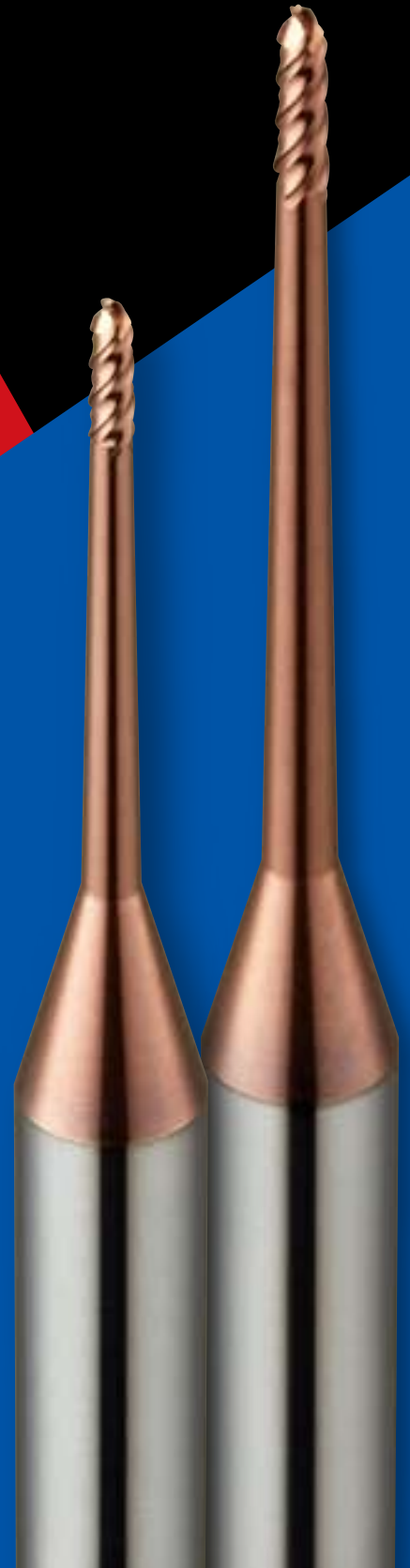


高精度リブ溝加工用テーパボールエンドミル

Taper Ball End Mill for High Accuracy Rib Slotting

EB4HR-ATH



株式会社 MOLDINO
MOLDINO Tool Engineering, Ltd.

New Product News No.1804-8 2023-4

等高線加工+テーパエンドミルの新しいリブ溝加工法 直彫り加工で磨き工数を削減

New rib slotting method by contouring with taper end mill.
Reduce the polishing time with direct milling.

EB4HR-ATHの特長 Features of EB4HR-ATH

01 工具交換時の加工段差を低減

Reduces machining steps occurring at tool change

外周刃をテーパ刃形状とすることで、工具交換時に発生する段差を低減します。さらに、荒加工から使用すると、削り残り量が低減し高精度な仕上げ加工を実現します。

Tapered peripheral edge shape reduces the machining steps occurring at tool change. Furthermore, when used from roughing, the cutting remain is reduced and high accuracy finishing is realized.

02 高品位な加工面を実現

Achieves high quality machined surface

2段逃げ形状+強ねじれ刃形により良好な加工面を得られます。次工程の磨き時間の削減を実現します。

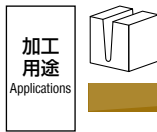
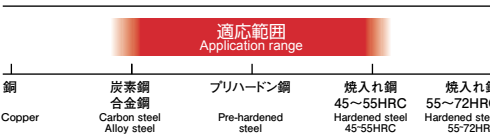
A good machined surface can be obtained with double flank shape and high-helix edge shape. Reduces the polishing time of the next process.

03 ATHコーティングを採用

Adopts ATH Coating

高硬度鋼の切削加工に良好な性能を発揮します。
(冷間ダイス鋼、高速度鋼、工具鋼、プリハードン鋼など)

Shows excellent performance for high hardness steels cutting such as cold die steels, high speed steels, pre-hardened steels etc.



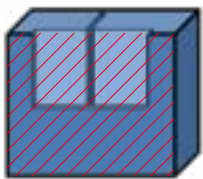
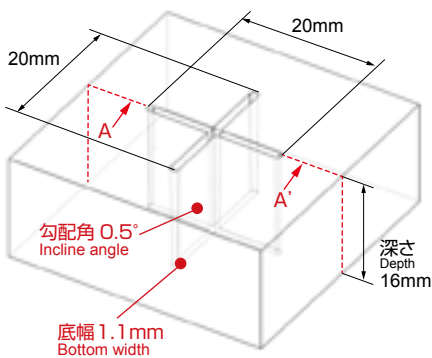
金型製作
Mold making

EB4HR-ATH

RE0.3~RE0.6 [108 アイテム]
Items

テクノロジー

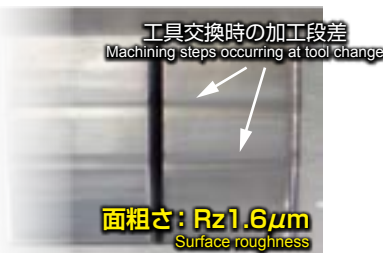
Technology



断面を観察
Cross-section observation

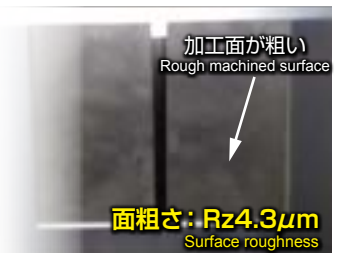
リブ溝モデル Rib slot model

従来工具の切削加工 Cutting by conventional tools



磨きで段差を除去することがむずかしい
Difficult to remove steps by polishing

放電加工 EDM



粗い加工面は磨きに時間がかかる
Takes time to polish rough machined surface

EB4HR-ATH

良好な加工面で
磨き工数を削減

Good machined surface
and reduces polishing time



工具交換による段差を抑制し、磨きを含むトータル加工時間を削減

Reduces the total machining time including polishing by suppressing the machining steps caused by tool change.

特長
Features

01

工具交換時の段差を低減

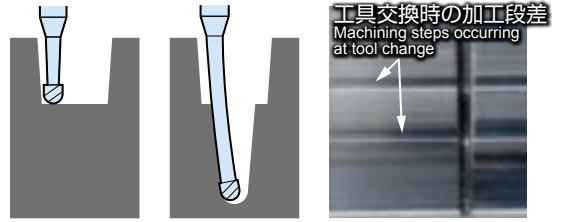
Reduces machining steps occurring at tool change

一般的な等高線荒加工における課題

Issue in general contour roughing

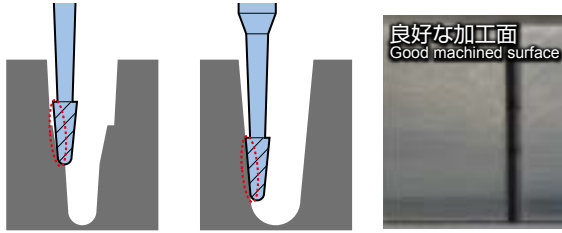
工具は首下長が異なるとたわみ量が異なるため、工具交換による加工段差が発生する。

Since deflection amount is different according to the tool neck length, the machining steps occur at tool change.



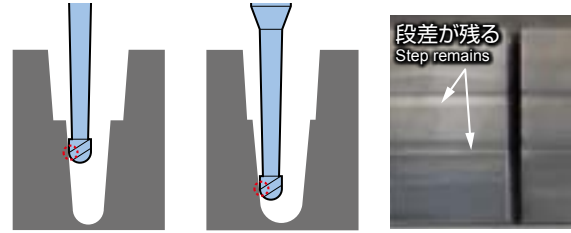
等高線仕上げ加工 Contour finishing

EB4HR-ATH



EB4HR-ATHの外周刃が何度も作用するので、容易に段差を除去できる。
Since the peripheral edge of EB4HR-ATH works repeatedly, easy to remove the steps.

