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catalogue!


EXPERT TOOLS
COMPOSITE



EXPERT cutting tools in solid carbide recommended for machining composite materials

Tool material : **SOLID CARBIDE**

Recommended Coating: **NEO**

Operation	Ref.	Picture	Page
Drilling	300		5
CFRP / GRFP* Milling	9020		6
CFRP / GRFP* Milling	9120		7
Honeycomb Milling	9530		8
CFRP / GRFP* Milling	9630		9



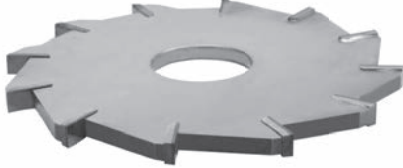



***CFRP**: Carbon Fiber Reinforced Polymer

***GRFP**: Glass Fiber Reinforced Polymer

This table presents only one optimal tool for each operation. You will find other tools suitable for composite machining in our full catalogue.

EXPERT cutting tools in PCD recommended for machining composite materials

Tool material : **POLYCRISTALLINE DIAMOND (PCD)**

Operation	Ref.	Picture	Page
Drilling	4500		11
Milling	4010		13
Saw blades	PCD Slitting saws		Upon request
Threading	45200		14
Engraving	4119-3		15
Custom cutters	Laser sharpening		Upon request

This table presents only one optimal tool for each operation. You will find other tools suitable for composite machining in our full catalogue.

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	Gr.
CFRP + Thermoplastics	b
GFRP + Thermoplastics	c
Honeycomb + Thermoplastics	a
CFRP + Duroplast	c
GFRP + Duroplast	b
Honeycomb + Duroplast	a

CFRP: Carbon Fiber Reinforced Polymer

GFRP: Glass Fiber Reinforced Polymer

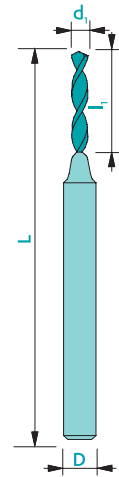
EXPERT drill for composite materials



300

Material group (see page 4)	a	b	c
Recommended coating	NEO	NEO	NEO
V_c uncoated [m/min]	150	120	100
V_c coated [m/min]	200	150	120
F [mm]	Ø/50	Ø/50	Ø/50

Tolerances d_1 : -0.002/-0.004
D: h5



Available uncoated or coated

Art. n°	d_1	l_1	D	L
300d0.50FC	0.50	8	3	38
300d1.00FC	1.00	10	3	38
300d1.50FC	1.50	10	3	38
300d2.00FC	2.00	10	3	38
300d3.00FC	3.00	12	3	38
300d6.00FC	6.00	18	6	51

Other dimensions available upon request



90°

Z2



CARB

Formulas

$$F = F_z \cdot Z$$

$$V_f = F_z \cdot Z \cdot n$$

$$n = \frac{V_c \cdot 1000}{\pi \cdot d_1}$$

$$V_c = \frac{\pi \cdot d_1 \cdot n}{1000}$$

$$f_z = \frac{V_f}{Z \cdot n}$$

Caption

F [mm]: Feed per rotation

F_z [mm]: Feed per tooth

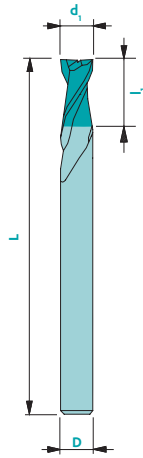
Z: Number of teeth

V_f [mm/min]: Feed speed

n: Spindle speed

9020

EXPERT end mill for composite materials



Material group (see page 4)

	a	b	c
Recommended coating	NEO	NEO	NEO
V _c uncoated [m/min]	250	150	120
V _c coated [m/min]	300	200	150
F _z ≤ Ø 0.50 [mm]	Ø/100	Ø/100	Ø/100
F _z > Ø 0.50 [mm]	Ø/70	Ø/70	Ø/70

