	9	26	.0874	.1165	.1450	.1747	.2324	.2900	.3494
		Finish	2 x D	.01 x D	9	26	.0552	.0736	.0916	.1104	.1468	.1832	.2208

D = Tool diameter
HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inches per Tooth) 1/2	5/8	3/4	1	1-1/4
K	Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Peripheral - HEM	≤ 2 x D	.08 x D	11	365	.0053	.0066	.0080	.0106	.0133
		Peripheral - HEM	> 2 - 3 x D	.07 x D	11	365	.0046	.0058	.0069	.0092	.0115
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	11	350	.0040	.0050	.0060	.0080	.0100
		Peripheral - HEM	> 3.5 - 4 x D	.065 x D	11	350	.0034	.0043	.0051	.0068	.0085
		Finish	3 x D	.01 x D	11	370	.0022	.0028	.0033	.0044	.0055
	Cast iron Malleable	Peripheral - HEM	≤ 2 x D	.07 x D	11	375	.0063	.0079	.0095	.0126	.0158
		Peripheral - HEM	> 2 - 3 x D	.07 x D	11	375	.0056	.0070	.0084	.0112	.0140
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	11	360	.0048	.0060	.0072	.0096	.0120
		Peripheral - HEM	> 3.5 - 4 x D	.07 x D	11	360	.0040	.0050	.0060	.0080	.0100
		Finish	3 x D	.01 x D	11	335	.0023	.0029	.0035	.0046	.0058
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Peripheral - HEM	≤ 2 x D	.07 x D	11	550	.0055	.0069	.0083	.0110	.0138
		Peripheral - HEM	> 2 - 3 x D	.07 x D	11	530	.0048	.0060	.0072	.0096	.0120
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	11	515	.0042	.0053	.0063	.0084	.0105
		Peripheral - HEM	> 3.5 - 4 x D	.07 x D	11	505	.0036	.0045	.0054	.0072	.0090
		Finish	3 x D	.01 x D	11	475	.0020	.0025	.0030	.0040	.0050
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Peripheral - HEM	≤ 2 x D	.07 x D	11	530	.0054	.0068	.0081	.0108	.0135
		Peripheral - HEM	> 2 - 3 x D	.07 x D	11	515	.0047	.0059	.0071	.0094	.0118
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	11	500	.0041	.0051	.0062	.0082	.0103
		Peripheral - HEM	> 3.5 - 4 x D	.07 x D	11	490	.0035	.0044	.0053	.0070	.0088
		Finish	3 x D	.01 x D	11	455	.0019	.0024	.0029	.0038	.0048
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Peripheral - HEM	≤ 2 x D	.06 x D	11	445	.0063	.0079	.0095	.0126	.0158
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	430	.0055	.0069	.0083	.0110	.0138
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	11	415	.0048	.0060	.0072	.0096	.0120
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	11	410	.0041	.0051	.0062	.0082	.0103
		Finish	3 x D	.01 x D	11	385	.0020	.0025	.0030	.0040	.0050
M	Martensitic & ferritic stainless steels 410, 416, 440	Peripheral - HEM	≤ 2 x D	.06 x D	11	450	.0068	.0085	.0102	.0136	.0170
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	450	.0060	.0075	.0090	.0120	.0150
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	11	425	.0054	.0068	.0081	.0108	.0135
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	11	425	.0044	.0055	.0066	.0088	.0110
		Finish	3 x D	.01 x D	11	390	.0023	.0029	.0035	.0046	.0058
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Peripheral - HEM	≤ 2 x D	.06 x D	11	445	.0067	.0084	.0101	.0134	.0168
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	430	.0059	.0074	.0089	.0118	.0148
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	11	415	.0052	.0065	.0078	.0104	.0130
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	11	410	.0043	.0054	.0065	.0086	.0108
		Finish	3 x D	.01 x D	11	385	.0025	.0031	.0038	.0050	.0063
	Precipitation hardening stainless steels 17-4, 15-5	Peripheral - HEM	≤ 2 x D	.06 x D	11	435	.0068	.0085	.0102	.0136	.0170
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	420	.0060	.0075	.0090	.0120	.0150
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	11	405	.0052	.0065	.0078	.0104	.0130
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	11	400	.0043	.0054	.0065	.0086	.0108
		Finish	3 x D	.01 x D	11	375	.0022	.0028	.0033	.0044	.0055
S	Titanium alloys 6Al-4V, 6-2-4	Peripheral - HEM	≤ 2 x D	.06 x D	11	425	.0060	.0075	.0090	.0120	.0150
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	415	.0043	.0054	.0065	.0086	.0108
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	11	395	.0042	.0053	.0063	.0084	.0105
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	11	395	.0039	.0049	.0059	.0078	.0098
		Finish	3 x D	.015 x D	11	370	.0023	.0029	.0035	.0046	.0058
	Difficult-to-machine titanium alloys 10-2-3	Peripheral - HEM	≤ 2 x D	0.06 x D	11	350	.0059	.0074	.0089	.0118	.0148
		Peripheral - HEM	> 2 - 3 x D	0.06 x D	11	330	.0042	.0053	.0063	.0084	.0105
		Peripheral - HEM	> 3 - 3.5 x D	0.055 x D	11	315	.0041	.0051	.0062	.0082	.0103
	Precipitation hardening stainless steel M 13-8	Peripheral - HEM	> 3.5 - 4 x D	0.05 x D	11	310	.0038	.0048	.0057	.0076	.0095
		Finish	3 x D	.01 x D	11	300	.0020	.0025	.0030	.0040	.0050
	Hastalloy, Waspalloy	Peripheral - HEM	≤ 2 x D	.07 X D	11	105	.0090	.0113	.0135	.0180	.0225
		Peripheral - HEM	> 2 - 3 x D	.065 x D	11	100	.0081	.0101	.0122	.0162	.0203
		Peripheral - HEM	> 3 - 3.5 x D	.055 x D	11	90	.0072	.0090	.0108	.0144	.0180
		Peripheral - HEM	> 3.5 - 4 x D	.055 x D	11	90	.0065	.0081	.0097	.0130	.0162
		Finish	3 x D	.01 x D	11	90	.0047	.0059	.0071	.0094	.0118
	Inconel 718, Rene 88	Peripheral - HEM	≤ 2 x D	.065 x D	11	100	.0062	.0078	.0093	.0124	.0155
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	95	.0060	.0075	.0090	.0120	.0150
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	11	95	.0060	.0075	.0090	.0120	.0150
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	11	95	.0052	.0065	.0078	.0104	.0130
		Finish	3 x D	.01 x D	11	90	.0032	.0040	.0048	.0064	.0080

D = Tool diameter
HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (M/min)	Feed (MM per Tooth) 12.0	16.0	20.0
K	Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Peripheral - HEM	≤ 2 x D	.08 x D	11	111	.1272	.1692	.2111
		Peripheral - HEM	> 2 - 3 x D	.07 x D	11	111	.1104	.1468	.1832
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	11	107	.0960	.1277	.1593
		Peripheral - HEM	> 3.5 - 4 x D	.065 x D	11	107	.0816	.1085	.1354
		Finish	3 x D	.01 x D	11	113	.0528	.0702	.0876
	Cast iron Malleable	Peripheral - HEM	≤ 2 x D	.07 x D	11	114	.1512	.2011	.2510
		Peripheral - HEM	> 2 - 3 x D	.07 x D	11	114	.1344	.1787	.2231
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	11	110	.1152	.1532	.1912
		Peripheral - HEM	> 3.5 - 4 x D	.07 x D	11	110	.0960	.1277	.1593
		Finish	3 x D	.01 x D	11	102	.0552	.0734	.0916
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Peripheral - HEM	≤ 2 x D	.07 x D	11	168	.1320	.1755	.2191
		Peripheral - HEM	> 2 - 3 x D	.07 x D	11	162	.1152	.1532	.1912
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	11	157	.1008	.1341	.1673
		Peripheral - HEM	> 3.5 - 4 x D	.07 x D	11	154	.0864	.1149	.1434
		Finish	3 x D	.01 x D	11	145	.0480	.0638	.0797
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Peripheral - HEM	≤ 2 x D	.07 x D	11	162	.1296	.1724	.2151
		Peripheral - HEM	> 2 - 3 x D	.07 x D	11	157	.1128	.1500	.1872
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	11	152	.0984	.1309	.1633
		Peripheral - HEM	> 3.5 - 4 x D	.07 x D	11	149	.0840	.1117	.1394
		Finish	3 x D	.01 x D	11	139	.0456	.0606	.0757
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Peripheral - HEM	≤ 2 x D	.06 x D	11	136	.1512	.2011	.2510
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	131	.1320	.1755	.2191
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	11	126	.1152	.1532	.1912
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	11	125	.0984	.1309	.1633
		Finish	3 x D	.01 x D	11	117	.0480	.0638	.0797
M	Martensitic & ferritic stainless steels 410, 416, 440	Peripheral - HEM	≤ 2 x D	.06 x D	11	137	.1608	.2138	.2669
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	137	.1416	.1883	.2350
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	11	130	.1248	.1660	.2072
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	11	130	.1032	.1372	.1713
		Finish	3 x D	.01 x D	11	119	.0600	.0798	.0996
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Peripheral - HEM	≤ 2 x D	.06 x D	11	136	.1632	.2170	.2709
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	131	.1440	.1915	.2390
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	11	126	.1296	.1724	.2151
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	11	125	.1056	.1404	.1753
		Finish	3 x D	.01 x D	11	117	.0552	.0734	.0916
	Precipitation hardening stainless steels 17-4, 15-5	Peripheral - HEM	≤ 2 x D	.06 x D	11	133	.1632	.2170	.2709
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	128	.1440	.1915	.2390
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	11	123	.1248	.1660	.2072
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	11	122	.1032	.1372	.1713
		Finish	3 x D	.01 x D	11	114	.0528	.0702	.0876
S	Titanium alloys 6Al-4V, 6-2-4	Peripheral - HEM	≤ 2 x D	.06 x D	11	130	.1440	.1915	.2390
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	126	.1032	.1372	.1713
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	11	120	.1008	.1341	.1673
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	11	120	.0936	.1245	.1554
		Finish	3 x D	.015 x D	11	113	.0552	.0734	.0916
	Difficult-to-machine titanium alloys 10-2-3	Peripheral - HEM	≤ 2 x D	0.06 x D	11	107	.1416	.1883	.2350
		Peripheral - HEM	> 2 - 3 x D	0.06 x D	11	101	.1008	.1341	.1673
		Peripheral - HEM	> 3 - 3.5 x D	0.055 x D	11	96	.0984	.1309	.1633
	Precipitation hardening stainless steel M 13-8	Peripheral - HEM	> 3.5 - 4 x D	0.05 x D	11	94	.0912	.1213	.1514
		Finish	3 x D	.01 x D	11	91	.0480	.0638	.0797
	Hastalloy, Waspalloy	Peripheral - HEM	≤ 2 x D	.07 X D	11	32	.2160	.2873	.3585
		Peripheral - HEM	> 2 - 3 x D	.065 x D	11	30	.1944	.2585	.3227
		Peripheral - HEM	> 3 - 3.5 x D	.055 x D	11	27	.1728	.2298	.2868
		Peripheral - HEM	> 3.5 - 4 x D	.055 x D	11	27	.1555	.2068	.2581
		Finish	3 x D	.01 x D	11	27	.1128	.1500	.1872
	Inconel 718, Rene 88	Peripheral - HEM	≤ 2 x D	.065 x D	11	30	.1488	.1979	.2470
		Peripheral - HEM	> 2 - 3 x D	.06 x D	11	29	.1440	.1915	.2390
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	11	29	.1440	.1915	.2390
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	11	29	.1248	.1660	.2072
		Finish	3 x D	.01 x D	11	27	.0768	.1021	.1275

D = Tool diameter *HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)*

Information on tips and adjustments can be found in our Technical Resources section beginning on page 108.

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inches per Tooth) 1/2	5/8	3/4	1	1-1/4
K	Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Peripheral - HEM	≤ 2 x D	.07 x D	13	370	.0045	.0056	.0068	.0090	.0113
		Peripheral - HEM	> 2 - 3 x D	.07 x D	13	370	.0040	.0050	.0060	.0080	.0100
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	13	360	.0034	.0043	.0051	.0068	.0085
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	13	360	.0030	.0038	.0045	.0060	.0075
		Finish	3 x D	.01 x D	13	365	.0020	.0025	.0030	.0040	.0050
	Cast iron Malleable	Peripheral - HEM	≤ 2 x D	.07 x D	13	380	.0048	.0060	.0072	.0096	.0120
		Peripheral - HEM	> 2 - 3 x D	.07 x D	13	380	.0042	.0053	.0063	.0084	.0105
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	13	365	.0039	.0049	.0059	.0078	.0098
		Peripheral - HEM	> 3.5 - 4 x D	.07 x D	13	365	.0036	.0045	.0054	.0072	.0090
		Finish	3 x D	.01 x D	13	340	.0017	.0021	.0026	.0034	.0043
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Peripheral - HEM	≤ 2 x D	.07 x D	13	450	.0044	.0055	.0066	.0088	.0110
		Peripheral - HEM	> 2 - 3 x D	.07 x D	13	430	.0039	.0049	.0059	.0078	.0098
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	13	420	.0036	.0045	.0054	.0072	.0090
		Peripheral - HEM	> 3.5 - 4 x D	.07 x D	13	410	.0034	.0043	.0051	.0068	.0085
		Finish	3 x D	.01 x D	13	395	.0017	.0021	.0026	.0034	.0043
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Peripheral - HEM	≤ 2 x D	.06 x D	13	405	.0044	.0055	.0066	.0088	.0110
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	405	.0041	.0051	.0062	.0082	.0103
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	13	405	.0039	.0049	.0059	.0078	.0098
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	405	.0036	.0045	.0054	.0072	.0090
		Finish	3 x D	.01 x D	13	370	.0017	.0021	.0026	.0034	.0043
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Peripheral - HEM	≤ 2 x D	.06 x D	13	420	.0045	.0056	.0068	.0090	.0113
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	420	.0040	.0050	.0060	.0080	.0100
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	13	415	.0037	.0046	.0056	.0074	.0093
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	415	.0035	.0044	.0053	.0070	.0088
		Finish	3 x D	.01 x D	13	385	.0015	.0019	.0023	.0030	.0038
M	Martensitic & ferritic stainless steels 410, 416, 440	Peripheral - HEM	≤ 2 x D	.06 x D	13	460	.0050	.0063	.0075	.0100	.0125
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	460	.0048	.0060	.0072	.0096	.0120
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	13	450	.0040	.0050	.0060	.0080	.0100
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	13	445	.0035	.0044	.0053	.0070	.0088
		Finish	3 x D	.01 x D	13	390	.0018	.0023	.0027	.0036	.0045
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Peripheral - HEM	≤ 2 x D	.06 x D	13	450	.0041	.0051	.0062	.0082	.0103
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	450	.0040	.0050	.0060	.0080	.0100
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	13	450	.0037	.0046	.0056	.0074	.0093
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	445	.0035	.0044	.0053	.0070	.0088
		Finish	3 x D	.01 x D	13	415	.0015	.0019	.0023	.0030	.0038
	Precipitation hardening stainless steels 17-4, 15-5	Peripheral - HEM	> 2 - 3 x D	.06 x D	13	440	.0041	.0051	.0062	.0082	.0103
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	13	435	.0038	.0048	.0057	.0076	.0095
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	435	.0034	.0043	.0051	.0068	.0085
		Finish	3 x D	.01 x D	13	400	.0017	.0021	.0026	.0034	.0043
S	Titanium alloys 6Al-4V, 6-2-4	Peripheral - HEM	≤ 2 x D	.08 x D	13	395	.0050	.0063	.0075	.0100	.0125
		Peripheral - HEM	> 2 - 3 x D	.07 x D	13	390	.0045	.0056	.0068	.0090	.0113
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	13	380	.0041	.0051	.0062	.0082	.0103
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	13	380	.0034	.0043	.0051	.0068	.0085
		Finish	3 x D	.015 x D	13	355	.0022	.0028	.0033	.0044	.0055
	Difficult-to-machine titanium alloys 10-2-3	Peripheral - HEM	≤ 2 x D	.06 x D	13	350	.0050	.0063	.0075	.0100	.0125
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	330	.0036	.0045	.0054	.0072	.0090
		Peripheral - HEM	> 3 - 3.5 x D	.055 x D	13	315	.0035	.0044	.0053	.0070	.0088
	Precipitation hardening stainless steels M 13-8	Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	310	.0032	.0040	.0048	.0064	.0080
		Finish	3 x D	.01 x D	13	300	.0017	.0021	.0026	.0034	.0043
	Hastalloy, Waspalloy	Peripheral - HEM	≤ 2 x D	.07 X D	13	105	.0071	.0089	.0107	.0142	.0178
		Peripheral - HEM	> 2 - 3 x D	.065 x D	13	100	.0064	.0080	.0096	.0128	.0160
		Peripheral - HEM	> 3 - 3.5 x D	.055 x D	13	90	.0062	.0078	.0093	.0124	.0155
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	90	.0057	.0071	.0086	.0114	.0143
		Finish	3 x D	.01 x D	13	90	.0044	.0055	.0066	.0088	.0110
	Inconel 718, Rene 88	Peripheral - HEM	≤ 2 x D	.06 x D	13	100	.0052	.0065	.0078	.0104	.0130
		Peripheral - HEM	> 2 - 3 x D	.05 x D	13	95	.0052	.0065	.0078	.0104	.0130
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	13	95	.0048	.0060	.0072	.0096	.0120
		Peripheral - HEM	> 3.5 - 4 x D	.04 x D	13	95	.0048	.0060	.0072	.0096	.0120
		Finish	3 x D	.01 x D	13	90	.0023	.0029	.0035	.0046	.0058

D = Tool diameter
HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (M/min)	Feed (MM per Tooth) 12.0	16.0	20.0
K	Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Peripheral - HEM	≤ 2 x D	.07 x D	13	113	.1080	.1436	.1793
		Peripheral - HEM	> 2 - 3 x D	.07 x D	13	113	.0960	.1277	.1593
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	13	110	.0816	.1085	.1354
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	13	110	.0720	.0958	.1195
		Finish	3 x D	.01 x D	13	111	.0480	.0638	.0797
	Cast iron Malleable	Peripheral - HEM	≤ 2 x D	.07 x D	13	116	.1152	.1532	.1912
		Peripheral - HEM	> 2 - 3 x D	.07 x D	13	116	.1008	.1341	.1673
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	13	111	.0936	.1245	.1554
		Peripheral - HEM	> 3.5 - 4 x D	.07 x D	13	111	.0864	.1149	.1434
		Finish	3 x D	.01 x D	13	104	.0408	.0543	.0677
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Peripheral - HEM	≤ 2 x D	.07 x D	13	137	.1056	.1404	.1753
		Peripheral - HEM	> 2 - 3 x D	.07 x D	13	131	.0936	.1245	.1554
		Peripheral - HEM	> 3 - 3.5 x D	.07 x D	13	128	.0864	.1149	.1434
		Peripheral - HEM	> 3.5 - 4 x D	.07 x D	13	125	.0816	.1085	.1354
		Finish	3 x D	.01 x D	13	120	.0408	.0543	.0677
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Peripheral - HEM	≤ 2 x D	.06 x D	13	123	.1056	.1404	.1753
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	123	.0984	.1309	.1633
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	13	123	.0936	.1245	.1554
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	123	.0864	.1149	.1434
		Finish	3 x D	.01 x D	13	113	.0408	.0543	.0677
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Peripheral - HEM	≤ 2 x D	.06 x D	13	128	.1080	.1436	.1793
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	128	.0960	.1277	.1593
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	13	126	.0888	.1181	.1474
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	126	.0840	.1117	.1394
		Finish	3 x D	.01 x D	13	117	.0360	.0479	.0598
M	Martensitic & ferritic stainless steels 410, 416, 440	Peripheral - HEM	≤ 2 x D	.06 x D	13	140	.0984	.1309	.1633
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	140	.0960	.1277	.1593
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	13	137	.0888	.1181	.1474
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	13	136	.0840	.1117	.1394
		Finish	3 x D	.01 x D	13	119	.0360	.0479	.0598
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Peripheral - HEM	≤ 2 x D	.06 x D	13	137	.1200	.1596	.1992
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	137	.1152	.1532	.1912
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	13	137	.0960	.1277	.1593
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	136	.0840	.1117	.1394
		Finish	3 x D	.01 x D	13	126	.0432	.0575	.0717
	Precipitation hardening stainless steels 17-4, 15-5	Peripheral - HEM	≤ 2 x D	.06 x D	13	134	.1080	.1436	.1793
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	134	.0984	.1309	.1633
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	13	133	.0912	.1213	.1514
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	133	.0816	.1085	.1354
		Finish	3 x D	.01 x D	13	122	.0408	.0543	.0677
S	Titanium alloys 6Al-4V, 6-2-4	Peripheral - HEM	≤ 2 x D	.08 x D	13	120	.1200	.1596	.1992
		Peripheral - HEM	> 2 - 3 x D	.07 x D	13	119	.1080	.1436	.1793
		Peripheral - HEM	> 3 - 3.5 x D	.06 x D	13	116	.0984	.1309	.1633
		Peripheral - HEM	> 3.5 - 4 x D	.06 x D	13	116	.0816	.1085	.1354
		Finish	3 x D	.015 x D	13	108	.0528	.0702	.0876
	Difficult-to-machine titanium alloys 10-2-3	Peripheral - HEM	≤ 2 x D	.06 x D	13	107	.1200	.1596	.1992
		Peripheral - HEM	> 2 - 3 x D	.06 x D	13	101	.0864	.1149	.1434
		Peripheral - HEM	> 3 - 3.5 x D	.055 x D	13	96	.0840	.1117	.1394
	Precipitation hardening stainless steel M 13-8	Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	94	.0768	.1021	.1275
		Finish	3 x D	.01 x D	13	91	.0408	.0543	.0677
	Hastalloy, Waspalloy	Peripheral - HEM	≤ 2 x D	.07 X D	13	32	.1704	.2266	.2828
		Peripheral - HEM	> 2 - 3 x D	.065 x D	13	30	.1536	.2043	.2550
		Peripheral - HEM	> 3 - 3.5 x D	.055 x D	13	27	.1488	.1979	.2470
		Peripheral - HEM	> 3.5 - 4 x D	.05 x D	13	27	.1368	.1819	.2271
		Finish	3 x D	.01 x D	13	27	.1056	.1404	.1753
	Inconel 718, Rene 88	Peripheral - HEM	≤ 2 x D	.06 x D	13	30	.1248	.1660	.2072
		Peripheral - HEM	> 2 - 3 x D	.05 x D	13	29	.1248	.1660	.2072
		Peripheral - HEM	> 3 - 3.5 x D	.05 x D	13	29	.1152	.1532	.1912
		Peripheral - HEM	> 3.5 - 4 x D	.04 x D	13	29	.1152	.1532	.1912
		Finish	3 x D	.01 x D	13	27	.0552	.0734	.0916

D = Tool diameter *HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)*

Information on tips and adjustments can be found in our Technical Resources section beginning on page 108.

Scan to calculate speeds and feed rates with Toolbot

FRACTIONAL /in.

ISO Code	Work Material	Tool LBS/d1	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inch per Tooth) 1/4	3/8	1/2	5/8	3/4	1
N	Aluminum alloys 6061, 7075, 2024	≤ 2	Slotting	1 x D	1 x D	5	600	.0015	.0023	.0030	.0038	.0045	.0060
		≤ 2	Peripheral - HEM	≤ 2 x D	.25 x D	5	850	.0050	.0075	.0100	.0125	.0150	.0200
		2 - 2.5	Peripheral - HEM	> 2 - 2.5 x D	.25 x D	5	800	.0050	.0075	.0100	.0125	.0150	.0200
		2.5 - 3	Peripheral - HEM	> 2.5 - 3 x D	.25 x D	5	800	.0050	.0075	.0100	.0125	.0150	.0200
		3 - 3.5	Peripheral - HEM	> 3 - 3.5 x D	.25 x D	5	800	.0048	.0071	.0095	.0119	.0143	.0190
		3.5 - 4	Peripheral - HEM	> 3.5 - 4 x D	.20 x D	5	780	.0048	.0071	.0095	.0119	.0143	.0190
		≤ 2	Peripheral - Rough	≤ 2 x D	.45 x D	5	1000	.0024	.0036	.0048	.0060	.0072	.0096
		>2 - 3	Peripheral - Rough	> 2 - 3 x D	.375 x D	5	900	.0023	.0035	.0046	.0058	.0069	.0092
		>3	Peripheral - Rough	> 3 - 4 x D	.35 x D	5	800	.0023	.0034	.0045	.0056	.0068	.0090
		≤ 4 x D	Finish	≤ 4 x D	.01 x D	5	650	.0015	.0023	.0030	.0038	.0045	.0060

D = Tool diameter *HEM = High-efficiency machining*

METRIC

ISO Code	Work Material	Tool LBS/d1	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (M/min)	Feed (MM per Tooth) 6.0	8.0	10.0	12.0	16.0	20.0
N	Aluminum alloys 6061, 7075, 2024	≤ 2	Slotting	1 x D	1 x D	5	183	.0360	.0480	.0598	.0720	.0958	.1195
		≤ 2	Peripheral - HEM	≤ 2 x D	.25 x D	5	259	.1200	.1600	.1992	.2400	.3192	.3984
		2 - 2.5	Peripheral - HEM	> 2 - 2.5 x D	.25 x D	5	244	.1200	.1600	.1992	.2400	.3192	.3984
		2.5 - 3	Peripheral - HEM	> 2.5 - 3 x D	.25 x D	5	244	.1200	.1600	.1992	.2400	.3192	.3984
		3 - 3.5	Peripheral - HEM	> 3 - 3.5 x D	.25 x D	5	244	.1140	.1520	.1892	.2280	.3032	.3784
		3.5 - 4	Peripheral - HEM	> 3.5 - 4 x D	.20 x D	5	238	.1140	.1520	.1892	.2280	.3032	.3784
		≤ 2	Peripheral - Rough	≤ 2 x D	.45 x D	5	305	.0576	.0768	.0956	.1152	.1532	.1912
		>2 - 3	Peripheral - Rough	> 2 - 3 x D	.375 x D	5	274	.0552	.0736	.0916	.1104	.1468	.1832
		> 3	Peripheral - Rough	> 3 - 4 x D	.35 x D	5	244	.0540	.0720	.0896	.1080	.1436	.1793
		≤ 4 x D	Finish	≤ 4 x D	.01 x D	5	198	.0360	.0480	.0598	.0720	.0958	.1195

D = Tool diameter
HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

AFC5

FRACTIONAL

ISO Code	Work Material	Type of Cut	Tool LC/Dia.	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inch per Tooth) 1/2	5/8	3/4	1
N	Aluminum alloys 6061, 7075, 2024	Peripheral - Finish	3 - 4	4 x D	.01 x D	5	425	.0021	.0026	.0032	.0042
		Peripheral - Finish	< 4 - 6	6 x D	.01 x D	5	350	.0017	.0022	.0026	.0035

D = Tool diameter

IFC5

FRACTIONAL

ISO Code	Work Material	Type of Cut	Tool LC/Dia.	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inch per Tooth) 1/2	5/8	3/4	1
K	Cast iron - Gray ASTM - A48, Class 20, 25, 30, 35 & 40	Peripheral - Finish	3 - 4	4 x D	.01 x D	5	290	.0017	.0021	.0026	.0034
		Peripheral - Finish	< 4 - 6	6 x D	.01 x D	5	235	.0014	.0017	.0021	.0028
	Cast iron - Malleable	Peripheral - Finish	3 - 4	4 x D	.01 x D	5	275	.0017	.0021	.0026	.0034
		Peripheral - Finish	< 4 - 6	6 x D	.01 x D	5	220	.0014	.0017	.0020	.0027
P	Low carbon steel ≤ 38 HRc 1018, 1020, 12L14, 5120, 8620	Peripheral - Finish	3 - 4	4 x D	.01 x D	5	300	.0018	.0023	.0027	.0036
		Peripheral - Finish	< 4 - 6	6 x D	.01 x D	5	240	.0014	.0018	.0022	.0029
	Medium carbon steel ≤ 48 HRc 1045, 4140, 4340, 5140	Peripheral - Finish	3 - 4	4 x D	.01 x D	5	290	.0017	.0021	.0026	.0034
		Peripheral - Finish	< 4 - 6	6 x D	.01 x D	5	235	.0014	.0017	.0021	.0028
	Tool & die steels ≤ 40 HRc A2, D2, O1, S7, P20, H13	Peripheral - Finish	3 - 4	4 x D	.01 x D	5	275	.0016	.0020	.0024	.0032
		Peripheral - Finish	< 4 - 6	6 x D	.01 x D	5	220	.0013	.0016	.0019	.0026
M	Martensitic & ferritic stainless steels 410, 416, 440	Peripheral - Finish	3 - 4	4 x D	.01 x D	5	280	.0017	.0021	.0026	.0034
		Peripheral - Finish	< 4 - 6	6 x D	.01 x D	5	227	.0014	.0017	.0021	.0028
	Austenitic stainless steels 303, 304, 316, Invar, Kovar	Peripheral - Finish	3 - 4	4 x D	.01 x D	5	275	.0016	.0020	.0024	.0032
		Peripheral - Finish	< 4 - 6	6 x D	.01 x D	5	220	.0013	.0016	.0019	.0026
	Precipitation hardening stainless steel 17-4, 15-5, 13-8	Peripheral - Finish	3 - 4	4 x D	.01 x D	5	255	.0015	.0019	.0023	.0030
		Peripheral - Finish	< 4 - 6	6 x D	.01 x D	5	204	.0012	.0015	.0018	.0024
S	Titanium alloys 6AL-4V, 6-2-4	Peripheral - Finish	3 - 4	4 x D	.01 x D	5	320	.0018	.0023	.0027	.0036
		Peripheral - Finish	< 4 - 6	6 x D	.01 x D	5	256	.0014	.0018	.0022	.0029

D = Tool diameter

Information on tips and adjustments can be found in our Technical Resources section beginning on page 108.

≈ Approximately Equals
≤ Less Than or Equal To
≥ Greater Than or Equal To
× Multiply
< Less Than
> Greater Than
= Equals

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Speed (SFM)	Feed Rate Per Tooth (IPT)												
						1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4
K	Cast iron- Gray ASTM-A48 Class 20, 25,30, 35 & 40	Peripheral -Rough	1.5 x D	.3 x D	352	.00071	.00107	.0014	.0018	.0021	.0025	.0029	.0036	.0043	.0050	.0057	.0064	.0071
		Peripheral -Finish	3 x D	.015 x D	356	.00069	.00103	.0014	.0017	.0021	.0024	.0028	.0034	.0041	.0048	.0055	.0062	.0069
		Peripheral -HEM	3 x D	.08 x D	361	.00166	.00249	.0033	.0042	.0050	.0058	.0067	.0083	.0100	.0116	.0133	.0150	.0166
		Slotting -Traditional	.625 x D	1 x D	285	.00050	.00075	.0010	.0012	.0015	.0017	.0020	.0025	.0030	.0035	.0040	.0045	.0050
		Rough Facing	.375 x D	.7 x D	387	.00064	.00096	.0013	.0016	.0019	.0022	.0026	.0032	.0038	.0045	.0051	.0058	.0064
		Finish Facing	.020 x D	.7 x D	374	.00063	.00095	.0013	.0016	.0019	.0022	.0025	.0032	.0038	.0044	.0051	.0057	.0063
		Helical Entry	3 x D	18 deg	309	.00040	.00060	.0008	.0010	.0012	.0014	.0016	.0020	.0024	.0028	.0032	.0036	.0040
		Straight Line Ramp	.630 x D	11 deg	285	.00046	.00069	.0009	.0011	.0014	.0016	.0018	.0023	.0028	.0032	.0037	.0041	.0046
		Zig Zag Pocket	.625 x D	.625 x D	285	.00050	.00075	.0010	.0012	.0015	.0017	.0020	.0025	.0030	.0035	.0040	.0045	.0050
	Cast iron- Ductile 15-25 HRc	Peripheral -Rough	1.5 x D	.32 x D	333	.00067	.00100	.0013	.0017	.0020	.0023	.0027	.0033	.0040	.0047	.0053	.0060	.0067
		Peripheral -Finish	3 x D	.015 x D	333	.00062	.00093	.0012	.0015	.0019	.0022	.0025	.0031	.0037	.0043	.0049	.0056	.0062
		Peripheral -HEM	3 x D	.08 x D	371	.00178	.00267	.0036	.0045	.0053	.0062	.0071	.0089	.0107	.0125	.0143	.0160	.0178
		Slotting -Traditional	.625 x D	1 x D	247	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
		Rough Facing	.375 x D	.7 x D	366	.00060	.00090	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0042	.0048	.0054	.0060
		Finish Facing	.020 x D	.7 x D	349	.00057	.00085	.0011	.0014	.0017	.0020	.0023	.0028	.0034	.0040	.0045	.0051	.0057
		Helical Entry	3 x D	20 deg	275	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
		Straight Line Ramp	.63 x D	14 deg	247	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Zig Zag Pocket	.625 x D	.625 x D	247	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
	Cast iron- Malleable 15-25 HRc	Peripheral -Rough	1.5 x D	.32 x D	333	.00064	.00096	.0013	.0016	.0019	.0022	.0026	.0032	.0038	.0045	.0051	.0058	.0064
		Peripheral -Finish	3 x D	.015 x D	333	.00059	.00089	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0042	.0048	.0053	.0059
		Peripheral -HEM	3 x D	.08 x D	371	.00176	.00264	.0035	.0044	.0053	.0062	.0070	.0088	.0105	.0123	.0141	.0158	.0176
		Slotting -Traditional	.625 x D	1 x D	252	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Rough Facing	.375 x D	.7 x D	366	.00058	.00087	.0012	.0014	.0017	.0020	.0023	.0029	.0035	.0040	.0046	.0052	.0058
		Finish Facing	.02 x D	.7 x D	349	.00055	.00082	.0011	.0014	.0016	.0019	.0022	.0027	.0033	.0038	.0044	.0049	.0055
		Helical Entry	3 x D	20 deg	270	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Straight Line Ramp	.63 x D	14 deg	252	.00041	.00061	.0008	.0010	.0012	.0014	.0016	.0020	.0024	.0028	.0032	.0036	.0041
		Zig Zag Pocket	.625 x D	.625 x D	252	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
P	Low carbon steel ≤38 HRc 1018, 1020, 12L14, 5120, 8620	Peripheral -Rough	2 x D	.55 x D	361	.00081	.00121	.0016	.0020	.0024	.0028	.0032	.0040	.0048	.0057	.0065	.0073	.0081
		Peripheral -Finish	3 x D	.015 x D	380	.00088	.00132	.0018	.0022	.0026	.0031	.0035	.0044	.0053	.0062	.0070	.0079	.0088
		Peripheral -HEM	3 x D	.09 x D	418	.00154	.00232	.0031	.0039	.0046	.0054	.0062	.0077	.0093	.0108	.0124	.0139	.0154
		Slotting -Traditional	1 x D	1 x D	309	.00059	.00089	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0042	.0048	.0053	.0059
		Rough Facing	.375 x D	.7 x D	397	.00073	.00109	.0015	.0018	.0022	.0025	.0029	.0036	.0044	.0051	.0058	.0065	.0073
		Finish Facing	.02 x D	.7 x D	399	.00085	.00128	.0017	.0021	.0026	.0030	.0034	.0043	.0051	.0060	.0068	.0077	.0085
		Helical Entry	3 x D	25 deg	371	.00046	.00069	.0009	.0012	.0014	.0016	.0018	.0023	.0028	.0032	.0037	.0041	.0046
		Straight Line Ramp	1 x D	20 deg	380	.00038	.00056	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0034	.0038
		Zig Zag Pocket	1 x D	.625 x D	309	.00059	.00089	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0042	.0048	.0053	.0059
	Medium carbon Steel ≤40 HRc 1045, 4140, 4340, 5140	Peripheral -Rough	2 x D	.55 x D	356	.00076	.00114	.0015	.0019	.0023	.0027	.0030	.0038	.0046	.0053	.0061	.0068	.0076
		Peripheral -Finish	3 x D	.015 x D	356	.00081	.00121	.0016	.0020	.0024	.0028	.0032	.0040	.0048	.0057	.0065	.0073	.0081
		Peripheral -HEM	3 x D	.09 x D	380	.00138	.00207	.0028	.0034	.0041	.0048	.0055	.0069	.0083	.0096	.0110	.0124	.0138
		Slotting -Traditional	1 x D	1 x D	285	.00055	.00082	.0011	.0014	.0016	.0019	.0022	.0027	.0033	.0038	.0044	.0049	.0055
		Rough Facing	.375 x D	.7 x D	392	.00068	.00103	.0014	.0017	.0021	.0024	.0027	.0034	.0041	.0048	.0055	.0062	.0068
		Finish Facing	.02 x D	.7 x D	374	.00078	.00117	.0016	.0020	.0023	.0027	.0031	.0039	.0047	.0055	.0063	.0070	.0078
		Helical Entry	3 x D	25 deg	356	.00041	.00061	.0008	.0010	.0012	.0014	.0016	.0020	.0025	.0029	.0033	.0037	.0041
		Straight Line Ramp	1 x D	20 deg	380	.00035	.00052	.0007	.0009	.0010	.0012	.0014	.0017	.0021	.0024	.0028	.0031	.0035
		Zig Zag Pocket	1 x D	.625 x D	285	.00055	.00082	.0011	.0014	.0016	.0019	.0022	.0027	.0033	.0038	.0044	.0049	.0055