従来工具の切削加工 Cutting by conventional tools



ボール刃は点で当たり加工するので、段差を十分に取りきれない。
Since ball edge works at a point, steps can not be removed sufficiently.

外周刃が工具交換時の加工段差を効果的に除去

The peripheral cutting edge effectively removes the steps occurring at tool change.

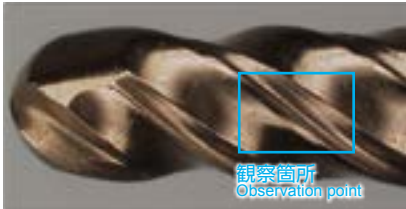
特長
Features

02

高品位な加工面の実現

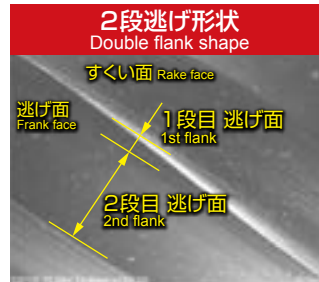
Achieve high quality machined surface

特殊外周刃形状 Special peripheral cutting edge shape

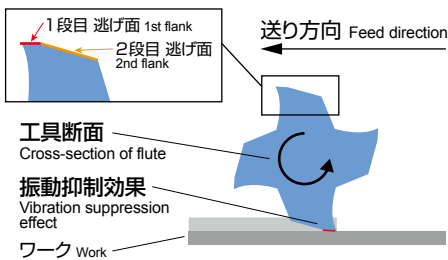


2段逃げ形状
Double flank shape

切れ味に優れた
40°強ねじれ形状
40° high helix edge shape
excellent in sharpness

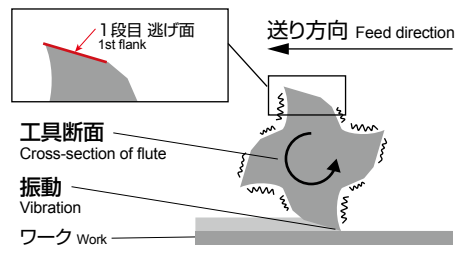


2段逃げ形状 Double flank shape



加工面の状態
Condition of machined surface

従来形状 Conventional shape



加工面の状態
Condition of machined surface

カッターマークが目立つ Cutter marks emerge

特殊外周刃形状により良好な加工面を得て磨き時間を削減

Special peripheral cutting edge shape gives better machined surface and reduces polishing time

特長
Features

03

ATHコーティングを採用

Adopts ATH Coating

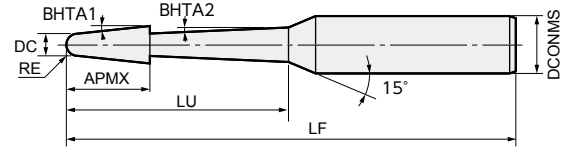
- THコーティングの硬さと耐酸化性をさらに改善。高硬度材切削加工の長寿命化、高能率化が可能になりました。(結晶粒子がさらに微細化したSi系ナノコンポジットコーティングです)
- 高硬度材料(55HRC以上)の切削加工に良好な性能を発揮します。冷間ダイス鋼、高速度鋼、工具鋼
- ドライでもウェットでも長寿命。

- Hardness and oxidation resistance of TH Coating is further improved. Enables longer life and higher efficient when cutting high-hardness materials. (Si nano composite coating with finer crystal particles)
- Exhibits amazing performance when cutting high-hardness materials (55HRC or higher) Cold-worked die steel, HSS, tool steel.
- Long life for both dry cutting and wet cutting

ラインナップ

Line Up

先端2枚刃
外周4枚刃
Tip : 2 flutes
Periphery : 4 flutes



EB4HR○○○○TN-○○-○○-ATH

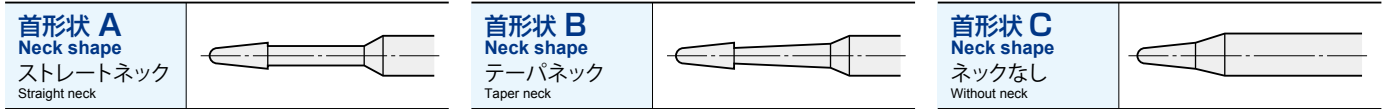
超硬 Carbide **ATH** ねじり40° Helix angle **h5**

