SQUARE SHOULDER
90° MILLING SOLUTIONS

CUTTING TOOLS
MADE IN THE USA

RHINO-FEED™
HIGH-FEED ROUGHING SOLUTIONS

TOROID
BUTTON / FACE MILLING SOLUTIONS

BALL NOSE / BACK DRAFT
SURFACE FINISHING SOLUTIONS

DAPRA®

SOLUTIONS

WORKHOLDING

POWER SCRAPING & DEBURRING

DIRECT PART MARKING

www.dapra.com **(800) 243-3344**

At Dapra, our mantra is that YOUR job is OUR job.

From the highest-quality, American-made indexable milling tools to the industry's leading added-value programs and our dedication to ongoing training and application support, our relationship with shops large and small doesn't start and end with a purchase order.

We're here to help you choose the best tooling, inserts and operating parameters to maximize your milling efficiency and productivity – from sale to the spindle. If you have questions about how to best apply the technology outlined in this catalog, contact us for a free application review!

Visit www.DAPRA.com for...

SPEED & FEED CALCULATORS

Program the right parameters the first time.

WWW.DAPRA.COM/SPEED

DEMO VIDEOS

Demos, side-by-side comparisons and more.

WWW.DAPRA.COM/VIDEO

MILLING TRAINING

Hands-on classes, free video series and more.

WWW.DAPRA.COM/TRAINING

RESOURCE LIBRARY

Application tips, technical articles and more.

WWW.DAPRA.COM/LIBRARY

DAPRA® provides maximum value with...

AUTOMATIC CUTTER REPLACEMENT

Keep fresh cutters in service and save your shop thousands with our industry-leading EDGE² DSS (page 5) and Ball Nose (page 92) replacement programs.

EDGE² TECHNOLOGY

Our double-sided inserts and premium-quality cutters deliver unbeatable indexable milling value.

GUARANTEED TEST ORDERS

Don't just take our word for it – try our tools risk-free! See back cover for details.

IN-HOUSE TECHNICAL SUPPORT

All of our field personnel are highly experienced CNC machinists, ready to provide guidance and support for maximizing your tooling investment.

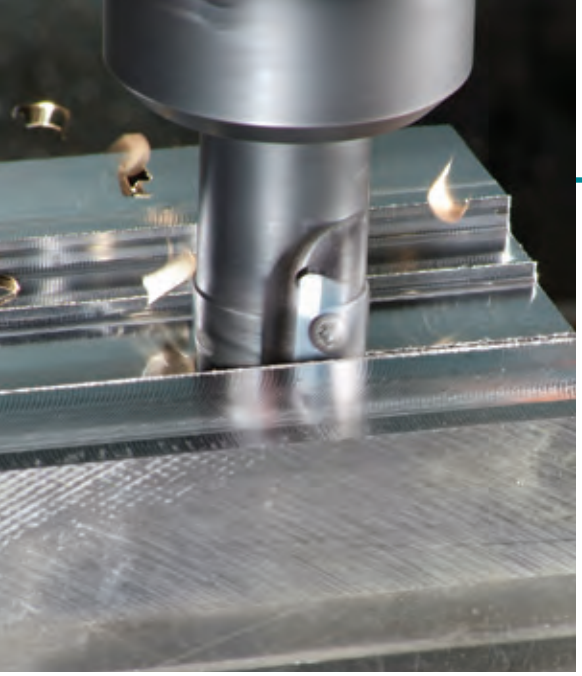
AMERICAN-MADE PRODUCT

Dapra is one of very few remaining companies making cutting tools right here in the USA. American-made tools for American manufacturers – one of the ways that ***your*** job is ***our*** job!

CATALOG INDEX

High-Performance Cutting Tools & Inserts

INDEX CONTINUED ON PAGE 2 »



90° Square Shoulder

Obtain extreme metal removal with our single-sided and EDGE² DSS double-sided 90° Square Shoulder indexable milling tools. Our high-performance Square Shoulder tools cut to a true 90 degrees, generating smoother finishes. These lines are a great solution for:

- Ramping
- Slotting
- Profiling
- Pocketing
- Step milling
- Face milling
- Shoulder milling
- Helical interpolation

YOUR CHOICE: EDGE² DSS or APET/XPET

EDGE² DSS Double-Sided

- Strong and positive double-sided inserts with four usable edges – suitable for all materials except nonferrous
- Excellent surface finishes for both face and shoulder milling
- Excellent value proposition with low cost per edge
- Permanent automatic cutter replacement program can save your shop thousands of dollars

SEE PAGE 4

APET/XPET Single-Sided

- Single-sided inserts with two usable edges – strong cutting edge, capable of the heaviest chiploads (feeds)
- Positive insert geometry provides excellent clearance for ramping and helixing
- Outstanding edge and polished ALU inserts for aluminums and plastics

SEE PAGE 10

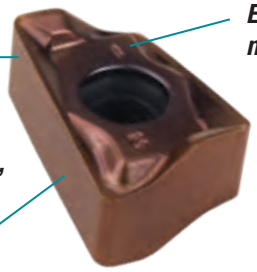
EDGE² DSS 90° Milling Series

NEW EDGE² Double-Sided Square Shoulder Series
The Industry's Best Indexable Milling Value

DSS is the evolution of our Square Shoulder line, offering premium 90-degree milling performance *and* maximum value. Double-sided DSS inserts offer four usable edges – double that of our current APET and XPET inserts. And Dapra is the only company in the industry to offer a permanent ***automatic cutter replacement program*** for this premium indexable milling line, allowing you to keep good-condition tools in use rather than making do with worn-out cutters. ***See page 5 for details!***

DSS Series Inserts

Double-sided DSS inserts provide twice the number of usable edges as a normal, single-sided insert.



2 cutting geometries:

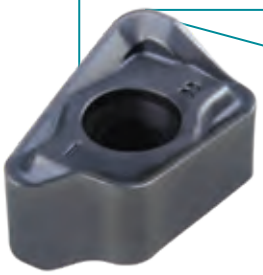
***T-land** for strength in steels and irons*

***Dished** for stainless steels, high-temp. alloys and gummy materials*

Designed convexity to create smooth surface finishes when step-down profile milling

Edges marked for ease of indexing and to achieve minimal runout when loaded in the cutter body

Positive geometry provides low cutting pressure while still maintaining strength



Two corner radii: .031" and .062"

Custom-designed wiper edge generates beautiful surface finishes

DSS Series Cutter Bodies

- Cutter bodies machined from hardened, high-shock tool steel to minimize runout and maximize durability and life
- Nickel plating provides a harder casing for improved pocket durability and resistance to chip galling
- Precision cutter and insert combination provides longer tool life and optimum surface finishes
- Deep gullets provide efficient chip evacuation, even on the heaviest cuts
- Long-reach tools are available with Carbide Core for enhanced rigidity and reduced deflection

EDGE² DSS 90° MILLING TOOLS INDEX

EDGE² DSS Series 90° Milling Cutters

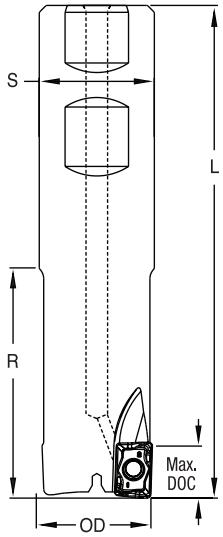
DSS Automatic Cutter Replacement Program

Stop making due with worn-out cutters! Our DSS replacement program allows you to keep good-condition tools in use at all times to maximize your productivity, and could save your shop thousands in cutter replacement costs. Simply order the specified number of inserts to receive a FREE or 1/2 PRICE cutter.

- *Pertains to DSS product line only*
- *Products can be shipped to the distributor or end user*
- *Dapra reserves the right to cancel program without notice*
- *Specials (non-standards) not eligible*

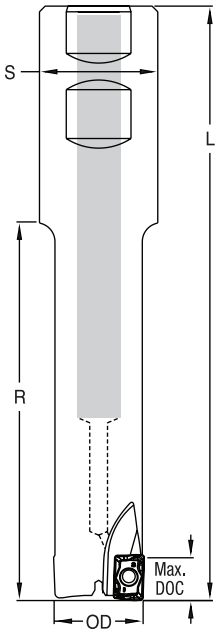
End Mills

***NOTE:** "C" in the part number denotes a thru-coolant tool.*



DSS END MILLS

EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length	FREE with # Inserts	1/2 PRICE with # Inserts
33300	1.000"	DSSEM-1000-1000-D45-2C	.420"	2	1.000"	4.28"	2.00"	30	10
33305	1.000"	DSSEM-1000-1000-D45-2LC	.420"	2	1.000"	5.28"	3.00"	30	10
33310	1.000"	DSSEM-1000-1000-D45-3C	.420"	3	1.000"	4.28"	2.00"	30	10
33315	1.000"	DSSEM-1000-1000-D45-3LC	.420"	3	1.000"	5.28"	3.00"	30	10
33325	1.250"	DSSEM-1250-1250-D45-4C	.420"	4	1.250"	4.78"	2.50"	40	20
33330	1.250"	DSSEM-1250-1250-D45-4LC	.420"	4	1.250"	6.03"	3.75"	50	20
33335	1.500"	DSSEM-1500-1250-D45-4C	.420"	4	1.250"	4.78"	2.50"	50	20



DSS EXTENDED-REACH END MILLS WITH CARBIDE CORE

EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length	FREE with # Inserts	1/2 PRICE with # Inserts
33385	1.000"	CC-DSSER1000-4000-D45-3C	.420"	3	1.250"	6.28"	4.00"	70	20
33390	1.000"	CC-DSSER1000-6000-D45-2C	.420"	2	1.250"	8.28"	6.00"	70	20
33395	1.250"	CC-DSSER1250-6000-D45-3C	.420"	3	1.500"	8.70"	6.00"	80	30

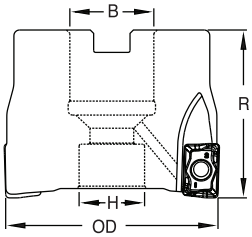
EDGE² DSS Series 90° Milling Cutters

***NOTE:** "C" in the part number denotes a thru-coolant tool.*

Shell Mills

DSS SHELL MILLS

EDP	OD Diameter	Holder	Max. DOC	Flutes	B Arbor Dia.	R Overall Length	H Counter Bore Dia.	FREE with # Inserts	1/2 PRICE with # Inserts
33400	1.500"	DSSSM-1500-0750-D45-5C	.420"	5	.750"	1.50"	0.59"	50	20
33405	2.000"	DSSSM-2000-0750-D45-5C	.420"	5	.750"	1.50"	0.59"	60	30
33410	2.500"	DSSSM-2500-1000-D45-6C	.420"	6	1.000"	1.75"	0.82"	70	30
33415	3.000"	DSSSM-3000-1000-D45-6C	.420"	6	1.000"	2.00"	0.82"	70	30
33420	4.000"	DSSSM-4000-1500-D45-8C	.420"	8	1.500"	2.25"	1.19"	80	40
33425	5.000"	DSSSM-5000-1500-D45-9	.420"	9	1.500"	2.00"	2.12"	90	40
33430	6.000"	DSSSM-6000-2000-D45-10	.420"	10	2.000"	2.00"	2.75"	100	40

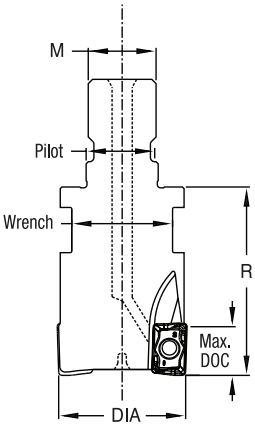


Screw-On Modular Heads

- Screw-on modular heads are 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
- All feature thru-coolant tooling
- See page 116 for modular extensions

DSS SCREW-ON MODULAR HEADS

EDP	Dia.	Holder	M Thread	Max. DOC	Flutes	Pilot	R Effective Length	Wrench	FREE with # Inserts	1/2 PRICE with # Inserts
33485	1.000"	DSSEM-1000-MOD-D45-2C	M12	.420"	2	.492"	1.50"	11/16"	30	10
33490	1.000"	DSSEM-1000-MOD-D45-3C	M12	.420"	3	.492"	1.50"	11/16"	40	20
33495	1.250"	DSSEM-1250-MOD-D45-4C	M16	.420"	4	.669"	1.75"	15/16"	50	20



SEE PAGE 116 FOR CARBIDE CORE, SOLID CARBIDE AND HEAVY METAL MODULAR EXTENSIONS.

DSS Spare Parts & Tools

Part Description	Order Number (EDP)
Clamping Screw	SSTX-10-SL (22606)
Flag-Style Wrench	T10-F (41070)
Tightening Torque for Clamping Screw	13-16 in lbs (1.5-1.8 Nm)

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

OUR TORQUE WRENCH SYSTEMS MAKE REPEATABLE, ACCURATE INSERT LOADING EASIER THAN EVER BEFORE! SEE PAGE 118 FOR DETAILS.

EDGE² DSS Series 90° Milling Inserts

DSS-T
Cutting Edge
(T-Land Edge)
High Strength

DSS-D
Cutting Edge
(Honed Edge)
High Shear

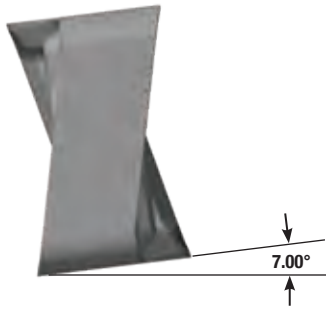
Insert Size	L	W	R	Uncoated (EDP)	Available Coated Grades (EDP)		
DSS-T	***DSS-T inserts feature a high-strength cutting edge and are ideal for high-performance milling of most tougher steels and cast irons.***						
DSS-1208-T	.480"	.315"	.031"	DMK30 (33700)	DMK30-TS (33785)	DMK30-HM (33765)	
				DMP25 (33800)	DMP25-TS (33885)	DMP25-HM (33865)	
				DMK15 (33900)	DMK15-TS (33985)	DMK15-HM (33965)	
DSS-1216-T	.480"	.315"	.062"	DMK30 (34000)	DMK30-TS (34085)	DMK30-HM (34065)	
				DMP25 (34100)	DMP25-TS (34185)	DMP25-HM (34165)	
				DMK15 (34200)	DMK15-TS (34285)	DMK15-HM (34265)	
DSS-D	***DSS-D inserts feature a sharper cutting edge ideally suited to high-shear milling of stainless steels, various exotic and nickel alloys, and low-carbon steels.***						
DSS-1208-D	.480"	.315"	.031"	DMK30 (33590)	DMK30-TS (33593)	DMK30-HM (33592)	DMK30-IN (33591)
				DMK35 (33500)		DMK35-HM (33565)	DMK35-IN (33545)
DSS-1216-D	.480"	.315"	.062"	DMK30 (33595)	DMK30-TS (33598)	DMK30-HM (33597)	DMK30-IN (33596)
				DMK35 (33600)		DMK35-HM (33665)	DMK35-IN (33645)

DSS Series Insert Grades

Shock & Wear Resistance	Uncoated (Base Grade)	with Coating	Description	Specifications
TOUGHEST Shock Resistance	**DMK30**		Moderate wear resistance/high shock resistance. Recommended for interrupted or unstable steel, most stainless steel, high-temperature alloys, and cast iron applications.	ANSI C5-C6, ISO P35-P40, M30-M40
		DMK30-TS	General-purpose grade for most materials except hardened steel. Tough and wear-resistant, with all-around coating.	
		DMK30-HM	Same tough carbide substrate, but with a higher-temperature coating. Usually used for high-temperature alloys or tough stainless steels.	
TOUGH Shock and Wear	**DMK35**		Specifically developed for inconel and other high-temperature alloys, as well as demanding stainless steel applications.	ANSI C5-C6, ISO M30-M40, P30-P40, K30-K40
		DMK35-HM	Use HM for a higher-temperature coating in tough stainless steels.	
		DMK35-IN	IN provides the best performance for high-temperature alloys and tough stainless steels. First choice for inconel.	
MEDIUM Shock and Wear	**DMP25**		High wear resistance/moderate shock resistance. Recommended for most steel and ductile iron applications.	ANSI C5, ISO P25-P35, K25-K35
		DMP25-TS	Use TS for high-performance milling of steels and ductile irons.	
		DMP25-HM	Use HM for high-performance milling of tougher steels and tool steels.	
HARDEST Wear Resistance	**DMK15**		Highest wear resistance with reduced shock absorption capabilities. Micro-grain carbide provides excellent edge strength. Suitable for all materials under stable conditions.	ANSI C2-C3, ISO K10-K30
		DMK15-TS	Use TS for good all-around performance in gray and ductile irons.	
		DMK15-HM	Use HM for the highest hardness in gray and ductile irons, as well as heat-treated steels.	

Application Tips

Feed & Ramping



DSS inserts are thick, with neutral (straight) sides, so feed rates are not as aggressive as can be seen on positive, single-sided inserts that have more clearance.

- Be sure to follow the recommended feed rate ranges shown on page 9 for optimum performance.
- Ramping is possible, but keep ramp angles < 1° for most applications (1/2° for shell/face mills).

Indexing

DSS inserts provide double the number of edges of single-sided inserts, but care must be taken to index properly in order to achieve the best performance.

- Clean the insert sides before indexing to the alternate cutting edge of the same insert face (edges 1 and 2).
- Clean both the insert sides and face when indexing to the backside edges (edges 3 and 4) to assure correct location and accuracy. Failure to clean the locating edges could result in runout, poor finish, poor tool life, and/or tool damage.

Radius

- Use the larger corner radius option (DSS-1216) for optimum strength.
- Use the smaller corner radius option (DSS-1208) for optimum floor finish quality.

DSS-1208-T

DSS-1216-T

Depth of Cut

Depth of cut is a user choice, typically dependent on machine tool horsepower and workpiece setup rigidity.

- A maximum DOC of .100” is generally recommended for normal cuts between 30% and 100% of the tool diameter on 40-taper machines; .200” on 50-taper machines.
- A maximum DOC of .375” is recommended for light radial cuts (WOC) less than 20% of the tool diameter.

Screw Torque

Use a small, flag-style wrench (included with all DSSEM and DSSSM cutter bodies) to tighten the insert screw, to avoid overtightening and potentially breaking off the insert screw heads. Alternately, purchase Dapra’s torque wrenches to assure correct insert screw torque (see page 118 for available T-handle and screwdriver-style torque wrenches).

Recommended Cutting Speeds/Feeds

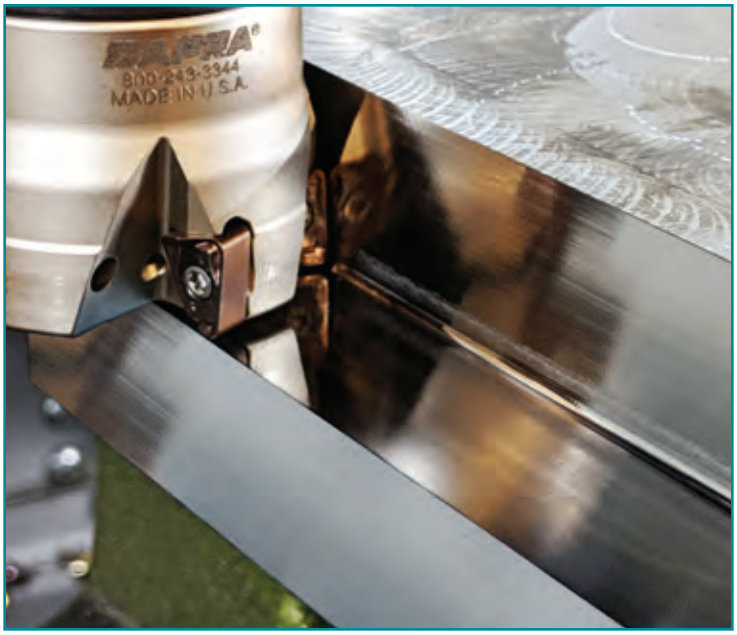
Recommended Cutting Speeds for Dapra DSS Cutters			1018, 12L14, 1041, 1045	4140, 4150 4340, H13, P20, A2, D2	4140, 4150, 4340, H13, P20, A2, D2 (40s RC)	4140, 4150 4340, H13, P20, A2, D2	303, 304 LOW 400 SERIES	316, 347, PH STAINLESS	GRAY, MALLEABLE, DUCTILE	AMPCO, BERYLLIUM	INCONEL, WASPALOY, MONEL	
			LOW-TO-MEDIUM CARBON STEELS	TOOL STEELS, HIGH-ALLOY STEELS (SOFT)	TOOL STEELS, HIGH-ALLOY STEELS (MID-HARDNESS)	TOOL STEELS, HIGH-ALLOY STEELS (HARDENED)	FREE MACHINING STAINLESS	TOUGHER STAINLESS	CAST IRONS	COPPER ALLOYS	HIGH-TEMP. ALLOYS	TITANIUM
LOWER TEMPS »	TOUGHEST Shock Resistance	DMK30-TS	700-900	450-750	300-500		**250-500 (wet) 600-750 (dry)**	**250-500**	550-1000	**250-500**	**50-110**	120-180
		DMK30-HM			300-500		**250-500 (wet) 600-750 (dry)**	**250-550**	600-1200	**300-600**	**50-110**	**120-180**
		DMK35-HM						300-600			**50-110 INCONEL**	120-180
		DMK35-IN						350-650			**50-110 INCONEL**	120-180
	MEDIUM Shock & Wear	DMP25-TS	**700-1100**	**500-800**	**350-550**	200-400			**550-900 DUCTILE**			
		DMP25-HM		**500-850**	**350-550**	200-400			**600-900 DUCTILE**			
« HIGHER TEMPS	HARDEST Wear Resistance	DMK15-TS	700-1100	500-800	350-550	**250-550**	250-500 (wet) 600-750 (dry)	**300-600 FINISHING**	**700-1100 GRAY**	**250-500**	50-110 FINISHING	120-180 FINISHING
		DMK15-HM		550-850	350-550	**250-550**	250-500 (wet) 600-750 (dry)	**350-650 FINISHING**	**800-1200 GRAY**	**300-600**	**50-110 FINISHING**	**120-180 FINISHING**
1ST CHOICE GEOMETRY			DSS-D / DSS-T	DSS-T	DSS-T	DSS-T	DSS-D	DSS-D	DSS-T	DSS-D	DSS-D	DSS-D
RECOMMENDED FPT RANGE			.004-.008	.005-.008	.004-.007	.003-.005	.003-.007	.003-.007	.004-.008	.003-.008	.002-.006	.002-.006

- First choice grade shown in **bold text**.
- For heavy WOC and/or DOC, use the lower end of the FPT range.
- For light WOC and DOC, the higher end of the FPT range may be possible.

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 IPT range. Next, increase IPT 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.



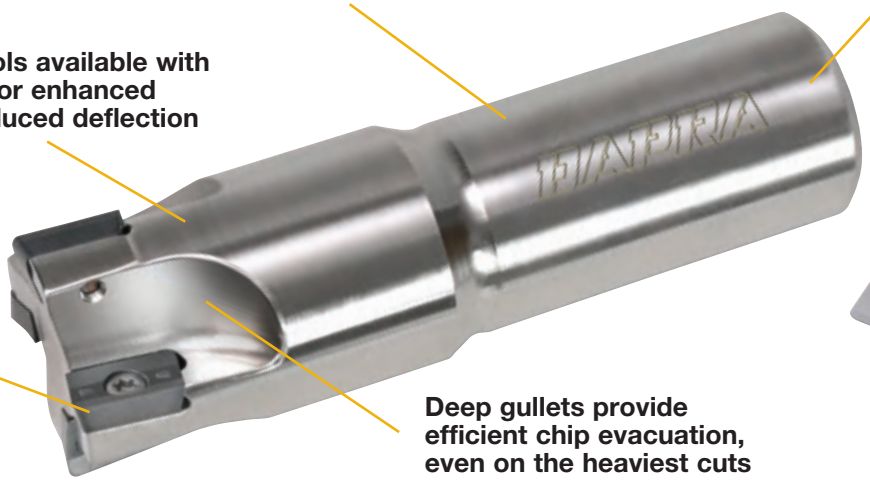
Single-Sided APET/XPET 90° Milling Series

DAPRA® Square Shoulder EXTREME Metal Removal

Cutter bodies machined from hardened steel to minimize runout and create excellent surface finishes at high feed rates

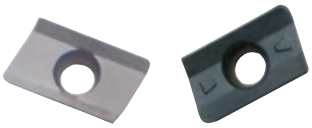
Nickel plating provides a harder casing for improved pocket durability and resistance to chip galling

Long-reach tools available with Carbide Core for enhanced rigidity and reduced deflection



Precision cutter and insert combination provides longer tool life

Deep gullets provide efficient chip evacuation, even on the heaviest cuts



Inserts offered in both pressed and lapped versions for a combination of economy and performance

SINGLE-SIDED SQUARE SHOULDER 90° MILLING TOOLS INDEX

APET & XPET CNC Pressed Inserts

The most economical, high-performance inserts available!

- ***APET and XPET*** inserts are manufactured using CNC press technology, providing reliable accuracy and repeatability.
- Feature a high positive pressed cutting geometry for aggressive material removal rates and low horsepower consumption.
- Have a strong edge preparation for heavy chiploads.
- Are available in a large variety of corner radii with a true tangential blend.
- Wiper geometry provides excellent surface finishes.

Insert Geometry Selection

APET Geometry	Traits	XPET Geometry
Positive/negative cutting edge with T-land	*Cutting Edge*	Positive cutting edge with a light hone and no T-land
Somewhat free-cutting; meant for higher chiploads (>.005" IPT); creates medium burr	*Cutting Action*	Free-cutting, small burr; can run at lighter chiploads (>.002" IPT)
Higher force due to negative edge; will deflect more than XPET	*Force*	Lower force due to sharper edge; less deflection
Higher heat generation than XPET; creates more heat at higher speeds	*Heat*	Less heat generated due to positive edge
Very strong cutting edge; able to withstand more shock and interruptions	*Strength*	Weaker, due to edge sharpness; not able to withstand significant interruptions
Longer edge life due to strong cutting edge; will roll more burr and wear out rather than chip out	*Edge Life*	Shorter, due to edge sharpness; may chip out if run too long

***APET** inserts feature a high-strength cutting edge and are ideal for high-performance milling of most harder steels and cast irons.*

***XPET** inserts are ideal for high-performance milling of stainless steels, high-temperature alloys and nonferrous materials. Also good for gummy, softer, free-machining steels.*

XPET Lapped, Aluminum Cutting Inserts

- Ground and lapped rake face is ideally suited for machining aluminum and copper alloys, bronze, brass, etc. Built-up edge is virtually eliminated.
- Positive rake angle is higher than standard inserts, providing highest shear possible.
- Sharp cutting edge is configured specifically for cutting nonferrous materials, yielding the ultimate in low-torque material removal.
- Variety of corner radii available with a true tangential blend.

***XPET Lapped** inserts feature a ground and lapped rake face for machining aluminum and copper alloys.*

***PCD-Tipped** inserts provide the ultimate in wear resistance for high-volume aluminum or graphite milling. Available in 1/32" corner radius only.*

See pages 24-25 for grade selection information.

Cutter Bodies for 10mm APET/XPET Inserts

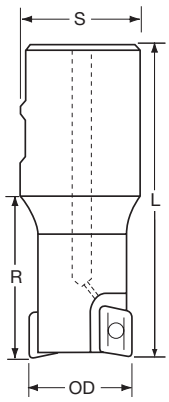
Dapra is in the process of transitioning to all thru-coolant tooling for SSEM, SSER, and CC-SSER cutter bodies. Solid bodies are available while stock lasts, after which only thru-coolant versions will be available. "C" denotes coolant thru tool.

10mm End Mills

10MM END MILLS

EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length
20000C	.500"	SSEM0500-0625-R35-1C	.350"	1	.625"	2.75"	.97"
20020C	.625"	SSEM0625-0625-R35-2C	.350"	2	.625"	3.00"	1.09"
20070	.750"	SSEM0750-0750-R35-2C	.350"	2	.750"	3.50"	1.47"
20100C	.750"	SSEM0750-0750-R35-3C	.350"	3	.750"	3.50"	1.47"
20150C	1.000"	SSEM1000-0750-R35-4C	.350"	4	.750"	3.50"	1.47"
20130	1.000"	SSEM1000-1000-R35-3C	.350"	3	1.000"	4.00"	1.72"
20230	1.250"	SSEM1250-1250-R35-5C	.350"	5	1.250"	4.78"	2.50"

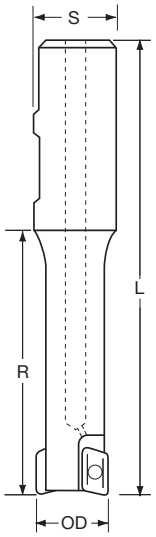
1.25" cutters and smaller are available without Weldon flats in limited supplies.
Add WOF to end of part number when ordering.



10MM EXTENDED-REACH END MILLS

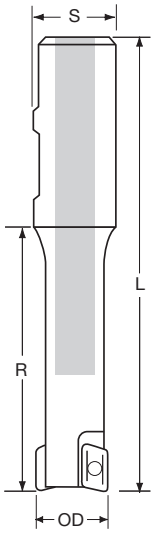
EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length
20500C	.500"	SSER0500-2000-R35-1C	.350"	1	.625"	3.91"	2.00"
20520	.625"	SSER0625-2500-R35-2C	.350"	2	.750"	4.41"	2.50"
20525	.625"	SSER0625-3300-R35-2C	.350"	2	.750"	5.21"	3.30"
20533C	.625"	SSER0625-7000-SS-R35-2C-WOF*	.350"	2	.625"	7.00"	1.25"
20540	.750"	SSER0750-2500-R35-2C	.350"	2	1.000"	4.78"	2.50"
20550	.750"	SSER0750-4000-R35-2C	.350"	2	1.000"	6.28"	4.00"
20565C	.750"	SSER0750-7000-SS-R35-2C-WOF*	.350"	2	.750"	7.00"	1.13"

** Cylindrical shank – no Weldon flats.*

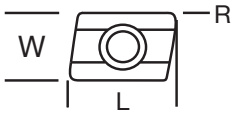


10MM EXTENDED-REACH END MILLS WITH CARBIDE CORE

EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length
20700	.750"	CC-SSER0750-2500-R35-2	.350"	2	1.000"	4.78"	2.50"
20700C	.750"	CC-SSER0750-2500-R35-2C	.350"	2	1.000"	4.78"	2.50"
20720	.750"	CC-SSER0750-4000-R35-2	.350"	2	1.000"	6.28"	4.00"



10mm APET/XPET Inserts and Grades



APET
Cutting Edge
(T-Land Edge)
High Strength

XPET
Cutting Edge
(Honed Edge)
High Shear

Insert Size	L	W	R	Uncoated (EDP)	Available Coated Grades (EDP)		
APET	*APET Inserts feature a high-strength cutting edge and are ideal for high-performance milling of most harder steels and cast irons.*						
APET100308	.380"	.250"	.031"	DMP35 (25200)	DMP35-TCI (25290)	DMP35-GLH (25260)	DMP35-HM (25285)
				DMP30 (25100)	DMP30-TCI (25190)	DMP30-GLH (25160)	DMP30-HM (25185)
				DMK25 (25000)	DMK25-TCI (25090)	DMK25-GLH (25060)	DMK25-HM (25085)
APET100316	.380"	.250"	.062"	DMP35 (25500)	DMP35-TCI (25590)	DMP35-GLH (25560)	DMP35-HM (25585)
				DMP30 (25400)	DMP30-TCI (25490)	DMP30-GLH (25460)	DMP30-HM (25485)
				DMK25 (25300)	DMK25-TCI (25390)	DMK25-GLH (25360)	DMK25-HM (25385)
XPET	*XPET Inserts are ideal for high-performance milling of stainless steels and nonferrous materials such as copper alloys and aluminum. Also good for gummy, softer, free-machining steels.*						
XPET100308	.380"	.250"	.031"	DMP35 (27300)	DMP35-TCI (27390)	DMP35-GLH (27360)	DMP35-HM (27385)
				DMK30 (27100)	DMK30-TCI (27190)	DMK30-GLH (27160)	DMK30-HM (REQ)
				DMP30 (27200)	DMP30-TCI (27290)	DMP30-GLH (27260)	DMP30-HM (REQ)
				DMK25 (27000)	DMK25-TCI (27090)	DMK25-GLH (27060)	DMK25-HM (27085)
XPET100316	.380"	.250"	.062"	DMP35 (27700)	DMP35-TCI (27790)	DMP35-GLH (27760)	DMP35-HM (REQ)
				DMK30 (27500)	DMK30-TCI (27590)	DMK30-GLH (27560)	DMK30-HM (REQ)
				DMP30 (27600)	DMP30-TCI (27690)	DMP30-GLH (27660)	DMP30-HM (REQ)
				DMK25 (27400)	DMK25-TCI (27490)	DMK25-GLH (27460)	DMK25-HM (REQ)
XPET-ALU	*XPET-ALU lapped inserts feature a ground and lapped rake face for machining aluminum and copper alloys, bronze, brass, etc. Built-up edge is virtually eliminated.*						
XPET100308-ALU	.380"	.250"	.031"	DMK25 (29902)	DMK25-TCI (REQ)	DMK25-GLH (29908)	DMK25-HM (REQ)
XPET100316-ALU	.380"	.250"	.062"	DMK25 (29910)	DMK25-TCI (REQ)	DMK25-GLH (REQ)	DMK25-HM (REQ)

REQ = Available upon request.

Older coatings available upon request; may have up to a 2-week lead time.

Other grades available upon request.

SEE PG. 25 FOR INSERT GRADE DESCRIPTIONS

See chart on page 29 for technical help on optimizing cutting performance.
See page 31 for recommended speeds/feeds.

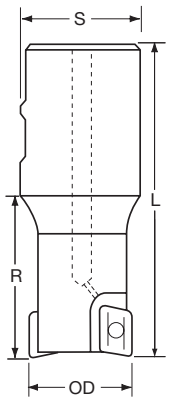
Cutter Bodies for 12mm APET/XPET Inserts

Dapra is in the process of transitioning to all thru-coolant tooling for SSEM, SSER, and CC-SSER cutter bodies. Solid bodies are available while stock lasts, after which only thru-coolant versions will be available. "C" denotes coolant thru tool.

