

Drills for high-hardened steels

NSBH-ATH/EMSBH-ATH

Carbide Oil Hole Non Step Borer H for high hardness material
Epoch Micro Step Borer H



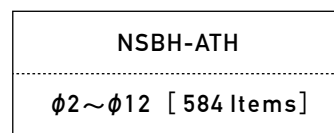
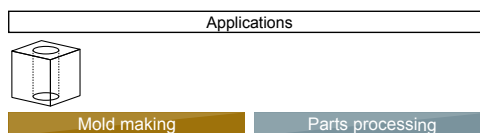
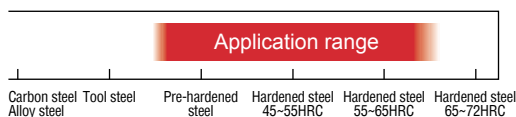
Mitsubishi Hitachi Tool Engineering, Ltd.

New Product News | No.1304E-5 | 2017-10

Achieves high-performance drilling of high-hardened steels.

Features of NSBH-ATH

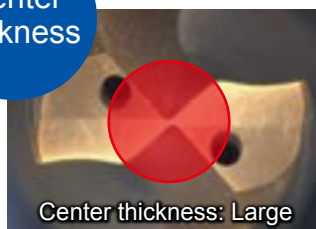
- High toughness and cutting edge strength for high-hardened steels.
- Smooth removal of chips by special flute shape.



Design

Increased tool toughness and cutting edge strength

Center thickness

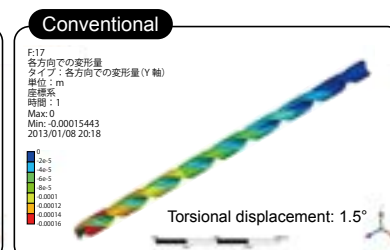
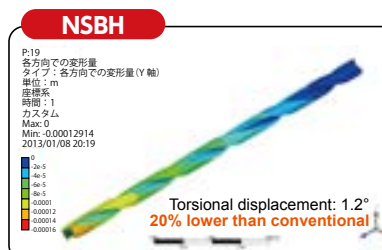


Helix angle



Deformation simulation by quasi model

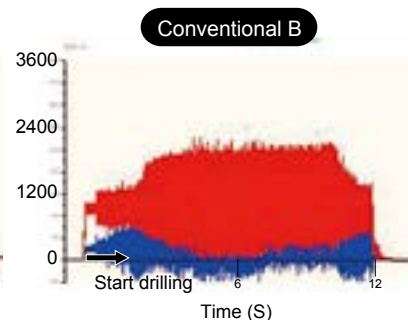
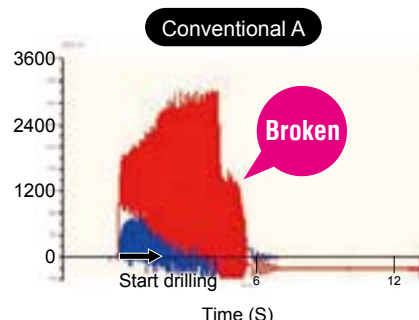
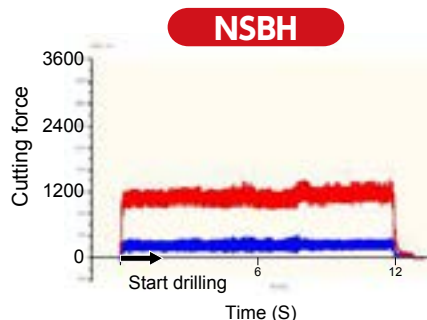
Torsional displacement for simulation using the thrust and torque values generated when boring steel material with a hardness of 50HRC for a tool model with a tool diameter of φ6.0 and a groove length of 140mm.
Thrust load: 1150N; Torque load: 240Ncm



Tool deformation and deflection due to large cutting force while boring high-hardened steel were suppressed.

Cutting force

Work material : DAC(50HRC) Item code & size : NSBH0600-150-ATH (φ6.0×150×205) $n=3,183\text{min}^{-1}$
 $v_c=60\text{m/min}$ $v_f=191\text{mm/min}$ $f=0.06\text{mm/rev}$ Cutting depth =56mm Internal water base coolant



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

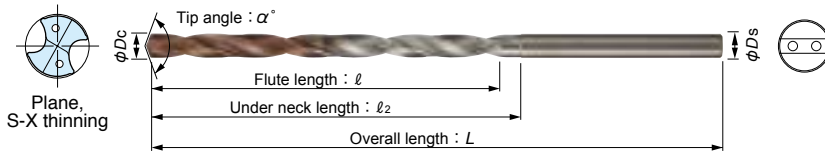
— Thrust(N)
— Torque(Ncm)

Improved heat-resistant coating

Please refer to 12 page for ATH coating.

ATH coating

Carbide Oil Hole Non Step Borer H for High Hardness Material



Tool dia. tolerance -NSBH-ATH (mm)

Tool dia.	2.0 ≤ Dc ≤ 6.0	6.0 < Dc ≤ 10.0	10.0 < Dc ≤ 12.0
Tolerance	+0.012 0	+0.015 0	+0.015 -0.003

NSBH-ATH

Cutting depth should be set to "under flute length-2xDc" as a general rule.

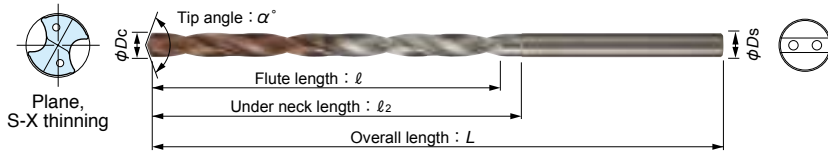


Item code	Stocks	Size (mm)					Point angle α
		Drill dia. Dc	Flute length ℓ	Overall length L	Under neck length ℓ2	Shank dia. Ds	
NSBH0200-10-ATH	●	2.0	10	60	14	4	140
NSBH0200-20-ATH	●		20	70	24		
NSBH0200-40-ATH	●		40	90	44		135
NSBH0200-60-ATH	●		60	110	64		
NSBH0210-10-ATH	●	2.1	10	60	14	4	140
NSBH0210-20-ATH	□		20	70	24		
NSBH0210-40-ATH	□		40	90	44		135
NSBH0210-60-ATH	□		60	110	64		
NSBH0220-10-ATH	●	2.2	10	60	14	4	140
NSBH0220-20-ATH	□		20	70	24		
NSBH0220-40-ATH	□		40	90	44		135
NSBH0220-60-ATH	□		60	110	64		
NSBH0230-10-ATH	●	2.3	10	60	14	4	140
NSBH0230-20-ATH	□		20	70	24		
NSBH0230-40-ATH	□		40	90	44		135
NSBH0230-60-ATH	□		60	110	64		
NSBH0240-10-ATH	●	2.4	10	60	14	4	140
NSBH0240-20-ATH	□		20	70	24		
NSBH0240-40-ATH	□		40	90	44		135
NSBH0240-60-ATH	□		60	110	64		
NSBH0250-10-ATH	●	2.5	10	60	14	4	140
NSBH0250-20-ATH	●		20	70	24		
NSBH0250-40-ATH	□		40	90	44		135
NSBH0250-60-ATH	□		60	110	64		
NSBH0260-10-ATH	●	2.6	10	60	14	4	140
NSBH0260-20-ATH	●		20	70	24		
NSBH0260-40-ATH	□		40	90	44		135
NSBH0260-60-ATH	□		60	110	64		
NSBH0270-10-ATH	●	2.7	10	60	14	4	140
NSBH0270-20-ATH	□		20	70	24		
NSBH0270-40-ATH	□		40	90	44		135
NSBH0270-60-ATH	□		60	110	64		
NSBH0280-10-ATH	●	2.8	10	60	14	4	140
NSBH0280-20-ATH	□		20	70	24		
NSBH0280-40-ATH	□		40	90	44		135
NSBH0280-60-ATH	□		60	110	64		
NSBH0290-10-ATH	●	2.9	10	60	14	4	140
NSBH0290-20-ATH	□		20	70	24		
NSBH0290-40-ATH	□		40	90	44		135
NSBH0290-60-ATH	□		60	110	64		
NSBH0300-20-ATH	●	3.0	20	70	23	4	140
NSBH0300-40-ATH	●		40	90	43		
NSBH0300-60-ATH	●		60	110	63		135
NSBH0300-90-ATH	●		90	140	93		
NSBH0310-20-ATH	□	3.1	20	70	23	4	140
NSBH0310-40-ATH	□		40	90	43		
NSBH0310-60-ATH	□		60	110	63		135
NSBH0310-90-ATH	□		90	140	93		
NSBH0320-20-ATH	●	3.2	20	70	23	4	140
NSBH0320-40-ATH	●		40	90	43		
NSBH0320-60-ATH	□		60	110	63		135
NSBH0320-90-ATH	□		90	140	93		
NSBH0330-20-ATH	●	3.3	20	70	23	4	140
NSBH0330-40-ATH	●		40	90	43		
NSBH0330-60-ATH	□		60	110	63		135
NSBH0330-90-ATH	□		90	140	93		
NSBH0340-20-ATH	●	3.4	20	70	23	4	140
NSBH0340-40-ATH	●		40	90	43		
NSBH0340-60-ATH	□		60	110	63		135
NSBH0340-90-ATH	□		90	140	93		

Item code	Stocks	Size (mm)					Point angle α
		Drill dia. Dc	Flute length ℓ	Overall length L	Under neck length ℓ2	Shank dia. Ds	
NSBH0350-20-ATH	□	3.5	20	70	23	4	140
NSBH0350-40-ATH	□		40	90	43		
NSBH0350-60-ATH	□		60	110	63		135
NSBH0350-90-ATH	□		90	140	93		
NSBH0360-20-ATH	□	3.6	20	70	23	4	140
NSBH0360-40-ATH	□		40	90	43		
NSBH0360-60-ATH	□		60	110	63		135
NSBH0360-90-ATH	□		90	140	93		
NSBH0370-20-ATH	□	3.7	20	70	23	4	140
NSBH0370-40-ATH	□		40	90	43		
NSBH0370-60-ATH	□		60	110	63		135
NSBH0370-90-ATH	□		90	140	93		
NSBH0380-20-ATH	□	3.8	20	70	23	4	140
NSBH0380-40-ATH	□		40	90	43		
NSBH0380-60-ATH	□		60	110	63		135
NSBH0380-90-ATH	□		90	140	93		
NSBH0390-20-ATH	□	3.9	20	70	23	4	140
NSBH0390-40-ATH	□		40	90	43		
NSBH0390-60-ATH	□		60	110	63		135
NSBH0390-90-ATH	□		90	140	93		
NSBH0400-20-ATH	●	4.0	20	70	23	6	140
NSBH0400-40-ATH	●		40	90	43		
NSBH0400-60-ATH	●		60	110	63		135
NSBH0400-90-ATH	●		90	140	93		
NSBH0410-20-ATH	●	4.1	20	70	23	6	140
NSBH0410-40-ATH	□		40	90	43		
NSBH0410-60-ATH	□		60	110	63		135
NSBH0410-90-ATH	□		90	140	93		
NSBH0420-20-ATH	●	4.2	20	70	23	6	140
NSBH0420-40-ATH	●		40	90	43		
NSBH0420-60-ATH	□		60	110	63		135
NSBH0420-90-ATH	□		90	140	93		
NSBH0430-20-ATH	●	4.3	20	70	23	6	140
NSBH0430-40-ATH	●		40	90	43		
NSBH0430-60-ATH	□		60	110	63		135
NSBH0430-90-ATH	□		90	140	93		
NSBH0440-20-ATH	□	4.4	20	70	23	6	140
NSBH0440-40-ATH	□		40	90	43		
NSBH0440-60-ATH	□		60	110	63		135
NSBH0440-90-ATH	□		90	140	93		
NSBH0450-20-ATH	□	4.5	20	70	23	6	140
NSBH0450-40-ATH	□		40	90	43		
NSBH0450-60-ATH	□		60	110	63		135
NSBH0450-90-ATH	□		90	140	93		
NSBH0460-20-ATH	□	4.6	20	70	23	6	140
NSBH0460-40-ATH	□		40	90	43		
NSBH0460-60-ATH	□		60	110	63		135
NSBH0460-90-ATH	□		90	140	93		
NSBH0460-120-ATH	□		120	170	123		
NSBH0460-150-ATH	□		150	205	153		

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

Carbide Oil Hole Non Step Borer H for High Hardness Material



Tool dia. tolerance -NSBH-ATH

(mm)

Tool dia.	2.0 ≤ Dc ≤ 6.0	6.0 < Dc ≤ 10.0	10.0 < Dc ≤ 12.0
Tolerance	+0.012 0	+0.015 0	+0.015 -0.003

NSBH-ATH

Cutting depth should be set to "under flute length-2xDc" as a general rule.



