Member IMC Group

Tungaloy

FEED the SPEED!

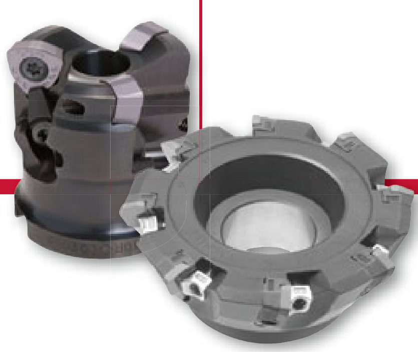
HIGH-FEED MILLING

the Go-to Solution for *Accelerated Machining*

Tungaloy´s renowned solutions for **High-Feed Milling (HFM)** *have been around for many years*

1990

Tungaloy´s insightfulness and devotion to HFM dates back to the late 1990s with the release of the MillFeed TXP series to meet the emerging needs for higher efficiency in face milling.



2010

Tungaloy introduces its DoFeed line in 2010 as the market starts to prefer more compact but faster machines. DoFeed revolutionized high-feed milling, offering large diameter cutters utilizing higher feed rates for incredible performance.

2016

MillQuad-Feed and DoTwist-Ball continue Tungaloy's history of offering high efficiency products reflecting the core concept of Accelerated Machining.

WHY HFM?

HFM is the go-to solution for Accelerated Machining!

In today's hypercompetitive machining market, ***cycle time plays a major role in productivity*** and often determines the profitability of any given job.

Simply increasing the speed or revolutions per minute (RPM) may appear to decrease cycle time. A reduction in cycle time, however, is hampered by the time to change inserts as the increase in speed or RPM shortens tool life, which increases the tool cost in parallel.

High-Feed Milling (HFM) is the solution for this problem. The tool works at elevated feed rates with modest speed or RPM which reduces cycle time while extending tool life.

Thus, **HFM has transformed** many manufacturers' ways **of thinking about milling.** These flexible and versatile tools offer much more than any other milling tool: dramatically reduced cycle time and cost, long tool life, and high quality of finished parts.

Faster and more efficient machining—long overhang, large components.

HFM specializes in long-reach applications such as deep hole and pocket machining. Combined with its capability of ramping, this feature allows the High Feed cutter to perform helical interpolation: the tool moves in a circular motion to X and Y axes while simultaneously moving downward on the Z axis.

HFM is the strongest and fastest in milling operations when machining large parts. Customers usually have to make an additional finishing pass, however, to clean up the rough surface generated. With the incorporation of wiper inserts, Tungaloy's **HFM cutter** can deliver outstanding surface finish with no reduction in feed rate. As a result, the efficiency of the overall machining process is drastically improved.

Simplifying the processes for near net shape

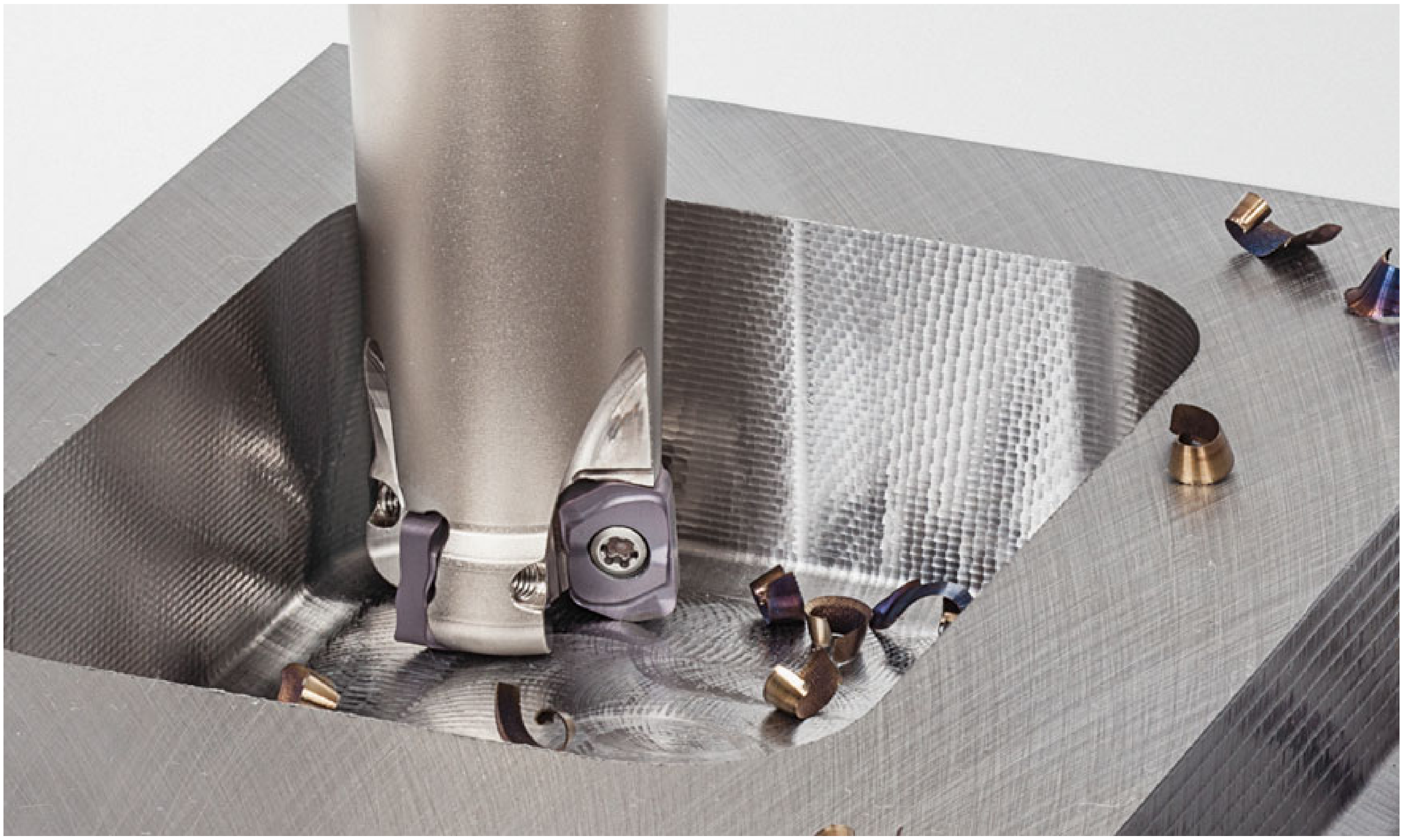
HFM provides a high metal removal rate, despite its small depth of cut. As this makes workpiece materials closer to the desired shape in one operation, semi-finishing operations can often be eliminated, and the finishing process can be simplified.

This characteristic is ideal for 3D machining. Most 3D machining begins with a solid block of material. The material is gradually removed until the desired configuration is obtained. This method is called subtractive manufacturing, and is the opposite of additive manufacturing. An example of additive manufacturing would be 3D printing. While a 3D printer places thin layers upon layers, 3D machining removes thin layers of material in each pass. In both cases, thin layers help produce a shape close to the final structure.

Versatility

Versatility is another advantage of **HFM**. **Tungaloy** offers **HFM inserts** with very positive cutting edges, which easily shear the material without work hardening.

For example, **DoFeed cutters** can machine multiple hole diameters and produce counter bore and countersink in the same operation, with no need to change or purchase multiple tools. This versatility saves on both cost, and time.



HOW IT WORKS?

High-Feed Milling Mechanism

The HFM mechanism is based on the ***"chip thinning"*** principle.

First utilized in the Die and Mold industry, **High-Feed Milling** is a milling method that pairs shallow depth of cut (DOC) with high feed rate up to 0.08" per tooth to maximize the amount of metal being removed from a part, resulting in more parts being machined more quickly.

The **HFM** mechanism is based on the "chip thinning" effect. Chip thinning depends on the lead angle of a milling cutter. A cutter with a 90° lead angle has no benefit of chip thinning as 0.008" of feed per tooth only delivers the same 0.008" of chip thickness (Fig. 1). In the case of a cutter with a 45° lead angle, a 0.01" of feed per tooth creates a 0.007" of chip thickness (Fig. 2) which allows the feed to be increased, resulting in reduced cycle time. Fig. 3 shows the chip thinning effect of **DoFeed**, Tungaloy's best selling **HFM** line, where a 0.05" of feed per tooth provides chip thickness of only 0.007", and cycle time is typically decreased by 50% or more.

Low cutting force is also an advantage of **HFM**. The lead angle on a cutter decides the direction of the cutting force. A 90° cutter (Fig. 1) will produce cutting force that acts perpendicular to the spindle, putting incredible pressure on the tool. As for a 45° cutter (Fig. 2), cutting force acts against the spindle at a 45° angle. With **DoFeed**, cutting force is almost parallel, and directed back to the spindle due to its acute lead angle (Fig. 3), which means less pressure on the spindle.

DoFeed Series

Fig.1

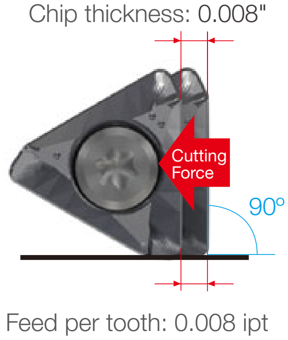


Fig.2

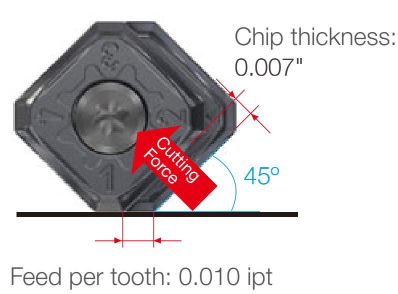
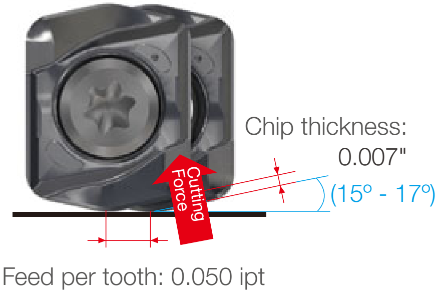


Fig.3



GET STARTED!

What is inside?

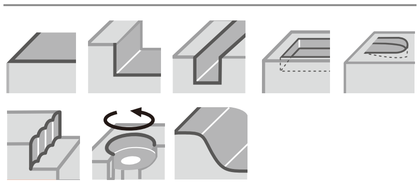
MILESTONE PRODUCTS

Tungaloy has developed the widest range of High-Feed Milling tools and inserts, covering a spectrum of applications

DOFEED
TUNGALOY

Versatility at its finest

- Perfect for **ramping, plunging, hole enlarging, slotting, drilling, and shoulder milling** in a wide range of industries.
- **Smooth chip evacuation** and minimal chattering.
- **Easy machining on long overhang applications** like large depth machining.
- **Maximum feed rate: 0.059 ipt**
- **Tool diameters ø0.625" - ø6.000"**



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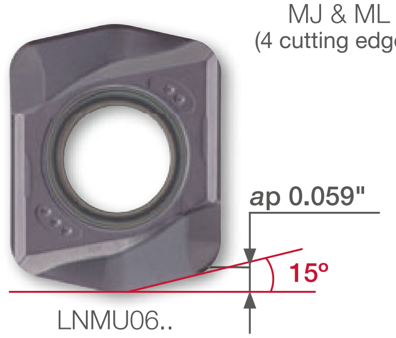
LNMU03..
MJ & ML
(4 cutting edges)



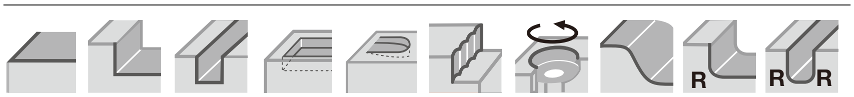
LNMU06..
MJ & ML
(4 cutting edges)

LNGU06 - W
(2 cutting edges - Wiper)

DOTWISTBALL
TUNGALOY

Unique twist on the insert to ensure *stability for incredible productivity*

- **04 inserts to complement DoFeed´s 03 and 06 inserts ranges**
- **R4 round inserts are also mountable**
- **Maximum feed rate: 0.051 ipt**
- **Tool diameters ø1.000" - ø2.000"**



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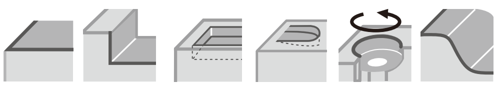
LNMX04..HJ
(4 cutting edges)

MILLQUADFEED
TUNGALOY

Simple but powerful for maximum performance and productivity

- Ideal for use with a **high power spindle** (40kW or more)
- **Maximum feed rate: 0.079 ipt**
- **Tool diameters ø2.500" - ø6.000"**



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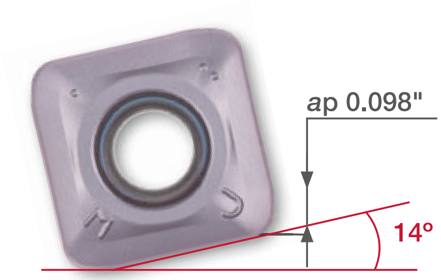


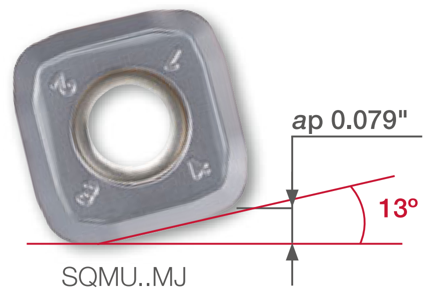
SWMT..MJ
(4 cutting edges)

DOFEEDQUAD
TUNGALOY

Economical tool for rough operations

- **Dovetail clamping** prevents inserts from lifting up during heavy roughing operation.
- **Maximum feed rate: 0.079 ipt**
- **Tool diameters ø2.000" - ø6.000"**

See pg. 34

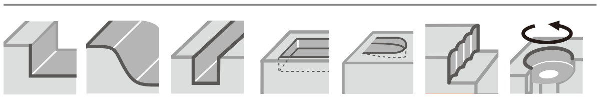


SQMU..MJ
(8 cutting edges)

TUNGMEISTER VFX
TUNGALOY

Indexable solid carbide head for high feed machining

- **Highly accurate repeatability**
- **Drastically reduces tool changeover time**
- **Maximum feed rate: 0.040 ipt**
- **Tool diameters ø0.375" - ø0.750"**



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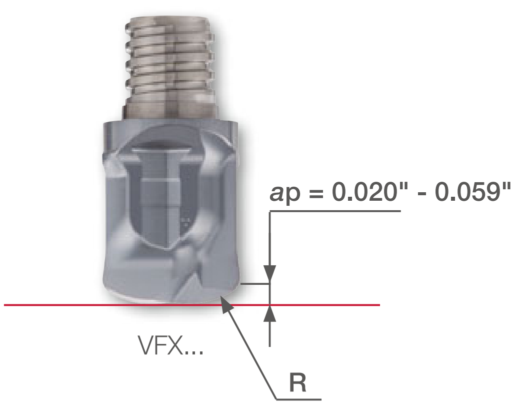
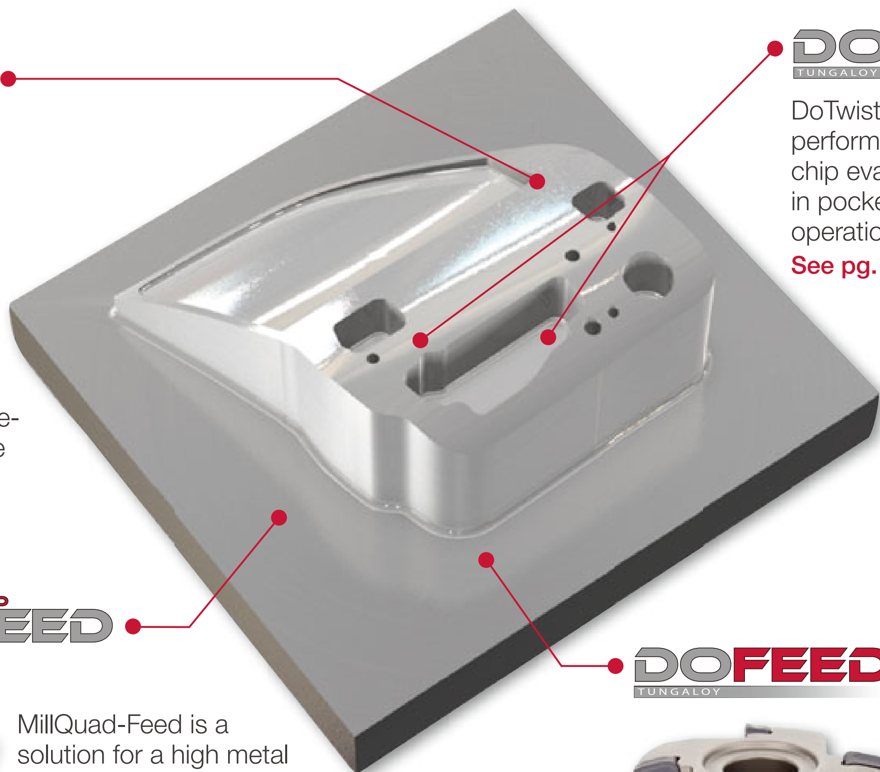


INDUSTRY SEGMENTS

The right tool for each application

Die & Mold INDUSTRY

Die and Mold machining primarily refers to the machining of complex 3D forms. Stamping, forming, forging dies, injection and blow molds are all examples of tooling that might have complex shapes precisely mirroring or matching the intended dimensions of a final, mass-produced part. HFM is an important topic for Die and Mold machining, because of the need to take light milling passes in order to obtain both the required geometry and surface finish.



DOFEED TUNGALOY

DoFeed features a close-pitch design to increase the feed rate in profiling operations.

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DOTWISTBALL TUNGALOY

DoTwist-Ball performs stable chip evacuation in pocketing operations.

See pg. 30

MILLQUADFEED TUNGALOY

MillQuad-Feed is a solution for a high metal removal rate especially in face milling.

See pg. 36

DOFEEDQUAD TUNGALOY

DoFeedQuad's dovetail clamping system ensures stable machining.

See pg. 34

Power Generation
INDUSTRY

The Power Generation industry is known for using components of complex structures made of stainless steel or heat-resistant alloys. To improve the performance in machining a complex structure, a cutter should be capable of delivering an elevated metal removal rate at a low depth of cut, and feature sharp cutting edges. With well balanced toughness and cutting edge sharpness, Tungaloy's High-Feed mills assure stable machining in delicate operations.

TUNGMEISTER
TUNGALOY

The TungMeister series of indexable end mills are available in small diameters for machining narrow work areas.

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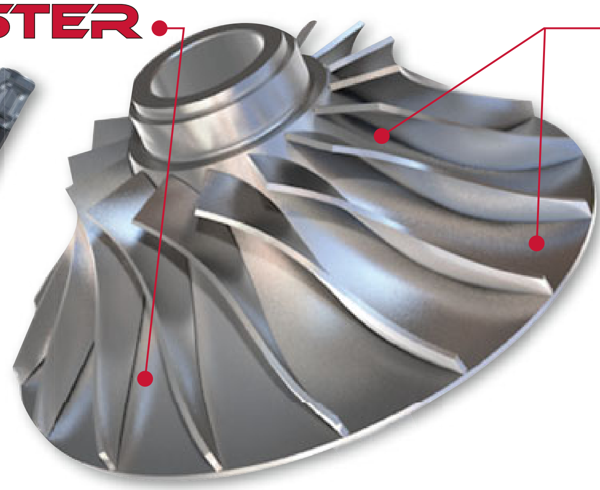

DOFEED
TUNGALOY

DoFeed's low cutting force prevents chattering even in a long overhang.