D = Tool diameter
HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Speed (SFM)	Feed Rate Per Tooth (IPT)												
						1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4
P	Tool & die steels ≤34 HRc A2, D2, O1, S7, P20, H13	Peripheral -Rough	1.5 x D	.52 x D	333	.00064	.00096	.0013	.0016	.0019	.0022	.0026	.0032	.0038	.0045	.0051	.0058	.0064
		Peripheral -Finish	3 x D	.015 x D	333	.00069	.00103	.0014	.0017	.0021	.0024	.0028	.0034	.0041	.0048	.0055	.0062	.0069
		Peripheral -HEM	3 x D	.08 x D	371	.00114	.00171	.0023	.0029	.0034	.0040	.0046	.0057	.0068	.0080	.0091	.0103	.0114
		Slotting -Traditional	.75 x D	1 x D	261	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
		Rough Facing	.375 x D	.7 x D	366	.00058	.00087	.0012	.0014	.0017	.0020	.0023	.0029	.0035	.0040	.0046	.0052	.0058
		Finish Facing	.02 x D	.7 x D	349	.00067	.00100	.0013	.0017	.0020	.0023	.0027	.0033	.0040	.0047	.0053	.0060	.0067
		Helical Entry	3 x D	18 deg	285	.00036	.00054	.0007	.0009	.0011	.0013	.0014	.0018	.0022	.0025	.0029	.0032	.0036
		Straight Line Ramp	.75 x D	18 deg	333	.00030	.00045	.0006	.0007	.0009	.0010	.0012	.0015	.0018	.0021	.0024	.0027	.0030
		Zig Zag Pocket	.75 x D	.625 x D	261	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
H	Tool & die steels 40-48- HRc	Peripheral -Rough	1 x D	.25 x D	290	.00048	.00071	.0010	.0012	.0014	.0017	.0019	.0024	.0029	.0033	.0038	.0043	.0048
		Peripheral -Finish	3 x D	.01 x D	285	.00050	.00075	.0010	.0012	.0015	.0017	.0020	.0025	.0030	.0035	.0040	.0045	.0050
		Peripheral -HEM	3 x D	.05 x D	337	.00132	.00197	.0026	.0033	.0039	.0046	.0053	.0066	.0079	.0092	.0105	.0118	.0132
		Slotting -Traditional	.45 x D	1 x D	238	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
		Rough Facing	.35 x D	.65 x D	319	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
		Finish Facing	.02 x D	.65 x D	298	.00045	.00067	.0009	.0011	.0013	.0016	.0018	.0022	.0027	.0031	.0036	.0040	.0045
		Helical Entry	.88 x D	12 deg	238	.00035	.00052	.0007	.0009	.0010	.0012	.0014	.0017	.0021	.0024	.0028	.0031	.0035
		Straight Line Ramp	.5 x D	8 deg	257	.00024	.00037	.0005	.0006	.0007	.0009	.0010	.0012	.0015	.0017	.0020	.0022	.0024
		Zig Zag Pocket	.45 x D	.4 x D	238	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
M	Martensitic & ferritic stainless steels 15-29 HRc 410, 416, 440	Peripheral -Rough	2.5 x D	.3 x D	347	.00072	.00108	.0014	.0018	.0022	.0025	.0029	.0036	.0043	.0050	.0058	.0065	.0072
		Peripheral -Finish	3 x D	.015 x D	356	.00081	.00121	.0016	.0020	.0024	.0028	.0032	.0040	.0048	.0057	.0065	.0073	.0081
		Peripheral -HEM	3 x D	.2 x D	380	.00102	.00153	.0020	.0026	.0031	.0036	.0041	.0051	.0061	.0071	.0082	.0092	.0102
		Slotting -Traditional	1 x D	1 x D	261	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Rough Facing	.375 x D	.7 x D	381	.00068	.00103	.0014	.0017	.0021	.0024	.0027	.0034	.0041	.0048	.0055	.0062	.0068
		Finish Facing	.02 x D	.7 x D	374	.00069	.00103	.0014	.0017	.0021	.0024	.0027	.0034	.0041	.0048	.0055	.0062	.0069
		Helical Entry	3 x D	7 deg	314	.00027	.00041	.0005	.0007	.0008	.0010	.0011	.0014	.0016	.0019	.0022	.0025	.0027
		Straight Line Ramp	.75 x D	5 deg	261	.00038	.00057	.0008	.0010	.0011	.0013	.0015	.0019	.0023	.0027	.0031	.0034	.0038
		Zig Zag Pocket	1 x D	.625 x D	261	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
	Austenitic stainless steels 15-29 HRc FeNi alloys 303, 304, 316, Invar, Kovar	Peripheral -Rough	2 x D	.3 x D	365	.00083	.00125	.0017	.0021	.0025	.0029	.0033	.0042	.0050	.0058	.0067	.0075	.0083
		Peripheral -Finish	3 x D	.015 x D	333	.00074	.00110	.0015	.0018	.0022	.0026	.0029	.0037	.0044	.0052	.0059	.0066	.0074
		Peripheral -HEM	3 x D	.2 x D	375	.00100	.00150	.0020	.0025	.0030	.0035	.0040	.0050	.0060	.0070	.0080	.0090	.0100
		Slotting -Traditional	1.25 x D	1 x D	261	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Rough Facing	.375 x D	.7 x D	381	.00075	.00112	.0015	.0019	.0022	.0026	.0030	.0037	.0045	.0052	.0060	.0067	.0075
		Finish Facing	.02 x D	.7 x D	349	.00064	.00097	.0013	.0016	.0019	.0023	.0026	.0032	.0039	.0045	.0052	.0058	.0064
		Helical Entry	3 x D	7 deg	308	.00026	.00039	.0005	.0007	.0008	.0009	.0010	.0013	.0016	.0018	.0021	.0023	.0026
		Straight Line Ramp	.75 x D	5 deg	270	.00038	.00057	.0008	.0010	.0011	.0013	.0015	.0019	.0023	.0027	.0031	.0034	.0038
		Zig Zag Pocket	1.25 x D	.625 x D	261	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
	Precipitation hardening stainless steel 15-38 HRc 17-4, 15-5, 13-8	Peripheral -Rough	2 x D	.28 x D	351	.00067	.00101	.0013	.0017	.0020	.0023	.0027	.0034	.0040	.0047	.0054	.0060	.0067
		Peripheral -Finish	3 x D	.015 x D	309	.00062	.00093	.0012	.0015	.0019	.0022	.0025	.0031	.0037	.0043	.0049	.0056	.0062
		Peripheral -HEM	3 x D	.2 x D	347	.00083	.00125	.0017	.0021	.0025	.0029	.0033	.0042	.0050	.0058	.0067	.0075	.0083
		Slotting -Traditional	.75 x D	1 x D	238	.00040	.00061	.0008	.0010	.0012	.0014	.0016	.0020	.0024	.0028	.0032	.0036	.0040
		Rough Facing	.375 x D	.7 x D	376	.00062	.00093	.0012	.0015	.0019	.0022	.0025	.0031	.0037	.0043	.0050	.0056	.0062
		Finish Facing	.02 x D	.7 x D	324	.00054	.00081	.0011	.0014	.0016	.0019	.0022	.0027	.0032	.0038	.0043	.0049	.0054
		Helical Entry	3 x D	7 deg	285	.00025	.00037	.0005	.0006	.0007	.0009	.0010	.0012	.0015	.0017	.0020	.0022	.0025
		Straight Line Ramp	.63 x D	5 deg	243	.00035	.00053	.0007	.0009	.0011	.0012	.0014	.0018	.0021	.0025	.0028	.0032	.0035
		Zig Zag Pocket	.75 x D	.625 x D	238	.00040	.00061	.0008	.0010	.0012	.0014	.0016	.0020	.0024	.0028	.0032	.0036	.0040

D = Tool diameter *HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)*

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Speed (SFM)	Feed Rate Per Tooth (IPT)												
						1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4
S	Titanium alloys 6AL-4V, 6-2-4 18-31 HRc	Peripheral -Rough	2 x D	.3 x D	261	.00059	.00089	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0042	.0048	.0053	.0059
		Peripheral -Finish	3 x D	.015 x D	285	.00059	.00089	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0042	.0048	.0053	.0059
		Peripheral -HEM	3 x D	.25 x D	390	.00095	.00143	.0019	.0024	.0029	.0033	.0038	.0048	.0057	.0067	.0076	.0086	.0095
		Slotting -Traditional	1 x D	1 x D	238	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Rough Facing	.375 x D	.7 x D	287	.00053	.00080	.0011	.0013	.0016	.0019	.0021	.0027	.0032	.0037	.0043	.0048	.0053
		Finish Facing	.02 x D	.7 x D	314	.00053	.00080	.0011	.0013	.0016	.0019	.0021	.0027	.0032	.0037	.0043	.0048	.0053
		Helical Entry	3 x D	20 deg	380	.00033	.00050	.0007	.0008	.0010	.0012	.0013	.0017	.0020	.0023	.0026	.0030	.0033
		Straight Line Ramp	1 x D	25 deg.	380	.00037	.00056	.0007	.0009	.0011	.0013	.0015	.0019	.0022	.0026	.0030	.0033	.0037
		Zig Zag Pocket	1 x D	.625 x D	238	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
	Difficult-to-machine titanium alloys 10-2-3 18-31 HRc	Peripheral -Rough	1.5 x D	.25 x D	233	.00048	.00071	.0010	.0012	.0014	.0017	.0019	.0024	.0029	.0033	.0038	.0043	.0048
		Peripheral -Finish	3 x D	.01 x D	238	.00050	.00075	.0010	.0012	.0015	.0017	.0020	.0025	.0030	.0035	.0040	.0045	.0050
		Peripheral -HEM	3 x D	.12 x D	328	.00076	.00114	.0015	.0019	.0023	.0027	.0030	.0038	.0046	.0053	.0061	.0068	.0076
		Slotting -Traditional	.75 x D	1 x D	214	.00038	.00057	.0008	.0010	.0011	.0013	.0015	.0019	.0023	.0027	.0030	.0034	.0038
		Rough Facing	.3 x D	.7 x D	256	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Finish Facing	.02 x D	.7 x D	261	.00046	.00069	.0009	.0011	.0014	.0016	.0018	.0023	.0028	.0032	.0037	.0041	.0046
		Helical Entry	3 x D	20 deg	324	.00029	.00044	.0006	.0007	.0009	.0010	.0012	.0015	.0018	.0021	.0024	.0026	.0029
		Straight Line Ramp	.63 x D	22 deg.	214	.00036	.00055	.0007	.0009	.0011	.0013	.0015	.0018	.0022	.0025	.0029	.0033	.0036
		Zig Zag Pocket	.75 x D	.625 x D	214	.00038	.00057	.0008	.0010	.0011	.0013	.0015	.0019	.0023	.0027	.0030	.0034	.0038
	Nickel-based super alloys Hastalloy, Waspalloy 15-30 HRc	Peripheral -Rough	1.25 x D	.25 x D	86	.00038	.00057	.0008	.0010	.0011	.0013	.0015	.0019	.0023	.0027	.0030	.0034	.0038
		Peripheral -Finish	3 x D	.01 x D	190	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Peripheral -HEM	2 x D	.075 x D	105	.00143	.00214	.0029	.0036	.0043	.0050	.0057	.0071	.0086	.0100	.0114	.0128	.0143
		Slotting -Traditional	.25 x D	1 x D	57	.00032	.00048	.0006	.0008	.0010	.0011	.0013	.0016	.0019	.0022	.0026	.0029	.0032
		Rough Facing	.3 x D	.7 x D	94	.00034	.00051	.0007	.0009	.0010	.0012	.0014	.0017	.0021	.0024	.0027	.0031	.0034
		Finish Facing	.02 x D	.7 x D	199	.00037	.00056	.0007	.0009	.0011	.0013	.0015	.0019	.0022	.0026	.0030	.0034	.0037
		Helical Entry	2 x D	12 deg	114	.00045	.00067	.0009	.0011	.0013	.0016	.0018	.0022	.0027	.0031	.0036	.0040	.0045
		Straight Line Ramp	.5 x D	3 deg	54	.00029	.00044	.0006	.0007	.0009	.0010	.0012	.0015	.0018	.0021	.0023	.0026	.0029
		Zig Zag Pocket	.25 x D	.55 x D	57	.00032	.00048	.0006	.0008	.0010	.0011	.0013	.0016	.0019	.0022	.0026	.0029	.0032
	Nickel Chromium- based super alloys Inconel 718, Rene 88 10-25 HRc	Peripheral -Rough	1.25 x D	.25 x D	71	.00038	.00057	.0008	.0010	.0011	.0013	.0015	.0019	.0023	.0027	.0030	.0034	.0038
		Peripheral -Finish	3 x D	.01 x D	86	.00078	.00118	.0016	.0020	.0024	.0027	.0031	.0039	.0047	.0055	.0063	.0071	.0078
		Peripheral -HEM	2 x D	.08 x D	86	.00185	.00278	.0037	.0046	.0056	.0065	.0074	.0093	.0111	.0130	.0148	.0167	.0185
		Slotting -Traditional	.25 x D	1 x D	48	.00029	.00043	.0006	.0007	.0009	.0010	.0011	.0014	.0017	.0020	.0023	.0026	.0029
		Rough Facing	.28 x D	.7 x D	78	.00034	.00051	.0007	.0009	.0010	.0012	.0014	.0017	.0021	.0024	.0027	.0031	.0034
		Finish Facing	.02 x D	.65 x D	94	.00067	.00100	.0013	.0017	.0020	.0023	.0027	.0033	.0040	.0047	.0053	.0060	.0067
		Helical Entry	2 x D	12 deg	119	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
		Straight Line Ramp	.37 x D	3 deg	50	.00029	.00043	.0006	.0007	.0009	.0010	.0011	.0014	.0017	.0020	.0023	.0026	.0029
		Zig Zag Pocket	.25 x D	.5 x D	48	.00029	.00043	.0006	.0007	.0009	.0010	.0011	.0014	.0017	.0020	.0023	.0026	.0029
N	Aluminum alloys O-T6 2024, 6061, 7075	Peripheral -Rough	2 x D	.28 x D	351	.00067	.00101	.0013	.0017	.0020	.0023	.0027	.0034	.0040	.0047	.0054	.0060	.0067
		Peripheral -Finish	3 x D	.015 x D	309	.00062	.00093	.0012	.0015	.0019	.0022	.0025	.0031	.0037	.0043	.0049	.0056	.0062
		Peripheral -HEM	3 x D	.2 x D	347	.00083	.00125	.0017	.0021	.0025	.0029	.0033	.0042	.0050	.0058	.0067	.0075	.0083
		Slotting -Traditional	.75 x D	1 x D	238	.00040	.00061	.0008	.0010	.0012	.0014	.0016	.0020	.0024	.0028	.0032	.0036	.0040
		Rough Facing	.375 x D	.7 x D	376	.00062	.00093	.0012	.0015	.0019	.0022	.0025	.0031	.0037	.0043	.0050	.0056	.0062
		Finish Facing	.02 x D	.7 x D	324	.00054	.00081	.0011	.0014	.0016	.0019	.0022	.0027	.0032	.0038	.0043	.0049	.0054
		Helical Entry	3 x D	7 deg	285	.00025	.00037	.0005	.0006	.0007	.0009	.0010	.0012	.0015	.0017	.0020	.0022	.0025
		Straight Line Ramp	.63 x D	5 deg	243	.00035	.00053	.0007	.0009	.0011	.0012	.0014	.0018	.0021	.0025	.0028	.0032	.0035
		Zig Zag Pocket	.75 x D	.625 x D	238	.00040	.00061	.0008	.0010	.0012	.0014	.0016	.0020	.0024	.0028	.0032	.0036	.0040

D = Tool diameter

HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$

$$sfm = rpm \times D \times .262$$

$$ipm = rpm \times ipt \times Z$$

$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$

$$m/min = rpm \times D \times .00314$$

$$mmpm = rpm \times mmpt \times Z$$

$$mrr = RDOC \times ADOC \times mmpm$$

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Speed (SFM)	Feed Rate Per Tooth (IPT)												
						1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4
N	High-silicon aluminum alloys A380, A390 45-75 Bhn	Peripheral -Rough	2.25 x D	.55 x D	495	.00150	.00225	.0030	.0038	.0045	.0053	.0060	.0075	.0090	.0105	.0120	.0135	.0150
		Peripheral -Finish	3 x D	.02 x D	725	.00063	.00094	.0013	.0016	.0019	.0022	.0025	.0031	.0038	.0044	.0050	.0056	.0063
		Peripheral -HEM	3 x D	.25 x D	600	.00163	.00244	.0033	.0041	.0049	.0057	.0065	.0081	.0098	.0114	.0130	.0146	.0163
		Slotting -Traditional	1 x D	1 x D	347	.00074	.00110	.0015	.0018	.0022	.0026	.0029	.0037	.0044	.0052	.0059	.0066	.0074
		Rough Facing	.375 x D	.7 x D	545	.00124	.00186	.0025	.0031	.0037	.0043	.0049	.0062	.0074	.0087	.0099	.0111	.0124
		Finish Facing	.02 x D	.7 x D	758	.00050	.00076	.0010	.0013	.0015	.0018	.0020	.0025	.0030	.0035	.0040	.0045	.0050
		Helical Entry	3 x D	10 deg	486	.00061	.00092	.0012	.0015	.0018	.0021	.0024	.0031	.0037	.0043	.0049	.0055	.0061
		Straight Line Ramp	.5 x D	10 deg	394	.00061	.00092	.0012	.0015	.0018	.0021	.0024	.0031	.0037	.0043	.0049	.0055	.0061
		Zig Zag Pocket	1 x D	.45 x D	365	.00078	.00116	.0016	.0019	.0023	.0027	.0031	.0039	.0047	.0054	.0062	.0070	.0078
	Magnesium alloys 47-140 Bhn	Peripheral -Rough	2.25 x D	.6 x D	500	.00175	.00263	.0035	.0044	.0053	.0061	.0070	.0088	.0105	.0123	.0140	.0158	.0175
		Peripheral -Finish	3 x D	.02 x D	750	.00063	.00094	.0013	.0016	.0019	.0022	.0025	.0031	.0038	.0044	.0050	.0056	.0063
		Peripheral -HEM	3 x D	.25 x D	665	.00166	.00249	.0033	.0042	.0050	.0058	.0067	.0083	.0100	.0116	.0133	.0150	.0166
		Slotting -Traditional	1 x D	1 x D	375	.00080	.00120	.0016	.0020	.0024	.0028	.0032	.0040	.0048	.0056	.0064	.0072	.0080
		Rough Facing	.375 x D	.7 x D	550	.00144	.00216	.0029	.0036	.0043	.0051	.0058	.0072	.0087	.0101	.0115	.0130	.0144
		Finish Facing	.02 x D	.7 x D	784	.00050	.00076	.0010	.0013	.0015	.0018	.0020	.0025	.0030	.0035	.0040	.0045	.0050
		Helical Entry	3 x D	10 deg	500	.00063	.00095	.0013	.0016	.0019	.0022	.0025	.0032	.0038	.0044	.0051	.0057	.0063
		Straight Line Ramp	.5 x D	10 deg	488	.00062	.00094	.0012	.0016	.0019	.0022	.0025	.0031	.0037	.0044	.0050	.0056	.0062
		Zig Zag Pocket	1 x D	.45 x D	375	.00080	.00120	.0016	.0020	.0024	.0028	.0032	.0040	.0048	.0056	.0064	.0072	.0080
	Copper, brass 111-170 Bhn	Peripheral -Rough	2 x D	.3 x D	361	.00059	.00089	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0042	.0048	.0053	.0059
		Peripheral -Finish	3 x D	.015 x D	366	.00055	.00082	.0011	.0014	.0016	.0019	.0022	.0027	.0033	.0038	.0044	.0049	.0055
		Peripheral -HEM	2.25 x D	.1 x D	380	.00107	.00160	.0021	.0027	.0032	.0037	.0043	.0053	.0064	.0075	.0086	.0096	.0107
		Slotting -Traditional	.75 x D	1 x D	276	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Rough Facing	.375 x D	.7 x D	418	.00049	.00073	.0010	.0012	.0015	.0017	.0019	.0024	.0029	.0034	.0039	.0044	.0049
		Finish Facing	.02 x D	.7 x D	402	.00046	.00070	.0009	.0012	.0014	.0016	.0019	.0023	.0028	.0033	.0037	.0042	.0046
		Helical Entry	3 x D	12 deg	304	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Straight Line Ramp	1 x D	20 deg	300	.00044	.00066	.0009	.0011	.0013	.0015	.0018	.0022	.0026	.0031	.0035	.0039	.0044
		Zig Zag Pocket	.75 x D	.625 x D	290	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
	Bronze 111-201 Bhn	Peripheral -Rough	2 x D	.3 x D	356	.00057	.00086	.0011	.0014	.0017	.0020	.0023	.0029	.0034	.0040	.0046	.0051	.0057
		Peripheral -Finish	3 x D	.015 x D	361	.00055	.00082	.0011	.0014	.0016	.0019	.0022	.0027	.0033	.0038	.0044	.0049	.0055
		Peripheral -HEM	2.25 x D	.1 x D	390	.00113	.00169	.0023	.0028	.0034	.0039	.0045	.0056	.0068	.0079	.0090	.0101	.0113
		Slotting -Traditional	.75 x D	1 x D	266	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Rough Facing	.375 x D	.7 x D	413	.00047	.00070	.0009	.0012	.0014	.0016	.0019	.0023	.0028	.0033	.0037	.0042	.0047
		Finish Facing	.02 x D	.7 x D	397	.00046	.00070	.0009	.0012	.0014	.0016	.0019	.0023	.0028	.0033	.0037	.0042	.0046
		Helical Entry	3 x D	12 deg	315	.00043	.00064	.0009	.0011	.0013	.0015	.0017	.0021	.0026	.0030	.0034	.0038	.0043
		Straight Line Ramp	1 x D	20 deg	295	.00044	.00066	.0009	.0011	.0013	.0015	.0018	.0022	.0026	.0031	.0035	.0039	.0044
		Zig Zag Pocket	.75 x D	.625 x D	280	.00045	.00068	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0041	.0045
	Composites, plastics, fiberglass	Peripheral -Rough	1.5 x D	.5 x D	428	.00071	.00107	.0014	.0018	.0021	.0025	.0029	.0036	.0043	.0050	.0057	.0064	.0071
		Peripheral -Finish	3 x D	.015 x D	447	.00069	.00103	.0014	.0017	.0021	.0024	.0028	.0034	.0041	.0048	.0055	.0062	.0069
		Peripheral -HEM	2.25 x D	.12 x D	475	.00119	.00178	.0024	.0030	.0036	.0042	.0048	.0059	.0071	.0083	.0095	.0107	.0119
		Slotting -Traditional	1 x D	1 x D	380	.00067	.00100	.0013	.0017	.0020	.0023	.0027	.0033	.0040	.0047	.0053	.0060	.0067
		Rough Facing	.375 x D	.7 x D	495	.00058	.00087	.0012	.0015	.0017	.0020	.0023	.0029	.0035	.0041	.0047	.0052	.0058
		Finish Facing	.02 x D	.7 x D	491	.00059	.00088	.0012	.0015	.0018	.0020	.0023	.0029	.0035	.0041	.0047	.0053	.0059
		Helical Entry	3 x D	20 deg	400	.00067	.00100	.0013	.0017	.0020	.0023	.0027	.0033	.0040	.0047	.0053	.0060	.0067
		Straight Line Ramp	1 x D	25 deg.	400	.00063	.00095	.0013	.0016	.0019	.0022	.0025	.0032	.0038	.0044	.0051	.0057	.0063
		Zig Zag Pocket	1 x D	.625 x D	400	.00070	.00105	.0014	.0018	.0021	.0025	.0028	.0035	.0042	.0049	.0056	.0063	.0070

D = Tool diameter *HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters)*

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (SFM)	Feed (Inches per Tooth) 1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2	5/8	3/4	1
K	Cast iron Gray	Slotting	1 x D	1 x D	4	325	.0006	.0008	.0009	.0011	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0048
		Peripheral – Rough	1.25 x D	.5 x D	4	400	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
		Finish	1.5 x D	.015 x D	4	475	.0008	.0010	.0012	.0014	.0017	.0021	.0025	.0029	.0033	.0041	.0050	.0066
	Cast iron Ductile	Slotting	1 x D	1 x D	4	300	.0006	.0007	.0008	.0010	.0011	.0014	.0017	.0019	.0022	.0028	.0033	.0044
		Peripheral – Rough	1.25 x D	.5 x D	4	375	.0007	.0008	.0010	.0012	.0014	.0017	.0020	.0024	.0027	.0034	.0041	.0054
		Finish	1.5 x D	.015 x D	4	450	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
	Cast iron Malleable	Slotting	.75 x D	1 x D	4	250	.0006	.0007	.0008	.0010	.0011	.0014	.0017	.0019	.0022	.0028	.0033	.0044
		Peripheral – Rough	1.25 x D	.5 x D	4	325	.0007	.0008	.0010	.0012	.0014	.0017	.0020	.0024	.0027	.0034	.0041	.0054
		Finish	1.5 x D	.015 x D	4	400	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
P	Low carbon steels 1018, 12L14, 8620	Slotting	1 x D	1 x D	4	350	.0007	.0008	.0010	.0011	.0013	.0016	.0020	.0023	.0026	.0033	.0039	.0052
		Peripheral – Rough	1.25 x D	.5 x D	4	425	.0008	.0010	.0012	.0014	.0016	.0020	.0024	.0028	.0032	.0040	.0048	.0064
		Finish	1.5 x D	.015 x D	4	500	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0045	.0054	.0072
	Medium carbon steels 4140, 4340	Slotting	1 x D	1 x D	4	300	.0006	.0008	.0009	.0011	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0048
		Peripheral – Rough	1.25 x D	.5 x D	4	375	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
		Finish	1.5 x D	.015 x D	4	450	.0008	.0010	.0012	.0014	.0017	.0021	.0025	.0029	.0033	.0041	.0050	.0066
	Tool & die steels <48 Rc A2, D2, H13, P20	Slotting	.75 x D	1 x D	4	300	.0006	.0008	.0009	.0011	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0048
		Peripheral – Rough	1.25 x D	.3 x D	4	375	.0007	.0009	.0011	.0013	.0015	.0018	.0022	.0025	.0029	.0036	.0044	.0058
		Finish	1.5 x D	.015 x D	4	450	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
M	Martensitic stainless steels 416, 410, 440C	Slotting	.75 x D	1 x D	4	300	.0006	.0008	.0009	.0011	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0048
		Peripheral – Rough	1.25 x D	.3 x D	4	375	.0007	.0009	.0011	.0013	.0015	.0018	.0022	.0025	.0029	.0036	.0044	.0058
		Finish	1.5 x D	.015 x D	4	450	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
	Austenitic stainless steels 303, 304, 316	Slotting	.75 x D	1 x D	4	275	.0007	.0008	.0010	.0011	.0013	.0016	.0020	.0023	.0026	.0033	.0039	.0052
		Peripheral – Rough	1.25 x D	.3 x D	4	325	.0008	.0010	.0012	.0014	.0016	.0020	.0024	.0028	.0032	.0040	.0048	.0064
		Finish	1.5 x D	.015 x D	4	400	.0008	.0010	.0012	.0014	.0017	.0021	.0025	.0029	.0033	.0041	.0050	.0066
	Precipitation hardening stainless steels 17-4, 15-5, 13-8	Slotting	.5 x D	1 x D	4	250	.0005	.0006	.0008	.0009	.0010	.0013	.0015	.0018	.0020	.0025	.0030	.0040
		Peripheral – Rough	1.25 x D	.3 x D	4	300	.0006	.0008	.0009	.0011	.0013	.0016	.0019	.0022	.0025	.0031	.0038	.0050
		Finish	1.5 x D	.015 x D	4	375	.0007	.0008	.0010	.0011	.0013	.0016	.0020	.0023	.0026	.0033	.0039	.0052
S	Titanium alloys 6AL - 4V	Slotting	.5 x D	1 x D	4	250	.0005	.0006	.0008	.0009	.0010	.0013	.0015	.0018	.0020	.0025	.0030	.0040
		Peripheral – Rough	1.25 x D	.3 x D	4	300	.0006	.0008	.0009	.0011	.0013	.0016	.0019	.0022	.0025	.0031	.0038	.0050
		Finish	1.5 x D	.015 x D	4	375	.0007	.0008	.0010	.0011	.0013	.0016	.0020	.0023	.0026	.0033	.0039	.0052
	Hi-temp alloys Inconel, Haynes, Stellite, Hastalloy	Slotting	.25 x D	1 x D	4	60	.0005	.0007	.0008	.0009	.0011	.0013	.0016	.0018	.0021	.0026	.0032	.0042
		Peripheral – Rough	1.25 x D	.25 x D	4	90	.0007	.0008	.0010	.0012	.0014	.0017	.0020	.0024	.0027	.0034	.0041	.0054
		Finish	1.5 x D	.01 x D	4	125	.0008	.0010	.0012	.0014	.0016	.0019	.0023	.0027	.0031	.0039	.0047	.0062

D = Tool diameter

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$

$$sfm = rpm \times D \times .262$$

$$ipm = rpm \times ipt \times Z$$

$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$

$$m/min = rpm \times D \times .00314$$

$$mmpm = rpm \times mmpt \times Z$$

$$mrr = RDOC \times ADOC \times mmpm$$

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (M/min)	Feed (MM per Tooth) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
K	Cast iron Gray	Slotting	1 x D	1 x D	4	99	.0144	.0192	.0240	.0288	.0384	.0478	.0576	.0672	.0766	.0956	.1198
		Peripheral – Rough	1.25 x D	.5 x D	4	122	.0180	.0240	.0300	.0360	.0480	.0598	.0720	.0840	.0958	.1195	.1497
		Finish	1.5 x D	.015 x D	4	145	.0198	.0264	.0330	.0396	.0528	.0657	.0792	.0924	.1053	.1315	.1647
	Cast iron Ductile	Slotting	1 x D	1 x D	4	91	.0132	.0176	.0220	.0264	.0352	.0438	.0528	.0616	.0702	.0876	.1098
		Peripheral – Rough	1.25 x D	.5 x D	4	114	.0162	.0216	.0270	.0324	.0432	.0538	.0648	.0756	.0862	.1076	.1348
		Finish	1.5 x D	.015 x D	4	137	.0180	.0240	.0300	.0360	.0480	.0598	.0720	.0840	.0958	.1195	.1497
	Cast iron Malleable	Slotting	.75 x D	1 x D	4	76	.0132	.0176	.0220	.0264	.0352	.0438	.0528	.0616	.0702	.0876	.1098
		Peripheral – Rough	1.25 x D	.5 x D	4	99	.0162	.0216	.0270	.0324	.0432	.0538	.0648	.0756	.0862	.1076	.1348
		Finish	1.5 x D	.015 x D	4	122	.0180	.0240	.0300	.0360	.0480	.0598	.0720	.0840	.0958	.1195	.1497
P	Low carbon steels 1018, 12L14, 8620	Slotting	1 x D	1 x D	4	107	.0156	.0208	.0260	.0312	.0416	.0518	.0624	.0728	.0830	.1036	.1298
		Peripheral – Rough	1.25 x D	.5 x D	4	130	.0192	.0256	.0320	.0384	.0512	.0637	.0768	.0896	.1021	.1275	.1597
		Finish	1.5 x D	.015 x D	4	152	.0216	.0288	.0360	.0432	.0576	.0717	.0864	.1008	.1149	.1434	.1797
	Medium carbon steels 4140, 4340	Slotting	1 x D	1 x D	4	91	.0144	.0192	.0240	.0288	.0384	.0478	.0576	.0672	.0766	.0956	.1198
		Peripheral – Rough	1.25 x D	.5 x D	4	114	.0180	.0240	.0300	.0360	.0480	.0598	.0720	.0840	.0958	.1195	.1497
		Finish	1.5 x D	.015 x D	4	137	.0198	.0264	.0330	.0396	.0528	.0657	.0792	.0924	.1053	.1315	.1647
	Tool & die steels <48 Rc A2, D2, H13, P20	Slotting	.75 x D	1 x D	4	91	.0144	.0192	.0240	.0288	.0384	.0478	.0576	.0672	.0766	.0956	.1198
		Peripheral – Rough	1.25 x D	.3 x D	4	114	.0174	.0232	.0290	.0348	.0464	.0578	.0696	.0812	.0926	.1155	.1448
		Finish	1.5 x D	.015 x D	4	137	.0180	.0240	.0300	.0360	.0480	.0598	.0720	.0840	.0958	.1195	.1497
M	Martensitic stainless steels 416, 410, 440C	Slotting	.75 x D	1 x D	4	91	.0144	.0192	.0240	.0288	.0384	.0478	.0576	.0672	.0766	.0956	.1198
		Peripheral – Rough	1.25 x D	.3 x D	4	114	.0174	.0232	.0290	.0348	.0464	.0578	.0696	.0812	.0926	.1155	.1448
		Finish	1.5 x D	.015 x D	4	137	.0180	.0240	.0300	.0360	.0480	.0598	.0720	.0840	.0958	.1195	.1497
	Austenitic stainless steels 303, 304, 316	Slotting	.75 x D	1 x D	4	84	.0156	.0208	.0260	.0312	.0416	.0518	.0624	.0728	.0830	.1036	.1298
		Peripheral – Rough	1.25 x D	.3 x D	4	99	.0192	.0256	.0320	.0384	.0512	.0637	.0768	.0896	.1021	.1275	.1597
		Finish	1.5 x D	.015 x D	4	122	.0198	.0264	.0330	.0396	.0528	.0657	.0792	.0924	.1053	.1315	.1647
	Precipitation hardening stainless steels 17-4, 15-5, 13-8	Slotting	.5 x D	1 x D	4	76	.0120	.0160	.0200	.0240	.0320	.0398	.0480	.0560	.0638	.0797	.0998
		Peripheral – Rough	1.25 x D	.3 x D	4	91	.0150	.0200	.0250	.0300	.0400	.0498	.0600	.0700	.0798	.0996	.1248
		Finish	1.5 x D	.015 x D	4	114	.0156	.0208	.0260	.0312	.0416	.0518	.0624	.0728	.0830	.1036	.1298
S	Titanium alloys 6AL - 4V	Slotting	.5 x D	1 x D	4	76	.0120	.0160	.0200	.0240	.0320	.0398	.0480	.0560	.0638	.0797	.0998
		Peripheral – Rough	1.25 x D	.3 x D	4	91	.0150	.0200	.0250	.0300	.0400	.0498	.0600	.0700	.0798	.0996	.1248
		Finish	1.5 x D	.015 x D	4	114	.0156	.0208	.0260	.0312	.0416	.0518	.0624	.0728	.0830	.1036	.1298
	Hi-temp alloys Inconel, Haynes, Stellite, Hastalloy	Slotting	.25 x D	1 x D	4	18	.0126	.0168	.0210	.0252	.0336	.0418	.0504	.0588	.0670	.0837	.1048
		Peripheral – Rough	1.25 x D	.25 x D	4	27	.0162	.0216	.0270	.0324	.0432	.0538	.0648	.0756	.0862	.1076	.1348
		Finish	1.5 x D	.01 x D	4	38	.0186	.0248	.0310	.0372	.0496	.0617	.0744	.0868	.0989	.1235	.1547

D = Tool diameter

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (SFM)	Feed (Inches per Tooth) 1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2	5/8	3/4	1
K	Cast iron Gray	Slotting	1 x D	1 x D	4	325	.0006	.0008	.0009	.0011	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0048
		Peripheral – Rough	1.25 x D	.5 x D	4	400	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
		Finish	1.5 x D	.015 x D	4	475	.0008	.0010	.0012	.0014	.0017	.0021	.0025	.0029	.0033	.0041	.0050	.0066
	Cast iron Ductile	Slotting	1 x D	1 x D	4	300	.0006	.0007	.0008	.0010	.0011	.0014	.0017	.0019	.0022	.0028	.0033	.0044
		Peripheral – Rough	1.25 x D	.5 x D	4	375	.0007	.0008	.0010	.0012	.0014	.0017	.0020	.0024	.0027	.0034	.0041	.0054
		Finish	1.5 x D	.015 x D	4	450	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
	Cast iron Malleable	Slotting	.75 x D	1 x D	4	250	.0006	.0007	.0008	.0010	.0011	.0014	.0017	.0019	.0022	.0028	.0033	.0044
		Peripheral – Rough	1.25 x D	.5 x D	4	325	.0007	.0008	.0010	.0012	.0014	.0017	.0020	.0024	.0027	.0034	.0041	.0054
		Finish	1.5 x D	.015 x D	4	400	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
P	Low carbon steels 1018, 12L14, 8620	Slotting	1 x D	1 x D	4	350	.0007	.0008	.0010	.0011	.0013	.0016	.0020	.0023	.0026	.0033	.0039	.0052
		Peripheral – Rough	1.25 x D	.5 x D	4	425	.0008	.0010	.0012	.0014	.0016	.0020	.0024	.0028	.0032	.0040	.0048	.0064
		Finish	1.5 x D	.015 x D	4	500	.0009	.0011	.0014	.0016	.0018	.0023	.0027	.0032	.0036	.0045	.0054	.0072
	Medium carbon steels 4140, 4340	Slotting	1 x D	1 x D	4	300	.0006	.0008	.0009	.0011	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0048
		Peripheral – Rough	1.25 x D	.5 x D	4	375	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
		Finish	1.5 x D	.015 x D	4	450	.0008	.0010	.0012	.0014	.0017	.0021	.0025	.0029	.0033	.0041	.0050	.0066
	Tool & die steels <48 Rc A2, D2, H13, P20	Slotting	.75 x D	1 x D	4	300	.0006	.0008	.0009	.0011	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0048
		Peripheral – Rough	1.25 x D	.3 x D	4	375	.0007	.0009	.0011	.0013	.0015	.0018	.0022	.0025	.0029	.0036	.0044	.0058
		Finish	1.5 x D	.015 x D	4	450	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
M	Martensitic stainless steels 416, 410, 440C	Slotting	.75 x D	1 x D	4	300	.0006	.0008	.0009	.0011	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0048
		Peripheral – Rough	1.25 x D	.3 x D	4	375	.0007	.0009	.0011	.0013	.0015	.0018	.0022	.0025	.0029	.0036	.0044	.0058
		Finish	1.5 x D	.015 x D	4	450	.0008	.0009	.0011	.0013	.0015	.0019	.0023	.0026	.0030	.0038	.0045	.0060
	Austenitic stainless steels 303, 304, 316	Slotting	.75 x D	1 x D	4	275	.0007	.0008	.0010	.0011	.0013	.0016	.0020	.0023	.0026	.0033	.0039	.0052
		Peripheral – Rough	1.25 x D	.3 x D	4	325	.0008	.0010	.0012	.0014	.0016	.0020	.0024	.0028	.0032	.0040	.0048	.0064
		Finish	1.5 x D	.015 x D	4	400	.0008	.0010	.0012	.0014	.0017	.0021	.0025	.0029	.0033	.0041	.0050	.0066
	Precipitation hardening stainless steel 17-4, 15-5	Slotting	.5 x D	1 x D	4	250	.0005	.0006	.0008	.0009	.0010	.0013	.0015	.0018	.0020	.0025	.0030	.0040
		Peripheral – Rough	1.25 x D	.3 x D	4	300	.0006	.0008	.0009	.0011	.0013	.0016	.0019	.0022	.0025	.0031	.0038	.0050
		Finish	1.5 x D	.015 x D	4	375	.0007	.0008	.0010	.0011	.0013	.0016	.0020	.0023	.0026	.0033	.0039	.0052
S	Titanium alloys 6AL - 4V	Slotting	.5 x D	1 x D	4	250	.0005	.0006	.0008	.0009	.0010	.0013	.0015	.0018	.0020	.0025	.0030	.0040
		Peripheral – Rough	1.25 x D	.3 x D	4	300	.0006	.0008	.0009	.0011	.0013	.0016	.0019	.0022	.0025	.0031	.0038	.0050
		Finish	1.5 x D	.015 x D	4	375	.0007	.0008	.0010	.0011	.0013	.0016	.0020	.0023	.0026	.0033	.0039	.0052
	Hi-temp alloys Inconel, Haynes, Stellite, Hastalloy	Slotting	.25 x D	1 x D	4	60	.0005	.0007	.0008	.0009	.0011	.0013	.0016	.0018	.0021	.0026	.0032	.0042
		Peripheral – Rough	1.25 x D	.25 x D	4	90	.0007	.0008	.0010	.0012	.0014	.0017	.0020	.0024	.0027	.0034	.0041	.0054
		Finish	1.5 x D	.01 x D	4	125	.0008	.0010	.0012	.0014	.0016	.0019	.0023	.0027	.0031	.0039	.0047	.0062

