BENSELER

Smart surface solutions

Have you got a moment or two?

Yes? Then this brochure is in the right hands. For over 50 years the BENSELER Group has been your partner for sophisticated tasks in the fields of coating, surface treatment, deburring, shaping, and styling. Our processes change the products visibly or enhance them. But not only appearances are important for our customers who cast a second, generally even more critical look at our work, for example with a microscope or high-tech quality testing methods.

Our processes also stand up to an economic assessment. As a system partner, especially of the automotive industry, medical technology and the electronics industry, cost-efficient processes are a matter of course for us.

In the following pages we present some products that we have processed with our technologies. We have coated, painted, deburred, cleaned, or enhanced them by means of upstream or downstream processes. They therefore offer added value for customers and users, and stand out from other products in the market place.

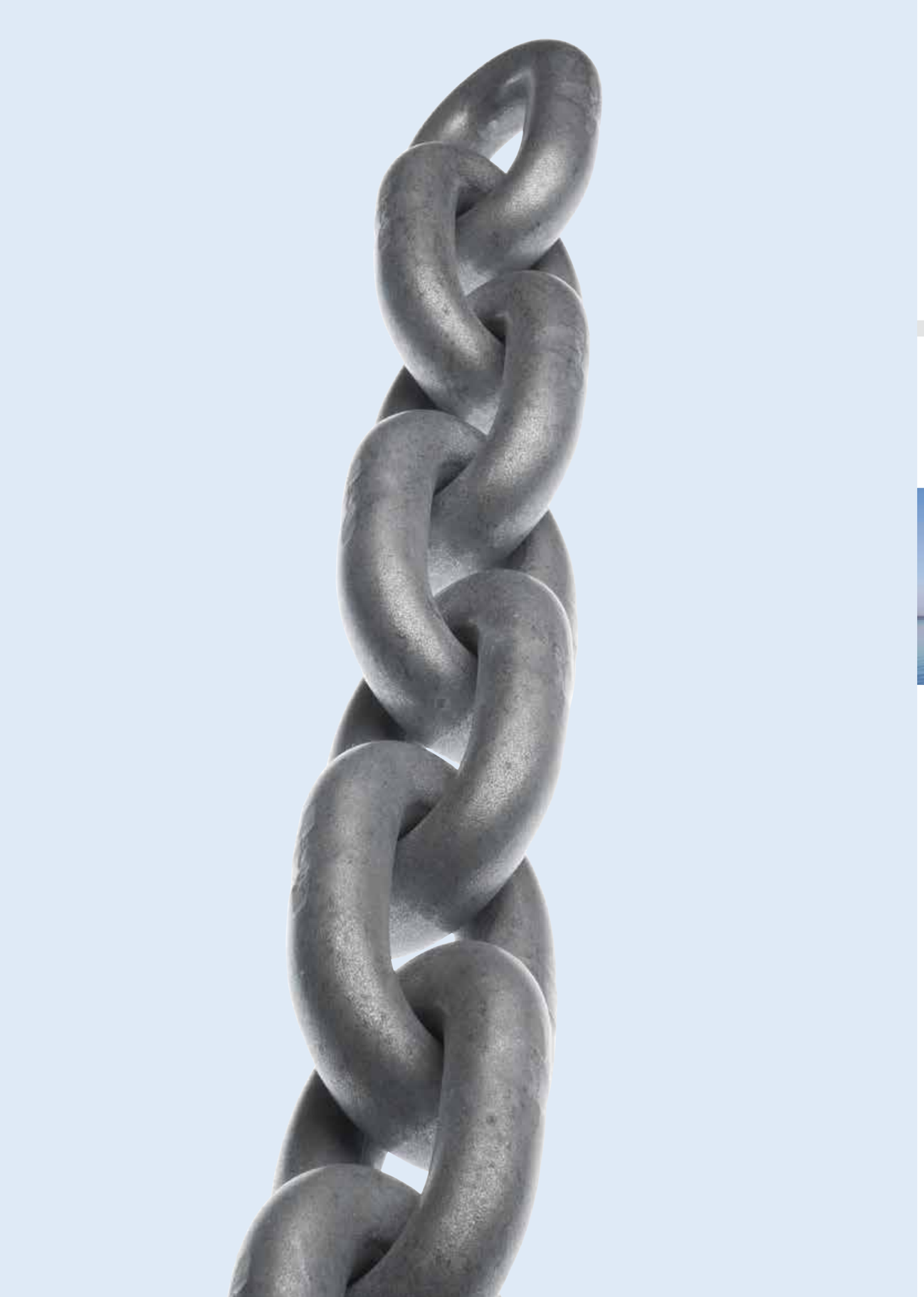
We trust that the brochure will give you an interesting insight into our work.

