

micro**EndMill** **PN** Coating

## EPHPB/EPHPR-PN

Epoch High Precision Ball/Radius PaNacea

For Tool Steels and Hardened Steels up to 55HRC  
Micro Grain Solid Carbide End Mill

### EPHPR-PN

- Radius type
- Diameter : 0.2mm-4mm
- L/D : max. 12x $\emptyset$   
( $\emptyset 1 l_n=12mm$ )
- Total : 47 items
- Tolerance CR: +/- 0.003 $\mu m$

In total **101 Items**

### EPHPB-PN

- Ball nose type
- Diameter : 0.1mm-4mm
- L/D : max. 13x $\emptyset$   
( $\emptyset 1 l_n=13mm$ )
- Total : 54 items
- Tolerance R : +/- 0.003 $\mu m$

MICRO**EndMill**  
Micro Grain Carbide End Mills - Nano PVD Coated  
 $\mu m$

Ultra Micro Grain Solid Carbide End Mill

EPHPB/EPHPR-PN | Epoch High Precision Ball/Radius PaNacea

Features Epoch High Precision Series **EPHPB-PN / EPHPR-PN**

**Point 1: Optimized cutting edge geometry**

Lower cutting force, higher geometrical precision

**Point 2: Unprecedented high Radius tolerance +/- 0.003 μm**

For extremely high precision finishing applications

**Point 3: Ball nose type is featured with “seamless” cutting edge,**

which is smooth connection between peripheral cutting edge and radius cutting edge for high surface quality with uniform texture

**Point 4: Back draft up to diameter 3 mm**

Avoids excessive contact with workpiece, stable machining

**Point 5: High rigidity shank with all 6 mm diameter**

Minimizes deflection even in case of long overhang

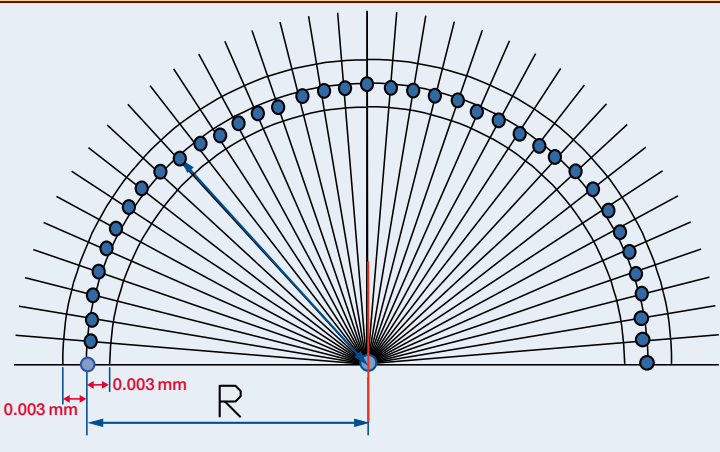
**Point 6: PaNacea coating (PN coating)**

