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Added products

Member IMC Group Tungaloy INDUSTRY 4.0

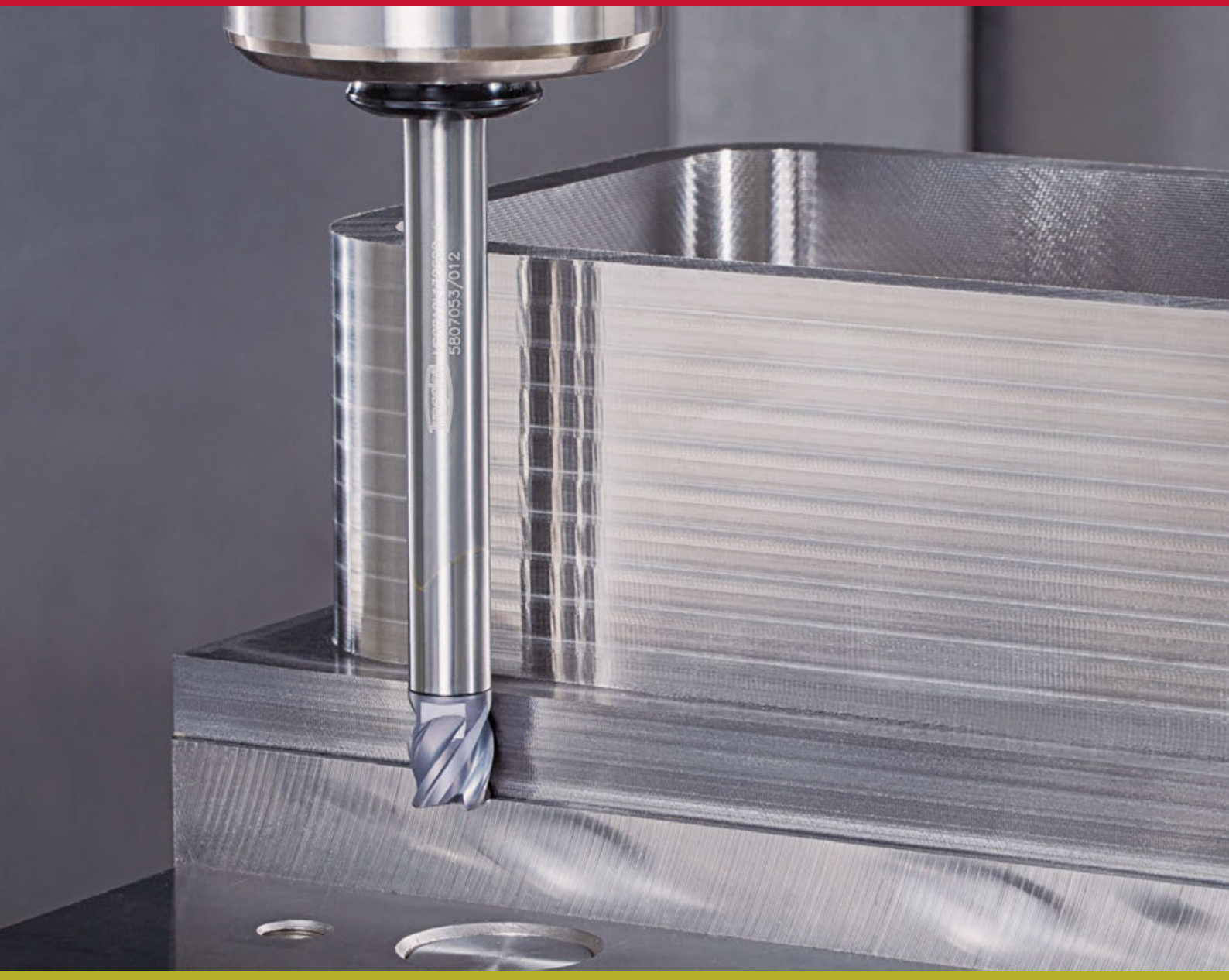
MillLine

TUNGMEISTER

www.tungaloy.com

Tungaloy Report No. 381-G

New endmilling innovation!!



INDUSTRY 4.0

FEED the SPEED!

ACCELERATED MACHINING

MillLine

TUNGMEISTER

TUNGALOY

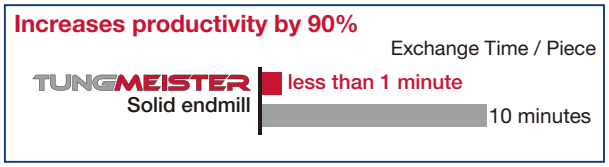
The most effective tooling solution with the option of hundreds of tools!

Tool changeover times can be measurably reduced!

“Choose the best head-shank combination for your endmilling operation!”
“Minimize setup time while maximizing your productivity”

Reduces tool changeover times drastically!!

- Machine downtime is decreased considerably.
- Enables users to only change cutting head, simplifying set-ups.



The weight of the tool to be disposed is reduced

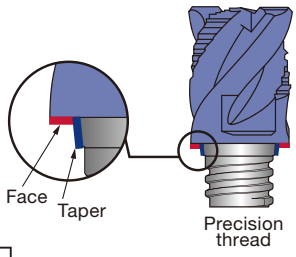
- Reduces tool disposal

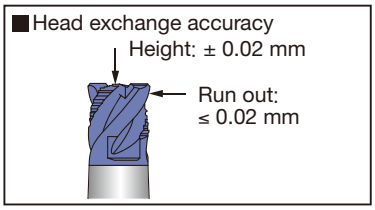
For example: ø12 mm / square endmill

TUNGMEISTER: OAL 20 mm → weight 20 g
Conventional solid endmill: OAL 80 mm → weight 140 g

Highly accurate repeatability

- Accuracy can be maintained by touching the taper and face.
- Repeatability is guaranteed and is not a concern for machine operators.





No regrinding cost

- No laborious endmill regrinding required.
- Easily replaceable heads eliminate the use of worn cutting edges.
- All tools can be used to breakage point or maximum wear point as no regrinding is necessary.

1 Wide range of cutting heads

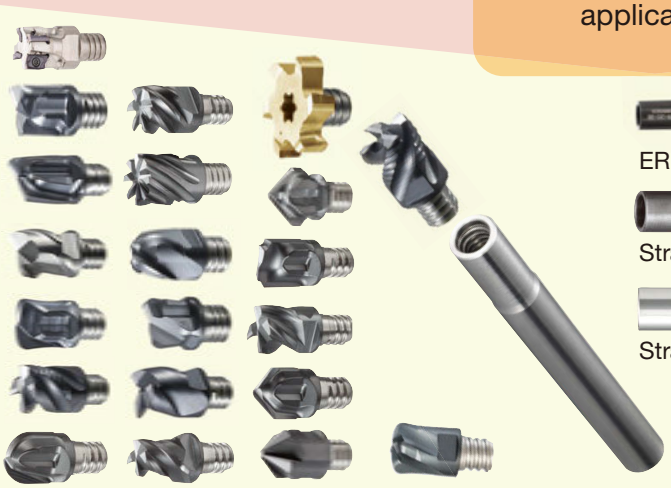
23 kinds of cutting heads are available. The head exchange is easy and highly accurate with the precision thread.

Flexible combinations

TungMeister can be applied to all kinds of endmill machining applications.

2 Three kinds of shank material

Users can choose the most suitable combination according to the machining parameters, length and rigidity required.




ER collet


Adaptor for TungFlex


Straight shank & neck


Straight shank & taper neck


Straight shank & neck (carbide)

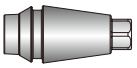

Straight (for grooving)

Steel: For general purpose
Carbide: For highly accurate machining due to excellent rigidity
Tungsten: Reduced chattering due to high vibration damping capacity

Head

Head	Square	High-feed Toroidal	Ball	Drilling (Centering drill)	Chamfering	Slotting	Indexable
Appearance							
Page	P. 8 ~ 15	P. 16 ~ 20	P.21 ~ 25	P. 26, 27	P. 29, 30	P. 31 ~ 34	P. 35

Shank

Shank	Straight	Weldon	Straight	Straight (Slotting)	Adaptor for TungFlex	ER collet
Neck	Straight	Straight	Taper			
Appearance						
Steel	●	●	●	●	●	●
Carbide	●	-	●	●	-	-
Carbide (with coolant hole)	-	-	-	●	-	-
Tungsten (with coolant hole)	●	-	●	-	-	-
Page	P. 38, 39	P. 40	P. 41	P. 42	P. 42	P. 43

CUTTING PERFORMANCE

Workpiece : SUS304 / X5CrNi18-10 (200HB)
Head : VEE100L07.0R05-04S06
(ø10 mm, square type, 4 flutes)

Grade : AH725
Shank : VSSD10L075S06-S
(Straight shank & neck, steel)

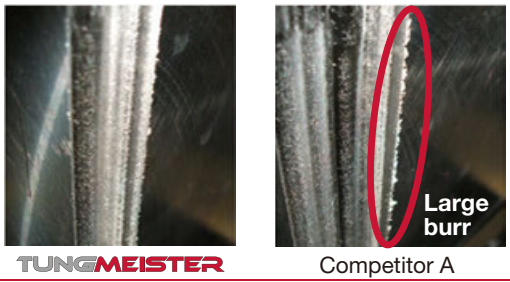
Machine : Horizontal M/C BT40
Holder : Collet chuck
Coolant : Dry

Comparison of milling for stainless steels

Cutting speed : *Vc* = 100 m/min
Feed per tooth : *fz* = 0.07 mm/t
Depth of cut : *ap* = 5 mm
Width of cut : *ae* = 1.5 mm

· Competitor A cutting edges fractured after 1.7 minutes machining and 1.5 m cutting length.
· The TungMeister cutting edges maintain operation after 5 minutes machining.

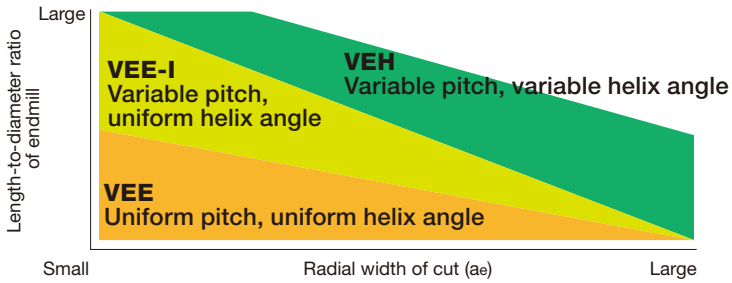
Comparison of milling surface on stainless steels

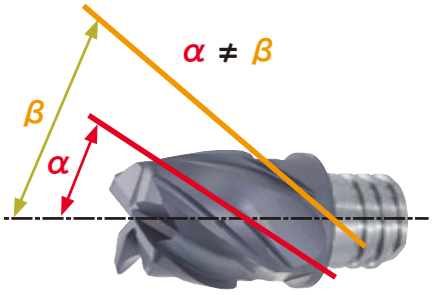


Cutting speed : *Vc* = 130 m/min
Feed per tooth : *fz* = 0.05 mm/t
Depth of cut : *ap* = 5 mm
Width of cut : *ae* = 2 mm

· When machining tough stainless steel the burr with the TungMeister is minimal. However, competitor A has a large burr when working under the same conditions.

VEH type: Variable pitch + Variable helix angle





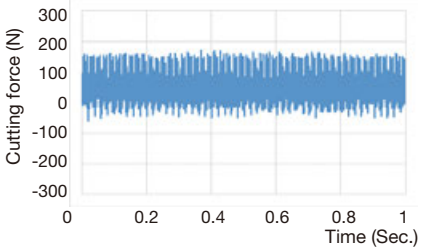
Variable helix angle

Different helix angles between flutes.

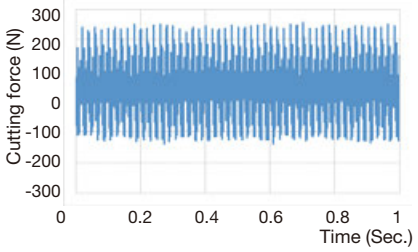
Effect: The axial and radial approach to the workpiece varies from edge to edge. This feature is especially effective when end-milling large radial width of cut (*ae*). The basic principle of chatter dampening approach is the same as that of variable pitch flutes. Different chip formations promote excellent chip flow.

Cutting forces analysis

✔ Variable pitch + variable helix



✗ Uniform pitch + uniform helix



Tool dia.	: *ø*D*c* = 16 mm
Cutting speed	: *V*c = 150 m/min
Feed per tooth:	: *f*z = 0.1 mm/t
Number of revolutions	: *n* = 2986 min^{-1}
Depth of cut	: *a*p = 12 mm
Cutting width	: *a*e = 0.5 mm
Feed speed	: *V*f = 1194 mm/min
Overhang	: 40.5 mm
Machine	: Vertical M/C, HSKA63

Variable geometry resulted less cutting force and thrust force

→ **Amplification of vibration is suppressed, providing machining stability**

ER collet conversion adaptor

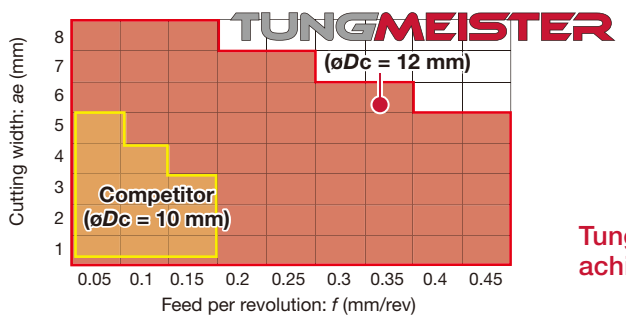
Wide application area by integration design of holder and collet

→ Larger tool diameter is available than conventional one! Robust connection make expanded application area and high rigidity!

Optimized tool overhang for improved chatter stability

→ Tool overhang is designed to ensure maximum rigidity, while eliminating tooling interference, making it ideal for the use in Swiss-type machines.

Application area (Stainless steel, SUS304)



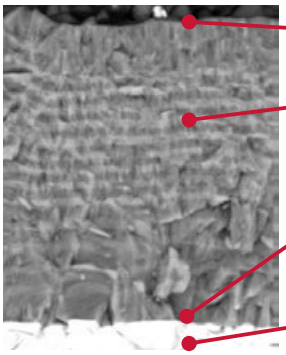
Head	: VEE120L09.0R00-03S08 AH725
Shank	: VER16CL006S08-S
Cutting speed	: *V*c = 40 m/min
Depth of cut	: *a*p = 3 mm
Machine	: Automatic lathe
Coolant	: Wet

TungMeister connection make larger diameter available, achieved wider application area than solid carbide end mill!

The new grade provides longer tool life thanks to the latest coating layer

AH715

- Unique nano-multilayered coating is made possible by Tungaloy's latest coating technology, providing 3 principal features



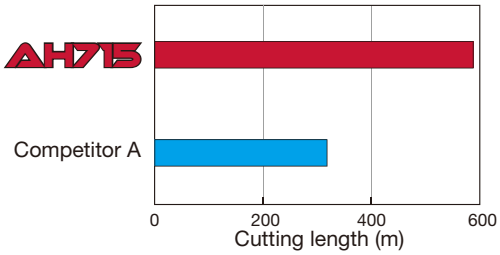
Feature 1: Resistance to builtup-edge
Coating layer to resist builtup-edge

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

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

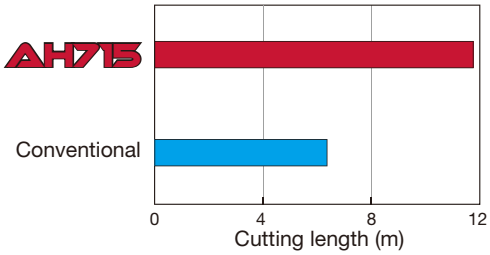
Substrate
Carbide substrate features wear and fracture resistance

Tool life comparison in steel milling
AH715 provides longer tool life than existing grade



P
Steel

Shank	: VSSD16L100S10-S
Head	: VED160L12.0R05-04S10
Workpiece material	: 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	: V M/C, BT40

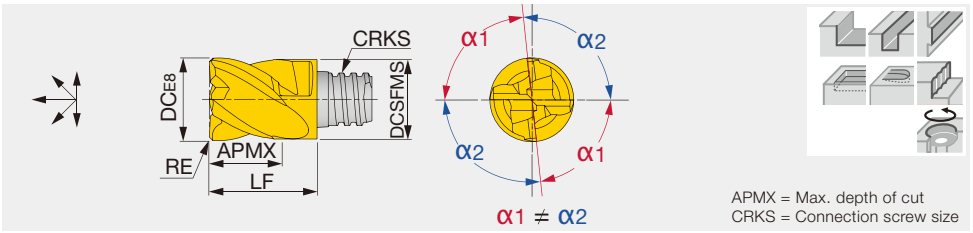


H
Steel

Shank	: VSSD16L100S10-S
Head	: VED160L12.0R05-04S10
Workpiece material	: SKD11(D2) (HRC58)
Cutting speed	: Vc = 60 m/min
Feed per tooth	: fz = 0.05 mm/t
Depth of cut	: ap = 5 mm
Width of cut	: ae = 0.5 mm
Machine	: V M/C, BT40

VEH...

TungMeister square head, with 4 flutes, variable pitch, variable helix (chatter dampening)



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

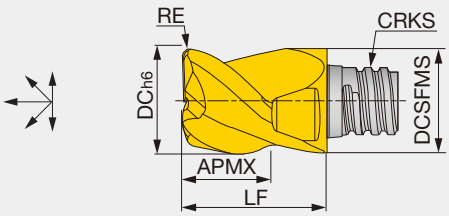
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEH080L05.0R05I04S05	●	4	35 - 39°	8	7.7	5	0.5	S05	10	KEYV-S05	7
VEH080L05.0R10I04S05	●	4	35 - 39°	8	7.7	5	1	S05	10	KEYV-S05	7
VEH100L07.0R05I04S06	●	4	35 - 39°	10	9.7	7	0.5	S06	13	KEYV-S06	10
VEH100L07.0R10I04S06	●	4	35 - 39°	10	9.7	7	1	S06	13	KEYV-S06	10
VEH120L09.0R05I04S08	●	4	35 - 39°	12	11.7	9	0.5	S08	16.5	KEYV-S08	15
VEH120L09.0R10I04S08	●	4	35 - 39°	12	11.7	9	1	S08	16.5	KEYV-S08	15
VEH160L12.0R05I04S10	●	4	35 - 39°	16	15.3	12	0.5	S10	20.5	KEYV-S10	28
VEH160L12.0R10I04S10	●	4	35 - 39°	16	15.3	12	1	S10	20.5	KEYV-S10	28
VEH200L15.0R05I04S12	●	4	35 - 39°	20	18.3	15	0.5	S12	25.5	KEYV-S12	28
VEH200L15.0R10I04S12	●	4	35 - 39°	20	18.3	15	1	S12	25.5	KEYV-S12	28

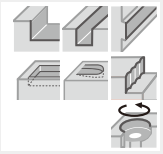
*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VEE**-03

TungMeister square head with 3 flutes for general purpose





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

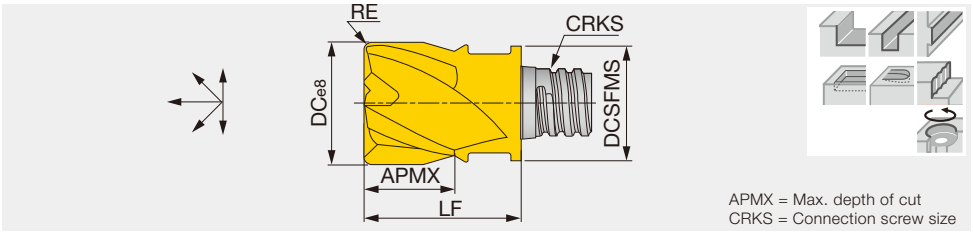
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEE080L05.0R00-03S05	●	3	45°	8	7.7	5	-	S05	10	KEYV-S05	7
VEE100L07.0R00-03S06	●	3	45°	10	9.7	7	-	S06	13	KEYV-S06	10
VEE120L09.0R00-03S08	●	3	45°	12	11.7	9	-	S08	16.5	KEYV-S08	15

*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

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

TungMeister square head with 4 flutes for general purposes



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

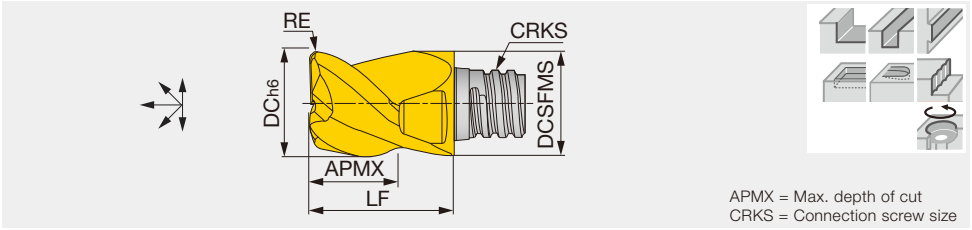
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEE060L05.0R00-04S05		●	4	45°	6	8	5	-	S05	10	KEYV-S05	7
VEE080L05.0R00-04S05		●	4	45°	8	7.7	5	-	S05	10	KEYV-S05	7
VED080L05.0R05-04S05		●	4	30°	8	7.7	5	0.5	S05	10	KEYV-S05	7
VED080L05.0R10-04S05		●	4	30°	8	7.7	5	1	S05	10	KEYV-S05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

*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VEE**-03...

TungMeister square head with 3 flutes for key way



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

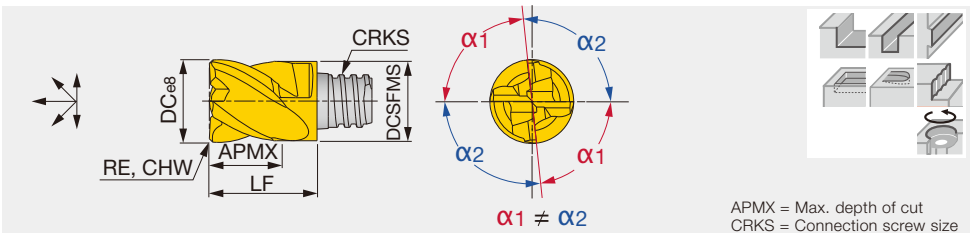
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEE077L04.0R02-03S05	●	3	38°	7.7	7.7	4	0.2	S05	10	KEYV-S05	7
VEE097L05.0R03-03S06	●	3	38°	9.7	9.7	5	0.3	S06	13	KEYV-S06	10
VEE117L07.0R03-03S08	●	3	38°	11.7	11.7	7	0.3	S08	16.5	KEYV-S08	15
VEE157L08.0R03-03S10	●	3	38°	15.7	15.3	8	0.3	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 torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VEE**-I...

TungMeister square head with irregular pitch flute for chatter free cutting



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

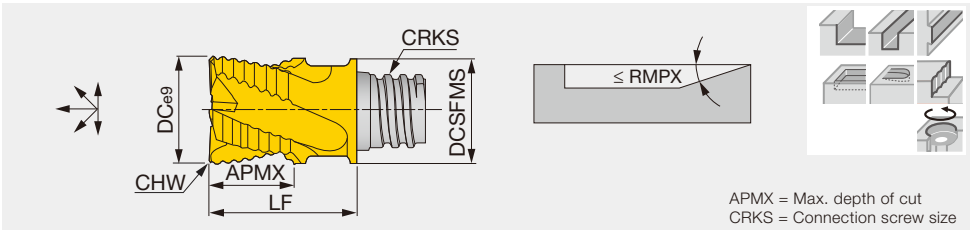
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CHW	CRKS	LF	Wrench	Torque*
VEE080L05.0C30I04S05		●	4	38°	8	7.7	5	-	0.3	S05	10	KEYV-S05	7
VEE100L07.0C40I04S06		●	4	38°	10	9.7	7	-	0.4	S06	13	KEYV-S06	10
VEE120L09.0C50I04S08		●	4	38°	12	11.7	9	-	0.5	S08	16.5	KEYV-S08	15
VEE160L12.0C60I04S10	●	●	4	38°	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 torque (N·m) for clamping.
VEE080 ~ VEE200: Packing quantity = 2 pcs.
VEE250: Packing quantity = 1pc.