Brilliant lightweights

A plastic roof-edge spoiler keeps the Audi A3 Sportback on course

The aim is that they should be lighter and therefore fuel-efficient, and even faster and more aerodynamic. Car manufacturers are faced with more and more new legal requirements and self-defined goals. These developments have an influence on the materials that are used in cars. The stars of the moment are lightweights like magnesium, aluminum, and synthetic materials. A challenge for the suppliers of the automotive industry.

With the A3 Sportback Basic and S-line the Audi engineers have opted for a plastic roof-edge spoiler: a material that needs to be professionally pretreated and coated in much the same way as the conventional steel parts. In the pretreatment of plastics, BENSELER relies on the 5-zone powerwash plant. This guarantees a very high surface quality and a high degree of process reliability for a very wide range of basic materials such as plastic injection molding, SMC and fiber-reinforced plastics. For the subsequent 3-layer wet coating, the surface coating specialist makes use of all the car colors that Audi has in its program.



Protecting chain links from brittleness

ArmorGalv®-system extends the life of steel chains

Anchor chains, buoy chains, lifting-gear, and load-securing chains: the possible uses of steel chains in the shipping sector are as varied as the types of ships that are under way on the world's oceans. However, in the long run salt water and extreme variations in temperature make even steel-hard links in a chain brittle.

With the zinc thermo-diffusion system ArmorGalv®, BENSELER provides chains in the maritime onshore and offshore sectors with a very high degree of corrosion protection and thus a considerably longer service life. With the Armor-Galv® coating, the corrosion rate is reduced many times over compared with unprotected steel.

So as a result, less chain material is needed in the first place – a plus as regards cost and weight reduction. In the case of the lashing chains on a freighter, the weight can therefore be reduced by up to 20 percent, with the result that additional goods can be loaded. And, unlike with hot-dip galvanized steels, white rust is also scarcely a problem with thermo-diffusion-coated chains – so, "cast off and full steam ahead!"

It begins work at 110 km/h

The extendable BMW 3er GT spoiler

It's reserved and it's not so easy to lure it out of its hideaway: the extendable rear spoiler of the BMW 3er GT only appears when it gets up to a speed of 110 km/h. A professional pretreatment and coating is essential for its successful appearance – even after years of use. After all, the rear wing of galvanized sheet steel is exposed to strong physical influences: its surface is eaten away by spray water, ice, salt, or the impact of flying stones.

BENSELER creates an important basis for durability and optimum corrosion protection by means of a cathodic dip coating. Additionally, a PVC flange-fold sealing provides an all-round seal for the component. Finally, the rear spoiler is given a 3-layer wet coating in one of the 14 different car colors.

Besides classical coating tasks BENSELER also carries out the associated assembly work on a project basis. In the case of the rear spoiler, the suppliers undertake to attach the fusible plug to the spoiler plate. After that, BENSELER sends the assembly-ready part direct to BMW in Dingolfing where, as the very final step, it simply has to be screwed on.

Seeing clearly – day and night

PVD UV coating prepares radio consoles optimally for night shifts

Plastic parts are frequently used in the automotive sector, above all because of their lightness. Besides exterior plastic parts, they are also genuine all-rounders inside the car. Here it is not just a question of the visual appearance: special functions are also in demand. In order to make, for example, the key symbols of radio consoles visible at night, a special coating process is required. For instance, the combination of plasma-vacuum deposition (PVD) with a 100-percent UV coating. The BENSELER Group employs this process to prepare radio consoles for use in Land Rover vehicles. After the basecoat, a PVD coating is applied to the blanks for the keys. This is then partially stripped off using laser technology – in the shape of each key symbol – and sealed with the UV coating.

