Member IMC Group Tungaloy

MillLine

For more information

Exchangeable head endmill

TUNGMEISTER

Tungaloy Report No. 381-G

High productive exchangeable head endmill series — now offering the latest AH715 grade milling heads + expansion of shanks lineup

TUNGALOY ADDFORCE ACCELERATED LINES

TUNGALOY ADDFORCE MILL
ACCELERATED MILLING

Over **13,000** combinations for optimal performance

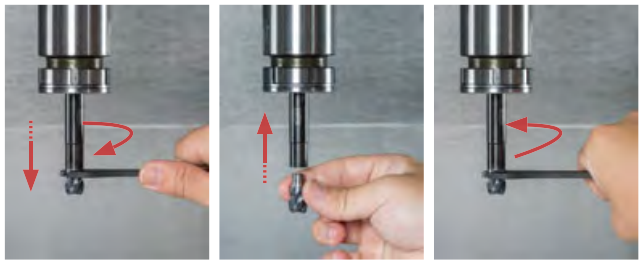
TUNGMEISTER

TUNGMEISTER

Maximize your endmilling productivity

1 Quick change over for reduced tool setup time

TUNGMEISTER



≈ 1 min.

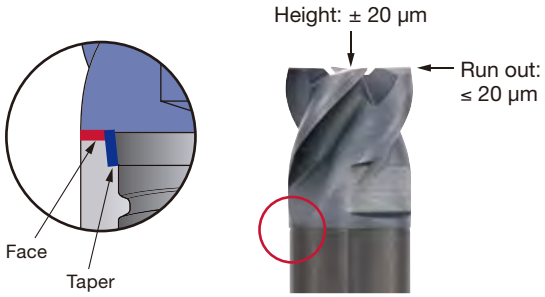
Tool setup time is down to 1/10

(with the shank remaining in the spindle)

Solid carbide endmill

■ High accuracy and repeatability

Repeatability and accuracy are maintained due to full contact of both taper and face.



2 Combine various tool holders and cutting heads to get an optimized tooling solution for your machining

Heads: square shoulder, ball nose, chamfer, T-slot …
Shanks: straight, tapered, integrated ER collet …

Combining the milling head and shank

Case 1 Replacing solid carbide endmill on machining centers

Greater tool diameter provides increased rigidity

TUNGMEISTER

Solid carbide endmill

Application area

P

Square

Shank	: VSSD25L075S12-S
Head	: VEH200L30.0R05I04S12 AH715
Workpiece material	: S55C / C55 (200HB)
Cutting speed	: *Vc* = 75 m/min
Feed per tooth	: *fz* = 0.07 mm/t
Depth of cut	: *ap* = 1 - 5 mm
Width of cut	: *ae* = 20 mm
Machine	: Vertical M/C, BT50
Overhang	: 45 mm
Coolant	: Dry

Increased tool rigidity for higher productivity.

Case 2 Replacing solid carbide endmill on Swiss machine

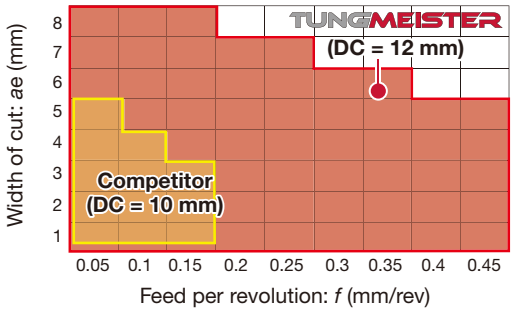
TungMeister enables the use of greater tool diameter when compared with using a standard ER collet of the same size

Increased rigidity

TUNGMEISTER

Solid carbide endmill

Application area



M

Square

Shank	: VER16AL006S08-S
Head	: VEE120L09.0R00-03S08 AH725
Workpiece material	: SUS304 / X5CrNi18-9 (160HB)
Cutting speed	: *Vc* = 40 m/min
Feed per revolution	: *f* = 0.05 - 0.45 mm/rev
Depth of cut	: *ap* = 3 mm
Width of cut	: *ae* = 1 - 8 mm
Machine	: Swiss lathe
Overhang	: 22.5 mm
Coolant	: Wet

Increased tool size for higher productivity.

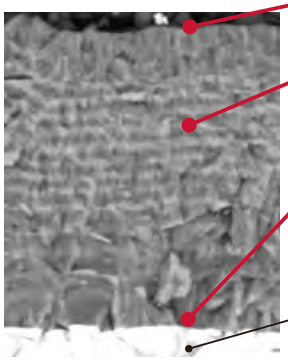
TUNGMEISTER

Constant and predictable tool life

AH715

The first choice grade for ISO P, M, K, and S material group applications. A nano-multilayered coating grade consisting of three distinctive layers for added multifunctionality.

Significant expansion has been made to the square shoulder and chamfering head lineups.



1. Resistance to built-up edge
Coating layer to resist built-up edge

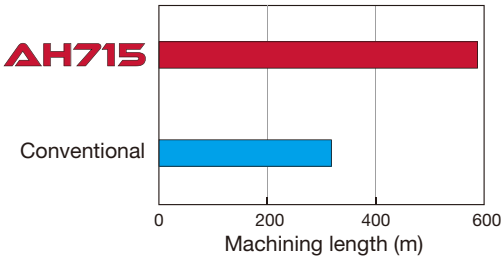
2. Resistance to wear, oxidation, and fracture
Two coating layers for wear and oxidation resistance. Layered alternatively to prevent crack from propagating to fracture

3. Strong coating-substrate adhesion
Coating is provided with strong adhesion between the coating layer and carbide substrate to prevent coating delamination

Carbide substrate
Provides a good balance of wear and fracture resistance

Tool life comparison

Better tool life performance in a wide group of materials.

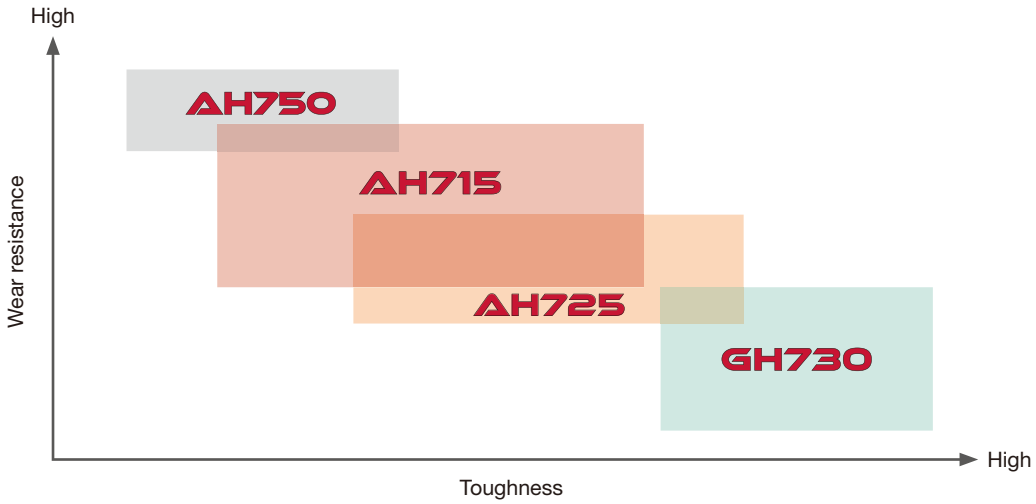


P

Square

Shank	: VSSD16L100S10-S
Head	: VED160L12.0R05-04S10 AH715
Workpiece material	: S55C / C55 (1055)
Cutting speed	: *Vc* = 150 m/min
Feed per tooth	: *fz* = 0.12 mm/t
Depth of cut	: *ap* = 5 mm
Width of cut	: *ae* = 1.5 mm
Machine	: Vertical M/C, BT40

Application range

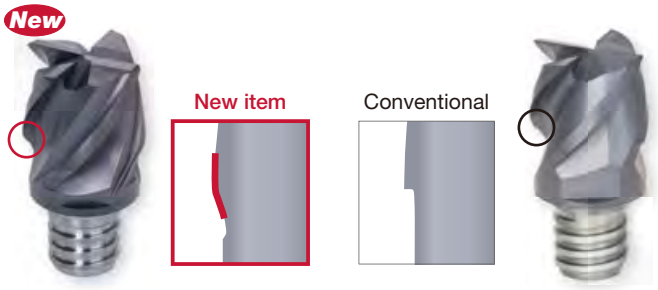


Square shoulder heads

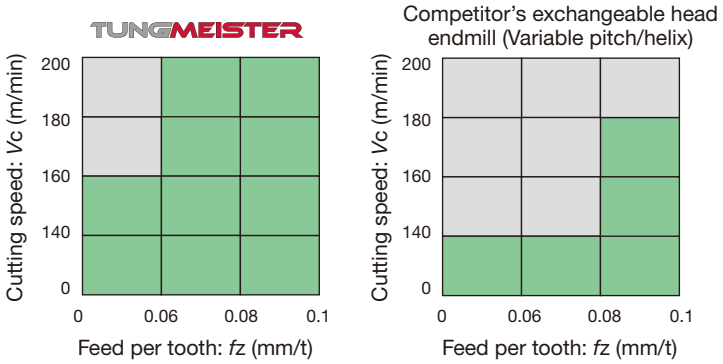
VEH

First choice geometry for square shoulder applications

- Variable pitch, variable helix design to eliminate chatter
- Applicable from rough to finish machining
- New The new AH715 grade milling heads incorporate a radius on the cutting edge ends to eliminate steps on the worked surface



Practical example



P

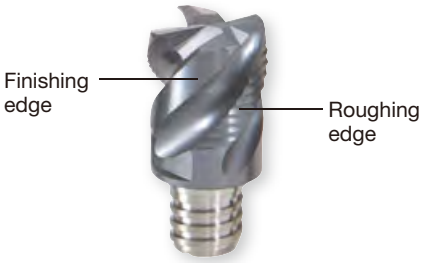
Square

Shank	: VSSD16L100S10-S
Head	: VEH160L24.0R05I04S10 AH715
Workpiece material	: S55C / C55 (204HB)
Cutting speed	: *Vc* = 140 - 200 m/min
Feed per tooth	: *fz* = 0.06 - 0.1 mm/t
Depth of cut	: *ap* = 16 mm
Width of cut	: *ae* = 4 mm
Machine	: Vertical M/C, BT40
Overhang	: 54 mm
Coolant	: Dry

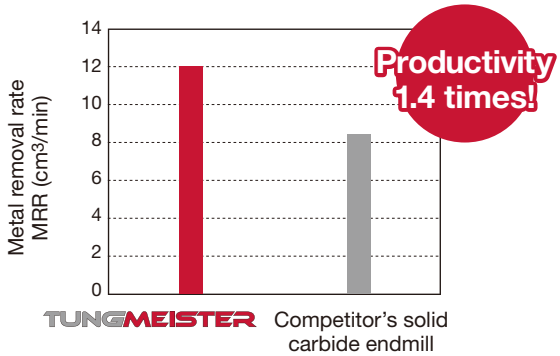
VEE-C

For increased efficiency in square shoulder applications

- Incorporating two roughing edges provides high efficiency milling equal to standard roughing endmill
- Applicable from rough to finish endmilling



Practical example



P

Square

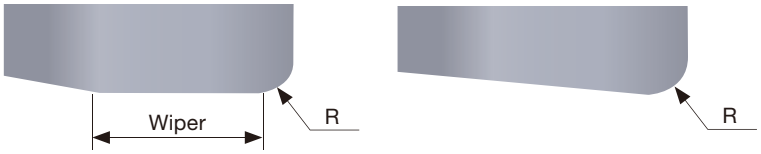
Shank	: VSSD12L070S08-C
Head	: VEE120L09.0C40C04S08 AH725
Workpiece material	: S45C / C45
Cutting speed	: *Vc* = 60 m/min
Feed per tooth	: *fz* = 0.12 mm/t (Competitor: 0.08 mm/t)
Feed speed	: *Vf* = 740 mm/min (Competitor: 530 mm/min)
Depth of cut	: *ap* = 8.5 mm
Width of cut	: *ae* = 1.9 mm
Machine	: Vertical M/C, HSK A63
Overhang	: 48 mm
Coolant	: Dry

TungMeister has minimized vibrations, allowing increased machining efficiency.

Face milling head

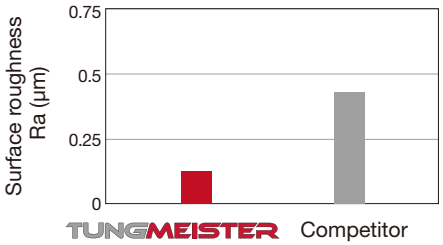
VFM

Features wiper geometry for better surface quality compared with solid carbide endmills.



TUNGMEISTER　　Solid carbide endmill

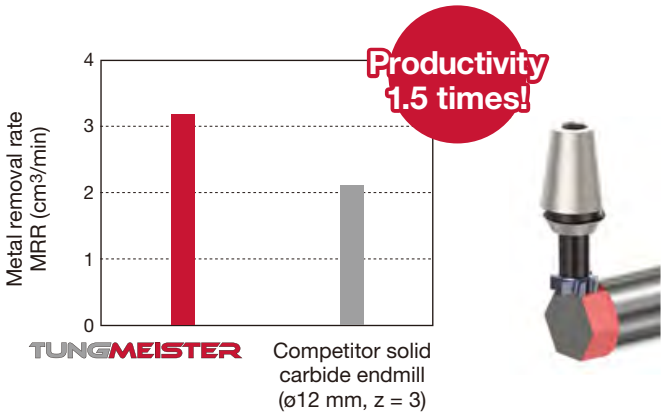
■ Practical example 1 (improved surface roughness)



M
Face mill

Shank	: VSSD12L090S08-S
Head	: VFM200L06.0R04I06S08 AH715
Workpiece material	: SUS303 / X10CrNiS18-9
Cutting speed	: *Vc* = 100 m/min
Feed per tooth	: *fz* = 0.05 mm/t
Depth of cut	: *ap* = 1 mm
Width of cut	: *ae* = 12 mm
Machine	: Vertical M/C, BT30
Overhang	: 30 mm
Coolant	: Wet

■ Practical example 2 (improved efficiency in Swiss machines)



M
Face mill

Shank	: VER16AL010S06-S
Head	: VFM160L04.8R04I06S06 AH715
Workpiece material	: SUS303
Cutting speed	: *Vc* = 60 m/min
Feed per tooth	: *fz* = 0.06 mm/t
Feed speed	: *Vf* = 430 mm/min (Competitor: 285 mm/min)
Depth of cut	: *ap* = 0.5 mm
Width of cut	: *ae* = 15 mm (Competitor: 7.5 mm)
Machine	: Swiss lathe
Overhang	: 11.6 mm (Competitor: 22.5 mm)
Coolant	: Wet

With greater tool diameter and optimized overhang, TungMeister provided better efficiency.

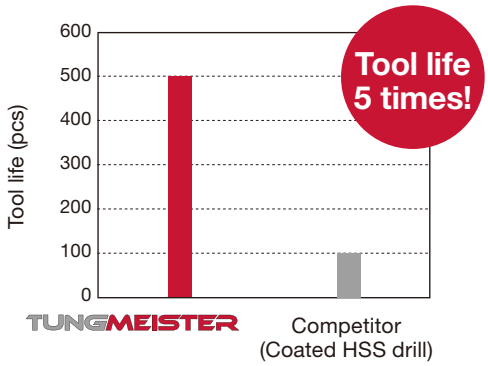
Chamfering and spot drilling heads

VCP

First choice for chamfering applications

Suited for spot drilling process.

■ **Practical example (chamfering in a single-plunge)**



P

Chamfering
Spot drill

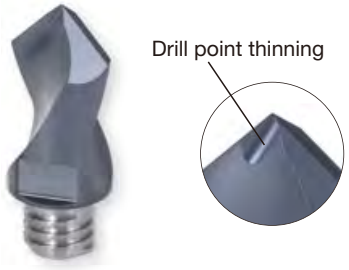
Shank	: VSSD20L120S12-S
Head	: VCP200L18.2A45-02S12 AH715
Workpiece material	: S50C / C50 (180HB)
Cutting speed	: *Vc* = 65 m/min (Competitor: 30 m/min)
Feed per tooth	: *f* = 0.12 mm/rev (Competitor: 0.1 mm/rev)
Feed speed	: *Vf* = 160 mm/min (Competitor: 60 mm/min)
Chamfering	: 0.2 mm
Machine	: Lathe
Overhang	: 50 mm
Coolant	: Dry

TungMeister improved efficiency and tool life over HSS drills.

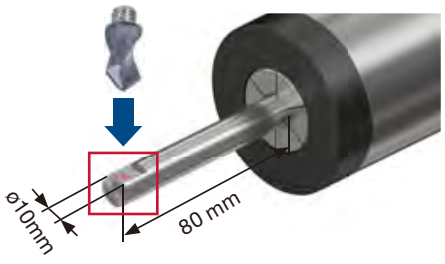
VDS

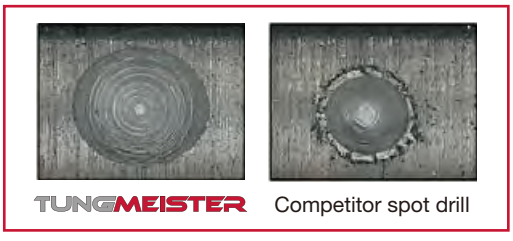
For light cutting

With optimized helical edges and drill point thinning, the drill eliminates burr formation during spot drilling or chamfering.



■ **Practical example (spot drilling on a long, slender barstock with only one side chucked)**





P

Chamfering
Spot drill

Shank	: VSSD10L075S06-S
Head	: VDS100A45-02S06 AH725
Workpiece material	: S55C / C55 (204HB)
Cutting speed	: *Vc* = 140 m/min
Feed per tooth	: *fz* = 0.02 mm/t
Spot depth	: 2 mm
Machine	: Vertical M/C, B50
Coolant	: Dry

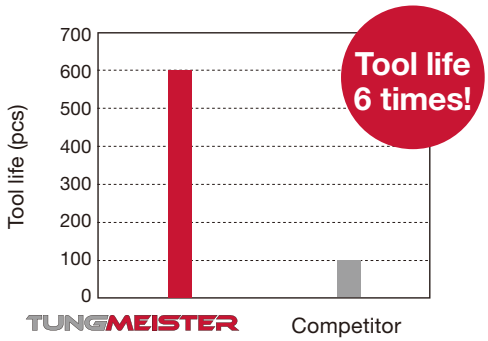
The competitor drill moved the barstock during spot drilling and formed burrs, resulting in unsuccessful spot drilling.
TungMeister generated light cutting action, providing successful spot drilling.

Centering drill head

VDP

Coated cemented carbide head for higher productivity and longer tool life.

■ Practical example



P

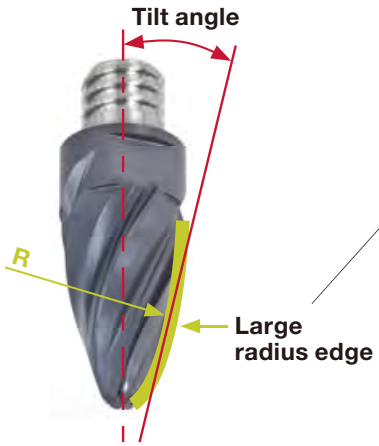
Center hole

Shank	: VSSD12L090S08-S
Head	: VDP513L07.2A30-02S08 AH725
Workpiece material	: SCM420H / 18CrMo4
Cutting speed	: *Vc* = 90 m/min (Competitor: 30 m/min)
Feed per revolution	: *f* = 0.04 mm/rev (Competitor: 0.08 mm/rev)
Hole depth	: 10 mm
Machine	: Horizontal M/C, BT40
Coolant	: External

Barrel heads

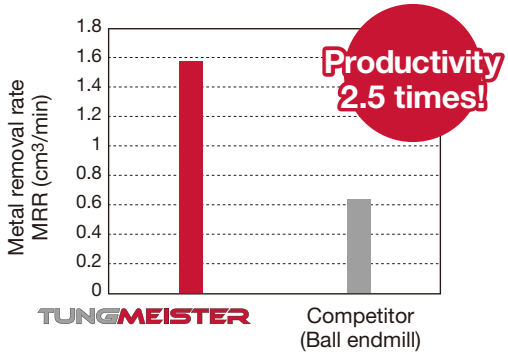
VBO, VBL, VBN

The cutting edge incorporates a large radius, which improves machining efficiency of 3D surfaces.



- Large radius cutting edge reduces the number of tool passes without degradation of surface quality, providing high machining efficiency
- The tool tilt angle provides an ideal cutting point for excellent surface finish
- 3 types of heads cover a wider range of parts

■ Practical example



P

Barrel

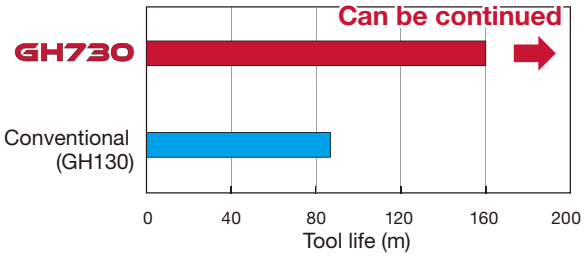
Shank	: VSSD12L070S08-C
Head	: VBO120L19.0R800-5S08 AH715
Workpiece material	: S50C / C50
Cutting speed	: *Vc* = 200 m/min
Feed per tooth	: *fz* = 0.03 mm/t
Feed speed	: *Vf* = 796 mm/min (Competitor: 636 mm/min)
Depth of cut	: *ap* = 4 mm (Competitor: 2 mm)
Width of cut	: *ae* = 0.5 mm
Machine	: Vertical M/C, BT30
Coolant	: Dry

Slotting heads

VST, VTB

- Made of coated cemented carbide, the milling head enables higher cutting speeds and feeds compared with HSS or brazed carbide tools for improved tool life and productivity
- Suited for machining DIN471/472 circlip retaining rings (snap rings)

Tool life



P

Slotting

Shank	: VSTD12L090S08-S
Head	: VST217W2.00R020-4S08 GH730
Workpiece material	: SCM440 /42CrMo4 (300HB)
Cutting speed	: *Vc* = 90 m/min
Feed per tooth	: *fz* = 0.08 mm/t
Depth of cut	: *ap* = 1.8 mm
Width of cut	: *ae* = 2 mm
Machine	: Vertical M/C, BT40

Automatic drawing generator system of customized slotting heads

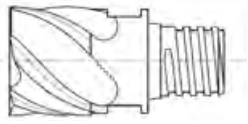
By entering the required tool information for each item (e.g. slot width, corner radius), you can create a simplified drawing of the **TungMeister** Special T-Slot Head.

For more information

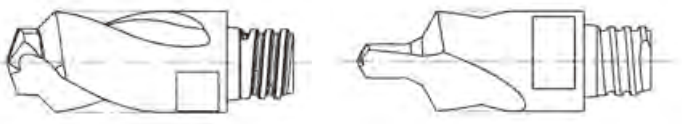
Special items

Special shapes are available on request.

