



DUO-LOCK

by Haimer and Kennametal

The **ONLY** modular system with
the performance of a solid
carbide end mill.

**BETTER
PERFORMANCE.
GUARANTEED.**

OFFER VALID THROUGH
JUNE 30, 2017

Call today and refer to promo code
DL-NORISK

Virtually unbreakable

Duo-Lock is a new revolutionary coupling for solid carbide end milling applications. This replaceable head design combines a high accuracy in runout and length repeatability with maximum stability, making it a precise and virtually unbreakable interface.

High Performance HARVI Geometry

High metal removal rates with up to 1 x D full slotting and up to 1,5 x D side milling at 50% a_p capability.

Repeatability

Benefit from 50 μ m / 0.0002" axial repeatability from tip-to-tip, independent from batch of tips.

Intelligent Thread

Ensures that stress levels remain below critical values.

3rd Contact Surface

Delivers high stiffness and accuracy below 5 μ m / 0.002" runout.

DUO-LOCK

by Haimer and Kennametal.



Asymmetrical Flute Spacing

Reduces vibrations, improving surface finish.

37/39° Variable Helix Technology

Minimizes chatter and harmonics for smoother machining.

Double Cone

Eliminates expensive presetting processes by providing an axial repeatability of 10 μ m / 0.004".

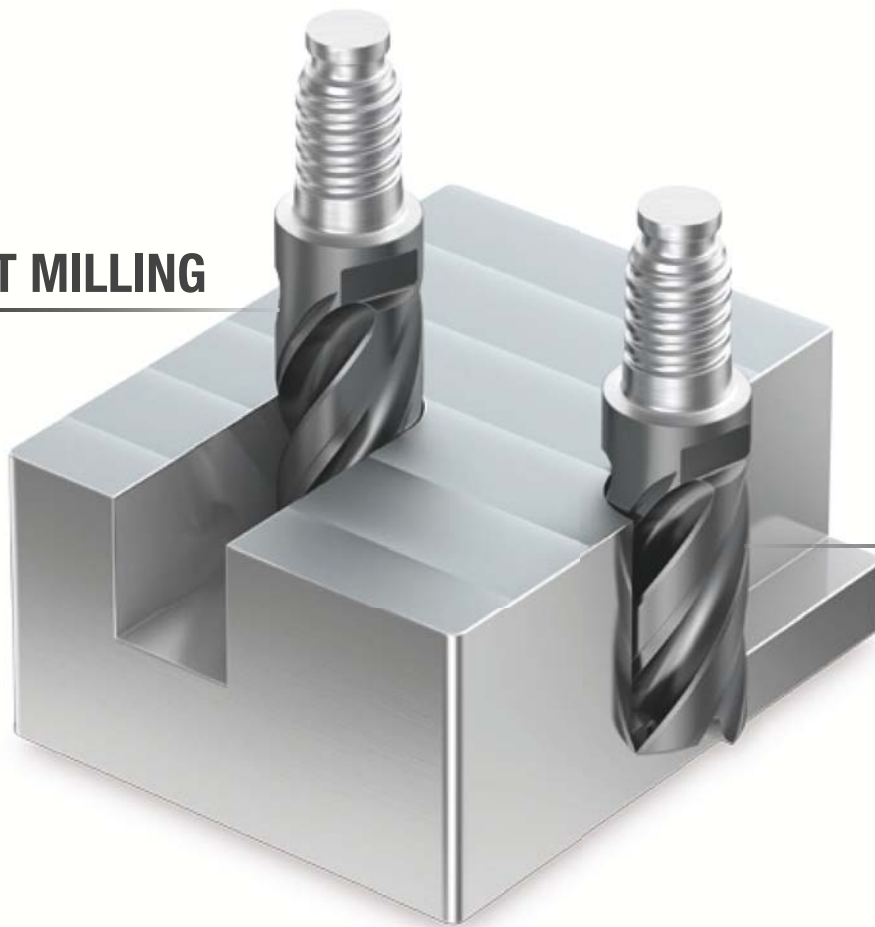
Combining the advantages of modular tooling and maximum productivity.

- Cost effective solution. Especially with large diameters and long length.
- Maximum flexibility in your shop.
- Tool exchange in the machine, no presetting.
- Maximum metal removal rates.
- Repeatable tool life and performance.

Try it now! Performance guarantee at no risk.

FULL SLOT MILLING

1 x D



SIDE MILLING

1.5 x D
up to 50%
radial engagement

The ONLY modular system capable of 1 x D FULL SLOT MILLING and / or 1.5 x D SIDE MILLING with 50% radial engagement.

Call today and refer to promo code *DL-NORISK*

In fact, we are so confident that we will out-perform your current tooling that we encourage you to test Duo-Lock with a “NO RISK” guarantee.*

If for some reason we do not perform as promised, we will credit you. Guaranteed. No risk.

* See next page for products included in this offer.

Rely on Kennametal’s strength and product innovation help you to maximize your productivity and make you more profitable.

That performance boost equates to better results on the shop floor and for your bottom line. Guaranteed.

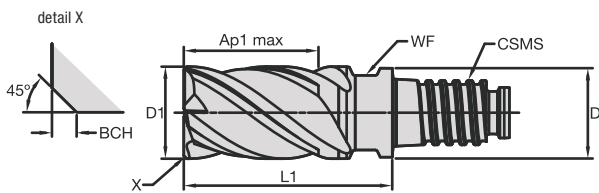
For more information about Duo-Lock go to **kennametal.com/DUOLOCK**

Get your money back if you are not satisfied.

Try any of these 4 fluted modular end mill tips
in combination with a conical shank.

HARVI 4 Flute UKDV Series in KCPM15*
For steel, stainless steel, and cast iron.

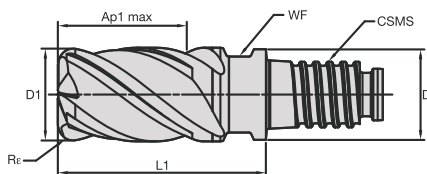
Duo-Lock Conical Shank



or

HARVI 4 Flute ULDV Series in KCSM15*
For stainless steels, and high temperature alloys.

Duo-Lock Conical Shank



* Choose from diameters 10, 12, 16, 20, 25 and 32 mm

For the current product offering, and application data please check Kennametal.com/DUOLOCK, or download NOVO for free: Kennametal.com/NOVO

NOTE: Duo-Lock conical shanks can be clamped with any adaptor style!

Call today and refer to promo code **DL-NORISK**

Duo-Lock Features & Benefits



- Asymmetrical flute spacing and variable helix configuration minimizes chatter and harmonics for smoother machining.
- Center cutting.
- Single tool for both roughing and finishing operations requiring fewer setups.

- Conical shape for best results in full slot milling and side milling.
- Pull out protection with Safe-Lock™.
- Strongest combination with Safe-Lock™ adaptors or sleeves.

Please note:

- Other adaptor styles can be utilized as well.
- Recommended adaptors: HydroForce, ShrinkFit and Milling Chucks.

Assembly Recommendation:

1. Clean both sides of the coupling before clamping!
2. Use a high quality torque wrench!



Take advantage of our wrench kit offering!

Two-armed torque wrench for Duo-Lock

- For highest runout accuracy.
No one-sided clamping.
- Optimal power transmission by constant force application.
- Maximum torque for highest clamping forces.
- Extension handles recommended for DL25 and DL32.



