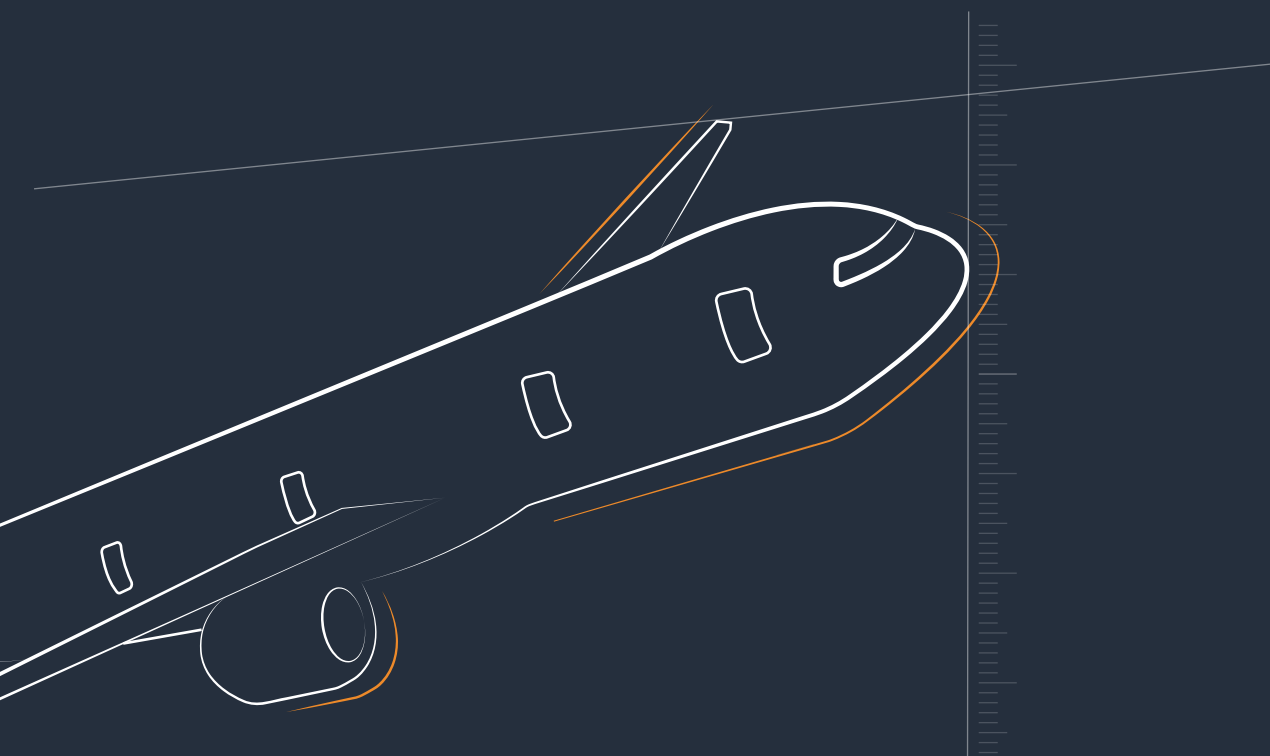


# Aerospace

Surface finishing methods for the aerospace industry

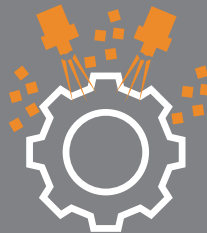


## Mass Finishing



High-performance equipment and innovative technologies – productive and cost-effective

## Shot Blasting



Customer-oriented equipment technology and intelligent process solutions – long-lasting and energy-efficient

## AM Solutions



Comprehensive solutions for additive manufacturing, especially 3D post processing equipment

› **80**

More than 80 years of **experience**



**15** locations –  
over **150** distributors –  
over **1,500** employees **across the globe**



Worldwide **Customer Experience Center**



More than **15,000**  
**different types of media and compounds**



Our technical service –  
**round-the-clock support**



**Transfer of professional knowledge**  
by certified trainers

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## HOW DOES MASS FINISHING WORK?

### A proven technology

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Mass finishing is a mechanical-chemical method for the refinement of surfaces. Besides the mass finishing equipment, grinding & polishing media as well as chemical compounds are utilized in the finishing processes. Either vibration, rotary movement or centrifugal force are induced into the machines. This causes intensive "rubbing" between the work pieces and

media and results in the removal of a small amount of material from the work pieces. The processing intensity depends on the selected type of equipment, the media and compounds, the machine settings and the processing times. We will be pleased to develop a finishing process for your specific requirements.

#### Mass finishing is used for treating:

- ▶ Work pieces made from metal, plastic, ceramics, rubber
- ▶ Work pieces created by casting, forging, drawing, rolling, powdered metal sintering, stamping/fine blanking, coining/embossing
- ▶ Work pieces after they have been machined by turning, milling, drilling, surface grinding
- ▶ Work pieces after they have been heat treated by annealing, tempering, hardening



# RÖSLER MASS FINISHING APPLICATIONS

in the aerospace industry

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## PROCESSING GOALS

### **Deburring**

A wide range of burs at outer contours, drilled holes and cut-outs are minimized or completely removed in a cost-efficient manner by choosing the right machine and grinding media.

### **Cleaning**

Contaminants, such as lubricants, must be removed from the work piece surface to ensure problem-free downstream manufacturing operations:

- ▶ Part-on-part processing
- ▶ Combined methods: Cleaning and deburring/edge radiusing in the same process

### **Descaling, pickling, cleaning**

With combined chemical-mechanical pickling processes surface contaminants left over after heat treatment are removed.

### **Surface smoothing, brightening, polishing, RÖSLER KeramoFinish<sup>®</sup>**

Numerous components used in the aerospace industry, such as turbines, the bearing industry and the production of drive train components must have a very smooth functional or an optically pleasing surface with low surface roughness readings (smaller than  $R_a = 0.02 \mu\text{m}$ ,  $R_z = 0.15 \mu\text{m}$ ,  $R_k = 0.035 \mu\text{m}$ ). These Rösler processes do not use any acids.

### **Ball burnishing, pressure deburring, vibro peening**

For processes like ball burnishing, etc., media made from ferrous or stainless steel are utilized. They exert a higher pressure on the work pieces. This produces a smoothing effect on the work piece surface.

## HOW DOES **SHOT BLASTING** WORK?

### Surface treatment with turbine or compressed air shot blast systems

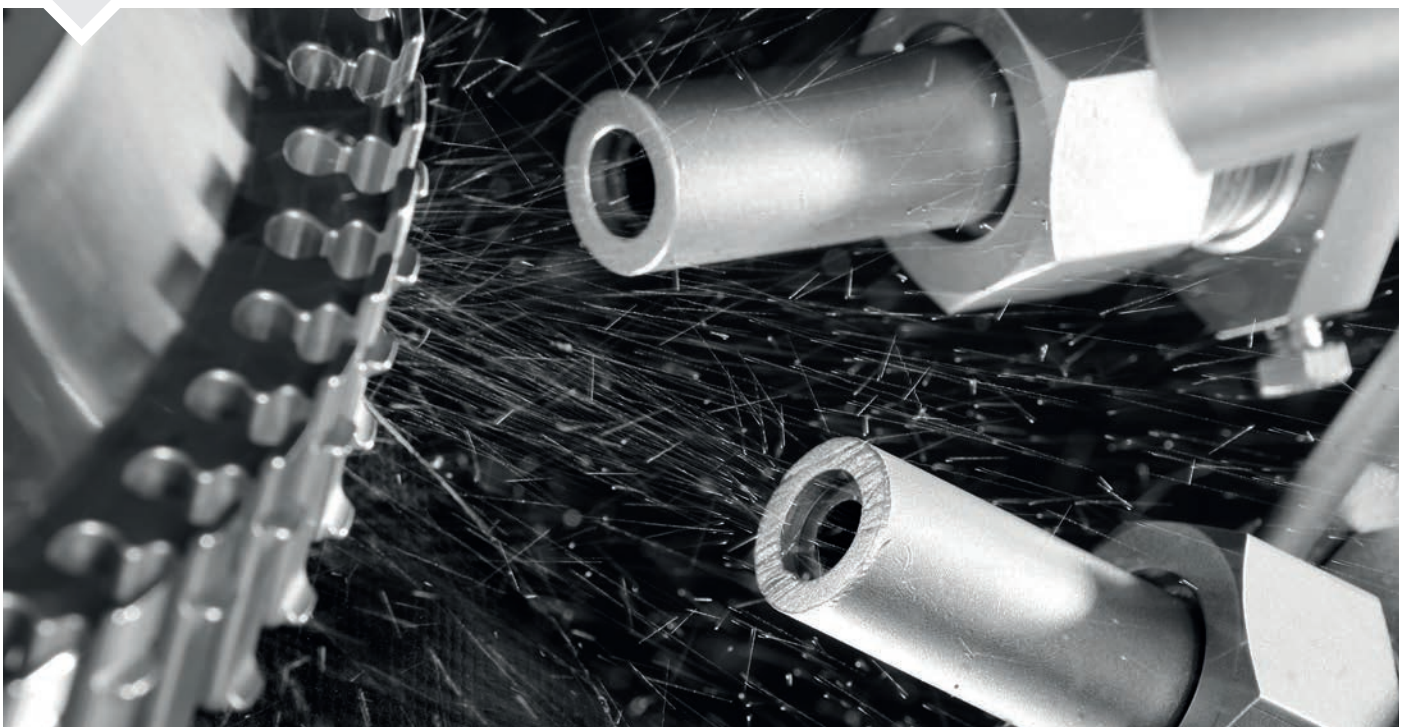
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In the shot blasting technology blast media is thrown onto the work piece surface at speeds of up to 170m/second. The blast media can be accelerated by compressed, high pressure pumps or blast turbines. The shot blasting results depend on the utilized machine type, the operating parameters and the selected blast media.