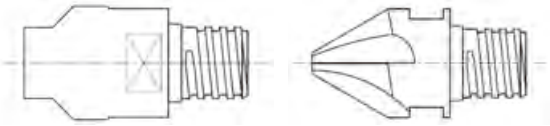
Square shoulder: with customized tool diameter, radius



Hole making: with customized steps



Profiling: with customized 3D profiles



TUNGMEISTER Quick Guide

Square, Face mill, High feed

★ : First choice ☆ : Second choice

Head geometry	Designation	Appearance	Application (Roughing — Finishing)	Tool dia. (mm)	No. of cutting edges	Cutting edge length L/D	Feature	Corner geometry	Workpiece material P	M	K	N	S	H	Page
Square	VEH...			ø8 - ø20	4	0.6 - 0.8XD	First choice for square head, General Variable helix, Variable pitch	Corner radius	★	★	★	☆	★	☆	16
	VEH...			ø8 - ø32	4	1.2 - 1.5XD	First choice for square head, General Variable helix, Variable pitch Long edge type (Max *ap* = 1.2 ~ 1.5XD)	Corner radius	★	★	★	☆	★	☆	17
	VEE**-04... VED**-04...			ø5 - ø20	4	0.8XD	General	Corner radius	★	★	★	☆	★	☆	18
	VEE**I...			ø8 - ø25	4	0.6 - 0.8XD	General Variable pitch	Corner radius/ Chamfered	★	★	★	☆	★	☆	19
	VEE**-03...			ø7.7 - ø19.7	3	0.5XD	General For key way	Corner radius	★	★	★	☆	★	☆	19
	VEE**A02...			ø10 - ø12	2	0.7XD	General For non-ferrous metal	Corner radius			☆	★			20
	VEE**A03...			ø8 - ø20	3	0.6XD	General For non-ferrous metal	Corner radius			☆	★			20
	VEE**R...			ø8 - ø25	4, 5, 6	0.6 - 0.8XD	Anti-chattering/Serrated cutting edge	Chamfered	★	★	★	☆	★	☆	21
	VED**R...			ø8 - ø25	4, 5, 6	1.5XD	Anti-chattering/Serrated cutting edge Long edge type (Max *ap* = 1.2 ~ 1.5XD)	Chamfered	★	★	★	☆	★	☆	21
	VEE**C...			ø8 - ø25	4	0.6 - 0.8XD	Anti-chattering Roughing and Finishing edge combination	Chamfered	★	★	★	☆	★	☆	22
	VED**-06..., VEE**-06...			ø8 - ø12	6	0.6 - 0.8XD	Small width of cut (*ae* = 0.02XD)	Corner radius/ Chamfered	☆	☆	☆		★	★	22
	VED**-08/10..., VEE**-08/10...			ø16 - ø25	8, 10	0.8XD	Small width of cut (*ae* = 0.02XD)	Corner radius/ Chamfered	☆	☆	☆		★	★	23
	VED**-07/09...			ø8 - ø25	7, 9	1.5XD	Variable helix, Variable pitch Small width of cut (*ae* = 0.02XD) Long edge type (Max *ap* = 1.5XD)	Corner radius	☆	☆	☆		★	★	23
Face mill	VFM...			ø12 - ø25	6	0.3XD	Face milling	Corner radius	★	★	★	☆	★	☆	26
High feed	VFX**-02...			ø10 - ø20	2	0.06XD	High feed	-	★	★	★	☆	★	★	27
	VFX**-04/06...			ø12, ø16	4, 6	0.05XD	High feed With coolant hole	-	★	★	★	☆	★	★	27

Recommended

Profiling (ball, radius, barrel)

★ : First choice ☆ : Second choice

Head geometry	Designation	Appearance	Application (Roughing – Finishing)	Tool dia. (mm)	No. of cutting edges	Feature	Helix angle	Workpiece material P	M	K	N	S	H	Page
Ball	VBB**-BM...			ø8 - ø16	2	Economical type	0	★	★	★	☆	★	★	29
	VBB**-BG...			ø8 - ø16	2	High accuracy h7 For hardenened material	0	★	★	★	☆	★	★	29
	VBD**-BG...			ø8 - ø16	2	Low cutting force Helix cutting edge	30	★	★	★	☆	★	★	29
	VBD**-BG-04... VBE**-BG-04...			ø5 - ø20	4	Low cutting force Helix cutting edge	30/38	★	★	★	☆	★	★	30
	VBB**-SG...			ø10 - ø20	2	High accuracy h7 Sphere cutting edge	0	★	★	★	☆	★	★	30
	VBE**-BGA...			ø8 - ø20	2	For non-ferrous metal	45			☆	★			30
Radius	VRB**-02... VRC**-02...			ø10 - ø20	2	Economical type	0/15	★	★	★	☆	★	☆	32
	VRD**-06...			ø8 - ø16	6	High productivity High number of cutting edges	30	★	★	★	☆	★	☆	32
Barrel	VBO...			ø8 - ø16	4, 5	High productive profiling Long edge type	30	★	★	★	☆	★	☆	34
	VBO...			ø10 - ø16	4	High productive profiling Short edge type	30	★	★	★	☆	★	☆	34
Bull nose	VBN...			ø10 - ø16	6	High productive profiling	35	★	★	★	☆	★	☆	34
Lens	VBL...			ø8 - ø16	6	High productive profiling	30	★	★	★	☆	★	☆	35

Recommended

TUNGMEISTER Quick Guide

Multi-function (chamfering, spot drill, center hole, counterboring)

★ : First choice ☆ : Second choice

Head geometry	Designation	Appearance	Center edge (Z-feed capability)	Tool dia. (mm)	No. of cutting edges	Feature	Helix angle	Workpiece material P	M	K	N	S	H	Page
Chamfering	VCA**-04/06...		Without	ø10 - ø20	4, 6	Chamfering angle: 45°	0	★	★	★	☆	★	☆	37
	VCW**-02...		Without	ø9.8 - ø15.7	2	Chamfering angle:45° Back chamfering capability	0	★	★	★	☆	★	☆	37
	VCR**-02...		Without	ø8 - ø20	2	Radius chamfering	0	★	★	★	☆	★	☆	37
Chamfering Spot drill	VCP**-02...		With	ø8 - ø20	2	Chamfering angle: 30°, 45°, 60°	0	★	★	★	☆	★	☆	39
	VDS...		With	ø8 - ø16	2	Chamfering angle: 45° Low cutting force Helix cutting edge: 10°	10	★	★	★	☆	★	☆	39
Center hole	VDP**-02...		With	ø1.07 - ø6.46	2	For center hole	0	★	★	★	☆	★	☆	41
Counterboring	VGC**-02...		With	ø7.8 - ø16	2	For counterboring	10	★	★	★	☆	★	☆	42

Recommended

Slotting

★ : First choice ☆ : Second choice

Head geometry	Designation	Appearance	Groove width (mm)	Tool dia. (mm)	No. of cutting edges	Feature	Edge shape	Helix angle	Workpiece material P	M	K	N	S	H	Page
Slotting	VST**-3/4/6...		0.76 - 10	ø15.7 - ø27.7	3, 4, 6	Slotting	Corner radius	0	★	★	★	☆	★	☆	43
	VST**A45...		3.4, 5.5	ø17.7, ø21.7	3, 4	Slotting with 45° chamfer	Chamfered	0	★	★	★	☆	★	☆	44
	VTB**-06...		2 - 8	ø13.5 - ø25	6	T-slotting	Corner radius	0	★	★	★	☆	★	☆	44
	VTB**C15-06...		2	ø13.5	6	T-slotting with 45° chamfer	Chamfered	0	★	★	★	☆	★	☆	45

Indexable modular head

★ : First choice ☆ : Second choice

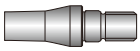
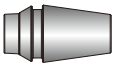
Head geometry	Designation	Appearance	Application (Roughing – Finishing)	Tool dia. (mm)	No. of cutting edges	Cutting edge length APMX (mm)	Tool family	Corner geometry	Workpiece material P	M	K	N	S	H	Page
Indexable modular head	HPAV06-S			ø10 - ø16	2, 3, 4	6	Indexable shoulder milling cutter TUNGFREC	Corner radius	★	★	★	★	★	★	46
	HXN02R-S			ø8 - ø16	1, 2, 4	0.5	Indexable high feed milling cutter ADDFEED	-	★	★	★	★	★	★	48
	TID-S L/D=2			ø6.5 - ø10.9	-	-	Exchangeable head drill DRILLMEISTER	-	★	★	★	★	★	★	50

Threading

★ : First choice ☆ : Second choice

Head geometry	Designation	Appearance	Feature	Wiper edge	No. of cutting edges	Tool dia. (mm)	Internal/ External	Thread type	Min. thread size	Workpiece material P	M	K	N	S	H	Page
Threading	VMT***IS		Full profile	With	3 - 6	ø10 - ø16	Internal	ISO metric	M12X0.75	★	★	★	☆	★	☆	53
	VMT***UN		Full profile	With	3, 4, 5	ø10 - ø16	Internal	Unified	9/16-24 UNEF	★	★	★	☆	★	☆	53
	VMT***W		Full profile	With	4	ø10, 16	Internal/ External	Whitworth	G1/4	★	★	★	☆	★	☆	54
	VTR***IS		Partial profile	Without	3, 4	ø15.7 - ø21.7	Internal/ External	60° partial profile	M20X0.5	★	★	★	☆	★	☆	54
	VTR***W		Partial profile	Without	4	ø21.7	Internal/ External	55° partial profile	G3/4	★	★	★	☆	★	☆	54

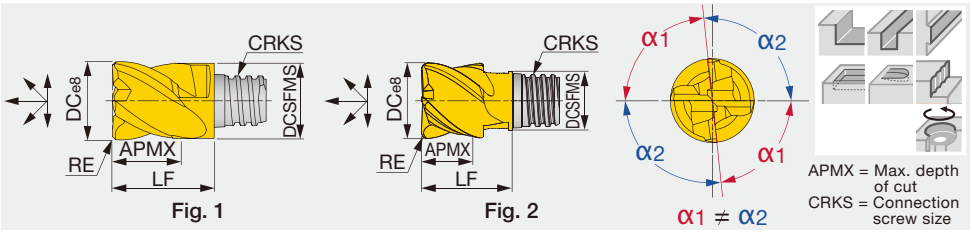
Shank

Shank	Appearance	Material: Steel	Carbide	Carbide (with coolant hole)	Tungsten (with coolant hole)	Page
Straight		✓	✓	✓	✓	57, 58
Taper		✓	✓	-	✓	59, 60
High rigidity shank (straight)		✓	-	-	-	58
High rigidity shank (weldon)		✓	-	-	-	59
Slotting shank		✓	✓	✓	-	60
Adapter for TungFlex		✓	-	-	-	61
ER collet		✓	-	-	-	61

VEH...

4 flute, roughing - finishing, variable helix and pitch

Square



Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*	Fig.
VEH080L05.0R00I04S05	●		4	41° - 45°	8	7.7	5	-	S05	10	KEYV-S05	7	1
VEH080L05.0R05I04S05	●	●	4	41° - 45°	8	7.7	5	0.5	S05	10	KEYV-S05	7	1
VEH080L05.0R10I04S05	●	●	4	41° - 45°	8	7.7	5	1	S05	10	KEYV-S05	7	1
VEH100L07.0R10I04S05	●		4	41° - 45°	10	7.7	7	1	S05	12.8	KEYV-S05	7	2
VEH100L07.0R00I04S06	●		4	41° - 45°	10	9.7	7	-	S06	13	KEYV-S06	10	1
VEH100L07.0R05I04S06	●	●	4	41° - 45°	10	9.7	7	0.5	S06	13	KEYV-S06	10	1
VEH100L07.0R10I04S06	●	●	4	41° - 45°	10	9.7	7	1	S06	13	KEYV-S06	10	1
VEH120L09.0R10I04S06	●		4	41° - 45°	12	9.3	9	1	S06	14.3	KEYV-S06	10	2
VEH120L09.0R00I04S08	●		4	41° - 45°	12	11.7	9	-	S08	16.5	KEYV-S08	15	1
VEH120L09.0R05I04S08	●	●	4	41° - 45°	12	11.7	9	0.5	S08	16.5	KEYV-S08	15	1
VEH120L09.0R10I04S08	●	●	4	41° - 45°	12	11.7	9	1	S08	16.5	KEYV-S08	15	1
VEH160L12.0R10I04S08	●		4	41° - 45°	16	11.7	12	1	S08	20	KEYV-S08	15	2
VEH160L12.0R00I04S10	●		4	41° - 45°	16	15.3	12	-	S10	20.5	KEYV-S10	28	1
VEH160L12.0R05I04S10	●	●	4	41° - 45°	16	15.3	12	0.5	S10	20.5	KEYV-S10	28	1
VEH160L12.0R10I04S10	●	●	4	41° - 45°	16	15.3	12	1	S10	20.5	KEYV-S10	28	1
VEH200L15.0R00I04S12	●		4	41° - 45°	20	18.3	15	-	S12	25.5	KEYV-S12	28	1
VEH200L15.0R05I04S12	●	●	4	41° - 45°	20	18.3	15	0.5	S12	25.5	KEYV-S12	28	1
VEH200L15.0R10I04S12	●	●	4	41° - 45°	20	18.3	15	1	S12	25.5	KEYV-S12	28	1
VEH250L22.0R00I04S15	●		4	41° - 45°	25	23.9	22	-	S15	37	KEYV-W20	40	1
VEH250L22.0R05I04S15	●		4	41° - 45°	25	23.9	22	0.5	S15	37	KEYV-W20	40	1
VEH250L22.0R10I04S15	●		4	41° - 45°	25	23.9	22	1	S15	37	KEYV-W20	40	1

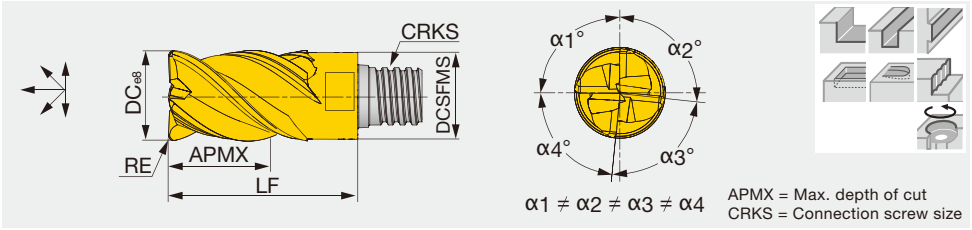
Torque*: Recommended clamping torque (N·m)
2 pieces per package

●: New product
●: Line up

VEH...

4 flute, roughing - finishing, long edge, variable helix and pitch

Square



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEH080L12.0R05I04S05	●	4	41° - 45°	8	7.7	12	0.5	S05	18	KEYV-S05	7
VEH080L12.0R10I04S05	●	4	41° - 45°	8	7.7	12	1	S05	18	KEYV-S05	7
VEH100L15.0R05I04S06	●	4	41° - 45°	10	9.7	15	0.5	S06	22	KEYV-S06	10
VEH100L15.0R10I04S06	●	4	41° - 45°	10	9.7	15	1	S06	22	KEYV-S06	10
VEH120L18.0R05I04S08	●	4	41° - 45°	12	11.7	18	0.5	S08	27	KEYV-S08	15
VEH120L18.0R10I04S08	●	4	41° - 45°	12	11.7	18	1	S08	27	KEYV-S08	15
VEH160L24.0R05I04S10	●	4	41° - 45°	16	15.3	24	0.5	S10	33.5	KEYV-S10	28
VEH160L24.0R10I04S10	●	4	41° - 45°	16	15.3	24	1	S10	33.5	KEYV-S10	28
VEH200L30.0R05I04S12	●	4	41° - 45°	20	18.45	30	0.5	S12	41	KEYV-S12	28
VEH200L30.0R10I04S12	●	4	41° - 45°	20	18.45	30	1	S12	41	KEYV-S12	28
VEH250L37.0R05I04S15	●	4	41° - 45°	25	23.9	37	0.5	S15	52.5	KEYV-W20	40
VEH250L37.0R10I04S15	●	4	41° - 45°	25	23.9	37	1	S15	52.5	KEYV-W20	40
VEH320L38.0R00I04S21	●	4	41° - 45°	32	30	38	-	S21	55	KS-24	110
VEH320L38.0R10I04S21	●	4	41° - 45°	32	30	38	1	S21	55	KS-24	110

Torque*: Recommended clamping torque (N·m)
VEH080 ~ VEH160: 2 pieces per package
VEH200 ~ VEH320: 1 piece per package

● : Line up

VEE**-04..., VED**-04...

4 flute, roughing - finishing, general

Square

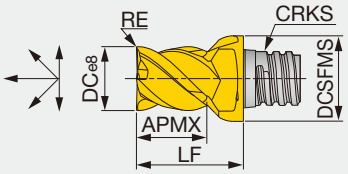


Fig. 1**

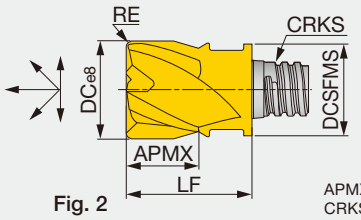
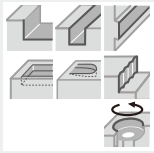


Fig. 2



APMX = Max. depth of cut
CRKS = Connection screw size

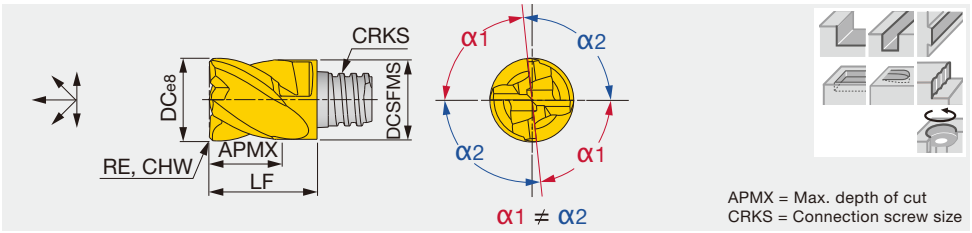
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*	Fig.
VEE050L04.0R05-04S04	●	●	4	45°	5	6	4	0.5	S04	8.5	KEYV-S05	4	1
VEE060L04.0R05-04S04	●	●	4	45°	6	5.8	4	0.5	S04	8.5	KEYV-S05	4	2
VEE060L05.0R00-04S05	●	●	4	45°	6	8	5	-	S05	10	KEYV-S05	7	1
VEE080L05.0R00-04S05	●	●	4	45°	8	7.7	5	-	S05	10	KEYV-S05	7	2
VED080L05.0R05-04S05	●	●	4	30°	8	7.7	5	0.5	S05	10	KEYV-S05	7	2
VED080L05.0R10-04S05	●	●	4	30°	8	7.7	5	1	S05	10	KEYV-S05	7	2
VED080L05.0R15-04S05	●	●	4	30°	8	7.7	5	1.5	S05	10	KEYV-S05	7	2
VEE100L07.0R00-04S06	●	●	4	45°	10	9.7	7	-	S06	13	KEYV-S06	10	2
VED100L07.0R05-04S06	●	●	4	30°	10	9.7	7	0.5	S06	13	KEYV-S06	10	2
VEE100L07.0R05-04S06	●	●	4	45°	10	9.7	7	0.5	S06	13	KEYV-S06	10	2
VED100L07.0R10-04S06	●	●	4	30°	10	9.7	7	1	S06	13	KEYV-S06	10	2
VEE100L07.0R10-04S06	●	●	4	45°	10	9.7	7	1	S06	13	KEYV-S06	10	2
VEE120L09.0R00-04S08	●	●	4	45°	12	11.7	9	-	S08	16.5	KEYV-S08	15	2
VED120L09.0R05-04S08	●	●	4	30°	12	11.7	9	0.5	S08	16.5	KEYV-S08	15	2
VEE120L09.0R05-04S08	●	●	4	45°	12	11.7	9	0.5	S08	16.5	KEYV-S08	15	2
VED120L09.0R10-04S08	●	●	4	30°	12	11.7	9	1	S08	16.5	KEYV-S08	15	2
VEE120L09.0R10-04S08	●	●	4	45°	12	11.7	9	1	S08	16.5	KEYV-S08	15	2
VEE160L12.0R00-04S10	●	●	4	45°	16	15.3	12	-	S10	20.5	KEYV-S10	28	2
VED160L12.0R05-04S10	●	●	4	30°	16	15.3	12	0.5	S10	20.5	KEYV-S10	28	2
VEE160L12.0R05-04S10	●	●	4	45°	16	15.3	12	0.5	S10	20.5	KEYV-S10	28	2
VED160L12.0R10-04S10	●	●	4	30°	16	15.3	12	1	S10	20.5	KEYV-S10	28	2
VEE160L12.0R10-04S10	●	●	4	45°	16	15.3	12	1	S10	20.5	KEYV-S10	28	2
VED160L12.0R15-04S10	●	●	4	30°	16	15.3	12	1.5	S10	20.5	KEYV-S10	28	2
VEE160L12.0R15-04S10	●	●	4	45°	16	15.3	12	1.5	S10	20.5	KEYV-S10	28	2
VED160L12.0R20-04S10	●	●	4	30°	16	15.3	12	2	S10	20.5	KEYV-S10	28	2
VEE160L12.0R20-04S10	●	●	4	45°	16	15.3	12	2	S10	20.5	KEYV-S10	28	2
VED160L12.0R30-04S10	●	●	4	30°	16	15.3	12	3	S10	20.5	KEYV-S10	28	2
VEE160L12.0R30-04S10	●	●	4	45°	16	15.3	12	3	S10	20.5	KEYV-S10	28	2
VED160L12.0R40-04S10	●	●	4	30°	16	15.3	12	4	S10	20.5	KEYV-S10	28	2
VEE160L12.0R40-04S10	●	●	4	45°	16	15.3	12	4	S10	20.5	KEYV-S10	28	2
VEE200L15.0R00-04S12	●	●	4	45°	20	18.3	15	-	S12	25.5	KEYV-S12	28	2
VED200L15.0R05-04S12	●	●	4	30°	20	18.3	15	0.5	S12	25.5	KEYV-S12	28	2
VED200L15.0R10-04S12	●	●	4	30°	20	18.3	15	1	S12	25.5	KEYV-S12	28	2
VED200L15.0R20-04S12	●	●	4	30°	20	18.3	15	2	S12	25.5	KEYV-S12	28	2
VED200L15.0R30-04S12	●	●	4	30°	20	18.3	15	3	S12	25.5	KEYV-S12	28	2

Torque*: Recommended clamping torque (N·m)
Fig. 1**: Avoid interference with workpiece when using this cutting head. The shank diameter is larger than the cutter diameter when assembled.
2 pieces per package

●: New product
●: Line up

VEE**-I...

4 flute, roughing - finishing, variable pitch



APMX = Max. depth of cut
CRKS = Connection screw size

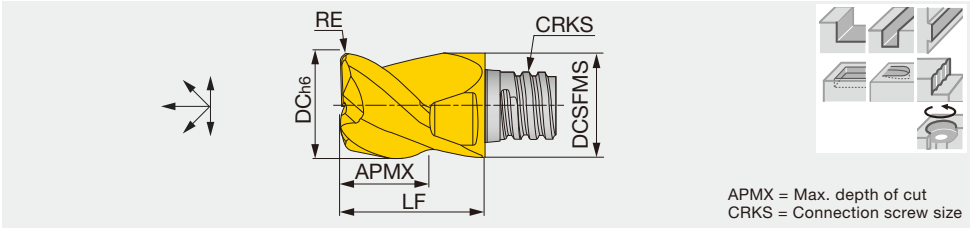
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CHW	CRKS	LF	Wrench	Torque*
VEE080L05.0C30I04S05		●	4	38°	8	7.7	5	-	0.3	S05	10	KEYV-S05	7
VEE100L07.0C40I04S06		●	4	38°	10	9.7	7	-	0.4	S06	13	KEYV-S06	10
VEE120L09.0C50I04S08	●	●	4	38°	12	11.7	9	-	0.5	S08	16.5	KEYV-S08	15
VEE160L12.0C60I04S10	●	●	4	38°	16	15.3	12	-	0.6	S10	20.5	KEYV-S10	28
VEE200L15.0C60I04S12		●	4	38°	20	18.3	15	-	0.6	S12	25.5	KEYV-S12	28
VEE250L22.0C60I04S15		●	4	38°	25	23.9	22	-	0.6	S15	37	KEYV-W20	40
VEE250L22.0R00I04S15		●	4	38°	25	23.9	22	-	-	S15	37	KEYV-W20	40
VEE250L22.0R05I04S15	●	●	4	38°	25	23.9	22	0.5	-	S15	37	KEYV-W20	40
VEE250L22.0R10I04S15		●	4	38°	25	23.9	22	1	-	S15	37	KEYV-W20	40
VEE250L22.0R20I04S15		●	4	38°	25	23.9	22	2	-	S15	37	KEYV-W20	40
VEE250L22.0R30I04S15		●	4	38°	25	23.9	22	3	-	S15	37	KEYV-W20	40

Torque*: Recommended clamping torque (N·m)
VEE080 ~ VEE200: 2 pieces per package
VEE250: 1 piece per package

●: New product
●: Line up

VEE**-03...

3 flute, roughing - finishing, general, for key way



APMX = Max. depth of cut
CRKS = Connection screw size

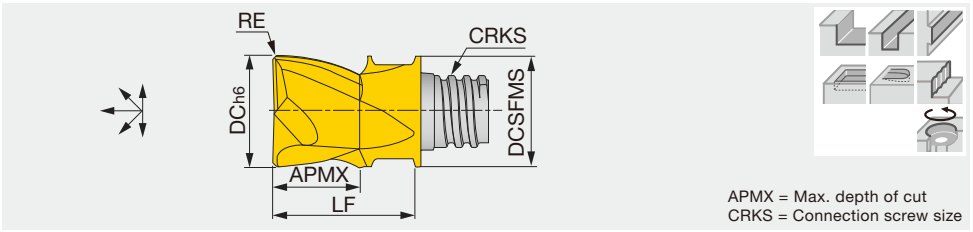
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEE077L04.0R02-03S05		●	3	38°	7.7	7.7	4	0.2	S05	10	KEYV-S05	7
VEE080L05.0R00-03S05		●	3	45°	8	7.7	5	-	S05	10	KEYV-S05	7
VEE097L05.0R03-03S06		●	3	38°	9.7	9.7	5	0.3	S06	13	KEYV-S06	10
VEE100L07.0R00-03S06		●	3	45°	10	9.7	7	-	S06	13	KEYV-S06	10
VEE117L07.0R03-03S08	●	●	3	38°	11.7	11.7	7	0.3	S08	16.5	KEYV-S08	15
VEE120L09.0R00-03S08		●	3	45°	12	11.7	9	-	S08	16.5	KEYV-S08	15
VEE157L08.0R03-03S10	●	●	3	38°	15.7	15.3	8	0.3	S10	20.5	KEYV-S10	28
VEE197L12.0R04-03S12		●	3	38°	19.7	18.3	12	0.4	S12	25.5	KEYV-S12	28

Torque*: Recommended clamping torque (N·m)
2 pieces per package

●: Line up

VEE**A02...

2 flute, roughing - finishing, for non-ferrous metal, general



APMX = Max. depth of cut
CRKS = Connection screw size

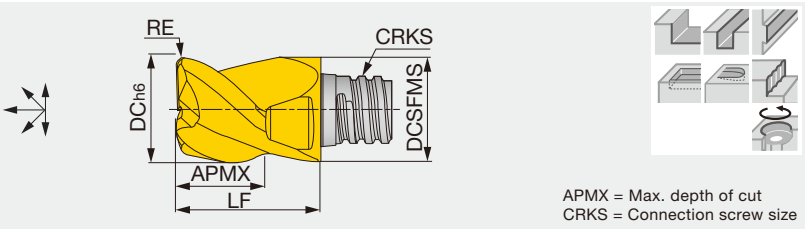
Designation	KS15F	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEE100L07.0R05A02S06	●	2	45°	10	9.7	7	0.5	S06	13	KEYV-S06	10
VEE100L07.0R10A02S06	●	2	45°	10	9.7	7	1	S06	13	KEYV-S06	10
VEE120L09.0R05A02S08	●	2	45°	12	11.7	9	0.5	S08	16.5	KEYV-S08	15

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VEE**A03...

3 flute, roughing - finishing, for non-ferrous metal, general



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	KS15F	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEE080L05.0R05A03S05	●	3	45°	8	7.7	5	0.5	S05	10	KEYV-S05	7
VEE100L06.0R05A03S06	●	3	45°	10	9.7	6	0.5	S06	13	KEYV-S06	10
VEE100L06.0R10A03S06	●	3	45°	10	9.7	6	1	S06	13	KEYV-S06	10
VEE120L08.0R05A03S08	●	3	45°	12	11.7	8	0.5	S08	16.5	KEYV-S08	15
VEE120L08.0R10A03S08	●	3	45°	12	11.7	8	1	S08	16.5	KEYV-S08	15
VEE160L10.0R00A03S10	●	3	45°	16	15.3	10	-	S10	20.5	KEYV-S10	28
VEE160L10.0R10A03S10	●	3	45°	16	15.3	10	1	S10	20.5	KEYV-S10	28
VEE160L10.0R20A03S10	●	3	45°	16	15.3	10	2	S10	20.5	KEYV-S10	28
VEE200L12.0R05A03S12	●	3	45°	20	18.3	12	0.5	S12	25.5	KEYV-S12	28
VEE200L12.0R10A03S12	●	3	45°	20	18.3	12	1	S12	25.5	KEYV-S12	28
VEE200L12.0R20A03S12	●	3	45°	20	18.3	12	2	S12	25.5	KEYV-S12	28

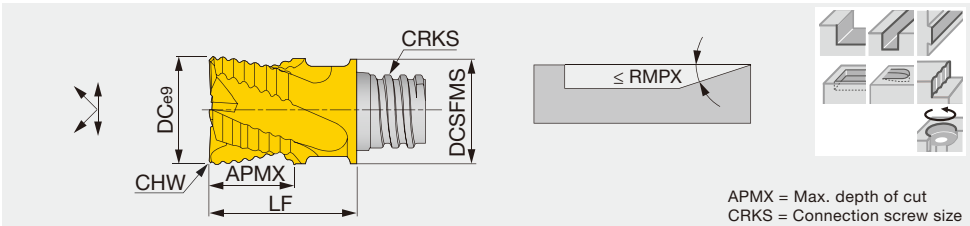
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VEE**R...

