PITTLER T&S

V300

The All-rounder for Geared Shafts

PITTLER.DE
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SWF

PITTLER T&S

PITTLER develops and produces high-precision multifunctional lathes and skiving machines. They are optimized for soft and hard turning as well as drilling and milling rotationally symmetrical components with a diameter of up to four meters.

In the spirit of the company's founder Wilhelm von Pittler, the skiving technology was further developed into an efficient gear cutting technology, which has established itself in PITTLER's machine portfolio both in the context of complete machining as well as an individual technology.

PITTLER T&S offers the skiving process as a single process or in combination with complete machining. An integrated tool magazine makes it possible to use this efficient gear cutting technology alongside turning, milling, drilling, grinding, thread production, and measuring in a single machine without compromise. The flexible use of technology enables machining in maximum two clampings, thus guaranteeing high levels of accuracy. Coolant, oil, compressed air, or a combination thereof can be used for cooling and better chip flow.

A DVS TECHNOLOGY GROUP COMPANY

The DVS TECHNOLOGY GROUP is a group of experienced companies engaged in the machining technologies of turning, gear cutting, grinding and honen.
The DVS TECHNOLOGY GROUP employs more than 1050 staff worldwide and is considered a leading system provider of machines, tools, and manufacturing solutions for the soft and hard-fine machining of components.

The DVS TECHNOLOGY GROUP includes the following divisions:

DVS Machine:
Manufacture and sale of high-precision machine tools and automation systems

DVS Services & Tools:
Customer-specific development, manufacturing, and sale of machine components, tools, and abrasives and related services.

DVS International Sales & Service:
Local DVS partners for sales and service in international markets.

FOCUS ON CORE TECHNOLOGIES

TURNING

MILLING

DRILLING

PITTLER SKIVING

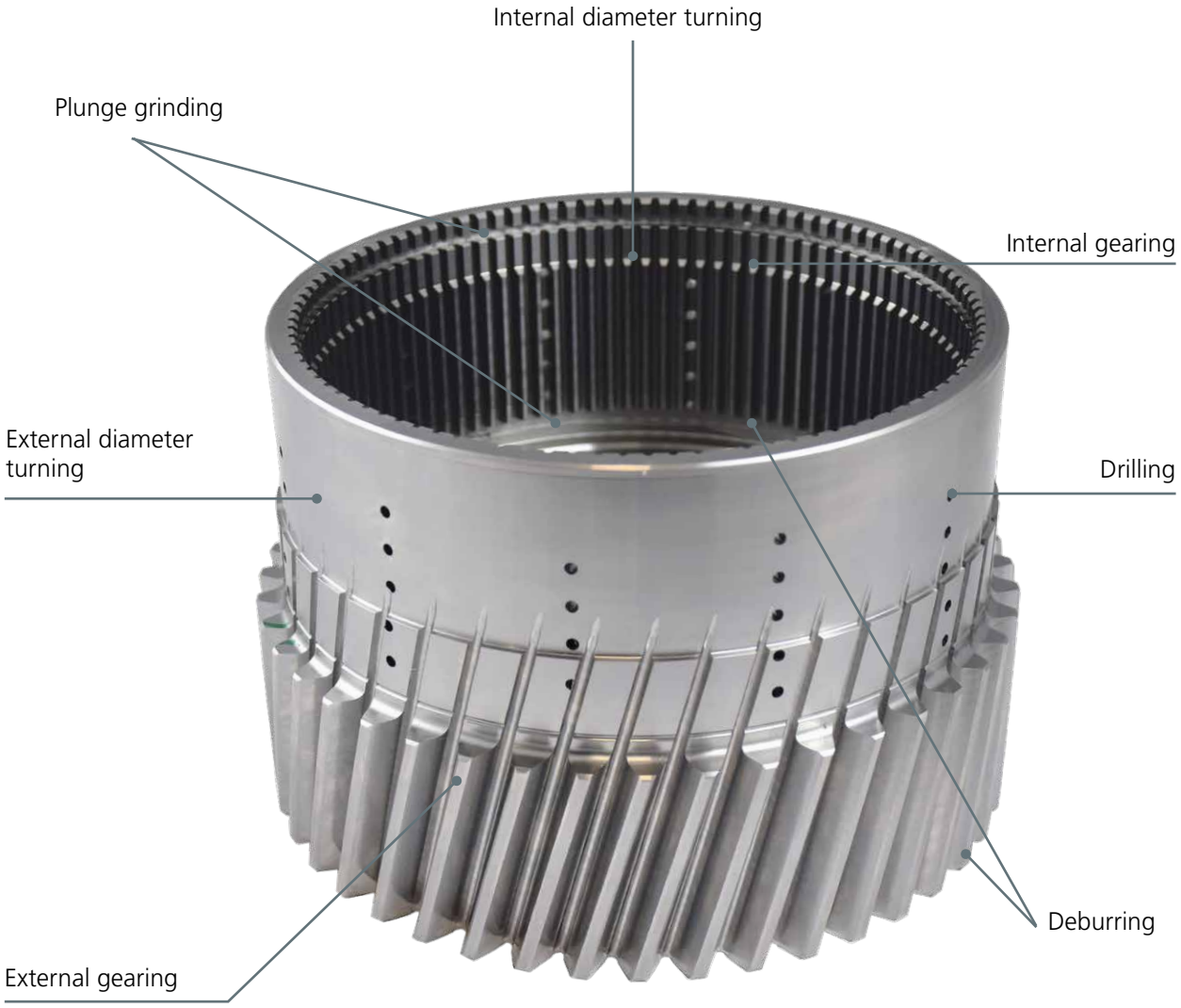
GRINDING

MEASURING

Skiving
Flexible and economical

Skiving is a metal cutting process for the production of gears which is based on a patent filed by Wilhelm von Pittler in 1912. The technology has emerged as an efficient and flexible alternative over recent years for the gear cutting of components.

One of the characteristics of skiving is the oblique arrangement of the tool axis to the workpiece axis. This positioning of the tool, a defined axial feed, and the coupled speed of the tool and workpiece result in a relative movement. This relative movement "peels" the tooth gap out of the workpiece along the main cutting direction.