12mm End Mills

12MM END MILLS

EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length
20035	.625"	SSEM0625-0625-R45-1C	.430"	1	.625"	3.00"	1.09"
20105	.750"	SSEM0750-0750-R45-2C	.430"	2	.750"	3.50"	1.47"
20107	.750"	SSEM0750-0750-R45-2LC	.430"	2	.750"	4.28"	2.25"
20169	1.000"	SSEM1000-1000-R45-3SC	.430"	3	1.000"	3.28"	1.00"
20165	1.000"	SSEM1000-1000-R45-3C	.430"	3	1.000"	4.28"	2.00"
20167	1.000"	SSEM1000-1000-R45-3LC	.430"	3	1.000"	5.28"	3.00"
20245	1.250"	SSEM1250-1250-R45-4C	.430"	4	1.250"	4.78"	2.50"
20247	1.250"	SSEM1250-1250-R45-4LC	.430"	4	1.250"	6.03"	3.75"
20295	1.500"	SSEM1500-1250-R45-5C	.430"	5	1.250"	4.78"	2.50"



12MM EXTENDED-REACH END MILLS

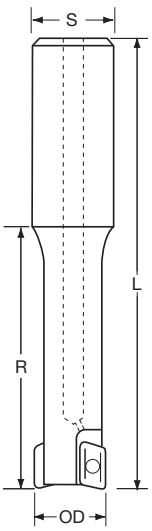
EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length
20535	.625"	SSER0625-7000-SS-R45-1C-WOF*	.430"	1	.625"	7.00"	1.09"
20567	.750"	SSER0750-7000-SS-R45-2C-WOF*	.430"	2	.750"	7.00"	1.45"
20603	1.000"	SSER1000-9000-SS-R45-2C-WOF*	.430"	2	1.000"	9.00"	2.00"
20612	1.250"	SSER1250-10000-SS-R45-2C-WOF*	.430"	2	1.250"	10.00"	2.50"

** Cylindrical shank – no Weldon flats.*

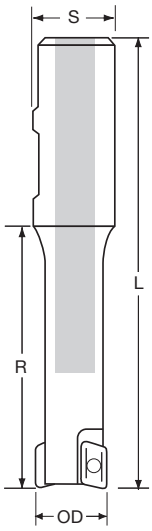
12MM EXTENDED-REACH END MILLS WITH CARBIDE CORE

EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length
20722	.750"	CC-SSER0750-4000-R45-2	.430"	2	1.000"	6.30"	4.00"
20724	1.000"	CC-SSER1000-4000-R45-3	.430"	3	1.250"	6.29"	4.00"
20726	1.000"	CC-SSER1000-6000-R45-3	.430"	3	1.250"	8.29"	6.00"

SSER -WOF*



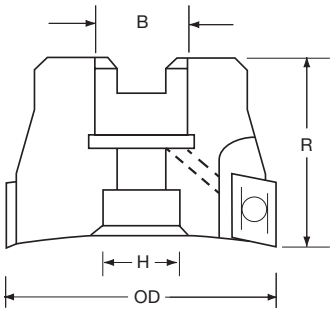
CC-SSER



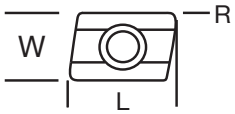
12mm Shell Mills

12MM STANDARD-PITCH SHELL MILLS

EDP	OD Diameter	Holder	Max. DOC	Flutes	B Arbor Dia.	R Overall Length	H Counter Bore Dia.	SHCS Socket Head Cap Screw
20890	1.500"	SSSM1500-0750-R45-5C	.430"	5	.750"	1.75"	.58"	TC-3/8
20913	2.000"	SSSM2000-0750-R45-5C	.430"	5	.750"	1.50"	.60"	TC-3/8
20915	2.000"	SSSM2000-0750-R45-7C	.430"	7	.750"	1.50"	.60"	TC-3/8
20945	2.500"	SSSM2500-1000-R45-8C	.430"	8	1.000"	1.75"	.80"	TC-1/2
20955	3.000"	SSSM3000-1000-R45-7C	.430"	7	1.000"	2.00"	.80"	TC-1/2
20957	3.000"	SSSM3000-1000-R45-10C	.430"	10	1.000"	2.00"	.80"	TC-1/2
20965	4.000"	SSSM4000-1500-R45-12	.430"	12	1.500"	2.00"	1.90"	N/A



12mm APET/XPET Inserts and Grades



APET
Cutting Edge
(T-Land Edge)
High Strength

XPET
Cutting Edge
(Honed Edge)
High Shear

Insert Size	L	W	R	Uncoated (EDP)	Available Coated Grades (EDP)			
APET	*APET Inserts feature a high-strength cutting edge and are ideal for high-performance milling of most harder steels and cast irons.*							
APET120408	.472"	.312"	.031"	DMP35 (30800)	DMP35-TCI (30890)	DMP35-GLH (30860)	DMP35-HM (REQ)	
				DMP30 (30700)	DMP30-TCI (30790)	DMP30-GLH (30760)	DMP30-HM (30785)	
				DMK25 (30500)	DMK25-TCI (30590)	DMK25-GLH (30560)	DMK25-HM (30585)	
APET120416	.472"	.312"	.062"	DMP35 (31200)	DMP35-TCI (31290)	DMP35-GLH (31260)	DMP35-HM (31285)	
				DMP30 (31100)	DMP30-TCI (31190)	DMP30-GLH (31160)	DMP30-HM (31185)	
				DMK25 (30900)	DMK25-TCI (30990)	DMK25-GLH (30960)	DMK25-HM (30985)	
APET120431	.472"	.312"	.120"	DMP35 (31600)	DMP35-TCI (31690)	DMP35-GLH (31660)	DMP35-HM (REQ)	
				DMP30 (31500)	DMP30-TCI (31590)	DMP30-GLH (31560)	DMP30-HM (REQ)	
				DMK25 (31300)	DMK25-TCI (31390)	DMK25-GLH (31360)	DMK25-HM (REQ)	
XPET	*XPET Inserts are ideal for high-performance milling of stainless steels and nonferrous materials such as copper alloys and aluminum. Also good for gummy, softer, free-machining steels.*							
XPET120408	.472"	.312"	.031"	DMP35 (32400)	DMP35-TCI (32490)	DMP35-GLH (32460)	DMP35-HM (32485)	
				DMP30 (32300)	DMP30-TCI (32390)	DMP30-GLH (32360)	DMP30-HM (32385)	
				DMK25 (32100)	DMK25-TCI (32190)	DMK25-GLH (32160)	DMK25-HM (32185)	
				DMK35 (32200)			DMK35-HM (32201)	DMK35-IN (32202)
XPET120416	.472"	.312"	.062"	DMP35 (32800)	DMP35-TCI (32890)	DMP35-GLH (32860)	DMP35-HM (REQ)	
				DMP30 (32700)	DMP30-TCI (32790)	DMP30-GLH (32760)	DMP30-HM (32785)	
				DMK25 (32500)	DMK25-TCI (32590)	DMK25-GLH (32560)		
				DMK35 (32640)			DMK35-HM (32641)	DMK35-IN (32642)
XPET120431	.472"	.312"	.120"	DMP35 (33200)	DMP35-TCI (33290)	DMP35-GLH (33260)	DMP35-HM (REQ)	
				DMP30 (33100)	DMP30-TCI (33190)	DMP30-GLH (33160)	DMP30-HM (REQ)	
				DMK25 (32900)	DMK25-TCI (32990)	DMK25-GLH (32960)	DMK25-HM (REQ)	
XPET-ALU	*XPET-ALU lapped inserts feature a ground and lapped rake face for machining aluminum and copper alloys, bronze, brass, etc. Built-up edge is virtually eliminated.*							
XPET120408-ALU	.472"	.312"	.031"	DMK25 (32010)	DMK25-TCI (REQ)	DMK25-GLH (32025)	DMK25-HM (REQ)	
XPET120416-ALU	.472"	.312"	.062"	DMK25 (32600)	DMK25-TCI (REQ)	DMK25-GLH (32615)	DMK25-HM (REQ)	
XPET120431-ALU	.472"	.312"	.120"	DMK25 (33000)	DMK25-TCI (REQ)	DMK25-GLH (33015)	DMK25-HM (REQ)	
PCD-TIPPED	*PCD-tipped inserts provide the ultimate in wear resistance for high-volume aluminum or graphite milling. Available in 1/32" corner radius only.*							
XPET120408-PCD-150	.472"	.312"	.031"	DMK25 (29895)				

REQ = Available upon request.

Older coatings available upon request; may have up to a 2-week lead time.

Other grades available upon request.

SEE PG. 25 FOR INSERT GRADE DESCRIPTIONS

See chart on page 29 for technical help on optimizing cutting performance.

See page 31 for recommended speeds/feeds.

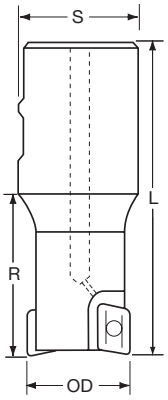
Cutter Bodies for 16mm APET/XPET Inserts

Dapra is in the process of transitioning to all thru-coolant tooling for SSEM, SSER, and CC-SSER cutter bodies. Solid bodies are available while stock lasts, after which only thru-coolant versions will be available. "C" denotes coolant thru tool.

16mm End Mills

16MM END MILLS

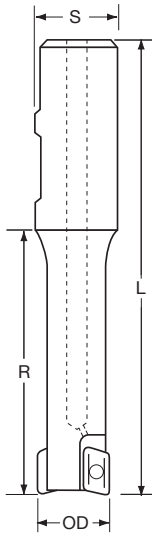
EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length
20040C	.625"	SSEM0625-0750-R55-1C	.600"	1	.750"	3.35"	1.15"
20110	.750"	SSEM0750-0750-R55-1	.600"	1	.750"	3.49"	1.40"
20170	1.000"	SSEM1000-1000-R55-2	.600"	2	1.000"	4.28"	2.00"
20190	1.000"	SSEM1000-1000-R55-2C	.600"	2	1.000"	4.28"	2.00"
20210	1.000"	SSEM1000-1000-R55-2LC	.600"	2	1.000"	5.28"	3.00"
20270	1.250"	SSEM1250-1250-R55-3C	.600"	3	1.250"	4.78"	2.50"
20300C	1.500"	SSEM1500-1250-R55-3C	.600"	3	1.250"	4.78"	2.50"
20310	1.500"	SSEM1500-1250-R55-4	.600"	4	1.250"	4.78"	2.50"
20320	1.500"	SSEM1500-1250-R55-4C	.600"	4	1.250"	4.78"	2.50"



16MM EXTENDED-REACH END MILLS

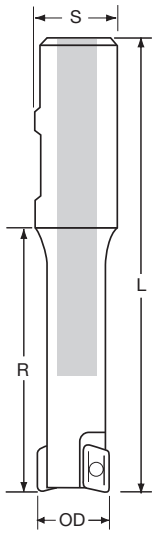
EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length
20570	1.000"	SSER1000-4000-R55-2C	.600"	2	1.250"	6.28"	4.00"
20590	1.000"	SSER1000-6000-R55-2C	.600"	2	1.250"	8.28"	6.00"
20605	1.000"	SSER1000-9000-SS-R55-2-WOF*	.600"	2	1.000"	9.00"	1.50"
20610	1.250"	SSER1250-4000-R55-3C	.600"	3	1.250"	6.28"	4.00"
20615	1.250"	SSER1250-10000-SS-R55-2-WOF*	.600"	2	1.250"	10.00"	1.88"
20620	1.500"	SSER1500-4000-R55-3C	.600"	3	1.500"	6.69"	4.00"

** Cylindrical shank – no Weldon flats.*



16MM EXTENDED-REACH END MILLS WITH CARBIDE CORE

EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length
20730C	1.000"	CC-SSER1000-4000-R55-2C	.600"	2	1.250"	6.28"	4.00"
20740C	1.000"	CC-SSER1000-6000-R55-2C	.600"	2	1.250"	8.28"	6.00"
20760C	1.000"	CC-SSER1000-8000-R55-2C	.600"	2	1.250"	10.28"	8.00"
20770	1.250"	CC-SSER1250-3200-R55-3	.600"	3	1.250"	5.50"	2.62"
20780	1.250"	CC-SSER1250-4000-R55-3	.600"	3	1.250"	6.28"	4.00"
20780C	1.250"	CC-SSER1250-4000-R55-3C	.600"	3	1.250"	6.28"	4.00"
20800C	1.250"	CC-SSER1250-6000-R55-2C	.600"	2	1.500"	8.70"	6.00"
20810C	1.250"	CC-SSER1250-8000-R55-2C	.600"	2	1.500"	10.70"	8.00"
20820C	1.500"	CC-SSER1500-6000-R55-2C	.600"	2	1.500"	8.69"	6.00"

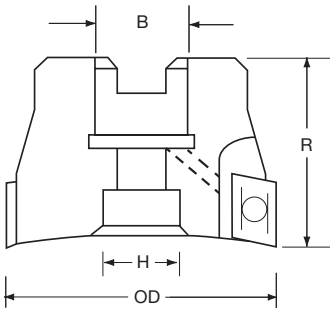


Cutter Bodies for 16mm APET/XPET Inserts

16mm Shell Mills

16MM STANDARD-PITCH SHELL MILLS

EDP	OD Diameter	Holder	Max. DOC	Flutes	B Arbor Dia.	R Overall Length	H Counter Bore Dia.	SHCS Socket Head Cap Screw
20905	1.500”	SSSM1500-0750-R55-4C	.600”	4	.750”	1.75”	.58”	TC-3/8
20930	2.000”	SSSM2000-0750-R55-4C	.600”	4	.750”	1.50”	.60”	TC-3/8
20940	2.000”	SSSM2000-0750-R55-5C	.600”	5	.750”	1.50”	.60”	TC-3/8
20950	2.500”	SSSM2500-1000-R55-5C	.600”	5	1.000”	1.75”	.80”	TC-1/2
20960	3.000”	SSSM3000-1000-R55-6C	.600”	6	1.000”	2.00”	.80”	TC-1/2
20970	4.000”	SSSM4000-1500-R55-8	.600”	8	1.500”	2.00”	1.90”	N/A
20980	5.000”	SSSM5000-1500-R55-8	.600”	8	1.500”	2.00”	2.10”	N/A
20990	6.000”	SSSM6000-2000-R55-7	.600”	7	2.000”	2.00”	2.75”	N/A
21000	8.000”	SSSM8000-FM-R55-9	.600”	9	2.500”	2.50”	4.00” BC	N/A

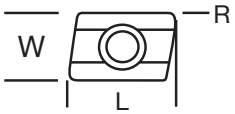


16MM COARSE-PITCH SHELL MILLS

EDP	OD Diameter	Holder	Max. DOC	Flutes	B Arbor Dia.	R Overall Length	H Counter Bore Dia.	SHCS Socket Head Cap Screw
21020	2.000”	SSSM2000-0750-R55-3C	.600”	3	.750”	1.50”	.60”	TC-3/8
21040	3.000”	SSSM3000-1000-R55-3C	.600”	3	1.000”	2.00”	.80”	TC-1/2

SEE PGS. 18-19 FOR 16MM INSERTS

16mm APET/XPET Inserts and Grades



APET
Cutting Edge
(T-Land Edge)
High Strength

XPET
Cutting Edge
(Honed Edge)
High Shear

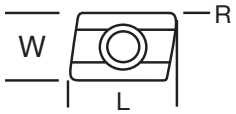
Insert Size	L	W	R	Uncoated (EDP)	With Coating (EDP)			
APET	*APET Inserts feature a high-strength cutting edge and are ideal for high-performance milling of most harder steels and cast irons.*							
APET160408	.625”	.375”	.031”	DMP35 (25800)	DMP35-TCI (25890)	DMP35-GLH (25860)	DMP35-HM (25885)	
				DMP30 (25700)	DMP30-TCI (25790)	DMP30-GLH (25760)	DMP30-HM (25785)	
				DMK25 (25600)	DMK25-TCI (25690)	DMK25-GLH (25660)	DMK25-HM (25685)	
APET160412	.625”	.375”	.047”	DMP35 (26100)	DMP35-TCI (26190)	DMP35-GLH (26160)	DMP35-HM (REQ)	
				DMP30 (26000)	DMP30-TCI (26090)	DMP30-GLH (26060)	DMP30-HM (REQ)	
				DMK25 (25900)	DMK25-TCI (25990)	DMK25-GLH (25960)	DMK25-HM (REQ)	
APET160416	.625”	.375”	.062”	DMP35 (26400)	DMP35-TCI (26490)	DMP35-GLH (26460)	DMP35-HM (26485)	
				DMP30 (26300)	DMP30-TCI (26390)	DMP30-GLH (26360)	DMP30-HM (26385)	
				DMK25 (26200)	DMK25-TCI (26290)	DMK25-GLH (26260)	DMK25-HM (26285)	
APET160431*	.625”	.375”	.120”	DMP35 (26700)	DMP35-TCI (26790)	DMP35-GLH (26760)	DMP35-HM (26785)	
				DMP30 (26600)	DMP30-TCI (26690)	DMP30-GLH (26660)	DMP30-HM (REQ)	
				DMK25 (26500)	DMK25-TCI (26590)	DMK25-GLH (26560)	DMK25-HM (26585)	
XPET	*XPET Inserts are ideal for high-performance milling of stainless steels and nonferrous materials such as copper alloys and aluminum. Also good for gummy, softer, free-machining steels.*							
XPET160404	.625”	.375”	.015”	DMP35 (28000)	DMP35-TCI (28090)	DMP35-GLH (28060)	DMP35-HM (28085)	
				DMP30 (27900)	DMP30-TCI (27990)	DMP30-GLH (27960)	DMP30-HM (REQ)	
				DMK25 (27800)	DMK25-TCI (REQ)	DMK25-GLH (27860)	DMK25-HM (REQ)	
XPET160408	.625”	.375”	.031”	DMP35 (28400)	DMP35-TCI (28490)	DMP35-GLH (28460)	DMP35-HM (28485)	
				DMK30 (28200)	DMK30-TCI (28290)	DMK30-GLH (28260)	DMK30-HM (REQ)	
				DMP30 (28300)	DMP30-TCI (28390)	DMP30-GLH (28360)	DMP30-HM (28385)	
				DMK25 (28100)	DMK25-TCI (28181)	DMK25-GLH (28160)	DMK25-HM (REQ)	
				DMK35 (28183)			DMK35-HM (28184)	DMK35-IN (28185)
XPET160412	.625”	.375”	.047”	DMP35 (28800)	DMP35-TCI (28890)	DMP35-GLH (28860)	DMP35-HM (REQ)	
				DMK30 (28600)	DMK30-TCI (28690)	DMK30-GLH (28660)	DMK30-HM (REQ)	
				DMP30 (28700)	DMP30-TCI (REQ)	DMP30-GLH (28760)	DMP30-HM (REQ)	
				DMK25 (28500)	DMK25-TCI (28590)	DMK25-GLH (28560)	DMK25-HM (REQ)	
XPET160416	.625”	.375”	.062”	DMP35 (29200)	DMP35-TCI (29290)	DMP35-GLH (29260)	DMP35-HM (29285)	
				DMK30 (29000)	DMK30-TCI (REQ)	DMK30-GLH (29060)	DMK30-HM (REQ)	
				DMP30 (29100)	DMP30-TCI (29190)	DMP30-GLH (29160)	DMP30-HM (REQ)	
				DMK25 (28900)	DMK25-TCI (28990)	DMK25-GLH (28960)	DMK25-HM (28985)	
				DMK35 (29083)			DMK35-HM (29084)	DMK35-IN (29085)
XPET160424	.625”	.375”	.094”	DMP35 (29400)	DMP35-TCI (29490)**	DMP35-GLH (29460)	DMP35-HM (29485)	
XPET160431*	.625”	.375”	.120”	DMP35 (29800)	DMP35-TCI (29890)	DMP35-GLH (29860)	DMP35-HM (29885)	
				DMK30 (29600)	DMK30-TCI (REQ)	DMK30-GLH (29660)	DMK30-HM (REQ)	
				DMP30 (29700)	DMP30-TCI (REQ)	DMP30-GLH (29760)	DMP30-HM (REQ)	
				DMK25 (29500)	DMK25-TCI (29590)	DMK25-GLH (29560)	DMK25-HM (REQ)	

REQ = Available upon request.

*** Not stocked standard; available by request.*

Older coatings available upon request; may have up to a 2-week lead time.

16mm APET/XPET Inserts and Grades



XPET
Cutting Edge
(Honed Edge)
High Shear

Insert Size	L	W	R	Uncoated (EDP)	Available Coated Grades (EDP)			
XPET-ALU	*XPET-ALU lapped inserts feature a ground and lapped rake face for machining aluminum and copper alloys, bronze, brass, etc. Built-up edge is virtually eliminated.*							
XPET160404-ALU	.625”	.375”	.015”	DMK25 (29912)	DMK25-TCI (REQ)	DMK25-GLH (29914)	DMK25-HM (REQ)	
XPET160408-ALU	.625”	.375”	.031”	DMK25 (29916)	DMK25-TCI (29923)	DMK25-GLH (29921)	DMK25-HM (REQ)	
XPET160412-ALU	.625”	.375”	.047”	DMK25 (29924)	DMK25-TCI (REQ)	DMK25-GLH (29928)	DMK25-HM (REQ)	
XPET160416-ALU	.625”	.375”	.062”	DMK25 (29932)	DMK25-TCI (REQ)	DMK25-GLH (29936)	DMK25-HM (29939)	
XPET160431-ALU*	.625”	.375”	.120”	DMK25 (29940)	DMK25-TCI (REQ)	DMK25-GLH (29948)	DMK25-HM (REQ)	
PCD-TIPPED	*PCD-tipped inserts provide the ultimate in wear resistance for high-volume aluminum or graphite milling. Available in 1/32” corner radius only. .225” leg length for the PCD tip.*							
XPET160408-PCD-225	.625”	.375”	.031”	DMK25 (29900)				

REQ = Available upon request.

Older coatings available upon request; may have up to a 2-week lead time.

** This insert is designed for heavy roughing and has a corner radius that actually measures closer to .115” than .125” (.010” difference) due to distortion by the positive radial insert angle.*

Other grades available upon request.

SEE PG. 25 FOR INSERT GRADE DESCRIPTIONS

See chart on page 29 for technical help on optimizing cutting performance.

See page 31 for recommended speeds/feeds.

Utility Cutters

Make the most of your APET and XPET Inserts!

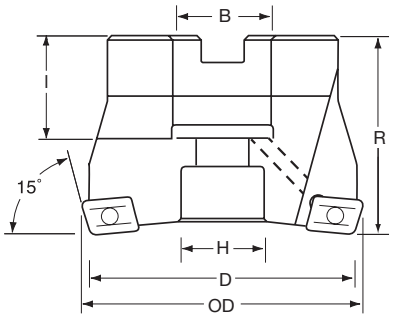
BCSM 15° Back-Corner Shell Mills

BCSM shell mills allow the unused corner of the APET/XPET inserts to be used for general face milling – this means you get 4 usable edges per insert instead of 2!

BCSM 15° BACK-CORNER SHELL MILLS

EDP	D Cutting Diameter	Holder	Max. DOC	Flutes	OD	B Arbor Dia.	R Overall Length	H Counter Bore Dia.	Inserts
22210	2.000"	BCSM2000-0750-R35-4C	.250"	4	2.11"	.750"	1.50"	.60"	*10mm (pg. 13)*
22215	2.000"	BCSM2000-0750-R45-4C	.312"	4	2.13"	.750"	1.50"	.60"	*12mm (pg. 15)*
22235	3.000"	BCSM3000-1000-R45-6C	.312"	6	3.13"	1.00"	2.00"	.80"	*12mm (pg. 15)*
22230	2.000"	BCSM2000-0750-R55-4C	.375"	4	2.16"	.750"	1.50"	.60"	*16mm (pg. 18)*
22240	3.000"	BCSM3000-1000-R55-5C	.375"	5	3.16"	1.00"	2.00"	.80"	*16mm (pg. 18)*
22245	4.000"	BCSM4000-1500-R55-6C	.378"	6	4.16"	1.50"	2.25"	.77"	*16mm (pg. 18)*

"C" denotes coolant thru tool.



BCSM
Back Corner Shell Mill

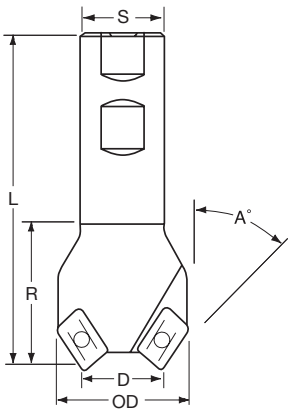
CMEM Chamfering End Mills

CMEM end mills are perfect for chamfer milling, providing a free-cutting positive geometry for both 30° and 45° chamfering.

CMEM CHAMFERING END MILLS

EDP	D Cutting Diameter	Holder	Max. DOC	Flutes	OD	S Shank Dia.	L Overall Length	R Effective Length	A	Inserts
22248	.500"	CMEM0500-30-R35-2	.300"	2	.80"	.750"	3.50"	1.45"	30°	*10mm (pg. 13)*
22255	.500"	CMEM0500-45-R35-2C	.245"	2	.94"	.750"	3.50"	1.45"	45°	*10mm (pg. 13)*
22265	.750"	CMEM0750-30-R45-3C	.355"	3	1.14"	.750"	3.50"	1.45"	30°	*12mm (pg. 15)*
22305	.750"	CMEM0750-45-R45-3C	.290"	3	1.31"	.750"	3.50"	1.45"	45°	*12mm (pg. 15)*
22310	.625"	CMEM0625-45-R55-2C	.245"	2	1.40"	.750"	3.50"	1.45"	45°	*16mm (pg. 18)*
22259	.700"	CMEM0700-30-R55-2C	.475"	2	1.25"	.750"	3.50"	1.45"	30°	*16mm (pg. 18)*
22300	.750"	CMEM0750-45-R35-3C	.245"	3	1.18"	.750"	3.50"	1.45"	45°	*10mm (pg. 13)*
22280	1.000"	CMEM1000-30-R55-3C	.475"	3	1.53"	1.000"	4.00"	1.72"	30°	*16mm (pg. 18)*
22320	1.000"	CMEM1000-45-R55-3C	.390"	3	1.76"	1.000"	4.00"	1.72"	45°	*16mm (pg. 18)*

Dapra is transitioning to thru-coolant on CMEM cutters. To specify the thru-coolant option, add a "C" to the end of the part number. Stock not guaranteed. Once the non-coolant cutter supply is exhausted, the thru-coolant option will be the only one available.



CMEM
Chamfering End Mill

Helical (Stacked) Utility Cutters

Make the most of your APET and XPET Inserts!

HREM/HRSM Helical Roughing End Mills & Shell Mills

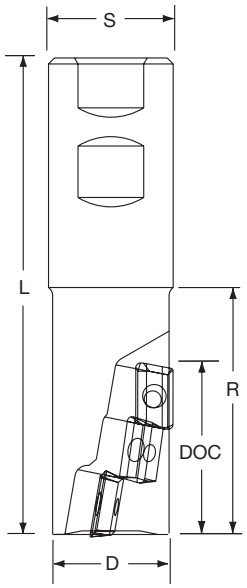
Helical Roughing end mills and shell mills are designed for high performance in long-edge profiling and step milling applications.

Helical ("stacked") cutters create much more tool pressure than standard end mills, due to the increased number of engaged inserts. We recommend not exceeding 10% of the tool diameter in width of cut (WOC) with these HREM tools; irreversible cutter damage may occur.

To reduce tool pressure, it is recommended that the more positive XPET insert geometry be used with Helical Roughing Mills.

HREM HELICAL ROUGHING END MILLS

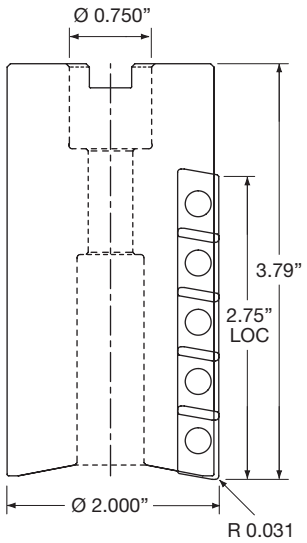
EDP	D Cutting Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length	# of Inserts	Inserts
21042	.750"	HREM0750-0750-R35-2-090	1.020"	2	.750"	3.50"	1.45"	6	*10mm (pg. 13)*
21060	1.000"	HREM1000-1000-R35-2-120	1.200"	2	1.000"	4.50"	2.04"	8	*10mm (pg. 13)*
21045	1.000"	HREM1000-1000-R45-2-110	1.100"	2	1.000"	4.50"	2.00"	6	*12mm (pg. 15)*
21075	1.250"	HREM1250-1250-R45-3-150	1.480"	3	1.250"	4.83"	2.50"	12	*12mm (pg. 15)*
21070	1.250"	HREM1250-1250-R55-2-165	1.650"	2	1.250"	4.88"	2.44"	6	*16mm (pg. 18)*
21080	1.500"	HREM1500-1250-R55-3-215	2.150"	3	1.250"	5.65"	3.15"	12	*16mm (pg. 18)*
21050	40mm	HREM40mm-1250-R55-2-165	1.650"	2	1.250"	4.80"	2.44"	6	*16mm (pg. 18)*



HREM
Helical Roughing End Mill

HRSM HELICAL ROUGHING SHELL MILLS

EDP	Cutting Diameter	Holder	Arbor Hole	Flutes	LOC	Overall Length	# of Inserts	Inserts
21085	2.000"	HRSM2000-0750-R55-4-265	.750"	4	2.75"	3.79"	20	*16mm (pg. 18)*



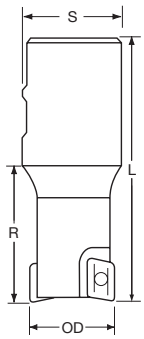
HRSM
Helical Roughing Shell Mill

Metric Cutter Bodies

Dapra is eliminating metric end mills and shell mills. Items shown are available while supplies last. "C" denotes coolant thru tool.

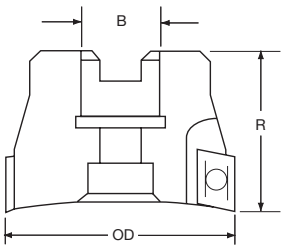
APET/XPET METRIC END MILLS

EDP	OD Diameter	Holder	Max. DOC	Flutes	S Shank Dia.	L Overall Length	R Effective Length	Inserts
22005	16mm	SSEM16-16-R35-2C	10mm	2	16mm	80mm	31mm	*10mm (pg. 13)*
22015	20mm	SSEM20-20-R35-2C	10mm	2	20mm	90mm	39mm	*10mm (pg. 13)*
22040	32mm	SSEM32-32-R35-5	10mm	5	32mm	100mm	44mm	*10mm (pg. 13)*
22050	32mm	SSEM32-32-R55-3	16mm	3	32mm	100mm	44mm	*16mm (pg. 18)*
22060	40mm	SSEM40-32-R55-4	16mm	4	32mm	115mm	55mm	*16mm (pg. 18)*



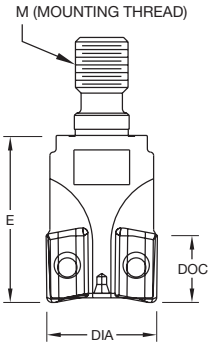
APET/XPET STANDARD-PITCH METRIC SHELL MILLS

EDP	OD Diameter	Holder	Max. DOC	Flutes	B Arbor Dia.	R Overall Length	Mounting Screw	Inserts
22105	50mm	SSSM50-22-R55-4C	16mm	4	22mm	38mm	M10	*16mm (pg. 18)*
22130	80mm	SSSM80-27-R55-6	16mm	6	27mm	50mm	M12	*16mm (pg. 18)*



Screw-On Modular Heads

- Screw-on heads are 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
- All feature thru-coolant tooling
- See page 116 for modular extensions



APET/XPET SCREW-ON MODULAR HEADS

EDP	DIA.	Holder	M	Max. DOC	E	Flutes	Inserts	Open-End Wrench
22400	.750”	SSEM0750-MOD-R35-2C	M10	.350”	1.50”	2	*10mm (pg. 13)*	9/16”
22405	.750”	SSEM0750-MOD-R45-2C	M10	.430”	1.50”	2	*12mm (pg. 15)*	9/16”
22407	1.000”	SSEM1000-MOD-R45-3C	M12	.430”	1.50”	3	*12mm (pg. 15)*	11/16”
22415	1.250”	SSEM1250-MOD-R45-4C	M16	.430”	1.75”	4	*12mm (pg. 15)*	15/16”
22410	1.000”	SSEM1000-MOD-R55-2C	M12	.600”	1.50”	2	*16mm (pg. 18)*	11/16”
22420	1.250”	SSEM1250-MOD-R55-2C	M16	.600”	1.75”	2	*16mm (pg. 18)*	15/16”
22430	1.500”	SSEM1500-MOD-R55-2C	M16	.600”	1.75”	2	*16mm (pg. 18)*	15/16”

SEE PAGE 116 FOR CARBIDE CORE, SOLID CARBIDE AND HEAVY METAL MODULAR EXTENSIONS.

APET/XPET Insert Selection

Carbide (Uncoated) Grade Selection

Traits	DMP35	DMK35	DMK30	DMP30	DMK25
Toughness (Fracture)	Very tough, able to withstand shock and interruptions	Somewhat tough – able to handle exotics and high-temp. alloys at normal parameters; not as fracture resistant as DMP35	Tough and hard; not as tough as DMP35, but tougher than DMK25	Tough and hard; not as tough as DMP35, but tougher than DMK25	Not as tough; may fracture in abusive applications
Wear Resistance (Edge Life)	Softer carbide, will not last as long as DMK25	Outstanding edge life in inconel and exotic materials where temperature control is primary and coolant is used	Good – harder than DMP35 but not as hard as DMK25	Longer life than DMP35, but shorter than DMK25	Longer edge life due to higher carbide hardness
Heat Resistance	Lower heat resistance due to lower hardness of carbide	Good heat resistance due to the fine grain structure of the carbide	Good heat resistance – more than DMP35, but less than DMK25	Higher heat resistance than DMP35, less than DMK25	Highest heat resistance
Resistance to Built-Up Edge (BUE)	Fair resistance to BUE; some buildup may occur – use coolant as a preventative	Excellent resistance to BUE; designed for the most challenging materials where coolant will be used, so BUE will be less problematic	Good resistance	Poorer resistance to BUE; not typically a stainless steel grade	Good resistance
Feed Capability	High, due to toughness	Feed at general parameters only; not intended for heavy feed rates	Average – less feed than DMP35 but more than DMK25	Strong feed capabilities, approx. 20% lower than DMP35	Lower, due to brittleness; run at higher speeds and lower feeds
Coolant Capability	Good; toughness gives it more resistance to thermal shock	Good; intended for use with coolant	Good on high-temp. alloys and some tough stainless steels	Fairly tough; will allow machining with good coolant flow	Not as high; may experience thermal shock unless coolant flow is very good

Choose the Best Grade for Your Application

Material	Operating Speed	Geometry	1st Choice Grade*	Coolant
Free machining, low-carbon steels	*Low to Medium*	XPET	DMP30-TCI	*Air/Flood*
	Higher	XPET	DMP30-GLH	*Air*
Medium-carbon steels, tool steels	*Low to Medium*	APET / XPET**	DMP30-TCI / DMK30-TCI	*Air*
	Higher	APET / XPET**	DMP30-GLH / DMK30-GLH	*Air*
All steels – interrupted cuts and heavy roughing cuts	*All*	APET	DMP35-TCI / DMP35-GLH	*Air*
Heat-treated steels (48-62 Rc)	*Low to Medium*	APET	DMK25-HM	*Air*
Soft stainless steels (303, 304)	*Low to Medium*	XPET	DMP35-TCI / DMK30-TCI	*Air/Flood*
	Higher	XPET	DMP35-HM / DMP35-GLH	*Air/Flood*
Tough stainless steels (304L, 316, 400 series and PH series)	*Low to Medium*	XPET	DMP35-GLH / DMK30-GLH	*Air/Flood*
	Higher	XPET	DMP35-HM / DMK35-IN	*Air/Flood*
Cast iron	*All*	APET / XPET**	DMK30-HM / DMK25-HM	*Air*
Aluminum alloys, copper alloys	*All*	XPET-ALU XPET-PCD	DMK25 / DMK25-GLH	*Flood*
High-temperature alloys, titanium	*All*	XPET	DMP35-HM	*Flood*

** Contact Applications Specialist if first choice doesn't work.*

*** Customer preference. Both are acceptable – see cutting edge differences on page 11.*

APET/XPET Insert Grade Descriptions

Shock & Wear Resistance	Uncoated (Base Grade)	with Coating	Description	Specifications
TOUGHEST Shock Resistance	DMP35		Moderate wear resistance/high shock resistance. Recommended for interrupted or unstable steel applications, most stainless steel, and high-temperature alloy applications.	ANSI C1-C2 ISO K25-K40, M25-M35
		DMP35-TCI	Modified AlTiN – premium medium- to high-temperature coating.	
		DMP35-GLH	Premium AlTiN – higher-temperature coating, very low friction characteristics.	
	NEW	DMP35-HM	Use HM for a higher-temperature coating in tough stainless steels, high-temperature alloys, and titanium.	
TOUGH Shock and Wear	DMK35 *XPET ONLY* *NEW*		Specifically developed for inconel and other high-temperature alloys, as well as demanding stainless steel applications.	ANSI C5-C6 ISO M30-M40, P30-P40, K30-K40
	NEW	DMK35-HM	Use HM for a higher-temperature coating in tough stainless steels.	
	NEW	DMK35-IN	IN provides the best performance for high-temperature alloys and tough stainless steels. First choice for inconel.	
MEDIUM Shock and Wear	DMK30 *XPET ONLY*		Micro-grain carbide providing higher wear resistance and moderate shock resistance for applications in tough stainless steels, high-temperature alloys, irons, and many tool steels.	ANSI C2-C3 ISO K15-K30, M15-M30
		DMK30-TCI	Modified AlTiN – premium medium- to high-temperature coating.	
		DMK30-GLH	Premium AlTiN – higher-temperature coating, very low friction characteristics.	
	NEW	DMK30-HM	Use HM for a higher-temperature coating in tough stainless steels.	
MEDIUM Shock and Wear	DMP30		High wear resistance/moderate shock resistance, recommended for most steel and some ductile iron applications.	ANSI C5-C6 ISO P25-P40
		DMP30-TCI	Modified AlTiN – premium medium- to high-temperature coating.	
		DMP30-GLH	Premium AlTiN – higher-temperature coating, very low friction characteristics.	
	NEW	DMP30-HM	Use HM for high-performance milling of tougher steels and tool steels.	
HARDEST Wear Resistance	DMK25		Highest wear resistance with reduced shock-absorption capabilities. Suitable for all materials where cutting conditions are very stable. First choice for hardened steel (> 52 Rc).	ANSI C2-C3 ISO K15-K25, M15-M25
		DMK25-TCI	Modified AlTiN – premium medium- to high-temperature coating.	
		DMK25-GLH	Premium AlTiN – higher-temperature coating, very low friction characteristics.	
	NEW	DMK25-HM	Use HM for the highest hardness in gray and ductile irons, as well as heat-treated steels.	

Older coatings available upon request; may have up to a 2-week lead time.

Spare Parts & Tools

Part Description	Order Number (EDP)		
	For all ..1003.. Inserts	For all ..1204.. Inserts	For all ..1604.. Inserts
Clamping Screw	SSTX-08-S (22600)	SSTX-10-S (22605)	SSTX-15-S (22610)
Wrench	T8-F (83000)	T10-T (83005)	T15-T (83010)
Tightening Torque for Clamping Screw	12 in-lbs (1.0 Nm)	20 in-lbs (2.25 Nm)	30 in-lbs (3.5 Nm)

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

OUR TORQUE WRENCH SYSTEMS MAKE REPEATABLE, ACCURATE INSERT LOADING EASIER THAN EVER BEFORE! SEE PAGE 118 FOR DETAILS.

Application Information

Technical Considerations

- Always use anti-seize compound on screws.
- Thoroughly clean pocket at each insert change.
- Change insert screw every 10 inserts.
- Use the shortest-length tool holder (end mill holder) for maximum rigidity. The shank of the cutting tool should be up inside the machine spindle taper whenever possible.
- Use tool holders appropriate for roughing operations: end mill holders and power chucks ***are*** recommended; collets ***are not*** recommended.

Recommendations

- Square Shoulder milling allows heavier Depths of Cut (DOC), but Dapra recommends that no more than 2/3 of the insert length should be engaged to reduce the chance for screw breakage.
- Although the cutter is capable of the heavier cut, take care to allow for the machine tool's capabilities in horsepower and rigidity.
- Utilize as much of the cutting edge per pass (DOC) as possible, to get the most metal removal within the insert's tool life.

- Feed rates should not go significantly below or above the recommended ranges (see page 31), or premature failure can occur.
- Square Shoulder tools can not plunge; instead, use up to a 2° ramp angle for full diameter cut. Greater ramp angles are possible with partial width cut.
  - ***Climb milling*** is recommended whenever possible.
  - Use the larger corner radii for the strongest cutting edge during roughing applications.
- Compensate for radial chip thinning (see chart on page 29) when Width of Cut (WOC) is less than 50% of the cutter diameter.
- Because our Square Shoulder tools cut a true 90°, they are a good choice for a wide range of finishing applications.
- Use Coarse Pitch cutters for slotting cuts or when cutting pressure needs to be reduced. Use Fine Pitch cutters for lighter profiling cuts or when feed rates can be maximized.
- Most of Dapra's high-performance grades run best without coolant. Coolant in most milling applications creates a high potential for thermal shock, which can produce premature, and sometimes catastrophic, failure. *Use air pressure to provide adequate cooling and chip evacuation.*
- For long-reach applications, utilize the Carbide Core cutting tools for increased rigidity and reduced chatter.

Troubleshooting

Concern	Possible Cause	Solutions
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 sharp edge insert incorrectly • Feed too high	❑ Verify correct speed and feed ❑ Increase spindle speed ❑ Decrease feed rate ❑ Change insert selection ❑ Decrease DOC
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 • Inadequate tool holding	❑ Use Carbide Core cutter body ❑ Reduce tool gage length ❑ Check tool holder wear ❑ Use high-rigidity tool holder
Tool shank breaks	• Tool pressure too great • Fatigued cutter body	❑ Decrease DOC ❑ Reduce tool gage length ❑ Decrease feed rate

Optimizing Cutting Performance

Dapra's high-performance cutters work best when allowed to perform within their designed operating parameters. Adhering to the following steps will ensure that you are getting the most from your investment.