4, 5, 6 flute, roughing, serrated cutting edge

Square



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	CHW	CRKS	LF	RMPX	Wrench	Torque*
VEE080L05.0C25R04S05	●	●	4	45°	8	7.7	5	0.25	S05	10	5°	KEYV-S05	7
VEE100L07.0C30R04S06	●	●	4	45°	10	9.7	7	0.3	S06	13	5°	KEYV-S06	10
VEE120L09.0C35R04S08	●	●	4	45°	12	11.7	9	0.35	S08	16.5	5°	KEYV-S08	15
VEE160L12.0C40R05S10	●	●	5	45°	16	15.3	12	0.4	S10	20.5	5°	KEYV-S10	28
VEE200L15.0C40R06S12		●	6	45°	20	18.3	15	0.4	S12	25.5	3°	KEYV-S12	28
VEE250L22.0C50R06S15		●	6	45°	25	23.9	22	0.5	S15	37	3°	KEYV-W20	40

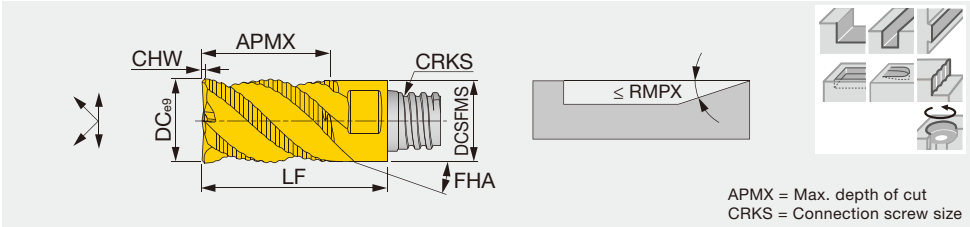
Torque*: Recommended clamping torque (N·m)
VEE080 ~ VEE200: 2 pieces per package
VEE250: 1 piece per package

● : Line up

VED**R...

4, 5, 6 flute, roughing, long cutting edge, serrated cutting edge

Square



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	CHW	CRKS	LF	RMPX	Wrench	Torque*
VED080L12.0C25R04S05	●	4	46°	8	7.7	12	0.25	S05	18	5°	KEYV-S05	7
VED100L15.0C30R04S06	●	4	46°	10	9.6	15	0.3	S06	22	5°	KEYV-S06	10
VED120L18.0C35R04S08	●	4	46°	12	11.7	18	0.35	S08	27	5°	KEYV-S08	15
VED160L24.0C40R05S10	●	5	40°	16	15.3	24	0.4	S10	33.5	5°	KEYV-S10	28
VED200L30.0C40R06S12	●	6	47°	20	18.45	30	0.4	S12	41	3°	KEYV-S12	28
VED250L37.0C50I06S15	●	6	47°	25	23.9	37	0.5	S15	52.5	3°	KEYV-W20	40

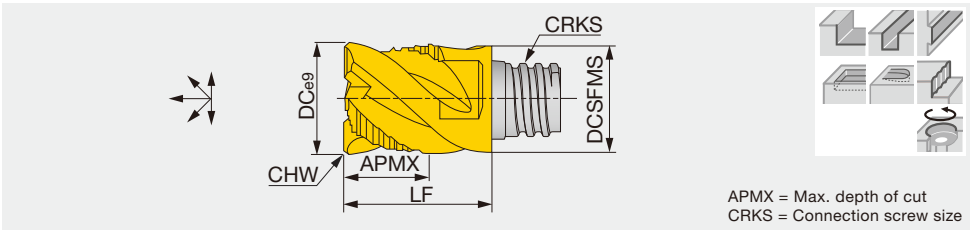
Torque*: Recommended clamping torque (N·m)
VED080 ~ VED160: 2 pieces per package
VED200, VED250: 1 piece per package

● : Line up

VEE**C...

4 flute, roughing - semi finishing, roughing and finishing edge combination

Square



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	CHW	CRKS	LF	Wrench	Torque*
VEE080L05.0C30C04S05	●	4	45°	8	7.7	5	0.3	S05	10	KEYV-S05	7
VEE100L07.0C30C04S06	●	4	45°	10	9.7	7	0.3	S06	13	KEYV-S06	10
VEE120L09.0C40C04S08	●	4	45°	12	11.7	9	0.4	S08	16.5	KEYV-S08	15
VEE160L12.0C60C04S10	●	4	45°	16	15.3	12	0.6	S10	20.5	KEYV-S10	28
VEE200L15.0C60C04S12	●	4	45°	20	18.3	15	0.6	S12	25.5	KEYV-S12	28
VEE250L22.0C60C04S15	●	4	45°	25	23.9	22	0.6	S15	37	KEYV-W20	40

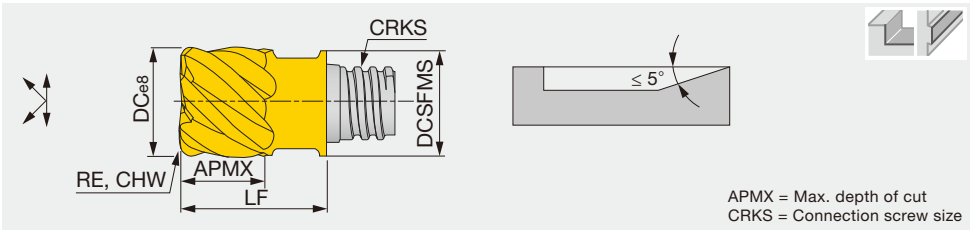
Torque*: Recommended clamping torque (N·m)
VEE080 ~ VEE200: 2 pieces per package
VEE250: 1 piece per package

● : Line up

VED**-06..., VEE**-06...

6 flute, roughing - finishing, small width of cut

Square



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH715	AH725	AH750	NOF	FHA	DC	DCSFMS	APMX	RE	CHW	CRKS	LF	Wrench	Torque*
VEE080L05.0R05-06S05		●		6	45°	8	7.7	5	0.5	-	S05	10	KEYV-S05	7
VEE080L05.0R10-06S05		●		6	45°	8	7.7	5	1	-	S05	10	KEYV-S05	7
VEE080L05.0R15-06S05		●		6	45°	8	7.7	5	1.5	-	S05	10	KEYV-S05	7
VEE080L05.0C10-06S05			●	6	50°	8	7.7	5	-	0.1	S05	10	KEYV-S05	7
VEE100L07.0R00-06S06		●		6	45°	10	9.7	7	-	-	S06	13	KEYV-S06	10
VED100L07.0R05-06S06		●		6	30°	10	9.7	7	0.5	-	S06	13	KEYV-S06	10
VEE100L07.0R05-06S06	●	●		6	45°	10	9.7	7	0.5	-	S06	13	KEYV-S06	10
VED100L07.0R10-06S06		●		6	30°	10	9.7	7	1	-	S06	13	KEYV-S06	10
VEE100L07.0R10-06S06		●		6	45°	10	9.7	7	1	-	S06	13	KEYV-S06	10
VED100L07.0R15-06S06		●		6	30°	10	9.7	7	1.5	-	S06	13	KEYV-S06	10
VEE100L07.0R15-06S06		●		6	45°	10	9.7	7	1.5	-	S06	13	KEYV-S06	10
VEE100L07.0C10-06S06			●	6	50°	10	9.7	7	-	0.1	S06	13	KEYV-S06	10
VEE120L09.0R00-06S08		●		6	45°	12	11.7	9	-	-	S08	16.5	KEYV-S08	15
VED120L09.0R05-06S08		●		6	30°	12	11.7	9	0.5	-	S08	16.5	KEYV-S08	15
VED120L09.0R10-06S08		●		6	30°	12	11.7	9	1	-	S08	16.5	KEYV-S08	15
VEE120L09.0R10-06S08		●		6	45°	12	11.7	9	1	-	S08	16.5	KEYV-S08	15
VEE120L09.0R15-06S08		●		6	45°	12	11.7	9	1.5	-	S08	16.5	KEYV-S08	15
VEE120L09.0C10-06S08			●	6	50°	12	11.7	9	-	0.1	S08	16.5	KEYV-S08	15

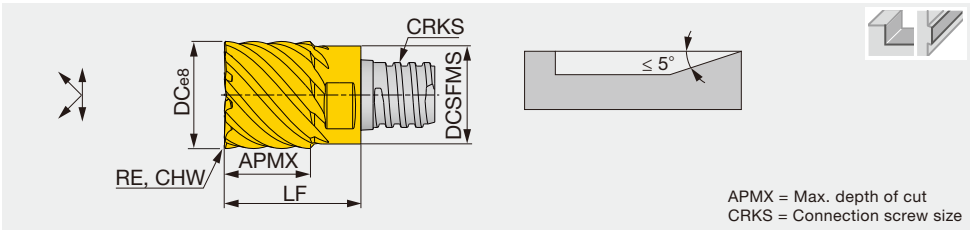
Torque*: Recommended clamping torque (N·m)
2 pieces per package

●: New product
●: Line up

VED**-08/10..., VEE**-08/10...

8, 10 flute, roughing - finishing, small width of cut

Square



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH715	AH725	AH750	NOF	FHA	DC	DCSFMS	APMX	RE	CHW	CRKS	LF	Wrench	Torque*
VED160L12.0R05-08S10		●		8	30°	16	15.3	12	0.5	-	S10	20.5	KEYV-S10	28
VED160L12.0R10-08S10	●	●		8	30°	16	15.3	12	1	-	S10	20.5	KEYV-S10	28
VED160L12.0R16-08S10		●		8	30°	16	15.3	12	1.6	-	S10	20.5	KEYV-S10	28
VED160L12.0R20-08S10		●		8	30°	16	15.3	12	2	-	S10	20.5	KEYV-S10	28
VEE160L12.0C20-08S10			●	8	50°	16	15.3	12	-	0.2	S10	20.5	KEYV-S10	28
VED200L15.0R10-10S12		●		10	30°	20	18.3	15	1	-	S12	25.5	KEYV-S12	28
VED200L15.0R20-10S12		●		10	30°	20	18.3	15	2	-	S12	25.5	KEYV-S12	28
VEE200L15.0C20-10S12			●	10	50°	20	18.3	15	-	0.2	S12	25.5	KEYV-S12	28
VED250L22.0R10-10S15		●		10	30°	25	23.9	22	1	-	S15	37	KEYV-W20	40

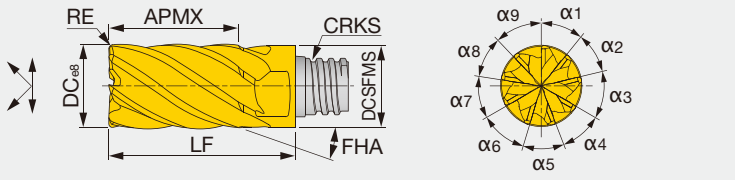
Torque*: Recommended clamping torque (N·m)
VEE / VED160 - 200: 2 pieces per package
VED250: 1 piece per package

● : Line up

VED**-07/09...

7, 9 flute, roughing - finishing, long edge, variable helix and pitch, small width of cut

Square



α1 ≠ α2 ≠ α3 ≠ α4 ≠ α5 ≠ α6 ≠ α7 ≠ α8 ≠ α9

APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VED080L12.0R05I07S05	●	7	34° - 40°	8	7.7	12	0.5	S05	18	KEYV-S05	7
VED100L15.0R05I07S06	●	7	34° - 40°	10	9.6	15	0.5	S06	22	KEYV-S06	10
VED120L18.0R05I07S08	●	7	34° - 40°	12	11.7	18	0.5	S08	27	KEYV-S08	15
VED160L24.0R08I09S10	●	9	34° - 40°	16	15.3	24	0.8	S10	33.5	KEYV-S10	28
VED200L30.0R10I09S12	●	9	34° - 40°	20	18.45	30	1	S12	41	KEYV-S12	28
VED250L37.0R10I09S15	●	9	34° - 40°	25	23.9	37	1	S15	52.5	KEYV-W20	40

Torque*: Recommended clamping torque (N·m)
VED080 ~ VED160: 2 pieces per package
VED200, VED250: 1 piece per package

● : Line up

TUNGMEISTER

STANDARD CUTTING CONDITIONS

Shoulder milling

VEH, VEE: 3 flutes, VED / VEE: 4 flutes, VEE-A, VEE-I, VEE-R, VED-R, VEE-C

ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 5	6	8	10	12	16	20	25	32	Depth of cut *ap* (mm)	Width of cut *ae* (mm)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	80 - 180	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	60 - 140	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	60 - 120	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	40 - 100	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	80 - 200	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	80 - 200	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
N	Aluminium alloys Si < 13%	-	200 - 700	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
	Aluminium alloys Si ≥ 13%	-	100 - 300	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	40 - 80	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	20 - 40	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	40 - 80	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC
	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	20 - 60	0.03 - 0.07	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.1 - 0.18	0.6 x DC	0.25 x DC

VED / VEE: 6 flutes, VED / VEE: 8, 10 flutes, VED: 7, 9 flutes

ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 8	10	12	16	20	25	Depth of cut *ap* (mm)	Width of cut *ae* (mm)
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	60 - 120	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.6 x DC	0.02 x DC
	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	30 - 60	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.6 x DC	0.02 x DC
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	80 - 160	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.6 x DC	0.02 x DC
	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	40 - 90	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	0.6 x DC	0.02 x DC

Slotting

VEH, VEE: 3 flutes, VED/VEE: 4 flutes, VEE-A, VEE-I, VEE-R, VEE-C

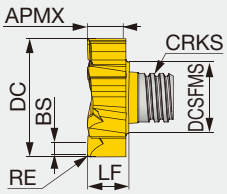
ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 5	6	8	10	12	16	20	25	32	Depth of cut *ap* (mm)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	50 - 70	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	40 - 80	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	40 - 70	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	30 - 60	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	50 - 120	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	50 - 120	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
N	Aluminium alloys Si < 13%	-	130 - 400	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
	Aluminium alloys Si ≥ 13%	-	70 - 200	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	20 - 40	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	10 - 20	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	25 - 60	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC
	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	10 - 30	0.03 - 0.04	0.03 - 0.04	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.07 - 0.1	0.07 - 0.1	0.5 x DC

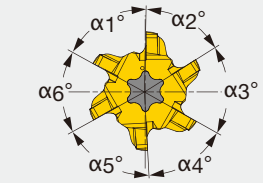
HEADS

VFM...

6 flute, roughing - finishing, for face milling

Face mill





α1 ≠ α2 ≠ α3 ≠ α4 ≠ α5 ≠ α6

APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	BS	CRKS	LF	Wrench	Torque*
VFM120L03.6R02I06S05	●	6	10°	12	7.7	3.6	0.2	1.2	S05	4.4	KEYV-T20	7
VFM160L04.8R04I06S06	●	6	10°	16	9.7	4.8	0.4	2	S06	5.6	KEYV-T25	10
VFM200L06.0R04I06S08	●	6	10°	20	11.7	6	0.4	2	S08	7	KEYV-T40L	15
VFM250L07.5R04I06S10	●	6	10°	25	15.3	7.5	0.4	2	S10	8.55	KEYV-T50L	28

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

Face milling

VFM

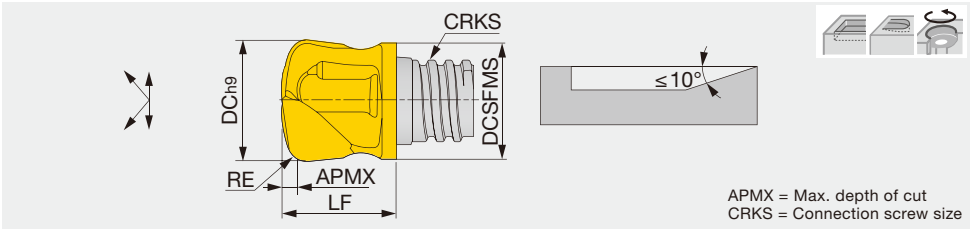
ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 12	16	20	25	Depth of cut *ap* (mm)	Width of cut *ae* (mm)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	80 - 180	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
P	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	60 - 140	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
P	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	60 - 120	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	40 - 100	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	80 - 200	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
K	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	80 - 200	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
N	Aluminium alloys Si < 13%	-	200 - 700	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
N	Aluminium alloys Si ≥ 13%	-	100 - 300	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	40 - 80	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
S	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	20 - 40	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	40 - 80	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC
H	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	20 - 60	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.1 - 0.17	1	0.7 x DC

HEADS

VFX**-02...

2 flute, roughing

High feed



Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE(1)	CRKS	LF	Wrench	Torque*	fz(mm/t)
VFX100L00.6R20-02S06	●	2	0°	10	9.6	0.6	2	S06	12.5	KEYV-S06	10	0.3 - 0.6
VFX120L01.0R25-02S08	●	2	0°	12	11.5	1.0	2.5	S08	11.1	KEYV-S08	15	0.5 - 1
VFX160L01.1R30-02S10	●	2	0°	16	15.2	1.1	3	S10	13.5	KEYV-S10	28	0.55 - 1.1
VFX200L01.5R33-02S12	●	2	0°	20	18.3	1.5	3.3	S12	17.5	KEYV-S12	28	0.75 - 1.5

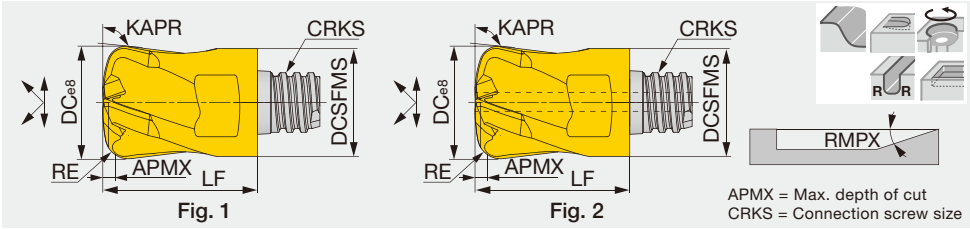
(1) Corner radius for CAM programming
For VFX head, taper neck shank or Tungsten shank should be recommended.
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VFX**-04/06...

4, 6 flute, roughing, with coolant hole (2 items do not have a coolant hole)

High feed



Designation	AH715	AH725	AH750	NOF	FHA	DC	DCSFMS	APMX	RE	KAPR	CRKS	LF	RMPX	Wrench	Torque*	fz(mm/t)	Fig.
VFX120L0.60R18E04S08	●			4	20°	12	11.5	0.6	1.8	97°	S08	16.5	5°	KEYV-S08	15	0.16 - 0.67	2
VFX120L0.60R18H04S08		●		4	20°	12	11.5	0.6	1.8	97°	S08	16.5	5°	KEYV-S08	15	0.16 - 0.67	1
VFX120L0.65R12E06S08			●	6	20°	12	11.5	0.65	0.6	97°	S08	12	3°	KEYV-S08	15	0.16 - 0.54	2
VFX160L0.80R22E04S10	●			4	20°	16	15.4	0.8	2.2	97°	S10	20.5	5°	KEYV-S10	28	0.2 - 0.75	2
VFX160L0.80R22H04S10		●		4	20°	16	15.4	0.8	2.2	97°	S10	20.5	5°	KEYV-S10	28	0.2 - 0.75	1
VFX160L1.05R20E06S10			●	6	20°	16	15.4	1.05	1	97°	S10	16	3°	KEYV-S10	28	0.2 - 0.65	2

Slot milling is not recommended for workpiece materials such as stainless steel where chips tend to adhere. Also max. ae < 0.4D.
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

High feed milling

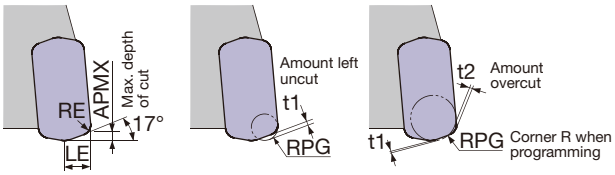
VFX: 2, 4, 6 flutes

ISO	Workpiece material	Hardness	Cutting speed Vc (m/min)	ø10 Feed per tooth fz (mm/t)	ø10 Depth of cut ap (mm)	ø12 Feed per tooth fz (mm/t)	ø12 Depth of cut ap (mm)	ø16 Feed per tooth fz (mm/t)	ø16 Depth of cut ap (mm)	ø20 Feed per tooth fz (mm/t)	ø20 Depth of cut ap (mm)	Width of cut ae (mm)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	100 - 200	0.3 - 0.7	0.5	0.4 - 0.8	0.5	0.5 - 0.9	0.75	0.6 - 1	1	0.6 x DC
P	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	80 - 180	0.2 - 0.6	0.5	0.3 - 0.7	0.5	0.4 - 0.8	0.75	0.5 - 0.9	1	0.6 x DC
P	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	80 - 160	0.2 - 0.5	0.4	0.2 - 0.5	0.4	0.3 - 0.6	0.5	0.3 - 0.6	0.75	0.6 x DC
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	60 - 100	0.2 - 0.6	0.4	0.2 - 0.6	0.4	0.3 - 0.7	0.5	0.3 - 0.7	0.75	0.6 x DC
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	100 - 220	0.3 - 0.7	0.5	0.4 - 0.8	0.75	0.5 - 0.9	0.75	0.6 - 1	1	0.6 x DC
K	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	100 - 220	0.2 - 0.6	0.5	0.3 - 0.7	0.75	0.4 - 0.8	0.75	0.5 - 0.9	1	0.6 x DC
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	40 - 80	0.2 - 0.5	0.4	0.2 - 0.5	0.4	0.2 - 0.6	0.5	0.2 - 0.6	0.5	0.25 x DC
S	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	20 - 40	0.1 - 0.3	0.3	0.1 - 0.3	0.3	0.1 - 0.3	0.4	0.1 - 0.3	0.4	0.25 x DC
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	40 - 80	0.2 - 0.4	0.3	0.2 - 0.4	0.3	0.3 - 0.5	0.4	0.3 - 0.5	0.4	0.45 x DC
H	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	20 - 60	0.1 - 0.2	0.2	0.1 - 0.2	0.2	0.1 - 0.3	0.3	0.1 - 0.3	0.3	0.25 x DC

Please note that the feed per tooth should not exceed the maximum feed per tooth for each product.

TOOL GEOMETRY ON PROGRAMMING

When programming for CAM, the tool should be considered as a radius cutter. Usually, the corner radius should be set as R = 1 mm.
If a larger radius is used, overcutting will occur. The following table shows the amount left uncut (t1) and overcut (t2).



Designation	Max. depth of cut APMX (mm)	Corner radius RE (mm)	Corner R when programming RPG	Amount left uncut t1 (mm)	Amount overcut t2 (mm)
VFX100L00.6R20-02S06	0.6	2	1.5	0.55	-
	0.6	2	2	0.35	-
	0.6	2	2.5	0.25	0.07
VFX120L01.0R25-02S08	1	2.5	2	0.55	-
	1	2.5	2.5	0.4	-
	1	2.5	3	0.3	0.1
VFX160L01.1R30-02S10	1.1	3	2	0.75	-
	1.1	3	2.5	0.65	-
	1.1	3	3	0.4	0.15
VFX200L01.5R33-02S12	1.5	3.3	2.5	1	-
	1.5	3.3	3	0.8	-
	1.5	3.3	3.5	0.7	0.05

Designation	Max. depth of cut APMX (mm)	Corner radius RE (mm)	Corner R when programming RPG	Amount left uncut t1 (mm)	Amount overcut t2 (mm)
VFX120L0.60R18E/H...	0.6	1.8	1	0.5	-
	0.6	1.8	1.5	0.37	-
	0.6	1.8	2	0.3	0.05
VFX120L0.65R12E06S08	0.6	1.2	1	0.45	-
	0.6	1.2	1.5	0.35	0.05
	0.6	1.2	2	0.2	0.11
VFX160L0.80R22E/H...	0.8	2.2	1.5	0.7	-
	0.8	2.2	2	0.55	-
	0.8	2.2	2.5	0.45	0.1
VFX160L1.05R20E06S10	1	2	1.5	0.8	-
	1	2	2	0.65	-
	1	2	2.5	0.5	0.1

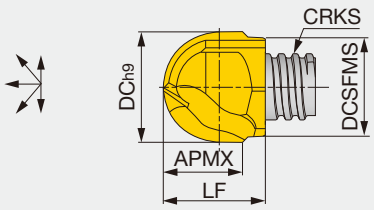
*Recommended

HEADS

VBB**-BM...

2 flute, roughing - semi finishing, economical

Ball



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	CRKS	LF	Wrench	Torque*
VBB080L08.0-BM-02S05	●	2	0°	8	7.6	8	S05	10	KEYV-S05	7
VBB100L10.0-BM-02S06	●	2	0°	10	9.5	10	S06	12.4	KEYV-S06	10
VBB120L12.0-BM-02S08	●	2	0°	12	11.5	11.5	S08	15.3	KEYV-S08	15
VBB160L16.0-BM-02S10	●	2	0°	16	15.2	16	S10	19.1	KEYV-S10	28

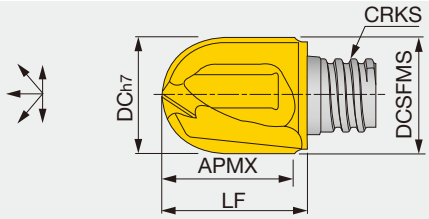
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VBB**-BG...

2 flute, finishing, high accuracy h7, for hardened material

Ball



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH750	NOF	FHA	DC	DCSFMS	APMX	CRKS	LF	Wrench	Torque*
VBB080L08.0-BG-02S05	●	2	0°	8	7.6	8	S05	10	KEYV-S05	7
VBB100L10.0-BG-02S06	●	2	0°	10	9.6	10	S06	12.4	KEYV-S06	10
VBB120L12.0-BG-02S08	●	2	0°	12	11.5	12	S08	15.3	KEYV-S08	15
VBB160L16.0-BG-02S10	●	2	0°	16	15.2	16	S10	19.1	KEYV-S10	28

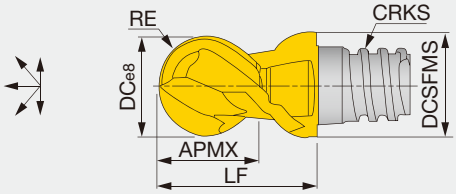
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VBD**-BG...

2 flute, semi finishing - finishing, helix cutting edge

Ball



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VBD080L05.0-BG-02S05	●	2	30°	8	7.7	5	3.982(1)	S05	10	KEYV-S05	7
VBD100L07.0-BG-02S06	●	2	30°	10	9.7	7	4.982(1)	S06	13	KEYV-S06	10
VBD120L09.0-BG-02S08	●	2	30°	12	11.7	9	5.978(2)	S08	16.5	KEYV-S08	15
VBD160L09.5-BG-02S10	●	2	30°	16	15.3	9	7.978(2)	S10	20.5	KEYV-S10	28

The tolerance of RE: (1) ± 0.01 (2) ± 0.012
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VBD**-BG-04..., VBE**-BG-04...