●: Line up

VEE**R...

TungMeister square head with serated edges for roughing



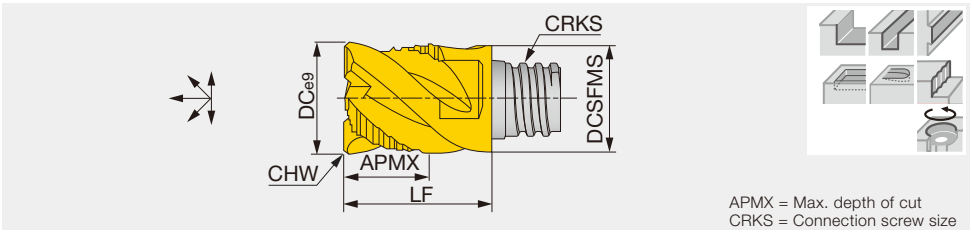
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	CHW	CRKS	LF	RMPX	Wrench	Torque*
VEE080L05.0C25R04S05		●	4	45°	8	7.7	5	0.25	S05	10	90°	KEYV-S05	7
VEE100L07.0C30R04S06		●	4	45°	10	9.7	7	0.3	S06	13	90°	KEYV-S06	10
VEE120L09.0C35R04S08		●	4	45°	12	11.7	9	0.35	S08	16.5	90°	KEYV-S08	15
VEE160L12.0C40R05S10	●	●	5	45°	16	15.3	12	0.4	S10	20.5	7°	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 torque (N·m) for clamping.
VEE080 ~ VEE200: Packing quantity = 2 pcs.
VEE250: Packing quantity = 1 pc.

●: Line up

VEE**C...

TungMeister square head with combined edges for finishing & roughing



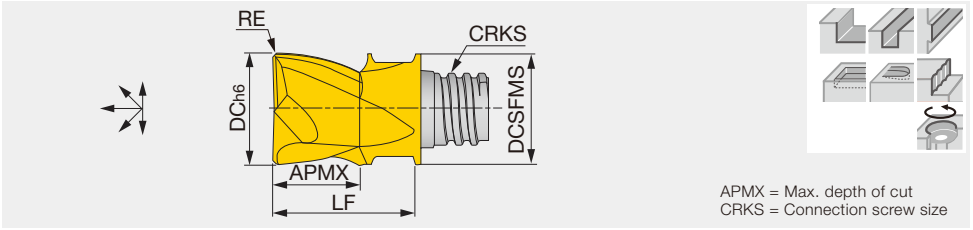
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	CHW	CRKS	LF	Wrench	Torque*
VEE080L05.0C30C04S05	●	4	45°	8	7.7	5	0.3	S05	10	KEYV-S05	7
VEE100L07.0C30C04S06	●	4	45°	10	9.7	7	0.3	S06	13	KEYV-S06	10
VEE120L09.0C40C04S08	●	4	45°	12	11.7	9	0.4	S08	16.5	KEYV-S08	15
VEE160L12.0C60C04S10	●	4	45°	16	15.3	12	0.6	S10	20.5	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 torque (N·m) for clamping.
VEE080 ~ VEE200: Packing quantity = 2 pcs.
VEE250: Packing quantity = 1 pc.

●: Line up

VEE**A02...

TungMeister square head with 2 flutes for aluminium machining



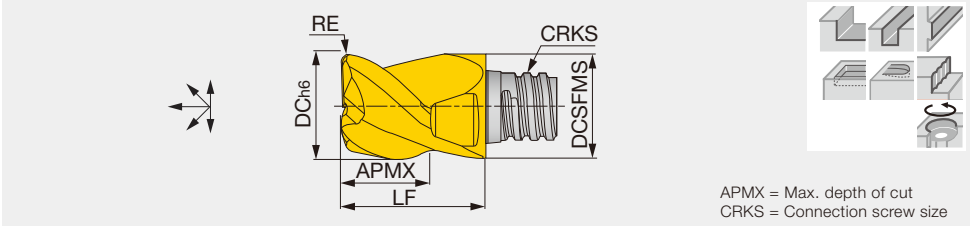
Designation	KS15F	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEE100L07.0R05A02S06	●	2	45°	10	9.7	7	0.5	S06	13	KEYV-S06	10
VEE100L07.0R10A02S06	●	2	45°	10	9.7	7	1	S06	13	KEYV-S06	10
VEE120L09.0R05A02S08	●	2	45°	12	11.7	9	0.5	S08	16.5	KEYV-S08	15

*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VEE**A03...

TungMeister square head with 3 flutes for aluminium machining



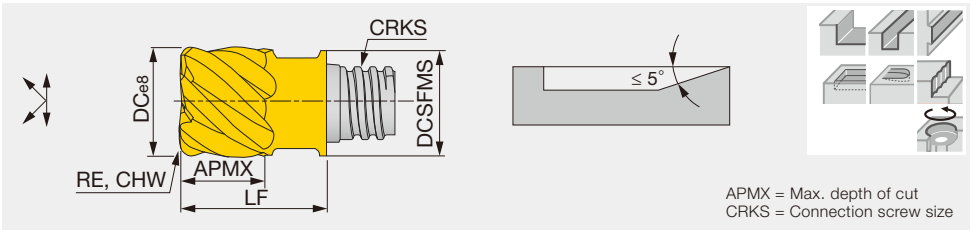
Designation	KS15F	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEE080L05.0R05A03S05	●	3	45°	8	7.7	5	0.5	S05	10	KEYV-S05	7
VEE100L06.0R05A03S06	●	3	45°	10	9.7	6	0.5	S06	13	KEYV-S06	10
VEE100L06.0R10A03S06	●	3	45°	10	9.7	6	1	S06	13	KEYV-S06	10
VEE120L08.0R05A03S08	●	3	45°	12	11.7	8	0.5	S08	16.5	KEYV-S08	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 torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

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

TungMeister square head with 6 flutes for difficult-to-cut material machining



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

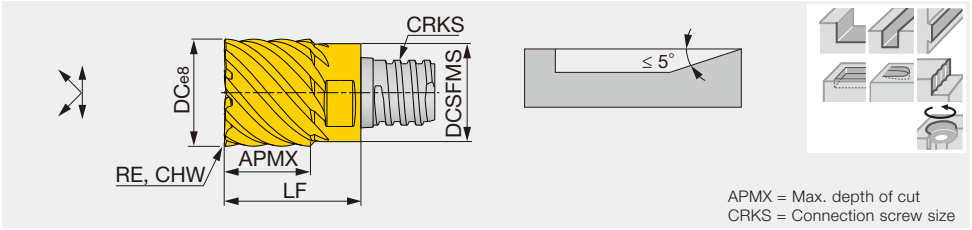
Designation	Grade AH725	Grade AH750	NOF	FHA	DC	DCSFMS	APMX	RE	CHW	CRKS	LF	Wrench	Torque*
VEE080L05.0R05-06S05	●		6	45°	8	7.7	5	0.5	-	S05	10	KEYV-S05	7
VEE080L05.0R10-06S05	●		6	45°	8	7.7	5	1	-	S05	10	KEYV-S05	7
VEE080L05.0R15-06S05	●		6	45°	8	7.7	5	1.5	-	S05	10	KEYV-S05	7
VEE080L05.0C10-06S05		●	6	50°	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 torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

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

TungMeister square head with 8, 10 flutes for difficult-to-cut material machining



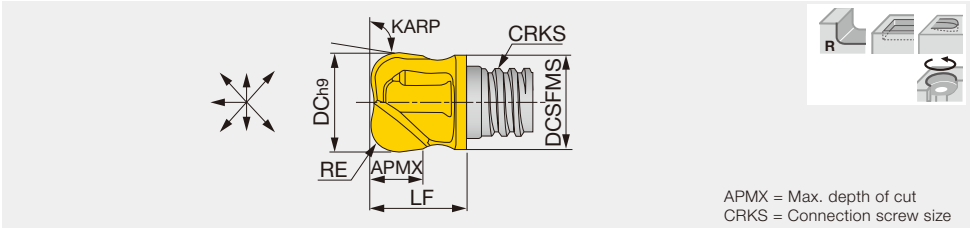
Designation	Grade AH725	Grade AH750	NOF	FHA	DC	DCSFMS	APMX	RE	CHW	CRKS	LF	Wrench	Torque*
VED160L12.0R05-08S10	●		8	30°	16	15.3	12	0.5	-	S10	20.5	KEYV-S10	28
VED160L12.0R10-08S10	●		8	30°	16	15.3	12	1	-	S10	20.5	KEYV-S10	28
VED160L12.0R16-08S10	●		8	30°	16	15.3	12	1.6	-	S10	20.5	KEYV-S10	28
VED160L12.0R20-08S10	●		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
VED250L22.0R20-10S15	●		10	30°	25	23.9	22	2	-	S15	37	KEYV-W20	40

*Torque: Recommended torque (N·m) for clamping.
VEE / VED160 - 200: Packing quantity = 2 pcs.
VED250: Packing quantity = 1 pc.

●: Line up

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

TungMeister radius head with 2 pressed flutes



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

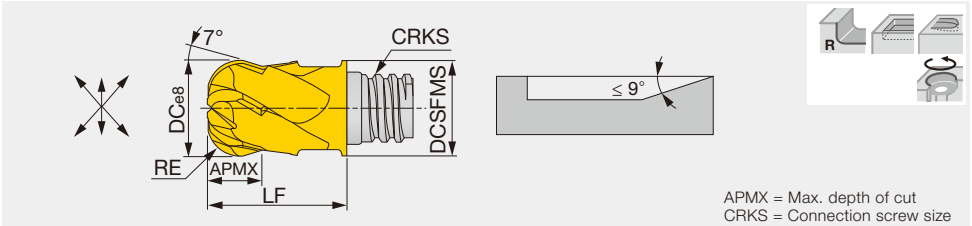
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	KARP	CRKS	LF	Wrench	Torque*
VRC100L07.0R05-02S06	●	2	15°	10	9.5	7	0.5	95°	S06	12.4	KEYV-S06	10
VRC100L07.0R10-02S06	●	2	15°	10	9.5	7	1	95°	S06	12.4	KEYV-S06	10
VRB100L06.0R20-02S06	●	2	0°	10	9.2	6	2	97°	S06	12.4	KEYV-S06	10
VRB120L05.7R30-02S06	●	2	0°	12	9.5	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

Note: Suitable for contouring operation. Some heads require different wrench sizes.
*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VRD**-06...

TungMeister radius head with 6 ground flutes



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 torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

STANDARD CUTTING CONDITIONS

Shoulder milling (VEH, VEE: 3 flutes, VED/VEE: 4 flutes, VEE-A, VEE-I, VEE-R, VEE-C, VRB, VRC, VRD)

ISO	Workpiece material	Hard-ness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 6	8	10	12	16	20	25	Depth of cut *ap* (mm)	Pick feed *Pf* (mm)
P	Low carbon steels S45C, S55C, etc. C45, C55, etc.	- 300 HB	80 - 180	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	0.6 x øDc	0.25 x øDc
P	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, etc.	- 300 HB	60 - 140	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	0.6 x øDc	0.25 x øDc
P	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	60 - 120	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	0.6 x øDc	0.25 x øDc
M	Stainless steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	40 - 100	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	0.6 x øDc	0.25 x øDc
K	Grey cast irons FC250, FC300, etc. 250, 300, etc.	150 - 250 HB	80 - 200	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	0.6 x øDc	0.25 x øDc
K	Ductile cast irons FCD400, etc. 400-15S, etc.	150 - 250 HB	80 - 200	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	0.6 x Dc	0.25 x øDc
N	Aluminium alloys Si < 13%	-	200 - 700	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	0.6 x øDc	0.25 x øDc
N	Aluminium alloys Si ≥13%	-	100 - 300	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	0.6 x øDc	0.25 x øDc
S	Titanium alloys Ti-6Al-4V, etc.	-	40 - 80	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	0.6 x øDc	0.05 x øDc
S	Heat-resistant alloys Inconel 718, etc.	-	20 - 40	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.10 - 0.17	0.1 - 0.17	0.6 x øDc	0.05 x øDc
H	Hardened steel SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, etc.	40 - 50 HRC	40 - 80	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	0.6 x øDc	0.05 x øDc
H	Hardened steel SKD11, SKH, etc. X153CrMoV12, HS18-0-1, etc.	50 - 60 HRC	20 - 60	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	0.6 x øDc	0.05 x øDc

Slot milling (VEH, VEE: 3 flutes, VED/VEE: 4 flutes, VEE-A, VEE-I, VEE-R, VEE-C, VRB, VRC, VRD)

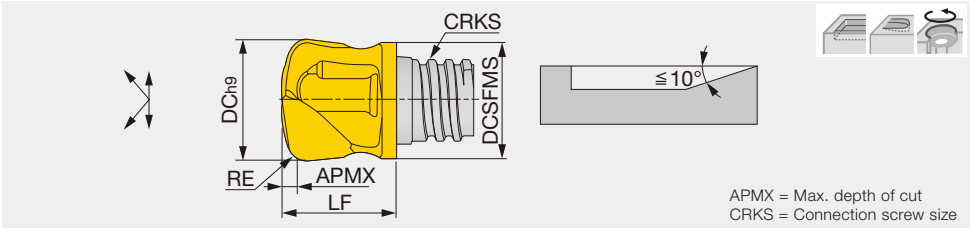
ISO	Workpiece material	Hard-ness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 6	8	10	12	16	20	25	Depth of cut *ap* (mm)
P	Low carbon steels S45C, S55C, etc. C45, C55, etc.	- 300 HB	80 - 180	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.5 x ø*Dc*
	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, etc.	- 300 HB	60 - 140	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.5 x ø*Dc*
	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	60 - 120	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.5 x ø*Dc*
M	Stainless steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	40 - 100	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.5 x ø*Dc*
K	Grey cast irons FC250, FC300, etc. 250, 300, etc.	150 - 250 HB	80 - 200	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.5 x ø*Dc*
	Ductile cast irons FCD400, etc. 400-15S, etc.	150 - 250 HB	80 - 200	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.10	0.5 x ø*Dc*
N	Aluminium alloys Si < 13%	-	200 - 700	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.5 x ø*Dc*
	Aluminium alloys Si ≥13%	-	100 - 300	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.5 x ø*Dc*
S	Titanium alloys Ti-6Al-4V, etc.	-	40 - 80	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.5 x ø*Dc*
	Heat-resistant alloys Inconel 718, etc.	-	20 - 40	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.5 x ø*Dc*
H	Hardened steel SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, etc.	40 - 50 HRC	40 - 80	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.2 x ø*Dc*
	Hardened steel SKD11, SKH, etc. X153CrMoV12, HS18-0-1, etc.	50 - 60 HRC	20 - 60	0.03 - 0.07	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.07 - 0.1	0.2 x ø*Dc*

Shoulder milling (VED / VEE: 6 flutes, VED / VEE: 8, 10 flutes)

ISO	Workpiece material	Hard-ness	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)	Pick feed *Pf* (mm)
S	Titanium alloys Ti-6Al-4V, etc.	-	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 ø*Dc*	0.02 x ø*Dc*
	Heat-resistant alloys Inconel 718, etc.	-	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 ø*Dc*	0.02 x ø*Dc*
H	Hardened steel SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, 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 ø*Dc*	0.02 x ø*Dc*
	Hardened steel SKD11, SKH, etc. X153CrMoV12, HS18-0-1, 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 ø*Dc*	0.02 x ø*Dc*

VFX**-02...

TungMeister radius head with 2 flutes for super high-feed milling

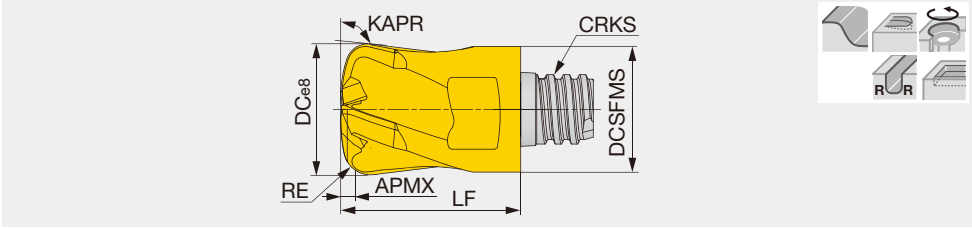


Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE(1)	CRKS	LF	Wrench	Torque*	*fz*(mm/t)
VFX100L00.6R20-02S06	●	2	0°	10	9.6	0.6	2	S06	12.5	KEYV-S06	10	0.3 - 0.6
VFX120L01.0R25-02S08	●	2	0°	12	11.5	1.0	2.5	S08	11.1	KEYV-S08	15	0.5 - 1
VFX160L01.1R30-02S10	●	2	0°	16	15.2	1.1	3	S10	13.5	KEYV-S10	28	0.55 - 1.1
VFX200L01.5R33-02S12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

(1) Corner radius for CAM programing
●: Line up
Note: For VFX head, taper neck shank or Tungsten shank should be recommended.
*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

VFX**-04...

TungMeister radius head with 4 flutes for super high-feed milling



Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	KAPR	CRKS	LF	Wrench	Torque*	*fz*(mm/t)
VFX120L0.60R18H04S08	●	4	20°	12	11.5	0.6	1.8	97°	S08	16.5	KEYV-S08	15	0.16 - 0.67
VFX160L0.80R22H04S10	●	4	20°	16	15.4	0.8	2.2	97°	S10	20.5	KEYV-S10	28	0.2 - 0.75

*Torque: Recommended torque (N·m) for clamping.
●: Line up
Packing quantity = 2 pcs.

STANDARD CUTTING CONDITIONS

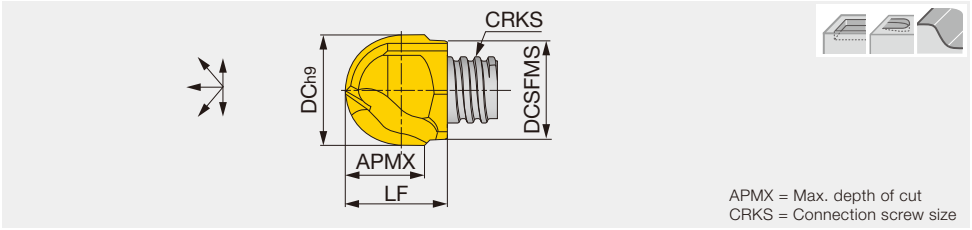
High feed milling (VFX)

ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	ø10		ø12		ø16		ø20		Width of cut *ae* (mm)
				Feed per tooth *fz* (mm/t)	Depth of cut *ap* (mm)	Feed per tooth *fz* (mm/t)	Depth of cut *ap* (mm)	Feed per tooth *fz* (mm/t)	Depth of cut *ap* (mm)	Feed per tooth *fz* (mm/t)	Depth of cut *ap* (mm)	
P	Low carbon steels 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 ø*Dc*
	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, 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 ø*Dc*
	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 ø*Dc*
M	Stainless steels 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 ø*Dc*
K	Grey cast irons FC250, FC300, etc. 250, 300, 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 ø*Dc*
	Ductile cast irons FCD400, etc. 400-15S, 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 ø*Dc*
S	Titanium alloys Ti-6Al-4V, etc.	-	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 ø*Dc*
	Heat-resistant alloys Inconel 718, etc.	-	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 ø*Dc*
H	Hardened steel SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, 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 ø*Dc*
	Hardened steel SKD11, SKH, etc. X153CrMoV12, HS18-0-1, 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 ø*Dc*

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

VBB**-BM...

TungMeister ball nose head with pressed edge for roughing



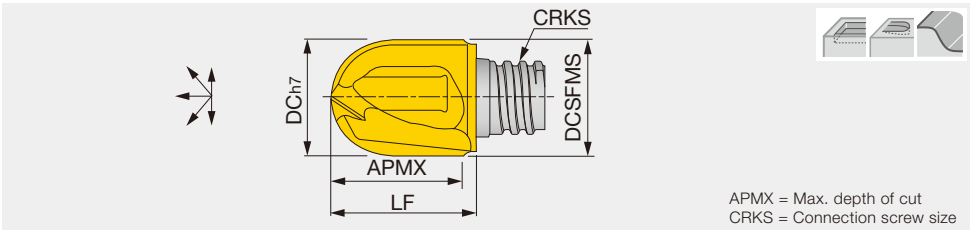
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	CRKS	LF	Wrench	Torque*
VBB080L08.0-BM-02S05	●	2	0°	8	7.6	8	S05	10	KEYV-S05	7
VBB100L10.0-BM-02S06	●	2	0°	10	9.5	10	S06	12.4	KEYV-S06	10
VBB120L12.0-BM-02S08	●	2	0°	12	11.5	11.5	S08	15.3	KEYV-S08	15
VBB160L16.0-BM-02S10	●	2	0°	16	15.2	16	S10	19.1	KEYV-S10	28

• For roughing
*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VBB**-BG...

TungMeister ball nose head with ground edge for semi-finishing



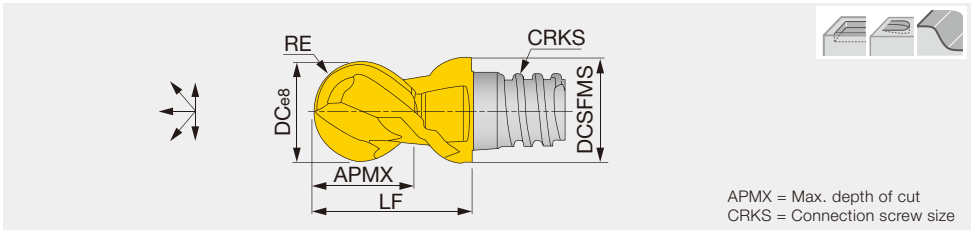
Designation	AH750	NOF	FHA	DC	DCSFMS	APMX	CRKS	LF	Wrench	Torque*
VBB080L08.0-BG-02S05	●	2	0°	8	7.6	8	S05	10	KEYV-S05	7
VBB100L10.0-BG-02S06	●	2	0°	10	9.6	10	S06	12.4	KEYV-S06	10
VBB120L12.0-BG-02S08	●	2	0°	12	11.5	12	S08	15.3	KEYV-S08	15
VBB160L16.0-BG-02S10	●	2	0°	16	15.2	16	S10	19.1	KEYV-S10	28

*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VBD**-BG...

