NC Helix Drill

Lower Spindle Power Consumption
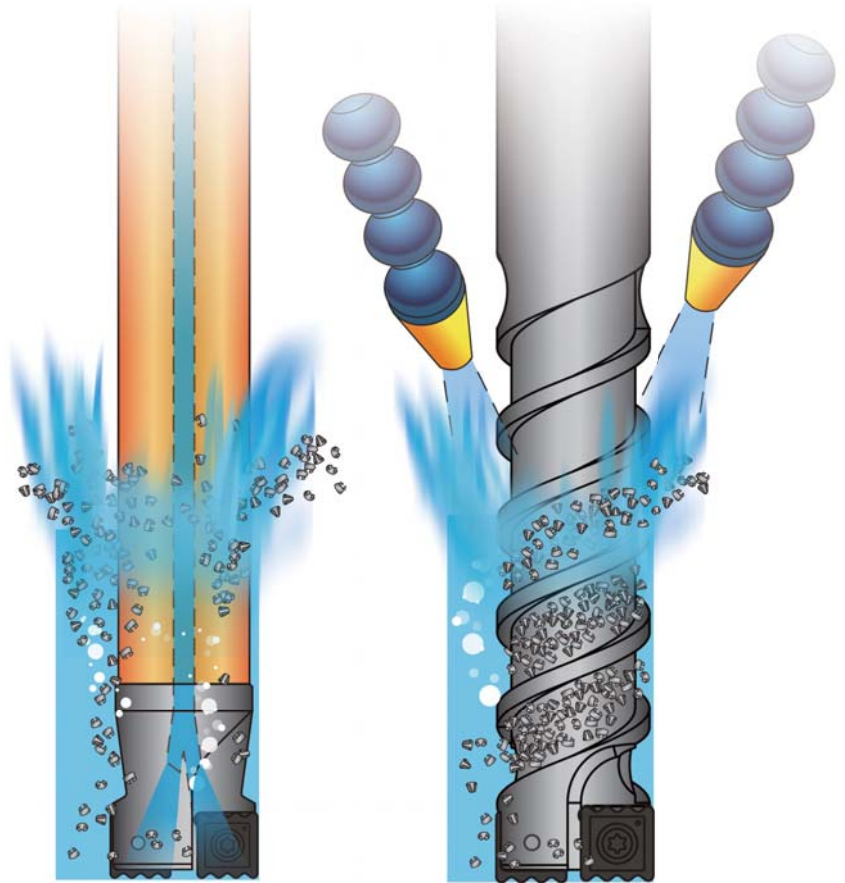
> Five cutters for drilling Ø13~Ø50 mm.
> One insert for all kind of materials.
> The drilling is done by helical interpolation.
  (circular ramping milling)

Nine9®

Nine9® NC Helix Drill — Patent Pending

Principle and Benefit

- The hole is cut by helical interpolation;
  just five sizes of cutter can cut Ø13 to Ø50 mm.

- Even long cutting chip material, such as low carbon steel,
  stainless steel and soft material can be drilled easily
  without any trouble of long spiral cutting chips.

- Thanks to the small cutting load of the serrated cutting edge
  and helical interpolation, low power consumption of the
  spindle is required.

Two types of NC Helix drill for your options

- **Cylindrical shank** with helical groove is designed for
  CNC machines without internal coolant supply.
  The rotation of helical groove generates the stream to
  flush out the cutting chips together with coolant.

