Nine9®

www.jic-tools.com.tw

Cat.3a

Super Power Drill
Super Drill

WE HAVE INVESTED RESOURCES IN THE DESIGN & MANUFACTURE OF INSERTED CUTTERS

Our innovative tooling design upgrades productivity and competitive capability while reducing production requirements in a wide range of industries.

The tooling system is designed to benefit users of machining centers and CNC lathe, turning center and special purpose machines.

Our outstanding R&D capabilities combined with fast delivery provide a strong competitive edge.

Contents

Highly Efficient

Long Tool Life

The Winner

is not necessarily the one who runs the fastest but the one who holds on to the last

Super Power

Indexable drills with carbide center
5xD up to 10xD, 19mm to 40mm.

A True Engineering Challenge

It is no doubt that deep hole drilling by indexable drill is always a challenge of the drill makers.

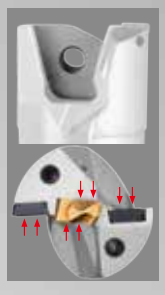
Nine9 "Super Power Drill", featuring by patented indexable center pilot insert design, which is the first time in the world, helping to achieve the cost-effective and good performance, making deep hole drilling up to 10xD possible.

With patented center pilot insert which aids accurate and steady deep hole drilling. Long tool life and better surface finish are achievable.

5xD ~10xD

Drill

pilot insert.



Patented pocket design

Supporting edge
Backup edge to absorb cutting force

Periphery inserts

It designed for optimum chip breaking
and good edge preparation
for longer tool life
4 cutting edges

Coolant

Internal coolant is necessary

The coolant is fed directly into the inserts cutting face, cooling the top of the drill and preventing chip adhesion, which allows for quick and smooth chip evacuation.

Insert Specification

Center Pilot Insert


NC2032

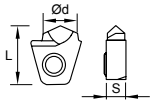

NC40

Features >>

- Special geometry design delivers the benefits of the center drill in guiding position and eliminates the defects caused by the chip flow from the gap between the center drill and insert.
- High precision fully ground and edge honing to increase tool life and surface finish.
- Patented insert pocket to absorb the cutting forces, supporting the center pilot insert functional while drilling.

NC2032 : K20F grade, AlTiN coated, fully ground, honed cutting edge.
For carbon steel & alloy steel C<0.3% and stainless steel.

NC40 : P35 grade, TiN coated, fully ground, honed cutting edge.
For carbon steel & alloy steel C>0.3% and stainless steel.

Ordering code					Dimensions		Screw	Key
Code of insert	Grade		Coating		Ød	S		
99307-CD6	NC40	P35	TiN		6	4	NS-35080 2.5Nm	NK-T15
	NC2032	K20F	AlTiN					
99307-CD8	NC40	P35	TiN		8	6	NS-35120 2.5Nm	NK-T15
	NC2032	K20F	AlTiN					

Features >>

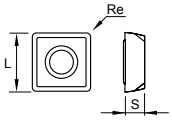

NC2032


NC40

- Patented Dual-relief angle insert.
- Honed on the cutting edge, good chip breaking condition.
- Fully ground carbide insert, Each insert has 4 cutting edges.
- The inserts are designed for optimum chip breaking and good edge preparation for longer tool life.

NC2032: K20F grade, AlTiN coated, for carbon steel, alloy steel, casting iron, stainless steel and hardened steel up to HRC 50.

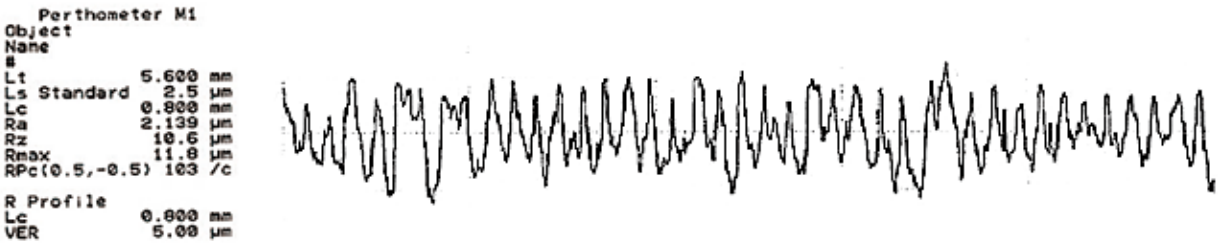
NC40 : P35 grade, tougher insert with special chip breaker, TiN coated, for low carbon steel and stainless steel. Only available for insert N9GX06020431 and N9GX09030831.