ボール半径 RE Ball radius	RE 公差 Tolerance on RE
0.3~0.6	±0.02

商品コード Item code	在庫 Stock	寸法 Size(mm)							首形状 Neck shape	首テーパ半角 Neck angle (°)		希望小売 価格(円) Suggested retail price (¥)
		ボール半径 Ball radius	外径 Tool dia.	刃部テーパ半角 Taper angle on side	首下長 Under Neck length	刃長 Flute length	全長 Overall length	シャンク径 Shank dia.		BHTA2		
		RE	DC	BHTA1	LU	APMX	LF	DCONMS				
EB4HR0060TN-4-05-ATH	●	0.3	0.6	0.5	4	3.2	50	4	A	-	18,210	
EB4HR0060TN-5-05-ATH	●	0.3	0.6	0.5	5	3.2	50	4	A	-	18,210	
EB4HR0060TN-6-05-ATH	●	0.3	0.6	0.5	6	3.2	50	4	A	-	18,330	
EB4HR0060TN-7-05-ATH	●	0.3	0.6	0.5	7	3.2	50	4	B	0.5	18,330	
EB4HR0060TN-8-05-ATH	●	0.3	0.6	0.5	8	3.2	50	4	B	0.5	18,330	
EB4HR0060TN-9-05-ATH	●	0.3	0.6	0.5	9	3.2	50	4	B	0.5	18,430	
EB4HR0060TN-10-05-ATH	●	0.3	0.6	0.5	10	3.2	50	4	B	0.5	18,430	
EB4HR0060TN-4-10-ATH	●	0.3	0.6	1	4	3.2	50	4	A	-	18,210	
EB4HR0060TN-5-10-ATH	●	0.3	0.6	1	5	3.2	50	4	A	-	18,210	
EB4HR0060TN-6-10-ATH	●	0.3	0.6	1	6	3.2	50	4	A	-	18,330	
EB4HR0060TN-7-10-ATH	●	0.3	0.6	1	7	3.2	50	4	B	1	18,330	
EB4HR0060TN-8-10-ATH	●	0.3	0.6	1	8	3.2	50	4	B	1	18,330	
EB4HR0060TN-9-10-ATH	●	0.3	0.6	1	9	3.2	50	4	B	1	18,430	
EB4HR0060TN-10-10-ATH	●	0.3	0.6	1	10	3.2	50	4	B	1	18,430	
EB4HR0070TN-4-05-ATH	●	0.35	0.7	0.5	4	3.2	50	4	A	-	17,140	
EB4HR0070TN-5-05-ATH	●	0.35	0.7	0.5	5	3.2	50	4	A	-	17,140	
EB4HR0070TN-6-05-ATH	●	0.35	0.7	0.5	6	3.2	50	4	A	-	17,260	
EB4HR0070TN-7-05-ATH	●	0.35	0.7	0.5	7	3.2	50	4	B	0.5	17,260	
EB4HR0070TN-8-05-ATH	●	0.35	0.7	0.5	8	3.2	50	4	B	0.5	17,360	
EB4HR0070TN-9-05-ATH	●	0.35	0.7	0.5	9	3.2	50	4	B	0.5	17,360	
EB4HR0070TN-10-05-ATH	●	0.35	0.7	0.5	10	3.2	50	4	B	0.5	17,360	
EB4HR0070TN-4-10-ATH	●	0.35	0.7	1	4	3.2	50	4	A	-	17,140	
EB4HR0070TN-5-10-ATH	●	0.35	0.7	1	5	3.2	50	4	A	-	17,140	
EB4HR0070TN-6-10-ATH	●	0.35	0.7	1	6	3.2	50	4	A	-	17,260	
EB4HR0070TN-7-10-ATH	●	0.35	0.7	1	7	3.2	50	4	B	1	17,260	
EB4HR0070TN-8-10-ATH	●	0.35	0.7	1	8	3.2	50	4	B	1	17,360	
EB4HR0070TN-9-10-ATH	●	0.35	0.7	1	9	3.2	50	4	B	1	17,360	
EB4HR0070TN-10-10-ATH	●	0.35	0.7	1	10	3.2	50	4	B	1	17,360	
EB4HR0080TN-4-05-ATH	●	0.4	0.8	0.5	4	3.2	50	4	A	-	16,190	
EB4HR0080TN-6-05-ATH	●	0.4	0.8	0.5	6	3.2	50	4	A	-	16,290	
EB4HR0080TN-8-05-ATH	●	0.4	0.8	0.5	8	3.2	50	4	B	0.5	16,290	
EB4HR0080TN-10-05-ATH	●	0.4	0.8	0.5	10	3.2	50	4	B	0.5	16,400	
EB4HR0080TN-12-05-ATH	●	0.4	0.8	0.5	12	3.2	55	4	B	0.5	16,500	
EB4HR0080TN-14-05-ATH	●	0.4	0.8	0.5	14	3.2	55	4	B	0.5	16,610	
EB4HR0080TN-4-10-ATH	●	0.4	0.8	1	4	3.2	50	4	A	-	16,190	
EB4HR0080TN-6-10-ATH	●	0.4	0.8	1	6	3.2	50	4	A	-	16,290	
EB4HR0080TN-8-10-ATH	●	0.4	0.8	1	8	3.2	50	4	B	1	16,290	
EB4HR0080TN-10-10-ATH	●	0.4	0.8	1	10	3.2	50	4	B	1	16,400	
EB4HR0080TN-12-10-ATH	●	0.4	0.8	1	12	3.2	55	4	B	1	16,500	
EB4HR0080TN-14-10-ATH	●	0.4	0.8	1	14	3.2	55	4	B	1	16,610	
EB4HR0090TN-4-05-ATH	●	0.45	0.9	0.5	4	3.2	50	4	A	-	16,070	
EB4HR0090TN-6-05-ATH	●	0.45	0.9	0.5	6	3.2	50	4	A	-	16,190	
EB4HR0090TN-8-05-ATH	●	0.45	0.9	0.5	8	3.2	50	4	B	0.5	16,290	
EB4HR0090TN-10-05-ATH	●	0.45	0.9	0.5	10	3.2	50	4	B	0.5	16,400	
EB4HR0090TN-12-05-ATH	●	0.45	0.9	0.5	12	3.2	55	4	B	0.5	16,500	
EB4HR0090TN-14-05-ATH	●	0.45	0.9	0.5	14	3.2	55	4	B	0.5	16,500	
EB4HR0090TN-4-10-ATH	●	0.45	0.9	1	4	3.2	50	4	A	-	16,070	
EB4HR0090TN-6-10-ATH	●	0.45	0.9	1	6	3.2	50	4	A	-	16,190	
EB4HR0090TN-8-10-ATH	●	0.45	0.9	1	8	3.2	50	4	B	1	16,290	
EB4HR0090TN-10-10-ATH	●	0.45	0.9	1	10	3.2	50	4	B	1	16,400	
EB4HR0090TN-12-10-ATH	●	0.45	0.9	1	12	3.2	55	4	B	1	16,500	
EB4HR0090TN-14-10-ATH	●	0.45	0.9	1	14	3.2	55	4	B	1	16,500	

● : 標準在庫品です。 ● : Stocked items.

■首形状詳細 Detail of neck shape



EB4HR○○○TN-○○○-○○○-ATH

商品コード Item code	在庫 Stock	寸法 Size(mm)							首形状 Neck shape	首テーパー角 Neck angle (°)	希望小売 価格(円) Suggested retail price (¥)
		ボール半径 Ball radius	外径 Tool dia.	刃部テーパー角 Taper angle on side	首下長 Under Neck length	刃長 Flute length	全長 Overall length	シャンク径 Shank dia.			
		RE	DC	BHTA1	LU	APMX	LF	DCONMS			
EB4HR0100TN-4-05-ATH	●	0.5	1	0.5	4	4	50	4	C	-	13,930
EB4HR0100TN-6-05-ATH	●	0.5	1	0.5	6	4	50	4	A	-	13,930
EB4HR0100TN-8-05-ATH	●	0.5	1	0.5	8	4	50	4	B	0.5	14,040
EB4HR0100TN-10-05-ATH	●	0.5	1	0.5	10	4	50	4	B	0.5	14,150
EB4HR0100TN-12-05-ATH	●	0.5	1	0.5	12	4	55	4	B	0.5	14,250
EB4HR0100TN-14-05-ATH	●	0.5	1	0.5	14	4	55	4	B	0.5	14,250
EB4HR0100TN-16-05-ATH	●	0.5	1	0.5	16	4	55	4	B	0.5	14,360
EB4HR0100TN-18-05-ATH	●	0.5	1	0.5	18	4	60	4	B	0.5	14,580
EB4HR0100TN-20-05-ATH	●	0.5	1	0.5	20	4	60	4	B	0.5	14,580
EB4HR0100TN-4-10-ATH	●	0.5	1	1	4	4	50	4	C	-	13,930
EB4HR0100TN-6-10-ATH	●	0.5	1	1	6	4	50	4	A	-	13,930
EB4HR0100TN-8-10-ATH	●	0.5	1	1	8	4	50	4	B	1	14,040
EB4HR0100TN-10-10-ATH	●	0.5	1	1	10	4	50	4	B	1	14,150
EB4HR0100TN-12-10-ATH	●	0.5	1	1	12	4	55	4	B	1	14,250
EB4HR0100TN-14-10-ATH	●	0.5	1	1	14	4	55	4	B	1	14,250
EB4HR0100TN-16-10-ATH	●	0.5	1	1	16	4	55	4	B	1	14,360
EB4HR0100TN-18-10-ATH	●	0.5	1	1	18	4	60	4	B	1	14,580
EB4HR0100TN-20-10-ATH	●	0.5	1	1	20	4	60	4	B	1	14,580
EB4HR0110TN-4-05-ATH	●	0.55	1.1	0.5	4	4	50	4	C	-	13,720
EB4HR0110TN-6-05-ATH	●	0.55	1.1	0.5	6	4	50	4	A	-	13,820
EB4HR0110TN-8-05-ATH	●	0.55	1.1	0.5	8	4	50	4	B	0.5	13,930
EB4HR0110TN-10-05-ATH	●	0.55	1.1	0.5	10	4	50	4	B	0.5	14,040
EB4HR0110TN-12-05-ATH	●	0.55	1.1	0.5	12	4	55	4	B	0.5	14,150
EB4HR0110TN-14-05-ATH	●	0.55	1.1	0.5	14	4	55	4	B	0.5	14,150
EB4HR0110TN-16-05-ATH	●	0.55	1.1	0.5	16	4	55	4	B	0.5	14,250
EB4HR0110TN-18-05-ATH	●	0.55	1.1	0.5	18	4	60	4	B	0.5	14,360
EB4HR0110TN-20-05-ATH	●	0.55	1.1	0.5	20	4	60	4	B	0.5	14,460
EB4HR0110TN-4-10-ATH	●	0.55	1.1	1	4	4	50	4	C	-	13,720
EB4HR0110TN-6-10-ATH	●	0.55	1.1	1	6	4	50	4	A	-	13,820
EB4HR0110TN-8-10-ATH	●	0.55	1.1	1	8	4	50	4	B	1	13,930
EB4HR0110TN-10-10-ATH	●	0.55	1.1	1	10	4	50	4	B	1	14,040
EB4HR0110TN-12-10-ATH	●	0.55	1.1	1	12	4	55	4	B	1	14,150
EB4HR0110TN-14-10-ATH	●	0.55	1.1	1	14	4	55	4	B	1	14,150
EB4HR0110TN-16-10-ATH	●	0.55	1.1	1	16	4	55	4	B	1	14,250
EB4HR0110TN-18-10-ATH	●	0.55	1.1	1	18	4	60	4	B	1	14,360
EB4HR0110TN-20-10-ATH	●	0.55	1.1	1	20	4	60	4	B	1	14,460
EB4HR0120TN-6-05-ATH	●	0.6	1.2	0.5	6	4.8	50	4	A	-	13,720
EB4HR0120TN-8-05-ATH	●	0.6	1.2	0.5	8	4.8	50	4	B	0.5	13,820
EB4HR0120TN-10-05-ATH	●	0.6	1.2	0.5	10	4.8	50	4	B	0.5	13,820
EB4HR0120TN-12-05-ATH	●	0.6	1.2	0.5	12	4.8	55	4	B	0.5	14,040
EB4HR0120TN-14-05-ATH	●	0.6	1.2	0.5	14	4.8	55	4	B	0.5	14,040
EB4HR0120TN-16-05-ATH	●	0.6	1.2	0.5	16	4.8	55	4	B	0.5	14,150
EB4HR0120TN-18-05-ATH	●	0.6	1.2	0.5	18	4.8	60	4	B	0.5	14,250
EB4HR0120TN-20-05-ATH	●	0.6	1.2	0.5	20	4.8	60	4	B	0.5	14,360
EB4HR0120TN-22-05-ATH	●	0.6	1.2	0.5	22	4.8	60	4	B	0.5	14,360
EB4HR0120TN-24-05-ATH	●	0.6	1.2	0.5	24	4.8	60	4	B	0.5	14,460
EB4HR0120TN-6-10-ATH	●	0.6	1.2	1	6	4.8	50	4	A	-	13,720
EB4HR0120TN-8-10-ATH	●	0.6	1.2	1	8	4.8	50	4	B	1	13,820
EB4HR0120TN-10-10-ATH	●	0.6	1.2	1	10	4.8	50	4	B	1	13,820
EB4HR0120TN-12-10-ATH	●	0.6	1.2	1	12	4.8	55	4	B	1	14,040
EB4HR0120TN-14-10-ATH	●	0.6	1.2	1	14	4.8	55	4	B	1	14,040
EB4HR0120TN-16-10-ATH	●	0.6	1.2	1	16	4.8	55	4	B	1	14,150
EB4HR0120TN-18-10-ATH	●	0.6	1.2	1	18	4.8	60	4	B	1	14,250
EB4HR0120TN-20-10-ATH	●	0.6	1.2	1	20	4.8	60	4	B	1	14,360
EB4HR0120TN-22-10-ATH	●	0.6	1.2	1	22	4.8	60	4	B	1	14,360
EB4HR0120TN-24-10-ATH	●	0.6	1.2	1	24	4.8	60	4	B	1	14,460

