RÖSLER®
finding a better way ...

Defense

Surface finishing methods for the defense industry

www.rosler.com

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

›90 More than 90 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

Contents

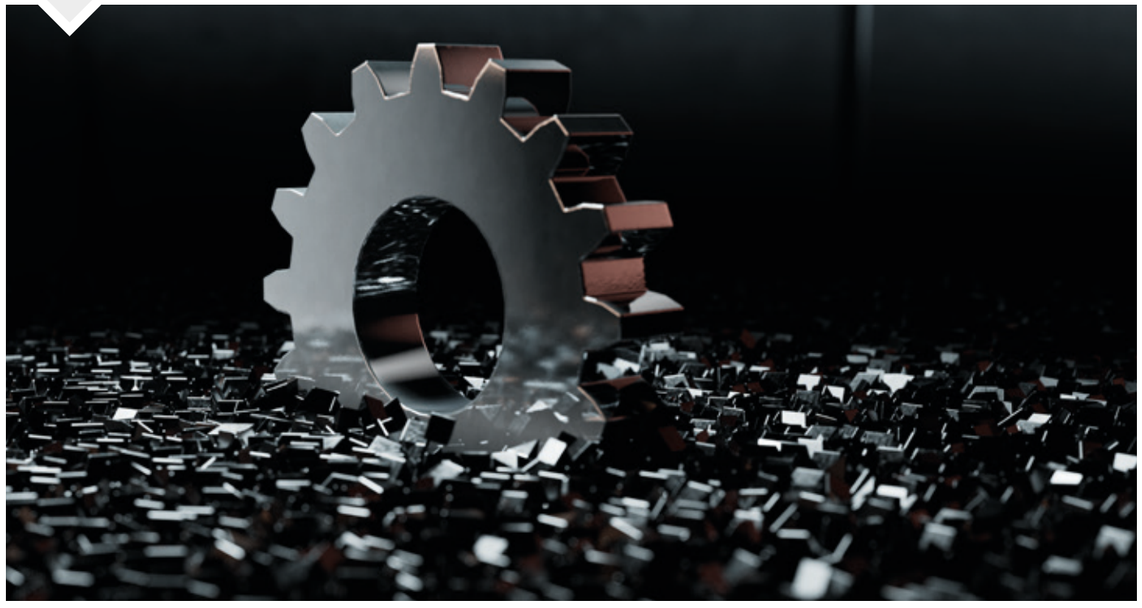
WHAT IS MASS FINISHING?

A technology that has proven itself over decades

Mass finishing is a mechanical-chemical system for the refinement, respectively, functional improvement of surfaces. Besides the actual equipment, grinding & polishing media along with compounds, chemically supporting the finishing process, are utilized. The vibratory, rotational or centrifugal force induced into the equipment creates pressure between the processing media and work pieces and causes them to intensively “rub” against each other. This results in a slight removal of material from the work pieces. The processing intensity depends on the type of finishing machine, the consumables in the form of media and compounds, the operational parameters of the equipment and the processing time. We will be pleased to develop a finishing process tailored to your specific requirements.

Typical components that must undergo mass finishing operations:

- Work pieces made from metal, plastic, ceramic or rubber
- Work pieces produced by casting, forging, drawing, roll forming, sintering, stamping/fine blanking or embossing
- Work pieces shaped by machining such as turning, milling, drilling or surface grinding
- Work pieces after heat treatment like annealing, tempering or hardening



RÖSLER MASS FINISHING TECHNOLOGIES

for the defense industry

FINISHING PROCESSES

Deburring

With the right selection of equipment and grinding media, burrs on outer work piece contours, drilled holes and cut-outs, are removed or, at least, minimized in a cost-efficient manner.

Cleaning

Contaminants like coolant or lubricant residue must be removed from the workpiece surface to ensure problem-free downstream manufacturing operations:

- Part-on-part processing without any media
- Two-in-one system: Cleaning and deburring/edge breaking in one single process

Surface smoothing, polishing, RÖSLER Keramo-Finish®

Numerous components used in the defense industry, the production of bearings as well as turbine and transmission parts must have a smooth surface finish, either to create a high-performance surface or simply for decorative reasons. The surface roughness readings must be < Ra 0.02 µm, Rz 0.15 µm and Rk 0.035 µm. Generally, such processes do not need any acidic compounds.

Descaling, pickling, cleaning

With these highly cost-efficient methods residues from heat treatment operations are removed with combined chemical/mechanical pickling operations.

Ball burnishing, pressure deburring, “Vibro Peening”

In ball burnishing processes non-abrasive media made from steel/stainless steel create a smoothing effect on the work piece surface. In pressure deburring operations specially shaped steel media with sharp edges removes or minimizes burrs on the work pieces. Since the steel media is literally “hammering” the work piece surface, a peening effect is created. Hence the term “vibro peening”.

Edge radiusing

Another extremely important requirement for work pieces used in the defense industry is the creation of clearly defined rounded edges on some work piece sections. For example, components for powertrains, such as jet engines, and weapons must have defined rounded edges to withstand high functional stress.

WHAT IS SHOT BLASTING?

Surface treatment with turbine or compressed air shot blast systems

In shot blasting applications the blast media is accelerated to a speed of up to 170 m/sec before it hits the work piece surface. The media is accelerated by compressed air, high pressure pumps or blast turbines. The shot blasting results depend on the type of blast machine, the operating parameters and the selected blast media.

In shot blasting identical processing goals can be achieved with different shot blasting methods. Based on your finishing requirements, production quantities, legal requirements and your specifications we will develop a suitable process. Rösler is in the unique position to supply complete solutions, all from one single source!

Typical components that must undergo shot blasting operations are:

- Work pieces made from metal, plastic, ceramic or rubber
- Work pieces produced by casting, forging, drawing, roll forming, sintering, stamping/fine blanking or embossing, laser & flame cutting
- Work pieces shaped by machining such as turning, milling, drilling or surface grinding
- Work pieces after heat treatment like annealing, tempering or hardening

RÖSLER SHOT BLASTING TECHNOLOGIES

for the defense industry

FINISHING PROCESSES

Cleaning, deburring
With the right blast media fully automated blast systems will quickly and economically remove surface contaminants and burrs.

Descaling, de-rusting
After forging operations or heat treatment the work piece surface is usually covered with scale or oxide layers. These are quickly and effectively removed with shot blasting.

Surface texturing
“Hammering” the work pieces with random-shaped media creates a defined rougher work piece surface, which substantially improves the adhesion of coating materials on the work piece surface. Therefore, shot blasting is an indispensable preparatory step for subsequent coating and painting operations.

Removal of sand cores, de-sanding
Sand or ceramic residues on raw castings are completely and efficiently removed by shot blasting.

Shot Peening
Shot peening induces a compressive stress in the work piece surface. This helps increase the service life of components exposed to high tensile and bending loads. Another substantial benefit of shot peening is that the components can be produced with less material input without affecting their performance and life expectancy.

Stripping of paint and other coatings from the work piece surface
All kinds of coatings and contaminants, such as paint, oxide layers, ceramic layers as well as plasma, HVOF, thermal barrier coatings etc., can be stripped from the work piece surface with special shot blasting processes without attacking the basic work piece material.

SHOT BLASTING SYSTEMS

Suction (injection) blasting
In suction blast systems compressed air is guided through a blast gun. The venturi principle creates negative pressure in the blast gun, which sucks in media through a separate hose. The compressed air flow accelerates the media and ejects it from the gun. Suction blast systems generally create a gentler effect on the work piece surface.

