

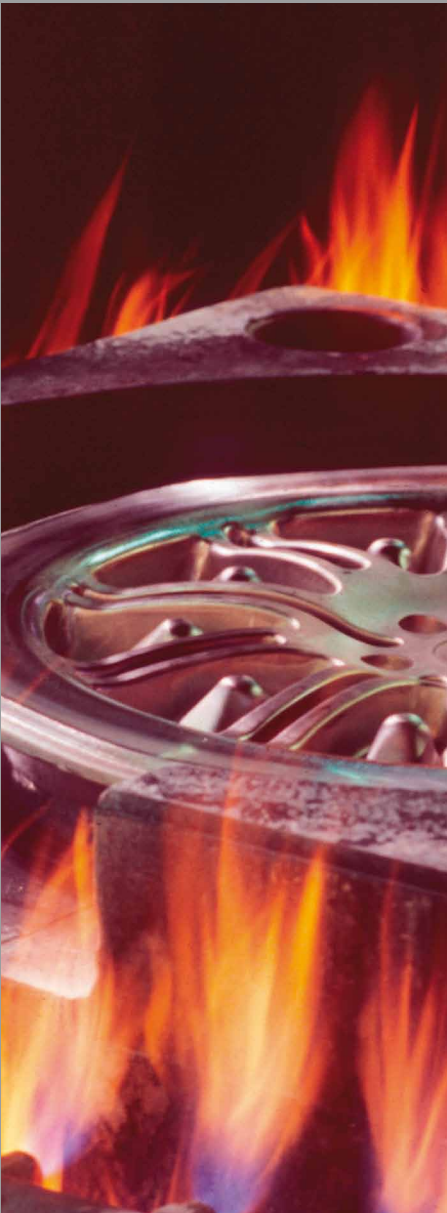


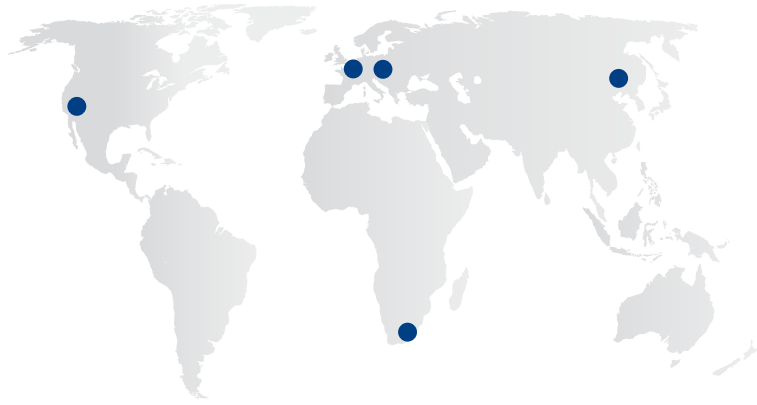
FORGING | EXTRUSION | RING ROLLING





FORGING | EXTRUSION | RING ROLLING





OTTO FUCHS KG, main office in Meinerzhagen

## THE OTTO FUCHS GROUP OF COMPANIES

What began on a small scale with a brass foundry, developed over the course of over 100 years into an internationally operating group of companies. In Germany, Europe and abroad, over 9,000 members of staff develop and produce a variety of highly-specialised products which have properties that leading global companies place their trust in.

As such, a company with a broad product base grew out of humble beginnings in metal processing – a company that today resolutely operates among large international clients and which has its base in the latest manufacturing facilities, a wealth of experience and innovative force. Organic growth and eye on maintaining the company's competitiveness on the one hand and cautious internationalisation on the other hand are the basic principles of the family business which focus on sustainability. OTTO FUCHS KG in Meinerzhagen is the nucleus and powerhouse of the group.



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2



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4



5



6



7

1 OTTO FUCHS Dülken GmbH & Co. KG, Viersen, Germany

2 SCHÜCO International KG, Bielefeld, Germany

3 OTTO FUCHS Oberflächentechnik GmbH, Leonberg, Germany

4 OTTO FUCHS Hungary Kft., Tatabánya, Hungary

5 WEBER METALS, INC., Paramount, USA

6 FOXTEC-IKHWEZI (Pty) Ltd., East London, South Africa

7 OTTO FUCHS Technology (Shenyang) Co., Ltd., P.R. China



“THE WORLD OF TOMORROW WILL BE  
WHAT WE HAVE MADE OF IT.“

Hans Joachim Fuchs  
(1903 - 1992)

Experience that has been gained over decades, the power to innovate and in-house research are factors that have led to competitive products with a consistent quality. We maintain our number one position as a result of process-oriented quality management that avoids errors.

Experienced, motivated employees and a corporate culture based on partnership go to create a unique fusion of creative thinking and technological understanding. Our clients see us as a competent and reliable partner that not only supplies but develops as well. We work to attain return on investment that secures a future for the company.

FORGING

EXTRUSION

RING ROLLING

1910



OTTO FUCHS, MEINERZHAGEN i. W.  
METALLPRESSWERK u. ARMATUREN-FABRIK METALLDIESSEREI, DREHEREI u. ZIEHEREI

The company was formed in 1910 as a brass foundry that mainly produced brass weights for the post office. Very early OTTO FUCHS concentrated on hot working technology and the new materials aluminium and magnesium. The company was able to win the aviation industry as a customer as early as the 1930's. In as early as the 1950's, production of the synchroniser rings started, initially for the VW beetle. With investment made in a 30,000 t press for drop forge parts made from aluminium and titanium alloys, OTTO FUCHS laid a further milestone. Even extreme requirements of the emerging aerospace industry were met using products made from the new aluminium, titanium and magnesium alloys.

At the same time, with forged aluminium parts and wheels, OTTO FUCHS also set new standards in the automotive industry. This is where the legendary Fuchsfelge for the Porsche 911 serves as just one example of many. The development of automatic forging technology in the 1980's led to the introduction of large series aluminium forged parts. With the finish machining of synchroniser rings and chassis components, OTTO FUCHS followed the trend towards ready to install components. In the new millennium, with the introduction of the ring rolling the company met the condition for expanding its market position in engine components made from titanium and nickel alloys.