Ordering code					Dimensions			Screw	Key
Code of insert	Grade		Coating		L	S	re		
N9GX04T002	NC2032	P35	AlTiN		4.07	1.8	0.2	NS-18037 0.6Nm	NK-T6
N9GX05T103	NC2032	P35	AlTiN		5.07	2.0	0.2	NS-20045 0.8Nm	NK-T6
N9GX060204	NC2032	P35	AlTiN		6.35	2.38	0.4	NS-22055 0.9Nm	NK-T7
N9GX06020431*	NC40	K20F	TiN		6.35	2.38	0.4		
N9GX090308	NC2032	P35	AlTiN		9.52	3.18	0.8	NS-30072 2.0Nm	NK-T9
N9GX09030831*	NC40	K20F	TiN		9.52	3.18	0.8		

• 31 means the insert has different chip breaker for tougher material applications.

Surface finish >>

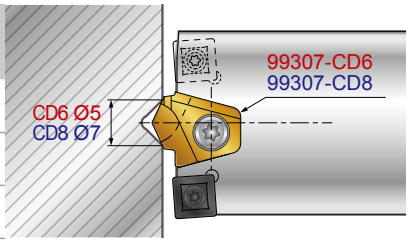
Center Pilot Insert	Material:Carbon steel (S45C)		
99307-CD8 N9GX060204 NC40 NC2032	Vc	80	m/min.
	S	880	r.p.m.
	f	0.10	mm/z
	F	88.0	mm/min.
	Ra	2.139	μm
	Rmax	11.8	μm



Apply on Stationary Machine Tool >>

Please use Nine9 NC Spot drill to make a spot and make sure the size of the spot according to following.

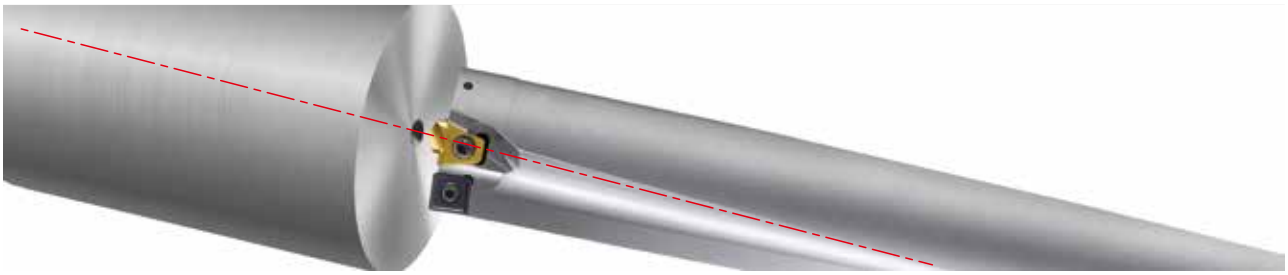
Center Pilot	CD6	CD8
Drill dia	19 ~26mm	27 ~40mm
Spotting Diameter	Ø5 mm	Ø7 mm
Spotting Depth	2.8 mm	3.8 mm



The way to make a spot hole >>

Action A

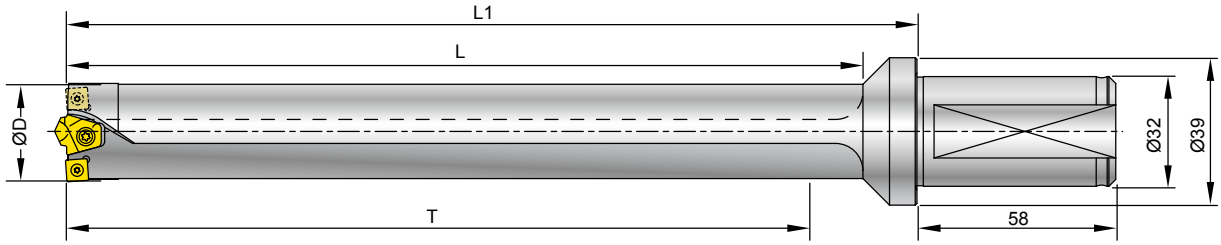
The spot hole will guide the pilot insert at the beginning and stablized the drill to get the perfect drilling operation.



