LOUIS BELET® Swiss Cutting tools

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EXPERT TOOLS
COMPOSITE

LOUIS BÉLET S.A.
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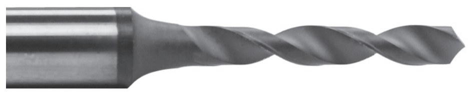
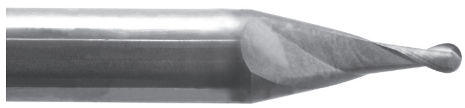
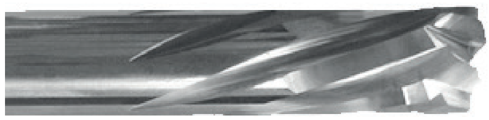
SWISS MADE

• Titanium
• Stainless steel
• Composite
• Brass
• Aluminium

LOUIS BELET®
Swiss Cutting tools

EXPERT cutting tools in solid carbide recommended for machining composite materials

Tool material : **SOLID CARBIDE**
Recommended Coating: **NEO**

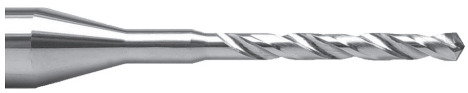
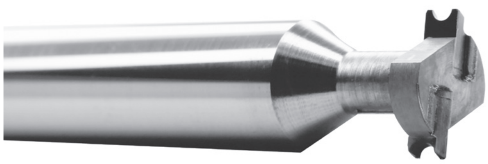
Operation	Ref.	Picture	Page
Drilling	**300**		5
CFRP / GRFP* Milling	**9020**		6
CFRP / GRFP* Milling	**9120**		7
Honeycomb Milling	**9530**		8
CFRP / GRFP* Milling	**9630**		9

***CFRP:** Carbon Fiber Reinforced Polymer
***GFRP:** 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.

Index - Composite materials

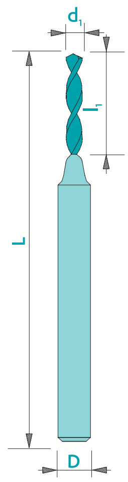
	Gr.
CFRP + Thermoplastics	b
GFRP + Thermoplastics	c
Honeycomb + Thermoplastics	a
CFRP + Duroplast	c
GFRP + Duroplast	b
Honeycomb + Duroplast	a

CFRP: Carbon Fiber Reinforced Polymer

GFRP: Glass Fiber Reinforced Polymer

EXPERT drill for composite materials

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

90°

Z2

CARB

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

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

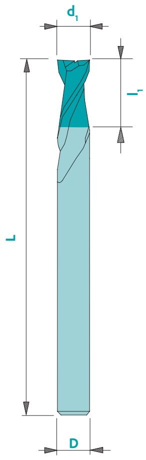
Z : Number of teeth

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

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

Z2-3

CARB

ap=0.25xd_1

ae=0.5xd_1
ap=0.5xd_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

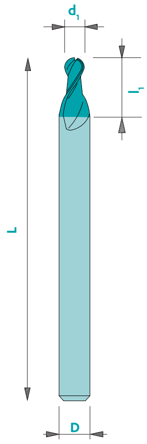
V_f [mm/min]: Feed speed

n : Spindle speed

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
$F_z \leq Ø$ 0.50 [mm]	Ø/100	Ø/100	Ø/100
$F_z > Ø$ 0.50 [mm]	Ø/70	Ø/70	Ø/70



Tolerance

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

◠ +0/-0.01
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

ap
ae

$ap=0.25xd_1$

$ae=0.5xd_1$
$ap=0.5xd_1$

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

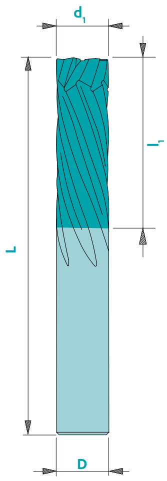
Z : Number of teeth

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 ≤ 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

Z6

CARB

ap / ap ae

ap=0.25xd_1

ae=0.5xd_1
ap=0.5xd_1

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

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

$F = F_z \cdot Z$

$V_F = F_z \cdot Z \cdot n$

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

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

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

Caption

F [mm]: Feed per rotation

F_z [mm]: Feed per tooth

Z : Number of teeth

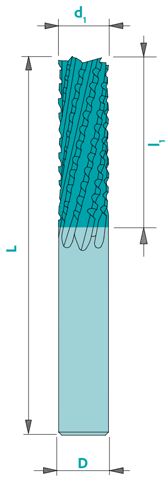
V_f [mm/min]: Feed speed

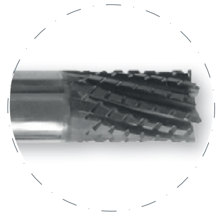
n : Spindle speed

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 > Ø 0.50 [mm]	Ø/300	Ø/300	Ø/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

Z7-14

CARB

ap=0.25xd_1

ae=0.5xd_1
ap=0.5xd_1

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

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

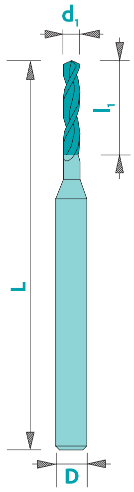
Z : Number of teeth

V_f [mm/min]: Feed speed

n : Spindle speed

PCD twist drill - 2 teeth

Material group (see page 4)	a	b	c
V_c [m/min]	400	400	400
F [mm]	Ø/50	Ø/50	Ø/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

118°

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

PCD twist drill - 2 teeth

118°

Z2

λ 30°

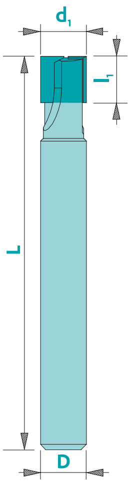
PCD

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
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