Lower frictional coefficient, high heat-resistance

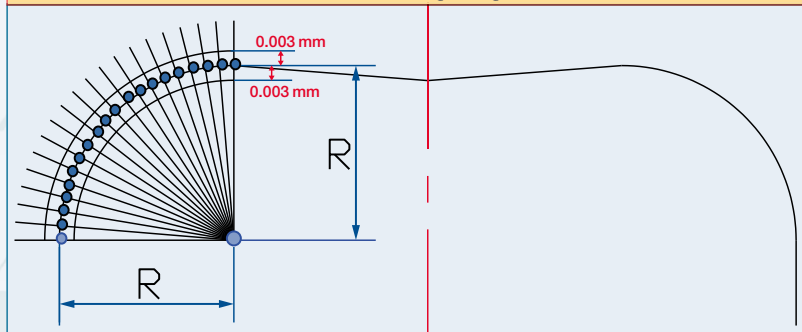


Radius Tolerance

EPHPB Radius cutting edge tolerance



EPHPR Radius cutting edge tolerance



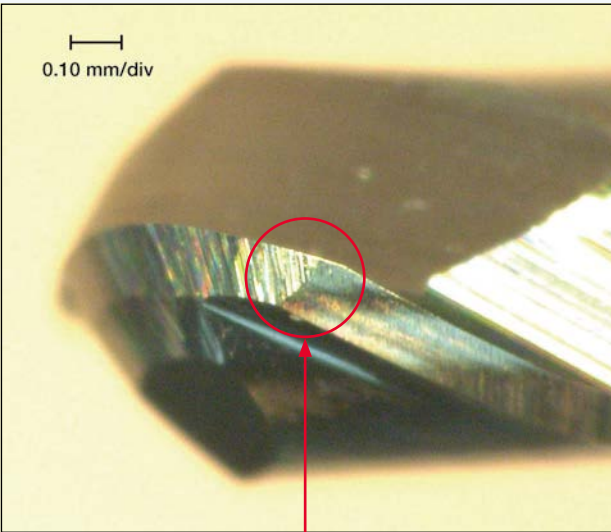


Ultra Micro Grain Solid Carbide End Mill

EPHPB/EPHPR-PN | Epoch High Precision Ball/Radius PaNacea

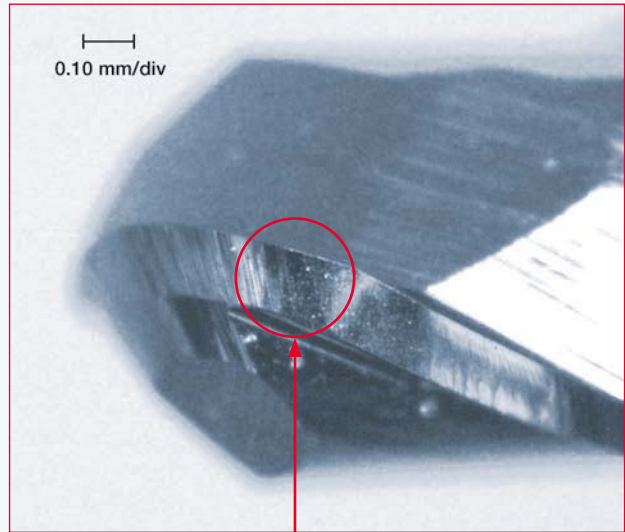
Seamless Cutting Edge EPHPB-PN

Conventional 2-flute ball nose



Conventional geometry with line probably damage or worsen surface quality.

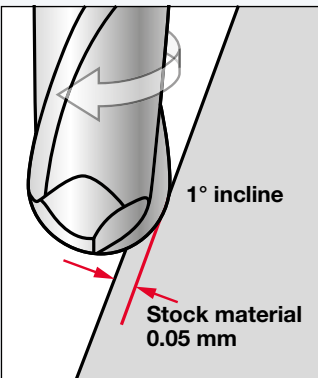
EPHPB-PN: Seamless Cutting Edge



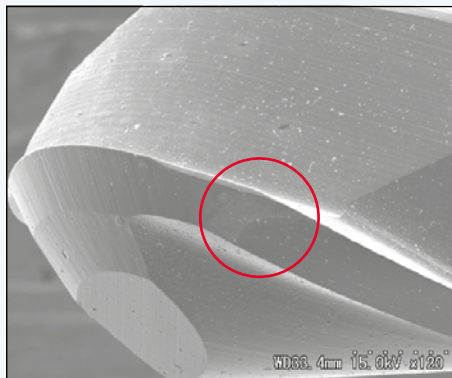
Very smooth connection between peripheral and radius cutting edges

Epoch High Precision Series EPHPB-PN

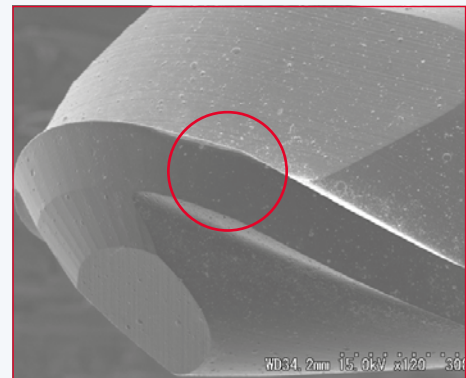
Stock material 0.05 mm



Conventional



EPHPB-2010-4-PN



EPHPB with seamless shows smaller and more stable wear

Work piece: 1.2083 (HRC52)  
Tool Diameter: 1 mm (R 0.5mm)  
Under neck length:  $l_n = 4$  mm  
Over hang: 21 mm  
Coolant: Dry air blow