Action B

Alignment of the work piece center and tool center is very important !

Holder 19mm~40mm



Ordering code	ØD mm(inch)	T	L	L1	Insert / Screw / Key	
					Center	Periphery
00-99307-19100	19 (0.748″)	100	119	134		N9GX04T002 x 1 pc. NS-18037 / 0.6Nm NK-T6
00-99307-19150		150	169	184		
00-99307-19200		200	219	239		
00-99307-20100	20 (0.787″)	100	120	134		N9GX05T103 x 1 pc. NS-20045 / 0.8Nm NK-T6
00-99307-20150		150	170	184		
00-99307-20200		200	220	239		
00-99307-21100	21 (0.827″)	100	120	134		
00-99307-21150		150	170	184		
00-99307-21200		200	220	239		
00-99307-22100	22 (0.866″)	100	125	139	99307-CD6 x 1 pc. NS-35080 2.5Nm NK-T15	N9GX060204 x 1 pc. NS-22055 / 0.9Nm NK-T7
00-99307-22150		150	175	189		
00-99307-22200		200	225	239		
00-99307-23100	23 (0.905″)	100	125	139		
00-99307-23150		150	175	189		
00-99307-23200		200	225	239		
00-99307-24100	24 (0.945″)	100	126	139		
00-99307-24150		150	176	189		
00-99307-24200		200	226	239		
00-99307-24250		250	276	289		
00-99307-25100	25 (0.984″)	100	126	139		
00-99307-25150		150	176	189		
00-99307-25200		200	226	239		
00-99307-25250		250	276	289		
00-99307-26150	26 (1.024″)	150	176	189		
00-99307-26200		200	226	239		
00-99307-26250		250	276	289		
00-99307-27150	27 (1.630″)	150	181	198	99307-CD8 x 1 pc. NS-35120 2.5Nm NK-T15	N9GX060204 x 2 pcs. NS-22055 / 1.0Nm NK-T7
00-99307-27200		200	231	248		
00-99307-27250		250	281	298		
00-99307-28150	28 (1.102″)	150	181	198		
00-99307-28200		200	231	248		
00-99307-28250		250	281	298		
00-99307-29150	29 (1.142″)	150	182	198		
00-99307-29200		200	232	248		
00-99307-29250		250	282	298		
00-99307-29300		300	332	348		

Ordering code	ØD mm(inch)	T	L	L1	Insert / Screw / Key	
					Center	Periphery
00-99307-30150	30 (1.181″)	150	182	198		
00-99307-30200		200	232	248		
00-99307-30250		250	282	298		
00-99307-30300		300	332	348		
00-99307-31150	31 (1.220″)	150	188	198		
00-99307-31200		200	238	248		
00-99307-31250		250	288	298		
00-99307-31300		300	338	348		N9GX060204 x 2 pcs.
00-99307-32150	32 (1.260″)	150	188	203		
00-99307-32200		200	238	253		
00-99307-32250		250	288	303		NS-22055 0.9Nm
00-99307-32300		300	338	353		
00-99307-33150	33 (1.300″)	150	189	203		
00-99307-33200		200	239	253		NK-T7
00-99307-33250		250	289	303		
00-99307-33300		300	339	353		
00-99307-34150	34 (1.339″)	150	189	203		
00-99307-34200		200	239	253		
00-99307-34250		250	289	303		
00-99307-34300		300	339	353	99307-CD8 x 1 pc.	
00-99307-34350		350	389	403		
00-99307-35200	35 (1.378″)	200	245	258		
00-99307-35250		250	295	308		
00-99307-35300		300	345	358	NS-35120 2.5Nm	
00-99307-35350		350	395	408		
00-99307-36200	36 (1.417″)	200	245	258		
00-99307-36250		250	295	308	NK-T15	
00-99307-36300		300	345	358		
00-99307-36350		350	395	408		
00-99307-37200	37 (1.457″)	200	246	258		
00-99307-37250		250	296	308		
00-99307-37300		300	346	358		N9GX090308 x 2 pcs.
00-99307-37350		350	396	408		
00-99307-38200	38 (1.496″)	200	246	258		
00-99307-38250		250	296	308		NS-30072 2.0Nm
00-99307-38300		300	346	358		
00-99307-38350		350	396	408		NK-T9
00-99307-39200	39 (1.535″)	200	247	258		
00-99307-39250		250	297	308		
00-99307-39300		300	346	358		
00-99307-39350		350	397	408		
00-99307-40200	40 (1.575″)	200	247	258		
00-99307-40250		250	297	308		
00-99307-40300		300	347	358		
00-99307-40350		350	397	408		

Machining Power Requirement for Drilling

5D~10D

Material Classifiction for Calculation

There are an extremely wide range of materials and different machining operations in the metal cutting industry. We follow the ISO material group and color to make brief information for calculation of the required power for super power drill, the main effective parameter is “specified cutting force”, please use following table and formula: (More detail of work piece material classification is listed in our website.)