Available uncoated or coated

Tolerances d₁ ≤ 1 mm ▶ +0/-0.01 D: h5
 d₁ > 1 mm ▶ +0/-0.02
 d₁ = D ▶ d₁: e8



Z2-3



Art. n°	d ₁	L ₁	D	L	Z
9020d0.50FC	0.5	1	3	38	2
9020d1.00FC	1.0	2	3	38	2
9020d2.00FC	2.0	4	3	38	2
9020d3.00FC	3.0	6	3	38	2
9020d6.00FC	6.0	12	6	51	3

CARB



ap=0.25xd₁

ae=0.5xd₁
ap=0.5xd₁

Formulas

F = F_z · Z

V_f = F_z · Z · n

n = $\frac{V_c \cdot 1000}{\pi \cdot d_1}$

V_c = $\frac{\pi \cdot d_1 \cdot n}{1000}$

f_z = $\frac{V_f}{Z \cdot n}$

Caption

F [mm]: Feed per rotation

F_z [mm]: Feed per tooth

Z : Number of teeth

V_f [mm/min]: Feed speed

n : Spindle speed

EXPERT end mill with ball end for composite materials

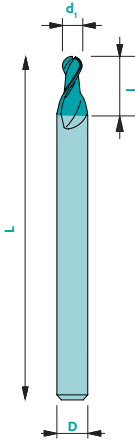


9120

Material group (see page 4)	a	b	c
Recommended coating	NEO	NEO	NEO
V_c uncoated [m/min]	250	150	120
V_c coated [m/min]	300	200	150
$F_z \leq \varnothing 0.50$ [mm]	$\varnothing/100$	$\varnothing/100$	$\varnothing/100$
$F_z > \varnothing 0.50$ [mm]	$\varnothing/70$	$\varnothing/70$	$\varnothing/70$

Tolerance $d_1 \leq 1$ mm ▶ +0/-0.01
 $d_1 > 1$ mm ▶ +0/-0.02
 $d_1 = D$ ▶ $d_1; e8$

D: h5



Available uncoated or coated

Art. n°	d_1	l_1	D	L	Z
9120d0.50FC	0.5	1	3	38	2
9120d1.00FC	1.0	2	3	38	2
9120d2.00FC	2.0	4	3	38	2
9120d3.00FC	3.0	6	3	38	2
9120d6.00FC	6.0	12	6	51	3



Z2-3



CARB



$$ap = 0.25 \cdot d_1$$



$$ae = 0.5 \cdot d_1$$

Formulas

$$F = F_z \cdot Z$$

$$V_f = F_z \cdot Z \cdot n$$

$$n = \frac{V_c \cdot 1000}{\pi \cdot d_1}$$

$$V_c = \frac{\pi \cdot d_1 \cdot n}{1000}$$

$$f_z = \frac{V_f}{Z \cdot n}$$

Caption

F [mm]: Feed per rotation

F_z [mm]: Feed per tooth

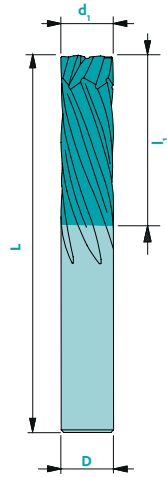
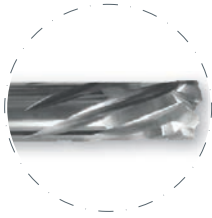
Z: Number of teeth

V_f [mm/min]: Feed speed

n: Spindle speed

9530

EXPERT end mill with double helix for composite materials



Material group (see page 4)

	a	b	c
Recommended coating	NEO	NEO	NEO
V_c uncoated [m/min]	250	150	120
V_c coated [m/min]	300	200	150
$F_z \leq \varnothing 0.50$ [mm]	$\varnothing/100$	$\varnothing/100$	$\varnothing/100$
$F_z > \varnothing 0.50$ [mm]	$\varnothing/70$	$\varnothing/70$	$\varnothing/70$

Available uncoated or coated

Tolerances $d_1 \leq 1$ mm ▶ +0/-0.01 D: h5
 $d_1 > 1$ mm ▶ +0/-0.02
 $d_1 = D$ ▶ $d_1: e8$



