

MillLine
DOTWISTBALL

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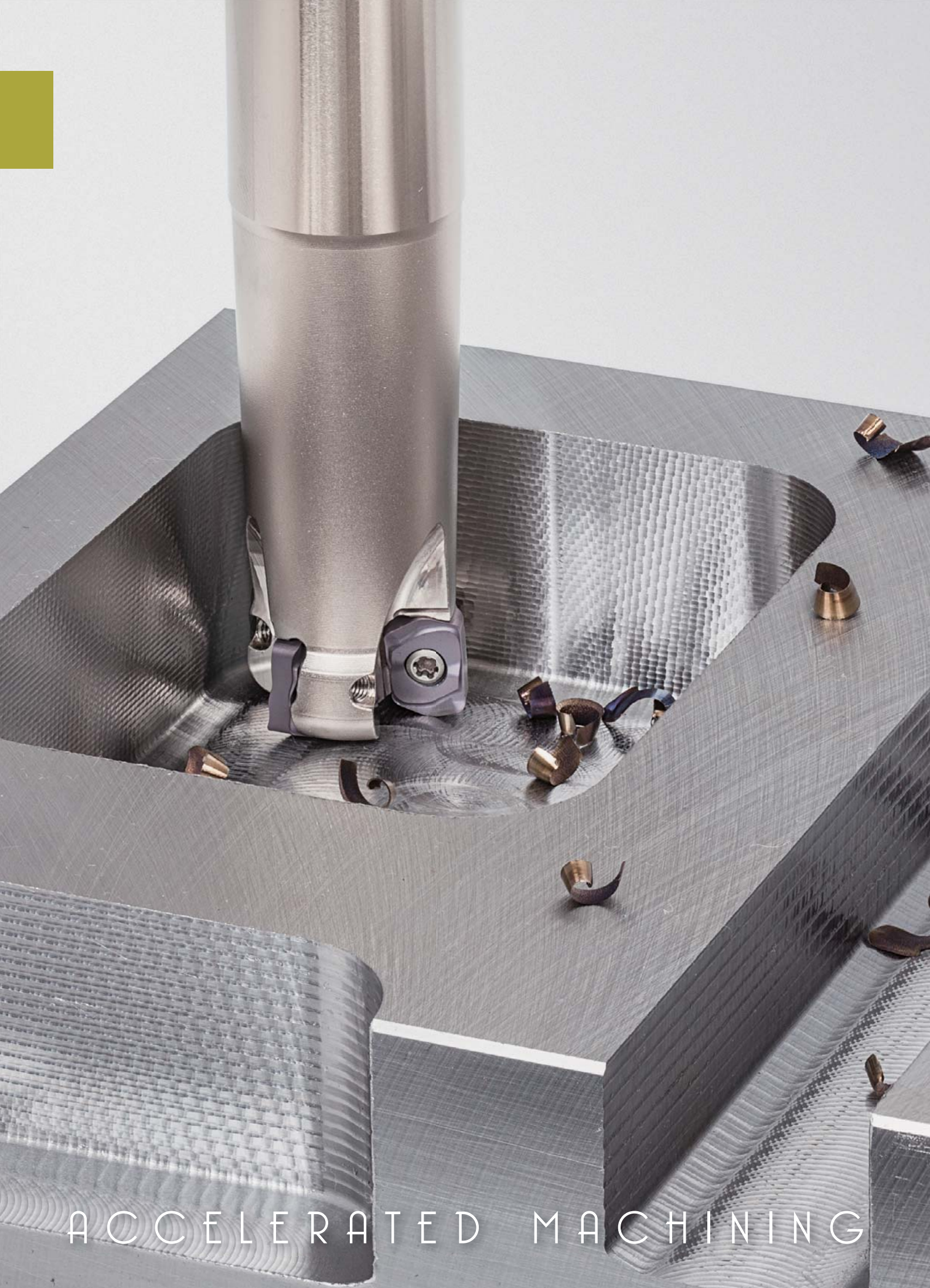
Tungaloy Report No. 507-G

DOTWISTBALL

Unique insert design to ensure high stability
for **incredible productivity**



Member IMC Group
Tungaloy



ACCELERATED MACHINING

TUNG ACCELERATED MACHINING **MILL** FORCE

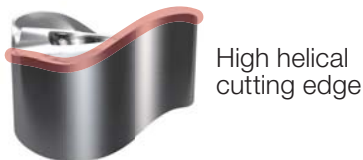


DoTwistBall features a **unique twisted-shape insert** in radius and high-feed geometries which clamps into the insert seat firmly, **providing high stability.**

Ideal tools for 3-dimensional machining due to helical cutting edges

Super positive round insert geometry

- High helical cutting edge and large positive inclination reduce cutting force.



