kennametal.com

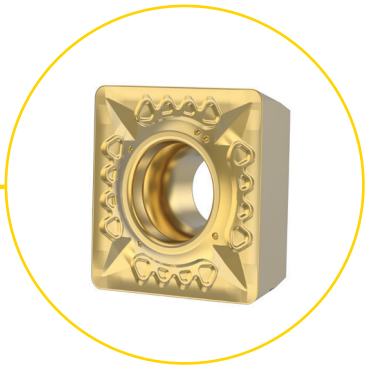
KENNAMETAL®

AEROSPACE SOLUTIONS

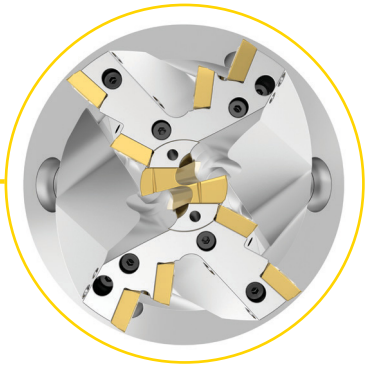
2022 | METRIC

FBX Drill

Modular Drill for Flat Bottom Holes



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



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

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.

AEROSPACE SOLUTIONS

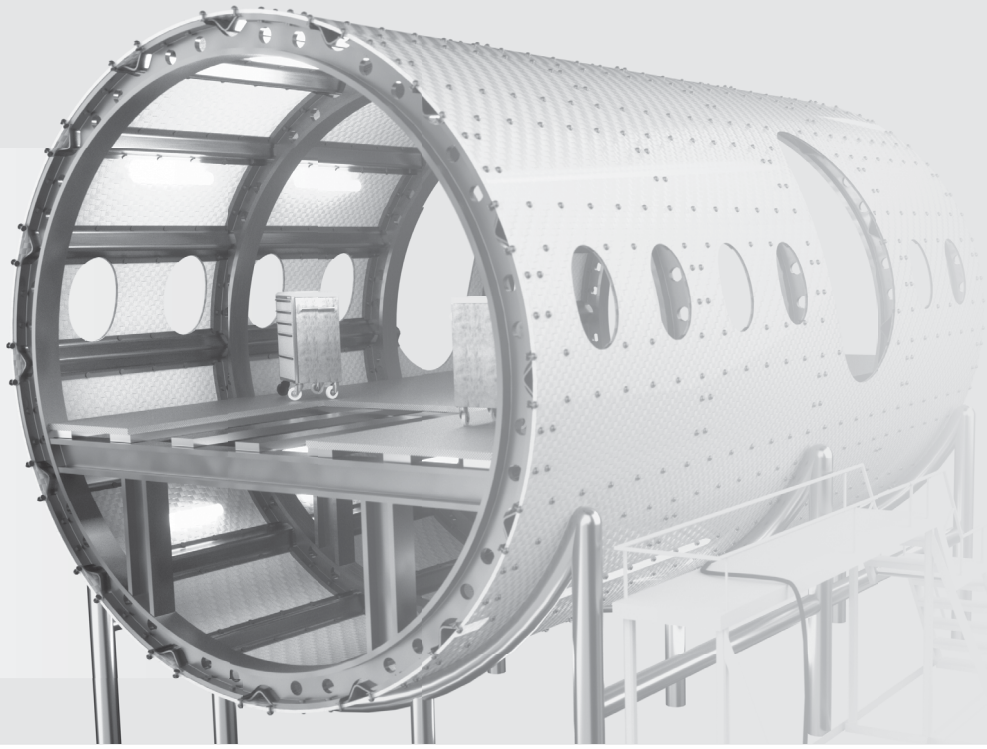
Solutions for Structural Parts **2–27**
FBX — Modular Drill for Flat Bottom Holes 4–9
Harvi Ultra 8X — Helical Shoulder Mill 10–21
BTF Adaptors — Bolt Taper Flange Mount Adaptors 22–27
Solutions for Assemblies **28–48**
KenTIP FS — Modular Drilling for CFRP and Stacked Materials 30–38
HiPACS — Fastener Hole Drilling and Countersinking 40–48
General Information **50–53**
Grades and Grade Descriptions 50–51
Key to Column Headings 52
Material Cross Reference 53

Aerospace

POWERED BY NOVO

Structural Parts Machining

Titanium Roughing with Maximum Metal Removal Rate



kennametal.com/Aerospace

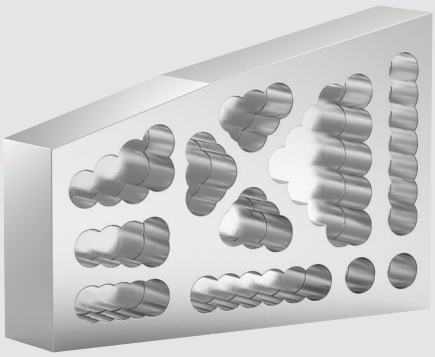
Titanium is typically produced in the shape of plates and bars, also forgings and castings. The Buy-to-Fly (BTF) ratio is typically between 10 and 16, meaning a raw material of 10kg titanium ends up being a finished part with the weight of 1kg.

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

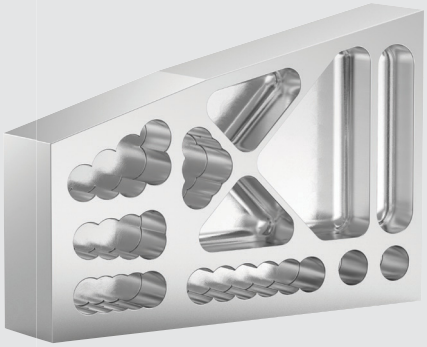
Kennametal has developed a process and tooling solutions to achieve maximum metal removal rates, and maximum tool life at the same time.

1 Raw Titanium Plate

2 Opening Cavities



3 Roughing

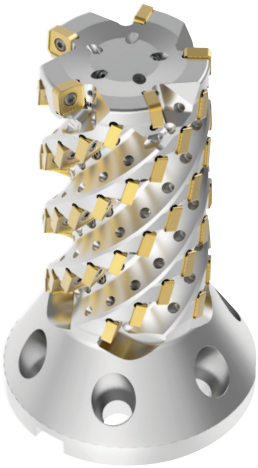


4 Finishing

Opening Cavities

FBX - Flat Bottom Drill with BTF

Roughing



HARVI™ Ultra 8X with BTF

Finishing

Solid Carbide End Mills

Holemaking

POWERED BY NOVO

FBX Drill

Indexable Drill for Flat Bottom Holes

Materials

P M S

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.

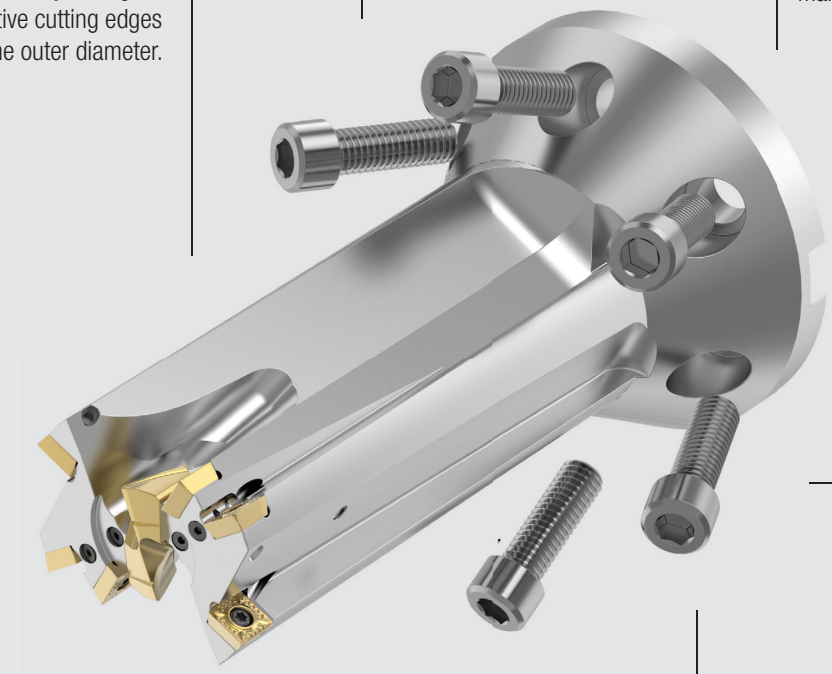
A centre insert with 2 effective cutting edges and chip splitters enables perfect chip formation, allowing maximum feed rates.

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.



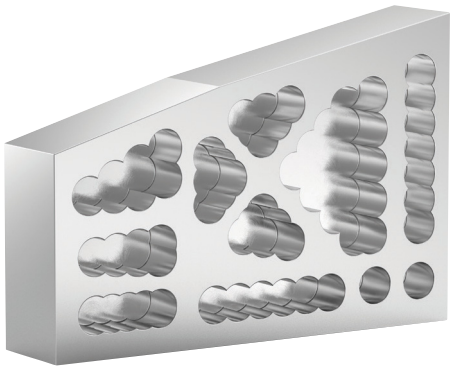
95mm and 150mm length FBX Drill Bodies.

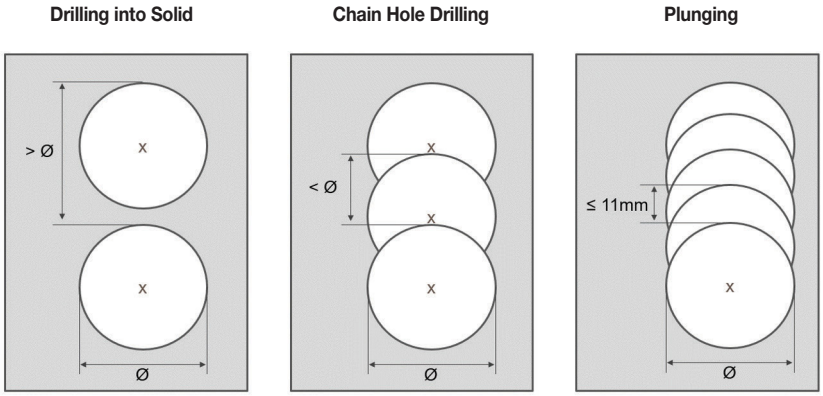
The Bolt Taper Flange (BTF) connection provides maximum tool stiffness. Nearly as rigid as a monoblock tool design but offers multiple machine side connections.