	Material Group	Material Type and description	Hardness HB	Strength N/mm²	Specified cutting force kc N/mm²
P	1.10	Carbon steel C<0.3%, free cutting steels	~125	500-850	1900
	1.20	Carbon steel C>0.3%	~150	850-1000	2100
	1.30	Low alloy steel C<0.3%	180	Up to 750	2100
	1.40	Low alloy steel C>0.3%	200	750-1200	2600
	1.50	High alloy steel	200	800-1200	2600
	1.60	Tool steel, harder steels for toughening. Martensitic stainless steels.	<230	850-1100	2200
	1.70	Casting steel			2900
M	2.10	Free cutting Stainless steel Austenitic stainless steels	200	490-700	2300
	2.20	Difficult Stainless steel Austenitic stainless steels and duplex	175	650-850	2450
K	3.10	Grey casting Iron	180	250-350	1100
	3.20	Malleable casting iron..	230	Up to 600	1200
	3.30	Nodular casting iron	250	Up to 800	1800
N	4.10	Al- alloys(Si<12%)	60	230-310	500
	4.20	Al-alloys(Si>12%)	75	150-200	750
	4.30	Non-ferrous materials, Zirconium, Magnesium, Copper alloys, etc.	100	150-200	800
	4.40	Carbon and graphite composites, plastics, wood, rubbers, etc.	—	—	—
S	5.10	Nickel-based heat-resistant alloys	250		3500
	5.20	Cobalt-based heat resistant alloys	350		4150
	5.30	Iron-based heat resistant alloys	250		3050
H	6.10	Tool steels and hardened steels	55HRC		4500
	6.20	Hardened cast iron	—	—	—

Formulas for Calculation of Machining Power Pc(Kw)

$$Pc(Kw) = \frac{f \times Vc \times D \times Kc}{60 \times 10^3 \times \eta}$$

feed force(KN) Ff

$$Ff = \frac{ap \times f \times Kc}{2000}$$

Drilling torque (Md) torque=(Nm)

$$Md = \frac{f \times \pi \times D2 \times Kc}{4000} \text{ Nm}$$

f =	feed rate	mm/rev.
Vc =	cutting speed	m/min.
D =	drill diameter	mm
Kc =	specified cutting force	N/mm²
η =	power transmition efficiency of spindle (75%-85%)	