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

- **Example:**
  Ø11 NC Helix drill can drill Ø15 and Ø20,
  just programmed different circular radius
  I=2mm and I=4.5mm.
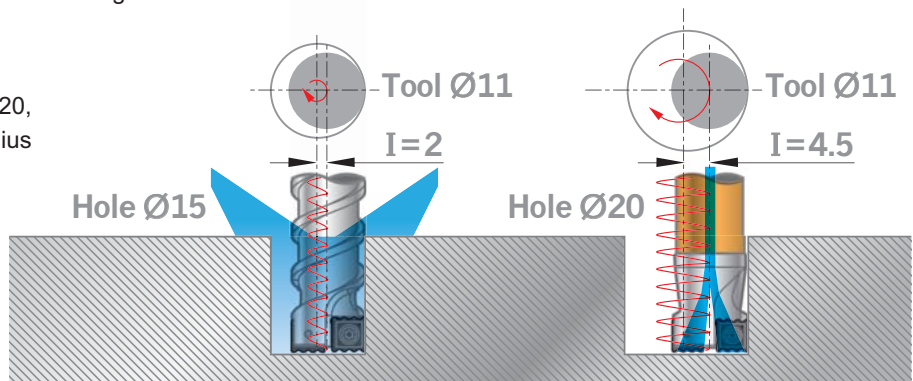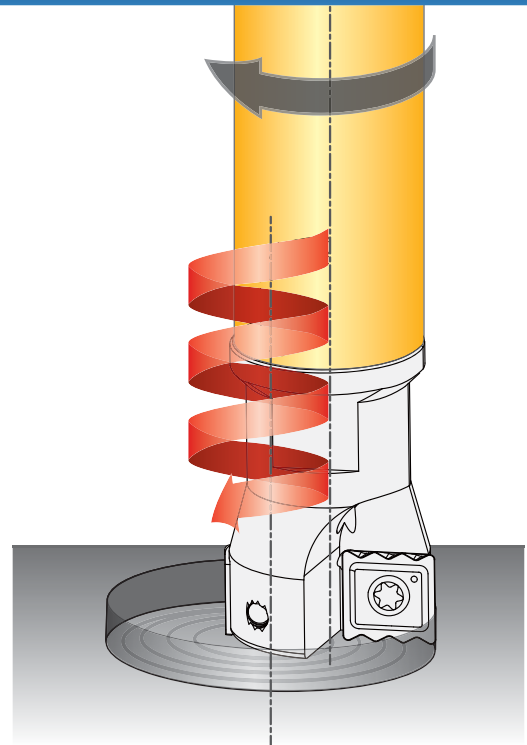
Tool Ø11 I=2 Hole Ø15
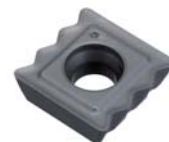
Tool Ø11 I=4.5 Hole Ø20

Insert

- Serrated cutting edge makes the cutting chips short and small,
  it is easily to be flushed out the drilled hole.

NC2032:

- K20F micro grain carbide insert, TiAlN Coated.
- One insert has 2 cutting edges.
- For almost all kind of materials,
 good for soft and long cutting chip materials!

Ordering Code	Grade	Coating		Dimensions			Screw	Key
				L	S	Re		
01-N9MX04T002-NC2032				4.75	1.8	0.2	NS-18037 / 0.6Nm	NK-T6
01-N9MX05T103-NC2032				5.75	2.0	0.3	NS-20045 / 0.6Nm	NK-T6
01-N9MX070204-NC2032	K20F	TiAlN		7.5	2.4	0.4	NS-25045 / 1.2Nm	NK-T7
01-N9MX100306-NC2032				10	3.18	0.6	NS-30072 / 2.0Nm	NK-T9
01-N9MX12T308-NC2032				12.5	3.97	0.8	NS-35080 / 3.0Nm	NK-T15

Holder

### ■ Cylindrical shank
Helical chip-removing groove
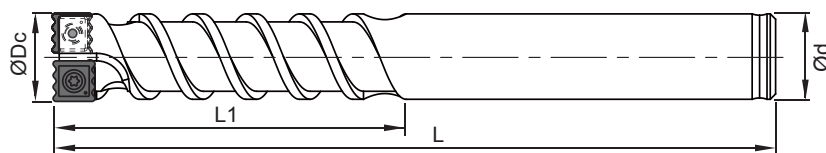
- The holder is made by high alloy steel and hardened.
- Special designed helical groove generates coolant chip-removing-stream.
- The coolant is pull-up by the rotating of helical groove and flushes out the cutting chips together with the coolant.
- Designed for the CNC machines with external coolant only.