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

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

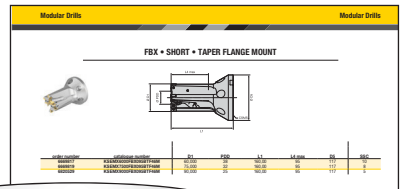
Process Step: Opening Cavities





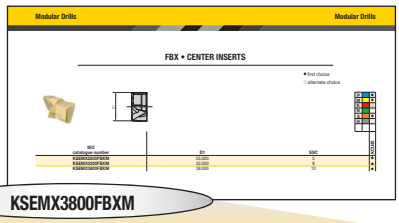
FBX • CATALOGUE NUMBERING SYSTEM

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



KSEMX6000FBX095BTF46M

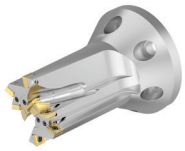
KSEMX	6000	FBX	095	BTF	46M
Tool Series	Diameter	Tool Name	Depth of Cut (DOC)	Connection Style Machine Side (CSMS)	Connection Size
KSEM = Modular drill **KSEMP** = Modular drill with exchangeable drill heads **KSEMX** = Modular drill with multi-flute design	**6000** = 60mm	**FBX** = Flat Bottom Drill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

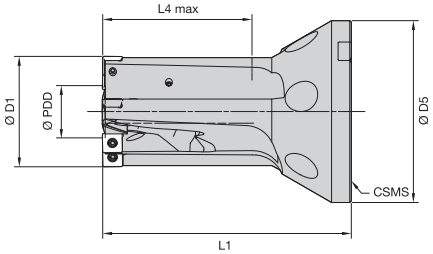


KSEMX3800FBXM

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

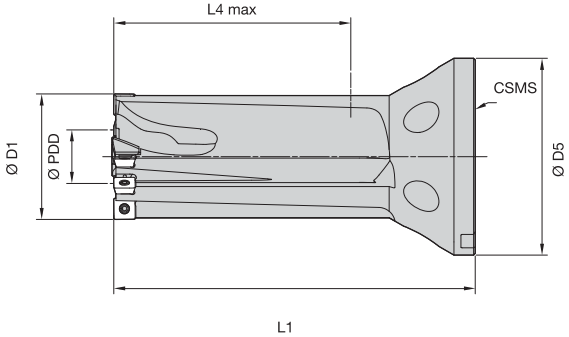
FBX • SHORT • TAPER FLANGE MOUNT





order number	catalogue 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

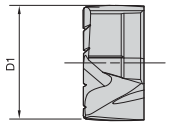


order number	catalogue number	D1	PDD	L1	L4 max	D5	SSC
6669818	KSEMX6000FBX150BTF46M	60,000	38	215,00	150	117	10
6669820	KSEMX7500FBX150BTF46M	75,000	32	215,00	150	117	8
6670013	KSEMX9000FBX150BTF46M	90,000	25	215,00	150	117	5

50–51	52	6	39, 54

FBX • CENTER INSERTS

● first choice
○ alternate choice

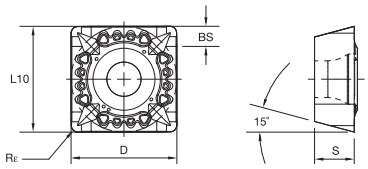


P	●
M	●
K	○
N	
S	●
H	

ISO catalogue number	D1	SSC	KCU45
KSEMX2500FBXM	25,000	5	●
KSEMX3200FBXM	32,000	8	●
KSEMX3800FBXM	38,000	10	●

FBX • OUTBOARD INSERTS

● first choice
○ alternate choice



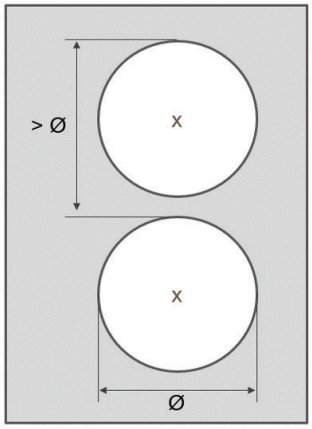
P	○
M	●
K	
N	
S	●
H	

ISO catalogue number	D	S	L10	BS	Rε	CE	KCSM40
SDET1204PDERGB	12,70	4,76	12,70	2,54	0,8	4	●
SDET1204PDSRGB	12,70	4,76	12,70	3,36	0,8	4	●

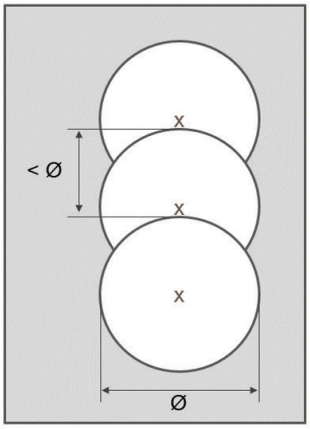
50–51	52	6	39, 54

FBX • APPLICATIONS

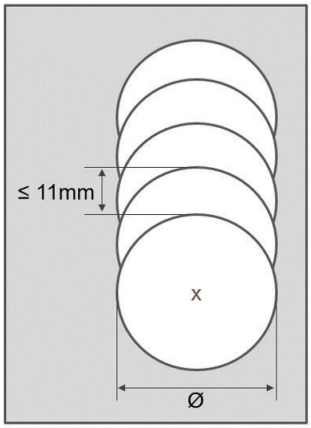
Drilling into Solid



Chain Hole Drilling



Plunging



FBX • INSERT SELECTION GUIDE

Material Group	Drilling into Solid (zeff = 2)		Chain Hole Driling (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 [MM/REV]

Material Group	Drilling into Solid (zeff = 2)			Chain Hole Driling (zeff = 2)			Plunging (zeff = 4)		
	min	Starting Value	max	min	Starting Value	max	min	Starting Value	max
P5-P6	0,16	**0,20**	0,24	0,08	**0,14**	0,20	0,20	**0,40**	0,48
M1-M3	0,16	**0,20**	0,24	0,08	**0,14**	0,20	0,20	**0,40**	0,48
S4	0,16	**0,20**	0,24	0,08	**0,14**	0,20	0,28	**0,48**	0,60

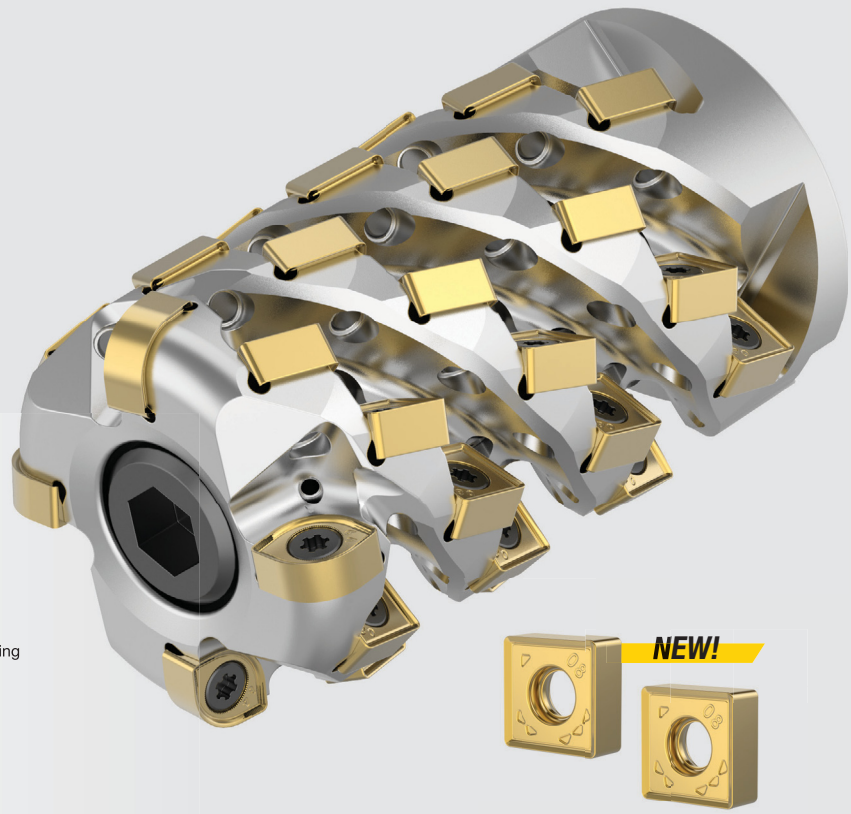
FBX • RECOMMENDED STARTING SPEEDS [M/MIN]

Material Group	Drilling into Solid (zeff = 2)			Chain Hole Driling (zeff = 2)			Plunging (zeff = 4)		
	min	Starting Value	max	min	Starting Value	max	min	Starting Value	max
P5-P6	80	**90**	100	80	**90**	100	90	**105**	120
M1-M3	80	**90**	100	80	**90**	100	90	**105**	120
S4	30	**40**	50	30	**40**	50	40	**50**	60

POWERED BY NOVO

HARVI™ Ultra 8X

Helical Shoulder Mill



Materials

P M S

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.

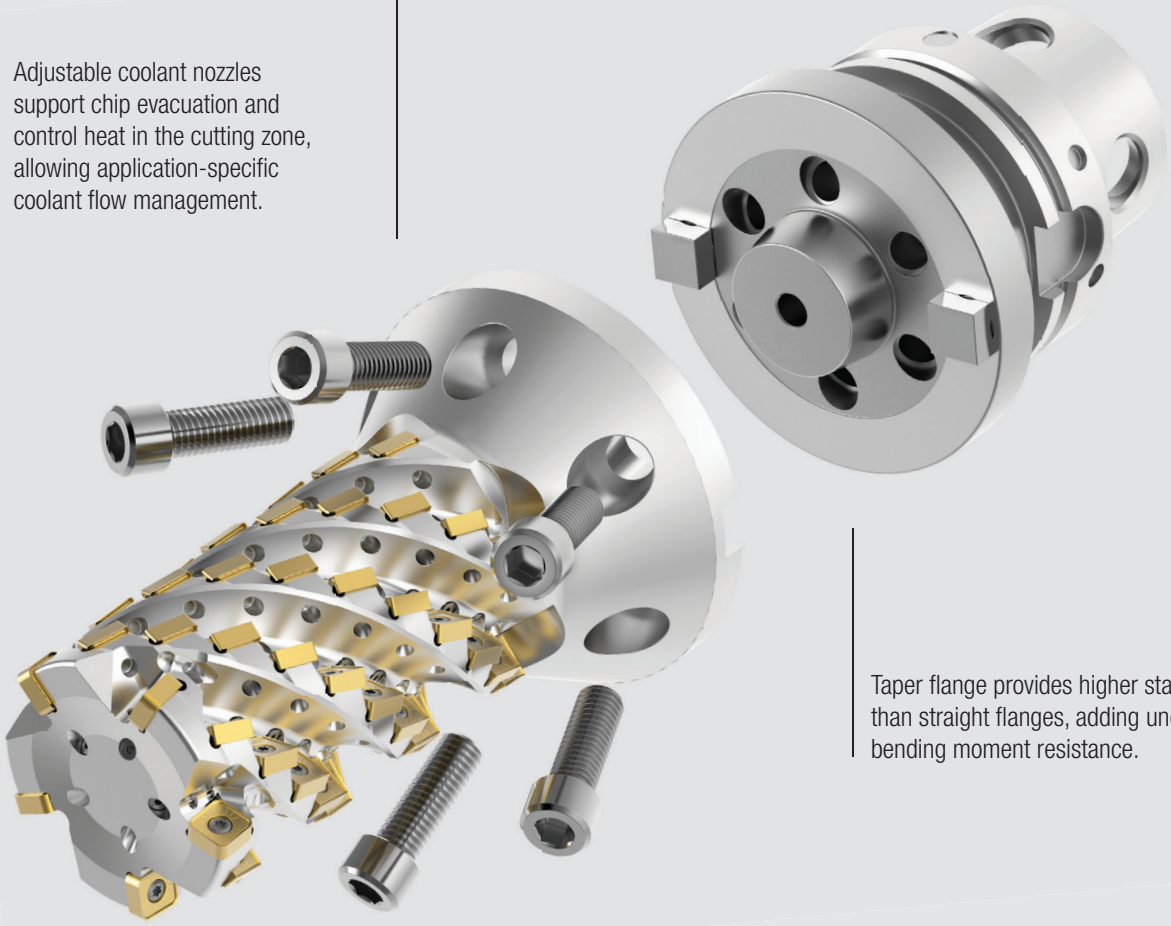
Lead inserts in various corner radii available, matching the needs of the aerospace industry.

