

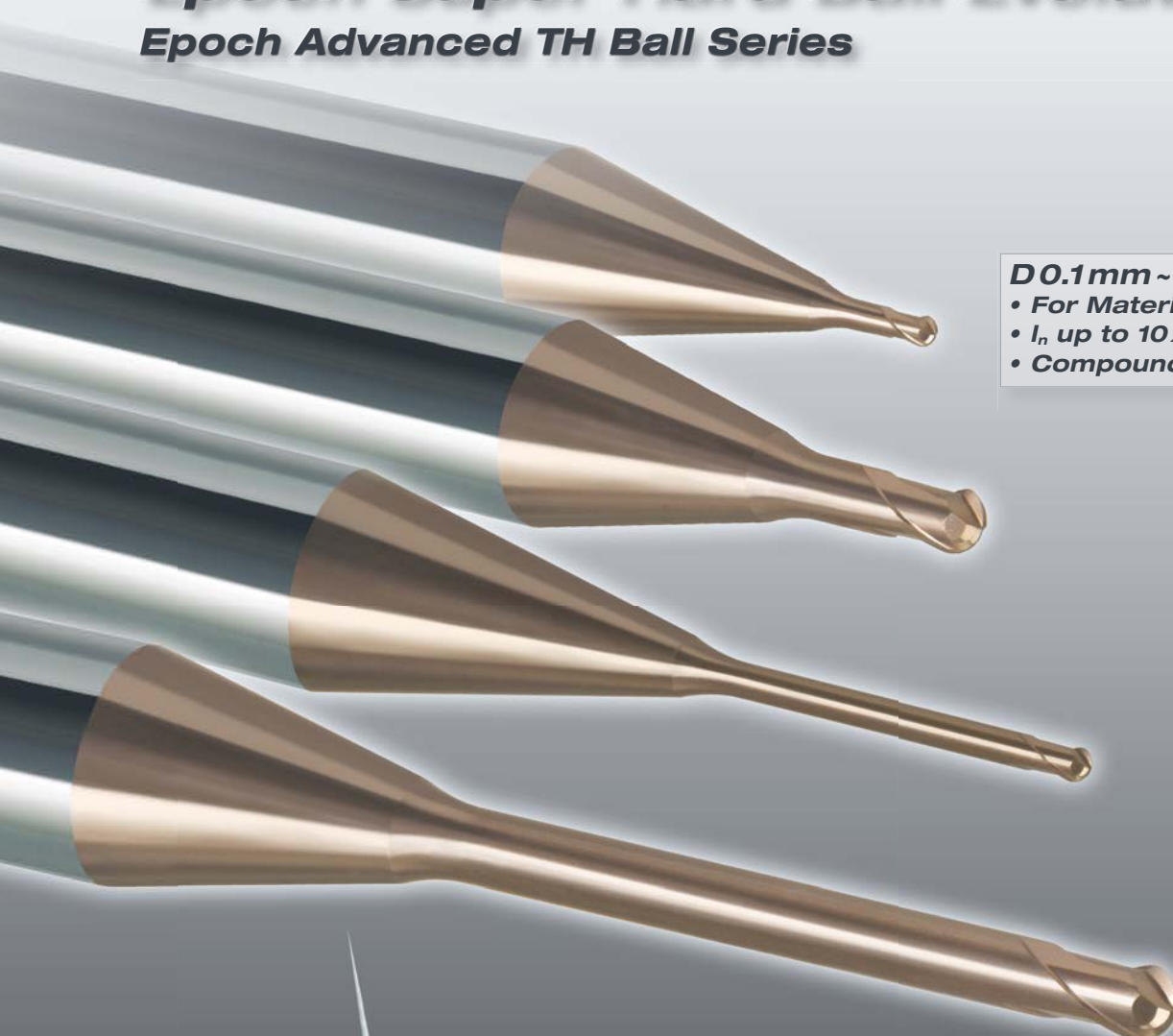
EPSBE-TH

Epoch Super Hard Ball Evolution

Epoch Advanced TH Ball Series

D0.1mm ~ D2mm

- For Materials $\leq 72\text{HRC}$
- l_n up to $10 \times D$
- Compound Neck Shape



MICRO

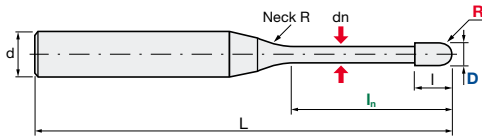
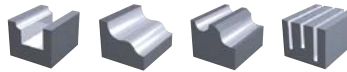
Micro Grain Carbide End Mills · Nano PVD Coated

μm

www.moldino.eu

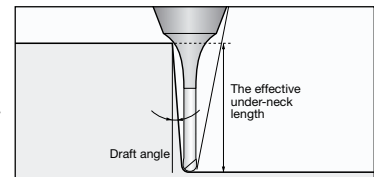
EPSBE | Epoch Super Hard Ball Evolution

| | | | | |
|----------------------------|----------------------------|-----------------------|------------------|--------------------------|
| V max High Speed | W Semi-Finishing | W Finishing | HRC 72 | No. of Teeth 2 |
|----------------------------|----------------------------|-----------------------|------------------|--------------------------|



| | | |
|-------------------------------|----------------------------------|-------------------------------|
| Carbide Micro Grain | TH60+ Nano-PVD Coating | Rake Angle Negative |
|-------------------------------|----------------------------------|-------------------------------|

| | | |
|-------------|------------------------|-----------|
| Helix Angle | R Tol. [mm] | d Tol. |
| 30° | +0.003 / -0.007 | h4 |

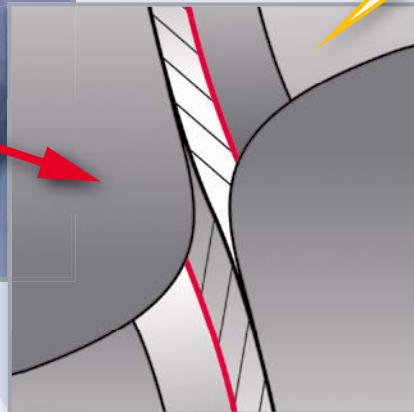
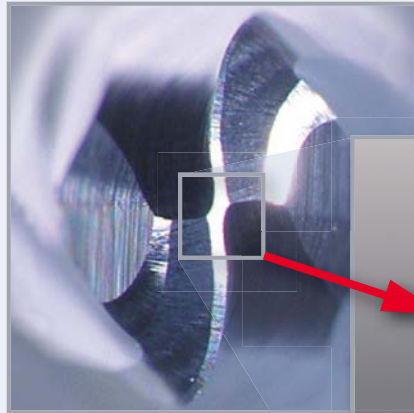