1

Basic Duo-Lock Wrench



2

Insert



3

Extension Handle



Order this

Get that

Order Number	Catalog Number	Kit Description	List Price in GBP
6342967	TWDL10TM	D-L WRENCH WITH DL10 INSERT AND HANDLES	424,00
6342968	TWDL12TM	D-L WRENCH WITH DL12 INSERT AND HANDLES	424,00
6342969	TWDL16TM	D-L WRENCH WITH DL16 INSERT AND HANDLES	424,00
6342970	TWDL20TM	D-L WRENCH WITH DL20 INSERT AND HANDLES	424,00
6343061	TWDL25TM	D-L WRENCH WITH DL25 INSERT AND HANDLES	424,00
6343062	TWDL32TM	D-L WRENCH WITH DL32 INSERT AND HANDLES	424,00

1 + 2 + 3



With NOVO™, tool selection is done in a few minutes, instead of hours.

kennametal.com/NOVO



Terms and Conditions

Kennametal reserves the right to have a Kennametal Sales Engineer assess the application to make recommendations for process improvement in order to achieve the targeted performance.

A request for credit must be submitted to Kennametal within 60 days of shipment of your order and a Returned Materials Authorization will be issued for the product.

All orders are subject to Kennametal's standard terms and conditions of sale. Unused and/or worn tools for which credit has been issued must be returned to Kennametal at the discretion of Kennametal (free-of-charge shipment).

Credit for individual tools will be issued on only one order per customer per year. Credit will be issued as a credit to the customer's account. Kennametal's liability under this promotion is limited to refunds issued on tooling and does not include damage to workpieces, machinery, or any other consequential damages.

This offer is valid through June 30, 2017. Offer void where prohibited by law. All local, state, and federal laws apply. Offer subject to product availability. Other restrictions may apply. Kennametal Inc. reserves the right to alter or cancel this promotion at any time and without further notice.

DUO-LOCK

High-performance modular
solid carbide end mills.



➤ DUO-LOCK[®] HARVI[™]

Primary Application

HARVI geometries for Duo-Lock[™] target applications where solid carbide end mills are currently used. Duo-Lock[™] combines the highest runout accuracy and length repeatability with maximum coupling stability. This enables the Duo-Lock[™] system to use the full potential of Kennametal cutting geometries and grades with the flexibility of a modular system. Significant metal removal rates can be achieved. A wide range of diameters and corner configurations, such as chamfer, radii, and sharp edges, are available from stock.

- Cutting data and tool life comparable to high-performance solid carbide.
- Proprietary HARVI geometries enable roughing and finishing with one tool.
- 1,5 x D standard cutting edge length enables fewer passes.
- Up to 1 x D full slotting increases metal removal rates, increasing productivity significantly.
- Extensive offering of straight and conical shank tools, and integral adaptors that include CV, DV, BT, and HSK.

Features and Benefits

Advanced Technology

- New asymmetrical HARVI 4-flute geometry for higher feed-per-tooth rates.
- Variable helix design for chatter-free machining at high feed rates.
- Less pressure on cutting edge through tailored axial and radial rake angles.
- Eccentric relief design increases tool life through higher edge stability.
- Proprietary tapered core for highest tool stability when roughing and finishing.

Tailored Grades

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

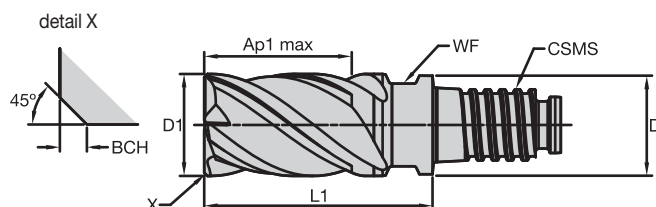
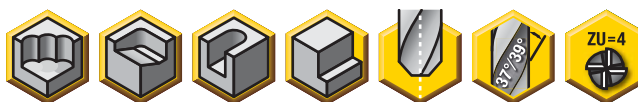
Customisation

- Intermediate diameters are available between 10–32mm.
- Chip divider geometry helps reduce power usage and improve chip formation in difficult-to-cut materials.
- Engineered solutions including shank and non-standard length versions available.
- Custom solutions within standard blank dimension are available.

Extensive Standard Offering

- Diameter ranges 10–32mm.
- Necked, corner radii, chamfer, and square-end tips available.
- Integral adaptors to reduce interface for maximum accuracy.
- Steel extensions with Safe-Lock[™] by HAIMER shanks to prevent pullout.
- Cut-to-size extra-long extensions available upon request off the shelf.

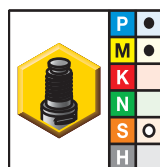
- Asymmetrical flute spacing and variable helix configuration minimises chatter and harmonics for smoother machining.
- Centre cutting.
- Single tool for both roughing and finishing, reducing setups.
- Standard items listed. Additional styles and coatings made-to-order.



End Mill Tolerances

D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073
> 30	-0,050/-0,089

UKDV • 4 Flute • Metric

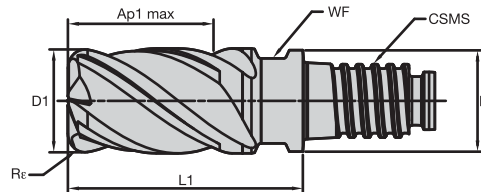


- first choice
- alternate choice

KCPM15	D1	D	Ap1 max	L1	CSMS system size	WF	BCH
UKDV1000X4CV	10,00	9,60	15,00	22,50	DL10	8,00	0,50
UKDV1200X4CV	12,00	11,50	18,00	27,00	DL12	9,50	0,50
UKDV1600X4CV	16,00	15,50	24,00	36,00	DL16	13,00	0,50
UKDV2000X4CV	20,00	19,30	30,00	45,00	DL20	16,00	0,50
UKDV2500X4CV	25,00	24,00	37,50	56,50	DL25	21,00	0,50
UKDV3200X4CV	32,00	31,00	48,00	71,20	DL32	28,00	0,50

NOTE: For application data, please see page O10.

- Asymmetrical flute spacing and variable helix configuration minimises chatter and harmonics for smoother machining.
- Centre cutting.
- Single tool for both roughing and finishing, reducing setups.
- Standard items listed. Additional styles and coatings made-to-order.



End Mill Tolerances

D1	tolerance e8
> 10-18	-0,032/-0,059
> 18-30	-0,040/-0,073
> 30	-0,050/-0,089

■ ULDV • 4 Flute • Metric



- first choice
- alternate choice

KCSM15	D1	D	Ap1 max	L1	CSMS system size	WF	Re
ULDV1000X4CQE	10,00	9,60	15,00	22,50	DL10	8,00	0,50
ULDV1000X4CQG	10,00	9,60	15,00	22,50	DL10	8,00	1,00
ULDV1000X4CQJ	10,00	9,60	15,00	22,50	DL10	8,00	1,50
ULDV1200X4CQE	12,00	11,50	18,00	27,00	DL12	9,50	0,50
ULDV1200X4CQG	12,00	11,50	18,00	27,00	DL12	9,50	1,00
ULDV1200X4CQJ	12,00	11,50	18,00	27,00	DL12	9,50	1,50
ULDV1200X4CQL	12,00	11,50	18,00	27,00	DL12	9,50	2,50
ULDV1600X4CQG	16,00	15,50	24,00	36,00	DL16	13,00	1,00
ULDV1600X4CQJ	16,00	15,50	24,00	36,00	DL16	13,00	1,50
ULDV1600X4CQK	16,00	15,50	24,00	36,00	DL16	13,00	2,00
ULDV1600X4CQL	16,00	15,50	24,00	36,00	DL16	13,00	2,50
ULDV1600X4CQM	16,00	15,50	24,00	36,00	DL16	13,00	3,00
ULDV2000X4CQG	20,00	19,30	30,00	45,00	DL20	16,00	1,00
ULDV2000X4CQK	20,00	19,30	30,00	45,00	DL20	16,00	2,00
ULDV2000X4CQL	20,00	19,30	30,00	45,00	DL20	16,00	2,50
ULDV2000X4CQM	20,00	19,30	30,00	45,00	DL20	16,00	3,00
ULDV2000X4CQN	20,00	19,30	30,00	45,00	DL20	16,00	4,00
ULDV2500X4CQL	25,00	24,00	37,50	56,50	DL25	21,00	2,50
ULDV2500X4CQN	25,00	24,00	37,50	56,50	DL25	21,00	4,00
ULDV3200X4CQL	32,00	31,00	48,00	71,70	DL32	28,00	2,50
ULDV3200X4CQN	32,00	31,00	48,00	71,70	DL32	28,00	4,00

NOTE: For application data, please see page O11.

