Nine9®

www.jic-tools.com.tw

Cat.03a

NC Helix Drill
Super Power Drill
Super Drill

Website

www.jic-tools.com.tw

Video

www.youtube.com/user/Jimmore99

Nine9®

Productivity &
Creativity & Infinity

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

Rough milling Drilling & Slotting

The expert to remove excess materials

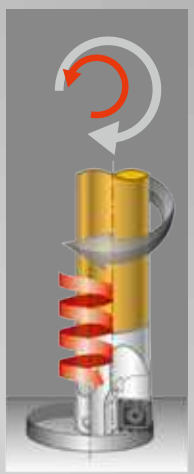
Principle and Benefit

One tool performs multiple functions. It cuts a hole by helical interpolation; the serrated cutting edge makes cutting chip short and easily to be removed.

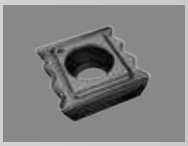
NC Helix Drill

- One tool performs multiple functions
- Lower spindle power consumption

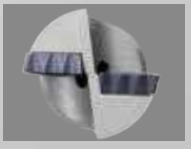
Patent Pending



All NC Helix Drill must be programmed by helical interpolation



2 cutting edges insert TIAiN coated



≃ Flat bottom shape

Two types

Cylindrical Shank

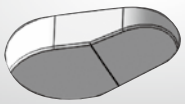
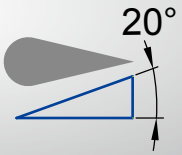
with helical groove is designed for CNC machines without internal coolant supply. The design of helical groove takes away the cutting chips while rotating.

Screw-fit Tool Holder

is applicable to fit into almost all extension bars in the market. It has internal coolant through center, the cutting chips can be flushed out from hole together with the coolant.

01 Feature

Page 15

Circular milling	Ramping Angle
	

Lower Spindle Power Consumption Fast and Easy !

- Thanks to the small cutting load of the serrated cutting edge and helical interpolation, low power consumption of the spindle is required.
- Circular ramping milling, Maximum ramping angle is 20°.

One tool performs multiple patterns

02 Feature

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Shape


- Not only a drill, but an end mill tool.
- Small path radius to cut a hole or step hole, various curved shape of cavity on different materials.

Special geometry insert to cut different materials

- Serrated cutting edge makes the cutting chips short and small, therefore easier to be removed.
- For almost all kind of materials, excellant for soft and long cutting chip materials!, such as low carbon steel, stainless steel, Titanium and Inconel.
- Eliminate swarf and virbration problems while drilling difficult cut materials or deeper hole.

03 Feature

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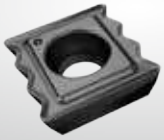
Insert	Chip
	

Only six tools for drilling Ø13~Ø65 mm

Feature 04

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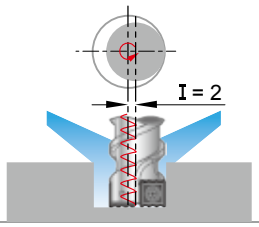
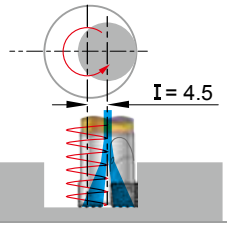
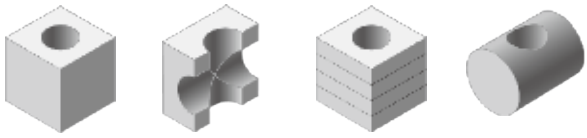
- The hole is cut by helical interpolation.
- Just one tool can machine different diameters and depth of holes.
- Example :

Hole Ø15 / Tool Ø11	Hole Ø20 / Tool Ø11
	



Applicable in different conditions

Feature 05

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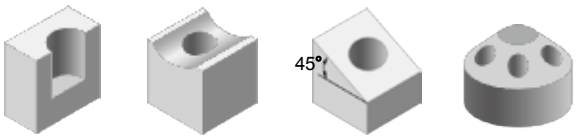
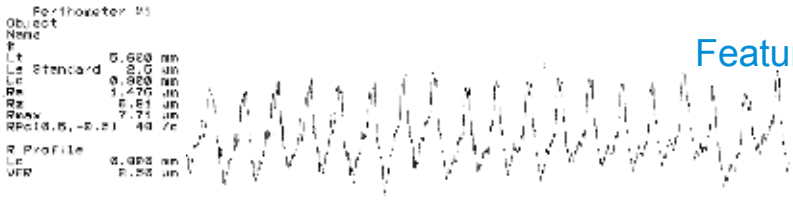


Flatness Measuring

Work piece


Make " One more turn" after reached the depth.
Ex :
:
G03 I-1.5 Z-30 P5
G03 I-1.5 <make one more turn >
G01 X0 Y0 < afterward, let tool back to center of hole >

Flatness



Feature 06

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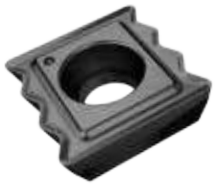
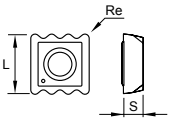
Specification

Insert



NC2032 : For almost all kind of materials,
good for soft and long cutting chip materials!

NC5073 : Tougher carbide grade provides stable cutting condition and chipping prevention.
Suit for deep hole machining above 3xDc to resolve chattering while using extension bar or while clamping device is weak.

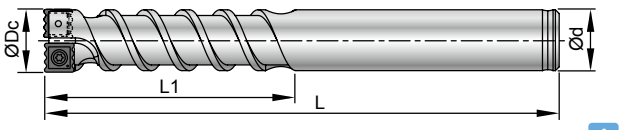
Ordering code	Grade		Coating		Dimensions L	S	Re	Screw	Key
01-N9MX04T002	NC2032	K20F	TiAlN		4.75	1.8	0.2	NS-18037 0.6Nm	NK-T6
	NC5073	P40							
01-N9MX05T103	NC2032	K20F	TiAlN		5.75	2.0	0.3	NS-20045 0.8Nm	NK-T6
	NC5073	P40							
01-N9MX070204	NC2032	K20F	TiAlN		7.5	2.4	0.4	NS-22045 1.2Nm	NK-T7
	NC5073	P40							
01-N9MX100306	NC2032	K20F	TiAlN		10.0	3.18	0.6	NS-30072 2.0Nm	NK-T9
	NC5073	P40							
01-N9MX12T308	NC2032	K20F	TiAlN		12.5	3.97	0.8	NS-35080 3.0Nm	NK-T15
	NC5073	P40							

Holder

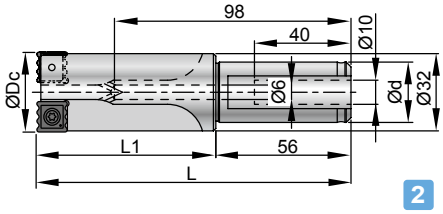
Cylindrical shank

▸ Helical chip-removing groove >>

- Made from high alloy steel and hardened.
- Special designed helical groove generates coolant chip-removing-stream.
- The helical groove is designed to take swarf away from the cutting zone with the coolant.
- Designed for the CNC machines with external coolant, not suit for horizontal machining.



1



2

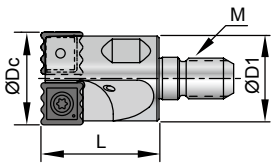
Fig.	Ordering Code	Type	Capable of drill dia. mm Dmin.	Dmax.	Ød	ØDc	L	L1	Max. Depth	Insert type	Max. ramping angle
1	00-99321-010-1320	BC10-HD11-1320	13	20	10	11	80	40	30	N9MX04T002	20°
1	00-99321-012-1525	BC12-HD13-1525	15	25	12	13	100	50	36	N9MX05T103	20°
1	00-99321-016-2030	BC16-HD17-2030	20	30	16	17	110	60	50	N9MX070204	20°
1	00-99321-020-2540	BC20-HD22-2540	25	40	20	22	125	70	60	N9MX100306	20°
1	00-99321-025-3050	BC25-HD27-3050	30	50	25	27	145	85	75	N9MX12T308	20°
2	* 00-99321-025-4265	SL25-HD33-4265	42	65	25	33	130	74	50		9°

* 99321-025-4265 is Ø25mm Side Lock Shank with internal coolant.

Screw fit cutter

Internal Coolant

- The holder is made from high alloy steel and hardened, standard screw-fit body adapts to almost any kind of the screw-fit tool holder or extension bar in the market.
- Designed for the CNC machines with internal coolant.

