FORMING EXCELLENCE

OUR COMPANY

Contents

What matters to us

Be it in the automotive industry, in drive technology, in aerospace or in the production of gas tanks – a large number of branches today are certainly in need of the chipless forming of metal parts. In a world which is continuously and quickly developing, at the same time the need for quality, sustainability and durability is growing. New challenges have to be met with lighter products, more powerful components and stronger capacities. In order to assist our customers in meeting these challenges there have to be trust and good cooperation.

On the global market of metal spinning we are technological leaders with a high regional added value. We excite our customers with innovate, powerful forming machines and procedures in the fields of metal spinning and flow forming. Our mission is to constantly develop new production processes and to open up new fields of application for our customers. We offer machines of the highest quality and comprehensive customer service.

We perform at the highest level.
“We are Forming Excellence”

Based on our own intensive research and development activities, we want to continually set new standards in the fields of metal spinning and flow forming and establish these new technologies on new markets untapped so far. One step ahead of our competitors, one step closer to our customers. Today and in future.

With best regards,

Christian Malkemper
Chief Executive Officer (CEO)

Who we are

84
active patents

130
experienced employees

800
m^2 R&D Center

1975
established at the current location in Sendenhorst

8,000
m^2 production area

For more than 40 years, the letters WF have been standing for competence, reliability and quality. Werner Winkelmann and Udo Friese, mechanical engineers with heart and soul, met in the Keilinghaus company established in 1900. After the insolvency of their employer they decided to establish their own enterprise: The WF Maschinenbau und Blechformtechnik GmbH & Co. KG was born. And not only Winkelmann and Friese but many other experienced Keilinghaus employees became part of the new company and have made us what we are today. In the course of succession management, Mr. Friese transferred the company to the mpool group from Düsseldorf.

Today we are the innovative leaders in metal spinning. The passion displayed by Winkelmann and Friese when designing their machines is still perceptible in the company. We enthusiastically build machines at the highest level and develop new processes in all areas of metal spinning and flow forming. On 8,000 m^2 we produce our machines and on further 800 m^2 we develop new processes in our R&D Center. Every day, more than 130 colleagues at our headquarters in Sendenhorst, in our subsidiary in Schaumburg, USA, and in our representation in Shanghai, China, are working on building modern, reliable and efficient machines.

We look ahead. We regularly secure our technical foundation by way of continuous test series, process developments and patent applications. And to make sure that WF Maschinenbau will remain at the top in future, we consider the training of our junior staff as an integral part of our company.

Our history

2020
Construction of a test machine for space research

2018
Establishment of a foreign representation in China. Extension of our production space in Germany to more than 8,000 m^2

2017
Establishment of the North American subsidiary WF Machinery Inc.
Construction of a vertical universal spinning machine as research and development machine

2016
WF Maschinenbau is sold to the mpool group

2013
Construction of a horizontal universal spinning machine as research and development machine

2009
Worldwide first vertical flow forming/turning machine with six freely programmable slide axes

2005–2007
Production lines for the manufacture of weight-optimized passenger car wheels and aluminium wheels

2004
First machine deliveries to China and South Korea

2003
Werner Winkelmann resigned from management and sold his shares to the Friese family

1999
First flow forming machine for the production of truck wheel discs

1998
Construction of the largest and heaviest horizontal flow forming machine of the world

1995
The Innovation – the WF hub patent, vertical machine for spinning of hubs at belt pulleys, clutch and transmission parts

1976–1994
Construction of numerous automatic processing machines and production lines, among them world novelties like horizontal and vertical flow forming machines for the production of internally geared clutch and transmission parts

1975
Establishment of WF Maschinenbau & Blechformtechnik GmbH & Co. KG after insolvency of the Keilinghaus company by the former Keilinghaus employees Werner Winkelmann and Udo Friese

1900
Establishment of the Keilinghaus company

Final check of a mounted headstock

We are more than machine builders. We are inventors, researchers, development partners for our customers. And in the end, we build machines. And this is what distinguishes us from other machine builders in our industry. We see the “big picture”. We want to develop ideas for and with our customers and to test their feasibility. It is our prime ambition that our customers are one step ahead of their own competitors.

WF Maschinenbau is a synonym for consequent customer and market orientation. In this way, we continuously develop new ideas which will be implemented in our R&D Center. Thanks to innovative Industry 4.0 components, our tailor-made machines fit perfectly into our customer’s production lines. Innovative services and training opportunities permit maximum machine availability and self-sufficiency – making our customers highly satisfied partners.

