

Thread Whirling

Features



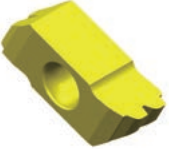
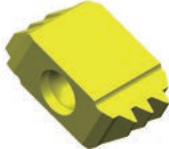
WATCH ON
New Double-lead video is on [YouTube](#)



- NTK's unique patented design technology makes precise and correct inserts possible the first time, *without any redesign or remanufacturing even if it is a multiple-lead thread*
- The sharper cutting edges produce a better surface finish and longer tool life than competitor's inserts

Form Double-lead or Multiple-lead with Single Pass

Patented

	Double-lead threads	Triple-lead threads
Work	Bone screw	Worm gear
Work material	Ti-6Al-4V ELI	brass
Work appearance		
Insert appearance		
Major Dia.	$\phi .157$ "(4.0mm)	$\phi .278$ "(7.0mm)
Minor Dia.	$\phi .094$ "(2.4mm)	$\phi .185$ "(4.7mm)
Lead [Pitch×No. of Lead]	.135"(3.42mm) [.067"×2(1.71mm×2)]	.193"(4.9mm) [.064"×3(1.63mm×3)]

- Can reduce cycle time by more than half
- NTK can achieve what other competitors cannot

Double-lead Bone Screw Process Example

- 1 1st thread whirl at taper part
- 2 Rotate the bar 180° and whirl the 2nd thread on same part as **1**
- 3 Thread whirl whole straight part
- 4 Thread whirl at very last part to get two-exits, after back of bar has been backed up a half lead (one pitch) and rotated 180°

Special Item Capability

- Even though almost all bone screw shapes are special, NTK thread whirling inserts can make the correct shape of thread the first time, without any redesign or remanufacturing
- Inserts will be delivered in 5 weeks after the order is received
- Within a 3 week time period, expedite delivery is available with an expedite fee
- Basically NTK thread whirling inserts are ground with topping and coated

Recommended Cutting Conditions

No. of teeth		9	6	4	
Conditions					
Main spindle	RPM	10 - 40	10 - 25	7 - 15	Faster RPM reduces machining time
	F	5400 - 14400	3600 - 9000	2500 - 5400	
Whirling cutter	RPM	1500 - 4000			
Feed Rate		Same as thread-lead			
Bar stock	φ	~φ .400" *		~φ .200"	* For cutter with φ 12mm ID
Work Material		Ti-6Al-4V ELI / 316SS / Titanium			

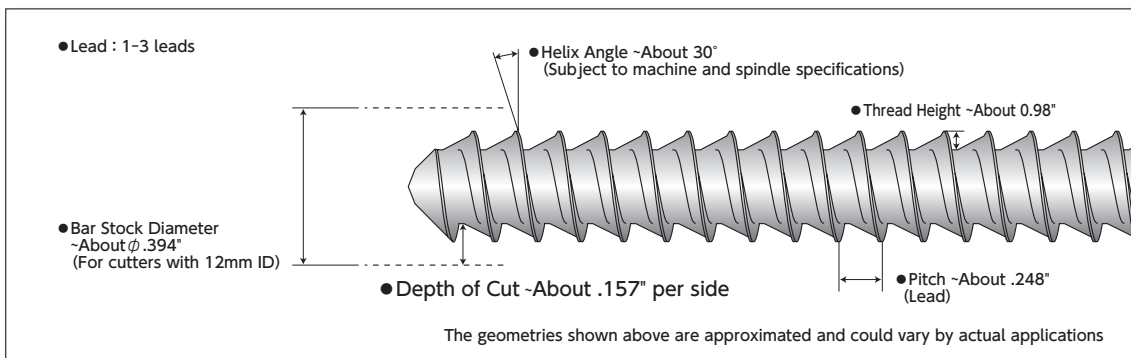
- Formula for calculating thread whirling process time

$$T \text{ (Seconds)} = \frac{60 \times \text{Thread length}}{\text{Main spindle rpm} \times \text{Feed rate (Thread lead)}}$$

Ex.) Double lead / 2" length / .100" lead (2×.050" pitch) / 30 rpm

$$T \text{ (Seconds)} = \frac{60 \times 2}{30 \times .100"} = 40 \text{ Seconds}$$