YOUR ADVANTAGE

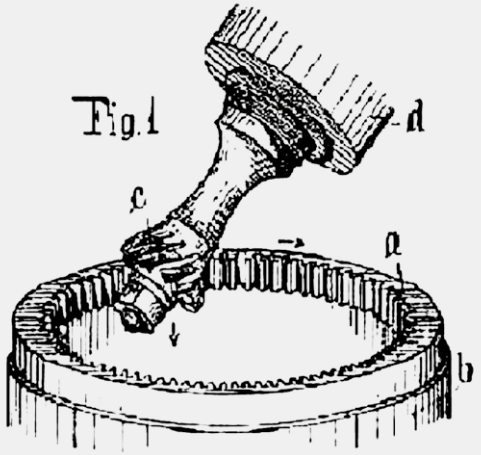
- High concentricity and gearing quality
- Short primary processing time
- Low process forces
- Moderate tool costs
- Can be combined with other machining methods
- Production of internal and external gears in one clamping
- Tools and technology from a single source

The invention of skiving

Wilhelm von Pittler was a German industrialist and engineer who lived in the late 19th and early 20th century, who had a major impact on the world of mechanical engineering. He introduced groundbreaking developments in the field of metalworking and produced numerous pioneering concepts.

One of his most revolutionary innovations was the skiving process, which was awarded a patent by the Emperor in 1912. This process was only rendered economically viable through the parallel development of electric drives, advanced production machines, modern tool materials, and innovative coatings.

With the introduction of skiving, Wilhelm von Pittler revolutionized the metal processing industry and made a significant impact on the evolution of manufacturing technologies. His creative ideas and entrepreneurial drive greatly contributed to the engineering industry.



Turning, milling, and gear cutting of shafts in a single clamping
Skiving and hobbing up to module 6 with the robust powered milling spindle

Automatic tool changeover in 12 seconds
with disk magazine in work area, supported if necessary through background magazine

6-sided machining
with robust and powerful powered milling spindles and turrets for main and counter spindles

Center drive technology
Highly efficient complete machining of shafts through simultaneous processing of the two shaft ends by turning, milling, and gear cutting

Fast workpiece changeover
through integrated automation

V300
The All-rounder for Geared Shafts

The V300 enables versatile configurations for multi-technology complete machining of geared shafts from small to very large quantities. With up to two work spindles and four tool carriers on a robust machine bed, you can turn, drill, mill, skive, and hob, all on a single machine. The center drive enables precise and quick machining of the workpiece ends. Combined with a second machine for processing the workpiece center, it is possible to realize extremely efficient, automated, yet easily convertible production cells for complete machining.

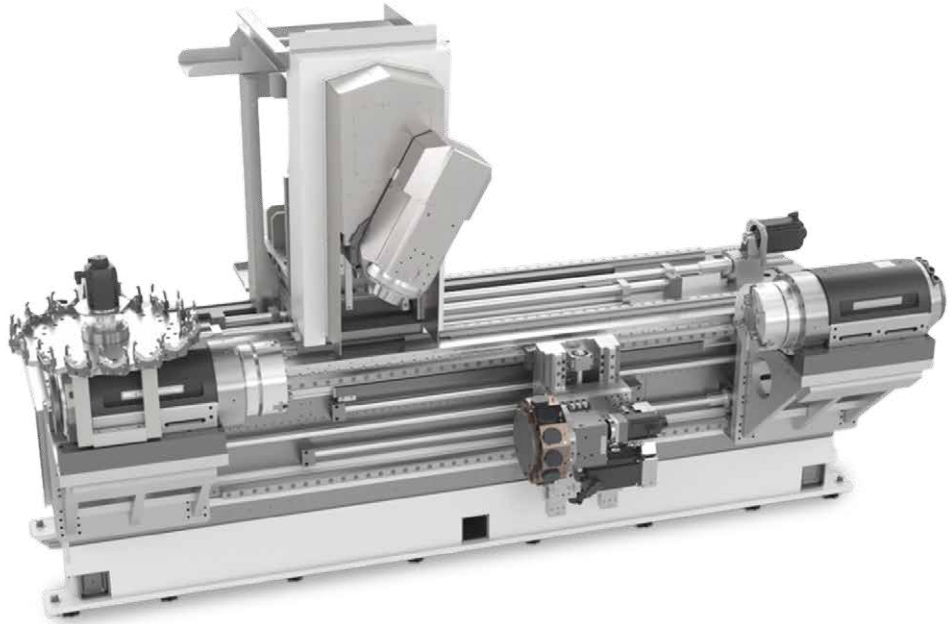
FOR DIAMETERS UP TO A MAXIMUM OF 350 MM

The all-rounder for shaft-shaped components

This machine design was adopted by our sister company WMZ and specifically matched to the requirements of our customers. Like the entire series, the V300 is characterized by its versatility when processing highly complex shaft-shaped components. With a multifunctional head and a magazine, the tried-and-tested PITTLER SKIVING technology can be implemented in high quality and with maximum productivity.

The V300 offers even more: it can be equipped with up to four supports and two main spindles. The efficient center drive technology can also be integrated into the machine.

Overall, the PITTLER V300 is the ideal solution for the processing of shafts. Thanks to the modular system, high flexibility and diverse software options tailored to the needs of the operators, the V300 is a perfect and powerful horizontal machine for the complex machining of shaft-shaped components.



YOUR ADVANTAGE

- Turning, milling, and gear cutting of shafts in only a single clamping
- Simultaneous machining of both shaft ends thanks to center drive technology
- 6-sided machining in main and counter spindle with up to four tool carriers
- Automatic tool changeover in 12 seconds with disk magazine
- Integrated automation for quick workpiece changes

Internal loader with external magazine

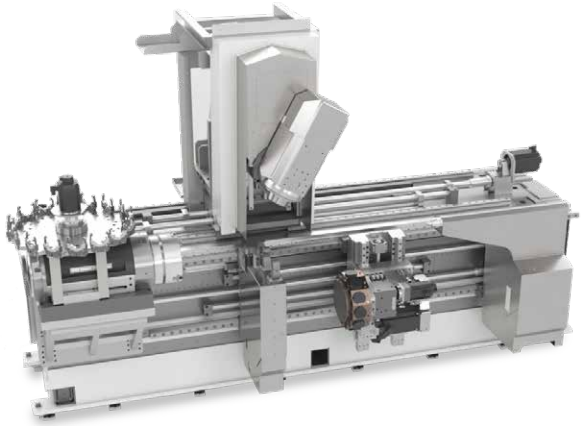
Machine with portal for top loading and external measuring station

Overview of modular system

The PITTLER V300 features not only process-optimized performance but also diverse configuration options, which are perfectly tailored to the workpiece and customer requirements. This means it offers an unbeatable price-performance ratio.