Ordering Code	Type	Capable of drill dia. mm		Max. Depth	Ød	ØDc	L	L1	Insert type	Max. ramping angle
		Dmin.	Dmax.							
00-99321-010-1320	BC10-HD11-1320	13	20	30	10	11	80	40	N9MX04T002	20°
00-99321-012-1525	BC12-HD13-1525	15	25	36	12	13	100	50	N9MX05T103	20°
00-99321-016-2030	BC16-HD17-2030	20	30	50	16	17	135	65	N9MX070204	20°
00-99321-020-2540	BC20-HD22-2540	25	40	60	20	22	170	80	N9MX100306	20°
00-99321-025-3050	BC25-HD27-3050	30	50	75	25	27	220	100	N9MX12T308	20°

■ Screw fit cutter
### Center coolant

- The holder is made by high alloy steel and hardened, standard screw-fit cutter adapts to almost any kind of the screw-fit tool holder or extension bar in the market.
- Designed for the CNC machines with center coolant.
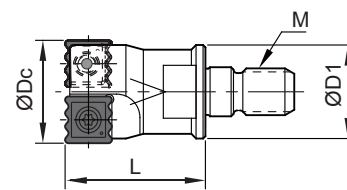
| Ordering Code	Type	Capable of drill dia. mm		ØDc	ØD1	L	M	Insert type	Max. ramping angle
		Dmin.	Dmax.						
00-99323-010-1320	M05-HD11-1320	13	20	11	10	20	M5	N9MX04T002	20°
00-99323-012-1525	M06-HD13-1525	15	25	13	12	25	M6	N9MX05T103	20°
00-99323-016-2030	M08-HD17-2030	20	30	17	16	25	M8	N9MX070204	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 Made

- TiN coated range is the maximum overhang length.
- With internal coolant hole.
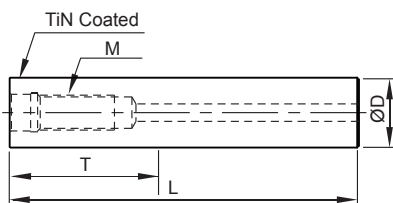
■ Extension Bar - Solid Carbide Made

- TiN coated range is the maximum overhang length.
- With internal coolant hole.
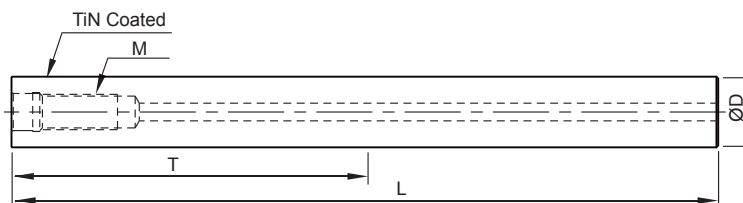
Ordering Code	Type	ØD	T	L	M
00-99801-12S	BC12-075M06S	12	25	75	M6
00-99801-16S	BC16-090M08S	16	35	90	M8
00-99801-20S	BC20-100M10S	20	40	100	M10
00-99801-25S	BC25-120M12S	25	50	120	M12

Ordering Code	Type	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

BT30 Machine, Drilling hole Ø30, Drilling Depth 2.5xD

- Work Material : S50C (JIS), high carbon steel
- Tool : 00-99321-020-2540 BC20-HD22-2540
- Insert : N9MX100306-NC2032
- Machine : BT30, 5.5 Kw < External coolant >

**Maximum drilling capacity of the 5.5 kw spindle is Ø16 mm.**

Low spindle power required!

► Drill bigger holes on as 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.