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

NEW!
LEH geometry for light-to-medium machining.

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

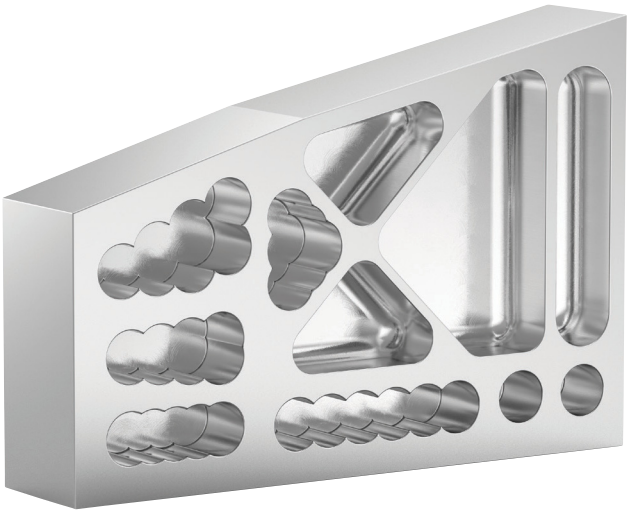
Adjustable coolant nozzles support chip evacuation and control heat in the cutting zone, allowing application-specific coolant flow management.



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

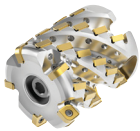
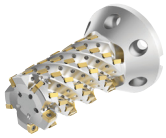
HARVI™ Ultra 8X cutters with different lead row pocket designs available. Especially for applications that require larger corner radii.

Process Step: Roughing



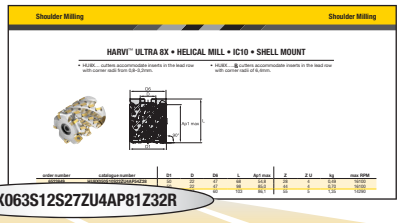
Aerospace typical insert radii from 8mm to 64mm available.

HARVI™ ULTRA 8X • TOOL SELECTION GUIDE

	HARVI Ultra 8X			
	SHELL MOUNT		TAPER FLANGE MOUNT	
				
Page	16, 19		16, 19	
Main operation				
Cutter diameter [D1]	50–80mm		50–80mm	
Maximum cutting depth [Ap1 max]	50,9–102,2mm		100,0–132,9mm	
Insert size IC	10 & 12mm		10 & 12mm	
Number of inserts per cutter [Z]	15–55		40–55	
Number of flutes per cutter [ZU]	3–5		4–5	
Internal coolant	✔		✔	
Additional operations				
Connection Style Machine Side (CSMS)				
Fits regular shell mill adaptors	✔		—	
Connection stiffness	■■		■■■	
Pilot diameter flange mount extension	22–32mm		117mm	
Flange mount size	BTF46		BTF46	
Cutting edges	8	4	8	4
Corner radius for 10mm inserts on 1st row	0,8mm	1,6–6,4mm	0,8mm	1,6–6,4mm
Corner radius for 10mm inserts after 1st row	0,8mm		0,8mm	
Corner radius for 12mm inserts on 1st row	0,8–2,4mm	3,2–6,4mm	0,8–2,4mm	3,2–6,4mm
Corner radius for 12mm inserts after 1st row	0,8mm		0,8mm	
Workpiece materials	P M S		P M S	

HARVI™ ULTRA 8X • CATALOGUE NUMBERING SYSTEM • CUTTERS

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

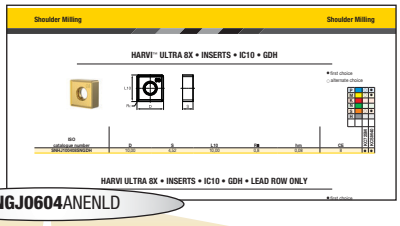


HU8X063S12S27ZU4AP81Z32R

HU8X	063	S12	S27	ZU4	AP81	Z32	R
HARVI Ultra 8X	Cutter Diameter	Insert Style and IC	Connection Style Machine Side (CSMS)	Number of Flutes	Maximum DoC	Number of Inserts	Large Radii
		S10 = IC10mm **S12** = IC12mm	**S** = Shell Mill **F** = Flange BTF46 Monoblock cutters available as custom solutions: KM4X™, HSK, CV, DV, etc.				*Cutters with an 'R' at the end have a 1st row that accepts larger corner radii.

HARVI™ ULTRA 8X • CATALOGUE NUMBERING SYSTEM • INSERTS

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

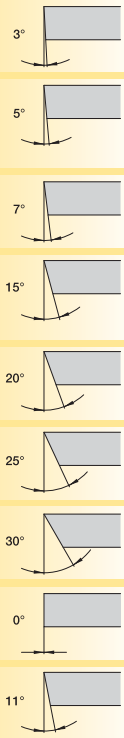


HNGJ0604ANENLD

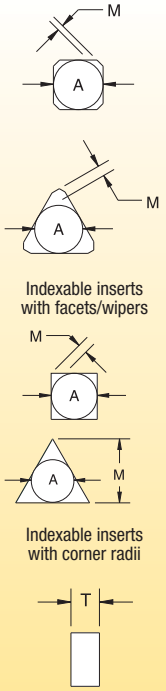
H — Insert Shape

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



G — Tolerance Class



J — Geometry and Clamping Type

06 — Size

	"L" for shapes						
A	C	T	R	O	C	H	E
6,00	–	–	06	–	–	–	–
6,35	06	11	06	02	06	03	06
8,00	–	–	08	–	–	–	–
9,52	09	16	09	04	09	05	09
10,00	–	–	10	–	–	–	–
12,00	–	–	12	–	–	–	–
12,70	12	22	12	05	12	07	13
15,88	15	27	15	06	16	09	16
16,00	–	–	16	–	–	–	–
19,05	19	33	19	07	19	11	19
20,00	–	–	20	–	–	–	–
25,00	–	–	25	–	–	–	–
25,40	25	44	25	10	25	14	26

For shapes A, L, and X, see position #1; use length of leading cutting edge.

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

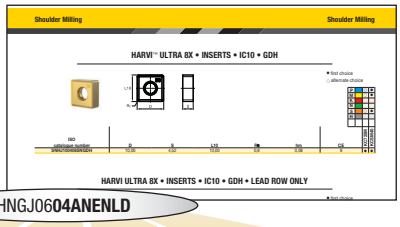
tolerance class	tolerance on "A"	tolerance on "M"	tolerance on "T"	tolerance class	tolerance on "A"	tolerance on "M"	tolerance on "T"
A	0,025	0,005	0,025	J	0,05–0,13*	0,005	0,025
B	0,025	0,005	0,13	K	0,05–0,13*	0,013	0,025
C	0,025	0,013	0,025	L	0,05–0,13*	0,025	0,025
D	0,025	0,013	0,13	M	0,05–0,10*	0,05–0,25*	0,13
E	0,025	0,025	0,025	N	0,05–0,10*	0,05–0,25*	0,025
F	0,013	0,005	0,025	P**	0,038	0,038	0,038
G	0,025	0,025	0,13	U	0,08–0,25*	0,13–0,30*	0,13
H	0,013	0,013	0,025	—	—	—	—

*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
4,76–10,00	0,051	0,076	0,076	0,127
11,11–14,29	0,076	0,127	0,127	0,203
15,00–20,64	0,102	0,178	0,152	0,279
22,00–31,16	0,127	0,254	0,178	0,381
31,75–35,00	0,152	0,254	0,203	0,381

HARVI™ ULTRA 8X • CATALOGUE NUMBERING SYSTEM • INSERTS

(continued)



HNGJ06**04ANENLD**

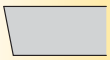
04 — Thickness

insert thickness

T	mm
2,38	02
3,18	03
3,97	T3
4,76	04
5,56	05
6,35	06
7,94	07

AN — Corner Configuration

E — Cutting Edge Form

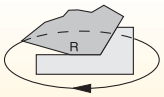
F 
Sharp

E
Honed

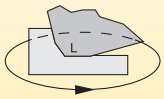
T
T-land

S
Honed T-land

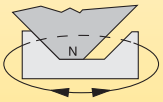
N — Insert Hand



direction of cutter rotation



direction of cutter rotation



direction of cutter rotation

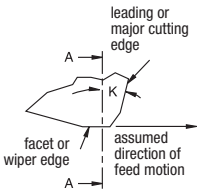
L — Edge Prep Size

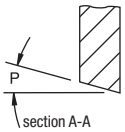
L = Light — sharp or lightly honed and/or T-land
G = General — medium hone and/or T-land
H = Heavy — large hone and/or T-land

D — Rake Face Angle

Added Info

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





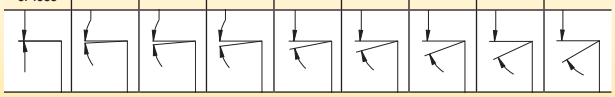
radius	
M0	round insert
01	0,1mm
02	0,2mm
04	0,4mm
05	0,5mm
08	0,8mm
10	1,0mm
12	1,2mm
15	1,5mm
16	1,6mm
24	2,4mm
32	3,2mm

If letter is replaced by number(s), refer to table for radius "r".

lead angle K	
A	45°
D	60°
E	75°
P	90°

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

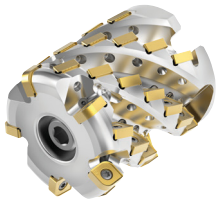
N	A	B	C	P	D	E	F	G
0° or less	3°	5°	7°	11°	15°	20°	25°	30°

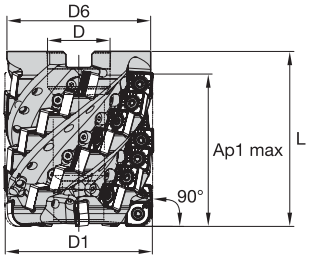


Nominal or average angle of rake on insert face at leading cutting edge before edge prep and before installation.

HARVI™ ULTRA 8X • HELICAL MILL • IC10 • SHELL MOUNT

- HU8X… cutters accommodate inserts in the lead row with corner radii from 0,8–3,2mm.
- HU8X…..**R** cutters accommodate inserts in the lead row with corner radii of 6,4mm.

