



Shaving Cutters



Shaving Knowhow

Maximum Economy

Shaving of tooth flanks is the most economic finishing process for the largescale production of gears. Its application limits are specified primarily by the tolerances specified for the end-product.

This soft-machining process is usually followed by a hardening process which causes known deformation. However, this can easily be compensated in advance during the shaving process.

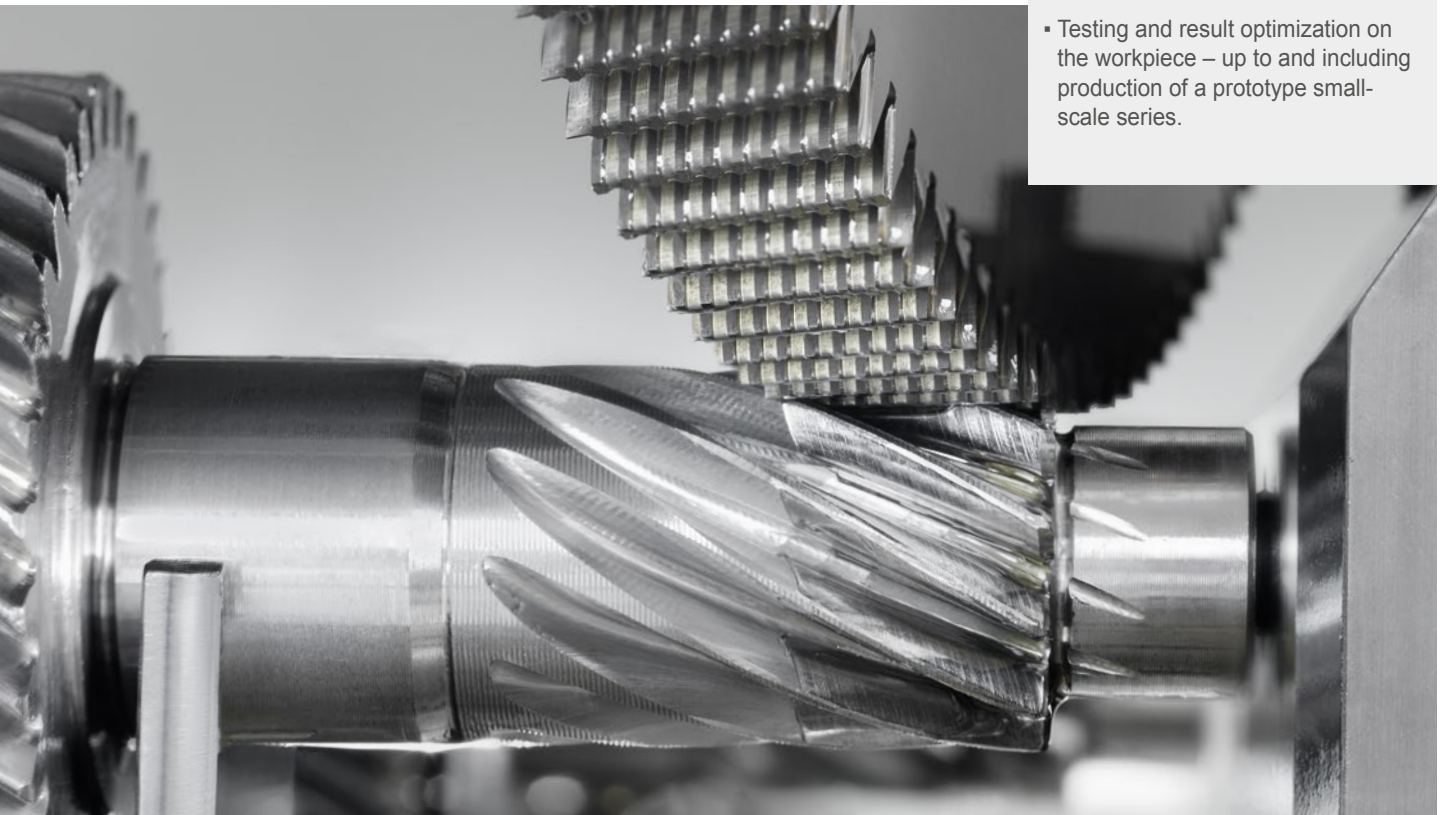
In other words, the better the shaving and hardening processes are managed, the broader the product range which can be covered by the shaving process at optimum cost.

