

Drills for high-hardened steels

# ***NSBH-ATH***

**Carbide Oil Hole Non Step Borer for high hardness materials**



**MOLDINO Tool Engineering Europe GmbH**

NSBH-ATH | 2024-07 | Version 1.2 | PDF

## Achieves high-performance drilling of hardened steels

### Features of NSBH-ATH

**01**

High toughness and cutting edge strength for high-hardened steels

**02**

Smooth removal of chips by special flute shape

**Line-up:** 63 items

**DC:** 2-12 mm



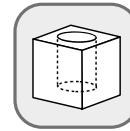
### Recommended usage

#### Application range

Tool steel	Pre-hardened steel	Hardened steel 45-55 HRC	Hardened steel 55-60 HRC	Hardened steel 60-65 HRC
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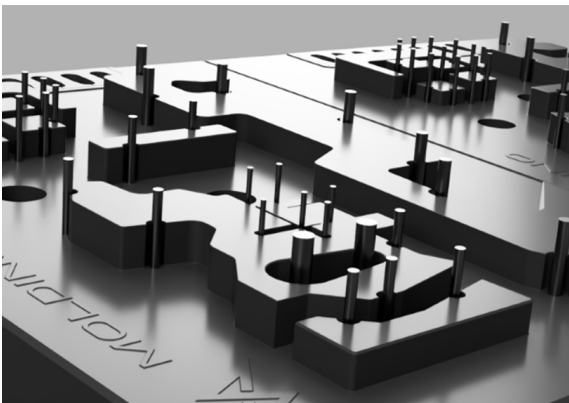


#### Application



### Customer need and product benefit

Stable drilling processes with long tool life and high accuracy in high-hardened steels up to 60HRC.



#### Challenge

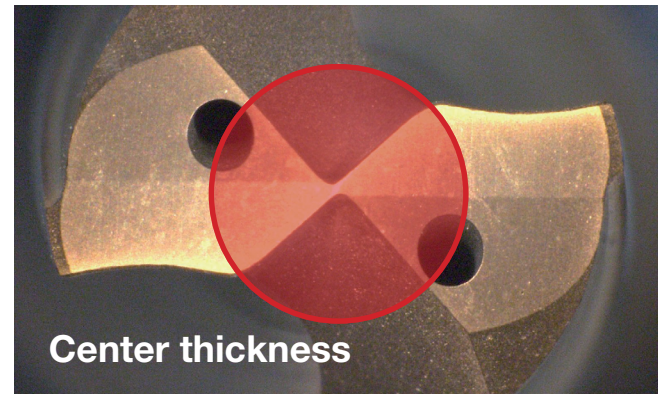
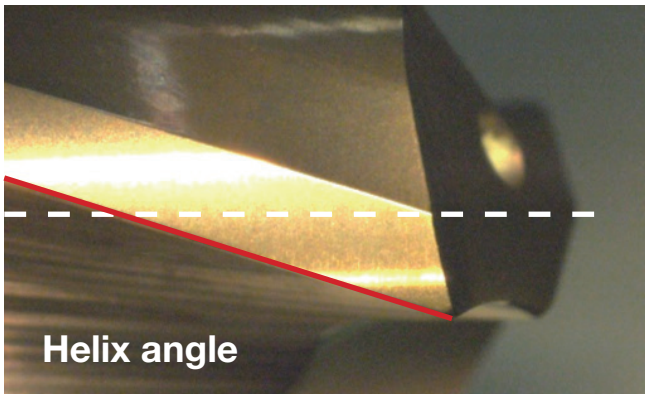
Ejector-Pin holes in H7 tolerance with expensive and time consuming EDM processes.



#### Solution

Process safe and efficient H7 drilling of steels in hardened conditions with NSBH-ATH.

