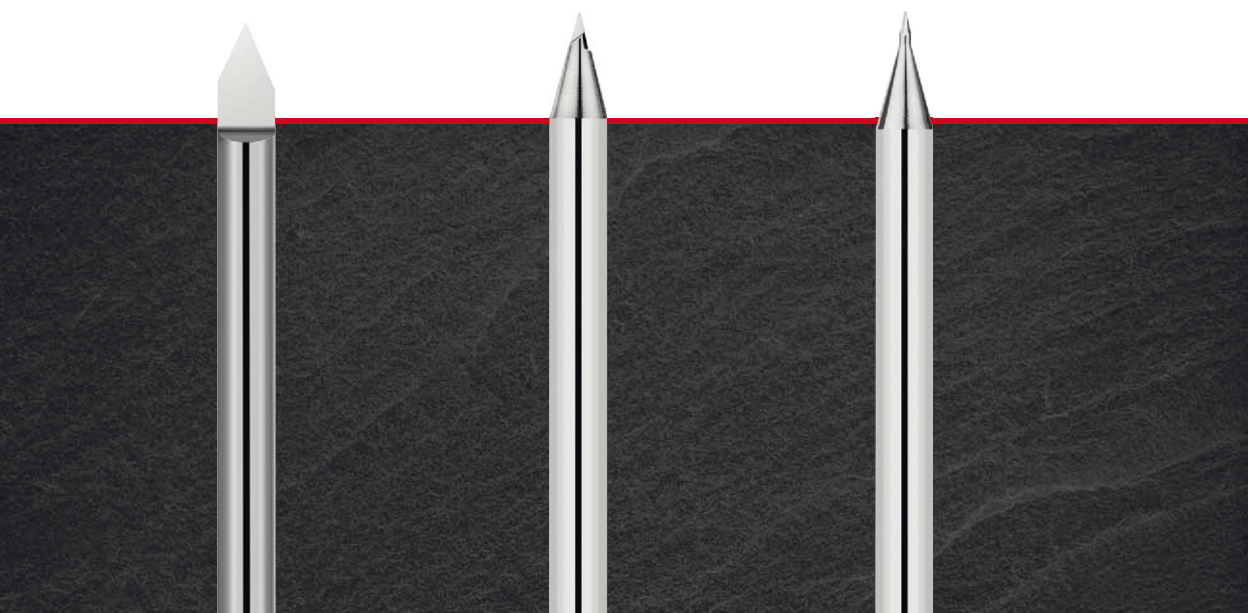


2000



Répertoire **Fraises à graver**
 Verzeichnis **Gravierfräser**
 Index **Engraving mills**

Paramètres de coupe indicatifs
 Empfohlene Schnittwerte
 Standard machining data

1.02

	Fraises à graver Gravierfräser Engraving mills				
	Type	A	Flat[E] / Radius [r]	D2	page
	2100-P	20° / 30° / 35° / 40° 45° / 50° / 55° / 60° 65° / 70° / 90° / 120°	0.05-0.30 0.05-0.10 / every 0.01 0.10-0.30 / every 0.05	Ø3h4 Ø6h5	1.03
	2300-P	20° / 30° / 35° / 40° 45° / 50° / 55° / 60° 65° / 70° / 90°	0.02-0.30 0.02-0.10 / every 0.01 0.10-0.30 / every 0.05	Ø3h4	1.04
	2300-R	20° / 30° / 35° / 40° 45° / 50° / 55° / 60° 65° / 70° / 90°	0.04-0.30 0.04-0.10 / every 0.01 0.10-0.30 / every 0.05	Ø3h4	1.05
	2900-P	20° / 30° / 35° / 40° 45° / 50° / 55° / 60° 65° / 70° / 90°	0.04-0.30 0.04-0.10 / every 0.01 0.10-0.30 / every 0.05	Ø3h4	1.06
	2900-R	20° / 30° / 35° / 40° 45° / 50° / 55° / 60° 65° / 70° / 90°	0.04-0.30 0.04-0.10 / every 0.01 0.10-0.30 / every 0.05	Ø3h4	1.07