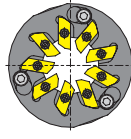
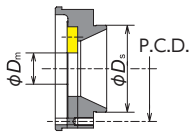
Applicable Thread Geometry (Approximated)



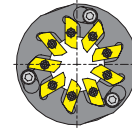
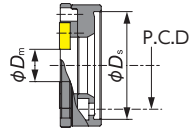
Thread Whirling System



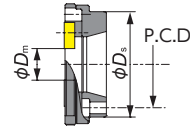
Type 1



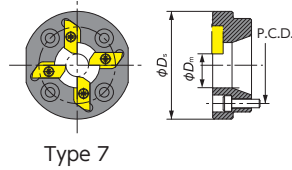
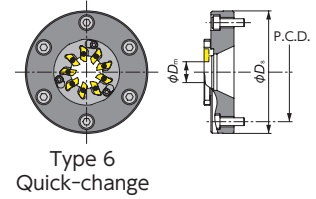
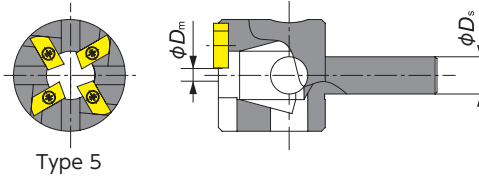
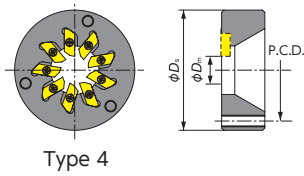
Type 2
Quick-change



Type 3
Quick-change



Machine make	Model	Location	Spindle make	Spindle model	Helix angle	NTK Thread whirling system	Stock	No. of tooth	ϕD_m (mm)	Type	ϕD_s	P.C.D.	Mount adapter bolt											
CITIZEN	M ₃₂ -VIII	Gang		BTW-4000	0° - 15°	TWC9C0746HP1	●	9	$\phi 12$	1	$\phi 46$	$\phi 35$	M3											
	L20/L20E/L20X	Gang		BTW-3000 BTW-3100	0° - 15°																			
	L32/L32X			BTW-3100	0° - 15°																			
	D25	Gang	CITIZEN	BTW-6000	±25°	TWC9C1040HP1 TWC6C1040HP1 TWC9C1040HP1-D16	●	9	$\phi 12$	1	$\phi 33$	$\phi 40$	M3 (Provided with spindle)											
	L32X				±25°																			
	L20X				0° - 15°																			
	M16			BTW-5000	±25°																			
	A20				0° - 15°																			
	A32			BTW-2000	±25°																			
	L20/L20X				±25°																			
	L32/L32X																							
	M20																							
	M32																							
	C32																							
	L20																							
	M20			BTW-1000	±25°																			
	M ₃₂	+20° - -25° ±25°																						
	C12/16	Gang	CITIZEN	LTR0170 LTR0128/LTR0168	±15°	TWC9C1037P2	●	9	$\phi 12$	2	$\phi 37$	$\phi 30.5$	CS0310(M3)											
	M12/16	Turret												MSW105										
	M12/16III													KSW110										
M20/32III	Gang	LTR0183		±15°	TWC9J1040P2	●	9	$\phi 12$	2	$\phi 40$	$\phi 32.5$	H-M4 × 12												
L20																								
M20/32																								
M20/32	Turret	LTR0169																						
K16	Attachment	PCM	GSW-101	±15°	TWC6P1620HP1-D9	●	6	$\phi 9$	1	$\phi 32$	$\phi 26$	M4 (Provided with spindle)												
L20	Gang		LSW-101-L20	±10°	TWC9P1340P2	●	9	$\phi 12$	2	$\phi 40$	$\phi 32.5$	M4 (Provided with spindle)												
M12/16	Turret		MSW-101																					
M20/M32			KSW-101																					
STAR	SW-12	Attachment	STAR	10159	±20°	TWC4S1433HP1	●	4	$\phi 8$	7	$\phi 38$	$\phi 27$	CS0310(M3)											
	ECAS-12/20			54178	±10°																			
	SB-20R			0M171	-20° - 0°																			
	SR-20J/20RIII 20RIV/32JII			68172	-20° - 0°																			
	ECAS-20T	Turret		59172	±20°	TWC9S1640P2	●	9	$\phi 12$	3	$\phi 40$	$\phi 33$	CS04148S(M4)											
	ECAS-32T			58171																				
	SR-38			10172																				
	ST-38			43156																				
	SV-12			45172																				
	SV-20/SV-20R			42173																				
	SV-32			43172																				
	SV-38R			43156																				
	BH20/BH38			Turret										TSUGAMI	3263-Y481	±10°	TWC9TS2252P2	●	9	$\phi 12$	3	$\phi 52$	$\phi 42$	CS0515(M5)
	BS20			Attachment											3214-Y1371	±10°	TWC9TS20550P2	●	9	$\phi 16$	3	$\phi 50$	$\phi 40$	CS0515(M5)
SS20/SS26/SS32 B0265/B0266-II B0325/B0326-II	Attachment	3268-Y450 3268-Y451	0° - 10°	TWC9TS2244HP1	●	9	$\phi 12$	4	$\phi 52$	$\phi 44$	CS0520(M5)													
S205/S206		3281-Y450 3281-Y451	0° - 20°	TWC9TS1944HP1	●	9	$\phi 12$	4	$\phi 52$	$\phi 44$	CS0520(M5)													
B0123/B0124/B0125/ B0126-II/III B0203/B0204/B0205/ B0205/B0206-II/III		3220-Y6540 3220-Y6541	0° - 25°	TWC9TS1644HP1	●	9	$\phi 12$	4	$\phi 52$	$\phi 44$	CS0515(M5)													
SS20/SS26/SS32		3268-Y271	0° - 10° 0° - 20°	TWC9TS1952P2BK TWC9TS1652P2BK	●	9	$\phi 12$	4	$\phi 52$	$\phi 38$	$\phi 38$	CS0515(M5) CS0515(M5)												
SS207/SS267/SS327		-	Using B-axis	0° - 15°	TWC4TS3010HP1	●	4	$\phi 7$	5	$\phi 10$	For single-corner inserts only													