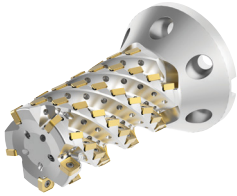


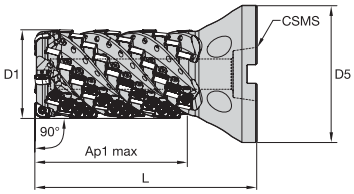


order number	catalogue number	D1	D	D6	L	Ap1 max	Z	Z U	kg	max RPM
6523849	HU8X050S10S22ZU4AP54Z28	50	22	47	68	54,8	28	4	0,49	16100
6523850	HU8X050S10S22ZU4AP84Z44	50	22	47	98	85,0	44	4	0,70	16100
6524711	HU8X063S10S27ZU5AP86Z55	63	27	60	103	86,1	55	5	1,35	14290

HARVI ULTRA 8X • HELICAL MILL • IC10 • TAPER FLANGE MOUNT

- HU8X… cutters accommodate inserts in the lead row with corner radii from 0,8–3,2mm.
- HU8X…..**R** cutters accommodate inserts in the lead row with corner radii of 6,4mm.

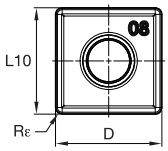


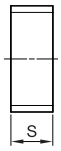


order number	catalogue number	D1	D5	CSMS	L	Ap1 max	Z	Z U	kg	max RPM
6523956	HU8X050S10F462ZU4AP100Z52	50	117	BTF46	178	100,0	52	4	3,70	16100

50–51	52	13, 14–15	39, 54

HARVI™ ULTRA 8X • INSERTS • IC10 • GDH



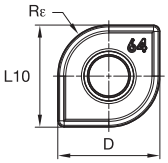


● first choice
○ alternate choice

P		○	●
M		○	●
K			
N			
S		○	●
H			

ISO catalogue number	D	S	L10	Rε	hm	CE	KC725M	KCSM40
SNHJ100408SNGDH	10,00	4,52	10,00	0,8	0,08	8	●	●

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



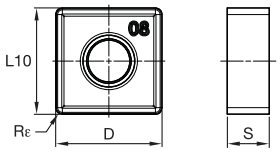
● first choice
○ alternate choice

P		○	●
M		○	●
K			
N			
S		○	●
H			

ISO catalogue number	D	S	L10	Rε	hm	CE	KC725M	KCSM40
SNHJ100416SNGDH	10,00	4,52	10,00	1,6	0,08	4	–	●
SNHJ100424SNGDH	10,00	4,52	10,00	2,4	0,08	4	–	●
SNHJ100432SNGDH	10,00	4,52	10,00	3,2	0,08	4	–	●
SNHJ100448SNGDH	10,00	4,52	10,00	4,8	0,08	4	–	●
SNHJ100464SNGDH	10,00	4,52	10,00	6,4	0,08	4	●	●

50–51	52	13, 14–15	39, 54

HARVI™ ULTRA 8X • INSERTS • IC10 • LEH

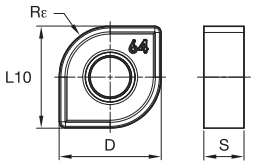


● first choice
○ alternate choice

P		○	●
M		○	●
K			
N			
S		○	●
H			

ISO catalogue number	D	S	L10	Rε	hm	CE	KC725M	KCSM40
SNHJ100408ENLEH	10,00	4,52	10,00	0,8	0,04	8	–	●

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



● first choice
○ alternate choice

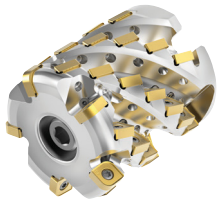
P		○	●
M		○	●
K			
N			
S		○	●
H			

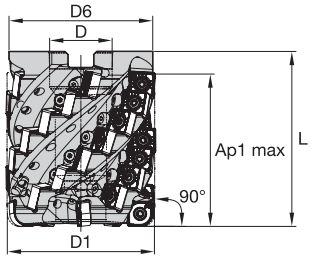
ISO catalogue number	D	S	L10	Rε	hm	CE	KC725M	KCSM40
SNHJ100464ENLEH	10,00	4,52	10,00	6,4	0,04	4	–	●

50–51	52	13, 14–15	39, 54

HARVI™ ULTRA 8X • HELICAL MILL • IC12 • SHELL MOUNT

- HU8X… cutters accommodate inserts in the lead row with corner radii from 0,8–3,2mm.
- HU8X…..**R** cutters accommodate inserts in the lead row with corner radii from 4,8–6,4mm.

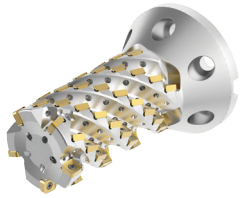


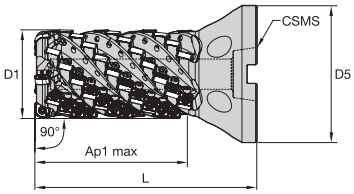


order number	catalogue number	D1	D	D6	L	Ap1 max	Z	Z U	kg	max RPM
6524712	HU8X050S12S22ZU3AP50Z15	50	22	49	75	50,9	15	3	0,57	16400
6524713	HU8X050S12S22ZU3AP70Z21	50	22	49	95	71,0	21	3	0,69	16400
6524714	HU8X063S12S27ZU4AP60Z24	63	27	60	75	60,8	24	4	0,88	14600
6423303	HU8X063S12S27ZU4AP81Z32R	63	27	60	95	81,2	32	4	1,11	14600
6423302	HU8X063S12S27ZU4AP81Z32	63	27	60	95	81,2	32	4	1,11	14600
6524715	HU8X080S12S32ZU5AP72Z35	80	32	78	90	72,0	35	5	2,02	12900
6423305	HU8X080S12S32ZU5AP102Z50R	80	32	77	115	102,2	50	5	2,46	12900
6423304	HU8X080S12S32ZU5AP102Z50	80	32	77	115	102,2	50	5	2,46	12900

HARVI ULTRA 8X • HELICAL MILL • IC12 • TAPER FLANGE MOUNT

- HU8X… cutters accommodate inserts in the lead row with corner radii from 0,8–3,2mm.
- HU8X…..**R** cutters accommodate inserts in the lead row with corner radii from 4,8–6,4mm.

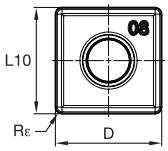


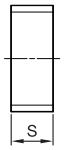


order number	catalogue number	D1	D5	CSMS	L	Ap1 max	Z	Z U	kg	max RPM
6524716	HU8X063S12F462ZU4AP100Z40R	63	117	BTF46	175	101,5	40	4	3,91	14600
6524717	HU8X080S12F462ZU5AP133Z65R	80	117	BTF46	204	132,9	65	5	2,46	12900

50–51	52	13, 14–15	39, 54

HARVI™ ULTRA 8X • INSERTS • IC12 • GDH



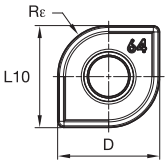


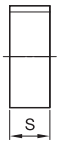
● first choice
○ alternate choice

P	○	●
M	○	●
K		
N		
S	○	●
H		

ISO catalogue number	D	S	L10	Rε	hm	CE	KC725M	KCSM40
SNHJ120608SNGDH	12,70	4,52	12,70	0,8	0,08	8	●	●

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





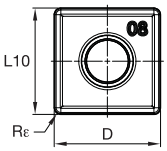
● first choice
○ alternate choice

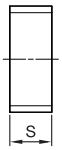
P	○	●
M	○	●
K		
N		
S	○	●
H		

ISO catalogue number	D	S	L10	Rε	hm	CE	KC725M	KCSM40
SNHJ120616SNGDH	12,70	4,52	12,70	1,6	0,08	8	–	●
SNHJ120624SNGDH	12,70	4,52	12,70	2,4	0,08	8	–	●
SNHJ120632SNGDH	12,70	4,52	12,70	3,2	0,08	4	–	●
* SNHJ120640SNGDH	12,70	4,52	12,70	4,0	0,08	4	–	●
SNHJ120648SNGDH	12,70	4,52	12,70	4,8	0,08	4	–	●
SNHJ120660SNGDH	12,70	4,52	12,70	6,0	0,08	4	–	●
SNHJ120664SNGDH	12,70	4,52	12,70	6,4	0,08	4	●	●

*SNHJ120640SNGDH requires modification of the cutter body.

HARVI ULTRA 8X • INSERTS • IC12 • LEH





● first choice
○ alternate choice

P	○	●
M	○	●
K		
N		
S	○	●
H		

ISO catalogue number	D	S	L10	Rε	hm	CE	KC725M	KCSM40
SNHJ120608ENLEH	12,70	4,56	12,70	0,8	0,04	8	–	●

50–51	52	13, 14–15	39, 54

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 [MM]

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	–	**–**	–	0,18	**0,29**	0,45	0,16	**0,26**	0,40	0,13	**0,21**	0,33	0,07	**0,12**	0,18
P6	–	**–**	–	0,18	**0,24**	0,38	0,16	**0,22**	0,34	0,13	**0,18**	0,27	0,07	**0,10**	0,15
M1	–	**–**	–	0,18	**0,28**	0,43	0,16	**0,25**	0,38	0,13	**0,20**	0,31	0,07	**0,11**	0,17
M2	–	**–**	–	0,18	**0,28**	0,43	0,16	**0,25**	0,38	0,13	**0,20**	0,31	0,07	**0,11**	0,17
M3	–	**–**	–	0,18	**0,24**	0,38	0,16	**0,22**	0,34	0,13	**0,18**	0,27	0,07	**0,10**	0,15
S1	–	**–**	–	0,18	**0,20**	0,30	0,16	**0,17**	0,27	0,13	**0,14**	0,22	0,07	**0,08**	0,12
S2	–	**–**	–	0,18	**0,20**	0,30	0,16	**0,17**	0,27	0,13	**0,14**	0,22	0,07	**0,08**	0,12
S3	–	**–**	–	0,18	**0,23**	0,35	0,16	**0,20**	0,31	0,13	**0,17**	0,26	0,07	**0,09**	0,14
S4	–	**–**	–	0,18	**0,28**	0,43	0,16	**0,25**	0,38	0,13	**0,20**	0,31	0,07	**0,11**	0,17

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

HARVI ULTRA 8X • RECOMMENDED STARTING SPEEDS [M/MIN]