■ HARVI • UKDV • Asymmetrical Flute Spacing

Material Group																					
		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.							
		A		B	adaptor reach									D1 – Diameter							
					KCPM15			KCPM15			KCPM15										
					Cutting Speed – vc m/min			Cutting Speed – vc m/min			Cutting Speed – vc m/min										
ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0			
P	0	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106	
	1	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106	
	2	1,5 x D	0,5 x D	1 x D	140	–	190	126	–	171	126	–	171	fz	0,061	0,070	0,086	0,097	0,105	0,106	
	3	1,5 x D	0,5 x D	1 x D	120	–	160	108	–	144	108	–	144	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	4	1,5 x D	0,4 x D	0,75 x D	90	–	150	81	–	135	81	–	135	fz	0,046	0,053	0,065	0,075	0,083	0,087	
	5	1,5 x D	0,4 x D	1 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077	0,084	
M	6	1,5 x D	0,4 x D	0,75 x D	50	–	75	42,5	–	63,75	40	–	60	fz	0,034	0,040	0,048	0,055	0,060	0,062	
	1	1,5 x D	0,4 x D	1 x D	90	–	115	72	–	92	63	–	80,5	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	2	1,5 x D	0,4 x D	1 x D	60	–	80	48	–	64	42	–	56	fz	0,041	0,048	0,059	0,069	0,077	0,084	
S	3	1,5 x D	0,4 x D	1 x D	60	–	70	48	–	56	42	–	49	fz	0,034	0,040	0,048	0,055	0,060	0,062	
	1	1,5 x D	0,3 x D	0,3 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	2	1,5 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057	
	3	1,5 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057	
	4	1,5 x D	0,4 x D	1 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071	0,077	

HARVI • ULDV • Asymmetrical Flute Spacing

Material Group																					
		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.							
		A		B	adaptor reach									D1 — Diameter							
					KCSM15			KCSM15			KCSM15										
						Cutting Speed — vc m/min			Cutting Speed — vc m/min			Cutting Speed — vc m/min									
		ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0	
P	0	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106	
	1	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106	
	2	1,5 x D	0,5 x D	1 x D	140	–	190	126	–	171	126	–	171	fz	0,061	0,070	0,086	0,097	0,105	0,106	
	3	1,5 x D	0,5 x D	1 x D	120	–	160	108	–	144	108	–	144	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	4	1,5 x D	0,4 x D	0,75 x D	90	–	150	81	–	135	81	–	135	fz	0,046	0,053	0,065	0,075	0,083	0,087	
	5	1,5 x D	0,4 x D	1 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077	0,084	
M	6	1,5 x D	0,4 x D	0,75 x D	50	–	75	42,5	–	63,75	40	–	60	fz	0,034	0,040	0,048	0,055	0,060	0,062	
	1	1,5 x D	0,4 x D	1 x D	90	–	115	72	–	92	63	–	80,5	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	2	1,5 x D	0,4 x D	1 x D	60	–	80	48	–	64	42	–	56	fz	0,041	0,048	0,059	0,069	0,077	0,084	
K	3	1,5 x D	0,4 x D	1 x D	60	–	70	48	–	56	42	–	49	fz	0,034	0,040	0,048	0,055	0,060	0,062	
	1	1,5 x D	0,5 x D	1 x D	120	–	150	108	–	135	108	–	135	fz	0,061	0,070	0,086	0,097	0,105	0,106	
	2	1,5 x D	0,5 x D	1 x D	110	–	140	99	–	126	99	–	126	fz	0,051	0,060	0,074	0,086	0,097	0,105	
S	3	1,5 x D	0,5 x D	1 x D	110	–	130	99	–	117	99	–	117	fz	0,041	0,048	0,059	0,069	0,077	0,084	
	1	1,5 x D	0,3 x D	0,3 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	2	1,5 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057	
	3	1,5 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057	
H	4	1,5 x D	0,4 x D	1 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071	0,077	
	1	1,5 x D	0,4 x D	0,75 x D	80	–	140	64	–	112	48	–	84	fz	0,046	0,053	0,065	0,075	0,083	0,087	
	2	1,5 x D	0,2 x D	0,5 x D	70	–	120	56	–	96	42	–	72	fz	0,034	0,040	0,048	0,055	0,060	0,062	

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

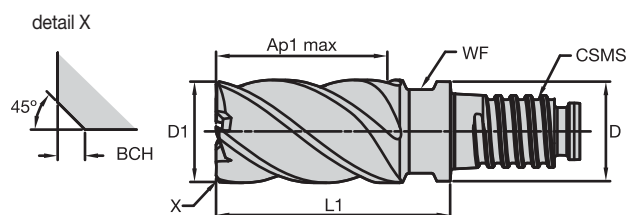
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.

Above parameters are based on ideal conditions. Please adjust parameters according to system stability.

For side milling with ap larger than 1 x D, reduce fz by 20%!

Cylindrical shanks not recommended for full slotting.

- Unequal flute spacing and variable helix configuration minimise chatter and harmonics for smoother machining.
- Non-centre cutting.
- Ramping up to 3°.
- Five-flute geometry able to slot up to 1 x D.
- Single tool for both roughing and finishing, reducing setups.
- Standard items listed. Additional styles and coatings made-to-order.



End Mill Tolerances

D1	tolerance e8
> 10-18	-0,032/-0,059
> 18-30	-0,040/-0,073
> 30	-0,050/-0,089

UCDV • 5 Flute • Metric

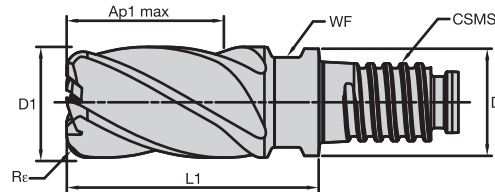


- first choice
- alternate choice

KCPM15	D1	D	Ap1 max	L1	CSMS system size	WF	BCH
UCDV1000X5CV	10,00	9,60	15,00	22,50	DL10	8,00	0,50
UCDV1200X5CV	12,00	11,50	18,00	27,00	DL12	9,50	0,50
UCDV1600X5CV	16,00	15,50	24,00	36,00	DL16	13,00	0,50
UCDV2000X5CV	20,00	19,30	30,00	45,00	DL20	16,00	0,50
UCDV2500X5CV	25,00	24,00	37,50	56,50	DL25	21,00	0,50
UCDV3200X5CV	32,00	31,00	48,00	71,20	DL32	28,00	0,50

NOTE: For application data, please see page O14.

- Unequal flute spacing and variable helix configuration minimise chatter and harmonics for smoother machining.
- Non-centre cutting.
- Ramping up to 3°.
- Five-flute geometry able to slot up to 1 x D.
- Single tool for both roughing and finishing, reducing setups.
- Standard items listed. Additional styles and coatings made-to-order.



