

*Create a world-famous cutting tool brand and  
become a prestigious enterprise.*



## Content

### **C** Drilling

Indexable short hole drills

C1-C16

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# Introduction

■ This catalogue presents Huareal's major cutting products as of October 2021.

■ This catalogue mainly introduces turning tools, milling tools and drilling tools. Wherein:

Turning tools include general turning tool, parting and grooving tool and threading tool;

Milling tools include indexable milling tool and solid carbide end mill;

Drilling tools include indexable short hole drills and solid carbide drill.

■ Products in this catalogue may be attached with the following symbols:

Indexable inserts: ★ Recommended grade ☆ Available grade

Indexable cutting tools: ▲ Running stock △ Make-to-order

Solid carbide cutting tool: ● Running stock ○ Make-to-order

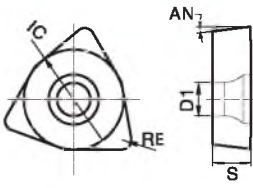
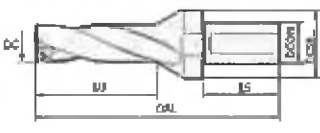
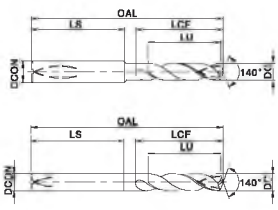
Application: ✱ Fit well ✨ Applicable

■ Marking of product dimensions

The basic dimensions of products in this catalogue are marked according to the ISO13399 Standard, and the specific symbols and corresponding definitions are following attached. According to the ISO13399 Standard, customers can input cutting tool information into PLM, CAD, CAM, CNC, etc. without replacing data from different companies.

Huareal is actively engaged in providing "cutting tool data" based on the ISO13399 Standard.

## Examples of basic dimension according to ISO13399 Standard

Tool type	Basic size marking form	Code	Definition
Short hole drilling insert		IC	Inscribed circle diameter
		D1	Insert hole diameter
		S	Insert thickness
		RE	Corner radius
		AN	Clearance angle major
Short hole drilling tool		DC	Cutting diameter
		DCON	Shank connection diameter
		DCSFMS	Connection diameter machine side
		LS	Shank length
		LU	Usable length
		OAL	Overall length
Solid carbide drill		DC	Cutting diameter
		DCON	Shank connection diameter
		OAL	Overall length
		LCF	Length chip flute
		LS	Shank length
		LU	Usable length





**HD**

*Short hole drills series*

**T79.RU**

## Selection guidance of indexable short hole drilling tools

A

General turning

Parting and grooving

Threading

B

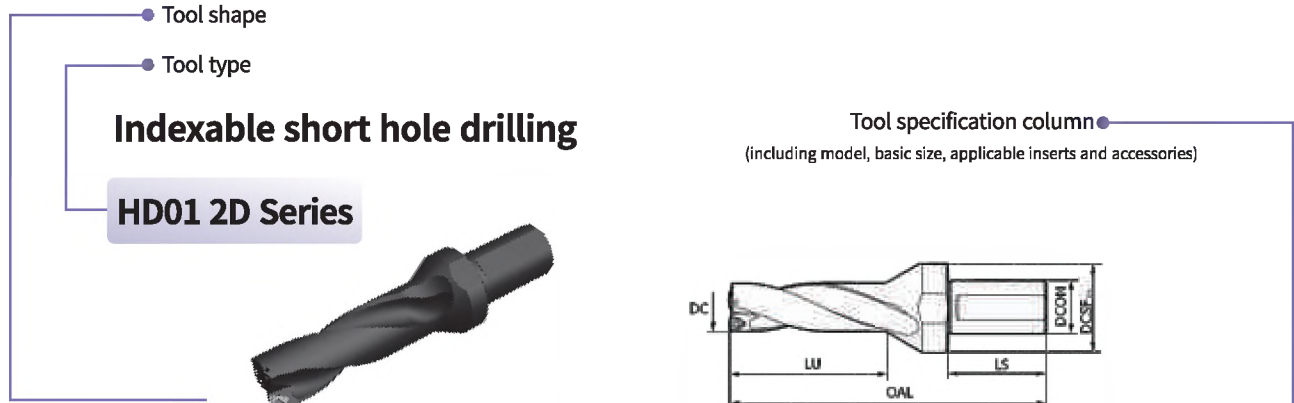
Indexable milling

Solid carbide end mills

C

Short hole drills

Solid carbide drills



### Indexable short hole drilling

#### HD01 2D Series

Tool specification column (including model, basic size, applicable inserts and accessories)

Tool model	Inventory	Basic dimension (mm)						Applicable inserts	Screw	Wrench
		DC	DCON	DCSF <sub>WS</sub>	LS	LU	OAL			
HD01-2D-440-S40	○	44	40	60	70	91	WCMX080412-DX	M3.5*10.4-60	WR15	
HD01-2D-450-S40	○	45	40	60	70	93				
HD01-2D-460-S40	○	46	40	60	70	95				
HD01-2D-470-S40	○	47	40	60	70	97				
HD01-2D-480-S40	○	48	40	70	70	99				
HD01-2D-490-S40	○	49	40	70	70	101				
HD01-2D-500-S40	○	50	40	70	70	103				

● Running stock ○ Make-to-order

## Selection guidance of indexable short hole drilling inserts

### Indexable short hole drilling insert

Workpiece material	Working condition: ● Stable ● Average ✪ Tough												
	P	M	K	N	S	HR8115	HR8125	HR8225	HR5110	HR5120	HR5130	HR7125	HR7225
<b>P</b> Steel	●	●	●	●	●	●	●	●	●	●	●	●	●
<b>M</b> Stainless steel						●	●	●	●	●	●	●	●
<b>K</b> Cast iron						●	●	●					
<b>N</b> Non-ferrous metal													
<b>S</b> Heat-resistant alloy Titanium alloy													

Insert shape	Type	Basic dimension (mm)					CVD			PVD				
		IC	S	RE	D1	AN	HR8115	HR8125	HR8225	HR5110	HR5120	HR5130	HR7125	HR7225
	SPMG050204DG-DX	5.00	2.38	0.4	2.25	14°	☆				☆	☆		
	SPMG060204DG-DX	6.00	2.38	0.4	2.61	14°	☆				☆	☆		
	SPMG07T308DG-DX	7.94	3.97	0.8	2.85	15.5°	☆				☆	☆		
	SPMG090408DG-DX	9.80	4.30	0.8	4.05	17.5°	☆				☆	☆		
	SPMG110408DG-DX	11.50	4.80	0.8	4.50	16.5°	☆				☆	☆		

☆ Recommended grade ☆ Available grade

Insert shape

Insert type

Insert specification column (including model, basic size and grade)



# C Drilling

## Indexable short hole drills

- ◆ Overview of drilling tools ----- C1
- ◆ Code key of indexable short hole drilling tools----- C2
- ◆ Code key of indexable short hole drilling inserts----- C3-C4
- ◆ Indexable short hole drilling tools----- C5-C10
- ◆ Indexable short hole drilling inserts ----- C11
- ◆ Recommended cutting parameters for indexable short hole drilling tools----- C12
- ◆ Technical information of indexable short hole drilling tools----- C14-C16

## Solid carbide drills

- ◆ Code key of solid carbide drills ----- C18
- ◆ Specification and parameters recommendation of solid carbide drills --- C19-C56
- ◆ Technical information of solid carbide drill----- C57-C58
- ◆ Non-standard customization of solid carbide drills----- C59
- ◆ Non-standard customization of solid carbide reamers----- C60



A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

C

Short hole drills

Solid carbide drills

## Overview of drilling tools

Tool type	Tool series	Size range (mm)	Tool shape	Cooling method	Applicable inserts	Workpiece material					
						P	M	K	N	S	H
Indexable short hole drill	HD01	Ø16-50		Internal cooling	WCMX□□	*	*	✱		✱	
	HD02	Ø16-42		Internal cooling	SPMG□□	*	*	✱		✱	
Solid carbide drill	BD03	Ø3-20		External cooling	/	*	*	✱		✱	
	BD03C	Ø3-20		Internal cooling	/	*	*	✱		✱	
	BD05	Ø3-20		External cooling	/	*	*	✱		✱	
	BD05C	Ø3-20		Internal cooling	/	*	*	✱		✱	
	BD08C	Ø3-20		Internal cooling	/	*	*	✱		✱	
							*	*	✱		✱

\* Fit well

✱ Applicable





## Code key of indexable short hole drilling tools

**HD** **01** - **2D** - **150** - **S** **20**

①                      ②                      ③                      ④                      ⑤                      ⑥

① Short hole drilling series

② Series number

01	With WC insert
02	With SP insert

③ Length-diameter ratio

2D	Length-diameter ratio: 2
3D	Length-diameter ratio: 3
5D	Length-diameter ratio: 5

④ Tool diameter

150	15mm
200	20mm
250	25mm
...	...