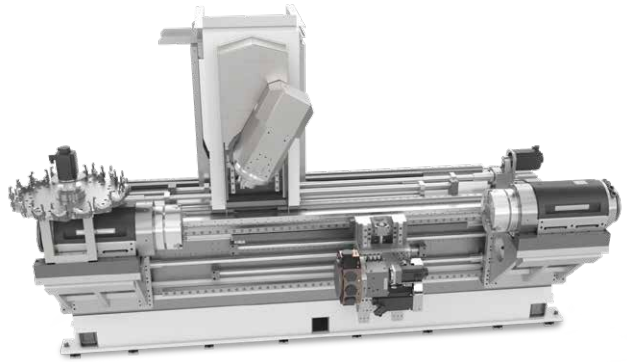
Regardless of whether it is used as a single-purpose machine with a main spindle and a multifunctional head for gear cutting on workpieces or whether it produces highly complex workpieces with four different tool carriers simultaneously on the main and counter spindle or the center drive: The V300 is able to adapt flexibly to the requirements of modern production with the highest quality and based on the customer's needs.

The modular system enables work-piece-adapted production. This reduces production times and thereby the cost per unit. Our priority is to increase the workpiece quality and the optimal use of resources, which was consistently implemented from the start in the development of the PITTLER V300.



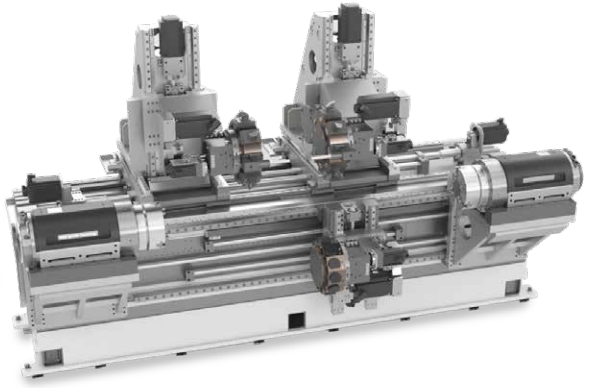
V300 S

- Powerful milling spindle with B-axis; In conjunction with a 16-slot tool magazine
- Lowerable steady rest: Switching between steady rest and headstock
- Lowerable tailstock: axial machining with milling spindle
- Powerful lower turret



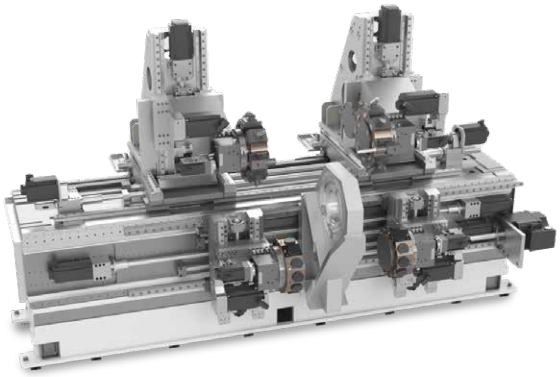
V300 MT

- 6-sided workpiece machining
- 5-axis machining
- Main and counter spindle
- Powerful milling spindle with B-swivel axis; WZM with 16 tools and Y-axis
- Lower turret optionally with driven tools in axis with milling spindle



V300 O

- 6-sided workpiece machining
- Main and counter spindle
- Three turrets optionally with powered tools
- Y-axis optionally on upper slide

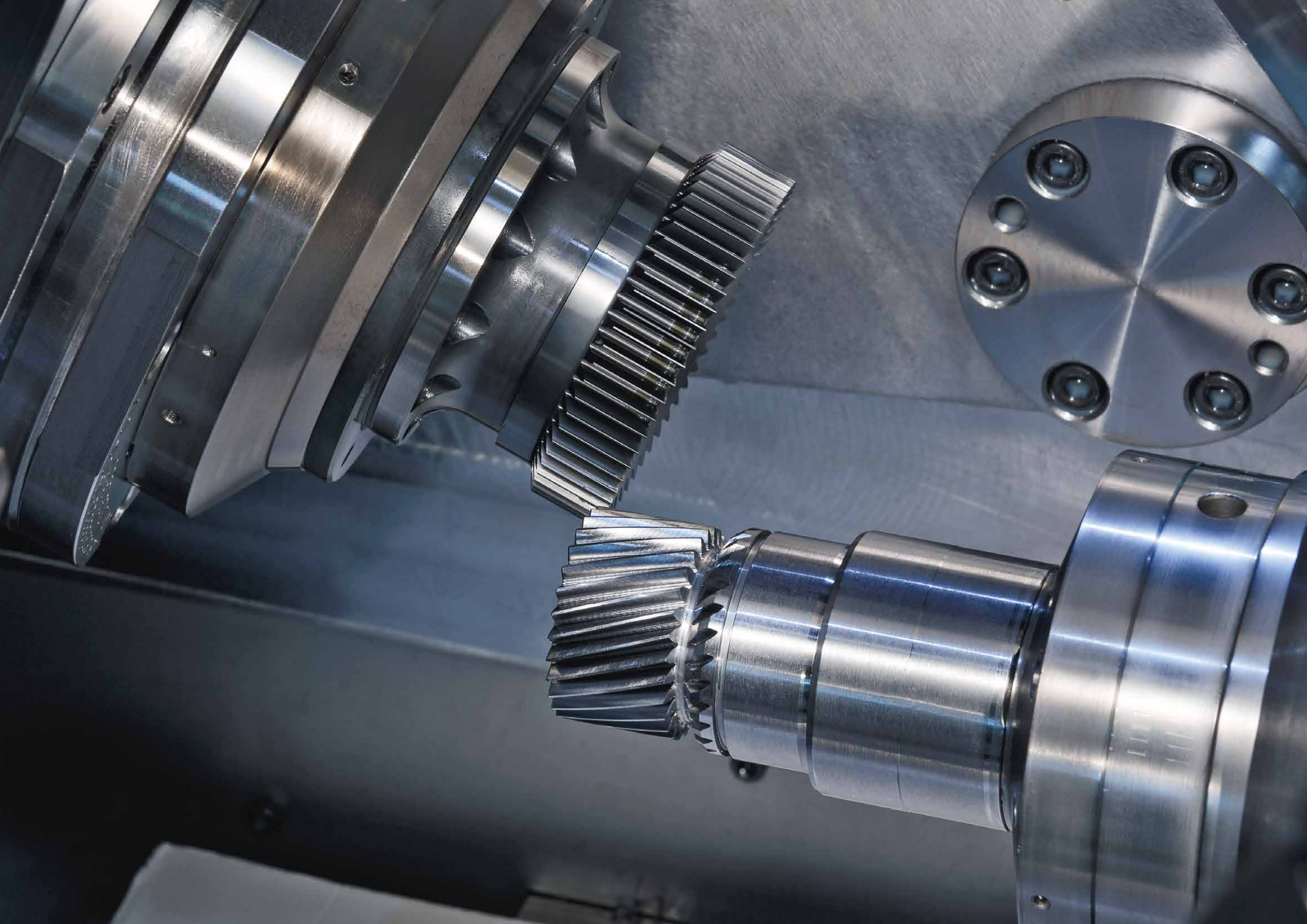


V300 CT

- 6-sided workpiece machining in a single setup
- Two upper turrets on a compound slide with X- and Z-axes and optional Y-axis
- Two ZX lower turrets with optional Life tools
- Highly efficient machine for processing the shaft ends in one clamping with the highest precision

