Member IMC Group Tungaloy

MillLine

For more information

High feed milling cutter

ADDFEED/DOFEED

Tungaloy Report No. 545-G

High feed milling cutter series for maximum productivity – Now offering 06 insert with low approach angle

TUNGALOY ADDFORCE ACCELERATED LINES

TUNGALOY

ADDFORCE MILL

ACCELERATED MILLING

ADDFEED / DOFEED

High-feed cutters reduce machining time in a wide range of applications

ADDDOFEED/DOFEED

High feed cutter for various applications

ADDDOFEED

Insert size 02

Max. depth of cut: 0.5 mm
Tool diameter: ø8 - ø25 mm

- ✓ The tool diameter is available starting from **ø8 mm**
- ✓ Featuring a highly reliable design, the tool ensures stable machining
- ✓ With long overhang machining, it suppresses chatter better than a solid endmill and enables high efficiency machining

P.8 - 13

DOFEED

Insert size 03

Max. depth of cut: 0.9 mm (UER), 1 mm (ZER)
Tool diameter: ø16 - ø50 mm

- ✓ **Close pitch cutter design** for high productivity
- ✓ **Extensive lineup** for various applications
- ✓ **New UER insert with small approach angle for long tool life**

P.14 - 25

New DOFEED

Insert size 06

Max. depth of cut: 1.5 mm
Tool diameter: ø32 - ø200 mm

- ✓ Tool diameters available for up to 200 mm, ideal for **rough milling of medium- and large-sized components**
- ✓ **Wiper insert** for improved surface roughness
- ✓ Expanded **UER insert with low cutting angle that contributes to longer tool life**

P.26 - 33

Tool diameters and number of teeth for each insert size

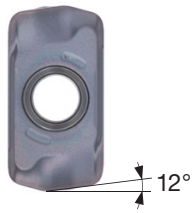
Insert size	Workpiece material	Tool diameter (mm), Number of teeth																					
		ø8	ø10	ø12	ø16	ø18	ø20	ø22	ø25	ø28	ø30	ø32	ø35	ø40	ø50	ø52	ø63	ø66	ø80	ø100	ø125	ø160	ø200
02	P M K S H	1	2	2	4 3		5 4		7 6														
03	P M K S H				2	2	4 3	4 3	5 4	5 4	5 4	5 6	5 6	5 6	5 8								
06	P M K S H											2	2	3	4 5	4 5	4 6	4 6	5 8	6	8	10	12

Two types of approach angles are available depending on the application (Insert size 03, 06)

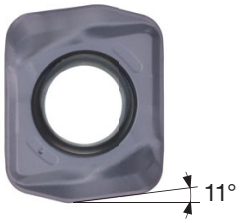
New

LNMU03/06UER insert
Low approach angle

- **Long tool life**
  Especially suitable for machining stainless steels and heat-resistant alloys.
- **Vibration suppression during long overhang machining**
  Enables stable, high-efficiency machining.

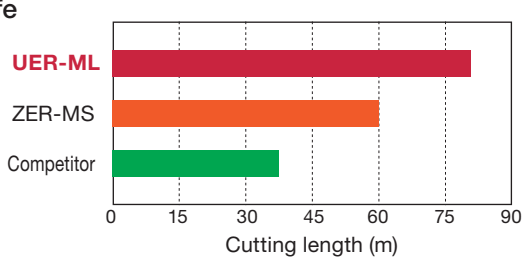


Insert size 03



Insert size 06

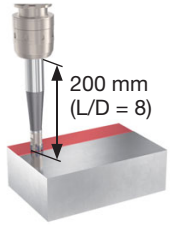
■ Tool life



M

Cutter	: EXN03R020M20.0-04-C (ø20 mm, CICT = 4)
Insert	: LNMU0303UER-ML AH130
Workpiece material	: SUS304 / X5CrNi18-9 (183HB)
Cutting speed	: *Vc* = 150 m/min
Feed per tooth	: *fz* = 0.6 mm/t
Depth of cut	: *ap* = 0.5 mm
Width of cut	: *ae* = 12 mm
Coolant	: Dry
Machine	: Vertical M/C, BT40

■ The machining area with long overhang



ap (mm)	UER MJ	ZER MJ	Competitor
0.3	OK	OK	OK
0.7	OK	×	×

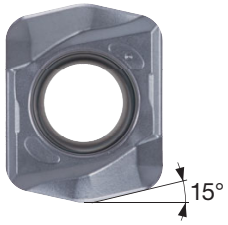
P

Cutter	: HXN03R025MM12-05-C (ø25 mm, CICT = 5)
Insert	: LNMU0303UER-MJ AH3225 LNMU0303ZER-MJ AH3225
Workpiece material	: NAK80 (38HRC)
Cutting speed	: *Vc* = 200 m/min
Feed per tooth	: *fz* = 0.5 mm/t
Depth of cut	: *ap* = fluctuation value
Width of cut	: *ae* = 15 mm
Coolant	: Dry
Machine	: Vertical M/C, BT40

LNM/GU03/06ZER insert
General-purpose approach angle

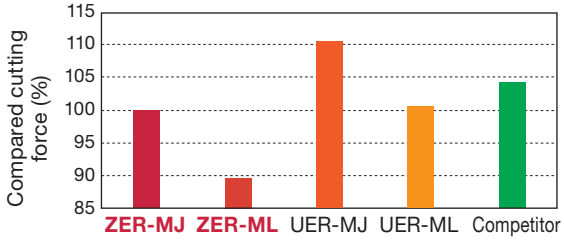
- **Low cutting force**
  Suitable for use on low-rigidity machines and under low-rigidity clamping conditions
- **Excellent chip evacuation**
  Prevents chip recutting during pocketing and slotting

Insert size 03



Insert size 06

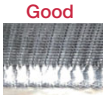
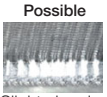
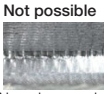
■ Cutting force



P

Cutter	: EXN03R020M20.0-04-C (ø20 mm, CICT = 4)
Insert	: LNMU0303ZER-MJ/ML AH3225 LNMU0303UER-MJ/ML AH3225
Workpiece material	: S55C / C55 (205HB)
Cutting speed	: *Vc* = 150 m/min
Feed per tooth	: *fz* = 0.8 mm/t
Depth of cut	: *ap* = 0.5 mm
Width of cut	: *ae* = 12 mm
Coolant	: Dry
Machine	: Vertical M/C, BT40

■ Chip evacuation performance

	ZER-MJ	UER-MJ	Competitor
Wall surface	Good  No abrasion marks	Possible  Slight abrasion marks	Not possible  Abrasion marks present
Chipbreaker shape	 Large, easily discharged curled chips	 Small-curled chips	 Chips trapped and flattened

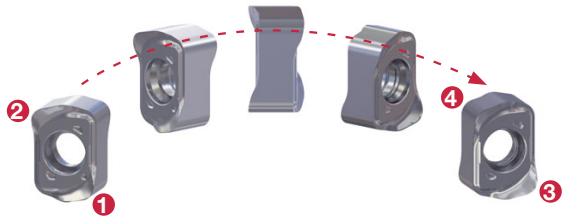
P

Cutter	: EXN03R020M20.0-04-C (ø20 mm, CICT = 4)
Insert	: LNMU0303ZER-MJ AH3225 LNMU0303UER-MJ AH3225
Workpiece material	: S55C / C55 (205HB)
Cutting speed	: *Vc* = 150 m/min
Feed per tooth	: *fz* = 0.5 mm/t
Depth of cut	: *ap* = 0.5 mm
Width of cut	: *ae* = 20 mm
Coolant	: Dry
Machine	: Vertical M/C, BT50

ADDDOFEED/DOFEED

Reliable and economical inserts

Economical double-sided inserts with four cutting edges



Cutter body design for maximum productivity

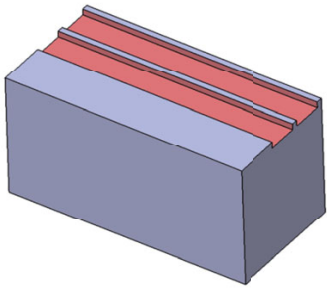
Extremely stiff body design with a large core

Close pitch cutter design for increased productivity

■ Inserts per diameter density comparisons:
DoFeed series vs competitor's high feed cutter

Tool diameter (mm)	ADDDOFEED	DOFEED 03	DOFEED 06	Competitor
ø16	4	2	-	2
ø25	7	5	-	4
ø50	-	8	5	4

■ Slotting example



Although it had more cutting edges than the competitor's tool, DoFeed operated without chatter and achieved 1.25 times higher machining efficiency.

	DOFEED 03	Competitor
Metal removal rate (cm^3/min)	163	130
Chatter	Without	With

P

Cutter : EXN03R025M25.0-05-C (ø25 mm, CICT = 5), Competitor (ø25 mm, CICT = 4)
Insert : LNMU0303UER-MJ AH3225
Workpiece material : NAK80 (38HRC)
Cutting speed : *Vc* = 200 m/min
Feed per tooth : *fz* = 0.64 mm/t
Depth of cut : *ap* = 0.8 mm
Width of cut : *ae* = 25 mm
Coolant : Dry
Machine : Vertical M/C, BT40

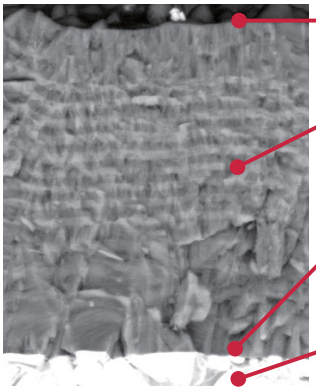
GRADES

Grades with long tool life for a wide range of materials

New

AH3225 P M

- Nano multi-layer coating technology with three major properties for optimal cutting edge integrity
- Increased resistance to wear, fracture, oxidation, built-up edge, and delamination



Resistance to built-up edge
The coating surface prevents built-up edge

Resistance to wear, oxidation, and fracture
Multi-layered coating is designed to resist wear and oxidation, while preventing micro-cracks from propagating in the coating layer for improved resistance to edge chipping

Strong coating / substrate adhesion
Coating is optimized for strong adhesion property with substrate to maintain strong cutting edge integrity

Carbide substrate
High resistance to fracture

AH8015 P K H

- High wear and chipping resistance and minimized built up edge due to nano multi-layered AlTiN coating with high Al content
- Well-suited for difficult materials of 45 - 55 HRc

AH8005 H

- High wear and chipping resistance and minimized built-up edge due to nano multi-layered AlTiN coating with high Al content
- Ideal for hardened steel of 55HRc and above

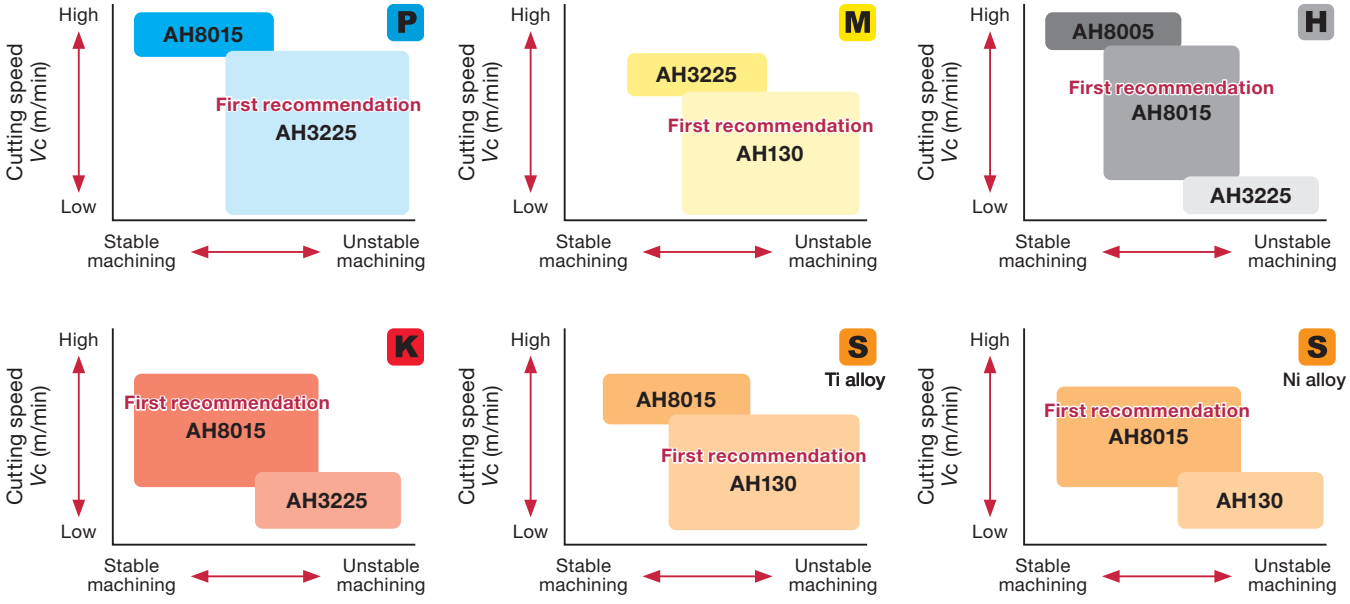
AH130 M S

- High chipping resistance
- Ideal for titanium alloy machining

AH120 K

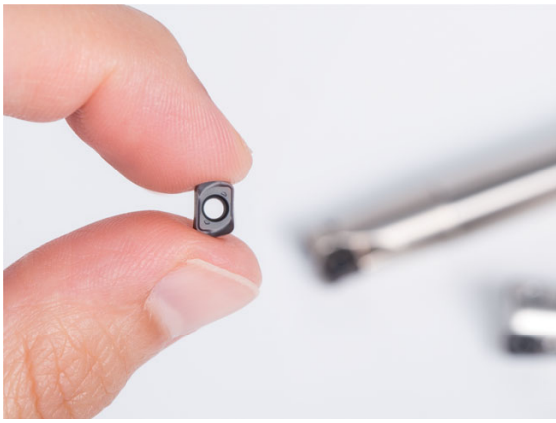
- Exceptionally wear resistant in cast iron machining

APPLICATION AREAS



Insert size 02

First choice for cutter diameters ø8 - ø16 mm
A high-performance high-feed cutter that significantly reduces carbide consumption.



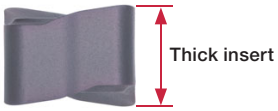
High reliability

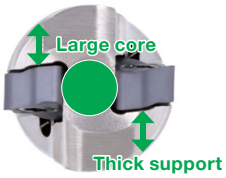
Three features of the insert design increase reliability of the small inserts, providing process security

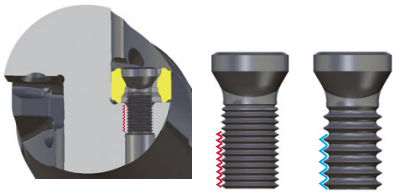
1. Thick insert
Insert with thickest possible design to prevent insert fracture.

2. Thick insert support
Sustains massive cutting loads generated during high feed machining.

3. Fine screw threads
Shallow-pitched fine threads prevent screw from self-loosening due to higher number of threads in contact.



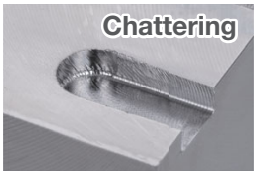




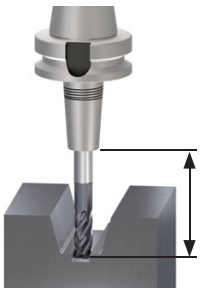
Use AddDoFeed instead of solid end mill to control chatter

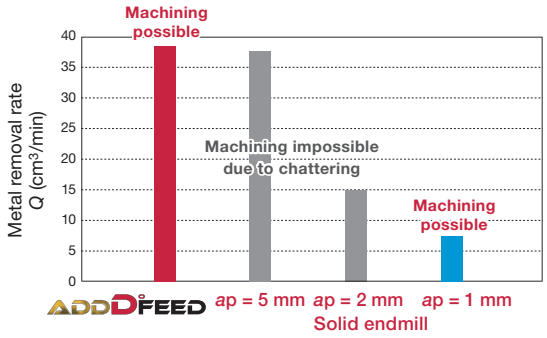
■ Comparison of chatter resistance at L/D = 4

ADDOFEED



Competitor
Solid endmill





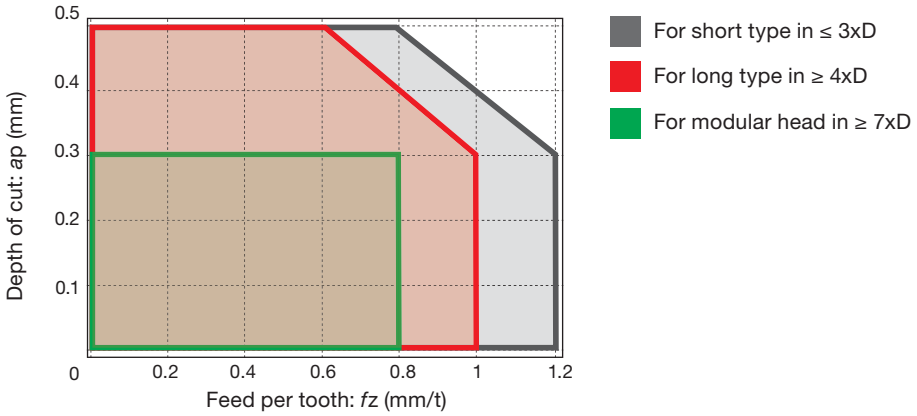
P

Cutter	: ø12 mm long type, CICT = 2 (Competitor: ø12 mm, CICT = 4)
Overhang length	: **50 mm (L/D = 4)**
Cutting speed	: *Vc* = **200** m/min (Competitor: 120 m/min)
Feed per tooth	: *fz* = **1.2** mm/t (Competitor: 0.05 mm/t)
Feed speed	: *Vf* = **12,740** mm/min (Competitor: 640 mm/min)
Depth of cut	: *ap* = 0.25 mm (Competitor: 5 mm)
Width of cut	: *ae* = 12 mm
Machine	: Vertical M/C, BT30

By using the chatter-resistant ADDOFEED :
- Longer tool life through stable machining
- Higher machining efficiency with high-feed cutting
- Significantly reduced tooling costs thanks to the insert-type design

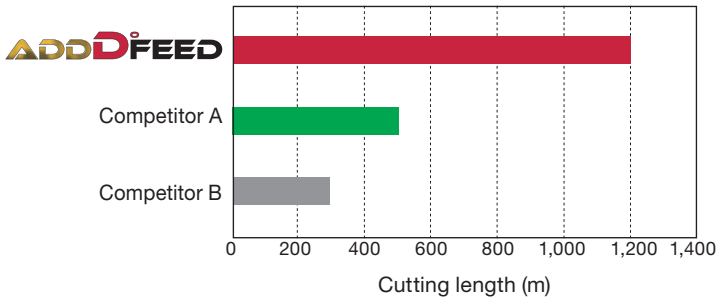
APPLICATION

P



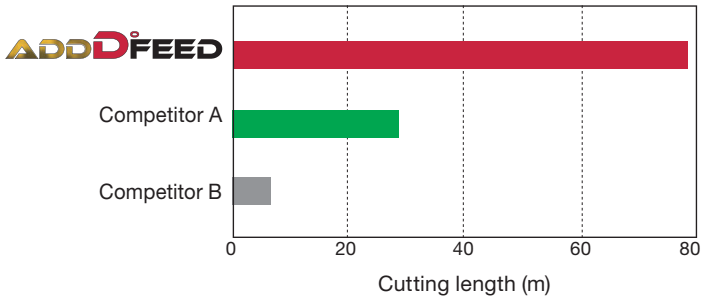
CUTTING PERFORMANCE

P S55C / C55 (190HB)



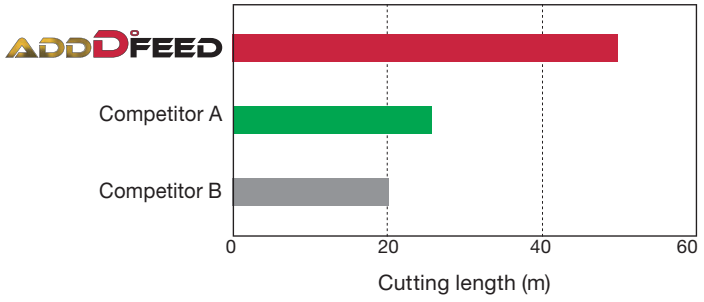
Cutter : EXN02R012M12.0-02 (ø12 mm, CICT = 2)
Insert : LNMU0202ZER-MM AH3225
Overhang length : 30 mm
Cutting speed : *Vc* = 250 m/min
Feed per tooth : *fz* = 0.6 mm/t
Depth of cut : *ap* = 0.4 mm
Width of cut : *ae* = 9.8 mm
Coolant : Dry
Machine : Vertical M/C, BT40

M SUS304 / X5CrNi18-9 (190HB)



Cutter : EXN02R012M12.0-02 (ø12 mm, CICT = 2)
Insert : LNMU0202ZER-MM AH130
Tool overhang : 30 mm
Cutting speed : *Vc* = 180 m/min
Feed per tooth : *fz* = 0.3 mm/t
Depth of cut : *ap* = 0.3 mm
Width of cut : *ae* = 9.8 mm
Coolant : Wet
Machine : Vertical M/C, BT40

H SKD61 / X40CrMoV5-1 (52HRC)



