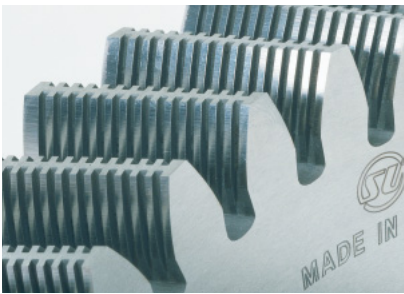
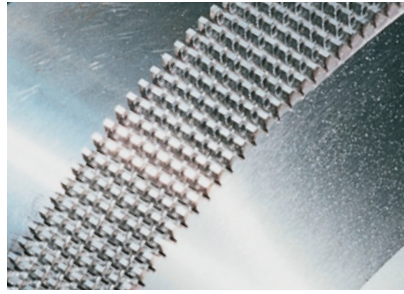
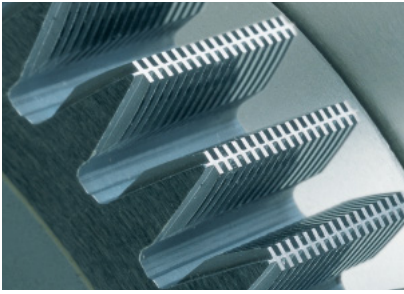




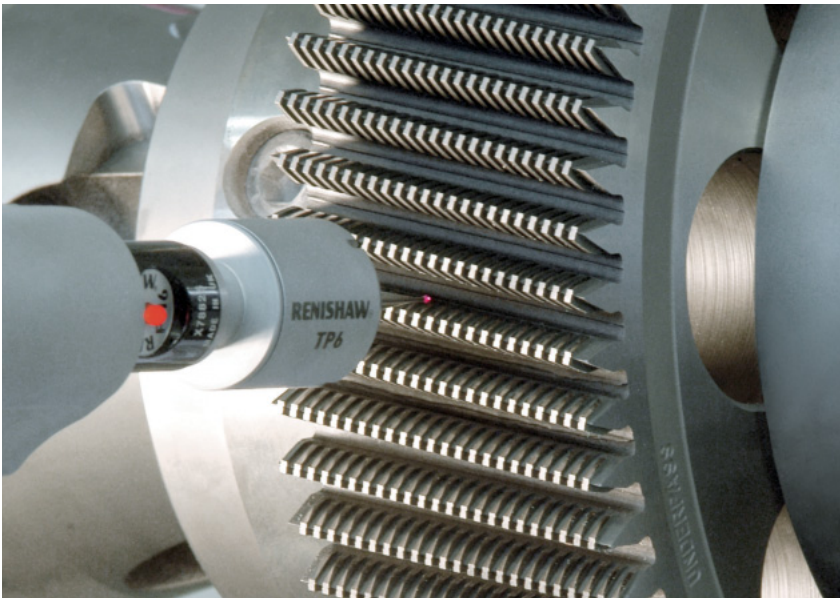
Shaving cutters

Shaving cutter production range and services



from left to right:
Shaving using the plunge method
Shaving using the plunge method and a very small module cutter
Shaving using the transverse method
A diagonal shaving cutter with lightening bores

Resharpener and on-machine measurement of shaving cutters on Samputensili brand production machines (S 400 GS)



Types of shaving cutters

As one of the largest producers of cutting tools worldwide and with particular expertise in shaving technology, we offer a wide range of shaving cutter types:

- Transverse
 - Diagonal
 - Diagonal-underpass
 - Underpass
 - Tangential
 - Plunge
-
- Internal/external shaving
 - Unground or finished shaving cutters
 - All tools are supplied with inspection and lead test charts.

Dimensions

Module	0,7 - 10 mm*
Max. width	65 mm
Outside diameter	70 - 330 mm

*All shaving cutter serrations from 0.7 up to 0.99 are formed by turning

Material

It is possible to choose from different conventional HSS or powder metals.