⑤ Shank type

S	Shank with flat
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⑥ Sizes of tool installation parts

20	20mm
25	25mm
...	...

A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

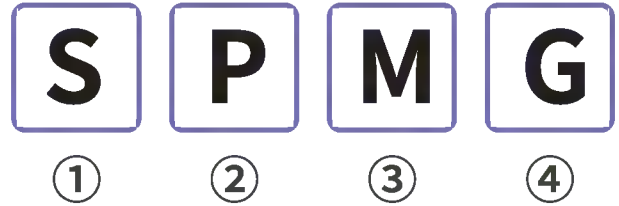
C

Short hole drills

Solid carbide drills



## Code key of indexable short hole drilling inserts



① Shape code	
S	
W	

③ Tolerance (mm)							
Class	Corner height (m)	Inscribed circle ( $\phi D$ )	Thickness (S)	Class	Corner height (m)	Inscribed circle ( $\phi D$ )	Thickness (S)
A	$\pm 0.005$	$\pm 0.025$	$\pm 0.025$	J	$\pm 0.005$	$\pm 0.025$	$\pm 0.025$
F	$\pm 0.005$	$\pm 0.013$	$\pm 0.025$	K	$\pm 0.005$	$\pm 0.013$	$\pm 0.025$
C	$\pm 0.013$	$\pm 0.025$	$\pm 0.025$	L	$\pm 0.013$	$\pm 0.025$	$\pm 0.025$
H	$\pm 0.013$	$\pm 0.013$	$\pm 0.025$	M	$\pm 0.013$	$\pm 0.013$	$\pm 0.025$
E	$\pm 0.025$	$\pm 0.025$	$\pm 0.025$	N	$\pm 0.025$	$\pm 0.025$	$\pm 0.025$
G	$\pm 0.025$	$\pm 0.025$	$\pm 0.13$	U	$\pm 0.025$	$\pm 0.025$	$\pm 0.13$

② Cutting edge clearance angle major			
Code	Clearance angle	Code	Clearance angle
A		B	
C		D	
E		F	
G		N	
P		O	Others

④ Chip breaker and clamping form							
Code	Hole	Chip breaker	Chip breaker	Code	Hole	Chip breaker	Chip breaker
B	Y	N/A		N	N/A	N/A	
H	Y	Single-sided		R	N/A	Single-sided	
C	Y	N/A		F	N/A	Double-sided	
J	Y	Double-sided		A	Y	N/A	
W	Y	N/A		M	Y	Single-sided	
T	Y	Single-sided		G	Y	Double-sided	
Q	Y	N/A		X	---	---	Exception
U	Y	Double-sided					

**07** **T3** **08** **R** - **DX**

⑤      ⑥      ⑦      ⑧      ⑨

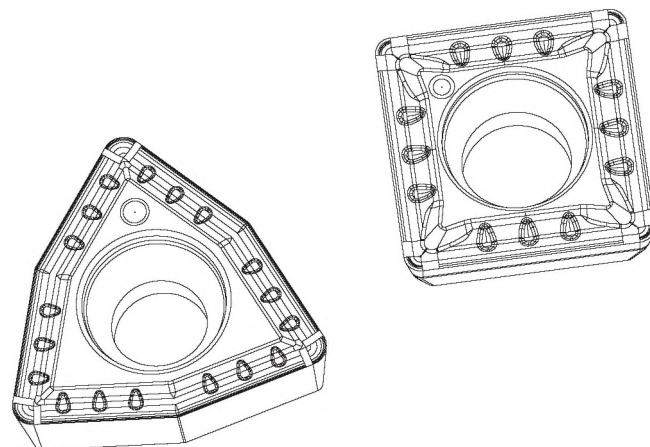
⑤ Cutting edge length		
Code	Insert shape	
	W	S
03	3.8	
04	4.3	
05	5.4	5.0
06	6.5	6.0
07		7.94
08	8.7	
09		9.8
11		11.5

⑥ Insert thickness			
Code	Thickness (mm)	Code	Thickness (mm)
00	0.79	05	5.96
T0	0.99	T5	5.95
01	1.59	06	6.35
T1	1.98	T6	6.75
02	2.38	07	7.94
T2	2.58	09	9.52
03	3.18	T9	11.11
T3	3.97	11	12.70
04	4.76	12	
T4	4.96		

⑦ Corner radius	
Code	Description
04	0.4mm
08	0.8mm
12	1.2mm

⑧ Cutting direction	
Code	Direction
R	Right
L	Left
N	Two-way

⑨ Chip breaker code
DX



A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

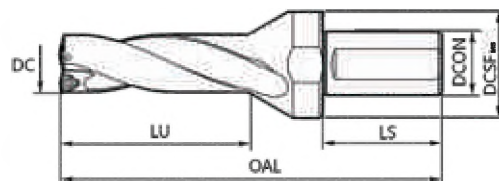
C



Short hole drills

Solid carbide drills

## Indexable short hole drilling

### HD01 2D Series

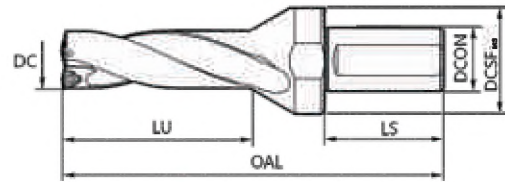


Tool model	Inventory	Basic dimension (mm)						Applicable inserts	Screw	Wrench
		DC	DCON	DCSF <sub>MS</sub>	LS	LU	OAL			
HD01-2D-160-S25	●	16	25	32	56	35	106	WCMX030204-DX WCMX030208-DX	M2.5*6.5-60	WR07
HD01-2D-170-S25	○	17	25	32	56	37	108			
HD01-2D-180-S25	○	18	25	32	56	39	116			
HD01-2D-190-S25	○	19	25	32	56	41	119	WCMX040204-DX WCMX040208-DX	M2.5*6.5T-60	WR08
HD01-2D-200-S25	●	20	25	32	56	43	121			
HD01-2D-210-S25	○	21	25	45	56	45	125			
HD01-2D-220-S25	○	22	25	45	56	47	126	WCMX050308-DX	M3.0*7.0-60	WR09
HD01-2D-230-S25	○	23	25	45	56	49	128			
HD01-2D-240-S25	○	24	25	45	56	51	130			
HD01-2D-250-S25	●	25	25	45	56	53	132	WCMX06T308-DX	M3.5*10.4-60	WR15
HD01-2D-260-S32	○	26	32	55	60	55	133			
HD01-2D-270-S32	○	27	32	55	60	57	135			
HD01-2D-280-S32	○	28	32	55	60	59	139	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-2D-290-S32	○	29	32	55	60	61	141			
HD01-2D-300-S32	●	30	32	55	60	63	143			
HD01-2D-310-S40	○	31	40	60	70	65	146	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-2D-320-S40	○	32	40	60	70	67	147			
HD01-2D-330-S40	○	33	40	60	70	69	150			
HD01-2D-340-S40	○	34	40	60	70	71	166	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-2D-350-S40	○	35	40	60	70	73	168			
HD01-2D-360-S40	○	36	40	60	70	75	170			
HD01-2D-370-S40	○	37	40	60	70	77	172	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-2D-380-S40	○	38	40	60	70	79	174			
HD01-2D-390-S40	○	39	40	60	70	81	176			
HD01-2D-400-S40	●	40	40	60	70	83	178	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-2D-410-S40	○	41	40	60	70	85	180			
HD01-2D-420-S40	○	42	40	60	70	87	189			
HD01-2D-430-S40	○	43	40	60	70	89	191	WCMX080412-DX	M3.5*10.4-60	WR15

