High-Performance Ball Nose Finishing Mills and Inserts

DAPRA®

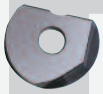
First in Industry
Ball Nose Replacement Program
See inside cover for details

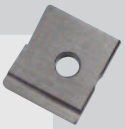
DAPRA CORPORATION
www.dapra.com

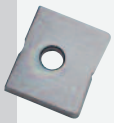
Ball Nose, Flat Bottom and Back Draft
Automatic Cutter Replacement Program

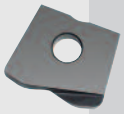
With the purchase of Dapra Ball Nose, Flat Bottom, Back Draft and High-Feed Inserts, receive FREE or discounted replacement Ball Nose, Back Draft and Flat Bottom Cutters!*

Here's how it works:


HBN


FBR-CB


FBR-N


HFBD

Every time you buy 30 inserts

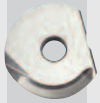
Dapra will give you a ***FREE*** corresponding Steel cutter body.*

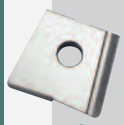
OR

Dapra will give you ***50% OFF*** the purchase of any replacement Carbide Core or Solid Carbide Shank tool.*


BDR-N


BNR-N


BNR-CB


BDR-CB

**** Notes:*** ***CUTTER SELECTION MUST BE INDICATED AT TIME OF ORDER***

Insert sizes can be mixed, however the FREE cutter body must accommodate the smallest insert size ordered. For example, ordering twenty 3/4" inserts and ten 1/2" inserts entitles the purchaser to a FREE 1/2" Steel cutter body. FREE or half-price holders are not eligible for exchange once order is filled.

Terms and Conditions:

- *Pertains to Ball Nose, Back Draft, Flat Bottom and High-Feed cutting tool products only.*
- *Product must be drop shipped to end user only.*
- *Dapra reserves the right to cancel program without notice.*
- *Blanket orders and specials are not eligible for this program.*
- *Ball Nose holders requested as part of the replacement program are not eligible for return or exchange; correct cutter selection must be made at the time of order.*

Index

3 Three Steps to Quick & Easy Ordering

1 Step One: *Choose Your Inserts*

2 Step Two: *Choose Your Insert Grade*

3 Step Three: *Choose Your Cutter Body*

With three quick steps and plenty of insert and cutter choices, Dapra makes it easy to find exactly what you need and get your cutting tools on time.

1 Step One: Choose Your Inserts

HBN Series – Helical Cutting Edge Ball Nose Inserts*

NEW

Improved Tip Geometry for Better Surface Finishes and Longer Tool Life

Optimize performance in all Ball Nose applications:

- *Smoother cutting action*
- *Reduced chatter*
- *Cleaner surface finish*
- *Heavier cutting capability*
- *Increased metal removal*
- *Reduced stress on work materials*
- *Reduced tool pressure and heat*
- *Longer tool life*

D Ø Diameter	Helical (HBN)
3/8"	HBN-0375
1/2"	HBN-0500
5/8"	HBN-0625
3/4"	HBN-0750
1"	HBN-1000
1 1/4"	HBN-1250

Metric	
10mm	HBN-10MM
12mm	HBN-12MM
16mm	HBN-16MM
20mm	HBN-20MM
25mm	HBN-25MM
30mm	HBN-30MM
32mm	HBN-32MM

** For insert grades and coatings, see chart on page 5.*

Refer to back cover for speed recommendations by material.

More insert options follow on page 4.

1 Step One: Choose Your Inserts

Standard Ball Nose Inserts

BNR-N

BNR-CB

D Ø Diameter	Without Chipbreaker
3/8"	BNR-0375-N
1/2"	BNR-0500-N
5/8"	BNR-0625-N
3/4"	BNR-0750-N
1"	BNR-1000-N
1 1/4"	BNR-1250-N

D Ø Diameter	Chipbreaker
5/16"	BNR-0312-CB
3/8"	BNR-0375-CB
1/2"	BNR-0500-CB
5/8"	BNR-0625-CB
3/4"	BNR-0750-CB
1"	BNR-1000-CB
1 1/4"	BNR-1250-CB

Metric *Without Chipbreaker*	
10mm	BNR-10MM-N
12mm	BNR-12MM-N
16mm	BNR-16MM-N
20mm	BNR-20MM-N
25mm	BNR-25MM-N
30mm	BNR-30MM-N†
32mm	BNR-32MM-N

Metric *Chipbreaker*	
8mm	BNR-08MM-CB
10mm	BNR-10MM-CB
12mm	BNR-12MM-CB
16mm	BNR-16MM-CB
20mm	BNR-20MM-CB
25mm	BNR-25MM-CB
32mm	BNR-32MM-CB

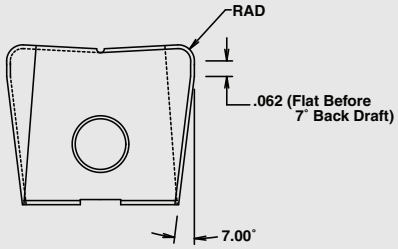
† *Use BNEM 1250 cutter body and size 32 insert screws.*

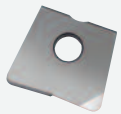
Back Draft (BDR) Inserts *(back draft angle: 4˚ per side)*

BDR-N

BDR-CB

D Ø Diameter	Without Chipbreaker	Chipbreaker	Corner Radius 1/32	1/16	1/8
3/8"	BDR-0375-N		✓	✓	
1/2"	BDR-0500-N	BDR-0500-CB	✓	✓	✓(CB)
5/8"	BDR-0625-N	BDR-0625-CB	✓	✓	
3/4"	BDR-0750-N	BDR-0750-CB	✓	✓	✓(CB)
1"	BDR-1000-N	BDR-1000-CB	✓	✓	✓





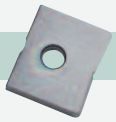
BDR-PCD

PCD-Tipped Inserts**

D Ø Diameter	Without Chipbreaker	Corner Radius 1/32	1/16
3/8"	BDR-0375-N-PCD	✓	
1/2"	BDR-0500-N-PCD	✓	✓
3/4"	BDR-0750-N-PCD	✓	✓