TungMeister ball nose head with 2 flutes and helical ground edge for finishing



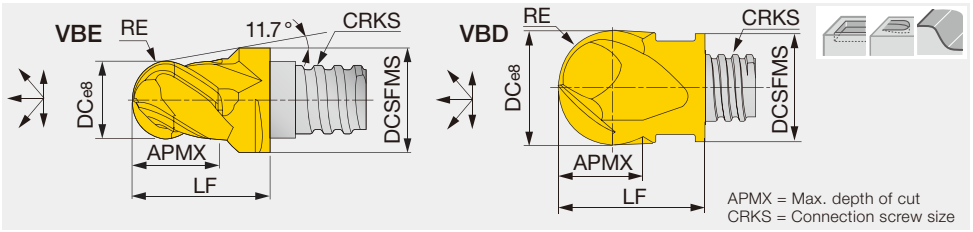
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VBD080L05.0-BG-02S05	●	2	30°	8	7.7	5	3.982(1)	S05	10	KEYV-S05	7
VBD100L07.0-BG-02S06	●	2	30°	10	9.7	7	4.982(1)	S06	13	KEYV-S06	10
VBD120L09.0-BG-02S08	●	2	30°	12	11.7	9	5.978(2)	S08	16.5	KEYV-S08	15
VBD160L09.5-BG-02S10	●	2	30°	16	15.3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

• The tolerance of R: (1) ± 0.01 (2) ± 0.012
*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

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

TungMeister ball nose head with 4 flutes and helical ground edge for finishing



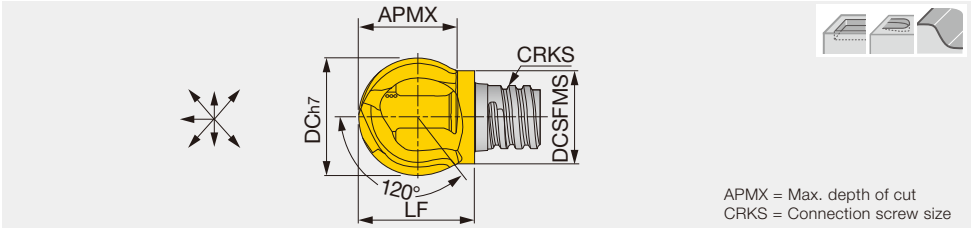
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VBE060L05.5-BG-04S05		●	4	38°	6	8	5.5	2.987(1)	S05	10	KEYV-S05	7
VBD080L05.0-BG-04S05		●	4	30°	8	7.7	5	3.982(1)	S05	10	KEYV-S05	7
VBD100L07.0-BG-04S06		●	4	30°	10	9.7	7	4.982(1)	S06	13	KEYV-S06	10
VBD120L09.0-BG-04S08		●	4	30°	12	11.7	9	5.978(2)	S08	16.5	KEYV-S08	15
VBD160L12.0-BG-04S10	●	●	4	30°	16	15.3	12	7.978(2)	S10	20.5	KEYV-S10	28
VBD200L15.0-BG-04S12		●	4	30°	20	18.3	15	9.972(2)	S12	25.5	KEYV-S12	28
VBD250L22.0-BG-04S15		●	4	30°	25	23.9	22	12.470(3)	S15	37	KEYV-W20	40

• The tolerance of R : (1) ± 0.01 (2) ± 0.012 (3) ± 0.02
*Torque: Recommended torque (N·m) for clamping.
VBE060/VBD080 ~ VBD200: Packing quantity = 2 pcs.
VBD250: Packing quantity = 1 pc.

●: Line up

VBB**-SG...

TungMeister ball nose head with spherical designed edge,available for pull-cutting on the wall



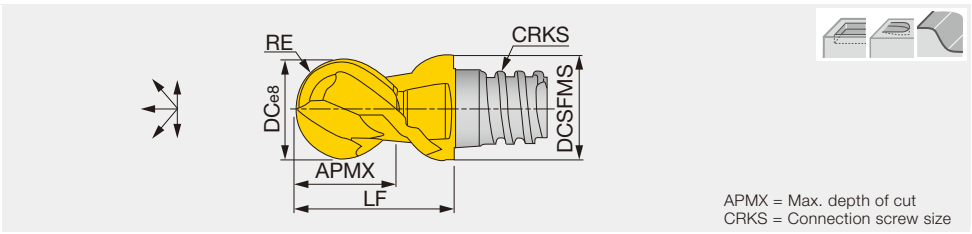
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	CRKS	LF	Wrench	Torque*
VBB100L08.0-SG-02S05	●	2	0°	10	7.6	7.5	S05	10	KEYV-S05	7
VBB120L09.6-SG-02S06	●	2	0°	12	9.5	9	S06	11.6	*KEYV-S08	10
VBB160L12.9-SG-02S08	●	2	0°	16	12.2	12	S08	15.4	*KEYV-S10	15
VBB200L16.1-SG-02S10	●	2	0°	20	15.2	15	S10	18.4	KEYV-S10	28

• For pull-cutting on the vertical wall
* Some heads require different size of wrench.
**Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VBE**-BGA

TungMeister ball nose head with 2 flutes and helical ground edge for Al machining



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 R : (1) ± 0.01 (2) ± 0.012
*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

STANDARD CUTTING CONDITIONS

Standard cutting conditions: Roughing (VBB-BM / BG / SG, VBD-BG, VBE-BGA)

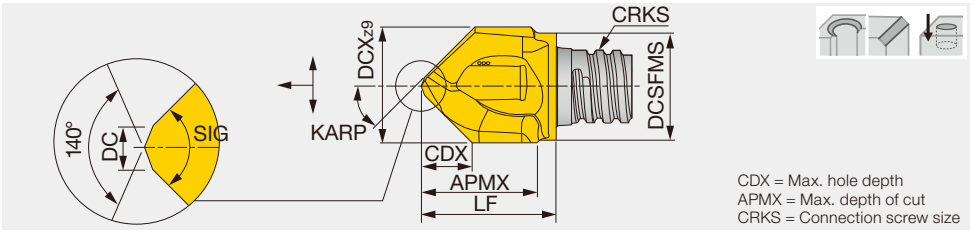
ISO	Workpiece material	Hard-ness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 6	8	10	12	16	20	25	Depth of cut *ap* (mm)	Pick feed *Pf* (mm)
P	Low carbon steels S45C, S55C, etc. C45, C55, etc.	- 300 HB	100 - 200	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.4 x øDc
	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, etc.	- 300 HB	80 - 180	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.4 x øDc
	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	80 - 160	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.4 x øDc
M	Stainless steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	60 - 100	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.4 x øDc
K	Grey cast irons FC250, FC300, etc. 250, 300, etc.	150 - 250 HB	100 - 220	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.4 x øDc
	Ductile cast irons FCD400, etc. 400-15S, etc.	150 - 250 HB	100 - 220	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.4 x øDc
N	Aluminium alloys Si < 13%	-	200 - 700	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.4 x øDc
	Aluminium alloys Si ≥13%	-	100 - 300	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.4 x øDc
S	Titanium alloys Ti-6Al-4V, etc.	-	40 - 80	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.2 x øDc
	Heat-resistant alloys Inconel 718, etc.	50 - 60 HRC	20 - 40	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.2 x øDc
H	Hardened steel SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, etc.	-	40 - 80	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.2 x øDc
	Hardened steel SKD11, SKH, etc. X153CrMoV12, HS18-0-1, etc.	50 - 60 HRC	20 - 60	0.03 - 0.07	0.04 - 0.08	0.05 - 0.10	0.06 - 0.11	0.07 - 0.13	0.08 - 0.15	0.08 - 0.15	0.3 x øDc	0.2 x øDc

Standard cutting conditions: Profiling for semi-finishing and finishing (VBB-BM / BG / SG, VBD-BG, VBE-BGA)

ISO	Workpiece material	Hard-ness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 6	8	10	12	16	20	25	Depth of cut *ap* (mm)	Pick feed *Pf* (mm)
P	Low carbon steels S45C, S55C, etc. C45, C55, etc.	- 300 HB	120 - 250	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 øDc	0.15 x øDc
	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, etc.	- 300 HB	100 - 220	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 øDc	0.15 x øDc
	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	100 - 200	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 øDc	0.15 x øDc
M	Stainless steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	80 - 120	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 øDc	0.15 x øDc
K	Grey cast irons FC250, FC300, etc. 250, 300, etc.	150 - 250 HB	120 - 280	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 øDc	0.15 x øDc
	Ductile cast irons FCD400, etc. 400-15S, etc.	150 - 250 HB	120 - 280	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 øDc	0.15 x øDc
N	Aluminium alloys Si < 13%	-	300 - 1000	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 øDc	0.15 x øDc
	Aluminium alloys Si ≥13%	-	150 - 400	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 øDc	0.15 x øDc
S	Titanium alloys Ti-6Al-4V, etc.	-	50 - 100	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 øDc	0.1 x øDc
	Heat-resistant alloys Inconel 718, etc.	50 - 60 HRC	30 - 50	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 øDc	0.1 x øDc
H	Hardened steel SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, etc.	-	50 - 100	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 øDc	0.1 x øDc
	Hardened steel SKD11, SKH, etc. X153CrMoV12, HS18-0-1, etc.	50 - 60 HRC	30 - 80	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 øDc	0.1 x øDc

VCP**-02...

TungMeister head with 2 pressed flutes for spot drilling and chamfering



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

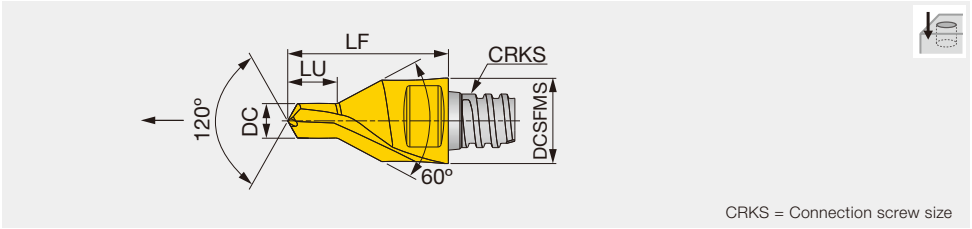
Designation	AH725	SIG	NOF	FHA	DCX	DCSFMS	APMX	CDX	CRKS	LF	DC	KAPR	Wrench	Torque*
VCP100L09.5A30-02S06	●	60	2	0°	10	9.5	8.5	7.5	S06	11.75	1.5	30°	KEYV-S06	10
VCP120L12.0A30-02S08	●	60	2	0°	12	11.5	11	9.2	S08	15.4	1.5	30°	KEYV-S08	15
VCP160L15.0A30-02S10	●	60	2	0°	16	15.2	16	12	S10	20.2	2.5	30°	KEYV-S10	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
VCP100L09.5A60-02S06	●	120	2	0°	10	9.5	9.5	2.7	S06	12.7	1.5	60°	KEYV-S06	10
VCP120L12.0A60-02S08	●	120	2	0°	12	11.5	11.5	3.3	S08	15.2	1.5	60°	KEYV-S08	15
VCP160L15.5A60-02S10	●	120	2	0°	16	15.2	16	4.4	S10	19.9	1.5	60°	KEYV-S10	28

●: Line up

• Min. chamfering: ø1.5 mm
*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

VDP**-02...

TungMeister head for center drilling



CRKS = Connection screw size

Designation	AH725	NOF	FHA	DC±0.02	DCSFMS	LU	CRKS	LF	Wrench	Torque*
VDP328L04.6A30-02S05	●	2	0°	3.28	8	4.6	S05	15	KEYV-S05	7
VDP412L05.9A30-02S06	●	2	0°	4.12	10	5.9	S06	19	KEYV-S06	10
VDP513L07.2A30-02S08	●	2	0°	5.13	12	7.2	S08	23	KEYV-S08	15
VDP646L08.9A30-02S10	●	2	0°	6.46	16	8.9	S10	28	KEYV-S10	28

*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

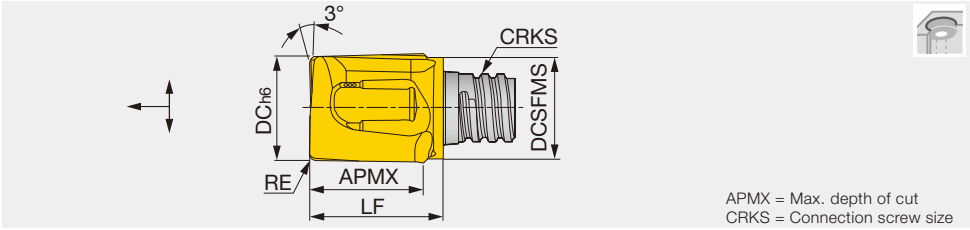
STANDARD CUTTING CONDITIONS

Drilling (VCP, VDP)

ISO	Workpiece material		Hardness	Cutting speed *Vc* (m/min)	Feed: *f* (mm/rev)				
					VDP328	VDP412	VDP513	VDP646	VCP
P	Low carbon steels S45C, S55C, etc. C45, C55, etc.		- 300 HB	40 - 80	0.04 - 0.08	0.05 - 0.10	0.05 - 0.10	0.06 - 0.12	0.06 - 0.12
	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, etc.		- 300 HB	30 - 50	0.04 - 0.08	0.05 - 0.10	0.05 - 0.10	0.06 - 0.12	0.06 - 0.12
	Prehardened steel PX5, NAK80, etc.		30 - 40 HRC	20 - 30	0.04 - 0.08	0.05 - 0.10	0.05 - 0.10	0.06 - 0.12	0.06 - 0.12
M	Stainless steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.		- 200 HB	15 - 25	0.04 - 0.08	0.05 - 0.10	0.05 - 0.10	0.06 - 0.12	0.06 - 0.12
K	Grey cast irons FC250, FC300, etc. 250, 300, etc.		150 - 250 HB	60 - 100	0.05 - 0.09	0.07 - 0.12	0.07 - 0.12	0.12 - 0.18	0.12 - 0.18
	Ductile cast irons FCD400, etc. 400-15S, etc.		150 - 250 HB	60 - 100	0.04 - 0.08	0.05 - 0.10	0.05 - 0.10	0.10 - 0.15	0.10 - 0.15
S	Titanium alloys Ti-6Al-4V, etc.		-	15 - 25	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07
	Heat-resistant alloys Inconel 718, etc.		-	10 - 20	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06
H	Hardened steel	SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, etc.	40 - 50 HRC	15 - 25	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07	0.04 - 0.07
		SKD11, SKH, etc. X153CrMoV12, HS18-0-1, etc.	50 - 60 HRC	10 - 20	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06	0.03 - 0.06

VGC**-02...

TungMeister head for counter boring



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
VGC117L10.0R03-02S08	●	2	10°	11.7	11.5	10	0.3	S08	14.2	KEYV-S08	15
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
VGC157L15.0R03-02S10	●	2	10°	15.7	15.2	15	0.3	S10	19	KEYV-S10	28
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 torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

STANDARD CUTTING CONDITIONS

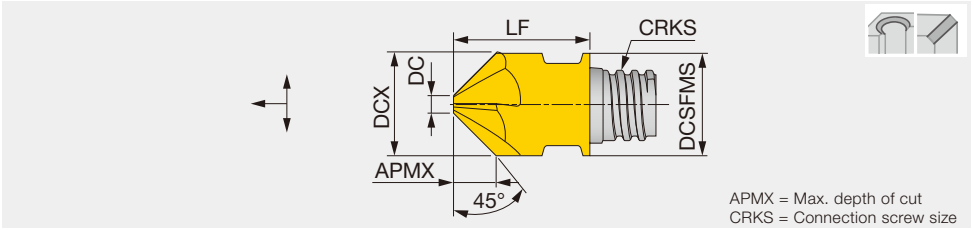
Counter boring (VGC)

ISO	Workpiece material		Hardness	Cutting speed *Vc* (m/min)	Feed per tooth *fz*(mm/t)
P	Low carbon steels S45C, S55C, etc. C45, C55, etc.		- 300 HB	40 - 80	0.04 - 0.08
P	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, 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 steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.		- 200 HB	15 - 25	0.04 - 0.08
K	Grey cast irons FC250, FC300, etc. 250, 300, etc.		150 - 250 HB	60 - 100	0.05 - 0.09
K	Ductile cast irons FCD400, etc. 400-15S, etc.		150 - 250 HB	60 - 100	0.04 - 0.08
S	Titanium alloys Ti-6Al-4V, etc.		-	15 - 25	0.04 - 0.07
S	Heat-resistant alloys Inconel 718, etc.		-	10 - 20	0.03 - 0.06
H	Hardened steel	SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, etc.	40 - 50 HRC	15 - 25	0.04 - 0.07
H	Hardened steel	SKD11, SKH, etc. X153CrMoV12, HS18-0-1, etc.	50 - 60 HRC	10 - 20	0.03 - 0.06

・When drilling, the step feed (woodpeckering feed) 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.

VCA**-04, 06...

TungMeister head with 4 or 6 flutes for countersinking and chamfering



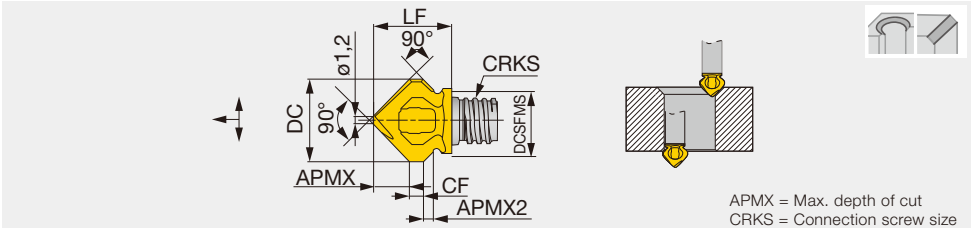
Designation	AH715	AH725	NOF	FHA	DCX	DCSFMS	APMX	DC	CRKS	LF	Wrench	Torque*
VCA100L04.0A45-04S06		●	4	0°	10	10	4	1.95	S06	13	KEYV-S06	10
VCA120L05.0A45-04S08		●	4	0°	12	12	5	1.95	S08	16.5	KEYV-S08	15
VCA127L05.3A45-04S08		●	4	0°	12.7	12.7	5.3	1.98	S08	16.5	KEYV-S08	15
VCA160L06.5A45-06S10	●	●	6	0°	16	16	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 torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VCW**-02

TungMeister head for countersinking, top and bottom chamfering



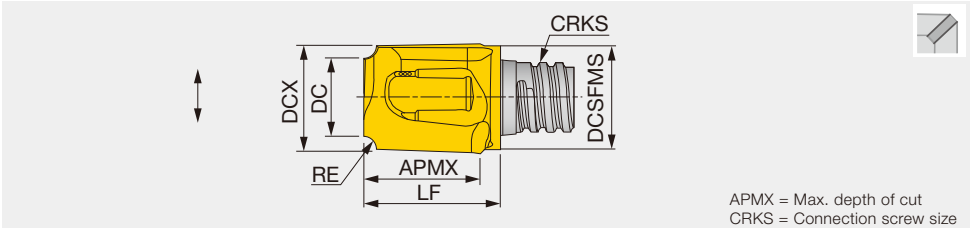
Designation	AH725	NOF	FHA	DC	DCSFMS	APMX	APMX2	CF	CRKS	LF	Wrench	Torque*
VCW118L05.0A45-02S06	●	2	0°	11.8	9.3	5	1.2	2	S06	11.2	KEYV-S06	10

• Available for chamfering of reverse side
* Some heads require different wrench sizes.
**Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VCR**-02

TungMeister head with 2 pressed flutes for concave radius chamfering



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 torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

STANDARD CUTTING CONDITIONS

Chamfering and countersinking (VCA, VCW, VCR, VCP)

ISO	Workpiece material		Hardness	Cutting speed *Vc* (m/min)	Feed *f* (mm/rev)
P	Low carbon steels S45C, S55C, etc. C45, C55, etc.		- 300 HB	60 - 100	0.06 - 0.12
P	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, 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 steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.		- 200 HB	30 - 50	0.06 - 0.12
K	Grey cast irons FC250, FC300, etc. 250, 300, etc.		150 - 250 HB	80 - 120	0.06 - 0.12
K	Ductile cast irons FC250, FC300, etc. 400-15S, etc.		150 - 250 HB	80 - 120	0.06 - 0.12
N	Aluminium alloys		-	100 - 200	0.08 - 0.15
S	Titanium alloys Ti-6Al-4V, etc.		-	30 - 50	0.05 - 0.1
S	Heat-resistant alloys Inconel 718, etc.		-	20 - 40	0.04 - 0.08
H	Hardened steel	SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, etc.	40 - 50 HRC	30 - 50	0.05 - 0.1
H	Hardened steel	SKD11, SKH, etc. X153CrMoV12, HS18-0-1, etc.	50 - 60 HRC	20 - 40	0.04 - 0.08

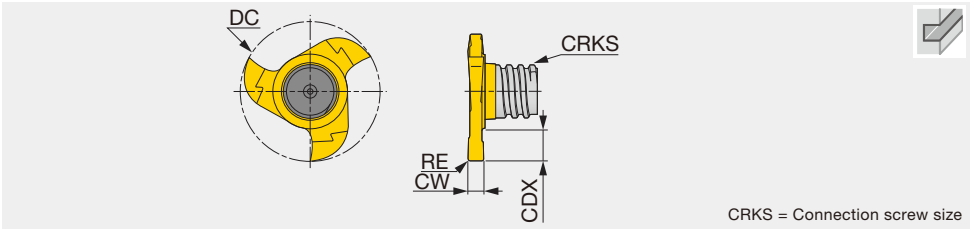
TOLERANCE OF TOOL DIAMETER

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

VST**-3...

TungMeister head for slotting of 1.5 - 3.17mm width with 3 teeth



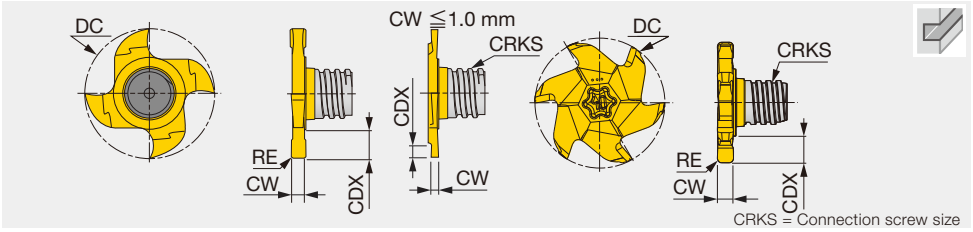
Designation	GH130	NOF	FHA	DC	CW±0.02	RE	CRKS	CDX	Wrench	Torque*
VST157W1.50R010-3S06	●	3	0°	15.7	1.5	0.1	S06	2.8	KEYV-177	10
VST157W1.57R020-3S06	●	3	0°	15.7	1.57	0.2	S06	2.8	KEYV-177	10
VST157W2.00R020-3S06	●	3	0°	15.7	2	0.2	S06	2.8	KEYV-177	10
VST157W2.39R020-3S06	●	3	0°	15.7	2.39	0.2	S06	2.8	KEYV-177	10
VST157W2.50R020-3S06	●	3	0°	15.7	2.5	0.2	S06	2.8	KEYV-177	10
VST157W3.00R020-3S06	●	3	0°	15.7	3	0.2	S06	2.8	KEYV-177	10
VST157W3.17R020-3S06	●	3	0°	15.7	3.17	0.2	S06	2.8	KEYV-177	10
VST177W1.20R005-3S06	●	3	0°	17.7	1.2(1)	0.05	S06	3.8	KEYV-177	10
VST177W1.40R005-3S06	●	3	0°	17.7	1.4(1)	0.05	S06	3.8	KEYV-177	10
VST177W1.50R010-3S06	●	3	0°	17.7	1.5	0.1	S06	3.8	KEYV-177	10
VST177W1.57R020-3S06	●	3	0°	17.7	1.57	0.2	S06	3.8	KEYV-177	10
VST177W1.70R005-3S06	●	3	0°	17.7	1.7(1)	0.05	S06	3.8	KEYV-177	10
VST177W2.00R020-3S06	●	3	0°	17.7	2	0.2	S06	3.8	KEYV-177	10
VST177W2.20R110-3S06	●	3	0°	17.7	2.20	1.1	S06	3.8	KEYV-177	10
VST177W2.39R020-3S06	●	3	0°	17.7	2.39	0.2	S06	3.8	KEYV-177	10
VST177W2.50R020-3S06	●	3	0°	17.7	2.5	0.2	S06	3.8	KEYV-177	10
VST177W3.00R020-3S06	●	3	0°	17.7	3	0.2	S06	3.8	KEYV-177	10
VST177W3.17R020-3S06	●	3	0°	17.7	3.17	0.2	S06	3.8	KEYV-177	10

(1) W is based on DIN471 / 472
*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VST**-4, 6...