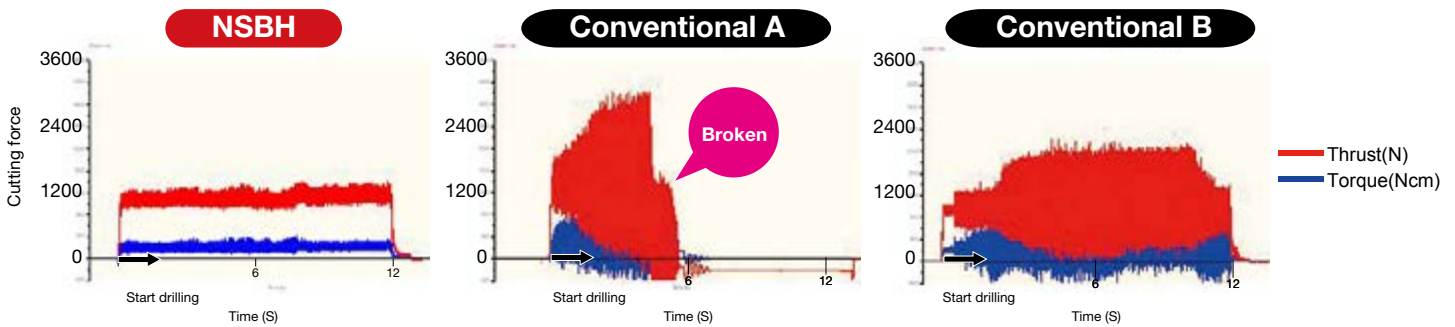
## Special design for high-hardened steels



Increased tool toughness and cutting edge strength.

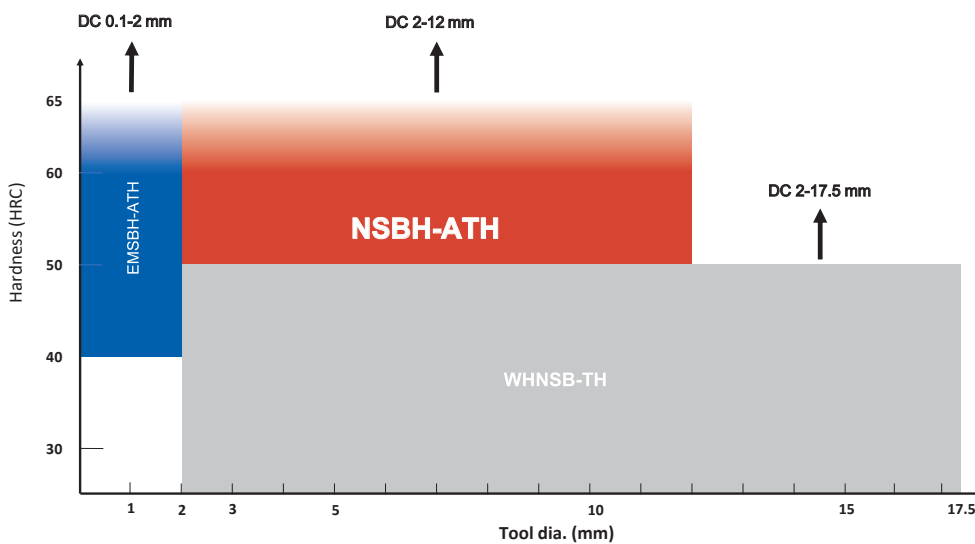
## Cutting force

Work material: Equivalent to 1.2344 (50 HRC) Item code & size: NSBH0600-150-ATH (DC 6.0x150x205)  
 n: 3,183 min<sup>-1</sup> V<sub>c</sub>: 60 m/min V<sub>f</sub>: 191 mm/min f: 0.06 mm/rev Cutting depth: 56mm  
 Internal water base coolant



Compared to conventional, cutting force variation on drilling is less and smooth drilling is achieved.

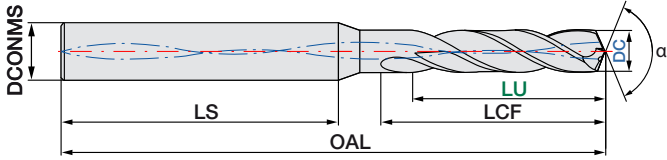
## NSBH-ATH positioning



# NSBH-ATH Line-Up

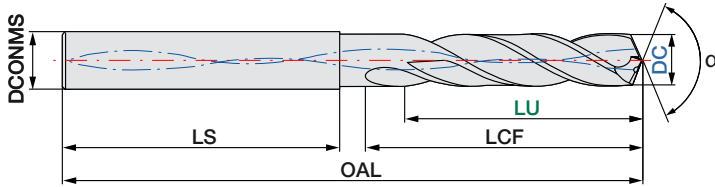
<b>NOF</b> 2		<b>h6</b>	<b>Carbide</b>	<b>ATH</b> coated	<b>60</b> HRC
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## Type-A



