MillLine

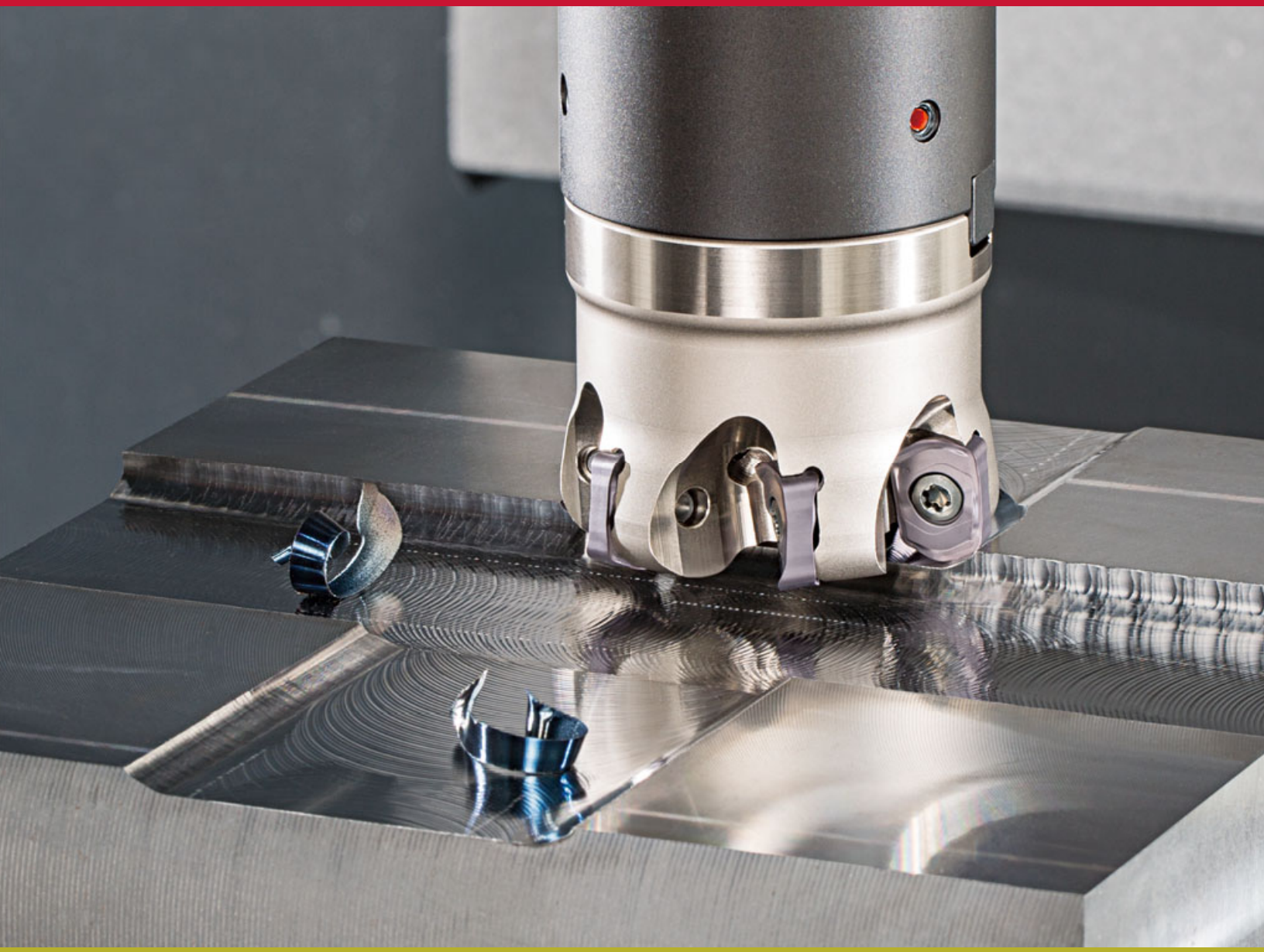
DOTBALL TWIST

www.tungaloy.com/us

Tungaloy Report No. 507-US

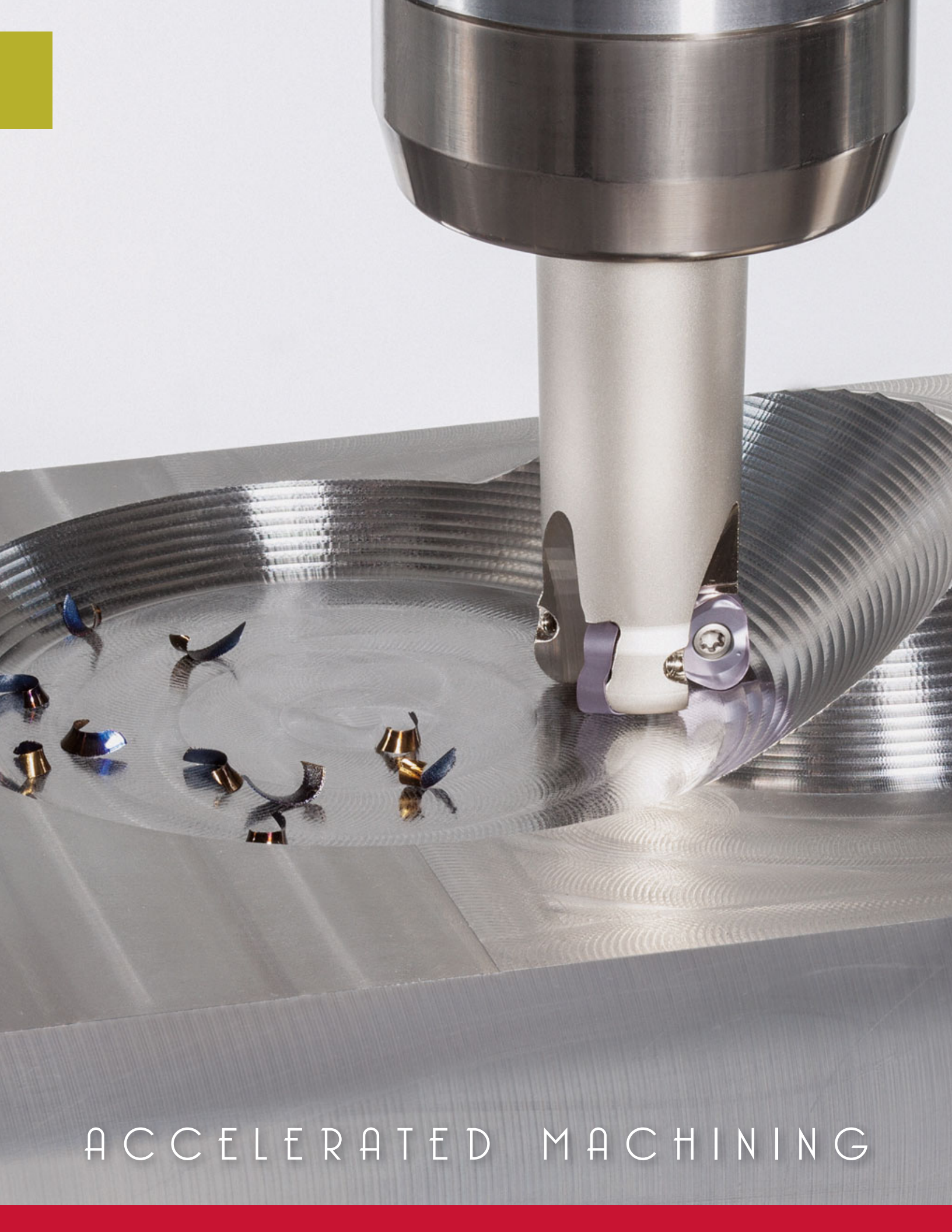
Member IMC Group Tungaloy

Profiling cutter with unique twisted insert - now available with R5, R6 and high feed inserts



INDUSTRY 4.0

FEED the SPEED!