D = Tool diameter

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inches per Tooth) 1/4	3/8	1/2	5/8	3/4
K	Cast iron - Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Ball 3D Roughing	0.50 x D	0.080 x D	6 , 8	470	.00125	.00188	.0025	.00313	.00375
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	450	.00170	.00255	.0034	.00425	.00510
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	550	.00200	.00300	.0040	.00500	.00600
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	430	.00200	.00300	.0040	.00500	.00600
	Cast iron - Ductile	Ball 3D Roughing	0.50 x D	0.080 x D	6 , 8	440	.00115	.00173	.0023	.00288	.00345
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	390	.00150	.00225	.0030	.00375	.00450
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	535	.00180	.00270	.0036	.00450	.00540
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	420	.00165	.00248	.0033	.00413	.00495
	Cast iron - Malleable	Ball 3D Roughing	0.50 x D	0.080 x D	6 , 8	440	.00110	.00165	.0022	.00275	.00330
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	410	.00145	.00218	.0029	.00363	.00435
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	535	.00160	.00240	.0032	.00400	.00480
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	420	.00160	.00240	.0032	.00400	.00480
P	Low carbon steel ≤38 HRc 1018, 1020, 12L14, 5120, 8620	Ball 3D Roughing	0.50 x D	0.080 x D	6 , 8	505	.00115	.00173	.0023	.00288	.00345
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	500	.00175	.00263	.0035	.00438	.00525
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	585	.00195	.00293	.0039	.00488	.00585
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	520	.00205	.00308	.0041	.00513	.00615
	Medium carbon steel ≤48 HRc 1045, 4140, 4340, 5140	Ball 3D Roughing	0.50 x D	0.080 x D	6 , 8	470	.00110	.00165	.0022	.00275	.00330
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	470	.00155	.00233	.0031	.00388	.00465
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	550	.00180	.00270	.0036	.00450	.00540
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	485	.00200	.00300	.0040	.00500	.00600
	Tool & die steels ≤40 HRc A2, D2, O1, S7, P20, H13	Ball 3D Roughing	0.50 x D	0.080 x D	6 , 8	450	.00100	.00150	.0020	.00250	.00300
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	425	.00150	.00225	.0030	.00375	.00450
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	510	.00150	.00225	.0030	.00375	.00450
		Peripheral Machining	2.50 x D	0.075 x D	6 , 8	450	.00180	.00270	.0036	.00450	.00540
H	Tool & die steels 40-48 HRc	Ball 3D Roughing	0.50 x D	0.065 x D	6 , 8	380	.00085	.00128	.0017	.00213	.00255
		Ball-Nose Slotting	0.030 x D	1.000 x D	6 , 8	375	.00110	.00165	.0022	.00275	.00330
		Finishing 3D Facing	0.02 x D	0.020 x D	6 , 8	450	.00135	.00203	.0027	.00338	.00405
		Peripheral Machining	2.00 x D	0.065 x D	6 , 8	400	.00110	.00165	.0022	.00275	.00330
M	Martensitic & ferritic stainless steels 410, 416, 440	Ball 3D Roughing	0.50 x D	0.080 x D	6 , 8	520	.00080	.00120	.0016	.00200	.00240
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	465	.00145	.00218	.0029	.00363	.00435
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	540	.00180	.00270	.0036	.00450	.00540
		Peripheral Machining	2.50 x D	0.075 x D	6 , 8	490	.00205	.00308	.0041	.00513	.00615
	Austenitic stainless steels FeNi alloys 303, 304, 316, Invar, Kovar	Ball 3D Roughing	0.50 x D	0.070 x D	6 , 8	500	.00075	.00113	.0015	.00188	.00225
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	425	.00130	.00195	.0026	.00325	.00390
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	510	.00165	.00248	.0033	.00413	.00495
		Peripheral Machining	2.50 x D	0.075 x D	6 , 8	490	.00185	.00278	.0037	.00463	.00555
	Precipitation hardening stainless steel 17-4, 15-5, 13-8	Ball 3D Roughing	0.50 x D	0.080 x D	6 , 8	490	.00075	.00113	.0015	.00188	.00225
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	390	.00105	.00158	.0021	.00263	.00315
		Finishing 3D Facing	0.030 x D	0.020 x D	6 , 8	470	.00140	.00210	.0028	.00350	.00420
		Peripheral Machining	2.00 x D	0.065 x D	6 , 8	480	.00150	.00225	.0030	.00375	.00450

D = Tool diameter

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$

$$sfm = rpm \times D \times .262$$

$$ipm = rpm \times ipt \times Z$$

$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$

$$m/min = rpm \times D \times .00314$$

$$mmpm = rpm \times mmpt \times Z$$

$$mrr = RDOC \times ADOC \times mmpm$$

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inches per Tooth) 1/4	3/8	1/2	5/8	3/4
S	Titanium alloys 6AL-4V, 6-2-4	Ball 3D Roughing	0.50 x D	0.080 x D	6 , 8	390	.00200	.00300	.0040	.00500	.00600
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	395	.00100	.00150	.0020	.00250	.00300
		Finishing 3D Facing	0.030 x D	0.020 x D	6 , 8	450	.00130	.00195	.0026	.00325	.00390
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	440	.00200	.00300	.0040	.00500	.00600
	Difficult-to-machine titanium alloys 10-2-3	Ball 3D Roughing	0.45 x D	0.070 x D	6 , 8	320	.00175	.00263	.0035	.00438	.00525
		Ball-Nose Slotting	0.035 x D	1.000 x D	6 , 8	322	.00075	.00113	.0015	.00188	.00225
		Finishing 3D Facing	0.030 x D	0.020 x D	6 , 8	380	.00115	.00173	.0023	.00288	.00345
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	400	.00175	.00263	.0035	.00438	.00525
	Nickel-based super alloys Hastalloy, Waspalloy	Ball 3D Roughing	0.50 x D	0.065 x D	6 , 8	325	.00150	.00225	.0030	.00375	.00450
		Ball-Nose Slotting	0.030 x D	1.000 x D	6 , 8	352	.00800	.01200	.0160	.02000	.02400
		Finishing 3D Facing	0.025 x D	0.020 x D	6 , 8	390	.00120	.00180	.0024	.00300	.00360
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	325	.00150	.00225	.0030	.00375	.00450
	Nickel Chromium-based super alloys Inconel 718, Rene 88	Ball 3D Roughing	0.50 x D	0.075 x D	6 , 8	200	.00200	.00300	.0040	.00500	.00600
		Ball-Nose Slotting	0.025 x D	1.000 x D	6 , 8	110	.00070	.00105	.0014	.00175	.00210
		Finishing 3D Facing	0.025 x D	0.020 x D	6 , 8	125	.00170	.00255	.0034	.00425	.00510
		Peripheral Machining	1.50 x D	0.070 x D	6 , 8	200	.00175	.00263	.0035	.00438	.00525
N	Aluminum alloys 2024, 6061, 7075	Ball 3D Roughing	0.50 x D	0.050 x D	6 , 8	1200	.00200	.00300	.0040	.00500	.00600
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	1200	.00180	.00270	.0036	.00450	.00540
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	1500	.00150	.00225	.0030	.00375	.00450
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	1400	.00150	.00225	.0030	.00375	.00450
	High silicon aluminum alloys A380, A390	Ball 3D Roughing	0.50 x D	0.050 x D	6 , 8	965	.00210	.00315	.0042	.00525	.00630
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	900	.00190	.00285	.0038	.00475	.00570
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	1150	.00150	.00225	.0030	.00375	.00450
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	1200	.00155	.00233	.0031	.00388	.00465
	Magnesium alloys	Ball 3D Roughing	0.50 x D	0.050 x D	6 , 8	1200	.00200	.00300	.0040	.00500	.00600
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	1200	.00180	.00270	.0036	.00450	.00540
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	1400	.00150	.00225	.0030	.00375	.00450
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	1400	.00150	.00225	.0030	.00375	.00450
	Copper alloys, brass	Ball 3D Roughing	0.50 x D	0.050 x D	6 , 8	720	.00190	.00285	.0038	.00475	.00570
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	825	.00170	.00255	.0034	.00425	.00510
		Finishing 3D Facing	0.030 x D	0.020 x D	6 , 8	860	.00140	.00210	.0028	.00350	.00420
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	1100	.00130	.00195	.0026	.00325	.00390
	Bronze	Ball 3D Roughing	0.50 x D	0.050 x D	6 , 8	715	.00185	.00278	.0037	.00463	.00555
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	825	.00165	.00248	.0033	.00413	.00495
		Finishing 3D Facing	0.030 x D	0.020 x D	6 , 8	855	.00125	.00188	.0025	.00313	.00375
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	1000	.00125	.00188	.0025	.00313	.00375
	Composites, plastics, fiberglass	Ball 3D Roughing	0.50 x D	0.050 x D	6 , 8	1100	.00210	.00315	.0042	.00525	.00630
		Ball-Nose Slotting	0.040 x D	1.000 x D	6 , 8	900	.00190	.00285	.0038	.00475	.00570
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	1400	.00155	.00233	.0031	.00388	.00465
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	1200	.00200	.00300	.0040	.00500	.00600

D = Tool diameter

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (M/min)	Feed (MM per Tooth) 6	10	12	16	20
K	Cast iron - Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Ball 3D and Tip Machining	0.50 x D	0.080 x D	6 , 8	143	.03000	.05000	.06000	.08000	.10000
		Slotting	0.040 x D	1.000 x D	6 , 8	137	.04080	.06800	.08160	.10880	.13600
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	168	.04800	.08000	.09600	.12800	.16000
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	131	.04800	.08000	.09600	.12800	.16000
	Cast iron - Ductile	Ball 3D and Tip Machining	0.50 x D	0.080 x D	6 , 8	134	.02760	.04600	.05520	.07360	.09200
		Slotting	0.040 x D	1.000 x D	6 , 8	119	.03600	.06000	.07200	.09600	.12000
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	163	.04320	.07200	.08640	.11520	.14400
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	128	.03960	.06600	.07920	.10560	.13200
	Cast iron - Malleable	Ball 3D and Tip Machining	0.50 x D	0.080 x D	6 , 8	134	.02640	.04400	.05280	.07040	.08800
		Slotting	0.040 x D	1.000 x D	6 , 8	125	.03480	.05800	.06960	.09280	.11600
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	163	.03840	.06400	.07680	.10240	.12800
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	128	.03840	.06400	.07680	.10240	.12800
P	Low carbon steel ≤38 HRc 1018, 1020, 12L14, 5120, 8620	Ball 3D and Tip Machining	0.50 x D	0.080 x D	6 , 8	154	.02760	.04600	.05520	.07360	.09200
		Slotting	0.040 x D	1.000 x D	6 , 8	152	.04200	.07000	.08400	.11200	.14000
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	178	.04680	.07800	.09360	.12480	.15600
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	158	.04920	.08200	.09840	.13120	.16400
	Medium carbon steel ≤48 HRc 1045, 4140, 4340, 5140	Ball 3D and Tip Machining	0.50 x D	0.080 x D	6 , 8	143	.02640	.04400	.05280	.07040	.08800
		Slotting	0.040 x D	1.000 x D	6 , 8	143	.03720	.06200	.07440	.09920	.12400
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	168	.04320	.07200	.08640	.11520	.14400
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	148	.04800	.08000	.09600	.12800	.16000
	Tool & die steels ≤40 HRc A2, D2, O1, S7, P20, H13	Ball 3D and Tip Machining	0.50 x D	0.080 x D	6 , 8	137	.02400	.04000	.04800	.06400	.08000
		Slotting	0.040 x D	1.000 x D	6 , 8	130	.03600	.06000	.07200	.09600	.12000
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	155	.03600	.06000	.07200	.09600	.12000
		Peripheral Machining	2.50 x D	0.075 x D	6 , 8	137	.04320	.07200	.08640	.11520	.14400
H	Tool & die steels 40-48 HRc	Ball 3D and Tip Machining	0.50 x D	0.065 x D	6 , 8	116	.02040	.03400	.04080	.05440	.06800
		Slotting	0.030 x D	1.000 x D	6 , 8	114	.02640	.04400	.05280	.07040	.08800
		Finishing 3D Facing	0.02 x D	0.020 x D	6 , 8	137	.03240	.05400	.06480	.08640	.10800
		Peripheral Machining	2.00 x D	0.065 x D	6 , 8	122	.02640	.04400	.05280	.07040	.08800
M	Martensitic & ferritic stainless steels 410, 416, 440	Ball 3D and Tip Machining	0.50 x D	0.080 x D	6 , 8	158	.01920	.03200	.03840	.05120	.06400
		Slotting	0.040 x D	1.000 x D	6 , 8	142	.03480	.05800	.06960	.09280	.11600
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	165	.04320	.07200	.08640	.11520	.14400
		Peripheral Machining	2.50 x D	0.075 x D	6 , 8	149	.04920	.08200	.09840	.13120	.16400
	Austenitic stainless steels FeNi alloys 303, 304, 316, Invar, Kovar	Ball 3D and Tip Machining	0.50 x D	0.070 x D	6 , 8	152	.01800	.03000	.03600	.04800	.06000
		Slotting	0.040 x D	1.000 x D	6 , 8	130	.03120	.05200	.06240	.08320	.10400
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	155	.03960	.06600	.07920	.10560	.13200
		Peripheral Machining	2.50 x D	0.075 x D	6 , 8	149	.04440	.07400	.08880	.11840	.14800
	Precipitation hardening stainless steel 17-4, 15-5, 13-8	Ball 3D and Tip Machining	0.50 x D	0.080 x D	6 , 8	149	.01800	.03000	.03600	.04800	.06000
		Slotting	0.040 x D	1.000 x D	6 , 8	119	.02520	.04200	.05040	.06720	.08400
		Finishing 3D Facing	0.030 x D	0.020 x D	6 , 8	143	.03360	.05600	.06720	.08960	.11200
		Peripheral Machining	2.00 x D	0.065 x D	6 , 8	146	.03600	.06000	.07200	.09600	.12000

D = Tool diameter

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (M/min)	Feed (MM per Tooth) 6	10	12	16	20
S	Titanium alloys 6AL-4V, 6-2-4	Ball 3D and Tip Machining	0.50 x D	0.080 x D	6 , 8	119	.04800	.08000	.09600	.12800	.16000
		Slotting	0.040 x D	1.000 x D	6 , 8	120	.02400	.04000	.04800	.06400	.08000
		Finishing 3D Facing	0.030 x D	0.020 x D	6 , 8	137	.03120	.05200	.06240	.08320	.10400
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	134	.04800	.08000	.09600	.12800	.16000
	Difficult-to-machine titanium alloys 10-2-3	Ball 3D and Tip Machining	0.45 x D	0.070 x D	6 , 8	98	.04200	.07000	.08400	.11200	.14000
		Slotting	0.035 x D	1.000 x D	6 , 8	98	.01800	.03000	.03600	.04800	.06000
		Finishing 3D Facing	0.030 x D	0.020 x D	6 , 8	116	.02760	.04600	.05520	.07360	.09200
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	122	.04200	.07000	.08400	.11200	.14000
	Nickel-based super alloys Hastalloy, Waspalloy	Ball 3D and Tip Machining	0.50 x D	0.065 x D	6 , 8	99	.03600	.06000	.07200	.09600	.12000
		Slotting	0.030 x D	1.000 x D	6 , 8	107	.19200	.32000	.38400	.51200	.64000
		Finishing 3D Facing	0.025 x D	0.020 x D	6 , 8	119	.02880	.04800	.05760	.07680	.09600
		Peripheral Machining	2.50 x D	0.080 x D	6 , 8	99	.03600	.06000	.07200	.09600	.12000
	Nickel Chromium-based super alloys Inconel 718, Rene 88	Ball 3D and Tip Machining	0.50 x D	0.075 x D	6 , 8	61	.04800	.08000	.09600	.12800	.16000
		Slotting	0.025 x D	1.000 x D	6 , 8	34	.01680	.02800	.03360	.04480	.05600
		Finishing 3D Facing	0.025 x D	0.020 x D	6 , 8	38	.04080	.06800	.08160	.10880	.13600
		Peripheral Machining	1.50 x D	0.070 x D	6 , 8	61	.04200	.07000	.08400	.11200	.14000
N	Aluminum alloys 2024, 6061, 7075	Ball 3D and Tip Machining	0.50 x D	0.050 x D	6 , 8	366	.04800	.08000	.09600	.12800	.16000
		Slotting	0.040 x D	1.000 x D	6 , 8	366	.04320	.07200	.08640	.11520	.14400
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	457	.03600	.06000	.07200	.09600	.12000
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	427	.03600	.06000	.07200	.09600	.12000
	High silicon aluminum alloys A380, A390	Ball 3D and Tip Machining	0.50 x D	0.050 x D	6 , 8	294	.05040	.08400	.10080	.13440	.16800
		Slotting	0.040 x D	1.000 x D	6 , 8	274	.04560	.07600	.09120	.12160	.15200
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	351	.03600	.06000	.07200	.09600	.12000
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	366	.03720	.06200	.07440	.09920	.12400
	Magnesium alloys	Ball 3D and Tip Machining	0.50 x D	0.050 x D	6 , 8	366	.04800	.08000	.09600	.12800	.16000
		Slotting	0.040 x D	1.000 x D	6 , 8	366	.04320	.07200	.08640	.11520	.14400
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	427	.03600	.06000	.07200	.09600	.12000
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	427	.03600	.06000	.07200	.09600	.12000
	Copper alloys, brass	Ball 3D and Tip Machining	0.50 x D	0.050 x D	6 , 8	219	.04560	.07600	.09120	.12160	.15200
		Slotting	0.040 x D	1.000 x D	6 , 8	251	.04080	.06800	.08160	.10880	.13600
		Finishing 3D Facing	0.030 x D	0.020 x D	6 , 8	262	.03360	.05600	.06720	.08960	.11200
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	335	.03120	.05200	.06240	.08320	.10400
	Bronze	Ball 3D and Tip Machining	0.50 x D	0.050 x D	6 , 8	218	.04440	.07400	.08880	.11840	.14800
		Slotting	0.040 x D	1.000 x D	6 , 8	251	.03960	.06600	.07920	.10560	.13200
		Finishing 3D Facing	0.030 x D	0.020 x D	6 , 8	261	.03000	.05000	.06000	.08000	.10000
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	305	.03000	.05000	.06000	.08000	.10000
	Composites, plastics, fiberglass	Ball 3D and Tip Machining	0.50 x D	0.050 x D	6 , 8	335	.05040	.08400	.10080	.13440	.16800
		Slotting	0.040 x D	1.000 x D	6 , 8	274	.04560	.07600	.09120	.12160	.15200
		Finishing 3D Facing	0.03 x D	0.020 x D	6 , 8	427	.03720	.06200	.07440	.09920	.12400
		Peripheral Machining	2.50 x D	0.070 x D	6 , 8	366	.04800	.08000	.09600	.12800	.16000

D = Tool diameter

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inches per Tooth) 1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	1
K	Cast iron Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Slotting	.5 x D	1 x D	5	300	.0006	.0009	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0048
		Peripheral - Rough	1.25 x D	.3 x D	5	375	.0008	.0012	.0016	.0020	.0025	.0029	.0033	.0041	.0049	.0065
		Finish	2 x D	.015 x D	5	375	.0008	.0012	.0017	.0021	.0025	.0029	.0033	.0042	.0050	.0067
	Castiron Malleable	Slotting	.5 x D	1 x D	5	275	.0005	.0008	.0010	.0013	.0015	.0018	.0020	.0025	.0030	.0040
		Peripheral - Rough	1.25 x D	.3 x D	5	350	.0007	.0010	.0014	.0017	.0020	.0024	.0027	.0034	.0041	.0055
		Peripheral - HEM*	3 x D	.05 x D	5	390	.0020	.0030	.0040	.0050	.0060	.0070	.0081	.0101	.0121	.0161
		Finish	2 x D	.015 x D	5	350	.0007	.0010	.0014	.0017	.0021	.0024	.0028	.0035	.0042	.0056
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Slotting	.5 x D	1 x D	5	325	.0007	.0011	.0014	.0018	.0021	.0025	.0028	.0035	.0042	.0056
		Peripheral - Rough	1.25 x D	.3 x D	5	400	.0010	.0014	.0019	.0024	.0029	.0033	.0038	.0048	.0057	.0076
		Peripheral - HEM*	3 x D	.07 x D	5	450	.0028	.0042	.0056	.0070	.0084	.0098	.0112	.0140	.0168	.0224
		Finish	2 x D	.015 x D	5	400	.0010	.0015	.0019	.0024	.0029	.0034	.0039	.0049	.0058	.0078
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Slotting	.5 x D	1 x D	5	300	.0006	.0010	.0013	.0016	.0019	.0022	.0026	.0032	.0038	.0051
		Peripheral - Rough	1.25 x D	.3 x D	5	375	.0009	.0013	.0017	.0022	.0026	.0031	.0035	.0044	.0052	.0070
		Peripheral - HEM*	3 x D	.05 x D	5	415	.0026	.0039	.0052	.0065	.0077	.0090	.0103	.0129	.0155	.0207
		Finish	2 x D	.015 x D	5	375	.0009	.0013	.0018	.0022	.0027	.0031	.0036	.0044	.0053	.0071
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Slotting	.5 x D	1 x D	5	275	.0005	.0008	.0011	.0014	.0016	.0019	.0022	.0027	.0032	.0043
		Peripheral - Rough	1.25 x D	.3 x D	5	350	.0007	.0011	.0015	.0018	.0022	.0026	.0029	.0037	.0044	.0059
		Peripheral - HEM*	3 x D	.05 x D	5	390	.0022	.0032	.0043	.0054	.0065	.0076	.0087	.0108	.0130	.0173
		Finish	2 x D	.015 x D	5	350	.0007	.0011	.0015	.0019	.0022	.0026	.0030	.0037	.0045	.0060
M	Martensitic & ferritic stainless steels 410, 416, 440	Slotting	.5 x D	1 x D	5	300	.0006	.0010	.0013	.0016	.0019	.0022	.0026	.0032	.0038	.0051
		Peripheral - Rough	1.25 x D	.3 x D	5	375	.0009	.0013	.0017	.0022	.0026	.0031	.0035	.0044	.0052	.0070
		Peripheral - HEM*	3 x D	.05 x D	5	415	.0026	.0039	.0052	.0065	.0077	.0090	.0103	.0129	.0155	.0207
		Finish	2 x D	.015 x D	5	375	.0009	.0013	.0018	.0022	.0027	.0031	.0036	.0044	.0053	.0071
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Slotting	.5 x D	1 x D	5	275	.0006	.0009	.0012	.0015	.0018	.0021	.0024	.0030	.0036	.0048
		Peripheral - Rough	1.25 x D	.3 x D	5	350	.0008	.0012	.0016	.0020	.0025	.0029	.0033	.0041	.0049	.0065
		Peripheral - HEM*	3 x D	.05 x D	5	390	.0025	.0037	.0049	.0062	.0074	.0086	.0099	.0123	.0148	.0198
		Finish	2 x D	.015 x D	5	350	.0008	.0012	.0017	.0021	.0025	.0029	.0033	.0042	.0050	.0067
	Precipitation hardening stainless steels 17-4, 15-5	Slotting	.5 x D	1 x D	5	250	.0005	.0008	.0010	.0013	.0015	.0018	.0020	.0025	.0030	.0040
		Peripheral - Rough	1.25 x D	.3 x D	5	325	.0007	.0010	.0014	.0017	.0020	.0024	.0027	.0034	.0041	.0055
		Peripheral - HEM*	3 x D	.05 x D	5	360	.0020	.0030	.0040	.0049	.0059	.0069	.0079	.0099	.0119	.0158
		Finish	1.5 x D	.015 x D	5	325	.0007	.0010	.0014	.0017	.0021	.0024	.0028	.0035	.0042	.0056
S	Titanium alloys 6Al-4V, 6-2-4	Slotting	.5 x D	1 x D	5	250	.0005	.0007	.0009	.0012	.0014	.0016	.0018	.0023	.0028	.0037
		Peripheral - Rough	1 x D	.3 x D	5	300	.0006	.0009	.0013	.0016	.0019	.0022	.0025	.0031	.0038	.0050
		Peripheral - HEM*	3 x D	.05 x D	5	330	.0018	.0027	.0036	.0046	.0055	.0064	.0073	.0091	.0109	.0146
		Finish	1.5 x D	.015 x D	5	300	.0006	.0010	.0013	.0016	.0019	.0022	.0026	.0032	.0038	.0051
	Difficult-to-machine titanium alloys 10-2-3	Slotting	.25 x D	1 x D	5	200	.0003	.0005	.0007	.0009	.0010	.0012	.0014	.0017	.0020	.0027
		Peripheral - Rough	1 x D	.25 x D	5	250	.0005	.0007	.0010	.0012	.0015	.0017	.0020	.0025	.0029	.0039
	Precipitation hardening stainless steels M 13-8	Peripheral - HEM*	3 x D	.05 x D	5	275	.0015	.0022	.0030	.0037	.0045	.0052	.0059	.0074	.0089	.0119
		Finish	1.5 x D	.01 x D	5	250	.0006	.0009	.0012	.0014	.0017	.0020	.0023	.0029	.0035	.0046

D = Tool diameter
**HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters shown).*

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

TECH TALK | *enDURO M525*

Unleash the Power of CMS

These bad boys have a well-earned reputation for moving easily through the nastiest metals you've seen. Using HEM or traditional methods, the enDURO end mill's high-shearing cutting edges and amazing corner strength give you impressive performance and tool life right out of the box. But our unique Chip Management System takes it to a whole new level.

This distinctive flute pattern is proven to save you time and money. CMS breaks the chips into shorter pieces without slowing your machine or reducing tool life. Chip evacuation is a breeze. Your machine auger keeps working smoothly. Just set it up and watch those chips fly.

If chip packing has been an issue in your shop, CMS is your solution. CMS is available on most IMCO high-performance end mills.

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (M/min)	Feed (MM per Tooth) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
K	Cast iron Gray ASTM-A48 Class 20, 25, 30, 35 & 40	Slotting	.5 x D	1 x D	5	91	.0288	.0384	.0478	.0576	.0766	.0956	.1200
		Peripheral - Rough	1.25 x D	.3 x D	5	114	.0393	.0524	.0652	.0786	.1045	.1304	.1636
		Finish	2 x D	.015 x D	5	114	.0400	.0533	.0664	.0800	.1063	.1327	.1666
	Castiron Malleable	Slotting	.5 x D	1 x D	5	84	.0240	.0320	.0398	.0480	.0638	.0797	.1000
		Peripheral - Rough	1.25 x D	.3 x D	5	107	.0327	.0436	.0543	.0655	.0871	.1087	.1364
		Peripheral - HEM*	3 x D	.05 x D	5	119	.0966	.1288	.1604	.1932	.2570	.3207	.4025
		Finish	2 x D	.015 x D	5	107	.0333	.0444	.0553	.0666	.0886	.1106	.1388
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Slotting	.5 x D	1 x D	5	99	.0336	.0448	.0558	.0672	.0894	.1115	.1400
		Peripheral - Rough	1.25 x D	.3 x D	5	122	.0458	.0611	.0761	.0916	.1219	.1521	.1909
		Peripheral - HEM*	3 x D	.07 x D	5	137	.1344	.1792	.2231	.2688	.3575	.4463	.5601
		Finish	2 x D	.015 x D	5	122	.0466	.0622	.0774	.0933	.1241	.1549	.1943
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Slotting	.5 x D	1 x D	5	91	.0307	.0410	.0510	.0614	.0817	.1020	.1280
		Peripheral - Rough	1.25 x D	.3 x D	5	114	.0419	.0559	.0695	.0838	.1114	.1391	.1746
		Peripheral - HEM*	3 x D	.05 x D	5	126	.1239	.1652	.2057	.2478	.3296	.4114	.5163
		Finish	2 x D	.015 x D	5	114	.0426	.0569	.0708	.0853	.1134	.1416	.1777
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Slotting	.5 x D	1 x D	5	84	.0259	.0346	.0430	.0518	.0689	.0860	.1080
		Peripheral - Rough	1.25 x D	.3 x D	5	107	.0353	.0471	.0587	.0707	.0940	.1174	.1473
		Peripheral - HEM*	3 x D	.05 x D	5	119	.1040	.1386	.1726	.2079	.2765	.3452	.4332
		Finish	2 x D	.015 x D	5	107	.0360	.0480	.0597	.0720	.0957	.1195	.1499
M	Martensitic & ferritic stainless steels 410, 416, 440	Slotting	.5 x D	1 x D	5	91	.0307	.0410	.0510	.0614	.0817	.1020	.1280
		Peripheral - Rough	1.25 x D	.3 x D	5	114	.0419	.0559	.0695	.0838	.1114	.1391	.1746
		Peripheral - HEM*	3 x D	.05 x D	5	126	.1239	.1652	.2057	.2478	.3296	.4114	.5163
		Finish	2 x D	.015 x D	5	114	.0426	.0569	.0708	.0853	.1134	.1416	.1777
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Slotting	.5 x D	1 x D	5	84	.0288	.0384	.0478	.0576	.0766	.0956	.1200
		Peripheral - Rough	1.25 x D	.3 x D	5	107	.0393	.0524	.0652	.0786	.1045	.1304	.1636
		Peripheral - HEM*	3 x D	.05 x D	5	119	.1185	.1580	.1967	.2370	.3152	.3934	.4937
		Finish	2 x D	.015 x D	5	107	.0400	.0533	.0664	.0800	.1063	.1327	.1666
	Precipitation hardening stainless steels 17-4, 15-5	Slotting	.5 x D	1 x D	5	76	.0240	.0320	.0398	.0480	.0638	.0797	.1000
		Peripheral - Rough	1.25 x D	.3 x D	5	99	.0327	.0436	.0543	.0655	.0871	.1087	.1364
		Peripheral - HEM*	3 x D	.05 x D	5	110	.0950	.1267	.1577	.1900	.2527	.3154	.3958
		Finish	1.5 x D	.015 x D	5	99	.0333	.0444	.0553	.0666	.0886	.1106	.1388
S	Titanium alloys 6Al-4V, 6-2-4	Slotting	.5 x D	1 x D	5	76	.0221	.0294	.0366	.0442	.0587	.0733	.0920
		Peripheral - Rough	1 x D	.3 x D	5	91	.0301	.0401	.0500	.0602	.0801	.1000	.1255
		Peripheral - HEM*	3 x D	.05 x D	5	101	.0875	.1167	.1452	.1750	.2327	.2905	.3646
		Finish	1.5 x D	.015 x D	5	91	.0307	.0409	.0509	.0613	.0815	.1018	.1277
	Difficult-to-machine titanium alloys 10-2-3	Slotting	.25 x D	1 x D	5	61	.0163	.0218	.0271	.0326	.0434	.0542	.0680
		Peripheral - Rough	1 x D	.25 x D	5	76	.0236	.0314	.0391	.0471	.0627	.0782	.0981
	Precipitation hardening stainless steels M 13-8	Peripheral - HEM*	3 x D	.05 x D	5	84	.0712	.0950	.1183	.1425	.1895	.2365	.2968
		Finish	1.5 x D	.01 x D	5	76	.0277	.0369	.0459	.0554	.0736	.0919	.1153

D = Tool diameter **HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters shown).*

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inch per Tooth) 3/8	1/2	5/8	3/4	1
K	Cast iron Gray	Slotting	.5 x D	1 x D	7	300	.0013	.0018	.0022	.0027	.0035
		Peripheral - Rough	1.25 x D	.3 x D	7	375	.0018	.0023	.0029	.0035	.0047
		Finish	2 x D	.015 x D	7	450	.0018	.0024	.0030	.0036	.0048
	Cast iron	Slotting	.5 x D	1 x D	7	275	.0011	.0014	.0018	.0021	.0029
		Peripheral - Rough	1.25 x D	.3 x D	7	350	.0015	.0019	.0024	.0029	.0039
		Peripheral - HEM*	3 x D	.05 x D	7	390	.0043	.0057	.0071	.0085	.0114
		Finish	2 x D	.015 x D	7	350	.0015	.0020	.0025	.0030	.0040
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Slotting	.5 x D	1 x D	7	325	.0015	.0020	.0025	.0030	.0040
		Peripheral - Rough	1.25 x D	.3 x D	7	400	.0020	.0027	.0034	.0041	.0055
		Peripheral - HEM*	3 x D	.05 x D	7	450	.0066	.0088	.0109	.0131	.0175
		Finish	2 x D	.015 x D	7	400	.0021	.0028	.0035	.0042	.0056
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Slotting	.5 x D	1 x D	7	300	.0014	.0018	.0023	.0027	.0037
		Peripheral - Rough	1.25 x D	.3 x D	7	375	.0019	.0025	.0031	.0037	.0050
		Peripheral - HEM*	3 x D	.05 x D	7	415	.0064	.0086	.0107	.0129	.0172
		Finish	2 x D	.015 x D	7	375	.0019	.0025	.0032	.0038	.0051
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Slotting	.5 x D	1 x D	7	275	.0012	.0015	.0019	.0023	.0031
		Peripheral - Rough	1.25 x D	.3 x D	7	350	.0016	.0021	.0026	.0032	.0042
		Peripheral - HEM*	3 x D	.05 x D	7	390	.0055	.0074	.0092	.0110	.0147
		Finish	2 x D	.015 x D	7	350	.0016	.0021	.0027	.0032	.0043
M	Martensitic & ferritic stainless steels 410, 416, 440	Slotting	.5 x D	1 x D	7	300	.0014	.0018	.0023	.0027	.0037
		Peripheral - Rough	1.25 x D	.3 x D	7	375	.0019	.0025	.0031	.0037	.0050
		Peripheral - HEM*	3 x D	.05 x D	7	415	.0064	.0086	.0107	.0129	.0172
		Finish	2 x D	.015 x D	7	375	.0019	.0025	.0032	.0038	.0051
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Slotting	.5 x D	1 x D	7	275	.0013	.0017	.0021	.0026	.0034
		Peripheral - Rough	1.25 x D	.3 x D	7	350	.0018	.0023	.0029	.0035	.0047
		Peripheral - HEM*	3 x D	.05 x D	7	390	.0063	.0083	.0104	.0125	.0167
		Finish	2 x D	.015 x D	7	350	.0018	.0024	.0030	.0036	.0048
	Precipitation hardening stainless steels 17-4, 15-5	Slotting	.5 x D	1 x D	7	250	.0011	.0014	.0018	.0021	.0029
		Peripheral - Rough	1.25 x D	.3 x D	7	325	.0015	.0019	.0024	.0029	.0039
		Peripheral - HEM*	3 x D	.05 x D	7	360	.0050	.0067	.0083	.0100	.0133
		Finish	1.5 x D	.015 x D	7	325	.0015	.0020	.0025	.0030	.0040
S	Titanium alloys 6Al-4V, 6-2-4	Slotting	.5 x D	1 x D	7	250	.0010	.0013	.0016	.0020	.0026
		Peripheral - Rough	1 x D	.3 x D	7	300	.0013	.0018	.0022	.0027	.0036
		Peripheral - HEM*	3 x D	.05 x D	7	330	.0047	.0063	.0079	.0095	.0126
		Finish	1.5 x D	.015 x D	7	300	.0014	.0018	.0023	.0027	.0036
	Difficult-to-machine titanium alloys 10-2-3	Slotting	.25 x D	1 x D	7	200	.0007	.0010	.0012	.0015	.0019
		Peripheral - Rough	1 x D	.25 x D	7	250	.0011	.0014	.0018	.0021	.0028
		Peripheral - HEM*	3 x D	.05 x D	7	275	.0037	.0049	.0061	.0073	.0098
	Precipitation hardening stainless steel M 13-8	Finish	1.5 x D	.01 x D	7	250	.0012	.0016	.0021	.0025	.0033

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D} \qquad sfm = rpm \times D \times .262$$

$$rpm = \frac{m/min \times 318.3}{D} \qquad m/min = rpm \times D \times .00314$$

$$ipm = rpm \times ipt \times Z \qquad mrr = RDOC \times ADOC \times ipm$$

$$mmpm = rpm \times mmpt \times Z \qquad mrr = RDOC \times ADOC \times mmpm$$

IMCO WEBSITE DEEP DIVE

Start with your tool of choice. Not sure? Just go into Products and choose the tool type. Use the filters at left to narrow it down. Wa-a-ay down.