Focus: the shaving cutter

The shaving cutter is a critical element in the shaving process. Its characteristics and performance affect both the quality of the product and the economy of production. As a market leader in shaving technology, Gleason has extensive experience in the production and use of shaving cutters for every conceivable variant in gear production. This competence ensures you get ideal support and results – from consulting and design, on to selection of the material and manufacture of the shaving cutter, up to services to accompany production itself.

Shaving Cutters Made by Gleason

- Consulting, design, manufacture and application engineering – all from a single-source.
- Short delivery times, express delivery service for urgent cases.
- “Opti-Edge®” Shaving Cutters: 40 to 100% longer tool lives depending on manufacturing conditions.
- Compensation for process-related deviations in geometry.
- Sharpening service.
- Testing and result optimization on the workpiece – up to and including production of a prototype small-scale series.



Plunge shaving of geared shafts

Shaving Cutter Range

Material choice and heat treatment

The “classic” material for our shaving cutters is high-quality high-speed steel (HSS). For particularly high stresses, we also supply shaving cutters made of PM materials as an alternative. However, because the precision of shaving cutters comes down literally to every last micron, our requirements go well beyond the nominal material standard. In-house heat treatment secures the optimum hardness-to-stiffness ratio as well as the structure of the material.

Micro Carbides

Because of smoother distributed carbides, the new shaving cutter material is significantly more cost-effective than standard materials. The advantages of Micro Carbides show specifically with modules smaller than 3.0 mm like in automotive applications.

Serial production or job-shop operation

Every shaving cutter is by no means the same. Even with a product identical down to the last detail, boundary conditions in production will have an effect on the design of the shaving cutter. We will advise you on the best compromise between tool life and investment requirement.

Customized cutter designs

Right back at the design stage, Gleason helps you harmonize the design of the shaving cutter with regard to the previous manufacturing process (such as hobbing and shaping) which are used.

Shaving cutter testing and prototype production

On request, we will test the shaving cutter on your specific workpiece (availability granted), determining

corrections required to achieve the targeted result. Production of prototype series available on request.

To guarantee short reaction times, we stock adequate quantities of blanks in all common sizes. In urgent cases, our express delivery service provides a ready-to-use shaving cutter in the shortest possible time.

Shaving cutter range*

Design		External shaving cutter	Internal shaving cutter
Module	mm	0.8 – 18	0.8 - 10
Diameter	mm	150 - 350	150 - 250
Helix angle	degree	0 - 50	0 - 50
Width	mm	20 - 65	20 - 65
Bore	mm	63.5 / 100	38.1 / 63.5 / 100
Material	high-alloy HSS, Powder Metal (PM), Microcarbide		
Method	Parallel/diagonal, tangential, underpass and plunge shaving		Parallel/diagonal, and plunge shaving

*other dimensions of request.

The information and specifications in this publication are subject to change without notice.

Shaving Cutter Design

Mastering Geometry and Process

In practice, the classic involute shape of the tooth flank serves only as a basic function on which numerous corrections are superimposed depending on task and purpose. While an initial group of corrections aims to optimize properties in use (load-dependent deformation, quiet running or wear behavior, for example), another series of measures is for the additional compensation of changes in the geometry of the gear material due to hardening deformation. The final geometry of the shaving cutter is achieved only once all these corrections are complete.

Optimum gear design

The costs and productivity of manufacturing are usually decided by the design. From the first draft, we support you in designing your workpieces to suit the shaving process.

Process design

Each individual step in the process chain for making gears – from selection of the material, on to heat treatment and initial cutting, up to shaving and hardening – has an impact on product quality and economy. We advise you on the optimum design for your process chain as a whole and make the customized shaving tool to suit it.