P	M	K
N	S	H

## Type-B



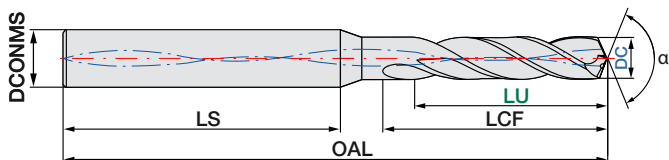
Tool diameter tolerance (mm)			
Tool DC	2.0 ≤ DC ≤ 6.0	6.0 < DC ≤ 10.0	10.0 < DC ≤ 12.0
DC Tolerance	+0.012 0	+0.015 0	+0.015 -0.003

ID Code	Item Code	NOF	Size (mm)						Tip Angle α (°)	Type	Inner coolant
			DC	LU	LS	LCF	OAL	DCONMS			
CD1148	NSBH0200-20-ATH	2	2	16.4	46	20.4	70.4	4	140	A	Yes
CD1086	NSBH0200-40-ATH	2	2	36.4	46	40.4	90.4	4	135	A	Yes
CD1087	NSBH0200-60-ATH	2	2	56.4	46	60.4	110.4	4	135	A	Yes
CD1088	NSBH0210-40-ATH	2	2.1	36.2	46	40.4	90.4	4	135	A	Yes
CD1089	NSBH0210-60-ATH	2	2.1	56.2	46	60.4	110.4	4	135	A	Yes
CD1090	NSBH0250-20-ATH	2	2.5	15.5	46	20.5	70.5	4	140	A	Yes
CD1091	NSBH0250-40-ATH	2	2.5	35.5	46	40.5	90.5	4	135	A	Yes
CD1092	NSBH0250-60-ATH	2	2.5	55.5	46	60.5	110.5	4	135	A	Yes
CD1093	NSBH0260-40-ATH	2	2.6	35.3	46	40.5	90.5	4	135	A	Yes
CD1094	NSBH0260-60-ATH	2	2.6	55.3	46	60.5	110.5	4	135	A	Yes
CD1095	NSBH0300-40-ATH	2	3	34.6	47	40.6	90.6	4	135	B	Yes
CD1096	NSBH0300-60-ATH	2	3	54.6	47	60.6	110.6	4	135	B	Yes
CD1097	NSBH0300-90-ATH	2	3	84.6	47	90.6	140.6	4	135	B	Yes
CD1098	NSBH0310-60-ATH	2	3.1	54.4	47	60.6	110.6	4	135	B	Yes
CD1099	NSBH0310-90-ATH	2	3.1	84.4	47	90.6	140.6	4	135	B	Yes
CD1100	NSBH0350-40-ATH	2	3.5	33.7	47	40.7	90.7	4	135	B	Yes
CD1101	NSBH0350-60-ATH	2	3.5	53.7	47	60.7	110.7	4	135	B	Yes
CD1102	NSBH0350-90-ATH	2	3.5	83.7	47	90.7	140.7	4	135	B	Yes
CD1103	NSBH0360-60-ATH	2	3.6	53.5	47	60.7	110.7	4	135	B	Yes
CD1104	NSBH0360-90-ATH	2	3.6	83.5	47	90.7	140.7	4	135	B	Yes
CD1105	NSBH0400-40-ATH	2	4	32.8	47	40.8	90.8	6	135	B	Yes
CD1106	NSBH0400-60-ATH	2	4	52.8	47	60.8	110.8	6	135	B	Yes
CD1107	NSBH0400-90-ATH	2	4	82.8	47	90.8	140.8	6	135	B	Yes
CD1108	NSBH0410-60-ATH	2	4.1	52.6	47	60.8	110.8	6	135	B	Yes
CD1109	NSBH0410-90-ATH	2	4.1	82.6	47	90.8	140.8	6	135	B	Yes
CD1110	NSBH0500-40-ATH	2	5	31.0	52	41.0	96	6	135	B	Yes
CD1111	NSBH0500-60-ATH	2	5	51.0	52	61.0	116	6	135	B	Yes
CD1112	NSBH0500-90-ATH	2	5	81.0	52	91.0	146	6	135	B	Yes
CD1113	NSBH0510-60-ATH	2	5.1	50.8	52	61.0	116	6	135	B	Yes
CD1114	NSBH0510-90-ATH	2	5.1	80.8	52	91.0	146	6	135	B	Yes