Z6



CARB



$$ap = 0.25 \cdot d_1$$



$$ae = 0.5 \cdot d_1$$

$$ap = 0.5 \cdot d_1$$

Art. n°	d_1	l_1	D	L	Z
9530d6.00FC	6.0	18	6	51	6
9530d8.00FC	8.0	24	8	61	6
9530d10.00FC	10.0	30	10	72	6
9530d12.00FC	12.0	36	12	83	6

Formulas

$$F = F_z \cdot Z$$

$$V_f = F_z \cdot Z \cdot n$$

$$n = \frac{V_c \cdot 1000}{\pi \cdot d_1}$$

$$V_c = \frac{\pi \cdot d_1 \cdot n}{1000}$$

$$f_z = \frac{V_f}{Z \cdot n}$$

Caption

F [mm]: Feed per rotation

F_z [mm]: Feed per tooth

Z: Number of teeth

V_f [mm/min]: Feed speed

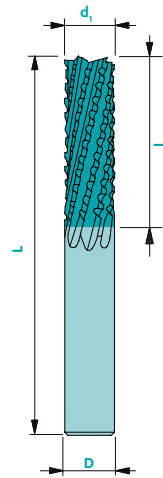
n: Spindle speed

EXPERT end mill with crossed teeth for composite materials



9630

Material group (see page 4)	a	b	c
Recommended coating	NEO	NEO	NEO
V_c uncoated [m/min]	200	120	100
V_c coated [m/min]	250	150	120
$F_z > \varnothing 0.50$ [mm]	$\varnothing/300$	$\varnothing/300$	$\varnothing/300$



Tolerances

$d_1 \leq 1$ mm ▶ +0/-0.01
 $d_1 > 1$ mm ▶ +0/-0.02
 d_1 : e8
 D: h5

Available uncoated or coated

Art. n°	d_1	L_1	D	L	Z
9630d3.00FC	3.0	12	3	38	7
9630d4.00FC	4.0	16	4	38	7
9630d6.00FC	6.0	18	6	51	8
9630d8.00FC	8.0	24	8	61	10
9630d10.00FC	10.0	30	10	72	12
9630d12.00FC	12.0	36	12	83	14



Z7-14



CARB



$$ap = 0.25 \cdot d_1$$



$$ae = 0.5 \cdot d_1$$

Formulas

$$F = F_z \cdot Z$$

$$V_f = F_z \cdot Z \cdot n$$

$$n = \frac{V_c \cdot 1000}{\pi \cdot d_1}$$

$$V_c = \frac{\pi \cdot d_1 \cdot n}{1000}$$

$$f_z = \frac{V_f}{Z \cdot n}$$

Caption

F [mm]: Feed per rotation

F_z [mm]: Feed per tooth

Z: Number of teeth

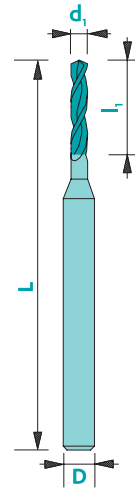
V_f [mm/min]: Feed speed

n: Spindle speed

PCD twist drill - 2 teeth

4500

Material group (see page 4)	a	b	c
V _c [m/min]	400	400	400
F [mm]	∅/50	∅/50	∅/50



Tolerances
 $d_1 = +0/-0.013$
 D: h6

Art. n°	d ₁	l ₁	D	L
4500d0.48	0.48	4.0	3	38
4500d0.49	0.49	4.0	3	38
4500d0.50	0.50	4.0	3	38
4500d0.51	0.51	4.0	3	38
4500d0.52	0.52	4.0	3	38
4500d0.53	0.53	4.0	3	38
4500d0.54	0.54	4.0	3	38
4500d0.55	0.55	4.0	3	38
4500d0.56	0.56	4.0	3	38
4500d0.57	0.57	4.0	3	38
4500d0.58	0.58	4.0	3	38
4500d0.59	0.59	4.0	3	38
4500d0.60	0.60	5.0	3	38
4500d0.61	0.61	5.0	3	38
4500d0.62	0.62	5.0	3	38
4500d0.63	0.63	5.0	3	38
4500d0.64	0.64	5.0	3	38
4500d0.65	0.65	5.0	3	38
4500d0.66	0.66	5.0	3	38
4500d0.67	0.67	5.0	3	38
4500d0.68	0.68	5.0	3	38
4500d0.69	0.69	5.0	3	38
4500d0.70	0.70	5.0	3	38
4500d0.71	0.71	5.0	3	38
4500d0.72	0.72	5.0	3	38
4500d0.73	0.73	5.0	3	38
4500d0.74	0.74	5.0	3	38
4500d0.75	0.75	5.0	3	38
4500d0.76	0.76	5.0	3	38