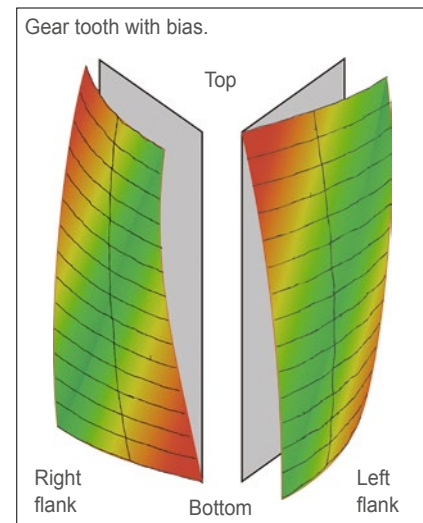
Standard corrections

Crown, taper, tip and root relief or twist – these “classic” corrections have generally already been specified by the user’s design department. On request, we can support you in calculating and implementing the corresponding microgeometry of the shaving cutter.

Compensating process-related deviations in geometry

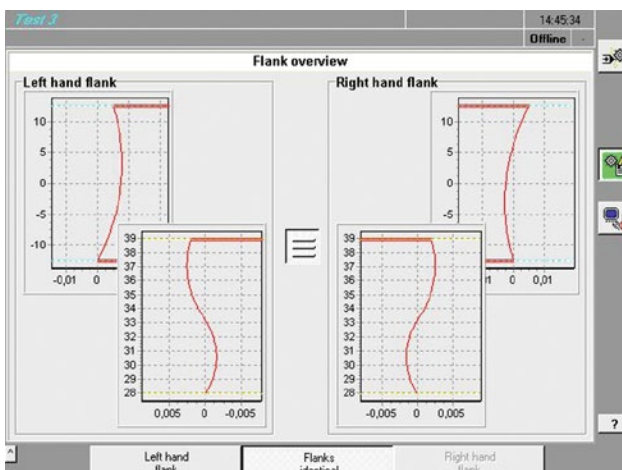
Hardening deformation is a well-known issue in gear production. These deviations can be compensated by

measuring the gears and by means of specific corrective grinding of the shaving cutter or parameterization of the shaving process. Our expertise can support you in setting up the corresponding process control circuits.



Harmonizing Your Design

As early as the design stage, Gleason helps you harmonize the design of the shaving cutter with regard to the previous manufacturing process such as hobbing and shaping.



NC corrections of shaving cutter profile and lead.

The Right Process for Your Application

Shaving Process Overview

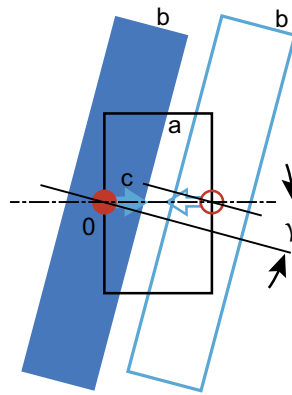
To machine the entire tooth surface, an additional relative motion between work and tool is required. This motion may be either parallel, diagonal or tangential to the workpiece axis, depending on the shaving method used.

Another alternative is plunge shaving in which only a single radial infeed motion is used. To ensure uniform shaving of the entire tooth surface, plunge cutters are ground with a hollow configuration in the direction of the teeth and are provided with staggered serrations.

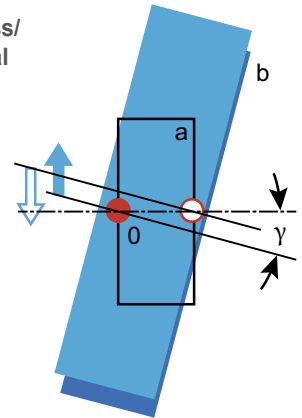
Application Technology

With decades of experience in shaving cutter manufacturing, process and machine design, Gleason is the perfect partner for all demands around shaving. With our extensive knowledge, we support you on-site with production support and process optimization, as well as in-house with prototype production, small batch series or trial of tools.