| Size | | | | | | | | | | | Interference angle | Effective Underneck Using Length by Draft Angle | | | | |
|---------|--------------------|----|-----|------|----------------|-------|-------|-------|------|--------|--------------------|---|-------|-------|-------|------|
| ID Code | Item Code | Z | D | R | I _n | I | dn | L | d | Neck R | | 0.5° | 1° | 1.5° | 2° | 3° |
| EP864 | EPSBE-2001-0.15-TH | 2 | 0.1 | 0.05 | 0.15 | 0.08 | 0.08 | 45 | 4 | 1 | 11.82 | 0.30 | 0.32 | 0.33 | 0.35 | 0.38 |
| EP865 | EPSBE-2001-0.3-TH | | | | 0.3 | | | | | | 11.64 | 0.46 | 0.48 | 0.50 | 0.52 | 0.57 |
| EP866 | EPSBE-2001-0.75-TH | | | | 0.75 | | | | | | 11.12 | 0.93 | 0.97 | 1.01 | 1.04 | 1.10 |
| EP867 | EPSBE-2002-0.3-TH | | 0.2 | 0.1 | 0.3 | 0.15 | 0.17 | | | | 11.66 | 0.49 | 0.50 | 0.52 | 0.54 | 0.58 |
| EP868 | EPSBE-2002-0.6-TH | | | | 0.6 | | | | | | 11.30 | 0.80 | 0.83 | 0.86 | 0.88 | 0.93 |
| EP870 | EPSBE-2002-1-TH | | | | 1 | | | | | | 10.86 | 1.22 | 1.26 | 1.30 | 1.33 | 1.39 |
| EP869 | EPSBE-2002-1.5-TH | | | | 1.5 | | | | | | 10.35 | 1.74 | 1.79 | 1.84 | 1.88 | 2.05 |
| EP871 | EPSBE-2002-2-TH | | | | 2 | | | | | | 9.88 | 2.25 | 2.32 | 2.37 | 2.45 | 2.71 |
| EP872 | EPSBE-2003-0.45-TH | | 0.3 | 0.15 | 0.45 | 0.25 | 0.27 | | | 11.53 | 0.73 | 0.77 | 0.80 | 0.84 | 0.91 | |
| EP873 | EPSBE-2003-0.9-TH | | | | 0.9 | | | | | 11.00 | 1.21 | 1.27 | 1.32 | 1.37 | 1.47 | |
| EP874 | EPSBE-2003-1.5-TH | | | | 1.5 | | | | | 10.36 | 1.84 | 1.92 | 1.99 | 2.06 | 2.18 | |
| EP875 | EPSBE-2003-2-TH | | | | 2 | | | | | 9.88 | 2.36 | 2.46 | 2.55 | 2.62 | 2.76 | |
| EP876 | EPSBE-2003-3-TH | | | | 3 | | | 9.05 | 3.41 | 3.53 | 3.64 | 3.73 | 4.02 | | | |
| EP877 | EPSBE-2004-0.6-TH | | 0.4 | 0.2 | 0.6 | 0.3 | 0.37 | 11.39 | 0.88 | 0.93 | 0.97 | 1.01 | 1.09 | | | |
| EP878 | EPSBE-2004-1.2-TH | | | | 1.2 | | | 10.69 | 1.52 | 1.59 | 1.65 | 1.71 | 1.82 | | | |
| EP879 | EPSBE-2004-2-TH | | | | 2 | | | 9.88 | 2.36 | 2.46 | 2.54 | 2.62 | 2.75 | | | |
| EP881 | EPSBE-2004-3-TH | | | | 3 | | | 9.03 | 3.41 | 3.53 | 3.63 | 3.73 | 4.01 | | | |
| EP880 | EPSBE-2004-3.5-TH | | | | 3.5 | | | 8.65 | 3.93 | 4.06 | 4.18 | 4.27 | 4.67 | | | |
| EP882 | EPSBE-2004-4-TH | | | | 4 | | | 8.30 | 4.45 | 4.59 | 4.71 | 4.83 | 5.33 | | | |
| EP883 | EPSBE-2005-0.75-TH | | 0.5 | 0.25 | 0.75 | 0.35 | 0.47 | 11.25 | 1.04 | 1.09 | 1.13 | 1.18 | 1.27 | | | |
| EP884 | EPSBE-2005-1.5-TH | | | | 1.5 | | | 10.39 | 1.83 | 1.91 | 1.98 | 2.05 | 2.17 | | | |
| EP885 | EPSBE-2005-3-TH | | | | 3 | | | 9.00 | 3.41 | 3.53 | 3.63 | 3.72 | 3.99 | | | |
| EP886 | EPSBE-2005-5-TH | | | | 5 | | | 7.64 | 5.48 | 5.65 | 5.78 | 6.01 | 6.65 | | | |
| EP887 | EPSBE-2006-0.9-TH | 2 | 0.6 | 0.3 | 0.9 | 0.4 | 0.57 | 4 | 4 | 11.10 | 1.33 | 1.42 | 1.51 | 1.59 | 1.75 | |
| EP888 | EPSBE-2006-1.8-TH | | | | 1.8 | | | | | 10.08 | 2.30 | 2.44 | 2.56 | 2.68 | 2.88 | |
| EP889 | EPSBE-2006-3-TH | | | | 3 | | | | | 8.98 | 3.58 | 3.77 | 3.93 | 4.07 | 4.32 | |
| EP890 | EPSBE-2006-5-TH | | | | 5 | | | | | 7.59 | 5.70 | 5.94 | 6.14 | 6.32 | 6.63 | |
| EP891 | EPSBE-2006-6-TH | | 0.8 | 0.4 | 6 | | | | | 7.04 | 6.75 | 7.02 | 7.23 | 7.42 | 7.96 | |
| EP892 | EPSBE-2008-1.2-TH | | | | 1.2 | 0.5 | 0.77 | | | 10.79 | 1.65 | 1.75 | 1.84 | 1.93 | 2.11 | |
| EP893 | EPSBE-2008-2.4-TH | | | | 2.4 | | | | | 9.47 | 2.94 | 3.10 | 3.24 | 3.36 | 3.59 | |
| EP894 | EPSBE-2010-1.5-TH | | | | 1.5 | | | | | 11.01 | 2.01 | 2.12 | 2.21 | 2.31 | 2.49 | |
| EP896 | EPSBE-2010-3-TH | | 1 | 0.5 | 3 | | | | | 9.88 | 3.61 | 3.78 | 3.93 | 4.06 | 4.30 | |
| EP897 | EPSBE-2010-6-TH | | | | 6 | | | | | 8.20 | 6.76 | 7.02 | 7.23 | 7.42 | 7.92 | |
| EP898 | EPSBE-2010-8-TH | | | | 8 | | | | | 7.36 | 8.85 | 9.15 | 9.40 | 9.61 | 10.58 | |
| EP895 | EPSBE-2010-10-TH | | | | 10 | | | | | 6.68 | 10.93 | 11.27 | 11.54 | 11.98 | 13.23 | |
| EP899 | EPSBE-2012-1.8-TH | 2 | 1.2 | 0.6 | 1.8 | 1.1 | 1.15 | 6 | 4 | 10.78 | 2.36 | 2.47 | 2.58 | 2.68 | 2.86 | |
| EP900 | EPSBE-2012-3.6-TH | | | | 3.6 | | | | | 9.46 | 4.27 | 4.45 | 4.61 | 4.75 | 5.01 | |
| EP902 | EPSBE-2015-2.25-TH | | | | 2.25 | | | | | 10.43 | 2.87 | 2.99 | 3.10 | 3.20 | 3.40 | |
| EP903 | EPSBE-2015-4.5-TH | | | | 4.5 | | | | | 8.84 | 5.24 | 5.43 | 5.61 | 5.76 | 6.03 | |
| EP904 | EPSBE-2015-8-TH | | 1.5 | 0.75 | 8 | 1.35 | 1.44 | | | 7.14 | 8.89 | 9.17 | 9.41 | 9.61 | 10.56 | |
| EP901 | EPSBE-2015-12-TH | | | | 12 | | | | | 5.85 | 13.03 | 13.39 | 13.74 | 14.38 | 15.87 | |
| EP908 | EPSBE-2020-3-TH | | 2 | 1 | 3 | | | | | 9.79 | 3.71 | 3.84 | 3.96 | 4.07 | 4.29 | |
| EP909 | EPSBE-2020-6-TH | | | | 6 | | | | | 7.81 | 6.84 | 7.07 | 7.26 | 7.43 | 7.89 | |
| EP910 | EPSBE-2020-8-TH | | | | 8 | | | | | 6.88 | 8.92 | 9.19 | 9.42 | 9.61 | 10.54 | |
| EP905 | EPSBE-2020-12-TH | | | | 12 | | | | | 5.55 | 13.06 | 13.41 | 13.76 | 14.39 | 15.85 | |
| EP906 | EPSBE-2020-16-TH | 16 | | | 4.65 | 17.19 | 17.59 | | | 18.32 | 19.17 | 21.16 | | | | |
| EP907 | EPSBE-2020-20-TH | 20 | | | 4.01 | 21.30 | 21.90 | | | 22.88 | 23.96 | 26.47 | | | | |

