

microEndMill

Nano-PVD Coating  
TH45+

No. 414.2

# EPSB Epoch Super Hard Ball

For Hardened Steels **55~72 HRC**

New Edition

- **SIZES**  
R 0.05 - 1.0 mm
- **TOLERANCE**  
R -0.007/+0.003  
Shank  $\varnothing$ d h4
- **New** Using Length  
with 3xD

R0.05

X200 100µm 0000

R1.0

# MICRO EndMill

Micro Grain Carbide End Mills · Nano PVD Coated

µm

## Ultra Micro Grain Carbide End Mill

### EPOCH SUPER HARD BALL

Recently, harder and harder materials are being used in mold processing, making machining extremely difficult. In addition, tool durability against wear is very important for ultra-high-accuracy processing, and CBN tools, etc. have been gaining focus in addition to carbide tools. However, there are many problems such as chipping, so that currently stable processing cannot be performed. The newly developed Epoch Super Hard Ball uses a new flute shape and new carbide material to push the limits of our original TH coating to provide wear durability approaching that of CBN tools.

#### FEATURES & APPLICATIONS

1. New flute shape provides a huge reduction in wear compared to conventional products.
2. Use of backdraft shape suppresses the vibrating chatter peculiar to small-diameter tools to enable stable processing.
3. Guaranteed ultra-high R accuracy and shank accuracy enable ultra-fine finishing.
4. Standard product R accuracy:  $-0.007\text{mm} \leq R \leq +0.003\text{mm}$
5. Wear durability approaching that of CBN tools provides long tool life even when directly machining materials with hardnesses exceeding 60HRC.
6. Dimensional sizes of R0.05 to R1 make them ideal for machining of small parts.

### EPOCH SUPER HARD BALL

In letzter Zeit kommen immer härtere Materialien im Werkzeug- und Formenbau zum Einsatz, welche die Bearbeitung immer schwieriger gestalten. Zusätzlich behindert der hohe Verschleiß der Werkzeuge die Herstellung von Formen mit höchstmöglichen Toleranzen. Daher wurden immer mehr CBN Werkzeuge für härtere Werkstoffe fokussiert. Diese konnten aufgrund von Ausbrüchen usw. oft nicht über eine längere Bearbeitungszeit prozesssicher eingesetzt werden.

Der neu entwickelte „EPOCH SUPER HARD BALL“ verringert nun die Lücke zwischen Vollhartmetall- und CBN Werkzeugen. Eine neue Schneidengeometrie, in Verbindung mit unserer bewährten TH45+ Beschichtung, und das optimale Feinstkorn-Vollhartmetallsubstrat bietet dem Anwender den Verschleißwiderstand ähnlich der CBN Werkzeuge an.

#### BESONDERHEITEN & BEARBEITUNGEN

1. Eine neue Schneidengeometrie reduziert den Verschleiß enorm gegenüber konventionellen Werkzeugen.
2. Der „Backdraft Effect“ minimiert Vibrationen und sorgt auch bei kleinsten Durchmessern für eine prozesssichere und stabile Bearbeitung.
3. Beste Toleranzen an Radien und Schaft ermöglichen genaueste Schlichtbearbeitungen.
4. Standardtoleranz am Radius:  $-0,007\text{ mm bis }+0,003\text{ mm}$
5. Der hohe Verschleißwiderstand, ähnlich der von CBN Werkzeugen, ermöglicht eine lange Lebensdauer, selbst bei Materialien über 60HRC.
6. Abmessungen von R0,05 mm bis R1,0 mm machen ihn ideal für Bearbeitungen von sehr kleinen Werkstücken.

### EPOCH SUPER HARD BALL

Attualmente vengono impiegati materiali sempre più duri per la costruzione degli stampi, ciò comporta un processo di fresatura estremamente difficile.

Inoltre, la resistenza contro l'usura dell' utensile è molto importante per un processo di elevatissime precisioni.

Entrambe le richieste venivano soddisfatte dagli utensili CBN.