Art. n°	d ₁	l ₁	D	L
4500d0.77	0.77	5.0	3	38
4500d0.78	0.78	5.0	3	38
4500d0.79	0.79	5.0	3	38
4500d0.80	0.80	6.0	3	38
4500d0.81	0.81	6.0	3	38
4500d0.82	0.82	6.0	3	38
4500d0.83	0.83	6.0	3	38
4500d0.84	0.84	6.0	3	38
4500d0.85	0.85	6.0	3	38
4500d0.86	0.86	6.0	3	38
4500d0.87	0.87	6.0	3	38
4500d0.88	0.88	6.0	3	38
4500d0.89	0.89	6.0	3	38
4500d0.90	0.90	7.0	3	38
4500d0.91	0.91	7.0	3	38
4500d0.92	0.92	7.0	3	38
4500d0.93	0.93	7.0	3	38
4500d0.94	0.94	7.0	3	38
4500d0.95	0.95	7.0	3	38
4500d0.96	0.96	7.0	3	38
4500d0.97	0.97	7.0	3	38
4500d0.98	0.98	7.0	3	38
4500d0.99	0.99	7.0	3	38
4500d1.00	1.00	8.0	3	38
4500d1.01	1.01	8.0	3	38
4500d1.02	1.02	8.0	3	38
4500d1.03	1.03	8.0	3	38
4500d1.04	1.04	8.0	3	38
4500d1.05	1.05	8.0	3	38