See pg. 22

Aerospace
INDUSTRY

Many components in the aerospace industry are made of tough materials such as precipitation hardened stainless steel or titanium alloy. This quickly uses up common tools, making it difficult to balance tool life and machining performance. Tungaloy's close-pitched High Feed mills will guarantee Accelerated Machining in aerospace manufacturing.

DOFEED
TUNGALOY

DoFeed can machine titanium alloy with high feed and speed because of the close pitch design.

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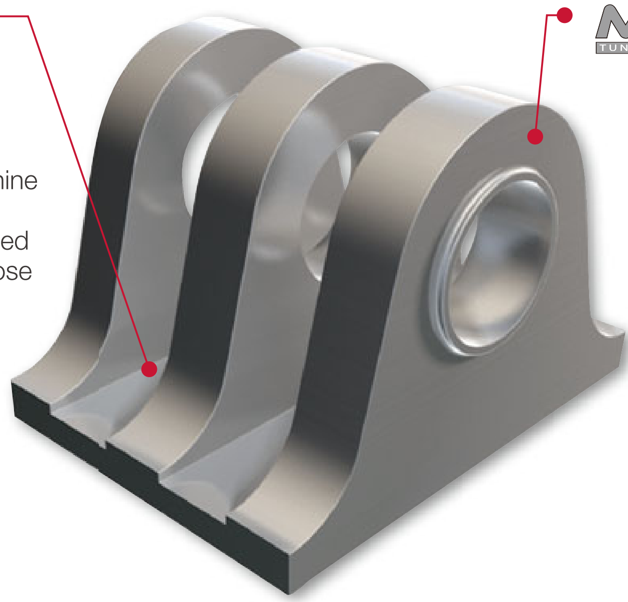


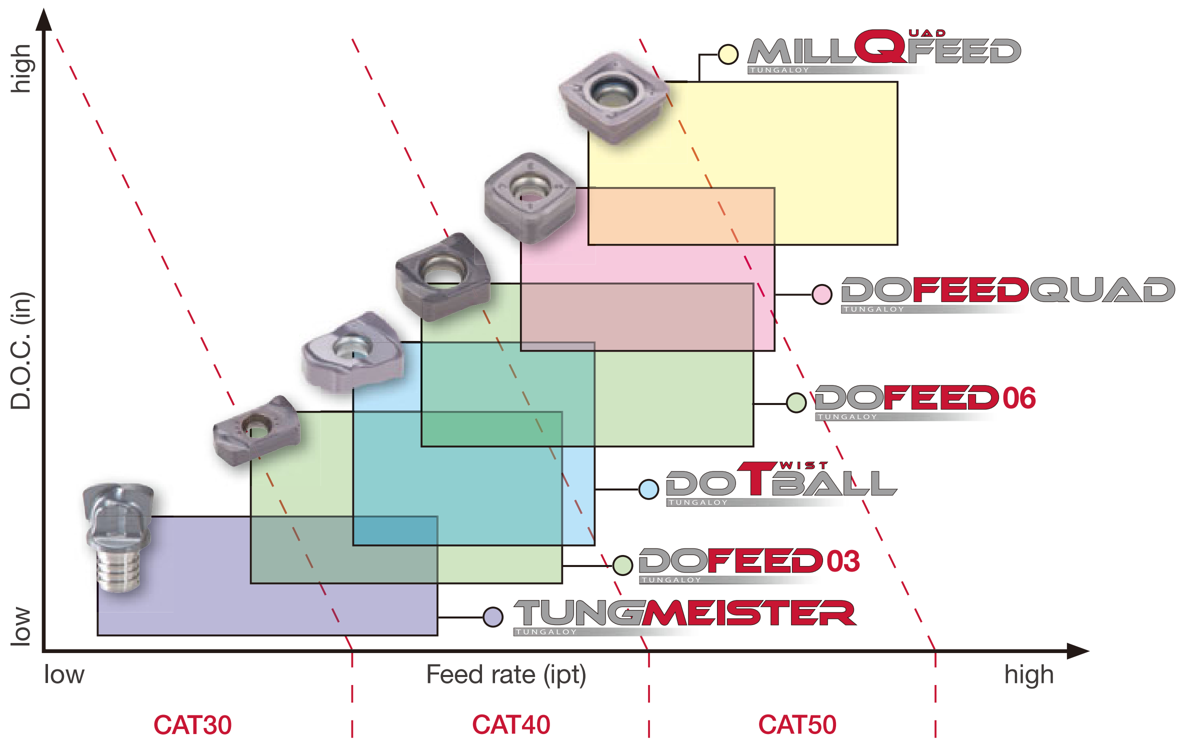
MILLQUADFEED
TUNGALOY

MillQuad-Feed ensures reliability in heavy high-feed milling on unstable surfaces.

See pg. 36

TOOL SELECTION GUIDE

Tungaloy's High-Feed MillLines are shown on this chart in relation to feed rate and depth of cut. Metal removal rates increase with spindle capacity.



In principle, the stronger the spindle power the machine is capable of, the higher the cutting parameters that can be used, such as a higher feed per tooth, larger cutter diameter, and/or denser tooth pitch. If the parameter is set too high, however, the cutting force will exceed the machine's spindle capacity, causing sudden machine stoppage. To prevent such machine failures, calculate the theoretical cutting force prior to machining to ensure that the parameters to be used are within the safe level.

For easy calculation of theoretical cutting power, download "Dr. Carbide" here

Dr. Carbide Tungaloy

Available on the App Store

GET IT ON Google play

Recommended ***Cutting Parameters***

Recommended cutting parameters for given materials in terms of cutting speed and feed per tooth.

		DoFeed 03	DoTwistBall 04	DoFeed 06	MillQuadFeed	DoFeedQuad	TungMeister
Density of cutter		Close					Coarse
P	Vc	330 - 980	490 - 820	330 - 980	330 - 980	330 - 980	260 - 660
	fz	0.020 - 0.047	0.020 - 0.051	0.020 - 0.059	0.039 - 0.079	0.020 - 0.059	0.008 - 0.028
M	Vc	330 - 490	330 - 660	330 - 490	330 - 490	330 - 490	200 - 330
	fz	0.012 - 0.027	0.012 - 0.027	0.012 - 0.027	0.012 - 0.039	0.012 - 0.031	0.008 - 0.024
K	Vc	330 - 980	490 - 820	330 - 980	330 - 980	330 - 980	330 - 720
	fz	0.020 - 0.047	0.020 - 0.051	0.020 - 0.059	0.039 - 0.079	0.020 - 0.059	0.008 - 0.028
S	Vc	100 - 200	100 - 200	100 - 200	100 - 200	100 - 200	130 - 260
	fz	0.012 - 0.027	0.012 - 0.027	0.012 - 0.027	0.012 - 0.027	0.012 - 0.027	0.008 - 0.020
H	Vc	260 - 430	160 - 490	260 - 430	260 - 430	260 - 430	130 - 260
	fz	0.004 - 0.012	0.004 - 0.020	0.004 - 0.012	0.004 - 0.012	0.004 - 0.012	0.008 - 0.016

Tool and application choices

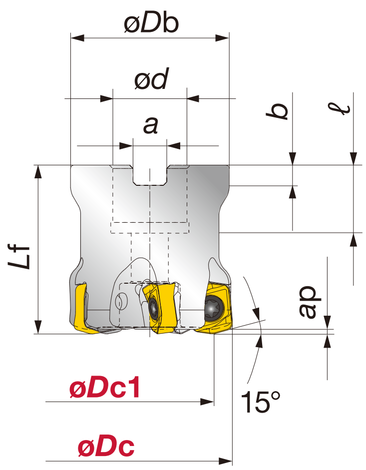
	Facing	Shouldering	Shouldering R	Slotting	Slotting R	Profiling	Pocketing	Ramping	Helical Interpolation	Plunging
TungMeister		●		●		●	●	●	●	●
DoFeed 03	●	●		●		●	●	●	●	●
DoTwistBall	●	●	●	●	●	●	●	●	●	●
DoFeed 06	●	●		●		●	●	●	●	●
DoFeedQuad	●									
MillQuadFeed	●					●	●	●	●	

TECHNICAL GUIDES AND TIPS IN HFM

For maximum performance

øDc1 and *øDc*

Effective tool diameter øDc1 is usually smaller than tool diameter øDc.

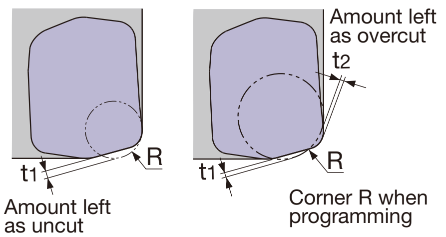


Designation	Max. ap	øDc	z	øDc1
TXN06R200U0075A04	0.059	2.000	4	1.513

Theoretical radius and programming

CAD/CAM systems will require a defined radius dimension in order to program for wall/shoulder machining. The parameters shown below are to be used for programming with **DoFeed's EXN06/TXN06 inserts.** The "R" noted below is defined as the **theoretical radius** to be used for programming.

When programming, a **theoretical radius** (R) and the actual profile left uncut on the machined surface (t1) should be noted. Here R=0.12" is recommended for a **EXN06/TXN06 insert**. If a larger radius (e.g. R=0.16") is programmed, an overcut (t2) of 0.01" may occur and the dimensional accuracy may be deviated from what is required.

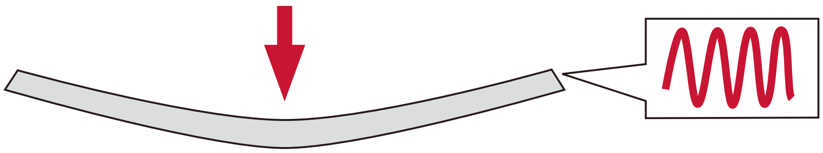


Max. depth of cut max. ap(in)	Corner radius r_ε	W (in)	Corner R when program-ming	Amount left as uncut t_1	Amount left as overcut t_2
0.059	0.079	0.236	0.079	0.040	-
			0.118	0.030	-
			0.157	0.021	0.010

Each value above is calculated theoretically at the maximum condition.

Machining thin workpieces with weak fixture

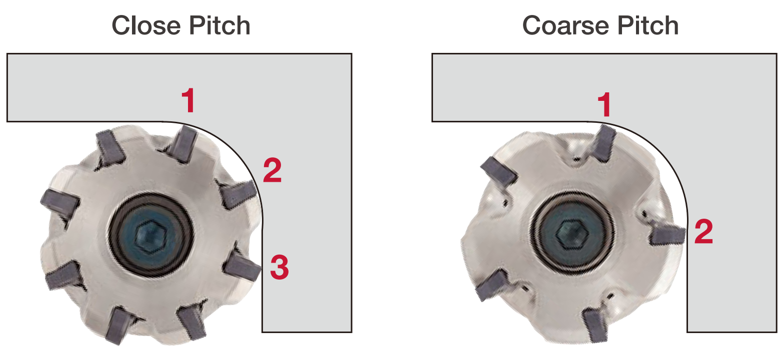
Workpieces in a thin, flat structure with weak fixture setting are prone to chatter. To minimize vibration, reduce thrust force by **decreasing D.O.C. or feed rate**. Another option is to use a cutter with a bigger approach angle for reduced thrust force.



Long overhang and chattering

Due to the cutting force acting vertically up to the spindle, **HFM** is an ideal method in long reach applications to improve efficiency. However, if a tool length of 5xD or longer is used, the following cautions are advised to be taken:

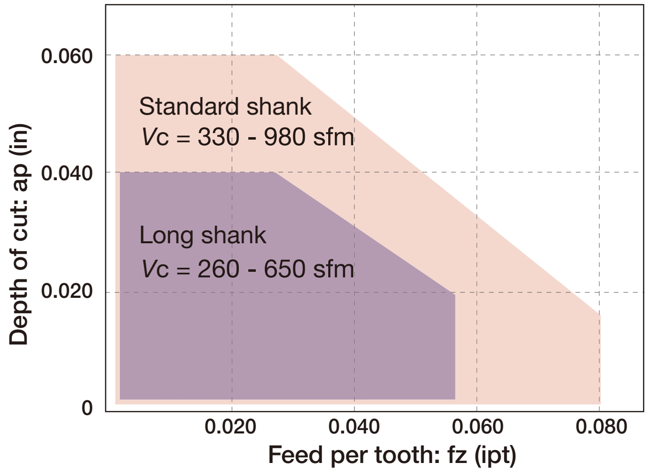
- Use a **coarse-pitched cutter**: This will decrease the number of cutting edges in contact simultaneously on the workpiece. If additional stability is needed, use an **ML chipbreaker** (Use only as a supplemental method).



- Vibration may be minimized by optimizing cutting parameters (to 70% of the recommended parameters). Adjust the parameters in the following orders:

1: Reduce the cutting speed (*Vc*)
2: Reduce the DOC (*ap*)
3: Reduce the feed rate (*fz*)

(Note: when using a fz=0.020 ipt or lower, a reduction in feed rate may adversely increase vibration.)



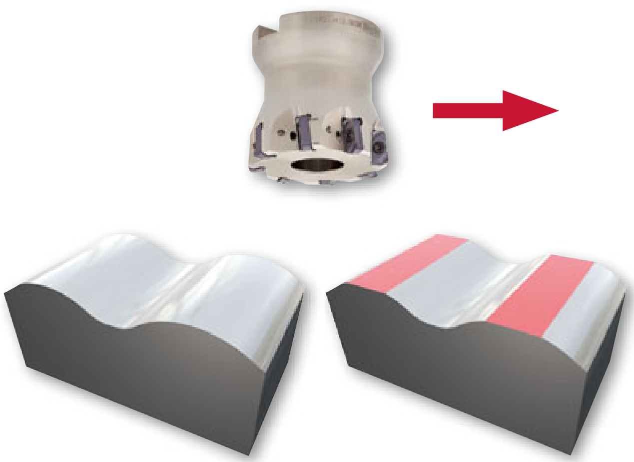
Note: If all the above measures are taken and chatter still exists, or production efficiency is not reaching an adequate level, use Tungaloy´s RoundSplit milling cutter.

Milling unstable surfaces

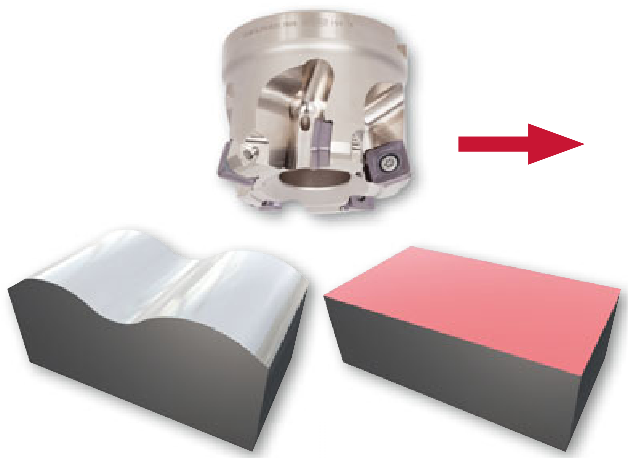
Milling unstable surfaces including scale removal is a troublesome operation. Insert damage is common in these operations, hindering unmanned machine operations. Many customers choose a **high-feed cutter** as a safe and productive machining solution. Due to surface unevenness, a **high-feed cutter** is forced to make unproductive "air cut" passes before the surfaces reaches a high enough quality for finishing operations to follow.

MillQuad-Feed is an extremely efficient milling solution for unstable surfaces, with its **high-feed capability** of 0.08" per tooth at 0.1" depth of cut **MillQuad-Feed** ensures high stability and metal removal rates. **DoTriple-Mill** round inserts are another solution: one single set of inserts can be used for both highly efficient scale removal and follow-up **high-feed milling.**

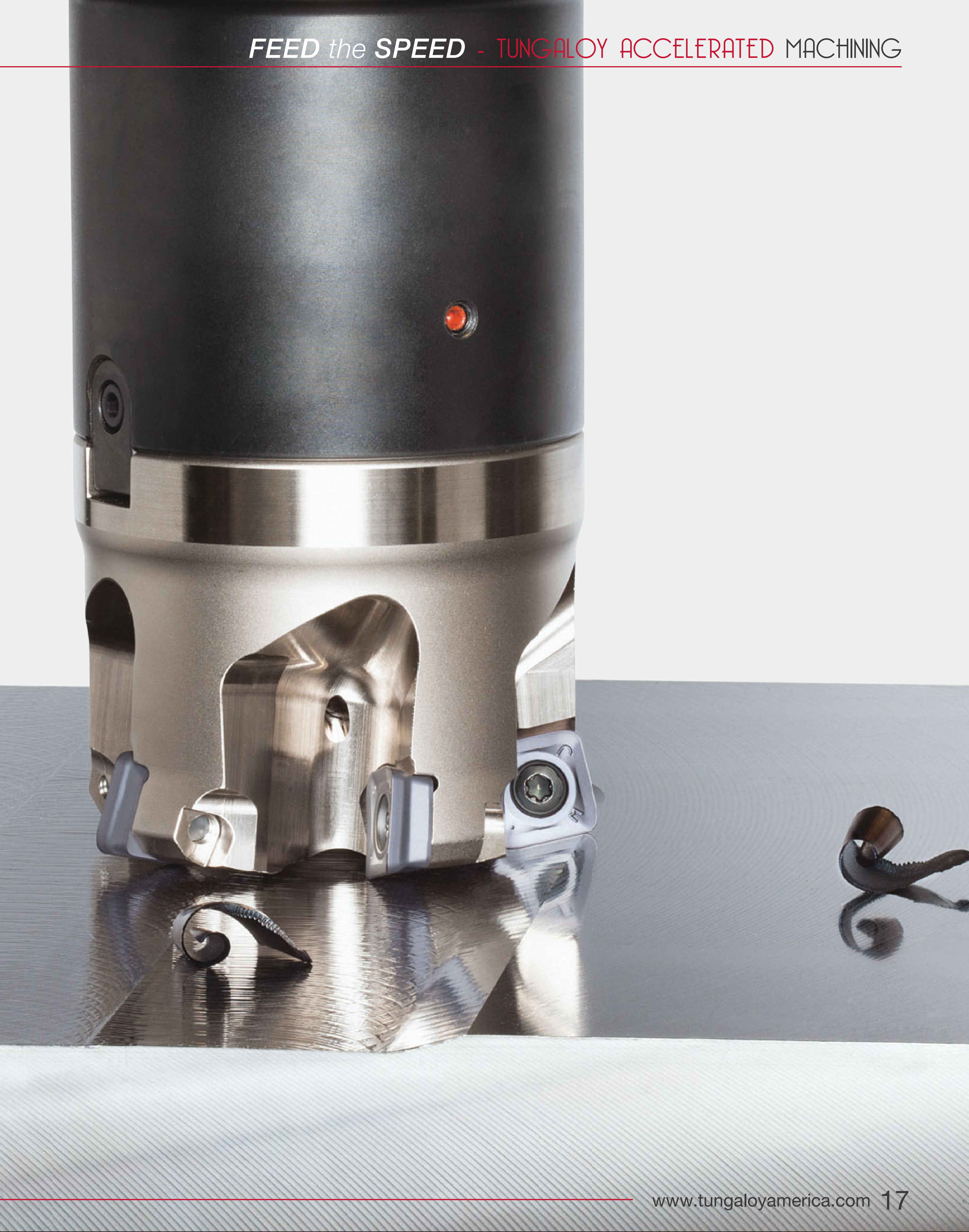
Small depth of cut



High depth of cut



MillQuad-Feed Series



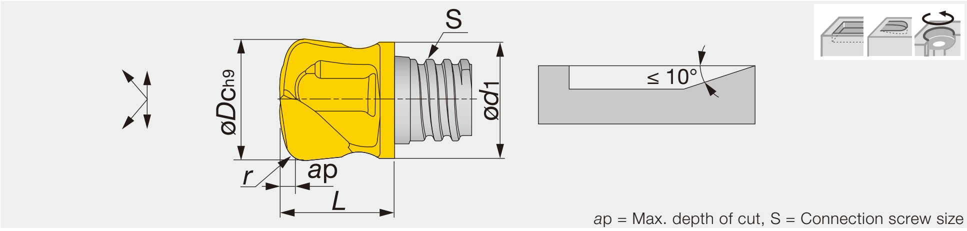
PRODUCT LINE-UP

A wide range of High-Feed Milling tools

TUNGMEISTER

VFX**-02...