● Running stock ○ Make-to-order

# Indexable short hole drilling

## HD01 2D Series



Tool model	Inventory	Basic dimension (mm)						Applicable inserts	Screw	Wrench
		DC	DCON	DCSF <sub>MS</sub>	LS	LU	OAL			
HD01-2D-440-S40	○	44	40	60	70	91	193	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-2D-450-S40	○	45	40	60	70	93	195			
HD01-2D-460-S40	○	46	40	60	70	95	197			
HD01-2D-470-S40	○	47	40	60	70	97	199			
HD01-2D-480-S40	○	48	40	70	70	99	201			
HD01-2D-490-S40	○	49	40	70	70	101	203			
HD01-2D-500-S40	○	50	40	70	70	103	205			

●Running stock    ○Make-to-order

A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

C

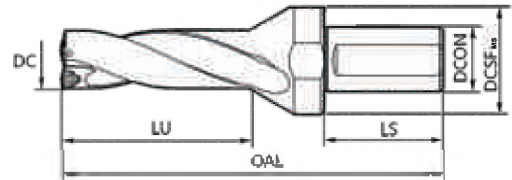
Short hole drills

Solid carbide drills



## Indexable short hole drilling

### HD01 3D Series

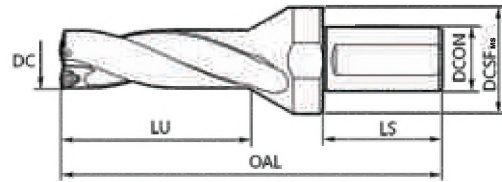


Tool model	Inventory	Basic dimension (mm)						Applicable inserts	Screw	Wrench
		DC	DCON	DCSF <sub>MS</sub>	LS	LU	OAL			
HD01-3D-160-S25	●	16	25	32	56	52	129	WCMX030204-DX WCMX030208-DX	M2.5*6.5-60	WR07
HD01-3D-170-S25	○	17	25	32	56	55	133			
HD01-3D-180-S25	○	18	25	32	56	58	137			
HD01-3D-190-S25	○	19	25	32	56	61	140	WCMX040204-DX WCMX040208-DX	M2.5*6.5T-60	WR08
HD01-3D-200-S25	●	20	25	32	56	64	143			
HD01-3D-210-S25	○	21	25	45	56	67	153			
HD01-3D-220-S25	○	22	25	45	56	70	156	WCMX050308-DX	M3.0*7.0-60	WR09
HD01-3D-230-S25	○	23	25	45	56	73	159			
HD01-3D-240-S25	○	24	25	45	56	76	162			
HD01-3D-250-S25	●	25	25	45	56	79	165	WCMX06T308-DX	M3.5*10.4-60	WR15
HD01-3D-260-S32	○	26	32	55	60	83	176			
HD01-3D-270-S32	○	27	32	55	60	86	180			
HD01-3D-280-S32	○	28	32	55	60	89	184	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-3D-290-S32	○	29	32	55	60	92	188			
HD01-3D-300-S32	●	30	32	55	60	95	192			
HD01-3D-310-S40	○	31	40	60	70	98	203	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-3D-320-S40	○	32	40	60	70	101	206			
HD01-3D-330-S40	○	33	40	60	70	104	209			
HD01-3D-340-S40	○	34	40	60	70	107	212	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-3D-350-S40	○	35	40	60	70	110	215			
HD01-3D-360-S40	○	36	40	60	70	113	218			
HD01-3D-370-S40	○	37	40	60	70	116	221	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-3D-380-S40	○	38	40	60	70	119	225			
HD01-3D-390-S40	○	39	40	60	70	122	228			
HD01-3D-400-S40	●	40	40	60	70	125	231	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-3D-410-S40	○	41	40	60	70	128	234			
HD01-3D-420-S40	○	42	40	60	70	131	239			
HD01-3D-430-S40	○	43	40	60	70	134	242	WCMX080412-DX	M3.5*10.4-60	WR15

● Running stock ○ Make-to-order

# Indexable short hole drilling

## HD01 3D Series



Tool model	Inventory	Basic dimension (mm)						Applicable inserts	Screw	Wrench
		DC	DCON	DCSF <sub>ms</sub>	LS	LU	OAL			
HD01-3D-440-S40	○	44	40	60	70	137	245	WCMX080412-DX	M3.5*10.4-60	WR15
HD01-3D-450-S40	○	45	40	60	70	140	248			
HD01-3D-460-S40	○	46	40	60	70	143	251			
HD01-3D-470-S40	○	47	40	60	70	146	253			
HD01-3D-480-S40	○	48	40	60	70	149	255			
HD01-3D-490-S40	○	49	40	60	70	152	257			
HD01-3D-500-S40	○	50	40	60	70	155	259			

● Running stock    ○ Make-to-order

A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

C

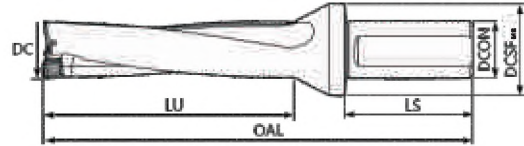
Short hole drills

Solid carbide drills

A

## Indexable short hole drilling

### HD02 2D Series



General turning

Parting and grooving

Threading

Indexable milling

Solid carbide end mills

C

Short hole drills

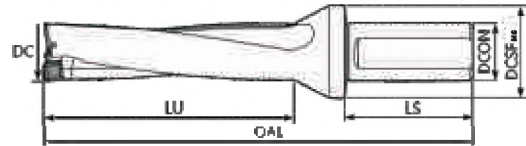
Solid carbide drills

Tool model	Inventory	Basic dimension (mm)						Applicable inserts	Screw	Wrench
		DC	DCON	DCSF <sub>MS</sub>	LS	LU	OAL			
HD02-2D-160-S20	●	16	20	25	50	35	102	SPMG050204-DX	M2.0*4.3-60	WR06
HD02-2D-170-S20	○	17	20	25	50	37	104	SPMG060204-DX	M2.2*5.5-60	WR07
HD02-2D-180-S25	○	18	25	32	56	39	113			
HD02-2D-190-S25	○	19	25	32	56	41	115			
HD02-2D-200-S25	●	20	25	32	56	43	117			
HD02-2D-210-S25	○	21	25	32	56	45	119	SPMG07T308-DX	M2.5*6.5-60	WR07
HD02-2D-220-S25	○	22	25	32	56	47	121			
HD02-2D-230-S25	○	23	25	32	56	49	123			
HD02-2D-240-S25	○	24	25	32	56	51	125			
HD02-2D-250-S25	●	25	25	32	56	53	127	SPMG090408-DX	M3.5*8.0-60	WR15
HD02-2D-260-S32	○	26	32	32	56	55	129			
HD02-2D-270-S32	○	27	32	32	56	57	131			
HD02-2D-280-S32	○	28	32	37	60	59	139			
HD02-2D-290-S32	○	29	32	37	60	61	141	SPMG110408-DX	M4.0*10-60	WR15
HD02-2D-300-S32	●	30	32	37	60	63	143			
HD02-2D-310-S40	○	40	32	37	60	65	145			
HD02-2D-320-S40	○	40	32	37	60	67	147			
HD02-2D-330-S40	○	40	32	37	60	69	149	SPMG110408-DX	M4.0*10-60	WR15
HD02-2D-340-S40	○	34	40	47	70	71	166			
HD02-2D-350-S40	○	35	40	47	70	73	168			
HD02-2D-360-S40	○	36	40	47	70	75	170			
HD02-2D-370-S40	○	37	40	47	70	77	172	SPMG110408-DX	M4.0*10-60	WR15
HD02-2D-380-S40	○	38	40	47	70	79	174			
HD02-2D-390-S40	○	39	40	47	70	81	176			
HD02-2D-400-S40	●	40	40	47	70	83	178			
HD02-2D-410-S40	○	41	40	47	70	85	180			

