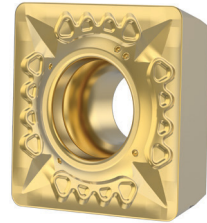


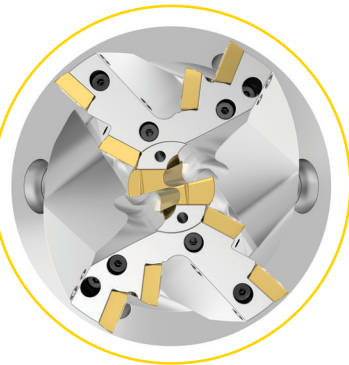
**AEROSPACE
SOLUTIONS
2022 | INCH**

FBX Drill

Modular Drill for Flat Bottom Holes



Indexable inserts with 4 cutting edges provide low cost per cutting edge.



4 large chip flutes, and 4 effective cutting edges on the outer diameter of the tool guarantee fast stock removal on large metal plates or forgings.



A center insert with 2 effective cutting edges and chip splitters enables perfect chip formation, allowing maximum feed rates.

AEROSPACE SOLUTIONS

Solutions for Structural Parts2–30

 FBX — Modular Drill for Flat Bottom Holes 4–9

 Harvi Ultra 8X — Helical Shoulder Mill 10–23

 BTF Adapters — Bolt Taper Flange Mount Adapters 24–30

Solutions for Assemblies.....32–52

 KenTIP FS — Modular Drilling for CFRP and Stacked Materials 34–43

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General Information.....54–58

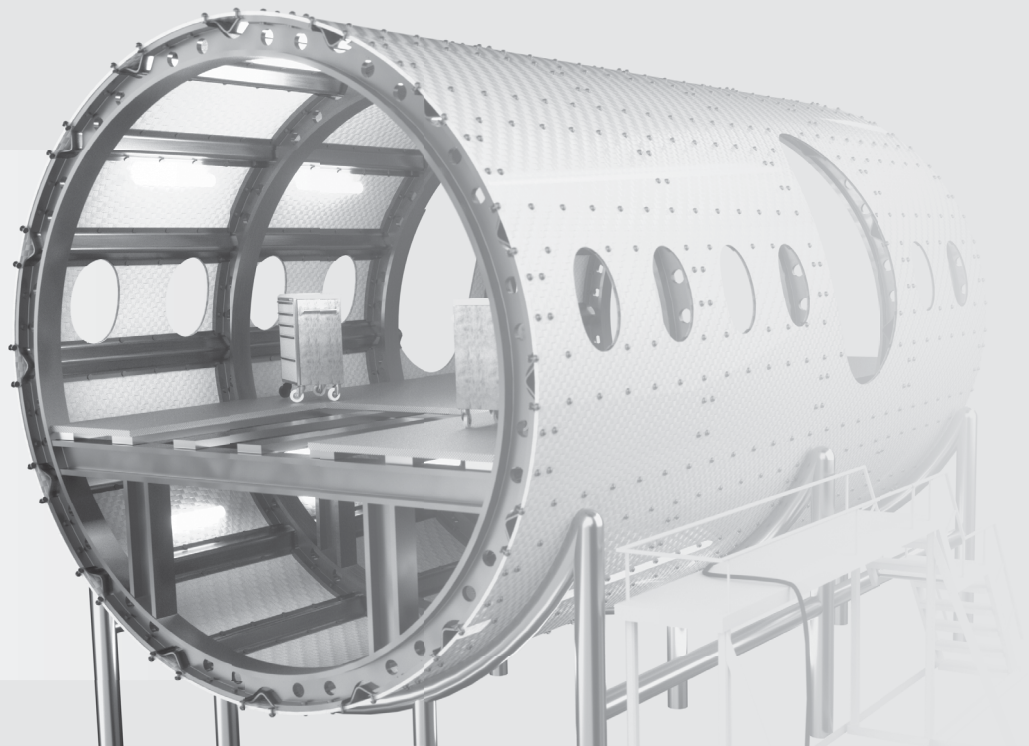
 Grades and Grade Descriptions..... 54–55

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 Material Cross Reference..... 57–58

Structural Parts Machining

Titanium Roughing with Maximum Metal Removal Rate



kennametal.com/Aerospace

Titanium is typically produced in the shape of plates and bars, also forgings and castings. The Buy-to-Fly (BTF) ratio is typically between 10 and 16, meaning a raw material of 10kg titanium ends up being a finished part with the weight of 1kg.

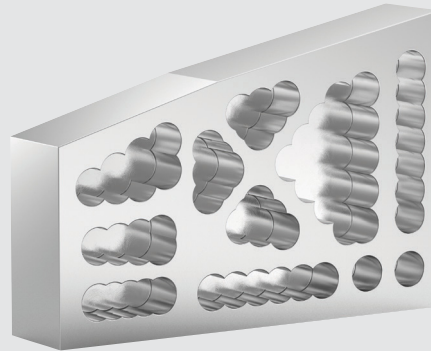
The BTF ratio requires the efficient removal of the excess material, which is achieved through titanium roughing applications.

Kennametal has developed a process and tooling solutions to achieve maximum metal removal rates, and maximum tool life at the same time.

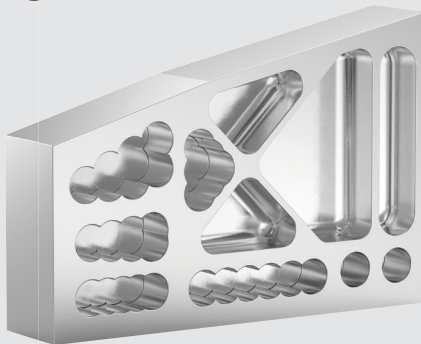
1 Raw Titanium Plate



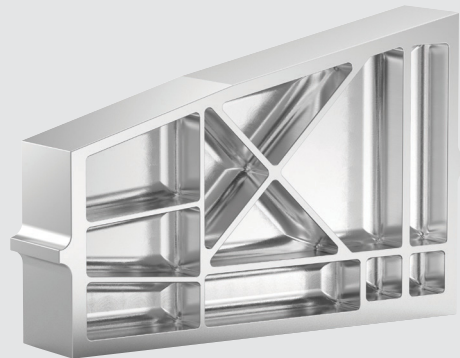
2 Opening Cavities



3 Roughing



4 Finishing

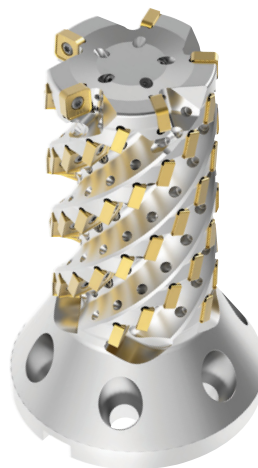


Opening Cavities



FBX - Flat Bottom Drill with BTF

Roughing



HARVI™ Ultra 8X with BTF

Finishing



Solid Carbide End Mills

FBX Drill

Indexable Drill for Flat Bottom Holes

Materials



Applications



Drilling



Drilling:
Chain Drilling



Drilling:
Flat Bottom

kennametal.com/FBX-Drill



The FBX Drill is ideal for pre-machining of high-temperature alloy airframe structural parts.

4 large chip flutes and 4 effective cutting edges on the outer diameter of the tool guarantee fast stock removal on large metal plates or forgings.

A center insert with 2 effective cutting edges and chip splitters enables perfect chip formation, allowing maximum feed rates.

The flat bottom drill point design eliminates radial forces. Ideal for applications on machines with lower horsepower.

Flat bottom drill point design. Plunging holes with highest productivity through 4 effective cutting edges on the outer diameter.

Indexable inserts with 4 cutting edges provide low cost per cutting edge.

Adjustable coolant nozzles for efficient heat management.

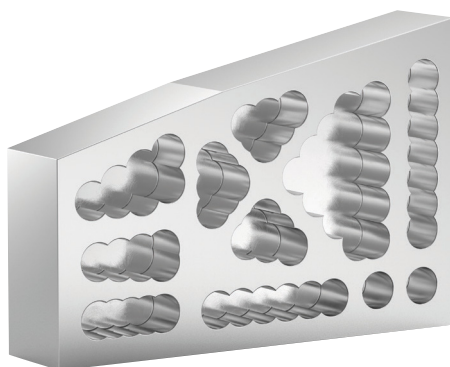
95mm and 150mm length FBX Drill Bodies.

The Bolt Taper Flange (BTF) connection provides maximum tool stiffness. Nearly as rigid as a monoblock tool design but offers multiple machine side connections.

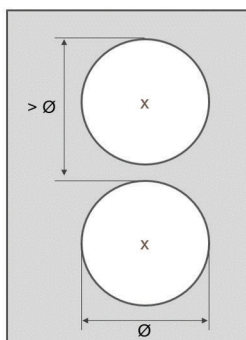
Center insert with 2 effective cutting edges, with chip splitters for maximum feed.

4 chip flutes for hassle-free chip evacuation and maximum stability for chain hole drilling applications.

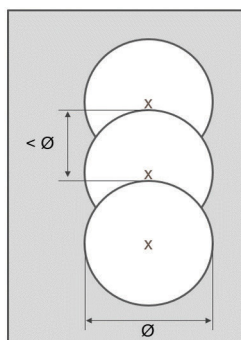
Process Step: Opening Cavities



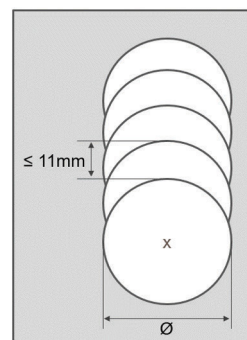
Drilling into Solid



Chain Hole Drilling

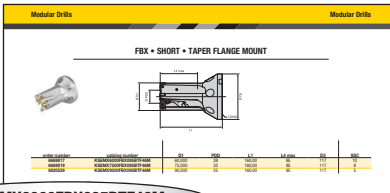


Plunging



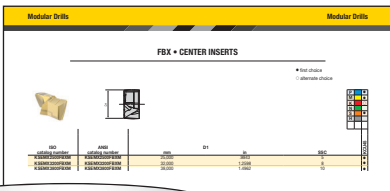
FBX • CATALOG NUMBERING SYSTEM

Each character in our catalog number signifies a specific trait of that product. Use the following key columns and corresponding images to easily identify which attributes apply.



KSEMX6000FBX095BTF46M

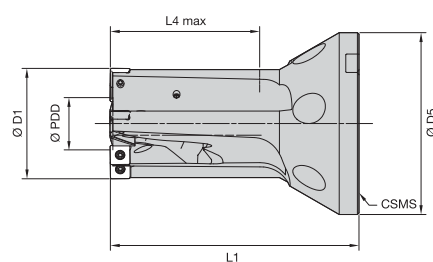
KSEMX	6000	FBX	095	BTF	46M
Tool Series	Diameter	Tool Name	Depth of Cut (DOC)	Connection Style Machine Side (CSMS)	Connection Size
KSEM = Modular drill KSEMP = Modular drill with exchangeable drill heads KSEMX = Modular drill with multi-flute design	6000 = 60mm	FBX = Flat Bottom Drill	095 = 95mm	BTF = Bolt Taper Flange	46M = 46mm



KSEMX3800FBXM

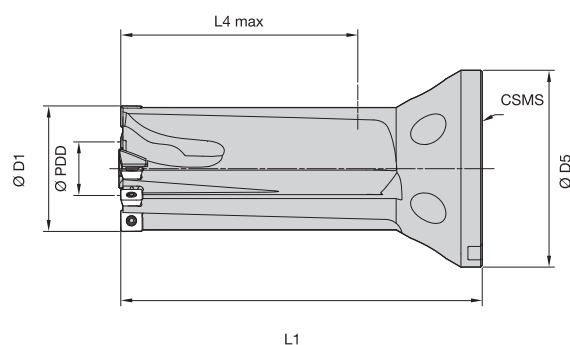
KSEMX	3800	FBX	M
Tool Series	Diameter	Point Geometry	Identification Values
KSEM = Modular Drill KSEMP = Modular Drill with exchangeable drill heads KSEMX = Modular Drill with multi-flute design	38000 = 38mm	FBX = Flat Bottom Drill	M = Tool built to metric values

FBX • SHORT • TAPER FLANGE MOUNT



order number	catalog number	D1	PDD	L1	L4 max	D5	SSC
6669817	KSEMX6000FBX095BTF46M	60,000	38	160,00	95	117	10
6669819	KSEMX7500FBX095BTF46M	75,000	32	160,00	95	117	8
6820529	KSEMX9000FBX095BTF46M	90,000	25	160,00	95	117	5

FBX • LONG • TAPER FLANGE MOUNT

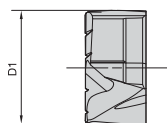


order number	catalog number	D1	PDD	L1	L4 max	D5	SSC
6669818	KSEMX6000FBX150BTF46M	60,000	38	215,00	150	117	10
6669820	KSEMX7500FBX150BTF46M	75,000	32	215,00	150	117	8
6670013	KSEMX9000FBX150BTF46M	90,000	25	215,00	150	117	5

54-55	56	6	60

FBX • CENTER INSERTS

- first choice
○ alternate choice

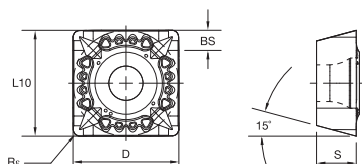


P	●
M	●
K	○
N	●
S	●
H	●

ISO catalog number	ANSI catalog number	D1		SSC	KCU45
		mm	in		
KSEMX2500FBXM	KSEMX2500FBXM	25,000	.9843	5	
KSEMX3200FBXM	KSEMX3200FBXM	32,000	1.2598	8	
KSEMX3800FBXM	KSEMX3800FBXM	38,000	1.4962	10	●

FBX • OUTBOARD INSERTS • IC12 • SDET-ERGB/SDET-SRGB

- first choice
○ alternate choice

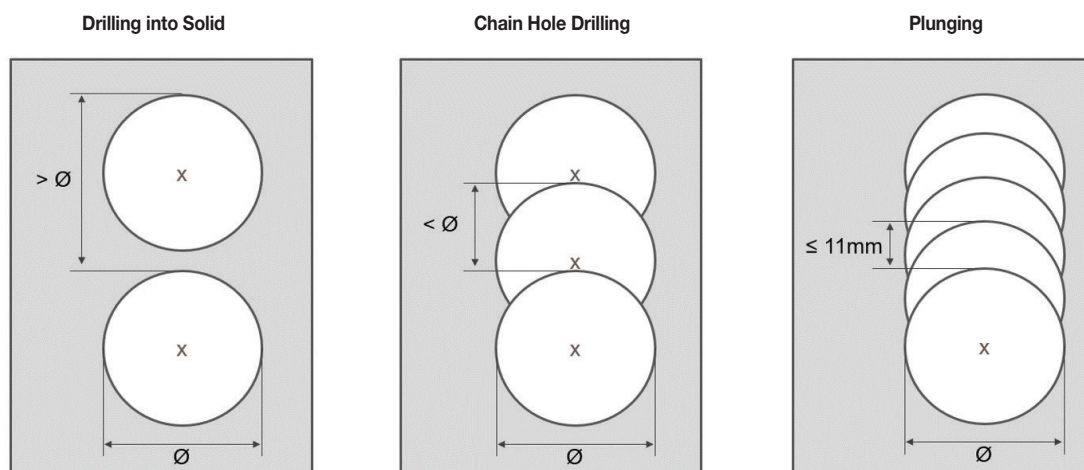


P	●
M	●
K	○
N	●
S	●
H	●

ISO catalog number	ANSI catalog number	D		S		L10		BS		Re		CE	KCSM40
		mm	in	mm	in	mm	in	mm	in	mm	in		
SDET1204PDERGB	SDET43PDER8GB	12,70	.500	4,76	.188	12,70	.500	2,54	.100	0,8	.031	4	
SDET1204PDSRGB	SDET43PDSR8GB	12,70	.500	4,76	.188	12,70	.500	3,36	.132	0,8	.312	4	

54-55	56	6	60
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FBX • APPLICATIONS



FBX • INSERT SELECTION GUIDE

Material Group	Drilling into Solid (zeff = 2)		Chain Hole Drilling (zeff = 2)		Plunging (zeff = 4)	
	Geometry	Grade	Geometry	Grade	Geometry	Grade
P5-P6	SDET1204PDERGB	KCSM40	SDET1204PDERGB	KCSM40	SDET1204PDERGB	KCSM40
M1-M3	SDET1204PDERGB	KCSM40	SDET1204PDERGB	KCSM40	SDET1204PDERGB	KCSM40
S4	SDET1204PDSRGB	KCSM40	SDET1204PDSRGB	KCSM40	SDET1204PDSRGB	KCSM40

FBX • RECOMMENDED STARTING FEEDS [IPR]

