

**YU-OP20**

BEST VALUE IN THE WORLD OF CUTTING TOOLS



**ONLY ONE**

COATED PM60 END MILLS

**All-New Material.  
All-New Approach to Cutting Tools.**

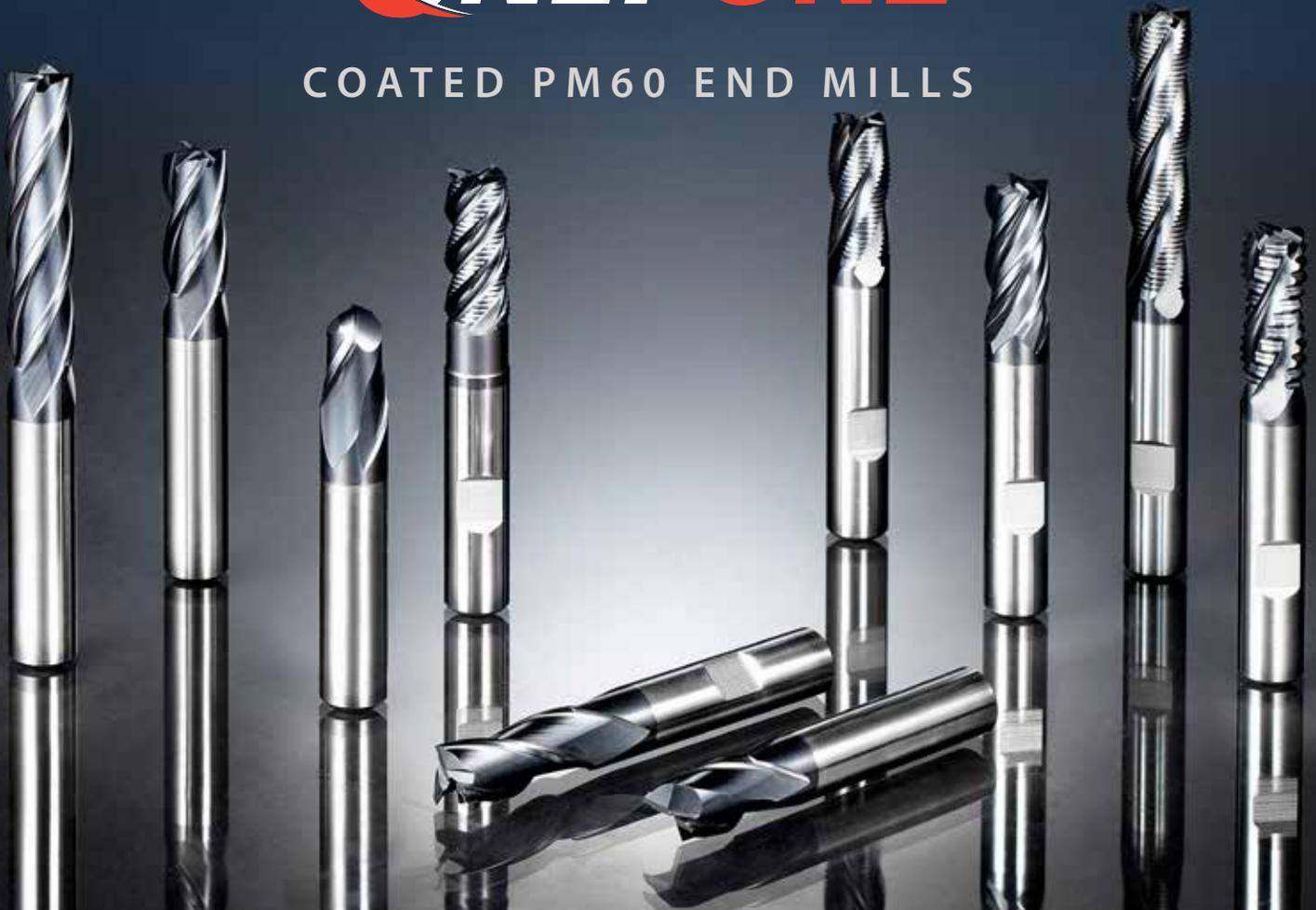


**The Ultimate Problem-Solver  
for Your Shop.**

- Higher feeds and speeds capability than traditional HSS and cobalt tools
- Higher performance in unstable cutting conditions with heavy vibrations
- Less expensive and more versatile than general purpose carbide tools



## COATED PM60 END MILLS



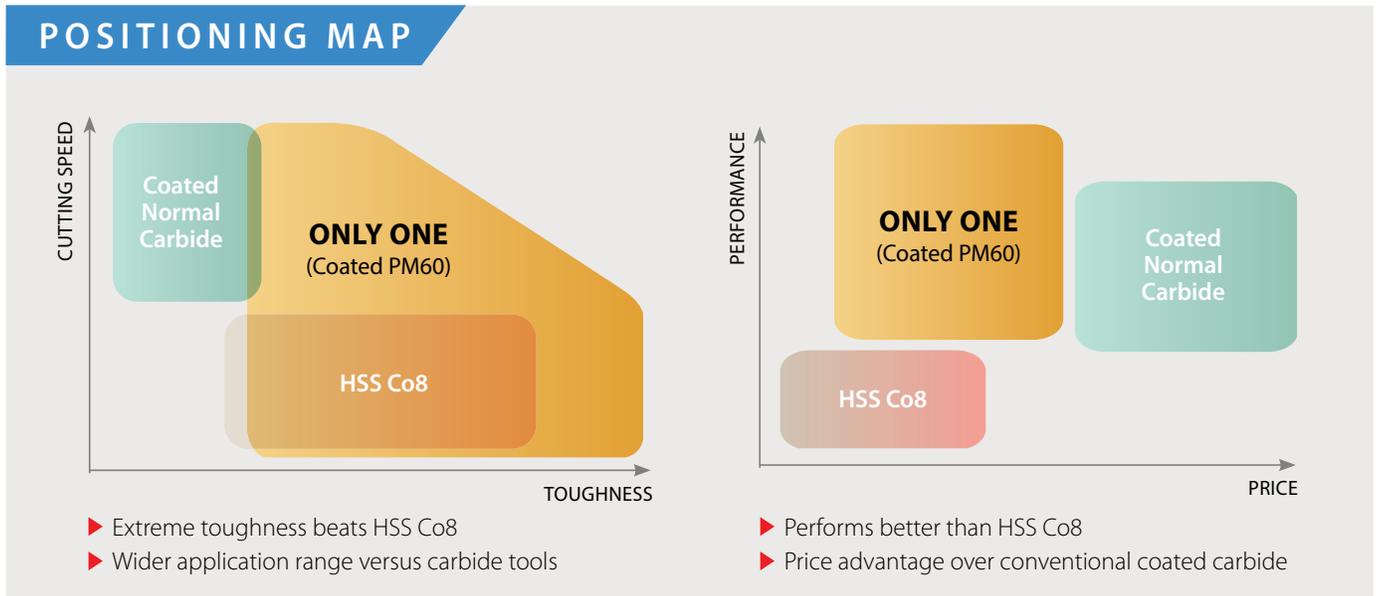
### **PUSH PRODUCTIVITY HIGHER** in the Most Challenging Conditions with Cost-Effective Performance.