● Running stock ○ Make-to-order

# Indexable short hole drilling

## HD02 3D Series



Tool model	Inventory	Basic dimension (mm)						Applicable inserts	Screw	Wrench
		DC	DCON	DCSF <sub>MS</sub>	LS	LU	OAL			
HD02-3D-160-S20	●	16	20	25	50	51	117	SPMG050204DG-DX	M2.0*4.3-60	WR06
HD02-3D-170-S20	○	17	20	25	50	54	120	SPMG060204DG-DX		
HD02-3D-180-S25	○	18	25	32	56	57	131			
HD02-3D-190-S25	○	19	25	32	56	60	134			
HD02-3D-200-S25	●	20	25	32	56	63	137			
HD02-3D-210-S25	○	21	25	32	56	66	140			
HD02-3D-220-S25	○	22	25	32	56	69	143			
HD02-3D-230-S25	○	23	25	32	56	72	147		SPMG07T308DG-DX	M2.5*6.5-60
HD02-3D-240-S25	○	24	25	32	56	75	150			
HD02-3D-250-S25	●	25	25	32	56	78	153			
HD02-3D-260-S32	○	26	32	32	56	81	156			
HD02-3D-270-S32	○	27	32	32	56	84	160			
HD02-3D-280-S32	○	28	32	37	60	87	169			
HD02-3D-290-S32	○	29	32	37	60	90	172			
HD02-3D-300-S32	●	30	32	37	60	93	175	SPMG090408DG-DX	M3.5*8.0-60	WR15
HD02-3D-310-S40	○	31	40	37	60	96	178			
HD02-3D-320-S40	○	32	40	37	60	99	181			
HD02-3D-330-S40	○	33	40	37	60	102	184			
HD02-3D-340-S40	○	34	40	47	70	105	200			
HD02-3D-350-S40	○	35	40	47	70	108	203			
HD02-3D-360-S40	○	36	40	47	70	111	206			
HD02-3D-370-S40	○	37	40	47	70	114	209	SPMG110408DG-DX	M4.0*10.0-60	WR15
HD02-3D-380-S40	○	38	40	47	70	117	212			
HD02-3D-390-S40	○	39	40	47	70	120	215			
HD02-3D-400-S40	●	40	40	47	70	123	218			
HD02-3D-410-S40	○	41	40	47	70	126	221			

● Running stock    ○ Make-to-order

- A
- General turning
- Parting and grooving
- Threading
- B
- Indexable milling
- Solid carbide end mills
- C
- Short hole drills
- Solid carbide drills



A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

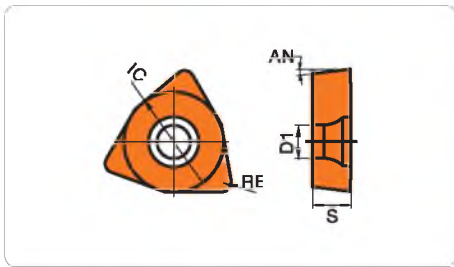
C

Short hole drills

Solid carbide drills

## Indexable short hole drilling insert

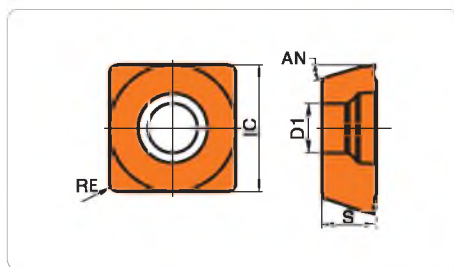
Working condition: ● Stable ● Average ⚡ Tough



Workpiece material	Working condition							
	●	●	●●	●●	●●●	●●●	●●●	●●●
<b>P</b> Steel	●	●	●●	●●	●●●	●●●	●●●	●●●
<b>M</b> Stainless steel				●	●●	●●	●●●	●●●
<b>K</b> Cast iron				●	●●	●		
<b>N</b> Non-ferrous metal								
<b>S</b> Heat-resistant alloy Titanium alloy								

Insert shape	Type	Basic dimension (mm)					CVD			PVD				
		IC	S	RE	D1	AN	HR8115	HR8125	HR8225	HR5110	HR5120	HR5130	HR7125	HR7225
	WCMX030204-DX	5.56	2.38	0.4	2.55	7°	☆				☆	★		
	WCMX030208-DX	5.56	2.38	0.8	2.55	7°	☆				☆	★		
	WCMX040204-DX	6.35	2.38	0.4	2.80	7°	☆				☆	★		
	WCMX040208-DX	6.35	2.38	0.8	2.80	7°	☆				☆	★		
	WCMX050308-DX	7.94	3.18	0.8	3.20	7°	☆				☆	★		
	WCMX06T308-DX	9.525	3.97	0.8	3.70	7°	☆				☆	★		
	WCMX080412-DX	12.70	4.76	1.2	4.30	7°	☆				☆	★		

★ Recommended grade ☆ Available grade



Workpiece material	Working condition							
	●	●	●●	●●	●●●	●●●	●●●	●●●
<b>P</b> Steel	●	●	●●	●●	●●●	●●●	●●●	●●●
<b>M</b> Stainless steel				●	●●	●●	●●●	●●●
<b>K</b> Cast iron				●	●●	●		
<b>N</b> Non-ferrous metal								
<b>S</b> Heat-resistant alloy Titanium alloy								

Insert shape	Type	Basic dimension (mm)					CVD			PVD				
		IC	S	RE	D1	AN	HR8115	HR8125	HR8225	HR5110	HR5120	HR5130	HR7125	HR7225
	SPMG050204-DX	5.00	2.38	0.4	2.25	14°	☆				☆	★		
	SPMG060204-DX	6.00	2.38	0.4	2.61	14°	☆				☆	★		
	SPMG07T308-DX	7.94	3.97	0.8	2.85	15.5°	☆				☆	★		
	SPMG090408-DX	9.80	4.30	0.8	4.05	17.5°	☆				☆	★		
	SPMG110408-DX	11.50	4.80	0.8	4.50	16.5°	☆				☆	★		

