

# Drilling of composite materials



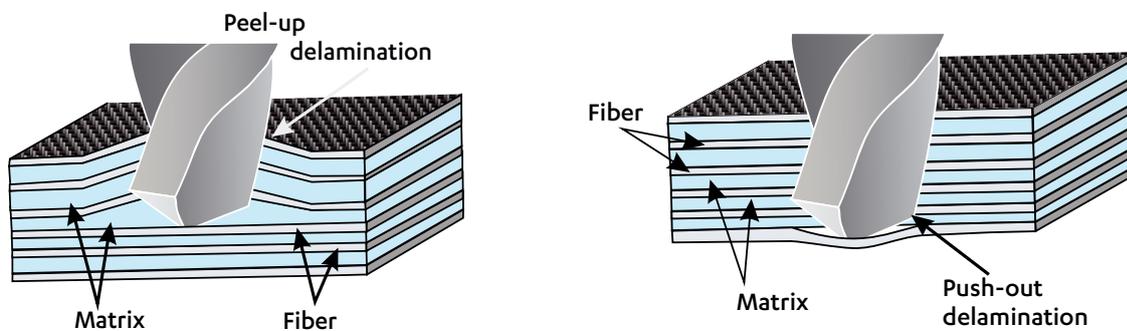
**A high performance  
drill**

# Machining of composite materials

## One problem

Carbon or Glass Fiber Reinforced Plastics (CFRP/GFRP) are very hard to machine. The drilling efficiency is reduced and delamination problems occur frequently.

As shown in the picture below, delamination may happen at two levels: at the entry of the drilled hole (peel-up delamination) and at the exit periphery of the drilled hole ("push out" delamination).



## One solution



- Bélet has developed a custom tool with specific carbide, geometry and coating for composite materials.
- This tool allows high speed drilling of thousands of holes in GFRP without experiencing delamination issues.

# N°1

This tool has been tested along with 12 competitors. Bélet's drill obtained the best results!

## Tool

Bélet's drill REF 300

## Through-hole drilling

1.6 mm

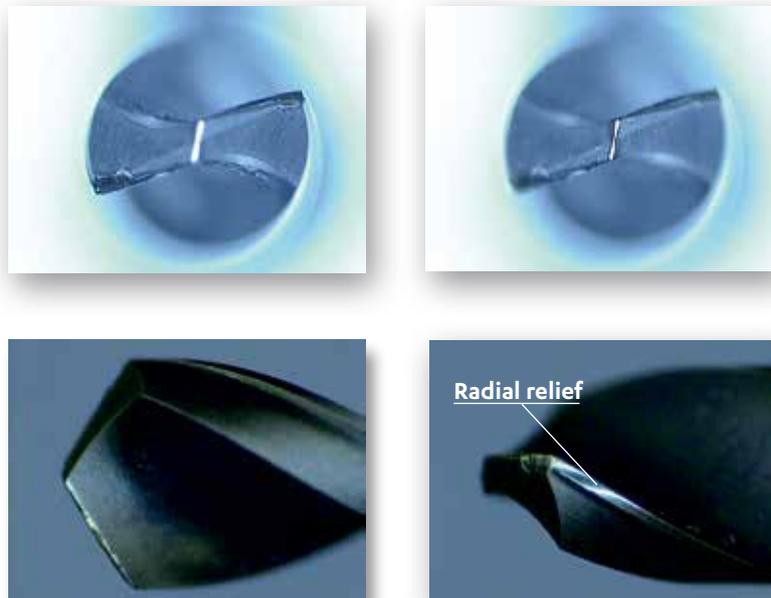
## Hole tolerance

± 0.05 mm

## Results

|                                | Drill von Bélet REF 300 | Competitor A |
|--------------------------------|-------------------------|--------------|
| # holes                        | 10'000                  | 10'000       |
| Conical from                   | All holes OK            | 3'000        |
| Out of tolerances from hole n° | All holes OK            | 5'000        |
| Burr on top from hole n°       | All holes OK            | 2'400        |
| Bottom burr from hole n°       | 6'600                   | 3'000        |
| Number of good holes           | 6'600                   | 3'000        |
| Tool wear after 10'000 holes   | Good                    | Highly worn  |