Pressure blasting
In pressure blast systems the media is stored in a pressure tank. Gravity causes the media to fall into the compressed air stream, where it is accelerated and transported to the blast nozzle(s). The nozzle bundles the media/air mixture and throws it onto the work piece surface. Pressure blasting is a high-energy system and is, therefore, very productive.

Wet blasting
A slurry consisting of media and water is accelerated by compressed air. Because it is a very gentle process, wet blasting creates finely structured surface finishes.

High-pressure waterjet blasting
With a pressure of up to 4,000 bar water is accelerated and shot at the workpiece surface. This creates a defined cleaning effect. This technology is used for cleaning, deburring and cleaning of welding seams but also stripping extremely hard plasma and hart metal coatings. The results are achieved without attacking the basic work piece material.

Solvent spray cleaning
Solvent spray cleaning accelerates solvent with relatively low pressure. It is used to remove drilling emulsions or other contaminants from difficult-to-reach work piece cavities.

WHAT IS 3D POST PROCESSING?

Automated post processing guarantees cost-efficient and absolutely repeatable results

THE CHALLENGES FOR POST PROCESSING OF 3D PRINTED COMPONENTS

The refinement of the raw components coming from a 3D printer, the so-called post processing, represents a difficult task for the users of additive manufacturing. Consistency of the results, scalability and cost-efficiency are demands that are difficult to fulfill with manual post processing operations.

In addition, depending on the utilized additive manufacturing system, several post processing steps are needed to transform the raw work piece into a functional product:

Unpacking / powder removal

After the print operation the components are removed from the powder bed and left-over material is removed from their surface. With clever vibratory unpacking operations the components are treated gently, and damage and scrap rates are minimized. Mechanical systems produce consistently high component qualities, make the post processing operation more efficient and can be easily integrated into automated manufacturing lines.

Support removal

Complex, delicate components printed with technologies like SLA, PolyJet, SLM/DMLS, EBM, FDM or Binder Jetting, may require printing of extra support structures. This is especially true when the components contain overhangs. Supports stabilize the work piece during the printing operation but must be removed afterwards.

Surface improvement

With certain print technologies 3D printed components are frequently characterized by a high initial surface roughness. Therefore, the surface of such components must be smoothed or even polished.

AM SOLUTIONS – 3D POST PROCESSING TECHNOLOGY

There is no “one system fits all” solution to the various post processing challenges. The post processing methods must be adapted to the utilized printing technologies and the respective work pieces. Under the brand AM Solutions – 3D post processing technology Rösler offers comprehensive mechanical post processing solutions for 3D printed components made from metal and plastic.

PROCESSING GOALS

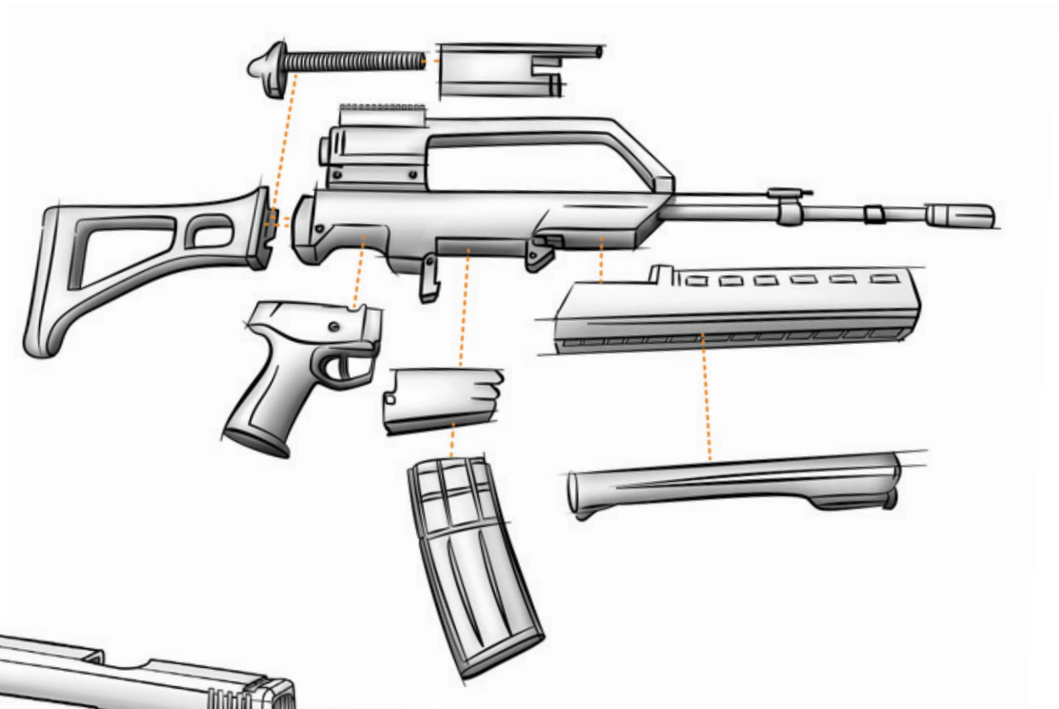
- Unpacking and powder removal
- Preparation of surfaces for subsequent coating
- Peening of components made from plastic
- Surface smoothing
- Mirror polishing
- Surface cleaning, including internal surface areas

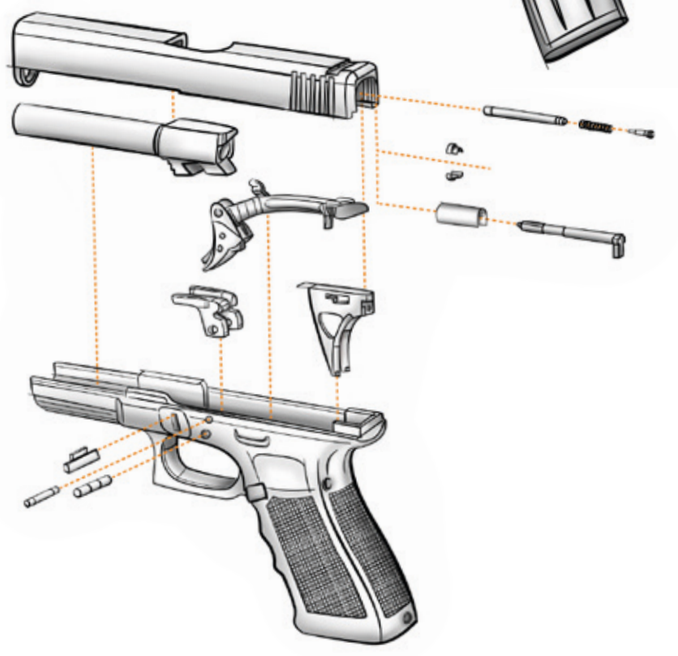
IMPORTANT!

We strongly recommend that during the design phase for 3D printed products all post processing aspects are already considered. This helps prevent long, costly process chains. We will be pleased to assist you with our expertise!

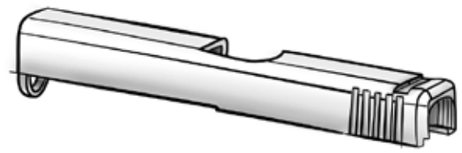
FIREARMS / HANDGUNS

The components in handguns, such as pistols and assault rifles, must be **extremely precise**, offer **excellent functionality** and must **last a long time**. Therefore, their surface must be perfectly finished. Only a good finish allows transforming the raw work pieces into highly **precise, durable, reliable** and absolutely **safe** components. Through operations like deburring, surface grinding and polishing we ensure **perfect fit** and **trouble-free operation** of **mechanical functions**. With our treatment systems we prepare surfaces for coatings that protect against corrosion and premature wear. A targeted shot peening operation will protect components against **various stresses** and will significantly prolong their **usable life**.