TungMeister head for slotting of 0.76 - 10mm width with 4, 6 teeth



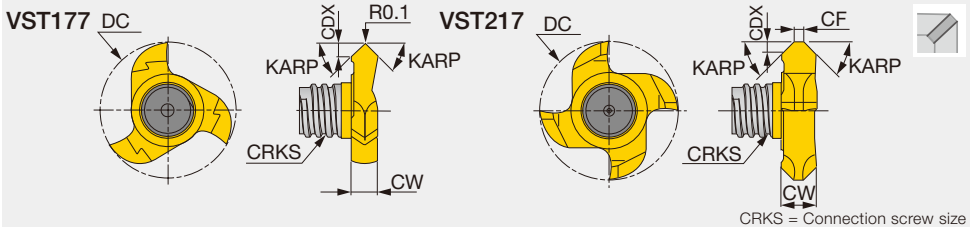
Designation	GH130	FHA	NOF	DC	CW±0.02	RE	CRKS	CDX	Wrench	Torque*
VST217W0.76R000-4S08	●	0°	4	21.7	0.76(1)	-	S08	1.5	KEYV-217	15
VST217W0.86R000-4S08	●	0°	4	21.7	0.86(1)	-	S08	1.7	KEYV-217	15
VST217W0.96R000-4S08	●	0°	4	21.7	0.96(1)	-	S08	1.9	KEYV-217	15
VST217W1.00R005-4S08	●	0°	4	21.7	1	0.05	S08	2	KEYV-217	15
VST217W1.20R005-4S08	●	0°	4	21.7	1.2(1)	0.05	S08	4.5	KEYV-217	15
VST217W1.40R005-4S08	●	0°	4	21.7	1.4(1)	0.05	S08	4.5	KEYV-217	15
VST217W1.57R000-4S08	●	0°	4	21.7	1.57	-	S08	4.5	KEYV-217	15
VST217W1.70R010-4S08	●	0°	4	21.7	1.7(1)	0.1	S08	4.5	KEYV-217	15
VST217W1.95R020-4S08	●	0°	4	21.7	1.95(1)	0.2	S08	4.5	KEYV-217	15
VST217W2.00R020-4S08	●	0°	4	21.7	2	0.2	S08	4.5	KEYV-217	15
VST217W2.25R020-4S08	●	0°	4	21.7	2.25(1)	0.2	S08	4.5	KEYV-217	15
VST217W2.39R020-4S08	●	0°	4	21.7	2.39	0.2	S08	4.5	KEYV-217	15
VST217W2.50R020-4S08	●	0°	4	21.7	2.5	0.2	S08	4.5	KEYV-217	15
VST217W2.75R020-4S08	●	0°	4	21.7	2.75(1)	0.2	S08	4.5	KEYV-217	15
VST217W3.00R020-4S08	●	0°	4	21.7	3	0.2	S08	4.5	KEYV-217	15
VST217W3.17R020-4S08	●	0°	4	21.70	3.17	0.2	S08	4.5	KEYV-217	15
VST217W3.25R020-4S08	●	0°	4	21.7	3.25(1)	0.2	S08	4.5	KEYV-217	15
VST217W4.00R020-4S08	●	0°	4	21.7	4	0.2	S08	4.5	KEYV-217	15
VST217W4.25R020-4S08	●	0°	4	21.7	4.25(1)	0.2	S08	4.5	KEYV-217	15
VST217W4.75R020-4S08	●	0°	4	21.7	4.75	0.2	S08	4.5	KEYV-217	15
VST217W5.25R020-4S08	●	0°	4	21.7	5.25(1)	0.2	S08	4.5	KEYV-217	15
VST277W2.50R020-6S10	●	0°	6	27.7	2.5	0.2	S10	6	KEYV-T40L	28
VST277W5.25R020-6S10	●	0°	6	27.7	5.25	0.2	S10	6	KEYV-T40L	28
VST277W10.0R020-6S10	●	0°	6	27.7	10	0.2	S10	6	KEYV-T40L	28

(1) W is based on DIN471 / 472
*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VST**-A45...

TungMeister head for chamfering on slots



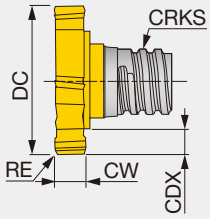
Designation	GH130	NOF	FHA	DC	CW	KARP	CRKS	CDX	CF	Wrench	Torque*
VST177L01.40A45-3S06	●	3	0°	17.7	3.4	45°	S06	1.4	-	KEYV-177	10
VST217L01.70A45-4S08	●	4	0°	21.7	5.5	45°	S08	1.7	1.5	KEYV-217	15

*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VTB**-06...

TungMeister head for T-slotting of 3 - 8mm width



CRKS = Connection screw size

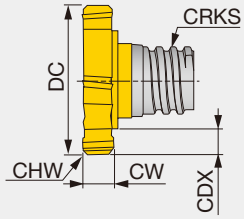
Designation	GH130	NOF	FHA	DC -0.05 0	CW±0.02	CDX	CRKS	RE	Wrench	Torque*
VTB135W3.00R04-06S05	●	6	0°	13.5	3	2.65	S05	0.4	KEYV-T20	7
VTB135W4.00R04-06S05	●	6	0°	13.5	4	2.65	S05	0.4	KEYV-T20	7
VTB160W2.00R04-06S06	●	6	0°	16	2	2.9	S06	0.4	KEYV-T20	10
VTB160W3.00R04-06S06	●	6	0°	16	3	2.9	S06	0.4	KEYV-T25	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
VTB250W6.00R04-06S10	●	6	0°	25	6	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 torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

VTB**-C15-06...

TungMeister head for T-slotting of 2 mm width with chamfered edges



CRKS = Connection screw size

Designation	GH130	NOF	FHA	DC -0.05 0	CW±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 torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up

STANDARD CUTTING CONDITIONS

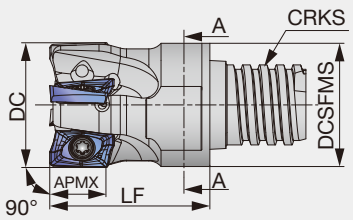
Slotting (VST, VTB)

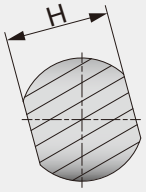
ISO	Workpiece material	Hardness HB	VST type		VTB type	
			Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
P	Low carbon steels S45C, S55C, etc. C45, C55, etc.	- 300	80 - 180	0.05 - 0.15	80 - 180	0.08 - 0.18
	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, etc.	- 300	60 - 120	0.04 - 0.12	60 - 120	0.05 - 0.15
M	Stainless steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200	50 - 120	0.04 - 0.12	50 - 120	0.05 - 0.15
K	Grey cast irons FC250, FC300, etc. 250, 300, etc.	150 - 250	100 - 200	0.05 - 0.15	100 - 200	0.08 - 0.18
	Ductile cast irons FCD400, etc. 400-15S, etc.	150 - 250	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
	Aluminium alloys Si ≥13%	-	100 - 300	0.03 - 0.13	100 - 300	0.05 - 0.15
S	Titanium alloys Ti-6Al-4V, etc.	-	40 - 60	0.04 - 0.12	40 - 60	0.05 - 0.15
	Heat-resistant alloys Inconel 718, etc.	-	15 - 35	0.02 - 0.1	15 - 35	0.02 - 0.1

TUNGFORCE TREC

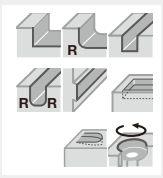
HPAV06-S...

Square shoulder milling cutter in small diameter; Modular head with TungMeister threaded adaptation





A-A cross section



Designation	APMX	DC	CICT	LF	H	DCSFMS	CRKS	WT(kg)	Insert
HPAV06M010S06R02	6	10	2	16	8	9.8	S06	0.01	AVGT06...
HPAV06M012S08R02	6	12	2	18	10	11.7	S08	0.02	AVGT06...
HPAV06M012S08R03	6	12	3	18	10	11.7	S08	0.02	AVGT06...
HPAV06M016S10R03	6	16	3	20	13	15.4	S10	0.03	AVGT06...
HPAV06M016S10R04	6	16	4	20	13	15.4	S10	0.03	AVGT06...

- Shank types: VSSD, VTSD, VSC, VSTD
- For connections between metric shank and TungMeister thread, please use VAD-M type connector

Spanner for clamping	Cat. No.	Connection screw size
	KEYV-S06	S06
	KEYV-S08	S08
	KEYV-S10	S10

Optional- to be ordered separately.

SPARE PARTS



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

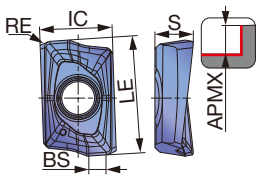
TUNGMEISTER
TUNGALOY

TUNGFORCE REC

INSERTS

AVGT-MJ

AVGT-AJ



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	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

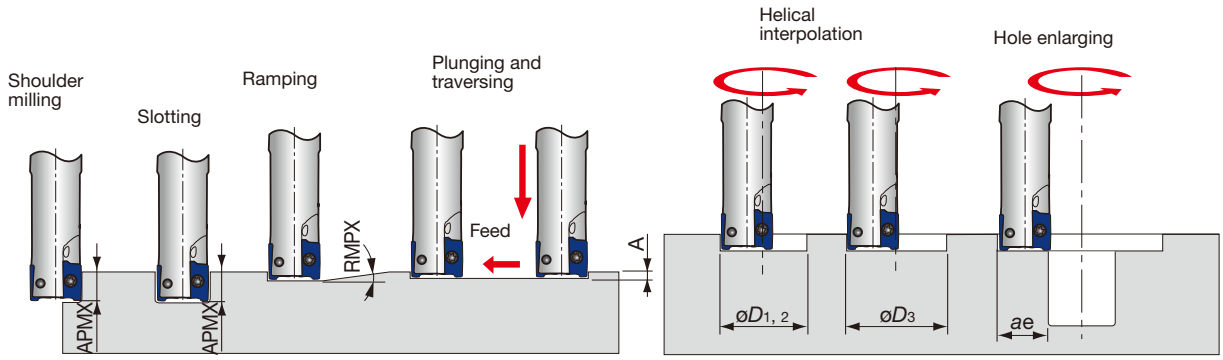
●: Line up

STANDARD CUTTING CONDITIONS

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	AH3135	230 - 430	0.07 - 0.12
	Carbon steel and alloy steel (S55C / C55, SCM440 / 42CrMo4, etc.)		- 300 HB	First choice	AH3135	150 - 350	0.07 - 0.12
	Prehardend steel (NAK80, PX5, etc.)		30 - 40 HRC	First choice	AH3135	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
	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
	Aluminium alloys (Si ≥ 13%)		-	First choice	KS05F	100 - 230	0.04 - 0.12
S	Titanium alloys (Ti-6Al-4V, etc.)		-	First choice	AH130	40 - 90	0.04 - 0.1
	Superalloys (Inconel718, etc.)		-	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
		(SKD11 / X153CrMoV12, etc.)	50 - 60 HRC		AH120	40 - 65	0.04 - 0.06

TUNGFORCE TUNGFREC

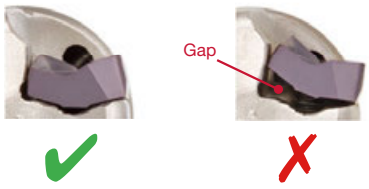
MACHINING APPLICATIONS



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
EPAV06_008…	8	6	-	-	-	-	-	-
EPAV/HPAV06_010…	10	6	3°	0.3	15	19	18	9.5
EPAV/HPAV06_012…	12	6	3°	0.3	18	23	22	11.5
EPAV/HPAV06_014…	14	6	2.3°	0.3	22	27	26	13.5
EPAV/HPAV06_016…	16	6	2°	0.3	28	31	30	15.5
EPAV/HPAV06_018…	18	6	1.6°	0.3	30	35	34	17.5
EPAV/HPAV06_020…	20	6	1.4°	0.3	34	39	38	19.5
EPAV/HPAV06_025…	25	6	1.1°	0.3	44	49	48	24.5
EPAV/HPAV06_032…	32	6	0.8°	0.3	58	63	62	31.5
TPAV06_040…	40	6	0.6°	0.3	74	79	78	39.5

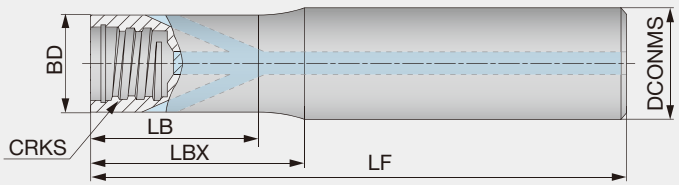
*Flat bottom hole

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



VSSD**-W-A...

TungMeister, straight shank and neck with coolant hole

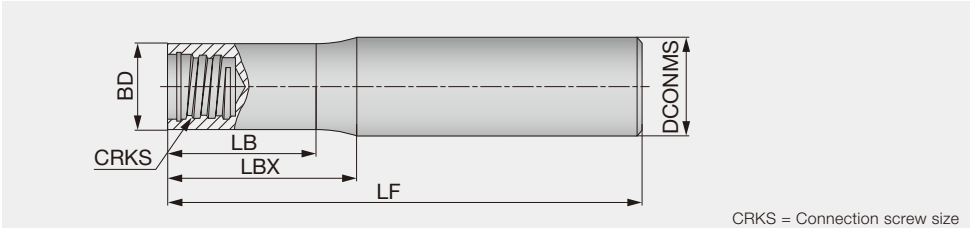


CRKS = Connection screw size

Designation	DCONMS	BD	LF	LBX	LB	CRKS	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...

TungMeister, straight neck and cylindrical shank

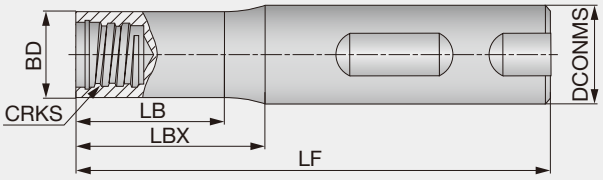


CRKS = Connection screw size

Designation	DCONMS	BD	LF	LBX	LB	CRKS	Type	Material
VSSD08L060S05-S	8	7.6	60	15	12.80	S05	CYLINDRICAL	STEEL
VSSD08L070S05-C	8	7.6	70	20	19	S05	CYLINDRICAL	CARBIDE
VSSD08L090S05-C	8	7.6	90	40	39	S05	CYLINDRICAL	CARBIDE
VSSD08L110S05-C	8	7.6	110	60	59	S05	CYLINDRICAL	CARBIDE
VSSD10L070S06-C	10	9.6	70	20	18.5	S06	CYLINDRICAL	CARBIDE
VSSD10L075S06-S	10	9.6	75	20	19.4	S06	CYLINDRICAL	STEEL
VSSD10L090S06-C	10	9.6	90	40	38.5	S06	CYLINDRICAL	CARBIDE
VSSD10L110S06-C	10	9.6	110	60	58.5	S06	CYLINDRICAL	CARBIDE
VSSD10L150S06-C	10	9.6	150	100	98.5	S06	CYLINDRICAL	CARBIDE
VSSD12L070S08-C	12	11.5	70	20	17	S08	CYLINDRICAL	CARBIDE
VSSD12L090S08-C	12	11.5	90	40	37	S08	CYLINDRICAL	CARBIDE
VSSD12L090S08-S	12	11.5	90	16	13.6	S08	CYLINDRICAL	STEEL
VSSD12L110S08-C	12	11.5	110	60	57	S08	CYLINDRICAL	CARBIDE
VSSD12L130S08-C	12	11.5	130	80	77	S08	CYLINDRICAL	CARBIDE
VSSD16L090S10-C	16	15.2	90	40	38	S10	CYLINDRICAL	CARBIDE
VSSD16L100S10-S	16	15.2	100	20	18	S10	CYLINDRICAL	STEEL
VSSD16L110S10-C	16	15.2	110	60	58	S10	CYLINDRICAL	CARBIDE
VSSD16L130S10-C	16	15.2	130	80	78	S10	CYLINDRICAL	CARBIDE
VSSD16L150S10-C	16	15.2	150	100	98	S10	CYLINDRICAL	CARBIDE
VSSD20L090S12-C	20	18.3	90	40	37	S12	CYLINDRICAL	CARBIDE
VSSD20L120S12-S	20	18.3	120	25	20.5	S12	CYLINDRICAL	STEEL
VSSD20L130S12-C	20	18.3	130	80	77	S12	CYLINDRICAL	CARBIDE
VSSD20L200S12-C	20	18.3	200	120	117	S12	CYLINDRICAL	CARBIDE
VSSD25L120S15-C	25	23.9	120	60	58	S15	CYLINDRICAL	CARBIDE
VSSD25L135S15-S	25	23.9	135	35	33	S15	CYLINDRICAL	STEEL
VSSD25L170S15-C	25	23.9	170	100	98	S15	CYLINDRICAL	CARBIDE
VSSD25L250S15-C	25	23.9	250	150	148	S15	CYLINDRICAL	CARBIDE

VSSD**-W...

TungMeister, straight neck and weldon shank

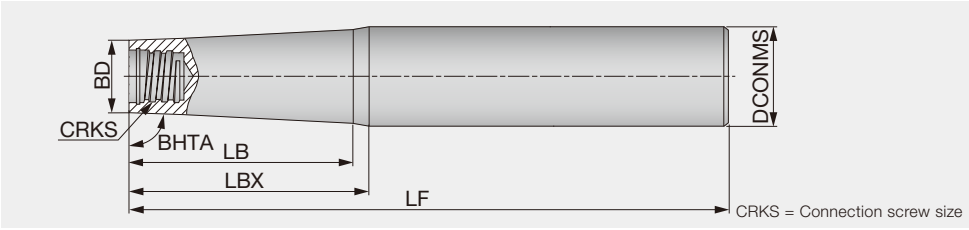


CRKS = Connection screw size

Designation	DCONMS	BD	LF	LBX	LB	CRKS	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...

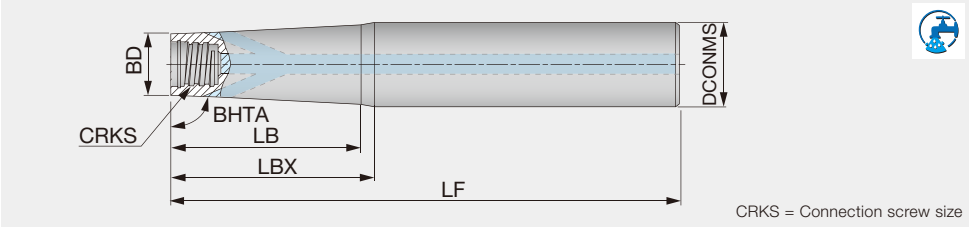
TungMeister, straight shank and taper neck



Designation	BHTA	DCONMS	BD	LF	LBX	LB	CRKS	Material
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
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
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
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
VTSD32L155S15-S	85°	32	23.9	155	45	-	S15	STEEL
VTSD32L190S12-S	85°	32	18.3	190	80	-	S12	STEEL
VTSD32L220S15-S	85°	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

VTSD**-W-A...

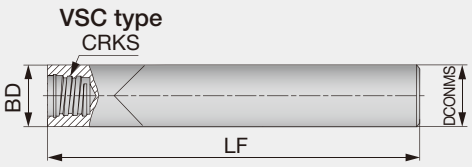
TungMeister, straight shank and taper neck with coolant hole

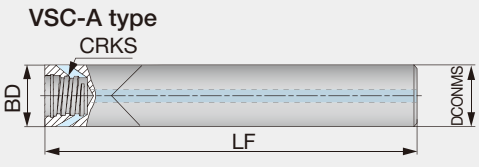


Designation	BHTA	DCONMS	BD	LF	LBX	LB	CRKS	Material
VTSD12L110S06-W-A	89°	12	9.6	110	60	59	S06	TUNGSTEN
VTSD16L170S06-W-A	89°	16	9.6	170	120	116	S06	TUNGSTEN

VSC...

TungMeister, straight shank for VST type slotting heads





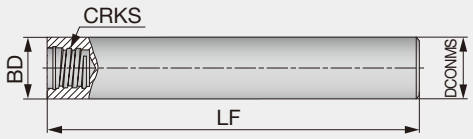
CRKS = Connection screw size

Designation	DCONMS	BD	LF	CRKS	Air hole	Material
VSC100L100S06-C	10	10	100	S06	without	CARBIDE
VSC120L100S08-C-A	12	12	100	S08	with	CARBIDE

Note: • 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...

TungMeister, straight shank for VTB type slotting heads



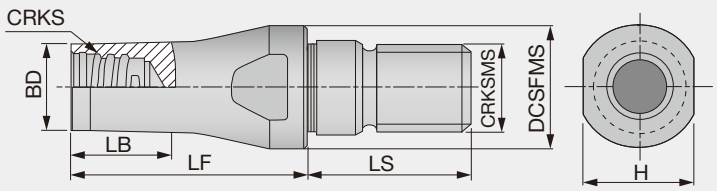
CRKS = Connection screw size

Designation	DCONMS	BD	LF	CRKS	Material
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

Note: • For VSTD type shank, just VTB grooving 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 adaptor with TungMeister

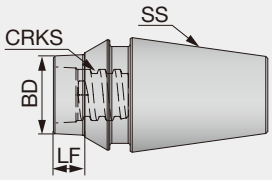


CRKS = Connection screw size

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

VER...