Confidence is the basis for our success. Absolute reliability in implementation, trust, loyalty, excellence in all processes – this is what we stand for.

We know that confidence has to be earned. This is why we try to interact with our customer in an open and honest dialogue right from the beginning. We listen, we exchange opinions, we learn to know each other, we understand particular requirements to be met.

We are at home on the markets of our customers and therefore know the challenges of tomorrow. Along with you we set standards in the trades:

- rim, wheel and wheel discs production
- engine and gear manufacturing
- aerospace industry
- energy and environmental engineering
- medical technology
- tank and apparatus construction
- air conditioning
- lighting industry
- home appliance industry
- instrument making

“We at WF Maschinenbau put great emphasis on innovation. I like to work with my team every day and to develop the machines and processes of tomorrow. Together we find solutions, we want to go ahead and cause enthusiasm, and we are proud when holding a new patent specification in our hand.”

Christian Malkemper, CEO

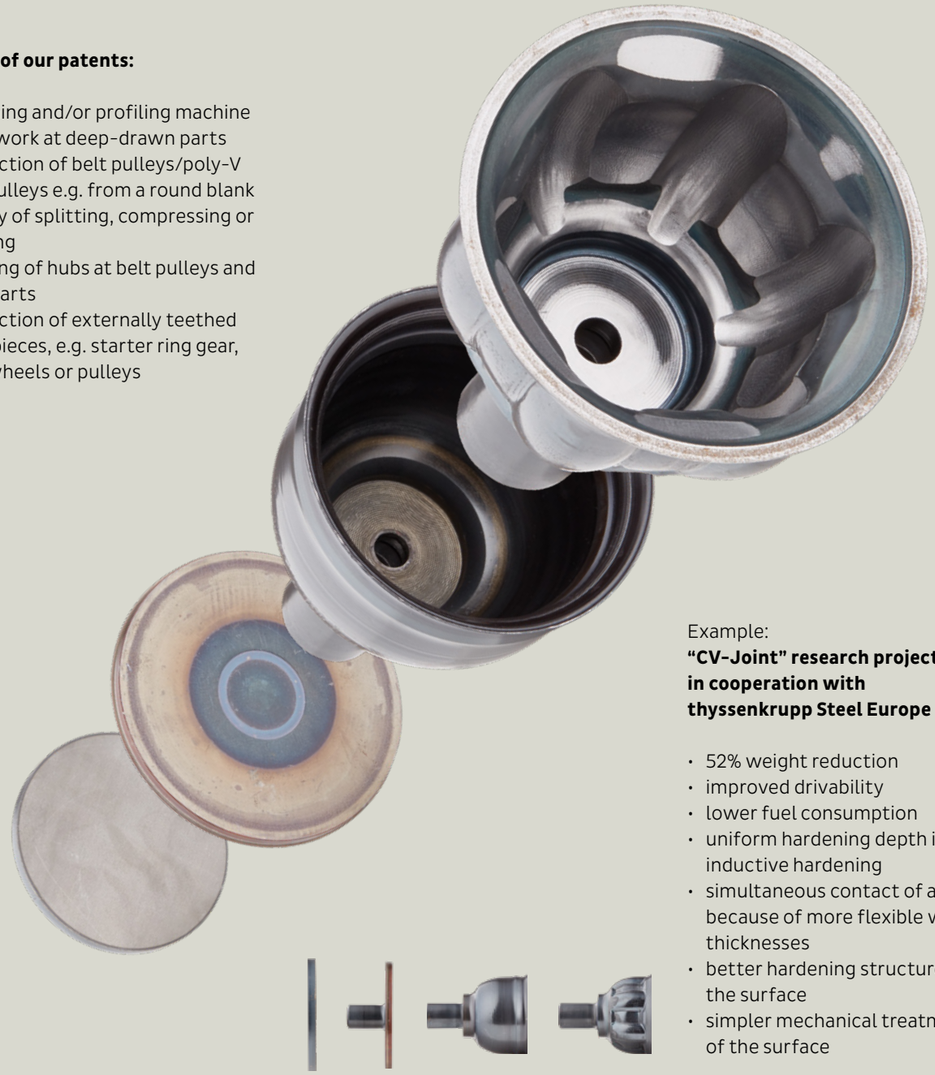
Our name is a synonym for innovation and reliability, quality and performance.
We know our markets and closely cooperate with research institutes. We use our internal R&D Center to develop new solutions and processes for our customers.