The shot blasting technology allows running similar applications with different blast processes. Based on your finishing goals, work piece volume, legal standards and your technical specifications we will develop a suitable shot blasting process for you. Rösler can offer you solutions from a single source.

#### Shot blasting is used for treating:

- ▶ Work pieces made from metal, plastic, ceramics, rubber
- ▶ Work pieces created by casting, forging, drawing, rolling, powdered metal sintering, stamping/fine/blanking, coining/embossing
- ▶ Work pieces after they have been machined by turning, milling, drilling, surface grinding
- ▶ Work pieces after they have been heat treated by annealing, tempering, hardening



# RÖSLER SHOT BLASTING APPLICATIONS

in the aerospace industry

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## PROCESSING GOALS

### **Cleaning, deburring**

With suitable blast media all kinds of surface contaminants can be quickly removed. Likewise, burs can be fully automatically removed in a cost-efficient manner.

### **Descaling, de-rusting**

Shot blasting quickly and completely removes scale, respectively, oxide layers created by forging or heat treatment operations.

### **Surface structuring**

The work pieces are exposed to randomly shaped blast media with sharp edges to create a rough surface and "activate" it. This creates a higher surface energy required for subsequent manufacturing operations, for example, coating.

### **Shot Peening**

The life of functional components exposed to high loads can be extended by compacting their surface with shot peening. This process increases the resistance against variable loads and increases the overall load bearing capacity. Alternatively, shot peening ensures the same performance of a component made with less material input.

### **Paint stripping, removal of coatings**

All kinds of surface layers like paint, oxide layers, ceramic layers, plasma coating, HFVO coatings, thermal barrier coatings, etc., can be completely removed from the component surface without negatively impacting the base material (substrate).

### **Sand core removal, de-sanding**

Casting processes leave contaminants in the form of sand or ceramic layers on the work piece surface. They can be quickly and efficiently removed by shot blasting.

## WHAT IS 3D POST PROCESSING?

Automated and cost-efficient post processing of 3D printed components with absolutely consistent results

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### THE POST PROCESSING CHALLENGES POSED BY 3D PRINTED COMPONENTS

The post processing of the raw components coming from the 3D printer poses significant challenges for the users. Consistent results in a volume production environment and cost-efficiency are important requirements, which can generally not be met by manual post processing methods. In addition, depending on

the utilized additive manufacturing technology, a whole range of post processing steps must be undertaken to transform the raw component into a usable product.

#### **Unpacking**

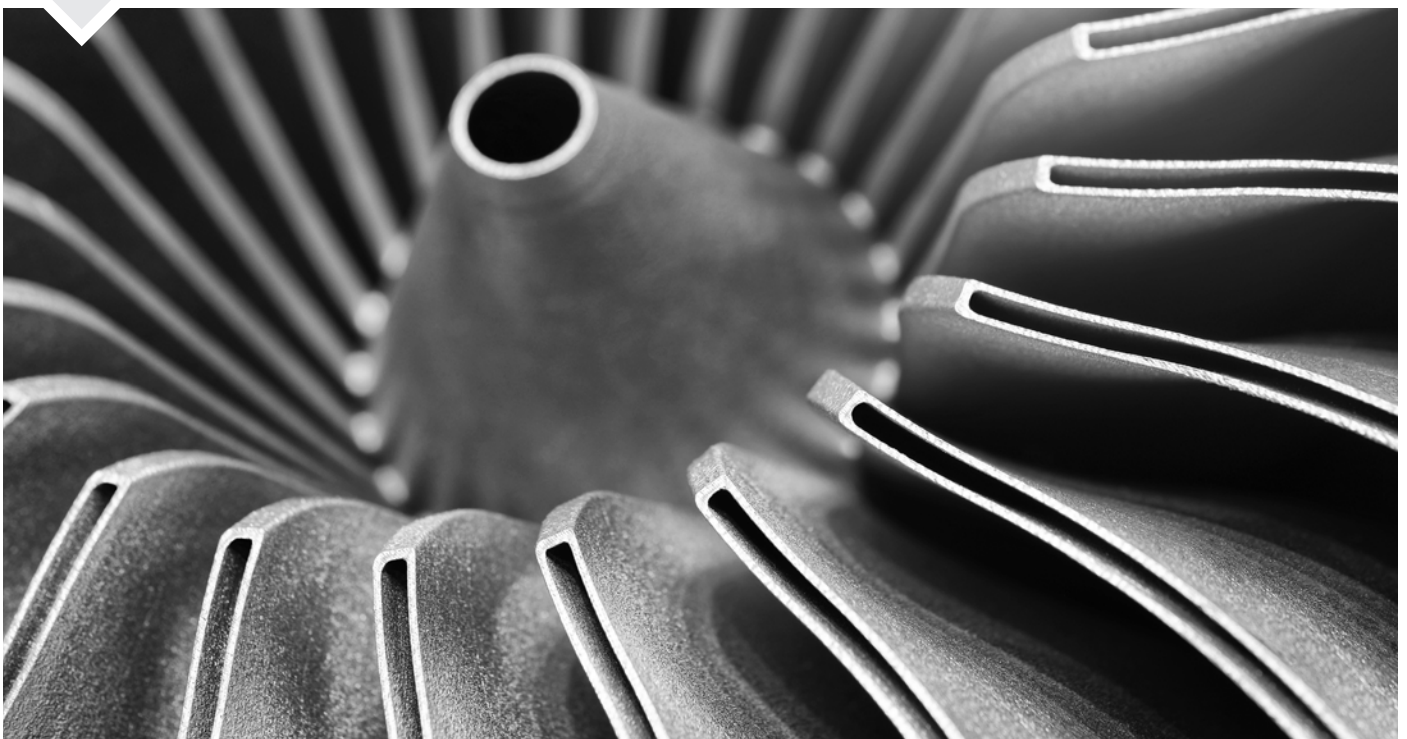
Unpacking usually includes the separation of the 3D printed components from the build plate and the removal of loose or sintered powder residues from the raw component.

#### **Support removal**

The production of delicate, complex components with printing systems like SLA, Poly-Jet, SLM/DMLS, EBW, FDM or Binder Jetting requires the printing of support structures for overhangs in the components. They stabilize the not yet hardened work pieces during the printing operation but must subsequently be removed from the finished component.

#### **Surface improvement**

3D printed components usually have a very high initial roughness with Ra values of up to 50  $\mu\text{m}$ . Depending on the intended use the component surface must be smoothed and, in some instances, polished to a Ra value of  $< 0.5 \mu\text{m}$ .





# AM SOLUTIONS – 3D POST PROCESSING TECHNOLOGY

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There is no “one system fits all” method for handling the various post processing challenges. The post processing technology must usually be adapted to the utilized printing method and

the individual work pieces. Under its brand AM Solutions – 3D post processing technology Rösler offers numerous equipment options for 3D printed components made from metal or plastic.

## RÖSLER POST PROCESSING SOLUTIONS

- ▶ Unpacking and de-powdering
- ▶ Fully automatic chemical-mechanical support removal
- ▶ Surface preparation for coating
- ▶ Defined edge radiusing
- ▶ Surface smoothing
- ▶ High-gloss polishing
- ▶ Cleaning and smoothing of internal surface area such as channels, undercuts, etc.
- ▶ Targeted and precise color staining of laser-sintered plastic components

### **IMPORTANT!**

It is highly recommended to consider all post processing aspects already during the design phase for a 3D component. This helps prevent costly mistakes. We will be pleased to support you with our know-how and experience!