$N = 25,000 \text{ min}^{-1}$  ( $V_c = 80 \text{ m/min}$ )  
 $V_f = 1,530 \text{ mm/min}$  ( $f_z = 0.03 \text{ mm}$ )  
 $a_p = 0.05 \text{ mm}$   
 $a_e = 0.05 \text{ mm}$

Line-up and content Epoch High Precision Series:

Item	Type	D	Page
EPHPB-PN	Epoch High Precision Ball PaNacea	0.1 - 4	6
EPHPR-PN	Epoch High Precision Radius PaNacea	0.2 - 4	7

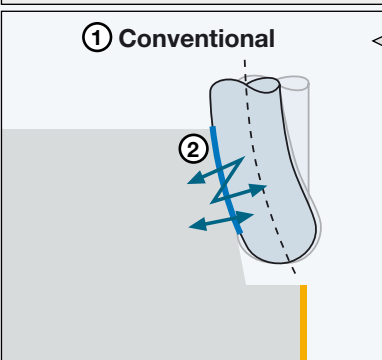
Ultra Micro Grain Solid Carbide End Mill

EPHPB/EPHPR-PN | Epoch High Precision Ball/Radius PaNacea


**Advanced by Back Draft**

**Standard**

① Conventional



**Cutting surface**



**ADVANCED BY BACK DRAFT**

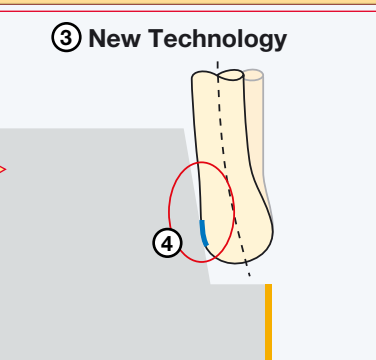
1. **Conventional:**  
More contact between cutter and work piece due to deflection
2. More contact between cutter and work piece stimulate the vibration characteristic
3. **New Technology:** Featured with Hitachi patented "Back Draft" Geometry, which can effectively avoid excessive contact between cutter and work piece, and guarantees stable process especially in deep geometry applications
4. Shorter contact length between cutter and work piece
5. Back Draft improves your mold surface quality!

**FORTSCHRITT DURCH „BACK DRAFT“**

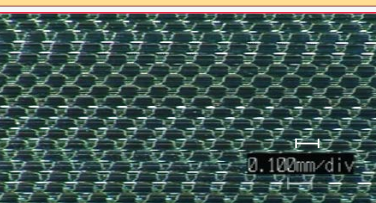
1. **Konventionell:**  
Mehr Kontakt zwischen Fräser und Werkstück durch Deflektion
2. Größere Kontaktfläche zwischen Fräser und Werkstück verstärkt Vibrationen
3. **Neue Technologie:** Durch die von Hitachi patentierte „Back Draft“ Geometrie, die effektiv einen zu langen Kontakt zwischen dem Werkstück und der Schneide verhindert, ist selbst in tiefen Geometrien ein stabiler Prozess möglich.
4. Kleinere Kontaktfläche zwischen Fräser und Werkstück
5. „Back Draft“ verbessert die Oberflächenqualität Ihrer Bauteile!

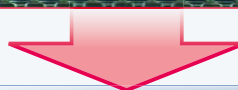
**EPHPB-2030-16-PN**

③ New Technology



**Cutting surface**





⑤ **Back Draft improves your surface quality!**

**EVOLUZIONE CON IL BACK DRAFT**

1. **Le frese convenzionali:**  
Eccessivo contatto tra tagliente e pezzo dovuto alla flessione
2. Il maggior contatto tra tagliente e pezzo induce maggiori vibrazioni
3. **Nuova Tecnologia:** Caratterizzata dalla Geometria brevettata Back Draft , che effettivamente evita l'eccessivo contatto tra fresa e pezzo e garantisce un processo stabile specialmente con lunghe sporgenze
4. Minore lunghezza di contatto tra fresa e pezzo
5. La tecnologia Back Draft“ migliora la qualità superficiale delle lavorazioni!