1916



1956



1999



2010



## WHATEVER THE PRODUCT OF YOUR CREATIVE GENIUS, THERE IS ONE THING YOU CAN RELY ON ...

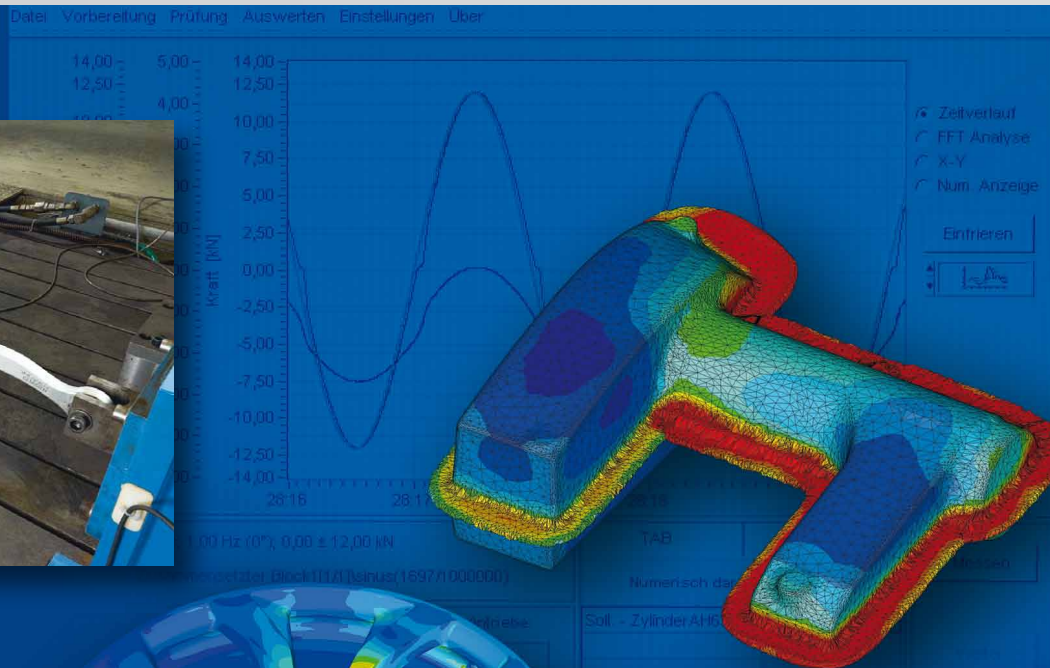
A wealth of experience, a high level of expertise in materials and quality operating equipment that is unrivalled have always put OTTO FUCHS in a position that enables the company to provide sound technological and economical solutions in response to ever changing customer needs. This is not achieved with off the shelf products.

At OTTO FUCHS, we place our entire expertise at the customer's disposition right from the very start of any project, especially during the development phase.

It is only through such close cooperation that we achieve an optimum product in the shortest way possible. For decades now, finite element technology has become indispensable in our product development processes as a tool for simulating components and processes. In the course of serial developments, we provide our customers with a comprehensive portfolio of simulation and computational software and product specific component test bench for validating the development results.



*component testing*



*shaping simulation*



*component design*



FORGING

EXTRUSION

RING ROLLING



TRANSVERSE LINK



GUIDING PROFILE



RING CASING

## ... NO MATTER WHETHER IT WEIGHS A FEW GRAMS OR A TON: WE SHAPE IT TO PERFECTION.

In addition to designing the components using finite element-supported strength calculations and automated optimisation of the topography, the development process also relies heavily on the appropriate simulation tools. For example, first of all, multi-stage forging processes are virtually matched to each other in order to achieve optimum component geometries for the necessary intermediate steps. As development grinding and tool changes can be avoided when running the forging tools in, this does not just save development time, but also saves costs.

For highly safety-relevant components such as engine parts made of titanium and nickel alloys, today's materials technology relies on highly developed simulation techniques. For these products, the individual process steps are determined in the basis of a simulation of the expected structural features, for example grain size distribution in

the component. Even at the enquiry stage, it is possible to clarify whether the component properties requested by the customer can ever be ensured and through which process it is possible to achieve them.

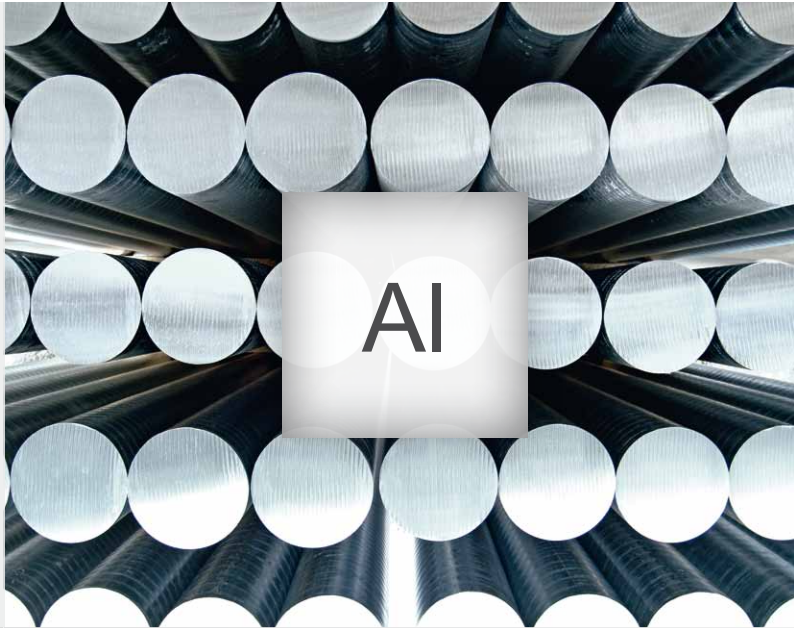
The link between the different simulation tools, from component design and process simulation through to the property prognosis for the component to be developed, represents a world-class standard!

