# WE KEEP IT RUNNING



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MASCHINENFABRIK ALFING KESSLER GMBH





## PERFECTION IN PRECISION MASCHINENFABRIK ALFING KESSLER







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#### AUTOMOTIVE

	Structure
	Engineering and prototype production
	Series production
	Surface treatment
38/39	Final crankshaft assembly

#### COMPETENCE

Quality management
Education & training

### **MASCHINENFABRIK ALFING KESSLER MILESTONES**

"My career as an engineer took me to many countries in Europe and North America and it struck me that such a high grade product as the crankshaft of an internal combustion engine would be a suitable object to manufacture in my home country of Germany. It was with this in mind that I returned home from North America."

Company founder Karl Kessler in the anniversary book "25 Years Alfing"





	Maschinenfabrik Alfing GmbH founded by Kar
	Production of the first case-hardened cranksha
	Establishment of the special-purpose forge for
	Manufacture of the one millionth crankshaft
	First induction hardening machine for crankship
	Change of name to Maschinenfabrik ALFING k
	New facilities for large crankshaft production
990	Expansion of automotive crankshaft productio
995	Establishment of a separate production depart
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004	Expansion of the automotive crankshaft produ
006	Production of the seven millionth crankshaft
800	New building for the large crankshaft product
011	Maschinenfabrik ALFING Kessler celebrates its
011	Further expansion of the facilities for series cra
012	Sixty years of hardening machines

# Maschinenfabrik Alfing GmbH. Wasseralfingen Würftemberg.

A site with tradition in Aalen-Wasseralfingen in Württemberg: With technical pioneering spirit, many ideas and the conviction to be successful, Karl Kessler founded Maschinenfabrik Alfing GmbH in 1911. Production started in a disused steam brickworks. In 1917 the up-and-coming company moved into this new, prestigious factory building with modern equipment and ideal lighting and ventilation.

l Kessler afts crankshaft forgings

afts Kessler GmbH

on, new production shop tment for prototypes and motor sports crankshafts FOMOTIVE, HARDENING action, new production halls

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### MASCHINENFABRIK ALFING KESSLER COMPANY PROFILE

Maschinenfabrik ALFING Kessler GmbH stands for highest crankshaft competence. In over 100 years more than 8 million crankshafts have been manufactured. On a production area of more than 90,000 m<sup>2</sup> we manufacture crankshafts of up to 8 m in length using state-of-the-art production facilities and excellent technical know-how. As a medium-sized company with around 1,250 employees the globally oriented Maschinenfabrik ALFING Kessler has developed an outstanding reputation on the world markets.

Maschinenfabrik ALFING Kessler is the largest independent manufacturer of 1.5 to 8 m long large crankshafts in the world. Our automotive crankshaft division produces ready-to-install crankshafts for automotive engines for speeds up to 20,000 rpm. The hardening division develops and produces hardening machines which are sold worldwide but also used in our own crankshaft production. This is the basis of our success in crankshaft production and also the 60 years of experience in the construction of hardening machines.

Last but not least our strong market position is also based on the expertise of our experienced and qualified employees, their commitment to the company and thorough education and training.







Optimised material flow and state-of-the-art technology: in 2008 new production shops were erected for the manufacture of large crankshafts. Aerial view of Maschinenfabrik ALFING Kessler GmbH. The companies Alfing Kessler Sondermaschinen GmbH and Alfing Montagetechnik GmbH can be seen in the background.







LARGE CRANKSHAFTS

Our ready-to-install large crankshafts from 1.5 to 8 m in length with enveloping circles up to 0.9 m are used in generators, ships, locomotives, construction machines and many other special applications for power transmission up to 12,000 kW. The forgings are made in our own closed-die and press forge. All operations from material testing, forging, heat treatment, turning, milling, surface treatment, grinding, finishing, assembly to balancing are carried out at our company site in Aalen-Wasseralfingen.