4 flute, roughing - finishing, helix cutting edge

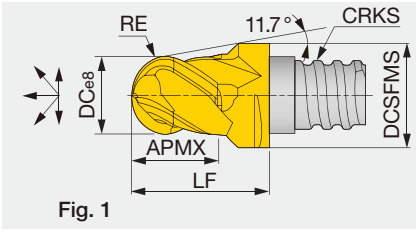


Fig. 1

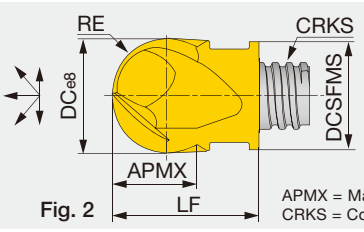


Fig. 2

APMX = Max. depth of cut
CRKS = Connection screw size

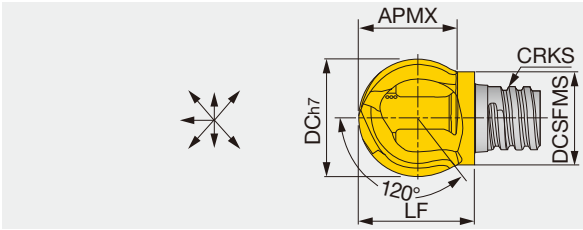
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*	Fig.
VBE050L04.0-BG-04S04		●	4	38°	5	6	4	2.487(1)	S04	8.5	KEYV-S05	4	1
VBE060L04.0-BG-04S04		●	4	38°	6	5.8	4	2.987(1)	S04	8.5	KEYV-S05	4	2
VBE060L05.5-BG-04S05		●	4	38°	6	8	5.5	2.987(1)	S05	10	KEYV-S05	7	1
VBD080L05.0-BG-04S05	●	●	4	30°	8	7.7	5	3.982(1)	S05	10	KEYV-S05	7	2
VBD100L07.0-BG-04S06	●	●	4	30°	10	9.7	7	4.982(1)	S06	13	KEYV-S06	10	2
VBD120L09.0-BG-04S08		●	4	30°	12	11.7	9	5.978(2)	S08	16.5	KEYV-S08	15	2
VBD160L12.0-BG-04S10	●	●	4	30°	16	15.3	12	7.978(2)	S10	20.5	KEYV-S10	28	2
VBD200L15.0-BG-04S12		●	4	30°	20	18.3	15	9.972(2)	S12	25.5	KEYV-S12	28	2

The tolerance of RE: (1) ± 0.01 (2) ± 0.012 (3) ± 0.02
Torque*: Recommended clamping torque (N·m)
VBE050/VBD080 ~ VBD200: 2 pieces per package
VBD250: 1 piece per package

● : Line up

VBB**-SG...

2 flute, roughing - finishing, sphere cutting edge, high accuracy h7



APMX = Max. depth of cut
CRKS = Connection screw size

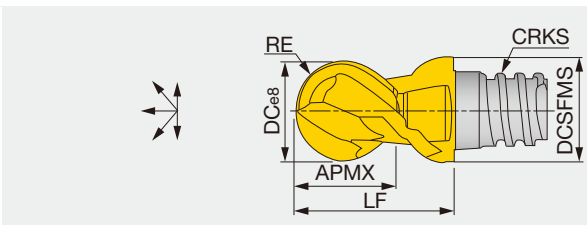
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	CRKS	LF	Wrench	Torque*
VBB100L08.0-SG-02S05	●	2	0°	10	7.6	7.5	S05	10	KEYV-S05	7
VBB120L09.6-SG-02S06	●	2	0°	12	9.5	9	S06	11.6	***KEYV-S08	10
VBB160L12.9-SG-02S08	●	2	0°	16	12.2	12	S08	15.4	***KEYV-S10	15
VBB200L16.1-SG-02S10	●	2	0°	20	15.2	15	S10	18.4	KEYV-S10	28

For pull-cutting on the vertical wall
Torque*: Recommended clamping torque (N·m)
*** The wrench size for these heads is different from the ones for the other head types.
2 pieces per package

● : Line up

VBE**-BGA...

2 flute, roughing - finishing, for non-ferrous metal, helix cutting edge



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	KS15F	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VBE080L05.0-BGA02S05	●	2	45°	8	7.7	5	3.982(1)	S05	10	KEYV-S05	7
VBE100L07.0-BGA02S06	●	2	45°	10	9.7	7	4.982(1)	S06	13	KEYV-S06	10
VBE120L09.0-BGA02S08	●	2	45°	12	11.7	9	5.987(2)	S08	16.5	KEYV-S08	15
VBE160L12.0-BGA02S10	●	2	45°	16	15.3	12	7.978(2)	S10	20.5	KEYV-S10	28
VBE200L15.0-BGA02S12	●	2	45°	20	18.3	15	9.972(2)	S12	25.5	KEYV-S12	28

The tolerance of RE: (1) ± 0.01 (2) ± 0.012
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

Profiling for roughing

VBB-BM / BG / SG, VBD-BG, VBE-BGA

ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 5	6	8	10	12	16	20	25	Depth of cut *ap* (mm)	Pick feed *Pf* (mm)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	100 - 200	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.4 x DC
	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	80 - 180	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.4 x DC
	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	80 - 160	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.4 x DC
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	60 - 100	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.4 x DC
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	100 - 220	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.4 x DC
	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	100 - 220	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.4 x DC
N	Aluminium alloys Si < 13%	-	200 - 700	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.4 x DC
	Aluminium alloys Si ≥ 13%	-	100 - 300	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.4 x DC
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	40 - 80	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.2 x DC
	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	20 - 40	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.2 x DC
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	40 - 80	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.2 x DC
	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	20 - 60	0.03 - 0.07	0.03 - 0.07	0.04 - 0.08	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x DC	0.2 x DC

Profiling for semi-finishing and finishing

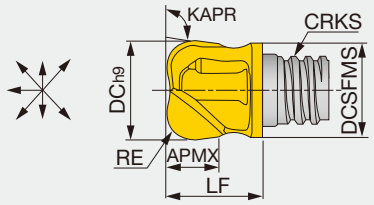
VBB-BM / BG / SG, VBD-BG, VBE-BGA

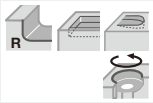
ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 5	6	8	10	12	16	20	25	Depth of cut *ap* (mm)	Pick feed *Pf* (mm)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	120 - 250	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.1 x DC	0.15 x DC
	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	100 - 220	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.1 x DC	0.15 x DC
	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	100 - 200	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.1 x DC	0.15 x DC
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	80 - 120	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.1 x DC	0.15 x DC
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	120 - 280	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.1 x DC	0.15 x DC
	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	120 - 280	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.1 x DC	0.15 x DC
N	Aluminium alloys Si < 13%	-	300 - 1000	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.1 x DC	0.15 x DC
	Aluminium alloys Si ≥ 13%	-	150 - 400	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.1 x DC	0.15 x DC
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	50 - 100	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.08 x DC	0.1 x DC
	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	30 - 50	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.08 x DC	0.1 x DC
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	50 - 100	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.08 x DC	0.1 x DC
	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	30 - 80	0.04 - 0.09	0.04 - 0.09	0.06 - 0.11	0.07 - 0.12	0.08 - 0.13	0.09 - 0.16	0.1 - 0.18	0.1 - 0.18	0.08 x DC	0.1 x DC

HEADS

VRB**-02..., VRC**-02...

2 flute, roughing - semi finishing, economical





APMX = Max. depth of cut
CRKS = Connection screw size

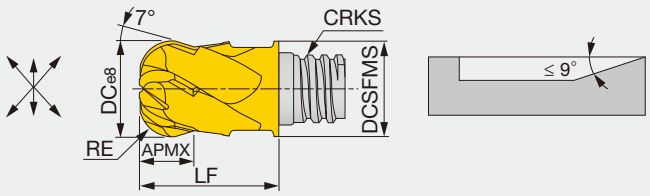
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	KAPR	CRKS	LF	Wrench	Torque*
VRC100L07.0R10-02S06	●	2	15°	10	9.5	7	1	95°	S06	12.4	KEYV-S06	10
VRB100L06.0R20-02S06	●	2	0°	10	9.2	6	2	97°	S06	12.4	KEYV-S06	10
VRB120L05.7R30-02S06	●	2	0°	12	9.5	5.7	3	97°	S06	9.1	***KEYV-S08	10
VRB120L05.4R40-02S06	●	2	0°	12	9.5	5.4	4	97°	S06	9.1	***KEYV-S08	10
VRB120L06.3R16-02S08	●	2	0°	12	11.5	5.9	1.6	97°	S08	11.1	KEYV-S08	15
VRB120L06.2R20-02S08	●	2	0°	12	11.5	6.2	2	97°	S08	11.1	KEYV-S08	15
VRB120L06.1R25-02S08	●	2	0°	12	11.5	5.8	2.5	97°	S08	11.1	KEYV-S08	15
VRB120L06.1R30-02S08	●	2	0°	12	11.5	5.7	3	97°	S08	11.1	KEYV-S08	15
VRB120L05.9R40-02S08	●	2	0°	12	11.5	5.5	4	97°	S08	11.1	KEYV-S08	15
VRB160L08.0R50-02S10	●	2	0°	16	15.2	8	5	97°	S10	20.2	KEYV-S10	28
VRB200L11.1R30-02S12	●	2	0°	20	18.3	11	3	97°	S12	17	KEYV-S12	28
VRB200L11.5R40-02S12	●	2	0°	20	18.3	11.3	4	97°	S12	17.3	KEYV-S12	28
VRB200L11.5R50-02S12	●	2	0°	20	18.3	11.3	5	97°	S12	17.3	KEYV-S12	28
VRB200L11.4R60-02S12	●	2	0°	20	18.3	11.2	6	97°	S12	17.3	KEYV-S12	28
VRB200L11.3R80-02S12	●	2	0°	20	18.3	11.1	8	97°	S12	17.3	KEYV-S12	28

Suitable for contouring operation.
Torque*: Recommended clamping torque (N·m)
*** The wrench size for these heads is different from the ones for the other head types.
2 pieces per package

● : Line up

VRD**-06...

6 flute, semi finishing - finishing, helix cutting edge



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VRD080L04.0R20-06S05	●	6	30°	8	7.7	4	2	S05	10	KEYV-S05	7
VRD100L05.0R30-06S06	●	6	30°	10	9.7	5	3	S06	13	KEYV-S06	10
VRD120L07.0R40-06S08	●	6	30°	12	11.7	7	4	S08	16.5	KEYV-S08	15
VRD160L09.0R50-06S10	●	6	30°	16	15.3	9	5	S10	20.5	KEYV-S10	28

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

Shoulder milling

VRB, VRC, VRD

ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 8	10	12	16	20	Depth of cut *ap* (mm)	Width of cut *ae* (mm)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	80 - 180	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
P	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	60 - 140	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
P	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	60 - 120	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	40 - 100	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	80 - 200	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
K	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	80 - 200	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
N	Aluminium alloys Si < 13%	-	200 - 700	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
N	Aluminium alloys Si ≥ 13%	-	100 - 300	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	40 - 80	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
S	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	20 - 40	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	40 - 80	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC
H	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	20 - 60	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.6 x DC	0.25 x DC

Slotting

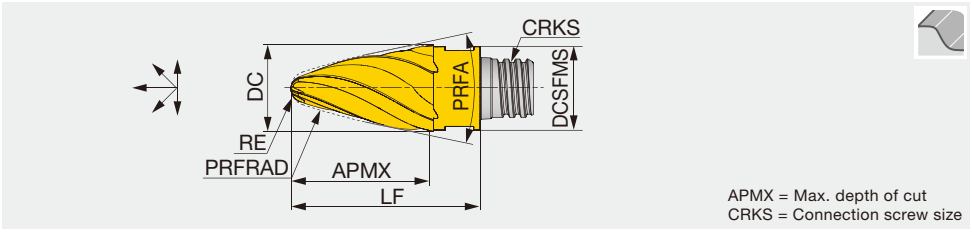
VRB, VRC, VRD

ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 8	10	12	16	20	Depth of cut *ap* (mm)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	50 - 70	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
P	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	40 - 80	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
P	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	40 - 70	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	30 - 60	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	50 - 120	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
K	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	50 - 120	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
N	Aluminium alloys Si < 13%	-	130 - 400	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
N	Aluminium alloys Si ≥ 13%	-	70 - 200	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	20 - 40	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
S	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	10 - 20	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	25 - 60	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC
H	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	10 - 30	0.03 - 0.04	0.04 - 0.05	0.05 - 0.06	0.06 - 0.08	0.07 - 0.1	0.5 x DC

HEADS

VBO...

4, 5 flute, semi finishing - finishing, long edge, high productive profiling



APMX = Max. depth of cut
CRKS = Connection screw size

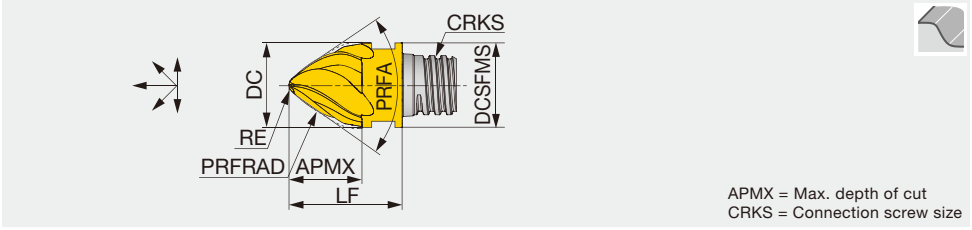
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	PRFRAD	PRFA	CRKS	LF	Wrench	Torque*
VBO080L12.0R900-4S05	●	4	30°	8	7.7	12	1	90	33.6°	S05	18	KEYV-S05	7
VBO100L15.0R850-5S06	●	5	30°	10	9.7	15	2	85	27.3°	S06	22	KEYV-S06	10
VBO120L19.0R800-5S08	●	5	30°	12	11.7	19	2	80	29.3°	S08	27	KEYV-S08	15
VBO160L25.0R750-5S10	●	5	30°	16	15.3	25	3	75	26.7°	S10	33.5	KEYV-S10	28

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VBO...

4 flute, semi finishing - finishing, short edge, high productive profiling



APMX = Max. depth of cut
CRKS = Connection screw size

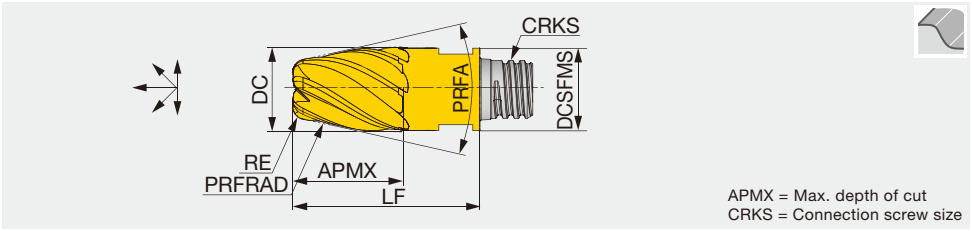
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	PRFRAD	PRFA	CRKS	LF	Wrench	Torque*
VBO100L08.0R250-4S06	●	4	30°	10	9.7	8	0.8	25	70.8°	S06	13	KEYV-S06	10
VBO120L09.0R300-4S08	●	4	30°	12	11.7	9	1.2	30	71.6°	S08	16.5	KEYV-S08	15
VBO160L13.0R400-4S10	●	4	30°	16	15.3	13	1.6	40	70.3°	S10	20.5	KEYV-S10	28

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VBN...

6 flute, semi finishing - finishing, high productive profiling



APMX = Max. depth of cut
CRKS = Connection screw size

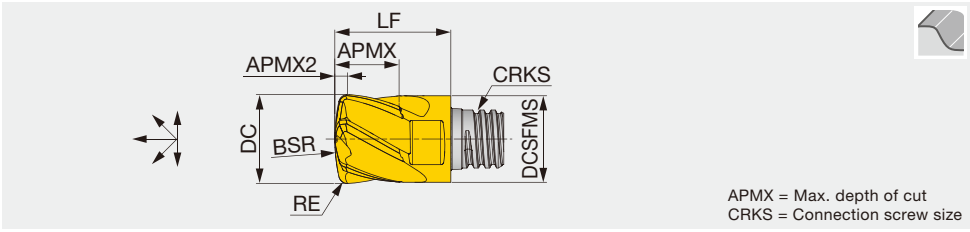
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	PRFRAD	PRFA	CRKS	LF	Wrench	Torque*
VBN100L13.0R450-6S06	●	6	35°	10	9.7	13	1.5	45	15.1°	S06	22	KEYV-S06	10
VBN120L15.0R500-6S08	●	6	35°	12	11.7	15	2	50	15.1°	S08	27	KEYV-S08	15
VBN160L18.0R600-6S10	●	6	35°	16	15.3	18	2	60	15.1°	S10	33.5	KEYV-S10	28

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VBL...

6 flute, semi finishing - finishing, high productive profiling



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	APMX2	RE	BSR	CRKS	LF	Wrench	Torque*
VBL080L0.90R160-6S05	●	6	30°	8	7.7	5.5	0.9	0.5	16	S05	10	KEYV-S05	7
VBL100L1.40R200-6S06	●	6	30°	10	9.7	7.5	1.42	1	20	S06	13	KEYV-S06	10
VBL120L1.50R240-6S08	●	6	30°	12	11.7	9	1.55	1	24	S08	16.5	KEYV-S08	15
VBL160L1.80R320-6S10	●	6	30°	16	15.3	12	1.8	1	32	S10	20.5	KEYV-S10	28

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

TARGET APPLICATIONS

VBO-short

Convex-curved surfaces, tapered surfaces, and surfaces consisting of combinations of a small corner radius and walls (the corner radius must be larger than the tool's nose radius).

VBO-long

Convex-curved and tapered surfaces in gentler profile than those of VBO-short.

VBN

Impellers, blisks, blades, and other aerospace parts.

TUNGMEISTER

STANDARD CUTTING CONDITIONS

Profiling

VBO, VBN, VBL

ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 10	12	16	Cusp height (mm)
P	Low carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	100 - 200	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
P	High carbon steel SCM440, SCr415, etc. 42CrMo4, 15Cr3, etc.	- 300 HB	80 - 180	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
P	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	80 - 160	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	60 - 100	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
K	Grey cast iron FC250, FC300, etc. 250, 300, etc.	150 - 250 HB	100 - 220	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
K	Ductile cast iron FCD400, etc. 400-15S, etc.	150 - 250 HB	100 - 220	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
N	Aluminium alloys Si < 13%	-	200 - 700	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
N	Aluminium alloys Si ≥13%	-	100 - 300	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	40 - 80	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
S	Heat-resistant alloys Inconel718, etc.	- 40 HRC	20 - 40	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
H	Hardened steel SKD61, SKT4, etc. X40CrMoV5-1, 55NiCrMoV6, etc.	-	40 - 80	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
H	Hardened steel SKD11, SKH, etc. X153CrMoV12, HS18-0-1, etc.	50 - 60 HRC	20 - 60	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1

TIPS FOR USING ON 3-AXIS MACHINES

The VBO/VBN milling heads are designed for the use on 5-axis machines. However, they are also effective on 3-axis machining centers when either of the following conditions is satisfied.

1. The angled walls or curved surfaces to be machined have tilt angles within the range specified in the chart on the right.
2. Use as a regular tapered ball mill with only the nose radius of the tool tip, and not the radius on the tool side, to be used. Please note that the working diameter will be smaller that those of a ball mill of the same working diameter.

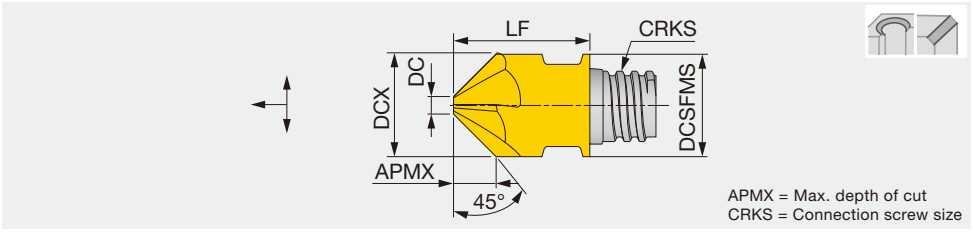
	Designation	Applicable ranges of tilt angles on workpiece Min.	Mean	Max.
VBO-short	VBO100L08.0R250-4S06	56°	70.8°	85°
	VBO120L09.0R300-4S08	58°	71.6°	85°
	VBO160L13.0R400-4S10	56°	70.3°	85°
VBO-long	VBO100L15.0R850-5S06	20°	27.3°	35°
	VBO120L19.0R800-5S08	19°	29.3°	40°
	VBO160L25.0R750-5S10	10°	26.7°	43°
VBN	VBN100L13.0R450-6S06	0°	15.1°	29°
	VBN120L15.0R500-6S08	0°	15.1°	29°
	VBN160L18.0R600-6S10	0°	15.1°	29°

HEADS

VCA**-04/06...

4, 6 flute, chamfering angle: 45°

Chamfering



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH715	AH725	NOF	FHA	DCX	DCSFMS	APMX	DC	CRKS	LF	Wrench	Torque*
VCA100L04.0A45-04S06	●	●	4	0°	10	10	4	1.95	S06	13	KEYV-S06	10
VCA120L05.0A45-04S08	●	●	4	0°	12	12	5	1.95	S08	16.5	KEYV-S08	15
VCA127L05.3A45-04S08		●	4	0°	12.7	12.7	5.3	1.98	S08	16.5	KEYV-S08	15
VCA160L06.5A45-06S10	●	●	6	0°	16	16	6.5	3	S10	20.3	KEYV-S10	28
VCA200L07.5A45-06S12		●	6	0°	20	18.3	7.5	5	S12	25.5	KEYV-S12	28

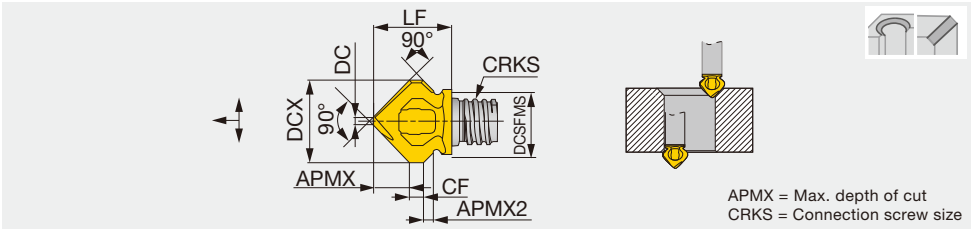
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VCW**-02...

2 flute, chamfering angle: 45°, back chamfering capability

Chamfering



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH715	AH725	NOF	FHA	DCX	DCSFMS	APMX	APMX2	CF	DC	CRKS	LF	Wrench	Torque*
VCW098L04.3A45-02S05	●		2	0°	9.8	7.6	4.3	0.9	2.5	1.2	S05	10.8	KEYV-S05	7
VCW118L05.0A45-02S06	●	●	2	0°	11.8	9.3	5	1.2	2	1.2	S06	11.2	***KEYV-S08	10
VCW157L07.1A45-02S08	●		2	0°	15.7	11.5	7.1	2.2	2	1.5	S08	14	KEYV-S08	15

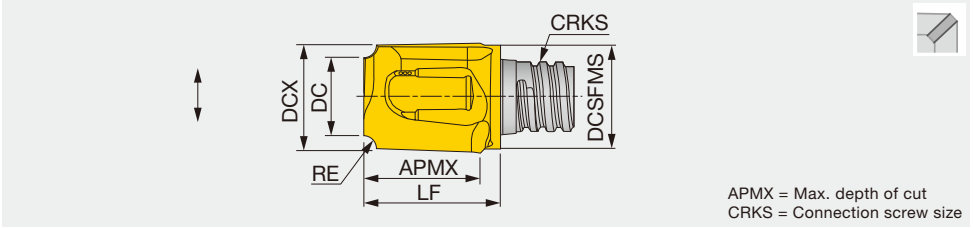
Available for chamfering of reverse side.
Torque*: Recommended clamping torque (N·m)
*** The wrench size for these heads is different from the ones for the other head types.
2 pieces per package

● : Line up

VCR**-02...

2 flute, radius chamfering

Chamfering



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH725	NOF	FHA	DCX	DCSFMS	DC	APMX	RE	CRKS	LF	Wrench	Torque*
VCR080L07.5R10-02S05	●	2	0°	8	7.6	5.8	7.5	1	S05	10.5	KEYV-S05	7
VCR100L09.5R16-02S06	●	2	0°	10	9.5	6.8	9.5	1.6	S06	12.5	KEYV-S06	10
VCR100L09.5R25-02S06	●	2	0°	10	9.5	5.1	9.5	2.5	S06	12.5	KEYV-S06	10
VCR127L12.0R30-02S08	●	2	0°	12.7	12.2	6.5	12	3	S08	15.6	KEYV-S08	15
VCR127L12.0R40-02S08	●	2	0°	12.7	12.2	4.7	12	4	S08	15.6	KEYV-S08	15
VCR160L15.0R50-02S10	●	2	0°	16	15.2	6.2	15	5	S10	19.1	KEYV-S10	28
VCR200L07.0R60-02S12	●	2	0°	20	18.3	8	7	6	S12	17.4	KEYV-S12	28

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

Chamfering and countersinking (Milling, Z-feed chamfering)

VCA, VCW, VCR

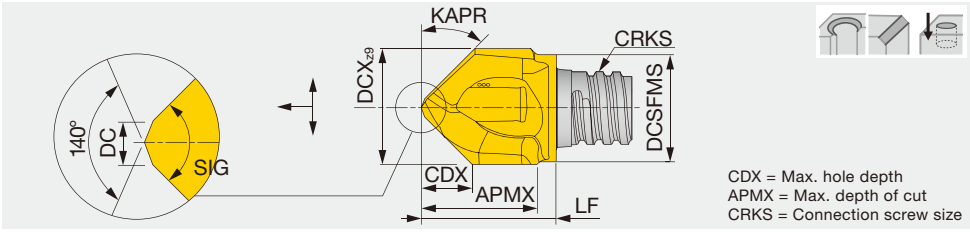
ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	60 - 100	0.03 - 0.06
P	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	50 - 80	0.03 - 0.06
P	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	40 - 70	0.03 - 0.06
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	30 - 50	0.03 - 0.06
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	80 - 120	0.03 - 0.06
K	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	80 - 120	0.03 - 0.06
N	Aluminium alloys	-	100 - 200	0.04 - 0.08
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	30 - 50	0.025 - 0.05
S	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	20 - 40	0.02 - 0.04
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	30 - 50	0.025 - 0.05
H	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	20 - 40	0.02 - 0.04

HEADS

VCP**-02...