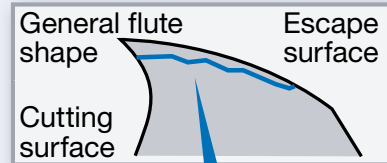
EPSBE | Epoch Super Hard Ball Evolution

THE EFFECT OF FLUTE SHAPE, MATERIAL AND COATING:

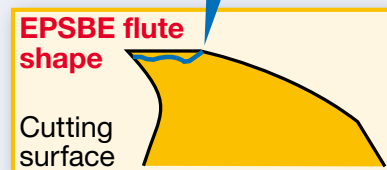
DOUBLE-FACE EFFECT OF NEW SHAPE PREVENTS SHAPE FROM DETERIORATING



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



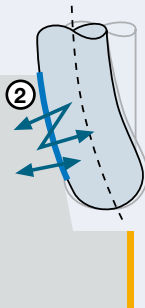
Direction of wear progress



Advanced Technology – Back Draft Effect

Standard

① Conventional



ADVANCED BY BACK DRAFT

1. Conventional:

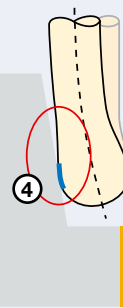
- More contact between cutter and work piece due to deflection
- 2. More contact between cutter and work piece stimulate the vibration characteristic

3. MOLDINO Tool Technology: Featured with the MOLDINO Tool “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

EPSBE-ATH

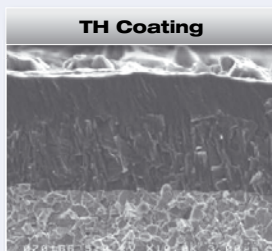
③ MOLDINO Tool Technology



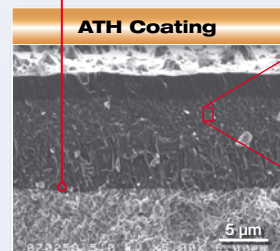
ATH (Advanced TH) Coating – Characteristics

- Excellent adhesion strength

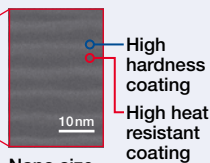
- Oxidation temperature: 1200°C
- Coating Hardness: 3800Hv
- Higher temperature resistance and wear resistance



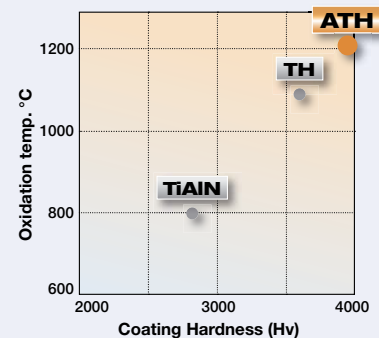
TH Coating (Conventional)



ATH Coating for hardened steel (45HRC-65HRC)

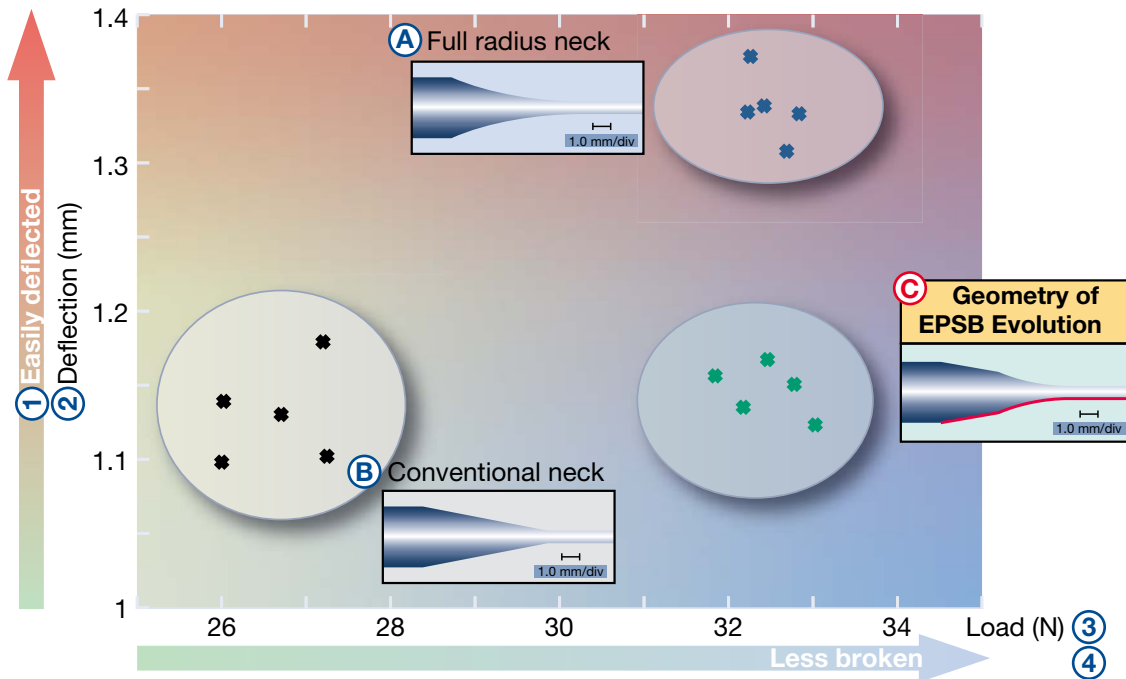


Nano size composite with atomic structure level



EPSBE | Epoch Super Hard Ball Evolution

COMPARISON OF BREAKAGE IN NECK GEOMETRIES



VERGLEICH DER BIEGEBRUCHFESTIGKEIT BEI UNTERSCHIEDLICHEN SCHAFT-GEOMETRIEN

- 1) Höhere Biegeanfälligkeit
- 2) Biegung (mm)
- 3) Kraft (N)
- 4) Geringere Bruchanfälligkeit
- A** Voll-Radius Geometrie
- B** Konventionelle Geometrie
- C** Geometrie der EPSB Evolution-Serie