We design at the highest level.
“We are Forming Excellence”

In our sector we are the only supplier with an in-house R&D Center:
- 4 extremely flexible trial machines for test series
- heating ovens and induction plants
- CMM measuring machines and projectors
- more than 100 processes registered for patent

Extract of our patents:

- trimming and/or profiling machine for rework at deep-drawn parts
- production of belt pulleys/poly-V belt pulleys e.g. from a round blank by way of splitting, compressing or beading
- spinning of hubs at belt pulleys and gear parts
- production of externally teethed workpieces, e.g. starter ring gear, gearwheels or pulleys



Example:
“CV-Joint” research project in cooperation with thyssenkrupp Steel Europe

- 52% weight reduction
- improved drivability
- lower fuel consumption
- uniform hardening depth in inductive hardening
- simultaneous contact of all balls because of more flexible wall thicknesses
- better hardening structure at the surface
- simpler mechanical treatment of the surface

Example:
“The hub patent”

The centric part of a pulley or of a gear part is spun in a non-cutting process starting from a round blank.

The hub geometry can be influenced by various parameters as well as by the machine programming.

Advantages of the hub production according to the WF production process

- flexible
- weight-optimized production
- various profiles can be implemented to the hub without an additional treatment
- production of pocket holes for contact surfaces
- hub and component parts made from same material – no welding!
- cost-effective production
- increase of tensile strength by strain hardening

“Mechanical engineering is not only the technical implementation of a customer requirement. Mechanical engineering also is commitment, understanding, confidence and foresight.”

Mario Anton, Authorized representative

We build flow forming machines for production of steel and aluminium wheels, belt pulleys and torsional vibration dampers, gas cylinders, gear components and hubs. Our machines mark up top scores with their technical superiority and durability.

To ensure that our machines not only run perfectly mechanically, but are also functionally cutting-edge, we live out the digital transformation and thus boost our customers’ productivity significantly. Our SMART FORMING tools enable machines to be digitally networked and facilitate optimisation of the whole production chain. All relevant information is available in real time - any time, any place.

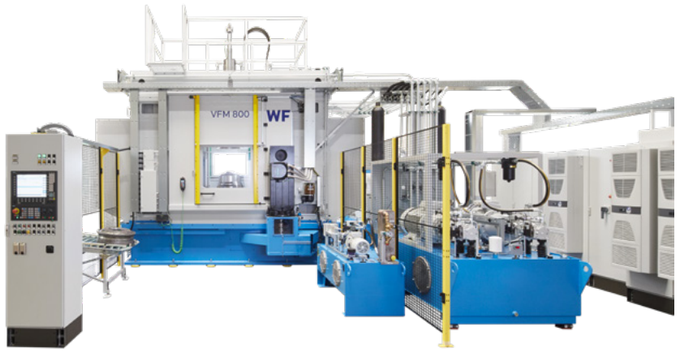
SMART FORMING tools are hardware and software modules which elevate our machines to a new level of productivity:

- **SMART FORMING assistant** facilitates programming and protects your machines against serious programming errors.
- **SMART FORMING viewer** assures perfect setting-up of processes and Quality Control functions.
- **SMART FORMING cam** monitors internal processes and production and gives our service team remote-diagnosis capabilities.
- **SMART FORMING inspector** is responsible for quality assurance of every component produced.
- **SMART FORMING diagnostics** permits on-line monitoring of production and machine data.

Our Industry 4.0 applications relieve the burden on employees significantly, assuring optimum project documentation, constantly up-to-date information and a high level of data safety and security.

A WF machine in action

An important quality feature: Cleanliness and tidiness right through to final assembly



Our machines – Made in Germany

Made in Germany is written in CAPITAL LETTERS in our company. We are fully aware of our responsibility. Responsibility towards the customer, towards the region, and towards the people who work for our company. This is why we exclusively produce in Germany. Sendenhorst is our home and it is the place where our machines come from. We rely on German quality suppliers. In this way we know what will be included in our machines. On the other hand, we deliberately want to demonstrate our social responsibility and to send out a clear signal against transactions with companies from low-wage countries with low social standards.

We cannot produce everything ourselves. But almost. We have the highest in-house production level in our industry. It reaches from mechanical treatment, via hydraulic piping, enclosure manufacturing, lacquering, electric cabinet wiring and programming the control towards the final assembling. In this way, we can be sure that our machines will meet the high WF standards.

