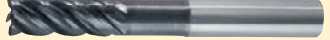
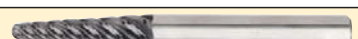
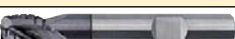
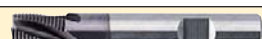
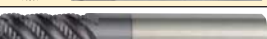


Solid End Milling • High-Performance Solid Carbide End Mills

High-Performance Tool Selector and Grades	P2-P11
High-Performance Capability End Mills	P12-P86
High-Performance Solid Carbide Roughing End Mills.....	P88-P104
High-Performance Solid Carbide Finishing End Mills.....	P106-P112
High-Performance Material Specific End Mills	P114-P163
High-Performance Application Specific End Mills	P164-P171

	*Beyond™ grade	series	D1 diameter (inch)	length of cut	flute Z	helix	internal coolant
HARVI™ I*		HPHV	1/8–1 1/4	1.8–2 x D1			
HARVI I*		UBDE/UADE	1/4–1	1.25 x D			
HARVI I*		HPRSHV	1/2–1	1–1.2 x D1			
HARVI I*		HPHVBN	1/8–1	1.5–4 x D1			
HARVI I		HPHVT	1/2–1	1.25–1.8 x D1			
CXE		CXE	1/8–1	2 x D			
CXER		CXER	1/8–1	2 x D			
HARVI II*		UCDE	3/16–1	1.75–3.3 x D1			
HARVI II*		UCDE	1/4–1	1.75–2 x D1			
HARVI II		UDDE	1/2–1	1.75–2.5 x D1			
HARVI II Long		UGDE	1/4–1	3 x D			
HARVI II Long		UGDE	1/4–1	5 x D			
HARVI III		UJDE	3/8–1 1/4	1.75–2 x D			
HARVI III		UJDE	3/8–1	1.75–2.25 x D			
HARVI III Ball Nose		UJBE	3/8–1	1.5–2 x D			
HARVI III Ball Nose		UJBE	3/8–1	1.5 x D1			
HARVI™ III Aerospace Expansion		UJDE	1/2–1.5	1.3–5.3 x D			
HARVI III Aerospace Expansion		UJBE	1/2–1.5	1.3–5.3 x D			
HARVI III Taper Ball Nose		UJBE	1/8–7/16	5–6 x D			
HP Rougher		HPRSS	1/4–3/4	2–3 x D1			
HP Rougher		MDRHEC	1/4–1	1–2.5 x D1			
HP Rougher		HPRST	1/4–1	1.5–2.5 x D1			
RSM II Short		FSDE	3/8–1	2 x D			
RSM II with neck		FSDE	1/4–1	2 x D1			
HP Finisher		HPFSS	1/8–3/4	2–4 x D1			
HP Finisher		HPFSS	1/8–3/8	2–3.25 x D1			
HP Finisher		HPFT	1/8–3/4	2–4 x D1			
Aluminum MaxiMet™		ABDF	3/16–1	2 x D1			
Aluminum MaxiMet		ABDE	3/16–1	1.2–2 x D1			
Aluminum MaxiMet		ABDF	1/4–1	1–4 x D1			
Aluminum MaxiMet		ABDE	1/4–1	1.25–4 x D1			
Aluminum		AADF	1/8–1	1–4 x D1			
Aluminum		AADE	1/8–1	1.25–4 x D1			
Aluminum		SFRHEC	1/4–1	2.25–3 x D1			

							shank	center cutting	neck	P	M	K	N	C	S	H							product page(s)	cutting data page(s)
			✓	✓	✓			✓		●	●	●			○	○							P16-P20	P25
				✓	✓			✓	✓	●	●	●			●	○							P21	P25
			✓	✓				✓		●	●	●											P22	P26
						✓		✓		●	●	●			○	○							P23	P26
			✓	✓				✓		●					●	○							P24	P27
					✓			✓	✓	○	●				○								P84	P86
					✓			✓	✓	○	●				○								P85	P86
			✓	✓						●	●	●			○	○							P30-P31	P34
			✓	✓					✓	●	●	●			●	○							P32	P35
			✓	✓						●					●								P33	P35
			✓	✓						●	●	○			●	○							P38	P40
			✓	✓						●	●	○			●	○							P39	P41
			✓	✓				✓		○	●				●	○							P44-P45	P47
					✓			✓	✓	○	●				●	○							P46	P48
					✓			✓		○	●				●	○							P52	P56
					✓			✓	✓	○	●				●	○							P53	P56
					✓			✓	✓	○	●				●	○							P60-P65	P70
								✓		○	●				●	○							P66-P67	P71
	✓							✓		●	●				●	○							P74	P80
					✓			✓		●	●	●			○								P90	P93
				✓				✓		●	●	●			○	○							P91	P94
					✓			✓		○	●	○			●	●							P92	P95
					✓					○	●				●	○							P98	P99
					✓					○	●				●	○							P100	P101
					✓			✓		●	●	●			○								P108	P111
			✓					✓		●	●	○			●	○							P109	P111
			✓					✓		●	●	●			●	○							P110	P112
			✓		✓			✓					●										P116	P122
			✓		✓			✓					●										P117	P122
			✓		✓			✓	✓				●										P118-P119	P123
			✓		✓			✓	✓				●										P120-P121	P123
			✓		✓			✓					●										P126-P127	P132
			✓		✓			✓					●										P128-P130	P132
				✓				✓					●										P131	P132

● first choice
○ alternate choice

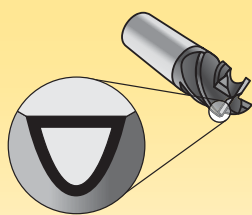
(continued)

(Solid Carbide End Mills — continued)

 *Beyond™ grade		series	D1 diameter (inch)	length of cut	flute Z	helix	internal coolant
CFRP		CCNC	1/4–1/2	3 x D1			
CFRP		CDDC	1/4–1/2	3 x D1			
CFRP		CBDB	1/4–1/2	3 x D1			
KenFeed™		KMDA	1/4–3/4	0.5 x D1			
KenFeed		KHDA	1/4–3/4	0.3 x D1			
Hard Steels		HPFDM	1/4–1	1.5–3.5 x D1			
Hard Steels		HPRDM	3/16–1/2	1 x D1			
Hard Steels Ball Nose		HPBNDM	1/8–3/4	1 x D1			
Ceramic Rougher		EADE	3/16–1/2	0,75 x D			
Ceramic Rougher		EADE	3/16–1/2	0,75 x D			
GOmill™		UEDE	5/64–1/2	1.25 x D1			
GOmill		UEDE	5/32–1/2	1.25 x D1			
GOmill		UEBD	5/64–1/2	1.25 x D1			
GOmill		UEBD	5/64–1/2	1.25 x D1			

							shank	center cutting	neck														product page(s)	cutting data page(s)	
															●								P136	P139	
															●								P137	P139	
															●								P138	P139	
										●						○							P142	P144	
																●							P143	P144	
										●						●							P148	P151	
										●	○	○				○	●							P149	P151
										●						●							P150	P152	
															●								P156	P158	
															●								P157	P158	
										●	●	●				○	○							P166	P170
										●	●	●			●	○							P167	P170	
										●	○	●				○	○						P168	P171	
										●	○	●				○	○						P169	P171	

● first choice
○ alternate choice

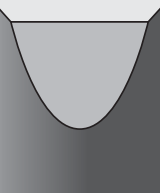


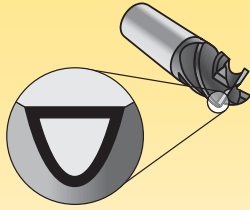
Coatings provide high-speed capability and are engineered for roughing to finishing.

P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High-Temp Alloys
H	Hardened Materials
C	CFRP Materials

wear resistance ← → toughness

Grades

Coating	Grade Description		05	10	15	20	25	30	35	40	45
KG00											
		N									
KCPM15		P									
		M									
		K									
KC643M		P									
		M									
		K									
		S									
KC637M											
		S									
		H									
KC635M		P									
		M									
		K									
		S									

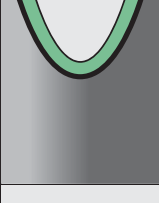


Coatings provide high-speed capability and are engineered for roughing to finishing.

P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High-Temp Alloys
H	Hardened Materials
C	CFRP Materials

wear resistance ← → toughness

Grades

Coating	Grade Description		05	10	15	20	25	30	35	40	45
KC625M		Coated carbide grade with PVD (TiCN) coating. For universal use due to its high wear resistance and hardness. Only use wet or with MQL (minimum quantity lubrication).	P								
			M								
			K								
			S								
KC639M		PVD- (AlTiN) coated carbide on a submicron carbide substrate. This hard coating provides outstanding performance in milling hardened materials (58–65 HRC).	P								
			M								
			K								
			H								
KCSM15		Coated carbide grade with thick PVD coating and optimized chemistry and process for increased wear resistance. Outstanding protection in milling stainless steel to mitigate crater, DOCN (depth-of-cut notching), and flank wear. Excellent performance up to 52 HRC.	M								
			K								
			S								
			H								
KCN05		High-performance grade A pure, diamond-coated carbide for milling CFRP and graphite. It is a very tough and wear-resistant grade.	P								
			M								
			K								
			C								
KC633M		Coated carbide grade with PVD multilayer coating. KC633M™ is designed for dry milling most types of material, apart from the hardened variety. This grade is characterized by good hardness and wear resistance. It provides outstanding protection for solid carbide tools against cratering and abrasion.	P								
			M								
			K								
			S								

➤ Beyond™ Solid Carbide End Milling

High-Performance milling in a new dimension



Kennametal is pleased to announce the KCPM15™ and KCSM15™ grades — the first Beyond grades for solid carbide end mills. KCPM15 and KCSM15 grades feature an improved high-performance carbide substrate with proprietary aluminum titanium nitride (AlTiN) PVD coating.

Features and Benefits

- Engineered to increase tool life and productivity by up to 30%.
- For use in milling steels and stainless steels.
- Improved resistance to cratering, flank wear, and depth-of-cut notching.

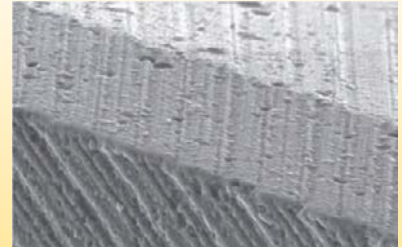
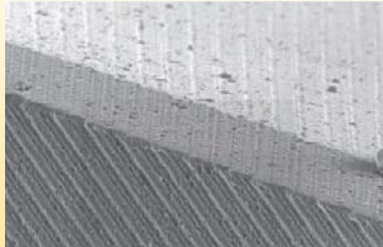
Workpiece Materials:

P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High-Temp Alloys
H	Hardened Materials

Coating	Grade Description	
KCPM15	Coated carbide grade with thick PVD coating and optimized chemistry and process for increased wear resistance. Outstanding protection in milling stainless steel to mitigate crater, DOCN (depth-of-cut notching), and flank wear. Excellent performance up to 52 HRC.	P M K
KCSM15	Coated carbide grade with thick PVD coating and optimized chemistry and process for increased wear resistance. Outstanding protection in milling stainless steel to mitigate crater, DOCN (depth-of-cut notching), and flank wear. Excellent performance up to 52 HRC.	M S H

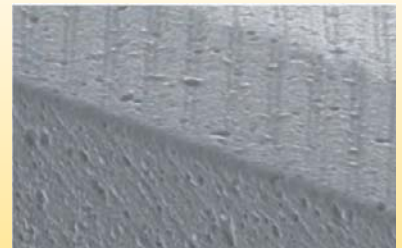
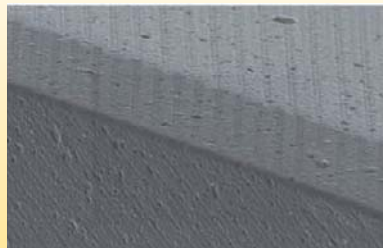
Conventional End Mill Cutting Edge

Conventional



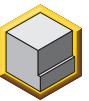
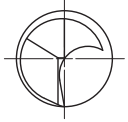
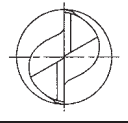
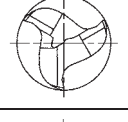
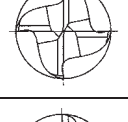
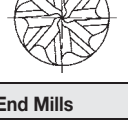
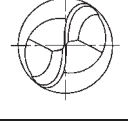
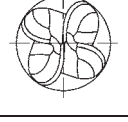
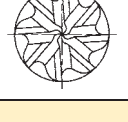
KCPM15™/KCSM15™ End Mill Cutting Edge

KCPM15/KCSM15 grade



View: 1st and 2nd relief.

■ End Mill Type Recommendation

End Mills									
Z = number of teeth		Fine Finishing	Finishing	Roughing	Slot Milling	Plunging	Contour Milling	Peel Milling	Trochoidal Milling
end mill Z = 1									
end mill Z = 2									
end mill Z = 3									
end mill Z = 4/5									
multi-flute cutter Z = 6–19									
Ball Nose and Torus End Mills									
ball nose end mill Z = 2									
ball nose end mill Z = 4									
ball nose end mill Z = 6									



first choice



suitable with limitations



not recommended

Always select a tool with the shortest possible flute length whenever possible. This will increase the stability of the tool and give the best results.

When selecting an end mill, the following machining factors will affect your selection of the correct end mill for your application:

1. Tool overhang.
2. Coolant flow.
3. Machine and setup stability.
4. Machine power and torque.
5. Material to be machined.
6. Machine adapter size (DV40, DV50, HSK63, etc.).
7. See Tool Reference Guides on pages P2–P5.

■ Recommended Adapters per End Mill Platform

SCEM Platform	Recommended Adapters	
	First Choice	Alternate Choice
HARVI™ I	HydroForce™	Shrink Fit
HARVI II	HydroForce	Shrink Fit
HARVI III	HydroForce	Shrink Fit
HARVI II Long	HydroForce	Shrink Fit
High-Performance Roughers	HydroForce	Weldon® Adapter
RSM II	Shrink Fit	Shrink Fit
High-Performance Finishers	HydroForce	Shrink Fit
MaxiMet™ /Aluminum Tools	HydroForce	Shrink Fit
Hard Material End Mills/KenFeed™	HydroForce	Shrink Fit
GOmill™	Shrink Fit	Weldon Adapter

■ Select Adapter per Technical Data/Characteristics

Technical data/characteristics	Toolholders				
	HydroForce high torque	Shrink Fit	Milling chuck	ER collet chuck	Weldon adapter
torque transmission	★★★★★	★★★★	★★★★★	★★	★★★★★
radial runout (T.I.R.) ¹	★★★★★	★★★★★	★★★★	★★★	★
radial rigidity ²	★★★★	★★★★★	★★★	★★★	★★★
tool length adjustment	★★★★★	★★★★	★	★★★★	★★
tool shank tolerance requirement	★★★★	★★	★★★	★★★★★	★★★
through coolant	★★★★★	★★★★★	★★★	★★★	★★
minimum quantity lubrication (MQL)	★★★★★	★★★★★	★	★	★
dampening capability	★★★★★	★	★★★	★★★	★★★
shank diameter range ³	★★★★★	★	★★★★★	★★★★★	★
cost of toolholder	★★	★★★	★	★★★★	★★★★★
low requirement of external devices ⁴	★★★★★	★	★★★★	★★★★	★★★★★
ease of handling	★★★★★	★★★	★★	★★★★	★★★★
dust resistance	★★★★★	★★★★★	★★★	★★★	★★★★
high-speed capability	★★★★★	★★★★★	★★★	★★★	★
balancing accuracy	★★★★★	★★★★★	★★★	★★★	★

¹ Radial runout may affect tool life.

² Radial rigidity for Weldon holder is low at a direction perpendicular to the screw.

³ Accepts different shank diameters through the use of reduction sleeves or due to collapse range.

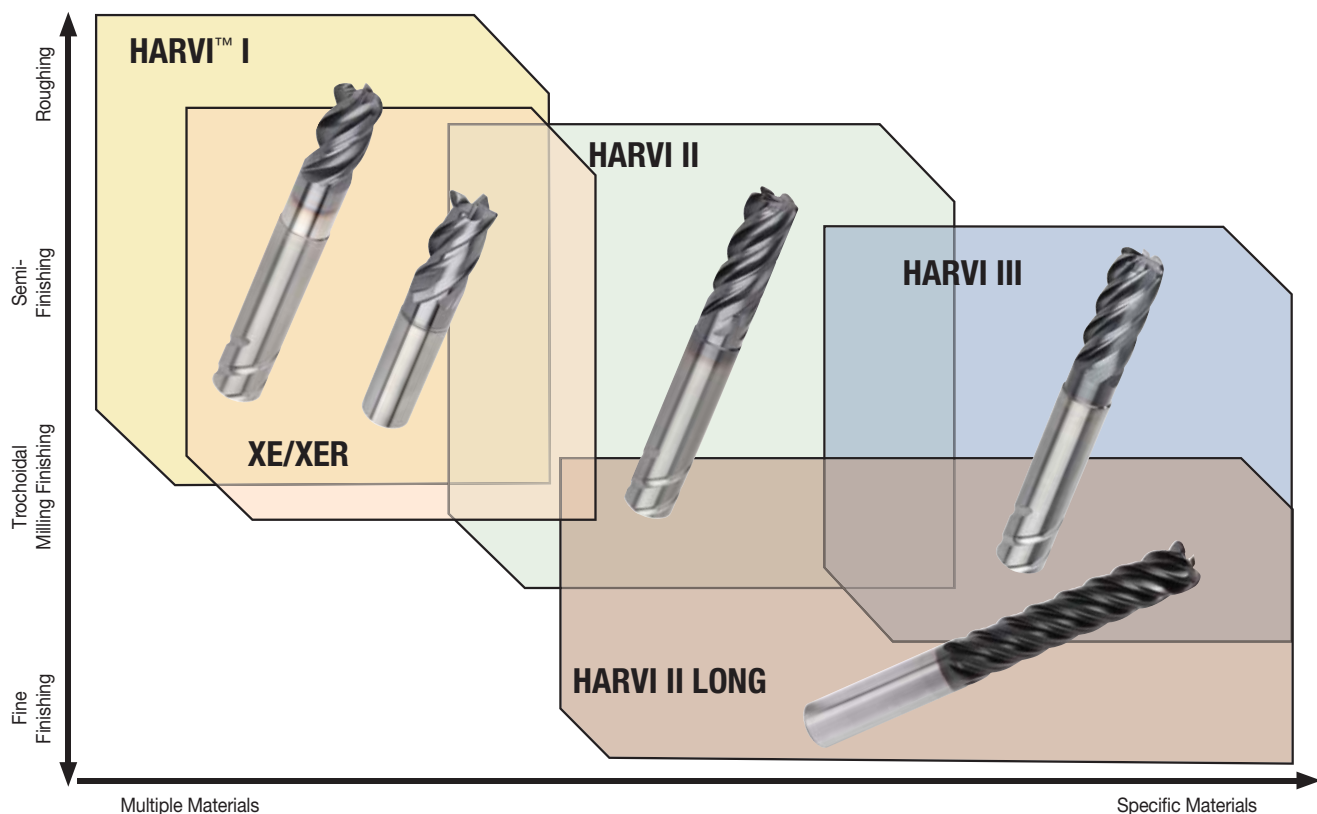
⁴ Collet chucks and milling chucks may require the use of a torque or special wrench; Shrink Fit adapter requires a shrinking unit.

➤ High-Performance Capability End Mills

Primary Application

High-performance capability offers plunging, slotting, and profiling at the highest possible feed rates for a wide range of materials from steel, stainless steel, cast iron, and high-temperature alloys to hard materials. These end mills are designed to provide maximum Metal Removal Rates (MRR) and to achieve superior surface conditions.

Several platforms with a wide range of diameters and corner configurations, such as chamfer, radii, sharp edges, and ball nose, are available from stock.



**Designed for roughing and finishing with one tool
in a wide range of applications and workpiece materials.**



- Roughing, semi-finishing, and finishing with one tool.
- Outstanding metal removal rates increase productivity.
- Excellent surface quality and accuracy.
- KCPM15™ and KCSM15™ Beyond™ grades for long tool life.
- Increased process safety with Safe-Lock™ by HAIMER® shanks.

HARVI™ I

High-Performance Solid Carbide End Mills

Primary Application

The HARVI I system offers plunging, slotting, and profiling at the highest possible feed rates for a wide range of materials. These end mills are designed to provide maximum Metal Removal Rates (MRR) and to achieve superior surface conditions. A wide range of diameters and corner configurations, such as chamfer, radii, and sharp edges, are available from stock. To prevent pull out of end mills during heavy cuts, the HARVI I system is available equipped with Safe-Lock™ system by HAIMER®.

- Roughing and finishing with one tool.
- Outstanding metal removal rates increase productivity.
- KCPM15™ and KCSM15™ Beyond™ grades for long tool life.

Features and Benefits

Advanced Technology

- Four unequally spaced flutes for chatter-free machining at high feed rates.
- Center cutting design for plunging and improved ramping and helical interpolation capabilities.
- 1 x D full slotting capability in:
 - Steel
 - Stainless steel
 - Titanium

Tailored Grades

- KCPM15 Beyond grade for outstanding wear protection in stainless steel to mitigate crater, depth-of-cut notching, and flank wear.
- KCSM15 Beyond grade for exceptional tool life in titanium.
- Universal KC643M™ grade suitable for cutting steel, cast iron, stainless steel (wet), and titanium (wet).

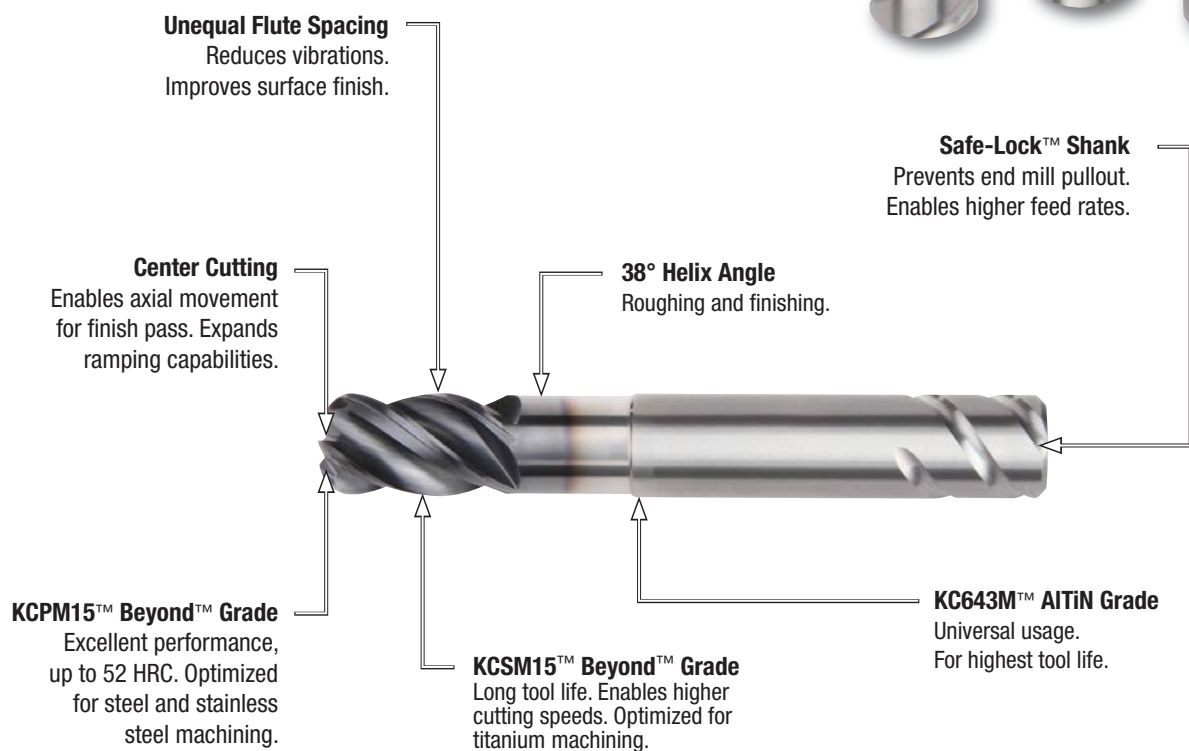
Customization

- Intermediate diameters available.
- Expanded length of tool and increased length of cut are possible.
- Chip divider geometry reduces power consumption and improves chip formation in difficult-to-cut materials.
- Internal coolant axial and radial available.
- Various shanks and non-standard coatings available.
- Multiple steps possible.