Technical Data

	V300 S	**V300 CT**	**V300 MT**	**V300 O**
WORKPIECE				
Max. diameter (mm)	250	150	300	250
Length (mm)	1500	700	Process dependent	Process dependent
TECHNOLOGIES	Turning (XZ / XYZ), five-axis milling (XYZBC), gear-cutting			Turn (XZ/XYZ), three-axis milling (XYZ)
Drive	Spindle tailstock	Center drive	Main and counter spindle	Main and counter spindle
S1 - Max. torque of the main drive [Nm]	820		290	820



Large image: cylindrical peeling tool
Small image: Roughing tool with V-inserts

PITTLER tool engineering

Intelligent, individual, and cost-saving

Another important factor for rolling formwork is the tools and their cutting geometry. These are designed individually for each gearing (module and number of teeth). Roughing tools that are used for gears with a module greater than 3 are equipped with standard indexable inserts. They have a significant impact in terms of reducing wear on the skiving tools.

The finishing process is carried out by means of cylindrically or conically shaped, powder-metallurgical coated tools or carbide tools. At the end of their service life, these can be stripped, sanded, and re-coated. PITTLER offers turnkey tooling services from a single source, from tool design to finishing.

CONICAL SHAPED SKIVING TOOL

- Symmetrical profile
- Easy positioning and technology guidance
- High flexibility

CYLINDRICALLY SHAPED SKIVING TOOL

- Significantly longer service life due to larger usable width
- Profile consistency through regrinding
- Complex profiles possible (e.g., protuberance)

Pittler Indexable Inserts

The Solution for High Demands

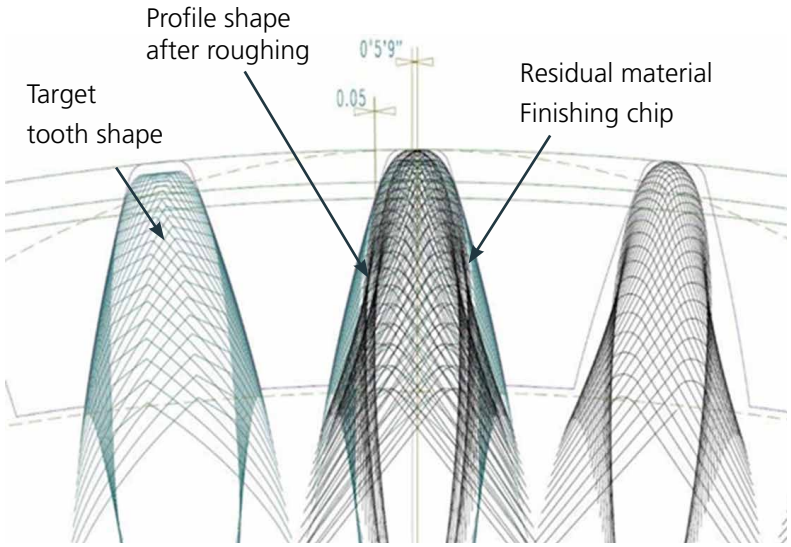
The use of PITTLER indexable inserts from module 4 opens up new possibilities in production. Here, the "large modules" are considered standard. At least one roughing tool and one finishing tool are used. But for special quality requirements, even two finishing tools with a single-flank cut can be used. However, previous approaches with V-shaped indexable inserts led to unfavorable results.

The V-shaped indexable inserts have suboptimal service lives in roughing machining due to their poor profile shape for skiving. The flank allowances are uneven and jagged flank profiles arise. These defects lead to a shorter service life of the expensive finishing tools. Furthermore, the full gap depth cannot be reached due to the limited insert height.

The answer to these challenges comes in the form of the PITTLER standard indexable insert. It features a near-evolute insert profile, which results in near-evolute workpiece profiles. A particularly uniform flank allowance is achieved, which in turn results in a longer service life of the finishing tools. These optimized inserts are ideal for roughing modules 4 to 10.

The innovation is that specific inserts have been developed for modules 4 – 6 and 6 – 10 respectively. This not only enables targeted adaptation to the different requirements of the modules, but also leads to faster cycle times compared to previous V plates. This is due, among other things, to the larger head radius. The cost structure is also optimized by these indexable inserts: The improved cycle times and downtime make the new solutions more attractive in terms of pricing.

Overall, the PITTLER standard indexable inserts are a groundbreaking innovation that skilfully overcomes the weak points of conventional V-shaped indexable inserts. They not only enable more efficient production, but also improved cost efficiency and product quality.



YOUR ADVANTAGE OVER SOLID TOOLS

- No regrinding process
- No large amount of capital tied up
- Does not require new setup with WKZ preset or profile correction
- No risk of transport damage
- No logistic organization
- Significantly less damage if a tooth breaks in the process

CHALLENGE

- At PITTLER, anything above module 4 is considered a ‘large module’.
- Generally speaking, at least one roughing tool and one finishing tool are used.
- Two finishing tools with single-flank cut for special quality requirements
- Previously, V-shaped inserts were often used for rough machining

DISADVANTAGES OF V-SHAPED INSERTS

- Poor service life due to unfavorable profile shape for skiving
- Uneven flank dimensions and jagged flank profiles
- Shorter service life of expensive finishing tools
- In some cases the full gap depth cannot be achieved due to the limited insert height

SOLUTION: PITTLER STANDARD INDEXABLE INSERTS

- Near-involute indexable insert profile
  - Leads to near-involute workpiece profiles
  - Very even flank measurement
  - Cost savings due to longer service life of the finishing tools
- Roughing from modules 4 to 10
  - Two different indexable inserts for modules 4–6 and modules 6–10
- Faster cycle times than with V-plates
  - Due to larger head radius
- Lower cost due to better cycle times and downtime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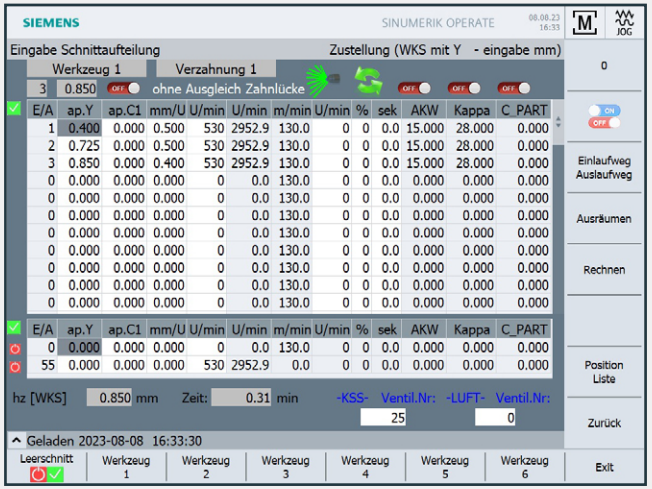
2

Operating software

Easy to Use



The Pittler Skiving software is a powerful solution that offers a workshop-oriented user interface and enables the machining of internal and external gears. A special highlight is the integrated plausibility check of the entered values, which ensures a high level of precision and safety.