- Double-sided insert with 4 cutting edges
- Large area on the effective cutting edge
- Unused corner protected during machining
- Excellent chip evacuation
- The inclination on the helical cutting edge forms small chips, delivering smooth chip evacuation.



Conventional round insert
3 usable edge
* in case of ramping operation



DOTWISTBALL
4 usable edge

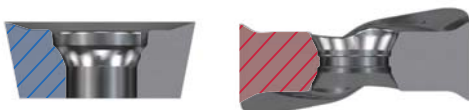
High reliable clamping:

- Twisted clamping technology avoid insert movement during machining
- Rectangle design ensures anti rotation, which is difficult to achieve with conventional inserts



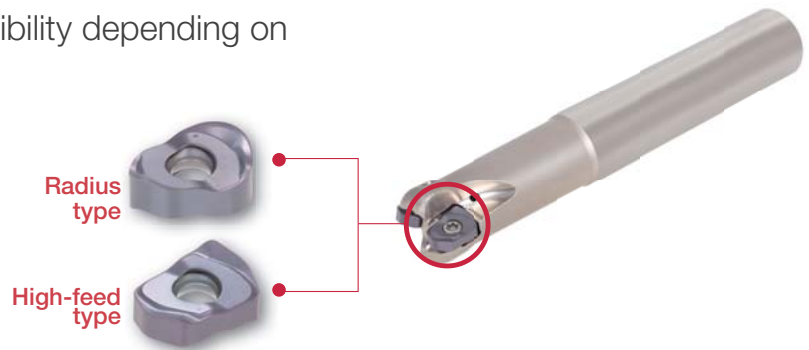
Strengthened cross section

- Insert design allows the cross section to be larger than that of the round insert in a similar size.



2 types of inserts for the same cutter body

- Both the radius insert and the high-feed insert fit on the same cutter body, which offers flexibility depending on the application.



Insert

Radius type



LNMX0405R4-MJ
LNMX0405R4-ML

- 4 mm radius for profile milling
- MJ chipbreaker for general purpose
- ML chipbreaker for low cutting force
- Helical cutting edge delivers smooth chip flow.

High-feed type



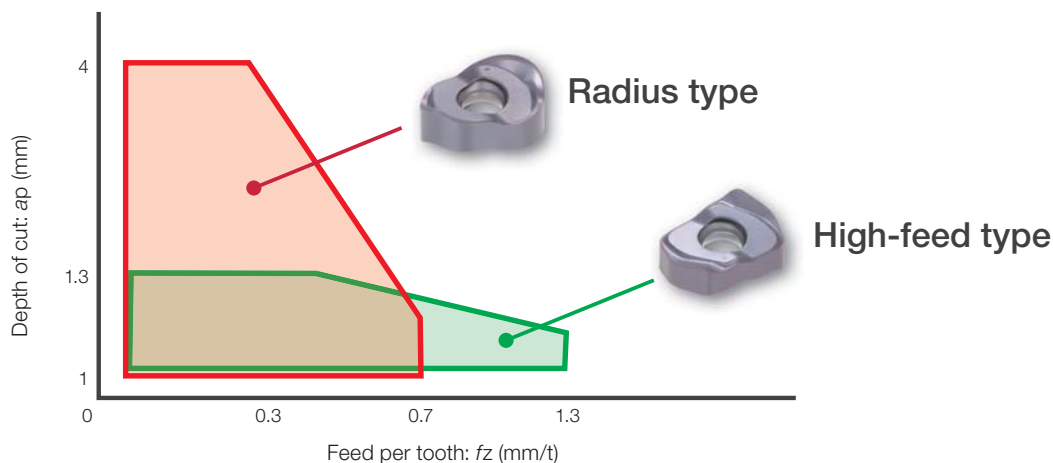
LNMX0405ZER-HJ

- HJ chipbreaker for face milling, ramping, and pocket milling at high feed
- Allows the depth of cut larger than that of the conventional high-feed cutters
- Max. depth of cut: $a_p = 1.3$ mm
- Uniquely designed cutting edge with rake angle reduces cutting force and provides smooth chip flow.