End Mill Tolerances

D1	tolerance e8
> 10-18	-0,032/-0,059
> 18-30	-0,040/-0,073
> 30	-0,050/-0,089

■ UDDV • 5 Flute • Metric

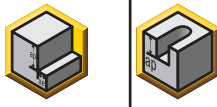


- first choice
- alternate choice

KC643M	D1	D	Ap1 max	L1	CSMS system size	WF	Re
UDDV1000X5CQE	10,00	9,60	15,00	22,50	DL10	8,00	0,50
UDDV1000X5CQG	10,00	9,60	15,00	22,50	DL10	8,00	1,00
UDDV1000X5CQJ	10,00	9,60	15,00	22,50	DL10	8,00	1,50
UDDV1200X5CQE	12,00	11,50	18,00	27,00	DL12	9,50	0,50
UDDV1200X5CQG	12,00	11,50	18,00	27,00	DL12	9,50	1,00
UDDV1200X5CQJ	12,00	11,50	18,00	27,00	DL12	9,50	1,50
UDDV1200X5CQL	12,00	11,50	18,00	27,00	DL12	9,50	2,50
UDDV1600X5CQG	16,00	15,50	24,00	36,00	DL16	13,00	1,00
UDDV1600X5CQJ	16,00	15,50	24,00	36,00	DL16	13,00	1,50
UDDV1600X5CQK	16,00	15,50	24,00	36,00	DL16	13,00	2,00
UDDV1600X5CQL	16,00	15,50	24,00	36,00	DL16	13,00	2,50
UDDV1600X5CQM	16,00	15,50	24,00	36,00	DL16	13,00	3,00
UDDV2000X5CQG	20,00	19,30	30,00	45,00	DL20	16,00	1,00
UDDV2000X5CQK	20,00	19,30	30,00	45,00	DL20	16,00	2,00
UDDV2000X5CQL	20,00	19,30	30,00	45,00	DL20	16,00	2,50
UDDV2000X5CQM	20,00	19,30	30,00	45,00	DL20	16,00	3,00
UDDV2000X5CQN	20,00	19,30	30,00	45,00	DL20	16,00	4,00
UDDV2500X5CQL	25,00	24,00	37,50	56,50	DL25	21,00	2,50
UDDV2500X5CQN	25,00	24,00	37,50	56,50	DL25	21,00	4,00
UDDV3200X5CQL	32,00	31,00	48,00	71,70	DL32	28,00	2,50
UDDV3200X5CQN	32,00	31,00	48,00	71,70	DL32	28,00	4,00

NOTE: For application data, please see page O15.

HARVI II • UCDV • Unequal Flute Spacing

Material Group																				
	Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.							
	A		B	adaptor reach									D1 – Diameter							
				KCPM15			KCPM15			KCPM15										
				Cutting Speed – vc m/min			Cutting Speed – vc m/min			Cutting Speed – vc m/min										
	ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0	
P	0	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106
	1	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,5 x D	0,5 x D	1 x D	140	–	190	126	–	171	126	–	171	fz	0,061	0,070	0,086	0,097	0,105	0,106
	3	1,5 x D	0,5 x D	1 x D	120	–	160	108	–	144	108	–	144	fz	0,051	0,060	0,074	0,086	0,097	0,105
	4	1,5 x D	0,4 x D	0,75 x D	90	–	150	81	–	135	81	–	135	fz	0,046	0,053	0,065	0,075	0,083	0,087
	5	1,5 x D	0,4 x D	1 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077	0,084
M	6	1,5 x D	0,4x D	0,75 x D	50	–	75	42,5	–	63,75	40	–	60	fz	0,034	0,040	0,048	0,055	0,060	0,062
	1	1,5 x D	0,4 x D	1 x D	90	–	115	72	–	92	63	–	80.5	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,5 x D	0,4 x D	1 x D	60	–	80	48	–	64	42	–	56	fz	0,041	0,048	0,059	0,069	0,077	0,084
K	3	1,5 x D	0,4 x D	1 x D	60	–	70	48	–	56	42	–	49	fz	0,034	0,040	0,048	0,055	0,060	0,062
	1	1,5 x D	0,5 x D	1 x D	120	–	150	108	–	135	108	–	135	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,5 x D	0,5 x D	1 x D	110	–	140	99	–	126	99	–	126	fz	0,051	0,060	0,074	0,086	0,097	0,105
S	3	1,5 x D	0,5 x D	1 x D	110	–	130	99	–	117	99	–	117	fz	0,041	0,048	0,059	0,069	0,077	0,084
	1	1,5 x D	0,3 x D	0,3 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,5 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057
	3	1,5 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057
H	4	1,5 x D	0,4 x D	1 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071	0,077
	1	1,5 x D	0,4 x D	0,75 x D	80	–	140	64	–	112	48	–	84	fz	0,046	0,053	0,065	0,075	0,083	0,087
	2	1,5 x D	0,2 x D	0,5 x D	70	–	120	56	–	96	42	–	72	fz	0,034	0,040	0,048	0,055	0,060	0,062

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

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

Above parameters are based on ideal conditions. Please adjust parameters according to system stability.

For side milling with ap larger than 1 x D, reduce fz by 20%!

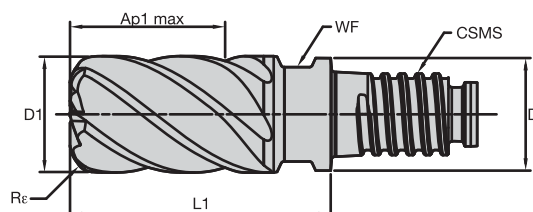
Cylindrical shanks not recommended for full slotting.

HARVI II • UDDV • Unequal Flute Spacing

Material Group																					
		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.							
		A		B	adaptor reach									D1 — Diameter							
					KC643M			KC643M			KC643M										
					Cutting Speed — vc m/min			Cutting Speed — vc m/min			Cutting Speed — vc m/min										
		ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0	
P	5	1,5 x D	0,4 x D	1 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077	0,084	
	6	1,5 x D	0,4 x D	0,75 x D	50	–	75	42,5	–	63,75	40	–	60	fz	0,034	0,040	0,048	0,055	0,060	0,062	
S	1	1,5 x D	0,3 x D	0,3 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	2	1,5 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057	
	3	1,5 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057	
	4	1,5 x D	0,4 x D	1 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071	0,077	
H	1	1,5 x D	0,4 x D	0,75 x D	80	–	140	64	–	112	48	–	84	fz	0,046	0,053	0,065	0,075	0,083	0,087	
	2	1,5 x D	0,2 x D	0,5 x D	70	–	120	56	–	96	42	–	72	fz	0,034	0,040	0,048	0,055	0,060	0,062	

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. Please adjust parameters according to system stability.
 For side milling with ap larger than 1 x D, reduce fz by 20%!
 Cylindrical shanks not recommended for full slotting.

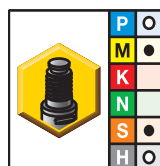
- Unequal flute spacing and variable helix configuration minimise chatter and harmonics for smoother machining.
- Centre cutting.
- Optimised geometry for titanium machining.
- Single tool for both roughing and finishing, reducing setups.
- Standard items listed. Additional styles and coatings made-to-order.