So the various key symbols can be recognized not only in daylight; illuminated from behind, the process also makes it easier for the driver to find the right button in the dark. In addition to the so-called day-night design, the PVD UV coating process is also characterized by its excellent durability: sweat, hand cream, fat or sharp fingernails will not harm the keys in any way.

Keeping a tight grip!

Long-term protection for high-strength connection elements in commercial vehicles

When it's a matter of screw connections in the automotive sector, two quality features are especially in demand: optimum screw connection characteristics and long-term corrosion protection.

An example of this are wheel bolts and nuts, which are frequently exposed to water and salt; also, they have to survive any necessary wheel changes without bending or breaking. That's not a simple matter, because wheel changes – whether in winter or summertime or resulting from a breakdown – demand a high degree of functional reliability from the threaded parts. Since screw connections count as safety-relevant parts, they have to be particularly robust and resilient – from the first tightening to the last unscrewing.

For decades, commercial vehicle manufacturers have been working with BENSELER to prepare connection elements optimally for these challenges. Depending on the size, geometry and specific requirements, the components are provided with surface protection and specified topcoats in bulk or on racks using the environmentally friendly GEOMET® process. The result of this coating system: enormous resistance to weathering and ideal screw connection characteristics lasting for many years.

Regulating under high pressure

Reliable deburring against all resistance

The fuel supply systems of vehicles powered by natural gas work under special pressure. They have to withstand the 200 bar under which the fuel natural gas is stored in the tank – and in addition to this remain leakproof for the whole life of a vehicle. So it goes without saying that every component used in the gas unit has to meet the highest production standards.

These components with special requirements also include the valve body of the natural gas pressure regulator. This has the task of regulating the gas stream ahead of the injectors. So that this works smoothly and without any problems, among other things a valve body that is completely free of burrs is required. BENSELER is responsible for this.

At their location in Marbach, the service providers deburr the internally intersecting drill holes by means of electrochemical deburring (ECM). This ensures that during operation no burrs become detached in the valve, thus possibly damaging the seals. The result: relative to the outside impermeable, internally clean fuel supply systems for safe and reliable combustion processes.

Keeping a clear head

Partial zinc flake coating for smooth connection

Protecting vehicle components seamlessly from corrosion is a challenging task. It is even more complex if only some areas of these components are to be coated, for example because ease of assembly requires it. This is the case, for instance, with the ball pivot. As a movable connection between the transverse control arm and steering stub axle, this rotatable element, which is exposed to all kinds of weather conditions, plays a key role in the wheel suspension.

As specialists for the partial zinc flake coating of components, BENSELER relies in such cases on the electrostatic spray technology, which permits adherence to the extremely tight tolerances specified. And so a zinc flake coating preserves the shaft and thread of the ball pivot from corrosion while its head remains uncoated – thus it is kept well-lubricated and it functions smoothly.

Burr-free and well-rounded

Precision shaping thanks to electrochemical metal machining

With some things you can't see from the outside what they are capable of – injectors, for example. They are a central component of the Common Rail injection technology. Injectors are responsible for injecting finely dosed quantities of fuel into the combustion chamber. So that this can be done successfully and precisely, there must be no restriction of the drill holes by burrs inside the injector. Additionally, these drill holes have to be connected with one another free of burrs and with well-rounded edges – an impossible task with mechanical machining.

The solution at BENSELER: metal machining with the ECM method. ECM stands for electrochemical deburring and permits precision shaping without causing secondary burrs in the process. In practical terms this means: burrs are dissolved electrolytically, edges are rounded, and interior chambers are machined by means of precise metal removal so as to connect the drill holes. In this way, drill holes can also be widened where necessary.

The result: injectors with a well-rounded interior for unchecked fuel injection.

Coating processes

GEOMET®

Water-based thin-film corrosion protection system

System specified worldwide in the automotive industry

High corrosion protection:
With Fe materials acc. to DIN EN 9227 NSS:
> 720 h for GEOMET® 321/500 with average coating thickness of 8 µm
No base metal corrosion
No infiltration

Temperature resistance:
Up to 250 °C

Baking temperature basecoat:
290 °C to 310 °C

Usual coating thicknesses:
Average 8 µm

Color:
Silver, or by means of topcoat: black

Resistance to:
· UV rays (sunlight)
· Fuels, brake fluid, oils, common organic solvents
· Biodiesel