- M 2
- ASP 23
- ASP 30

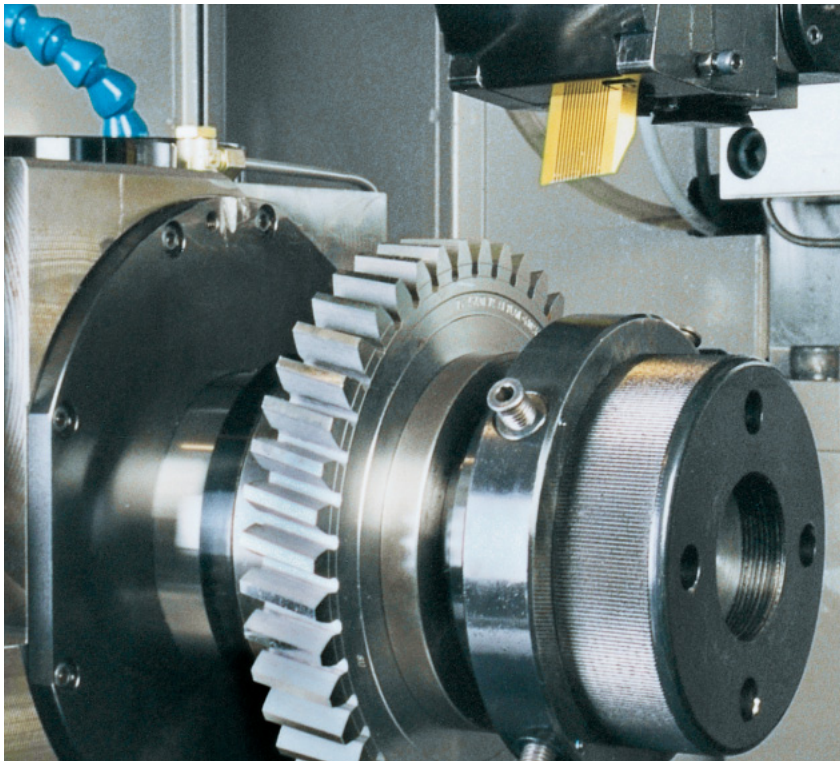
Service

From design to delivery, all processes are carried out in-house and Samputensili shaving cutters are manufactured on our own process machines.

Our Service Centres in Europe and in the United States regrind all types of shaving cutters whether produced by ourselves or by third parties on the very latest grinding machines available on the market.

In certain areas collection and delivery services are available and we can even offer complete CMS (Commodity Management System) solutions. We would be delighted to answer any specific questions on tool management or tool application parameters you may have.

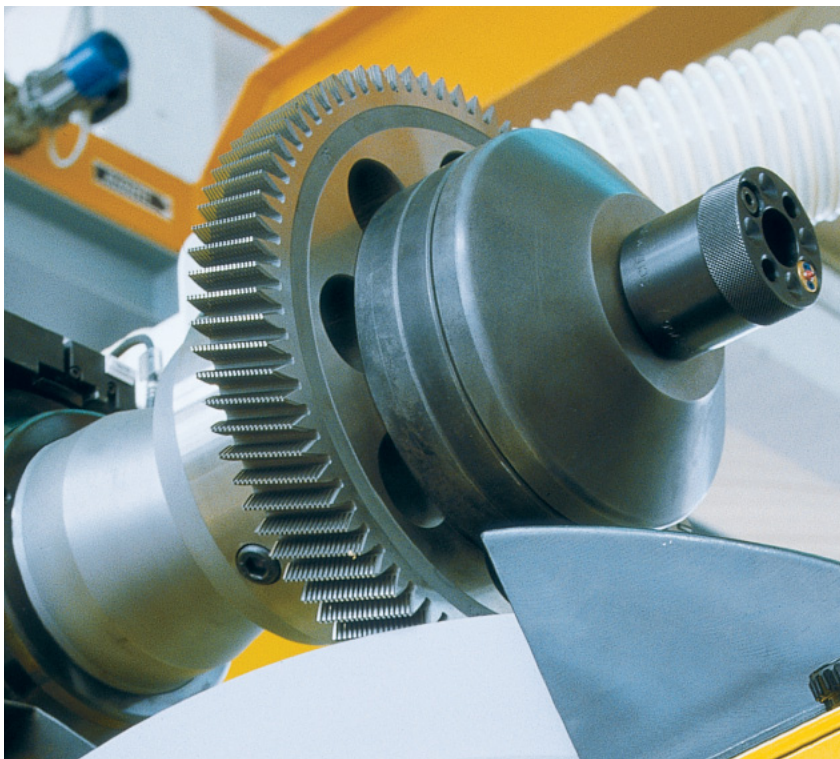
Production technology from Samputensili



In 1949 Samputensili started the production of gear cutting tools. Quality requirements were not satisfied by the production machinery available on the market at that time. It was from this need that Samputensili began developing its own manufacturing solutions for high precision gear tooling.