Item code	Stocks	Size (mm)					Point angle α°
		Drill dia. Dc	Flute length ℓ	Overall length L	Under neck length ℓ2	Shank dia. Ds	
NSBH0470-20-ATH	☐	4.7	20	70	23	6	140
NSBH0470-40-ATH	☐		40	90	43		135
NSBH0470-60-ATH	☐		60	110	63		
NSBH0470-90-ATH	☐		90	140	93		
NSBH0470-120-ATH	☐		120	170	123		
NSBH0470-150-ATH	☐		150	205	153		
NSBH0480-20-ATH	☐	4.8	20	70	23	6	140
NSBH0480-40-ATH	☐		40	90	43		135
NSBH0480-60-ATH	☐		60	110	63		
NSBH0480-90-ATH	☐		90	140	93		
NSBH0480-120-ATH	☐		120	170	123		
NSBH0480-150-ATH	☐		150	205	153		
NSBH0490-20-ATH	☐	4.9	20	70	23	6	140
NSBH0490-40-ATH	☐		40	90	43		135
NSBH0490-60-ATH	☐		60	110	63		
NSBH0490-90-ATH	☐		90	140	93		
NSBH0490-120-ATH	☐		120	170	123		
NSBH0490-150-ATH	☐		150	205	153		
NSBH0500-25-ATH	☒	5.0	25	80	28	6	140
NSBH0500-40-ATH	☒		40	95	43		135
NSBH0500-60-ATH	☒		60	115	63		
NSBH0500-90-ATH	☒		90	145	93		
NSBH0500-120-ATH	☒		120	175	123		
NSBH0500-150-ATH	☒		150	205	153		
NSBH0510-30-ATH	☒	5.1	30	85	33	6	140
NSBH0510-60-ATH	☒		60	115	63		135
NSBH0510-90-ATH	☐		90	145	93		
NSBH0510-120-ATH	☐		120	175	123		
NSBH0510-150-ATH	☐		150	205	153		
NSBH0520-30-ATH	☐	5.2	30	85	33	6	140
NSBH0520-60-ATH	☐		60	115	63		135
NSBH0520-90-ATH	☐		90	145	93		
NSBH0520-120-ATH	☐		120	175	123		
NSBH0520-150-ATH	☐		150	205	153		
NSBH0530-30-ATH	☐	5.3	30	85	33	6	140
NSBH0530-60-ATH	☐		60	115	63		135
NSBH0530-90-ATH	☐		90	145	93		
NSBH0530-120-ATH	☐		120	175	123		
NSBH0530-150-ATH	☐		150	205	153		
NSBH0540-30-ATH	☐	5.4	30	85	33	6	140
NSBH0540-60-ATH	☐		60	115	63		135
NSBH0540-90-ATH	☐		90	145	93		
NSBH0540-120-ATH	☐		120	175	123		
NSBH0540-150-ATH	☐		150	205	153		
NSBH0550-30-ATH	☐	5.5	30	85	33	6	140
NSBH0550-60-ATH	☐		60	115	63		135
NSBH0550-90-ATH	☐		90	145	93		
NSBH0550-120-ATH	☐		120	175	123		
NSBH0550-150-ATH	☐		150	205	153		
NSBH0560-30-ATH	☐	5.6	30	85	33	6	140
NSBH0560-60-ATH	☐		60	115	63		135
NSBH0560-90-ATH	☐		90	145	93		
NSBH0560-120-ATH	☐		120	175	123		
NSBH0560-150-ATH	☐		150	205	153		
NSBH0570-30-ATH	☐	5.7	30	85	33	6	140
NSBH0570-60-ATH	☐		60	115	63		135
NSBH0570-90-ATH	☐		90	145	93		
NSBH0570-120-ATH	☐		120	175	123		
NSBH0570-150-ATH	☐		150	205	153		

Item code	Stocks	Size (mm)					Point angle α°
		Drill dia. Dc	Flute length ℓ	Overall length L	Under neck length ℓ2	Shank dia. Ds	
NSBH0580-30-ATH	☐	5.8	30	85	33	6	140
NSBH0580-60-ATH	☐		60	115	63		135
NSBH0580-90-ATH	☐		90	145	93		
NSBH0580-120-ATH	☐		120	175	123		
NSBH0580-150-ATH	☐		150	205	153		
NSBH0590-30-ATH	☐	5.9	30	85	33	6	140
NSBH0590-60-ATH	☐		60	115	63		135
NSBH0590-90-ATH	☐		90	145	93		
NSBH0590-120-ATH	☐		120	175	123		
NSBH0590-150-ATH	☐		150	205	153		
NSBH0600-30-ATH	☒	6.0	30	85	33	8	140
NSBH0600-60-ATH	☒		60	115	63		135
NSBH0600-90-ATH	☒		90	145	93		
NSBH0600-120-ATH	☒		120	175	123		
NSBH0600-150-ATH	☒		150	205	153		
NSBH0610-30-ATH	☐	6.1	30	85	33	8	140
NSBH0610-60-ATH	☐		60	115	63		135
NSBH0610-90-ATH	☐		90	145	93		
NSBH0610-120-ATH	☐		120	175	123		
NSBH0610-150-ATH	☐		150	205	153		
NSBH0620-30-ATH	☐	6.2	30	85	33	8	140
NSBH0620-60-ATH	☐		60	115	63		135
NSBH0620-90-ATH	☐		90	145	93		
NSBH0620-120-ATH	☐		120	175	123		
NSBH0620-150-ATH	☐		150	205	153		
NSBH0630-30-ATH	☐	6.3	30	85	33	8	140
NSBH0630-60-ATH	☐		60	115	63		135
NSBH0630-90-ATH	☐		90	145	93		
NSBH0630-120-ATH	☐		120	175	123		
NSBH0630-150-ATH	☐		150	205	153		
NSBH0640-30-ATH	☐	6.4	30	85	33	8	140
NSBH0640-60-ATH	☐		60	115	63		135
NSBH0640-90-ATH	☐		90	145	93		
NSBH0640-120-ATH	☐		120	175	123		
NSBH0640-150-ATH	☐		150	205	153		
NSBH0650-30-ATH	☐	6.5	30	85	33	8	140
NSBH0650-60-ATH	☐		60	115	63		135
NSBH0650-90-ATH	☐		90	145	93		
NSBH0650-120-ATH	☐		120	175	123		
NSBH0650-150-ATH	☐		150	205	153		
NSBH0660-30-ATH	☐	6.6	30	85	33	8	140
NSBH0660-60-ATH	☐		60	115	63		135
NSBH0660-90-ATH	☐		90	145	93		
NSBH0660-120-ATH	☐		120	175	123		
NSBH0660-150-ATH	☐		150	205	153		
NSBH0670-30-ATH	☐	6.7	30	85	33	8	140
NSBH0670-60-ATH	☐		60	115	63		135
NSBH0670-90-ATH	☐		90	145	93		
NSBH0670-120-ATH	☐		120	175	123		
NSBH0670-150-ATH	☐		150	205	153		
NSBH0680-30-ATH	☒	6.8	30	85	33	8	140
NSBH0680-60-ATH	☒		60	115	63		135
NSBH0680-90-ATH	☐		90	145	93		
NSBH0680-120-ATH	☐		120	175	123		
NSBH0680-150-ATH	☐		150	205	153		
NSBH0680-200-ATH	☐		200	255	203		

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

NSBH○○○○-○○○-ATH

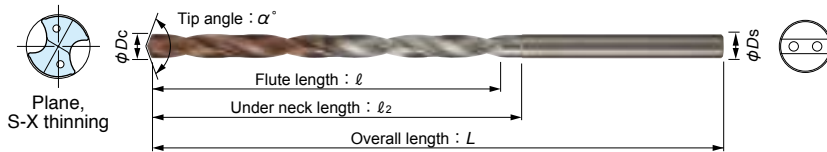
Cutting depth should be set to "under flute length-2xDc" as a general rule.

Item code	Stocks	Size (mm)					Point angle α
		Drill dia. Dc	Flute length ℓ	Overall length L	Under neck length ℓ ₂	Shank dia. Ds	
NSBH0690-30-ATH	●	6.9	30	85	33	8	140
NSBH0690-60-ATH	●		60	115	63		135
NSBH0690-90-ATH	□		90	145	93		
NSBH0690-120-ATH	□		120	175	123		
NSBH0690-150-ATH	□		150	205	153		
NSBH0690-200-ATH	□		200	255	203		
NSBH0700-35-ATH	●	7.0	35	90	38	8	140
NSBH0700-60-ATH	●		60	115	63		135
NSBH0700-90-ATH	●		90	145	93		
NSBH0700-120-ATH	●		120	175	123		
NSBH0700-150-ATH	●		150	205	153		
NSBH0700-200-ATH	●		200	255	203		
NSBH0710-35-ATH	□	7.1	35	90	38	8	140
NSBH0710-60-ATH	□		60	115	63		135
NSBH0710-90-ATH	□		90	145	93		
NSBH0710-120-ATH	□		120	175	123		
NSBH0710-150-ATH	□		150	205	153		
NSBH0710-200-ATH	□		200	255	203		
NSBH0720-35-ATH	□	7.2	35	90	38	8	140
NSBH0720-60-ATH	□		60	115	63		135
NSBH0720-90-ATH	□		90	145	93		
NSBH0720-120-ATH	□		120	175	123		
NSBH0720-150-ATH	□		150	205	153		
NSBH0720-200-ATH	□		200	255	203		
NSBH0730-35-ATH	□	7.3	35	90	38	8	140
NSBH0730-60-ATH	□		60	115	63		135
NSBH0730-90-ATH	□		90	145	93		
NSBH0730-120-ATH	□		120	175	123		
NSBH0730-150-ATH	□		150	205	153		
NSBH0730-200-ATH	□		200	255	203		
NSBH0740-35-ATH	□	7.4	35	90	38	8	140
NSBH0740-60-ATH	□		60	115	63		135
NSBH0740-90-ATH	□		90	145	93		
NSBH0740-120-ATH	□		120	175	123		
NSBH0740-150-ATH	□		150	205	153		
NSBH0740-200-ATH	□		200	255	203		
NSBH0750-35-ATH	□	7.5	35	90	38	8	140
NSBH0750-60-ATH	□		60	115	63		135
NSBH0750-90-ATH	□		90	145	93		
NSBH0750-120-ATH	□		120	175	123		
NSBH0750-150-ATH	□		150	205	153		
NSBH0750-200-ATH	□		200	255	203		
NSBH0760-35-ATH	□	7.6	35	90	38	8	140
NSBH0760-60-ATH	□		60	115	63		135
NSBH0760-90-ATH	□		90	145	93		
NSBH0760-120-ATH	□		120	175	123		
NSBH0760-150-ATH	□		150	205	153		
NSBH0760-200-ATH	□		200	255	203		
NSBH0760-250-ATH	□		250	305	253		
NSBH0770-35-ATH	□	7.7	35	90	38	8	140
NSBH0770-60-ATH	□		60	115	63		135
NSBH0770-90-ATH	□		90	145	93		
NSBH0770-120-ATH	□		120	175	123		
NSBH0770-150-ATH	□		150	205	153		
NSBH0770-200-ATH	□		200	255	203		
NSBH0770-250-ATH	□		250	305	253		
NSBH0780-35-ATH	□	7.8	35	90	38	8	140
NSBH0780-60-ATH	□		60	115	63		135
NSBH0780-90-ATH	□		90	145	93		
NSBH0780-120-ATH	□		120	175	123		