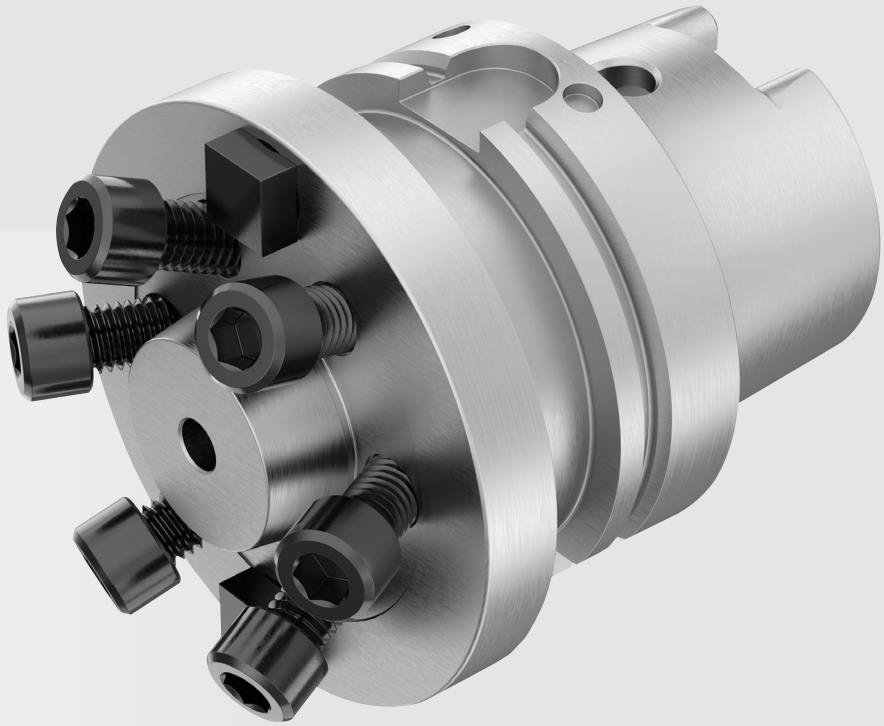
Material Group		KC725M			KCSM40		
P	1	–	**–**	–	–	**–**	–
	2	–	**–**	–	–	**–**	–
	3	–	**–**	–	–	**–**	–
	4	–	**–**	–	–	**–**	–
	5	120	**110**	95	250	**138**	125
	6	105	**80**	65	225	**127**	115
M	1	135	**120**	110	270	**127**	115
	2	125	**105**	90	270	**127**	115
	3	90	**80**	65	200	**88**	80
K	1	–	**–**	–	–	**–**	–
	2	–	**–**	–	–	**–**	–
	3	–	**–**	–	–	**–**	–
N	1	–	**–**	–	–	**–**	–
	2	–	**–**	–	–	**–**	–
	3	–	**–**	–	–	**–**	–
S	1	30	**25**	20	60	**27**	23
	2	30	**25**	20	50	**27**	21
	3	35	**30**	20	55	**32**	24
	4	45	**35**	25	80	**45**	35
H	1	–	**–**	–	–	**–**	–
	2	–	**–**	–	–	**–**	–
	3	–	**–**	–	–	**–**	–

NOTE: First choice starting speeds are in **bold** type.
Do not exceed max RPM. Reduce speed if necessary.

POWERED BY NOVO™

BTF Adaptors

Bolt Taper Flange Mount Adaptors



kennametal.com/BTF-Adapters

The BTF Adaptors are designed to provide maximum tool stiffness, increasing tool life and productivity in very demanding aerospace titanium component applications.

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

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

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

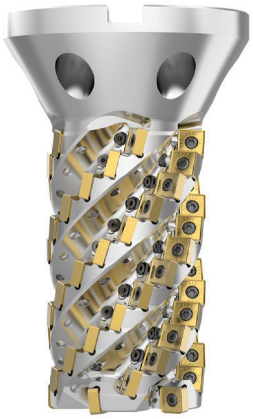
Connectivity flexibility

DV BT HSK KM4X

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

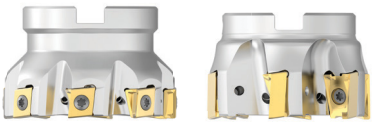
Shell mill adaptor with taper flange mount

FBX Drill



HARVI™ Ultra 8X with taper flange mount

HARVI Ultra 8X with shell mill mount

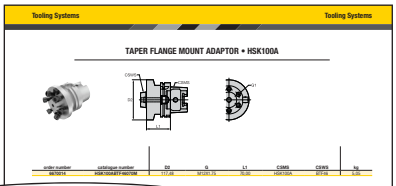


Other milling cutters with shell mill mount

Shoulder Milling

TAPER FLANGE MOUNTING ADAPTORS • CATALOGUE NUMBERING SYSTEM

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



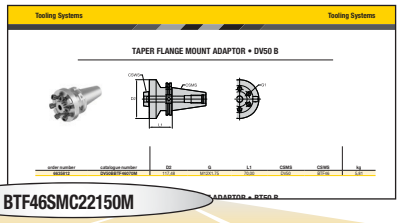
HSK50FBTF46070M

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

Shoulder Milling

SHELL MILL ADAPTOR WITH TAPER FLANGE MOUNT • CATALOGUE NUMBERING SYSTEM

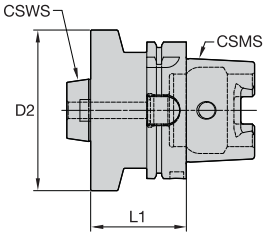
Each character in our catalogue number signifies a specific trait of that product. Use the following key columns and corresponding images to easily identify which attributes apply.

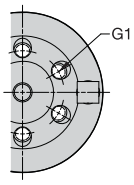


BTF46SMC22150M

BTF	46	SMC	22	150	M
Toolholder Style	Mounting Size	Shell Mill Style	Pilot Size (D1)	Tool Length	Identification Values
BTF = Bolt Taper Flange	**46** = 46mm	**SMC** = Shell Mill Adaptor with Coolant **SM2C** = Shell Mill Adaptor with Coolant and reduced D2 dimension **SM3C** = Shell Mill Adaptor with Coolant and reduced D2 dimension-bolt on keys	**22** = 22mm **27** = 27mm **32** = 32mm	Gage Line of Adaptor in mm/inch	**M** = Tool built to metric values **Blank** = Inch

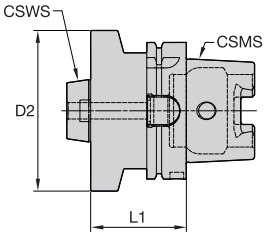
TAPER FLANGE MOUNT ADAPTOR • HSK100A

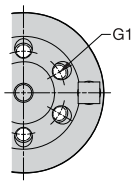




order number	catalogue number	D2	G	L1	CSMS	CSWS	kg
6670014	**HSK100ABTF46070M**	117,48	M12X1.75	70,00	HSK100A	BTF46	5,05

TAPER FLANGE MOUNT ADAPTOR • HSK125A

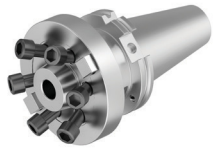


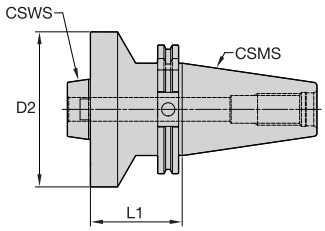


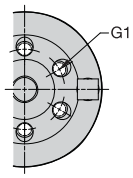
order number	catalogue number	D2	G	L1	CSMS	CSWS	kg
6670017	**HSK125ABTF46070M**	117,48	M12X1.75	70,00	HSK125A	BTF46	6,68

52	24–25	39, 54

TAPER FLANGE MOUNT ADAPTOR • DV50 B

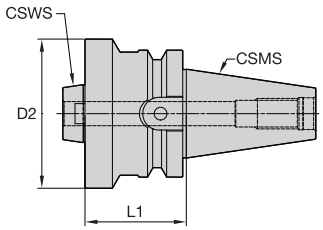


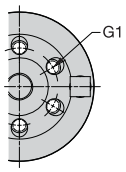




order number	catalogue number	D2	G	L1	CSMS	CSWS	kg
6635812	DV50BBTF46070M	117,48	M12X1.75	70,00	DV50	BTF46	5,81

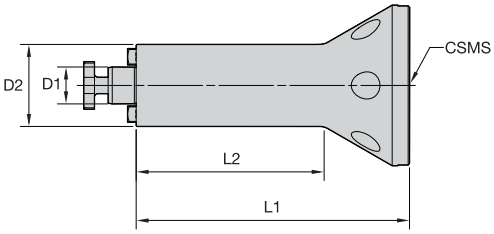
TAPER FLANGE MOUNT ADAPTOR • BT50 B





order number	catalogue number	D2	G	L1	CSMS	CSWS	kg
6621043	BT50BBTF46080M	117,48	M12X1.75	80,00	BT50	BTF46	6,85

TAPER FLANGE MOUNT ADAPTOR • SHELL MILL ADAPTOR



order number	catalogue number	D1	D2	L1	L2	CSMS	kg
6808363	BTF46SMC22150M	22,00	49,00	150,00	74,80	BTF46	4,25
6808364	BTF46SMC22200M	22,00	49,00	200,00	124,80	BTF46	4,25
6808365	BTF46SMC27150M	27,00	60,00	150,00	84,30	BTF46	4,84
6808366	BTF46SMC27200M	27,00	60,00	200,00	134,30	BTF46	5,92
6808367	BTF46SMC32150M	32,00	78,00	150,00	99,90	BTF46	6,32
6808368	BTF46SMC32200M	32,00	78,00	200,00	149,90	BTF46	8,13