Grade

- **AH3135**: Suitable for machining steel and stainless steel with high toughness
- **AH120** : Ideal for machining cast iron and heat-resistant alloy

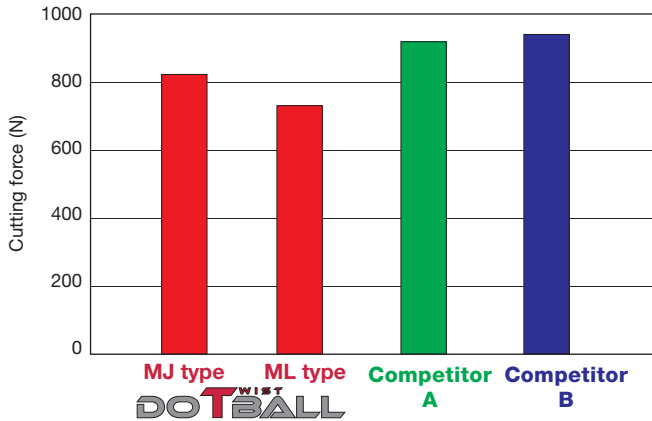
APPLICATION RANGE



CUTTING PERFORMANCE

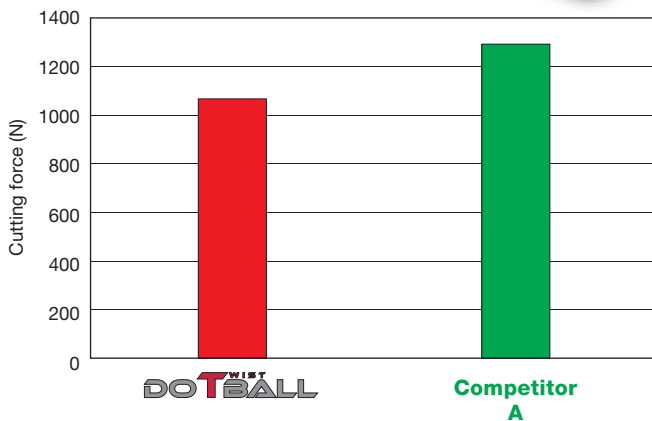
Cutting force

Radius type



P Cutter : EXLN04M025C25.0R03
($\phi D_c = 25 \text{ mm}$, $z = 1$)
Insert : LNMX0405R4-MJ AH3135
LNMX0405R4-ML AH3135
Workpiece material : S55C / C55
Cutting speed : $V_c = 200 \text{ m/min}$
Feed per tooth : $f_z = 0.3 \text{ mm/t}$
Depth of cut : $a_p = 2.0 \text{ mm}$
Width of cut : $a_e = 17 \text{ mm}$
Coolant : Dry

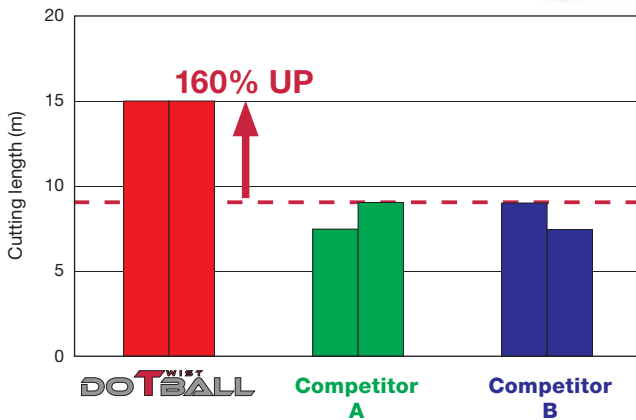
High-feed type



P Cutter : EXLN04M025C25.0R03
($\phi D_c = 25 \text{ mm}$, $z = 1$)
Insert : LNMX0405ZER-HJ AH3135
Workpiece material : S55C / C55
Cutting speed : $V_c = 200 \text{ m/min}$
Feed per tooth : $f_z = 1.0 \text{ mm/t}$
Depth of cut : $a_p = 1.0 \text{ mm}$
Width of cut : $a_e = 17 \text{ mm}$
Coolant : Dry