Open a tool page (A). On each tool page you open, check the right column to see how many we have in stock 1. Then scroll down (B) and check out the important specifications 2 and speed and feed recommendations 3.

It's all right there, including the Toolbot link. And the list price 4 and detailed specs. And the link for finding your distributor 5. Need help? The contact numbers for Customer Service are right there 6. All of it. Right there.

Need to backtrack? No problem. Check below the logo at the top. All the selections you've made are there 7. They're called "breadcrumbs," and they help you find your way back.

Need to check a catalog? Go to the Home page, click Resources, then Catalogs. Want to see videos? Same steps but click on Video Gallery.

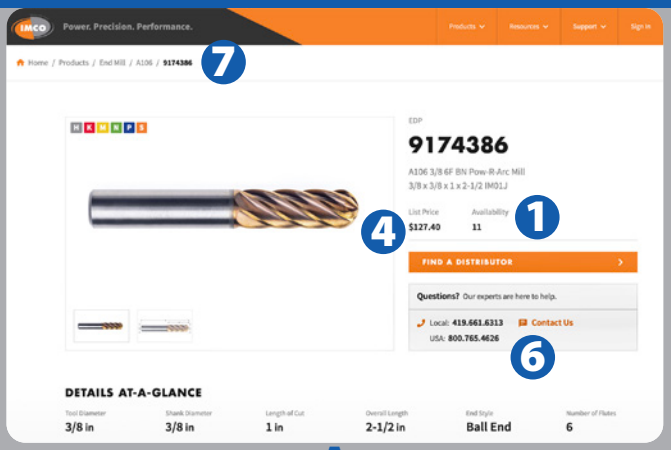
Have trouble? Call that Customer Service number. They've got your back.

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (M/min)	Feed (MM per Tooth) 10.0	12.0	16.0	20.0	25.0
K	Cast iron Gray	Slotting	.5 x D	1 x D	7	91	.0353	.0425	.0566	.0706	.0886
		Peripheral - Rough	1.25 x D	.3 x D	7	114	.0467	.0563	.0749	.0935	.1173
		Finish	2 x D	.015 x D	7	137	.0476	.0573	.0762	.0951	.1194
	Cast iron	Slotting	.5 x D	1 x D	7	84	.0285	.0343	.0456	.0569	.0714
		Peripheral - Rough	1.25 x D	.3 x D	7	107	.0388	.0468	.0622	.0776	.0974
		Peripheral - HEM*	3 x D	.05 x D	7	119	.1133	.1365	.1816	.2266	.2844
		Finish	2 x D	.015 x D	7	107	.0395	.0476	.0633	.0790	.0992
P	Low carbon steels ≤ 38 Rc 1018, 1020, 12L14, 5120, 8620	Slotting	.5 x D	1 x D	7	99	.0398	.0480	.0638	.0797	.1000
		Peripheral - Rough	1.25 x D	.3 x D	7	122	.0543	.0655	.0871	.1087	.1364
		Peripheral - HEM*	3 x D	.05 x D	7	137	.1743	.2100	.2793	.3486	.4375
		Finish	2 x D	.015 x D	7	122	.0553	.0666	.0886	.1106	.1388
	Medium carbon steels ≤ 48 HRc 1045, 4140, 4340, 5140	Slotting	.5 x D	1 x D	7	91	.0364	.0439	.0584	.0729	.0914
		Peripheral - Rough	1.25 x D	.3 x D	7	114	.0497	.0599	.0796	.0994	.1247
		Peripheral - HEM*	3 x D	.05 x D	7	126	.1708	.2058	.2737	.3417	.4288
		Finish	2 x D	.015 x D	7	114	.0506	.0609	.0810	.1011	.1269
	Tool and die steels ≤ 48 Rc A2, D2, O1, S7, P20, H13	Slotting	.5 x D	1 x D	7	84	.0307	.0370	.0493	.0615	.0772
		Peripheral - Rough	1.25 x D	.3 x D	7	107	.0419	.0505	.0672	.0838	.1052
		Peripheral - HEM*	3 x D	.05 x D	7	119	.1464	.1764	.2346	.2929	.3675
		Finish	2 x D	.015 x D	7	107	.0427	.0514	.0684	.0853	.1071
M	Martensitic & ferritic stainless steels 410, 416, 440	Slotting	.5 x D	1 x D	7	91	.0364	.0439	.0584	.0729	.0914
		Peripheral - Rough	1.25 x D	.3 x D	7	114	.0497	.0599	.0796	.0994	.1247
		Peripheral - HEM*	3 x D	.05 x D	7	126	.1708	.2058	.2737	.3417	.4288
		Finish	2 x D	.015 x D	7	114	.0506	.0609	.0810	.1011	.1269
	Austenitic stainless steels, FeNi alloys 303, 304, 316, Invar, Kovar	Slotting	.5 x D	1 x D	7	84	.0341	.0411	.0547	.0683	.0857
		Peripheral - Rough	1.25 x D	.3 x D	7	107	.0466	.0561	.0746	.0931	.1169
		Peripheral - HEM*	3 x D	.05 x D	7	119	.1660	.2000	.2660	.3320	.4166
		Finish	2 x D	.015 x D	7	107	.0474	.0571	.0760	.0948	.1190
	Precipitation hardening stainless steels 17-4, 15-5	Slotting	.5 x D	1 x D	7	76	.0285	.0343	.0456	.0569	.0714
		Peripheral - Rough	1.25 x D	.3 x D	7	99	.0388	.0468	.0622	.0776	.0974
		Peripheral - HEM*	3 x D	.05 x D	7	110	.1328	.1600	.2128	.2656	.3333
		Finish	1.5 x D	.015 x D	7	99	.0395	.0476	.0633	.0790	.0992
S	Titanium alloys 6Al-4V, 6-2-4	Slotting	.5 x D	1 x D	7	76	.0262	.0315	.0420	.0524	.0657
		Peripheral - Rough	1 x D	.3 x D	7	91	.0357	.0430	.0572	.0714	.0896
		Peripheral - HEM*	3 x D	.05 x D	7	101	.1257	.1515	.2015	.2515	.3156
		Finish	1.5 x D	.015 x D	7	91	.0363	.0438	.0582	.0727	.0912
	Difficult-to-machine titanium alloys 10-2-3	Slotting	.25 x D	1 x D	7	61	.0193	.0233	.0310	.0387	.0486
		Peripheral - Rough	1 x D	.25 x D	7	76	.0279	.0336	.0447	.0558	.0701
		Peripheral - HEM*	3 x D	.05 x D	7	84	.0975	.1175	.1563	.1950	.2448
	Precipitation hardening stainless steel M 13-8	Finish	1.5 x D	.01 x D	7	76	.0328	.0395	.0526	.0656	.0824

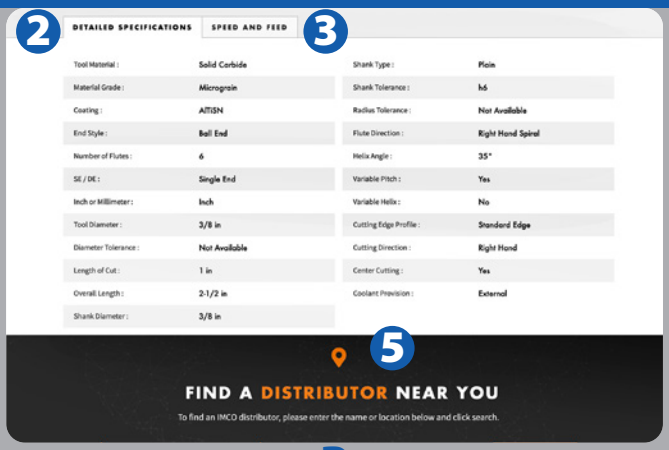
D = Tool diameter **HEM = High-efficiency machining (chip thinning calculations have already been applied to HEM parameters shown).*

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Scan to calculate speeds and feed rates with Toolbot



A



B

ISO Code	Work Material	Type of Cut	Tool LC/ Dia.	Axial DOC	Radial DOC	Ramp Angle	Number of Flutes	Speed (SFM)	Feed (Inch per Tooth) 1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
N	Aluminum alloys 2024, 6061, 7075 Magnesium alloys O-T6	Slotting	≤ 2	1 x D	1 x D	-	3	800	.0015	.0023	.0030	.0038	.0045	.0060	.0075	.0090	.0120
		Peripheral - Rough	≤ 2	1 x D	.75 x D	-	3	1000	.0020	.0030	.0040	.0050	.0060	.0080	.0100	.0120	.0160
		Peripheral - Rough	> 2 - 3	1 x D	.75 x D	-	3	1000	.0019	.0028	.0038	.0047	.0056	.0075	.0094	.0113	.0150
		Peripheral - Rough	> 3 - 4	1 x D	.75 x D	-	3	900	.0016	.0024	.0032	.0041	.0049	.0065	.0081	.0097	.0130
		Peripheral - Rough	> 4 - 5	1 x D	.75 x D	-	3	800	.0014	.0022	.0029	.0036	.0043	.0058	.0072	.0086	.0115
		Finish	≤ 2.5	2 x D	.015 x D	-	3	1200	.0007	.0010	.0014	.0017	.0020	.0027	.0034	.0041	.0054
		Helical Ramp	≤ 2	2 x D	1 x D	15 deg	3	800	.0015	.0023	.0030	.0038	.0045	.0060	.0075	.0090	.0120
		Straight Line Ramp	≤ 2	1 x D	1 x D	45 deg	3	800	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060	.0080
	Aluminum alloys 2024, 6061, 7075 hardened or anodized	Slotting	≤ 2	1 x D	1 x D	-	3	780	.0014	.0020	.0027	.0034	.0041	.0055	.0068	.0082	.0109
		Peripheral - Rough	≤ 2	1 x D	.75 x D	-	3	950	.0020	.0029	.0039	.0049	.0059	.0078	.0098	.0117	.0156
		Peripheral - Rough	> 2 - 3	1 x D	.75 x D	-	3	950	.0018	.0027	.0037	.0046	.0055	.0073	.0092	.0110	.0147
		Peripheral - Rough	> 3 - 4	1 x D	.625 x D	-	3	855	.0016	.0024	.0032	.0039	.0047	.0063	.0079	.0095	.0126
		Peripheral - Rough	> 4 - 5	1 x D	.625 x D	-	3	760	.0014	.0021	.0028	.0035	.0042	.0056	.0070	.0084	.0112
		Finish	≤ 2.5	2 x D	.010 x D	-	3	1170	.0006	.0009	.0012	.0015	.0018	.0024	.0030	.0037	.0049
		Helical Ramp	≤ 2	2 x D	1 x D	15 deg	3	800	.0015	.0023	.0030	.0038	.0045	.0060	.0075	.0090	.0120
		Straight Line Ramp	≤ 2	1 x D	1 x D	45 deg	3	800	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060	.0080
	High-silicon Aluminum alloys A380, A390 Bhn 30-150 500kg	Slotting	≤ 2	.75 x D	1 x D	-	3	500	.0011	.0017	.0023	.0028	.0034	.0045	.0056	.0068	.0090
		Peripheral - Rough	≤ 2	1 x D	.5 x D	-	3	700	.0014	.0021	.0029	.0036	.0043	.0057	.0071	.0086	.0114
		Peripheral - Rough	> 2 - 3	1 x D	.5 x D	-	3	700	.0014	.0021	.0027	.0034	.0041	.0055	.0068	.0082	.0109
		Peripheral - Rough	> 3 - 4	1 x D	.4 x D	-	3	600	.0012	.0018	.0024	.0030	.0036	.0048	.0061	.0073	.0097
		Peripheral - Rough	> 4 - 5	1 x D	.4 x D	-	3	500	.0010	.0015	.0020	.0025	.0030	.0040	.0051	.0061	.0081
		Finish	≤ 2.5	2 x D	.015 x D	-	3	900	.0006	.0009	.0013	.0016	.0019	.0025	.0031	.0038	.0050
		Helical Ramp	≤ 2	2 x D	1 x D	15 deg	3	500	.0011	.0017	.0023	.0028	.0034	.0045	.0056	.0068	.0090
		Straight Line Ramp	≤ 2	1 x D	1 x D	45 deg	3	500	.0008	.0011	.0015	.0019	.0023	.0030	.0038	.0045	.0061
	High-silicon aluminum alloys A380, A390 anodized	Slotting	≤ 2	.75 x D	1 x D	-	3	488	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060	.0080
		Peripheral - Rough	≤ 2	1 x D	.45 x D	-	3	690	.0014	.0021	.0029	.0036	.0043	.0057	.0071	.0086	.0114
		Peripheral - Rough	> 2 - 3	1 x D	.45 x D	-	3	690	.0014	.0021	.0027	.0034	.0041	.0055	.0068	.0082	.0109
		Peripheral - Rough	> 3 - 4	1 x D	.375 x D	-	3	621	.0012	.0018	.0024	.0030	.0036	.0048	.0061	.0073	.0097
		Peripheral - Rough	> 4 - 5	1 x D	.375 x D	-	3	552	.0010	.0015	.0020	.0025	.0030	.0040	.0051	.0061	.0081
		Finish	≤ 2.5	2 x D	.010 x D	-	3	878	.0006	.0008	.0011	.0014	.0017	.0022	.0028	.0034	.0045
		Helical Ramp	≤ 2	2 x D	1 x D	15 deg	3	488	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060	.0080
		Straight Line Ramp	≤ 2	1 x D	1 x D	45 deg	3	488	.0007	.0010	.0013	.0017	.0020	.0027	.0033	.0040	.0053
	Copper, brass 10-80 HRb	Slotting	≤ 2	.75 x D	1 x D	-	3	500	.0009	.0014	.0019	.0023	.0028	.0037	.0046	.0056	.0074
		Peripheral - Rough	≤ 2	1 x D	.75 x D	-	3	600	.0012	.0017	.0023	.0029	.0035	.0046	.0058	.0069	.0092
		Peripheral - Rough	> 2 - 3	1 x D	.75 x D	-	3	600	.0011	.0017	.0022	.0028	.0033	.0045	.0056	.0067	.0089
		Peripheral - Rough	> 3 - 4	1 x D	.75 x D	-	3	500	.0010	.0014	.0019	.0024	.0029	.0039	.0048	.0058	.0077
		Peripheral - Rough	> 4 - 5	1 x D	.75 x D	-	3	450	.0008	.0012	.0017	.0021	.0025	.0033	.0041	.0050	.0066
		Finish	≤ 2.5	2 x D	.015 x D	-	3	650	.0005	.0008	.0011	.0013	.0016	.0021	.0026	.0032	.0042
		Helical Ramp	≤ 2	2 x D	1 x D	15 deg	3	500	.0009	.0014	.0019	.0023	.0028	.0037	.0046	.0056	.0074
		Straight Line Ramp	≤ 2	1 x D	1 x D	25 deg	3	500	.0006	.0009	.0012	.0016	.0019	.0025	.0031	.0037	.0050
	Copper alloys, brass alloys 81-100 HRb	Slotting	≤ 2	.75 x D	1 x D	-	3	488	.0009	.0014	.0018	.0023	.0027	.0036	.0045	.0054	.0072
		Peripheral - Rough	≤ 2	1 x D	.75 x D	-	3	590	.0012	.0017	.0023	.0029	.0035	.0046	.0058	.0069	.0092
		Peripheral - Rough	> 2 - 3	1 x D	.75 x D	-	3	590	.0011	.0017	.0022	.0028	.0033	.0044	.0055	.0066	.0088
		Peripheral - Rough	> 3 - 4	1 x D	.625 x D	-	3	492	.0009	.0014	.0019	.0024	.0028	.0038	.0047	.0057	.0075
		Peripheral - Rough	> 4 - 5	1 x D	.625 x D	-	3	443	.0008	.0012	.0016	.0020	.0024	.0032	.0040	.0048	.0064
		Finish	≤ 2.5	2 x D	.010 x D	-	3	634	.0005	.0007	.0010	.0012	.0015	.0020	.0024	.0029	.0039
		Helical Ramp	≤ 2	2 x D	1 x D	15 deg	3	488	.0009	.0014	.0018	.0023	.0027	.0036	.0045	.0054	.0072
		Straight Line Ramp	≤ 2	1 x D	1 x D	25 deg	3	488	.0006	.0009	.0012	.0015	.0018	.0024	.0030	.0036	.0048
	Bronze Bhn 166-186	Slotting	≤ 2	.75 x D	1 x D	-	3	500	.0009	.0013	.0018	.0022	.0026	.0035	.0044	.0053	.0070
		Peripheral - Rough	≤ 2	1 x D	.5 x D	-	3	600	.0011	.0017	.0022	.0028	.0033	.0044	.0055	.0066	.0088
		Peripheral - Rough	> 2 - 3	1 x D	.5 x D	-	3	600	.0010	.0016	.0021	.0026	.0031	.0042	.0052	.0063	.0084
		Peripheral - Rough	> 3 - 4	1 x D	.4 x D	-	3	500	.0009	.0013	.0018	.0022	.0026	.0035	.0044	.0053	.0070
		Peripheral - Rough	> 4 - 5	1 x D	.4 x D	-	3	450	.0007	.0011	.0015	.0019	.0022	.0030	.0037	.0045	.0059
		Finish	≤ 2.5	2 x D	.015 x D	-	3	650	.0005	.0007	.0010	.0012	.0014	.0019	.0024	.0029	.0038
		Helical Ramp	≤ 2	2 x D	1 x D	12 deg	3	500	.0009	.0013	.0018	.0022	.0026	.0035	.0044	.0053	.0070
		Straight Line Ramp	≤ 2	1 x D	1 x D	20 deg	3	500	.0006	.0009	.0012	.0015	.0018	.0023	.0029	.0035	.0047
	Bronze high-tin bronze, manganese bronze, work-hardened bronze Bhn 187-212	Slotting	≤ 2	.75 x D	1 x D	-	3	488	.0009	.0013	.0017	.0021	.0026	.0034	.0043	.0051	.0068
		Peripheral - Rough	≤ 2	1 x D	.45 x D	-	3	590	.0011	.0017	.0022	.0028	.0033	.0044	.0055	.0066	.0088
		Peripheral - Rough	> 2 - 3	1 x D	.45 x D	-	3	590	.0010	.0016	.0021	.0026	.0031	.0042	.0052	.0063	.0084
		Peripheral - Rough	> 3 - 4	1 x D	.375 x D	-	3	492	.0009	.0013	.0018	.0022	.0026	.0035	.0044	.0053	.0070
		Peripheral - Rough	> 4 - 5	1 x D	.375 x D	-	3	443	.0007	.0011	.0015	.0019	.0022	.0030	.0037	.0045	.0059
		Finish	≤ 2.5	2 x D	.010 x D	-	3	634	.0004	.0007	.0009	.0011	.0013	.0018	.0022	.0026	.0035
		Helical Ramp	≤ 2	2 x D	1 x D	12 deg	3	488	.0009	.0013	.0017	.0021	.0026	.0034	.0043	.0051	.0068
		Straight Line Ramp	≤ 2	1 x D	1 x D	20 deg	3	488	.0006	.0009	.0011	.0014	.0017	.0023	.0029	.0034	.0046
	Composites, plastics, fiberglass	Slotting	≤ 2	1 x D	1 x D	-	3	500	.0011	.0017	.0023	.0028	.0034	.0045	.0056	.0068	.0090
		Peripheral - Rough	≤ 2	1 x D	.75 x D	-	3	700	.0014	.0021	.0029	.0036	.0043	.0057	.0071	.0086	.0114
		Peripheral - Rough	> 2 - 3	1 x D	.75 x D	-	3	700	.0014	.0021	.0027	.0034	.0041	.0055	.0068	.0082	.0109
		Peripheral - Rough	> 3 - 4	1 x D	.75 x D	-	3	600	.0012	.0018	.0024	.0030	.0036	.0048	.0061	.0073	.0097
		Peripheral - Rough	> 4 - 5	1 x D	.75 x D	-	3	500	.0010	.0015	.0020	.0025	.0030	.0040	.0051	.0061	.0081
		Finish	≤ 2.5	2 x D	.015 x D	-	3	900	.0006	.0009	.0013	.0016	.0019	.0025	.0031	.0038	.0050
		Helical Ramp	≤ 2	2 x D	1 x D	15 deg	3	500	.0011	.0017	.0023	.0028	.0034	.0045	.0056	.0068	.0090
		Straight Line Ramp	≤ 2	1 x D	1 x D	45 deg	3	500	.0008	.0011	.0015	.0019	.0023	.0030	.0038	.0045	.0061

D = Tool diameter

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$

$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

ISO Code	Work Material	Type of Cut	Tool LBS/ Dia.	Axial DOC	Radial DOC	Ramp Angle	Number of Flutes	Speed (SFM)	Feed (Inch per Tooth) 1/8	3/16	1/4	3/8	1/2	5/8	3/4	1
N	Aluminum alloys 2024, 6061, 7075 Magnesium alloys O-T6	Slotting	>2-3	1 x D	1 x D	-	3	800	.0015	.0023	.0030	.0045	.0060	.0075	.0090	.0120
		Peripheral -Rough	>2-3	1 x D	.75 x D	-	3	1000	.0020	.0030	.0040	.0060	.0080	.0100	.0120	.0160
		Peripheral -Rough	>3-4	1 x D	.75 x D	-	3	1000	.0019	.0028	.0038	.0056	.0075	.0094	.0113	.0150
		Peripheral -Rough	>4-5	1 x D	.75 x D	-	3	900	.0016	.0024	.0032	.0049	.0065	.0081	.0097	.0130
		Peripheral -Rough	>5-6	1 x D	.625 x D	-	3	800	.0014	.0022	.0029	.0043	.0058	.0072	.0086	.0115
		Finish	>2-3	3 x D	.015 x D	-	3	1200	.0007	.0010	.0014	.0020	.0027	.0034	.0041	.0054
		Helical Ramp	>2-3	3 x D	1 x D	15 deg	3	800	.0015	.0023	.0030	.0045	.0060	.0075	.0090	.0120
		Straight Line Ramp	>2-3	1 x D	1 x D	45 deg	3	800	.0010	.0015	.0020	.0030	.0040	.0050	.0060	.0080
	Aluminum alloys 2024, 6061, 7075 hardened or anodized	Slotting	>2-3	1 x D	1 x D	-	3	780	.0014	.0020	.0027	.0041	.0055	.0068	.0082	.0109
		Peripheral -Rough	>2-3	1 x D	.75 x D	-	3	950	.0020	.0029	.0039	.0059	.0078	.0098	.0117	.0156
		Peripheral -Rough	>3-4	1 x D	.625 x D	-	3	950	.0018	.0027	.0037	.0055	.0073	.0092	.0110	.0147
		Peripheral -Rough	>4-5	1 x D	.625 x D	-	3	855	.0016	.0024	.0032	.0047	.0063	.0079	.0095	.0126
		Peripheral -Rough	>5-6	.75 x D	.5 x D	-	3	760	.0014	.0021	.0028	.0042	.0056	.0070	.0084	.0112
		Finish	>2-3	3 x D	.010 x D	-	3	1170	.0006	.0009	.0012	.0018	.0024	.0030	.0037	.0049
		Helical Ramp	>2-3	3 x D	1 x D	15 deg	3	780	.0014	.0020	.0027	.0041	.0055	.0068	.0082	.0109
		Straight Line Ramp	>2-3	1 x D	1 x D	45 deg	3	780	.0009	.0014	.0018	.0027	.0037	.0046	.0055	.0073
	High-silicon Aluminum alloys A380, A390 Bhn 30-150 500kg	Slotting	>2-3	.75 x D	1 x D	-	3	500	.0011	.0017	.0023	.0034	.0045	.0056	.0068	.0090
		Peripheral -Rough	>2-3	1 x D	.5 x D	-	3	700	.0014	.0021	.0029	.0043	.0057	.0071	.0086	.0114
		Peripheral -Rough	>3-4	1 x D	.4 x D	-	3	700	.0014	.0021	.0027	.0041	.0055	.0068	.0082	.0109
		Peripheral -Rough	>4-5	1 x D	.4 x D	-	3	600	.0012	.0018	.0024	.0036	.0048	.0061	.0073	.0097
		Peripheral -Rough	>5-6	1 x D	.3 x D	-	3	500	.0010	.0015	.0020	.0030	.0040	.0051	.0061	.0081
		Finish	>2-3	3 x D	.015 x D	-	3	900	.0006	.0009	.0013	.0019	.0025	.0031	.0038	.0050
		Helical Ramp	>2-3	3 x D	1 x D	15 deg	3	500	.0011	.0017	.0023	.0034	.0045	.0056	.0068	.0090
		Straight Line Ramp	>2-3	1 x D	1 x D	45 deg	3	500	.0008	.0011	.0015	.0023	.0030	.0038	.0045	.0061
	High-silicon aluminum alloys A380, A390 anodized	Slotting	>2-3	.75 x D	1 x D	-	3	488	.0010	.0015	.0020	.0030	.0040	.0050	.0060	.0080
		Peripheral -Rough	>2-3	1 x D	.45 x D	-	3	690	.0014	.0021	.0029	.0043	.0057	.0071	.0086	.0114
		Peripheral -Rough	>3-4	1 x D	.375 x D	-	3	690	.0014	.0021	.0027	.0041	.0055	.0068	.0082	.0109
		Peripheral -Rough	>4-5	1 x D	.375 x D	-	3	621	.0012	.0018	.0024	.0036	.0048	.0061	.0073	.0097
		Peripheral -Rough	>5-6	.75 x D	.3 x D	-	3	552	.0010	.0015	.0020	.0030	.0040	.0051	.0061	.0081
		Finish	>2-3	3 x D	.010 x D	-	3	878	.0006	.0008	.0011	.0017	.0022	.0028	.0034	.0045
		Helical Ramp	>2-3	3 x D	1 x D	15 deg	3	488	.0010	.0015	.0020	.0030	.0040	.0050	.0060	.0080
		Straight Line Ramp	>2-3	1 x D	1 x D	45 deg	3	488	.0007	.0010	.0013	.0020	.0027	.0033	.0040	.0053
	Copper, brass	Slotting	>2-3	.75 x D	1 x D	-	3	500	.0009	.0014	.0019	.0028	.0037	.0046	.0056	.0074
		Peripheral -Rough	>2-3	1 x D	.75 x D	-	3	600	.0012	.0017	.0023	.0035	.0046	.0058	.0069	.0092
		Peripheral -Rough	>3-4	1 x D	.75 x D	-	3	600	.0011	.0017	.0022	.0033	.0045	.0056	.0067	.0089
		Peripheral -Rough	>4-5	1 x D	.75 x D	-	3	500	.0010	.0014	.0019	.0029	.0039	.0048	.0058	.0077
		Peripheral -Rough	>5-6	1 x D	.625 x D	-	3	450	.0008	.0012	.0017	.0025	.0033	.0041	.0050	.0066
		Finish	>2-3	3 x D	.015 x D	-	3	650	.0005	.0008	.0011	.0016	.0021	.0026	.0032	.0042
		Helical Ramp	>2-3	3 x D	1 x D	15 deg	3	500	.0009	.0014	.0019	.0028	.0037	.0046	.0056	.0074
		Straight Line Ramp	>2-3	1 x D	1 x D	25 deg	3	500	.0006	.0009	.0012	.0019	.0025	.0031	.0037	.0050
	Copper alloys, Brass alloys	Slotting	>2-3	.75 x D	1 x D	-	3	488	.0009	.0014	.0018	.0027	.0036	.0045	.0054	.0072
		Peripheral -Rough	>2-3	1 x D	.75 x D	-	3	590	.0012	.0017	.0023	.0035	.0046	.0058	.0069	.0092
		Peripheral -Rough	>3-4	1 x D	.625 x D	-	3	590	.0011	.0017	.0022	.0033	.0044	.0055	.0066	.0088
		Peripheral -Rough	>4-5	1 x D	.625 x D	-	3	492	.0009	.0014	.0019	.0028	.0038	.0047	.0057	.0075
		Peripheral -Rough	>5-6	.75 x D	.5 x D	-	3	443	.0008	.0012	.0016	.0024	.0032	.0040	.0048	.0064
		Finish	>2-3	3 x D	.010 x D	-	3	634	.0005	.0007	.0010	.0015	.0020	.0024	.0029	.0039
		Helical Ramp	>2-3	3 x D	1 x D	15 deg	3	488	.0009	.0014	.0018	.0027	.0036	.0045	.0054	.0072
		Straight Line Ramp	>2-3	1 x D	1 x D	25 deg	3	488	.0006	.0009	.0012	.0018	.0024	.0030	.0036	.0048
	Bronze	Slotting	>2-3	.75 x D	1 x D	-	3	500	.0009	.0013	.0018	.0026	.0035	.0044	.0053	.0070
		Peripheral -Rough	>2-3	1 x D	.5 x D	-	3	600	.0011	.0017	.0022	.0033	.0044	.0055	.0066	.0088
		Peripheral -Rough	>3-4	1 x D	.4 x D	-	3	600	.0010	.0016	.0021	.0031	.0042	.0052	.0063	.0084
		Peripheral -Rough	>4-5	1 x D	.4 x D	-	3	500	.0009	.0013	.0018	.0026	.0035	.0044	.0053	.0070
		Peripheral -Rough	>5-6	1 x D	.3 x D	-	3	450	.0007	.0011	.0015	.0022	.0030	.0037	.0045	.0059
		Finish	>2-3	3 x D	.015 x D	-	3	650	.0005	.0007	.0010	.0014	.0019	.0024	.0029	.0038
		Helical Ramp	>2-3	3 x D	1 x D	12 deg	3	500	.0009	.0013	.0018	.0026	.0035	.0044	.0053	.0070
		Straight Line Ramp	>2-3	1 x D	1 x D	20 deg	3	500	.0006	.0009	.0012	.0018	.0023	.0029	.0035	.0047
	Bronze high-tin bronze, manganese bronze, work-hardened bronze	Slotting	>2-3	.75 x D	1 x D	-	3	488	.0009	.0013	.0017	.0026	.0034	.0043	.0051	.0068
		Peripheral -Rough	>2-3	1 x D	.45 x D	-	3	590	.0011	.0017	.0022	.0033	.0044	.0055	.0066	.0088
		Peripheral -Rough	>3-4	1 x D	.375 x D	-	3	590	.0010	.0016	.0021	.0031	.0042	.0052	.0063	.0084
		Peripheral -Rough	>4-5	1 x D	.375 x D	-	3	492	.0009	.0013	.0018	.0026	.0035	.0044	.0053	.0070
		Peripheral -Rough	>5-6	.75 x D	.3 x D	-	3	443	.0007	.0011	.0015	.0022	.0030	.0037	.0045	.0059
		Finish	>2-3	3 x D	.010 x D	-	3	634	.0004	.0007	.0009	.0013	.0018	.0022	.0026	.0035
		Helical Ramp	>2-3	3 x D	1 x D	12 deg	3	488	.0009	.0013	.0017	.0026	.0034	.0043	.0051	.0068
		Straight Line Ramp	>2-3	1 x D	1 x D	20 deg	3	488	.0006	.0009	.0011	.0017	.0023	.0029	.0034	.0046
	Composites, plastics, fiberglass	Slotting	>2-3	1 x D	1 x D	-	3	500	.0011	.0017	.0023	.0034	.0045	.0056	.0068	.0090
		Peripheral - Rough	>2-3	1 x D	.75 x D	-	3	700	.0014	.0021	.0029	.0043	.0057	.0071	.0086	.0114
		Peripheral - Rough	>3-4	1 x D	.75 x D	-	3	700	.0014	.0021	.0027	.0041	.0055	.0068	.0082	.0109
		Peripheral - Rough	>4-5	1 x D	.75 x D	-	3	600	.0012	.0018	.0024	.0036	.0048	.0061	.0073	.0097
		Peripheral -Rough	>5-6	1 x D	.625 x D	-	3	500	.0010	.0015	.0020	.0030	.0040	.0051	.0061	.0081
		Finish	>2-3	3 x D	.015 x D	-	3	900	.0006	.0009	.0013	.0019	.0025	.0031	.0038	.0050
		Helical Entry	>2-3	3 x D	1 x D	15 deg	3	500	.0011	.0017	.0023	.0034	.0045	.0056	.0068	.0090
		Straight Line Ramp	>2-3	1 x D	1 x D	45 deg	3	500	.0008	.0011	.0015	.0023	.0030	.0038	.0045	.0061

D = Tool diameter

Tool LC/Dia equals amount of tool projection from the holder.