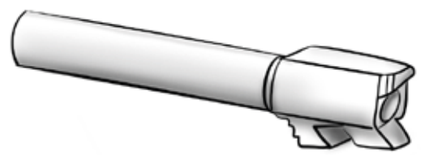


Slide / sled



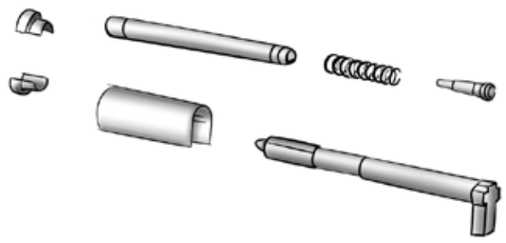
DEBURRING | EDGE RADIUSING
POLISHING | SMOOTHING

Gun barrel



DEBURRING | EDGE RADIUSING | POLISHING
CLEANING | GRINDING

Firing pin



DEBURRING | EDGE RADIUSING | POLISHING
CLEANING | GRINDING

Handle

DEBURRING | EDGE RADIUSING
TEXTURING | POLISHING

Ammunition magazine (clip)

DEBURRING | EDGE RADIUSING | POLISHING
SMOOTHING | RÖSLER KERAMO-FINISH®

Silencer

POLISHING | EDGE RADIUSING
DEBURRING | SHOT PEENING

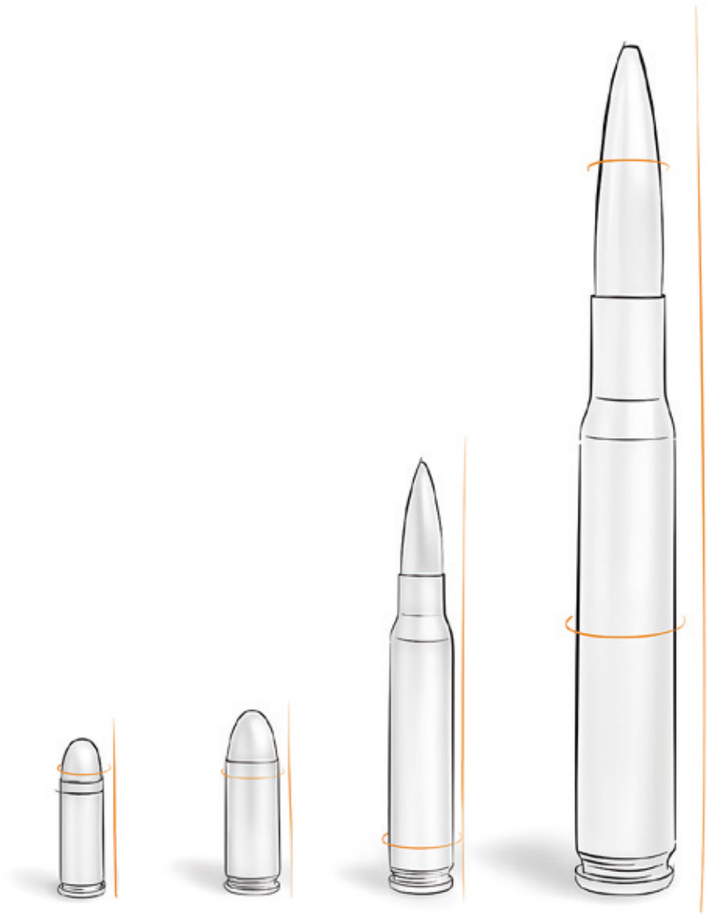
AMMUNITION / CARTRIDGES

Ammunition components undergo several manufacturing steps. In-between targeted surface finishing operations are creating the **basis for high quality**. Depending on the respective manufacturing phase, different finishing methods are utilized:

Single components go through cleaning, de-greasing, rinsing, pickling, passivating, neutralizing or brightening operations. Besides these “wet“ chemical treatments we also offer dry processing methods for surface smoothing and cleaning. Their main goal is the improvement of the dimensional accuracy and a better surface finish.

In our high energy disc systems we can oil, polish and peen fitted cartridges. This improves their **corrosion resistance**, **functional stability** and **shelf life**.

For larger **caliber weapons** and **thrown or dropped ammunition**, such as rockets, our shot blasting systems offer excellent surface treatment possibilities. For **optimal adhesion** of paint and coatings external surfaces are textured, whereas contaminants are effectively removed from internal surface areas.