Tuttavia l'utilizzo di tali utensili non è in grado di risolvere molti problemi come per esempio la scheggiatura che attualmente non permette di stabilire un processo sicuro.

Per la nuova serie Epoch Super Hard Ball abbiamo sviluppato una innovativa geometria del tagliente con il nostro originale rivestimento TH. Questo ci permette di garantire una elevata vita del tagliente che si avvicina a quella del CBN.

#### CARATTERISTICHE E APPLICAZIONI

1. La nuova geometria del tagliente permette una enorme riduzione dell'usura rispetto agli utensili convenzionali.
2. L' utilizzo dell' effetto "BACKDRAFT" garantisce minori vibrazioni tra il tagliente e la parete durante lavorazioni sul fianco.
3. L'altissima precisione sia del raggio che del gambo garantisce lavorazioni di elevatissime qualità.
4. La tolleranza standard del raggio è del  $-0.007\text{ mm} \leq R \leq +0.003\text{ mm}$ .
5. La resistenza all' usura (come CBN) garantisce una elevata vita del tagliente durante la fresatura diretta su materiali oltre i 60HRC.
6. La gamma dal R0.05 a R1 rendono questi utensili ideali per lavorazioni di piccole dimensioni.

### EPOCH SUPER HARD BALL

En la actualidad, el uso de materiales cada vez más duros en la fabricación de moldes, hace que el mecanizado resulte cada vez más dificultoso. Asimismo, la resistencia de la herramienta al desgaste es un factor vital en el mecanizado de ultra-precisión, y las herramientas de CBN y similares están ganando terreno a las de metal duro. Sin embargo, este tipo de herramientas conllevan problemas como la microrotura, y no permiten realizar procesos estables de mecanizado. El desarrollo de la nueva EPOCH SUPER HARD BALL utiliza una nueva geometría de filo y una nueva composición de metal duro, que permiten obtener el máximo rendimiento de nuestro recubrimiento exclusivo TH, consiguiendo niveles de vida muy próximos a los de las herramientas de CBN.

#### CARACTERÍSTICAS Y APLICACIONES

1. La nueva geometría de los filos proporciona una notable reducción del desgaste en comparación con los productos convencionales.
2. La geometría "backdraft" elimina las vibraciones características de las fresas miniatura mejorando considerablemente la estabilidad del proceso de mecanizado.
3. La estrecha y garantizada tolerancia de radio y mango permiten unos acabados dimensionales y superficiales excelentes.
4. Tolerancia estándar del radio:  $-0.007\text{mm} \leq R \leq +0.003\text{mm}$ .
5. La resistencia al desgaste, cercana a la de las fresas CBN, permite realizar procesos largos de mecanizado directo en materiales que están por encima de los 60 HRC.
6. La gama, de R0.05 a R1, las hacen ideales para el mecanizado de pequeños componentes.

### EPOCH SUPER HARD BALL

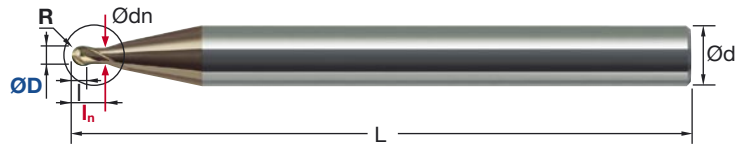
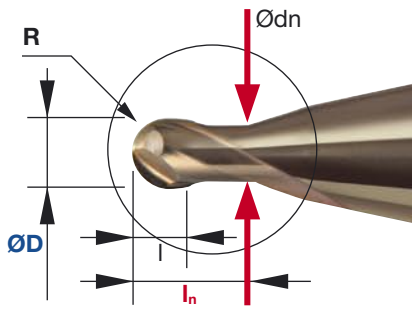
Depuis peu, dans l'usinage de moules et matrices, nous constatons une forte orientation vers l'utilisation de matériaux de plus en plus durs, rendant les phases d'usinage très difficiles. Dans de telles applications, la résistance à l'usure des outils devient un facteur essentiel afin de pouvoir garantir de hautes tolérances. C'est pourquoi, parallèlement aux outils en carbure, on constate une augmentation de l'utilisation d'outils de type CBN, etc... Cependant, les problèmes d'usure restent trop nombreux pour garantir la stabilité des processus d'usinage. Lors du récent développement de notre Epoch Super Hard Ball, nous avons optés pour l'utilisation d'un nouveau substrat, ainsi que d'une nouvelle géométrie, afin de pouvoir encore repousser les limites de notre propre revêtement TH jusqu'à concurrencer la résistance à l'usure des outils CBN.