Extensive Standard Offering

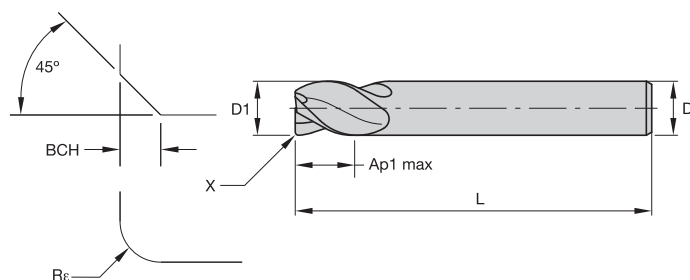
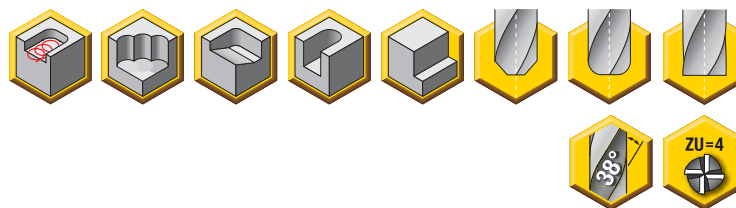
- Diameter range 1/8–1-1/4".
- Necked, corner radii, chamfer, and square-end offering.
- Extended-reach length.
- Ball nose with extended length of cut.

Designed for roughing and finishing
with one tool in almost all materials.



SAFE-LOCK®
by HAIMER®

- Kennametal standard dimensions.
- Center cutting.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.

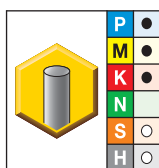
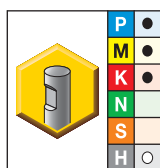
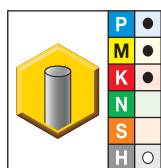


End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+0.000/- .002"	≤1/8"	+0/-0.00024"
		>1/8-1/4"	+0/-0.00031"
		>1/4-3/8"	+0/-0.00035"
		>3/8-23/32"	+0/-0.00043"
		>23/32-1-3/16"	0/.00051"



■ HPHV • UADE • 4 Flute • Inch

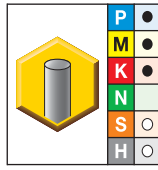
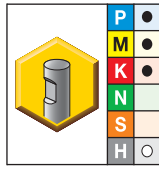
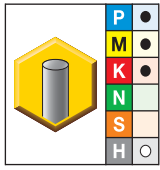


- first choice
- alternate choice

	KCPM15	KCPM15	KC643M	D1	D	Ap1 max	L	Re	BCH
HPHV125S4025CH	—	—	—	1/8	1/8	1/4	1 1/2	—	.015
HPHV125S4025	—	—	—	1/8	1/8	1/4	1 1/2	—	—
HPHV125S4025LR015	—	—	—	1/8	1/8	1/4	2 1/2	.015	—
HPHV125S4050R015	—	—	—	1/8	1/8	1/2	2	.015	—
HPHV125S4050CH	—	—	—	1/8	1/8	1/2	2	—	.015
HPHV125S4050	—	—	—	1/8	1/8	1/2	2	—	—
HPHV125S4050L	—	—	—	1/8	1/8	1/2	2 1/2	—	—
HPHV188S4031CH	—	—	—	3/16	3/16	5/16	1 1/2	—	.015
HPHV188S4031	—	—	—	3/16	3/16	5/16	1 1/2	—	—
HPHV188S4031LR015	—	—	—	3/16	3/16	5/16	2 1/2	.015	—
HPHV188S4031L	—	—	—	3/16	3/16	5/16	2 1/2	—	—
HPHV188S4063R015	—	—	—	3/16	3/16	5/8	2 1/4	.015	—
HPHV188S4063R030	—	—	—	3/16	3/16	5/8	2 1/4	.030	—
HPHV188S4063CH	—	—	—	3/16	3/16	5/8	2 1/4	—	.015
HPHV188S4063	—	—	—	3/16	3/16	5/8	2 1/4	—	—
HPHV188S4063LR015	—	—	—	3/16	3/16	5/8	2 1/2	.015	—
HPHV188S4063LR030	—	—	—	3/16	3/16	5/8	2 1/2	.030	—
HPHV188S4063L	—	—	—	3/16	3/16	5/8	2 1/2	—	—
HPHV250S4038R030	—	—	—	1/4	1/4	3/8	2	.030	—
HPHV250S4038CH	—	—	—	1/4	1/4	3/8	2	—	.015
HPHV250S4038	—	—	—	1/4	1/4	3/8	2	—	—
HPHV250S4038LR015	—	—	—	1/4	1/4	3/8	2 1/2	.015	—
HPHV250S4050R015	—	—	—	1/4	1/4	1/2	2 1/2	.015	—
HPHV250S4050R030	—	—	—	1/4	1/4	1/2	2 1/2	.030	—
HPHV250S4050R060	—	—	—	1/4	1/4	1/2	2 1/2	.060	—
HPHV250S4050	—	—	—	1/4	1/4	1/2	2 1/2	—	—
HPHV250S4075R015	—	—	UADE250J4ARA	1/4	1/4	3/4	2 1/2	.015	—
HPHV250S4075R030	—	—	—	1/4	1/4	3/4	2 1/2	.030	—

(continued)

(HPHV • UADE • 4 Flute • Inch — continued)

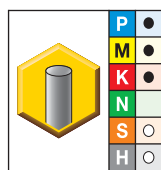
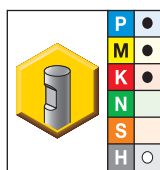
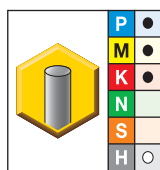


● first choice
○ alternate choice

KCPM15	KCPM15	KC643M	D1	D	Ap1 max	L	Re	BCH
HPHV250S4075R060	—	UADE250J4ARC	1/4	1/4	3/4	2 1/2	.060	—
HPHV250S4075CH	—	—	1/4	1/4	3/4	2 1/2	—	.015
HPHV250S4075	—	—	1/4	1/4	3/4	2 1/2	—	—
HPHV250S4100R015	—	—	1/4	1/4	1	3	.015	—
HPHV250S4100	—	—	1/4	1/4	1	3	—	—
HPHV250S4125R030	—	—	1/4	1/4	1 1/4	3 1/4	.030	—
HPHV250S4125CH	—	—	1/4	1/4	1 1/4	3 1/4	—	.015
HPHV250S4125	—	—	1/4	1/4	1 1/4	3 1/4	—	—
HPHV250S4175R015	—	—	1/4	1/4	1 3/4	4	.015	—
HPHV250S4175R030	—	—	1/4	1/4	1 3/4	4	.030	—
HPHV312S4050R030	—	—	5/16	5/16	1/2	2	.030	—
HPHV312S4050CH	—	—	5/16	5/16	1/2	2	—	.015
HPHV312S4050	—	—	5/16	5/16	1/2	2	—	—
HPHV312S4050LR015	—	—	5/16	5/16	1/2	2 1/2	.015	—
HPHV312S4050L	—	—	5/16	5/16	1/2	2 1/2	—	—
HPHV312S4075R015	—	—	5/16	5/16	3/4	2 1/2	.015	—
HPHV312S4075R030	—	—	5/16	5/16	3/4	2 1/2	.030	—
HPHV312S4075R060	—	—	5/16	5/16	3/4	2 1/2	.060	—
HPHV312S4075CH	—	—	5/16	5/16	3/4	2 1/2	—	.015
HPHV312S4075	—	—	5/16	5/16	3/4	2 1/2	—	—
HPHV312S4125R030	—	—	5/16	5/16	1 1/4	3 1/4	.030	—
HPHV375S4050R030	—	—	3/8	3/8	1/2	2	.030	—
HPHV375S4050CH	—	—	3/8	3/8	1/2	2	—	.020
HPHV375S4050	—	—	3/8	3/8	1/2	2	—	—
HPHV375S4050LR015	—	—	3/8	3/8	1/2	2 1/2	.015	—
HPHV375S4050LR030	—	—	3/8	3/8	1/2	2 1/2	.030	—
HPHV375S4050L	—	—	3/8	3/8	1/2	2 1/2	—	—
HPHV375S4088R015	—	—	3/8	3/8	7/8	2 1/2	.015	—
HPHV375S4088R030	—	—	3/8	3/8	7/8	2 1/2	.030	—
HPHV375S4088R060	—	—	3/8	3/8	7/8	2 1/2	.060	—
HPHV375S4088R090	—	—	3/8	3/8	7/8	2 1/2	.090	—
HPHV375S4088CH	—	—	3/8	3/8	7/8	2 1/2	—	.020
HPHV375S4088	—	—	3/8	3/8	7/8	2 1/2	—	—
HPHV375S4088LR015	—	—	3/8	3/8	7/8	3	.015	—
HPHV375S4088LR030	—	—	3/8	3/8	7/8	3	.030	—
HPHV375S4088LR090	—	—	3/8	3/8	7/8	3	.090	—
HPHV375S4088L	—	—	3/8	3/8	7/8	3	—	—
HPHV375S4100R015	—	—	3/8	3/8	1	3	.015	—
HPHV375S4100R030	—	—	3/8	3/8	1	3	.030	—
HPHV375S4100R060	—	—	3/8	3/8	1	3	.060	—
HPHV375S4100	—	—	3/8	3/8	1	3	—	—
HPHV375S4125R015	—	—	3/8	3/8	1 1/4	3	.015	—
HPHV375S4125R030	—	—	3/8	3/8	1 1/4	3	.030	—
HPHV375S4125R060	—	—	3/8	3/8	1 1/4	3	.060	—
HPHV375S4125	—	—	3/8	3/8	1 1/4	3	—	—
HPHV375S4150R030	—	—	3/8	3/8	1 1/2	4	.030	—
HPHV375S4150R060	—	—	3/8	3/8	1 1/2	4	.060	—
HPHV375S4150	—	—	3/8	3/8	1 1/2	4	—	—
HPHV375S4250R030	—	—	3/8	3/8	2 1/2	4	.030	—
HPHV375S4250R060	—	—	3/8	3/8	2 1/2	4	.060	—
—	—	UADE375J4ARA	3/8	3/8	1/2	2	.015	—
—	—	UADE375J4ARB	3/8	3/8	1/2	2	.030	—

(continued)

(HPHV • UADE • 4 Flute • Inch — continued)

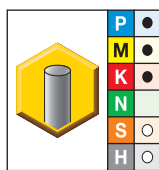
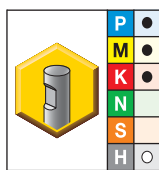
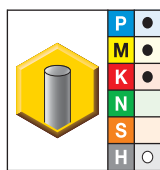


● first choice
○ alternate choice

KCPM15	KCPM15	KC643M	D1	D	Ap1 max	L	Re	BCH
—	—	UADE375J4ARC	3/8	3/8	1/2	2	.060	—
—	—	UADE375J4BRA	3/8	3/8	7/8	2 1/2	.015	—
—	—	UADE375J4BRB	3/8	3/8	7/8	2 1/2	.030	—
HPHV438S4063CH	—	—	7/16	7/16	5/8	2 1/2	—	.020
HPHV438S4088CH	—	—	7/16	7/16	7/8	2 1/2	—	.020
HPHV438S4113R015	—	—	7/16	7/16	1 1/8	3 1/2	.015	—
—	HPHV500S4063R030	—	1/2	1/2	5/8	2 1/2	.030	—
—	HPHV500S4063R060	—	1/2	1/2	5/8	2 1/2	.060	—
—	HPHV500S4063CH	—	1/2	1/2	5/8	2 1/2	—	.020
—	HPHV500S4063	—	1/2	1/2	5/8	2 1/2	—	—
—	HPHV500S4063LR015	—	1/2	1/2	5/8	3	.015	—
—	HPHV500S4063LR030	—	1/2	1/2	5/8	3	.030	—
—	HPHV500S4063LR060	—	1/2	1/2	5/8	3	.060	—
—	HPHV500S4063L	—	1/2	1/2	5/8	3	—	—
—	—	UADE500J4ARA	1/2	1/2	5/8	2 1/2	.015	—
—	—	UADE500J4ARB	1/2	1/2	5/8	2 1/2	.030	—
—	—	UADE500J4ARC	1/2	1/2	5/8	2 1/2	.060	—
—	—	UADE500J4ARE	1/2	1/2	5/8	2 1/2	.120	—
—	HPHV500S4100R030	—	1/2	1/2	1	3	.030	—
—	HPHV500S4100R060	—	1/2	1/2	1	3	.060	—
—	HPHV500S4100CH	—	1/2	1/2	1	3	—	.020
—	HPHV500S4100	—	1/2	1/2	1	3	—	—
—	HPHV500S4125R015	UADE500J4BRA	1/2	1/2	1 1/4	3	.015	—
—	HPHV500S4125R030	UADE500J4BRB	1/2	1/2	1 1/4	3	.030	—
—	HPHV500S4125R060	UADE500J4BRC	1/2	1/2	1 1/4	3	.060	—
—	HPHV500S4125R090	UADE500J4BRD	1/2	1/2	1 1/4	3	.090	—
—	HPHV500S4125R120	UADE500J4BRE	1/2	1/2	1 1/4	3	.120	—
—	HPHV500S4125CH	—	1/2	1/2	1 1/4	3	—	.020
—	HPHV500S4125	—	1/2	1/2	1 1/4	3	—	—
—	—	UADE500J4CRA	1/2	1/2	1 1/2	4	.015	—
—	HPHV500S4150R030	UADE500J4CRB	1/2	1/2	1 1/2	4	.030	—
—	HPHV500S4150R060	UADE500J4CRC	1/2	1/2	1 1/2	4	.060	—
—	—	UADE500J4CRD	1/2	1/2	1 1/2	4	.090	—
—	—	UADE500J4CRE	1/2	1/2	1 1/2	4	.120	—
—	HPHV500S4150CH	—	1/2	1/2	1 1/2	4	—	.020
—	HPHV500S4150	—	1/2	1/2	1 1/2	4	—	—
—	HPHV500S4163R030	—	1/2	1/2	1 5/8	4	.030	—
—	HPHV500S4163R060	—	1/2	1/2	1 5/8	4	.060	—
—	HPHV500S4163R120	—	1/2	1/2	1 5/8	4	.120	—
—	HPHV500S4163	—	1/2	1/2	1 5/8	4	—	—
—	HPHV500S4200R030	—	1/2	1/2	2	4	.030	—
—	HPHV500S4200CH	—	1/2	1/2	2	4	—	.020
—	HPHV500S4200	—	1/2	1/2	2	4	—	—
—	HPHV500S4250R030	—	1/2	1/2	2 1/2	4 1/2	.030	—
—	HPHV500S4300R030	—	1/2	1/2	3	5	.030	—
—	HPHV500S4300R060	—	1/2	1/2	3	5	.060	—
—	HPHV625S4075R060	—	5/8	5/8	3/4	3	.060	—
—	HPHV625S4075CH	—	5/8	5/8	3/4	3	—	.020
—	HPHV625S4075	—	5/8	5/8	3/4	3	—	—
—	HPHV625S4075LR015	—	5/8	5/8	3/4	3 1/2	.015	—
—	HPHV625S4075LR030	—	5/8	5/8	3/4	3 1/2	.030	—
—	HPHV625S4075LR060	—	5/8	5/8	3/4	3 1/2	.060	—

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(HPHV • UADE • 4 Flute • Inch — continued)



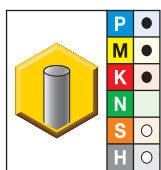
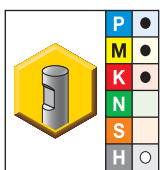
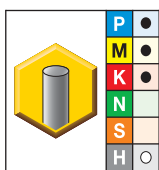
● first choice

○ alternate choice

KCPM15	KCPM15	KC643M	D1	D	Ap1 max	L	R _e	BCH
—	HPHV625S4075L	—	5/8	5/8	3/4	3 1/2	—	—
—	HPHV625S4125R030	—	5/8	5/8	1 1/4	3 1/2	.030	—
—	HPHV625S4125R060	—	5/8	5/8	1 1/4	3 1/2	.060	—
—	HPHV625S4125R090	—	5/8	5/8	1 1/4	3 1/2	.090	—
—	HPHV625S4125CH	—	5/8	5/8	1 1/4	3 1/2	—	.020
—	HPHV625S4125	—	5/8	5/8	1 1/4	3 1/2	—	—
—	HPHV625S4163R030	—	5/8	5/8	1 5/8	3 1/2	.030	—
—	HPHV625S4163R060	—	5/8	5/8	1 5/8	3 1/2	.060	—
—	HPHV625S4163R120	—	5/8	5/8	1 5/8	3 1/2	.120	—
—	HPHV625S4163	—	5/8	5/8	1 5/8	3 1/2	—	—
—	HPHV625S4213R030	—	5/8	5/8	2 1/8	4	.030	—
—	HPHV625S4213R120	—	5/8	5/8	2 1/8	4	.120	—
—	HPHV625S4213	—	5/8	5/8	2 1/8	4	—	—
—	HPHV625S4225R060	—	5/8	5/8	2 1/4	5	.060	—
—	—	UADE625J4ARB	5/8	5/8	3/4	3	.030	—
—	—	UADE625J4ARC	5/8	5/8	3/4	3	.060	—
—	HPHV750S4088CH	—	3/4	3/4	7/8	3 1/2	—	.020
—	HPHV750S4088	—	3/4	3/4	7/8	3 1/2	—	—
—	HPHV750S4088LR030	—	3/4	3/4	7/8	4	.030	—
—	HPHV750S4088L	—	3/4	3/4	7/8	4	—	—
—	—	UADE750J4ARB	3/4	3/4	7/8	3 1/2	.030	—
—	—	UADE750J4ARE	3/4	3/4	7/8	3 1/2	.120	—
—	HPHV750S4150R015	UADE750J4BRA	3/4	3/4	1 1/2	4	.015	—
—	HPHV750S4150R030	UADE750J4BRB	3/4	3/4	1 1/2	4	.030	—
—	HPHV750S4150R060	UADE750J4BRC	3/4	3/4	1 1/2	4	.060	—
—	HPHV750S4150R090	—	3/4	3/4	1 1/2	4	.090	—
—	HPHV750S4150R120	UADE750J4BRE	3/4	3/4	1 1/2	4	.120	—
—	HPHV750S4150CH	—	3/4	3/4	1 1/2	4	—	.020
—	HPHV750S4150	—	3/4	3/4	1 1/2	4	—	—
—	HPHV750S4163R030	—	3/4	3/4	1 5/8	4	.030	—
—	HPHV750S4163R060	—	3/4	3/4	1 5/8	4	.060	—
—	HPHV750S4163R120	—	3/4	3/4	1 5/8	4	.120	—
—	HPHV750S4163CH	—	3/4	3/4	1 5/8	4	—	.020
—	HPHV750S4225R030	—	3/4	3/4	2 1/4	5	.030	—
—	HPHV750S4225R060	—	3/4	3/4	2 1/4	5	.060	—
—	HPHV750S4225CH	—	3/4	3/4	2 1/4	5	—	.020
—	HPHV750S4225	—	3/4	3/4	2 1/4	5	—	—
—	HPHV750S4300CH	—	3/4	3/4	3	6	—	.020
—	HPHV750S4300	—	3/4	3/4	3	6	—	—
—	HPHV750S4400R030	—	3/4	3/4	4	6 1/4	.030	—
—	HPHV750S4400R060	—	3/4	3/4	4	6 1/4	.060	—
—	—	UADE1000J4ARA	1	1	1 1/2	4	.015	—
—	HPHV1000S4150R030	UADE1000J4ARB	1	1	1 1/2	4	.030	—
—	—	UADE1000J4ARC	1	1	1 1/2	4	.060	—
—	—	UADE1000J4ARD	1	1	1 1/2	4	.090	—
—	HPHV1000S4150R120	—	1	1	1 1/2	4	.120	—
—	HPHV1000S4150R250	UADE1000J4ARF	1	1	1 1/2	4	.250	—
—	HPHV1000S4150	—	1	1	1 1/2	4	—	—
—	HPHV1000S4150CH	—	1	1	1 1/2	4	—	.020
—	HPHV1000S4200R030	—	1	1	2	4	.030	—
—	HPHV1000S4200R060	—	1	1	2	4	.060	—
—	HPHV1000S4200R120	—	1	1	2	4	.120	—

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(HPHV • UADE • 4 Flute • Inch — continued)

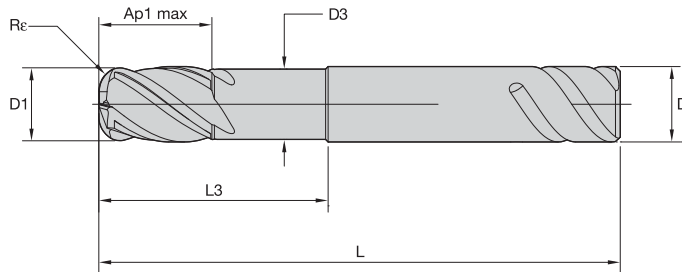
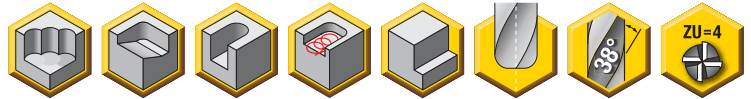


● first choice
○ alternate choice

KCPM15	KCPM15	KC643M	D1	D	Ap1 max	L	R _ε	BCH
—	HPHV1000S4200	—	1	1	2	4	—	—
—	HPHV1000S4225R030	—	1	1	2 1/4	5	.030	—
—	HPHV1000S4225R060	—	1	1	2 1/4	5	.060	—
—	HPHV1000S4225CH	—	1	1	2 1/4	5	—	.020
—	HPHV1000S4225	—	1	1	2 1/4	5	—	—
—	HPHV1000S4263R030	—	1	1	2 5/8	5	.030	—
—	HPHV1000S4263CH	—	1	1	2 5/8	5	—	.020
—	HPHV1000S4263	—	1	1	2 5/8	5	—	—
—	HPHV1000S4300R030	—	1	1	3	6	.030	—
—	HPHV1000S4300R060	—	1	1	3	6	.060	—
—	HPHV1000S4300CH	—	1	1	3	6	—	.020
—	HPHV1000S4400R030	—	1	1	4	7	.030	—
—	HPHV1000S4400R060	—	1	1	4	7	.060	—
—	HPHV1000S4400CH	—	1	1	4	7	—	.020
—	HPHV1250S4225R030	—	1 1/4	1 1/4	2 1/4	5	.030	—
—	HPHV1250S4225CH	—	1 1/4	1 1/4	2 1/4	5	—	.020

NOTE: For application data, see page P25.

- Kennametal standard dimensions.
- Center cutting.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.