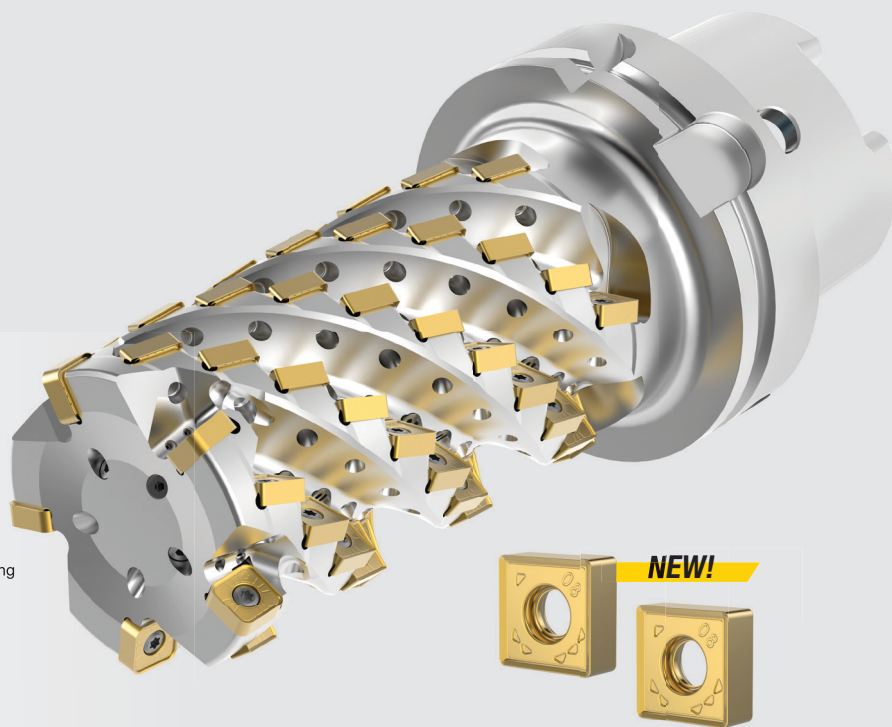
Material Group	Drilling into Solid (zeff = 2)			Chain Hole Drilling (zeff = 2)			Plunging (zeff = 4)		
	min	Starting Value	max	min	Starting Value	max	min	Starting Value	max
P5-P6	0.006	0.008	0.009	0.003	0.006	0.008	0.008	0.016	0.019
M1-M3	0.006	0.008	0.009	0.003	0.006	0.008	0.008	0.016	0.019
S4	0.006	0.008	0.009	0.003	0.006	0.008	0.011	0.019	0.024

FBX • RECOMMENDED STARTING SPEEDS [SFM]

Material Group	Drilling into Solid (zeff = 2)			Chain Hole Drilling (zeff = 2)			Plunging (zeff = 4)		
	min	Starting Value	max	min	Starting Value	max	min	Starting Value	max
P5-P6	262	295	328	262	295	328	295	344	394
M1-M3	262	295	328	262	295	328	295	344	394
S4	98	131	164	98	131	164	131	164	197

HARVI™ Ultra 8X

Helical Shoulder Mill



Materials



Applications



Shoulder Milling



Shoulder/Slot Milling



Chamfer Milling



Pocketing



Profile Milling

kennametal.com/Harvi-Ultra-8X

HARVI Ultra 8X helical milling cutters are designed to deliver the highest metal removal rates (MRR), especially in high-temperature alloy airframe structural parts machining.

Up to 8 cutting edges per insert providing lowest possible cost-per-edge.

Lead inserts in various corner radii available, matching the needs of the aerospace industry.

The Bolt Taper Flange (BTF) connection provides maximum tool stiffness and flexibility.

NEW!

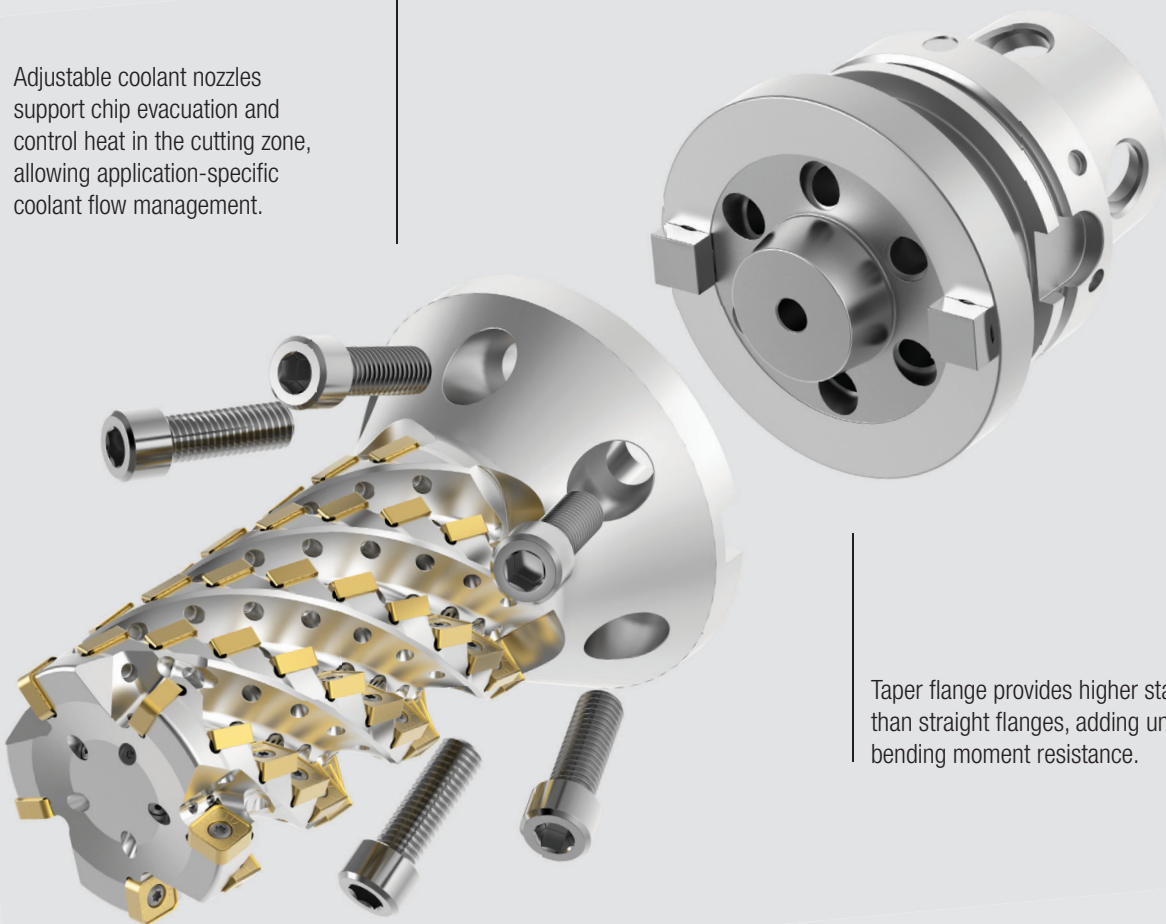
Monoblock tool designs for maximum stiffness and rigidity.

NEW!

LEH geometry for light-to-medium machining.

Adjustable coolant nozzles support chip evacuation and control heat in the cutting zone, allowing application-specific coolant flow management.

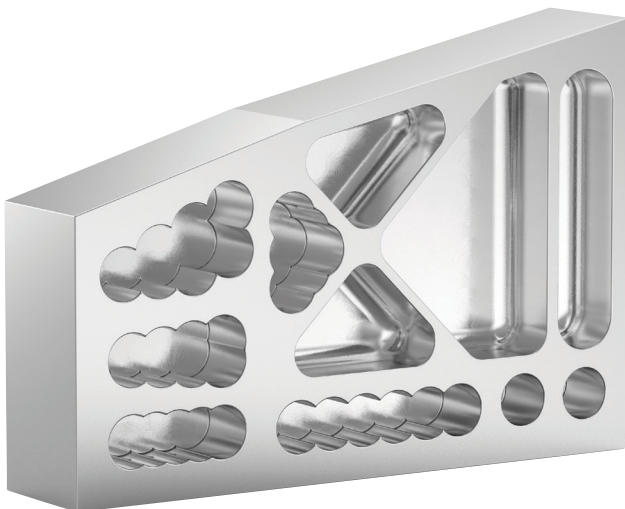
Large helix ensures hassle-free chip evacuation even at highest metal removal rates (MRR).



Taper flange provides higher stability than straight flanges, adding unequaled bending moment resistance.

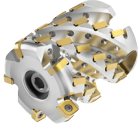
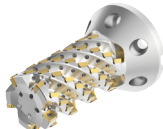
HARVI™ Ultra 8X cutters with different lead row pocket designs available. Especially for applications that require larger corner radii.

Process Step: Roughing



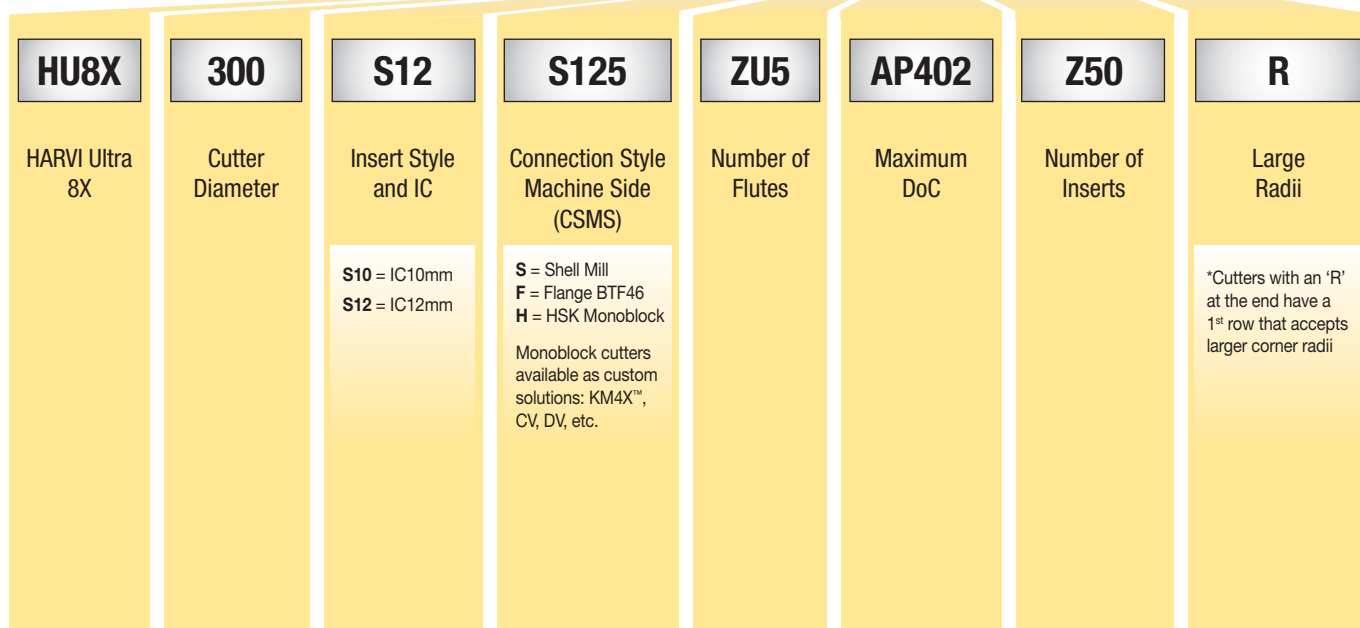
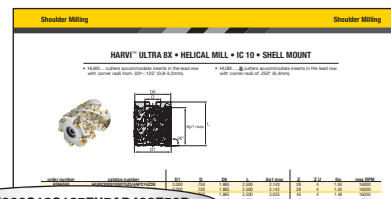
Aerospace typical insert radii from 8mm to 64mm available.

HARVI™ ULTRA 8X • TOOL SELECTION GUIDE

	HARVI Ultra 8X					
	SHELL MOUNT		TAPER FLANGE MOUNT		HSK MONOBLOCK TOOL	
						
Page	16, 20		17, 20		21	
Main operation						
Cutter diameter [D1]	2–3"		2–3"		3"	
Maximum cutting depth [Ap1 max]	2.0–4.2"		4.2–9.3"		5.26"	
Insert size IC	10 & 12mm		10 & 12mm		12mm	
Number of inserts per cutter [Z]	15–60		56–115		65	
Number of flutes per cutter [ZU]	3–6		4–6		5	
Internal coolant	✓		✓		✓	
Additional operations						
Connection Style Machine Side (CSMS)						
Fits regular shell mill adapters	✓		—		—	
Connection stiffness	■ ■		■ ■ ■		■ ■ ■ ■	
Pilot diameter flange mount extension	3/4–1-1/2"		—		—	
Flange mount size	BTF46		BTF46		—	
						
Cutting edges	8	4	8	4	8	4
Corner radius for 10mm inserts on 1st row	.031"	.062–.250"	.031"	.062–.250"	.031"	.062–.250"
Corner radius for 10mm inserts after 1st row	.031"		.031"		.031"	
Corner radius for 12mm inserts on 1st row	.031–.094"	.125–.250"	.031–.094"	.125–.250"	.031–.094"	.125–.250"
Corner radius for 12mm inserts after 1st row	.031"		.031"		.031"	
Workpiece materials	P	M	S	P	M	S

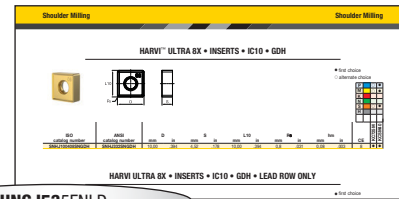
HARVI™ ULTRA 8X • CATALOG NUMBERING SYSTEM • CUTTERS

Each character in our catalog number signifies a specific trait of that product. Use the following key columns and corresponding images to easily identify which attributes apply.



HARVI™ ULTRA 8X • CATALOG NUMBERING SYSTEM • INSERTS

Each character in our catalog number signifies a specific trait of that product. Use the following key columns and corresponding images to easily identify which attributes apply.



HNGJ535ENLD

H

Insert Shape

A	Parallelogram 85°	
C	Rhomboid 80°	
E	75°	
H	Hexagon 120°	
L	Rectangular 90°	
O	Octagon 135°	
R	Round	
S	Square 90°	
T	Triangular 60°	
X	Kennametal Standard Form	

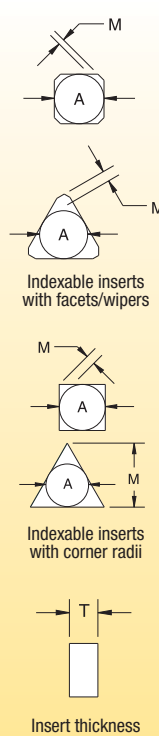
N

Insert Clearance
Angle

A	3°	
B	5°	
C	7°	
D	15°	
E	20°	
F	25°	
G	30°	
N	0°	
P	11°	

G

Tolerance
Class



J

Geometry
and
Clamping
Type

5

Size

A	symbol
1.000	8
.750	6
.625	5
.500	4
.375	3
.250	2
	inscribed circle "A"
For shapes A, L, and X, see position #1; use length of leading cutting edge in increments of 1/4".	

3

Thickness

T	in 1/16"
.0938	1.5
.125	2
.1562	2.5
.1875	3
.2188	3.5
.2500	4
.3125	5

tolerance class	tolerance on "A"	tolerance on "M"	tolerance on "T"	tolerance class	tolerance on "A"	tolerance on "M"	tolerance on "T"
A	.001	.0002	.001	J	.002-.005*	.0002	.001
B	.001	.0002	.005	K	.002-.005*	.0005	.001
C	.001	.0005	.001	L	.002-.005*	.001	.001
D	.001	.0005	.005	M	.002-.005*	.003-.008*	.005
E	.001	.001	.001	N	.002-.005*	.003-.008*	.001
F	.0005	.0002	.001	P**	.0015	.0015	.0015
G	.001	.001	.005	U	.003-.010*	.005-.015*	.005
H	.0005	.0005	.001				

*See table below for tolerances according to insert size and class.

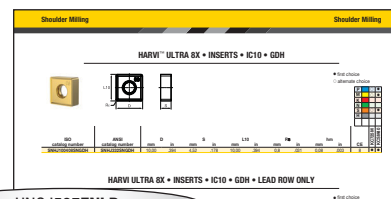
**Kennametal standard only.

A	tolerances on "A"		tolerances on "M"	
	classes J, K, L, M, N	class U	classes M & N	class U
.1875-.3937	.002	.003	.003	.005
.4375-.5625	.003	.005	.005	.008
.5906-.8125	.004	.007	.006	.011
.8661-1.188	.005	.010	.007	.015
1.250-1.378	.006	.010	.008	.015

symbol	hole	shape of hole	chipbreaker	shape of insert's section
N	without		without	
R			single sided	
F			double sided	
A	cylindrical hole		without	
M			single sided	
G			double sided	
W	partly cylindrical hole, 40-60° countersink		without	
T			single sided	
Q			double sided	
U	partly cylindrical hole, 70-90° countersink		without	
B			single sided	
H			double sided	
C	partly cylindrical hole, 70-90° double countersink		without	
J			single sided	
X			double sided	
			special design	

HARVI™ ULTRA 8X • CATALOG NUMBERING SYSTEM • INSERTS

(continued)



HNGJ535ENLD

5

Corner
Configuration

E

Cutting Edge
Form

F

Sharp

E

Honed

T

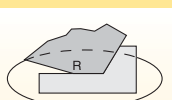
T-land

S

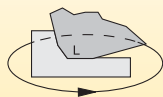
Honed T-land

N

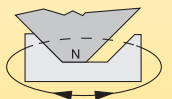
Insert
Hand



direction of
cutter rotation



direction of
cutter rotation



direction of
cutter rotation

-

Facet
Width

L

Edge
Prep
Size

D

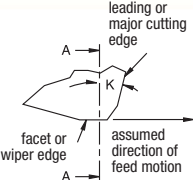
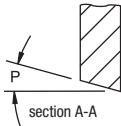
Rake
Face
Angle

Added
Info

J = Polished
rake face
P = Partial
T-land
W = Wiper/radiused
facet
H = Helical

.0312	2
.0469	3
.0625	4
.0938	6

Facet width is number of 1/64" increments (1/32" for old styles).