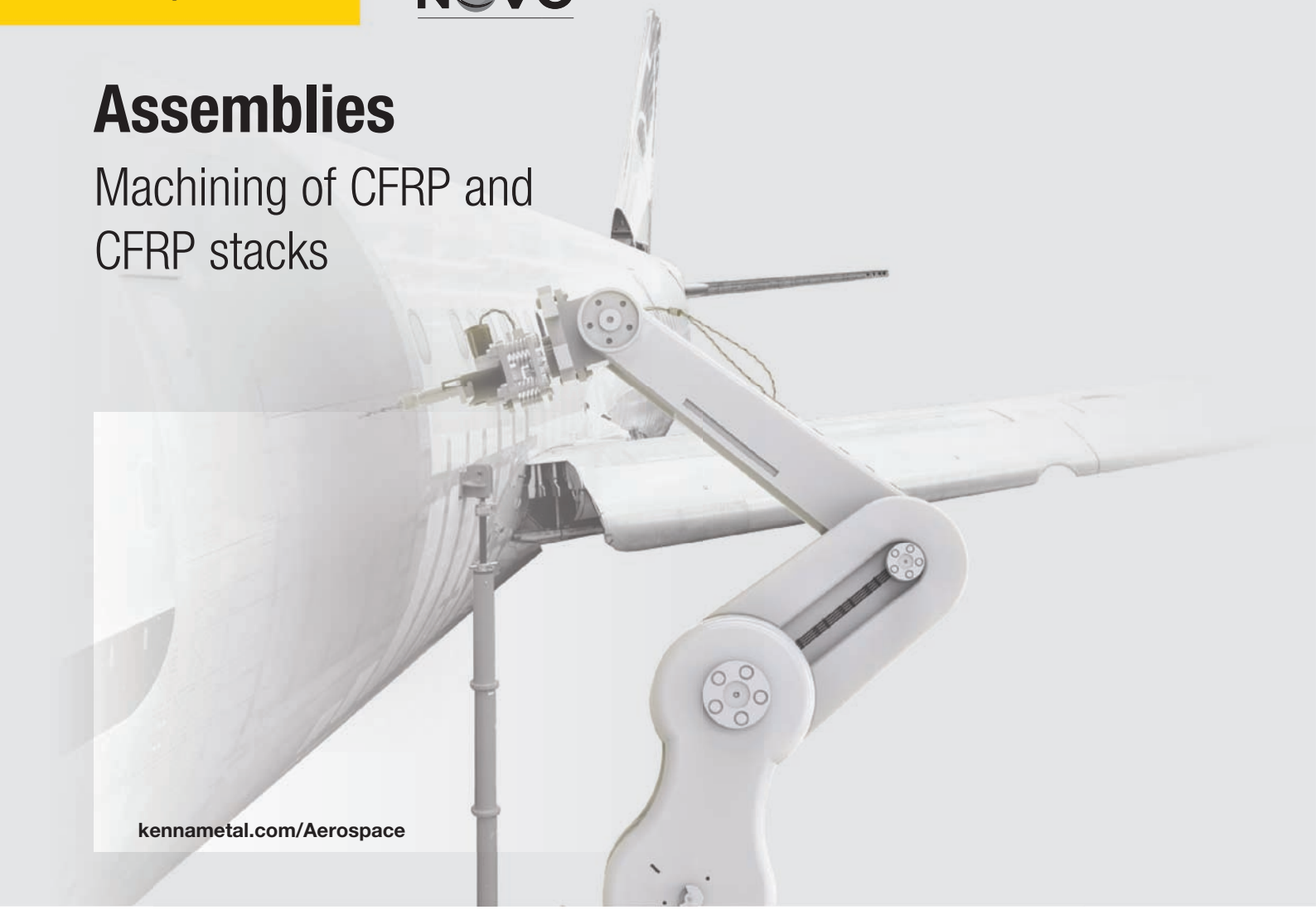
52	24–25	39, 54

Aerospace

POWERED BY NOVO

Assemblies

Machining of CFRP and CFRP stacks



kennametal.com/Aerospace

Composite materials are utilised 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 centres.

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

Modern Airplane Material Mix

POWERED BY NOVO

KenTIP™ FS – DAL and SPF Inserts

Modular Drilling for CFRP and Stack Materials

Materials

P M K

Applications

- Counterboring
- Drilling
- Drilling: Inclined Entry
- Drilling: Flat Bottom
- Drilling: Inclined Exit
- Drilling: Cross Hole

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.

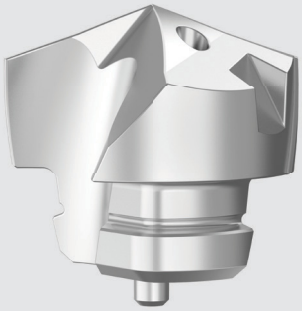
Quick release. Every drill body comes with a KenTIP smart wrench. Insert exchange in the machine becomes easy and saves idle time. And that saves money.

DAL insert for CFRP stacks with metal exit, non-ferrous materials, and titanium.

Diamond coating for best tool life.

Through coolant.

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



DAL

SPF insert for CFRP.

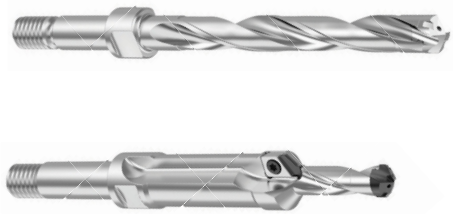
Diamond coating for best tool life on CFRP stacks.

Through coolant.

Uncoated for cost-efficient aluminium machining.

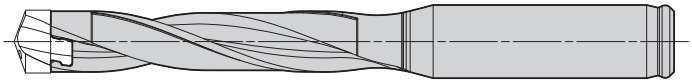
Double angle geometry with 128° and 155° point angle to minimise exits burrs.

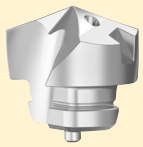
SPF



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

MODULAR DRILLS • TOOL SELECTION GUIDE

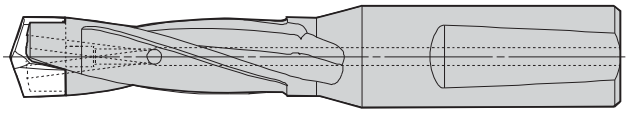


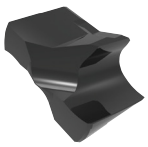
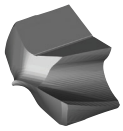
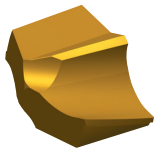
	KenTIP™ FS					
	DAL	SPF	FEG	HPG	HPC	HPL
	NEW! 	NEW!				
Page	37	37	31**	H8*	H12*	H14*
Workpiece material						
Primary	N C	C	P K	P	K	M
Secondary	S		M	K	P	S
Main operation						
Point angle	128°/155°	128°/90°	145°/180°	143°	143°	140°
Cutting diameter [D1]	6,35–12,7mm	6,35–12,7mm	6,0–26,0mm	6,0–26,0mm	6,0–26,0mm	6,0–26,0mm
Flutes and margin						
Corner chamfer			C	C	R	C

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

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

MODULAR DRILLS • TOOL SELECTION GUIDE



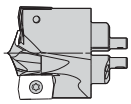
	KSEM™						
	FEG	HP	HPG	HPCCL	HPL	SPL	PC
							
Page	H29*	H26*	H8*	H48*	H14*	H52*	H56*
Workpiece material							
Primary	P K	P	P	K	M	M S	P K
Secondary	M S	K	M K			P N	M
Main operation							
Point angle	150°/180°	140°	140°	140°	140°	140°	150°
Cutting diameter [D1]	12,5–40,0mm	12,5–40,0mm	12,5–40,0mm	12,5–40,0mm	12,5–40,0mm	12,5–40,0mm	12,5–40,0mm
Flutes and margin							
Corner chamfer							

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

MODULAR DRILLS • TOOL SELECTION GUIDE

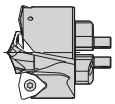
KSEM PLUS™—A1 Heads

dia.: 28–31,75mm



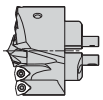
2 x DFR

dia.: 31,76–70,34mm



2 x DFT

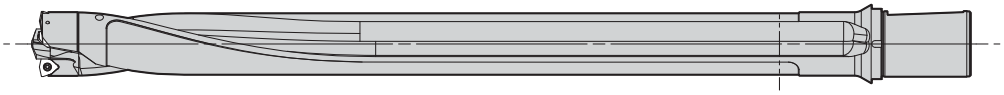
dia.: 70,35–93,34mm



4 x DFT

dia.: 93,35–101mm

6 x DFT



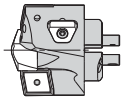
	KSEM PLUS A1 Heads					
Drill head style						
Centre insert	HPG			FEG		
Outboard insert	DFR-GD	DFR-MD	DFR-LD	DFT-HP	DFT-MD	DFT-DS
Page	H89–J84*			H90–J87*		
Workpiece material						
Primary	P K S	P M	K N	P K S	P M	P M
Secondary	M N	K N S	P M S	M N	K N S	N S
Main operation						
Cutting diameter [D1]	28,0–31,75mm			31,75–101,40mm		
Flutes and margin						

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

MODULAR DRILLS • TOOL SELECTION GUIDE

KSEM PLUS™ — B1 Heads

dia.: 28–70,34mm



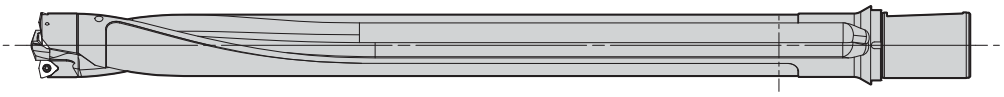
2 x DFC

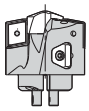
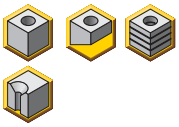
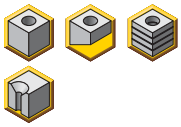
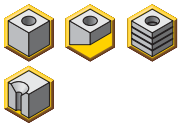
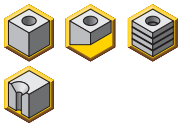
dia.: 70,34–93,34mm

4 x DFC

dia.: 93,35–101mm

6 x DFC



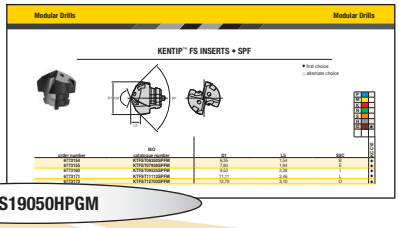
	KSEM PLUS B1 Heads			
Drill head style				
Centre insert	HPG		FEG	
Outboard insert	DFC-HP	DFC-MD	DFC-DS	DFC-HPF
Page	H90*			40**
Workpiece material				
Primary	P K S	P M	P M	P S
Secondary	M N	K N S	N S	M K N
Main operation				
Cutting diameter [D1]	28,0–101mm			
Flutes and margin				

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

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

KENTIP™ FS • INSERT • CATALOGUE NUMBERING SYSTEM

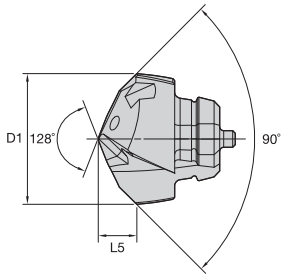
Each character in our catalogue number signifies a specific trait of that product.
Use the following key columns and corresponding images to easily identify which attributes apply.

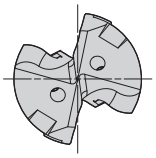


KTFSS19050HPGM

KTFS	S	19050	HPG	M
Drill Series	Coolant Type	Diameter	Point Geometry	Suffix
KTFS = KenTIP FS	**T** = Through-the-insert coolant **S** = Solid insert without coolant channels	Metric or Inch, depends on suffix	**HPG** = Steel **HPL** = Stainless Steel **HPC** = Cast Iron **FEG** = Flat Bottom **DAL** = Stack, Titanium, Aluminium **SPF** = CFPR	**M** = Metric diameter **Blank** = Inch diameter

KENTIP™ FS INSERTS • SPF



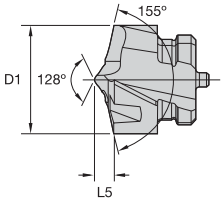


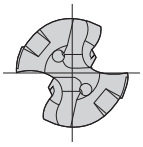
● first choice
○ alternate choice

P		
M		
K		
N		
S		
H		
C		●

order number	ISO catalogue number	D1	L5	SSC	KCC10
6773154	KTFST06350SPFM	6,35	1,54	B	●
6773155	KTFST07938SPFM	7,94	1,94	E	●
6773160	KTFST09525SPFM	9,53	2,38	I	●
6773171	KTFST11113SPFM	11,11	2,46	L	●
6773172	KTFST12700SPFM	12,70	3,10	O	●