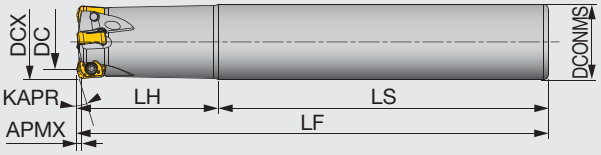
Cutter : EXN02R012M12.0-02 (ø12 mm, CICT = 2)
Insert : LNMU0202ZER-MM AH8015
Tool overhang : 30 mm
Cutting speed : *Vc* = 120 m/min
Feed per tooth : *fz* = 0.5 mm/t
Depth of cut : *ap* = 0.3 mm
Width of cut : *ae* = 9.8 mm
Coolant : Dry
Machine : Vertical M/C, BT40

Insert size 02

EXN02

High feed endmill, shank type, for 4-corner double sided inserts

GAMP = +6°, GAMF = +5° ~ +11°



Designation	APMX	DCX	CICT	DC	DCONMS	LF	LH	LS	KAPR	WT(kg)	Air hole	Insert
EXN02R008M08.0-01	0.5	8	1	3.95	8	75	16	59	17°	0.02	With	LNMU02…
EXN02R008M08.0-01L	0.5	8	1	3.95	8	90	31	59	17°	0.03	With	LNMU02…
EXN02R010M10.0-02	0.5	10	2	5.85	10	80	20	60	17°	0.04	With	LNMU02…
EXN02R010M10.0-02L	0.5	10	2	5.85	10	100	40	60	17°	0.05	With	LNMU02…
EXN02R012M12.0-02	0.5	12	2	7.8	12	80	20	60	17°	0.06	With	LNMU02…
EXN02R012M12.0-02L	0.5	12	2	7.8	12	110	50	60	17°	0.08	With	LNMU02…
EXN02R016M16.0-04	0.5	16	4	11.8	16	100	30	70	17°	0.14	With	LNMU02…
EXN02R016M16.0-03L	0.5	16	3	11.8	16	120	50	70	17°	0.17	With	LNMU02…
EXN02R020M20.0-04L	0.5	20	4	15.8	20	160	80	80	17°	0.32	With	LNMU02…
EXN02R020M20.0-05	0.5	20	5	15.8	20	130	50	80	17°	0.27	With	LNMU02…
EXN02R025M25.0-07	0.5	25	7	20.8	25	140	60	80	17°	0.46	With	LNMU02…
EXN02R025M25.0-06L	0.5	25	6	20.8	25	180	100	80	17°	0.57	With	LNMU02…

SPARE PARTS

Designation	Clamping screw	Wrench
EXN02R008...	CSPB-1.8FL3.6	IP-6DB
EXN02R010... - EXN02R025...	CSPB-1.8FL4.3	IP-6DB

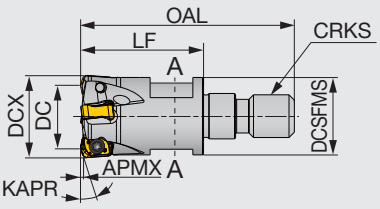
Tool diameter tolerance	
Tool diameter	0 / -0.4

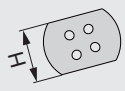
*Recommended clamping torque (N·m): CSPB-1.8FL3.6, CSPB-1.8FL4.3 = 0.5

HXN02

High feed endmill, modular type (TungFlex)

GAMP = +6°, GAMF = +5° ~ +11°





A-A cross section

Designation	APMX	DCX	CICT	DC	DCSFMS	OAL	LF	H	KAPR	CRKS	WT(kg)	Air hole	Insert
HXN02R008MM06-01	0.5	8	1	3.95	9.5	33.5	19	7	17°	M6	0.01	With	LNMU02…
HXN02R010MM06-02	0.5	10	2	5.85	9.5	31.5	17	7	17°	M6	0.01	With	LNMU02…
HXN02R012MM06-02	0.5	12	2	7.8	10	31.5	17	7	17°	M6	0.01	With	LNMU02…
HXN02R016MM08-04	0.5	16	4	11.8	14.5	40	23	10	17°	M8	0.03	With	LNMU02…
HXN02R020MM10-05	0.5	20	5	15.8	17.8	49	30	15	17°	M10	0.06	With	LNMU02…
HXN02R025MM12-07	0.5	25	7	20.8	23	52	30	17	17°	M12	0.1	With	LNMU02...

SPARE PARTS

Designation	Clamping screw	Wrench
HXN02R008... - HXN02R025...	CSPB-1.8FL3.6	IP-6DB

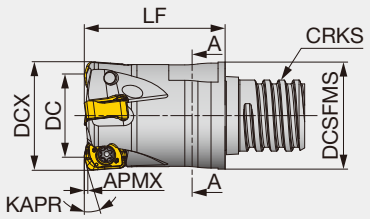
Tool diameter tolerance	
Tool diameter	0 / -0.4

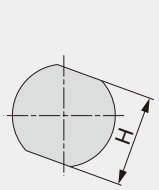
*Recommended clamping torque (N·m): CSPB-1.8FL3.6, CSPB-1.8FL4.3 = 0.5

TUNGMEISTER

HXN02R-S

High feed endmill, modular type (TungMeister)





A-A cross section

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

SPARE PARTS

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

Tool diameter tolerance	
Tool diameter	0 / -0.4

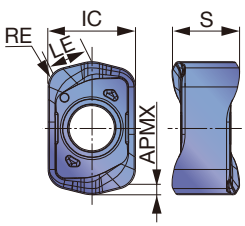
For modular shank selection

Note : Dedicated wrench is sold separately.

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

INSERT

LNMU02-MM



		Coated		
		AH130	AH3225	AH8015
P	Steel		★	☆
M	Stainless	★	☆	
K	Cast iron		☆	★
N	Non-ferrous			
S	Titanium alloy	★		☆
S	Heat-resistant alloy	☆		★
H	Hard materials		☆	★

★ : First choice
☆ : Second choice

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

● : Line up

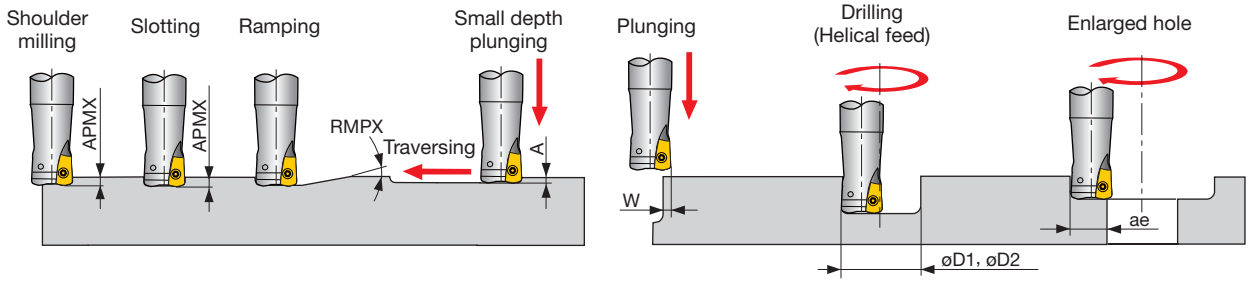
ADDDOFEED

Insert size 02

STANDARD CUTTING CONDITIONS

ISO	Workpiece materials		Hardness	Priority	Grades	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
P	Carbon steels S45C, S55C, etc. C45, C55, etc.		- 300HB	First choice	AH3225	100 - 300	0.2 - 1.2
			- 300HB	For wear resistance	AH8015	100 - 300	0.2 - 1.2
	Alloy steels SCM440, SCr415, etc. 42CrMo4, etc.		- 300HB	First choice	AH3225	100 - 300	0.2 - 1.2
			- 300HB	For wear resistance	AH8015	100 - 300	0.2 - 1.2
	Prehardened steels NAK80, PX5, etc.		30 - 40HRC	First choice	AH8015	100 - 200	0.2 - 0.8
			30 - 40HRC	For impact resistance	AH3225	100 - 200	0.2 - 0.8
M	Stainless steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.		- 200HB	First choice	AH130	100 - 150	0.2 - 0.8
K	Gray cast irons FC250, FC300, etc. 250, 300, etc.		150 - 250HB	First choice	AH8015	100 - 300	0.2 - 1.2
			150 - 250HB	For impact resistance	AH3225	100 - 300	0.2 - 1.2
	Ductile cast irons FCD400, etc. 400-15, 600-3, etc.		150 - 250HB	First choice	AH8015	80 - 200	0.2 - 1.2
			150 - 250HB	For impact resistance	AH3225	80 - 200	0.2 - 1.2
S	Titanium alloy Ti-6Al-4V, etc.		- 40HRC	First choice	AH130	30 - 60	0.2 - 0.7
			- 40HRC	For wear resistance	AH8015	30 - 60	0.2 - 0.7
	Heat-resistant alloy Inconel, Hastelloy, etc.		- 40HRC	First choice	AH8015	20 - 50	0.1 - 0.3
			- 40HRC	For impact resistance	AH3225	20 - 50	0.1 - 0.3
H	Hardened steel	SKD61, etc. X40CrMoV5-1, etc.	40 - 50HRC	First choice	AH8015	80 - 150	0.1 - 0.5
			40 - 50HRC	For impact resistance	AH3225	80 - 150	0.1 - 0.5
		SKD11, etc. X153CrMoV12, etc.	50~60HRC	First choice	AH8015	50 - 70	0.1 - 0.3

APPLICATION RANGE



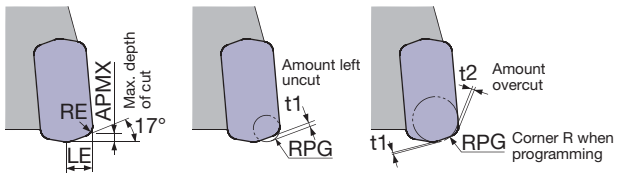
Designation	DCX	Max. depth of cut APMX	Max. ramping angle RMPX	Max. plunging depth A	Max. cutting width in plunging W	Min. machinable hole dia. øD1	Max. machinable hole dia. øD2	Max. cutting width in enlarged hole ae
E/HXN02R008...	8	0.5	0.5	0.03	2	11.5	13.2	5.87
E/HXN02R010...	10	0.5	2.8	0.15	2	13.8	17	7.82
E/HXN02R012...	12	0.5	1.9	0.15	2	17.8	21	9.81
E/HXN02R016...	16	0.5	1.2	0.15	2	25.8	29	13.8
E/HXN02R020...	20	0.5	0.88	0.15	2	33.8	37	17.8
E/HXN02M025...	25	0.5	0.66	0.15	2	43.8	47	22.8

Tool dia.: DCX (mm), Number of revolutions: *n* (min^{-1}), Feed speed: *Vf* (mm/min), Max. depth of cut: *ap* = 0.5 mm, Number of teeth: CICT

ø8, CICT = 1		ø10, CICT = 2		ø12, CICT = 2		ø16			ø20			ø25		
n	*Vf*	*n*	*Vf*	*n*	*Vf*	*n*	*Vf*		*n*	*Vf*		*n*	*Vf*	
							CICT = 3	CICT = 4		CICT = 4	CICT = 5		CICT = 6	CICT = 7
7,960	6,370	6,370	10,200	5,310	8,500	3,980	9,560	12,740	3,180	10,180	12,720	2,550	12,240	14,280
Vc = 200 m/min, *fz* = 0.8 mm/t														
7,960	6,370	6,370	10,200	5,310	8,500	3,980	9,560	12,740	3,180	10,180	12,720	2,550	12,240	14,280
Vc = 200 m/min, *fz* = 0.8 mm/t														
5,970	2,990	4,780	4,780	3,980	3,980	2,990	4,490	5,980	2,390	4,780	5,980	1,910	5,730	6,690
Vc = 150 m/min, *fz* = 0.5 mm/t														
4,780	2,390	3,820	3,820	3,190	3,190	2,390	3,590	4,780	1,910	3,820	4,780	1,530	4,590	5,360
Vc = 120 m/min, *fz* = 0.5 mm/t														
7,960	6,370	6,370	10.200	5,310	8,500	3,980	9,560	12,740	3,180	10,180	12,720	2,550	12,240	14,280
Vc = 200 m/min, *fz* = 0.8 mm/t														
5,970	4,780	4,780	7,650	3,980	6,370	2,990	7,180	9,570	2,390	7,650	9,560	1,530	7,350	8,570
Vc = 150 m/min, *fz* = 0.8 mm/t														
1,590	800	1,270	1,270	1,060	1,060	800	1,200	1,600	640	1,280	1,600	510	1,530	1,790
Vc = 40 m/min, *fz* = 0.5 mm/t														
1,190	240	1,000	400	800	320	600	360	480	480	390	480	380	460	540
Vc = 30 m/min, *fz* = 0.2 mm/t														
4,780	1,440	3,820	2,300	3,190	1,920	2,390	2,160	2,870	1,910	2,300	2,870	1,530	2,760	3,220
Vc = 120 m/min, *fz* = 0.3 mm/t														
2,390	480	1,910	770	1,590	640	1,190	720	960	950	760	950	760	920	1,070
Vc = 60 m/min, *fz* = 0.2 mm/t														

TOOL GEOMETRY ON PROGRAMMING

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



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

*Recommended

DOFEED

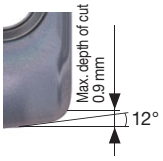
Insert size 03

Popular DoFeed 03 series now offers UER inserts with small approach angle for higher performance

Various insert line up

LNMU0303UER insert
Low approach angle

for long tool life and reduced vibration

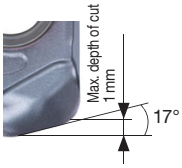


MJ
General machining

ML
Low cutting force

LNM/GU0303ZER insert
General-purpose approach angle

for low cutting forces



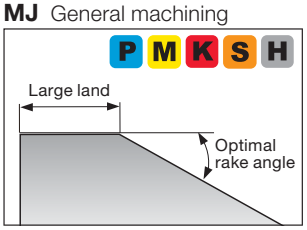
MJ
General machining

ML
Low cutting force

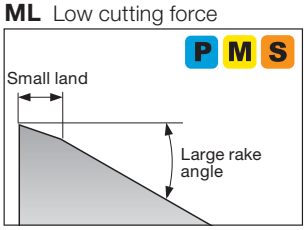
MS
For stainless steel

MH
Robust cutting edges

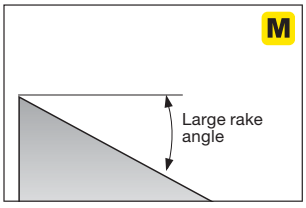
MJ General machining



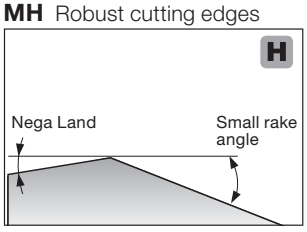
ML Low cutting force



MS For stainless steel

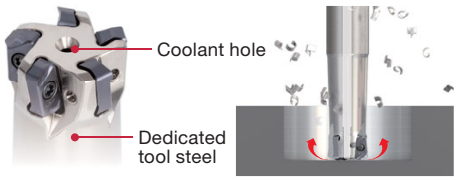


MH Robust cutting edges

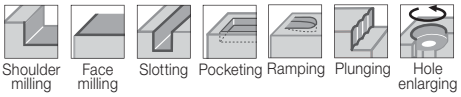


Available in 3 body types (E/HXN03)

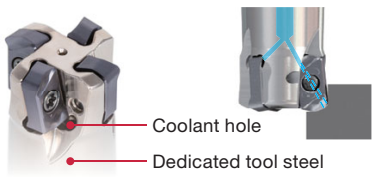
Premium body / Center-through coolant



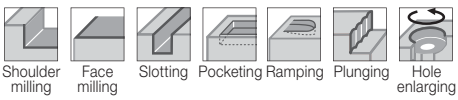
- Effectively evacuates chips
- Most suitable for pocket milling



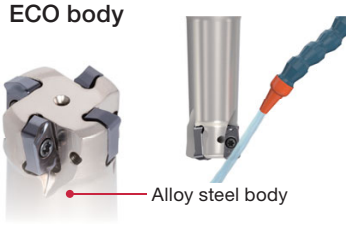
Premium body / Optimal coolant supply



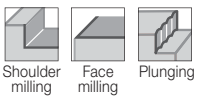
- Coolant goes to the edge directly for effective cooling
- Suitable for the machining of difficult-to-cut materials or small-width cutting



ECO body



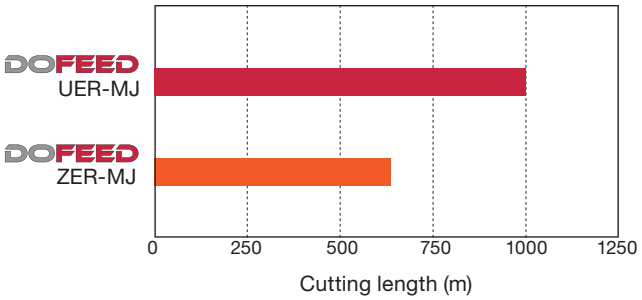
- High-economical bodies due to no coolant-hole



CUTTING PERFORMANCE

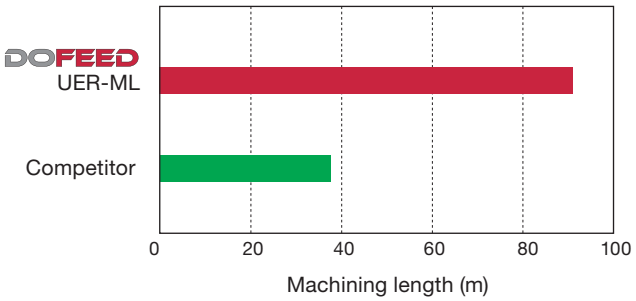
Insert size 03

P S55C / C55 (190HB)



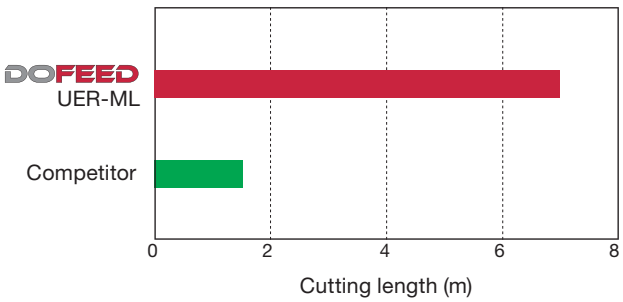
Cutter	: EXN03R020M20.0-04-C (ø20 mm, CICT = 4)
Insert	: LNMU0303UER-MJ AH3225 LNMU0303ZER-MJ AH3225
Cutting speed	: *Vc* = 200 m/min
Feed per tooth	: *fz* = 1.2 mm/t
Depth of cut	: *ap* = 0.5 mm
Width of cut	: *ae* = 12 mm
Coolant	: Dry
Machine	: Vertical M/C, BT40

M SUS630 / X5CrNiCuNb16-4 (42HRC)



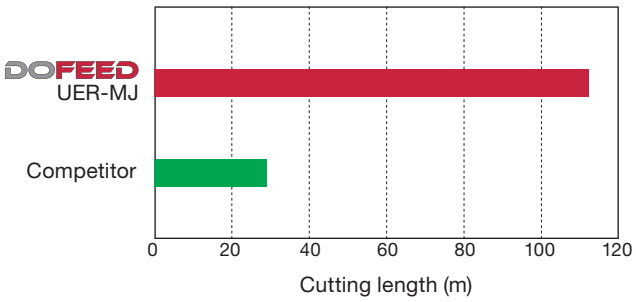
Cutter	: EXN03R020M20.0-04-C (ø20 mm, CICT = 4)
Insert	: LNMU0303UER-ML AH130
Cutting speed	: *Vc* = 100 m/min
Feed per tooth	: *fz* = 0.6 mm/t
Depth of cut	: *ap* = 0.5 mm
Width of cut	: *ae* = 12 mm
Coolant	: Dry
Machine	: Vertical M/C, BT40

S Ti-6Al-4V (40HRC)



Cutter	: EXN03R025M25.0-05-C (ø25 mm, CICT = 5)
Insert	: LNMU0303UER-ML AH130
Cutting speed	: *Vc* = 65 m/min
Feed per tooth	: *fz* = 1.2 mm/t
Depth of cut	: *ap* = 0.6 mm
Width of cut	: *ae* = 12.5 mm
Coolant	: Wet
Machine	: Vertical M/C, BT40

H SKD61 (HRC50)



Cutter	: EXN03R020M20.0-04-C (ø20 mm, CICT = 4)
Insert	: LNMU0303UER-MJ AH8015
Cutting speed	: *Vc* = 150 m/min
Feed per tooth	: *fz* = 0.5 mm/t
Depth of cut	: *ap* = 0.5 mm
Width of cut	: *ae* = 12 mm
Coolant	: Dry
Machine	: Vertical M/C, BT40

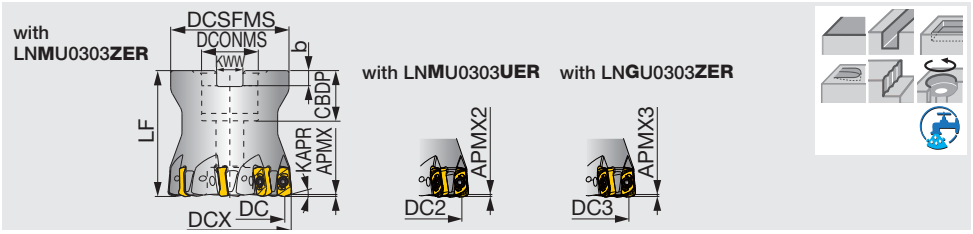
DOFEED

Insert size 03

TXN03

High feed mill, for 4-corner double sided inserts

GAMP = +6°,GAMF = +12° ~ 13°



Designation	APMX	APMX2	APMX3	DCX	CICT	DC	DC2	DC3	DCSFMS	DCONMS	CBDP	LF	b	KWW	KAPR	KAPR2*	KAPR3*	WT(kg)	Air hole	Insert
TXN03R040M16.0E05	1	0.9	1	40	5	33.6	32.8	33.7	35	16	18	40	5.6	8.4	17°	12°	17°	0.2	With	LN*U03...
TXN03R040M16.0E06	1	0.9	1	40	6	33.6	32.8	33.7	35	16	18	40	5.6	8.4	17°	12°	17°	0.2	With	LN*U03...
TXN03R050M22.0E05	1	0.9	1	50	5	43.6	42.8	43.7	47	22	20	50	6.3	10.4	17°	12°	17°	0.5	With	LN*U03...
TXN03R050M22.0E08	1	0.9	1	50	8	43.6	42.8	43.7	47	22	20	50	6.3	10.4	17°	12°	17°	0.5	With	LN*U03...
TXN03R050M22.2-08	1	0.9	1	50	8	43.6	42.8	43.7	47	22.225	20	50	5	8	17°	12°	17°	0.5	With	LN*U03...