ACCELERATED MACHINING

MillLine

TWIST DOTBALL

TUNGALOY

TUNG FORCE MILL

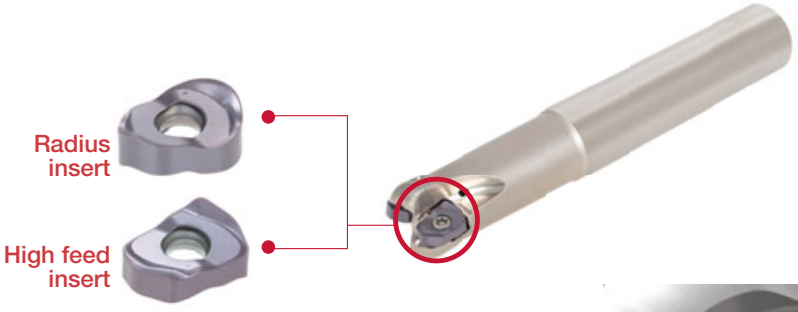
ACCELERATED MACHINING

Unique twisted insert in radius and high feed geometries ensures secure insert clamping for **high stability**.

High productive insert geometries: Reliable radius inserts + high feed insert with large depth of cut capability

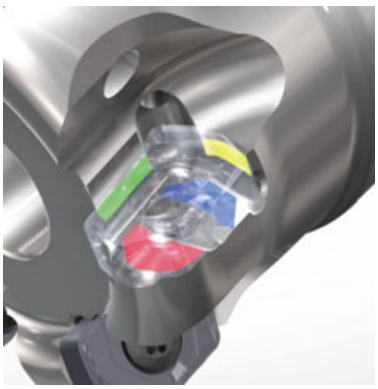
Multi-functional cutter body with superior reliability

Two types of inserts fit one cutter: radius and high efficiency inserts



Secure insert clamping to prevent insert from moving during machining

- Insert is securely fixed on four supporting places (Twist Clamping technology)
- No wedge is needed, providing extra space to allow smooth chip evacuation in various applications

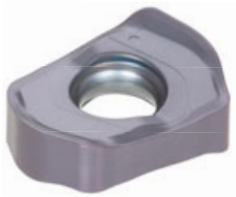


 Profiling

 Pocketing

Slotting (with radii)

High feed insert with greater depth of cut


LNMX-HJ

High machining efficiency with 30% greater depth of cut than conventional tool

- LNMX04-HJ : APMX = 0.051"
- LNMX06-HJ : APMX = 0.079"

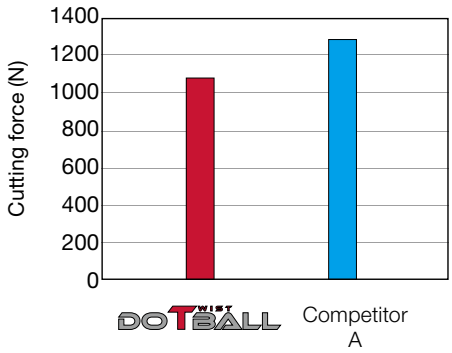
(Use DoFeed (Technical report #TR403) for light depths of cut)

Smooth chip control enables stable machining

- Chip is formed in a short spiral curl to avoid re-cutting during pocketing and slotting.

Helical cutting edge with large positive inclination angle reduces cutting load during machining

Cutting load comparison

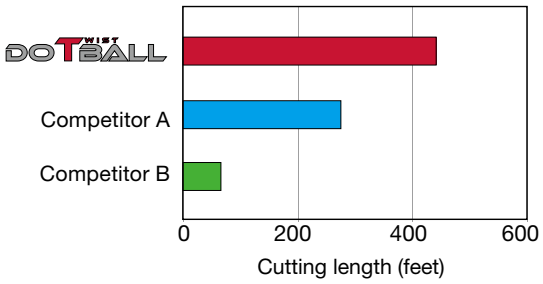


P Steel

Cutter : EXLN04U1.00C1.00R03 (ø = 1.0", z = 1)
Insert : LNMX0405ZER-HJ AH3135
Workpiece material : 1055
Cutting speed : *Vc* = 656 sfm
Feed per tooth : *fz* = 0.039 ipt
Depth of cut : *ap* = 0.039"
Width of cut : *ae* = 0.68"
Coolant : Dry

Stable tool life at large depths of cut

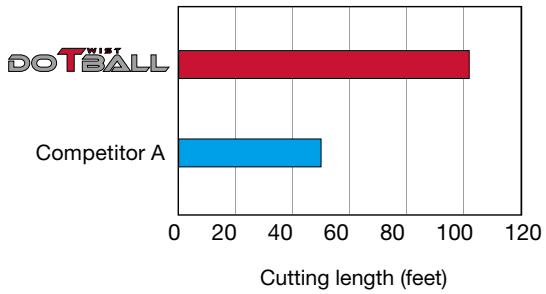
Tool life comparison in machining carbon steel



P Steel

Cutter : TXLN06U2.00B0.75R05 (ø = 2.0", z = 1)
Insert : LNMX0607ZER-HJ AH3135 New
Workpiece material : 1055
Cutting speed : *Vc* = 656 sfm
Feed per tooth : *fz* = 0.039 ipt
Depth of cut : *ap* = 0.079"
Width of cut : *ae* = 1.28"
Coolant : Dry

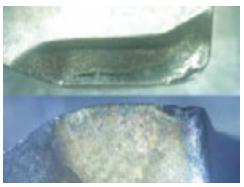
Tool life comparison in machining stainless steel



M Stainless

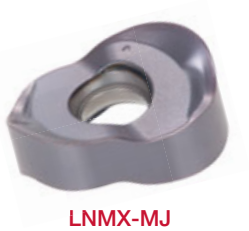
Cutter : EXLN04U1.00C1.00R03 (ø = 1.0", z = 1)
Insert : LNMX0405ZER-HJ AH3135
Workpiece material : 304
Cutting speed : *Vc* = 492 sfm
Feed per tooth : *fz* = 0.028 ipt
Depth of cut : *ap* = 0.039"
Width of cut : *ae* = 0.6"
Coolant : Dry (Air blow)

DOTBALL



Competitor A

Radius insert with high reliability (R4, R5, R6)



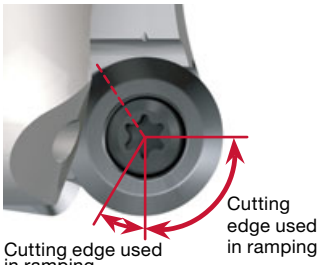
LNMX-MJ

Insert cross section is designed to be 2x as large as that of a round insert in an equivalent size for added robustness.

Conventional round insert

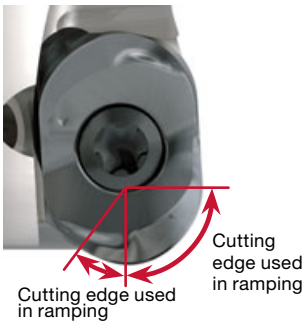
4 fully functional edges for ultimate insert economy

- 4 cutting edges on the insert are located apart from one another, designed to ensure full usage of all 4 cutting edges in 3D profiling applications



3 indexes are available in ramping

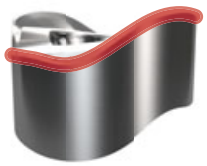
Conventional round insert



4 fully functional cutting edges per insert

Excellent chip evacuation in various applications

- Cutting edge generates perfect chip formation to improve machining reliability during slotting and pocketing operations, while promoting free cutting action.