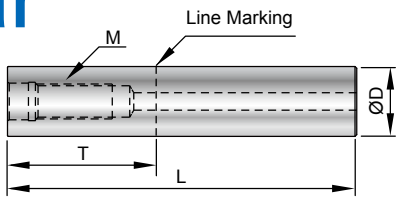


Ordering Code	Type	Capable of drill dia. mm		ØDc	ØD1	L	M	Insert type	Max. ramping angle
		Dmin.	Dmax.						
00-99323-010-1320	M05-HD11-1320	13	20	11	10	20	M5	N9MX04T002	20°
00-99323-012-1525	M06-HD13-1525	15	25	13	12	25	M6	N9MX05T103	20°
00-99323-016-2030	M08-HD17-2030	20	30	17	16	25	M8	N9MX070204	20°
00-99323-020-2540	M10-HD22-2540	25	40	22	20	30	M10	N9MX100306	20°
00-99323-025-3050	M12-HD27-3050	30	50	27	25	35	M12	N9MX12T308	20°

Extension Bar

Steel Type

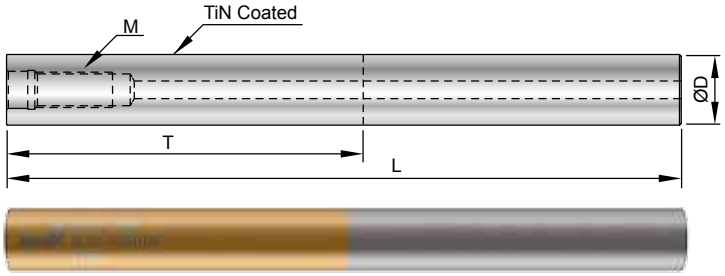
- T is the maximum overhang length.
- With internal coolant hole.



Ordering Code	Type	ØD	T	L	M
00-99801-10S	BC12-075M05S	10	25	75	M5
00-99801-12S	BC12-075M06S	12	25	75	M6
00-99801-16S	BC16-090M08S	16	35	90	M8
00-99801-20S	BC20-100M10S	20	40	100	M10
00-99801-25S	BC25-120M12S	25	50	120	M12

Solid Carbide Type

- T is the maximum overhang length.
- With internal coolant hole.



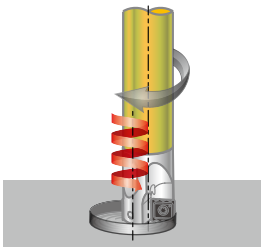
Ordering Code	Tipo	ØD	T	L	M
00-99801-10W	BC10-100M05W	10	60	100	M5
00-99801-12W	BC12-100M06W	12	60	100	M6
00-99801-16W	BC16-150M08W	16	80	150	M8
00-99801-20W	BC20-200M10W	20	100	200	M10
00-99801-25W	BC25-200M12W	25	125	200	M12

Technical Guide
Cutting Data

※ Before you start, please pay attention the following conditions >>

⚠ 1

All NC Helix Drill must be programmed by helical interpolation.

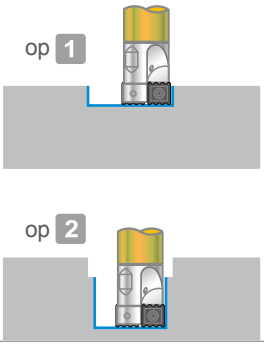


⚠ 2

Tool path of moving downward by CCW (G03) direction is recommended.

⚠ 3

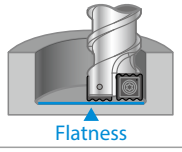
Step Hole



⚠ 4

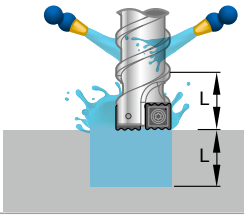
Flatness on blind hole bottom

Make one more turn after reached the depth. Ex. :
⋮
G03 I-1.5 Z-30 P5
G03 I-1.5
<make one more turn >
G01 X0 Y0
< afterward, make tool back to center of hole >

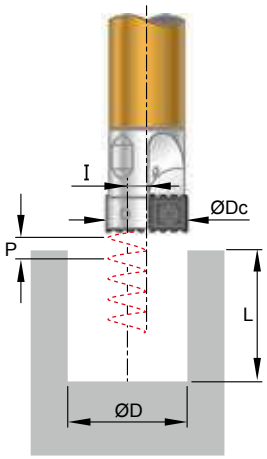


⚠ 5

For external coolant supply, lower pressure higher volume is recommended.
Let nozzle aim to the tool body, let coolant go inside the hole effectually.



• The NC Helix Drill is programing with "Helical interpolation" on CNC machine, the CNC controller must have 3-axis simultaneously motion function.

NC Helix Drill	Cutting Parameters (S & F)	Formula		
	$S = \frac{Vc \times 1000}{Dc \times \pi}$ r.p.m. $F = S \times f$ mm/min. $d = D - Dc$ mm $I = \frac{(D-Dc)}{2}$ mm	**Dc** = Dia. of Drill	mm	
		D = Dia. of Hole	mm	
		L = Depth of Drilling	mm	
		Vc = Cutting Speed	m/min.	
		S = Spindle Speed	r.p.m.	
		I = Circular radius	mm	
		f = Feed rate	mm/rev.	
		F = Table feed rate	mm/min.	
		d = Circular diameter (D-Dc)	mm	
		P = Pitch of helical interpolation	mm	
		T = Cutting time	sec.	
		Q = Chip removal volume	cm^3 / min	

Cutting time (T)

$$T = \frac{\pi \times d \times L \times 60}{F \times P} \text{ sec.}$$

Chip removal Volume (Q)

$$Q = \frac{\pi \times D^2 \times L \times 60}{4 \times 1000 \times T} \ cm^3/min$$

Example

Material	S45C (JIS)
Tool	00-99321-016-BC16-HD17, Dc= Ø17
Insert	N9MX070204-NC2032
D : Ø30mm, L=20mm	
S =	(120 x 1000) / 17 / 3.14 = 2248 r.p.m.
F = S x f	2248 x 0.26 = 584 mm/min.
P = 4mm (refer cutting data P for Carbon Steel 0.45%C)	
d = D – Dc	30-17 = 13 mm

$$T = \frac{3.14 \times 13 \times 20 \times 60}{584 \times 4} = 21 \text{ sec.}$$

$$Q = \frac{3.14 \times 30^2 \times 20 \times 60}{4 \times 1000 \times 21} = 40.3 \ cm^3/min$$

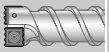
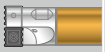
99321-010-1320 / 99323-010-1320 >>

Work piece material		Vc m/min.		Ø13		Ø14		Ø16		Ø18		Ø20	
		99321	99323	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm
P	Carbon steel 0.25%C	60~130	100~220	0.04 0.07	0.60 1.00	0.06 0.10	0.70 1.25	0.08 0.14	0.90 1.50	0.10 0.18	1.00 1.75	0.12 0.20	1.20 2.00
P	Carbon steel 0.45% C	60~120	100~200	0.04 0.07	0.60 1.00	0.06 0.10	0.70 1.25	0.08 0.14	0.90 1.50	0.10 0.18	1.00 1.75	0.12 0.20	1.20 2.00
P	Carbon steel 0.60%C	50~110	80~180	0.04 0.06	0.60 0.90	0.06 0.09	0.70 1.12	0.07 0.12	0.80 1.35	0.09 0.16	0.90 1.57	0.10 0.18	1.00 1.80
P	Low alloy steel	40~100	80~160	0.03 0.05	0.50 0.80	0.05 0.08	0.60 1.00	0.07 0.12	0.70 1.20	0.08 0.15	0.80 1.40	0.09 0.16	1.00 1.60
P	High alloy steel	40~ 80	60~120	0.03 0.05	0.50 0.80	0.05 0.08	0.60 1.00	0.07 0.12	0.70 1.20	0.08 0.15	0.80 1.40	0.09 0.16	1.00 1.60
M	Stainless steel	40~ 80	60~120	0.03 0.05	0.50 0.80	0.05 0.08	0.60 1.00	0.07 0.12	0.70 1.20	0.08 0.15	0.80 1.40	0.09 0.16	1.00 1.60
K	Cast Iron	40~100	80~160	0.04 0.07	0.60 1.00	0.06 0.10	0.70 1.25	0.08 0.14	0.90 1.50	0.10 0.18	1.00 1.75	0.12 0.20	1.20 2.00
N	Al	80~180	120~300	0.04 0.07	0.90 1.50	0.06 0.10	1.10 1.87	0.08 0.14	1.30 2.25	0.10 0.18	1.50 2.62	0.12 0.20	1.80 3.00
N	Cu	60~150	100~240	0.04 0.07	0.70 1.20	0.06 0.10	0.90 1.50	0.08 0.14	1.00 1.80	0.10 0.18	1.20 2.10	0.12 0.20	1.40 2.40
S	Ni- Alloy	10~ 30	15~ 40	0.01 0.03	0.50 0.80	0.01 0.04	0.60 1.00	0.02 0.05	0.70 1.20	0.03 0.07	0.80 1.40	0.04 0.08	0.90 1.60
S	Titanium	30~ 50	40~ 80	0.01 0.03	0.50 0.80	0.01 0.04	0.60 1.00	0.02 0.05	0.70 1.20	0.03 0.07	0.80 1.40	0.04 0.08	0.90 1.60