A special feature of our industry:
Hand-formed bronze slideways

Because we are passionate about building our machines, we attach the very greatest importance to them running perfectly at our customers'. This is the reason we provide and continuously expand a comprehensive range of standard and additional services. The benefits for you:

Comprehensive advice
Your direct WF contact means that you always have a professional at your side, both during the pre-sales and the after-sales phase.

Our knowledge lead
At our training events, experienced instructors teach you lasting and sustainable knowledge and skills with an optimum blend of theory and practice.

Optimum machine condition
Regular servicing and maintenance keep your machines in good condition - so that you can produce smoothly, dependably and without unscheduled downtime.

Flexibility
Automation and Industry 4.0 solutions enable you to react quickly to market changes. Assuring you greater productivity and improved results all round.

Our services – an overview

Troubleshooting
WF helpdesk, remote diagnosis and assistance, SMART glasses support and on-site maintenance

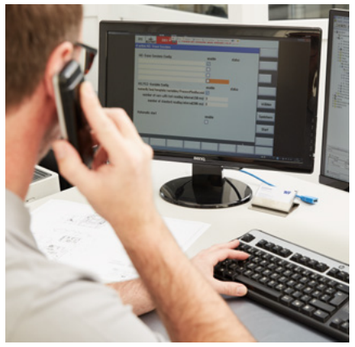
Innovation Engineering
Machine setting-up, product development, feasibility studies, fundamental testing, short runs and WF Future Zone

Automation solutions
Load/unload systems, gripper and manipulator systems, conveying and handling equipment, robots, safety equipment

Training
Handling, operation, maintenance, programming – on-line and off-line

Servicing/maintenance arrangements
Maintenance agreements, remote/SMART glasses maintenance and spare-parts packages

Retrofit and upgrading
General overhaul of older machines, upgrading/uprating of individual components



“On the basis of interaction with selected partners, we are continuously expanding our ranking as the technological leader. Equitable cooperation with our customers gives us an ever deeper understanding of their industries. The synergy generated from industry expertise and our innovation lead forms the basis for our progress. And for the progress of our customers.”

Christian Malkemper, CEO

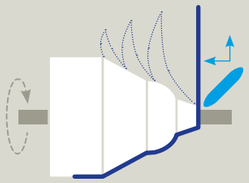
We cooperate both with universities (such as the Technical University of Applied Sciences, in Bochum, in the field of materials science) and with commercial companies (e. g. thyssen-krupp Steel Europe AG, on the topics of machine development and new processes).

From left to right: Christian Malkemper (CEO) , Dipl.-Ing. Beate Winkelmann (Authorized representative), Mario Anton (Authorized representative)

A customer is satisfied when we meet his expectations. With great pride we can look at a long list of satisfied customers. The first to be mentioned is a customer from Germany who on average purchases 4 machines per year from us and who can meanwhile call more than 100 WF machines his own. Another is the Canadian customer who currently already has produced more than 25,000,000 starter ring gears on his 15 WF machines. And with other customers we mutually celebrate the 30th anniversary as regular customers. These and many more success stories prove the satisfaction of our customers.

Successful customers are in dialogue with us. We communicate to each other at eye level. We exchange our views. Since we are already deeply rooted in the individual trades, we get to know our customers better and better. And this is exactly where and when customer and market orientation starts again – because we want to form the future.

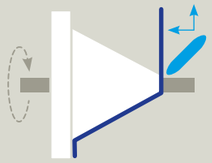
AAOsteel
A.J. ROSE MANUFACTURING CO. Established 1922 MOVING METALS IN INNOVATIVE WAYS
ALFA LAVAL
BAOSTEEL
BTE BETTER HOLDING
BorgWarner
信发集团 XINFA GROUP
Clark Pulley INDUSTRIES INC
Continental
EMK EM KOREA CO.,LTD. ENERGY&MACHINERY KOREA CO.,LTD.
FAW
FEINTOOL EXPANDING HORIZONS
FIUKA
GIANETTI RUOTE An Accuride Company
Hanwha Techwin
金固股份 JINGU GROUP
KAMAZ
Kawasaki
KNORR-BREMSE
LIZER JPM
MAGNA MAGNA POWERTRAIN
MAXION WHEELS
McGREGOR
PWO
Quantum automotive
reflex Thinking solutions
RIMSTOCK
TANRAY
TIMKEN
TRANSFORM AUTOMOTIVE
WELZ gas cylinder
WHEELS INDIA LIMITED You Name it... We Make it
WINKELMANN MSR TECHNOLOGY



Spinning

Spinning in accordance with DIN 8584 is a production procedure using push-pull forming technology. Spinning mostly is applied to produce rotationally symmetrical hollows of a nearly arbitrary surface line contour in small and medium batches starting from a circular cut sheet (the so-called round blank).

