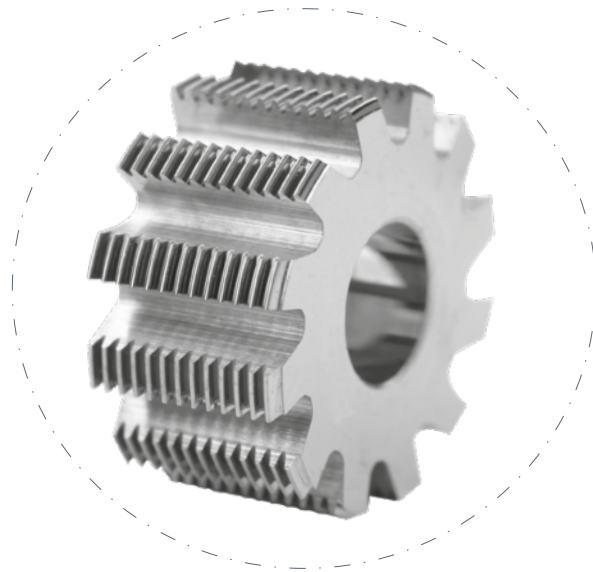


# 9. Hob cutters





# Hob cutters for gears

Louis Bélet produces hob cutters for more than 10 years. Our ORIGIN hob cutters are well-known and trusted, especially in the Swiss prestige watchmaking. We are one of the leader on that market!

Gear cutting is a very high precision operation. It can be performed in multiple ways. The best one is the most efficient in terms of time and cost, depending on :

- ▶ The quantity of pieces to be cut
- ▶ The type of pieces
- ▶ The shape of the tooth profile
- ▶ The machine
- ▶ The habits and the know-how

For many years, Louis Bélet manufactures all kinds of gear cutting hobs. All have been tested and approved by our reference customers to their whole satisfaction.

## On-line form

You may send a request for a quotation for hob cutters via our on-line form. Our technical office shall analyse your requirements and can recommend the suitable hob cutter for your application.

> [www.goo.gl/AVQHQ6](http://www.goo.gl/AVQHQ6)

## Online Spreadsheet for gear hobbing

Calculate your cutting and machining parameters using our interactive tool:

> [www.goo.gl/BqgDXs](http://www.goo.gl/BqgDXs)



# Hob cutters for gears

## Z<sup>2</sup> - Tooth by tooth gear cutters

Easy to set up, Perfect shape

Tooth by tooth gear cutting is a simple process, fast and economical for prototyping and small scale productions. This process allows cutting of all types of tothing, including deep teeth and asymmetrical profiles.

Louis Bélet produces tooth by tooth gear cutters as circular mills or T-slot end mills, the dimensions being customized according to customer's needs. A perfect profile is guaranteed on the tool.

Tool



Machined part



## REVOLUTION - Hobs for asymmetrical gears

Fast cutting, Positioning drawing

Our « Revolution » hobs allows the cutting of gears which have a special profile : non symmetrical, too deep or simply not feasible using a classical gear cutting hob.

The hob is delivered with the positioning drawing.



## E<sub>2</sub>F - Hobs for frontal gear cutting

Easy to set up, Perfect shape, Short cycles, Burrs avoided

Frontal gear cutting is a process which is far more complex than it appears at first glance. The main challenge is the need to cut more and more teeth on smaller and smaller diameters.

The possibilities made available by our E<sub>2</sub>F cutting hobs, which also have a long service life, help you to overcome these problems.

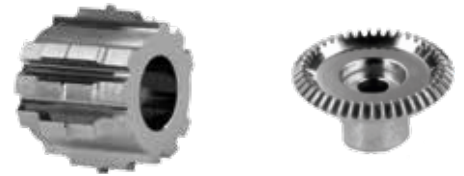


# Hob cutters for gears

## TRINITY - Hobs for conical gears

Positioning drawing, All kinds of profiles possible

Cutting conical pinions or gears is also a specialty from Louis Bélet. Our Trinity tool allows cutting of all kinds of conical gears, whatever the tooth shape and the module are. These hobs can be used on any gear cutting machine.



## ORIGIN - Hobs for epicyclic and involute teeth

Fast cutting, Clean cutting

The « Origin » hobs are characterized by the high precision of the profile as well as the geometry of the whole tool. The bore tolerance (h3), the perpendicularity and the parallelism of the sides of the mill are essential features.

Louis Bélet goes further than just producing high quality tools. Listening carefully to the needs of our customers, we help them solving the troubles they may have in gear cutting.

«Origin» hobs distinguish themselves from module 0.02 up to module 2.00 in the watch gears and mechanical profiles.