End Mill Tolerances

D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073
> 30	-0,050/-0,089

■ UJDV • 6-Flute with Eccentric Relief Grind • Metric



- first choice
- alternate choice

KCSM15	D1	D	Ap1 max	L1	CSMS system size	WF	Re
UJDV1000X6CQE	10,00	9,60	15,00	22,50	DL10	8,00	0,50
UJDV1000X6CQG	10,00	9,60	15,00	22,50	DL10	8,00	1,00
UJDV1000X6CQJ	10,00	9,60	15,00	22,50	DL10	8,00	1,50
UJDV1200X6CQE	12,00	11,50	18,00	27,00	DL12	9,50	0,50
UJDV1200X6CQG	12,00	11,50	18,00	27,00	DL12	9,50	1,00
UJDV1200X6CQJ	12,00	11,50	18,00	27,00	DL12	9,50	1,50
UJDV1200X6CQL	12,00	11,50	18,00	27,00	DL12	9,50	2,50
UJDV1600X6CQG	16,00	15,50	24,00	36,00	DL16	13,00	1,00
UJDV1600X6CQJ	16,00	15,50	24,00	36,00	DL16	13,00	1,50
UJDV1600X6CQK	16,00	15,50	24,00	36,00	DL16	13,00	2,00
UJDV1600X6CQL	16,00	15,50	24,00	36,00	DL16	13,00	2,50
UJDV1600X6CQM	16,00	15,50	24,00	36,00	DL16	13,00	3,00
UJDV2000X6CQG	20,00	19,30	30,00	45,00	DL20	16,00	1,00
UJDV2000X6CQK	20,00	19,30	30,00	45,00	DL20	16,00	2,00
UJDV2000X6CQL	20,00	19,30	30,00	45,00	DL20	16,00	2,50
UJDV2000X6CQM	20,00	19,30	30,00	45,00	DL20	16,00	3,00
UJDV2000X6CQN	20,00	19,30	30,00	45,00	DL20	16,00	4,00
UJDV2500X6CQL	25,00	24,00	37,50	56,50	DL25	21,00	2,50
UJDV2500X6CQN	25,00	24,00	37,50	56,50	DL25	21,00	4,00
UJDV3200X6CQL	32,00	31,00	48,00	71,70	DL32	28,00	2,50
UJDV3200X6CQN	32,00	31,00	48,00	71,70	DL32	28,00	4,00

NOTE: For application data, please see page O17.

■ HARVI III • UJDV • Unequal Flute Spacing • Roughing

Material Group																				
		Side Milling (A)		short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A).							
		A		adaptor reach									D1 – Diameter							
				KCSM15			KCSM15			KCSM15										
				Cutting Speed – vc m/min			Cutting Speed – vc m/min			Cutting Speed – vc m/min										
ap	ae	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0			
P	4	Ap max	0,4 x D	90	–	150	81	–	135	81	–	135	fz	0,046	0,053	0,065	0,075	0,083	0,087	
	5	Ap max	0,4 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077	0,084	
M	1	Ap max	0,4 x D	90	–	115	72	–	92	63	–	80.5	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	2	Ap max	0,4 x D	60	–	80	48	–	64	42	–	56	fz	0,041	0,048	0,059	0,069	0,077	0,084	
	3	Ap max	0,4 x D	60	–	70	48	–	56	42	–	49	fz	0,034	0,040	0,048	0,055	0,060	0,062	
S	1	Ap max	0,4 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	2	Ap max	0,4 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057	
	3	Ap max	0,4 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057	
	4	Ap max	0,4 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071	0,077	
H	1	Ap max	0,4 x D	80	–	140	64	–	112	48	–	84	fz	0,046	0,053	0,065	0,075	0,083	0,087	
	2	Ap max	0,4 x D	70	–	120	56	–	96	42	–	72	fz	0,034	0,040	0,048	0,055	0,060	0,062	

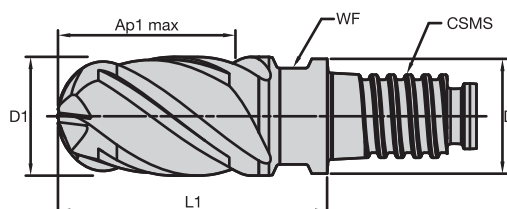
NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. Please adjust parameters according to system stability.
 For side milling with ap larger than 1 x D, reduce fz by 20%!
 Cylindrical shanks not recommended for full slotting.

■ HARVI III • UJDV • Unequal Flute Spacing • Finishing

Material Group																				
		Side Milling (A)		short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A).							
		A		adaptor reach									D1 – Diameter							
				KCSM15			KCSM15			KCSM15										
				Cutting Speed – vc m/min			Cutting Speed – vc m/min			Cutting Speed – vc m/min										
ap	ae	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0			
P	4	Ap max	0,06 x D	171	–	285	153,9	–	256,5	153,9	–	256,5	fz	0,046	0,053	0,065	0,075	0,083	0,087	
	5	Ap max	0,06 x D	114	–	190	96,9	–	161,5	91,2	–	152	fz	0,041	0,048	0,059	0,069	0,077	0,084	
M	1	Ap max	0,06 x D	171	–	218,5	136,8	–	174,8	119,7	–	152,95	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	2	Ap max	0,06 x D	114	–	152	91,2	–	121,6	79,8	–	106,4	fz	0,041	0,048	0,059	0,069	0,077	0,084	
	3	Ap max	0,06 x D	114	–	133	91,2	–	106,4	79,8	–	93,1	fz	0,034	0,040	0,048	0,055	0,060	0,062	
S	1	Ap max	0,06 x D	95	–	171	76	–	136,8	57	–	102,6	fz	0,051	0,060	0,074	0,086	0,097	0,105	
	2	Ap max	0,06 x D	47,5	–	76	38	–	60,8	28,5	–	45,6	fz	0,027	0,032	0,039	0,046	0,052	0,057	
	3	Ap max	0,06 x D	47,5	–	76	38	–	60,8	28,5	–	45,6	fz	0,027	0,032	0,039	0,046	0,052	0,057	
	4	Ap max	0,06 x D	95	–	114	76	–	91,2	57	–	68,4	fz	0,038	0,044	0,055	0,063	0,071	0,077	
H	1	Ap max	0,06 x D	152	–	266	121,6	–	212,8	91,2	–	159,6	fz	0,046	0,053	0,065	0,075	0,083	0,087	
	2	Ap max	0,06 x D	133	–	228	106,4	–	182,4	79,8	–	136,8	fz	0,034	0,040	0,048	0,055	0,060	0,062	

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
 Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
 Above parameters are based on ideal conditions. Please adjust parameters according to system stability.
 For side milling with ap larger than 1 x D, reduce fz by 20%!
 Cylindrical shanks not recommended for full slotting.

- Asymmetrical flute spacing and variable helix configuration minimise chatter and harmonics for smoother machining.
- Centre cutting.
- Single tool for both roughing and finishing operations, reducing setups.
- Standard items listed. Additional styles and coatings made-to-order.



End Mill Tolerances

D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073

■ UKBV • 4-Flute Ball Nose • Metric

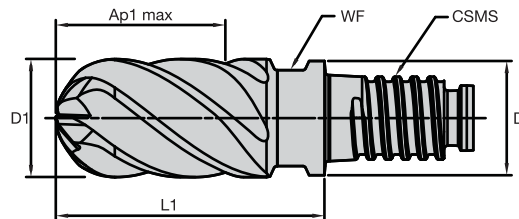


- first choice
- alternate choice

KCPM15	D1	D	Ap1 max	L1	CSMS system size	WF
UKBV1000X4CN	10,00	9,60	15,00	22,50	DL10	8,00
UKBV1200X4CN	12,00	11,50	18,00	27,00	DL12	9,50
UKBV1600X4CN	16,00	15,50	24,00	36,00	DL16	13,00
UKBV2000X4CN	20,00	19,30	30,00	45,00	DL20	16,00
UKBV2500X4CN	25,00	24,00	37,50	56,50	DL25	21,00

NOTE: For application data, please see page O20.

- Unequal flute spacing and variable helix configuration minimise chatter and harmonics for smoother machining.
- Centre cutting.
- Optimised geometry for titanium machining.
- Single tool for both roughing and finishing operations, reducing setups.
- Standard items listed. Additional styles and coatings made-to-order.