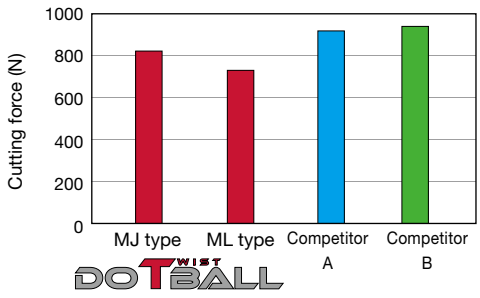


Chip formation comparison (slotting)

R5 insert, Shoulder mill

Round insert

Cutting load comparison



P Steel

Cutter	: TXLN06U2.00B0.75R05 (ø = 2.0", z = 5)
Insert	: LNMX0607R6-MJ AH3135
Workpiece material	: 1055
Cutting speed	: *Vc* = 492 sfm
Feed per tooth	: *fz* = 0.024 ipt
Depth of cut	: *ap* = 0.079"
Width of cut	: *ae* = 2.0"
Coolant	: Dry

New

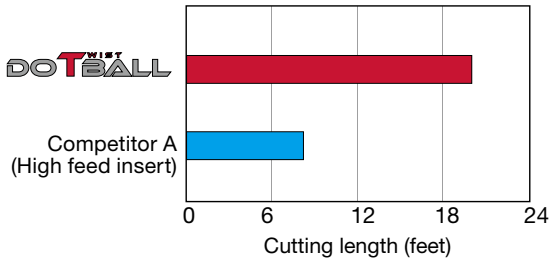
P Steel

Cutter	: EXLN04U1.00C1.00R03 (ø = 1.0", z = 1)
Insert	: LNMX0405R4-MJ AH3135 LNMX0405R4-ML AH3135
Workpiece material	: 1055
Cutting speed	: *Vc* = 656 sfm
Feed per tooth	: *fz* = 0.012 ipt
Depth of cut	: *ap* = 0.079"
Width of cut	: *ae* = 0.68"
Coolant	: Dry

- 2 types of chipbreakers are available for R4 insert
  MJ : First choice
  ML : Low cutting force

Insert life predictability – tool life comparison

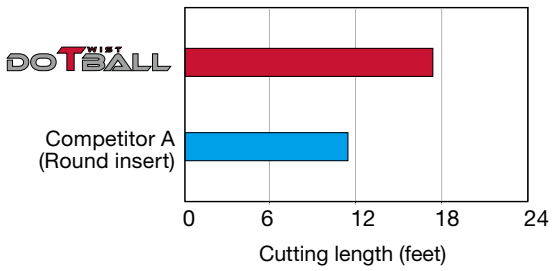
Tool steel



P
Steel

Cutter	: TXLN04U2.00B0.75R07 (ø = 2.0", z = 7)
Insert	: LNMX0405R4-MJ AH3135
Workpiece material	: D2 (300HB)
Cutting speed	: *Vc* = 623 sfm
Feed per tooth	: *fz* = 0.020 ipt
Depth of cut	: *ap* = 0.030"
Width of cut	: *ae* = 1.0"
Coolant	: Dry

Hard steels

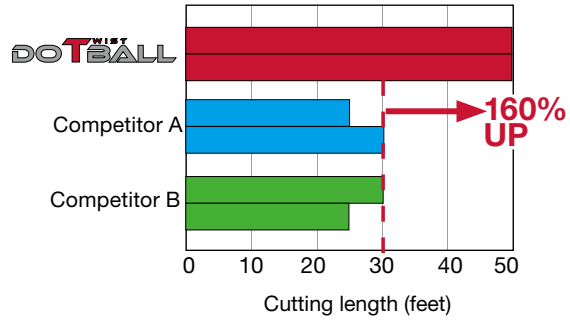


H
Hardness

Cutter	: TXLN06U2.00B0.75R05 (ø = 2.0", z = 1)
Insert	: LNMX0607R6-MJ AH120
Workpiece material	: H13 (55HRC)
Cutting speed	: *Vc* = 230 sfm
Feed per tooth	: *fz* = 0.006 ipt
Depth of cut	: *ap* = 0.039"
Width of cut	: *ae* = 1.28"
Coolant	: Dry

New

Stainless steel



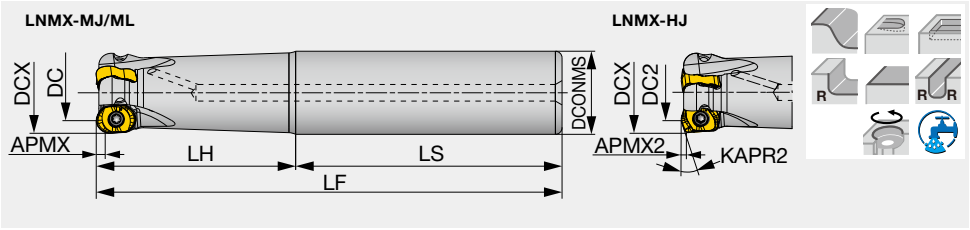
M
Stainless

Cutter	: EXLN04U1.00C1.00R03 (ø = 1.0", z = 1)
Insert	: LNMX0405R4-MJ AH3135
Workpiece material	: 420 (300 - 315HB)
Cutting speed	: *Vc* = 984 sfm
Feed per tooth	: *fz* = 0.008 ipt
Depth of cut	: *ap* = 0.079"
Width of cut	: *ae* = 0.48"
Coolant	: Dry (Air blow)

EXLN

Radius cutter with double-sided insert with 4 edges

A.R. = +3°, R.R. = -12° ~ -14°



Inch	APMX	APMX2	DCX	CICT	DC	DC2	KAPR2	DCONMS	LS	LH	LF	WT(lb)	Air hole	Insert
EXLN04U1.00C1.00R03	0.157	0.051	1	3	0.693	0.669	20	1.00	3	2.5	5.5	1.00	with	LNMX04...
EXLN04U1.25C1.25R04	0.157	0.051	1.25	4	0.941	0.917	20	1.25	3	3	6	1.80	with	LNMX04...
EXLN04U1.25C1.25R05	0.157	0.051	1.25	5	0.941	0.917	20	1.25	3	3	6	1.80	with	LNMX04...
New EXLN06U1.25C1.25R02	0.236	0.079	1.25	2	0.758	0.746	25	1.25	3	3	6	1.90	with	LNMX06..
New EXLN06U1.50C1.25R03	0.236	0.079	1.5	3	1.012	1.000	25	1.25	4	2	6	2.06	with	LNMX06..

Metric	APMX	APMX2	DCX	z	DC	DC2	KAPR2	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EXLN04M020C20.0R02	4	1.3	20	2	12.2	11.6	20	20	80	50	130	0.28	with	LNMX04...
EXLN04M025C25.0R03	4	1.3	25	3	17.2	16.6	20	25	80	60	140	0.46	with	LNMX04...
EXLN04M032C32.0R04	4	1.3	32	4	24.2	23.6	20	32	80	70	150	0.83	with	LNMX04...
EXLN04M032C32.0R05	4	1.3	32	5	24.2	23.6	20	32	80	70	150	0.83	with	LNMX04...
New EXLN05M025C25.0R02	5	-	25	2	15	-	-	25	90	60	150	0.54	with	LNMX05..
New EXLN05M032C32.0R04	5	-	32	4	21.9	-	-	32	80	70	150	0.87	with	LNMX05..
New EXLN06M032C32.0R02	6	2	32	2	19.6	19.3	25	32	80	70	150	0.90	with	LNMX06..
New EXLN06M040C32.0R04	6	2	40	4	27.6	27.3	25	32	100	50	150	0.95	with	LNMX06..