					
0	.004	If letter is replaced by number(s), refer to table for radius "r".		wiper edge clearance P	
0.5	.008			A	3°
1	1/64			B	5°
2	1/32			C	7°
3	3/64	lead angle K		D	15°
4	1/16	D	handed 30°	E	20°
5	5/64	K	neutral 30°	F	25°
6	3/32	E	handed 15°	G	30°
7	7/64	L	neutral 15°	N	0°
8	1/8	P	0°	P	11°

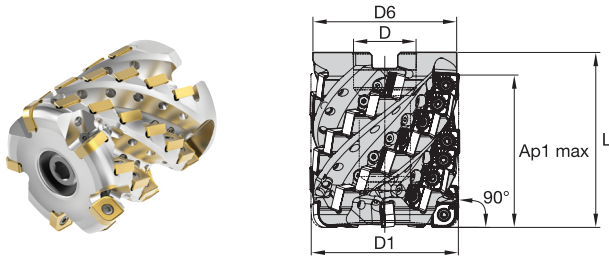
L = Light — sharp or lightly
honed and/or T-land
G = General — medium hone
and/or T-land
H = Heavy — large hone
and/or T-land

N	A	B	C	P	D	E	F	G
0° or less	3°	5°	7°	11°	15°	20°	25°	30°

Nominal or average angle of rake on insert face at leading cutting edge before edge prep and before installation.

HARVI™ ULTRA 8X • HELICAL MILL • IC 10 • SHELL MOUNT

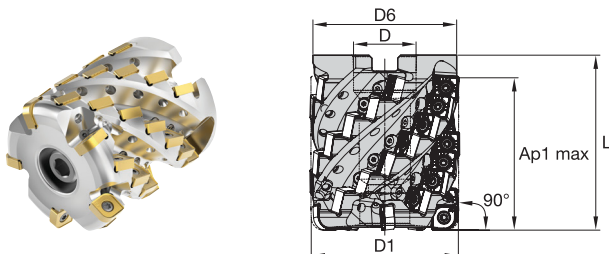
- HU8X... cutters accommodate inserts in the lead row with corner radii from .031"-.125" (0,8–3,2mm).
- HU8X.....R cutters accommodate inserts in the lead row with corner radii of .250" (6,4mm).



order number	catalog number	D1	D	D6	L	Ap1 max	Z	Z U	lbs	max RPM
6366550	HU8X200S10S075ZU4AP214Z28	2.000	.750	1.885	2.500	2.143	28	4	1.04	16000
6366561	HU8X200S10S075ZU4AP214Z28R	2.000	.750	1.885	2.500	2.142	28	4	1.04	16000
6366565	HU8X200S10S075ZU4AP303Z40	2.000	.750	1.885	3.500	3.035	40	4	1.49	16000
6366566	HU8X200S10S075ZU4AP303Z40R	2.000	.750	1.885	3.500	3.033	40	4	1.49	16000
6456649	HU8X200S10S100ZU4AP214Z28	2.000	1.000	1.885	2.750	2.143	28	4	1.20	16000
6456650	HU8X200S10S100ZU4AP214Z28R	2.000	1.000	1.885	2.750	2.143	28	4	1.20	16000
6719442	HU8X200S10S100ZU4AP214Z28R48	2.000	1.000	1.884	2.500	2.142	28	4	1.01	16000
6719441	HU8X200S10S100ZU4AP303Z40R	2.000	1.000	1.885	3.500	3.033	40	4	1.46	16000
6719443	HU8X200S10S100ZU4AP303Z40R48	2.000	1.000	1.885	3.500	3.034	40	4	1.26	16000
6521667	HU8X250S10S100ZU5AP308Z50	2.500	1.000	2.188	3.750	3.084	50	5	2.78	14240
6456642	HU8X300S10S125ZU6AP308Z60	3.000	1.250	2.875	4.000	3.085	60	6	4.78	13000
6456641	HU8X300S10S125ZU6AP308Z60R	3.000	1.250	2.875	4.000	3.085	60	6	4.79	13000

HARVI ULTRA 8X • HELICAL MILL • IC 10 • LEAD ROW ONLY • SHELL MOUNT

- HU8X.....R48 cutters accommodate inserts in the lead row with corner radii of .189" (4,8mm).

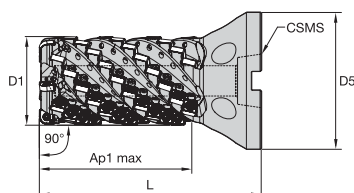
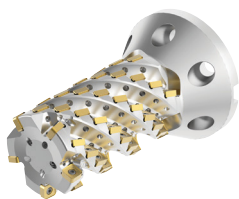


order number	catalog number	D1	D	D6	L	Ap1 max	Z	Z U	lbs	max RPM
6523595	HU8X200S10S075ZU4AP214Z28R48	2.000	.750	1.884	2.500	2.142	28	4	1.04	16000
6523596	HU8X200S10S075ZU4AP303Z40R48	2.000	.750	1.884	3.500	3.034	40	4	1.49	16000
6523598	HU8X300S10S125ZU6AP300Z60R48	3.000	1.250	2.875	4.000	3.085	60	6	4.80	13000
6523599	HU8X300S10S125ZU6AP400Z84R48	3.000	1.250	2.889	5.000	4.237	84	6	4.79	13000

54–55	56	13, 14–15	60

HARVI™ ULTRA 8X • HELICAL MILL • IC 10 • TAPER FLANGE MOUNT

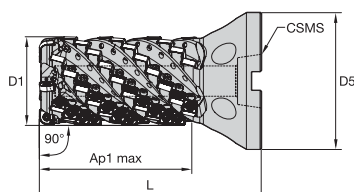
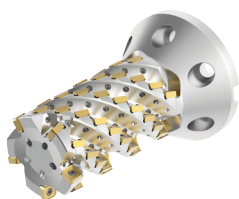
- HU8X... cutters accommodate inserts in the lead row with corner radii from .031–.125" (0,8–3,2mm).
- HU8X.....R cutters accommodate inserts in the lead row with corner radii of .250" (6,4mm).



order number	catalog number	D1	D5	CSMS	L	Ap1 max	Z	Z U	lbs	max RPM
6366567	HU8X200S10F462ZU4AP422Z56	2.000	4.625	BTf46	7.500	4.224	56	4	8.40	16000
6366568	HU8X200S10F462ZU4AP422Z56R	2.000	4.625	BTf46	7.500	4.222	56	4	8.39	16000
6158972	HU8X300S10F462ZU6AP520Z102	3.000	4.625	BTf46	7.757	5.208	102	6	11.45	13000
6456648	HU8X300S10F462ZU6AP520Z102R	3.000	4.625	BTf46	7.757	5.208	102	6	11.44	13000

HARVI ULTRA 8X • HELICAL MILL • IC 10 • LEAD ROW ONLY • TAPER FLANGE MOUNT

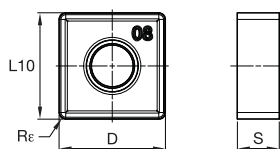
- HU8X.....R48 cutters accommodate inserts in the lead row with corner radii of .189" (4,8mm).



order number	catalog number	D1	D5	CSMS	L	Ap1 max	Z	Z U	lbs	max RPM
6523597	HU8X200S10F462ZU4AP422Z56R48	2.000	4.625	BTf46	7.500	4.223	56	4	8.39	16000
6523600	HU8X300S10F462ZU6AP520Z102R48	3.000	4.625	BTf46	7.757	5.208	102	6	11.44	13000

			
54–55	56	13, 14–15	60

HARVI™ ULTRA 8X • INSERTS • IC10 • GDH



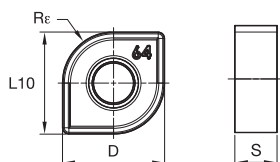
● first choice

○ alternate choice

P	Blue	○	●
M	Yellow	○	●
K	Red	○	●
N	Green	○	●
S	Orange	○	●
H	Grey	○	●

ISO catalog number	ANSI catalog number	D		S		L10		Rε		hm		CE	KC725M	KCSM40
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in			
SNHJ100408SNGDH	SNHJ332SNGDH	10,00	.394	4,52	.178	10,00	.394	0,8	.031	0,08	.003	8	●	●

HARVI ULTRA 8X • INSERTS • IC10 • GDH • LEAD ROW ONLY



● first choice

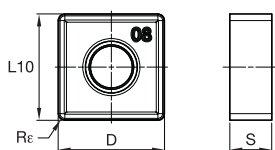
○ alternate choice

P	Blue	○	●
M	Yellow	○	●
K	Red	○	●
N	Green	○	●
S	Orange	○	●
H	Grey	○	●

ISO catalog number	ANSI catalog number	D		S		L10		Rε		hm		CE	KC725M	KCSM40
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in			
SNHJ100416SNGDH	SNHJ334SNGDH	10,00	.394	4,52	.178	10,00	.394	1,6	.062	0,08	.003	4	-	●
SNHJ100424SNGDH	SNHJ336SNGDH	10,00	.394	4,52	.178	10,00	.394	2,4	.094	0,08	.003	4	-	●
SNHJ100432SNGDH	SNHJ338SNGDH	10,00	.394	4,52	.178	10,00	.394	3,2	.125	0,08	.003	4	-	●
SNHJ100448SNGDH	SNHJ3312SNGDH	10,00	.394	4,52	.178	10,00	.394	4,8	.188	0,08	.003	4	-	●
SNHJ100464SNGDH	SNHJ3316SNGDH	10,00	.394	4,52	.178	10,00	.394	6,4	.250	0,08	.003	4	●	●

54-55	56	13, 14-15	60

HARVI™ ULTRA 8X • INSERTS • IC10 • LEH



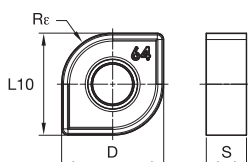
● first choice

○ alternate choice

P	Blue	○	●
M	Yellow	○	●
K	Red	○	●
N	Green	○	●
S	Orange	○	●
H	Grey	○	●

ISO catalog number	ANSI catalog number	D		S		L10		Rε		hm		CE	KC725M	KCSM40
		mm	in	mm	in	mm	in	mm	in	mm	in			
SNHJ100408ENLEH	SNHJ332ENLEH	10,00	.394	4,52	.178	10,00	.394	0,8	.031	0,04	.002	8	-	●

HARVI ULTRA 8X • INSERTS • IC10 • LEH • LEAD ROW ONLY



● first choice

○ alternate choice

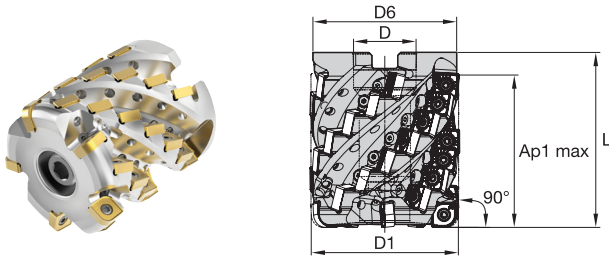
P	Blue	○	●
M	Yellow	○	●
K	Red	○	●
N	Green	○	●
S	Orange	○	●
H	Grey	○	●

ISO catalog number	ANSI catalog number	D		S		L10		Rε		hm		CE	KC725M	KCSM40
		mm	in	mm	in	mm	in	mm	in	mm	in			
SNHJ100464ENLEH	SNHJ3316ENLEH	10,00	.394	4,52	.178	10,00	.394	6,4	.250	0,04	.002	4	-	●

54-55	56	13, 14-15	60

HARVI™ ULTRA 8X • HELICAL MILL • IC 12 • SHELL MOUNT

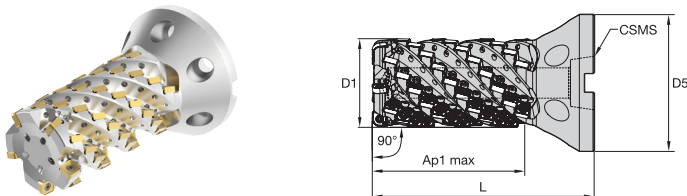
- HU8X... cutters accommodate inserts in the lead row with corner radii from .031–.125" (0,8–3,2mm).
- HU8X.....R cutters accommodate inserts in the lead row with corner radii from .189–.250" (4,8–6,4mm).



order number	catalog number	D1	D	D6	L	Ap1 max	Z	Z U	lbs	max RPM
6518761	HU8X200S12S075ZU3AP200Z15	2.000	.750	1.750	3.000	2.003	15	3	1.29	16290
6521701	HU8X250S12S100ZU4AP240Z24	2.500	1.000	2.441	3.500	2.402	24	4	2.73	14570
6521702	HU8X250S12S100ZU4AP400Z40	2.500	1.000	2.441	5.000	4.001	40	4	3.60	14570
6366487	HU8X300S12S125ZU5AP305Z40	3.000	1.250	2.876	3.500	3.053	40	5	3.58	13300
6366488	HU8X300S12S125ZU5AP305Z40R	3.000	1.250	2.875	3.500	3.052	40	5	3.58	13300
6366489	HU8X300S12S125ZU5AP402Z50	3.000	1.250	2.859	4.500	4.024	50	5	4.65	13300
6366490	HU8X300S12S125ZU5AP402Z50R	3.000	1.250	2.875	4.500	4.024	50	5	4.66	13300

HARVI ULTRA 8X • HELICAL MILL • IC 12 • TAPER FLANGE MOUNT

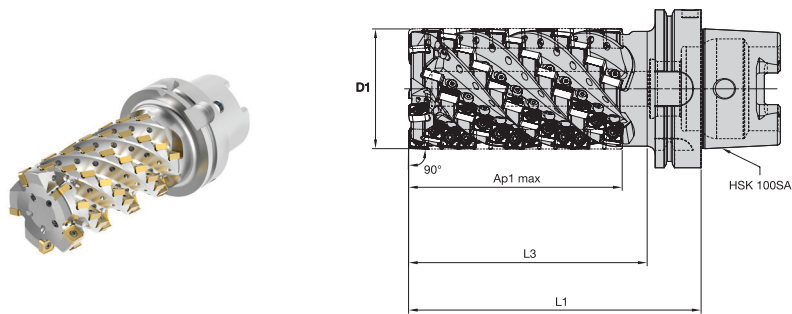
- HU8X... cutters accommodate inserts in the lead row with corner radii from .031–.125" (0,8–3,2mm).
- HU8X.....R cutters accommodate inserts in the lead row with corner radii from .189–.250" (4,8–6,4mm).



order number	catalog number	D1	D5	CSMS	L	Ap1 max	Z	Z U	lbs	max RPM
6366541	HU8X300S12F462ZU5AP526Z65	3.000	4.625	BTF46	7.500	5.263	65	5	10.50	13300
6366543	HU8X300S12F462ZU5AP526Z65R	3.000	4.625	BTF46	7.500	5.294	65	5	10.51	13300
6366544	HU8X300S12F462ZU5AP728Z90	3.000	4.625	BTF46	9.500	7.278	90	5	11.44	13300
6366545	HU8X300S12F462ZU5AP728Z90R	3.000	4.625	BTF46	9.500	7.278	90	5	11.44	13300
6366547	HU8X300S12F462ZU5AP929Z115	3.000	4.625	BTF46	11.500	9.293	115	5	11.44	13300
6366548	HU8X300S12F462ZU5AP929Z115R	3.000	4.625	BTF46	11.500	9.293	115	5	11.44	13300

54–55	56	13, 14–15	60

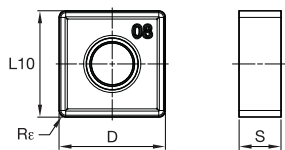
HARVI™ ULTRA 8X • HELICAL MILL • MONO BLOCK • IC 12 • HSK



order number	catalog number	D1	CSMS	L	Ap1 max	Z	Z U	lbs	max RPM
6565664	HU8X300S12H100AZU5AP526Z65	3.000	HSK100A	9.215	5.262	65	5	10.90	13000

			
54-55	56	13, 14-15	60

HARVI™ ULTRA 8X • INSERTS • IC12 • GDH



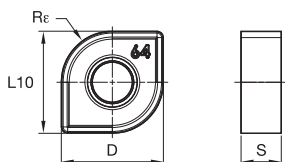
● first choice

○ alternate choice

P	Blue	○	●
M	Yellow	○	●
K	Red	○	●
N	Green	○	●
S	Orange	○	●
H	Grey	○	●

ISO catalog number	ANSI catalog number	D		S		L10		Re		hm		CE	KC725M	KCSM40
		mm	in	mm	in	mm	in	mm	in	mm	in			
SNHJ120608SNGDH	SNHJ442SNGDH	12,70	.500	4,52	.178	12,70	.500	0,8	.031	0,08	.003	8	●	●

HARVI ULTRA 8X • INSERTS • IC12 • GDH • LEAD ROW ONLY



● first choice

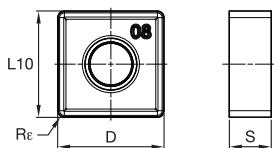
○ alternate choice

P	Blue	○	●
M	Yellow	○	●
K	Red	○	●
N	Green	○	●
S	Orange	○	●
H	Grey	○	●

ISO catalog number	ANSI catalog number	D		S		L10		Re		hm		CE	KC725M	KCSM40
		mm	in	mm	in	mm	in	mm	in	mm	in			
SNHJ120616SNGDH	SNHJ444SNGDH	12,70	.500	4,52	.178	12,70	.500	1,6	.062	0,08	.003	8	-	●
SNHJ120624SNGDH	SNHJ446SNGDH	12,70	.500	4,52	.178	12,70	.500	2,4	.094	0,08	.003	8	-	●
SNHJ120632SNGDH	SNHJ448SNGDH	12,70	.500	4,52	.178	12,70	.500	3,2	.125	0,08	.003	4	-	●
*SNHJ120640SNGDH	*SNHJ120640SNGDH	12,70	.500	4,52	.178	12,70	.500	4,0	.158	0,08	.003	4	-	●
SNHJ120648SNGDH	SNHJ4412SNGDH	12,70	.500	4,52	.178	12,70	.500	4,8	.188	0,08	.003	4	-	●
SNHJ120660SNGDH	SNHJ120660SNGDH	12,70	.500	4,52	.178	12,70	.500	6,0	.236	0,08	.003	4	-	●
SNHJ120664SNGDH	SNHJ4416SNGDH	12,70	.500	4,52	.178	12,70	.500	6,4	.250	0,08	.003	4	●	●

*SNHJ120640SNGDH requires modification of the cutter body.