#### **Don't fear unstable cutting conditions.**

ONLY ONE end mills provide unbridled performance that won't fade in the long runs. Compared to HSS Co8 and solid carbide, ONLY ONE can take the vibrations – without fear of chipping – and get the job done. With YG-1's unique PM60 coating that provides 12% more cobalt than most competitors, ONLY ONE end mills not only out-perform the competition, they outlast them, too.



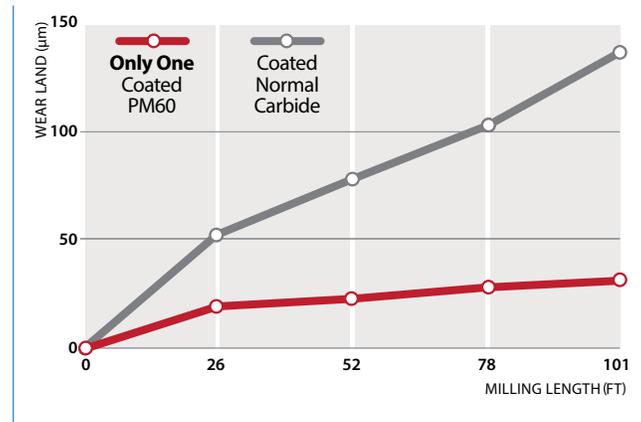
- ▶ Top toughness performance through new advanced PM60 tool material
- ▶ Versatile – Use on nearly any workpiece material or machine
- ▶ Productivity – Operate at speeds and feeds above traditional HSS tools
- ▶ Stands up to conditions where carbide may chip: unstable conditions, older equipment, heavier cuts
- ▶ Exceptional heat disbursement through advanced PM60 coating
- ▶ Coarse and fine profile roughing style through 1½-inch diameters



## CASE STUDY Stop Cutting Yourself Short on Performance and Durability.

Compared to 4-Flute Square End Mill, S45C

Cutting Conditions		
Competing tools	ONLY ONE Coated PM60	Coated Normal Carbide
Size	Ø10xØ10x22x72	Ø10xØ10x22x70
Work Material	- JIS : S45C - DIN : C45	- KS : SM45C - AISI : 1045
RPM	2,750 rev/min.	
Feed	20.47 inch/min.	
Milling Method	Down & Side Cutting	
Milling Depth	Axial: 12" Radial: .04"	
Coolant	Wet Cut	
Machine	Machining Center	
RESULT	<b>ONLY ONE Coated PM60 &gt; Coated Normal Carbide</b>	



### This case study proves the point.

ONLY ONE end mills stay sharper, cut cleaner and resist wear longer than convention coated carbide. That's performance and durability you can bank on.

## Get the economic edge.

With ONLY ONE in your shop, you've got the power to cut the toughest materials and your machine tool cost, too. That's because ONLY ONE end mills are competitively priced and can replace a wide range of tools in your crib. Priced about 30%

less than larger carbide tools, ONLY ONE end mills can outperform M42 and PM30. So go deeper. Go faster. Go longer – with ONLY ONE.

## SELECTION GUIDE

Item	Model	Description	Diameter		Page
			Min.	Max.	
Unit: Inch					
<b>GYG64</b>		2-FLUTE (Center Cut)	D1/8	D1	<b>7</b>
<b>GYG65</b>		4-FLUTE (Center Cut)	D1/8	D1	<b>7</b>
<b>GYG66</b>		4-FLUTE MULTIPLE HELIX (Center Cut)	D1/8	D1	<b>8</b>
<b>GYG67</b>		PM60, 4-FLUTE BALL NOSE	R1/16	R1/2	<b>9</b>
<b>GYG68</b>		MULTI-FLUTE ROUGHING - FINE (Center Cut)	D1/4	D1-1/4	<b>10</b>
<b>GYG69</b>		MULTI-FLUTE MULTIPLE HELIX CORNER RADIUS ROUGHING - FINE (Center Cut)	D1/4	D1	<b>11</b>
<b>GYG70</b>		MULTI-FLUTE ROUGHING - COARSE (Center Cut)	D1/4	D1-1/4	<b>12</b>
<b>RECOMMENDED CUTTING CONDITIONS</b>					<b>14</b>

## GUIDE TO ICONS

### Tool Material



### Cutting Conditions



### Tolerance of Ball Radius



### Helix Angle



### No. of Flutes



### Type of Shank



### Type of Periphery



⊙ Excellent ○ Good

P				M	K	N		S
Carbon Steels	Alloy Steels	Prehardened Steels	Carbon Steels	Stainless Steels	Cast Iron	Copper	Aluminum	Titanium
~HRc20	HRc20-30	HRc30-40	HRc40-45					
⊙	⊙	○	○	⊙	⊙	○		
⊙	⊙	○	○	⊙	⊙	○		
⊙	⊙	○	○	⊙	⊙	○		
⊙	⊙	○	○	⊙	⊙	○		
⊙	⊙	○	○	⊙	⊙	○		
⊙	⊙	○	○	⊙	⊙	○		
⊙	⊙	○	○	⊙	⊙	○		
⊙	⊙	○	○	⊙	⊙	○		

**ONLY ONE COATED PM60 KITS ARE HERE!**

**Versatile performance comes packed in every kit.**

Not only will the new ONLY ONE kits cut your toughest materials, they'll cut your tool cost, too. That's because they replace a whole host of carbide end mills at a much lower price. Check out our three new cutting kits.

**See page 13 for more details.**



# ONLY ONE Focus: Getting the Job Done.

As the illustrations show, neither coated carbide or HSS Co8 can keep pace with the ONLY ONE end mills' superior cutting performance. In fact, coated carbide breaks down halfway through the cut (Illustration A). HSS Co8 can't take the heat and stops dead in its tracks (Illustration B). But the ONLY ONE end mill cuts on and on.

The formula for this success – a combination of an advanced powdered metal substrate, 12% cobalt and YG-1's super-tough ALCr-based Y-Coating. It all comes together to deliver unmatched performance in the toughest materials.

## Run Faster. Run Deeper

With edge strength that won't back down, you've got the cutting power to take on heavier, deeper cuts with fewer passes. And since ONLY ONE was born with PM60 at its core, it outlasts, outperforms and can save you up to 30% compared to the cost of carbide.