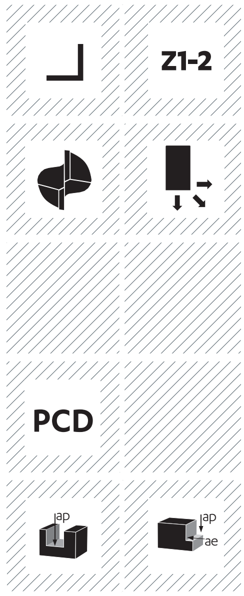
Material group (see page 4)	a	b	c
V_c [m/min]	500	500	500
F_z Ø 0.50 [mm]	Ø/100	Ø/100	Ø/100
F_z > Ø 0.50 [mm]	Ø/70	Ø/70	Ø/70



Tolerances

d_1 < 1mm	▶ +0/-0.01	l_1: +0.2/-0
d_1 > 1mm	▶ +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



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

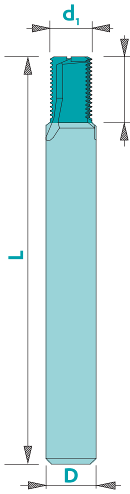
Vf [mm/min]: Feed speed

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 d_1=+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

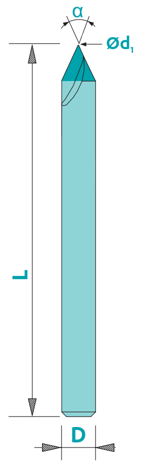
Vf [mm/min]: Feed speed

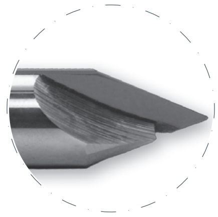
n : Spindle speed

Other dimensions, CVD/CBN available upon request.

Engraving mill in PCD - ¾ - flat tip

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]	$Ød_1/10$	$Ød_1/10$	$Ø d_1/10$





Tolerances d_1: +/- 0.01
D: h5

Art. n°	α	d_1	D	L
4119-3a40d0.05	40°	0.05	3	33
4119-3a40d0.08	40°	0.08	3	33
4119-3a40d0.10	40°	0.10	3	33
4119-3a50d0.05	50°	0.05	3	33
4119-3a50d0.10	50°	0.08	3	33
4119-3a50d0.15	50°	0.10	3	33
4119-3a60d0.05	60°	0.05	3	33
4119-3a60d0.08	60°	0.08	3	33

Art. n°	α	d_1	D	L
4119-3a60d0.10	60°	0.10	3	33
4119-3a70d0.05	70°	0.05	3	33
4119-3a70d0.08	70°	0.08	3	33
4119-3a70d0.10	70°	0.10	3	33
4119-3a90d0.05	90°	0.05	3	33
4119-3a90d0.08	90°	0.08	3	33
4119-3a90d0.10	90°	0.10	3	33

≥ 0.02

Z1

PCD

☐ **Order** ☐ **Quotation request**

Angle (α):

☐ By default : 60° ☐ 30° ☐ 35° ☐ 45°

☐ Other : ________ ☐ 50° ☐ 55° ☐ 90°

Shank Ø :

☐ By default : D=3

☐ Other : D= ________

Order No :

____

Machined material : ________

Quantity : ________

d_1 (from 0.02 mm) : ________

Contact person : ________

Company's stamp & date : ________

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

Other dimensions, CVD/CBN available upon request.

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

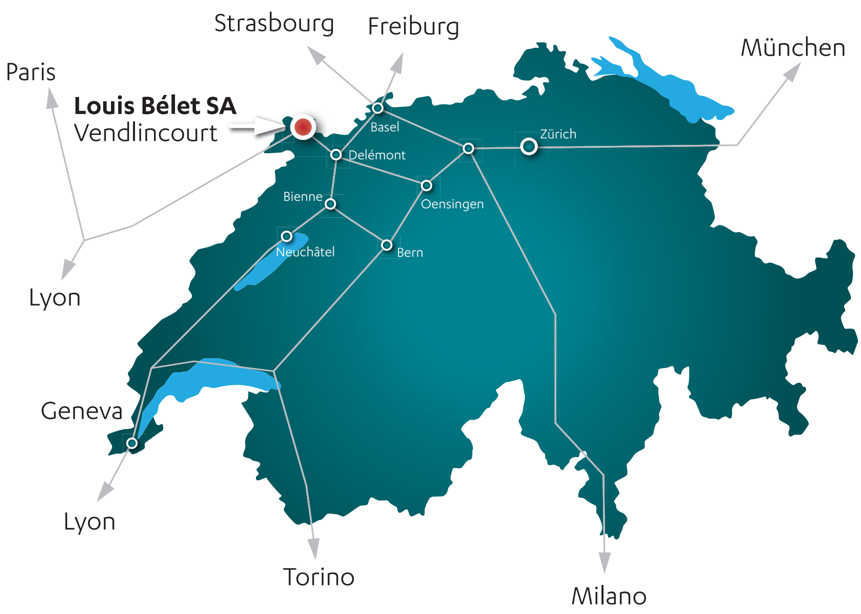
Z : Number of teeth

V_f [mm/min]: Feed speed

n : Spindle speed

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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The quest of excellence

Bélet's spirit relies on the quest of excellence. In all our activities, we constantly focus on finding the best solutions, for our customers and our employees.

Quality and environmental management are testified by our ISO 9001:2008 and ISO 14001:2004 certifications.

List of authorized distributors available on www.louisbelet.ch