

WHSR-ATH

Carbide Drill for SR machining



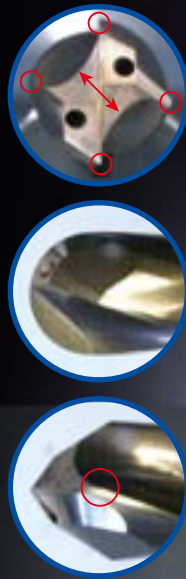
Mitsubishi Hitachi Tool Engineering, Ltd.

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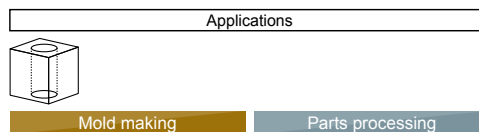
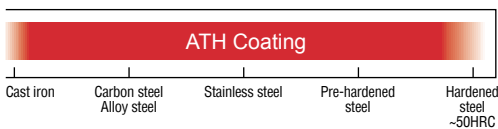
Suppression of stress corrosion cracking in the cooling hole of the mold

Features of WHSR-ATH

- Employs high rigidity groove shape and double margin**
Suppresses chatter while drilling
- Employs oil hole and special thinning**
Increases chip removability to improve surface roughness of hole wall
- Employs edge shape with sharpness and strength**
Reduces scratches and gurge on hole wall surface, also suppresses tool chipping
- Employs high-hardness ultrafine grain carbide and ATH coating**
Possible to use for a wide range of steels regardless of before or after heat treatment



Pat. No.6057038

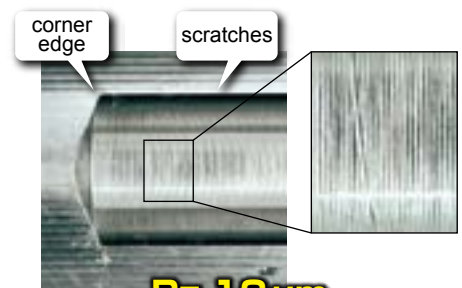
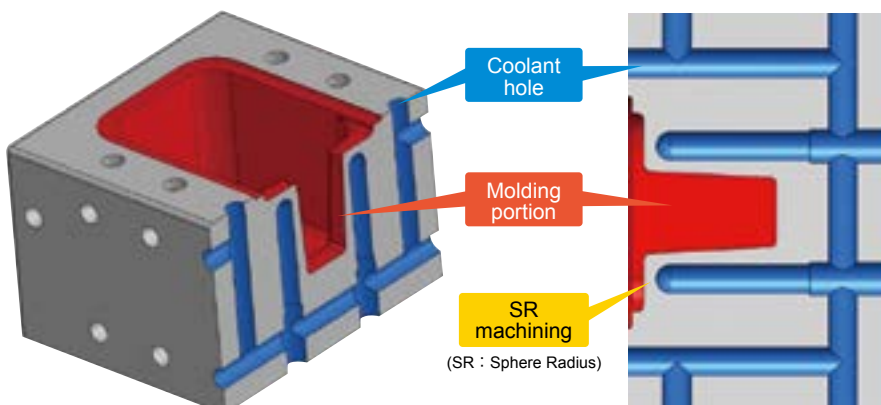


WHSR-ATH
$\phi 3 \sim \phi 12$ 8D·20D·30D [42 Items]

Technology

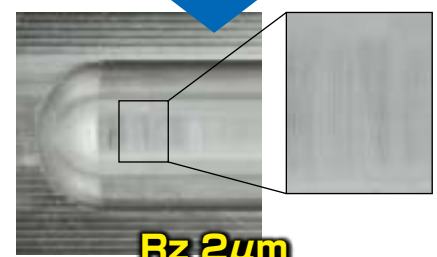
Stress corrosion cracking may occur around the corner of the cooling hole or scratches on the hole wall surface in die casting or plastics molds.

By using a carbide drill for SR machining, it is possible to round the hole bottom and to reduce scratches on the hole wall, thereby suppressing stress corrosion cracking and extending the life of the molds.