SPARE PARTS



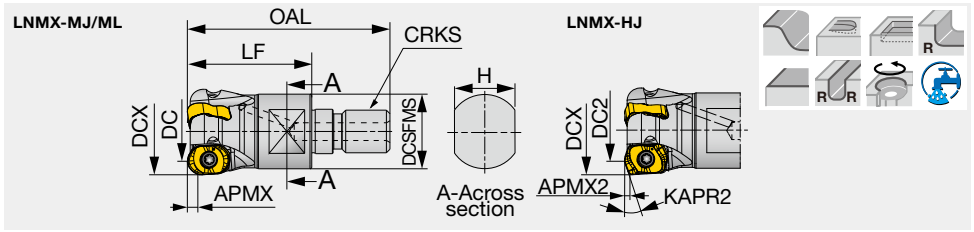

Designation	Clamping screw	Mono block type wrench	Torx bit	Grip
EXLN04...	CSPD-3	IP-10D	-	-
New EXLN06...	CSPB-5	-	BLDIP20/S7	H-TB2W

TUNGFLEX

HXLN04-M

Radius cutter with double-sided insert with 4 edges, Modular head with metric thread connection

A.R. = +3°, R.R. = -12° ~ -14°



Metric	APMX	APMX2	DCX	CICT	DC	DC2	KAPR2	OAL	LF	H	DCSFMS	CRKS	WT(kg)	Air hole	Insert
HXLN04M020M10R02	4	1.3	20	2	12.2	11.6	20	49	30	15	18	M10	0.07	with	LNMX04...
HXLN04M025M12R03	4	1.3	25	3	17.2	16.6	20	57	35	17	21	M12	0.16	with	LNMX04...
HXLN04M032M16R04	4	1.3	32	4	24.2	23.6	20	63	40	22	29	M16	0.20	with	LNMX04...
New *HXLN05M025M12R02	5	-	25	2	15	-	-	57	35	17	21	M12	0.10	with	LNMX05...
New *HXLN05M032M16R04	5	-	32	4	21.9	-	-	63	40	22	28.8	M16	0.20	with	LNMX05...
New HXLN06M032M16R02	6	2	32	2	19.6	19.3	25	63	40	22	28.8	M16	0.24	with	LNMX06...

* HJ geometry inserts aren't available for T/E/HXLN05 cutters.

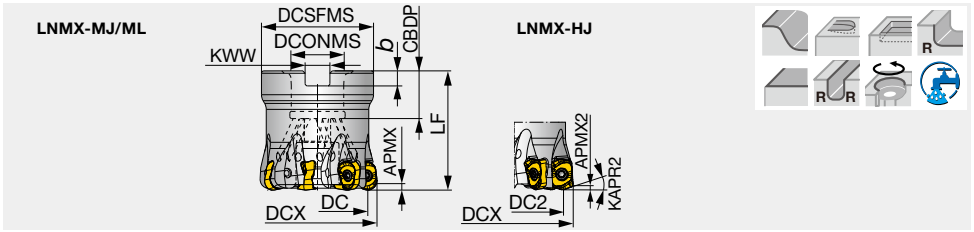
SPARE PARTS

Designation	Clamping screw	Mono block type wrench	Torx bit	Grip
HXLN04...	CSPD-3	IP-10D	-	-
New HXLN05...	CSPB-4S	-	BLDIP15/S7	H-TB2W
New HXLN06...	CSPB-5	-	BLDIP20/S7	H-TB2W

TXLN

Radius cutter with double-sided insert with 4 edges

A.R. = +3°, R.R. = -13°



Inch	APMX	APMX2	DCX	CICT	DC	DC2	KAPR2	DCSFMS	LF	DCONMS	CBDP	KWW	*b*	WT(lb)	Air hole	Insert
TXLN04U1.50B0.50R06	0.157	0.051	1.5	6	1.193	1.169	20	1.378	1.574	0.500	0.610	0.258	0.157	0.84	with	LNMX04...
TXLN04U2.00B0.75R07	0.157	0.051	2	7	1.693	1.669	20	1.850	1.969	0.750	0.750	0.315	0.197	1.10	with	LNMX04...
New TXLN06U2.00B0.75R05	0.236	0.079	2	5	1.511	1.499	25	1.850	1.969	0.750	0.750	0.315	0.197	1.17	with	LNMX06...
New TXLN06U2.50B0.75R06	0.236	0.079	2.5	6	2.009	1.997	25	2.323	1.969	0.750	0.750	0.315	0.197	1.90	with	LNMX06...
New TXLN06U3.00B1.00R07	0.236	0.079	3	7	2.510	2.498	25	2.835	2.480	1.000	1.024	0.374	0.236	3.47	with	LNMX06...

Metric	APMX	APMX2	DCX	CICT	DC	DC2	KAPR2	DCSFMS	LF	DCONMS	CBDP	KWW	*b*	WT(kg)	Air hole	Insert
TXLN04M040B16.0R06	4	1.3	40	6	32.2	31.6	20	35	40	16	18	8.4	5.6	0.35	with	LNMX04...
TXLN04M050B22.0R07	4	1.3	50	7	42.2	41.6	20	47	50	22	20	10.4	6.3	0.45	with	LNMX04...
New TXLN05M040B16.0R05	5	-	40	5	29.8	-	-	35	40	16	18	8.4	5.6	0.26	with	LNMX05...
New TXLN05M050B22.0R06	5	-	50	6	39.8	-	-	47	50	22	20	10.4	6.3	0.50	with	LNMX05...
New TXLN06M050B22.0R05	6	2	50	5	37.6	37.3	25	47	50	22	20	10.4	6.3	0.50	with	LNMX06...
New TXLN06M052B22.0R05	6	2	52	5	39.6	39.3	25	49	50	22	20	10.4	6.3	0.55	with	LNMX06...
New TXLN06M063B22.0R06	6	2	63	6	50.6	50.3	25	59	50	22	20	10.4	6.3	0.82	with	LNMX06...

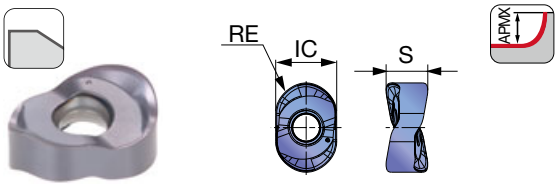
SPARE PARTS



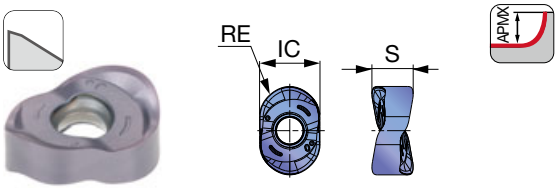
Designation	Clamping screw	Torx bit	Grip
TXLN04U...	CSPD-3	BLD IP10/S7	SW6-SD
New TXLN06U...	CSPB-5	BLDIP20/S7	H-TB2W

INSERT

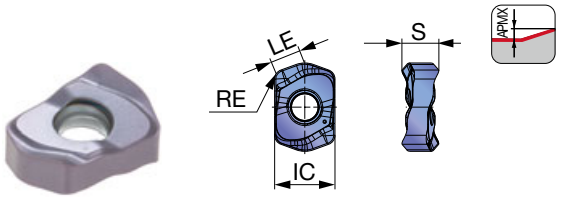
LNMX-MJ (Radius)



