PRÄWEMA ANTRIEBSTECHNIK GMBH

MANUFACTURING SOLUTIONS FOR DRIVE TECHNOLOGY

System Provider for Soft and Hard-fine Machining

PRAEWEMA.COM
DVS-TECHNOLOGY.COM

Contents

PRÄWEMA Antriebstechnik

PRÄWEMA ANTRIEBSTECHNIK

At the Eschwege site in northern Hesse, PRÄWEMA Antriebstechnik GmbH produces and develops machines for machining and producing gears. The company specializes in gears, synchronous parts, and shafts that ensure proper torque in vehicle transmissions.
In addition to gear skiving and gear honing, PRÄWEMA's technology portfolio also includes the milling milling of latching grooves, backings, and gearings, but also taper cutting.

PRÄWEMA further developed the technology of gear honing to make it competitive on the market. Today, it is the worldwide market and technology leader in this segment with over 1000 machines sold.

In particular, the global vehicle industry relies on high-precision machine tools from PRÄWEMA.

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


GEAR HONING


SKIVING

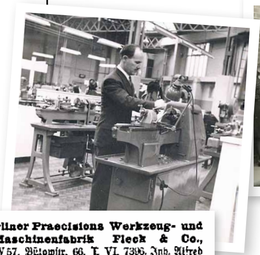

DEBURRING

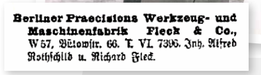

MILLING


SHARPENING


BACKING

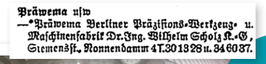
1908
Company foundation
Foundation of the company as "Berliner Werkzeugfabrik Fleck und Co." in Berlin-Siemensstadt, manufacture of precision tools



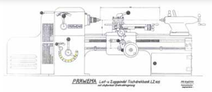

Berliner Praecisions Werkzeug- und Maschinenfabrik Fleck & Co., W 57, Bülowstr. 66. T. VI. 7305. Inh. Alfred Rothschild u. Richard Fleck.

1920
Expansion of the product range to include turret lathes, tool maker lathes, master lathes and draw spindle lathes

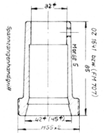
1936
Change of name to PRÄWEMA PRÄzisionsWErkzeug-MAschienenfabrik KG"


Präwema usw
—*Präwema Berliner Präzisions-Werkzeug- u. Maschinenfabrik Dr.Ing. Wilhelm Scholz K.-G., Siemensst., Nonnendamm 47.301328 u. 346037.

1943
Relocation of the company to Eschwege



1947
Start of the clamping device construction



1952
Expansion of the production program with gear edge milling machines in cooperation with Uhlich

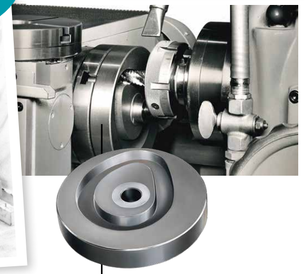
1957
Construction of the first packaging machines for the cigarette industry
Tobacco company Tabacalera (Spain)

1960
Takeover of the company by the packaging machine manufacturer Schmermund (Gevelsberg)

1964
Expansion of sales to non-European markets

1971
Relocation to newly built factory halls on Hessenring, launch of the special machine program

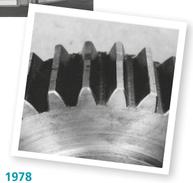
1975
Start of production of the NC-controlled cam-type milling and grinding machine



1980
Construction of the first large transfer plants

1982
Aufnahme des Produktionszweiges Flachschleifmaschinen

1984
Delivery of the product range to all continents, 500 employees



1978
NC versions and new milling methods added to the range of gear edge milling machines

1985-1989
Death of the company owner Mr. Schmermund

Bankruptcy and takeover by PITTLER AG, own training facilities

Sale of the surface grinding machine division, development of two new machine concepts and presentation of the new PRÄWEMA at EMO