Machine make	Model	Location	Spindle make	Spindle model	Helix angle	NTK Thread whirling system	Stock	No. of tooth	ϕD_m (mm)	Type	ϕD_s	P.C.D.	Mount adapter bolt
TORNOS	DECO 10/10a	Attachment	TORNOS	224-1900	$\pm 15^\circ$	TWC6TO11542HP1	●	6	$\phi 12$	4	$\phi 42$	$\phi 32$	CS0410(M4)
	Evo DECO 10/10			242-1900									
	DECO 13a/13e			226-1900	$\pm 15^\circ$	TWC9TO10540P2	●	9	$\phi 12$	3	$\phi 40$	$\phi 31$	CS0410(M4)
	Evo DECO 16/10			243-1900									
	Swiss ST26			246-1900									
	DECO 20a			223-1900									
	DECO 26a			225-1900	$\pm 25^\circ$	TWC9TO12050P2-D18	●	9	$\phi 18$	3	$\phi 50$	$\phi 40$	CS0410(M4)
	Sigma 20			234-2750									
Sigma 32	236-2750												
HASEGAWA	JS-1W	—	HASEGAWA	—	$0^\circ - 20^\circ$	TWC9HA22594P2	●	9	$\phi 16$	6	$\phi 94$	$\phi 76$	CS0620(M6)

■ Spare Insert Holder (Cartridge)

Item number	No. of tooth	ϕD_m (mm)	Compatible cutters
TWC6HP2	6	12	For Type 2 and Type 3*
TWC9HP2	9	12	For Type 2 and Type 3*
TWC9HP2-D16	9	12	For Type 6

Note: Insert holder comes with insert screws and wrench
Insert holder mounting screw is not included