★ Recommended grade ☆ Available grade

► Recommended cutting parameters for indexable short hole drilling

ISO	Workpiece material		Brinell hardness	Cutting speed vc m/min	Feed rate $f_n$ (mm/r)					
					Diameter of drill bit (mm)					
					16-20	20-25	25-30	30-35	35-50	
P	Non-alloyed steel	$C \leq 0.10\%$	125	70-200	0.04-0.09	0.07-0.11	0.10-0.21	0.18-0.27	0.25-0.35	
		$0.10 < C \leq 0.25\%$	125	70-180	0.04-0.09	0.07-0.11	0.10-0.21	0.18-0.27	0.25-0.35	
		$0.25 < C \leq 0.55\%$	150	70-150	0.04-0.09	0.07-0.11	0.10-0.21	0.18-0.27	0.25-0.35	
		$0.55 < C \leq 0.80\%$	170	70-130	0.04-0.09	0.07-0.11	0.10-0.21	0.18-0.27	0.25-0.35	
	High carbon Steel	Carbon tool steel	210	70-130	0.04-0.09	0.07-0.11	0.10-0.21	0.18-0.27	0.25-0.35	
	Low-alloyed steel	Non-hardened	180	80-180	0.04-0.08	0.05-0.10	0.08-0.22	0.15-0.28	0.23-0.38	
		Quenching and tempering	275	70-150	0.04-0.08	0.05-0.10	0.08-0.22	0.15-0.28	0.23-0.38	
		Quenching and tempering	350	70-150	0.04-0.08	0.05-0.10	0.08-0.22	0.15-0.28	0.23-0.38	
	High-alloyed steel	Annealing	200	55-110	0.04-0.08	0.05-0.10	0.08-0.22	0.15-0.28	0.23-0.38	
		Quenching and tempering	325	55-110	0.04-0.08	0.05-0.10	0.08-0.22	0.15-0.28	0.23-0.38	
Cast steel	Non-alloyed	180	55-110	0.04-0.08	0.05-0.09	0.07-0.20	0.16-0.27	0.22-0.36		
	Low alloy (alloy composition < 5%)	200	55-110	0.04-0.08	0.05-0.09	0.07-0.20	0.16-0.27	0.22-0.36		
M	Stainless steel	Unquenched/ferrite/martensite	200	80-180	0.04-0.09	0.06-0.11	0.10-0.20	0.17-0.29	0.25-0.38	
		Austenite, quenching	200	80-180	0.04-0.09	0.06-0.10	0.10-0.20	0.17-0.29	0.25-0.38	
		Austenite, precipitation hardening stainless steel (PH stainless steel)	300	80-180	0.04-0.09	0.06-0.10	0.10-0.20	0.17-0.25	0.21-0.33	
		Austenite- ferrite, duplex stainless steel	230	80-180	0.04-0.09	0.06-0.10	0.10-0.20	0.17-0.25	0.21-0.33	
K	Malleable cast iron	Ferrite	200	100-200	0.04-0.10	0.10-0.15	0.11-0.22	0.17-0.29	0.25-0.38	
		Pearlite	260	100-200	0.04-0.10	0.10-0.15	0.11-0.22	0.17-0.29	0.25-0.38	
	Grey cast iron	Low tensile strength	180	120-220	0.04-0.10	0.10-0.15	0.11-0.22	0.17-0.29	0.25-0.38	
		High tensile strength/austenite	245	120-220	0.04-0.10	0.10-0.15	0.11-0.22	0.17-0.29	0.25-0.38	
	Ductile iron	Ferrite	155	100-200	0.04-0.10	0.10-0.15	0.11-0.22	0.17-0.29	0.25-0.38	
		Pearlite	265	100-200	0.04-0.10	0.10-0.15	0.11-0.22	0.17-0.29	0.25-0.38	
Compacted graphite iron	GGV (CGI)	230								
N	Wrought aluminum alloy	Non-aging	30	150-300	0.05-0.12	0.09-0.16	0.15-0.23	0.19-0.27	0.21-0.33	
		Ageable and aged	100	150-300	0.05-0.12	0.09-0.16	0.15-0.23	0.19-0.27	0.21-0.33	
	Foundry aluminum alloy	$\leq 12\%$ silicon, non-aging	75	150-300	0.05-0.12	0.09-0.16	0.15-0.23	0.19-0.27	0.21-0.33	
		$\leq 12\%$ silicon, ageable and aged	90	150-300	0.05-0.12	0.09-0.16	0.15-0.23	0.19-0.27	0.21-0.33	
		$> 12\%$ silicon, non-aging	130	150-300	0.05-0.12	0.09-0.16	0.15-0.23	0.19-0.27	0.21-0.33	
	Magnesium alloy		70							
		Copper and copper alloy (Bronze/brass)	Non-alloyed, electrolytic copper	100	150-300	0.05-0.12	0.09-0.16	0.15-0.23	0.19-0.27	0.21-0.33
			Brass, bronze, red brass	90	150-300	0.05-0.12	0.09-0.16	0.15-0.23	0.19-0.27	0.21-0.33
Copper alloy, short chip			110	150-300	0.05-0.12	0.09-0.16	0.15-0.23	0.19-0.27	0.21-0.33	
Ampco alloy of high strength	300		150-300	0.05-0.12	0.09-0.16	0.15-0.23	0.19-0.27	0.21-0.33		
S	Iron-based alloy	Iron-based	Annealing	200	10-55	0.07-0.10	0.09-0.14	0.13-0.20	0.19-0.25	0.23-0.30
			Aged	280	10-55	0.07-0.10	0.09-0.14	0.13-0.20	0.19-0.25	0.23-0.30
		Nickel-based or cobalt-based	Annealing	250	10-55	0.07-0.10	0.09-0.14	0.13-0.20	0.19-0.25	0.23-0.30
			Aged	350	10-55	0.07-0.10	0.09-0.14	0.13-0.20	0.19-0.25	0.23-0.30
	Titanium alloy		Casting	320	10-55	0.07-0.10	0.09-0.14	0.13-0.20	0.19-0.25	0.23-0.30
			Pure titanium	200	30-60	0.07-0.10	0.09-0.14	0.13-0.20	0.19-0.25	0.23-0.30
			$\alpha$ phase alloy	375	30-60	0.07-0.10	0.09-0.14	0.13-0.20	0.19-0.25	0.23-0.30
			$\alpha$ and $\beta$ phase alloys, aged	375	30-60	0.07-0.10	0.09-0.14	0.13-0.20	0.19-0.25	0.23-0.30
	$\beta$ phase alloy	410	30-60	0.07-0.10	0.09-0.14	0.13-0.20	0.19-0.25	0.23-0.30		

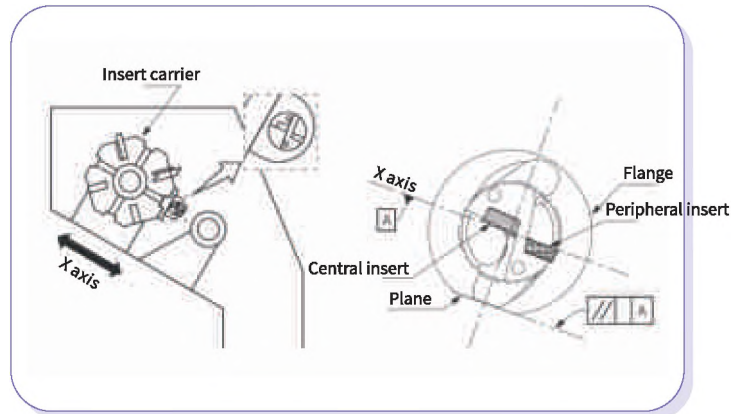
A General turning  
 Parting and grooving  
 Threading  
 B Indexable milling  
 Solid carbide end mills  
 C Short hole drills  
 Solid carbide drills

## Precautions for indexable short hole drilling

### 1 Precautions for short hole drilling in lathe

I. The peripheral insert is mounted parallel to the X axis of the equipment.

II. The peripheral insert should be mounted towards the operator. With upper and lower turrets on the lathe, if the drill bit needs to be mounted on the lower one, The peripheral insert should face towards the operator.



### 2 Adjustment method of center height:

The center height of the central insert is about 0.05 mm lower than the center (design state). If the turntable is staggered from the spindle center, the center may be too high or the core may be too low. It is very important to check the center height of the inner insert in order to stabilize the machining.

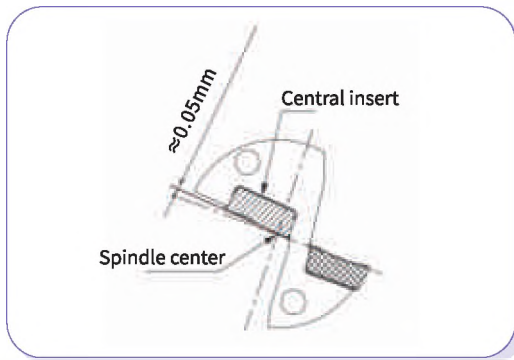


Figure 2

Illustration of center height of the drill bit inner insert

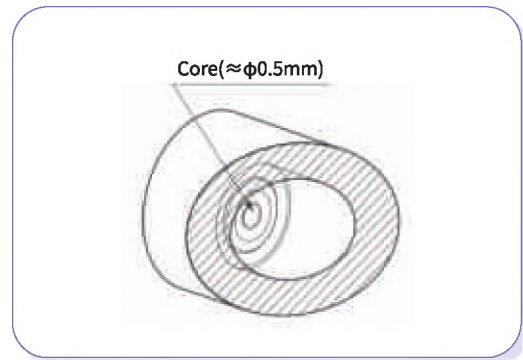


Figure 3

Illustration of core residues in blind hole drilling

#### I. How to check center height of inner cutter insert:

Check whether the center height setting of the central insert is proper by the cores remaining in the center of the inner end face of the blind hole. If the diameter of residual cores is about 0.5mm, the center height is correct. If there is no core residue at all or the diameter is over 1mm, the center height needs to be adjusted.

◎ The blind holes used for checking is machined by a feed rate below 0.1 mm/rev and a depth of about 10mm.

◎ If there is no core residue at all (or it is very small), it is necessary to adjust the center height because the parts around the drill bit center of the inner cutter insert are prone to collapse.