1990
Concentration on gear machining machines and cam production -> Market launch SynchroForm

1994
Konkurs im Zuge der Werkzeugmaschinenkrise

1995
Takeover by the Rothenberger Group, market launch PRÄWEMA SynchroFine Single-spindle machine

2001
Integration into the DVS TECHNOLOGY GROUP

2007
Market launch PRÄWEMA SynchroFine Double spindles

2013
Tool system VSD

2016
VarioCrossHoning to improve the surface roughness

2018
Construction of the tool shop

2019
Sale of of the 1000th milling machine

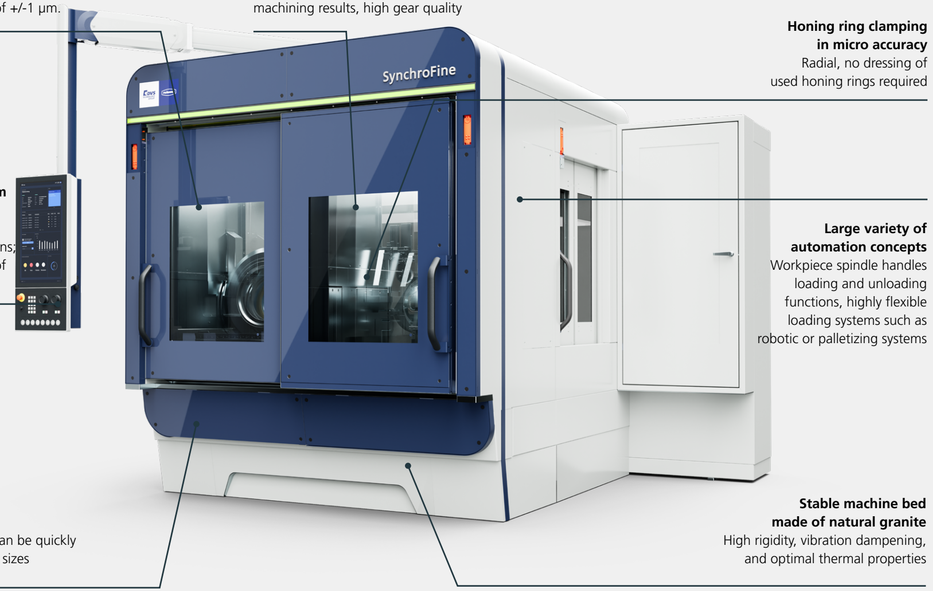
2024
Sale of the 1000th honing machine

Optimized tool costs thanks to flexible VSD dressing strategy
Every VSD® is refined with LaserCut Technology and dressed with a geometrically determined cutting edge. The result is a homogeneous structure of the surface edge and a profile shape accuracy of +/-1 µm.

Efficient direct drive
through extremely fast movement sequences, no maintenance, maximum precision, zero backlash, no mechanical transmission elements, shortest non-productive times, lower downtimes, best machining results, high gear quality

Honing ring clamping in micro accuracy
Radial, no dressing of used honing rings required

Newly developed binding system Tool technology: Tool Ring Pro
Performance increase up to 70% thanks to optimized number of grains; Significant increase in the number of workpieces per dressing cycle



Large variety of automation concepts
Workpiece spindle handles loading and unloading functions, highly flexible loading systems such as robotic or palletizing systems

Compact machine
Single or double spindle machine, can be quickly converted for small and large batch sizes

Stable machine bed made of natural granite
High rigidity, vibration dampening, and optimal thermal properties

SynchroFine
More refinement needed?

The SynchroFine is a compact machine with a natural granite bed for optimal thermal and vibration-damping characteristics. It uses digital, directly driven tool and workpiece spindles to ensure a backlash-free drive. The machine is self-loading and can be equipped with various automation solutions. Digital logging of operating parameters is standard and can be expanded for process optimization.

SOPHISTICATED PROCESS RELIABILITY WITH SHORT CYCLE TIMES

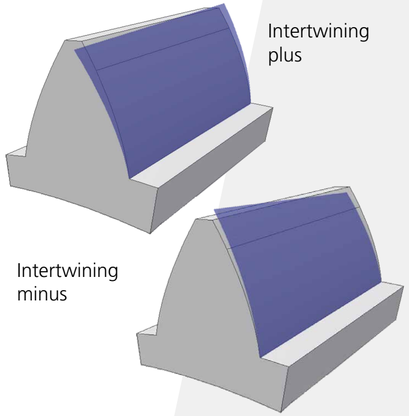
Machining Scope

Gear Cutting – Hardening – PräwemaHoning®

In recent years, gear honing has become established as an economical and powerful hard-finishing process for the production of gears or toothed shafts. Honed gear surfaces are important for lower noise levels and reduced wear on components in modern vehicle transmissions. Thanks to the consistent further development at PRÄWEMA, the technology has established itself as a standard in large parts of the international vehicle industry.

GEARING

- Interlock free or targeted interlocking
- Induced residual compressive stress prevents pitting
- No risk of grinding burns
- Noise reducing microstructure
- Shoulder processing possible



ADVANTAGES

- High cost-effectiveness thanks to a short process chain
- Pioneering gear quality
- Best machining results regardless of the pre-processing quality
- Superior process reliability with short cycle times
- Universal application of the process for straight and helical gears, shafts, and wheels
- Extremely low tool costs thanks to flexible VSD dressing strategy