KENTIP FS INSERTS • DAL





● first choice
○ alternate choice

P			
M			
K			
N			●
S			○
H			
C		●	●

order number	ISO catalogue number	D1	L5	SSC	KCC10	KN15
6773176	KTFST06350DALM	6,35	1,13	B	●	–
6773231	KTFST06350DALM	6,35	1,13	B	–	●
6773232	KTFST06800DALM	6,80	1,21	C	–	●
6773177	KTFST07938DALM	7,94	1,41	E	●	–
6773233	KTFST07938DALM	7,94	1,41	E	–	●
6773234	KTFST08000DALM	8,00	1,44	F	–	●
6773235	KTFST08500DALM	8,50	1,54	G	–	●
6773236	KTFST09000DALM	9,00	1,63	H	–	●
6773178	KTFST09525DALM	9,53	1,73	I	●	–
6773237	KTFST09525DALM	9,53	1,73	I	–	●
6773238	KTFST10000DALM	10,00	1,83	J	–	●
6773179	KTFST11113DALM	11,11	2,04	L	●	–
6773239	KTFST11113DALM	11,11	2,04	L	–	●
6773240	KTFST11500DALM	11,50	2,13	M	–	●
6773180	KTFST12700DALM	12,70	2,37	O	●	–
6773241	KTFST12700DALM	12,70	2,37	O	–	●

50–51	52	36	39, 54

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

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	80	120	150	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
	3	10	15	25	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
	4	10	25	50	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

KENTIP FS • DAL • APPLICATION DATA • KN15

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
S	4	10	15	25	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
N	1	100	230	270	mm/r	0.13–0.22	0.16–0.24	0.20–0.28	0.24–0.32	0.28–0.40	0.32–0.48
	2	100	220	270	mm/r	0.14–0.23	0.16–0.28	0.20–0.32	0.24–0.36	0.28–0.44	0.32–0.52
	3	90	180	230	mm/r	0.13–0.22	0.16–0.24	0.20–0.28	0.24–0.32	0.28–0.40	0.32–0.44
	4	90	130	200	mm/r	0.10–0.18	0.16–0.28	0.20–0.32	0.24–0.36	0.28–0.40	0.32–0.48

NOVO™

Digitally access and leverage product data and knowledge to connect systems and processes throughout the entire manufacturing lifecycle.

VISIT **KENNAMETAL.COM**/NOVO AND DOWNLOAD TODAY.

KENNAMETAL®

kennametal.com

POWERED BY NOVO

HiPACS

Fastener Hole Drilling and Countersinking System

Materials

C N S

Applications

- Drilling
- Drilling: Half-Cylindrical
- Drilling: Stacked Plates
- Drilling: Countersinking/ Stroke Chamfering
- Coolant: Dry: Drilling
- Through Coolant: Radial: Drilling

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.

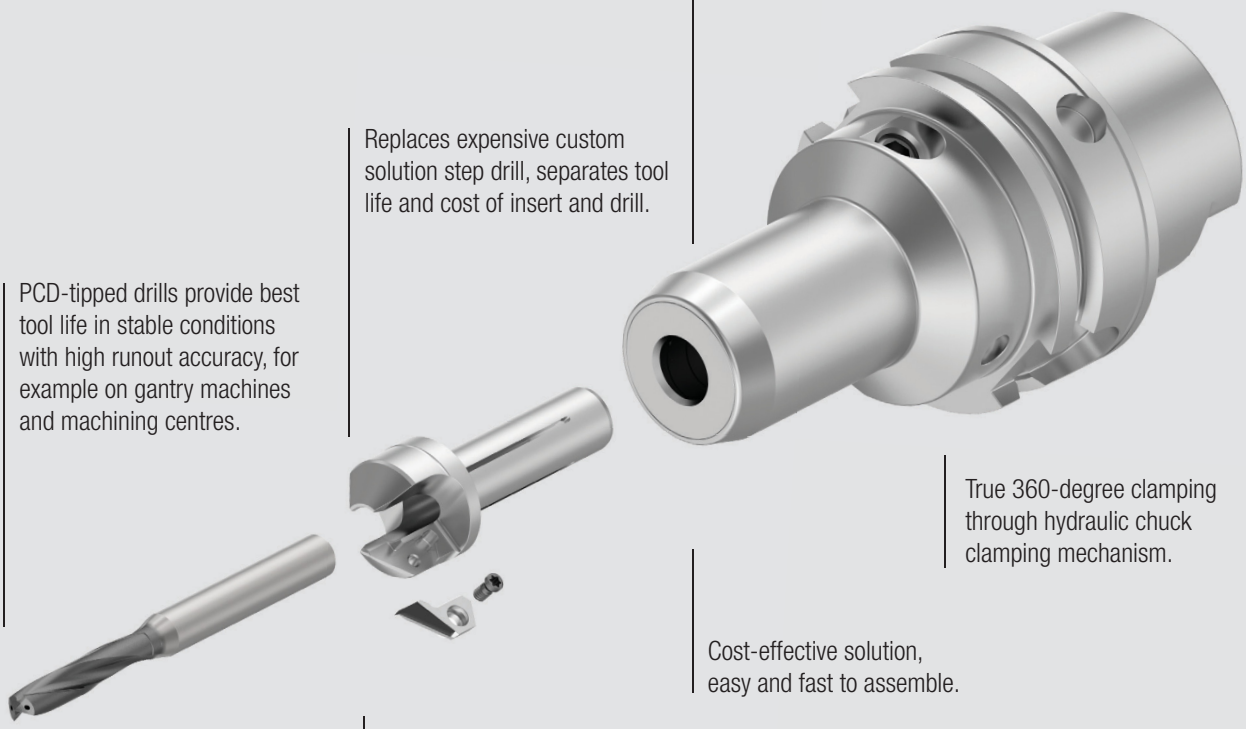
This easy-to-assemble system reduces cost per hole since drill and chamfer insert can be indexed independently from another.

The straight shank enables length adjustment of 10mm.

Designed to be clamped in a standard hydraulic chuck.

Replaces expensive custom solution step drill, separates tool life and cost of insert and drill.

PCD-tipped drills provide best tool life in stable conditions with high runout accuracy, for example on gantry machines and machining centres.



True 360-degree clamping through hydraulic chuck clamping mechanism.

Cost-effective solution, easy and fast to assemble.

High-precision system to drill and chamfer in one operation.

Diamond coated carbide drills offer competitive tool life in less stable conditions like on robot end effectors.

B516 – SPF PCD-tipped drill for CFRP.

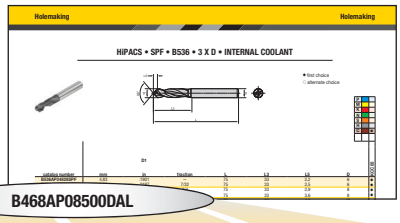
B536 – SPF Diamond coated carbide drill for CFRP.

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 • CATALOGUE NUMBERING SYSTEM • DRILLS

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

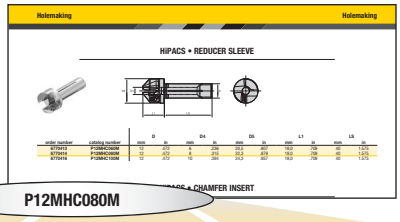


B468AP08500DAL

B	46	8	A	P	08500	DAL
Style	Drill Series	Length/Coolant	Shank	Insert Surface	Diameter	Point Geometry/ Application
B = Metric **K** = Inch	**51** = SPF, PCD **53** = SPF, carbide **55** = DAL, carbide **56** = DAL, PCD	**6** = 3 x D, internal coolant	**A** = Form HA, straight round shank	**P** = HiPACS clearance	**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

HiPACS • CATALOGUE NUMBERING SYSTEM • SLEEVE

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

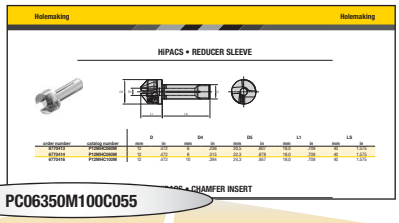


P12MHC080M

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 • CATALOGUE NUMBERING SYSTEM • INSERT

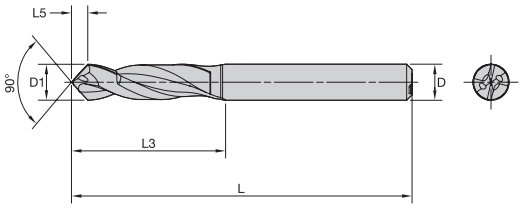
Each character in our catalogue number signifies a specific trait of that product.
Use the following key columns and corresponding images to easily identify which attributes apply.



PC06350M100C055

PC	06350	M	100	C055
Style	Diameter of Drill	Drill Diameter Unit	Countersink Angle	Corner Style
HiPACS	**06350** = 6.35mm	**M** = Metric	**100** = 100°	**C055** = With chamfer, 55° **R090** = With radius, 0.9mm

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

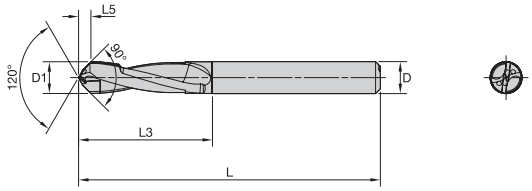


● first choice
○ alternate choice

P		
M		
K		
N		
S		
H		
C		●

catalogue number	D1	L	L3	L5	D	KCC05
B536AP04828SPF	4,83	75	33	2,2	6	●
B536AP05558SPF	5,56	75	33	2,5	6	●
B536AP06350SPF	6,35	75	33	2,9	8	●
B536AP07938SPF	7,94	75	33	3,6	8	●
B536AP09525SPF	9,53	75	33	4,3	10	●

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



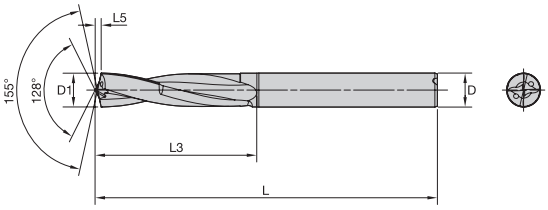
● first choice
○ alternate choice

P		
M		
K		
N		
S		
H		
C		●

catalogue number	D1	L	L3	L5	D	KDC05
B516AP04828SPF	4,83	75	33	1,9	6	●
B516AP05558SPF	5,56	75	33	2,2	6	●
B516AP06350SPF	6,35	75	33	2,5	8	●
B516AP07938SPF	7,94	75	33	3,1	8	●
B516AP09525SPF	9,53	75	33	3,7	10	●

50–51	52	42–43	39, 54

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

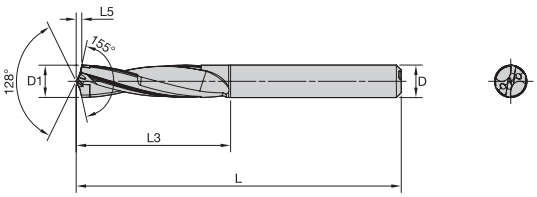


● first choice
○ alternate choice

P		
M		
K		
N		
S		
H		
C		●

catalogue number	D1	L	L3	L5	D	KCC05
B556AP04828DAL	4,83	80	38	0,9	6	●
B556AP05558DAL	5,56	80	38	1,0	6	●
B556AP06350DAL	6,35	80	38	1,1	8	●
B556AP07938DAL	7,94	80	38	1,4	8	●
B556AP09525DAL	9,53	80	38	1,7	10	●