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (SFM)	Feed (Inch per Tooth) 1/8	3/16	1/4	3/8	1/2	5/8	3/4	1
N	Aluminum alloys 6061, 7075, 2024	Slotting	1 x D	1 x D	3	800	.0015	.0030	.0038	.0045	.0060	.0075	.0090	.0120
		Peripheral - Rough	≤ 2 x D	.5 x D	3	1000	.0020	.0040	.0050	.0060	.0080	.0100	.0120	.0160
		Peripheral - Rough	> 2 - 3 x D	.5 x D	3	1000	.0019	.0038	.0047	.0056	.0075	.0094	.0113	.0150
		Peripheral - Rough	> 3 - 4 x D	.45 x D	3	900	.0016	.0033	.0041	.0049	.0065	.0081	.0098	.0130
		Peripheral - Rough	> 4 - 5 x D	.4 x D	3	800	.0015	.0029	.0036	.0044	.0058	.0073	.0087	.0116
		Finish	2.5 x D	.015 x D	3	1200	.0007	.0014	.0017	.0020	.0027	.0034	.0041	.0054
		*Helical Ramp Angle	3.0 deg.	1 x D	3	800	.0012	.0024	.0030	.0036	.0048	.0060	.0072	.0096
	High-silicon aluminum A380, A390	Slotting	.75 x D	1 x D	3	500	.0011	.0023	.0028	.0034	.0045	.0056	.0068	.0090
		Peripheral - Rough	≤ 2 x D	.4 x D	3	700	.0014	.0029	.0036	.0043	.0057	.0071	.0086	.0114
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	700	.0014	.0028	.0034	.0041	.0055	.0069	.0083	.0110
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	600	.0012	.0024	.0030	.0036	.0048	.0060	.0072	.0096
		Peripheral - Rough	> 4 - 5 x D	.35 x D	3	500	.0010	.0020	.0025	.0030	.0040	.0050	.0060	.0080
		Finish	2.5 x D	.015 x D	3	900	.0006	.0013	.0016	.0019	.0025	.0031	.0038	.0050
		*Helical Ramp Angle	2.5 deg.	1 x D	3	500	.0009	.0018	.0023	.0027	.0036	.0045	.0054	.0072
	Magnesium alloys	Slotting	1 x D	1 x D	3	800	.0015	.0030	.0038	.0045	.0060	.0075	.0090	.0120
		Peripheral - Rough	≤ 2 x D	.5 x D	3	1000	.0020	.0040	.0050	.0060	.0080	.0100	.0120	.0160
		Peripheral - Rough	> 2 - 3 x D	.5 x D	3	1000	.0019	.0038	.0047	.0056	.0075	.0094	.0113	.0150
		Peripheral - Rough	> 3 - 4 x D	.45 x D	3	900	.0016	.0033	.0041	.0049	.0065	.0081	.0098	.0130
		Peripheral - Rough	> 4 - 5 x D	.4 x D	3	800	.0015	.0029	.0036	.0044	.0058	.0073	.0087	.0116
		Finish	2.5 x D	.015 x D	3	1200	.0007	.0014	.0017	.0020	.0027	.0034	.0041	.0054
		*Helical Ramp Angle	3.0 deg.	1 x D	3	800	.0012	.0024	.0030	.0036	.0048	.0060	.0072	.0096
	Copper alloys, brass	Slotting	.75 x D	1 x D	3	500	.0009	.0019	.0023	.0028	.0037	.0046	.0056	.0074
		Peripheral - Rough	≤ 2 x D	.4 x D	3	600	.0012	.0023	.0029	.0035	.0046	.0058	.0069	.0092
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	600	.0011	.0023	.0028	.0034	.0045	.0056	.0068	.0090
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	500	.0010	.0020	.0024	.0029	.0039	.0049	.0059	.0078
		Peripheral - Rough	> 4 - 5 x D	.35 x D	3	450	.0008	.0017	.0021	.0025	.0033	.0041	.0050	.0066
		Finish	2.5 x D	.015 x D	3	650	.0005	.0011	.0013	.0016	.0021	.0026	.0032	.0042
		*Helical Ramp Angle	2.5 deg.	1 x D	3	500	.0007	.0015	.0019	.0022	.0030	.0037	.0044	.0059
	Bronze	Slotting	.75 x D	1 x D	3	500	.0009	.0018	.0022	.0026	.0035	.0044	.0053	.0070
		Peripheral - Rough	≤ 2 x D	.4 x D	3	600	.0011	.0022	.0028	.0033	.0044	.0055	.0066	.0088
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	600	.0011	.0021	.0026	.0032	.0042	.0053	.0063	.0084
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	500	.0009	.0018	.0022	.0026	.0035	.0044	.0053	.0070
		Peripheral - Rough	> 4 - 5 x D	.35 x D	3	450	.0007	.0015	.0018	.0022	.0029	.0036	.0044	.0058
		Finish	2.5 x D	.015 x D	3	650	.0005	.0010	.0012	.0014	.0019	.0024	.0029	.0038
		*Helical Ramp Angle	2.0 deg.	1 x D	3	500	.0007	.0014	.0018	.0021	.0028	.0035	.0042	.0056
	Composites, plastic, fiberglass	Slotting	.75 x D	1 x D	3	500	.0011	.0023	.0028	.0034	.0045	.0056	.0068	.0090
		Peripheral - Rough	≤ 2 x D	.4 x D	3	700	.0014	.0029	.0036	.0043	.0057	.0071	.0086	.0114
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	700	.0014	.0028	.0034	.0041	.0055	.0069	.0083	.0110
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	600	.0012	.0024	.0030	.0036	.0048	.0060	.0072	.0096
		Peripheral - Rough	> 4 - 5 x D	.35 x D	3	500	.0010	.0020	.0025	.0030	.0040	.0050	.0060	.0080
		Finish	2.5 x D	.015 x D	3	900	.0006	.0013	.0016	.0019	.0025	.0031	.0038	.0050
		*Helical Ramp Angle	3.0 deg.	1 x D	3	500	.0009	.0018	.0023	.0027	.0036	.0045	.0054	.0072

**Straight-line ramp angle = Helical ramp angle x 5 for entry up to 1 x D.*

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (M/min)	Feed (MM per Tooth) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
N	Aluminum alloys 6061, 7075, 2024	Slotting	1 x D	1 x D	3	244	.0360	.0479	.0600	.0720	.0960	.1195	.1440	.1915	.2390	.2995
		Peripheral - Rough	≤ 2 x D	.5 x D	3	305	.0480	.0639	.0800	.0960	.1280	.1593	.1920	.2553	.3187	.3993
		Peripheral - Rough	> 2 - 3 x D	.5 x D	3	305	.0450	.0599	.0750	.0900	.1200	.1494	.1800	.2394	.2988	.3744
		Peripheral - Rough	> 3 - 4 x D	.45 x D	3	274	.0390	.0519	.0650	.0780	.1040	.1295	.1560	.2075	.2589	.3245
		Peripheral - Rough	> 4 - 5 x D	.4 x D	3	244	.0348	.0463	.0580	.0696	.0928	.1155	.1392	.1851	.2311	.2895
		Finish	2.5 x D	.015 x D	3	366	.0162	.0216	.0270	.0324	.0432	.0538	.0648	.0862	.1076	.1348
		*Helical Ramp Angle	3.0 deg.	1 x D	3	244	.0288	.0384	.0480	.0576	.0768	.0956	.1152	.1532	.1912	.2396
	High-silicon aluminum A380, A390	Slotting	.75 x D	1 x D	3	152	.0270	.0360	.0450	.0540	.0720	.0896	.1080	.1436	.1793	.2246
		Peripheral - Rough	≤ 2 x D	.4 x D	3	213	.0342	.0456	.0570	.0684	.0912	.1135	.1368	.1819	.2271	.2845
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	213	.0330	.0440	.0550	.0660	.0880	.1096	.1320	.1755	.2191	.2745
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	183	.0288	.0384	.0480	.0576	.0768	.0956	.1152	.1532	.1912	.2396
		Peripheral - Rough	> 4 - 5 x D	.35 x D	3	152	.0240	.0320	.0400	.0480	.0640	.0797	.0960	.1277	.1593	.1997
		Finish	2.5 x D	.015 x D	3	274	.0150	.0200	.0250	.0300	.0400	.0498	.0600	.0798	.0996	.1248
		*Helical Ramp Angle	2.5 deg.	1 x D	3	152	.0216	.0288	.0360	.0432	.0576	.0717	.0864	.1149	.1434	.1797
	Magnesium alloys	Slotting	1 x D	1 x D	3	244	.0360	.0479	.0600	.0720	.0960	.1195	.1440	.1915	.2390	.2995
		Peripheral - Rough	≤ 2 x D	.5 x D	3	305	.0480	.0639	.0800	.0960	.1280	.1593	.1920	.2553	.3187	.3993
		Peripheral - Rough	> 2 - 3 x D	.5 x D	3	305	.0450	.0599	.0750	.0900	.1200	.1494	.1800	.2394	.2988	.3744
		Peripheral - Rough	> 3 - 4 x D	.45 x D	3	274	.0390	.0519	.0650	.0780	.1040	.1295	.1560	.2075	.2589	.3245
		Peripheral - Rough	> 4 - 5 x D	.4 x D	3	244	.0348	.0463	.0580	.0696	.0928	.1155	.1392	.1851	.2311	.2895
		Finish	2.5 x D	.015 x D	3	366	.0162	.0216	.0270	.0324	.0432	.0538	.0648	.0862	.1076	.1348
		*Helical Ramp Angle	3.0 deg.	1 x D	3	244	.0288	.0384	.0480	.0576	.0768	.0956	.1152	.1532	.1912	.2396
	Copper alloys, brass	Slotting	.75 x D	1 x D	3	152	.0222	.0296	.0370	.0444	.0592	.0737	.0888	.1181	.1474	.1847
		Peripheral - Rough	≤ 2 x D	.4 x D	3	183	.0276	.0368	.0460	.0552	.0736	.0916	.1104	.1468	.1832	.2296
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	183	.0270	.0360	.0450	.0540	.0720	.0896	.1080	.1436	.1793	.2246
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	152	.0234	.0312	.0390	.0468	.0624	.0777	.0936	.1245	.1554	.1947
		Peripheral - Rough	> 4 - 5 x D	.35 x D	3	137	.0198	.0264	.0330	.0396	.0528	.0657	.0792	.1053	.1315	.1647
		Finish	2.5 x D	.015 x D	3	198	.0126	.0168	.0210	.0252	.0336	.0418	.0504	.0670	.0837	.1048
		*Helical Ramp Angle	2.5 deg.	1 x D	3	152	.0178	.0237	.0296	.0355	.0474	.0590	.0710	.0945	.1179	.1478
	Bronze	Slotting	.75 x D	1 x D	3	152	.0210	.0280	.0350	.0420	.0560	.0697	.0840	.1117	.1394	.1747
		Peripheral - Rough	≤ 2 x D	.4 x D	3	183	.0264	.0352	.0440	.0528	.0704	.0876	.1056	.1404	.1753	.2196
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	183	.0252	.0336	.0420	.0504	.0672	.0837	.1008	.1341	.1673	.2096
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	152	.0210	.0280	.0350	.0420	.0560	.0697	.0840	.1117	.1394	.1747
		Peripheral - Rough	> 4 - 5 x D	.35 x D	3	137	.0174	.0232	.0290	.0348	.0464	.0578	.0696	.0926	.1155	.1448
		Finish	2.5 x D	.015 x D	3	198	.0114	.0152	.0190	.0228	.0304	.0378	.0456	.0606	.0757	.0948
		*Helical Ramp Angle	2.0 deg.	1 x D	3	152	.0168	.0224	.0280	.0336	.0448	.0558	.0672	.0894	.1115	.1398
	Composites, plastic, fiberglass	Slotting	.75 x D	1 x D	3	152	.0270	.0360	.0450	.0540	.0720	.0896	.1080	.1436	.1793	.2246
		Peripheral - Rough	≤ 2 x D	.4 x D	3	213	.0342	.0456	.0570	.0684	.0912	.1135	.1368	.1819	.2271	.2845
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	213	.0330	.0440	.0550	.0660	.0880	.1096	.1320	.1755	.2191	.2745
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	183	.0288	.0384	.0480	.0576	.0768	.0956	.1152	.1532	.1912	.2396
		Peripheral - Rough	> 4 - 5 x D	.35 x D	3	152	.0240	.0320	.0400	.0480	.0640	.0797	.0960	.1277	.1593	.1997
		Finish	2.5 x D	.015 x D	3	274	.0150	.0200	.0250	.0300	.0400	.0498	.0600	.0798	.0996	.1248
		*Helical Ramp Angle	3.0 deg.	1 x D	3	152	.0216	.0288	.0360	.0432	.0576	.0717	.0864	.1149	.1434	.1797

**Straight-line ramp angle = Helical ramp angle x 5 for entry up to 1 x D.*

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Scan to calculate speeds and feed rates with Toolbot

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (SFM)	Feed (Inches per Tooth) 1/4	3/8	1/2	5/8	3/4	1
N	Aluminum alloys 2024, 6061, 7075	Slotting	1 x D	1 x D	3	800	.0030	.0045	.0060	.0075	.0090	.0120
		Peripheral - Rough	≤ 2 x D	.5 x D	3	1000	.0040	.0060	.0080	.0100	.0120	.0160
		Peripheral - Rough	> 2 - 3 x D	.5 x D	3	1000	.0038	.0056	.0075	.0094	.0113	.0150
		Peripheral - Rough	> 3 - 4 x D	.45 x D	3	900	.0033	.0049	.0065	.0081	.0098	.0130
		*Helical Ramp Angle	3.0 deg.	1 x D	3	800	.0024	.0036	.0048	.0060	.0072	.0096
	High-silicon aluminum A380, A390	Slotting	.75 x D	1 x D	3	500	.0023	.0034	.0045	.0056	.0068	.0090
		Peripheral - Rough	≤ 2 x D	.4 x D	3	700	.0029	.0043	.0057	.0071	.0086	.0114
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	700	.0028	.0041	.0055	.0069	.0083	.0110
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	600	.0024	.0036	.0048	.0060	.0072	.0096
		*Helical Ramp Angle	2.5 deg.	1 x D	3	500	.0018	.0027	.0036	.0045	.0054	.0072
	Magnesium alloys	Slotting	1 x D	1 x D	3	800	.0030	.0045	.0060	.0075	.0090	.0120
		Peripheral - Rough	≤ 2 x D	.5 x D	3	1000	.0040	.0060	.0080	.0100	.0120	.0160
		Peripheral - Rough	> 2 - 3 x D	.5 x D	3	1000	.0038	.0056	.0075	.0094	.0113	.0150
		Peripheral - Rough	> 3 - 4 x D	.45 x D	3	900	.0033	.0049	.0065	.0081	.0098	.0130
		*Helical Ramp Angle	3.0 deg.	1 x D	3	800	.0024	.0036	.0048	.0060	.0072	.0096
	Copper alloys, arass	Slotting	.75 x D	1 x D	3	500	.0019	.0028	.0037	.0046	.0056	.0074
		Peripheral - Rough	≤ 2 x D	.4 x D	3	600	.0023	.0035	.0046	.0058	.0069	.0092
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	600	.0023	.0034	.0045	.0056	.0068	.0090
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	500	.0020	.0029	.0039	.0049	.0059	.0078
		*Helical Ramp Angle	2.5 deg.	1 x D	3	500	.0015	.0022	.0030	.0037	.0044	.0059
	Bronze	Slotting	.75 x D	1 x D	3	500	.0018	.0026	.0035	.0044	.0053	.0070
		Peripheral - Rough	≤ 2 x D	.4 x D	3	600	.0022	.0033	.0044	.0055	.0066	.0088
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	600	.0021	.0032	.0042	.0053	.0063	.0084
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	500	.0018	.0026	.0035	.0044	.0053	.0070
		*Helical Ramp Angle	2.0 deg.	1 x D	3	500	.0014	.0021	.0028	.0035	.0042	.0056
	Composites, plastics, fiberglass	Slotting	.75 x D	1 x D	3	500	.0023	.0034	.0045	.0056	.0068	.0090
		Peripheral - Rough	≤ 2 x D	.4 x D	3	700	.0029	.0043	.0057	.0071	.0086	.0114
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	700	.0028	.0041	.0055	.0069	.0083	.0110
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	600	.0024	.0036	.0048	.0060	.0072	.0096
		*Helical Ramp Angle	3.0 deg.	1 x D	3	500	.0018	.0027	.0036	.0045	.0054	.0072

**Straight-line ramp angle = Helical ramp angle x 5 for entry up to 1 x D.*

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

WHAT OUR SALES REPS BRING TO THE TABLE

IMCO sales reps are very valuable resources. They typically have years and years of metalworking experience. They know the process, the tools and the challenges.

Our reps have been there and done that – whatever operation you're knee-deep in. They're an immense library of metalworking knowledge and experts at offering suggestions/solutions to your most complicated challenges. They're always ready to help you optimize your process to increase your productivity. In fact, they may be able to

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (M/min)	Feed (MM per Tooth) 6.0	10.0	12.0	16.0	20.0
N	Aluminum alloys 2024, 6061, 7075	Slotting	1 x D	1 x D	3	244	.0720	.1195	.1440	.1915	.2390
		Peripheral - Rough	≤ 2 x D	.5 x D	3	305	.0960	.1593	.1920	.2553	.3187
		Peripheral - Rough	> 2 - 3 x D	.5 x D	3	305	.0900	.1494	.1800	.2394	.2988
		Peripheral - Rough	> 3 - 4 x D	.45 x D	3	274	.0780	.1295	.1560	.2075	.2589
		*Helical Ramp Angle	3.0 deg.	1 x D	3	244	.0576	.0956	.1152	.1532	.1912
	High-silicon aluminum A380, A390	Slotting	.75 x D	1 x D	3	152	.0540	.0896	.1080	.1436	.1793
		Peripheral - Rough	≤ 2 x D	.4 x D	3	213	.0684	.1135	.1368	.1819	.2271
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	213	.0660	.1096	.1320	.1755	.2191
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	183	.0576	.0956	.1152	.1532	.1912
		*Helical Ramp Angle	2.5 deg.	1 x D	3	152	.0432	.0717	.0864	.1149	.1434
	Magnesium alloys	Slotting	1 x D	1 x D	3	244	.0720	.1195	.1440	.1915	.2390
		Peripheral - Rough	≤ 2 x D	.5 x D	3	305	.0960	.1593	.1920	.2553	.3187
		Peripheral - Rough	> 2 - 3 x D	.5 x D	3	305	.0900	.1494	.1800	.2394	.2988
		Peripheral - Rough	> 3 - 4 x D	.45 x D	3	274	.0780	.1295	.1560	.2075	.2589
		*Helical Ramp Angle	3.0 deg.	1 x D	3	244	.0576	.0956	.1152	.1532	.1912
	Copper alloys, arass	Slotting	.75 x D	1 x D	3	152	.0444	.0737	.0888	.1181	.1474
		Peripheral - Rough	≤ 2 x D	.4 x D	3	183	.0552	.0916	.1104	.1468	.1832
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	183	.0540	.0896	.1080	.1436	.1793
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	152	.0468	.0777	.0936	.1245	.1554
		*Helical Ramp Angle	2.5 deg.	1 x D	3	152	.0355	.0590	.0710	.0945	.1179
	Bronze	Slotting	.75 x D	1 x D	3	152	.0420	.0697	.0840	.1117	.1394
		Peripheral - Rough	≤ 2 x D	.4 x D	3	183	.0528	.0876	.1056	.1404	.1753
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	183	.0504	.0837	.1008	.1341	.1673
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	152	.0420	.0697	.0840	.1117	.1394
		*Helical Ramp Angle	2.0 deg.	1 x D	3	152	.0336	.0558	.0672	.0894	.1115
	Composites, plastics, fiberglass	Slotting	.75 x D	1 x D	3	152	.0540	.0896	.1080	.1436	.1793
		Peripheral - Rough	≤ 2 x D	.4 x D	3	213	.0684	.1135	.1368	.1819	.2271
		Peripheral - Rough	> 2 - 3 x D	.4 x D	3	213	.0660	.1096	.1320	.1755	.2191
		Peripheral - Rough	> 3 - 4 x D	.375 x D	3	183	.0576	.0956	.1152	.1532	.1912
		*Helical Ramp Angle	3.0 deg.	1 x D	3	152	.0432	.0717	.0864	.1149	.1434

**Straight-line ramp angle = Helical ramp angle x 5 for entry up to 1 x D.*

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Scan to calculate speeds and feed rates with Toolbot

help conduct a comparative tool test to see which tool performs best under identical parameters. We have lots of ways to help you save valuable time and money.

Distributor sales reps also receive hands-on training at IMCO. That training means they're more than just familiar with the tools they recommend: They've seen the amazing feats these tools can do, up close and in person.

Both IMCO sales reps and the distributor salespeople they work with travel the country and talk with lots of people in our industry. At customer shops, trade shows, seminars, training sessions, webinars and other venues, they get access to the latest trends, new machining techniques, toolmaker initiatives and the direction/future of the metalworking industry.

So, if you haven't been in touch lately with your IMCO sales rep or your distributor's sales rep, now is a great time to reconnect and find out what's new.

Don't know your sales rep or contact information? Visit www.imcousa.com and scroll down the home page to find the "Find an IMCO Sales Rep" or "Find a Distributor" link.

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (SFM)	Feed (Inch per Tooth) 1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
N	Aluminum alloys 2024, 6061, 7075	Slotting	1 x D	1 x D	2	800	.0015	.0023	.0030	.0038	.0045	.0060	.0075	.0090	.0120
		Peripheral - Rough	1 x D	.75 x D	2	1000	.0019	.0028	.0038	.0047	.0056	.0075	.0094	.0113	.0150
		Peripheral - Finish	1.5 x D	.01 x D	2	1200	.0024	.0035	.0047	.0059	.0071	.0094	.0118	.0141	.0188
	High-silicon aluminum A380, A390	Slotting	.75 x D	1 x D	2	500	.0013	.0020	.0026	.0033	.0039	.0052	.0065	.0078	.0104
		Peripheral - Rough	1 x D	.5 x D	2	700	.0016	.0024	.0033	.0041	.0049	.0065	.0081	.0098	.0130
		Peripheral - Finish	1.5 x D	.01 x D	2	900	.0020	.0031	.0041	.0051	.0061	.0082	.0102	.0122	.0163
	Magnesium alloys	Slotting	1 x D	1 x D	2	800	.0015	.0023	.0030	.0038	.0045	.0060	.0075	.0090	.0120
		Peripheral - Rough	1 x D	.75 x D	2	1000	.0019	.0028	.0038	.0047	.0056	.0075	.0094	.0113	.0150
		Peripheral - Finish	1.5 x D	.01 x D	2	1200	.0024	.0035	.0047	.0059	.0071	.0094	.0118	.0141	.0188
	Copper alloys brass, bronze	Slotting	.75 x D	1 x D	2	500	.0013	.0020	.0026	.0033	.0039	.0052	.0065	.0078	.0104
		Peripheral - Rough	1 x D	.75 x D	2	575	.0016	.0024	.0033	.0041	.0049	.0065	.0081	.0098	.0130
		Peripheral - Finish	1.5 x D	.01 x D	2	650	.0020	.0031	.0041	.0051	.0061	.0082	.0102	.0122	.0163
	Composites, plastics, fiberglass	Slotting	1 x D	1 x D	2	500	.0013	.0020	.0026	.0033	.0039	.0052	.0065	.0078	.0104
		Peripheral - Rough	1 x D	.75 x D	2	700	.0016	.0024	.0033	.0041	.0049	.0065	.0081	.0098	.0130
		Peripheral - Finish	1.5 x D	.01 x D	2	900	.0020	.0031	.0041	.0051	.0061	.0082	.0102	.0122	.0163
	Aluminum alloys 2024, 6061, 7075	Slotting	.75 x D	1 x D	3	800	.0013	.0020	.0026	.0033	.0039	.0052	.0065	.0078	.0104
		Peripheral - Rough	1 x D	.75 x D	3	1000	.0016	.0024	.0033	.0041	.0049	.0065	.0081	.0098	.0130
		Peripheral - Finish	1.5 x D	.01 x D	3	1200	.0020	.0031	.0041	.0051	.0061	.0082	.0102	.0122	.0163
	High-silicon aluminum A380, A390	Slotting	.5 x D	1 x D	3	500	.0011	.0017	.0022	.0028	.0033	.0044	.0055	.0066	.0088
		Peripheral - Rough	1 x D	.5 x D	3	700	.0014	.0021	.0028	.0034	.0041	.0055	.0069	.0083	.0110
		Peripheral - Finish	1.5 x D	.01 x D	3	900	.0017	.0026	.0035	.0043	.0052	.0069	.0086	.0104	.0138
	Magnesium alloys	Slotting	.75 x D	1 x D	3	800	.0013	.0020	.0026	.0033	.0039	.0052	.0065	.0078	.0104
		Peripheral - Rough	1 x D	.75 x D	3	1000	.0016	.0024	.0033	.0041	.0049	.0065	.0081	.0098	.0130
		Peripheral - Finish	1.5 x D	.01 x D	3	1200	.0020	.0031	.0041	.0051	.0061	.0082	.0102	.0122	.0163
	Copper alloys brass, bronze	Slotting	.75 x D	1 x D	3	500	.0011	.0017	.0022	.0028	.0033	.0044	.0055	.0066	.0088
		Peripheral - Rough	1 x D	.75 x D	3	575	.0014	.0021	.0028	.0034	.0041	.0055	.0069	.0083	.0110
		Peripheral - Finish	1.5 x D	.01 x D	3	650	.0017	.0026	.0035	.0043	.0052	.0069	.0086	.0104	.0138
	Composites, plastics, fiberglass	Slotting	1 x D	1 x D	3	500	.0011	.0017	.0022	.0028	.0033	.0044	.0055	.0066	.0088
		Peripheral - Rough	1 x D	.75 x D	3	700	.0014	.0021	.0028	.0034	.0041	.0055	.0069	.0083	.0110
		Peripheral - Finish	1.5 x D	.01 x D	3	900	.0017	.0026	.0035	.0043	.0052	.0069	.0086	.0104	.0138

D = Tool diameter

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

CASE STUDY | *STREAKERS M203*

Shorter Cycle Time. Sweet Savings.

Cycle time was a critical problem for a customer machining aluminum using a competitor's three-flute end mill at 1,300 sfm and 60 ipm with an axial and radial cut of .125". IMCO suggested using a STREAKERS M203 end mill at 90 ipm and increasing the axial and radial depths of cut to .265". **That change reduced his cycle time by 15 minutes per part, a 50% feed rate increase.**

STREAKERS M203 REDUCED CYCLE TIME BY 15 MINUTES A 50% FEED RATE INCREASE

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (M/Min)	Feed (MM per Tooth) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
N	Aluminum alloys 2024, 6061, 7075	Slotting	1 x D	1 x D	2	244	.0360	.0480	.0600	.0720	.0960	.1195	.1440	.1915	.2405
		Peripheral - Rough	1 x D	.75 x D	2	305	.0450	.0600	.0750	.0900	.1200	.1494	.1800	.2394	.3006
		Peripheral - Finish	1.5 x D	.01 x D	2	365	.0565	.0754	.0942	.1131	.1508	.1877	.2261	.3007	.3776
	High-silicon aluminum A380, A390	Slotting	.75 x D	1 x D	2	153	.0312	.0416	.0520	.0624	.0832	.1036	.1248	.1660	.2084
		Peripheral - Rough	1 x D	.5 x D	2	213	.0390	.0520	.0650	.0780	.1040	.1295	.1560	.2075	.2605
		Peripheral - Finish	1.5 x D	.01 x D	2	274	.0490	.0653	.0817	.0980	.1307	.1627	.1960	.2606	.3273
	Magnesium alloys	Slotting	1 x D	1 x D	2	244	.0360	.0480	.0600	.0720	.0960	.1195	.1440	.1915	.2405
		Peripheral - Rough	1 x D	.75 x D	2	305	.0450	.0600	.0750	.0900	.1200	.1494	.1800	.2394	.3006
		Peripheral - Finish	1.5 x D	.01 x D	2	365	.0565	.0754	.0942	.1131	.1508	.1877	.2261	.3007	.3776
	Copper alloys brass, bronze	Slotting	.75 x D	1 x D	2	153	.0312	.0416	.0520	.0624	.0832	.1036	.1248	.1660	.2084
		Peripheral - Rough	1 x D	.75 x D	2	175	.0390	.0520	.0650	.0780	.1040	.1295	.1560	.2075	.2605
		Peripheral - Finish	1.5 x D	.01 x D	2	198	.0490	.0653	.0817	.0980	.1307	.1627	.1960	.2606	.3273
	Composites, plastics, fiberglass	Slotting	1 x D	1 x D	2	153	.0312	.0416	.0520	.0624	.0832	.1036	.1248	.1660	.2084
		Peripheral - Rough	1 x D	.75 x D	2	213	.0390	.0520	.0650	.0780	.1040	.1295	.1560	.2075	.2605
		Peripheral - Finish	1.5 x D	.01 x D	2	274	.0490	.0653	.0817	.0980	.1307	.1627	.1960	.2606	.3273
	Aluminum alloys 2024, 6061, 7075	Slotting	.75 x D	1 x D	3	244	.0312	.0416	.0520	.0624	.0832	.1036	.1248	.1660	.2084
		Peripheral - Rough	1 x D	.75 x D	3	305	.0390	.0520	.0650	.0780	.1040	.1295	.1560	.2075	.2605
		Peripheral - Finish	1.5 x D	.01 x D	3	365	.0490	.0653	.0817	.0980	.1307	.1627	.1960	.2606	.3273
	High-silicon aluminum A380, A390	Slotting	.5 x D	1 x D	3	153	.0264	.0352	.0440	.0528	.0704	.0876	.1056	.1404	.1763
		Peripheral - Rough	1 x D	.5 x D	3	213	.0330	.0440	.0550	.0660	.0880	.1096	.1320	.1755	.2204
		Peripheral - Finish	1.5 x D	.01 x D	3	274	.0415	.0553	.0691	.0829	.1106	.1376	.1658	.2205	.2769
	Magnesium alloys	Slotting	.75 x D	1 x D	3	244	.0312	.0416	.0520	.0624	.0832	.1036	.1248	.1660	.2084
		Peripheral - Rough	1 x D	.75 x D	3	305	.0390	.0520	.0650	.0780	.1040	.1295	.1560	.2075	.2605
		Peripheral - Finish	1.5 x D	.01 x D	3	365	.0490	.0653	.0817	.0980	.1307	.1627	.1960	.2606	.3273
	Copper alloys brass, bronze	Slotting	.75 x D	1 x D	3	153	.0264	.0352	.0440	.0528	.0704	.0876	.1056	.1404	.1763
		Peripheral - Rough	1 x D	.75 x D	3	175	.0330	.0440	.0550	.0660	.0880	.1096	.1320	.1755	.2204
		Peripheral - Finish	1.5 x D	.01 x D	3	198	.0415	.0553	.0691	.0829	.1106	.1376	.1658	.2205	.2769
	Composites, plastics, fiberglass	Slotting	1 x D	1 x D	3	153	.0264	.0352	.0440	.0528	.0704	.0876	.1056	.1404	.1763
		Peripheral - Rough	1 x D	.75 x D	3	213	.0330	.0440	.0550	.0660	.0880	.1096	.1320	.1755	.2204
		Peripheral - Finish	1.5 x D	.01 x D	3	274	.0415	.0553	.0691	.0829	.1106	.1376	.1658	.2205	.2769

D = Tool diameter

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Scan to calculate speeds and feed rates with Toolbot

SOCIAL MEDIA

Are Ya Feelin' Lucky?

When you post a photo or video using an IMCO tool to social media, tag us so we're notified! We love it! You know, IMCO frequently has contests and giveaways on Facebook, Instagram, X and LinkedIn. Just follow us, then like and/or comment on our original post. You may discover something new from IMCO that can save you time and money. (There's a LOT of that going around.) It could be your lucky day …

			INCH							METRIC						
ISO Code	No. of Flutes	Type of Cut	Tool Dia.	Axial Max	Radial Max	Speed (SFM)	RPM	IPT	IPM	Tool Dia.	Axial Max	Radial Max	Speed (M/Min)	RPM	MMPT	MM/Min
H 51 HRc–63 HRc	5	Rough	1/8	.1250	.0075	350	10,696	.00035	18.7	3.0	3.0	.18	106	11,318	.0089	5039
		Rough < 10,000		.1250	.0075	325	9,932	.00035	17.4		3.0	.18	94	9,973	.0089	443
		Finish		.2500	.001	300	9,168	.00030	13.7		6.0	.025	91	9,701	.0075	363
	5	Rough	3/16	.1875	.0130	250	5,093	.00070	17.8	4.0	4.0	.275	64	5,093	.0180	458
		Finish		.3750	.0015	300	6,112	.00040	12.2		8.0	.032	91	7,241	.0097	351
	6	Rough	1/4	.2500	.0150	400	6,112	.00100	36.6	5.0	5.0	.345	80	5,093	.0200	509
		Finish		.5000	.0020	300	4,584	.00050	13.8		10.0	.050	91	5,793	.0107	309
	6	Rough	5/16	.3125	.0220	400	4,890	.00125	36.6	6.0	6.0	.380	122	6,472	.0254	986
		Finish		.6250	.0020	300	3,667	.00060	13.2		12.0	.050	91	4,828	.0127	367
	6	Rough	3/8	.3750	.0300	400	4,074	.00150	36.6	8.0	8.0	.558	121	4,814	.0330	953
		Finish		.7500	.0030	300	3,056	.00070	12.8		16.0	.050	91	3,621	.0152	330
	6	Rough	1/2	.5000	.0400	400	3,056	.00200	36.6	10.0	10.0	.800	121	3,851	.0400	924
		Finish		1.000	.0030	300	2,292	.00100	13.7		20.0	.076	91	2,897	.0200	347
	6	Rough	5/8	.6250	.0500	400	2,445	.00250	36.6	12.0	12.0	.960	121	3,210	.0480	924
		Finish		1.250	.0050	300	1,833	.00130	14.3		24.0	.076	91	2,414	.0240	347
	6	Rough	3/4	.750	.0600	400	2,037	.00300	36.6	16.0	16.0	1.270	121	2,407	.0635	917
		Finish		1.500	.0050	300	1,528	.00150	13.7		32.0	.127	91	1,810	.0330	358
	6	Rough	1	1.000	.0800	400	1,528	.00400	36.6	20.0	20.0	1.524	121	1,926	.0760	878
		Finish		2.000	.0080	300	1,146	.00200	13.7		40.0	.127	91	1,448	.0380	330
K H 43 HRc–50 HRc	5	Rough	1/8	.1250	.010	500	15,280	.0006	45.8	3.0	3.0	.254	152	16,127	.0152	1225
		Rough < 10,000		.1250	.010	325	9,932	.0006	29.8		3.0	.254	94	9,973	.0152	758
		Finish		.2500	.001	400	12,224	.0003	18.3		6.0	.025	121	12,838	.0076	487
		Finish < 10,000		.2500	.001	325	9,932	.0003	14.9		6.0	.025	94	9,973	.0076	379
	5	Rough	3/16	.1875	.015	500	10,186	.0009	45.8	4.0	4.0	.320	152	12,095	.0192	1161
		Rough < 10,000		.1875	.015	480	9,780	.0009	44.0		4.0	.320	125	9,947	.0192	954
		Finish		.3750	.0015	400	8,150	.0005	20.4		8.0	.025	121	9,629	.0103	495
	6	Rough	1/4	.2500	.020	500	7,640	.0012	55.0	5.0	5.0	.400	152	9,676	.0239	1156
		Finish		.5000	.003	400	6,112	.0007	25.7		10.0	.040	121	7,703	.0132	508
	6	Rough	5/16	.3125	.025	500	6,112	.0014	51.3	6.0	6.0	.480	152	8,064	.0305	1475
		Finish		.6250	.003	400	4,889	.0007	20.5		12.0	.075	121	6,419	.0170	654
	6	Rough	3/8	.7500	.030	500	5,093	.0017	52.0	8.0	8.0	.640	152	6,048	.0355	1288
		Finish		.7500	.005	400	4,074	.0010	24.4		16.0	.080	121	4,814	.0175	505
	6	Rough	1/2	.5000	.040	500	3,820	.0023	52.7	10.0	10.0	.800	152	4,838	.0453	1315
		Finish		1.0000	.007	400	3,056	.0014	25.6		20.0	.130	121	3,851	.0266	614
	6	Rough	5/8	.6250	.050	500	3,056	.0029	53.2	12.0	12.0	.970	152	4,032	.0552	1335
		Finish		1.2500	.008	400	2,445	.0018	26.4		24.0	.180	121	3,210	.0336	647
	6	Rough	3/4	.7500	.060	500	2,547	.0034	52.0	16.0	16.0	1.280	152	3,024	.0736	1335
		Finish		1.5000	.009	400	2,037	.0020	24.4		32.0	.200	121	2,407	.0455	657
	6	Rough	1	1.0000	.080	500	1,910	.0046	52.7	20.0	20.0	1.600	152	2,419	.0863	1252
		Finish		2.0000	.010	400	1,528	.0023	21.0		40.0	.230	121	1,926	.0508	587
P M 36 HRc–42 HRc	5	Rough	1/8	.1250	.0100	600	18,336	.0010	91.7	3.0	3.0	.240	182	19,310	.0254	2452
		Rough < 10,000		.1250	.0100	325	9,932	.0010	49.6		3.0	.240	94	9,973	.0254	1266
		Finish		.2500	.0015	450	13,752	.0005	34.4		6.0	.038	137	14,536	.0127	923
		Finish < 10,000		.2500	.0015	325	9,932	.0005	24.8		6.0	.038	94	9,973	.0127	633
	5	Rough	3/16	.1875	.0150	600	12,224	.0013	79.5	4.0	4.0	.320	182	14,483	.0280	2027
		Rough < 10,000		.1875	.0150	475	9,677	.0013	63.0		4.0	.320	125	9,947	.0280	1392
		Finish		.3750	.0020	450	9,168	.0008	36.7		8.0	.043	125	9,947	.0170	845
	6	Rough	1/4	.2500	.0250	600	9,168	.0020	110.0	5.0	5.0	.400	182	11,586	.0345	1998
		Rough < 10,000		–	–	–	–	–	–		5.0	.400	157	9,995	.0345	1724
		Finish		.5000	.0030	500	7,640	.0010	45.8		10.0	.053	137	8,721	.0212	924
	6	Rough	5/16	.3125	.0310	600	7,334	.0025	110.0	6.0	6.0	.600	183	9,708	.0510	2970
		Finish		.6250	.0030	500	6,112	.0013	47.6		12.0	.076	152	8,064	.0254	1228
	6	Rough	3/8	.3750	.0370	600	6,112	.0030	110.0	8.0	8.0	.800	183	7,281	.0635	2774
		Finish		.7500	.0030	500	5,093	.0015	45.8		16.0	.076	152	6,048	.0330	1197
	6	Rough	1/2	.5000	.0500	600	4,584	.0040	110.0	10.0	10.0	1.000	183	5,825	.0800	2795
		Finish		1.0000	.0050	500	3,820	.0020	45.8		20.0	.076	152	4,838	.0400	1161
	6	Rough	5/8	.6250	.0625	600	3,667	.0050	110.0	12.0	12.0	1.200	183	4,854	.0960	2795
		Finish		1.2500	.0050	500	3,056	.0025	45.8		24.0	120	152	4,032	.0480	1161
	6	Rough	3/4	.7500	.0750	600	3,056	.0060	110.0	16.0	16.0	1.600	183	3,641	.1270	2774
		Finish		1.5000	.0050	500	2,546	.0030	45.8		32.0	.127	152	3,024	.0635	1152
	6	Rough	1	1.0000	.1000	600	2,292	.0080	110.0	20.0	20.0	2.000	183	2,912	.1524	2663
		Finish		2.0000	.0070	500	1,910	.0040	45.8		40.0	.127	152	2,419	.0762	1106

D = Tool diameter

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

ISO Code	Tool Dia	Type of Cut	Axial Max	Radial Max	Speed (SFM)	RPM	IPT	IPM
H 51 HRc–63 HRc	1/8	Roughing	.125	.025	65	1986	.00035	4
		Finishing	.1875	.0015	100	3056	.0004	7
	3/16	Roughing	.1875	.0375	65	1324	.0005	4
		Finishing	.28125	.002	100	2037	.0005	6
	1/4	Roughing	.250	.05	65	993	.0007	4
		Finishing	.375	.003	100	1528	.0007	6
	5/16	Roughing	.3125	.0625	65	795	.0009	4
		Finishing	.46875	.004	100	1222	.0009	6
	3/8	Roughing	.375	.075	65	662	.0011	4
		Finishing	.563	.005	100	1019	.0011	6
	1/2	Roughing	.5	.100	65	497	.0015	4
		Finishing	.375	.007	100	764	.0015	6
	5/8	Roughing	.625	.125	65	397	.0019	4
		Finishing	.938	.010	100	611	.0019	7
	3/4	Roughing	.750	.150	65	331	.0024	4
		Finishing	1.125	.012	100	509	.0024	7
	1	Roughing	1.000	.200	65	248	.003	4
		Finishing	1.500	.015	100	382	.003	6
K H 43 HRc–50 HRc	1/8	Roughing	.125	.031	200	6112	.0003	11
		Finishing	.1875	.0015	275	8404	.0003	15
	3/16	Roughing	.1875	.047	200	4075	.0005	12
		Finishing	.28125	.002	275	5603	.0005	16
	1/4	Roughing	.250	.063	200	3056	.0007	12
		Finishing	.375	.003	275	4202	.0007	17
	5/16	Roughing	.3125	.078	200	2445	.0009	13
		Finishing	.46875	.004	275	3362	.0009	18
	3/8	Roughing	.375	.094	200	2037	.0011	13
		Finishing	.563	.005	275	2801	.0011	18
	1/2	Roughing	.5	.125	200	1528	.0015	13
		Finishing	.375	.007	275	2101	.0015	18
	5/8	Roughing	.625	.156	200	1222	.0018	13
		Finishing	.938	.010	275	1681	.0018	18
	3/4	Roughing	.750	.188	200	1019	.0022	13
		Finishing	1.125	.012	275	1401	.0022	18
	1	Roughing	1.000	.250	200	764	.0030	13
		Finishing	1.500	.015	275	1051	.0030	18
P M 36 HRc–42 HRc	1/8	Roughing	.125	.044	250	7640	.0004	18.3
		Finishing	.1875	.002	325	9932	.0004	23.8
	3/16	Roughing	.1875	.065625	250	5093	.0005	15.3
		Finishing	.28125	.004	325	6621	.0006	23.8
	1/4	Roughing	.250	.0875	250	3820	.0007	16
		Finishing	.375	.005	325	4966	.0009	26.8
	5/16	Roughing	.3125	.109	250	3056	.0009	16.5
		Finishing	.46875	.007	325	3973	.0011	26.2
	3/8	Roughing	.375	.132	250	2547	.0011	16.8
		Finishing	.563	.01	325	3311	.0013	25.8
	1/2	Roughing	.5	.175	250	1910	.0015	17.2
		Finishing	.375	.012	325	2483	.0018	26.8
	5/8	Roughing	.625	.21875	250	1528	.0019	17.4
		Finishing	.938	.015	325	1986	.0022	26.2
	3/4	Roughing	.750	.2625	250	1273	.0024	18.3
		Finishing	1.125	.015	325	1655	.0027	26.8
	1	Roughing	1.000	.350	250	955	.003	17.2
		Finishing	1.500	.015	325	1242	.0036	26.8

D = Tool diameter

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$

$$sfm = rpm \times D \times .262$$

$$ipm = rpm \times ipt \times Z$$

$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$

$$m/min = rpm \times D \times .00314$$

$$mmpm = rpm \times mmpt \times Z$$

$$mrr = RDOC \times ADOC \times mmpm$$

Scan to calculate speeds and feed rates with Toolbot

		INCH							METRIC						
ISO Code	Type of Cut	Tool Dia.	Axial Depth	Radial Depth	Speed (SFM)	RPM	IPT	IPM	Tool Dia.	Axial Depth	Radial Depth	Speed (M/Min)	RPM	MMPT	MM/Min
S Inconel, Hastalloy, Waspalloy Not recommended for titanium	Rough	1/4	1.25 x D	.2 x D	80	1222	.0008	5.87	6.0	1.25 x D	.2 x D	24.38	1239	.019	141.2
	Slot		0.165	1 x D	80	1222	.00050	3.67		4.15	1 x D	24.38	1239	.0127	94.4
	Rough	5/16	1.25 x D	.2 x D	80	978	.0010	5.87	8.0	1.25 x D	.2 x D	24.38	970	.025	145.5
	Slot		0.205	1 x D	80	978	.00063	3.67		5.20	1 x D	24.38	970	.0160	93.1
	Rough	3/8	1.25 x D	.2 x D	80	815	.0012	5.87	10.0	1.25 x D	.2 x D	24.38	776	.031	144.3
	Slot		0.250	1 x D	80	815	.00075	3.67		6.35	1 x D	24.38	776	.0190	88.5
	Rough	1/2	1.25 x D	.2 x D	80	611	.0016	5.87	12.0	1.25 x D	.2 x D	24.38	647	.037	143.6
	Slot		0.330	1 x D	80	611	.00100	3.67		8.35	1 x D	24.38	647	.0254	98.5
	Rough	5/8	1.25 x D	.2 x D	80	489	.0020	5.87	16.0	1.25 x D	.2 x D	24.38	485	.050	145.5
	Slot		0.415	1 x D	80	489	.00125	3.67		10.50	1 x D	24.38	485	.0317	92.2
	Rough	3/4	1.25 x D	.2 x D	80	407	.0024	5.87	20.0	1.25 x D	.2 x D	24.38	388	.061	142.1
	Slot		0.500	1 x D	80	407	.00150	3.67		12.70	1 x D	24.38	388	.0380	88.4
	Rough	1	1.25 x D	.2 x D	80	306	.0032	5.87	25.0	1.25 x D	.2 x D	24.38	310	.080	148.8
	Slot		0.665	1 x D	80	306	.00200	3.67		16.90	1 x D	24.38	310	.0508	94.4

For using HEM techniques in hi-temp alloys, please reference the POW•R•PATH line of end mills beginning on page 14.

