



GEAR CHAMFERING SOLUTIONS

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Mechanical Deburring

Systems for Chamfering Toothed Parts

- Manual deburring/chamfering
- Chamfer-Cut
- Electrochemical deburring
- Mechanical chamfering
- Chamfering/deburring via robot
- Gear rolling
- Vibratory finishing

Our deburring and chamfering solutions are suitable for almost any application:

- From small to big diameters
- From small to large series production

We will define the most suitable machine type with you in order to satisfy your production requirements.

Advantages of Mechanical Chamfering

- Repeatability: constant quality of the machining result
- Operators' safety thanks to the closed structure of our machines
- Robust machines which require little maintenance
- Simple operation
- Low costs for chamfering tools
- Customized equipment of the machine: from highly flexible to highly productive.

Why Choose Tecnomachine

- We have 20 years of experience in the gear sector and customers worldwide.
- In the course of the years, we have developed several standard machine models. We keep chassis of these models on stock, so that we can offer our customers extremely short delivery times.
- Tecnomachine develops customized solutions for their customers. Every machine will be equipped with the necessary tools to reach the best possible process, with optimized costs.
- We have studied and tested chamfering tools with our suppliers in order to ensure the optimization of the chamfering result.
- Tecnomachine reaches for customer satisfaction: Our service ranges from feasibility study, through mechanical, electrical and software planning, up to assembly and inspection.
- In addition to chamfering machines, Tecnomachine also has considerable experience in industrial automation. We are thus able to supply complete integrated automated production lines.

Tools and Machining Process

Pre-Machining via Disk-Cutter

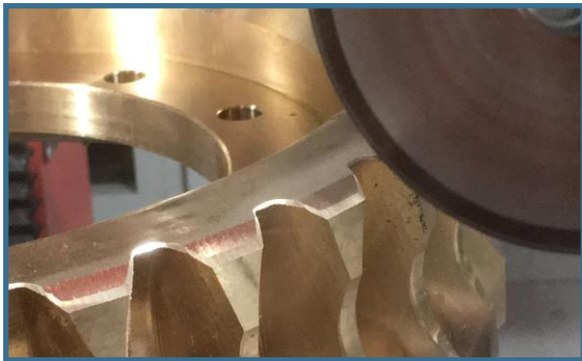
Especially the hobbing process of the geared parts generates burrs with significant dimensions.

As an alternative to manual filing, Tecnomacchine offers a pre-machining process, during which the burr is cut off with a disk-cutter.



Standard Chamfering

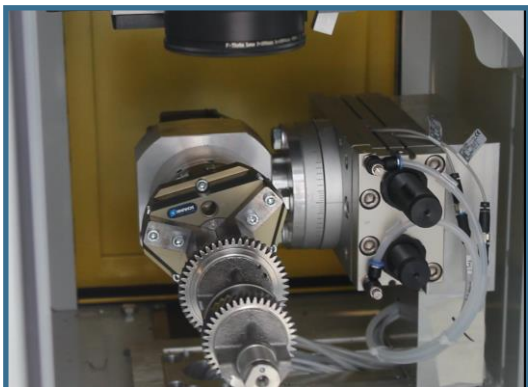
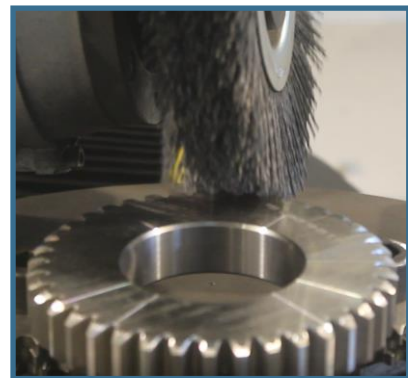
It is possible to use both abrasive wheels (suitable for hardened and non-hardened material) as well as end mills (only suitable for non-hardened material).



Depending on the chosen machine type, the tools can be adjusted manually or can be CNC-controlled. The pressure of the tool is adjustable thanks to an electronic pneumatic

Brushing

The chamfering process via end mills or abrasive wheels creates a secondary burr on the tooth flank. It is therefore highly recommended to follow up with a brushing process for final finishing. The CNC-controlled brushes offer the possibility to compensate their wear automatically.