1. Refer to the Feed and Speed Chart (see page 31) to find the recommended Surface Feet per Minute (**SFM**) and Feed per Tooth (**FPT**) at which to run your cutter, based on the material to be machined.
2. Use the following formula to determine the Revolutions per Minute (**RPM**) for your cutting tool:

   (**SFM** x 3.82) / Tool Dia. = **RPM**

   Example: A 2" diameter tool operating at 900 **SFM** (900 x 3.82) / 2 = 1720 **RPM**
3. Use the following formula to determine the feed in Inches per Minute (**IPM**) to be programmed into the machine tool:

   FPT x **RPM** x **N** (number of teeth in cutter) = Feed

   Example: A 5-flute cutter at .008" **FPT** (.008 x 1720) x 5 = 69 **IPM**
4. If the Width of Cut (**WOC**) is < 1/2 the cutter diameter, use the feed rate compensation chart (below) to compensate for chip thinning.

Width of Cut (WOC) (% of tool Ø)	50% or >	40%	30%	20%	10%
Feed Rate Multiplier	1	1.02	1.1	1.25	1.7

After determining the percentage of **WOC** for the tool diameter, multiply the desired feed rate by the corresponding factor shown in the chart. This will be the Adjusted Feed per Tooth (**AFPT**) resulting in a true chip thickness of the desired amount.

EXAMPLE: If using a 1" dia. end mill @ .100" **WOC**, the **WOC** = 10% of the cutter diameter. Using the chart above, the factor for the chip thickness = 1.7. If a chip thickness of .005" is desired, a feed rate of .0085" (.005 x 1.7) should be programmed into the machine tool.

or

Adjusted Feed per Tooth (**AFPT**) = desired chip thickness x chip thinning factor (from chart).

Hole Diameter Calculation

Helical Interpolation for Larger-Diameter Hole Making

Larger-diameter hole making can be quick and easy when a Square Shoulder Cutter is used in combination with Helical Interpolation. This technique resembles thread milling in that all three axes (X, Y and Z) are in motion simultaneously. It differs from thread milling in that the tool is introduced into the material without a start hole of any kind.

The tool simply is positioned at the inside diameter of the hole to begin its helix from there, achieving complete material removal from the hole by ramping down to the final depth. This smooth operation tends to avoid the high horsepower consumption characteristic of large diameter hole making. The quick and easy process offers the added advantage of allowing many different hole sizes to be generated with the same diameter tool. Hole size variation is all in the programming.

For more information on how Helical Interpolation can improve your manufacturing efficiency, contact your Dapra Applications Specialist.

Part Number	Min. Hole Dia.*	Max. Hole Dia.
SSEM0500-R35-1	0.63”	1.00”
SSEM0625-R35-2	0.78”	1.25”
SSEM0750-R35-2	1.03”	1.50”
SSEM0625-R45-1	0.75”	1.25”
SSEM0750-R45-2	0.88”	1.50”
SSEM1000-R45-3	1.38”	2.00”
SSEM1250-R45-4	1.88”	2.50”
SSEM1500-R45-5	2.38”	3.00”
SSEM1000-R55-2	1.28”	2.00”
SSEM1250-R55-3	1.78”	2.50”
SSEM1500-R55-3	2.28”	3.00”
SSSM2000-R55-5	3.28”	4.00”
SSSM2500-R55-5	4.28”	5.00”
SSSM3000-R55-6	5.28”	6.00”
SSSM4000-R55-8	7.28”	8.00”
SSSM5000-R55-8	9.28”	10.00”
SSSM6000-R55-7	11.28”	12.00”

** Smaller holes may be interpolated by pre-drilling.*

Typical recommended ramp angle = 1 degree or less.

Recommended Cutting Speeds/Feeds

Recommended Cutting Speeds for Dapra Square Shoulder Cutters			1018, 12L14, 1041, 1045	4140, 4150, 4340, H13, P20, A2, D2	4140, 4150, 4340, H13, P20, A2, D2 (40s RC)	4140, 4150, 4340, H13, P20, A2, D2	303, 304 LOW 400 SERIES	316, 347, PH STAINLESS	GRAY, MALLEABLE, DUCTILE	6061, 7075	AMPCO, WEARITE	INCONEL, WASPALOY, MONEL		
			LOW-TO-MEDIUM CARBON STEELS	TOOL STEELS, HIGH-ALLOY STEELS (SOFT)	TOOL STEELS, HIGH-ALLOY STEELS (MID-HARDNESS)	TOOL STEELS, HIGH-ALLOY STEELS (HARDENED)	FREE MACHINING STAINLESS	TOUGHER STAINLESS	CAST IRONS	ALUMINUM ALLOYS	COPPER ALLOYS	HIGH-TEMP. ALLOYS	TITANIUM	PLASTICS, NON-FERROUS
LOWER TEMPS »	TOUGHEST Shock Resistance	DMP35	**300-450**	250-400			150-300	125-250	300-450		200-600	50-150 ROUGHING	100-150	
		DMP35-TCI	**500-800**	400-700	250-450		**400-640**	**250-500**	500-800		400-1200			
		DMP35-GLH	**700-1000**	500-900	250-450		**480-880**	**300-800**	600-1200			**55-90 ROUGHING**	**120-180**	
		DMP35-HM	**770-1100**	550-990	250-450		**530-970**	**330-880**	660-1320			**55-120 ROUGHING**	**140-200**	
	TOUGH Shock & Wear	DMK35					200-320	140-275				**50-80**	100-150	
		DMK35-HM					250-500 (wet) 600-750 (dry)	**300-600**			300-600	**50-110**	140-200	
		DMK35-IN					**300-550 (wet)** 600-750 (dry)	**350-650**				**50-110**	140-200	
	MEDIUM Shock Resistance	DMK30	400-700	300-600			200-320	140-275	350-550			50-75	100-150	
		DMK30-TCI	500-900	500-800			400-720	275-550	**500-900**					
		DMK30-GLH	700-1400	500-1000		200-600	480-960	330-880	**500-1300**			75-120	120-180	
		DMK30-HM	770-1540	550-1100		220-660	528-1056	363-968	**550-1430**			75-120	140-200	
	MEDIUM Shock & Wear	DMP30	400-700	300-600					350-550 DUCTILE					
		DMP30-TCI	**500-900**	**400-800**	**350-550**				**500-900 DUCTILE**		200-500			
		DMP30-GLH	**700-1400**	**500-1000**	**350-550**	200-600			**500-1300 DUCTILE**		200-500			
		DMP30-HM		**500-850**	**350-550**	250-550			**600-1000 DUCTILE**					
« HIGHER TEMPS	HARDEST Wear Resistance	DMK25					250-400	125-250 FINISHING	350-600 GRAY	**1500+**	200-600	50-75 FINISHING	100-150	**1000+**
		DMK25-TCI	500-900	400-800			500-900	**250-500 FINISHING**	**600-900 GRAY**		**400-900**			1000+
		DMK25-GLH	700-1400	500-1000	350-550	**250-600**	600-1200	**300-800 FINISHING**	**800-1300 GRAY**		**400-1200**	**50-100 FINISHING**	120-180	1000+
		DMK25-HM		550-850	350-550	**250-700**	250-500 (wet) 600-750 (dry)	**350-650 FINISHING**	**800-1200 GRAY**		**300-600**	**50-100 FINISHING**	**140-200**	
		PCD								**2000+**				
1ST CHOICE GEOMETRY			XPET/APET	APET	APET	APET	XPET	XPET	APET	XPET-ALU	XPET	XPET	XPET	XPET-ALU
REC'D FPT – 10MM			.003-.008	.003-.008	.003-.005	.003-.005	.003-.008	.003-.007	.003-.010	.003-.020	.003-.010	.003-.006	.002-.005	.003-.025
REC'D FPT – 12MM			.004-.012	.004-.010	.004-.006	.003-.006	.003-.010	.003-.010	.004-.012	.003-.020	.003-.015	.003-.007	.002-.006	.003-.025
REC'D FPT – 16MM			.006-.015	.006-.012	.004-.008	.003-.008	.005-.012	.004-.010	.006-.015	.003-.025	.003-.020	.003-.008	.003-.007	.003-.025

- First choice grade shown in **bold text**.
- For heavy WOC and/or DOC, use the lower end of the FPT range.
- For light WOC and DOC, the higher end of the FPT range may be possible.

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 IPT range. Next, increase IPT 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.

RHINO-FEED™ High-Feed Milling Series

What is RHINO-FEED™ ?

The ultra-aggressive geometry of RHINO-FEED, DAPRA's high-feed line, takes advantage of chip thinning to allow feed rates up to 5x faster than normal!

Use RHINO-FEED high-feed inserts for:

- Mold cavity and core roughing
- Roughing of complex part contours
- Slotting
- 2D contouring
- Pocketing
- Helical interpolation
- Face milling
- Step milling

NOTE: *High-feed milling does a tremendous amount of work in a short period of time. This line's high production rate can create more heat than typical milling tools. Strong air blast is recommended (multiple lines if possible).*

RHINO-FEED™ Options:

R2 Mini-Feed Cutters and Inserts pg. 34-35

- .500" - 2.000" OD
- 8mm IC
- 3 usable edges
- "D" cutting edge
- .030" max. DOC

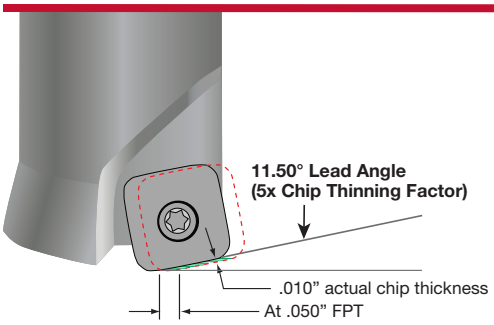
R3 Mid-Feed Cutters and Inserts pg. 36-37

- 1.000" - 3.000" OD
- 10mm IC
- 4 usable edges
- "T," "D" or "F" cutting edge
- .045" max. DOC

R4 Heavy-Feed Cutters and Inserts pg. 38-39

- 1.250" - 6.000" OD
- 12mm IC
- 4 usable edges
- "T," "D" or "F" cutting edge
- .060" max. DOC

How Does RHINO-FEED™ Work?



High-feed milling creates significant chip thinning due to an extreme lead angle. Feed rates must compensate for this to maximize productivity. The figure at left shows an example of this condition. Adjusting feed rates to account for chip thinning creates cutting conditions that provide very high feeds (IPM), but at lighter depths of cut (DOC). See the specific instructions for each size of high-feed insert to get the most out of your Dapra RHINO-FEED product!

High-Feed Cutter Bodies

- Through-hardened, extra-tough tool steel for optimum strength
- Surface hardened for extra wear and chip-welding resistance
- Machined after hardening for excellent runout
- Standard and long-reach bodies available

High-Feed Inserts

- Strong design allows high feed rates in all materials
- Positive clearance provides excellent ramping and helixing capabilities
- Multiple geometries for either smooth cutting or strong edge conditions
- Simple but effective grade variety provides strong performance in all materials

RHINO-FEED™ HIGH-FEED MILLING TOOLS INDEX

R2 Mini-Feed Cutter Bodies

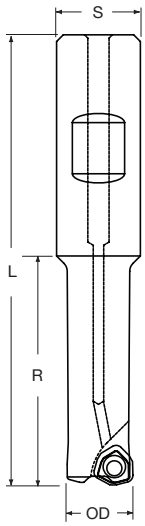
R2 • .500" - 2.000" OD • 8mm IC • 3 usable edges • "D" cutting edge • .030" max. DOC

R2 End Mills

R2 – 8MM IC END MILLS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	DOC Recommended	Insert
60000	.500"	HFEM050-150-R2-1	1.500"	3.530"	.750"	1	.010-.015"	RF-08
60010	.500"	HFEM050-250-R2-1	2.500"	4.530"	.750"	1	.010-.015"	RF-08
60020	.625"	HFEM063-200-R2-1	2.000"	4.030"	.750"	1	.010-.025"	RF-08
60030	.625"	HFEM063-300-R2-1	3.000"	5.030"	.750"	1	.010-.020"	RF-08
60040	.750"	HFEM075-200-R2-2	2.000"	4.030"	.750"	2	.010-.025"	RF-08
60050	.750"	HFEM075-300-R2-2	3.000"	5.030"	.750"	2	.010-.020"	RF-08
60060	1.000"	HFEM100-250-R2-3	2.500"	4.750"	1.000"	3	.010-.025"	RF-08
60070	1.000"	HFEM100-450-R2-3	4.500"	6.750"	1.000"	3	.010-.025"	RF-08

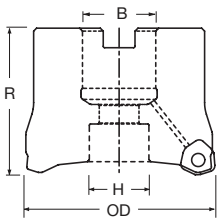
End Mills are solid steel, manufactured for coolant thru tool.



R2 Shell Mills

R2 – 8MM IC SHELL MILLS

EDP	OD Diameter	Holder	R Effective Length	B Arbor Dia.	H Counter Bore Dia.	Flutes	DOC Recommended	Insert
60380	2.000"	HFSM200-075-R2-7C	1.500"	0.750"	0.590"	7	.015-.040"	RF-08

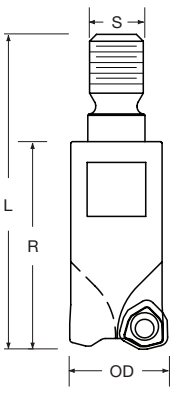


R2 Screw-On Modular Heads

R2 – 8MM IC MODULAR HEADS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Thread	DOC Recommended	Insert
60200	.750"	HFEM075-MOD-R2-2C	1.500"	2.275"	0.413"	2	M10	.010-.020"	RF-08
60210	1.000"	HFEM100-MOD-R2-3C	1.500"	2.375"	0.492"	3	M12	.010-.020"	RF-08

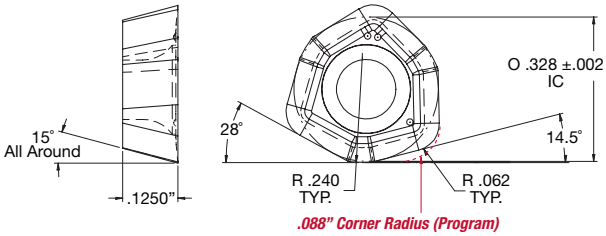
SEE PAGE 116 FOR CARBIDE CORE, SOLID CARBIDE AND HEAVY METAL MODULAR EXTENSIONS.



R2 Mini-Feed Inserts

"D" INSERTS
Positive cutting geometry designed to reduce cutting forces and heat. Suitable for all materials.

Insert	Thickness	# of Usable Edges	Corner Radius Actual	Corner Radius Program	DOC Max.	DOC Recommended	FPT Compensated
RF-08-D	.125"	3	.062"	.088"	.030"	.010-.025"	.012-.032"



** A special corner radius value is required for correct programming of a high-feed insert. Using the program radius avoids gouging of the corners in the workpiece material.*

The high-feed insert will naturally leave a small amount of extra material at the bottom-most layer of the cut, at the intersection of the wall and pocket floor. See diagram at bottom of this page.

RHINO-FEED inserts are labeled with dots to indicate die position during pressing. For the most accurate runout when loaded into the cutter body, make sure each insert is loaded with the corresponding edge.

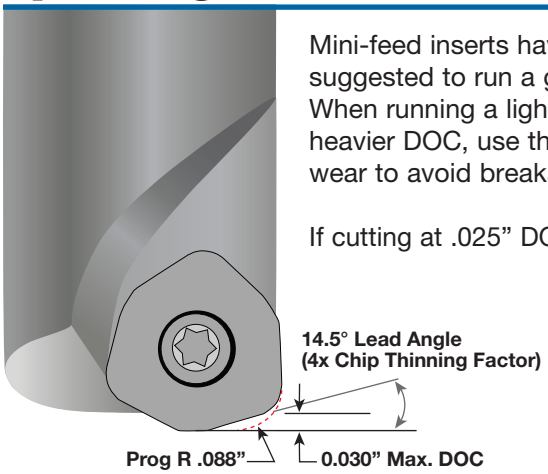
Mini-Feed RF-08 Grade Availability

Insert	IC	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)				
RF-08-D	8mm	Positive (sharper)	DMK30 (62100)	DMK30-GLH (62160)	DMK30-TCI (62190)	DMK30-HM (62185)		DMK30-TS (62187)
			DMK35 (62193)			DMK35-HM (62194)	DMK35-IN (62195)	
			DMK25 (62000)	DMK25-GLH (62060)	DMK25-TCI (62090)			
			DMP25 (62200)	DMP25-GLH (62260)	DMP25-TCI (62290)			

Other grades available upon request.

SEE PG. 40 FOR INSERT GRADE DESCRIPTIONS

Operating Instructions for Mini-Feed Inserts



Mini-feed inserts have the smallest IC (Inscribed Circle) and smallest cross section. It is suggested to run a good common-sense combination of feed and DOC with these inserts. When running a light DOC, the higher end of the feed range is acceptable. When running heavier DOC, use the lower to middle feed ranges. Index inserts promptly upon visible wear to avoid breakage.

If cutting at .025" DOC and trying for a .007" chip thickness, multiply .007" x 4 = .028" FPT.

Compensated FPT (from chart above):

Dapra's mini-feed inserts have a 4x chip thinning factor. The compensated FPT recommendation of .012-.032" represents an actual chip thickness of .003-.008".

R3 Mid-Feed Cutter Bodies

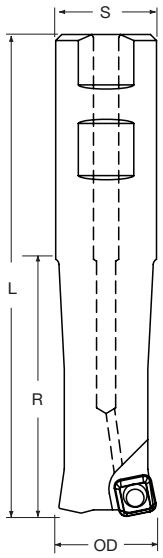
R3 • 1.000" - 3.000" OD • 10mm IC • 4 usable edges • "T," "D" or "F" cutting edge • .045" max. DOC

R3 End Mills

R3 – 10MM IC END MILLS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	DOC Recommended	Insert
60300	1.000"	HFEM100-250-R3-2	2.500"	4.750"	1.000"	2	.015-.040"	RF-10
60310	1.000"	HFEM100-450-R3-2	4.500"	6.750"	1.000"	2	.015-.030"	RF-10
60320	1.250"	HFEM125-300-R3-3	3.000"	5.280"	1.250"	3	.015-.040"	RF-10
60330	1.250"	HFEM125-500-R3-3	5.000"	7.280"	1.250"	3	.015-.030"	RF-10
60340	1.500"	HFEM150-350-R3-3	3.500"	5.780"	1.250"	3	.015-.040"	RF-10
60350	1.500"	HFEM150-550-R3-3	5.500"	7.780"	1.250"	3	.015-.030"	RF-10

End Mills are solid steel, manufactured for coolant thru tool.

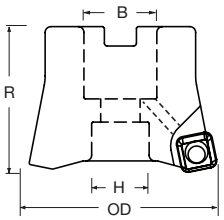


R3 Shell Mills

R3 – 10MM IC SHELL MILLS

EDP	OD Diameter	Holder	R Effective Length	B Arbor Dia.	H Counter Bore Dia.	Flutes	DOC Recommended	Insert
60400	2.000"	HFSM200-075-R3-5C	1.500"	0.750"	0.590"	5	.015-.040"	RF-10
60410	3.000"	HFSM300-100-R3-6C	2.000"	1.000"	0.790"	6	.015-.040"	RF-10

Shell Mills are solid steel, manufactured for coolant thru tool.

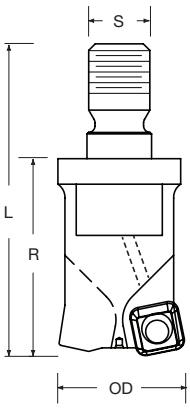


R3 Screw-On Modular Heads

R3 – 10MM IC MODULAR HEADS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Thread	DOC Recommended	Insert
60500	1.000"	HFEM100-MOD-R3-2C	1.500"	2.375"	0.492"	2	M12	.015-.030"	RF-10
60510	1.250"	HFEM125-MOD-R3-3C	1.750"	2.750"	0.669"	3	M16	.015-.030"	RF-10
60520	1.500"	HFEM150-MOD-R3-3C	1.750"	2.750"	0.669"	3	M16	.015-.030"	RF-10

Modular Heads are solid steel, manufactured for coolant thru tool.



*SEE **PAGE 116** FOR CARBIDE CORE, SOLID CARBIDE AND HEAVY METAL MODULAR EXTENSIONS.*

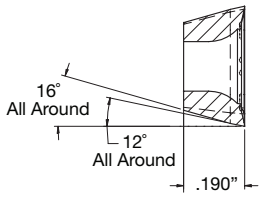
R3 Mid-Feed Inserts

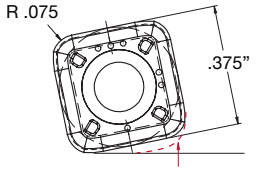
"D" INSERTS
Positive cutting geometry designed to reduce cutting forces and heat. Suitable for most materials, except hardened steel.

"T" INSERTS
Reinforced cutting edge for steels, irons and hard milling.

"F" INSERTS
Specially reinforced for the heaviest feeds and most abusive applications in steels or irons.
(Available in grade DMK30 only).

Insert	Thickness	# of Usable Edges	Corner Radius Actual	Corner Radius Program	DOC Max.	DOC Recommended	FPT Compensated
RF-10-D	.190"	4	.075"	.105"	.045"	.015-.040"	.015-.050"
RF-10-T	.190"	4	.075"	.105"	.045"	.015-.040"	.020-.060"
RF-10-F	.190"	4	.075"	.105"	.045"	.015-.040"	.030-.065"





.105" Corner Radius (Program)

** A special corner radius value is required for correct programming of a high-feed insert. Using the program radius avoids gouging of the corners in the workpiece material.*

The high-feed insert will naturally leave a small amount of extra material at the bottom-most layer of the cut, at the intersection of the wall and pocket floor. See diagram at bottom of this page.

RHINO-FEED inserts are labeled with dots to indicate die position during pressing. For the most accurate runout when loaded into the cutter body, make sure each insert is loaded with the corresponding edge.

Mid-Feed RF-10 Grade Availability

Insert	IC	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)				
RF-10-D	10mm	Positive (sharper)	DMK30 (63100)	DMK30-GLH (63160)	DMK30-TCI (63190)	DMK30-HM (63185)		DMK30-TS (63187)
			DMK35 (63193)			DMK35-HM (63194)	DMK35-IN (63195)	
			DMK25 (63000)	DMK25-GLH (63060)	DMK25-TCI (63090)			
			DMP25 (63200)	DMP25-GLH (63260)	DMP25-TCI (63285)			
RF-10-T	10mm	T-land (stronger)	DMK30 (63300)	DMK30-GLH (63360)	DMK30-TCI (63390)	DMK30-HM (63385)		DMK30-TS (63395)
			DMP25 (63400)	DMP25-GLH (63460)	DMP25-TCI (63490)	DMP25-HM (63485)		DMP25-TS (63487)
			DMK15 (63290)	DMK15-GLH (63292)	DMK15-TCI (63298)	DMK15-HM (63296)		DMK15-TS (63297)
RF-10-F	10mm	Flat-top (strongest)	DMK30 (63500)	DMK30-GLH (63560)	DMK30-TCI (63590)			DMK30-TS (63595)

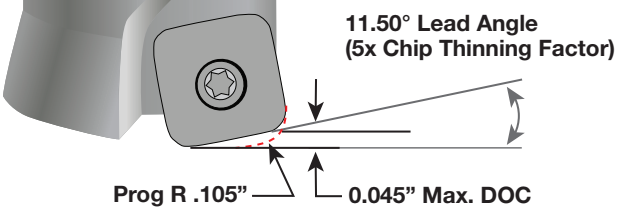
Other grades available upon request.

SEE PG. 40 FOR INSERT GRADE DESCRIPTIONS

Operating Instructions for Mid-Feed Inserts

Mid-feed inserts have a stronger cross-section than the mini-feed, but are smaller than the heavy-feed. These are great general-purpose inserts best suited for lighter-duty (40-taper, linear ways, etc.) machines. Run faster feeds with lighter DOC in most situations. In heavier DOC, run the lower to middle area of the feed ranges.

If cutting at .030" DOC and trying for a .010" chip thickness, multiply .010" x 5 = .050" FPT.



Compensated FPT (from chart above):

Dapra's mid-feed inserts have a 5x chip thinning factor. The compensated FPT recommendation of .020-.060" ("T") and .015-.050" ("D") represents an actual chip thickness of .004-.012" and .003-.010", respectively.

R4 Heavy-Feed Cutter Bodies

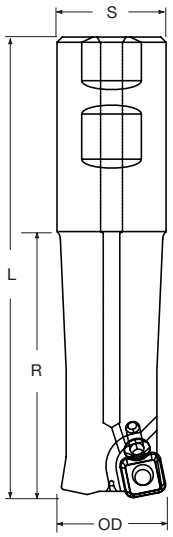
R4 • 1.250" - 6.000" OD • 12mm IC • 4 usable edges • "T," "D" or "F" cutting edge • .060" max. DOC

R4 End Mills

R4 – 12MM IC END MILLS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	DOC Recommended	Insert
60600	1.250"	HFEM125-300-R4-2	3.000"	5.280"	1.250"	2	.020-.050"	RF-12
60610	1.250"	HFEM125-500-R4-2	5.000"	7.280"	1.250"	2	.020-.040"	RF-12
60620	1.500"	HFEM150-350-R4-3	3.500"	5.780"	1.250"	3	.020-.050"	RF-12
60630	1.500"	HFEM150-550-R4-3	5.500"	7.780"	1.250"	3	.020-.040"	RF-12

End Mills are solid steel, manufactured for coolant thru tool.

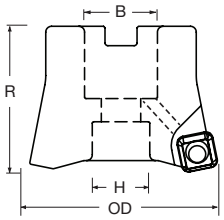


R4 Shell Mills

R4 – 12MM IC SHELL MILLS

EDP	OD Diameter	Holder	R Effective Length	B Arbor Dia.	H Counter Bore Dia.	Flutes	DOC Recommended	Insert
60700	2.000"	HFSM200-075-R4-4C	1.500"	.750"	0.590"	4	.020-.050"	RF-12
60710	2.000"	HFSM200-075-R4-5C	1.500"	.750"	0.590"	5	.020-.050"	RF-12
60720	2.500"	HFSM250-100-R4-5C	2.000"	1.000"	0.790"	5	.020-.050"	RF-12
60730	3.000"	HFSM300-100-R4-6C	2.000"	1.000"	0.790"	6	.020-.050"	RF-12
60740	4.000"	HFSM400-150-R4-8	2.000"	1.500"	2.060"	8	.020-.050"	RF-12
60750	5.000"	HFSM500-150-R4-8	2.000"	1.500"	2.060"	8	.020-.050"	RF-12
60760	6.000"	HFSM600-200-R4-9	2.000"	2.000"	2.875"	9	.020-.050"	RF-12

"C" denotes coolant thru tool.



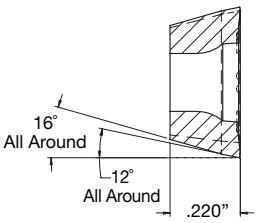
R4 Heavy-Feed Inserts

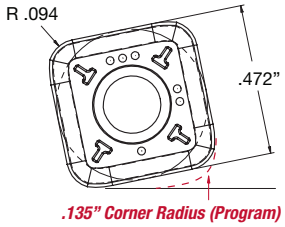
"D" INSERTS
Positive cutting geometry designed to reduce cutting forces and heat. Suitable for most materials, except hardened steel.

"T" INSERTS
Reinforced cutting edge for steels, irons and hard milling.

"F" INSERTS
Specially reinforced for the heaviest feeds and most abusive applications in steels or irons.
(Available in grade DMK30 only).

Insert	Thickness	# of Usable Edges	Corner Radius Actual	Corner Radius Program	DOC Max.	DOC Recommended	FPT Compensated
RF-12-D	.220"	4	.094"	.135"	.060"	.020-.050"	.020-.055"
RF-12-T	.220"	4	.094"	.135"	.060"	.020-.050"	.025-.070"
RF-12-F	.220"	4	.094"	.135"	.060"	.020-.050"	.035-.080"





.135" Corner Radius (Program)

** A special corner radius value is required for correct programming of a high-feed insert. Using the program radius avoids gouging of the corners in the workpiece material.*

The high-feed insert will naturally leave a small amount of extra material at the bottom-most layer of the cut, at the intersection of the wall and pocket floor. See diagram at bottom of this page.

RHINO-FEED inserts are labeled with dots to indicate die position during pressing. For the most accurate runout when loaded into the cutter body, make sure each insert is loaded with the corresponding edge.

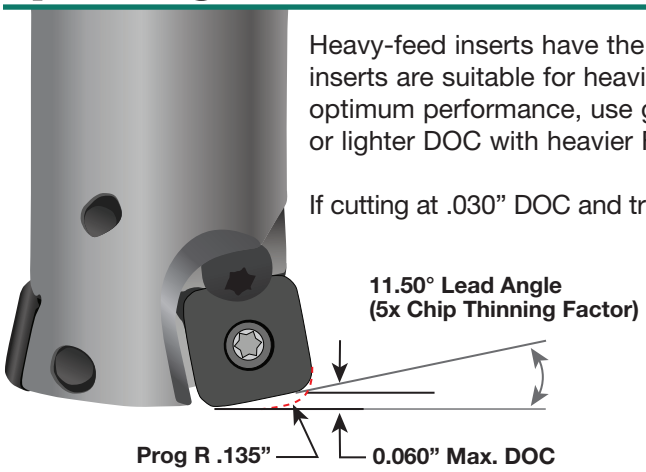
Heavy-Feed RF-12 Grade Availability

Insert	IC	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)				
RF-12-D	12mm	Positive (sharper)	DMK30 (64000)	DMK30-GLH (64060)	DMK30-TCI (64090)	DMK30-HM (64085)	DMK30-IN (64062)	DMK30-TS (64087)
			DMK35 (64093)			DMK35-HM (64094)	DMK35-IN (64095)	
			DMP25 (64100)	DMP25-GLH (64160)	DMP25-TCI (64185)	DMP25-HM (64125)		
RF-12-T	12mm	T-land (stronger)	DMK30 (64200)	DMK30-GLH (64260)	DMK30-TCI (64290)	DMK30-HM (64285)		DMK30-TS (64295)
			DMP25 (64300)	DMP25-GLH (64360)	DMP25-TCI (64390)	DMP25-HM (64385)		DMP25-TS (64395)
			DMK15 (64190)	DMK15-GLH (64192)	DMK15-TCI (64198)	DMK15-HM (64196)		DMK15-TS (64197)
RF-12-F	12mm	Flat-top (strongest)	DMK30 (64600)	DMK30-GLH (64660)	DMK30-TCI (64690)	DMK30-HM (64685)		DMK30-TS (64695)

Other grades available upon request.

SEE PG. 40 FOR INSERT GRADE DESCRIPTIONS

Operating Instructions for Heavy-Feed Inserts



Heavy-feed inserts have the strongest cross-section of the RHINO-FEED line. Heavy-feed inserts are suitable for heavier DOC and larger machines (50-taper, box ways, etc). For optimum performance, use good combinations of heavier DOC with light-to-middle FPT, or lighter DOC with heavier FPT.

If cutting at .030" DOC and trying for a .010" chip thickness, multiply .010" x 5 = .050" FPT.

Compensated FPT (from chart above):

Dapra's heavy-feed inserts have a 5x chip thinning factor. The compensated FPT recommendation of .025-.070" ("T") and .020-.055" ("D") represents an actual chip thickness of .005-.014" and .004-.011", respectively.

High-Feed Insert Grade Descriptions

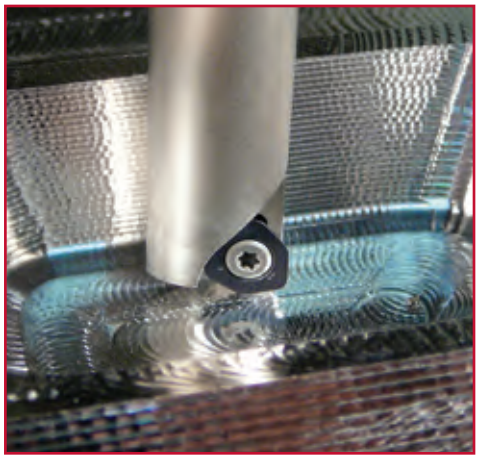
Shock & Wear Resistance	Uncoated (Base Grade)	with Coating	Description	Specifications
TOUGHEST Shock Resistance	DMK30		Moderate wear resistance/high shock resistance. Recommended for interrupted or unstable steel, most 300 series stainless steel, high-temperature alloys, and cast iron applications.	ANSI C1-C2 ISO K25-K40, M25-M35
		DMK30-TCI	High-performance medium- to high-temperature grade. Outstanding wear resistance in steels, irons, and stainless steels. Best suited for materials < 44 Rc.	
		DMK30-GLH	Premium high-temperature coating. Good resistance to heat for high-shock applications. Excellent for tough stainless steels, high-temperature alloys, and many tool steels.	
	NEW	DMK30-TS	General-purpose grade for most materials except hardened steel. Tough and wear-resistant, with all-around coating.	
	NEW	DMK30-HM	Same tough carbide substrate, but with a higher-temperature coating. Usually used for high-temperature alloys or tough stainless steels.	
TOUGH Shock and Wear	DMK35 *"D" ONLY NEW*		Special carbide grade formulated for inconel applications. Can also be used in other high-temperature alloys and austenitic stainless steels.	ANSI C5-C6 ISO M30-M40, P30-P40, K30-K40
	NEW	DMK35-HM	Use HM for a higher-temperature coating in tough stainless steels.	
	NEW	DMK35-IN	IN provides the best performance for high-temperature alloys and tough stainless steels. First choice for inconel.	
MEDIUM Shock and Wear	DMK25		Micro-grain carbide providing higher wear resistance and good shock resistance for applications in tough stainless steels, high-temperature alloys, irons, and many tool steels.	ANSI C2-C3 ISO K15-K30, M15-M30
		DMK25-GLH	Premium high-temperature coating. Outstanding performance and wear resistance in high-heat applications involving tough stainless steels, high-temperature alloys, and many tool steels.	
	NEW	DMK25-HM	Use HM for a higher-temperature coating in tough stainless steels.	
MEDIUM Shock and Wear	DMP25		High wear resistance/moderate shock resistance. Recommended for most steel and ductile iron applications.	ANSI C5-C6 ISO P25-P40
		DMP25-TCI	High-performance medium- to high-temperature grade. Outstanding wear resistance in steels and ductile. Best suited for materials < 44 Rc.	
		DMP25-GLH	Premium high-temperature grade. Unbeatable performance and wear resistance in high-heat applications such as higher-speed machining in steels (< 44 Rc) and ductile irons.	
	NEW	DMP25-TS	Use TS for high-performance milling of steels and ductile irons.	
	NEW	DMP25-HM	Use HM for high-performance milling of tougher steels and tool steels.	
HARDEST Wear Resistance	DMK15		Highest wear resistance with reduced shock absorption capabilities. Micro-grain carbide provides excellent edge strength. Suitable for all materials under stable conditions.	ANSI C2-C3 ISO K15-K25, M15-M25
		DMK15-TCI	High-performance medium- to high-temperature grade. Great for higher-speed grey iron applications and lighter cuts in steels or ductile iron.	
		DMK15-GLH	Premium high-temperature grade for optimum wear resistance in cast irons and steel hard milling > 44 Rc.	
	NEW	DMK15-TS	Use TS for good all-around performance in harder steels.	
	NEW	DMK15-HM	Use HM for the highest hardness in gray and ductile irons, as well as heat-treated steels.	

DMK30-GLH is a good first choice for most applications. The older "HP" coating has been replaced by "TCI."

Additional coatings available on request. Contact us for details.

Application Information

Recommendations



- Tool is most appropriate for "Z-level" roughing; ramp to Depth of Cut (DOC) and clear entire level.
- Solid plunging ***is not*** recommended with RHINO-FEED inserts. Ramping (up to 2° max.) ***is*** recommended.
- Climb milling is absolutely required with RHINO-FEED tooling. Cutter or part damage can occur with extended conventional milling.
- Try to maintain at least 75% of the cutter diameter on the workpiece whenever possible. Hanging a cutter off to the side of your work is detrimental to tool life and performance.
- Width of Cut (WOC) should be 60-75% of cutter diameter whenever possible. A slight scalloping effect between passes is acceptable. For longer-reach tools, this is especially important – cutting pressure should be on both sides of the center line.
- High-feed milling produces a thick chip that is efficient at carrying away heat. Combine this with running a slightly lower SFM than normal to get very good tool life.
- Use the Feed Rate Compensation charts on each insert page to compensate for chip thinning that occurs with RHINO-FEED inserts. This will provide for optimum metal removal rates and tool life.

Technical Considerations

- Always use anti-seize compound on screws.
- Change insert screw every 10 inserts.
- Use the shortest-length tool holder (end mill holder) for maximum rigidity; the shank of the cutting tool should be up inside the machine spindle taper whenever possible.
- Thoroughly clean pocket and screw at each insert change.
- Use tool holders appropriate for roughing operations: end mill holders and power chucks ***are*** recommended; collets ***are not*** recommended.

Spare Parts & Tools

Part Description	Order Number (EDP)		
	R2 MINI-FEED	R3 MID-FEED	R4 HEAVY-FEED
Insert Screw	TRS-3 (83040)	SSTX-15-S (22610)	TRS-4L (83090)
Torque	12-15 in-lbs	30-35 in-lbs	30-35 in-lbs
Wrench	T8-F Flag (83000)	T15-T T-Handle (83010)	T15-T T-Handle (83010)

All listed tools use Anti-Seize Grease ASG-120.

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

OUR TORQUE WRENCH SYSTEMS MAKE REPEATABLE, ACCURATE INSERT LOADING EASIER THAN EVER BEFORE! SEE PAGE 118 FOR DETAILS.

Hole Diameter Calculation

Helical Interpolation for Larger-Diameter Hole Making

Larger diameter hole making can be quick and easy when a RHINO-FEED Cutter is used in combination with helical interpolation. This technique resembles thread milling in that all three axes (X, Y and Z) are in motion simultaneously. It differs from thread milling in that the tool is introduced into the material without a start hole of any kind.