*KAPR2 : with LNMU0303UER
*KAPR3 : with LNGU0303ZER

SPARE PARTS

Designation	Clamping screw	Lubricant (Optional)	Shell locking bolt	Wrench
TXN03R04...	CSPB-2.5L080	(M-1000)	CM8X30H	IP-8D
TXN03R05...	CSPB-2.5L080	(M-1000)	CM10X30H	IP-8D

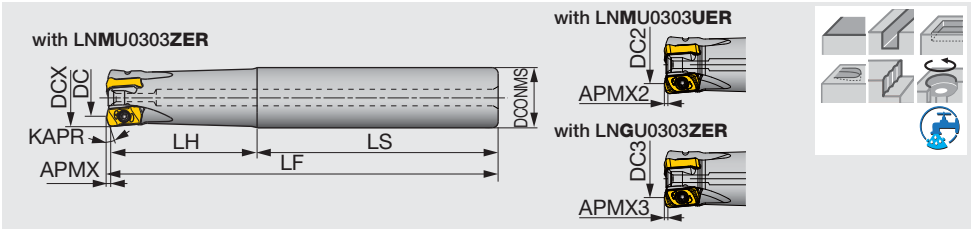
*Recommended clamping torque (N·m) : CSPB-2.5L080 = 1.3

Tool diameter tolerance	
Tool diameter	0 / -0.45

EXN03

High feed endmill, shank type, with center through coolant hole, for 4-corner double sided inserts

GAMP = +6°, GAMF = +5° ~ +11°



Designation	APMX	APMX2	APMX3	DCX	CICT	DC	DC2	DC3	DCONMS	LF	LH	LS	KAPR	KAPR2*	KAPR3*	WT(kg)	Air hole	Insert
EXN03R016M16.0-02(1)	1	0.9	1	16	2	9.6	8.8	9.8	16	100	30	70	15°	10°	15°	0.2	With	LN*U03...
EXN03R016M16.0-02L(1)	1	0.9	1	16	2	9.6	8.8	9.8	16	150	50	100	15°	10°	15°	0.2	With	LN*U03...
EXN03R018M16.0-02(1)	1	0.9	1	18	2	11.5	10.7	11.7	16	100	30	70	17°	12°	17°	0.2	With	LN*U03...
EXN03R018M16.0-02L(1)	1	0.9	1	18	2	11.5	10.7	11.7	16	150	25	125	17°	12°	17°	0.2	With	LN*U03...
EXN03R020M20.0-03(2)	1	0.9	1	20	3	13.5	12.7	13.6	20	130	50	80	17°	12°	17°	0.3	With	LN*U03...
EXN03R020M20.0-03L(2)	1	0.9	1	20	3	13.5	12.7	13.6	20	160	80	80	17°	12°	17°	0.3	With	LN*U03...
EXN03R020M20.0-04(1)	1	0.9	1	20	4	13.5	12.7	13.6	20	130	50	80	17°	12°	17°	0.3	With	LN*U03...
EXN03R022M20.0-03(2)	1	0.9	1	22	3	15.5	14.7	15.6	20	130	50	80	17°	12°	17°	0.3	With	LN*U03...
EXN03R022M20.0-03L(2)	1	0.9	1	22	3	15.5	14.7	15.6	20	160	30	130	17°	12°	17°	0.4	With	LN*U03...
EXN03R022M20.0-04(1)	1	0.9	1	22	4	15.5	14.7	15.6	20	130	50	80	17°	12°	17°	0.3	With	LN*U03...
EXN03R025M25.0-04(2)	1	0.9	1	25	4	18.5	17.7	18.6	25	140	60	80	17°	12°	17°	0.5	With	LN*U03...
EXN03R025M25.0-04L(2)	1	0.9	1	25	4	18.5	17.7	18.6	25	180	100	80	17°	12°	17°	0.6	With	LN*U03...
EXN03R025M25.0-05(1)	1	0.9	1	25	5	18.5	17.7	18.6	25	140	60	80	17°	12°	17°	0.5	With	LN*U03...
EXN03R028M25.0-04(2)	1	0.9	1	28	4	21.5	20.7	21.6	25	140	60	80	17°	12°	17°	0.5	With	LN*U03...
EXN03R028M25.0-04L(2)	1	0.9	1	28	4	21.5	20.7	21.6	25	180	35	145	17°	12°	17°	0.7	With	LN*U03...
EXN03R028M25.0-05(2)	1	0.9	1	28	5	21.5	20.7	21.6	25	140	60	80	17°	12°	17°	0.5	With	LN*U03...
EXN03R030M32.0-04(2)	1	0.9	1	30	4	23.5	22.7	23.6	32	150	70	80	17°	12°	17°	0.8	With	LN*U03...
EXN03R030M32.0-04L(2)	1	0.9	1	30	4	23.5	22.7	23.6	32	200	120	80	17°	12°	17°	0.9	With	LN*U03...
EXN03R030M32.0-05(2)	1	0.9	1	30	5	23.5	22.7	23.6	32	150	70	80	17°	12°	17°	0.8	With	LN*U03...
EXN03R032M32.0-05(2)	1	0.9	1	32	5	25.5	24.7	25.6	32	150	70	80	17°	12°	17°	0.8	With	LN*U03...
EXN03R032M32.0-05L(2)	1	0.9	1	32	5	25.5	24.7	25.6	32	200	120	80	17°	12°	17°	1.1	With	LN*U03...
EXN03R032M32.0-06(1)	1	0.9	1	32	6	25.5	24.7	25.6	32	150	70	80	17°	12°	17°	0.9	With	LN*U03...
EXN03R035M32.0-05(2)	1	0.9	1	35	5	28.5	27.7	28.6	32	150	35	115	17°	12°	17°	0.9	With	LN*U03...
EXN03R035M32.0-05L(2)	1	0.9	1	35	5	28.5	27.7	28.6	32	200	35	165	17°	12°	17°	1.2	With	LN*U03...
EXN03R035M32.0-06(2)	1	0.9	1	35	6	28.5	27.7	28.6	32	150	35	115	17°	12°	17°	0.9	With	LN*U03...

*KAPR2 : with LNMU0303UER
*KAPR3 : with LNGU0303ZER
Clamping screws used for (1) and (2) above are different. See below for the part codes.

SPARE PARTS

Designation	Clamping screw	Lubricant (Optional)	Wrench
EXN03...	(1) CSPB-2.5 (2) CSPB-2.5L080	(M-1000)	IP-8D

*Recommended clamping torque (N·m) : CSPB-2.5/CSPB-2.5L080 = 1.3

Tool diameter tolerance	
Tool diameter	0 / -0.45

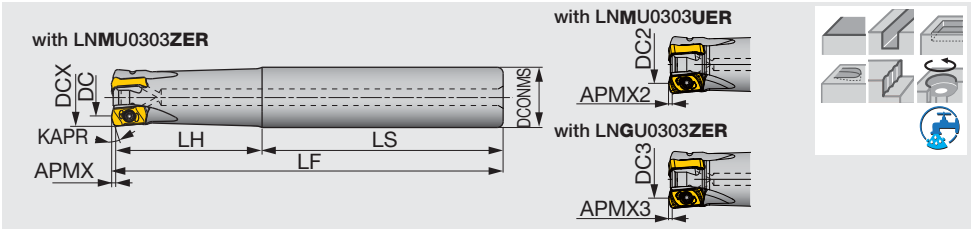
DOFEED

Insert size 03

EXN03-C

High feed endmill, shank type, with coolant directly to the tool tips, for 4-corner double sided inserts

GAMP = +6°,GAMF = +5° ~ +11°



Designation	APMX	APMX2	APMX3	DCX	CICT	DC	DC2	DC3	DCONMS	LF	LH	LS	KAPR	KAPR2*	KAPR3*	WT(kg)	Air hole	Insert
EXN03R016M16.0-02-C(1)	1	0.9	1	16	2	9.6	8.8	9.8	16	100	30	70	15°	10°	15°	0.2	With	LN*U03...
EXN03R016M16.0-02L-C(1)	1	0.9	1	16	2	9.6	8.8	9.8	16	150	50	100	15°	10°	15°	0.2	With	LN*U03...
EXN03R020M20.0-03-C(2)	1	0.9	1	20	3	13.5	12.7	13.6	20	130	50	80	17°	12°	17°	0.3	With	LN*U03...
EXN03R020M20.0-03L-C(2)	1	0.9	1	20	3	13.5	12.7	13.6	20	160	80	80	17°	12°	17°	0.3	With	LN*U03...
EXN03R020M20.0-04-C(1)	1	0.9	1	20	4	13.5	12.7	13.6	20	130	50	80	17°	12°	17°	0.3	With	LN*U03...
EXN03R025M25.0-04-C(2)	1	0.9	1	25	4	18.5	17.7	18.6	25	140	60	80	17°	12°	17°	0.5	With	LN*U03...
EXN03R025M25.0-04L-C(2)	1	0.9	1	25	4	18.5	17.7	18.6	25	180	100	80	17°	12°	17°	0.6	With	LN*U03...
EXN03R025M25.0-05-C(1)	1	0.9	1	25	5	18.5	17.7	18.6	25	140	60	80	17°	12°	17°	0.5	With	LN*U03...
EXN03R032M32.0-05-C(2)	1	0.9	1	32	5	25.5	24.7	25.6	32	150	70	80	17°	12°	17°	0.8	With	LN*U03...
EXN03R032M32.0-05L-C(2)	1	0.9	1	32	5	25.5	24.7	25.6	32	200	120	80	17°	12°	17°	1.1	With	LN*U03...
EXN03R032M32.0-06-C(1)	1	0.9	1	32	6	25.5	24.7	25.6	32	150	70	80	17°	12°	17°	0.8	With	LN*U03...
EXN03R040M32.0-06-C(2)	1	0.9	1	40	6	33.6	32.8	33.7	32	150	45	105	17°	12°	17°	1	With	LN*U03...
EXN03R040M32.0-06L-C(2)	1	0.9	1	40	6	33.6	32.8	33.7	32	220	45	175	17°	12°	17°	1.4	With	LN*U03...

*KAPR2 : with LNMU0303UER
*KAPR3 : with LNGU0303ZER
Clamping screws used for (1) and (2) above are different. See below for the part codes.

SPARE PARTS

Designation	Clamping screw	Lubricant (Optional)	Wrench
EXN03...	(1) CSPB-2.5 (2) CSPB-2.5L080	(M-1000)	IP-8D

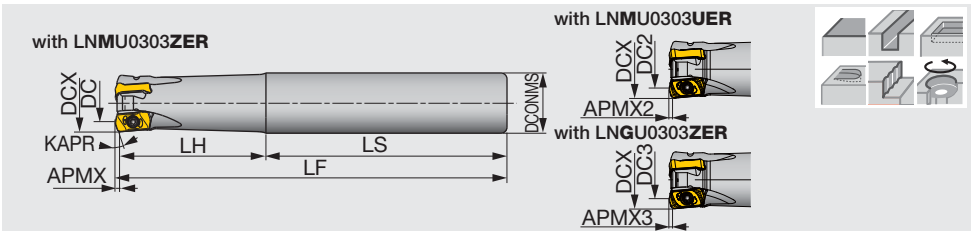
Tool diameter tolerance	
Tool diameter	0 / -0.45

*Recommended clamping torque (N·m):CSPB-2.5/CSPB-2.5L080 = 1.3

EXN03-N

High feed endmill (Eco), shank type, for double sided inserts

GAMP = +6°, GAMF = +5° ~ +11°



Designation	APMX	APMX2	APMX3	DCX	CICT	DC	DC2	DC3	DCONMS	LF	LH	LS	KAPR	KAPR2*	KAPR3*	WT(kg)	Air hole	Insert
EXN03R016M16.0-02N(1)	1	0.9	1	16	2	9.6	8.8	9.8	16	100	30	70	15°	10°	15°	0.2	Without	LN*U03...
EXN03R020M20.0-03N(2)	1	0.9	1	20	3	13.5	12.7	13.6	20	130	50	80	17°	12°	17°	0.3	Without	LN*U03...
EXN03R025M25.0-04N(2)	1	0.9	1	25	4	18.5	17.7	18.6	25	140	60	80	17°	12°	17°	0.5	Without	LN*U03...
EXN03R032M32.0-05N(2)	1	0.9	1	32	5	25.5	24.7	25.6	32	150	70	80	17°	12°	17°	0.8	Without	LN*U03...

*KAPR2 : with LNMU0303UER
*KAPR3 : with LNGU0303ZER
Clamping screws used for (1) and (2) above are different. See below for the part codes.

SPARE PARTS

Designation	Clamping screw	Lubricant (Optional)	Wrench
EXN03...	(1) CSPB-2.5 (2) CSPB-2.5L080	(M-1000)	IP-8D

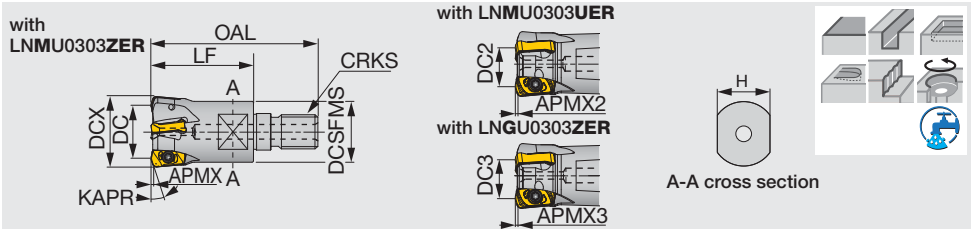
Tool diameter tolerance	
Tool diameter	0 / -0.45

*Recommended clamping torque (N·m):CSPB-2.5/CSPB-2.5L080 = 1.3

HXN03

High feed endmill, modular type (TungFlex)

GAMP= +6°,GAMF= +5° ~ +11°



Designation	APMX	APMX2	APMX3	DCX	CICT	DC	DC2	DC3	OAL	LF	H	DCSFMS	KAPR	KAPR2*	KAPR3*	CRKS	WT(kg)	Air hole	Insert
HXN03R016MM08-02(1)	1	0.9	1	16	2	9.6	8.8	9.8	42	25	10	12.8	15°	10°	15°	M8	0.03	With	LN*U03...
HXN03R018MM08-02(1)	1	0.9	1	18	2	11.5	10.7	11.7	42	25	10	14.5	17°	12°	17°	M8	0.04	With	LN*U03...
HXN03R020MM10-03(2)	1	0.9	1	20	3	13.5	12.7	13.6	49	30	15	17.8	17°	12°	17°	M10	0.06	With	LN*U03...
HXN03R020MM10-04(1)	1	0.9	1	20	4	13.5	12.7	13.6	49	30	15	17.8	17°	12°	17°	M10	0.06	With	LN*U03...
HXN03R022MM10-03(2)	1	0.9	1	22	3	15.5	14.7	15.6	49	30	15	17.8	17°	12°	17°	M10	0.06	With	LN*U03...
HXN03R022MM10-04(1)	1	0.9	1	22	4	15.5	14.7	15.6	49	30	15	17.8	17°	12°	17°	M10	0.07	With	LN*U03...
HXN03R025MM12-04(2)	1	0.9	1	25	4	18.5	17.7	18.6	57	35	17	20.8	17°	12°	17°	M12	0.1	With	LN*U03...
HXN03R025MM12-05(1)	1	0.9	1	25	5	18.5	17.7	18.6	57	35	17	20.8	17°	12°	17°	M12	0.11	With	LN*U03...
HXN03R028MM12-04(2)	1	0.9	1	28	4	21.5	20.7	21.6	57	35	17	23	17°	12°	17°	M12	0.12	With	LN*U03...
HXN03R028MM12-05(2)	1	0.9	1	28	5	21.5	20.7	21.6	57	35	17	23	17°	12°	17°	M12	0.12	With	LN*U03...
HXN03R030MM16-04(2)	1	0.9	1	30	4	23.5	22.7	23.6	63	40	22	28.8	17°	12°	17°	M16	0.19	With	LN*U03...
HXN03R030MM16-05(2)	1	0.9	1	30	5	23.5	22.7	23.6	63	40	22	28.8	17°	12°	17°	M16	0.2	With	LN*U03...
HXN03R032MM16-05(2)	1	0.9	1	32	5	25.5	24.7	25.6	63	40	22	28.8	17°	12°	17°	M16	0.2	With	LN*U03...
HXN03R032MM16-06(1)	1	0.9	1	32	6	25.5	24.7	25.6	63	40	22	28.8	17°	12°	17°	M16	0.21	With	LN*U03...

*KAPR2 : with LNMU0303UER
*KAPR3 : with LNGU0303ZER
Clamping screws used for (1) and (2) above are different. See below for the part codes.

SPARE PARTS

Designation	Clamping screw	Lubricant (Optional)	Wrench
HXN03...	(1) CSPB-2.5 (2) CSPB-2.5L080	(M-1000)	IP-8D

*Recommended clamping torque (N·m):CSPB-2.5/CSPB-2.5L080 = 1.3

Tool diameter tolerance	
Tool diameter	0 / -0.45

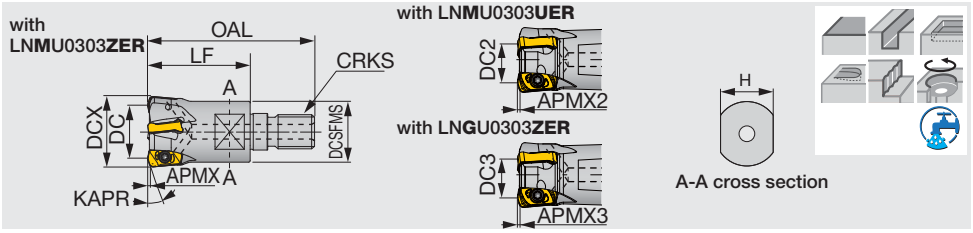
DOFEED

Insert size 03

HXN03-C

High feed endmill, modular type, with coolant directly to the tool tips (TungFlex)

GAMP= +6°,GAMF= +5° ~ +11°



Designation	APMX	APMX2	APMX3	DCX	CICT	DC	DC2	DC3	OAL	LF	H	DCSFMS	KAPR	KAPR2*	KAPR3*	CRKS	WT(kg)	Air hole	Insert
HXN03R016MM08-02-C(1)	1	0.9	1	16	2	9.6	8.8	9.8	42	25	10	12.8	15°	10°	15°	M8	0.03	With	LN*U03...
HXN03R020MM10-03-C(2)	1	0.9	1	20	3	13.5	12.7	13.6	49	30	15	17.8	17°	12°	17°	M10	0.06	With	LN*U03...
HXN03R020MM10-04-C(1)	1	0.9	1	20	4	13.5	12.7	13.6	49	30	15	17.8	17°	12°	17°	M10	0.06	With	LN*U03...
HXN03R025MM12-04-C(2)	1	0.9	1	25	4	18.5	17.7	18.6	57	35	17	20.8	17°	12°	17°	M12	0.1	With	LN*U03...
HXN03R025MM12-05-C(1)	1	0.9	1	25	5	18.5	17.7	18.6	57	35	17	20.8	17°	12°	17°	M12	0.1	With	LN*U03...
HXN03R032MM16-05-C(2)	1	0.9	1	32	5	25.5	24.7	25.6	63	40	22	28.8	17°	12°	17°	M16	0.2	With	LN*U03...
HXN03R032MM16-06-C(1)	1	0.9	1	32	6	25.5	24.7	25.6	63	40	22	28.8	17°	12°	17°	M16	0.2	With	LN*U03...
HXN03R040MM16-06-C(2)	1	0.9	1	40	6	33.6	32.8	33.7	63	40	22	28.8	17°	12°	17°	M16	0.27	With	LN*U03...

*KAPR2 : with LNMU0303UER
*KAPR3 : with LNGU0303ZER
Clamping screws used for (1) and (2) above are different. See below for the part codes.