## OVERVIEW OVER THE WORK PIECES USED IN THE AEROSPACE INDUSTRY

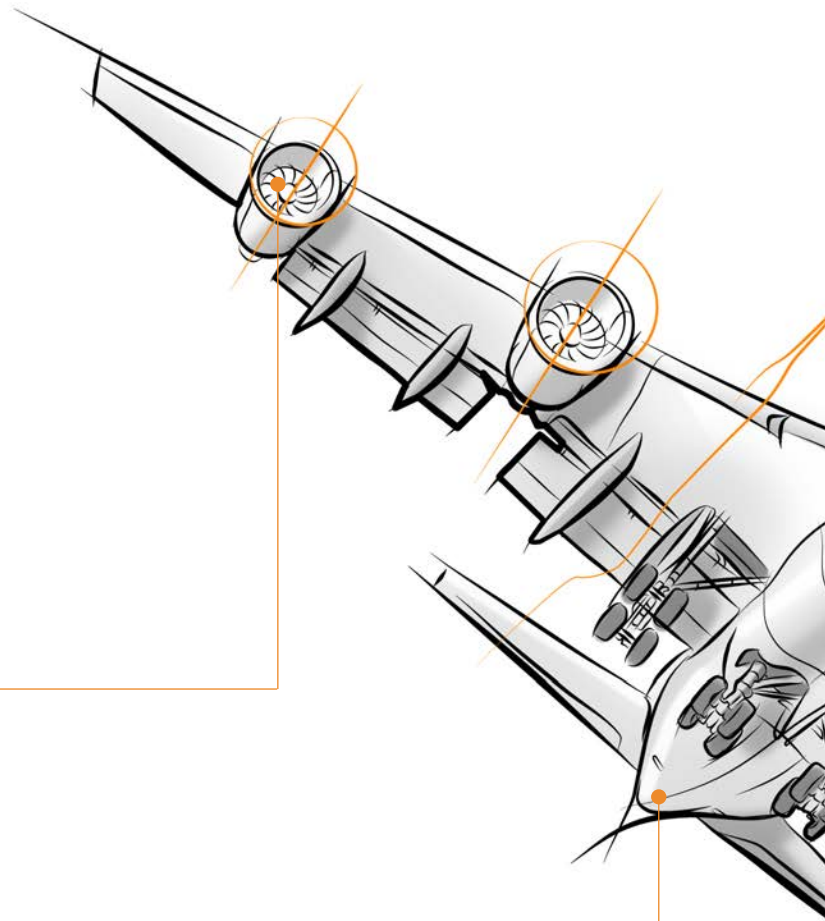
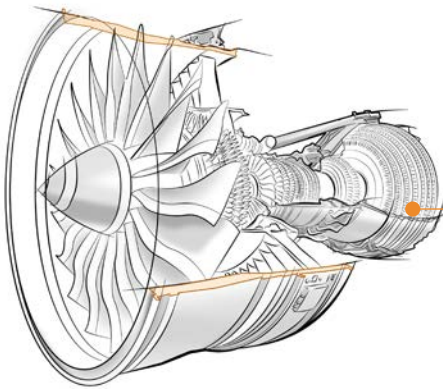
**Efficiency** and **safety** are extremely important for components used in the aerospace industry. Therefore, it is not surprising that the surface finishing standards for **jet engines, undercarriage / landing gears** and **structural aircraft components** are very strict. In compliance with all relevant standards we have developed **high-quality surface finishing solutions** and have

successfully worked with international **OEM's** and **MROs** for many years. Below you will find an overview of the most important aircraft components that a high-quality surface finish. On the following pages we describe individual components in more detail and highlight possible finishing solutions and the respective finishing equipment.

### AERO ENGINES

Typical components:

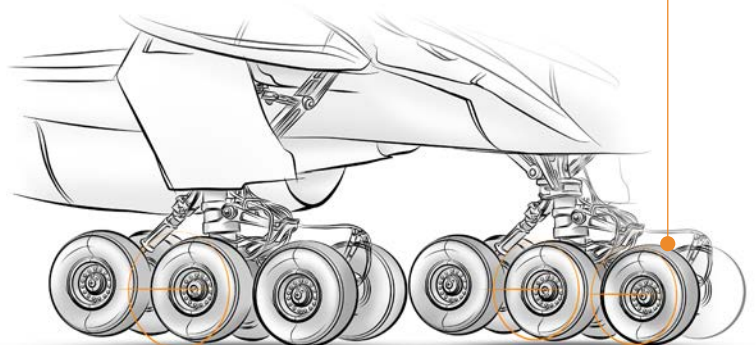
Blisks, turbine blades, turbine disks, vanes, drive shafts, housings, gear components, combustion chambers, seals, rings, drums, radomes and many more.



### UNDERCARRIAGE / LANDING GEAR

Typical components:

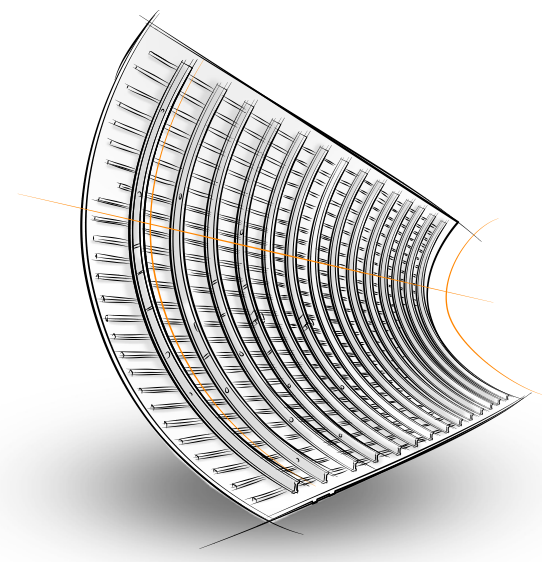
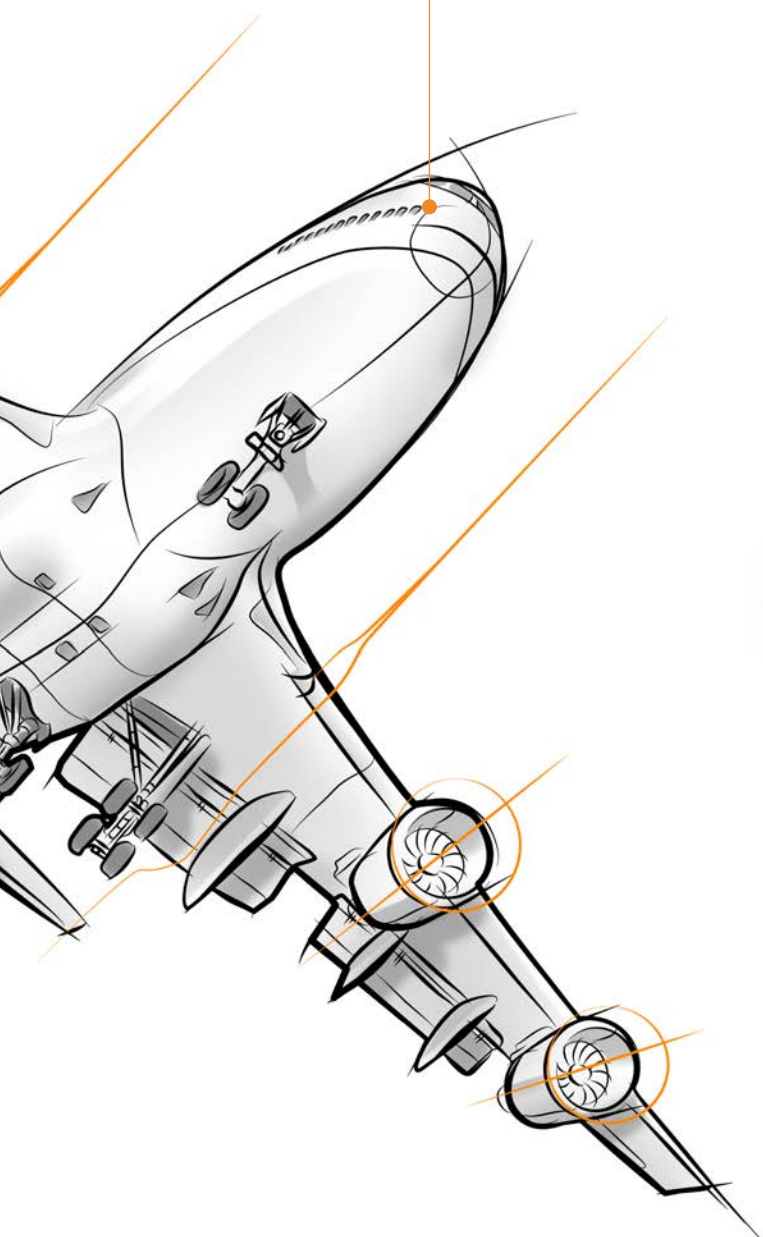
Undercarriage and landing gear housings, wheels, brake housings, all kinds of linkages and many more.



## AIRFRAMES

Typical components:

Structural components, air frame panels, re-enforcements, stringers, wing spars, ribs, landing flaps, brackets and many more.