Paramètres de coupe indicatifs **Fraises à graver**
 Empfohlene Schnittwerte **Gravierfräser**
 Standard machining data **Engraving mills**

Matière Werkstoff Material	n (tr/min)	Vf (mm/min)	N	TiAlN*	STF*	TiCN*	ALFA- TOP*
Acier de décolletage Automatenstahl Free-cutting steel (P)	20 - 50'000	100 - 180	-	+++	+++	++	-
Acier Stahl Steel < 600 N/mm² (P)	20 - 50'000	100 - 180	-	+++	+++	++	-
Acier Stahl Steel < 800 N/mm² (P)	20 - 50'000	100 - 180	-	+++	+++	++	-
Acier Stahl Steel > 800 N/mm² (P)	20 - 50'000	100 - 150	-	+++	+++	++	-
Acier trempé Gehärteter Stahl Hardened steel -55HRC (H)	20 - 50'000	-	-	+++	+++	+	-
Acier trempé Gehärteter Stahl Hardened steel +55HRC (H)	20 - 50'000	-	-	+++	+++	+	-
Inox Rostfreistahl Stainless steel (M)	20 - 50'000	100 - 170	-	+++	+++	++	-
Aluminium (N)	20 - 50'000	100 - 250	+++	++	++	+	+++
Cuivre, laiton, bronze Kupfer, Messing, Bronze Copper, brass, bronze (N)	20 - 50'000	70 - 150	+++	++	++	++	+++
Matière synthétique Synthetisches Material Synthetic material (N)	20 - 50'000	100 - 200	+++	++	++	++	+++
Métaux précieux Edelmetalle Precious metals (N)	20 - 50'000	100 - 200	+++	++	++	++	+++
Titane Titan Titanium (S)	20 - 50'000	70 - 150	-	+++	+++	++	-
Alliage de nickel Nickel-Legierung Nickel alloy (S)	20 - 50'000	80 - 180	-	+++	+++	++	-
Matière exotique Exotisches material Exotic material (O)	20 - 50'000	80 - 180	+	+++	+++	++	+++

* Avec revêtement, augmenter les valeurs de 20 %
 Mit Beschichtung, Daten um 20 % erhöhen
 With coating, increase data by 20 %

+ Bien / Gut / Good
 ++ Très bien / Sehr gut / Very good
 +++ Excellent / Ausgezeichnet / Excellent

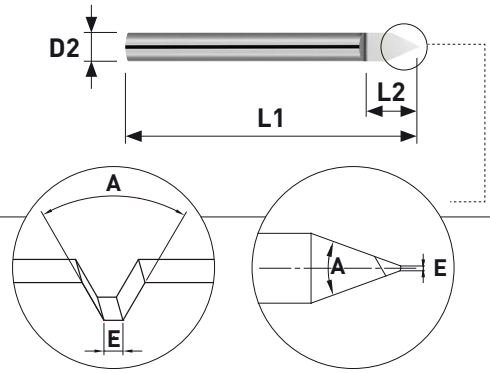
Avance conseillée pour des vitesses de rotation entre 20'000 et 30'000 tours/min
 Empfohlener Vorschub für Drehgeschwindigkeiten zwischen 20'000 und 30'000 U/Min
 Recommended feed rate for rotation speeds between 20'000 and 30'000 RPM