Laser Marking

It is possible to integrate further machining stations, such as for example a laser marking station.

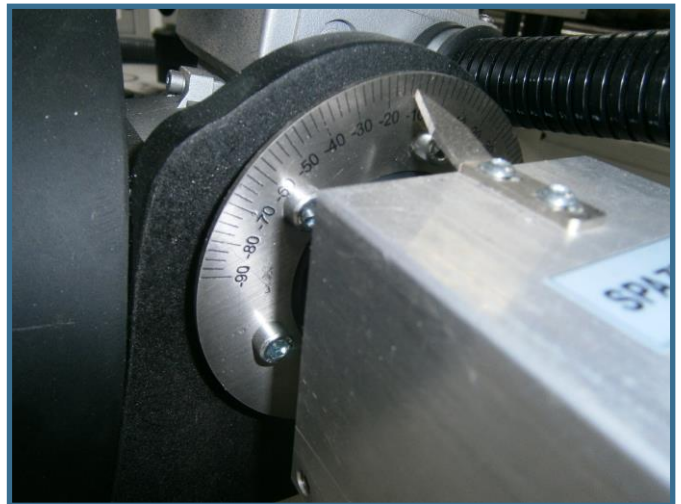
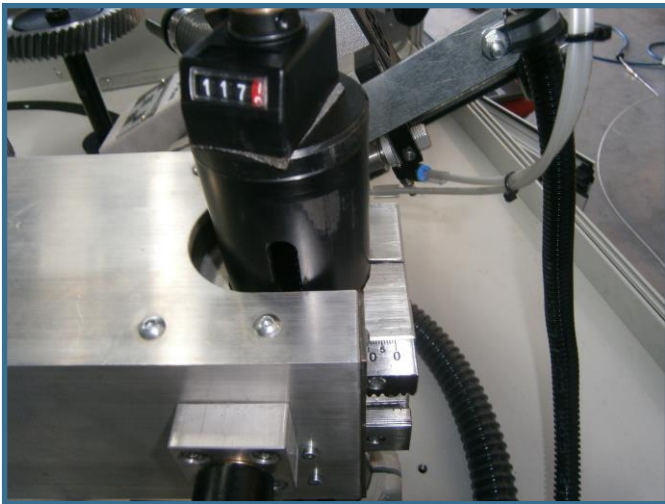
The marking system lasers important production data onto the part, such as the item number, serial number, date, batch or a DMC-code.

Tool Set-Up

Tecnomacchine provides three options for the adjustment of the tools during set-up:

- Low-priced, highly flexible adjustment by means of handwheels
- Manual, repeatable adjustment with rotary counter and nonius
- CNC-controlled tools

Manual Set-Up of the Tools



The vertical and radial machining position is adjusted by means of handwheels.

Set-Up of the CNC-Controlled Tools

The CNC axes of the tools are adjusted in the JOG mode. Once the machining position for the part has been determined, the parameters are saved in the part program.

Tecnomacchine thus lowers the set-up time for recurring parts, as it is sufficient to load the previously saved program.

This solution is particularly suitable for those customers whose production requirements include low set-up time for recurring batches.



Chamfering Machines for small series production

- Standard: self-centering manual three-jaw chuck
- Alternatively: pneumatic chuck or inclinable chuck (by +/-90° for spiral bevel or internal gears), optionally also inclinable CNC-controlled chuck
- PLC with touchscreen display
- Optional: opening on top if the production includes big / heavy parts
- Optional: dust collector