The tool simply is positioned at the inside diameter of the hole to begin its helix from there, achieving complete material removal from the hole by ramping down to the final depth. This smooth operation tends to avoid the high horsepower consumption characteristic of large diameter hole making. This quick and easy process offers the added advantage of allowing many different hole sizes to be generated with the same diameter tool. Hole size variation is all in the programming.

For more information on how Helical Interpolation can improve your manufacturing efficiency, contact your Dapra Applications Specialist.

MINI-FEED
R2 – 8MM IC

Holder	Minimum Hole Dia.
HFEM050-150-R2-1	.65”
HFEM050-250-R2-1	.65”
HFEM063-200-R2-1	.78”
HFEM063-300-R2-1	.78”
HFEM075-MOD-R2-2	1.09”
HFEM075-200-R2-2	1.09”
HFEM075-300-R2-2	1.09”
HFEM100-250-R2-3	1.58”
HFEM100-450-R2-3	1.58”
HFEM100-MOD-R2-3	1.58”

MID-FEED
R3 – 10MM IC

Holder	Minimum Hole Dia.
HFEM100-250-R3-2	1.375”
HFEM100-450-R3-2	1.375”
HFEM100-MOD-R3-2	1.375”
HFEM125-300-R3-3	1.875”
HFEM125-500-R3-3	1.875”
HFEM125-MOD-R3-3	1.875”
HFEM150-350-R3-3	2.375”
HFEM150-550-R3-3	2.375”
HFEM150-MOD-R3-3	2.375”
HFSM200-075-R3-5	3.375”
HFSM300-100-R3-6C	5.375”

HEAVY-FEED
R4 – 12MM IC

Holder	Minimum Hole Dia.
HFEM125-300-R4-2	1.75”
HFEM125-500-R4-2	1.75”
HFEM150-350-R4-3	2.25”
HFEM150-550-R4-3	2.25”
HFSM200-075-R4-4	3.25”
HFSM200-075-R4-5	3.25”
HFSM250-100-R4-5	4.25”
HFSM300-100-R4-6	5.25”
HFSM400-150-R4-8	7.25”
HFSM500-150-R4-8	9.25”
HFSM600-200-R4-9	11.25”

Maximum Hole Dia.* = Tool Dia. x 2

** Not generally recommended. At this diameter, the center tip is at its maximum. It is suggested that you stay slightly under this number.*

Recommended Cutting Speeds/Feeds

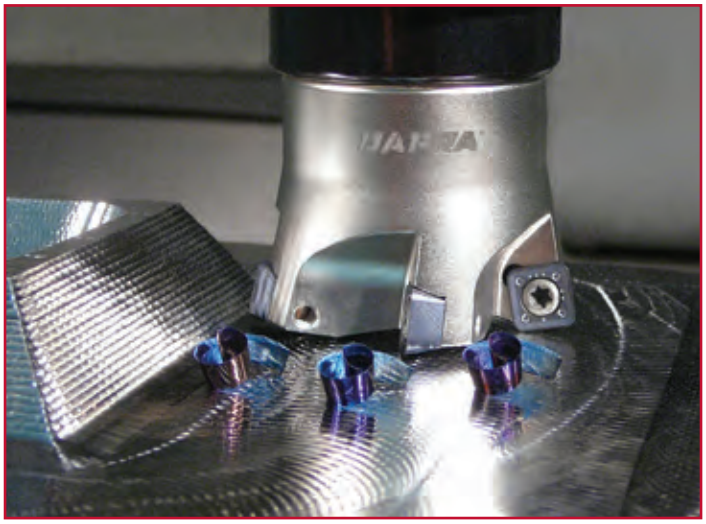
Recommended Cutting Speeds for Dapra RHINO-FEED Cutters			1018, 12L14, 1041, 1045	4140, 4150, 4340, H13, P20, A2, D2	4140, 4150, 4340, H13, P20, A2, D2 (40s Rc)	4140, 4150, 4340, H13, P20, A2, D2	303, 304 LOW 400 SERIES	316, 347, PH STAINLESS	GRAY, MALLEABLE, DUCTILE	AMPCO, WEARITE	INCONEL, WASPALOY, MONEL	
			LOW-TO-MEDIUM CARBON STEELS	TOOL STEELS, HIGH-ALLOY STEELS (SOFT)	TOOL STEELS, HIGH-ALLOY STEELS (MID-HARDNESS)	TOOL STEELS, HIGH-ALLOY STEELS (HARDENED)	FREE MACHINING STAINLESS	TOUGHER STAINLESS	CAST IRONS	COPPER ALLOYS	HIGH-TEMP. ALLOYS	TITANIUM
LOWER TEMPS »	TOUGHEST Shock Resistance	DMK30-TCI	**450-700**	**350-600**	250-450		**250-550**	250-450	400-750	400-600		
		DMK30-GLH	**550-800**	**450-700**	250-450		**300-600**	**250-550**	500-800	400-600	**50-150**	**120-180**
		DMK30-TS	550-800	450-700	250-450			250-550				
		DMK30-HM			250-450		**300-600**	**250-550**	500-800		**50-150**	**120-180**
	TOUGH Shock & Wear	DMK35-HM						250-500			**50-150 INCONEL**	
		DMK35-IN						250-500			**50-150 INCONEL**	
	MEDIUM Shock Resistance	DMK25-GLH	450-800	400-700			300-700	250-600	300-750	**400-650**	50-150	120-180
		DMK25-HM					300-700	250-600	300-750	**400-650**	50-150	120-180
	MEDIUM Shock & Wear	DMP25-TCI	**400-700**	**350-600**					**300-650 DUCTILE**	**400-600**		
		DMP25-GLH	**450-800**	**400-700**	**300-500**	200-400			**300-750 DUCTILE**	**400-600**		
		DMP25-TS			**300-500**	200-400			**300-750 DUCTILE**			
		DMP25-HM			**300-500**	200-400			**300-750 DUCTILE**			
« HIGHER TEMPS	HARDEST Wear Resistance	DMK15-TCI	400-800	450-750	250-450	**> 42 Rc 250-450**			**300-750 GRAY**			
		DMK15-GLH	550-900	450-800	300-500	**> 42 Rc 250-450**			**400-800 GRAY**			
		DMK15-TS			300-500							
		DMK15-HM			300-500	**> 42 Rc 250-450**			**400-800 GRAY**			
1ST CHOICE GEOMETRY			T/D	T/F	T	T	D	D	T/F	D	D	D

NOTE: *High-feed milling does a tremendous amount of work in a short period of time. This line's high production rate can create more heat than typical milling tools. Strong air blast is recommended (multiple lines if possible).*

** First choice grade shown in **bold text**.

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 FPT range. Next, increase FPT to optimize productivity and tool life. Higher SFM will provide higher output but may reduce tool life. Try different combinations to find the parameters that best suit your needs.

- The -TCI and -TS coatings are best suited for low-to-medium operating speeds (temperatures) and softer materials.
- The -GLH and -HM coatings are best suited for high operating speeds (temperatures) and harder materials.



High-Performance Toroid Roughing Mills

Maximize your roughing operations with our single-sided and EDGE² DTB double-sided high-performance Toroid series indexable milling tools. This line is great for:

- Mold cavity and core roughing
- Roughing complex part contours
- Profiling
- Pocketing
- Step milling
- Face milling
- Slotting
- Helical interpolation

YOUR CHOICE: EDGE² DTB or Single-Sided

EDGE² DTB Double-Sided

- Double-sided button inserts offer outstanding value with 12 usable edges each
- Robust insert for premium heat and stress absorption
- One insert size: 12mm
- End mills in 1.25” and 1.50” sizes; shell mills from 2.0” to 4.0”
- Not suited for nonferrous materials

SEE PAGE 45

Single-Sided

- Single-sided button and octagonal ground or CNC-pressed RHINO-CARB™ inserts, designed for aggressive metal cutting and long tool life
- Excellent variety of end mills and shell mills
- Extra clearance allows aggressive ramping and nonferrous cutting

SEE PAGE 56

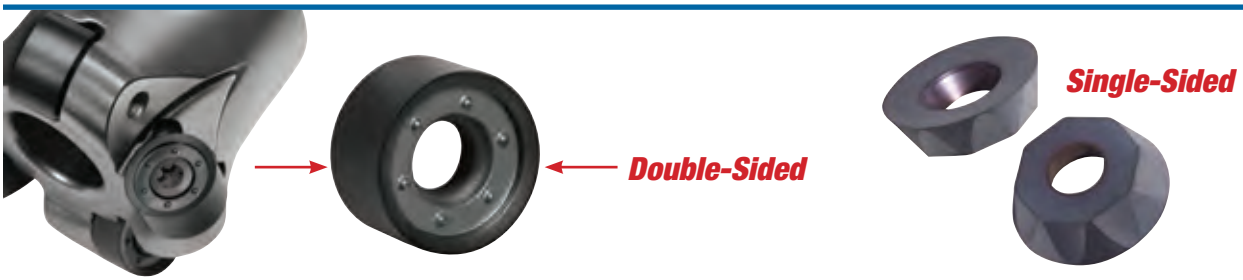
EDGE² DTB Toroid Roughing Series

Double-Sided Button Inserts and Cutter Bodies:
Twice the Metal Removal – Twice the Value

The EDGE² DTB roughing series features double-sided button inserts and super-tough cutter bodies for premium performance across a wide range of roughing applications. ***Double-sided DTB inserts provide twice the number of usable edges as a normal, single-sided insert.***

From mold cavity, core and complex part contour roughing to helical interpolation, pocketing, semi-finishing and face milling, the DTB series was designed to help you maximize your efficiencies in your most challenging roughing applications.

DTB Series Inserts



- Outstanding insert life for roughing applications – significantly outlasts single-sided button inserts, as well as competitors' double-sided offerings
- Thicker carbide insert provides better heat and stress absorption
- Smooth cutting action, with available geometries suitable for cutting virtually all materials (except bar-stock aluminum and plastics)
- Anti-rotation raised dimples for securely and consistently seating insert in cutter body when indexing
- Recessed mounting face creates unobstructed chip flow for reduced stress and heat
- Capable of metal removal rates approaching high-feed, but with better reliability

DTB Series Cutter Bodies

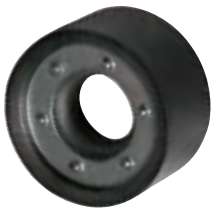
- Super-tough, high-shock tool steel
- Fully thru- and case-hardened bodies for optimum strength and longevity
- High accuracy/centrality for minimal runout, providing best finishes and tool life
- Anti-rotation recessed dimples correspond with raised insert dimples for secure, consistent seating and indexing
- Thru-coolant standard in many bodies for optimum air blast or high-pressure coolant use

EDGE² DTB ROUGHING TOOLS INDEX

DTB Double-Sided Button Inserts

Round inserts have a strong cutting edge, making them an excellent choice for many applications, including:

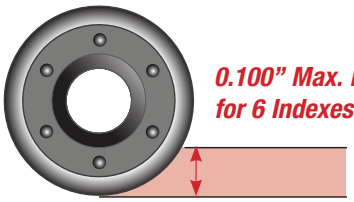
- Mold cavity and core roughing
- Roughing of complex part contours
- Helical interpolation (larger diameter hole making)
- Pocketing
- Semi-finishing
- Face milling



"D" INSERTS
Positive cutting geometry designed to reduce cutting forces and heat. Suitable for most materials except hardened steel.

"T" INSERTS
Reinforced cutting edge for steels, irons and hard milling.

Insert	Thickness	# of Usable Edges	Radius
DTB-12-D	.250"	12	6mm
DTB-12-T	.250"	12	6mm



0.100" Max. DOC for 6 Indexes Per Side

DTB Grade Availability

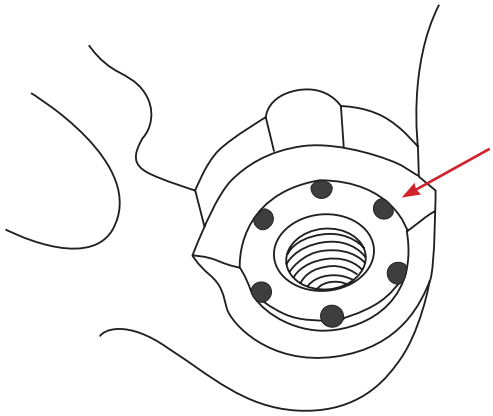
Insert	IC	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)			
DTB-12-D	12mm	Positive (sharper)	DMK30 (70450)	DMK30-TCI (70480)	DMK30-GLH (70460)	DMK30-TS (70485)	DMK30-HM (70454)
DTB-12-T	12mm	T-land (stronger)	DMK30 (70600)	DMK30-TCI (70630)	DMK30-GLH (70610)	DMK30-TS (70635)	DMK30-HM (70625)
			DMP25 (70650)	DMP25-TCI (70680)	DMP25-GLH (70660)	DMP25-TS (70695)	DMP25-HM (70675)
			DMK15 (70550)	DMK15-TCI (70580)	DMK15-GLH (70560)	DMK15-TS (70585)	DMK15-HM (70575)

SEE PG. 54 FOR INSERT GRADE DESCRIPTIONS

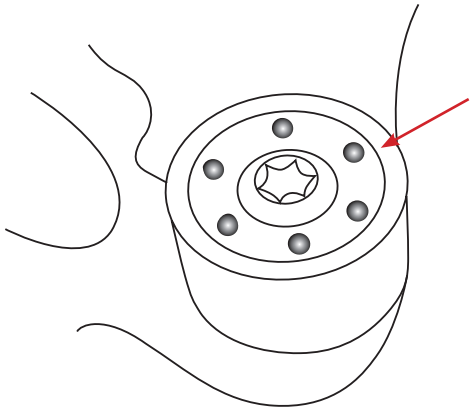
Other grades available upon request.

DTB Insert Loading

Your DTB series tool has hemispherical dimples designed to provide anti-rotation support, as well as help maintain a minimum of 6 indexes per insert side (12 indexes total per insert). It is important that the insert be loaded correctly – with the raised dimples on the insert seating down into the recessed dimples in the cutter body pocket. See the diagram below.



Cutter body pocket with recessed dimples



Double-sided DTB insert with raised dimples inserted into cutter body pocket

See chart on page 52 for technical help on optimum feeds for button inserts.
See page 54 for insert grade descriptions.
See page 55 for recommended speeds/feeds.

DTB Series Cutter Bodies

End Mills

DTB END MILLS

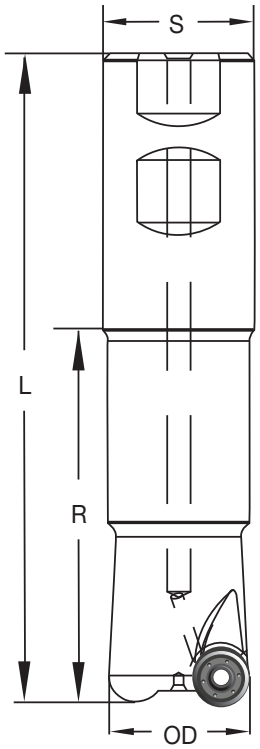
EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert Dia.
70060	1.250”	DTEM125-300-R4-3	3.00”	5.40”	1.25”	3	12mm
70080	1.500”	DTEM150-350-R4-3	3.50”	5.90”	1.25”	3	12mm

DTEM end mills have thru-coolant.

DTB CARBIDE CORE, LONG-REACH END MILLS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert Dia.
70240	1.250”	CC-DTEM125-500-R4-3	5.00”	7.40”	1.25”	3	12mm
70260	1.500”	CC-DTEM150-550-R4-3	5.50”	7.90”	1.25”	3	12mm

CC-DTEM end mills are solid, no thru-coolant.

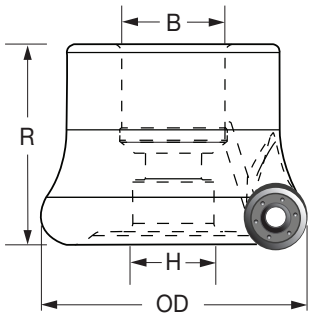


Shell Mills

DTB SHELL MILLS

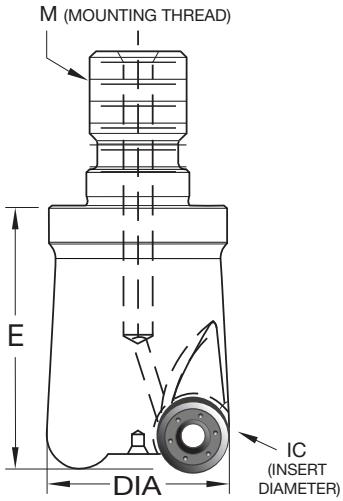
EDP	OD Diameter	Holder	R Effective Length	B Arbor Dia.	H Counter Bore Dia.	Flutes	Insert Dia.
70120	2.000”	DTSM200-075-R4-5	1.50”	0.75”	0.59”	5	12mm
70140	2.500”	DTSM250-100-R4-6	1.75”	1.00”	0.79”	6	12mm
70160	3.000”	DTSM300-100-R4-7	2.00”	1.00”	0.79”	7	12mm
70180	4.000”	DTSM400-150-R4-8	2.25”	1.50”	1.10”	8	12mm

All DTSM shell mills come with thru-coolant standard.



DTB Series Screw-On Modular Heads

- Screw-on modular heads are 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
- See page 116 for modular extensions



DTB SCREW-ON MODULAR HEADS

EDP	DIA Diameter	Holder	M Thread	E Effective Length	Flutes	Wrench	Insert Dia.
70340	1.250”	DTEM125-MOD-R4-2	M16	1.75”	2	15/16”	12mm
70360	1.500”	DTEM150-MOD-R4-2	M16	1.75”	2	15/16”	12mm

SEE PAGE 116 FOR CARBIDE CORE, SOLID CARBIDE AND HEAVY METAL MODULAR EXTENSIONS.

DTB Spare Parts & Tools

Part Description	Order Number (EDP)
Insert Screw	TRS-4L (83090)
Wrench	T-15T (83010)
Torque Recommendation	30-35 in-lbs

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

All listed tools use Anti-Seize Grease ASG-120.

OUR TORQUE WRENCH SYSTEMS MAKE REPEATABLE, ACCURATE INSERT LOADING EASIER THAN EVER BEFORE! SEE PAGE 118 FOR DETAILS.

Application Information

Recommendations

- Tool is most appropriate for “Z-level” roughing; ramp to Depth of Cut (DOC) and clear entire level.
- Plunging ***is not*** recommended with DTB series cutters. Ramping (up to 2° max.) ***is*** recommended.
- Try to maintain at least 75% of the cutter diameter on the workpiece whenever possible. Hanging a cutter off to the side of your work is detrimental to tool life and performance.
- Width of Cut (WOC) should be 60-75% of cutter diameter whenever possible, creating a “scalloping” effect (end mills only) between passes, especially with longer-length tools.
- Round inserts provide a very strong cutting edge and the ability to machine much closer to finish size. Utilize high feeds with light DOC to take advantage of these benefits. High metal removal rates will be achieved without high horsepower consumption.
- Use the Feed Rate Compensation chart on page 51 to compensate for chip thinning that occurs with round inserts. This will provide for optimum metal removal rates and tool life; the lighter the DOC, the more critical feed compensation becomes.

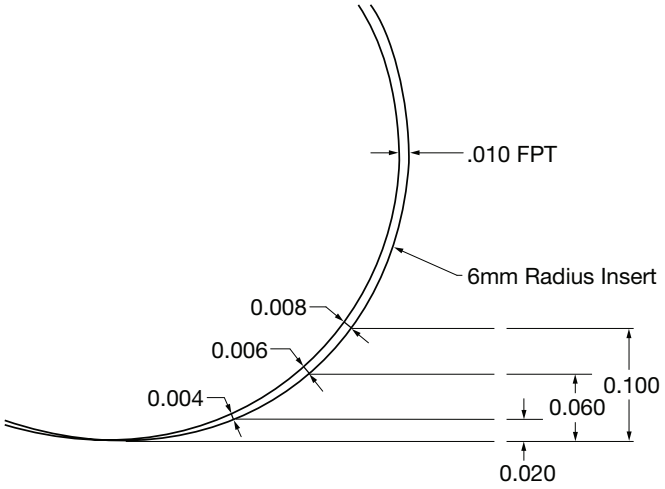
Technical Considerations

- Always use anti-seize compound on screws.
- Change insert screw every 10 inserts.
- Use the shortest-length tool holder (end mill holder) for maximum rigidity; the shank of the cutting tool should be up inside the machine spindle taper whenever possible.
- Thoroughly clean pocket and screw at each insert change.
- Use tool holders appropriate for roughing operations: end mill holders and power chucks ***are*** recommended; collets ***are not*** recommended.

Running

Your double-sided DTB series inserts are very thick, providing outstanding strength and superior tool life in operation. With this increased thickness comes the requirement that the feed per tooth (FPT) not exceed the clearance the insert allows. In general, it is recommended to initially not exceed an FPT of .025". Under certain circumstances (lighter DOC and/or WOC) the feed can be higher, but the potential for rubbing (or heeling) of the back-side cutting edge exists. When trying heavier feeds, evaluate the back-side cutting edge after running the tool for only a few minutes, looking for evidence of rubbing or damage.

Your DTB series inserts utilize chip-thinning for optimum performance. Chip-thinning is the process in which the actual chip thickness created by a cut is less than the FPT at which the tool is programmed. See the chart below to see the chip-thinning factor for various depths of cut. ***For a correct chip thickness, multiply the FPT (from page 55) by the chip thinning factor below.*** This will give you an accurate feed and optimize your performance.



This diagram (left) shows the varying chip thickness when feeding .010" feed per tooth (FPT) at different depths of cut (DOC) with a 12mm diameter insert:

At .250" DOC, the chip thickness is a true .010"
At .100" DOC, the chip thickness is .008"
At .060" DOC, the chip thickness is .006"
At .020" DOC, the chip thickness is only .004"

Feed Rate Compensation

After determining the desired chip thickness (FPT – see chart on page 55), find the Depth of Cut intersection in the chart at right. Multiply the desired chip thickness by the factor shown in the chart. This will be the Adjusted Feed per Tooth (AFPT), resulting in a true chip thickness of the desired amount.

Example:

At .03" Depth of Cut (DOC), the factor for the chip thickness = 2.1.
So, if a chip thickness of .005" is desired, a feed rate of .0105" (.005 x 2.1) needs to be programmed into the machine tool.

or

Adjusted Feed per Tooth (AFPT) = chip thickness x chip thinning factor (from chart)

Depth of Cut (DOC)	Insert Diameter 12mm
0.005	5
0.010	3.6
0.015	2.9
0.020	2.6
0.025	2.3
0.030	2.1
0.035	2
0.040	1.8
0.050	1.7
0.060	1.5
0.075	1.4
0.085	1.3
0.100	1.3
0.125	1.2
0.150	1.1
0.180	NR
0.200	NR
>0.20	NR

Hole Diameter Calculation

Helical Interpolation for Larger-Diameter Hole Making

Shell Mill Part Number	Minimum Hole Dia.	Maximum Hole Dia.*
DTEM125-300-R4-3	2.00”	2.50”
DTEM150-350-R4-3	2.50”	3.00”
DTSM200-075-R4-5	3.50”	4.00”
DTSM250-100-R4-6	4.50”	5.00”
DTSM300-100-R4-7	5.50”	6.00”
DTSM400-150-R4-8	7.50”	8.00”

Formulas:

Minimum Hole Dia.:
(Tool Dia. x 2) - (1.5 x Insert Dia.)

Maximum Hole Dia.*:
Tool Dia. x 2

** Not generally recommended. At this diameter, the center tip is at its maximum. It is suggested that you stay slightly under this number.*

Larger diameter hole making can be quick and easy when a DTB Series Cutter is used in combination with helical interpolation. This technique resembles thread milling in that all three axes (X, Y and Z) are in motion simultaneously. It differs from thread milling in that the tool is introduced into the material without a start hole of any kind.

The is tool simply positioned at the inside diameter of the hole to begin its helix from there, achieving complete material removal from the hole by ramping down to the final depth. This smooth operation tends to avoid the high horsepower consumption characteristic of large diameter hole making. This quick and easy process offers the added advantage of allowing many different hole sizes to be generated with the same diameter tool. Hole size variation is all in the programming.

For more information on how helical interpolation can improve your manufacturing efficiency, contact your Dapra Applications Specialist.

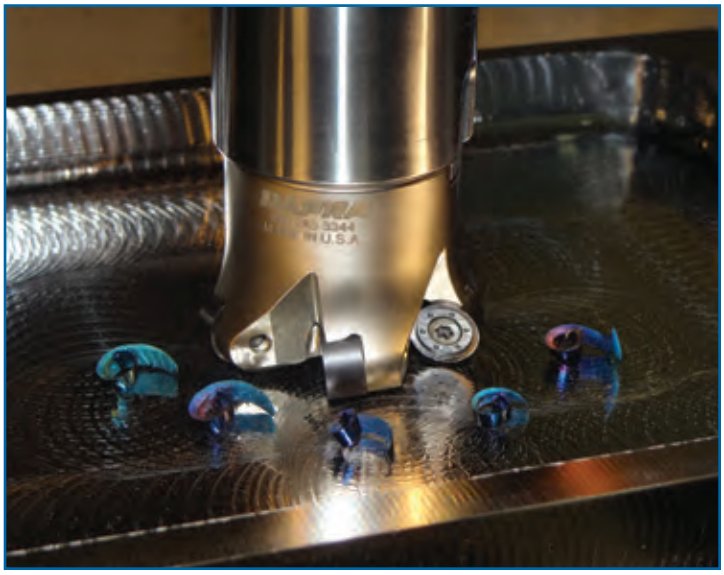
Troubleshooting

Concern	Possible Cause	Solutions
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 ❑ Increase DOC ❑ Use harder grade
Insert chipping	• Surface footage is low • Incorrect grade or coating • Using Dished insert incorrectly • Feed too high	❑ Verify correct speed and feed ❑ Increase spindle speed ❑ Decrease feed rate ❑ Decrease DOC ❑ Use T-Land Insert ❑ Use tougher grade
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 ❑ Use coolant
Poor finish/chatter	• Cutter hung out too far • Excessive runout • Inadequate tool holding	❑ Reduce tool gage length ❑ Check tool holder wear ❑ Use high-rigidity tool holder
Tool shank breaks	• Tool pressure too great • Fatigued cutter body	❑ Decrease DOC ❑ Reduce tool gage length ❑ Decrease feed rate

DTB Insert Grades

Shock & Wear Resistance	Uncoated (Base Grade)	with Coating	Description	Specifications
TOUGHEST Shock Resistance	DMK30		Moderate wear resistance/high shock resistance. Recommended for interrupted or unstable steel, most stainless steel, high-temperature alloys and cast iron applications.	ANSI C1-C2 ISO K25-K40, M25-M35
		DMK30-TCI	High-performance medium- to high-temperature grade. Outstanding shock and wear resistance in steels, irons and stainless steels. Best suited for materials < 44 Rc.	
		DMK30-GLH	Premium high-temperature coating. Best resistance to heat for high-shock applications. Excellent for tough stainless steels, high-temperature alloys and many tool steels.	
	NEW	DMK30-HM	Same tough carbide substrate, but with a higher-temperature coating. Usually used for high-temperature alloys or tough stainless steels.	
MEDIUM Shock and Wear	DMP25		High wear resistance/moderate shock resistance. Recommended for most steel and ductile iron applications.	ANSI C5-C6 ISO P25-P40
		DMP25-TCI	High-performance medium- to high-temperature grade. Outstanding wear resistance in steels and ductile. Best suited for materials < 44 Rc.	
		DMP25-GLH	Premium high-temperature grade. Unbeatable performance and wear resistance in high-heat applications such as higher-speed machining in steels (< 44 Rc) and ductile irons.	
	NEW	DMP25-HM	Use HM for high-performance milling of tougher steels and tool steels.	
HARDEST Wear Resistance	DMK15		Highest wear resistance with reduced shock absorption capabilities. Micro-grain carbide provides excellent edge strength. Suitable for all materials under stable conditions.	ANSI C2-C3 ISO K15-K25, M15-M25
		DMK15-TCI	High-performance medium- to high-temperature grade. Great for higher-speed gray iron applications and lighter cuts in steels <52 Rc or ductile iron.	
		DMK15-GLH	Premium high-temperature grade for optimum wear resistance in cast irons and steel hard milling > 44 Rc.	
	NEW	DMK15-HM	Use HM for the highest hardness in gray and ductile irons, as well as heat-treated steels.	

Additional coatings available on request.
Contact us for details.



Recommended Cutting Speeds/Feeds

Recommended Cutting Speeds for Dapra DTB Cutters			1018, 12L14, 1041, 1045	4140, 4150, 4340, H13, P20, A2, D2	4140, 4150, 4340, H13, P20, A2, D2 (40s Rc)	4140, 4150, 4340, H13, P20, A2, D2	303, 304 LOW 400 SERIES	316, 347, PH STAINLESS	GRAY, MALLEABLE, DUCTILE	AMPCO, WEARITE	INCONEL, WASPALOY, MONEL	Ti-6AL-4V
			LOW-TO-MEDIUM CARBON STEELS	TOOL STEELS, HIGH-ALLOY STEELS (SOFT)	TOOL STEELS, HIGH-ALLOY STEELS (MID-HARDNESS)	TOOL STEELS, HIGH-ALLOY STEELS (HARDENED)	FREE MACHINING STAINLESS	TOUGHER STAINLESS	CAST IRONS	COPPER ALLOYS	HIGH-TEMP. ALLOYS	TITANIUM
LOWER TEMPS »	TOUGHEST Shock Resistance	DMK30-TCI	**450-700**	350-600	250-400		**250-550**	**250-450**	400-750	**300-550**		
		DMK30-GLH	**550-800**	450-700	250-400		**300-600**	**300-550**	500-800	**400-600**	**50-120**	**120-180**
		DMK30-HM	**550-800**	450-700	250-400		**300-600**	**300-550**	500-800	**400-600**	**50-120**	**120-180**
	MEDIUM Shock & Wear	DMP25-TCI	**400-700**	**350-600**	**300-500**				**300-650 DUCTILE**	300-600		
		DMP25-GLH	**450-800**	**400-700**	**350-550**	200-400			**300-750 DUCTILE**	400-650		
		DMP25-HM			**350-550**	200-400			**300-750 DUCTILE**	400-650		
« HIGHER TEMPS	HARDEST Wear Resistance	DMK15-TCI	500-800	450-750	300-500	**< 52 Rc 250-450**			**300-750 GRAY**			
		DMK15-GLH	550-900	450-800	350-550	**> 44 Rc 250-450**			**400-800 GRAY**			
		DMK15-HM	550-900	450-800	350-550	**> 44 Rc 250-450**			**400-800 GRAY**			
1ST CHOICE GEOMETRY			T	T	T	T	D	D	T	D	D	D
RECOMMENDED FPT RANGE			.005-.015”	.005-.012”	.005-.009”	.002-.006”	.004-.012”	.003-.010”	.005-.015”	.005-.012”	.002-.006”	.002-.006”

** First choice grade shown in **bold text**.

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 FPT range. Next, increase FPT to optimize productivity and tool life. Higher SFM will provide higher output but may reduce tool life. Try different combinations to find the parameters that best suit your needs.

- The -TCI coatings are best suited for low-to-medium operating speeds (temperatures) and softer materials.
- The -GLH and -HM coatings are best suited for high operating speeds (temperatures) and harder materials.

Single-Sided Toroid Series

High-performance Toroid cutters are available with standard ground or CNC-pressed RHINO-CARB™ single-sided inserts.

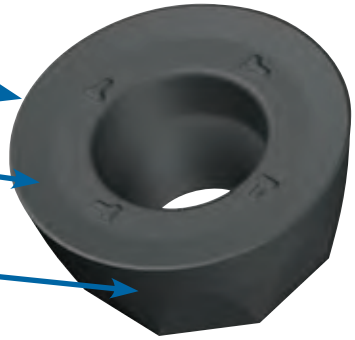
RHINO-CARB™ Pressed Toroid Inserts

Dapra's RHINO-CARB high-performance inserts are designed for very aggressive metal cutting and long tool life.

Stronger cutting edge for heavier chiploads, greater shock absorption and longer tool life

Positive top rake for reduced cutting forces and lower torque

Thicker inserts for greater strength and enhanced heat absorption capabilities



"T" inserts have a strong, negative reinforced cutting edge for steels, irons and hard milling.

"D" inserts have a high-positive cutting edge for stainless steels, high-temperature alloys and gummy materials.

"N" inserts are more positive than the "T" edge, but stronger than "D."

Our Toroid series includes TWO high-performance inserts to maximize the versatility of your Toroid cutting tools:

Match the insert (R) value to the designation on your cutter body.

Each R value = 1/8" of insert dia.

For example, R5 = 5/8" IC.

Button Inserts

R3
R4
R5
R6

RPMH RHINO-CARB™ DP
RDCH & RXCH (ground)

Octagonal Inserts

R4
R5
R6

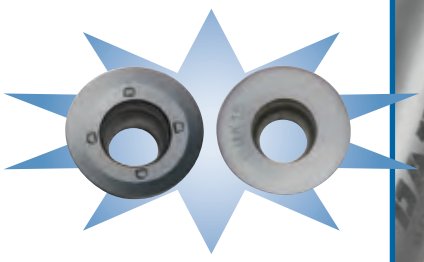
OPMH RHINO-CARB™ DP
OXCH (ground)

1 Button Inserts

R3 R4 R5 R6

Round inserts have a strong cutting edge, making them an excellent choice for many applications, including:

- Mold cavity and core roughing
- Roughing of complex part contours
- Helical interpolation (larger diameter hole making)
- Pocketing
- Semi-finishing
- Face milling



See chart on page 72 for technical help on optimum feeds for button inserts.

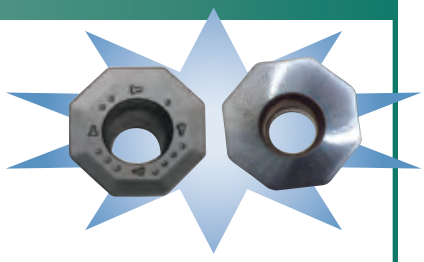
2 Octagonal Inserts

R4* R5 R6

8-sided geometry is excellent for general face milling. 45° lead angle provides increased feed capacity for:

- Face milling
- Profiling
- Helical interpolation
- Chamfering

Each of the 8 usable edges comes with an integral wiper flat for outstanding surface finishes. *(RHINO-CARB only)*



** R4 Octagonal available in RHINO-CARB style only.*

See information on page 72 regarding 45° lead angle compensation for octagonal inserts.

TOROID BUTTON / FACE MILLING TOOLS INDEX

R3 3/8" IC Insert Cutter Bodies

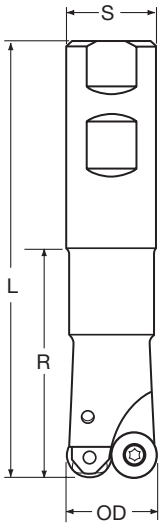
1.250" shank dia. cutters and smaller are available in limited supply without Weldon Flats.
Add WOF to the end of the part number when ordering.

R3 End Mills

R3 3/8" IC END MILLS

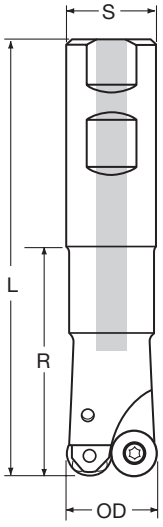
EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert Match to pg. 59 insert color	Insert Dia.
80000	.750"	TREM075-200-R3-2C	2.000"	2.000"	.750"	2	Button	.375"
80020	.750"	TREM075-300-R3-2C	3.000"	3.000"	.750"	2	Button	.375"
80040	1.000"	TREM100-250-R3-2C	2.500"	2.500"	1.000"	2	Button	.375"
80060	1.000"	TREM100-250-R3-3C	2.500"	2.500"	1.000"	3	Button	.375"

"C" denotes coolant-thru tool.



R3 3/8" IC CARBIDE CORE END MILLS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert Match to pg. 59 insert color	Insert Dia.
80400	.750"	CC-TREM075-300-R3-2	3.000"	5.030"	.750"	2	Button	.375"
80420	1.000"	CC-TREM100-450-R3-2	4.500"	6.750"	1.000"	2	Button	.375"
80440	1.000"	CC-TREM100-450-R3-3	4.500"	6.750"	1.000"	3	Button	.375"



R3 3/8" IC Inserts

"D" INSERTS
High-positive cutting edge for stainless steels, high-temperature alloys and gummy materials.

"T" INSERTS
Reinforced cutting edge for steels, irons and hard milling.

Button Inserts

Insert	IC	Thick-ness	Radius	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)	
RHINO-CARB®							
RPMH-33-D	.375"	.157"	.187"	Positive (sharper)	DMK30 (85200)	DMK30-TCI (85290)	DMK30-GLH (85260)
RPMH-33-T	.375"	.157"	.187"	T-land (stronger)	DMK30 (85500)		DMK30-GLH (85560)
					DMP25 (85600)	DMP25-TCI (85690)	DMP25-GLH (85660)
					DMK15 (85400)		DMK15-GLH (85460)
GROUND							
RDCH-32-D	.375"	.125"	.187"	Sharpest	DMK15 (96000)		
RDCH-32-T‡	.375"	.125"	.187"	T-land (stronger)	DMK15 (96200)		DMK15-GLH (96260)

‡ *Closeout item. Available while supplies last.*

Other grades available upon request.

SEE PG. 74 FOR INSERT GRADE DESCRIPTIONS

See chart on page 72 for technical help on optimum feeds for button inserts.
See page 75 for recommended speeds/feeds.

R4 1/2" IC Insert Cutter Bodies

1.250" shank dia. cutters and smaller are available in limited supply without Weldon Flats.
Add WOF to the end of the part number when ordering.