■ Cutting Data:

Dc	Dia. of Drill	= Ø22 mm
D	Drilling diameter	= Ø30 mm
L	Depth of Drilling	= 70 mm
Vc	Cutting Speed	= 200 m/min.
S	Spindle speed	= 2893 r.p.m., 3000 r.p.m. is used.
F	Table feed rate	= 600 mm/min.
f	Feed rate	= 0.2 mm/rev.
I	Circular radius	= 4 mm
P	Axial feed rate while helical interpolation	= 2.8 mm
	Cutting time	= **34 sec. a hole**

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

Ⓐ Ø53.5mm
Ⓑ Ø45mm
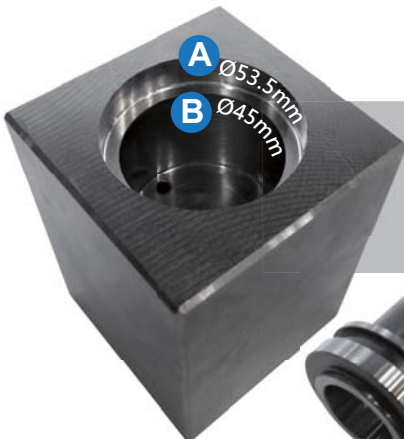
- Work Material : S50C (JIS). High carbon steel
- Tool : 99323-LS32-HD40 (Non-standard size)
- Insert : N9MX12T309-NC2032
- Machine : BT40, 22.5 Kw < Center coolant >

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

Tool Ø40   Tool Ø40

I =6.75   **I =2.5**

Hole A Ø53.5   Hole B Ø45
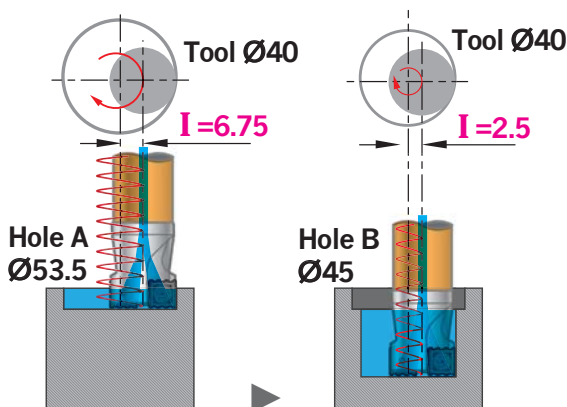
■ Cutting Data:

Dc	Dia. of Drill	= Ø40 mm
D	Drilling diameter	= Hole A: Ø53.5mm Hole B: Ø45.0mm
L	Depth of Drilling	= Hole A: 10mm Hole B: 32mm
Vc	Cutting Speed	= 300 m/min.
S	Spindle speed	= 2400 r.p.m.,
F	Table feed rate	= 360 mm/min.
f	Feed rate	= 0.15 mm/rev.
I	Circular radius	= Hole A: 6.75mm Hole B: 2.5mm
P	Axial feed rate while helical interpolation	= For hole A: 5.0 mm For hole B: 2.0 mm
	Cutting time	= **38 seconds**

Just one "NC Helix Drill" can machine different diameter and depth holes!
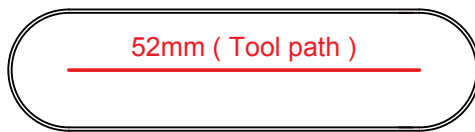
Replace your end mill by NC Helix Drill.
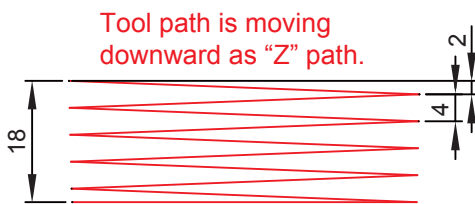# Make impossible became possible!
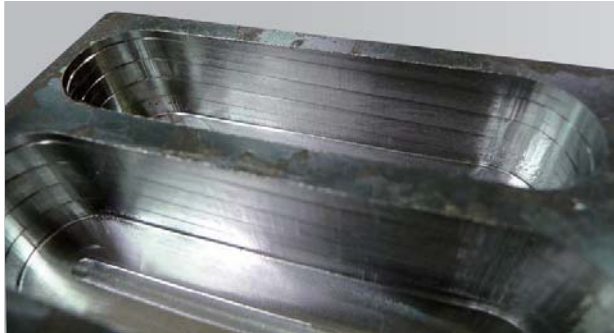
◀ **Rough Slotting**