SPARE PARTS

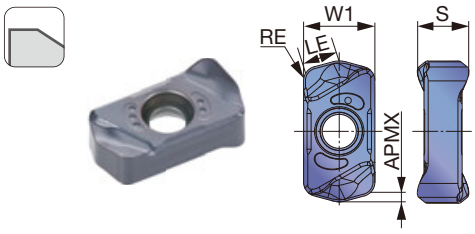
Designation	Clamping screw	Lubricant (Optional)	Wrench
HXN03...	(1) CSPB-2.5 (2) CSPB-2.5L080	(M-1000)	IP-8D

Tool diameter tolerance	
Tool diameter	0 / -0.45

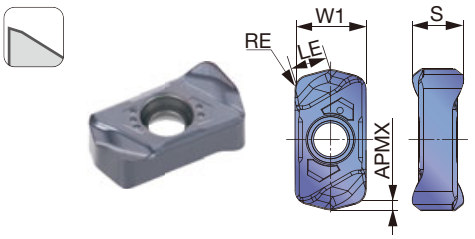
*Recommended clamping torque (N·m):CSPB-2.5/CSPB-2.5L080 = 1.3

INSERT

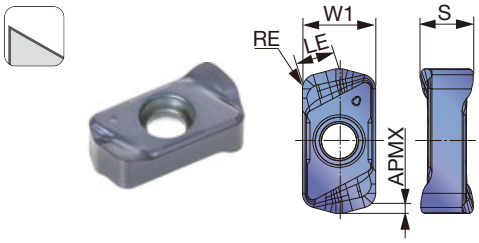
LNMU0303ZER-MJ (for general purpose)



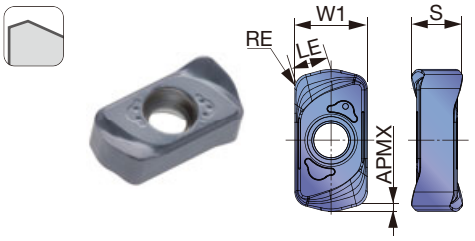
LNMU0303ZER-ML (for low cutting force)



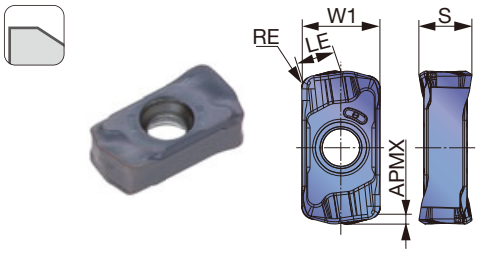
LNMU0303ZER-MS (for stainless steel)



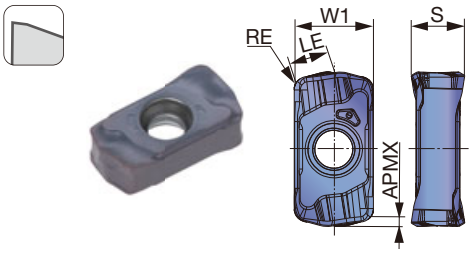
LNGU0303ZER-MH (Robust cutting edges)



LNMU0303UER-MJ (for general purpose, low approach angle)



LNMU0303UER-ML (for low cutting force, low approach angle)



		AH130	AH3225	AH725	AH120	AH8015	AH8005
P	Steel		★			☆	
M	Stainless	★	☆				
K	Cast iron		☆	☆	☆	★	
N	Non-ferrous						
S	Titanium alloy	★	☆			☆	
S	Heat-resistant alloy	☆		☆		★	
H	Hard materials			☆		★	☆

★ : First choice
☆ : Second choice

Designation	RE	APMX	Coated						LE	W1	S
			AH130	AH3225	AH725	AH120	AH8015	AH8005			
LNMU0303ZER-MJ	1.2	1	●	●	●	●	●		3.2	6	4.3
LNMU0303ZER-ML	1.2	1	●	●	●		●		3.2	6	4.3
LNMU0303ZER-MS	1.2	1	●	●					3.2	6	4.3
LNMU0303UER-MJ	1	0.9	●	●			●		3.1	6	4.1
LNMU0303UER-ML	1	0.9	●	●			●		3.1	6	4.1
LNGU0303ZER-MH	1.2	1					●	●	3.2	6	4.3

● : Line up

DOFEED

Insert size 03

STANDARD CUTTING CONDITIONS

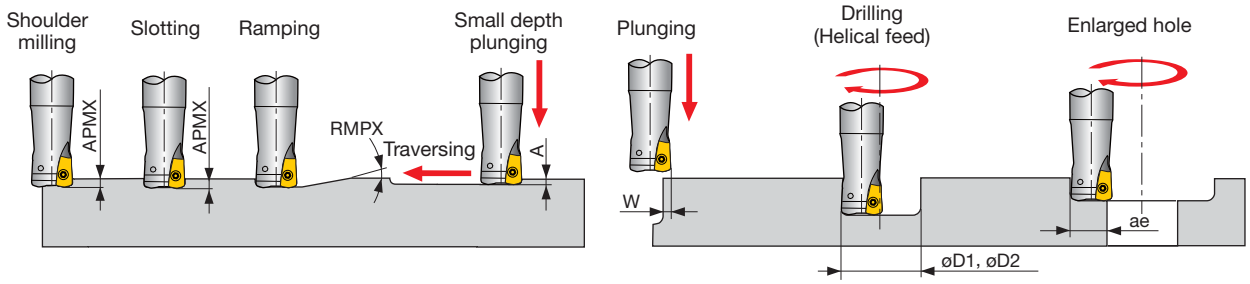
ZER type

ISO	Workpiece materials	Hardness	Priority	Grade	Chip-breaker	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool dia.: DCX (mm) ø16 - ø22	ø25 - ø50	Plunging	ø16, CICT = 2 *n*	ø16, CICT = 2 *Vf*	ø18, CICT = 2 *n*	ø18, CICT = 2 *Vf*	ø20 *n*	ø20 *Vf* CICT = 3	ø20 *Vf* CICT = 4
P	Carbon steels S45C, S55C, etc. C45, C55, etc.	- 300HB	First choice	AH3225	MJ	100 - 300	0.5 -1.2	0.5 - 1.5	0.1	3,980	6,370	3,540	5,660	3,180	7,630	10,180
			Low resistance	AH3225	ML						*Vc* = 200 m/min, *fz* = 0.8 mm/t					
	Alloy steels SCM440, SCr415, etc.	- 300HB	First choice	AH3225	MJ	100 - 250	0.5 -1.2	0.5 - 1.5	0.1	3,980	6,370	3,540	5,660	3,180	7,630	10,180
			for wear resistance	AH8015	MJ						*Vc* = 200 m/min, *fz* = 0.8 mm/t					
	Prehardened steels NAK80, PX5, etc.	30-40HRC	First choice	AH3225	MJ	100 - 200	0.5 - 1.0	0.5 - 1.0	0.1	2,980	4,170	2,650	3,710	2,390	5,020	6,690
											Vc = 150 m/min, *fz* = 0.7 mm/t					
		30-40HRC	for wear resistance	AH8015	MJ	100 - 200	0.5 - 1.0	0.5 - 1.0	0.1	2,980	4,170	2,650	3,710	2,390	5,020	6,690
											Vc = 150 m/min, *fz* = 0.7 mm/t					
M	Stainless steels SUS304, X5CrNi18-9, etc.	- 200HB	First choice	AH130	MS	80 - 200	0.3 - 0.8	0.3 - 0.8	0.1	2,390	2,390	2,120	2,120	1,910	2,860	3,820
			for impact resistance	AH130	MJ						*Vc* = 120 m/min, *fz* = 0.5 mm/t					
	Precipitation hardening stainless steels SUS630, X5CrNiCuNb16-4, etc.	28HRC - (H1150)	First choice	AH130	MS	80 - 150	0.2 - 0.5	0.2 - 0.5	0.1	2,390	1,430	2,120	1,270	1,910	1,720	2,290
			for wear resistance	AH130	MJ						*Vc* = 120 m/min, *fz* = 0.3 mm/t					
		40HRC - (H900)	First choice	AH130	MS	80 - 120	0.1 - 0.3	0.1 - 0.3	0.1	1,990	800	1,770	710	1,590	950	1,270
			for impact resistance	AH130	MJ						*Vc* = 100 m/min, *fz* = 0.2 mm/t					
K	Gray cast irons FC250, GG25, 250, etc.	150-250HB	First choice	AH8015	MJ	100 - 300	0.5 - 1.2	0.5 - 1.5	0.1	3,980	6,370	3,540	5,660	3,180	7,630	10,180
			for impact resistance	AH3225	MJ						*Vc* = 200 m/min, *fz* = 0.8 mm/t					
	Ductile cast irons FCD400, etc.	150-250HB	First choice	AH8015	MJ	80 - 200	0.5 - 1.2	0.5 - 1.5	0.1	2,980	4,770	2,650	4,240	2,390	5,740	7,650
			for impact resistance	AH3225	MJ						*Vc* = 150 m/min, *fz* = 0.8 mm/t					
S	Titanium alloy Ti-6Al-4V, etc.	- 40HRC	First choice	AH130	ML	30 - 60	0.3 - 0.7	0.3 - 0.7	0.08	800	640	710	570	640	770	1,020
			for impact resistance	AH130	MJ						*Vc* = 40 m/min, *fz* = 0.4 mm/t					
	Heat-resistant alloy Inconel, Hastelloy, etc.	- 40HRC	First choice	AH8015	ML	20 - 50	0.1 - 0.3	0.1 - 0.3	0.05	600	240	530	210	480	290	380
			for impact resistance	AH8015	MJ						*Vc* = 30 m/min, *fz* = 0.2 mm/t					
H	Hot mold steel SKD61, X40CrMoV5-1, etc.	40-55HRC	First choice	AH8015	MH	80 - 150	0.1 - 0.5	0.1 - 0.5	0.05	2,390	1,430	2,120	1,270	1,910	1,720	2,290
			Low resistance	AH8015	MJ		0.1 - 0.3	0.1 - 0.3			*Vc* = 120 m/min, *fz* = 0.3 mm/t					
	Hot mold steel of D.T.C materials DAC**, DH**, DIEVER, etc	40-55HRC	First choice	AH8015	MJ	50-100	0.1 - 0.3	0.1 - 0.3	0.05	1,590	640	1,420	570	1,270	760	1,020
			for impact resistance	AH8015	MH		0.1 - 0.5	0.1 - 0.5			*Vc* = 80 m/min, *fz* = 0.2 mm/t					
	Cold mold steels SKD11, X153CrMoV12, etc.	55-60HRC	First choice	AH8005	MH	50 - 70	0.05 - 0.2	0.05 - 0.2	0.03	1,190	290	1,060	250	950	340	450
			for impact resistance	AH8015	MH						*Vc* = 60 m/min, *fz* = 0.12 mm/t					

- When chips stay in the cutting zone during slotting or pocketing, use air blast to remove chips from the work area

- 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

APPLICATION RANGE



Designation	DCX	Max. depth of cut APMX	Max. ramping angle RMPX MJ/ML/MS	RMPX MH	Max. plunging depth A	Max. cutting width in plunging W MJ/ML/MS	W MH	Min. machinable hole dia. øD1 MJ/ML/MS	øD1 MH	Max. machinable hole dia. øD2	Max. cutting width in enlarged hole ae
E/HXN03R016M...	16	1	2.1	1.7	0.3	3.5	3	22	23	30	12.5
E/HXN03R018M...	18	1	1.7	1.6	0.3	3.5	3	26	27	34	14.5
E/HXN03R020M...	20	1	1.4	1.3	0.3	3.5	3	30	31	38	16.5
E/HXN03R022M...	22	1	1.2	1.1	0.3	3.5	3	34	35	42	18.5
E/HXN03R025M...	25	1	1.0	0.9	0.3	3.5	3	40	41	48	21.5
E/HXN03R028M...	28	1	0.8	0.8	0.3	3.5	3	46	46	54	24.5
E/HXN03R030M...	30	1	0.7	0.7	0.3	3.5	3	50	50	58	26.5
E/HXN03R032M...	32	1	0.7	0.7	0.3	3.5	3	54	54	62	28.5
EXN03R035M...	35	1	0.6	0.6	0.3	3.5	3	60	60	68	31.5
E/H/TXN03R040M…	40	1	0.5	0.5	0.3	3.5	3	70	70	78	36.5
TXN03R050M...	50	1	0.4	0.4	0.3	3.5	3	90	90	98	46.5

Note: For DCX above ø33 mm, slot milling, ramping or contouring is not recommended as chips may be re-cut

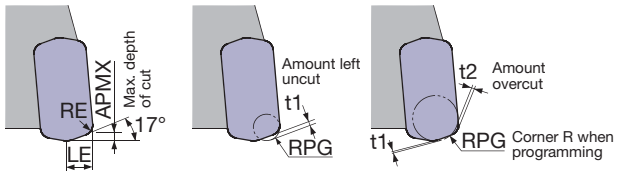
Tool dia.: DCX (mm), Number of revolutions: *n* (min^{-1}), Feed speed: *Vf* (mm/min), Max. depth of cut: *ap* = 1 mm, Number of teeth: CICT

ø22			ø25			ø28			ø30			ø32			ø35			ø40			ø50		
n	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*	
	CICT=3	CICT=4		CICT=4	CICT=5		CICT=4	CICT=5		CICT=4	CICT=5		CICT=5	CICT=6		CICT=5	CICT=6		CICT=5	CICT=6		CICT=5	CICT=8
2,890	6,940	9,250	2,550	8,160	10,180	2,270	7,280	9,100	2,120	8,480	10,600	1,990	9,950	11,940	1,820	9,100	10,920	1,590	7,950	9,540	1,270	6,350	10,160
Vc = 200 m/min, *fz* = 1 mm/t																							
2,890	6,940	9,250	2,550	8,160	10,180	2,270	7,280	9,100	2,120	8,480	10,600	1,990	9,950	11,940	1,820	9,100	10,920	1,590	7,950	9,540	1,270	6,350	10,160
Vc = 200 m/min, *fz* = 1 mm/t																							
2,170	4,560	6,080	1,910	5,350	6,690	1,710	4,790	5,990	1,590	4,450	5,570	1,490	5,220	6,260	1,360	4,760	5,710	1,190	4,170	5,000	950	3,330	5,320
Vc = 150 m/min, *fz* = 0.7 mm/t																							
2,170	4,560	6,080	1,910	5,350	6,690	1,710	4,790	5,990	1,590	4,450	5,570	1,490	5,220	6,260	1,360	4,760	5,710	1,190	4,170	5,000	950	3,330	5,320
Vc = 150 m/min, *fz* = 0.7 mm/t																							
3,180	4,770	6,360	1,530	3,060	3,820	1,360	2,720	3,400	1,270	2,540	3,180	1,190	2,980	3,570	1,090	2,720	3,270	960	2,400	2,880	760	1,900	2,280
Vc = 120 m/min, *fz* = 0.5 mm/t																							
1,740	1,570	2,090	1,530	1,840	2,300	1,370	1,640	2,060	1,270	1,520	1,910	1,190	1,790	2,140	1,090	1,640	1,960	960	1,440	1,730	760	1,140	1,820
Vc = 120 m/min, *fz* = 0.3 mm/t																							
1,450	870	1,160	1,270	1,020	1,270	1,140	910	1,140	1,060	850	1,060	1,000	1,000	1,200	910	910	1,090	800	800	960	640	640	1,020
Vc = 100 m/min, *fz* = 0.2 mm/t																							
2,890	6,940	9,250	2,550	8,160	10,180	2,270	7,280	9,100	2,120	8,480	10,600	1,990	9,950	11,940	1,820	9,100	10,920	1,590	7,950	9,540	1,270	6,350	10,160
Vc = 200 m/min, *fz* = 1 mm/t																							
2,170	5,210	6,940	1,910	6,110	7,640	1,710	5,460	6,820	1,590	6,360	7,950	1,490	7,450	8,940	1,360	6,800	8,160	1,190	5,950	7,140	950	4,750	5,700
Vc = 150 m/min, *fz* = 1 mm/t																							
580	700	930	510	820	1,020	450	730	910	420	840	1,050	400	1,000	1,200	360	900	1,080	320	800	960	250	630	1,000
Vc = 40 m/min, *fz* = 0.5 mm/t																							
430	260	340	380	230	290	340	200	260	320	260	320	300	300	360	270	270	320	240	240	290	190	190	300
Vc = 30 m/min, *fz* = 0.2 mm/t																							
1,740	1,570	2,090	1,530	1,840	2,300	1,360	1,630	2,040	1,270	1,520	1,910	1,190	1,790	2,140	1,090	1,640	1,960	950	1,430	1,710	760	1,140	1,820
Vc = 120 m/min, *fz* = 0.3 mm/t																							
1,160	700	930	1,020	820	1,020	910	730	910	850	680	850	800	800	960	730	730	880	640	640	770	510	510	820
Vc = 80 m/min, *fz* = 0.2 mm/t																							
870	310	420	760	360	460	680	330	410	640	310	380	600	360	430	550	330	400	480	270	350	380	230	360
Vc = 60 m/min, *fz* = 0.12 mm/t																							

- The above table shows the conditions for standard shank type cutters. When using long shank type cutters, the number of teeth may be different.
- Cutting conditions are generally limited by the rigidity and power of the machine and the rigidity of the workpiece. 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

TOOL GEOMETRY ON PROGRAMMING

When programming for CAM, the tool should be considered as a radius cutter. Usually, the corner radius should be set as R = 1.5 mm.
If a larger radius is used, overcutting will occur. The following table shows the amount left uncut (t1) and overcut (t2).



LNMU0303ZER...

Max. depth of cut APMX (mm)	Corner radius RE (mm)	LE (mm)	Corner R when programming RPG	Amount left uncut t1 (mm)	Amount overcut t2 (mm)
1	1.2	3	1	0.6	-
1	1.2	3	1.5	0.5	-
1	1.2	3	2	0.25	0.08
1	1.2	3	2.5	0.14	0.26

LNGU0303ZER...

Max. depth of cut APMX (mm)	Corner radius RE (mm)	LE (mm)	Corner R when programming RPG	Amount left uncut t1 (mm)	Amount overcut t2 (mm)
1	1.2	3	1	0.45	-
1	1.2	3	1.5	0.35	-
1	1.2	3	2	0.2	0.1
1	1.2	3	2.5	0.08	0.29

Note: Each value in table is calculated theoretically at the maximum condition

DOFEED

Insert size 03

STANDARD CUTTING CONDITIONS

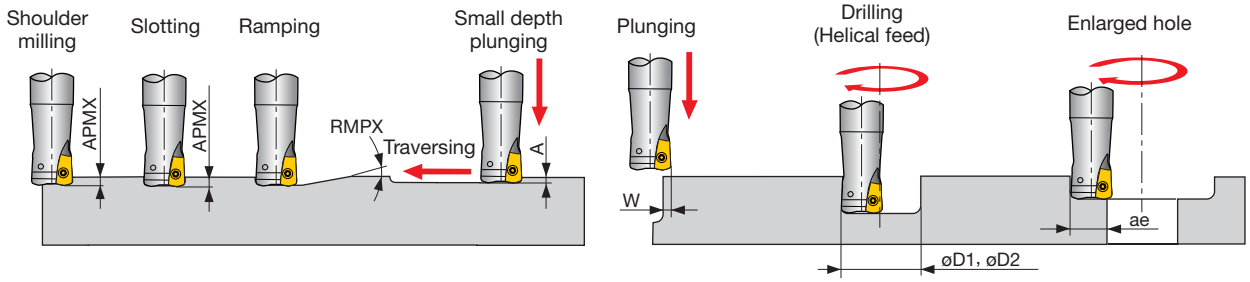
UER type

ISO	Workpiece material	Hardness	Priority	Grade	Chip-breaker	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool dia.: DCX (mm) ø16 - ø22	ø25 - ø50	Plunging	ø16, CICT = 2 *n*	ø16, CICT = 2 *Vf*	ø18, CICT = 2 *n*	ø18, CICT = 2 *Vf*	ø20 *n*	ø20 *Vf* CICT = 3	ø20 *Vf* CICT = 4
P	Carbon steels S45C, S55C, etc. C45, C55, etc.	- 300HB	First choice	AH3225	MJ	100 - 300	0.5 - 1.2	0.5 - 1.5	0.1	3,980	7,960	3,540	7,080	3,180	9,540	12,720
			Low resistance	AH3225	ML						*Vc* = 200 m/min, *fz* = 1 mm/t					
			for wear resistance	AH8015	MJ											
	Alloy steels SCM440, SCr415, etc.	- 300HB	First choice	AH3225	MJ	100 - 250	0.5 - 1.2	0.5 - 1.5	0.1	3,980	7,960	3,540	7,080	3,180	9,540	12,720
			Low resistance	AH3225	ML						*Vc* = 200 m/min, *fz* = 1 mm/t					
			for wear resistance	AH8015	MJ											
	Prehardened steels NAK80, PX5, etc.	30 - 40HRC	First choice	AH3225	MJ	100 - 200	0.5 - 1	0.5 - 1	0.1	2,980	4,770	2,650	4,240	2,390	5,740	7,650
			Low resistance	AH3225	ML						*Vc* = 150 m/min, *fz* = 0.8 mm/t					
			for wear resistance	AH8015	MJ											
M	Stainless steels SUS304, X5CrNi18-9, etc.	- 200HB	First choice	AH130	ML	80 - 200	0.3 - 1	0.3 - 1	0.1	2,390	2,870	2,120	2,550	1,910	3,440	4,590
			for impact resistance	AH130	MJ						*Vc* = 120 m/min, *fz* = 0.6 mm/t					
	Precipitation hardening stainless steels SUS630, X5CrNiCuNb16-4, etc.	28HRC -	First choice	AH130	ML	80 - 150	0.3 - 0.8	0.3 - 0.8	0.1	2,390	2,390	2,120	2,120	1,910	2,870	3,820
			for impact resistance	AH130	MJ						*Vc* = 120 m/min, *fz* = 0.5 mm/t					
		40HRC -	First choice	AH130	ML	80 - 120	0.3 - 0.5	0.3 - 0.5	0.1	1,990	1,600	1,770	1,420	1,590	1,910	2,550
			for impact resistance	AH130	MJ						*Vc* = 100 m/min, *fz* = 0.4 mm/t					
K	Gray cast irons FC250, GG25, 250, etc.	150 - 250HB	First choice	AH8015	MJ	100 - 300	0.5 - 1.2	0.5 - 1.5	0.1	3,980	7,960	3,540	7,080	3,180	9,540	12,720
			for impact resistance	AH3225	MJ						*Vc* = 200 m/min, *fz* = 1 mm/t					
	Ductile cast irons FCD400, etc.	150 - 250HB	First choice	AH8015	MJ	80 - 200	0.5 - 1.2	0.5 - 1.5	0.1	2,980	5,960	2,650	5,300	2,390	7,170	9,560
			for impact resistance	AH3225	MJ						*Vc* = 150 m/min, *fz* = 1 mm/t					
S	Titanium alloy Ti-6Al-4V, etc.	- 40HRC	First choice	AH130	ML	30 - 60	0.3 - 0.8	0.3 - 0.8	0.08	800	960	710	860	640	1,160	1,540
			for impact resistance	AH130	MJ						*Vc* = 40 m/min, *fz* = 0.6 mm/t					
	Heat-resistant alloy Inconel, Hastelloy, etc.	- 40HRC	First choice	AH8015	ML	20 - 50	0.2 - 0.5	0.2 - 0.5	0.05	600	360	530	320	480	440	580
			for impact resistance	AH8015	MJ						*Vc* = 30 m/min, *fz* = 0.3 mm/t					
H	Hot mold steel SKD61, X40CrMoV5-1, etc.	40 - 50HRC	First choice	AH8015	MJ	80 - 150	0.1 - 0.5	0.1 - 0.5	0.05	2,390	1,440	2,120	1,280	1,910	1,720	2,300
			for impact resistance	AH3225	MJ						*Vc* = 120 m/min, *fz* = 0.3 mm/t					
	Hot mold steel of D.T.C materials DAC**, DH**, DIEVER, etc	40 - 50HRC	First choice	AH8015	MJ	50 - 100	0.1 - 0.4	0.1 - 0.4	0.05	1,590	960	1,410	850	1,270	1,150	1,530
			for impact resistance	AH3225	MJ						*Vc* = 80 m/min, *fz* = 0.3 mm/t					
	Cold mold steels SKD11, X153CrMoV12, etc.	50 - 60HRC	First choice	AH8005	MJ	50 - 70	0.1 - 0.3	0.1 - 0.3	0.03	1,190	480	1,060	430	950	570	760
											Vc = 60 m/min, *fz* = 0.2 mm/t					