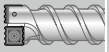
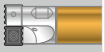
99321-012-1525 / 99323-012-1525 >>

Work piece material		Vc m/min.		Ø15		Ø17		Ø20		Ø22		Ø25	
		99321	99323	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm
P	Carbon steel 0.25%C	60~130	100~220	0.05 0.09	1.20 2.00	0.07 0.13	1.30 2.25	0.09 0.16	1.50 2.50	0.12 0.20	1.60 2.75	0.13 0.22	1.80 3.00
P	Carbon steel 0.45% C	60~120	100~200	0.05 0.09	1.20 2.00	0.07 0.13	1.30 2.25	0.09 0.16	1.50 2.50	0.12 0.20	1.60 2.75	0.13 0.22	1.80 3.00
P	Carbon steel 0.60%C	50~110	80~180	0.05 0.08	1.10 1.80	0.07 0.11	1.20 2.02	0.08 0.15	1.30 2.25	0.10 0.18	1.40 2.47	0.12 0.20	1.60 2.70
P	Low alloy steel	40~100	80~160	0.04 0.07	1.00 1.60	0.06 0.10	1.00 1.80	0.07 0.13	1.20 2.00	0.09 0.16	1.30 2.20	0.10 0.17	1.40 2.40
P	High alloy steel	40~ 80	60~120	0.04 0.07	1.00 1.60	0.06 0.10	1.00 1.80	0.07 0.13	1.20 2.00	0.09 0.16	1.30 2.20	0.10 0.17	1.40 2.40
M	Stainless steel	40~ 80	60~120	0.04 0.07	1.00 1.60	0.06 0.10	1.00 1.80	0.07 0.13	1.20 2.00	0.09 0.16	1.30 2.20	0.10 0.17	1.40 2.40
K	Cast Iron	40~100	80~160	0.05 0.09	1.20 2.00	0.07 0.13	1.30 2.25	0.09 0.16	1.30 2.50	0.12 0.20	1.60 2.75	0.13 0.22	1.80 3.00
N	Al	80~180	120~300	0.05 0.09	1.80 3.00	0.07 0.13	2.00 3.37	0.09 0.16	2.20 3.75	0.12 0.20	2.40 4.12	0.13 0.22	2.70 4.50
N	Cu	60~150	100~240	0.05 0.09	1.40 2.40	0.07 0.13	1.60 2.70	0.09 0.16	1.80 3.00	0.12 0.20	2.00 3.30	0.13 0.22	2.10 3.60
S	Ni- Alloy	10~ 30	15~ 40	0.02 0.03	1.00 1.60	0.03 0.05	1.00 1.80	0.03 0.06	1.20 2.00	0.04 0.08	1.30 2.20	0.04 0.08	1.40 2.40
S	Titanium	30~ 50	40~ 80	0.02 0.03	1.00 1.60	0.03 0.05	1.00 1.80	0.03 0.06	1.20 2.00	0.04 0.08	1.30 2.20	0.04 0.08	1.40 2.40

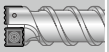
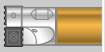
99321-016-2030 / 99323-016-2030 >>

Work piece material		Vc m/min.		Ø20		Ø22		Ø25		Ø27		Ø30	
		99321 	99323 	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm
P	Carbon steel 0.25%C	60~130	100~220	0.06 0.10	1.80 3.00	0.09 0.15	1.90 3.25	0.12 0.20	2.10 3.50	0.14 0.24	2.20 3.75	0.15 0.26	2.40 4.00
P	Carbon steel 0.45% C	60~120	100~200	0.06 0.10	1.80 3.00	0.09 0.15	1.90 3.25	0.12 0.20	2.10 3.50	0.14 0.24	2.20 2.75	0.15 0.26	2.40 4.00
P	Carbon steel 0.60%C	50~110	80~180	0.05 0.09	1.60 2.70	0.08 0.13	1.70 2.90	0.10 0.18	19.0 3.20	0.13 0.22	2.00 3.40	0.13 0.23	2.10 3.60
P	Low alloy steel	40~100	80~160	0.05 0.08	1.40 2.40	0.07 0.12	1.50 2.60	0.09 0.16	1.60 2.80	0.11 0.19	1.80 3.00	0.12 0.20	1.90 3.20
P	High alloy steel	40~ 80	60~120	0.05 0.08	1.40 2.40	0.07 0.12	1.50 2.60	0.09 0.16	1.60 2.80	0.11 0.19	1.80 3.00	0.12 0.20	1.90 3.20
M	Stainless steel	40~ 80	60~120	0.05 0.08	1.40 2.40	0.07 0.12	1.50 2.60	0.09 0.16	1.60 2.80	0.11 0.19	1.80 3.00	0.12 0.20	1.90 3.20
K	Cast Iron	40~100	80~160	0.06 0.10	1.80 3.00	0.09 0.15	1.90 3.25	0.12 0.20	2.10 3.50	0.14 0.24	2.20 3.75	0.15 0.26	2.40 4.00
N	Al	80~180	120~300	0.06 0.10	2.70 4.50	0.09 0.15	2.80 4.87	0.12 0.20	3.10 5.00	0.14 0.24	3.30 5.60	0.15 0.26	3.60 6.00
N	Cu	60~150	100~240	0.06 0.10	2.10 3.60	0.09 0.15	2.30 3.90	0.12 0.20	2.50 4.20	0.14 0.24	2.70 4.50	0.15 0.26	2.80 4.80
S	Ni- Alloy	10~ 30	15~ 40	0.02 0.04	1.40 2.40	0.03 0.06	1.50 2.60	0.04 0.08	1.60 2.80	0.04 0.09	1.80 3.00	0.05 0.10	1.90 3.20
S	Titanium	30~ 50	40~ 80	0.02 0.04	1.40 2.40	0.03 0.06	1.50 2.60	0.04 0.08	16.0 2.80	0.04 0.09	1.80 3.00	0.05 0.10	1.90 3.20

99321-020-2540 / 99323-020-2540 >>

Work piece material		Vc m/min.		Ø25		Ø28		Ø32		Ø36		Ø40	
		99321 	99323 	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm
P	Carbon steel 0.25%C	60~130	100~220	0.07 0.12	1.80 3.00	0.10 0.17	2.10 3.50	0.14 0.23	2.40 4.00	0.17 0.28	2.70 4.50	0.18 0.30	3.00 5.00
P	Carbon steel 0.45% C	60~120	100~200	0.07 0.12	1.80 3.00	0.10 0.17	2.10 3.50	0.14 0.23	2.40 4.00	0.17 0.28	2.70 4.50	0.18 0.30	3.00 5.00
P	Carbon steel 0.60%C	50~110	80~180	0.06 0.10	1.60 2.70	0.09 0.16	1.90 3.20	0.12 0.20	2.20 3.60	0.15 0.25	2.40 4.00	0.16 0.27	2.70 4.50
P	Low alloy steel	40~100	80~160	0.05 0.09	1.40 2.40	0.08 0.14	1.70 2.80	0.10 0.18	1.90 3.20	0.13 0.22	2.20 3.60	0.14 0.24	2.40 4.00
P	High alloy steel	40~ 80	60~120	0.05 0.09	1.40 2.40	0.08 0.14	1.70 2.80	0.10 0.18	1.90 3.20	0.13 0.22	2.20 3.60	0.14 0.24	2.40 4.00
M	Stainless steel	40~ 80	60~120	0.05 0.09	1.40 2.40	0.08 0.14	1.70 2.80	0.10 0.18	1.90 3.20	0.13 0.22	2.20 3.60	0.14 0.24	2.40 4.00
K	Cast Iron	40~100	80~160	0.07 0.12	1.80 3.00	0.10 0.17	2.10 3.50	0.14 0.23	2.40 4.00	0.17 0.28	2.70 4.50	0.18 0.30	3.00 5.00
N	Al	80~180	120~300	0.07 0.12	2.70 4.50	0.10 0.17	3.10 5.20	0.14 0.23	3.60 6.00	0.17 0.28	4.00 6.70	0.18 0.30	4.50 7.50
N	Cu	60~150	100~240	0.07 0.12	2.10 3.60	0.10 0.17	2.50 4.20	0.14 0.23	2.90 4.80	0.17 0.28	3.20 5.40	0.18 0.30	3.60 6.00
S	Ni- Alloy	10~ 30	15~ 40	0.02 0.05	1.40 2.40	0.03 0.07	1.70 2.80	0.04 0.09	1.90 3.20	0.05 0.10	2.20 3.60	0.06 0.12	2.40 4.00
S	Titanium	30~ 50	40~ 80	0.02 0.05	1.40 2.40	0.03 0.07	1.70 2.80	0.04 0.09	19.0 3.20	0.05 0.10	2.20 3.60	0.06 0.12	2.40 4.00