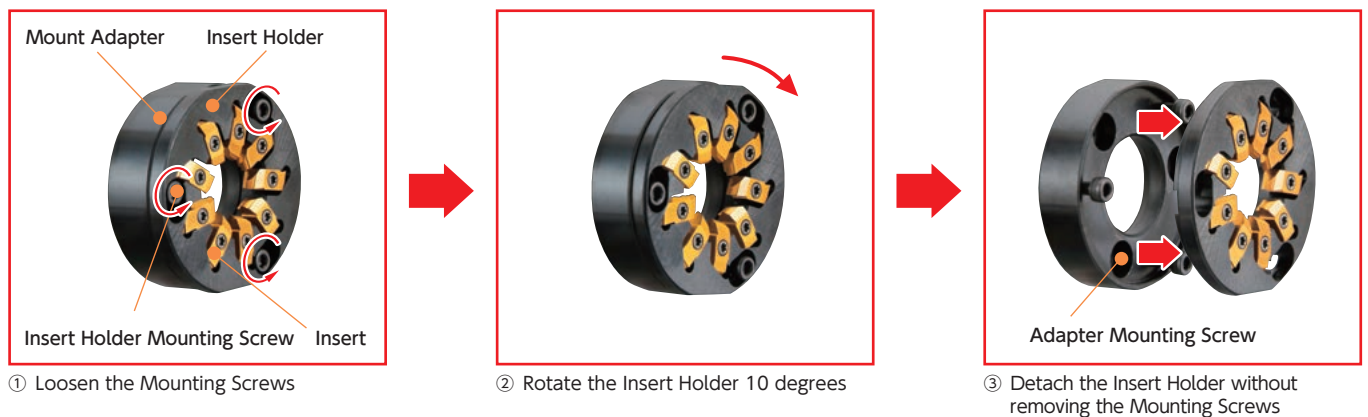
*Cannot be used for TWC9TS20550P2, TWC9TO12050P2-D18 and TWC9HA22594P2

■ Spare Parts

Description		Item number
Insert Screw	For 4mm thick inserts	FSI17-2.2×6.0
	For 6.5mm thick inserts	FSI24-2.2×7.9
Wrench		T-07
Insert Holder Mounting Bolt		CS0309-TW

NTK's Unique Attachment System

NTK's whirling insert holder can be attached and detached without removing mounting screws



● : Stock
● : Stock (Newly added)
■□□□ : While stocks last

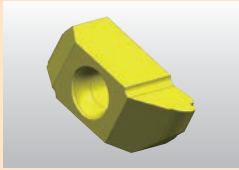
R L : Stock (Right / Left-hand only)
R L : Stock (Right / Left-hand only, Newly added)
Ⓜ : Mirror finish

○ : 1-2 week delivery
○ : 1-2 week delivery (Newly added)
⦿ : Coolant through

Ⓜ : 1-2 week delivery (Right / Left-hand only)
Ⓜ : 1-2 week delivery (Right / Left-hand only, Newly added)

Basic Insert Grade

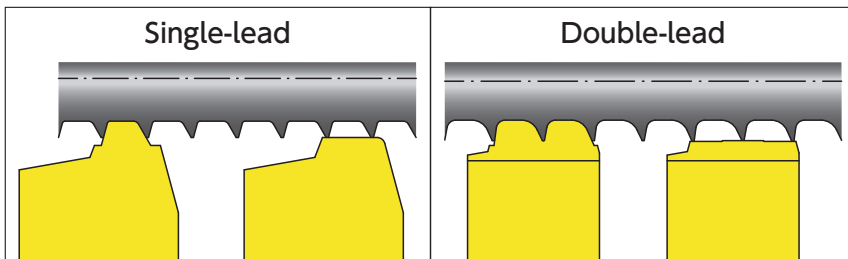
ZM3



- ZM3 is our basic grade for NTK thread whirling
- ZM3 offers excellent surface finish
- NTK can make inserts with other coatings to meet customers demands

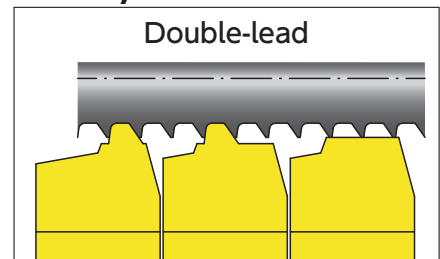
NTK Experiences and Solutions Example

For absolute flat on OD



- Two insert combination brings absolute flat on OD to meet the drawing

For tiny thread

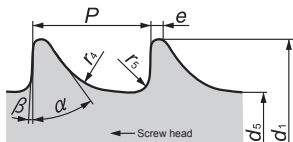


- NTK's Thread Whirling system can machine small diameter multi-lead screws to spec, with lower tool pressure, by using several types of specially designed and accurately ground inserts on the cutter.