End Mill Tolerances

D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073

■ UJBV • 6-Flute Ball Nose with Eccentric Relief Grind • Metric

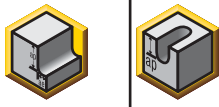


- first choice
- alternate choice

KCSM15	D1	D	Ap1 max	L1	CSMS system size	WF
UJBV1000X6CN	10,00	9,60	15,00	22,50	DL10	8,00
UJBV1200X6CN	12,00	11,50	18,00	27,00	DL12	9,50
UJBV1600X6CN	16,00	15,50	24,00	36,00	DL16	13,00
UJBV2000X6CN	20,00	19,30	30,00	45,00	DL20	16,00
UJBV2500X6CN	25,00	24,00	37,50	56,50	DL25	21,00

NOTE: For application data, please see pages O21–O22.

HARVI Ball Nose • UKBV • Asymmetrical Flute Spacing • Roughing • Finishing

Material Group																			
		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.					
					adaptor reach												D1 – Diameter		
		A		B	KCPM15			KCPM15			KCPM15								
					Cutting Speed – vc m/min			Cutting Speed – vc m/min			Cutting Speed – vc m/min								
ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0		
P	0	1,25 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105
	1	1,25 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105
	2	1,25 x D	0,5 x D	1 x D	140	–	190	126	–	171	126	–	171	fz	0,061	0,070	0,086	0,097	0,105
	3	1,25 x D	0,5 x D	1 x D	120	–	160	108	–	144	108	–	144	fz	0,051	0,060	0,074	0,086	0,097
	4	1,25 x D	0,4 x D	0,75 x D	90	–	150	81	–	135	81	–	135	fz	0,046	0,053	0,065	0,075	0,083
	5	1,25 x D	0,4 x D	1 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077
M	6	1,25 x D	0,4 x D	0,75 x D	50	–	75	42,5	–	63,75	40	–	60	fz	0,034	0,040	0,048	0,055	0,060
	1	1,25 x D	0,4 x D	1 x D	90	–	115	72	–	92	63	–	80,5	fz	0,051	0,060	0,074	0,086	0,097
	2	1,25 x D	0,4 x D	1 x D	60	–	80	48	–	64	42	–	56	fz	0,041	0,048	0,059	0,069	0,077
K	3	1,25 x D	0,4 x D	1 x D	60	–	70	48	–	56	42	–	49	fz	0,034	0,040	0,048	0,055	0,060
	1	1,25 x D	0,5 x D	1 x D	120	–	150	108	–	135	108	–	135	fz	0,061	0,070	0,086	0,097	0,105
	2	1,25 x D	0,5 x D	1 x D	110	–	140	99	–	126	99	–	126	fz	0,051	0,060	0,074	0,086	0,097
S	3	1,25 x D	0,5 x D	1 x D	110	–	130	99	–	117	99	–	117	fz	0,041	0,048	0,059	0,069	0,077
	1	1 x D	0,3 x D	0,3 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097
	2	1 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052
	3	1,25 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052
H	4	1,25 x D	0,4 x D	1 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071
	1	1,25 x D	0,4 x D	0,75 x D	80	–	140	64	–	112	48	–	84	fz	0,046	0,053	0,065	0,075	0,083
	2	1,25 x D	0,2 x D	0,5 x D	70	–	120	56	–	96	42	–	72	fz	0,034	0,040	0,048	0,055	0,060

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

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

Above parameters are based on ideal conditions. Please adjust parameters according to system stability.

For side milling with ap larger than 1 x D, reduce fz by 20%!

Cylindrical shanks not recommended for full slotting.

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

Material Group																		
		Side Milling (A)		short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A).					
		A		adaptor reach									D1 – Diameter					
				KCSM15			KCSM15			KCSM15								
				Cutting Speed – vc m/min			Cutting Speed – vc m/min			Cutting Speed – vc m/min								
ap	ae	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0		
P	0	Ap max	0,4 x D	150	–	200	135	–	180	135	–	180	fz	0,052	0,060	0,073	0,082	0,089
	1	Ap max	0,4 x D	150	–	200	135	–	180	135	–	180	fz	0,052	0,060	0,073	0,082	0,089
	2	Ap max	0,4 x D	140	–	190	126	–	171	126	–	171	fz	0,052	0,060	0,073	0,082	0,089
	3	Ap max	0,4 x D	120	–	160	108	–	144	108	–	144	fz	0,044	0,051	0,063	0,073	0,082
	4	Ap max	0,4 x D	90	–	150	81	–	135	81	–	135	fz	0,039	0,045	0,055	0,064	0,070
	5	Ap max	0,4 x D	60	–	100	51	–	85	48	–	80	fz	0,035	0,041	0,050	0,058	0,066
M	6	Ap max	0,4 x D	50	–	75	42,5	–	63,75	40	–	60	fz	0,029	0,034	0,041	0,047	0,051
	1	Ap max	0,4 x D	90	–	115	72	–	92	63	–	80,5	fz	0,044	0,051	0,063	0,073	0,082
	2	Ap max	0,4 x D	60	–	80	48	–	64	42	–	56	fz	0,035	0,041	0,050	0,058	0,066
K	3	Ap max	0,4 x D	60	–	70	48	–	56	42	–	49	fz	0,029	0,034	0,041	0,047	0,051
	1	Ap max	0,4 x D	120	–	150	108	–	135	108	–	135	fz	0,052	0,060	0,073	0,082	0,089
	2	Ap max	0,4 x D	110	–	140	99	–	126	99	–	126	fz	0,044	0,051	0,063	0,073	0,082
S	3	Ap max	0,4 x D	110	–	130	99	–	117	99	–	117	fz	0,035	0,041	0,050	0,058	0,066
	1	Ap max	0,4 x D	50	–	90	40	–	72	30	–	54	fz	0,044	0,051	0,063	0,073	0,082
	2	Ap max	0,4 x D	25	–	40	20	–	32	15	–	24	fz	0,023	0,027	0,034	0,039	0,044
	3	Ap max	0,4 x D	25	–	40	20	–	32	15	–	24	fz	0,023	0,027	0,034	0,039	0,044
H	4	Ap max	0,4 x D	50	–	60	40	–	48	30	–	36	fz	0,032	0,037	0,046	0,054	0,060
	1	Ap max	0,4 x D	80	–	140	64	–	112	48	–	84	fz	0,039	0,045	0,055	0,064	0,070
	2	Ap max	0,4 x D	70	–	120	56	–	96	42	–	72	fz	0,029	0,034	0,041	0,047	0,051

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

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

Above parameters are based on ideal conditions. Please adjust parameters according to system stability.

For side milling with ap larger than 1 x D, reduce fz by 20%!

Cylindrical shanks not recommended for full slotting.

