

# Gears Manufacturing



*Driven by Innovation*

# Why 5 axis tooling machines?

Gear manufacturing conventional processes require dedicated machines and tools. Small production batches are not compatible or profitable with these methods because setup times, which include tools definition and acquisition, are very long.

Tools are very specific and expensive, as they depend significantly from type of gear and geometry. Furthermore, design to market lead times are long as they are strongly influenced by tools development and manufacturing .

Non standard geometries are very difficult to manufacture and development process itself is “narrowed” by equipment available. Few manufacturers hold strong proprietor solutions. Breton Gear machines can drastically skip these limitations.

With BRETON 5 axis tooling machines  
**ANY GEAR GEOMETRY IS POSSIBLE,  
THERE'S NO LIMIT TO GEAR DESIGN PROCESS,  
ONE SINGLE VERSATILE MACHINE IS USED FOR  
MULTIPLE GEAR SIZES OR SHAPES,  
COSTS AND LEAD TIMES FOR  
ONE PIECE FLOW ARE DRASTICALLY REDUCED,  
THERE'S NO NEED FOR SPECIAL TOOLS,  
QUALITY RESULT IS VERY HIGH**

In partnership with KISSOFT, leader in the Design software for gears and transmissions for construction vehicles, Formula 1 cars, cableways etc. a specific software for surface generation has been developed.

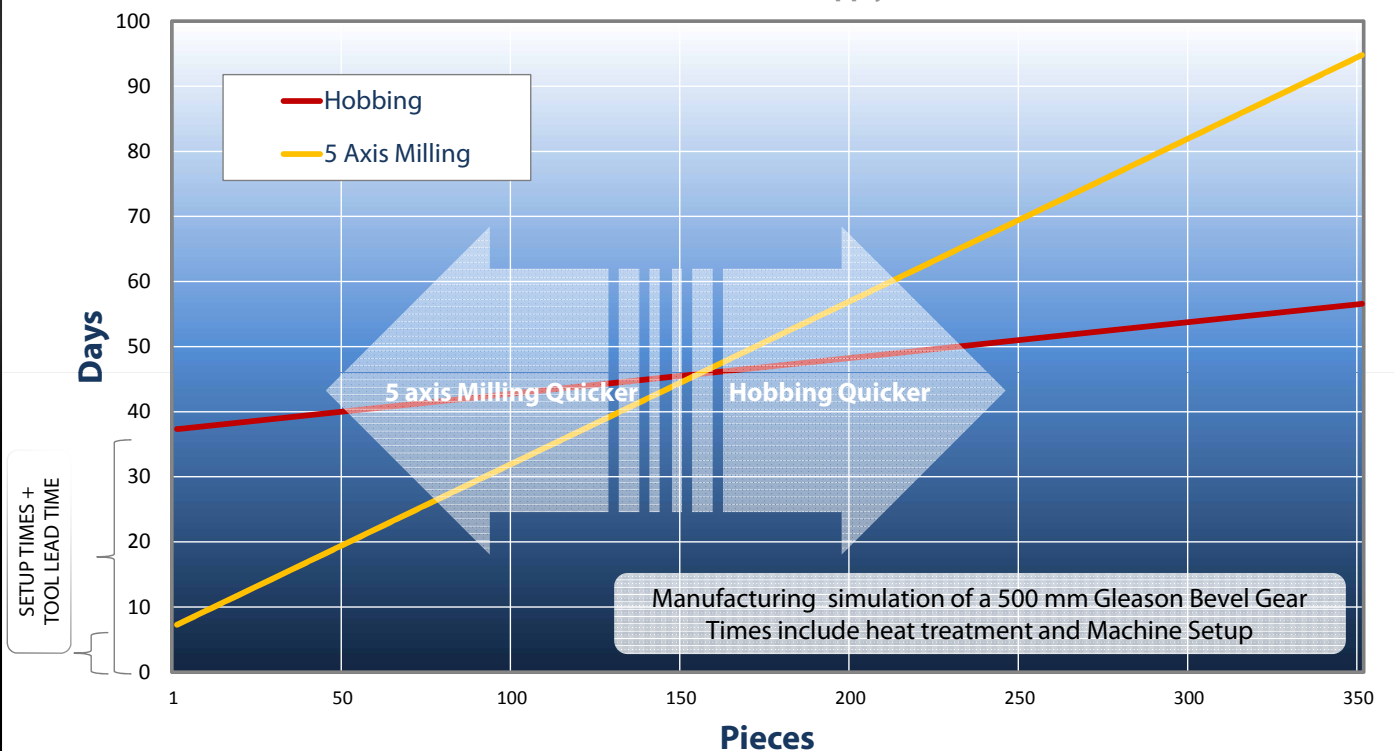
A CAM application dedicated to cut and measurement of pinions and gears delivers precision and quality.