標準切削条件表

Recommended Cutting Conditions

○ 荒加工条件 Roughing conditions

被削材 Work material				1		2		3		4	
				炭素鋼・合金鋼 Carbon steels, Alloy steels (180~250HB)		工具鋼 Tool steels (25~35HRC)		プリハードン鋼 Pre-hardened steels (35~45HRC)		焼入れ鋼 Hardened steels (45~55HRC)	
切り込み比率 Ratio to standard depth of cut				100%		90%		80%		65%	
ボール半径RE Ball radius (mm)	外径DC Tool dia. (mm)	首下長LU Under neck length (mm)	ap (mm)	回転数 n min ⁻¹	送り速度 Vf mm/min	回転数 n min ⁻¹	送り速度 Vf mm/min	回転数 n min ⁻¹	送り速度 Vf mm/min	回転数 n min ⁻¹	送り速度 Vf mm/min
0.3	0.6	4	0.024	36,000	1,030	32,400	920	30,600	760	27,000	610
	0.6	5	0.020	36,000	970	32,400	880	30,600	720	27,000	580
	0.6	6	0.015	36,000	970	32,400	880	30,600	720	27,000	580
	0.6	7	0.008	32,000	820	28,800	730	27,200	600	24,000	490
	0.6	8	0.008	32,000	820	28,800	730	27,200	600	24,000	490
	0.6	9	0.006	32,000	820	28,800	730	27,200	600	24,000	490
0.35	0.6	10	0.005	28,000	710	25,200	640	23,800	530	21,000	430
	0.7	4	0.034	36,000	1,130	32,400	1,020	30,600	840	27,000	690
	0.7	5	0.030	36,000	1,130	32,400	1,020	30,600	840	27,000	690
	0.7	6	0.027	36,000	1,070	32,400	960	30,600	800	27,000	650
	0.7	7	0.020	32,000	840	28,800	760	27,200	630	24,000	520
	0.7	8	0.010	32,000	840	28,800	760	27,200	630	24,000	520
0.4	0.7	9	0.008	32,000	840	28,800	760	27,200	630	24,000	520
	0.7	10	0.005	28,000	740	25,200	670	23,800	550	21,000	460
	0.8	4	0.035	40,000	1,440	36,000	1,300	34,000	1,090	30,000	900
	0.8	6	0.032	36,000	1,170	32,400	1,050	30,600	880	27,000	730
	0.8	8	0.020	32,000	1,040	28,800	930	27,200	780	24,000	650
	0.8	10	0.010	32,000	980	28,800	880	27,200	740	24,000	610
0.45	0.8	12	0.008	32,000	980	28,800	880	27,200	740	24,000	610
	0.8	14	0.005	28,000	860	25,200	770	23,816	650	21,000	530
	0.9	4	0.045	38,000	1,620	34,200	1,460	32,300	1,200	28,500	1,000
	0.9	6	0.042	34,200	1,310	30,800	1,180	29,100	980	25,700	810
	0.9	8	0.030	30,400	1,170	27,400	1,050	25,800	880	22,800	720
	0.9	10	0.020	30,400	1,170	27,400	1,050	25,800	880	22,800	720
0.5	0.9	12	0.010	30,400	1,170	27,400	1,050	25,800	880	22,800	720
	0.9	14	0.008	26,000	1,000	23,500	900	22,100	750	19,500	620
	1	4	0.040	32,400	1,460	29,200	1,310	27,500	1,120	24,300	920
	1	6	0.040	32,400	1,460	29,200	1,310	27,500	1,120	24,300	920
	1	8	0.040	32,400	1,460	29,200	1,310	27,500	1,120	24,300	920
	1	10	0.025	32,400	1,460	29,200	1,310	27,500	1,120	24,300	920
	1	12	0.013	28,800	1,220	25,900	1,100	24,500	940	21,600	770
	1	14	0.010	28,800	1,220	25,900	1,100	24,500	940	21,600	770
0.55	1	16	0.008	28,800	1,220	25,900	1,100	24,500	940	21,600	770
	1	18	0.006	25,200	1,010	22,700	910	21,400	770	18,900	640
	1	20	0.005	21,600	860	19,400	780	18,400	660	16,200	540
	1.1	4	0.040	30,600	1,480	27,500	1,330	26,000	1,090	23,000	920
	1.1	6	0.040	30,600	1,480	27,500	1,330	26,000	1,090	23,000	920
	1.1	8	0.040	30,600	1,480	27,500	1,330	26,000	1,090	23,000	920
	1.1	10	0.025	30,600	1,480	27,500	1,330	26,000	1,090	23,000	920
	1.1	12	0.020	27,200	1,240	24,500	1,110	23,100	920	20,400	770
0.6	1.1	14	0.015	27,200	1,240	24,500	1,110	23,100	920	20,400	770
	1.1	16	0.010	27,200	1,240	24,500	1,110	23,100	920	20,400	770
	1.1	18	0.008	23,800	1,020	21,400	910	20,200	750	17,800	630
	1.1	20	0.005	20,400	870	18,300	780	17,300	640	15,200	540
	1.2	6	0.060	28,800	1,500	25,900	1,350	24,500	1,100	21,600	950
	1.2	8	0.040	28,800	1,500	25,900	1,350	24,500	1,100	21,600	950
	1.2	10	0.035	28,800	1,420	25,900	1,210	24,500	1,100	21,600	860
	1.2	12	0.030	28,800	1,350	25,900	1,210	24,500	1,100	21,600	860
	1.2	14	0.025	24,600	1,150	22,200	1,040	21,000	940	18,500	730
	1.2	16	0.020	24,600	1,150	22,200	1,040	21,000	940	18,500	730
0.6	1.2	18	0.015	24,600	1,150	22,200	1,040	21,000	940	18,500	730
	1.2	20	0.010	21,000	990	19,000	890	18,000	810	15,900	630
	1.2	22	0.010	21,000	990	19,000	890	18,000	810	15,900	630
	1.2	24	0.008	21,000	990	19,000	890	18,000	810	15,900	630