Hobbing/skiving
slotting and deburring

Hardening

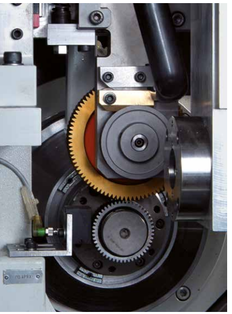
Präwema Honing©

Gear installation

VERY HIGH QUALITY
EXTREMELY QUIET
LOW UNIT COSTS
REDUCED CONSUMPTION / CO2

ROLL CHECKER

- Dimension control on the raw part
- Ball size check before and after machining (selectable)
- Detect type of error (runout and damage)
- Data history of the preparatory work

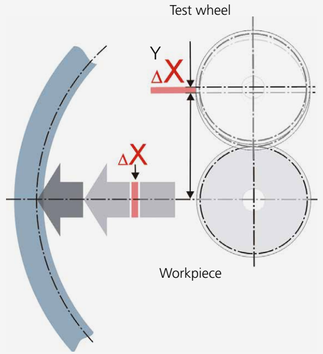


Smart honing

To shorten the cycle time, the allowance is measured on the raw part using a center distance test before machining. Depending on the measurement, the rapid feed is adjusted so that inefficient processing paths are avoided.

Key:

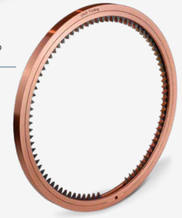
Δ Y = Fluctuation in dimensions compared to the previous component
Δ X = Optimization of landing path in comparison to the previous component
Δ X = Δ Y



Superfinishing

A specially developed oscillation process during the honing process ensures a further reduction in surface roughness and thus additional increase in the surface quality of geared components. This innovation – with which PRÄWEMA once again sets new quality standards for gear surfaces – allows gear manufacturers to further reduce the friction losses of gear pairs. Moreover, the geared gear components are subjected to less wear, which increases their service life.

VARIOSPEEDDRESSER®



VARIOSPEEDDRESSERi®

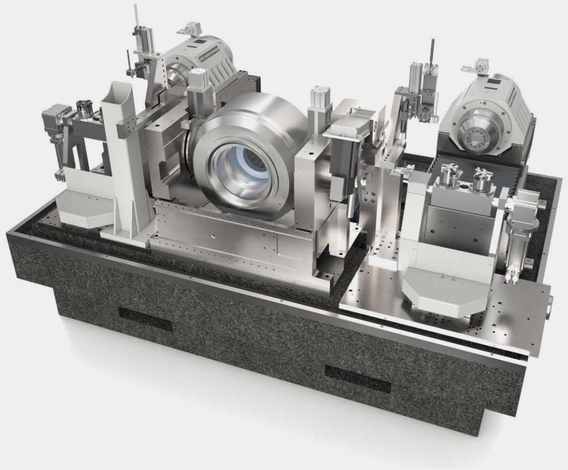
VarioSpeedDressing®

The latest generation of gear honing machines (PRÄWEMA SynchroFine®) is optionally equipped with so-called VSD technology. “VSD” stands for VarioSpeedDressing® and describes a dressing process in which only the frontmost, continuously defined cutting edge of the dressing tool engages in the honing ring. Compared to dressing with conventional diamond dressing gears, the new VSD technology offers unprecedented flexibility in terms of the profile and flank line.

The Construction Concept

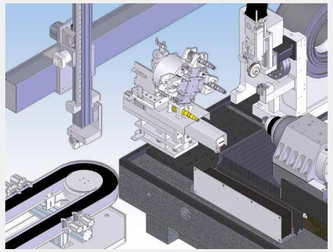
Single spindle model

The “pickup” design of the machine enables the straightforward implementation of automation concepts. The workpiece spindle takes on the loading and unloading function of both the workpieces and the dressing tools.

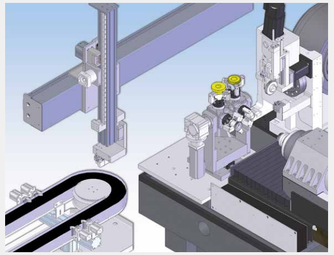


Two-spindle model

Even the single spindle SynchroFine achieves extremely short cycle times.
With Präwema’s decades of experience in the production of machines with two or more spindles, the SynchroFinetype is also used for the two-spindle PräwemaHoning®. This reduces the non-productive time to three seconds.