Rz 13μm

Hole cross section after drilling

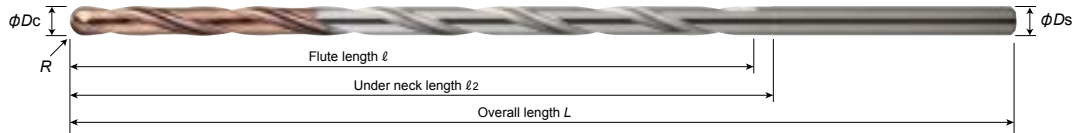


Rz 2μm

Hole cross section after SR machining

Figure: Image of cooling holes of mold

Line Up



08/20/30WHSR-ATH



φ3	0~0.014
φ4	0~0.018
φ6	0~0.023
φ7~φ10	0~0.027
φ10.5~φ12	0~0.027



6<Ds≤10	0~0.008
10<Ds	0~0.009
	0~0.011

	Item code	Stock	Size (mm)					
			Radius R	Tool dia. Dc	Flute length ℓ	Under neck length ℓ2	Overall length L	Shank dia. Ds
L/D=8	08WHSR0300-ATH	●	1.5	3	37	40	85	4
	08WHSR0400-ATH	●	2	4	48	51	97	4
	08WHSR0500-ATH	●	2.5	5	62	65	114	6
	08WHSR0600-ATH	●	3	6	70	73	123	6
	08WHSR0700-ATH	●	3.5	7	81	84	133	8
	08WHSR0800-ATH	●	4	8	92	95	145	8
	08WHSR0850-ATH	●	4.25	8.5	99	102	154	10
	08WHSR0900-ATH	●	4.5	9	104	107	158	10
	08WHSR0950-ATH	●	4.75	9.5	110	113	165	10
	08WHSR1000-ATH	●	5	10	115	118	170	10
	08WHSR1050-ATH	●	5.25	10.5	122	125	181	12
	08WHSR1100-ATH	●	5.5	11	127	130	185	12
	08WHSR1150-ATH	●	5.75	11.5	133	136	192	12
	08WHSR1200-ATH	●	6	12	138	141	197	12
L/D=20	20WHSR0300-ATH	●	1.5	3	71	74	119	4
	20WHSR0400-ATH	●	2	4	94	97	143	4
	20WHSR0500-ATH	●	2.5	5	119	122	171	6
	20WHSR0600-ATH	●	3	6	142	145	195	6
	20WHSR0700-ATH	●	3.5	7	166	169	218	8
	20WHSR0800-ATH	●	4	8	189	192	242	8
	20WHSR0850-ATH	●	4.25	8.5	201	204	256	10
	20WHSR0900-ATH	●	4.5	9	213	216	267	10
	20WHSR0950-ATH	●	4.75	9.5	224	227	279	10
	20WHSR1000-ATH	●	5	10	236	239	291	10
	20WHSR1050-ATH	●	5.25	10.5	249	252	308	12
	20WHSR1100-ATH	●	5.5	11	260	263	318	12
	20WHSR1150-ATH	●	5.75	11.5	272	275	331	12
	20WHSR1200-ATH	●	6	12	283	286	342	12
L/D=30	30WHSR0300-ATH	●	1.5	3	101	104	149	4
	30WHSR0400-ATH	●	2	4	134	137	183	4
	30WHSR0500-ATH	●	2.5	5	169	172	221	6
	30WHSR0600-ATH	●	3	6	202	205	255	6
	30WHSR0700-ATH	●	3.5	7	236	239	288	8
	30WHSR0800-ATH	●	4	8	269	272	322	8
	30WHSR0850-ATH	●	4.25	8.5	286	289	341	10
	30WHSR0900-ATH	●	4.5	9	303	306	357	10
	30WHSR0950-ATH	●	4.75	9.5	320	323	374	10
	30WHSR1000-ATH	●	5	10	336	339	391	10
	30WHSR1050-ATH	●	5.25	10.5	353	356	412	12
	30WHSR1100-ATH	●	5.5	11	370	373	429	12
	30WHSR1150-ATH	●	5.75	11.5	387	390	445	12
	30WHSR1200-ATH	●	6	12	404	407	460	12

● : Stocked Items.

Re-grinding compatibility range table

Item Code	Product	Tool Dia. (mm)	Shape	Re-grinding compatibility range(mm)
				End
WHSR-ATH	Carbide drill for SR machining	3~12		3~12

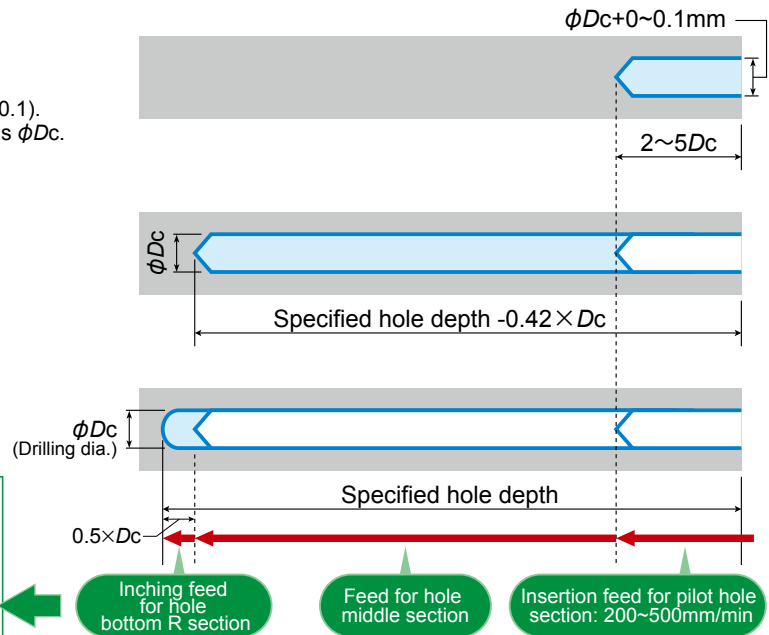
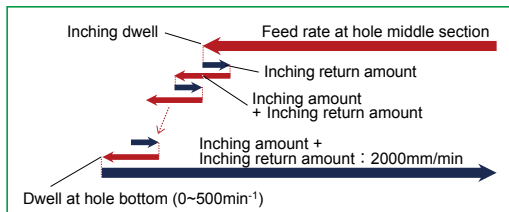
Cutting method

When finishing only the hole bottom

- Machine a pilot hole using **03 to 05WHNSB (or NSBH)**.
※Recommended Pilot hole diameter is $\phi D_c (+0.03 \sim +0.1)$.
Gurge might be decreased if the diameter is same as ϕD_c .

- Machine the long hole using **WHNSB (or NSBH)**.

- Machine the hole bottom using **WHSR**.



When finishing the hole walls and hole bottom

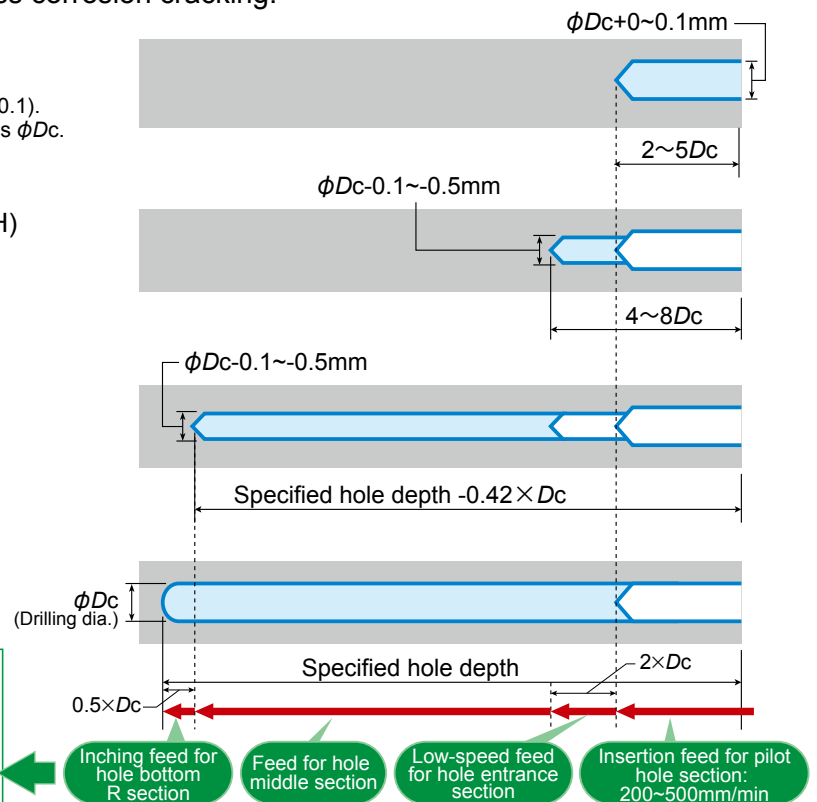
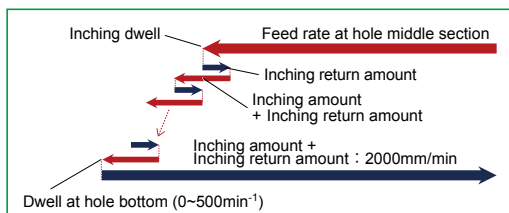
Finishing the hole walls further reduces stress corrosion cracking.