#### AUTOMOTIVE CRANKSHAFTS

We develop and produce ready-to-install crankshafts of up to approx. 1m in length for cars, high-performance and race engines up to 850kW and speeds of up to 20,000 rpm. Series production takes place on highly efficient automated production lines. Test specimens, prototypes, small batches and racing crankshafts are produced on flexible and multifunctional CNC machines. From CAD/FEM simulation to just-in-time delivery we offer customised services to all engine manufacturers.

### MASCHINENFABRIK ALFING KESSLER CORPORATE COMPETENCE



All services from a single source with all production steps on site: The expertise of the Maschinenfabrik ALFING Kessler covers the complete value-added chain from engineering to ready-to-install crankshafts.

Different forging processes for large crankshafts

Die manufacture CAD/CAM

### Production process

Preparation of drawings &design optimisation

Component testing: bending&torsional fatigue strength

### **EVERYTHING ON SITE RANGE OF SERVICES**



Simultaneous engineering makes it possible to optimise the crankshaft already prior to starting the production.



### SIMULTANEOUS ENGINEERING

#### **Customer drawings &** specifications

The customer specifications are the database for our development divisions in the simultaneous engineering process.

#### **CAD/FEM** simulation

Usually we can directly use the customer's 3D data in our CAD/FEM systems to simulate the required strength of the crankshaft, e.g. bending and torsional strength. Based on this data suggestions for optimisation are worked out.

#### Process development for performance enhancement

Recommendations e.g. regarding material, heat treatment, surface treatment or the geometrical design of the pin journals are based on over a hundred years of company knowhow.

#### Material testing & optimisation In our laboratories we examine the materials systematically for their behaviour under mechanical, thermal and chemical stresses and develop improvement proposals for the chemical properties or the use of alternative materials.

#### Prototypes

Our company has a separate prototype division in which all processes and process changes from engineering to manufacture of the crankshaft can be performed very flexibly within a short time without interrupting the series production.

#### Component testing: bending & torsional fatigue strength

We are able to subject the crankshafts and crankpins to realistic testing on our own test benches and record the results on the computer. Thus detailed recommendations can be made for the future performance of the crankshafts prior to the series production.

#### Preparation of drawings & design optimisation

The end of the engineering process is an optimised and fully documented solution that is ready for production based on the customer specifications. To complete this process work plans and drawings for the manufacturing process are prepared based on the crankshaft model.

### **PRODUCTION PROCESS**

#### Die manufacture CAD/CAM

In forging design the 3D model of the crankshaft forging is derived from the 3D CAD crankshaft model. From this the CNC data for machining on our five-axis die-machining centres is derived.

#### **Different forging processes** for large crankshafts

Forgings of up to approx. 4.5 m in length are produced by closed-die forging in our company. Larger forgings up to 9 m in length are produced by throw-by-throw forging on hydraulic presses.

#### Heat treatment

Through tempering and guenching of the forgings our material experts are able to adjust the mechanical material properties by exactly specifying the temperature, time and cooling parameters.

#### Material testing

The properties set for heat treatment are thoroughly checked and documented in our materials laboratory prior to machining.

#### Pre- and intermediate machining

Machining operations such as turning, drilling, milling & thread cutting can be carried out precisely and economically in one set up on our computercontrolled CNC mill-turning machines.

#### Surface treatment & hardening

By creating internal compressive stresses through hardening and/or patented forming processes, resistance to wear and service life can be significantly increased. Our company can offer a number of cost-efficient procedures, in particular induction hardening. Our hardening machine division which also does contract work for external customers was founded back in 1952 based on our own hardening expertise.

The company's machine park covers all processes required for the economic manufacture of crankshafts.

#### Finish machining & assembly

As a system supplier our company can deliver ready-to-install crankshafts directly to the engine manufacturer's line. Accessories such as counterweights and other mounted components are assembled and dynamically balanced together.

#### Washing & residual dirt analysis

After a thorough final inspection the crankshaft systems are cleaned in fully automated washing lines, preserved and packed according to their size. Even the slightest residual dirt particles are excluded because these operations are carried out in airconditioned cleanrooms.