Item code	Stocks	Size (mm)					Point angle α
		Drill dia. Dc	Flute length ℓ	Overall length L	Under neck length ℓ ₂	Shank dia. Ds	
NSBH0780-150-ATH	□	7.8	150	205	153	8	135
NSBH0780-200-ATH	□		200	255	203		
NSBH0780-250-ATH	□		250	305	253		
NSBH0790-35-ATH	□	7.9	35	90	38	8	140
NSBH0790-60-ATH	□		60	115	63		135
NSBH0790-90-ATH	□		90	145	93		
NSBH0790-120-ATH	□		120	175	123		
NSBH0790-150-ATH	□		150	205	153		
NSBH0790-200-ATH	□		200	255	203		
NSBH0790-250-ATH	□		250	305	253		
NSBH0800-40-ATH	●	8.0	40	95	43	10	140
NSBH0800-60-ATH	●		60	115	63		135
NSBH0800-90-ATH	●		90	145	93		
NSBH0800-120-ATH	●		120	175	123		
NSBH0800-150-ATH	●		150	205	153		
NSBH0800-200-ATH	●		200	255	203		
NSBH0800-250-ATH	●		250	305	253		
NSBH0810-45-ATH	□	8.1	45	105	48	10	140
NSBH0810-90-ATH	□		90	150	93		135
NSBH0810-120-ATH	□		120	180	123		
NSBH0810-150-ATH	□		150	210	153		
NSBH0810-200-ATH	□		200	260	203		
NSBH0810-250-ATH	□		250	310	253		
NSBH0820-45-ATH	□	8.2	45	105	48	10	140
NSBH0820-90-ATH	□		90	150	93		135
NSBH0820-120-ATH	□		120	180	123		
NSBH0820-150-ATH	□		150	210	153		
NSBH0820-200-ATH	□		200	260	203		
NSBH0820-250-ATH	□		250	310	253		
NSBH0830-45-ATH	□	8.3	45	105	48	10	140
NSBH0830-90-ATH	□		90	150	93		135
NSBH0830-120-ATH	□		120	180	123		
NSBH0830-150-ATH	□		150	210	153		
NSBH0830-200-ATH	□		200	260	203		
NSBH0830-250-ATH	□		250	310	253		
NSBH0840-45-ATH	□	8.4	45	105	48	10	140
NSBH0840-90-ATH	□		90	150	93		135
NSBH0840-120-ATH	□		120	180	123		
NSBH0840-150-ATH	□		150	210	153		
NSBH0840-200-ATH	□		200	260	203		
NSBH0840-250-ATH	□		250	310	253		
NSBH0850-45-ATH	●	8.5	45	105	48	10	140
NSBH0850-90-ATH	●		90	150	93		135
NSBH0850-120-ATH	●		120	180	123		
NSBH0850-150-ATH	●		150	210	153		
NSBH0850-200-ATH	●		200	260	203		
NSBH0850-250-ATH	●		250	310	253		
NSBH0860-45-ATH	●	8.6	45	105	48	10	140
NSBH0860-90-ATH	□		90	150	93		135
NSBH0860-120-ATH	□		120	180	123		
NSBH0860-150-ATH	□		150	210	153		
NSBH0860-200-ATH	□		200	260	203		
NSBH0860-250-ATH	□		250	310	253		
NSBH0870-45-ATH	●	8.7	45	105	48	10	140
NSBH0870-90-ATH	□		90	150	93		135
NSBH0870-120-ATH	□		120	180	123		
NSBH0870-150-ATH	□		150	210	153		
NSBH0870-200-ATH	□		200	260	203		
NSBH0870-250-ATH	□		250	310	253		

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

Carbide Oil Hole Non Step Borer H for High Hardness Material



Tool dia. tolerance -NSBH-ATH (mm)

Tool dia.	2.0 ≤ Dc ≤ 6.0	6.0 < Dc ≤ 10.0	10.0 < Dc ≤ 12.0
Tolerance	+0.012 0	+0.015 0	+0.015 -0.003

NSBH-ATH

Cutting depth should be set to "under flute length-2xDc" as a general rule.



Item code	Stocks	Size (mm)					Point angle α
		Drill dia. Dc	Flute length ℓ	Overall length L	Under neck length ℓ₂	Shank dia. Ds	
NSBH0880-45-ATH	●	8.8	45	105	48	10	140
NSBH0880-90-ATH	□		90	150	93		135
NSBH0880-120-ATH	□		120	180	123		
NSBH0880-150-ATH	□		150	210	153		
NSBH0880-200-ATH	□		200	260	203		
NSBH0880-250-ATH	□		250	310	253		
NSBH0890-45-ATH	●	8.9	45	105	48	10	140
NSBH0890-90-ATH	□		90	150	93		135
NSBH0890-120-ATH	□		120	180	123		
NSBH0890-150-ATH	□		150	210	153		
NSBH0890-200-ATH	□		200	260	203		
NSBH0890-250-ATH	□		250	310	253		
NSBH0900-45-ATH	●	9.0	45	105	48	10	140
NSBH0900-90-ATH	●		90	150	93		135
NSBH0900-120-ATH	●		120	180	123		
NSBH0900-150-ATH	●		150	210	153		
NSBH0900-200-ATH	●		200	260	203		
NSBH0900-250-ATH	●		250	310	253		
NSBH0910-50-ATH	□	9.1	50	110	53	10	140
NSBH0910-90-ATH	□		90	150	93		135
NSBH0910-120-ATH	□		120	180	123		
NSBH0910-150-ATH	□		150	210	153		
NSBH0910-200-ATH	□		200	260	203		
NSBH0910-250-ATH	□		250	310	253		
NSBH0910-300-ATH	□		300	360	303		
NSBH0920-50-ATH	□	9.2	50	110	53	10	140
NSBH0920-90-ATH	□		90	150	93		135
NSBH0920-120-ATH	□		120	180	123		
NSBH0920-150-ATH	□		150	210	153		
NSBH0920-200-ATH	□		200	260	203		
NSBH0920-250-ATH	□		250	310	253		
NSBH0920-300-ATH	□		300	360	303		
NSBH0930-50-ATH	□	9.3	50	110	53	10	140
NSBH0930-90-ATH	□		90	150	93		135
NSBH0930-120-ATH	□		120	180	123		
NSBH0930-150-ATH	□		150	210	153		
NSBH0930-200-ATH	□		200	260	203		
NSBH0930-250-ATH	□		250	310	253		
NSBH0930-300-ATH	□		300	360	303		
NSBH0940-50-ATH	□	9.4	50	110	53	10	140
NSBH0940-90-ATH	□		90	150	93		135
NSBH0940-120-ATH	□		120	180	123		
NSBH0940-150-ATH	□		150	210	153		
NSBH0940-200-ATH	□		200	260	203		
NSBH0940-250-ATH	□		250	310	253		
NSBH0940-300-ATH	□		300	360	303		
NSBH0950-50-ATH	□	9.5	50	110	53	10	140
NSBH0950-90-ATH	□		90	150	93		135
NSBH0950-120-ATH	□		120	180	123		
NSBH0950-150-ATH	□		150	210	153		
NSBH0950-200-ATH	□		200	260	203		
NSBH0950-250-ATH	□		250	310	253		
NSBH0950-300-ATH	□		300	360	303		
NSBH0960-50-ATH	□	9.6	50	110	53	10	140
NSBH0960-90-ATH	□		90	150	93		135
NSBH0960-120-ATH	□		120	180	123		
NSBH0960-150-ATH	□		150	210	153		
NSBH0960-200-ATH	□		200	260	203		
NSBH0960-250-ATH	□		250	310	253		
NSBH0960-300-ATH	□		300	360	303		

Item code	Stocks	Size (mm)					Point angle α
		Drill dia. Dc	Flute length ℓ	Overall length L	Under neck length ℓ₂	Shank dia. Ds	
NSBH0970-50-ATH	□	9.7	50	110	53	10	140
NSBH0970-90-ATH	□		90	150	93		135
NSBH0970-120-ATH	□		120	180	123		
NSBH0970-150-ATH	□		150	210	153		
NSBH0970-200-ATH	□		200	260	203		
NSBH0970-250-ATH	□		250	310	253		
NSBH0970-300-ATH	□		300	360	303		
NSBH0980-50-ATH	□	9.8	50	110	53	10	140
NSBH0980-90-ATH	□		90	150	93		135
NSBH0980-120-ATH	□		120	180	123		
NSBH0980-150-ATH	□		150	210	153		
NSBH0980-200-ATH	□		200	260	203		
NSBH0980-250-ATH	□		250	310	253		
NSBH0980-300-ATH	□		300	360	303		
NSBH0990-50-ATH	□	9.9	50	110	53	10	140
NSBH0990-90-ATH	□		90	150	93		135
NSBH0990-120-ATH	□		120	180	123		
NSBH0990-150-ATH	□		150	210	153		
NSBH0990-200-ATH	□		200	260	203		
NSBH0990-250-ATH	□		250	310	253		
NSBH0990-300-ATH	□		300	360	303		
NSBH1000-50-ATH	●	10.0	50	110	53	12	140
NSBH1000-90-ATH	●		90	150	93		135
NSBH1000-120-ATH	●		120	180	123		
NSBH1000-150-ATH	●		150	210	153		
NSBH1000-200-ATH	●		200	260	203		
NSBH1000-250-ATH	●		250	310	253		
NSBH1000-300-ATH	●		300	360	303		
NSBH1010-50-ATH	□	10.1	50	110	53	12	140
NSBH1010-90-ATH	□		90	150	93		135
NSBH1010-120-ATH	□		120	180	123		
NSBH1010-150-ATH	□		150	210	153		
NSBH1010-200-ATH	□		200	260	203		
NSBH1010-250-ATH	□		250	310	253		
NSBH1010-300-ATH	□		300	360	303		
NSBH1020-50-ATH	□	10.2	50	110	53	12	140
NSBH1020-90-ATH	□		90	150	93		135
NSBH1020-120-ATH	□		120	180	123		
NSBH1020-150-ATH	□		150	210	153		
NSBH1020-200-ATH	□		200	260	203		
NSBH1020-250-ATH	□		250	310	253		
NSBH1020-300-ATH	□		300	360	303		
NSBH1030-50-ATH	●	10.3	50	110	53	12	140
NSBH1030-90-ATH	□		90	150	93		135
NSBH1030-120-ATH	□		120	180	123		
NSBH1030-150-ATH	□		150	210	153		
NSBH1030-200-ATH	□		200	260	203		
NSBH1030-250-ATH	□		250	310	253		
NSBH1030-300-ATH	□		300	360	303		
NSBH1040-50-ATH	●	10.4	50	110	53	12	140
NSBH1040-90-ATH	□		90	150	93		135
NSBH1040-120-ATH	□		120	180	123		
NSBH1040-150-ATH	□		150	210	153		
NSBH1040-200-ATH	□		200	260	203		
NSBH1040-250-ATH	□		250	310	253		
NSBH1040-300-ATH	□		300	360	303		
NSBH1050-50-ATH	●	10.5	50	110	53	12	140
NSBH1050-90-ATH	□		90	150	93		135
NSBH1050-120-ATH	□		120	180	123		
NSBH1050-150-ATH	□		150	210	153		

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

NSBH-ATH

Cutting depth should be set to "under flute length-2xDc" as a general rule.