2 flute, chamfering angle: 30°, 45°, 60°

Chamfering
Spot drill



CDX = Max. hole depth
APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH715	AH725	SIG	NOF	FHA	DCX	DCSFMS	APMX	CDX	CRKS	LF	DC	KAPR	Wrench	Torque*
VCP100L09.5A30-02S06	●	●	60°	2	0°	10	9.5	8.5	7.5	S06	11.75	1.5	60°	KEYV-S06	10
VCP120L12.0A30-02S08	●	●	60°	2	0°	12	11.5	11	9.2	S08	15.4	1.5	60°	KEYV-S08	15
VCP160L15.0A30-02S10	●	●	60°	2	0°	16	15.2	16	12	S10	20.2	2.5	60°	KEYV-S10	28
VCP200L18.2A30-02S12	●		60°	2	0°	20	18.3	18.2	15.5	S12	24.7	2.5	60°	KEYV-S12	28
VCP080L07.7A45-02S05	●	●	90°	2	0°	8	7.6	7.5	3.7	S05	9.75	1	45°	KEYV-S05	7
VCP083L07.9A45-02S05		●	90°	2	0°	8.3	7.6	7.5	3.8	S05	10	1	45°	KEYV-S05	7
VCP100L09.0A45-02S06	●	●	90°	2	0°	10	9.5	9.5	4.4	S06	11.75	1.5	45°	KEYV-S06	10
VCP104L09.0A45-02S06		●	90°	2	0°	10.4	9.5	9.5	4.6	S06	11.75	1.5	45°	KEYV-S06	10
VCP120L12.0A45-02S08	●	●	90°	2	0°	12	11.5	11.5	5.4	S08	15.4	1.5	45°	KEYV-S08	15
VCP124L12.0A45-02S08		●	90°	2	0°	12.4	11.5	11.5	5.6	S08	15.4	1.5	45°	KEYV-S08	15
VCP160L15.0A45-02S10	●	●	90°	2	0°	16	15.2	15	7.1	S10	18.8	1.5	45°	KEYV-S10	28
VCP165L15.0A45-02S10		●	90°	2	0°	16.5	15.2	15	7.1	S10	18.8	1.5	45°	KEYV-S10	28
VCP200L18.2A45-02S12	●		90°	2	0°	20	18.3	19.5	9.5	S12	24.7	1.5	45°	KEYV-S12	28
VCP100L09.5A60-02S06	●	●	120°	2	0°	10	9.5	9.5	2.7	S06	12.7	1.5	30°	KEYV-S06	10
VCP120L12.0A60-02S08	●	●	120°	2	0°	12	11.5	11.5	3.3	S08	15.2	1.5	30°	KEYV-S08	15
VCP160L15.5A60-02S10	●	●	120°	2	0°	16	15.2	16	4.4	S10	19.9	1.5	30°	KEYV-S10	28
VCP200L14.6A60-02S12	●		120°	2	0°	20	18.3	14.65	5.55	S12	21.15	1.5	30°	KEYV-S12	28

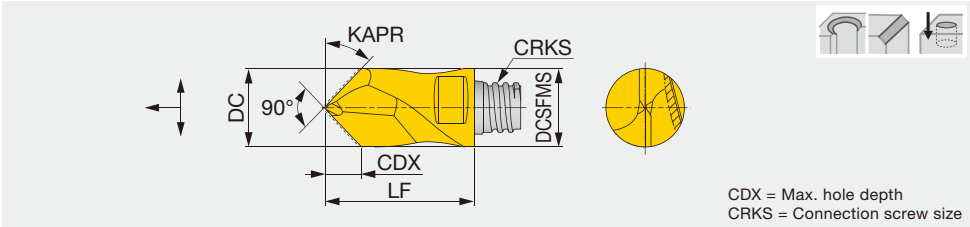
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VDS...

2 flute, chamfering angle: 45°, helix cutting edge

Chamfering
Spot drill



CDX = Max. hole depth
CRKS = Connection screw size

Designation	AH725	NOF	FHA	DC	DCSFMS	CDX	KAPR	CRKS	LF	Wrench	Torque*
VDS080A45-02S05	●	2	10°	8	7.7	3.7	45°	S05	15	KEYV-S05	7
VDS100A45-02S06	●	2	10°	10	9.7	4.4	45°	S06	19	KEYV-S06	10
VDS120A45-02S08	●	2	10°	12	11.7	5.4	45°	S08	23	KEYV-S08	15
VDS160A45-02S10	●	2	10°	16	15.3	7.1	45°	S10	28	KEYV-S10	28

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

Spot drill

VCP, VDS

ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed *f* (mm/rev)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	60 - 100	0.06 - 0.12
P	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	50 - 80	0.06 - 0.12
P	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	40 - 70	0.06 - 0.12
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	30 - 50	0.06 - 0.12
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	80 - 120	0.06 - 0.12
K	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	80 - 120	0.06 - 0.12
N	Aluminium alloys	-	100 - 200	0.08 - 0.16
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	30 - 50	0.05 - 0.1
S	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	20 - 40	0.04 - 0.08
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	30 - 50	0.05 - 0.1
H	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	20 - 40	0.04 - 0.08

HEADS

VDP**-02...

2 flute, A/B type center

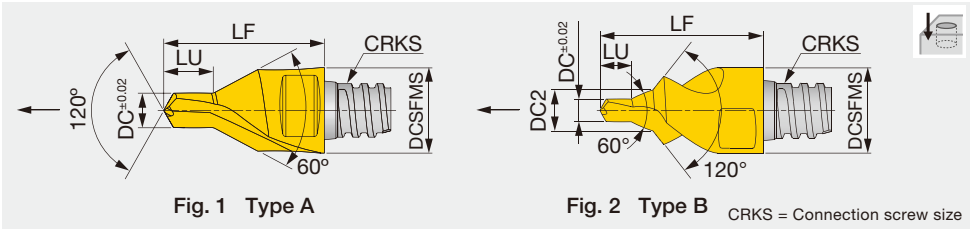


Fig. 1 Type A

Fig. 2 Type B

CRKS = Connection screw size

Designation	AH725	NOF	FHA	DC±0.02	DC2	DCSFMS	LU	CRKS	LF	Wrench	Torque*	Fig.
VDP107L1.60A30-02S04	●	2	0°	1.07	-	6	1.6	S04	10	KEYV-S05	4	1
VDP165L2.40A30-02S04	●	2	0°	1.65	-	6	2.4	S04	10	KEYV-S05	4	1
VDP207L2.90A30-02S04	●	2	0°	2.07	-	6	2.9	S04	10	KEYV-S05	4	1
VDP328L04.6A30-02S05	●	2	0°	3.28	-	8	4.6	S05	15	KEYV-S05	7	1
VDP412L05.9A30-02S06	●	2	0°	4.12	-	10	5.9	S06	19	KEYV-S06	10	1
VDP513L07.2A30-02S08	●	2	0°	5.13	-	12	7.2	S08	23	KEYV-S08	15	1
VDP646L08.9A30-02S10	●	2	0°	6.46	-	16	8.9	S10	28	KEYV-S10	28	1
VDP324L4.38B30-02S08	●	2	0°	3.24	6.77	12	4.4	S08	23	KEYV-S08	15	2
VDP409L5.60B30-02S08	●	2	0°	4.09	8.56	12.7	5.6	S08	23	KEYV-S08	15	2
VDP509L6.89B30-02S12	●	2	0°	5.09	10.69	18.45	6.9	S12	25.5	KEYV-S12	28	2
VDP641L8.63B30-02S12	●	2	0°	6.41	13.29	20	8.6	S12	25.5	KEYV-S12	28	2

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

Center drill

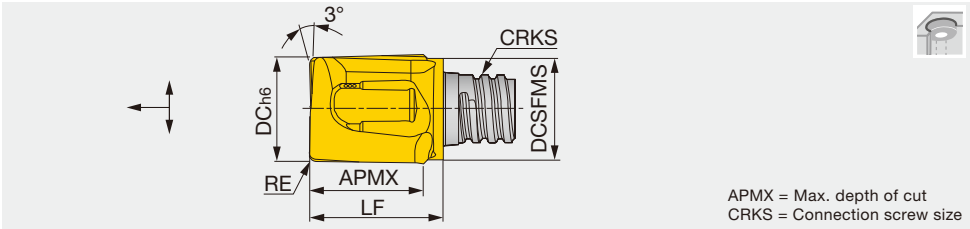
VDP

ISO	Workpiece material	Hardness	Cutting speed Vc (m/min)	Feed : f (mm/rev)						
				VDP107	VDP165	VDP2	VDP3	VDP4	VDP5	VDP6
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	40 - 80	0.02 - 0.04	0.025 - 0.05	0.025 - 0.05	0.04 - 0.08	0.05 - 0.1	0.05 - 0.1	0.06 - 0.12
P	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	30 - 50	0.02 - 0.04	0.025 - 0.05	0.025 - 0.05	0.04 - 0.08	0.05 - 0.1	0.05 - 0.1	0.06 - 0.12
P	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	20 - 30	0.02 - 0.04	0.025 - 0.05	0.025 - 0.05	0.04 - 0.08	0.05 - 0.1	0.05 - 0.1	0.06 - 0.12
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	15 - 25	0.015 - 0.03	0.02 - 0.04	0.02 - 0.04	0.04 - 0.08	0.05 - 0.1	0.05 - 0.1	0.06 - 0.12
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	60 - 100	0.02 - 0.04	0.025 - 0.05	0.025 - 0.05	0.05 - 0.09	0.07 - 0.012	0.07 - 0.12	0.12 - 0.18
K	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	60 - 100	0.02 - 0.04	0.025 - 0.05	0.025 - 0.05	0.04 - 0.08	0.05 - 0.1	0.05 - 0.1	0.1 - 0.15
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	15 - 25	0.01 - 0.02	0.01 - 0.02	0.015 - 0.03	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07
S	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	10 - 20	0.01 - 0.02	0.01 - 0.02	0.015 - 0.03	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	15 - 25	-	-	-	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07
H	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	10 - 20	-	-	-	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06

HEADS

VGC**-02...

2 flute, for counterboring (can be used for milling)



APMX = Max. depth of cut
CRKS = Connection screw size

Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VGC078L08.0R02-02S05	●	2	10°	7.8	7.6	8	0.2	S05	10	KEYV-S05	7
VGC080L08.0R04-02S05	●	2	10°	8	7.6	8	0.4	S05	10	KEYV-S05	7
VGC080L08.0R10-02S05	●	2	10°	8	7.6	8	1	S05	10	KEYV-S05	7
VGC080L08.0R20-02S05	●	2	10°	8	7.6	8	2	S05	10	KEYV-S05	7
VGC098L09.0R03-02S06	●	2	10°	9.8	9.5	9.5	0.3	S06	12.4	KEYV-S06	10
VGC100L09.0R04-02S06	●	2	10°	10	9.5	9.5	0.4	S06	12.4	KEYV-S06	10
VGC100L09.0R10-02S06	●	2	10°	10	9.5	9.5	1	S06	12.4	KEYV-S06	10
VGC100L09.0R20-02S06	●	2	10°	10	9.5	9.5	2	S06	12.4	KEYV-S06	10
VGC120L10.0R04-02S08	●	2	10°	12	11.5	10	0.4	S08	14.2	KEYV-S08	15
VGC120L10.0R10-02S08	●	2	10°	12	11.5	10	1	S08	14.2	KEYV-S08	15
VGC120L10.0R20-02S08	●	2	10°	12	11.5	10	2	S08	14.2	KEYV-S08	15
VGC160L15.0R04-02S10	●	2	10°	16	15.2	15	0.4	S10	19	KEYV-S10	28
VGC160L15.0R08-02S10	●	2	10°	16	15.2	15	0.8	S10	19	KEYV-S10	28

Can drill with step feed
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

Counterboring

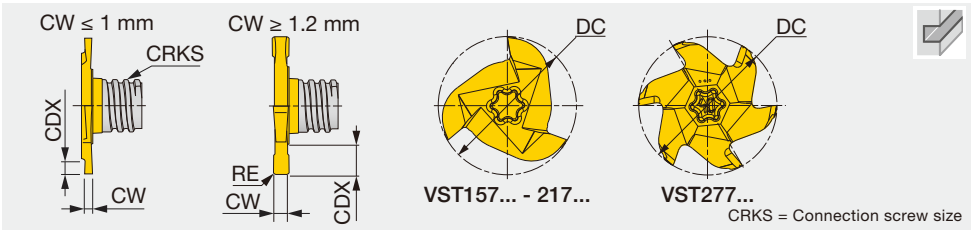
VGC

ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	40 - 80	0.04 - 0.08
P	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	30 - 50	0.04 - 0.08
P	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	20 - 30	0.04 - 0.08
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	15 - 25	0.04 - 0.08
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	60 - 100	0.05 - 0.09
K	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	60 - 100	0.04 - 0.08
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	15 - 25	0.04 - 0.07
S	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	10 - 20	0.03 - 0.06
H	Hardened steel SKD6, SKT4, etc. 55NiCrMoV7, etc.	40 - 50 HRC	15 - 25	0.04 - 0.07
H	Hardened steel SKD11, SKH51, etc. HS6-5-2, etc.	50 - 60 HRC	10 - 20	0.03 - 0.06

When drilling, pecking operation should be applied with the depth of 0.3 - 0.5 mm per step.
Apply the same cutting conditions as the VEE type head when conducting shoulder milling or slotting operations.

VST**-3/4/6...

3, 4, 6 flute, for slotting



Designation	GH730	NOF	FHA	DC	CW$^{\pm 0.02}$	RE	CRKS	CDX	Wrench	Torque*
VST157W1.50R010-3S06	●	3	0°	15.7	1.5	0.1	S06	2.8	KEYV-T20	10
VST157W1.57R020-3S06	●	3	0°	15.7	1.57	0.2	S06	2.8	KEYV-T20	10
VST157W2.00R020-3S06	●	3	0°	15.7	2	0.2	S06	2.8	KEYV-T20	10
VST157W2.39R020-3S06	●	3	0°	15.7	2.39	0.2	S06	2.8	KEYV-T20	10
VST157W2.50R020-3S06	●	3	0°	15.7	2.5	0.2	S06	2.8	KEYV-T20	10
VST157W3.00R020-3S06	●	3	0°	15.7	3	0.2	S06	2.8	KEYV-T25	10
VST177W1.20R005-3S06	●	3	0°	17.7	1.2(1)	0.05	S06	3.8	KEYV-T20	10
VST177W1.40R005-3S06	●	3	0°	17.7	1.4(1)	0.05	S06	3.8	KEYV-T20	10
VST177W1.50R010-3S06	●	3	0°	17.7	1.5	0.1	S06	3.8	KEYV-T20	10
VST177W1.57R020-3S06	●	3	0°	17.7	1.57	0.2	S06	3.8	KEYV-T20	10
VST177W1.70R005-3S06	●	3	0°	17.7	1.7(1)	0.05	S06	3.8	KEYV-T20	10
VST177W2.00R020-3S06	●	3	0°	17.7	2	0.2	S06	3.8	KEYV-T20	10
VST177W2.50R020-3S06	●	3	0°	17.7	2.5	0.2	S06	3.8	KEYV-T20	10
VST177W3.00R020-3S06	●	3	0°	17.7	3	0.2	S06	3.8	KEYV-T25	10
VST217W0.76R000-4S08	●	4	0°	21.7	0.76(1)	-	S08	1.5	KEYV-T25	15
VST217W0.96R000-4S08	●	4	0°	21.7	0.96(1)	-	S08	1.9	KEYV-T25	15
VST217W1.00R005-4S08	●	4	0°	21.7	1	0.05	S08	2	KEYV-T25	15
VST217W1.20R005-4S08	●	4	0°	21.7	1.2(1)	0.05	S08	4.5	KEYV-T25	15
VST217W1.40R005-4S08	●	4	0°	21.7	1.4(1)	0.05	S08	4.5	KEYV-T25	15
VST217W1.57R000-4S08	●	4	0°	21.7	1.57	-	S08	4.5	KEYV-T25	15
VST217W1.70R010-4S08	●	4	0°	21.7	1.7(1)	0.1	S08	4.5	KEYV-T25	15
VST217W1.95R020-4S08	●	4	0°	21.7	1.95(1)	0.2	S08	4.5	KEYV-T25	15
VST217W2.00R020-4S08	●	4	0°	21.7	2	0.2	S08	4.5	KEYV-T25	15
VST217W2.25R020-4S08	●	4	0°	21.7	2.25(1)	0.2	S08	4.5	KEYV-T25	15
VST217W2.39R020-4S08	●	4	0°	21.7	2.39	0.2	S08	4.5	KEYV-T25	15
VST217W2.50R020-4S08	●	4	0°	21.7	2.5	0.2	S08	4.5	KEYV-T25	15
VST217W2.75R020-4S08	●	4	0°	21.7	2.75(1)	0.2	S08	4.5	KEYV-T25	15
VST217W3.00R020-4S08	●	4	0°	21.7	3	0.2	S08	4.5	KEYV-T30L	15
VST217W3.17R020-4S08	●	4	0°	21.7	3.17	0.2	S08	4.5	KEYV-T30L	15
VST217W3.25R020-4S08	●	4	0°	21.7	3.25(1)	0.2	S08	4.5	KEYV-T30L	15
VST217W4.00R020-4S08	●	4	0°	21.7	4	0.2	S08	4.5	KEYV-T30L	15
VST217W4.25R020-4S08	●	4	0°	21.7	4.25(1)	0.2	S08	4.5	KEYV-T30L	15
VST217W4.75R020-4S08	●	4	0°	21.7	4.75	0.2	S08	4.5	KEYV-T30L	15
VST217W5.25R020-4S08	●	4	0°	21.7	5.25(1)	0.2	S08	4.5	KEYV-T30L	15
VST277W2.50R020-6S10	●	6	0°	27.7	2.5	0.2	S10	6	KEYV-T40L	28
VST277W5.25R020-6S10	●	6	0°	27.7	5.25(1)	0.2	S10	6	KEYV-T40L	28
VST277W10.0R020-6S10	●	6	0°	27.7	10	0.2	S10	6	KEYV-T40L	28

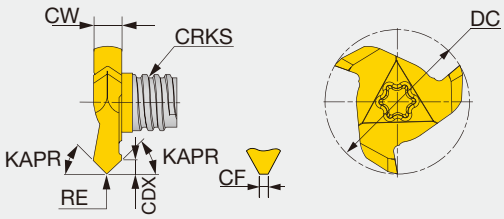
(1) CW is based on DIN471 / 472
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VST**A45...

3, 4 flute, for slotting with 45°chamfer

Slotting



CRKS = Connection screw size

Designation	GH730	NOF	FHA	DC	CW	KAPR	CRKS	CDX	CF	RE	Wrench	Torque*
VST177L01.40A45-3S06	●	3	0°	17.7	3.4	45°	S06	1.4	-	0.1	KEYV-T25	10
VST217L01.70A45-4S08	●	4	0°	21.7	5.5	45°	S08	1.7	1.5	-	KEYV-T30L	15

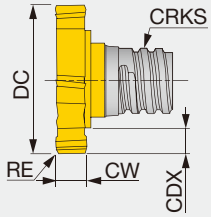
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VTB**-06...

6 flute, for T-slotting

Slotting



CRKS = Connection screw size

Designation	GH730	NOF	FHA	DC $^{0}_{-0.05}$	CW±0.02	CDX	CRKS	RE	Wrench	Torque*
VTB135W3.00R04-06S05	●	6	0°	13.5	3	2.65	S05	0.4	KEYV-T20	7
VTB135W4.00R04-06S05	●	6	0°	13.5	4	2.65	S05	0.4	KEYV-T20	7
VTB160W2.00R04-06S06	●	6	0°	16	2	2.9	S06	0.4	KEYV-T20	10
VTB160W3.00R04-06S06	●	6	0°	16	3	2.9	S06	0.4	KEYV-T25	10
VTB160W4.00R04-06S06	●	6	0°	16	4	2.9	S06	0.4	KEYV-T25	10
VTB165W2.00R04-06S06	●	6	0°	16.5	2	3.15	S06	0.4	KEYV-T20	10
VTB165W3.00R04-06S06	●	6	0°	16.5	3	3.15	S06	0.4	KEYV-T25	10
VTB165W4.00R04-06S06	●	6	0°	16.5	4	3.15	S06	0.4	KEYV-T25	10
VTB195W4.00R04-06S08	●	6	0°	19.5	4	3.45	S08	0.4	KEYV-T30L	15
VTB195W5.00R04-06S08	●	6	0°	19.5	5	3.45	S08	0.4	KEYV-T30L	15
VTB195W6.00R04-06S08	●	6	0°	19.5	6	3.45	S08	0.4	KEYV-T30L	15
VTB225W5.00R04-06S08	●	6	0°	22.5	5	4.95	S08	0.4	KEYV-T40L	15
VTB225W6.00R04-06S08	●	6	0°	22.5	6	4.95	S08	0.4	KEYV-T40L	15
VTB225W8.00R04-06S08	●	6	0°	22.5	8	4.95	S08	0.4	KEYV-T40L	15
VTB250W6.00R04-06S08	●	6	0°	25	6	5.9	S08	0.4	KEYV-T50L	15
VTB250W8.00R04-06S08	●	6	0°	25	8	5.9	S08	0.4	KEYV-T50L	15
VTB250W5.00R04-06S10	●	6	0°	25	5	4.3	S10	0.4	KEYV-T50L	28
VTB250W8.00R04-06S10	●	6	0°	25	8	4.3	S10	0.4	KEYV-T50L	28

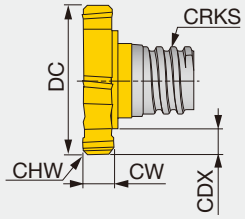
Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VTB**C15-06...

6 flute, for T-slotting with 45°chamfer

Slotting



CRKS = Connection screw size

Designation	GH730	NOF	FHA	DC $^{0}_{-0.05}$	CW$^{\pm 0.02}$	CDX	CRKS	CHW	Wrench	Torque*
VTB135W2.00C15-06S05	●	6	0°	13.5	2	2.65	S05	0.15	KEYV-T20	7

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

Slotting

VST, VTB

ISO	Workpiece material	Hardness	VST		VTB	
			Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
P	Carbon steel S45C, S55C, etc. C45, C55, etc.	- 300 HB	80 - 180	0.05 - 0.15	80 - 180	0.08 - 0.18
P	Alloy steel SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	60 - 120	0.04 - 0.12	60 - 120	0.05 - 0.15
M	Stainless steel SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	50 - 120	0.04 - 0.12	50 - 120	0.05 - 0.15
K	Grey cast iron FC250, FC300, etc. 250, 300, etc., GG250, GG300, etc.	150 - 250 HB	100 - 200	0.05 - 0.15	100 - 200	0.08 - 0.18
K	Ductile cast iron FCD450, etc. 450-10S, etc., GGG450, etc.	150 - 250 HB	100 - 200	0.04 - 0.12	100 - 200	0.05 - 0.15
N	Aluminium alloys Si < 13%	-	200 - 600	0.05 - 0.15	200 - 600	0.08 - 0.18
N	Aluminium alloys Si ≥ 13%	-	100 - 300	0.03 - 0.13	100 - 300	0.05 - 0.15
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	40 - 60	0.04 - 0.12	40 - 60	0.05 - 0.15
S	Heat-resistant alloys Inconel 718, etc.	- 40 HRC	15 - 35	0.02 - 0.1	15 - 35	0.02 - 0.1

Tolerance of tool diameter

Basic dimensions (mm)		Permissible dimensional deviations (μm)						
>	≤	e8	e9	h6	h7	h9	h10	z9
6	10	-25 -47	-25 -61	0 -9	0 -15	0 -36	0 -58	+78 +42
10	14	-32 -59	-32 -75	0 -11	0 -18	0 -43	0 -70	+93 +50
14	18	-32 -59	-32 -75	0 -11	0 -18	0 -43	0 -70	+103 +60
18	30	-40 -73	-40 -92	0 -13	0 -21	0 -52	0 -84	-

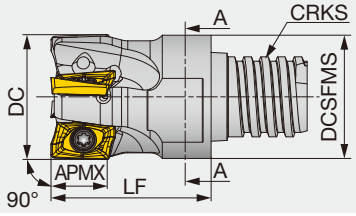
JISB0401-2: 1998 (ISO286-2: 1988) extract

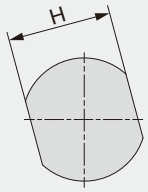
HPAV06-S

TUNGFREC

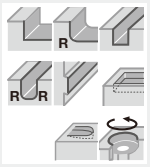
2, 3, 4 tooth, roughing - semi finishing, shoulder milling cutter

Indexable modular head





A-A cross section



Designation	APMX	DC	CICT	LF	H	DCSFMS	CRKS	WT (kg)	Air hole	Insert
HPAV06M010S05R02 ***	6	10	2	10	8	8	S05	0.01	Without	AVGT06...
HPAV06M010S06R02	6	10	2	16	8	9.8	S06	0.01	Without	AVGT06...
HPAV06M012S08R02	6	12	2	18	10	11.7	S08	0.02	Without	AVGT06...
HPAV06M012S08R03	6	12	3	18	10	11.7	S08	0.02	Without	AVGT06...
HPAV06M016S10R03	6	16	3	20	13	15.4	S10	0.03	Without	AVGT06...
HPAV06M016S10R04	6	16	4	20	13	15.4	S10	0.03	Without	AVGT06...

Applicable shank: VSSD, VTSD, VSC, VSTD, VER
Please use VAD-M adapter to connect TungMeister with a metric thread shank.
*** The wrench size for these heads is different from the ones for the other head types.

SPARE PARTS

Designation	Clamping screw	Lubricant	Wrench
HPAV06M...	CSPB-2H	M-1000	IP-6DB

*Recommended clamping torque (N·m): CSPB-2H = 0.7

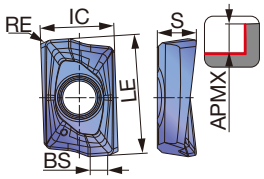
Designation	Wrench*
HPAV06M010S...	KEYV-S06
HPAV06M012S...	KEYV-S08
HPAV06M016S...	KEYV-S10

*sold separately

INSERTS

AVGT-MJ

AVGT-AJ



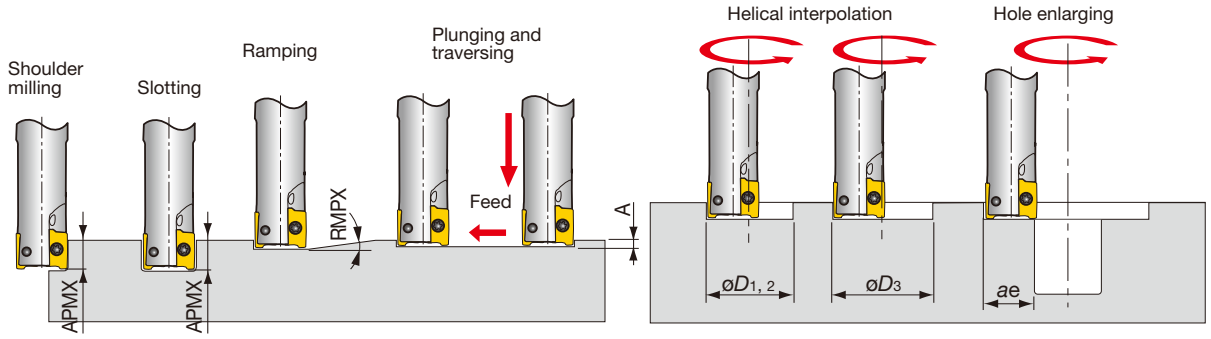
		AH120	AH130	AH3135	AH3225	KS05F
P	Steel	☆		☆	★	
M	Stainless		☆	★	☆	
K	Cast iron	★				
N	Non-ferrous					★
S	Superalloys	☆	★			
H	Hard materials	★				

★ : First choice
☆ : Second choice

Designation	RE	APMX	Coated				Carbide	LE	IC	S	BS
			AH120	AH130	AH3135	AH3225	KS05F				
AVGT060300PBER-MJ	0.0	6			●	●		8	5	2.7	1.6
AVGT060302PBER-MJ	0.2	6	●	●	●	●		8	5	2.7	1.5
AVGT060304PBER-MJ	0.4	6	●	●	●	●		8	5	2.7	1.3
AVGT060308PBER-MJ	0.8	6	●	●	●	●		8	5	2.6	0.9
AVGT060300PBFR-AJ	0.0	6					●	8	5	2.7	1.6
AVGT060302PBFR-AJ	0.2	6					●	8	5	2.7	1.5
AVGT060304PBFR-AJ	0.4	6					●	8	5	2.7	1.3
AVGT060308PBFR-AJ	0.8	6					●	8	5	2.6	0.9

● : Line up

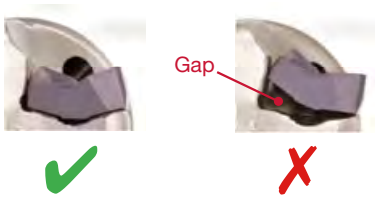
MACHINING APPLICATIONS



Designation	DC	Max. depth of cut APMX	Max. ramping angle RMPX	Max. plunging A	Min. machining øD1	Max. machining øD2	Max. machining øD3*	Max. cutting width in enlarging ae
HPAV06M010…	10	6	3°	0.3	15	19	18	9.5
HPAV06M012…	12	6	3°	0.3	18	23	22	11.5
HPAV06M016…	16	6	2°	0.3	28	31	30	15.5

*Flat bottom hole

When clamping the insert, please confirm that there is no gap between the cutter body and the insert as shown in the picture.