### LARGE **STRUCTURE OF DIVISION**



The LARGE division produces ready-to-install large crankshafts for large engines such as marine propulsion systems. All process steps interlock seamlessly, accompanied by continuous quality assurance measures and laboratory tests.

#### **Engineering/logistics**

Large crankshafts are defined by very detailed design specifications. All design parameters are determined and optimised jointly with the customer: materials, web profile, radii, oil lubrication channels, surface treatment, counterweights, etc. Our specialists accompany all subprocesses from planning to material procurement, laboratory tests and simulations to certification and delivery of the ready-to-install crankshaft. State-of-the-art CAD/CAM systems enable direct data exchange with the customer's systems. The seamless interlocking of all processes provides highest efficiency.

#### Forging & heat treatment

As a basic principle forgings for large crankshafts are forged inhouse. Thus we are able to check the quality consistently any time. All dies and equipment are designed and manufactured in-house. Depending on their length the forgings are closed-die forged or produced under 3500 t presses by the throwby-throw process. In the subsequent heat treatment the material properties are set exactly. This prepares the forgings perfectly for the subsequent machining.

#### Surface treatment & hardening

Since the beginning of our company hardening of crankshafts has been one of our core competences. Surface treatment through nitriding, stroke peening or induction hardening increases the fatigue strength, allowing higher engine performance and reducing wear. The HARDENING division developed out of this specialist know-how:

To manufacture induction hardening machines both for in-house crankshaft manufacture and for external customers.

#### Mechanical manufacture

Also in the case of mechanical machining we have taken the deliberate decision to provide the complete manufacturing chain inhouse. Whether inner or outer contour milling, turning, deep-hole drilling, gear cutting, deburring or finishing: each operation is individually checked and constantly optimised. We have at our disposal a stateof-the-art CNC machine park and a comprehensive quality management system. This also includes the processes of assembly, dynamic balancing, automated washing with residual dirt analysis and crankshaft certification.







### LARGE ENGINEERING, CAD/CAM/CNC INTERFACE

Crankshaft forgings between 1.5 and approx. 4.5 m in length are produced in the closed-die forge. This requires precision forming dies. They are produced to high accuracy on our CNC die milling machines. Thus significantly reduced machining allowances are required for the subsequent mechanical machining.





The design of large crankshafts is based on detailed customer specifications.Our engineering divisions transfer these requirements to our 3D CAD system and together with the customer check whether it is possible to optimise e.g. the geometry, the material used, the surface treatment, etc. At the customer's request we can also offer laboratory testing to simulate critical processes. After the customer has given his approval, the readyto-install crankshaft is defined as a 3D model with all its parameters. Based on this data the dies, fixtures and tools are designed, the production planned, the detailed drawings for production prepared and program data generated for the CAM system.



Our CNC die milling machines can machine forging dies weighing up to 90 t.



#### Top left

The 3D model of the forging is derived from the data model of the finished crankshaft.

#### Top right

Based on the 3D model of the forging the CNC milling programs for machining the dies are created using the CAD/CAM interface.

### LARGE CLOSED-DIE FORGE



The forgings are heated up to 1300 °C in chamber furnaces and then transferred to the forging dies.

High precision contours in the forging dies ensure the efficiency of the subsequent mechanical machining processes. Counterblow hammers with an impact energy of 450 or 630 kJ are used for closed-die forging. The chamber furnaces heat the forgings to temperatures of up to 1300 °C. The forgings may weigh up to 2.6 t and be up to 4.5 m in length. Depending on the weight

three to five heating and forging cycles may be required. Closed-die forging ensures optimum grain flow and excellent component strength, thus significantly contributing to the long life of our crankshafts. Our highly skilled personnel at the furnaces and hammers have decades of experience which helps to ensure the highest quality.









The forging process includes several heating and forging cycles which continue until the initial billet has been transformed into a forging with the desired contour.