Tool life

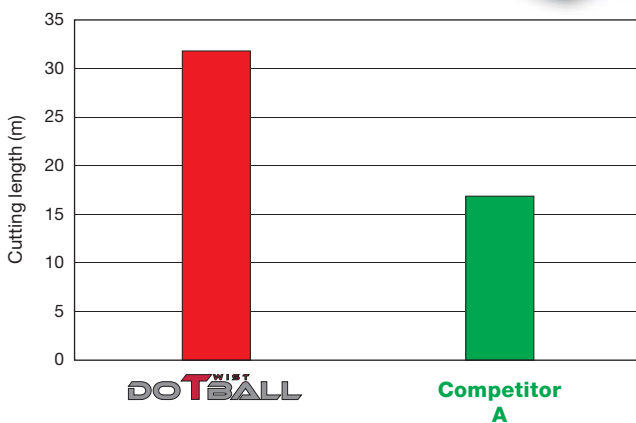
Radius type



M

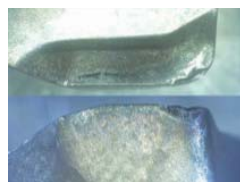
Cutter : EXLN04M025C25.0R03
 (ø25 mm, z = 1)
 Insert : LNMX0405R4-MJ AH3135
 Workpiece material : SUS420J1 / X20Cr13 (300 - 315HB)
 Cutting speed : $V_c = 300$ m/min
 Feed per tooth : $f_z = 0.2$ mm/t
 Depth of cut : $a_p = 2.0$ mm
 Width of cut : $a_e = 12$ mm
 Coolant : Dry (Air blow)

High-feed type



M

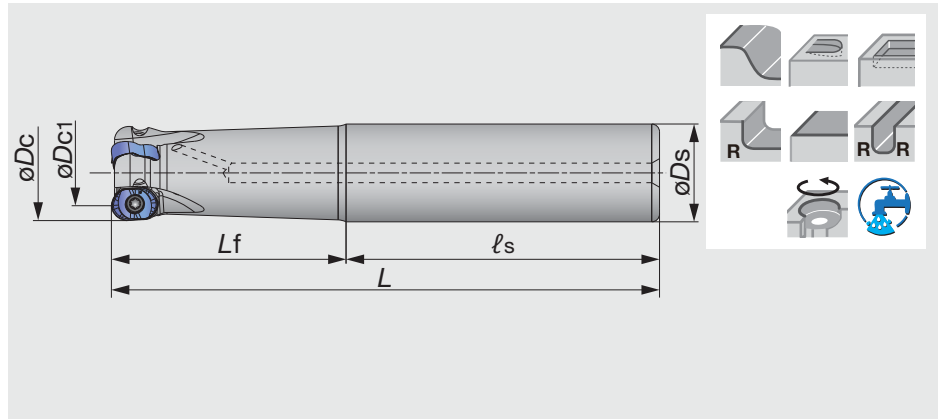
Cutter : EXLN04M025C25.0R03
 (ø25 mm, z = 1)
 Insert : LNMX0405ZER-HJ AH3135
 Workpiece material : SUS304 / X5CrNi18-9 (170HB)
 Cutting speed : $V_c = 150$ m/min
 Feed per tooth : $f_z = 0.7$ mm/t
 Depth of cut : $a_p = 1.0$ mm
 Width of cut : $a_e = 15$ mm
 Coolant : Dry (Air blow)



Radius cutter with double-sided insert; shank type

CUTTER - SHANK TYPE

DoTwistBall EXLN



Designation	Max. ap	ϕD_c	z	ϕD_{c1}	ϕD_s	l_s	L_f	L	Kg	Insert
EXLN04M020C20.0R02	4	20.00	2	12.0	20.0	80.0	50.0	130.0	0.28	LNMX04**
EXLN04M025C25.0R03	4	25.00	3	17.0	25.0	80.0	60.0	140.0	0.46	LNMX04**
EXLN04M032C32.0R04	4	32.00	4	24.0	32.0	80.0	70.0	150.0	0.83	LNMX04**
EXLN04M032C32.0R05	4	32.00	5	24.0	32.0	80.0	70.0	150.0	0.83	LNMX04**