## Gear Manufacturing Times versus Batch size

**WITHOUT TOOL IN HOUSE**

(1 month estimated supply time)



# Integrated Design and Manufacturing Process Management

The whole gear design and manufacturing process is managed by a **software suite**, that gives control on all phases.

The designer can still follow the normal design-simulation-testing-delivering sequence. He can first generate a 3D model with an application called **Breton Gear Design, powered by KISS SOFT**.

The model can be then modified in a dedicated **CAD environment, powered by RHINO**.

In this way specific modifications such as variable semitopping chamfer can also be applied on a 5 axis milling machine.

The model is finally transmitted to a CAM application called **Breton Gear CAM, powered by RHINO NC** that brings to the machine the most proper manufacturing strategy.

After heat treatment the piece is re-positioned on machine through a “best fitting” procedure.

On machine measurement is performed.

# Integrated Design and Manufacturing Process Management

**breton** Gear  
DESIGN

powered by  
KISS SOFT

Intermediate CAD STEP

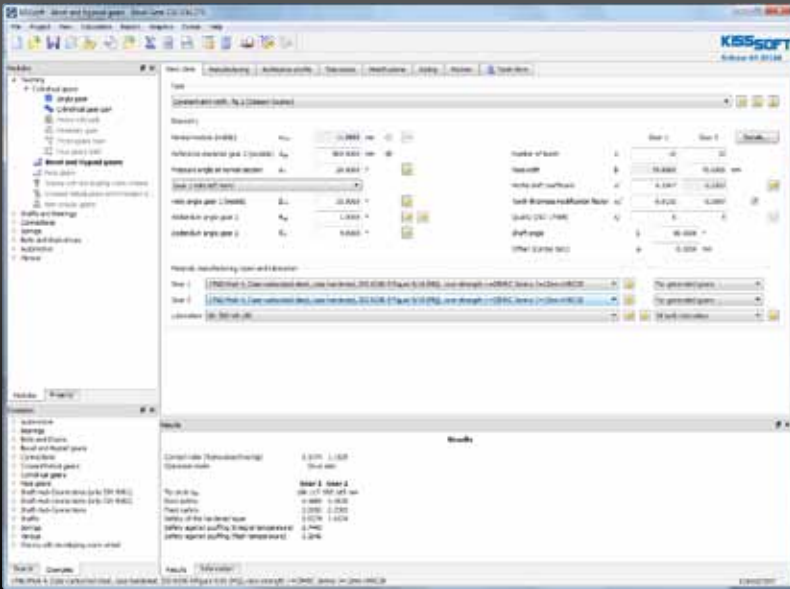
powered by  
RHINO

**breton** Gear  
CAM

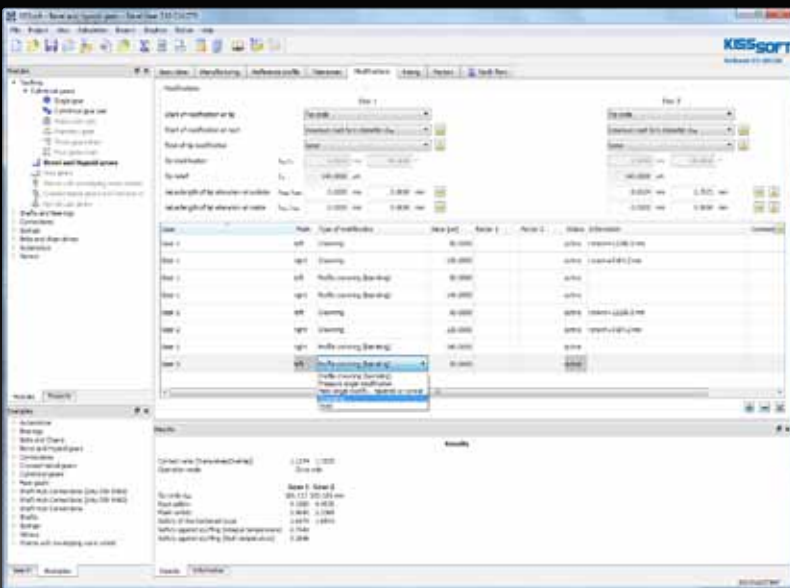
powered by  
RHINO NC



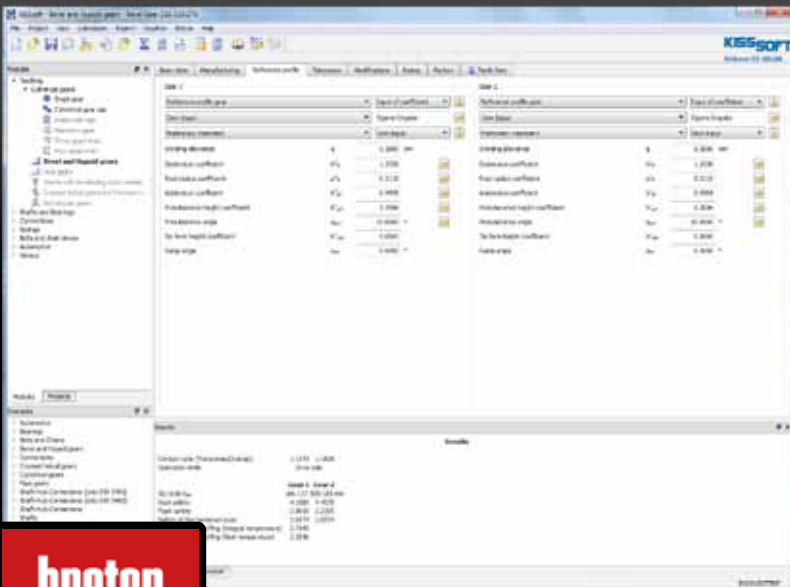




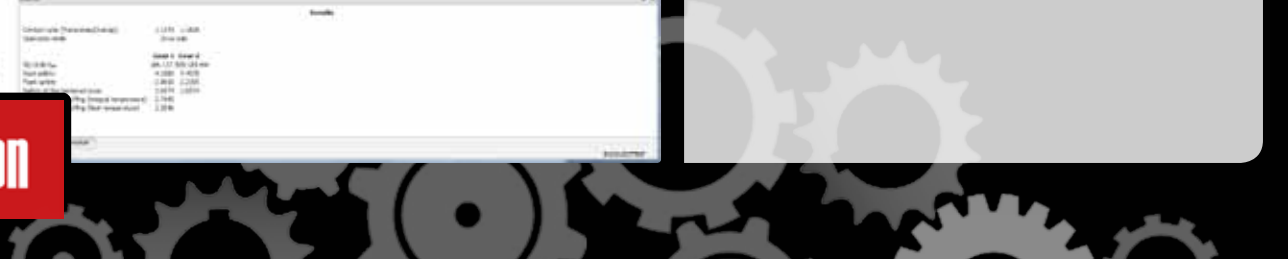
Breton Gear Design, is the 3D model software generator specifically and exclusively developed in partnership with KISSOFT. It allows to input all gear parameters in a dedicated interface. User can for example start from gear Gleason sheet or other specs.



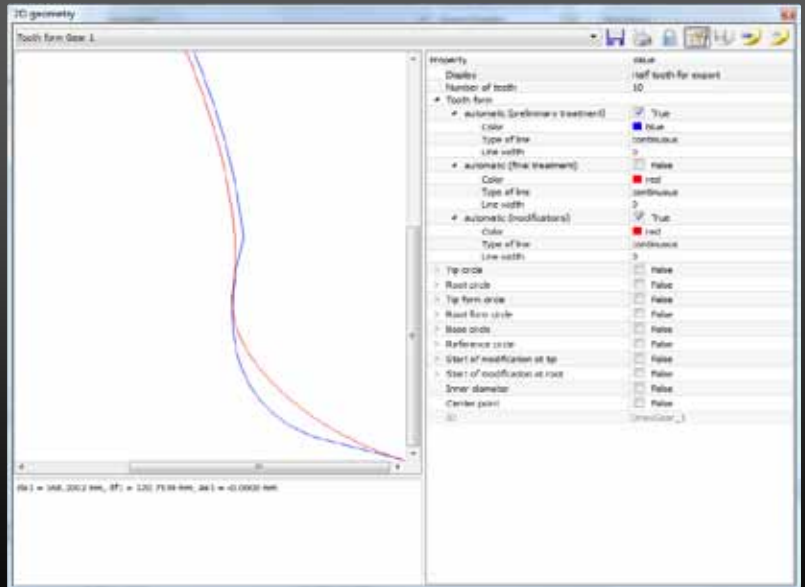
All tooth profile modifications can be implemented, such as tip and root relief, crowning etc. Individual topological modifications can also be applied to the nominal face width for drive or coast flank in order to give the optimal tooth contact result.