≈ Approximately equals
≤ Less than or equal to
≥ Greater than or equal to
× Multiply
< Less than
> Greater than
= Equals

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$
$$sfm = rpm \times D \times .262$$
$$ipm = rpm \times ipt \times Z$$
$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$
$$m/min = rpm \times D \times .00314$$
$$mmpm = rpm \times mmpt \times Z$$
$$mrr = RDOC \times ADOC \times mmpm$$

Scan to calculate speeds and feed rates with Toolbot

CASE STUDY | *INCONEX M806*

Proof of Performance

Roughing a work piece in 718 Inconel is hardly a walk in the park. But with increasing demand for hi-temp alloys in the aerospace and energy industries, machinists needed a solution. IMCO developed INCONEX M8 end mills specifically for hi-temp alloys, with each cutting edge specially shaped to reduce edge-wearing stress in the cutting zone. Tested in 718 Inconel, M806 cutters not only did the job, they excelled. **Our M806 did peripheral roughing (axial .625, radial .100) with incredible longevity.** Our tool lasted up to 3x longer than the competitor's tool.

INCONEX M806 LASTED UP TO 3X LONGER THAN THE COMPETITOR'S TOOL

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (SFM) Non-coated	TiCN	AlTiN	Feed (Inches Per Tooth) 1/16	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
K	Cast iron - Gray	Slotting	.5 x D	1 x D	4	--	350	350	.00032	.0006	.0010	.0013	.0016	.0019	.0026	.0032	.0038	.0051
		Peripheral - Rough	1 x D	.5 x D	4	--	400	400	.00040	.0008	.0012	.0016	.0020	.0024	.0032	.0040	.0048	.0064
		Peripheral - Finish	1.5 x D	.01 x D	4	--	450	450	.00046	.0009	.0014	.0018	.0023	.0027	.0036	.0046	.0055	.0073
	Cast iron - Ductile	Slotting	.5 x D	1 x D	4	--	250	250	.00030	.0006	.0009	.0012	.0015	.0018	.0024	.0030	.0036	.0048
		Peripheral - Rough	1 x D	.5 x D	4	--	275	275	.00038	.0008	.0011	.0015	.0019	.0023	.0030	.0038	.0045	.0060
		Peripheral - Finish	1.5 x D	.01 x D	4	--	325	325	.00042	.0008	.0013	.0017	.0021	.0025	.0034	.0042	.0051	.0068
P	Low carbon steels 1018, 12L14, 8620	Slotting	.5 x D	1 x D	4	250	275	300	.00030	.0006	.0009	.0012	.0015	.0018	.0024	.0030	.0036	.0048
		Slotting	.5 x D	1 x D	3	250	275	300	.00030	.0006	.0009	.0012	.0015	.0018	.0024	.0030	.0036	.0048
		Peripheral - Rough	1 x D	.5 x D	4	275	300	325	.00038	.0008	.0011	.0015	.0019	.0023	.0030	.0038	.0045	.0060
		Peripheral - Rough	1 x D	.5 x D	3	275	300	325	.00038	.0008	.0011	.0015	.0019	.0023	.0030	.0038	.0045	.0060
		Finish	1.5 x D	.01 x D	4	300	325	350	.00047	.0009	.0014	.0019	.0024	.0028	.0038	.0047	.0057	.0075
	Medium carbon steels 4140, 4340	Slotting	.5 x D	1 x D	4	225	250	275	.00027	.0005	.0008	.0011	.0014	.0016	.0022	.0027	.0032	.0043
		Peripheral - Rough	1 x D	.5 x D	4	250	275	300	.00034	.0007	.0010	.0014	.0017	.0020	.0027	.0034	.0041	.0054
		Finish	1.5 x D	.01 x D	4	275	300	325	.00042	.0008	.0013	.0017	.0021	.0025	.0034	.0042	.0051	.0068
	Tool & die steels ≤ 48 HRc A2, D2, H13, P20	Slotting	.5 x D	1 x D	4	225	250	275	.00025	.0005	.0008	.0010	.0013	.0015	.0020	.0025	.0030	.0040
		Peripheral - Rough	1 x D	.5 x D	4	250	275	300	.00031	.0006	.0009	.0013	.0016	.0019	.0025	.0031	.0038	.0050
		Finish	1.5 x D	.01 x D	4	275	300	325	.00039	.0008	.0012	.0016	.0020	.0024	.0031	.0039	.0047	.0063
H	Hardened steels 49 HRc to 58 HRc	Slotting	.25 x D	1 x D	4	60	75	225	.00014	.0003	.0004	.0006	.0007	.0008	.0011	.0014	.0017	.0022
		Peripheral - Rough	1 x D	.25 x D	4	80	100	250	.00017	.0003	.0005	.0007	.0009	.0010	.0014	.0017	.0021	.0028
		Finish	1.5 x D	.01 x D	4	100	125	275	.00019	.0004	.0006	.0008	.0009	.0011	.0015	.0019	.0023	.0030
M	Martensitic stainless steels 416, 410, 440C	Slotting	.5 x D	1 x D	4	--	250	250	.00020	.0004	.0006	.0008	.0010	.0012	.0016	.0020	.0024	.0032
		Peripheral - Rough	1 x D	.5 x D	4	--	275	275	.00025	.0005	.0008	.0010	.0013	.0015	.0020	.0025	.0030	.0040
		Finish	1.5 x D	.01 x D	4	--	325	325	.00031	.0006	.0009	.0013	.0016	.0019	.0025	.0031	.0038	.0050
	Austenitic stainless steels 303, 304, 316	Slotting	.5 x D	1 x D	4	200	225	250	.00020	.0004	.0006	.0008	.0010	.0012	.0016	.0020	.0024	.0032
		Slotting	.5 x D	1 x D	3	200	225	250	.00020	.0004	.0006	.0008	.0010	.0012	.0016	.0020	.0024	.0032
		Peripheral - Rough	1 x D	.5 x D	4	250	275	300	.00025	.0005	.0008	.0010	.0013	.0015	.0020	.0025	.0030	.0040
		Peripheral - Rough	1 x D	.5 x D	3	250	275	300	.00025	.0005	.0008	.0010	.0013	.0015	.0020	.0025	.0030	.0040
		Finish	1.5 x D	.01 x D	4	300	325	350	.00031	.0006	.0009	.0013	.0016	.0019	.0025	.0031	.0038	.0050
	Precipition hardening stainless steels 17-4 PH, 15-5 PH	Slotting	.25 x D	1 x D	4	175	200	225	.00020	.0004	.0006	.0008	.0010	.0012	.0016	.0020	.0024	.0031
		Peripheral - Rough	1 x D	.25 x D	4	200	225	250	.00025	.0005	.0007	.0010	.0012	.0015	.0020	.0025	.0029	.0039
		Finish	1.5 x D	.01 x D	4	225	250	275	.00027	.0005	.0008	.0011	.0013	.0016	.0021	.0027	.0032	.0043
S	Titanium alloys	Slotting	.25 x D	1 x D	4	175	200	225	.00020	.0004	.0006	.0008	.0010	.0012	.0016	.0020	.0024	.0031
		Peripheral - Rough	1 x D	.25 x D	4	200	225	250	.00025	.0005	.0007	.0010	.0012	.0015	.0020	.0025	.0029	.0039
		Finish	1.5 x D	.01 x D	4	225	250	275	.00027	.0005	.0008	.0011	.0013	.0016	.0021	.0027	.0032	.0043
	Hi-temp alloys Inconel, Haynes, Stellite, Hastalloy	Slotting	.25 x D	1 x D	4	35	40	45	.00017	.0003	.0005	.0007	.0009	.0010	.0014	.0017	.0021	.0028
		Peripheral - Rough	1 x D	.25 x D	4	45	50	60	.00022	.0004	.0006	.0009	.0011	.0013	.0017	.0022	.0026	.0035
		Finish	1.5 x D	.01 x D	4	55	55	65	.00024	.0005	.0007	.0009	.0012	.0014	.0019	.0024	.0028	.0038
N	Aluminum alloys 2024, 6061, 7075	Slotting	.5 x D	1 x D	2	350	550	--	.00038	.0008	.0011	.0015	.0019	.0023	.0030	.0038	.0046	.0061
		Peripheral - Rough	1 x D	.5 x D	2	450	650	--	.00048	.0010	.0014	.0019	.0024	.0029	.0038	.0048	.0057	.0076
		Peripheral - Finish	1.5 x D	.01 x D	3	550	--	--	.00053	.0011	.0016	.0021	.0027	.0032	.0043	.0053	.0064	.0085
	Copper alloys brass & bronze	Slotting	.5 x D	1 x D	2	275	350	350	.00040	.0008	.0012	.0016	.0020	.0024	.0032	.0040	.0048	.0064
		Peripheral - Rough	1 x D	.5 x D	2	300	400	400	.00050	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060	.0080
		Peripheral - Rough	1 x D	.5 x D	3	300	--	400	.00045	.0009	.0014	.0018	.0023	.0027	.0036	.0045	.0054	.0072
		Peripheral - Finish	1.5 x D	.01 x D	2	350	450	450	.00063	.0013	.0019	.0025	.0031	.0038	.0050	.0063	.0075	.0101
		Peripheral - Finish	1.5 x D	.01 x D	3	350	--	450	.00057	.0011	.0017	.0023	.0028	.0034	.0045	.0057	.0068	.0090
	Composites, plastics	Slotting	.5 x D	1 x D	4	300	350	350	.00040	.0008	.0012	.0016	.0020	.0024	.0032	.0040	.0048	.0064
		Peripheral - Rough	1 x D	.5 x D	4	375	450	450	.00050	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060	.0080
		Peripheral - Finish	1.5 x D	.01 x D	4	450	650	650	.00057	.0011	.0017	.0023	.0028	.0034	.0045	.0057	.0068	.0090
	Magnesium alloys	Slotting	.5 x D	1 x D	2	350	550	550	.00040	.0008	.0012	.0016	.0020	.0024	.0032	.0040	.0048	.0064
		Peripheral - Rough	1 x D	.5 x D	2	450	650	650	.00050	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0060	.0080
		Peripheral - Finish	1.5 x D	.01 x D	2	550	750	750	.00057	.0011	.0017	.0023	.0028	.0034	.0045	.0057	.0068	.0090
	Graphite	Slotting	.5 x D	1 x D	4	350	400	450	.00045	.0009	.0014	.0018	.0023	.0027	.0036	.0045	.0054	.0072
		Peripheral - Rough	1 x D	.5 x D	4	425	475	525	.00056	.0011	.0017	.0023	.0028	.0034	.0045	.0056	.0068	.0090
		Peripheral - Finish	1.5 x D	.01 x D	4	500	550	600	.00063	.0013	.0019	.0025	.0031	.0038	.0050	.0063	.0075	.0101

D = Tool diameter

Information on tips and adjustments can be found in our Technical Resources section beginning on page 108.

Common Machining Formulas

$$rpm = \frac{sfm \times 3.82}{D}$$

$$sfm = rpm \times D \times .262$$

$$ipm = rpm \times ipt \times Z$$

$$mrr = RDOC \times ADOC \times ipm$$

$$rpm = \frac{m/min \times 318.3}{D}$$

$$m/min = rpm \times D \times .00314$$

$$mmpm = rpm \times mmpt \times Z$$

$$mrr = RDOC \times ADOC \times mmpm$$

ISO Code	Work Material	Type of Cut	Axial DOC	Radial DOC	Number of Flutes	Speed (M/min) Non-coated	TiCN	AlTiN	Feed (MM per Tooth) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
K	Cast iron - Gray	Slotting	.5 x D	1 x D	4	--	107	107	.0154	.0205	.0256	.0307	.0410	.0512	.0614	.0717	.0768	.1026
		Peripheral - Rough	1 x D	.5 x D	4	--	122	122	.0192	.0256	.0320	.0384	.0512	.0640	.0768	.0896	.0960	.1282
		Peripheral - Finish	1.5 x D	.01 x D	4	--	137	137	.0219	.0291	.0364	.0437	.0583	.0729	.0874	.1020	.1093	.1460
	Cast iron - Ductile	Slotting	.5 x D	1 x D	4	--	76	76	.0144	.0192	.0240	.0288	.0384	.0480	.0576	.0672	.0720	.0962
		Peripheral - Rough	1 x D	.5 x D	4	--	84	84	.0180	.0240	.0300	.0360	.0480	.0600	.0720	.0840	.0900	.1202
		Peripheral - Finish	1.5 x D	.01 x D	4	--	99	99	.0204	.0271	.0339	.0407	.0543	.0678	.0814	.0950	.1018	.1359
P	Low carbon steels 1018, 12L14, 8620	Slotting	.5 x D	1 x D	4	76	84	91	.0144	.0192	.0240	.0288	.0384	.0480	.0576	.0672	.0720	.0962
		Slotting	.5 x D	1 x D	3	76	84	91	.0144	.0192	.0240	.0288	.0384	.0480	.0576	.0672	.0720	.0962
		Peripheral - Rough	1 x D	.5 x D	4	84	91	99	.0180	.0240	.0300	.0360	.0480	.0600	.0720	.0840	.0900	.1202
		Peripheral - Rough	1 x D	.5 x D	3	84	91	99	.0180	.0240	.0300	.0360	.0480	.0600	.0720	.0840	.0900	.1202
		Finish	1.5 x D	.01 x D	4	91	99	107	.0226	.0301	.0377	.0452	.0603	.0754	.0904	.1055	.1131	.1510
	Medium carbon steels 4140, 4340	Slotting	.5 x D	1 x D	4	69	76	84	.0130	.0173	.0216	.0259	.0346	.0432	.0518	.0605	.0648	.0866
		Peripheral - Rough	1 x D	.5 x D	4	76	84	91	.0162	.0216	.0270	.0324	.0432	.0540	.0648	.0756	.0810	.1082
		Finish	1.5 x D	.01 x D	4	84	91	99	.0204	.0271	.0339	.0407	.0543	.0678	.0814	.0950	.1018	.1359
	Tool & die steels ≤ 48 HRc A2, D2, H13, P20	Slotting	.5 x D	1 x D	4	69	76	84	.0120	.0160	.0200	.0240	.0320	.0400	.0480	.0560	.0600	.0802
		Peripheral - Rough	1 x D	.5 x D	4	76	84	91	.0150	.0200	.0250	.0300	.0400	.0500	.0600	.0700	.0750	.1002
		Finish	1.5 x D	.01 x D	4	84	91	99	.0188	.0251	.0314	.0377	.0503	.0628	.0754	.0879	.0942	.1259
H	Hardened steels 49 HRc to 58 HRc	Slotting	.25 x D	1 x D	4	18	23	69	.0067	.0089	.0111	.0133	.0177	.0222	.0266	.0310	.0333	.0444
		Peripheral - Rough	1 x D	.25 x D	4	24	30	76	.0083	.0111	.0139	.0166	.0222	.0277	.0333	.0388	.0416	.0555
		Finish	1.5 x D	.01 x D	4	30	38	84	.0090	.0121	.0151	.0181	.0241	.0301	.0362	.0422	.0452	.0604
M	Martensitic stainless steels 416, 410, 440C	Slotting	.5 x D	1 x D	4	--	76	76	.0096	.0128	.0160	.0192	.0256	.0320	.0384	.0448	.0480	.0641
		Peripheral - Rough	1 x D	.5 x D	4	--	84	84	.0120	.0160	.0200	.0240	.0320	.0400	.0480	.0560	.0600	.0802
		Finish	1.5 x D	.01 x D	4	--	99	99	.0151	.0201	.0251	.0301	.0402	.0502	.0603	.0703	.0754	.1007
	Austenitic stainless steels 303, 304, 316	Slotting	.5 x D	1 x D	4	61	69	76	.0096	.0128	.0160	.0192	.0256	.0320	.0384	.0448	.0480	.0641
		Slotting	.5 x D	1 x D	3	61	69	76	.0096	.0128	.0160	.0192	.0256	.0320	.0384	.0448	.0480	.0641
		Peripheral - Rough	1 x D	.5 x D	4	76	84	91	.0120	.0160	.0200	.0240	.0320	.0400	.0480	.0560	.0600	.0802
		Peripheral - Rough	1 x D	.5 x D	3	76	84	91	.0120	.0160	.0200	.0240	.0320	.0400	.0480	.0560	.0600	.0802
		Finish	1.5 x D	.01 x D	4	91	99	107	.0151	.0201	.0251	.0301	.0402	.0502	.0603	.0703	.0754	.1007
	Precipition hardening stainless steels 17-4 PH, 15-5 PH	Slotting	.25 x D	1 x D	4	53	61	69	.0094	.0126	.0157	.0188	.0251	.0314	.0377	.0440	.0471	.0629
		Peripheral - Rough	1 x D	.25 x D	4	61	69	76	.0118	.0157	.0196	.0236	.0314	.0393	.0471	.0550	.0589	.0787
		Finish	1.5 x D	.01 x D	4	69	76	84	.0128	.0171	.0214	.0256	.0342	.0427	.0513	.0598	.0641	.0856
S	Titanium alloys	Slotting	.25 x D	1 x D	4	53	61	69	.0094	.0126	.0157	.0188	.0251	.0314	.0377	.0440	.0471	.0629
		Peripheral - Rough	1 x D	.25 x D	4	61	69	76	.0118	.0157	.0196	.0236	.0314	.0393	.0471	.0550	.0589	.0787
		Finish	1.5 x D	.01 x D	4	69	76	84	.0128	.0171	.0214	.0256	.0342	.0427	.0513	.0598	.0641	.0856
	Hi-temp alloys Inconel, Haynes, Stellite, Hastalloy	Slotting	.25 x D	1 x D	4	11	12	14	.0083	.0111	.0139	.0166	.0222	.0277	.0333	.0388	.0416	.0555
		Peripheral - Rough	1 x D	.25 x D	4	14	15	18	.0104	.0139	.0173	.0208	.0277	.0346	.0416	.0485	.0520	.0694
		Finish	1.5 x D	.01 x D	4	17	17	20	.0113	.0151	.0188	.0226	.0302	.0377	.0452	.0528	.0565	.0755
N	Aluminum alloys 2024, 6061, 7075	Slotting	.5 x D	1 x D	2	107	168	--	.0182	.0243	.0304	.0365	.0486	.0608	.0730	.0851	.0912	.1218
		Peripheral - Rough	1 x D	.5 x D	2	137	198	--	.0228	.0304	.0380	.0456	.0608	.0760	.0912	.1064	.1140	.1523
		Peripheral - Finish	1.5 x D	.01 x D	3	168	--	--	.0256	.0342	.0427	.0513	.0683	.0854	.1025	.1196	.1281	.1712
	Copper alloys brass & bronze	Slotting	.5 x D	1 x D	2	84	107	107	.0192	.0256	.0320	.0384	.0512	.0640	.0768	.0896	.0960	.1282
		Peripheral - Rough	1 x D	.5 x D	2	91	122	122	.0240	.0320	.0400	.0480	.0640	.0800	.0960	.1120	.1200	.1603
		Peripheral - Rough	1 x D	.5 x D	3	91	--	122	.0216	.0288	.0360	.0432	.0576	.0720	.0864	.1008	.1080	.1443
		Peripheral - Finish	1.5 x D	.01 x D	2	107	137	137	.0301	.0402	.0502	.0603	.0804	.1005	.1206	.1407	.1507	.2014
		Peripheral - Finish	1.5 x D	.01 x D	3	107	--	137	.0271	.0362	.0452	.0543	.0724	.0904	.1085	.1266	.1357	.1813
	Composites, plastics	Slotting	.5 x D	1 x D	4	91	107	107	.0192	.0256	.0320	.0384	.0512	.0640	.0768	.0896	.0960	.1282
		Peripheral - Rough	1 x D	.5 x D	4	114	137	137	.0240	.0320	.0400	.0480	.0640	.0800	.0960	.1120	.1200	.1603
		Peripheral - Finish	1.5 x D	.01 x D	4	137	198	198	.0271	.0362	.0452	.0543	.0724	.0904	.1085	.1266	.1357	.1813
	Magnesium alloys	Slotting	.5 x D	1 x D	2	107	168	168	.0192	.0256	.0320	.0384	.0512	.0640	.0768	.0896	.0960	.1282
		Peripheral - Rough	1 x D	.5 x D	2	137	198	198	.0240	.0320	.0400	.0480	.0640	.0800	.0960	.1120	.1200	.1603
		Peripheral - Finish	1.5 x D	.01 x D	2	168	229	229	.0271	.0362	.0452	.0543	.0724	.0904	.1085	.1266	.1357	.1813
	Graphite	Slotting	.5 x D	1 x D	4	107	122	137	.0216	.0288	.0360	.0432	.0576	.0720	.0864	.1008	.1080	.1443
		Peripheral - Rough	1 x D	.5 x D	4	130	145	160	.0270	.0360	.0450	.0540	.0720	.0900	.1080	.1260	.1350	.1803
		Peripheral - Finish	1.5 x D	.01 x D	4	152	168	183	.0301	.0402	.0502	.0603	.0804	.1005	.1206	.1407	.1507	.2014

Information on tips and adjustments can be found in our Technical Resources section beginning on page 108.

D = Tool diameter

Scan to calculate speeds and feed rates with Toolbot

POW·R·PATH IPT7

Legacy Part #	New Part #
63214	0339969
63215	0339970
63216	0339971
63217	0339972
63218	0339973
63219	0339974
63220	0339975
63234	0339976
63236	0339977
63238	0339978
63240	0339979
63242	0339980
63244	0339981
63246	0339982
63247	0339983
63251	0339984
63253	0339985
63258	0339986
63262	0339987
63264	0339988
63269	0339989
63270	0339990
63271	0339991
63273	0339992
63275	0339993
63280	0339994
63282	0339995
63284	0339996
63288	0339997
63290	0339998
63305	0339999
63306	0340000
63307	0340001
63312	0340002
63313	0340003
63314	0340004
63319	0340005
63320	0340006
63321	0340007
63332	0340008
63333	0340009
63334	0340010
63335	0340011
63336	0340012
63337	0340013
63399	0340014
63451	0340031
63453	0340033
63454	0340034
63476	0340036
63477	0340037
63478	0340038
63479	0340039
63480	0340040
63481	0340041
63482	0340042
63483	0340043
63484	0340044
63485	0340045
63486	0340046
63487	0340047
63488	0340048
63489	0340049
63490	0340050
63491	0340051
63492	0340052
63493	0340053
63494	0340054
63495	0340055
63496	0340056
63497	0340057
63498	0340058
63499	0340059
63500	0340060
63501	0340061
63502	0340062
63503	0340063
63504	0340064
63505	0340065
63506	0340066
63507	0340067
63508	0340068
63509	0340069
63510	0340070
63511	0340071
63512	0340072
63513	0340073
63514	0340074
63515	0340075
63516	0340076
63517	0340077
63518	0340078
63519	0340079
63520	0340080
63526	0340086
63527	0340087
63528	0340088
63529	0340089
63530	0340090
63536	0340096
63537	0340097
63538	0340098
63539	0340099
63540	0340100
63541	0340101
63542	0340102
63543	0340103
63544	0340104
63545	0340105
63546	0340106
63547	0340107
63548	0340108
63549	0340109
63550	0340110
63551	0340111
63558	0340118
63559	0340119
63560	0340120
63561	0340121
63562	0340122
63563	0340123
63568	0340128
63569	0340129
63570	0340130
63571	0340131
63572	0340132
63573	0340133
63574	0340134
63575	0340135
63576	0340136
63577	0340137
63585	0340145
63586	0340146
63587	0340147
63588	0340148
63589	0340149
63590	0340150
63591	0340151
63592	0340152
63593	0340153
63594	0340154
63595	0340155
63596	0340156
63597	0340157
63598	0340158
63599	0340159
63600	0340160
63615	0340175
63616	0340176
63617	0340177
63618	0340178
63623	0340183
63624	0340184
63625	0340185
63626	0340186
63627	0340187
63628	0340188
63629	0340189
63670	0340230
63671	0340231
63672	0340232
63673	0340233
63674	0340234
63675	0340235
63678	0340238
63679	0340239
63680	0340240
63681	0340241
63682	0340242
63683	0340243
63684	0340244
63685	0340245
63686	0340246
63687	0340247
63688	0340248
63689	0340249
63690	0340250
63691	0340251
63692	0340252
63693	0340253
63699	0340259
63700	0340260
63701	0340261
63702	0340262
63703	0340263
63714	0340274
63715	0340275
63716	0340276
63717	0340277
63718	0340278
63734	0340294
63735	0340295
63736	0340296
63737	0340297
63738	0340298
63739	0340299
63740	0340300
63741	0340301
63742	0340302
63743	0340303
63744	0340304
63745	0340305
63746	0340306
63747	0340307
63748	0340308
63754	0340314
63755	0340315
63756	0340316
63757	0340317
63758	0340318
63764	0340324
63765	0340325
63766	0340326
63767	0340327
63768	0340328
63769	0340329
63770	0340330
63771	0340331
63772	0340332
63773	0340333
63779	0340339
63780	0340340
63781	0340341
63782	0340342
63783	0340343
63810	0340370
63811	0340371
63812	0340372
64007	0340556
64008	0340557
64015	0340558
64016	0340559
64023	0340560
64024	0340561
64029	0340562
64036	0340563
64037	0340564
64043	0340566
64050	0340567
64051	0340568
64057	0340569
64058	0340570
64064	0340572
64070	0340573
64071	0340574
64075	0340575
64076	0340576
64081	0340578
64085	0340579
64086	0340580
64087	0340581
64088	0340582
64090	0340584
64091	0340585
64092	0340586
64093	0340587
64094	0340588
64096	0340590
64097	0340591
64098	0340592
64099	0340593
64100	0340594
64108	0340596
64115	0340597
64116	0340598
64123	0340599
64124	0340600
64136	0340602
64137	0340603
64142	0340604
63002	0853437
63008	0853438
63009	0853439
63015	0853440
63017	0853441
63019	0853445
63021	0853450
63023	0853451
63031	0853453
63033	0853454
63035	0853455
63037	0853457
63039	0853458
63041	0853459
63042	0853461
63053	0853462
63055	0853464
63057	0853465

POW·R·PATH IPC7

Legacy Part #	New Part #
63410	0340015
63411	0340016
63412	0340017
63413	0340018
63414	0340019
63415	0340020
63416	0340021
63417	0340022
63418	0340023
63419	0340024
63424	0340025
63433	0340027
63441	0340028
63442	0340029
63443	0340030
63452	0340032
63461	0340035
63630	0340190
63631	0340191
63634	0340194
63635	0340195
63638	0340198
63639	0340199
63640	0340200
63641	0340201
63644	0340204
63645	0340205
63648	0340208
63649	0340209
63650	0340210
63651	0340211
63654	0340214
63655	0340215
63656	0340216
63657	0340217
63658	0340218
63659	0340219
63664	0340224
63665	0340225
63668	0340228
63669	0340229
63789	0340349
63790	0340350
63791	0340351
63792	0340352
63795	0340355
63799	0340359
63800	0340360
63801	0340361
63803	0340363
63805	0340365
63806	0340366
63808	0340368
64042	0340565
64063	0340571
64080	0340577
64089	0340583
64095	0340589
64107	0340595
64129	0340601
63339	0853466
63341	0853468
63352	0853469
63353	0853472
63355	0853486
63366	0853489
63367	0853490
63368	0853498
63369	0853500

POW·R·PATH IPT9

Legacy Part #	New Part #
63932	0340488
63933	0340489
63934	0340490
63935	0340491
63936	0340492
63937	0340493
63938	0340494
63939	0340495
63940	0340496
63941	0340497
63942	0340498
63943	0340499
63944	0340500
63945	0340501
63946	0340502
63947	0340503
63948	0340504
63949	0340505
63950	0340506
63951	0340507
63952	0340508
63953	0340509
63954	0340510
63955	0340511
63956	0340512
63957	0340513
63958	0340514
63959	0340515
63960	0340516
63961	0340517
63962	0340518
63963	0340519
63964	0340520
63965	0340521
63966	0340522
63967	0340523
63968	0340524
63969	0340525
63970	0340526
63971	0340527
63972	0340528
63789	0340349
63973	0340529
63974	0340530
63975	0340531
63976	0340532
63977	0340533
63978	0340534
63979	0340535
63980	0340536
63981	0340537
63982	0340538
63983	0340539
63984	0340540
63985	0340541
63986	0340542
63987	0340543
64357	0340787
64358	0340788
64359	0340789
64360	0340790
64361	0340791
64362	0340792
64363	0340793
64364	0340794
64365	0340795
64366	0340796
64367	0340797
64368	0340798
64369	0340799
64370	0340800
64371	0340801
64372	0340802
64373	0340803
64374	0340804
64375	0340805
64376	0340806
64377	0340807
64378	0340808
64379	0340809
64380	0340810
64381	0340811
64382	0340812
64383	0340813
64384	0340814
64385	0340815
64386	0340816
64387	0340817
64388	0340818
64389	0340819
64390	0340820
64391	0340821
64392	0340822
64393	0340823
64394	0340824
64395	0340825
64396	0340826
64397	0340827
64398	0340828
64399	0340829
64400	0340830
64401	0340831
64402	0340832
64403	0340833
64404	0340834
64405	0340835
64406	0340836
64407	0340837
64408	0340838
64409	0340839
64410	0340840
64411	0340841
64412	0340842
64413	0340843
64414	0340844

POW·R·PATH IPC9

Legacy Part #	New Part #
63831	0340389
63835	0340393
63839	0340397
63843	0340401
63847	0340405
63848	0340406
63851	0340409
63852	0340410
63853	0340411
63854	0340412
63859	0340417
63860	0340418
63889	0340445
63901	0340457
63903	0340459
63904	0340460
63907	0340463
63908	0340464
63911	0340467
63912	0340468
63915	0340471
63916	0340472
63919	0340475
63920	0340476
63921	0340477
63922	0340478
63923	0340479
63924	0340480
63925	0340481
63926	0340482
63927	0340483
63928	0340484
63929	0340485
63930	0340486
63931	0340487
63988	0340544
63989	0340545
63990	0340546
63991	0340547
63992	0340548
63993	0340549
63994	0340550
63995	0340551
63996	0340552
63997	0340553
63998	0340554
63999	0340555
64143	0340605
64150	0340606
64151	0340607
64157	0340608
64158	0340609
64163	0340610
64164	0340611
64170	0340612
64171	0340613
64175	0340614
64415	0340845
64416	0340846
64417	0340847
64418	0340848
64419	0340849
64420	0340850
64421	0340851
64422	0340852
64423	0340853
63813	0853501
63814	0853502
63863	0853505
63864	0853507

POW·R·PATH IPT11

Legacy Part #	New Part #
64185	0340615
64186	0340616
64187	0340617
64188	0340618
64189	0340619
64190	0340620
64191	0340621
64192	0340622
64193	0340623
64194	0340624
64195	0340625
64196	0340626
64197	0340627
64198	0340628
64199	0340629
64200	0340630
64201	0340631
64202	0340632
64203	0340633
64204	0340634
64205	0340635
64206	0340636
64207	0340637
64208	0340638
64209	0340639
64210	0340640
64211	0340641
64212	0340642
64213	0340643
64214	0340644
64215	0340645
64216	0340646
64217	0340647
64218	0340648
64219	0340649
64220	0340650
64221	0340651
64222	0340652
64223	0340653
64224	0340654
64225	0340655
64226	0340656
64227	0340657
64228	0340658
64229	0340659
64230	0340660
64424	0340854
64425	0340855
64426	0340856
64427	0340857
64428	0340858
64429	0340859
64430	0340860
64431	0340861
64432	0340862
64433	0340863
64434	0340864
64435	0340865
64436	0340866
64437	0340867
64438	0340868
64439	0340869
64440	0340870
64441	0340871
64442	0340872
64443	0340873
64444	0340874
64445	0340875
64446	0340876
64447	0340877
64448	0340878
64449	0340879
64450	0340880
64451	0340881

POW·R·PATH IPC11

Legacy Part #	New Part #
64231	0340661
64232	0340662
64233	0340663
64234	0340664
64235	0340665
64236	0340666
64237	0340667
64238	0340668
64239	0340669
64240	0340670
64241	0340671
64242	0340672
64243	0340673
64244	0340674
64245	0340675
64246	0340676
64247	0340677
64248	0340678
64249	0340679
64250	0340680
64251	0340681
64252	0340682
64253	0340683
64254	0340684
64255	0340685
64256	0340686
64257	0340687
64258	0340688
64259	0340689
64260	0340690
64261	0340691
64262	0340692
64263	0340693
64264	0340694
64265	0340695
64266	0340696
64267	0340697
64269	0340699
64270	0340700
64452	0340882
64453	0340883
64454	0340884
64455	0340885
64456	0340886
64457	0340887
64458	0340888
64459	0340889
64460	0340890
64461	0340891
64462	0340892
64463	0340893
64464	0340894
64465	0340895
64466	0340896
64467	0340897
64468	0340898
64469	0340899
64470	0340900
64471	0340901
64472	0340902
64473	0340903

POW·R·PATH IPT13

Legacy Part #	New Part #
64271	0340701
64272	0340702
64273	0340703
64274	0340704
64275	0340705
64276	0340706
64277	0340707
64278	0340708
64279	0340709
64280	0340710
64281	0340711
64282	0340712
64283	0340713
64284	0340714
64285	0340715
64286	0340716
64287	0340717
64288	0340718
64289	0340719
64290	0340720
64291	0340721
64292	0340722
64293	0340723
64294	0340724
64295	0340725
64296	0340726
64297	0340727
64298	0340728
64299	0340729
64300	0340730
64301	0340731
64302	0340732
64303	0340733
64304	0340734
64305	0340735
64306	0340736
64307	0340737
64308	0340738
64309	0340739
64310	0340740
64311	0340741
64312	0340742
64313	0340743
64314	0340744
64315	0340745
64316	0340746
64474	0340904
64475	0340905
64476	0340906
64477	0340907
64478	0340908
64479	0340909
64480	0340910
64481	0340911
64482	0340912
64483	0340913
64484	0340914
64485	0340915
64486	0340916
64487	0340917
64488	0340918
64489	0340919
64490	0340920
64491	0340921
64492	0340922
64493	0340923
64494	0340924
64495	0340925
64496	0340926
64497	0340927
64498	0340928
64499	0340929
64500	0340930
64501	0340931