SPARE PARTS

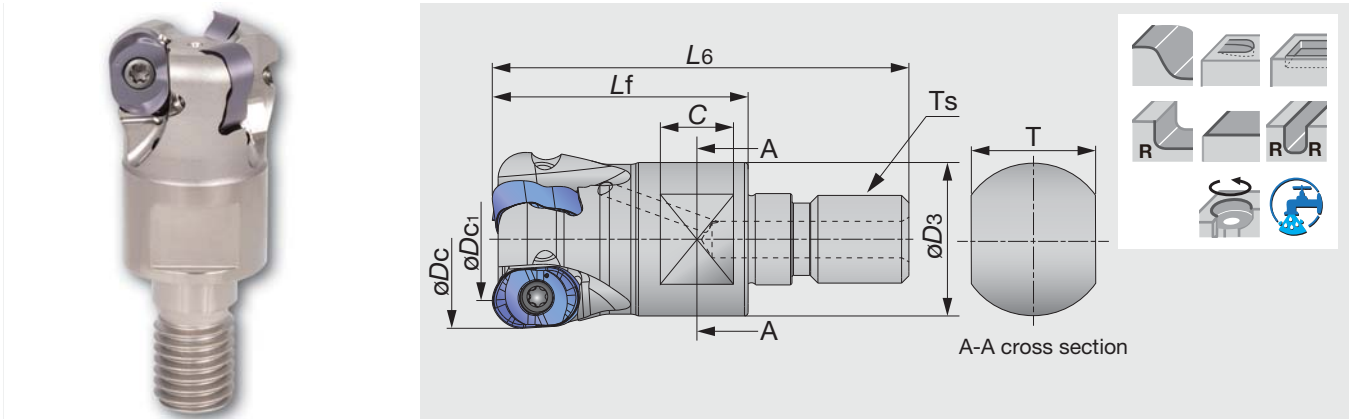


Designation	Clamping screw	Mono block type wrench
EXLN04M***	CSPD-3	IP-10D

Radius cutter with double-sided insert: modular type

CUTTER - MODULAR TYPE

DoTwistBall HXLN



Designation	Max. ap	øDc	z	øDc1	L6	Lf	C	T	øD3	Ts	Kg	Insert
HXLN04M020M10R02	4	20.00	2	12.0	49.0	30.0	10.0	15.0	18.0	M10	0.07	LNMX04**
HXLN04M025M12R03	4	25.00	3	17.0	57.0	35.0	10.0	17.0	21.0	M12	0.16	LNMX04**
HXLN04M032M16R04	4	32.00	4	24.0	63.0	40.0	12.0	22.0	29.0	M16	0.20	LNMX04**

- For the details of metric shanks, please refer to TungFlex series in Tungaloy Report No. 413, TungHold.

SPARE PARTS

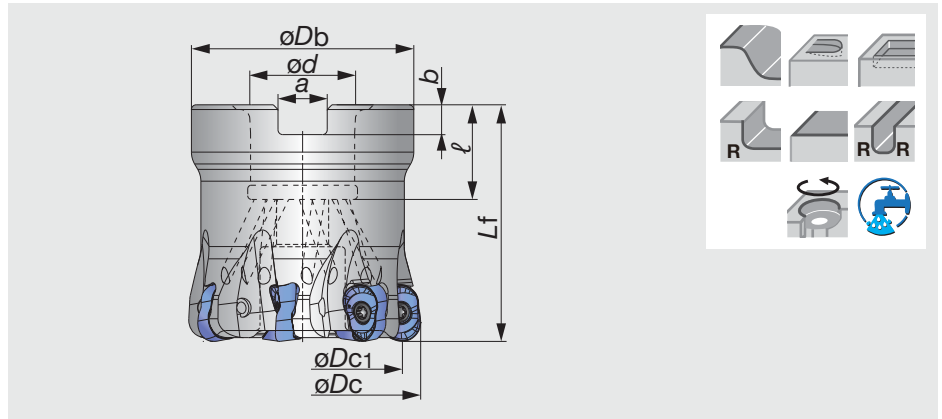


Designation	Clamping screw	Mono block type wrench
HXLN04M***	CSPD-3	IP-10D

Radius cutter with double-sided insert; bore type

CUTTER - BORE TYPE

DoTwistBall TXLN



Designation	Max. ap	øDc	z	øDc1	øDb	Lf	ød	ℓ	a	b	Kg	C.bolt	Insert
TXLN04M040B16.0R06	4	40.00	6	32.0	35	40.0	16.000	18.00	8.40	5.60	0.35	FSHM8-30H	LNMX04**
TXLN04M050B22.0R07	4	50.00	7	42.0	47	50.0	22.000	20.00	10.40	6.30	0.45	CM10X30H	LNMX04**

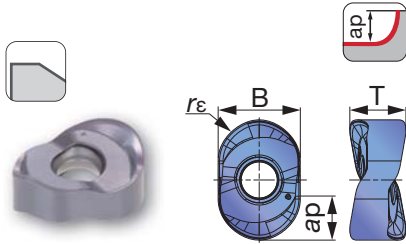
SPARE PARTS



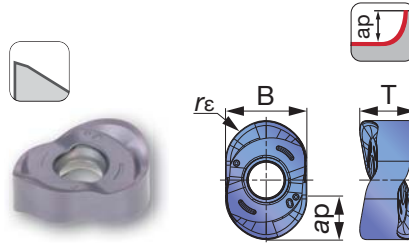
Designation	Clamping screw	Wrench	
		Torx bit	Grip
TXLN04M***	CSPD-3	BLD IP10/S7	SW6-SD