HARVI ULTRA 8X • INSERTS • IC12 • LEH



● first choice

○ alternate choice

P	Blue	○	●
M	Yellow	○	●
K	Red	○	●
N	Green	○	●
S	Orange	○	●
H	Grey	○	●

ISO catalog number	ANSI catalog number	D		S		L10		Re		hm		CE	KC725M	KCSM40
		mm	in	mm	in	mm	in	mm	in	mm	in			
SNHJ120608ENLEH	SNHJ442ENLEH	12,70	.500	4,56	.180	12,70	.500	0,8	.031	0,04	.002	8	-	●

54-55	56	13, 14-15	60
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HARVI™ ULTRA 8X • INSERT SELECTION GUIDE

Material Group	Light Machining (Light geometry)		General Purpose		Heavy Machining (Strong geometry)	
	wear resistance				toughness	
	Geometry	Grade	Geometry	Grade	Geometry	Grade
P1-P2	.E..LEH	KCSM40	.E..LEH	KCSM40	.S..GDH	KCSM40
P3-P4	.E..LEH	KCSM40	.E..LEH	KCSM40	.S..GDH	KCSM40
P5-P6	.E..LEH	KCSM40	.E..LEH	KCSM40	.S..GDH	KCSM40
M1-M2	.E..LEH	KCSM40	.E..LEH	KCSM40	.S..GDH	KCSM40
M3	.E..LEH	KCSM40	.S..GDH	KCSM40	.S..GDH	KCSM40
K1-K2	—	—	—	—	—	—
K3	—	—	—	—	—	—
N1-N2	—	—	—	—	—	—
N3	—	—	—	—	—	—
S1-S2	.E..LEH	KCSM40	.E..LEH	KCSM40	.S..GDH	KCSM40
S3	.E..LEH	KCSM40	.S..GDH	KCSM40	.S..GDH	KCSM40
S4	.E..LEH	KCSM40	.S..GDH	KCSM40	.S..GDH	KCSM40
H1	—	—	—	—	—	—

HARVI ULTRA 8X • RECOMMENDED STARTING FEEDS [IPT]

											Light Machining	General Purpose	Heavy Machining		
Material Group	Recommended Starting Feed per Tooth (Fz) in Relation to % of Radial Engagement (ae)														
	5%			10%			20%			30%			40–100%		
P5	—	—	—	.007	.012	.018	.006	.010	.016	.005	.008	.013	.003	.005	.007
P6	—	—	—	.007	.010	.015	.006	.009	.013	.005	.007	.011	.003	.004	.006
M1	—	—	—	.007	.011	.017	.006	.010	.015	.005	.008	.012	.003	.004	.007
M2	—	—	—	.007	.011	.017	.006	.010	.015	.005	.008	.012	.003	.004	.007
M3	—	—	—	.007	.010	.015	.006	.009	.013	.005	.007	.011	.003	.004	.006
S1	—	—	—	.007	.008	.012	.006	.007	.011	.005	.006	.009	.003	.003	.005
S2	—	—	—	.007	.008	.012	.006	.007	.011	.005	.006	.009	.003	.003	.005
S3	—	—	—	.007	.009	.014	.006	.008	.012	.005	.007	.010	.003	.004	.006
S4	—	—	—	.007	.011	.017	.006	.010	.015	.005	.008	.012	.003	.004	.007

NOTE: Use "General Purpose" values as starting feed rate (ae = radial depth of cut, Dc = cutting diameter).

HARVI ULTRA 8X • RECOMMENDED STARTING SPEEDS [SFM]

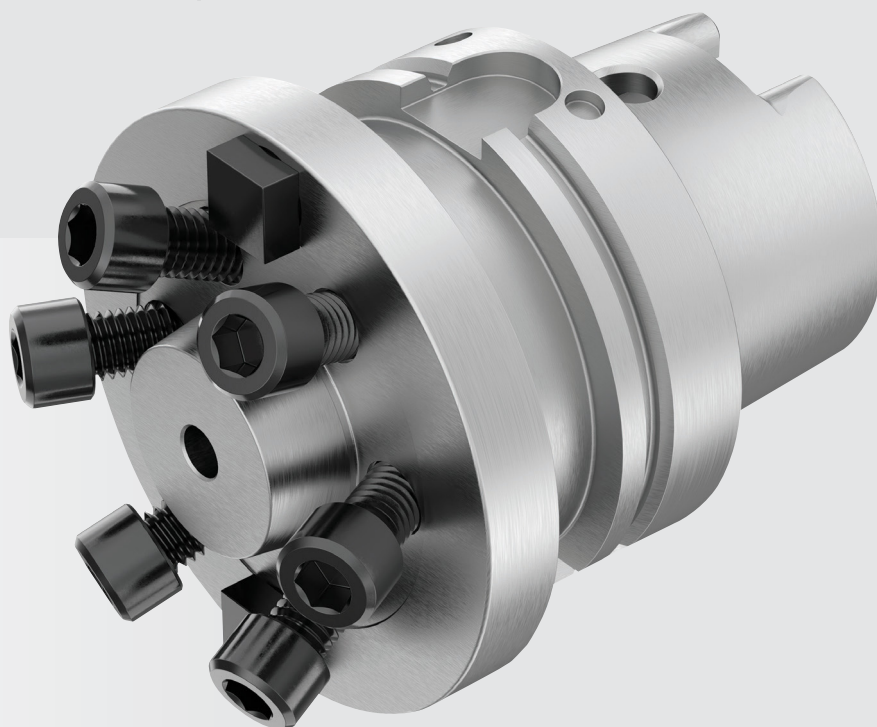
Material Group		KC725M			KCSM40		
P	1	—	—	—	—	—	—
	2	—	—	—	—	—	—
	3	—	—	—	—	—	—
	4	—	—	—	—	—	—
	5	390	355	315	820	450	410
	6	340	265	210	740	415	375
M	1	450	390	355	885	415	375
	2	410	340	290	885	415	375
	3	300	265	210	655	290	260
K	1	—	—	—	—	—	—
	2	—	—	—	—	—	—
	3	—	—	—	—	—	—
N	1	—	—	—	—	—	—
	2	—	—	—	—	—	—
	3	—	—	—	—	—	—
S	1	90	80	65	195	90	75
	2	90	80	65	165	90	70
	3	120	90	65	180	105	80
	4	145	120	80	260	150	115
H	1	—	—	—	—	—	—
	2	—	—	—	—	—	—
	3	—	—	—	—	—	—

NOTE: First choice starting speeds are in **bold** type.

Do not exceed max RPM. Reduce speed if necessary.

BTF Adapters

Bolt Taper Flange Mount Adapters



kennametal.com/BTF-Adapters

The BTF Adapters are designed to provide maximum tool stiffness, increasing tool life and productivity in very demanding applications like high-temperature alloy airframe structural parts machining.

Higher stability than any straight flange connection, adding unequalled bending moment resistance.

The bolt taper flange provides maximum flexibility with connections to standard HSK, BT, DV, CV, and KM4X™ adapters. KM4X provides highest bending moment resistance in the industry, making it the best choice for demanding applications.

Large volume coolant supply through the center to support chip evacuation and to control heat in the cutting zone.

Connectivity flexibility



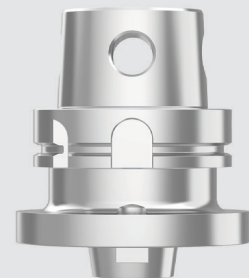
DV



BT



HSK



KM4X

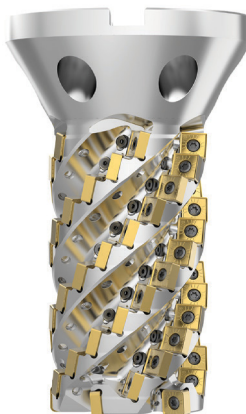
- Specially designed drive keys for maximum torque transmission.
- 6 bolts for secure mounting.
- Taper pilot ensures maximum tool stabilization.



Shell mill adapter with taper flange mount



FBX Drill



HARVI™ Ultra 8X with taper flange mount



HARVI Ultra 8X with shell mill mount

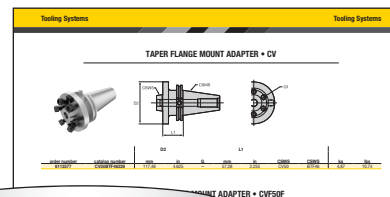


Other milling cutters with shell mill mount



TAPER FLANGE MOUNTING ADAPTERS • CATALOG NUMBERING SYSTEM

Each character in our catalog number signifies a specific trait of that product. Use the following key columns and corresponding images to easily identify which attributes apply.



HSK50BTF46070M

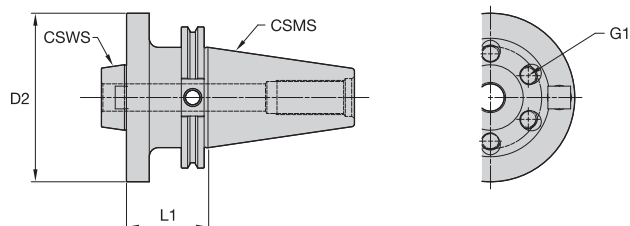
HSK	50	F	BTF	46	070	M
Connection Style Machine Side (CSMS)	Connection Size	Special Feature	Connection Style Workpiece Side (CSWS)	Connection Size	Tool Length	Identification Values
CV = CAT Shank Style ANSI B5.50 HSK = HSK Shank Style DIN 69893-1 KM4X™ = KM4X Shank Style BT = BT Shank Style JIS B6339 DV = DV Shank DIN 69871	40 = 40 50 = 50 100 = 100 125 = 125	F = Face Contact — Face Contact (not interchangeable with CVKV tooling) B = DIN form B coolant feature, tool shipped to AD specifications (design allows conversion to form B style)	BTF = Bolt Taper Flange	46 = 46mm	Gage Line of Toolholder	M = Tool built to metric values and has metric retention thread Blank = Inch

Each character in our catalog number signifies a specific trait of that product. Use the following key columns and corresponding images to easily identify which attributes apply.



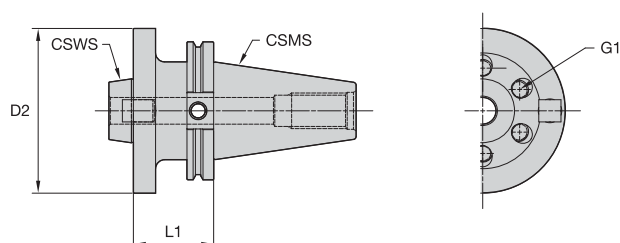
BTF	46	SMC	075	504	M
Toolholder Style	Mounting Size	Shell Mill Style	Pilot Size (D1)	Tool Length	Identification Values
BTF = Bolt Taper Flange	46 = 46mm	SMC = Shell Mill Adapter with Coolant SM2C = Shell Mill Adapter with Coolant and reduced D2 dimension SM3C = Shell Mill Adapter with Coolant and reduced D2 dimension-bolt on keys	22 = 22mm 27 = 27mm 32 = 32mm 075 = .075" 100 = 1.00" 125 = 1.25" 150 = 1.50"	Gage Line of Adapter	M = Tool built to metric values Blank = Inch

TAPER FLANGE MOUNT ADAPTER • CV



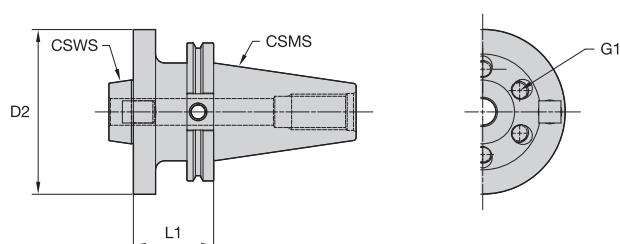
order number	catalog number	D2		G	L1		CSMS	CSWS	kg	lbs
		mm	in		mm	in				
6113577	CV50BTF46226	117,48	4.625	—	57,28	2.255	CV50	BTF46	4,87	10.74

TAPER FLANGE MOUNT ADAPTER • CVF50F



order number	catalog number	D2		mm	in	mm	in	CSMS	CSWS	kg	lbs
		mm	in								
6113578	CV50FBTF46226	117,48	4.625	57,28	2.255	CV50F	BTF46			4,95	10.90

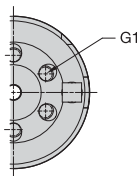
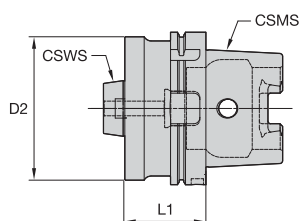
TAPER FLANGE MOUNT ADAPTER • CV60F



order number	catalog number	D2		mm	in	mm	in	CSMS	CSWS	kg	lbs
		mm	in								
5996208	CV60FBTF46245	117,48	4.625	62,25	2.451	CV60F	BTF46			13,57	29.92

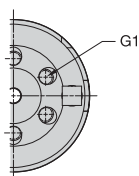
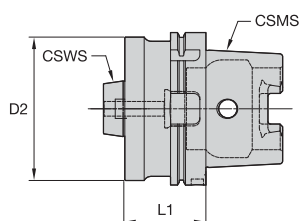
56	26-27	60

TAPER FLANGE MOUNT ADAPTER • HSK100A



order number	catalog number	D2		G1	L1		CSMS	CSWS	kg	lbs
		mm	in		mm	in				
6113477	HSK100ABTF46265	117,48	4.625	1/2-20 UNF	67,24	2.647	HSK100A	BTF46	4,81	10.61

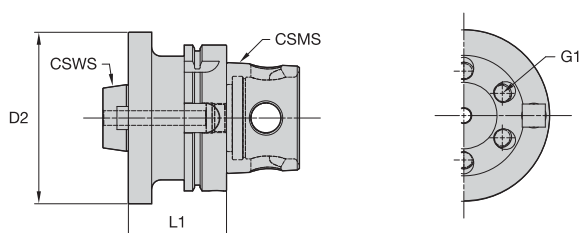
TAPER FLANGE MOUNT ADAPTER • HSK125A



order number	catalog number	D2		G1	L1		CSMS	CSWS	kg	lbs
		mm	in		mm	in				
6113478	HSK125ABTF46262	117,48	4.625	1/2-20 UNF	66,43	2.615	HSK125A	BTF46	6,65	14.67

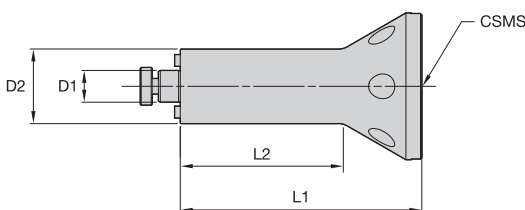
56	26-27	60

TAPER FLANGE MOUNT ADAPTER • KM4X™



order number	catalog number	D2		G1	L1		CSMS	CSWS	kg	lbs
		mm	in		mm	in				
6285330	KM4X100BTF46265	117,48	4.625	1/2-20 UNF	67,24	2.647	KM4X100	BTF46	5,02	11.06