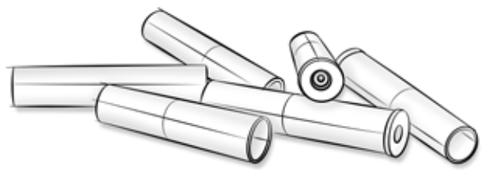
Circular blanks

PICKLING | RINSING | DRYING

Cups

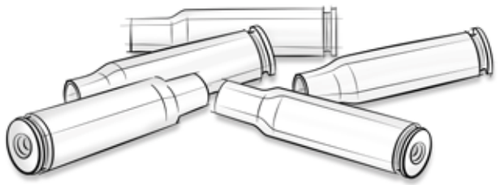
CLEANING | RINSING | PICKLING
BRIGHTENING | NEUTRALIZING | DRYING

Deep drawn casings



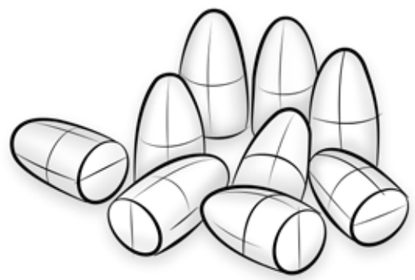
CLEANING | DE-GREASING | RINSING
PICKLING | PASSIVATING | DRYING

Cartridges



CLEANING | DE-GREASING | RINSING | PICKLING
POLISHING | PASSIVATING | DRYING

Bullets



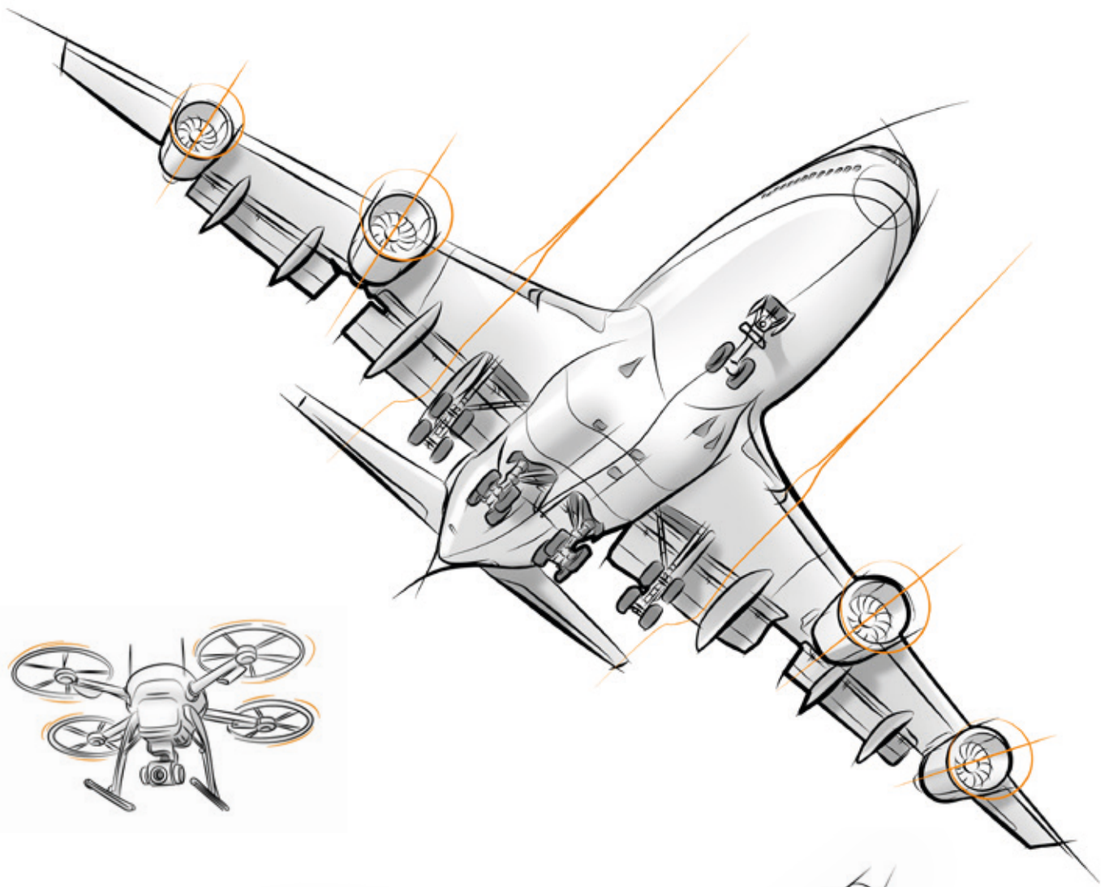
SMOOTHING | CLEANING
DRYING | DRY POLISHING

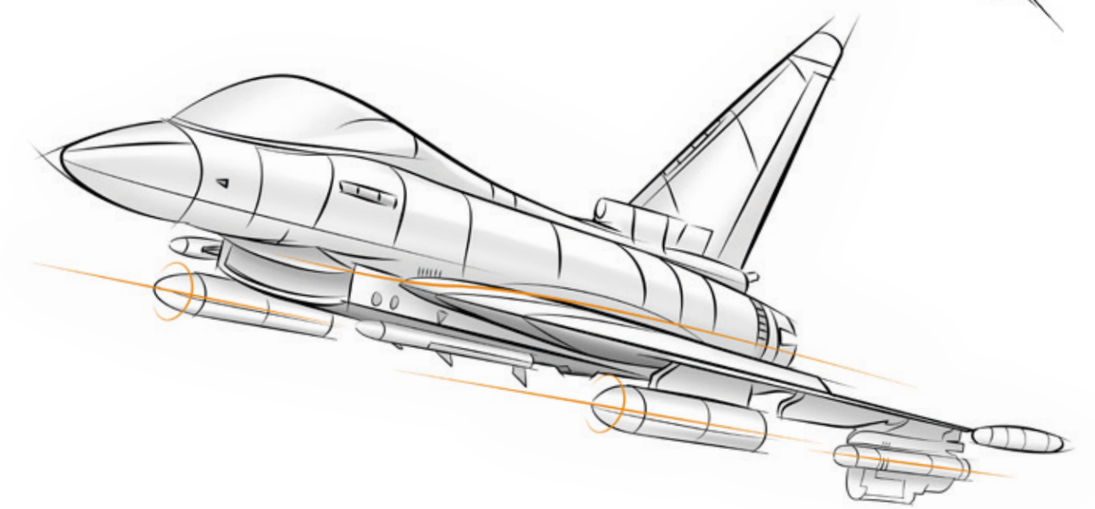
Percussion cups

DEBURRING | EDGE RADIUSING
DRYING

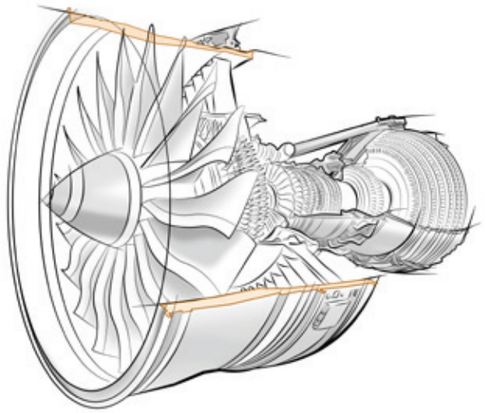
AIRBORNE SYSTEMS / AIR FORCE

With airborne systems every little detail counts: Only precisely treated surfaces ensure the needed **precision**, **reliability** and **longevity** of the various components. Our various shot blasting and mass finishing systems guarantee high-quality work pieces – from complex, delicate turbine components to large structural parts.





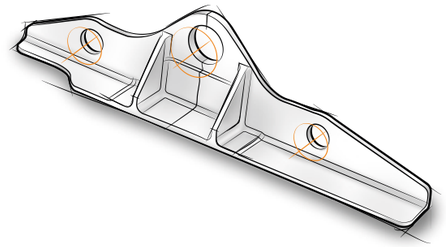
Aero engines



Some work piece examples:
Blisks, blades, disks, vanes, turbine shafts, housings, drive components, combustion chamber, seals, rings, drums, etc.

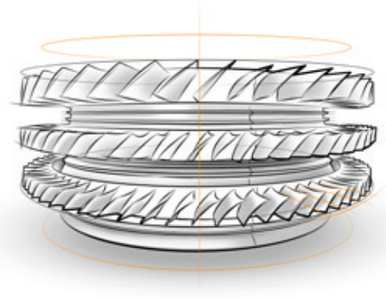
SHOT PEENING | POLISHING
BLAST CLEANING | EDGE RADIUSING
SURFACE PREPARATION (ACTIVATING) | STRIPPING