TungMeister radius head for super high-feed milling



ap = Max. depth of cut, S = Connection screw size

Inch	AH725	z	Helx	øDc	ød1	Max. ap	r(1)	S	L	Wrench	Torque*
VFX037L02R060-U02S06	●	2	0°	0.375	0.360	0.020	0.060	S06	0.490	KEYV-S06	10
VFX050L04R080-U02S08	●	2	0°	0.500	0.480	0.040	0.080	S08	0.590	KEYV-S08	15
VFX075L06R080-U02S12	●	2	0°	0.750	0.720	0.059	0.080	S12	0.685	KEYV-S10	28

●: Standard item

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

STANDARD CUTTING CONDITIONS

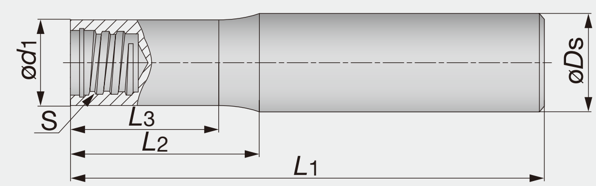
High feed milling (VFX)

ISO	Workpiece material	Hardness	Cutting speed Vc (ipt)	ø0.375" Feed per tooth fz (ipt)	ø0.375" Depth of cut ap (ipt)	ø0.500" Feed per tooth fz (ipt)	ø0.500" Depth of cut ap (ipt)	ø0.750" Feed per tooth fz (ipt)	ø0.750" Depth of cut ap (ipt)	Width of cut ae (in)
P	Low carbon steels 1045, 1055, etc.	- 300 HB	330 - 660	0.012 - 0.028	0.020	0.016 - 0.031	0.020	0.024 - 0.040	0.040	0.6 x øDc
	High carbon steels 4140, 5120, etc.	- 300 HB	260 - 590	0.008 - 0.024	0.020	0.012 - 0.028	0.020	0.020 - 0.035	0.040	0.6 x øDc
	Prehardened steel PX5, NAK80, etc.	30 - 40 HRC	260 - 530	0.008 - 0.020	0.016	0.008 - 0.02	0.016	0.012 - 0.024	0.030	0.6 x øDc
M	Stainless steels S30400, S31600, etc.	- 200 HB	200 - 330	0.008 - 0.024	0.016	0.008 - 0.024	0.016	0.012 - 0.028	0.030	0.6 x øDc
K	Grey cast irons No.250B, No.300B, etc.	150 - 250 HB	330 -720	0.012 - 0.028	0.020	0.016 - 0.031	0.030	0.024 - 0.040	0.040	0.6 x øDc
	Ductile cast irons 60-40-18, etc.	150 - 250 HB	330 - 720	0.008 - 0.024	0.020	0.012 - 0.028	0.030	0.020 - 0.035	0.040	0.6 x øDc
S	Titanium alloys Ti-6Al-4V, etc.	-	130 - 260	0.008 - 0.020	0.016	0.008 - 0.020	0.016	0.008 - 0.024	0.020	0.25 x øDc
	Heat-resistant alloys Inconel 718, etc.	-	66 - 130	0.004 - 0.012	0.012	0.004 - 0.012	0.012	0.004 - 0.012	0.016	0.25 x øDc
H	Hardened steel H13, etc.	40 - 50 HRC	130 - 260	0.008 - 0.016	0.012	0.008 - 0.016	0.012	0.012 - 0.020	0.016	0.45 x øDc
	Hardened steel D2, etc.	50 - 60 HRC	66 - 200	0.004 - 0.008	0.008	0.004 -0.008	0.008	0.004 - 0.012	0.012	0.25 x øDc

TUNGMEISTER

VSS...

TungMeister, straight neck and cylindrical shank



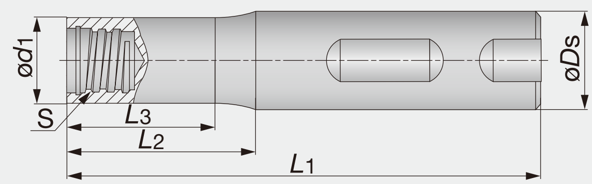
S = Connection screw size

Inch	øDs	ød1	L1	L2	L3	S	Type	Material
VSS031L250S05US	0.312	0.300	2.500	0.590	0.510	S05	CYLINDRICAL	STEEL
VSS037L300S06US	0.375	0.364	3.000	0.590	0.510	S06	CYLINDRICAL	STEEL
VSS050L350S08US	0.500	0.480	3.540	0.630	0.530	S08	CYLINDRICAL	STEEL
VSS062L400S10US	0.625	0.598	4.000	0.780	0.680	S10	CYLINDRICAL	STEEL
VSS075L500S12US	0.750	0.720	5.000	1.000	0.880	S12	CYLINDRICAL	STEEL
VSS031L300S05UC	0.312	0.300	3.000	1.000	0.950	S05	CYLINDRICAL	CARBIDE
VSS031L350S05UC	0.312	0.300	3.500	1.500	1.450	S05	CYLINDRICAL	CARBIDE
VSS031L400S05UC	0.312	0.300	4.000	2.000	1.950	S05	CYLINDRICAL	CARBIDE
VSS037L400S06UC	0.375	0.364	4.000	1.250	1.200	S06	CYLINDRICAL	CARBIDE
VSS037L475S06UC	0.375	0.364	4.750	2.000	1.950	S06	CYLINDRICAL	CARBIDE
VSS050L400S08UC	0.500	0.480	4.000	1.500	1.400	S08	CYLINDRICAL	CARBIDE
VSS050L550S08UC	0.500	0.480	5.500	2.500	2.450	S08	CYLINDRICAL	CARBIDE
VSS062L325S10UC	0.625	0.600	3.250	1.250	1.180	S10	CYLINDRICAL	CARBIDE
VSS062L450S10UC	0.625	0.600	4.500	2.500	2.430	S10	CYLINDRICAL	CARBIDE
VSS062L550S10UC	0.625	0.600	5.500	3.500	3.430	S10	CYLINDRICAL	CARBIDE
VSS062L700S10UC	0.625	0.600	7.000	5.000	4.930	S10	CYLINDRICAL	CARBIDE
VSS075L400S12UC	0.750	0.720	4.000	1.500	1.430	S12	CYLINDRICAL	CARBIDE
VSS075L550S12UC	0.750	0.720	5.500	3.000	2.930	S12	CYLINDRICAL	CARBIDE
VSS075L800S12UC	0.750	0.720	8.000	4.500	4.430	S12	CYLINDRICAL	CARBIDE
VSS031L300S05UW	0.312	0.299	3.000	1.000	0.978	S05	CYLINDRICAL	TUNGSTEN
VSS031L450S05UW	0.312	0.299	4.500	2.000	1.978	S05	CYLINDRICAL	TUNGSTEN
VSS037L355S06UW	0.375	0.364	3.550	0.750	0.680	S06	CYLINDRICAL	TUNGSTEN
VSS050L425S08UW	0.500	0.480	4.250	0.630	0.530	S08	CYLINDRICAL	TUNGSTEN
VSS050L218W05US	0.500	0.299	2.185	0.150	-	S05	WELDON	STEEL
VSS062L258W06US	0.625	0.366	2.580	0.236	-	S06	WELDON	STEEL
VSS062L258W08US	0.625	0.480	2.580	0.157	-	S08	WELDON	STEEL
VSS075L275W10US	0.750	0.598	2.750	0.157	-	S10	WELDON	STEEL
VSS100L300W12US	1.000	0.720	3.000	0.283	-	S12	WELDON	STEEL
VSS100L537S15US	1.000	0.957	5.375	1.375	1.313	S15	CYLINDRICAL	STEEL
VSS100L475S15UC	1.000	0.957	4.750	2.375	2.313	S15	CYLINDRICAL	CARBIDE
VSS100L675S15UC	1.000	0.957	6.750	4.000	3.938	S15	CYLINDRICAL	CARBIDE
VSS100L1000S15UC	1.000	0.957	10.000	6.000	5.938	S15	CYLINDRICAL	CARBIDE

TUNGMEISTER

VSSD**W...

TungMeister, straight neck and weldon shank



S = Connection screw size

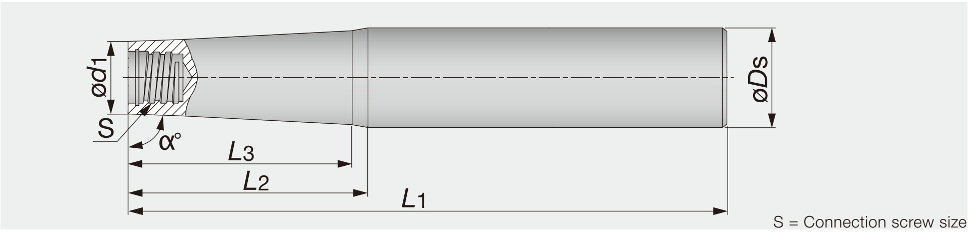
Metric	øDs	ød1	L1	L2	L3	S	Shank	Material
VSSD12L055W05-S	12	7.6	55	3.8	-	S05	WELDON	STEEL
VSSD16L065W06-S	16	9.6	65	6	-	S06	WELDON	STEEL
VSSD16L065W08-S	16	11.5	65	4	-	S08	WELDON	STEEL
VSSD20L070W10-S	20	15.2	70	4	-	S10	WELDON	STEEL
VSSD25L075W12-S	25	18.3	75	6	-	S12	WELDON	STEEL

(Unit : mm)

TUNGMEISTER

VTS...

TungMeister, straight shank and taper neck



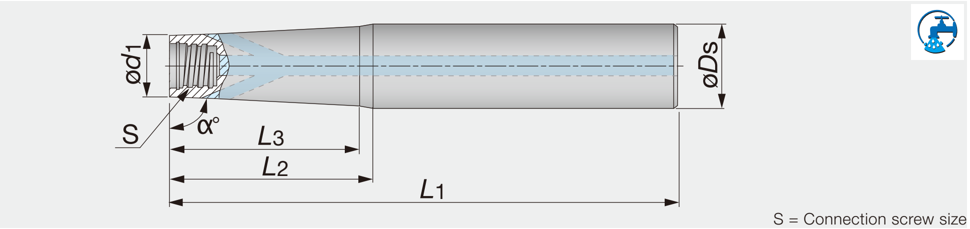
S = Connection screw size

Inch	α°	øDs	ød1	L1	L2	L3	S	Material
VTS050L300S05US	85	0.500	0.300	3.000	1.000	0.930	S05	STEEL
VTS050L400S05US	89	0.500	0.300	4.000	1.500	1.300	S05	STEEL
VTS062L500S06US	85	0.625	0.370	5.000	1.380	1.283	S06	STEEL
VTS062L630S06US	89	0.625	0.364	6.300	2.170	1.750	S06	STEEL
VTS062L550S08US	85	0.625	0.480	5.500	0.870	0.770	S08	STEEL
VTS075L650S08US	89	0.750	0.480	6.500	3.150	2.770	S08	STEEL
VTS075L550S10US	85	0.750	0.598	5.500	0.880	0.000	S10	STEEL
VTS100L670S10US	85	1.000	0.598	6.700	1.600	0.000	S10	STEEL
VTS075L750S10US	89	0.750	0.600	7.500	3.150	2.950	S10	STEEL
VTS100L630S12US	85	1.000	0.720	6.300	1.600	-	S12	STEEL
VTS125L750S12US	85	1.250	0.720	7.500	3.150	-	S12	STEEL
VTS100L800S12US	89	1.000	0.720	8.000	3.750	3.400	S12	STEEL
VTS037L350S05UC	89	0.375	0.300	3.500	1.500	0.000	S05	CARBIDE
VTS050L450S05UC	89	0.500	0.300	4.500	2.500	1.400	S05	CARBIDE
VTS062L600S05UC	89	0.625	0.300	6.000	4.000	3.900	S05	CARBIDE
VTS050L550S06UC	89	0.500	0.364	5.500	2.500	2.470	S06	CARBIDE
VTS062L650S06UC	89	0.625	0.364	6.500	3.500	3.380	S06	CARBIDE
VTS062L650S08UC	89	0.625	0.480	6.500	3.500	3.440	S08	CARBIDE
VTS075L700S08UC	89	0.750	0.480	7.000	4.000	3.900	S08	CARBIDE
VTS075L650S10UC	89	0.750	0.600	6.500	4.000	0.000	S10	CARBIDE
VTS075L880S10UC	89	0.750	0.600	8.800	6.300	6.240	S10	CARBIDE
VTS100L1000S12UC	89	1.000	0.720	10.000	5.500	-	S12	CARBIDE
VTS075L550S06UW	85	0.750	0.370	5.500	2.240	0.000	S06	TUNGSTEN
VTS062L670S06UW	89	0.625	0.364	6.700	2.180	1.770	S06	TUNGSTEN
VTS075L670S08UW	89	0.750	0.480	6.700	3.150	2.700	S08	TUNGSTEN

TUNGMEISTER

VTSD**-W-A

TungMeister, straight shank and taper neck with coolant hole



S = Connection screw size

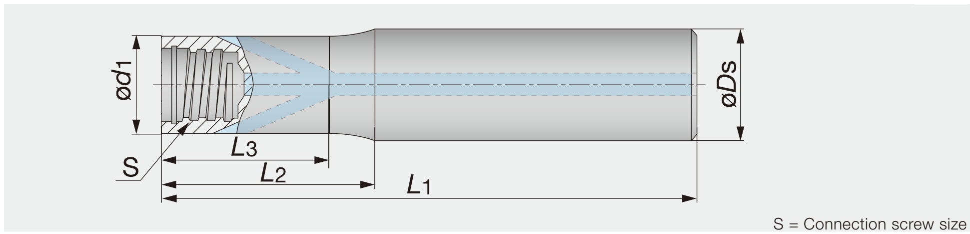
Metric	α°	øDs	ød1	L1	L2	L3	S	Material
VTSD12L110S06-W-A	89	12	9.6	110	60	59	S06	TUNGSTEN
VTSD16L170S06-W-A	89	16	9.6	170	120	116	S06	TUNGSTEN

(Unit : mm)

TUNGMEISTER

VSSD**-W-A

TungMeister, straight shank and neck with coolant hole



S = Connection screw size

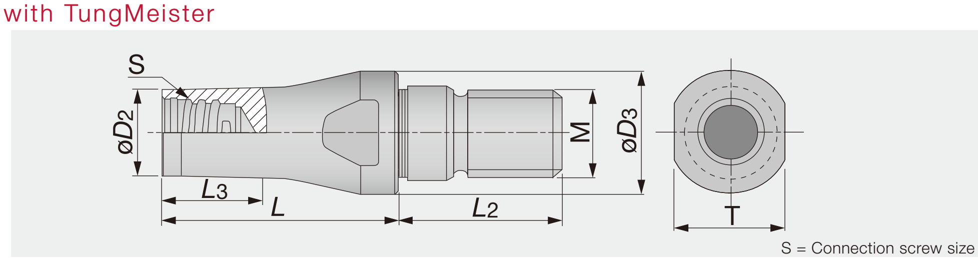
Metric	øDs	ød1	L1	L2	L3	S	Material
VSSD10L070S06-W-A	10	9.6	70	20	19	S06	TUNGSTEN
VSSD10L090S06-W-A	10	9.6	90	40	39	S06	TUNGSTEN
VSSD10L110S06-W-A	10	9.6	110	60	59	S06	TUNGSTEN
VSSD12L070S08-W-A	12	11.5	70	20	19	S08	TUNGSTEN
VSSD12L090S08-W-A	12	11.5	90	40	39	S08	TUNGSTEN
VSSD12L110S08-W-A	12	11.5	110	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

(Unit : mm)

TUNGMEISTER TUNGFLEX

VAD**-M...

TungFlex conversion adaptor with TungMeister

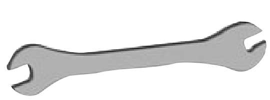


S = Connection screw size

Metric	øD2	øD3	L	L2	L3	S	M	T
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

(Unit : mm)

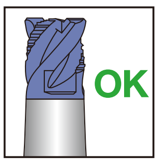
WRENCH

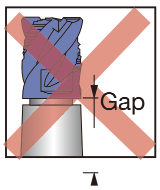
Appearance	Designation	Connection screw size	Torque (N·m)	Applicable head
	KEYV-S05	S05	7	Square Ball Radius Drilling Chamfering Counter boring
	KEYV-S06	S06	10	
	KEYV-S08	S08	15	
	KEYV-S10	S10	28	
	KEYV-S12	S12	28	
	KEYV-W20	S15	40	

Note: Optional parts

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 supplied wrench. 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-tighten or over-tighten. Excessive tightening may cause the cutting head to break.
- Do not apply excessive force or hammer when tightening or exchanging the cutting heads.



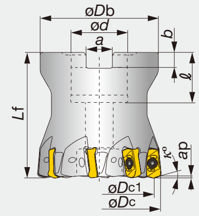


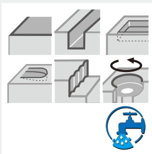
DOFEED

TXN03

Super high-feed milling cutters with double sided inserts with 4 edges

A.R. = +6°, R.R. = +12° ~ 13°





Inch	Max. ap	øDc	z	øDc1	øDb	ød	ℓ	Lf	b	a	κ°	lb	Air hole	Insert
TXN03R150U0050A05	0.039	1.500	5	1.244	1.461	0.500	0.750	1.574	0.197	0.315	17	0.440	✓	LNMU03...
TXN03R150U0050A06	0.039	1.500	6	1.244	1.461	0.500	0.750	1.969	0.197	0.315	17	0.440	✓	LNMU03...
TXN03R200U0075A05	0.039	2.000	5	1.744	1.693	0.750	0.750	1.969	0.197	0.315	17	1.000	✓	LNMU03...
TXN03R200U0075A08	0.039	2.000	8	1.744	1.693	0.750	0.750	1.969	0.197	0.315	17	1.000	✓	LNMU03...
TXN03R200U0075A10	0.039	2.000	10	1.744	1.693	0.750	0.750	1.969	0.197	0.315	17	1.100	✓	LNMU03...