Item code	Stocks	Size (mm)					Point angle α
		Drill dia. Dc	Flute length ℓ	Overall length L	Under neck length ℓ_2	Shank dia. Ds	
NSBH1050-200-ATH	☐	10.5	200	260	203	12	135
NSBH1050-250-ATH	☐		250	310	253		
NSBH1050-300-ATH	☐		300	360	303		
NSBH1060-50-ATH	☒	10.6	50	110	53	12	140
NSBH1060-90-ATH	☐		90	150	93		
NSBH1060-120-ATH	☐		120	180	123		
NSBH1060-150-ATH	☐		150	210	153		
NSBH1060-200-ATH	☐		200	260	203		
NSBH1060-250-ATH	☐		250	310	253		
NSBH1060-300-ATH	☐		300	360	303		
NSBH1070-50-ATH	☐	10.7	50	110	53	12	140
NSBH1070-90-ATH	☐		90	150	93		
NSBH1070-120-ATH	☐		120	180	123		
NSBH1070-150-ATH	☐		150	210	153		
NSBH1070-200-ATH	☐		200	260	203		
NSBH1070-250-ATH	☐		250	310	253		
NSBH1070-300-ATH	☐		300	360	303		
NSBH1080-50-ATH	☒	10.8	50	110	53	12	140
NSBH1080-90-ATH	☐		90	150	93		
NSBH1080-120-ATH	☐		120	180	123		
NSBH1080-150-ATH	☐		150	210	153		
NSBH1080-200-ATH	☐		200	260	203		
NSBH1080-250-ATH	☐		250	310	253		
NSBH1080-300-ATH	☐		300	360	303		
NSBH1090-50-ATH	☒	10.9	50	110	53	12	140
NSBH1090-90-ATH	☐		90	150	93		
NSBH1090-120-ATH	☐		120	180	123		
NSBH1090-150-ATH	☐		150	210	153		
NSBH1090-200-ATH	☐		200	260	203		
NSBH1090-250-ATH	☐		250	310	253		
NSBH1090-300-ATH	☐		300	360	303		
NSBH1100-55-ATH	☒	11.0	55	120	58	12	140
NSBH1100-90-ATH	☒		90	155	93		
NSBH1100-120-ATH	☒		120	185	123		
NSBH1100-150-ATH	☒		150	215	153		
NSBH1100-200-ATH	☒		200	265	203		
NSBH1100-250-ATH	☒		250	315	253		
NSBH1100-300-ATH	☒		300	365	303		
NSBH1110-55-ATH	☐	11.1	55	120	58	12	140
NSBH1110-90-ATH	☐		90	155	93		
NSBH1110-120-ATH	☐		120	185	123		
NSBH1110-150-ATH	☐		150	215	153		
NSBH1110-200-ATH	☐		200	265	203		
NSBH1110-250-ATH	☐		250	315	253		
NSBH1110-300-ATH	☐		300	365	303		
NSBH1120-55-ATH	☐	11.2	55	120	58	12	140
NSBH1120-90-ATH	☐		90	155	93		
NSBH1120-120-ATH	☐		120	185	123		
NSBH1120-150-ATH	☐		150	215	153		
NSBH1120-200-ATH	☐		200	265	203		
NSBH1120-250-ATH	☐		250	315	253		
NSBH1120-300-ATH	☐		300	365	303		
NSBH1130-55-ATH	☐	11.3	55	120	58	12	140
NSBH1130-90-ATH	☐		90	155	93		
NSBH1130-120-ATH	☐		120	185	123		
NSBH1130-150-ATH	☐		150	215	153		
NSBH1130-200-ATH	☐		200	265	203		
NSBH1130-250-ATH	☐		250	315	253		
NSBH1130-300-ATH	☐		300	365	303		

Item code	Stocks	Size (mm)					Point angle α
		Drill dia. Dc	Flute length ℓ	Overall length L	Under neck length ℓ_2	Shank dia. Ds	
NSBH1140-55-ATH	☐	11.4	55	120	58	12	140
NSBH1140-90-ATH	☐		90	155	93		
NSBH1140-120-ATH	☐		120	185	123		
NSBH1140-150-ATH	☐		150	215	153		
NSBH1140-200-ATH	☐		200	265	203		
NSBH1140-250-ATH	☐		250	315	253		
NSBH1140-300-ATH	☐		300	365	303		
NSBH1150-60-ATH	☒	11.5	60	125	63	12	140
NSBH1150-90-ATH	☒		90	155	93		
NSBH1150-120-ATH	☒		120	185	123		
NSBH1150-150-ATH	☒		150	215	153		
NSBH1150-200-ATH	☒		200	265	203		
NSBH1150-250-ATH	☒		250	315	253		
NSBH1150-300-ATH	☒		300	365	303		
NSBH1160-60-ATH	☐	11.6	60	125	63	12	140
NSBH1160-90-ATH	☐		90	155	93		
NSBH1160-120-ATH	☐		120	185	123		
NSBH1160-150-ATH	☐		150	215	153		
NSBH1160-200-ATH	☐		200	265	203		
NSBH1160-250-ATH	☐		250	315	253		
NSBH1160-300-ATH	☐		300	365	303		
NSBH1170-60-ATH	☐	11.7	60	125	63	12	140
NSBH1170-90-ATH	☐		90	155	93		
NSBH1170-120-ATH	☐		120	185	123		
NSBH1170-150-ATH	☐		150	215	153		
NSBH1170-200-ATH	☐		200	265	203		
NSBH1170-250-ATH	☐		250	315	253		
NSBH1170-300-ATH	☐		300	365	303		
NSBH1180-60-ATH	☐	11.8	60	125	63	12	140
NSBH1180-90-ATH	☐		90	155	93		
NSBH1180-120-ATH	☐		120	185	123		
NSBH1180-150-ATH	☐		150	215	153		
NSBH1180-200-ATH	☐		200	265	203		
NSBH1180-250-ATH	☐		250	315	253		
NSBH1180-300-ATH	☐		300	365	303		
NSBH1190-60-ATH	☐	11.9	60	125	63	12	140
NSBH1190-90-ATH	☐		90	155	93		
NSBH1190-120-ATH	☐		120	185	123		
NSBH1190-150-ATH	☐		150	215	153		
NSBH1190-200-ATH	☐		200	265	203		
NSBH1190-250-ATH	☐		250	315	253		
NSBH1190-300-ATH	☐		300	365	303		
NSBH1200-60-ATH	☒	12.0	60	125	63	12	140
NSBH1200-90-ATH	☒		90	155	93		
NSBH1200-120-ATH	☒		120	185	123		
NSBH1200-150-ATH	☒		150	215	153		
NSBH1200-200-ATH	☒		200	265	203		
NSBH1200-250-ATH	☒		250	315	253		
NSBH1200-300-ATH	☒		300	365	303		

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

Recommended Cutting Conditions



Carbide Oil Hole Non Step Borer H for High Hardness Material

NSBH-ATH

Work materials	Hardness (HRC)	Cutting speed v_c (m/min)	Feed rate f (mm/rev)					
			$\phi 2$	$\phi 4$	$\phi 6$	$\phi 8$	$\phi 10$	$\phi 12$
Pre-hardened steels	40~45	20~ 60 ~80	0.01~0.05	0.02~0.08	0.08~0.15	0.1~0.2	0.12~0.25	0.13~0.25
Hardened steels	45~55	20~ 40 ~60	0.01~0.03	0.01~0.06	0.05~0.09	0.06~0.12	0.08~0.15	0.1~0.15
	55~60	10 ~20	0.01~0.02	0.01~0.04	0.03~0.06	0.04~0.08	0.06~0.1	0.06~0.1

[Setting of Cutting Conditions] ※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;
 - ① Keep v_c and lower feed. (The thinner chip for better removal)
 - ② 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 times. When coolant dilution exceeds 20 times, decrease the cutting speed to the lowest in the specified range. When the tool diameter is $\phi 5.0$ or less, the coolant pressure should be 2.0 MPa or higher, and when the diameter is over $\phi 5.0$, 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 drilling.
- 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.

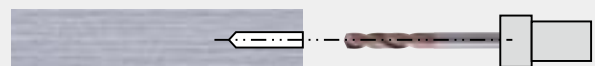


Drilling process

1 Drilling of pilot hole (guide hole)

- Recommended tools :
Use the product with the shortest flute length for each size of product.
(Point angle 140-degree NSBH-ATH)
- Drilling depth : tool diameter $\times 3.0$ times
※When using a product for which the flute length is more than $L/D=8$, bore a pilot hole first.

※Please refer to 9page for attention for use



2 Supplying coolant during low-speed revolution

- Leading to the pilot hole at low speed ($n=0\sim 500 \text{ min}^{-1}$)
- Stop 2.0~5.0 mm before the end of the pilot hole.
※When a long tool (200mm or longer) is used, position the tool to the pilot hole at low revolution speed ($n=200 \text{ min}^{-1}$ or less).



3 High-speed revolution for drilling feed (NSBH-ATH)

- After confirming that the revolution speed is increasing at the specified rate, start cutting.



4 Finish drilling

- Withdraw the tool at low speed. ($n=0\sim 500 \text{ min}^{-1}$)
※When a long tool (200mm or longer) is used, withdraw the tool at low revolution speed ($n=200 \text{ min}^{-1}$ or less).



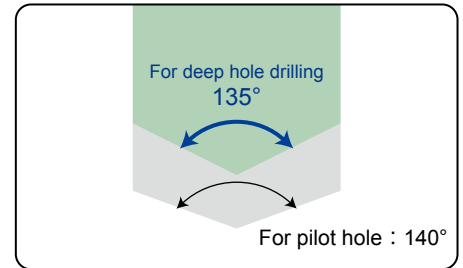
Attention for use

Regarding pilot hole drilling for NSBH-ATH

The shortest NSBH-ATH among each diameter length series has point angle of 140°, though others have that of 135°. It is recommended first to drill a guide hole with NSBH-ATH of point angle 140° before deep boring. +5° gives better tool edge allocation onto work material.

Example Hole diameter : $\phi 6 \times 100\text{mm}$

- ① Pilot hole → NSBH0600-30-ATH
- ② Deep hole drilling → NSBH0600-120-ATH



Regarding tolerance of diameter for NSBH-ATH

Diameter of NSBH-ATH has a positive tolerance in order to compensate hole shrink after boring, and keep clearance for ejector pin of die mold. WHNSB and WNSB have negative tolerance of diameter.

Use of WHNSB or WNSB for pilot hole may cause diameter interference with NSBH-ATH.

【Diameter tolerance】

$D_c \leq 6$	0	$\sim +0.012$
$6 < D_c \leq 10$	0	$\sim +0.015$
$10 < D_c$	-0.003	$\sim +0.015$

The intention of added items NSBH-ATH

Expanded lineup! For pilot hole of tapping products added. Tapping is possible by NSBH-ATH and carbide threading cutters combination easily.

Screw size		Item code	Stocks	Drill dia.	Flute length	Overall length	Under neck length	Adapted carbide threading cutters
Nominal dia.	Pitch							
M3	0.5	NSBH0240-10-ATH	●	2.4	10	60	14	ET-0.5-6-PN、ET0.5-7.5-PN
		NSBH0250-10-ATH	●	2.5				
		NSBH0260-10-ATH	●	2.6				
M4	0.7	NSBH0320-20-ATH	●	3.2	20	70	23	ET-0.7-8-PN、ET-0.7-10-PN
		NSBH0330-20-ATH	●	3.3				
		NSBH0340-20-ATH	●	3.4				
M5	0.8	NSBH0410-20-ATH	●	4.1	20	70	23	ET-0.8-10-PN、ET-0.8-12.5-PN
		NSBH0420-20-ATH	●	4.2				
		NSBH0430-20-ATH	●	4.3				
M6	1	NSBH0490-20-ATH	□	4.9	20	70	23	ET-1.0-12-PN、ET-1.0-15-PN
		NSBH0500-25-ATH	●	5.0	25	80	28	
		NSBH0510-30-ATH	●	5.1	30	85	33	
M8	1.25	NSBH0670-30-ATH	□	6.7	30	85	33	ET-1.25-16-PN、ET-1.25-20-PN
		NSBH0680-30-ATH	●	6.8				
		NSBH0690-30-ATH	●	6.9				
M10	1.5	NSBH0850-45-ATH	●	8.5	45	105	48	ET-1.5-20-PN、ET-1.5-25-PN
		NSBH0860-45-ATH	●	8.6				
		NSBH0870-45-ATH	●	8.7				
M12	1.75	NSBH0880-45-ATH	●	8.8	50	110	53	ET-1.75-24-PN、ET-1.75-30-PN
		NSBH1030-50-ATH	●	10.3				
		NSBH1040-50-ATH	●	10.4				
M14	2	NSBH1050-50-ATH	●	10.5	60	125	63	Not applicable
		NSBH1190-60-ATH	□	11.9				
		NSBH1200-60-ATH	●	12.0				

● : Stocked items. □ : Stocked by specified distributor. Contact to sales office.



Trouble shooting

Phenomenons	Factors	Actions
Not stable tool life.	Performance fell because the drill for pilot holes was not used.	Please use drill of wide point angle one for pilot hole drilling.
	Hit to pilot hole, because WHNSB or WNSB was used pilot hole drilling.	Please use same series drills for pilot hole drilling and normal drilling.
	Drill has runout.	Please set drill runout less than 0.02mm. Please change to collet of free from dent or dirt for increase accuracy.
It will break.	Less chip removal.	Please use step drilling. Please use dwell process about a second on step drilling.
	Less coolant clogged chip in the hole.	Please check coolant system. Please use coolant steadily.