But the best software only leads to the desired result in synthesis with the knowledge and practical experience of qualified and motivated employees. The decades of experience in metal shaping are essential for determining the necessary basic conditions for the simulation calculations and for comparing their results with operational practice.



# ALUMINIUM

Despite its low weight, aluminium exhibits high strength, it is also resistant to corrosion and can be processed very well by forging, extrusion and ring rolling. Due to its attractive properties it is used at OTTO FUCHS in all our areas of business. With our over 80 years of experience with this material, OTTO FUCHS KG currently offers 68 different aluminium alloys which are made into a host of semi-finished formats in our foundry.



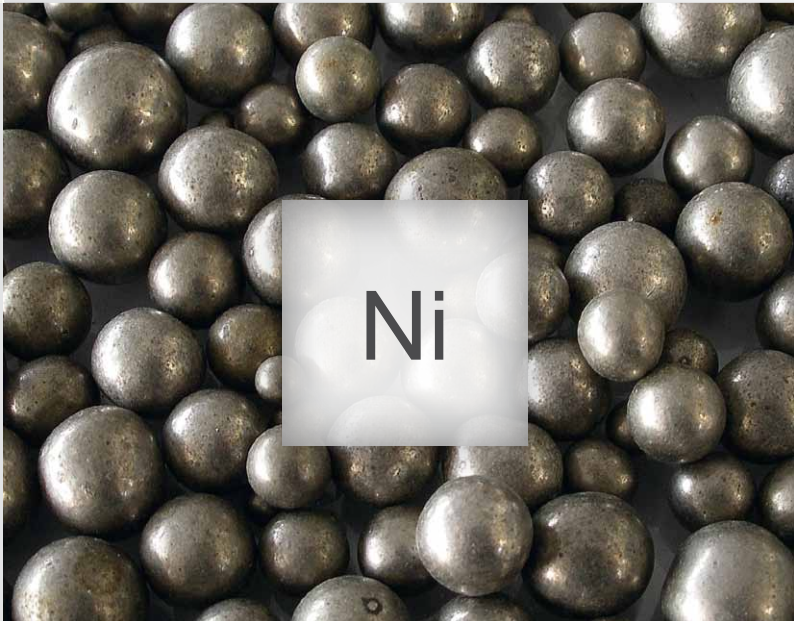
Al



Mg

# MAGNESIUM

Magnesium has an extremely low density and is the lightest of all construction materials. For over 70 years, OTTO FUCHS has used these special properties to produce components which are especially used in applications, where every gram counts, but where compromises can hardly be made in terms of load bearing capacity, for example in the aerospace industry. With their respective characteristic profiles, the current 12 magnesium alloys produced by our foundry cover a wide range of applications.



Ni

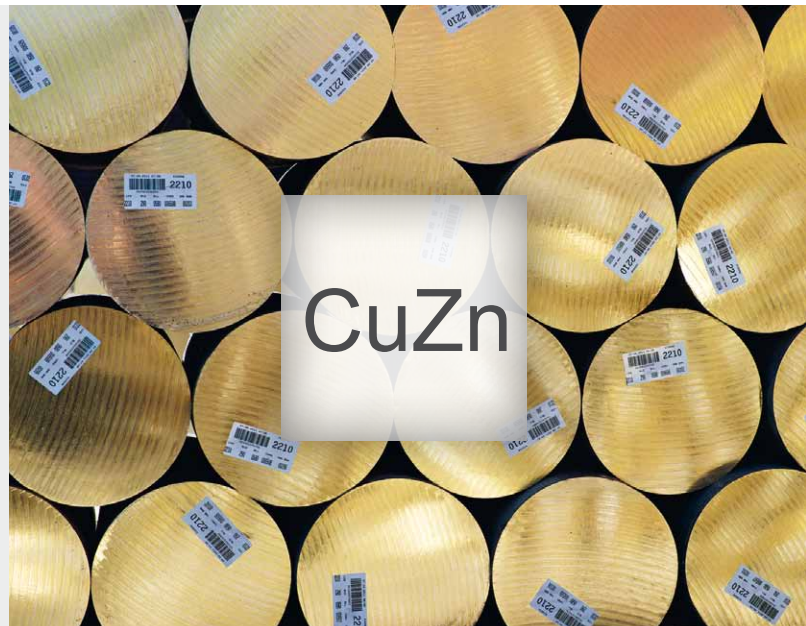
FORGING

EXTRUSION

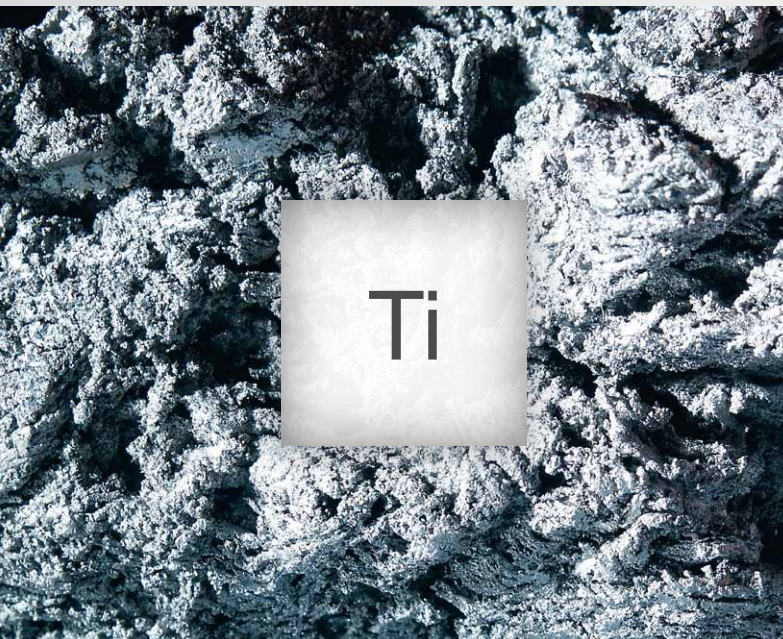
RING ROLLING

# BRASS

Copper is one of the oldest of all metals and is also used at OTTO FUCHS in the form of brass: an alloy that has been applied for the longest period – 100 years. It has unique friction and wear properties, and combines high strength with formability. Products are manufactured for the automotive industry, general engineering industry and the construction industry from a current range of 60 copper alloys, including lead-free alloys.