Due to the fact that the PITTLER Skiving software generates the NC program fully automatically after the gear data, tool data, and cutting parameters have been entered, no specialized gear expert is required. Of course, the operator can easily and efficiently select various strategies, such as roughing and finishing with different tools, blank cut after deburring, etc., which enables the correct machining options to be carried out. This saves time and resources.
The PITTLER skiving software also boasts the “SkiveExpert” options for beginners and “free cutting data input” for gear experts.

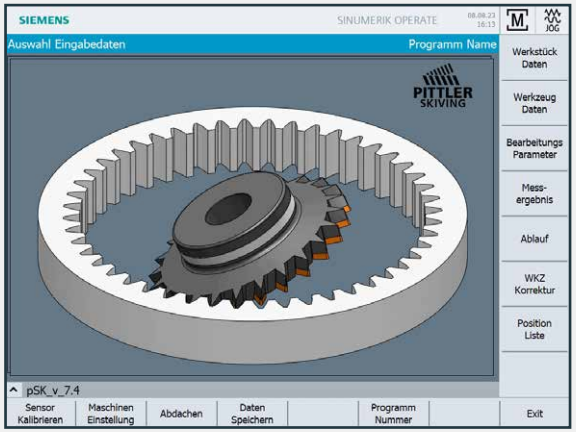
While SkivingExpert was designed for beginners to suggest intelligent cutting strategies and thus make it easier to get started with skiving, the “free cutting data input” enables users to intervene in the skiving process and

to adapt and optimize it perfectly for each component. With these versatile functions, the PITTLER skiving software offers an outstanding solution for high-quality and demanding gear cutting applications.

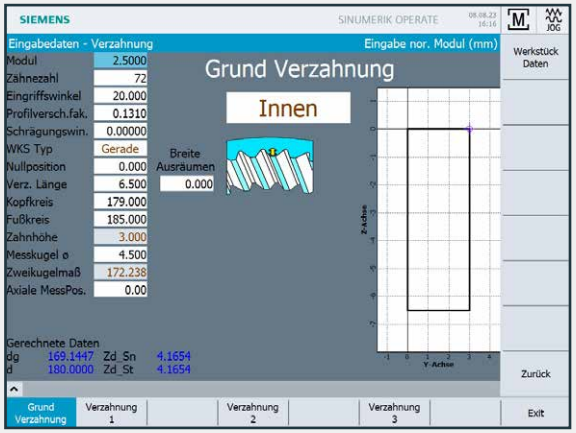
YOUR ADVANTAGE

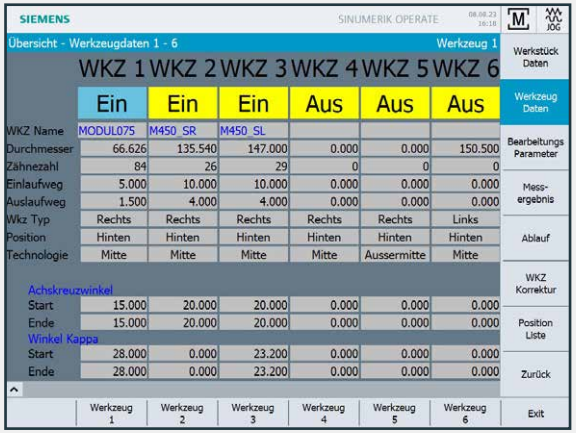
- Workshop-oriented user interface for internal and external gears
- Integrated plausibility check of entered values
- Optional roughing-finishing strategy
- Automatic NC program generation, no gear expert required
- Pittler SkiveExpert with cutting strategy suggestion