ER collet chucks conversion adaptor with TungMeister



CRKS = Connection screw size

Designation	SS	BD	LF	CRKS
VER11CL006S05-S	ER11	7.92	6	S05
VER11CL020S05-S	ER11	7.92	20	S05
VER16CL012S05-S	ER16	7.92	12	S05
VER16CL020S05-S	ER16	7.92	20	S05
VER16CL010S06-S	ER16	9.92	10	S06
VER16CL020S06-S	ER16	9.92	20	S06
VER16CL006S08-S	ER16	11.6	6	S08
VER16CL020S08-S	ER16	11.6	20	S08

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	for T-Slotting
AD	TungFlex adapter
ER	ER collet holder

③ Shank diameter (mm)	
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	
11C	Collet size
16C	Collet size

④ Length (mm)	
L070	70

⑤ Shape of shank	
S	Cylindrical
W	Weldon

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

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	for high feed
CA	for chamfering
CP	Spot drilling
CW	for chamfering (front and back)
CR	for R chamfering
GC	for counter boring
DP	for center drilling
S	for slotting
T	for T-slot milling

③ Helix angle / Rake face	
B	0°
C	15°
D	30°
E	38° ~ 50°
F	60°
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

⑦ Additional feature	
I	Irregular pitch
A	for aluminium
R	for roughing
C	Combined edge

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

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

WRENCH

Appearance	Designation	Connection screw size	Torque (N·m)	Applicable head
	KEYV-S05	S05	7	Square Ball Radius Drilling Chamfering Counter boring
	KEYV-S06	S06	10	
	KEYV-S08	S08	15	
	KEYV-S10	S10	28	
	KEYV-S12	S12	28	
	KEYV-W20	S15	40	
	KEYV-177	S06	10	Slotting VST type
	KEYV-217	S08	15	
	KEYV-T40L	S08	15	Slotting VST, VTB type
		S10	28	
	KEYV-T20	S05	7	Slotting VTB type
		S06	10	
	KEYV-T25	S06	10	
	KEYV-T30L	S08	15	
	KEYV-T50L	S08	15	
		S10	28	

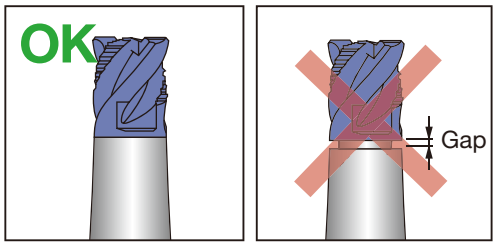
Note: Optional parts

TORQUE WRENCHES

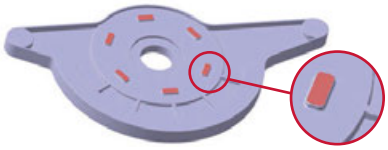
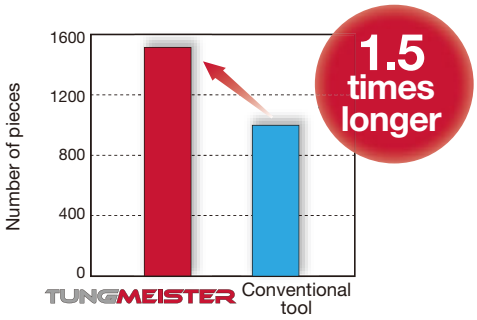
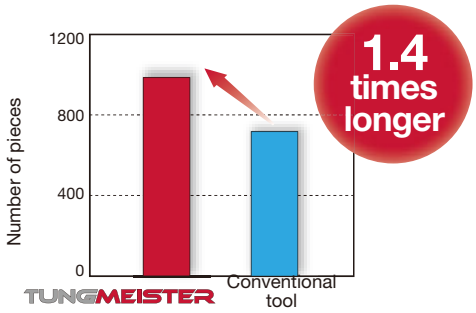
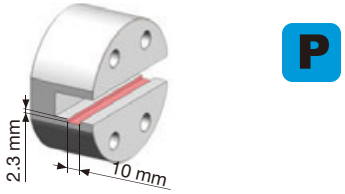
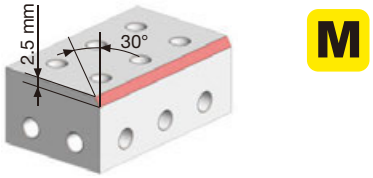
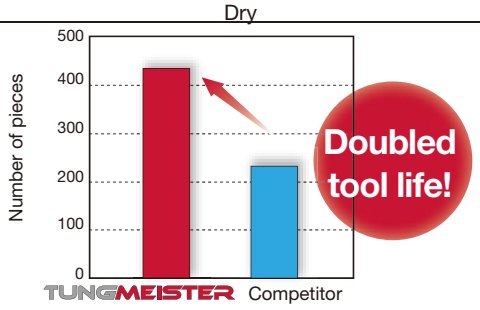
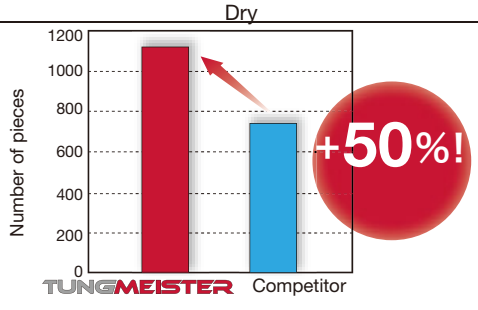
Appearance		Description	Stock	Connection	TM Head description	Torque (N·m)
Handle		TORQUEWRENCH5-50NM9x12	●	-	-	-
Open wrenches for cylindrical heads		TM-WRENCH-6-05	●	S05	VED, VEE VEE-I, VEE-R VEE-C, VEE-A VRD, VBD-BG VBE-BGA VDP, VCA	7
		TM-WRENCH-8-06	●	S06		10
		TM-WRENCH-10-08	●	S08		15
		TM-WRENCH-13-10	●	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, VBB-BM VBB-BG VCP, VGC VCW, VCR, VBB-SG	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° adaptor for Torx bits		INSERT-TOOL-9X12MM	●	-	-	-
Torx bits sockets		BIT-SOCKET-T20-DRIVE	●	S05, S06	VTB135 VTB160W2.00 VTB165W2.00	7, 10
		BIT-SOCKET-T25-DRIVE	●	S06	VTB160W3.00 VTB160W4.00	10
		BIT-SOCKET-T30-DRIVE	●	S08	VTB165W3.00	15
		BIT-SOCKET-T40-DRIVE	●	S08, S10	VTB165W4.00 VTB195	15, 28
		BIT-SOCKET-T50-DRIVE	●	S08, S10	VST277 VTB225 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.



PRACTICAL EXAMPLES

Workpiece type		Cover	Bolt sheat
Shank		VSSD16L100S10-S (Steel, ø16)	VSSD16L100S10-S (Steel, ø16)
Head		VED160L12.0R05-04S10 (ø16)	VED160L12.0C60I04S10 (ø16)
Grade		AH715	AH715
Workpiece material		FC250	FCD400
			
Cutting conditions	**Cutting speed :*Vc* (m/min)**	250	60
	Feed per tooth :*fz* (mm/t)	0.12	0.08
	Depth of cut :*ap* (mm)	1	2
	Width of cut :*ae* (mm)	10	16
	Coolant	Dry	Wet
Results		 AH715 adopted latest coating layer, so it was improved wear and chipping resistance. The result was 1.5 times longer and more stable tool life than conventional tool.	 AH715 adopted latest coating layer, so it was improved wear resistance. The result was 1.4 times longer tool life than conventional tool, and surface finish was kept good longer time.
Workpiece type		Machine parts	Machine parts
Shank		VSTD10L080S06-S (Steel, ø10)	VSSD16L100S10-S (Steel, ø16)
Head		VTB160W4.00R04-06S06 (ø16)	VCP160L15.0A30-02S10 (ø16)
Grade		GH130	AH725
Workpiece material		Alloy steels SCM440 (42CrMo4)	Stainless steels SUS316 (X5CrNiMo17-12-2)
			
Cutting conditions	**Cutting speed :*Vc* (m/min)**	110	160
	Feed per tooth :*fz* (mm/t)	0.07	0.1
	Depth of cut :*ap* (mm)	2.3	2.5
	Width of cut :*ae* (mm)	4 + 4 + 2	1.4
	Coolant	Dry	Dry
Results		 TungMeister eliminates any need for regrinding.	 TungMeister reduces changeover time to 1/10 compared to competitor's solid endmill.

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 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 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 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 Germany GmbH
An der Alten Ziegelei 1
D-40789 Monheim, Germany
Phone: +49-2173-90420-0
Fax: +49-2173-90420-19
www.tungaloy.com/de

Tungaloy France S.A.S.
ZA Courtaboeuf - Le Rio
1 rue de la Terre de feu
F-91952 Courtaboeuf Cedex, France
Phone: +33-1-6486-4300
Fax: +33-1-6907-7817
www.tungaloy.com/fr

Tungaloy Italia S.r.l.
Via E. Andolfato 10
I-20126 Milano, Italy
Phone: +39-02-252012-1
Fax: +39-02-252012-65
www.tungaloy.com/it

Tungaloy Czech s.r.o.
Turanka 115
CZ-627 00 Brno, Czech Republic
Phone: +420-532 123 391
Fax: +420-532 123 392
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
Fax: +34 93 876 2798
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 U.K. Ltd
Gallan Park, Watling Street,
Cannock, WS110XG, 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 Cutting Tools (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, #06-11 Oxley BizHub 2
Singapore 408734
Phone: +65-6391-1833
Fax: +65-6299-4557
www.tungaloy.com/sg

Tungaloy Vietnam
LE04.38, Lexington Residence
67 Mai Chi Tho St., Dist. 2,
Ho Chi Minh City, Vietnam
Phone: +84-2837406660
www.tungaloy.com/sg

Tungaloy India Pvt. Ltd.
Indiabulls Finance Centre,
Unit # 902-A, 9th Floor,
Tower 1, Senapati Bapat Marg,
Elphinstone Road (West),
Mumbai -400013, India
Phone: +91-22-6124-8804
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
Kompleks Grand Wisata Block AA-10 No.3-5
Cibitung
Bekasi 17510, Indonesia
Phone: +62-21-8261-5808
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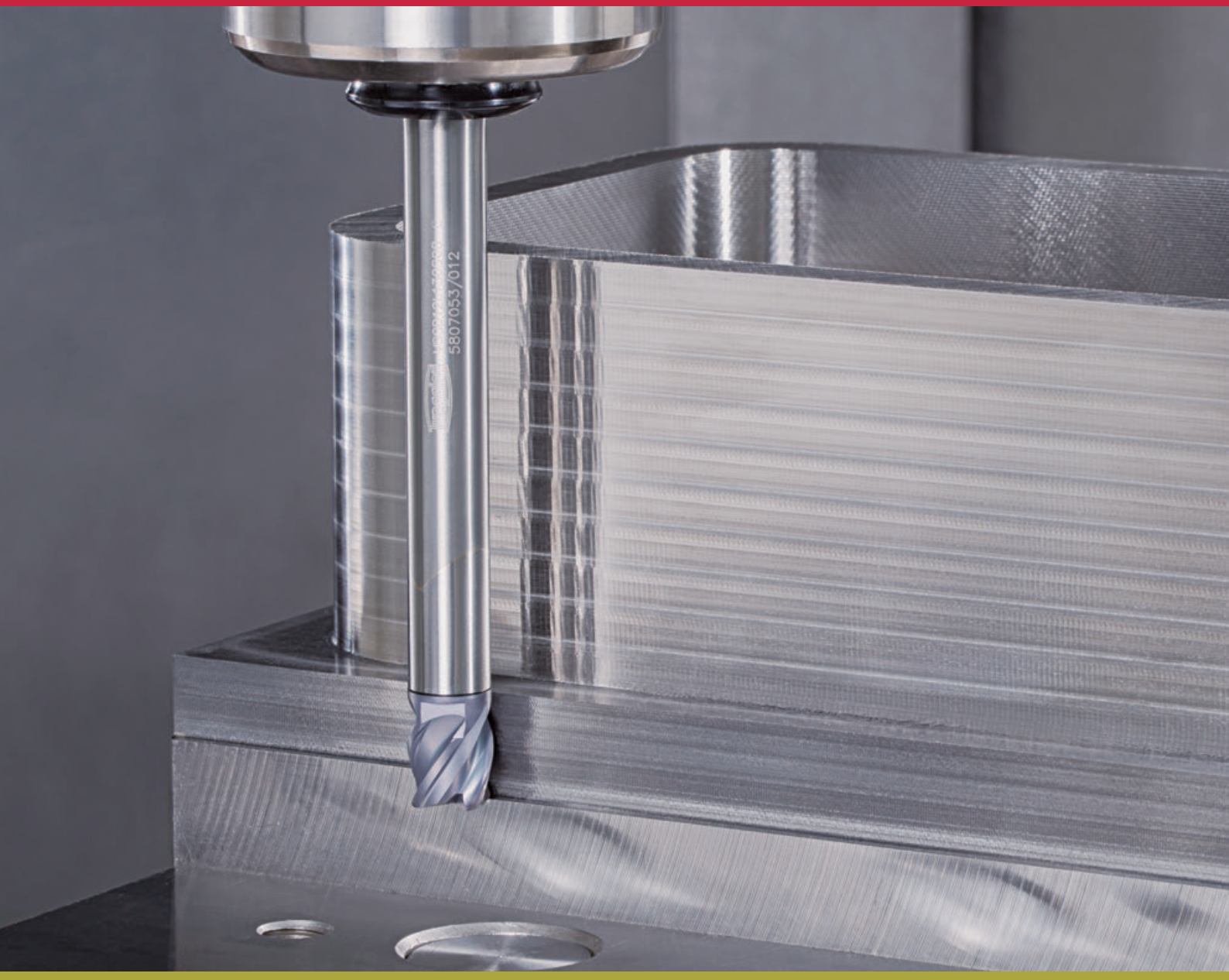
Tungaloy Report No. 381S1-G

New Grade AH715 for longer tool life



INDUSTRY 4.0

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ACCELERATED MACHINING

MillLine

TUNGMEISTER

TUNGALOY

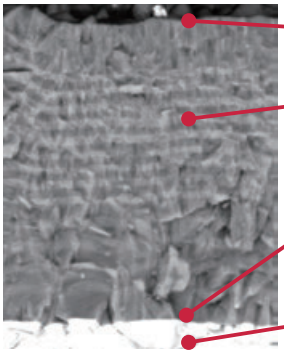
The most effective tooling solution with the option of hundreds of tools!

Tool changeover times can be measurably reduced!

The new grade provides longer tool life thanks to the latest coating layer

New AH715

- Unique nano-multilayered coating is made possible by Tungaloy's latest coating technology, providing 3 principal features



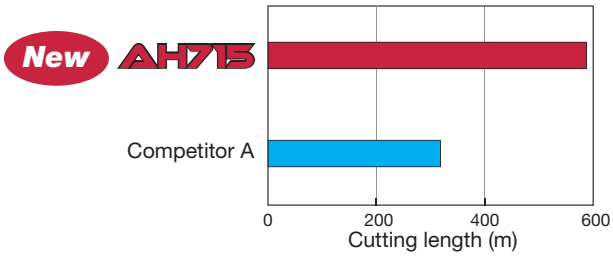
Feature 1: Resistance to builtup-edge
Coating layer to resist builtup-edge

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

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

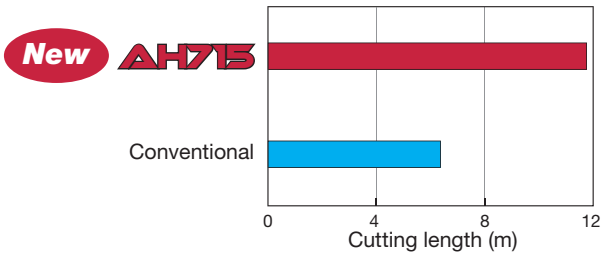
Substrate
Carbide substrate features wear and fracture resistance

Tool life comparison in steel milling
AH715 provides longer tool life than existing grade



P
Steel

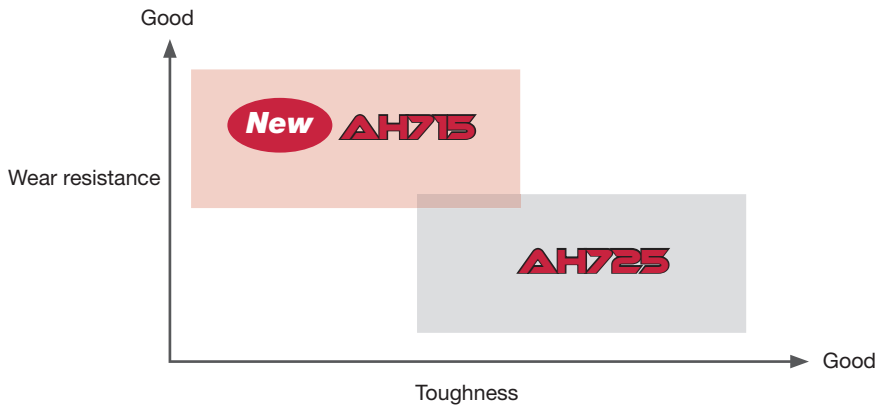
Shank	: VSSD16L100S10-S
Head	: VED160L12.0R05-04S10
Workpiece material	: C55 (1055)
Cutting speed	: Vc = 150 m/min
Feed per tooth	: fz = 0.12 mm/t
Depth of cut	: ap = 5 mm
Width of cut	: ae = 1.5 mm
Machine	: V M/C, BT40



H
Hard material

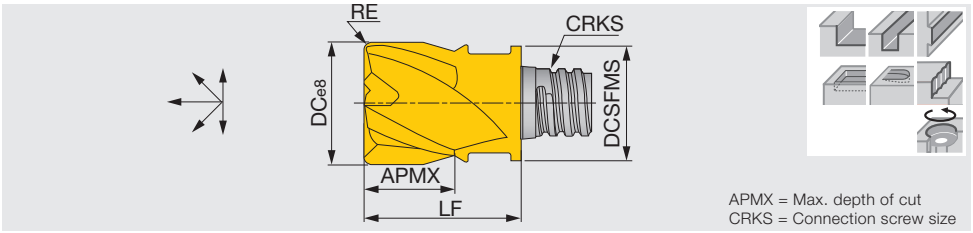
Shank	: VSSD16L100S10-S
Head	: VED160L12.0R05-04S10
Workpiece material	: SKD11(D2) (HRC58)
Cutting speed	: Vc = 60 m/min
Feed per tooth	: fz = 0.05 mm/t
Depth of cut	: ap = 5 mm
Width of cut	: ae = 0.5 mm
Machine	: V M/C, BT40

APPLICATION RANGE



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

TungMeister square head with 4 flutes for general purposes



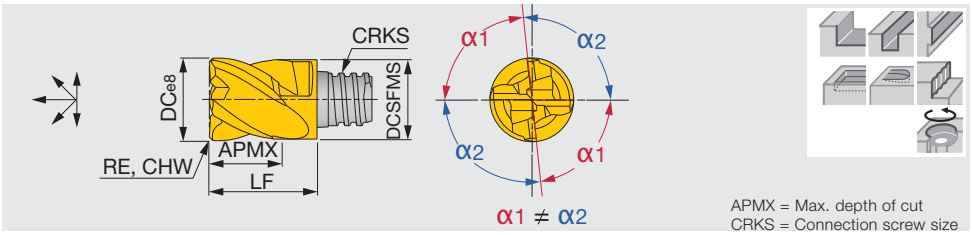
Designation	New	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEE160L12.0R00-04S10		●	●	4	45°	16	15.3	12	-	S10	20.5	KEYV-S10	28
VED160L12.0R05-04S10		●	●	4	30°	16	15.3	12	0.5	S10	20.5	KEYV-S10	28

*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up
●: New

VEE**I...

TungMeister square head with irregular pitch flute for chatter free cutting



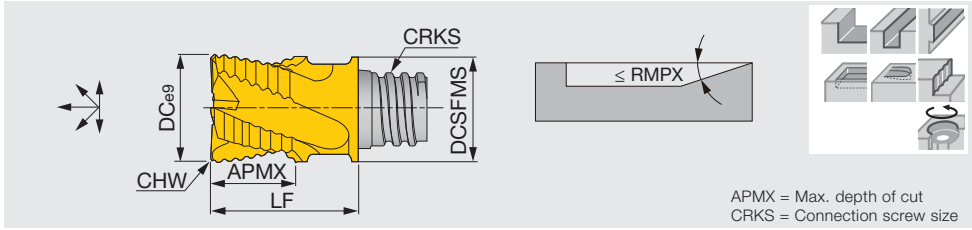
Designation	New	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CHW	CRKS	LF	Wrench	Torque*
VEE160L12.0C60I04S10		●	●	4	38°	16	15.3	12	-	0.6	S10	20.5	KEYV-S10	28

*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up
●: New

VEE**R...

TungMeister square head with serated edges for roughing



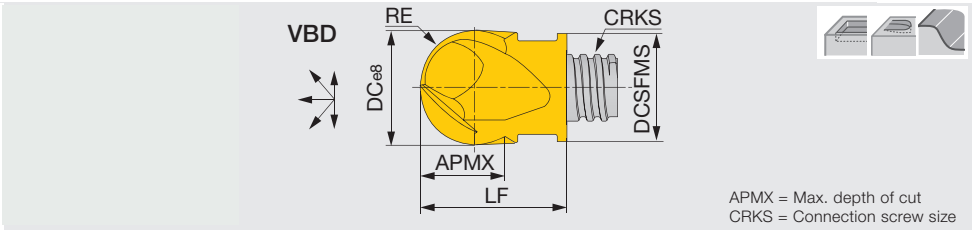
Designation	New	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	CHW	CRKS	LF	RMPX	Wrench	Torque*
VEE160L12.0C40R05S10		●	●	5	45°	16	15.3	12	0.4	S10	20.5	7°	KEYV-S10	28

*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up
●: New

VBD**-BG...

TungMeister ball nose head with 4 flutes and helical ground edge for finishing



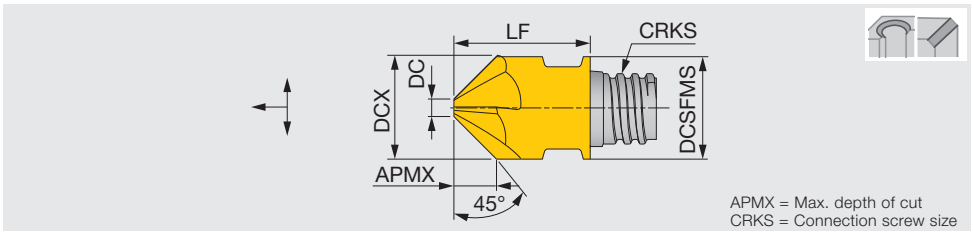
Designation	New	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VBD160L12.0-BG-04S10		●	●	4	30°	16	15.3	12	7.978	S10	20.5	KEYV-S10	28

• The tolerance of R : ± 0.012
*Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up
●: New

VCA**-06...

TungMeister head with 4 or 6 flutes for countersinking and chamfering

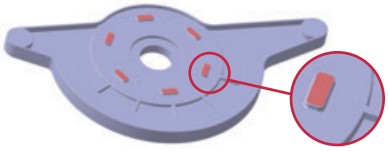
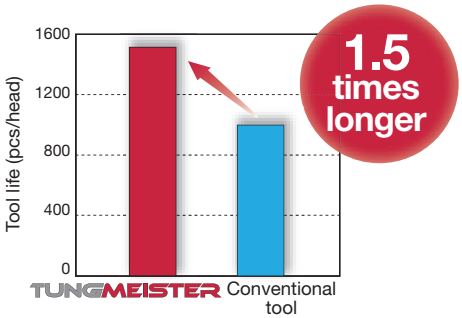
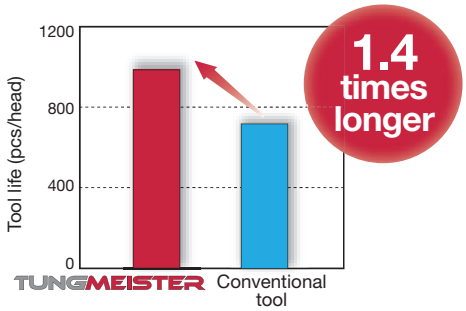


Designation	New	AH715	AH725	NOF	FHA	DCX	DCSFMS	APMX	DC	CRKS	LF	Wrench	Torque*
VCA160L06.5A45-06S10		●	●	6	0°	16	16	6.5	3	S10	20.3	KEYV-S10	28

**Torque: Recommended torque (N·m) for clamping.
Packing quantity = 2 pcs.

●: Line up
●: New

PRACTICAL EXAMPLES

Workpiece type		Cover	Bolt sheat
Shank		VSSD16L100S10-S (Steel, ø16)	VSSD16L100S10-S (Steel, ø16)
Head		VED160L12.0R05-04S10 (ø16)	VED160L12.0C60I04S10 (ø16)
Grade		AH715	AH715
Workpiece material		FC250	FCD400
			
Cutting conditions	Cutting speed :*Vc* (m/min)	250	60
	Feed per tooth :*fz* (mm/t)	0.12	0.08
	Depth of cut :*ap* (mm)	1	2
	Width of cut :*ae* (mm)	10	16
	Coolant	Dry	Wet
Results		 AH715 adopted latest coating layer, so it was improved wear and chipping resistance. The result was 1.5 times longer and more stable tool life than conventional tool.	 AH715 adopted latest coating layer, so it was improved wear resistance. The result was 1.4 times longer tool life than conventional tool, and surface finish was kept good longer time.