INSERT

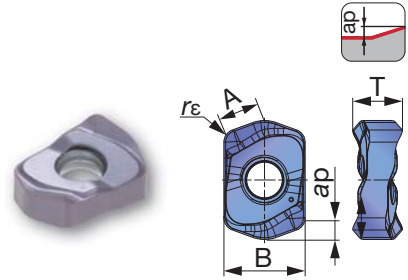
LNMX-MJ



LNMX-ML



LNMX-HJ



Designation	Max. ap	A	B	T	r_ϵ	AH3135				AH120			
						P	M	K	H	P	M	K	H
LNMX0405R4-MJ	4	-	8.2	5.6	4	●	●	●	●	○	○	●	●
LNMX0405R4-ML	4	-	8.2	5.6	4	●	●	●	●	○	○	●	●
LNMX0405ZER-HJ	1.3	4.3	8.2	5.6	1.3	●	●	●	●	○	○	●	●

● First choice

STANDARD CUTTING CONDITIONS

MJ / ML type

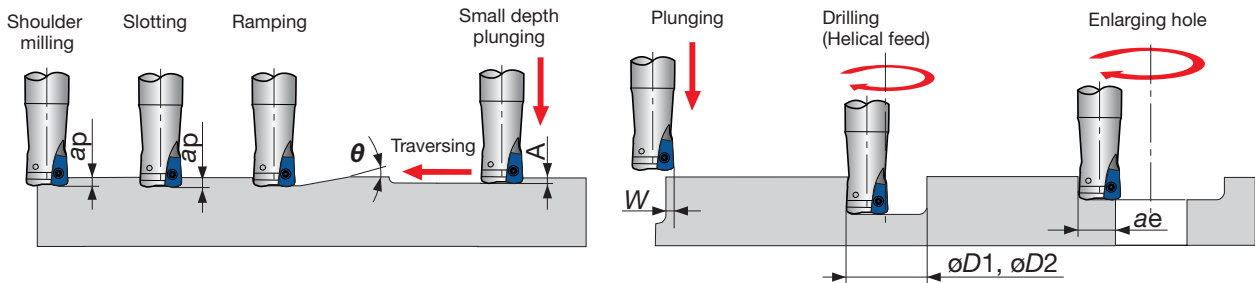
ISO	Workpiece material	Hardness	Priority	Grade	Chip-breaker	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	
P	Low carbon steel C15, C20, etc.	- 300 HB	First choice	AH3135	MJ	150 - 250	0.2 - 0.6	
		- 300 HB	Second choice	AH3135	ML	150 - 250	0.2 - 0.6	
	Carbon steel, Alloy steel C55, 42CrMoS4, etc.	- 300 HB	First choice	AH3135	MJ	150 - 250	0.2 - 0.6	
		- 300 HB	Second choice	AH3135	ML	150 - 250	0.2 - 0.6	
	Prehardened steel NAK80, PX5, etc.	30 - 40 HRC	First choice	AH3135	MJ	100 - 200	0.15 - 0.4	
		30 - 40 HRC	Second choice	AH3135	ML	100 - 200	0.15 - 0.4	
M	Stainless steel X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	First choice	AH3135	MJ	100 - 200	0.2 - 0.6	
		- 200 HB	Second choice	AH3135	ML	100 - 200	0.2 - 0.6	
	Stainless steel X12Cr113, X20Cr13, etc.	- 200 HB	First choice	AH3135	MJ	100 - 300	0.2 - 0.6	
		- 200 HB	Second choice	AH3135	ML	100 - 300	0.2 - 0.6	
K	Grey cast iron 250, 300, etc.	150 - 250 HB	First choice	AH120	MJ	150 - 250	0.2 - 0.6	
		150 - 250 HB	Second choice	AH120	ML	150 - 250	0.2 - 0.6	
	Ductile cast iron 400-15, 600-3, etc.	150 - 250 HB	First choice	AH120	MJ	150 - 250	0.2 - 0.6	
		150 - 250 HB	Second choice	AH120	ML	150 - 250	0.2 - 0.6	
H	Hardened steel	SKD61, etc	40 - 50 HRC	First choice	AH3135	MJ	50 - 150	0.1 - 0.3
			40 - 50 HRC	Second choice	AH3135	ML	50 - 150	0.1 - 0.3
	SKD11, etc	50 - 60 HRC	First choice	AH120	MJ	50 - 70	0.05 - 0.15	
		50 - 60 HRC	Second choice	AH120	ML	50 - 70	0.05 - 0.15	