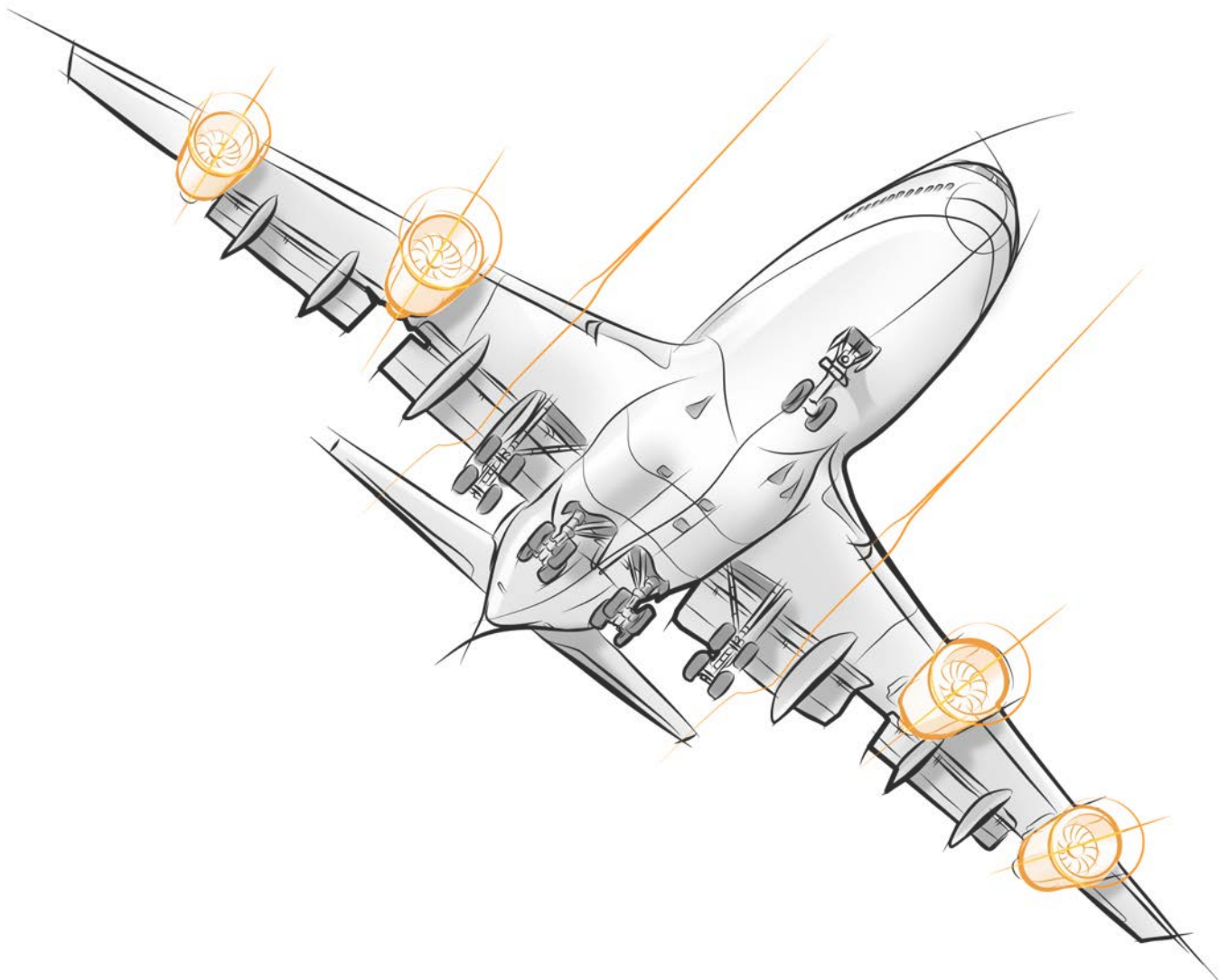


## AERO ENGINES

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The most complex and challenging item in airplanes are the aero engines. Various Rösler finishing processes have successfully proven to ensure the **functionality of the engine components** and to **extend their service life**. For example, the shot peening of fan blades or the polishing of blisks for jet engines have

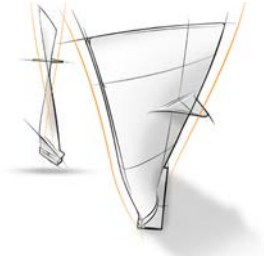
become indispensable surface improvement processes. In this respect the Rösler equipment technology guarantees you absolute **efficiency, precision and consistency of the results**.



You cannot find your work pieces?  
We will develop the perfect finishing solution for  
any work piece. Simply contact us!



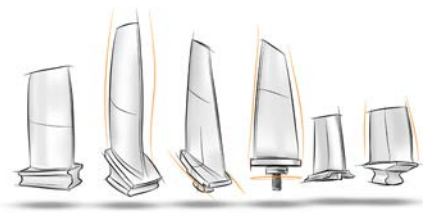
## Fan blades



Because of their complex shape fan blades pose a particular difficult challenge for treating their surface.

SHOT PEENING | POLISHING | SURFACE STRUCTURING | STRIPPING / COATING REMOVAL

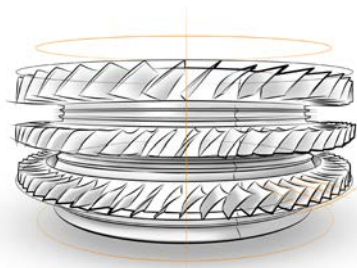
## Turbine blades



Used in the high-pressure and low-pressure section of jet engines, the blades are particularly critical turbine components.

SHOT PEENING | POLISHING | BLAST CLEANING | EDGE RADIUSING | SURFACE STRUCTURING | STRIPPING / COATING REMOVAL

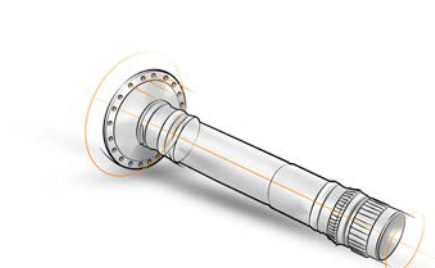
## Blisks



The surface finishing and process control specifications for blisks, the most expensive components in a jet engine, are particularly demanding.

SHOT PEENING | POLISHING

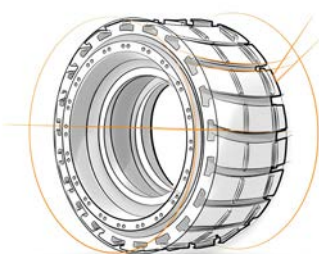
## Jet engine drive shafts



The shafts in a turbine must transfer enormous forces. Failure prevention is the most important requirement.

SHOT PEENING | POLISHING | SURFACE STRUCTURING | STRIPPING / COATING REMOVAL

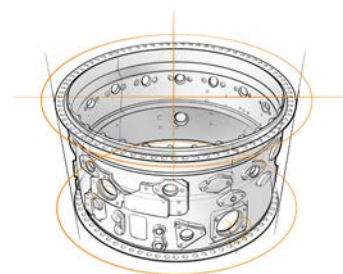
## Fan disks / turbine disks



The disks in different versions must ensure that the fan and turbine blades are safely anchored at extremely high rotary speeds.

SHOT PEENING | POLISHING | EDGE RADIUSING

## Housings



Housings are an essential part of any turbine. They must be equipped with numerous attachments and have, therefore, complex shapes.

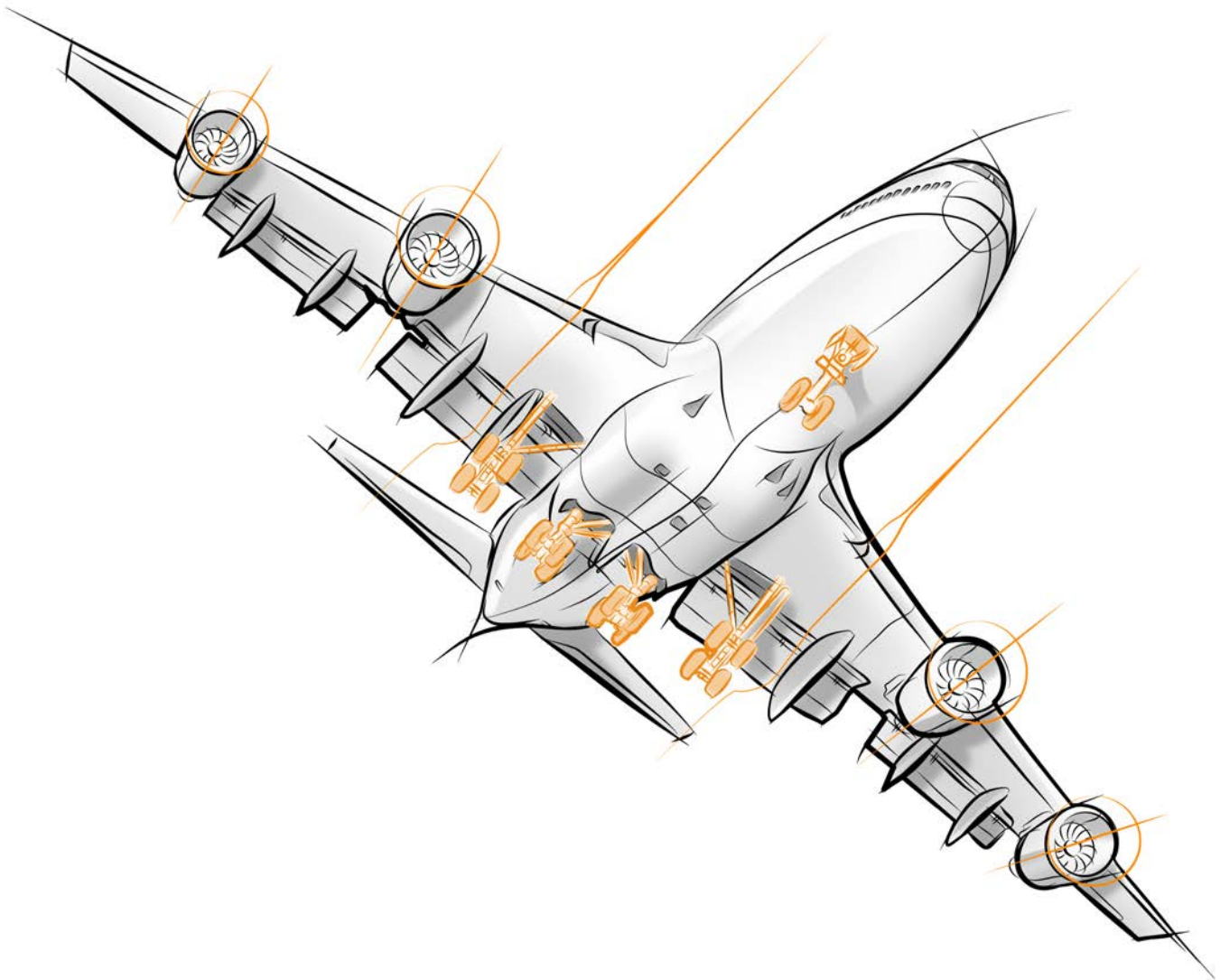
SHOT PEENING | POLISHING | EDGE RADIUSING | SURFACE STRUCTURING | STRIPPING / COATING REMOVAL