These production requirements led to many technological innovations including our shaving technology which was born in the early 1960's.

Still today, the most critical operations in terms of quality are performed on Samputensili process machinery which is now into its fourth generation of development. The same principal has been extended to other areas and Samputensili also produces special production tooling in-house to guarantee high quality standards while keeping costs under our direct control.



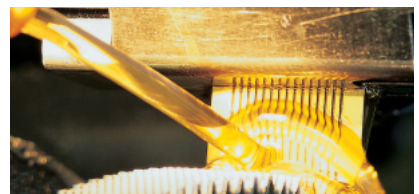
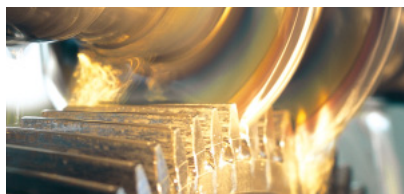
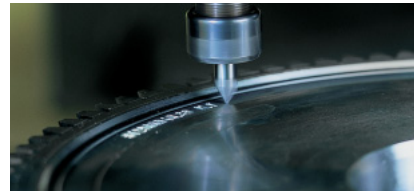
From top to bottom:
A Samputensili developed serrating machine to cut serrations on shaving cutters to the strictest tolerances.
The Samputensili S 400 GS shaving cutter and master gear profile grinding machine both as part of the production process and for tool resharpening. Customers may purchase this machine to resharpen tools in-house. The machine is equipped with direct drive torque motors and an integrated on-machine measuring system.

Samputensili serrating tools which are used on our serrating machines



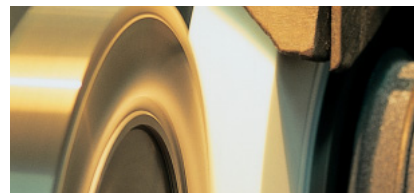
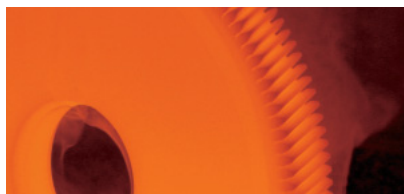
Certified efficiency

At Samputensili we produce shaving cutters exclusively on our own CNC production machinery at above average speeds and with high precision and quality standards. All steps in the production process from the cutting of the base cylinder to final quality inspection are optimised. The strict compliancy with our precise and well-defined quality system is guaranteed by UNI EN ISO 9001 quality certification which we have held since 1996.



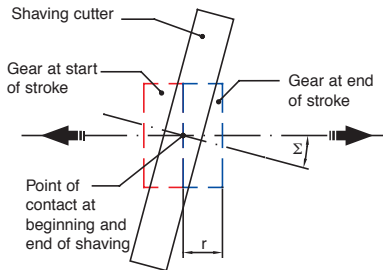
From left to right:

1. Design and optimisation of a shaving cutter according to customer specifications.
2. A wide range of different materials is available at all times - cutting base cylinder to size.
3. Turning of a shaving cutter body
4. Engraving shaving cutter data
5. Pre-milling of teeth
6. Quality checks after each process - here complete shaving cutter geometry inspection
7. Formation of the undercut
8. Serration of shaving cutter grooves
9. Hardening of a shaving cutter in salt baths to minimise distortion
10. Bore and face grinding
11. Profile grinding
12. Grinding of the outside diameter
13. Final quality inspection
14. Finished shaving cutter



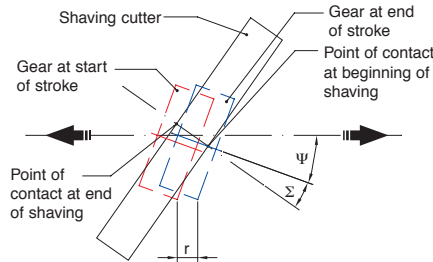
Leaders in technology

Transverse shaving



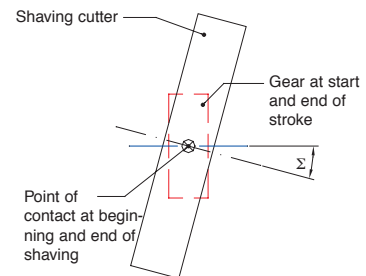
The gear to be shaved reciprocates in the direction of its own axis while the gear and the tool are in mesh. With each reciprocation a small amount of radial feeding of the shaving cutter occurs. The theoretical table stroke is as long as the face width of the gear to be shaved and it is recommended to calculate 1 extra stroke per module in order to guarantee clean shaving of the edges. As illustrated in the above figure, this method is unsuitable for shaving shoulder gears.