- Machine a pilot hole using **03 to 05WHNSB (or NSBH)**.
※Recommended Pilot hole diameter is $\phi D_c (+0.03 \sim +0.1)$.
Gurge might be decreased if the diameter is same as ϕD_c .

- Machine a guide hole for WHNSB (or NSBH) using **05 to 08 WHNSB (or NSBH)**.

- Machine the long hole using **WHNSB (or NSBH)**.

- Machine using **WHSR**.



When inserting into the pilot hole with WHSR, please set rpm as 0 ~ 500 min⁻¹ to prevent breakage.

If the WHSR and the pilot hole have the same diameter and the wall of pilot hole has gurge, it might be improved by setting the rotation speed as 500 min⁻¹ and the feed rate as 200 mm/min.

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Recommended Cutting Conditions

When finishing only the hole bottom

Work material	Cutting speed m/min	Machined area	Cutting condition	General criteria	Tool dia (mm)							
					3.0	4.0	6.0	8.0	8.5	10.0	11.5	12.0
Pre-hardened steel Hardened steel (From before hardening to 50HRC)	Internal coolant 40~70 ~100		Revolution (min ⁻¹)		7431	5573	3715	2787	2623	2229	1939	1858
		Middle section of hole	Feed per rev (mm/rev)	Dc×(1~2~3)%	0.060	0.080	0.120	0.160	0.170	0.200	0.230	0.240
			Feed rate (mm/min)		446	446	446	446	446	446	446	446
R section of hole bottom		Inching feed per rev (mm/rev)	Dc×(0.2~0.3~0.5)%	0.012	0.016	0.024	0.024	0.026	0.020	0.023	0.024	
		Inching feed rate (mm/min)		89	89	89	67	67	45	45	45	
		Inching amount (mm)	Dc×1%	0.030	0.040	0.060	0.080	0.085	0.100	0.115	0.120	
		Inching return amount (mm)	0.2	Inching return rate (mm/min)	100	Inching dwell time (sec)		0.1	Hole bottom dwell time (sec)		0.3	
Stainless steel SUS												

When finishing the hole walls and hole bottom

Work material	Cutting speed m/min	Machined area	Cutting condition	General criteria	Tool dia (mm)							
					3.0	4.0	6.0	8.0	8.5	10.0	11.5	12.0
Pre-hardened steel Hardened steel (From before hardening to 45HRC)	Internal coolant 40~70 ~100		Revolution (min ⁻¹)		7431	5573	3715	2787	2623	2229	1939	1858
		Hole entrance section	Feed per rev (mm/rev)	$Dc \times (0.5 \sim 1 \sim 1.5)\%$	0.030	0.040	0.060	0.080	0.085	0.100	0.115	0.120
			Feed rate (mm/min)		223	223	223	223	223	223	223	223
		Middle section of hole	Feed per rev (mm/rev)	$Dc \times (0.5 \sim 1.2 \sim 2)\%$	0.036	0.048	0.072	0.096	0.102	0.120	0.138	0.144
			Feed rate (mm/min)		268	268	268	268	268	268	268	268
		R section of hole bottom	Inching feed per rev (mm/rev)	$Dc \times (0.2 \sim 0.3 \sim 0.5)\%$	0.012	0.016	0.024	0.024	0.026	0.020	0.023	0.024
			Inching feed rate (mm/min)		89	89	89	67	67	45	45	45
			Inching amount (mm)	$Dc \times 1\%$	0.030	0.040	0.060	0.080	0.085	0.100	0.115	0.120
Inching return amount (mm)	0.2		Inching return rate (mm/min)	100	Inching dwell time (sec)	0.1	Hole bottom dwell time (sec)	0.3				

Work material	Cutting speed m/min	Machined area	Cutting condition	General criteria	Tool dia (mm)							
					3.0	4.0	6.0	8.0	8.5	10.0	11.5	12.0
Pre-hardened steel Hardened steel (40~50HRC)	Internal coolant 30~70 ~100		Revolution (min ⁻¹)		7431	5573	3715	2787	2623	2229	1939	1858
		Hole entrance section	Feed per rev (mm/rev)	$Dc \times (0.25 \sim 0.5 \sim 1)\%$	0.015	0.020	0.030	0.040	0.043	0.050	0.058	0.060
			Feed rate (mm/min)		111	111	111	111	111	111	111	111
		Middle section of hole	Feed per rev (mm/rev)	$Dc \times (0.5 \sim 1 \sim 1.5)\%$	0.030	0.040	0.060	0.080	0.085	0.100	0.115	0.120
			Feed rate (mm/min)		223	223	223	223	223	223	223	223
		Stainless steel SUS	R section of hole bottom	Inching feed per rev (mm/rev)	$Dc \times (0.2 \sim 0.3 \sim 0.5)\%$	0.012	0.016	0.024	0.024	0.026	0.020	0.023
Inching feed rate (mm/min)				89	89	89	67	67	45	45	45	
Inching amount (mm)	$Dc \times 1\%$			0.030	0.040	0.060	0.080	0.085	0.100	0.115	0.120	
Inching return amount (mm)	0.2			Inching return rate (mm/min)	100	Inching dwell time (sec)	0.1	Hole bottom dwell time (sec)	0.3			