## Versatile Problem-Solver

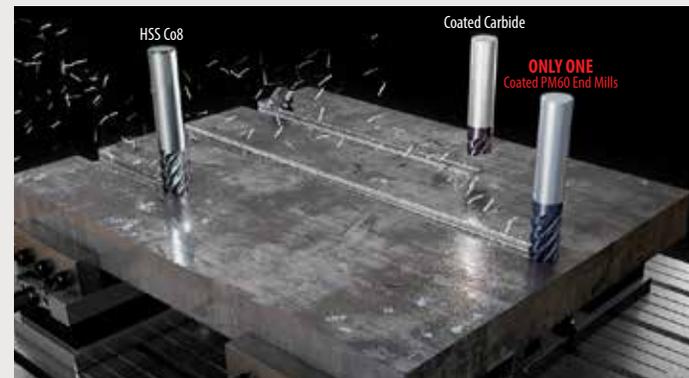
For stainless, alloys, carbon steels and cast irons, the ONLY ONE end mill can be the only tool you need. With this kind of versatile performance built in, you can say goodbye to the competition's powdered metal and carbide mills and hello to the best value in cutting tools today, only from YG-1..



ONLY ONE will get the job done on vertical mills.  
(Shown here:  
JET™ JTM-4VS)



**A.** Coated carbide starts out strong. But as the race heats up, it breaks down halfway through the cut.

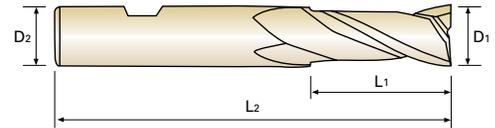
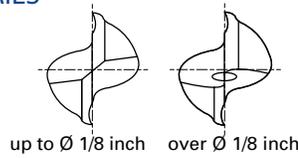


**B.** The HSS Co8 mill's 8% cobalt coating is no match for the ONLY ONE's 12% carbide and PM60 core.

## Why ONLY ONE end mills?

- ▶ Less expensive and more versatile than general purpose carbide tools
- ▶ Excellent performance in unstable conditions, such as extended reach applications (tool length > 2X diameter of tool) and less stable set-ups, due to fixturing or long overhangs
- ▶ Perfect for older equipment, and manual machines, as well as newer CNC machines
- ▶ Higher performance in slotting applications
- ▶ Increased productivity in deep, heavy cuts
- ▶ Maximum toughness to resist wear
- ▶ Exceptional heat disbursement through advanced PM60 core
- ▶ Coarse and fine profile roughing style through 1½-inch diameters
- ▶ Ideal for training and tech schools

## 2-FLUTE (CENTER CUT) GYG64 SERIES

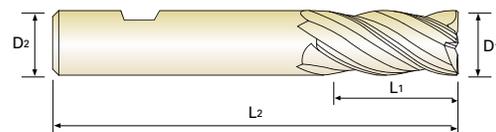
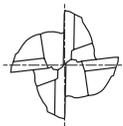


P. 14

Unit: Inch

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
Y-Coated	D1	D2	L1	L2
GYG64008	1/8	3/8	3/8	2-5/16
GYG64012	3/16	3/8	7/16	2-5/16
GYG64016	1/4	3/8	1/2	2-5/16
GYG64020	5/16	3/8	9/16	2-5/16
GYG64024	3/8	3/8	9/16	2-5/16
GYG64032	1/2	1/2	1	3
GYG64040	5/8	5/8	1-5/16	3-7/16
GYG64048	3/4	3/4	1-5/16	3-7/16
GYG64064	1	1	1-5/8	4-1/8

## 4-FLUTE (CENTER CUT) GYG65 SERIES



P. 15

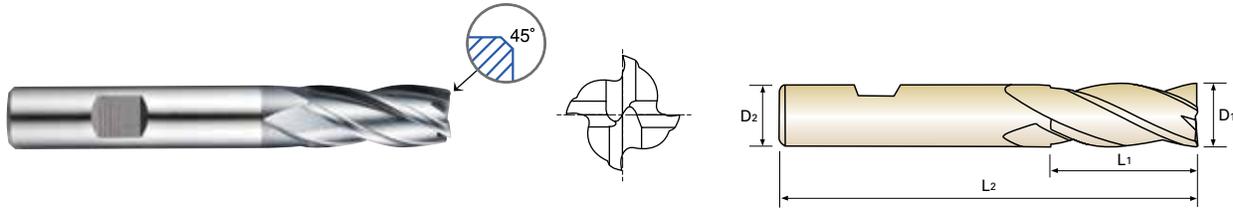
Unit: Inch

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Overall Length
Y-Coated	D1	D2	L1	L2
GYG65008	1/8	3/8	3/8	2-5/16
GYG65012	3/16	3/8	1/2	2-3/8
GYG65016	1/4	3/8	5/8	2-7/16
GYG65020	5/16	3/8	3/4	2-1/2
GYG65024	3/8	3/8	3/4	2-1/2
GYG65032	1/2	1/2	1-1/4	3-1/4
GYG65040	5/8	5/8	1-5/8	3-3/4
GYG65048	3/4	3/4	1-5/8	3-7/8
GYG65056	7/8	7/8	1-7/8	4-1/8
GYG65064	1	1	2	4-1/2

Mill Dia. Tolerance (inch)	Shank Dia. Tolerance
0 ~ -.0012	h6

# 4-FLUTE MULTIPLE HELIX (CENTER CUT)

GYG66 SERIES

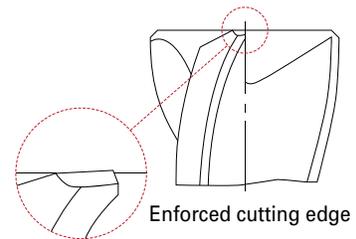


PM 60
4
35°/37°
FLAT
C x 45°
P. 16

Unit: Inch

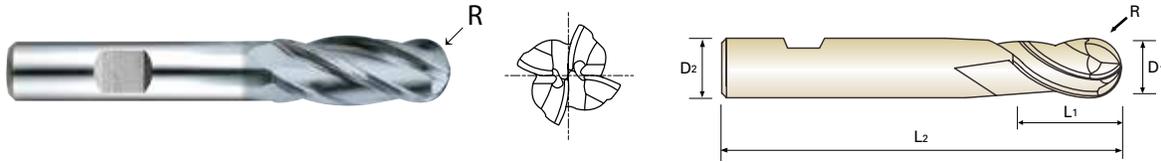
EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Overall Length	Chamfer
Y-Coated	D1	D2	L1	L2	
GYG66008	1/8	3/8	3/8	2-5/16	.004
GYG66012	3/16	3/8	1/2	2-3/8	.006
GYG66016	1/4	3/8	5/8	2-7/16	.007
GYG66020	5/16	3/8	3/4	2-1/2	.007
GYG66024	3/8	3/8	3/4	2-1/2	.011
GYG66032	1/2	1/2	1-1/4	3-1/4	.013
GYG66040	5/8	5/8	1-5/8	3-3/4	.015
GYG66048	3/4	3/4	1-5/8	3-7/8	.019
GYG66064	1	1	2	4-1/2	.019