STANDARD CUTTING CONDITIONS

HPAV06-S

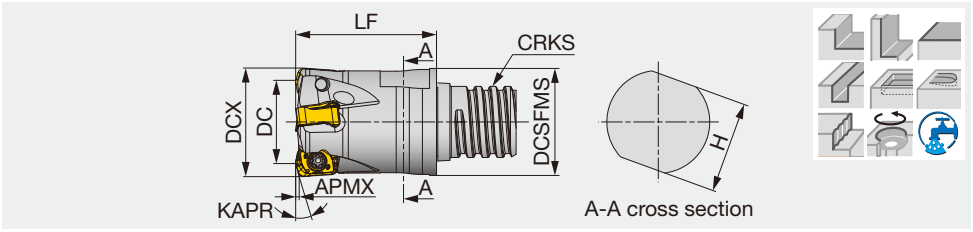
ISO	Workpiece materials		Hardness	Priority	Grades	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)
P	Low carbon steel S15C / C15E4, SS400 / E275A, etc.		- 200 HB	First choice	AH3225	230 - 430	0.07 - 0.12
P	Carbon steel and alloy steel S55C / C55, SCM440 / 42CrMo4, etc.		- 300 HB	First choice	AH3225	150 - 350	0.07 - 0.12
P	Prehardend steel NAK80, PX5, etc.		30 - 40 HRC	First choice	AH3225	100 - 230	0.07 - 0.12
M	Stainless steel SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3, etc.		-	First choice	AH3135	150 - 220	0.06 - 0.1
K	Grey cast iron FC250 / 250, FC300 / 300, etc.		150 - 250 HB	First choice	AH120	200 - 330	0.07 - 0.12
K	Ductile cast iron FCD400, FCD600 / 600-3, etc.		150 - 250 HB	First choice	AH120	150 - 240	0.07 - 0.12
N	Aluminium alloys Si < 13%		-	First choice	KS05F	650 - 1000	0.07 - 0.12
N	Aluminium alloys Si ≥ 13%		-	First choice	KS05F	100 - 230	0.04 - 0.12
S	Titanium alloys Ti-6Al-4V, etc.		- 40 HRC	First choice	AH130	40 - 90	0.04 - 0.1
S	Superalloys Inconel718, etc.		- 40 HRC	First choice	AH130	45 - 65	0.04 - 0.09
H	Hardened steel	SKD61 / X40CrMoV5-1, etc.	40 - 50 HRC	First choice	AH120	45 - 70	0.04 - 0.08
H	Hardened steel	SKD11 / X153CrMoV12, etc.	50 - 60 HRC	First choice	AH120	40 - 65	0.04 - 0.06

HXN02R-S

ADDFEED

High feed endmill, modular type (TungMeister)

Indexable modular head



Designation	APMX	DCX	CICT	DC	DCSFMS	LF	H	KAPR	CRKS	WT(kg)	Air hole	Insert
HXN02R008MS05-01	0.5	8	1	3.97	7.6	10	5.5	17	S05	0.004	With	LNMU0202…
HXN02R010MS06-02	0.5	10	2	5.88	9.6	16	8	17	S06	0.01	With	LNMU0202…
HXN02R012MS08-02	0.5	12	2	7.8	11.5	18	10	17	S08	0.01	With	LNMU0202…
HXN02R016MS10-04	0.5	16	4	11.8	15.2	20	13	17	S10	0.03	With	LNMU0202…

SPARE PARTS

Designation	Clamping screw	Wrench 1	Wrench 2
HXN02R008MS05…	CSPB-1.8FL3.6	IP-6DB	KEYV-S05
HXN02R010MS06…	CSPB-1.8FL4.3	IP-6DB	KEYV-S06
HXN02R012MS08…	CSPB-1.8FL4.3	IP-6DB	KEYV-S08
HXN02R016MS10…	CSPB-1.8FL4.3	IP-6DB	KEYV-S10

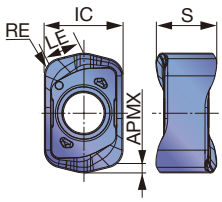
Tool diameter tolerance	
Tool diameter	0 / -0.4

Note : Dedicated wrench is sold separately.

*Recommended clamping torque (N·m) : CSPB-1.8FL3.6, CSPB-1.8FL4.3 = 0.5
KEYV-S05 = 7, KEYV-S06 = 10, KEYV-S08 = 15, KEYV-S10 = 28

INSERT

LNMU02-MM (for general purpose)



P	Steel		★	☆
M	Stainless	★	☆	
K	Cast iron		☆	★
N	Non-ferrous			
S	Superalloy	★		★
H	Hard materials		☆	★

★ : First choice
☆ : Second choice

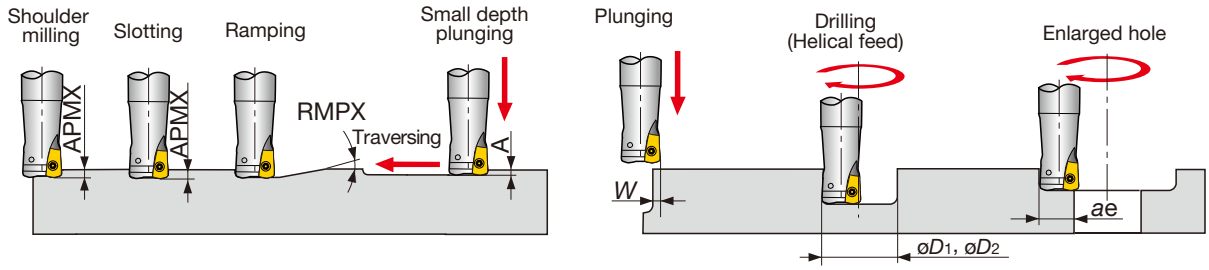
Designation	RE	APMX	Coated AH130	Coated AH3225	Coated AH8015	LE	IC	S
LNMU0202ZER-MM	0.9	0.5	●	●	●	1.79	4	3.1

● : Line up

STANDARD CUTTING CONDITIONS

ISO	Workpiece materials		Hardness	Priority	Grades	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)	Tool dia.: DCX (mm), Number of revolutions: *n* (min^{-1}), Feed speed: *Vf* (mm/min), Max. depth of cut: *ap* = 0.5 mm, Number of teeth: CICT							
								ø8, CICT = 1		ø10, CICT = 2		ø12, CICT = 2		ø16, CICT = 4	
								n	*Vf*	*n*	*Vf*	*n*	*Vf*	*n*	*Vf*
P	Carbon steels S45C, S55C, etc. C45, C55, etc.		- 300HB	First choice	AH3225	100 - 300	0.2 - 1.2	7,960	6,370	6,370	10,200	5,310	8,500	3,980	12,740
			- 300HB	For wear resistance	AH8015	100 - 300	0.2 - 1.2	*Vc* = 200 m/min, *fz* = 0.8 mm/t							
	Alloy steels SCM440, SCr415, etc. 42CrMo4, etc.		- 300HB	First choice	AH3225	100 - 300	0.2 - 1.2	7,960	6,370	6,370	10,200	5,310	8,500	3,980	12,740
			- 300HB	For wear resistance	AH8015	100 - 300	0.2 - 1.2	*Vc* = 200 m/min, *fz* = 0.8 mm/t							
	Prehardened steels NAK80, PX5, etc.		30 - 40HRC	First choice	AH8015	100 - 200	0.2 - 0.8	5,970	2,990	4,780	4,780	3,980	3,980	2,990	5,980
			30 - 40HRC	For impact resistance	AH3225	100 - 200	0.2 - 0.8	*Vc* = 150 m/min, *fz* = 0.5 mm/t							
M	Stainless steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.		- 200HB	First choice	AH130	100 - 150	0.2 - 0.8	4,780	2,390	3,820	3,820	3,190	3,190	2,390	4,780
								Vc = 120 m/min, *fz* = 0.5 mm/t							
K	Gray cast irons FC250, FC300, etc. 250, 300, etc.		150 - 250HB	First choice	AH8015	100 - 300	0.2 - 1.2	7,960	6,370	6,370	10.200	5,310	8,500	3,980	12,740
			150 - 250HB	For impact resistance	AH3225	100 - 300	0.2 - 1.2	*Vc* = 200 m/min, *fz* = 0.8 mm/t							
	Ductile cast irons FCD400, etc. 400-15, 600-3, etc.		150 - 250HB	First choice	AH8015	80 - 200	0.2 - 1.2	5,970	4,780	4,780	7,650	3,980	6,370	2,990	9,570
			150 - 250HB	For impact resistance	AH3225	80 - 200	0.2 - 1.2	*Vc* = 150 m/min, *fz* = 0.8 mm/t							
S	Titanium alloy Ti-6Al-4V, etc.		- 40HRC	First choice	AH130	30 - 60	0.2 - 0.7	1,590	800	1,270	1,270	1,060	1,060	800	1,600
			- 40HRC	For wear resistance	AH8015	30 - 60	0.2 - 0.7	*Vc* = 40 m/min, *fz* = 0.5 mm/t							
	Heat-resistant alloy Inconel, Hastelloy, etc.		- 40HRC	First choice	AH8015	20 - 50	0.1 - 0.3	1,190	240	1,000	400	800	320	600	480
			- 40HRC	For impact resistance	AH3225	20 - 50	0.1 - 0.3	*Vc* = 30 m/min, *fz* = 0.2 mm/t							
H	Hardened steel	SKD61, etc. X40CrMoV5-1, etc.	40 - 50HRC	First choice	AH8015	80 - 150	0.1 - 0.5	4,780	1,440	3,820	2,300	3,190	1,920	2,390	2,870
			40 - 50HRC	For impact resistance	AH3225	80 - 150	0.1 - 0.5	*Vc* = 120 m/min, *fz* = 0.3 mm/t							
		SKD11, etc. X153CrMoV12, etc.	50~60HRC	First choice	AH8015	50 - 70	0.1 - 0.3	2,390	480	1,910	770	1,590	640	1,190	960
								Vc = 60 m/min, *fz* = 0.2 mm/t							

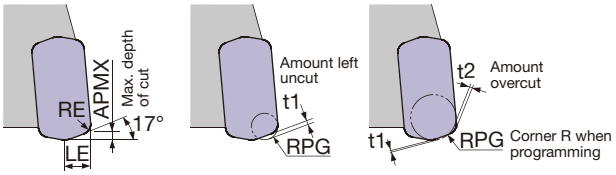
APPLICATION RANGE



Designation	DCX	Max. depth of cut APMX	Max. ramping angle RMPX	Max. plunging depth A	Max. cutting width in plunging W	Min. machining øD_1	Max. machining øD_2	Max. cutting width in enlarged hole *ae*
HXN02R008MS05-01	8	0.5	0.5	0.03	2	11.5	13.2	5.87
HXN02R010MS06-02	10	0.5	2.8	2.8	2	13.8	17	7.82
HXN02R012MS08-02	12	0.5	1.9	1.9	2	17.8	21	9.81
HXN02R016MS10-04	16	0.5	1.2	1.2	2	25.8	29	13.8

TOOL GEOMETRY ON PROGRAMMING

When programming for CAM, the tool should be considered as a radius cutter. Usually, the corner radius should be set as R = 1 mm.
If a larger radius is used, overcutting will occur. The following table shows the amount left uncut (t1) and overcut (t2).



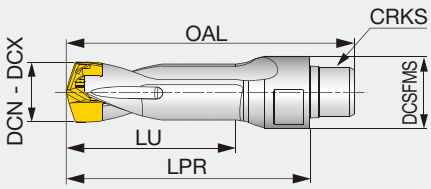
Max. depth of cut APMX (mm)	Corner radius RE (mm)	LE (mm)	Corner R when programming RPG	Amount left uncut t1 (mm)	Amount overcut t2 (mm)
0.5	0.9	2	0.5	0.38	0
0.5	0.9	2	0.8	0.31	0
0.5	**0.9**	**2**	**1**	**0.26**	**0**
0.5	0.9	2	1.5	0.14	0.08

*Recommended

TID-S L/D=2

DRILLMEISTER

Modular body with "TungMeister" connection



Designation	DC	DCSFMS	LU	LPR	OAL DMP	OAL DMC	OAL DMF	CRKS	Pocket size	H	Head
TID065S06-2	6.5 - 6.9	10	14.5	27.15	33.45	33.6	32.58	S06	6.5	8	DM*065
TID085S06-2	8.5 - 8.9	10	19.5	33.15	39.45	39.55	38.59	S06	8.5	8	DM*085
TID105S08-2	10.5 - 10.9	12	23.5	40.55	48.05	48.67	46.72	S08	10.5	10	DM*105

Tool diameter	Hole diameter tolerance*
ø6.5 - ø10.9	+0.04 / 0

Just for reference*

SPARE PARTS

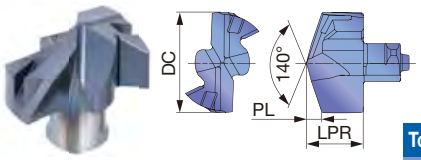
Designation	Clamping key
TID065S06-2, TID085S06-2	K-TID6-9.99
TID105S08-2	K-TID10-19.99

Designation	Wrench*
TID065S06-2, TID085S06-2	KEYV-S06
TID105S08-2	KEYV-S08

*Sold separately

DRILL HEAD

DMP (General purpose)



DRILLMEISTER

DMP060 - DMP259

Tool diameter	Head diameter tolerance
ø6.5 - ø10.9	+0.018 / 0

P	Steel	☆	★
M	Stainless	☆	★
K	Cast iron	☆	★
N	Non-ferrous		
S	Superalloys	☆	★
H	Hard materials	☆	★

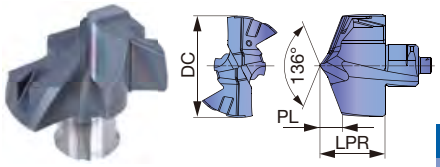
★ : First choice
☆ : Second choice

Designation	DC	LPR	Coated AH725	Coated AH9130	PL	Body
DMP065	6.5	4.15	●	●	1.27	TID*065...
DMP066	6.6	4.15	●	●	1.29	TID*065...
DMP067	6.7	4.15	●	●	1.31	TID*065...
DMP068	6.8	4.15	●	●	1.33	TID*065...
DMP069	6.9	4.15	●	●	1.34	TID*065...
DMP085	8.5	5.25	●	●	1.29	TID*085...
DMP086	8.6	5.25	●	●	1.31	TID*085...
DMP087	8.7	5.25	●	●	1.33	TID*085...
DMP088	8.8	5.25	●	●	1.35	TID*085...
DMP089	8.9	5.25	●	●	1.36	TID*085...
DMP105	10.5	6.05	●	●	1.56	TID*105...
DMP106	10.6	6.05	●	●	1.58	TID*105...
DMP107	10.7	6.05	●	●	1.6	TID*105...
DMP108	10.8	6.05	●	●	1.62	TID*105...
DMP109	10.9	6.05	●	●	1.63	TID*105...

ø6.5 - ø10.9 = 2 pieces per package

● : Line up

DMC (High precision hole making)



DRILLMEISTER

DMC060 - DMC259

Tool diameter	Head diameter tolerance
ø6.5 - ø10.9	+0.018 / 0

P	Steel	★	
M	Stainless	★	
K	Cast iron	★	
N	Non-ferrous	☆	
S	Superalloys	★	
H	Hard materials	★	

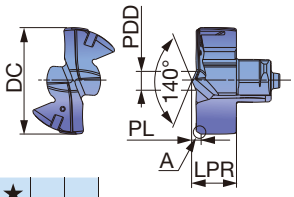
★ : First choice
☆ : Second choice

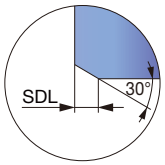
Designation	DC	LPR	Coated AH9130	PL	Body
DMC065	6.5	4.3	●	1.33	TID*065...
DMC066	6.6	4.3	●	1.35	TID*065...
DMC067	6.7	4.3	●	1.37	TID*065...
DMC068	6.8	4.3	●	1.39	TID*065...
DMC069	6.9	4.3	●	1.41	TID*065...
DMC085	8.5	5.4	●	1.72	TID*085...
DMC086	8.6	5.4	●	1.74	TID*085...
DMC087	8.7	5.4	●	1.76	TID*085...
DMC088	8.8	5.4	●	1.78	TID*085...
DMC089	8.9	5.4	●	1.8	TID*085...
DMC105	10.5	6.67	●	2.19	TID*105...
DMC106	10.6	6.67	●	2.21	TID*105...
DMC107	10.7	6.67	●	2.23	TID*105...
DMC108	10.8	6.67	●	2.25	TID*105...
DMC109	10.9	6.67	●	2.27	TID*105...

ø6.5 - ø10.9 = 2 pieces per package

● : Line up

DMF Flat geometry head





Detail in A

Tool diameter	Head diameter tolerance
ø6.5 - ø10.9	+0.018 / 0

P	Steel	★		
M	Stainless	★		
K	Cast iron	★		
N	Non-ferrous	☆		
S	Superalloys	★		
H	Hard materials	★		

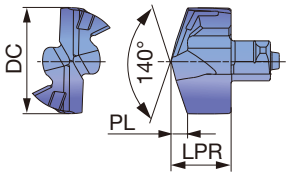
★ : First choice
☆ : Second choice

Designation	DC	LPR	Coated AH9130	SDL	PL	PDD	Body
DMF065	6.5	3.28	●	0.4	0.68	1.54	TID*065...
DMF066	6.6	3.28	●	0.4	0.68	1.54	TID*065...
DMF067	6.7	3.28	●	0.4	0.68	1.54	TID*065...
DMF068	6.8	3.28	●	0.4	0.68	1.54	TID*065...
DMF069	6.9	3.28	●	0.4	0.68	1.54	TID*065...
DMF085	8.5	4.39	●	0.7	1.09	2.44	TID*085...
DMF086	8.6	4.39	●	0.7	1.09	2.44	TID*085...
DMF087	8.7	4.39	●	0.7	1.09	2.44	TID*085...
DMF088	8.8	4.39	●	0.7	1.09	2.44	TID*085...
DMF089	8.9	4.39	●	0.7	1.09	2.44	TID*085...
DMF105	10.5	4.72	●	0.7	1.17	2.89	TID*105...
DMF106	10.6	4.72	●	0.7	1.17	2.89	TID*105...
DMF107	10.7	4.72	●	0.7	1.17	2.89	TID*105...
DMF108	10.8	4.72	●	0.7	1.17	2.89	TID*105...
DMF109	10.9	4.72	●	0.7	1.17	2.89	TID*105...

ø6.5 - ø10.9 = 2 pieces per package

● : Line up

DMH High strength cutting edge



P	Steel	★		
M	Stainless	★		
K	Cast iron	★		
N	Non-ferrous			
S	Superalloys	★		
H	Hard materials	★		

Tool diameter	Head diameter tolerance
ø6.5 - ø10.9	+0.018 / -0.005

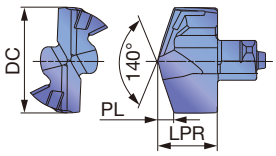
★ : First choice

Designation	DC	LPR	Coated AH9130	PL	Body
DMH065	6.5	4.15	●	1.27	TID*065...
DMH066	6.6	4.15	●	1.29	TID*065...
DMH067	6.7	4.15	●	1.31	TID*065...
DMH068	6.8	4.15	●	1.33	TID*065...
DMH069	6.9	4.15	●	1.34	TID*065...
DMH085	8.5	5.25	●	1.29	TID*085...
DMH086	8.6	5.25	●	1.31	TID*085...
DMH087	8.7	5.25	●	1.33	TID*085...
DMH088	8.8	5.25	●	1.35	TID*085...
DMH089	8.9	5.25	●	1.36	TID*085...
DMH105	10.5	6.05	●	1.56	TID*105...
DMH106	10.6	6.05	●	1.58	TID*105...
DMH107	10.7	6.05	●	1.6	TID*105...
DMH108	10.8	6.05	●	1.62	TID*105...
DMH109	10.9	6.05	●	1.63	TID*105...

ø6.5 - ø10.9 = 2 pieces per package

● : Line up

DMN Non-ferrous metals drilling



P	Steel			
M	Stainless			
K	Cast iron			
N	Non-ferrous	★		
S	Superalloys			
H	Hard materials			

Tool diameter	Head diameter tolerance
ø6.8 - ø10.8	+0.01 / 0

★ : First choice

Designation	DC	LPR	Coated KS15F	PL	Body
DMN068	6.8	4.15	●	1.33	TID*065...
DMN085	8.5	5.25	●	1.29	TID*085...
DMN088	8.8	5.25	●	1.35	TID*085...
DMN105	10.5	6.05	●	1.56	TID*105...
DMN108	10.8	6.05	●	1.62	TID*105...

ø6.8 - ø10.8 = 2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

DRILLMEISTER

ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed: *f* (mm/rev) Tool diameter: DC (mm) ø6 - 7.9	ø8 - 9.9	ø10 - ø11.9
P	Low carbon steels (C < 0.3) SS400, SM490, S25C, etc. C15E4, E275A, E355D, etc.	- 200 HB	80 - 140	0.09 - 0.13	0.12 - 0.25	0.15 - 0.28
P	High carbon steels (C > 0.3) S45C, S55C, etc. C45, C55, etc.	- 300 HB	70 - 120	0.09 - 0.13	0.12 - 0.25	0.15 - 0.28
P	Low alloy steels SCM415, etc. 18CrMo4, etc.	- 200 HB	70 - 120	0.08 - 0.13	0.11 - 0.25	0.14 - 0.28
P	Alloy steels SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	- 300 HB	40 - 90	0.08 - 0.13	0.11 - 0.25	0.14 - 0.28
M	Stainless steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 250 HB	30 - 70	0.08 - 0.1	0.1 - 0.15	0.12 - 0.18
K	Grey cast irons FC250, etc. GG25, etc.	150 - 250 HB	80 - 180	0.12 - 0.18	0.15 - 0.3	0.20 - 0.35
K	Ductile cast irons FCD700, etc. GGG70, etc.	150 - 250 HB	80 - 140	0.12 - 0.18	0.15 - 0.3	0.20 - 0.35
N	Aluminium alloys ADC12, etc. AlSi11Cu3, etc.	-	80 - 220	0.1 - 0.2	0.2 - 0.35	0.25 - 0.4
S	Titanium alloys Ti-6Al-4V, etc.	- 40 HRC	20 - 50	0.05 - 0.07	0.06 - 0.12	0.08 - 0.15
S	Nickel-based alloys	- 40 HRC	20 - 50	0.05 - 0.07	0.06 - 0.11	0.08 - 0.13
H	Hardened steel	- 50 HRC	20 - 50	0.05 - 0.07	0.06 - 0.12	0.08 - 0.15

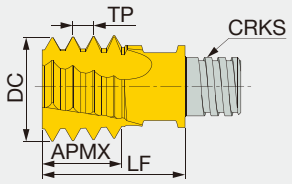
- Cutting conditions in the above table show standard cutting conditions
- Cutting conditions may change due to the rigidity and power of the machine and the workpiece material
- Machined hole diameter may change depending upon the rigidity of the machine tool or cutting conditions

ISO metric

VMT***IS

3 - 6 flute, full profile, for internal thread

Threading



CRKS = Connection screw size

Designation	AH725	TP	Application range		DC	NOF	APMX	LF	CRKS	Wrench	Torque*
			Coarse	Fine							
VMT100L06IS07-4S05	●	0.75	-	≥M12	10	4	6	12.8	S05	KEYV-S05	7
VMT100L06IS10-4S05	●	1	-	≥M12	10	4	6	12.8	S05	KEYV-S05	7
VMT100L06IS15-4S05	●	1.5	-	≥M14	10	4	6	12.8	S05	KEYV-S05	7
VMT120L08IS15-4S06	●	1.5	-	≥M16	12	4	7.6	14.3	S06	KEYV-S06	10
VMT120L08IS20-4S06	●	2	M16	≥M17	12	4	8	14.3	S06	KEYV-S06	10
VMT160L12IS15-6S08	●	1.5	-	≥M20	16	6	12	20	S08	KEYV-S08	15
VMT160L12IS20-5S08	●	2	-	≥M19	16	5	12	20	S08	KEYV-S08	15
VMT154L13IS25-5S08	●	2.5	M20	≥M22	15.4	5	12.7	20	S08	KEYV-S08	15
VMT160L12IS30-3S08	●	3	M24	≥M25	16	3	12.1	20	S08	KEYV-S08	15

Torque*: Recommended clamping torque (N·m)
2 pieces per package

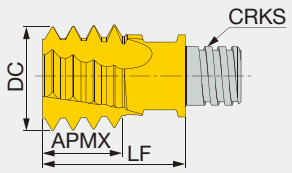
● : Line up

Unified

VMT***UN

3, 4, 5 flute, full profile, for internal thread

Threading



CRKS = Connection screw size

Designation	AH725	TPI	Application range			DC	NOF	APMX	LF	CRKS	Wrench	Torque*
			UNC	UNF	UNEF							
VMT100L06UN24-4S05	●	24	-	-	9/16-5/8	10	4	5.3	12.8	S05	KEYV-S05	7
VMT100L06UN20-4S05	●	20	-	1/2	-	10	4	5.1	12.8	S05	KEYV-S05	7
VMT120L08UN16-4S06	●	16	-	3/4	-	12	4	8	14.3	S06	KEYV-S06	10
VMT120L07UN14-4S06	●	14	-	7/8	-	12	4	7.3	14.3	S06	KEYV-S06	10
VMT160L13UN12-5S08	●	12	-	1-1 1/2	-	16	5	12.7	20	S08	KEYV-S08	15
VMT153L13UN10-4S08	●	10	3/4	-	-	15.3	4	12.7	20	S08	KEYV-S08	15
VMT160L11UN09-3S08	●	9	7/8	-	-	16	3	11.3	20	S08	KEYV-S08	15
VMT160L13UN08-3S08	●	8	1	-	-	16	3	12.7	20	S08	KEYV-S08	15

Torque*: Recommended clamping torque (N·m)
2 pieces per package

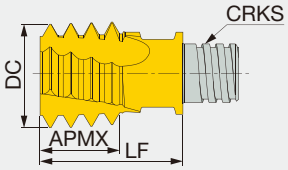
● : Line up

Whitworth

VMT***W

4 flute, full profile, for internal/external thread

Threading



CRKS = Connection screw size

Designation	AH725	TPI	Application range	DC	NOF	APMX	LF	CRKS	Wrench	Torque*
VMT100L06W19-4S05	●	19	G1/4-3/8	10	4	5.3	12.8	S05	KEYV-S05	7
VMT160L13W14-4S08	●	14	G1/2-7/8	16	4	12.7	20	S08	KEYV-S08	15
VMT160L12W11-4S08	●	11	≥G1	16	4	11.5	20	S08	KEYV-S08	15

Torque*: Recommended clamping torque (N·m)
2 pieces per package

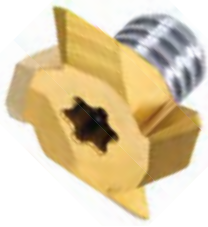
● : Line up

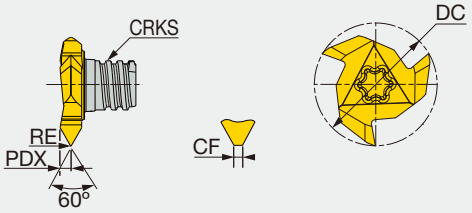
60° partial profile

VTR***IS...