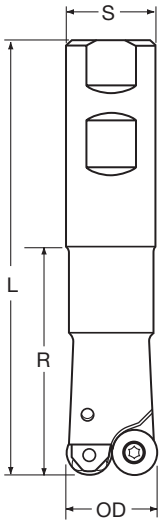
R4 End Mills

R4 1/2" IC END MILLS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert Match to pg. 61 insert color		Insert Dia.
80080	1.000"	TREM100-125-R4-2C	1.250"	3.530"	1.000"	2	Button	Octagonal	.500"
80090	1.000"	TREM100-250-R4-2C	2.500"	4.750"	1.000"	2	Button	Octagonal	.500"
80110	1.000"	TREM100-450-R4-2C	4.500"	6.750"	1.000"	2	Button	Octagonal	.500"
80130	1.250"	TREM125-300-R4-3*	3.000"	5.280"	1.250"	3	Button	Octagonal	.500"
80160	1.500"	TREM150-350-R4-3*	3.500"	5.780"	1.250"	3	Button	Octagonal	.500"

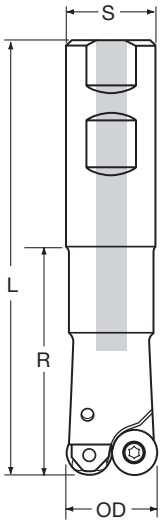
"C" denotes coolant-thru tool.

** Does not have thru-tool coolant.*



R4 1/2" IC CARBIDE CORE END MILLS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert Match to pg. 61 insert color		Insert Dia.
80460	1.000"	CC-TREM100-450-R4-2	4.500"	6.750"	1.000"	2	Button	Octagonal	.500"
80480	1.250"	CC-TREM125-500-R4-3	5.000"	7.280"	1.250"	3	Button	Octagonal	.500"

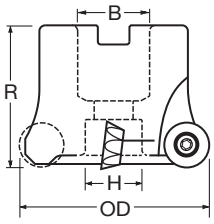


R4 Shell Mills

R4 1/2" IC SHELL MILLS

EDP	OD Diameter	Holder	R Effective Length	B Arbor Dia.	H Counter Bore Dia.	Flutes	Insert Match to pg. 61 insert color		Insert Dia.
80710	2.000"	TRSM200-075-R44-4C	1.500"	.750"	.590"	4	Button	Octagonal	.500"
80730	2.000"	TRSM200-075-R4-5C	1.500"	.750"	.590"	5	Button	Octagonal	.500"
80760	2.500"	TRSM250-100-R4-6C	2.000"	1.000"	.790"	6	Button	Octagonal	.500"
80800	3.000"	TRSM300-100-R4-6C	2.000"	1.000"	.790"	6	Button	Octagonal	.500"
80870	4.000"	TRSM400-150-R4-7	2.000"	1.500"	2.050"	7	Button	Octagonal	.500"
80930	5.000"	TRSM500-150-R4-9	2.000"	1.500"	2.060"	9	Button	Octagonal	.500"

"C" denotes coolant-thru tool.



R4 1/2" IC Inserts

"D" INSERTS
High-positive cutting edge for stainless steels, high-temperature alloys and gummy materials.

"N" INSERTS
For typical cutting applications where high-performance milling of steels, irons and 400-series stainless is desired.

"T" INSERTS
Reinforced cutting edge for steels, irons and hard milling.

Button Inserts

Insert	IC	Thick-ness	Radius	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)		
RHINO-CARB RP								
RPMH-44-D	.500"	.220"	.250"	Positive (Sharper)	DMK30 (86300)	DMK30-TCI (86390)	DMK30-GLH (86360)	
					DMK25 (86200)	DMK25-TCI (86290)	DMK25-GLH (86260)	
					DMP25 (86400)	DMP25-TCI (86490)	DMP25-GLH (86460)	DMP25-HM (86485)
RPMH-44-N	.500"	.220"	.250"	Neutral	DMK30 (87000)	DMK30-TCI (87090)	DMK30-GLH (87060)	DMK30-HM (87085)
					DMK25 (86900)		DMK25-GLH (86960)	
					DMP25 (87100)	DMP25-TCI (87190)	DMP25-GLH (87160)	DMP25-HM (87185)
					DMK15 (86800)		DMK15-GLH (86860)	DMK15-HM (86885)
RPMH-44-T	.500"	.220"	.250"	T-land (Stronger)	DMK30 (86600)	DMK30-TCI (86690)	DMK30-GLH (86660)	DMK30-HM (86685)
					DMP25 (86700)	DMP25-TCI (86790)	DMP25-GLH (86760)	DMP25-HM (86785)
					DMK15 (86500)	DMK15-TCI (86590)	DMK15-GLH (86560)	DMK15-HM (86585)
GROUND								
RDCH-43-D	.500"	.187"	.250"	Sharpest	DMK30 (96500)	DMK30-TCI (96590)	DMK30-GLH (96560)	
RDCH-43-T‡	.500"	.187"	.250"	T-land (Stronger)	DMP25 (96700)	DMP25-TCI (96790)	DMP25-GLH (96760)	

DMK25 substrate is available for RHINO-CARB D and N geometries only.

‡ *Closeout item. Available while supplies last. DMK30 and DMK15 are out of stock.*

Octagonal Inserts

Insert	IC	Thick-ness	Radius	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)		
RHINO-CARB OP								
OPMH-442-D	.500"	.220"	.031"	Positive (sharper)	DMK30 (90200)	DMK30-TCI (90290)	DMK30-GLH (90260)	
					DMK25 (90100)		DMK25-GLH (90160)	
					DMP25 (90300)		DMP25-GLH (90360)	
OPMH-442-N	.500"	.220"	.031"	Neutral	DMK25 (90800)		DMK25-GLH (90860)	
					DMP25 (91000)	DMP25-TCI (91090)	DMP25-GLH (91060)	DMP25-HM (87185)
OPMH-442-T	.500"	.220"	.031"	T-land (stronger)	DMP25 (90600)	DMP25-TCI (90690)	DMP25-GLH (90660)	
					DMK15 (90400)		DMK15-GLH (90460)	DMK15-HM (90485)

DMK25 substrate is available for RHINO-CARB D and N geometries only.

OPMH-442 inserts have a maximum DOC of .135".

Other grades available upon request.

SEE PG. 74 FOR INSERT GRADE DESCRIPTIONS

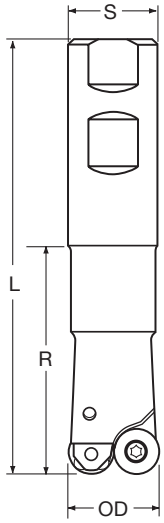
R5 5/8" IC Insert Cutter Bodies

R5 End Mills

R5 5/8" IC END MILLS

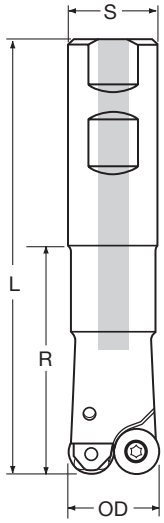
EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert Match to pg. 63 insert color		Insert Dia.
80150	1.250"	TREM125-300-R5-2C	3.000"	5.250"	1.250"	2	Button	Octagonal	.625"

"C" denotes coolant-thru tool.



R5 5/8" IC CARBIDE CORE END MILLS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert Match to pg. 63 insert color		Insert Dia.
80490	1.250"	CC-TREM125-500-R5-2	5.000"	7.250"	1.250"	2	Button	Octagonal	.625"

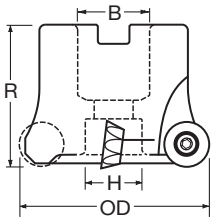


R5 Shell Mills

R5 5/8" IC SHELL MILLS

EDP	OD Diameter	Holder	R Effective Length	B Arbor Dia.	H Counter Bore Dia.	Flutes	Insert Match to pg. 63 insert color		Insert Dia.
80740	2.000"	TRSM200-075-R5-3C	1.500"	.750"	.590"	3	Button	Octagonal	.625"
80780	2.500"	TRSM250-100-R5-4C	2.000"	1.000"	.790"	4	Button	Octagonal	.625"
80830	3.000"	TRSM300-100-R5-5C	2.000"	1.000"	.790"	5	Button	Octagonal	.625"
80840	3.430"	TRSM343-100-R5-5	2.000"	1.000"	.790"	5	Button	Octagonal	.625"
80890	4.000"	TRSM400-150-R5-6	2.000"	1.500"	2.060"	6	Button	Octagonal	.625"
80900	4.430"	TRSM443-150-R5-6	2.000"	1.500"	2.060"	6	Button	Octagonal	.625"
80960	5.000"	TRSM500-150-R5-8	2.000"	1.500"	2.060"	8	Button	Octagonal	.625"
81000	6.000"	TRSM600-200-R5-10	2.000"	2.000"	2.875"	10	Button	Octagonal	.625"
81010	6.430"	TRSM643-200-R5-10	2.000"	2.000"	2.875"	10	Button	Octagonal	.625"

"C" denotes coolant-thru tool.



R5 5/8" IC Inserts

"D" INSERTS
High-positive cutting edge for stainless steels, high-temperature alloys and gummy materials.

"N" INSERTS
For typical cutting applications where high-performance milling of steels, irons and 400-series stainless is desired.

"T" INSERTS
Reinforced cutting edge for steels, irons and hard milling.

Button Inserts

Insert	IC	Thick-ness	Radius	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)		
RHINO-CARB R5								
RPMH-54-D	.625"	.220"	.312"	Positive (Sharper)	DMK30 (87400)		DMK30-GLH (87460)	
					DMK25 (87300)		DMK25-GLH (87360)	
RPMH-54-N	.625"	.220"	.312"	Neutral	DMK30 (88100)	DMK30-TCI (88190)	DMK30-GLH (88160)	DMK30-HM (87085)
					DMK25 (88000)		DMK25-GLH (88060)	
					DMP25 (88200)	DMP25-TCI (88290)	DMP25-GLH (88260)	DMP25-HM (87185)
RPMH-54-T	.625"	.220"	.312"	T-land (Stronger)	DMK30 (87700)	DMK30-TCI (87790)	DMK30-GLH (87760)	DMK30-HM (86685)
					DMP25 (87800)	DMP25-TCI (87890)	DMP25-GLH (87860)	DMP25-HM (86785)

DMK25 substrate is available for RHINO-CARB D and N geometries only.

Octagonal Inserts

Insert	IC	Thick-ness	Radius	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)		
RHINO-CARB OP								
OPMH-544-D	.625"	.220"	.062"	Positive (Sharper)	DMK30 (91300)	DMK30-TCI (91390)	DMK30-GLH (91360)	
					DMP25 (91400)		DMP25-GLH (91460)	
					DMK15 (91100)		DMK15-GLH (91160)	
OPMH-544-N	.625"	.220"	.062"	Neutral	DMK30 (92000)	DMK30-TCI (92090)	DMK30-GLH (92060)	
					DMK15 (91800)		DMK15-GLH (91860)	
OPMH-544-T	.625"	.220"	.062"	T-land (Stronger)	DMP25 (91700)	DMP25-TCI (91790)	DMP25-GLH (91760)	
					DMK15 (91500)		DMK15-GLH (91560)	DMK15-HM (91585)
GROUND								
OXCH-534-D	.625"	.187"	.062"	Sharpest	DMK30 (98100)	DMK30-TCI (98190)	DMK30-GLH (98160)	

OPMH-544 inserts have a maximum DOC of .165".

Other grades available upon request.

SEE PG. 74 FOR INSERT GRADE DESCRIPTIONS

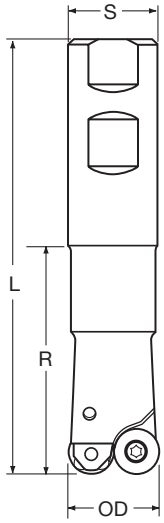
R6 3/4" IC Insert Cutter Bodies

R6 End Mills

R6 3/4" IC END MILLS

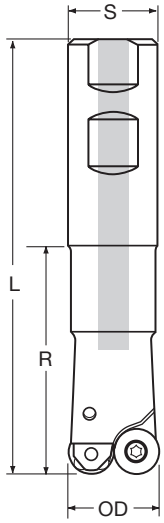
EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert Match to pg. 65 insert color		Insert Dia.
80180	1.500"	TREM150-350-R6-2C	3.500"	6.190"	1.500"	2	Button	Octagonal	.750"

"C" denotes coolant-thru tool.



R6 3/4" IC CARBIDE CORE END MILLS

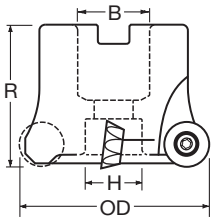
EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert Match to pg. 65 insert color		Insert Dia.
80505	1.500"	CC-TREM150-550-R6-2	5.500"	8.190"	1.500"	2	Button	Octagonal	.750"



R6 Shell Mills

R6 3/4" IC SHELL MILLS

EDP	OD Diameter	Holder	R Effective Length	B Arbor Dia.	H Counter Bore Dia.	Flutes	Insert Match to pg. 65 insert color		Insert Dia.
80850	3.000"	TRSM300-100-R6-4	2.000"	1.000"	.790"	4	Button	Octagonal	.750"
80860	3.500"	TRSM350-100-R6-4	2.000"	1.000"	.790"	4	Button	Octagonal	.750"
80920	4.500"	TRSM450-150-R6-6	2.000"	1.500"	2.060"	6	Button	Octagonal	.750"
81040	6.500"	TRSM650-200-R6-8	2.000"	2.000"	2.875"	8	Button	Octagonal	.750"
80620	8.440"	TRSM850-FM-R6-10 FLANGE MOUNTED	2.380"	2.500"	4.0" B/C	10	Button	Octagonal	.750"



R6 3/4" IC Inserts

"D" INSERTS
High-positive cutting edge for stainless steels, high-temperature alloys and gummy materials.

"N" INSERTS
For typical cutting applications where high-performance milling of steels, irons and 400-series stainless is desired.

"T" INSERTS
Reinforced cutting edge for steels, irons and hard milling.

Button Inserts

Insert	IC	Thick-ness	Radius	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)		
RHINO-CARB RP								
RPMH-64-N	.750"	.220"	.375"	Neutral	DMK25 (89100)		DMK25-GLH (89160)	
					DMP25 (89300)		DMP25-GLH (89360)	
RPMH-64-T	.750"	.220"	.375"	T-land (stronger)	DMK30 (88800)		DMK30-GLH (88860)	
					DMP25 (88900)	DMP25-TCI (88990)	DMP25-GLH (88960)	

Octagonal Inserts

Insert	IC	Thick-ness	Radius	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)		
RHINO-CARB OP								
OPMH-644-N	.750"	.220"	.062"	Neutral	DMK30 (93100)		DMK30-GLH (93160)	
					DMK25 (93000)		DMK25-GLH (93060)	
					DMK15 (92900)		DMK15-GLH (92960)	
OPMH-644-T	.750"	.220"	.062"	T-land (stronger)	DMK30 (92700)		DMK30-GLH (92760)	
					DMP25 (92800)		DMP25-GLH (92860)	
					DMK15 (92600)		DMK15-GLH (92660)	
GROUND								
OXCH-634-D	.750"	.187"	.062"	Sharpest	DMK30 (98400)		DMK30-GLH (98460)	
OXCH-634-T‡	.750"	.187"	.062"	T-land (stronger)	DMK15 (98600)		DMK15-GLH (98660)	

OPMH-644 inserts have a maximum DOC of .200".

‡ *Closeout item. Available while supplies last. DMK30 and DMP25 are out of stock.*

Other grades available upon request.

SEE PG. 74 FOR INSERT GRADE DESCRIPTIONS

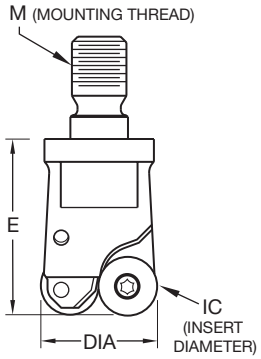
Screw-On Modular Heads

- Screw-on heads are 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
- See page 116 for modular extensions

SCREW-ON MODULAR HEADS

EDP	"R" Value	DIA Diameter	Holder	M Thread	E Effective Length	Flutes	Wrench	Insert See pg. for holder "R" value		Insert Dia.
82505	R3	.750"	TREM075-MOD-R3-2C	M10	1.50"	2	9/16"	Button		.375"
82515	R4	1.000"	TREM100-MOD-R4-2C	M12	1.50"	2	11/16"	Button	Octagonal	.500"
82525	R4	1.250"	TREM125-MOD-R4-3C	M16	1.75"	3	15/16"	Button	Octagonal	.500"
SY00075	R4	1.500"	TREM150-MOD-R4-3	M16	1.75"	3	15/16"	Button	Octagonal	.500"
SY00080	R6	1.500"	TREM150-MOD-R6-2	M16	1.75"	2	15/16"	Button	Octagonal	.750"

"C" denotes coolant-thru tool.

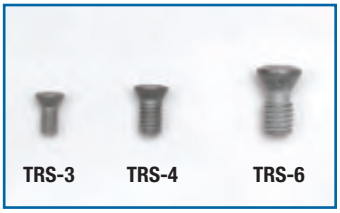


SEE PAGE 116 FOR CARBIDE CORE, SOLID CARBIDE AND HEAVY METAL MODULAR EXTENSIONS.

Spare Parts & Tools

FOR INCH PRODUCT			
Part Description	Order Number (EDP)		
	R3	R4	R5 / R6
Insert Screw	TRS-3 (83040)	TRS-4 (83050)	TRS-6 (83080)
Wrench	T8-F Flag (83000)	T15-T T-Handle (83010)	T20-T T-Handle (83020)
Torque	12-15 in-lbs	30-35 in-lbs	40-50 in-lbs

FOR METRIC PRODUCT		
Part Description	Order Number (EDP)	
	R5	R6
Insert Screw	TRS-3 (83040)	TRS-4 (83050)
Wrench	T8-F Flag (83000)	T15-T T-Handle (83010)
Torque	1.5 - 1.7 nM	3.5 - 4.0 nM



All listed tools use Anti-Seize Grease ASG-120.

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

OUR TORQUE WRENCH SYSTEMS MAKE REPEATABLE, ACCURATE INSERT LOADING EASIER THAN EVER BEFORE! SEE PAGE 118 FOR DETAILS.

Metric Series Cutter Bodies

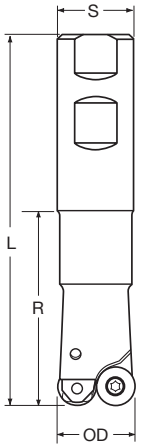
We offer high-performance metric series Toroid cutters and inserts in the most commonly used sizes and styles.

Metric End Mills

32mm shank dia. cutters and smaller are available in limited supply without Weldon Flats. Add WOF to the end of the part number when ordering.

METRIC END MILLS

EDP	OD Diameter	Holder	R Effective Length	L Overall Length	S Shank Dia.	Flutes	Insert
82000	20mm	TREM20-50-R5-2	50mm	103mm	20mm	2	RDCH10
82020	20mm	TREM20-75-R5-2C-WOF	75mm	128mm	20mm	2	RDCH10
82040	25mm	TREM25-65-R5-2C-WOF	65mm	121mm	25mm	2	RDCH10
82050	25mm	TREM25-65-R5-3	65mm	121mm	25mm	3	RDCH10
82060	25mm	TREM25-115-R5-3	115mm	171mm	25mm	3	RDCH10
82070	25mm	TREM25-65-R6-2	65mm	121mm	25mm	2	RDCH12
82080	25mm	TREM25-115-R6-2	115mm	171mm	25mm	2	RDCH12
82090	32mm	TREM32-75-R6-2	75mm	133mm	32mm	2	RDCH12
82110	32mm	TREM32-130-R6-2-WOF	130mm	184mm	32mm	2	RDCH12

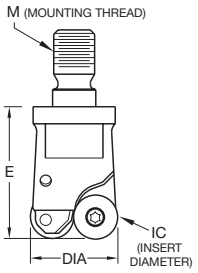


"C" denotes coolant-thru tool.

Metric Screw-On Modular Heads

METRIC SCREW-ON MODULAR HEADS

EDP	DIA Diameter	Holder	M Thread	E Effective Length	IC	Flutes	Insert
82550	20mm	TREM20-MOD-R5-2C	M10	38mm	10mm	2	RDCH10
82560	25mm	TREM25-MOD-R5-2C	M12	38mm	10mm	2	RDCH10



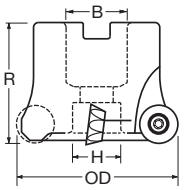
"C" denotes coolant-thru tool. These modular heads do not come with top clamps.

See page 116 for Carbide Core, Solid Carbide and Heavy Metal Modular Extensions.

Metric Shell Mills

METRIC SHELL MILLS

EDP	OD Diameter	Holder	R Effective Length	B Arbor Dia.	H Counter Bore Dia.	Flutes	Insert
82300	50mm	TRSM50-22-R6-4	38mm	22mm	10.4mm	4	RDCH12
82310	63mm	TRSM63-27-R6-5	50mm	27mm	12.4mm	5	RDCH12



Metric Series Inserts

"D" INSERTS
High-positive cutting edge for stainless steels, high-temperature alloys and gummy materials.

"T" INSERTS
Reinforced cutting edge for steels, irons and hard milling.

Button Inserts

Insert	IC	Thick-ness	Radius	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)	
PRESSED							
RDCH-10-D	10mm	3.18mm	5mm	Positive (sharper)	DMK30 (99050)	DMK30-TCI (99095)	DMK30-GLH (99080)
					DMP25 (99100)		DMP25-GLH (99130)
					DMK15 (99000)		DMK15-GLH (99030)
RDCH-10-T	10mm	3.18mm	5mm	T-land (stronger)	DMK30 (99200)	DMK30-TCI (99245)	DMK30-GLH (99230)
					DMP25 (99250)	DMP25-TCI (99295)	DMP25-GLH (99280)
					DMK15 (99150)	DMK15-TCI (99195)	DMK15-GLH (99180)
RDCH-12-D	12mm	4.75mm	6mm	Positive (sharper)	DMK30 (99350)		DMK30-GLH (99380)
					DMP25 (99400)		DMP25-GLH (99430)
					DMK15 (99300)		DMK15-GLH (99330)
RDCH-12-T	12mm	4.75mm	6mm	T-land (stronger)	DMK30 (99500)	DMK30-TCI (99545)	DMK30-GLH (99530)
					DMP25 (99550)	DMP25-TCI (99595)	DMP25-GLH (99580)
					DMK15 (99450)	DMK15-TCI (99495)	DMK15-GLH (99480)

Other grades available upon request.

SEE PG. 74 FOR INSERT GRADE DESCRIPTIONS

Application Information

Recommendations

- Tool is most appropriate for “Z-level” roughing; ramp to Depth of Cut (DOC) and clear entire level.
- Plunging ***is not*** recommended with Toroid cutters when using RHINO-CARB inserts. Ramping (up to 2° max.) ***is*** recommended.
- Minimum diametric plunging engagement is 75% of cutter diameter (RDCH inserts only).
- Try to maintain at least 75% of the cutter diameter on the workpiece whenever possible. Hanging a cutter off to the side of your work is detrimental to tool life and performance.
- Width of Cut (WOC) should be 60-75% of cutter diameter whenever possible, creating a “scalloping” effect (end mills only) between passes, especially with longer-length tools.
- Round inserts provide a very strong cutting edge and the ability to machine much closer to finish size. Utilize high speeds and feeds with light DOC to take advantage of these benefits. High metal removal rates will be achieved without high horsepower consumption.
- Use the Feed Rate Compensation charts on page 72 to compensate for chip thinning that occurs with Toroid inserts. This will provide for optimum metal removal rates and tool life; the lighter the DOC, the more critical feed compensation becomes.

Technical Considerations

- Always use anti-seize compound on screws.
- Change insert screw every 10 inserts.
- Use the shortest-length tool holder (end mill holder) for maximum rigidity; the shank of the cutting tool should be up inside the machine spindle taper whenever possible.
- Thoroughly clean pocket and screw at each insert change.
- Use tool holders appropriate for roughing operations: end mill holders and power chucks ***are*** recommended; collets ***are not*** recommended.

Troubleshooting

Concern	Possible Cause	Solutions
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 ❑ Increase DOC ❑ Use harder grade
Insert chipping	• Surface footage is low • Incorrect grade or coating • Using Dished insert incorrectly • Feed too high	❑ Verify correct speed and feed ❑ Increase spindle speed ❑ Decrease feed rate ❑ Decrease DOC ❑ Use T-Land Insert ❑ Use tougher grade
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 ❑ Use coolant
Poor finish/chatter	• Cutter hung out too far • Excessive runout • Inadequate tool holding	❑ Reduce tool gage length ❑ Check tool holder wear ❑ Use high-rigidity tool holder
Tool shank breaks	• Tool pressure too great • Fatigued cutter body	❑ Decrease DOC ❑ Reduce tool gage length ❑ Decrease feed rate

Feed Rate Compensation (Round Inserts)

After determining the desired chip thickness (FPT – see chart on pg. 75), find the insert diameter and Depth of Cut intersection in the chart at right. Multiply the desired chip thickness by the factor shown in the chart. This will be the Adjusted Feed per Tooth (AFPT), resulting in a true chip thickness of the desired amount.

Example: If using a 1" Toroid end mill with the 1/2" inserts @ .03" Depth of Cut (DOC), the factor for the chip thickness = 2.1. So, if a chip thickness of .005" is desired, a feed rate of .0105" (.005 x 2.1) needs to be programmed into the machine tool.

or

Adjusted Feed per Tooth (AFPT) = chip thickness x chip thinning factor (from chart)

Depth of Cut (DOC)	Insert Diameter 3/8"	1/2"	5/8"	3/4"
0.005	4.4	5	5.6	6.1
0.010	3.1	3.6	4	4.4
0.015	2.6	2.9	3.3	3.6
0.020	2.2	2.6	2.8	3.1
0.025	2	2.3	2.6	2.8
0.030	1.8	2.1	2.3	2.6
0.035	1.7	2	2.2	2.4
0.040	1.6	1.8	2	2.2
0.050	1.5	1.7	1.8	2
0.060	1.4	1.5	1.7	1.8
0.075	1.3	1.4	1.5	1.7
0.085	1.2	1.3	1.5	1.6
0.100	1.1	1.3	1.4	1.5
0.125	1.1	1.2	1.3	1.3
0.150	NR	1.1	1.2	1.3
0.180	NR	NR	1.1	1.2
0.200	NR	NR	NR	1.1
>0.20	NR	NR	NR	NR

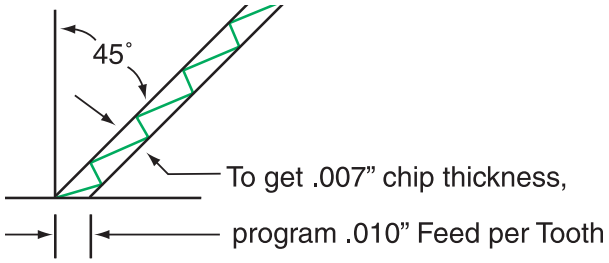
Compensation for 45° Lead Angle (Octagonal Inserts)

For all Depths of Cut:

Multiply desired chip thickness by 1.4 for Adjusted (programmed) Feed per Tooth (AFPT).

Example:

For .007" chip thickness, feed @ .010" (.007 x 1.4 = .010)



Hole Diameter Calculation

Helical Interpolation for Larger-Diameter Hole Making

Larger diameter hole making can be quick and easy when a Toroid Cutter is used in combination with helical interpolation. This technique resembles thread milling in that all three axes (X, Y and Z) are in motion simultaneously. It differs from thread milling in that the tool is introduced into the material without a start hole of any kind.

The tool is simply positioned at the inside diameter of the hole to begin its helix from there, achieving complete material removal from the hole by ramping down to the final depth. This smooth operation tends to avoid the high horsepower consumption characteristic of large diameter hole making. And with the high clearance angles of Toroid cutting tools, ramp angles during helical interpolation can be aggressive, without concern for rubbing the bottom of the cutting edge. This quick and easy process offers the added advantage of allowing many different hole sizes to be generated with the same diameter tool. Hole size variation is all in the programming.

For more information on how helical interpolation can improve your manufacturing efficiency, contact your Dapra Applications Specialist.

Shell Mill Part Number	Minimum Hole Dia.	Maximum Hole Dia.*
TRSM200-075-R4-4C	3.25”	4.00”
TRSM200-075-R4-5C	3.25”	4.00”
TRSM200-075-R5-3C	3.06”	4.00”
TRSM250-100-R5-4C	4.06”	5.00”
TRSM250-100-R4-6C	4.25”	5.00”
TRSM300-100-R4-6C	5.25”	6.00”
TRSM300-100-R5-5C	5.06”	6.00”
TRSM400-150-R4-7	7.25”	8.00”
TRSM400-150-R5-6	7.06”	8.00”

Minimum Hole Dia. =
(Tool Dia. x 2) - (1.5 x Insert Dia.)

Maximum Hole Dia.* =
Tool Dia. x 2

** Not generally recommended. At this diameter, the center tip is at its maximum. It is suggested that you stay slightly under this number.*

Toroid Insert Grade Descriptions

Shock & Wear Resistance	Uncoated (Base Grade)	with Coating	Description	Specifications
TOUGHEST Shock Resistance	DMK30		Moderate wear resistance/high shock resistance. Recommended for interrupted or unstable steel, most stainless steel, high-temperature alloys, and cast iron applications.	ANSI C1-C2 ISO K25-K40, M25-M35
		DMK30-TCI	High-performance medium- to high-temperature grade. Outstanding shock and wear resistance in steels, irons, and stainless steels. Best suited for materials < 44 Rc.	
		DMK30-GLH	Premium high-temperature coating. Good resistance to heat for high-shock applications. Excellent for tough stainless steels, high-temperature alloys, and many tool steels.	
	NEW	DMK30-HM	Same tough carbide substrate, but with a higher-temperature coating. Usually used for high-temperature alloys or tough stainless steels.	
MEDIUM Shock and Wear	DMK25 *RHINO-CARB D & N ONLY*		Micro-grain carbide providing higher wear resistance and good shock resistance for applications in tough stainless steels, high-temperature alloys, irons, and many tool steels.	ANSI C2-C3 ISO K15-K30, M15-M30
		DMK25-TCI	High-performance medium- to high-temperature grade. Outstanding shock and wear resistance in steels, irons, and stainless steels. Best suited for materials < 44 Rc.	
		DMK25-GLH	Premium high-temperature coating. Outstanding performance and wear resistance in high-heat applications involving tough stainless steels, high-temperature alloys, and many tool steels.	
MEDIUM Shock and Wear	DMP25		High wear resistance/moderate shock resistance. Recommended for most steel and many ductile iron applications.	ANSI C5-C6 ISO P25-P40
		DMP25-TCI	High-performance medium- to high-temperature grade. Outstanding wear resistance in steels and ductile. Best suited for materials < 44 Rc.	
		DMP25-GLH	Premium high-temperature grade. Unbeatable performance and wear resistance in high-heat applications such as higher speed machining in steels (< 44 Rc) and ductile irons.	
	NEW	DMP25-HM	Use HM for high-performance milling of tougher steels and tool steels.	
HARDEST Wear Resistance	DMK15		Highest wear resistance with reduced shock absorption capabilities. Micro-grain carbide provides excellent edge strength. Suitable for all materials under stable conditions. Optimum cast iron substrate.	ANSI C2-C3 ISO K15-K25, M15-M25
		DMK15-TCI	High-performance medium- to high-temperature grade. Great for higher-speed gray iron applications and lighter cuts in steels <52 Rc or ductile iron.	
		DMK15-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.	
	NEW	DMK15-HM	Use HM for the highest hardness in gray and ductile irons, as well as heat-treated steels.	

DMK30-GLH is a good first choice for most applications.

Additional coatings available on request. Contact us for details.

Recommended Cutting Speeds/Feeds

Recommended Cutting Speeds for Dapra Toroid Cutters			1018, 12L14, 1041, 1045	4140, 4150, 4340, H13, P20, A2, D2	4140, 4150, 4340, H13, P20, A2, D2 (40s Rc)	4140, 4150, 4340, H13, P20, A2, D2	STAINLESS STEEL – 300, 400 & PH SERIES	STAINLESS STEEL – 300, 400 & PH SERIES	GRAY, MALLEABLE, DUCTILE	6061, 7075	AMPCO, WEARITE	INCONEL, WASPALOY, MONEL	Ti-6AL-4V	
			LOW-TO-MEDIUM CARBON STEELS	TOOL STEELS, HIGH-ALLOY STEELS (SOFT)	TOOL STEELS, HIGH-ALLOY STEELS (MID-HARDNESS)	TOOL STEELS, HIGH-ALLOY STEELS (HARDENED)	DRY MACHINING	WITH COOLANT	CAST IRONS	ALU ALLOYS	COPPER ALLOYS	HIGH-TEMP. ALLOYS	TITANIUM	PLASTICS, NON-FERROUS
LOWER TEMPS »	TOUGHEST Shock Resistance	DMK30								**1500+**	200-600	50-120	120-180	**1500+**
		DMK30-TCI	450-700	350-600	250-400		**450-650**	**250-450**	450-750		300-550	50-120	120-180	
		DMK30-GLH	550-800	450-700	250-400		**450-700**	**300-550**	500-800		400-600	**50-120**	**120-180**	1500+
		DMK30-HM	550-800	450-700	250-400		450-700	**300-550**	500-800		400-600	**50-120**	**120-180**	
	MEDIUM Shock Resistance	DMK25-TCI†	400-700	350-600			450-650	250-450	450-750 (GRAY)		**300-550**			
		DMK25-GLH†	450-900	400-700			450-700	300-550	500-800 (GRAY)		**400-600**	**50-120 FINISHING**	**120-180 FINISHING**	
	MEDIUM Shock & Wear	DMP25-TCI	**400-700**	**350-600**	**300-500**				**300-650 DUCTILE**		300-600			
		DMP25-GLH	**450-900**	**400-700**	**350-550**	200-400			**300-750 DUCTILE**		400-650			
		DMP25-HM	450-900	**400-700**	**350-550**	200-400			**300-750 DUCTILE**		400-650			
« HIGHER TEMPS	HARDEST Wear Resistance	DMK15-TCI	500-800	450-750	300-500	**< 52 Rc 250-450**		250-650 FINISHING	**300-750 GRAY**		300-600			
		DMK15-GLH	550-900	450-800	350-550	**> 44 Rc 250-450**		**225-600 FINISHING**	**400-800 GRAY**		**400-650**	**50-120 FINISHING**	**120-180 FINISHING**	
		DMK15-HM	550-900	450-800	350-550	**> 44 Rc 250-450**		**225-600 FINISHING**	**400-800 GRAY**		**400-650**	**50-120 FINISHING**	**120-180 FINISHING**	
1ST CHOICE GEOMETRY			N/D	N/T	T	T	D/N	D/N	T/N	D (Ground)	D/N	D/N	D	D (Ground)
RECOMMENDED IPT			.006-.012	.006-.012	.005-.009	.002-.006	.004-.012	.003-.010	.005-.015	.005-.030	.005-.012	.002-.006	.002-.006	.005-.030

** Best choice for material shown in **bold text**.

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 FPT range. Next, increase FPT to optimize productivity and tool life. Higher SFM will provide higher output but may reduce tool life. Try different combinations to find the parameters that best suit your needs.

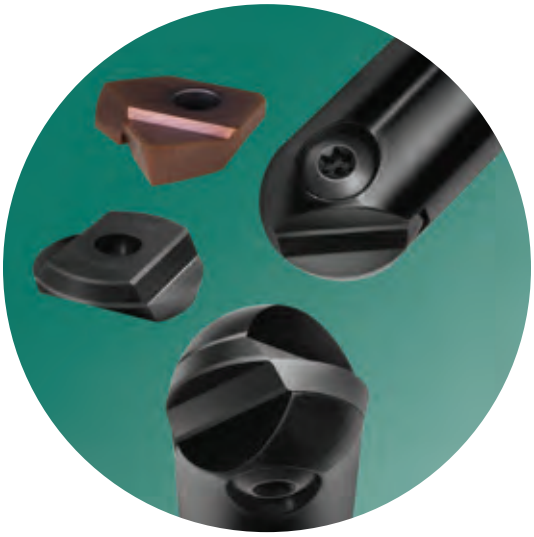
- The -TCI coating is best suited for low to medium operating speeds (temperatures) and softer materials.
- The -GLH and -HM coatings are best suited for high operating speeds (temperatures) and harder materials.

Ball Nose Finishing Mills

Achieve superior surface finishes with our single-sided and EDGE² SBN double-sided Ball Nose series indexable finish mills, including back draft and flat bottom tools. Ball Nose is great for:

- Close-tolerance, unattended contour finishing
- Light roughing
- Cavity/core roughing
- Pocketing
- Detail area roughing
- Tip cutting
- 3D profiling
- Semi-finishing
- Helical interpolation

YOUR CHOICE: EDGE² SBN or Single-Sided



EDGE² SBN Double-Sided

- Lower cost-per-edge with spherical, twin-edge inserts
- Thick, strong insert for greater heat and stress absorption
- Advanced geometry on new SBD back draft-style inserts provides outstanding finishes and the most accurate cutting
- Not as suitable for lacing or undercutting (must keep cutting to bottom 180°)

SEE PAGE 77

Single-Sided

- Larger total cutting angle for outstanding versatility
- Suitable for lacing and slight undercutting
- Ideal for finishing and light semi-finishing
- Huge cutter and insert variety

SEE PAGE 92

EDGE² SBN Spherical Ball Nose Series

Spherical, Twin-Edge Ball Nose System:
Truly Indexable Finishing Inserts!

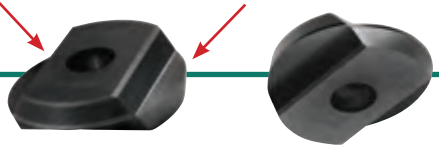
The EDGE² SBN spherical ball nose system features truly indexable inserts with two usable cutting edges, delivering both cost savings and the highest-quality finishes.

Thicker carbide construction provides better heat and stress absorption, and outstanding insert life allows for the longest unattended finishing runs – with superior surface finishes created by an improved grinding process. The SBN series is excellent for tip-cutting, 3D profiling, semi-finishing and light roughing.

SBN Series Inserts

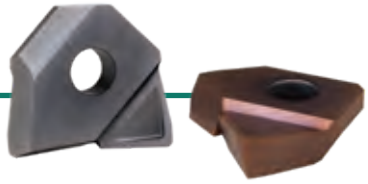
2x

Two usable cutting edges!



