

PRÄWEMA ANTRIEBSTECHNIK GMBH

MANUFACTURING SOLUTIONS FOR DRIVE TECHNOLOGY

System Provider for Soft and Hard-fine Machining

PRAEWEMA.COM DVS-TECHNOLOGY.COM PRÄWEMA Antriebstechnik

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The Company

PRÄWEMA, located in Eschwege, is a leading manufacturer of high-precision machine tools for machining gears, synchronous parts, and vehicle transmission shafts.

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SynchroFormV enables the flexible, precise production of geared drive components with economical cycle times and a variety of technology modules for turnkey machining.



06 SynchroFine

A compact machine with directly driven tool and workpiece spindles for backlash-free drive, self-loading function, and expandable digital operating parameter logging for optimum process control.





PREWEMA TOOLS

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Our team of experts specializes in gear cutting tools for honing and skiving machines as well as special machines from the DVS TECHNOLOGY GROUP.





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.

The PRÄWEMA technology portfolio comprises not only the milling of latching grooves, backings, and gearings, but also taper cutting.

PÄWEMA 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 900 machines sold.

In particular, the global vehicle industry relies on highprecision 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 honing.

The DVS TECHNOLOGY GROUP employs more than 1400 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 Tools & Automation:

Manufacture and sale of high-precision machine tools and automation systems and related services.

DVS Tools & Components:

Customer-specific development, manufacturing, and sale of machine components, tools, and abrasives.

DVS Production:

Series production of small and large series on DVS machine tools.

DVS International Sales & Service:

DVS contact for sales and service in international markets.

FOCUS ON CORE TECHNOLOGIES



GEAR HONING



SKIVING



DEBURRING



MILLING



SHARPENING



BACKING

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 $+/-1 \mu m$.

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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



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

Compact machine

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

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.





- 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





- 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:

$\Delta Y =$	Fluctuation in dimensions compared to
	the previous component
$\triangle X =$	Optimization of landing path in comparison
	to the previous component
∆ 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.



VarioSpeedDressing®

The latest generation of gear honing machines (PRÄWE-MA 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.





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.

Wheel loading

rbc robotics Automation for Tomorrow's Manufacturing

We are shaping the future of robot automation in close partnership with our sister company rbc robotics, which is part of the DVS Technology Group. rbc robotics offers innovative solutions for component feeding, machine loading, and component packaging. Our modular high-end solutions use visual systems and industrial robots to make production smarter and more economical. We offer individual solutions through modularization and integrate external automation concepts, such as belt solutions, stacking cells, and robot loading. Together we are shaping the future of manufacturing.



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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		SynchroFine 205	SynchroFine 305	
WORKPIECE			TOOL SPINDLE			
Max. workpiece diameter (mm)	150	225	Rated power (kW)	30)	
Max. workpiece length (mm)	600		Rated torque	15	150	
Additional workpiece dimensions subject to techni	cal clarification		Mount/interface	Hydraulic expansion	n clamping system	
			DIMENSIONS / WEIGHT	Single spindle machine	Double spindle machine	
X-axis travel (mm)	1200					
Y-axis travel (mm) (WKZ option)	Loading portal: 850					
Z-axis travel (mm)			Depth (mm) 	280	2800	
·			Height (mm)	235	50	
WORKPIECE SPINDLE			Total net weight (kg)	12000	15000	
Drive power 100% duty cycle (kW) 35						
Torque 100% duty cycle (Nm)	112		AUTOMATION	Conveyor belt Conveyor belt Robot directly in M/C Robot on intermediate storage		
Max. speed (rpm)	6000					

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

Flexible automation solutions thanks to various integration options for loading systems

Quality assurance

HRI analyzes and detects potential damage and errors before they occur

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Stable processes through monitoring and wear detection SynchroFormV

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







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

Detent groove milling

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		SynchroFormV
WORKPIECE		TOOL SPINDLE	
Max. workpiece diameter (mm)	300	Max. speed (rpm)	6000 – 10000
Max. workpiece length (mm)	290 for CL* – 100 for SL*	Rated power (kW)	6 – 42
dditional workpiece dimensions subject to technical clarification R		Rated torque	10 – 140
		Mount/interface	Capto
COMPOUND SLIDES			
X-axis travel (mm)		DIMENSIONS / WEIGHT	
Y-axis travel (mm) (WKZ option)		Width (mm)	2800 – 3450
Z-axis travel (mm)	330	Depth (mm)	2760
		Height (mm)	2550
WORKPIECE SPINDLE		Total net weight (kg)	7000 – 10000
Drive power 100% duty cycle (kW)	 35 – 63		
Torque 100% duty cycle (Nm)		AUTOMATION	Manual loading
Max. speed (rpm)	6000 – 10000		(standard) Loading shuttle Robot loading

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

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

VARIOSPEEDDRESSER®*

SINGLE-USE TOOLS

SHAFT TOOLS

INDEXABLE INSERTS

REUSABLE OR SINGLE-USE TOOLS WITH HOLLOW & STEPPED GRINDING

Präwema Honing®

DVS as system provider

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 TECHNOL-OGY 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 DIGITAL 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

DVS Digital Experience

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

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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continuously, or selectively.

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Members of the DVS TECHNOLOGY GROUP

DVS MACHINE TOOLS & AUTOMATION

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

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

DVS Universal Grinding GmbH | dvs-technology.com/dvs-universal-grinding Combined hard-fine machining for small and medium size batches

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

Werkzeugmaschinenbau Ziegenhain GmbH | dvs-technology.com/wmz Turning & Combined machining of shafts – Motor spindles

DVS TOOLS & COMPONENTS

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

DVS Production

DVS Production GmbH | dvs-technology.com/production DVS Technologies in mass production for passenger car components

DVS Production South GmbH | dvs-technology.com/dvs-production-south DVS Technologies in mass production for commercial vehicle components

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

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 Sales & Service in China

DVS Technology Europe GmbH | dvs-technology.com DVS Sales & Service in South Europe