Typical hob for the watch industry

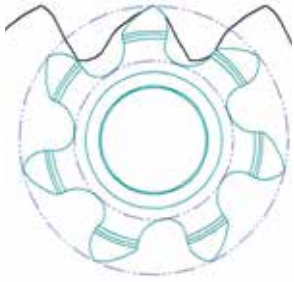


Typical hob for mechanical parts



Gear cutting hob on a shank

# Hob cutters for gears



## Customized profile

Bélet is able to design hobs according to any conceivable profile in a very short timeframe. Prototypes can then be produced with the final profile of the teeth.

We calculate in house the profiles of the hobs thanks to a special software bundle developed by our means. Thus, there is no intermediate, ensuring a high reactivity and an optimisation of the profiles starting from the prototyping step.



## Non symmetrical profiles

The flexibility of our profiling process allows the creation of the most various gear cutting hobs.

Non symmetrical toothings have been tested. The advantage is to be able to use a hob cutter instead of a special «setting hob». The lifespan of the tool is much longer and the setting the machine is easier.

It's not possible to cut all profiles with this technique, so a study is performed at the stage of the quotation.



## NIHS profiles

One special feature associated with the NIHS norms is a sharp tip of the tooth. Bélet's hobs allows the cutting of pointed teeth without any modification of the standard machining settings.

# Hob cutters for gears

## Standard dimensions of gear cutting hobs

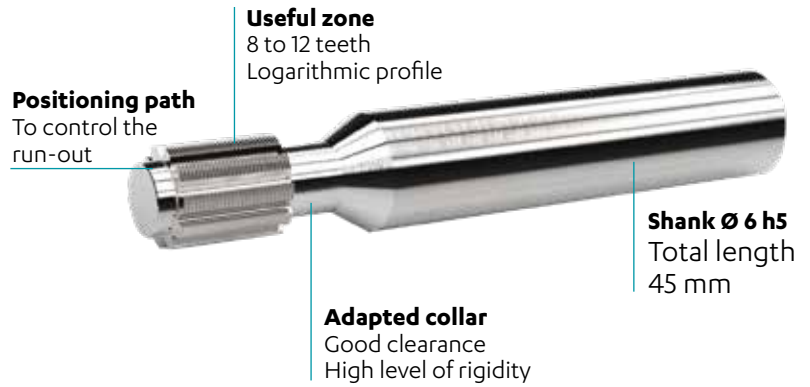
Ø External	Thickness	Ø Bore	Z
6	4	3.5	12
6	5	3.5	12
6	6	3.5	12
8	4	3.5	12
8	5	3.5	12
8	6	3.5	12
8	6	4.5	12
8	8	4.5	12
10	4	3.5	12 / 15
10	4	4	12 / 15
10	4	4.5	12 / 15
10	5	3.5	12 / 15
10	6	3.5	12 / 15
10	5	4.5	12 / 15
10	6	4.5	12 / 15
12	6	3.5	15
12	5	4.5	15
12	6	4.5	15
12	8	4.5	15
12	10	4.5	15
12	6	5	15
12	8	5	15
12	6	6	15
12	8	6	15
16	4	8	15
16	6	8	15
16	8	8	15
16	10	8	15
16	12	8	15
18	6	6	15
18	6	8	15
18	8	8	15
18	10	8	15
18	12	8	15
24	4	8	15
24	5	8	15
24	6	8	15
24	8	8	15
24	10	8	15
24	12	8	15
24	15	8	15

Other dimensions (Ø max: 100 mm) or teeth number available upon customer's request

# Hob cutters for gears

## ORIGIN gear cutting hob on a shank

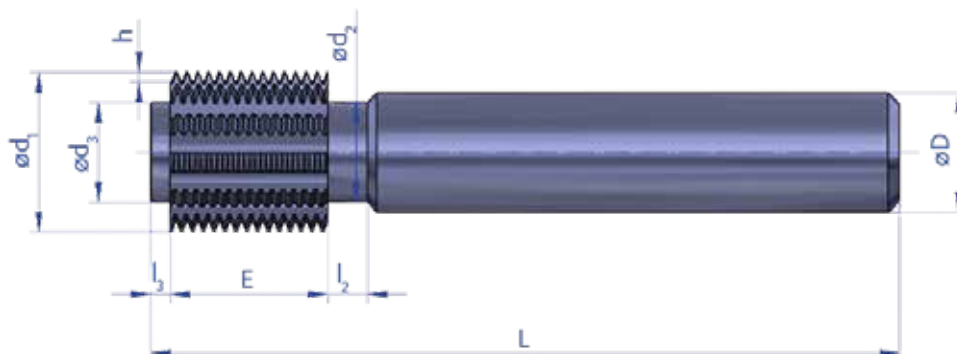
- Are the  $\varnothing$  of gear cutting hobs always too big?
- Do you never seem to have the right arbor?
- Is the arbor always worn or marked?
- Do you find it difficult to position the run-out?