99321-025-3050 / 99323-025-3050 >>

Work piece material		Vc m/min.		Ø30		Ø35		Ø40		Ø45		Ø50	
		99321 	99323 	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm
P	Carbon steel 0.25%C	60~130	100~220	0.08 0.13	2.40 4.00	0.12 0.20	2.70 4.50	0.17 0.28	3.00 5.00	0.19 0.32	3.30 5.50	0.20 0.34	3.60 6.00
	Carbon steel 0.45% C	60~120	100~200	0.08 0.13	2.40 4.00	0.12 0.20	2.70 4.50	0.17 0.28	3.00 5.00	0.19 0.32	3.30 5.50	0.20 0.34	3.60 6.00
	Carbon steel 0.60%C	50~110	80~180	0.07 0.12	2.20 3.60	0.10 0.18	2.40 4.00	0.15 0.25	2.70 4.50	0.17 0.28	3.00 5.00	0.18 0.30	3.20 5.40
	Low alloy steel	40~100	80~160	0.06 0.10	1.90 3.20	0.09 0.16	2.20 3.60	0.13 0.22	2.40 4.00	0.15 0.25	2.60 4.40	0.16 0.27	2.90 4.80
	High alloy steel	40~ 80	60~120	0.06 0.10	1.90 3.20	0.09 0.16	2.20 3.60	0.13 0.22	2.40 4.00	0.15 0.25	2.60 4.40	0.16 0.27	2.90 4.80
M	Stainless steel	40~ 80	60~120	0.06 0.10	1.90 3.20	0.09 0.16	2.20 3.60	0.13 0.22	2.40 4.00	0.15 0.25	2.60 4.40	0.16 0.27	2.90 4.80
K	Cast Iron	40~100	80~160	0.08 0.13	2.40 4.00	0.12 0.20	2.70 4.50	0.17 0.28	3.00 5.00	0.19 0.32	3.30 5.50	0.20 0.34	3.60 6.00
N	Al	80~180	120~300	0.08 0.13	3.60 6.00	0.12 0.20	4.00 6.70	0.17 0.28	4.50 7.50	0.19 0.32	4.90 8.20	0.20 0.34	5.40 9.00
	Cu	60~150	100~240	0.08 0.13	2.90 4.80	0.12 0.20	3.20 5.40	0.17 0.28	3.60 6.00	0.19 0.32	4.00 6.60	0.20 0.34	4.30 7.20
S	Ni- Alloy	10~ 30	15~ 40	0.02 0.05	1.90 3.20	0.04 0.08	2.20 3.60	0.06 0.12	2.40 4.00	0.06 0.12	2.60 4.40	0.07 0.14	2.90 4.80
	Titanium	30~ 50	40~ 80	0.02 0.05	1.90 3.20	0.04 0.08	2.20 3.60	0.06 0.12	2.40 4.00	0.06 0.12	2.60 4.40	0.07 0.14	2.90 4.80

99321-025-4265 >>

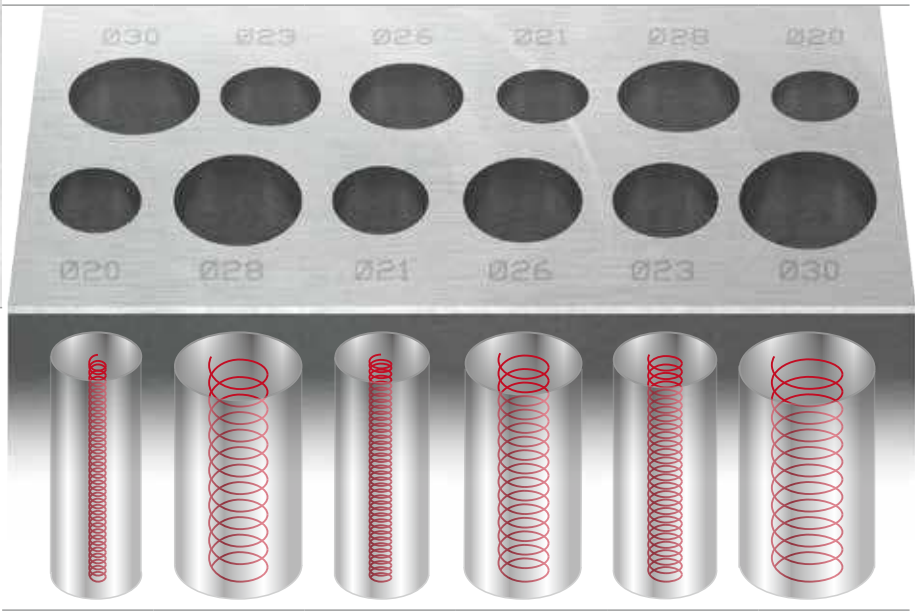
Work piece material		Vc m/min.	Ø42		Ø50		Ø55		Ø60		Ø65	
		99321 	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm	f mm/rev.	Pitch mm
P	Carbon steel 0.25%C	100 ~ 220	0.12 0.20	3.00 5.00	0.15 0.24	3.10 5.20	0.18 0.30	3.30 5.50	0.19 0.32	3.40 5.70	0.20 0.34	3.60 6.00
	Carbon steel 0.45% C	100 ~ 200	0.12 0.20	3.00 5.00	0.15 0.24	3.10 5.20	0.18 0.30	3.30 5.50	0.19 0.32	3.40 5.70	0.20 0.34	3.60 6.00
	Carbon steel 0.60%C	80 ~ 180	0.11 0.18	2.70 4.50	0.13 0.22	2.80 4.70	0.16 0.27	3.00 5.00	0.17 0.29	3.00 5.10	0.18 0.30	3.20 5.40
	Low alloy steel	80 ~ 160	0.10 0.16	2.40 4.00	0.11 0.19	2.50 4.20	0.14 0.24	2.60 4.40	0.15 0.25	2.80 4.60	0.16 0.27	2.90 4.80
	High alloy steel	60 ~ 120	0.10 0.16	2.40 4.00	0.11 0.19	2.50 4.20	0.14 0.24	2.60 4.40	0.15 0.25	2.80 4.60	0.16 0.27	2.90 4.80
M	Stainless steel	60 ~ 120	0.10 0.16	2.40 4.00	0.11 0.19	2.50 4.20	0.14 0.24	2.60 4.40	0.15 0.25	2.80 4.60	0.16 0.27	2.90 4.80
K	Cast Iron	80 ~ 160	0.12 0.20	3.00 5.00	0.15 0.24	3.10 5.20	0.18 0.30	3.30 5.50	0.19 0.32	3.40 5.70	0.20 0.34	3.60 6.00
N	Al	120 ~ 300	0.12 0.20	4.50 7.50	0.15 0.24	4.70 7.80	0.18 0.30	4.90 8.20	0.19 0.32	5.20 8.60	0.20 0.34	5.40 9.00
	Cu	100 ~ 240	0.12 0.20	3.60 6.00	0.15 0.24	3.80 6.30	0.18 0.30	4.00 6.60	0.19 0.32	4.10 6.90	0.20 0.34	4.30 7.20
S	Ni- Alloy	15 ~ 40	0.04 0.08	2.40 4.00	0.05 0.10	2.50 4.20	0.06 0.12	2.60 4.40	0.06 0.13	2.80 4.60	0.07 0.14	2.90 4.80
	Titanium	40 ~ 80	0.04 0.08	2.40 4.00	0.05 0.10	2.50 4.20	0.06 0.12	2.60 4.40	0.06 0.13	2.80 4.60	0.07 0.14	2.90 4.80

Performance
Application Example

▸Just one tool can cut holes from Ø20 to Ø30 mm >>

Example 1

Material	S50C (JIS)
Tool	00-99321-016-2030 / BC16-HD17-2030
Insert	N9MX070204-NC2032
Coolant	External coolant



Up to 3xD with
external coolant can drill direct.
No need to peck drill or
dwell in operation.
Circular helical cutting is easy
setting by NC machine program.
Saving your tool inventory
and cost!