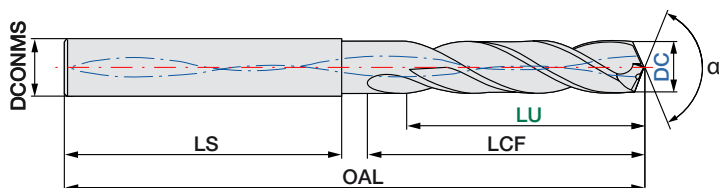
## NSBH-ATH Line-Up



### Type-A



### Type-B

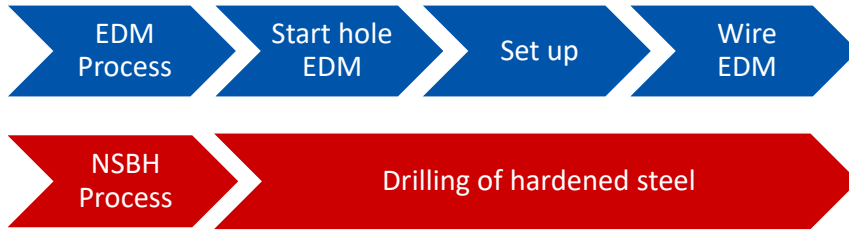


Tool diameter tolerance (mm)			
Tool DC	2.0 ≤ DC ≤ 6.0	6.0 < DC ≤ 10.0	10.0 < DC ≤ 12.0
DC Tolerance	+0.012 0	+0.015 0	+0.015 -0.003