Mill Dia. Tolerance (inch)	Shank Dia. Tolerance
0 ~ -.0012	h6



# 4-FLUTE BALL NOSE

GYG67 SERIES



PM 60
4
30°
R ± 0.001
FLAT
P. 17

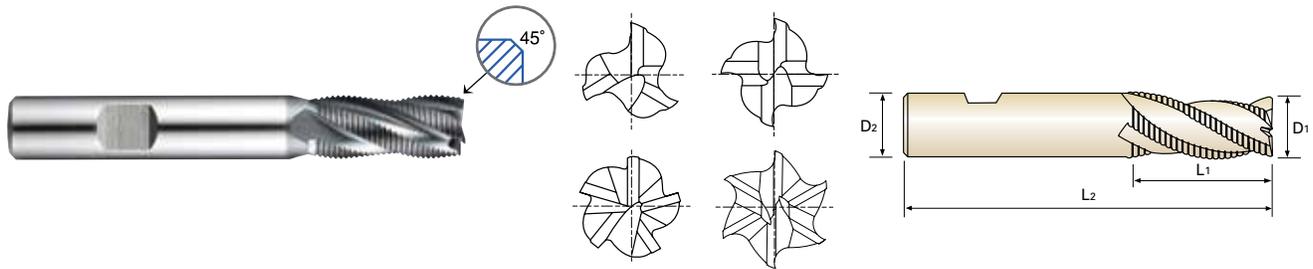
Unit: Inch

Radius of Ball Nose (R)	Mill Diameter D1	Shank Diameter (D2)	Length of Cut (L1)	Overall Length (L2)	EDP No.
					Y-Coated
R1/16	1/8	3/8	3/8	2-5/16	GYG67008
R3/32	3/16	3/8	1/2	2-3/8	GYG67012
R1/8	1/4	3/8	5/8	2-7/16	GYG67016
R5/32	5/16	3/8	3/4	2-1/2	GYG67020
R3/16	3/8	3/8	3/4	2-1/2	GYG67024
R1/4	1/2	1/2	1-1/4	3-1/4	GYG67032
R5/16	5/8	5/8	1-5/8	3-3/4	GYG67040
R3/8	3/4	3/4	1-5/8	3-7/8	GYG67048
R1/2	1	1	2	4-1/2	GYG67064

Mill Dia. Tolerance (inch)	Shank Dia. Tolerance
0 ~ -.0012	h6

# MULTI-FLUTE ROUGHING - FINE (CENTER CUT)

**GYG68** SERIES

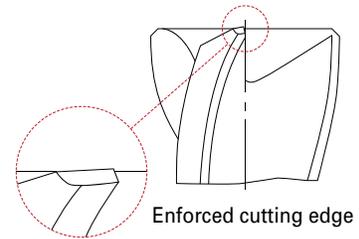


PM 60
3-6
30°
FINE
FLAT
C x 45°
P. 19

Unit: Inch

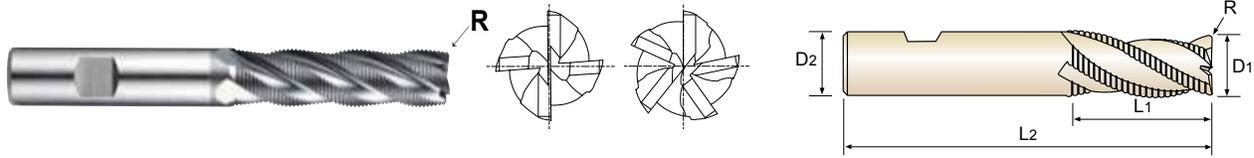
EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Overall Length	No. of Flutes	Chamfer
Y-Coated	D1	D2	L1	L2		
GYG68016	1/4	3/8	5/8	2-7/16	3	.020
GYG68020	5/16	3/8	3/4	2-1/2	3	.020
GYG68901	5/16	3/8	1-3/8	3-3/16	3	.020
GYG68024	3/8	3/8	3/4	2-1/2	4	.020
GYG68902	3/8	3/8	1-1/2	3-1/4	4	.020
GYG68032	1/2	1/2	1-1/4	3-1/4	4	.030
GYG68903	1/2	1/2	2	4	4	.030
GYG68040	5/8	5/8	1-5/8	3-3/4	4	.030
GYG68904	5/8	5/8	2-1/2	4-5/8	4	.030
GYG68048	3/4	3/4	1-5/8	3-7/8	4	.030
GYG68905	3/4	3/4	2-1/2	4-3/4	4	.030
GYG68906	3/4	3/4	3	5-1/4	4	.030
GYG68064	1	1	2	4-1/2	5	.030
GYG68907	1	1	4	6-1/2	5	.030
GYG68116	1-1/4	1-1/4	2	4-1/2	6	.042

Mill Dia. Tolerance(inch)	
up to 1	0~+.0030
over 1	0~+.0060



# MULTI-FLUTE MULTIPLE HELIX (CENTER CUT) CORNER RADIUS ROUGHING - FINE (CENTER CUT)

GYG69 SERIES



PM 60
4-5
44°/45°
5 Flute, 44°/44.5°/45°
FINE
FLAT
P. 18

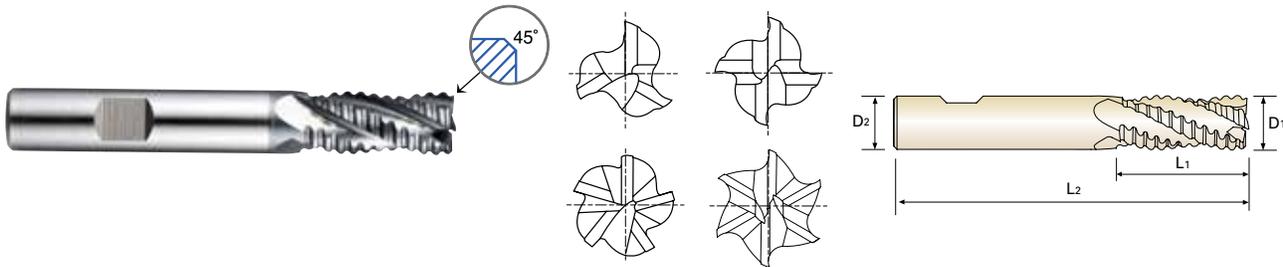
Unit: Inch

EDP No.	Corner Radius	Mill Diameter	Shank Diameter	Length of Cut	Overall Length	No. of Flutes
Y-Coated	R	D1	D2	L1	L2	
GYG69016	R.020	1/4	3/8	5/8	2-7/16	4
GYG69020	R.020	5/16	3/8	3/4	2-1/2	4
GYG69024	R.020	3/8	3/8	3/4	2-1/2	4
GYG69032	R.020	1/2	1/2	1-1/4	3-1/4	4
GYG69040	R.040	5/8	5/8	1-1/4	3-3/8	5
GYG69048	R.040	3/4	3/4	1-5/8	3-7/8	5
GYG69064	R.040	1	1	2	4-1/2	5