3, 4 flute, partial profile, for internal/external thread

Threading





CRKS = Connection screw size

Designation	GH730	Internal			External		DC	NOF	RE	CF	PDX	CRKS	Wrench	Torque*
		TPN	TPX	Smallest possible thread	TPN	TPX								
VTR160L12IS05-3S06	●	0.5	2	M20	0.4	2	15.7	3	-	0.05	1.4	S06	KEYV-T25	10
VTR160L12IS15-3S06	●	1.5	2	M22	1	1.5	15.7	3	0.05	-	1.4	S06	KEYV-T25	10
VTR220L28IS30-4S08	●	3	4.5	M36	2.5	4	21.7	4	0.2	-	2.4	S08	KEYV-T30L	15

Torque*: Recommended clamping torque (N·m)
2 pieces per package

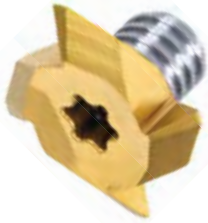
● : Line up

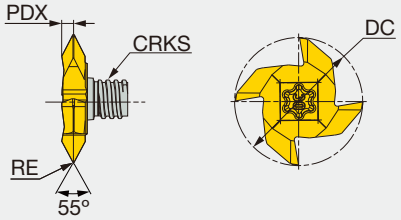
55° partial profile

VTR***W...

4 flute, partial profile, for internal/external thread

Threading





CRKS = Connection screw size

Designation	GH730	Internal			External		DC	NOF	RE	PDX	CRKS	Wrench	Torque*
		TPIN	TPIX	Smallest possible thread	TPIN	TPIX							
VTR220L24W14-4S08	●	14	11	G3/4	16	11.5	21.7	4	0.2	2	S08	KEYV-T30L	15

Torque*: Recommended clamping torque (N·m)
2 pieces per package

● : Line up

STANDARD CUTTING CONDITIONS

Threading

VMT, VTR

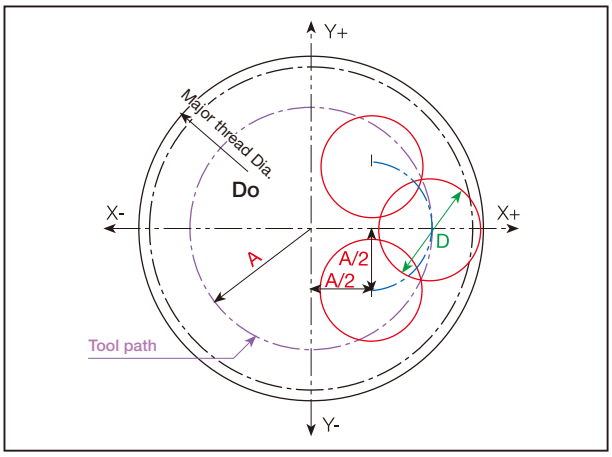
ISO	Material		Condition	Tensile strength [N/mm²]	Hardness	Cutting speed *Vc* (m/min)	Tool dia. : DC (mm) Feed per tooth: *fz* (mm/t) ø10	ø12	ø15.4, ø15.7, ø16	ø21.7
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C	Annealed	420	125 HB	100 - 250	0.08	0.09	0.12	0.15
		≥ 0.25 %C	Annealed	650	190 HB	80 - 210	0.08	0.09	0.12	0.15
		< 0.55 %C	Quenched and tempered	850	250 HB	65 - 170				
		≥ 0.55 %C	Annealed	750	220 HB	110 - 180	0.07	0.08	0.1	0.12
			Quenched and tempered	1000	300 HB	95 - 160	0.07	0.08	0.1	0.12
	Low alloy steel and cast steel (less than 5% of alloying elements)		Annealed	600	200 HB	90 - 160	0.05	0.05	0.07	0.08
			Quenched and tempered	930	275 HB	65 - 200	0.05	0.05	0.07	0.08
				1000	300 HB	70 - 210	0.05	0.05	0.07	0.08
				1200	350 HB	95 - 160	0.05	0.05	0.07	0.08
	High alloyed steel, cast steel, and tool steel		Annealed	680	200 HB	130 - 170	0.05	0.05	0.07	0.08
			Quenched and tempered	1100	325 HB	75 - 100	0.05	0.05	0.07	0.08
	Stainless steel and cast steel		Ferritic/martensitic	680	200 HB	110 - 170	0.05	0.05	0.07	0.08
			Martensitic	820	240 HB	70 - 155	0.05	0.05	0.07	0.08
M	Stainless steel		Annealed	600	180 HB	85 - 100	0.05	0.05	0.07	0.08
K	Cast iron nodular (GGG)		Ferritic/martensitic		180 HB	120 - 160	0.08	0.09	0.12	0.15
			Pearlitic		260 HB	75 - 160	0.08	0.09	0.12	0.15
	Grey cast iron (GG)		Ferritic		160 HB	70 - 150	0.08	0.09	0.12	0.15
			Pearlitic		250 HB	110 - 140	0.08	0.09	0.12	0.15
	Malleable cast iron		Ferritic		130 HB	120 - 160	0.08	0.09	0.12	0.15
			Pearlitic		230 HB	110 - 140	0.08	0.09	0.21	0.15
N	Aluminium-wrought alloy		Not cureable		60 HB	160 - 300	0.08	0.09	0.12	0.15
			Cured		100 HB					
	Aluminium-cast, alloyed	≤12% Si	Not cureable		75 HB	150 - 350	0.08	0.09	0.12	0.15
			Cured		90 HB					
		>12% Si	High temperature		130 HB	100 - 250	0.05	0.05	0.07	0.08
	Copper alloys	>1% Pb	Free cutting		110 HB					
			Brass		90 HB					
			Electrolitic copper		100 HB					
	Non-metallic		Duroplastics, fiber plastics			100 - 400	0.11	0.12	0.15	0.18
			Hard rubber							
S	High temp. alloys	Fe based	Annealed		200 HB					
			Cured		280 HB					
		Ni or Co based	Annealed		250 HB	20 - 80	0.03	0.03	0.04	0.04
			Cured		350 HB					
			Cast		320 HB					
	Titanium Ti alloys			RM 400						
			Alpha+beta alloys cured	RM 1050		20 - 80	0.03	0.03	0.04	0.04
H	Hardened steel		Hardened		55 HRC	55 - 65				
			Hardened		60 HRC	45 - 55				
	Chilled cast iron		Cast		400 HB	90 - 105				
	Cast iron		Hardened		55 HRC	55 - 65				

Thread Milling CNC Program for Internal Thread

Right-hand thread (climb milling) from bottom up. Program is based on tool center.
This method of programming needs no tool radius compensation value, other than an offset for wear.

General Program

G90 G00 G54 G43 H1X0 Y0 Z10 S (n : Number of revolutions)
G00 Z-(to thread depth)
G01 G91 G41 D1 X (A/2) Y-(A/2) Z0 F (Center of tool)
G03 X(A/2) Y(A/2) R (A/2) Z(1/8 pitch) F (Cutting edge)
G03 X0 Y0 I -(A) J0 Z (pitch)
G03 X-(A/2) Y(A/2) R (A/2) Z(1/8 pitch)
G01 G40 X -(A/2) Y-(A/2) Z0
G90 X0 Y0 Z0



$$A = \frac{Do - D}{2}$$

A = Radius of tool path
Do = Major thread diameter
D = Cutting diameter

F (Center of tool) = n x *f* x z

F (Cutting edge) = $\frac{Do - D}{Do}$ x n x *f* x z

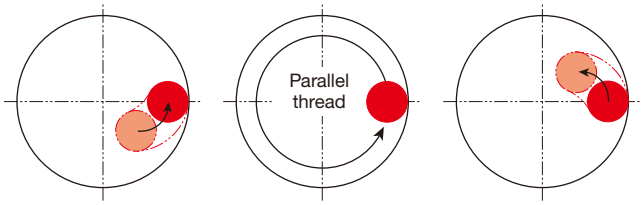
n : Number of revolutions
f : rev / tooth
z : Number of edge

Internal Thread

Example: M20x2.0 **IN-RH** (Thread depth 20 mm)
Tool : **MTEC1010C27 2.0ISO**
(Cutting dia. 10 mm)
A=(**Do**-**D**)/2=(20-10)/2=5
A/2=2.5
(Tool compensation of radius=0)

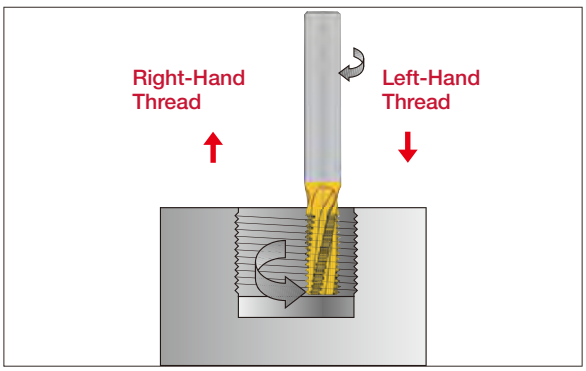
G90 **G0** **G**54 **G**43 **G**17 **H1X**0 **Y**0 **Z**10 **S**4000
G0 **Z**-20
G01 **G**91 **G**41 **D1X** 2.5 **Y**-2.5 **Z**0 **F**840
G03 **X**2.5 **Y**2.5 **R**2.5 **Z**0.25 F420
G03 **X**0 **Y**0 **I**-5.0 **J**0 **Z**2.0
G03 **X**-2.5 **Y**2.5 **R**2.5 **Z**0.25
G01 **G**40 **X**-2.5 **Y**-2.5 **Z**0
G90 **G**0 **X**0 **Y**0 **Z**0
M30
%

Machining procedure

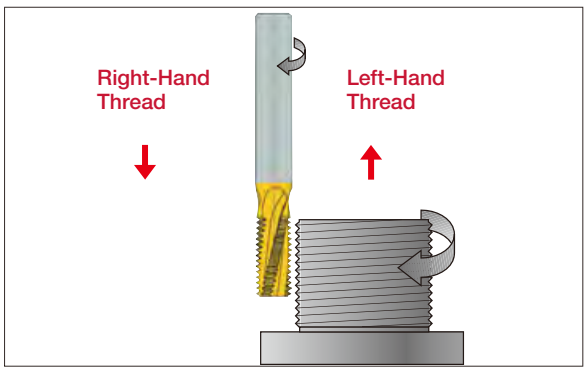


(a) Tool approach (b) Machining thread (c) Tool retraction

Internal Thread



External Thread



A thread milling operation is applicable for thread cutting in non-symmetrical parts utilizing the advantage of helical interpolation programs on modern machining centers.

For more details, please check ThreadMilling advisor.

SHANKS

VSSD...

Straight neck and cylindrical shank

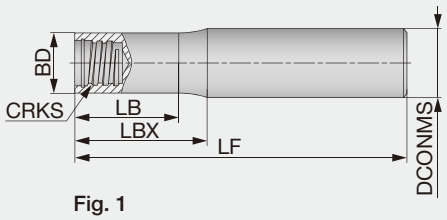


Fig. 1

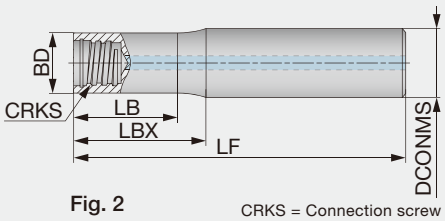


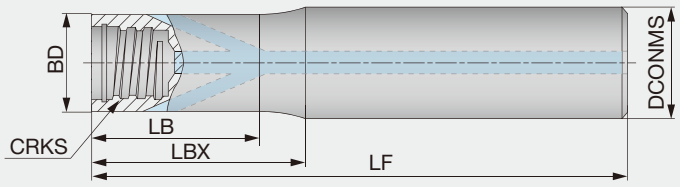
Fig. 2

CRKS = Connection screw size

Designation	DCONMS	BD	LF	LBX	LB	CRKS	Shank shape	Shank material	Fig.
VSSD06L050S04-S	6	5.8	50	11	10	S04	Cylindrical	Steel	1
VSSD06L060S04-C	6	5.8	60	18	17	S04	Cylindrical	Carbide	1
VSSD08L050S04-S	8	5.8	50	14	10	S04	Cylindrical	Steel	1
VSSD08L060S04-C	8	5.8	60	20	17	S04	Cylindrical	Carbide	1
VSSD08L060S05-S	8	7.6	60	15	12.8	S05	Cylindrical	Steel	1
VSSD08L070S05-C	8	7.6	70	20	19	S05	Cylindrical	Carbide	1
VSSD08L090S05-C	8	7.6	90	40	39	S05	Cylindrical	Carbide	1
VSSD08L110S05-C	8	7.6	110	60	59	S05	Cylindrical	Carbide	1
VSSD10L070S06-C	10	9.6	70	20	18.5	S06	Cylindrical	Carbide	1
VSSD10L075S06-S	10	9.6	75	20	19.4	S06	Cylindrical	Steel	1
VSSD10L090S06-C	10	9.6	90	40	38.5	S06	Cylindrical	Carbide	1
VSSD10L110S06-C	10	9.6	110	60	58.5	S06	Cylindrical	Carbide	1
VSSD10L150S06-C	10	9.6	150	100	98.5	S06	Cylindrical	Carbide	1
VSSD12L070S08-C	12	11.5	70	20	17	S08	Cylindrical	Carbide	1
VSSD12L070S08-C-A	12	11.5	70	20	17	S08	Cylindrical	Carbide	2
VSSD12L090S08-C	12	11.5	90	40	37	S08	Cylindrical	Carbide	1
VSSD12L090S08-S	12	11.5	90	16	13.6	S08	Cylindrical	Steel	1
VSSD12L090S08-S-A	12	11.5	90	16	13.6	S08	Cylindrical	Steel	2
VSSD12L090LS08-C-A	12	11.5	90	40	37	S08	Cylindrical	Carbide	2
VSSD12L090LS08-S-A	12	11.5	90	42	37	S08	Cylindrical	Steel	2
VSSD12L110S08-C	12	11.5	110	60	58	S08	Cylindrical	Carbide	1
VSSD12L110S08-C-A	12	11.5	110	60	57	S08	Cylindrical	Carbide	2
VSSD12L130S08-C	12	11.5	130	80	78	S08	Cylindrical	Carbide	1
VSSD12L130S08-C-A	12	11.5	130	80	77	S08	Cylindrical	Carbide	2
VSSD16L090S10-C	16	15.2	90	40	38	S10	Cylindrical	Carbide	1
VSSD16L090S10-C-A	16	15.2	90	40	38	S10	Cylindrical	Carbide	2
VSSD16L100S10-S	16	15.2	100	20	18	S10	Cylindrical	Steel	1
VSSD16L100S10-S-A	16	15.2	100	20	18	S10	Cylindrical	Steel	2
VSSD16L100LS10-S-A	16	15.2	100	42	38	S10	Cylindrical	Steel	2
VSSD16L110S10-C	16	15.2	110	60	58	S10	Cylindrical	Carbide	1
VSSD16L110S10-C-A	16	15.2	110	60	58	S10	Cylindrical	Carbide	2
VSSD16L130S10-C	16	15.2	130	80	78	S10	Cylindrical	Carbide	1
VSSD16L130S10-C-A	16	15.2	130	80	78	S10	Cylindrical	Carbide	2
VSSD16L150S10-C	16	15.2	150	100	98	S10	Cylindrical	Carbide	1
VSSD20L090S12-C	20	18.3	90	40	37	S12	Cylindrical	Carbide	1
VSSD20L120S12-S	20	18.3	120	25	20.5	S12	Cylindrical	Steel	1
VSSD20L130S12-C	20	18.3	130	80	77	S12	Cylindrical	Carbide	1
VSSD20L200S12-C	20	18.3	200	120	117	S12	Cylindrical	Carbide	1
VSSD25L120S15-C	25	23.9	120	60	58	S15	Cylindrical	Carbide	1
VSSD25L135S15-S	25	23.9	135	35	33	S15	Cylindrical	Steel	1
VSSD25L170S15-C	25	23.9	170	100	98	S15	Cylindrical	Carbide	1
VSSD25L250S15-C	25	23.9	250	150	148	S15	Cylindrical	Carbide	1
VSSD32L100S21-S	32	30	100	35	32	S21	Cylindrical	Steel	1
VSSD32L150S21-S	32	30	150	54	50	S21	Cylindrical	Steel	1

VSSD**-W-A...

Straight shank and neck with coolant hole

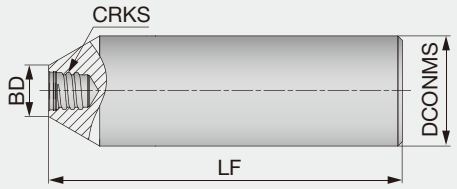


CRKS = Connection screw size

Designation	DCONMS	BD	LF	LBX	LB	CRKS	Shank material
VSSD10L070S06-W-A	10	9.6	70	20	19	S06	Tungsten
VSSD10L090S06-W-A	10	9.6	90	40	39	S06	Tungsten
VSSD10L110S06-W-A	10	9.6	110	60	59	S06	Tungsten
VSSD12L070S08-W-A	12	11.5	70	20	19	S08	Tungsten
VSSD12L090S08-W-A	12	11.5	90	40	39	S08	Tungsten
VSSD12L110S08-W-A	12	11.5	110	60	59	S08	Tungsten
VSSD12L130S08-W-A	12	11.5	130	80	79	S08	Tungsten
VSSD16L070S10-W-A	16	15.2	70	20	18.5	S10	Tungsten
VSSD16L090S10-W-A	16	15.2	90	40	36.5	S10	Tungsten
VSSD16L110S10-W-A	16	15.2	110	60	58.5	S10	Tungsten
VSSD16L130S10-W-A	16	15.2	130	80	78.5	S10	Tungsten
VSSD20L090S12-W-A	20	18.3	90	40	37	S12	Tungsten
VSSD20L130S12-W-A	20	18.3	130	80	77	S12	Tungsten

VSSD...

High rigidity shank (straight)

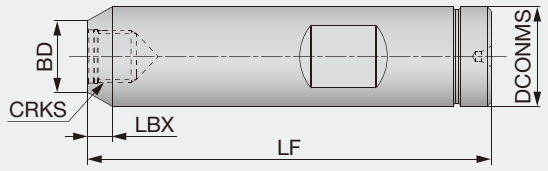


CRKS = Connection screw size

Designation	DCONMS	BD	LF	CRKS	Shank shape	Shank material
VSSD10L055S05-S	10	7.6	55	S05	Cylindrical	Steel
New VSSD10L080S05-S	10	7.6	80	S05	Cylindrical	Steel
VSSD12L065S06-S	12	9.6	65	S06	Cylindrical	Steel
New VSSD12L090S06-S	12	9.6	90	S06	Cylindrical	Steel
VSSD16L065S08-S	16	11.6	65	S08	Cylindrical	Steel
New VSSD16L100S08-S	16	11.6	100	S08	Cylindrical	Steel
VSSD20L070S10-S	20	15.3	70	S10	Cylindrical	Steel
New VSSD20L120S10-S	20	15.3	120	S10	Cylindrical	Steel
VSSD25L075S12-S	25	18.3	75	S12	Cylindrical	Steel
New VSSD25L130S12-S	25	18.3	130	S12	Cylindrical	Steel
VSSD32L100S15-S	32	23.9	100	S15	Cylindrical	Steel
New VSSD32L170S15-S	32	23.9	170	S15	Cylindrical	Steel
VSSD40L100S21-S	40	30	100	S21	Cylindrical	Steel

VSSD**-W...

High rigidity shank (weldon)

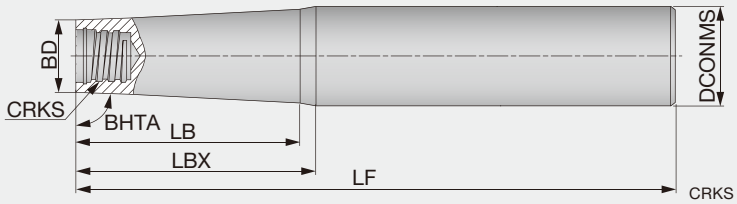


CRKS = Connection screw size

Designation	DCONMS	BD	LF	LBX	CRKS	Shank shape	Shank material
VSSD12L055W05-S	12	7.6	55	3.8	S05	Weldon	Steel
VSSD16L065W06-S	16	9.6	65	6	S06	Weldon	Steel
VSSD16L065W08-S	16	11.5	65	4	S08	Weldon	Steel
VSSD20L070W10-S	20	15.2	70	4	S10	Weldon	Steel
VSSD25L075W12-S	25	18.3	75	6	S12	Weldon	Steel

VTSD...

Straight shank and taper neck

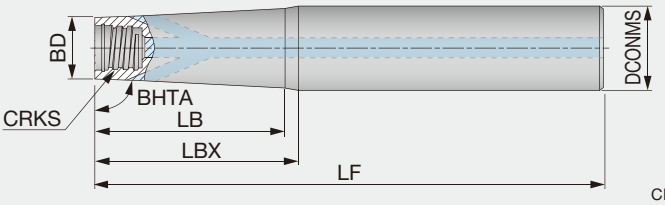


CRKS = Connection screw size

Designation	BHTA	DCONMS	BD	LF	LBX	LB	CRKS	Shank material
VTSD08L080S04-S	87.4°	8	5.8	80	24	-	S04	Steel
VTSD12L080S05-S	85°	12	7.6	80	25	-	S05	Steel
VTSD12L100S05-S	89°	12	7.6	100	35	29	S05	Steel
VTSD12L110S05-C	89°	12	7.6	110	60	56	S05	Carbide
VTSD12L130S05-C	89°	12	7.6	130	80	77	S05	Carbide
New VTSD16L085S05-S	85°	16	7.6	85	32	27	S05	Steel
VTSD16L125S06-S	85°	16	9.6	125	34	31	S06	Steel
VTSD16L130S08-C	89°	16	11.5	130	80	76.5	S08	Carbide
VTSD16L140S08-S	85°	16	11.5	140	22	19	S08	Steel
VTSD16L150S05-C	89°	16	7.6	150	100	91	S05	Carbide
VTSD16L150S06-C	89°	16	9.6	150	100	94.5	S06	Carbide
VTSD16L150S08-C	89°	16	11.5	150	100	98	S08	Carbide
VTSD16L160S06-S	89°	16	9.6	160	55	46.5	S06	Steel
VTSD16L170S06-C	89°	16	9.6	170	120	116.5	S06	Carbide
New VTSD20L095S06-S	85°	20	9.6	95	40	34	S06	Steel
New VTSD20L100S08-S	85°	20	11.5	100	48	-	S08	Steel
VTSD20L140S10-S	85°	20	15.2	140	27.5	-	S10	Steel
VTSD20L170S08-C	89°	20	11.5	170	120	112	S08	Carbide
VTSD20L170S08-S	89°	20	11.5	170	80	69.5	S08	Steel
VTSD20L170S10-C	89°	20	15.2	170	120	119	S10	Carbide
VTSD20L190S10-C	89°	20	15.2	190	140	-	S10	Carbide
VTSD20L190S10-S	89°	20	15.2	190	80	73	S10	Steel
VTSD20L210S10-C	89°	20	15.2	210	160	-	S10	Carbide
New VTSD25L120S10-S	85°	25	15.2	120	55	-	S10	Steel
VTSD25L160S12-S	85°	25	18.3	160	40	-	S12	Steel
VTSD25L170S10-S	85°	25	15.2	170	56	-	S10	Steel
VTSD25L180S12-C	89°	25	18.3	180	120	115	S12	Carbide
VTSD25L210S12-S	89°	25	18.3	210	100	94.5	S12	Steel
VTSD25L250S12-C	89°	25	18.3	250	140	136.5	S12	Carbide
New VTSD32L150S12-S	85°	32	18.3	150	78	-	S12	Steel
VTSD32L155S15-S	85°	32	23.9	155	45	-	S15	Steel
VTSD32L190S12-S	85°	32	18.3	190	80	-	S12	Steel
VTSD32L220S15-S	88°	32	23.9	220	100	-	S15	Steel
VTSD32L250S15-C	89°	32	23.9	250	150	145	S15	Carbide
VTSD32L300S15-C	89°	32	23.9	300	200	198	S15	Carbide
VTSD40L150S21-S	85°	40	30	150	57	-	S21	Steel
New VTSD40L180S15-S	85°	40	23.9	180	92	-	S15	Steel

VTSD**-W-A...

Straight shank and taper neck with coolant hole

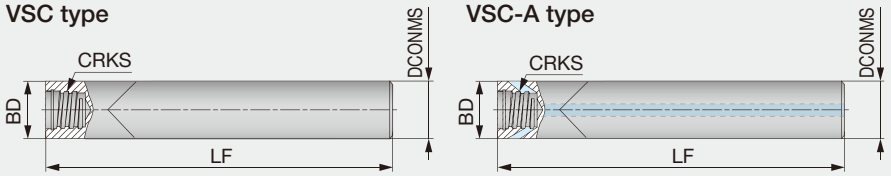


CRKS = Connection screw size

Designation	BHTA	DCONMS	BD	LF	LBX	LB	CRKS	Shank material
VTSD12L110S06-W-A	89°	12	9.6	110	60	59	S06	Tungsten
VTSD16L170S06-W-A	89°	16	9.6	170	120	116	S06	Tungsten

VSC...