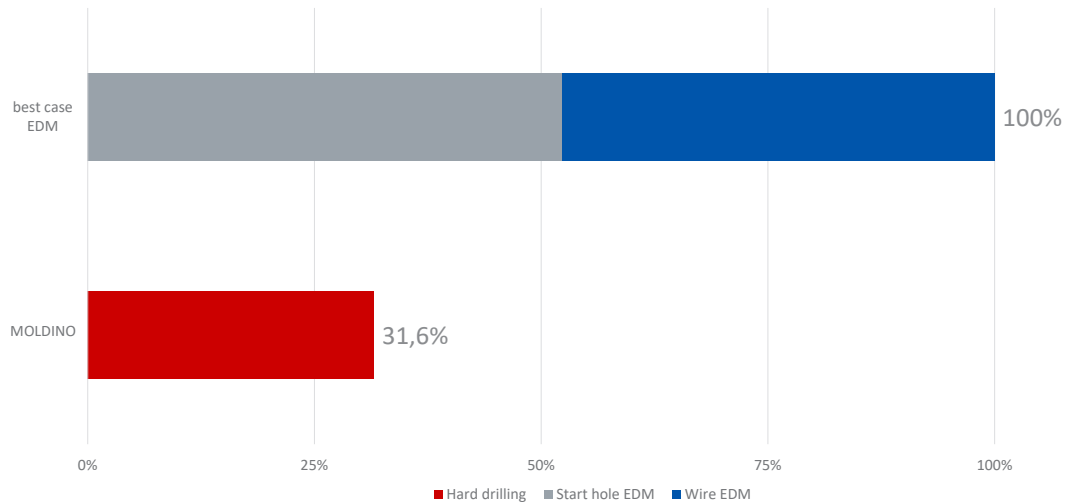
ID Code	Item Code	NOF	Size (mm)						Tip Angle $\alpha$ (°)	Type	Inner coolant
			DC	LU	LS	LCF	OAL	DCONMS			
CD1115	NSBH0600-30-ATH	2	6	19.1	52	31.1	86.1	8	140	B	Yes
CD1116	NSBH0600-60-ATH	2	6	49.2	52	61.2	116.2	8	135	B	Yes
CD1117	NSBH0600-90-ATH	2	6	79.2	52	91.2	146.2	8	135	B	Yes
CD1118	NSBH0600-120-ATH	2	6	109.2	52	121.2	176.2	8	135	B	Yes
CD1119	NSBH0610-60-ATH	2	6.1	49.0	52	61.2	116.2	8	135	B	Yes
CD1120	NSBH0610-90-ATH	2	6.1	79.0	52	91.2	146.2	8	135	B	Yes
CD1121	NSBH0610-120-ATH	2	6.1	109.0	52	121.2	176.2	8	135	B	Yes
CD1122	NSBH0700-60-ATH	2	7	47.4	52	61.4	116.4	8	135	B	Yes
CD1123	NSBH0700-90-ATH	2	7	77.4	52	91.4	146.4	8	135	B	Yes
CD1124	NSBH0700-120-ATH	2	7	107.4	52	121.4	176.4	8	135	B	Yes
CD1125	NSBH0700-150-ATH	2	7	137.4	52	151.4	206.4	8	135	B	Yes
CD1126	NSBH0800-60-ATH	2	8	45.6	52	61.6	116.6	10	135	B	Yes
CD1127	NSBH0800-90-ATH	2	8	75.6	52	91.6	146.6	10	135	B	Yes
CD1128	NSBH0800-120-ATH	2	8	105.6	52	121.6	176.6	10	135	B	Yes
CD1129	NSBH0800-150-ATH	2	8	135.6	52	151.6	206.6	10	135	B	Yes
CD1130	NSBH0850-90-ATH	2	8.5	74.7	57	91.7	151.7	10	135	B	Yes
CD1131	NSBH0850-120-ATH	2	8.5	104.7	57	121.7	181.7	10	135	B	Yes
CD1132	NSBH0850-150-ATH	2	8.5	134.7	57	151.7	211.7	10	135	B	Yes
CD1133	NSBH0900-90-ATH	2	9	73.8	57	91.8	151.8	10	135	B	Yes
CD1134	NSBH0900-120-ATH	2	9	103.8	57	121.8	181.8	10	135	B	Yes
CD1135	NSBH0900-150-ATH	2	9	133.8	57	151.8	211.8	10	135	B	Yes
CD1136	NSBH1000-90-ATH	2	10	72.0	57	92.0	152	12	135	B	Yes
CD1137	NSBH1000-120-ATH	2	10	102.0	57	122.0	182	12	135	B	Yes
CD1138	NSBH1000-150-ATH	2	10	132.0	57	152.0	212	12	135	B	Yes
CD1139	NSBH1000-200-ATH	2	10	182.0	57	202.0	262	12	135	B	Yes
CD1140	NSBH1100-90-ATH	2	11	70.2	62	92.2	157.2	12	135	B	Yes
CD1141	NSBH1100-120-ATH	2	11	100.2	62	122.2	187.2	12	135	B	Yes
CD1142	NSBH1100-150-ATH	2	11	130.2	62	152.2	217.2	12	135	B	Yes
CD1143	NSBH1100-200-ATH	2	11	180.2	62	202.2	267.2	12	135	B	Yes
CD1144	NSBH1200-90-ATH	2	12	68.4	62	92.4	157.4	12	135	B	Yes
CD1145	NSBH1200-120-ATH	2	12	98.4	62	122.4	187.4	12	135	B	Yes
CD1146	NSBH1200-150-ATH	2	12	128.4	62	152.4	217.4	12	135	B	Yes
CD1147	NSBH1200-200-ATH	2	12	178.4	62	202.4	267.4	12	135	B	Yes

## NSBH-ATH Application Example

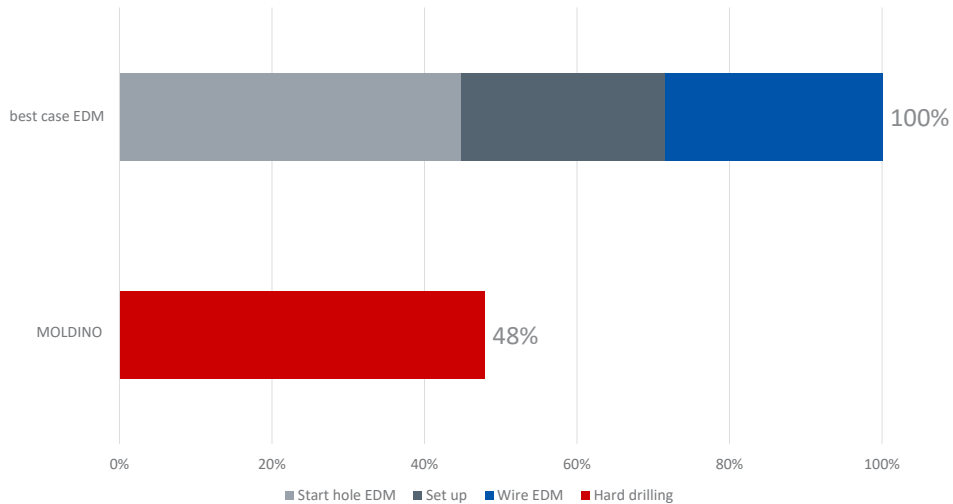
### ○ Benefits of drilling hardened steel (Ejector pin holes H7)