***Note: DOC of PCD-Tipped Inserts is .125"*

Flat Bottom (FBR) Inserts



FBR-N

FBR-CB

D Ø Diameter	Without Chipbreaker	Chipbreaker	Corner Radius 1/32	1/16	1/8
3/8"	FBR-0375-N		✓		
1/2"	FBR-0500-N	FBR-0500-CB	✓	✓	
5/8"	FBR-0625-N	FBR-0625-CB	✓	✓	
3/4"	FBR-0750-N	FBR-0750-CB	✓	✓	
1"	FBR-1000-N	FBR-1000-CB	✓	✓	✓

1 Step One: Choose Your Inserts

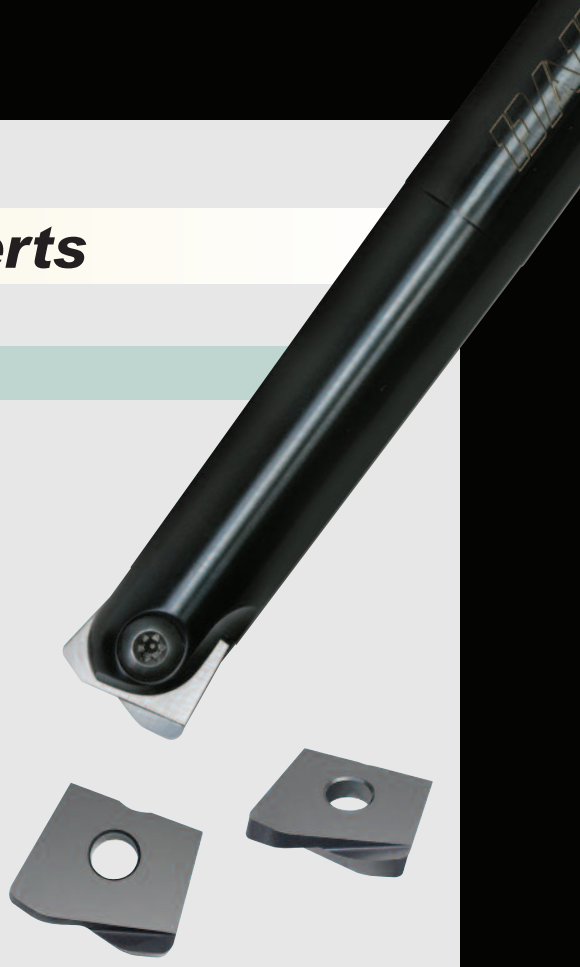
HFBD Series – High-Feed Inserts

Ultimate roughing capability for smaller-diameter applications:

- *3/8" to 1" diameter*
- *Use for cavity/core roughing, pocketing, detail area roughing and helical interpolation*
- *Must be run with a BNEM cutter body (will not fit BDEM cutters)*

D Ø Dia.	Insert	Uses Cutter	Program Radius	Corner Radius	FPT	Max. DOC
3/8"	HFBD-0375	BNEM0375 / GWR10**	.0295"	.020"	.010-.020	.013"
1/2"	HFBD-0500	BNEM0500 / GWR12**	.0558"	.034"	.012-.025	.020"
5/8"	HFBD-0625	BNEM0625 / GWR16**	.0766"	.048"	.012-.030	.025"
3/4"	HFBD-0750	BNEM0750 / GWR20**	.0852"	.062"	.012-.040	.028"
1"	HFBD-1000	BNEM1000 / GWR25**	.1104"	.076"	.012-.040	.033"

** *MOD, Undersized Cutters or Metric.*
** *DAPRA recommends a maximum 1˚ ramp angle on these inserts.*



2 Step Two: Choose Your Insert Grade

Ball Nose, Back Draft, Flat Bottom and High-Feed Insert Grades

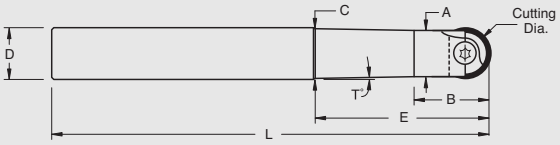
Uncoated (Base Grade)	with Coating	Description	Specifications
F1		Micro-grain tungsten carbide with high edge strength and good toughness. Good for machining steels, stainless steels, high-temperature alloys, cast iron and nonferrous materials.	(C-2), (K10)
	FPX	Titanium carbon nitride (TiCN) is a functional hard coating offering an optimal combination of hardness, toughness and antifriction characteristics. TiCN is recommended for high shock resistance. Excellent titanium grade.	3000 HV, 750˚ F, .4 Co
	FPO	High-performance, medium-temperature grade. Optimum performance and wear resistance in most soft steels, soft stainless steels and cast irons.	3200 HV, 1850˚ F, .4 Co
	FPA	Aluminum titanium nitride (AlTiN) is recommended when extra hardness and heat resistance are required. AlTiN makes both machining at higher speeds and dry machining possible.	3600 HV, 2000˚ F, .4 Co
	FP-GLH	Premium high-temperature grade. Unbeatable performance and wear resistance in high-heat applications such as harder steels, tough stainless steels and high-temperature alloys.	3600 HV, 2000˚ F, .2 Co
	FPD	CVD-applied PCD (diamond) coating. Excellent wear resistance in nonmetallic materials such as graphite, epoxy-based resins and plastics.	CVD Diamond Coating
	PCD	Only available for BDR-0375-N, BDR-0500-N and BDR-0750-N inserts. Premium **diamond-tipped** grade for carbon or light aluminum milling. Use in dedicated holder for the optimum in wear resistance, up to 100 times standard PVD-coated inserts.	Brazed-On Diamond Tips

- **"FP-GLH" and "FPA" coatings are best suited for higher operating speeds (temperatures) and harder materials.**
- **"FPO" and "FPX" coatings are best suited for low to medium operating speeds (temperatures) and softer materials.**
- **Other coatings available on request. Contact Dapra for details.**

3 Step Three: Choose Your Cutter Body

STANDARD SHANK

Tools starting with "SE" are short effective-reach cutters, designed for optimum strength and limited clearance