Dimension: W:17mm x D:18mm x L:70mm.

- Work Material : S45C (JIS), Medium Carbon Steel
- Tool : 00-99323-016-2030 M08-HD17-2030
- Insert : N9MX070204-NC2032
- Machine : BT40 < Center coolant, emulsion. >

52mm (Tool path)

Dimension: W:17mm x D:18mm x L:70mm.

Tool path is moving downward as "Z" path.

■ **Cutting Data:**

Dc	Dia. of Drill	=	Ø17 mm
Vc	Cutting Speed	=	200 m/min
S	Spindle speed	=	3800 r.p.m.,
F	Table feed rate	=	380 mm/min.
f	Feed rate	=	0.1 mm/rev.
P	Axial feed rate while helical interpolation	=	P= 2 mm. Ramping depth per cut= 2 mm
	Cutting time	=	**91 seconds**

A Tool B Tool

One tool performed multiple patterns

It is not only working like a drill but also like a end mill, 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 cut it all !*

Tool Path

20°
Ramping Angle
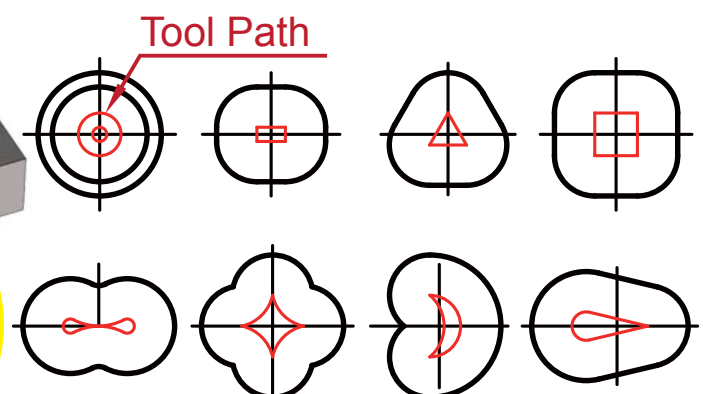
# Special geometry insert to cut difference material
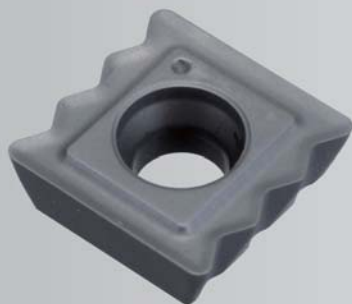
■ **Insert:**

► Serrated cutting edge makes the cutting chips short and small, it is easily to be flushed out the drilled hole.

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

Chip

- Tool : 00-99323-016-2030 M08-HD17-2030
- Insert : N9MX070204-NC2032
- Machine : BT40, 22.5KW **<Center coolant>**

56 Sec. 60 Sec. 70 Sec. 86 Sec.
108 Sec. 92 Sec. 120 Sec. 140 Sec.
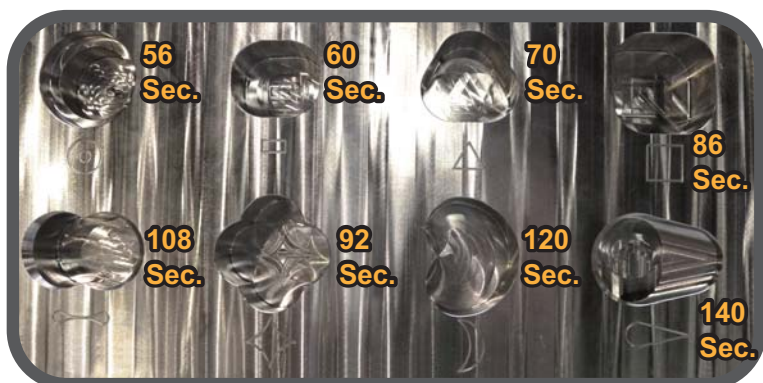
Work Material: SUS304
(Stainless steel 304)