COMPARAZIONE TRA GEOMETRIE DI RASTREMAZIONE E ROTTURA

- 1) Alta resistenza alla flessione
- 2) Flessione
- 3) Carico (N)
- 4) Alta resistenza alla rottura
- A** Rastremazione raggiata
- B** Rastremazione convenzionale
- C** Geometria EPSB Evolution

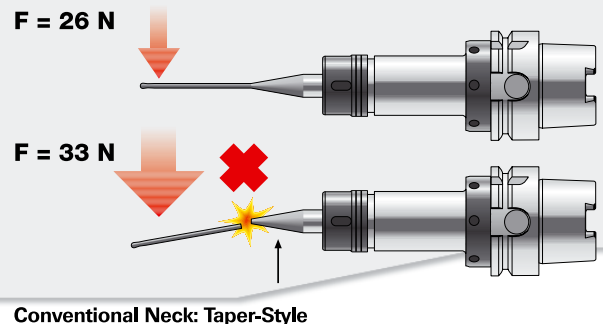
COMPARACIÓN DE LA ROTURA SEGÚN LA GEOMETRÍA DEL CUELLO

- 1) Flexa con facilidad
- 2) Flexión (mm)
- 3) Carga (N)
- 4) Menor rotura
- A** Cuello de radio
- B** Cuello convencional
- C** Geometría EPSB Evolution

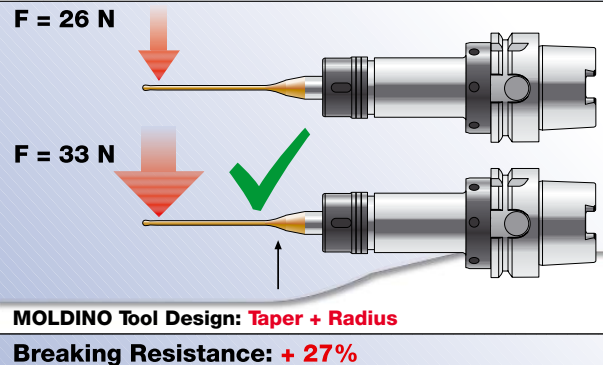
COMPARAISON DE BRIS DANS LA GÉOMÉTRIE DU DÉGAGEMENT

- 1) Facilement flexible
- 2) Battement (mm)
- 3) Charge (N)
- 4) Moins de bris
- A** Rayon renforcé
- B** Dégagement conventionnelle
- C** Géométrie EPSB Evolution

Conventional Neck Geometry



Joint Neck Geometry




COMPARAÇÃO DE ROTURA NA GEOMETRIA DE RESPIGA

- 1) Facilidade de flexão
- 2) Flexão (mm)
- 3) Carga (N)
- 4) Menor rotura
- A** Respiga de raio completo
- B** Respiga convencional
- C** Geometria EPSB Evolution

EPSBE | Recommended Cutting Conditions


Theoretical cusp height in end milling (µm)

 Die theoretische Rautiefe in der Fräsbearbeitung (µm)

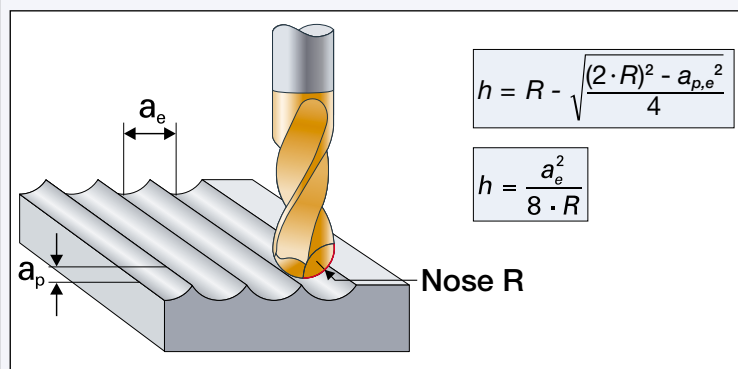
 Cálculo de altura de la cresta teórica en fresado (µm)

 Cresta teórica de fresado (µm)


 Hauteur de crête théorique en fraisage (µm)


 Altura teórica da crista, em fresagem de acabamento (µm)


| | | a _e (Pick feed) mm | | | | | | | | | | | |
|----------------|------|-------------------------------|-------|-------|------|------|------|------|-------|------|-------|-------|-------|
| | | 0.005 | 0.01 | 0.015 | 0.02 | 0.03 | 0.04 | 0.05 | 0.075 | 0.1 | 0.15 | 0.2 | 0.3 |
| Nose R (mm) | 0.05 | 0.063 | 0.251 | 0.57 | 1.01 | 2.30 | 4.17 | - | - | - | - | - | - |
| | 0.1 | 0.031 | 0.125 | 0.28 | 0.50 | 1.13 | 2.02 | 3.18 | - | - | - | - | - |
| | 0.15 | 0.021 | 0.083 | 0.19 | 0.33 | 0.75 | 1.34 | 2.01 | 4.76 | 8.58 | - | - | - |
| | 0.2 | 0.016 | 0.063 | 0.14 | 0.25 | 0.56 | 1.00 | 1.57 | 3.55 | 6.35 | 14.60 | - | - |
| | 0.25 | 0.013 | 0.050 | 0.11 | 0.20 | 0.45 | 0.80 | 1.25 | 2.83 | 5.05 | 11.52 | 20.87 | - |
| | 0.3 | 0.011 | 0.042 | 0.09 | 0.17 | 0.38 | 0.67 | 1.04 | 2.35 | 4.20 | 9.53 | 17.18 | - |
| | 0.4 | 0.008 | 0.031 | 0.07 | 0.13 | 0.28 | 0.50 | 0.78 | 1.76 | 3.14 | 7.09 | 12.70 | - |
| | 0.5 | 0.006 | 0.025 | 0.06 | 0.10 | 0.23 | 0.40 | 0.63 | 1.41 | 2.51 | 5.66 | 10.10 | - |
| | 0.6 | 0.005 | 0.021 | 0.05 | 0.08 | 0.19 | 0.33 | 0.52 | 1.17 | 2.09 | 4.71 | 8.39 | 19.05 |
| | 0.75 | 0.004 | 0.017 | 0.04 | 0.07 | 0.15 | 0.27 | 0.42 | 0.94 | 1.67 | 3.76 | 6.70 | 15.15 |
| | 1 | 0.003 | 0.013 | 0.03 | 0.05 | 0.11 | 0.20 | 0.31 | 0.70 | 1.25 | 2.82 | 5.01 | 11.31 |





Feed pitch and cusp height

 a_e (mm) Zeilensprung

 Paso y altura de cresta

 Relación Paso / Cresta

 Pas et hauteur de crête

 Passo e altura da crista

NOTE

1. Use a highly rigid and accurate machine as available.
2. The radial step over (a_e, pick feed) in the above table is for general information. Please select the conditions to suit your actual surface finish requirements, according to the cusp height stated.
3. 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.
4. If the rpm speed available is lower, adjust the feed rate to the same ratio with the rpm.