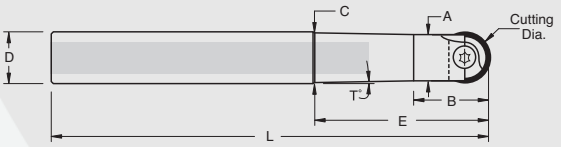
Ball Nose End Mills – Standard Shank

Part Number	Cutting Dia.	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
BNEM-0500-3500-SS	0.500"	0.413"	0.750"	0.490"	0.500"	1.250"	4.400˚	3.500"
BNEM-0500-5250-SS	0.500"	0.413"	0.750"	0.490"	0.500"	2.000"	1.775˚	5.250"
BNEM-0500-6000-SS	0.500"	0.413"	0.750"	0.490"	0.500"	2.500"	1.000˚	6.000"
SE-BNEM-0500-7000-SS	0.500"	0.413"	0.750"	0.490"	0.500"	1.210"	4.400˚	7.000"
BNEM-0625-5500-SS	0.625"	0.547"	0.750"	0.615"	0.625"	1.380"	3.090˚	5.500"
BNEM-0625-6250-SS	0.625"	0.547"	0.750"	0.615"	0.625"	2.500"	1.088˚	6.250"
SE-BNEM-0625-7000-SS	0.625"	0.547"	0.750"	0.615"	0.625"	1.340"	3.100˚	7.000"
BNEM-0750-4500-SS	0.750"	0.670"	1.000"	0.740"	0.750"	1.750"	2.690˚	4.500"
BNEM-0750-7000-SS	0.750"	0.670"	1.000"	0.740"	0.750"	3.000"	1.030˚	7.000"
BNEM-0750-8250-SS	0.750"	0.670"	1.000"	0.740"	0.750"	4.500"	0.573˚	8.250"
SE-BNEM-0750-9000-SS	0.750"	0.670"	1.000"	0.740"	0.750"	1.710"	2.700˚	9.000"
BNEM-1000-6250-SS	1.000"	0.860"	1.500"	0.990"	1.000"	2.000"	7.400˚	6.250"
BNEM-1000-7500-SS	1.000"	0.860"	1.500"	0.990"	1.000"	3.750"	1.660˚	7.500"
BNEM-1000-9000-SS	1.000"	0.860"	1.500"	0.990"	1.000"	5.000"	1.088˚	9.000"
SE-BNEM-1000-10000-SS	1.000"	0.860"	1.500"	0.990"	1.000"	1.940"	7.400˚	10.000"
BNEM-1250-7000-SS	1.250"	1.070"	1.750"	1.240"	1.250"	2.500"	6.447˚	7.000"
BNEM-1250-9000-SS	1.250"	1.070"	1.750"	1.240"	1.250"	4.500"	1.775˚	9.000"

Achieve Higher Performance with Carbide Core Cutter Bodies!

Optimize performance with Carbide Core tooling:

• reduced deflection • increased stiffness • less chatter



Carbide Core Ball Nose End Mills – Standard Shank

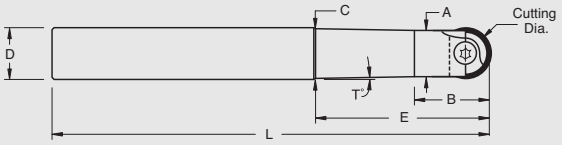
Part Number	Cutting Dia.	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
CC-BNEM-0750-7000-SS	0.750"	0.670"	1.000"	0.740"	0.750"	3.000"	1.031˚	7.000"
CC-BNEM-0750-8250-SS	0.750"	0.670"	1.000"	0.740"	0.750"	4.500"	0.573˚	8.250"
CC-BNEM-1000-6250-SS	1.000"	0.860"	1.500"	0.990"	1.000"	2.000"	7.400˚	6.250"
CC-BNEM-1000-7500-SS	1.000"	0.860"	1.500"	0.990"	1.000"	3.750"	1.661˚	7.500"
CC-BNEM-1000-9000-SS	1.000"	0.860"	1.500"	0.990"	1.000"	5.000"	1.088˚	9.000"
CC-BNEM-1250-7000-SS	1.250"	1.070"	1.750"	1.240"	1.250"	2.500"	6.447˚	7.000"
CC-BNEM-1250-9000-SS	1.250"	1.070"	1.750"	1.240"	1.250"	4.500"	1.775˚	9.000"

**Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*
Example: BNEM0750 and GWR20 accept either a 3/4" or 20mm diameter insert.
BNEM0500 and GWR12 accept either a 1/2" or 12mm diameter insert.

3 Step Three: Choose Your Cutter Body

OVERSIZED SHANK

Tools starting with "SE" are short effective-reach cutters, designed for optimum strength and limited clearance



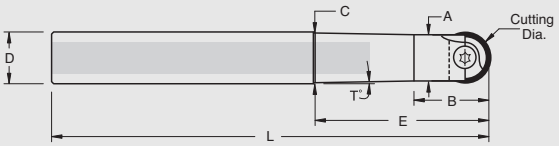
Ball Nose End Mills – Oversized Shank

Part Number	Cutting Dia.	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
BNEM-0313-5500-OS	0.313"	0.280"	0.625"	0.415"	0.500"	1.910"	3.000˚	5.500"
BNEM-0375-3500-OS	0.375"	0.335"	0.625"	0.365"	0.500"	1.340"	1.200˚	3.500"
BNEM-0375-6000-OS	0.375"	0.335"	0.625"	0.365"	0.500"	1.880"	0.688˚	6.000"
SE-BNEM-0375-6000-OS	0.375"	Tapered	n/a	n/a	0.500"	1.380"	3.000˚	5.880"
BNEM-0500-6000-OS	0.500"	0.414"	0.750"	0.490"	0.625"	2.500"	1.260˚	6.000"
SE-BNEM-0500-6000-OS	0.500"	Tapered	n/a	n/a	0.625"	2.310"	3.000˚	6.000"
BNEM-0625-7000-OS	0.625"	0.547"	0.750"	0.615"	0.750"	3.130"	0.802˚	7.000"
BNEM-0750-7500-OS	0.750"	0.670"	1.000"	0.740"	1.000"	3.500"	0.802˚	7.500"
BNEM-0750-9500-OS	0.750"	0.670"	1.000"	0.740"	1.000"	4.500"	0.573˚	9.500"
SE-BNEM-0750-9500-OS	0.750"	Tapered	n/a	n/a	1.000"	3.000"	3.000˚	9.440"
BNEM-1000-8250-OS	1.000"	0.860"	1.500"	0.990"	1.250"	4.500"	1.260˚	8.250"
SE-BNEM-1000-9500-OS	1.000"	Tapered	n/a	n/a	1.250"	3.880"	3.000˚	9.440"
BNEM-1000-10000-OS	1.000"	0.860"	1.500"	0.990"	1.250"	4.500"	0.022˚	10.000"
BNEM-1250-11000-OS	1.250"	1.070"	1.750"	1.240"	1.500"	6.000"	1.146˚	11.000"

Achieve Higher Performance with Carbide Core Cutter Bodies!