LNMX-ML (Radius)



LNMX-HJ (High feed)



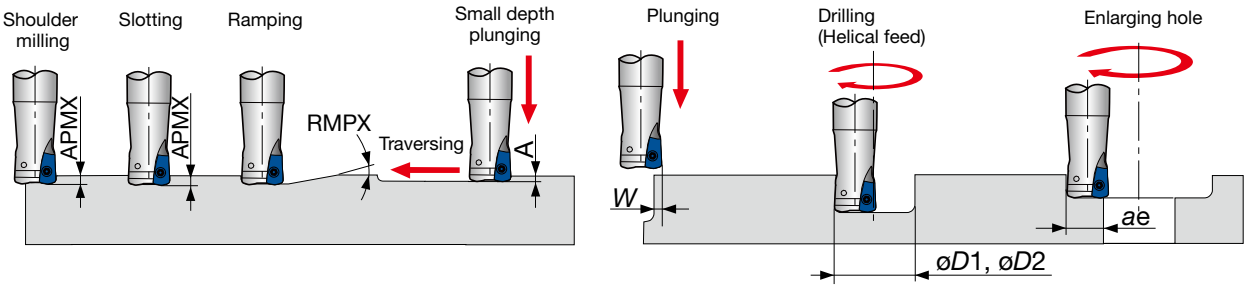
P	Steel	☆ ★
M	Stainless	★
K	Cast iron	★ ☆
N	Non-ferrous	
S	Superalloys	★ ☆
H	Hard materials	★ ★

★ : First choice
☆ : Second choice

	Designation	RE	APMX	Coated AH120	Coated AH3135	LE	IC	S
	LNMX0405R4-MJ	0.157	0.157	●	●	-	0.323	0.220
	LNMX0405R4-ML	0.157	0.157	●	●	-	0.323	0.220
	LNMX0405ZER-HJ	0.051	0.051	●	●	0.172	0.323	0.197
New	LNMX0506R5-MJ	0.197	0.197	●	●	-	0.409	0.240
New	LNMX0607R6-MJ	0.236	0.236	●	●	-	0.496	0.291
New	LNMX0607ZER-HJ	0.079	0.079	●	●	0.264	0.500	0.283

●: Line up

MACHINING APPLICATIONS



For Radius MJ, ML type

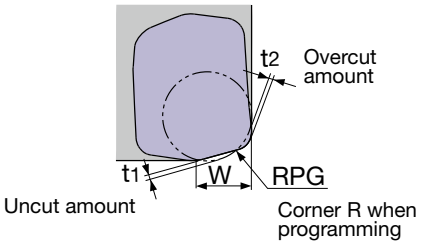
	Designation	DCX	Max. depth of cut APMX	Max. ramping angle RMPX	Max. plunging A	Max. cutting width in plunging W	Min. machining dia. øD1	Max. machining dia. øD2	Max. cutting width in enlarging ae
	EXLN04U1.00C1.00R03	1.000	0.157	3°	0.031	0.157	1.535	1.929	0.803
	EXLN04U1.25C1.25R04	1.250	0.157	1.9°	0.031	0.157	2.047	2.402	1.053
	EXLN04U1.25C1.25R05	1.250	0.157	1.9°	0.031	0.157	2.047	2.402	1.053
	TXLN04U1.50B0.50R06	1.500	0.157	1.2°	0.024	0.157	2.511	2.905	1.342
	TXLN04U2.00B0.75R07	2.000	0.157	1°	0.027	0.157	3.496	3.889	1.842
	HXLN04M020M10R02	0.787	0.157	4.7°	0.031	0.157	1.102	1.496	0.591
	HXLN04M025M12R03	0.984	0.157	3°	0.031	0.157	1.496	1.890	0.787
	HXLN04M032M16R04	1.260	0.157	2°	0.031	0.157	2.047	2.441	1.063
New	EXLN06U1.25C01.25R02	1.250	0.236	3.7°	0.039	0.354	1.732	2.421	0.827
New	EXLN06U1.50C01.25R03	1.500	0.236	4°	0.067	0.394	2.165	2.921	1.063
New	TXLN06U2.00B0.75R05	2.000	0.236	2.7°	0.067	0.394	3.150	3.921	1.575
New	TXLN06U2.50B0.75R06	2.500	0.236	2.3°	0.079	0.433	4.134	4.921	2.047
New	TXLN06U3.00B1.00R07	3.000	0.236	1.6°	0.071	0.394	5.157	5.921	2.559

For High Feed HJ type

	Designation	DCX	Max. depth of cut APMX	Max. ramping angle RMPX	Max. plunging A	Max. cutting width in plunging W	Min. machining øD1	Max. machining øD2	Max. cutting width in enlarging ae
	EXLN04U1.00C1.00R03	1.000	0.051	3°	0.030	0.161	1.496	1.929	0.803
	EXLN04U1.25C1.25R04	1.250	0.051	2°	0.030	0.161	2.008	2.441	1.053
	EXLN04U1.25C1.25R05	1.250	0.051	2°	0.030	0.161	2.008	2.441	1.053
	TXLN04U1.50B0.50R06	1.500	0.157	1.3°	0.024	0.157	2.456	2.905	1.342
	TXLN04U2.00B0.75R07	2.000	0.157	1°	0.027	0.157	3.456	3.889	1.842
	HXLN04M020M10R02	0.787	0.051	4.9°	0.030	0.161	1.063	1.496	0.610
	HXLN04M025M12R03	0.984	0.051	3°	0.030	0.161	1.457	1.890	0.807
	HXLN04M032M16R04	1.260	0.051	2°	0.030	0.161	2.008	2.441	1.083
New	EXLN06U1.25C01.25R02	1.250	0.079	5.7°	0.055	0.433	1.614	2.421	0.787
New	EXLN06U1.50C01.25R03	1.500	0.079	4.3°	0.059	0.433	2.087	2.921	1.024
New	TXLN06U2.00B0.75R05	2.000	0.079	2.7°	0.063	0.433	3.110	4.000	1.535
New	TXLN06U2.50B0.75R06	2.500	0.079	2°	0.067	0.433	4.094	4.921	2.008
New	TXLN06U3.00B1.00R07	3.000	0.079	1.4°	0.067	0.433	5.079	5.921	2.520

TOOL GEOMETRY ON PROGRAMMING FOR HIGH FEED

The following table shows the amount left uncut (t1) and overcut (t2).



	Max. depth of cut APMX (mm)	W (mm)	Programmed corner R RPG (mm)	Amount left uncut t1 (mm)	Amount overcut t2 (mm)
LNMX04-HJ	0.051	0.161	R0.059	0.031	0
	0.051	0.161	R0.079	0.026	0
	0.051	0.161	R0.098	0.020	0.002
	0.051	0.161	R0.118	0.014	0.008
LNMX06-HJ	0.079	0.236	R0.079	0.055	-
	0.079	0.236	R0.118	0.043	-
	0.079	0.236	R0.138	0.036	-
	0.079	0.236	R0.157	0.029	0.002
	0.079	0.236	R0.197	0.016	0.014

STANDARD CUTTING CONDITIONS FOR RADIUS (MJ, ML)

