CaravelCut
Explorer l'usinage

Tutorial precisions & vibrations

Step by step, this site will guide you to solutions to your machining issues (including various technical problems). The site is based on several methods: "design of experiments" (D.O.E), the kriging interpolation, the computation of statistical significance (Fischer exact test), "solution tree" analysis.

Economic Optimization

Evaluate your production from an economic viewpoint (service without additional tests). We determine the best cutting settings to reduce your production costs.

Production Optimization

Evaluate the productivity of your machining process and determine the optimal cutting parameters to increase your productivity.

D.O.E to improve machining

We guide you step by step to launch any type of design of experiment to improve any manufacturing process (grinding, design of cutting tools, etc.).

Statistical Analysis

If you are hesitating between various cutting conditions, we conduct statistical analyses to determine the best one.

Reduction of torque

We find the right machining conditions to reduce torsion in your parts.

Improvement of the roughness

We find the right cutting conditions to reduce roughness of your parts to a minimum.

Tool life

We find the right machining conditions to prolong the life of your tools.

Accuracy and vibrations

We guide you step by step to determine the origin of inaccuracies or signs of vibration in your machined parts.

Reduction of burr.

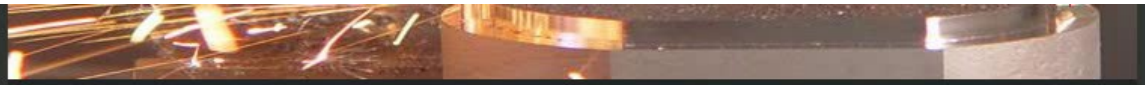
We find the right machining conditions to reduce burrs on your parts.

Kriging Interpolation

We predict new values and results based on trials you already conducted randomly and without plans.

sélectionnez le service

select the service



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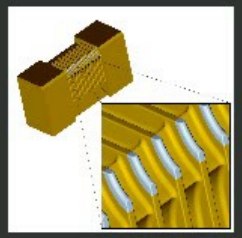
Increasing the accuracy and / or reduce the vibrations



Description

User manual

See an example

Start the service

The following factors are frequent sources of inaccuracies of machine tools by chip removal:

- thermal deformations of the machine.
- imprecise tool sizes and form.
- runout of the rotation of the tool.
- bending of tools due to cutting forces.
- inaccuracies or deficiencies of the technical control.
- systems of measurement inaccuracies of the position of the axes.

The order of the list meets (approximately) the order of importance of errors under the conditions more common or -normal-. The letter indicates the type of error generated by each source of error.

The errors of precision of machined parts are of two types:

- form errors (F).
- dimensional errors (D).

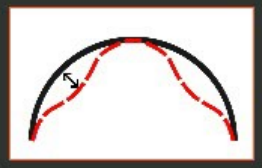
To increase the machining accuracy you must identify the source of errors and act to eliminate or compensate them.

Usually these operations can be accomplished through a series of operations and tests that will be indicated in the following pages. Through these operations, usually, we can determine the factors that are causing errors.

An improved of the accuracy from normal is very likely. Cons by their elimination or full compensation is possible only in certain cases (depending on the source of inaccuracy).

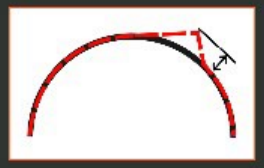
lire les indications et démarrez le service

read the info and start the service



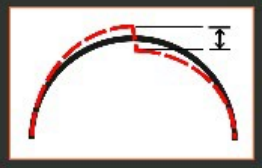
Path deviations at 45 °

When running circles or curves. Path deviation around 45 ° between the actual tool path and the theoretical trajectory



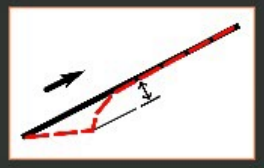
Path deviations when an axis inverses the direction, when running circles or curves

When running circles or curves. Local path deviation correspondig with the inversion of the movement of an axis: flat at the inversions



Shifting half of a curve, when running circles or curves

When running circles or curves. Path deviation correspondig with the inversion of the movement of an axis: a full half of the circumference is shift compared to the other half

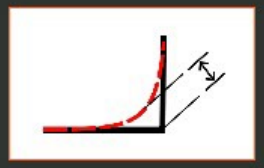


Path deviation when starting a movement

Path deviation (between the actual tool path and the theoretical trajectory) when starting a movement of an axis.