Vc	Cutting Speed	= 150 m/min.
S	Spindle speed	= 2800 r.p.m.
F	Table feed rate	= 280 mm/min.
f	Feed rate	= 0.15 mm/rev.
L	Depth of Drilling	= 16 mm

28 Sec. 30 Sec. 35 Sec. 43 Sec.
54 Sec. 46 Sec. 60 Sec. 70 Sec.
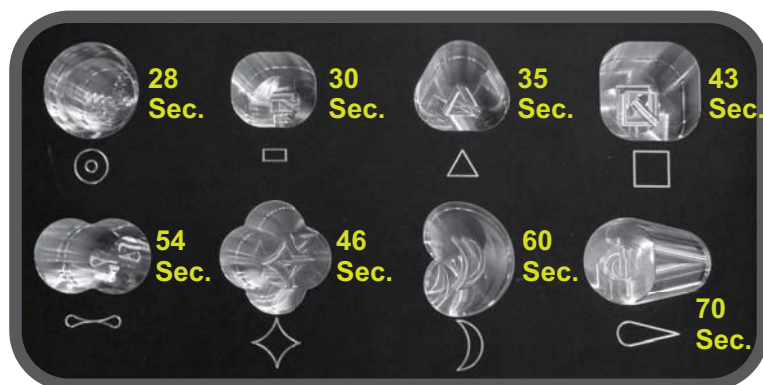
Work Material: AL6061T6
(Aluminum 6061T6)

Vc	Cutting Speed	= 300 m/min.
S	Spindle speed	= 5600 r.p.m.
F	Table feed rate	= 560 mm/min.
f	Feed rate	= 0.1 mm/rev.
L	Depth of Drilling	= 16 mm

28 Sec. 30 Sec. 35 Sec. 43 Sec.
54 Sec. 46 Sec. 60 Sec. 70 Sec.
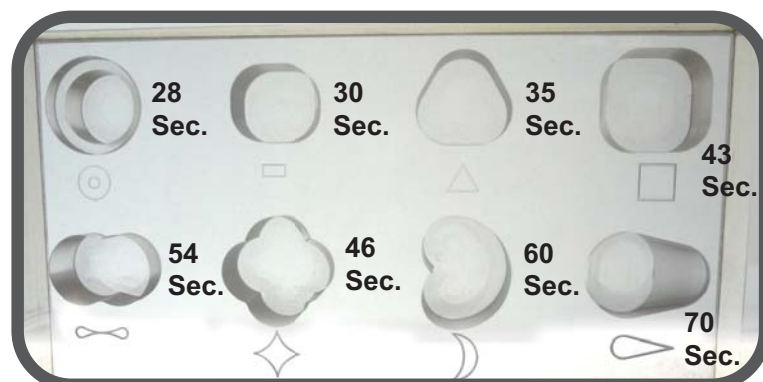
Work Material: Acrylic

Vc	Cutting Speed	= 300 m/min.
S	Spindle speed	= 5600 r.p.m.
F	Table feed rate	= 560 mm/min.
f	Feed rate	= 0.1 mm/rev.
L	Depth of Drilling	= 16 mm