Fulfills the EU end-of-life vehicle directive:
Lead: free
Cadmium: free
Mercury: free
Chromium 6+: free

Subsequent cleaning of the exhaust air after coating:
Not necessary, as almost organic, solvent-free, water-based thin-film corrosion protection system
Basecoat < 4% organic solvent
Topcoat water basis

Product range:
GEOMET® 321, GEOMET® 500
Topcoat-PLUS® series:
XL/VL/ML/M/ML/VL/H-Black
GEOBLACK® system
GEOKOTE® system
DACROLUB® system

Other items:
· If required, the frictional coefficients are adjusted, with the corresponding topcoat, to the desired narrow window: Overall window: 0.06 to 0.20 µ
· Hydrogen-embrittlement-free system

DELTA MKS® System

Organic solvent-based thin-film corrosion protection system

System specified worldwide in the automotive industry

High corrosion protection:
With Fe materials acc. to DIN EN 9227 NSS:
> 720 h for DELTA-PROTEKT® with average coating thickness of 10 µm
> 480 h for DELTA-TONE® with average coating thickness of 12 µm
No base metal corrosion
No infiltration

Temperature resistance:
Up to 190 °C

Baking temperature basecoat:
180 °C to 240 °C

Usual coating thicknesses:
Average DELTA-PROTEKT 10 µm
Average DELTA-TONE 12 µm

Color:
Silver, or by means of topcoat: black

Resistance to:
· UV rays (sunlight)
· Fuels, brake fluid, oils, common organic solvents
· Biodiesel

Fulfills the EU end-of-life vehicle directive:
Lead: free
Cadmium: free
Mercury: free
Chromium: free

Subsequent cleaning of the exhaust air after coating:
Necessary, as base- and topcoats are mostly organic solvents

Product range:
DELTA-TONE®, DELTA-PROTEKT® KL100
Topcoats: DELTA®-SEAL – SILVER/BLACK
DELTA-PROTEKT®-VH series
300/301/302
DELTA-LUBE®
DELTACOLL®

Other items:
· If required, the frictional coefficients are adjusted, with the corresponding topcoat, to the desired narrow window: Overall window: 0.08 to 0.16 µ
· Hydrogen-embrittlement-free system

ZINTEK® System

Organic solvent-based thin-film corrosion protection system

System specified worldwide in the automotive industry

High corrosion protection:
With Fe materials acc. to DIN EN 9227 NSS:
> 720 h for ZINTEK® with average coating thickness of 9 µm

Temperature resistance:
Up to 190 °C

Baking temperature basecoat:
200 °C to 230 °C

Usual coating thicknesses:
Average ZINTEK 200/300 9 µm

Color:
Silver, or by means of topcoat: black

Resistance to:
· UV rays (sunlight)
· Fuels, brake fluid, oils, common organic solvents
· Biodiesel

Fulfills the EU end-of-life vehicle directive:
Lead: free
Cadmium: free
Mercury: free
Chromium: free

Subsequent cleaning of the exhaust air after coating:
Necessary, as base- and topcoats are mostly organic solvents

Product range:
ZINTEK® 200 (silver basecoat)
ZINTEK® 300 (black basecoat)
Topcoats: TEC-SEAL® L
ZINTEK® Top L

Other items:
· If required, the frictional coefficients are adjusted, with the corresponding topcoat, to the desired narrow window: Overall window: 0.08 to 0.16 µ
· Hydrogen-embrittlement-free system

ArmorGalv®

Zinc thermal diffusion process

Specified widely in the industry

High corrosion protection:
With Fe materials acc. to DIN EN 9227 NSS:
1,500 to 5,000 h
No base metal corrosion,
No infiltration

Temperature resistance:
200 °C ta 650 °C depending on the topcoat

Baking temperature basecoat:
330 °C to 420 °C

Usual coating thicknesses:
ArmorGalv® 10 – 50 µm

Color:
Metallic grey,
Silver or black by means of topcoat

Resistance to:
· UV rays (sunlight)
· Fuels, brake fluid, oils, common organic solvents
· Biodiesel
· Resistance to acids and alkalis pH > 2 and pH < 11

Sustainability:
No solvents or toxic substances in the process chain
Fulfills the EU end-of-life vehicle directive