**Mill Dia. Tolerance (inch)**  
 0 ~ -.0030

# MULTI-FLUTE ROUGHING - COARSE (CENTER CUT)

GYG70 SERIES

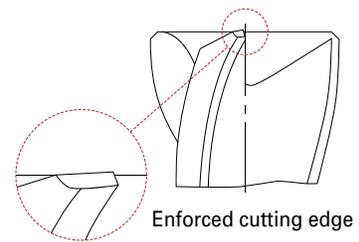


PM 60
3-6
30°
COARSE
FLAT
C x 45°
P. 19

Unit: Inch

EDP No.	Mill Diameter	Shank Diameter	Length of Cut	Overall Length	No. of Flutes	Chamfer
Y-Coated	D1	D2	L1	L2		
GYG70016	1/4	3/8	5/8	2-7/16	3	.014
GYG70020	5/16	3/8	3/4	2-1/2	3	.014
GYG70024	3/8	3/8	3/4	2-1/2	4	.014
GYG70032	1/2	1/2	1-1/4	3-1/4	4	.022
GYG70040	5/8	5/8	1-5/8	3-3/4	4	.024
GYG70048	3/4	3/4	1-5/8	3-7/8	4	.024
GYG70064	1	1	2	4-1/2	5	.024
GYG70116	1-1/4	1-1/4	2	4-1/2	6	.030

Mill Dia. Tolerance(inch)	
up to 1	0~+.0030
over 1	0~+.0060



# NEW YG-1 ONLY ONE VALUE PACKS

## Pick Up a Pack of Problem-Solvers Today!

Raise productivity while lowering your tool costs with a new YG-1 ONLY ONE Kit.

Made of an advanced powdered metal material (PM60), ONLY ONE tools are designed to hold up under challenging machining conditions where carbide tools may fail due to chipping from vibration or chatter.

Get a handle on unstable milling conditions and cut where carbide tools fail due to chipping or lower speeds. Take on the most challenging cuts at the most cost-effective price. Older machines or new, the ONLY ONE end mill line gives you more performance for less. These ONLY ONE kits, in three sizes and including speed and feed charts, are what every shop needs.

**These tools are included in each kit:**

**Kit EDP No. GYG65KIT7**

ONLY ONE PM60 4-FLUTE 30-DEGREE HELIX CENTER CUT REGULAR LENGTH END MILL

- 1) GYG65008 • 1/8 x 3/8 x 3/8 x 2-5/16
- 1) GYG65012 • 3/16 x 3/8 x 1/2 x 2-3/8
- 1) GYG65016 • 1/4 x 3/8 x 5/8 x 2-7/16
- 1) GYG65020 • 5/16 x 3/8 x 3/4 x 2-1/2
- 1) GYG65024 • 3/8 x 3/8 x 3/4 x 2-1/2
- 2) GYG65032 • 1/2 x 1/2 x 1-1/4 x 3-1/4

**KIT EDP No. GYG66KIT7**

ONLY ONE PM60 4-FLUTE MULTIPLE HELIX CENTER CUT REGULAR LENGTH END MILL

- 1) GYG66008 • 1/8 x 3/8 x 3/8 x 2-5/16
- 1) GYG66012 • 3/16 x 3/8 x 1/2 x 2-3/8
- 1) GYG66016 • 1/4 x 3/8 x 5/8 x 2-7/16
- 1) GYG66020 • 5/16 x 3/8 x 3/4 x 2-1/2
- 1) GYG66024 • 3/8 x 3/8 x 3/4 x 2-1/2
- 2) GYG66032 • 1/2 x 1/2 x 1-1/4 x 3-1/4

**KIT EDP No. GYG68KIT5**

ONLY ONE PM60 4-FLUTE 30-DEGREE HELIX ROUGHING (FINE) CENTER CUT END MILL

- 1) GYG68024 • 3/8 x 3/8 x 3/4 x 2-1/2
- 2) GYG68032 • 1/2 x 1/2 x 1-1/4 x 3-1/4
- 1) GYG68040 • 5/8 x 5/8 x 1-5/8 x 3-3/4
- 1) GYG68048 • 3/4 x 3/4 x 1-5/8 x 3-7/8



# RECOMMENDED CUTTING CONDITIONS

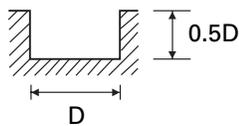
## GYG64 SERIES

### 2-FLUTE (CENTER CUT)

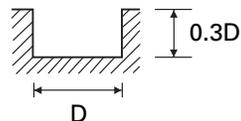
Unit: Inch

Hardness (HRc)	Work Materials	Type of Cut	Speed and Feed Recommendations				Diameter (in.)						
			Ap x D1	Ae x D1	Vc (SFM)	Parameters	1/8	1/4	3/8	1/2	5/8	3/4	1
HRc < 20	CARBON STEELS 10**, 11**, 12**, 12L**, 15**	Slotting 	0.5	1	220 (176-264)	RPM	6723	3362	2241	1681	1345	1121	840
						Fz (hex)*	.0007	.0015	.0025	.0031	.0037	.0042	.0045
HRc > 20 HRc < 30	ALLOY STEELS 41**, 43**, 51**, 86**	Slotting 	0.5	1	175 (140-210)	RPM	5348	2674	1783	1337	1070	891	669
						Fz (hex)*	.0006	.0014	.0025	.0031	.0036	.0041	.0044
HRc > 30 HRc < 35	ALLOY STEELS TOOL STEELS	Slotting 	0.5	1	110 (88-132)	RPM	3362	1681	1121	840	672	560	420
						Fz (hex)*	.0006	.0013	.0024	.0030	.0035	.0039	.0042
HRc > 35 HRc < 40	ALLOY STEELS TOOL STEELS	Slotting 	0.3	1	85 (68-102)	RPM	2598	1299	866	649	520	433	325
						Fz (hex)*	.0005	.0012	.0022	.0027	.0031	.0035	.0038
K	CAST IRON Gray, Malleable, Ductile	Slotting 	0.5	1	220 (176-264)	RPM	6723	3362	2241	1681	1345	1121	840
						Fz (hex)*	.0007	.0015	.0025	.0031	.0037	.0042	.0045
M	STAINLESS STEELS 303, 304, 316, 316L, 410, 416	Slotting 	0.5	1	95 (76-114)	RPM	2903	1452	968	726	581	484	363
						Fz (hex)*	.0005	.0012	.0022	.0027	.0031	.0035	.0038