ISO	Workpiece material		Hardness	Priority	Grade	Chip-breaker	Cutting speed *Vc* (sfm)	Feed per tooth *fz* (ipt)
P	Low carbon steel 1015, 1020, etc.		- 200 HB	First choice	AH3135	MJ	325 - 980	100%APMX : 0.004 - 0.012 40%APMX : 0.012 - 0.028 20%APMX : 0.012 - 0.047
			- 200 HB	For low cutting force	AH3135	ML	325 - 980	
	Carbon steel, Alloy steel 1055, 4140, etc.		- 300 HB	First choice	AH3135	MJ	325 - 820	
			- 300 HB	For low cutting force	AH3135	ML	325 - 820	
	Prehardened steel NAK80, PX5, etc.		30 - 40 HRC	First choice	AH3135	MJ	325 - 655	
			30 - 40 HRC	For low cutting force	AH3135	ML	325 - 655	
M	Austenitic Stainless steel 304SS, 316SS, etc.		- 200 HB	First choice	AH3135	MJ	325 - 655	100%APMX : 0.004 - 0.010 40%APMX : 0.012 - 0.024 20%APMX : 0.012 - 0.039
			- 200 HB	For low cutting force	AH3135	ML	325 - 655	
	Martensitic Stainless steel 420SS etc.		- 200 HB	First choice	AH3135	ML	325 - 980	
			- 200 HB	For impact resistance	AH3135	MJ	325 - 980	
K	Grey cast iron Class 25, Class 30, etc.		150 - 250 HB	First choice	AH120	MJ	325 - 980	100%APMX : 0.004 - 0.012 40%APMX : 0.012 - 0.028 20%APMX : 0.012 - 0.047
			150 - 250 HB	For low cutting force	AH120	ML	325 - 980	
	Ductile cast iron 60-40-18, 80-55-06, etc.		150 - 250 HB	First choice	AH120	MJ	260 - 820	
			150 - 250 HB	For low cutting force	AH120	ML	260 - 820	
S	Titanium alloy Ti-6Al-4V, etc.		-	First choice	AH3135	ML	95 - 195	20%APMX : 0.004 - 0.028
			-	For impact resistance	AH3135	MJ	95 - 195	
	Superalloys Inconel718, etc.		-	First choice	AH120	ML	65 - 160	20%APMX : 0.002 - 0.010
			-	For impact resistance	AH120	MJ	65 - 160	
H	Hardened steel	H13, etc.	40 - 50 HRC	First choice	AH3135	MJ	160 - 490	20%APMX : 0.004 - 0.010
			40 - 50 HRC	For wear resistance	AH120	MJ	160 - 490	
		D2, etc.	50 - 60 HRC	First choice	AH120	MJ	160 - 225	10%APMX : 0.001 - 0.006

The above cutting parameters are for reference. Adjustments may be required depending on applications, machine powers and rigidity, and/or workpiece fixture/clamping methods.

STANDARD CUTTING CONDITIONS FOR HIGH FEED (HJ)

LNMX04-HJ

ISO	Workpiece material		Hardness	Priority	Grade	Chip-breaker	Cutting speed *Vc* (sfm)	Feed per tooth *fz* (ipt)
P	Low carbon steel 1015, 1020, etc.		- 300HB	First choice	AH3135	HJ	325 - 980	0.020 - 0.051
				For wear resistance	AH120			
	Carbon steel, Alloy steel 1055, 4140, etc.		- 300HB	First choice	AH3135	HJ	325 - 820	0.020 - 0.051
				For wear resistance	AH120			
	Prehardened steel NAK80, PX5, etc.		30 - 40HRC	First choice	AH3135	HJ	325 - 655	0.016 - 0.039
				For wear resistance	AH120			
M	Austenitic Stainless steel 304SS, 316SS, etc.		- 200HB	First choice	AH3135	HJ	325 - 655	0.012 - 0.035
	Martensitic Stainless steel 420SS etc.		- 200HB	First choice	AH3135	HJ	325 - 980	0.012 - 0.035
K	Grey cast iron Class 25, Class 30, etc.		150 - 250HB	First choice	AH120	HJ	325 - 980	0.020 - 0.051
				For impact resistance	AH3135			
	Ductile cast iron 60-40-18, 80-55-06, etc.		150 - 250HB	First choice	AH120	HJ	260 - 820	0.020 - 0.051
				For impact resistance	AH3135			
S	Titanium alloy Ti-6Al-4V, etc.		150 - 250HB	First choice	AH3135	HJ	95 - 195	0.012 - 0.028
	Superalloys Inconel718, etc.		150 - 250HB	First choice	AH120	HJ	65 - 160	0.004 - 0.012
H	Hardened steel	H13, etc.	40 - 50HRC	First choice	AH3135	HJ	160 - 490	0.004 - 0.020
				For wear resistance	AH120			
		D2, etc.	50 - 60HRC	First choice	AH120	HJ	160 - 225	0.002 - 0.008

LNMX06-HJ

ISO	Workpiece material		Hardness	Priority	Grade	Chip-breaker	Cutting speed *Vc* (sfm)	Feed per tooth *fz* (ipt)
P	Low carbon steel 1015, 1020, etc.		- 300HB	First choice	AH3135	HJ	325- 980	0.012 - 0.044
				For wear resistance	AH120			
	Carbon steel, Alloy steel 1055, 4140, etc.		- 300HB	First choice	AH3135	HJ	325 - 820	0.012 - 0.044
				For wear resistance	AH120			
	Prehardened steel NAK80, PX5, etc.		30 - 40HRC	First choice	AH3135	HJ	325 - 655	0.008 - 0.028
				For wear resistance	AH120			
M	Austenitic Stainless steel 304SS, 316SS, etc.		- 200HB	First choice	AH3135	HJ	325 - 655	0.008 - 0.028
	Martensitic Stainless steel 420SS etc.		- 200HB	First choice	AH3135	HJ	325 - 980	0.008 - 0.028
K	Grey cast iron Class 25, Class 30, etc.		150 - 250HB	First choice	AH120	HJ	325 - 980	0.012 - 0.044
				For impact resistance	AH3135			
	Ductile cast iron 60-40-18, 80-55-06, etc.		150 - 250HB	First choice	AH120	HJ	260 - 820	0.012 - 0.044
				For impact resistance	AH3135			
S	Titanium alloy Ti-6Al-4V, etc.		150 - 250HB	First choice	AH3135	HJ	95 - 195	0.006 - 0.024
	Superalloys Inconel718, etc.		150 - 250HB	First choice	AH120	HJ	65 - 160	0.002 - 0.012
H	Hardened steel	H13, etc.	40 - 50HRC	First choice	AH3135	HJ	160 - 490	0.004 - 0.012
				For wear resistance	AH120			
		D2, etc.	50 - 60HRC	First choice	AH120	HJ	160 - 225	0.002 - 0.006

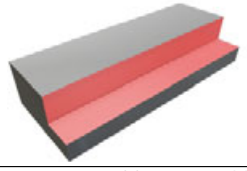
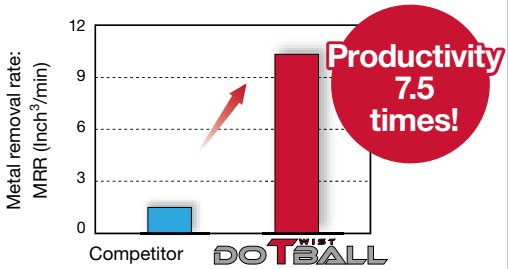
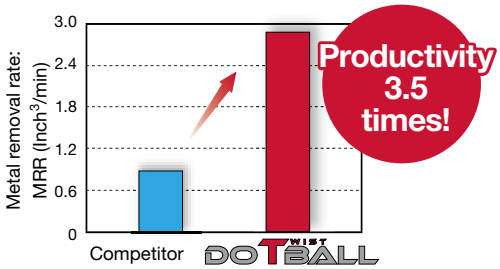
Tool dia: ø*D*c (in), Number of revolution: *n* (rpm), Feed speed: *V*f (ipm), Max. depth of cut: *a*p = 0.051", Number of teeth: z