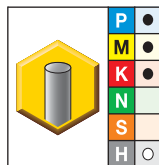
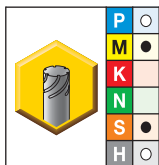


End Mill Tolerances

D1	tolerance	D	tolerance h6 +/-
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1-3/16"	+0/- .00051"



■ UADE • UBDE • 4 Flute with Neck • Inch



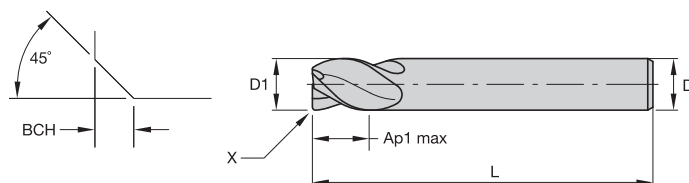
- first choice
- alternate choice

KCSM15	KCPM15	D1	D	D3	Ap1 max	L3	L	R _c
—	UADE0250J4AQA	1/4	1/4	.235	3/8	1 1/4	4	.015
—	UADE0250J4AQB	1/4	1/4	.235	3/8	1 1/4	4	.030
—	UADE0375J4AQA	3/8	3/8	.345	1/2	2	4	.015
—	UADE0375J4AQB	3/8	3/8	.345	1/2	2	4	.030
UBDE0500N4AQA *	—	1/2	3/4	.470	5/8	2 1/4	4	.015
—	UADE0500J4AQB	1/2	1/2	.470	5/8	2 1/4	4	.030
UBDE0500N4AQB *	—	1/2	3/4	.470	5/8	2 1/4	4	.030
UBDE0625N4AQB *	UADE0625J4AQB	5/8	5/8	.587	3/4	2 1/4	4	.030
UBDE0625N4AQC *	—	5/8	5/8	.587	3/4	2 1/4	4	.060
UBDE0750N4AQB *	UADE0750J4AQB	3/4	3/4	.700	1	2 1/4	4 1/2	.030
UBDE0750N4AQC *	—	3/4	3/4	.700	1	2 1/4	4 1/2	.060
UBDE0750N4AQD *	—	3/4	3/4	.700	1	2 1/4	4 1/2	.090
UBDE0750N4AQE *	—	3/4	3/4	.700	1	2 1/4	4 1/2	.120
UBDE0750N4BQB *	UADE0750J4BQB	3/4	3/4	.700	1	3 1/4	5 1/2	.030
UBDE0750N4BQC *	—	3/4	3/4	.700	1	3 1/4	5 1/2	.060
UBDE0750N4BQD *	—	3/4	3/4	.700	1	3 1/4	5 1/2	.090
UBDE0750N4BQE *	—	3/4	3/4	.700	1	3 1/4	5 1/2	.120
UBDE1000N4BQB *	UADE1000J4BQB *	1	1	.939	1 1/8	3 1/4	5 1/2	.030
UBDE1000N4BQC *	—	1	1	.939	1 1/8	3 1/4	5 1/2	.060
UBDE1000N4BQE *	—	1	1	.939	1 1/8	3 1/4	5 1/2	.120

NOTE: For application data, see page P25.

*Made-to-order standard item. Standard pricing, manufacturing lead time, and minimum order quantity applies.

- Kennametal standard dimensions.
- Center cutting.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.

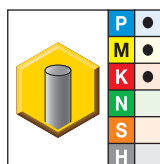


End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1-3/16"	+0/- .00051"



■ HPRSHV • 4 Flute with Extended Reach • Inch

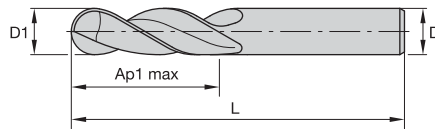


- first choice
- alternate choice

KCPM15	D1	D	Ap1 max	L	BCH
HPRSHV500S4600CH	1/2	1/2	5/8	6	.020
HPRSHV500S4600	1/2	1/2	5/8	6	—
HPRSHV625S4600CH	5/8	5/8	3/4	6	.020
HPRSHV625S4600	5/8	5/8	3/4	6	—
HPRSHV750S4500CH	3/4	3/4	1	5	.020
HPRSHV750S4600CH	3/4	3/4	1	6	.020
HPRSHV750S4600	3/4	3/4	1	6	—
HPRSHV1000S4700CH	1	1	1 1/8	7	.020

NOTE: For application data, see page P26.

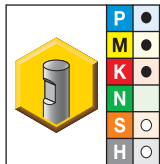
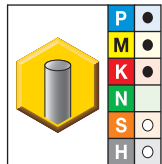
- Kennametal standard dimensions.
- Center cutting.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.



End Mill Tolerances			
D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1 3/16"	+0/- .00051"



■ HPHVBN • 4 Flute with Extended Length-of-Cut • Ball Nose • Inch

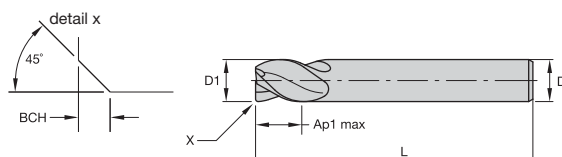


- first choice
- alternate choice

KCPM15	KCPM15	D1	D	Ap1 max	L
HPHVBN125S4050	—	1/8	1/8	1/2	2
HPHVBN188S4063	—	3/16	3/16	5/8	2 1/4
HPHVBN250S4075	—	1/4	1/4	3/4	2 1/2
HPHVBN312S4075	—	5/16	5/16	3/4	2 1/2
HPHVBN375S4088	—	3/8	3/8	7/8	2 1/2
HPHVBN438S4088	—	7/16	7/16	7/8	2 1/2
—	HPHVBN500S4100	1/2	1/2	1	3
—	HPHVBN500S4125	1/2	1/2	1 1/4	3
—	HPHVBN625S4125	5/8	5/8	1 1/4	3 1/2
—	HPHVBN750S4150	3/4	3/4	1 1/2	4
—	HPHVBN1000S4150	1	1	1 1/2	4

NOTE: For application data, see page P26.

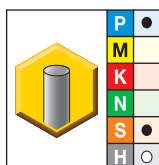
- Kennametal standard dimensions.
- Center cutting.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Optimized geometry for titanium machining.



End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1 3/16"	+0/- .00051"

■ HPHVT • 4 Flute • Inch



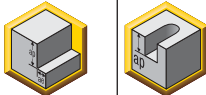
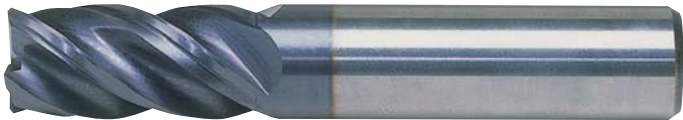
- first choice
- alternate choice

KC643M	D1	D	Ap1 max	L	BCH
HPHVT500S4063CH	1/2	1/2	5/8	2 1/2	.020
HPHVT500S4063	1/2	1/2	5/8	2 1/2	—
HPHVT500S4125CH	1/2	1/2	1 1/4	3	.020
HPHVT500S4125	1/2	1/2	1 1/4	3	—
HPHVT625S4075CH	5/8	5/8	3/4	3	.020
HPHVT625S4075	5/8	5/8	3/4	3	—
HPHVT625S4125CH	5/8	5/8	1 1/4	3 1/2	.020
HPHVT625S4125	5/8	5/8	1 1/4	3 1/2	—
HPHVT750S4088CH	3/4	3/4	7/8	3 1/2	.020
HPHVT750S4088	3/4	3/4	7/8	3 1/2	—
HPHVT750S4150CH	3/4	3/4	1 1/2	4	.020
HPHVT750S4150	3/4	3/4	1 1/2	4	—
HPHVT1000S4150CH *	1	1	1 1/2	4	.020
HPHVT1000S4150 *	1	1	1 1/2	4	—

NOTE: For application data, see page P27.

*Made-to-order standard item. Standard pricing, manufacturing lead time, and minimum order quantity applies.

■ HARVI I • HPHV • UADE • Unequal Flute Spacing

Material Group																					
		Side Milling (A) and Slotting (B)		KC643M		KCPM15		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.													
								D1 – Diameter													
		A		B		Cutting Speed – vc SFM				frac.											
ap		ae		ap		min	max	min	max	dec.	.125	.188	.250	.313	.375	.438	.500	.625	.750	1.000	1.250
P	0	Ap max	0.5 x D	1 x D	490	660	490	660	IPT	.0009	.0013	.0018	.0023	.0027	.0031	.0034	.0039	.0044	.0049	.0049	
	1	Ap max	0.5 x D	1 x D	490	660	490	660	IPT	.0009	.0013	.0018	.0023	.0027	.0031	.0034	.0039	.0044	.0049	.0049	
	2	Ap max	0.5 x D	1 x D	460	620	460	620	IPT	.0009	.0013	.0018	.0023	.0027	.0031	.0034	.0039	.0044	.0049	.0049	
	3	Ap max	0.5 x D	1 x D	390	520	390	520	IPT	.0007	.0011	.0015	.0020	.0023	.0026	.0029	.0034	.0039	.0045	.0048	
	4	Ap max	0.5 x D	0.75 x D	300	490	300	490	IPT	.0007	.0010	.0014	.0017	.0020	.0023	.0026	.0030	.0034	.0039	.0040	
	5	Ap max	0.5 x D	1 x D	200	330	200	330	IPT	.0006	.0009	.0012	.0016	.0018	.0021	.0023	.0027	.0031	.0036	.0039	
M	6	Ap max	0.5 x D	0.75 x D	160	250	160	250	IPT	.0005	.0008	.0010	.0013	.0015	.0017	.0019	.0022	.0025	.0028	.0029	
	1	Ap max	0.5 x D	1 x D	300	380	300	380	IPT	.0007	.0011	.0015	.0020	.0023	.0026	.0029	.0034	.0039	.0045	.0048	
	2	Ap max	0.5 x D	1 x D	200	260	200	260	IPT	.0006	.0009	.0012	.0016	.0018	.0021	.0023	.0027	.0031	.0036	.0039	
K	3	Ap max	0.5 x D	1 x D	200	230	200	230	IPT	.0005	.0008	.0010	.0013	.0015	.0017	.0019	.0022	.0025	.0028	.0029	
	1	Ap max	0.5 x D	1 x D	390	490	390	490	IPT	.0009	.0013	.0018	.0023	.0027	.0031	.0034	.0039	.0044	.0049	.0049	
	2	Ap max	0.5 x D	1 x D	360	460	360	460	IPT	.0007	.0011	.0015	.0020	.0023	.0026	.0029	.0034	.0039	.0045	.0048	
S	3	Ap max	0.5 x D	1 x D	360	430	360	430	IPT	.0006	.0009	.0012	.0016	.0018	.0021	.0023	.0027	.0031	.0036	.0039	
	1	Ap max	0.3 x D	0.3 x D	160	300	–	–	IPT	.0007	.0011	.0015	.0020	.0023	.0026	.0029	.0034	.0039	.0045	.0048	
	2	Ap max	0.3 x D	0.3 x D	80	130	–	–	IPT	.0004	.0006	.0008	.0010	.0012	.0014	.0015	.0018	.0021	.0024	.0026	
	3	Ap max	0.3 x D	0.3 x D	80	130	–	–	IPT	.0004	.0006	.0008	.0010	.0012	.0014	.0015	.0018	.0021	.0024	.0026	
H	4	Ap max	0.5 x D	1 x D	160	200	–	–	IPT	.0005	.0008	.0011	.0014	.0017	.0019	.0021	.0025	.0028	.0033	.0036	
H	1	Ap max	0.5 x D	0.75 x D	260	460	260	460	IPT	.0007	.0010	.0014	.0017	.0020	.0023	.0026	.0030	.0034	.0039	.0040	

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

For tools 2 x D < LOC (Ap1 max) =< 3 x D Ae = 0.25 x D, for tools with LOC (Ap1 max) longer than 3 x D, Ae = 0, Ae = 0.1 x D and no slot.

■ HARVI I • UADE • UBDE • Unequal Flute Spacing • With Neck

Material Group																		
	Side Milling (A) and Slotting (B)		KCSM15		KCPM15		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.											
	A		B		Cutting Speed — vc SFM				D1 — Diameter									
	ap	ae	ap		min	max	max	max	frac.	1/4	3/8	1/2	5/8	3/4	1			
P	0	0.75 x D	0.5 x D	0.75 x D	490	660	490	660	IPT	.0018	.0027	.0034	.0039	.0044	.0049			
	1	0.75 x D	0.5 x D	0.75 x D	490	660	490	660	IPT	.0018	.0027	.0034	.0039	.0044	.0049			
	2	0.75 x D	0.5 x D	0.75 x D	460	620	460	620	IPT	.0018	.0027	.0034	.0039	.0044	.0049			
	3	0.75 x D	0.5 x D	0.75 x D	390	520	390	520	IPT	.0015	.0023	.0029	.0034	.0039	.0045			
	4	0.75 x D	0.5 x D	0.5 x D	300	490	300	490	IPT	.0014	.0020	.0026	.0030	.0034	.0039			
	5	0.75 x D	0.5 x D	0.75 x D	200	330	200	330	IPT	.0012	.0018	.0023	.0027	.0031	.0036			
M	6	0.75 x D	0.5 x D	0.5 x D	160	250	160	250	IPT	.0010	.0015	.0019	.0022	.0025	.0028			
	1	0.75 x D	0.5 x D	0.75 x D	300	380	300	380	IPT	.0015	.0023	.0029	.0034	.0039	.0045			
	2	0.75 x D	0.5 x D	0.75 x D	200	260	200	260	IPT	.0012	.0018	.0023	.0027	.0031	.0036			
K	3	0.75 x D	0.5 x D	0.75 x D	200	230	200	230	IPT	.0010	.0015	.0019	.0022	.0025	.0028			
	1	0.75 x D	0.5 x D	0.75 x D	—	—	390	490	IPT	.0018	.0027	.0034	.0039	.0044	.0049			
	2	0.75 x D	0.5 x D	0.75 x D	—	—	360	460	IPT	.0015	.0023	.0029	.0034	.0039	.0045			
S	3	0.75 x D	0.5 x D	0.75 x D	—	—	360	430	IPT	.0012	.0018	.0023	.0027	.0031	.0036			
	1	0.75 x D	0.3 x D	0.3 x D	160	300	—	—	IPT	.0015	.0023	.0029	.0034	.0039	.0045			
	2	0.75 x D	0.3 x D	0.3 x D	80	130	—	—	IPT	.0008	.0012	.0015	.0018	.0021	.0024			
	3	0.75 x D	0.3 x D	0.3 x D	80	130	—	—	IPT	.0008	.0012	.0015	.0018	.0021	.0024			
H	4	0.75 x D	0.5 x D	0.75 x D	160	200	—	—	IPT	.0011	.0017	.0021	.0025	.0028	.0033			
H	1	0.75 x D	0.5 x D	0.5 x D	260	460	260	460	IPT	.0014	.0020	.0026	.0030	.0034	.0039			

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

Side milling applications — for longest reach (L3) tools, reduce ae by 30%.

Slot milling applications — for longest reach (L3) tools, reduce ap by 30%.

■ HARVI I • HPRSHV • Unequal Flute Spacing • Extended Reach

											
		Side Milling (A) and Slotting (B)		KCPM15		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.					
Material Group		A		B	Cutting Speed — vc SFM		D1 — Diameter				
		ap	ae	ap	min	max	frac.	1/2	5/8	3/4	1
							dec.	.500	.625	.750	1.000
P	1	0.75 x D	0.5 x D	0.75 x D	500	650	IPT	.0035	.0039	.0043	.0050
	2	0.75 x D	0.5 x D	0.75 x D	450	625	IPT	.0035	.0039	.0043	.0050
	3	0.75 x D	0.5 x D	0.75 x D	400	525	IPT	.0029	.0034	.0038	.0046
	4	0.75 x D	0.5 x D	0.5 x D	300	475	IPT	.0026	.0030	.0033	.0039
	5	1.5 x D	0.5 x D	0.75 x D	200	325	IPT	.0023	.0027	.0030	.0036
	6	0.75 x D	0.5 x D	0.5 x D	150	225	IPT	.0019	.0022	.0024	.0028
M	1	0.75 x D	0.5 x D	0.75 x D	260	330	IPT	.0029	.0034	.0038	.0046
	2	0.75 x D	0.5 x D	0.75 x D	200	260	IPT	.0023	.0027	.0030	.0036
	3	0.75 x D	0.5 x D	0.75 x D	200	260	IPT	.0019	.0022	.0024	.0028
K	1	0.75 x D	0.5 x D	0.75 x D	390	520	IPT	.0035	.0039	.0043	.0050
	2	0.75 x D	0.5 x D	0.75 x D	360	460	IPT	.0029	.0034	.0038	.0046
	3	0.75 x D	0.5 x D	0.75 x D	330	430	IPT	.0023	.0027	.0030	.0036

NOTE: Those guidelines may require variations to achieve optimum results.

For tools with reach > 3 x D, reduce fz by 20%.

For tools with reach > 5 x D, reduce fz by 30%.

For tools with reach > 10 x D, reduce vc and fz by 30%.

■ HARVI I • HPHVBN • 4 Flute with Extended Length-of-Cut • Ball Nose

Material Group																	
		Side Milling (A) and Slotting (B)			KCPM15		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.										
							D1 — Diameter										
		A		B	Cutting Speed — vc SFM		frac.	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	1
ap		ae	ap	min	max	dec.	.125	.188	.250	.313	.375	.438	.500	.625	.750	1.000	
P	0	1.25 x D	0.5 x D	1 x D	490	660	IPT	.0009	.0013	.0018	.0023	.0027	.0031	.0034	.0039	.0044	.0049
	1	1.25 x D	0.5 x D	1 x D	490	660	IPT	.0009	.0013	.0018	.0023	.0027	.0031	.0034	.0039	.0044	.0049
	2	1.25 x D	0.5 x D	1 x D	460	620	IPT	.0009	.0013	.0018	.0023	.0027	.0031	.0034	.0039	.0044	.0049
	3	1.25 x D	0.5 x D	1 x D	390	520	IPT	.0007	.0011	.0015	.0020	.0023	.0026	.0029	.0034	.0039	.0044
	4	1.25 x D	0.5 x D	0.75 x D	300	490	IPT	.0007	.0010	.0014	.0017	.0020	.0023	.0026	.0030	.0034	.0039
	5	1.25 x D	0.5 x D	1 x D	200	330	IPT	.0006	.0009	.0012	.0016	.0018	.0021	.0023	.0027	.0031	.0036
M	6	1.25 x D	0.5 x D	0.75 x D	160	250	IPT	.0005	.0008	.0010	.0013	.0015	.0017	.0019	.0022	.0025	.0028
	1	1.25 x D	0.5 x D	1 x D	300	380	IPT	.0007	.0011	.0015	.0020	.0023	.0026	.0029	.0034	.0039	.0045
	2	1.25 x D	0.5 x D	1 x D	200	260	IPT	.0006	.0009	.0012	.0016	.0018	.0021	.0023	.0027	.0031	.0036
K	3	1.25 x D	0.5 x D	1 x D	200	230	IPT	.0005	.0008	.0010	.0013	.0015	.0017	.0019	.0022	.0025	.0028
	1	1.25 x D	0.5 x D	1 x D	390	490	IPT	.0009	.0013	.0018	.0023	.0027	.0031	.0034	.0039	.0044	.0049
	2	1.25 x D	0.5 x D	1 x D	360	460	IPT	.0007	.0011	.0015	.0020	.0023	.0026	.0029	.0034	.0039	.0045
S	3	1.25 x D	0.5 x D	1 x D	360	430	IPT	.0006	.0009	.0012	.0016	.0018	.0021	.0023	.0027	.0031	.0036
	1	1 x D	0.3 x D	0.3 x D	160	300	IPT	.0007	.0011	.0015	.0020	.0023	.0026	.0029	.0034	.0039	.0045
	2	1 x D	0.3 x D	0.3 x D	80	130	IPT	.0004	.0006	.0008	.0010	.0012	.0014	.0015	.0018	.0021	.0024
	3	1.25 x D	0.3 x D	0.3 x D	80	130	IPT	.0004	.0006	.0008	.0010	.0012	.0014	.0015	.0018	.0021	.0024
H	4	1.25 x D	0.5 x D	1 x D	160	200	IPT	.0005	.0008	.0011	.0014	.0017	.0019	.0021	.0025	.0028	.0033
	1	1.25 x D	0.5 x D	0.75 x D	260	460	IPT	.0007	.0010	.0014	.0017	.0020	.0023	.0026	.0030	.0034	.0039

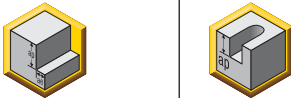
NOTE: These guidelines may require variations to achieve optimum results.

Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ HARVI I • HPHVT • Unequal Flute Spacing

Material Group											
		Side Milling (A) and Slotting (B)			KC643M		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.				
		A		B	Cutting Speed — vc SFM		frac.	D1 — Diameter			
ap		ae	ap	min	max	dec.	1/2	5/8	3/4	1	
P	5	1.5 x D	0.5 x D	1 x D	200	330	IPT	.0023	.0027	.0031	.0036
	6	1.5 x D	0.5 x D	0.75 x D	160	250	IPT	.0019	.0022	.0025	.0028
S	1	1.5 x D	0.3 x D	0.3 x D	160	300	IPT	.0029	.0034	.0039	.0045
	2	1.5 x D	0.3 x D	0.3 x D	80	130	IPT	.0015	.0018	.0021	.0024
	3	1.5 x D	0.3 x D	0.3 x D	80	130	IPT	.0015	.0018	.0021	.0024
	4	1.5 x D	0.5 x D	1 x D	160	200	IPT	.0021	.0025	.0028	.0033
H	1	1.5 x D	0.5 x D	0.75 x D	260	460	IPT	.0026	.0030	.0034	.0039

NOTE: These guidelines may require variations to achieve optimum results.

Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

HARVI™ II

High-Performance Solid Carbide End Mills

Primary Application

The HARVI II system is designed to provide maximum metal removal rates with five unequally spaced flutes for roughing and finishing operations in side milling, slotting, and profiling. A wide range of diameters and corner configurations, such as chamfer, radii, and sharp edges, are available from stock.

- 1 x D slotting in titanium and stainless steels with five unequally spaced flutes.
- Roughing and finishing with one tool.
- KCPM15™ Beyond™ grades for long tool life.

Features and Benefits

Advanced Technology

- Five unequally spaced flutes for chatter-free machining at high feed rates.
- Proprietary parabolic core design increases stability.
- Ramping up to 3°.
- 1 x D full slotting capability in:
 - Titanium
 - Stainless steel

Tailored Grades

- KCPM15 Beyond grade for outstanding wear protection in stainless steel to mitigate crater, depth-of-cut notching, and flank wear.
- Universal KC643M™ grade suitable for cutting steel, cast iron, stainless steel (wet), and titanium (wet).

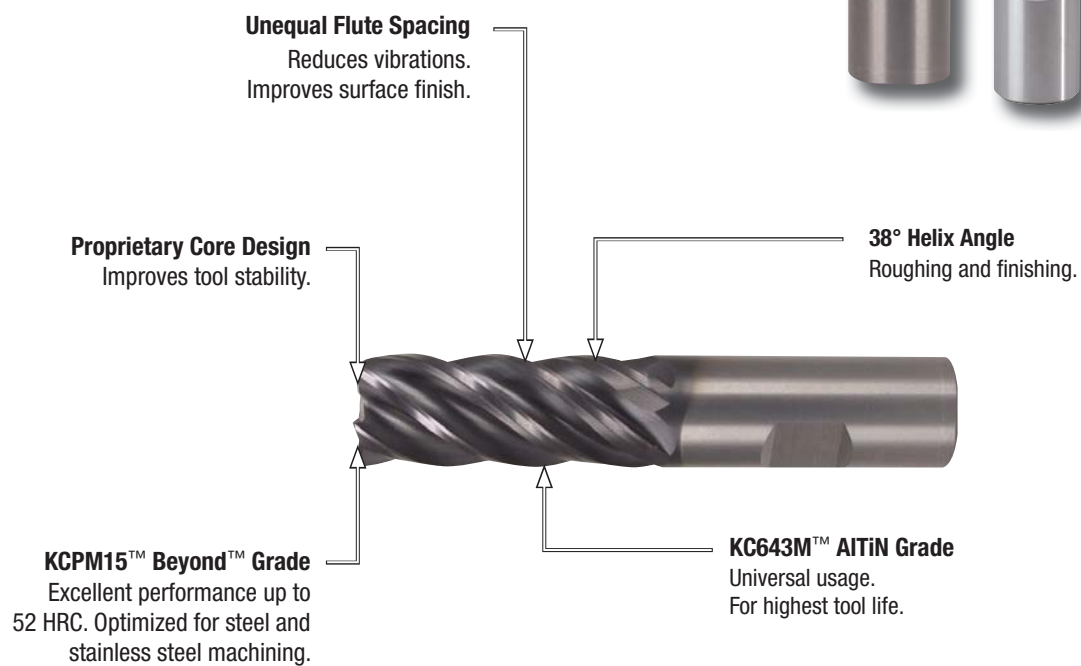
Customization

- Intermediate diameters available.
- Expanded length of tool and increased length of cut possible.
- Chip divider geometry reduces power consumption and improves chip formation in difficult-to-cut materials.
- Ball-nose version available.
- Internal coolant axial and radial available.
- Various shanks, including Safe-Lock™ by Haimer, and non-standard coatings available.
- Multiple steps possible.

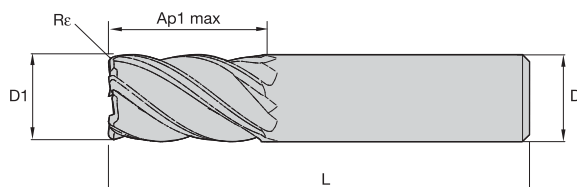
Extensive Standard Offering

- Diameter range 3/16–1".
- Necked, corner radii, and square-end offering.