Ø20 Ø28 Ø21 Ø26 Ø23 Ø30

▸Making a hole Ø60x 27mm only by one tool Eliminates 2nd operation from before process Machine load 8% >>

Example 2

Material	Stainless Steel SS304
Tool	00-99321-025-4265 (Ø25mm Side Lock Shank)
Insert	N9MX12T308-NC2032
Machine	BT40
Coolant	External coolant

Dc mm	D mm	L mm	Vc m/min.	S r.p.m	f mm/rev.	F mm/min.	I mm	P mm	T sec.	Q cm³ /min
Ø33	Ø60	27	100	1000	0.2	200	13.5	4	**172**	**26.6**

BT30 Machine, Drilling hole Ø30, Drilling Depth 3.3xDc >>

Example 3

Maximum drilling capacity of the 5.5 kw spindle is Ø16 mm

Material	S50C (JIS), High carbon steel
Tool	00-99321-020-2540 / BC20-HD22-2540
Insert	N9MX100306-NC2032
Machine	BT30, 5.5 Kw
Coolant	External coolant

Dc mm	D mm	L mm	Vc m/min.	S r.p.m	f mm/rev.	F mm/min.	I mm	P mm	T sec.
Ø22	Ø30	70	200	2893	0.2	600	4	2.8	**62**

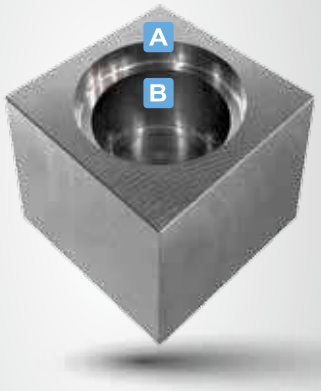
* 3000 r.p.m. is used.

Only Low spindle power required! >>

- Drill bigger holes on a small spindle power machine, such as Tapping Center or small spindle power machine.
- One tool can make different diameter of holes, more flexible and less occupied tool magazine of CNC machines.

Reduce drilling cycle time. To make step hole Ø53.5 & Ø45 by one tool >>

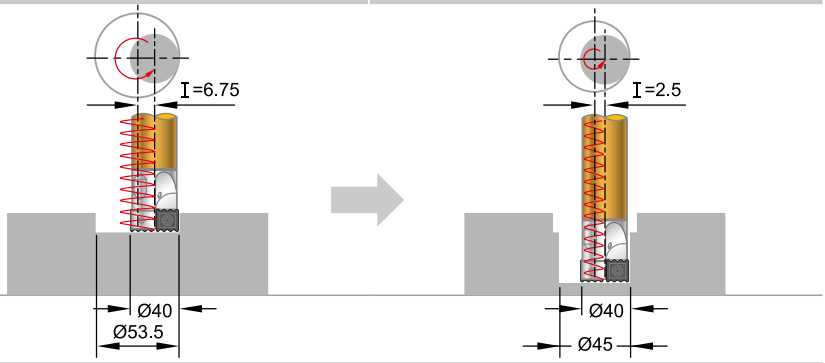
Example 4



Material	S50C (JIS). High carbon steel
Tool	99323-LS32-HD40 (Non-standard size)
Insert	N9MX12T308-NC2032
Machine	BT40, 22.5 Kw
Coolant	Internal

Hole	Dc mm	D mm	L mm	Vc m/min.	S r.p.m	f mm/rev.	F mm/min.	I mm	P mm	T sec.
A	Ø40	Ø53.5	10	300	2400	0.15	360	6.75	5.0	**14**
B		Ø45.0	32	300	2400	0.15	360	2.5	2.0	**42**

op 1 Ø53.5 / Tool Ø40	op 2 Ø45 / Tool Ø40



Application

- Port of hydraulic port for plug-in valve, cylinders, counter bore for bolt, and more!

Just one "NC Helix Drill" can machine different diameter and depth holes >>

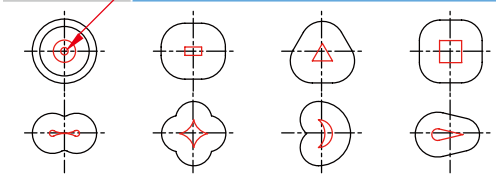
Example 5		
Work piece	op 1	op 2
	99323-020-2540	99323-012-1525

One tool performs multiple patterns

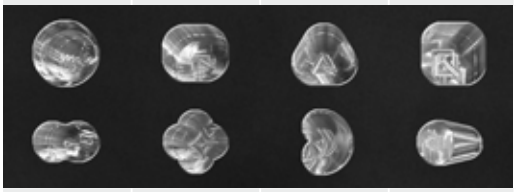
Not only a drill, but an end mill tool. Maximum ramping angle is 20°, small path radius to cut hole, counter-sink hole, various shape of cavity on different material.
Less inventory of different sizes of drills and indexable end mills,
NC Helix Drill cuts it all !

Special geometry insert to cut different materials >>

- Serrated cutting edge makes the cutting chips short and small, easier to be flushed out the drilled hole.
- For almost all kind of materials, good for soft and long cutting chip materials!

Tool Path	Example 6		Chip
	**Tool**	00-99323-016-2030 M08-HD17-2030	
	Insert	N9MX070204-NC2032	
	Machine	BT40, 22.5KW	
	Coolant	Internal	

56 sec.	60 sec.	70 sec.	86 sec.	**Material**	**SUS304** (Stainless steel 304)			
				**Vc**	Cutting Speed	=	150	m/min.
				S	Spindle speed	=	2800	r.p.m.
				f	Feed rate	=	0.1	mm/rev.
				F	Table feed rate	=	280	mm/min
108 sec.	92 sec.	120 sec.	140 sec.	**L**	Depth of Drilling	=	16	mm

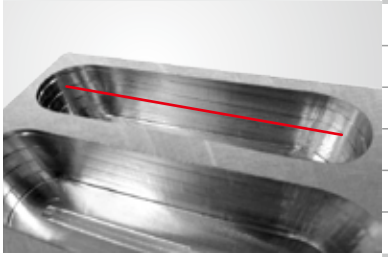
28 sec.	30 sec.	35 sec.	43 sec.	**Material**	**AL6061T6** (Aluminium 6061T6)			
				**Vc**	Cutting Speed	=	300	m/min.
				S	Spindle speed	=	5600	r.p.m.
				f	Feed rate	=	0.1	mm/rev.
				F	Table feed rate	=	560	mm/min
54 sec.	46 sec.	60 sec.	70 sec.	**L**	Depth of Drilling	=	16	mm

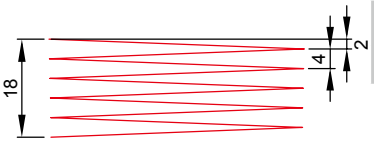
28 sec.	30 sec.	35 sec.	43 sec.	**Material**	**Acrylic**			
				**Vc**	Cutting Speed	=	300	m/min.
				S	Spindle speed	=	5600	r.p.m.
				f	Feed rate	=	0.1	mm/rev.
				F	Table feed rate	=	560	mm/min
54 sec.	46 sec.	60 sec.	70 sec.	**L**	Depth of Drilling	=	16	mm

Replace your end mill by NC Helix Drill. Make the impossible become possible >>

Example 7

Tool Path : 52mm





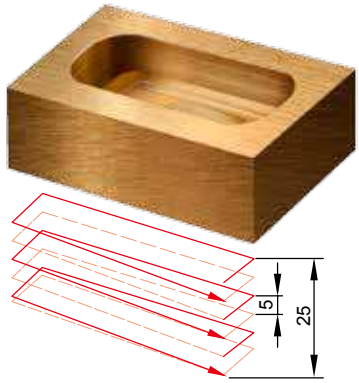
Rough Slotting

Slot Dimension	**W:17mm x D:18mm x L:70mm**
Material	S45C (JIS), Medium Carbon Steel
Tool	00-99323-016-2030 M08-HD17-2030
Insert	N9MX070204-NC2032
Machine	BT40
Coolant	Internal coolant, emulsion

Dc mm	L mm	Vc m/min.	S r.p.m	f mm/rev.	F mm/min.	P mm	T sec.	Q cm³ /min
Ø17	70	200	3800	0.1	380	4*	91	34

* Ramping depth per cut = 2 mm

Notch of Tool Path : 128mm



Rough Slotting

Slot Dimension	**W:40mm x D:25mm x L:70mm**
Material	C95400, Aluminium Bronze
Tool	00-99323-020-2540 M10-HD22-2540
Insert	N9MX100306-NC2032
Machine	HAAS BT40
Coolant	External / Internal coolant

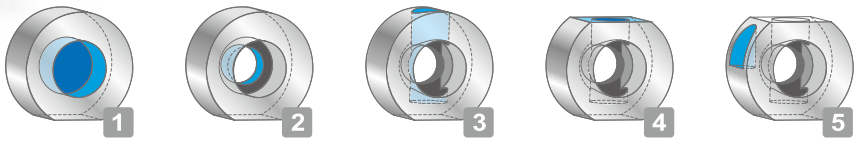
Dc mm	L mm	Vc m/min.	S r.p.m	f mm/rev.	F mm/min.	P mm	T sec.	Q cm³ /min
Ø22	25	350	5000	0.2	1000	5	23	212

NC2032 insert grade is able to cut Titanium in different conditions >>

Example 8

Material	Ti6Al4V, Titanium
Tool	00-99323-016-2030 M08-HD17-2030
Insert	N9MX070204-NC2032
Machine	HAAS VM-3, BT40, 22.5KW
Coolant	Internal

Fig.	Dc mm	D mm	L mm	Vc m/min.	S r.p.m	f mm/rev.	F mm/min.	P mm	T sec.
1	Ø17	Ø30.5	20	60	1200	0.05	60	2	423
2		Ø20.5	20	60	1200	0.03	36	1	366
3		Ø20	50	60	1200	0.03	36	1	785
5		Ø20	20	60	1200	0.05	60	2	94



1	2	3	4	5
Counter sink for M20 bolt	For M20 bolt hole	Cross hole	Surfacing	Half hole on radius

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

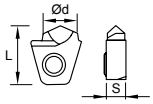

NC40

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					

Periphery Insert


NC2032

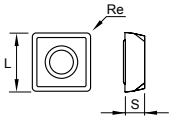

NC40

Features >>

- 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.