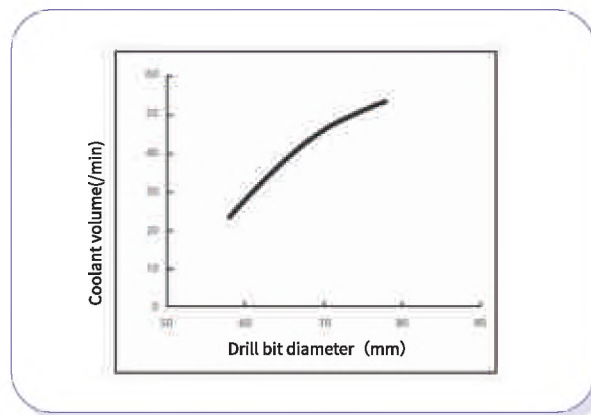
## ► Short hole drilling and recommended countermeasures

### 1 Countermeasures to drill hole diameter changes

If the hole diameter gradually shrinks or increases toward the bottom, it is often caused by cutting blockage. It is suggested to adjust the cutting parameters, such as increasing cutting speed and reducing feed rate. If the overall hole diameter is too small, it may be caused by plastic deformation of materials. It is recommended to replace a short hole drilling tool with a long one.

### 2 Can external cooling be used for short hole drilling?

Given the large amount of chips in short hole drilling, external cooling is not recommended considering the machining efficiency. Meanwhile, the cutting pressure of internal cooling should be ensured for longer tool life and better machining performance.



Recommended relationship between drill bit diameter and coolant volume

### 3 Chip entanglement is highly possible in the cutting process.

When the material to be cut is sticky and the chip is long, the combination of low speed + large feed or high speed + small feed may be used to solve the problem. If chip entanglement is highly possible from the entrance to 10mm while the cutting is stable after 10mm, the entry machining parameters may be adjusted or segmented cutting can be adopted.

At a low speed + large feed, thicker chips are produced, which are easy to break and control.

At a high speed + small feed, thinner chips are produced, and the chip flow direction could be controlled by centrifugal force.

1-10mm can be processed by segment cutting, which can be followed by continuous machining.

### 4 There is tool vibration in the cutting process.

Tool vibration may be caused by insufficient feed per revolution during the cutting process. The cutting parameters are adjusted as follows:

Increase the feed rate if it is too small.

If the feed rate is below  $f=0.06\text{mm/rev}$ , please increase it to  $f=0.08-0.12\text{mm/rev}$ .

If the over fast cutting speed causes cutter vibration, decrease to about  $V_c=100-150\text{m/rev}$ .

If there are obvious burrs at the drill or the workpiece clamping rigidity is poor, decrease the feed rate to  $f=0.07-0.08\text{mm/rev}$ .

### 5 There are obvious scratches on the surface of the machined hole

Please change the cutting parameters or optimize the way of returning the insert.

A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

C

Short hole drills

Solid carbide drills



A

General turning

Parting and grooving

Threading

B

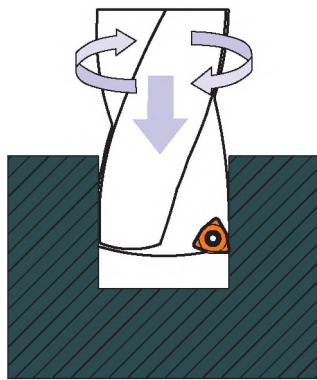
Indexable milling

Solid carbide end mills

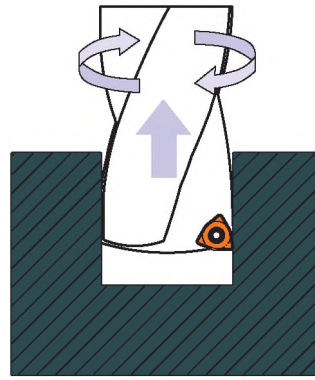
C

Short hole drills

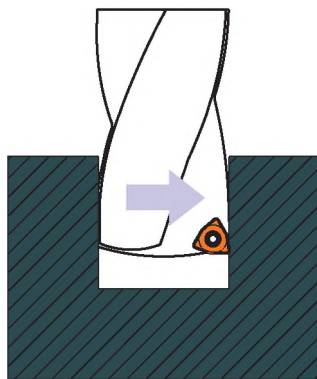
Solid carbide drills



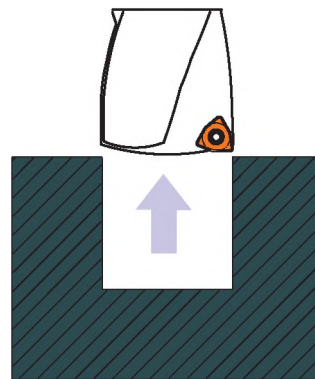
① Rotate to return the insert



② After machining, retract 0.5mm and then return the insert



③ Return the insert eccentrically



④ Return the insert directly

## ▶ Drilling means and measures of drill bits

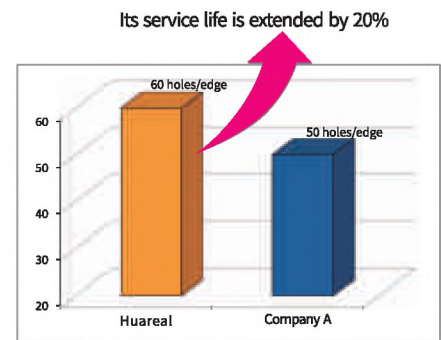
Drilling bit is a key factor for successful drilling. One way to ensure good quality of the hole is to ensure that the drilling surface of the workpiece is perpendicular to the central axis of the drill bit. In addition, the indexable short hole drilling may also be used to process convex, concave, inclined and irregular drilling surfaces by adjusting the feed rate.

Workpiece surface	Solutions
	The normal feed rate can be adopted for convex surface, because its machining conditions are relatively good, and the drilling core can contact the workpiece first as expected.
	The surface of the drilling part is inclined, so the cutting edge is subjected to uneven load, which will cause premature wear of the cutting edge. If the angle of the inclined surface exceeds 2°, decrease the feed rate to 1/3 of the recommended value.
	Usually, the drill bit axis deviates from the center when drilling into a concave surface, for which the feed rate is reduced to 1/3 of the recommended value.
	When drilling an asymmetric curved surface, the drill bit may deviate from the center. So its feed rate should be smaller than that of drilling a concave surface.
	A danger of insert collapse may occur when drilling into irregular surfaces, so the feed rate must be reduced at the beginning of drilling. This may also occur when the drill bit drills through the material, so the feed must also be reduced.

# Application

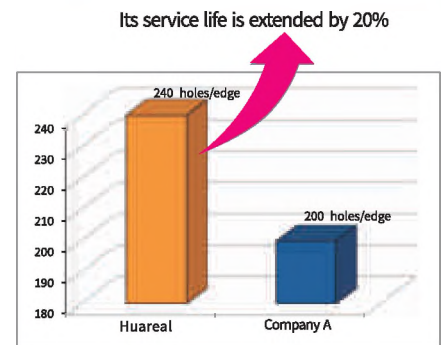
## Coupler drilling

- Workpiece material 40CrMo
- Machining method External cooling drilling
- Insert WCMX0080412-DX HR5130
- Tool type HD01-3D-440-S40
- Machining parameters  $V_c=76.3\text{m/min}$ ,  $f=0.133\text{mm/r}$



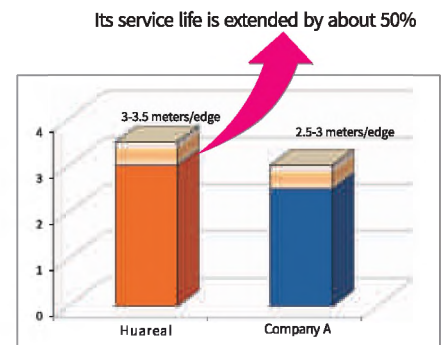
## Flange drilling

- Workpiece material Stainless steel SUS304
- Machining method Drill hole  $D=14.5\text{mm}$ , Depth= 25mm
- Insert SPMG050204-DX HR5130
- Tool type HD02-2D-170-S20
- Machining parameters  $V_c=159.4\text{m/min}$ ,  $f=0.034\text{mm/r}$  ( $R_a \leq 1.6\mu\text{m}$ )



## Condenser tube sheet drilling

- Workpiece material Stainless steel 304
- Machining method Internal cooling drilling  $D23.5$
- Insert SPMG07T308-DX HR5130
- Tool type HD02-3D-250-S25
- Machining parameters  $V_c=140\text{m/min}$ ,  $f_n=0.10\text{mm/r}$