High-feed roughing and finishing with one tool at highest length of cut.



- Kennametal standard dimensions.
- Non-center cutting.
- Ramping up to 3°.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Five-flute geometry enables slotting up to 1 x D.

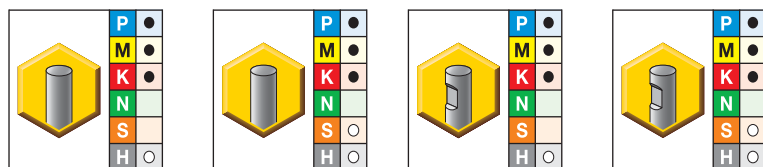


End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1 3/16"	+0/- .00051"



■ UCDE • 5 Flute • Inch

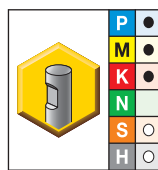
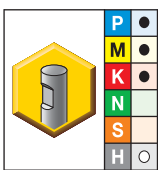
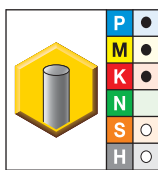
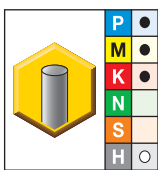


- first choice
- alternate choice

KCPM15	KC643M	KCPM15	KC643M	D1	D	Ap1 max	L	Re
UCDE188J5BRA	UCDE188J5BRA	—	—	3/16	3/16	5/8	2 1/4	.015
UCDE188J5BRB	UCDE188J5BRB	—	—	3/16	3/16	5/8	2 1/4	.030
UCDE188J5BS	UCDE188J5BS	—	—	3/16	3/16	5/8	2 1/4	—
—	UCDE219J5BS	—	—	7/32	1/4	5/8	2 1/2	—
UCDE250J5BRA	UCDE250J5BRA	—	—	1/4	1/4	3/4	2 1/2	.015
UCDE250J5BRB	UCDE250J5BRB	—	—	1/4	1/4	3/4	2 1/2	.030
UCDE250J5BS	UCDE250J5BS	—	—	1/4	1/4	3/4	2 1/2	—
—	UCDE281J5BS	—	—	9/32	5/16	3/4	2 1/2	—
UCDE312J5BRA	UCDE312J5BRA	—	—	5/16	5/16	3/4	2 1/2	.015
UCDE312J5BRB	UCDE312J5BRB	—	—	5/16	5/16	3/4	2 1/2	.030
UCDE312J5BS	UCDE312J5BS	—	—	5/16	5/16	3/4	2 1/2	—
—	UCDE344J5BS	—	—	11/32	3/8	1	2 1/2	—
UCDE375J5BRA	UCDE375J5BRA	—	—	3/8	3/8	7/8	2 1/2	.015
UCDE375J5BRB	UCDE375J5BRB	—	—	3/8	3/8	7/8	2 1/2	.030
UCDE375J5BS	UCDE375J5BS	—	—	3/8	3/8	7/8	2 1/2	—
—	UCDE375J5CRA	—	—	3/8	3/8	1	3	.015
—	UCDE375J5CRB	—	—	3/8	3/8	1	3	.030
—	UCDE438J5BS	—	—	7/16	7/16	1	2 1/2	—
UCDE500J5BRA	UCDE500J5BRA	UCDE500K5BRA	UCDE500K5BRA	1/2	1/2	1 1/4	3	.015
UCDE500J5BRB	UCDE500J5BRB	UCDE500K5BRB	UCDE500K5BRB	1/2	1/2	1 1/4	3	.030
—	UCDE500J5BRD	—	—	1/2	1/2	1 1/4	3	.060
UCDE500J5BRF	UCDE500J5BRF	UCDE500K5BRF	UCDE500K5BRF	1/2	1/2	1 1/4	3	.120
UCDE500J5BS	UCDE500J5BS	UCDE500K5BS	UCDE500K5BS	1/2	1/2	1 1/4	3	—
—	UCDE562J5BRA	—	—	9/16	5/8	1 1/4	3 1/2	.015
—	UCDE562J5BRB	—	—	9/16	5/8	1 1/4	3 1/2	.030
—	UCDE562J5BS	—	—	9/16	5/8	1 1/4	3 1/2	—
—	UCDE625J5BRA	—	—	5/8	5/8	1 1/4	3 1/2	.015
UCDE625J5BRB	UCDE625J5BRB	UCDE625K5BRB	UCDE625K5BRB	5/8	5/8	1 1/4	3 1/2	.030
—	UCDE625J5BRD	—	—	5/8	5/8	1 1/4	3 1/2	.060
UCDE625J5BS	UCDE625J5BS	UCDE625K5BS	UCDE625K5BS	5/8	5/8	1 1/4	3 1/2	—
—	UCDE750J5BRA	—	—	3/4	3/4	1 1/2	4	.015
UCDE750J5BRB	UCDE750J5BRB	UCDE750K5BRB	UCDE750K5BRB	3/4	3/4	1 1/2	4	.030

(continued)

(UCDE • 5 Flute • Inch — continued)



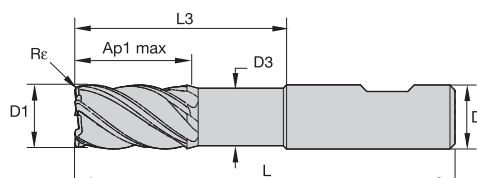
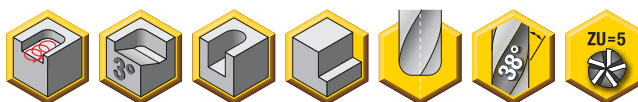
● first choice
 ○ alternate choice

KCPM15	KC643M	KCPM15	KC643M	D1	D	Ap1 max	L	Re
UCDE750J5BRD	UCDE750J5BRD	—	—	3/4	3/4	1 1/2	4	.060
UCDE750J5BRE	UCDE750J5BRE *	—	—	3/4	3/4	1 1/2	4	.090
UCDE750J5BRF	UCDE750J5BRF	—	UCDE750K5BRF	3/4	3/4	1 1/2	4	.120
UCDE750J5BS	UCDE750J5BS	UCDE750K5BS	UCDE750K5BS	3/4	3/4	1 1/2	4	—
—	UCDE750J5CRB	—	—	3/4	3/4	1 5/8	4	.030
—	UCDE750J5CRD	—	—	3/4	3/4	1 5/8	4	.060
—	UCDE750J5CRF	—	—	3/4	3/4	1 5/8	4	.120
—	UCDE750J5CS	—	—	3/4	3/4	1 5/8	4	—
—	UCDE1000J5BRA	—	—	1	1	1 3/4	4 1/2	.015
UCDE1000J5BRB	UCDE1000J5BRB	UCDE1000K5BRB	UCDE1000K5BRB	1	1	1 3/4	4 1/2	.030
UCDE1000J5BRD	UCDE1000J5BRD *	—	—	1	1	1 3/4	4 1/2	.060
UCDE1000J5BRE *	UCDE1000J5BRE *	—	—	1	1	1 3/4	4 1/2	.090
UCDE1000J5BRF	UCDE1000J5BRF	UCDE1000K5BRF *	UCDE1000K5BRF *	1	1	1 3/4	4 1/2	.120
UCDE1000J5BS	UCDE1000J5BS *	UCDE1000K5BS	UCDE1000K5BS	1	1	1 3/4	4 1/2	—

NOTE: For application data, see page P34.

*Made-to-order standard item. Standard pricing, manufacturing lead time, and minimum order quantity applies.

- Kennametal standard dimensions.
- Non-center cutting.
- Ramping up to 3°.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Five-flute geometry enables slotting up to 1 x D.

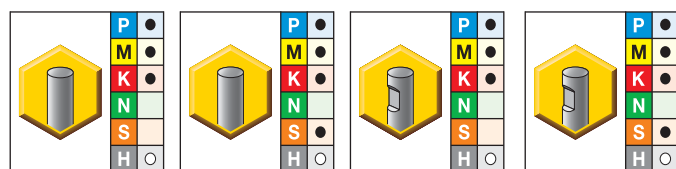


End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1 3/16"	+0/- .00051"

beyond

■ UCDE • 5 Flute with Neck • Inch

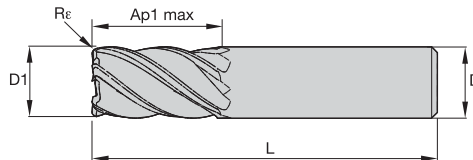


- first choice
- alternate choice

KCPM15	KC643M	KCPM15	KC643M	D1	D	D3	Ap1 max	L3	L	Re
UCDE250J5ARA	UCDE250J5ARA	—	—	1/4	1/4	.235	1/2	1 1/4	4	.015
UCDE375J5ARA	UCDE375J5ARA	—	—	3/8	3/8	.353	7/8	1 7/8	4	.015
—	—	UCDE500K5ARB	UCDE500K5ARB	1/2	1/2	.472	1 1/4	2 1/4	4	.030
—	—	UCDE625K5ARB	UCDE625K5ARB	5/8	5/8	.590	1 1/4	2 1/4	4	.030
—	—	UCDE750K5ARB	UCDE750K5ARB	3/4	3/4	.704	1 1/2	3 1/4	5 1/2	.030
—	—	UCDE1000K5ARB	UCDE1000K5ARB	1	1	.940	1 3/4	3 1/4	5 1/2	.030

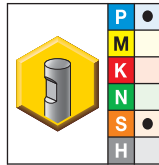
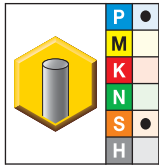
NOTE: For application data, see page P35.

- Kennametal standard dimensions.
- Non-center cutting.
- Ramping up to 3°.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.
- Optimized geometry for titanium machining.
- Five-flute geometry enables slotting up to 1 x D.


End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1 3/16"	+0/- .00051"

UDDE • 5 Flute • Inch



- first choice
- alternate choice

KC643M	KC643M	D1	D	Ap1 max	L3	L	Re
UDDE500J5BRA	—	1/2	1/2	1 1/4	1 1/4	3	.015
UDDE500J5BRB	—	1/2	1/2	1 1/4	1 1/4	3	.030
UDDE500J5BRF	—	1/2	1/2	1 1/4	1 1/4	3	.120
UDDE500J5BS	—	1/2	1/2	1 1/4	1 1/4	3	—
—	UDDE500K5BRA	1/2	1/2	1 1/4	1 1/2	3	.015
—	UDDE500K5BRB	1/2	1/2	1 1/4	1 1/2	3	.030
—	UDDE500K5BRF	1/2	1/2	1 1/4	1 1/2	3	.120
—	UDDE500K5BS	1/2	1/2	1 1/4	1 1/2	3	—
UDDE625J5BRB	—	5/8	5/8	1 1/4	1 1/4	3 1/2	.030
UDDE625J5BS	—	5/8	5/8	1 1/4	1 1/4	3 1/2	—
—	UDDE625K5BRB	5/8	5/8	1 1/4	1 1/2	3 1/2	.030
—	UDDE625K5BS	5/8	5/8	1 1/4	1 1/2	3 1/2	—
UDDE750J5BRB	—	3/4	3/4	1 1/2	1 1/4	4	.030
UDDE750J5BRF	—	3/4	3/4	1 1/2	1 1/4	4	.120
UDDE750J5BS	—	3/4	3/4	1 1/2	1 1/4	4	—
—	UDDE750K5BRB	3/4	3/4	1 1/2	1 3/4	4	.030
—	UDDE750K5BRF	3/4	3/4	1 1/2	1 3/4	4	.120
—	UDDE750K5BS	3/4	3/4	1 1/2	1 3/4	4	—
UDDE1000J5BRB	—	1	1	1 3/4	1 1/4	4 1/2	.030
UDDE1000J5BRF *	—	1	1	1 3/4	1 1/4	4 1/2	.120
UDDE1000J5BS	—	1	1	1 3/4	1 1/4	4 1/2	—
—	UDDE1000K5BRB	1	1	1 3/4	1 3/4	4 1/2	.030
—	UDDE1000K5BRF	1	1	1 3/4	1 3/4	4 1/2	.120
—	UDDE1000K5BS	1	1	1 3/4	1 3/4	4 1/2	—

NOTE: For application data, see page P35.

*Made-to-order standard item. Standard pricing, manufacturing lead time, and minimum order quantity applies.

■ HARVI II • UCDE • Unequal Flute Spacing

Material Group																
		Side Milling (A) and Slotting (B)														
		A		B	KC643M		KCPM15		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.							
					Cutting Speed — vc SFM					D1 — Diameter						
		ap	ae	ap	min	max	min	max	frac. dec.	1/4	3/8	1/2	5/8	3/4	1	
P	0	1.5 x D	0.5 x D	1 x D	490	660	490	660	IPT	.0018	.0027	.0034	.0039	.0044	.0049	
	1	1.5 x D	0.5 x D	1 x D	490	660	490	660	IPT	.0018	.0027	.0034	.0039	.0044	.0049	
	2	1.5 x D	0.5 x D	1 x D	460	620	460	620	IPT	.0018	.0027	.0034	.0039	.0044	.0049	
	3	1.5 x D	0.5 x D	1 x D	390	520	390	520	IPT	.0015	.0023	.0029	.0034	.0039	.0045	
	4	1.5 x D	0.5 x D	0.75 x D	300	490	300	490	IPT	.0014	.0020	.0026	.0030	.0034	.0039	
	5	1.5 x D	0.5 x D	1 x D	200	330	200	330	IPT	.0012	.0018	.0023	.0027	.0031	.0036	
M	6	1.5 x D	0.5 x D	0.75 x D	160	250	160	250	IPT	.0010	.0015	.0019	.0022	.0025	.0028	
	1	1.5 x D	0.5 x D	1 x D	300	380	300	380	IPT	.0015	.0023	.0029	.0034	.0039	.0045	
	2	1.5 x D	0.5 x D	1 x D	200	260	200	260	IPT	.0012	.0018	.0023	.0027	.0031	.0036	
K	3	1.5 x D	0.5 x D	1 x D	200	230	200	230	IPT	.0010	.0015	.0019	.0022	.0025	.0028	
	1	1.5 x D	0.5 x D	1 x D	390	490	390	490	IPT	.0018	.0027	.0034	.0039	.0044	.0049	
	2	1.5 x D	0.5 x D	1 x D	360	460	360	460	IPT	.0015	.0023	.0029	.0034	.0039	.0045	
S	3	1.5 x D	0.5 x D	1 x D	360	430	360	430	IPT	.0012	.0018	.0023	.0027	.0031	.0036	
	1	1.5 x D	0.3 x D	0.3 x D	160	300	—	—	IPT	.0015	.0023	.0029	.0034	.0039	.0045	
	2	1.5 x D	0.3 x D	0.3 x D	80	130	—	—	IPT	.0008	.0012	.0015	.0018	.0021	.0024	
	3	1.5 x D	0.3 x D	0.3 x D	80	130	—	—	IPT	.0008	.0012	.0015	.0018	.0021	.0024	
H	4	1.5 x D	0.5 x D	1 x D	160	200	—	—	IPT	.0011	.0017	.0021	.0025	.0028	.0033	
	1	1.5 x D	0.5 x D	0.75 x D	260	460	260	460	IPT	.0014	.0020	.0026	.0030	.0034	.0039	

NOTE: These guidelines may require variations to achieve optimum results.

Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ HARVI II • UCDE • Unequal Flute Spacing • With Neck

Material Group															
		Side Milling (A) and Slotting (B)													
		A		B	KC643M		KCPM15		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.						
					Cutting Speed — vc SFM					D1 — Diameter					
		ap	ae	ap	min	max	max	max	frac. dec.	1/4	3/8	1/2	5/8	3/4	1
P	0	0.75 x D	0.5 x D	0.75 x D	490	660	490	660	IPT	.0018	.0027	.0034	.0039	.0044	.0049
	1	0.75 x D	0.5 x D	0.75 x D	490	660	490	660	IPT	.0018	.0027	.0034	.0039	.0044	.0049
	2	0.75 x D	0.5 x D	0.75 x D	460	620	460	620	IPT	.0018	.0027	.0034	.0039	.0044	.0049
	3	0.75 x D	0.5 x D	0.75 x D	390	520	390	520	IPT	.0015	.0023	.0029	.0034	.0039	.0045
	4	0.75 x D	0.5 x D	0.5 x D	300	490	300	490	IPT	.0014	.0020	.0026	.0030	.0034	.0039
	5	0.75 x D	0.5 x D	0.75 x D	200	330	200	330	IPT	.0012	.0018	.0023	.0027	.0031	.0036
M	6	0.75 x D	0.5 x D	0.5 x D	160	250	160	250	IPT	.0010	.0015	.0019	.0022	.0025	.0028
	1	0.75 x D	0.5 x D	0.75 x D	300	380	300	380	IPT	.0015	.0023	.0029	.0034	.0039	.0045
	2	0.75 x D	0.5 x D	0.75 x D	200	260	200	260	IPT	.0012	.0018	.0023	.0027	.0031	.0036
K	3	0.75 x D	0.5 x D	0.75 x D	200	230	200	230	IPT	.0010	.0015	.0019	.0022	.0025	.0028
	1	0.75 x D	0.5 x D	0.75 x D	390	490	390	490	IPT	.0018	.0027	.0034	.0039	.0044	.0049
	2	0.75 x D	0.5 x D	0.75 x D	360	460	360	460	IPT	.0015	.0023	.0029	.0034	.0039	.0045
S	3	0.75 x D	0.5 x D	0.75 x D	360	430	360	430	IPT	.0012	.0018	.0023	.0027	.0031	.0036
	1	0.75 x D	0.3 x D	0.3 x D	160	300	—	—	IPT	.0015	.0023	.0029	.0034	.0039	.0045
	2	0.75 x D	0.3 x D	0.3 x D	80	130	—	—	IPT	.0008	.0012	.0015	.0018	.0021	.0024
	3	0.75 x D	0.3 x D	0.3 x D	80	130	—	—	IPT	.0008	.0012	.0015	.0018	.0021	.0024
H	4	0.75 x D	0.5 x D	0.75 x D	160	200	—	—	IPT	.0011	.0017	.0021	.0025	.0028	.0033
	1	0.75 x D	0.5 x D	0.5 x D	260	460	260	460	IPT	.0014	.0020	.0026	.0030	.0034	.0039

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.
Side milling applications — for longest reach (L3) tools, reduce ae by 30%.
Slot milling applications — for longest reach (L3) tools, reduce ap by 30%.

■ HARVI II • UDDE • Unequal Flute Spacing

Material Group											
		Side Milling (A) and Slotting (B)									
		A		B	KC643M		Recommended feed per tooth (IPT = inch/th) for side milling (A). For slotting (B), reduce IPT by 20%.				
					Cutting Speed — vc SFM			D1 — Diameter			
		ap	ae	ap	min	max	frac. dec.	1/2	5/8	3/4	1
P	5	1.25 x D	0.5 x D	1 x D	200	325	IPT	.0023	.0027	.0003	.0036
	6	1.25 x D	0.5 x D	0.75 x D	150	225	IPT	.0019	.0022	.0024	.0028
S	2	1.0 x D	0.3 x D	0.3 x D	70	130	IPT	.0016	.0018	.0020	.0025
	3	1.25 x D	0.5 x D	1 x D	160	260	IPT	.0023	.0027	.0030	.0036
	4	1.25 x D	0.5 x D	1 x D	150	210	IPT	.0022	.0025	.0028	.0033

NOTE: These guidelines may require variations to achieve optimum results.
Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

➤ HARVI™ II Long

High-Performance Solid Carbide End Mills

Primary Application

The HARVI II Long system is designed for machining titanium, steels, and stainless steels with excellent surface finishes at maximum Metal Removal Rates (MRR). The extended cutting length enables the HARVI II Long system to machine deep pockets with thin walls in semi-finishing and finishing operations. It also reduces the number of cuts when machining wing profiles for the aerospace industry.

- 5 x D side milling finishing operations in titanium and stainless steels.
- Exceptionally straight walls.
- Universal KC643M™ grade for long tool life.

Features and Benefits

Advanced Technology

- Five unequally spaced flutes for chatter-free machining at high feed rates, improving surface finish and tool life.
- 3 x D and 5 x D lengths for reduced number of cuts.
- Innovative core design increases stability for exceptionally straight walls.
- Improved feed rate in corner machining operations versus conventional cutters.

Tailored Grades

- Universal KC643M grade suitable for cutting steel, cast iron, stainless steel (wet), and titanium (wet).

Customization

- Intermediate diameters available.
- Chip divider geometry available for reduced power consumption and improved chip formation in difficult-to-cut materials.
- Internal coolant axial, as well as radial, available.
- Various shank options, including Safe-Lock™ by Haimer, and non-standard coatings available.

Extensive Standard Offering

- Diameter range 1/4–1".
- Various corner radii in stock.

3 x D and 5 x D lengths of cut without reduced feed rates when machining corners.



Innovative Core Design
Improves tool stability and wall straightness.

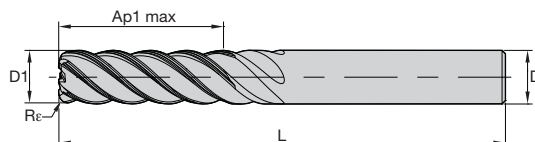
Unequal Flute Spacing
Reduces vibrations.
Improves surface finish.

KC643M™ AlTiN Grade
Universal usage.
For highest tool life.

43° Helix Angle
Improves results and machining of corners.



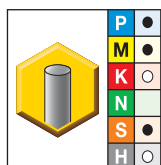
- Kennametal standard dimensions.
- Non-center cutting.
- Unequal flute spacing minimizes chatter for smoother machining.
- For finishing and semi-finishing applications.
- Optimized geometry for machining corners at deep cavities.



End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1 3/16"	+0/- .00051"

■ HARVI II • UGDE • 3 x D Lengths of Cut



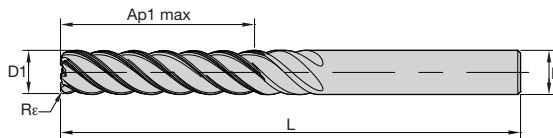
- first choice
- alternate choice

KC643M	D1	D	Ap1 max	L	Re
UGDE0250J5ARA	1/4	1/4	3/4	2 1/2	.015
UGDE0250J5ARB	1/4	1/4	3/4	2 1/2	.030
UGDE0250J5AE	1/4	1/4	3/4	2 1/2	—
UGDE0312J5ARA	5/16	5/16	15/16	3	.015
UGDE0312J5ARB *	5/16	5/16	15/16	3	.030
UGDE0312J5AE	5/16	5/16	15/16	3	—
UGDE0375J5ARA	3/8	3/8	1 1/8	4	.015
UGDE0375J5ARB	3/8	3/8	1 1/8	4	.030
UGDE0375J5ARC	3/8	3/8	1 1/8	4	.060
UGDE0375J5AE	3/8	3/8	1 1/8	4	—
UGDE0500J5ARA	1/2	1/2	1 1/2	4	.015
UGDE0500J5ARB	1/2	1/2	1 1/2	4	.030
UGDE0500J5ARC	1/2	1/2	1 1/2	4	.060
UGDE0500J5AE	1/2	1/2	1 1/2	4	—
UGDE0625J5ARA	5/8	5/8	1 7/8	5	.015
UGDE0625J5ARB	5/8	5/8	1 7/8	5	.030
UGDE0625J5ARC	5/8	5/8	1 7/8	5	.060
UGDE0625J5ARD	5/8	5/8	1 7/8	5	.120
UGDE0625J5AE	5/8	5/8	1 7/8	5	—
UGDE0750J5ARA	3/4	3/4	2 1/4	5	.015
UGDE0750J5ARB	3/4	3/4	2 1/4	5	.030
UGDE0750J5ARC	3/4	3/4	2 1/4	5	.060
UGDE0750J5ARD	3/4	3/4	2 1/4	5	.120
UGDE0750J5AE	3/4	3/4	2 1/4	5	—
UGDE1000J5ARA	1	1	3	6	.015
UGDE1000J5ARB	1	1	3	6	.030
UGDE1000J5ARC	1	1	3	6	.060
UGDE1000J5ARD	1	1	3	6	.120
UGDE1000J5AE	1	1	3	6	—

NOTE: For application data, see page P40.