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



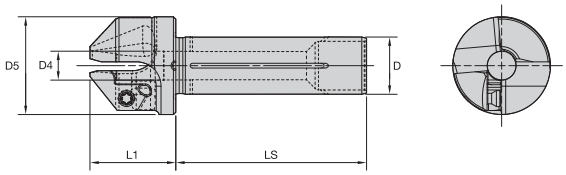
● first choice
○ alternate choice

P		
M		
K		
N		●
S		○
H		
C		●

catalogue number	D1	L	L3	L5	D	KDC15
B566AP04828DAL	4,83	80	38	0,8	6	●
B566AP05558DAL	5,56	80	38	1,0	6	●
B566AP06350DAL	6,35	80	38	1,1	8	●
B566AP07938DAL	7,94	80	38	1,4	8	●
B566AP09525DAL	9,53	80	38	1,7	10	●

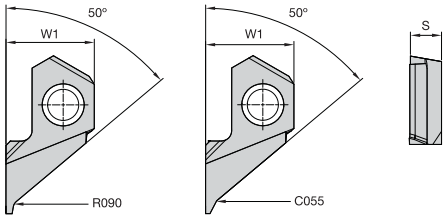
50–51	52	42–43	39, 54

HiPACS • REDUCER SLEEVE



order number	catalogue number	D	D4	D5	L1	LS
6770413	P12MHC060M	12	6	20,5	18,0	40
6770414	P12MHC080M	12	8	22,3	18,0	40
6770416	P12MHC100M	12	10	24,3	18,0	40

HiPACS • CHAMFER INSERT



● first choice
○ alternate choice

P		
M		
K		
N		●
S		○
H		
C		●

catalogue number	W1	S	KD1425
PC06350M100C055	8,52	3,00	●
PC06350M100R090	8,52	3,00	●

50–51	52	42–43	39, 54

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	—	—

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	—	—

DAL • B566 • INTERNAL COOLANT • APPLICATION DATA • KDC15

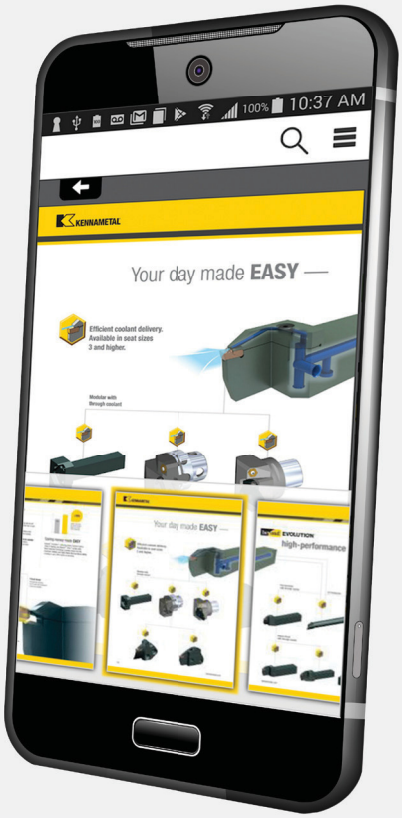
Material Group		Cutting Speed — vc Range — m/min min	Starting Value	max	Metric Recommended Feed Rate per Rev	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
C	2	80	120	150	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12	0,05–0,15	0,05–0,18	0,06–0,21	0,07–0,23
	3	10	15	25	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12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

DAL • B556• INTERNAL COOLANT • APPLICATION DATA • KCC05

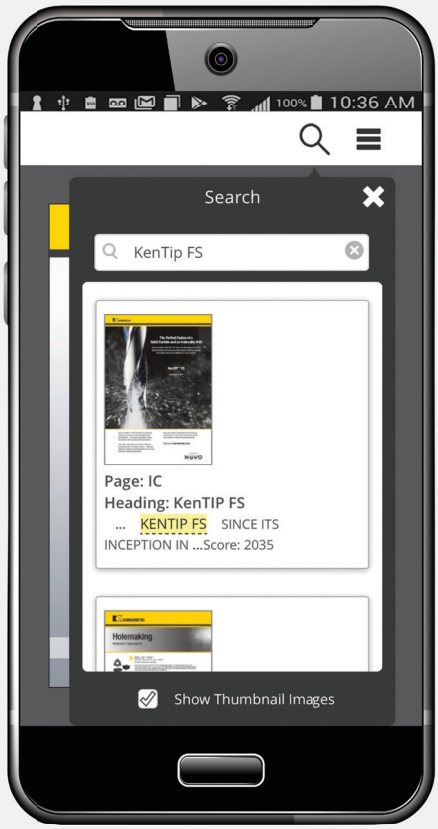
Material Group		Cutting Speed — vc Range — m/min min	Starting Value	max	Metric Recommended Feed Rate per Rev	3,0	4,0	6,0	8,0	10,0	12,0	16,0	20,0
C	2	80	120	150	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12	0,05–0,15	0,05–0,18	0,06–0,21	0,07–0,23
	3	10	15	25	mm/r	0,01–0,05	0,02–0,07	0,03–0,10	0,04–0,12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

Catalogue App

Browse Pages



Search Products



Watch a Video

Check out our new catalogue app.
Available in the Google Play™ Store
or the App Store®

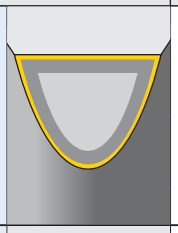
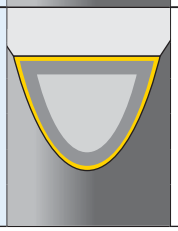
OR VISIT **CATALOGS.KENNAMETAL.COM** TODAY.

KENNAMETAL

Grades and Grade Descriptions

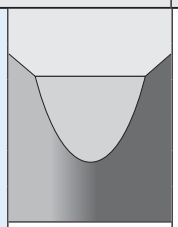
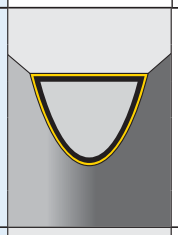
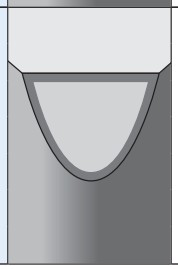
INDEXABLE MILLING

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

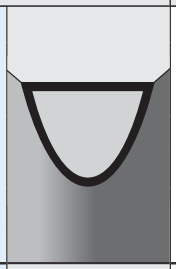
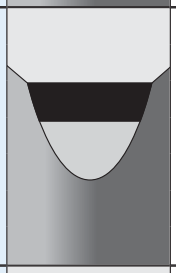
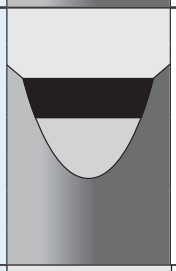
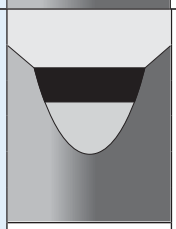
wear resistance ← → toughness

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									
			C									
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.	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									

Grades and Grade Descriptions

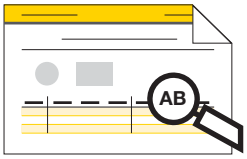
HOLEMAKING

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.	C									
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.	C									
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.	N C									
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.	N C									

General Information

KEY TO PRODUCT TABLE COLUMN HEADINGS



You may notice a slight change in the appearance of our product tables and specification charts. In this catalogue, 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	Adaptor/Shank 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
Ll	Insert Length
LS	Shank Length
R	Profile or Ball Nose Radii
Rε	Corner Radius
Torque (ft. lbs.)	Torque Foot Pounds
Nm	Torque Newton Meters
Z	Number of Flutes
Z U	Number of Flutes

Material Cross Reference • DIN

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	–	–
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	Grey 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 Aluminium	–	–	–	–	AlMg1, Al99.5, AlCuMg1, AlCuBiPb, AlMgSi1, ALMgSiPb
N2	Low-Silicon Aluminium Alloys and Magnesium Alloys	Si <12,2%	–	–	–	GAlSiCu4, GDAlSi10Mg
N3	High-Silicon Aluminium 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, Fibreglass	–	–	–	–	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	–	–	–	–	–

NOVO™

Digitally access and leverage product data and knowledge to connect systems and processes throughout the entire manufacturing lifecycle.

VISIT **KENNAMETAL.COM**/NOVO AND DOWNLOAD TODAY.

KENNAMETAL®

kennametal.com

METALCUTTING SAFETY

IMPORTANT SAFETY INSTRUCTIONS

Read before using the tools in this catalogue!

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 catalogue 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.

Kennametal, the stylized K, HARVI, KenTIP, KM4X, KSEM PLUS, NOVO, and Stellite are trademarks of Kennametal, Inc. and are used as such herein. The absence of a product, service name, or logo from this list does not constitute a waiver of the Kennametal trademarks or other intellectual property rights concerning that name or logo.

Android ™ is a trademark of Google Inc.
App Store ® is a registered trademark of Apple Inc., registered in the U.S. and other countries.
Astroloy ™ is a trademark of Svedala Industries, Inc. Corporation.
Discaloy ™ is a trademark of Westinghouse Electric Corporation.
DUO--λOCK ® is a registered trademark and Duo-Lock ™ is a trademark of Haimer GmbH.
Google Play ™ is a trademark of Google Inc.
Hardox ® is a registered trademark of SSAB Technology AB Corporation.
Hastelloy ® and Haynes ® are registered trademarks of Haynes International, Inc. Corporation.
Hostalen ™ is a trademark of Hoechst GmbH Corporation.
INCONEL ®, Monel ®, NIMONIC ®, and Udimet ® are registered trademarks of Special Metals Corporation.
INCOLOY ® is a registered trademark of Inco Alloys International, Inc.
INVAR ® is a registered trademark of Imphy Alloys Joint Stock Company.
Lexan ® is a registered trademark of Sabic Innovative Plastics IP B.V. Company.
SAFE--λOCK ® is a registered trademark and Safe-Lock ™ is a trademark of Haimer GmbH.
Weldon ® is a registered trademark of Weldon Tool Company.

© 2021 Kennametal Inc. All rights reserved.

AEROSPACE SOLUTIONS

WORLD HEADQUARTERS
Kennametal Inc.
525 William Penn Place I Suite 3300
Pittsburgh, PA 15219 USA
Tel: 1 800 446 7738
ftmill.service@kennametal.com

EUROPEAN HEADQUARTERS
Kennametal Europe GmbH
Rheingoldstrasse 50
CH 8212 Neuhausen am Rheinfall
Switzerland
Tel: +41 52 6750 100
neuhausen.info@kennametal.com

ASIA-PACIFIC HEADQUARTERS
Kennametal Singapore Pte. Ltd.
3A International Business Park
Unit #01-02/03/05, ICON@IBP
Singapore 609935
Tel: +65 6265 9222
k-sg.sales@kennametal.com

INDIA HEADQUARTERS
Kennametal India Limited
CIN: L27109KA1964PLC001546
8/9th Mile, Tumkur Road
Bangalore - 560 073
Tel: +91 080 22198444 or +91 080 43281444
bangalore.information@kennametal.com

KENNAMETAL®

kennametal.com

©2021 Kennametal Inc. I All rights reserved. I A-21-06343EN_me