**SOLUTIONNÉ PAR LA GÉOMÉTRIE « BACK DRAFT »**

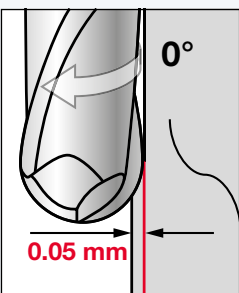
1. **Conventionnel :**  
À Cause de la flexion, le contact entre la pièce et l'outil est plus important
2. Le contact excessif entre l'outil et la pièce augmente les phénomènes vibratoires
3. **Nouvelle technologie :** La géométrie « Back Draft » brevetée par Hitachi permet effectivement d'éviter les zones de contact non désirées et garantie un processus stable, tout particulièrement lors d'usinages profonds
4. Zone de contact réduite entre l'outil et la pièce à usiner
5. La géométrie « Back Draft » améliore la qualité surfacique des pièces que vous usinez !

**VENTAJAS DEL BACK DRAFT**

1. **Convencional:**  
Una mayor superficie de contacto entre la herramienta y la pieza de trabajo debido a la flexión.
2. Un mayor contacto entre la herramienta y el material provoca vibraciones.
3. **Nueva Tecnología:** Hitachi ha patentado la geometría "Back Draft", que permite evitar el contacto excesivo entre la herramienta y el material, garantizando un proceso estable especialmente en aplicaciones de geometría profunda
4. Zona de contacto menor entre la herramienta y el material.
5. La tecnología "Back Draft" mejora la calidad superficial de la pieza.

**AVANÇADO POR BACK DRAFT**

1. **Convencional :**  
Mais contacto entre a navalha e a peça a maquinar maior deflexão.
2. Mais contacto entre a navalha e peça a maquinar vai provocar mais vibração.
3. **Nova Tecnologia :** Apresentado e patenteado pela Hitachi a geometria "Back Draft " pode evitar o contacto excessivo entre a navalha e a peça a maquinar, e garante um processo estável, especialmente em aplicações profundas.
4. Menor face de contacto entre a fresa e peça a maquinar.
5. "Back Draft" melhora a qualidade de superfície do seu molde!



**Work piece:** 1.2343 (HRC52)  
**Tool Diameter:** 3 mm (R 1.5 mm)  
**Under neck length:**  $l_n = 16$  mm  
**Over hang:** 21 mm  
**Coolant:** Emulsion  
 $N = 12,000 \text{ min}^{-1}$  ( $V_c = 113 \text{ m/min}$ )  
 $V_f = 1,500 \text{ mm/min}$  ( $f_z = 0.0625 \text{ mm}$ )  
 $a_p = 0.05 \text{ mm}$   
 $a_e = 0.05 \text{ mm}$

4

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Ultra Micro Grain Solid Carbide End Mill

EPHPB/EPHPR-PN | Epoch High Precision Ball/Radius PaNacea

**Features PaNacea Coating**

- PaNacea coating (PN coating):  
lower frictional coefficient, high heat-resistance

**PaNacea Coating:**  
high adhesion and wear resistance

PaNacea (AlCrN)  
1000°C/540 min.  
Oxidation Layer  
2 μm

Oxidation temp. °C vs Coating Hardness (Hv)

Friction coefficient vs Coating Hardness (Hv)

Theoretical cusp height in end milling (μm)

Die theoretische Rautiefe in der Fräsbearbeitung (μm)

Cresta teorica di fresatura (μm)

Cálculo de altura de la cresta teórica en fresado (mm)

Hauteur de crête théorique en fraisage (μm)

Altura da crista teórica em fresagem (μm)

Feed pitch and cusp height

a<sub>e</sub> (mm) Zeilensprung

Passo di avanzamento / Cresta

Paso y altura de cresta

Pas et hauteur de crête

Passo lateral x/ Altura da crista

$$h = R - \sqrt{\frac{(2 \cdot R)^2 - a_{p,e}^2}{4}}$$

$$h = \frac{a_e^2}{8 \cdot R}$$

**NOTA**

1. Usate centri di lavoro più precisi e rigidi possibile.
2. Le condizioni di taglio indicate sono valori generali. Per ottimizzare il Vostro processo di lavoro analizzate i parametri in funzione delle geometrie che dovete generare e del centro di lavoro a disposizione.
3. In caso la disponibilità dei giri mandrino sia inferiore a quella raccomandata ricordarsi di abbassare della stessa percentuale anche la velocità di avanzamento

**NOTE**

1. Use a highly rigid and accurate machine as available.
2. The cutting conditions in the above table are a general guide. For your actual work piece adjust the conditions according to the machining shape, purpose and the machine tool to be used.
3. If your available rpm is lower than in our recommendation, adjust the feed rate to the same ratio with the rpm.