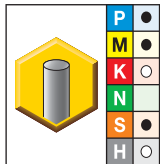
*Made-to-order standard item. Standard pricing, manufacturing lead time, and minimum order quantity applies.

- Kennametal standard dimensions.
- Non-center cutting.
- Unequal flute spacing minimizes chatter for smoother machining.
- For finishing and semi-finishing applications.
- Optimized geometry for machining corners at deep cavities.


End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+0.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1 3/16"	+0/- .00051"

■ HARVI II • UGDE • 5 x D Lengths of Cut



- first choice
- alternate choice

KC643M	D1	D	Ap1 max	L	Re
UGDE0250J5BRA	1/4	1/4	1 1/4	3	.015
UGDE0250J5BRB	1/4	1/4	1 1/4	3	.030
UGDE0250J5BE	1/4	1/4	1 1/4	3	—
UGDE0312J5BRA	5/16	5/16	1 1/4	3 1/2	.015
UGDE0312J5BRB	5/16	5/16	1 1/4	3 1/2	.030
UGDE0312J5BE	5/16	5/16	1 1/4	3 1/2	—
UGDE0375J5BRA	3/8	3/8	1 7/8	4	.015
UGDE0375J5BRB	3/8	3/8	1 7/8	4	.030
UGDE0375J5BRC	3/8	3/8	1 7/8	4	.060
UGDE0375J5BE	3/8	3/8	1 7/8	4	—
UGDE0500J5BRA	1/2	1/2	2 1/2	5	.015
UGDE0500J5BRB	1/2	1/2	2 1/2	5	.030
UGDE0500J5BRC	1/2	1/2	2 1/2	5	.060
UGDE0500J5BE	1/2	1/2	2 1/2	5	—
UGDE0625J5BRA	5/8	5/8	3 1/8	6	.015
UGDE0625J5BRB	5/8	5/8	3 1/8	6	.030
UGDE0625J5BRC	5/8	5/8	3 1/8	6	.060
UGDE0625J5BRD	5/8	5/8	3 1/8	6	.120
UGDE0625J5BE	5/8	5/8	3 1/8	6	—
UGDE0750J5BRA	3/4	3/4	3 3/4	7	.015
UGDE0750J5BRB	3/4	3/4	3 3/4	7	.030
UGDE0750J5BRC	3/4	3/4	3 3/4	7	.060
UGDE0750J5BRD	3/4	3/4	3 3/4	7	.120
UGDE0750J5BE	3/4	3/4	3 3/4	7	—
UGDE1000J5BRA	1	1	5	7 1/2	.015
UGDE1000J5BRB	1	1	5	7 1/2	.030
UGDE1000J5BRC	1	1	5	7 1/2	.060
UGDE1000J5BRD	1	1	5	7 1/2	.120
UGDE1000J5BE	1	1	5	7 1/2	—

NOTE: For application data, see page P41.

■ HARVI II • UGDE • Unequal Flute Spacing • 3 x D Lengths of Cut

Material Group													
		Side Milling (A)											
		A		KC643M		Recommended feed per tooth (IPT = inch/th) for side milling (A).							
				Cutting Speed — vc SFM		D1 — Diameter							
						frac.	1/4	5/16	3/8	1/2	5/8	3/4	1
		ap	ae	min	max	dec.	.2500	.3125	.3750	.5000	.6250	.7500	1.0000
P	0	Ap max	0.05 x D	980	1310	IPT	.0022	.0028	.0033	.0041	.0047	.0053	.0059
	1	Ap max	0.05 x D	980	1310	IPT	.0022	.0028	.0033	.0041	.0047	.0053	.0059
	2	Ap max	0.05 x D	920	1250	IPT	.0022	.0028	.0033	.0041	.0047	.0053	.0059
	3	Ap max	0.05 x D	790	1050	IPT	.0018	.0023	.0027	.0035	.0041	.0046	.0054
	4	Ap max	0.05 x D	590	980	IPT	.0017	.0021	.0025	.0031	.0036	.0040	.0046
	5	Ap max	0.05 x D	390	660	IPT	.0015	.0019	.0022	.0028	.0033	.0037	.0043
M	6	Ap max	0.05 x D	330	490	IPT	.0012	.0016	.0018	.0023	.0027	.0030	.0034
	1	Ap max	0.05 x D	590	750	IPT	.0018	.0023	.0027	.0035	.0041	.0046	.0054
	2	Ap max	0.05 x D	390	520	IPT	.0015	.0019	.0022	.0028	.0033	.0037	.0043
K	3	Ap max	0.05 x D	390	460	IPT	.0012	.0016	.0018	.0023	.0027	.0030	.0034
	1	Ap max	0.05 x D	790	980	IPT	.0022	.0028	.0033	.0041	.0047	.0053	.0059
	2	Ap max	0.05 x D	720	920	IPT	.0018	.0023	.0027	.0035	.0041	.0046	.0054
S	3	Ap max	0.05 x D	720	850	IPT	.0015	.0019	.0022	.0028	.0033	.0037	.0043
	1	Ap max	0.05 x D	330	590	IPT	.0018	.0023	.0027	.0035	.0041	.0046	.0054
	2	Ap max	0.05 x D	160	260	IPT	.0010	.0012	.0015	.0018	.0022	.0025	.0029
	3	Ap max	0.05 x D	160	260	IPT	.0010	.0012	.0015	.0018	.0022	.0025	.0029
H	4	Ap max	0.05 x D	330	390	IPT	.0013	.0017	.0020	.0026	.0030	.0034	.0040
	1	Ap max	0.05 x D	520	920	IPT	.0017	.0021	.0025	.0031	.0036	.0040	.0046
	2	Ap max	0.05 x D	460	790	IPT	.0012	.0016	.0018	.0023	.0027	.0030	.0034

* For the above cutting data, do not exceed an overall ae of .031".

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ HARVI II • UGDE • Unequal Flute Spacing • 5 x D Lengths of Cut

Material Group													
		Side Milling (A)											
		A		KC643M		Recommended feed per tooth (IPT = inch/th) for side milling (A).							
				Cutting Speed — vc SFM		frac.	D1 — Diameter						
							1/4	5/16	3/8	1/2	5/8	3/4	1
		ap	ae	min	max	dec.	.2500	.3125	.3750	.5000	.6250	.7500	1.0000
P	0	Ap max	0.05 x D	980	1310	IPT	.0022	.0028	.0033	.0041	.0047	.0053	.0059
	1	Ap max	0.05 x D	980	1310	IPT	.0022	.0028	.0033	.0041	.0047	.0053	.0059
	2	Ap max	0.05 x D	920	1250	IPT	.0022	.0028	.0033	.0041	.0047	.0053	.0059
	3	Ap max	0.05 x D	790	1050	IPT	.0018	.0023	.0027	.0035	.0041	.0046	.0054
	4	Ap max	0.05 x D	590	980	IPT	.0017	.0021	.0025	.0031	.0036	.0040	.0046
	5	Ap max	0.05 x D	390	660	IPT	.0015	.0019	.0022	.0028	.0033	.0037	.0043
M	6	Ap max	0.05 x D	330	490	IPT	.0012	.0016	.0018	.0023	.0027	.0030	.0034
	1	Ap max	0.05 x D	590	750	IPT	.0018	.0023	.0027	.0035	.0041	.0046	.0054
	2	Ap max	0.05 x D	390	520	IPT	.0015	.0019	.0022	.0028	.0033	.0037	.0043
K	3	Ap max	0.05 x D	390	460	IPT	.0012	.0016	.0018	.0023	.0027	.0030	.0034
	1	Ap max	0.05 x D	790	980	IPT	.0022	.0028	.0033	.0041	.0047	.0053	.0059
	2	Ap max	0.05 x D	720	920	IPT	.0018	.0023	.0027	.0035	.0041	.0046	.0054
S	3	Ap max	0.05 x D	720	850	IPT	.0015	.0019	.0022	.0028	.0033	.0037	.0043
	1	Ap max	0.05 x D	330	590	IPT	.0018	.0023	.0027	.0035	.0041	.0046	.0054
	2	Ap max	0.05 x D	160	260	IPT	.0010	.0012	.0015	.0018	.0022	.0025	.0029
	3	Ap max	0.05 x D	160	260	IPT	.0010	.0012	.0015	.0018	.0022	.0025	.0029
H	4	Ap max	0.05 x D	330	390	IPT	.0013	.0017	.0020	.0026	.0030	.0034	.0040
	1	Ap max	0.05 x D	520	920	IPT	.0017	.0021	.0025	.0031	.0036	.0040	.0046
	2	Ap max	0.05 x D	460	790	IPT	.0012	.0016	.0018	.0023	.0027	.0030	.0034

* For the above cutting data, do not exceed an overall ae of .031".

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

HARVI™ III

High-Performance Solid Carbide End Mills

Primary Application

The HARVI III system takes high-performance profiling, semi-finishing, and finishing to the next level. These end mills are designed to provide maximum metal removal rates in titanium and stainless steel while achieving supreme surface conditions. A wide range of diameters and corner radii are available from stock as well as the Safe-Lock™ system by HAIMER® shanks.

- Outstanding metal removal rates increase productivity.
- Longest tool life due to eccentric relief grind and proprietary KCSM15™ Beyond™ grade.
- Increased process safety with Safe-Lock™ shanks.

Features and Benefits

Advanced Technology

- Six unequally spaced flutes for chatter-free machining at high feed rates.
- Lower cutting forces and pressure on cutting edge through tailored axial and radial rake angles.
- Eccentric relief design increases tool life through higher edge stability.
- Proprietary tapered core provides highest tool stability in roughing and finishing operations.
- Center cutting design for higher flexibility as well as radial and axial finishing pass after roughing operation.

Tailored Grades

- KCSM15™ Beyond™ grade for exceptional tool life in titanium and stainless steels.

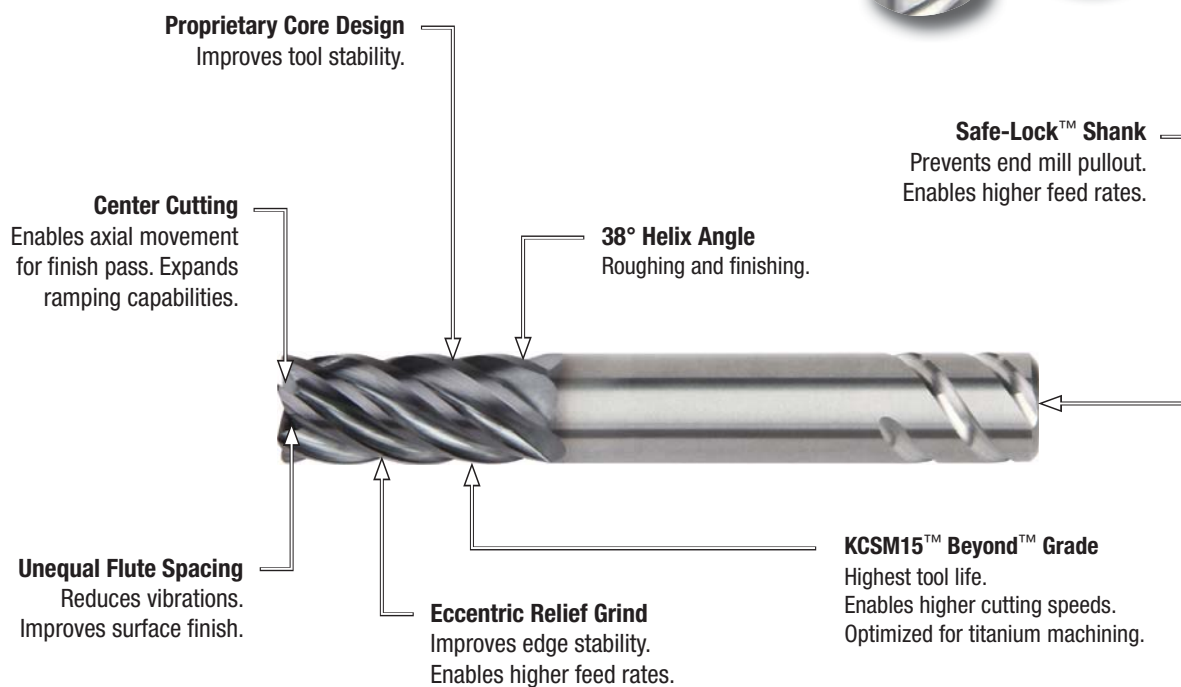
Customization

- Engineered solutions, including ball nose versions, are available upon request.

Extensive Standard Offering

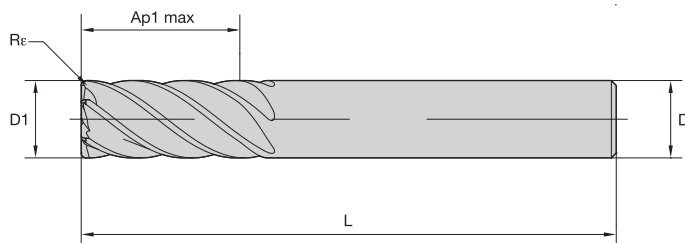
- Diameter ranges 3/8–1-1/4".
- Necked, corner radii, and square-end offering.
- Round shank and Safe-Lock™ shank available.

Maximum metal removal rates in machining titanium and stainless steel with supreme surfaces.



SAFE-LOCK®
by HAIMER®

- Kennametal standard dimensions.
- Center cutting.
- Optimized geometry for titanium machining.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.

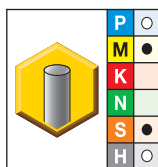


End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1-3/16"	0/.00051"



■ **UJDE • 6 Flute with Eccentric Relief Grind • Inch**

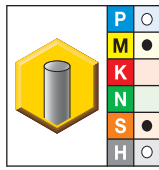
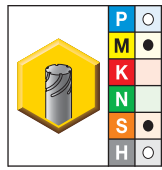


- first choice
- alternate choice

KCSM15	KCSM15	D1	D	Ap1 max	L	Rε
—	UJDE375J6CRA	3/8	3/8	1	3	.015
—	UJDE375J6CRB	3/8	3/8	1	3	.030
—	UJDE375J6CRC	3/8	3/8	1	3	.060
—	UJDE375J6CS	3/8	3/8	1	3	—
—	UJDE0500J6ARB	1/2	1/2	1	3	.030
—	UJDE0500J6ARC	1/2	1/2	1	3	.060
UJDE500N6BRA	UJDE500J6BRA	1/2	1/2	1 1/4	3	.015
UJDE500N6BRB	UJDE500J6BRB	1/2	1/2	1 1/4	3	.030
UJDE500N6BRC	UJDE500J6BRC	1/2	1/2	1 1/4	3	.060
UJDE500N6BRE	UJDE500J6BRE	1/2	1/2	1 1/4	3	.120
UJDE500N6BS	UJDE500J6BS	1/2	1/2	1 1/4	3	—
—	UJDE0500J6CRB	1/2	1/2	2	4	.030
—	UJDE0500J6CRE	1/2	1/2	2	4	.120
—	UJDE0625J6ARA	5/8	5/8	1	3 1/2	.015
UJDE625N6BRB	UJDE625J6BRB	5/8	5/8	1 1/4	3 1/2	.030
UJDE625N6BRC	UJDE625J6BRC	5/8	5/8	1 1/4	3 1/2	.060
UJDE625N6BS	UJDE625J6BS	5/8	5/8	1 1/4	3 1/2	—
—	UJDE0625J6CRB	5/8	5/8	1 5/8	3 1/2	.030
—	UJDE0625J6CRC	5/8	5/8	1 5/8	3 1/2	.060
—	UJDE0625J6CRD	5/8	5/8	1 5/8	3 1/2	.090
—	UJDE0625J6CRE	5/8	5/8	1 5/8	3 1/2	.120
—	UJDE0750J6ARB	3/4	3/4	1	3	.030
UJDE750N6BRB	UJDE750J6BRB	3/4	3/4	1 1/2	4	.030
UJDE750N6BRC	UJDE750J6BRC	3/4	3/4	1 1/2	4	.060
UJDE750N6BRD	UJDE750J6BRD	3/4	3/4	1 1/2	4	.090
UJDE750N6BRE	UJDE750J6BRE	3/4	3/4	1 1/2	4	.120
—	UJDE0750J6BRH	3/4	3/4	1 1/2	4	.190
UJDE750N6BS	UJDE750J6BS	3/4	3/4	1 1/2	4	—

(continued)

(UJDE • 6 Flute with Eccentric Relief Grind • Inch — continued)



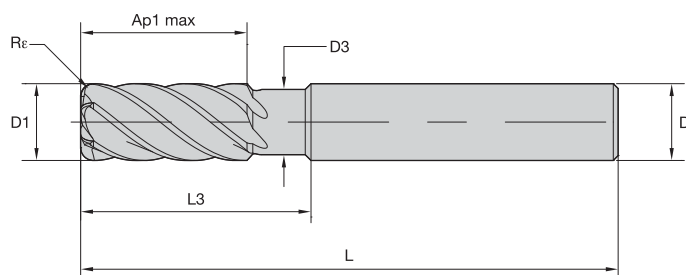
● first choice
○ alternate choice

KCSM15	KCSM15	D1	D	Ap1 max	L	R _e
UJDE750N6CRB	UJDE750J6CRB	3/4	3/4	1 5/8	4	.030
UJDE750N6CRC	UJDE750J6CRC	3/4	3/4	1 5/8	4	.060
UJDE750N6CRD	UJDE750J6CRD	3/4	3/4	1 5/8	4	.090
UJDE750N6CRE	UJDE750J6CRE	3/4	3/4	1 5/8	4	.120
UJDE750N6CS	UJDE750J6CS	3/4	3/4	1 5/8	4	—
—	UJDE1000J6ARB	1	1	1 1/2	4	.030
—	UJDE1000J6ARC	1	1	1 1/2	4	.060
—	UJDE1000J6ARE *	1	1	1 1/2	4	.120
—	UJDE1000J6AS	1	1	1 1/2	4	—
UJDE1000N6BRB	—	1	1	1 3/4	4 1/2	.030
UJDE1000N6BRC	UJDE1000J6BRC	1	1	1 3/4	4 1/2	.060
UJDE1000N6BRE	UJDE1000J6BRE	1	1	1 3/4	4 1/2	.120
UJDE1000N6BRF	UJDE1000J6BRF	1	1	1 3/4	4 1/2	.250
UJDE1000N6BS	UJDE1000J6BS	1	1	1 3/4	4 1/2	—
—	UJDE1000J6CRB	1	1	2	4 1/2	.030
—	UJDE1000J6CRC	1	1	2	4 1/2	.060
—	UJDE1000J6CRD	1	1	2	4 1/2	.090
—	UJDE1000J6CRE	1	1	2	4 1/2	.120
—	UJDE1000J6CRH	1	1	2	4 1/2	.190
—	UJDE1000J6CRF	1	1	2	4 1/2	.250
—	UJDE1000J6CS	1	1	2	4 1/2	—
—	UJDE1000J6DRB	1	1	2	5	.030
—	UJDE1000J6DS	1	1	2 1/4	5	—
UJDE1250N6BRB	UJDE1250J6BRB	1 1/4	1 1/4	2 1/4	5	.030
UJDE1250N6BRE	—	1 1/4	1 1/4	2 1/4	5	.120
UJDE1250N6BS	—	1 1/4	1 1/4	2 1/4	5	—

NOTE: For application data, see page P47.

*Made-to-order standard item. Standard pricing, manufacturing lead time, and minimum order quantity applies.

- Kennametal standard dimensions.
- Center cutting.
- Optimized geometry for titanium machining.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.

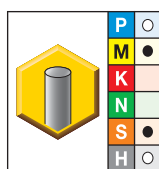


End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1-3/16"	0/.00051"



UJDE • 6 Flute with Eccentric Relief Grind and Neck • Inch



- first choice
- alternate choice

KCSM15	KCSM15	D1	D	D3	Ap1 max	L3	L	Re
—	UJDE0375J6BQE	3/8	3/8	.353	7/8	1 1/4	3	.120
—	UJDE375J6BQA	3/8	3/8	.353	7/8	1 7/8	4	.015
—	UJDE0500J6DQB	1/2	1/2	.470	3/4	2 1/4	6	.030
UJDE500N6BQB	—	1/2	1/2	.470	1 1/4	2 1/4	4	.030
UJDE625N6BQB	—	5/8	5/8	.588	1 1/4	2 1/4	4	.030
—	UJDE0625J6DQB	5/8	5/8	.588	1 1/4	2 1/4	6	.030
UJDE750N6BQB	—	3/4	3/4	.705	1 1/2	3 1/4	5 1/2	.030
UJDE1000N6BQB	—	1	1	.940	1 3/4	3 1/4	5 1/2	.030

NOTE: For application data, see page P48.

■ HARVI III • UJDE • Unequal Flute Spacing • Roughing

Material Group												
		Side Milling (A)		KCSM15								
		A		Cutting Speed — vc SFM		frac.	Recommended feed per tooth (IPT = inch/th) for side milling (A).					
		ap	ae	min	max		D1 — Diameter					
						dec.	3/8	1/2	5/8	3/4	1	1 1/4
P	4	Ap max	0.4 x D	300	490	IPT	.0020	.0026	.0030	.0034	.0039	.0040
	5	Ap max	0.4 x D	200	330	IPT	.0018	.0023	.0027	.0031	.0036	.0039
M	1	Ap max	0.4 x D	300	380	IPT	.0023	.0029	.0034	.0039	.0045	.0048
	2	Ap max	0.4 x D	200	260	IPT	.0018	.0023	.0027	.0031	.0036	.0039
	3	Ap max	0.4 x D	200	230	IPT	.0015	.0019	.0022	.0025	.0028	.0029
S	1	Ap max	0.4 x D	160	300	IPT	.0023	.0029	.0034	.0039	.0045	.0048
	2	Ap max	0.4 x D	80	130	IPT	.0012	.0015	.0018	.0021	.0024	.0026
	3	Ap max	0.4 x D	80	130	IPT	.0012	.0015	.0018	.0021	.0024	.0026
	4	Ap max	0.4 x D	160	200	IPT	.0017	.0021	.0025	.0028	.0033	.0036
H	1	Ap max	0.4 x D	260	460	IPT	.0020	.0026	.0030	.0034	.0039	.0040

■ HARVI III • UJDE • Unequal Flute Spacing • Finishing

Material Group												
		Side Milling (A)		KCSM15								
		A		Cutting Speed — vc SFM		frac.	Recommended feed per tooth (IPT = inch/th) for side milling (A).					
		ap	ae	min	max		D1 — Diameter					
						dec.	3/8	1/2	5/8	3/4	1	1 1/4
P	4	Ap max	0.06 x D	560	940	IPT	.0025	.0031	.0036	.0040	.0046	.0048
	5	Ap max	0.06 x D	370	620	IPT	.0022	.0028	.0033	.0037	.0043	.0047
M	1	Ap max	0.06 x D	560	720	IPT	.0027	.0035	.0041	.0046	.0054	.0058
	2	Ap max	0.06 x D	370	500	IPT	.0022	.0028	.0033	.0037	.0043	.0047
	3	Ap max	0.06 x D	370	440	IPT	.0018	.0023	.0027	.0030	.0034	.0035
S	1	Ap max	0.06 x D	310	560	IPT	.0027	.0035	.0041	.0046	.0054	.0058
	2	Ap max	0.06 x D	160	250	IPT	.0015	.0018	.0022	.0025	.0029	.0032
	3	Ap max	0.06 x D	160	250	IPT	.0015	.0018	.0022	.0025	.0029	.0032
	4	Ap max	0.06 x D	310	370	IPT	.0020	.0026	.0030	.0034	.0040	.0043
H	1	Ap max	0.06 x D	500	870	IPT	.0025	.0031	.0036	.0040	.0046	.0048

NOTE: Those guidelines may require variations to achieve optimum results.

Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ HARVI III • UJDE • Unequal Flute Spacing • Roughing • With Neck

Material Group											
		Side Milling (A)		KCSM15		Recommended feed per tooth (IPT = inch/th) for side milling (A).					
		A		Cutting Speed — vc SFM			D1 — Diameter				
		ap	ae	min	max	frac. dec.	3/8	1/2	5/8	3/4	1
P	4	Ap1 max	0.4 x D	300	490	IPT	.0020	.0026	.0030	.0033	.0039
	5	Ap1 max	0.4 x D	200	330	IPT	.0018	.0023	.0027	.0030	.0036
M	1	Ap1 max	0.4 x D	300	380	IPT	.0023	.0029	.0034	.0038	.0046
	2	Ap1 max	0.4 x D	200	260	IPT	.0018	.0023	.0027	.0030	.0036
	3	Ap1 max	0.4 x D	200	230	IPT	.0015	.0019	.0022	.0024	.0028
S	1	Ap1 max	0.4 x D	160	300	IPT	.0023	.0029	.0034	.0038	.0046
	2	Ap1 max	0.4 x D	160	300	IPT	.0023	.0029	.0034	.0038	.0046
	3	Ap1 max	0.4 x D	80	130	IPT	.0012	.0016	.0018	.0020	.0025
	4	Ap1 max	0.4 x D	160	260	IPT	.0017	.0022	.0025	.0028	.0033
H	1	Ap1 max	0.4 x D	260	460	IPT	.0020	.0026	.0030	.0033	.0039

■ HARVI III • UJDE • Unequal Flute Spacing • Finishing • With Neck

Material Group											
		Side Milling (A)		KCSM15		Recommended feed per tooth (IPT = inch/th) for side milling (A).					
		A		Cutting Speed — vc SFM			D1 — Diameter				
		ap	ae	min	max	frac. dec.	3/8	1/2	5/8	3/4	1
P	4	Ap1 max	0.06 x D	560	940	IPT	.0024	.0031	.0036	.0040	.0047
	5	Ap1 max	0.06 x D	370	620	IPT	.0022	.0028	.0033	.0036	.0044
M	1	Ap1 max	0.06 x D	560	720	IPT	.0027	.0035	.0041	.0045	.0055
	2	Ap1 max	0.06 x D	370	500	IPT	.0022	.0028	.0033	.0036	.0044
	3	Ap1 max	0.06 x D	370	440	IPT	.0018	.0023	.0027	.0029	.0034
S	1	Ap1 max	0.06 x D	310	560	IPT	.0027	.0035	.0041	.0045	.0055
	2	Ap1 max	0.06 x D	310	560	IPT	.0027	.0035	.0041	.0045	.0055
	3	Ap1 max	0.06 x D	160	250	IPT	.0014	.0019	.0022	.0024	.0029
	4	Ap1 max	0.06 x D	310	500	IPT	.0020	.0026	.0030	.0033	.0040
H	1	Ap1 max	0.06 x D	500	870	IPT	.0024	.0031	.0036	.0040	.0047

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

EADE Solid Ceramic End Mill

- Roughing nickel-based high-temperature alloys.
- Highest productivity and longest tool life.
- Outstanding reduction of machining time.
- Less tool changes due to higher tool life.
- Benefit from throw-away type of tooling.
- Minimum cutting speed of 1300 SFM (400 m/min).

Offering

- 4-flute necked tools for slotting.
- 6-flute version for face and side milling.

KYS40

- Cutting speeds up to 3300 SFM (1000 m/min)
increases Metal Removal Rates (MRR).



Visit kennametal.com or contact your local
Authorized Kennametal Distributor.



kennametal.com

➤ HARVI™ III Ball Nose

High-Performance Solid Carbide End Mills

Primary Application

HARVI III Ball Nose tooling takes high-performance profiling, semi-finishing, and finishing to the next level. Designed to provide maximum metal removal rates in titanium and stainless steel while achieving supreme surface conditions. A wide range of diameters and length variations are available from stock.

- Outstanding metal removal rates increase productivity.
- Highest tool life increases due to eccentric relief grind and proprietary KCSM15™ Beyond™ grade.

Features and Benefits

Advanced Technology

- Six unequally spaced flutes for chatter-free machining at high feed rates.
- Lower cutting forces and pressure on cutting edge through tailored axial and radial rake angles.
- Eccentric relief design increases tool life through higher edge stability.
- Proprietary tapered core provides highest tool stability at roughing and finishing operations.

Tailored Grade

- KCSM15 Beyond grade for exceptional tool life in titanium and stainless steels.

Extensive Standard Offering

- Diameter ranges 3/8–1".
- Necked, round shank offering in two length variations.

Customization

- Engineered solutions, including shank and non-standard length versions, are available upon request.

3D profiling at highest productivity in titanium and stainless steels.



Proprietary Core Design
Improves tool stability.

38° Helix Angle
Roughing and finishing.

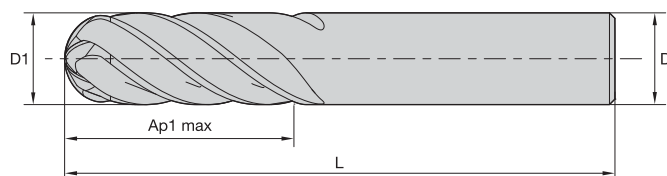
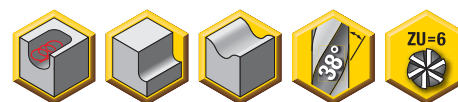
Eccentric Relief Grind
Improves edge stability.
Enables higher feed rates.

Unequal Flute Spacing
Reduces vibrations.
Improves surface finish.

KCSM15™ Beyond™ grade
Optimized for titanium machining.
Highest tool life. Enables higher
cutting speeds.



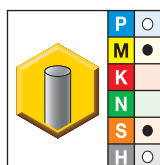
- Kennametal standard dimensions.
- Center cutting.
- Optimized geometry for titanium machining.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.



End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+0.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1-3/16"	0/.00051"

UJBE • 6-Flute Ball Nose with Eccentric Relief Grind • Inch

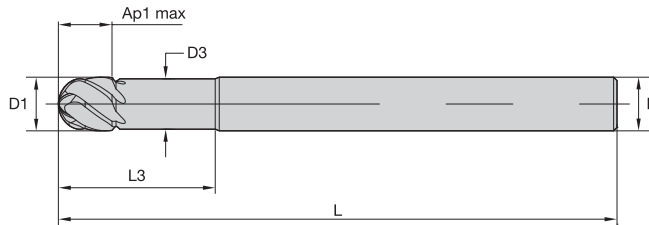
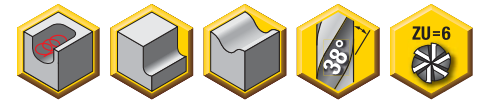


- first choice
- alternate choice

KCSM15	D1	D	Ap1 max	L
UJBE0375J6B	3/8	3/8	7/8	2 1/2
UJBE0500J6B	1/2	1/2	1	3
UJBE0500J6C	1/2	1/2	1 1/4	3
UJBE0625J6B	5/8	5/8	1 1/4	3 1/2
UJBE0750J6B	3/4	3/4	1 1/2	4
UJBE1000J6B	1	1	1 1/2	4

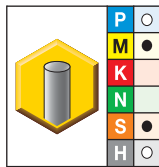
NOTE: For application data, see page P56.

- Kennametal standard dimensions.
- Center cutting.
- Optimized geometry for titanium machining.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.



End Mill Tolerances			
D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1-3/16"	0/.00051"

■ UJBE • 6-Flute Ball Nose with Eccentric Relief Grind and Neck • Inch



- first choice
- alternate choice

KCSM15	D1	D	D3	Ap1 max	L3	L
UJBE0375J6AL	3/8	3/8	.35	1/2	2.00	6
UJBE0500J6AL	1/2	1/2	.47	5/8	2.25	6
UJBE0625J6AL	5/8	5/8	.59	3/4	2.25	6
UJBE0750J6AL	3/4	3/4	.71	1	2.25	6
UJBE1000J6AL	1	1	.94	1 1/4	3.25	6

NOTE: For application data, see page P56.



HARVI III Ball Nose with Eccentric Relief

- CHALLENGE**
- Finish profile machining of keel for weapon attachment.
 - Vertical machining center.
 - Titanium Alloy Beta (R56400).
 - External emulsion.

- SOLUTION**
- HARVI III ball nose $\varnothing .5"$ with eccentric relief in KCSM15™.
 - Six effective teeth.

- CUTTING DATA**
- vc 300 SFM
 - fz .0018 IPT
 - ap 1.2"
 - ae .025"

- RESULT**
- Significantly increased tool life.
 - Reduced machining time from 210 minutes to 90 minutes.
 - Surface finish 90 RMS.

- BENEFIT**
- Predictable wear at main lands instead of cutting edge flaking with competitive tooling.
 - Extended tool life of HARVI III eliminated a mid-part tool change.
 - Improved surface finish compared to previous four-flute ball nose tools.

HARVI III Ball Nose with Eccentric Relief

- CHALLENGE**
- Rough profile yoke contour milling of bogey pitch trimmer.
 - Lathe with driven tooling.
 - 4340 low-alloy steel.
 - External emulsion.

- SOLUTION**
- HARVI III ball nose $\varnothing .787"$ (20mm) with eccentric relief in KCSM15.
 - Six effective teeth.

- CUTTING DATA**
- vc 400 SFM
 - fz .003 IPT
 - ap 1.7"
 - ae .1"

- RESULT**
- Tool completed seven workpieces compared to five workpieces with existing tooling.
 - Surface finish 120 RMS.

- BENEFIT**
- Reduced machining time from 88 minutes to 49 minutes.
 - About 30% higher feed rate due to feed per tooth and six flutes rather than four flutes.

(continued)

(continued)



HARVI III Ball Nose with Eccentric Relief

- CHALLENGE**
- Hem stitch profile neck to flanged blend.
 - Lathe with driven tooling.
 - 4340 low-alloy steel.
 - External emulsion.

- SOLUTION**
- HARVI III ball nose Ø .5" with eccentric relief in KCSM15™.
 - Six effective teeth.

- CUTTING DATA**
- vc 350 SFM
 - fz .0025 IPT
 - ap .05"
 - ae .05"

- RESULT**
- Increase in cutting speed from 150 SFM to 350 SFM.
 - Tool completed ten workpieces compared to six workpieces with existing tooling.

- BENEFIT**
- Reduced machining time to eight minutes compared to 29 minutes with competitive four-flute ball nose tool.
 - 200% increase in Metal Removal Rate (MRR).

HARVI III Ball Nose with Eccentric Relief

- CHALLENGE**
- Finish interior walls and blend filet radius.
 - Horizontal machining center.
 - 4340 low-alloy steel.
 - External emulsion.

- SOLUTION**
- HARVI III ball nose Ø .5" with eccentric relief in KCSM15.
 - Six effective teeth.

- CUTTING DATA**
- vc 350 SFM
 - fz .0025 IPT
 - ap .553"
 - ae .05"

- RESULT**
- Tool completed six workpieces compared to two workpieces with existing solution.
 - Surface finish 63 RMS.

- BENEFIT**
- Reduced machining time from 25 minutes to 10 minutes.
 - Improved surface finish from 90 RMS to 63 RMS at accelerated feeds and speeds.
 - Reduction in harmonics, noise level, and vibrations with HARVI III ball nose tooling.

■ HARVI III • UJBE • Ball Nose • Unequal Flute Spacing • Roughing

Material Group												
		Side Milling (A)		KCSM15			Recommended feed per tooth (IPT = inch/th) for side milling (A).					
		A		Cutting Speed – vc SFM			D1 – Diameter					
		ap	ae	min		max	frac.	3/8	1/2	5/8	3/4	1
P	0	Ap max	0.4 x D	490	–	660	IPT	.0027	.0034	.0039	.0044	.0049
	1	Ap max	0.4 x D	490	–	660	IPT	.0027	.0034	.0039	.0044	.0049
	2	Ap max	0.4 x D	460	–	620	IPT	.0027	.0034	.0039	.0044	.0049
	3	Ap max	0.4 x D	390	–	520	IPT	.0023	.0029	.0034	.0039	.0045
	4	Ap max	0.4 x D	300	–	490	IPT	.0020	.0026	.0030	.0034	.0039
	5	Ap max	0.4 x D	200	–	330	IPT	.0018	.0023	.0027	.0031	.0036
	4	Ap max	0.4 x D	160	–	250	IPT	.0015	.0019	.0022	.0025	.0028
M	1	Ap max	0.4 x D	300	–	380	IPT	.0023	.0029	.0034	.0039	.0045
	2	Ap max	0.4 x D	200	–	260	IPT	.0018	.0023	.0027	.0031	.0036
	3	Ap max	0.4 x D	200	–	230	IPT	.0015	.0019	.0022	.0025	.0028
S	1	Ap max	0.4 x D	160	–	300	IPT	.0023	.0029	.0034	.0039	.0045
	2	Ap max	0.4 x D	80	–	130	IPT	.0012	.0015	.0018	.0021	.0024
	3	Ap max	0.4 x D	80	–	130	IPT	.0012	.0015	.0018	.0021	.0024
	4	Ap max	0.4 x D	160	–	200	IPT	.0017	.0021	.0025	.0028	.0033
H	1	Ap max	0.4 x D	260	–	460	IPT	.0020	.0026	.0030	.0034	.0039

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ HARVI III • UJBE • Ball Nose • Unequal Flute Spacing • Finishing

Material Group												
		Side Milling (A)		KCSM15			Recommended feed per tooth (IPT = inch/th) for side milling (A).					
		A		Cutting Speed – vc SFM			D1 – Diameter					
		ap	ae	min		max	frac.	3/8	1/2	5/8	3/4	1
P	0	Ap max	0.06 x D	940	–	1250	IPT	.0033	.0041	.0047	.0053	.0059
	1	Ap max	0.06 x D	940	–	1250	IPT	.0033	.0041	.0047	.0053	.0059
	2	Ap max	0.06 x D	870	–	1180	IPT	.0033	.0041	.0047	.0053	.0059
	3	Ap max	0.06 x D	750	–	1000	IPT	.0027	.0035	.0041	.0046	.0054
	4	Ap max	0.06 x D	560	–	940	IPT	.0025	.0031	.0036	.0040	.0046
	5	Ap max	0.06 x D	370	–	620	IPT	.0022	.0028	.0033	.0037	.0043
	6	Ap max	0.06 x D	310	–	470	IPT	.0018	.0023	.0027	.0030	.0034
M	1	Ap max	0.06 x D	560	–	720	IPT	.0027	.0035	.0041	.0046	.0054
	2	Ap max	0.06 x D	370	–	500	IPT	.0022	.0028	.0033	.0037	.0043
	3	Ap max	0.06 x D	370	–	440	IPT	.0018	.0023	.0027	.0030	.0034
S	1	Ap max	0.06 x D	310	–	560	IPT	.0027	.0035	.0041	.0046	.0054
	2	Ap max	0.06 x D	160	–	250	IPT	.0015	.0018	.0022	.0025	.0029
	3	Ap max	0.06 x D	160	–	250	IPT	.0015	.0018	.0022	.0025	.0029
	4	Ap max	0.06 x D	310	–	370	IPT	.0020	.0026	.0030	.0034	.0040
H	1	Ap max	0.06 x D	500	–	870	IPT	.0025	.0031	.0036	.0040	.0046

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

Superior Finishing **MaxiMet**[™]

Designed to significantly reduce machining time in aluminum!
The innovative geometry designs include a wiper facet for superior surface finish on aluminum parts. MaxiMet handles roughing and finishing cuts with one tool.

- Use only one tool for roughing and finishing operations.
- Slotting is effective up to full 1 x D axial depth; side milling is effective up to 0.5 x D radial, by 1.5 x D axial depth.
- Three-flute series uses unequal flute spacing for chatter-free performance.
- Effective in a full range of machine speeds.
- Multiple corner radii and extended neck configurations are available as standard.



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kennametal.com

HARVI™ III

High-Performance Solid Carbide End Mills

Primary Application

This new HARVI III version is tailored to address traditional machining techniques, as well as high-velocity machining techniques with one tool design. This allows for the highest level of flexibility, fully utilizing the tool capabilities. This is designed specifically for high-performance profiling, semi-finishing, and finishing of titanium. The HARVI III provides maximum metal removal rates and achieves supreme surfaces. The standard offering comprises various length versions for each diameter to satisfy the need for maximum stability, as well as highest reach lengths in ball nose and square end designs.

- Outstanding metal removal rates increase productivity.
- Longest tool life due to eccentric relief grind and proprietary KCSM15™ Beyond™ grade.
- Increased process safety with Safe-Lock™ shanks.

Features and Benefits

Advanced Technology

- Six unequally-spaced flutes for chatter-free machining at high feed rates.
- Lower cutting forces and pressure on cutting edge through tailored axial and radial rake angles.
- Eccentric relief design increases tool life through higher edge stability.
- Proprietary tapered core provides the highest tool stability in roughing and finishing operations.
- Center cutting design for higher flexibility, as well as radial and axial finishing pass after roughing operation.
- Tailored rake angles allow for high performance in both traditional and high-velocity machining techniques.

Tailored Grades

- KCSM15™ Beyond™ grade for exceptional tool life in titanium and stainless steels.

Customization

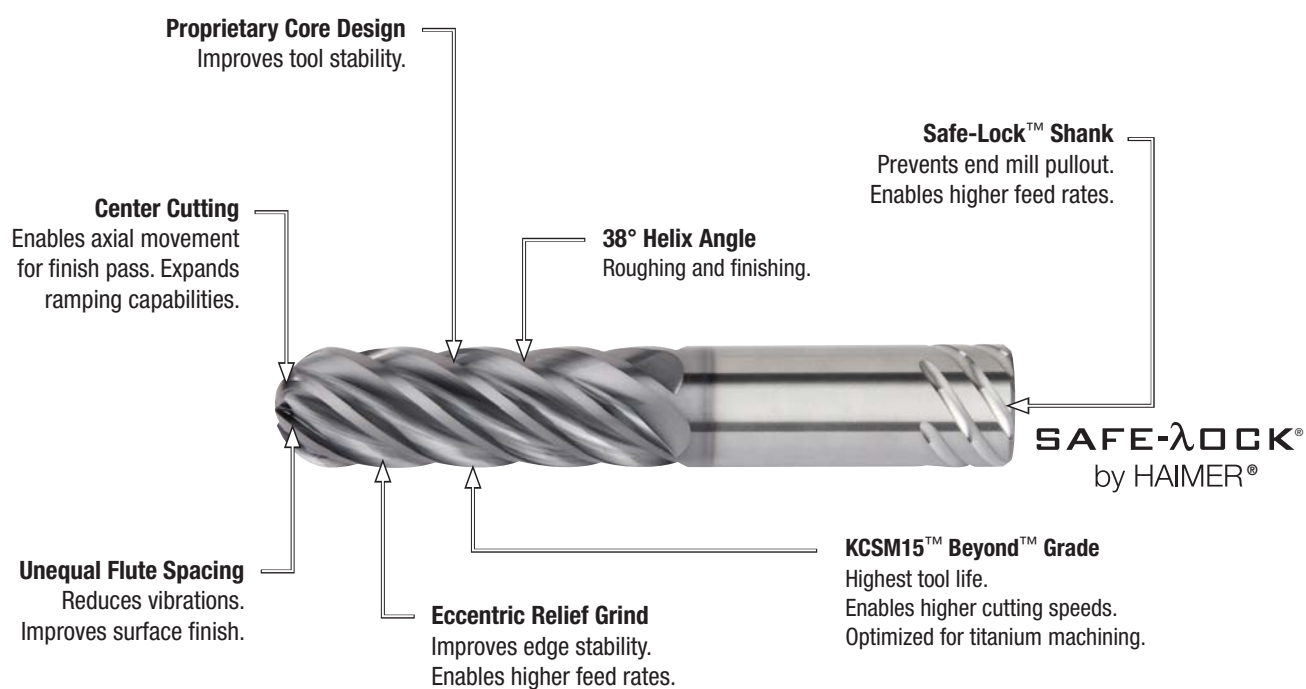
- Engineered solutions, including ball nose versions, are available upon request.

Extensive Standard Offering

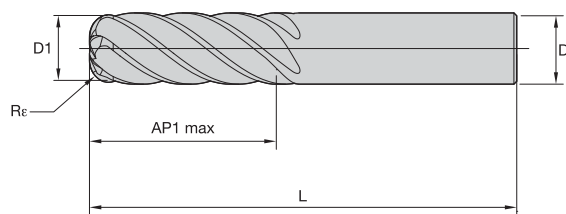
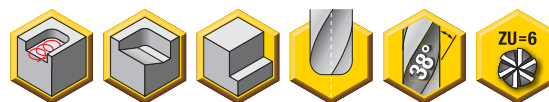
- Off-the-shelf standard diameter range 1/2–1".
- 1 1/2" diameter items are made-to-order.
- Ball nose and corner radii tooling in various length.
- Round shank and Safe-Lock™ shank available.

The new HARVI™ III by Kennametal.

"The HARVI III line boasts a portfolio of 300+ tools that have met the expectations set forth in the Industry Challenge — Increased tool life, High MRR, Reduced Tool Changes, and Decreasing overall tooling cost."



- Kennametal standard dimensions.
- Center cutting.
- Optimized geometry for titanium machining.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.

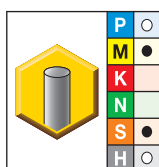
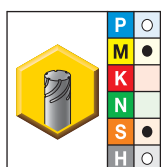


End Mill Tolerances

D1	tolerance	D	tolerance
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1-3/16"	0/.00051"



■ HARVI III • UJDE • Unequal Flute Spacing • With Eccentric Relief Grind

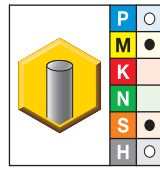
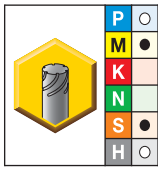


- first choice
- alternate choice

KCSM15	KCSM15	D1	D	Ap1 max	L	Rε
—	UJDE0500J6ABB	1/2	1/2	1	3	.030
—	UJDE0500J6ABC	1/2	1/2	1	3	.060
—	UJDE0500J6ABD	1/2	1/2	1	3	.090
—	UJDE0500J6ABE	1/2	1/2	1	3	.120
—	UJDE0500J6ABH	1/2	1/2	1	3	.190
—	UJDE0500J6ZBB	1/2	1/2	1 1/2	3 1/2	.030
—	UJDE0500J6ZBC	1/2	1/2	1 1/2	3 1/2	.060
—	UJDE0500J6ZBD	1/2	1/2	1 1/2	3 1/2	.090
—	UJDE0500J6ZBE	1/2	1/2	1 1/2	3 1/2	.120
—	UJDE0500J6ZBH	1/2	1/2	1 1/2	3 1/2	.190
—	UJDE0500J6CBB	1/2	1/2	2	4	.030
—	UJDE0500J6CBC	1/2	1/2	2	4	.060
—	UJDE0500J6CBD	1/2	1/2	2	4	.090
—	UJDE0500J6CBE	1/2	1/2	2	4	.120
—	UJDE0500J6CBH	1/2	1/2	2	4	.190
—	UJDE0500J6DBB	1/2	1/2	2 1/2	4 1/2	.030
—	UJDE0500J6DBC	1/2	1/2	2 1/2	4 1/2	.060
—	UJDE0500J6DBD	1/2	1/2	2 1/2	4 1/2	.090
—	UJDE0500J6DBE	1/2	1/2	2 1/2	4 1/2	.120
—	UJDE0500J6DBH	1/2	1/2	2 1/2	4 1/2	.190
—	UJDE0750J6ABB	3/4	3/4	1	3 1/2	.030
—	UJDE0750J6ABC	3/4	3/4	1	3 1/2	.060
—	UJDE0750J6ABD	3/4	3/4	1	3 1/2	.090
—	UJDE0750J6ABE	3/4	3/4	1	3 1/2	.120
—	UJDE0750J6ABH	3/4	3/4	1	3 1/2	.190
—	UJDE0750J6ABF	3/4	3/4	1	3 1/2	.250
—	UJDE0750J6ZBB	3/4	3/4	2	4 1/2	.030
—	UJDE0750J6ZBC	3/4	3/4	2	4 1/2	.060
—	UJDE0750J6ZBD	3/4	3/4	2	4 1/2	.090
—	UJDE0750J6ZBE	3/4	3/4	2	4 1/2	.120
—	UJDE0750J6ZBH	3/4	3/4	2	4 1/2	.190
—	UJDE0750J6ZBF	3/4	3/4	2	4 1/2	.250

(continued)

(HARVI III • UJDE • Unequal Flute Spacing • With Eccentric Relief Grind — continued)

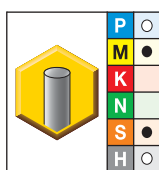
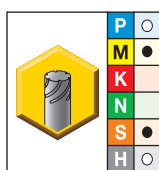