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 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 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 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 Germany GmbH
An der Alten Ziegelei 1
D-40789 Monheim, Germany
Phone: +49-2173-90420-0
Fax: +49-2173-90420-19
www.tungaloy.com/de

Tungaloy France S.A.S.
ZA Courtaboeuf - Le Rio
1 rue de la Terre de feu
F-91952 Courtaboeuf Cedex, France
Phone: +33-1-6486-4300
Fax: +33-1-6907-7817
www.tungaloy.com/fr

Tungaloy Italia S.r.l.
Via E. Andolfato 10
I-20126 Milano, Italy
Phone: +39-02-252012-1
Fax: +39-02-252012-65
www.tungaloy.com/it

Tungaloy Czech s.r.o.
Turanka 115
CZ-627 00 Brno, Czech Republic
Phone: +420-532 123 391
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Tungaloy Ibérica S.L.
C/Miquel Servet, 43B, Nau 7
Pol. Ind. Bufalvent
ES-08243 Manresa (BCN), Spain
Phone: +34 93 113 1360
Fax: +34 93 876 2798
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 U.K. Ltd
Gallan Park, Watling Street,
Cannock, WS110XG, 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
Dudullu,OSB 4. Cad No:4
34776 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
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www.tungaloy.com/nl

Tungaloy Croatia
Ulica bana Josipa Jelačića 87,
10430, Samobor, Croatia
Phone: +385 1 3326 604
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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,
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24251 Taiwan
Phone: +886-2-8521-9986
Fax: +886-2-8521-8935
www.tungaloy.com/tw

Tungaloy Cutting Tools (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, #06-11 Oxley BizHub 2
Singapore 408734
Phone: +65-6391-1833
Fax: +65-6299-4557
www.tungaloy.com/sg

Tungaloy Vietnam
LE04.38, Lexington Residence
67 Mai Chi Tho St., Dist. 2,
Ho Chi Minh City, Vietnam
Phone: +84-2837406660
www.tungaloy.com/sg

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Unit # 902-A, 9th Floor,
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Beotkkot-ro 244, Geumcheon-gu
153-788 Seoul, Korea
Phone: +82-2-2621-6161
Fax: +82-2-6393-8952
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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
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Tungaloy Australia Pty Ltd
Unit 68 1470 Ferntree Gully Road
Knoxfield 3180 Victoria, Australia
Phone: +61-3-9755-8147
Fax: +61-3-9755-6070
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Kompleks Grand Wisata Block AA-10 No.3-5
Cibitung
Bekasi 17510, Indonesia
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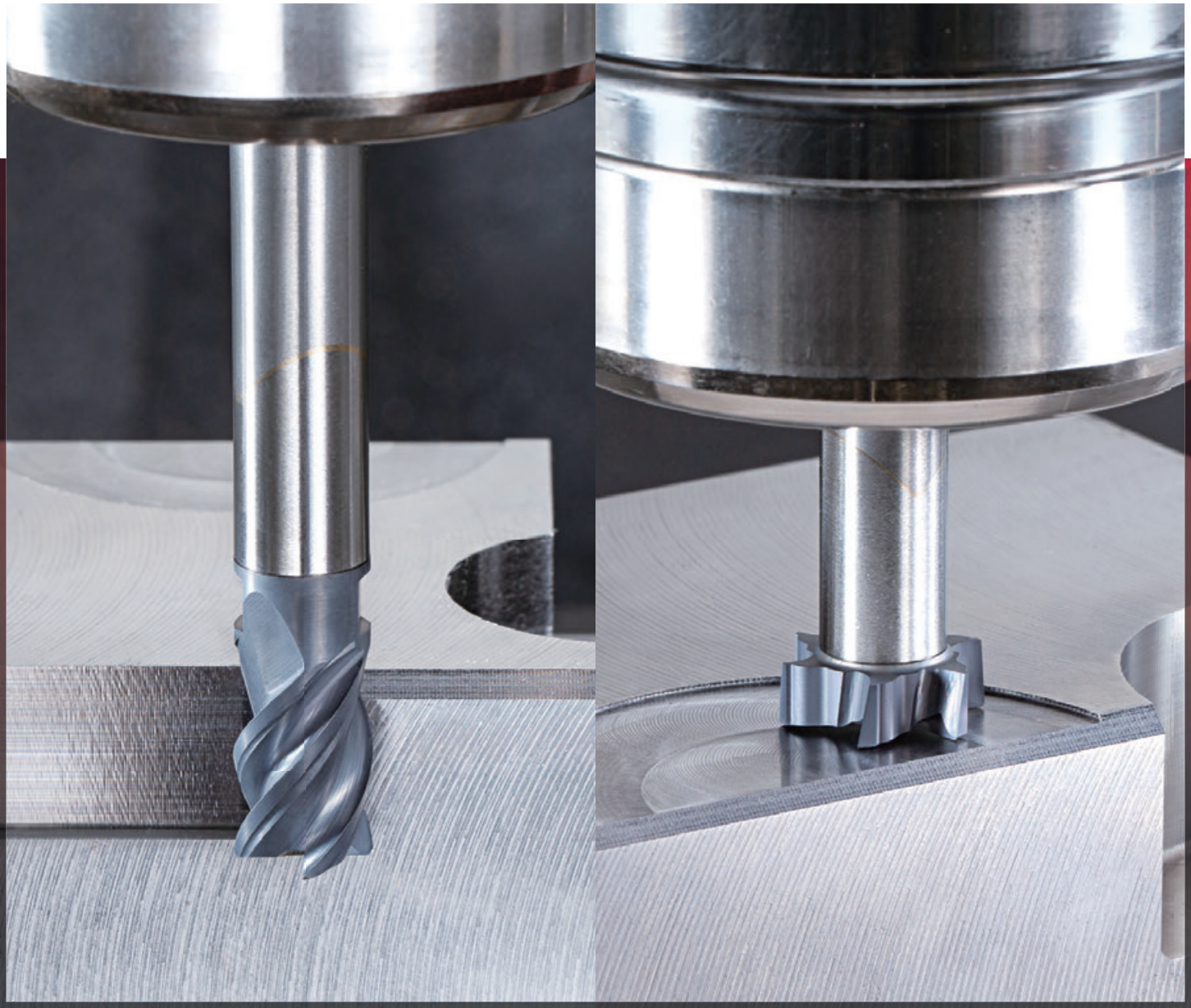
MillLine
Expansion 2

TUNGMEISTER

Tungaloy Report No. 381S2-G

Now offers **exchangeable heads with long cutting edge** and **face milling capability**



TUNGALOY ADDFORCE ACCELERATED LINES

TUNGMEISTER

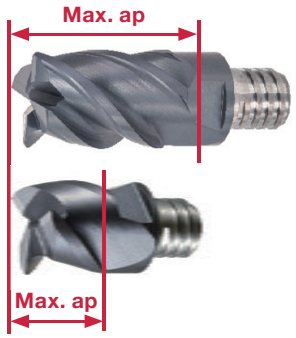
For more information

Expansion to TungMeister series: **New VEH milling head** with 1.5xD flute length and high-rigidity shanks

New TungMeister **VEH** style milling head features 1.5xD flute length. This design ensures chatter-free roughing and finishing operations at double DOC compared to existing milling heads' of the same diameters. Combined with a new high-rigidity shank holder, TungMeister further expands its application coverage.

Long flute with 1.5xD

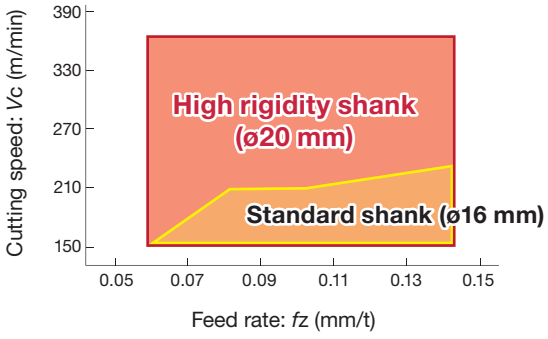
The new **VEH** head enables deep wall cutting thanks to long effective cutting edges.



Diameter (mm)	Max. *ap* (mm)	
	VEH Long 1.5xD	VEH Standard 0.75xD
8	**12**	6
10	**15**	7
12	**18**	9
16	**24**	12
20	**30**	15

Benefit of new high-rigidity shank

The new **VEH** head enables a broader application range when combined with the high rigidity shank holder. Large diameter shank provides increased rigidity.



P

Workpiece material	: S55C / C55 (204HB)
Tool dia.	: ø16 mm
Tool overhang	: 54 mm
Depth of cut	: *ap* = 16 mm
Width of cut	: *ae* = 4 mm
Coolant	: Dry
Machine	: Vertical M/C (BT40)

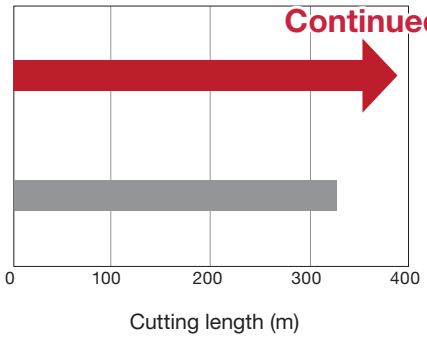
Long tool life

The **new VEH** head 1.5xD is available in **AH715** - Tungaloy's latest PVD grade for milling applications.

Tool life comparisons in carbon steel: S55C / C55 (206HB)

VEH head
Head:
VEH160L24.0R05I04S10
Shank:
VSSD16L100S10-S

Competitor
Head: ø16 mm, z = 4
Shank: ø16 mm, steel



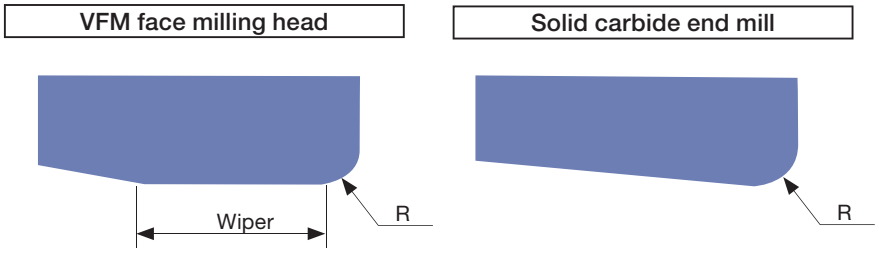
Cutting speed	: *Vc* = 150 m/min
Holder	: BBT40-MEGA20D-75
Tool overhang	: 36 mm
Feed per tooth	: *fz*=0.15 mm/t
Depth of cut	: *ap* = 16 mm
Width of cut	: *ae* = 2 mm
Coolant	: Dry
Machine	: Horisontal M/C (BT40)

Expansion to TungMeister series: **New VFM face milling head**

New TungMeister **VFM** face milling head features an optimal cutting edge geometry that is designed to improve integrity of the worked surface when the surface quality requirement is not satisfied with an existing end mill. The cutter head has a 6-flute close-pitch design allowing high productivity machining.

Optimal wiper design

The **VFM** cutting edge incorporates a built-in wiper that will provide better surface quality during face milling applications than standard solid carbide end mills.



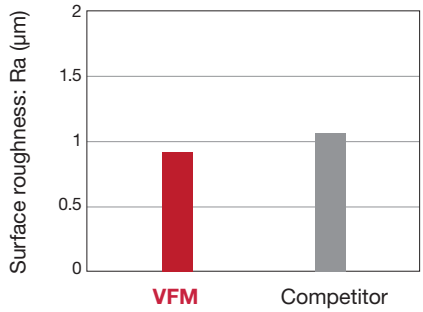
The head diameter is designed to be larger than the shank diameter to avoid interference with the part or fixture

Suited for machining close to the wall or long reach face milling with a small entrance

Head ø > Shank ø

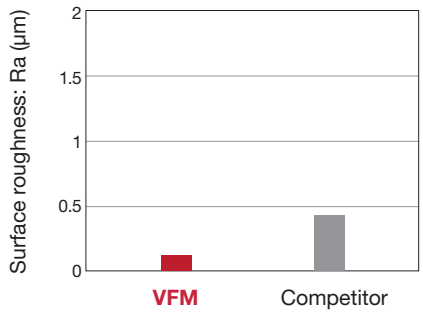
Excellent surface finish

P S55C / C55 (204HB)



Tool dia.	: ø20 mm
Shank dia.	: ø12 mm
Tool overhang	: 30 mm
Cutting speed	: *Vc* = 200 m/min
Feed per tooth	: *fz*=0.1 mm/t
Depth of cut	: *ap* = 1 mm
Width of cut	: *ae* = 12 mm
Coolant	: Dry
Machine	: Vertical M/C (BT30)

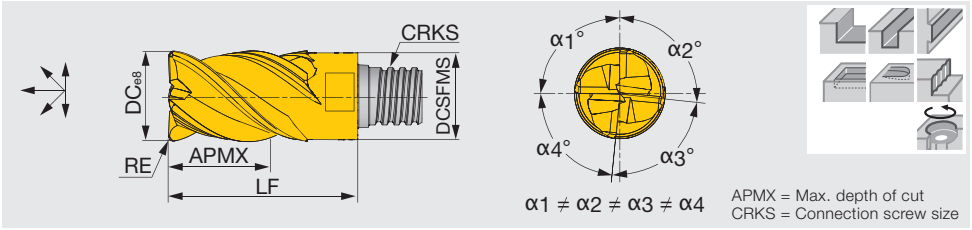
M SUS304 / X5CrNi18-9



Tool dia.	: ø20 mm
Shank dia.	: ø12 mm
Tool overhang	: 30 mm
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
Coolant	: Wet
Machine	: Vertical M/C (BT30)

VEH...

4 flute square head, long cutting edge, for general purpose



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

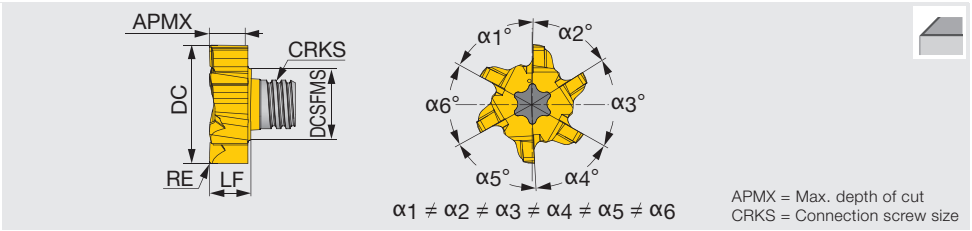
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEH080L12.0R05I04S05	●	4	41 - 45°	8	7.7	12	0.5	S05	18	KEYV-S05	7
VEH080L12.0R10I04S05	●	4	41 - 45°	8	7.7	12	1.0	S05	18	KEYV-S05	7
VEH100L15.0R05I04S06	●	4	41 - 45°	10	9.7	15	0.5	S06	22	KEYV-S06	10
VEH100L15.0R10I04S06	●	4	41 - 45°	10	9.7	15	1.0	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	1.0	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	1.0	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	1.0	S12	41	KEYV-S12	28

*Torque: Recommended torque (N·m) for clamping.
Packaging quantity:
VEH080, VEH100, VEH120 and VEH160 = 2 pcs.
VEH200 = 1 pcs.

●: New

VFM...

6 flute face milling head



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

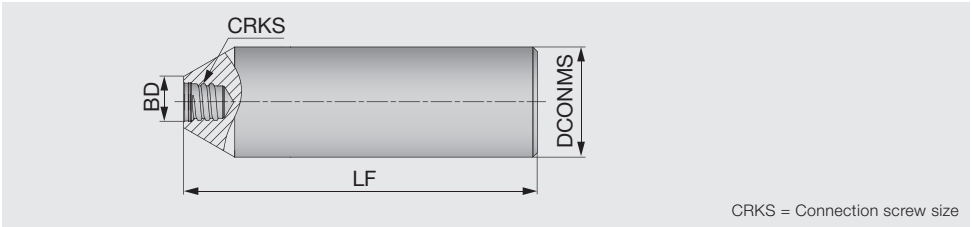
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VFM120L03.6R02I06S05	★	6	10°	12	7.7	3.6	0.2	S05	4.4	KEYV-T20	7
VFM160L04.8R04I06S06	★	6	10°	16	9.7	4.8	0.4	S06	5.6	KEYV-T25	10
VFM200L06.0R04I06S08	★	6	10°	20	11.7	6	0.4	S08	7	KEYV-T40L	15

*Torque: Recommended torque (N·m) for clamping.
Packaging quantity = 2 pcs.

★: To be released in September 2020

VSSD...

High rigidity shank



CRKS = Connection screw size

Designation	DCONMS	BD	LF	CRKS	Type	Material
VSSD10L055S05-S	10	7.6	55	S05	Cylindrical	Steel
VSSD12L065S06-S	12	9.6	65	S06	Cylindrical	Steel
VSSD16L065S08-S	16	11.6	65	S08	Cylindrical	Steel
VSSD20L070S10-S	20	15.3	70	S10	Cylindrical	Steel
VSSD25L075S12-S	25	18.3	75	S12	Cylindrical	Steel
VSSD32L100S15-S	32	23.9	100	S15	Cylindrical	Steel

TUNGMEISTER

STANDARD CUTTING CONDITIONS

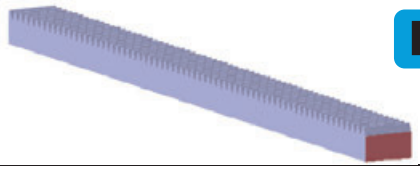
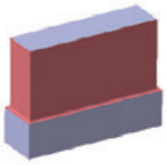
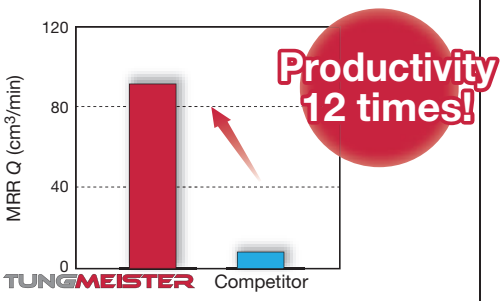
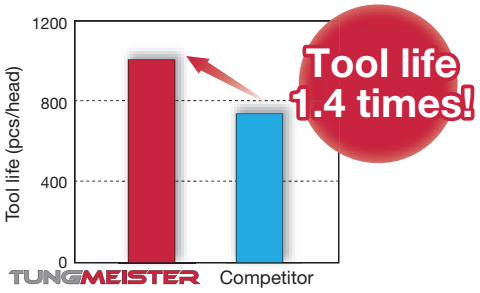
Shoulder milling

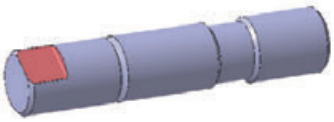
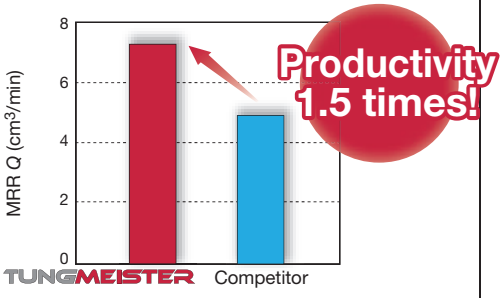
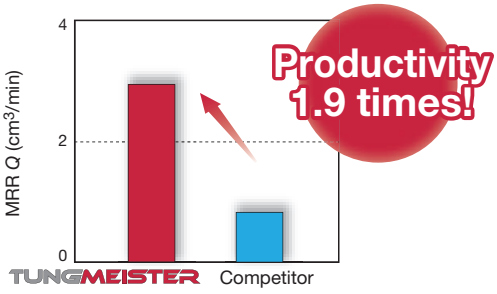
ISO	Workpiece material	Hardness	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool diameter: DC (mm) 8	10	12	16	20	Depth of cut *ap* (mm)	Pick feed *Pf* (mm)
P	Low carbon steels S45C, S55C, etc. C45, C55, etc.	- 300 HB	80 - 180	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	1 x øDc	0.25 x øDc
	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, 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	1 x øDc	0.25 x øDc
	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	1 x øDc	0.25 x øDc
M	Stainless steels 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	1 x øDc	0.25 x øDc
K	Grey cast irons FC250, FC300, etc. 250, 300, 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	1 x øDc	0.25 x øDc
	Ductile cast irons FCD400, etc. 400-15S, 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	1 x øDc	0.25 x øDc
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	1 x øDc	0.25 x øDc
	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	1 x øDc	0.25 x øDc
S	Titanium alloys Ti-6Al-4V, etc.	-	40 - 80	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	1 x øDc	0.05 x øDc
	Heat-resistant alloys Inconel 718, etc.	-	20 - 40	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.10 - 0.17	1 x øDc	0.05 x øDc
H	Hardened steel SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, 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	1 x øDc	0.05 x øDc
	Hardened steel SKD11, SKH, etc. X153CrMoV12, HS18-0-1, 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	1 x øDc	0.05 x øDc

Slot milling

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	Low carbon steels 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	0.5 x øDc
	High carbon steels SCM440, SCr415, etc. 42CrMo4, 15Cr3, 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	0.5 x øDc
	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	0.5 x øDc
M	Stainless steels 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	0.5 x øDc
K	Grey cast irons FC250, FC300, etc. 250, 300, 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	0.5 x øDc
	Ductile cast irons FCD400, etc. 400-15S, 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	0.5 x øDc
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	0.5 x øDc
	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	0.5 x øDc
S	Titanium alloys Ti-6Al-4V, etc.	-	40 - 80	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.5 x øDc
	Heat-resistant alloys Inconel 718, etc.	-	20 - 40	0.05 - 0.09	0.07 - 0.12	0.08 - 0.13	0.09 - 0.15	0.1 - 0.17	0.5 x øDc
H	Hardened steel SKD61, SKT4, etc. X40CrMoV5 1, 55NiCrMoV6, 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	0.2 x øDc
	Hardened steel SKD11, SKH, etc. X153CrMoV12, HS18-0-1, 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	0.2 x øDc

PRACTICAL EXAMPLES

Workpiece type		Rack	Small part
Shank		VSSD25L075S12-S (ø25)	VSSD16L130S10-C (ø16)
Head		VEH200L30.0R05I04S12 (ø20)	VEH160L24.0R05I04S10 (ø16)
Grade		AH715	AH715
Workpiece material		SCM440 / 42CrMo4	FCD400
		 P	 K
Cutting conditions	Cutting speed : *Vc* (m/min)	140	100
	Feed per tooth : *fz* (mm/t)	0.08	0.04
	Depth of cut : *ap* (mm)	24	15
	Width of cut : *ae* (mm)	5.5	1
	Coolant	Wet	Wet
Results		 TungMeister can improve width of cut thanks to excellent anti-vibration design.	 The nano-multilayer PVD coating of AH715 provides improved wear resistance. The result was 1.4 times longer tool life than conventional tool with better surface finish.

Workpiece type		Housing	Shaft
Shank		VSSD10L075S06-S (ø10)	VER11CL020S05-S (ø8)
Head		VFM160L04.8R04I06S06 (ø16)	VFM120L03.6R02I06S05 (ø12)
Grade		AH715	AH715
Workpiece material		Cast stainless steel	S45C / C45
		 M	 P
Cutting conditions	Cutting speed : *Vc* (m/min)	100	60
	Feed per tooth : *fz* (mm/t)	0.1	0.05
	Depth of cut : *ap* (mm)	0.5	1
	Width of cut : *ae* (mm)	12	6
	Coolant	Wet	Wet
Results		 150% productivity has been achieved due to increased number of cutting edges. The latest AH715 grade and reduced work per cutting edge have enabled longer tool life with no compromise to surface finish.	 The customer had to use a small diameter end mill because of machine limitation. TungMeister VFM has allowed a larger diameter and reduced tool passes. Vibration has been eliminated thanks to irregular pitch despite 6 flutes. The result: 190% productivity with 1/3 machining time.