- When chips stay in the cutting zone during slotting or pocketing, use air blast to remove chips from the work area

- 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

APPLICATION RANGE



Designation	DCX	Max. depth of cut APMX	Max. ramping angle RMPX	Max. plunging depth A	Max. cutting width in plunging W	Min. machinable hole dia. øD1	Max. machinable hole dia. øD2	Max. cutting width in enlarged hole ae
E/HXN03R016M...	16	0.9	Not possible	Not possible	3.8	Not possible	Not possible	12.2
E/HXN03R018M...	18	0.9	1.7°	0.27	3.8	26	34	14.2
E/HXN03R020M...	20	0.9	1.4°	0.27	3.8	30	38	16.2
E/HXN03R022M...	22	0.9	1.2°	0.27	3.8	34	42	18.2
E/HXN03R025M...	25	0.9	1°	0.27	3.8	40	48	21.2
E/HXN03R028M...	28	0.9	0.8°	0.27	3.8	46	54	24.2
E/HXN03R030M...	30	0.9	0.7°	0.27	3.8	50	58	26.2
E/HXN03R032M...	32	0.9	0.7°	0.27	3.8	54	62	28.2
EXN03R035M...	35	0.9	0.6°	0.27	3.8	60	68	31.2
E/H/TXN03R040M...	40	0.9	0.5°	0.27	3.8	70	78	36.2
TXN03R050M...	50	0.9	0.4°	0.27	3.8	90	98	46.2

Note: For DCX above ø33 mm, slot milling, ramping or contouring is not recommended as chips may be re-cut

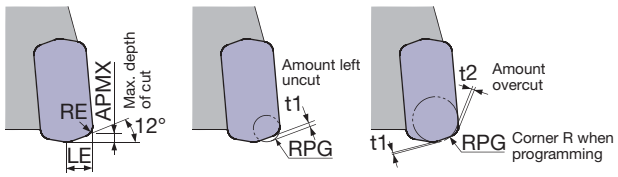
Tool dia.: DCX (mm), Number of revolutions: *n* (min^{-1}), Feed speed: *Vf* (mm/min), Max. depth of cut: *ap* = 0.5 mm, Number of teeth: CICT

ø22			ø25			ø28			ø30			ø32			ø35			ø40			ø50		
n	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*	
	CICT=3	CICT=4		CICT=4	CICT=5		CICT=4	CICT=5		CICT=4	CICT=5		CICT=5	CICT=6		CICT=5	CICT=6		CICT=5	CICT=6		CICT=5	CICT=8
2,890	8,670	11,560	2,550	10,200	12,750	2,270	9,080	11,350	2,120	8,480	10,600	1,990	9,950	11,940	1,820	9,100	10,920	1,590	7,950	9,540	1,270	6,350	10,160
Vc = 200 m/min, *fz* = 1 mm/t																							
2,890	8,670	11,560	2,550	10,200	12,750	2,270	9,080	11,350	2,120	8,480	10,600	1,990	9,950	11,940	1,820	9,100	10,920	1,590	7,950	9,540	1,270	6,350	10,160
Vc = 200 m/min, *fz* = 1 mm/t																							
2,170	5,210	6,950	1,910	6,120	7,640	1,710	5,480	6,840	1,590	5,090	6,360	1,490	5,960	7,160	1,360	5,440	6,530	1,190	4,760	5,720	950	3,800	6,080
Vc = 150 m/min, *fz* = 0.8 mm/t																							
1,740	3,140	4,180	1,530	3,680	4,590	1,360	3,270	4,080	1,270	3,050	3,810	1,190	3,570	4,290	1,090	3,270	3,930	950	2,850	3,420	760	2,280	3,650
Vc = 120 m/min, *fz* = 0.6 mm/t																							
1,740	2,610	3,480	1,530	3,060	3,830	1,360	2,720	3,400	1,270	2,540	3,180	1,190	2,980	3,570	1,090	2,730	3,270	950	2,380	2,850	760	1,900	3,040
Vc = 120 m/min, *fz* = 0.5 mm/t																							
1,450	1,740	2,320	1,270	2,040	2,540	1,140	1,830	2,280	1,060	1,700	2,120	990	1,980	2,380	910	1,820	2,190	800	1,600	1,920	640	1,280	2,050
Vc = 100 m/min, *fz* = 0.4 mm/t																							
2,890	8,670	11,560	2,550	10,200	12,750	2,270	9,080	11,350	2,120	8,480	10,600	1,990	9,950	11,940	1,820	9,100	10,920	1,590	7,950	9,540	1,270	6,350	10,160
Vc = 200 m/min, *fz* = 1 mm/t																							
2,170	6,510	8,680	1,910	7,640	9,550	1,710	6,840	8,550	1,590	6,360	7,950	1,490	7,450	8,940	1,360	6,800	8,160	1,190	5,950	7,140	950	4,750	7,600
Vc = 150 m/min, *fz* = 1 mm/t																							
580	1,050	1,400	510	1,230	1,530	450	1,080	1,350	420	1,010	1,260	400	1,200	1,440	360	1,080	1,300	320	960	1,160	250	750	1,200
Vc = 40 m/min, *fz* = 0.6 mm/t																							
430	390	520	380	460	570	340	410	510	320	390	480	300	450	540	270	410	490	240	360	440	190	290	460
Vc = 30 m/min, *fz* = 0.3 mm/t																							
1,740	1,570	2,090	1,530	1,840	2,300	1,360	1,640	2,040	1,270	1,530	1,910	1,190	1,790	2,150	1,090	1,640	1,970	950	1,430	1,710	760	1,140	1,830
Vc = 120 m/min, *fz* = 0.3 mm/t																							
1,160	1,050	1,400	1,020	1,230	1,530	910	1,100	1,370	850	1,020	1,280	800	1,200	1,440	730	1,100	1,320	640	960	1,160	510	770	1,230
Vc = 80 m/min, *fz* = 0.3 mm/t																							
870	530	700	760	610	760	680	550	680	640	520	640	600	600	720	550	550	660	480	480	580	380	380	610
Vc = 60 m/min, *fz* = 0.2 mm/t																							

- The above table shows the conditions for standard shank type cutters. When using long shank type cutters, the number of teeth may be different.
- Cutting conditions are generally limited by the rigidity and power of the machine and the rigidity of the workpiece. 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

TOOL GEOMETRY ON PROGRAMMING

When programming for CAM, the tool should be considered as a radius cutter. Usually, the corner radius should be set as R = 1.5 mm. If a larger radius is used, overcutting will occur. The following table shows the amount left uncut (t1) and overcut (t2).



LNMU0303UER...

Max. depth of cut APMX (mm)	Corner radius RE (mm)	LE (mm)	Corner R when programming RPG	Amount left uncut t1 (mm)	Amount overcut t2 (mm)
0.9	1	3.5	1	0.48	-
0.9	1	3.5	1.5	0.39	-
0.9	1	3.5	2	0.3	0.12
0.9	1	3.5	2.5	0.21	0.31

Note: Each value in table is calculated theoretically at the maximum condition.
*Recommended

DOFEED

Insert size 06

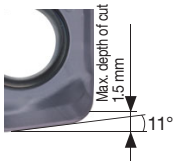
For machining of medium- and large-sized components

Two different types of inserts fit the same cutter body

New

LNMU06X5UER insert
Low approach angle

for long tool life and reduced vibration

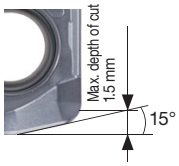


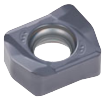
MJ
General machining

ML
Low cutting force

LNMU06X5ZER insert
General-purpose approach angle

for low cutting forces

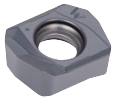




MJ
General machining

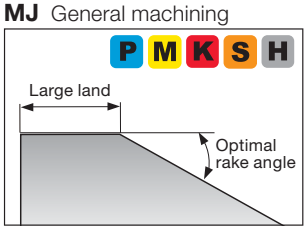
ML
Low cutting force

MH
Robust cutting edges

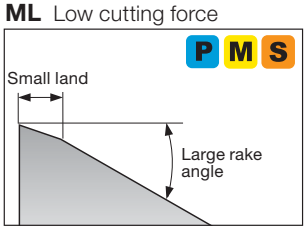


W
Wiper

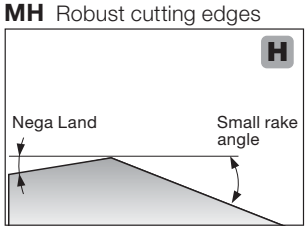
MJ General machining



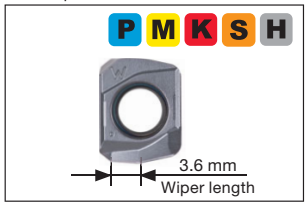
ML Low cutting force



MH Robust cutting edges



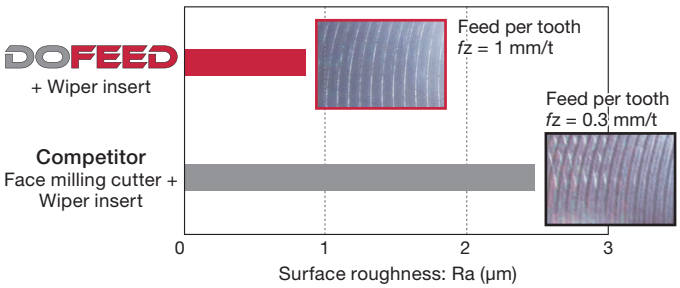
W Wiper



Effect of the wiper insert

P S55C / C55

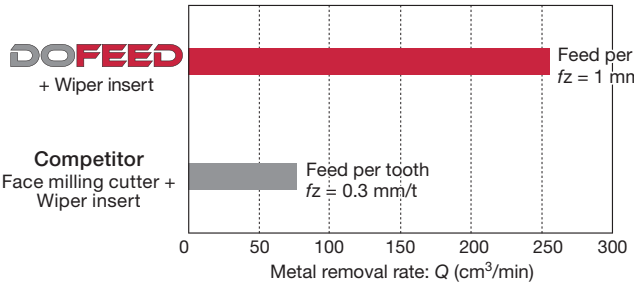
Comparison of surface finish



Cutter	: TXN06R080M31.7-05
Insert	: LNMU06X5ZER-ML AH725 x 3 inserts
	: LNGU06X5ZER-W AH725 x 2 inserts
Cutting speed	: *Vc* = 150 m/min
Depth of cut	: *ap* = 1.5 mm
Width of cut	: *ae* = 60 mm
Coolant	: Dry
Machine	: Vertical M/C, BT50

Comparison of metal removal rate

Tripled metal removal rate!

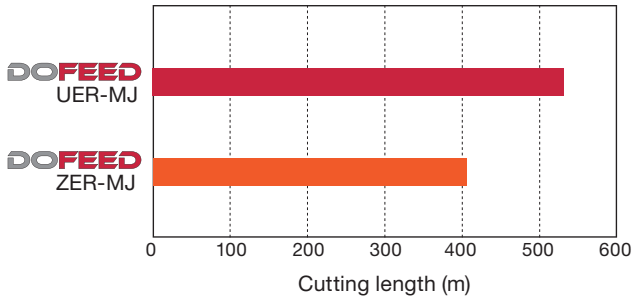


Significantly improves machining efficiency while maintaining surface roughness

CUTTING PERFORMANCE

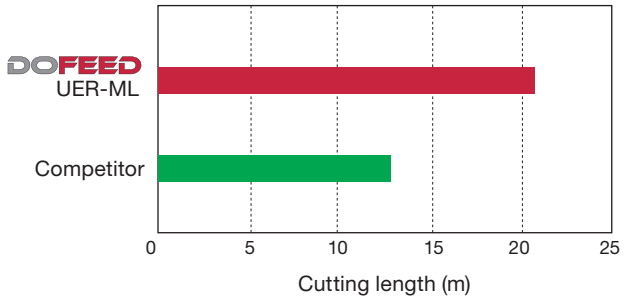
Insert size 06

P S55C / C55 (190HB)



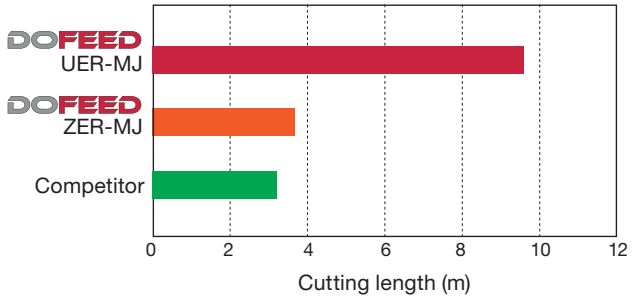
Cutter : TXN06R050M22.0E05 (ø50 mm, CICT = 5)
Insert : LNMU06X5UER-MJ AH3225
LNMU06X5ZER-MJ AH3225
Cutting speed : *Vc* = 200 m/min
Feed per tooth : *fz* = 1.25 mm/t
Depth of cut : *ap* = 1 mm
Width of cut : *ae* = 20 mm
Coolant : Dry
Machine : Vertical M/C, BT50

M SUS304 / X5CrNi18-9 (150HB)



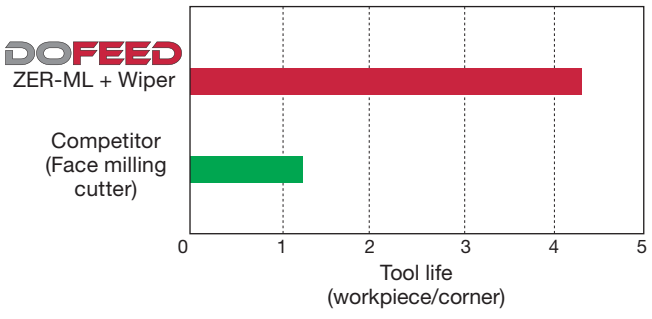
Cutter : TXN06R050M22.0E05 (ø50 mm, CICT = 5)
Insert : LNMU06X5UER-ML AH130
Cutting speed : *Vc* = 130 m/min
Feed per tooth : *fz* = 0.6 mm/t
Depth of cut : *ap* = 0.6 mm
Width of cut : *ae* = 20 mm
Coolant : Dry
Machine : Vertical M/C, BT50

S Inconel718 (42HRC)



Cutter : TXN06R050M22.0E05 (ø50 mm, CICT = 5)
Insert : LNMU06X5UER-MJ AH8015
LNMU06X5ZER-MJ AH8015
Cutting speed : *Vc* = 40 m/min
Feed per tooth : *fz* = 0.3 mm/t
Depth of cut : *ap* = 0.8 mm
Width of cut : *ae* = 20 mm
Coolant : Wet
Machine : Vertical M/C, BT50

S Titanium alloy (43HRC)



Cutter : TXN06R063M22.0E06 (ø63 mm, CICT = 6)
(Competitor: Face milling cutter)
Insert : LNMU06X5ZER-ML AH130 + LNGU06X5ZER-W AH725
(Competitor: Positive, square insert)
Grade : AH130 (ML), AH725 (W), (Competitor: PVD, S30)
Cutting speed : *Vc* = **38** m/min (Competitor: 25 m/min)
Feed per tooth : *fz* = **0.64** mm/t (Competitor: 0.15 mm/t)
Feed speed : *Vf* = **735** m/min (Competitor: 115 m/min)
Depth of cut : *ap* = 1.25 mm (Competitor: 2.5 mm)
Width of cut : *ae* = 45 mm
Coolant : Wet (External coolant)

DOFEED

Insert size 06

TXN06

High feed mill, for 4-corner double sided inserts

GAMP = +10°, GAMF = +2° ~ +6°

With LN*U06X5ZER-MJ/ML/W

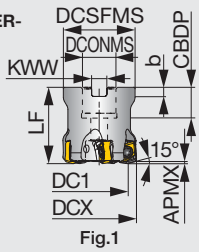
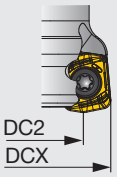
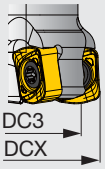


Fig.1

With LNMU06X5UER-MJ/ML



With LNGU06X5ZER-MH



Designation	APMX	DCX	CICT	DC1	DC2	DC3	DCSFMS	LF	DCONMS	CBDP	KWW	b	WT (kg)	Air hole	Insert	Fig.
TXN06R050M22.0E04	1.5	50	4	37.6	35.8	36.9	47	50	22	20	10.4	6.3	0.4	with	LN*U06...	1
TXN06R050M22.0E05	1.5	50	5	37.6	35.8	36.9	47	50	22	20	10.4	6.3	0.4	with	LN*U06...	1
TXN06R050M22.2-04	1.5	50	4	37.6	35.8	36.9	47	50	22.225	20	8	5	0.4	with	LN*U06...	1
TXN06R050M22.2-05	1.5	50	5	37.6	35.8	36.9	47	50	22.225	20	8	5	0.4	with	LN*U06...	1
TXN06R052M22.0E04	1.5	52	4	39.6	37.8	38.9	49	50	22	20	10.4	6.3	0.5	with	LN*U06...	1
TXN06R052M22.0E05	1.5	52	5	39.6	37.8	38.9	49	50	22	20	10.4	6.3	0.5	with	LN*U06...	1
TXN06R063M22.0E04	1.5	63	4	50.6	48.8	49.8	59	50	22	20	10.4	6.3	0.8	with	LN*U06...	1
TXN06R063M22.0E06	1.5	63	6	50.6	48.8	49.8	59	50	22	20	10.4	6.3	0.8	with	LN*U06...	1
TXN06R063M22.2-04	1.5	63	4	50.6	48.8	49.8	59	50	22.225	20	8	5	0.8	with	LN*U06...	1
TXN06R063M22.2-06	1.5	63	6	50.6	48.8	49.8	59	50	22.225	20	8	5	0.8	with	LN*U06...	1
TXN06R066M27.0E04	1.5	66	4	53.6	51.8	52.8	63	50	27	22	12.4	7	0.8	with	LN*U06...	1
TXN06R066M27.0E06	1.5	66	6	53.6	51.8	52.8	63	50	27	22	12.4	7	0.8	with	LN*U06...	1
TXN06R080M27.0E05	1.5	80	5	67.6	65.8	66.8	76	63	27	22	12.4	7	1.6	with	LN*U06...	1
TXN06R080M27.0EE05	1.5	80	5	67.6	65.8	66.8	60	63	27	22	12.4	7	1.2	with	LN*U06...	1
TXN06R080M27.0E08	1.5	80	8	67.6	65.8	66.8	76	63	27	22	12.4	7	1.6	with	LN*U06...	1
TXN06R080M27.0EE08	1.5	80	8	67.6	65.8	66.8	60	63	27	22	12.4	7	1.2	with	LN*U06...	1
TXN06R080M31.7-05	1.5	80	5	67.6	65.8	66.8	76	63	31.75	32	12.7	8	1.6	with	LN*U06...	1
TXN06R080M31.7-08	1.5	80	8	67.6	65.8	66.8	76	63	31.75	32	12.7	8	1.6	with	LN*U06...	1
TXN06R100M31.7-06	1.5	100	6	87.6	85.8	86.8	96	63	31.75	32	12.7	8	2.2	with	LN*U06...	1
TXN06R100M32.0E06	1.5	100	6	87.6	85.8	86.8	96	63	32	25	14.4	8	2.2	with	LN*U06...	1
TXN06R125M38.1-08	1.5	125	8	112.6	110.8	111.8	100	63	38.1	43	15.9	10	3	with	LN*U06...	1
TXN06R125M40.0E08	1.5	125	8	112.6	110.8	111.8	100	63	40	37	16.4	9	3	with	LN*U06...	1
TXN06R160M40.0E10	1.5	160	10	147.6	145.8	146.8	100	63	40	37	16.4	9	5	with	LN*U06...	1
TXN06R160M50.8-10	1.5	160	10	147.6	145.8	146.8	100	63	50.8	46	19	11	4.6	with	LN*U06...	1
TXN06R200M47.6-12	1.5	200	12	187.6	185.8	186.8	130	63	47.625	38	25.4	14	7.7	without	LN*U06...	2
TXN06R200M60.0E12	1.5	200	12	187.6	185.8	186.8	130	63	60	38	25.7	14	7.2	without	LN*U06...	3

SPARE PARTS

Designation	Clamping screw	Grip	Lubricant (Optional)	Shell locking bolt 1	Shell locking bolt 2	Torx bit
TXN06R050M22.0...	CSPB-5	H-TB2W	(M-1000)	-	FSHM10-40H	BLD IP20/S7
TXN06R050M22.2-04	CSPB-5	H-TB2W	(M-1000)	-	CM10-30H	BLD IP20/S7
TXN06R050M22.2-05, TXN06R052M22.0...	CSPB-5	H-TB2W	(M-1000)	-	FSHM10-40H	BLD IP20/S7
TXN06R063M...	CSPB-5	H-TB2W	(M-1000)	-	CM10X30H	BLD IP20/S7
TXN06R066,080M27.0...	CSPB-5	H-TB2W	(M-1000)	-	CM12X30H	BLD IP20/S7
TXN06R080,100M31.7...	CSPB-5	H-TB2W	(M-1000)	-	CM16X40H	BLD IP20/S7
TXN06R125M...	CSPB-5	H-TB2W	(M-1000)	TMBA-M20H	-	BLD IP20/S7
TXN06R160M40.0...	CSPB-5	H-TB2W	(M-1000)	TMBA-M20H	-	BLD IP20/M7
TXN06R160M50.8...	CSPB-5	H-TB2W	(M-1000)	TMBA-M24H	-	BLD IP20/M7
TXN06R200M...	CSPB-5	H-TB2W	(M-1000)	-	-	BLD IP20/M7

TXN06R200M47.6...