SPARE PARTS

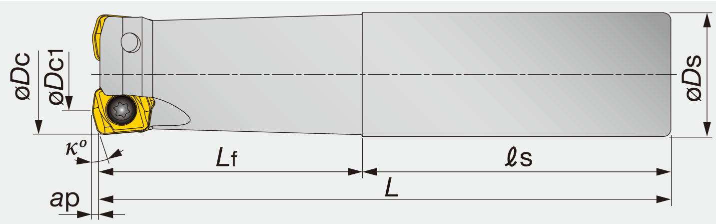
Designation	Clamping screw	Lubricant	Wrench
TXN03...	CSPB-2.5	M-1000	IP-8D

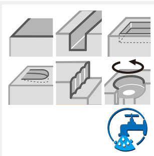
DOFEED

EXN03

Super high-feed milling endmills with double sided inserts with 4 edges

A.R. = +6°, R.R. = +5° ~ +11°





Inch	Max. ap	øDc	z	øDc1	øDs	L	Lf	ℓs	κ°	lb	Air hole	Insert
EXN03R062U0062-02	0.039	0.625	2	0.369	0.625	4.000	1.250	2.750	15	0.440	✓	LNMU03...
EXN03R062U0062-02L	0.039	0.625	2	0.369	0.625	6.000	2.000	4.000	15	0.440	✓	LNMU03...
EXN03R068U0062-02	0.039	0.688	2	0.432	0.625	4.000	1.250	2.750	17	0.440	✓	LNMU03...
EXN03R068U0062-02L	0.039	0.688	2	0.432	0.625	6.000	1.000	5.000	17	0.440	✓	LNMU03...
EXN03R075U0075-02	0.039	0.750	2	0.494	0.750	5.000	2.000	3.000	17	0.660	✓	LNMU03...
EXN03R075U0075-03	0.039	0.750	3	0.494	0.750	5.000	2.000	3.000	17	0.660	✓	LNMU03...
EXN03R075U0075-03L	0.039	0.750	3	0.494	0.750	6.500	3.500	3.000	17	0.660	✓	LNMU03...
EXN03R087U0075-02	0.039	0.875	2	0.619	0.750	5.000	2.000	3.000	17	0.660	✓	LNMU03...
EXN03R087U0075-03	0.039	0.875	3	0.619	0.750	5.000	2.000	3.000	17	0.660	✓	LNMU03...
EXN03R087U0075-03L	0.039	0.875	3	0.619	0.750	6.500	1.250	5.250	17	0.880	✓	LNMU03...
EXN03R100U0100-04	0.039	1.000	4	0.764	1.000	5.500	2.500	3.000	17	1.100	✓	LNMU03...
EXN03R100U0100-04L	0.039	1.000	4	0.764	1.000	7.000	4.000	3.000	17	1.320	✓	LNMU03...
EXN03R100U0100-05	0.039	1.000	5	0.764	1.000	5.500	2.500	3.000	17	1.100	✓	LNMU03...
EXN03R112U0100-04	0.039	1.125	4	0.869	1.000	5.500	2.500	3.000	17	1.100	✓	LNMU03...
EXN03R112U0100-04L	0.039	1.125	4	0.869	1.000	7.000	1.500	5.500	17	1.540	✓	LNMU03...
EXN03R112U0100-05	0.039	1.125	5	0.869	1.000	5.500	2.500	3.000	17	1.100	✓	LNMU03...
EXN03R125U0125-05	0.039	1.250	5	0.994	1.250	6.000	3.000	3.000	17	1.760	✓	LNMU03...
EXN03R125U0125-05L	0.039	1.250	5	0.994	1.250	8.000	5.000	3.000	17	2.430	✓	LNMU03...
EXN03R125U0125-06	0.039	1.250	6	0.994	1.250	6.000	3.000	3.000	17	1.760	✓	LNMU03...

SPARE PARTS

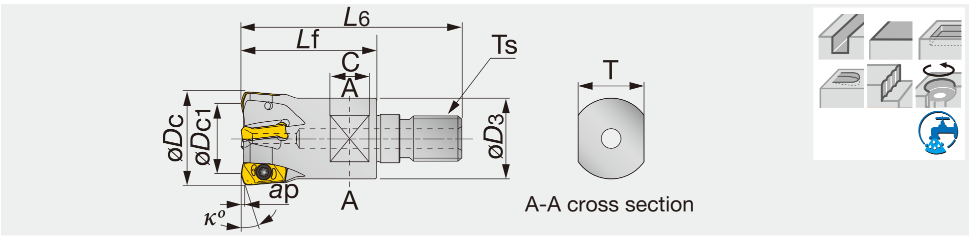
Designation	Clamping screw	Lubricant	Wrench
EXN03...	CSPB-2.5	M-1000	IP-8D

DOFEED

HXN03-M

Super high-feed milling endmills (Dofeed) with TungFlex

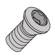
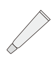
A.R. = +6°, R.R. = +5° ~ +11°



Metric	Max. ap	øDc	z	øDc1	L6	Lf	C	T	øD3	κ°	Ts	Kg	Air hole	Insert
HXN03R016MM08-02	1	16	2	9.5	42	25	8	10	12.8	15	M8	0.03	✓	LNMU03...
HXN03R018MM08-02	1	18	2	11.5	42	25	8	10	14.5	17	M8	0.04	✓	LNMU03...
HXN03R020MM10-03	1	20	3	13.5	49	30	10	15	17.8	17	M10	0.06	✓	LNMU03...
HXN03R020MM10-04	1	20	4	13.5	49	30	10	15	17.8	17	M10	0.06	✓	LNMU03...
HXN03R022MM10-03	1	22	3	15.5	49	30	10	15	17.8	17	M10	0.06	✓	LNMU03...
HXN03R022MM10-04	1	22	4	15.5	49	30	10	15	17.8	17	M10	0.07	✓	LNMU03...
HXN03R025MM12-04	1	25	4	18.5	57	35	10	17	20.8	17	M12	0.1	✓	LNMU03...
HXN03R025MM12-05	1	25	5	18.5	57	35	10	17	20.8	17	M12	0.11	✓	LNMU03...
HXN03R028MM12-04	1	28	4	21.5	57	35	10	17	23	17	M12	0.12	✓	LNMU03...
HXN03R028MM12-05	1	28	5	21.5	57	35	10	17	23	17	M12	0.12	✓	LNMU03...
HXN03R030MM16-04	1	30	4	23.5	63	40	12	22	28.8	17	M16	0.19	✓	LNMU03...
HXN03R030MM16-05	1	30	5	23.5	63	40	12	22	28.8	17	M16	0.2	✓	LNMU03...
HXN03R032MM16-05	1	32	5	25.5	63	40	12	22	28.8	17	M16	0.2	✓	LNMU03...
HXN03R032MM16-06	1	32	6	25.5	63	40	12	22	28.8	17	M16	0.21	✓	LNMU03...

(Unit : mm)

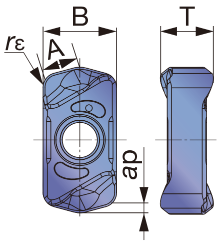
SPARE PARTS

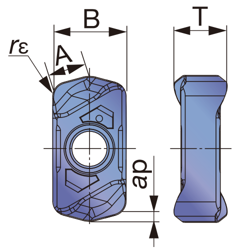

Designation	Clamping screw	Lubricant	Wrench
HXN03...	CSPB-2.5	M-1000	IP-8D

INSERTS

LNMU03-MJ (for general use)



LNMU03-ML (for low cutting force)



		AH130	AH725	AH3035
P	Steel		★	★
M	Stainless	★	☆	☆
K	Cast iron		☆	
N	Non-ferrous			
S	Superalloys	☆	★	
H	Hard materials		★	★

★ : First choice
☆ : Second choice

Designation	rε	Max. ap	Coated AH130	Coated AH725	Coated AH3035	A	B	T
LNMU0303ZER-MJ	0.047	0.039	●	●	●	0.126	0.236	0.169
LNMU0303ZER-ML	0.047	0.039	●	●	●	0.126	0.236	0.169

●: Standard item

STANDARD CUTTING CONDITIONS TXN03/EXN03/HXN03

ISO	Workpiece material	Hardness	Priority	Grade	Chip-breaker	Cutting speed Vc (sfm)	Feed per tooth: *fz* (ipt) Tool dia.: *ø*Dc (in) ø0.625 ~ ø0.875	ø1.0 ~ ø1.25	Plunging	ø0.625", z = 2 n	ø0.625", z = 2 Vf	ø0.688", z = 2 n	ø0.688", z = 2 Vf	Conditions
P	Carbon steels 1045, 1055, etc.	~ 300HB	First choice	AH725	MJ	330 - 980	0.020 - 0.050	0.020 - 0.060	0.004	4034	242	3664	220	Vc = 660 sfm, fz = 0.030 ipt
P	Carbon steels 1045, 1055, etc.	~ 300HB	For low cutting force	AH725	ML	330 - 980	0.020 - 0.030	0.020 - 0.040	0.004	4034	202	3664	183	Vc = 660 sfm, fz = 0.025 ipt
P	Carbon steels 1045, 1055, etc.	~ 300HB	For impact resistance	AH3035	MJ	330 - 980	0.020 - 0.050	0.020 - 0.060	0.004	4034	242	3664	220	Vc = 660 sfm, fz = 0.030 ipt
P	Alloy steels 4140, SCr415, etc.	~ 300HB	First choice	AH725	MJ	330 - 660	0.020 - 0.050	0.020 - 0.060	0.004	2995	180	2720	163	Vc = 490 sfm, fz = 0.030 ipt
P	Alloy steels 4140, SCr415, etc.	~ 300HB	For low cutting force	AH725	ML	330 - 660	0.020 - 0.030	0.020 - 0.040	0.004	2995	150	2720	136	Vc = 490 sfm, fz = 0.025 ipt
P	Alloy steels 4140, SCr415, etc.	~ 300HB	For impact resistance	AH3035	MJ	330 - 660	0.020 - 0.050	0.020 - 0.060	0.004	2995	180	2720	163	Vc = 490 sfm, fz = 0.030 ipt
P	Prehardened steels NAK80, PX5, etc.	30 ~ 40HRC	-	AH3035	ML	330 - 660	0.020 - 0.030	0.020 - 0.040	0.004	2995	150	2720	136	Vc = 490 sfm, fz = 0.025 ipt
M	Stainless steels 304, 316, etc.	~ 200HB	First choice	AH130	ML	330 - 490	0.012 - 0.020	0.012 - 0.030	0.003	2445	78	2221	71	Vc = 400 sfm, fz = 0.016 ipt
M	Stainless steels 304, 316, etc.	~ 200HB	For impact resistance	AH130	MJ	330 - 490	0.012 - 0.031	0.012 - 0.031	0.003	2445	98	2221	89	Vc = 400 sfm, fz = 0.020 ipt
K	Gray cast irons GG25, GG30, etc.	150 ~ 250HB	First choice	AH725	MJ	330 - 980	0.020 - 0.050	0.020 - 0.060	0.004	4034	242	3664	220	Vc = 660 sfm, fz = 0.030 ipt
K	Gray cast irons GG25, GG30, etc.	150 ~ 250HB	For low cutting force	AH725	ML	330 - 980	0.020 - 0.030	0.020 - 0.040	0.004	4034	202	3664	183	Vc = 660 sfm, fz = 0.025 ipt
K	Ductile cast irons GGG40, etc.	150 ~ 250HB	First choice	AH725	MJ	330- 660	0.020 - 0.050	0.020 - 0.060	0.004	2995	180	2720	163	Vc = 490 sfm, fz = 0.030 ipt
K	Ductile cast irons GGG40, etc.	150 ~ 250HB	For low cutting force	AH725	ML	330- 660	0.020 - 0.030	0.020 - 0.040	0.004	2995	150	2720	136	Vc = 490 sfm, fz = 0.025 ipt
S	Titanium alloys Ti-6Al-4V, etc.	~ 40HRC	-	AH725	ML	100 - 200	0.012 - 0.020	0.012 - 0.030	0.003	917	29	833	27	Vc = 150 sfm, fz = 0.016 ipt
S	Heat-resistant alloys Inconel, Hastelloy, etc.	~ 40HRC	-	AH725	MJ	60 - 160	0.004 - 0.008	0.004 - 0.012	0.002	611	7	555	7	Vc = 100 sfm, fz = 0.006 ipt
H	Hardened steels X40CrMoV5-1, etc.	40 ~ 50HRC	First choice / For wear resistance	AH3035 / AH725	MJ	260 - 430	0.004 - 0.008	0.004 - 0.012	0.002	2017	24	1832	22	Vc = 330 sfm, fz = 0.006 ipt
H	Hardened steels X153CrMoV12, etc.	50 ~ 60HRC	First choice / For impact resistance	AH725 / AH3035	MJ	160 - 230	0.001 - 0.002	0.001 - 0.003	0.001	1222	4	1110	3	Vc = 200 sfm, fz = 0.0015 ipt

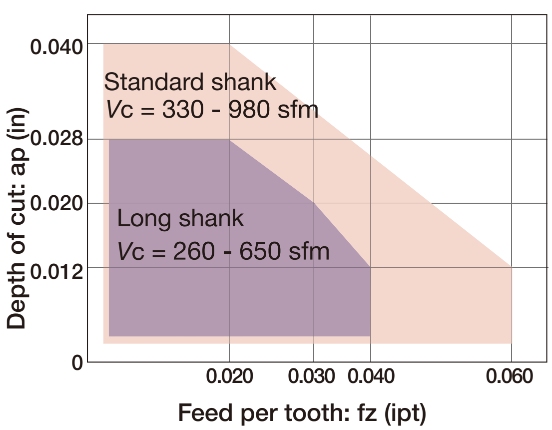
Always use an airgun to clear cavities and slots completely of chips and debris.

Tool overhang length must be as short as possible to avoid chatter. When the tool overhang length is long, decrease the number of revolutions and feed.

CAUTIONARY POINTS IN USE

The usage of standard and long shanks

When using a long shank, always lower the cutting conditions (*Vc*, *fz*, *ap*) to 70% of the maximum conditions for the standard shank.

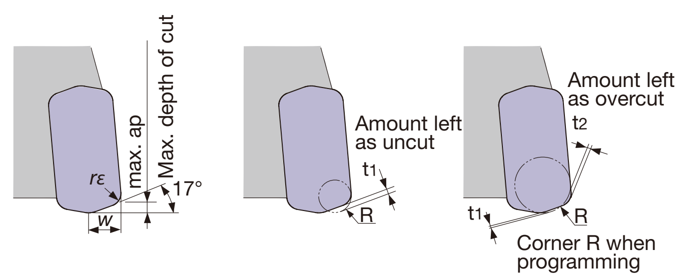


Tool dia.: øDc = ø0.625 - 1.250"
Workpiece material: 1055 (200HB)

L/D ratio of overhang
Standard shank: L/D ≤ 3
Long shank: L/D = 4

CAM programming

When programming for CAM, the tool should be considered as a round insert cutter. Usually, the corner radius should be set as R = 0.06". If a larger radius is used, overcutting will occur. The following table shows the amount left as uncut (t_1) and overcut (t_2).



Max. depth of cut max. ap (in)	Corner radius rε	W (in)	Corner R when programming	Amount left as uncut t_1	Amount left as overcut t_2
0.039	0.047	0.118	0.039	0.024	-
			0.060	0.020	-
			0.079	0.010	0.003
			0.098	0.006	0.010

Each value in the table is calculated theoretically at the maximum condition.

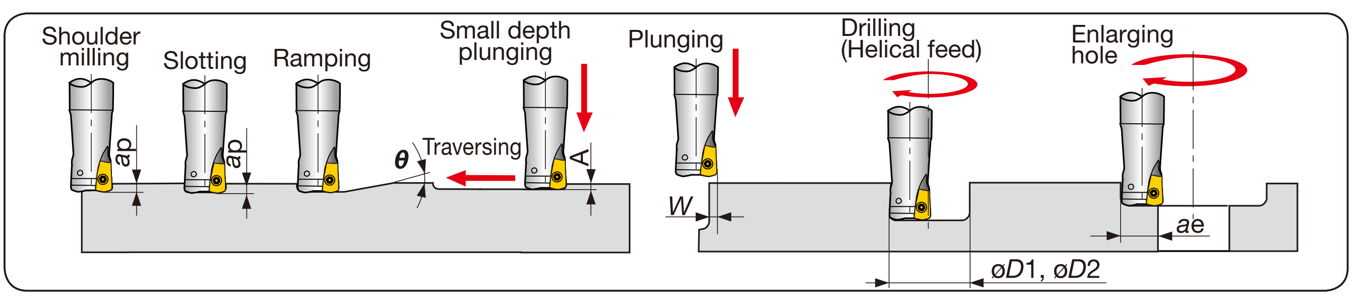
Tool dia.: øDc (in), Number of revolutions: *n* (rpm), Feed speed: *Vf* (ipm), Max. depth of cut: *ap* = 0.039"

ø0.750"			ø0.875"			ø1.000"			ø1.125"			ø1.250"			ø1.500"			ø2.000"		
n	Vf		n	Vf		n	Vf		n	Vf		n	Vf		n	Vf		n	Vf	
	z = 2	z = 3		z = 2	z = 3		z = 4	z = 5		z = 4	z = 5		z = 5	z = 6		z = 5	z = 6		z = 5	z = 8
3361	202	303	2881	173	259	2521	403	504	2241	359	448	2017	403	484	1681	336	403	1261	252	403
Vc = 660 sfm, fz = 0.030 ipt						Vc = 660 sfm, fz = 0.040 ipt														
3361	168	252	2881	144	216	2521	303	378	2241	269	336	2017	303	363	1681	252	303	1261	189	303
Vc = 660 sfm, fz = 0.025 ipt						Vc = 660 sfm, fz = 0.030 ipt														
3361	202	303	2881	173	259	2521	403	504	2241	359	448	2017	403	484	1681	336	403	1261	252	403
Vc = 660 sfm, fz = 0.030 ipt						Vc = 660 sfm, fz = 0.040 ipt														
2496	150	225	2139	128	193	1872	299	374	1664	266	333	1497	299	359	1248	250	299	936	187	299
Vc = 490 sfm, fz = 0.030 ipt						Vc = 490 sfm, fz = 0.040 ipt														
2496	125	188	2139	107	160	1872	225	281	1664	200	250	1497	225	270	1248	187	225	936	140	225
Vc = 490 sfm, fz = 0.025 ipt						Vc = 490 sfm, fz = 0.030 ipt														
2496	150	225	2139	128	193	1872	299	374	1664	266	333	1497	299	359	1248	250	299	936	187	299
Vc = 490 sfm, fz = 0.030 ipt						Vc = 490 sfm, fz = 0.040 ipt														
2496	125	225	2139	107	160	1872	225	281	1664	200	250	1497	225	270	1248	187	225	936	140	225
Vc = 490 sfm, fz = 0.025 ipt						Vc = 490 sfm, fz = 0.030 ipt														
2037	65	98	1746	56	84	1528	122	153	1358	109	136	1222	122	147	1019	102	122	764	76	122
Vc = 400 sfm, fz = 0.016 ipt						Vc = 400 sfm, fz = 0.020 ipt														
2037	81	122	1746	70	105	1528	134	168	1358	120	149	1222	134	161	1019	112	134	764	84	134
Vc = 400 sfm, fz = 0.020 ipt						Vc = 400 sfm, fz = 0.022 ipt														
3361	202	302	2881	173	259	2521	403	504	2241	359	448	2017	403	484	1681	336	403	1261	252	403
Vc = 660 sfm, fz = 0.030 ipt						Vc = 660sfm, fz = 0.040 ipt														
3361	168	252	2881	144	216	2521	303	378	2241	269	336	2017	303	363	1681	252	303	1261	189	303
Vc = 660 sfm, fz = 0.025 ipt						Vc = 660 sfm, fz = 0.030 ipt														
2496	150	300	2139	128	193	1872	299	374	1664	266	333	1497	299	359	1248	250	299	936	187	299
Vc = 490 sfm, fz = 0.030 ipt						Vc = 490 sfm, fz = 0.040 ipt														
2496	125	250	2139	107	160	1872	225	281	1664	200	250	1497	225	270	1248	187	225	936	140	225
Vc = 490 sfm, fz = 0.025 ipt						Vc = 490 sfm, fz = 0.030 ipt														
764	24	49	655	21	31	573	46	57	509	41	51	458	46	55	382	38	46	286	29	46
Vc = 150 sfm, fz = 0.016 ipt						Vc = 150 sfm, fz = 0.020 ipt														
509	6	9	437	5	8	382	12	15	340	11	14	306	12	15	255	10	12	191	8	12
Vc = 100 sfm, fz = 0.006 ipt						Vc = 100 sfm, fz = 0.008 ipt														
1681	20	40	1441	17	26	1261	40	50	1120	36	45	1008	40	48	840	34	40	630	25	40
Vc = 330 sfm, fz = 0.006 ipt						Vc = 330 sfm, fz = 0.008 ipt														
1019	3	5	873	3	4	764	6	8	679	5	7	611	6	7	509	5	6	382	4	6
Vc = 200 sfm, fz = 0.0015 ipt						Vc = 200 sfm, fz = 0.002 ipt														

The above table shows the conditions for standard shank type cutters. When using long shank type cutters, the number of teeth may be different. In this case, the cutting conditions should be changed by referring to: "The usage of standard and long shanks" shown on the previous page.