HJ type

ISO	Workpiece material	Hardness	Priority	Grade	Chipbreaker	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	
P	Low carbon steel C15, C20, etc.	- 300 HB	First choice	AH3135	HJ	150-250	0.5-1.3	
			Second choice	AH120	HJ	150-250	0.5-1.3	
	Carbon steel, Alloy steel C55, 42CrMoS4, etc.	- 300 HB	First choice	AH3135	HJ	150-250	0.5-1.3	
			Second choice	AH120	HJ	150-250	0.5-1.3	
	Prehardened steel NAK80, PX5, etc.	30 - 40 HRC	First choice	AH3135	HJ	100-200	0.3-0.7	
			Second choice	AH120	HJ	100-200	0.3-0.7	
M	Stainless steel X5CrNi18-9, X5CrNiMo17-12-2, etc.	- 200 HB	First choice	AH3135	HJ	100-200	0.3-0.7	
			First choice	AH3135	HJ	100-300	0.3-0.7	
K	Grey cast iron 250, 300, etc.	150 - 250 HB	First choice	AH120	HJ	150-250	0.5-1.3	
	Ductile cast iron 400-15, 600-3, etc.	150 - 250 HB	First choice	AH120	HJ	150-250	0.5-1.3	
H	Hardened steel	SKD61, etc	40 - 50 HRC	First choice	AH3135	HJ	50-150	0.1-0.5
			40 - 50 HRC	Second choice	AH120	HJ	50-150	0.1-0.5
		SKD11, etc	50 - 60 HRC	First choice	AH120	HJ	50-70	0.05-0.2

Note: The values in the table are just for reference in case of general machining.

MACHINING APPLICATIONS



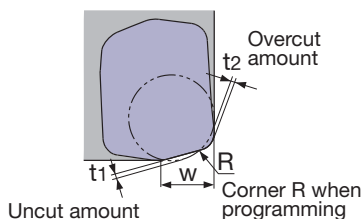
MJ / ML type

Designation	ϕDc	Max. depth of cut ap	Max. ramping angle θ	Max. plunging A	Max. cutting width in plunging W	Min. machining dia. $\phi D1$	Max. machining dia. $\phi D2$	Max. cutting width in enlarging ae
EXLN04M020C20.0R02	20	4	4.7°	0.8	4	28	38	15
EXLN04M025C25.0R03	25	4	3°	0.8	4	38	48	20
EXLN04M032C32.0R04	32	4	2°	0.8	4	50	62	27
EXLN04M032C32.0R05	32	4	1.7°	0.7	4	50	62	27
TXLN04M040B16.0R06	40	4	1.3°	0.7	4	68	78	36
TXLN04M050B22.0R07	50	4	1°	0.7	4	88	98	46
HXLN04M020M10R02	20	4	4.7°	0.8	4	28	38	15
HXLN04M025M12R03	25	4	3°	0.8	4	38	48	20
HXLN04M032M16R04	32	4	2°	0.8	4	50	62	27

HJ type




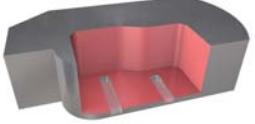
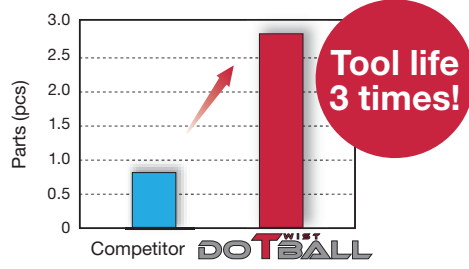
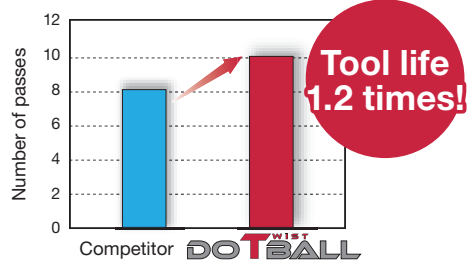
Designation	ϕDc	Max. depth of cut ap	Max. ramping angle θ	Max. plunging A	Max. cutting width in plunging W	Min. machining $\phi D1$	Max. machining $\phi D2$	Max. cutting width in enlarging ae
EXLN04M020C20.0R02	20	1.3	4.9°	0.75	4.1	27	38	15.5
EXLN04M025C25.0R03	25	1.3	3°	0.75	4.1	37	48	20.5
EXLN04M032C32.0R04	32	1.3	2°	0.75	4.1	51	62	27.5
EXLN04M032C32.0R05	32	1.3	2°	0.75	4.1	51	62	27.5
TXLN04M040B16.0R06	40	1.3	1.4°	0.75	4.1	67	78	35.5
TXLN04M050B22.0R07	50	1.3	1°	0.75	4.1	87	98	45.5
HXLN04M020M10R02	20	1.3	4.9°	0.75	4.1	27	38	15.5
HXLN04M025M12R03	25	1.3	3°	0.75	4.1	37	48	20.5
HXLN04M032M16R04	32	1.3	2°	0.75	4.1	51	62	27.5