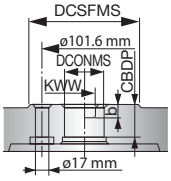


Fig.2

TXN06R200M60.0...

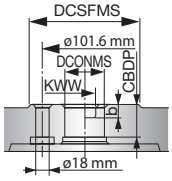


Fig.3

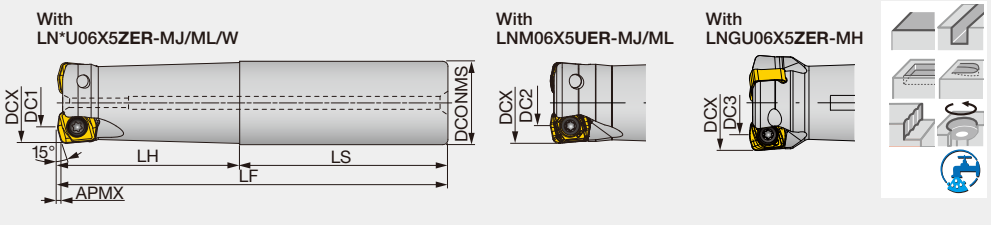
*Recommended clamping torque (N·m) : CSPB-5=5

Tool diameter tolerance	
Tool diameter	0 / -0.55

EXN06

High feed endmill, shank type, for 4-corner double sided inserts

GAMP = +10°, GAMF = -2° ~ +6°



Designation	APMX	DCX	CICT	DC1	DC2	DC3	DCONMS	LF	LH	LS	WT (kg)	Air hole	Insert
EXN06R032M32.0-02	1.5	32	2	19.7	17.8	19.1	32	150	70	80	0.8	with	LN*U06...
EXN06R032M32.0-02L	1.5	32	2	19.7	17.8	19.1	32	200	120	80	1.1	with	LN*U06...
EXN06R035M32.0-02	1.5	35	2	22.7	20.8	22	32	150	45	105	0.9	with	LN*U06...
EXN06R035M32.0-02L	1.5	35	2	22.7	20.8	22	32	200	45	155	1.2	with	LN*U06...
EXN06R040M32.0-03	1.5	40	3	27.7	25.8	27	32	150	45	105	0.9	with	LN*U06...
EXN06R040M32.0-03L	1.5	40	3	27.7	25.8	27	32	220	45	175	1.3	with	LN*U06...

SPARE PARTS

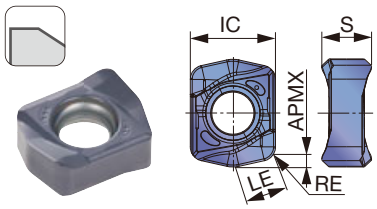
Designation	Clamping screw	Lubricant (Optional)	Wrench
EXN06	CSPB-5	(M-1000)	IP-20D

Tool diameter tolerance	
Tool diameter	0 / -0.55

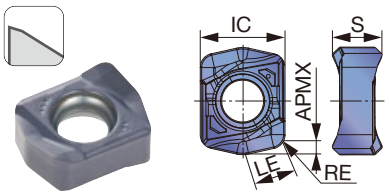
*Recommended clamping torque (N·m): CSPB-5=5

INSERT

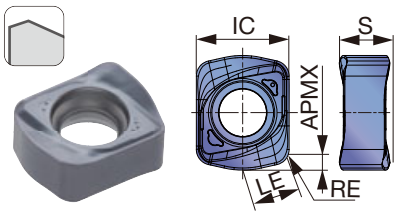
LNMU06X5ZER-MJ
(for general purpose)



LNMU06X5ZER-ML
(for low cutting force)

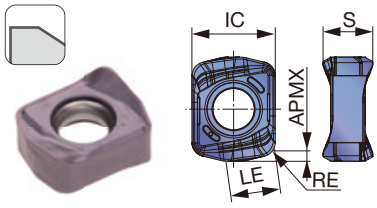


LNGU06X5ZER-MH
(Robust cutting edges)



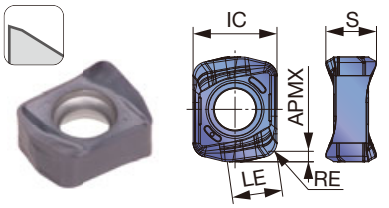
New

LNMU06X5UER-MJ
(for general purpose, low approach angle)

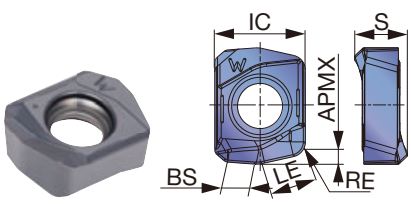


New

LNMU06X5UER-ML
(for low cutting force, low approach angle)



LNGU06X5ZER-W
(Wiper, 2 cutting edge)



		AH130	AH3225	AH725	AH120	AH8015	AH8005
P	Steel		★			☆	
M	Stainless	★	☆				
K	Cast iron		☆	☆	☆	★	
N	Non-ferrous						
S	Titanium alloy	★	☆			☆	
S	Heat-resistant alloy	☆		☆		★	
H	Hard materials			☆		★	☆

★ : First choice
☆ : Second choice

Designation	RE	APMX	Coated						LE	IC	S	BS
			AH130	AH3225	AH725	AH120	AH8015	AH8005				
LNMU06X5ZER-MJ	2	1.5	●	●	●	●	●		6	12	7	-
LNMU06X5ZER-ML	2	1.5	●	●	●	●	●		6	12	7	-
LNMU06X5UER-MJ	2	1.5	●	●			●		7.17	12	7	-
LNMU06X5UER-ML	2	1.5	●	●			●		7.17	12	7	-
LNGU06X5ZER-MH	2	1.5					●	●	6	12	7	-
LNGU06X5ZER-W	2	1.5			●				6	12	7	3.6

- When wiper insert (-W) is used, the value of feed per rev. (mm/rev) must be less than 3.6 mm x n. for keeping this value, the number of wiper insert (n) and feed per tooth (mm/tooth) should be adjusted
- Wiper insert (-W) can be used just for face milling. It's not suitable for ramping or pocket milling

● : New product
● : Line up

DOFEED

Insert size 06

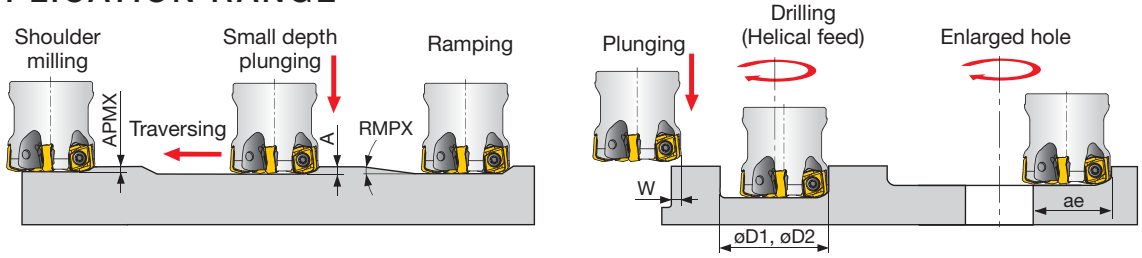
STANDARD CUTTING CONDITIONS

ZER type

ISO	Workpiece materials	Hardness	Priority	Grade	Chip-breaker	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool dia.: DCX (mm) ø32 - ø200	Plunging	ø32, CICT = 2		ø35, CICT = 2		ø40, CICT = 3	
									n	*Vf*	*n*	*Vf*	*n*	*Vf*
P	Carbon steels S45C, S55C, etc. C45, C55, etc.	- 300HB	First choice	AH3225	MJ	100 - 300	0.5 - 1.5	0.15	1,990	3,980	1,820	3,640	1,590	4,770
			Low resistance	AH3225	ML				*Vc* = 200 m/min, *fz* = 1 mm/t					
			for wear resistance	AH8015	MJ									
	Alloy steels SCM440, SCr415, etc.	- 300HB	First choice	AH3225	MJ	100 - 250	0.5 - 1.5	0.15	1,990	3,980	1,820	3,640	1,590	4,770
			Low resistance	AH3225	ML				*Vc* = 200 m/min, *fz* = 1 mm/t					
			for wear resistance	AH8015	MJ									
	Prehardened steels NAK80, PX5, etc.	30 - 40HRC	First choice	AH3225	MJ	100 - 200	0.5 - 1.2	0.15	1,490	2,380	1,360	2,180	1,190	2,860
			Low resistance	AH3225	ML				*Vc* = 150 m/min, *fz* = 0.8 mm/t					
		30 - 40HRC	for wear resistance	AH8015	MJ	100 - 200	0.5 - 1.2	0.15	1,490	2,380	1,360	2,180	1,190	2,860
									Vc = 150 m/min, *fz* = 0.8 mm/t					
M	Stainless steels SUS304, X5CrNi18-9, etc.	- 200HB	First choice	AH130	ML	80 - 200	0.3 - 0.9	0.1	1,190	1,430	1,090	1,310	950	1,710
			for impact resistance	AH130	MJ				*Vc* = 120 m/min, *fz* = 0.6 mm/t					
	Precipitation hardening stainless steels SUS630, X5CrNiCuNb16-4, etc.	28HRC- (H1150)	First choice	AH130	ML	80 - 150	0.1 - 0.6	0.1	1,190	940	1,090	860	960	1,130
			for impact resistance	AH130	MJ				*Vc* = 120 m/min, *fz* = 0.4 mm/t					
		40HRC - (H900)	First choice	AH130	ML	80 - 120	0.1 - 0.4	0.1	1,000	400	910	360	800	480
			for impact resistance	AH130	MJ				*Vc* = 100 m/min, *fz* = 0.2 mm/t					
K	Gray cast irons FC250, GG25, 250, etc.	150 - 250HB	First choice	AH8015	MJ	100 - 300	0.5 - 1.5	0.15	1,990	3,980	1,820	3,640	1,590	4,770
			for impact resistance	AH3225	MJ				*Vc* = 200 m/min, *fz* = 1 mm/t					
	Ductile cast irons FCD400, etc.	150 - 250HB	First choice	AH8015	MJ	80 - 200	0.5 - 1.5	0.15	1,490	2,980	1,360	2,720	1,190	3,570
			for impact resistance	AH3225	MJ				*Vc* = 150 m/min, *fz* = 1 mm/t					
S	Titanium alloy Ti-6Al-4V, etc.	- 40HRC	First choice	AH130	ML	30 - 60	0.3 - 0.8	0.08	400	400	360	360	320	480
			for impact resistance	AH130	MJ				*Vc* = 40 m/min, *fz* = 0.5 mm/t					
	Heat-resistant alloy Inconel, Hastelloy, etc.	- 40HRC	First choice	AH8015	ML	20 - 50	0.1 - 0.4	0.05	300	120	270	110	240	140
			for impact resistance	AH8015	MJ				*Vc* = 30 m/min, *fz* = 0.2 mm/t					
H	Hot mold steel SKD61, X40CrMoV5-1, etc.	40 - 55HRC	First choice	AH8015	MH	80 - 150	0.1 - 0.5	0.05	1,190	710	1,090	650	950	850
			Low resistance	AH8015	MJ		0.1 - 0.3		*Vc* = 120 m/min, *fz* = 0.3 mm/t					
	Hot mold steel of D.T.C materials DAC**, DH**, DIEVER, etc	40 - 55HRC	First choice	AH8015	MJ	50-100	0.1 - 0.3	0.05	800	320	730	290	640	380
			for impact resistance	AH8015	MH		0.1 - 0.5		*Vc* = 80 m/min, *fz* = 0.2 mm/t					
	Cold mold steels SKD11, X153CrMoV12, etc.	55 - 60HRC	First choice	AH8005	MH	50 - 70	0.05 - 0.3	0.03	600	120	550	110	480	140
									Vc = 60 m/min, *fz* = 0.1 mm/t					
		55 - 60HRC	for impact resistance	AH8015	MH	50 - 70	0.05 - 0.3	0.03	600	60	550	55	480	70
									Vc = 60 m/min, *fz* = 0.05 mm/t					

- The above table shows the conditions for standard shank type cutters. When using long shank type cutters, the number of teeth may be different.
- Cutting conditions are generally limited by the rigidity and power of the machine and the rigidity of the workpiece. 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



Designation	DCX	Max. depth of cut APMX	Max. ramping angle RMPX MJ/ML	RMPX MH	Max. plunging depth A MJ/ML	A MH	Max. cutting width in plunging W	Min. machinable hole dia. øD1	Max. machinable hole dia. øD2	Max. cutting width in enlarged hole ae
EXN06R032M...	32	1.5	2	1.4	0.5	0.4	6	47	59	25
EXN06R035M...	35	1.5	1.7	1.1	0.5	0.4	6	53	65	28
EXN06R040M...	40	1.5	1.3	0.8	0.5	0.4	6	63	75	33
TXN06R050M...	50	1.5	0.9	0.7	0.5	0.4	6	83	95	43
TXN06R052M...	52	1.5	0.8	0.6	0.5	0.4	6	87	99	45
TXN06R063M...	63	1.5	0.6	0.5	0.5	0.4	6	109	121	56
TXN06R066M...	66	1.5	0.5	0.5	0.5	0.4	6	115	127	59
TXN06R080M...	80	1.5	0.5	0.3	0.5	0.4	6	143	155	73
TXN06R100M...	100	1.5	0.34	0.25	0.5	0.4	6	183	195	93
TXN06R125M...	120	1.5	0.26	0.2	0.5	0.4	6	233	245	118
TXN06R160M...	160	1.5	0.2	0.15	0.5	0.4	6	303	315	153
TXN06R200M...	200	1.5	0.15	0.11	0.5	0.4	6	383	395	193

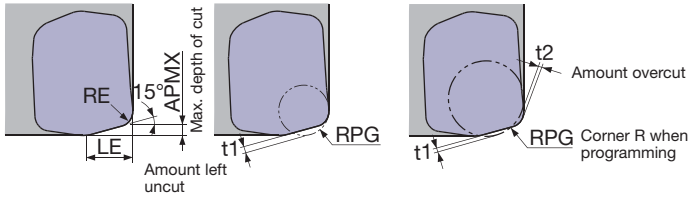
Note: For DCX above 100 mm, slot milling, ramping or contouring is not recommended as chips may be re-cut.

Tool dia.: DCX (mm), Number of revolutions: *n* (min^{-1}), Feed speed: *Vf* (mm/min), Max. depth of cut: *ap* = 1.5 mm, Number of teeth: CICT

ø50			ø63			ø80			ø100, CICT = 6		ø125, CICT = 8		ø160, CICT = 10		ø200, CICT = 12	
n	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*	*n*	*Vf*	*n*	*Vf*	*n*	*Vf*
	CICT = 4	CICT = 5		CICT = 4	CICT = 6		CICT = 5	CICT = 8								
1,270	5,080	6,350	1,010	4,040	6,060	800	4,000	6,400	640	3,820	510	4,080	400	3,980	320	3,820
							Vc = 200 m/min, *fz* = 1 mm/t									
1,270	5,080	6,350	1,010	4,040	6,060	800	4,000	6,400	640	3,820	510	4,080	400	3,980	320	3,820
							Vc = 200 m/min, *fz* = 1 mm/t									
950	3,040	3,800	760	2,430	3,650	600	2,400	3,840	480	2,290	380	2,450	300	2,390	240	2,290
							Vc = 150 m/min, *fz* = 0.8 mm/t									
950	3,040	3,800	760	2,430	3,650	600	2,400	3,840	480	2,290	380	2,450	300	2,390	240	2,290
							Vc = 150 m/min, *fz* = 0.8 mm/t									
760	1,820	2,280	610	1,470	2,200	480	1,440	2,300	380	1,380	310	1,470	240	1,430	190	1,380
							Vc = 120 m/min, *fz* = 0.6 mm/t									
760	1,210	1,520	610	970	1,460	480	950	1,530	380	900	310	980	240	960	190	900
							Vc = 120 m/min, *fz* = 0.4 mm/t									
640	510	640	510	410	610	400	400	640	320	380	260	420	200	400	160	380
							Vc = 100 m/min, *fz* = 0.2 mm/t									
1,270	5,080	6,350	1,010	4,040	6,060	800	4,000	6,400	640	3,820	510	4,080	400	3,980	320	3,820
							Vc = 200 m/min, *fz* = 1 mm/t									
950	3,800	4,750	760	3,040	4,560	600	3,000	4,800	480	2,870	380	3,060	300	2,990	240	2,870
							Vc = 150 m/min, *fz* = 1 mm/t									
250	500	630	200	400	600	160	400	640	130	380	100	410	80	400	60	380
							Vc = 40 m/min, *fz* = 0.5 mm/t									
190	150	190	150	120	180	120	120	190	100	120	80	120	60	120	50	120
							Vc = 30 m/min, *fz* = 0.2 mm/t									
760	910	1,140	610	730	1,100	480	720	1,150	380	680	310	740	240	720	190	680
							Vc = 120 m/min, *fz* = 0.3 mm/t									
510	410	510	400	320	480	320	320	510	250	300	200	320	160	320	130	310
							Vc = 80 m/min, *fz* = 0.2 mm/t									
380	150	190	300	120	180	240	120	190	190	110	150	120	120	120	100	120
							Vc = 60 m/min, *fz* = 0.1 mm/t									
380	75	95	300	60	90	240	60	95	190	55	150	60	120	60	100	60
							Vc = 60 m/min, *fz* = 0.05 mm/t									

TOOL GEOMETRY ON PROGRAMMING

When programming for CAM, the tool should be considered as a radius cutter. Usually, the corner radius should be set as R = 3 mm.
If a larger radius is used, overcutting will occur. The following table shows the amount left uncut (t1) and overcut (t2).



LNMU06X5ZER...