Optimize performance with Carbide Core tooling:

• reduced deflection • increased stiffness • less chatter



Carbide Core Ball Nose End Mills – Oversized Shank

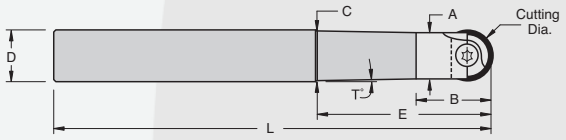
Part Number	Cutting Dia.	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
CC-BNEM-0750-7500-OS	0.750"	0.670"	1.000"	0.740"	1.000"	3.500"	0.802˚	7.500"
CC-BNEM-0750-9500-OS	0.750"	0.670"	1.000"	0.740"	1.000"	4.500"	0.573˚	9.500"
CC-BNEM-1000-8250-OS	1.000"	0.860"	1.500"	0.990"	1.250"	4.500"	1.260˚	8.250"
CC-BNEM-1000-10000-OS	1.000"	0.860"	1.500"	0.990"	1.250"	4.500"	1.260˚	10.000"
CC-BNEM-1000-12000-OS	1.000"	0.860"	1.500"	0.990"	1.250"	6.500"	0.750˚	12.000"
CC-BNEM-1000-15000-OS	1.000"	0.860"	1.500"	0.990"	1.250"	6.500"	0.750˚	15.000"
CC-BNEM-1250-11000-OS	1.250"	1.070"	1.750"	1.240"	1.500"	7.500"	0.859˚	11.000"

More cutter options follow on page 8.

**Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*
Example: BNEM0750 and GWR20 accept either a 3/4" or 20mm diameter insert.
BNEM0500 and GWR12 accept either a 1/2" or 12mm diameter insert.

3 Step Three: Choose Your Cutter Body

SOLID CARBIDE



*Achieve **Maximum** Performance with Solid Carbide Cutter Bodies!*

Optimize performance with Carbide Shank tooling:

• ***reduced deflection*** • ***increased stiffness*** • ***less chatter***

• ***heat shrink toolholding capability*** *(Ball Nose with Solid Carbide Shank only)*

**** Keep brazed joint a minimum of 2" away from heat shrink toolholder.***
SC (Solid Carbide Shank) tooling is suitable for FINISHING APPLICATIONS ONLY.
SC tooling is NOT suitable for roughing and applications with significant heat.

Solid Carbide Ball Nose End Mills – Standard Shank

Part Number	Cutting Dia.	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
SC-BNEM-0375-3950-SS	0.375"	0.335"	0.625"	0.365"	0.375"	1.500"	0.516˚	3.950"
SC-BNEM-0375-3950-OS	0.375"	0.335"	0.750"	0.360"	0.500"	1.375"	0.120˚	3.950"
SC-BNEM-0375-7000-SS	0.375"	0.335"	0.625"	0.365"	0.375"	3.000"	0.172˚	7.000"
SC-BNEM-0500-3950-SS	0.500"	0.413"	0.750"	0.490"	0.500"	1.500"	2.920˚	3.950"
SC-BNEM-0500-6500-SS	0.500"	0.413"	0.750"	0.490"	0.500"	3.500"	0.800˚	6.500"
SC-BNEM-0500-7000-SS	0.500"	0.413"	0.750"	0.490"	0.500"	4.000"	0.688˚	7.000"
SC-BNEM-0500-7000-12MM-SS	0.500"	0.413"	0.500"	0.490"	12mm	1.450"	1.500˚	7.000"
SC-BNEM-0625-7000-SS	0.625"	0.547"	0.750"	0.615"	0.625"	4.000"	0.500˚	7.000"
SC-BNEM-0750-7500-SS	0.750"	0.670"	1.000"	0.740"	0.750"	2.250"	1.600˚	7.500"
SC-BNEM-0750-10000-SS	0.750"	0.670"	1.000"	0.740"	0.750"	6.000"	0.400˚	10.000"
SC-BNEM-0750-10000-18MM-SS	0.750"	0.670"	1.000"	0.740"	18mm	2.250"	1.600˚	10.000"
SC-BNEM-1000-7500-SS	1.000"	0.860"	1.500"	0.990"	1.000"	3.000"	2.500˚	7.500"
SC-BNEM-1000-10000-SS	1.000"	0.860"	1.500"	0.990"	1.000"	7.000"	0.670˚	10.000"
SC-BNEM-1000-10000-25MM-SS	1.000"	0.860"	1.500"	0.990"	25mm	3.000"	2.500˚	10.000"

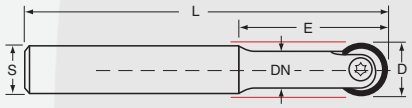
See page 5 for available insert grades.

**Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*
Example: BNEM0750 and GWR20 accept either a 3/4" or 20mm diameter insert.
BNEM0500 and GWR12 accept either a 1/2" or 12mm diameter insert.

3 Step Three: Choose Your Cutter Body

UNDERSIZED SHANK

Save time and money by using Dapra's Undersized Shank Holders…
They give you INSTANT CLEARANCE!

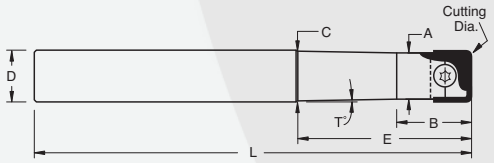


Undersized Shank GWR Cutters

D Ø Diameter	Holder	E Effective Length	L Overall Length	S Shank Diameter	DN Neck Diameter	Insert Screw
1/2" or 12mm	US-GWR12-150-11MM-RZ	0.98"	5.91"	11mm	0.41"	GWS 12
5/8" or 16mm	US-GWR16-180-15MM-RZ	2.05"	7.09"	15mm	0.57"	GWS 16
3/4" or 20mm	US-GWR20-230-18MM-RZ	2.56"	9.06"	18mm	0.71"	GWS 20
1" or 25mm	US-GWR25-250-24MM-RZ	2.76"	9.84"	24mm	0.89"	GWS 25

**Note: Tool neck diameter is exaggerated to show clearance available with undersized shank cutters.*

BACK DRAFT & FLAT BOTTOM



For use with BDR and FBR inserts only.