## UNDERCARRIAGE / LANDING GEARS

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The start and landing phase of an aircraft is extremely critical, because during these times extremely high forces come into play. Therefore, the undercarriage / landing gear must be especially robust. With various Rösler surface improvement

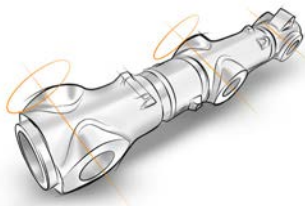
processes the functional characteristics of the **undercarriage components can be significantly improved**, for example through shot peening, polishing, surface structuring or stripping / coating removal.



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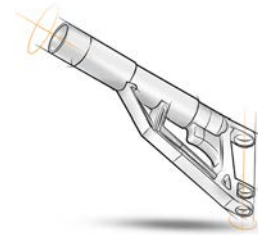
## Cross members / struts



The cross members / struts are key components of the undercarriage / landing gear. They must absorb particularly high loads.

SHOT PEENING | POLISHING | SURFACE STRUCTURING | STRIPPING / COATING REMOVAL

## Main Fittings



Another important undercarriage component is the main fitting.

SHOT PEENING | POLISHING  
BLAST CLEANING | EDGE RADIUSING

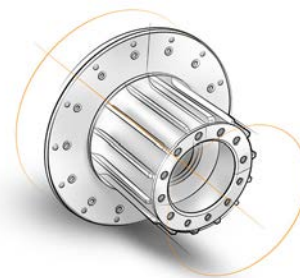
## Wheels



The undercarriage / landing gear wheels must be particularly sturdy to guarantee safe starts and landings.

SHOT PEENING | STRIPPING / COATING REMOVAL

## Torque Tube



The torque tube must absorb and deflect the entire energy of the braking operation. Therefore, it must follow particularly strict specifications.

SHOT PEENING | POLISHING

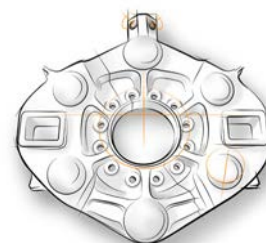
## Support bracket



The support bracket keeps the undercarriage in its required position.

SHOT PEENING | DEBURRING

## Brake housing



The brake housing serves as enclosure for all essential components of the aircraft brake system.

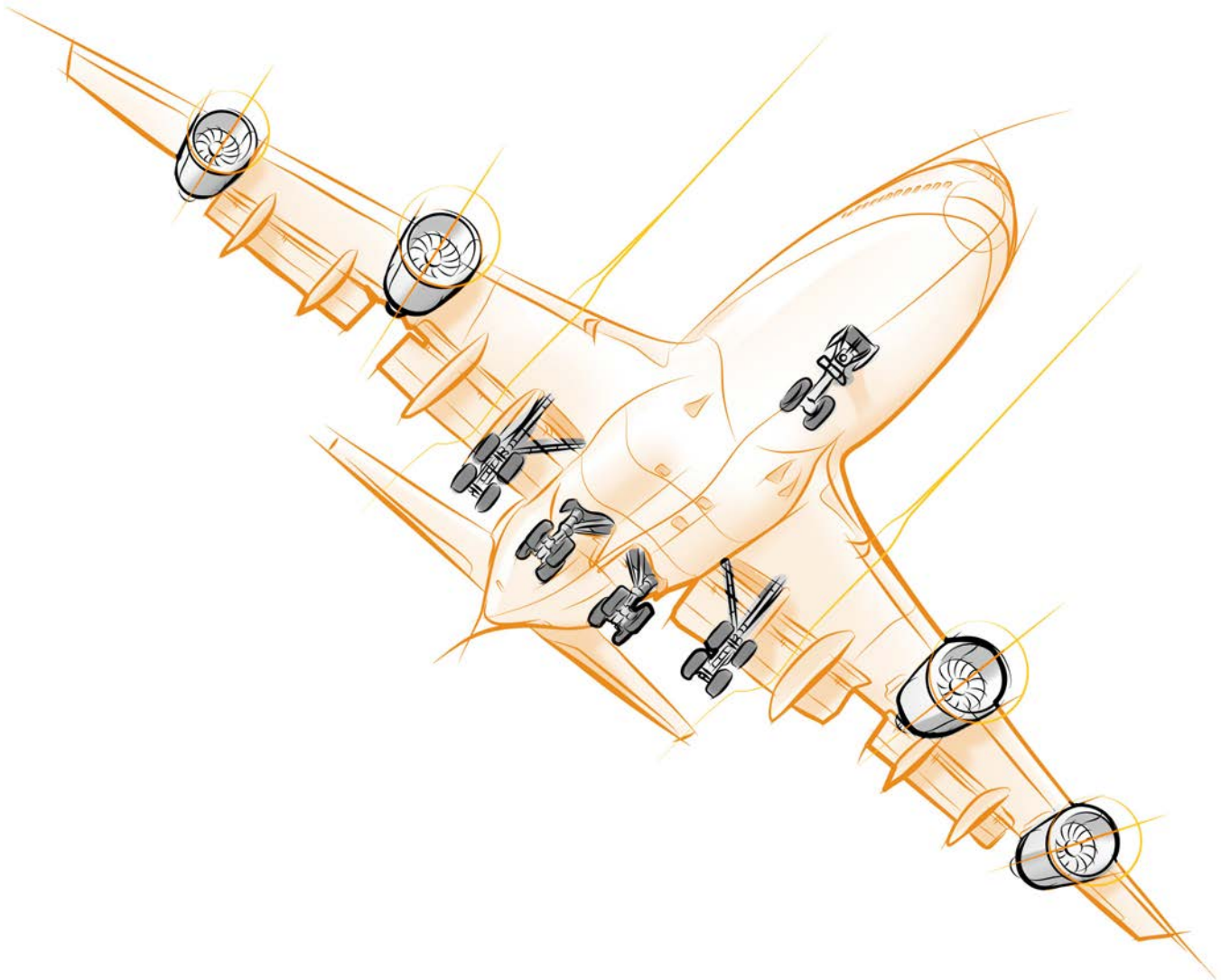
SHOT PEENING | SURFACE STRUCTURING | STRIPPING / COATING REMOVAL

## AIRFRAMES

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The design and construction of the structural aircraft parts is critical for the safety of an airplane. Various surface treatment systems are available to **improve the functional**

**characteristics** of the respective components and **extend their service life**. Even large structural airframe components can be treated without difficulty in Rösler equipment.

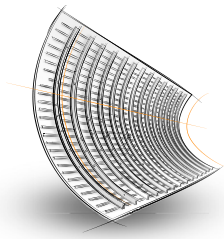


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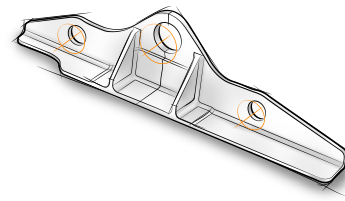
## Fuselage



The fuselage, the aircraft's main body section, must be stable and must keep the airplane airtight. At the same time, the fuselage design must be lightweight.

SHOT PEENING | SURFACE STRUCTURING  
STRIPPING / COATING REMOVAL | RESHAPING

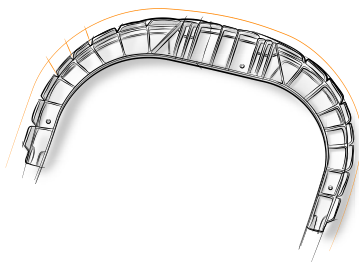
## Connecting parts



The various components are joined by special connecting parts, which must, therefore, be particularly safe and sturdy.