- 【注意】**
- ① apは被削材グループ1での目安を示しています。その他のグループの場合は、上表の切り込み比率を目安に調整してください。
 - ② aeの設定はap×切り込み比率×3~5倍を目安に調整してください。仕上げ加工を行う場合、理論ルスプハイトを計算し設定してください。
【切り込み設定例】 EB4HR0100TN-10-05-ATH の仕上げ加工条件でプリハードン鋼を切削する場合
切り込み = 0.032 (ap) × 0.8 (プリハードン鋼グループ3の切り込み比率) = 0.0256mm
 - ③ 被削材、加工形状に合わせて、水溶性および油性のクーラントを使用してください。
 - ④ この標準切削条件表は切削条件の目安を示すものです。実際の加工では加工形状、目的、使用機械等により条件を調整してください。
 - ⑤ 機械の回転数が合わない場合は、回転数と送り速度を同じ比率で調整してください。

仕上げ加工条件 Finishing conditions

被削材 Work material				1		2		3		4	
				炭素鋼・合金鋼 Carbon steels, Alloy steels (180~250HB)		工具鋼 Tool steels (25~35HRC)		プリハードン鋼 Pre-hardened steels (35~45HRC)		焼入れ鋼 Hardened steels (45~55HRC)	
切り込み比率 Ratio to standard depth of cut				100%		90%		80%		65%	
ボール半径RE Ball radius (mm)	外径DC Tool dia. (mm)	首下長LU Under neck length (mm)	a_p (mm)	回転数 n min ⁻¹	送り速度 V_f mm/min	回転数 n min ⁻¹	送り速度 V_f mm/min	回転数 n min ⁻¹	送り速度 V_f mm/min	回転数 n min ⁻¹	送り速度 V_f mm/min
0.3	0.6	4	0.023	18,000	1,030	16,200	920	15,300	760	13,500	620
	0.6	5	0.023	18,000	970	16,200	880	15,300	720	13,500	580
	0.6	6	0.020	18,000	970	16,200	880	15,300	720	13,500	580
	0.6	7	0.020	16,000	820	14,400	730	13,600	600	12,000	490
	0.6	8	0.020	16,000	820	14,400	730	13,600	600	12,000	490
	0.6	9	0.020	16,000	820	14,400	730	13,600	600	12,000	490
0.35	0.6	10	0.020	14,000	710	12,600	640	11,900	530	10,500	430
	0.7	4	0.023	18,000	1,130	16,200	1,020	15,300	840	13,500	690
	0.7	5	0.023	18,000	1,130	16,200	1,020	15,300	840	13,500	690
	0.7	6	0.020	18,000	1,070	16,200	960	15,300	790	13,500	650
	0.7	7	0.020	16,000	840	14,400	760	13,600	630	12,000	520
	0.7	8	0.020	16,000	840	14,400	760	13,600	630	12,000	520
0.4	0.7	9	0.020	16,000	840	14,400	760	13,600	630	12,000	520
	0.7	10	0.020	14,000	740	12,600	670	11,900	550	10,500	460
	0.8	4	0.028	20,000	1,440	18,000	1,300	17,000	1,090	15,000	900
	0.8	6	0.028	18,000	1,170	16,200	1,050	15,300	880	13,500	730
	0.8	8	0.025	16,000	1,040	14,400	930	13,600	780	12,000	650
	0.8	10	0.025	16,000	980	14,400	880	13,600	740	12,000	610
0.45	0.8	12	0.025	16,000	980	14,400	880	13,600	740	12,000	610
	0.8	14	0.025	14,000	860	12,600	770	11,900	650	10,500	530
	0.9	4	0.028	19,000	1,620	17,100	1,460	16,200	1,220	14,300	1,000
	0.9	6	0.028	17,100	1,310	15,400	1,180	14,600	980	12,900	810
	0.9	8	0.025	15,200	1,170	13,700	1,050	12,900	880	11,400	720
	0.9	10	0.025	15,200	1,170	13,700	1,050	12,900	880	11,400	720
0.5	0.9	12	0.025	15,200	1,170	13,700	1,050	12,900	880	11,400	720
	0.9	14	0.025	13,000	1,000	11,800	900	11,100	750	9,800	620
	1	4	0.035	16,200	1,460	14,600	1,310	13,800	1,120	12,200	920
	1	6	0.035	16,200	1,460	14,600	1,310	13,800	1,120	12,200	920
	1	8	0.035	16,200	1,460	14,600	1,310	13,800	1,120	12,200	920
	1	10	0.032	16,200	1,460	14,600	1,310	13,800	1,120	12,200	920
	1	12	0.032	14,400	1,220	13,000	1,100	12,300	940	10,800	770
	1	14	0.032	14,400	1,220	13,000	1,100	12,300	940	10,800	770
0.55	1	16	0.032	14,400	1,220	13,000	1,100	12,300	940	10,800	770
	1	18	0.030	12,600	1,010	11,400	900	10,700	770	9,500	640
	1	20	0.030	10,800	860	9,700	780	9,200	660	8,100	540
	1.1	4	0.035	15,300	1,480	13,800	1,330	13,000	1,090	11,500	920
	1.1	6	0.035	15,300	1,480	13,800	1,330	13,000	1,090	11,500	920
	1.1	8	0.035	15,300	1,480	13,800	1,330	13,000	1,090	11,500	920
	1.1	10	0.032	15,300	1,480	13,800	1,330	13,000	1,090	11,500	920
	1.1	12	0.032	13,600	1,240	12,300	1,110	11,600	920	10,200	770
0.6	1.1	14	0.032	13,600	1,240	12,300	1,110	11,600	920	10,200	770
	1.1	16	0.032	13,600	1,240	12,300	1,110	11,600	920	10,200	770
	1.1	18	0.030	11,900	1,020	10,700	910	10,100	750	8,900	630
	1.1	20	0.030	10,200	870	9,200	780	8,700	640	7,600	540
	1.2	6	0.043	14,400	1,500	13,000	1,350	12,300	1,100	10,800	950
	1.2	8	0.043	14,400	1,500	13,000	1,350	12,300	1,100	10,800	950
	1.2	10	0.043	14,400	1,400	13,000	1,210	12,300	1,100	10,800	860
	1.2	12	0.040	14,400	1,350	13,000	1,210	12,300	1,100	10,800	860
0.6	1.2	14	0.040	12,300	1,150	11,100	1,040	10,500	940	9,300	730
	1.2	16	0.040	12,300	1,150	11,100	1,040	10,500	940	9,300	730
	1.2	18	0.040	12,300	1,150	11,100	1,040	10,500	940	9,300	730
	1.2	20	0.037	10,500	990	9,500	890	9,000	810	8,000	630
	1.2	22	0.037	10,500	990	9,500	890	9,000	810	8,000	630
	1.2	24	0.037	10,500	990	9,500	890	9,000	810	8,000	630