Back Draft and Flat Bottom Cutters

	Part Number	Cutting Dia.	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
	BDEM-0375-5250-OS	0.375"	0.335"	0.625"	0.365"	0.500"	1.125"	1.700°	5.250"
	BDEM-0500-6000-SS	0.500"	0.413"	0.750"	0.490"	0.500"	1.500"	2.900°	6.000"
Carbide Shank ➤	SC-BDEM-0500-3950-SS	0.500"	0.413"	0.750"	0.490"	0.500"	1.500"	2.920°	3.950"
Carbide Shank ➤	SC-BDEM-0500-7000-SS	0.500"	0.413"	0.750"	0.490"	0.500"	4.000"	0.688°	7.000"
Carbide Shank ➤	SC-BDEM-0625-7000-SS2	0.625"	0.547"	0.750"	0.615"	0.625"	2.050"	1.500°	7.000"
	BDEM-0625-7000-SS	0.625"	0.547"	0.750"	0.615"	0.625"	1.875"	1.700°	7.000"
	BDEM-0750-9000-SS	0.750"	0.670"	1.000"	0.740"	0.750"	2.250"	1.600°	9.000"
	BDEM-1000-10000-SS	1.000"	0.860"	1.500"	0.990"	1.000"	3.000"	2.500°	10.000"

More cutter options follow on page 10.

**Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*
Example: BNEM0750 and GWR20 accept either a 3/4" or 20mm diameter insert.
BNEM0500 and GWR12 accept either a 1/2" or 12mm diameter insert.

3 Step Three: Choose Your Cutter Body

CARBIDE CORE MODULAR EXTENSIONS

Dapra's Carbide Core Modular Extensions Are Ideal for Standard Inch End Mill Holders

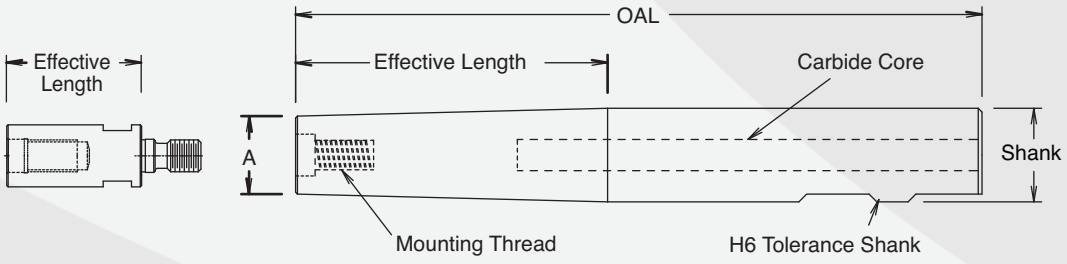
- Standard inch shanks, providing adaptation for end mill holders, milling chucks and heat-shrink holders
- 3 sizes to accommodate modular head sizes from $^{3}/_{4}$" to $1^{1}/_{2}$"
- Carbide core for enhanced vibration dampening capability; reduced deflection and improved rigidity
- Optional add-on extensions for additional 2" reach – screw on to base extensions (for $^{3}/_{4}$" to $1^{1}/_{2}$" modular heads)

Carbide Core Modular Extensions

For Head Dia.	Extension Part No.	Shank Dia.	Effective Length	OAL	Thread	CC	A
.750"	CC-ME-0750-3500 WOF	1.000"	3.7"	6.0"	M10	7/16" x 4.0"	.660
1.000"	CC-ME-1000-4500 WOF	1.000"	4.7"	7.0"	M12	7/16" x 5.0"	.935
1.250"/1.500"	CC-ME-1250-5500 WOF	1.250"	5.7"	8.0"	M16	1/2" x 6.0"	1.175

2" Add-On Extensions

For Head Dia.	Extension Part No.	Effective Length	Thread
.750"	ME-0750-2" EXTENSION ADAPTER	2.0"	M10
1.000"	ME-1000-2" EXTENSION ADAPTER	2.0"	M12
1.250"/1.500"	ME-1250-2" EXTENSION ADAPTER	2.0"	M16

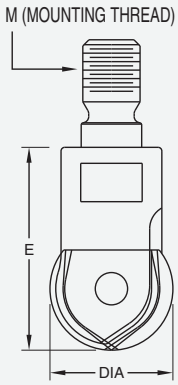


See next page for standard line of Modular Heads and Extensions.

3 Step Three: Choose Your Cutter Body

SCREW-ON MODULAR HEADS & EXTENSIONS

Dapra's Screw-On Heads Fit Industry Standard Cutting Systems



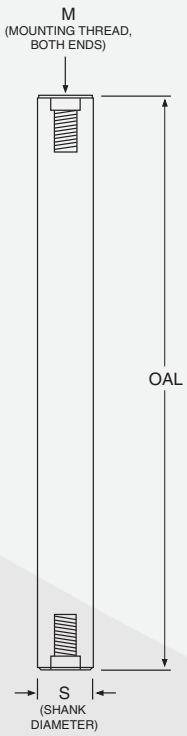
- Compatible with ISO standard modular cutting systems
- Close-tolerance mounting of heads minimizes runout and maximizes rigidity
- Provide significantly more effective reach than solid end mills
- Use standard inch wrench flats, no special metric wrenches needed

Ball Nose Screw-On Heads

Dia.	Holder	M	E	Flutes	Wrench
.500"/12mm	GWR12-MOD	M8*	1.05"	2	3/8"
.625"/16mm	GWR16-MOD	M8*	1.11"	2	7/16"
.750"/20mm	GWR20-MOD	M10	1.28"	2	9/16"
1.000"/25mm	GWR25-MOD	M12	1.65"	2	11/16"
1.250"/32mm	GWR32-MOD	M16	1.78"	2	15/16"

** M8 modular extensions not available. Use ISO standard bars.*

Modular Extensions** Provide Even More Cutting Options



- Made of high-density tungsten, providing extra resistance to deflection and chatter
- Machined on both ends; can be cut in half and used with two different modular heads
- Metric shank diameter provides clearance for each inch size modular head

*** Using modular extensions at full length is not generally recommended. Use for very light cutting at significantly reduced speeds and feeds only.*

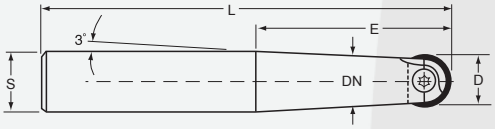
Modular Extensions**

Modular Head Dia.	Part No.	OAL	M	S
.750"/20mm	ME-0750-18MM-900	9"	M10	18mm
1.000"/25mm	ME-1000-25MM-1100	11"	M12	25mm
1.250"/32mm	ME-125/150-25MM-1200	12"	M16	25mm

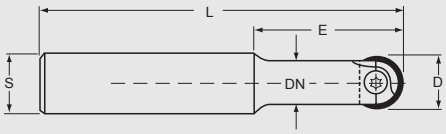
More cutter options follow on page 12.