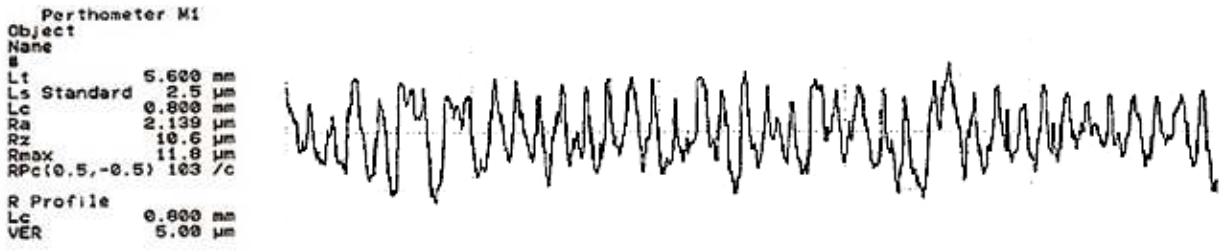
NC40 : P35 grade, tougher insert with special chip breaker, TiN coated, for low carbon steel and stainless steel. Only available for insert N9GX06020431 and N9GX09030831.

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 1.0Nm	 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 >>

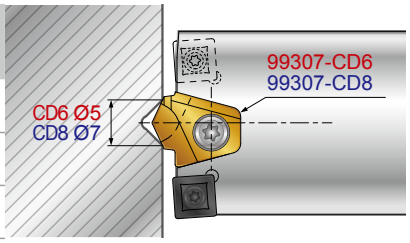
Center Pilot Insert	Material:Carbon steel (S45C)		
99307-CD8 N9GX060204 NC40 NC2032	Vc	80	m/min.
	S	880	r.p.m.
	f	0.10	mm/z
	F	88.0	mm/min.
	Ra	2.139	μm
	Rmax	11.8	μm



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.

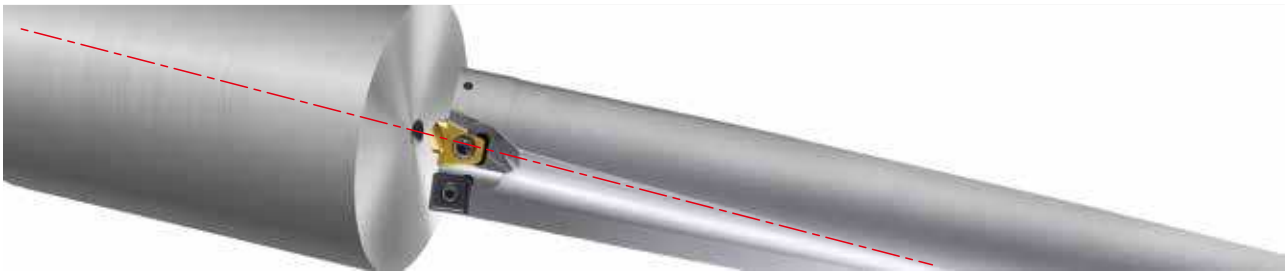
Center Pilot	CD6	CD8
Drill dia	19 ~26mm	27 ~40mm
Spotting Diameter	Ø5 mm	Ø7 mm
Spotting Depth	2.8 mm	3.8 mm



The way to make a spot hole >>

Action A

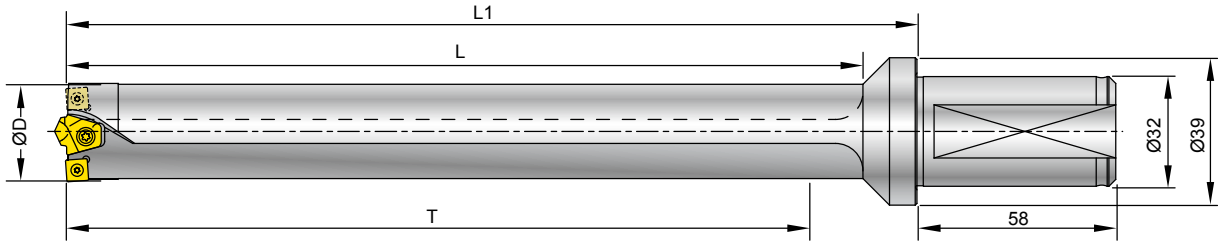
The spot hole will guide the pilot insert at the beginning and stablized the drill to get the perfect drilling operation.



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.	
00-99307-22150		150	175	189		
00-99307-22200		200	225	239		
00-99307-23100	23 (0.905″)	100	125	139	NS-35080 2.5Nm NK-T15	
00-99307-23150		150	175	189		
00-99307-23200		200	225	239		
00-99307-24100	24 (0.945″)	100	126	139		N9GX060204 x 1 pc. NS-22055 / 1.0Nm NK-T7
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		
00-99307-27200		200	231	248	99307-CD8 x 1 pc.	
00-99307-27250		250	281	298		
00-99307-28150	28 (1.102″)	150	181	198		N9GX060204 x 2 pcs. NS-22055 / 1.0Nm NK-T7
00-99307-28200		200	231	248		
00-99307-28250		250	281	298	NS-35120 2.5Nm NK-T15	
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. NS-22055 1.0Nm NK-T7
00-99307-32150	32 (1.260″)	150	188	203		
00-99307-32200		200	238	253		
00-99307-32250		250	288	303		
00-99307-32300		300	338	353		
00-99307-33150	33 (1.300″)	150	189	203		
00-99307-33200		200	239	253		
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	NS-35120 2.5Nm	
00-99307-35300		300	345	358		
00-99307-35350		350	395	408	NK-T15	
00-99307-36200	36 (1.417″)	200	245	258		
00-99307-36250		250	295	308		
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		NS-30072 2.0Nm
00-99307-38250		250	296	308		
00-99307-38300		300	346	358		NK-T9
00-99307-38350		350	396	408		
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