#### CARACTÉRISTIQUES & APPLICATIONS

1. Nouvelle géométrie apportant une énorme réduction des phénomènes d'usures en comparaison avec des outils conventionnels.
2. L'utilisation de notre géométrie « back-draft » supprime les vibrations dues à la flexion latérale propre aux outils de petits diamètres et permet des processus d'usinage stables.
3. La garantie d'extrêmement hautes tolérances sur les rayons et sur les queues de ces fraises permet des applications ultra fines en finitions.
4. Sur cette gamme, la tolérance standard du rayon est de :  $-0,007\text{mm} \leq R \leq +0,003\text{mm}$
5. La résistance à l'usure, proche de celle du CBN, apporte une longue durée de vie même dans l'usinage direct de matières dépassant 60HRC.
6. Les diamètres de cette gamme, de 0,1 à 2, la délicatesse idéalement à l'usinage de petites pièces.

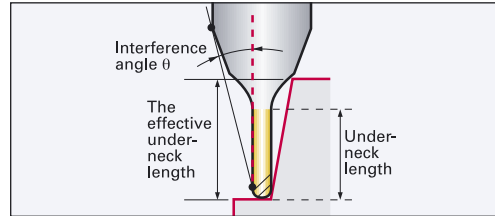
Ultra Micro Grain Carbide End Mill

EPSB | Epoch Super Hard Ball



<b>Carbide</b>	<b>TH45+</b>	<b>Rake Angle</b>
Ultra Micro Grain	Nano-PVD Coating	Positive