ANMERKUNG

1. Nutzen Sie für die Bearbeitungen die Maschine mit der höchsten Genauigkeit und der höchsten Steifigkeit.
2. Der in der Tabelle angegebene Zeilensprung ist eine generelle Empfehlung. Um die jeweiligen Anforderungen an die Oberflächengüte zu erreichen wählen Sie die Bedingungen entsprechend der angegebenen Rautiefe.
3. 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.
4. Sollte die Ihnen verfügbare Drehzahl niedriger als der in der Tabelle angegebene Wert sein, sollte der Vorschub im gleichen Verhältnis reduziert werden.

NOTA

1. Usate centri di lavoro più precisi e rigidi possibile.
2. Gli indicazioni sul passo laterale (a_e) espresso nella tabella sopra riportata sono valori generali. Per ottimizzare il processo di lavoro usate le relazioni cresta/raggio più vicine alle Vostre esigenze.
3. 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.
4. Se i giri del mandrino della macchina disponibili sono più bassi rispetto al valore espresso regolate l'avanzamento con lo stesso rapporto.

OBSERVACIONES

1. Utilizar la máquina más rígida y precisa posible.
2. El paso radial (a_e, paso) de la tabla es una información general. Hay que utilizar el paso adecuado en función del acabado superficial que se pretenda obtener según la rugosidad máxima prevista (Altura de cresta).
3. 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.
4. Si las rpm de la maquina son inferiores, hay que ajustar el avance en proporción a las mismas.

NOTE

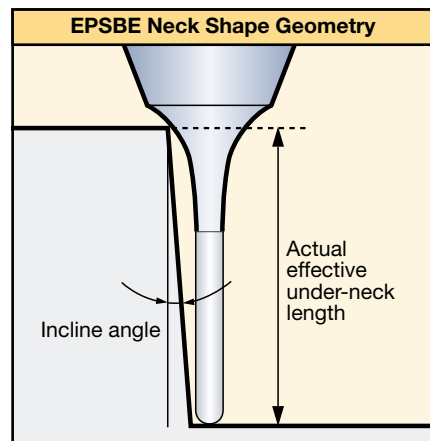
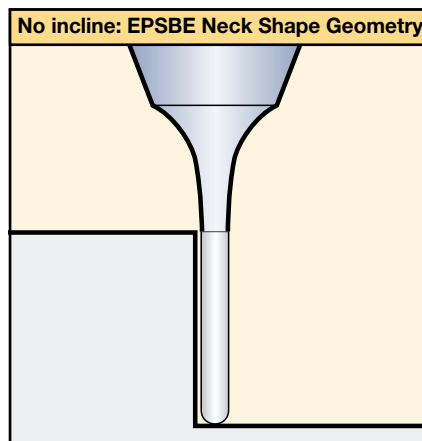
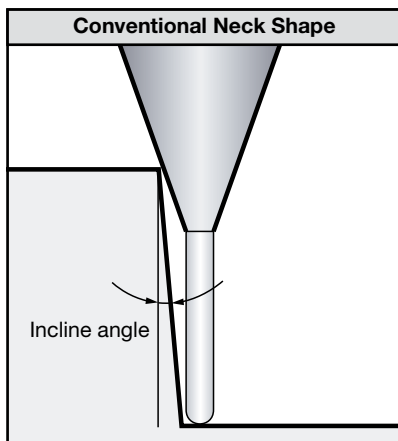
1. Utiliser une machine aussi fiable et rigide que possible .
2. SVP choisissez vos conditions en fonction de l'état de surface requis .
3. Les conditions de coupe du tableau sont indicatives. Pour votre application, ajuster cette base en fonction de votre machine .
4. Si le nombre de tours est insuffisant ajuster les avances dans la même proportion que la rotation disponible .

NOTA:

1. Utilizar a máquina o mais precisa e rígida possível.
2. O passo lateral (a_e) na tabela acima é de informação geral. Queira selecionar as condições que se adequem aos requisitos de acabamento da peça, de acordo com a altura da crista.
3. As condições de corte da tabela acima são um guia geral. Ajuste as condições para a sua peça de acordo com a forma de maquinação, objetivos do trabalho e a ferramenta a utilizar.
4. Se a velocidade rpm disponível for inferior, ajuste o avanço para o mesmo rácio com o rpm.