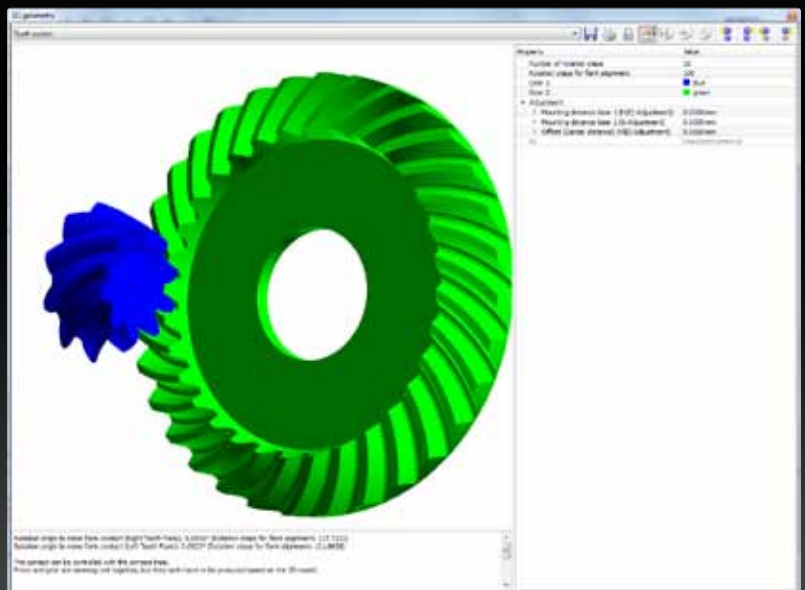
Tool protuberance can be adopted, and the setting for protuberance and root radius along the face width can even be variable.



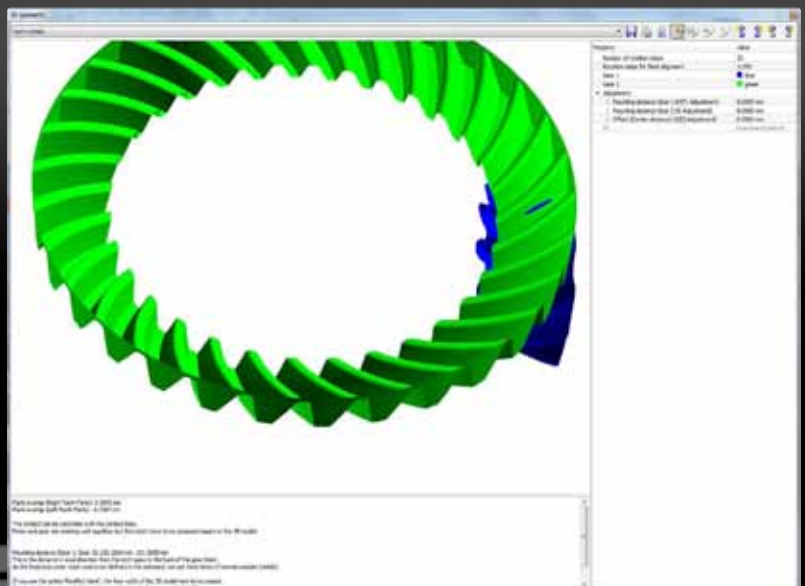
A specific focus exclusively developed by KISSSOFT for Breton has been adopted on the transition area between flank and root of the tooth in order to optimise it.



3D model is generated and displayed, for a designer fine analysis of the gear meshing. The 3D model is then sent to the CAM application, but can still be modified through an intermediate CAD step.