R	-0.007/+0.003
Ød	h4



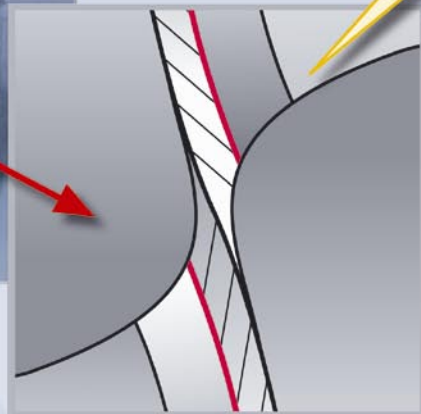
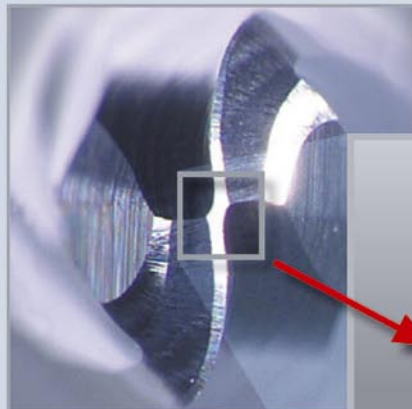
ID Code	Item Code	Stock	Z	Size							Neck R	The effective under-neck length for the various draft angles											
				R	ØD	ln	l	dn	L	Ød		0.5°	1°	2°	3°	Interference angle θ							
MM001	EPSB-2001N	■	2	0.05	0.1	-	0.08	0.08	-	-	-	-	1	0.08					11.87				
MM022	EPSB-2001-0.3N					0.3								0.08	0.08	0.46	0.48	0.53	0.57	11.64			
MM002	EPSB-2002N					-								0.15	-	0.15					11.74		
MM023	EPSB-2002-0.6N					0.6								0.15	0.17	0.80	0.83	0.88	0.93	11.30			
MM003	EPSB-2003N			0.15	0.3	-	0.25	-	0.27	-	-	-	-	4	2	0.25					11.61		
MM024	EPSB-2003-0.9N					0.9										0.25	0.27	1.21	1.27	1.37	1.47	11.00	
MM004	EPSB-2004N					-										0.3	-	0.30					11.47
MM025	EPSB-2004-1.2N					1.2										0.3	0.37	1.52	1.59	1.71	1.82	10.69	
MM005	EPSB-2005N			0.25	0.5	-	0.35	-	0.47	-	-	-	-	4	2	0.35					11.33		
MM026	EPSB-2005-1.5N					1.5										0.35	0.47	1.83	1.91	2.05	2.17	10.39	
MM006	EPSB-2006N					-										0.4	-	0.40					11.18
MM027	EPSB-2006-1.8N					1.8										0.4	0.57	2.30	2.44	2.68	2.88	10.08	
MM007	EPSB-2008N			0.4	0.8	-	0.5	-	0.77	-	-	-	-	6	4	0.50					10.88		
MM028	EPSB-2008-2.4N					2.4										0.5	0.77	2.94	3.10	3.36	3.59	9.47	
MM008	EPSB-2010N					-										0.8	0.96	0.80					11.00
MM029	EPSB-2010-3N					3										0.8	0.96	3.61	3.78	4.06	4.30	9.88	
MM009	EPSB-2012N			0.6	1.2	1.8	1.1	1.15	-	-	-	-	-	6	4	0.60					10.78		
MM030	EPSB-2012-3.6N					3.6										1.1	1.15	4.27	4.45	4.75	5.01	9.46	
MM010	EPSB-2015N					-										1.35	1.44	0.75					10.43
MM031	EPSB-2015-4.5N					4.5										1.35	1.44	5.24	5.44	5.76	6.04	8.84	
MM011	EPSB-2020N			1	2	3	1.7	1.92	-	-	-	-	-	6	4	0.80					9.78		
MM032	EPSB-2020-6N					6										1.7	1.92	6.84	7.07	7.43	7.89	7.81	

■ = Stock | Germany

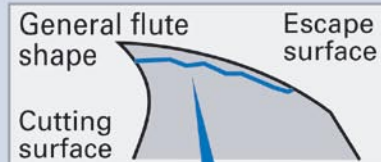
If the workpiece has draft angle, the interference length will be longer than the under-neck length. Please refer to the effective under-neck length for the various draft angles. In addition, the angle at which the tool will interfere with the workpiece is shown as the "interference angle θ", and should also be referred to.

THE EFFECT OF FLUTE SHAPE, MATERIAL AND COATING:

DOUBLE-FACE EFFECT OF NEW SHAPE PREVENTS SHAPE FROM DETERIORATING



By creating two faces on the escape surface, the first surface has the effect of stopping wear.