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 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 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 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 Germany GmbH
An der Alten Ziegelei 1
D-40789 Monheim, Germany
Phone: +49-2173-90420-0
Fax: +49-2173-90420-19
www.tungaloy.com/de

Tungaloy France S.A.S.
ZA Courtaboeuf - Le Rio
1 rue de la Terre de feu
F-91952 Courtaboeuf Cedex, France
Phone: +33-1-6486-4300
Fax: +33-1-6907-7817
www.tungaloy.com/fr

Tungaloy Italia S.r.l.
Via E. Andolfato 10
I-20126 Milano, Italy
Phone: +39-02-252012-1
Fax: +39-02-252012-65
www.tungaloy.com/it

Tungaloy Czech s.r.o.
Turanka 115
CZ-627 00 Brno, Czech Republic
Phone: +420-532 123 391
Fax: +420-532 123 392
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
Fax: +34 93 876 2798
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 U.K. Ltd
Gallan Park, Watling Street,
Cannock, WS110XG, 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 Cutting Tools (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, #06-11 Oxley BizHub 2
Singapore 408734
Phone: +65-6391-1833
Fax: +65-6299-4557
www.tungaloy.com/sg

Tungaloy Vietnam
LE04.38, Lexington Residence
67 Mai Chi Tho St., Dist. 2,
Ho Chi Minh City, Vietnam
Phone: +84-2837406660
www.tungaloy.com/sg

Tungaloy India Pvt. Ltd.
Indiabulls Finance Centre,
Unit # 902-A, 9th Floor,
Tower 1, Senapati Bapat Marg,
Elphinstone Road (West),
Mumbai -400013, India
Phone: +91-22-6124-8804
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
Kompleks Grand Wisata Block AA-10 No.3-5
Cibitung
Bekasi 17510, Indonesia
Phone: +62-21-8261-5808
Fax: +62-21-8261-5809
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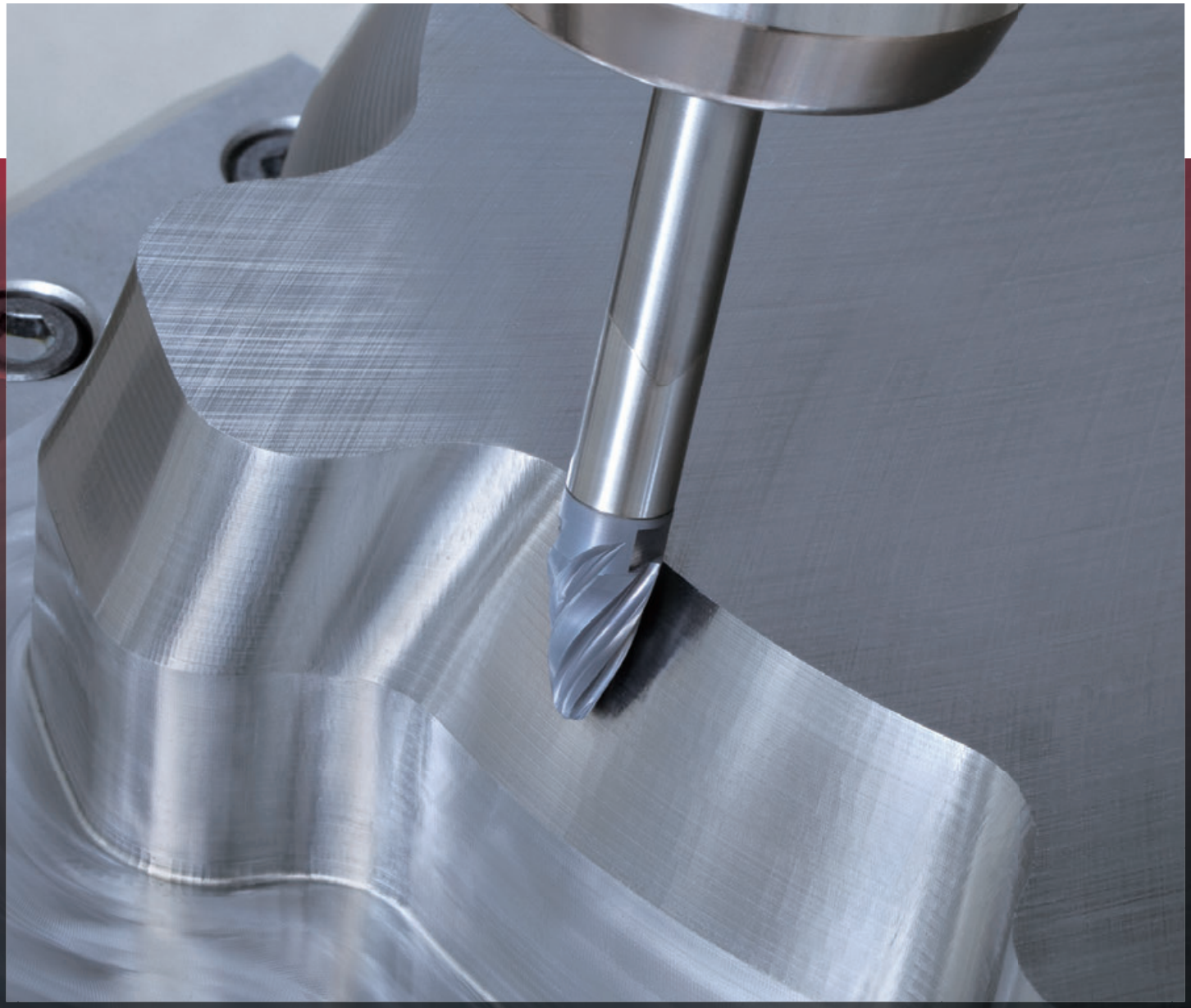
MillLine
Expansion 3

TUNGMEISTER

Tungaloy Report No. 381S3-G

Productive 3D profiling in 5-axis machines

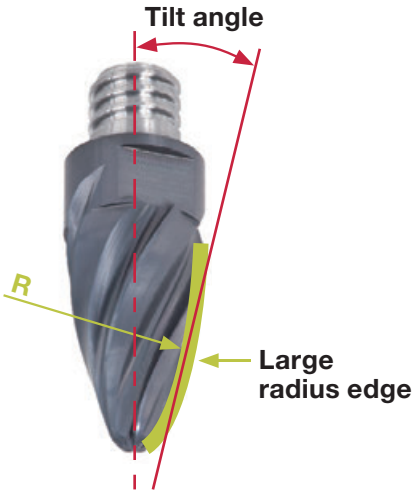


TUNGALOY ADDFORCE ACCELERATED LINES

TUNGMEISTER

For more information

Expansion to **TungMeister** series: New **VBO** and **VBN** conical barrel milling heads for 3D profiling in 5-axis machines

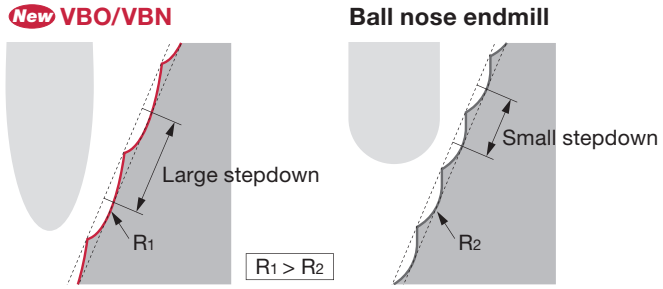


- Large radius cutting edge reduces the number of tool passes without degradation of surface quality, providing high machining efficiency
- The tool tilt angle provides an ideal cutting point for excellent surface finish
- 3 types of heads cover a wider range of parts

High productivity with larger-radius cutting edge

TUNGMEISTER VBO/VBN barrel heads vs ball nose end mills

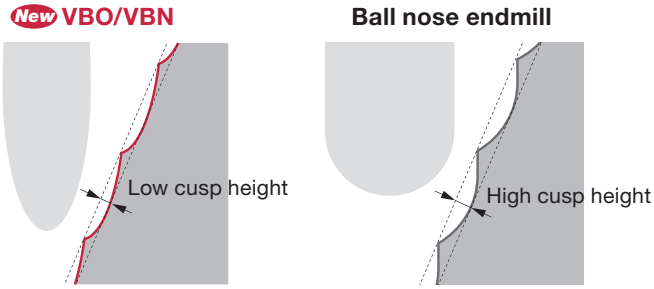
When the cusp heights are equal



Improved productivity

VBO and **VBN** provide larger stepdowns than ball nose end mill, reducing the number of tool passes.

When the stepdowns are equal



Good surface finish

VBO and **VBN** can reduce the cusp height generated by ball nose end mill, substantially increasing surface quality.

VBO-short

- Small ball nose + medium tapered radius (R25, R30, R40). A large range of tool tilt angle to allow sharp tool turns
- High productivity due to reduced tool passes compared to ball endmills
- For semi-finishing of general parts with 3D contour including die and mold parts

VBO-long

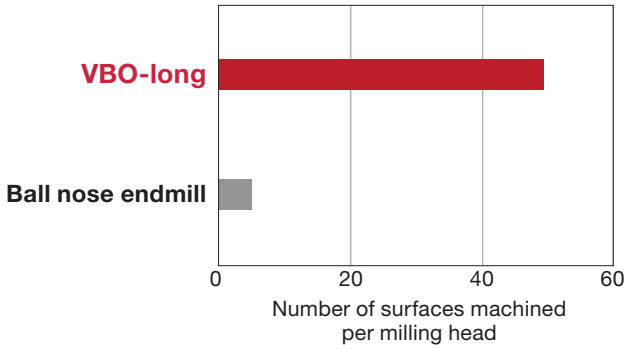
- Small ball nose + large tapered radius (R75, R80, R85). For high productivity and surface precision
- Improved productivity due to reduced tool passes compared to ball endmills
- For semi-finishing and finishing of die and mold parts

VBN

- Small corner radius + large tapered radius (R45, R50, R60). Suited for blade surfaces and roots
- High productivity due to reduced tool passes compared to ball endmills
- For semi-finishing and finishing of blades, blisks, impellers, and other aerospace parts

Long tool life

Tool life at max. flank wear width: VBmax = 0.05 mm



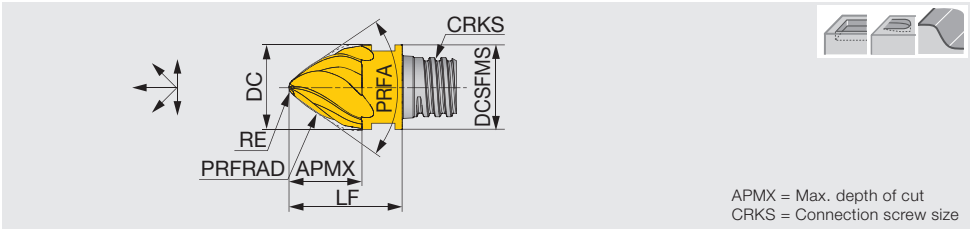
P

Head	: VBO100L15.0R850-5S06 (ø10 mm)
Workpiece material	: S55C / C55 (206HB)
Cutting speed	: *Vc* = 50 m/min
Feed per tooth	: *fz* = 0.08 mm/t
Width of cut	: *ae* = 0.03 mm
Tool overhang length	: 75 mm
Machining area	: 150 x 100 mm
Coolant	: Wet
Machine	: 5-axis (BT40)

The large-radius cutting edge of **VBO** and **VBN** milling heads allows larger stepover increments, substantially increasing cycle time and tool life relative to ball nose endmill.

VBO**S...

Short type barrel head with 4 flute, for 3D profiling with 5-axis machine



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

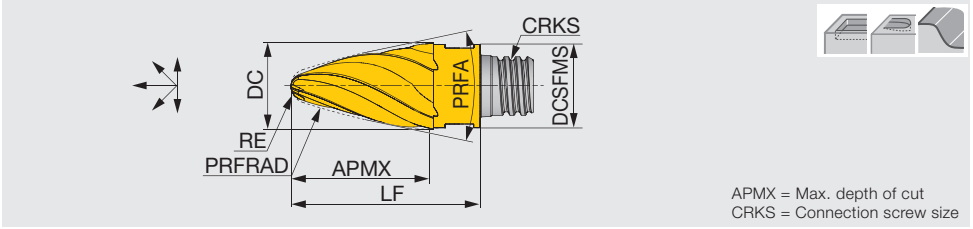
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	PRFRAD	PRFA	CRKS	LF	Wrench	Torque*
VBO100L08.0R250-4S06	●	4	30°	10	9.7	8	0.8	25	70.8°	S06	13	KEYV-S06	10
VBO120L09.0R300-4S08	●	4	30°	12	11.7	9	1.2	30	71.6°	S08	16.5	KEYV-S08	15
VBO160L13.0R400-4S10	●	4	30°	16	15.3	13	1.6	40	70.3°	S10	20.5	KEYV-S10	28

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

●: New

VBO**L...

Long type barrel head with 5 flute, for 3D profiling with 5-axis machine



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

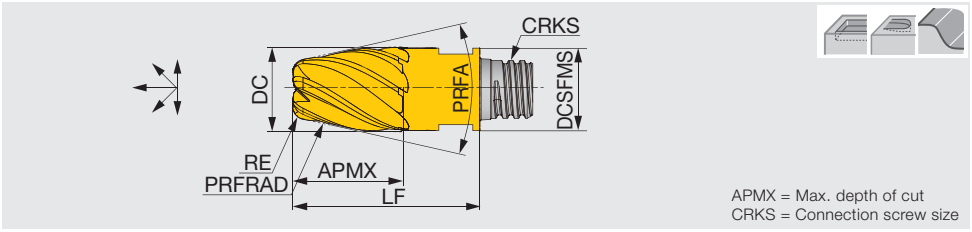
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	PRFRAD	PRFA	CRKS	LF	Wrench	Torque*
VBO100L15.0R850-5S06	●	5	30°	10	9.7	15	2	85	27.3°	S06	22	KEYV-S06	10
VBO120L19.0R800-5S08	●	5	30°	12	11.7	19	2	80	29.3°	S08	27	KEYV-S08	15
VBO160L25.0R750-5S10	●	5	30°	16	15.3	25	3	75	26.7°	S10	33.5	KEYV-S10	28

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

●: New

VBN...

Bull nose head with 6 flute, for 3D profiling with 5-axis machine

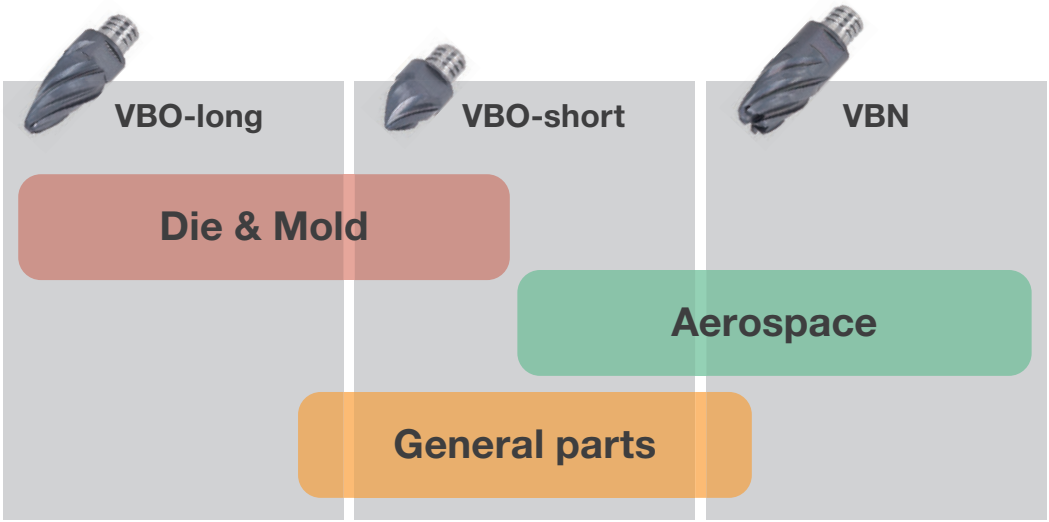


Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	PRFRAD	PRFA	CRKS	LF	Wrench	Torque*
VBN100L13.0R450-6S06	●	6	35°	10	9.7	13	1.5	45	15.1°	S06	22	KEYV-S06	10
VBN120L15.0R500-6S08	●	6	35°	12	11.7	15	2	50	15.1°	S08	27	KEYV-S08	15
VBN160L18.0R600-6S10	●	6	35°	16	15.3	18	2	60	15.1°	S10	33.5	KEYV-S10	28

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

●: New

TARGET MARKET



STANDARD CUTTING CONDITIONS

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 - 80	0.05 - 0.1	0.06 - 0.11	0.07 - 0.13	0.1
S	Heat-resistant alloys Inconel718, etc.	50 - 60 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 can also bring out effective results 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 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°

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.

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 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 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 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 Germany GmbH
An der Alten Ziegelei 1
D-40789 Monheim, Germany
Phone: +49-2173-90420-0
Fax: +49-2173-90420-19
www.tungaloy.com/de

Tungaloy France S.A.S.
ZA Courtaboeuf - Le Rio
1 rue de la Terre de feu
F-91952 Courtaboeuf Cedex, France
Phone: +33-1-6486-4300
Fax: +33-1-6907-7817
www.tungaloy.com/fr

Tungaloy Italia S.r.l.
Via E. Andolfato 10
I-20126 Milano, Italy
Phone: +39-02-252012-1
Fax: +39-02-252012-65
www.tungaloy.com/it

Tungaloy Czech s.r.o.
Turanka 115
CZ-627 00 Brno, Czech Republic
Phone: +420-532 123 391
Fax: +420-532 123 392
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
Fax: +34 93 876 2798
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 U.K. Ltd
Gallan Park, Watling Street,
Cannock, WS110XG, 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 Cutting Tools (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, #06-11 Oxley BizHub 2
Singapore 408734
Phone: +65-6391-1833
Fax: +65-6299-4557
www.tungaloy.com/sg

Tungaloy Vietnam
LE04.38, Lexington Residence
67 Mai Chi Tho St., Dist. 2,
Ho Chi Minh City, Vietnam
Phone: +84-2837406660
www.tungaloy.com/sg

Tungaloy India Pvt. Ltd.
Indiabulls Finance Centre,
Unit # 902-A, 9th Floor,
Tower 1, Senapati Bapat Marg,
Elphinstone Road (West),
Mumbai -400013, India
Phone: +91-22-6124-8804
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
Kompleks Grand Wisata Block AA-10 No.3-5
Cibitung
Bekasi 17510, Indonesia
Phone: +62-21-8261-5808
Fax: +62-21-8261-5809
www.tungaloy.com/id

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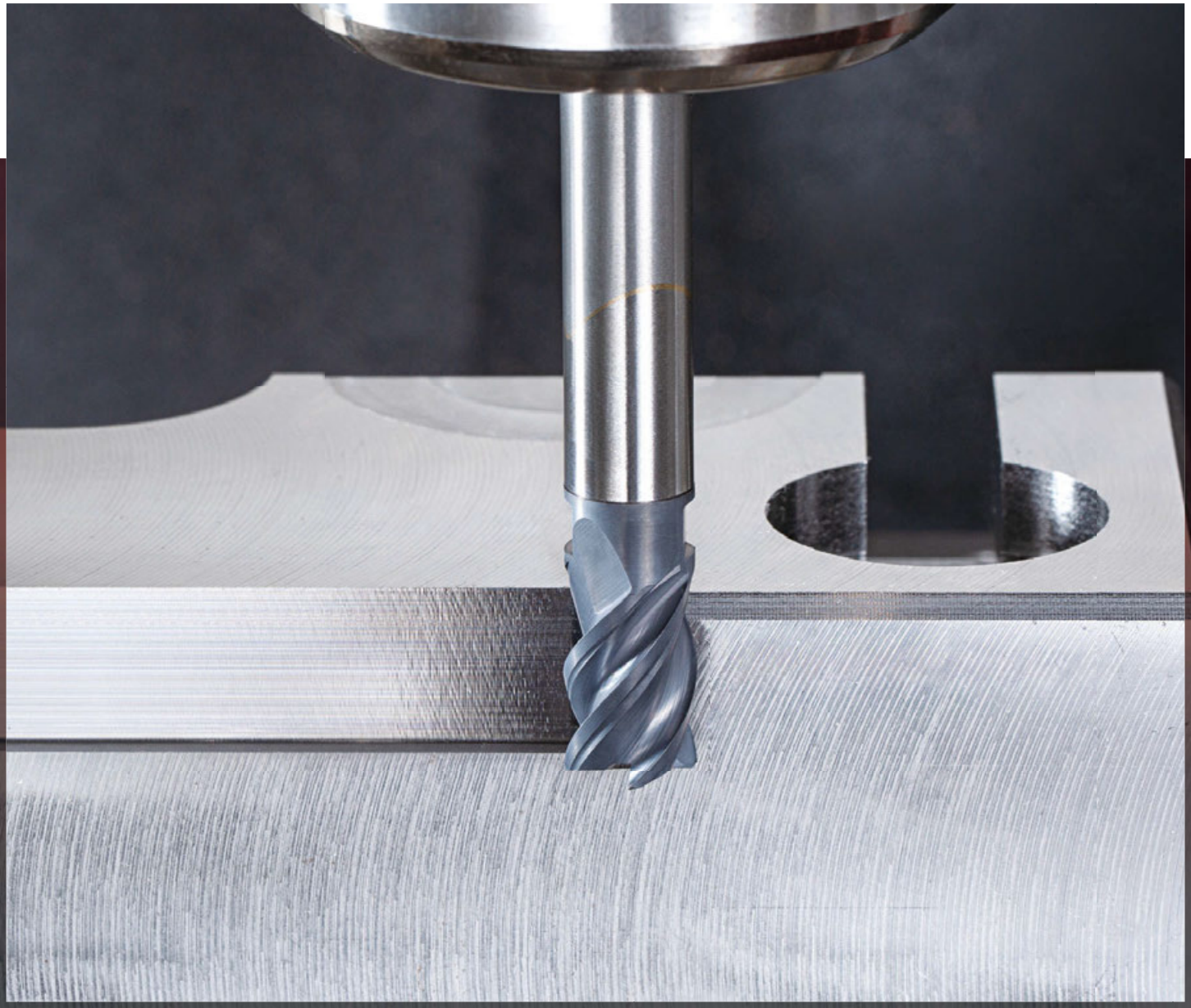
MillLine
Expansion 4

TUNGMEISTER

Tungaloy Report No. 381S4-G

Now available in AH735 grade along with additional AH715 grade inserts



TUNGALOY ADDFORCE ACCELERATED LINES

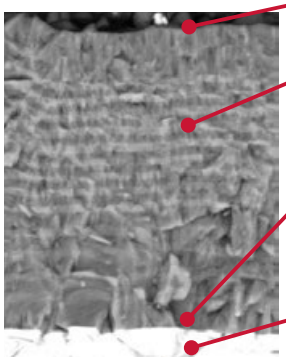
TUNGMEISTER

For more information

Latest wear and fracture resistant grades for longer and more predictable tool life

New AH715 / AH735

Unique nano-multilayed coating using Tungaloy's latest technology providing 3 principal features



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

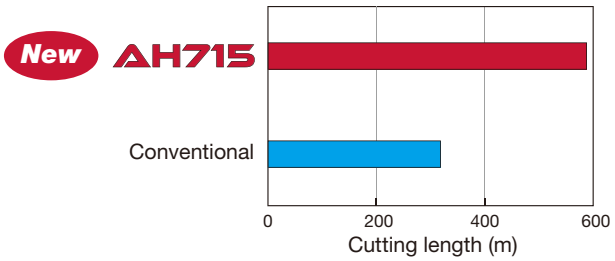
2. Resistance to wear, oxidation, and fracture
Two coating layers for wear and oxidation resistance. Layered alternatively to prevent crack from propagating to fracture