## Benefits

- **Cutting hob with a minimum  $\varnothing$  of 3 mm** Shortens the length of the gear cutting inlets and outlets. Enables working closer to a wall.
- **Single shank  $\varnothing$  of 6 mm** One single clamp for all the cutting hob dimensions
- **No special device for the arbor** Avoids often high additional expenses
- **Makes controlling the run-out easier** Comparator control on the positioning path

$d_1$	E	$d_2$	$l_2$	D	L	Z	$d_3$	$l_3$
3	4	2	2	6	45	8	2	1
3.5	4	2.5	2	6	45	8	2.5	1
4	5	3	3	6	45	8	3	1
5	6	3.5	3	6	45	10	3.5	1
6	6	4	3	6	45	12	4	1
8	6	-	-	6	45	12	5	1
10	8	-	-	6	45	15	6	1
12	8	-	-	6	45	15	8	1





# Hob cutters for gears

## Hob cutter : From Watch industry to microtechnology

### Involute gear cutter with watch industry quality!



Our hob cutter's department found solutions for profiling involute gear cutters in a way, that grinding time is dramatically reduced. However and thanks to our watch industry's experience, quality and precision are kept at a really high level, flirting with what we do get for that market.

We are now well positioned offering micro-technique, car or medical markets, involute hob cutting tools with watch industry precision whilst competitive price!

### Modules and dimensions

Our modules sizes values starts at m 0.02 and goes up to m 2.00. Other modules are also available upon request.

All dimensions are seriously studied. We for instance already produced hob cutters of  $\varnothing$  4.0 mm with a cylindrical shank.

### Generation hobbing's principle

Hob cutter turns and come to hit the part to be cut, that also turns on it's axis. The important point is the rotation ratio between the two parts and which should be:

$$n_{\text{Gear}} = \frac{N_{\text{hob}} \times \text{Number of threads}}{Z_{\text{workpiece}}}$$

Putting correctly machine's axis position and angle, the cutter generates in that way the correct teeth.

Beware, hob cutting require run-out as minimal as possible!

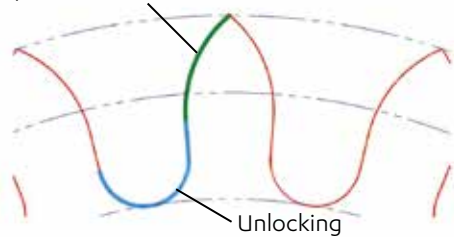


# Hob cutters for gears

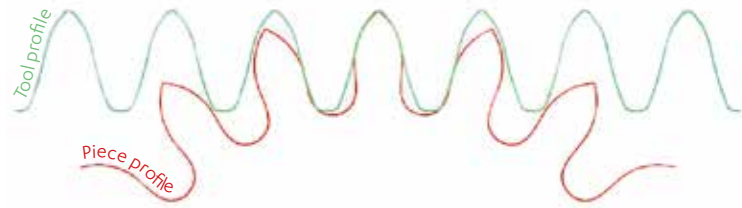
There are 2 big teeth shape's families:

## Cycloids

Cycloid curve



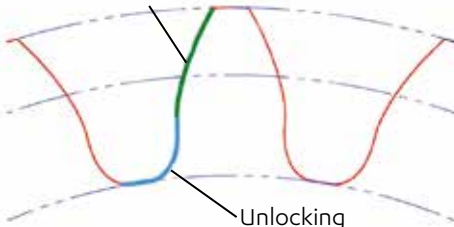
NIHS profile's example:



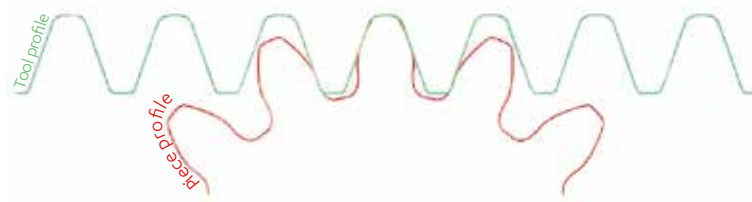
Mainly used in the watch industry. NIHS, NHS, EVJ norms (and many other proprietary norms from watch brands) follow cycloids teeth shapes. Generation hob cutters for cycloid shapes have complex profiles and requires a very high precision. We are talking here about microns!

## Involutes:

Involute curve



Hob cutter's profile is simpler, for instance:



DIN, ISO, AGMA, JIS (and many others) are the norms for involute gearing. These are mainly used in car industry, micro-techniques and general mechanics. Please note that sometimes, watch industry also use involute norms, mainly proprietary, for their movements' gear-trains.