**OBSERVACIONES**

1. Utilizar la máquina más rígida y precisa posible.
2. Las condiciones de corte de la tabla son una orientación general. Para un trabajo específico hay que ajustar las condiciones en función de la geometría de la pieza, el resultado esperado y el tipo de máquina que vamos a utilizar.
3. Si las rpm disponibles son menores a las recomendadas, reducir también el avance en la misma proporción.
- 4.

**ANMERKUNG**

1. Nutzen Sie für die Bearbeitungen die Maschine mit der höchsten Genauigkeit und der höchsten Steifigkeit.
2. Die in der Tabelle angegebenen Schnittbedingungen stellen eine generelle Empfehlung dar. Die Werte sollten immer an die jeweilige Bearbeitung, deren Form und die verwendete Maschine angepasst werden.
3. Sollte die Ihnen verfügbare Drehzahl niedriger als der in der Tabelle angegebene Wert sein, sollte der Vorschub im gleichen Verhältnis reduziert werden.

**NOTA**

1. Use a máquina disponível mais rígida e precisa possível.
2. As condições de corte no quadro acima são uma informação geral. Para o seu trabalho real ajuste as condições de acordo com a forma da peça, máquina e ferramenta a ser usada para objectivo pretendido.
3. Se a sua rpm disponível é menor do que o recomendado, ajuste o avanço para a mesma relação com a rpm.

		a <sub>e</sub> (mm)							
		0.05	0.075	0.1	0.15	0.2	0.3	0.4	0.5
R (mm)	0.5	0.63	1.41	2.51	5.66	10.10	23.03	41.74	66.99
	1.0	0.31	0.70	1.25	2.82	5.01	11.31	20.20	31.75
	2.0	0.16	0.35	0.63	1.41	2.50	5.63	10.03	15.69
	3.0	0.10	0.23	0.42	0.94	1.67	3.75	6.67	10.43
	4.0	0.08	0.18	0.31	0.70	1.25	2.81	5.00	7.82
	5.0	0.06	0.14	0.25	0.56	1.00	2.25	4.00	6.25
	6.0	0.05	0.12	0.21	0.47	0.83	1.88	3.33	5.21
	8.0	0.04	0.09	0.16	0.35	0.63	1.41	2.50	3.91
	10.0	0.03	0.07	0.13	0.28	0.50	1.13	2.0	3.13

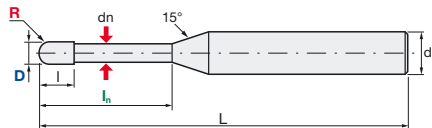


Ultra Micro Grain Solid Carbide End Mill

EPHPB-PN | Epoch High Precision Ball PaNacea

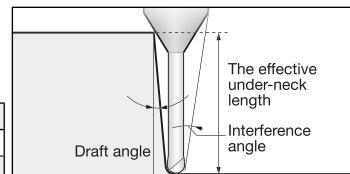


A



<b>Carbide</b>	<b>PN</b>	<b>Rake Angle</b>
Micro Grain	PaNacea Coating	Positive

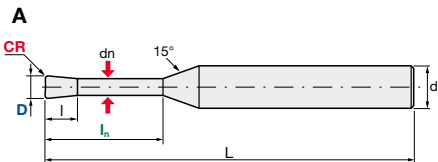
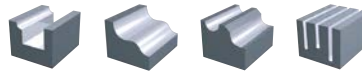
Helix angle	30°
R	± 0.003 mm
d	h4