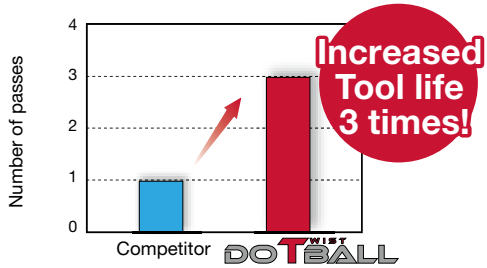
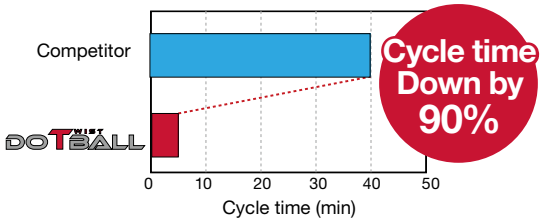
ø1.000, z = 3		ø1.250			ø1.500, z = 6		ø2.000, z = 7	
			*V*f					
n	*V*f	*n*	Coarse pitch (Z = 4)	Close pitch (Z = 5)	*n*	*V*f	*n*	*V*f
2,510	270	2,010	290	360	1,670	360	1,250	320
			*V*c = 656 sfm, *f*z = 0.036 ipt					
2,260	240	1,800	260	320	1,500	320	1,130	280
			*V*c = 590 sfm, *f*z = 0.036 ipt					
1,880	160	1,500	170	210	1,250	210	940	180
			*V*c = 492 sfm, *f*z = 0.028 ipt					
1,880	140	1,500	140	180	1,250	180	940	160
			*V*c = 492 sfm, *f*z = 0.024 ipt					
2,510	180	2,010	190	240	1,670	240	1,250	210
			*V*c = 656 sfm, *f*z = 0.024 ipt					
2,510	270	2,010	290	360	1,670	360	1,250	320
			*V*c = 656 sfm, *f*z = 0.036 ipt					
2,010	220	1,600	230	290	1,340	290	1,000	250
			*V*c = 525 sfm, *f*z = 0.036 ipt					
560	30	450	40	50	380	50	280	40
			*V*c = 148 sfm, *f*z = 0.02 ipt					
380	10	300	10	10	250	10	190	10
			*V*c = 98 sfm, *f*z = 0.008 ipt					
1,250	50	1,000	50	60	840	60	630	50
			*V*c = 328 sfm, *f*z = 0.012 ipt					
750	10	600	10	20	500	20	380	10
			*V*c = 197 sfm, *f*z = 0.005 ipt					

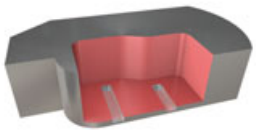
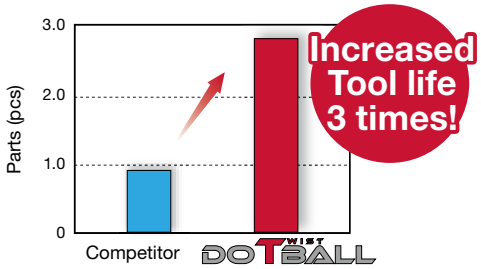
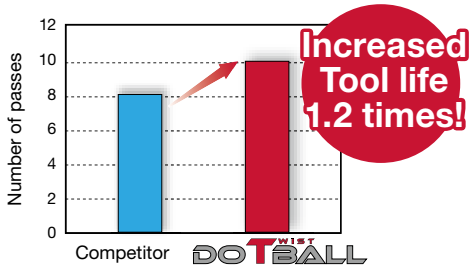
Tool dia: ø*D*c (in), Number of revolution: *n* (rpm), Feed speed: *V*f (ipm), Max. depth of cut: *a*p = 0.079", Number of teeth: z

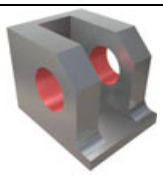
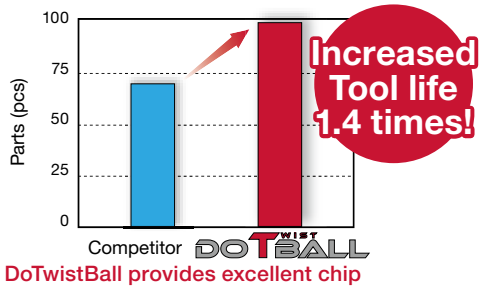
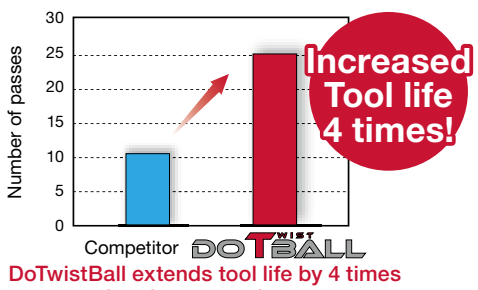
ø1.260, z = 2		ø1.575, z = 4		ø1.969, z = 5		ø2.047, z = 5		ø2.480, z = 6	
n	*V*f	*n*	*V*f	*n*	*V*f	*n*	*V*f	*n*	*V*f
2,010	110	1,670	140	1,250	180	1,000	170	840	160
				*V*c = 656 sfm, *f*z = 0.028 ipt					
1,800	100	1,500	130	1,130	160	900	150	750	150
				*V*c = 590 sfm, *f*z = 0.028 ipt					
1,500	50	1,250	70	940	80	750	80	630	80
				*V*c = 492 sfm, *f*z = 0.018 ipt					
1,500	50	1,250	70	940	80	750	80	630	80
				*V*c = 492 sfm, *f*z = 0.018 ipt					
2,010	70	1,670	90	1,250	110	1,000	110	840	110
				*V*c = 656 sfm, *f*z = 0.018 ipt					
2,010	110	1,670	140	1,250	180	1,000	170	840	160
				*V*c = 656 sfm, *f*z = 0.028 ipt					
1,600	90	1,340	110	1,000	140	800	130	670	130
				*V*c = 525 sfm, *f*z = 0.028 ipt					
450	14	380	17	280	21	230	21	190	20
				*V*c = 148 sfm, *f*z = 0.015 ipt					
300	4	250	5	190	7	150	6	130	6
				*V*c = 98 sfm, *f*z = 0.007 ipt					
1,000	16	840	20	630	25	500	24	420	24
				*V*c = 328 sfm, *f*z = 0.008 ipt					
600	5	500	6	380	8	300	7	250	7
				*V*c = 197 sfm, *f*z = 0.004 ipt					

PRACTICAL EXAMPLES

Workpiece type		Fixture part	Slide core
Cutter		EXLN04U1.00C1.00R03 (ø1", z = 3)	EXLN04U1.00C1.00R03 (ø1", z = 3)
Insert		LNMX0405R4-MJ	LNMX0405R4-MJ
Grade		AH3135	AH3135
Workpiece material		304	NAK80 (40HRC)
		 M	 P
Cutting conditions	Cutting speed : *Vc* (sfm)	722 ← 394	492
	Feed per tooth: *fz* (ipt)	0.016 ← 0.004	0.012 ← 0.006
	Feed speed : *Vf* (ipm)	132 ← 21	67 ← 23
	Depth of cut : *ap* (in)	0.138 ← 0.118	0.157 ← 0.197
	Width of cut : *ae* (in)	0.591	0.276 ← 0.197
	Machining	Shoulder milling	Shoulder milling
	Coolant	External supply	External supply
	Machine	Vertical M/C	Vertical M/C
Results		 Feed per tool is improved by 4x, MRR by 7.5 times.	 A combination of large insert radius and tough AH3135 grade eliminated chipping even when machined at higher feed per tooth.