Diagonal shaving



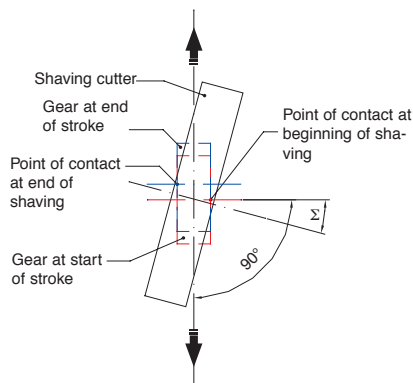
The gear to be shaved reciprocates obliquely in relation to its own axis while the gear and the tool are in mesh. The diagonal angle is achieved either by positioning the workpiece table obliquely or by interpolating two machine axes. With each reciprocation radial feeding of the shaving cutter occurs. In general the diagonal angle can be between 0 and 40 degrees but should not be above 25 degrees for reasons of wear.

Plunge shaving



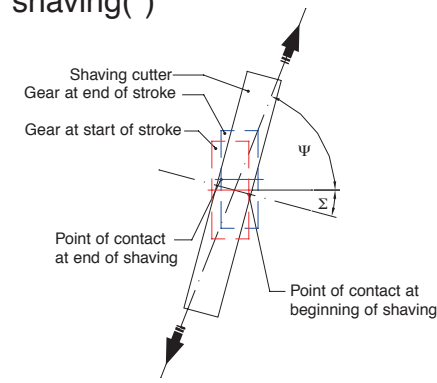
With this method there is no worktable translation but only a radial feed of the workpiece against the shaving cutter. The shaving cutter must be wider than the gear to be shaved and the serrations of the shaving cutter must be in the form of a helix in order to produce the relative tooth flank feed. Plunge shaving is particularly suited to shaving shoulder gears. In this case, however, all tooth modifications must be made to the shaving cutter as it will not be possible to realise them through axial movements on the machine.

Underpass shaving



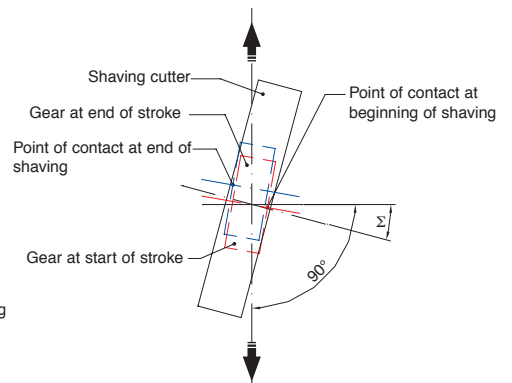
Underpass shaving is basically the same as diagonal shaving but with a diagonal angle of 90 degrees. With underpass shaving there is no axial table reciprocation. Instead the workpiece reciprocates perpendicularly to its own axis. The shaving cutter must be wider than the gear to be shaved and its serrations must be placed on a helix. All tooth corrections must be made to the shaving cutter as it will not be possible to realise them through axial movements on the machine.

Diagonal-Underpass shaving(*)



Diagonal-Underpass shaving is diagonal shaving but with a very large oblique angle. With each reciprocation radial feeding of the shaving cutter occurs. The oblique angle is in general between 40 and 90 degrees. Since the oblique angle may be very large, this method is also suitable for shaving shoulder gears but it is important to use shaving cutters with similar characteristics to plunge-type shaving cutters.

Tangential shaving(*)



With tangential shaving the oblique angle is between 60 and 90 degrees. The table stroke is in the direction of a tangent. The shaving cutter must be wider than the gear to be shaved and its serrations must be placed on a helix in order to produce the relative tooth flank feed. Furthermore all tooth modifications must be made to the shaving cutter as it will not be possible to realise them through axial movements on the machine.

(*) these shaving methods are only application variants but are particularly used in the automotive industry.