TCA (Tooth Contact Analysis) is performed and visualized for a fine adjustment of all parameters and corrections.



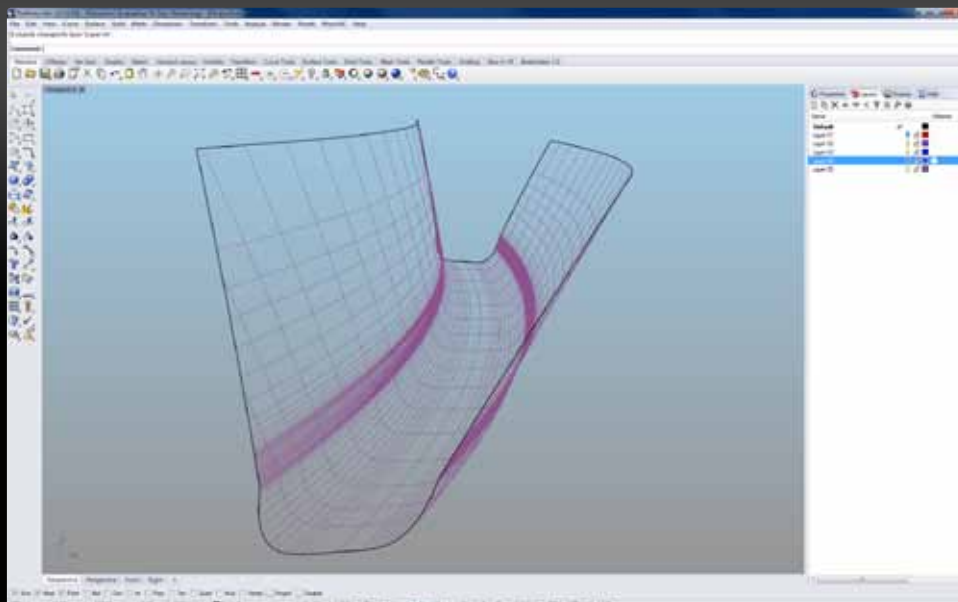
The 3D Model generated by Breton gear Design is fetched by a CAD application powered by RHINO. This intermediate step leaves to the designer full flexibility and the chance to modify the surface previously created, when required. In this way it is possible, for example, to generate a semitopping chamfer adjustment.

Breton Gear CAM is an application powered by RHINO NC.

It receives the 3D model as an input and lets the user choose tools from a library in order to apply the most proper manufacturing strategy.