Z2



λ
30°

PCD

Formulas

$$F = F_z \cdot Z$$

$$V_f = F_z \cdot Z \cdot n$$

$$n = \frac{V_c \cdot 1000}{\pi \cdot d_1}$$

$$V_c = \frac{\pi \cdot d_1 \cdot n}{1000}$$

$$f_z = \frac{V_f}{Z \cdot n}$$

Caption

F [mm]: Feed per rotation

F_z [mm]: Feed per tooth

Z: Number of teeth

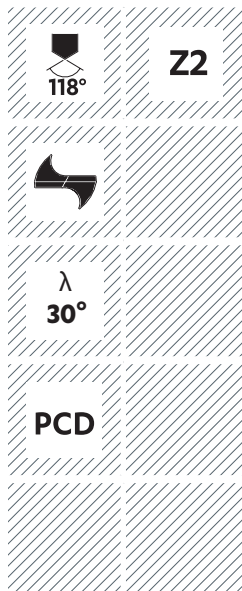
V_f [mm/min]: Feed speed

n: Spindle speed

4500

Continuation

PCD twist drill - 2 teeth



Art. n°	d ₁	l ₁	D	L
4500d1.06	1.06	8.0	3	38
4500d1.07	1.07	8.0	3	38
4500d1.08	1.08	8.0	3	38
4500d1.09	1.09	8.0	3	38
4500d1.10	1.10	9.0	3	38
4500d1.11	1.11	9.0	3	38
4500d1.12	1.12	9.0	3	38
4500d1.13	1.13	9.0	3	38
4500d1.14	1.14	9.0	3	38
4500d1.15	1.15	9.0	3	38
4500d1.16	1.16	9.0	3	38
4500d1.17	1.17	9.0	3	38
4500d1.18	1.18	9.0	3	38
4500d1.19	1.19	9.0	3	38
4500d1.20	1.20	9.0	3	38
4500d1.21	1.21	9.0	3	38
4500d1.22	1.22	9.0	3	38
4500d1.23	1.23	9.0	3	38
4500d1.24	1.24	9.0	3	38
4500d1.25	1.25	9.0	3	38
4500d1.26	1.26	9.0	3	38
4500d1.27	1.27	9.0	3	38
4500d1.28	1.28	9.0	3	38
4500d1.29	1.29	9.0	3	38
4500d1.30	1.30	9.0	3	38
4500d1.31	1.31	9.0	3	38
4500d1.32	1.32	9.0	3	38
4500d1.33	1.33	9.0	3	38
4500d1.34	1.34	9.0	3	38
4500d1.35	1.35	9.0	3	38
4500d1.36	1.36	9.0	3	38
4500d1.37	1.37	9.0	3	38
4500d1.38	1.38	9.0	3	38
4500d1.39	1.39	9.0	3	38
4500d1.40	1.40	9.0	3	38
4500d1.41	1.41	9.0	3	38
4500d1.42	1.42	9.0	3	38
4500d1.43	1.43	9.0	3	38
4500d1.44	1.44	9.0	3	38
4500d1.45	1.45	9.0	3	38
4500d1.46	1.46	9.0	3	38
4500d1.47	1.47	9.0	3	38
4500d1.48	1.48	9.0	3	38
4500d1.49	1.49	9.0	3	38
4500d1.50	1.50	9.0	3	38

Art. n°	d ₁	l ₁	D	L
4500d1.55	1.55	9.0	3	38
4500d1.60	1.60	9.0	3	38
4500d1.65	1.65	9.0	3	38
4500d1.70	1.70	9.0	3	38
4500d1.75	1.75	9.0	3	38
4500d1.80	1.80	9.0	3	38
4500d1.85	1.85	9.0	3	38
4500d1.90	1.90	9.0	3	38
4500d1.95	1.95	9.0	3	38
4500d2.00	2.00	9.0	3	38
4500d2.05	2.05	9.0	3	38
4500d2.10	2.10	9.0	3	38
4500d2.15	2.15	9.0	3	38
4500d2.20	2.20	9.0	3	38
4500d2.25	2.25	9.0	3	38
4500d2.29	2.29	9.0	3	38
4500d2.30	2.30	9.0	3	38
4500d2.40	2.40	9.0	3	38
4500d2.50	2.50	9.0	3	38

Other dimensions, CVD/CBN available upon request.

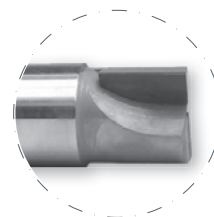
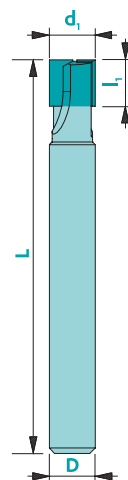
PCD end mill $l_1=1xd_1$

4010

Material group (see page 4)

	a	b	c
V_c [m/min]	500	500	500
F_z \leq 0.50 [mm]	$\varnothing/100$	$\varnothing/100$	$\varnothing/100$
F_z $>$ 0.50 [mm]	$\varnothing/70$	$\varnothing/70$	$\varnothing/70$

Tolerances
 $d_1 < 1\text{ mm}$ ▶ $+0/-0.01$ $l_1: +0.2/-0$
 $d_1 > 1\text{ mm}$ ▶ $+0/-0.02$ $D: h5$



Art. n°	d_1	l_1	D	L	Z
4010d0.50L38Z1	0.5	0.5	6	38	1
4010d1.00L38Z1	1.0	1.0	6	38	1
4010d1.50L38Z1	1.5	1.5	6	38	1
4010d2.00L38Z1	2.0	2.0	6	38	1
4010d2.50L38Z1	2.5	2.5	6	38	1
4010d3.00L38Z1	3.0	3.0	6	38	1
4010d3.50L38Z1	3.5	3.5	6	38	1
4010d4.00L51Z1	4.0	4.0	6	51	1
4010d4.00L51Z2	4.0	4.0	6	51	2
4010d5.00L51Z2	5.0	5.0	6	51	2
4010d6.00L51Z2	6.0	6.0	6	51	2
4010d7.00L61Z2	7.0	7.0	8	61	2
4010d8.00L61Z2	8.0	8.0	8	61	2
4010d8.00L120Z2	8.0	8.0	8	120	2
4010d10.00L72Z2	10.0	10.0	10	72	2
4010d10.00L120Z2	10.0	10.0	10	120	2
4010d12.00L83Z2	12.0	12.0	12	83	2
4010d12.00L150Z2	12.0	12.0	12	150	2
4010d14.00L83Z2	14.0	14.0	14	83	2
4010d14.00L150Z2	14.0	14.0	14	150	2
4010d16.00L92Z2	16.0	16.0	16	92	2
4010d16.00L180Z2	16.0	16.0	16	180	2
4010d20.00L104Z2	20.0	20.0	20	104	2
4010d20.00L180Z2	20.0	20.0	20	180	2