Cutting conditions are generally limited by the spindle rigidity, machine power and the workpiece fixture stability. When setting the conditions, start from half of the values of the standard cutting conditions and then increase the value gradually while making sure the machine is running normally.

APPLICATION RANGE



Inch	Tool dia. øDc	Max. depth of cut Max ap	Max. ramping angle θ°	Max. plunging depth A	Max. cutting width in plunging W	Min.machinable hole diameter øD1	Max.machinable hole diameter øD2	Max. cutting width in enlarged hole ae
EXN03R062U0062...	0.625	0.039	2.1	0.012	0.138	0.866	1.181	0.492
EXN03R068U0062...	0.688	0.039	1.7	0.012	0.138	1.024	1.339	0.571
EXN03R075U0075...	0.750	0.039	1.4	0.012	0.138	1.181	1.496	0.650
EXN03R087U0075...	0.875	0.039	1.2	0.012	0.138	1.339	1.654	0.728
EXN03R100U0100...	1.000	0.039	1.0	0.012	0.138	1.575	1.890	0.846
EXN03R112U0100...	1.125	0.039	0.8	0.012	0.138	1.811	2.126	0.965
EXN03R125U0125...	1.250	0.039	0.7	0.012	0.138	2.126	2.441	1.122
TXN03R150U0075...	1.500	0.039	0.5	0.012	0.138	2.750	3.070	1.437
TXN03R200U0075...	2.000	0.039	0.4	0.012	0.138	3.540	3.858	1.830

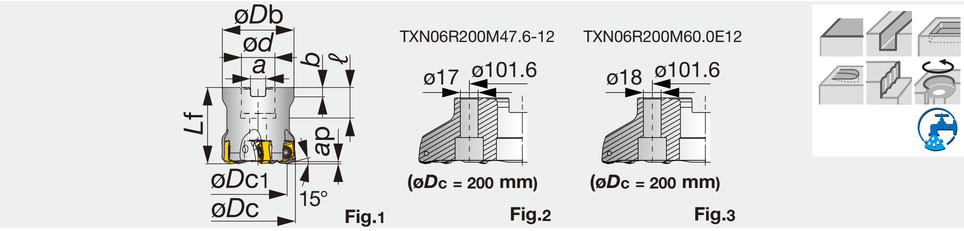
· For øDc above 1.300", slot milling, ramping or contouring is not recommended as chips may be re-cut.

DOFEED

TXN06

Super high-feed milling cutters with double sided inserts with 4 edges

A.R. = +10°, R.R. = +2° ~ +6°



Inch	Max. ap	øDc	z	øDc1	øDb	Lf	ød	ℓ	a	b	lb	Air hole	Insert
TXN06R200U0075A04	0.059	2.000	4	1.513	1.850	1.969	0.750	0.750	0.315	0.197	0.970	✓	LN*U06...
TXN06R200U0075A05	0.059	2.000	5	1.513	1.850	1.969	0.750	0.750	0.315	0.197	0.990	✓	LN*U06...
TXN06R250U0075A04	0.059	2.500	4	2.012	2.323	1.969	0.750	0.750	0.315	0.197	1.740	✓	LN*U06...
TXN06R250U0075A06	0.059	2.500	6	2.012	2.323	1.969	0.750	0.750	0.315	0.197	1.760	✓	LN*U06...
TXN06R300U0100A05	0.059	3.000	5	2.512	2.835	2.480	1.000	1.049	0.374	0.236	3.130	✓	LN*U06...
TXN06R300U0100A07	0.059	3.000	7	2.512	2.835	2.480	1.000	1.049	0.374	0.236	3.280	✓	LN*U06...
TXN06R400U0150A06	0.059	4.000	6	3.512	3.819	2.480	1.500	1.610	0.626	0.394	4.850	✓	LN*U06...
TXN06R400U0150A10	0.059	4.000	10	3.512	1.500	2.480	1.500	1.610	0.626	0.394	4.850	✓	LN*U06...
TXN06R500U0150A08	0.059	5.000	8	4.512	3.819	2.480	1.500	1.610	0.626	0.394	7.050	✓	LN*U06...
TXN06R500U0150A12	0.059	5.000	12	4.512	1.500	2.480	1.500	1.610	0.626	0.394	7.280	✓	LN*U06...
TXN06R600U0200A10	0.059	6.000	10	5.512	4.331	2.480	2.000	1.496	0.748	0.433	9.480	✓	LN*U06...
TXN06R600U0200A14	0.059	6.000	14	5.512	2.000	2.480	2.000	1.496	0.748	0.433	9.260	✓	LN*U06...

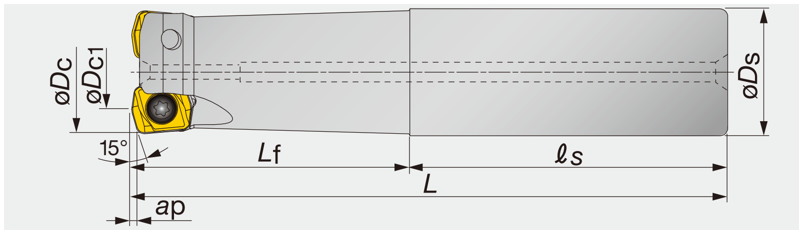
SPARE PARTS

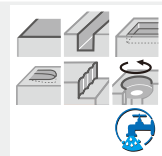
Designation	Clamping screw	Grip	Lubricant	Torx bit
TXN06R200U - 500U	CSPB-5	H-TB2W	M-1000	BLDIP20/S7
TXN06R600U...	CSPB-5	H-TB2W	M-1000	BLDIP20/M7

DOFEED

EXN06

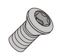
Super high-feed milling endmills with double sided inserts with 4 edges





Inch	Max. ap	øDc	z	øDc1	øDs	L	Lf	ℓs	lb	Air hole	Insert
EXN06R125U0125W02	0.059	1.250	2	0.766	1.250	5.000	3.000	2.000	1.760	✓	LN*U06...
EXN06R125U0125-02L	0.059	1.250	2	0.766	1.250	8.000	5.000	3.000	2.430	✓	LN*U06...
EXN06R150U0125W03	0.059	1.500	3	1.008	1.250	6.000	3.500	2.500	1.980	✓	LN*U06...
EXN06R150U0125-03L	0.059	1.500	3	1.008	1.250	10.000	2.000	8.000	2.870	✓	LN*U06...

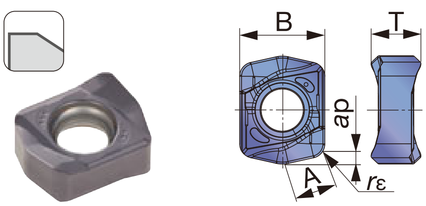
SPARE PARTS



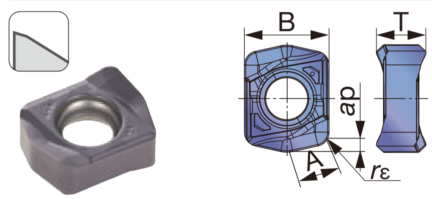
Designation	Clamping screw	Lubricant	Wrench
EXN06...	CSPB-5	M-1000	IP-20D

INSERTS

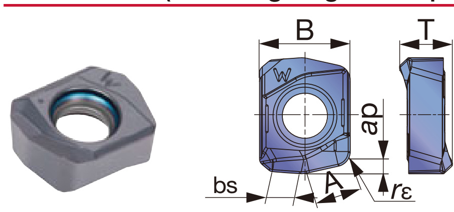
LNMU06-MJ



LNMU06-ML



LNGU06-W (2 cutting edges - Wiper)



		AH120	AH130	AH725	AH3035
P	Steel	☆		★	★
M	Stainless		★	☆	☆
K	Cast iron	★		☆	
N	Non-ferrous				
S	Superalloys	★	☆	★	
H	Hard materials			★	★

★ : First choice
☆ : Second choice

Designation	rε	Max. ap	Coated AH120	Coated AH130	Coated AH725	Coated AH3035	A	B	T	bs
LNMU06X5ZER-MJ	0.079	0.059	●	●	●	●	0.236	0.472	0.276	-
LNMU06X5ZER-ML	0.079	0.059	●	●	●	●	0.236	0.472	0.276	-
LNGU06X5ZER-W	0.079	0.059			●		0.236	0.472	0.276	0.142

●: Standard item

STANDARD CUTTING CONDITIONS TXN06 / EXN06

ISO	Workpiece material	Hardness	Priority	Grade	Chip-breaker	Cutting speed Vc (sfm)	Feed per tooth: fz (ipt) Tool dia.: øDc (in) ø1.25" - ø6.0"	Feed per tooth: fz (ipt) Plunging	ø1.250", z = 2 n	ø1.250", z = 2 Vf	ø1.500", z = 2 n	ø1.500", z = 2 Vf	
P	Carbon steels 1045, 1055, etc.	~ 300HB	First choice	AH725	MJ	330 - 980	0.020 - 0.059	0.006	2,010	161	1,670	134	Vc = 660 sfm, fz = 0.040 ipt
			For wear resistance	AH120									
			For impact resistance	AH3035									
	Alloy steels 4140, SCr415, etc.	~ 300HB	First choice	AH725	MJ	330 - 660	0.020 - 0.059	0.006	1,500	120	1,250	100	Vc = 490 sfm, fz = 0.040 ipt
			For wear resistance	AH120									
			For impact resistance	AH3035									
	Prehardened steels NAK80, PX5, etc.	30 ~ 40HRC	-	AH3035	ML	330 - 660	0.020 - 0.039	0.006	1,500	90	1,250	75	Vc = 490 sfm, fz = 0.030 ipt
M	Stainless steels 304, 316, etc.	~ 200HB	First choice	AH130	ML	330 - 490	0.012 - 0.028	0.004	1,200	48	1,000	40	Vc = 400 sfm, fz = 0.020 ipt
		~ 200HB	For impact resistance	AH130	MJ	330 - 490	0.012 - 0.031	0.004	1,200	50	1,000	42	Vc = 400 sfm, fz = 0.021 ipt
K	Gray cast irons GG25, GG30, etc.	150 ~ 250HB	First choice	AH120	MJ	330 - 980	0.020 - 0.059	0.006	2,010	161	1,670	134	Vc = 660 sfm, fz = 0.040 ipt
		150 ~ 250HB	For low cutting force	AH120	ML	330 - 980	0.020 - 0.039	0.006	2,010	121	1,670	100	Vc = 660 sfm, fz = 0.030 ipt
	Ductile cast irons GGG40, etc.	150 ~ 250HB	First choice	AH120	MJ	260 - 660	0.020 - 0.059	0.006	1,500	120	1,250	100	Vc = 490 sfm, fz = 0.040 ipt
		150 ~ 250HB	For low cutting force	AH120	ML	260 - 660	0.020 - 0.039	0.006	1,500	90	1,250	75	Vc = 490 sfm, fz = 0.030 ipt
S	Titanium alloys Ti-6Al-4V, etc.	~ 40HRC	-	AH725	ML	100 - 200	0.012 - 0.028	0.003	450	18	380	15	Vc = 150 sfm, fz = 0.020 ipt
	Heat-resistant alloys Inconel, Hastelloy, etc.	~ 40HRC	-	AH725	MJ	60 - 160	0.004 - 0.012	0.002	300	5	250	4	Vc = 100 sfm, fz = 0.008 ipt
H	Hardened steels X40CrMoV5-1, etc.	40 ~ 50HRC	First choice	AH3035	MJ	260 - 430	0.004 - 0.012	0.002	1,000	16	840	13	Vc = 330 sfm, fz = 0.008 ipt
			For wear resistance	AH725									
	Hardened steels X153CrMoV12, etc.	50 ~ 60HRC	First choice	AH725	MJ	160 - 230	0.001 - 0.003	0.001	600	2	500	2	Vc = 200 sfm, fz = 0.002 ipt
			For impact resistance	AH3035									

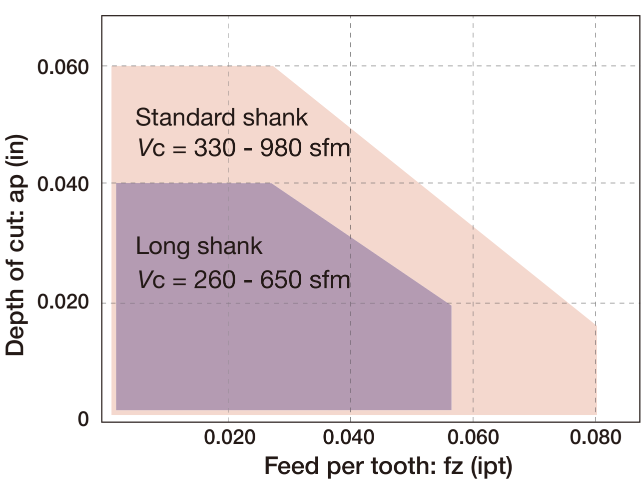
Always use an airgun to clear cavities and slots completely of chips and debris.

Tool overhang length must be as short as possible to avoid chatter. When the tool overhang length is long, decrease the number of revolutions and feed.

CAUTIONARY POINTS IN USE

The usage of standard and long shanks

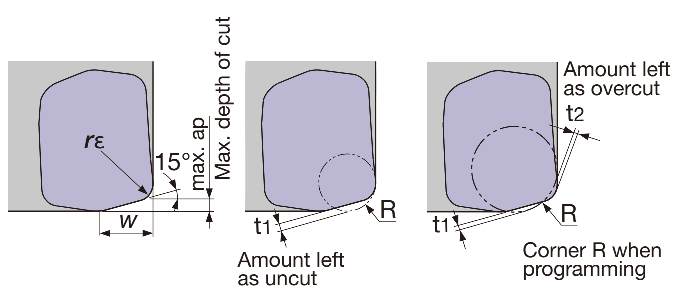
When using a long shank, always lower the cutting conditions (*Vc*, *fz*, *ap*) to 70% of the maximum conditions for the standard shank.



Tool dia.: øDc = ø1.250" - 1.500"	**L/D ratio of overhang**
Workpiece material: 1055 (200HB)	Standard shank: L/D ≤ 3
	Long shank: L/D = 4

CAM programming

When programming for CAM, the tool should be considered as a round insert cutter. Usually, the corner radius should be set as R = 0.12". If a larger radius is used, overcutting will occur. The following table shows the amount left as uncut (t_1) and overcut (t_2).



Max. depth of cut max. ap(in)	Corner radius rε	W (in)	Corner R when programming	Amount left as uncut t_1	Amount left as overcut t_2
0.059	0.079	0.236	0.079	0.040	-
			0.118	0.030	-
			0.157	0.021	0.010

Each value in the table is calculated theoretically at the maximum condition.