Customer -No.: _____
 First-/last name: _____
 Company: _____
 Department: _____
 Tel.: _____
 Fax.: _____
 E-mail: _____

Inquiry
 Order

SU-ID-No: _____
 Workpiece drawing-No.: _____
 Tool drawing-No.: _____

Shaving method: Transverse
 Diagonal
 Diagonal-Underpass
 Underpass
 Tangential
 Plunge

Shaving cutter type: For external gears
 For internal gears

Shaving cutter data
 No. of teeth: _____
 Normal module: _____
 Pressure angle: _____
 Helix angle: _____
 Direction of helix: right left
 Width: _____

Workpiece data
 No. of teeth: _____
 Normal module: _____
 Pressure angle: _____
 Helix angle: _____
 Direction of helix: right left
 Outside diameter: _____
 Width: _____

For shoulder gears
 Shoulder diameter: _____
 Distance from gear: _____

Tool clamping
 Bore: Ø 63,50 Ø 100,00
 Other _____
 Longitudinal keyway DIN138
 Centring hole

Hole diameter: _____
 Hole centre distance: _____

Orders without drawing
 Outside diameter: _____
 Root diameter: _____
 Tooth depth: _____
 Start of active profile: _____
 End of active profile: _____

Pre-shaving tool data
 Start of active profile: _____
 End of active profile: _____
 Start of root radius: _____
 Start of undercut: _____

Quality: Unground
 Finished
 Involute unground
 Outside diam. unground

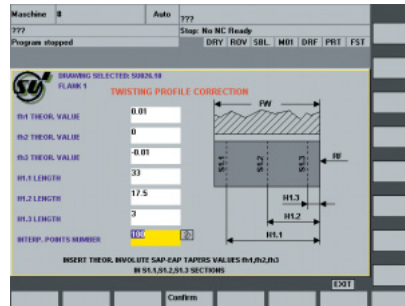
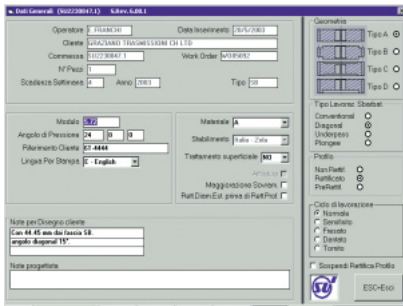
Material (High alloy ASP-Steels): M 2 (HSS-E)
 ASP 23 (PM)
 ASP 30 (PM)
 Other _____

Quantity: 1 piece 2 pieces
 3 pieces 4 pieces
 5 pieces ____ pieces

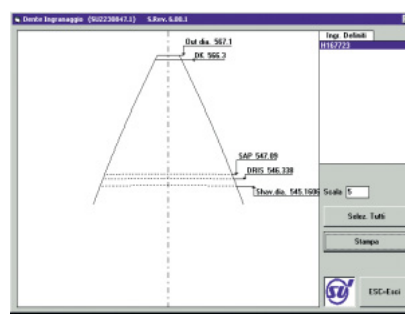
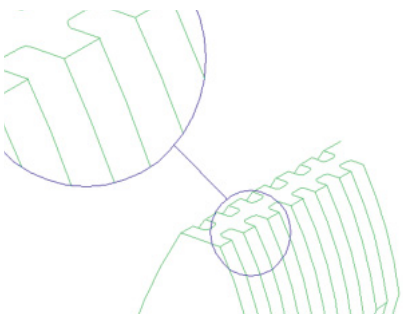
Remarks: _____

Please send the completed form to the following fax number:
Fax: +39 (051) 4341-49
 Tel.: +39 (051) 4132-311
 E-mail: info@samputensili.com
 For the US, Canada and Mexico, please contact Star-SU:
Fax: +1 (847) 649 1450
 Tel.: +1 (847) 649 0112
 E-mail: sales@star-su.com

Design and service



Samputensili software solutions are the cornerstone of our mission to provide good service: tool design and optimisation are based on decades of experience of our shaving cutter design engineers. Unique software developments implemented on our shaving cutter grinding machine and test programmes mean high precision and efficient resharping of your tools.