Setting of cutting conditions

- This standard cutting condition table is for general guidance regarding cutting conditions. The conditions should be adjusted according to the machining shape, application, machine used, etc. for the actual machining.
- When installing the tool, use a collet without scratches or dirt, and keep the tool runout to within 0.02 mm.
- Secure the work material firmly so that deformation, deflection, or vibration does not occur.
- Internal coolant is for when a water-soluble cutting fluid diluted up to 20 times is used. For dilutions of greater than 20 times, the cutting speed range should be used as a guide for adjustment. In addition, it is recommended that the coolant pressure be set to 2.0 MPa or higher if the tool diameter is Ø5.0 or less and to 1.5 MPa or higher if the tool diameter is greater than Ø5.0. Particularly in case of a vertical MC, chips tend not to be discharged easily. Better chip discharge is expected with higher coolant pressures- 3MPa or more is recommended.
- When using an oil-based cutting fluid, use conditions with speeds lower than the lower limit of the cutting speed range. Also, please be careful of smoke or fire caused by the hot cutting chips and tool.
- Be sure to sufficiently maintain the oil hole to prevent clogging.
- Please contact us about work materials not listed.

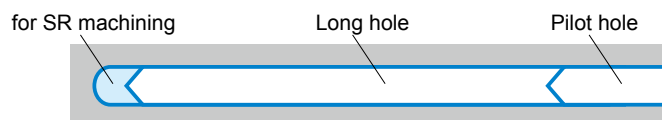
Tool selection example

※Cautions

- As a guide of the maximum hole depth, please set with groove length minus 2xDc.
- Even with the same tool diameter, shank diameter may be different for each tool. The size of the collet to use also varies, so please check carefully.
(The shank diameter of the corresponding tool is indicated by red number.)
- Due to tolerance, the tool diameter for the guide hole and the long hole may be slightly smaller than WHSR-ATH. but the SR machining itself is not affected.

~45HRC

When finishing only the hole bottom



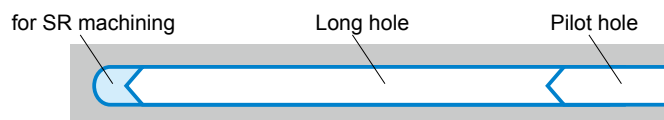
Tool dia. (mm)	Max. hole depth (mm)	Pilot hole				Long hole				for SR machining			
		Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)
3	31	Pilot hole is not required. However, when hole accuracy is necessary, using 03WHNSB is recommended.	●	3	29	08WHNSB0300-TH	●	3	35	08WHSR0300-ATH	●	4	37
4	40					08WHNSB0400-TH	●	4	46	08WHSR0400-ATH	●	4	48
5	52					08WHNSB0500-TH	●	5	59	08WHSR0500-ATH	●	6	62
6	58					08WHNSB0600-TH	●	6	67	08WHSR0600-ATH	●	6	70
7	67					08WHNSB0700-TH	●	7	77	08WHSR0700-ATH	●	8	81
8	76					08WHNSB0800-TH	●	8	88	08WHSR0800-ATH	●	8	92
8.5	82					08WHNSB0850-TH	●	9	94	08WHSR0850-ATH	●	10	99
9	86					08WHNSB0900-TH	●	9	99	08WHSR0900-ATH	●	10	104
9.5	91					08WHNSB0950-TH	●	10	105	08WHSR0950-ATH	●	10	110
10	95					08WHNSB1000-TH	●	10	110	08WHSR1000-ATH	●	10	115
10.5	101					08WHNSB1050-TH	●	11	116	08WHSR1050-ATH	●	12	122
11	105					08WHNSB1100-TH	●	11	121	08WHSR1100-ATH	●	12	127
11.5	110					08WHNSB1150-TH	●	12	127	08WHSR1150-ATH	●	12	133
12	114					08WHNSB1200-TH	●	12	132	08WHSR1200-ATH	●	12	138
3	65	05WHNSB0300-TH	●	3	29	20WHNSB0300-TH	●	3	69	20WHSR0300-ATH	●	4	71
4	86	05WHNSB0400-TH	●	4	37	20WHNSB0400-TH	●	4	92	20WHSR0400-ATH	●	4	94
5	109	05WHNSB0500-TH	●	5	47	20WHNSB0500-TH	●	5	116	20WHSR0500-ATH	●	6	119
6	130	05WHNSB0600-TH	●	6	47	20WHNSB0600-TH	●	6	139	20WHSR0600-ATH	●	6	142
7	152	05WHNSB0700-TH	●	7	55	20WHNSB0700-TH	●	7	162	20WHSR0700-ATH	●	8	166
8	173	05WHNSB0800-TH	●	8	63	20WHNSB0800-TH	●	8	185	20WHSR0800-ATH	●	8	189
8.5	184	05WHNSB0850-TH	●	9	71	20WHNSB0850-TH	●	9	196	20WHSR0850-ATH	●	10	201
9	195	05WHNSB0900-TH	●	9	71	20WHNSB0900-TH	●	9	208	20WHSR0900-ATH	●	10	213
9.5	205	05WHNSB0950-TH	●	10	79	20WHNSB0950-TH	□→②	10	219	20WHSR0950-ATH	●	10	224
10	216	05WHNSB1000-TH	●	10	79	20WHNSB1000-TH	□→②	10	231	20WHSR1000-ATH	●	10	236
10.5	228	05WHNSB1050-TH	●	11	87	20WHNSB1050-TH	□→②	11	243	20WHSR1050-ATH	●	12	249
11	238	05WHNSB1100-TH	●	11	87	20WHNSB1100-TH	□→②	11	254	20WHSR1100-ATH	●	12	260
11.5	249	05WHNSB1150-TH	●	12	93	20WHNSB1150-TH	□→②	12	266	20WHSR1150-ATH	●	12	272
12	259	05WHNSB1200-TH	●	12	93	20WHNSB1200-TH	□→②	12	277	20WHSR1200-ATH	●	12	283
3	95	05WHNSB0300-TH	●	3	29	30WHNSB0300-TH	●	3	99	30WHSR0300-ATH	●	4	101
4	126	05WHNSB0400-TH	●	4	37	30WHNSB0400-TH	●	4	132	30WHSR0400-ATH	●	4	134
5	159	05WHNSB0500-TH	●	5	47	30WHNSB0500-TH	●	5	166	30WHSR0500-ATH	●	6	169
6	190	05WHNSB0600-TH	●	6	47	30WHNSB0600-TH	●	6	199	30WHSR0600-ATH	●	6	202
7	222	05WHNSB0700-TH	●	7	55	30WHNSB0700-TH	●	7	232	30WHSR0700-ATH	●	8	236
8	253	05WHNSB0800-TH	●	8	63	30WHNSB0800-TH	●	8	265	30WHSR0800-ATH	●	8	269
8.5	269	05WHNSB0850-TH	●	9	71	30WHNSB0850-TH	□→②	9	281	30WHSR0850-ATH	●	10	286
9	285	05WHNSB0900-TH	●	9	71	30WHNSB0900-TH	□→②	9	298	30WHSR0900-ATH	●	10	303
9.5	301	05WHNSB0950-TH	●	10	79	30WHNSB0950-TH	★	10	314	30WHSR0950-ATH	●	10	320
10	316	05WHNSB1000-TH	●	10	79	30WHNSB1000-TH	★	10	331	30WHSR1000-ATH	●	10	336
10.5	332	05WHNSB1050-TH	●	11	87	30WHNSB1050-TH	★	11	348	30WHSR1050-ATH	●	12	353
11	348	05WHNSB1100-TH	●	11	87	30WHNSB1100-TH	★	11	364	30WHSR1100-ATH	●	12	370
11.5	364	05WHNSB1150-TH	●	12	93	30WHNSB1150-TH	★	12	381	30WHSR1150-ATH	●	12	387
12	380	05WHNSB1200-TH	●	12	93	30WHNSB1200-TH	★	12	397	30WHSR1200-ATH	●	12	404