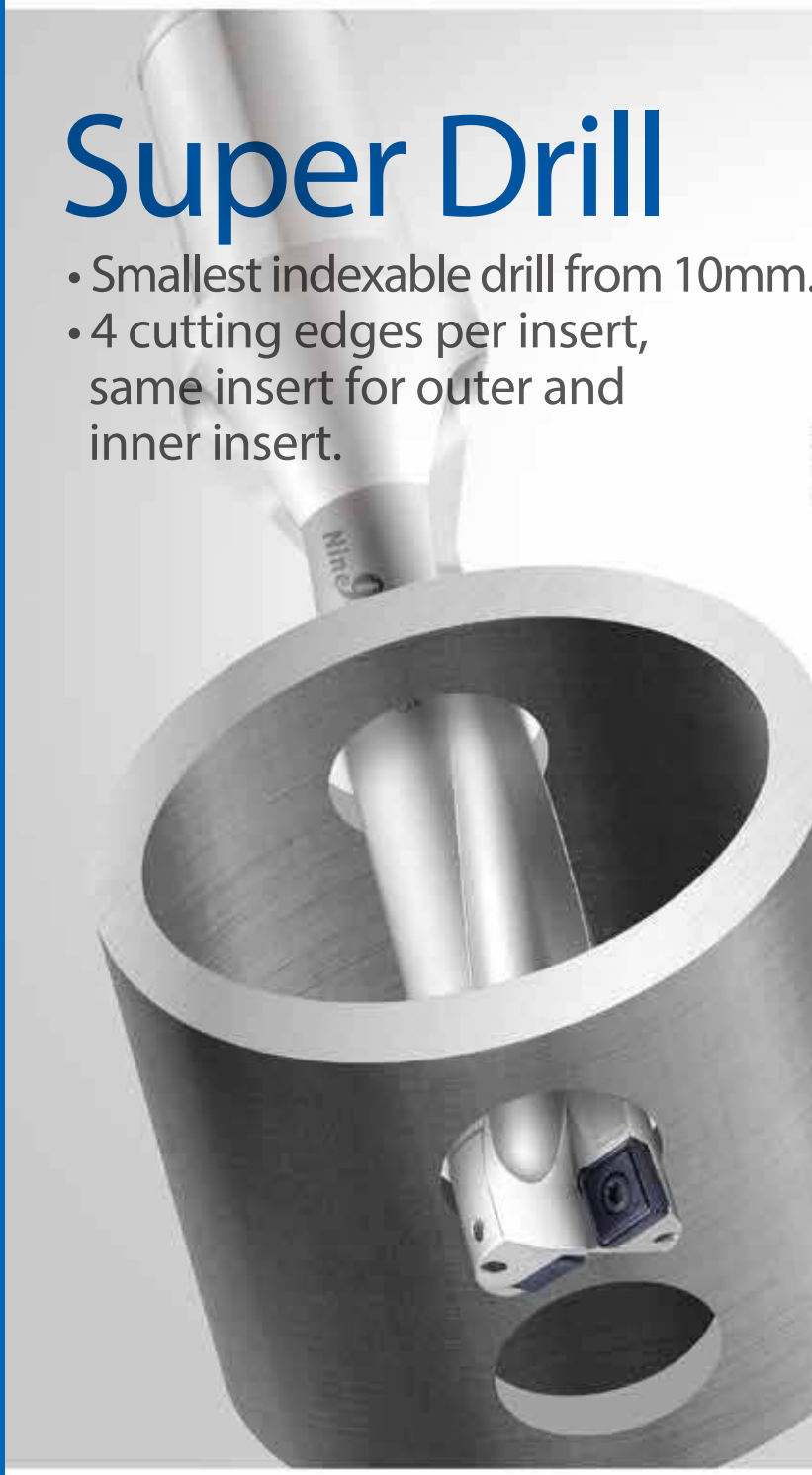
Work piece material	T= Length/ Dia.	Vc (m/min.)	f (mm/rev.)				Grade of insert	
			N9GX04T002	N9GX05T103	N9GX060204	N9GX090308		
			Dia.19	Dia.20-21	Dia.22-34	Dia.35-40	Center	Periphery
Carbon steel C<0.3% Ex.:S25C, SS41	T<7D	80~150	0.03~0.07	0.04~0.08	0.06~0.10	0.08~0.12	NC2032	NC2032
	T>7D	60~120	0.03~0.07	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.

Super Drill

- Smallest indexable drill from 10mm.
- 4 cutting edges per insert, same insert for outer and inner insert.



Ø10
~
Ø30

SMALLEST DIMENSION
3xD : Ø10 to Ø30 mm.
4xD : Ø16 to Ø30 mm.

SMALLER CUTTING CHIP
- The center and peripheral inserts are positioned in order to divide the cutting chips into smaller spiral shape.
  It helps the cutting chip to be removed faster and easier.
- Designed for high productivity, high speed cutting.
  Coolant supply is needed.

BETTER SURFACE FINISH AND BETTER DIAMETER ACCURACY
- Special insert positioning to balance the cutting forces, better surface finish and diameter accuracy are achievable.

3xD & 4xD

4 cutting edges insert
AlTiN coated

Chip breaker of SPD insert provides excellent chip control property due to its engineered design

Easy and simple change of cutting edge without inconvenience

≃ Flat bottom shape

Angled Surfaces

Possible to drill into angled surfaces without pre-drilling

Coolant

Internal coolant is recommended
In case of external coolant
Cutting depth must be 1xD or less

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

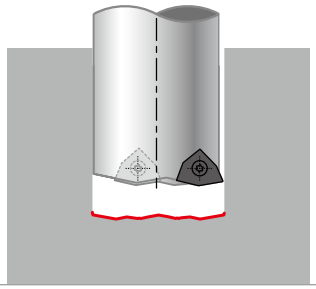
Insert Specification

Periphery Insert

Features

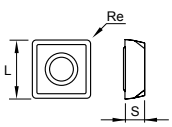
- Fully ground dual-relief insert, for improved surface finish and higher feed rate.
- Primary relief angle is to increase the toughness of the insert, secondary relief angle is to strengthen the axial feed rate.
- Same insert for outer and inner insert.
- Square insert with 4 cutting edges, reducing cost per insert.
- Better surface finish.
- Better diameter accuracy.

NC2032

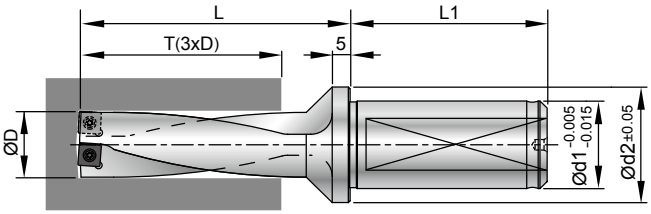
Nine9 SD	Other makers
	

Insert >>

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

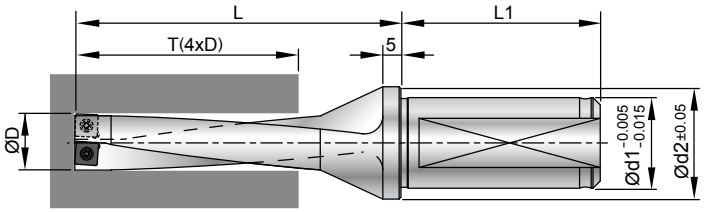
Ordering code					Dimensions			Screw	Key
Code of insert	Grade		Coating		L	S	re		
N9GX04T002	NC2032	K20F	AlTiN		4.07	1.8	0.2	NS-18037 0.6Nm	NK-T6
N9GX05T103	NC2032	K20F	AlTiN		5.07	2.0	0.2	NS-20045 0.8Nm	NK-T6
N9GX060204	NC2032	K20F	AlTiN		6.35	2.38	0.4	NS-22055 1.0Nm	NK-T7
N9GX070304	NC2032	K20F	AlTiN		7.94	3.18	0.4	NS-25060 1.2Nm	NK-T7
N9GX090308	NC2032	K20F	AlTiN		9.52	3.18	0.8	NS-30072 2.0Nm	NK-T9

Holder 3xD 10mm~30mm



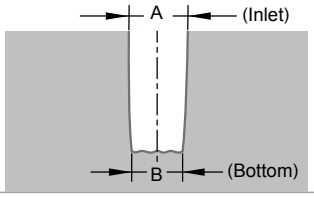
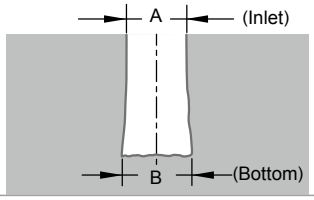
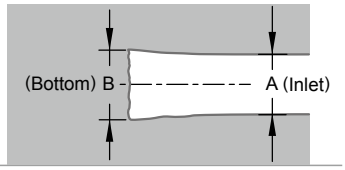
Ordering code	ØD	T	L	d1	d2	L1	Insert Screw / Key	Radial Adjustment	D max
00-99313-10	10.0	30.0	49	20	27	49		0.25	10.5
00-99313-10.3	10.3	30.9	52	20	27	49	N9GX04T002	0.25	10.8
00-99313-10.5	10.5	31.5	52	20	27	49		0.25	11.0
00-99313-11	11.0	33.0	52	20	27	49	NS-18037 0.6Nm	0.20	11.4
00-99313-11.5	11.5	34.5	55	20	27	49		0.20	11.9
00-99313-12	12.0	36.0	55	20	27	49	NK-T6	0.15	12.3
00-99313-12.5	12.5	37.5	58	20	27	49		0.15	12.8
00-99313-13	13.0	39.0	58	20	27	49		0.30	13.6
00-99313-13.5	13.5	40.5	61	20	27	49	N9GX05T103	0.30	14.1
00-99313-14	14.0	42.0	61	20	27	49		0.25	14.5
00-99313-14.5	14.5	43.5	64	20	27	49	NS-20045 0.8Nm	0.25	15.0
00-99313-15	15.0	45.0	64	20	27	49		0.20	15.4
00-99313-15.5	15.5	46.5	67	20	27	49	NK-T6	0.20	15.9
00-99313-16	16.0	48.0	74	25	31	49		0.40	16.8
00-99313-16.5	16.5	49.5	76	25	31	55		0.40	17.3
00-99313-17	17.0	51.0	76	25	31	55	N9GX060204	0.35	17.7
00-99313-17.5	17.5	52.5	78	25	31	55		0.35	18.2
00-99313-18	18.0	54.0	78	25	31	55	NS-22055 1.0Nm	0.30	18.6
00-99313-18.5	18.5	55.5	80	25	31	55		0.30	19.1
00-99313-19	19.0	57.0	80	25	31	55	NK-T7	0.25	19.5
00-99313-19.5	19.5	58.5	85	25	31	55		0.25	20.0
00-99313-20	20.0	60.0	85	25	31	55		0.50	21.0
00-99313-20.5	20.5	61.5	87	25	31	55		0.50	21.5
00-99313-21	21.0	63.0	87	25	31	55	N9GX070304	0.45	21.9
00-99313-21.5	21.5	64.5	88	25	31	55		0.45	22.4
00-99313-22	22.0	66.0	88	25	31	55		0.40	22.8
00-99313-22.5	22.5	67.5	90	25	31	55	NS-25060 1.2Nm	0.40	23.3
00-99313-23	23.0	69.0	90	25	31	55		0.35	23.7
00-99313-23.5	23.5	70.5	92	25	31	55	NK-T7	0.35	24.2
00-99313-24	24.0	72.0	92	25	31	55		0.30	24.6
00-99313-25	25.0	75.0	114	32	43	58		0.50	26.0
00-99313-26	26.0	78.0	115	32	43	58		0.50	27.0
00-99313-27	27.0	81.0	117	32	43	58	N9GX090308	0.40	27.8
00-99313-28	28.0	84.0	126	32	43	58		0.40	28.8
00-99313-29	29.0	87.0	127	32	43	58	NS-30072 NK-T9	0.30	29.6
00-99313-30	30.0	90.0	130	32	43	58	2.0Nm	0.30	30.6