Technical Guide

Cutting Data

Work piece material	T= Length/ Dia.	Vc (m/min.)	f (mm/rev.)				Grade of insert	
			N9GX04T002	N9GX05T103	N9GX060204	N9GX090308		
			Dia.19	Dia.20-21	Dia.22-34	Dia.35-40	Center	Periphery
Carbon steel C<0.3% Ex.:S25C, SS41	T<7D	80~150	0.03~0.07	0.04~0.08	0.06~0.10	0.08~0.12	NC2032	NC2032
	T>7D	60~120	0.03~0.07	0.04~0.08	0.06~0.10	0.08~0.12		
	T<7D	80~130	—	—	0.06~0.10	0.08~0.12	NC40	NC40
	T>7D	60~100	—	—	0.06~0.10	0.08~0.12		
Carbon steel C>0.3% Ex.:S50C, P5	T<7D	80~150	0.04~0.08	0.04~0.10	0.06~0.12	0.08~0.15	NC40	NC2032
	T>7D	60~120	0.04~0.08	0.04~0.10	0.06~0.12	0.08~0.15		
Low alloy stee C<0.3% Ex.:SCM415	T<7D	60~150	0.04~0.08	0.04~0.10	0.06~0.10	0.08~0.12	NC2032	NC2032
	T>7D	40~120	0.04~0.08	0.04~0.10	0.06~0.10	0.08~0.12		
Low alloy steel C>0.3% Ex.:SCM440	T<7D	60~150	0.04~0.08	0.04~0.10	0.06~0.12	0.08~0.15	NC40	NC2032
	T>7D	40~120	0.04~0.08	0.04~0.10	0.06~0.12	0.08~0.15		
High alloy steel Ex.:SKD11	T<7D	60~120	0.03~0.07	0.04~0.08	0.06~0.10	0.08~0.12	NC40	NC2032
	T>7D	40~100	0.03~0.07	0.04~0.08	0.06~0.10	0.08~0.12		
Casting steel	T<7D	60~120	0.03~0.07	0.04~0.08	0.06~0.10	0.08~0.12	NC40	NC2032
	T>7D	40~100	0.03~0.07	0.04~0.08	0.06~0.10	0.08~0.12		
Stainless steel Ex.:SUS304	T<7D	60~120	0.03~0.06	0.04~0.07	0.05~0.08	0.06~0.10	NC2032	NC2032
	T>7D	40~100	0.03~0.06	0.04~0.07	0.05~0.08	0.06~0.10		
	T<7D	60~120	—	—	0.05~0.08	0.06~0.10	NC40	NC40
	T>7D	40~100	—	—	0.05~0.08	0.06~0.10		
Casting Iron Ex.:FC25	T<7D	60~120	0.04~0.08	0.04~0.10	0.06~0.10	0.08~0.12	NC40	NC2032
	T>7D	40~100	0.04~0.08	0.04~0.10	0.06~0.10	0.08~0.12		
Al, and non-ferrous metal Ex.:A6061	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—
Hardened steel <HRC 50° Ex.:SKD61	T<7D	50~80	0.03~0.06	0.04~0.07	0.05~0.08	0.06~0.10	NC40	NC2032
	T>7D	40~60	0.03~0.06	0.04~0.07	0.05~0.08	0.06~0.10		

Important Information

- Reduce feed rate 50% at the beginning of 3-5 mm.
- The cutting speed relates to the periphery inserts, The feed rate depends on the load of the center pilot insert.
- The best condition will create short cutting chips. The feed rate can be applied ± 25% of the recommended value depended on the shape of the cutting chips.
- Be careful to monitor the spindle power consumption !
  When the spindle load is 15% higher than starting power consumption, please change the periphery insert to next new cutting edge and change a new center pilot insert.
- Minimum coolant pressure is 10 bar (about 150 psi.). Internal coolant is required.
- Increase 20% of the cutting speed and the feed rate for horizontal spindle machine.
- For the CNC lathes, maximum miss-alignment of drill center and spindle center is ±0.05 mm, it is not necessary to drill center hole in advance.

Technical Guide

Cutting Data

Work piece material	T= Length/ Dia.	Vc (m/min.)	f (mm/rev.)					Grade of insert
			N9GX 04T002	N9GX 05T103	N9GX 060204	N9GX 070304	N9GX 090308	
			Dia. 10~12.5	Dia. 13~15.5	Dia. 16~19.5	Dia. 20~24	Dia. 25~30	
Carbon steel C<0.3% Ex.:S25C, SS41	T=3D	80~250	0.03~0.06	0.04~0.08	0.06~0.10	0.06~0.10	0.08~0.12	NC2032
	T=4D	60~180	—	—	0.06~0.10	0.06~0.10	0.08~0.12	
Carbon steel C>0.3% Ex.:S50C, P5	T=3D	80~300	0.04~0.08	0.06~0.10	0.06~0.12	0.08~0.12	0.08~0.15	NC2032
	T=4D	60~150	—	—	0.06~0.12	0.08~0.12	0.08~0.15	
Low alloy steel C<0.3% Ex.:SCM415	T=3D	80~250	0.04~0.08	0.04~0.08	0.06~0.10	0.06~0.10	0.08~0.12	NC2032
	T=4D	60~150	—	—	0.06~0.10	0.06~0.10	0.08~0.12	
Low alloy steel C>0.3% Ex.:SCM440	T=3D	80~250	0.04~0.08	0.04~0.10	0.06~0.12	0.06~0.12	0.08~0.15	NC2032
	T=4D	60~150	—	—	0.06~0.12	0.06~0.12	0.08~0.15	
High alloy steel Ex.:SKD11	T=3D	60~150	0.03~0.06	0.04~0.08	0.06~0.10	0.06~0.10	0.08~0.12	NC2032
	T=4D	50~100	—	—	0.06~0.10	0.06~0.10	0.08~0.12	
Casting steel	T=3D	80~180	0.03~0.06	0.04~0.08	0.06~0.10	0.06~0.10	0.08~0.12	NC2032
	T=4D	60~120	—	—	0.06~0.10	0.06~0.10	0.08~0.12	
Stainless steel Ex.:SUS304	T=3D	60~150	0.03~0.06	0.04~0.08	0.04~0.10	0.06~0.10	0.06~0.12	NC2032
	T=4D	50~100	—	—	0.04~0.10	0.06~0.10	0.06~0.12	
Casting Iron Ex.:FC25	T=3D	80~120	0.04~0.08	0.06~0.08	0.06~0.08	0.06~0.10	0.08~0.12	NC2032
	T=4D	60~100	—	—	0.06~0.08	0.06~0.10	0.08~0.12	
Hardened steel <HRC 50° Ex.:SKD61	T=3D	60~100	0.03~0.06	0.04~0.08	0.05~0.08	0.06~0.08	0.06~0.10	NC2032
	T=4D	40~80	—	—	0.05~0.08	0.06~0.08	0.06~0.10	