Call up the PITTLER SKIVING software

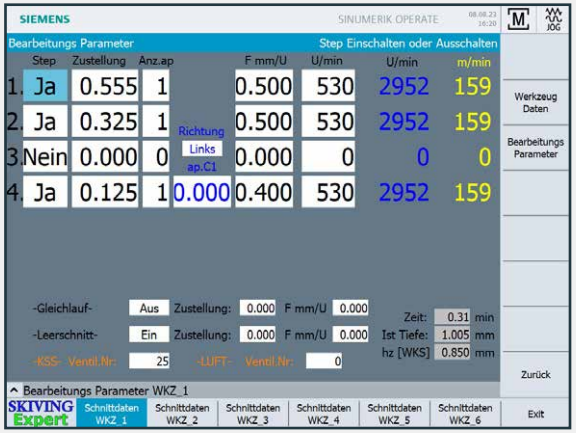


Enter the geometry data of the workpiece



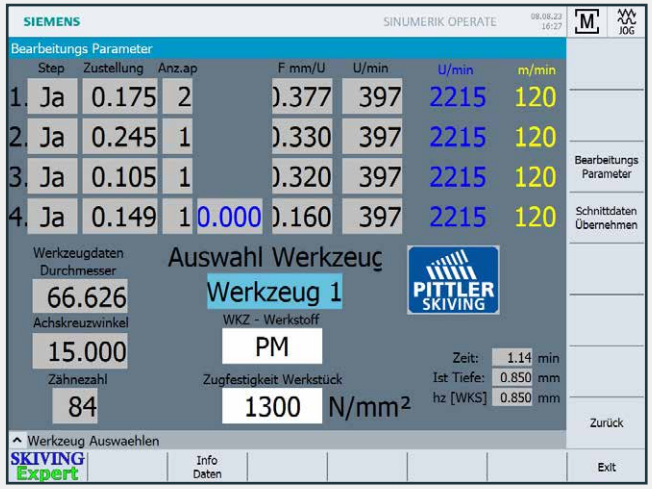


Enter the geometry data of the tools



Enter the processing parameters

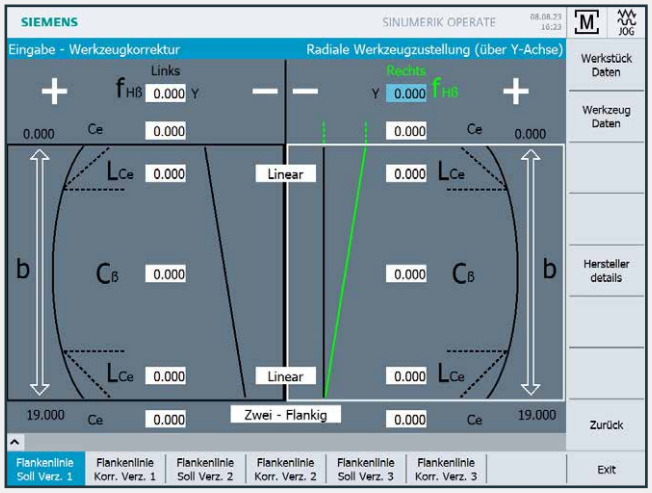
SkivingExpert

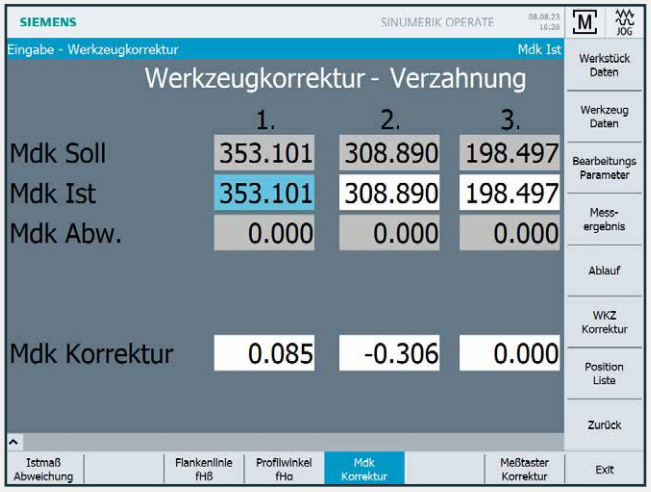


YOUR ADVANTAGE

- Ideal for skiving beginners
- Self-explanatory user interface
- With just five parameters for gearing:
  - → Specification from the tool manufacturer
  - → Workpiece-specific information
- Subsequent optimization of the cutting strategy suggestion is possible

Simple corrections





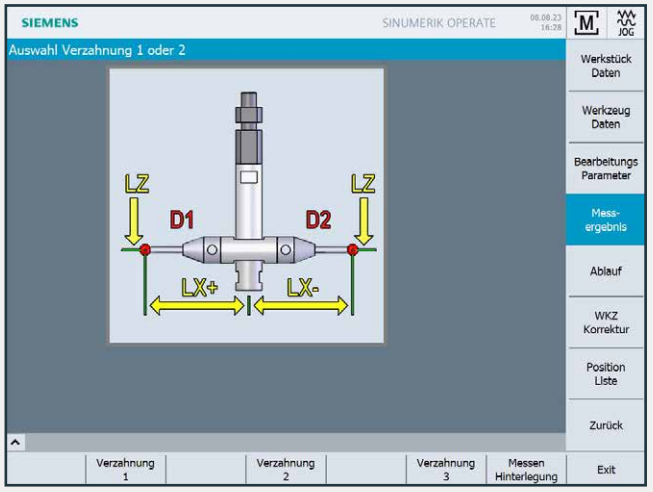
YOUR ADVANTAGE

- Simple operation possible without in-depth programming know-how
- Symmetrical/asymmetrical correction Flank line corrections
- Correction of diametrical two-ball measurement
- Targeted corrections of flank line angle such as end retracts possible
- Crowning corrections of flanks possible
- Preservation of dimensional deviations before a subsequent heat treatment

Operating software extensions

Measuring:

- In-process measurement of gearing
- Simple control and evaluation of integrated measurement processes
- Measuring of:
  - → MDK, two-ball measure
  - → Angle of the flank line or helix angle
- Automatic correction of measurement characteristics



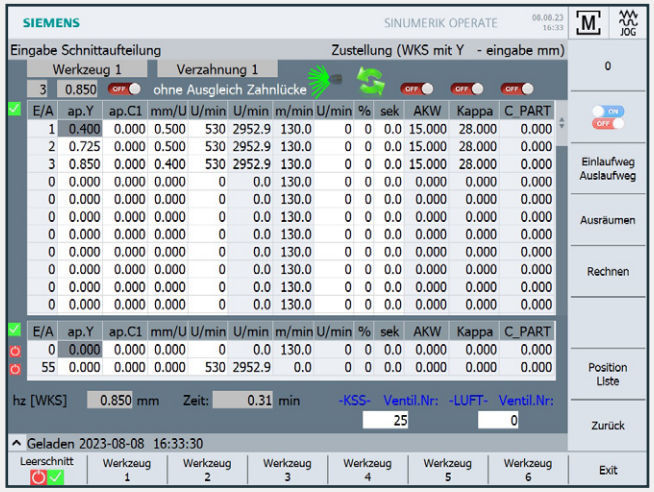
Alignment with sensor:

- Easier setup
- Reduction of setup time for skiving with multiple tools
- Subsequent corrections of the tooth positions possible

Custom cutting data input

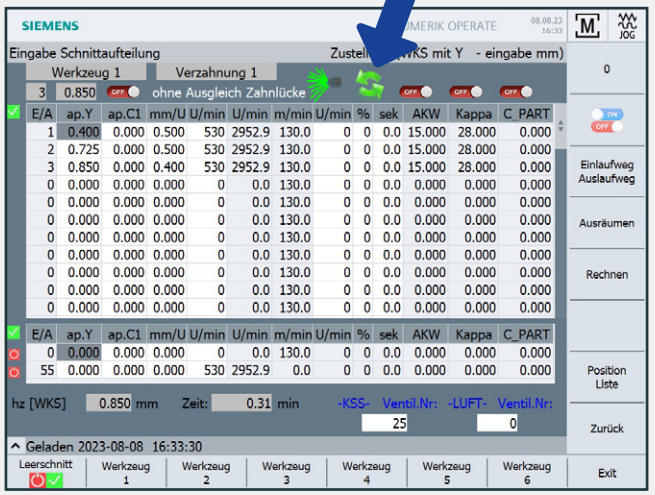
YOUR ADVANTAGE

- Every cut from 1–54 can be freely entered; This ensures a uniform, linearly degressive infeed without intermediate
- Almost every cutting parameter can be freely entered
- Ideal for large-module gears with a lot of roughing
- Ideal when using multiple tools, e.g., an indexable insert roughing tool and two finishing tools
- Many additional options such as rinse stop, alternating decreasing speed, rotation of the workpiece, or tool axis