Shaft loading



Wheel loading

Workpiece handling

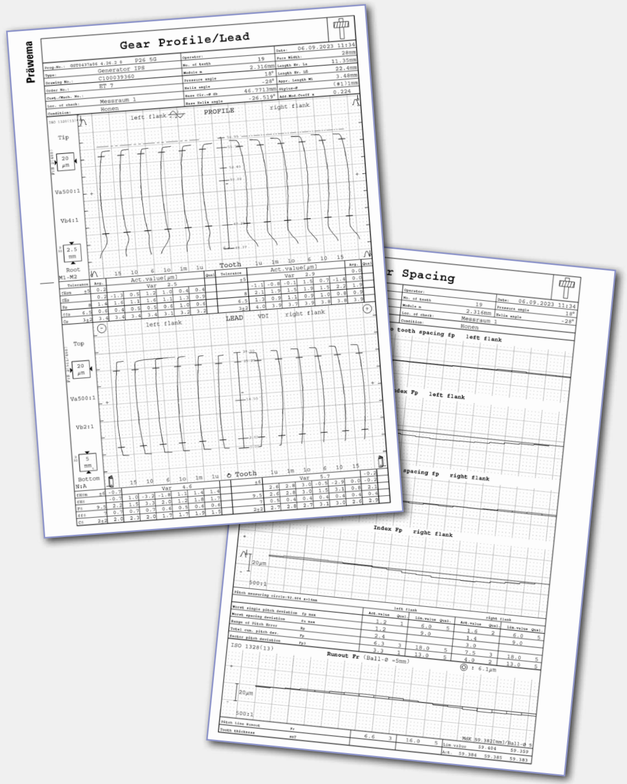
We offer a wide range of automation solutions for workpiece feeding into the machine. The automation unit can be put together individually by our customers depending on their capacity requirements or available installation space. The integration of external robot or palletizing systems as well as outfeeds to special conveyor belts can be easily implemented.

The Quality

GEAR DATA	
Number of teeth	19
Module (mm)	2.316
Pressure angle α (°)	18
Helix angle β (°)	-28
Oversize per edge (µm)	50 – 60
Dressing cycle (parts)	> 500
Cutting ring	Ceramics

Measurement protocols

Process control during gear honing is comparatively uncomplicated. The defined dressing intervals vary between 150 and 300 parts and remain constant during the optimization phase. To monitor the process, it is sufficient to measure the last part before dressing and the first part after dressing on a gear measuring machine. This guarantees a high level of quality without excessive measuring.



Technical Data

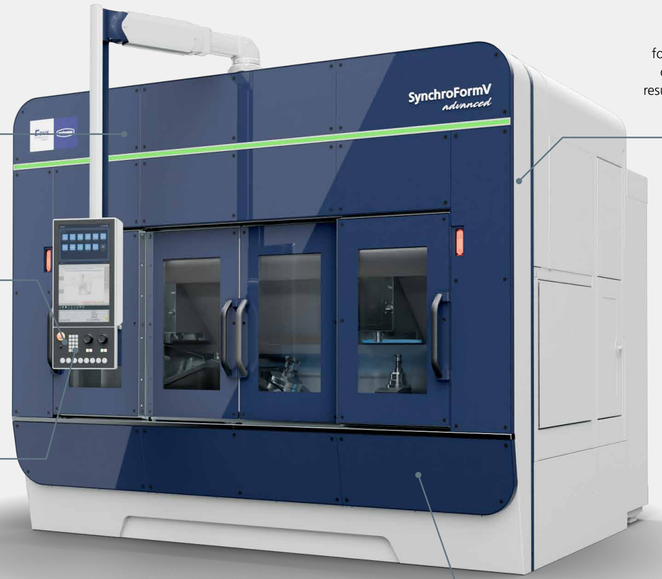
	SynchroFine 205	SynchroFine 305
WORKPIECE		
Max. workpiece diameter (mm)	150	225
Max. workpiece length (mm)	600	
Additional workpiece dimensions subject to technical clarification		
COMPOUND SLIDES		
X-axis travel (mm)	1200	
Y-axis travel (mm) (WKZ option)	Loading portal: 850	
Z-axis travel (mm)	560	
WORKPIECE SPINDLE		
Drive power 100% duty cycle (kW)	35	
Torque 100% duty cycle (Nm)	112	
Max. speed (rpm)	6000	

	SynchroFine 205	SynchroFine 305
TOOL SPINDLE		
Rated power (kW)	30	
Rated torque	150	
Mount/interface	Hydraulic expansion clamping system	
DIMENSIONS / WEIGHT	**Single spindle machine**	**Double spindle machine**
Width (mm)	2200	3000
Depth (mm)	2800	
Height (mm)	2350	
Total net weight (kg)	12000	15000
AUTOMATION	Manual loading Conveyor belt Robot directly in M/C Robot on intermediate storage	

Flexible automation solutions
thanks to various integration options for loading systems

Quality assurance
HRI analyzes and detects potential damage and errors before they occur

Stable processes
through monitoring and wear detection



Modular machine
as a single or double spindle machine, for the series production of transmission components, high-precision machining results, versatile range of technologies for precise soft and hard machining

Can be implemented flexibly
and in accordance with the number of pieces with one or two workpiece spindles

SynchroFormV
Modularity has a Name

The SynchroFormV machine series can be modularly adapted for the production of geared drive components. As a single or two-spindle machine, it plays to its strengths in series production with extremely economical cycle times and high-precision machining results. With the diverse technology modules, efficient turnkey machining can be realized for all aspects of gearing in soft and hard fine machining.