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

Substrate
Carbide substrate features wear and fracture resistance

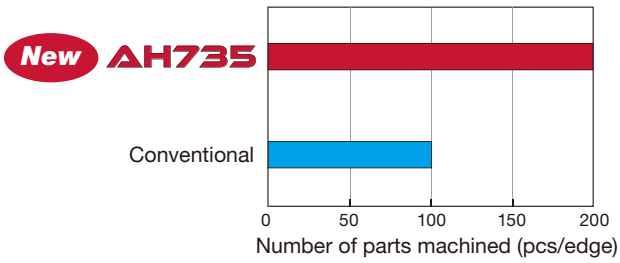
Tool life comparisons

AH715 and **AH735** provide better tool life performance in comparisons with the previous-generation grades



P
Steel

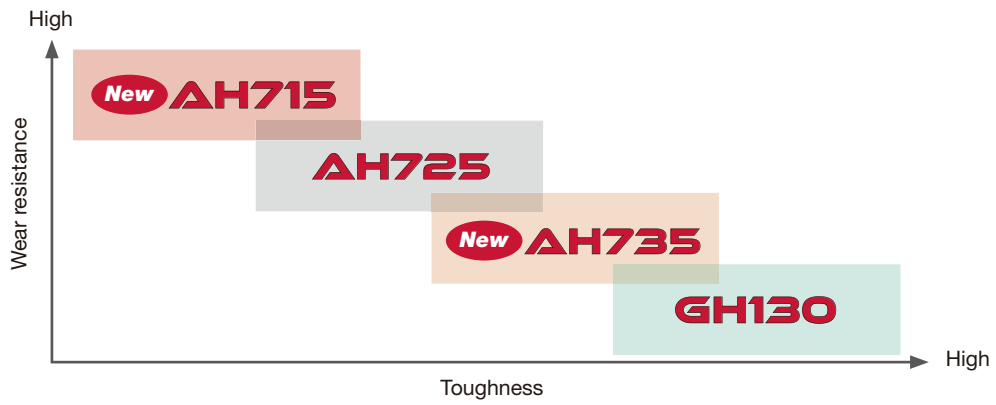
Shank	: VSSD16L100S10-S
Head	: VED160L12.0R05-04S10
Workpiece material	: S55C / C55 (1055)
Cutting speed	: *Vc* = 150 m/min
Feed per tooth	: *fz* = 0.12 mm/t
Depth of cut	: *ap* = 5 mm
Width of cut	: *ae* = 1.5 mm
Machine	: Vertical M/C, BT40



S
Superalloy

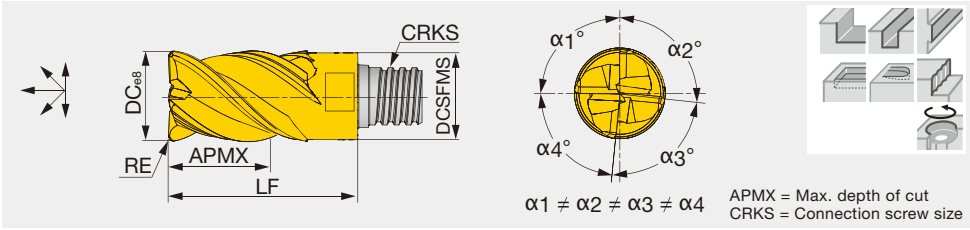
Shank	: VSC120L100S08-C-A
Head	: VST217W2.50R020-4S08
Workpiece material	: Titanium alloy
Cutting speed	: *Vc* = 50 m/min
Feed per tooth	: *fz* = 0.1 mm/t
Depth of cut	: *ap* = 4 mm
Width of cut	: *ae* = 2.5 mm
Machine	: Vertical M/C, HSK A63

APPLICATION RANGE



VEH...

4 flute square head, long cutting edge, for general purpose



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

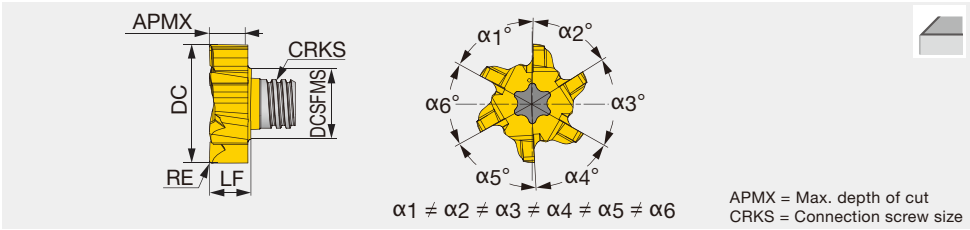
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEH080L12.0R05I04S05	●	4	41° - 45°	8	7.7	12	0.5	S05	18	KEYV-S05	7
VEH080L12.0R10I04S05	●	4	41° - 45°	8	7.7	12	1.0	S05	18	KEYV-S05	7
VEH100L15.0R05I04S06	●	4	41° - 45°	10	9.7	15	0.5	S06	22	KEYV-S06	10
VEH100L15.0R10I04S06	●	4	41° - 45°	10	9.7	15	1.0	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	1.0	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	1.0	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	1.0	S12	41	KEYV-S12	28

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

●: Line up

VFM...

6 flute face milling head



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

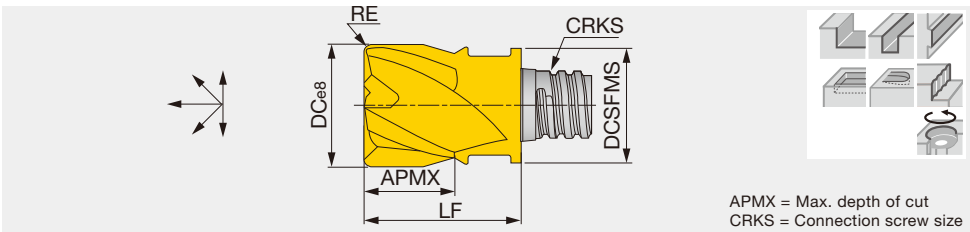
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VFM120L03.6R02I06S05	●	6	10°	12	7.7	3.6	0.2	S05	4.4	KEYV-T20	7
VFM160L04.8R04I06S06	●	6	10°	16	9.7	4.8	0.4	S06	5.6	KEYV-T25	10
VFM200L06.0R04I06S08	●	6	10°	20	11.7	6	0.4	S08	7	KEYV-T40L	15

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

●: Line up

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

4 flute square head, for general purpose



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

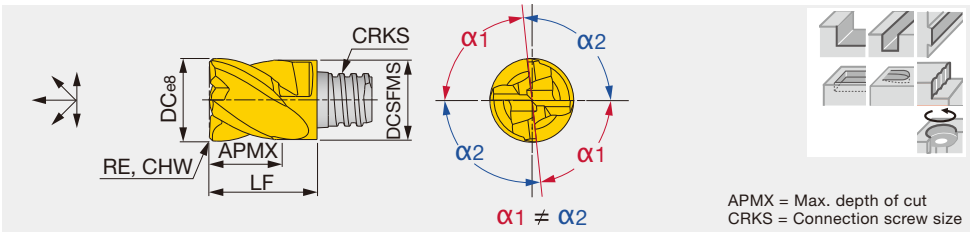
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VEE060L05.0R00-04S05	●	●	4	45°	6	7.7	5	-	S05	10	KEYV-S05	7
VEE160L12.0R00-04S10	●	●	4	45°	16	15.3	24	-	S10	20.5	KEYV-S10	28
VED160L12.0R05-04S10	●	●	4	30°	16	15.3	24	0.5	S10	20.5	KEYV-S10	28

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

●: New
●: Line up

VEE**I...

4 flute square head, variable pitch, for chatter dampening



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

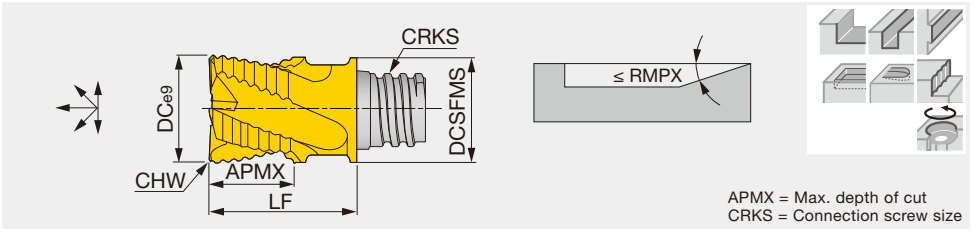
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CHW	CRKS	LF	Wrench	Torque*
VEE160L12.0C60I04S10	●	●	4	38°	16	15.3	12	-	0.6	S10	20.5	KEYV-S10	28

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

●: Line up

VEE**R...

4 flute square head, with serrated edges, for roughing



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

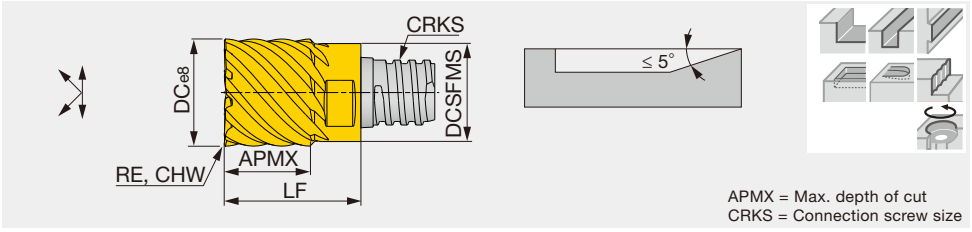
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	CHW	CRKS	LF	RMPX	Wrench	Torque*
VEE120L09.0C35R04S08	●	●	4	45°	12	11.7	9	0.35	S08	16.5	90°	KEYV-S08	15
VEE160L12.0C40R05S10	●	●	4	45°	16	15.3	12	0.6	S10	20.5	7°	KEYV-S10	28

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

●: New
●: Line up

VED**-08...

8 flute square head, for difficult-to-cut material



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

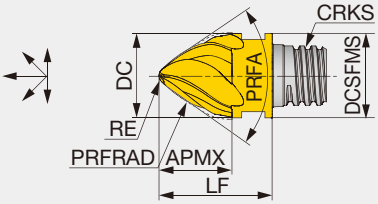
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CHW	CRKS	LF	Wrench	Torque*
VED160L12.0R10-08S10	●	●	8	30°	16	15.3	12	1	-	S10	20.5	KEYV-S10	28

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

●: New
●: Line up

VBO**S...

Short type barrel head with 4 flute, for 3D profiling with 5-axis machine



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

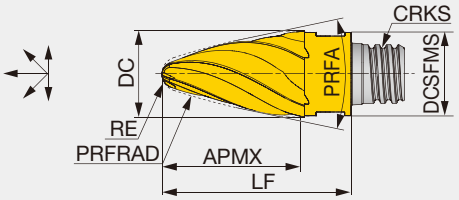
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	PRFRAD	PRFA	CRKS	LF	Wrench	Torque*
VBO100L08.0R250-4S06	●	4	30°	10	9.7	8	0.8	25	70.8°	S06	13	KEYV-S06	10
VBO120L09.0R300-4S08	●	4	30°	12	11.7	9	1.2	30	71.6°	S08	16.5	KEYV-S08	15
VBO160L13.0R400-4S10	●	4	30°	16	15.3	13	1.6	40	70.3°	S10	20.5	KEYV-S10	28

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

●: Line up

VBO**L...

Long type barrel head with 5 flute, for 3D profiling with 5-axis machine



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

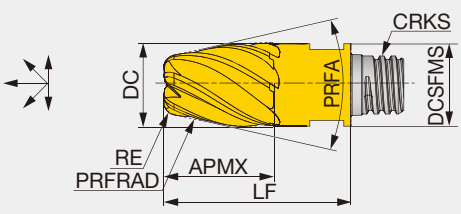
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	PRFRAD	PRFA	CRKS	LF	Wrench	Torque*
VBO100L15.0R850-5S06	●	5	30°	10	9.7	15	2	85	27.3°	S06	22	KEYV-S06	10
VBO120L19.0R800-5S08	●	5	30°	12	11.7	19	2	80	29.3°	S08	27	KEYV-S08	15
VBO160L25.0R750-5S10	●	5	30°	16	15.3	25	3	75	26.7°	S10	33.5	KEYV-S10	28

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

●: Line up

VBN...

Bull nose head with 6 flute, for 3D profiling with 5-axis machine



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

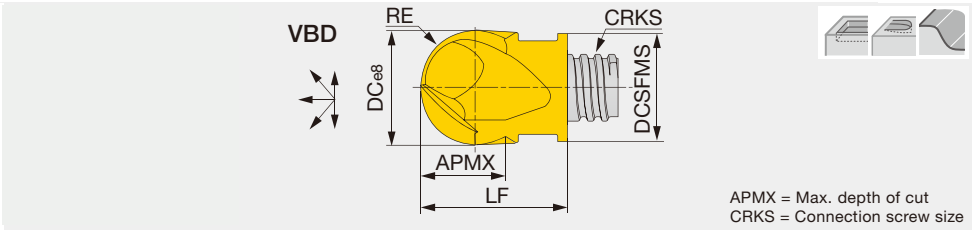
Designation	AH715	NOF	FHA	DC	DCSFMS	APMX	RE	PRFRAD	PRFA	CRKS	LF	Wrench	Torque*
VBN100L13.0R450-6S06	●	6	35°	10	9.7	13	1.5	45	15.1°	S06	22	KEYV-S06	10
VBN120L15.0R500-6S08	●	6	35°	12	11.7	15	2	50	15.1°	S08	27	KEYV-S08	15
VBN160L18.0R600-6S10	●	6	35°	16	15.3	18	2	60	15.1°	S10	33.5	KEYV-S10	28

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

●: Line up

VBD**-BG...

Ball nose head with 4 ground flutes for finishing



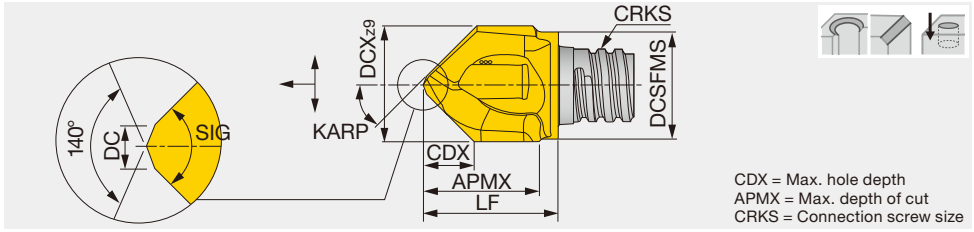
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	RE	CRKS	LF	Wrench	Torque*
VBD160L12.0-BG-04S10	●	●	4	30°	16	15.3	12	7.978	S10	20.5	KEYV-S10	28

RE tolerance: ± 0.012
* Recommended clamping torque (N·m)
2 pieces per package

● : Line up

VCP**-02...

2 flute head, for spot drilling and chamfering



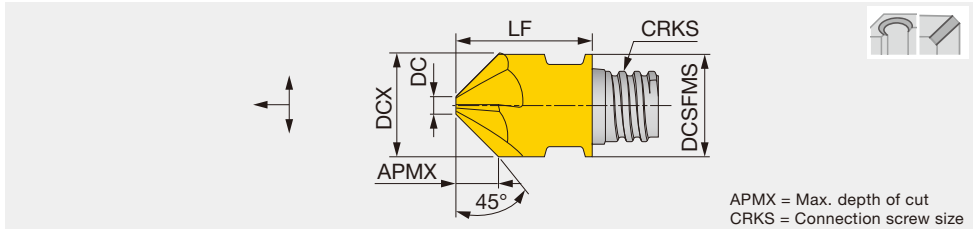
Designation	AH715	AH725	SIG	NOF	FHA	DCX	DCSFMS	APMX	CDX	CRKS	LF	DC	KAPR	Wrench	Torque*
VCP080L07.7A45-02S05	●	●	90	2	0°	8	7.6	7.5	3.7	S05	9.75	1	45°	KEYV-S05	7
VCP100L09.0A45-02S06	●	●	90	2	0°	10	9.5	9.5	4.4	S06	11.75	1.5	45°	KEYV-S06	10
VCP160L15.0A45-02S10	●	●	90	2	0°	16	15.2	15	7.1	S10	18.8	1.5	45°	KEYV-S10	28

Minimum hole diameter ø1.5 mm
* Recommended clamping torque (N·m)
2 pieces per package

● : New
● : Line up

VCA**-04, 06...

4 or 6 flute head, without center cutting edge, for countersinking and chamfering



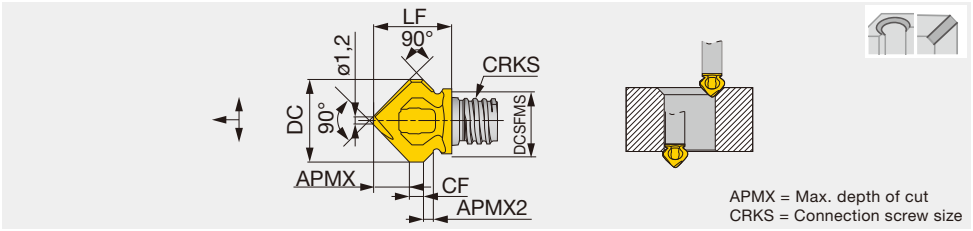
Designation	AH715	AH725	NOF	FHA	DCX	DCSFMS	APMX	DC	CRKS	LF	Wrench	Torque*
VCA100L04.0A45-04S06	●	●	4	0°	10	10	4	1.95	S06	13	KEYV-S06	10
VCA160L06.5A45-06S10	●	●	6	0°	16	16	6.5	3	S10	20.3	KEYV-S10	28

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

● : New
● : Line up

VCW**-02

2 flute head, for front and back chamfering



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

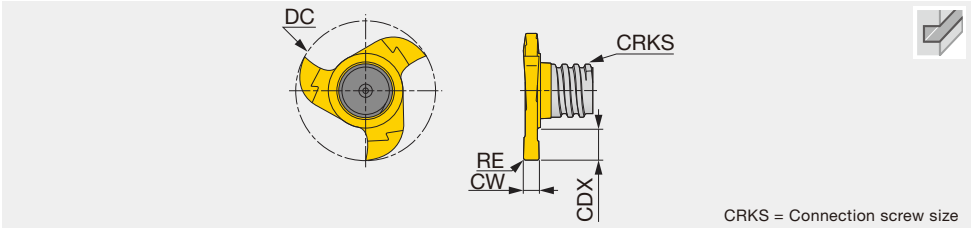
Designation	AH715	AH725	NOF	FHA	DC	DCSFMS	APMX	APMX2	CF	CRKS	LF	Wrench	Torque*
VCW118L05.0A45-02S06	●	●	2	0°	11.8	9.3	5	1.2	2	S06	11.2	KEYV-S06	10

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

● : New
● : Line up

VST**-3...

3 tooth slotting head, 3 mm slot width



CRKS = Connection screw size

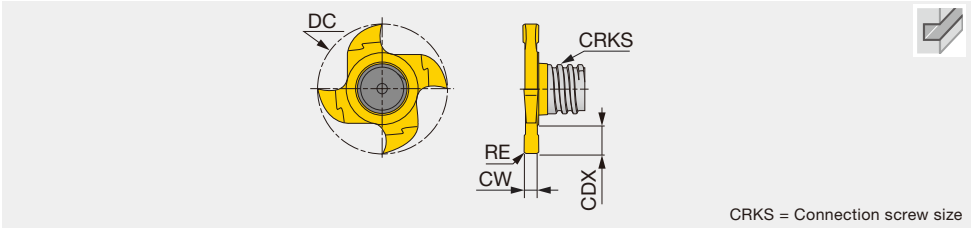
Designation	AH735	GH130	NOF	FHA	DC	CW±0.02	RE	CRKS	CDX	Wrench	Torque*
VST177W3.00R020-3S06	●	●	3	0°	17.7	3	0.2	S06	3.8	KEYV-177	10

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

● : New
● : Line up

VST**-4...

4 tooth slotting head, 2.5, 3 mm slot width



CRKS = Connection screw size

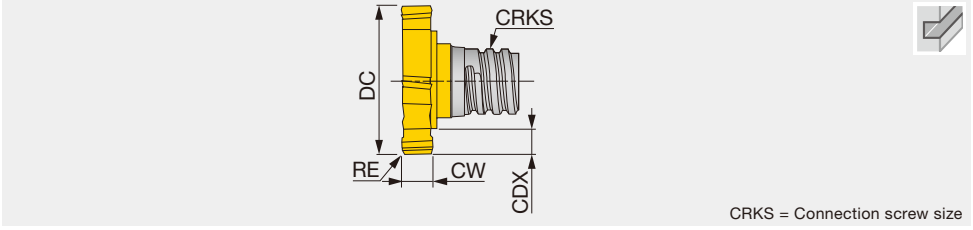
Designation	AH735	GH130	NOF	FHA	DC	CW±0.02	RE	CRKS	CDX	Wrench	Torque*
VST217W2.50R020-4S08	●	●	4	0°	21.7	2.5	0.2	S08	4.5	KEYV-217	15
VST217W3.00R020-4S08	●	●	4	0°	21.7	3	0.2	S08	4.5	KEYV-217	15

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

● : New
● : Line up

VTB**-06...

6 tooth T-slotting head, 6 mm slot width



CRKS = Connection screw size

Designation	AH735	GH130	NOF	FHA	DC -0.05 0	CW±0.02	CDX	CRKS	RE	Wrench	Torque*
VTB250W6.00R04-06S10	●	●	6	0°	25	6	4.3	S10	0.4	KEYV-S06	28

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

● : New
● : Line up

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 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 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 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 Germany GmbH
An der Alten Ziegelei 1
D-40789 Monheim, Germany
Phone: +49-2173-90420-0
Fax: +49-2173-90420-19
www.tungaloy.com/de

Tungaloy France S.A.S.
ZA Courtaboeuf - Le Rio
1 rue de la Terre de feu
F-91952 Courtaboeuf Cedex, France
Phone: +33-1-6486-4300
Fax: +33-1-6907-7817
www.tungaloy.com/fr

Tungaloy Italia S.r.l.
Via E. Andolfato 10
I-20126 Milano, Italy
Phone: +39-02-252012-1
Fax: +39-02-252012-65
www.tungaloy.com/it

Tungaloy Czech s.r.o.
Turanka 115
CZ-627 00 Brno, Czech Republic
Phone: +420-532 123 391
Fax: +420-532 123 392
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
Fax: +34 93 876 2798
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 U.K. Ltd
Gallan Park, Watling Street,
Cannock, WS110XG, 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 Cutting Tools (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, #06-11 Oxley BizHub 2
Singapore 408734
Phone: +65-6391-1833
Fax: +65-6299-4557
www.tungaloy.com/sg

Tungaloy Vietnam
LE04.38, Lexington Residence
67 Mai Chi Tho St., Dist. 2,
Ho Chi Minh City, Vietnam
Phone: +84-2837406660
www.tungaloy.com/sg

Tungaloy India Pvt. Ltd.
Indiabulls Finance Centre,
Unit # 902-A, 9th Floor,
Tower 1, Senapati Bapat Marg,
Elphinstone Road (West),
Mumbai -400013, India
Phone: +91-22-6124-8804
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
Kompleks Grand Wisata Block AA-10 No.3-5
Cibitung
Bekasi 17510, Indonesia
Phone: +62-21-8261-5808
Fax: +62-21-8261-5809
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