Direction of wear progress



## EPSB | Epoch Super Hard Ball | Recommended Cutting Conditions

Workpiece Material			I Hardened Steels (45-55HRC)						II Hardened Steels (55-65HRC)					
Epoch Super Hard Ball End Mill Item Code	R (mm)	ØD (mm)	Depth of cut			Depth of cut			Depth of cut			Depth of cut		
			a <sub>p</sub> (mm)	a <sub>e</sub> (mm)	n (min <sup>-1</sup> )	f <sub>z</sub> (mm)	V <sub>r</sub> (mm/min)	a <sub>p</sub> (mm)	a <sub>e</sub> (mm)	n (min <sup>-1</sup> )	f <sub>z</sub> (mm)	V <sub>r</sub> (mm/min)	a <sub>p</sub> (mm)	a <sub>e</sub> (mm)
EPSB-2001N	0.05	0.1	0.003	0.009	42,000	0.012	1,008	0.003	0.008	40,000	0.011	880		
EPSB-2001-0.3N			0.002					0.002					37,800	0.011
EPSB-2002N	0.1	0.2	0.008	0.024	40,000	0.016	1,280	0.007	0.022	38,000	0.014	1,064		
EPSB-2002-0.6N			0.005					0.004					36,000	0.014
EPSB-2003N	0.15	0.3	0.012	0.036	38,000	0.018	1,368	0.011	0.032	36,000	0.016	1,152		
EPSB-2003-0.9N			0.007					0.006					34,200	0.016
EPSB-2004N	0.2	0.4	0.016	0.048	36,000	0.022	1,584	0.014	0.043	34,000	0.018	1,224		
EPSB-2004-1.2N			0.010					0.009					32,400	0.020
EPSB-2005N	0.25	0.5	0.020	0.060	36,000	0.024	1,728	0.018	0.054	34,000	0.021	1,428		
EPSB-2005-1.5N			0.012					0.011					32,400	0.022
EPSB-2006N	0.3	0.6	0.030	0.090	34,000	0.026	1,768	0.027	0.081	32,000	0.024	1,536		
EPSB-2006-1.8N			0.018					0.016					30,600	0.023
EPSB-2008N	0.4	0.8	0.040	0.120	34,000	0.029	1,972	0.036	0.108	32,000	0.026	1,664		
EPSB-2008-2.4N			0.024					0.022					30,600	0.026
EPSB-2010N	0.5	1	0.050	0.150	32,000	0.033	2,112	0.045	0.135	30,000	0.028	1,680		
EPSB-2010-3N			0.030					0.027					28,800	0.030
EPSB-2012N	0.6	1.2	0.060	0.180	28,000	0.038	2,128	0.054	0.162	26,000	0.033	1,716		
EPSB-2012-3.6N			0.036					0.032					25,200	0.034
EPSB-2015N	0.75	1.5	0.070	0.210	24,000	0.044	2,112	0.063	0.189	22,000	0.039	1,716		
EPSB-2015-4.5N			0.042					0.038					21,600	0.040
EPSB-2020N	1	2	0.080	0.240	20,000	0.053	2,120	0.072	0.216	18,000	0.047	1,692		
EPSB-2020-6N			0.048					0.043					18,000	0.048

Workpiece Material			III Hardened Steels (65-68HRC) · Welded HSS						IV Hardened Steels (68-72HRC) · Powdered HSS					
Epoch Super Hard Ball End Mill Item Code	R (mm)	ØD (mm)	Depth of cut			Depth of cut			Depth of cut			Depth of cut		
			a <sub>p</sub> (mm)	a <sub>e</sub> (mm)	n (min <sup>-1</sup> )	f <sub>z</sub> (mm)	V <sub>r</sub> (mm/min)	a <sub>p</sub> (mm)	a <sub>e</sub> (mm)	n (min <sup>-1</sup> )	f <sub>z</sub> (mm)	V <sub>r</sub> (mm/min)	a <sub>p</sub> (mm)	a <sub>e</sub> (mm)
EPSB-2001N	0.05	0.1	0.002	0.006	38,000	0.009	684	0.002	0.005	36,000	0.008	576		
EPSB-2001-0.3N			0.001					0.001					34,200	0.008
EPSB-2002N	0.1	0.2	0.006	0.017	36,000	0.012	864	0.005	0.014	34,000	0.009	612		
EPSB-2002-0.6N			0.003					0.003					32,400	0.011
EPSB-2003N	0.15	0.3	0.008	0.025	34,000	0.013	884	0.007	0.022	32,000	0.011	704		
EPSB-2003-0.9N			0.005					0.004					30,600	0.012
EPSB-2004N	0.2	0.4	0.011	0.034	32,000	0.016	1,024	0.010	0.029	30,000	0.013	780		
EPSB-2004-1.2N			0.007					0.006					28,800	0.014
EPSB-2005N	0.25	0.5	0.014	0.042	32,000	0.018	1,152	0.012	0.036	30,000	0.014	840		
EPSB-2005-1.5N			0.008					0.007					28,800	0.016
EPSB-2006N	0.3	0.6	0.021	0.063	30,000	0.020	1,200	0.018	0.054	28,000	0.016	896		
EPSB-2006-1.8N			0.013					0.011					27,000	0.018
EPSB-2008N	0.4	0.8	0.028	0.084	30,000	0.022	1,320	0.024	0.072	28,000	0.018	1,008		
EPSB-2008-2.4N			0.017					0.014					27,000	0.020
EPSB-2010N	0.5	1	0.035	0.105	28,000	0.024	1,344	0.030	0.090	26,000	0.020	1,040		
EPSB-2010-3N			0.021					0.018					25,200	0.022
EPSB-2012N	0.6	1.2	0.042	0.126	24,000	0.028	1,344	0.036	0.108	22,000	0.024	1,056		
EPSB-2012-3.6N			0.025					0.022					21,600	0.025
EPSB-2015N	0.75	1.5	0.049	0.147	20,000	0.033	1,320	0.042	0.126	18,000	0.028	1,008		
EPSB-2015-4.5N			0.029					0.025					18,000	0.030
EPSB-2020N	1	2	0.056	0.168	16,000	0.041	1,312	0.048	0.144	14,000	0.036	1,008		
EPSB-2020-6N			0.034					0.029					14,400	0.037