POW·R·PATH IPC13

Legacy Part #	New Part #
64317	0340747
64318	0340748
64319	0340749
64320	0340750
64321	0340751
64322	0340752
64323	0340753
64324	0340754
64325	0340755
64326	0340756
64327	0340757
64328	0340758
64329	0340759
64330	0340760
64331	0340761
64332	0340762
64333	0340763
64334	0340764
64335	0340765
64336	0340766
64337	0340767
64338	0340768
64339	0340769
64340	0340770
64341	0340771
64342	0340772
64343	0340773
64344	0340774
64345	0340775
64346	0340776
64347	0340777
64348	0340778
64349	0340779
64350	0340780
64351	0340781
64352	0340782
64353	0340783
64354	0340784
64355	0340785
64356	0340786
64502	0340932
64503	0340933
64504	0340934
64505	0340935
64506	0340936
64507	0340937
64508	0340938
64509	0340939
64510	0340940
64511	0340941
64512	0340942
64513	0340943
64514	0340944
64515	0340945
64516	0340946
64517	0340947
64518	0340948
64519	0340949
64520	0340950
64521	0340951
64522	0340952
64523	0340953

POW·R·PATH APT5

Legacy Part #	New Part #
61500	0339588
61501	0339589
61502	0339590
61503	0339591
61504	0339592
61505	0339593
61506	0339594
61507	0339595
61508	0339596
61509	0339597
61510	0339598
61511	0339599
61512	0339600
61513	0339601
61514	0339602
61515	0339603
61516	0339604
61517	0339605
61518	0339606
61519	0339607
61520	0339608
61521	0339609
61522	0339610
61523	0339611
61524	0339612
61525	0339613
61526	0339614
61527	0339615
61528	0339616
61529	0339617
61530	0339618
61531	0339619
61532	0339620
61533	0339621
61534	0339622
61535	0339623
61536	0339624
61537	0339625
61538	0339626
61539	0339627
61540	0339628
61541	0339629
61542	0339630
61543	0339631
61544	0339632
61545	0339633
61546	0339634
61547	0339635
61548	0339636
61549	0339637
61550	0339638
61551	0339639
61552	0339640
61553	0339641
61554	0339642
61555	0339643
61556	0339644
61557	0339645
61558	0339646
61559	0339647
61560	0339648
61561	0339649
61562	0339650
61563	0339651
61564	0339652
61565	0339653
61566	0339654
61567	0339655
61568	0339656
61569	0339657
61570	0339658
61571	0339659
61572	0339660
61573	0339661
61574	0339662
61575	0339663
61576	0339664
61577	0339665
61578	0339666
61579	0339667
61580	0339668
61581	0339669
61582	0339670
61583	0339671
61584	0339672
61585	0339673
61586	0339674
61587	0339675
61588	0339676
61589	0339677
61590	0339678
61591	0339679
61592	0339680
61593	0339681
61594	0339682
61595	0339683
61596	0339684
61597	0339685
61598	0339686
61599	0339687
61600	0339688
61601	0339689
61602	0339690
61603	0339691
61604	0339692
61605	0339693
61606	0339694
61607	0339695
61608	0339696
61700	0339786
61701	0339787
61702	0339788
61703	0339789
61704	0339790
61705	0339791
61706	0339792
61707	0339793
61708	0339794
61709	0339795
61710	0339796
61711	0339797
61712	0339798
61713	0339799
61714	0339800
61715	0339801
61716	0339802
61717	0339803
61718	0339804
61719	0339805
61720	0339806
61721	0339807
61722	0339808
61723	0339809
61724	0339810
61725	0339811
61726	0339812
61727	0339813
61728	0339814
61729	0339815
61730	0339816
61731	0339817
61732	0339818
61733	0339819
61734	0339820
61735	0339821
61736	0339822
61737	0339823
61738	0339824
61739	0339825
61740	0339826
61741	0339827
61742	0339828
61743	0339829
61744	0339830
61745	0339831
61746	0339832
61747	0339833
61748	0339834
61749	0339835
61750	0339836
61751	0339837
61752	0339838
61753	0339839
61754	0339840
61755	0339841
61756	0339842
61757	0339843
61758	0339844
61759	0339845
61760	0339846
61761	0339847
61762	0339848
61763	0339849
61764	0339850
61765	0339851
61766	0339852
61767	0339853
61768	0339854
61769	0339855
61770	0339856
61771	0339857
61772	0339858
61773	0339859
61774	0339860
61775	0339861
61776	0339862
61777	0339863
61778	0339864
61779	0339865
61780	0339866
61781	0339867
61782	0339868
61783	0339869
61784	0339870
61785	0339871
61786	0339872
61787	0339873
61788	0339874
61789	0339875
61790	0339876
61791	0339877
61792	0339878
61793	0339879
61794	0339880
61795	0339881
61796	0339882
61797	0339883
61798	0339884
61799	0339885
61800	0339886
61801	0339887
61802	0339888
61803	0339889
61804	0339890
61805	0339891
61806	0339892
61807	0339893
61808	0339894
61809	0339895
61810	0339896
61811	0339897
61812	0339898
61813	0339899
61814	0339900
61815	0339901
61816	0339902
61817	0339903
61818	0339904
61819	0339905
61820	0339906

POW·R·PATH APT5N

Legacy Part #	New Part #
61609	0339697
61610	0339698
61611	0339699
61612	0339700
61613	0339701
61614	0339702
61615	0339703
61616	0339704
61617	0339705
61618	0339706
61619	0339707
61620	0339708
61621	0339709
61622	0339710
61623	0339711
61624	0339712
61625	0339713
61626	0339714
61627	0339715
61628	0339716
61629	0339717
61630	0339718
61631	0339719
61632	0339720
61633	0339721
61634	0339722
61635	0339723
61636	0339724
61637	0339725
61638	0339726
61639	0339727
61640	0339728
61641	0339729
61642	0339730
61643	0339731
61644	0339732
61645	0339733
61646	0339734
61647	0339735
61648	0339736
61649	0339737
61650	0339738
61651	0339739
61652	0339740
61653	0339741
61654	0339742
61655	0339743
61656	0339744
61657	0339745
61658	0339746
61659	0339747
61660	0339748
61661	0339749
61662	0339750
61663	0339751
61664	0339752
61665	0339753
61666	0339754
61667	0339755
61668	0339756
61669	0339757
61670	0339758
61671	0339759
61672	0339760
61673	0339761
61674	0339762
61675	0339763
61676	0339764
61677	0339765
61678	0339766
61679	0339767
61680	0339768
61681	0339769
61682	0339770
61683	0339771
61684	0339772
61685	0339773
61686	0339774
61687	0339775
61688	0339776
61689	0339777
61690	0339778
61691	0339779
61692	0339780
61693	0339781
61694	0339782
61695	0339783
61696	0339784
61697	0339785
61821	0339907
61822	0339908
61823	0339909
61824	0339910
61825	0339911
61826	0339912
61827	0339913
61828	0339914
61829	0339915
61830	0339916
61831	0339917
61832	0339918
61833	0339919
61834	0339920
61835	0339921
61836	0339922
61837	0339923
61838	0339924
61839	0339925
61840	0339926
61841	0339927
61842	0339928
61843	0339929
61844	0339930
61845	0339931
61846	0339932
61847	0339933
61848	0339934
61849	0339935
61850	0339936
61851	0339937
61852	0339938
61853	0339939
61854	0339940
61855	0339941
61856	0339942
61857	0339943
61858	0339944
61859	0339945
61860	0339946
61861	0339947
61862	0339948
61863	0339949
61864	0339950
61865	0339951
61866	0339952
61867	0339953
61868	0339954
61869	0339955
61870	0339956
61871	0339957
61872	0339958
61873	0339959
61874	0339960
61875	0339961
61876	0339962
61877	0339963
61878	0339964
61879	0339965
61880	0339966
61881	0339967
61882	0339968
62214	0853402
62215	0853403
62219	0853404
62223	0853405
62229	0853406
62230	0853407
62231	0853408
62239	0853409
62244	0853410
62245	0853411
62247	0853413
62251	0853415
62252	0853416
62253	0853417
62254	0853419
62255	0853421
62258	0853422
62259	0853426
62281	0853428
62286	0853431
62295	0853432
62298	0853433
62211	0856027
62228	0856028
62246	0856029

POW·R·PATH APC5

Legacy Part #	New Part #
61500	0339588
61501	0339589
61502	0339590
61503	0339591
61504	0339592
61505	0339593
61506	0339594
61507	0339595
61508	0339596
61509	0339597
61510	0339598
61511	0339599
61512	0339600
61513	0339601
61514	0339602
61515	0339603
61516	0339604
61517	0339605
61518	0339606
61519	0339607
61520	0339608
61521	0339609
61522	0339610
61523	0339611
61524	0339612
61525	0339613
61526	0339614
61527	0339615
61528	0339616
61529	0339617
61530	0339618
61531	0339619
61532	0339620
61533	0339621
61534	0339622
61535	0339623
61536	0339624
61537	0339625
61538	0339626
61539	0339627
61540	0339628
61541	0339629
61542	0339630
61543	0339631
61544	0339632
61545	0339633
61546	0339634
61547	0339635
61548	0339636
61549	0339637
61550	0339638
61551	0339639
61552	0339640
61553	0339641
61554	0339642
61555	0339643
61848	0339934
61849	0339935
61850	0339936
61851	0339937
61852	0339938
61853	0339939
61854	0339940
61855	0339941
61856	0339942
61857	0339943
61858	0339944
61859	0339945
61860	0339946
61861	0339947
61862	0339948
61863	0339949
61864	0339950
61865	0339951
61866	0339952
61867	0339953
61868	0339954
61869	0339955
61870	0339956
61871	0339957
61872	0339958
61873	0339959
61874	0339960
61875	0339961
61876	0339962
61877	0339963
61878	0339964
61879	0339965
61880	0339966
61881	0339967
61882	0339968
62214	0853402
62215	0853403
62219	0853404
62223	0853405
62229	0853406
62230	0853407
62231	0853408
62239	0853409
62244	0853410
62245	0853411
62247	0853413
62251	0853415
62252	0853416
62253	0853417
62254	0853419
62255	0853421
62258	0853422
62259	0853426
62281	0853428
62286	0853431
62295	0853432
62298	0853433
62211	0856027
62228	0856028
62246	0856029

POW R PATH APT5

Legacy Part #	New Part #
61420	0339528
61421	0339529
61422	0339530
61423	0339531
61424	0339532
61425	0339533
61426	0339534
61427	0339535
61428	0339536
61429	0339537
61430	0339538
61431	0339539
61432	0339540
61433	0339541
61434	0339542
61435	0339543
61436	0339544
61437	0339545
61438	0339546
61439	0339547
61440	0339548
61441	0339549
61442	0339550
61443	0339551
61444	0339552
61445	0339553
61446	0339554
61447	0339555
61448	0339556
61449	0339557
61450	0339558
61451	0339559
61452	0339560
61453	0339561
61454	0339562
61455	0339563
61456	0339564
61457	0339565
61458	0339566
61459	0339567
61460	0339568
61461	0339569
61462	0339570
61463	0339571
61464	0339572
61465	0339573
61466	0339574
61467	0339575
61468	0339576
61469	0339577
61470	0339578
61471	0339579
61472	0339580
61473	0339581
61474	0339582
61475	0339583
61476	0339584
61477	0339585
61478	0339586
61479	0339587

POW·R·PATH AFC5

Legacy Part #	New Part #
62480	0335265
62481	0335266
62482	0335267
62483	0335268
62484	0335269
62485	0335270
62486	0335271
62487	0335272

POW·R·PATH IFC5

Legacy Part #	New Part #
62488	0335273
62489	0335274
62490	0335275
62491	0335276
62492	0335277
62493	0335278
62494	0335279
62495	0335280

POW·R·FEED M924

Legacy Part #	New Part #
67092	0338103
67093	0338104
67094	0338105
67098	0338106
67099	0338107
67100	0338108
67101	0338109
67104	0338111
67105	0338112
67106	0338113
67110	0338114
67111	0338115
67112	0338116
67116	0338117
67117	0338118
67118	0338119
67124	0338120
67125	0338121
67126	0338122
67127	0338123
67128	0338124
67132	0338126
67133	0338127
67134	0338128
67135	0338129
67148	0338130
67149	0338131
67150	0338132
67151	0338133
67164	0338134
67165	0338135
67166	0338136
67167	0338137
67180	0338138
67182	0338139
67188	0338140
67190	0338141
67196	0338143
67198	0338144
67204	0338145
67206	0338146
67207	0338147
67213	0338148
67214	0338149
67215	0338150
67216	0338151
67217	0338152
67218	0338153
67222	0338155
67223	0338156
67224	0338157
67225	0338158
67226	0338159
67227	0338160
67231	0338162
67233	0338163
67234	0338164
67235	0338165
67236	0338166
67249	0338167
67251	0338168
67252	0338169
67253	0338170
67254	0338171
67258	0338172
67260	0338173
67261	0338174
67267	0338175
67269	0338176
67270	0338177
67276	0338178
67278	0338179
67279	0338180
67286	0338181
67288	0338182
67289	0338183
67296	0338187
67298	0338188
67299	0338189
67300	0338190
67301	0338191
67316	0338192
67318	0338193
67319	0338194
67326	0338195
67346	0338198
67348	0338199
67349	0338200
67356	0338201
67358	0338202
67359	0338203
67360	0338204
67361	0338205
67366	0338207
67368	0338208
67369	0338209
67370	0338210
67371	0338211
67386	0338212
67388	0338213
67389	0338214
67396	0338215
67398	0338216
67399	0338217
67406	0338218
67408	0338219
67409	0338220
67417	0338223
67419	0338224
67439	0338227
67441	0338228
67450	0338230
67452	0338231
67494	0338245
67495	0338246
67498	0338247
67499	0338248
67502	0338250
67503	0338251
67506	0338252
67507	0338253
67508	0338254
67510	0338255
67511	0338256
67512	0338257
67514	0338259
67515	0338260
67516	0338261
67518	0338262
67519	0338263
67520	0338264
67524	0338265
67525	0338266
67526	0338267
67527	0338268
67530	0338270
67531	0338271
67532	0338272
67536	0338273
67537	0338274
67538	0338275
67539	0338276
67541	0338278
67542	0338279
67543	0338280
67544	0338281
67546	0338283
67547	0338284
67548	0338285
67549	0338286
67550	0338287
67551	0338288
67552	0338289
67553	0338290
67554	0338291
67555	0338292
67556	0338293
67557	0338294
67558	0338295
67559	0338296
67560	0338297
67900	0338628
67902	0338630
67924	0338646
67925	0338647
67926	0338648
67932	0338654
67933	0338655
67939	0338660
67940	0338661
67942	0338663
67943	0338664
67948	0338668
67949	0338669
67950	0338670
67953	0338673
67954	0338674
67959	0338679
67960	0338680
67961	0338681
67964	0338684
67965	0338685
67967	0338687
67968	0338688
67970	0338690
67972	0338692
67975	0338693
67976	0338694
67977	0338695
67980	0338698
67981	0338699
67983	0338701
67984	0338702
67986	0338704
67988	0338706
67996	0338714
67999	0338717
68002	0338720
68007	0338725
68116	0338824
68117	0338825
68119	0338827
68120	0338828
68131	0338836
68132	0338837

68136	0338840
68139	0338842
68147	0338848
68149	0338850
68155	0338856
68158	0338859
68167	0338866
68171	0338869
68195	0338885
68196	0338886
68201	0338891
68202	0338892
68203	0338893
68206	0338896
68207	0338897
68210	0338900
68211	0338901
68214	0338904
68215	0338905
68710	0339036
68711	0339037
68712	0339038
67024	0340954
67025	0340955
67026	0340956
67027	0340957
67028	0340958
67029	0340959
67030	0340960
67031	0340961
67032	0340962
67033	0340963
67034	0340964
67035	0340965
67036	0340966
67038	0340967
67039	0340968
67040	0340969
67041	0340970
67043	0340971
67044	0340972
67045	0340973
67046	0340974
67048	0340975
67903	0340976
67908	0340977
67909	0340978
67910	0340979
67911	0340980
67914	0340981
67917	0340982
67920	0340983
67923	0340984
68064	0436095
67738	0440706
67974	0853639
68065	0853642
68066	0853643
68067	0853645
68068	0853648

68099	0853653
68128	0853656
68130	0853657
68977	0853658
68978	0853664
68979	0853671
68980	0853684
68981	0853688
68982	0853691
68983	0853692
68984	0853707
68985	0853709
68986	0853717
68987	0853718
68988	0853734
68989	0853736
68990	0853744
68991	0853749
68992	0853751
68993	0853757
68994	0853758
68995	0853763
68996	0853764
67737	0855957
67739	0855958
67938	0855959
67947	0855960
67973	0855961
68069	0856030

POW·R·FEED M924N

Legacy Part #	New Part #
67731	0338463
67733	0338465
67734	0338466
67740	0338468
67741	0338469
67742	0338470
67744	0338472
67745	0338473
67746	0338474
67748	0338476
67749	0338477
67750	0338478
67753	0338481
67754	0338482
67755	0338483
67758	0338486
67759	0338487
67760	0338488
67763	0338491
67764	0338492
67765	0338493
67768	0338496
67769	0338497
67773	0338501
67774	0338502
67778	0338506

67779	0338507
67783	0338511
67784	0338512
67788	0338516
67789	0338517
67793	0338521
67794	0338522
67798	0338526
67799	0338527
67803	0338531
67804	0338532
67808	0338536
67809	0338537
67813	0338541
67814	0338542
67818	0338546
67819	0338547
67823	0338551
67824	0338552
67828	0338556
67829	0338557
67833	0338561
67834	0338562
67838	0338566
67839	0338567
67858	0338586
67859	0338587
67861	0338589
67862	0338590
67864	0338592
67865	0338593
67876	0338604
67877	0338605
67879	0338607
67880	0338608
67882	0338610
67883	0338611
68020	0338737
68021	0338738
68023	0338739
68024	0338740
68025	0338741
68026	0338742
68027	0338743
68028	0338744
68029	0338745
68030	0338746
68031	0338747
68032	0338748
68033	0338749
68034	0338750
68035	0338751
68036	0338752
68037	0338753
68038	0338754
68039	0338755
68040	0338756
68041	0338757
68042	0338758
68043	0338759

68044	0338760
68045	0338761
68046	0338762
68047	0338763
68048	0338764
68049	0338765
68050	0338766
68051	0338767
68052	0338768
68053	0338769
68054	0338770
68055	0338771
68056	0338772
68057	0338773
68058	0338774
68059	0338775
68060	0338776
68061	0338777
68062	0338778
68063	0338779
68324	0338931
68325	0338932
68326	0338933
68327	0338934
68328	0338935
68329	0338936
68330	0338937
68331	0338938
68332	0338939

POW·R·FEED M924C

Legacy Part #	New Part #
68624	9164826
68625	9164827
68626	9164828
68627	9164829
68628	9164830
68629	9164831
68630	9164832
68631	9164833
68632	9164834
68633	9164835
68634	9164836
68635	9164837
68636	9164838
68637	9164839
68638	9164840
68639	9164841
68640	9164842
68641	9164843
68642	9164844
68643	9164845
68644	9164846
68645	9164847
68646	9164848
68647	9164849
68648	9164850
68649	9164851

68650	9164852
68651	9164853
68652	9164854
68653	9164855
68654	9164856

POW·R·FEED M904

Legacy Part #	New Part #
63003	0335521
63004	0335522
63005	0335523
63010	0335526
63011	0335527
63012	0335528
63013	0335529
63014	0335530
63016	0335531
63018	0335532
63020	0335533
63022	0335534
63024	0335535
63025	0335536
63026	0335537
63043	0335547
63045	0335549
63046	0335550
63047	0335551
63058	0335559
63059	0335560
63060	0335561
63064	0335564
63065	0335565
63066	0335566
63067	0335567
63068	0335568
63069	0335569
63070	0335570
63071	0335571
63072	0335572
63073	0335573
63083	0335580
63085	0335582
63086	0335583
63087	0335584
63098	0335592
63099	0335593
63100	0335594
63101	0335595
63118	0335605
63119	0335606
63248	0335668
63249	0335669
63390	0335756
63391	0335757
63393	0335759
63395	0335761
63397	0335763
63400	0335765

63423	0335777
63425	0335779
63426	0335780
63427	0335781
63428	0335782
63429	0335783
63432	0335786
63466	0335801

enDURO M525

Legacy Part #	New Part #
65001	0335808
65002	0335809
65003	0335810
65005	0335812
65006	0335813
65007	0335814
65009	0335816
65010	0335817
65011	0335818
65013	0335820
65014	0335821
65015	0335822
65017	0335824
65018	0335825
65019	0335826
65021	0335828
65022	0335829
65023	0335830
65025	0335832
65026	0335833
65027	0335834
65028	0335835
65029	0335836
65049	0335856
65050	0335857
65051	0335858
65052	0335859
65053	0335860
65055	0335862
65056	0335863
65057	0335864
65058	0335865
65059	0335866
65061	0335868
65062	0335869
65063	0335870
65064	0335871
65065	0335872
65067	0335874
65068	0335875
65069	0335876
65070	0335877
65071	0335878
65073	0335880
65074	0335881
65075	0335882
65076	0335883
65077	0335884
65079	0335886
65080	0335887
65081	0335888
65082	0335889
65083	0335890
65085	0335892
65086	0335893
65087	0335894
65088	0335895
65089	0335896
65090	0335897
65133	0335940
65134	0335941
65135	0335942
65136	0335943
65137	0335944
65138	0335945
65141	0335948
65142	0335949
65143	0335950
65144	0335951
65145	0335952
65146	0335953
65149	0335956
65150	0335957
65151	0335958
65152	0335959
65153	0335960
65154	0335961
65157	0335964
65158	0335965
65159	0335966
65160	0335967
65161	0335968
65162	0335969
65173	0335980
65174	0335981
65175	0335982
65176	0335983
65177	0335984
65178	0335985
65189	0335996
65190	0335997
65191	0335998
65197	0336004
65198	0336005
65199	0336006
65205	0336012
65206	0336013
65207	0336014
65213	0336020
65214	0336021
65215	0336022
65216	0336023
65217	0336024
65218	0336025
65258	0336065
65259	0336066
65260	0336067
65261	0336068
65262	0336069
65263	0336070
65267	0336074
65268	0336075
65269	0336076
65270	0336077
65271	0336078
65272	0336079
65274	0336081
65276	0336083
65277	0336084
65278	0336085
65279	0336086
65280	0336087
65281	0336088
65285	0336092
65286	0336093
65287	0336094
65288	0336095
65289	0336096
65290	0336097
65294	0336101
65295	0336102
65296	0336103
65297	0336104
65298	0336105
65299	0336106
65301	0336108
65303	0336110
65304	0336111
65305	0336112
65306	0336113
65307	0336114
65308	0336115
65312	0336119
65313	0336120
65314	0336121
65315	0336122
65316	0336123
65317	0336124
65321	0336128
65322	0336129
65323	0336130
65324	0336131
65326	0336133
65361	0336168
65362	0336169
65363	0336170
65364	0336171
65365	0336172
65366	0336173
65368	0336175
65371	0336178
65372	0336179
65373	0336180
65374	0336181
65376	0336183
65381	0336188
65382	0336189
65383	0336190
65384	0336191
65386	0336193
65391	0336198
65392	0336199
65393	0336200
65394	0336201
65395	0336202
65396	0336203
65398	0336205
65401	0336208
65402	0336209
65403	0336210
65404	0336211
65406	0336213
65411	0336218
65412	0336219
65413	0336220
65414	0336221
65416	0336223
65421	0336228
65422	0336229
65423	0336230
65424	0336231
65426	0336233
65429	0336236
65461	0336268
65462	0336269
65463	0336270
65464	0336271
65465	0336272
65466	0336273
65468	0336275
65469	0336276
65471	0336278
65472	0336279
65473	0336280
65474	0336281
65475	0336282
65476	0336283
65478	0336285
65479	0336286
65481	0336288
65482	0336289
65483	0336290
65484	0336291
65486	0336293
65489	0336296
65491	0336298
65492	0336299
65493	0336300
65494	0336301
65496	0336303
65499	0336306
65501	0336308
65502	0336309
65503	0336310
65504	0336311
65506	0336313
65509	0336316
65555	0336362
65556	0336363
65557	0336364
65558	0336365
65559	0336366
65560	0336367
65562	0336369
65563	0336370
65566	0336373
65567	0336374
65568	0336375
65569	0336376
65570	0336377
65571	0336378
65573	0336380
65574	0336381
65588	0336384
65589	0336385
65590	0336386
65591	0336387
65593	0336389
65596	0336392
65599	0336395
65600	0336396
65601	0336397
65602	0336398
65604	0336400
65607	0336403
66655	0336918
66656	0336919
66658	0336921
66659	0336922
66660	0336923
66661	0336924
66663	0336926
66664	0336927
66665	0336928
66666	0336929
66668	0336931
66669	0336932
66670	0336933
66671	0336934
66672	0336935
66673	0336936
66674	0336937
66675	0336938
66676	0336939
66677	0336940
66678	0336941
66679	0336942
66680	0336943
66681	0336944
66682	0336945
66683	0336946
66684	0336947
66685	0336948
66687	0336950
66688	0336951
66689	0336952
66690	0336953
66691	0336954

66692	0336955
66693	0336956
66695	0336958
66696	0336959
66697	0336960
66698	0336961
66699	0336962
66700	0336963
66825	0337088
66826	0337089
66828	0337091
66829	0337092
66830	0337093
66831	0337094
66832	0337095
66833	0337096
66834	0337097
66836	0337099
66837	0337100
66838	0337101
66839	0337102
66840	0337103
66841	0337104
66844	0337106
66845	0337107
66846	0337108
66847	0337109
66848	0337110
66849	0337111
66850	0337112
66852	0337114
66853	0337115
66854	0337116
66855	0337117
66856	0337118
66857	0337119
66870	0337122
66871	0337123
66872	0337124
66873	0337125
66874	0337126
66875	0337127
66876	0337128
66877	0337129
66878	0337130
66879	0337131
66880	0337132
66881	0337133
66882	0337134
66883	0337135
66884	0337136
66885	0337137
66886	0337138
66888	0337140
66889	0337141
66890	0337142
66892	0337144
66893	0337145
66894	0337146
66896	0337148
66897	0337149

enDURO M525N

Legacy Part #	New Part #
65680	0336472
65681	0336474
65682	0336476
65683	0336478
65686	0336484
65687	0336486
65688	0336488
65689	0336490
65692	0336496
65693	0336498
65694	0336500
65695	0336502
65706	0336508
65707	0336510
65708	0336512
65709	0336514
65714	0336524
65715	0336526
65716	0336528
65717	0336530
65722	0336540
65723	0336542
65724	0336544
65725	0336546
65738	0336572
65739	0336574
65740	0336576
65741	0336578
65743	0336582
65747	0336590
65748	0336592
65749	0336594
65750	0336596
65752	0336600
65756	0336608
65757	0336610
65758	0336612
65759	0336614
65761	0336618
65765	0336626
65766	0336628
65767	0336630
65768	0336632
65770	0336636
65774	0336644
65776	0336648
65777	0336650
65779	0336654
65784	0336664
65786	0336668
65787	0336670
65789	0336674
65794	0336684
65796	0336688
65797	0336690
65799	0336694

65804	0336704
65806	0336708
65807	0336710
65809	0336714
65812	0336720
65814	0336724
65816	0336728
65817	0336730
65819	0336734
65822	0336740
65824	0336744
65826	0336748
65827	0336750
65829	0336754
65832	0336760
65845	0336786
65847	0336790
65848	0336792
65850	0336796
65853	0336802
65856	0336808
65858	0336812
65859	0336814
65861	0336818
65864	0336824
65867	0336830
65869	0336834
65870	0336836
65872	0336840
65875	0336846
66701	0336964
66702	0336965
66703	0336966
66704	0336967
66705	0336968
66706	0336969
66707	0336970
66708	0336971
66709	0336972
66710	0336973
66711	0336974
66712	0336975
66713	0336976
66714	0336977
66715	0336978
66716	0336979
66717	0336980
66718	0336981
66719	0336982
66720	0336983
66721	0336984
66723	0336986
66724	0336987
66725	0336988
66727	0336990
66732	0336995
66733	0336996
66734	0336997
66735	0336998
66736	0336999

66737	0337000
66738	0337001
66739	0337002
66740	0337003
66741	0337004
66742	0337005
66743	0337006
66744	0337007
66745	0337008
66746	0337009
66748	0337011
66749	0337012
66750	0337013
66751	0337014
66752	0337015
66753	0337016
66754	0337017
66755	0337018
66756	0337019
66757	0337020
66758	0337021
66759	0337022
66761	0337024
66762	0337025
66763	0337026
66764	0337027
66765	0337028
66768	0337031
66774	0337037
66775	0337038
66776	0337039
66777	0337040
66778	0337041
66781	0337044
66782	0337045
66783	0337046
66784	0337047
66785	0337048
66788	0337051
66789	0337052
66790	0337053
66791	0337054
66792	0337055
66795	0337058
66797	0337060
66798	0337061
66799	0337062
66803	0337066
66811	0337074
66819	0337082
66827	0337090
66835	0337098
66843	0337105
66851	0337113
66859	0337120
66867	0337121
67061	0337276
67063	0337280
67064	0337282
67066	0337286
67069	0337292

enDURO M525C

Legacy Part #	New Part #
66900	0337150
66901	0337151
66902	0337152
66903	0337153
66904	0337154
66905	0337155
66906	0337156
66907	0337157
66908	0337158
66909	0337159
66910	0337160
66911	0337161
66912	0337162
66913	0337163
66914	0337164
66915	0337165
66916	0337166
66918	0337168
66919	0337169
66920	0337170
66922	0337172
66923	0337173
66924	0337174
66926	0337176
66927	0337177
66928	0337178
66930	0337180
66931	0337181
68250	0337309
68251	0337310
68252	0337311
68253	0337312
68255	0337314
68256	0337315
68257	0337316
68258	0337317
68260	0337319
68261	0337320
68262	0337321
68263	0337322
68265	0337324
68267	0337326
68268	0337327
68270	0337329
68272	0337331
68273	0337332
68275	0337334
68277	0337336
68278	0337337
68280	0337339
68282	0337341
68284	0337343
68285	0337344
68287	0337346
68289	0337348
68290	0337349

68292	0337351
68294	0337353
68295	0337354
68297	0337356
68299	0337358
68300	0337359
68302	0337361
68304	0337363
68305	0337364
68307	0337366
68309	0337368

enDURO M527

Legacy Part #	New Part #
65920	0339048
65921	0339049
65922	0339050
65923	0339051
65968	0339054
65969	0339055
65970	0339056
65971	0339057
65976	0339060
65977	0339061
65978	0339062
65979	0339063
66000	0339066
66001	0339067
66002	0339068
66003	0339069
66005	0339071
66045	0339072
66046	0339073
66047	0339074
66048	0339075
66050	0339077
66054	0339078
66055	0339079
66056	0339080
66057	0339081
66059	0339083
66072	0339084
66073	0339085
66074	0339086
66075	0339087
66077	0339089
66081	0339090
66082	0339091
66083	0339092
66084	0339093
66086	0339095
66090	0339096
66092	0339098
66093	0339099
66095	0339101
66130	0339102
66132	0339104
66133	0339105
66135	0339107
66140	0339108
66142	0339110
66143	0339111
66145	0339113
66160	0339114
66162	0339116
66163	0339117
66165	0339119
66170	0339120
66172	0339122
66173	0339123
66175	0339125
66180	0339126
66182	0339128
66183	0339129
66185	0339131
66220	0339132
66222	0339134
66223	0339135
66225	0339137
66230	0339138
66232	0339140
66233	0339141
66235	0339143
66250	0339144
66252	0339146
66253	0339147
66255	0339149
66260	0339150
66262	0339152
66263	0339153
66265	0339155
66314	0339156
66316	0339158
66317	0339159
66319	0339161
66325	0339162
66327	0339164
66328	0339165
66330	0339167
66347	0339168
66349	0339170
66350	0339171
66352	0339173
66358	0339174
66360	0339176
66361	0339177
66363	0339179
66440	0339198
66441	0339199
66442	0339200
66443	0339201
66448	0339206
66449	0339207
66450	0339208
66451	0339209
66460	0339218
66461	0339219
66462	0339220
66463	0339221
66472	0339230
66473	0339231
66474	0339232
66475	0339233
66581	0440705
66575	0853512
66576	0853513
66577	0853516
66578	0853532
66579	0853540
66580	0853543
66582	0853544
66583	0853550
66584	0853551
66585	0853563
66586	0853571
66587	0853579
66588	0853584
66589	0853600
66590	0853601

enDURO M527C

Legacy Part #	New Part #
66492	0339250
66493	0339251
66494	0339252
66497	0339255
66498	0339256
66499	0339257
66502	0339260
66504	0339262
66505	0339263
66507	0339265
66509	0339267
66510	0339268
66512	0339270
66514	0339272
66515	0339273
66517	0339275
66519	0339277
66520	0339278
66522	0339280
66524	0339282
66525	0339283
66527	0339285
66529	0339287
66530	0339288
66532	0339290
66534	0339292
66535	0339293
66537	0339295
66539	0339297
66540	0339298
66542	0339300
66544	0339302
66545	0339303

STREAKERS M213

Legacy Part #	New Part #
64550	9163464
64551	9163465
64552	9163466
64553	9163467
64554	9163468
64555	9163469
64556	9163470
64557	9163471
64558	9163472
64559	9163473
64560	9163474
64561	9163475
64562	9163476
64563	9163477
64564	9163478
64565	9163479
64566	9163480
64567	9163481
64568	9163482
64569	9163483
64570	9163484
64571	9163485
64572	9163486
64573	9163487
64574	9163488
64575	9163489
64576	9163490
64577	9163491
64578	9163492
64579	9163493
64580	9163494
64581	9163495
64582	9163496
64583	9163497
64584	9163498
64585	9163499
64586	9163500
64587	9163501
64588	9163502
64589	9163503
64590	9163504
64591	9163505
64592	9163506
64593	9163507
64594	9163508
64595	9163509
64596	9163510
64597	9163511
64598	9163512
64599	9163513
64600	9163514
64601	9163515
64602	9163516
64603	9163517
64604	9163518
64605	9163519
64606	9163520
64607	9163521
64608	9163522
64609	9163523
64610	9163524
64611	9163525
64612	9163526
64613	9163527
64614	9163528
64615	9163529
64616	9163530
64617	9163531
64618	9163532
64619	9163533
64620	9163534
64621	9163535
64622	9163536
64623	9163537
64624	9163538
64625	9163539
64626	9163540
64627	9163541
64628	9163542
64629	9163543
64630	9163544
64631	9163545
64632	9163546
64633	9163547
64634	9163548
64635	9163549
64636	9163550
64637	9163551
64638	9163552
64639	9163553
64640	9163554
64641	9163555
64642	9163556
64643	9163557
64644	9163558
64645	9163559
64646	9163561
64647	9163562
64648	9163563
64649	9163564
64650	9163565
64651	9163566
64652	9163567
64653	9163568
64654	9163569
64655	9163570
64656	9163571
64657	9163572
64658	9163573
64659	9163574
64660	9163575
64661	9163576
64662	9163577
64663	9163578
64664	9163579
64665	9163580

64666	9163581
64667	9163582
64668	9163583
64669	9163584
64670	9163585
64671	9163586
64672	9163587
64673	9163588
64674	9163589
64675	9163590
64676	9163591
64677	9163592
64678	9163593
64679	9163594
64680	9163595
64681	9163596
64682	9163597
64683	9163598
64684	9163599
64685	9163600
64686	9163601
64687	9163602
64688	9163603
64689	9163604
64690	9163605
64691	9163606
64692	9163607
64693	9163608
64694	9163609
64695	9163610
64696	9163611
64697	9163612
64698	9163613
64699	9163614
64700	9163615
64701	9163616
64702	9163617
64703	9163618
64704	9163619
64705	9163620
64706	9163621
64707	9163622
64708	9163623
64709	9163624
64710	9163625
64711	9163626
64712	9163627
64713	9163628
64714	9163629
64715	9163630
64716	9163631
64717	9163632
64718	9163633
64719	9163634
64720	9163635
64721	9163636
64722	9163637
64723	9163638
64724	9163639
64725	9163640
64726	9163641
64727	9163642
64728	9163643
64729	9163644
64730	9163645
64731	9163646
64732	9163647
64733	9163648
64734	9163649
64735	9163650
64736	9163651
64737	9163652
64738	9163653
64739	9163654
64740	9163655
64741	9163656
64742	9163657
64763	9163676
64764	9163677
64765	9163678
64766	9163679
64767	9163680
64768	9163681
64769	9163682
64770	9163683
64771	9163684
64772	9163685