The 630 kJ counterblow hammer forges workpieces of up to 2.6 t in weight. The redhot forging is in the upper part of the die; mold releasing agents are sprayed in the lower part of the die.



### LARGE PRESS FORGE

10 chamber furnaces in total are available in the press forge. In each furnace two spindles can be partially heated simultaneously.



Crankshaft forgings from approx. 4.5 to 9 m in length are produced on hydraulic presses using the throw-by-throw forging process. In this process extremely high forming forces have to be transmitted. The forging spindles are heated section by section up to 1300 °C . The spindle sections are then axially compressed and vertically offset to form the individual pin journals. The operation is repeated successively to form the whole crankshaft. Our tool and process repeatability are vital in ensuring that the subsequent mechanical machining operations require only little metal removal, thus minimizing the machining time. Our forging process is based on the TR procedure developed by Tadeusz Rut. All equipment for throw-by-throw forging is designed and manufactured in-house at Maschinenfabrik ALFING Kessler.



#### Top left The spindles are safely transported between the furnaces and presses by cranes with a load capacity of up to 40 t.

#### Top right

The hydraulic presses have a capacity of 3500 t each. Batches of up to 10 forgings per press can be produced in one forging cycle.

### LARGE **HEAT TREATMENT**

A red-hot crankshaft forging emerges from the hearth furnace to be transported to the oil quenching bath.



After the forging process itself, subsequent tempering and quenching of the crankshaft forging is decisive for the quality. For tempering, forgings are heated in hearth furnaces to temperatures above the limit for micro-structural transformation. The forgings are then quenched in oil or water emulsion and thereby hardened. Finally they are annealed at low temperature and allowed to cool slowly to

provide the steel with the required strength. Through the various heat treatment operations the required mechanical/technical properties of the crankshaft forging can be achieved precisely. The years of experience and specialist know-how of Maschinenfabrik ALFING Kessler is vital to this process. Our experts can adjust the parameters precisely to suit the customer's application and requirements.





A forging is removed from the oil bath where it was quenched and hardened.







### LARGE **MECHANICAL MACHINING**

CNC mill-turning machines make it possible to perform even complex, very different machining operations in just a single setup with tolerances in the range of 1/100 mm.





We achieve huge increases in efficiency by performing operations such as turning, milling, drilling and thread cutting in only one clamping of the part on CNC millturning machines. This ensures short throughput times, reduced work-in-progress and low setting up and production costs. As the first company worldwide, we used CNC orbital grinding machines to fully automatically grind large crankshafts of up to 8 m in length. Here

the crankshaft is clamped round the main axis and the orbital grinding wheel follows the movement of the pin journal. Roundness, diameter, dressing correction values and temperature differences are entered and corrected online. Reproducibility tolerances are in the range of 1/1000 mm. Thus we are able to produce large crankshafts up to 8 m in length in a highly automated way and very cost-effectively.



Only the use of high-strength tools makes it possible to mill-turn previously hardened pin journals.



Quantum leap: Even large crankshafts can be ground using state-of-the-art CNC orbital grinding machines.

### LARGE SURFACE TREATMENT



One of the processes used to increase fatigue strength is induction hardening of the pin journal radii. First the inductor heats the crankpin, then the journal surface is quenched by spraying with cooling medium.

Crankshafts are highly solicited engine components which require high fatigue strength and wear resistance. Maschinenfabrik ALFING Kessler has been a pioneer for years in tackling this technical challenge. The first breakthrough was achieved back in 1913 with the case hardening of the crankshafts. Today different procedures are used to increase the reciprocal alternating bending and torsional fatigue strength and reduce surface wear. Our specialist knowledge includes the microstructure,

shape and surface finish of the radii in the pin and main bearing journal areas as well as the application of compressive stresses. Based on this knowledge, in 1952 ALFING started to design and build hardening machines for induction hardening of crankshafts which today has become a separate division of the company. More than 500 ALFING hardening machines have been supplied worldwide to renowned car and commercial vehicle manufacturers.