Processing H7 holes Drilling/EDM time comparison



Processing H7 holes Drilling/EDM cost comparison





## NSBH-ATH General Cutting Conditions

### ○ Cutting conditions (water base internal coolant)

Work material	Pre-hardened steels (40-45 HRC)		Hardened steels (45-55 HRC)		Hardened steels (55-60 HRC)		
	Tool DC (mm)	$V_c$ m/min	f mm/rev	$V_c$ m/min	f mm/rev	$V_c$ m/min	f mm/rev
2	20-60-80		20-40-60		10-20		0.01-0.05
4							0.01-0.03
6							0.01-0.06
8							0.05-0.09
10							0.06-0.12
12							0.08-0.15
							0.01-0.02
							0.01-0.04
							0.03-0.06
							0.04-0.08
							0.06-0.1
							0.06-0.1

- Be sure to refer to the drilling process as follows when selecting a tool.
- These standard cutting conditions are intended as approximate values for cutting conditions. For actual drilling, cutting conditions should be adjusted according to the drilling shape, purpose, machine used, etc.
- NSBH-ATH series have positive tolerance on the diameter. Please select guide and long-hole drills out of NSBH-ATH series. Mixed use of conventional WHNSB-TH series harms drilling stability due to negative tolerance of WHNSB-TH series.
- When changing the tool, use collet free from flaws and stains and attach the tool firmly so that its runout is 0.02mm or less.
- Works should be gripped firmly to prevent deformation, deflection and vibration.
- Upon drilling hole, dwell time at the final depth helps chip removal.
- If cutting chips are not smoothly removed, perform step drilling at depth around the tool diameter.
- Upon matters in chip removal during drilling, please refer to following countermeasures:
  - Keep  $V_c$  and lower feed. (The thinner chip for better removal)
  - Keep f and higher  $V_c$ . (Higher rotation for better removal)
  - At the time of through-hole reduce feed rate f to one-half or less.
- Internal supply of water based coolant is recommended.
- The above cutting conditions are based on the use of a water base coolant diluted to a maximum of 20 htimes. When coolant dilution exceeds 20 times, decrease the cutting speed to the lowest in the specified range. When the tool diameter is DC 5.0 or less, the coolant pressure should be 2.0 MPa or higher, and when the diameter is over DC 5.0, the pressure should be 1.5 MPa or higher.
- When performing MQL (mist) machining, depending on the amount or conditions of spray from the tool, it may be necessary to reduce the cutting speed in order to drill.
- When oil base coolant is used, reduce the cutting speed to a speed lower than the lowest speed in the specified range. Take the greatest care to avoid smoke or ignition due to heating of chips and the tool.
- Perform sufficient maintenance of coolant systems to prevent clogging of the oil hole.