* The maximum misalignment of the drill center is +0.2 mm/-0.5 mm on the CNC lathe.

Metric

$$S = \frac{Vc \times 1000}{\pi \times d}$$

$$F = S \times f$$

d = diameter -mm

S = Spindle Speed -r.p.m.

Vc = Cutting Speed -m/min.

f = mm/rev.

F = mm/min.

Inch

$$S = \frac{(3.82 \times SFM)}{d}$$

$$F = f \times S$$

d = diameter-inch

S = Spindle Speed-r.p.m.

SFM = Surface Speed-ft./min. Vc (m/min.) x 3.28

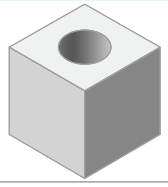
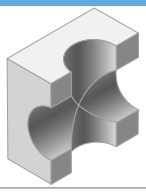
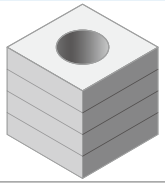
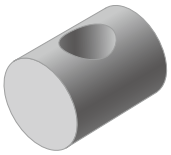
f = IPR = inch/rev.

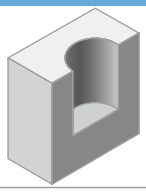
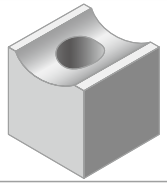
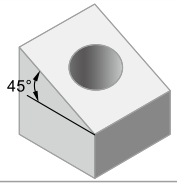
F = IPM=RPM x f / 25.4.

Technical Guide

Application of Drill in Different Conditions

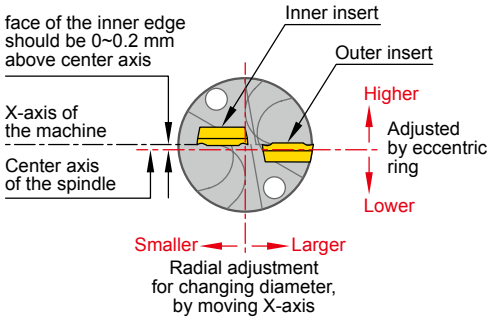
Material Classifiction for Calculation

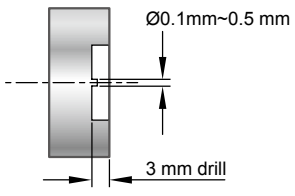
Application	* Regular Surface	Cross Holes	Stack Drilling	Round Work Piece Offset Drilling
Work Piece Shape				
Cutting Speed Vc (m/min.)	100%	80%	80%~70%	80%~60%
Feed Rate (mm/rev.)	100%	80%	80%~70%	80%~60%

Application	Plunge Drilling	Concave Surfaces	Angled Surfaces	Cone Work Piece Offset Drilling
Work Piece Shape				
Cutting Speed Vc (m/min.)	80%	80%	80%~70%	80%~70%
Feed Rate (mm/rev.)	80%	80%	80%~70%	80%~70%