A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

C

Short hole drills

Solid carbide drills

# Comparison table of PVD turning grades

Type	Classification codes		HUAREAL	SANDVIK	KENNAMETAL	ISCAR	MITSUBISHI	TUNGALOY	KYOCERA	SUMITOMO	TEAGUTEC	ZCC.CT	
	IOS classification	Groups of materials											
PVD turning	P	P10	HR5225 HR7225	GC1025 GC1125	KCS10 KCU10 KC5010	IC807	VP10MF MS6015	AH710	PR930 PR1005 PR1025 PR1115 PR1215 PR1425 PR1225	AC1030U ACZ150 AC5025S AC520U		YBG102	
		P20	HR5125 HR5225 HR7125 HR7225	GC1025 GC1125	KCS10 KCU10 KCU25 KC5010 KC5025	IC807 IC808 IC810	VP10RT VP20RT VP15TF VP20MF	AH120 AH725 AH730 SH725 SH730 J740	PR930 PR1025 PR1115 PR1215 PR1225 PR1625	AC1030U AC5025S AC520U AC530U	TT9020 TT9030	YBG202	
		P30	HR5125 HR5225 HR7125 HR7225	GC1025 GC1125	KCU25 KC5025	IC328 IC330 IC830 IC928	VP10RT VP20RT VP15TF VP20MF	AH725 AH7025 AH730 SH725 SH730 GH730 GH330 J740	PR1025 PR1225 PR1535	AC1030U AC530U	TT8020 TT8080 TT9030	YBG202	
		P40	HR5125 HR7125	GC1025		IC830		AH120 AH725 AH645		AC1030U	TT8020 TT8080 TT9080		
		M10	HR9105 HR7115	GC1115 GC1125	KCS10 KCU10 KC5010	IC807 IC808 IC907 IC908	VP10MF MS6015	AH8005 AH630	PR1025 PR1215 PR1225	AC515S AC5025S AC510U AC520U ACZ150	TT5080	YBG202 YBG205	
	M20	HR5125 HR5225 HR7115 HR7125 HR7225	GC1115 GC1125 GC2035	KCS10 KCU10 KCU25 KC5010 KC5025	IC330 IC806 IC808 IC830 IC908 IC330 IC806 IC808 IC830 IC908 IC928	VP10RT VP20RT VP15TF VP20MF	AH8015 AH630 AH120 AH7025 AH725 SH725 SH730	PR930 PR1025 PR1125 PR1215 PR1425 PR1225 PR1515	AC5015S AC5025S AC1030U AC520U	TT5080 TT9080	YBG202 YBG205		
	M30	HR5125 HR5225 HR7125 HR7225	GC1125 GC2035	KCU25 KC5025	IC328 IC330 IC830 IC840 IC882	VP10RT VP20RT VP15TF VP20MF MP7035	AH645 AH120 AH725 SH725 SH730 J740	PR1125 PR1535	AC5025S AC6040M AC1030U AC520U AC530U	TT8020 TT8080 TT9020 TT9080			
		HR5125 HR7125	GC2035		IC830 IC928	MP7035	AH645		AC6040M AC1030U AC530U	TT8020 TT8080 TT9020 TT9080			

A General turning  
B Parting and grooving  
C Threading  
D Indexable milling  
E Solid carbide end mills  
F Short hole drills  
G Solid carbide drills

Type	Classification codes		HUAREAL	SANDVIK	KENNAMETAL	ISCAR	MITSUBISHI	TUNGALOY	KYOCERA	SUMITOMO	TEAGUTEC	ZCC.CT
	IOS classification	Groups of materials										
PVD turning	K	K10		GC3330 GC3220 K20W K20D K20M K15W	KCS10 KCU10 KC5010	IC810		GH110 AH110	PR905 PR1215	AC1030U AC510U ACZ150		
		K20		GC3330 GC3220 GC3040 K20W K20D GC4230 K20M K15W	KCS10 KCU10 KCU25 KC5010 KC5025		VP10RT VP20RT VP15TF	AH120 AH725 AH730 SH725 SH730 J740	PR905 PR1215	AC1030U AC5025S AC520U AC530U		
		K30		GC3330 GC3040 K20W GC4240 GC4230		IC830 IC908 IC910 IC928	VP10RT VP20RT VP15TF	AH725 AH7025 AH730 SH725 SH730 GH730 GH330 J740		AC1030U AC530U		
	S	S01				IC804 IC806	MP9005 VP05RT	AH8005 AH905			PR005S	YBG102
	S10	HR9105 HR7115	GC1105 GC1005 GC1025	KC5010 KC5510 KCU10 KCS10	IC807 IC808 IC907 IC908	MP9005 MP9015 VP10RT	AH8015 AH905 SH730 AH110	PR005S PR015S	AC510U AC5015S	TT9080 TT9030	YBG102 YBG105 YBG202 YBG103	
	S20	HR7115	GC1025 GC1125	KC5025 KC5525 KCU25	IC806 IC808 IC908	MP9015 MT9015 VP20RT MP9025	AH8015 AH120 AH725	PR015S PR1535	AC510U AC520U AC5025S	TT8080 TT8020	YBG212 YBG105 YBS103	
	S30	HR7225	GC1125		IC3028	MP9025	AH725	PR1535	AC520U		YBG212	

A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

C

Short hole drills

Solid carbide drills



# Comparison table of PVD milling grades

Type	Classification codes		HUAREAL	SANDVIK	KENNAMETAL	ISCAR	MITSUBISHI	TUNGALOY	KYOCERA	SUMITOMO	TEAGUTEC	ZCC.CT	
	IOS classification	Groups of materials											
PVD milling	P	P10	HR5110	GC1010	KC5010M	IC807		AH120	PR830	ACP2500	TT2510	YBG252	
			HR5120	GC1025	KC515M	IC903	AH725	PR1025	ACP200	TT7080			
		P20	HR5110	GC1025	KC522M	IC807		AH120	PR1525	ACP3000	TT2510	YBG202	
			HR5120	GC1030	KC525M	IC808	MP6120	AH725	PR830	ACU2500	TT7080		YBG205
			HR5130	GC2030	KCSM30	IC810	VP15TF	AH3135	PR1025	ACP200	TT8020		
				SP6519	IC380		AH9030	PR1225	ACP300	TT9030	YBG252		
					IC330		AH3225	PR1230		TT9080			
	M	P30	HR5120	GC1030	KC525M	IC328		AH120		ACP3000	TT8020	YBG302	
			HR5130	GC1010	KC530	IC330	MP6120	AH725	PR1230	ACU2500	TT8080		
			HR7130	GC2030	KC725M	IC380	VP15TF	AH3135	PR1535	ACP200	TT9030	YBG302	
				KC735M	IC830	MP6130	AH130	ACP300	TT9080				
				KCPM40	IC830	VP30RT	AH3225						
			X400	IC928		AH9130							
P40	HR7130	GC1030	KC725M	IC830	VP30RT	AH120		ACP3000	TT8020	YBG302			
		GC2030	KC735M			AH725	ACU2500	TT8080	TT9030				
			KCPM40			AH645	ACP300	TT9080					
M	M10	HR5110	GC1010	KC515M	IC807		AH725	PR1025	ACU2500		YBG252		
		HR5120	GC1030	SP4019	IC808			PR1225	ACM100				
				SP6519	IC903			ACK300	ACP300				
	M20	HR5110	GC1030	KC522M	IC330		AH725	PR1525	ACU2500	TT9030	YBG202		
		HR5120	GC1040	KC525M	IC808	VP15TF	AH3135	PR1025	ACK300	TT9080		YBG205	
HR5130		GC2030	SP4019	IC830	MP7130	AH130	PR1225	ACP300					
		S30T	SP6519	IC840	MP7030	AH6030				YBG9320			
			X700	IC882	VP20RT	AH3225			YBG252				
				IC908		AH9130							
M30	HR5120	GC1040	KC522M	IC328		AH3135		TT8020	TT8020	YBG302			
	HR5130	S30T	KC725M	IC330	VP15TF	AH130	PR1535	TT8080	TT8080				
		GC2030	KC735M	IC830	MP7130	AH9130		TT9030	TT9020				
			KCPM40	IC840	MP7030			TT9080	TT9080				
			KCSM30	IC882	VP20RT								
			KCSM40		MP7140								
			SC6525										
			X700										
M40	HR7130		KC725M	IC830	MP7140	AH140		TT8020	TT8020	YBG302			
			KCPM40	IC928	VP30RT			TT8080	TT8080				
			KCSM40					TT9030	TT9020				
								TT9080	TT9080				