3 Step Three: Choose Your Cutter Body

METRIC STEEL



Tapered Metric Holder



Straight Metric Holder

D Ø Diameter	Holder	E Effective Length	L Overall Length	S Shank Diameter	DN Neck Diameter	Insert Screw
Tapered Solid Metric						
8 mm	GWR08-100-10-RZK	25mm	100mm	10mm	7mm	GWS 08
Straight Solid Metric						
10mm	GWR10-130-10-RZ	25mm	130mm	10mm	9mm	GWS 10
12mm	GWR12-150-12-RZ	47mm	150mm	12mm	10.5mm	GWS 12
12mm	SC-GWR-12-180-12MM-RZ	38mm	180mm	12mm (CARBIDE)	10.5mm	GWS 12
16mm	GWR16-180-16-RZ	52mm	180mm	16mm	14.5mm	GWS 16
20mm	SC-GWR-20-250-18MM-RZ	57mm	250mm	18mm (CARBIDE)	17mm	GWS 18
20mm	GWR20-230-20-RZ	65mm	230mm	20mm	18mm	GWS 20
25mm	GWR25-250-25-RZ	70mm	250mm	25mm	22.5mm	GWS 25
25mm	SC-GWR-25-250-25MM-RZ	76mm	250mm	25mm (CARBIDE)	22mm	GWS 25
32mm	GWR32-250-32-RZ	70mm	250mm	32mm	27.5mm	GWS 32

**Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*
Example: BNEM0750 and GWR20 accept either a 3/4" or 20mm diameter insert.
BNEM0500 and GWR12 accept either a 1/2" or 12mm diameter insert.

Spare Parts & Tools

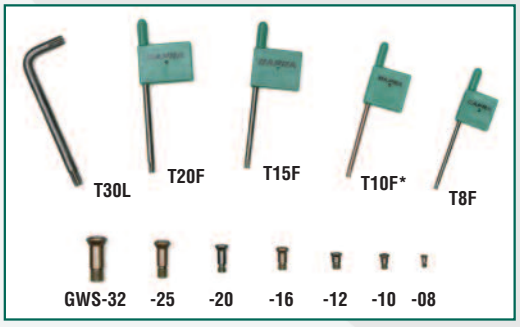
Insert Screw	Insert Size Inch	Insert Size Metric	Dia.	Major Dia.	Pitch	Wrenches Torx®	Torque Nm/in.lbs.
GWS 08	.312	8	3mm	3mm	.5mm	T8F	Manual
GWS 10	.375	10	4mm	4mm	.5mm	T15F	Manual
GWS 12	.500	12	5mm	5mm	.5mm	T20F	6.0/53
GWS 16	.625	16	5mm	5mm	.5mm	T20F	6.2/55
GWS 20	.750	20	5mm	5mm	.5mm	T20F	6.2/55
GWS 25	1.000	25	6mm	6mm	.75mm	T30L	6.5/58
GWS 32	1.250	30/32	8mm	8mm	.75mm	T30L	6.5/58

TORX® is a registered trademark of Camcar/Textron.

NOTE: New cutter bodies may require additional torque to fully seat the inserts. Once new cutter pockets are "broken in," the recommended torque specs in the chart can be followed regularly.

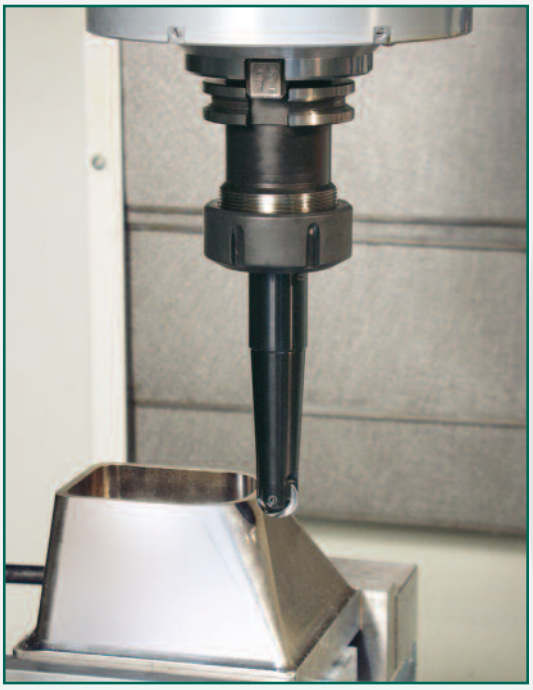
Miscellaneous

Description	Catalog No.
Special Anti-Seize Grease	ASG-120



** T10 wrenches available for older-style insert screws.*

Application Information

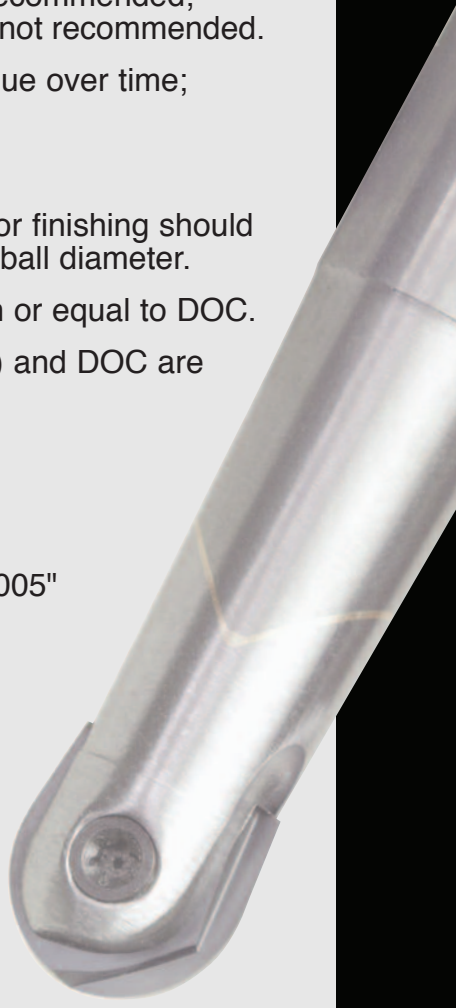


Technical Considerations

- Always use anti-seize compound on threads and screw body.
- Thoroughly clean pocket and screw at each insert change.
- Change insert screw every 10 inserts.
- Use high quality tool holders for rigidity and concentricity: milling chucks, heat-shrink and mechanical shrink holders are recommended; collets and end mill holders are not recommended.
- Cutter bodies will wear and fatigue over time; inspect tool before each use.