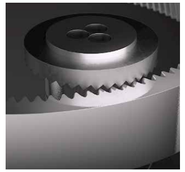
SOPHISTICATED PROCESS RELIABILITY WITH SHORT CYCLE TIMES

Reliable Technologies
Tailored to your Application

The reliable coordination of technological solutions is imperative for precision and efficiency in manufacturing. With a diverse range of technologies for precise soft and hard machining, we can meet a wide range of requirements. Adapting to the quantity is a flexible process and can be carried out with either one or two spindles. This enables efficient turnkey machining that covers all aspects of gear cutting for drive components, which not only saves time but also ensures high quality products.

ADVANTAGES

- Versatile range of technologies for precise soft and hard machining
- One or two spindles depending on quantity requirements
- Efficient turnkey machining for the gearing of drive components



DEBURRING

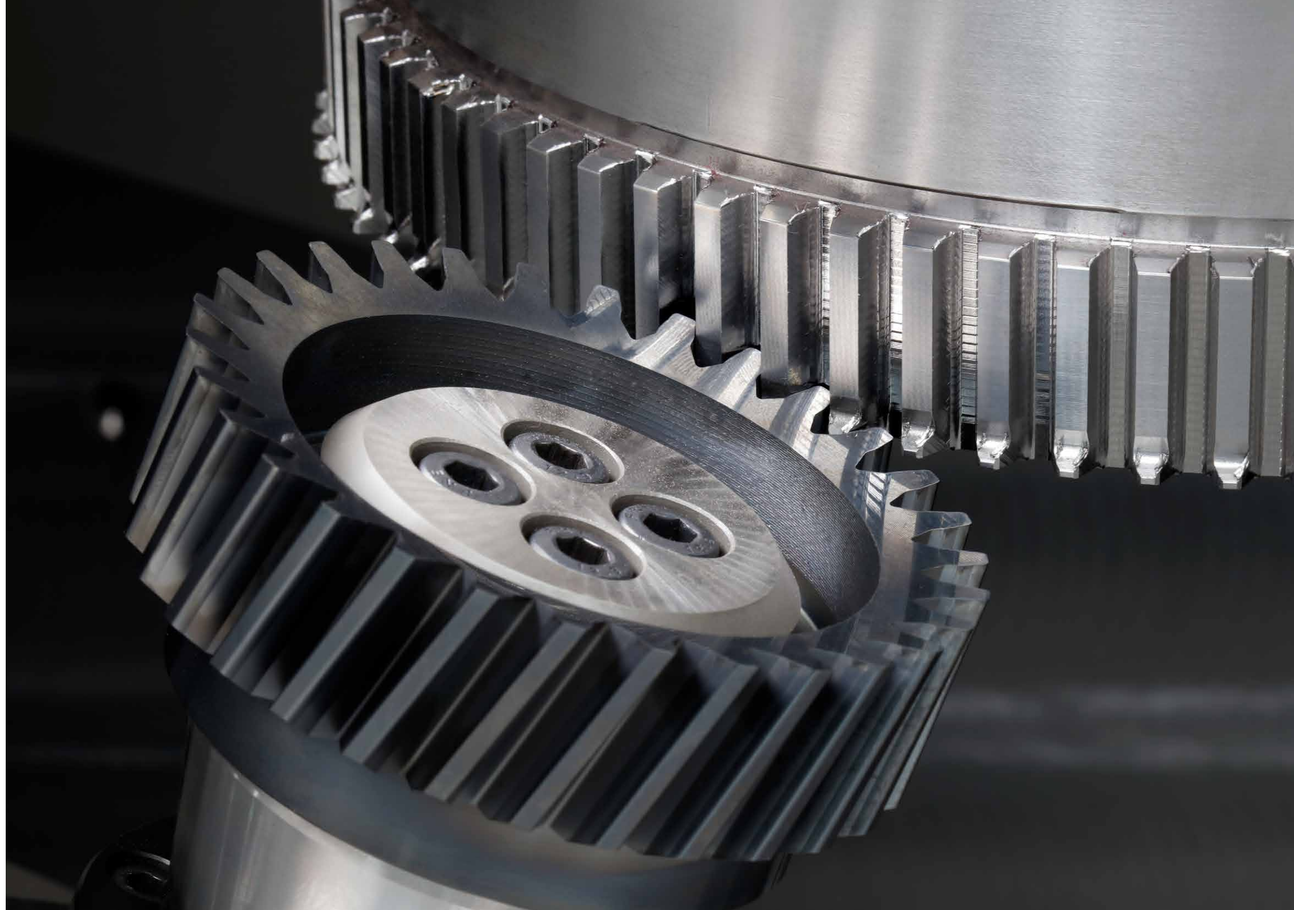
IMPACT MILLING

SHARPENING

BACKING

SKIVING

INTERNAL HONING



Maximum Precision for Internally Toothed Ring Gears

The requirements for ring gears of planetary gears used in hybrid or electric vehicles have increased significantly in recent times. Due to the higher speeds and higher load ratios of the gearing in alternative drives, ring gears are hardened. The resulting hardness distortions on the gearing can be precisely and efficiently compensated for with the PRÄWEMA internal gear honing technology.