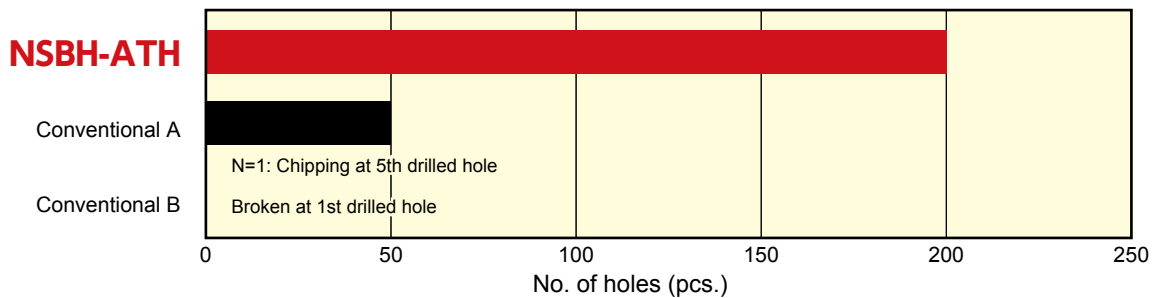
Field data, Re-grinding



Achieved long tool life with high-performance drilling of high-hardened steels.

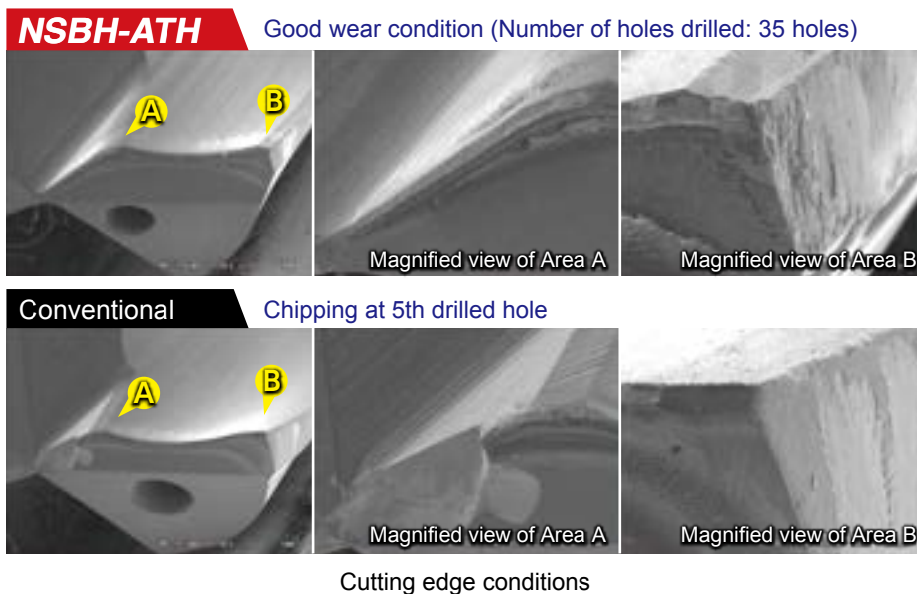
01 Drilling for DAC (50HRC), ($\phi 6 \times 120\text{mm}$)

Work material : DAC(50HRC) Item code & size : NSBH0600-150-ATH ($\phi 6.0 \times 150 \times 205$) Cutting depth = 120mm (Pilot hole 12mm)
Coolant : Internal water base coolant $n=3,183\text{min}^{-1}$ $v_c=60\text{m/min}$ $v_f=191\text{mm/min}$ $f=0.06\text{mm/rev}$



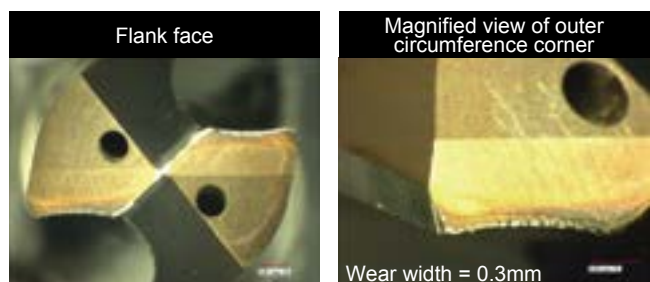
02 Drilling for equivalent to SUS420J2(52HRC), ($\phi 6 \times 120\text{mm}$)

Work material : Equivalent to SUS420J2 (52HRC) Item code & size : NSBH0600-150-ATH($\phi 6.0 \times 150 \times 205$)
Cutting depth = 120mm (Pilot hole 18mm) Coolant : Internal water base coolant
 $n=3,183\text{min}^{-1}$ $v_c=60\text{m/min}$ $v_f=191\text{mm/min}$ $f=0.06\text{mm/rev}$



03 Drilling for DAC-MAGIC (48HRC), ($\phi 6 \times 125\text{mm}$)

Work material : DAC-MAGIC(48HRC)
Tool : NSBH0600-150-ATH $\phi 6.0 \times 150 \times 205$
Cutting depth = 125mm (Pilot hole 18mm)
Non-step
Coolant : Internal water base coolant
 $n=3,183\text{min}^{-1}$ $v_c=60\text{m/min}$
 $v_f=191\text{mm/min}$ $f=0.06\text{mm/rev}$



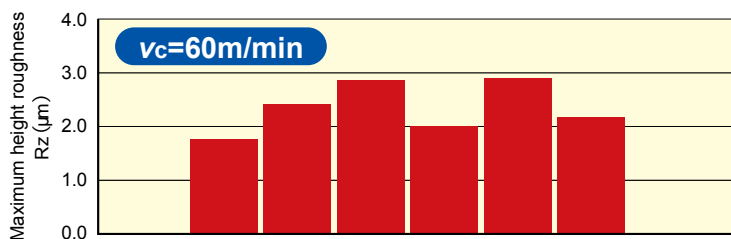
Cutting edge conditions (After drilling 70 holes)

Achieved high-grade holes and good chip removal.

01 Wall surface conditions ($\phi 6 \times 125\text{mm}$)

※Surface roughness measured at 6 locations per hole.

Work material : DAC-MAGIC(48HRC) Item code & size : NSBH0600-150-ATH ($\phi 6.0 \times 150 \times 205$)
Cutting depth = 125mm Coolant : Internal water base coolant $f=0.06\text{mm/rev}$

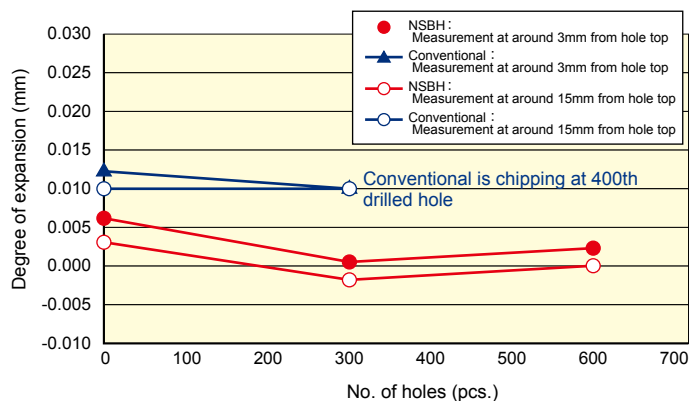


Condition at depth of around 100mm

Possible long tool life drilling with good accuracy

01 Inside diameter ($\phi 6 \times 25\text{mm}$)

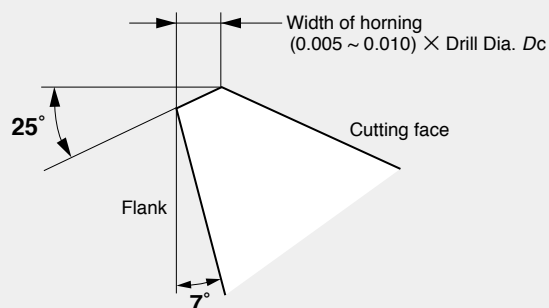
Work material : DAC-MAGIC(48HRC)
Item code & size : NSBH0600-60-ATH ($\phi 6.0 \times 60 \times 115$)
Cutting depth = 25mm
Coolant : Internal water base coolant
 $n=3,183\text{min}^{-1}$ $v_c=60\text{m/min}$
 $v_r=191\text{mm/min}$ $f=0.06\text{mm/rev}$



Conventional is chipping at 400th drilled hole

Re-grinding

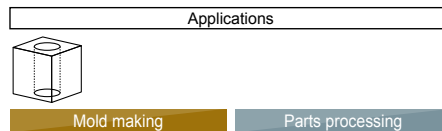
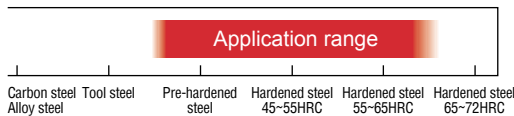
- Performance may deteriorate of the initial performance due to the method of re-grinding and re-coating. Without coating after re-grinding, performance may be further reduced and cause chipping or breakage of the drill. It is recommended that you ask us to re-grind and re-coat your drill.
- Finish the cutting edge surface so that its roughness is 1.6S or less and the lip height difference is 0.02mm or less.



Please inquire drill re-grinding/re-coating to sales office.

Features of EMSBH-ATH

Achieved small-diameter deep drilling of high-hardened steels by using special substrate, shape, and coating.



EMSBH-ATH
φ0.1~φ2.02 [111 Items]

Design

**Special flute design for high-hardened steels enables smooth drilling.
Flow of cutting chips is also smooth.**

Special edge shape for high-hardened steels

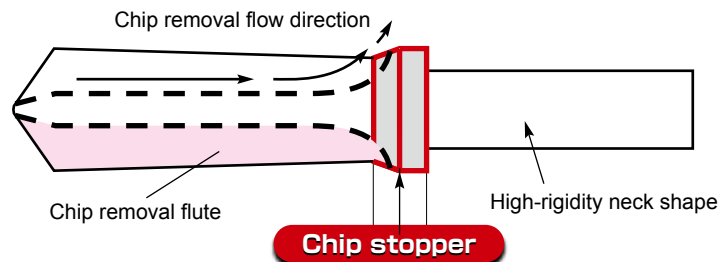


Chip-removal stopper

Chips are reliably removed, improving guide characteristics during drilling.

Chip-removal stopper technology + high-rigidity neck shape enables high-accuracy drilling of minute holes.

PAT. No. 4350161



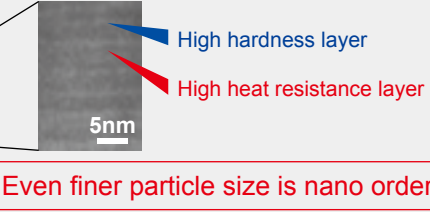
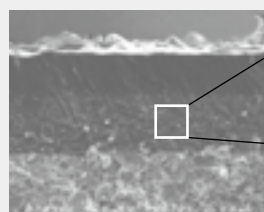
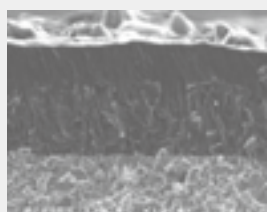
Improved heat-resistant coating

ATHcoating

Features

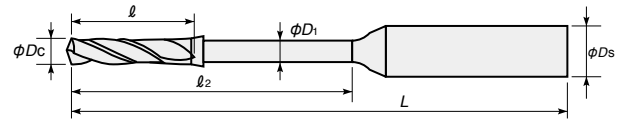
- The heat-resistant TH coating used previously has further evolved. A laminated structure is used to achieve both heat resistance and adhesion strength.
- Achieves even **higher hardness (3800HV)** than before! Exhibits good abrasion resistance. (Hardness of conventional high-hardness coating: 3600HV)
- Achieves long life for cutting high-hardened materials of 50HRC or higher such as plastic molds, diecast molds, etc.