[Note] ① a_p is shown as the criteria for Group 1 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
 ② Adjust by setting a_e to (3 to 5) × (a_p) × (cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.
 Cutting depth setting example : When finishing in pre-hardened steel with EB4HR0100TN-10-05-ATH.
 Cutting depth = 0.032(a_p) × 0.8(Cutting depth factor for group 3 pre-hardened steel) = 0.0256mm

- ③ Use the water or oil based coolant for the work material and machining shape.
- ④ 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.
- ⑤ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

加工事例

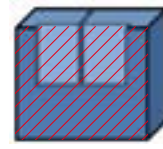
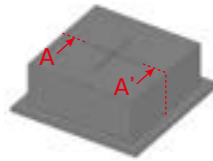
Field data

従来工具の加工方法との比較

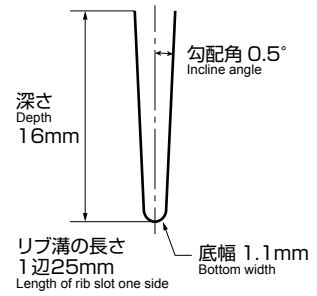
Comparison with conventional tools

機械 Machine : 立型M/C Vertical M/C
 クーラント Coolant : 水溶性 Water base
 被削材 Work material : NAK80(40HRC)
 L/D=16

十字のリブ溝 Cross rib slot



断面を観察
Cross-section observation

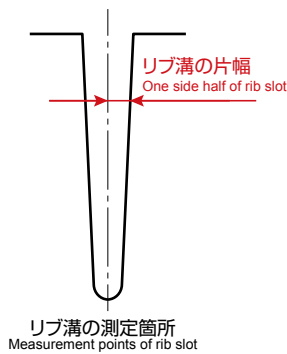


加工工程 Process	商品コード Item code	工具径 Tool dia. (mm)	首下長 Under neck length (mm)	回転数 Revolution (min ⁻¹)	送り速度 Feed rate (mm/min)	ap (mm)	残し代 Removal stock (mm)	加工時間 Cutting time (min)
等高線荒加工 Contour roughing	EB4HR0100TN-6-05-ATH	1	6	24,000	1,000	0.023	0.03	20分
等高線荒加工 Contour roughing	EB4HR0100TN-10-05-ATH	1	10	21,000	910	0.013	0.03	19分
等高線荒加工 Contour roughing	EB4HR0100TN-16-05-ATH	1	16	21,000	770	0.008	0.03	56分
等高線仕上げ加工 Contour finishing	EB4HR0100TN-16-05-ATH	1	16	10,820	424	0.025	0	41分

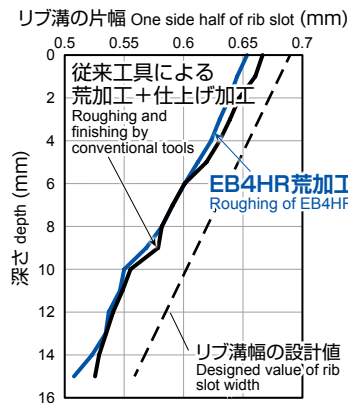
合計加工時間 Total machining time 136分 min.

加工面の比較 Comparison of machined surface

従来工具による荒加工+仕上げ加工 Roughing and finishing by conventional tools



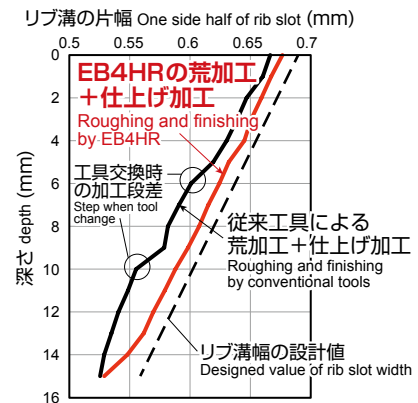
EB4HRで荒加工のみ実施 Roughing with EB4HR



EB4HRの荒加工は
従来工具の荒加工+仕上げ加工と
同等の加工精度

Machining accuracy got by roughing with EB4HR is equivalent to that of roughing and finishing with conventional tools

EB4HRで荒加工及び仕上げ加工を実施 Roughing and finishing of EB4HR



EB4HRで荒加工および仕上げ加工を
行うことでより高精度な
リブ溝を加工可能

More accurate rib slots can be machined by using EB4HR from roughing to finishing

荒加工からEB4HRを使用することで高精度な加工を実現

Realizes high precision machining by using EB4HR from roughing to finishing

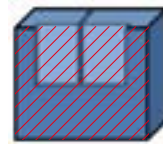
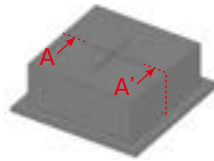


L/D=20のリブ溝の放電加工との比較

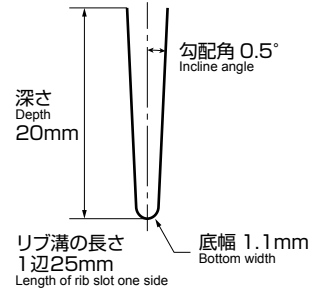
Comparison between EDM and direct milling for rib slot (L/D=20mm)

機械 Machine : 立型M/C Vertical M/C
 クーラント Coolant : 水溶性 Water base
 被削材 Work material : NAK80 (40HRC)
 L/D=20

十字のリブ溝 Cross rib slot



断面を観察
Cross-section observation



加工工程 Process	商品コード Item code	使用本数 No. of tools used	工具径 Tool dia. (mm)	首下長 Under neck length (mm)	回転数 Revolution (min ⁻¹)	送り速度 Feed rate (mm/min)	ap (mm)	残し代 Removal stock (mm)	加工時間 Cutting time (min)
等高線荒加工 Contour roughing	EB4HR0100TN-6-05-ATH	1	1	6	24,000	1,000	0.030	0.03	25分
等高線荒加工 Contour roughing	EB4HR0100TN-12-05-ATH	1	1	12	24,000	900	0.022	0.03	34分
等高線荒加工 Contour roughing	EB4HR0100TN-16-05-ATH	1	1	16	21,000	700	0.014	0.03	47分
等高線荒加工 Contour roughing	EB4HR0100TN-20-05-ATH	1	1	20	18,000	660	0.010	0.03	68分
等高線中仕上げ加工 Contour semi-finishing	EB4HR0100TN-20-05-ATH	1	1	20	18,000	660	0.040	0.02	75分
等高線仕上げ加工 Contour finishing	EB4HR0100TN-20-05-ATH		1	20	12,000	450	0.020	0	209分

合計加工時間 Total machining time **458分** min.

切削加工と放電加工の加工面比較 Comparison of machined surface by machining and EDM

EB4HR

面粗さ: **Rz0.67μm**
Surface roughness

切削時間 **合計約 7時間30分**
Total cutting time : About 7 hours 30 min.