FOR CARBON STEELS (HRc <20),  
ALLOY STEELS (HRc >20 ~ <30),  
ALLOY/TOOL STEELS (HRc >30 ~ <35),  
CAST IRON AND STAINLESS STEELS:



FOR ALLOY/TOOL STEELS  
(HRc >30 ~ <35):



RPM = rev./min.  
SFM = ft/min.  
Fz (hex) = chip load per tooth  
Ap = Axial depth of cut  
Ae = Radial depth of cut

\* Fz (hex) is the actual chip thickness per tooth when chip thinning calculations are applied. Use appropriate chip thinning calculations for your application.

- ▶ Maximum recommended axial and radial depths shown.
- ▶ Recommendations above are based on ideal conditions.
- ▶ Adjust parameters accordingly for small taper machining centers or less rigid conditions.
- ▶ Reduce feed and speed recommendations as process dictates.
- ▶ Reduce feed by approximately 50% if L.O.C. (length of cut) is over 3 x D.

# RECOMMENDED CUTTING CONDITIONS

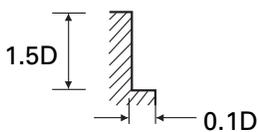
## GYG65 SERIES

### 4-FLUTE (CENTER CUT)

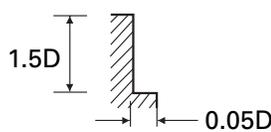
Unit: Inch

Hardness (HRc)	Work Materials	Type of Cut	Speed and Feed Recommendations				Diameter (in.)						
			Ap x D1	Ae x D1	Vc (SFM)	Parameters	1/8	1/4	3/8	1/2	5/8	3/4	1
HRc < 20	CARBON STEELS 10**, 11**, 12**, 12L**, 15**	Side Cutting 	1.5	0.1	260 (208 - 312)	RPM	7946	3973	2649	1986	1589	1324	993
						Fz (hex)*	.0006	.0013	.0025	.0027	.0031	.0035	.0037
HRc > 20 HRc < 30	ALLOY STEELS 41**, 43**, 51**, 86**	Side Cutting 	1.5	0.1	200 (160 - 220)	RPM	6112	3056	2037	1528	1222	1019	764
						Fz (hex)*	.0006	.0012	.0023	.0026	.0030	.0034	.0037
HRc > 30 HRc < 35	ALLOY STEELS TOOL STEELS	Side Cutting 	1.5	0.1	130 (104 - 156)	RPM	3973	1986	1324	993	795	662	497
						Fz (hex)*	.0006	.0012	.0023	.0026	.0029	.0032	.0035
HRc > 35 HRc < 40	ALLOY STEELS TOOL STEELS	Side Cutting 	1.5	0.05	105 (84 - 126)	RPM	3209	1604	1070	802	642	535	401
						Fz (hex)*	.0005	.0012	.0022	.0025	.0029	.0031	.0034
K	CAST IRON Gray, Malleable, Ductile	Side Cutting 	1.5	0.1	260 (208 - 312)	RPM	7946	3973	2649	1986	1589	1324	993
						Fz (hex)*	.0006	.0012	.0025	.0027	.0030	.0033	.0035
M	STAINLESS STEELS 303, 304, 316, 316L, 410, 416	Side Cutting 	1.5	0.1	120 (96 - 144)	RPM	3667	1834	1222	917	733	611	458
						Fz (hex)*	.0005	.0012	.0022	.0025	.0030	.0032	.0035

FOR CARBON STEELS (HRc <20),  
ALLOY STEELS (HRc >20 ~ <30),  
ALLOY/TOOL STEELS (HRc >30 ~ <35),  
CAST IRON AND STAINLESS STEELS:



FOR ALLOY/TOOL STEELS  
(HRc >30 ~ <35):



RPM = rev./min.  
SFM = ft/min.  
Fz (hex) = chip load per tooth  
Ap = Axial depth of cut  
Ae = Radial depth of cut

\* Fz (hex) is the actual chip thickness per tooth when chip thinning calculations are applied. Use appropriate chip thinning calculations for your application.

- ▶ Maximum recommended axial and radial depths shown.
- ▶ Recommendations above are based on ideal conditions.
- ▶ Adjust parameters accordingly for small taper machining centers or less rigid conditions.
- ▶ Reduce feed and speed recommendations as process dictates.
- ▶ Reduce feed by approximately 50% if L.O.C. (length of cut) is over 3 x D.