- Two usable edges for major cost savings – twice the number of usable edges as a normal, single-sided insert
- Thicker carbide insert construction for better heat and stress absorption
- Superior surface finishes due to an improved grinding process
- Outstanding insert life for finishing applications – allowing the longest unattended runs

NEW SBD Back Draft Inserts



- Design maximizes surface finish and rigidity while also minimizing cutting forces
- Interchangeable with SBN series inserts
- Ideal for semi-finishing and finishing of straight or tapered walls, as well as flat-bottom surfaces

SBN Series Cutter Bodies

- Fully thru-hardened bodies for optimum strength and longevity
- High accuracy/centrality for minimal runout, providing best finishes and tool life
- Close-tolerance insert pocket produced by EDM, removing less body material for improved insert support

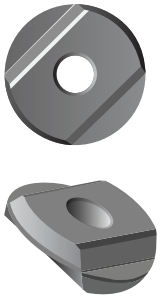
EDGE² SBN FINISHING TOOLS INDEX

STEP 1: CHOOSE YOUR INSERTS

SBN Spherical Ball Nose

EDGE² SBN series spherical ball nose finishing inserts are truly indexable, offering cost savings with two usable cutting edges instead of just one.

- Thicker carbide insert construction for better heat and stress absorption
- Superior surface finishes due to an improved grinding process
- Outstanding insert life for finishing applications – allowing the longest unattended runs
- Close-tolerance insert pocket produced by EDM, removing less body material for improved insert support
- Inserts come individually packed in tear-off boxes for easy vending machine loading



SBN INSERTS

Part #	D Ø Diameter	Thickness	Radius	Hole Diameter	Uncoated (EDP)	Available Coated Grades (EDP)		
					UC	GLH	TS	HM
SBN-0500	.500”	0.138”	0.250”	0.2070”	55500	55560	55587	55585
SBN-0750	.750”	0.218”	0.375”	0.2070”	55700	55760	55787	55765
SBN-1000	1.000”	0.250”	0.500”	0.2464”	55800	55860	55887	55865

SEE PG. 80 FOR INSERT GRADE DESCRIPTIONS

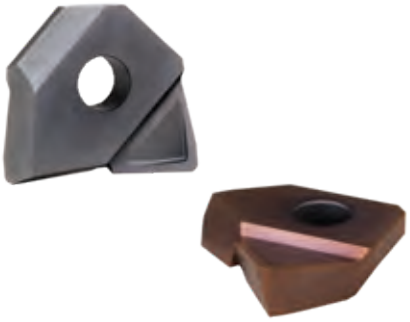
Other grades available upon request.

STEP 1: CHOOSE YOUR INSERTS

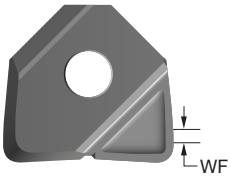
NEW SBD Back Draft-Style

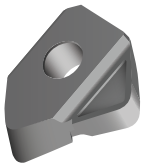
SBD is a brand-new Back Draft-style insert designed specifically for use in our EDGE² SBN finishing system. The SBD's superior design maximizes surface finish and rigidity while also minimizing cutting forces. These inserts are ideal for semi-finishing and finishing of straight or tapered walls, as well as flat-bottom surfaces.

- Interchangeable with EDGE² Spherical Ball Nose (SBN) inserts
- Positive-rake cutting wiper allows for larger stepdowns and faster feed rates than traditional Back Draft-style inserts
- Insert thickness provides optimum rigidity and heat control, resulting in superior tool life
- EDM pocket provides accuracy and accepts cutting forces with minimal deflection, allowing no insert movement
- Double-positive geometry minimizes cutting forces, maximizing accuracy
- Inserts come individually packed in tear-off boxes for easy vending machine loading



(Back draft angle: 7° per side)





SBD INSERTS

Part #	D Ø Diameter	Thickness	Radius	Hole Diameter	WF Wiper Flat	Uncoated (EDP)	Available Coated Grades (EDP)	
						UC	TS	HM
SBD-0500-R1/32	.500"	0.138"	0.031"	0.2070"	0.050"	54700	54795	54785
SBD-0500-R1/16	.500"	0.138"	0.062"	0.2070"	0.050"	54800	54895	54885
SBD-0750-R1/32	.750"	0.218"	0.031"	0.2070"	0.075"	55000	55095	55085
SBD-0750-R1/16	.750"	0.218"	0.062"	0.2070"	0.075"	55100	55195	55185
SBD-1000-R1/32	1.000"	0.250"	0.031"	0.2464"	0.100"	55200	55295	55285
SBD-1000-R1/16	1.000"	0.250"	0.062"	0.2464"	0.100"	55300	55395	55385

Other grades available upon request.

SEE PG. 80 FOR INSERT GRADE DESCRIPTIONS

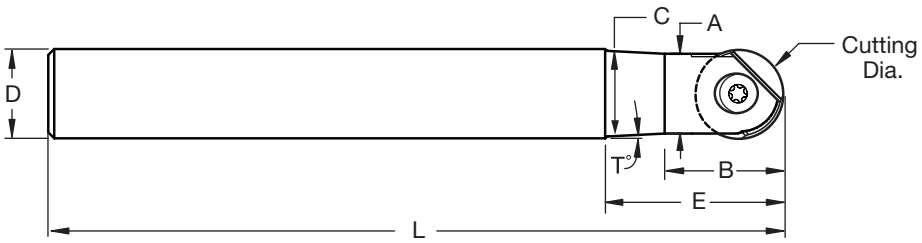
STEP 2: CHOOSE YOUR INSERT GRADE

Uncoated (Base Grade)	with Coating	Description	Specifications
UC		Sub-micron 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)
	GLH (SBN ONLY)	High-temperature and high-hardness coating. Proven performance and wear resistance in virtually all materials makes this a versatile and simple grade choice.	3600 HV, 2000° F, .2 Co
	TS	New coating intended for general-purpose use across a wide variety of materials including steels and stainless steels. High-temperature grade providing excellent heat and wear resistance. Use for most applications.	3800 HV, 2200° F, .2 Co
	HM	New coating intended primarily for high-temperature applications like hardened steels and tough PH-stainless steels. Highest hardness and heat resistance. Also excellent for irons.	4000 HV, 2400° F, .2 Co
	FPDL	Diamond-like coating for achieving better tool life vs. standard PVD coatings in graphite and composite applications, without the high cost of diamond-tipped or diamond-coated inserts.	5000 HV, 1000° F, .2 Co

STEP 3: CHOOSE YOUR CUTTER BODY

SBNEM Standard Shank

- Thru-hardened steel shanks
- EDM pocket for optimum strength and accuracy
- Straight inch or metric shanks



SBN END MILLS – STANDARD SHANK

	EDP	Holder	Cutting Diameter	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
INCH SHANK	41415	SBNEM-0500-7000-SS	0.500”	0.450”	0.750”	0.470”	0.500”	1.250”	1.7°	7.000”
	41440	SBNEM-0750-7500-SS	0.750”	0.670”	1.000”	0.720”	0.750”	1.880”	1.5°	7.500”
	41455	SBNEM-1000-8000-SS	1.000”	0.890”	1.500”	0.970”	1.000”	2.500”	2.2°	8.000”
METRIC SHANK	41420	SBNEM-0500-7000-SS-12MM	0.500”	0.450”	1.250”	Straight	12mm	1.250”	N/A	7.000”
	41445	SBNEM-0750-10000-SS-18MM	0.750”	0.670”	1.880”	Straight	18mm	1.880”	N/A	10.000”
	41460	SBNEM-1000-10000-SS-25MM	1.000”	0.890”	1.500”	0.970”	25mm	2.500”	1.7°	10.000”

Standard steel shank end mills can be saw cut to desired length.

STEP 3: CHOOSE YOUR CUTTER BODY

SC-SBNEM Solid Carbide

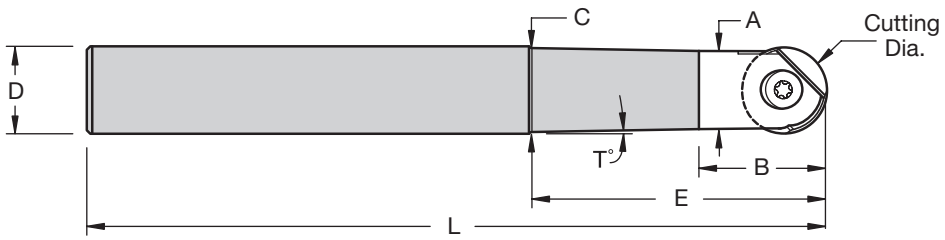
Achieve Maximum Performance with Solid Carbide Cutter Bodies!

Optimize performance with Carbide Shank tooling:

• Reduced deflection • Increased stiffness • Less chatter

• Heat shrink toolholding capability

**** 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.



SBN END MILLS – SOLID CARBIDE SHANK

	EDP	Holder	Cutting Diameter	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
INCH SHANK	41510	SC-SBNEM-0500-7000-SS	0.500"	0.450"	0.750"	0.470"	0.500"	2.000"	0.70°	7.000"
	41525	SC-SBNEM-0750-7500-SS	0.750"	0.670"	1.000"	0.720"	0.750"	2.500"	1.00°	7.500"
	41530	SC-SBNEM-0750-10000-SS	0.750"	0.670"	1.000"	0.720"	0.750"	3.750"	0.50°	10.000"
	41535	SC-SBNEM-1000-8000-SS	1.000"	0.890"	1.500"	0.970"	1.000"	3.000"	2.25°	8.000"
	41540	SC-SBNEM-1000-11000-SS	1.000"	0.890"	1.500"	0.970"	1.000"	4.500"	0.75°	11.000"
METRIC SHANK	41515	SC-SBNEM-0500-7000-SS-12MM	0.500"	0.450"	N/A	N/A	12mm	1.250"	N/A	7.000"
	41529	SC-SBNEM-0750-9000-SS-18MM	0.750"	0.670"	1.000"	N/A	18mm	1.500"	N/A	9.000"
	41545	SC-SBNEM-1000-10000-SS-25MM	1.000"	0.890"	1.500"	.970"	25mm	2.000"	3.70°	10.000"

Wire EDM is recommended for cutting solid carbide shank end mills to length.

STEP 3: CHOOSE YOUR CUTTER BODY

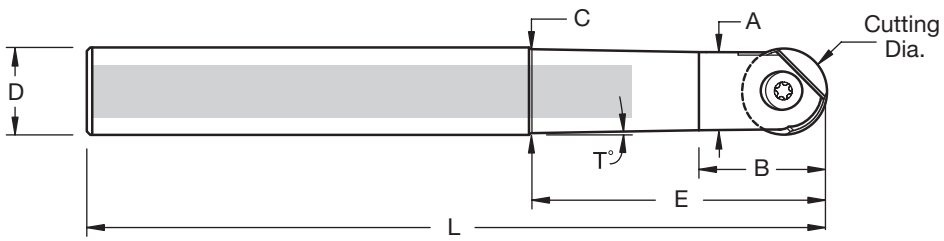
CC-SBNEM Carbide Core

Achieve Higher Performance with Carbide Core Cutter Bodies!

Optimize performance with Carbide Core tooling:

• Reduced deflection • Increased stiffness • Less chatter

Carbide core end mills are better suited to light roughing applications than solid carbide shank tools.



SBN END MILLS – CARBIDE CORE SHANK

	EDP	Holder	Cutting Diameter	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
INCH SHANK	41470	CC-SBNEM-0750-9000-SS	0.750”	0.670”	1.000”	0.720”	0.750”	2.250”	1.10°	9.000”
	41475	CC-SBNEM-1000-8000-SS	1.000”	0.890”	1.500”	0.970”	1.000”	3.000”	1.50°	8.000”

Wire EDM is recommended for cutting carbide core end mills to length.

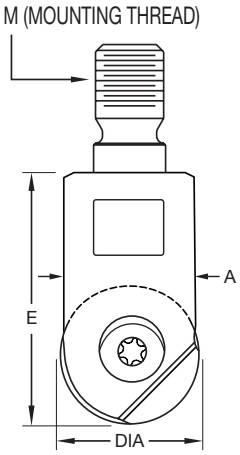
Screw-On Modular Heads

- Screw-on heads are 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
- See page 116 for modular extensions

SBN SCREW-ON MODULAR HEADS

EDP	DIA Diameter	Holder	M Thread	A Ø	E Effective Length	Flutes	Wrench
41590-M6	.500”	SBNEM-0500-MOD-M6	M6	0.440”	1.06”	2	3/8”
41590	.500”	SBNEM-0500-MOD	M8*	0.440”	1.06”	2	3/8”
41600	.750”	SBNEM-0750-MOD	M10	0.670”	1.25”	2	9/16”
41605	1.000”	SBNEM-1000-MOD	M12	0.890”	1.63”	2	9/16”

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



SEE PAGE 116 FOR CARBIDE CORE, SOLID CARBIDE AND HEAVY METAL MODULAR EXTENSIONS.

Spare Parts & Tools

Insert Screw (EDP)	Thread	Wrenches TORX® (EDP)	Torque Nm / in lbs
SBNS-0500-T20 (41710)	M5x.5	T20-T (83020)	6.0 / 45
SBNS-0750-T20 (41720)	M5x.5	T20-T (83020)	6.2 / 55
SBNS-1000-T20 (41730)	M6x.75	T20-T (83020)	6.5 / 58

All listed tools use Anti-Seize Grease ASG-120.

TORX® is a registered trademark of Camcar/Textron.

SBNS-0500-T20

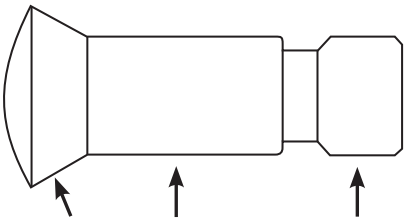
SBNS-0750-T20

SBNS-1000-T20

T20-T

OUR TORQUE WRENCH SYSTEMS MAKE REPEATABLE, ACCURATE INSERT LOADING EASIER THAN EVER BEFORE! SEE PAGE 118 FOR DETAILS.

Correctly Applying Anti-Seize & Indexing Inserts



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

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 and clean off insert mounting surfaces before assembly of insert/screw combination.
5. Place insert into cutter-body pocket. ***If you have already used one edge of your SBN insert, rotate insert 180° before placing into 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 on page 85.
9. Repeat steps 2-8 for each insert change.
10. Replace screw with each new box of inserts to assure maximum performance.

Keys to Success

ONLY Dapra's SBN tool system allows you to achieve high-quality finishes AND use a Ball Nose insert twice!

Achieving this cost savings requires adhering to a few simple application guidelines (see Diagram D1 below for examples):

MOST IMPORTANT! *Your SBN insert has a full 360 degrees of metal-cutting surface, but it must be used only 180 degrees at a time. All cutting must be kept at or below the insert center line to allow the cutting edges to perform correctly. Any attempts at cutting above the insert center line may result in failure, including insert and/or cutter damage.*

FINISHING

Use your SBN insert for finishing, preferably with a top-down program. In other words, start your cutting at the top of a part and profile around, slowly working your way down to the bottom (water-line programming/Z-level finishing). A raster-pass (lacing) cut may be used, but take care to leave less than .010" finish stock to avoid cutting above the insert center line. Best performance is achieved in tapered-wall work, but straight-wall finishing can be accomplished by using **ONLY** the "top-down" approach detailed below (see Diagram D1).

SEMI-FINISHING (LIGHT ROUGHING)

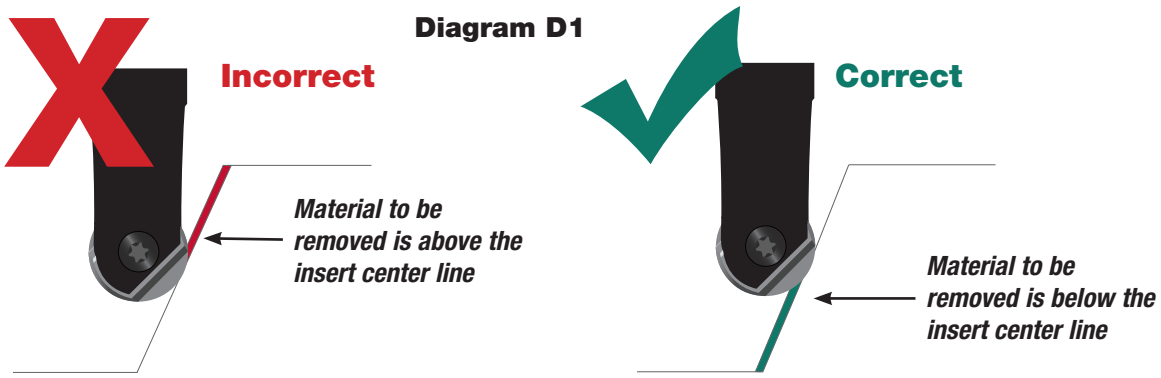
Use your SBN insert **ONLY** with a top-down approach when semi-finishing or light roughing. Start your cutting at the top of a part and profile around, working your way down. Do **NOT** attempt to lace cut or raster, as rubbing on the back side of your SBN insert may occur (cutting above insert center-line), ruining the surface finish and potentially damaging your SBN insert.

ROUGHING

Your SBN insert is **NOT** suitable for roughing.

***** IN GENERAL, KEEP YOUR CUTTING CONTAINED TO THE BOTTOM 180 DEGREES OF THE INSERT – THIS ALLOWS TWO USES INSTEAD OF ONE!***

Diagram D1



Application Information

Technical Considerations

- Always use anti-seize compound on threads and screw body.
- Thoroughly clean insert pocket and insert mounting surfaces at each index to maintain best concentricity.
- Change insert screw every 10 inserts (20 edges).
- 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 stock removal for semi-finishing should be less than 7% of the SBN diameter.
- Optimum amount of finishing stock to leave is .003-.007”.
- Stepover should be greater than or equal to DOC.
- Climb milling is preferred.
- Compensate for Effective Cutting Diameter (see Table 1 and Fig. 1 on p. 89).
- Compensate for chip thinning with Feed Rate Adjustment (see Table 2 on p. 89).
- 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.

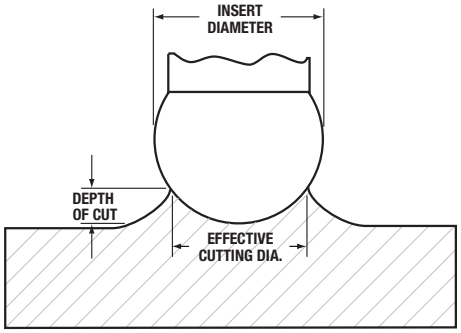
Feed, Speed & Diameter Compensation

Table 1: Effective Cutting Diameter (ECD)

INSERT DIA.	DEPTH OF CUT (DOC)										
	.005	.010	.015	.025	.035	.050	.100	.125	.150	.200	.250
.500	.099	.140	.171	.218	.255	.300	.400	.433	.458	.490	.500
.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. 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 page 91 to select Feed per Tooth (**FPT**). Calculate Inches per Minute (**IPM**). (**RPM** x **FPT** x 2 x **FRA** = **IPM**)

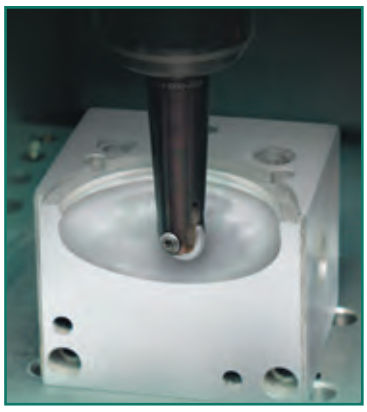
FIGURE 1



** For the cuts that are not strictly tip-cutting, but will use both the tips and sides of the SBN insert, pick an effective cutting diameter in between the ECD in the chart and the actual diameter of the insert. For example: If the ECD comes out to .210" with a .750" diameter insert, use .480" as your ECD when calculating RPM.*

Table 2: Feed Rate Adjustment (FRA)

These feed rate multipliers are for applications involving tip-cutting only.
For applications including side-cutting or slight/draft angles, lower the multiplier by 20-50%.



DEPTH OF CUT (DOC)	INSERT DIAMETER		
	1/2"	3/4"	1"
.005	5.0	6.1	7.1
.010	3.6	4.4	5.0
.015	2.9	3.6	4.1
.020	2.6	3.1	3.6
.025	2.3	2.8	3.2
.050	1.7	2.0	2.3
.075	N/R	1.7	1.9
.100	N/R	N/R	1.7

Use multiple above to calculate adjusted feed rate.

For optimum speed and feed calculation assistance, visit our website: 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

Recommended Cutting Speeds/Feeds

Recommended Cutting Speeds for Dapra SBN Cutters

MATERIAL GROUP		EXAMPLE	F1 *(uncoated)*	FP-GLH	FP-HM/TS	FPT
PLAIN STEELS	< 3%C	1008, 1018, 12L14	300-600	**800-1200**	**800-1200**	.002-.007
	3%-6%C	1040, 1045, 1055				
	5%-1.5%C	1060, 1070, 1095				
ALLOY STEELS	Mo	4012, 4320, 4340		**600-1000**	**600-1000**	
	Cr	52100, 5120				
	NiCrMo	8620, 8622, 8640				
TOOL & DIE STEELS		A2, D2, P20, W2, H13, S7				
HARDENED STEELS			N/R	**250-600**	**250-600**	.002-.005
STAINLESS STEELS	Ferritic/Martensitic	403, 416, 430, 430F, 434, 446, S44400	150-300	**400-900**	**500-900**	.002-.006
	Austenitic	304L, 303, 304, 316L		**300-800**	**300-800**	
	Precipitation Hardening (PH)	15-5PH, 17-4PH, custom, 455, PH13-8 Mo, AM355		**250-700**	**250-700**	
CAST IRON	Gray	A48 Class xx B, A436 Type 2	350-600	**600-1000**	**600-1000 (HM)**	.003-.008
	Malleable	A47, A220, SAE J148		**400-850**	**400-900 (HM)**	
	Ductile	60-40-18, 100-70-03, SAE J434				
ALUMINUM ALLOYS		2024-T4, 6061-T6, 7075-T6	**1000+**	1000+	1000+	.005-.010
COPPER ALLOYS	CuNi: refer to High-Temp. Alloys below	J463, B121, Ampco 21, Wearite 4-13	300-600	**500-800**	500-800	
HIGH-TEMP. ALLOYS		Inconel 617, Monel K500, Waspaloy, CuNi 70-30	50-125	**50-150**	**50-150**	.002-.004
TITANIUM ALLOYS		Ti99.9, Alpha Alloy, Ti-6Al-4V	100-200	**100-250**	**100-250**	.002-.005
CARBON GRAPHITE			700-1000 **1200+** **FPDL**	1200+	1200+	.004-.010

Other coatings available upon request.

Refer to the Diameter and Feed Rate Adjustment charts on page 89 for accurate RPM and IPM calculations.

** Best choice grades shown in **bold text**.

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 FPT range. Next, increase FPT 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.

Single-Sided Ball Nose Finishing Series

Achieve superior surface finishes with the many insert and cutter choices in our Ball Nose finishing series. We offer a huge variety of finishing inserts that all fit the same cutter bodies.

- Geometry and coatings produce superior surface finishes
- Excellent tool life reduces or eliminates costly bench work
- Ideal for unattended contour finishing applications
- High-speed runs reduce cycle time by 50%
- Precision-ground inserts achieve closer tolerances and longer life
- Hardened steel cutter bodies ensure close-tolerance finishing
- ***NEW*** Rough-Duty RDBN inserts for demanding light roughing and finishing applications

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

We were the first company in the industry to offer a permanent Automatic Cutter Replacement Program. Receive ***FREE*** or ***1/2 PRICE*** replacement Ball Nose, Back Draft, and Flat Bottom cutters with the purchase of our Ball Nose, Flat Bottom, Back Draft, and High-Feed inserts!*

HERE'S HOW IT WORKS:


HBN


FBR-N


BDR-N


BNR-N


BDR-CB


FBR-CB


HFBD


BNR-CB


BNR-PCD


RDBN

Every time you buy 30 inserts...

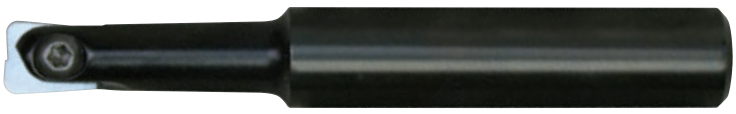
Dapra will give you a ***FREE*** corresponding Steel cutter body.*

OR

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

**** 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.*

3 THREE STEPS to Quick & Easy Ordering

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

2 ***STEP TWO:***
Choose Your Insert Grade

3 ***STEP THREE:***
Choose Your Cutter Body

BALL NOSE FINISHING TOOLS INDEX

STEP 1: CHOOSE YOUR INSERTS

NEW RDBN Rough-Duty Ball Nose Inserts

Designed for demanding light roughing and finishing applications.

RDBN is a stronger insert for our standard Ball Nose tool line, designed to stand up to more demanding light roughing and finishing applications: heavier cuts, long tool overhangs, and tougher materials.

- Tougher carbide substrate for added shock resistance
- Stronger ground cutting edges for extra strength and durability
- Helical geometry for reduced cutting forces

RDBN INSERTS

Part #	D Ø Diameter	Thickness	Hole Diameter	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)	
					T1	TS	HM
RDBN-0500	0.500”	0.098”	0.197”	Strong, Helical	57000	57003	57001
RDBN-0625	0.625”	0.118”	0.197”	Strong, Helical	57020	57023	57021
RDBN-0750	0.750”	0.118”	0.197”	Strong, Helical	57040	57043	57041
RDBN-1000	1.000”	0.157”	0.237”	Strong, Helical	57060	57063	57061

SEE PG. 101 FOR INSERT GRADE DESCRIPTIONS

Other grades available upon request.

Refer to pg. 115 for speed recommendations by material.

More insert options follow on pages 95-100.

STEP 1: CHOOSE YOUR INSERTS

HBN Helical Cutting Edge Ball Nose Inserts

Improved tip geometry for better surface finishes and longer tool life.

Single-sided HBN series helical cutting edge inserts provide optimized performance in all Ball Nose finishing applications.

- Smoother cutting action
- Reduced chatter
- Cleaner surface finish
- Reduced stress on work materials
- Reduced tool pressure and heat
- Longer tool life
- Sharpest cutting edge – ideal for all nonferrous applications

HBN INSERTS

Part #	D Ø Diameter	Thickness	Hole Diameter	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)			
					F1	FP0	FP-GLH	FP-HM	FPD
HBN-0375	0.375”	0.0981”	0.1578”	Sharp, Helical	42300	42360	42340	42365	49105
HBN-0500	0.500”	0.0981”	0.1972”	Sharp, Helical	42400	42460	42440	42465	49110
HBN-0625	0.625”	0.1178”	0.1972”	Sharp, Helical	42500	42560	42540	42565	REQ
HBN-0750	0.750”	0.1178”	0.1972”	Sharp, Helical	42600	42660	42640	42665	49120
HBN-1000	1.000”	0.1572”	0.2365”	Sharp, Helical	42700	42760	42740	42765	49130
HBN-1250	1.250”	0.1965”	0.3152”	Sharp, Helical	42800	42860	42840	REQ	REQ
METRIC									
HBN-10MM	10mm	2.5mm	4.0mm	Sharp, Helical	54000	54080	54060	REQ	REQ
HBN-12MM	12mm	2.5mm	5.0mm	Sharp, Helical	54100	54180	54160	REQ	REQ
HBN-16MM	16mm	3.0mm	5.0mm	Sharp, Helical	54200	54280	54260	REQ	REQ
HBN-20MM	20mm	3.0mm	5.0mm	Sharp, Helical	54300	54380	54360	REQ	REQ
HBN-25MM	25mm	4.0mm	6.0mm	Sharp, Helical	54400	54480	54460	REQ	REQ
HBN-30MM	30mm	5.0mm	8.0mm	Sharp, Helical	54500	54580	54560	REQ	REQ
HBN-32MM	32mm	5.0mm	8.0mm	Sharp, Helical	54600	54680	54660	REQ	REQ

REQ = Available upon request; 2-week lead time typical.
8-week lead time for FPD (diamond).

Other grades available upon request.

SEE PG. 101 FOR INSERT GRADE DESCRIPTIONS

STEP 1: CHOOSE YOUR INSERTS

BNR Standard Ball Nose Inserts


BNR-N


BNR-CB


BNR-N-PCD

- The industry standard for indexable ball nose finishing
- Precision-ground inserts are maintained at a .0005" tolerance
- Strong cutting edge for steels and irons ("N")
- Sharp cutting edge for stainless steel and high-temperature alloys ("CB")
- Excellent for light roughing, semi-finishing, and finishing – even lights-out finishing work
- Interchangeable with BDR, FBR, RDBN, and HFBD inserts

PCD-tipped inserts (see coated grade column PCD below) are ideal for the milling of soft, nonferrous materials such as graphite and aluminum (not for steels or iron). They offer outstanding wear resistance and are precision ground to provide a sharp, accurate cutting radius. Choose PCD-tipped Ball Nose inserts when milling these materials, and you may achieve tool life improvement of 50 to 100 times better than coated carbide!

BNR INSERTS – INCH SIZES

Part #	D Ø Diameter	Thickness	Hole Diameter	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)						
					F1	FPO	FP-GLH	FP-TS	FP-HM	FP-DL	FPD	PCD
BNR-0375-N	0.375"	0.0981"	0.1578"	Strong, Flat	43000	43060	43040	43067	43065	43030	49000	43070
BNR-0500-N	0.500"	0.0981"	0.1972"	Strong, Flat	43100	43160	43140	43167	43165	43135	49010	43170
BNR-0625-N	0.625"	0.1178"	0.1972"	Strong, Flat	43200	43260	43240	43267	43265	REQ	43230	
BNR-0750-N	0.750"	0.1178"	0.1972"	Strong, Flat	43300	43360	43340	43395	43365	43372	49020	43370
BNR-1000-N	1.000"	0.1572"	0.2365"	Strong, Flat	43400	43460	43440	43467	43465	43475	49030	43470
BNR-1250-N	1.250"	0.1965"	0.3152"	Strong, Flat	43500	43560	43540	REQ	REQ	REQ		
BNR-0312-CB	0.312"	0.0784"	0.1184"	Strong, Chipbreaker	43700	43760	43740	REQ	43765	REQ	49300	
BNR-0375-CB	0.375"	0.0981"	0.1578"	Strong, Chipbreaker	43800	43860	43840	REQ	REQ	REQ		
BNR-0500-CB	0.500"	0.0981"	0.1972"	Strong, Chipbreaker	43900	43960	43940	43967	REQ	REQ	49310	
BNR-0625-CB	0.625"	0.1178"	0.1972"	Strong, Chipbreaker	44000	44060	44040	REQ	REQ	REQ		
BNR-0750-CB	0.750"	0.1178"	0.1972"	Strong, Chipbreaker	44100	44160	44140	44167	44165	REQ		
BNR-1000-CB	1.000"	0.1572"	0.2365"	Strong, Chipbreaker	44200	44260	44240	44267	44265	REQ	MP00795	
BNR-1250-CB	1.250"	0.1965"	0.3152"	Strong, Chipbreaker	44300	44360	44340	REQ	REQ	REQ		

REQ = Available upon request; 2-week lead time typical.

SEE PG. 101 FOR INSERT GRADE DESCRIPTIONS

Other grades available upon request.

STEP 1: CHOOSE YOUR INSERTS

BNR Standard Ball Nose Inserts – Metric

BNR INSERTS – METRIC SIZES

Part #	D Ø Diameter	Thickness	Hole Diameter	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)				
					F1	FP0	FP-GLH	FP-TS	FP-HM	FP-DL
BNR-12MM-N	12mm	2.5mm	5.0mm	Strong, Flat	51200	51260	51240	REQ	REQ	REQ
BNR-16MM-N	16mm	3.0mm	5.0mm	Strong, Flat	51300	51360	51340	REQ	REQ	REQ
BNR-20MM-N	20mm	3.0mm	5.0mm	Strong, Flat	51400	51460	51440	REQ	REQ	REQ
BNR-25MM-N	25mm	4.0mm	6.0mm	Strong, Flat	51500	51560	51540	REQ	REQ	REQ
BNR-30MM-N	30mm	5.0mm	8.0mm	Strong, Flat	51600	51660	51640	REQ	REQ	REQ
BNR-32MM-N	32mm	5.0mm	8.0mm	Strong, Flat	51700	REQ	REQ	REQ	REQ	REQ
BNR-08MM-CB	8mm	2.0mm	3.0mm	Strong, Chipbreaker	52000	REQ	52040	REQ	REQ	REQ
BNR-10MM-CB	10mm	2.5mm	4.0mm	Strong, Chipbreaker	52100	52160	52140	REQ	REQ	REQ
BNR-12MM-CB	12mm	2.5mm	5.0mm	Strong, Chipbreaker	52200	52260	52240	REQ	REQ	REQ
BNR-16MM-CB	16mm	3.0mm	5.0mm	Strong, Chipbreaker	52300	52360	52340	REQ	REQ	REQ
BNR-20MM-CB	20mm	3.0mm	5.0mm	Strong, Chipbreaker	52400	REQ	52490	REQ	REQ	REQ
BNR-25MM-CB	25mm	4.0mm	6.0mm	Strong, Chipbreaker	52500	REQ	52540	REQ	REQ	REQ
BNR-32MM-CB	32mm	5.0mm	8.0mm	Strong, Chipbreaker	52600	REQ	REQ	REQ	REQ	REQ

REQ = Available upon request; 2-week lead time typical.

Other grades available upon request.

SEE PG. 101 FOR INSERT GRADE DESCRIPTIONS

STEP 1: CHOOSE YOUR INSERTS

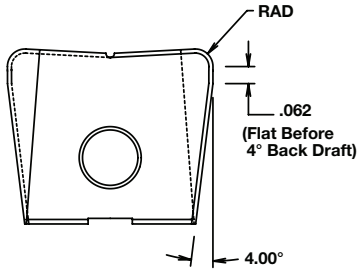
BDR Back Draft Inserts

BDR-N

BDR-CB

BDR-PCD

- Reduced tool pressure for long-reach wall, core, and cavity finishing
- Wiper flat produces fine finishes on straight-wall work
- Multiple corner radii available
- Strong "N" geometry for steels, irons, and graphite electrodes
- Sharper "CB" geometry for stainless and high-temp. alloys, and for minimizing fracture on graphite



(Back draft angle: 4° per side)

BDR INSERTS

Part #	D Ø Diameter	Corner Radius	Thick-ness	Hole Dia.	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)						
						F1	FPO	FP-GLH	FP-TS	FP-HM	FP-DL	FPD	PCD
BDR-0375-N R1/32	0.375"	1/32	0.0981"	0.1578"	Strong, Flat	46600	46660	46640	46667	46665	46630	49050	49200*
BDR-0375-N-R1/16	0.375"	1/16	0.0981"	0.1578"	Strong, Flat	46700	46760	46740	REQ	46765	46730	49055	
BDR-0500-N-R1/32	0.500"	1/32	0.0981"	0.1972"	Strong, Flat	46800	46860	46840	46867	46865	46805	49060	49210*
BDR-0500-N-R1/16	0.500"	1/16	0.0981"	0.1972"	Strong, Flat	46900	46960	46940	46967	46965	46930	49070	49220*
BDR-0625-N-R1/32	0.625"	1/32	0.1178"	0.1972"	Strong, Flat	48100	48160	48140	REQ	REQ	REQ	REQ	
BDR-0625-N-R1/16	0.625"	1/16	0.1178"	0.1972"	Strong, Flat	48200	48260	48240	REQ	REQ	REQ		
BDR-0750-N-R1/32	0.750"	1/32	0.1178"	0.1972"	Strong, Flat	47200	47260	47240	REQ	47265	47230	47250	49230*
BDR-0750-N-R1/16	0.750"	1/16	0.1178"	0.1972"	Strong, Flat	47300	47360	47340	47367	47365	47330	49080	49240*
BDR-1000-N-R1/32	1.000"	1/32	0.1572"	0.2365"	Strong, Flat	47400	47460	47440	47467	47465	47430	49090	49250*
BDR-1000-N-R1/16	1.000"	1/16	0.1572"	0.2365"	Strong, Flat	47500	47560	47540	47567	47565	47530	49100	49255*
BDR-1000-N-R1/8	1.000"	1/8	0.1572"	0.2365"	Strong, Flat	47600	47660	47640	47667	47665	REQ		
BDR-0500-CB-R1/32	0.500"	1/32	0.0981"	0.1972"	Strong, Chipbreaker	47800	47860	47840	47867	REQ	REQ		
BDR-0500-CB-R1/16	0.500"	1/16	0.0981"	0.1972"	Strong, Chipbreaker	47900	47960	47940	47967	REQ	REQ		
BDR-0500-CB-R1/8	0.500"	1/8	0.0981"	0.1972"	Strong, Chipbreaker	48000	48060	48040	REQ	REQ	REQ		
BDR-0625-CB-R1/32	0.625"	1/32	0.1178"	0.1972"	Strong, Chipbreaker	48100	48160	48140	REQ	REQ	REQ		
BDR-0625-CB-R1/16	0.625"	1/16	0.1178"	0.1972"	Strong, Chipbreaker	48200	48260	48240	REQ	REQ	REQ		
BDR-0750-CB-R1/32	0.750"	1/32	0.1178"	0.1972"	Strong, Chipbreaker	48300	48360	48340	48367	REQ	REQ		
BDR-0750-CB-R1/16	0.750"	1/16	0.1178"	0.1972"	Strong, Chipbreaker	48400	48460	48440	48467	48465	REQ		
BDR-0750-CB-R1/8	0.750"	1/8	0.1178"	0.1972"	Strong, Chipbreaker	48500	48560	48540	REQ	REQ	REQ		
BDR-1000-CB-R1/32	1.000"	1/32	0.1572"	0.2365"	Strong, Chipbreaker	48600	48660	48640	48667	REQ	REQ		
BDR-1000-CB-R1/16	1.000"	1/16	0.1572"	0.2365"	Strong, Chipbreaker	48700	48760	48740	48767	REQ	REQ		
BDR-1000-CB-R1/8	1.000"	1/8	0.1572"	0.2365"	Strong, Chipbreaker	48800	48860	48840	REQ	REQ	REQ		

REQ = Available upon request; 2-week lead time typical.

8-week lead time for FPD (diamond coating).

**** DOC of PCD-tipped BDR inserts is 0.125".***

SEE PG. 101 FOR INSERT GRADE DESCRIPTIONS

Other grades available upon request.