Max. depth of cut APMX (mm)	Corner radius RE (mm)	LE (mm)	Corner R when programming RPG	Amount left uncut t1 (mm)	Amount overcut t2 (mm)
1.5	2	6	2	1	-
			3	0.77	-
			4	0.54	0.26

LNGU06X5ZER-MH

Max. depth of cut APMX (mm)	Corner radius RE (mm)	LE (mm)	Corner R when programming RPG	Amount left uncut t1 (mm)	Amount overcut t2 (mm)
1.5	2	6	2	0.9	-
			3	0.66	-
			4	0.41	0.26

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

DOFEED

Insert size 06

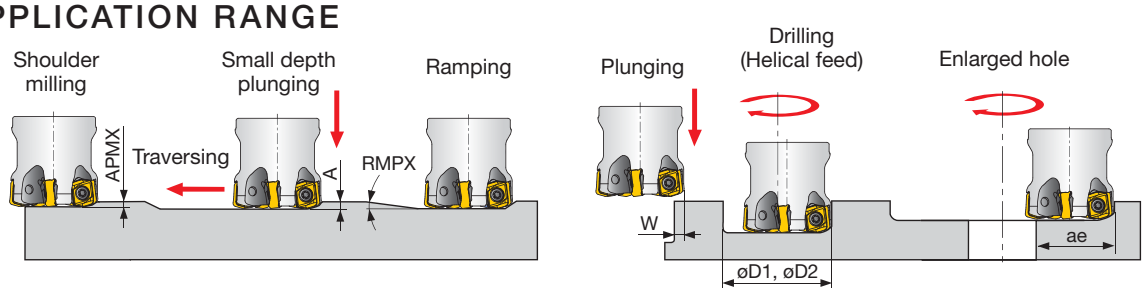
STANDARD CUTTING CONDITIONS

UER type

ISO	Workpiece materials	Hardness	Priority	Grade	Chip-breaker	Cutting speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t) Tool dia.: DCX (mm) ø32 - ø200	Plunging	ø32, CICT = 2 *n*	ø32, CICT = 2 *Vf*	ø35, CICT = 2 *n*	ø35, CICT = 2 *Vf*	ø40, CICT = 3 *n*	ø40, CICT = 3 *Vf*
P	Carbon steels S45C, S55C, etc. C45, C55, etc.	- 300HB	First choice	AH3225	MJ	100 - 300	0.5 - 2	0.15	1,990	3,980	1,820	3,640	1,590	4,770
			Low resistance	AH3225	ML				*Vc* = 200 m/min, *fz* = 1 mm/t					
			Wear resistance	AH8015	MJ									
	Alloy steels SCM440, SCr415, etc.	- 300HB	First choice	AH3225	MJ	100 - 250	0.5 - 2	0.15	1,990	3,980	1,820	3,640	1,590	4,770
			Low resistance	AH3225	ML				*Vc* = 200 m/min, *fz* = 1 mm/t					
			Wear resistance	AH8015	MJ									
	Prehardened steels NAK80, PX5, etc.	30 - 40HRC	First choice	AH3225	MJ	100 - 200	0.5 - 1.6	0.15	1,490	2,980	1,360	2,720	1,190	3,570
			Low resistance	AH3225	ML				*Vc* = 150 m/min, *fz* = 1 mm/t					
			Wear resistance	AH8015	MJ									
M	Stainless steels SUS304, X5CrNi18-9, etc.	- 200HB	First choice	AH130	ML	80 - 200	0.4 - 1.1	0.1	1,190	1,790	1,090	1,640	950	2,140
			for impact resistance	AH130	MJ				*Vc* = 120 m/min, *fz* = 0.75 mm/t					
	Precipitation hardening stainless steels SUS630, X5CrNiCuNb16-4, etc.	28HRC- (H1150)	First choice	AH130	ML	80 - 150	0.4 - 0.8	0.1	1,190	1,430	1,090	1,310	950	1,710
			for impact resistance	AH130	MJ				*Vc* = 120 m/min, *fz* = 0.6 mm/t					
		40HRC - (H900)	First choice	AH130	ML	80 - 120	0.2 - 0.6	0.1	1,000	800	910	720	800	960
			for impact resistance	AH130	MJ				*Vc* = 100 m/min, *fz* = 0.4 mm/t					
K	Gray cast irons FC250, GG25, 250, etc.	150 - 250HB	First choice	AH8015	MJ	100 - 300	0.8 - 2	0.15	1,990	3,980	1,820	3,640	1,590	4,770
			for impact resistance	AH3225	MJ				*Vc* = 200 m/min, *fz* = 1 mm/t					
	Ductile cast irons FCD400, etc.	150 - 250HB	First choice	AH8015	MJ	80 - 200	0.8 - 2	0.15	1,490	2,980	1,360	2,720	1,190	3,570
			for impact resistance	AH3225	MJ				*Vc* = 150 m/min, *fz* = 1 mm/t					
S	Titanium alloy Ti-6Al-4V, etc.	- 40HRC	First choice	AH130	ML	30 - 70	0.3 - 1	0.08	400	480	360	430	320	580
			for impact resistance	AH130	MJ				*Vc* = 40 m/min, *fz* = 0.6 mm/t					
	Heat-resistant alloy Inconel, Hastelloy, etc.	- 40HRC	First choice	AH8015	ML	30 - 60	0.1 - 0.6	0.05	300	240	270	220	240	280
			for impact resistance	AH8015	MJ				*Vc* = 30 m/min, *fz* = 0.4 mm/t					
H	Hot mold steel SKD61, X40CrMoV5-1, etc.	40 - 55HRC	First choice	AH8015	MJ	80 - 150	0.1 - 0.6	0.05	1,190	940	1,090	860	950	1,130
									Vc = 120 m/min, *fz* = 0.4 mm/t					
	Hot mold steel of D.T.C materials DAC**, DH**, DIEVER, etc	40 - 55HRC	First choice	AH8015	MJ	50-100	0.1 - 0.4	0.05	800	480	730	440	640	570
									Vc = 80 m/min, *fz* = 0.4 mm/t					
	Cold mold steels SKD11, X153CrMoV12, etc.	55 - 60HRC	First choice	AH8015	MJ	50 - 70	0.05 - 0.3	0.03	600	120	550	110	480	140
									Vc = 60 m/min, *fz* = 0.1 mm/t					

- The above table shows the conditions for standard shank type cutters. When using long shank type cutters, the number of teeth may be different.
- Cutting conditions are generally limited by the rigidity and power of the machine and the rigidity of the workpiece. 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



Designation	DCX	Max. depth of cut APMX	Max. ramping angle RMPX MJ/ML	Max. plunging depth A MJ/ML	Max. cutting width in plunging W	Min. machinable hole dia. øD1	Max. machinable hole dia. øD2	Max. cutting width in enlarged hole ae
EXN06R032M...	32	1.5	1.6	0.4	6.8	47	59	24.5
EXN06R035M...	35	1.5	1.3	0.4	6.8	53	65	27.5
EXN06R040M...	40	1.5	1	0.4	6.8	63	75	32.5
TXN06R050M...	50	1.5	0.7	0.4	6.8	83	95	42.5
TXN06R052M...	52	1.5	0.6	0.4	6.8	87	99	44.5
TXN06R063M...	63	1.5	0.4	0.4	6.8	109	121	55.5
TXN06R066M...	66	1.5	0.4	0.4	6.8	115	127	58.5
TXN06R080M...	80	1.5	0.3	0.4	6.8	143	155	72.5
TXN06R100M...	100	1.5	0.2	0.4	6.8	183	195	92.5
TXN06R125M...	125	1.5	0.1	0.4	6.8	233	245	117.5
TXN06R160M...	160	1.5	0.1	0.4	6.8	303	315	152.5
TXN06R200M...	200	1.5	0.1	0.4	6.8	383	395	192.5

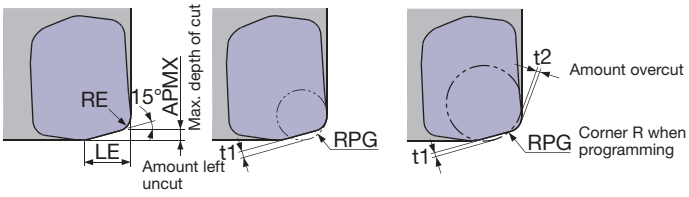
Note: For DCX above 100 mm, slot milling, ramping or contouring is not recommended as chips may be re-cut.

Tool dia.: DCX (mm), Number of revolutions: *n* (min^{-1}), Feed speed: *Vf* (mm/min), Max. depth of cut: *ap* = 1.5 mm, Number of teeth: CICT

ø50			ø63			ø80			ø100, CICT = 6		ø125, CICT = 8		ø160, CICT = 10		ø200, CICT = 12	
n	*Vf*		*n*	*Vf*		*n*	*Vf*		*n*	*Vf*	*n*	*Vf*	*n*	*Vf*	*n*	*Vf*
	CICT = 4	CICT = 5		CICT = 4	CICT = 6		CICT = 5	CICT = 8								
1,270	5,080	6,350	1,010	4,040	6,060	800	4,000	6,400	640	3,820	510	4,080	400	3,980	320	3,820
							Vc = 200 m/min, *fz* = 1 mm/t									
1,270	5,080	6,350	1,010	4,040	6,060	800	4,000	6,400	640	3,820	510	4,080	400	3,980	320	3,820
							Vc = 200 m/min, *fz* = 1 mm/t									
950	3,800	4,750	760	3,040	4,560	600	3,000	4,800	480	2,880	380	3,040	300	3,000	240	2,880
							Vc = 150 m/min, *fz* = 1 mm/t									
760	2,280	2,840	610	1,840	2,750	480	1,800	2,880	380	1,730	310	1,840	240	1,790	190	1,730
							Vc = 120 m/min, *fz* = 0.75 mm/t									
760	1,820	2,280	610	1,470	2,200	480	1,440	2,300	380	1,380	310	1,470	240	1,430	190	1,380
							Vc = 120 m/min, *fz* = 0.6 mm/t									
640	1,020	1,280	510	820	1,220	400	800	1,280	320	760	260	840	200	800	160	760
							Vc = 100 m/min, *fz* = 0.4 mm/t									
1,270	5,080	6,350	1,010	4,040	6,060	800	4,000	6,400	640	3,820	510	4,080	400	3,980	320	3,820
							Vc = 200 m/min, *fz* = 1 mm/t									
950	3,800	4,750	760	3,040	4,560	600	3,000	4,800	480	2,870	380	3,060	300	2,990	240	2,870
							Vc = 150 m/min, *fz* = 1 mm/t									
250	600	750	200	480	720	160	480	770	130	460	100	490	80	480	60	480
							Vc = 40 m/min, *fz* = 0.6 mm/t									
190	300	380	150	240	360	120	240	380	100	240	80	240	60	240	50	240
							Vc = 30 m/min, *fz* = 0.4 mm/t									
760	1,210	1,520	610	970	1,460	480	950	1,530	380	900	310	980	240	960	190	900
							Vc = 120 m/min, *fz* = 0.4 mm/t									
510	620	770	400	480	720	320	480	770	250	450	200	480	160	480	130	470
							Vc = 80 m/min, *fz* = 0.3 mm/t									
380	150	190	300	120	180	240	120	190	190	110	150	120	120	120	100	120
							Vc = 60 m/min, *fz* = 0.1 mm/t									

TOOL GEOMETRY ON PROGRAMMING

When programming for CAM, the tool should be considered as a radius cutter. Usually, the corner radius should be set as R = 3 mm.
If a larger radius is used, overcutting will occur. The following table shows the amount left uncut (t1) and overcut (t2).



LNMU06X5UER...

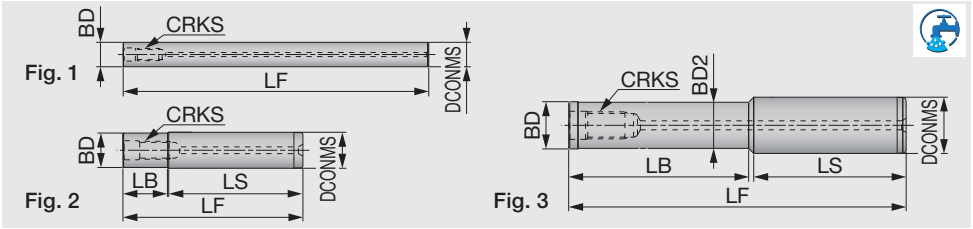
Max. depth of cut APMX (mm)	Corner radius RE (mm)	LE (mm)	Corner R when programming RPG	Amount left uncut t1 (mm)	Amount overcut t2 (mm)
1.5	2.1	6.8	2	0.92	-
			3	0.74	-
			4	0.58	0.29

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

TUNGFLEX

SM-C-H

Carbide modular shank

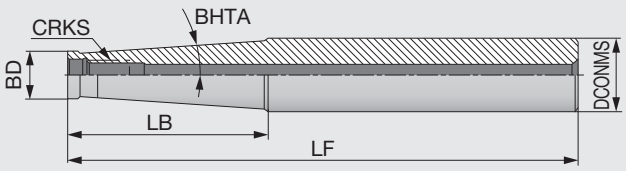


Designation	CRKS	DCONMS	LF	LB	LS	BD	BD2	Fig.
SM06-L100-C10-C-H	M6	10	100	-	-	10	-	1
SM06-L150-C10-C-H	M6	10	150	-	-	10	-	1
SM06-L100-C12-C-H	M6	12	100	-	-	12	-	1
SM06-L150-C12-C-H	M6	12	150	-	-	12	-	1
SM08-L80-20-C16-C-H	M8	16	80	20	59.6	15.3	-	2
SM08-L100-40-C16-C-H	M8	16	100	40	59.6	15.3	-	2
SM08-L150-80-C16-C-H	M8	16	150	80	69.6	15.3	-	2
SM08-L200-100-C16-C-H	M8	16	200	100	98.2	13	12.5	3
SM08-L200-140-C16-C-H	M8	16	200	140	59.6	15.3	-	2
SM08-L250-180-C16-C-H	M8	16	250	180	69.6	15.3	-	2
SM10-L80-20-C20-C-H	M10	20	80	20	59.2	18.5	-	2
SM10-L100-40-C20-C-H	M10	20	100	40	59.2	18.5	-	2
SM10-L150-80-C20-C-H	M10	20	150	80	69.2	18.5	-	2
SM10-L200-100-C20-C-H	M10	20	200	100	99.2	18.5	-	2
SM10-L200-140-C20-C-H	M10	20	200	140	58.7	18	17.5	3
SM10-L200-140-C20-C-H-N	M10	20	200	140	59.2	18.5	-	2
SM10-L250-130-C20-C-H	M10	20	250	130	118.7	18	17.5	3
SM10-L250-180-C20-C-H	M10	20	250	180	68.7	18	17.5	3
SM10-L250-180-C20-C-H-N	M10	20	250	180	69.2	18.5	-	2
SM10-L300-180-C20-C-H	M10	20	300	180	118.7	18	17.5	3
SM10-L300-230-C20-C-H	M10	20	300	230	68.7	18	17.5	3
SM12-L100-40-C25-C-H	M12	25	100	40	59.5	24	-	2
SM12-L150-80-C25-C-H	M12	25	150	80	67.7	21	20.5	3
SM12-L150-80-C25-C-H-N	M12	25	150	80	69.5	24	-	2
SM12-L200-100-C25-C-H	M12	25	200	100	97.7	21	20.5	3
SM12-L200-100-C25-C-H-N	M12	25	200	100	99.5	24	-	2
SM12-L200-140-C25-C-H	M12	25	200	140	57.7	21	20.5	3
SM12-L250-130-C25-C-H	M12	25	250	130	117.7	21	20.5	3
SM12-L250-180-C25-C-H	M12	25	250	180	69.5	24	-	2
SM12-L300-180-C25-C-H	M12	25	300	180	117.7	21	20.5	3
SM12-L300-180-C25-C-H-N	M12	25	300	180	119.5	24	-	2
SM12-L300-230-C25-C-H	M12	25	300	230	67.7	21	20.5	3
SM16-L100-40-C32-C-H	M16	32	100	40	58.5	29	-	2
SM16-L150-80-C32-C-H	M16	32	150	80	68.5	29	-	2
SM16-L200-100-C32-C-H	M16	32	200	100	98.5	29	-	2
SM16-L200-140-C32-C-H	M16	32	200	140	58.5	29	-	2
SM16-L250-130-C32-C-H	M16	32	250	130	118.5	29	-	2
SM16-L250-180-C32-C-H	M16	32	250	180	68.5	29	-	2
SM16-L300-180-C32-C-H	M16	32	300	180	118.5	29	-	2
SM16-L300-230-C32-C-H	M16	32	300	230	68.5	29	-	2
SM16-L350-230-C32-C-H	M16	32	350	230	118.5	29	-	2
SM16-L350-280-C32-C-H	M16	32	350	280	68.5	29	-	2

TUNGFLEX

SM

TungFlex - Modular shank

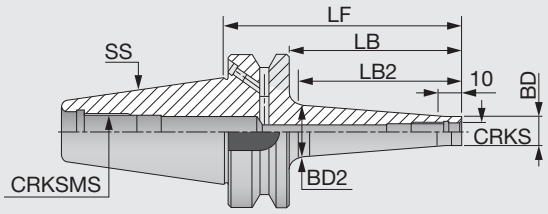


Designation	DCONMS	BD	LF	LB	BHTA	CRKS
SM06-L60C10	10	9.7	60	20	0°	M6
SM06-L105-C12	12	9.7	105	60	1.2°	M6
SM06-L125-C16	16	9.7	125	60	3.3°	M6
SM08-L73C16	16	13	73	25	0°	M8
SM08-L128-C16	16	13	128	80	0.9°	M8
SM08-L170-C20	20	13	170	66.8	3.3°	M8
SM10-L80-C20	20	18	80	30	0°	M10
SM10-L130-C20	20	18	130	80	0.6°	M10
SM10-L200-C25	25	19	200	57.2	3.3°	M10
SM12-L86-C25	25	21	86	30	5.1°	M12
SM12-L200-C32	32	21	200	78	4.4°	M12
SM16-L95-C32	32	29	95	35	1.7°	M16
SM16-L230-C32	32	29	230	50	1.8°	M16

TUNGFLEX

BT-ODP (Screw clamping head holder)

TungFlex modular tooling system with BT shank



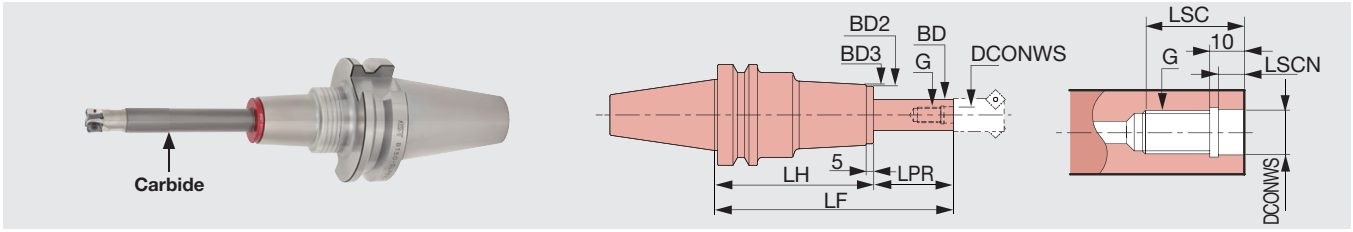
Designation	SS	CRKS	BD	BD2	LF	LB	LB2	CRKSMS
BT40ODP6X66	40	M6	9.8	13	66	39	30	M16
BT40ODP6X106	40	M6	9.8	23	106	79	70	M16
BT40ODP8X66	40	M8	13	15	66	39	30	M16
BT40ODP8X106	40	M8	13	23	106	79	70	M16
BT40ODP10X66	40	M10	18	20	66	39	30	M16
BT40ODP10X106	40	M10	18	28	106	79	70	M16
BT40ODP12X66	40	M12	21	24	66	39	30	M16
BT40ODP12X106	40	M12	21	31	106	79	70	M16
BT40ODP16X66	40	M16	29	28.6	66	39	-	M16
BT40ODP16X106	40	M16	29	34	106	79	70	M16
BT50ODP12X94	50	M12	23	30	94	56	50	M24
BT50ODP12X144 (1)	50	M12	23	40	144	106	100	M24
BT50ODP12X194 (1)	50	M12	23	40	194	156	150	M24
BT50ODP12X244 (1)	50	M12	23	46	244	206	200	M24
BT50ODP16X94 (1)	50	M16	29	34	94	56	50	M24
BT50ODP16X144 (1)	50	M16	29	40	144	106	100	M24
BT50ODP16X194 (1)	50	M16	29	55	194	156	150	M24
BT50ODP16X244 (1)	50	M16	29	60	244	206	200	M24

Applicable for 10 MPa pressure coolant
(1) Balanced to G6.3 at 12,000 min^{-1}

TUNGFLEX

BT-RSG (Screw clamping head holder)

TungFlex modular tooling system with BT shank



Designation	DCONWS	LSC	LSCN	BD	LF	LPR	LH	BD2	BD3	WT (kg)	G
BT40-RSG 8-105-M 25	8.5	18	6.5	15	105	25	80	30	32	1.4	M8
BT40-RSG 8-135-M 25	8.5	18	6.5	15	135	25	110	30	32	1.8	M8
BT40-RSG 8-130-M 50	8.5	18	6.5	15	130	50	80	30	32	1.4	M8
BT40-RSG 8-160-M 50	8.5	18	6.5	15	160	50	110	30	32	1.8	M8
BT40-RSG 8-155-M 75	8.5	18	6.5	15	155	75	80	30	32	1.5	M8
BT40-RSG 8-185-M 75	8.5	18	6.5	15	185	75	110	30	32	1.9	M8
BT40-RSG 10-125-M 25	10.5	22	6.5	19	125	25	100	36	38	1.8	M10
BT40-RSG 10-155-M 25	10.5	22	6.5	19	155	25	130	36	38	2.2	M10
BT40-RSG 10-150-M 50	10.5	22	6.5	19	150	50	100	36	38	1.9	M10
BT40-RSG 10-180-M 50	10.5	22	6.5	19	180	50	130	36	38	2.3	M10
BT40-RSG 10-175-M 75	10.5	22	6.5	19	175	75	100	36	38	2	M10
BT40-RSG 10-205-M 75	10.5	22	6.5	19	205	75	130	36	38	2.4	M10
BT40-RSG 10-200-M100	10.5	22	6.5	19	200	100	100	36	38	2	M10
BT40-RSG 10-230-M100	10.5	22	6.5	19	230	100	130	36	38	2.4	M10
BT40-RSG 12-125-M 25	12.5	22	6	24	125	25	100	43	45	2	M12
BT40-RSG 12-155-M 25	12.5	22	6	24	155	25	130	43	45	2.4	M12
BT40-RSG 12-150-M 50	12.5	22	6	24	150	50	100	43	45	2.1	M12
BT40-RSG 12-180-M 50	12.5	22	6	24	180	50	130	43	45	2.5	M12
BT40-RSG 12-175-M 75	12.5	22	6	24	175	75	100	43	45	2.3	M12
BT40-RSG 12-205-M 75	12.5	22	6	24	205	75	130	43	45	2.7	M12
BT40-RSG 12-200-M100	12.5	22	6	24	200	100	100	43	45	2.4	M12
BT40-RSG 12-230-M100	12.5	22	6	24	230	100	130	43	45	2.8	M12
BT50-RSG 8-120-M 25	8.5	18	6.5	15	120	25	95	30	32	4	M8
BT50-RSG 8-150-M 25	8.5	18	6.5	15	150	25	125	30	32	4.3	M8
BT50-RSG 8-145-M 50	8.5	18	6.5	15	145	50	95	30	32	4	M8
BT50-RSG 8-175-M 50	8.5	18	6.5	15	175	50	125	30	32	4.3	M8
BT50-RSG 8-170-M 75	8.5	18	6.5	15	170	75	95	30	32	4.1	M8
BT50-RSG 8-200-M 75	8.5	18	6.5	15	200	75	125	30	32	4.4	M8
BT50-RSG 10-140-M 25	10.5	22	6.5	19	140	25	115	36	38	4.3	M10
BT50-RSG 10-170-M 25	10.5	22	6.5	19	170	25	145	36	38	4.6	M10
BT50-RSG 10-165-M 50	10.5	22	6.5	19	165	50	115	36	38	4.4	M10
BT50-RSG 10-195-M 50	10.5	22	6.5	19	195	50	145	36	38	4.7	M10
BT50-RSG 10-190-M 75	10.5	22	6.5	19	190	75	115	36	38	4.5	M10
BT50-RSG 10-220-M 75	10.5	22	6.5	19	220	75	145	36	38	4.8	M10
BT50-RSG 10-215-M100	10.5	22	6.5	19	215	100	115	36	38	4.5	M10
BT50-RSG 10-245-M100	10.5	22	6.5	19	245	100	145	36	38	4.8	M10
BT50-RSG 12-140-M 25	12.5	22	6	24	140	25	115	43	45	4.6	M12
BT50-RSG 12-170-M 25	12.5	22	6	24	170	25	145	43	45	5	M12
BT50-RSG 12-165-M 50	12.5	22	6	24	165	50	115	43	45	4.7	M12
BT50-RSG 12-195-M 50	12.5	22	6	24	195	50	145	43	45	5.1	M12
BT50-RSG 12-190-M 75	12.5	22	6	24	190	75	115	43	45	4.9	M12
BT50-RSG 12-220-M 75	12.5	22	6	24	220	75	145	43	45	5.3	M12
BT50-RSG 12-215-M100	12.5	22	6	24	215	100	115	43	45	5	M12
BT50-RSG 12-245-M100	12.5	22	6	24	245	100	145	43	45	5.4	M12
BT50-RSG 12-240-M125	12.5	22	6	24	240	125	115	43	45	5.2	M12
BT50-RSG 16-140-M 25	17	25	6	29	140	25	115	52	54	5.4	M16
BT50-RSG 16-165-M 50	17	25	6	29	165	50	115	52	54	5.6	M16
BT50-RSG 16-190-M 75	17	25	6	29	190	75	115	52	54	5.8	M16
BT50-RSG 16-215-M100	17	25	6	29	215	100	115	52	54	6	M16
BT50-RSG 16-240-M125	17	25	6	29	240	125	115	52	54	6.2	M16