CuZn



Ti

# TITANIUM

Titanium is not only extremely strong but also resistant to corrosion and with just over half the density of steel, is ideal for applications in which very high loads have to be taken up on an ongoing basis. As such, OTTO FUCHS makes structural parts for the aerospace industry and rotating parts in aircraft engines from a current range of 12 titanium alloys. As one of the first titanium forges in Europe, OTTO FUCHS now looks back on 50 years of experience in handling this material.

# NICKEL

Nickel alloys are used in all applications that require stable material properties in extreme environments, for example in the design of drive and engine components in the aerospace industry. Our forgings made from nickel and nickel-base superalloys are highly durable when applied at high temperatures and also highly resistant to corrosion. OTTO FUCHS has processed nickel alloys for almost 20 years. Today, our customers can fall back on the materials Inconel 718 as well as Inconel 718+.



## WHATEVER MATERIAL YOU HAVE IN MIND, WE KNOW EVERYTHING ABOUT IT – AS IF WE'D MADE IT OURSELVES.

The unique materials expertise of OTTO FUCHS is a cornerstone of the business' success. The development of new materials has been of central importance since the very beginnings of the company. This is because customers have to stand their ground in a competitive environment which brings with it ever greater requirements in terms of product characteristics that can only be met through improved or new materials. Due to this, lightweight yet high strength materials have often come to act as a focus. They serve to reduce the energy input and this reduces material costs, weight and volume.

Very early on we recognised that it is not enough to plan the shape of a component. As such, the material is also individually adjusted to the respective application and optimised where necessary.

Today, the wealth of experience that has built up over many decades enables us to offer customers a range of material properties that cannot be found elsewhere. The wide range of materials on offer incorporates 150 aluminium, magnesium, titanium, nickel and copper alloys. If customers need optimised characteristics for specific applications, this is often a starting point for the new development of an application based material. Our modern strand casting facility does not just ensure efficiency and quality in terms of production, it also ensures the constant availability of the individual materials in the various dimensions, at all times.

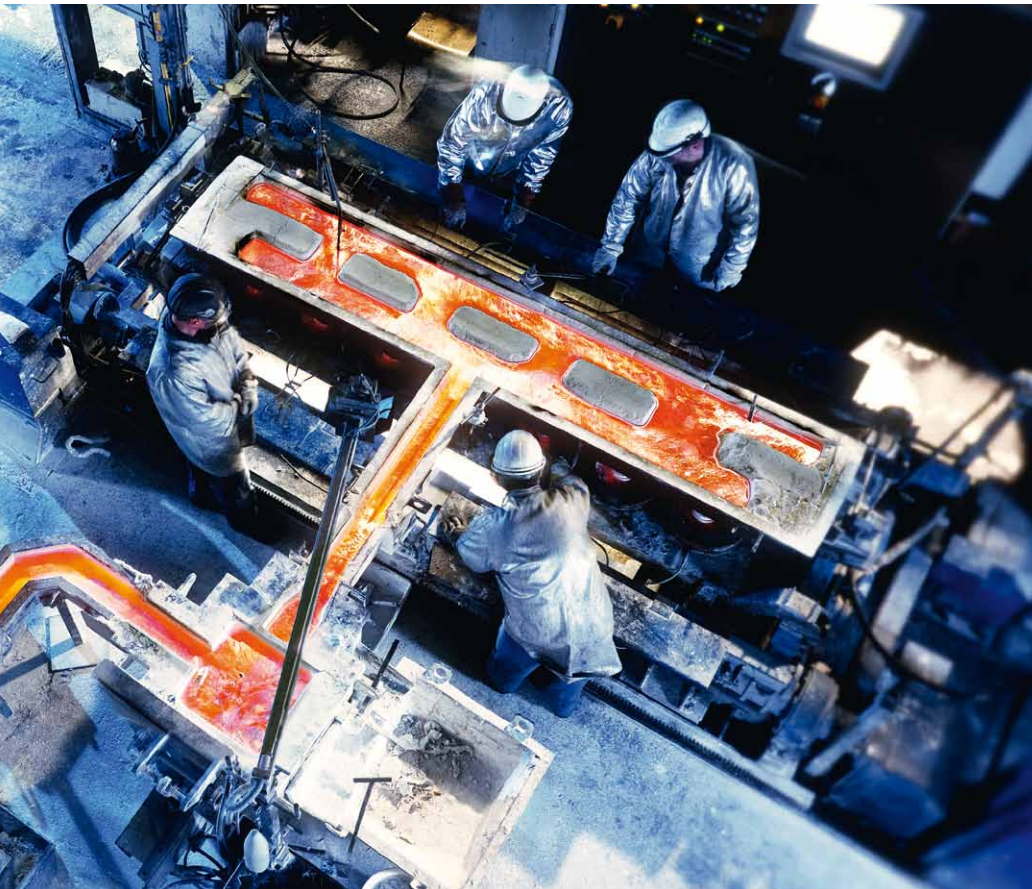
*withdrawal of a sample  
in the brass foundry at  
Viersen-Dülken*



FORGING

EXTRUSION

RING ROLLING



*aluminium strand casting  
in Meinerzhagen*

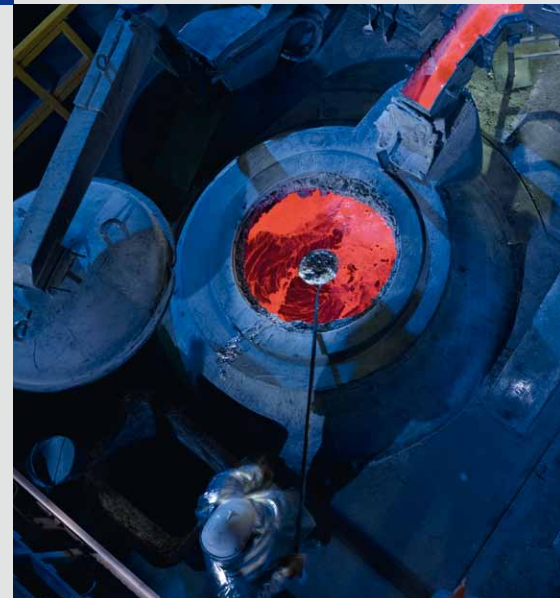
## AND VERY OFTEN THAT IS PRECISELY THE CASE.