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

Material Group																				
		Side Milling (A)		short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A).							
				A		adaptor reach									D1 – Diameter					
						KCSM15			KCSM15			KCSM15								
		ap	ae	Cutting Speed – vc m/min			Cutting Speed – vc m/min			Cutting Speed – vc m/min			mm	10,0	12,0	16,0	20,0	25,0		
P	0	Ap max	0,06 x D	285	–	380	257	–	342	257	–	342	fz	0,061	0,070	0,086	0,097	0,105		
	1	Ap max	0,06 x D	285	–	380	257	–	342	257	–	342	fz	0,061	0,070	0,086	0,097	0,105		
	2	Ap max	0,06 x D	266	–	361	239	–	325	239	–	325	fz	0,061	0,070	0,086	0,097	0,105		
	3	Ap max	0,06 x D	228	–	304	205	–	274	205	–	274	fz	0,051	0,060	0,074	0,086	0,097		
	4	Ap max	0,06 x D	171	–	285	154	–	257	154	–	257	fz	0,046	0,053	0,065	0,075	0,083		
	5	Ap max	0,06 x D	114	–	190	97	–	162	91	–	152	fz	0,041	0,048	0,059	0,069	0,077		
M	6	Ap max	0,06 x D	95	–	143	81	–	121	76	–	114	fz	0,034	0,040	0,048	0,055	0,060		
	1	Ap max	0,06 x D	171	–	219	137	–	175	120	–	153	fz	0,051	0,060	0,074	0,086	0,097		
	2	Ap max	0,06 x D	114	–	152	91	–	122	80	–	106	fz	0,041	0,048	0,059	0,069	0,077		
K	3	Ap max	0,06 x D	114	–	133	91	–	106	80	–	93	fz	0,034	0,040	0,048	0,055	0,060		
	1	Ap max	0,06 x D	228	–	285	205	–	257	205	–	257	fz	0,061	0,070	0,086	0,097	0,105		
	2	Ap max	0,06 x D	209	–	266	188	–	239	188	–	239	fz	0,051	0,060	0,074	0,086	0,097		
S	3	Ap max	0,06 x D	209	–	247	188	–	222	188	–	222	fz	0,041	0,048	0,059	0,069	0,077		
	1	Ap max	0,06 x D	95	–	171	76	–	137	57	–	103	fz	0,051	0,060	0,074	0,086	0,097		
	2	Ap max	0,06 x D	48	–	76	38	–	61	29	–	46	fz	0,027	0,032	0,039	0,046	0,052		
	3	Ap max	0,06 x D	48	–	76	38	–	61	29	–	46	fz	0,027	0,032	0,039	0,046	0,052		
H	4	Ap max	0,06 x D	95	–	114	76	–	91	57	–	68	fz	0,038	0,044	0,055	0,063	0,071		
	1	Ap max	0,06 x D	152	–	266	122	–	213	91	–	160	fz	0,046	0,053	0,065	0,075	0,083		
	2	Ap max	0,06 x D	133	–	228	106	–	182	80	–	137	fz	0,034	0,040	0,048	0,055	0,060		

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

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

Above parameters are based on ideal conditions. Please adjust parameters according to system stability.

For side milling with ap larger than 1 x D, reduce fz by 20%!

Cylindrical shanks not recommended for full slotting.



Duo-Lock™ HARVI™ III

- CHALLENGE**
- Facing steel (1215) material.
 - External emulsion.
 - Current solution solid carbide.

- SOLUTION**
- Duo-Lock™ Ø 15,875mm
 - HARVI III UJDV
 - Corner Radius R = 0,4mm

- CUTTING DATA**
- v_c 213 m/min
 - f_z 0,05 mm/Z
 - a_p 1,27mm
 - a_e 12,0mm

- RESULT**
- 40% higher feed per tooth.
 - 15% increase in cutting speed.
 - Good surface finish and minimum wear on edges.

- BENEFIT**
- Reduced machining time.
 - Increased productivity.
 - Reduced tooling cost.



Duo-Lock™ HARVI

- CHALLENGE**
- Roughing of sensor mounting slot in cast iron.
 - External emulsion.
 - Current solution solid carbide.

- SOLUTION**
- Duo-Lock™ Ø 16mm – cylindrical shank
 - HARVI UKDV
 - Corner Radius R = 0,5mm

- CUTTING DATA**
- v_c 58 m/min
 - f_z 0,065 mm/Z
 - a_p 22mm
 - a_e 8,0mm

- RESULT**
- Less wear.
 - More stable process.

- BENEFIT**
- No unpredictable breakage like with competitive solid carbide tool.
 - Stable machining process.



Duo-Lock™ HARVI™ III

Duo-Lock™ HARVI III

CHALLENGE

- Finishing contour milling with lightly interrupted cut.
- Blade machining of X20Cr and X22Cr (M3).
- External emulsion.
- Current solution solid carbide.

CHALLENGE

- Hard machining — side milling.
- Hardened steel (17–4 PH) — 35 HRC.
- External emulsion.
- Current solution solid carbide.

SOLUTION

- Duo-Lock™ Ø 16mm — cylindrical shank
- HydroForce™ with reducer sleeve
- HARVI III UJDV geometry in KCSM15™
- Corner Radius R = 4mm

SOLUTION

- Duo-Lock™ Ø 15,875mm
- HARVI III UJDV
- Corner Radius R = 0,4mm

CUTTING DATA

- v_c 350 m/min
- f_z 0,12 mm/Z
- a_p 0,5mm
- a_e 4,0mm

CUTTING DATA

- v_c 224 m/min
- f_z 0,113 mm/Z
- a_p 15,25mm
- a_e 0,76mm

RESULT

- Tool life increased from 34 to 103 parts.
- Machining time per part reduced by 50%.

RESULT

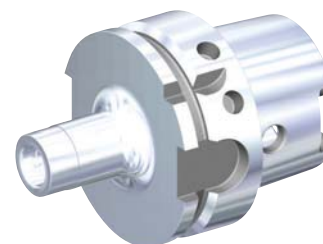
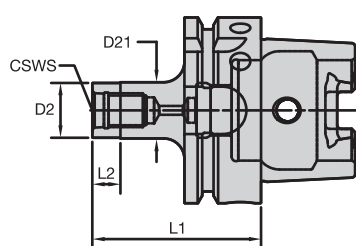
- 15% increase in cutting speed.
- Good surface finish and minimum wear on edges.

BENEFIT

- Increase of productivity.
- Cost reduction through almost triple tool life.
- Improved surface finish.

BENEFIT

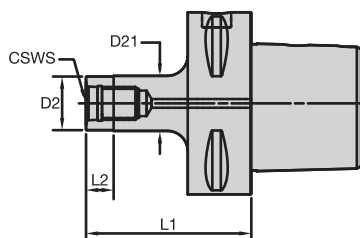
- Increased productivity.
- Reduced tooling cost.
- Long reach capability.



■ DL HSK Form A Metric

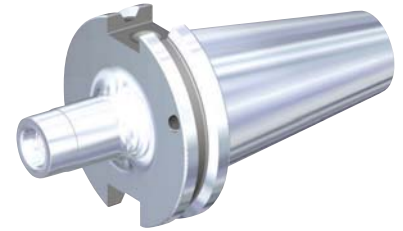
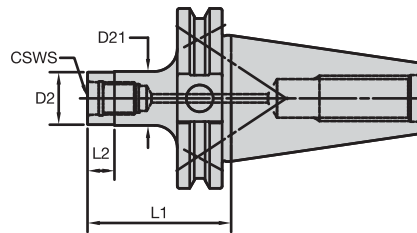
order number	catalogue number	CSWS system size	D2	D21	L1	L2	kg
6136949	HSK63ADL10048M	DL10	10	10	48	5	0,65
6136950	HSK63ADL12052M	DL12	12	12	52	6	0,66
6136951	HSK63ADL16057M	DL16	16	16	57	8	0,68
6136952	HSK63ADL20057M	DL20	19	20	57	10	0,70
6136953	HSK63ADL25061M	DL25	24	25	61	13	0,71
6136954	HSK63ADL32072M	DL32	31	32	72	16	0,80