Size											Actual Effective Length in Incline angles				
ID Code	Item Code	Z	D	R	In	l	dn	L <sub>s</sub>	L	d	0.5°	1°	1.5°	2°	3°
EP1462	EPHPB-2001-0.2-PN	2	0.1	0.05	0.2	0.08	0.08	33.8	45	6	0.24	0.25	0.25	0.26	0.28
EP1463	EPHPB-2001-0.3-PN				0.3						0.34	0.35	0.36	0.38	0.40
EP1464	EPHPB-2001-0.5-PN				0.5						0.55	0.57	0.59	0.61	0.65
EP1465	EPHPB-2002-0.5-PN		0.2	0.1	0.5	0.15	0.17	38.1	37.6		1.08	1.12	1.15	1.19	1.28
EP1466	EPHPB-2002-1-PN				1						1.60	1.65	1.71	1.77	1.91
EP1467	EPHPB-2002-1.5-PN				1.5						1.08	1.11	1.15	1.19	1.27
EP1468	EPHPB-2003-0.5-PN		0.3	0.15	0.5	0.25	0.27	38.8	38.3		0.56	0.58	0.60	0.61	0.65
EP1469	EPHPB-2003-1-PN				1						1.08	1.11	1.15	1.19	1.27
EP1470	EPHPB-2004-1-PN				1						1.08	1.11	1.14	1.18	1.26
EP1471	EPHPB-2004-2-PN		0.4	0.2	2	0.3	0.37	37.5	36.5		2.11	2.18	2.25	2.33	2.50
EP1472	EPHPB-2004-3-PN				3						3.15	3.25	3.36	3.48	3.75
EP1473	EPHPB-2005-1-PN				1						1.08	1.11	1.14	1.17	1.25
EP1474	EPHPB-2005-2-PN	0.5	0.25	2	0.35	0.47	37.7	36.7	2.11	2.18	2.25	2.32	2.49		
EP1475	EPHPB-2005-3-PN			3					3.15	3.25	3.36	3.47	3.73		
EP1476	EPHPB-2005-4-PN			4					4.18	4.32	4.46	4.62	4.98		
EP1477	EPHPB-2005-6-PN			6					6.25	6.46	6.68	6.92	7.46		
EP1478	EPHPB-2006-2-PN			2					2.11	2.17	2.24	2.31	2.48		
EP1479	EPHPB-2006-3-PN	0.6	0.3	3	0.4	0.57	36.9	35.9	3.14	3.24	3.35	3.46	3.72		
EP1480	EPHPB-2006-4-PN			4					4.18	4.31	4.46	4.61	4.97		
EP1481	EPHPB-2006-6-PN			6					6.24	6.45	6.67	6.91	7.45		
EP1482	EPHPB-2006-8-PN	0.8	0.4	8	0.5	0.77	31.9	38.2	8.31	8.59	8.89	9.21	9.94		
EP1483	EPHPB-2008-2-PN			2					2.11	2.17	2.23	2.30	2.46		
EP1484	EPHPB-2008-4-PN			4					4.17	4.31	4.45	4.60	4.94		
EP1485	EPHPB-2008-6-PN			6					6.24	6.45	6.66	6.90	7.43		
EP1486	EPHPB-2008-8-PN			8					8.31	8.58	8.88	9.20	9.92		
EP1487	EPHPB-2008-10-PN	10	10.38	10.72	11.10	11.50	12.40								
EP1488	EPHPB-2010-2-PN	1	0.5	2	0.8	0.96	38.6	36.6	2.12	2.18	2.24	2.31	2.46		
EP1489	EPHPB-2010-4-PN			4					4.19	4.32	4.46	4.61	4.94		
EP1490	EPHPB-2010-6-PN			6					6.26	6.46	6.67	6.91	7.43		
EP1491	EPHPB-2010-8-PN			8					8.32	8.60	8.89	9.21	9.91		
EP1492	EPHPB-2010-10-PN			10					10.39	10.74	11.11	11.51	12.40		
EP1493	EPHPB-2010-12-PN	12	12.46	12.88	13.32	13.81	14.89								
EP1494	EPHPB-2015-4-PN	1.5	0.75	4	1.35	1.45	37.5	35.5	4.20	4.32	4.45	4.59	4.91		
EP1495	EPHPB-2015-8-PN			8					8.34	8.60	8.88	9.19	9.88		
EP1496	EPHPB-2015-12-PN			12					12.47	12.88	13.32	13.79	14.85		
EP1497	EPHPB-2015-16-PN			16					16.60	17.16	17.75	18.39	19.82		
EP1498	EPHPB-2015-20-PN			20					20.74	21.44	22.18	22.99	24.80		
EP1499	EPHPB-2020-4-PN	2	1	4	1.7	1.95	38.4	36.4	4.19	4.30	4.42	4.55	4.85		
EP1500	EPHPB-2020-6-PN			6					6.26	6.44	6.64	6.85	7.33		
EP1501	EPHPB-2020-8-PN			8					8.33	8.58	8.86	9.15	9.82		
EP1502	EPHPB-2020-10-PN			10					10.39	10.72	11.07	11.45	12.31		
EP1503	EPHPB-2020-12-PN			12					12.46	12.86	13.29	13.75	14.79		
EP1504	EPHPB-2020-16-PN	16	16.60	17.14	17.72	18.35	19.76								
EP1505	EPHPB-2020-20-PN	20	20.73	21.42	22.16	22.95	24.74								
EP1506	EPHPB-2020-25-PN	25	25.90	26.77	27.70	28.70	30.95								
EP1507	EPHPB-2030-8-PN	3	1.5	8	2.5	2.9	41.2	39.2	8.41	8.65	8.91	9.19	9.82		
EP1508	EPHPB-2030-12-PN			12					12.54	12.93	13.34	13.79	14.79		
EP1509	EPHPB-2030-16-PN			16					16.68	17.21	17.77	18.39	19.76		
EP1510	EPHPB-2030-20-PN			20					20.81	21.48	22.21	22.99	24.73		
EP1511	EPHPB-2030-25-PN			25					25.98	26.83	27.75	28.74	-		
EP1512	EPHPB-2040-10-PN	4	2	10	3	3.9	41.1	36.1	10.46	10.75	11.07	11.41	12.18		
EP1513	EPHPB-2040-20-PN			20					20.79	21.45	22.15	22.91	-		
EP1514	EPHPB-2040-30-PN			30					31.13	32.15	33.24	-	-		
EP1515	EPHPB-2040-40-PN			40					41.47	42.84	-	-	-		