Our foundries represent the cutting edge of technology and have an annual capacity of around 150,000 tons of primary material (aluminium, copper and magnesium groups). We achieve melts of the highest purity using sophisticated melt treatments and specially-effective double filter systems. State of the art operational control systems ensure indispensable process security and the traceability of each individual batch.

Our foundries ensure a closed material cycle in which waste production is 100 % reused by returning it back to the production line. This enables optimised production taking economic and ecological aspects into account.

Due to this, in the development of new alloys, we always work with significantly closer tolerances than the standards specify. As such, outstanding quality comes as standard.

**Further information can be found in our material data sheets which are available to download at [www.otto-fuchs.com](http://www.otto-fuchs.com).**





# THERE ARE AREAS IN WHICH WE ARE THE ONLY ORIGINAL – THOUGH WE DO HAVE IMITATORS.

For decades, OTTO FUCHS has been a close development partner of numerous companies from the aerospace industry, a high-tech industry in which compromise solutions are categorically excluded.

OTTO FUCHS KG is the partner of the market leaders wherever high precision and maximum care is required in dealing with high performance materials, wherever the race is on to bring out the technologically feasible and where work at the highest level represents a 'must'.

Alone in this business field, over 150 companies in 40 different countries rely on the products made by OTTO FUCHS.

We produce over 5,000 products from almost 100 different aluminium, magnesium and titanium alloys on over 50 forging presses with press capacities of up to 30,000 tons.

Today there is hardly any type of aircraft without components from OTTO FUCHS, which fulfil different, in most cases vital functions for the airplane. Besides large sized structural components, as the gigantic fuselage frames for the Airbus A350, tail unit fittings or window frames, also highly stressed landing gear parts and wheels are important applications for aluminium forgings. If lowest weight is most urgent magnesium forgings are used, for example as housings for helicopter gear boxes.

Forgings made of titanium are applied if highest strength properties, particularly also at elevated temperatures, and a low component weight are indispensable, for instance for sleeves of rotor blades for helicopters or aircraft engine parts. The combustion chamber of the carrier rocket Ariane 5 is a further highlight of our production range.

*passenger window frame  
aluminium 7175 T74  
530 x 480 mm | 1.1 kg*

*aircraft wheel half  
aluminium 2214 T6  
Ø 606 x 277 mm | 50.0 kg*



*hydraulic 30,000 tons  
forging press*



**fuselage frame Airbus A350**  
aluminium 7050 T7452  
2,410 x 500 mm | 330.0 kg



**main fitting**  
aluminium 7175 T01  
1,250 x 800 mm | 112.0 kg



**sleeve**  
titanium Ti 10-2-3  
700 x 500 mm | 130.0 kg



**gearbox cover**  
magnesium ZK 60-A T5  
1,100 x 165 mm | 34.0 kg





## THE VERY HIGHEST LEVEL OF PRECISION DOWN TO THE FINEST DETAIL IS IN NO WAY DEPENDENT ON QUANTITY.

Over five decades ago OTTO FUCHS was one of the first German companies to produce forged components made from aluminium and copper alloys for the automotive industry.

OTTO FUCHS' particular strength lies in the development of highly automated processes along with enormous productivity and cost efficiency whilst at the same time maintaining outstanding quality. The products themselves stand for longevity, high levels of safety and innovative lightweight construction and as such, play an active role in improving ride comfort and reducing CO<sub>2</sub> emission.

As a development and system partner for well known manufacturers and suppliers, we manufacture chassis parts, steering mechanism parts and gear parts out of aluminium. In fully linked processes, these are machined and fitted with additionally bought completion parts to make ready to install components. With an annual capacity of 24 million forged steering arms, OTTO FUCHS has risen to be a global leader in this sector.

OTTO FUCHS is also a leading technology provider in the field of synchroniser rings made from special brass. Through a new development of the microstructure ring (which is forged ready to install), the company has managed to optimise the component properties and at the same time, reduce production costs. An optional injected carbon coating improves the friction and wear characteristics and increases longevity.

Another special feature is the aluminium forged wheel. Through the combination of low weight, attractive styling and a high-grade, polished surface, the Fuchsfelgen are a real highlight on any car.

**Further information concerning our forged wheels can be found in the technical information for forged wheels and online at: [www.fuchsfelge.com](http://www.fuchsfelge.com).**

*wheel production*

*transverse link  
aluminium EN AW 6082*

*finestructure synchroniser rings  
special brass partly carbon  
injected*

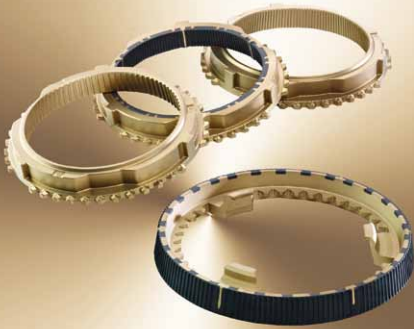




## FORGING



*socket housing*  
aluminium  
EN AW 6082



*forged exclusive wheel*  
aluminium EN AW 6082



*support plate*  
(transmission application)  
aluminium EN AW 6082



## IT IS POSSIBLE TO FULFIL MINIMUM REQUIREMENTS. BUT OUR AIM IS TO SET THE BENCHMARK.

Over time, the drop forge and open die forge parts from a number of different OTTO FUCHS alloys have come to set the standard in many sectors, as well as in general engineering and in transport technology. Once again, it is the outstanding material properties that have made products from OTTO FUCHS first choice.