● : Stocked Items. ★ : Stocked Items of New Products. □→② : Stocked items since Feb.2018.

Details are mentioned on Page 3

45HRC~

When finishing only the hole bottom



Tool dia. (mm)	Max. hole depth (mm)	Pilot hole				Long hole				for SR machining			
		Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)
3	31	NSBH0300-20-ATH	●	4	20	NSBH0300-40-ATH	●	4	40	08WHSR0300-ATH	●	4	37
4	40	NSBH0400-20-ATH	●	6	20	NSBH0400-60-ATH	●	6	60	08WHSR0400-ATH	●	4	48
5	52	NSBH0500-25-ATH	●	6	25	NSBH0500-90-ATH	●	6	90	08WHSR0500-ATH	●	6	62
6	58	NSBH0600-30-ATH	●	8	30	NSBH0600-90-ATH	●	8	90	08WHSR0600-ATH	●	6	70
7	67	NSBH0700-35-ATH	●	8	35	NSBH0700-90-ATH	●	8	90	08WHSR0700-ATH	●	8	81
8	76	NSBH0800-40-ATH	●	10	40	NSBH0800-120-ATH	●	10	120	08WHSR0800-ATH	●	8	92
8.5	82	NSBH0850-45-ATH	●	10	45	NSBH0850-120-ATH	●	10	120	08WHSR0850-ATH	●	10	99
9	86	NSBH0900-45-ATH	●	10	45	NSBH0900-120-ATH	●	10	120	08WHSR0900-ATH	●	10	104
9.5	91	NSBH0950-50-ATH	□	10	50	NSBH0950-120-ATH	□	10	120	08WHSR0950-ATH	●	10	110
10	95	NSBH1000-50-ATH	●	12	50	NSBH1000-120-ATH	●	12	120	08WHSR1000-ATH	●	10	115
10.5	101	NSBH1050-50-ATH	●	12	50	NSBH1050-150-ATH	□	12	150	08WHSR1050-ATH	●	12	122
11	105	NSBH1100-55-ATH	●	12	55	NSBH1100-150-ATH	●	12	150	08WHSR1100-ATH	●	12	127
11.5	110	NSBH1150-60-ATH	●	12	60	NSBH1150-150-ATH	●	12	150	08WHSR1150-ATH	●	12	133
12	114	NSBH1200-60-ATH	●	12	60	NSBH1200-150-ATH	●	12	150	08WHSR1200-ATH	●	12	138
3	65	NSBH0300-20-ATH	●	4	20	NSBH0300-90-ATH	●	4	90	20WHSR0300-ATH	●	4	71
4	86	NSBH0400-20-ATH	●	6	20	NSBH0400-120-ATH	●	6	120	20WHSR0400-ATH	●	4	94
5	109	NSBH0500-25-ATH	●	6	25	NSBH0500-150-ATH	●	6	150	20WHSR0500-ATH	●	6	119
6	130	NSBH0600-30-ATH	●	8	30	NSBH0600-150-ATH	●	8	150	20WHSR0600-ATH	●	6	142
7	152	NSBH0700-35-ATH	●	8	35	NSBH0700-200-ATH	●	8	200	20WHSR0700-ATH	●	8	166
8	173	NSBH0800-40-ATH	●	10	40	NSBH0800-200-ATH	●	10	200	20WHSR0800-ATH	●	8	189
8.5	184	NSBH0850-45-ATH	●	10	45	NSBH0850-250-ATH	●	10	250	20WHSR0850-ATH	●	10	201
9	195	NSBH0900-45-ATH	●	10	45	NSBH0900-250-ATH	●	10	250	20WHSR0900-ATH	●	10	213
9.5	205	NSBH0950-50-ATH	□	10	50	NSBH0950-250-ATH	□	10	250	20WHSR0950-ATH	●	10	224
10	216	NSBH1000-50-ATH	●	12	50	NSBH1000-250-ATH	●	12	250	20WHSR1000-ATH	●	10	236
10.5	228	NSBH1050-50-ATH	●	12	50	NSBH1050-250-ATH	□	12	250	20WHSR1050-ATH	●	12	249
11	238	NSBH1100-55-ATH	●	12	55	NSBH1100-300-ATH	●	12	300	20WHSR1100-ATH	●	12	260
11.5	249	NSBH1150-60-ATH	●	12	60	NSBH1150-300-ATH	●	12	300	20WHSR1150-ATH	●	12	272
12	259	NSBH1200-60-ATH	●	12	60	NSBH1200-300-ATH	●	12	300	20WHSR1200-ATH	●	12	283
3	95	NSBH0300-20-ATH	●	4	20	NSBH0300-100-ATH		BTO		30WHSR0300-ATH	●	4	101
4	126	NSBH0400-20-ATH	●	6	20	NSBH0400-130-ATH		BTO		30WHSR0400-ATH	●	4	134
5	159	NSBH0500-25-ATH	●	6	25	NSBH0500-165-ATH		BTO		30WHSR0500-ATH	●	6	169
6	190	NSBH0600-30-ATH	●	8	30	NSBH0600-200-ATH		BTO		30WHSR0600-ATH	●	6	202
7	222	NSBH0700-35-ATH	●	8	35	NSBH0700-235-ATH		BTO		30WHSR0700-ATH	●	8	236
8	253	NSBH0800-40-ATH	●	10	40	NSBH0800-265-ATH		BTO		30WHSR0800-ATH	●	8	269
8.5	269	NSBH0850-45-ATH	●	10	45	NSBH0850-285-ATH		BTO		30WHSR0850-ATH	●	10	286
9	285	NSBH0900-45-ATH	●	10	45	NSBH0900-300-ATH		BTO		30WHSR0900-ATH	●	10	303
9.5	301	NSBH0950-50-ATH	□	10	50	NSBH0950-320-ATH		BTO		30WHSR0950-ATH	●	10	320
10	316	NSBH1000-50-ATH	●	12	50	NSBH1000-335-ATH		BTO		30WHSR1000-ATH	●	10	336
10.5	332	NSBH1050-50-ATH	●	12	50	NSBH1050-350-ATH		BTO		30WHSR1050-ATH	●	12	353
11	348	NSBH1100-55-ATH	●	12	55	NSBH1100-370-ATH		BTO		30WHSR1100-ATH	●	12	370
11.5	364	NSBH1150-60-ATH	●	12	60	NSBH1150-385-ATH		BTO		30WHSR1150-ATH	●	12	387
12	380	NSBH1200-60-ATH	●	12	60	NSBH1200-400-ATH		BTO		30WHSR1200-ATH	●	12	404