Recommendations

- Maximum Depth of Cut (DOC) for finishing should be less than or equal to 10% of ball diameter.
- Stepover should be greater than or equal to DOC.
- For roughing operations, maximum recommended Width of Cut (WOC) and DOC are 30% of ball diameter.
- Starting Feed per Revolution (FPR) should be 1% of ball diameter.
  Example: .750" diameter x .01 = .0075" FPR
- Climb milling is preferred.
- When plunging with Ball Nose, use pecking cycle with a maximum of .005" FPR; maximum recommended depth is 30% of ball diameter.
- Back Draft and Flat Bottom Inserts are not designed for plunging; ramp in at a maximum angle of 2˚.
- Compensate for Effective Cutting Diameter (see Table 1 and Fig.1 on p. 14).
- Compensate for chip thinning with Feed Rate Adjustment (see Table 2 on p. 14).
- Surface finish (RMS) is a function of stepover and feed per tooth.
- Try to work within recommended surface footage and chip loads.
- Decrease feed rate coming into corners to reduce chatter.
- For long-reach applications, utilize the Carbide Shank/Carbide Core cutting tools for increased rigidity and reduced chatter.



DISCLAIMER: Modern metal cutting techniques involve the potential use of very high operating parameters (speeds, feeds, depths of cut, etc.). This creates the potential for flying chips and debris, and can also create tool breakage due to a variety of causes. As such, any metal cutting operation should be executed in a completely enclosed (shielded) environment to protect against injury from flying objects. Dapra does not assume responsibility for any loss, damage or expense incurred in any use or handling of our product after purchase. Grinding produces hazardous dust. To avoid adverse health effects, use adequate ventilation and read material safety data sheet first. This product contains a chemical known to the state of California to cause cancer.

Feed, Speed & Diameter Compensation

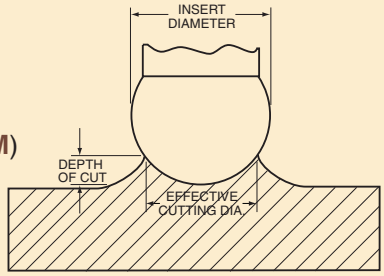
Table 1: Effective Cutting Diameter (ECD)

Depth of Cut (DOC)

Insert Diameter	.005	.010	.015	.025	.035	.050	.100	.125	.150	.200	.250
.250	.070	.098	.119	.150	.173	.200	.245	.250			
.375	.086	.121	.147	.187	.218	.255	.332	.354	.367	.374	
.500	.099	.140	.171	.218	.255	.300	.400	.433	.458	.490	.500
.625	.111	.157	.191	.245	.287	.339	.458	.500	.534	.583	.612
.750	.122	.172	.210	.269	.316	.374	.510	.559	.600	.663	.707
1.000	.141	.199	.243	.312	.368	.436	.600	.661	.714	.800	.866
1.250	.158	.223	.272	.350	.412	.490	.678	.750	.812	.917	1.000

1. Select diameter of tool to be used.
2. Determine Depth of Cut (**DOC**) to be used.
3. Refer to Figure 1 and Table 1 to find the Effective Cutting Diameter (**ECD**).
4. Refer to Feed and Speed chart on back cover to select the surface footage to be used (**SFM**).
5. Calculate **RPM** using the **ECD** and **SFM**. (**SFM** x 3.82 / **ECD** = **RPM**)
6. Refer to Table 2 to determine Feed Rate Adjustment (**FRA**).
7. Refer to chart on back cover to select Feed per Revolution (**FPR**). Calculate Inches per Minute (**IPM**). (**RPM** x **FPR** x **FRA** = **IPM**)

Figure 1



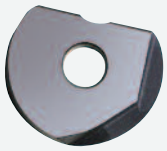
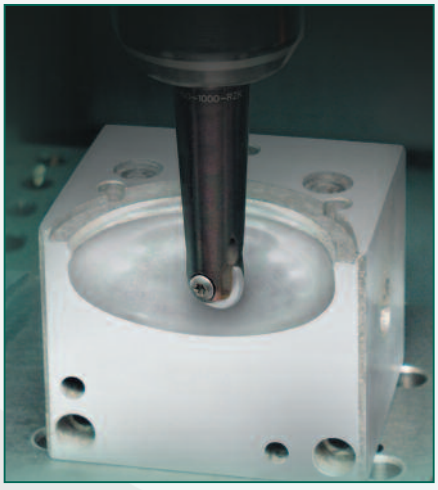


Table 2: Feed Rate Adjustment (FRA)

Insert Diameter

Depth of Cut (DOC)	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"	1 1/4"
.005	3.6	4.0	4.4	5.0	5.6	6.1	7.1	7.9
.010	2.6	2.8	3.1	3.6	4.0	4.4	5.0	5.6
.015	2.1	2.3	2.6	2.9	3.3	3.6	4.1	4.6
.020	1.8	2.0	2.2	2.6	2.8	3.1	3.6	4.0
.025	1.7	1.8	2.0	2.3	2.6	2.8	3.2	3.6
.050	1.2	1.4	1.5	1.7	1.8	2.0	2.3	2.6
.075	1.1	1.2	1.2	1.4	1.5	1.7	1.9	2.1
.100		1.1	1.1	1.2	1.4	1.5	1.7	1.8
.125			1.1	1.2	1.3	1.3	1.5	1.7
.150				1.1	1.2	1.3	1.4	1.5
.175					1.1	1.2	1.3	1.4
.200						1.1	1.3	1.4
.250							1.2	1.2
.300							1.1	1.2
.400								1.1

Use multiple above to calculate adjusted feed rate.