Just one tool can cut holes from Ø20 to Ø30 mm
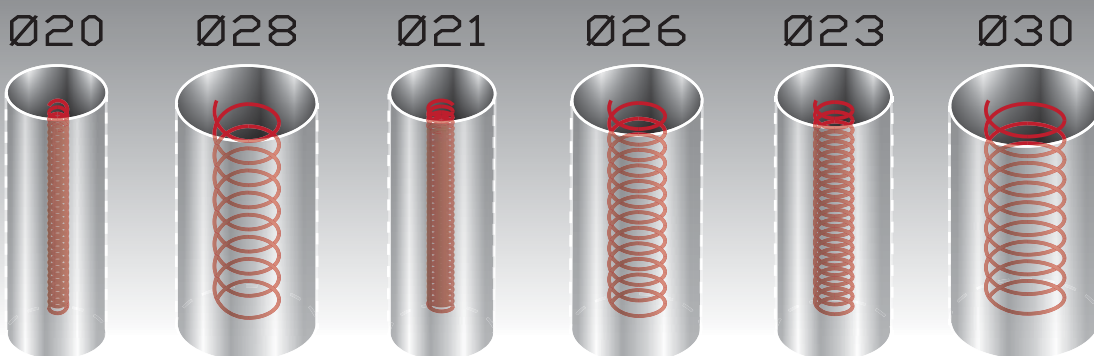
quickly and easy!

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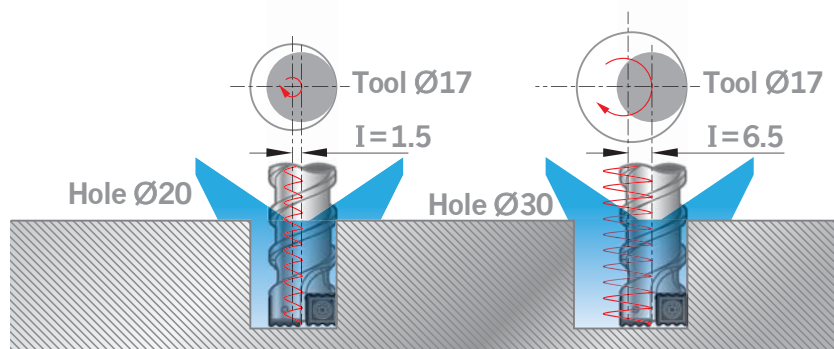- ▪ Coolant   : **External coolant**

Tool Path

| Ø20 | Ø28 | Ø21 | Ø26 | Ø23 | Ø30 |

Up to 3xD with external coolant can drill direct.
No need peck drilling or dwell operation.
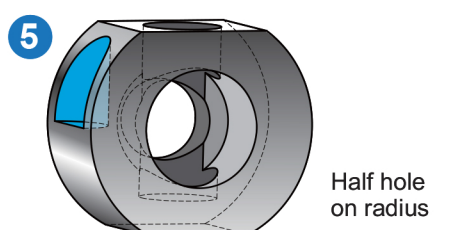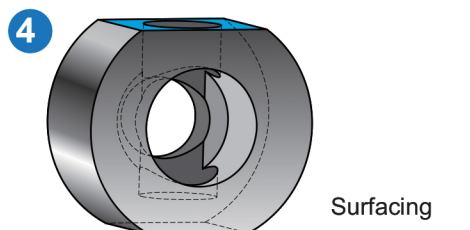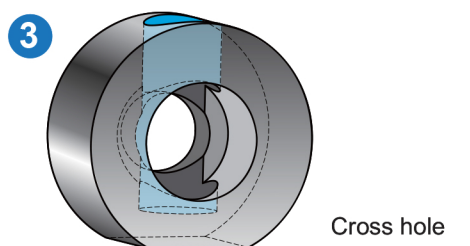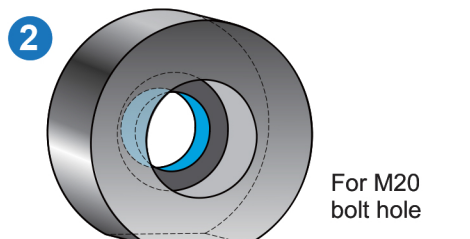**Circular helical cutting is easy setting by**
NC machine program.