Cross-section photograph of ATH coating layer structure



Pat.No.3934136

Epoch Micro Step Borer H



EMSBH-ATH



Tolerance on dia. : ± 0.006
 ± 0.001

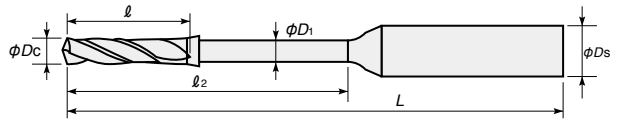
Item code	Stocks	Size(mm)					
		Drill dia. D_c	Flute length ℓ	Under neck length ℓ_2	Neck dia. D_1	Overall length L	Shank dia. D_s
EMSBH0010-1-ATH	●	0.1	0.50	1.0	0.09	45	3.0
EMSBH0010-2-ATH	●			2.0			
EMSBH0010-3-ATH	●			3.0			
EMSBH0011-1-ATH	□	0.11	0.55	1.0	0.1	45	3.0
EMSBH0011-2-ATH	□			2.0			
EMSBH0011-3-ATH	□			3.0			
EMSBH0012-1-ATH	□	0.12	0.60	1.0	0.11	45	3.0
EMSBH0012-2-ATH	□			2.0			
EMSBH0012-3-ATH	□			3.0			
EMSBH0015-1.5-ATH	□	0.15	0.75	1.5	0.14	45	3.0
EMSBH0015-3-ATH	□			3.0			
EMSBH0015-4.5-ATH	□			4.5			
EMSBH0020-2-ATH	●	0.2	1.00	2.0	0.19	45	3.0
EMSBH0020-4-ATH	●			4.0			
EMSBH0020-6-ATH	●			6.0			
EMSBH0021-2-ATH	□	0.21	1.05	2.0	0.19	45	3.0
EMSBH0021-4-ATH	□			4.0			
EMSBH0021-6-ATH	□			6.0			
EMSBH0022-2-ATH	□	0.22	1.10	2.0	0.2	45	3.0
EMSBH0022-4-ATH	□			4.0			
EMSBH0022-6-ATH	□			6.0			
EMSBH0030-3-ATH	●	0.3	1.5	3.0	0.28	45	3.0
EMSBH0030-6-ATH	●			6.0			
EMSBH0030-9-ATH	●			9.0			
EMSBH0031-3-ATH	□	0.31	1.5	3.0	0.29	45	3.0
EMSBH0031-6-ATH	□			6.0			
EMSBH0031-9-ATH	□			9.0			
EMSBH0032-3-ATH	□	0.32	1.5	3.0	0.3	45	3.0
EMSBH0032-6-ATH	□			6.0			
EMSBH0032-9-ATH	□			9.0			
EMSBH0040-4-ATH	●	0.4	2.0	4.0	0.38	50	3.0
EMSBH0040-8-ATH	●			8.0			
EMSBH0040-12-ATH	●			12.0			

Item code	Stocks	Size(mm)					
		Drill dia. D_c	Flute length ℓ	Under neck length ℓ_2	Neck dia. D_1	Overall length L	Shank dia. D_s
EMSBH0041-4-ATH	□	0.41	2.0	4.0	0.39	50	3.0
EMSBH0041-8-ATH	□			8.0			
EMSBH0041-12-ATH	□			12.0			
EMSBH0042-4-ATH	□	0.42	2.0	4.0	0.4	50	3.0
EMSBH0042-8-ATH	□			8.0			
EMSBH0042-12-ATH	□			12.0			
EMSBH0050-5-ATH	●	0.5	2.5	5.0	0.48	50	3.0
EMSBH0050-10-ATH	●			10.0			
EMSBH0050-15-ATH	●			15.0			
EMSBH0051-5-ATH	□	0.51	2.5	5.0	0.48	50	3.0
EMSBH0051-10-ATH	□			10.0			
EMSBH0051-15-ATH	□			15.0			
EMSBH0052-5-ATH	□	0.52	2.5	5.0	0.49	50	3.0
EMSBH0052-10-ATH	□			10.0			
EMSBH0052-15-ATH	□			15.0			
EMSBH0060-6-ATH	●	0.6	3.0	6.0	0.57	55	3.0
EMSBH0060-12-ATH	●			12.0			
EMSBH0060-18-ATH	●			18.0			
EMSBH0061-6-ATH	□	0.61	3.0	6.0	0.58	55	3.0
EMSBH0061-12-ATH	□			12.0			
EMSBH0061-18-ATH	□			18.0			
EMSBH0062-6-ATH	□	0.62	3.0	6.0	0.59	55	3.0
EMSBH0062-12-ATH	□			12.0			
EMSBH0062-18-ATH	□			18.0			
EMSBH0070-7-ATH	●	0.7	3.5	7.0	0.67	60	4.0
EMSBH0070-14-ATH	●			14.0			
EMSBH0070-21-ATH	●			21.0			
EMSBH0071-7-ATH	□	0.71	3.5	7.0	0.67	60	4.0
EMSBH0071-14-ATH	□			14.0			
EMSBH0071-21-ATH	□			21.0			
EMSBH0072-7-ATH	□	0.72	3.5	7.0	0.68	60	4.0
EMSBH0072-14-ATH	□			14.0			
EMSBH0072-21-ATH	□			21.0			

● : Stocked items. □ : Stocked by specified distributor. Contact to sales office.

(Note) For products with tool dimensions other than those listed above, separate consultation is needed. Please contact to sales office.

Epoch Micro Step Borer H



EMSBH-ATH



Tolerance on dia. : $+0.006$
 $+0.001$

Item code	Stocks	Size(mm)					
		Drill dia. D_c	Flute length ℓ	Under neck length ℓ_2	Neck dia. D_1	Overall length L	Shank dia. D_s
EMSBH0080-8-ATH	●	0.8	4.0	8.0	0.76	60	4.0
EMSBH0080-16-ATH	●			16.0			
EMSBH0080-24-ATH	●			24.0			
EMSBH0081-8-ATH	□	0.81	4.0	8.0	0.76	60	4.0
EMSBH0081-16-ATH	□			16.0			
EMSBH0081-24-ATH	□			24.0			
EMSBH0082-8-ATH	□	0.82	4.0	8.0	0.77	60	4.0
EMSBH0082-16-ATH	□			16.0			
EMSBH0082-24-ATH	□			24.0			
EMSBH0090-9-ATH	●	0.9	4.5	9.0	0.85	65	4.0
EMSBH0090-18-ATH	●			18.0			
EMSBH0090-27-ATH	●			27.0			
EMSBH0091-9-ATH	□	0.91	4.5	9.0	0.86	65	4.0
EMSBH0091-18-ATH	□			18.0			
EMSBH0091-27-ATH	□			27.0			
EMSBH0092-9-ATH	□	0.92	4.5	9.0	0.87	65	4.0
EMSBH0092-18-ATH	□			18.0			
EMSBH0092-27-ATH	□			27.0			
EMSBH0100-10-ATH	●	1.0	5.0	10.0	0.95	70	4.0
EMSBH0100-20-ATH	●			20.0			
EMSBH0100-30-ATH	●			30.0			
EMSBH0101-10-ATH	□	1.01	5.0	10.0	0.97	70	4.0
EMSBH0101-20-ATH	□			20.0			
EMSBH0101-30-ATH	□			30.0			
EMSBH0102-10-ATH	□	1.02	5.0	10.0	0.98	70	4.0
EMSBH0102-20-ATH	□			20.0			
EMSBH0102-30-ATH	□			30.0			
EMSBH0150-15-ATH	●	1.5	15.0	15.0	1.44	70	4.0
EMSBH0150-30-ATH	●			30.0		70	
EMSBH0150-45-ATH	●			45.0		100	
EMSBH0151-15-ATH	□	1.51	15.0	15.0	1.45	70	4.0
EMSBH0151-30-ATH	□			30.0		70	
EMSBH0151-45-ATH	□			45.0		100	

● : Stocked items. □ : Stocked by specified distributor. Contact with to sales office.

Item code	Stocks	Size(mm)					
		Drill dia. D_c	Flute length ℓ	Under neck length ℓ_2	Neck dia. D_1	Overall length L	Shank dia. D_s
EMSBH0152-15-ATH	□	1.52	15.0	15.0	1.46	70	4.0
EMSBH0152-30-ATH	□			30.0		70	
EMSBH0152-45-ATH	□			45.0		100	
EMSBH0200-20-ATH	●	2.0	20.0	20.0	1.92	70	4.0
EMSBH0200-40-ATH	●			40.0		100	
EMSBH0200-60-ATH	●			60.0		100	
EMSBH0201-20-ATH	□	2.01	20.0	20.0	1.93	70	4.0
EMSBH0201-40-ATH	□			40.0		100	
EMSBH0201-60-ATH	□			60.0		100	
EMSBH0202-20-ATH	□	2.02	20.0	20.0	1.94	70	4.0
EMSBH0202-40-ATH	□			40.0		100	
EMSBH0202-60-ATH	□			60.0		100	

(Note) For products with tool dimensions other than those listed above, separate consultation is needed. Please contact to sales office.

Recommended Cutting Conditions

Epoch Micro Step Borer H EMSBH-ATH

Item code	Tool dia.	Under neck length	Step feed (mm)	Pre-hardened steels (35~45HRC)		Hardened steels (45~60HRC)	
				Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min
EMSBH0010-1-ATH	0.1	1.0	0.01	22,300	67	12,420	41
EMSBH0010-2-ATH		2.0					
EMSBH0010-3-ATH		3.0					
EMSBH0011-1-ATH	0.11	1.0	0.011	22,300	67	12,420	41
EMSBH0011-2-ATH		2.0					
EMSBH0011-3-ATH		3.0					
EMSBH0012-1-ATH	0.12	1.0	0.012	22,300	67	12,420	41
EMSBH0012-2-ATH		2.0					
EMSBH0012-3-ATH		3.0					
EMSBH0015-1.5-ATH	0.15	1.5	0.015	22,300	65	12,420	45
EMSBH0015-3-ATH		3.0					
EMSBH0015-4.5-ATH		4.5					
EMSBH0020-2-ATH	0.2	2.0	0.02	15,800	63	11,150	50
EMSBH0020-4-ATH		4.0					
EMSBH0020-6-ATH		6.0					
EMSBH0021-2-ATH	0.21	2.0	0.021	15,800	63	11,150	50
EMSBH0021-4-ATH		4.0					
EMSBH0021-6-ATH		6.0					
EMSBH0022-2-ATH	0.22	2.0	0.022	15,800	63	11,150	50
EMSBH0022-4-ATH		4.0					
EMSBH0022-6-ATH		6.0					
EMSBH0030-3-ATH	0.3	3.0	0.03	13,000	51	11,150	43
EMSBH0030-6-ATH		6.0					
EMSBH0030-9-ATH		9.0					
EMSBH0031-3-ATH	0.31	3.0	0.031	13,000	51	11,150	43
EMSBH0031-6-ATH		6.0					
EMSBH0031-9-ATH		9.0					
EMSBH0032-3-ATH	0.32	3.0	0.032	13,000	51	11,150	43
EMSBH0032-6-ATH		6.0					
EMSBH0032-9-ATH		9.0					
EMSBH0040-4-ATH	0.4	4.0	0.04	11,200	55	10,350	52
EMSBH0040-8-ATH		8.0					
EMSBH0040-12-ATH		12.0					
EMSBH0041-4-ATH	0.41	4.0	0.041	11,200	55	10,350	52
EMSBH0041-8-ATH		8.0					
EMSBH0041-12-ATH		12.0					
EMSBH0042-4-ATH	0.42	4.0	0.042	11,200	55	10,350	52
EMSBH0042-8-ATH		8.0					
EMSBH0042-12-ATH		12.0					
EMSBH0050-5-ATH	0.5	5.0	0.05	10,500	52	10,000	50
EMSBH0050-10-ATH		10.0					
EMSBH0050-15-ATH		15.0					
EMSBH0051-5-ATH	0.51	5.0	0.051	10,500	52	10,000	50
EMSBH0051-10-ATH		10.0					
EMSBH0051-15-ATH		15.0					
EMSBH0052-5-ATH	0.52	5.0	0.052	10,500	52	10,000	50
EMSBH0052-10-ATH		10.0					
EMSBH0052-15-ATH		15.0					
EMSBH0060-6-ATH	0.6	6.0	0.06	10,060	56	9,560	55
EMSBH0060-12-ATH		12.0					
EMSBH0060-18-ATH		18.0					
EMSBH0061-6-ATH	0.61	6.0	0.061	10,060	56	9,560	55
EMSBH0061-12-ATH		12.0					
EMSBH0061-18-ATH		18.0					
EMSBH0062-6-ATH	0.62	6.0	0.062	10,060	56	9,560	55
EMSBH0062-12-ATH		12.0					
EMSBH0062-18-ATH		18.0					