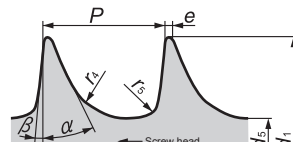
Standard Thread Whirling Inserts (two-sided) for Medical ISO Style Threads

4mm thickness insert

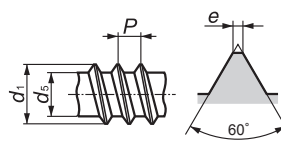
(Note: Must use Thread whirling cutters with 12mm ϕ Dm dimension. See page U18-19 to find ϕ Dm for each cutter.)



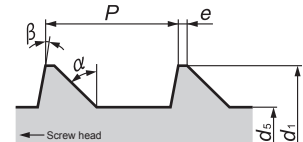
ISO5835 HA



ISO5835 HB




ISO9268 HC





ISO9268 HD


Item number	ISO Standard	d_1	d_5	P	e	r_4	r_5	α	β	Metric dimensions			
										Supposition material Dia.	Coated Carbide ZM3		
TW5835-HA1.5-D12	ISO5835	HA1.5	1.5 ⁰ _{0.15}	1.1 ⁰ _{0.1}	0.5	0.1	0.3	0.1	35°	3°	ϕ 8	○	
TW5835-HA2.0-D12		HA2.0	2.0 ⁰ _{0.15}	1.3 ⁰ _{0.1}	0.6	0.1	0.4	0.1	35°	3°		○	
TW5835-HA2.7-D12		HA2.7	2.7 ⁰ _{0.15}	1.9 ⁰ _{0.15}	1	0.1	0.6	0.2	35°	3°		○	
TW5835-HA3.5-D12		HA3.5	3.5 ⁰ _{0.15}	2.4 ⁰ _{0.15}	1.25	0.1	0.8	0.2	35°	3°		○	
TW5835-HA4.0-D12		HA4.0	4.0 ⁰ _{0.15}	2.9 ⁰ _{0.15}	1.5	0.1	0.8	0.2	35°	3°		○	
TW5835-HA4.5-D12		HA4.5	4.5 ⁰ _{0.15}	3.0 ⁰ _{0.15}	1.75	0.1	1	0.3	35°	3°		○	
TW5835-HA5.0-D12		HA5.0	5.0 ⁰ _{0.15}	3.5 ⁰ _{0.15}	1.75	0.1	1	0.3	35°	3°		ϕ 10	○
TW5835-HB4.0-D12		HB4.0	4.0 ⁰ _{0.15}	1.9 ⁰ _{0.15}	1.75	0.1	0.8	0.3	25°	5°		ϕ 8	○
TW5835-HB6.5-D12	HB6.5	6.5 ⁰ _{0.15}	3.0 ⁰ _{0.15}	2.75	0.2	1.2	0.8	25°	5°	ϕ 10	○		
TW9268-HC2.9-D12	ISO9268	HC2.9	2.79 to 2.9	2.03 to 2.18	1.06	0.1max	—	—	—	—	ϕ 8		
TW9268-HC3.5-D12		HC3.5	3.43 to 3.53	2.51 to 2.64	1.27	0.1max	—	—	—	—			
TW9268-HC3.9-D12		HC3.9	3.78 to 3.91	2.77 to 2.92	1.27	0.1max	—	—	—	—			
TW9268-HC4.2-D12		HC4.2	4.09 to 4.22	2.95 to 3.25	1.27	0.1max	—	—	—	—			
TW9268-HD4.0-D12		HD4.0	4.0±0.03	2.92±0.03	1.59	0.1	—	—	45°	10°			
TW9268-HD4.5-D12		HD4.5	4.5±0.03	2.92±0.03	2.18	0.1	—	—	45°	10°			

Application Examples

Double-lead Bone Screw			
Work Material : Ti-6Al-4v ELI			
Bar Stock Dia.	φ.375	Number of start	2
Major Dia.	φ.157	Helix Angle	28.5°
Minor Dia.	φ.098	Hand of thread	Right
Cutting condition			
Main Spindle Speed (rpm)	15	Speed of whirling cutter (rpm)	3,500
Lead = Feed (IPR)	.217	Result	OK
NTK Thread Whirling	Dramatically improved productivity		
Competitor's Thread Whirling		<i>Cannot complete with single pass. Requires feeding stock multiple times and two passes for threading each time.</i>	
NTK thread whirling succeeded in double lead screw machining when one of the major thread whirling suppliers has failed many times.			