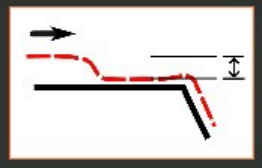
Passes at different levels

Passes back and forth are executed at different levels (width of the passes is different)



Cut sharp corners

Sharp corners are cut



Path deviations when the feed rate changes

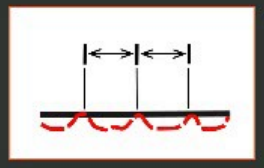
Inaccuracies in correspondence with changes of feed rate

Path deviations on inclined surfaces

Inaccuracies on inclined surfaces

Holes inaccurate when drilling

Inaccuracies in the execution of holes when drilling



Vibrations

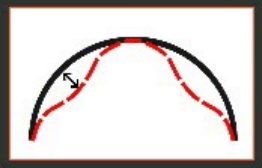
Traces of vibration on the machined surfaces

vous obtenez une liste de problèmes

you get a list of troubles

choisissez votre problème

choose your problem



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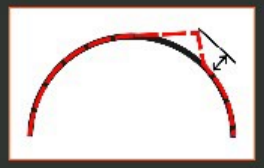

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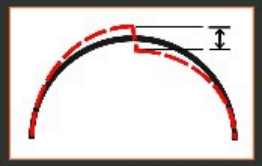

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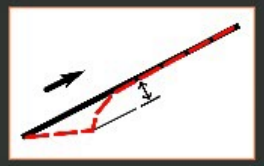

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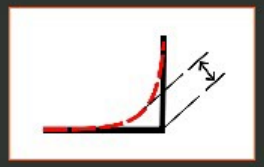

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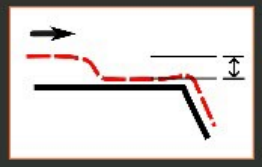

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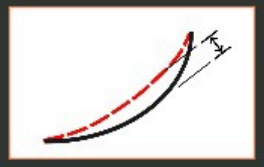

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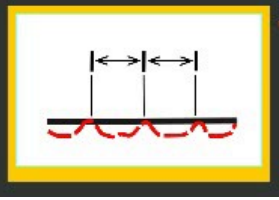

Vibrations

Traces of vibration on the machined surfaces

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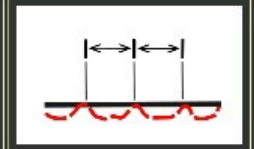
Vibrations

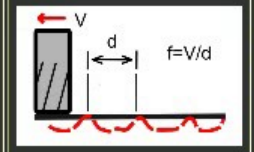
schema	description	To to (importance)
	Traces of vibration on the machined surfaces	• frequency of vibration to be measured (++++) • vibration due to the natural frequency of the machine (++) • vibration due to an element of the machine (++) • vibration due the -chatter- (++) • vibrations of high / low frequency (++) • gain: Kv / wrong machine settings (++) • runout, of the spindle rotation () • bending of the tools ()

Back to the error's list

vous obtenez une liste de suggestions

you get a list of suggestions

frequency of vibration to be measured

schema	What do?	Warning
	Some vibrations are due to forces that vary over the time (forced vibration). In this case the vibration changes its frequency if the force that produced it changes its frequency (eg vibration forced by the cutting forces when milling. If we increase the speed of rotation of the spindle, the frequency of the vibration increases accordingly). Other forces are due to the combination among forces and elastic elements (self-excited vibration). In this case the frequency is fixed and is related to the stiffness of the object and therefore to its -natural frequency-. Some other vibrations are related to some parameters of the CNC machine. The vibrations are characterized by their frequency (cycles per second). The frequency of a vibration can lead to the identification of its origin. The frequency of a vibration (a * 1) can be determined with specific instruments (accelerometers), but generally it can also be identified through the traces left by the vibration on the machined parts: crests and valleys. To identify the frequency first of all you have to measure the distance between the crests (in mm, or hundredths of a millimeter ... etc..) left by ont the machined surface and due to the vibration. Depending on the type of machining and the type of vibration, you have to identify the speed with which the object which left the trace (usually the tool) moved on the surface from a crest the other (usually the feed rate). - The division between the distance between the crests and velocity (a * 2) gives the time period of the vibration. - The number of periods that occur in a second give the frequency in Hz (Feed rate divided by the spacing between a peak, or crest, and the next).	(a * 1) - frequently there are several components in a vibration. They can be seen as cycles of vibration not perfectly regular (may be you will see small crests, less visible, between two crests more evident. You should take into account mainly the cycle that is more pronounced and more evident: it corresponds to the largest component of the vibration and that should mainly be eliminated or reduced. (a * 2) - The measurement units of distance and time must be consistent, probably you have to perform a conversion of units (for example: mm and seconds, for displacements and also for feed-rate).

Possible solutions

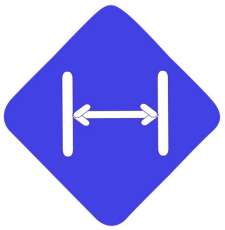
(s * 1) - check if the vibration frequency changes with the feed rate, or the rotation speed of the spindle, ... or with the other elements. Read the chapter concerning this activity.

lisez les remèdes

read the remedy

Bon travail

Good work



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