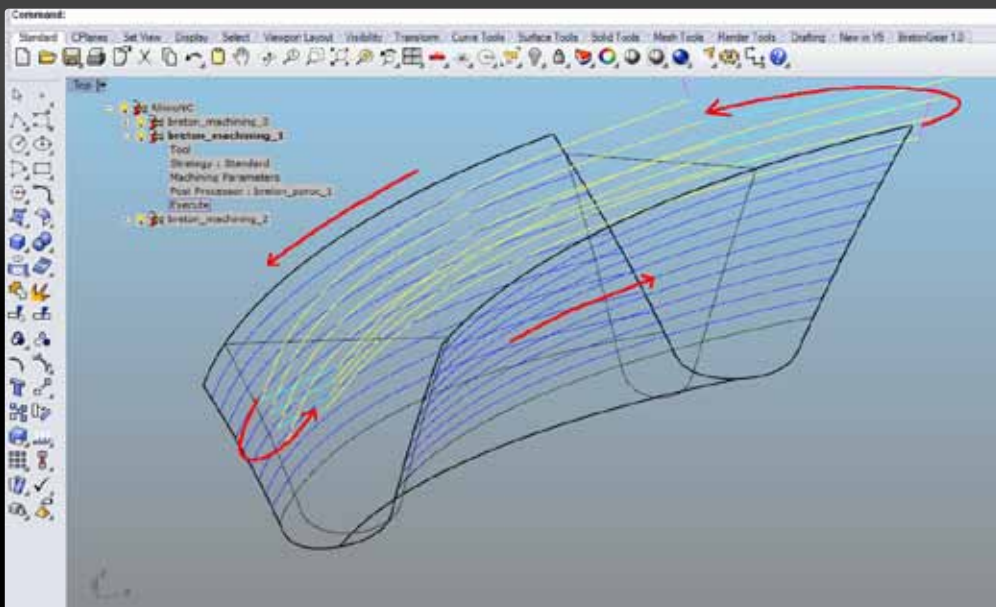
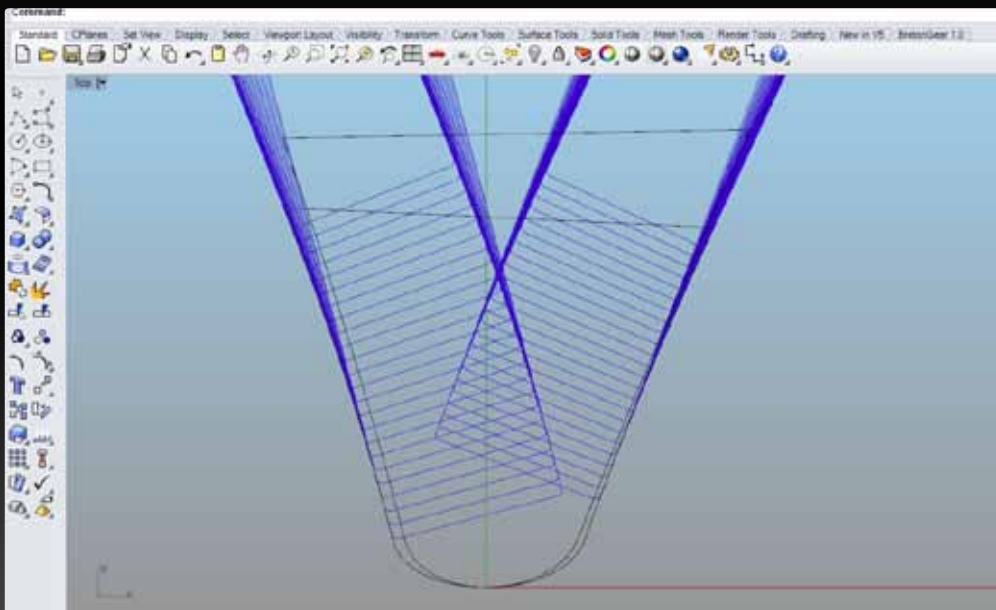
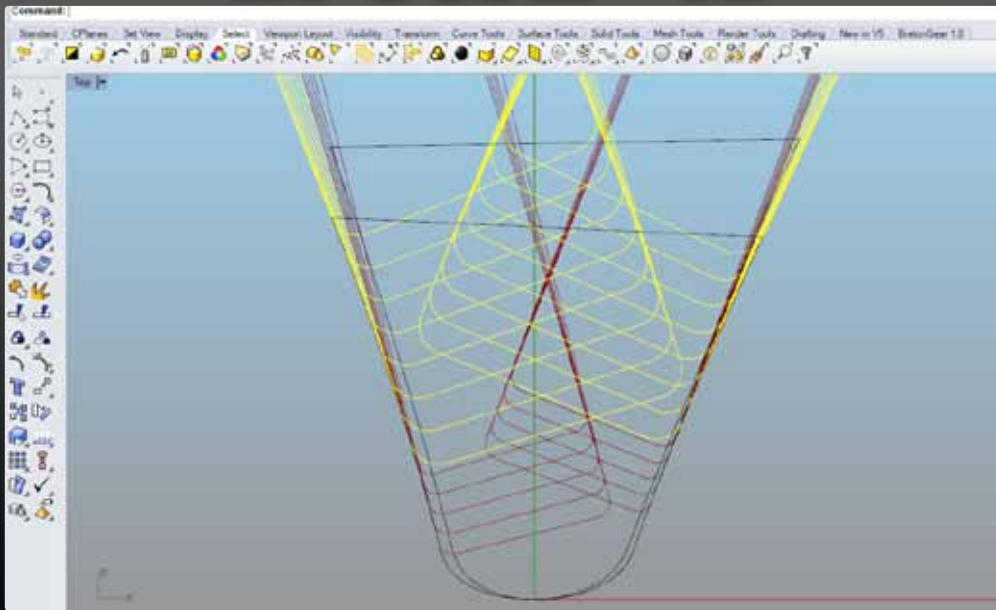
Tool paths are created in a sequence for both roughing and pre-finishing/finishing.