STREAKERS M213N

Legacy Part #	New Part #
64773	9163686
64774	9163687
64775	9163688
64777	9163689
64778	9163690
64779	9163691
64780	9163692
64781	9163693
64782	9163694
64783	9163695
64784	9163696
64785	9163697
64786	9163698
64787	9163699
64788	9163700
64789	9163701
64790	9163702
64791	9163703
64792	9163704
64793	9163705
64794	9163706
64795	9163707
64796	9163708
64797	9163709
64798	9163710
64799	9163711
64800	9163712
64801	9163713
64802	9163714
64803	9163715
64804	9163716
64805	9163717
64806	9163718
64807	9163719
64808	9163720
64810	9163721
64811	9163722
64812	9163723
64813	9163724
64814	9163725
64815	9163726
64816	9163727
64817	9163728
64818	9163729
64819	9163730
64820	9163731
64821	9163732
64822	9163733
64823	9163734
64824	9163735
64826	9163736
64827	9163737
64828	9163738
64829	9163739
64830	9163740
64831	9163741
64832	9163742
64833	9163743
64834	9163744
64835	9163745
64836	9163746
64837	9163747
64838	9163748
64839	9163749
64840	9163750
64841	9163751
64842	9163752
64843	9163753
64844	9163754
64845	9163755
64846	9163756
64847	9163757
64848	9163758
64849	9163759
64850	9163760
64851	9163761
64852	9163762
64853	9163763
64854	9163764
64855	9163765
64856	9163766
64857	9163767
64858	9163768
64859	9163769
64860	9163770
64861	9163771
64862	9163772
64863	9163773
64865	9163775
64866	9163776
64867	9163777
64868	9163778
64869	9163779
64870	9163780
64871	9163781
64872	9163782
64873	9163783
64874	9163784
64875	9163785
64876	9163786
64877	9163787
64878	9163788
64879	9163789
64880	9163790
64881	9163791
64882	9163792
64883	9163793
64884	9163794
64885	9163795
64886	9163796
64887	9163797
64888	9163798
64889	9163799
64890	9163800
64891	9163801
64892	9163802
64893	9163803
64894	9163804
64895	9163805
64896	9163806
64897	9163807
64898	9163808
64899	9163809
64900	9163810
64901	9163811
64902	9163812
64903	9163813
64904	9163814

STREAKERS M213C

Legacy Part #	New Part #
64939	9163847
64940	9163848
64941	9163849
64942	9163850
64943	9163851
64944	9163852
64945	9163853
64946	9163854
64947	9163855
64950	9163856
64952	9163857
64955	9163859
64956	9163860
64958	9163861
64960	9163862
64961	9163863
64962	9163864
64964	9163865
64965	9163866
64966	9163867
64967	9163868
64969	9163869
64970	9163870
64971	9163871
64973	9163872
64974	9163873

STREAKERS M223

Legacy Part #	New Part #
61000	0334692
61001	0334693
61002	0334694
61004	0334696
61005	0334697
61006	0334698
61007	0334699
61009	0334701
61010	0334702
61011	0334703
61012	0334704
61013	0334705
61014	0334706
61016	0334708
61017	0334709
61018	0334710
61019	0334711
61020	0334712
61021	0334713
61022	0334714
61023	0334715
61024	0334716
61025	0334717
61026	0334718
61027	0334719
61028	0334720
61030	0334722
61031	0334723
61032	0334724
61033	0334725
61034	0334726
61035	0334727
61036	0334728
61037	0334729
61038	0334730
61039	0334731
61040	0334732
61041	0334733
61042	0334734
61043	0334735
61044	0334736
61045	0334737
61046	0334738
61047	0334739

61048	0334740
61050	0334742
61051	0334743
61052	0334744
61053	0334745
61054	0334746
61055	0334747
61056	0334748
61057	0334749
61058	0334750
61059	0334751
61060	0334752
61061	0334753
61062	0334754
61063	0334755
61064	0334756
61065	0334757
61066	0334758
61067	0334759
61068	0334760
61069	0334761
61070	0334762
61071	0334763
61073	0334765
61074	0334766
61075	0334767
61076	0334768
61077	0334769
61078	0334770
61080	0334772
61081	0334773
61082	0334774
61083	0334775
61084	0334776
61085	0334777
61086	0334778
61087	0334779
61088	0334780
61089	0334781
61090	0334782
61091	0334783
61092	0334784
61093	0334785
61094	0334786
61095	0334787
61096	0334788
61097	0334789
61098	0334790
61099	0334791
61100	0334792
61101	0334793
61102	0334794
61103	0334795
61104	0334796
61105	0334797
61220	0334910
61221	0334911
61223	0334913
61224	0334914
61226	0334916

61227	0334917
61229	0334919
61230	0334920
61231	0334921
61232	0334922
61234	0334924
61235	0334925
61236	0334926
61237	0334927
61238	0334928
61239	0334929
61240	0334930
61241	0334931
61242	0334932
61244	0334934
61245	0334935
61246	0334936
61247	0334937
61248	0334938
61249	0334939
61250	0334940
61251	0334941
61252	0334942
61253	0334943
61254	0334944
61255	0334945
61257	0334947
61258	0334948
61259	0334949
61260	0334950
61261	0334951
61262	0334952
61263	0334953
61264	0334954
61265	0334955
61266	0334956
61267	0334957
61268	0334958
61269	0334959
61270	0334960
61271	0334961
61272	0334962
61273	0334963
61274	0334964
61275	0334965
61276	0334966
61277	0334967
61278	0334968
61279	0334969
61281	0334971
61282	0334972
61283	0334973
61284	0334974
61285	0334975
61286	0334976
61287	0334977
61288	0334978
61289	0334979
61290	0334980
61291	0334981

61292	0334982
61293	0334983
61294	0334984
61295	0334985
61296	0334986
61297	0334987
61299	0334989
61300	0334990
61301	0334991
61302	0334992
61303	0334993
61304	0334994
61305	0334995
61306	0334996
61307	0334997
61308	0334998
61309	0334999
61310	0335000
61311	0335001
61312	0335002
61313	0335003
61315	0335005
61316	0335006
61317	0335007
61318	0335008
61319	0335009
61320	0335010
61321	0335011
61322	0335012
61323	0335013
61324	0335014
61325	0335015

STREAKERS M223N

Legacy Part #	New Part #
61122	0334812
61123	0334813
61125	0334815
61126	0334816
61128	0334818
61129	0334819
61131	0334821
61132	0334822
61134	0334824
61135	0334825
61136	0334826
61138	0334828
61139	0334829
61140	0334830
61142	0334832
61143	0334833
61144	0334834
61146	0334836
61147	0334837
61148	0334838
61149	0334839
61151	0334841
61152	0334842

61153	0334843
61154	0334844
61156	0334846
61157	0334847
61158	0334848
61160	0334850
61161	0334851
61162	0334852
61163	0334853
61164	0334854
61166	0334856
61167	0334857
61168	0334858
61169	0334859
61170	0334860
61172	0334862
61173	0334863
61174	0334864
61175	0334865
61176	0334866
61178	0334868
61179	0334869
61180	0334870
61181	0334871
61182	0334872
61184	0334874
61185	0334875
61186	0334876
61188	0334878
61189	0334879
61190	0334880
61192	0334882
61193	0334883
61194	0334884
61196	0334886
61197	0334887
61198	0334888
61199	0334889
61201	0334891
61202	0334892
61203	0334893
61204	0334894
61206	0334896
61207	0334897
61208	0334898
61209	0334899
61211	0334901
61212	0334902
61214	0334904
61215	0334905
61217	0334907
61218	0334908
61342	0335029
61343	0335030
61344	0335031
61345	0335032
61347	0335034
61348	0335035
61349	0335036
61350	0335037

61352	0335039
61353	0335040
61354	0335041
61355	0335042
61357	0335044
61358	0335045
61359	0335046
61360	0335047
61361	0335048
61363	0335050
61364	0335051
61365	0335052
61366	0335053
61367	0335054
61369	0335056
61370	0335057
61371	0335058
61372	0335059
61373	0335060
61374	0335061
61376	0335063
61377	0335064
61378	0335065
61379	0335066
61380	0335067
61381	0335068
61382	0335069
61384	0335071
61385	0335072
61386	0335073
61387	0335074
61388	0335075
61389	0335076
61391	0335078
61392	0335079
61393	0335080
61394	0335081
61395	0335082
61397	0335084
61398	0335085
61399	0335086
61400	0335087
61402	0335089
61403	0335090
61404	0335091
61405	0335092
61406	0335093
62011	0853374
62014	0853375
62015	0853376
62039	0853377
62045	0853378
62046	0853379
62047	0853380
62051	0853381
62052	0853382
62099	0853387
62101	0853390
62102	0853391
62103	0853392

62123	0853393
62139	0853394
62151	0853395
62152	0853396
62154	0853397
62155	0853398
62156	0853399
62161	0853400
62164	0853401
62300	0853434
62010	0856023
62027	0856024
62100	0856025
62153	0856026

STREAKERS M233

Legacy Part #	New Part #
61108	0334798
61109	0334799
61110	0334800
61111	0334801
61112	0334802
61113	0334803
61114	0334804
61115	0334805
61116	0334806
61117	0334807
61118	0334808
61119	0334809
61120	0334810
61121	0334811
61329	0335016
61330	0335017
61331	0335018
61332	0335019
61333	0335020
61334	0335021
61335	0335022
61336	0335023
61337	0335024
61338	0335025
61339	0335026
61340	0335027
61341	0335028

STREAKERS M203

Legacy Part #	New Part #
32520	0332884
32521	0332885
32522	0332886
32634	0332928
32635	0332929
32637	0332930
32638	0332931
32639	0332932
32701	0332935
32702	0332936
32703	0332937
32704	0332938
32714	0332943
32720	0332946
32726	0332948
32986	0333017
32988	0333019
32989	0333020
32991	0333022
32992	0333023
32993	0333024
32994	0333025
32995	0333026
32996	0333027
32997	0333028
32998	0333029
32999	0333030
33001	0333031
33002	0333032
33003	0333033
33004	0333034
33006	0333035
33007	0333036
33008	0333037
33009	0333038
33011	0333040
33012	0333041
33013	0333042
33137	0333115
33167	0333137
33169	0333138
33170	0333139
33172	0333140
33174	0333141
33175	0333142
33177	0333144
33179	0333145
33246	0333152
33248	0333153
33250	0333154
33601	0333206
33607	0333216
33610	0333219
33611	0333220
33614	0333225
34302	0333454
34303	0333455
34305	0333456
34306	0333457
34307	0333458
34311	0333462
34384	0333504
34385	0333505
34386	0333506
34388	0333508
34435	0333534
34438	0333537
34454	0333550
34458	0333553
34460	0333555
34462	0333557
34480	0333560
34492	0333566
34522	0333584
34526	0333587
34531	0333590
34534	0333593
34537	0333596
34545	0333604
34549	0333607
34553	0333611
34558	0333616
34560	0333618
38025	0334037
38028	0334039
38033	0334044
38036	0334047
38261	0334249
38262	0334250

STREAKERS M202

Legacy Part #	New Part #
32430	0332864
32431	0332865
32432	0332866
32434	0332867
32436	0332868
32444	0332869
32445	0332870
32446	0332871
32447	0332872
32504	0332876
32506	0332877
32510	0332879
32512	0332880
32514	0332881
32516	0332882
32606	0332924
32941	0332975
32942	0332976
32943	0332977
32945	0332979
32946	0332980
32949	0332983
32950	0332984
32951	0332985
32952	0332986
32953	0332987
32954	0332988
32955	0332989
32957	0332991
32958	0332992
32959	0332993
32960	0332994
32962	0332995
32964	0332997
32965	0332998
32968	0333000
32971	0333002
33526	0333183
33542	0333186
33544	0333187
33546	0333188
33548	0333189
33550	0333190
33552	0333191
33648	0333238
33649	0333239
33689	0333240
33691	0333241
33692	0333242
33693	0333243
33886	0333283
34100	0333344
34144	0333378
34146	0333380
34147	0333381
34161	0333387
34162	0333388
34196	0333401
34197	0333402
34198	0333403
34199	0333404
34204	0333405
34205	0333406
34206	0333407
34207	0333408
34235	0333428
34237	0333430
34243	0333433
34245	0333435
34246	0333436
34262	0333438
34343	0333482
34344	0333483
34345	0333484
34382	0333502
36974	0333775
36976	0333777
38076	0334087
38078	0334089
38081	0334092
38082	0334093
38084	0334095
38090	0334101
38490	0334347
38494	0334349
38504	0334356
38506	0334358
62402	0335239
62403	0335240
62404	0335241
62406	0335242
62408	0335244
62410	0335245
90358	0338030

OMEGA-6 M725/M726

Legacy Part #	New Part #
69050	0337576
69051	0337577
69052	0337578
69053	0337579
69054	0337580
69055	0337581
69056	0337582
69057	0337583
69058	0337584
69059	0337585
69060	0337586
69061	0337587
69062	0337588
69063	0337589
69070	0337590
69071	0337591
69072	0337592
69073	0337593
69074	0337594
69075	0337595
69076	0337596
69077	0337597
69078	0337598
69079	0337599
69080	0337600
69081	0337601
69082	0337602
69083	0337603
69084	0337604
69085	0337605
69086	0337606
69087	0337607
69088	0337608
69089	0337609
69090	0337610
69091	0337611
69092	0337612
69093	0337613
69094	0337614
69095	0337615
69096	0337616
69097	0337617
69098	0337618
69099	0337619
69101	0337620
69102	0337621
69103	0337622
69105	0337623
69106	0337624
69107	0337625
69109	0337626
69110	0337627
69111	0337628
69113	0337629
69114	0337630
69115	0337631

69117	0337632
69118	0337633
69119	0337634
69121	0337635
69122	0337636
69138	0337637
69139	0337638
69140	0337639
69141	0337640
69142	0337641
69143	0337642
69144	0337643
69145	0337644
69146	0337645
69147	0337646
69148	0337647
69149	0337648
69150	0337649
69151	0337650
69152	0337651
69153	0337652
69154	0337653
69155	0337654
69156	0337655
69157	0337656
69158	0337657
69159	0337658
69160	0337659
69161	0337660
69162	0337661
69163	0337662
69164	0337663
69165	0337664
69166	0337665
69167	0337666
69168	0337667
69169	0337668
69170	0337669
69171	0337670
69172	0337671
69173	0337672
69174	0337673
69175	0337674
69176	0337675
69177	0337676
69178	0337677
69179	0337678
69181	0337679
69182	0337680
69183	0337681
69185	0337682
69186	0337683
69187	0337684
69189	0337685
69190	0337686
69191	0337687
69193	0337688
69194	0337689
69195	0337690
69197	0337691
69198	0337692
69199	0337693
69201	0337694
69202	0337695
69220	0337696
69221	0337697
69222	0337698
69223	0337699
69224	0337700
69225	0337701
69226	0337702
69227	0337703
69228	0337704
69229	0337705
69230	0337706
69231	0337707
69232	0337708
69233	0337709
69234	0337710
69235	0337711
69236	0337712
69237	0337713
69238	0337714
69239	0337715
69240	0337716
69241	0337717
69242	0337718
69243	0337719
69244	0337720
69245	0337721
69246	0337722
69247	0337723
69248	0337724
69249	0337725
69251	0337726
69252	0337727
69253	0337728
69255	0337729
69256	0337730
69257	0337731
69259	0337732
69260	0337733
69261	0337734
69263	0337735
69264	0337736
69265	0337737
69267	0337738
69268	0337739
69269	0337740
69271	0337741
69272	0337742

OMEGA-6 M725N/M726N

Legacy Part #	New Part #
69351	0337791
69355	0337795
69359	0337799
69369	0337809
69421	0337851
69427	0337857
69491	0337902
69493	0337904
69495	0337906
69498	0337909
69502	0337913
69505	0337916
69508	0337919
69512	0337923
69516	0337927
69520	0337931
69528	0337937
69532	0337940
69536	0337943
69540	0337946
69544	0337949
69557	0337952
69559	0337954
69563	0337956
69565	0337958
69567	0337960
69570	0337963
69573	0337966
69577	0337970
69581	0337974
69585	0337978
69589	0337981
69593	0337984
69597	0337987
69601	0337990
69605	0337993
69609	0337996

OMEGA-6 M706

Legacy Part #	New Part #
30491	0332137
30493	0332139
30495	0332141
30497	0332142
30498	0332143
30499	0332144
30568	0332187
30570	0332189
30572	0332191
30574	0332193
30575	0332194
62781	0335360
62782	0335361
62783	0335362
62784	0335363
62785	0335364
62787	0335366
62788	0335367
62789	0335368
62790	0335369
62791	0335370
62792	0335371
62793	0335372
62794	0335373
62795	0335374
62797	0335376
62798	0335377
62799	0335378
62800	0335379
62801	0335380
62838	0335417
62847	0335422
62983	0335502
62984	0335503
62985	0335504
62986	0335505
62987	0335506
62988	0335507
62989	0335508
63190	0335642
63192	0335643
63194	0335644
63196	0335645
63198	0335646
63199	0335647
63200	0335648

OMEGA-6 M706N

Legacy Part #	New Part #
31092	0332413
31093	0332414
31095	0332416
31103	0332422
31104	0332423
31192	0332434
31193	0332435
31194	0332436
31197	0332438
31198	0332439
62820	0335399
62821	0335400
62822	0335401
62823	0335402
62824	0335403
62825	0335404
62827	0335406
62901	0335445
62902	0335446
62903	0335447
62904	0335448
62905	0335449
62906	0335450
62907	0335451
62908	0335452
62909	0335453
62910	0335454
62911	0335455
62912	0335456
62914	0335458
62915	0335459

INCONEX M806

Legacy Part #	New Part #
68731	0339333
68732	0339334
68733	0339335
68734	0339336
68735	0339337
68736	0339338
68737	0339339
68738	0339340
68739	0339341
68740	0339342
68741	0339343
68742	0339344
68743	0339345
68744	0339346
68746	0339348
68747	0339349
68748	0339350
68749	0339351
68751	0339353
68752	0339354
68753	0339355
68754	0339356
68755	0339357
68756	0339358
68757	0339359
68758	0339360
68759	0339361
68760	0339362
68761	0339363
68762	0339364
68763	0339365
68764	0339366
68765	0339367
68766	0339368
68767	0339369
68768	0339370
68769	0339371
68770	0339372
68771	0339373
68772	0339374
68773	0339375
68774	0339376
68775	0339377
68776	0339378
68777	0339379
68778	0339380
68779	0339381
68780	0339382
68781	0339383
68782	0339384
68783	0339385
68784	0339386
68891	0339493
68892	0339494

INCONEX M806N

Legacy Part #	New Part #
68786	0339388
68788	0339390
68791	0339393
68795	0339397
68799	0339401
68803	0339405
68811	0339413
68815	0339417
68819	0339421
68823	0339425
68833	0339435
68837	0339439
68841	0339443
68849	0339451
68853	0339455
68857	0339459
68861	0339463
68869	0339471
68873	0339475
68877	0339479
68881	0339483

truCORE E14-ALTiN

Legacy Part #	New Part #
30252	0332062
30253	0332063
30417	0332111
30458	0332117
30461	0332118
30463	0332120
30469	0332124
30475	0332128
30500	0332145
30501	0332146
30506	0332150
30507	0332151
30519	0332157
30520	0332158
30521	0332159
30523	0332160
30529	0332165
30531	0332167
30534	0332169
30537	0332170
30546	0332172
30555	0332177
30561	0332182
30800	0332300
30898	0332339
30972	0332379
30976	0332381
30979	0332384
30996	0332390
31003	0332393
31004	0332394
31024	0332395
31026	0332396
31028	0332397
31030	0332398
31032	0332399
31034	0332400
31038	0332402
31040	0332403
31150	0332430
31545	0332548
31546	0332549
31548	0332550
31549	0332551
31595	0332552
32202	0332815
32204	0332816
32208	0332817
32212	0332818
32214	0332819
32216	0332820
32218	0332821
32224	0332823
32226	0332824
32228	0332826
32230	0332828
32231	0332829
32301	0332840
32302	0332841
32305	0332842
32306	0332843
32308	0332844
32310	0332845
32312	0332846
32318	0332847
32324	0332848
32325	0332849
34115	0333355
34123	0333362
34135	0333372
34136	0333373
34143	0333377
34151	0333385
34167	0333392
36587	0333742
36593	0333743
36595	0333744
36597	0333745
36838	0333772
36899	0333773
37443	0333854
37444	0333855
37445	0333856
37446	0333857
37447	0333858
37449	0333860
37450	0333861
37451	0333862
37452	0333863
37453	0333864
37727	0333930
37731	0333933
37735	0333937
37751	0333944
37767	0333947
37793	0333948
39168	0334494
39169	0334495
39170	0334496
39171	0334497
39172	0334498
39177	0334502
39178	0334503
39365	0334513
39513	0334528
39601	0334555
39604	0334557
39694	0334594
39695	0334595
39696	0334596
39697	0334597
39698	0334598
39700	0334599
39701	0334600
39722	0334611
39725	0334612
39757	0334619
39772	0334628
39790	0334638
39791	0334639
39793	0334641
39794	0334642
39796	0334644
39804	0334645
39805	0334646
39806	0334647
39807	0334648
39808	0334649
39810	0334650
39812	0334651
39814	0334652
62107	0335145
62110	0335147
62111	0335148
90523	0338032
90695	0338039
96156	0338046
97662	0338057
97847	0338064
97850	0338065
97871	0338067
98244	0338073
98245	0338074
98955	0338077
98956	0338078
98957	0338079
98978	0338081
99106	0338089
99284	0338091
99336	0338093
99345	0338094

truCORE E14-TiCN

Legacy Part #	New Part #
31532	0332537
31534	0332539
31536	0332541
34110	0333351
34114	0333354
34118	0333358
34126	0333365
34134	0333371
34142	0333376
34150	0333384
34166	0333391
34402	0333510
34403	0333511
34404	0333512
34406	0333514
34408	0333516
34410	0333518
34412	0333520
34416	0333524
34420	0333527
34424	0333530
34430	0333532
34432	0333533
34440	0333539
34448	0333544
34464	0333559
37710	0333917
37718	0333923
37726	0333929
37734	0333936
37742	0333940
37750	0333943
37766	0333946
39781	0334632
39782	0334633
39784	0334634
39785	0334635

truCORE E14-TiN

Legacy Part #	New Part #
30706	0332253
30710	0332257
30714	0332260
30722	0332266
30730	0332272
30738	0332277
30746	0332279
30762	0332286
30766	0332290
30770	0332294

truCORE E14 - Non-coated

Legacy Part #	New Part #
30040	0332025
30043	0332026
30049	0332027
30052	0332028
30055	0332029
30058	0332030
30061	0332031
30067	0332032
30073	0332033
30079	0332034
30125	0332044
30126	0332045
30127	0332046
30131	0332047
30133	0332048
30135	0332049
30137	0332050
30138	0332051
30701	0332249
30703	0332251
30705	0332252
30707	0332254
30709	0332256
30711	0332258
30713	0332259
30717	0332262
30721	0332265
30725	0332268
30729	0332271
30737	0332276
30745	0332278
30761	0332285
30765	0332289
30769	0332293
30772	0332295
30777	0332297
31471	0332495
31473	0332496
31474	0332497
31475	0332498
31477	0332500
31479	0332502
31480	0332503
31482	0332505
31484	0332507
31485	0332508
31507	0332516
31511	0332519
31515	0332522
31519	0332526
31523	0332530
34108	0333349
34112	0333352
34116	0333356
34120	0333359
34124	0333363

34132	0333369
34140	0333374
34148	0333382
36579	0333739
36581	0333740
37708	0333915
37712	0333918
37716	0333921
37720	0333924
37724	0333927
37732	0333934
37740	0333938
37748	0333941
38607	0334410
38608	0334411
39745	0334617
39761	0334621
39765	0334623
39769	0334626
34164	0856263
37764	0856267

truCORE E24-ALTiN

Legacy Part #	New Part #
30410	0332110
31900	0332663
31926	0332686
31927	0332687
31929	0332689
31949	0332698
31957	0332702
31958	0332703
31959	0332704
31985	0332720
31990	0332722
31991	0332723
31995	0332725
31998	0332726

truCORE E13-ALTiN

Legacy Part #	New Part #
30247	0332060
30897	0332338
33800	0333256
33801	0333257
33810	0333259
33814	0333261
33819	0333263
33826	0333266
33827	0333267
33850	0333271
33852	0333272
33853	0333273
33854	0333274
33855	0333275
33856	0333276
33913	0333290
33929	0333296
33931	0333297
33955	0333300
34011	0333304
34046	0333333
34047	0333334
34051	0333336
34057	0333337
34058	0333338
34059	0333339
34069	0333341
36773	0333763
36779	0333764
36781	0333765
36783	0333766
37012	0333783
37014	0333784
37016	0333785
37020	0333786
37024	0333787
37026	0333788
37028	0333789
37031	0333790
37033	0333791
37034	0333792
37166	0333800
62170	0335175
62171	0335176
62174	0335177
62175	0335178
62176	0335179
62178	0335180
62180	0335181
62260	0335212
62261	0335213
62262	0335214
62263	0335215
62264	0335216
62266	0335217
62268	0335218
62270	0335219
62456	0335255
62457	0335256
62458	0335257
90089	0338027

truCORE E13-Non-coated

Legacy Part #	New Part #
33775	0333245
33776	0333246
33777	0333247
33782	0333248
33783	0333249
33784	0333250
33786	0333251
33787	0333252
33789	0333253
33792	0333255
33808	0333258
33812	0333260
33816	0333262
33820	0333264
33824	0333265
33832	0333268
33840	0333269
33848	0333270

truCORE E12-ALTiN

Legacy Part #	New Part #
30336	0332072
30337	0332073
30338	0332074
30339	0332075
30344	0332076
30345	0332077
30348	0332078
30503	0332147
30509	0332152
30510	0332153
30532	0332168
30552	0332174
30553	0332175
30554	0332176
30556	0332178
30557	0332179
30700	0332248
31492	0332511
32601	0332919
32604	0332922
34015	0333307
34023	0333313
34035	0333323
34036	0333324
34037	0333325
34039	0333327
35603	0333738
36610	0333748
36619	0333749
36640	0333750
36645	0333751
36646	0333752
36647	0333753
36648	0333754
36649	0333755
36758	0333760
36764	0333761
37174	0333802
37980	0334026
37981	0334027
37982	0334028
37984	0334030
38923	0334422
39093	0334465
39104	0334466
39105	0334467
39131	0334479
39154	0334484
62182	0335182
62183	0335183
62185	0335184
62186	0335185
62187	0335186
62188	0335187
62194	0335188
62195	0335189
62196	0335190
62197	0335191
62198	0335192
62200	0335193
62288	0335220
62455	0335254
90088	0338026
96342	0338048
97907	0338069
99079	0338083
99081	0338085
99357	0338096
99358	0338097
99359	0338098
32610	0332927

truCORE E12-Non-coated

Legacy Part #	New Part #
30001	0332018
30004	0332019
30010	0332020
30013	0332021
30016	0332022
30019	0332023
30022	0332024
30153	0332052
30155	0332053
30156	0332054
30223	0332056
30231	0332057
30234	0332058
30235	0332059
30601	0332199
30603	0332201
30605	0332203
30607	0332205
30609	0332207
30611	0332209
30613	0332211
30617	0332214
30621	0332217
30629	0332223
30637	0332228
30645	0332229
30661	0332233
30665	0332236
30669	0332239
31035	0332401
31047	0332406
31063	0332409
31407	0332464
31411	0332466
31415	0332468
31417	0332470
31431	0332478
31434	0332480
31435	0332481
31437	0332483
31439	0332485
31440	0332486
31442	0332488
31444	0332490
31445	0332491
34008	0333301
34012	0333305
34016	0333308
34020	0333311
34024	0333314
34032	0333321
37608	0333894
37612	0333897
37616	0333899
37620	0333902
37624	0333904
37632	0333909
37640	0333911
37648	0333912
38602	0334408
38603	0334409

DECIMAL EQUIVALENT CHART

Tool Size	Decimal Equiv.	Tool Size	Decimal Equiv.	Tool Size	Decimal Equiv.	Tool Size	Decimal Equiv.	Tool Size	Decimal Equiv.	Tool Size	Decimal Equiv.
#80	.0135	1/16	.0625	3.30	.1299	5.40	.2126	O	.3160	17/32	.5312
0.35	.0138	1.60	.0630	3.40	.1339	#3	.2130	8.10	.3189	13.50	.5315
#79	.0145	#52	.0635	#29	.1360	5.50	.2165	8.20	.3228	35/64	.5469
1/64	.0156	1.65	.0650	3.50	.1378	7/32	.2188	P	.3230	14.00	.5512
0.40	.0158	1.70	.0669	#28	.1405	5.60	.2205	8.25	.3248	9/16	.5625
#78	.0160	#51	.0670	9/64	.1406	#2	.2210	8.30	.3268	14.50	.5709
0.45	.0177	1.75	.0689	3.60	.1417	5.70	.2244	21/64	.3281	37/64	.5781
#77	.0180	#50	.0700	#27	.1440	5.75	.2264	8.40	.3307	15.00	.5906
0.50	.0197	1.80	.0709	3.70	.1457	#1	.2280	Q	.3320	19/32	.5938
#76	.0200	1.85	.0728	#26	.1470	5.80	.2283	8.50	.3346	39/64	.6094
#75	.0210	#49	.0730	3.75	.1476	5.90	.2323	8.60	.3386	15.50	.6102
0.55	.0217	1.90	.0748	#25	.1495	A	.2340	R	.3390	5/8	.6250
#74	.0225	#48	.0760	3.80	.1496	15/64	.2344	8.70	.3425	16.00	.6299
0.60	.0236	1.95	.0768	#24	.1520	6.00	.2362	11/32	.3438	41/64	.6406
#73	.0240	5/64	.0781	3.90	.1535	B	.2380	8.75	.3445	16.50	.6496
#72	.0250	#47	.0785	#23	.1540	6.10	.2402	8.80	.3465	21/32	.6562
0.65	.0256	2.00	.0787	5/32	.1562	C	.2420	S	.3480	17.00	.6693
#71	.0260	2.05	.0807	#22	.1570	6.20	.2441	8.90	.3504	43/64	.6719
0.70	.0276	#46	.0810	4.00	.1575	D	.2460	9.00	.3543	11/16	.6875
#70	.0280	#45	.0820	#21	.1590	6.25	.2461	T	.3580	17.50	.6890
#69	.0292	2.10	.0827	#20	.1610	6.30	.2480	9.10	.3583	45/64	.7031
0.75	.0295	2.15	.0846	4.10	.1614	1/4	.2500	23/64	.3594	18.00	.7087
#68	.0310	#44	.0860	4.20	.1654	E	.2500	9.20	.3622	23/32	.7188
1/32	.0312	2.20	.0866	#19	.1660	6.40	.2520	9.25	.3642	18.50	.7283
0.80	.0315	2.25	.0886	4.25	.1673	6.50	.2559	9.30	.3661	47/64	.7344
#67	.0320	#43	.0890	4.30	.1693	F	.2570	U	.3680	19.00	.7480
#66	.0330	2.30	.0906	#18	.1695	6.60	.2598	9.40	.3701	3/4	.7500
0.85	.0335	2.35	.0925	11/64	.1719	G	.2610	9.50	.3740	49/64	.7656
#65	.0350	#42	.0935	#17	.1730	6.70	.2638	3/8	.3750	19.50	.7677
0.90	.0354	3/32	.0938	4.40	.1732	17/64	.2656	V	.3770	25/32	.7812
#64	.0360	2.40	.0945	#16	.1770	6.75	.2657	9.60	.3780	20.00	.7874
#63	.0370	#41	.0960	4.50	.1772	H	.2660	9.70	.3819	51/64	.7969
0.95	.0374	2.45	.0965	#15	.1800	6.80	.2677	9.75	.3839	20.50	.8071
#62	.0380	#40	.0980	4.60	.1811	6.90	.2717	9.80	.3858	13/16	.8125
#61	.0390	2.50	.0984	#14	.1820	I	.2720	W	.3860	21.00	.8268
1.00	.0394	#39	.0995	#13	.1850	7.00	.2756	9.90	.3898	53/64	.8281
#60	.0400	#38	.1015	4.70	.1850	J	.2770	25/64	.3906	27/32	.8438
#59	.0410	2.60	.1024	4.75	.1870	7.10	.2795	10.00	.3937	21.50	.8465
1.05	.0413	#37	.1040	3/16	.1875	K	.2810	X	.3970	55/64	.8594
#58	.0420	2.70	.1063	4.80	.1890	9/32	.2812	Y	.4040	22.00	.8661
#57	.0430	#36	.1065	#12	.1890	7.20	.2835	13/32	.4062	7/8	.8750
1.10	.0433	2.75	.1083	#11	.1910	7.25	.2854	Z	.4130	22.50	.8858
1.15	.0453	7/64	.1094	4.90	.1929	7.30	.2874	10.50	.4134	57/64	.8906
#56	.0465	#35	.1100	#10	.1935	L	.2900	27/64	.4219	23.00	.9055
3/64	.0469	2.80	.1102	#9	.1960	7.40	.2913	11.00	.4331	29/32	.9062
1.20	.0472	#34	.1110	5.00	.1969	M	.2950	7/16	.4375	59/64	.9219
1.25	.0492	#33	.1130	#8	.1990	7.50	.2953	11.50	.4528	23.50	.9252
1.30	.0512	2.90	.1142	5.10	.2008	19/64	.2969	29/64	.4531	15/16	.9375
#55	.0520	#32	.1160	#7	.2010	7.60	.2992	15/32	.4688	24.00	.9449
1.35	.0531	3.00	.1181	13/64	.2031	N	.3020	12.00	.4724	61/64	.9531
#54	.0550	#31	.1200	#6	.2040	7.70	.3031	31/64	.4844	24.50	.9646
1.40	.0551	3.10	.1220	5.20	.2047	7.75	.3051	12.50	.4921	31/32	.9688
1.45	.0571	1/8	.1250	#5	.2055	7.80	.3071	1/2	.5000	25.00	.9843
1.50	.0591	3.20	.1260	5.25	.2067	7.90	.3110	13.00	.5118	63/64	.9844
#53	.0595	3.25	.1280	5.30	.2087	5/16	.3125	33/64	.5156	1	1.000
1.55	.0610	#30	.1285	#4	.2090	8.00	.3150				

BREAKING BARRIERS IN MACHINING

True to our mission, everything we do is to provide the tools you need to get even more from your operation then you ever thought possible... and to give your future the Class A finish you deserve.

Your IMCO sales reps and distributors are very valuable resources with years of metalworking experience. They know the process, the tools, and are experts at offering suggestions/solutions to your most complicated challenges.

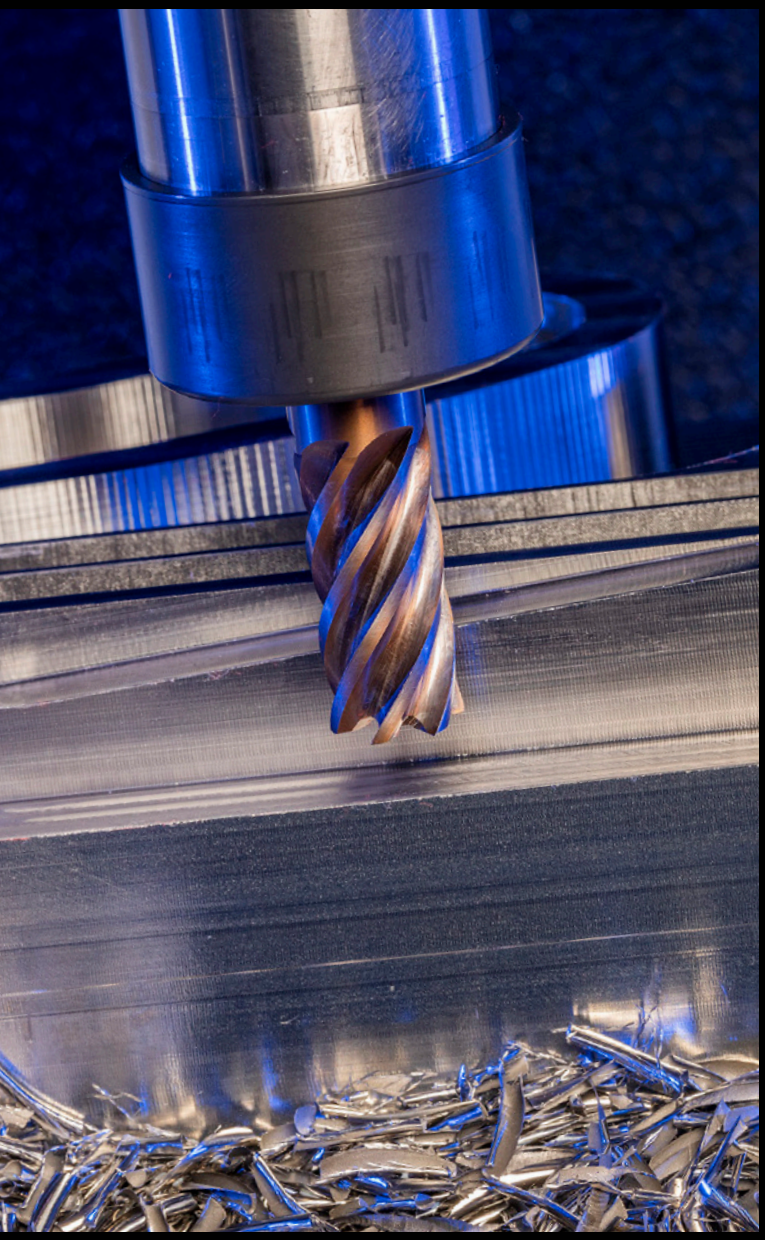
Reach out to your rep today. Now is the time to break barriers in machining with IMCO.

Member IMC Group

IMCO

Power. Precision. Performance.

The metalmorphosis moves forward with IMCO.



We design great end mills, and then we make them even better. We solve machining issues and then take those solutions to the next level. We always ask, "What if … ?" That way of thinking is what puts IMCO at the frontier of advanced end mill design.

So, ask yourself: What if IMCO could solve the machining issues holding you back?

Call us and find out.

In USA call **1-800-765-4626**
International **(+01) 419-661-6313**
Fax **419-661-6314**
Email **support@imcousa.com**

Visit **www.imcousa.com**
by scanning this QR code.

Member IMC Group

IMCO

Power. Precision. Performance.

IMCO Carbide Tool Inc.
28170 Cedar Park Blvd., Perrysburg, OH 43551

©2024 IMCO Carbide Tool Inc.
Made in U.S.A.