Structural components / airframes



SHOT PEENING | POLISHING
ACTIVATING | EDGE RADIUSING

Blisks

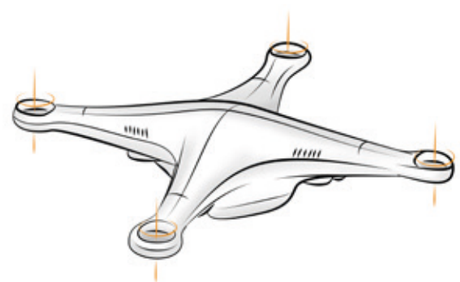


SHOT PEENING | POLISHING

Thrown or dropped ammunition

DEBURRING | DESCALING | WET BLASTING
EDGE RADIUSING | TEXTURING

Drone components / drone body

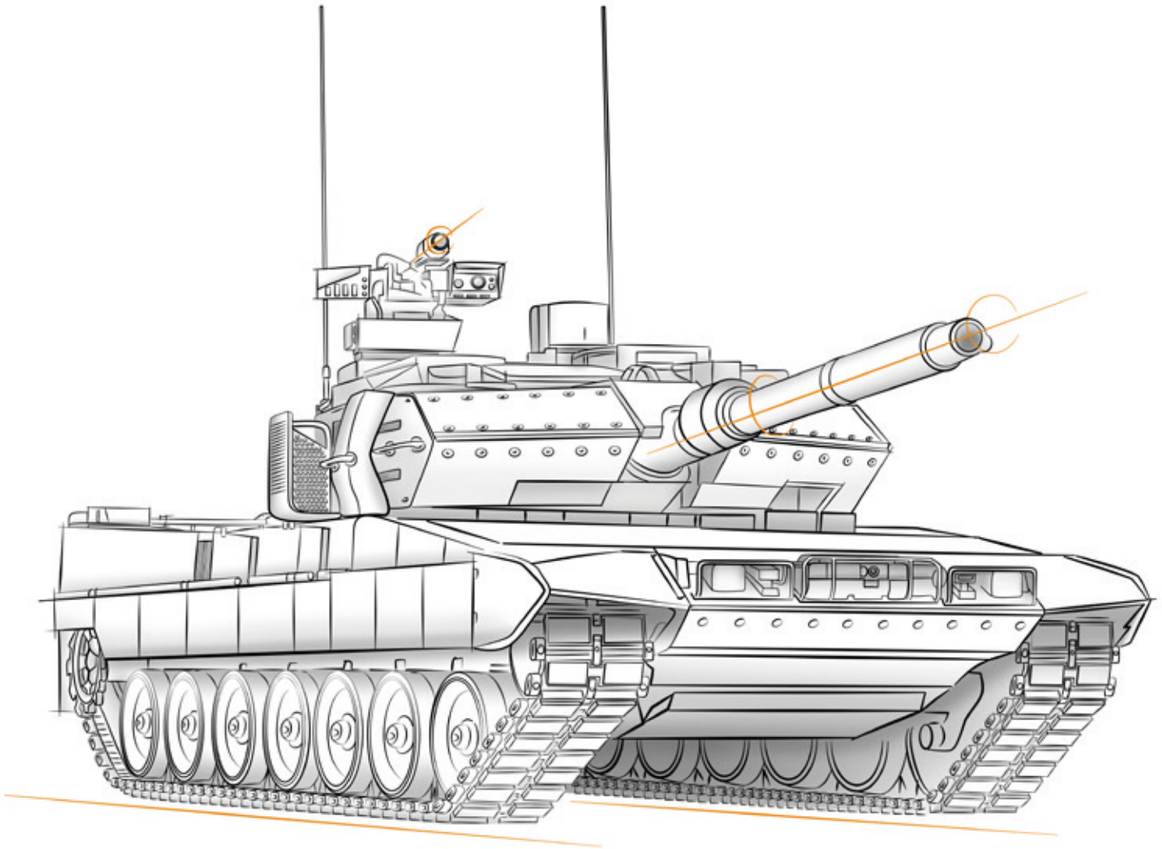


DEBURRING | EDGE RADIUSING | POWDER REMOVAL
(FROM COMPONENTS PRINTED WITH SLS)

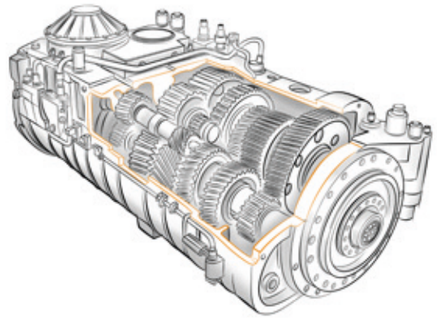
ARMOR-PLATED VEHICLES

Armor-plated transport vehicles, tanks and tactical vehicles must be able to withstand the **enormous loads** they are exposed to on the battlefield. Every component – from the drivetrain to large structural components – is essential for the **reliability** and **operational readiness** of the entire system. Only precise surface finishes ensure the required **toughness**, uptime and **functional stability** under the toughest operating conditions.

Mass finishing is primarily used for deburring and smoothing the surface of components. This prevents premature product failures and ensures **trouble-free functionality**. With shot blasting component surfaces are cleaned and peened. Shot blasting is also the ideal technology to prepare components – from small work pieces to very large welded structural assemblies – for subsequent **painting/coating**. The result are sturdy components, which significantly increase the reliability of modern fighting vehicles.



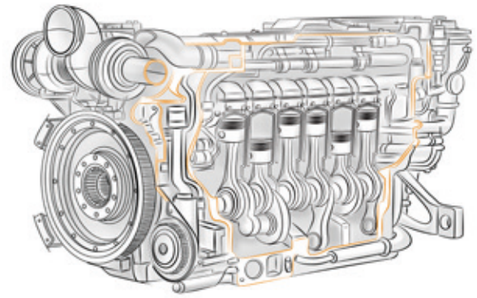
Transmission



Some work piece examples:
Drive shafts, gears, housings, etc.

DEBURRING | DESCALING | EDGE RADIUSING
GRINDING | SHOT PEENING

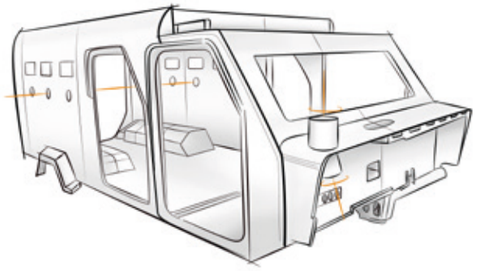
Engine



Some work piece examples:
Pistons, connecting rods, crank shafts, housings, etc.

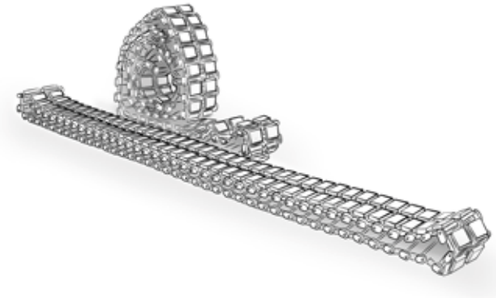
DEBURRING | DESCALING | EDGE RADIUSING
POLISHING | SMOOTHING | DEGREASING | CLEANING