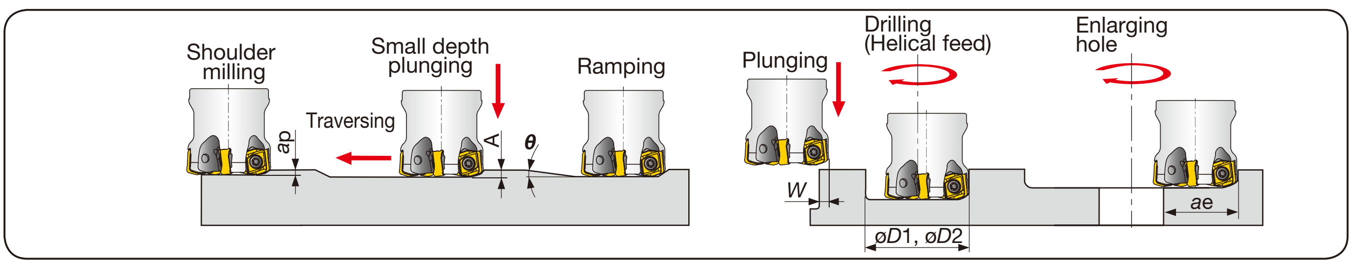
Tool dia.: øDc (in), Number of revolutions: n (rpm), Feed speed: Vf (ipm), Max. depth of cut: ap = 0.059", No. of inserts: z

ø2.000"			ø2.500"			ø3.000"			ø4.000"			ø5.000"			ø6.000"		
n	Vf		n	Vf		n	Vf		n	Vf		n	Vf		n	Vf	
	z = 4	z = 5		z = 4	z = 6		z = 5	z = 7		z = 6	z = 10		z = 8	z = 12		z = 10	z = 15
1,250	200	250	1,000	160	240	840	168	235	631	151	252	504	161	242	420	168	252
Vc = 660 sfm, fz = 0.040 ipt																	
940	150	188	750	120	180	630	126	176	468	112	187	375	120	180	312	125	187
Vc = 490 sfm, fz = 0.040 ipt																	
940	112	141	750	90	135	630	94	132	468	84	140	375	90	135	312	94	140
Vc = 490 sfm, fz = 0.030 ipt																	
750	60	75	600	48	72	500	50	70	382	46	76	306	49	73	255	51	76
Vc = 400 sfm, fz = 0.020 ipt																	
750	63	79	600	51	76	500	53	74	382	48	80	306	51	77	255	54	80
Vc = 400 sfm, fz = 0.021 ipt																	
1,250	200	250	1,000	160	240	840	168	235	631	151	252	504	161	242	420	168	252
Vc = 660 sfm, fz = 0.040 ipt																	
1,250	150	188	1,000	120	180	840	126	176	631	114	189	504	121	182	420	126	189
Vc = 660 sfm, fz = 0.030 ipt																	
940	150	188	750	120	180	630	126	176	468	112	187	375	120	180	312	125	187
Vc = 490 sfm, fz = 0.040 ipt																	
940	112	141	750	90	135	630	94	132	468	84	140	375	90	135	312	94	140
Vc = 490 sfm, fz = 0.030 ipt																	
280	22	28	230	19	28	190	19	27	143	17	29	115	18	28	96	19	29
Vc = 150 sfm, fz = 0.020 ipt																	
190	6	8	150	5	7	130	5	7	96	5	8	76	5	7	64	5	8
Vc = 100 sfm, fz = 0.008 ipt																	
630	20	25	500	16	24	420	17	24	315	15	25	252	16	24	210	17	25
Vc = 330 sfm, fz = 0.008 ipt																	
380	3	4	300	2	4	250	3	4	191	2	4	153	2	4	127	3	4
Vc = 200 sfm, fz = 0.002 ipt																	

The above table shows the conditions for standard shank type cutters. When using long shank type cutters, the number of teeth may be different. In this case, the cutting conditions should be changed by referring to: "The usage of standard and long shanks" shown on the previous page.

Cutting conditions are generally limited by the spindle rigidity, machine power and the workpiece fixture stability. When setting the conditions, start from half of the values of the standard cutting conditions and then increase the value gradually while making sure the machine is running normally.

APPLICATION RANGE



Inch	Tool dia. øDc	Max. depth of cut Max. ap	Max. ramping angle θ°	Max. plunging depth A	Max. cutting width in plunging W	Min.machinable hole diameter øD1	Max.machinable hole diameter øD2	Max. cutting width in enlarged hole ae
EXN06R125U...	ø1.250	0.059	2.0°	0.020	0.236	1.830	2.300	0.970
EXN06R150U...	ø1.500	0.059	1.5°	0.020	0.236	2.330	2.800	1.220
TXN06R200U...	ø2.000	0.059	0.9°	0.020	0.236	3.330	3.800	1.720
TXN06R250U...	ø2.500	0.059	0.6°	0.020	0.236	4.330	4.800	2.220
TXN06R300U...	ø3.000	0.059	0.5°	0.020	0.236	5.330	5.800	2.720

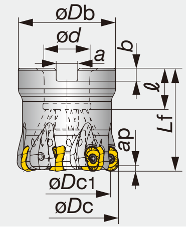
· For øDc above 4.000", slot milling, ramping or contouring is not recommended as chips may be re-cut.

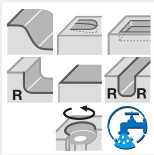
DOTWIST BALL

TXLN

Radius cutter with double sided inserts with 4 edges

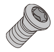
A.R. = +3°, R.R. = -13°





Inch	Max. ap	øDc	z	øDc1	øDb	Lf	ød	ℓ	a	b	lb	Air hole	Insert
TXLN04U1.50B0.50R06	0.157	1.500	6	1.186	1.461	1.574	0.500	0.750	0.315	0.197	0.770	✓	LNMX04...
TXLN04U2.00B0.75R07	0.157	2.000	7	1.680	1.693	1.969	0.750	0.750	0.315	0.197	0.990	✓	LNMX04...

SPARE PARTS

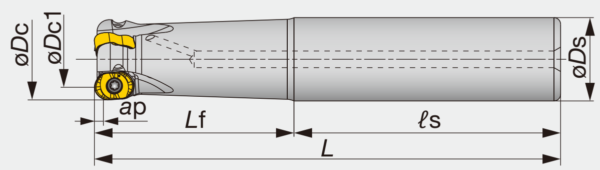
Designation	Clamping screw	Grip	Lubricant	Torx bit
TXLN04U...	CSPD-3	SW6-SD	M-1000	BLD IP10/S7

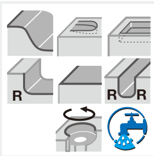
DOTWIST BALL

EXLN

Radius cutter with double sided inserts with 4 edges

A.R. = +3°, R.R. = -12° ~ -14°





Inch	Max. ap	øDc	z	øDc1	øDs	ℓs	Lf	L	lb	Air hole	Insert
EXLN04U1.00C1.00R03	0.157	1.000	3	0.685	1.000	3.000	2.500	5.500	1.000	✓	LNMX04...
EXLN04U1.25C1.25R04	0.157	1.250	4	0.935	1.250	3.000	3.000	6.000	1.800	✓	LNMX04...
EXLN04U1.25C1.25R05	0.157	1.250	5	0.935	1.250	3.000	3.000	6.000	1.800	✓	LNMX04...

SPARE PARTS

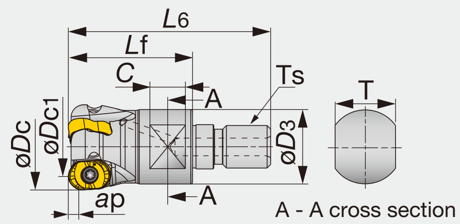
Designation	Clamping screw	Mono block type wrench
EXLN04U...	CSPD-3	IP-10D

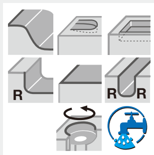
DOTWIST BALL

HXLN04-M

Radius cutter with double sided inserts with 4 edges, Modular head with metric threaded connection

A.R. = +3°, R.R. = -12° ~ -14°

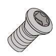




Metric	Max. ap	øDc	z	øDc1	L6	Lf	C	T	øD3	Ts	Kg	Air hole	Insert
HXLN04M020M10R02	4	20	2	12	49	30	10	15	18	M10	0.07	✓	LNMX04...
HXLN04M025M12R03	4	25	3	17	57	35	10	17	21	M12	0.16	✓	LNMX04...
HXLN04M032M16R04	4	32	4	24	63	40	12	22	29	M16	0.2	✓	LNMX04...

(Unit : mm)

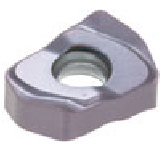
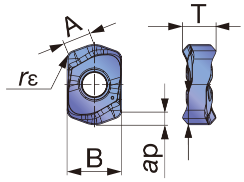
SPARE PARTS



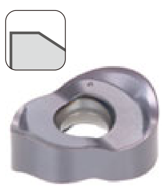
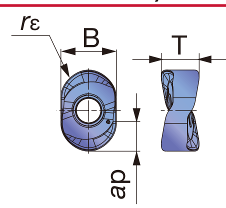
Designation	Clamping screw	Lubricant	Wrench
HXLN04...	CSPD-3	M-1000	IP-10D

INSERTS

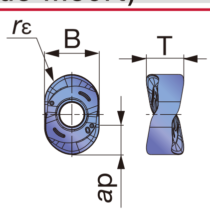
LNMX-HJ

LNMX-MJ (Radius insert)

LNMX-ML (Radius insert)

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

★ : First choice
☆ : Second choice

Designation	rε	Max. ap	Coated AH120	Coated AH3135	A	B	T
LNMX0405R4-MJ	0.157	0.157	●	●	-	0.323	0.220
LNMX0405R4-ML	0.157	0.157	●	●	-	0.323	0.220
LNMX0405ZER-HJ	0.051	0.051	●	●	0.169	0.323	0.197

●: Standard item

STANDARD CUTTING CONDITIONS

For HJ type

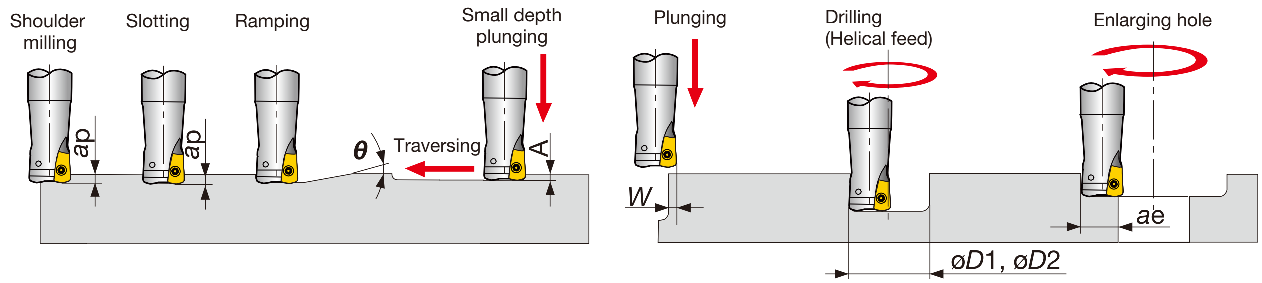
ISO	Workpiece material		Hardness	Priority	Grade	Chipbreaker	Cutting speed Vc (sfm)	Feed per tooth fz (ipt)
P	Low carbon steels C15, C20, etc.		- 300 HB	First choice	AH3135	HJ	490 - 820	0.020 - 0.051
				Second choice	AH120	HJ	490 - 820	0.020 - 0.051
	Carbon steels, Alloy steels 1055, etc.		- 300 HB	First choice	AH3135	HJ	490 - 820	0.020 - 0.051
				Second choice	AH120	HJ	490 - 820	0.020 - 0.051
	Carbon steels, Alloy steels 1055, etc.		30 - 40 HRC	First choice	AH3135	HJ	330 - 660	0.012 - 0.028
				Second choice	AH120	HJ	330 - 660	0.012 - 0.028
M	Stainless steels S30400, etc		- 200 HB	First choice	AH3135	HJ	330 - 660	0.012 - 0.028
			- 200 HB	First choice	AH3135	HJ	330 - 980	0.012 - 0.028
K	Grey cast irons No.250B, No.300B, etc.		150 - 250 HB	First choice	AH120	HJ	490 - 820	0.020 - 0.051
	Ductile cast irons 60-40-18, 80-50-06, etc.		150 - 250 HB	First choice	AH120	HJ	490 - 820	0.020 - 0.051
H	Hardened steel	H13, etc	40 - 50 HRC	First choice	AH3135	HJ	160 - 490	0.004 - 0.020
				Second choice	AH120	HJ	160 - 490	0.004 - 0.020
		D2, etc	50 - 60 HRC	First choice	AH120	HJ	160 - 230	0.002 - 0.008

Note: Recommended cutting conditions are just for reference in general machining.

For MJ, ML type

ISO	Workpiece material		Hardness	Priority	Grade	Chip-breaker	Cutting speed Vc (sfm)	Feed per tooth fz (ipt)
P	Low carbon steels 1015, etc.		- 300 HB	First choice	AH3135	MJ	490 - 820	0.008 - 0.024
			- 300 HB	Second choice	AH3135	ML	490 - 820	0.008 - 0.024
	Carbon steels, Alloy steels 1055, etc.		- 300 HB	First choice	AH3135	MJ	490 - 820	0.008 - 0.024
			- 300 HB	Second choice	AH3135	ML	490 - 820	0.008 - 0.024
	Prehardened steels NAK80, PX5, etc.		30 - 40 HRC	First choice	AH3135	MJ	330 - 660	0.006 - 0.016
			30 - 40 HRC	Second choice	AH3135	ML	330 - 660	0.006 - 0.016
M	Stainless steels S30400, etc		- 200 HB	First choice	AH3135	MJ	330 - 660	0.008 - 0.024
			- 200 HB	Second choice	AH3135	ML	330 - 660	0.008 - 0.024
	Stainless steels S4200, etc		- 200 HB	First choice	AH3135	MJ	330 - 980	0.008 - 0.024
			- 200 HB	Second choice	AH3135	ML	330 - 980	0.008 - 0.024
K	Grey cast irons No.250B, No.300B, etc.		150 - 250 HB	First choice	AH120	MJ	490 - 820	0.008 - 0.024
			150 - 250 HB	Second choice	AH120	ML	490 - 820	0.008 - 0.024
	Ductile cast irons 60-40-18, 80-50-06, etc.		150 - 250 HB	First choice	AH120	MJ	490 - 820	0.008 - 0.024
			150 - 250 HB	Second choice	AH120	ML	490 - 820	0.008 - 0.024
H	Hardened steel	H13, etc	40 - 50 HRC	First choice	AH3135	MJ	160 - 490	0.004 - 0.012
			40 - 50 HRC	Second choice	AH3135	ML	160 - 490	0.004 - 0.012
		D2, etc	50 - 60 HRC	First choice	AH120	MJ	160 - 230	0.002 - 0.006
			50 - 60 HRC	Second choice	AH120	ML	160 - 230	0.002 - 0.006

APPLICATION RANGE



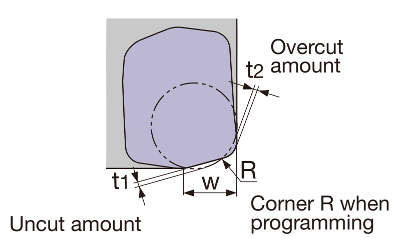
For HJ type

Inch	øDc	Max. depth of cut (in) ap	Max. ramping angle θ°	Max. plunging (in) A	Max. cutting width in plunging (in) W	Min. machining (in) øD1	Max. machining (in) øD2	Max. cutting width in enlarging (in) ae
EXLN04U1.00C1.00R03	1.000	0.051	3	0.030	0.161	1.496	1.496	0.803
EXLN04U1.25C1.25R04	1.250	0.051	2	0.030	0.161	2.008	2.008	1.053
EXLN04U1.25C1.25R05	1.250	0.051	2	0.030	0.161	2.008	2.008	1.053
HXLN04M020M10R02	0.787	0.051	4.9	0.030	0.161	1.063	1.063	0.610
HXLN04M025M12R03	0.984	0.051	3	0.030	0.161	1.457	1.457	0.807
HXLN04M032M16R04	1.260	0.051	2	0.030	0.161	2.008	2.008	1.083

For MJ, ML type

Inch	øDc	Max. depth of cut (in) ap	Max. ramping angle θ°	Max. plunging (in) A	Max. cutting width in plunging (in) W	Min. machining (in) øD1	Max. machining (in) øD2	Max. cutting width in enlarging (in) ae
EXLN04U1.00C1.00R03	1.000	0.157	3	0.031	0.157	1.535	1.929	0.803
EXLN04U1.25C1.25R04	1.250	0.157	1.9	0.031	0.157	2.047	2.402	1.053
EXLN04U1.25C1.25R05	1.250	0.157	1.9	0.031	0.157	2.047	2.402	1.053
HXLN04M020M10R02	0.787	0.157	4.7	0.031	0.157	1.102	1.496	0.591
HXLN04M025M12R03	0.984	0.157	3	0.031	0.157	1.496	1.890	0.787
HXLN04M032M16R04	1.260	0.157	2	0.031	0.157	2.047	2.441	1.063

TOOL GEOMETRY ON PROGRAM



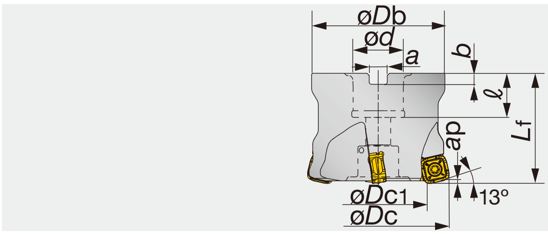
Max. depth of cut max. ap (in)	W (in)	Programmed corner R (In)	Amount left uncut t1 (In)	Amount left overcut t2 (In)
0.051	0.161	R0.059	0.031	0
0.051	0.161	R0.079	0.026	0
0.051	0.161	R0.098	0.020	0.002
0.051	0.161	R0.118	0.014	0.008

DOFEEDQUAD

TXQ

High-feed cutter for face milling

A.R. = +7°, R.R. = -8° ~ -4.5°



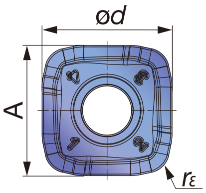
Inch	Max. ap	øDc	z	øDc1	øDb	Lf	ød	ℓ	a	b	lb	Air hole	Insert
TXQ12R200U0075A03	0.079	2.000	3	1.362	1.850	1.969	0.750	0.750	0.315	0.197	1.120	✓	SQMU1206ZSR-MJ
TXQ12R200U0075A04	0.079	2.000	4	1.362	1.850	1.969	0.750	0.750	0.315	0.197	1.120	✓	SQMU1206ZSR-MJ
TXQ12R250U0075A04	0.079	2.500	4	1.862	2.323	1.969	0.750	0.750	0.315	0.197	1.760	✓	SQMU1206ZSR-MJ
TXQ12R300U0100A05	0.079	3.000	5	2.362	2.835	1.969	1.000	1.024	0.374	0.236	3.770	✓	SQMU1206ZSR-MJ
TXQ12R400U0150A06	0.079	4.000	6	3.362	3.780	1.969	1.500	1.457	0.626	0.394	5.710	✓	SQMU1206ZSR-MJ
TXQ12R500U0150A07	0.079	5.000	7	4.362	3.780	1.969	1.500	1.457	0.626	0.394	7.010	✓	SQMU1206ZSR-MJ
TXQ12R600U0200A08	0.079	6.000	8	5.362	3.937	2.480	2.000	1.496	0.748	0.433	7.350	✓	SQMU1206ZSR-MJ

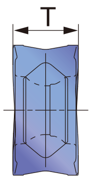
SPARE PARTS

Designation	Clamping screw	Grip	Lubricant	Torx bit
TXQ12R**U...	CSPB-4	H-TBS	M-1000	BLDIP15/S7

INSERTS

SQMU-MJ





		AH120	AH130	AH725	T3130
P	Steel	☆		★	☆
M	Stainless		★	☆	
K	Cast iron	★		☆	
N	Non-ferrous				
S	Superalloys	★	☆	★	
H	Hard materials			★	

★ : First choice
☆ : Second choice

Designation	rε	Max. ap	AH120 (Coated)	AH130 (Coated)	AH725 (Coated)	T3130 (Coated)	A	T	ød
SQMU1206ZSR-MJ	0.079	0.079	●	●	●	●	0.461	0.236	0.461

●: Standard item

STANDARD CUTTING CONDITIONS

ISO	Workpiece material	Hardness	Priority	Grade	Cutting speed Vc (sfm)	Feed per tooth fz (ipt)
P	High carbon steels (1045, 1055 etc.)	~ 300HB	First choice	AH725	330 - 980	0.020 - 0.080
			For wear resistance	T3130	330 - 980	0.020 - 0.080
			For impact resistance	AH130	330 - 980	0.020 - 0.080
	Alloyed steels (4140 etc.)	~ 300HB	First choice	AH725	330 - 660	0.020 - 0.060
			For wear resistance	T3130	330 - 660	0.020 - 0.060
			For impact resistance	AH130	330 - 660	0.020 - 0.060
	Prehardened steels (NAK80, PX5, etc.)	30 ~ 40HRC	-	AH725	330 - 660	0.020 - 0.040
M	Stainless steel (304, 316 etc.)	~ 200HB	-	AH130	330 - 500	0.012 - 0.030
K	Gray cast iron (No.25, No.30 etc.)	-	-	AH120	100 - 300	0.020 - 0.080
	Ductile cast irons (60-40-18, 65-45-12 etc.)	-	-	AH120	260 - 660	0.020 - 0.080
S	Titanium alloy (Ti-6Al-4V etc.)	~ 40HRC	-	AH725	100 - 200	0.012 - 0.028
H	Hardened steels (H13 etc.)	40 ~ 50HRC	-	AH725	260 - 430	0.004 - 0.012
	Hardened steels (D2 etc.)	50 ~ 60HRC	-	AH725	160 - 230	0.001 - 0.003

Tool dia.: øDc (in), Number of revolutions: n (rpm), Feed speed: Vf (ipm), Max. depth of cut: ap = 0.079"

ø2.000		ø2.500		ø3.000		ø4.000		ø5.000	
n	Vf	n	Vf	n	Vf	n	Vf	n	Vf
1,260	227	1,010	242	790	237	630	227	500	210
Vc = 660 sfm, fz = 0.060 ipt									
950	114	750	120	590	118	470	113	380	106
Vc = 500 sfm, fz = 0.040 ipt									
950	86	750	90	590	89	470	85	380	80
Vc = 490 sfm, fz = 0.030 ipt									
760	46	600	48	470	47	380	46	300	42
Vc = 400 sfm, fz = 0.020 ipt									
1,260	227	1,010	242	790	237	630	227	500	210
Vc = 660 sfm, fz = 0.060 ipt									
950	171	750	180	590	177	470	170	380	160
Vc = 500 sfm, fz = 0.060 ipt									
250	15	200	16	150	15	120	14	100	14
Vc = 130 sfm, fz = 0.020 ipt									
630	15	500	16	390	16	310	15	250	14
Vc = 330 sfm, fz = 0.008 ipt									
380	2	300	2	240	2	190	2	150	2
Vc = 200 sfm, fz = 0.002 ipt									

· Slot or pocket milling is not recommended since chip re-cutting can easily occur.
· Tool overhang length must be as short as possible to avoid chatter. When the tool overhang length is long, decrease the number of revolutions and feed.