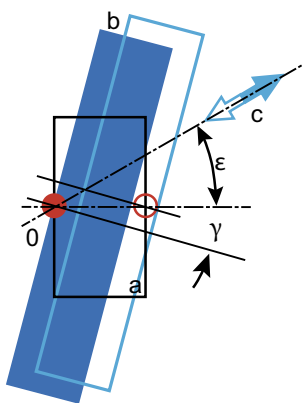
Parallel



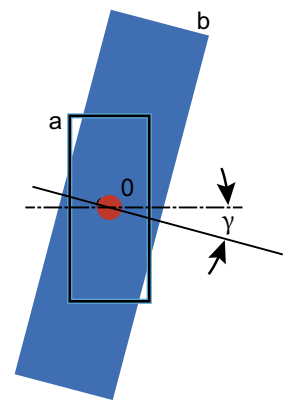
Underpass/
Tangential



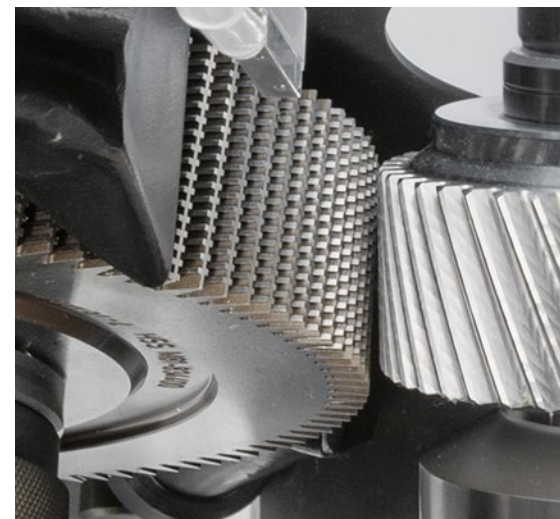
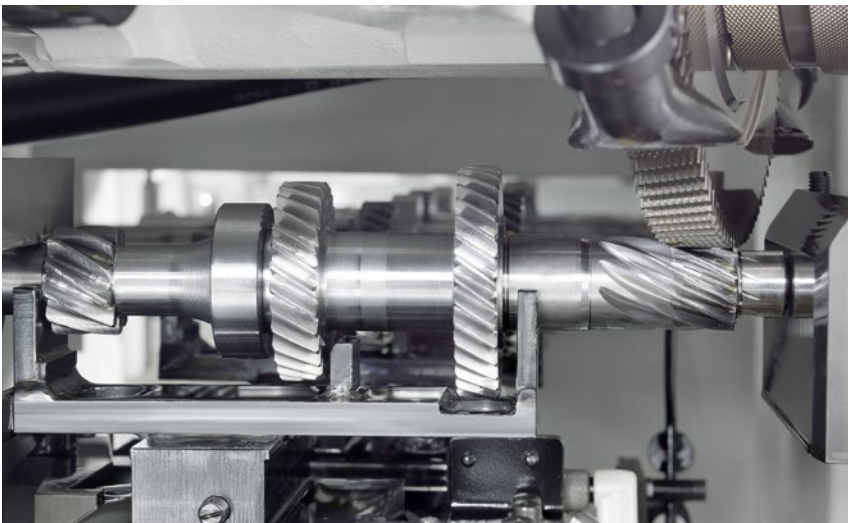
Diagonal



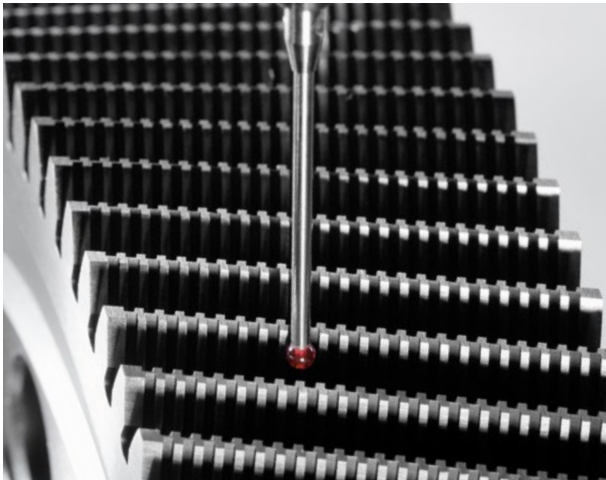
Plunge



a) Workpiece, b) Shaving cutter, c) Feed motion, γ) Crossed-axes angle, ϵ) Diagonal angle, o) Pivot point