Structural components / Vehicle body



TEXTURING | DE-RUSTING

Track chains

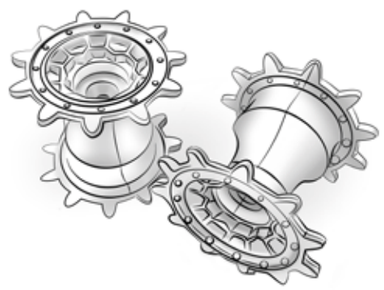


TEXTURING | DE-RUSTING
CLEANING

Tank rollers

DEBURRING | POLISHING | SMOOTHING
EDGE RADIUSING | GRINDING

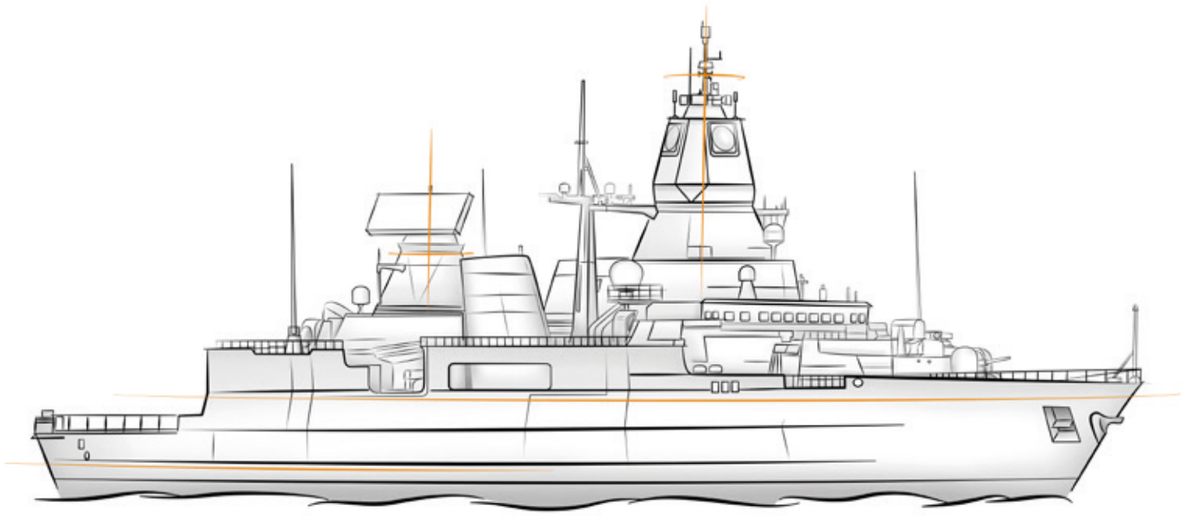
Drive wheels



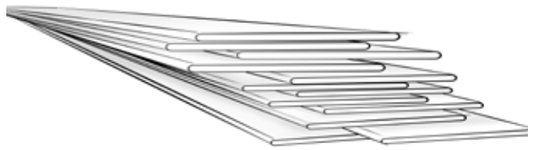
DEBURRING | POLISHING | SMOOTHING
EDGE RADIUSING | GRINDING

NAVY / SHIPYARD

Components in military ships are continuously exposed to salt water. This increases the risk of corrosion. On the high seas the **quality of surfaces** is extremely important for safety and **operational capability**. Especially steel plates and beams must be perfectly prepared for high-quality anti-corrosion coatings. Shot blasting systems remove scale, rust and other contaminants from the component surface and create ideal surface conditions for long-lasting coatings. This targeted surface preparation is especially important for welded assemblies with complex shapes. Optimal paint preparation helps increase **performance** and guarantees long-term operational safety. Our surface improvement technologies make a significant contribution towards making navy systems absolutely reliable, even under extreme conditions.

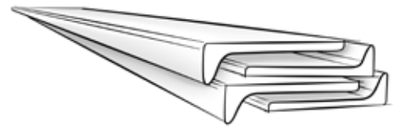


Steel plates



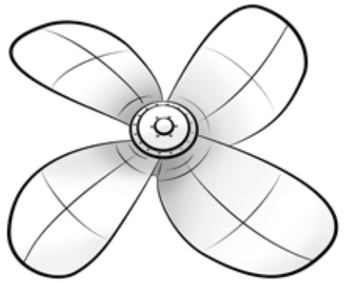
TEXTURING | DE-RUSTING | DESCALING

Bulb profiles



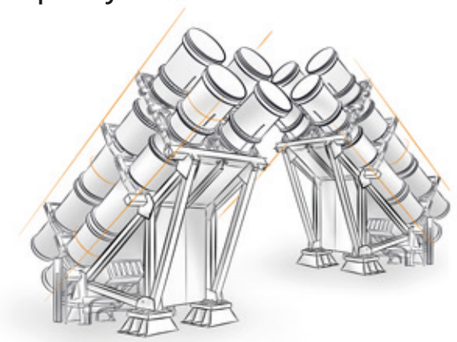
TEXTURING | DE-RUSTING | DESCALING

Ship propellers



ACTIVATION | POLISHING | EDGE RADIUSING
ISOTROPIC SURFACE FINISHING ISF®

Weapon systems



SHOT PEENING | ACTIVATION | POLISHING
EDGE RADIUSING | DEBURRING

You cannot find your work pieces?
We develop the perfect surface finishing process for any work piece.
Contact us, and we will assist you!

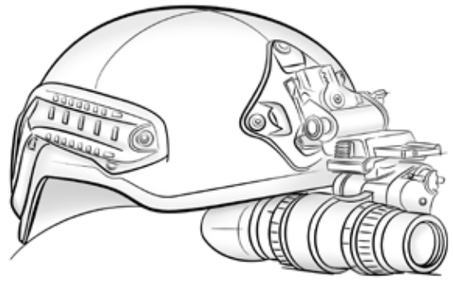
3D PRINTED COMPONENTS FOR SOLDIERS

Additive manufacturing offers a new approach towards creating individualized kits: The component dimensions are **perfectly adapted** to each individual soldier and, if needed, can be produced on site. Functional elements and man-portable systems are exactly tailored to the individual user and his/her needs. To fulfill the demanding specifications for **precision**, **stability** and **wear-comfort**, the raw 3D printed components must undergo a clearly defined post-processing operation. Our mechanical systems for surface refinement of 3D printed components create **homogeneous component structures** as well as technical and functional surface finishes. This guarantees high performance and functional reliability of any military gear, which will meet the toughest conditions in the field.

Helmet padding with a micro lattice structure

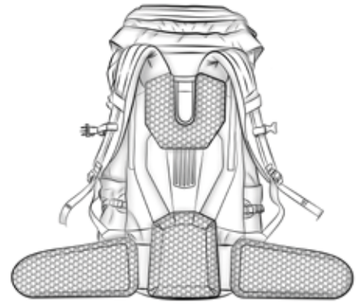
POWDER REMOVAL | HOMOGENIZATION
COMPACTING | CLEANING | SMOOTHING

Tailored Night Vision Gear



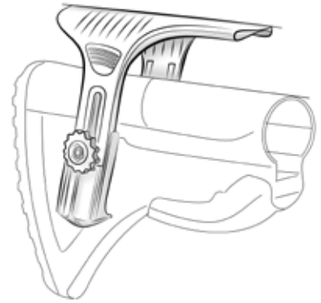
POWDER REMOVAL | HOMOGENIZATION
COMPACTING | CLEANING | SMOOTHING | POLISHING

Backpack with cushioning net



POWDER REMOVAL | HOMOGENIZATION
COMPACTING | CLEANING | SMOOTHING

Cheek rest for rifles



POWDER REMOVAL | HOMOGENIZATION
COMPACTING | CLEANING | SMOOTHING | POLISHING

Individualized grips

POWDER REMOVAL | HOMOGENIZATION
COMPACTING | CLEANING | SMOOTHING | POLISHING

Tailormade orthosis components

POWDER REMOVAL | HOMOGENIZATION
COMPACTING | CLEANING | SMOOTHING | POLISHING

TYPES OF MASS FINISHING EQUIPMENT

Mass finishing offers numerous surface treatment methods for components used in the defense industry. These methods create excellent surface finishes, which meet the most stringent quality standards. The components can be processed in **batch machines**, where a mix of work pieces and processing media is loosely tumbling in a machine. High-value components are usually **treated in single piece operations**. Moreover, the components can be processed in **continuous flow mode** or in **fully automatic systems**. The Rösler equipment portfolio offers a solution for any surface finishing task. The equipment selection always depends on work piece size & dimensions and the production volume.

OVERVIEW RÖSLER PORTFOLIO OF MASS FINISHING EQUIPMENT

Rotary vibrators

In these machines a special vibratory motor induces vibratory energy into the processing bowl, causing the media/work piece mix to move in a spiral motion. The resulting "rubbing" between media and work pieces produces highly homogeneous surface finishes. Standard machines are typically used for cost-efficient finishing of entire batches. Rotary vibrators without inner dome allow the processing of high-value single components, which must not collide with each other during the finishing operation. Because of their compact design, high process stability and easy integration into manufacturing lines, rotary vibrators represent a highly flexible solution for a wide range of finishing tasks.