Type	Classification codes		HUAREAL	SANDVIK	KENNAMETAL	ISCAR	MITSUBISHI	TUNGALOY	KYOCERA	SUMITOMO	TEAGUTEC	ZCC.CT
	IOS classification	Groups of materials										
PVD milling	K	K10		GC1010 GC1020	KC514M KC515M KCK20 SP4019	IC810	MP8010	AH110 GH120	PR510 PR905 PR1210	ACK3000 ACU2500	TT6080	YBG102 YBG252
		K20	HR5120	GC1020	KC514M KC520M KC524M KCK20 SP6519	IC808 IC810 IC83	VP15TF VP20RT	AH120 AH9030 AH9130	PR905 PR1210	ACK3000 ACU2500 ACK300	TT6080	YBG152
		K30			KC522M KC524M SP6519	IC830 IC810 IC908 IC910 IC928 IC950	VP15TF VP20RT	AH120		ACK3000 ACU2500 ACK300		

A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

C

Short hole drills

Solid carbide drills

# Comparison table of CVD turning grades

Type	Classification codes		HUAREAL	SANDVIK	KENNAMETAL	ISCAR	MITSUBISHI	TUNGALOY	KYOCERA	SUMITOMO	TEAGUTEK	ZCC.CT
	IOS classification	Groups of materials										
CVD turning	P	P01	HR8115	GC4305 GC4315	KCP05B KCPK05 KCK05B KCK15B	IC8005 IC8150 IC428	UE6105	T9205 T9105	CA510 CA5505	AC8015P AC810P	TT8105	
		P10	HR8115	GC4305 GC4415 GC4325	KCP05B KCPK05 KCP10B KCK15B KCK20B	IC5100 IC8150 IC8250 IC9015	UE6105 MC6015 UE6110 MY5015	T9205 T9105 T9215 T9115	CA510 CA515 CA5505 CA5515	AC8015P AC810P	TT8105 TT8115	YBC151 YBC152
		P20	HR8125 HR8225	GC4225 GC4325 GC4425	KCP10B KCP25B KCM15B	IC8150 IC8250 IC8350 IC9015	MC6015 UE6110 MC6025 UE6020 MY5015	T9215 T9115 T9225 T9125	CA025P CA525 CA5515 CA5525 CR9025	AC8025P AC820P	TT5100 TT8125	YBC251 YBC252
		P30	HR8225	GC4315 GC4325 GC4335 GC2025	KCP25B KCP30B KCM15B	IC8350 IC8025	MC6025 UE6020 MC6035 UE6035 UH6400	T9225 T9125 T9235 T9135 T6130	CA025P CA525 CA5525 CA530 CA5535 CA9025	AC8035P AC830P AC6030M AC630M	TT8125 T5100	YBC252 YBC351 YBC352
		P40		GC4325 GC4335	KCP30B KCP40B KCM25B KCM35B	IC8350 IC8025	MC6035 UE6035 UH6400		CA530 CA5535	AC8035P AC830P AC6030M AC630M	TT8135 TT7100	YBC351 YBC352
	M	M10		GC2015 GC1515	KCM15B	IC6015 IC8025 IC8150 IC8250 IC5820	MC7015 US7020	T9235 T9135 T6130	CA6515	AC6020M AC610M	TT9215	
		M20		GC2015 GC2025 GC2020	KCP30B KCP40B KCM15B KCM25B	IC6015 IC6025 IC8320	MC7015 US7020 MC7025	T9215 T9115	CA6525	AC6020M AC6030M AC610M AC630M	TT9225	YBM151 YBM153
		M30		GC2025 GC2020	KCP40B KCM25B KCM35B	IC6025	MC7025 US735	T6120 T9215 T9115		AC6030M AC630M AC8035P AC830P	TT9235	YBM151 YBM251
		M40			KCM35B KCM35		US735	T6130		AC6030M AC630M	TT9235	YB253

Type	Classification codes		HUAREAL	SANDVIK	KENNAMETAL	ISCAR	MITSUBISHI	TUNGALOY	KYOCERA	SUMITOMO	TEAGUTEC	ZCC.CT
	IOS classification	Groups of materials										
CVD turning	K	K01		GC3210	KCK05B KCK05	IC5005	MC5005 UC5105	T5105	CA310 CA4010 CA4505 CA5505	AC4010K AC405K	TT7005	YBD052
		K10		GC3210	KCK05B KCK05 KCK15B KCK15	IC5005 IC5010 IC5100	MC5015 UC5115 MY5015	T5105 T515 T5115 T9215	CA310 CA315 CA4010 CA4115 CA4505 CA4515 CA5505	AC4010K AC4015K AC405K AC415K	TT7015	YBD102
		K20	HR6115	GC3210 GC3225	KCK15B KCK15 KCK20B KCK20	IC5010 IC8150	MC5015 UC5115 UE6110 MY5115	T515 T5115 T5125 T9215	CA315 CA320 CA4115 CA4120 CA4515	AC4015K AC415K AC420K AC425K AC8025P	TT7015 TT7025	YBD152 YBD252
		K30	HR6115	GC3225	KCP05B KCPK05 KCP10B KCP25B KCK20B		UE6110	T5125	CA320			

A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

C

Short hole drills

Solid carbide drills



# Comparison table of CVD turning grades

Type	Classification codes		HUAREAL	SANDVIK	KENNAMETAL	ISCAR	MITSUBISHI	TUNGALOY	KYOCERA	SUMITOMO	TEAGUTEK	ZCC.CT	
	IOS classification	Groups of materials											
CVD milling	<b>P</b>	P10		GC4220 GC4230 GC3040	KC930M KC935P	IC4100 IC520M IC4050 DT7150 IC5400				ACP2000 ACP100	TT7515		
		P20		GC4220 GC4230 GC3040	SC6525 SP6519		F7030 MC7020	T3225		ACP2000 ACP100	TT7515	YBC301 YBC251	
		P30	HR8140	GC4230 GC3040 GC2040 M30B	MP91M SC6525 KCPK30 X500		F7030 MC7020	T3130 T3225		ACP2000 ACP100	TT7800	YBM351	
		P40	HR8140	GC4240 GC4230 GC3040 GC2040 M30B	KCPK30 X500						TT7800	YBC302	
	<b>M</b>	M10								ACM200			
		M20		GC2040 GC4230	SC6525		F7030 MC7020	T3225	CA6535	ACM200		YBM251 YBM253	
		M30		GC2040 GC4230 GC4240 M30B S40T	SC6525 X500	IC5820	F7030 MC7020	T3225 T3130		ACM200	TT7800	YBM302	
		M40		GC2040 M30B S40T GC4240	X500					ACM200	TT7800		
	<b>K</b>	K10			SC3025 KCK15	IC5100	MC5020	T1215 T1115		ACK2000 ACK100 ACK200	TT7515	YBD151	
		K20		GC3220 K20W	KCK15 SC3025 MP91M	IC5100 DT7150 IC4010 IC4050 IC4100	MC5020	T1215	CA420M	ACK200 ACK200	TT7515	YBD252	
		K30	HR8140	GC3040	MP91M KCPK30 SC6525							YBD252	

## Comparison table of cermet grades

Type	Classification codes		HUAREAL	SANDVIK	KENNAMETAL	ISCAR	MITSUBISHI	TUNGALOY	KYOCERA	SUMITOMO	TEAGUTEC	ZCC.CT
	IOS classification	Groups of materials										
Cermet	P	P10			KT1120	IC20N	NX1010	NS520	TN610	T110A T1000A		
		P20	HRC20	CT5015	KT1120 KT175	IC20N IC75T	NX2525	NS520 NS9530	TN610 TN60	T1200A T1500A	CT3000	YNG151 YNG151C
		P30	HRC20	CT5015	KT125	IC20N IC75T IC30N	NX2525 NX3035	NS9530 NS530 NS730	TN620 TN90	T1200A T1500A	CT3000	
		P40				IC75T IC30N	NX3035 NX4545	NS740		T250A		

A

General turning

Parting and grooving

Threading

B

Indexable milling

Solid carbide end mills

C

Short hole drills

Solid carbide drills