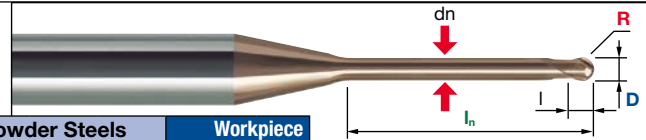
EPSBE | Recommended Cutting Conditions

| Workpiece Material | | | Tool Steels (35 ~ 45HRC) | | | | | | Hardened Steels (45 ~ 55HRC) | | | | | | Hardened Steels (55 ~ 65HRC) | | | | | |
|--------------------|-----|----------------|--------------------------|------------------------|------------------------|--------------------------|----------------------|----------------------|------------------------------|------------------------|------------------------|--------------------------|----------------------|----------------------|------------------------------|------------------------|------------------------|--------------------------|----------------------|----------------------|
| R | D | I _n | V _c m/min | n min ⁻¹ | f _z mm/t | V _f mm/min | a _p mm | a _e mm | V _c m/min | n min ⁻¹ | f _z mm/t | V _f mm/min | a _p mm | a _e mm | V _c m/min | n min ⁻¹ | f _z mm/t | V _f mm/min | a _p mm | a _e mm |
| 0.05 | 0.1 | 0.15 | 20 | 59500 | 0.012 | 1430 | 0.003 | 0.010 | 20 | 54100 | 0.010 | 1080 | 0.003 | 0.009 | 20 | 51400 | 0.009 | 930 | 0.003 | 0.008 |
| | | 0.3 | 20 | 59500 | 0.011 | 1290 | 0.002 | 0.007 | 20 | 50000 | 0.009 | 900 | 0.002 | 0.006 | 20 | 51400 | 0.008 | 830 | 0.002 | 0.005 |
| | | 0.75 | 10 | 35700 | 0.010 | 690 | 0.001 | 0.003 | 10 | 32500 | 0.008 | 520 | 0.001 | 0.003 | 10 | 30800 | 0.007 | 440 | 0.001 | 0.003 |
| 0.1 | 0.2 | 0.3 | 30 | 55400 | 0.018 | 1990 | 0.009 | 0.026 | 30 | 50400 | 0.015 | 1510 | 0.008 | 0.024 | 30 | 47900 | 0.014 | 1290 | 0.007 | 0.022 |
| | | 0.6 | 30 | 55400 | 0.018 | 1990 | 0.007 | 0.020 | 30 | 50400 | 0.015 | 1510 | 0.006 | 0.018 | 30 | 47900 | 0.014 | 1290 | 0.005 | 0.016 |
| | | 1 | 30 | 41600 | 0.016 | 1300 | 0.006 | 0.017 | 20 | 37800 | 0.013 | 980 | 0.005 | 0.015 | 20 | 35900 | 0.012 | 840 | 0.005 | 0.014 |
| | | 1.5 | 20 | 33300 | 0.016 | 1040 | 0.003 | 0.010 | 20 | 30200 | 0.013 | 790 | 0.003 | 0.009 | 20 | 28700 | 0.012 | 670 | 0.003 | 0.008 |
| | | 2 | 20 | 33300 | 0.014 | 960 | 0.002 | 0.007 | 20 | 30200 | 0.012 | 720 | 0.002 | 0.006 | 20 | 28700 | 0.011 | 620 | 0.002 | 0.005 |
| 0.15 | 0.3 | 0.45 | 50 | 50600 | 0.019 | 1940 | 0.013 | 0.040 | 40 | 46000 | 0.016 | 1470 | 0.012 | 0.036 | 40 | 43700 | 0.014 | 1260 | 0.011 | 0.032 |
| | | 0.9 | 50 | 50600 | 0.019 | 1940 | 0.010 | 0.030 | 40 | 46000 | 0.016 | 1470 | 0.009 | 0.027 | 40 | 43700 | 0.014 | 1260 | 0.008 | 0.024 |
| | | 1.5 | 40 | 37900 | 0.017 | 1270 | 0.007 | 0.020 | 30 | 34500 | 0.014 | 970 | 0.006 | 0.018 | 30 | 32800 | 0.013 | 830 | 0.005 | 0.016 |
| | | 2 | 30 | 30300 | 0.017 | 1020 | 0.006 | 0.017 | 30 | 27600 | 0.014 | 770 | 0.005 | 0.015 | 20 | 26200 | 0.013 | 660 | 0.005 | 0.014 |
| | | 3 | 30 | 30300 | 0.016 | 950 | 0.003 | 0.010 | 30 | 27600 | 0.013 | 720 | 0.003 | 0.009 | 20 | 26200 | 0.012 | 610 | 0.003 | 0.008 |
| 0.2 | 0.4 | 0.6 | 60 | 43800 | 0.024 | 2100 | 0.018 | 0.053 | 50 | 39800 | 0.020 | 1590 | 0.016 | 0.048 | 50 | 37800 | 0.018 | 1360 | 0.014 | 0.043 |
| | | 1.2 | 60 | 43800 | 0.024 | 2100 | 0.013 | 0.040 | 50 | 39800 | 0.020 | 1590 | 0.012 | 0.036 | 50 | 37800 | 0.018 | 1360 | 0.011 | 0.032 |
| | | 2 | 40 | 35000 | 0.022 | 1510 | 0.010 | 0.030 | 40 | 31800 | 0.018 | 1140 | 0.009 | 0.027 | 40 | 30200 | 0.016 | 980 | 0.008 | 0.024 |
| | | 3 | 40 | 28000 | 0.022 | 1210 | 0.007 | 0.020 | 30 | 25500 | 0.018 | 920 | 0.006 | 0.018 | 30 | 24200 | 0.016 | 780 | 0.005 | 0.016 |
| | | 3.5 | 40 | 28000 | 0.022 | 1210 | 0.006 | 0.017 | 30 | 25500 | 0.018 | 920 | 0.005 | 0.015 | 30 | 24200 | 0.016 | 780 | 0.005 | 0.014 |
| 0.25 | 0.5 | 4 | 40 | 28000 | 0.019 | 1080 | 0.004 | 0.013 | 30 | 25500 | 0.016 | 820 | 0.004 | 0.012 | 30 | 24200 | 0.014 | 700 | 0.004 | 0.011 |
| | | 0.75 | 60 | 37300 | 0.026 | 1970 | 0.022 | 0.066 | 50 | 34000 | 0.022 | 1500 | 0.020 | 0.060 | 50 | 32300 | 0.020 | 1280 | 0.018 | 0.054 |