Holder 4xD 16mm~30mm



Ordering code	ØD	T	L	Ød1	Ød2	L1	Insert Screw / Key	Radial Adjustment	D max
00-99314-16	16	64	90	25	31	55	N9GX060204	0.40	16.8
00-99314-17	17	68	93	25	31	55	NS-22055 1.0Nm	0.35	17.7
00-99314-18	18	72	96	25	31	55	NK-T7	0.30	18.6
00-99314-19	19	76	99	25	31	55		0.25	19.5
00-99314-20	20	80	105	25	31	55	N9GX070304	0.50	21.0
00-99314-21	21	84	108	25	31	55	NS-25060 1.2Nm	0.45	21.9
00-99314-22	22	88	110	25	31	55	NK-T7	0.40	22.8
00-99314-23	23	92	113	25	31	55		0.35	23.7
00-99314-24	24	96	116	25	31	55		0.30	24.6
00-99314-25	25	100	139	32	43	58		0.50	26.0
00-99314-26	26	104	141	32	43	58	N9GX090308	0.50	27.0
00-99314-27	27	108	144	32	43	58	NS-30072 2.0Nm	0.40	27.8
00-99314-28	28	112	154	32	43	58	NK-T9	0.40	28.8
00-99314-29	29	116	156	32	43	58		0.30	29.6
00-99314-30	30	120	160	32	43	58		0.30	30.6

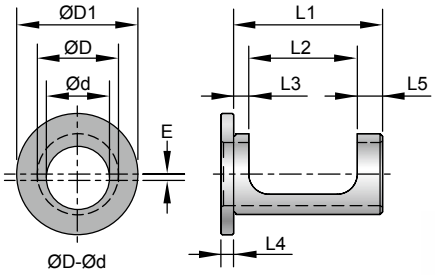
Trouble Shooting

Problem	Hole diameter become smaller at hole bottom	Hole diameter become larger at hole bottom	Hole diameter become smaller from the hole inlet
Details			
	A>B	**A<B**	**A<B**
	No problem at hole inlet, but hole diameter decreases gradually	No problem at hole inlet, but hole diameter increases gradually	Hole diameter become smaller from inlet. (at stationary drilling)
Cause	Chip evacuation from inner and outer edge	Chip evacuation from inner edge	Improper cutting dia. adjustment Inner insert is above the center (No core remains)
Countermeasure	Change the cutting conditions ·Increase the cutting speed ·Reduce the feed rate	Change the cutting conditions ·Increase the cutting speed ·Reduce the feed rate	When using with lathe, adjust the hole dia. by moving the tool the in X-axis direction See page 32

Eccentric Ring
for 3xD, 4xD Super Drill

Sleeve Dimension

- For hole diameter adjustment on Machining Center.
- For center height adjustment of CNC Lathe.



Ordering Code	Part No.	Dimension (mm)								Adjustment Range (mm)
		ØD	Ød	ØD1	L1	L2	L3	L4	L5	E
00-99302-2520	LS25-ID20	25	20	41	43	33	3	4	7	+0.2, –0.2
00-99302-3225	LS32-ID25	32	25	48	59	41	6	5	12	
00-99302-4032	LS40-ID32	40	32	58	69	43	6	5	20	

How to Use

- Eccentric Ring is designed for only the small diameter Drill.
- Eccentric Ring is for cutting diameter adjustment only. (up to +0.2mm or -0.2mm)
- Eccentric Ring is not for center height adjustment like a conventional adjustable sleeve.
- Apply Eccentric Ring when adjusting the cutting diameter.
  a. Set the outer edge horizontally: 90° to the marking line on the sleeve (Fig.1)
  b. To adjust to a larger diameter, align the +0.2 mark on the sleeve with the flat on the drill shank.
  To adjust to a smaller diameter, align the -0.2 mark on the sleeve with the flat on the drill shank.
  c. Tighten the bottom screw firmly which is directly touching the drill. Slightly tighten the upper screw which is directly touching the sleeve.

Fig. 1 Diameter Adjustment Method (ex. Ø10 Drill)

To adjust for a Larger Diameter	To adjust for a Smaller Diameter

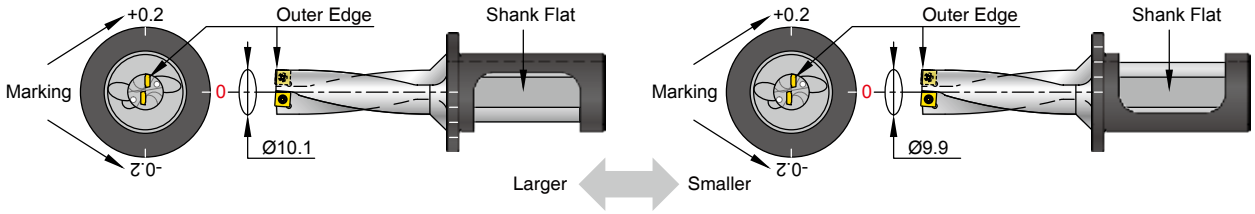
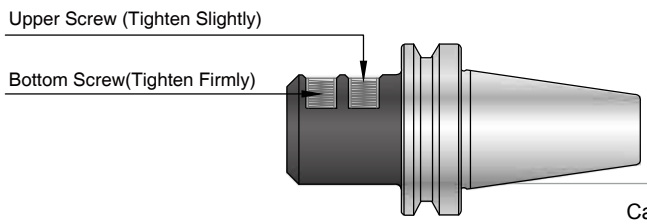


Fig. 2



Caution: Not for use with Collet Chuck type Arbor

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

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

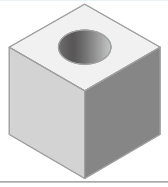
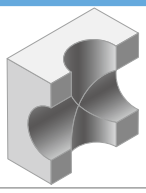
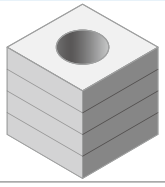
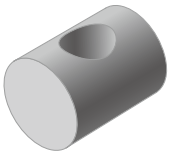
$$F = f \times S$$

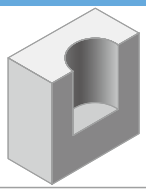
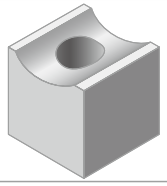
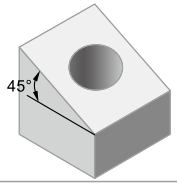
d = diameter-inch
S = Spindle Speed-r.p.m.
SFM = Surface Speed-ft./min. Vc (m/min.) x 3.28
f = IPR = inch/rev.
F = IPM=RPM x f / 25.4.

Technical Guide

Application of Drill in Different Conditions

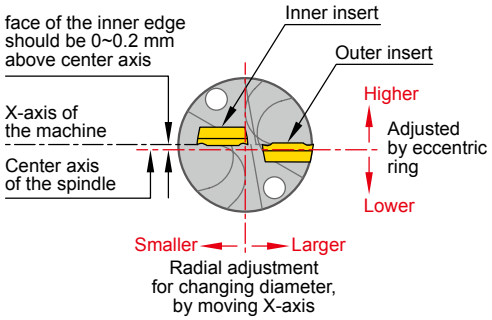
Material Classifiction for Calculation

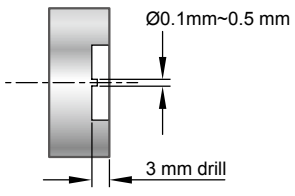
Application	* Regular Surface	Cross Holes	Stack Drilling	Round Work Piece Offset Drilling
Work Piece Shape				
Cutting Speed Vc (m/min.)	100%	80%	80%~70%	80%~60%
Feed Rate (mm/rev.)	100%	80%	80%~70%	80%~60%

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.	

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