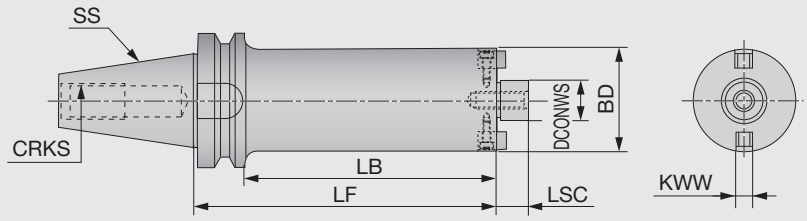
For more modular products.

e-catalog

Manufactured by: MST corporation

BT50-FM

Shell mill holder, long type (BT)

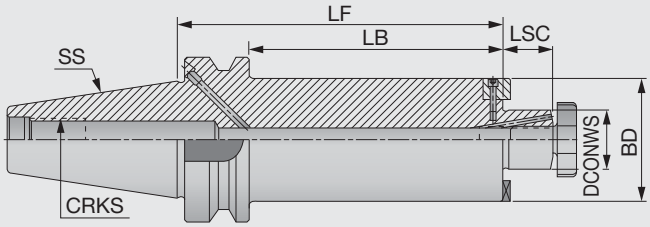


Designation	SS	DCONWS	BD	LSC	LF	LB	CRKS	KWW	WT(kg)
BT50-FMC22-138-47	50	22	47	18	138	100	M24	10	5.2
BT50-FMC22-188-47	50	22	47	18	188	150	M24	10	5.9
BT50-FMC22-243-47	50	22	47	18	243	205	M24	10	6.5
BT50-FMC22-293-47	50	22	47	18	293	255	M24	10	7.2
BT50-FMC22-178-59	50	22	59	18	178	140	M24	10	6.8
BT50-FMC22-238-59	50	22	59	18	238	200	M24	10	8
BT50-FMC22-308-59	50	22	59	18	308	270	M24	10	9.5
BT50-FMC22-373-59	50	22	59	18	373	335	M24	10	10.9
BT50-FMA31.75-215-76	50	31.75	76	30	215	177	M24	12.7	10
BT50-FMA31.75-295-76	50	31.75	76	30	295	257	M24	12.7	12.9
BT50-FMA31.75-375-76	50	31.75	76	30	375	337	M24	12.7	15.8
BT50-FMA31.75-275-96	50	31.75	96	30	275	237	M24	12.7	16.8
BT50-FMA31.75-375-96	50	31.75	96	30	375	337	M24	12.7	23

Option: Wrench for collet

BT-SEM-C

Shell mill holder with coolant hole, long type (BT)



Designation	SS	DCONWS	BD	LF	LB	LSC	CRKS
BT40SEM16X60C	40	16	38	60	33	17	M16
BT40SEM16X100C	40	16	38	100	73	17	M16
BT40SEM22X100C	40	22	47	100	73	19	M16
BT40SEM27X100C	40	27	58	100	73	21	M16
BT40SEM32X60C	40	32	66	60	33	24	M16
BT50SEM16X100C	50	16	38	100	62	17	M24
BT50SEM22X75C	50	22	47	75	37	19	M24
BT50SEM22X48X220C	50	22	48	220	182	19	M24
BT50SEM22X61X320C	50	22	61	320	282	19	M24
BT50SEM25.4X60C	50	25.4	50.4	60	22	22	M24
BT50SEM27X100C	50	27	58	100	62	21	M24
BT50SEM27X61X320C	50	27	61	320	282	21	M24
BT50SEM32X75C	50	32	66	75	37	24	M24
BT50SEM32X100C	50	32	66	100	62	24	M24
BT50SEM32X78X390C	50	32	78	390	352	24	M24

- Applicable for 10 MPa coolant
- When being used as a flange-through type, the plug screw must be removed from the flange with a 2-mm hex key

Option: Wrench for lock screw

TECHNICAL GUIDE FOR OPTIMUM TOOLING

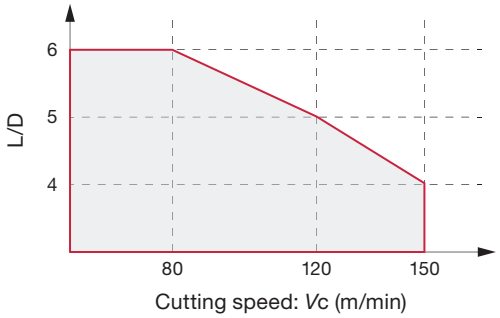
● For long overhang tool setup

The number of teeth

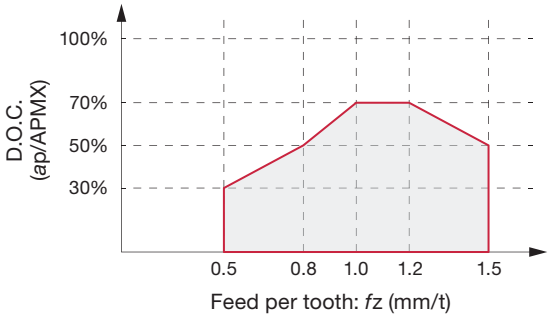
When using a tool overhang of over 4xD up to 6xD, extra care must be taken in determining the number of teeth and the cutting parameters to be used for the application.
A cutter body with **standard tooth pitch** must be selected as a minimum number of teeth are always in contact with the workpiece simultaneously for maximum tool stability.

Cutting parameter settings

The cutting parameters must be set **within the range as described below**.
For a tool overhang of over 6xD, use a taper shank or carbide shank holder or **BoreMeister** holder with vibration dampening for extra machining stability.



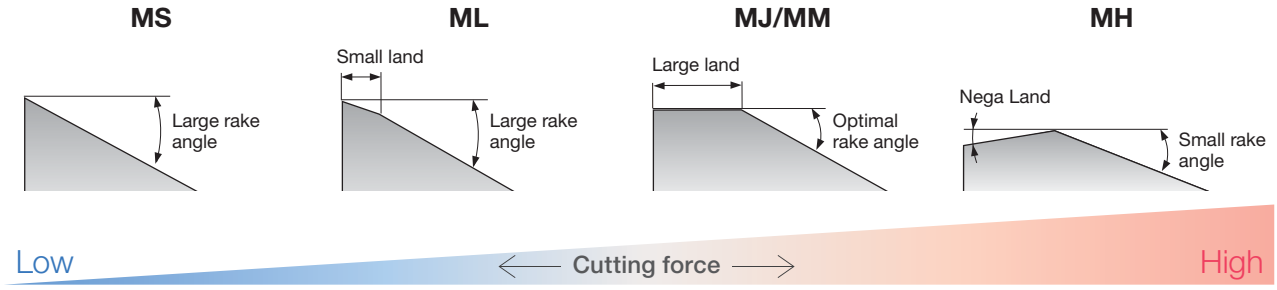
Cutting speed: *Vc* (m/min)



Feed per tooth: *fz* (mm/t)

Chipbreakers

Soft cutting inserts eliminate chatter and provide stability during machining.
Four different chipbreaker styles of **DoFeed** inserts are described below in order from the lowest cutting load to the highest.
Select a softer cutting chipbreaker when excess chatter occurs.
(All four chipbreakers are not available for all insert sizes. See the list below for chipbreaker availability for each insert size.)



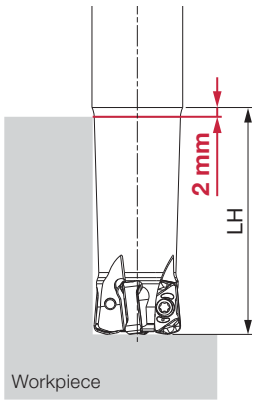
Chipbreaker availability for each insert size

Insert size	MS	ML	MJ/MM	MH
02	-	-	✓	-
03	✓	✓	✓	✓
06	-	✓	✓	✓

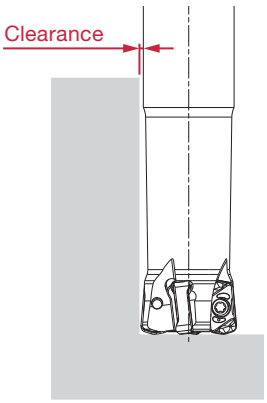
● Milling of shoulders located deep

Extra care must be taken for work-tool interference.
For **straight bodies**, whose cutter and shank diameters are identical, maximum axial cutting depth that allows machining without interference will be: **Head Length (LH) - 2 mm**.
To avoid tool interference with the workpiece, use reduced-shank cutter bodies or modular system tools, whose cutter diameter is larger than the shank diameter.

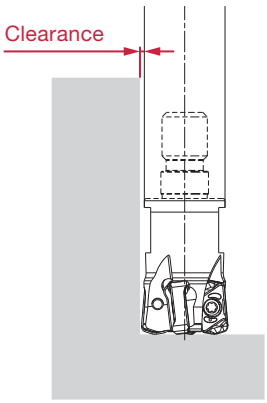
Straight cutter body



Reduced shank



Modular tool



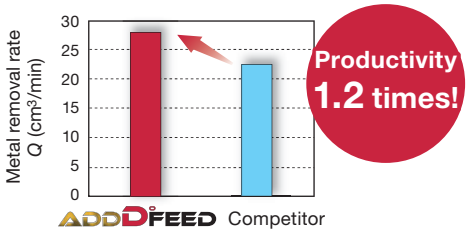
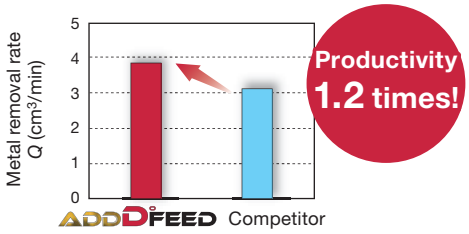
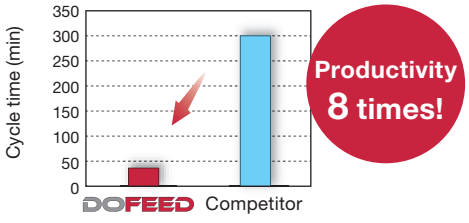
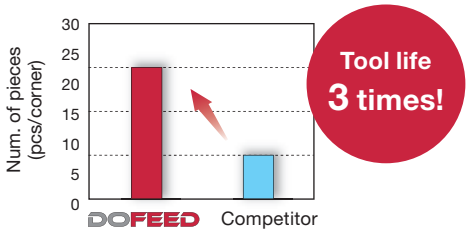
● Insert selection for machining hard materials

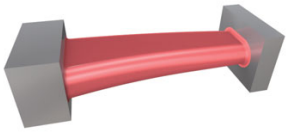
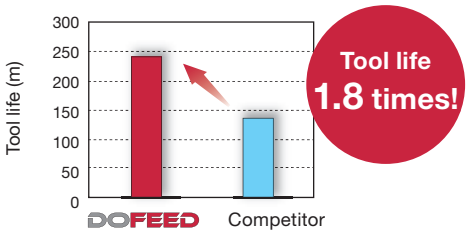
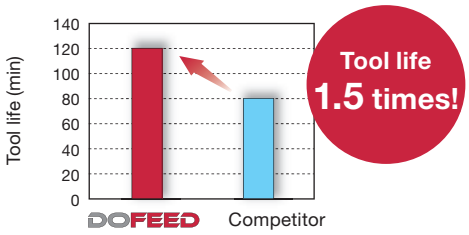
The following list shows optimal insert grade and chipbreaker selections for different hardness scale ranges.

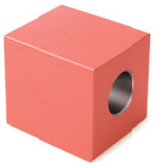
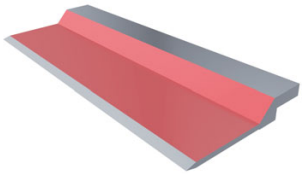
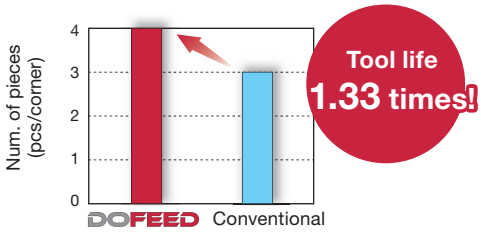
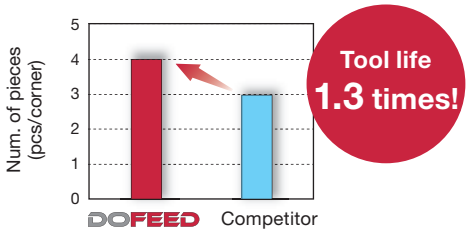
	Hardness range of the workpiece (HRC)	Chipbreaker		Grade	
H	- 40	First choice	**MJ/MM**	First choice	**AH3225**
		For soft cutting/ built-up edge resistance	**ML**	Wear resistance	**AH8015**
	40 - 45	First choice	**MJ/MM**	First choice	**AH3225**
		For impact resistance	**MH**	Wear resistance	**AH8015**
	45 - 55	First choice	**MH**	First choice	**AH8015**
				Wear resistance	**AH8005**
	55 - 60	First choice	**MH**	First choice	**AH8005**
				Impact resistance	**AH8015**

ADDDOFEED/DOFEED

PRACTICAL EXAMPLES

Workpiece type		**Compressor shaft**	**Gas turbine component**
Cutter		EXN02R010M10.0-02 (ø10 mm, CICT = 2)	EXN02R012M12.0-02 (ø12 mm, CICT = 2)
Insert		LNMU0202ZER-MM	LNMU0202ZER-MM
Grade		AH3225	AH130
Workpiece material		SNCM439 (42HRC)	SUH660
		P	M
Cutting conditions	**Cutting speed : *Vc* (m/min)**	180	60
	Feed per tooth: *fz* (mm/t)	0.6	0.5
	Depth of cut : *ap* (mm)	0.4	0.3
	Width of cut : *ae* (mm)	10	8
	Machining	Slotting	Shoulder milling
	Coolant	Wet	Wet
	Machine	Vertical M/C, BT30	Vertical M/C, BT50
Results		 **AddDoFeed** eliminated chatter despite high cutting speed thanks to low cutting force, gaining productivity by 1.2 times.	 **AddDoFeed**'s small depth of cut, but much faster feed improved productivity by 1.2 times.
Workpiece type		**Heavy equipment part**	**Turbine blade**
Cutter		EXN03R020M20.0-03L (ø20 mm, CICT = 3)	EXN03R016M16.0-02 (ø16 mm, CICT = 2)
Insert		LNMU0303UER-MJ	LNMU0303UER-MJ
Grade		AH3225	AH8015
Workpiece material		SS400 / E275A	Ti-6Al-4V
		P	S
Cutting conditions	**Cutting speed : *Vc* (m/min)**	182	200
	Feed per tooth: *fz* (mm/t)	0.69	0.5
	Depth of cut : *ap* (mm)	0.7	0.25
	Width of cut : *ae* (mm)	20	16
	Machining	Pocketing	Shoulder milling
	Coolant	Wet	Wet
	Machine	Vertical M/C, BT40	Vertical M/C, BT50
Results		 Featuring superior chatter stability, **DoFeed UER** inserts (small entry angle) minimized chatter even at high cutting parameters. As a result, cycle time has been shortened to 1/8.	 **DoFeed UER** inserts (small entry angle) combined with AH8015 grade which is perfectly suited for wear resistance and thermal shock in exotic materials resulted in a 3 times increase in tool life.

Workpiece type		Die & Mold	Aircraft part
Cutter		HXN03R025MM12-05 (ø25 mm, CICT = 5)	EXN03R025M25.0-05-C (ø25 mm, CICT = 5)
Insert		LNMU0303UER-MJ	LNMU0303UER-ML
Grade		AH3225	AH130
Workpiece material		SKD61 / X40CrMoV5-1 (45HRC)	15-5PH
		P	 M
Cutting conditions	Cutting speed : *Vc* (m/min)	118	105
	Feed per tooth: *fz* (mm/t)	0.4	0.33
	Depth of cut : *ap* (mm)	0.5	0.76
	Width of cut : *ae* (mm)	- 25	- 25
	Machining	Contouring	Profiling
	Coolant	Dry	Wet
	Machine	Vertical M/C, HSK63	Vertical M/C, BT40
Results		 **UER** inserts in AH3225 grade provided 180% tool life increase.	 **UER** inserts provided 150% tool life increase in exotic material.

Workpiece type		Block	Press-cutter blade
Cutter		TXN06R300U0100A05 (ø100 mm, CICT = 5)	TXN06R063M22.0E06 (ø63 mm, CICT = 6)
Insert		LNMU06X5UER-ML	LNGU06X5ZER-MH
Grade		AH130	AH8015
Workpiece material		SUS304 / X5CrNi18-9	SCM440/42CrMo4(44HRC)
		 M	 H
Cutting conditions	Cutting speed : *Vc* (m/min)	107	118
	Feed per tooth: *fz* (mm/t)	0.58	0.8
	Depth of cut : *ap* (mm)	1.27	0.8
	Width of cut : *ae* (mm)	50	38
	Machining	Face milling	Face milling
	Coolant	Dry	Dry
	Machine	Vertical M/C, CAT40	Vertical M/C
Results		 By using the **UER** type with a smaller approach angle, the tool life was extended while maintaining machining efficiency.	 A combination of the **MH** chipbreaker and AH8015 reduced chipping and wear. Tool life has increased to 130%.

SOLIDFIXWRENCH

Features and benefits of the new key wrench

- **Ease-of-use**

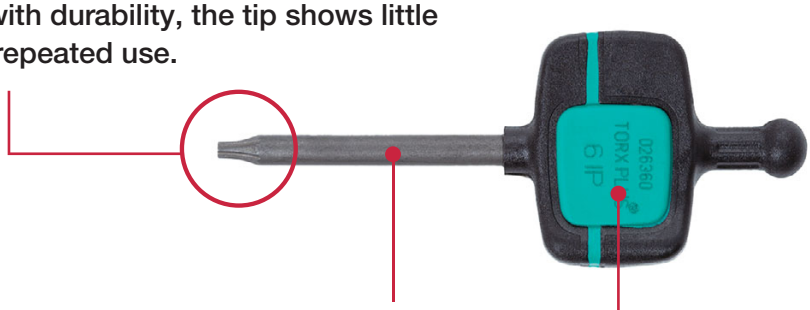
  Designed for precision, durability, and rigidity, the key shaft provides easy handling and long service life.

- **Extended service life of screws**

  The key also helps extend service life of screws by preventing stripped screws and eliminating the risk of cam-out.

- **Designed with precision, the tip allows for a full engagement with a screw head.**

- **Designed with durability, the tip shows little wear after repeated use.**



A thick shaft that fully transfers the driving torque.

Ergonomic grip design that can prevent excessive torque from being applied to the screw.

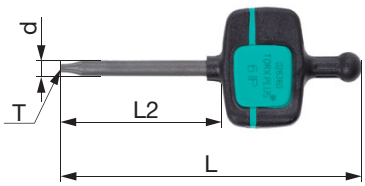
WRENCH

Ex. **IP** - **6DF**

❶ Torx Plus® IP screw

❷ Tip size + Double Flag

Dedicated to Torx Plus® screw



Designation	T	L	L2	d
IP-6DF	6IP	62	33	3
IP-7DF	7IP	62	33	3

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