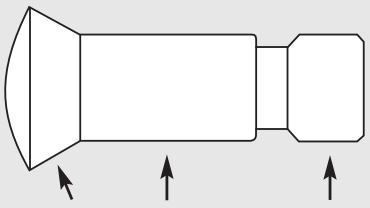
For a Ball Nose scallop height calculator, please refer to our speed and feed calculator at www.dapra.com.

Troubleshooting

Concern	Possible Cause	Solutions
Insert wear at tip	• Not enough chip load	❑ Verify correct speed and feed ❑ Increase feed rate ❑ Decrease RPM ❑ Increase DOC
Insert wear appears high (flank wear)	• Not enough chip load • Surface footage is high • Incorrect grade or coating	❑ Verify correct speed and feed ❑ Increase feed rate ❑ Decrease RPM ❑ Consider different insert
Insert chipping	• Surface footage is low • Incorrect grade or coating • Using CB style insert incorrectly • Feed too high	❑ Verify correct speed and feed ❑ Increase spindle speed ❑ Decrease feed rate ❑ Change insert selection ❑ Decrease DOC ❑ Use N style insert
Built-up edge on insert	• Low surface footage • Light chip load (feed per tooth) • Incorrect coating	❑ Verify correct speed and feed ❑ Increase cutting speed ❑ Increase feed rate ❑ Select different coating
Poor finish/chatter	• Cutter hung out too far • Excessive runout	❑ Use Carbide Core cutter body ❑ Reduce tool gage length ❑ Check tool holder wear
Tool shank breaks	• Tool pressure too great • Fatigued cutter body	❑ Decrease DOC ❑ Reduce tool gage length ❑ Decrease feed rate

How to Apply Anti-Seize to Ball Nose Insert Screws

1. Anti-seize must be applied before using tool for first time.
2. Remove screw from cutter body.
3. Generously apply anti-seize to *entire length* of screw body, not to just the threads (see diagram).
4. Clean out insert pocket before assembly of insert/screw combination.
5. Place insert into cutter-body pocket.
6. Place screw with applied anti-seize into position in cutter body.
7. While gently pushing on the end of the TORX® screwdriver/ wrench, begin tightening the screw (may turn with slight resistance in order to pull insert tight into the pocket).
8. Tighten screw to snug fit, taking care not to overtighten. Follow torque specifications shown above.
9. Repeat steps 2-8 for each insert change.
10. Replace screw with each new box of inserts to assure maximum performance.



Generously apply anti-seize to these surfaces with each insert change.

Recommended Cutting Speeds

MATERIAL GROUP		Example	F1 *(uncoated)*	FPX	FPO	FPA/ FP-GLH	PCD	Geometry	FPR
PLAIN STEELS	< 3%C	1008, 1018, 12L14	300-600	400-1000	**500-1200**	800-1600	N/R	HBN N CB	.002-.012
	3%-6%C	1040, 1045, 1055							
	5%-1.5%C	1060, 1070, 1095							
ALLOY STEELS	Mo	4012, 4320, 4340		300-900	**350-1100**	**700-1400**	N/R		
	Cr	52100, 5120							
	NiCrMo	8620, 8622, 8640							
TOOL & DIE STEELS		A2, D2, P20, W2, H13, S7							
HARDENED STEELS			N/R	N/R	N/R	**400-800**	N/R	HBN, N	
STAINLESS STEELS	Ferritic/ Martensitic	403, 416, 430, 430F, 434, 446, S44400	150-300	250-800	**300-950**	**350-1200**	N/R	HBN, N, CB	.003-.010
	Austenitic	304L, 303, 304, 316L		150-650	**180-780**	**300-1100**	N/R	HBN, CB	
	Precipitation Hardening (PH)	15-5PH, 17-4PH, custom, 455, PH13-8 Mo, AM355		150-500	**180-600**	**300-900**	N/R		
CAST IRON	Gray	A48 Class xx B, A436 Type 2	350-600	300-900	**360-1100**	**500-1200**	N/R	HBN,N	.003-.015
	Malleable	A47, A220, SAE J148							
	Ductile	60-40-18, 100-70-03, SAE J434				**400-1100**	N/R		
ALUMINUM ALLOYS		2024-T4, 6061-T6, 7075-T6	**1000+**	**1000+**	1000+	1000+	**2000+**	HBN, CB	.005-.025
COPPER ALLOYS	CuNi:refer to High-Temp. Alloys below	J463, B121, Ampco 21, Wearite 4-13	400-600	**400-800**	450-950	500-1000	N/R		
HIGH-TEMP. ALLOYS		Inconel 617, Monel K500, Waspaloy, CuNi 70-30	50-125	50-200	**50-200**	**100-450**	N/R	HBN, CB	.002-.009
TITANIUM ALLOYS		Ti99.9, Alpha Alloy, Ti-6Al-4V	50-125	**50-200**	**50-200**	**150-650**	N/R	HBN, CB	.002-.008
CARBON GRAPHITE			700-1200	700-1500	700-1500	**1200+**	**1200+**	HBN, N, PCD	.002-.015

*** Best choice grades shown in bold text*

Refer to the Diameter and Feed Rate Adjustment charts on page 14 for accurate RPM and IPM calculations

SPEED

Lower Speed Ranges for: Heavier cuts, harder materials, larger diameter tools
Medium Speed Ranges for: Semi-finishing
Higher Speed Ranges for: Lighter cuts, softer materials, smaller diameter tools

FEED

Lower Feed Ranges for: Heavier cuts, harder materials, smaller diameter tools
Higher Feed Ranges for: Lighter cuts, softer materials, larger diameter tools

The parameters provided are suggested operating parameters. Actual speeds and feeds will depend on many variables, such as rigidity, workpiece hardness, tool extension, machine accuracy, Depth of Cut, etc. Start at the middle of the SFM range and the low end of the FPR range. Next, increase FPR to optimize productivity and tool life. Higher SFM will provide higher output but will reduce tool life. Try different combinations to find the parameters that best suit your needs.

Dapra Ball Nose finishing products are proudly made in the USA.

DAPRA® CORPORATION

Bringing Better Ideas to the Cutting Edge™

66 Granby Street, Bloomfield, CT 06002

800-243-3344 • 860-242-8539 • Fax 860-242-3017

Email info@dapra.com • **www.dapra.com**