STEP 1: CHOOSE YOUR INSERTS

FBR Flat Bottom Inserts

FBR-CB FBR-N

- For fine finishing of tapered walls or floor work
- Multiple corner radii available
- Excellent for any bull nose cutter applications

FBR INSERTS

Part #	D Ø Diameter	Corner Radius	Thickness	Hole Dia.	Edge Type	Uncoated (EDP)	Available Coated Grades (EDP)				
						F1	FP0	FP-GLH	FP-TS	FP-HM	FP-DL
FBR-0375-N-R1/32	0.375”	1/32	0.0981”	0.1578”	Strong, Flat	44500	44560	44540	REQ	REQ	REQ
FBR-0500-N-R1/32	0.500”	1/32	0.0981”	0.1972”	Strong, Flat	44600	44660	44640	44667	REQ	REQ
FBR-0500-N-R1/16	0.500”	1/16	0.0981”	0.1972”	Strong, Flat	44700	44760	44740	REQ	44765	REQ
FBR-0625-N-R1/32	0.625”	1/32	0.1178”	0.1972”	Strong, Flat	44820	44860	44840	REQ	REQ	REQ
FBR-0625-N-R1/16	0.625”	1/16	0.1178”	0.1972”	Strong, Flat	44920	44960	44940	REQ	REQ	REQ
FBR-0750-N-R1-32	0.750”	1/32	0.1178”	0.1972”	Strong, Flat	45000	45060	45040	REQ	REQ	REQ
FBR-0750-N-R1/16	0.750”	1/16	0.1178”	0.1972”	Strong, Flat	45100	45160	45140	REQ	45165	REQ
FBR-1000-N-R1/32	1.000”	1/32	0.1572”	0.2365”	Strong, Flat	45200	45260	45240	REQ	REQ	45275
FBR-1000-N-R1/16	1.000”	1/16	0.1572”	0.2365”	Strong, Flat	45300	45360	45340	REQ	45365	REQ
FBR-0500-CB-R1/32	0.500”	1/32	0.0981”	0.1972”	Strong, Chipbreaker	45600	45660	45640	REQ	REQ	REQ
FBR-0500-CB-R1/16	0.500”	1/16	0.0981”	0.1972”	Strong, Chipbreaker	45700	45760	45740	REQ	REQ	REQ
FBR-0625-CB-R1/32	0.625”	1/32	0.1178”	0.1972”	Strong, Chipbreaker	45800	45860	45840	REQ	REQ	REQ
FBR-0625-CB-R1/16	0.625”	1/16	0.1178”	0.1972”	Strong, Chipbreaker	45900	45960	45940	REQ	REQ	REQ
FBR-0750-CB-R1/32	0.750”	1/32	0.1178”	0.1972”	Strong, Chipbreaker	46000	46060	46040	REQ	REQ	REQ
FBR-0750-CB-R1/16	0.750”	1/16	0.1178”	0.1972”	Strong, Chipbreaker	46100	46160	46140	REQ	REQ	REQ
FBR-1000-CB-R1/32	1.000”	1/32	0.1572”	0.2365”	Strong, Chipbreaker	46200	46260	46240	REQ	REQ	REQ
FBR-1000-CB-R1/16	1.000”	1/16	0.1572”	0.2365”	Strong, Chipbreaker	46300	46360	46340	REQ	46365	REQ

REQ = Available upon request; 2-week lead time typical.

Other grades available upon request.

SEE PG. 101 FOR INSERT GRADE DESCRIPTIONS

STEP 1: CHOOSE YOUR INSERTS

HFBD High-Feed Inserts

High-feed HFBD inserts provide the 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)

Program the HFBD insert as a “Bull Nose” (end mill with corner radius) using the Program Radius listed in the chart below.

DAPRA recommends a maximum 1° ramp angle on these inserts.

HFBD INSERTS

Part #	D Ø Diameter	Uses Cutter	Program Radius	Corner Radius Actual	FPT*	Max. DOC	Uncoated (EDP)	Available Coated Grades (EDP)			
							F1	FP0	FP-GLH	FP-TS	FP-HM
HFBD-0375	0.375”	BNEM0375 / GWR10	.0295”	.020”	.010-.020	.013”	42000	42020	42010	42027	42025
HFBD-0500	0.500”	BNEM0500 / GWR12	.0558”	.034”	.012-.025	.020”	42030	42060	42050	42067	42065
HFBD-0625	0.625”	BNEM0625 / GWR16	.0766”	.048”	.012-.030	.025”	42080	42100	42090	REQ	REQ
HFBD-0750	0.750”	BNEM0750 / GWR20	.0852”	.062”	.012-.040	.028”	42110	42130	42120	42137	42135
HFBD-1000	1.000”	BNEM1000 / GWR25	.1104”	.076”	.012-.040	.033”	42140	42170	42160	42177	REQ

REQ = Available upon request; 2-week lead time typical.

Please refer to standard BNR ball nose insert pages for insert thickness and hole size dimensions.

A special corner radius value is required for correct programming of a high-feed insert. Using the Program Radius avoids gouging of the corners in the workpiece material.

**** FPT is already adjusted for high-feed chip thinning. Use the actual FPT shown here to calculate the feed in IPM (inches per minute).***

SEE PG. 101 FOR INSERT GRADE DESCRIPTIONS

Other grades available upon request.

STEP 2: CHOOSE YOUR INSERT GRADE

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

Uncoated (Base Grade)	with Coating	Description	Specifications
F1		Sub-micron 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)
	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
	FP-GLH	Premium high-temperature grade. Strong 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
	FP-TS *NEW*	New coating intended for general-purpose use across a wide variety of materials including steels and stainless steels. High-temperature grade providing excellent heat and wear resistance. Use for most applications.	3800 HV, 2200° F, .2 Co
	FP-HM *NEW*	New coating intended primarily for high-temperature applications like hardened steels, tough stainless steels, high-temperature alloys, and titanium. Highest hardness and heat resistance. Also excellent for irons.	4000 HV, 2400° 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	Premium **diamond-tipped** grade for carbon, composites, 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-DL *NEW*	Diamond-like coating for achieving better tool life vs. standard PVD coatings in graphite and composite applications, without the high cost of diamond-tipped or diamond-coated inserts.	5000 HV, 1000° F, .2 Co

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

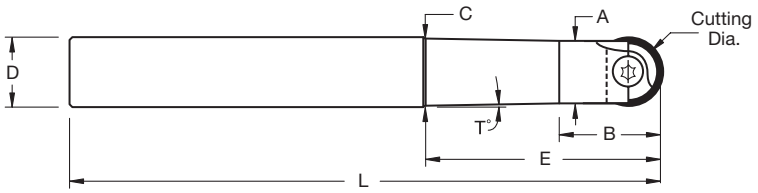
RDBN Rough-Duty Ball Nose Insert Grades

Uncoated (Base Grade)	with Coating	Description	Specifications
T1		Micro-grain tungsten carbide with high edge strength and enhanced toughness. Good for machining steels, stainless steels, high-temperature alloys, cast iron, and nonferrous materials.	C1-C2, ANSI K20-K40
	TS	New coating intended for general-purpose use across a wide variety of materials including steels, stainless steels, and irons. High-temperature grade providing excellent heat and wear resistance. Use for most applications.	3800 HV, 2200°F, .2 Co
	HM	New coating intended primarily for high-temperature applications like hardened steels, tough stainless steels, high-temperature alloys, and titanium. Highest hardness and heat resistance.	4000 HV, 2400°F, .2 Co

STEP 3: CHOOSE YOUR CUTTER BODY

Standard Shank – Steel

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



BALL NOSE END MILLS – STANDARD SHANK

EDP	Holder	Cutting Diameter	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
40095	BNEM-0375-3950-SS	0.375"	0.335"	0.625"	0.365"	0.375"	1.500"	0.516°	3.950"
40100	BNEM-0500-3500-SS	0.500"	0.413"	0.750"	0.490"	0.500"	1.250"	4.400°	3.500"
40110	BNEM-0500-5250-SS	0.500"	0.413"	0.750"	0.490"	0.500"	2.000"	1.775°	5.250"
40120	BNEM-0500-6000-SS	0.500"	0.413"	0.750"	0.490"	0.500"	2.500"	1.000°	6.000"
40270	SE-BNEM-0500-7000-SS	0.500"	0.413"	0.750"	0.490"	0.500"	1.210"	4.400°	7.000"
40130	BNEM-0625-5500-SS	0.625"	0.547"	0.750"	0.615"	0.625"	1.380"	3.090°	5.500"
40140	BNEM-0625-6250-SS	0.625"	0.547"	0.750"	0.615"	0.625"	2.500"	1.088°	6.250"
40280	SE-BNEM-0625-7000-SS	0.625"	0.547"	0.750"	0.615"	0.625"	1.340"	3.100°	7.000"
40150	BNEM-0750-4500-SS	0.750"	0.670"	1.000"	0.740"	0.750"	1.750"	2.690°	4.500"
40160	BNEM-0750-7000-SS	0.750"	0.670"	1.000"	0.740"	0.750"	3.000"	1.030°	7.000"
40170	BNEM-0750-8250-SS	0.750"	0.670"	1.000"	0.740"	0.750"	4.500"	0.573°	8.250"
40290	SE-BNEM-0750-9000-SS	0.750"	0.670"	1.000"	0.740"	0.750"	1.710"	2.700°	9.000"
40180	BNEM-1000-6250-SS	1.000"	0.860"	1.500"	0.990"	1.000"	2.000"	7.400°	6.250"
40190	BNEM-1000-7500-SS	1.000"	0.860"	1.500"	0.990"	1.000"	3.750"	1.660°	7.500"
40200	BNEM-1000-9000-SS	1.000"	0.860"	1.500"	0.990"	1.000"	5.000"	1.088°	9.000"
40300	SE-BNEM-1000-10000-SS	1.000"	0.860"	1.500"	0.990"	1.000"	1.940"	7.400°	10.000"
40210	BNEM-1250-7000-SS	1.250"	1.070"	1.750"	1.240"	1.250"	2.500"	6.447°	7.000"
40220	BNEM-1250-9000-SS	1.250"	1.070"	1.750"	1.240"	1.250"	4.500"	1.775°	9.000"

Standard steel shank end mills can be saw cut to desired length.

** Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*

Examples: BNEM0750 and GWR20 accept either a 3/4" or 20mm diameter insert. BNEM0500 and GWR12 accept either a 1/2" or 12mm diameter insert.

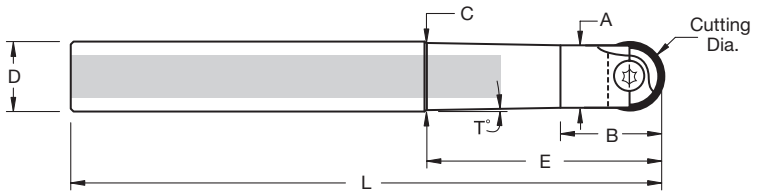
STEP 3: CHOOSE YOUR CUTTER BODY

Standard Shank – Carbide Core

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

EDP	Holder	Cutting Diameter	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
40570	CC-BNEM-0750-7000-SS	0.750”	0.670”	1.000”	0.740”	0.750”	3.000”	1.031°	7.000”
40580	CC-BNEM-0750-8250-SS	0.750”	0.670”	1.000”	0.740”	0.750”	4.500”	0.573°	8.250”
40590	CC-BNEM-1000-6250-SS	1.000”	0.860”	1.500”	0.990”	1.000”	2.000”	7.400°	6.250”
40600	CC-BNEM-1000-7500-SS	1.000”	0.860”	1.500”	0.990”	1.000”	3.750”	1.661°	7.500”
40610	CC-BNEM-1000-9000-SS	1.000”	0.860”	1.500”	0.990”	1.000”	5.000”	1.088°	9.000”
40620	CC-BNEM-1250-7000-SS	1.250”	1.070”	1.750”	1.240”	1.250”	2.500”	6.447°	7.000”

Wire EDM is recommended for cutting carbide core end mills to length.

** Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*

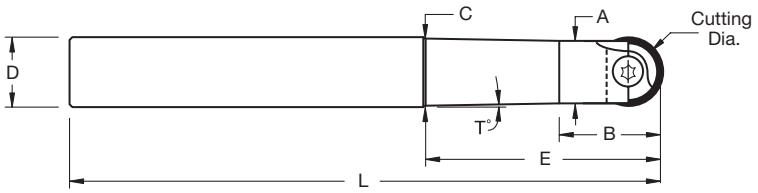
Examples: BNEM0750 and GWR20 accept either a 3/4” or 20mm diameter insert. BNEM0500 and GWR12 accept either a 1/2” or 12mm diameter insert.

More cutter options follow on pages 104-109.

STEP 3: CHOOSE YOUR CUTTER BODY

Oversized Shank – Steel

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



BALL NOSE END MILLS – OVERSIZED SHANK

EDP	Holder	Cutting Diameter	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
40000	BNEM-0313-5500-OS	0.313"	0.280"	0.625"	0.415"	0.500"	1.910"	3.000°	5.500"
40010	BNEM-0375-3500-OS	0.375"	0.335"	0.625"	0.365"	0.500"	1.340"	1.200°	3.500"
40020	BNEM-0375-6000-OS	0.375"	0.335"	0.625"	0.365"	0.500"	1.880"	0.688°	6.000"
40230	SE-BNEM-0375-6000-OS	0.375"	Tapered	N/A	N/A	0.500"	1.380"	3.000°	5.880"
40030	BNEM-0500-6000-OS	0.500"	0.414"	0.750"	0.490"	0.625"	2.500"	1.260°	6.000"
40240	SE-BNEM-0500-6000-OS	0.500"	Tapered	N/A	N/A	0.625"	2.310"	3.000°	6.000"
40040	BNEM-0625-7000-OS	0.625"	0.547"	0.750"	0.615"	0.750"	3.130"	0.802°	7.000"
40050	BNEM-0750-7500-OS	0.750"	0.670"	1.000"	0.740"	1.000"	3.500"	0.802°	7.500"
40060	BNEM-0750-9500-OS	0.750"	0.670"	1.000"	0.740"	1.000"	4.500"	0.573°	9.500"
40250	SE-BNEM-0750-9500-OS	0.750"	Tapered	N/A	N/A	1.000"	3.000"	3.000°	9.500"
40070	BNEM-1000-8250-OS	1.000"	0.860"	1.500"	0.990"	1.250"	4.500"	1.260°	8.250"
40260	SE-BNEM-1000-9500-OS	1.000"	Tapered	N/A	N/A	1.250"	3.880"	3.000°	9.500"
40080	BNEM-1000-10000-OS	1.000"	0.860"	1.500"	0.990"	1.250"	4.500"	0.022°	10.000"

Standard steel shank end mills can be saw cut to desired length.

** Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*

Examples: BNEM0750 and GWR20 accept either a 3/4" or 20mm diameter insert. BNEM0500 and GWR12 accept either a 1/2" or 12mm diameter insert.

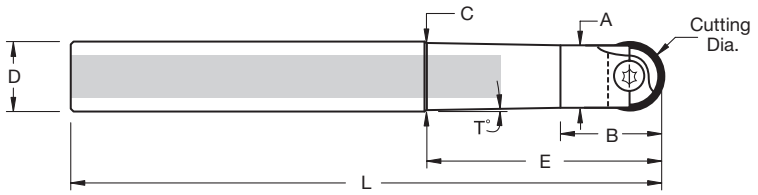
STEP 3: CHOOSE YOUR CUTTER BODY

Oversized Shank – Carbide Core

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

EDP	Holder	Cutting Diameter	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
40510	CC-BNEM-0750-9500-OS	0.750”	0.670”	1.000”	0.740”	1.000”	4.500”	0.573°	9.500”
40520	CC-BNEM-1000-8250-OS	1.000”	0.860”	1.500”	0.990”	1.250”	4.500”	1.260°	8.250”
40560	CC-BNEM-1250-11000-OS	1.250”	1.070”	1.750”	1.240”	1.500”	7.500”	0.859°	11.000”

Wire EDM is recommended for cutting carbide core end mills to length.

** Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*

Examples: BNEM0750 and GWR20 accept either a 3/4” or 20mm diameter insert. BNEM0500 and GWR12 accept either a 1/2” or 12mm diameter insert.

STEP 3: CHOOSE YOUR CUTTER BODY

Solid Carbide Shank

Achieve Maximum Performance with Solid Carbide Cutter Bodies!

Optimize performance with Carbide Shank tooling:

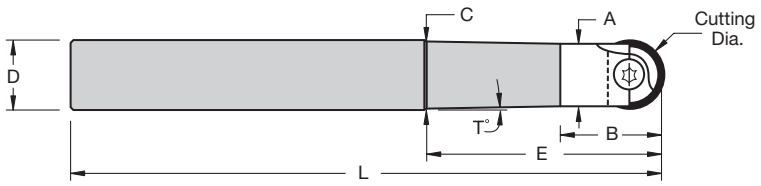
• Reduced deflection • Increased stiffness • Less chatter

• Heat shrink toolholding capability

**** 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

EDP	Holder	Cutting Diameter	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
40640	SC-BNEM-0375-3950-SS	0.375"	0.335"	0.625"	0.365"	0.375"	1.500"	0.516°	3.950"
40645	SC-BNEM-0375-3950-OS	0.375"	0.335"	0.750"	0.360"	0.500"	1.375"	0.120°	3.950"
40650	SC-BNEM-0375-7000-SS	0.375"	0.335"	0.625"	0.365"	0.375"	3.000"	0.172°	7.000"
40655	SE-SC-BNEM-0375-7000-SS	0.375"	0.335"	0.500"	0.365"	0.375"	1.250"	0.500°	7.000"
40660	SC-BNEM-0500-3950-SS	0.500"	0.413"	0.750"	0.490"	0.500"	1.500"	2.920°	3.950"
40670	SC-BNEM-0500-7000-SS	0.500"	0.413"	0.750"	0.490"	0.500"	4.000"	0.688°	7.000"
40680	SC-BNEM-0500-7000-12MM-SS	0.500"	0.413"	0.500"	0.490"	12mm	1.450"	1.500°	7.000"
40690	SC-BNEM-0625-7000-SS	0.625"	0.547"	0.750"	0.615"	0.625"	1.500"	3.400°	7.000"
40695	SC-BNEM-0625-7000-15MM-SS	0.625"	0.547"	1.300"	N/A	15mm	1.300"	N/A	7.000"
40700	SC-BNEM-0750-7500-SS	0.750"	0.670"	1.000"	0.740"	0.750"	2.250"	1.600°	7.500"
40710	SC-BNEM-0750-10000-SS	0.750"	0.670"	1.000"	0.740"	0.750"	6.000"	0.400°	10.000"
40720	SC-BNEM-0750-10000-18MM-SS	0.750"	0.670"	1.000"	0.698"	18mm	2.250"	1.600°	10.000"
40730	SC-BNEM-1000-7500-SS	1.000"	0.860"	1.500"	0.990"	1.000"	3.000"	2.500°	7.500"
40740	SC-BNEM-1000-10000-SS	1.000"	0.860"	1.500"	0.990"	1.000"	7.000"	0.670°	10.000"
40750	SC-BNEM-1000-10000-25MM-SS	1.000"	0.860"	1.500"	0.990"	25mm	3.000"	2.500°	10.000"

Wire EDM is recommended for cutting solid carbide shank end mills to length.

** Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*

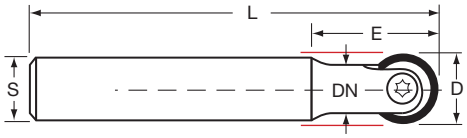
Examples: BNEM0750 and GWR20 accept either a 3/4" or 20mm diameter insert. BNEM0500 and GWR12 accept either a 1/2" or 12mm diameter insert.

STEP 3: CHOOSE YOUR CUTTER BODY

Undersized Shank

Save time and money using Dapra's Undersized Shank Holders...

*They give you **INSTANT CLEARANCE!***



UNDERSIZED SHANK GWR CUTTERS

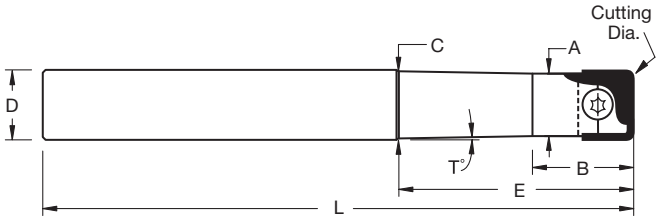
EDP	Holder	D Ø Insert Diameter	E Effective Length	L Overall Length	S Shank Ø	DN Neck Ø	Insert Screw
41200	US-GWR12-150-11MM-RZ	1/2" or 12mm	Full	5.91"	11mm	0.41"	GWS 12
41250	BNEM-0500-7000-12MM-SS	1/2" or 12mm	Full	7.00"	12mm	0.41"	GWS 12
41210	US-GWR16-180-15MM-RZ	5/8" or 16mm	Full	7.09"	15mm	0.57"	GWS 16
41220	US-GWR20-230-18MM-RZ	3/4" or 20mm	Full	9.06"	18mm	0.71"	GWS 20
41260	BNEM-0750-10000-18MM-SS	3/4" or 20mm	Full	10.00"	18mm	0.67"	GWS 20
41230	US-GWR25-250-24MM-RZ	1" or 25mm	Full	9.84"	24mm	0.89"	GWS 25
41270	BNEM-1000-10000-25MM-SS	1" or 25mm	Full	10.00"	25mm	0.86"	GWS 25

Standard steel shank end mills can be saw cut to desired length.

**** 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 & FLAT BOTTOM CUTTERS

EDP	Holder	Cutting Diameter	A Ø	B Straight Length	C Taper End Ø	D Shank Ø	E Effective Length	T Taper Angle	L Overall Length
40760	BDEM-0375-5250-OS	0.375"	0.335"	0.625"	0.365"	0.500"	1.125"	1.700°	5.250"
40770	BDEM-0500-6000-SS	0.500"	0.413"	0.750"	0.490"	0.500"	1.500"	2.900°	6.000"
40810	Carbide Shank > SC-BDEM-0500-3950-SS	0.500"	0.413"	0.750"	0.490"	0.500"	1.500"	2.920°	3.950"
40820	Carbide Shank > SC-BDEM-0500-7000-SS	0.500"	0.413"	0.750"	0.490"	0.500"	4.000"	0.688°	7.000"
40780	BDEM-0625-7000-SS	0.625"	0.547"	0.750"	0.615"	0.625"	1.875"	1.700°	7.000"
40790	BDEM-0750-9000-SS	0.750"	0.670"	1.000"	0.740"	0.750"	2.250"	1.600°	9.000"
40800	BDEM-1000-10000-SS	1.000"	0.860"	1.500"	0.990"	1.000"	3.000"	2.500°	10.000"

Standard steel shank end mills can be saw cut to desired length.

** Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*

Examples: BNEM0750 and GWR20 accept either a 3/4" or 20mm diameter insert. BNEM0500 and GWR12 accept either a 1/2" or 12mm diameter insert.

STEP 3: CHOOSE YOUR CUTTER BODY

Screw-On Modular Heads

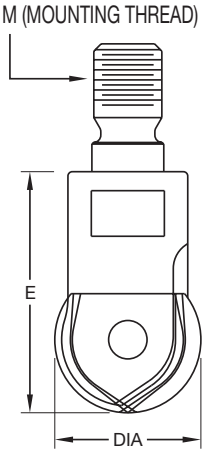
- Screw-on heads are compatible with ISO standard modular cutting systems
- Close-tolerance mounting of heads minimizes runout and maximizes rigidity
- Provide significantly more effective reach than solid end mills
- Use standard inch wrench flats – no special metric wrenches needed
- See page 116 for modular extensions

BALL NOSE SCREW-ON MODULAR HEADS

EDP	DIA Insert Diameter	Holder	M Thread	E Effective Length	Flutes	Wrench
40835-6	.500”/12mm	GWR12-MOD-C (M6)	M6	1.05”	2	3/8”
40835	.500”/12mm	GWR12-MOD-C (M8)	M8*	1.05”	2	3/8”
40840C	.625”/16mm	GWR16-MOD-C	M8*	1.11”	2	7/16”
40855	.750”/20mm	GWR20-MOD-C	M10	1.28”	2	9/16”
40865	1.000”/25mm	GWR25-MOD-C	M12	1.65”	2	11/16”
40875	1.250”/32mm	GWR32-MOD-C	M16	1.78”	2	15/16”

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

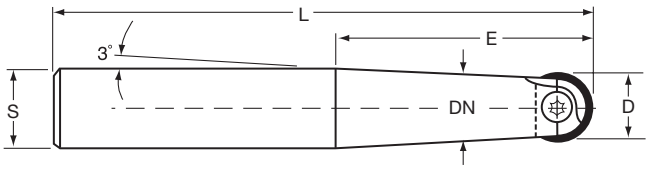
“C” denotes thru-tool coolant.



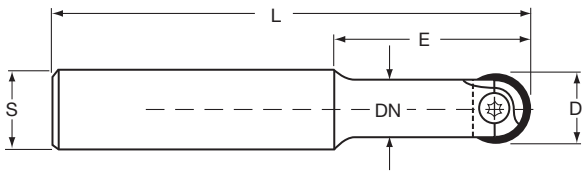
SEE PAGE 116 FOR CARBIDE CORE, SOLID CARBIDE AND HEAVY METAL MODULAR EXTENSIONS.

STEP 3: CHOOSE YOUR CUTTER BODY

Metric – Steel & Carbide



Tapered Metric Holder



Straight Metric Holder

METRIC SERIES BALL NOSE CUTTERS

EDP	Holder	D Ø Diameter	E Effective Length	L Overall Length	S Shank Ø	DN Neck Ø	Insert Screw
TAPERED SOLID METRIC							
50000	GWR08-100-10-RZK	8mm	25mm	100mm	10mm	7mm	GWS 08
STRAIGHT SOLID METRIC							
50010	GWR10-130-10-RZ	10mm	25mm	130mm	10mm	9mm	GWS 10
50020	GWR12-150-12-RZ	12mm	47mm	150mm	12mm	10.5mm	GWS 12
40680	SC-BNEM-0500-7000-12MM-SS	12mm	38mm	180mm	12mm (CARBIDE)	10.5mm	GWS 12
50030	GWR16-180-16-RZ	16mm	52mm	180mm	16mm	14.5mm	GWS 16
40720	SC-BNEM-0750-10000-18MM-SS	20mm	57mm	250mm	18mm (CARBIDE)	17mm	GWS 18
50040	GWR20-230-20-RZ	20mm	65mm	230mm	20mm	18mm	GWS 20
40750	SC-BNEM-1000-10000-25MM-SS	25mm	76mm	250mm	25mm (CARBIDE)	22mm	GWS 25

Standard steel shank end mills can be saw cut to desired length. Wire EDM is recommended for cutting solid carbide shank end mills to length.

** Note: All Dapra Ball Nose end mills accept either inch or metric inserts of like sizes.*

Examples: 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 (EDP)	Insert Size		Dia.	Major Dia.	Pitch	Wrenches TORX® (EDP)	Torque Nm / in lbs
	Inch	Metric					
GWS-08 (41000)	.312	8	3mm	3mm	.5mm	T8-F (83000)	Manual
GWS-10 (41010)	.375	10	4mm	4mm	.5mm	T15-T (83010)	Manual
GWS-12 (41020)	.500	12	5mm	5mm	.5mm	T20-T (83020)	6.0 / 53
GWS-16 (41030)	.625	16	5mm	5mm	.5mm	T20-T (83020)	6.2 / 55
GWS-20 (41040)	.750	20	5mm	5mm	.5mm	T20-T (83020)	6.2 / 55
GWS-25 (41050)	1.000	25	6mm	6mm	.75mm	T30-T (41100)	6.5 / 58
GWS-32 (41060)	1.250	30/32	8mm	8mm	.75mm	T30-T (41100)	6.5 / 58

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

All listed tools use Anti-Seize Grease ASG-120.

TORX® is a registered trademark of Camcar/Textron.

OUR TORQUE WRENCH SYSTEMS MAKE REPEATABLE, ACCURATE INSERT LOADING EASIER THAN EVER BEFORE! SEE PAGE 118 FOR DETAILS.

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 ball nose should be less than or equal to 10% of ball diameter.
- Stepover should be greater than or equal to DOC.
- Ball nose tools are not designed for roughing. Use high-speed machining techniques (light DOC and high feed rates) for stable and fast cuts where greater metal removal is required.
- Climb milling is preferred.
- When plunging with Ball Nose, use pecking cycle with a maximum of .002” FPT; 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. 112).
- Compensate for chip thinning with Feed Rate Adjustment (see Table 2 on p. 112).
- 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.

Feed, Speed & Diameter Compensation

Table 1: Effective Cutting Diameter (ECD)

DEPTH OF CUT (DOC)

INSERT DIA.	.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 page 115 to select Feed per Tooth (**FPT**). Calculate Inches per Minute (**IPM**). (**RPM** x **FPT** x 2 x **FRA** = **IPM**)

FIGURE 1

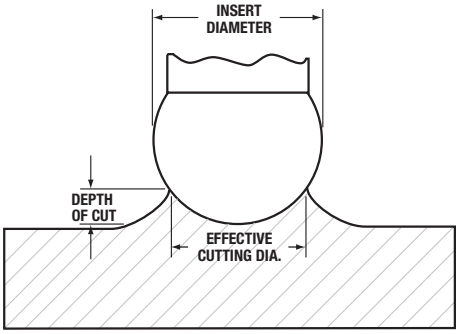
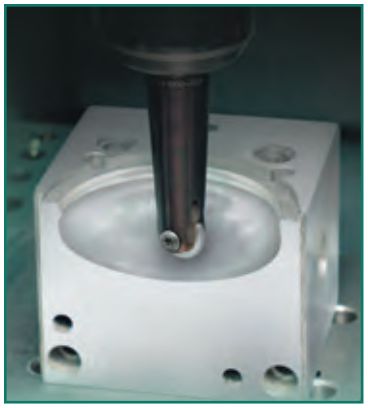


Table 2: Feed Rate Adjustment (FRA)



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

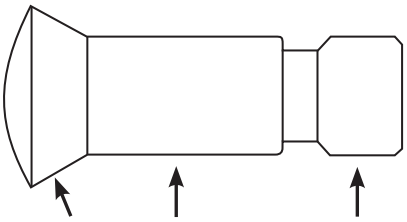
Use multiple above to calculate adjusted feed rate.

For optimum speed and feed calculation assistance, visit our website: 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 Insert Screws



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

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 and clean off insert mounting surfaces 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 on page 110.
9. Repeat steps 2-8 for each insert change.
10. Replace screw with each new box of inserts to assure maximum performance.

Recommended Cutting Speeds/Feeds

Recommended Cutting Speeds for Dapra Ball Nose Cutters

MATERIAL GROUP		EXAMPLE	F1/T1 *(uncoated)*	FPO	FP-GLH	FP-HM/TS	PCD	Geometry	FPT
PLAIN STEELS	< 3%C	1008, 1018, 12L14	300-600	**700-1100**	**800-1200**	800-1200	N/R	HBN, RDBN, N	.002-.007
	3%-6%C	1040, 1045, 1055							
	5%-1.5%C	1060, 1070, 1095							
ALLOY STEELS	Mo	4012, 4320, 4340		**500-900**	**600-1000**	**600-1000**	N/R		
	Cr	52100, 5120							
	NiCrMo	8620, 8622, 8640							
TOOL & DIE STEELS		A2, D2, P20, W2, H13, S7							
HARDENED STEELS			N/R	N/R	**250-600**	**250-600**	N/R	N, RDBN	.002-.005
STAINLESS STEELS	Ferritic/Martensitic	403, 416, 430, 430F, 434, 446, S44400	150-300	300-750	**400-900**	500-900	N/R	HBN, RDBN, N	.002-.006
	Austenitic	304L, 303, 304, 316L		300-700	**300-800**	**300-800**	N/R	HBN, RDBN, CB	
	Precipitation Hardening (PH)	15-5PH, 17-4PH, custom, 455, PH13-8 Mo, AM355		200-500	**250-700**	**250-700**	N/R		
CAST IRON	Gray	A48 Class xx B, A436 Type 2	350-600	400-750	**600-1000**	**600-1000 (HM)**	N/R	HBN, RDBN, N	.003-.008
	Malleable	A47, A220, SAE J148			**400-850**	**400-900 (HM)**	N/R		
	Ductile	60-40-18, 100-70-03, SAE J434							
ALUMINUM ALLOYS		2024-T4, 6061-T6, 7075-T6	**1000+**	1000+	1000+	1000+	**2000+**	HBN, CB, PCD	.005-.010
COPPER ALLOYS	CuNi: refer to High-Temp. Alloys below	J463, B121, Ampco 21, Wearite 4-13	300-600	400-700	**500-800**	500-800	N/R	HBN, CB	
HIGH-TEMP. ALLOYS		Inconel 617, Monel K500, Waspaloy, CuNi 70-30	50-125	50-150	**50-150**	**50-150 (HM)**	N/R	HBN, RDBN, CB	.002-.004
TITANIUM ALLOYS		Ti99.9, Alpha Alloy, Ti-6Al-4V	100-200	100-250	**100-250**	**100-250 (HM)**	N/R		.002-.005
CARBON GRAPHITE			700-1000	800-1200	1200+	1200+	**1200+ (PCD, FPD, FP-DL)**	HBN, CB, PCD	.004-.010

PCD – diamond tipped / FPD – diamond coated / FP-DL – diamond-like coating

** Best choice grades shown in **bold text**.

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

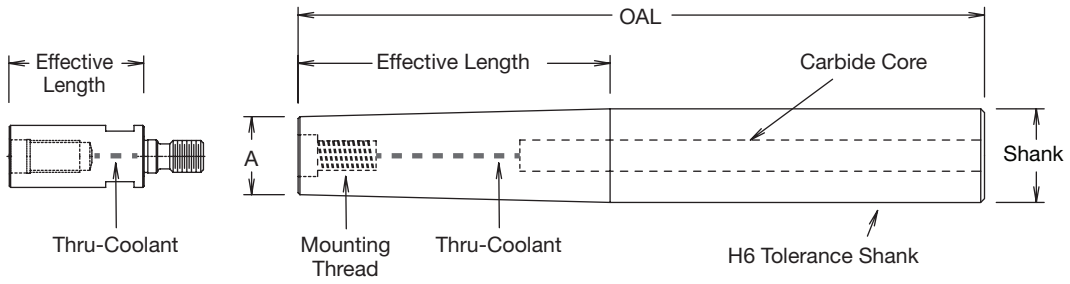
Lower Feed Ranges for: Heavier cuts, harder materials, smaller diameter tools
Higher Feed Ranges for: Lighter cuts, softer materials, larger diameter tools

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 FPT range. Next, increase FPT 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.

Carbide Core Modular Extensions

Ideal for Standard Inch End Mill Holders

- All styles of modular extensions are ***UNIVERSAL*** – use them with any of our screw-on modular heads, as well as many competitors' modular heads
- Cylindrical inch shanks, providing adaptation for end mill holders (add your own flat), 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)
- Thru-coolant for delivery of air or coolant right at the cutting edge



CARBIDE CORE MODULAR EXTENSIONS

EDP	For Head Dia.	Extension Part No.	Shank Dia.	Effective Length	OAL	Thread	CC	A
22475	.750" / 20mm	CC-ME-0750-2500-5500-C	.750"	2.5"	5.5"	M10	3/8" x 4.0"	.660"
22485	.750" / 20mm	CC-ME-0750-3500-C-SS	.750"	3.7"	5.8"	M10	3/8" x 4.0"	.660"
22480	.750" / 20mm	CC-ME-0750-3500-C	1.000"	3.7"	6.0"	M10	7/16" x 4.0"	.660"
22495	1.000" / 25mm	CC-ME-1000-2500-5500-C	1.000"	2.5"	5.5"	M12	7/16" x 4.0"	.935"
22500	1.000" / 25mm	CC-ME-1000-4500-C	1.000"	4.7"	7.0"	M12	7/16" x 5.0"	.935"
22510	1.250" / 1.500"	CC-ME-1250-5500-C	1.250"	5.7"	8.0"	M16	1/2" x 6.0"	1.175"

Extensions feature a cylindrical shank, with no Weldon flats. Hold with high-performance milling chucks or heat/mechanical shrink holders, or mill Weldon flats and use a short-length solid end mill holder.

2" ADD-ON EXTENSIONS

EDP	For Head Dia.	Extension Part No.	Effective Length	Thread
22520	.750" / 20mm	ME-0750-2C Extension Adapter	2.0"	M10
22530	1.000" / 25mm	ME-1000-2C Extension Adapter	2.0"	M12
22540	1.250" / 1.500"	ME-1250-2C Extension Adapter	2.0"	M16

Solid Carbide Modular Extensions

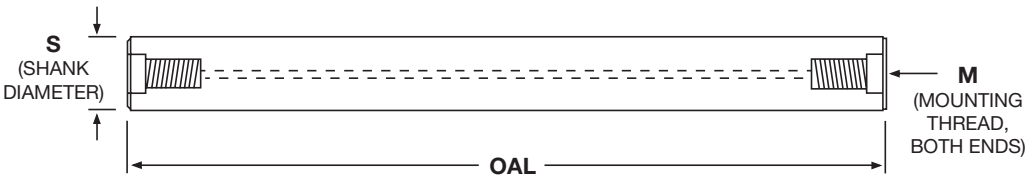
- Optimum rigidity reduces deflection and chatter
- No braze joints
- Best option for finishing with modular heads
- Thru-coolant for delivery of air or coolant right at the cutting edge

SOLID CARBIDE MODULAR EXTENSIONS

EDP	For Head Dia.	Extension Part No.	Shank Dia.	Effective Length	OAL	Thread	A
22550-6	.500”	SC-ME-0500-6500-C-M6	.500”	1.500”	6.5”	M6	.460”
22560	.750”	SC-ME-0750-7700-C	.750”	2.250”	7.7”	M10	.709”
22570	1.000”	SC-ME-1000-8300-C	1.00”	5.000”	8.3”	M12	.890”/.950”

Heavy-Metal Modular Extensions

- Made of high-density tungsten, providing extra resistance to vibration and deflection
- 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
- Thru-coolant equipped



HEAVY-METAL MODULAR EXTENSIONS

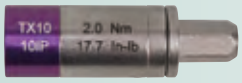
EDP	For Head Dia.	Extension Part No.	OAL	M	Shank Dia.
22440	.750” / 20mm	ME-0750-18MM-900-C	9”	M10	18mm
22460	1.000” / 25mm	ME-1000-25MM-1100-C	11”	M12	25mm
22470	1.250” / 1.500”	ME-125/150-25MM-1200-C	12”	M16	25mm

Torque Wrench Systems

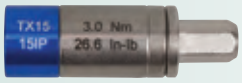
Precise Tightening without Binding and Stripping

Accurate torque application for insert screws is just a CLICK away with Dapra's line of torque wrenches. With two handle styles and three bit set sizes, repeatable and accurate insert loading and clamping is easier than ever!