□ : Stocked by specified distributor. Contact with our sales department.

BTO: Build-to-order product

Details are mentioned on Page 3

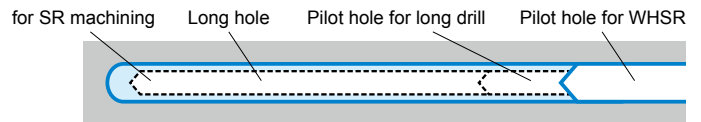
Tool selection example

※Cautions

- As a guide of the maximum hole depth, please set with groove length minus 2xDc.
- Even with the same tool diameter, shank diameter may be different for each tool. The size of the collet to use also varies, so please check carefully.
(The shank diameter of the corresponding tool is indicated by red number.)
- Due to tolerance, the tool diameter for the guide hole and the long hole may be slightly smaller than WHSR-ATH. but the SR machining itself is not affected.

~45HRC

When finishing the hole walls and hole bottom



Tool dia. (mm)	Max. hole depth (mm)	Pilot hole for WHSR				Pilot hole for long drill				Long hole				For SR machining			
		Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)
3	31	03WHNSB0300-TH	●	3	19	Pilot hole for long drill is not required.				08WHNSB0290-TH	●	3	35	08WHSR0300-ATH	●	4	37
4	40	03WHNSB0400-TH	●	4	23					08WHNSB0390-TH	●	4	46	08WHSR0400-ATH	●	4	48
5	52	03WHNSB0500-TH	●	5	29					08WHNSB0490-TH	●	5	59	08WHSR0500-ATH	●	6	62
6	58	03WHNSB0600-TH	●	6	29					08WHNSB0590-TH	●	6	67	08WHSR0600-ATH	●	6	70
7	67	03WHNSB0700-TH	●	7	34					08WHNSB0690-TH	●	7	77	08WHSR0700-ATH	●	8	81
8	76	03WHNSB0800-TH	●	8	39					08WHNSB0790-TH	●	8	88	08WHSR0800-ATH	●	8	92
8.5	82	03WHNSB0850-TH	●	9	44					08WHNSB0840-TH	□→②	9	94	08WHSR0850-ATH	●	10	99
9	86	03WHNSB0900-TH	●	9	44					08WHNSB0890-TH	□→②	9	99	08WHSR0900-ATH	●	10	104
9.5	91	03WHNSB0950-TH	●	10	49					08WHNSB0940-TH	□→②	10	105	08WHSR0950-ATH	●	10	110
10	95	03WHNSB1000-TH	●	10	49					08WHNSB0990-TH	□→②	10	110	08WHSR1000-ATH	●	10	115
10.5	101	03WHNSB1050-TH	●	11	54					08WHNSB1040-TH	□→②	11	116	08WHSR1050-ATH	●	12	122
11	105	03WHNSB1100-TH	●	11	54					08WHNSB1090-TH	□→②	11	121	08WHSR1100-ATH	●	12	127
11.5	110	03WHNSB1150-TH	●	12	59					08WHNSB1140-TH	□→②	12	127	08WHSR1150-ATH	●	12	133
12	114	03WHNSB1200-TH	●	12	59					08WHNSB1190-TH	□→②	12	132	08WHSR1200-ATH	●	12	138
3	65	05WHNSB0300-TH	●	3	29	08WHNSB0290-TH	●	3	35	20WHNSB0290-TH	●	3	69	20WHSR0300-ATH	●	4	71
4	86	05WHNSB0400-TH	●	4	37	08WHNSB0390-TH	●	4	46	20WHNSB0390-TH	●	4	92	20WHSR0400-ATH	●	4	94
5	109	05WHNSB0500-TH	●	5	47	08WHNSB0490-TH	●	5	59	20WHNSB0490-TH	●	5	116	20WHSR0500-ATH	●	6	119
6	130	05WHNSB0600-TH	●	6	47	08WHNSB0590-TH	●	6	67	20WHNSB0590-TH	●	6	139	20WHSR0600-ATH	●	6	142
7	152	05WHNSB0700-TH	●	7	55	08WHNSB0690-TH	●	7	77	20WHNSB0690-TH	●	7	162	20WHSR0700-ATH	●	8	166