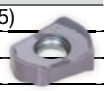
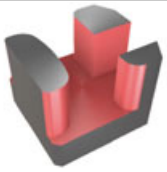
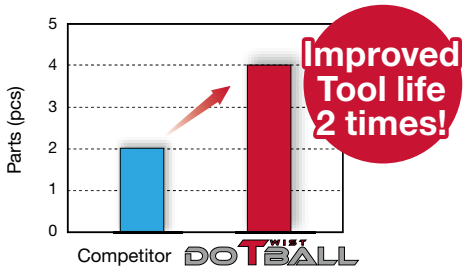
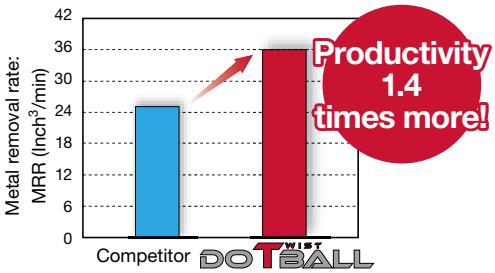
Workpiece type		Fixture part	Stamping die part
Cutter		TXLN06U2.50B0.75R06 (ø2.5", z = 6)	EXLN04U1.00C1.00R03 (ø1", z = 3)
Insert		LNMX0607R6-MJ New	LNMX0405ZER-HJ
Grade		AH120	AH3135
Workpiece material		Stellite (60HRC)	YXR3 (before hardening)
		 H	 P
Cutting conditions	Cutting speed : *Vc* (sfm)	164	623 ← 771
	Feed per tooth: *fz* (ipt)	0.008	0.031 ← 0.016
	Feed speed : *Vf* (ipm)	8 ← 4	220 ← 94
	Depth of cut : *ap* (in)	0.079	0.051 ← 0.012
	Width of cut : *ae* (in)	1.575	0.984
	Machining	Face milling	Slotting and face milling
	Coolant	Air	External supply
	Machine	Vertical M/C (CAT50)	Vertical M/C
Results		 Superior cutting edge integrity eliminated fracture, improving tool life reliability.	 Increased cutting depth and feed per tooth reduced the cycle time to 1/10.

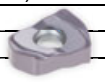
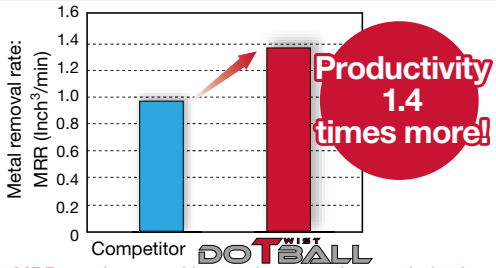
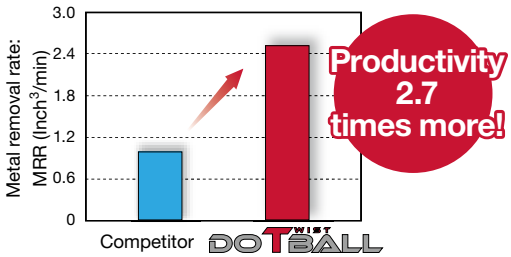
	Workpiece type	Turbine blade	Die and Mold
	Cutter	EXLN04U1.00C1.00R03 (ø1", z = 4)	EXLN04U1.25C1.25R05 (ø1.25", z = 5)
	Insert	LNMX0405R4-MJ	LNMX0405R4-MJ
	Grade	AH3135	AH120
	Workpiece material	410SS	DAC-MAGIC (48HRC)
		 M	 H
Cutting conditions	Cutting speed : *Vc* (sfm)	722	492
	Feed per tooth: *fz* (ipt)	0.012	0.013
	Feed speed : *Vf* (ipm)	103	98
	Depth of cut : *ap* (in)	0.039	0.012
	Machining	Profile milling	Contour machining
	Coolant	Dry	Dry
	Machine	Turning center	Vertical M/C
	Results	 DoTwistBall's tool life is 3 times longer than the competitor's.	 DoTwistBall's tool life is 1.2 times longer than the competitor's.

	Workpiece type	Machine part	Die and mold
	Cutter	EXLN04U1.25C1.25R05 (ø1.25", z = 5)	TXLN04U2.00B0.75R07 (ø2", z = 7)
	Insert	LNMX0405ZER-HJ	LNMX0405ZER-HJ
	Grade	AH3135	AH120
	Workpiece material	1049	DAC10 (48HRC)
		 P	 H
Cutting conditions	Cutting speed : *Vc* (sfm)	656	328
	Feed per tooth: *fz* (ipt)	0.031	0.017 ← 0.015
	Feed speed : *Vf* (ipm)	315	77
	Depth of cut : *ap* (in)	0.031	0.020
	Width of cut : *ae* (in)	1.260	-
	Machining	Helical contouring	Contour machining
	Coolant	Dry	Air
	Machine	CAT40	Vertical M/C (CAT50)
	Results	 DoTwistBall provides excellent chip evacuation, preventing chip packing.	 DoTwistBall extends tool life by 4 times compared to the competitor.

DOTWISTBALL TUNGALOY

PRACTICAL EXAMPLES

		Planetary carrier	Stamping die part
Workpiece type			
Cutter		EXLN04U1.25C1.25R05 (ø1.25", z = 5)	TXLN06U2.00B0.75R05 (ø2", z = 5)
Insert		LNMX0405ZER-HJ 	LNMX0607ZER-HJ New 
Grade		AH3135	AH3135
Workpiece material		347  M	No35B  K
Cutting conditions	Cutting speed : *Vc* (sfm)	459 ← 394	492
	Feed per tooth: *fz* (ipt)	0.028 ← 0.008	0.047
	Feed speed : *Vf* (ipm)	192 ← 28	236
	Depth of cut : *ap* (in)	0.047 ← 0.157	0.079 ← 0.059
	Width of cut : *ae* (in)	1.260	1.969
	Machining	Profile milling	Profile and face milling
	Coolant	Air	None (dry)
	Machine	Vertical M/C (CAT50)	Double column (CAT50)
Results		 DoTwistBall's tool life is 2 times longer than the competitor's.	 Chip re-cutting was eliminated, while tool life was doubled. MRR was also doubled.

		Arm part for heavy equipment	Base plate
Workpiece type			
Cutter		EXLN04U1.25C1.25R04 (ø1.25", z = 4)	EXLN04U1.25C1.25R04 (ø1.25", z = 4)
Insert		LNMX0405ZER-HJ 	LNMX0405ZER-HJ 
Grade		AH3135	AH3135
Workpiece material		65-35  P	Steel (20HRC)  P
Cutting conditions	Cutting speed : *Vc* (sfm)	656	492
	Feed per tooth: *fz* (ipt)	0.014 ← 0.018	0.031 ← 0.024
	Feed speed : *Vf* (ipm)	112.795 ← 96.063	187.992 ← 70.512
	Depth of cut : *ap* (in)	0.047 ← 0.039 (per pitch of helix)	0.020
	Width of cut : *ae* (in)	0.394	0.709
	Machining	Helical interpolation	Ramping and pocketing
	Coolant	External supply	External supply
	Machine	Horizontal M/C	Vertical M/C
Results		 MRR was improved by 1.4 times at a larger pitch of helix. Improved chip control provided stability during machining.	 High density cutter with low cutting force geometry improved MRR by 2.7x and tool life by 2.3 times.

Check our site and our App to get more info!

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