TAPER FLANGE MOUNT ADAPTER • SHELL MILL ADAPTER

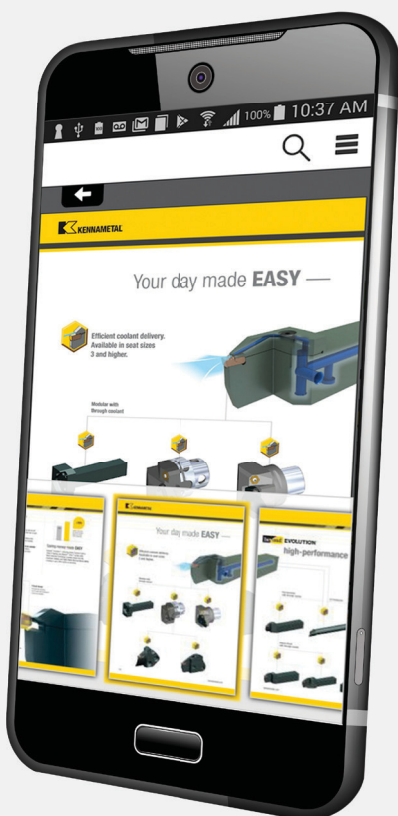


order number	catalog number	D1	D2	L1	L2	CSMS	lbs
6113053	BTF46SM2C075504	.750	1.850	5.037	2.000	BTF46	8.41
6113059	BTF46SM2C075604	.750	1.850	6.037	3.000	BTF46	9.14
6113144	BTF46SM2C075804	.750	1.850	8.037	5.000	BTF46	10.61
6113146	BTF46SM2C075904	.750	1.850	9.037	6.000	BTF46	11.35
6289284	BTF46SMC0751147	.750	1.930	11.468	8.500	BTF46	13.72
6113150	BTF46SMC100460	1.000	2.350	4.604	2.000	BTF46	9.03
6153013	BTF46SM3C100497	1.000	1.930	4.968	2.000	BTF46	8.53
6113221	BTF46SMC100560	1.000	2.350	5.604	3.000	BTF46	10.21
6153015	BTF46SM3C100597	1.000	1.930	5.968	3.000	BTF46	9.31
6113223	BTF46SMC100660	1.000	2.350	6.604	4.000	BTF46	11.39
6153019	BTF46SM3C100697	1.000	1.930	6.968	4.000	BTF46	10.10
6113226	BTF46SMC100760	1.000	2.350	7.604	5.000	BTF46	12.57
6153020	BTF46SM3C100797	1.000	1.930	7.968	5.000	BTF46	10.88
6113227	BTF46SMC100860	1.000	2.350	8.604	6.000	BTF46	13.75
6153072	BTF46SM3C100897	1.000	1.930	8.968	6.000	BTF46	11.66
6101579	BTF46SM3C1001047	1.000	1.930	10.468	7.500	BTF46	12.82
6113228	BTF46SMC125426	1.250	2.750	4.258	2.000	BTF46	9.65
6113300	BTF46SMC125526	1.250	2.750	5.258	3.000	BTF46	11.26
6113332	BTF46SMC125626	1.250	2.750	6.258	4.000	BTF46	12.87
6113333	BTF46SMC125726	1.250	2.750	7.258	5.000	BTF46	14.47
6113334	BTF46SMC125826	1.250	2.750	8.258	6.000	BTF46	16.08
6113335	BTF46SMC150334	1.500	3.813	3.337	2.000	BTF46	10.94
6113385	BTF46SMC150434	1.500	3.813	4.337	3.000	BTF46	14.06
6113386	BTF46SMC150534	1.500	3.813	5.337	4.000	BTF46	17.19
6113387	BTF46SMC150634	1.500	3.813	6.337	5.000	BTF46	20.31
6113388	BTF46SMC150734	1.500	3.813	7.337	6.000	BTF46	23.44

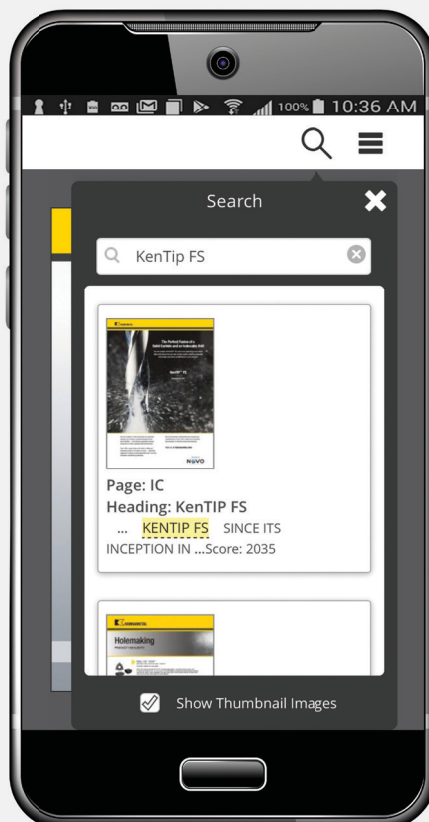
56	26-27	60

Catalog App

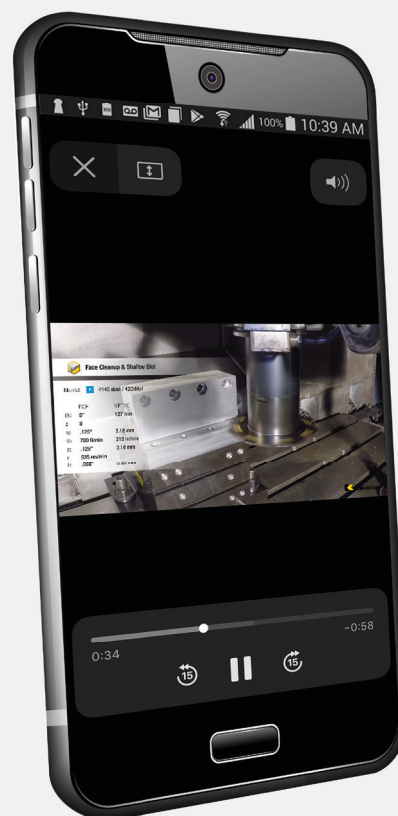
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Assemblies

Machining of CFRP and CFRP stacks



kennametal.com/Aerospace

Composite materials are utilized in multiple applications, including flight surfaces and some internal cabin parts.

These materials are unique to each design in their fiber layering techniques, resins, and curing processes, which creates great challenges to consistency in manufacturing and assembly.

Kennametal offers tooling solutions that can be applied on automated drilling units, robot end effectors, as well as in gantry machines to machine CFRP, CFRP stacks with metal exit, non-ferrous materials, and titanium.

Tooling for
automated drilling units.

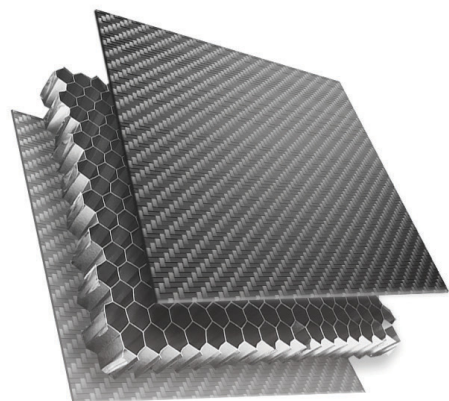
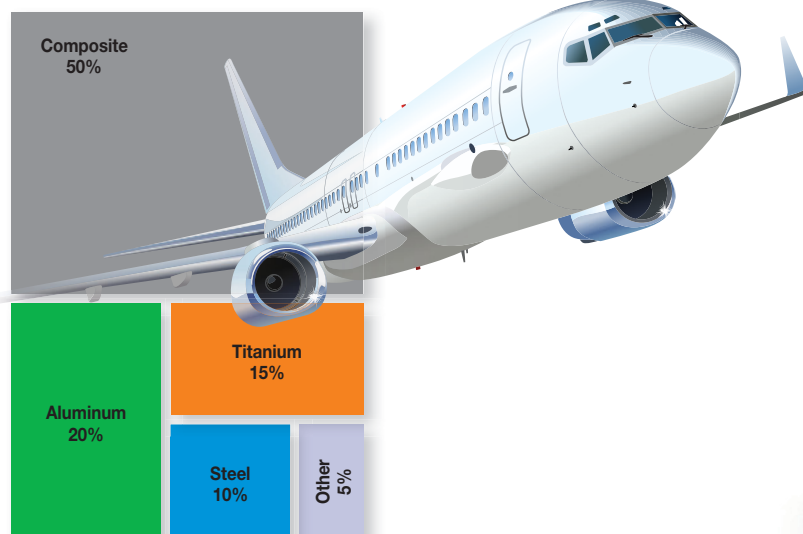


Tooling for gantry machines, robot end
effectors, and common machining centers.



KenTIP™ FS customized drill bodies for automated drilling units (ADU). Contact our regional service centers to request a quote.

Modern Airplane Material Mix



KenTIP™ FS

Modular Drilling for CFRP and Stack Materials

Materials



Applications



Counterboring



Drilling



Drilling:
Inclined Entry



Drilling:
Stacked Plates



Drilling:
Flat Bottom



Drilling:
Inclined Exit



Drilling:
Cross Hole



Drilling:
Vibration Assisted

kennametal.com/KenTIPFS



KenTIP FS covers more applications and provides better performance than any other modular system, delivering substantial cost savings and process simplifications on your shop floor.

NEW!

KenTIP FS inserts for CFRP and Stack Materials.

KenTIP FS inserts cover the entire front part of the drill. The coupling is completely protected from chip flow and contact with the workpiece. Carbide where it matters.

Quick release. Every drill body comes with a KenTIP smart wrench. Insert exchange in the machine becomes easy and saves idle time. And that saves money.

Double angle geometry with 128° and 90° point angle to avoid delamination.
For CFRP and CFRP stacks.

Through coolant.

Diamond coating for best tool life on CFRP stacks.



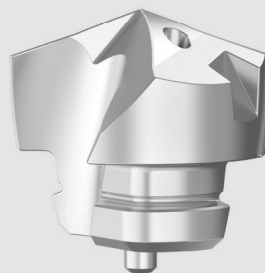
SPF

Double angle geometry with 128° and 155° point angle to minimize exits burrs.
For CFRP-metal stacks, non-ferrous materials and high-temperature alloys.

Through coolant.

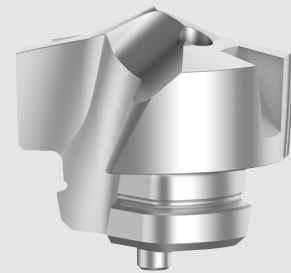
Uncoated for cost-efficient drilling.
 Diamond coating for extended tool life optional.

**FOR
REGULAR
DRILLING
APPLICATIONS**

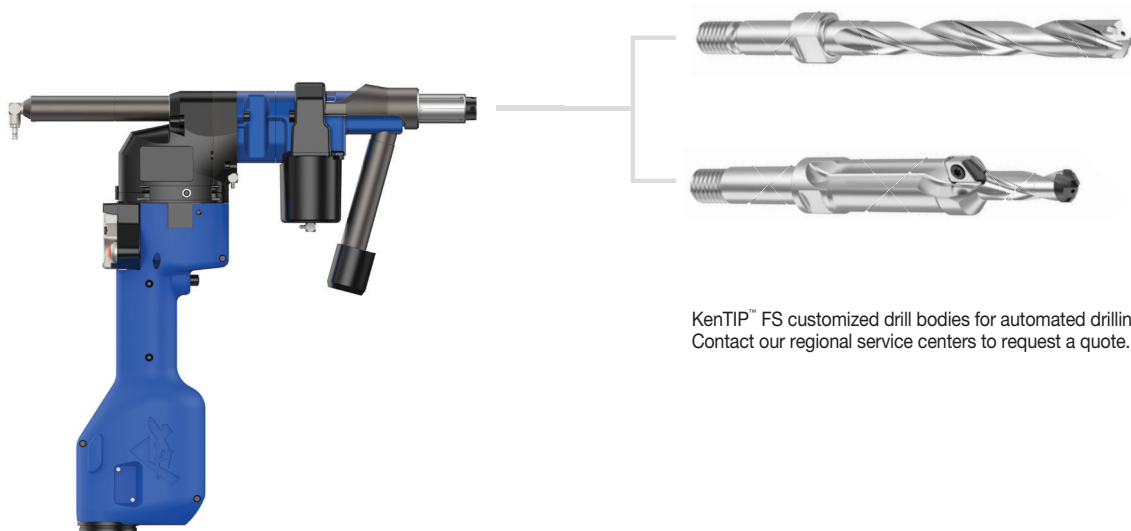


DAL

**FOR
VIBRATION-ASSISTED
DRILLING**

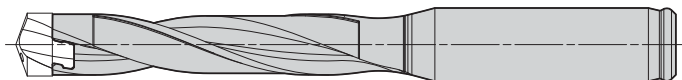


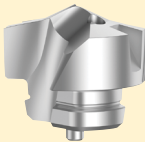
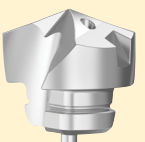
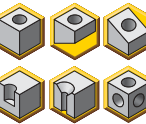
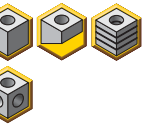
DAV



KenTIP™ FS customized drill bodies for automated drilling units (ADU).
 Contact our regional service centers to request a quote.

MODULAR DRILLS • TOOL SELECTION GUIDE

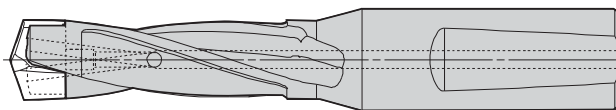


	KenTIP™ FS						
	DAV	DAL	SPF	FEG	HPG	HPC	HPL
							
Page	41	41	42	35**	H8*	H12*	H15*
Workpiece material							
Primary	N C	N C	C	P K	P	K	M
Secondary	S	S		M	K	P	S
Main operation							
Point angle	128°/155°	128°/155°	128°/90°	145°/180°	143°	143°	140°
Cutting diameter [D1]	6,35–12,7mm (0.2500–0.500")	6,35–12,7mm (0.2500–0.500")	6,35–12,7mm (0.2500–0.500")	6,0–26,0mm (0.2362–1.0236")	6,0–26,0mm (0.2362–1.0236")	6,0–26,0mm (0.2362–1.0236")	6,0–26,0mm (0.2362–1.0236")
Flutes and margin							
Corner chamfer							

**See page in the Kennametal Innovations 2020 • 02, A-19-06096.

*See page in the Kennametal Master Catalog 2018 • Volume Two • Rotating Tools, A-16-05217.

MODULAR DRILLS • TOOL SELECTION GUIDE



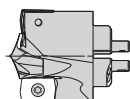
	KSEM™						
	FEG	HP	HPG	HPCCL	HPL	SPL	PC
							
Page	H36*	H32*	H52*	H60*	H62*	H64*	H70*
Workpiece material							
Primary	P K	P	P	K	M	M S	P K
Secondary	M S	K	M K			P N	M
Main operation							
Point angle	150°/180°	140°	140°	140°	140°	140°	150°
Cutting diameter [D1]	12,5–40,0mm (0.4921–1.5748")	12,5–40,0mm (0.4921–1.5748")	12,5–40,0mm (0.4921–1.5748")	12,5–40,0mm (0.4921–1.5748")	12,5–40,0mm (0.4921–1.5748")	12,5–40,0mm (0.4921–1.5748")	12,5–40,0mm (0.4921–1.5748")
Flutes and margin							
Corner chamfer							

*See page in the Kennametal Master Catalog 2018 • Volume Two • Rotating Tools, A-16-05217.

MODULAR DRILLS • TOOL SELECTION GUIDE

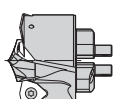
KSEM PLUS™ –A1 Heads

dia.: 1.102-1.249"
(28-31,74mm)



2 x DFR

dia.: 1.250-2.794"
(31,75-70,99mm)



2 x DFT

dia.: 2.795-3.674"
(71-93,34mm)



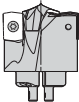
4 x DFT

dia.: 3.675-4"
(93,35-101,60mm)



6 x DFT



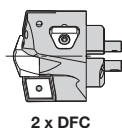
	KSEM PLUS A1 Heads					
Drill head style						
Center insert	HPG			FEG		
						
Outboard insert	DFR-GD	DFR-MD	DFR-LD	DFT-HP	DFT-MD	DFT-DS
						
Page	H113*			H112-H113*		
Workpiece material						
Primary	P	K	S		P	M
Secondary	M	N		K	N	S
Main operation						
						
Cutting diameter [D1]	28,0–31,75mm (1.1024–1.2500")			31,75–101,40mm (1.1875–4,0000")		
Flutes and margin						

*See page in the Kennametal Master Catalog 2018 • Volume Two • Rotating Tools, A-16-05217.

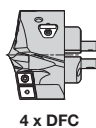
MODULAR DRILLS • TOOL SELECTION GUIDE

KSEM PLUS™ –B1 Heads

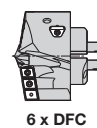
dia.: 1.102-2.794"
(28-70,99mm)



dia.: 2.795-3.674"
(71-93,34mm)



dia.: 3.675-4"
(93,35-101.60mm)



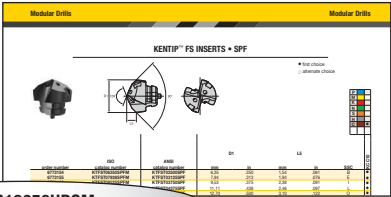
KSEM PLUS B1 Heads				
Drill head style				
Center insert	HPG		FEG	
Outboard insert	DFC-HP	DFC-MD	DFC-DS	DFC-HPF
Page	H114*			44**
Workpiece material				
Primary	P K S	P M	P M	P S
Secondary	M N	K N S	N S	M K N
Main operation				
Cutting diameter [D1]	28,0-101mm (1.1024-4.0000")			
Flutes and margin				

*See page in the Kennametal Master Catalog 2018 • Volume Two • Rotating Tools, A-16-05217.