SHOT PEENING | POLISHING  
SURFACE STRUCTURING | EDGE RADIUSING

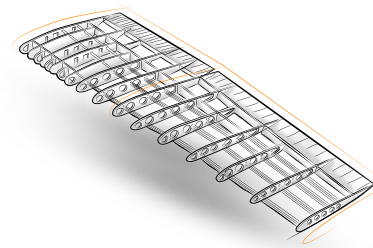
## Main frame



The main frame is the main support structure of the aircraft onto which all components are directly or indirectly attached.

SHOT PEENING | DEBURRING  
EDGE RADIUSING | SURFACE STRUCTURING

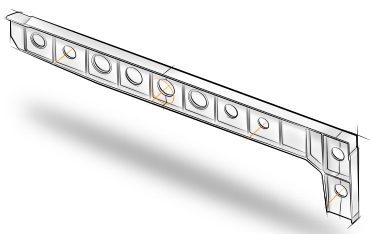
## Re-enforcements



Re-enforcing struts (longerons, stringers, etc.) stabilize the main body and the wings of an aircraft.

SHOT PEENING | EDGE RADIUSING | SURFACE  
STRUCTURING | STRIPPING / COATING REMOVAL

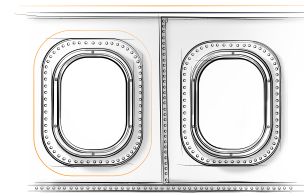
## Support bars



The bars ensure the structural stability of the aircraft. At the same time, they must be lightweight.

SHOT PEENING | SURFACE STRUCTURING |  
POLISHING | EDGE RADIUSING | DEBURRING

## Door and window frames



The door and window frames must reduce the noise level and ensure that the cabin is airtight. Their external design must offer low air resistance.

SHOT PEENING | EDGE RADIUSING |  
SURFACE STRUCTURING

# PROCESS TECHNOLOGIES AND EQUIPMENT USED FOR MASS FINISHING

The mass finishing technology allows the implementation of many for the aerospace industry critical surface finishing processes in full compliance with the strictest quality standards. Be it **batch processing** with work pieces and media loosely tumbling, **single piece processing** of high-value components,

**continuous flow operation** or **fully automated one-piece flow** – the Rösler equipment range can handle any finishing task. The equipment choice always depends on the work piece shape and size as well as the work piece volume.

## MASS FINISHING PROCESSES IN THE AEROSPACE INDUSTRY

### Deburring

With the right machine and respective media, sharp edges or burs can be reliably and consistently removed. A wide range of aerospace components like turbine blades, structural fuselage components and stampings, for example, safety belt latches, must be deburred. With suitable media shapes

& sizes and the needed grinding intensity the finishing process can be precisely tuned to the deburring task at hand. Typical processing times may vary between a few and 45 minutes. In continuous flow operations the cycle times are around 15 minutes.

Suitable equipment: Vibratory and high energy disc systems, also drag and surf finishers.

### Edge radiusing

Another important requirement for aerospace components is edge radiusing to a precisely defined radius. Radiused edges are frequently only needed on certain work piece segments. For example, precisely rounded edges on blisks and housing components will increase their load bearing

capacity. Rotary vibratory are particularly suitable for these tasks because they not only finish external but also internal surface sections. For targeted finishing of defined surface areas the surf finishing technology with robotic movement of the work pieces represents the best alternative.

Suitable equipment: Vibratory systems, drag and surf finishers.

### Surface grinding and smoothing, polishing

Frequently, the surface roughness of the work pieces must be within very tight tolerances. Precise surface roughness readings are frequently required for jet engine components, for example, for surface smoothing of turbine blades, polishing of vane segments and blisk sections, but also for

bearing components like bearing rollers, cages or bearing rings. The RÖSLER KeramoFinish® and special chemical finishing processes will easily generate surface roughness readings of as low as  $Ra = 0.02 \mu m$ .

Suitable equipment: Vibratory systems, drag and surf finishers.

## OVERVIEW RÖSLER PORTFOLIO OF MASS FINISHING EQUIPMENT BASED ON THE ...

### ... Vibratory technology

In vibratory finishing equipment one or multiple special vibratory motors induce a defined vibration into the processing bowl. This causes a spiral (helical) movement of the media/work piece mix in the processing bowl and a constant rubbing action between media and work pieces. While standard rotary and tub vibrators are used for cost-efficient processing of entire work piece batches, rotary vibrators without inner dome allow the individual finishing of one or multiple high-value components. In the latter case the work pieces never touch each other during the finishing operation.



Rotary vibrator



Tub vibrator

### ... High energy disc systems

High energy disc systems consist of a stationary cylindrical processing bowl and a rotary disk located in the bowl bottom. The centrifugal force created by the rotating disk pushes the media/work piece mix up the wall of the cylindrical bowl. Once it has lost its kinetic energy, the media/work piece mix falls back onto the rotating disk, where it is accelerated again. Compared to vibratory finishing systems the centrifugal disk technology generates a 15 times higher processing intensity.



### ... Drag finishing

The drag finishing technology is utilized for treating high-value components, which are complex but, at the same time, very delicate. It allows precise and targeted finishing without the work pieces touching each other during the entire operation. Drag finishers consist of a rotary carousel equipped with multiple rotating spindles and a stationary work bowl filled with grinding or polishing media. The work pieces, mounted to special fixtures, are attached to the spindles. By lowering the carousel the spindles with attached work pieces are immersed into the work bowl and "dragged" through the media under constant rotation. Compared to vibratory finishing systems the drag finishing technology generates an up to 30 times higher processing intensity.



### ... Surf finishing

Several spindles, each holding one work piece, or robots clamping a work piece, are immersing the work pieces into the rotating work bowl filled with media. While the work piece movement in spindle machines is somewhat limited, the robotic work piece handling offers infinite degrees of movement. This allows the successful handling of practically any finishing task. Because of the rotating work bowl the processing intensity is particularly high, actually much higher than in any other mass finishing system.



# PROCESS TECHNOLOGIES AND EQUIPMENT USED FOR SHOT BLASTING

The shot blasting technology offers a broad spectrum of processing possibilities ranging from the manual blasting of **single components** or entire **work piece batches** to **fully automatic continuous flow solutions**. Shot blast machines can be either equipped with turbines or compressed air systems for accelerating the blast media. This diversity allows the successful handling of practically any finishing task.

Shot blasting is used in the **aerospace industry** to increase the load bearing capacity of particularly critical components. For example, by a tightly controlled shot blast process the so-called **shot peening** technology induces a compressive stress in the component, which, in turn, increases the resistance against premature wear and breakage.

## SHOT BLASTING PROCESSES IN THE AEROSPACE INDUSTRY

### Suction (injection) shot blasting

In suction (injection) blast systems the compressed air is guided through a blast gun. The so-called venturi effect generates a negative pressure in the gun. This causes blast media to be sucked into the gun through a separate

hose. The compressed air flowing through the gun then accelerates the media and throws it against the work pieces. Suction (injection) blasting is very gentle and does not damage the work piece surface.

### Pressure blasting

In pressure blast systems the media is stored in a pressure vessel. Gravity causes the media to move to the bottom of the vessel, where compressed air picks it up. On the way to the blast nozzle the media is accelerated to its final speed.

The blast nozzle concentrates the media/air mixture before it hits the work piece surface. Pressure blasting is very intensive and can, therefore, cover large surface areas in relatively short times.

### Wet blasting

A mixture of blast media and water, the so-called "slurry", is accelerated by compressed air. This gentle process creates very fine finishes and is ideal for treating delicate work pieces.

### High pressure water jet blasting

The desired effect is achieved by shooting pure water at the work piece surface with a very high pressure of up to 4,000 bar. Applications range from simple cleaning tasks to paint stripping, deburring, cleaning of welding seams and removal

of extremely hard plasma or hard metal coatings without damaging the base material (substrate). The high-pressure water jet is guided onto the surface with various tools that can be adapted to special customer requirements.

### Solvent spray cleaning

The solvent spray cleaning method injects solvents onto the work piece surface with moderate pressure. It is used to remove cutting emulsions and/or other contaminants from the work pieces.

## OVERVIEW RÖSLER PORTFOLIO OF SHOT BLASTING EQUIPMENT BASED ON ...

### ... manual shot blasting methods

Discover the versatility of manual shot blasting systems with our flexible and economic machine range! Our equipment allows the use of different blast media for achieving optimal surface finishes. For single piece or batch processing – our machines guarantee a maximum of flexibility and efficiency. With manual operation you always have full control of the shot blasting process and, therefore, will achieve precise blasting results. Thanks to its compact design and easy operation, our equipment is ideal for pre- and post-treatment in many manufacturing operations.