● first choice
○ alternate choice

KCSM15	KCSM15	D1	D	Ap1 max	L	R _e
—	UJDE0750J6DBB	3/4	3/4	3	5 1/2	.030
—	UJDE0750J6DBC	3/4	3/4	3	5 1/2	.060
—	UJDE0750J6DBD	3/4	3/4	3	5 1/2	.090
—	UJDE0750J6DBE	3/4	3/4	3	5 1/2	.120
—	UJDE0750J6DBH	3/4	3/4	3	5 1/2	.190
—	UJDE0750J6DBF	3/4	3/4	3	5 1/2	.250
—	UJDE0750J6EBB	3/4	3/4	4	6 1/2	.030
—	UJDE0750J6EBC	3/4	3/4	4	6 1/2	.060
—	UJDE0750J6EBD	3/4	3/4	4	6 1/2	.090
—	UJDE0750J6EBE	3/4	3/4	4	6 1/2	.120
—	UJDE0750J6EBH	3/4	3/4	4	6 1/2	.190
—	UJDE0750J6EBF	3/4	3/4	4	6 1/2	.250
UJDE1000N6XBB	—	1	1	1	4	.030
UJDE1000N6XBC	—	1	1	1	4	.060
UJDE1000N6XBD	—	1	1	1	4	.090
UJDE1000N6XBE	—	1	1	1	4	.120
UJDE1000N6XBH	—	1	1	1	4	.190
UJDE1000N6XBF	—	1	1	1	4	.250
UJDE1000N6XBK	—	1	1	1	4	.375
UJDE1000N6ABB	—	1	1	1 1/2	4 1/2	.030
UJDE1000N6ABC	—	1	1	1 1/2	4 1/2	.060
UJDE1000N6ABD	—	1	1	1 1/2	4 1/2	.090
UJDE1000N6ABE	—	1	1	1 1/2	4 1/2	.120
UJDE1000N6ABH	—	1	1	1 1/2	4 1/2	.190
UJDE1000N6ABF	—	1	1	1 1/2	4 1/2	.250
UJDE1000N6ABK	—	1	1	1 1/2	4 1/2	.375
UJDE1000N6CBB	—	1	1	2	5	.030
UJDE1000N6CBC	—	1	1	2	5	.060
UJDE1000N6CBD	—	1	1	2	5	.090
UJDE1000N6CBE	—	1	1	2	5	.120
UJDE1000N6CBH	—	1	1	2	5	.190
UJDE1000N6CBF	—	1	1	2	5	.250
UJDE1000N6CBK	—	1	1	2	5	.375
UJDE1000N6ZBB	—	1	1	2 1/2	5 1/2	.030
UJDE1000N6ZBC	—	1	1	2 1/2	5 1/2	.060
UJDE1000N6ZBD	—	1	1	2 1/2	5 1/2	.090
UJDE1000N6ZBE	—	1	1	2 1/2	5 1/2	.120
UJDE1000N6ZBH	—	1	1	2 1/2	5 1/2	.190
UJDE1000N6ZBF	—	1	1	2 1/2	5 1/2	.250
UJDE1000N6ZBK	—	1	1	2 1/2	5 1/2	.375
UJDE1000N6FBB	—	1	1	3	6	.030
UJDE1000N6FBC	—	1	1	3	6	.060
UJDE1000N6FBD	—	1	1	3	6	.090
UJDE1000N6FBE	—	1	1	3	6	.120
UJDE1000N6FBH	—	1	1	3	6	.190
UJDE1000N6FBF	—	1	1	3	6	.250
UJDE1000N6FBK	—	1	1	3	6	.375
UJDE1000N6GBB	—	1	1	3 1/2	6 1/2	.030
UJDE1000N6GBC	—	1	1	3 1/2	6 1/2	.060
UJDE1000N6GBD	—	1	1	3 1/2	6 1/2	.090
UJDE1000N6GBE	—	1	1	3 1/2	6 1/2	.120
UJDE1000N6GBH	—	1	1	3 1/2	6 1/2	.190

(continued)

(HARVI III • UJDE • Unequal Flute Spacing • With Eccentric Relief Grind — continued)

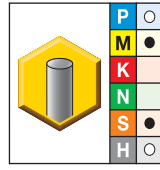
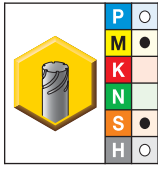


● first choice
○ alternate choice

KCSM15	KCSM15	D1	D	Ap1 max	L	Re
UJDE1000N6GBF	—	1	1	3 1/2	6 1/2	.250
UJDE1000N6GBK	—	1	1	3 1/2	6 1/2	.375
UJDE1000N6DBB	—	1	1	4	7	.030
UJDE1000N6DBC	—	1	1	4	7	.060
UJDE1000N6DBD	—	1	1	4	7	.090
UJDE1000N6DBE	—	1	1	4	7	.120
UJDE1000N6DBH	—	1	1	4	7	.190
UJDE1000N6DBF	—	1	1	4	7	.250
UJDE1000N6DBK	—	1	1	4	7	.375
UJDE1000N6HBB	—	1	1	4 1/2	7 1/2	.030
UJDE1000N6HBC	—	1	1	4 1/2	7 1/2	.060
UJDE1000N6HBD	—	1	1	4 1/2	7 1/2	.090
UJDE1000N6HBE	—	1	1	4 1/2	7 1/2	.120
UJDE1000N6HBH	—	1	1	4 1/2	7 1/2	.190
UJDE1000N6HBF	—	1	1	4 1/2	7 1/2	.250
UJDE1000N6HBK	—	1	1	4 1/2	7 1/2	.375
UJDE1000N6EBB	—	1	1	5	8	.030
UJDE1000N6EBC	—	1	1	5	8	.060
UJDE1000N6EBD	—	1	1	5	8	.090
UJDE1000N6EBE	—	1	1	5	8	.120
UJDE1000N6EBH	—	1	1	5	8	.190
UJDE1000N6EBF	—	1	1	5	8	.250
UJDE1000N6EBK	—	1	1	5	8	.375
UJDE1250N6ABB	—	1 1/4	1 1/4	2	5	.030
UJDE1250N6ABC	—	1 1/4	1 1/4	2	5	.060
UJDE1250N6ABD	—	1 1/4	1 1/4	2	5	.090
UJDE1250N6ABE	—	1 1/4	1 1/4	2	5	.120
UJDE1250N6ABH	—	1 1/4	1 1/4	2	5	.190
UJDE1250N6ABF	—	1 1/4	1 1/4	2	5	.250
UJDE1250N6ABJ	—	1 1/4	1 1/4	2	5	.375
UJDE1250N6ABK	—	1 1/4	1 1/4	2	5	.500
UJDE1250N6XBB	—	1 1/4	1 1/4	2 1/2	5 1/2	.030
UJDE1250N6XBC	—	1 1/4	1 1/4	2 1/2	5 1/2	.060
UJDE1250N6XBD	—	1 1/4	1 1/4	2 1/2	5 1/2	.090
UJDE1250N6XBE	—	1 1/4	1 1/4	2 1/2	5 1/2	.120
UJDE1250N6XBH	—	1 1/4	1 1/4	2 1/2	5 1/2	.190
UJDE1250N6XBF	—	1 1/4	1 1/4	2 1/2	5 1/2	.250
UJDE1250N6XBJ	—	1 1/4	1 1/4	2 1/2	5 1/2	.375
UJDE1250N6XBK	—	1 1/4	1 1/4	2 1/2	5 1/2	.500
UJDE1250N6ZBB	—	1 1/4	1 1/4	3	6	.030
UJDE1250N6ZBC	—	1 1/4	1 1/4	3	6	.060
UJDE1250N6ZBD	—	1 1/4	1 1/4	3	6	.090
UJDE1250N6ZBE	—	1 1/4	1 1/4	3	6	.120
UJDE1250N6ZBH	—	1 1/4	1 1/4	3	6	.190
UJDE1250N6ZBF	—	1 1/4	1 1/4	3	6	.250
UJDE1250N6ZBJ	—	1 1/4	1 1/4	3	6	.375
UJDE1250N6ZBK	—	1 1/4	1 1/4	3	6	.500
UJDE1250N6CBB	—	1 1/4	1 1/4	3 1/2	6 1/2	.030
UJDE1250N6CBC	—	1 1/4	1 1/4	3 1/2	6 1/2	.060
UJDE1250N6CBD	—	1 1/4	1 1/4	3 1/2	6 1/2	.090
UJDE1250N6CBE	—	1 1/4	1 1/4	3 1/2	6 1/2	.120
UJDE1250N6CBH	—	1 1/4	1 1/4	3 1/2	6 1/2	.190

(continued)

(HARVI III • UJDE • Unequal Flute Spacing • With Eccentric Relief Grind — continued)

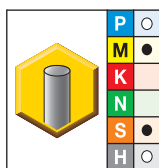
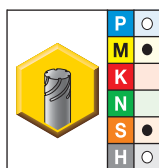


● first choice
○ alternate choice

KCSM15	KCSM15	D1	D	Ap1 max	L	R _e
UJDE1250N6CBF	—	1 1/4	1 1/4	3 1/2	6 1/2	.250
UJDE1250N6CBJ	—	1 1/4	1 1/4	3 1/2	6 1/2	.375
UJDE1250N6CBK	—	1 1/4	1 1/4	3 1/2	6 1/2	.500
UJDE1250N6FBB	—	1 1/4	1 1/4	4	7	.030
UJDE1250N6FBC	—	1 1/4	1 1/4	4	7	.060
UJDE1250N6FBD	—	1 1/4	1 1/4	4	7	.090
UJDE1250N6FBE	—	1 1/4	1 1/4	4	7	.120
UJDE1250N6FBH	—	1 1/4	1 1/4	4	7	.190
UJDE1250N6FBF	—	1 1/4	1 1/4	4	7	.250
UJDE1250N6FBJ	—	1 1/4	1 1/4	4	7	.375
UJDE1250N6FBK	—	1 1/4	1 1/4	4	7	.500
UJDE1250N6GBB	—	1 1/4	1 1/4	4 1/2	7 1/2	.030
UJDE1250N6GBC	—	1 1/4	1 1/4	4 1/2	7 1/2	.060
UJDE1250N6GBD	—	1 1/4	1 1/4	4 1/2	7 1/2	.090
UJDE1250N6GBE	—	1 1/4	1 1/4	4 1/2	7 1/2	.120
UJDE1250N6GBH	—	1 1/4	1 1/4	4 1/2	7 1/2	.190
UJDE1250N6GBF	—	1 1/4	1 1/4	4 1/2	7 1/2	.250
UJDE1250N6GBJ	—	1 1/4	1 1/4	4 1/2	7 1/2	.375
UJDE1250N6GBK	—	1 1/4	1 1/4	4 1/2	7 1/2	.500
UJDE1250N6DBB	—	1 1/4	1 1/4	5	8	.030
UJDE1250N6DBC	—	1 1/4	1 1/4	5	8	.060
UJDE1250N6DBD	—	1 1/4	1 1/4	5	8	.090
UJDE1250N6DBE	—	1 1/4	1 1/4	5	8	.120
UJDE1250N6DBH	—	1 1/4	1 1/4	5	8	.190
UJDE1250N6DBF	—	1 1/4	1 1/4	5	8	.250
UJDE1250N6DBJ	—	1 1/4	1 1/4	5	8	.375
UJDE1250N6DBK	—	1 1/4	1 1/4	5	8	.500
UJDE1250N6HBB	—	1 1/4	1 1/4	5 1/2	8 1/2	.030
UJDE1250N6HBC	—	1 1/4	1 1/4	5 1/2	8 1/2	.060
UJDE1250N6HBD	—	1 1/4	1 1/4	5 1/2	8 1/2	.090
UJDE1250N6HBE	—	1 1/4	1 1/4	5 1/2	8 1/2	.120
UJDE1250N6HBH	—	1 1/4	1 1/4	5 1/2	8 1/2	.190
UJDE1250N6HBF	—	1 1/4	1 1/4	5 1/2	8 1/2	.250
UJDE1250N6HBJ	—	1 1/4	1 1/4	5 1/2	8 1/2	.375
UJDE1250N6HBK	—	1 1/4	1 1/4	5 1/2	8 1/2	.500
UJDE1250N6JBB	—	1 1/4	1 1/4	6	9	.030
UJDE1250N6JBC	—	1 1/4	1 1/4	6	9	.060
UJDE1250N6JBD	—	1 1/4	1 1/4	6	9	.090
UJDE1250N6JBE	—	1 1/4	1 1/4	6	9	.120
UJDE1250N6JBH	—	1 1/4	1 1/4	6	9	.190
UJDE1250N6JBF	—	1 1/4	1 1/4	6	9	.250
UJDE1250N6JBJ	—	1 1/4	1 1/4	6	9	.375
UJDE1250N6JBK	—	1 1/4	1 1/4	6	9	.500
UJDE1250N6EBB	—	1 1/4	1 1/4	6 1/2	9 1/2	.030
UJDE1250N6EBC	—	1 1/4	1 1/4	6 1/2	9 1/2	.060
UJDE1250N6EBD	—	1 1/4	1 1/4	6 1/2	9 1/2	.090
UJDE1250N6EBE	—	1 1/4	1 1/4	6 1/2	9 1/2	.120
UJDE1250N6EBH	—	1 1/4	1 1/4	6 1/2	9 1/2	.190
UJDE1250N6EBF	—	1 1/4	1 1/4	6 1/2	9 1/2	.250
UJDE1250N6EBJ	—	1 1/4	1 1/4	6 1/2	9 1/2	.375
UJDE1250N6EBK	—	1 1/4	1 1/4	6 1/2	9 1/2	.500
UJDE1500N6XBB *	—	1 1/2	1 1/2	2	6	.030

(continued)

(HARVI III • UJDE • Unequal Flute Spacing • With Eccentric Relief Grind — continued)

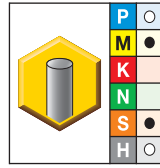
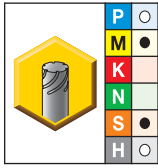


- first choice
- alternate choice

KCSM15	KCSM15	D1	D	Ap1 max	L	R _e
UJDE1500N6XBC *	—	1 1/2	1 1/2	2	6	.060
UJDE1500N6XBD *	—	1 1/2	1 1/2	2	6	.090
UJDE1500N6XBE *	—	1 1/2	1 1/2	2	6	.120
UJDE1500N6XBH *	—	1 1/2	1 1/2	2	6	.190
UJDE1500N6XBF *	—	1 1/2	1 1/2	2	6	.250
UJDE1500N6XBJ *	—	1 1/2	1 1/2	2	6	.375
UJDE1500N6XBK *	—	1 1/2	1 1/2	2	6	.500
UJDE1500N6XBL *	—	1 1/2	1 1/2	2	6	.625
UJDE1500N6ABB *	—	1 1/2	1 1/2	2 1/2	6 1/2	.030
UJDE1500N6ABC *	—	1 1/2	1 1/2	2 1/2	6 1/2	.060
UJDE1500N6ABD *	—	1 1/2	1 1/2	2 1/2	6 1/2	.090
UJDE1500N6ABE *	—	1 1/2	1 1/2	2 1/2	6 1/2	.120
UJDE1500N6ABH *	—	1 1/2	1 1/2	2 1/2	6 1/2	.190
UJDE1500N6ABF *	—	1 1/2	1 1/2	2 1/2	6 1/2	.250
UJDE1500N6ABJ *	—	1 1/2	1 1/2	2 1/2	6 1/2	.375
UJDE1500N6ABK *	—	1 1/2	1 1/2	2 1/2	6 1/2	.500
UJDE1500N6ABL *	—	1 1/2	1 1/2	2 1/2	6 1/2	.625
UJDE1500N6BBB *	—	1 1/2	1 1/2	3	7	.030
UJDE1500N6BBC *	—	1 1/2	1 1/2	3	7	.060
UJDE1500N6BBD *	—	1 1/2	1 1/2	3	7	.090
UJDE1500N6BBE *	—	1 1/2	1 1/2	3	7	.120
UJDE1500N6BBH *	—	1 1/2	1 1/2	3	7	.190
UJDE1500N6BBF *	—	1 1/2	1 1/2	3	7	.250
UJDE1500N6BBJ *	—	1 1/2	1 1/2	3	7	.375
UJDE1500N6BBK *	—	1 1/2	1 1/2	3	7	.500
UJDE1500N6BBL *	—	1 1/2	1 1/2	3	7	.625
UJDE1500N6ZBB *	—	1 1/2	1 1/2	3 1/2	7 1/2	.030
UJDE1500N6ZBC *	—	1 1/2	1 1/2	3 1/2	7 1/2	.060
UJDE1500N6ZBD *	—	1 1/2	1 1/2	3 1/2	7 1/2	.090
UJDE1500N6ZBE *	—	1 1/2	1 1/2	3 1/2	7 1/2	.120
UJDE1500N6ZBH *	—	1 1/2	1 1/2	3 1/2	7 1/2	.190
UJDE1500N6ZBF *	—	1 1/2	1 1/2	3 1/2	7 1/2	.250
UJDE1500N6ZBJ *	—	1 1/2	1 1/2	3 1/2	7 1/2	.375
UJDE1500N6ZBK *	—	1 1/2	1 1/2	3 1/2	7 1/2	.500
UJDE1500N6ZBL *	—	1 1/2	1 1/2	3 1/2	7 1/2	.625
UJDE1500N6CBB *	—	1 1/2	1 1/2	4	8	.030
UJDE1500N6CBC *	—	1 1/2	1 1/2	4	8	.060
UJDE1500N6CBD *	—	1 1/2	1 1/2	4	8	.090
UJDE1500N6CBE *	—	1 1/2	1 1/2	4	8	.120
UJDE1500N6CBH *	—	1 1/2	1 1/2	4	8	.190
UJDE1500N6CBF *	—	1 1/2	1 1/2	4	8	.250
UJDE1500N6CBJ *	—	1 1/2	1 1/2	4	8	.375
UJDE1500N6CBK *	—	1 1/2	1 1/2	4	8	.500
UJDE1500N6CBL *	—	1 1/2	1 1/2	4	8	.625
UJDE1500N6FBB *	—	1 1/2	1 1/2	4 1/2	8 1/2	.030
UJDE1500N6FBC *	—	1 1/2	1 1/2	4 1/2	8 1/2	.060
UJDE1500N6FBD *	—	1 1/2	1 1/2	4 1/2	8 1/2	.090
UJDE1500N6FBE *	—	1 1/2	1 1/2	4 1/2	8 1/2	.120
UJDE1500N6FBH *	—	1 1/2	1 1/2	4 1/2	8 1/2	.190
UJDE1500N6FBF *	—	1 1/2	1 1/2	4 1/2	8 1/2	.250
UJDE1500N6FBJ *	—	1 1/2	1 1/2	4 1/2	8 1/2	.375
UJDE1500N6FBK *	—	1 1/2	1 1/2	4 1/2	8 1/2	.500

(continued)

(HARVI III • UJDE • Unequal Flute Spacing • With Eccentric Relief Grind — continued)



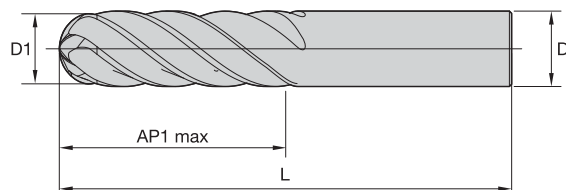
● first choice
○ alternate choice

KCSM15	KCSM15	D1	D	Ap1 max	L	R _e
UJDE1500N6FBL *	—	1 1/2	1 1/2	4 1/2	8 1/2	.625
UJDE1500N6GBB *	—	1 1/2	1 1/2	5	9	.030
UJDE1500N6GBC *	—	1 1/2	1 1/2	5	9	.060
UJDE1500N6GBD *	—	1 1/2	1 1/2	5	9	.090
UJDE1500N6GBE *	—	1 1/2	1 1/2	5	9	.120
UJDE1500N6GBH *	—	1 1/2	1 1/2	5	9	.190
UJDE1500N6GBF *	—	1 1/2	1 1/2	5	9	.250
UJDE1500N6GBJ *	—	1 1/2	1 1/2	5	9	.375
UJDE1500N6GBK *	—	1 1/2	1 1/2	5	9	.500
UJDE1500N6GBL *	—	1 1/2	1 1/2	5	9	.625
UJDE1500N6DBB *	—	1 1/2	1 1/2	5 1/2	9 1/2	.030
UJDE1500N6DBC *	—	1 1/2	1 1/2	5 1/2	9 1/2	.060
UJDE1500N6DBD *	—	1 1/2	1 1/2	5 1/2	9 1/2	.090
UJDE1500N6DBE *	—	1 1/2	1 1/2	5 1/2	9 1/2	.120
UJDE1500N6DBH *	—	1 1/2	1 1/2	5 1/2	9 1/2	.190
UJDE1500N6DBF *	—	1 1/2	1 1/2	5 1/2	9 1/2	.250
UJDE1500N6DBJ *	—	1 1/2	1 1/2	5 1/2	9 1/2	.375
UJDE1500N6DBK *	—	1 1/2	1 1/2	5 1/2	9 1/2	.500
UJDE1500N6DBL *	—	1 1/2	1 1/2	5 1/2	9 1/2	.625
UJDE1500N6HBB *	—	1 1/2	1 1/2	6	10	.030
UJDE1500N6HBC *	—	1 1/2	1 1/2	6	10	.060
UJDE1500N6HBD *	—	1 1/2	1 1/2	6	10	.090
UJDE1500N6HBE *	—	1 1/2	1 1/2	6	10	.120
UJDE1500N6HBH *	—	1 1/2	1 1/2	6	10	.190
UJDE1500N6HBF *	—	1 1/2	1 1/2	6	10	.250
UJDE1500N6HBJ *	—	1 1/2	1 1/2	6	10	.375
UJDE1500N6HBK *	—	1 1/2	1 1/2	6	10	.500
UJDE1500N6HBL *	—	1 1/2	1 1/2	6	10	.625

NOTE: For application data, see page P70.

*Made-to-order standard item. Standard pricing, manufacturing lead time, and minimum order quantity applies.

- Kennametal standard dimensions.
- Center cutting.
- Optimized geometry for titanium machining.
- Unequal flute spacing minimizes chatter for smoother machining.
- Single tool for both roughing and finishing operations requiring fewer setups.

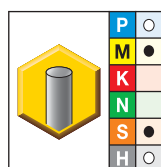
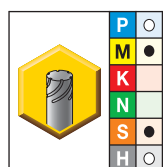


End Mill Tolerances

D1	tolerance	D	tolerance h6
All	+.000/- .002"	≤1/8"	+0/- .00024"
		>1/8-1/4"	+0/- .00031"
		>1/4-3/8"	+0/- .00035"
		>3/8-23/32"	+0/- .00043"
		>23/32-1-3/16"	0/.00051"



■ HARVI III Ball Nose • UJBE • Unequal Flute Spacing • With Eccentric Relief Grind

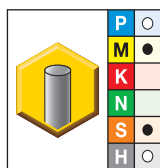
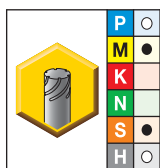


- first choice
- alternate choice

KCSM15	KCSM15	D1	D	Ap1 max	L
—	UJBE0500J6BB	1/2	1/2	1	3
—	UJBE0500J6ZB	1/2	1/2	1 1/2	3 1/2
—	UJBE0500J6CB	1/2	1/2	2	4
—	UJBE0500J6DB	1/2	1/2	2 1/2	4 1/2
—	UJBE0750J6AB	3/4	3/4	1	3 1/2
—	UJBE0750J6ZB	3/4	3/4	2	4 1/2
—	UJBE0750J6DB	3/4	3/4	3	5 1/2
—	UJBE0750J6EB	3/4	3/4	4	6 1/2
UJBE1000N6XB	—	1	1	1	4
UJBE1000N6AB	—	1	1	1 1/2	4 1/2
UJBE1000N6CB	—	1	1	2	5
UJBE1000N6ZB	—	1	1	2 1/2	5 1/2
UJBE1000N6FB	—	1	1	3	6
UJBE1000N6GB	—	1	1	3 1/2	6 1/2
UJBE1000N6DB	—	1	1	4	7
UJBE1000N6HB	—	1	1	4 1/2	7 1/2
UJBE1000N6EB	—	1	1	5	8
UJBE1250N6AB	—	1 1/4	1 1/4	2	5
UJBE1250N6XB	—	1 1/4	1 1/4	2 1/2	5 1/2
UJBE1250N6ZB	—	1 1/4	1 1/4	3	6
UJBE1250N6CB	—	1 1/4	1 1/4	3 1/2	6 1/2
UJBE1250N6FB	—	1 1/4	1 1/4	4	7
UJBE1250N6GB	—	1 1/4	1 1/4	4 1/2	7 1/2
UJBE1250N6DB	—	1 1/4	1 1/4	5	8
UJBE1250N6HB	—	1 1/4	1 1/4	5 1/2	8 1/2
UJBE1250N6JB	—	1 1/4	1 1/4	6	9
UJBE1250N6EB	—	1 1/4	1 1/4	6 1/2	9 1/2
UJBE1500N6XB *	—	1 1/2	1 1/2	2	6

(continued)

(HARVI III Ball Nose • UJBE • Unequal Flute Spacing • With Eccentric Relief Grind — continued)



● first choice
○ alternate choice

KCSM15	KCSM15	D1	D	Ap1 max	L
UJBE1500N6AB *	—	1 1/2	1 1/2	2 1/2	6 1/2
UJBE1500N6BB *	—	1 1/2	1 1/2	3	7
UJBE1500N6ZB *	—	1 1/2	1 1/2	3 1/2	7 1/2
UJBE1500N6CB *	—	1 1/2	1 1/2	4	8
UJBE1500N6FB *	—	1 1/2	1 1/2	4 1/2	8 1/2
UJBE1500N6GB *	—	1 1/2	1 1/2	5	9
UJBE1500N6DB *	—	1 1/2	1 1/2	5 1/2	9 1/2
UJBE1500N6HB *	—	1 1/2	1 1/2	6	10

NOTE: For application data, see page P71.