Shaving Cutter Technology Made by Gleason



Shaving Cutter Manufacturing Technology Made by Gleason

Since we started manufacturing shaving cutters in the 1970s, technology advances have been made possible by utilizing the right equipment. Our shaving cutters are made with proprietary technology, machines uniquely built to make high-precision tools with maximum tool-life.

Production technology must keep up with the demands and expectations of customers, so our production machines have been updated several times to reflect the latest technologies and make machines even more productive and precise than ever before.

Opti-Edge for Cutting Edge Results

Opti-Edge – a special production process for gashes – facilitates longer tool life and extends cutting edge life assuming all other machining parameters are identical.

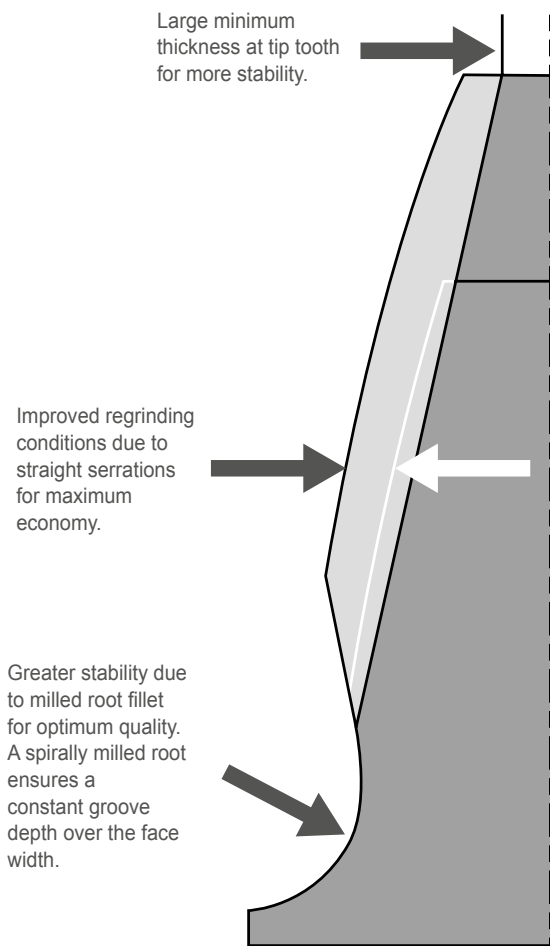
Depending on boundary conditions, the additional benefit can range between a 40-100% increase in tool life longevity and in some cases, even longer.

Tooth flank consistency

In the interest of high economy, a used shaving cutter must be reground in due time to avoid loss of tool life. To maintain the tooth parameters that are key to workpiece geometry and accuracy, it is important to regrind both the flanks and the tip.

An important issue is the consistency of blade length. This is why the cutter blade geometry of Gleason Shaving Cutters ends in a slot at the base of the tooth, the angle of which is dimensioned so that blade length corresponds to its original value after every grinding process.

This facilitates optimum consistency of the machining result, regardless of the current degree of wear of the shaving cutter.



Quality Through a Lifetime

Shaving Cutter Grinding with SRS and SCG Combines Precision with Speed

The Gleason 410SCG Shaving Cutter Grinding Machine is more than just a machine for the precision regrinding of shaving cutters.