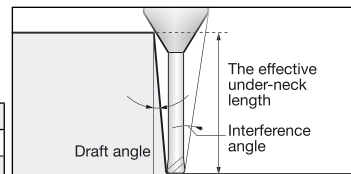
Ultra Micro Grain Solid Carbide End Mill

EPHPR-PN | Epoch High Precision Radius PaNacea



<b>Carbide</b>	<b>PN</b>	<b>Rake Angle</b>
Micro Grain	PaNacea Coating	Positive

Helix angle	30°
CR	± 0.003 mm
d	h4



Size											Actual Effective Length in Incline angles				
ID Code	Item Code	Z	D	CR	ln	l	dn	L <sub>s</sub>	L	d	0.5°	1°	1.5°	2°	3°
EP1516	EPHPR-2002-0.5-005-PN	2	0.2	0.05	0.5	0.15	0.17	38.6	50	6	0.57	0.59	0.61	0.63	0.67
EP1517	EPHPR-2002-1-005-PN				1			38.1			1.08	1.12	1.16	1.20	1.30
EP1518	EPHPR-2003-1-005-PN		0.3		0.25	0.27	2	38.3			2.12	2.19	2.27	2.35	2.54
EP1519	EPHPR-2003-2-005-PN						1	37.7			1.08	1.12	1.15	1.19	1.28
EP1520	EPHPR-2004-1-01-PN		0.4		0.3	0.37	2	37.5			2.12	2.19	2.26	2.34	2.53
EP1521	EPHPR-2004-2-01-PN						1	38.7			1.08	1.12	1.15	1.19	1.28
EP1522	EPHPR-2005-1-01-PN		0.5	0.35	0.47	2	37.7	2.12	2.19		2.26	2.34	2.53		
EP1523	EPHPR-2005-2-01-PN					3	36.7	3.15	3.26		3.37	3.49	3.77		
EP1524	EPHPR-2005-3-01-PN					2	37.9	2.12	2.19		2.26	2.34	2.53		
EP1525	EPHPR-2006-2-01-PN		0.6	0.4	0.57	4	35.9	4.18	4.33		4.48	4.64	5.01		
EP1526	EPHPR-2006-4-01-PN					6	33.9	6.25	6.47		6.70	6.94	7.50		
EP1527	EPHPR-2006-6-01-PN					2	38.2	2.12	2.19		2.26	2.34	2.53		
EP1528	EPHPR-2008-2-01-PN		0.8	0.5	0.77	4	36.2	4.18	4.33		4.48	4.64	5.01		
EP1529	EPHPR-2008-4-01-PN					6	34.2	6.25	6.47		6.70	6.94	7.50		
EP1530	EPHPR-2008-6-01-PN					2	38.6	2.15	2.22		2.29	2.37	2.55		
EP1531	EPHPR-2010-2-02-PN		1	0.8	0.95	4	36.6	4.22	4.36		4.51	4.67	5.04		
EP1532	EPHPR-2010-4-02-PN					6	34.6	6.29	6.50		6.73	6.97	7.52		
EP1533	EPHPR-2010-6-02-PN					8	32.6	8.35	8.64		8.94	9.27	10.01		
EP1534	EPHPR-2010-8-02-PN					10	30.6	10.42	10.78		11.16	11.57	12.50		
EP1535	EPHPR-2010-10-02-PN					12	33.6	12.49	12.92		13.38	13.87	14.98		
EP1536	EPHPR-2010-12-02-PN					4	37.5	4.22	4.36		4.51	4.67	5.04		