Overview of input the custom cutting data table

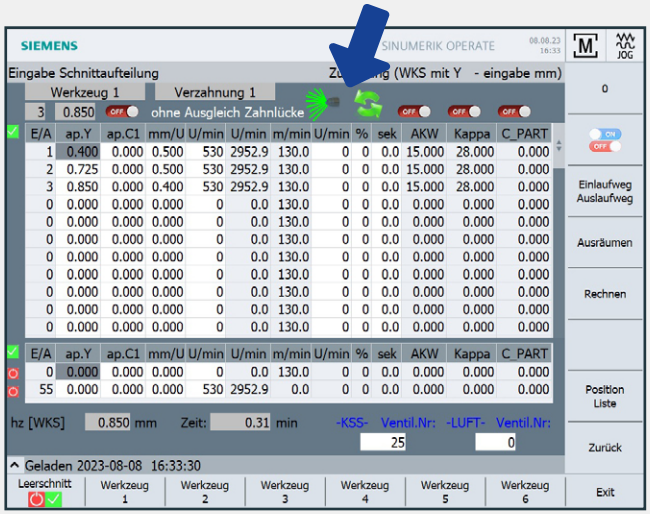
- Custom entry of cutting parameters, cuts 1–54
- Option of entering two blank sections, e.g., when using two finishing tools



Alternating speed input

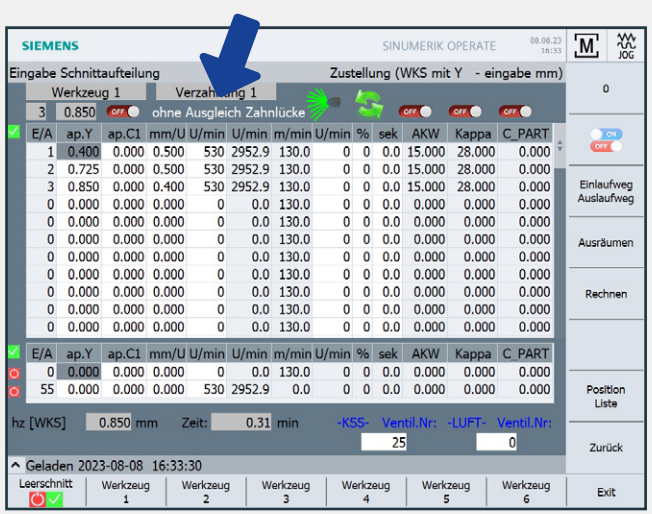
To enable a percentage, e.g., 5%, and a time in seconds., e.g., 0.5 seconds, enter in the white field in the desired cut.

Function: The speed is first reduced by 5% for 0.5 seconds and then increased again to 100% for 0.5 seconds (in constant alternation).



Rinse stop to make it easier to rinse out chips

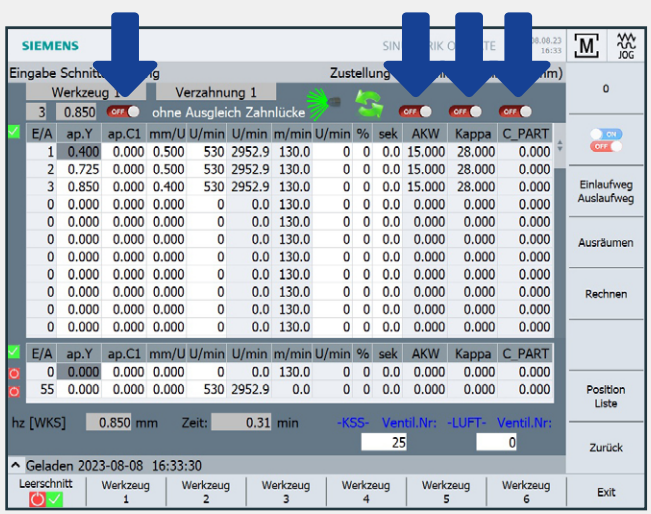
To enable a speed, e.g., 40 rpm, enter in the desired cut in the white field.



Machining with one or two finishing tools (for high quality)

Switch on to activate (see blue arrow)
Function when activated: When machining with several tools and rotation, the rotation is compensated with the first tool so that the subsequent tool can cuts both flanks.

Without compensation, the follow-up tool would only cut one flank.



The columns AKW, KAPPA, C_Part and ap.C1 can be switched on (see blue arrows).

This activates the input fields in the lines.

The specified axis cross angle AKW and the offset angle KAPPA can be changed.

C_Part: A workpiece rotation can be entered here.

ap.C1: A tool rotation can be entered here.

ProAC Software
Profile Angle Correction

ProAC is a software program from PITTLER that was specifically developed to calculate the machine parameters to reduce profile angle errors when skiving (PITTLER SKIVING).

To access ProAC, the DVS Connect portal is used. This requires either a computer or a mobile device, such as a cell phone or tablet. In the future it will also be possible to call up ProAC directly on the machine tool. This is made possible by the DVS Edge through a separate IPC that is connected to the Internet.

A big advantage of direct installation is that ProAC directly accesses the machine's gearing and tool data. The operator only has to enter the measured error of the profile angle. This simplifies operation and reduces potential sources of error.

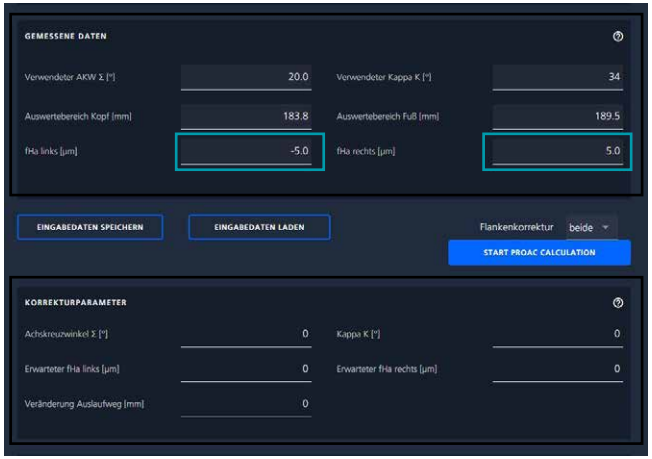
For a calculation with PITTLER ProAC, it does not matter whether cylindrical or conical tools are used. It is also irrelevant whether the profile angle error comes from tool production or is caused by the regrinding of the conical tools. ProAC can handle both variants and delivers reliable results.

Thanks to ProAC, companies can benefit from more precise profile angle calculation, resulting in improved quality of the workpieces produced. The software simplifies the process, saves time, and minimizes potential sources of error, which ultimately contributes to more efficient and economical production.