### GENERAL ENGINEERING INDUSTRY

In combination with the sophisticated processing expertise, the special forging alloys from OTTO FUCHS enable large, highly stressed components to be produced. These are used in turbine construction, energy and process engineering, environmental and climate technology, in the field of textiles and printing machines as well as in many other demanding technical applications. As such, we manufacture, for example, compressor wheels and large pistons for marine diesel engines and stationary energy systems through to a combination of drop forge and open die forge parts. Due to high requirement in terms of strength, toughness, resistance and processability, we also produce aluminium and copper forgings that are required in hydraulic and pneumatic systems and vacuum pumps.

### TRANSPORT TECHNOLOGY

Weight optimisation and the related energy efficiency that goes with it are also top of the bill in the transport industry. As such, OTTO FUCHS produces components for the railway sector and commercial vehicle engineering. Examples of products include components for chassis and car bodies, railway carriages and forged truck wheels. These offer advantages over steel wheels – a weight saving of up to 50 %.



*forged truck wheel  
aluminium EN AW 6082  
22.5J x 11.75 | ET 0 | 26.0 kg*

*3,600 tons open  
die forging press*

## FORGING



*rotor for turbomolecular vacuum pump*  
aluminium EN AW 2618  
19.0 kg



*impeller*  
titanium Ti 6-4  
ø 88 x 49 mm | 0.2 kg



*connection for city trains*  
aluminium EN AW 6082  
610 x 375 mm | 97.0 kg





## THE COMBINATION OF CREATIVITY AND COMPETENCE SETS US APART.

In the construction industry, alongside the thrifty use of energy and a high level of recycling, the great design freedom of extruded aluminium profiles provides a focus. Therefore it is clear to see why aluminium has become such an integral part of modern architecture.

OTTO FUCHS manufactures customised profiles made from aluminium and copper alloys on twelve different extrusion presses with press capacities ranging from 710 - 7,500 tons. Based on a high level of processing skill and the unique combination of formability and resistance to corrosion, our extruded profiles are used in many areas of the construction industry such as insulation sections for windows, sun protection segments for facades as well as lighting systems and door thresholds. In addition, the OTTO FUCHS production range includes conical tubes for lighting masts and flagpoles.

7,500 t extrusion press



### *threshold*

*multifunctional insulating profile construction  
aluminium | plastic  
EN AW 6060*



## EXTRUSION



**sliding rail**  
insulating profile  
construction  
aluminium | plastic  
EN AW 6060



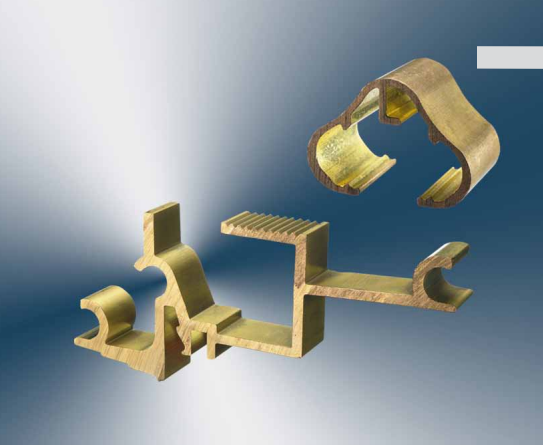
**solar shading  
louvres**  
aluminium profile  
construction  
EN AW 6063



**flagpole**  
aluminium  
EN AW 6063



**conical lighting post**  
aluminium  
EN AW 6063



**lighting system  
and door treshold**  
copper  
EN CW 622 N



## IT IS OUR PASSION TO BE THE PILLAR OF SUPPORT.

With highly advanced extrusion technology, OTTO FUCHS has managed to steadily extend load limits in lightweight construction for decades and in doing so, has made a contribution to resource conservation and energy saving. Apart from the wealth of experience, it is the especially creative ideas that have enabled OTTO FUCHS to open up ever-new business areas.

### TRANSPORT TECHNOLOGY

Lightweight construction allows savings to be made. With the help of the OTTO FUCHS cold joining process, an economic as well as powerful joining technology, we are able to firmly and permanently connect our aluminium profiles to large-scale integral structures. On the basis of this technique, OTTO FUCHS produces tailgates and freight compartment floors for commercial vehicles as well as wall elements for noise abatement in the railway sector.

### AEROSPACE INDUSTRY

Extruded sections of aluminium and magnesium alloys have long played a major role in the construction of interiors and aircraft skins. The pressure to reduce weight has promoted the development of new high-strength materials. As such, OTTO FUCHS has become the world's first approved supplier of weldable stringer profiles with a strength of 450 MPa. Another example of applied high-tech materials include seat rail profiles, which are manufactured from an aluminium alloy developed by OTTO FUCHS with a tensile strength of 700 MPa. For aerospace OTTO FUCHS manufactures extrusions from magnesium alloys, assembling the cladding half shells, for example for Ariane 5 or VEGA, which compose the vertical separation of the highly stressed payload cladding.