EP1537	EPHPR-2015-4-02-PN		1.5	1.35	1.45	8	33.5	8.35	8.64		8.94	9.27	10.01		
EP1538	EPHPR-2015-8-02-PN					12	34.5	12.49	12.92		13.38	13.87	14.98		
EP1539	EPHPR-2015-12-02-PN					16	30.5	16.62	17.20		17.81	18.47	19.95		
EP1540	EPHPR-2015-16-02-PN		2	1.7	1.95	4	38.4	4.22	4.36		4.51	4.67	5.04		
EP1541	EPHPR-2020-4-02-PN					8	34.4	8.35	8.64		8.94	9.27	10.01		
EP1542	EPHPR-2020-8-02-PN					12	35.4	12.49	12.92		13.38	13.87	14.98		
EP1543	EPHPR-2020-12-02-PN					16	31.4	16.62	17.20		17.81	18.47	19.95		
EP1544	EPHPR-2020-16-02-PN					20	32.4	20.76	21.47		22.24	23.07	24.93		
EP1545	EPHPR-2020-20-02-PN					8	34.4	8.34	8.62		8.91	9.23	9.94		
EP1546	EPHPR-2020-8-05-PN		0.5	1.7	1.95	12	35.4	12.48	12.90		13.34	13.83	14.91		
EP1547	EPHPR-2020-12-05-PN					16	31.4	16.61	17.18		17.78	18.43	19.88		
EP1548	EPHPR-2020-16-05-PN					20	32.4	20.75	21.45		22.21	23.03	24.86		
EP1549	EPHPR-2020-20-05-PN		3	2.5	2.9	8	41.2	8.45	8.74		9.05	9.38	10.12		
EP1550	EPHPR-2030-8-02-PN					12	42.2	12.59	13.02		13.48	13.98	15.10		
EP1551	EPHPR-2030-12-02-PN					16	38.2	16.72	17.30		17.91	18.58	20.07		
EP1552	EPHPR-2030-16-02-PN	20				39.2	20.85	21.57	22.35	23.18	25.04				
EP1553	EPHPR-2030-20-02-PN	30				39.2	31.19	32.27	33.43	34.68	-				
EP1554	EPHPR-2030-30-02-PN	8				41.2	8.44	8.72	9.01	9.33	10.05				
EP1555	EPHPR-2030-8-05-PN	0.5	2.5	2.9	12	42.2	12.58	13.00	13.45	13.93	15.03				
EP1556	EPHPR-2030-12-05-PN				16	38.2	16.71	17.27	17.88	18.53	20.00				
EP1557	EPHPR-2030-16-05-PN				20	39.2	20.84	21.55	22.31	23.13	24.97				
EP1558	EPHPR-2030-20-05-PN	4	3.5	3.8	30	39.2	31.18	32.25	33.40	34.63	-				
EP1559	EPHPR-2030-30-05-PN				12	43.9	12.77	13.20	13.65	14.15	15.26				
EP1560	EPHPR-2040-12-05-PN				24	41.9	25.17	26.03	26.95	27.95	-				
EP1561	EPHPR-2040-24-05-PN	0.5	3.5	3.8	36	39.9	37.58	38.87	-	-	-				
EP1562	EPHPR-2040-36-05-PN														

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