Internal gear honing

This technology creates a much finer surface and a defined flank geometry of the internal teeth. The noise behavior of the ring gear remains low despite high speeds.

System Solution for the Machining of Running Gears

Running gear

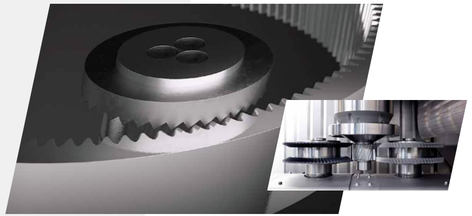
The PRÄWEMA SynchroFormV is also the ideal machining solution for drive components with running gears. The machine reliably performs turning, gear cutting, and deburring operations in soft machining. Already hardened components are geared using the hard skiving process. For the final machining of external gears, PRÄWEMA offers gear honing with the SynchroFine machine type.

Skiving

PRÄWEMA's gear skiving technology enables maximum cost-effectiveness thanks to the high cutting volume that can be achieved.

Deburring

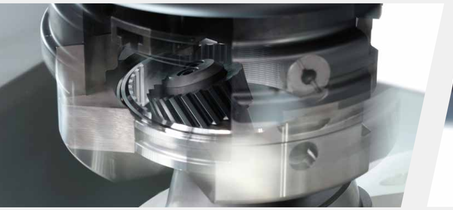
The removal of the massive main burr can usually be integrated into the machining process without affecting the cycle time. Moreover, VarioChamfer is now also a process for the targeted introduction of chamfers.



Honing of internal gears

PRÄWEMA gear honing is a highly accurate and economical process for the hard-fine machining of internal gears up to a pitch circle diameter of 250 mm.

Complete Machining
of Sliding Sleeves



Skiving

Thanks to the latest developments in manufacturing technology, this efficient and flexible technology is one of the most economical methods for the gearing of workpieces.

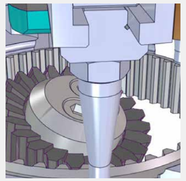
Backing/detent groove milling

PRÄWEMA uses the hypocycloid milling process for the economical machining of backings and detent grooves in a metal-cutting process on internal and external gears.

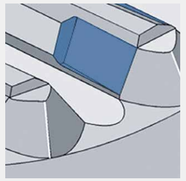
Pointing/sharpening

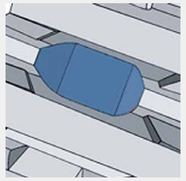
A wide variety of pointing shapes can be realized. These include crowned, rotary, and straight pointing.

Skiving

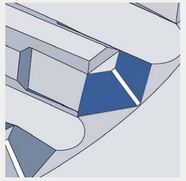


Backing





Detent groove milling



Pointing

Sliding sleeves

Sliding sleeves enable gear changes in manual transmissions and transmit the torque from the transmission shaft to the gear wheel via the synchronizer and clutch body. With the SynchroFormV, sliding sleeves can be fully machined with high precision and at a low cost per unit.

Special Gearing
Impact Milling etc.

Impact milling

Impact milling is an advanced machining technology. It involves striking a rotating tool on the workpiece at high speed and thus removing or shaping material in the process. This technique enables precise and efficient machining. Impact milling is widely used in the production of precision parts and enables complex shaping and a surface finish of the highest quality.

Technical Data

	SynchroFormV
WORKPIECE	
Max. workpiece diameter (mm)	300
Max. workpiece length (mm)	290 for CL* – 100 for SL*
Additional workpiece dimensions subject to technical clarification	
COMPOUND SLIDES	
X-axis travel (mm)	1500 – 3300
Y-axis travel (mm) (WKZ option)	284 – 364
Z-axis travel (mm)	330
WORKPIECE SPINDLE	
Drive power 100% duty cycle (kW)	35 – 63
Torque 100% duty cycle (Nm)	75 – 430
Max. speed (rpm)	6000 – 10000

	SynchroFormV
TOOL SPINDLE	
Max. speed (rpm)	6000 – 10000
Rated power (kW)	6 – 42
Rated torque	10 – 140
Mount/interface	Capto
DIMENSIONS / WEIGHT	
Width (mm)	2800 – 3450
Depth (mm)	2760
Height (mm)	2550
Total net weight (kg)	7000 – 10000
AUTOMATION	Manual loading Circular loader with oval band (standard) Loading shuttle Robot loading