## EXTRUSION

**z-section Airbus A380**  
aluminium 2024  
1.33 kg/m

**seat rail Airbus A340**  
aluminium 7349  
1.51 kg/m

**taillift platform**  
aluminium profile construction  
EN AW 6063  
1,150 x 2,400 mm



**payload fairing extrusion**  
**Ariane 5**  
magnesium MA 82  
Length 3.7 m  
13.65 kg/piece



**spring support**  
aluminium EN AW 6082  
165 x 85 mm | 21.8 kg/m

**noise barrier**  
aluminium profile construction  
EN AW 6063

**trailer flooring**  
aluminium profile construction  
EN AW 6060/6063  
1,348 x 2,274 mm



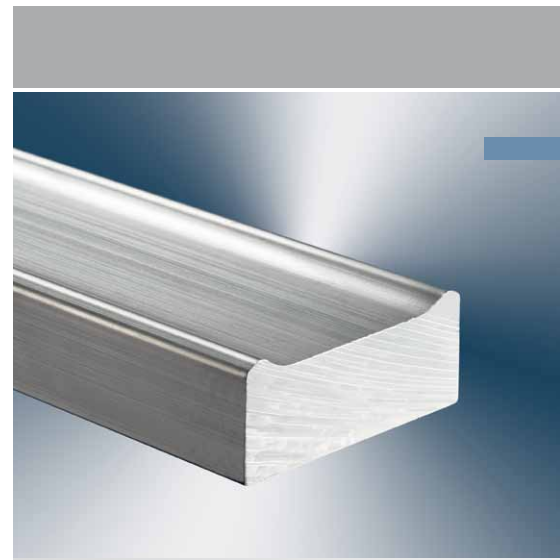


## WE HAVE MANAGED IT TIME AND AGAIN: TO IMPROVE THE VIRTUALLY PERFECT

Extruded components from OTTO FUCHS are used in many areas of automobile construction. After all, the reduction of vehicle weight alongside heavy-duty construction is one of the key objectives in the automotive industry. As a recognised partner in the automotive industry, OTTO FUCHS has taken up an ever greater number of development tasks and produces technically, economically and ecologically optimised components using advanced manufacturing technologies.

For example, we produce extruded aluminium structural profiles for the automotive industry from special crash alloys which, in an accident, ensure regular as well as crack-free deformation and in so doing, absorb the impact energy. This type of uniform and well-defined absorption ensures significantly improved crash protection for the occupant and is the result of many years of experience, a unique knowledge of materials and tireless research.

In addition to car body structures, profiles and components made of aluminium and copper alloys are built into a vehicle's hydraulic system, its steering and drivetrain. As such, we press profiles, for example, for ABS and steering housing in large serial quantities and continue to process them in a customised way until they are pre-finished components. Because of their excellent friction and wear properties, profiles made from copper alloys form the basis of a variety of bearings and bushings in the field of drives.





**profile for antilocking system housing**  
aluminium EN AW 6061  
7.155 kg/m

**structure-profile**  
crashable aluminium special alloy



**side impact beam**  
aluminium EN AW 7020

**bushing**  
special brass EN CW 708 R



**steering housing**  
aluminium EN AW 6063  
Ø 95 x 126 mm | 4.9 kg/m



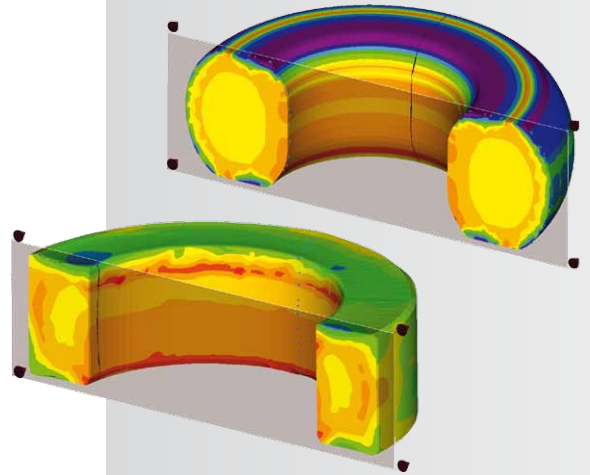
## WHAT WE PROVIDE YOU WITH IS ALWAYS OF HIGH CALIBRE – NO MATTER WHAT THE SIZE.

OTTO FUCHS has been a supplier of components made of nickel and titanium alloys for aircraft turbines for many years. The rings required for turbines are produced on a separate ring rolling mill with a radial rolling force of 400 tons and an axial rolling force of 250 tons. Where appropriate, the rings are then in part drop forged, heat treated and processed using customer-specific machining techniques. The size of the rings manufactured in our company ranges from 300 to 2,000 mm in diameter and from 30 to 1,000 mm in height. Rings made from aluminium and copper alloys are produced for various applications in the aerospace industry and plant engineering.

The closed value chain from raw material through to the machined component does not only allow optimum production efficiency, it also enables the product and material properties to be optimised very efficiently, including the use of the latest forging and microstructure simulations. It also helps significantly to reduce costs. As such, OTTO FUCHS is also able to offer world-class products in this field.



*disc turbine*  
nickel Inconel 718  
Ø 645 x 75 mm | 61.2 kg



*above: microstructure simulations*  
*below: rolling mill*





**tambour**

titanium Ti 6-4

Ø 780 x 401 mm | 135.0 kg

**engine stator section**

aluminium 2219

Ø 800 x 245 mm | 116.5 kg



**real seal**

aluminium 2618

Ø 1,205 x 242 mm | 67.0 kg





## IT IS GREAT CHALLENGE TO DO THE SAME THING OVER AND OVER AGAIN.

For 70 years, the international aerospace industry has set quality benchmarks for OTTO FUCHS. These form the basis for our approach to quality in all areas of the business. It is especially thanks to the consistent implementation of this understanding that OTTO FUCHS occupies a leading market position in so many fields around the world.

This tradition of quality is in large part based on a workforce which is already in the third or even fourth generation and which takes an active role in building up the company. On the other hand a sophisticated quality assurance system sets the framework for the reliable adherence to a high standard of quality.

This begins with a detailed examination of the raw material, continues with the development of ever more precise manufacturing processes and ends with stringent controls of the semi-finished and finished products. As such, OTTO FUCHS has all of the key global certifications for development management, production management, quality management and environmental management, all of which certify production at the highest level.

Among others, these include ISO 9001, ISO 14001, OHASA 18001, ISO/TS 16949, EN 9100 and IRIS.