放電加工 EDM

面粗さ: **Rz4.33μm**
Surface roughness

Preparation time of electrode 電極の準備時間 約4時間 hours
 Processing time of EDM 放電加工時間約 約9時間 hours
合計約 13時間
Total time : About 13 hours



#600ペーパーで磨き後(1時間)

After polishing with 600-grit sandpaper (1h)



平滑な加工面
Smooth machined surface

面粗さ: **Rz0.47μm**
Surface roughness

切削面硬さ 40HRC
Hardness

放電面硬さ 47HRC
Hardness

放電面が残る
Electric discharge traces remain

面粗さ: **Rz1.02μm**
Surface roughness

面粗さ: Rz0.5μm以下を達成
Achieved Rz0.5μm or less surface roughness

面粗さ: Rz1.0μmで放電面が残る
Surface roughness: Rz1.0μm
Electric discharge traces remain

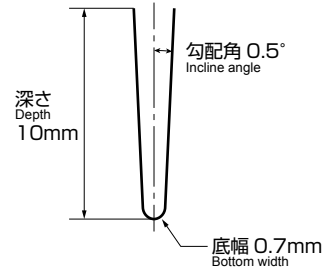
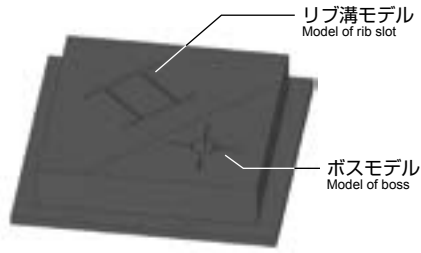
良好な加工面が磨き時間の削減を実現

Achieves to reduce polishing time since machined surface is smooth

高硬度鋼の切削事例

Cutting example of high hardness steel

機械 Machine : 立型M/C Vertical M/C
 クーラント Coolant : 水溶性 Water base
 被削材 Work material : STAVAX(52HRC)
 L/D=16



リブ溝モデル Model of rib slot

加工工程 Process	商品コード Item code	使用本数 No. of tools used	工具径 Tool dia. (mm)	首下長 Under neck length (mm)	回転数 Revolution (min ⁻¹)	送り速度 Feed rate (mm/min)	ap (mm)	残し代 Removal stock (mm)	加工時間 Cutting time (min)
等高線荒加工 Contouring roughing	EB4HR0060TN-4-05-ATH	3	0.6	4	27,000	610	0.016	0.02	60分
等高線荒加工 Contouring roughing	EB4HR0060TN-7-05-ATH	3	0.6	7	24,000	500	0.007	0.02	73分
※1 等高線荒加工 Contouring roughing	EB4HR0060TN-10-05-ATH	2	0.6	10	21,000	430	0.005	0.02	43分
※2 等高線中仕上げ加工 Contouring semi-finishing	EB4HR0060TN-10-05-ATH	1	0.6	10	10,500	500	0.02	0.02	115分
等高線仕上げ加工 Contouring finishing	EB4HR0060TN-10-05-ATH		0.6	10	10,500	500	0.02	0	115分

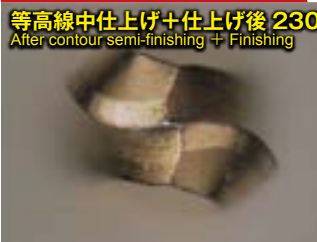
合計加工時間 Total machining time 406分 min.

工具摩耗の状態 Condition of tool wear

EB4HR0060TN-10-05-ATH ※1



EB4HR0060TN-10-05-ATH ※2



ボスモデル Model of boss

加工工程 Process	商品コード Item code	使用本数 No. of tools used	工具径 Tool dia. (mm)	首下長 Under neck length (mm)	回転数 Revolution (min ⁻¹)	送り速度 Feed rate (mm/min)	ap (mm)	残し代 Removal stock (mm)	加工時間 Cutting time (min)
等高線荒加工 Contouring roughing	EPDBEH2020-8-TH3	1	2	8	7,950	320	0.02	0.02	60分
等高線荒加工 Contouring roughing	EB4HR0060TN-4-05-ATH	1	0.6	4	23,800	470	0.016	0.02	28分
等高線仕上げ加工 Contouring finishing	EB4HR0060TN-7-05-ATH	1	0.6	7	10,500	500	0.02	0	19分

合計加工時間 Total machining time 107分 min.

加工面の状態

Condition of machined surface



リブ溝以外の形状部も加工可能
 Other form than rib slot can also be machined.

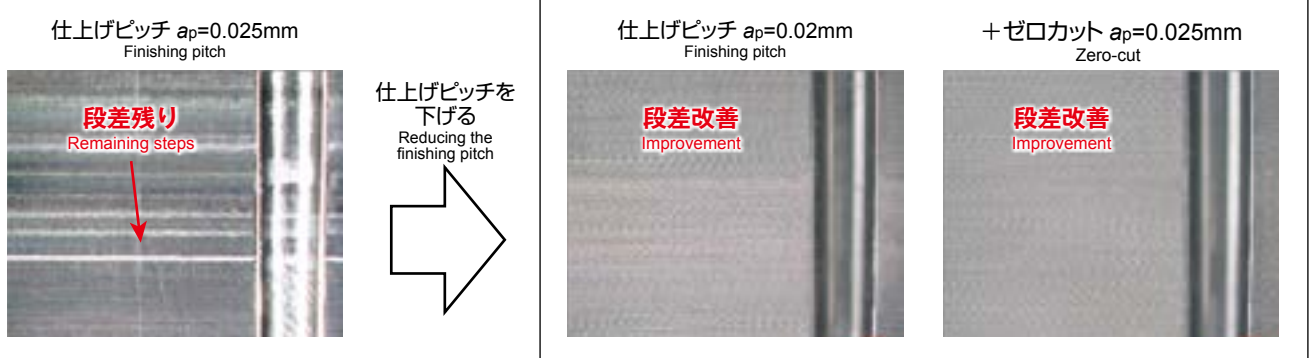
高硬度鋼における高精度な直彫り加工が長時間可能

It is possible to machine high hardness steel with high precision for a long time.

○ 仕上げ加工後に工具交換時の加工段差が残ったとき In case machining steps that occurred at tool change remained after finishing

工具：外径 ϕ 1×首下長20mm
 Tool Tool dia. Under neck length
 EB4HR0100TN-20-05-ATH

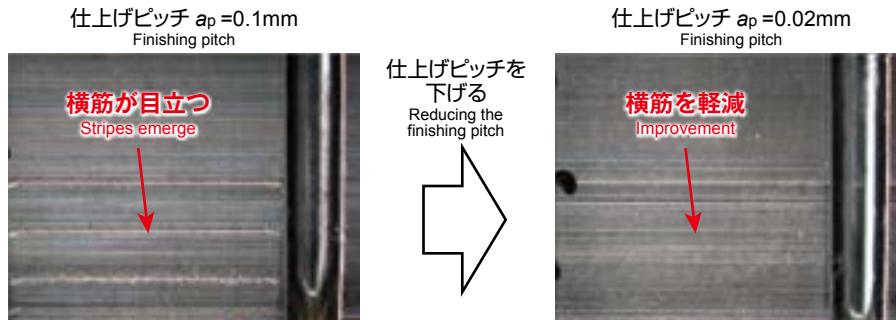
仕上げピッチが大きいと外周刃が十分に作用せず段差を取りきれないことがあります。仕上げピッチを下げるかゼロカットをすることで改善が見込めます。
 If the finishing pitch is large, the peripheral edge might not work sufficiently and the steps might not be removed. It is expected to improve by reducing the finishing pitch or do zero cutting



○ 仕上げ加工後にリブ底に横筋が残ったとき In case horizontal stripes remained at the bottom of rib slot after finishing