We are able to increase the fatigue strength by targeted provision of compressive stresses, so-called stroke peening.



Stroke peening is performed at precisely defined locations on the highly stressed radii.







Hardening of large crankshafts is seamlessly integrated into the production process. The workplace consists of a washing machine, an induction hardening machine, crack-detecting equipment and a tempering furnace. Maschinenfabrik ALFING Kessler is a recognised world expert in induction hardening machines.



### LARGE **ACCESSORIES AND ASSEMBLY**



We not only manufacture crankshafts but supply ready-to- install crankshaft systems to engine manufacturers. This also includes the production and assembly of counterweights and gears, mounting of oil lubrication channel seals and dynamic balancing. All these processes together optimise the running of the crankshaft in the engine leading to the lowest possible vibrations.

No crankshaft is released for final assembly until it has been thoroughly inspected and fully documented all around. Our CNC balancing machines can balance crankshafts up to 8 m in length with enveloping circles of up to 1.3 m and weighing up to 13 t. The compensation holes are drilled directly in the same operation on the balancing machine.



Many accessories and perfect final assembly are required to produce ready-to-install crankshaft systems.



Counterweights are mounted using the latest industrial tools according to the customer's specifications.



Innovative production technology and a lot of experience in dynamic balancing ensure that the large crankshaft runs with low vibration in the engine.



The balancing machine screen displays the angular position, diameter and depth of the necessary compensation holes which are drilled directly on the balancing machine.

### LARGE FINISHING, FINAL INSPECTION



Manual work steps are also required to achieve the completed product. This figure shows how oil channels are checked on burrs using an optical endoscope.

Each crankshaft system is perfected<br/>at the finishing stage. Oil channels<br/>and oil channel intersections have to<br/>be chamfered and polished and the<br/>pin journals finish smoothed. Crack<br/>testing is performed using an non-<br/>destructive electromagnetic process.thoroughly ch<br/>quent final ins<br/>washed in sen<br/>washing lines,<br/>and finally pre-<br/>tioned cleance<br/>slightest reside<br/>excluded. We<br/>performed by machine. The manual<br/>finishing is performed by highly<br/>skilled employees with long-termthoroughly ch<br/>quent final ins<br/>washed in sen<br/>washing lines,<br/>and finally pre-<br/>tioned cleance<br/>slightest reside<br/>carry out certi<br/>half – clear ev<br/>and reliability.

thoroughly checked in the subsequent final inspection. They are then washed in semi- or fully automated washing lines, visually inspected and finally preserved and packed; the latter taking place in airconditioned cleanrooms so that even the slightest residual dirt particles are excluded. We are authorized by the leading classification societies to carry out certification on their behalf – clear evidence of our quality and reliability.



Video endoscopes enable us to check even the least accessible lubrication channel intersections for burrs.

The bearing surfaces and fillet radii of crankshafts over approx. 5 m in length are usually finished manually, an operation requiring a great deal of experience.







Final inspection: System-relevant parameters of the crankshaft are thoroughly checked. 3D measuring probes collect all form and position tolerances. We are authorized by classification societies to certify completed crankshafts on site.

### AUTOMOTIVE STRUCTURE OF THE DIVISION



Whether crankshafts for production

engines, boxer engines, V-engines,

one-offs, small batches or proto-

high-performance or racing engines,

types: the AUTOMOTIVE division has

become the long-term, dependable

partner of well-established brands

and exclusive manufacturers. We

produce and deliver ready-to-install

crankshafts up to 1 m in length for

engines up to 850 kW and speeds

up to 20,000 rpm. Our specialists

for any customer requirements.

Our services include initial advise, continuous support, preparation of

quotations, forging logistics through

to the just-in-time delivery. All cur-

rent data-exchange standards are

supported: VDA, Odette and ENX

interfaces, Delfor, Deljit and others.

will find the best technical solution

Automotive crankshafts: this means a high continuous power and excellent running performance for prototypes as well as series crankshafts.