| | | 1.5 | 60 | 37300 | 0.026 | 1970 | 0.018 | 0.053 | 50 | 34000 | 0.022 | 1500 | 0.016 | 0.048 | 50 | 32300 | 0.020 | 1280 | 0.014 | 0.043 |
| | | 3 | 40 | 28000 | 0.024 | 1340 | 0.011 | 0.033 | 40 | 25500 | 0.020 | 1020 | 0.010 | 0.030 | 40 | 24200 | 0.018 | 870 | 0.009 | 0.027 |
| | | 5 | 40 | 23100 | 0.022 | 1000 | 0.006 | 0.017 | 30 | 21000 | 0.018 | 760 | 0.005 | 0.015 | 30 | 20000 | 0.016 | 650 | 0.005 | 0.014 |
| 0.3 | 0.6 | 0.9 | 70 | 35000 | 0.030 | 2100 | 0.033 | 0.099 | 60 | 31800 | 0.025 | 1590 | 0.030 | 0.090 | 60 | 30200 | 0.023 | 1360 | 0.027 | 0.081 |
| | | 1.8 | 70 | 35000 | 0.030 | 2100 | 0.026 | 0.079 | 60 | 31800 | 0.025 | 1590 | 0.024 | 0.072 | 60 | 30200 | 0.023 | 1360 | 0.022 | 0.065 |
| | | 3 | 50 | 27000 | 0.028 | 1490 | 0.019 | 0.056 | 50 | 24500 | 0.023 | 1130 | 0.017 | 0.051 | 40 | 23300 | 0.021 | 960 | 0.015 | 0.046 |
| | | 5 | 40 | 22200 | 0.028 | 1230 | 0.012 | 0.036 | 40 | 20200 | 0.023 | 930 | 0.011 | 0.033 | 40 | 19200 | 0.021 | 790 | 0.010 | 0.030 |
| | | 6 | 40 | 22200 | 0.025 | 1120 | 0.008 | 0.023 | 40 | 20200 | 0.021 | 850 | 0.007 | 0.021 | 40 | 19200 | 0.019 | 730 | 0.006 | 0.019 |
| 0.4 | 0.8 | 1.2 | 70 | 29200 | 0.034 | 1960 | 0.044 | 0.132 | 70 | 26500 | 0.028 | 1480 | 0.040 | 0.120 | 60 | 25200 | 0.025 | 1270 | 0.036 | 0.108 |
| | | 2.4 | 70 | 29200 | 0.034 | 1960 | 0.035 | 0.106 | 70 | 26500 | 0.028 | 1480 | 0.032 | 0.096 | 60 | 25200 | 0.025 | 1270 | 0.029 | 0.086 |
| | | 1.5 | 90 | 28600 | 0.043 | 2470 | 0.055 | 0.165 | 80 | 26000 | 0.036 | 1870 | 0.050 | 0.150 | 80 | 24700 | 0.032 | 1600 | 0.045 | 0.135 |
| 0.5 | 1 | 3 | 90 | 28600 | 0.043 | 2470 | 0.044 | 0.132 | 80 | 26000 | 0.036 | 1870 | 0.040 | 0.120 | 80 | 24700 | 0.032 | 1600 | 0.036 | 0.108 |
| | | 6 | 70 | 22300 | 0.043 | 1920 | 0.028 | 0.083 | 60 | 20300 | 0.036 | 1460 | 0.025 | 0.075 | 60 | 19300 | 0.032 | 1250 | 0.023 | 0.068 |
| | | 8 | 60 | 19300 | 0.042 | 1630 | 0.022 | 0.066 | 50 | 17500 | 0.035 | 1230 | 0.020 | 0.060 | 50 | 16600 | 0.032 | 1050 | 0.018 | 0.054 |
| | | 10 | 60 | 19300 | 0.040 | 1540 | 0.014 | 0.043 | 50 | 17500 | 0.033 | 1160 | 0.013 | 0.039 | 50 | 16600 | 0.030 | 990 | 0.012 | 0.035 |
| 0.6 | 1.2 | 1.8 | 100 | 25300 | 0.052 | 2630 | 0.066 | 0.198 | 90 | 23000 | 0.043 | 1990 | 0.060 | 0.180 | 80 | 21800 | 0.039 | 1700 | 0.054 | 0.162 |
| | | 3.6 | 100 | 25300 | 0.052 | 2630 | 0.053 | 0.158 | 90 | 23000 | 0.043 | 1990 | 0.048 | 0.144 | 80 | 21800 | 0.039 | 1700 | 0.043 | 0.130 |
| | | 2.25 | 100 | 21400 | 0.065 | 2780 | 0.083 | 0.248 | 90 | 19500 | 0.054 | 2110 | 0.075 | 0.225 | 90 | 18500 | 0.049 | 1800 | 0.068 | 0.203 |
| 0.75 | 1.5 | 4.5 | 100 | 21400 | 0.065 | 2780 | 0.066 | 0.198 | 90 | 19500 | 0.054 | 2110 | 0.060 | 0.180 | 90 | 18500 | 0.049 | 1800 | 0.054 | 0.162 |
| | | 8 | 90 | 18300 | 0.061 | 2240 | 0.046 | 0.139 | 80 | 16700 | 0.051 | 1700 | 0.042 | 0.126 | 70 | 15800 | 0.046 | 1450 | 0.038 | 0.113 |
| | | 12 | 80 | 16600 | 0.058 | 1910 | 0.033 | 0.099 | 70 | 15100 | 0.048 | 1450 | 0.030 | 0.090 | 70 | 14400 | 0.043 | 1240 | 0.027 | 0.081 |
| | | 3 | 120 | 18400 | 0.086 | 3170 | 0.099 | 0.297 | 100 | 16700 | 0.072 | 2400 | 0.090 | 0.270 | 100 | 15900 | 0.065 | 2060 | 0.081 | 0.243 |
| 1 | 2 | 6 | 120 | 18400 | 0.086 | 3170 | 0.079 | 0.238 | 100 | 16700 | 0.072 | 2400 | 0.072 | 0.216 | 100 | 15900 | 0.065 | 2060 | 0.065 | 0.194 |
| | | 8 | 120 | 18400 | 0.086 | 3170 | 0.072 | 0.215 | 100 | 16700 | 0.072 | 2400 | 0.065 | 0.195 | 100 | 15900 | 0.065 | 2060 | 0.059 | 0.176 |
| | | 12 | 100 | 15300 | 0.077 | 2350 | 0.050 | 0.149 | 90 | 13900 | 0.064 | 1780 | 0.045 | 0.135 | 80 | 13200 | 0.058 | 1520 | 0.041 | 0.122 |
| | | 16 | 90 | 14600 | 0.072 | 2110 | 0.035 | 0.106 | 80 | 13300 | 0.060 | 1600 | 0.032 | 0.096 | 80 | 12600 | 0.054 | 1360 | 0.029 | 0.086 |
| | | 20 | 80 | 13500 | 0.072 | 1950 | 0.024 | 0.073 | 80 | 12300 | 0.060 | 1480 | 0.022 | 0.066 | 70 | 11600 | 0.054 | 1260 | 0.020 | 0.059 |