工具：外径 ϕ 1×首下長16mm
 Tool Tool dia. Under neck length
 EB4HR0100TN-16-05-ATH

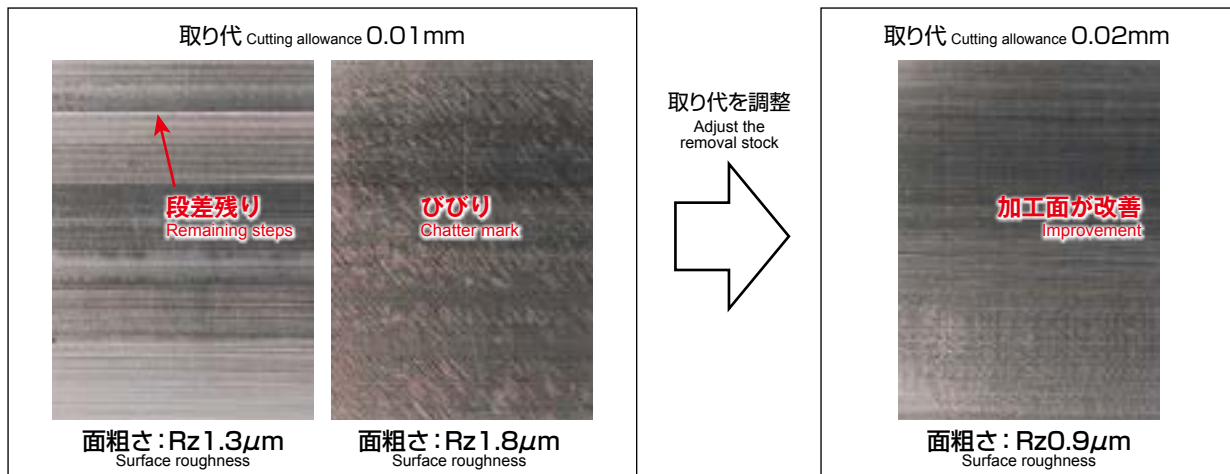
リブの底部は、工具とのクリアランスが小さいため加工条件によっては横筋が目立つことがあります。仕上げピッチを小さくすることで改善が見込めます。
 Since the clearance between the bottom of the rib and the tool is small, the horizontal stripes might emerge depending on the cutting conditions. It is expected to improve by reducing the finishing pitch.



○ 仕上げ加工後に加工面が荒れたとき In case the machined surface is rough after finishing

工具：外径 ϕ 1×首下長16mm
 Tool Tool dia. Under neck length
 EB4HR0100TN-16-05-ATH

取り代を小さくしすぎると段差残りやびびりが生じることがあります。取り代を調整することで改善が見込めます。
 If the cutting allowance is set too small, remaining steps or chatter mark might occur. It is expected to improve by adjusting the cutting allowance.





図、表等のデータは試験結果の一例であり、保証値ではありません。
「MOLDINO」は株式会社MOLDINOの登録商標です。

The diagrams and table data are examples of test results, and are not guaranteed values.
“MOLDINO” is a registered trademark of MOLDINO Tool Engineering, Ltd.

安全上のご注意 Attention on Safety

1. 取扱上のご注意

- (1) 工具をケース(梱包)から取り出す際は、工具の飛び出し、落下にご注意ください。特に工具刃部との接触には十分ご注意ください。
- (2) 鋭利な切れ刃を有する工具を取扱う際は、切れ刃を素手で直接触れないように注意してください。

2. 取り付け時のご注意

- (1) 使用前に、工具の傷・割れ等の外観確認を行っていただき、コレットチャック等への取り付けは確実に行ってください。
- (2) 使用中に、異常な振動等が発生した場合は、直ちに機械を停止させて、その振動の原因を取り除いてください。

3. 使用上のご注意

- (1) 切削工具あるいは被削材の寸法・回転の方向は、あらかじめ確認しておいてください。
- (2) 標準切削条件表の数値は、新しい作業の立上げの目安としてご利用ください。切込みが大きい場合、使用機械の剛性が小さい場合は被加工物の性状に応じて切削条件を適正に調整してご使用ください。
- (3) 切削工具材料は硬質の材料です。ご使用中に破損して飛散する場合があります。また、切りくずが飛散することがあります。これらの飛散物等は作業者を切傷させ、火傷あるいは目に入って負傷させる恐れがありますので、工具をご使用中はその周囲に安全カバーを取付け、保護メガネ等の保護具を着用して安全な環境下での作業をお願いいたします。
- (4) 切削中に発生する火花や、破損による発熱や、切りくずによる引火・火災の危険があります。引火や爆発の危険のあるところでは使用しないでください。不水溶性切削液をご使用される場合は防火対策を必ず行なってください。
- (5) 工具を本来の目的以外にはご使用にならないでください。

4. 再研削時のご注意

- (1) 再研削時期が不適当であると工具が破損する恐れがあります。適正な工具と交換するか、再研削を行ってください。
- (2) 工具を再研削しますと粉塵が発生します。再研削時にはその周囲に安全カバーを取付け、保護メガネ等の保護具を着用してください。
- (3) 本製品には特定化学物質に指定されたコバルト及びその無機化合物が含まれています。再研削等の加工を加える場合は特定化学物質障害予防規則(特化則)に従った取扱いをしてください。

5. 工具に関して、安全上の問題点・不明の点・その他相談がありましたら

フリーダイヤル技術相談へご相談ください。

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.

株式会社 MOLDINO

MOLDINO Tool Engineering, Ltd.

本社 〒130-0026 東京都墨田区両国4-31-11(ヒューリック両国ビル8階)
☎ 03-6890-5101 FAX 03-6890-5134
International Sales Dept.: ☎ +81-3-6890-5103 FAX +81-3-6890-5128

ホームページ

<http://www.moldino.com>

フリーダイヤル技術相談

☎ 0120-134159

工具選定データベース [TOOL SEARCH]

TOOLSEARCH

検索

営業企画部	☎ 03-6890-5102 FAX03-6890-5134	海外営業部	☎ 03-6890-5103 FAX03-6890-5128
東京営業所	☎ 03-6890-5110 FAX03-6890-5133	静岡営業所	☎ 054-273-0360 FAX054-273-0361
東北営業所	☎ 022-208-5100 FAX022-208-5102	名古屋営業所	☎ 052-687-9150 FAX052-687-9144
新潟営業所	☎ 0258-87-1224 FAX0258-87-1158	大阪営業所	☎ 06-7668-0190 FAX06-7668-0194
東関東営業所	☎ 0294-88-9430 FAX0294-88-9432	中四営業所	☎ 082-536-2001 FAX082-536-2003
長野営業所	☎ 0268-21-3700 FAX0268-21-3711	九州営業所	☎ 092-289-7010 FAX092-289-7012
北関東営業所	☎ 0276-59-6001 FAX0276-59-6005		
神奈川営業所	☎ 046-400-9429 FAX046-400-9435		

ヨーロッパ MOLDINO Tool Engineering Europe GmbH Itterpark 12, 40724 Hilden, Germany. TEL : +49-(0)2103-24820, FAX : +49-(0)2103-248230
 アメリカ MITSUBISHI MATERIALS U.S.A. CORPORATION 41700 Gardenbrook Road, Suite 120, Novi, MI 48375-1320 U.S.A. TEL : +(1)248)308-2620, FAX : +(1)248)308-2627
 メキシコ MMC METAL DE MEXICO, S.A. DE C.V. Av. La Cañada No.16, Parque Industrial Bernardo Quintana, El Marques, Queretaro, CP 76246, Mexico TEL : +52-442-1926800
 ブラジル MMC METAL DO BRASIL LTDA. Rua Cincinnati Braga, 340 13° andar, Bela Vista - CEP 01333-010 São Paulo - SP., Brasil TEL : +55(11)3506-5600 FAX : +55(11)3506-5677
 タイ MMC Hardmetal (Thailand) Co., Ltd. MOLDINO Division 622 Emporium Tower, Floor 22/1-4, Sukhumvit Road, Klong Tan, Klong Toei, Bangkok 10110, Thailand TEL : +66(0)2-661-8175 FAX : +66(0)2-661-8176
 インド MMC Hardmetal India Pvt Ltd. H.O., Prasad Enclave, #11/11/19, 1st Floor, 2nd Stage, 5th main, BBMP Ward #11, (New 33), Industrial Suburb, Yeshwanthpur, Bengaluru, 560 022, Karnataka, India. Tel : +91-90-2204-3600

掲載価格は2022年10月1日改定後の消費税抜きの単価を表示しております。予告なく、改良・改善のために仕様変更することがあります。
Specifications for the products listed in this catalog are subject to change without notice due to replacement or modification.



ベジタブルインクで印刷しています。
Printed using vegetable oil ink.

Printed in JAPAN

2023-4 (K)
2018-11:FP

店名

VISI INDOTAMA SEJAHTERA
0811330377 (WA)
081217801333 (WA)
www.visiindotama.com