Rotary vibrator

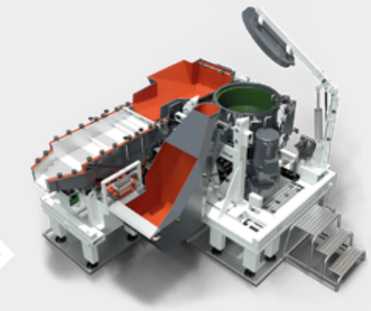
Dome-less rotary vibrator

Tub vibrators

Tub vibrators are used for the treatment of large and/or heavy parts. They permit the processing of one single component at a time, as well as the simultaneous finishing of several work pieces. If these are very delicate, the processing bowl can be partitioned into several chambers. Alternatively, the work pieces can be mounted on special fixtures. In either case they never touch each other during the process. Tub vibrators are equipped with special vibratory drive systems, which, like in rotary vibrators, cause the media/work piece mix to rotate in the processing bowl. They are the ideal solution for efficient and gentle finishing of large and particularly heavy components.

High energy disc systems

The main components of high energy disc systems are a stationary cylindrical work bowl and a rotating disc running at speeds of 60 – 250 RPM. The centrifugal force of the rotating disc impels the mix of processing media and work pieces up the wall of the stationary work bowl. Once the media/work piece mix has lost its kinetic energy, it collapses to the center of the disc, from where it is accelerated again. Compared to vibratory systems high energy disc systems create an up to 15 times higher processing intensity.



Washing and drying systems

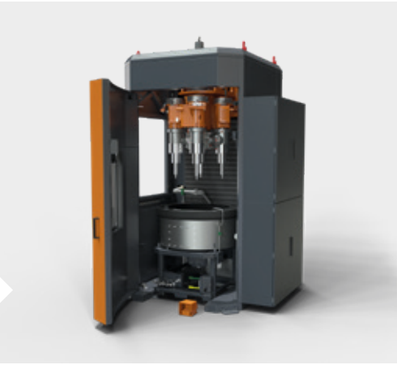
WTA machines allow the integration of mass finishing, cleaning and drying operations into one single, fully automatic unit. Part-on-part processing without any media creates excellent surface finishes and helps keeping the costs low. Depending on how they are equipped, WTA systems are used for standard mass finishing tasks as well as for cleaning, de-oiling or pickling operations. Different machine types like rotary vibrators or high energy disc systems permit the perfect adaptation to any kind of finishing task.

Drag Finishers

Drag finishing is ideal for treating high-value, delicate and complex components, which require precise and targeted single piece processing. Attached to special fixtures, the work pieces are mounted to rotating workstations (spindles) integrated into a carousel. As the carousel is lowered, the workstations with attached work pieces are immersed into a bed of grinding or polishing media. The rotation of carousel and workstations creates enormous pressure so that compared to vibratory systems drag finishers achieve an up to 30 times higher processing intensity.

Surf-Finisher

Several working spindles, each containing one work piece, or work pieces mounted to the collet of a robot, are immersed into the rotating processing bowl filled with grinding or polishing media. While systems with fixed working spindles are somewhat limited in their motion, robot-guided work piece processing can handle practically any surface finishing task. The high pressure generated by the impact of the rotating media on the work pieces results in an extremely high processing intensity.



TYPES OF SHOT BLASTING EQUIPMENT

Shot blast machines, equipped with turbines or pressure blast systems, offer a wide range of treatment options, from **manual handling of single pieces**, over **batch processing** to **fully automated continuous flow equipment**.
In demanding industries like defense, shot blasting systems are, for example, used to increase the wear and stress resistance of safety components. The so-called **shot peening** technology induces a residual compressive stress on the component surface, which increases the component's resistance against bending and tensile loads.

OVERVIEW RÖSLER PORTFOLIO OF SHOT BLASTING EQUIPMENT

Preservation line KON

Preservation lines are custom engineered, fully automated systems for pre-warming, de-rusting / descaling and applying a temporary corrosion protection coating (welding primer) for all kinds of steel components. At the center of every preservation line is always a shot blast machine, preceded and followed by various different equipment modules.

Continuous feed spinner hanger blast machine RHBD-K

Rösler continuous feed hanger machines are designed for cleaning high volumes of large, bulky steel components. Flexible work piece transport systems, such as power & free lines, link the shot blast equipment with the subsequent painting and drying units.

Spinner hanger blast machine RHBE / RHBD-T

RHBE machines are used for blast cleaning delicate work pieces with complex shapes, as well as heavy and bulky components, which must not touch each other during the cleaning process. The work pieces are placed onto a special work piece carrier and then transported into the blast chamber. There, the work piece carrier is simultaneously rotating and oscillating back and forth. This ensures excellent blast coverage on the work pieces.

Wire mesh belt blast machine RDGE

Rösler wire mesh blast machine allow the all-around shot blasting of flat, bulky and very complex work pieces in continuous flow mode.

Tumble belt batch blast machine RMBC

Tumble belt batch machines are ideal for treating small to midsize work pieces, which can tumble over each other without causing any damage. RMBC machines produce excellent blast results, on extremely small as well as relatively large, compact work pieces.

Blast cabinet RSK

Rösler blast cabinets are standard blast machines, which have proven their reliability and productivity hundreds of times. In their basic version RSK machines can be equipped with a suction or pressure blast system, along with a dust collector. Standard machines are equipped with a roll-up front door and a large viewing window. The cabin design is modular, allowing easy addition of a rotary table or basket. Additional options are automated nozzle movement, expanded blast media recycling and cleaning system and additional wear protection.

AM SOLUTIONS EQUIPMENT

Essential post processing tasks for raw 3D printed components are, among others, the **removal of powder** from the work pieces. The powder can be **loose or sintered to the work pieces**. Additional tasks are surface improvement through **defined edge radiusing**, **surface smoothing** or **mirror polishing**.

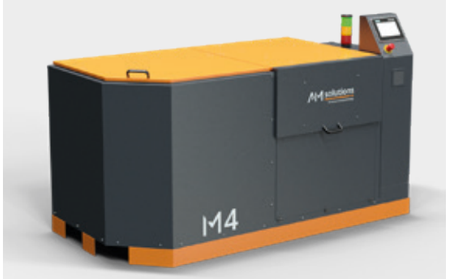
OVERVIEW AM SOLUTIONS POST PROCESSING SYSTEMS

S1 – Smart multi-talented machines for perfect surface cleaning and finishing

The latest generation of the S1 system is setting new standards for post processing components printed with the powder bed-based polymer technology. The smart plug-and-play solution permits cleaning and surface finishing in one single machine. Thanks to software that allows fully automatic operation, S1 machines are very easy to operate. The compact and sturdy machine design facilitates integration of the S1 into any production line. The machines produce not only highly consistent results, but they also allow traceability of the work pieces and are very economical. The ergonomic design, combined with an optimized nozzle setup for automatic operation, are other essential machine features.

M4 – mobile 2-in-1 system guarantees absolute process stability and a maximum in cost-efficiency

The M4 combines a mass finishing machine with a cleaning centrifuge for fully automatic operation. It allows economic and reliable post processing of 3D printed plastic and metal components. The system handles a broad spectrum of tasks like surface grinding and smoothing, polishing, deburring, matting and cleaning. It guarantees excellent and consistent finishing results. The M4 allows single part- as well as batch-processing. The integrated controls with storable electronic programs ensure precise process management that is perfectly adapted to work piece material, shape and desired surface finish. The closed-loop centrifugal process water cleaning and recycling system makes the M4 independent from the fresh-water supply and guarantees absolutely clean work pieces with a drastically reduced water consumption. The machine housing, insulated for noise reduction reduces the ambient operating noise to below 69 dB(A), ideal for use in any production environment.