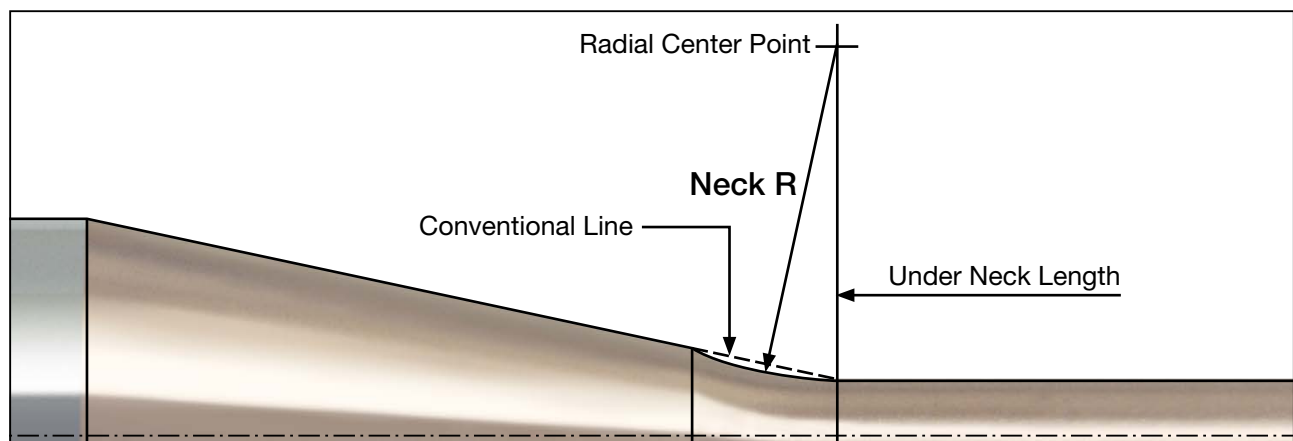




EPSBE | Recommended Cutting Conditions



| Hardened Steels, Powder Steels (65 ~ 68HRC) | | | | | | Hardened Steels, Powder Steels (68 ~ 72HRC) | | | | | | Workpiece Material | | |
|--|------------------------|------------------------|--------------------------|----------------------|----------------------|--|------------------------|------------------------|--------------------------|----------------------|----------------------|-----------------------|-----|----------------|
| V _c m/min | n min ⁻¹ | f _z mm/t | V _f mm/min | a _p mm | a _e mm | V _c m/min | n min ⁻¹ | f _z mm/t | V _f mm/min | a _p mm | a _e mm | R | D | L _n |
| 10 | 46000 | 0.008 | 690 | 0.002 | 0.007 | 10 | 43300 | 0.006 | 520 | 0.002 | 0.005 | | | 0.15 |
| 10 | 46000 | 0.007 | 620 | 0.002 | 0.005 | 10 | 43300 | 0.005 | 470 | 0.001 | 0.004 | 0.05 | 0.1 | 0.3 |
| 10 | 27600 | 0.006 | 330 | 0.001 | 0.002 | 10 | 26000 | 0.005 | 250 | 0.001 | 0.002 | | | 0.75 |
| 30 | 42800 | 0.011 | 960 | 0.006 | 0.018 | 30 | 40300 | 0.009 | 730 | 0.005 | 0.014 | | | 0.3 |
| 30 | 42800 | 0.011 | 960 | 0.005 | 0.014 | 30 | 40300 | 0.009 | 730 | 0.004 | 0.011 | | | 0.6 |
| 20 | 32100 | 0.010 | 630 | 0.004 | 0.011 | 20 | 30200 | 0.008 | 470 | 0.003 | 0.009 | 0.1 | 0.2 | 1 |
| 20 | 25700 | 0.010 | 500 | 0.002 | 0.007 | 20 | 24200 | 0.008 | 380 | 0.002 | 0.005 | | | 1.5 |
| 20 | 25700 | 0.009 | 460 | 0.002 | 0.005 | 20 | 24200 | 0.007 | 350 | 0.001 | 0.004 | | | 2 |
| 40 | 39100 | 0.012 | 940 | 0.009 | 0.027 | 30 | 36800 | 0.010 | 710 | 0.007 | 0.022 | | | 0.45 |
| 40 | 39100 | 0.012 | 940 | 0.007 | 0.020 | 30 | 36800 | 0.010 | 710 | 0.005 | 0.016 | | | 0.9 |
| 30 | 29300 | 0.011 | 620 | 0.005 | 0.014 | 30 | 27600 | 0.008 | 460 | 0.004 | 0.011 | 0.15 | 0.3 | 1.5 |
| 20 | 23400 | 0.011 | 490 | 0.004 | 0.011 | 20 | 22100 | 0.008 | 370 | 0.003 | 0.009 | | | 2 |
| 20 | 23400 | 0.010 | 460 | 0.002 | 0.007 | 20 | 22100 | 0.008 | 340 | 0.002 | 0.005 | | | 3 |
| 40 | 33800 | 0.015 | 1010 | 0.012 | 0.036 | 40 | 31800 | 0.012 | 760 | 0.010 | 0.029 | | | 0.6 |
| 40 | 33800 | 0.015 | 1010 | 0.009 | 0.027 | 40 | 31800 | 0.012 | 760 | 0.007 | 0.022 | | | 1.2 |
| 30 | 27100 | 0.014 | 730 | 0.007 | 0.020 | 30 | 25500 | 0.011 | 550 | 0.005 | 0.016 | | | 2 |
| 30 | 21600 | 0.014 | 580 | 0.005 | 0.014 | 30 | 20400 | 0.011 | 440 | 0.004 | 0.011 | 0.2 | 0.4 | 3 |
| 30 | 21600 | 0.014 | 580 | 0.004 | 0.011 | 30 | 20400 | 0.011 | 440 | 0.003 | 0.009 | | | 3.5 |
| 30 | 21600 | 0.012 | 520 | 0.003 | 0.009 | 30 | 20400 | 0.010 | 390 | 0.002 | 0.007 | | | 4 |
| 50 | 28900 | 0.017 | 950 | 0.015 | 0.045 | 40 | 27200 | 0.013 | 720 | 0.012 | 0.036 | | | 0.75 |
| 50 | 28900 | 0.017 | 950 | 0.012 | 0.036 | 40 | 27200 | 0.013 | 720 | 0.010 | 0.029 | 0.25 | 0.5 | 1.5 |
| 30 | 21600 | 0.015 | 650 | 0.008 | 0.023 | 30 | 20400 | 0.012 | 490 | 0.006 | 0.018 | | | 3 |
| 30 | 17900 | 0.014 | 480 | 0.004 | 0.011 | 30 | 16800 | 0.011 | 360 | 0.003 | 0.009 | | | 5 |
| 50 | 27100 | 0.019 | 1020 | 0.023 | 0.068 | 50 | 25500 | 0.015 | 770 | 0.018 | 0.054 | | | 0.9 |
| 50 | 27100 | 0.019 | 1020 | 0.018 | 0.054 | 50 | 25500 | 0.015 | 770 | 0.014 | 0.043 | | | 1.8 |
| 40 | 20900 | 0.017 | 720 | 0.013 | 0.038 | 40 | 19600 | 0.014 | 540 | 0.010 | 0.031 | 0.3 | 0.6 | 3 |
| 30 | 17100 | 0.017 | 590 | 0.008 | 0.025 | 30 | 16100 | 0.014 | 440 | 0.007 | 0.020 | | | 5 |
| 30 | 17100 | 0.016 | 540 | 0.005 | 0.016 | 30 | 16100 | 0.013 | 410 | 0.004 | 0.013 | | | 6 |
| 60 | 22500 | 0.021 | 950 | 0.030 | 0.090 | 50 | 21200 | 0.017 | 710 | 0.024 | 0.072 | 0.4 | 0.8 | 1.2 |
| 60 | 22500 | 0.021 | 950 | 0.024 | 0.072 | 50 | 21200 | 0.017 | 710 | 0.019 | 0.058 | | | 2.4 |
| 70 | 22100 | 0.027 | 1190 | 0.038 | 0.113 | 70 | 20800 | 0.022 | 900 | 0.030 | 0.090 | | | 1.5 |
| 70 | 22100 | 0.027 | 1190 | 0.030 | 0.090 | 70 | 20800 | 0.022 | 900 | 0.024 | 0.072 | | | 3 |
| 50 | 17200 | 0.027 | 930 | 0.019 | 0.056 | 50 | 16200 | 0.022 | 700 | 0.015 | 0.045 | 0.5 | 1 | 6 |
| 50 | 14900 | 0.026 | 790 | 0.015 | 0.045 | 40 | 14000 | 0.021 | 590 | 0.012 | 0.036 | | | 8 |
| 50 | 14900 | 0.025 | 740 | 0.010 | 0.029 | 40 | 14000 | 0.020 | 560 | 0.008 | 0.023 | | | 10 |
| 70 | 19500 | 0.032 | 1270 | 0.045 | 0.135 | 70 | 18400 | 0.026 | 960 | 0.036 | 0.108 | 0.6 | 1.2 | 1.8 |
| 70 | 19500 | 0.032 | 1270 | 0.036 | 0.108 | 70 | 18400 | 0.026 | 960 | 0.029 | 0.086 | | | 3.6 |
| 80 | 16500 | 0.041 | 1340 | 0.056 | 0.169 | 70 | 15600 | 0.032 | 1010 | 0.045 | 0.135 | | | 2.25 |
| 80 | 16500 | 0.041 | 1340 | 0.045 | 0.135 | 70 | 15600 | 0.032 | 1010 | 0.036 | 0.108 | 0.75 | 1.5 | 4.5 |
| 70 | 14200 | 0.038 | 1080 | 0.032 | 0.095 | 60 | 13300 | 0.031 | 810 | 0.025 | 0.076 | | | 8 |
| 60 | 12900 | 0.036 | 930 | 0.023 | 0.068 | 60 | 12100 | 0.029 | 700 | 0.018 | 0.054 | | | 12 |
| 90 | 14200 | 0.054 | 1530 | 0.068 | 0.203 | 80 | 13400 | 0.043 | 1160 | 0.054 | 0.162 | | | 3 |
| 90 | 14200 | 0.054 | 1530 | 0.054 | 0.162 | 80 | 13400 | 0.043 | 1160 | 0.043 | 0.130 | | | 6 |
| 90 | 14200 | 0.054 | 1530 | 0.049 | 0.146 | 80 | 13400 | 0.043 | 1160 | 0.039 | 0.117 | 1 | 2 | 8 |
| 70 | 11800 | 0.048 | 1130 | 0.034 | 0.101 | 70 | 11100 | 0.038 | 850 | 0.027 | 0.081 | | | 12 |
| 70 | 11300 | 0.045 | 1020 | 0.024 | 0.072 | 70 | 10600 | 0.036 | 770 | 0.019 | 0.058 | | | 16 |
| 70 | 10400 | 0.045 | 940 | 0.017 | 0.050 | 60 | 9800 | 0.036 | 710 | 0.013 | 0.040 | | | 20 |



Always up to date: Please check our P50 QuickFinder



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) When preparing for use, be sure that the inserts are firmly mounted in place and that they are firmly mounted on the arbor, etc.
- (3) 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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