### ... shot blasting technology with PLC or CNC axes

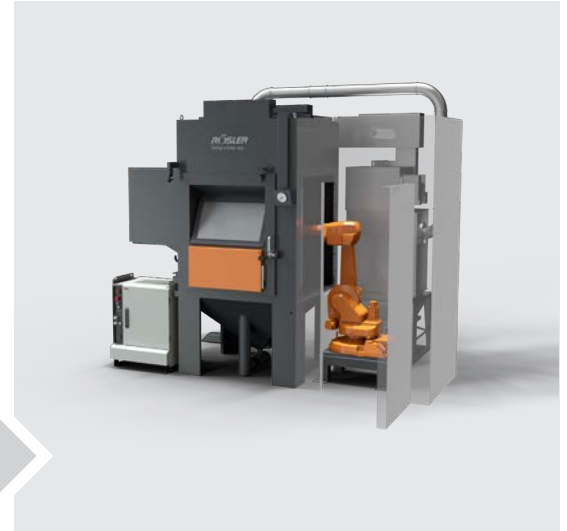
Discover the area of shot blasting systems, where the blast nozzle movement is guided by PLC or CNC axes! Our state-of-the-art systems are specially designed for small and midsize work pieces and can be used for high work piece volumes. Thanks to their high operational precision our systems produce excellent finishing results. Digital programming of our machines is simple and makes their integration into your manufacturing operation easy. Let us convince you of the efficiency and reliability of our shot blast equipment. We can help you to improve the quality of your finished products.



## OVERVIEW RÖSLER PORTFOLIO OF SHOT BLASTING EQUIPMENT BASED ON ...

### ... Shot blast equipment with robotic handling

Discover the unlimited flexibility of our shot blast machines with robotic handling! With up to 7 axes with one robot and 13 axes with two robots our systems offer endless possibilities. No matter how complex your work pieces may be, our blast machines will handle them to your satisfaction. Thanks to the high precision and consistency of our equipment, you can count on absolutely repeatable, high-quality results. Manual operations are practically eliminated because the robot controls the entire shot blast process. With our innovative robot-based shot blast equipment you will discover a new era of efficiency and productivity in the field of surface treatment!



### ... Fully automated shot blast equipment

Discover the seamless integration of Rösler shot blast equipment into your production! Our machines allow fully automatic work piece loading and unloading. This helps to optimize the workflow and increase operational efficiency. The use of optical work piece recognition systems guarantees precise, reliable and, above all, safe operation. The work piece handling systems, specifically developed by Rösler, can be perfectly adapted to the respective shot blasting environment. This ensures high-quality, cost-efficient results. To further streamline the production flow, entire work piece storage systems can be integrated. Through various interfaces our shot blast machines communicate with higher-level production control systems. Discover the perfect interplay of performance and integration with Rösler shot blast equipment.





# PROCESS TECHNOLOGIES AND EQUIPMENT USED FOR AM SOLUTIONS

An important post processing task for 3D printed components is the **removal of powder** from the work pieces, be it loose or sintered to the raw components. Another important task is

the surface refinement by **defined edge radiusing, surface smoothing** and, frequently, **high gloss polishing**.

## OVERVIEW OVER THE AM SOLUTIONS EQUIPMENT PORTFOLIO FOR THE AEROSPACE INDUSTRY

### S1 Wet – A wet process for perfect cleaning, surface homogenization and smoothing

With numerous accessories the versatile S1 system can be quickly adapted to your post processing requirements: It is equally effective for cleaning and/or surface homogenization/smoothing of single components or entire batches of work pieces made from metal and plastic. The S1 system has a very small footprint, and the integrated classification/cleaning system allows the re-use of the blast media. The process slurry, consisting of water and media, is also constantly recycled. In addition, the machine is equipped with a process water cleaning and recycling system. Especially for processing of 3D printed metal components the S1 offers significant advantages. For example, it prevents the creation of explosive dust, and the process slurry absorbs even the tiniest particles produced during the 3D printing process. Moreover, the S1 is equally effective on external as well internal surface areas like inner channels and undercuts.



### M3 – Surface smoothing and high gloss polishing of delicate work pieces with size of up to 600 mm

The M3 allows the simultaneous surface smoothing or high gloss polishing of several work pieces or one single component at a time. The work pieces are always firmly mounted in the machine so that they do not touch each other during the finishing operation. This prevents any damage through part-on-part contact. The M3 system generates either a pre-polish or a high gloss polish on turbine blades, blisks, battery and sensor housings, all kinds of brackets, and many more. The machine is equally suitable for surface finishing of plastic and metal components. The all-around flow of grinding or polishing media over the work pieces guarantees an even and intensive treatment of all surface areas, including complex internal passages. Automatic media handling of the grinding or polishing media, including automatic media replenishment, sensor-controlled imbalance weight settings and processing programs stored in the PLC guarantee a high degree of process stability and absolutely repeatable finishing results.





## C2 – Chemical surface smoothing and color staining of polymers in the same machine

We streamline your manufacturing chain! For example, with our new C2 system we combine the chemical surface smoothing and color staining of 3D printed plastic components in a single process in one single machine. Moreover, the utilized immersion smoothing technology reduces cycle times by up to 50%. Altogether, compared to other processes the costs per piece can be decreased by up to 60%. In addition, our processing media, specifically developed for this application, allows an absolutely eco-friendly process, which is also efficient and economic. Finally, the C2 system requires very little space.



## Cooperation with HP produces a novelty for the MJF print technology: An innovative, fully automatic 3D unpacking system

The new 3D automatic unpacking station, jointly developed with HP, allows the fully automatic de-powdering of components printed with the HP Multi Jet Fusion technology: After a batch of printed components has been cooled down, the entire batch is transferred to the 3D unpacking station. There, with a specially developed unpacking method, residual powder is removed, suctioned off and collected in a container. The new unpacking station allows fully automatic linking of the printing operation with the unpacking function. This increases productivity, reduces the costs und guarantees high process stability. Moreover, the new unpacking station achieves a significantly higher powder reclaim rate!



## AUTOMATED MACHINERY

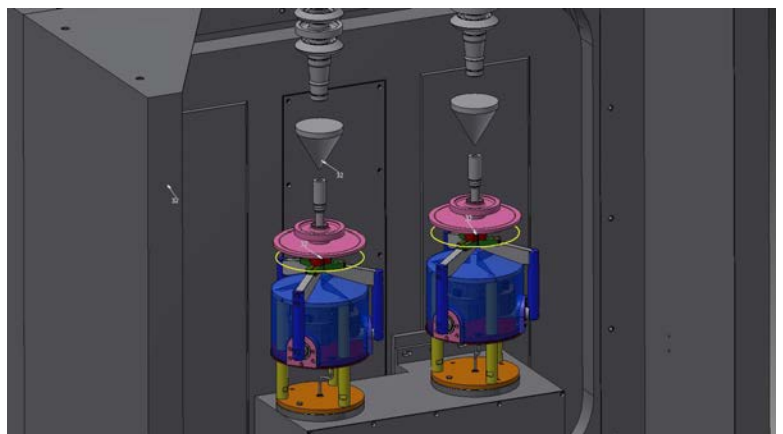
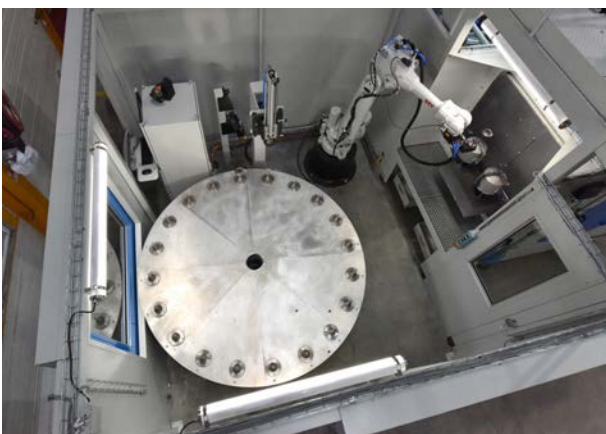
### Precise results and high process stability

The automatic work piece handling produces **more precise results** and helps ensure compliance with technical specifications and standards. With our finishing technologies we make the components used in aerospace products significantly safer. This

applies equally to high work piece quantities as well as high-value single components. Our automated processes produce not only excellent, consistent results but also **significant savings in material and personnel costs**.

#### Benefits achieved with the Rösler automation solutions:

- ▶ Savings in costs and manufacturing space combined with optimal capacity utilization
  - Custom-engineered, space-saving solutions
  - Fully automatic work piece handling – from loading to unloading – minimizes unproductive times
- ▶ Improved precision and increased safety
  - Combining multiple work functions, for example, the integration of optical controls and automatic measurements, saves time and prevents the need for manual intervention by specialists
  - Fully automatic masking and de-masking of specific work piece areas helps lowering the material costs
  - Automatic measurements and work piece recognition speed up the workflow
  - Tracing of the work pieces throughout the entire process makes quality control easier
- ▶ Decades of experience and in-house customer experience centers
  - Comprehensive know-how from numerous successful aerospace projects
  - Material handling solutions, specifically developed for particularly challenging shot blasting applications
  - Work piece fixture designs for manual or automatic clamping based on proven technical principles
- ▶ Integration of industrial robots
  - Setup, programming and technical guidance for, among others, multi robot systems with 14 simultaneous axes and more
  - Comprehensive know-how with ABB and RobotStudio