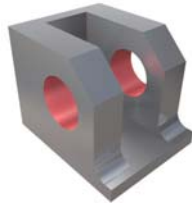
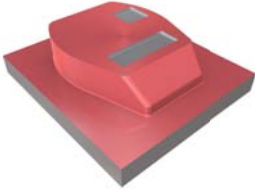
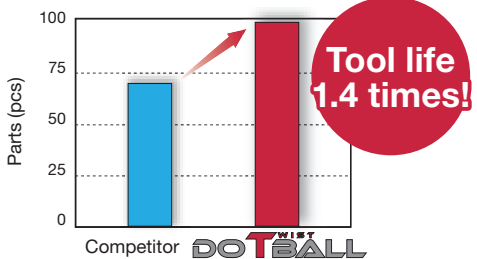
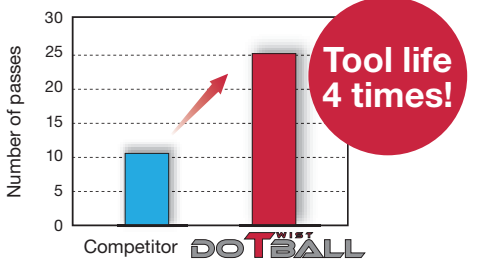
TOOL GEOMETRY ON PROGRAM



Max. depth of cut max. ap (mm)	W (mm)	Programmed corner R (mm)	Amount left uncut $t1$ (mm)	Amount left overcut $t2$ (mm)
1.3	4.1	R1.5	0.8	0
1.3	4.1	R2.0	0.65	0
1.3	4.1	R2.5	0.5	0.05

PRACTICAL EXAMPLES

Workpiece type		Turbine blade	Die and Mold
Cutter		EXLN04M032C32.0R04 ($\phi 32, z = 4$)	EXLN04M032C32.0R05 ($\phi 32, z = 5$)
Insert		LNMX0405R4-MJ 	LNMX0405R4-MJ 
Grade		AH3135	AH120
Workpiece material		13Cr-Mo stainless	DAC-MAGIC (48HRC)
		 M	 H
Cutting conditions	Cutting speed : V_c (m/min)	220	150
	Feed per tooth: f_z (mm/t)	0.30	0.33
	Feed speed : V_f (mm/min)	2,626	2,478
	Depth of cut : a_p (mm)	1.0	0.3
	Machining	Profile milling	Contour machining
	Coolant	Dry	Dry
	Machine	Mazak_640 MT Pro	MAKINO_HSK63
Results		 <p>DoTwistBall's tool life is 3 times longer than the competitor's.</p>	 <p>DoTwistBall's tool life is 1.2 times longer than the competitor's.</p>

Workpiece type	Machine part	Die and mold	
Cutter	EXLN04M032C32.0R05 ($\phi 32, z = 5$)	TXLN04M050B22.0R07 ($\phi 50, z = 7$)	
Insert	LNMX0405ZER-HJ	LNMX0405ZER-HJ	
Grade	AH3135 	AH120 	
Workpiece material	S50C / C50	DAC10 (48HRC)	
	 P	 H	
Cutting conditions	Cutting speed : V_c (m/min)	200	100
	Feed per tooth: f_z (mm/t)	0.8	0.44
	Feed speed : V_f (mm/min)	8,000	1,961
	Depth of cut : a_p (mm)	0.8	0.5
	Width of cut : a_e (mm)	32	-
	Machining	Helical contouring	Contour machining
	Coolant	Dry	Air
	Machine	BT40	MITSUBISHI_BT50
Results	 <p>DoTwistBall provides excellent chip evacuation, preventing chip packing.</p>	 <p>DoTwistBall extends tool life by 4 times compared to the competitor.</p>	

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