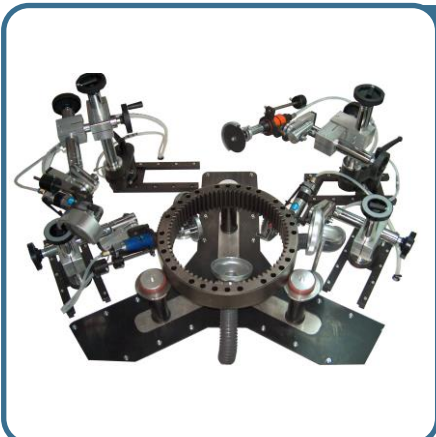


Gear Chamfering Machine TM150 / TM150

- Universally applicable, low-priced solution
- Parts with Ø30-400mm (optionally 700mm)
- Standard equipment: two chamfering tools for top and bottom
- Option: brushing tool
- Option: bore in the chuck in order to clamp long shafts
- Option: inclinable chuck for spiral bevel gears

Gear Chamfering Machine TM1000

- Solution for big workparts with up to Ø1.000mm
- Standard Equipment:
Double tool with a disk-cutter and brush,
Two chamfering tools
- Option: pneumatic or automatic (CNC-controlled) clamping system



Gear Chamfering Machine TM400

- Solution for internal gears with Ø180-500mm
- Two chamfering and two brushing tools, which machine the part simultaneously on the top and bottom side.

Chamfering Machines for Medium-Sized Serial Production

The challenge with the production of medium-sized series / batches is:

- The cycle time plays a stronger role as compared to small series.
 - solution: **loading/unloading in masked time** on a station positioned outside of the machining area
- Having a greater variety of parts requires very short set-up times
 - solution: **few tools, which can be easily and quickly adjusted**



Gear Chamfering Machine TM250

- Rotary table equipped with:
 - Loading/unloading station outside the machining area
 - Machining station with two chamfering tools and one optional brushing tool
- Suitable for spur gears, shafts and pinions with $\varnothing 400\text{mm}$
- CNC-controlled version available
- Machine can be connected to an automation by Tecnomacchine or other suppliers

Gear Chamfering Machine TM90

- Solution for gears, shafts and pinions with $\varnothing 30\text{-}350\text{mm}$
- Rotary magazine with 10-20 stations, which rotates through the machining chamber in order to ensure a small autonomy despite a medium-sized batch
- Two chamfering tools which can be equipped with abrasive wheels or end mills



Gear Chamfering Machine TM500

- Highly flexible solution, suitable for all kinds of workparts with $\varnothing 10\text{-}250\text{mm}$
- 4 machining units: two chamfering and two brushing tools, all CNC-controlled
- Pneumatic, CNC-controlled inclinable chuck
- Maximum flexibility for positioning the tools and workpart



Chamfering Machines for Large Series Production

The challenge with the production of large series / batch production is:

Compliance with a maximum admitted cycle time, which is often dictated by the hobbing machine

→ solution: **Rotary table with several workstations**, each of which takes care of one specific machining operation

In case of automated machines, the down time is a significant criterion

→ solution: **Robust mechanical and electronic components, remote technical assistance**



- Suitable for gears with $\varnothing 30-200\text{mm}$
- Rotary table with 5 workstations
 - 1) loading / unloading
 - 2) and 3) chamfering top and bottom
 - 4) and 5) brushing top and bottom
- Option: CNC-controlled machining tools in order to reduce the set-up time

Gear Chamfering Machine TM200-R3

- Rotary magazine with 10 adjustable towers
- Each tower is 450mm
- Extremely easy and fast set-up
- Programming of the automation with few parameters



Gear Chamfering Machine TM200-2C

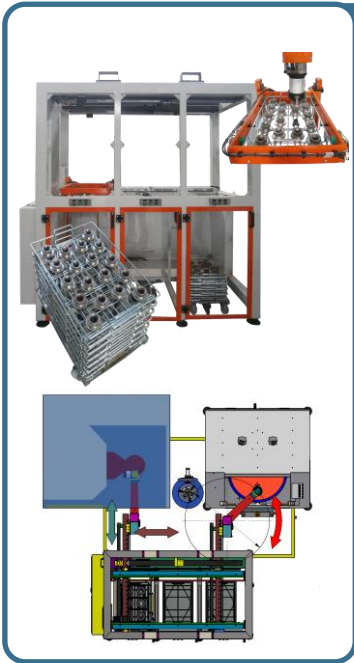
- Basket loading system which handles 2 or 3 stacks of trays and a manipulator equipped with a three-jaw-chuck for pick and place
- Maximum height of each stack of trays: 1100mm
- Unlimited number of parts in the tray
- Easy and fast set-up



Solutions for Automation

Our automation solutions allow our Customers to significantly reduce the need for the operator's presence on the machine. Depending on the dimensions of the parts, our automation models are able to work autonomously for several hours. They are therefore suitable to be applied to machine medium-sized and large series/batches.