*Made-to-order standard item. Standard pricing, manufacturing lead time, and minimum order quantity applies.



HARVI III Aerospace Expansion

- CHALLENGE**
- Industry challenge II.
 - Traditional approach.
 - Ti6AL4V.
 - External emulsion.

- SOLUTION**
- HARVI III Ø 1.250" (31.75mm) — Safe-Lock™ shank.
 - SK50 Type B coolant shrink fit.
 - Corner Radius R = 0.090" (2.28mm).

- CUTTING DATA**
- V_c 250 SFM (76 m/min).
 - F_z .0074" (0,187mm).
 - A_p 2.000" (50.8mm).
 - A_e .100" (2,54mm).

- RESULT**
- After one hour of cut time, less than .001" (0,025mm) wear.
 - Surface finish of 23 μ in Ra (0,6 μ m Ra).

- BENEFIT**
- Increased tool life.
 - High MRR.
 - Reduced tool changes.
 - Decrease overall tooling cost.



HARVI III Aerospace Expansion

- CHALLENGE**
- Industry challenge II.
 - High-Velocity Approach.
 - Ti6AL4V.
 - External emulsion.

- SOLUTION**
- HARVI III Ø 1.250" (31.75mm) — Safe-Lock™ shank.
 - SK50 Type B coolant shrink fit.
 - Corner Radius R = 0.090" (2.28mm).

- CUTTING DATA**
- V_c 500 SFM (152 m/min).
 - F_z .0095" (0,24mm).
 - A_p 2.000" (50.8mm).
 - A_e .020" (0,508mm).

- RESULT**
- After one hour of cut time, less than .0014" (0,035mm) wear.
 - Surface finish of 27.5 μ in Ra (0,7 μ m Ra).

- BENEFIT**
- Increased tool life.
 - High MRR.
 - Reduced tool changes.
 - Decrease overall tooling cost.



HARVI III Aerospace Expansion

CHALLENGE

- Seat track.
- Ti6AL4V.
- External emulsion.
- Test vs. regular HARVI III.

SOLUTION

- HARVI III Ø .750" (19.05mm) — cylindrical shank
- HydroForce™ with reducer sleeve
- Corner Radius R = 0.120" (3.05mm)

CUTTING DATA

- V_c 40 m/min (130 SFM).
- F_z Varies.
- A_p From .050" (1,27mm) to 1.500" (38.1mm).
- A_e From .050" (1,27mm) to full slot.

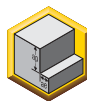
RESULT

- Tool life increased from 45min up to 5h.

BENEFIT

- Increased tool life.
- Reduced tool changes.
- Decrease overall tooling cost.

■ HARVI III™ • UJDE • Unequal Flute Spacing

Material Group													
	Side Milling (A)		KCSM15				Recommended feed per tooth (IPT = inch/th) for side milling (A).						
	A		Cutting Speed — vc SFM			D1 — Diameter							
						frac.	1/2	5/8	3/4	1	1 1/4	1 1/2	
	ap	ae	min		max	dec.	.5000	.6250	.7500	1.0000	1.2500	1.5000	
P	4	Ap max	0.4 x D	300	—	490	IPT	.0026	.0030	.0033	.0039	.0043	.0046
	5	Ap max	0.4 x D	200	—	330	IPT	.0023	.0027	.0030	.0036	.0041	.0045
M	1	Ap max	0.4 x D	300	—	380	IPT	.0029	.0034	.0038	.0046	.0051	.0056
	2	Ap max	0.4 x D	200	—	260	IPT	.0023	.0027	.0030	.0036	.0041	.0045
	3	Ap max	0.4 x D	200	—	230	IPT	.0019	.0022	.0024	.0028	.0031	.0033
S	1	Ap max	0.4 x D	160	—	300	IPT	.0029	.0034	.0038	.0046	.0051	.0056
	2	Ap max	0.4 x D	160	—	300	IPT	.0029	.0034	.0038	.0046	.0051	.0056
	3	Ap max	0.4 x D	80	—	130	IPT	.0016	.0018	.0020	.0025	.0028	.0031
	4	Ap max	0.4 x D	150	—	200	IPT	.0022	.0025	.0028	.0033	.0037	.0041
H	1	Ap max	0.4 x D	260	—	460	IPT	.0026	.0030	.0033	.0039	.0043	.0046

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly.

■ Adjustment factor table for feed and speed calculation

	Ae/D	0.50%	1.00%	1.60%	2.00%	4.00%	5.00%	8.00%	10.00%	20.00%	30.00%
Speed factor	Kv	2.9	2.85	2.8	2	1.5	1.45	1.4	1.35	1.25	1.2
Feed factor	KFz	2.8	2.6	2.5	2.4	2.3	2.2	2	1.7	1.25	1.02

To calculate application specific cutting data, please use above KV coefficient for adaptation of cutting speed and KFz for feed respectively.

Vc new = Vc * Kv

Fz new = IPT * KFz

Calculation example:

Application: D = 1 inch; S4 material group; Ae 0,02 inch

Cutting data recommendation: 150 SFM; fz = 0.0033 IPT

Adjustment coefficients: Ae = 0,02 = inch equals 2,00%; Kv = 2; KFz = 2.4

Final cutting data recommendation:

Vc new = 150 SFM * 2 = 300 SFM

Fz new = .0033 IPT * 2.4 = .0079 IPT

■ HARVI™ III • UJBE • Ball Nose • Unequal Flute Spacing

Material Group													
	Side Milling (A)		KCSM15			Recommended feed per tooth (IPT = inch/th) for side milling (A).							
	A		Cutting Speed — vc SFM			D1 — Diameter							
						frac.	1/2	5/8	3/4	1	1 1/4	1 1/2	
	ap	ae	min		max	dec.	.5000	.6250	.7500	1.0000	1.2500	1.5000	
P	4	Ap max	0.4 x D	300	–	490	IPT	.0026	.0030	.0033	.0039	.0043	.0046
	5	Ap max	0.4 x D	200	–	330	IPT	.0023	.0027	.0030	.0036	.0041	.0045
M	1	Ap max	0.4 x D	300	–	380	IPT	.0029	.0034	.0038	.0046	.0051	.0056
	2	Ap max	0.4 x D	200	–	260	IPT	.0023	.0027	.0030	.0036	.0041	.0045
	3	Ap max	0.4 x D	200	–	230	IPT	.0019	.0022	.0024	.0028	.0031	.0033
S	1	Ap max	0.4 x D	160	–	300	IPT	.0029	.0034	.0038	.0046	.0051	.0056
	2	Ap max	0.4 x D	160	–	300	IPT	.0029	.0034	.0038	.0046	.0051	.0056
	3	Ap max	0.4 x D	80	–	130	IPT	.0016	.0018	.0020	.0025	.0028	.0031
	4	Ap max	0.4 x D	150	–	200	IPT	.0022	.0025	.0028	.0033	.0037	.0041
H	1	Ap max	0.4 x D	260	–	460	IPT	.0026	.0030	.0033	.0039	.0043	.0046

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly.

■ Adjustment factor table for feed and speed calculation

	Ae/D	0.50%	1.00%	1.60%	2.00%	4.00%	5.00%	8.00%	10.00%	20.00%	30.00%
Speed factor	Kv	2.9	2.85	2.8	2	1.5	1.45	1.4	1.35	1.25	1.2
Feed factor	KFz	2.8	2.6	2.5	2.4	2.3	2.2	2	1.7	1.25	1.02

To calculate application specific cutting data, please use above KV coefficient for adaptation of cutting speed and KFz for feed respectively.

Vc new = Vc * Kv

Fz new = IPT * KFz

Calculation example:

Application: D = 1 inch; S4 material group; Ae 0,02 inch

Cutting data recommendation: 150 SFM; fz = 0.0033 IPT

Adjustment coefficients: Ae = 0,02 = inch equals 2,00%; Kv = 2; KFz = 2.4

Final cutting data recommendation:

Vc new = 150 SFM * 2 = 300 SFM

Fz new = .0033 IPT * 2.4 = .0079 IPT

HARVI™ III Taper Ball Nose

High-Performance Solid Carbide End Mills

Primary Application

HARVI III taper ball nose addresses the demand from energy and aerospace turbine customers to increase output and solve capacity issues by significantly reducing of machining time in 5-axis machining.

- Up to 50% higher Metal Removal Rates (MRR) with same tool life or up to 50% higher tool life due to 6-flute geometry with unequal flute spacing.
- Different tapered front end for highest tool stability on a variety of long-reach applications.
- Proprietary KCSM15™ grade for high tool life.

Features and Benefits

Advanced Technology

- Six flutes in ball nose and taper section for highest metal removal rates.
- Unequally spaced flutes to minimize vibrations and provide high tool life and superior surface quality.

Tailored Grades

- KCSM15 Beyond™ grade for outstanding wear protection in stainless steels and high-temperature alloys.

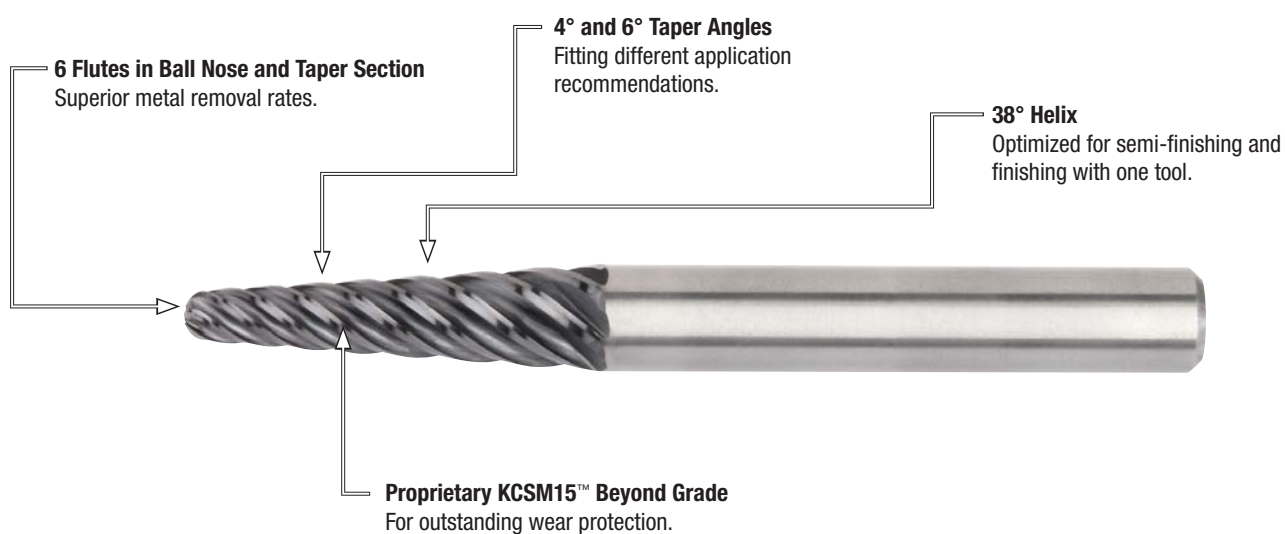
Customization

- Intermediate diameters available.
- Expanded length of tool and increased length of cut are possible.

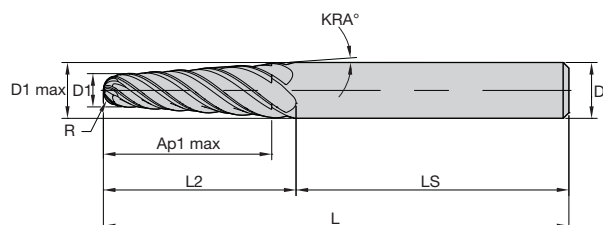
Standard Offerings

- Diameter ranges 1/8–7/16".

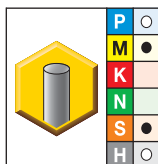
Designed for 5-axis machining in steel,
stainless steel, nickel-based alloys,
and titanium.



- Center cutting.
- 6 flutes for highest material removal rates.
- Unequal flute spacing minimizes chatter for smoother machining.
- 2 taper angle versions for optimized stability in long-reach operations.
- Single tool for both semi-finishing and finishing operations requiring fewer setups.
- Optimized geometry for stainless, nickel-based-alloys, and titanium machining.



■ UJBE • 6-Flute Taper Ball Nose • Unequal Flute Spacing



- first choice
- alternate choice

KCSM15	D1	D	Ap1 max	L	L2	LS	R	KRA
UJBE0125J6CP	1/8	5/16	1.188	3	1.401	1.599	.063	4
UJBE0125J6BP	1/8	3/8	1.000	3 1/2	1.249	2.252	.063	6
UJBE0188J6BP	3/16	3/8	1.188	3 1/2	1.431	2.069	.094	4
UJBE0188J6CP	3/16	1/2	1.250	4	1.576	2.425	.094	6
UJBE0250J6CP	1/4	1/2	1.563	4	1.908	2.092	.125	4
UJBE0250J6BP	1/4	5/8	1.500	5	1.902	3.098	.125	6
UJBE0312J6BP	5/16	5/8	1.250	5	1.635	3.365	.156	6
UJBE0312J6CP	5/16	5/8	2.000	5	2.385	2.615	.156	4
UJBE0375J6BP	3/8	5/8	1.000	5	1.367	3.633	.188	6
UJBE0375J6CP	3/8	5/8	1.563	5	1.969	3.032	.188	4
UJBE0438J6BP	7/16	5/8	.750	5	1.099	3.901	.219	6
UJBE0438J6CP	7/16	5/8	1.188	5	1.552	3.448	.219	4

NOTE: For application data, see page P80.

The Economical Milling Cutter Line

G0mill™

The G0mill line is specifically engineered to work on short length-of-cut applications in multiple workpiece materials, like soft and hard steels up to 48 HRC, stainless steels, high-temperature alloys, and cast iron. With the very short overall length and soft cutting geometries, the line is made to conform to the growing market of mill-turn machines.

What does this mean for you?

- Unequal flute spacing.
- AlTiN coating.
- Short overall tool length.
- Positive rake angle.
- Better surface finish and tool life.
- Universal usage on multiple workpiece materials.
- Higher cutting conditions, higher productivity, lower price due to less carbide.
- Lower power consumption.



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Ball Nose Surface Finish

Unit:

Ball Nose Radius: in

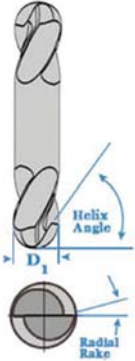
Helix Angle: °

Radial Rake: °

Choose Additional Parameter(s)

R_a Surface finish: 20.31 μ in.

⚠ These calculations are based upon theoretical values and are only intended for planning purposes. Actual results will vary. No responsibility from Kennametal is assumed.

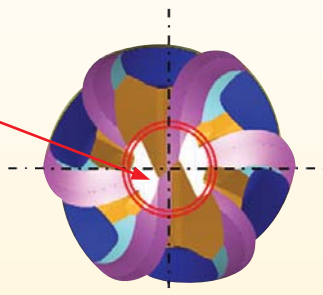


Use 5–10° for radial rake angle.

***Make use of calculators such as:
[kennametal.com/en/resources/calculators/
 end-milling-calculators/ball-nose-surface-finish.html](http://kennametal.com/en/resources/calculators/end-milling-calculators/ball-nose-surface-finish.html)***

Not all 6 cutting edges are reaching to the center of the HARVI III taper ball nose end mill.
Therefore, certain machining angles will result in different numbers of effective cutting edges.

Between 15–17° transition from
4–6 effective cutting edges due
to grinding profile.



0°

Avoid (center cutting speed = 0)



15°

<15° z = 2 effective cutting edges



17°

>17° z = 6 effective cutting edges



HARVI™ III Taper Ball Nose UJBE

CHALLENGE

- Finishing contour milling with lightly interrupted cut.
- Blade machining for energy customer.
- X22 CrMoV12.
- External emulsion.

SOLUTION

- HARVI III taper ball nose UJBE, 6° taper angle, and KCSM15™ with 6 effective cutting edges, Ø 0.315".

CUTTING DATA

- vc 328 SFM
- fz .0020 IPT
- ap .0787"
- ae .0236"

RESULT

- 73% increased productivity.

BENEFIT

- Reduced cost per component as the tool life increased.
- New 6-flute geometry has given better surface finish compared to 4 flutes.
- Regrindable tool.

HARVI III Taper Ball Nose UJBE

CHALLENGE

- Finishing intersection and hub on blade airfoil.
- Blade machining for energy customer.
- X22CrMoV12-1.
- External emulsion.

SOLUTION

- HARVI III taper ball nose UJBE, 6° taper angle, and KCSM15 with 6 effective cutting edges, Ø 0.394".

CUTTING DATA

- vc 853 SFM
- fz .0024 IPT
- ap .0236"
- ae .0118"

RESULT

- 50% increase in feed.
- 28% increase in tool life.
- Improved surface finish and minimum wear on edges.

BENEFIT

- Reduced tooling cost.
- Reduction in cost per component.
- Good surface finish.
- Regrindable tool.

(continued)

(continued)



HARVI™ III Taper Ball Nose UJBE

- Finishing intersection and hub on blade airfoil.
- X22CrMoV12-1.
- External emulsion.

CHALLENGE

- HARVI III taper ball nose UJBE, 6° taper angle, and KCSM15™.
- Ø 0.157" with 8 effective cutting edges.

SOLUTION

- vc 459 SFM
- fz .0006 IPT
- ap .0197"
- ae .0138"

CUTTING DATA

- Substantial increase in Metal Removal Rates (MRR).

RESULT

- Improved surface quality.
- Regrindable tool to reduce tool cost.

BENEFIT

■ HARVI III • UJBE • Ball Nose • Unequal Flute Spacing • Roughing

Material Group																		
Side Milling (A)		KCSM15					Recommended feed per tooth (IPT = inch/th) for side milling (A).											
A		Cutting Speed — vc SFM			frac.	D1 — Diameter												
						1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1				
ap	ae	min		max	dec.	.1250	.1875	.2500	.3125	.3750	.5000	.6250	.7500	1.0000				
P	0	Ap max	0.4 x D	490	–	660	IPT	.0009	.0014	.0018	.0023	.0027	.0034	.0039	.0044	.0049		
	1	Ap max	0.4 x D	490	–	660	IPT	.0009	.0014	.0018	.0023	.0027	.0034	.0039	.0044	.0049		
	2	Ap max	0.4 x D	460	–	620	IPT	.0009	.0014	.0018	.0023	.0027	.0034	.0039	.0044	.0049		
	3	Ap max	0.4 x D	390	–	520	IPT	.0008	.0011	.0015	.0019	.0023	.0029	.0034	.0039	.0045		
	4	Ap max	0.4 x D	300	–	490	IPT	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039		
	5	Ap max	0.4 x D	200	–	330	IPT	.0006	.0009	.0012	.0015	.0018	.0023	.0027	.0031	.0036		
M	6	Ap max	0.4 x D	160	–	250	IPT	.0005	.0008	.0010	.0013	.0015	.0019	.0022	.0025	.0028		
	1	Ap max	0.4 x D	300	–	380	IPT	.0008	.0011	.0015	.0019	.0023	.0029	.0034	.0039	.0045		
	2	Ap max	0.4 x D	200	–	260	IPT	.0006	.0009	.0012	.0015	.0018	.0023	.0027	.0031	.0036		
S	3	Ap max	0.4 x D	200	–	230	IPT	.0005	.0008	.0010	.0013	.0015	.0019	.0022	.0025	.0028		
	1	Ap max	0.4 x D	160	–	300	IPT	.0008	.0011	.0015	.0019	.0023	.0029	.0034	.0039	.0045		
	2	Ap max	0.4 x D	80	–	130	IPT	.0004	.0006	.0008	.0010	.0012	.0015	.0018	.0021	.0024		
	3	Ap max	0.4 x D	80	–	130	IPT	.0004	.0006	.0008	.0010	.0012	.0015	.0018	.0021	.0024		
H	4	Ap max	0.4 x D	160	–	200	IPT	.0006	.0008	.0011	.0014	.0017	.0021	.0025	.0028	.0033		
	1	Ap max	0.4 x D	260	–	460	IPT	.0007	.0010	.0014	.0017	.0020	.0026	.0030	.0034	.0039		

NOTE: Those guidelines may require variations to achieve optimum results.

Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.

■ HARVI™ III • UJBE • Ball Nose • Unequal Flute Spacing • Finishing

Material Group																		
				Side Milling (A)		KCSM15			Recommended feed per tooth (IPT = inch/th) for side milling (A).									
A		Cutting Speed — vc SFM			frac.	D1 — Diameter												
ap	ae	min		max	dec.	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1				
P	0	Ap max	.06 x D	940	—	1250	IPT	.0011	.0016	.0022	.0027	.0033	.0041	.0047	.0053	.0059		
	1	Ap max	.06 x D	940	—	1250	IPT	.0011	.0016	.0022	.0027	.0033	.0041	.0047	.0053	.0059		
	2	Ap max	.06 x D	870	—	1180	IPT	.0011	.0016	.0022	.0027	.0033	.0041	.0047	.0053	.0059		
	3	Ap max	.06 x D	750	—	1000	IPT	.0009	.0014	.0018	.0023	.0027	.0035	.0041	.0046	.0054		
	4	Ap max	.06 x D	560	—	940	IPT	.0008	.0012	.0016	.0020	.0025	.0031	.0036	.0040	.0046		
	5	Ap max	.06 x D	370	—	620	IPT	.0007	.0011	.0015	.0018	.0022	.0028	.0033	.0037	.0043		
M	6	Ap max	.06 x D	310	—	470	IPT	.0006	.0009	.0012	.0015	.0018	.0023	.0027	.0030	.0034		
	1	Ap max	.06 x D	560	—	720	IPT	.0009	.0014	.0018	.0023	.0027	.0035	.0041	.0046	.0054		
	2	Ap max	.06 x D	370	—	500	IPT	.0007	.0011	.0015	.0018	.0022	.0028	.0033	.0037	.0043		
S	3	Ap max	.06 x D	370	—	440	IPT	.0006	.0009	.0012	.0015	.0018	.0023	.0027	.0030	.0034		
	1	Ap max	.06 x D	310	—	560	IPT	.0009	.0014	.0018	.0023	.0027	.0035	.0041	.0046	.0054		
	2	Ap max	.06 x D	160	—	250	IPT	.0005	.0007	.0010	.0012	.0015	.0018	.0022	.0025	.0029		
	3	Ap max	.06 x D	160	—	250	IPT	.0005	.0007	.0010	.0012	.0015	.0018	.0022	.0025	.0029		
H	4	Ap max	.06 x D	310	—	370	IPT	.0007	.0010	.0013	.0017	.0020	.0026	.0030	.0034	.0040		
	1	Ap max	.06 x D	500	—	870	IPT	.0008	.0012	.0016	.0020	.0025	.0031	.0036	.0040	.0046		

NOTE: Those guidelines may require variations to achieve optimum results.

Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.

Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on >1/2" diameter.