Function

ProAC is based on the concept of approximation through iterative calculation. Various variable parameters, such as the axis crossing angle (sigma angle) and the kappa angle, are varied according to a specific logic. The intersection points of the two profile lines are then compared with a zero degree profile angle error. In the ideal case, these three surfaces meet at one point, which theoretically results in a profile angle error of 0°.

Additionally, limit values are monitored to ensure that the tool does not collide with the workpiece if there is too much change in sigma or kappa.



MACHINING EXAMPLE

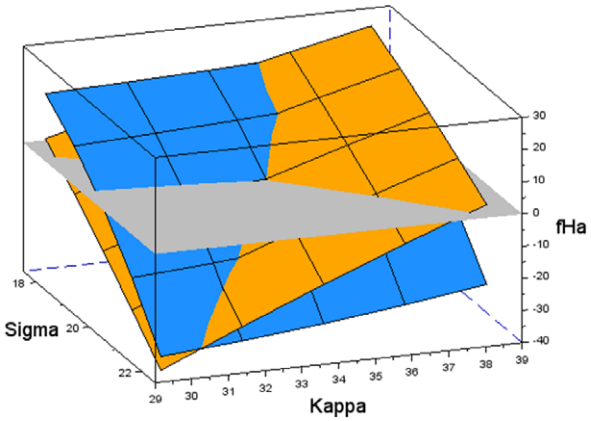
- Measurement result of the first component
- Quality profile angle error **fHa 7**

DIN 3961/62	Q	[..]	x		#63	#42	#22	#1	Zahn	#1	#22	#42	#63		x	[..]	Q
	7	-12/12	6.8		6.2	7.8	6.4	6.6	fHa	-1.0	3	2.6	3.3		1.3	-12/12	5
!=8	!=8	6	0/20	8.2		7.1	8.2	8.0	9.4	Fa	4.6	2.6	4.9	5.5		4.4	0/20	5
= 7	= 5	5	0/16	5.3		5.3	5.1	5.1	5.5	ffa	4.3	2.8	3.5	3.9		3.6	0/16	5

- Measurement result of the second component after calculation with ProAC
- Quality profile angle error **fHa 4**

DIN 3961/62	Q	[..]	x		#63	#42	#22	#1	Zahn	#1	#22	#42	#63		x	[..]	Q
	3	-9/9	0.0		1.9	2	-4	-1.8	fHa	1.1	-6	-2.2	-5		-6	-9/9	4
!=7	!=7	5	0/14	5.1		4.7	5.0	5.7	5.1	Fa	4.5	4.0	3.5	3.9		4.0	0/14	4
= 5	= 5	5	0/11	4.9		4.3	4.9	5.3	5.0	ffa	4.2	3.7	2.3	4.1		3.6	0/11	5

PITTLER SKIVING and PITTLER ProAC reduce waiting times, avoid unnecessary calculations, and good parts can be used from the second workpiece and tools despite fHa errors.

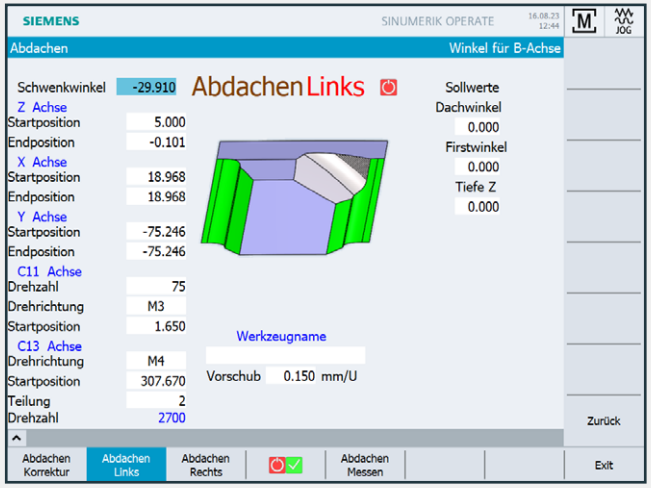


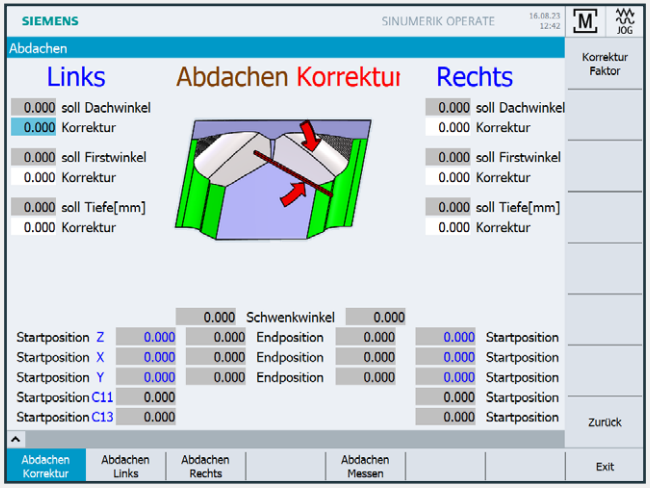
YOUR ADVANTAGE

- Easy to use (through the use of actual values)
- No complex calculations by operators necessary
- No more trial and error, operator errors are reduced
- Visual display for the operator or message if no improvement in the profile angle error is possible
- Reduction in the number of setup parts
- Reduces setup time
- Tool errors are compensated for and service life can be increased
- Both conical and cylindrical tools can be compensated
- Increasing machine availability through reduction in waiting time
- Can be used flexibly, i.e., machine-independently

Additional gearing processes

Another possible use for the PITTLER SKIVING software is pointing. Using the input masks specially developed by PITTLER, the use of the complex pointing kinematics is simplified and the process is more accessible for the operator.





Pointing:

- Self-explanatory user interfaces
- Integration of another manufacturing process without re-clamping
- No re-clamping error
- Easier setup
- Reduces setup time

Pointing correction and measuring:

- Defined tool corrections
- Correction of pointing angle, ridge angle, pointing depth
- In-process measurement of pointing
- Automatically correct while processing
- Measuring the pointing depth

Worldwide Service
Maximum Performance and Sustainability

PITTLER machines are used whenever performance is the top priority. In order to reliably and sustainably ensure this, customer-oriented service is an important aspect of what we do.

The aim of all our services is to sustainably increase our customers' earnings and to meet customer needs and expectations faster and better. To achieve this goal, we offer a variety of service products that are developed and constantly adapted in collaboration with our customers.

To ensure the longest possible life cycle for your machine, we offer the following services:

- Repair
- Maintenance
- Remote diagnosis
- Spare parts supply
- Training
- Production support
- Retrofit

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