NO MORE GUESSING! **Dapra's torque wrench system features color-coded adapters and bits for quick identification of the correct size for your application. Each adapter size has a preset torque value. When the correct torque is achieved – *CLICK* – and the screw is tight.**



T10 Torque Adapter
TW-AD-10



T15 Torque Adapter
TW-AD-15

T20 Torque Adapter
TW-AD-20

T-Handle Torque Driver
TW-TH with TW-AD-20 and TW-BT-20

Straight-Handle Torque Driver
TW-SH-L

T-Handle Torque Driver
TW-TH

Dapra's new torque system offers users the following benefits:

- Accurate application of torque to insert screws
- No over-tightening, stripping or binding of screws
- Accurate, repeatable insert loading and clamping
- More secure grip and leverage when compared to typical flag-style wrenches
- Two handle styles for user preference

COMPLETE SET PART NUMBERS

T10	T15	T20
Straight Handle: TW-SS-10	Straight Handle: TW-SS-15	Straight Handle: TW-SS-20
T-Handle: TW-TS-10	T-Handle: TW-TS-15	T-Handle: TW-TS-20

INDIVIDUAL PIECES

Torque Driver Handle: Straight Handle – TW-SH-L T-Handle – TW-TH	Torque Driver Handle: Straight Handle – TW-SH-L T-Handle – TW-TH	Torque Driver Handle: Straight Handle – TW-SH-L T-Handle – TW-TH
Adapter: TW-AD-10	Adapter: TW-AD-15	Adapter: TW-AD-20
TORX® Bits: TW-BT-10	TORX® Bits: TW-BT-15	TORX® Bits: TW-BT-20

T10 TORX® Bits (set of 6)
TW-BT-10

T15 TORX® Bits (set of 6)
TW-BT-15

T20 TORX® Bits (set of 6)
TW-BT-20

Straight-Handle Torque Driver
TW-SH-L with TW-AD-10 and TW-BT-10

Other sizes available upon request.

TORX® is a registered trademark of Camcar/Textron.

Workholding & Positioning Equipment

The primary links in the chain for machining excellence include your:

- Machine tool
- Cutting tool
- Workholding

Investing in high-quality machine and cutting tools can only have maximum impact on productivity when your workholding is rigid, repeatable, and reliable. That is why Dapra has partnered with the world's highest-quality manufacturers of high-pressure vises and clamping: Allmatic (Germany) and Fresmak (Spain).

These vises provide outstanding solutions for a variety of applications, from general machining and production machining to 5-axis milling. Most available models provide much higher clamping pressure than standard screw-type vises. They won't wear out due to repeated use, and they won't allow contamination due to coolants, chips, or dust. The pressure is created through the use of mechanical or hydraulic intensification within the vise spindle, allowing either maximum or precisely controlled pressure to be applied – regardless of the size or strength of the operator. Dapra's workholding solutions are truly a strong link in the chain of machining excellence.

Arnold High-Pressure Machine Vises

High clamping force, outstanding accuracy and large jaw capacity. Combination of a close-tolerance vise with heavy-duty, rugged design, and the highest-quality materials. Truly dependable vises suitable for milling, grinding, drilling, toolroom and production work, and many other uses.

Clamping pressure can be almost effortlessly applied, achieving up to 18,000 lbs. of clamping force. New 5-axis models are industry leaders for part accessibility and clamping repeatability. The Arnold line of vises has the solution for most any workholding challenge.

SEE PAGE 120

Allmatic Precision Vises

Preset holding sensitivity, close-tolerance part location, and intensified holding power – all in one vise. Part repeatability within .0002". Holding pressures are repeatable and can be preset from 0 to more than 12,000 lbs.

Available with adjustable gripper studs embedded into the workpiece, ensuring safe and quick clamping of raw parts, thermal-cut parts, and sawed-off material.

SEE PAGE 122

Servopress Indexing Tables

Superior indexing accuracy and repeatability, extremely rapid index times for high-production applications, and precise locking with Hirth or Ball couplings. Great for square block grinding. Drives available in electric, pneumatic, hydraulic, or combination.

VISIT DAPRA.COM FOR DETAILS

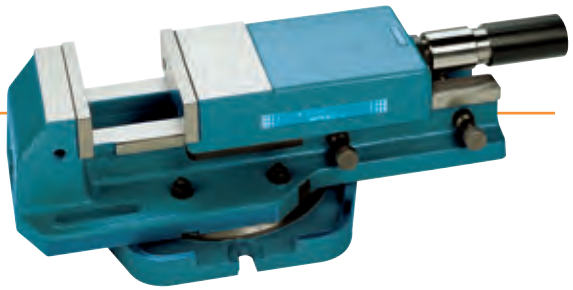
Arnold High-Pressure Machine Vises

Controllable power and dependable clamping for milling, grinding, and other production workholding applications.

Arnold vises, manufactured by world-leader Fresmak and represented in the USA by Dapra, offer high-pressure workholding solutions that are suitable for milling, grinding, drilling, toolroom and production work. All Arnold vises are manufactured to precision tolerances and accurate standards to ensure reliability and long life.

They combine a heavy-duty, rugged design with precision manufacturing and the highest quality materials available to give the best value to our customers.

Arnold Classic – HydraVise



- Up to 18,000 lbs. pressure in four vise sizes: 3.5", 5.0", 6.5" and 8" jaw widths
- Hydraulic and mechanical spindles available
- Normal and narrow vise bases (for close mounting)

Arnold MAT

- Fully-ground periphery guarantees parallelism and perpendicularity for side and end mounting
- High-pressure pull-down clamping provides ultimate security and accuracy
- Built-in rear jaw for strength and stability
- Hydraulic and mechanical versions with up to 11,000 lbs. pressure in 3.5", 5.0", 6.5" and 8" jaw widths

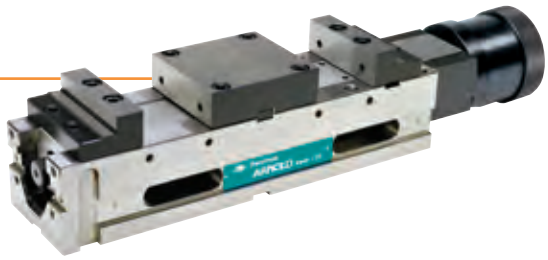
Arnold MB2

- Top-bottom ground version of MAT vise – economy model
- Interchangeable front and rear jaws for optimum versatility
- Hydraulic and mechanical versions with up to 11,000 lbs. pressure in 5.0" and 6.5" jaw widths

Arnold Durmak

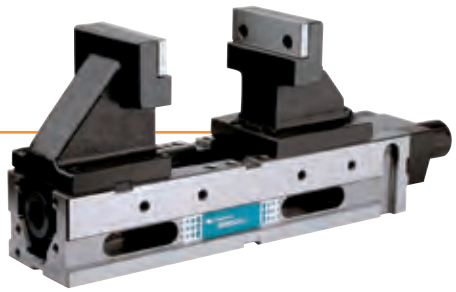
- MB2 clamping capacity with better clamping variability
- One fixed and one moving jaw, flat for adding clamping fixtures/grippers
- Mechanical intensifier provides up to 11,000 lbs. pressure in 5.0" and 6.5" jaw widths

Arnold Twin



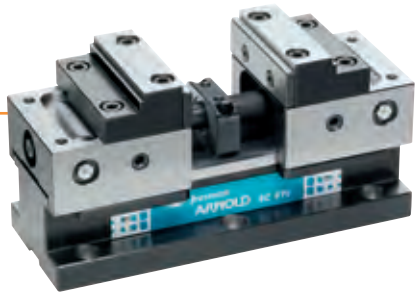
- High-pressure clamping of two workpieces simultaneously
- 3rd-hand feature allows clamping of each piece in two stages
- Fully-ground periphery guarantees parallelism and perpendicularity for side and end-mounting
- Hydraulic intensifier provides up to 11,000 lbs. pressure in 3.5” and 5.0” jaw widths

Arnold 5X Vise for 5-Axis Machining



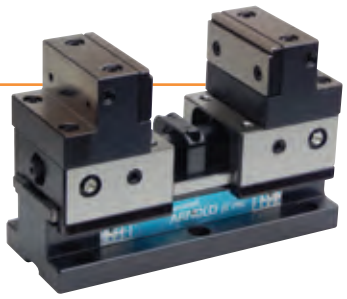
- Tall jaws for 5-axis machining
- Mechanical intensifier provides up to 6,600 lbs. clamping pressure
- 5.0” jaw width on two different length vise bodies (medium and long)
- Large opening accepts workpieces up to 9.5” long

Arnold SC Self-Centering Vise



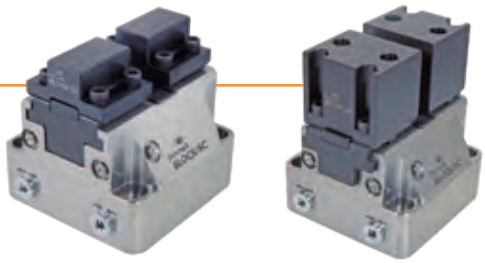
- Self-centering vise without high-pressure clamping
- High-mount screw maximizes clamping force and minimizes jaw deflection
- Centering accuracy: 0.0007”
- Small footprint suitable for 5X machining in jaw widths of 2.75”, 3.5” and 5.0”

Arnold SC 5X



- Self-centering vise without high-pressure clamping
- Tall jaws for optimum 5X access
- High-mount screw maximizes clamping force and minimizes jaw deflection
- Centering accuracy: 0.0007”
- Small footprint suitable for 5X machining in jaw widths of 3.5” and 5.0”

Fresmak Block-SC Hydraulic & Pneumatic



- Hydraulic static blocks reach a pressure between 16 to 40 KN with an infeed power of 20 bar; pneumatic static blocks reach a pressure between 8 to 20 KN with an infeed power of 6 bar
- 0.24” and 0.31” stroke range
- Repeatability accuracy: 0.0008”
- Hydraulic supply up to 120 bar or pneumatic supply up to 9 bar

VIEW AVAILABLE MODELS & SPECS AT DAPRA.COM/ARNOLD

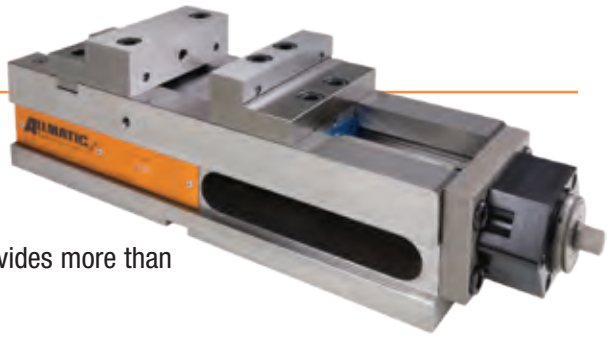
Allmatic Precision Vises

From high-pressure vises for conventional milling machines to complex workholding solutions for flexible manufacturing centers.

When you need preset holding sensitivity, close-tolerance part location or intensified holding power, only the best vise will do it all – Allmatic from Dapra.

Avoid deformed parts, ensure constant holding pressure and guarantee part location. Put the world's best workholding tools on the job. With Allmatic vise and tombstone systems, we hold any job just right.

Allmatic NC Series



Pairing outstanding flexibility with extreme accuracy.

- Four models available: LC, TC, NC 70 and Duo 90
- Available in jaw widths from 3.9" (100mm) to 7.8" (200mm)
- Enclosed high-pressure spindle with mechanical pressure intensifier provides more than 13,000 pounds of clamping pressure in some models
- Variety of optional jaws available

Allmatic T-REX 125

Ideal for clamping unmachined parts for 5-sided machining.

- Horizontal installation – suitable for vertical CNC-controlled milling machines
- Ideal for use on 5-axis machines
- Gripper jaws provide reliable, fast clamping of unmachined parts and flame-cut and sawed materials
- Clamping of parallel pre-machined workpieces with optional step jaws
- Gripper studs suitable for materials with a strength of up to approx. 1000 N/mm²
- 4.9" (125mm) jaw width

Allmatic TITAN SC 125

Designed for quick machining of raw parts to finished product.

- The classic, universal clamp for vertical 3-axis machining centers
- Conventional clamping and grip clamping capabilities
- Clamping of raw parts and burn and saw cuts by penetrating hardened and interchangeable grip elements into the workpiece
- 4.9" (125mm) jaw width

Allmatic CENTRO GRIPP 125

Self-centering vise allows a workpiece to be held during the complete machining process – from start to finish.

- Horizontal installation – suitable for vertical CNC-controlled milling machines
- Compact design for use on 5-axis machining centers
- Depending on the clamping jaws selected, both pre-machined workpieces and unmachined parts can be clamped
- With support jaws, unmachined parts with varying types of flame-cut and sawed materials and even complex castings can be clamped safely and economically
- Gripper studs suitable for materials of mechanical strength of up to approx. 1000 N/mm²
- 4.9" (125mm) jaw width

NEW Allmatic TeleCentric Series

Five-axis vises for small- and medium-sized machine tables.

- Provides maximum accessibility
- Safe and reliable clamping; high precision and low susceptibility to vibration
- Quick-change jaws for easy changeover – for zero-point clamping systems
- Lightweight and easy to operate
- Ideal for small- and medium-sized machining tables – optimal table size: 11" to 15.75"

Allmatic Tombstones for Horizontal Machining

Multiple clamping system for horizontal machining.

- Available as single or duo version, in jaw widths of 3.5" (90mm) or 5" (125mm)
- 4 or 8 clamping stations
- Enclosed, maintenance-free, high-force spindle
- Mechanical force intensifier
- Hardened workpiece support
- Maximum clamping force of 9,000 lbf (40 kN) and clamping width of 12.3" (313mm)

VIEW AVAILABLE MODELS & SPECS AT DAPRA.COM/ALLMATIC

Part Marking & Traceability Solutions

Dapra's experts are armed with 30+ years of experience and the industry's most well-rounded portfolio of direct part marking technologies and configurations.

We pride ourselves in providing comprehensive, cost-effective marking and traceability solutions fueled by intuitive, powerful software and backed by industry-leading training and support.

Fiber Laser

Powerful fiber laser marking workstations for fast, precise, repeatable marking and deep engraving.

Dot Peen

Heavy-duty dot peen marking systems in bench-top, integrated, hand-held and combo portable/bench configurations.

CNC Tools

CNC marking tools to mark components right from your existing CNC setup.

SEE PAGES 126-127

Vision Systems

Part identification and traceability products, including portable and fixed-station Data Matrix code readers and verifiers.

Visit our Marking Systems division website to request a ***FREE*** application review or personalized demo. Our experienced engineering staff will work with you to choose the best system to fit your current or evolving direct part marking and traceability needs, from stock models to custom-designed solutions.

www.DapraMarking.com

FIBER LASER

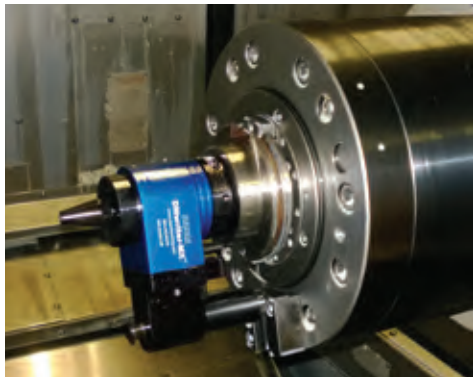
- Class 1 enclosures and open-style Class 4 configurations, featuring laser sources from 3 Watts to 100 Watts
- Industrial-grade, American-made components
- Manual and power programmable Z-axis options; optional rotary D-axis for marking round parts

CLASS 4

DOT PEEN

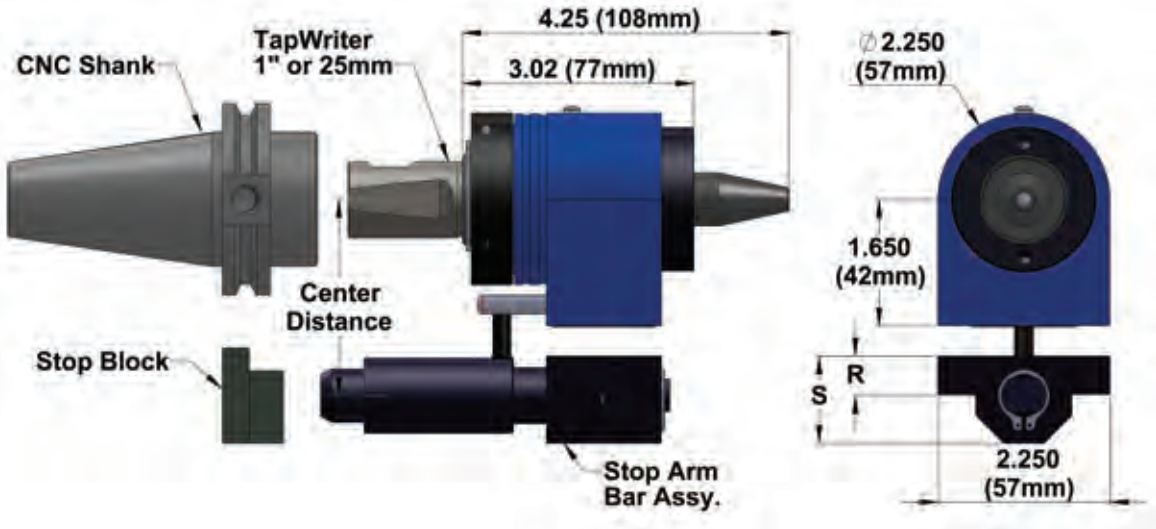
- Clear, cost-effective solutions for permanent identification and Data Matrix codes
- Programmable 2-, 3- and 4-axis systems in every type of configuration and a wide variety of window sizes
- Low-stress marking of most materials up to 65 HRC

DMwriter™ MX
Dot Peen Mechanical CNC Spindle Marking Tools



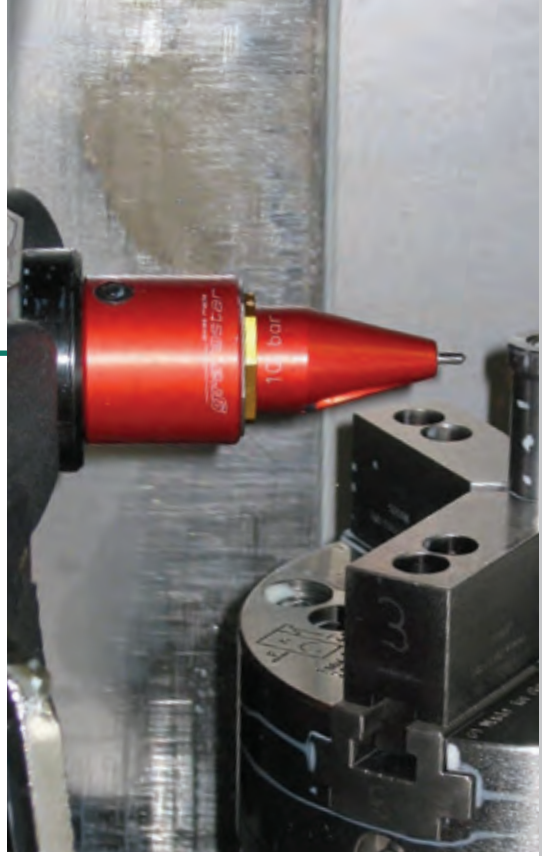
- An affordable alternative to secondary direct part marking – mark parts directly in CNC milling equipment
- No electric or pneumatic input required
- Use standard CNC engraving software
- Mark alphanumeric text, symbols and logos
- Use existing machine tool fixturing
- Most standard CNC shanks available
- Center distance available in 55mm, 65mm and 80mm – larger center distances available upon review of application

DMwriter™ MX DIMENSIONS:



SEE DAPRA.COM/CNCMARKING FOR MORE INFORMATION ON OUR CNC MARKING SOLUTIONS

Micro-Percussion, Scribe & Roller Emboss CNC Marking Tools



- Mark flat, round or uneven parts directly in conventional machining centers and CNC lathe milling systems
- Coolant and pneumatically driven options
- Scribing and roller embossing tools available for finer marking
- Mark alphanumeric text, symbols and logos

gravostar Technologies

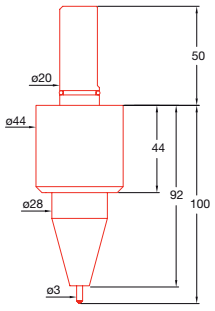
SPECIFICATIONS:

Micro-percussion

Needle drive via internal tool cooling (types W-*)

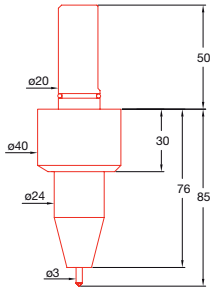
Coolant pressure	from 2 bar
Coolant	emulsion or oil
Distance compensation	up to 5 mm
Marking depth	adjustable to 0.2 mm, max.
Hardness of marking surface	up to 62 HRC
Font size	from 1 mm
Marking time	approx. 1 second per digit
Feed	up to 5.000 mm/min

* Depending on the application, different types W-20, WS-20, WX-20, WSX-20 or WSRX-20 are used



Needle drive via compressed air (type H-20, H-20 PP)

Air pressure	from 3 bar
Distance compensation	up to 5 mm
Marking depth	adjustable to 0.3 mm, max.
Hardness of marking surface	up to 62 HRC
Font size	from 1 mm
Marking time	approx. 1 second per digit
Feed	up to 5.000 mm/min



SEE DAPRA.COM/CNCMARKING FOR MORE INFORMATION ON OUR CNC MARKING SOLUTIONS

BIAX Power Scrapers

BIAX power scrapers from Dapra are many times faster and more accurate than hand scraping, making them ideal for OEM remanufacturing and MRO applications.

- Quick and easy to use – reduces fatigue
- Adapts to individual operator techniques
- Use on cast steel, hard cast iron, malleable cast iron, nonferrous materials and more

Five unique scraper models are available to suit your specific needs:

7ESM/BS-40 Heavy-duty, variable-speed electric scraper

Technical Specifications	
Scraping Speed, *electronically variable*:	Up to 1900 strokes/minute
Length of Stroke, *infinitely variable*:	0” to 0.8” (0 to 20mm)
Operating Voltage, Standard:	110 VAC, 60Hz (220 V available)
Power Draw:	320 watts
Weight:	11.5 lbs. (5.2kg)
Dimensions:	4.4” x 2.6” x 17.4” (110 x 65 x 440mm)

Applications

Heavy roughing and work on large machines and equipment. Scraping of hardened steel guide ways. Large turbine housings, drives, pumps, valves. Extension handle included.

7ELM/BL-40 All-purpose, medium-weight, variable-speed electric scraper

Scraping Speed, *electronically variable*:	Up to 1900 strokes/minute
Length of Stroke, *infinitely variable*:	0” to 0.8” (0 to 20mm)
Operating Voltage, Standard:	110 VAC, 60Hz (220 V available)
Power Draw:	320 watts
Weight:	9.3 lbs. (4.2kg)
Dimensions:	4.4” x 2.6” x 17.4” (110 x 65 x 440mm)

Specially designed for Scraping Technique 40. Roughing, semi-finish and finish scraping. Oil-tight or steam-tight scraping. Dovetail and Vee-way scraping. Uprights, cross-rails and harder-to-reach areas. Machine tool maintenance and repair.

Our all-purpose workhorse for medium to larger work.

BL-10 All-purpose, lightweight, variable-speed electric scraper

Scraping Speed, *electronically variable*:	Up to 1900 strokes/minute
Length of Stroke, *infinitely variable*:	0” to 0.4” (0 to 10mm)
Operating Voltage, Standard:	110 VAC, 60Hz (220 V available)
Power Draw:	320 watts
Weight:	7.0 lbs. (3.3kg)
Dimensions:	4.4” x 2.6” x 17.4” (110 x 65 x 440mm)

The ideal scraper for square, Vee and dovetail ways. Highest-quality bearing points and finish on surface plates and master plates. Lightweight and compact design makes this model particularly suitable for finish scraping of cast steel, cast iron, brass and way-liner material.

Our all-purpose model for medium to smaller work.

7DLM All-purpose, single-speed pneumatic scraper*

Scraping Speed, at 6 bar (90 psi):	1400 strokes/minute
Length of Stroke, *infinitely variable*:	0” to 0.8” (0 to 20mm)
Power Draw:	350 watts
Weight:	8.0 lbs. (3.6kg)
Dimensions:	4.4” x 2.6” x 16.8” (110 x 65 x 425mm)
Hose Connection:	3/8” pipe thread

**** AVAILABLE ON REQUEST.***

Used on applications where pneumatic power is desired or necessary (danger of explosion). Same applications as the 7ELM/BL-40 model. Single stroke speed. Often used for special applications in chemical, plastics and food industries to scrape off hardened resin or coating residue, etc. Muffler/air silencer not included.

HM-10 Half-moon pattern “flaker,” variable-speed electric model

Scraping Speed, *electronically variable*:	Up to 1900 strokes/minute
Length of Stroke:	Fixed
Pattern Size *(depends on blade)*:	Small, medium, large, extra large
Operating Voltage, Standard:	110 VAC, 60Hz (220 V available)
Power Draw:	320 watts
Weight:	6.6 lbs. (2.8kg)
Dimensions:	4.4” x 2.6” x 17.4” (110 x 65 x 440mm)

Scraping/flaking of half-moon oil-pocket patterns for slide way lubrication, or to break up friction and “stick-slip” on precision-machined flat surfaces and ways. Pattern creates pleasing appearance and ensures good surface lubrication with better wear characteristics. Rescraping of worn ways to reestablish lubrication and prevent further wear. Our “Flaker” or “Spotter” model.

Blade Kits & Replacement Blades

Scraper blade kits, scraper blades, and inserts with holders will fit all scraper models except Half-Moon Pattern Scraper HM10. The HM10 takes the #8/E kit, as well as the separate blades listed below.

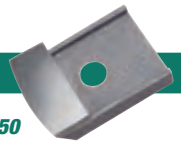
Scraper Blade Kits

Order	Description
Blade Kit ALL-PURPOSE	***BLADE KIT, Assortment ALL-PURPOSE*** Our most popular set includes general scraping blades, inserts and insert holders. Contents: #15, 20, 25, 30 blades; #25/20, 25/25, 25/30 indexable carbide inserts; #30/40 HSS indexing inserts; #120M, 130M insert holders; control gauge.
Blade Kit FINISH	***BLADE KIT, Assortment FINISH*** Long, flexible blades give a soft feel and are most suitable for semi-finish and finish work. This set greatly enhances all scraper models when semi-finish and finish scraping is desired. Contents: #10-150, 15-150, 20-150, 25-150, 30-150 carbide-tipped blades; 20-150ST steel scraping blades; control gauge.
Blade Kit DOVETAIL	***BLADE KIT, Assortment DOVETAIL*** This kit contains the proper blades for dovetail and hard-to-reach area scraping in horizontal and vertical positions. A perfect addition to the all-purpose blade kit. Contents: #25/20, 25/25 carbide inserts; 15T, 20T twisted long blades; 120MT, 130MT twisted insert holders; crimped insert holders; 30/25HSS insert; KL170 blade extension for use on hard-to-reach areas, used with long finish blades.
Blade Kit #8/E	***BLADE KIT, Assortment #8/E (for Half-Moon Pattern Scraping)*** This kit is used only for half-moon pattern scraping with Model HM10 and is the perfect complementary kit for this model. Contents: #R60, R90, R120, R150, KL70, KL140; control gauge.

WE CAN REPAIR AND SERVICE ALL OF YOUR BIAX TOOLS AT OUR HEADQUARTERS IN BLOOMFIELD, CT.

Replacement Blades for Half-Moon Pattern Scraper Model HM10

Catalog Number	Radius	Description
Half-Moon Pattern Scraper Blades (for holders)		
R60	2-3/8”	Small pattern
R90	3-5/8”	Standard pattern
R120	4-3/4”	Large pattern
R150	6”	Extra-large pattern
Tool Holders (for half-moon pattern scraper blades, Series R60-R150)		
KL70	3”	Short holder
KL140	6”	Long holder
Half-Moon Pattern Carbide Blades		
R60KL	2-3/8”	Small pattern
R90KL	3-5/8”	Standard pattern
R120KL	4-3/4”	Large pattern
R150KL	6”	Extra-large pattern


R150


KL140

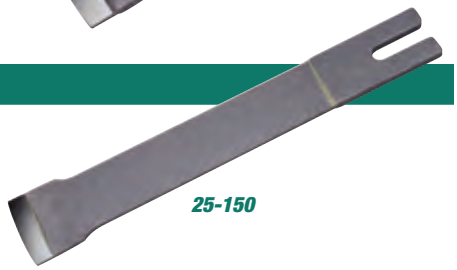

R90KL

Replacement Blade Selection

Individual Replacement Blades

Catalog Number	Radius	Description
Regular-Length (3-1/2") Scraper Blades		
15	5/8"	Carbide-tipped, reversible, standard stiff type, regular length (3-1/2"), all-purpose
20	3/4"	
25	1"	
30	1-1/4"	
Long-Length (6") Scraper Blades		
10-150	3/8"	Carbide-tipped, reversible, special elastic type, long length (6"), for smooth semi-finishing and finishing
15-150	5/8"	
20-150	5/8"	
25-150	1"	
30-150	1-1/4"	
20-150ST	3/4"	**Special HSS Blade** for steel scraping
Tight-Radius Scraper Blades for Point Scraping and Scraper Technique 40		
20-R40	3/4"	Carbide-tipped, short type, 40mm radius
15-150-R20	5/8"	Carbide-tipped, long type, 20mm radius
Reversible, Special 90° Twisted Stiff-Type Scraper Blades		
15T	5/8"	Carbide-tipped, reversible, special 90° twisted stiff type, long length (6"), for dovetail work and hard-to-reach areas
20T	3/4"	
25T	1"	
30T	1-1/4"	

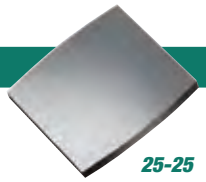
15


25-150


25T

Individual Replacement Inserts & Holders

Catalog Number	Radius	Description
Solid Carbide Scraper Blades		
25/20	3/4"	All-purpose indexable insert type made of solid carbide. Ideal for scraping most materials. 1" length. To be used with tool holders below pattern.
25/25	1"	
25/30	1-1/4"	
HSS Scraper Blades		
30/25 HSS	1"	Indexable inserts made of special HSS. To be used with holder, positive cutting angle, 1-1/4" length. Used to scrape softer wrought and cast steels. Use with 120M and 130M holders.
30/40 HSS	1-5/8"	
Tool Holder (for Indexable Insert-Type Blades)		
120M		Short (3"), stiff type
130M		Long (6")
130ME		Long (6"), 1/2" offset for shoulders
Tool Holder Extension		
KL170		For scraping of dovetails and hard-to-reach areas. Use with the long special elastic scraper blade series – 150, 6-3/4" long.


25-25

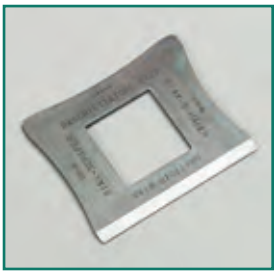

130M

Scraping Accessories & Aids

Catalog Number	Size	Description
Water-Soluble Spotting Ink* – in plastic bottle dispenser		
BB10000	1-1/2 oz.	Blue spotting ink
BB10007	8 oz.	
BB10005	1-1/2 oz.	Red spotting ink
BB10008	8 oz.	
BB10006	1-1/2 oz.	Yellow spotting ink
BB10009	8 oz.	
Prussian Blue & Spotting Ink Roller		
BB10011 / BB10010	.75 oz. / 7"	Prussian Blue [in tube, .75 oz. or 7" (on request)]
BB10019	2" dia. x 6"	Large Ink Roller
BB10015	1-1/2" dia. x 5"	Small Ink Roller
BB10016		Small Ink Pad
Control Gauge		
BB20000		For checking of scraper blade radii, checking of carrying points per square inch and removal of scraping chips, dust, etc.
Hand Scraper		
BB20016	15.5" x 1"	Universal hand scraper with adapter extension for use with **all** Biax scraper blades.
Book & DVD		
BB50000		"Machine Tool Reconditioning," a 500+ page comprehensive, time-tested publication with many photos and illustrations.
BB50020		3-Part Scraping DVD

** Other colors available, subject to minimum order requirements. Contact us for details.*

Water-Soluble Spotting Ink



Control Gauge

Prussian Blue and Spotting Ink Roller

Hand Scraper

Book

WE CAN REPAIR AND SERVICE ALL OF YOUR BIAX TOOLS AT OUR HEADQUARTERS IN BLOOMFIELD, CT.

Pneumatic Spindles for Automated Deburring

Dapra is proud to be the official U.S. distributor of BIAX pneumatic spindles for automated deburring. From stationary spindles to complete modular systems and spindles with deflection for use in industrial robots and machining centers, we can outfit you with the ideal solution for your requirements and budget.

Straight Spindles

Straight pneumatic spindles are ideal for grinding, milling, engraving, brushing and drilling. High-speed, low-speed and oil-free options are available.

Spindles with Angle Head

Pneumatic spindles are available with an angled head for surface finishing and deburring in hard-to-reach areas.

Oscillating Drives

Pneumatic oscillating drives are available with swash plate drive or piston motor, with varying stroke lengths.

Drill Deburring Spindles

Pneumatic drill deburring spindles are great for deburring and countersinking holes from 5.5mm to 29mm. Available with straight or angled heads.

VIEW AVAILABLE MODELS & SPECS AT DAPRA.COM/BIAXSPINDLES

RSC Modular System for Automated Deburring

The Biax RSC Modular System offers interchangeable components to satisfy most automated deburring applications: rigid or with deflection; rotating or oscillating; on an industrial robot or in a machining center:

- Choose from straight and angled spindles in different speeds (16,000 rpm to 100,000 rpm), as well as oscillating tools
- Optional deflection unit with adjustable deflection force
- Attachments for machining centers, including HSK, SK and a Weldon adapter – allows for high-speed deburring, engraving, polishing and fine milling
- Universal adapters for stationary mounting or mounting to a robot
- Schunk quick-change attachment also available

Spindles with Radial Deflection

Pneumatic spindles with radial deflection for use with an industrial robot or stationary set-up. Deflectable spindles are capable of compensating part and positioning tolerances when machining, making it possible to trace a part contour with constant pressure and achieve uniform removal – even under fluctuating conditions. Ideal for applications such as automated deburring of castings or machined components using an industrial robot.

Hand-Held Air Tools

Dapra is proud to be the official U.S. distributor of BIAX air-powered hand tools for grinding, filing, deburring, polishing, chiseling, engraving, and drilling.

Grinders – Straight & Angled

High-speed pneumatic grinders for the finest deburring jobs, including with oil-free motors; high-powered, low-speed grinders for the toughest applications; both straight and angle grinders.

Belt Sanders

Air-powered belt sanders from 6mm to 20mm wide. Compact, lightweight models available.

Saws

Pneumatic saws are ideal for car body work and safer working in explosion hazard areas.

Files

Air-driven tools for filing, deburring and even rough machining of cast parts. Available in straight and pistol-style configurations. Low-vibration models are available.

VIEW AVAILABLE MODELS & SPECS AT DAPRA.COM/BIAXHANDTOOLS

Chiseling & Engraving

Pneumatic hand tools for chiseling and engraving.

Drills

Air-powered drills in pistol and angled configurations.

Drill Deburring – Straight & Angled

A variety of straight or angled pneumatic drilling deburrers make it easy to debur even cross bores that are difficult to access.

Screwdriving Tools

Pneumatic hand-held screwdrivers and automatic screw feeding systems are available.

WE CAN REPAIR AND SERVICE ALL OF YOUR BIAX TOOLS AT OUR HEADQUARTERS IN BLOOMFIELD, CT.

Safety

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 products after purchase.

Grinding produces hazardous dust. To avoid adverse health effects, use adequate ventilation and read material safety data sheet first.

Technical Milling Training

When we say that ***your*** job is ***our*** job, it's also a reflection of our dedication to customer education.

We pride ourselves in being a total solutions provider. Selling a tool is just one small step in a collaborative journey that includes process evaluation, tool and insert grade/geometry selection, operating optimization, troubleshooting, and productivity enhancement. To that end, we are pleased to provide both industry-leading technical milling training classes at our Midwest Training & Testing Center and a series of free, on-demand training videos.

Hands-On Milling Training Classes

Our Milling Training & Testing Center was designed specifically for customer education, prototype testing and application development.

FREE Milling Training Videos

We offer a growing library of ***FREE*** milling training videos, available on-demand to help you maximize your productivity.

www.dapra.com/training

YOUR JOB – OUR JOB

CUTTING TOOLS
100% MADE IN THE USA

QUALITY | DESIGN | PERFORMANCE

DAPRA stands with you, the American Manufacturer – committed to keeping jobs on United States soil and strengthening the U.S. economy.

Our cutting tools and inserts are 100% designed and manufactured in the USA. Your business is built around keeping manufacturing in America. Shouldn't your tools carry the same badge of quality and dependability as the product you create?

Place your Guaranteed Test Order today and see the benefits of American quality, design and performance!

1. **Contact us to discuss your application and tooling requirements.**
2. **Place your Guaranteed Test Order and receive a free gift.**
3. **DAPRA stands behind the performance of our cutting tools. If you don't achieve the expected results, you will receive a full refund!**

Call us today or visit DAPRA.com/USA for complete details on our Guaranteed Test Order program. Rest assured, you have our unwavering commitment to improve your bottom line.

DAPRA®

Bringing Better Ideas to the Cutting Edge™

800-243-3344 | info@dapra.com | www.dapra.com

HEADQUARTERS:

66 Granby Street, Bloomfield, CT 06002 | 860-242-8539 | Fax: 860-242-3017

MIDWEST TRAINING & TESTING CENTER:

4861 American Rd., Suite A-B, Rockford, IL 61109