Fraises à graver avec plat

Gravierfräser mit Fläche

Engraving mills with flat

MD
VHM
HM



Art. N°	A	E	L2	D2 Ø3h4 Ø6h5	L1	N	TiAlN	STF	TiCN	ALFA- TOP
2120-P-_(E)	20°	0.05-0.10* / 0.10-0.30 **	5.20	3.00	33	●	●	●	●	●
2130-P-_(E)	30°	0.05-0.10* / 0.10-0.30 **	5.20	3.00	33	●	●	●	●	●
2135-P-_(E)	35°	0.05-0.10* / 0.10-0.30 **	5.20	3.00	33	●	●	●	●	●
2140-P-_(E)	40°	0.05-0.10* / 0.10-0.30 **	6.00	3.00	33	●	●	●	●	●
2145-P-_(E)	45°	0.05-0.10* / 0.10-0.30 **	6.00	3.00	33	●	●	●	●	●
2150-P-_(E)	50°	0.05-0.10* / 0.10-0.30 **	6.00	3.00	33	●	●	●	●	●
2155-P-_(E)	55°	0.05-0.10* / 0.10-0.30 **	6.00	3.00	33	●	●	●	●	●
2160-P-_(E)	60°	0.05-0.10* / 0.10-0.30 **	8.00	3.00	33	●	●	●	●	●
2165-P-_(E)	65°	0.05-0.10* / 0.10-0.30 **	8.00	3.00	33	●	●	●	●	●
2170-P-_(E)	70°	0.05-0.10* / 0.10-0.30 **	8.00	3.00	33	●	●	●	●	●
2190-P-_(E)	90°	0.05-0.10* / 0.10-0.30 **	8.00	3.00	33	●	●	●	●	●
21120-P-_(E)	120°	0.05-0.10* / 0.10-0.30 **	8.00	3.00	33	●	●	●	●	●
2130-6-P-_(E)	30°	0.05-0.10* / 0.10-0.30 **	12.00	6.00	40	●	●	●	●	●
2140-6-P-_(E)	40°	0.05-0.10* / 0.10-0.30 **	12.00	6.00	40	●	●	●	●	●

* tous les 0.01 mm
alle 0.01 mm
every 0.01 mm

** tous les 0.05 mm
alle 0.05 mm
every 0.05 mm

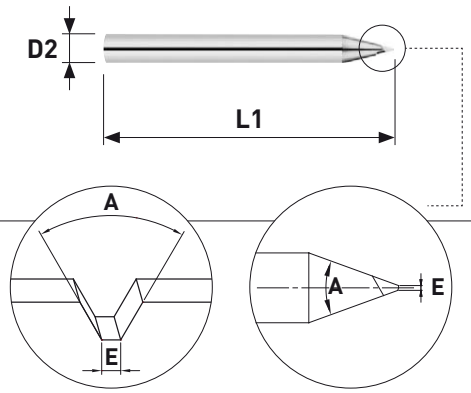


Fraises à graver avec plat

Gravierfräser mit Fläche

Engraving mills with flat

MD
VHM
HM



Art. N°	A	E	D2 _{h4}	L1	N	TiAlN	STF	TiCN	ALFA-TOP
2320-P-_(E)	20°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2330-P-_(E)	30°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2335-P-_(E)	35°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2340-P-_(E)	40°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2345-P-_(E)	45°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2350-P-_(E)	50°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2355-P-_(E)	55°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2360-P-_(E)	60°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2365-P-_(E)	65°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2370-P-_(E)	70°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2390-P-_(E)	90°	0.02-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●

* tous les 0.01 mm
alle 0.01 mm
every 0.01 mm

** tous les 0.05 mm
alle 0.05 mm
every 0.05 mm

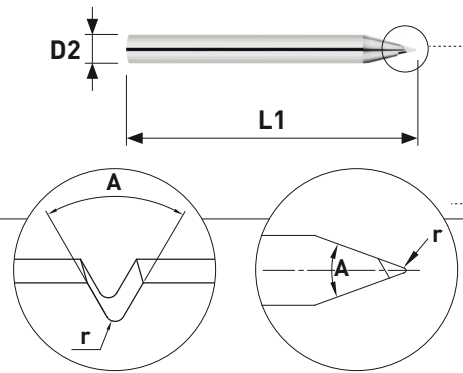


Fraises à graver à rayon

Gravierfräser mit Radius

Engraving mills with radius

MD
VHM
HM



Art. N°	A	r	D2 h4	L1	N	TiAlN	STF	TiCN	ALFA-TOP
2320-R-_(r)	20°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2330-R-_(r)	30°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2335-R-_(r)	35°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2340-R-_(r)	40°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2345-R-_(r)	45°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2350-R-_(r)	50°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2355-R-_(r)	55°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2360-R-_(r)	60°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2365-R-_(r)	65°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2370-R-_(r)	70°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●
2390-R-_(r)	90°	0.04-0.10* / 0.10-0.30**	3.00	33	●	●	●	●	●