**See page in the Kennametal Innovations 2020 • 02, A-19-06096.

KENTIP™ FS • INSERT • CATALOG NUMBERING SYSTEM

Each character in our catalog number signifies a specific trait of that product. Use the following key columns and corresponding images to easily identify which attributes apply.



KTFS

Drill Series

KTFS = KenTIP FS

S

Coolant Type

T = Through-the-insert coolant
S = Solid insert without coolant channels

19050

Diameter

Metric or Inch, depends on suffix

HPG

Point Geometry

HPG = Steel
HPL = Stainless Steel
HPC = Cast Iron
FEG = Flat Bottom
DAL = Stack, Titanium, Aluminum
SPF = CFPR
DAV = Vibration Assisted Applications in Stacks, Titanium, Aluminum

M

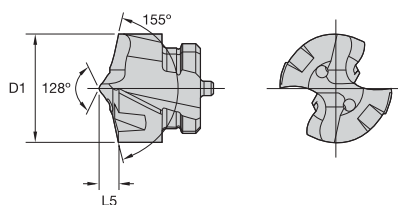
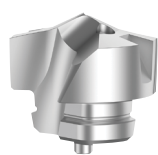
Suffix

M = Metric diameter
Blank = Inch diameter

KENTIP™ FS INSERTS • DAV

● first choice

○ alternate choice



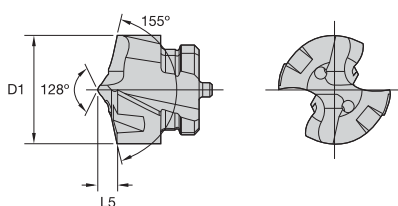
P		
M		
K		
N	●	
S	●	
H	●	
C	●	

order number	ISO catalog number	ANSI catalog number	D1		L5		SSC	KN15
			mm	in	mm	in		
6957701	KTFST06350DAVM	KTFST02500DAV	6,35	.250	1,12	.044	B	●
6957702	KTFST07938DAVM	KTFST03125DAV	7,94	.313	1,38	.054	E	●
6957703	KTFST09525DAVM	KTFST03750DAV	9,53	.375	1,69	.067	I	●
6957704	KTFST11113DAVM	KTFST04375DAV	11,11	.438	1,96	.077	L	●
6957705	KTFST12700DAVM	KTFST05000DAV	12,70	.500	2,24	.088	O	●

KENTIP™ FS INSERTS • DAL

● first choice

○ alternate choice

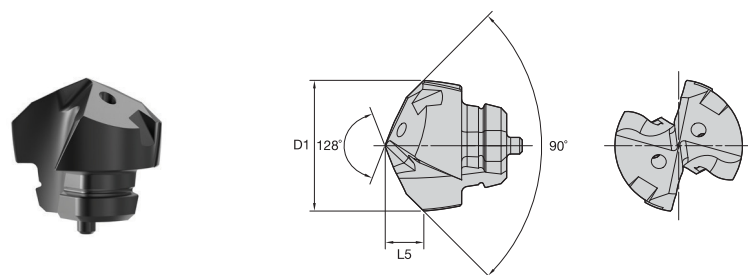


P		
M		
K		
N	●	
S	●	
H	●	
C	●	●

order number	ISO catalog number	ANSI catalog number	D1		L5		SSC	KCC10	KN15
			mm	in	mm	in			
6773176	KTFST06350DALM	KTFST02500DAL	6,35	.250	1,13	.045	B	●	-
6773231	KTFST06350DALM	KTFST02500DAL	6,35	.250	1,13	.045	B	-	●
6773232	KTFST06800DALM	KTFST06800DALM	6,80	.268	1,21	.048	C	-	●
6773233	KTFST07938DALM	KTFST03125DAL	7,94	.313	1,41	.056	E	-	●
6773177	KTFST07938DALM	KTFST03125DAL	7,94	.313	1,41	.056	E	●	-
6773234	KTFST08000DALM	KTFST08000DALM	8,00	.315	1,44	.057	F	-	●
6773235	KTFST08500DALM	KTFST08500DALM	8,50	.335	1,54	.061	G	-	●
6773236	KTFST09000DALM	KTFST09000DALM	9,00	.354	1,63	.064	H	-	●
6773178	KTFST09525DALM	KTFST03750DAL	9,53	.375	1,73	.068	I	●	-
6773237	KTFST09525DALM	KTFST03750DAL	9,53	.375	1,73	.068	I	-	●
6773238	KTFST10000DALM	KTFST10000DALM	10,00	.394	1,83	.072	J	-	●
6773179	KTFST11113DALM	KTFST04375DAL	11,11	.438	2,04	.080	L	●	-
6773239	KTFST11113DALM	KTFST04375DAL	11,11	.438	2,04	.080	L	-	●
6773240	KTFST11500DALM	KTFST11500DALM	11,50	.453	2,13	.084	M	-	●
6773180	KTFST12700DALM	KTFST05000DAL	12,70	.500	2,37	.093	O	●	-
6773241	KTFST12700DALM	KTFST05000DAL	12,70	.500	2,37	.093	O	-	●

54-55	56	40	60

KENTIP FS INSERTS • SPF



● first choice

○ alternate choice

P	
M	
K	
N	
S	
H	
C	

order number	ISO catalog number	ANSI catalog number	D1		L5		SSC	KCC10
			mm	in	mm	in		
6773154	KTFST06350SPFM	KTFST02500SPF	6,35	.250	1,54	.061	B	●
6773155	KTFST07938SPFM	KTFST03125SPF	7,94	.313	1,94	.076	E	●
6773160	KTFST09525SPFM	KTFST03750SPF	9,53	.375	2,38	.091	I	●
6773171	KTFST11113SPFM	KTFST04375SPF	11,11	.438	2,46	.097	L	●
6773172	KTFST12700SPFM	KTFST05000SPF	12,70	.500	3,10	.122	O	●

KENTIP™ FS • DAL & DAV • APPLICATION DATA • KN15

Material Group					 DAL						
----------------	--	--	--	--	--	--	--	--	--	--	--

Material Group		Cutting Speed — vc			Inch						
		Range — SFM			Recommended Feed Rate per Rev						
		min	Starting Value	max		1/4 .250	5/16 .313	3/8 .375	1/2 .500	5/8 .625	3/4 .750
S	4	30	40	70	IPR	.001–.003	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008
N	1	330	750	890	IPR	.005–.009	.006–.009	.008–.011	.009–.013	.011–.016	.013–.019
	2	330	720	890	IPR	.006–.009	.006–.011	.008–.013	.009–.014	.011–.017	.013–.021
	3	300	590	750	IPR	.005–.009	.006–.009	.008–.011	.009–.013	.011–.016	.013–.019
C	4	300	430	660	IPR	.004–.007	.006–.011	.008–.013	.009–.014	.011–.016	.013–.019
	2	230	360	460	IPR	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008	.003–.009
	3	30	40	70	IPR	.001–.003	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008
	4	30	70	130	IPR	.001–.003	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008

54–55	56	40	60

KENTIP FS • DAL • APPLICATION DATA • KCC10

Material Group	 									
	Cutting Speed — vc			Metric						
	Range — m/min			Recommended Feed Rate per Rev						
	min	Starting Value	max		6,0	8,0	10,0	12,0	16,0	20,0
C 2	70	110	140	mm/r	0.03–0.10	0.04–0.12	0.05–0.15	0.05–0.18	0.06–0.21	0.07–0.23

Material Group	Cutting Speed — vc			Inch						
	Range — SFM			Recommended Feed Rate per Rev						
	min	Starting Value	max		1/4 .250	5/16 .313	3/8 .375	1/2 .500	5/8 .625	3/4 .750
	C 2	230	360	460	IPR	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008

KENTIP FS • SPF • APPLICATION DATA • KCC10

Material Group	 									
	Cutting Speed — vc			Metric						
	Range — m/min			Recommended Feed Rate per Rev						
	min	Starting Value	max		6,0	8,0	10,0	12,0	16,0	20,0
C 1	80	100	150	mm/r	0.05–0.20	0.05–0.20	0.05–0.20	0.05–0.20	0.05–0.20	0.05–0.20

Material Group	Cutting Speed — vc			Inch							
	Range — SFM			Recommended Feed Rate per Rev							
	min	Starting Value	max		1/4 .250	5/16 .313	3/8 .375	1/2 .500	5/8 .625	3/4 .750	
C	1	260	330	490	IPR	.002–.008	.002–.008	.002–.008	.002–.008	.002–.008	.002–.008

HiPACS

Fastener Hole Drilling and Countersinking System

Materials



Applications



Drilling



Coolant:
Dry: Drilling



Drilling:
Half-Cylindrical



Through Coolant:
Radial: Drilling



Drilling:
Stacked Plates



Drilling:
Countersinking/
Stroke Chamfering



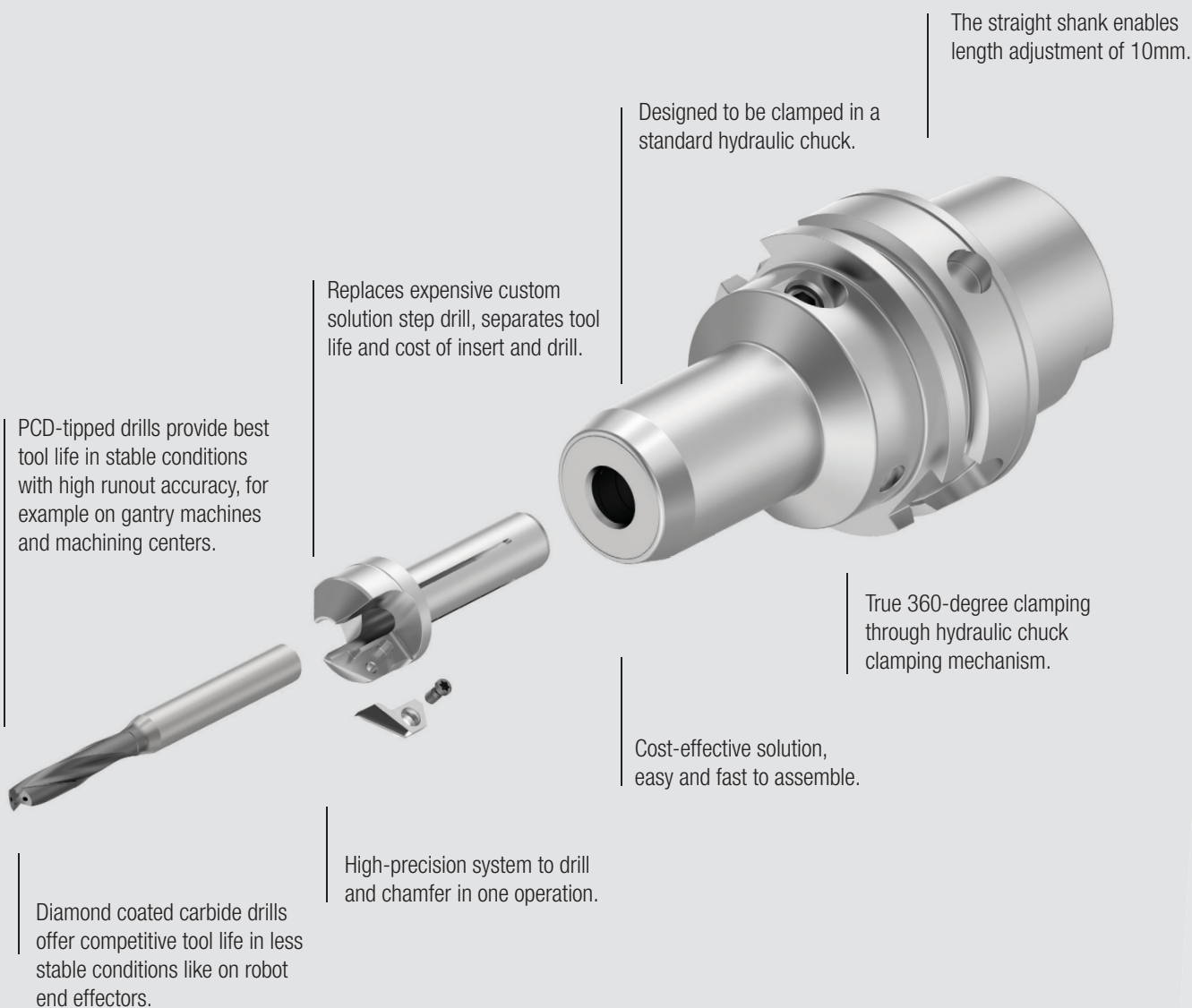
kennametal.com/HiPACS

The HiPACS drilling and countersinking tool is a unique high-precision system, achieving 1-degree angular countersink tolerances in aerospace fastener hole applications.

Designed to be clamped in a standard hydraulic chuck, HiPACS consists of 3 standard off-the-shelf components:

- The HiPACS reducer sleeve, featuring a built-in, high-precision pocket seat for a countersinking insert.
- The HiPACS PCD countersinking insert.
- The HiPACS solid carbide drills with SPF and DAL point geometry.

This easy-to-assemble system reduces cost per hole since drill and chamfer insert can be indexed independently from another.



B516 – SPF PCD-tipped drill for CFRP.



B536 – SPF Diamond coated carbide drill for CFRP.



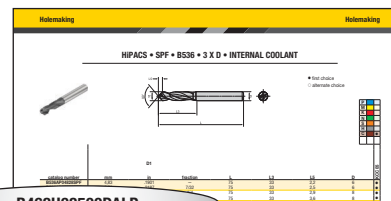
B566 – DAL PCD-tipped drill for CFRP stacks with metal exit and non-ferrous materials.



B556 – DAL Diamond coated carbide drill for CFRP stacks with metal exit.

HiPACS • CATALOG NUMBERING SYSTEM • DRILLS

Each character in our catalog number signifies a specific trait of that product.
Use the following key columns and corresponding images to easily identify which attributes apply.

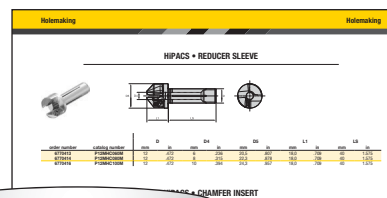


B468H08500DALP

B	46	8	H	08500	DAL	P
Style	Drill Series	Length/Coolant	Shank	Diameter	Point Geometry/ Application	Insert Surface
B = Metric K = Inch	51 = SPF, PCD 53 = SPF, carbide 55 = DAL, carbide 56 = DAL, PCD	6 = Internal coolant	H = Straight round shank	08500 = 8.5mm 06350 = 1/4" = E = 6.35mm	SPF = Point geometry for CFRP DAL = Point geometry for CFRP stacks with metal exit, non-ferrous materials, and titanium	P = HiPACS clearance

HiPACS • CATALOG NUMBERING SYSTEM • SLEEVE

Each character in our catalog number signifies a specific trait of that product.
Use the following key columns and corresponding images to easily identify which attributes apply.

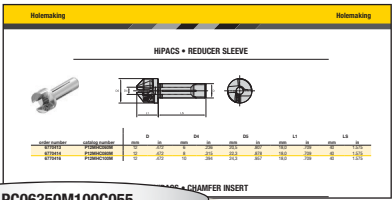


P12MHC080M

P	12	M	HC	080	M
Style	Outer Diameter	Outer Diameter Unit	Back-End Type	Inner Diameter	Inner Diameter Unit
HiPACS	12 = 12mm	M = Metric	HC = Hydraulic Chuck	080 = 8mm	M = Metric

HiPACS • CATALOG NUMBERING SYSTEM • INSERT

Each character in our catalog number signifies a specific trait of that product.
Use the following key columns and corresponding images to easily identify which attributes apply.