Double-lead Bone Screw			
Work Material : Ti-6Al-4v ELI			
Bar Stock Dia.	φ.350	Number of start	2
Major Dia.	φ.180	Helix Angle	23.0°
Minor Dia.	φ.120	Hand of thread	Right
Cutting condition			
Main Spindle Speed (rpm)	12	Speed of whirling cutter (rpm)	2,500
Lead = Feed (IPR)	.200	Result	OK
NTK Thread Whirling	Dramatically improved productivity		
Competitor's Thread Whirling		<i>Cannot complete with single pass. Requires feeding stock multiple times and two passes for threading each time.</i>	
The customer could not get perfect double lead thread form in single pass from other manufacturers. NTK got perfect thread form with a single pass on first trial saving cycle time.			

Double-lead Bone Screw			
Work Material : Ti-6Al-4v ELI			
Bar Stock Dia.	φ.250	Number of start	2
Major Dia.	φ.118	Helix Angle	15.4°
Minor Dia.	φ.083	Hand of thread	Right
Cutting condition			
Main Spindle Speed (rpm)	11	Speed of whirling cutter (rpm)	2,200
Lead = Feed (IPR)	.087	Result	OK
NTK Thread Whirling	Dramatically improved productivity		
Competitor's Thread Whirling		<i>Cannot complete with single pass. Requires feeding stock multiple times and two passes for threading each time.</i>	
Customer was concerned with stock rigidity and long cycle time. NTK applied three geometry inserts to achieve single pass machining, in dramatically short time. The up-sharp cutting edges and low cutting pressure produced "excellent" surface finish.			

Single-lead Bone Screw			
Work Material : 316SS			
Bar Stock Dia.	φ.315	Number of start	1
Major Dia.	φ.138	Helix Angle	7.5°
Minor Dia.	φ.098	Hand of thread	Right
Cutting condition			
Main Spindle Speed (rpm)	23	Speed of whirling cutter (rpm)	2,000
Pitch = Feed (IPR)	.049	Result	OK
NTK Thread Whirling	2600 pcs		
Competitor's Thread Whirling		1000 pcs	
Some thread whirling manufacturers offer 6-teeth or 12-teeth systems, too many teeth cause chip packing issues and more tool pressure. Fewer teeth means greater cycle time. NTK concluded that 9-teeth is the best configuration. Our customers can run 1.5 times faster and get longer tool life.			

Single-lead Bone Screw			
Work Material : Ti-6Al-4v ELI			
Bar Stock Dia.	φ.197	Number of start	1
Major Dia.	φ.091	Helix Angle	5.3°
Minor Dia.	φ.067	Hand of thread	Right
Cutting condition			
Main Spindle Speed (rpm)	30	Speed of whirling cutter (rpm)	3,100
Pitch = Feed (IPR)	.023	Result	OK
NTK Thread Whirling	2200 pcs		
This thread is up to 1.26" length with a small pitch. Cycle time could be increased with a single-point threading tool. NTK's inserts, designed for lower tool pressure, ran 2,200 pcs/corner at 30 rpm of bar stock (F10,800). It only took 110 seconds to finish a 1.26" length thread.			

Triple-lead Worm Gear			
Work Material : Brass			
Bar Stock Dia.	φ.315	Number of start	3
Major Dia.	φ.276	Helix Angle	14.6°
Minor Dia.	φ.185	Hand of thread	Left
Cutting condition			
Main Spindle Speed (rpm)	20	Speed of whirling cutter (rpm)	3,500
Lead = Feed (IPR)	.189	Result	OK
Multi-lead threads, common in the Worm Gear industry are made by a forming or cutting process. The large helix angle is difficult to machine with single-point threading. NTK now makes thread whirling inserts for multi-lead threads. Cycle time is reduced with a one pass process and thread form dimensions are stable with the low tool pressure.			