# RECOMMENDED CUTTING CONDITIONS

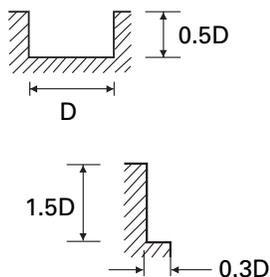
## GYG66 SERIES

### 4-FLUTE MULTIPLE HELIX (CENTER CUT)

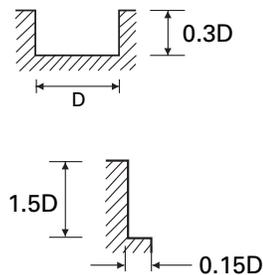
Unit: Inch

Hardness (HRc)	Work Materials	Speed and Feed Recommendations					Diameter (in.)						
		Type of Cut	Ap x D1	Ae x D1	Vc (SFM)	Parameters	1/8	1/4	3/8	1/2	5/8	3/4	1
HRc < 20	CARBON STEELS 10**, 11**, 12**, 12L**, 15**	Side Cutting	1.5	0.3	<b>260</b> (208 - 312)	RPM	7946	3973	2649	1986	1589	1324	993
		Fz (hex)*				.0006	.0013	.0025	.0027	.0031	.0035	.0037	
		Slotting	0.5	1	<b>210</b> (168 - 252)	RPM	6418	3209	2139	1604	1284	1070	802
		Fz (hex)*				.0004	.0007	.0014	.0019	.0022	.0025	.0028	
HRc > 20 HRc < 30	ALLOY STEELS 41**, 43**, 51**, 86**	Side Cutting	1.5	0.3	<b>200</b> (160 - 220)	RPM	6112	3056	2037	1528	1222	1019	764
		Fz (hex)*				.0006	.0012	.0023	.0026	.0030	.0034	.0037	
		Slotting	0.5	1	<b>160</b> (128 - 192)	RPM	4890	2445	1630	1222	978	815	611
		Fz (hex)*				.0004	.0007	.0014	.0019	.0022	.0025	.0027	
HRc > 30 HRc < 35	ALLOY STEELS TOOL STEELS	Side Cutting	1.5	0.3	<b>130</b> (104 - 156)	RPM	3973	1986	1324	993	795	662	497
		Fz (hex)*				.0006	.0012	.0023	.0026	.0029	.0032	.0035	
		Slotting	0.5	1	<b>105</b> (84 - 126)	RPM	3209	1604	1070	802	642	535	401
		Fz (hex)*				.0004	.0007	.0012	.0017	.0020	.0023	.0025	
HRc > 35 HRc < 40	ALLOY STEELS TOOL STEELS	Side Cutting	1.5	0.15	<b>105</b> (84 - 126)	RPM	3209	1604	1070	802	642	535	401
		Fz (hex)*				.0005	.0012	.0022	.0025	.0029	.0031	.0034	
		Slotting	0.3	1	<b>85</b> (68 - 102)	RPM	2598	1299	866	649	520	433	325
		Fz (hex)*				.0003	.0006	.0010	.0014	.0017	.0020	.0022	
K	CAST IRON Gray, Malleable, Ductile	Side Cutting	1.5	0.3	<b>260</b> (208 - 312)	RPM	7946	3973	2649	1986	1589	1324	993
		Fz (hex)*				.0006	.0012	.0025	.0027	.0030	.0033	.0035	
		Slotting	0.5	1	<b>210</b> (168 - 252)	RPM	6418	3209	2139	1604	1284	1070	802
		Fz (hex)*				.0004	.0007	.0014	.0019	.0022	.0025	.0028	
M	STAINLESS STEELS 303, 304, 316, 316L, 410, 416	Side Cutting	1.5	0.3	<b>120</b> (96 - 144)	RPM	3667	1834	1222	917	733	611	458
		Fz (hex)*				.0005	.0012	.0022	.0025	.0030	.0032	.0035	
		Slotting	0.5	1	<b>95</b> (76 - 114)	RPM	2903	1452	968	726	581	484	363
		Fz (hex)*				.0004	.0007	.0012	.0017	.0020	.0023	.0025	

FOR CARBON STEELS (HRc <20),  
ALLOY STEELS (HRc >20 ~ <30),  
ALLOY/TOOL STEELS (HRc >30 ~ <35),  
CAST IRON AND STAINLESS STEELS:



FOR ALLOY/TOOL STEELS  
(HRc >30 ~ <35):



RPM = rev./min.  
SFM = ft/min.  
Fz (hex) = chip load per tooth  
Ap = Axial depth of cut  
Ae = Radial depth of cut

\* Fz (hex) is the actual chip thickness per tooth when chip thinning calculations are applied. Use appropriate chip thinning calculations for your application.

- ▶ Maximum recommended axial and radial depths shown.
- ▶ Recommendations above are based on ideal conditions.
- ▶ Adjust parameters accordingly for small taper machining centers or less rigid conditions.
- ▶ Reduce feed and speed recommendations as process dictates.
- ▶ Reduce feed by approximately 50% if L.O.C. (length of cut) is over 3 x D.

# RECOMMENDED CUTTING CONDITIONS

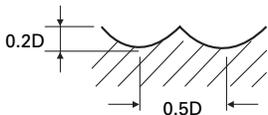
## GYG67 SERIES

### 4-FLUTE BALL NOSE

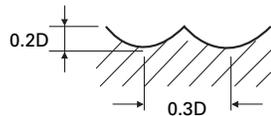
Unit: Inch

Hardness (HRC)	Work Materials	Type of Cut	Speed and Feed Recommendations				Diameter (in.)						
			Ap x D1	Ae x D1	Vc (SFM)	Parameters	1/8	1/4	3/8	1/2	5/8	3/4	1
HRC < 20	CARBON STEELS 10**, 11**, 12**, 12L**, 15**	Profiling 	0.2	0.5	260 (208-312)	RPM	7946	3973	2649	1986	1589	1324	993
						Fz (hex)*	.0006	.0014	.0028	.0032	.0037	.0041	.0045
HRC > 20 HRC < 30	ALLOY STEELS 41**, 43**, 51**, 86**	Profiling 	0.2	0.5	175 (140-210)	RPM	5348	2674	1783	1337	1070	891	669
						Fz (hex)*	.0005	.0011	.0024	.0027	.0030	.0034	.0037
HRC > 30 HRC < 35	ALLOY STEELS TOOL STEELS	Profiling 	0.2	0.5	130 (104-156)	RPM	3973	1986	1324	993	795	662	497
						Fz (hex)*	.0005	.0011	.0021	.0024	.0027	.0031	.0034
HRC > 35 HRC < 40	ALLOY STEELS TOOL STEELS	Profiling 	0.2	0.3	95 (76-114)	RPM	2903	1452	968	726	581	484	363
						Fz (hex)*	.0004	.0010	.0019	.0021	.0024	.0027	.0030
K	CAST IRON Gray, Malleable, Ductile	Profiling 	0.2	0.5	260 (208-312)	RPM	7946	3973	2649	1986	1589	1324	993
						Fz (hex)*	.0006	.0014	.0028	.0032	.0037	.0041	.0044
M	STAINLESS STEELS 303, 304, 316, 316L, 410, 416	Profiling 	0.2	0.5	95 (76-114)	RPM	2903	1452	968	726	581	484	363
						Fz (hex)*	.0004	.0010	.0019	.0021	.0024	.0027	.0030

FOR CARBON STEELS (HRC <20),  
ALLOY STEELS (HRC >20 ~ <30),  
ALLOY/TOOL STEELS (HRC >30 ~ <35),  
CAST IRON AND STAINLESS STEELS:



FOR ALLOY/TOOL STEELS  
(HRC >30 ~ <35):



RPM = rev./min.  
SFM = ft/min.  
Fz (hex) = chip load per tooth  
Ap = Axial depth of cut  
Ae = Radial depth of cut

\* Fz (hex) is the actual chip thickness per tooth when chip thinning calculations are applied. Use appropriate chip thinning calculations for your application.

- ▶ Maximum recommended axial and radial depths shown.
- ▶ Recommendations above are based on ideal conditions.
- ▶ Adjust parameters accordingly for small taper machining centers or less rigid conditions.
- ▶ Reduce feed and speed recommendations as process dictates.
- ▶ Reduce feed by approximately 50% if L.O.C. (length of cut) is over 3 x D.