# CONTROLS AND DIGITIZATION

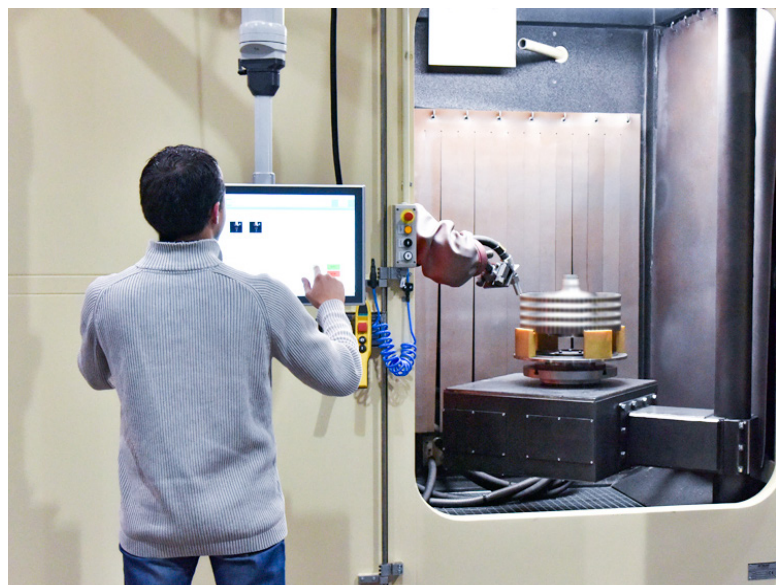
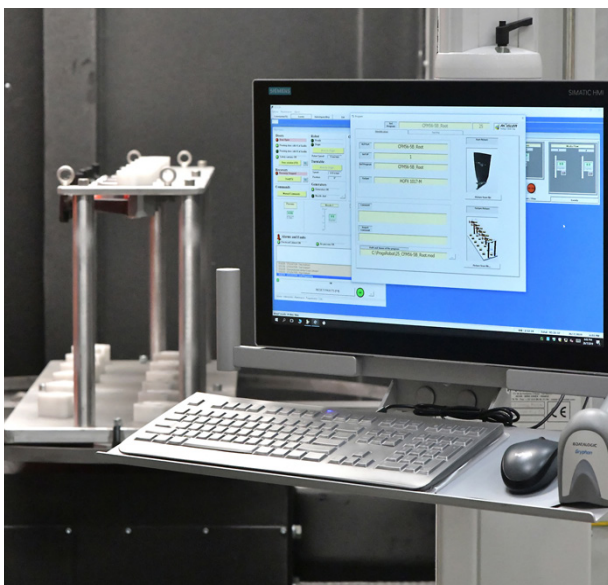
## The practical implementation of Industry 4.0

Most components used in aerospace applications must comply with strict safety requirements. This demands a particularly **high degree of reliability, efficiency** and precise, **repeatable**

**results.** Our control and digitization solutions help make your manufacturing operations more transparent and safer, and they facilitate the automation of internal processes.

### Benefits achieved with the Rösler control and digitization solutions:

- ▶ 3D equipment modelling helps eliminate unproductive and equipment down times
  - Simulation, offline programming and remote access facilitate process development and programming for new work pieces
  
- ▶ High cost efficiency through automatically controlled maintenance schedules and quick remote trouble shooting
  - Display and recording of component failures in the equipment
  - VPN access to all Rösler sub systems allows safe remote trouble shooting
  - Maintenance management with time log for every wear part, including automatic reordering (optional)
  
- ▶ Process optimization through cross-system communication
  - Integration of the Rösler equipment into your internal digital network
  - Automatic work piece recognition and data management for all work pieces
  - Transfer of work piece data and process parameters to external systems (e.g. central data bank, SAP interface, etc.)
  - Recording of all process parameters in a work piece specific document as part of a procedure for compliance with certification standards
  - Integration of PLC, CNC and robot controls into one single system



# CONSUMABLES

In addition to our equipment portfolio we can also offer the worldwide most comprehensive range of media and compounds, These are developed and produced in-house with the highest "made in Germany" quality. With more than 80

years of experience in the field of surface treatment we not only supply individual solutions for new finishing applications but also assist our customers to exploit the potential for product improvement and cost savings.

**Developing stable processes with repeatable results is our business.**



## The worldwide most comprehensive range of media and compounds in the market

With 15,000 individual products our consumables portfolio is by far the most comprehensive in the world. It includes ceramic and plastic grinding and polishing media, compounds and process water cleaning agents. Because of their excellent quality many of our consumables are approved for use in the aerospace, medical engineering and automotive industry. Of course, they can always be adapted to the requirements of our customers.



Our ceramic media production

## Excellent quality and quick availability

We produce in compliance with strict ecological standards and our consumables production is subject to strict quality controls per DIN EN ISO 9001 und 50001.

In our central warehouse we stock a minimum of 8,000 tons of media and compounds at any time. This allows us to quickly supply our customers around the world with the consumables they need.

# BLAST MEDIA

## An essential shot blasting tool

Blast media are available in a wide range of different materials, sizes and shapes. Our experts will help you determine which blast media is most suitable for your work pieces and your finishing requirements.



Blast media can be classified into the following categories:

- ▶ Liquid / gaseous  
WATER | DRY ICE
- ▶ Mineral  
GARNET | OLIVIN | SODA / KALIUM SULFATE | QUARTZ
- ▶ Metallic  
IRON AND DIFFERENT TYPES OF STEEL |  
STAINLESS STEEL | NON-FERROUS METALS
- ▶ Natural, organic  
NUT SHELLS / FRUIT KERNELS
- ▶ Synthetic, organic  
PLASTIC
- ▶ Synthetic, mineral  
SLAG | CORUNDUM (ALUMINUM OXIDE) | GLASS |  
CERAMIC

# CUSTOMER EXPERIENCE CENTER

The Rösler approach is characterized by **looking at all aspects** of a surface finishing task. On the one hand the equipment and processes are individually adapted to the respective finishing requirements. On the other hand they are tailored for perfect integration into the overall manufacturing operation. Many

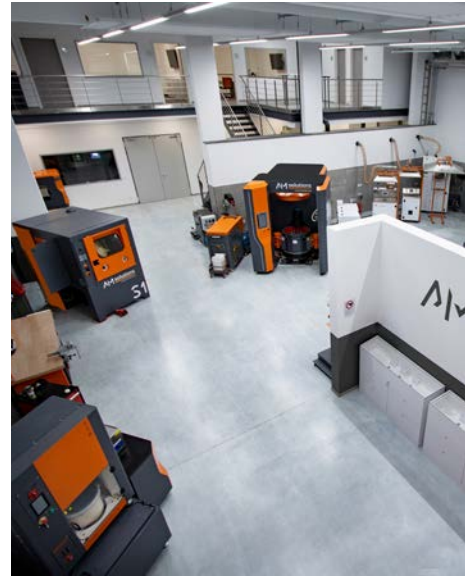
Rösler subsidiaries around the world have their own **Customer Experience Centers** equipped with state-of-the-art machinery. Essential for the development of a finishing process are **practical processing trials** with the customers' work pieces, which are conducted in the CEC's.



CEC Mass Finishing



CEC Shot Blasting



CEC AM Solutions

## Process development and process optimization

From processing trials, the process development, the equipment design and production, to a professional after-sales service, Rösler can offer a **one-stop solution from one single source!**

In our well-equipped CEC's we can run full-scale surface finishing processes under actual production conditions.

**Ultra-modern measuring technologies** – mechanical – chemical – complement our process development and optimization activities. Our process and design engineers from the **R&D and engineering departments** are constantly developing **tailormade surface treatment solutions.**

## Product development and product optimization

The unique depth of the Rösler product range, the **CEC's around the world** and our well-equipped central laboratory at our main office in Untermerzbach, Germany, are an excellent basis for cost-efficient and innovative product

development and optimization. Our equipment, our consumables and numerous components are **developed and produced in-house.** This represents a manufacturing depth that is truly unique in our industry.

# LEARNING FROM THE GLOBAL LEADER

Our comprehensive mass finishing know-how is founded on over 80 years of experience. As the global technology and market leader in the field of surface treatment we can offer proven

solutions ranging from a broad equipment and consumables portfolio to round-the-clock after-sales service. In our training seminars we are passing our extensive knowledge on to you.



## Rösler Academy

The central training center of the Rösler Oberflächentechnik GmbH

- ▶ An area of more than 1,350 m<sup>2</sup> for learning and working
- ▶ Equipped with the latest digital media and communication technologies
- ▶ Certified professional trainers
- ▶ Specialized fields: Mass finishing, shot blasting, additive manufacturing
- ▶ More than 10 different training seminars
- ▶ Focus on hands-on learning
- ▶ Training seminars in German and English
- ▶ Customized training seminars at customer locations upon request

## Our professional trainers


All our trainers are certified and are among the best in their respective fields. In our training seminars you will benefit from the extensive experience of our trainers, who will provide you with first-hand practical knowledge.

Ø Participants per year




Over 1,000

Ø Rating



9.6 out of 10 possible points<sup>1</sup>

Ø Recommendation rate



99 %<sup>1</sup>

<sup>1</sup> Source: Evaluation questionnaires filled out by participants, Status 31/12/2022

You can find more information about our seminars, dates and registration procedures under [www.rosler-academy.com](http://www.rosler-academy.com) or scan the QR-Code.



Mass Finishing  
Shot Blasting  
AM Solutions  
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