* tous les 0.01 mm
alle 0.01 mm
every 0.01 mm

** tous les 0.05 mm
alle 0.05 mm
every 0.05 mm

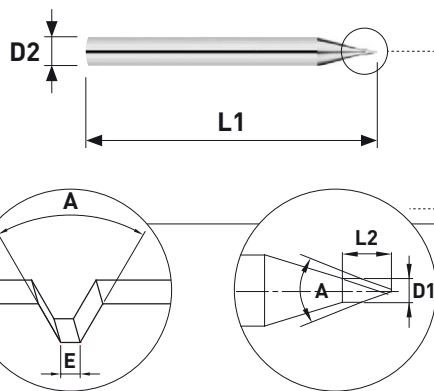


Fraises à graver renforcées

Verstärkte Gravierfräser

Reinforced engraving mills

MD
VHM
HM



Art. N°	A	E	D1	L2	D2 _{h4}	L1	N	TiAlN	STF	TiCN	ALFA-TOP
2920-P_(E)	20°	0.04-0.10* / 0.10-0.30**	0.60	1.80	3.00	33	●	●	●	●	●
2930-P_(E)	30°	0.04-0.10* / 0.10-0.30**	0.60	1.80	3.00	33	●	●	●	●	●
2935-P_(E)	35°	0.04-0.10* / 0.10-0.30**	0.60	1.80	3.00	33	●	●	●	●	●
2940-P_(E)	40°	0.04-0.10* / 0.10-0.30**	0.60	1.80	3.00	33	●	●	●	●	●
2945-P_(E)	45°	0.04-0.10* / 0.10-0.30**	1.00	1.80	3.00	33	●	●	●	●	●
2950-P_(E)	50°	0.04-0.10* / 0.10-0.30**	1.00	2.00	3.00	33	●	●	●	●	●
2955-P_(E)	55°	0.04-0.10* / 0.10-0.30**	1.00	2.00	3.00	33	●	●	●	●	●
2960-P_(E)	60°	0.04-0.10* / 0.10-0.30**	1.20	2.00	3.00	33	●	●	●	●	●
2965-P_(E)	65°	0.04-0.10* / 0.10-0.30**	1.20	2.00	3.00	33	●	●	●	●	●
2970-P_(E)	70°	0.04-0.10* / 0.10-0.30**	1.20	2.00	3.00	33	●	●	●	●	●
2990-P_(E)	90°	0.04-0.10* / 0.10-0.30**	1.20	2.00	3.00	33	●	●	●	●	●