# RECOMMENDED CUTTING CONDITIONS

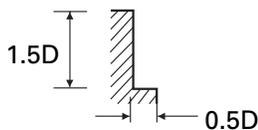
## GYG69 SERIES

### MULTI-FLUTE MULTIPLE HELIX CORNER RADIUS ROUGHING - FINE (CENTER CUT)

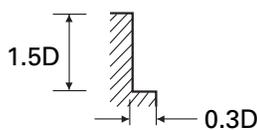
Unit: Inch

Hardness (HRc)	Work Materials	Type of Cut	Speed and Feed Recommendations				Diameter (in.)						
			Ap x D1	Ae x D1	Vc (SFM)	Parameters	1/4	5/16	3/8	1/2	5/8	3/4	1
HRc < 20	CARBON STEELS 10**, 11**, 12**, 12L**, 15**	Side Cutting 	1.5	0.5	220 (176-264)	RPM	3362	2689	2241	1681	1345	1121	840
						Fz (hex)*	.0010	.0015	.0020	.0025	.0030	.0036	.0042
HRc > 20 HRc < 30	ALLOY STEELS 41**, 43**, 51**, 86**	Side Cutting 	1.5	0.5	160 (128-192)	RPM	2445	1956	1630	1222	978	815	611
						Fz (hex)*	.0009	.0014	.0019	.0024	.0029	.0035	.0042
HRc > 30 HRc < 35	ALLOY STEELS TOOL STEELS	Side Cutting 	1.5	0.5	130 (104-156)	RPM	1986	1589	1324	993	795	662	497
						Fz (hex)*	.0009	.0013	.0018	.0023	.0028	.0034	.0040
HRc > 35 HRc < 40	ALLOY STEELS TOOL STEELS	Side Cutting 	1.5	0.3	105 (84-126)	RPM	1604	1284	1070	802	642	535	401
						Fz (hex)*	.0008	.0012	.0017	.0021	.0026	.0032	.0038
K	CAST IRON Gray, Malleable, Ductile	Side Cutting 	1.5	0.5	220 (176-264)	RPM	3362	2689	2241	1681	1345	1121	840
						Fz (hex)*	.0010	.0015	.0020	.0025	.0030	.0036	.0042
M	STAINLESS STEELS 303, 304, 316, 316L, 410, 416	Side Cutting 	1.5	0.5	140 (112-168)	RPM	2139	1711	1426	1070	856	713	535
						Fz (hex)*	.0009	.0013	.0018	.0023	.0028	.0034	.0040

FOR CARBON STEELS (HRc <20),  
ALLOY STEELS (HRc >20 ~ <30),  
ALLOY/TOOL STEELS (HRc >30 ~ <35),  
CAST IRON AND STAINLESS STEELS:



FOR ALLOY/TOOL STEELS  
(HRc >30 ~ <35):



RPM = rev./min.  
SFM = ft/min.  
Fz (hex) = chip load per tooth  
Ap = Axial depth of cut  
Ae = Radial depth of cut

\* Fz (hex) is the actual chip thickness per tooth when chip thinning calculations are applied. Use appropriate chip thinning calculations for your application.

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- ▶ Recommendations above are based on ideal conditions.
- ▶ Adjust parameters accordingly for small taper machining centers or less rigid conditions.
- ▶ Reduce feed and speed recommendations as process dictates.
- ▶ Reduce feed by approximately 50% if L.O.C. (length of cut) is over 3 x D.

# RECOMMENDED CUTTING CONDITIONS

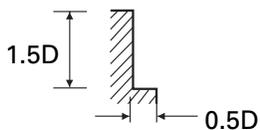
GYG68 | GYG70 SERIES

## MULTI-FLUTE ROUGHING (CENTER CUT)

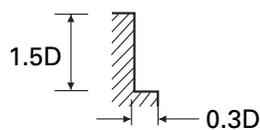
Unit: Inch

Hardness (HRc)	Work Materials	Type of Cut	Speed and Feed Recommendations				Diameter (in.)						
			Ap x D1	Ae x D1	Vc (SFM)	Parameters	1/8	1/4	3/8	1/2	5/8	3/4	1
HRc < 20	CARBON STEELS 10**, 11**, 12**, 12L**, 15**	Side Cutting 	1.5	0.5	180 (144-216)	RPM	2750	2200	1834	1375	1100	917	688
						Fz (hex)*	.0011	.0016	.0021	.0027	.0034	.0041	.0044
HRc > 20 HRc < 30	ALLOY STEELS 41**, 43**, 51**, 86**	Side Cutting 	1.5	0.5	130 (104-156)	RPM	1986	1589	1324	993	795	662	497
						Fz (hex)*	.0010	.0015	.0020	.0026	.0033	.0040	.0043
HRc > 30 HRc < 35	ALLOY STEELS TOOL STEELS	Side Cutting 	1.5	0.5	105 (84-126)	RPM	1604	1284	1070	802	642	535	401
						Fz (hex)*	.0009	.0014	.0019	.0026	.0033	.0039	.0041
HRc > 35 HRc < 40	ALLOY STEELS TOOL STEELS	Side Cutting 	1.5	0.3	80 (64-96)	RPM	1222	978	815	611	489	407	306
						Fz (hex)*	.0008	.0012	.0017	.0023	.0030	.0036	.0040
K	CAST IRON Gray, Malleable, Ductile	Side Cutting 	1.5	0.5	180 (144-216)	RPM	2750	2200	1834	1375	1100	917	688
						Fz (hex)*	.0011	.0016	.0021	.0027	.0034	.0041	.0044
M	STAINLESS STEELS 303, 304, 316, 316L, 410, 416	Side Cutting 	1.5	0.5	115 (92-138)	RPM	1757	1406	1171	879	703	586	439
						Fz (hex)*	.0009	.0014	.0019	.0026	.0033	.0039	.0041

FOR CARBON STEELS (HRc <20),  
ALLOY STEELS (HRc >20 ~ <30),  
ALLOY/TOOL STEELS (HRc >30 ~ <35),  
CAST IRON AND STAINLESS STEELS:



FOR ALLOY/TOOL STEELS  
(HRc >30 ~ <35):



RPM = rev./min.  
SFM = ft/min.  
Fz (hex) = chip load per tooth  
Ap = Axial depth of cut  
Ae = Radial depth of cut

\* Fz (hex) is the actual chip thickness per tooth when chip thinning calculations are applied. Use appropriate chip thinning calculations for your application.

- ▶ Maximum recommended axial and radial depths shown.
- ▶ Recommendations above are based on ideal conditions.
- ▶ Adjust parameters accordingly for small taper machining centers or less rigid conditions.
- ▶ Reduce feed and speed recommendations as process dictates.
- ▶ Reduce feed by approximately 50% if L.O.C. (length of cut) is over 3 x D.



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