Item code	Tool dia.	Under neck length	Step feed (mm)	Pre-hardened steels (35~45HRC)		Hardened steels (45~60HRC)	
				Revolution n min ⁻¹	Feed rate V_f mm/min	Revolution n min ⁻¹	Feed rate V_f mm/min
EMSBH0070-7-ATH	0.7	7.0	0.07	9,600	59	9,100	54
EMSBH0070-14-ATH		14.0					
EMSBH0070-21-ATH		21.0					
EMSBH0071-7-ATH	0.71	7.0	0.071	9,600	59	9,100	54
EMSBH0071-14-ATH		14.0					
EMSBH0071-21-ATH		21.0					
EMSBH0072-7-ATH	0.72	7.0	0.072	9,600	59	9,100	54
EMSBH0072-14-ATH		14.0					
EMSBH0072-21-ATH		21.0					
EMSBH0080-8-ATH	0.8	8.0	0.08	9,260	57	8,760	55
EMSBH0080-16-ATH		16.0					
EMSBH0080-24-ATH		24.0					
EMSBH0081-8-ATH	0.81	8.0	0.081	9,260	57	8,760	55
EMSBH0081-16-ATH		16.0					
EMSBH0081-24-ATH		24.0					
EMSBH0082-8-ATH	0.82	8.0	0.082	9,260	57	8,760	55
EMSBH0082-16-ATH		16.0					
EMSBH0082-24-ATH		24.0					
EMSBH0090-9-ATH	0.9	9.0	0.09	9,000	60	8,500	56
EMSBH0090-18-ATH		18.0					
EMSBH0090-27-ATH		27.0					
EMSBH0091-9-ATH	0.91	9.0	0.091	9,000	60	8,500	56
EMSBH0091-18-ATH		18.0					
EMSBH0091-27-ATH		27.0					
EMSBH0092-9-ATH	0.92	9.0	0.092	9,000	60	8,500	56
EMSBH0092-18-ATH		18.0					
EMSBH0092-27-ATH		27.0					
EMSBH0100-10-ATH	1.0	10.0	0.1	8,500	63	8,000	56
EMSBH0100-20-ATH		20.0					
EMSBH0100-30-ATH		30.0					
EMSBH0101-10-ATH	1.01	10.0	0.101	8,500	63	8,000	56
EMSBH0101-20-ATH		20.0					
EMSBH0101-30-ATH		30.0					
EMSBH0102-10-ATH	1.02	10.0	0.102	8,500	63	8,000	56
EMSBH0102-20-ATH		20.0					
EMSBH0102-30-ATH		30.0					
EMSBH0150-15-ATH	1.5	15.0	0.15	5,750	60	4,250	43
EMSBH0150-30-ATH		30.0					
EMSBH0150-45-ATH		45.0					
EMSBH0151-15-ATH	1.51	15.0	0.151	5,750	60	4,250	43
EMSBH0151-30-ATH		30.0					
EMSBH0151-45-ATH		45.0					
EMSBH0152-15-ATH	1.52	15.0	0.152	5,750	60	4,250	43
EMSBH0152-30-ATH		30.0					
EMSBH0152-45-ATH		45.0					
EMSBH0200-20-ATH	2.0	20.0	0.2	5,000	60	3,190	43
EMSBH0200-40-ATH		40.0					
EMSBH0200-60-ATH		60.0					
EMSBH0201-20-ATH	2.01	20.0	0.201	5,000	60	3,190	43
EMSBH0201-40-ATH		40.0					
EMSBH0201-60-ATH		60.0					
EMSBH0202-20-ATH	2.02	20.0	0.202	5,000	60	3,190	43
EMSBH0202-40-ATH		40.0					
EMSBH0202-60-ATH		60.0					

[Note]

Please understand "Drilling method and attentions" 16 page, and use EMSBH-ATH.

Drilling process and attentions

Setting of cutting conditions

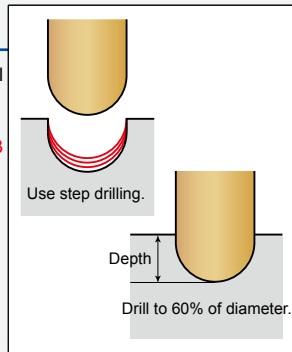
- This standard cutting condition table is intended as reference cutting conditions. The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
- Please use EPDBEH-ATH as a starter.
- Please always use G83 mode (peck drilling cycle).
- For drilling hardened steel, when drilling holes with an L/D of 30D, it is recommended to use a 10D tool for pre-drilling. In addition, when the diameter is less than $\phi 0.5$, in addition to pre-drilling with a 10D tool, further pre-drilling with a 20D tool is also recommended.
Example: When drilling a $\phi 0.1 \times 30D$ hole in SKD11 (60HRC), etc.
- Under-neck length (ℓ_2) conforms to through-hole drilling depth.
- When drilling through holes, drill the through hole to a depth of between 20% and 30% of the diameter from the tip of the tool.
Ex.: For work thickness $T=5\text{mm}$ and tool= $\phi 0.5 \times 5\text{mm}$,
drilling depth should be 5.14mm (from tip of tool).
- Water-soluble or oil-based coolant should be used to ensure chip removal.
- Please pay attention on the below "Drilling process and attentions on drilling".

<About starter>

※ Use of a special starter (Epoch Deep Ball Evolution Hard EPDBEH-ATH) is recommended.

Be sure to perform step drilling using a G83 program.

Drilling depth: Be sure to perform drilling to a depth of 60% of the tool diameter.
(For example, 0.06mm deep for a tool diameter of $\phi 0.1\text{mm}$)



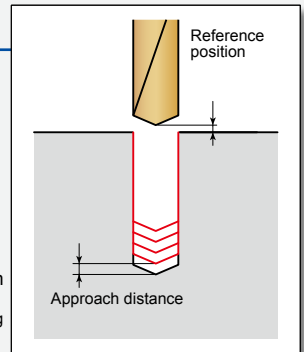
<About machining programs>

Always perform drilling using a G83 program (Peck drilling cycle).

Recommended reference position: 0.05 to 0.1mm

However, for aspect ratios of greater than 50D, the position should be set as 30% of the tool dia. below the surface of the work.
(Ex.: For $\phi 1 \times 100\text{mm}$ below-neck length, reference position = -0.3mm)

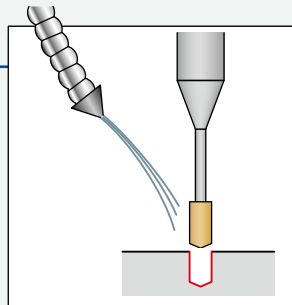
Recommended approach distance: 0.05mm
※ Change according to the machine parameter setting screen. If these values are large, machining time may become longer.



<About coolants>

Oil-based or water-soluble coolants are recommended.

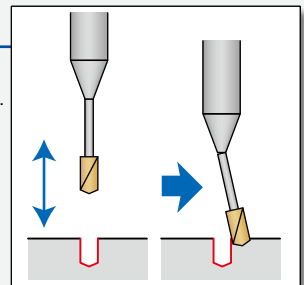
When using, set it up so that the coolant hits the flute tips.



<About fast feed rates>

When the below-neck length is long, if the fast feed rate is too fast, bit may be broken.

Recommended: 20m/min. or less
(for greater than 30D, 5m/min. or less)



Regarding tolerance of diameter for EMSBH-ATH

Diameter of EMSBH-ATH has a positive tolerance in order to compensate hole shrink after boring, and keep clearance for ejector pin of die mold.
Conventional EMSBS has negative tolerance of diameter.

[Diameter tolerance]

+0.006
+0.001

Trouble shooting

Phenomenons	Factors	Actions
It will break.	Less chip removal.	▶ Please hit coolant to the flute steadily. ▶ Please keep feed speed, and increase revolution speed. Improve chip removal.
	Hole will bend.	▶ Please added drilling process by short EMSBH after drilling by starter.
Not stable tool life.	Drill has runout.	▶ Please set drill runout less than 0.005mm. Please change to collet of free from dent or dirt for increase accuracy.

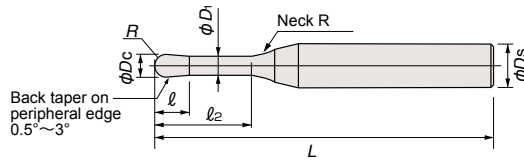
Special starter

Tolerance on R : Right table Helix angle : 30°

2 Flutes



Tolerance on shank : h5



EPDBEH2-ATH

Ball radius R	Tolerance on R
$R \leq 0.25$	± 0.003
$0.25 < R$	± 0.005

Item code	Stocks	Size(mm)							
		Ball radius R	Tool dia. Dc	Under neck length ℓ_2	Flute length ℓ	Neck dia. D1	Overall length L	Shank dia. Ds	Neck R
EPDBEH2001-0.2-ATH	●	0.05	0.1	0.2	0.08	0.08	45	4	1
EPDBEH20011-0.2-ATH	□	0.055	0.11	0.2	0.09	0.09	45	4	1
EPDBEH20012-0.2-ATH	□	0.06	0.12	0.2	0.1	0.1	45	4	1
EPDBEH20015-0.2-ATH	□	0.075	0.15	0.2	0.13	0.13	45	4	1
EPDBEH2002-0.5-ATH	●	0.1	0.2	0.5	0.15	0.17	50	4	1
EPDBEH20021-0.5-ATH	□	0.105	0.21	0.5	0.16	0.18	50	4	1
EPDBEH20022-0.5-ATH	□	0.11	0.22	0.5	0.17	0.19	50	4	1
EPDBEH2003-0.5-ATH	●	0.15	0.3	0.5	0.25	0.27	50	4	2
EPDBEH20031-0.5-ATH	□	0.155	0.31	0.5	0.26	0.28	50	4	2
EPDBEH20032-0.5-ATH	□	0.16	0.32	0.5	0.27	0.29	50	4	2
EPDBEH2004-0.75-ATH	●	0.2	0.4	0.75	0.3	0.37	50	4	2
EPDBEH20041-0.75-ATH	□	0.205	0.41	0.75	0.31	0.38	50	4	2
EPDBEH20042-0.75-ATH	□	0.21	0.42	0.75	0.32	0.39	50	4	2
EPDBEH2005-1-ATH	●	0.25	0.5	1	0.35	0.47	50	4	2
EPDBEH20051-1-ATH	□	0.255	0.51	1	0.36	0.48	50	4	2
EPDBEH20052-1-ATH	□	0.26	0.52	1	0.37	0.49	50	4	2
EPDBEH2006-1-ATH	●	0.3	0.6	1	0.4	0.57	50	4	4
EPDBEH20061-1-ATH	□	0.305	0.61	1	0.41	0.58	50	4	4
EPDBEH20062-1-ATH	□	0.31	0.62	1	0.42	0.59	50	4	4

● : Stocked Items. □ : Stocked by specified distributor. Contact to sales office.