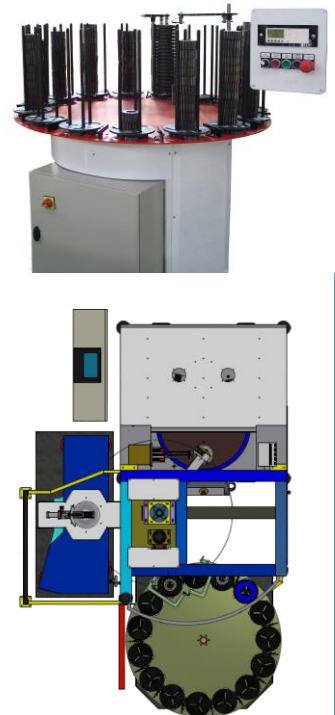
Automated Basket Loader TM100



- The system can be entirely adapted to the customer's workpart flow in the production processes
- The solution includes:
 - 1) a two- or three-bay basket loading system
 - 2) a CNC-controlled manipulator which takes care of the pick and place process between the automation and the machine tool
- The TM100 is able to handle up to three machine tools at a time and can be linked to any machine tool.

Rotary Magazine Rotostore TM15

- This solution is suitable for cylindrical parts with $\varnothing 30-300\text{mm}$.
- The system includes:
 - 1) A rotary table with 15 towers, each of which with a height of 450mm
 - 2) System to lift the towers to the loading and unloading position
 - 3) CNC-controlled manipulator for the pick and place operation between the automation and the machine tool
- The autonomy of the automation depends on the height of the workparts. The lower the part the longer the machine will run without intervention by the operator.



Gear Drilling Machines

Tecnomachine also supplies CNC-controlled drilling machines to make holes on gears, which require lubrication.



Gear Drilling Machine TM T3

- \varnothing of the parts: 30-160mm
- **3 drilling units** at an angle of 120°
Alternatively, the **TM T2** is equipped with **2 drilling units** at an angle of 180°
- All movements are CNC-controlled:
 - the radial movement of the bits
 - The vertical movement of the chuck
 - The rotation of the workpart
- It is possible to make central, higher or lower drillings on 1, 2 or 3 differently staggered
- The machine automatically checks the integrity of the bit after every drilling cycle.
- Depending on the number of drilling cycles to perform on one part, the system is able to machine up to 350 parts per hour.



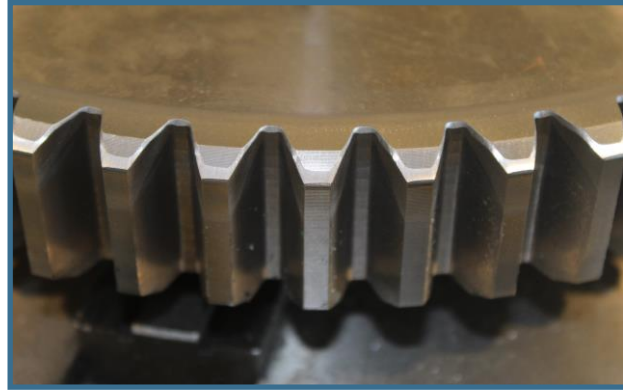
References in Italy



International References



Example of Achieved Results



Chamfering of straight-toothed or helical spur gears.

The picture on the left shows the result achieved with a manually adjusted tool, while the picture on the right shows the result achieved with a CNC-controlled tool.



Machining of a bronze worm gear.

This result has been achieved by machining the part with a pre-machining disk-cutter, then chamfering and finally brushing the part.



Machining of a spiral bevel gear.

This result has been achieved by chamfering both the tip and toe by means of CBN abrasive wheels and a final brushing cycle.