8	173	05WHNSB0800-TH	●	8	63	08WHNSB0790-TH	●	8	88	20WHNSB0790-TH	●	8	185	20WHSR0800-ATH	●	8	189
8.5	184	05WHNSB0850-TH	●	9	71	08WHNSB0840-TH	□→②	9	94	20WHNSB0840-TH	□→②	9	196	20WHSR0850-ATH	●	10	201
9	195	05WHNSB0900-TH	●	9	71	08WHNSB0890-TH	□→②	9	99	20WHNSB0890-TH	□→②	9	208	20WHSR0900-ATH	●	10	213
9.5	205	05WHNSB0950-TH	●	10	79	08WHNSB0940-TH	□→②	10	105	20WHNSB0940-TH	□→②	10	219	20WHSR0950-ATH	●	10	224
10	216	05WHNSB1000-TH	●	10	79	08WHNSB0990-TH	□→②	10	110	20WHNSB0990-TH	□→②	10	231	20WHSR1000-ATH	●	10	236
10.5	228	05WHNSB1050-TH	●	11	87	08WHNSB1040-TH	□→②	11	116	20WHNSB1040-TH	□→②	11	243	20WHSR1050-ATH	●	12	249
11	238	05WHNSB1100-TH	●	11	87	08WHNSB1090-TH	□→②	11	121	20WHNSB1090-TH	□→②	11	254	20WHSR1100-ATH	●	12	260
11.5	249	05WHNSB1150-TH	●	12	93	08WHNSB1140-TH	□→②	12	127	20WHNSB1140-TH	□→②	12	266	20WHSR1150-ATH	●	12	272
12	259	05WHNSB1200-TH	●	12	93	08WHNSB1190-TH	□→②	12	132	20WHNSB1190-TH	□→②	12	277	20WHSR1200-ATH	●	12	283
3	95	05WHNSB0300-TH	●	3	29	08WHNSB0290-TH	●	3	35	30WHNSB0290-TH	●	3	99	30WHSR0300-ATH	●	4	101
4	126	05WHNSB0400-TH	●	4	37	08WHNSB0390-TH	●	4	46	30WHNSB0390-TH	●	4	132	30WHSR0400-ATH	●	4	134
5	159	05WHNSB0500-TH	●	5	47	08WHNSB0490-TH	●	5	59	30WHNSB0490-TH	●	5	166	30WHSR0500-ATH	●	6	169
6	190	05WHNSB0600-TH	●	6	47	08WHNSB0590-TH	●	6	67	30WHNSB0590-TH	●	6	199	30WHSR0600-ATH	●	6	202
7	222	05WHNSB0700-TH	●	7	55	08WHNSB0690-TH	●	7	77	30WHNSB0690-TH	●	7	232	30WHSR0700-ATH	●	8	236
8	253	05WHNSB0800-TH	●	8	63	08WHNSB0790-TH	●	8	88	30WHNSB0790-TH	●	8	265	30WHSR0800-ATH	●	8	269
8.5	269	05WHNSB0850-TH	●	9	71	08WHNSB0840-TH	□→②	9	94	30WHNSB0840-TH	□→②	9	281	30WHSR0850-ATH	●	10	286
9	285	05WHNSB0900-TH	●	9	71	08WHNSB0890-TH	□→②	9	99	30WHNSB0890-TH	□→②	9	298	30WHSR0900-ATH	●	10	303
9.5	301	05WHNSB0950-TH	●	10	79	08WHNSB0940-TH	□→②	10	105	30WHNSB0940-TH	★	10	314	30WHSR0950-ATH	●	10	320
10	316	05WHNSB1000-TH	●	10	79	08WHNSB0990-TH	□→②	10	110	30WHNSB0990-TH	★	10	331	30WHSR1000-ATH	●	10	336
10.5	332	05WHNSB1050-TH	●	11	87	08WHNSB1040-TH	□→②	11	116	30WHNSB1040-TH	★	11	348	30WHSR1050-ATH	●	12	353
11	348	05WHNSB1100-TH	●	11	87	08WHNSB1090-TH	□→②	11	121	30WHNSB1090-TH	★	11	364	30WHSR1100-ATH	●	12	370
11.5	364	05WHNSB1150-TH	●	12	93	08WHNSB1140-TH	□→②	12	127	30WHNSB1140-TH	★	12	381	30WHSR1150-ATH	●	12	387
12	380	05WHNSB1200-TH	●	12	93	08WHNSB1190-TH	□→②	12	132	30WHNSB1190-TH	★	12	397	30WHSR1200-ATH	●	12	404

● : Stocked Items. ★ : Stocked Items of New Products. □→② : Stocked items since Feb.2018.

Details are mentioned on Page 3

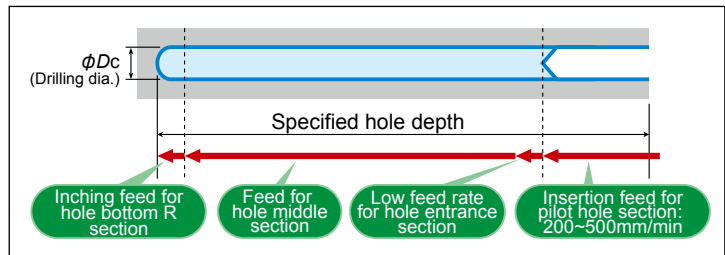
When finishing the hole walls and hole bottom



☐ : Stocked by specified distributor. Contact with our sales department.