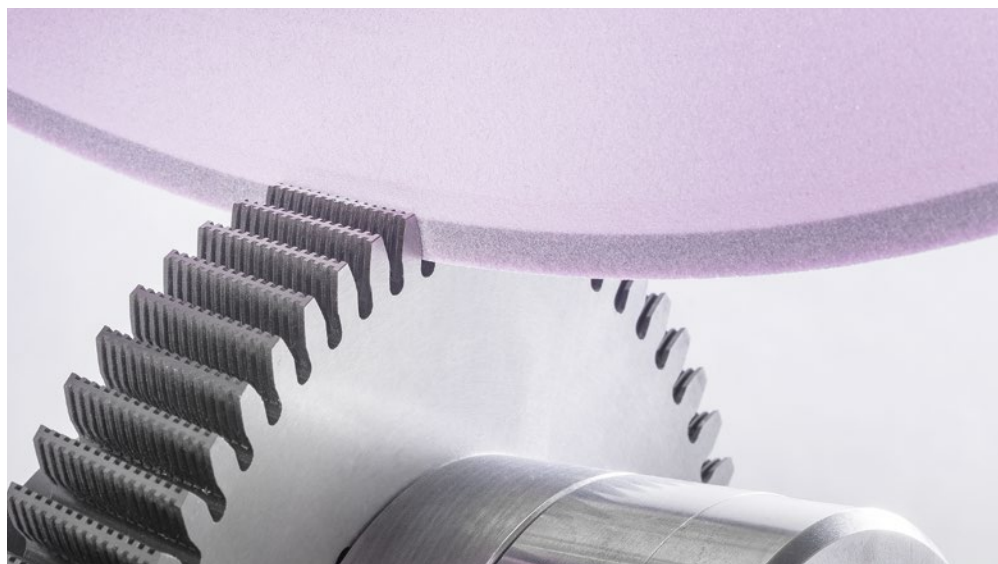
Its Windows®-based technical software provides the user with everything necessary for quick, simple generation of all kinds of shaving cutter modifications. Features include the integrated grinding of the shaving cutter OD and an on-board measuring unit to make sure the first tooth is ground just right. The graphical interface is extremely helpful when generating complex profiles and a plausibility check for data entries.



High-Precision Shaving Cutter Refurbishing with Quick Turnaround

In addition to new cutters, Gleason offers its customers a competent, high quality sharpening service to refurbish any type of shaving cutter, including the appropriate documentation.

Shaving cutters are reground on the latest equipment, like the Gleason 410SCG Shaving Cutter Grinding Machine or its predecessors of the SRS series. The productivity and repeatability of such modern equipment guarantees considerably faster turnaround times than ever before.



Complete Solutions from One Source



Shaving Machines

Gleason Shaving Machines are available for different shaving processes, from universal solutions to dedicated plunge shaving machines. Designed for medium and high-volume production, available with different automation options, they are backed with decades of Gleason's knowledge and experience in shaving – for economic, superior quality results.

The principle of all Gleason shaving machines is simple but efficient: the workpiece is mounted in a fixed location for maximum stiffness and easy automation while the shaving cutter is moving. This provides the best workpiece quality.



Shaving Cutters and Shaving Cutter Sharpening Service

Gleason has extensive experience in the production and application knowhow of shaving cutters for all different variants imaginable – from process consulting and cutter design, to the selection of tool material and the manufacturing of cutters.

Gleason Shaving Cutter Sharpening Service guarantees high quality sharpening while maintaining longevity of your cutters. With optimum stock removal rates, modern sharpening equipment assures that only the required stock is removed to achieve cutting edges of like-new cutters.



Shaving Cutter Sharpening Equipment

With the 410SCG you can resharpen your shaving cutters in-house at the highest quality level with minimum turnaround time. The 410SCG Shaving Cutter Grinding Machine features up to 11 CNC-controlled axes including a

high performance electronic pitch block, as well as an on-board inspection unit. The SCG Technology Software has been specifically developed for easy computer-aided grinding of shaving cutters.



Workholding

Gleason designs and manufactures a complete line of workholding equipment for cylindrical gears.

Fixtures for horizontal shaving machines cover all market needs: Simple plug-type arbors, expanding fixtures for high quality requirements as well as fixtures

for small bore workpieces like planetary pinions. Gleason Shaving Workholding is designed and manufactured to the highest standards and will result in high quality shaving results

Gleason

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