Saving your tool numbers and cost!

Tip

Tool Ø17
I=1.5
Hole Ø20

Tool Ø17
I=6.5
Hole Ø30

Near-flat bottom of hole

1
Counter sink for M20 bolt

2
For M20 bolt hole

3
Cross hole

4
Surfacing

5
Half hole on radius
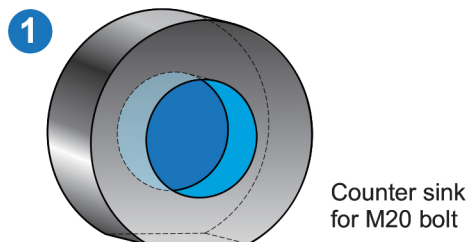
Work Material: Ti6Al4V

Tool holder: 00-99323-016-2030
              M08-HD17-2030
Insert: 01-N9MX070204-NC2032
Machine: HAAS VM-3, BT40, 22.5KW

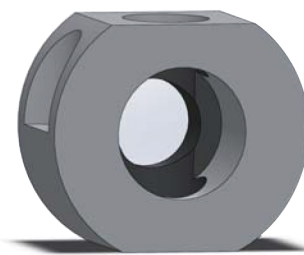| Fig.	Dc	D	L	Vc	S	fz	P
●		Ø30.5	20	60	1200	0.05	2
●	Ø17	Ø20.5	20	60	1200	0.03	1
●		Ø20	50	60	1200	0.03	1
●		Ø20	20	60	1200	0.05	2

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

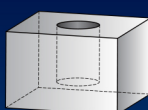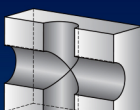|		
Dc	= Dia. of Drill	mm
D	= Drilling diameter	mm
L	= Depth of Drilling	mm
Vc	= Cutting Speed	m/min.
S	= Spindle Speed	r.p.m.
F	= Table feed rate	mm/min.
I	= Circular radius	mm
fz	= Feed rate	mm/tooth
P	= Pitch of helical interpolation	mm

Formula:

$$S= \frac{Vc \times 1000}{Dc \times \pi} \qquad I= \frac{(D-Dc)}{2} \qquad F= S \times f$$
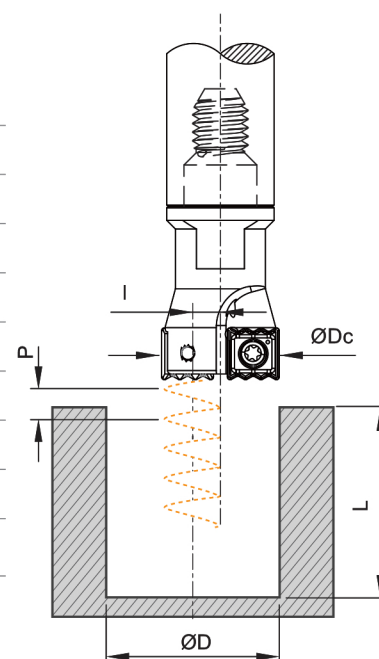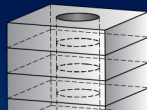
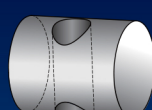## ■ Possible in Different Conditions
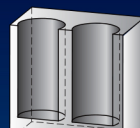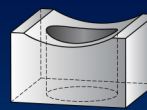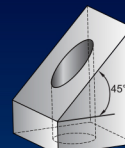
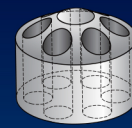Regular Surface   Cross Holes   Stack Drilling   Round Work Piece Offset Drilling   Partial Hole Drilling   Concave Surfaces   Angled Surfaces   Cone Work Piece Offset Drilling

IMPORTMETAL
TOOLING SOLUTIONS

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