#### ENGINEERING

From the interface data we create a 3D model of the required crankshaft, deriving from this the drawings of the crankshaft, production equipment required, the necessary work plans, the CNC programs and the design of the tools – all with the aid of the latest machine technologies.

#### **PROTOTYPE PRODUCTION**

Thanks to our experience and the use of flexible and multifunctional CNC machines we are able to efficiently produce one-offs, prototypes, small batches and racing crankshafts exactly to the customer specifications.

#### SERIES PRODUCTION

The highest standard of production, the high level of automation and the consistently high quality standard ensure us a well respected reputation in series crankshaft production. Our automated production lines and interconnected CNC machining centres equipped with portal loading and unloading devices guarantee high efficiency.

#### SURFACE TREATMENT

The quality of surface treatment significantly influences the performance, fatigue strength and wear of high-speed crankshafts. We have built up knowledge and experience in this area over decades including in the fields of gas nitriding, gas nitro carburizing, stroke peening, induction hardening and quenching. We own many patented in-house processes. In the area of induction hardening and quenching we have over 60 years of practical experience which has been directly applied to the design and development of our own hardening machines and inductors.

#### FINAL ASSEMBLY

After washing on automated washing lines the crankshafts are finally checked for dimensional accuracy using the latest measuring machines, classified automatically, laser marked and packed ready for dispatch. Of course this all takes place in air-conditioned cleanrooms.







As partner of the automotive industry we offer a high degree of automation for the production to be as efficient as possible. The figure shows a robot-controlled intermediate storage for the cooling of premachined crankshafts.





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### AUTOMOTIVE **ENGINEERING AND PROTOTYPE PRODUCTION**

Our engineers use complex CAD simulations to develop optimised design variants for material, radius geometry and surface treatment.



Research, design optimisation and production technology, from prototype to series crankshaft, are among our core competences. Our CAD services include data transfer to all customer systems, FEM simulation and balancing analysis. We develop new processes for increasing crankshaft performance, carry out material testing and analysis and investigate bending and torsional fatigue strength on our own







Engineers and production specialists cooperate closely with the customer to develop the optimal solution for a new type of crankshaft .





A crankshaft is rough machined for hardening and grinding from a round bar in the CNC mill-turning centre.



A crankshaft is machined in the grinding cell accompanied by continuous quality assurance measures.

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testing equipment. Our consultancy advice includes all aspects e.g. of crankshaft material and design. This very innovative and fast changing process is made possible through close, trusting cooperation with the customer. Due to the high degree of engineering skill and relatively low amount of production automation we are able to react quickly to changing customer requirements.

Prototype production requires more manual operations and thus is particularly flexible.

### AUTOMOTIVE SERIES PRODUCTION



Nonstop production lines: the CNC machining centers for grinding the main and pin bearing journal in series are interlinked with portal loaders.

In series production we concentrate on forged crankshafts with a delivery volume of 5000 to 170,000 crankshafts per type and year. Overall we produce about 300,000 crankshafts per year. While forgings of large crankshafts are produced in our own forge, the forgings for automotive crankshafts are purchased externally from press forges. In different production lines for crankshafts for series and 6- or 12-stroke V-engines the crankshafts are premachined, hardened and ground. We are also able to produce very complicated split-pin crankshafts in large quantities. Bearing surfaces and radii are finished using state-ofthe-art band finishing machines, allowing us to satisfy the demanding surface accuracies and form tolerances. In spite of the high degree of automation, additional visual inspections are also performed, ensuring reliable delivery of the ready-toinstall crankshafts just-in-time.



According to the specification a variety of sprocket wheels and gears can be machined.



The required surface finish and form tolerances are achieved using automatic band finishing machines.



Fully automatic, dynamic balancing machines are loaded and unloaded automatically.









After mechanical machining the crankshafts and their oil lubrication channels are washed in a multi-stage system at high pressures up to 750 bar. The crankshafts are manipulated by automatic handling systems and robots.