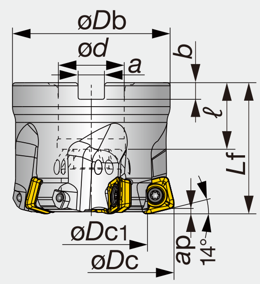
Cutting conditions are generally limited by the spindle rigidity, machine power and the workpiece fixture stability. When setting the conditions, start from half of the values of the standard cutting conditions and then increase the value gradually while making sure the machine is running normally.

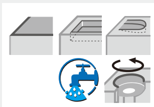
MILLQUADFEED

TXSW

Super high-feed miling cutter with large depth of cut; Bore type

A.R. = +5°, R.R. = 0°





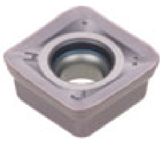
Inch	Max. ap	øDc	z	øDc1	øDb	Lf	ød	ℓ	a	b	lb	Air hole	Insert
TXSW15U2.50B0.75R04	0.098	2.500	4	1.480	2.323	1.969	0.750	0.750	0.315	0.197	1.520	✓	SWMT15...
TXSW15U3.00B1.00R05	0.098	3.000	5	1.980	2.835	2.480	1.000	1.024	0.374	0.236	2.710	✓	SWMT15...
TXSW15U4.00B1.50R06	0.098	4.000	6	2.980	3.819	2.480	1.500	1.063	0.626	0.394	4.870	✓	SWMT15...
TXSW15U5.00B1.50R07	0.098	5.000	7	3.980	3.819	2.480	1.500	1.614	0.626	0.394	6.370	✓	SWMT15...
TXSW15U6.00B2.00R08	0.098	6.000	8	4.980	4.331	2.480	2.000	1.496	0.748	0.433	8.290	✓	SWMT15...

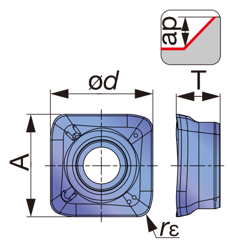
SPARE PARTS

Designation	Clamping screw	Grip	Lubricant	Torx bit
TXSW15U2.50 - 4.00	TS50115i	H-TB2W	M-1000	BT20S
TXSW15U5.00, 6.00	TS50115i	H-TB2W	M-1000	BT20M

INSERT

SWMT-MJ





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

★ : First choice
☆ : Second choice

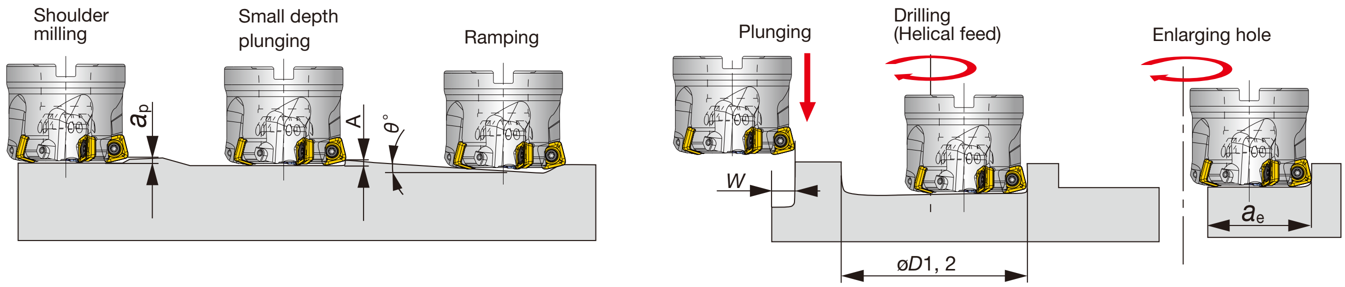
Designation	rε	Max. ap	Coated AH120	Coated AH3135	A	ød	T
SWMT1506ZER-MJ	0.079	0.098	●	●	0.625	0.625	0.268

●: Standard item

STANDARD CUTTING CONDITIONS

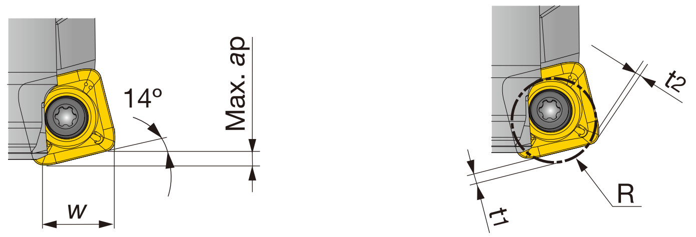
ISO	Workpiece materials		Hardness	Priority	Grades	Chip-breaker	Cutting speed Vc (sfm)	Feed per tooth fz (ipt)
P	Low carbon steel (1015, etc.)		- 300 HB	First choice	AH3135	MJ	330 - 1000	0.02 - 0.08
			- 300 HB	Second choice	AH120	MJ	330 - 1000	0.02 - 0.08
	Carbon steel and alloy steel (1015, 4140, etc.)		- 300 HB	First choice	AH3135	MJ	330 - 660	0.02 - 0.08
			- 300 HB	Second choice	AH120	MJ	330 - 660	0.02 - 0.08
	Prehardened steel (NAK80, PX5, etc.)		30 - 40 HRC	First choice	AH3135	MJ	330 - 660	0.02 - 0.06
			30 - 40 HRC	Second choice	AH120	MJ	330 - 660	0.02 - 0.06
M	Stainless steel (S30400, S31600, etc.)		- 200 HB	First choice	AH3135	MJ	330 - 500	0.012 - 0.04
K	Grey cast iron (No.250B, No.300B, etc.)		150 -250 HB	First choice	AH120	MJ	330 - 1000	0.02 - 0.08
	Ductile cast iron (60-40-18, 80-55-06, etc.)		150 -250 HB	First choice	AH120	MJ	260 - 660	0.02 - 0.08
S	Titanium alloys (Ti-6Al-4V, etc.)		- 40 HRC	First choice	AH3135	MJ	100 - 200	0.012 - 0.028
	Superalloys (Inconel718, etc.)		- 40 HRC	First choice	AH120	MJ	60 - 160	0.004 - 0.012
H	Hardened steel	(H13, etc.)	40 - 50 HRC	First choice	AH3135	MJ	260 - 420	0.004 - 0.012
		(D2, etc.)	50 - 60 HRC	First choice	AH120	MJ	160 - 230	0.001 - 0.003

APPLICATION RANGE



Inch	øDc	Max. depth of cut ap	Max. plunging A	Max. ramping angle °θ	Max. cutting width in plunging W	Min. machining diameter øD1	Max. machining diameter øD2	Max. cutting width in enlarging ae
TXSW15U2.50B0.75R04	2.500	0.098	0.028	2.9	0.591	3.819	4.803	1.949
TXSW15U3.00B1.00R05	3.000	0.098	0.028	2.1	0.591	4.819	5.803	2.449
TXSW15U4.00B1.50R06	4.000	0.098	0.028	1.4	0.591	6.819	7.803	3.449
TXSW15U5.00B1.50R07	5.000	0.098	0.028	1.0	0.591	8.819	9.803	4.449
TXSW15U6.00B2.00R08	6.000	0.098	0.028	0.8	0.591	10.819	11.803	5.449

TOOL GEOMETRY ON PROGRAM



Max. ap (in)	Actual corner radius rε (in)	W (in)	Programmed corner radius R (in)	Uncut amount t1 (in)	Overcut amount t2 (in)
0.098	0.079	0.500	0.157	0.078	-
0.098	0.079	0.500	0.177	0.074	-
0.098	0.079	0.500	0.197	0.070	0.0004

- When programming for CAM, the tool should be considered as a radius cutter. Usually, the corner radius should be set in R = 0.177".
If a larger radius is used, overcutting may occur. The above table shows the uncut (t1) and overcut (t2) amounts for the programmed corner radius.

FIELD TEST REPORTS

Success Stories

DOFEED TUNGALOY

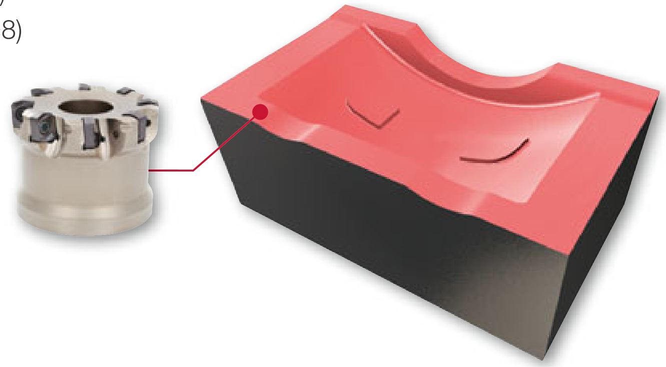
P

Industry: Die&Mold / Back block
Material: Prehardened steel HPM7 (HRC30)
Cutter: TXN06R080M31.7-08 (ø3.15", z=8)
Insert: LNMU06X5ZER-MJ
Grade: AH3035

Cutting conditions:

Vc = 377 sfm
fz = 0.028 ipt
Vf = 101 ipm
ap = 0.043"
ae = 1.654"

Process: Contour milling, Air blow
Machine: Vertical M/C, CAT50



Result:
AH3035 showed better chipping resistance than its competition, improving tool life by 50%.

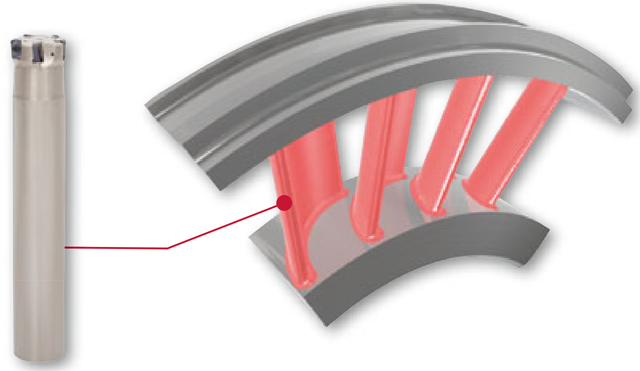
S

Industry: Power Generation / Turbine blade
Material: Heat resistant cast steel
Cutter: EXN03R035M32.0-05 (ø1.38", z=5)
Insert: LNMU0303ZER-ML
Grade: AH725

Cutting conditions:

Vc = 230 sfm
fz = 0.020 ipt
Vf = 73 ipm
ap = 0.020"
ae = 1.181"

Process: Shoulder milling, Wet
Machine: Vertical M/C, CAT50



Result:
Cutting speed tripled, while super high feed milling offered 160% higher productivity.

Industry: **Aerospace** / Component

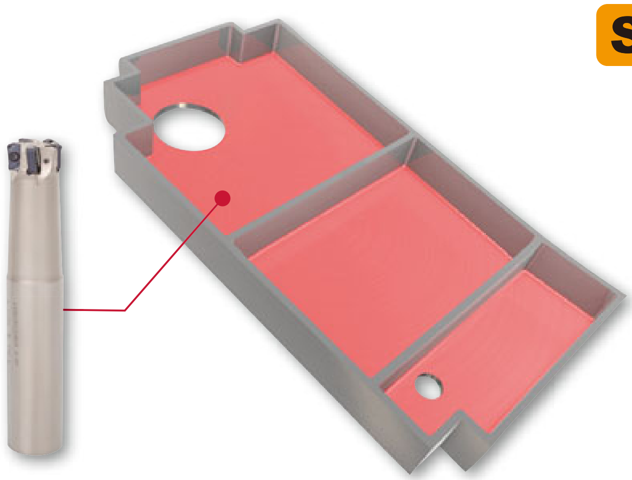
S

Material: Ti-6Al-4V (36HRC)
Cutter: EXN03R025M25.0-05 (ø0.98", z=5)
Insert: LNMU0303ZER-ML
Grade: AH725

Cutting conditions:

Vc **=** 164 sfm
fz **=** 0.028 ipt
Vf **=** 88 ipm
ap **=** 0.020"
ae **=** 0.984"

Process: Pocket milling, Wet
Machine: Vertical M/C, CAT40



Result:
Feed rate increased 730%, drastically improving metal removal rate by 330%.

Industry: **Aerospace** / End fitting

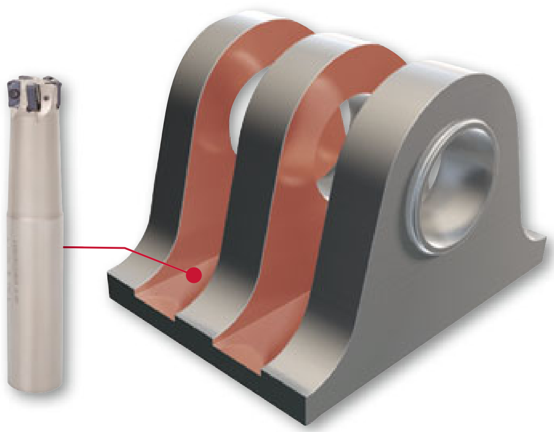
S

Material: Ti-6Al-4V
Cutter: EXN03R025M25.0-05 (ø0.98", z=5)
Insert: LNMU0303ZER-ML
Grade: AH130

Cutting conditions:

Vc **=** 131 sfm
fz **=** 0.028 ipt
Vf **=** 71 ipm
ap **=** 0.031"
ae **=** variable

Process: Rough pocket milling, Wet
Machine: HMC Heller H5000



Result:
DoFeed prevented built up edge and coating peel-off, which significantly improved tool life.
Parts production rate was 250% more than the competitor, due to a sharp ML chipbreaker and tough AH130 grade.

Industry: **Heavy Industry** / Body

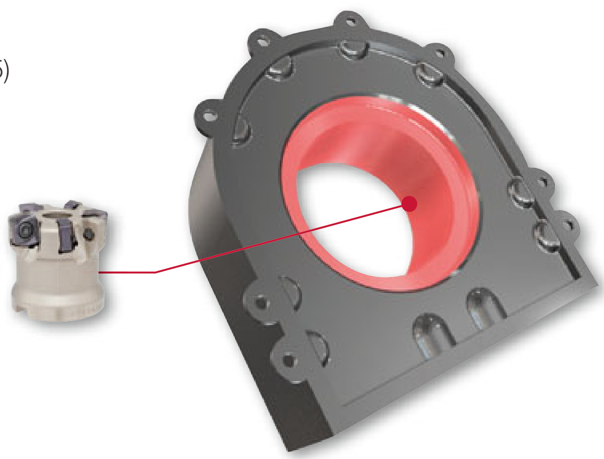
K

Material: FCMP45-06
Cutter: TXN06R050M22.0E05 (ø1.97", z=5)
Insert: LNMU06X5ZER-MJ
Grade: AH130

Cutting conditions:

Vc **=** 558 sfm
fz **=** 0.039 ipt
Vf **=** 213 ipm
ap **=** 0.051"
ae **=** 1.490"

Process: Plunging / Helical milling, Dry
Machine: Horizontal M/C, CAT50



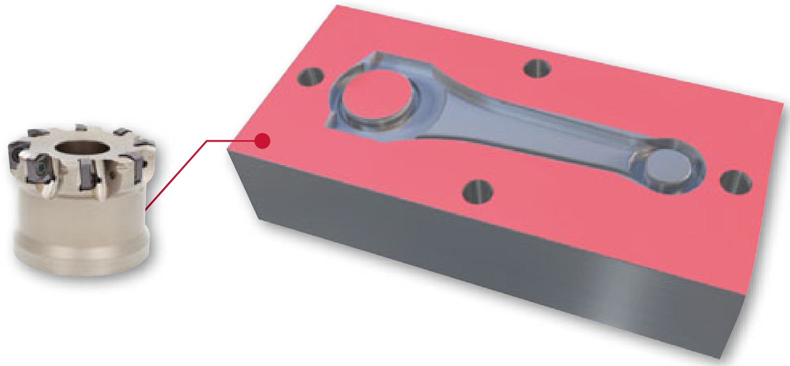
Result:
Dofeed´s positive geometry reduced cutting force while improving metal removal rate.