Z1-2



PCD



$ap=0.15xd_1$



$ae=0.03xd_1$
 $ap=1xd_1$

Formulas

$$F = F_z \cdot Z$$

$$V_f = F_z \cdot Z \cdot n$$

$$n = \frac{V_c \cdot 1000}{\pi \cdot d_1}$$

$$V_c = \frac{\pi \cdot d_1 \cdot n}{1000}$$

$$f_z = \frac{V_f}{Z \cdot n}$$

Caption

F [mm]: Feed per rotation

FZ [mm]: Feed per tooth

Z : Number of teeth

Vf [mm/min]: Feed speed

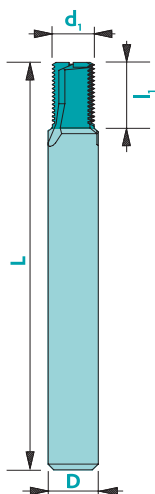
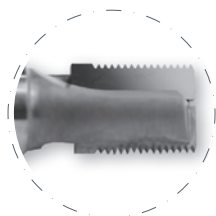
n : Spindle speed

Other dimensions, CVD/CBN available upon request.

45200

PCD thread mill

Internal and external threading



Material group (see page 4)

	a	b	c
V _c [m/min]	400	400	400
F _z	Ø/300	Ø/300	Ø/300

Tolerances
d₁: +0/-0.1
D: h5

Z1-2



PCD

Art. n°	Ø nominal	Pitch	d ₁	l ₁	D	L	Z
45200M2.00	M2.00	0.40	1.40	4.0	3	38	1
45200M2.50	M2.50	0.45	1.80	5.0	6	57	1
45200M3.00	M3.00	0.50	2.30	6.0	6	57	1
45200M4.00	M4.00	0.70	3.00	8.0	6	57	2
45200M5.00	M5.00	0.80	3.80	10.0	6	57	2
45200M6.00	M6.00	1.00	4.50	12.0	6	57	2
45200M8.00	M8.00	1.25	5.00	16.0	6	57	2

Formulas

$$F = F_z \cdot Z$$

$$V_f = F_z \cdot Z \cdot n$$

$$n = \frac{V_c \cdot 1000}{\pi \cdot d_1}$$

$$V_c = \frac{\pi \cdot d_1 \cdot n}{1000}$$

$$f_z = \frac{V_f}{Z \cdot n}$$

Caption

F [mm]: Feed per rotation

FZ [mm]: Feed per tooth

Z : Number of teeth

Vf [mm/min]: Feed speed

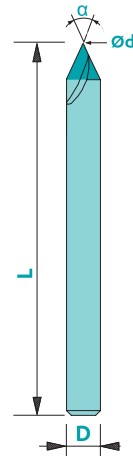
n : Spindle speed

Other dimensions, CVD/CBN available upon request.