Details are mentioned on Page 3

Trouble shooting



Trouble	Where	Cause	Countermeasures
Gurge/ chatter of hole walls	Insertion of pilot hole entrance	Excessive feed at insertion into hole	Reduce feed when insertion into hole ($v_r=200\text{mm/min}$)
	Hole entrance	Excessive feed	Reduce feed (0.5~0.8 times)
		Excessive stock amount	Maximize prepared hole diameter ($\phi D_c-0.1$)
	Middle section of hole	Excessive feed (tends to occur with $\phi 6$ or more)	Reduce feed (0.5~0.8 times)
		Insufficient feed (tends to occur with $\phi 6$ or less)	Increase feed (1.1~1.2 times)
		Excessive stock amount	Maximize prepared hole diameter ($\phi D_c-0.1$)
Insufficient surface roughness of hole walls	R section of hole bottom	Excessive inching feed	Reduce inching feed (0.5~0.8times)
			Increase feed (1.1~1.2 times)
			Reduce feed (0.5~0.8 times)
	Middle section of hole	Tool wear	Maximize prepared hole diameter ($\phi D_c-0.1$)
		Tool chipping	Increase inching feed (1.1~1.2 times)
		Excessive stock amount	Reduce inching feed (0.5~0.8times)
Drill breakage	Insertion of pilot hole entrance	Insufficient rpm when insertion into hole	Increase rpm when insertion into hole (1.2~1.5 times)
		Excessive feed when insertion into hole	Increase feed when insertion into hole (0.5~0.8 times)
	Hole entrance Middle section of hole	Excessive feed	Reduce feed (0.5~0.8 times)
		Excessive stock amount	Maximize prepared hole diameter ($\phi D_c-0.1$)
	R section of hole bottom	Excessive inching feed	Reduce feed (0.5~0.8 times)
		Inching starting position is too deep	Deepen R section of hole bottom ($0.7 \times D_c$)
		Excessive inching return feed	Reduce inching return feed (0.5 times)
Chips clogging/ entangling with drill	Middle section of hole	Insufficient rpm	Increase cutting speed (+10~20m/min)
		Insufficient feed	Increase feed (1.1~1.2 times)
Machining noise becomes loud at end of hole	R section of hole bottom	Excessive inching feed	Reduce inching feed (0.5~0.8times)
		Inching starting position is too deep	Deepen R section of hole bottom ($0.7 \times D_c$)
		Excessive inching return feed	Reduce inching return feed (0.5 times)
Drill chipping	R peripheral part	Excessive feed at middle section of hole	Reduce feed (0.5~0.8 times)
		Excessive stock amount at middle section of hole	Maximize prepared hole diameter ($\phi D_c-0.1$)
	Chisel	Excessive inching feed at R section of hole bottom	Reduce inching feed (0.5~0.8times)

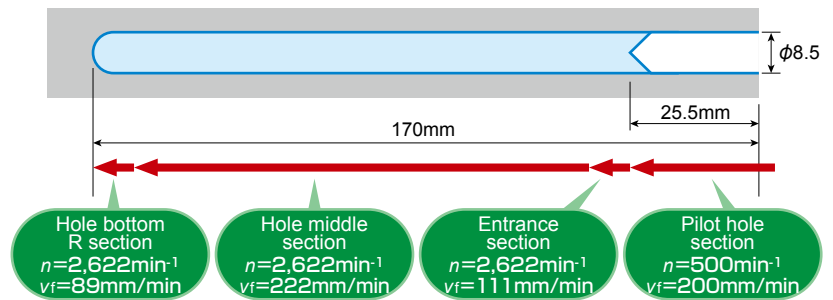
Field data

DAC-P (45HRC) drilling example

Cutting condition

Tool : 20WHSR0850-ATH ($\phi 8.5 \times L201 \times L256 \times \phi 10$)
 Work material : DAC-P (45HRC)
 Machine : Horizontal MC (HSK-A63)
 $v_c = 70 \text{ m/min}$ Water base coolant
 Internal coolant 2.2MPa

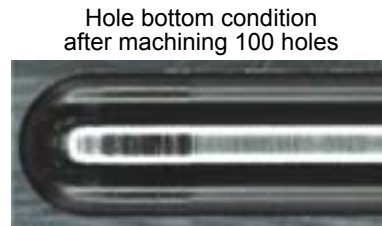
Hole bottom R section
 Inching length : 0.085mm
 Inching return amount : 0.2mm
 Inching return rate : 100mm/min



Rake



Margin



Hole bottom condition after machining 100 holes

Hole wall surface roughness Rz: 1.5 μm

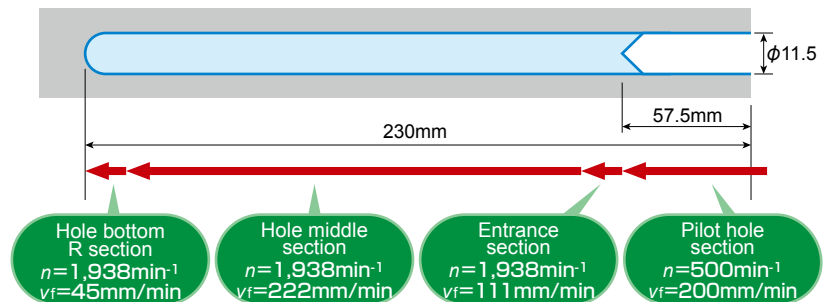
Possible to machine 100 holes and more

KDA1S(A) drilling example

Cutting condition

Tool : 20WHSR1150-ATH ($\phi 11.5 \times L272 \times L331 \times \phi 12$)
 Work material : KDA1S(A)
 Machine : Horizontal MC (HSK-A63)
 $v_c = 70 \text{ m/min}$ Water base coolant
 Internal coolant 2.2MPa

Hole bottom R section
 Inching length : 0.115mm
 Inching return amount : 0.2mm
 Inching return rate : 100mm/min



Rake



Margin



Hole bottom condition after machining 60 holes

Hole wall surface roughness Rz: 1.8 μm

Possible to machine 60 holes

Comparison of gundrill

Cutting condition

Tool : 20WHSR0850-ATH ($\phi 8.5 \times L201 \times L256 \times \phi 10$) Work material : DAC-P (A)
 Machine : Horizontal MC (HSK-A63) Water base coolant Internal coolant 2.2MPa

Drill	Cutting condition	Drilling time / hole	Hole wall surface roughness Rz	Tool life judgement: Hole surface roughness
R Gun drill $\phi 8.5$	$v_c = 50 \text{ m/min}$ $v_f = 18 \text{ mm/min}$	440 sec	3 holes or less: $8 \mu\text{m}$ or less 4 holes or more: $10 \mu\text{m}$ or more	3 holes
20WHSR0850-ATH	$v_c = 70 \text{ m/min}$ $v_f = 111 \text{ mm/min}$ (Hole entrance section) → 223 mm/min (Middle section of hole) → 45 mm/min (R section of hole bottom)	80 sec	$4 \mu\text{m}$ or less	100 holes or more

More than 5 times the machining performance and more than 30 times the tool life



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

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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) 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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