Product range:
ArmorGalv®, topcoat and sealing as specified

Other items:
· If required, the frictional coefficients are adjusted, with the corresponding topcoat, to the desired narrow window: Overall window: 0.08 to 0.16 µ
· Hydrogen-embrittlement-free system

KTL

Cathodic dip coating

Specified in the automotive industry:
Worldwide for all auto manufacturers and their suppliers

High corrosion protection:
· 240 h ... 1000 h salt spray test (Depends on the coating thickness)
· Up to 15 cycles VDA change test (Depends on base material and coating thickness)

Temperature resistance:
Up to 150 °C

Usual baking temperature:
180 °C to 200 °C

Usual coating thicknesses:
Thin film: From 15 µm to 25 µm
Thick film: From 30 µm to 35 µm

Color:
Black

Characteristics:
· Good coating (coverage) of cavities
· Chemical resistance (Common fuels, brake fluids, oils, and solvents)
· Uniform coating thickness
· Can be painted over
· Resistance to common fuels, brake fluids, oils, and solvents

Fulfills the EU end-of-life vehicle directive:
Lead: free
Cadmium: free
Mercury: free
Chromium 6+: free

Sonstiges:
Catalytic dip coating is often used as a basecoat for powder and wet coatings

EPS

Electrostatic powder coating

High corrosion protection:
With Fe materials and light metals, depending on the conversion layer selected, at least 240 h
No infiltration in the scratch track acc. to DIN EN ISO 9227 NSS (previously DIN 50021SS)

Temperature resistance:
Up to 150 °C

Usual baking temperature:
120 °C to 180 °C

Usual coating thicknesses:
From 40 µm to 300 µm

Color:
All the available colors and degrees of gloss can be used

Resistance to:
· UV rays (sunlight)
· Common fuels, brake fluids, oils, and solvents
· Biodiesel
· Resistance to stone impact

Fulfills the EU end-of-life vehicle directive:
Lead: free
Cadmium: free
Mercury: free
Chromium 6+: free

Product range:
· Epoxy
· Polyester
· Metallic and acrylic paints in outer skin quality

NL

Wet coating

Specified in the automotive industry:
Varying requirements, depending on the OEM, are defined in the drawing messages in accordance with the field of application of the paintwork, e.g. powerwash, robotic painting etc.

High corrosion protection:
With Fe materials and light metals depending on the conversion layer chosen at least 240 h without infiltration in the scratch track acc. to DIN EN ISO 9227 NSS (previously DIN 50021SS).

Temperature resistance:
From –35 °C to 180 °C, with special coatings up to 600 °C possible

Usual drying temperature:
· Plastic parts up to 80 °C
· Metal parts up to max. 250 °C

Usual coating thicknesses:
Up to 80 µm

Color:
All the colors and degrees of gloss can be used, also various tactile characteristics

Depending on the paint system, resistance to:
· UV rays (sunlight)
· Fuels, brake fluid, oils, common solvents
· Biodiesel
· Acids > than pH 4
· Alkaline solutions < than pH 9
· Resistance to stone impact

Fulfills the EU end-of-life vehicle directive:
Lead: free
Cadmium: free
Mercury: free
Chromium 6+: free

Product range:
Soft coats, decorative paints, metallic paints, metallic effect paints, clear coats, 2-component paints and UV-hardening paint systems

PVD

Plasma vacuum coating

Specified in the automotive and consumer goods industries:
Varying requirements, depending on the OEM, are defined in the drawing messages according to the field of application

Corrosion protection:
No corrosion protection

Temperature resistance:
Depends on the base material to be coated
With plastics approx. 60 °C to 80 °C

Usual baking temperature:
PVD coating does not have to be baked

Usual coating thicknesses:
from 0,3 µm to 2 µm

Color:
Metallic silver, in various shades and degrees of gloss

Resistance and scratch resistance:
depending on the topcoat used

Fulfills the EU end-of-life vehicle directive:
Lead: free
Cadmium: free
Mercury: free
Chromium 6+: free

Product range:
Decorative coating, as substitution for chrome-plating in the design

Deburring processes

TEM

Thermal deburring

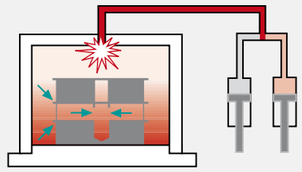
We employ the thermal deburring method wherever the quality of the deburring substantially affects the functioning of the components or where alternatives have to be found for wage-intensive deburring work.