Engraving mill in PCD - 3/4 - flat tip

4119-3

Material group (see page 4)	a	b	c
n [rpm]	40'000	40'000	40'000
Fz↓ [mm]	0.003	0.003	0.003
Fz→ [mm]	∅d ₁ /10	∅d ₁ /10	∅d ₁ /10



Tolerances
d₁: +/- 0.01
D: h5

Art. n°	α	d ₁	D	L	Art. n°	α	d ₁	D	L
4119-3a40d0.05	40°	0.05	3	33	4119-3a60d0.10	60°	0.10	3	33
4119-3a40d0.08	40°	0.08	3	33	4119-3a70d0.05	70°	0.05	3	33
4119-3a40d0.10	40°	0.10	3	33	4119-3a70d0.08	70°	0.08	3	33
4119-3a50d0.05	50°	0.05	3	33	4119-3a70d0.10	70°	0.10	3	33
4119-3a50d0.10	50°	0.08	3	33	4119-3a90d0.05	90°	0.05	3	33
4119-3a50d0.15	50°	0.10	3	33	4119-3a90d0.08	90°	0.08	3	33
4119-3a60d0.05	60°	0.05	3	33	4119-3a90d0.10	90°	0.10	3	33
4119-3a60d0.08	60°	0.08	3	33					



Z1



PCD

Order Quotation request

Angle (α): <input type="checkbox"/> By default : 60° <input type="checkbox"/> 30° <input type="checkbox"/> 35° <input type="checkbox"/> 45° <input type="checkbox"/> Other : _____ <input type="checkbox"/> 50° <input type="checkbox"/> 55° <input type="checkbox"/> 90°		Shank Ø : <input type="checkbox"/> By default : D=3 <input type="checkbox"/> Other : D= _____		Order No : _____	
Machined material : _____		Quantity : _____		d₁ (from 0.02 mm) : _____	
Contact person : _____			Company's stamp & date : _____		

Formulas

$$F = F_z \cdot Z$$

$$V_f = F_z \cdot Z \cdot n$$

$$n = \frac{V_c \cdot 1000}{\pi \cdot d_1}$$

$$V_c = \frac{\pi \cdot d_1 \cdot n}{1000}$$

$$f_z = \frac{V_f}{Z \cdot n}$$

Caption

F [mm]: Feed per rotation

F_z [mm]: Feed per tooth

Z: Number of teeth

V_f [mm/min]: Feed speed

n: Spindle speed

Standard dimensions of the bars : ∅ 3x L 38, ∅ 4x L 38, ∅ 6x L 38, ∅ 6x L 51, ∅ 8x L 61, ∅ 10x L 72, ∅ 12x L 83, ∅ 16x L 92, ∅ 20x L 104

Other dimensions, CVD/CBN available upon request.

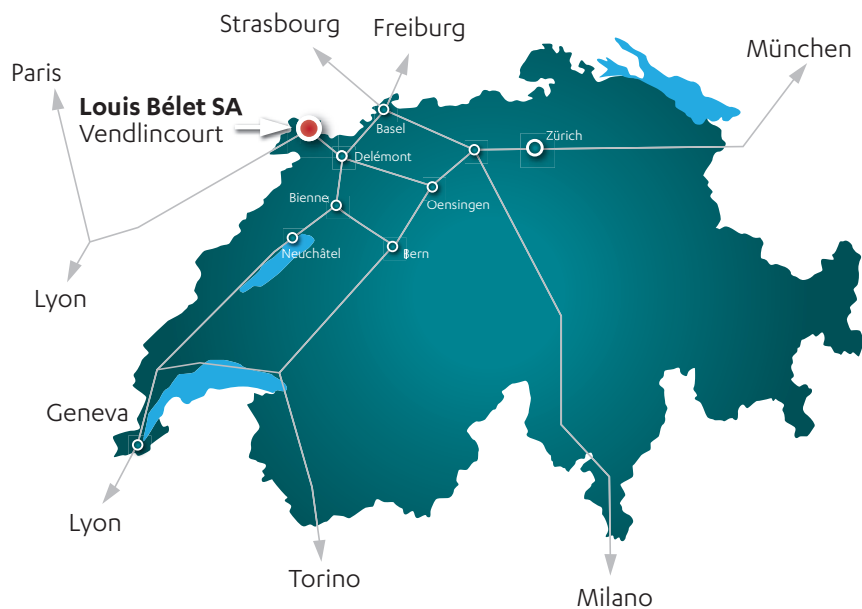


Since 1948

Louis BELET SA is a family business of about 150 employees. The company is run by the two grandchildren of the founder, Mrs Roxane Piquerez and Mr Arnaud Maître.

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