PC06350M100C055

PC

Style

HiPACS

06350

Diameter of Drill

06350 = 6.35mm

M

Drill Diameter Unit

M = Metric

100

Countersink Angle

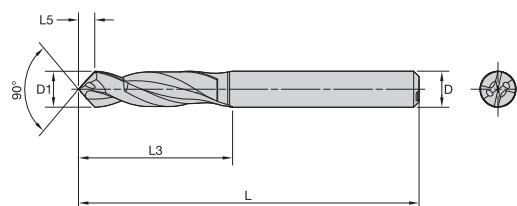
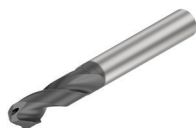
100 = 100°

C055

Corner Style

C055 = With chamfer, 55°
R090 = With radius, 0.9mm

HiPACS • SPF • B536 • 3 X D • INTERNAL COOLANT



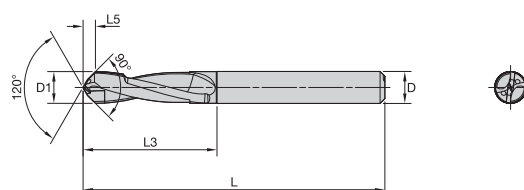
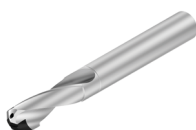
● first choice

○ alternate choice

P	
M	
K	
N	
S	
H	
C	●

D1								KCC05
catalog number	mm	in	fraction	L	L3	L5	D	
B536H04828SPFP	4,83	.1901	—	75	33	2,2	6	●
B536H05558SPFP	5,56	.2187	7/32	75	33	2,5	6	●
B536H06350SPFP	6,35	.2500	1/4	75	33	2,9	8	●
B536H07938SPFP	7,94	.3125	5/16	75	33	3,6	8	●
B536H09525SPFP	9,53	.3750	3/8	75	33	4,3	10	●

HiPACS • SPF • B516 • 3 X D • INTERNAL COOLANT



● first choice

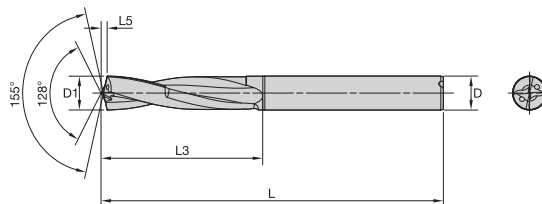
○ alternate choice

P	
M	
K	
N	
S	
H	
C	●

D1								KDC05
catalog number	mm	in	fraction	L	L3	L5	D	
B516H04828SPFP	4,83	.1901	—	75	33	1,9	6	●
B516H05558SPFP	5,56	.2188	7/32	75	33	2,2	6	●
B516H06350SPFP	6,35	.2500	1/4	75	33	2,5	8	●
B516H07938SPFP	7,94	.3125	5/16	75	33	3,1	8	●
B516H09525SPFP	9,53	.3750	5/8	75	33	3,7	10	●

54-55	56	46-47	60

HiPACS • DAL • B556 • 3 X D • INTERNAL COOLANT



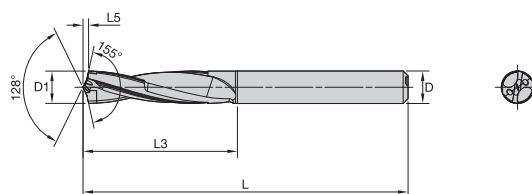
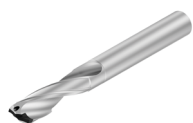
● first choice

○ alternate choice

P	
M	
K	
N	
S	
H	
C	

	D1								
catalog number	mm	in	fraction	L	L3	L5	D		KCC05
B556H04828DALP	4,83	.1901	—	80	38	0,9	6	●	
B556H05558DALP	5,56	.2188	7/32	80	38	1,0	6	●	
B556H06350DALP	6,35	.2500	1/4	80	38	1,1	8	●	
B556H07938DALP	7,94	.3125	5/16	80	38	1,4	8	●	
B556H09525DALP	9,53	.3750	3/8	80	38	1,7	10	●	

HiPACS • DAL • B566 • 3 X D • INTERNAL COOLANT



● first choice

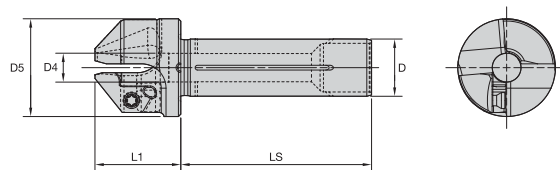
○ alternate choice

P	
M	
K	
N	●
S	○
H	
C	●

	D1								
catalog number	mm	in	fraction	L	L3	L5	D		KDC15
B566H04828DALP	4,83	.1901	—	80	38	0,8	6	●	
B566H05558DALP	5,56	.2188	7/32	80	38	1,0	6	●	
B566H06350DALP	6,35	.2500	1/4	80	38	1,1	8	●	
B566H07938DALP	7,94	.3125	5/16	80	38	1,4	8	●	
B566H09525DALP	9,53	.3750	3/8	80	38	1,7	10	●	

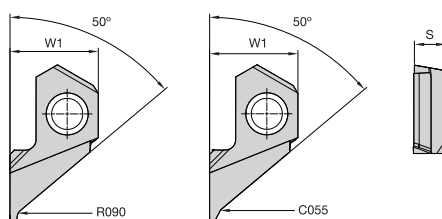
54-55	56	46-47	60

HiPACS • REDUCER SLEEVE



order number	catalog number	D		D4		D5		L1		LS	
		mm	in	mm	in	mm	in	mm	in	mm	in
6770413	P12MHC060M	12	.472	6	.236	20,5	.807	18,0	.709	40	1.575
6770414	P12MHC080M	12	.472	8	.315	22,3	.878	18,0	.709	40	1.575
6770416	P12MHC100M	12	.472	10	.394	24,3	.957	18,0	.709	40	1.575

HiPACS • CHAMFER INSERT



● first choice

○ alternate choice

P	
M	
K	
N	●
S	○
H	
C	●

catalog number	W1		S		KD1425
	mm	in	mm	in	
PC06350M100C055	8,52	.335	3,11	.122	●
PC06350M100R090	8,52	.335	3,11	.122	●

54-55	56	46-47	60

SPF • B536 • INTERNAL COOLANT • APPLICATION DATA • KCC05

Material Group													
	Cutting Speed — vc			Metric									
	Range — m/min			Recommended Feed Rate per Rev									
	min	Starting Value	max		3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0	
C	1	90	120	180	mm/r	0,05–0,20	0,05–0,20	0,05–0,20	0,05–0,20	0,05–0,20	0,05–0,20	—	—

Material Group	Cutting Speed — vc			Inch									
	Range — SFM			Recommended Feed Rate per Rev									
	min	Starting Value	max		1/8 .125	3/16 .188	1/4 .250	5/16 .313	3/8 .375	1/2 .500	5/8 .625	3/4 .750	
C	1	300	390	590	IPR	.002–.008	.002–.008	.002–.008	.002–.008	.002–.008	.002–.008	—	—

SPF • B516 • INTERNAL COOLANT • APPLICATION DATA • KDC05

Material Group													
	Cutting Speed — vc			Metric									
	Range — m/min			Recommended Feed Rate per Rev									
	min	Starting Value	max		3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0	
C	1	90	120	180	mm/r	0,05–0,20	0,05–0,20	0,05–0,20	0,05–0,20	0,05–0,20	0,05–0,20	—	—

Material Group	Cutting Speed — vc			Inch									
	Range — SFM			Recommended Feed Rate per Rev									
	min	Starting Value	max		1/8 .125	3/16 .188	1/4 .250	5/16 .313	3/8 .375	1/2 .500	5/8 .625	3/4 .750	
C	1	300	390	590	IPR	.002–.008	.002–.008	.002–.008	.002–.008	.002–.008	.002–.008	—	—

DAL • B566 • INTERNAL COOLANT • APPLICATION DATA • KDC15

Material Group													
	Cutting Speed — vc			Metric									
	Range — m/min			Recommended Feed Rate per Rev									
	min	Starting Value	max		3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0	
C	2	80	120	150	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12	0,05–0,15	0,05–0,18	0,06–0,21	0,07–0,23
	3	10	15	25	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12	0,05–0,15	0,05–0,18	0,06–0,21	0,07–0,23
	4	10	25	50	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12	0,05–0,15	0,05–0,18	0,06–0,21	0,07–0,23
S	4	10	15	25	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12	0,05–0,15	0,05–0,18	0,06–0,21	0,07–0,23
	1	100	230	270	mm/r	0,13–0,25	0,14–0,29	0,17–0,35	0,21–0,42	0,27–0,50	0,33–0,57	0,37–0,69	0,43–0,82
	2	100	220	270	mm/r	0,14–0,23	0,15–0,28	0,17–0,34	0,22–0,39	0,29–0,46	0,34–0,54	0,39–0,67	0,45–0,80
	3	90	180	230	mm/r	0,13–0,20	0,14–0,21	0,16–0,27	0,20–0,33	0,28–0,40	0,33–0,45	0,38–0,60	0,44–0,68
N	4	90	130	200	mm/r	0,10–0,18	0,12–0,20	0,14–0,26	0,16–0,30	0,18–0,34	0,20–0,38	0,24–0,42	0,28–0,46

Material Group	Cutting Speed — vc			Inch									
	Range — SFM			Recommended Feed Rate per Rev									
	min	Starting Value	max		1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	
					.125	.188	.250	.313	.375	.500	.625	.750	
C	2	260	390	490	IPR	.001–.002	.001–003	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008	.003–.009
	3	30	50	80	IPR	.001–.002	.001–003	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008	.003–.009
	4	30	80	160	IPR	.001–.002	.001–003	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008	.003–.009
S	4	30	50	80	IPR	.001–.002	.001–003	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008	.003–.009
	1	330	750	890	IPR	.005–.010	.006–.011	.007–.014	.008–.017	.011–.020	.013–.022	.015–.027	.017–.032
	2	330	720	890	IPR	.006–.009	.006–.011	.007–.013	.009–.015	.011–.018	.013–.021	.015–.026	.018–.032
	3	300	590	750	IPR	.005–.008	.006–.008	.006–.011	.008–.013	.011–.016	.013–.018	.015–.024	.017–.027
N	4	300	430	660	IPR	.004–.007	.005–.008	.006–.010	.006–.012	.007–.013	.008–.015	.009–.017	.011–.018

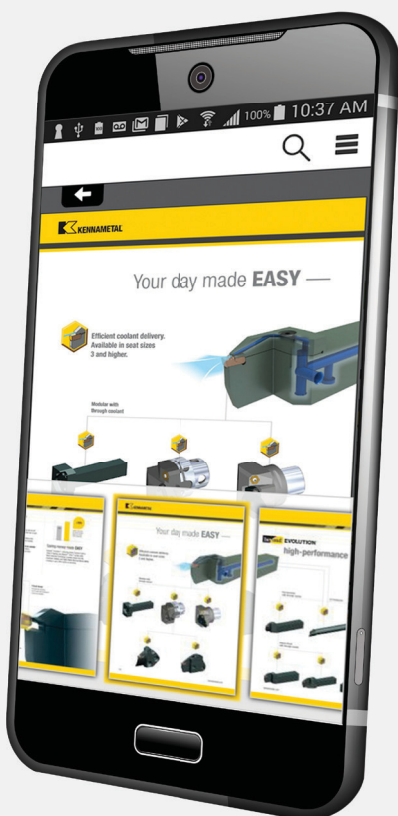
DAL • B556 • INTERNAL COOLANT • APPLICATION DATA • KCC05

Material Group													
	Cutting Speed — vc			Metric									
	Range — m/min			Recommended Feed Rate per Rev									
	min	Starting Value	max		3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0	
C	2	80	120	150	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12	0,05–0,15	0,05–0,18	0,06–0,21	0,07–0,23
	3	10	15	25	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12	0,05–0,15	0,05–0,18	0,06–0,21	0,07–0,23
	4	10	25	50	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12	0,05–0,15	0,05–0,18	0,06–0,21	0,07–0,23

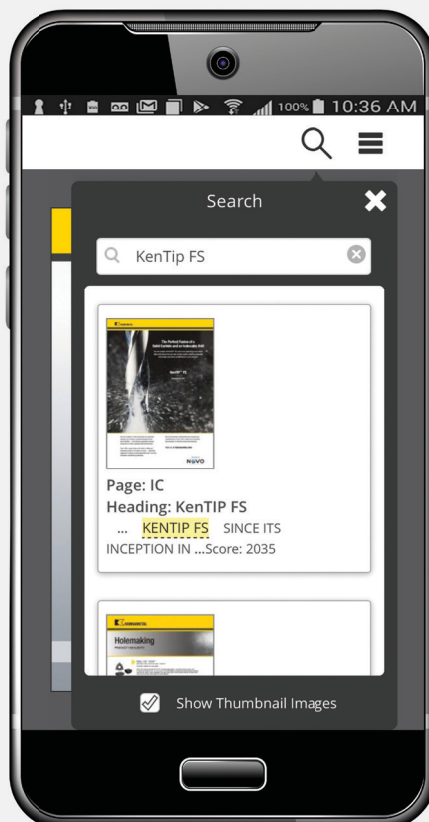
Material Group	Cutting Speed — vc			Inch									
	Range — SFM			Recommended Feed Rate per Rev									
	min	Starting Value	max		1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	
					.125	.188	.250	.313	.375	.500	.625	.750	
C	2	260	390	490	IPR	.001–.002	.001–003	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008	.003–.009
	3	30	50	80	IPR	.001–.002	.001–003	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008	.003–.009
	4	30	80	160	IPR	.001–.002	.001–003	.001–.004	.002–.005	.002–.006	.002–.007	.002–.008	.003–.009

Catalog App

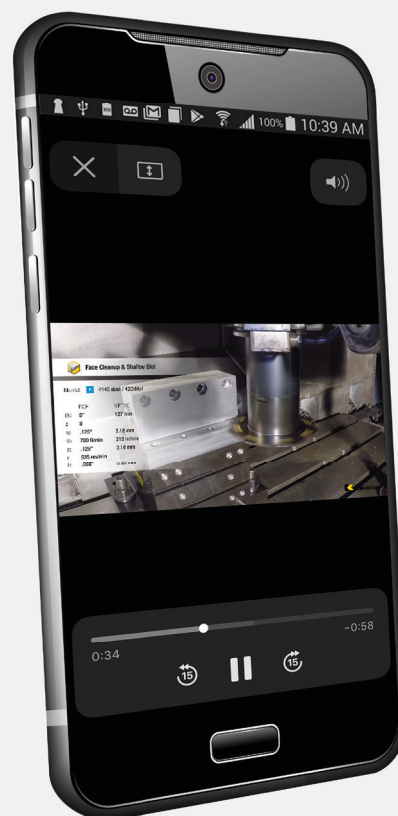
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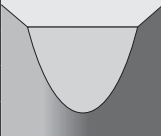
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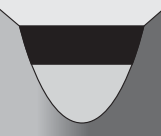
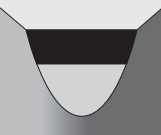
INDEXABLE MILLING

		wear resistance ← → toughness									
Coating	Grade Description		05	10	15	20	25	30	35	40	45
KC725M		Coated carbide grade with an advanced PVD TiAlN coating. KC725M is a high-performance grade for milling steel, stainless steel, and ductile cast iron. The good thermal shock resistance of the substrate makes this grade ideal for both wet and dry machining. Primarily for use in general and heavy machining.	P								
			M								
			S								
KCSM40		Coated carbide grade with an advanced PVD TiAlN/TiN coating. Premium substrate with newly developed binder composition. KCSM40 is a high-performance grade for titanium, super alloys, and stainless steel. High thermal shock resistance of the substrate makes this grade ideal for wet machining. First choice for roughing and unsuitable cutting conditions.	M								
			S								

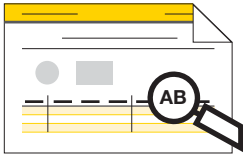
HOLEMAKING

		wear resistance ← → toughness									
Coating	Grade Description		05	10	15	20	25	30	35	40	45
KN15		Composition: Uncoated, highly wear-resistant fine-grain carbide. Application: Highly polished chip flute surfaces ensure superior chip evacuation and reduce tendency for built-up edges. First choice for non-ferrous materials.									
			N								
			S								
KCU45		Composition: Multilayered PVD TiN-TiAlN coated medium-grain carbide with high toughness and a TiN top layer for better wear identification. Application: The versatile TiAlN multilayer coating combined with a tough carbide substrate are perfectly suited to help with pre-centering operations and any other metastable machining conditions.	C								
			P								
			M								
			K								
			S								
KCC05		Composition: Multilayered CVD diamond-coated, submicron-grain carbide. Application: First choice for machining carbon-fiber reinforced polymers (CFRPs). This grade offers best wear resistance and highest tool life in most CFRP materials.									
			C								

HOLEMAKING

		wear resistance ← → toughness											
Coating	Grade Description		05	10	15	20	25	30	35	40	45		
KCC10		Composition: Multilayered CVD diamond-coated, submicron-grain carbide. Application: First choice for machining challenging carbon-fiber reinforced polymers (CFRPs). This grade offers best compromise of abrasive wear resistance and sharpest possible cutting geometries to allow defect free machining of difficult to cut CFRP materials.											
KDC05		Composition: Multi-modal polycrystalline diamond. Application: First choice for machining carbon-fiber reinforced polymer/metal stack materials (CFRP/Al and CFRP/Ti). The multi-modal PCD offers best wear resistance and maintains good toughness properties to allow maximum tool life.											
KDC15		Composition: Fine-grained polycrystalline diamond. Application: Alternate choice for machining carbon-fiber reinforced polymer/metal stack materials (CFRP/Al and CFRP/Ti). The fine-grain PCD offers increased toughness compared to KDC05 and makes it first choice for CFRP/metal stacks containing high-strength, non-ferrous materials, especially titanium alloys.											
KD1425		Composition: A multimodal PCD grade with a range of grain sizes brazed on carbide substrate. Application: Engineered for excellent abrasion resistance combined with good edge strength for demanding applications. An ideal choice for high-silicon aluminum alloys, MMCs, carbon fiber reinforced plastics, and other abrasive non-ferrous materials.											

KEY TO PRODUCT TABLE COLUMN HEADINGS



You may notice a slight change in the appearance of our product tables and specification charts. In this catalog, Kennametal introduces a set of short-name codes to improve the readability of tables and drawings. These codes replace full-text descriptions. The full list of codes and their definitions can be found below.