Key:
CL* = center loading
SL* = side loading

SynchroFine Vario Finish
Die SynchroFine Vario Finish wurde für höchste Flexibilität und Prozesssicherheit bei der Feinstbearbeitung von Verzahnungen entwickelt. Aufbauend auf dem bewährten Maschinenkonzept der SynchroFine, kombiniert sie alle Vorteile des Natur-Granit-Betts – wie exzellente thermische Stabilität und optimale Schwingungsdämpfung – mit einer neuen, modularen Bearbeitungsarchitektur.
Im Zentrum steht ein zweistufiger Prozessablauf, bei dem Werkstücke zunächst vorgehont und anschließend feingehont oder poliert werden. Zwei vollständig voneinander unabhängige Bearbeitungseinheiten ermöglichen den Einsatz separater Werkzeuge für die jeweiligen Prozessschritte. Die mittige Anordnung beider Werkzeuge zur Schwenkachse sorgt dabei für höchste Präzision ohne aufwendige Korrekturen aufgrund von Außermittigkeit. Beide Einheiten verfügen über eigene Wechselintervalle – ein deutlicher Vorteil im Hinblick auf Wartung und Prozessplanung.
Diese Maschinenkonzeption eröffnet darüber hinaus die Möglichkeit, Werkstücke mit zwei unterschiedlichen Verzahnungen in nur einer Aufspannung zu bearbeiten. Komplexe Geometrien wie Stufenplaneten für Planetengetriebe, inklusive des zunehmend geforderten Timings zwischen den Verzahnungen, lassen sich so prozesssicher und effizient realisieren.
Die Vario Finish bietet großes Potenzial zur Prozessoptimierung. Durch die Trennung in einen groben Vorhonprozess und einen hochpräzisen Fertighonprozess lassen sich sowohl die Bearbeitungszeit als auch die Werkzeugkosten signifikant reduzieren. Das Vorhonen erfolgt mit einem leistungsstarken Werkzeug, bei dem enge Toleranzen zunächst nicht erforderlich sind. Dadurch ergeben sich kürzere Taktzeiten, längere Abrichtzyklen sowie eine verringerte Abrichtzeit. Beim anschließenden Feinhonen wird – durch das reduzierte Aufmaß – eine hochpräzise Endbearbeitung mit ebenfalls verkürzter Taktzeit und optimierter Werkzeugstandzeit erreicht.
Wie alle Maschinen der SynchroFine-Baureihe ist auch die Vario Finish mit digital angetriebenen Werkzeug- und Werkstückspindeln ausgestattet. Dies garantiert einen spielfreien Antrieb für maximale Prozessstabilität. Die digitale Erfassung aller relevanten Betriebsparameter ist serienmäßig integriert und bietet erweiterte Optionen zur Prozessüberwachung und -optimierung.
Ausblick: Die modulare Bauweise der SynchroFine Vario Finish ermöglicht künftig die Integration zusätzlicher Bearbeitungsprozesse, um weitere Schritte der Wertschöpfungskette in einem einzigen Spannzyklus abzubilden.

PRÄWEMA Antriebstechnik

PRÄWEMA TOOLS
Gear cutting tools with maximum performance

The team of experts at PRÄWEMA Antriebstechnik GmbH has specialized exclusively in the development and production of gear cutting tools for honing and skiving machines as well as special machines for the DVS TECHNOLOGY GROUP.

Customer-specific tools, such as deburring or skiving tools, are also developed and manufactured.

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The tool is the interface between the machine and the workpiece. It is critical to ensure process reliability. High-quality tools deliver consistent quality and reduce production fluctuations. This applies to both new and remanufactured tools in original equipment quality.

Tool quality is especially important for gear skiving tools, which must achieve the highest gear quality through the rolling process.

PRÄWEMA TOOLS maps the entire technology process from analysis, design, manufacturing, coating, and application in-house and thus guarantees a customer-oriented tool solution, no matter what the challenge may be.