PSC63 Duo-Lock™ Integrated



■ DL PSC63 Metric

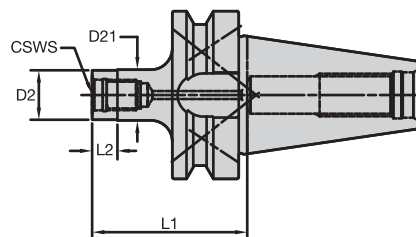
order number	catalogue number	CSWS system size	D2	D21	L1	L2	kg
6136955	PSC63DL10050M	DL10	10	10	50	5	0,78
6136956	PSC63DL12050M	DL12	12	12	50	6	0,79
6136957	PSC63DL16055M	DL16	16	16	55	8	0,81
6136958	PSC63DL20055M	DL20	19	20	55	10	0,82
6136959	PSC63DL25060M	DL25	24	25	60	13	0,85
6136960	PSC63DL32068M	DL32	31	32	68	16	0,93



■ DL CV40 Metric

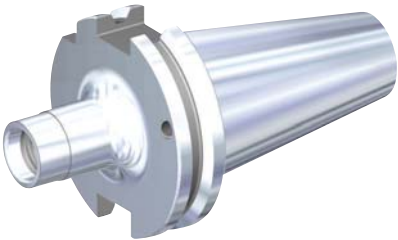
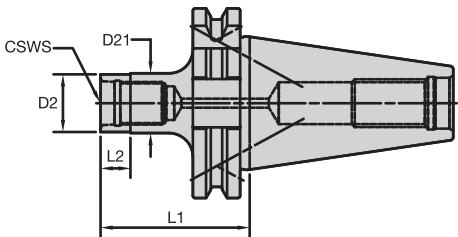
order number	catalogue number	CSWS system size	D2	D21	L1	L2	kg
6136971	CV40BDL10041M	DL10	10	10	41	5	0,85
6136972	CV40BDL12041M	DL12	12	12	41	6	0,85
6136973	CV40BDL16050M	DL16	16	16	50	8	0,87
6136974	CV40BDL20050M	DL20	19	20	50	10	0,90
6136975	CV40BDL25056M	DL25	24	25	56	13	0,91
6136976	CV40BDL32065M	DL32	31	32	65	16	0,99

BT40 Duo-Lock™ Integrated



■ DL BT40 Metric

order number	catalogue number	CSWS system size	D2	D21	L1	L2	kg
6136977	BT40BDL10049M	DL10	10	10	49	5	0,99
6136978	BT40BDL12049M	DL12	12	12	49	6	1,00
6136979	BT40BDL16058M	DL16	16	16	58	8	1,02
6136980	BT40BDL20058M	DL20	19	20	58	10	1,03
6136991	BT40BDL25060M	DL25	24	25	60	13	1,05
6136992	BT40BDL32068M	DL32	31	32	68	16	1,11

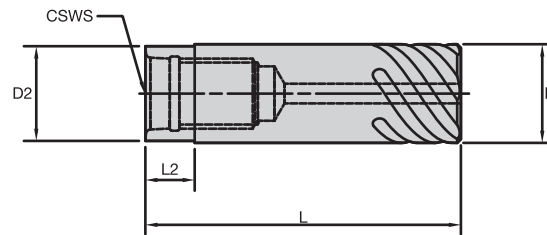


■ DL DV40 Metric

order number	catalogue number	CSWS system size	D2	D21	L1	L2	kg
6136993	DV40BDL10041M	DL10	10	10	41	5	0,85
6136994	DV40BDL12041M	DL12	12	12	41	6	0,85
6136995	DV40BDL16050M	DL16	16	16	50	8	0,87
6136996	DV40BDL20050M	DL20	19	20	50	10	0,89
6136997	DV40BDL25056M	DL25	24	25	56	13	0,91
6136998	DV40BDL32065M	DL32	31	32	65	16	0,99

Duo-Lock Modular Milling

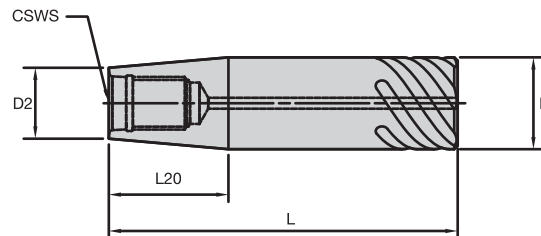
			40	(2x) MS2221S	2,5mm
			50	(2x) MS1296S	3mm



DL SS SL Cylindrical Metric

order number	catalogue number	CSWS system size	D	D2	L	L2	kg
6134889	SS10SLDL10055M	DL10	10	9,60	55	5	0,03
6135043	SS12SLDL12060M	DL12	12	11,50	60	6	0,05
6135049	SS16SLDL16065M	DL16	16	15,50	65	8	0,08
6135057	SS20SLDL20070M	DL20	20	19,30	70	10	0,14
6135063	SS25SLDL25080M	DL25	25	24,00	80	13	0,24
6135067	SS32SLDL32090M	DL32	32	31,00	90	16	0,43

NOTE: Cylindrical shanks not recommended for full slotting.



DL SS SL Conical Metric

order number	catalogue number	CSWS system size	D	D2	L	L20	kg
6135041	SS12SLDL10065M	DL10	12	9,60	65	14	0,05
6135045	SS16SLDL10090M	DL10	16	9,60	90	37	0,12
6135051	SS20SLDL10115M	DL10	20	9,60	115	59	0,21
6135047	SS16SLDL12080M	DL12	16	11,50	80	26	0,11
6135053	SS20SLDL12105M	DL12	20	11,50	105	49	0,20
6135055	SS20SLDL16080M	DL16	20	15,50	80	26	0,17
6135059	SS25SLDL16115M	DL16	25	15,50	115	54	0,35
6135061	SS25SLDL20095M	DL20	25	19,30	95	33	0,31
6135065	SS32SLDL25105M	DL25	32	24,00	105	46	0,53
6135069	SS40SLDL32140M	DL32	40	31,00	140	51	1,13
6135081	SS50SLDL32200M	DL32	50	31,00	200	109	2,37

Duo-Lock Modular Milling



■ Torque Wrench

order number	catalogue number	Description
6135412	TWDLTMSSET	TORQUE WRENCH SET
6135413	TWDLTM	BASIC DUO LOCK WRENCH
6135414	TWTMINSERTDL10	TORQUE WRENCH INSERT DL10
6135415	TWTMINSERTDL12	TORQUE WRENCH INSERT DL12
6135416	TWTMINSERTDL16	TORQUE WRENCH INSERT DL16
6135417	TWTMINSERTDL20	TORQUE WRENCH INSERT DL20
6135418	TWTMINSERTDL25	TORQUE WRENCH INSERT DL25
6135419	TWTMINSERTDL32	TORQUE WRENCH INSERT DL32
6135420	TWTMINSERTDL10W	TORQUE WRENCH INSERT DL10 WEAR
6135421	TWTMINSERTDL12W	TORQUE WRENCH INSERT DL12 WEAR
6135422	TWTMEXT	TORQUE WRENCH EXTENSION HANDLE
6135423	TWTMBC	TORQUE WRENCH BOLT SET

NOTE: Torque wrench set contains all items necessary for Duo-Lock 10–32.
Combine basic Duo-Lock wrench with selected torque wrench inserts needed.

Duo-Lock Modular Milling

Assembly

Please wear sufficient personal safety equipment such as gloves and eye protection during assembly.

- 1** Clean the Duo-Lock™ cutting insert and shank coupling.



- 2** Mount the Duo-Lock™ adaptor in a mounting block with a clamping chuck sufficient to enable torque transmission.



- 3** Screw the Duo-Lock™ cutting tip into adaptor by hand.

Attention: Use of protective gloves is mandatory!



- 4** A gap of approx. 0,15–0,3mm should be visible.



- 5** Apply the torque shown in the table. Use of a high quality common torque wrench is mandatory. The ERICKSON™ Torque Master wrench is recommended.



Duo-Lock™ Size	Torque Nm
DL 10	25
DL 12	30
DL 16	60
DL 20	80
DL 25	100
DL 32	130