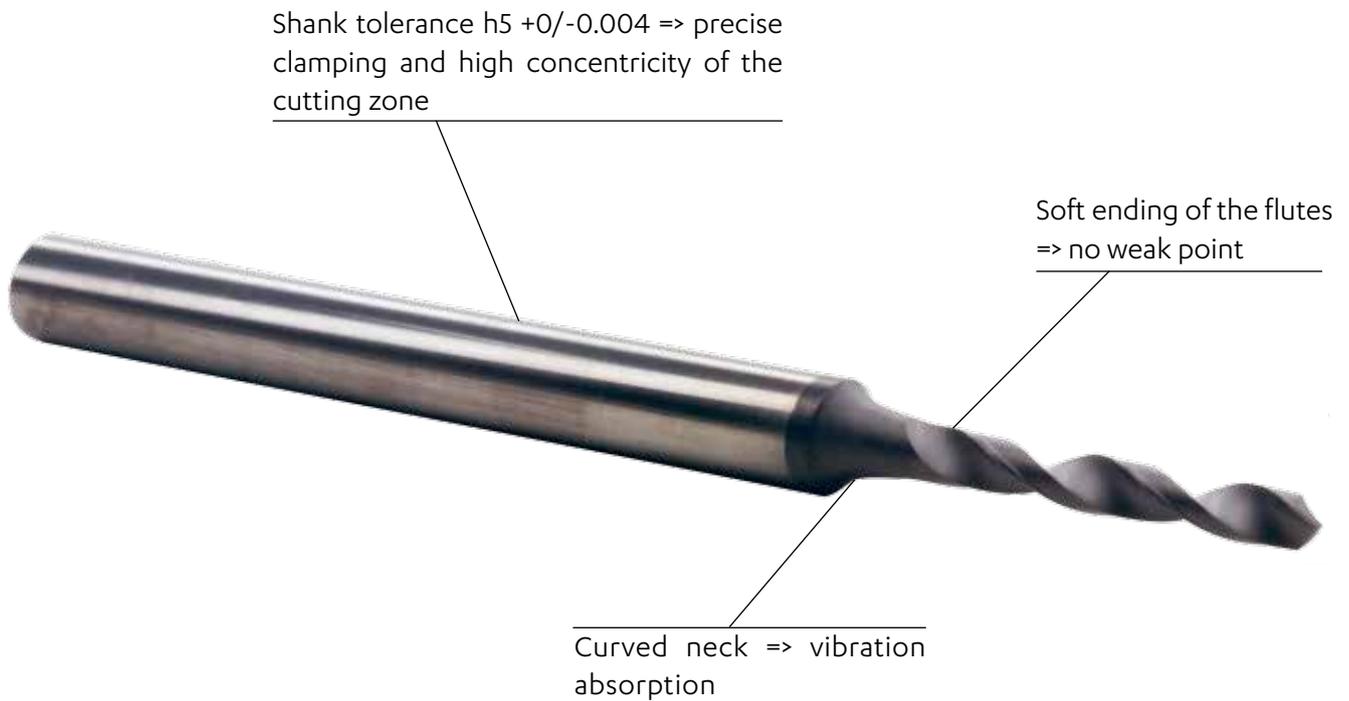
## Drill Bélet REF 300: tool wear after 10'000 holes



## Observations :

- After 10'000 holes, only the cutting edge is worn. Other edges are sharp
- The tip is intact
- The radial relief is present => drilling ø is correct
- The coating is still present

# Main features



## High quality micro grain solid carbide

- Chosen for its hardness and high tenacity
- Allows also a flexibility of the drill

## Tight geometric tolerances

- Centered tool sharpening
- Less constraints when drilling

## Polished surface

- Allows a good chip evacuation
- Sharp cutting edges

## Specific coating

- Reduces friction coefficient
- High reduction of the tool war

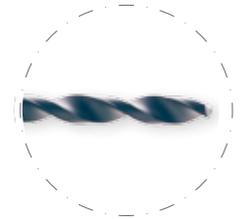
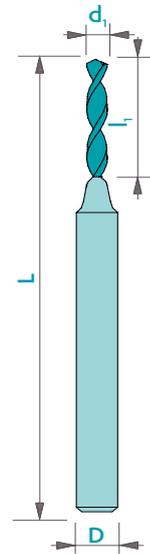
# Drill for composite materials

REF. 300

| Material            | Vc<br>[m/min] |
|---------------------|---------------|
| Composite materials | 200           |

## Tolerances

$d_1$ : +0  
-0.004  
D: h5



**Long tool life**

**Minimal delamination**



Z2



HM  
MG

N  
HSC

| $d_1$ | $l_1$ | D | L  |
|-------|-------|---|----|
| 0.80  | 8     | 3 | 38 |
| 0.90  | 8     | 3 | 38 |
| 1.00  | 10    | 3 | 38 |
| 1.10  | 10    | 3 | 38 |
| 1.20  | 10    | 3 | 38 |
| 1.30  | 10    | 3 | 38 |
| 1.40  | 10    | 3 | 38 |
| 1.50  | 10    | 3 | 38 |
| 1.55  | 10    | 3 | 38 |
| 1.60  | 10    | 3 | 38 |
| 1.65  | 10    | 3 | 38 |
| 1.70  | 10    | 3 | 38 |
| 1.75  | 10    | 3 | 38 |
| 1.80  | 10    | 3 | 38 |
| 1.85  | 10    | 3 | 38 |
| 1.90  | 10    | 3 | 38 |
| 1.95  | 10    | 3 | 38 |
| 2.00  | 10    | 3 | 38 |

Prices  
and other  
dimensions  
available upon  
request