1. 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.

2. If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

1. Die angegebenen Schnittwerte stellen eine generelle Empfehlung dar. Die Werte sollten immer an die jeweilige Bearbeitung, deren Form und die verwendete Maschine angepasst werden.

2. Ist die Ihnen verfügbare Drehzahl niedriger als der in der Tabelle angegebene Wert, sollte der Vorschub im gleichen Verhältnis reduziert werden.

1. Le condizioni di taglio raccomandate sono solamente consigli da applicare alle reali condizioni. In pratica le condizioni devono essere

sistemate a seconda delle dimensioni del pezzo, dell'obiettivo e del tipo di macchina.

2. Quando i giri della macchina disponibili sono più bassi rispetto al valore espresso, regolate l'avanzamento con lo stesso rapporto.

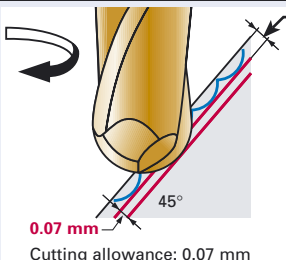

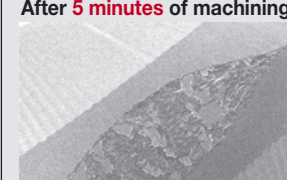
1. Las condiciones de corte recomendadas son únicamente una orientación. Las condiciones de corte reales deben ajustarse en función de la figura a mecanizar y el tipo de máquina.

2. Si la máquina no dispone de suficientes revoluciones, debe reducirse el avance proporcionalmente.

1. Ces conditions sont indicatives : Pour vos usinages, veuillez adapter celles-ci à la géométrie de la pièce, au résultat souhaité et au type de machine que vous utilisez.

2. Si la vitesse disponible est inférieure à celle recommandée, réduisez l'avance du même ratio.

No need to set a uniform cutting allowance · Problemlöser Übergang vom Schrapp- in den Schlichtprozess · Non è necessario garantire un sovrametallo costante · No es necesario que el excedente previo de material sea uniforme · Il n'est pas nécessaire de préparer une surépaisseur uniforme

 <p>Cusp amount from prior process  <b>W = 1.2379 (60HRC)</b>  <b>R1 x 2 Flutes</b>          n = 20,000 min<sup>-1</sup>          V<sub>r</sub> = 1,200 mm/min          a<sub>p</sub> = 0.07 mm</p> <p>The Epoch Super Hard Ball performs finish processing – even if prior processing was rough.</p>	<p><b>Epoch Super Hard Ball</b>  <b>After 1 hour of machining</b></p>  <p>Cusp amount from prior process: 10 µm</p>	<p><b>Competitor's conventional tool</b>  <b>After 5 minutes of machining</b></p>  <p>Cusp amount from prior process: 1 µm or less</p>
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