After the surface treatment by nitrocarburisation the hardened crankshafts are quenched in an oil bath.







Surface treatment is one of the basic skills of the AUTOMOTIVE division. Excellent engineering expertise is augmented by decades of experience in induction hardening. Based on this we set up our hardening machine division in 1952. Over 500 hardening machines have been produced for engine manufacturers worldwide. Highly stressed crankshaft journal radii can also be strengthened by induction hardening. Gas nitriding

hardens the surface by adding nitrogen. In nitro carburising crankshafts are treated with ammonia, nitrogen, carbon dioxide and other gases and then quenched in an oil bath. Mechanical compacting also increases fatigue strength. With these varied technologies we are able to satisfy nearly all customer requirements for increasing performance and reducing wear.



Maschinenfabrik ALFING Kessler uses its own induction hardening machines and inductors for crankshaft production.

Inducing compressive stress through cold forming is another way to increase fatigue strength.

### AUTOMOTIVE FINAL CRANKSHAFT ASSEMBLY

Production details and test results are engraved by laser on the flange of the crankshaft .





Besides fully automated measuring processes for large-scale production we have a separate final assembly area for small and medium series. Driverless transport systems carry the crankshafts from the production areas into the final assembly cleanrooms, where final inspection and classification using state-ofthe-art optical and non-contact 3D measuring machines takes place. Permissible tolerances for diameter, roundness and conicity are often in

the 1/1000 mm range. The results for each crankshaft are electronically documented, archived and at the customer's request burned by laser on the crankshaft flange, e.g. in data matrix code. The crankshafts are then packed in VCI bags, put onto the customer's transport pallets and taken to the dispatch area by driverless transport systems, from where they are delivered just-in-time to the customer's assembly line.



Left Driverless transport system in the final assembly cleanroom.

Right Final visual inspection before final 3D measurement.









WE KEEP IT RUNNING 39

Robot-controlled loading and unloading station of a 3D measuring machine.

### **QUALITY MANAGEMENT TESTING AND CERTIFICATES**



#### Secure supply chain AEO certificate

Our development engineers provide of long years of know-how which is in demand by the engine developers of automotive and large engines. Fatigue strength tests of crankshaft crankpins (alternating bending and torsional fatigue stress) as well as rotary bending strength of material samples are carried out in the testing department.

The quality assurance systems of Maschinenfabrik ALFING Kessler have been approved by internationally renowned classification societies. This shows that we satisfy all current standards and regulations regarding quality, the environment, occupational health and safety,

Energy ISO 50001:2011

energy conservation, customs and export control. As an internationally acknowledged supplier of large crankshafts we have been certified by renowned classification societies and are authorised to carry out acceptance testing on their behalf at our own responsibility.

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The bending strength of automotive crankshafts is tested on a bending test rig.



The bending stress can be analysed with strain gauges in the transition radii to the crankshaft flange.



A torsional fatigue strength test resulted in a crack in the pin journal: the root cause analysis is about to start.











ISO/TS 16949:2009











# VOCATIONAL TRAINING AT MASCHINENFABRIK ALFING KESSLER

## "I am fully committed and in charge of my future."





Training young people to us not only means imparting knowledge but also passing on our experience and team spirit. Many people who later achieved leading positions started their careers in the workshop or in a commercial department of Maschinenfabrik ALFING Kessler. The great loyalty of our employees and often their long service are key pillars of our company success. This is how we achieve perfection in precision.

### Apprenticeships at Maschinenfabrik ALFING Kessler

- Machinist - Mechatronician
- Tool mechanic
- Production mechanic



- Bachelor of Engineering – Mechanical Engineering - Bachelor of Arts – Commercial



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**PRINT** Druckerei Opferkuch GmbH Aalen



# PRECISION BY PERFECTION MASCHINENFABRIK ALFING KESSLER



Wherever a translational motion needs to be converted to a rotationally symmetrical motion a crankshaft is required.