Short-Name Code	Full Text Description
Ap1 max	Maximum Cutting Depth
BCH	Corner Chamfer Width
BS	Corner Facet Length
CE	Cutting Edges
CSMS	Connection Style Machine Side
CSWS	Connection Style Workpiece Side
D	Insert: Insert IC Size
D	Shank/Bore Diameter
D	Toolholder: Shank/Bore Diameter
D1	Holemaking: Drill Diameter
D1	Holemaking: Reamer Diameter
D1	Insert: Insert Hole Size
D1	Milling: Cutter Diameter
D1	Toolholder: Clamping Diameter
D1 max	Toolholder: Maximum Shank/Bore Diameter
D1 max	Maximum Drill Diameter
D2	Body Diameter 1 Workpiece Side
D3	Neck Diameter
hm	Average Chip Thickness
kg	Weight Kilograms
L	Overall Length
L1	Holemaking: Reamer Gage Length
L1	Holemaking: Tool Length
L1	Toolholder: Gage Length
L10	Insert Cutting Edge Length
L10	Holemaking: Reamer Cut Edge Length
L2	Usable Length
L3	Drill Flute Length
L3	Milling: Maximum Depth
L4	Holemaking: Reamer Maximum Depth
L4 max	Maximum Drill Depth
L5	Drill Point Length
lbs	Weight Pounds
LI	Insert Length
LS	Shank Length
R	Profile or Ball Nose Radii
R _c	Corner Radius
Torque (ft. lbs.)	Torque Foot Pounds
Nm	Torque Newton Meters
Z	Number of Flutes
Z U	Number of Flutes

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

material group	description	content	tensile strength RM (MPa)*	hardness (HB)	hardness (HRC)	material number
P0	Low-Carbon Steels, Long Chipping	C <0,25%	<530	<125	–	A36, 1008, 1010, 1018 through 1029; 1108, 1117
P1	Low-Carbon Steels, Short Chipping, Free Machining	C <0,25%	<530	<125	–	10L18, 1200 Series, 1213, 12L14
P2	Medium- and High-Carbon Steels	C >0,25%	>530	<220	<25	1035, 1045, 10L45, 1050, 10L50, 1080, 1137, 1144, 11L44, 1525, 1545, 1572
P3	Alloy Steels and Tool Steels	C >0,25%	600–850	<330	<35	1300, 2000, 3000, 4000, 5000, 8000, P20, SAE: A, D, H, O, S, M, T
P4	Alloy Steels and Tool Steels	C >0,25%	850–1400	340–450	35–48	1300, 2000, 3000, 4000, 5000, 8000, P20, SAE: A, D, H, O, S, M, T
P5	Ferritic, Martensitic, and PH Stainless Steels	–	600–900	<330	<35	15–5 PH, 13–8 PH, 17–4 PH, 400 and 500 Series
P6	High-Strength Ferritic, Martensitic, and PH Stainless Steels	–	900–1350	350–450	35–48	15–5 PH, 13–8 PH, 17–4 PH, 400 and 500 Series
M1	Austenitic Stainless Steel	–	<600	130–200	–	200 Series, 301, 302, 304, 304L, 309
M2	High-Strength Austenitic Stainless and Cast Stainless Steels	–	600–800	150–230	<25	310, 316, 316L, 321, 347, 384 ASTM Cast XM-1, XM-5, XM-7, XM-21
M3	Duplex Stainless Steel	–	<800	135–275	<30	323, 329, F55, 2205, S329000
K1	Gray Cast Iron	–	125–500	120–290	<32	class 20, 25, 30, 35, 40, 45, 50, 55, 60, G1800, G3000, G3500, G4000
K2	Low- and Medium-Strength Ductile Irons (Nodular Irons) and Compacted Graphite Irons (CGI)	–	<600	130–260	<28	60-40-18, 65-45-12, 80-55-06; SAE J434: D4018, D4512, D5506; ASTM A47: Grade 32510, 35018; SAE J158: Grade M3210, M4504, M5003, M5503, M7002; ASTM A842: Grade 250, 300, 350, 400, 450
K3	High-Strength Ductile Irons and Austempered Ductile Iron (ADI)	–	>600	180–350	<43	ASTM A536:100-70-03, 120-90-02, SAE J434: D7003, SAE J158: Grade M8501AST A897: 125-80-10, 150-100-7, 175-125-4, 200-150-1, 230-185
N1	Wrought Aluminum	–	–	–	–	2025, 5050, 7050, 1000, 2017
N2	Low-Silicon Aluminum Alloys and Magnesium Alloys	Si <12,2%	–	–	–	2024, 6061, 7075
N3	High-Silicon Aluminum Alloys and Magnesium Alloys	Si >12,2%	–	–	–	–
N4	Copper-, Brass-, Zinc-Based on Machinability Index Range of 70–100	–	–	–	–	C81500
N5	Nylon, Plastics, Rubbers, Phenolics, Resins, Fiberglass	–	–	–	–	–
N6	Carbon, Graphite Composites, CFRP	–	–	–	–	Graphite, CFK, CFRP
N7	Metal Matrix Composites (MMC)	–	–	–	–	C63000
S1	Iron-Based, Heat-Resistant Alloys	–	500–1200	160–260	25–48	A-286, INCOLOY® 800 Series, A608, A567, Discaloy, INVAR®, N-155, 16-25-6, 19-9 DL; Cast: ASTM A-297, A-351, A-567, A-608
S2	Cobalt-Based, Heat-Resistant Alloys	–	1000–1450	250–450	25–48	Haynes® 25 (L605), Haynes 188, J-1570, Stellite®, AiResist 213; Cast: AiResist 13, Haynes 21, MAR-M302, MAR-M509, NASA Co-W-Re, WI-52
S3	Nickel-Based, Heat-Resistant Alloys	–	600–1700	160–450	<48	Astroloy™, Hastelloy® B/C/ C-276 /X, INCONEL® 600 and 700 Series, IN102, INCOLOY 900 Series, Rene 41, Waspalloy, MONEL®, K-500, MAR-M20, NIMONIC®, UDIMET®
S4	Titanium and Titanium Alloys	–	900–1600	300–400	33–48	Pure: Ti 98.8, Ti 98.9, Ti 99.9; Alloyed: Ti 5Al-2.5Sn, Ti6Al-4V, Ti6Al-2Sn-4Zr-2Mo, Ti-3Al-8V-6Cr-4Mo-4Zr, Ti-10V-2Fe-3Al, Ti-13V-11Cr-3Al
H1	Hardened Materials	–	–	–	44–48	Tool Steel H10, H11, H13, D2, D3, 4340, P20
H2	Hardened Materials	–	–	–	48–55	Tool Steel H10, H11, H13, D2, D3, 4340, P20
H3	Hardened Materials	–	–	–	56–60	Tool Steel H10, H11, H13, D2, D3, 4340, P20
H4	Hardened Materials	–	–	–	>60	Tool Steel H10, H11, H13, D2, D3, 4340, P20
C1	CFRP, CFRP/CFRP	–	–	–	–	–
C2	CFRP/Non-Ferrous	–	–	–	–	–
C3	CFRP/High-Temp	–	–	–	–	–
C4	CFRP/Stainless Steel	–	–	–	–	–
C5	CFRP/Non-Ferrous/High-Temp	–	–	–	–	–

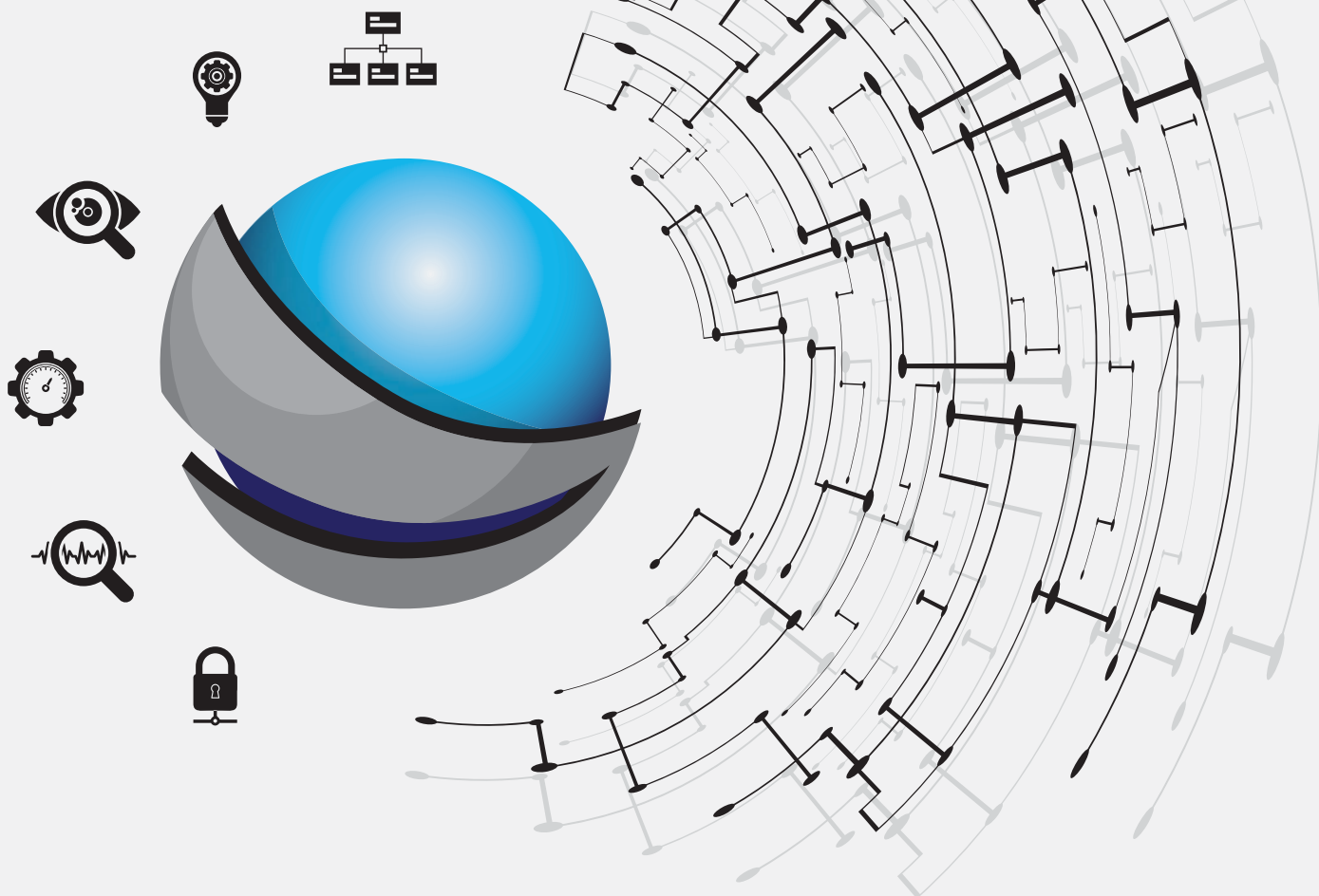
P	Steel
M	Stainless Steel
K	Cast Iron

N	Non-Ferrous
S	High-Temp Alloys

H	Hardened Materials
C	CFRP Materials

material group	description	content	tensile strength RM (MPa)*	hardness (HB)	hardness (HRC)	material number
P0	Low-Carbon Steels, Long Chipping	C <0,25%	<530	<125	–	–
P1	Low-Carbon Steels, Short Chipping, Free Machining	C <0,25%	<530	<125	–	C15, Ck22, ST37-2, S235JR, 9SMnPb28, GS38
P2	Medium- and High-Carbon Steels	C >0,25%	>530	<220	<25	ST52, S355JR, C35, GS60, Cf53
P3	Alloy Steels and Tool Steels	C >0,25%	600–850	<330	<35	16MnCr5, Ck45, 21CrMoV5-7, 38SMn28
P4	Alloy Steels and Tool Steels	C >0,25%	850–1400	340–450	35–48	100Cr6, 30CrNiMo8, 42CrMo4, C70W2, S6525, X120Mn12
P5	Ferritic, Martensitic, and PH Stainless Steels	–	600–900	<330	<35	100Cr6, 30CrNiMo8, 42CrMo4, C70W2, S6525, X120Mn12
P6	High-Strength Ferritic, Martensitic, and PH Stainless Steels	–	900–1350	350–450	35–48	X102CrMo17, G-X120Cr29
M1	Austenitic Stainless Steel	–	<600	130–200	–	X5CrNi 18 10, X2CrNiMo 17 13 2, G-X25CrNiSi18 9, X15CrNiSi 20 12
M2	High-Strength Austenitic Stainless and Cast Stainless Steels	–	600–800	150–230	<25	X2CrNiMo 13 4, X5NiCr 32 21, X5CrNiNb 18 10, G-X15CrNi 25-20
M3	Duplex Stainless Steel	–	<800	135–275	<30	X8CrNiMo27 5, X2CrNiMoN22 5 3, X20CrNiSi25 4, G-X40CrNiSi27 4
K1	Gray Cast Iron	–	125–500	120–290	<32	GG15, GG25, GG30, GG40, GTW40
K2	Low- and Medium-Strength Ductile Irons (Nodular Irons) and Compacted Graphite Irons (CGI)	–	<600	130–260	<28	GGG40, GTS35
K3	High-Strength Ductile Irons and Austempered Ductile Iron (ADI)	–	>600	180–350	<43	GGG60, GTW55, GTS65
N1	Wrought Aluminum	–	–	–	–	AlMg1, Al99.5, AlCuMg1, AlCuBiPb, AlMgSi1, AlMgSiPb
N2	Low-Silicon Aluminum Alloys and Magnesium Alloys	Si <12,2%	–	–	–	GAISiCu4, GDAISi10Mg
N3	High-Silicon Aluminum Alloys and Magnesium Alloys	Si >12,2%	–	–	–	G-ALSi12, G-ALSi17Cu4, G-ALSi21CuNiMg
N4	Copper-, Brass-, Zinc-Based on Machinability Index Range of 70–100	–	–	–	–	CuZn40, Ms60, G-CuSn5ZnPb, CuZn37, CuSi3Mn
N5	Nylon, Plastics, Rubbers, Phenolics, Resins, Fiberglass	–	–	–	–	LEXAN®, Hostalen®, Polystyrol®, MAKROLON
N6	Carbon, Graphite Composites, CFRP	–	–	–	–	CFK, GFK
N7	Metal Matrix Composites (MMC)	–	–	–	–	–
S1	Iron-Based, Heat-Resistant Alloys	–	500–1200	160–260	25–48	X1NiCrMoCu32 28 7, X12NiCrSi36 16, X5NiCrAlTi31 20, X40CoCrNi20 20
S2	Cobalt-Based, Heat-Resistant Alloys	–	1000–1450	250–450	25–48	Haynes® 188, Stellite™ 6,21,31
S3	Nickel-Based, Heat-Resistant Alloys	–	600–1700	160–450	<48	INCONEL® 690, INCONEL 625, Hastelloy®, NIMONIC® 75
S4	Titanium and Titanium Alloys	–	900–1600	300–400	33–48	Ti1, TiAl5Sn2, TiAl6V4, TiAl4Mo4Sn2
H1	Hardened Materials	–	–	–	44–48	GX260NiCr42, GX330NiCr42, GX300CrNiSi952, GX300CrMo153, Hardox® 400
H2	Hardened Materials	–	–	–	48–55	–
H3	Hardened Materials	–	–	–	56–60	–
H4	Hardened Materials	–	–	–	>60	–
C1	CFRP, CFRP/CFRP	–	–	–	–	–
C2	CFRP/Non-Ferrous	–	–	–	–	–
C3	CFRP/High Temp	–	–	–	–	–
C4	CFRP/Stainless Steel	–	–	–	–	–
C5	CFRP/Non-Ferrous/High-Temp	–	–	–	–	–

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METALCUTTING SAFETY

IMPORTANT SAFETY INSTRUCTIONS

Read before using the tools in this catalog!

Projectile and Fragmentation Hazards:

Modern metalcutting operations involve high spindle and cutter speeds and high temperatures and cutting forces. Hot metal chips may fly off the workpiece during metalcutting. Although cutting tools are designed and manufactured to withstand high cutting forces and temperatures, they can sometimes fragment, particularly if they are subjected to over-stress, severe impact, or other abuse.

To avoid injury:

- Always wear appropriate personal protective equipment, including safety goggles, when operating metalcutting machines or working nearby.
- Always make sure all machine guards are in place.

Breathing and Skin Contact Hazards:

Grinding carbide or other advanced cutting tool materials produces dust or mist containing metallic particles. Breathing this dust or mist — especially over an extended period — can cause temporary or permanent lung disease or make existing medical conditions worse. Contact with this dust or mist can irritate eyes, skin, and mucous membranes and may make existing skin conditions worse.

To avoid injury:

- Always wear breathing protection and safety goggles when grinding.
- Provide ventilation control and collect and properly dispose of dust, mist, or sludge from grinding.
- Avoid skin contact with dust or mist.

For more information, read the applicable Material Safety Data Sheet provided by Kennametal and consult General Industry Safety and Health Regulations, Part 1910, Title 29 of the Code of Federal Regulations.

These safety instructions are general guidelines. Many variables affect machining operations. It is impossible to cover every specific situation. The technical information included in this catalog and recommendations on machining practices may not apply to your particular operation. For more information, consult the Kennametal Metalcutting Safety booklet, available free from Kennametal at 724 539 5747 or fax 724 539 5439. For specific product safety and environmental questions, contact our Corporate Environmental Health and Safety Office at 724 539 5066 or fax 724 539 5372.

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