FORGING

EXTRUSION

RING ROLLING



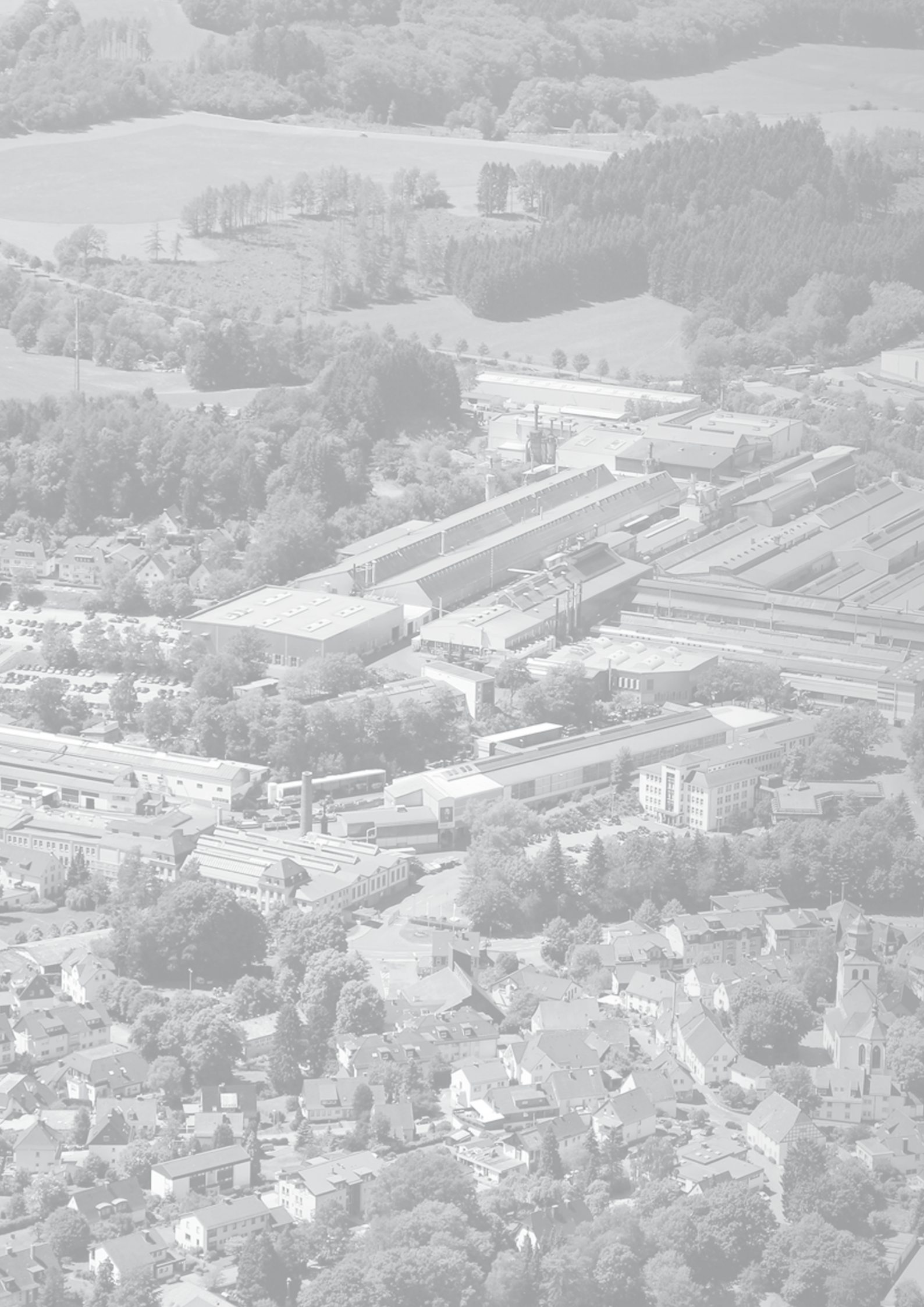
## OTHERS HAVE EMPLOYEES – WE HAVE ASSOCIATES.

Highly qualified and motivated employees are the real assets of a company. As such, OTTO FUCHS has long realised that quality and productivity increase when job satisfaction is high. Consequently, a management philosophy formed over the decades based on fairness and trust, one which promotes genuine partnership between management and employees. Such cooperation leads to a stronger identification with the company and creates greater confidence in the things that individuals do themselves.

It is for this reason that early on, OTTO FUCHS introduced a profit sharing model for the staff that is found nowhere else. Having a stake in the economic success of the company motivates each member of the staff to contribute his/her own ideas and suggestions for improvement. The continuous improvement process covers all areas of work and is based on the foundations of staff information, the company suggestion scheme, 5A, set-up workshops and the Team Oriented Maintenance System (TOMIS).

A high value is placed upon intensive promotion and the training of staff. Increasing the knowledge base further is the safest investment that a company could make and one which will ensure the continued successful future of OTTO FUCHS KG.





#### CLIENTS

- Aerospace industry
- Automotive industry
- Construction industry
- Transport technology
- General engineering industry

#### PRODUCT RANGE

- Forged parts made from aluminium, magnesium, titanium, nickel and copper alloys
- Extruded profiles made from aluminium, magnesium and copper alloys
- Rolled rings made from titanium, nickel, aluminium and copper alloys
- Ready to install components made from profiles and forged parts
- Forged aluminium wheels for cars and trucks

#### PRODUCTION AREAS

- Primary material casting shop for aluminium, magnesium and copper
- Extrusion presses with 710 to 7,500 tons press capacity
- Forging presses with 110 to 30,000 tons press capacity
- Radial axial rolling mill with 400/250 tons rolling capacity
- Machining and fitting of components
- Wheel production
- Own tooling and equipment construction
- Hardening shop

#### DEVELOPMENT COMPETENCY

- Component design with a linear / non linear FEM
- 3D shaping simulation with a Transvalor forge
- Microstructure simulation with Simufact forming
- Topology and shape optimisation using Tosca from FE design
- Optimisation of material properties

#### QUALITY

The foundation of the certified management systems:

- ISO 9001 – Quality management
- ISO 14001 – Environmental protection
- OHASA 18001 - Health and safety management

as well as sector specific requirements in accordance with:

- ISO/TS 16949 – Automotive industry
- EN 9100 – Aerospace industry
- IRIS – Railway industry

These are supplemented by the specific laboratory requirements:

- ISO/IEC 17025
- NADCAP

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