Straight shank for VST type slotting heads



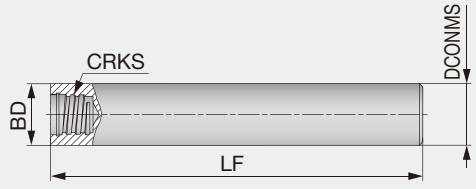
CRKS = Connection screw size

Designation	DCONMS	BD	LF	CRKS	Air hole	Shank material
VSC100L100S06-C	10	10	100	S06	without	Carbide
VSC120L100S08-C-A	12	12	100	S08	with	Carbide

For VSC-C type shank, just VST slotting head is recommended.
If other heads are used on the VSC-C shank, the depth of cut must be smaller than the max. *ap* in each head.
The VSC-C type shank does not have external clearance, so the shank may interfere with the work piece.

VSTD...

Straight shank for VTB type T-slotting heads



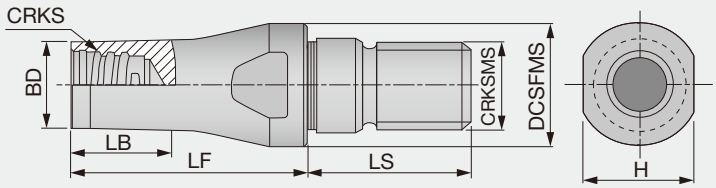
CRKS = Connection screw size

Designation	DCONMS	BD	LF	CRKS	Shank material
VSTD06L070S04-S	6	6	70	S04	Steel
VSTD08L070S05-S	8	8	70	S05	Steel
VSTD10L080S06-S	10	10	80	S06	Steel
VSTD12L090S08-S	12	12	90	S08	Steel
VSTD16L100S10-S	16	16	100	S10	Steel

For VSTD type shank, just VTB T-slotting head is recommended.
If other heads are used on the VSTD shank, the depth of cut must be smaller than the max. *ap* in each head.
The VSTD type shank does not have external clearance, so the shank may interfere with the work piece.

VAD**-M...

TungFlex conversion adapter

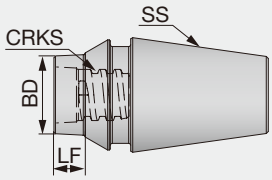


CRKS = Connection screw size

Designation	BD	DCSFMS	LF	LS	LB	CRKS	CRKSMS	H	Shank material
VAD130L016S08-S-M8	11.7	13	16	17.5	6	S08	M8	11	Steel
VAD130L025S08-S-M8	11.7	13	25	17.5	20	S08	M8	11	Steel
VAD180L020S08-S-M10	11.7	18	20	20	12	S08	M10	13	Steel
VAD180L025S08-S-M10	11.7	18	25	20	15	S08	M10	11	Steel
VAD210L020S08-S-M12	11.7	21	20	20	10	S08	M12	12.75	Steel
VAD210L025S08-S-M12	11.7	21	25	20	13	S08	M12	12.75	Steel

VER...

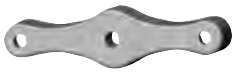
Straight neck with ER11/16/20/25 collet



CRKS = Connection screw size

Designation	SS	BD	LF	CRKS	Shank material
VER11AL006S04-S	ER11	5.8	6	S04	Steel
VER11AL006S05-S	ER11	7.9	6	S05	Steel
VER11AL020S05-S	ER11	7.9	20	S05	Steel
VER16AL012S05-S	ER16	7.9	12	S05	Steel
VER16AL020S05-S	ER16	7.9	20	S05	Steel
VER16AL010S06-S	ER16	9.9	10	S06	Steel
VER16AL020S06-S	ER16	9.9	20	S06	Steel
VER16AL006S08-S	ER16	11.6	6	S08	Steel
VER16AL020S08-S	ER16	11.6	20	S08	Steel
VER20AL004S05-S	ER20	7.6	4	S05	Steel
VER20AL004S06-S	ER20	9.25	4	S06	Steel
VER20AL004S08-S	ER20	11.6	4	S08	Steel
VER20AL004S10-S	ER20	15.3	4	S10	Steel
VER20AL0105S05-S	ER20	7.6	10.5	S05	Steel
VER20AL0105S06-S	ER20	9.25	10.5	S06	Steel
VER20AL013S08-S	ER20	11.6	13	S08	Steel
VER20AL016S10-S	ER20	15.3	16	S10	Steel
VER25AL004S05-S	ER25	7.6	4	S05	Steel
VER25AL0105S05-S	ER25	7.6	10.5	S05	Steel
VER25AL004S06-S	ER25	9.25	4	S06	Steel
VER25AL0105S06-S	ER25	9.25	10.5	S06	Steel
VER25AL004S08-S	ER25	11.6	4	S08	Steel
VER25AL0105S08-S	ER25	11.6	10.5	S08	Steel
VER25AL004S10-S	ER25	15.3	4	S10	Steel
VER25AL0105S10-S	ER25	15.3	10.5	S10	Steel
VER25AL004S12-S	ER25	18.3	4	S12	Steel
VER25AL0105S12-S	ER25	18.3	10.5	S12	Steel

WRENCH

Appearance	Designation	Connection screw size	Torque (N·m)	Applicable head
	KEYV-S05	S04	4	Square Ball Radius Drilling Chamfering Counterboring Barrel Lens Bull nose Indexable modular head Threading VMT
		S05	7	
	KEYV-S06	S06	10	
	KEYV-S08	S08	15	
	KEYV-S10	S10	28	
	KEYV-S12	S12	28	
	KEYV-W20	S15	40	Square Ball
	KS-24	S21	110	
	KEYV-177	S06	10	Slotting VST Threading VTR (GH130, AH735 grades)
	KEYV-217	S08	15	
	KEYV-T20	S05	7	Slotting VST, VTB Face mill Threading VTR
		S06	10	
	KEYV-T25	S06	10	
		S08	15	
	KEYV-T30L	S08	15	
	KEYV-T40L	S08	15	Slotting VST, VTB Face mill
		S10	28	
	KEYV-T50L	S08	15	Slotting VTB Face mill
		S10	28	

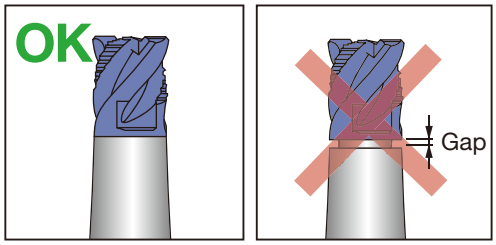
Note: Wrenches are sold separately.

TORQUE WRENCHES

Appearance		Designation	Stock	Connection screw size	TM Head description	Torque (N·m)
Handle		TORQUEWRENCH5-50NM9x12	●	-	-	5 - 50
Open wrenches for cylindrical heads		TM-WRENCH-6-05	●	S05	VEH, VED, VEE, VEE-I, VEE-R, VEE-C, VEE-A, VFX**-04/06, VRD, VBD-BG, VBE-BG, VBE-BGA, VDP, VDS, VCA, VBO, VBL, VBN, HPAV06-S, HXN02R-S, TID-S, VMT	7
		TM-WRENCH-8-06	●	S06		10
		TM-WRENCH-10-08	●	S08		15
		TM-WRENCH-13-10	●	S10		28
		TM-WRENCH-16-12	●	S12		28
		TM-WRENCH-20-15	●	S15		40
Open wrenches for 2 flute heads		TM-WRENCH-4E-05	●	S05	VRB, VRC, VFX**-02, VBB-BM, VBB-BG, VBB-SG, VCP, VGC, VCW, VCR	7
		TM-WRENCH-5E-06	●	S06		10
		TM-WRENCH-7E-08	●	S08		15
		TM-WRENCH-8E-10	●	S10		28
		TM-WRENCH-9E-12	●	S12		28
90° adapter for Torx bits		INSERT-TOOL-9X12MM	●	-	-	-
Torx bits sockets		BIT-SOCKET-T20-DRIVE	●	S05, S06	VFM120, VTB135, VTB160W2.00, VTB165W2.00	7, 10
		BIT-SOCKET-T25-DRIVE	●	S06	VFM160, VTB160W3.00, VTB160W4.00, VTB165W3.00, VTB165W4.00	10
		BIT-SOCKET-T30-DRIVE	●	S08	VTB195	15
		BIT-SOCKET-T40-DRIVE	●	S08, S10	VFM200, VST277, VTB225	15, 28
		BIT-SOCKET-T50-DRIVE	●	S08, S10	VFM250, VTB250	15, 28

CAUTIONARY POINTS IN USE

· The cutting heads specified by Tungaloy must be used. Avoid using alternate heads that are not Tungaloy products as this will damage the shank and can cause severe accident or injury.
· Before setting the head, clean the connection screw with an air blast or a wiping cloth to remove chips and other foreign matter that may remain.
· Do not apply the lubricant to the connection screw.
· Please use the correct wrench with the correct cutting head. Tighten the head slowly until the face of the head contacts the shank. (Please refer to the picture shown on the right.) Do not re-tightening or over-tightening. Excessive tightening may cause the cutting head to break.
· Do not apply excessive force or a hammer when tightening or exchanging the cutting heads.



DESIGNATION SYSTEM

Shank

V	SS	D10	L070	S	06	-	W	-	A
①	②	③	④	⑤	⑥		⑦		⑧

① Series	
V	TungMeister

② Shank type	
SS	Straight neck
TS	Taper neck
SC	Slotting
ST	T-slotting
AD	TungFlex adapter
ER	ER collet holder

③ Shank diameter (mm)	
D06	ø6
D08	ø8
D10	ø10
D12	ø12
D16	ø16
D20	ø20
D25	ø25
D32	ø32
VSC, VAD type	
100	ø10
120	ø12
130	ø13
180	ø18
210	ø21
VER type	
11A	Collet size
16A	Collet size

④ Length (mm)	
L070	70

⑤ Shape of shank	
S	Cylindrical
W	Weldon

⑥ Connection screw size	
04	S04
05	S05
06	S06
08	S08
10	S10
12	S12
15	S15
21	S21

⑦ Shank material	
S	Steel
C	Carbide
W	Tungsten

⑧ Additional feature	
A	with coolant hole
M	Thread size (TungFlex adapters)

Head

● Square endmill

V	E	E	080	L05.0	R00	-	03	S05
①	②	③	④	⑤	⑥	⑦	⑧	⑨

● Ball nose endmill

V	B	D	200	L15.0	-	BG	-	04	S12
①	②	③	④	⑤		⑥	⑦	⑧	⑨

① Series	
V	TungMeister

② Cutting edge	
E	Square
B	Ball
R	Radius
FX	High feed
CA	Chamfering
CP	Spot drilling
DS	Spot drill with helical flutes
CW	Chamfering (front and back)
CR	R chamfering
GC	Counterboring
DP	Center drilling
S	Slotting
TB	T-slotting
FM	Face milling
BO	Taper barrel
BN	Bull nose
BL	Lens
MT	Threading (full profile)
TR	Threading (partial profile)

③ Helix angle / Rake face	
B	0°
C	15°
D	30°, 37°, 47°
E	38°, 45°, 50°
F	60°
H	43°
T	Land

④ Diameter (mm)	
060	ø6
200	ø20

⑤ Cutting edge length (mm)	
Length	
L07.0	7
L15.0	15
Groove width	
W1.50	1.5
W1.57	1.57
W10.0	10

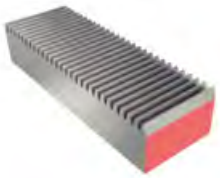
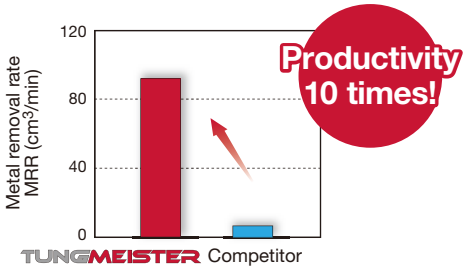
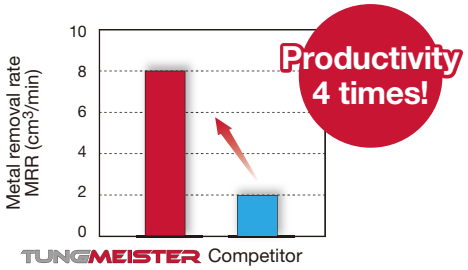
⑥ Corner shape / Angle	
Nose radius	
R00	Sharp edge
R005	R0.05
R01	R0.1
R05	R0.5
R10	R1.0
Chamfer type	
C15	0.15 x 45°
C30	0.3 x 45°
C60	0.6 x 45°
Chamfering head	
A30	30°
A60	60°
R chamfering head	
R10	R1.0
R16	R1.6
Ball nose	
SG	Sphere / high precision
BM	Ball / general purpose
BG	Ball / high precision
Threading	
IS**	ISO metric, pitch**
UN**	Unified, **TPI
W**	Whitworth, pitch**

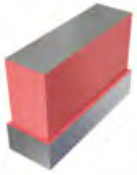
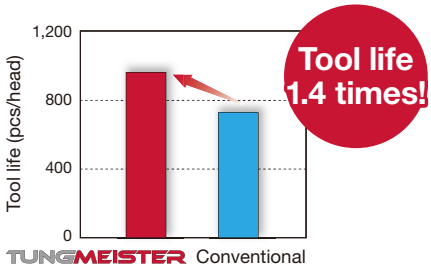
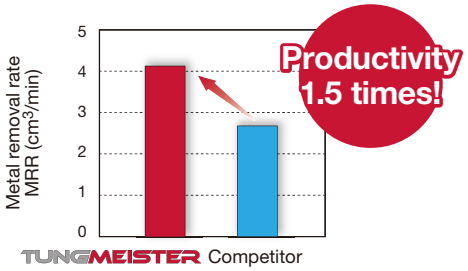
⑦ Additional feature	
I	Irregular pitch (or Intermittent edge)
A	for aluminium
R	Serrated edge
C	Combined edge

⑧ The number of flutes	
General	
02	2
06	6
Slotting head VST type	
3	3
4	4

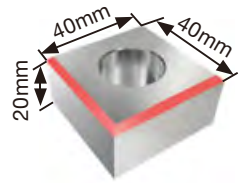
⑨ Connection screw size	
S04	S04
S05	S05
S06	S06
S08	S08
S10	S10
S12	S12
S15	S15
S21	S21

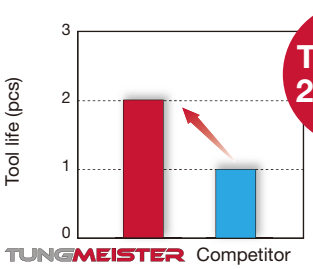
PRACTICAL EXAMPLES

Workpiece type		Rack	Shaft
Shank		VSSD25L075S12-S (Steel, ø25 mm)	VER11AL006S05-S (Steel, ER11)
Head		VEH200L30.0R05I04S12 (ø20 mm)	VEE060L05.0R00-04S05 (ø6 mm)
Grade		AH715	AH725
Workpiece material		SCM440 / 42CrMo4	SUS303 / X10CrNiS18-9
		Square  P	Square  M
Cutting conditions	Cutting speed : *Vc* (m/min)	140	80
	Feed per tooth: *fz* (mm/t)	0.08	0.03
	Depth of cut : *ap* (mm)	24	3
	Width of cut : *ae* (mm)	5.5	5
	Coolant	Wet	Wet
Results		 **VEH** milling head enabled the use of wider cutting width (*ae*), thanks to excellent anti-vibration design, reducing the number of passes for improved cycle time.	 Integrated ER collet shank provides an optimal tool overhang, allowing double cutting speed and depth of cut to be applied, while also ensuring stability.

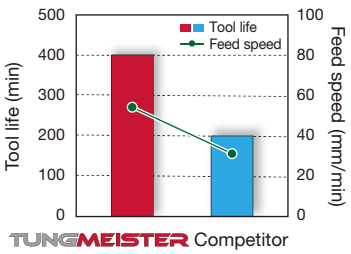
Workpiece type		Machine part	Valve
Shank		VSSD16L130S10-C (Carbide, ø16 mm)	VER16AL010S06-S (Steel, ER16)
Head		VEH160L24.0R05I04S10 (ø16 mm)	VFM160L04.8R04I06S06 (ø16 mm)
Grade		AH715	AH715
Workpiece material		FCD400 / GGG40	A5052 / AlMg2.5
		Square  K	Face mill  N
Cutting conditions	Cutting speed : *Vc* (m/min)	100	40
	Feed per tooth: *fz* (mm/t)	0.04	0.03
	Depth of cut : *ap* (mm)	15	2.6
	Width of cut : *ae* (mm)	1	11
	Coolant	Wet	External
Results		 AH715, the latest PVD coating grade improved wear resistance, providing 1.4 times increase in tool life and better surface finish.	 Featuring sharp cutting edge and built-in wiper edge, **VFM** head provided 1.5 times higher productivity with excellent surface finish.

Workpiece type		Lip slot die	Base plate
Shank		VSSD20L130S12-C (Carbide, ø20 mm)	VSSD10L075S06-S (Steel, ø10 mm)
Head		VBD200L15.0-BG-04S12 (ø20 mm)	VCP100L09.0A45-02S06 (ø10 mm)
Grade		AH725	AH715
Workpiece material		SUS630 / X5CrNiCuNb16-4	SUS430 / X6Cr17
Cutting conditions	Cutting speed : *Vc* (m/min)	75	22
	Feed per tooth: *fz* (mm/t)	0.04	0.04
	Depth of cut : *ap* (mm)	0.5	2
	Width of cut : *ae* (mm)	10	2
	Coolant	Air blast	External
Results		Tool life 2 times!	Tool life 2 times! Productivity 2 times!



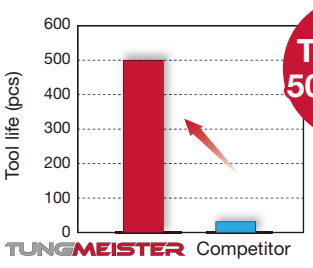


VBD head with sharp cutting edge generated low cutting force, providing 2 times longer tool life without vibration.

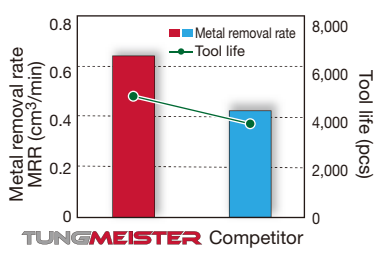


TungMeister, combined with built-up edge resistant AH715 grade, eliminated built-up edge and provided double tool life.

Workpiece type		Rotor	Shaft
Shank		VSSD10L075S06-S (Steel, ø10 mm)	VSSD06L050S04-S (Steel, ø6 mm)
Head		VDS100A45-02S06 (ø10 mm)	VST217W1.40R005-4S08 (ø21.7 mm)
Grade		AH725	GH730
Workpiece material		SCM440 / 42CrMo4	S45C / C45
Cutting conditions	Cutting speed : *Vc* (m/min)	100	205
	Feed per tooth : *fz* (mm/t)	-	0.02
	Feed per revolution: *f* (mm/rev)	0.2	-
	Depth of cut : *ap* (mm)	-	1.4
	Width of cut : *ae* (mm)	-	2
	Hole depth : *L* (mm)	3	-
	Coolant	External	External
Results		Tool life 50 times!	Tool life 1.25 times! Productivity 1.6 times!



VDS head has sharp cutting edge, eliminating burr generation. 500 parts were drilled without the need for post-process manual burr removal.



VST head provided excellent chip evacuation and process security while eliminated jamming at increased feeds and speeds.

MEMO

Tungaloy Corporation (Head office)
11-1 Yoshima-Kogyodanchi
Iwaki-city, Fukushima 970-1144 Japan
Phone: +81-246-36-8501
Fax: +81-246-36-8542
www.tungaloy.co.jp

Tungaloy-NTK America Inc.
3726 N Ventura Drive
Arlington Heights,IL 60004, U.S.A.
Phone: +1-888-554-8394
Fax: +1-888-554-8392
www.tungaloy.com/us

Tungaloy Canada
432 Elgin St. Unit 3
Brantford, Ontario N3S 7P7, Canada
Phone: +1-519-758-5779
Fax: +1-519-758-5791
www.tungaloy.com/ca

Tungaloy-NTK De Mexico S.A.
C Los Arellano 113,
Parque Industrial Siglo XXI
Aguascalientes, AGS, Mexico 20290
Phone: +52-449-929-5410
Fax: +52-449-929-5411
www.tungaloy.com/mx

Tungaloy-NTK do Brasil Ltda.
Avd. Independencia N4158 Residencial Flora
13280-000 Vinhedo, São Paulo, Brasil
Phone: +55-19-38262757
Fax: +55-19-38262757
www.tungaloy.com/br

Tungaloy-NTK Germany GmbH.
Katzbergstr. 3a
D-40764 Langenfeld, Germany
Phone: +49-2173-90420-0
Fax: +49-2173-90420-19
www.tungaloy.com/de

Tungaloy France s.a.s
Les Fjords
19 avenue de Norvège
91140 Villebon Sur Yvette, France
Phone: +33-1-6486-4300
Fax: +33-1-6907-7817
www.tungaloy.com/fr

Tungaloy Italia S.r.l.
Viale Sarca 336/Edificio 13
20126 Milano, Italy
Phone: +39-02-252012-1
Fax: +39-02-252012-65
www.tungaloy.com/it

Tungaloy Czech s.r.o.
Turanka 1583/115g,
627 00 Brno, Czech Republic
Phone: +420-532 123 391
www.tungaloy.com/cz

Tungaloy Ibérica S.L.
C/Miquel Servet, 43B, Nau 7
Pol. Ind. Bufalvent
ES-08243 Manresa (BCN), Spain
Phone: +34 93 113 1360
www.tungaloy.com/es

Tungaloy Scandinavia AB
Bultgatan 38
442 40 Kungälv, Sweden
Phone: +46-462119200
Fax: +46-462119207
www.tungaloy.com/se

Tungaloy Rus, LLC
Andropova avenue, h.18/7,
11 floor, office 3, 115432,
Moscow, Russia
Phone: +7-499-683-01-80
Fax: +7-499-683-01-81
www.tungaloy.com/ru

Tungaloy Polska Sp. z o.o.
Ul. Irysowa 1, 55-040 Bielany
Wrocławskie, Poland
Phone: +48 607 907 237
www.tungaloy.com/pl

Tungaloy-NTK UK Ltd.
Suite 3, Pioneer House, Mill Street,
Cannock, WS11 0EF, UK
Phone: +44 121 4000 231
Fax: +44 121 270 9694
www.tungaloy.com/uk

Tungaloy Hungary Kft
Erzsébet királyné útja 125
H-1142 Budapest, Hungary
Phone: +36 1 781-6846
Fax: +36 1 781-6866
www.tungaloy.com/hu

Tungaloy Turkey
Serifali Mah.bayraktar Bulvari Kule Sk. No:26
34775 Umraniye / Istanbul / Turkey
Phone: +90 216 540 04 67
Fax: +90 216 540 04 87
www.tungaloy.com/tr

Tungaloy Benelux b.v.
Tjalk 70
NL-2411 NZ Bodegraven, Netherlands
Phone: +31 172 630 420
Fax: +31 172 630 429
www.tungaloy.com/nl

Tungaloy Croatia
Ulica bana Josipa Jelačića 87,
10430, Samobor, Croatia
Phone: +385 1 3326 604
Fax: +385 1 3327 683
www.tungaloy.com/hr

Tungaloy Cutting Tool (Shanghai) Co. Ltd.
Rm No 401 No.88 Zhabei
Jiangchang No.3 Rd
Shanghai 200436, China
Phone: +86-21-3632-1880
Fax: +86-21-3621-1918
www.tungaloy.com/cn

Tungaloy Cutting Tools Taiwan Co. Ltd.
9F. No.293, Zhongyang Rd,
Xinzhuang Dist, New Taipei City,
24251 Taiwan
Phone: +886-2-8521-9986
Fax: +886-2-8521-8935
www.tungaloy.com/tw

Tungaloy-NTK Cutting Tool (Thailand) Co.,Ltd.
Interlink tower 4th Fl.
1858/5-7 Bangna-Trad Road
km.5 Bangna, Bangna, Bangkok 10260
Thailand
Phone: +66-2-751-5711
Fax: +66-2-751-5715
www.tungaloy.com/th

Tungaloy Singapore (Pte.), Ltd.
62 Ubi Road 1, #08-09 Oxley BizHub 2
Singapore 408734
Phone: +65-6391-1833
Fax: +65-6299-4557
www.tungaloy.com/sg

Tungaloy-NTK Vietnam LLC
3rd Floor, Licogi 13 Tower, 164 Khuat Duy
Tien, Nhan Chinh, Thanh Xuan District,
Hanoi, Vietnam
Phone: +84 24 63282086
www.tungaloy.com/vn

Tungaloy India Pvt. Ltd.
One International Center,
Unit # 902-A, 9th Floor,
Tower 1, Senapati Bapat Marg,
Elphinstone Road (West),
Mumbai 400013, India
Phone: +91-22-6124-8803
Fax: +91-22-6124-8899
www.tungaloy.com/in

Tungaloy Korea Co., Ltd
#1312, Byucksan Digital Valley 5-cha
Beotkkot-ro 244, Geumcheon-gu
153-788 Seoul, Korea
Phone: +82-2-2621-6161
Fax: +82-2-6393-8952
www.tungaloy.com/kr

Tungaloy Malaysia Sdn Bhd
50 K-2, Kelana Mall, Jalan SS6/14
Kelana Jaya, 47301
Petaling Jaya, Selangor Darul Ehsan
Malaysia
Phone: +603-7805-3222
Fax: +603-7804-8563
www.tungaloy.com/my

Tungaloy Australia Pty Ltd
Unit 68 1470 Ferntree Gully Road
Knoxfield 3180 Victoria, Australia
Phone: +61-3-9755-8147
Fax: +61-3-9755-6070
www.tungaloy.com/au

PT. Tungaloy Indonesia
Ruko Blok AA.10 No3&5, Grand Wisata,
Lambangjaya, Tambun Selatan, Bekasi,
17510 Indonesia
Phone: +62-21-8261-5808
Fax: +62-21-8261-5809
www.tungaloy.com/id

Member IMC Group Tungaloy

tungaloy.com
follow us at:
facebook.com/tungaloyjapan
twitter.com/tungaloyjapan
www.youtube.com/tungaloycorporation

Distributed by:

Explore the Tungaloy world!
Tungaloy APP & SNS

FIND US ON THE CLOUD!
machiningcloud.com

AS9100 Certified
78006
2015.11.04

ISO 14001 Certified
EC97J1123
1997.11.26

Jun. 2025 (TJ)