H

Industry: **Die&Mold** / Automotive parts
Material: DHA WORLD (X40CrMoV5-1) 44HRC
Cutter: TXN06R080M31.7-08 (ø3.15", z=8)
Insert: LNMU06X5ZER-MJ x7
LNGU06X5ZER-W x1 (Wiper)
Grade: AH725

Cutting conditions:

Vc = 495 sfm
fz = 0.004 ipt
Vf = 21 ipm
ap = 0.004"
ae = 2.362"



Process: Face milling, Air blow
Machine: Vertical M/C, CAT50

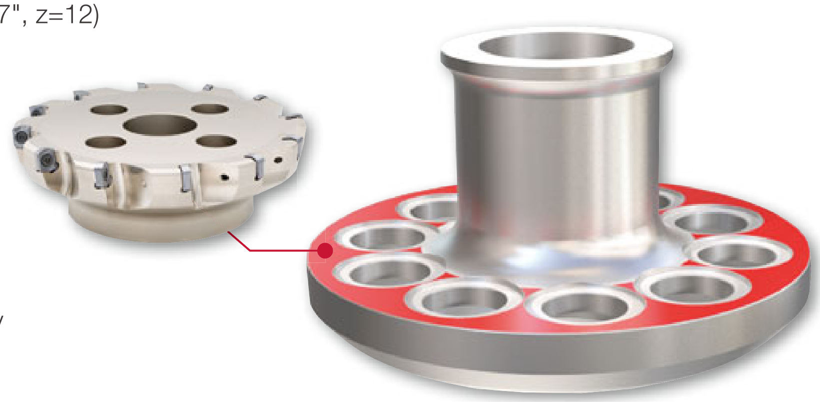
Result:
Dofeed wiper inserts improved metal removal rate and left a good surface roughness for mold face milling, eliminating the semi-finishing process.

M

Industry: **Power Generation** / Discharge casing
Material: Duplex stainless steel
Cutter: TXN06R200M47.6-12 (ø7.87", z=12)
Insert: LNMU06X5ZER-MJ
Grade: AH3035

Cutting conditions:

Vc = 246 sfm
fz = 0.038 ipt
Vf = 55 ipm
ap = 0.020"
ae = 6.299"



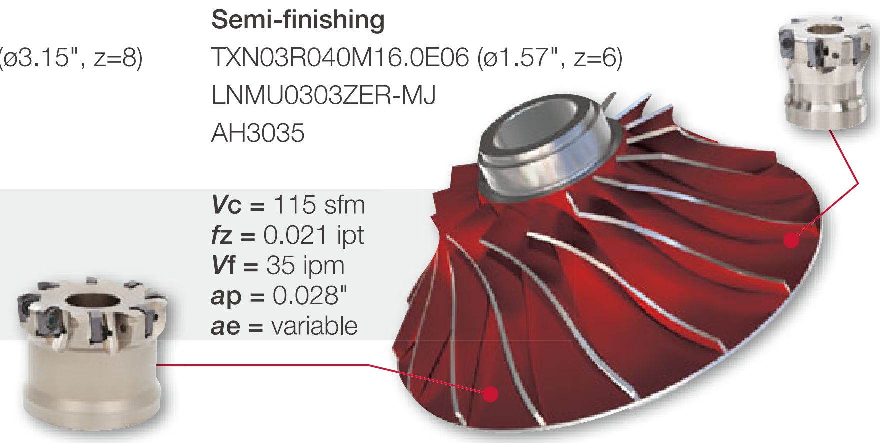
Process: Face milling: Interrupted, Dry
Machine: Vertical M/C, CAT50

Result:
Due to its close-pitch structure, DoFeed improved output by 40% while using at a higher cutting speed.
AH3035 improved tool life 150% due to its excellent thermal shock resistance.

M

Industry: **Power Generation** / Impeller wing
Material: SRUD, SUS630

	Roughing	Semi-finishing
Cutter:	TXN06R080M31.7E08 (ø3.15", z=8)	TXN03R040M16.0E06 (ø1.57", z=6)
Insert:	LNMU06X5ZER-MJ	LNMU0303ZER-MJ
Grade:	AH3035	AH3035
Cutting conditions:		
	Vc = 153 sfm	*Vc* = 115 sfm
	fz = 0.026 ipt	*fz* = 0.021 ipt
	Vf = 39 ipm	*Vf* = 35 ipm
	ap = 0.028"	ap = 0.028"
	ae = variable	ae = variable



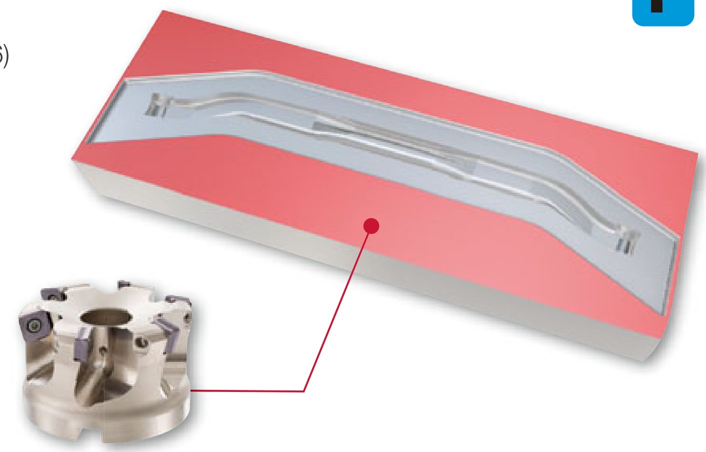
Process: Pocketing, Wet
Machine: Vertical M/C, CAT50

Result:
Both types of DoFeed inserts performed smooth machining in precipitation hardened stainless steel even during long overhang tooling due to their low cutting force. Insert tool life doubled compared to the competition.

MILLQUAD FEED
TUNGALOY

Industry: **Die&Mold** / Forging die
Material: SKT4/55NiCrMoV7 (35HRC)
Cutter: TXSW15J100B31.7R06 (ø3.94", z=6)
Insert: SWMT1506ZER-MJ
Grade: AH3135

P



Cutting conditions:

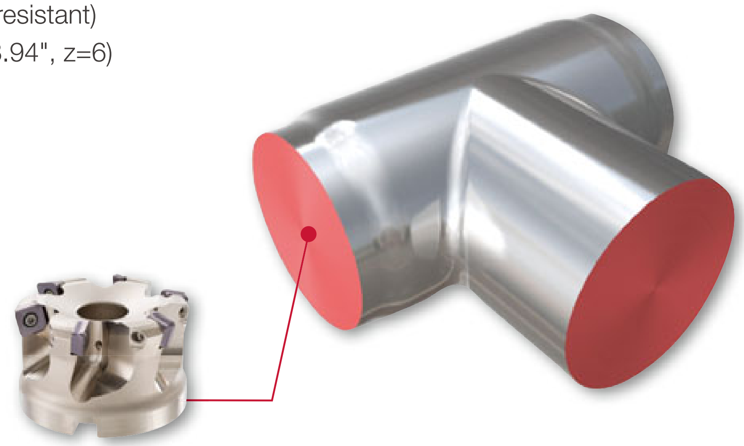
Vc **=** 328 sfm
fz **=** 0.016 ipt
Vf **=** 30 ipm
ap **=** 0.098"
ae **=** 2.756"

Process: Face milling, Air blow
Machine: V-M/C, CAT50, 30kw

Result:
MillQuad-Feed´s capability for a large depth of cut reduced the number of passes required, thus improving metal removal by 110%. Its robust cutting edge eliminated instability concerns in machining the extremely hard surface of a forging die.

Industry: **Power Generation** / Joint for power plant
Material: High Chromium steel (heat resistant)
Cutter: TXSW15J100B31.7R06 (ø3.94", z=6)
Insert: SWMT1506ZER-MJ
Grade: AH3135

P



Cutting conditions:

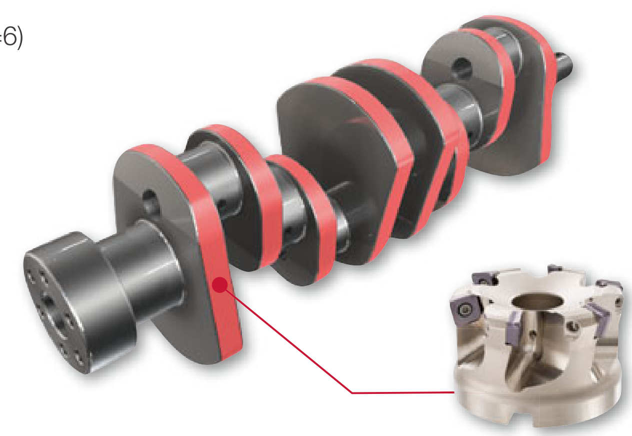
Vc **=** 394 sfm
fz **=** 0.039 ipt
Vf **=** 90 ipm
ap **=** 0.079"
ae **=** 2.756"

Process: Face milling, Dry
Machine: V-M/C, CAT50, 22kw

Result:
MillQuad-Feed, with the wear resistant AH3135 grade allowed for increased cutting speed and double depth of cut without sacrificing tool life. As a result MillQuad-Feed improved material removal rate by 240%.

Industry: **Heavy Industry** / Ship´s Crankshaft
Material: FCMP45-06
Cutter: TXSW15J100B31.7R06 (ø3.94", z=6)
Insert: SWMT1506ZER-MJ
Grade: AH3135

P



Cutting conditions:

Vc **=** 492 sfm
fz **=** 0.079 ipt
Vf **=** 226 ipm
ap **=** 0.079"
ae **=** 1.732"

Process: Face milling, Air blow
Machine: Turning center, 51kw

Result:
AH3135´s excellent combination of wear and fracture resistances assured stability and eliminated chipping and fracture during extreme machining, while also removing 136% more material than its competition.

K

Industry: Power Generation / Windmill housing
Material: Ductile cast iron 450 (GGG40)
Cutter: TXSW15J125B40.0R07 (ø4.92", z=7)
Insert: SWMT1506ZER-MJ
Grade: AH120

Cutting conditions:

Vc = 722 sfm
fz = 0.051 ipt
Vf = 198 ipm
ap = 0.098"
ae = 4.921"

Process: Face milling, Air blow
Machine: Horizontal M/C, CAT50

Result:
MillQuad-Feed's capability allowed for a 340% increase of metal removal rate over its competition.

DoTwistBall TUNGALOY

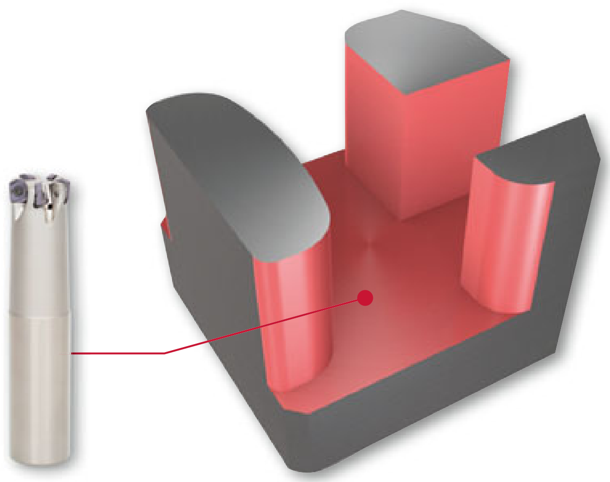
P

Industry: Power Generation / Planetary carrier
Material: Stainless steel X5CrNiNb 18-10
Cutter: EXLN04M32C32.0R05 (ø1.26", z=5)
Insert: LNMX0405ZER-HJ
Grade: AH3135

Cutting conditions:

Vc = 459 sfm
fz = 0.028 ipt
Vf = 192 ipm
ap = 0.047"
ae = 1.260"

Process: Deep 3D profiling, Air blow
Machine: Vertical M/C, CAT50



Result:
The total machining time was decreased by 25%, due to DoTwistBall´s excellent chip evacuation. Chip re-cutting was also eliminated, thus doubling tool life against the competition.

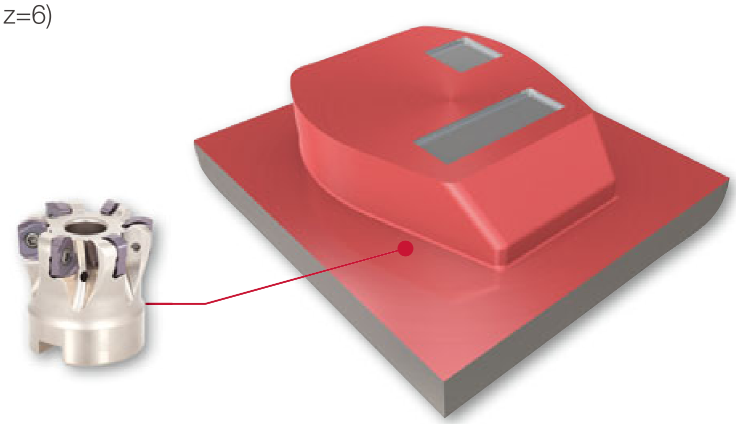
H

Industry: Die&Mold / Die
Material: DAC10 (48HRC)
Cutter: TXLN04M040B16.0R06 (ø1.57", z=6)
Insert: LNMX0405ZER-HJ
Grade: AH120

Cutting conditions:

Vc = 328 sfm
fz = 0.017 ipt
Vf = 83 ipm
ap = 0.077"
ae = variable

Process: Contouring, Air blow
Machine: Mitsubishi CAT50



Result:
DoTwist-Ball extended tool life by 400% beyond its competition.

DOFEEDQUAD
TUNGALOY

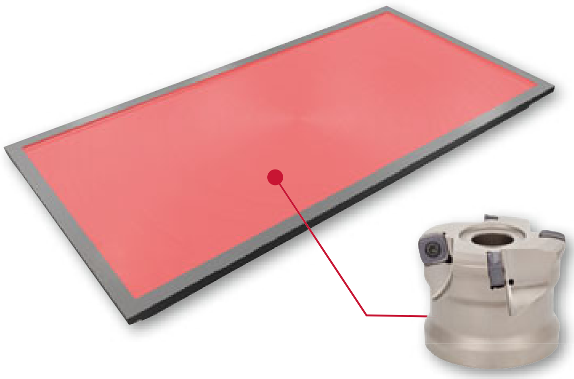
P

Industry: Die&Mold / Die for Ceramic tile
Material: Die steel (32-38 HRC)
Cutter: TXQ12R063M22.0E04 (ø2.48", z=4)
Insert: SQMU1206ZSR-MJ
Grade: AH130

Cutting conditions:

Vc = 820 sfm
fz = 0.062 ipt
Vf = 315 ipm
ap = 0.024"
ae = variable

Process: Pocket milling (including ramping), Wet
Machine: Vertical M/C (CAT50)



Result:
DoFeedQuad was able to machine at double the feed rate of its competition due to its tough cutting edge. The AH130 grade also provided double the tool life due to its high thermal crack resistance.

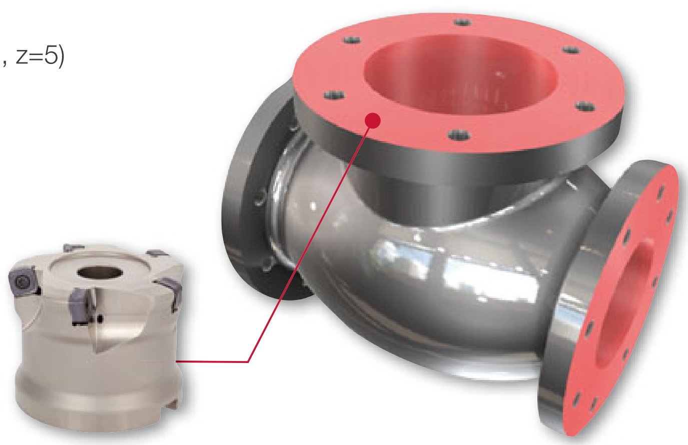
M

Industry: Heavy Industry / Body and frame
Material: Super-duplex stainless steel
Cutter: TXQ12R080M27.0E05 (ø3.15", z=5)
Insert: SQMU1206ZSR-MJ
Grade: AH130

Cutting conditions:

Vc = 262 sfm
fz = 0.024 ipt
Vf = 38 ipm
ap = 0.031"
ae = 2.756"

Process: Face milling, Dry
Machine: Multi-axis M/C



Result:
Due to its 8 cornered insert, DoFeedQuad provided a 250% boost in productivity.

TUNGMEISTER
TUNGALOY

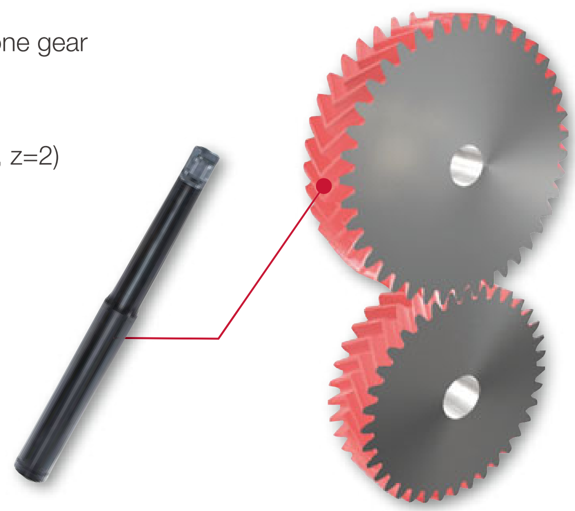
P

Industry: General Engineering / Herringbone gear
Material: SCM440 / 42CrMo4 (34HRC)
Shank: VTSD12L110S06-W-A
Head: VFX120L01.0R25-02S08 (ø0.47", z=2)
Grade: AH725

Cutting conditions:

Vc = 394 sfm
fz = 0.031 ipt
Vf = 201 ipm
ap = 0.024"
ae = 0.500"

Process: Slot milling, 1000 PSI
Machine: Horizontal M/C



Result:
TungMeister´s VFX geometry improved workflow and ease of use due to its simple head changeability while still seated in the machine spindle.

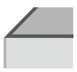
OTHER PRODUCTS

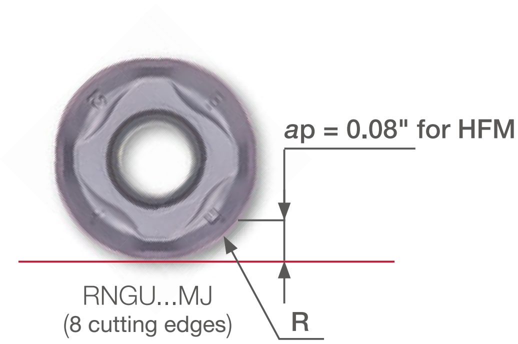
Complementary Lines

TRIPLE DOTMILL TUNGALOY RNGU...MJ

Round insert applicable for both high-feed and high depth of cut machining

- Double-sided round insert with **dovetail clamping system** enables productive and safe high-feed machining
- **Maximum feed rate: 0.059 ipt (*ap* ≦ 0.039")**
  0.031 ipt (*ap* ≦ 0.079")
- **Tool diameters ø2.40" - ø6.73" mm**

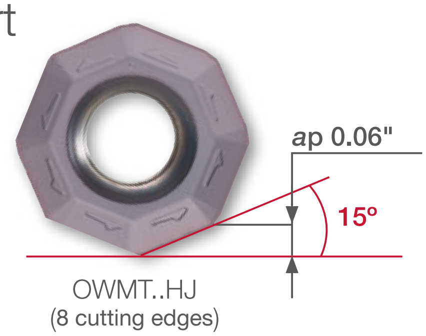




DOOCTO TUNGALOY HJ Chipbreaker

Low cutting force with positive insert

- **Large diameter cutters** are suitable for high-feed face milling with large width of cut
- **Maximum feed rate: 0.079 ipt**
- **Tool diameters ø2.65" - ø12.57"**



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