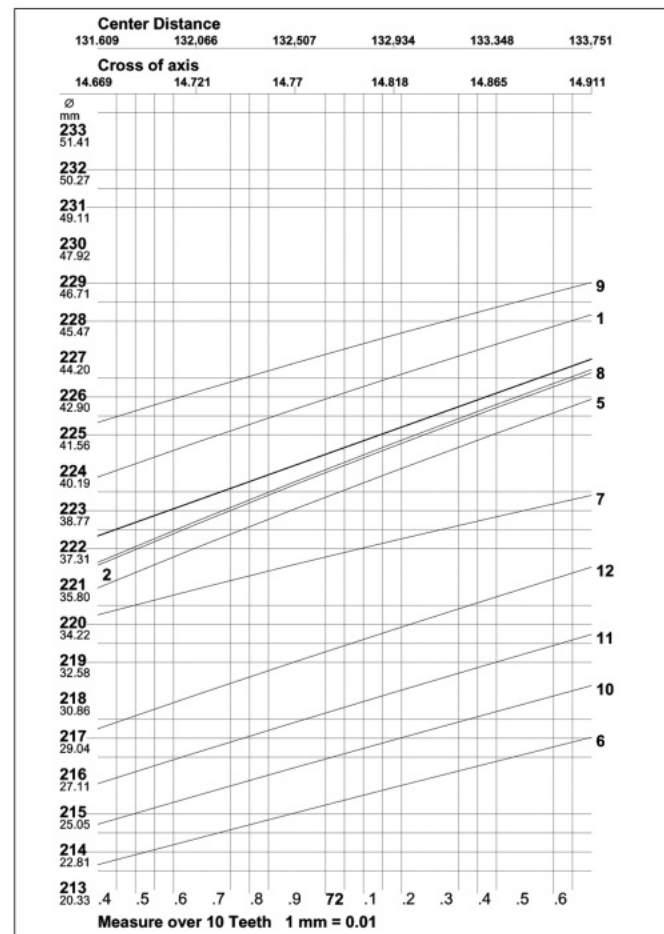


- From left to right:
1. Samputensili software for the design and optimisation of shaving cutter applications.
 2. Samputensili software for twisting profile corrections on Samputensili shaving cutter grinding machines.
 3. Samputensili software for the design and optimisation of serration positioning.
 4. Samputensili post shaving gear simulation software

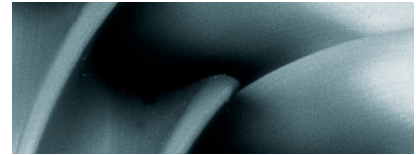
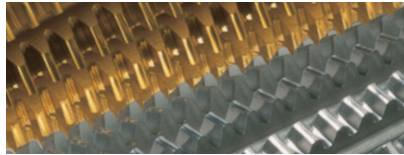
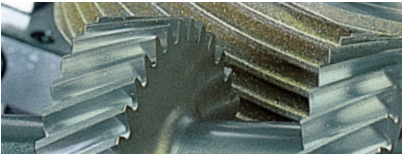
Would you like to resharpen your own tools?

No problem. Samputensili delivers each tool with a user-friendly resharping diagram which enables you to monitor the life cycle of your tool and to directly control the resharping process, providing you have the right equipment for this high quality process. Our expert engineers are always ready to support you with assistance or advice. For those customers that would rather take advantage of our wide range of tooling services, we can guarantee the highest possible quality standards of resharping on modern Samputensili grinding machines.

1. Points which touch the root diameter of the gear
2. Points which touch the root radius of the gear
3. Points which produce the start of the undercut after shaving
4. Points which produce the start of the undercut after milling
5. Points which generate the start of the active profile (SAP)
6. Points which generate the end of the active profile (EAP)
7. Lines of even contact 4-2-4
8. Lines of even contact 4-4-4-4
9. Lines of even contact 6-4-6-4-6



System technology from one source



Cylindrical gear hobbing
Bevel gear cutting
Shaping
Profile grinding
Continuous generating grinding
Shave grinding/honing
Shaving cutter grinding
Hob grinding
Universal tool grinding
Carbide tool grinding
Chamfering and deburring

HSS and carbide hobs
Shaper cutters
Broaches
Milling cutters
Rack and saw cutters
Shaving cutters
CBN profile grinding wheels
Master gears
Chamfering and deburring tools
Bevel gear cutting tools

Regrinding of hobs, shaper cutters,
shaving cutters and master gears

Coating of cutting tools, dies, stamps,
mechanical parts, punching dies/tools

Replating of grinding wheels and
grinding worms

Grinding of compressor rotors, rotors
for hydraulic pumps, gears of special
design, worms and cams



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