Item code	Stocks	Size(mm)							
		Ball radius R	Tool dia. Dc	Under neck length ℓ_2	Flute length ℓ	Neck dia. D1	Overall length L	Shank dia. Ds	Neck R
EPDBEH2007-2-ATH	●	0.35	0.7	2	0.45	0.67	50	4	4
EPDBEH20071-2-ATH	□	0.355	0.71	2	0.46	0.68	50	4	4
EPDBEH20072-2-ATH	□	0.36	0.72	2	0.47	0.69	50	4	4
EPDBEH2008-2-ATH	●	0.4	0.8	2	0.5	0.77	50	4	4
EPDBEH20081-2-ATH	□	0.405	0.81	2	0.51	0.78	50	4	4
EPDBEH20082-2-ATH	□	0.41	0.82	2	0.52	0.79	50	4	4
EPDBEH2009-2-ATH	●	0.45	0.9	2	0.6	0.87	50	4	4
EPDBEH20091-2-ATH	□	0.455	0.91	2	0.61	0.88	50	4	4
EPDBEH20092-2-ATH	□	0.46	0.92	2	0.62	0.89	50	4	4
EPDBEH2010-2-ATH	●	0.5	1	2	0.8	0.96	50	4	4
EPDBEH20101-2-ATH	□	0.505	1.01	2	0.81	0.97	50	4	4
EPDBEH20102-2-ATH	□	0.51	1.02	2	0.82	0.98	50	4	4
EPDBEH2015-2-ATH	●	0.75	1.5	2	1.35	1.44	50	4	4
EPDBEH20151-2-ATH	□	0.755	1.51	2	1.36	1.45	50	4	4
EPDBEH20152-2-ATH	□	0.76	1.52	2	1.37	1.46	50	4	4
EPDBEH2020-3-ATH	●	1	2	3	1.7	1.92	50	4	4
EPDBEH20201-3-ATH	□	1.005	2.01	3	1.71	1.93	50	4	4
EPDBEH20202-3-ATH	□	1.01	2.02	3	1.72	1.94	50	4	4

Cutting condition for starter (EPDBEH-ATH)

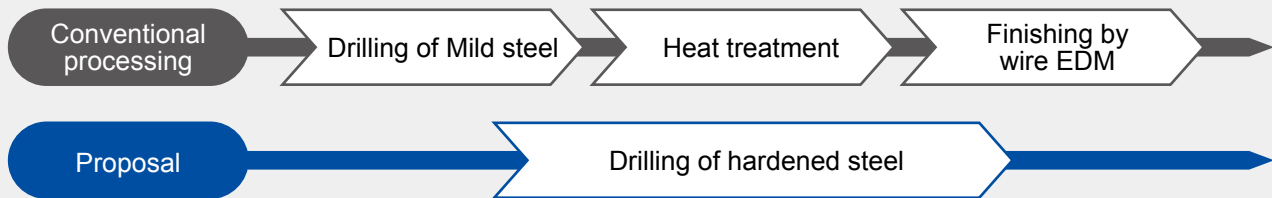
Tool dia. Dc	Under neck length ℓ_2	Pre-hardened steels (35~45HRC)			Hardened steels (45~55HRC)			Hardened steels (55~60HRC)		
		Revolution n min ⁻¹	Feed rate V_f mm/min	Step feed mm	回転数 n min ⁻¹	送り速度 V_f mm/min	ステップ量 (mm) Step feed	回転数 n min ⁻¹	送り速度 V_f mm/min	ステップ量 (mm) Step feed
0.1	0.2									
0.11	0.2	13,369	33	0.003	12,414	21	0.003	12,414	21	0.003
0.12	0.2									
0.15	0.2	13,369	34	0.0045	12,414	23	0.0045	12,414	23	0.0045
0.2	0.5									
0.21	0.5	10,504	35	0.006	10,027	25	0.006	10,027	25	0.006
0.22	0.5									
0.3	0.5									
0.31	0.5	8,913	25	0.009	8,541	21	0.009	8,541	21	0.009
0.32	0.5									
0.4	0.75									
0.41	0.75	8,077	23	0.012	7,520	21	0.012	7,520	21	0.012
0.42	0.75									
0.5	1									
0.51	1	6,462	23	0.015	6,016	21	0.015	6,016	21	0.015
0.52	1									
0.6	1									
0.61	1	5,385	23	0.018	5,013	21	0.018	5,013	21	0.018
0.62	1									

Tool dia. Dc	Under neck length ℓ_2	Pre-hardened steels (35~45HRC)			Hardened steels (45~55HRC)			Hardened steels (55~60HRC)		
		Revolution n min ⁻¹	Feed rate V_f mm/min	Step feed mm	回転数 n min ⁻¹	送り速度 V_f mm/min	ステップ量 (mm) Step feed	回転数 n min ⁻¹	送り速度 V_f mm/min	ステップ量 (mm) Step feed
0.7	2									
0.71	2	4,615	23	0.021	4,297	21	0.021	4,297	21	0.021
0.72	2									
0.8	2									
0.81	2	4,039	23	0.024	3,760	21	0.024	3,760	21	0.024
0.82	2									
0.9	2									
0.91	2	3,590	23	0.027	3,342	21	0.027	3,342	21	0.027
0.92	2									
1	2									
1.01	2	3,231	23	0.045	3,008	21	0.03	3,008	21	0.03
1.02	2									
1.5	2									
1.51	2	2,154	23	0.045	2,005	21	0.045	2,005	21	0.045
1.52	2									
2	3									
2.01	3	1,615	23	0.06	1,504	21	0.06	1,504	21	0.06
2.02	3									

- These recommended cutting conditions indicate only the rule of a thumb for the cutting conditions.
- In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- Water-soluble or oil-based coolant should be used to ensure chip removal.
- Always use with a G83 program (Peck drilling cycle).
- Hole depth: Be sure to drill to a depth of 60% of the diameter. (Ex.: For $\phi 0.1$, depth=0.06mm)

Merits of drilling hardened steel

Example Ejector pin drilling of SUS420J2 (52HRC) die



Process to be 1/3. By stock hardened blanks, delivery time can be reduced.

Comparison of process cost

Example: Fine hole drilling of SUS420J2 (52HRC); Hole diameter: $\phi 0.5$; Hole depth: 11mm (L/D=22 $\times$); 300 holes

			Current processing	Proposal
Tool name or process			Fine hole electrodischarge machining	EMSBH0050-15-ATH
C	Tool unit price	(¥/pcs.)	¥250	¥12,300
L	Tool life	(hole/pcs.)	6	300
Nϕ	Hole count per lot	(hole/lot)	300	300
Tmϕ	Processing time per lot	(min./lot)	3000	750
Cϕ	Tool cost per lot	(¥/lot)	¥12,500	¥12,300
Tt	Tool replacement time	(min./pcs.)	1	1
Mc	Machine cost	(Assumed value 50¥/min.)	¥50	¥50
Xϕ	Processing cost per lot	(¥/lot)	¥165,000	¥49,800
Processing cost ratio			100%	30.20%
Monthly processed hole count			300	300
Monthly processing cost for current processing time			¥165,000	¥49,800

Process cost is reduced by about 70% compared to conventional processing!!

※Conventional process condition (Electric discharge machining)

Electrodischarge machining

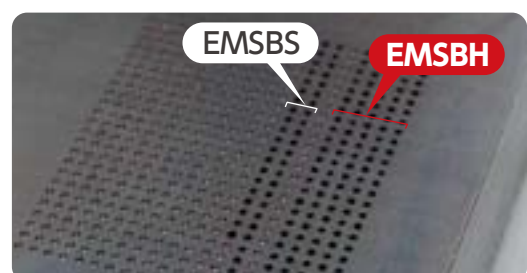
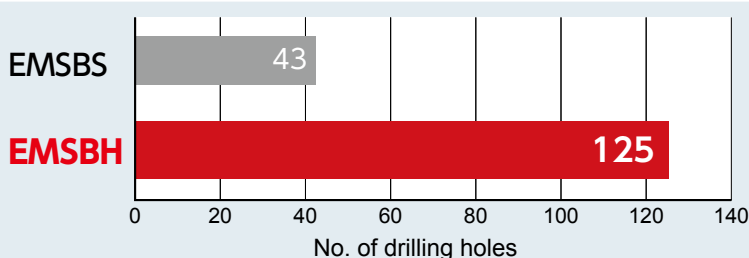
- 1 Fine hole electrodischarge electrode $\phi 0.3 \times 150$ mm
- 2 Heat treatment
- 3 Finishing by wire EDM

- Electrode unit price: Unit price of $\phi 0.3$ copper pile electrode = **¥250**
- Processing time: Electrodischarge machining + wire EDM = **10 minutes**
- Tool life: 6 holes per electrode = **50 electrodes required**

New specifications suitable for high-hardened steels provide high performance.

01 Drilling for $\phi 0.5$ SUS420J2 (52HRC)

Work material : SUS420J2(52HRC) Tool : $\phi 0.5 \times$ under neck 15mm(L/D=30D) Cutting depth =15mm
Coolant : External water base coolant $n=10,000\text{min}^{-1}$ $vc=15\text{m/min}$ $vf=50\text{mm/min}$ $f=0.005\text{mm/rev}$ Step=0.05mm



Although EMSBS broke on the 43rd hole, EMSBH was not broken up to the 125th holes.

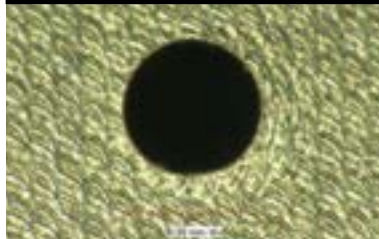
02 Drilling for $\phi 0.5$ Equivalent to SUS440C[Ⓜ](60HRC)

Work material : Equivalent to SUS440CH (60HRC) Tool : EMSBH0050-5-TH (L/D=10D) Coolant : External water base coolant
 $n=10,000\text{min}^{-1}$ $v_c=15\text{m/min}$ $v_f=50\text{mm/min}$ $f=0.005\text{mm/rev}$ Step = 0.05mm Drilling time = 50sec./hole

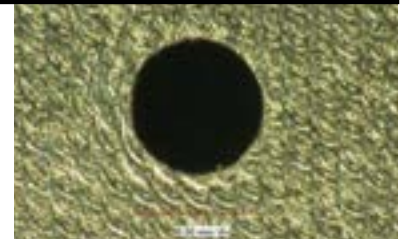


Drilled hole count: 50 holes

Hole condition after 50th drilling process.



A way in

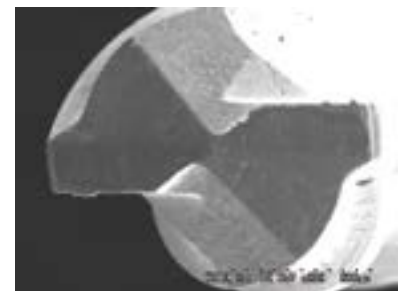
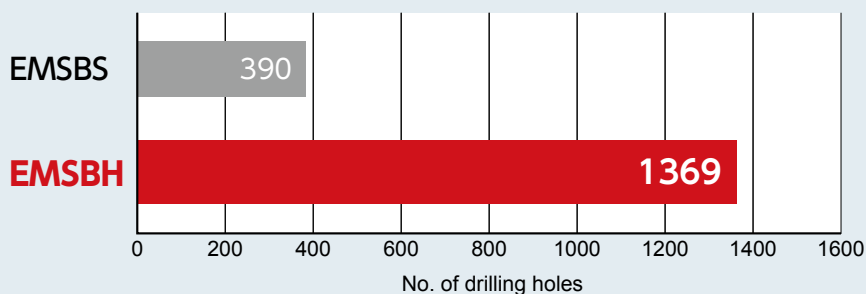


A way out

Possible drilling of up to 50 holes of L/D=10 on 60HRC material!

03 Drilling for $\phi 0.5$ Pre-hardened steels (40HRC)

Work material : Pre-hardened steel (40HRC) Tool : $\phi 0.5 \times$ Under neck 15mm (L/D=30D) Cutting depth = 15mm
Coolant : External water base coolant $n=10,000\text{min}^{-1}$ $v_c=15\text{m/min}$ $v_f=50\text{mm/min}$ $f=0.005\text{mm/rev}$ Step = 0.05mm

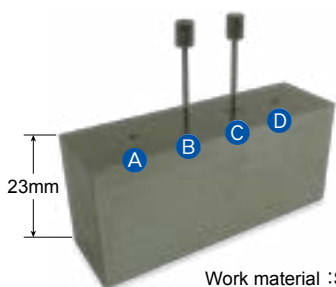


Condition of EMSBH cutting edge (after processing 1,050 holes)

Although EMSBS broke on the 390th hole, EMSBH was not broken up to the 1,369th holes.

04 Result of drilling for $\phi 0.8$ equivalent to SUS420J2 (52HRC)

Work material : Equivalent to SUS420J2 (52HRC) Tool : Special EMSBH0080-24-ATH (L/D=30D) Tolerance : +0.001 +0.006mm
Coolant : External water base coolant $n=5,370\text{min}^{-1}$ $v_c=13.5\text{m/min}$ $v_f=43\text{mm/min}$ $f=0.008\text{mm/rev}$ Step=0.04mm T=24mm



Work material : SUS420J2(52HRC)

Diameter of ejector pin : 0.790mm

Dia.way-in	Dia.way-out
A : 0.803mm	A : 0.806mm
B : 0.803mm	B : 0.803mm
C : 0.805mm	C : 0.806mm
D : 0.804mm	D : 0.804mm

Hole diameters are quite similar to diameter of tool, with less discrepancy between way-in and way-out.



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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