C1 Max – efficient cleaning of large SLA components

The C1 Max is an automated, user-friendly post processing machine with process monitoring for 3D printed polymer components measuring up to 750 x 750 x 550 mm (L x W x H). The perfect interplay between chemical, thermal and mechanical effects results in excellent cleaning results. Even extremely complex components with difficult-to-reach internal surface areas are perfectly cleaned without jeopardizing the component integrity and without the use of hazardous solvents like IPA. Moreover, the process facilitates the manual removal of support structures, which saves time and costs. Different process programs, stored in the machine controls, guarantee optimal operational flexibility. The C1 Max is equipped with a level sensor for the cleaning medium to ensure consistently high quality. The clever machine design facilitates the loading and unloading of the base plate. In addition, it allows quick and easy exchange of the cleaning medium.

Strong technology partnerships

New 3D printing technologies are continuously expanding the possibilities of additive manufacturing. At the same time, the demands for high precision, quality and efficiency, particularly for complex components, are rapidly growing.
We at AM Solutions are, therefore, promoting close cooperation with leading manufacturers and service companies to be up to date with the latest additive manufacturing technologies. Jointly with EOS, Stratasys and HP we develop integrated total solutions, which ensure that the printing process as well as the automated post processing functions are efficient and absolutely repeatable. Thanks to these cooperative partnerships we can supply state-of-the-art post processing equipment, which meets the strictest requirements regarding work piece complexity, production quantities and quality. If you work with AM Solutions, you gain access to an ecosystem of professional knowledge, technological solutions and experience ranging across many industries. We guarantee optimal results in the field of additive manufacturing.

AUTOMATED FINISHING SYSTEMS

High precision and low risk

Automated surface treatment of work pieces results in **more precise results** and consistent compliance with specifications and legal standards. However, we achieve not only **significant savings in material and personnel** when treating large work piece volumes but also when processing high-value single components.

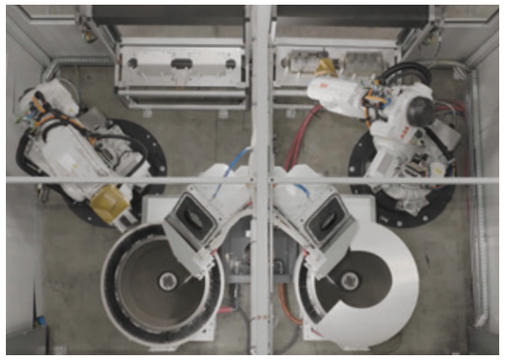
The benefits of Rösler automation:

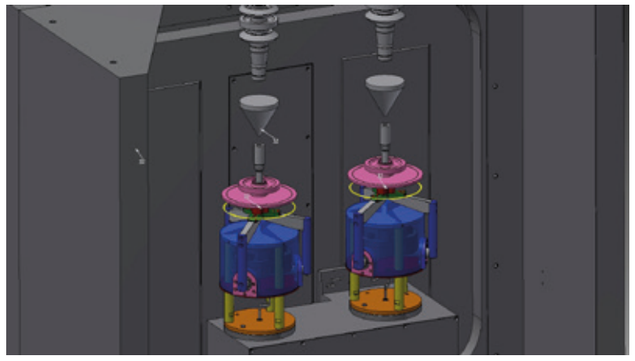
- Savings of costs and space combined with **maximum capacity utilization**
  - Tailormade solutions save valuable manufacturing space
  - Fully automatic loading and unloading of work pieces minimizes idle production times

- Increased **precision and process safety**
  - The consolidation of sequential work steps (integration of optical monitoring, control and measuring) saves time and minimizes the need for manual intervention by qualified personnel
  - Fully automatic masking and de-masking helps lower the material costs
  - Integrated measuring operations and automatic work piece recognition speed up the manufacturing process
  - Tracing of work pieces through the entire surface treatment system simplifies quality control

- Decades of experience and **in-house Customer Experience Centers**
  - Comprehensive expertise from numerous successful projects
  - Special material handling solutions for the rough shot blasting environment
  - Development of work piece fixtures (for automatic or manual operation) based on proven concepts

- Integration of **industrial robots**
  - Set-up, programming and consulting for multi robot systems with 14 simultaneous axes and more
  - Comprehensive experience with ABB and RobotStudio





EQUIPMENT CONTROLS AND DIGITIZATION

Practical use of Industry 4.0

Components used in the defense industry must be extremely safe and reliable. This demands a **high degree of efficiency** and exact **repeatability** of the process results. Our control and digitization solutions facilitate monitoring of the production and the automation of individual customer operations.

The benefits of Rösler control and digitization solutions:

- Minimization of idle production times and interruptions of the production through digital **3D machine models**
  - Programming and production preparation for new work pieces through simulation, offline programming and remote access

- **Automatically managed maintenance** and quick, **remote trouble shooting** improve the cost-efficiency
  - Display and recording of all equipment faults
  - Safe remote maintenance support via VPN and access to all Rösler subsystems
  - Active management of maintenance operations with recorded time for each wear part and optional re-ordering module

- **Direct, cross-system communication** facilitates process optimization
  - Integration of your Rösler equipment into your internal digital network
  - Automatic work piece recognition and data management for every single work piece
  - Exchange of work piece data and process parameters with external systems (e.g., internal data bank, SAP interface, etc.)
  - Recording of all process parameters in a work piece specific document as preparation for compliance with certification rules
  - Combination of PLC, CNC and robot controls into one integrated network

- Digital process water monitoring and management with **Rösler Smart Solutions**
  - Continuous monitoring and control of the mass finishing process
  - Automatic analysis and tuning of the process water
  - Optimal use of resources and reduction of costs

SMART SOLUTIONS

MEDIA AND COMPOUNDS

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, medial 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.

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.

CUSTOMER EXPERIENCE CENTER

A particular strength of the Rösler system is the **integrated approach** towards the development of finishing solutions. Equipment and the underlying processes are tailored to the given finishing requirements. And they are optimally integrated into the existing manufacturing flow. Many Rösler subsidiaries have their own **Customer Experience Centers (CEC)** equipped with the latest equipment technologies.

To develop feasible surface treatment processes, we conduct **processing trials** with the customer work pieces in one of our customer experience centers.

CEC Mass finishing

CEC Shot blasting

CEC AM Solutions

Process development and optimization

From initial processing trials, over process development to detailed equipment concepts/implementation and professional after sales service – we provide **total solutions from one single source**.

In our well-equipped CEC’s we can re-create the most complex finishing operations, under actual manufacturing conditions.

With ultramodern chemical and physical **measuring technologies** we support the process development and optimization. Day in and day out our engineers in the **engineering and development departments** are creating finishing solutions tailored to the **individual customer requirements**.

Product development and optimization

The enormous depth of the Rösler product and service range, numerous **CEC’s around the world** and our state-of-the-art chemical laboratory at the Untermerzbach location in Germany are the ideal precondition for cost-efficient, innovative development and optimization of new products.

At Rösler we **develop and produce** all our products, from media & compounds to the most complex equipment solutions, in house. This high manufacturing depth is unparalleled in our industry

RÖSLER®
finding a better way ...

Mass Finishing

Shot Blasting

AM Solutions

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