REUSABLE TOOLS


SINGLE-USE TOOLS

GEAR DRESSER, SPECIAL TOOLS


SHAFT TOOLS


TURNING TOOLS


INDEXABLE INSERTS


GEAR DRESSER, SPECIAL TOOLS


REUSABLE OR SINGLE-USE TOOLS WITH HOLLOW & STEPPED GRINDING

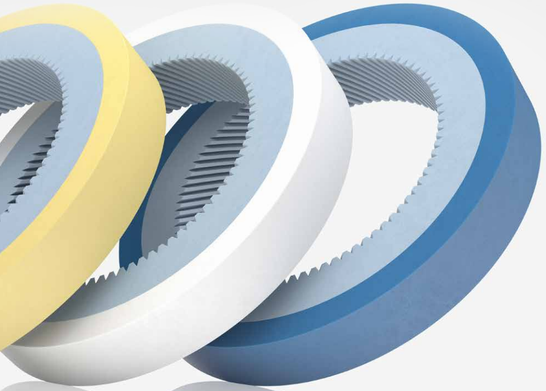
Präwema Honing®
DVS as system provider

VarioSpeedDresser® | **Honing machine** | **Honing rings**

DVS as system provider: Technology + Machine + Tools

DVS TOOLING – Tool Solutions & Technology Support for PRÄWEMA gear honing

With original tool solutions and global technology support for PRÄWEMA gear honing, DVS TOOLING GmbH, which is also a member of the DVS TECHNOLOGY GROUP, offers important added value for the producers of geared components.



ORIGINAL tool. ORIGINAL performance.
PRÄWEMA ORIGINAL honing rings from DVS TOOLING
The honing tools from the PRÄWEMA ORIGINAL series guarantee stable processes and long service lives. Pre-cut honing rings are delivered with a gearing quality that is significantly closer to the required production quality than comparable honing rings from other suppliers. In addition, the toothed processing zone of a PRÄWEMA ORGINAL honing ring is surrounded by a second so-called damping zone, which absorbs undesirable vibrations.

More precise dressing with the VarioSpeedDresser®
VSD dressers, also called VarioSpeedDresser®, are manufactured at DVS TOOLING using the specially developed finishing process "DVS LaserCut." This process creates a homogeneous cutting edge surface on the dresser. The result is an excellent surface quality that is transferred to the honing ring and ultimately to the workpiece during the dressing process.

Worldwide technology support
DVS TOOLING offers various further training measures for the users of PRÄWEMA gear honing machines.

- For machine operators: Individually tailored operator training with a strong focus on practical application
- For production planners & operations managers: Seminars on the topics of process optimization and technology development

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DVS LaserCut

DVS SERVICE
Turning, grinding, gear cutting – and learning, networking, and improving

DVS TECHNOLOGY GROUP machines produce high-quality components. We also strive to exploit the potential of digitalization and making it even easier for you to produce workpieces and operate machines. The future is digital, networked, smart – and it just feels right.

What's great about it: As a user, you can also gradually tap into the digital potential of your production and benefit from the advantages that are particularly beneficial for your production – from the use of the customer portal to almost self-sufficient production.

DVS Connect
The digital customer portal DVS Connect serves as a platform and starting point for accessing information and applications from the DVS TECHNOLOGY GROUP and is therefore at the center of networking and integration.

DVS Edge
As the basis for all applications, smart machines need a brain that allows them to speak. That is exactly what DVS Edge does, and it networks data, machines, and people into a self-learning system that operates in different modes: online and offline, continuously, or selectively.

DVS Digital Experience
The DVS Digital Experience consists of the applications and functions that you can use based on the knowledge and experience of the DVS TECHNOLOGY GROUP. Your benefits: ergonomics, efficiency, and consistent quality.

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Members of the DVS TECHNOLOGY GROUP

DVS MACHINE

BUDERUS Schleiftechnik GmbH | dvs-technology.com/buderus-schleiftechnik
I.D. grinding – O.D. grinding – Bore honing – Hard turning

PITTLER T&S GmbH | dvs-technology.com/pittler
Vertical turning center and Pick systems – Gear cutting for complete machining

PRÄWEMA Antriebstechnik GmbH | dvs-technology.com/praewema-antriebstechnik
Gear honing – Gear grinding – Hobbing/Fly-cutting – Chamfering

rbc robotics GmbH | dvs-technology.com/rbc-robotics
Camera-guided robot automation systems

DVS INTERNATIONAL SALES & SERVICE

DVS Technology America, Inc. | dvs-technology.com
DVS Sales & Service in USA, Canada & Mexico

DVS Technology (Taicang) Co., Ltd. | dvs-technology.com
DVS Sales & Service in China

DVS SERVICES & TOOLS

DVS TOOLING GmbH | dvs-technology.com/dvs-tooling
Tool solutions and technology support for PRÄWEMA gear honing

NAXOS-DISKUS Schleifmittelwerke GmbH | dvs-technology.com/naxos-diskus
Conventional grinding tools – CBN and diamond tools

Werkzeugmaschinenbau Ziegenhain GmbH | dvs-technology.com/wmz
Motorspindles & Components

DVS Service GmbH | dvs-technology.com/dvs-service
Maintenance – Complete overhauls – Repairs

DISKUS WERKE Schleiftechnik GmbH | diskus-werke.dvs-gruppe.com
Face grinding – Double face grinding – Special machining

DVS PRODUCTION

DVS Precision Components (Taicang) Co. Ltd.
Precision powertrain components in series production for passenger cars and trucks on DVS machines

PRW-2025.03-ENG