### ○ Centering

#### General:

Use for centering: DN2HC-ATH

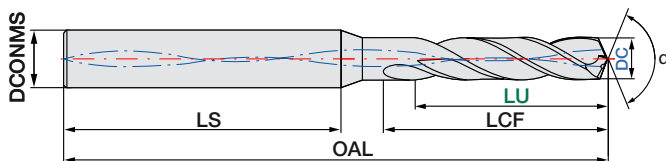


## NSBH-ATH General technical information

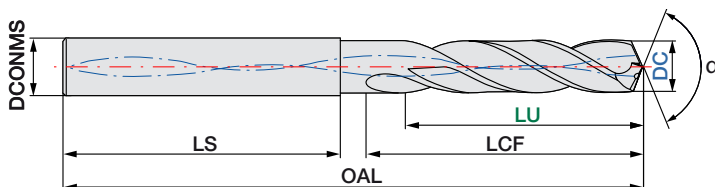
ISO 513 Symbol	Description	Examples
<b>P</b>	Non-alloy steel, low alloy steel, high alloy steel, ferritic/martensitic stainless steel, tool steel	1.2343 / X38CrMoV5-1; 1.2738 / 40CrMnNiMo8; 1.0503 / C45; 1.0570 / ST52-3; 1.1730 / C45W; 1.7131 / 16MnCr5; 1.7225 / 42CrMo4; 1.3343 / HS6-5-2; 1.0511 / C40; 1.2312 / 40CrMnMoS8-6; 1.2311 / 40CrMnMo7; 1.2344 / X40CrMoV5-1; 1.2767 / X45NiCrMo4; 1.2083 / X42Cr13; 1.2085 / X33CrS16; 1.2714 / 55NiCrMoV7; 1.2842 / 90MnCrV8;
<b>M</b>	Austenitic stainless steel	1.4301 / X5CrNi18-9; 1.4401 / X5CrNiMo17-12-2; 1.4404 / X2CrNiMo17-13-2; 1.4828 / X15CrNiSi20 12
<b>K</b>	Grey cast iron (GG), nodular cast iron (GGG), malleable cast iron	0.6025 / GG-25; GGG-40.3; 0.8155 / GTS-55-04
<b>N</b>	Aluminum wrought all, copper alloy, aluminum-cast, alloyed, non-metallic	2.0060 / E-Cu57; 2.0321 / CuZn37; 3.0255 / Al99.5; 3.5103 / MgSE3Zn27r1
<b>S</b>	High temperature alloys, titanium and Ti alloys	1.4864 / X12NiCrSi36 16; 2.4856 / NiCr22Mo9Nb; 1.4977 / X40CoCrNi20 20; 2.4669 / NiCr15Fe7TiAl
<b>H</b>	Hardened steel, chilled cast iron, cast iron	



### Type-A



### Type-B



Drawing Nomenclature	
DC	Cutting Diameter
DCONMS	Connection Diameter Machine side
LCF	Length Chip Flute
LU	Usable Length
LS	Shank Length
OAL	Overall Length



### **Attentions on Safety**

#### **1. Cautions regarding handling**

- (1) When removing the tool from its case (packaging), be careful that the tool does not pop out or is dropped. Be particularly careful regarding contact with the tool flutes.
- (2) When handling tools with sharp cutting flutes, be careful not to touch the cutting flutes directly with your bare hands.

#### **2. Cautions regarding mounting**

- (1) Before use, check the outside appearance of the tool for scratches, cracks, etc. and that it is firmly mounted in the collet chuck, etc.
- (2) When preparing for use, be sure that the inserts are firmly mounted in place and that they are firmly mounted on the arbor, etc.
- (3) If abnormal chattering, etc. occurs during use, stop the machine immediately and remove the cause of the chattering.

#### **3. Cautions during use**

- (1) Before use, confirm the dimensions and direction of rotation of the tool and milling work material.
- (2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.
- (3) Cutting tools are made of a hard material. During use, they may break and fly off. In addition, cutting chips may also fly off. Since there is a danger of injury to workers, fire, or eye damage from such flying pieces, a safety cover should be attached when work is performed and safety equipment such as safety goggles should be worn to create a safe environment for work.
- (4) There is a risk of fire or inflammation due to sparks, heat due to breakage, and cutting chips. Do not use where there is a risk of fire or explosion. Please caution of fire while using oil base coolant, fire prevention is necessary.
- (5) Do not use the tool for any purpose other than that for which it is intended.

#### **4. Cautions regarding regrinding**

- (1) If regrinding is not performed at the proper time, there is a risk of the tool breaking. Replace the tool with one in good condition, or perform regrinding.
- (2) Grinding dust will be created when regrinding a tool. When regrinding, be sure to attach a safety cover over the work area and wear safety clothes such as safety goggles, etc.
- (3) This product contains the specified chemical substance cobalt and its inorganic compounds. When performing regrinding or similar processing, be sure to handle the processing in accordance with the local laws and regulations regarding prevention of hazards due to specified chemical substances.

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**Specifications for the products listed in this catalog are subject to change without notice due to replacement or modification.**

**The diagrams and table data are examples of test results and are not guaranteed values.**

**For more details please check our digital tool database**

**P50F QuickFinder**

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