With this method all the burrs on the workpiece are burnt off in a deburring chamber filled with a oxygen-fuel gas mixture. The combustion of the burrs, which is effected on the surface of the component without material removal, only takes a few milliseconds, so that the workpieces only warm up insignificantly.

The deburring quality, in particular the complete stabilization of all the burr edges, is determined on the one hand by means of the gas volume and on the other by the mixture ratio of the oxygen-fuel gas mixture. Here the optimum design of the deburring equipment required is of decisive importance for the result.

Advantages:

· All the burr locations on the workpiece are deburred
· Very high process reliability
· The burr roots are sealed



ECM

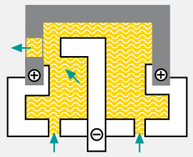
Electrochemical deburring

The method of electrochemical metal machining is ideally suited for precise workpiece deburring and for rounding edges at exactly defined locations. This technique also enables us to incorporate contours in the surface of the workpiece.

The ECM deburring process is not dependent on the burr thickness and texture or on the alloy and the microstructure of the components. It is also applicable to casting burrs, flashes and forging burrs. We can even deburr hardened parts with this method. In this process, the burrs on the workpiece connected to an anode are dissolved electrolytically.

Advantages:

· Components subjected neither to thermal nor mechanical stress
· Precise deburring at the pre-defined locations
· No secondary burrs are formed



HDW

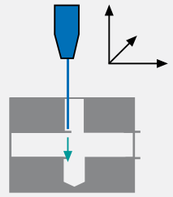
High-pressure water jet deburring

Working with a high-pressure water jet is suitable for deburring, chip removal, and cleaning. With this method, water alone is used to remove burrs at locations where other processes reach their technical or economic limits.

To achieve this, the water jet is directed with up to 800 bar pressure onto the areas of the workpiece to be deburred. In this way even inaccessible intersections and drill holes can be reached. In the process, the high kinetic energy of the water jet quickly and reliably removes the burrs at the machined edges, and also the chips and other dirt adhering to the component.

Advantages:

· Deburring, chip removal, and cleaning in one operation
· Precise positioning movement and deburring of the specified locations
· Also suitable for larger workpieces (travel distances: x = 300 mm, y = 300 mm, z = 600 mm)



Industrial parts cleaning

And cleanliness analysis in accordance with VDA 19

The task of cleaning is to enhance the functionality, quality, and service life of sophisticated components and assemblies such as hydraulic, brake, or injection systems.

The parts are cleaned in a closed multi-chamber immersion system with an automatic feeder. Here, a large number of different sizes and materials are cleaned in an aqueous solution. In addition to the lifting, lowering and rotating movements the cleaning effect can also be reinforced with 12 kW (20 watts/liter) ultrasonic transducers. Particle contaminants in deep drill holes or difficult locations are also removed with a high degree of process reliability using this method. The components are dried in a rotary and heated vacuum dryer.

Analytics:

The technical cleanliness is determined in our own laboratory in accordance with VDA 19 or guidelines specified by the customer:
· Extraction
· Gravimetry (up to 0.1 mg)
· Microscopy (automated)
· Evaluation protocol

Any other questions?

We'll be pleased to answer them.

Zinc flake systems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Organic coatings


3

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Deburring processes


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Product group:
TEM

* Affiliated company

There’s a solution to every task

Trust requires the right partner

This brochure offers you insights into the BENSELER Group and its special products and services. Maybe you have noticed a possible solution for one or other of your products in the examples given. What is presented here is just a selection from the many areas of BENSELER’s services. You will find more details of the various process technologies in our separate data sheets.

But even the most detailed descriptions and clearest visual representations in a brochure cannot replace a personal talk with one of our specialists.

So if you have any further questions, you are always cordially welcome at BENSELER.

The BENSELER Group is a company certified in accordance with ISO TS 16949, DIN EN ISO 14001.

All the information in this brochure is intended to describe our company and the effectiveness of the processes that we offer. It does not include any specific propositions for individual cases; for this, each component has to be examined and discussed individually. Therefore, binding undertakings can only be given on the basis of contracts that have actually been concluded.

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