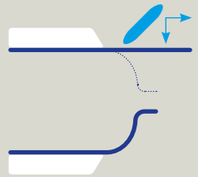
Typical components produced by spinning for example are: Pots, cans and kettles for canteen kitchens, art and decoration objects such as vases and cups, parts needed in tank construction like vessel bottoms or tank ends (dished ends, domed ends), separators, funnels, inlet rings and jet engines in aerospace, lamp shades, reflectors, car wheels, and many more.



Shear forming

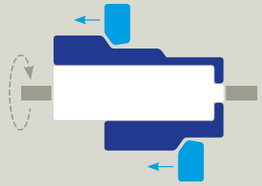
Shear forming is a particular form of spinning that is applied with conical or tapered shapes with a shear forming angle > 18°.

Shear forming allows a rather fast production of separators, for example, in just one operation. The wall-thickness during forming however does not remain constant but follows the mathematical law S1 = S0 * sin **α**.



Necking-in (Reducing)

The diameter of a tube or a pipe section is stepwise reduced by necking-in such that bottom or end of a gas cylinder is produced. At the same time, the wall-thickness in the necked-in area (bottom or neck) can be increased many times over in order to achieve a reliable gas-tightness. Accordingly, our necking-in machines are predominantly used for the production of gas cylinders of type I, II and III (steel cylinders, weight-reduced steel cylinders and aluminium cylinders). The resulting products mainly are CNG cylinders (natural gas) and hydrogen cylinders (hydrogen) for the automotive industry. However, WF machines are also used to produce breathing cylinders, fire extinguishers, industrial gas cylinders or other pressure vessels.

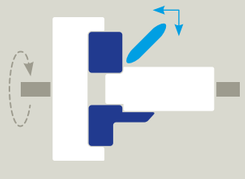


Flow forming

During flow forming, a raw part (preform or round blank) is fixed on a tool mandrel and then set in rotation. By simultaneous impact of one or more forming rollers in radial direction, pressure cones are generated in the raw part. The pressure cone(s) is/are then displaced by the axially acting forces.

The material starts to “flow” in axial direction under proportional thinning of the wall-thickness, i.e. the unmachined part “grows” in length. Internally, the unmachined part will adopt the contour of the tool mandrel. This is how, for example, internally toothed gear parts, disk carriers, clutch parts and also wheels and wheel discs are generated.

A special form of flow forming is the cylindrical flow forming where the unmachined part normally is a pipe. By way of forward or reverse flow forming thin-walled pipes with perfect wall-thickness are produced from simple thick-walled pipes. No other process could produce them with comparable precision. Flow forming is mainly used in the field of precision tubes for the defence industry.



Hub forming

The process “forming of hubs” invented by and patented for us nowadays enables us to simply produce hubs and double hubs at pulleys and transmission parts by way of “hub forming”.

In the past, such hubs were produced by way of expensive turning and milling operations or they were subsequently welded or soldered in. Today, we produce them starting from a simple blank in nearly any length and wall-thickness. Even internally toothed hubs, both-sided hubs or hubs with Hirth serrations on the mounting surface can be produced without any problems.

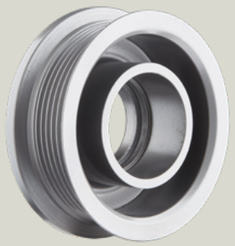
Your benefits:

- a one-piece component part
- hub and component part made of the same material
- no welding or soldering operations required
- significantly increased durability of the component part
- improved material properties through cold-working

Profiling

Profiling is a widespread process for the production of belt pulleys, especially the multi-groove (poly-V) belt pulleys. Several profiling rollers acting one after another and perfectly matching each other which are pushed against the rotating workpiece, step by step force the workpiece to accept an outside contour.

Still today, this chipless process again and again opens up new opportunities and is perfectly suited to produce simple and complex geometries at belt pulleys with or without a hub.



ENGINEERED FOR THE WORLD.
BUILT IN SENDENHORST.

map: © freepik.com

Headquarter

WF Maschinenbau
Sendenhorst, Germany

Locations

WF Machinery
Schaumburg, USA

WF China
Beijing, China

WF Korea
Incheon, Korea

Representations

Canada – England – France – India – Italy – Japan – Mexico – Portugal – Spain – Taiwan – Turkey

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