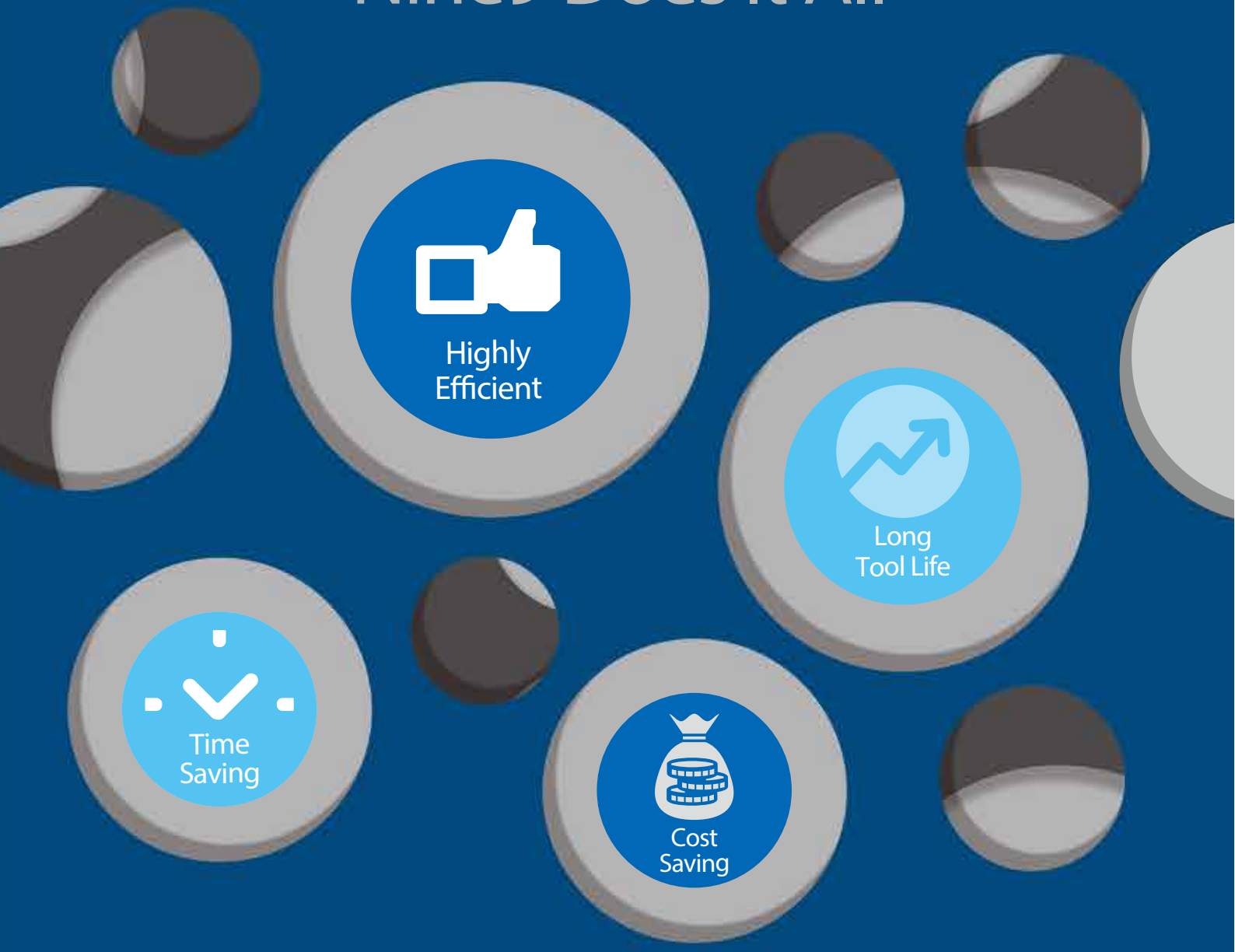
* SPD, SD both are suitable.

Adjustment on CNC Lathe

Centre height on the lathe	Diameter of the drill	Caution
• The face of the inner edge must be 0-0.2 mm over the centre. • The height of the inner edge can be adjusted by eccentric ring.	• The diameter of the drilled hole can be adjusted along X-axis of the lathe. • The maximum radial adjustment is shown on the specification of the product.	

Check the centre height of the inner insert	Caution
• Drill 3 mm depth and check that there is a small pip at the centre of the bottom of the hole. • The pip should be between 0.1mm and 0.5mm in diameter. • If there is no pip; the inner insert must be adjusted to be over the centre. • If the pip is larger than 0.5mm diameter; the centre of the drill should be adjusted lower.	

No Need To Choose
Nine9 Does It All



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