* tous les 0.01 mm
alle 0.01 mm
every 0.01 mm

** tous les 0.05 mm
alle 0.05 mm
every 0.05 mm

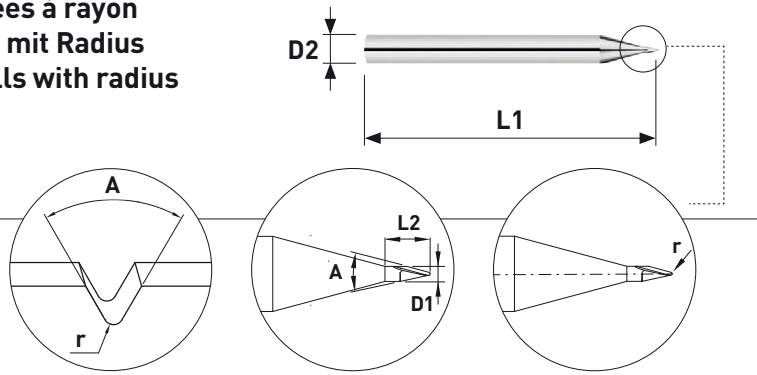


Fraises à graver renforcées à rayon

Verstärkte Gravierfräser mit Radius

Reinforced engraving mills with radius

MD
VHM
HM



Art. N°	A	r	D1	L2	D2 _{h4}	L1	N	TiAlN	STF	TiCN	ALFA-TOP
2920-R-_(r)	20°	0.04-0.10* / 0.10-0.20**	0.60	1.80	3.00	33	●	●	●	●	●
2930-R-_(r)	30°	0.04-0.10* / 0.10-0.20**	0.60	1.80	3.00	33	●	●	●	●	●
2935-R-_(r)	35°	0.04-0.10* / 0.10-0.20**	0.60	1.80	3.00	33	●	●	●	●	●
2940-R-_(r)	40°	0.04-0.10* / 0.10-0.20**	0.60	1.80	3.00	33	●	●	●	●	●
2945-R-_(r)	45°	0.04-0.10* / 0.10-0.30**	1.00	1.80	3.00	33	●	●	●	●	●
2950-R-_(r)	50°	0.04-0.10* / 0.10-0.30**	1.00	2.00	3.00	33	●	●	●	●	●
2955-R-_(r)	55°	0.04-0.10* / 0.10-0.30**	1.00	2.00	3.00	33	●	●	●	●	●
2960-R-_(r)	60°	0.04-0.10* / 0.10-0.30**	1.20	2.00	3.00	33	●	●	●	●	●
2965-R-_(r)	65°	0.04-0.10* / 0.10-0.30**	1.20	2.00	3.00	33	●	●	●	●	●
2970-R-_(r)	70°	0.04-0.10* / 0.10-0.30**	1.20	2.00	3.00	33	●	●	●	●	●
2990-R-_(r)	90°	0.04-0.10* / 0.10-0.30**	1.20	2.00	3.00	33	●	●	●	●	●

* tous les 0.01 mm
alle 0.01 mm
every 0.01 mm

** tous les 0.05 mm
alle 0.05 mm
every 0.05 mm



Informations techniques et symboles

Technische Informationen und Symbole

Technical information and symbols

 60° 90° 120°	Angle Winkel Angle	 Sharp Corner	Coin vif Scharfkantige Ecke Sharp corner
 λ 25°	Angle d'hélice Spiralwinkel Helix angle		Fraises hémisphériques Radiusfräser End mills with ball nose
 λ 36° λ 38° λ 40°	Hélice différente Unterschiedliche Spirale Different helix	 Radius Corner	Rayon de coin Eckradius Corner radius
 λ 35°/38°	Hélice progressive Progressive Spirale Progressive helix		Dents avec coupe centrale Zähne Zentrumschnitt Teeth center cutting
 Z	Nombre de dents Anzahl der Zähne Number of teeth		Denture décalée Versetzte Verzahnung Alternated teeth
 2xD1	Rapport longueur-diamètre Länge-Durchmesser Verhältnis Length to diameter ratio	 DHD	Denture à pas irrégulier, hélice différente Ungleiche Teilung, unterschiedliche Spirale Uneven tooth pitch, different helix
	Lèvres, affûtage à facettes Schneiden, Facettenschärfen Flutes, sharpening with facets	 DHP	Denture à pas irrégulier, hélice progressive Ungleiche Teilung, progressive Spirale Uneven tooth pitch, progressive helix
	Taillage demi-lune Kanonenbohrer Spitze Gundrills tip		Usinage torique Torusbearbeitung Toroidal machining
	Taillage renforcé 3/4 3/4 genuteter Fräser 3/4 straight fluted	 CW	Sens horaire Uhrzeigersinn Clockwise
	Usinage radial, diagonal et axial Radiale, diagonale und axiale Bearbeitung Radial, diagonal and axial machining	 CCW	Sens antihoraire Gegenuhrzeigersinn Counterclockwise
	Usinage radial et axial Radiale und axiale Bearbeitung Radial and axial machining	 MD VHM HM	Métal dur Vollhartmetall Hard metal
 45° E	Chanfrein Fase Chamfer		