A specific attention has been focused on the finishing manufacturing phase: hardened gear is first precisely positioned through a “best fitting” procedure that minimises the effect of treatment’s distortions and then it’s finished following a smart algorithm called T.A.O. (Teeth Accuracy Optimizer) that calculates the sequence of teeth to be worked by keeping into account the progressive tool wear, and proposes the tool change accordingly, or foresees a number of tool changes as a function of the geometry being worked.





# breton



# Gears can be manufactured on...

Breton multipurpose machining centres are specially conceived for high speed, top performance and unbeatable versatility.

The mobile bridge gantry design, **Metalquartz** damped structures and integrated customized technical solutions are the main features of these machines.

High dynamics from the **Direct Drive** technology and high speed machining, excellent surface finish and outstanding machining accuracy are a byword for efficiency, quality and productivity.

Whatever the requirements, even the most demanding ones, Breton's full range of machines meets them easily in the major industrial sectors such as aerospace, energy, automotive, mold and die and general mechanics.

Machining and finishing precision is guaranteed thanks to the high geometric accuracy, thermal stability and the implementation of a specific software for compensating spindle thermal expansion and drifts which occur when machining and production conditions vary.

With the automated pallet changeover system, automatic workpiece loading / unloading productivity is increased allowing for precise production planning and scheduling.

In the very wide product range XCEEDER, ULTRIX, MAXIMA and TITAN are the models on which gears can be manufactured

# Gears can be manufactured on...

**XCEEDER** is a gantry multitask 5-axis machining centre with a vertical spindle, rotary tilting table, mobile crossbeam.

The vertical design of these Breton machining centres is the ideal solution for machining up to 1000 mm gears. The incorporated Direct Drive technology and gantry drive ensure maximum machine performance and rigidity thus guaranteeing machining quality and precision.



Like XCEEDER, **ULTRIX** is a gantry multitask 5-axis machining centre that adds the possibility of vertical turning.

ULTRIX is the perfect solution for providing the workshop with the required flexibility, still guaranteeing the performance level - in terms of accuracy and quality - that gear manufacturing requires.



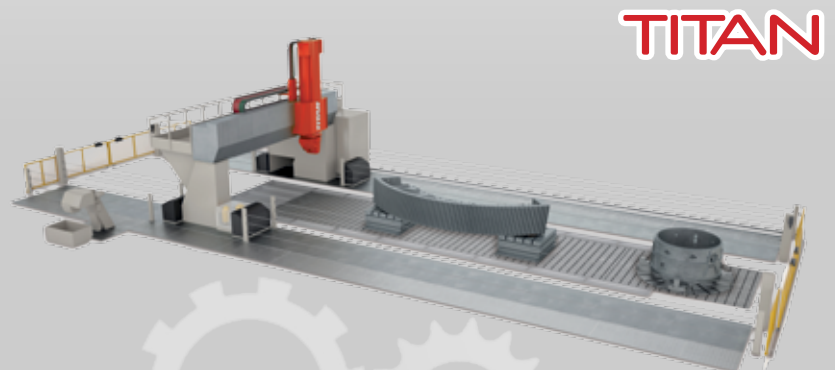
**MAXIMA** is the perfect solution for turning, milling, boring and tapping workpieces with complex 3-D shape.

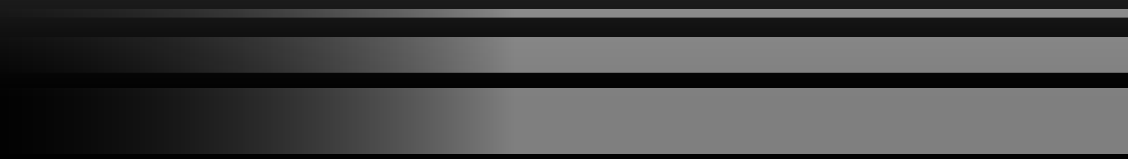
It gives maximum flexibility, performance and efficiency with work ranges spanning from 2500x2500x1200 mm up to 10000x3500x2000 mm and over.

The range of electrospindles enhances the range, in order to satisfy specific production requirements.



**TITAN** is a highly dynamic 5 interpolated axis milling centre with a moving portal making it the perfect solution for intensive milling operations, high-speed machining of titanium, superalloys, high alloy steel, steel alloys and light alloys.





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