

# AVIATION





Do you know our competences in automotive?



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*"Because the future needs a partner with ideas and commitment!" Dipl.-Ing. Kurt Stricker, Managing Director*



## FICHTNER & SCHICHT GMBH – THE NEXT GENERATION FORM

Perfect surface structures and the individual manufacture of parts at the highest level are characteristic for our proficiency in the field of erosion protection profiles. At the same time they are the recipe of success responsible for our leading market position in the aviation sector. Besides the series production of annually around 13,000 erosion protection profiles our expertise in tool mould making also comes to fruition: for parts with especially large dimensions we construct individual laminating devices. For tool applications without autoclave and tempering furnace we make innovative CRP/GRP moulds with a nickel top coating. Regular customers here include renowned companies from the international aviation industry.

### TECHNICAL PERFECTION WITH AN HOLISTIC APPROACH

In this context our electroforming with 30 high performance baths forms the core element and technological platform. Every enquiry undergoes a feasibility study and

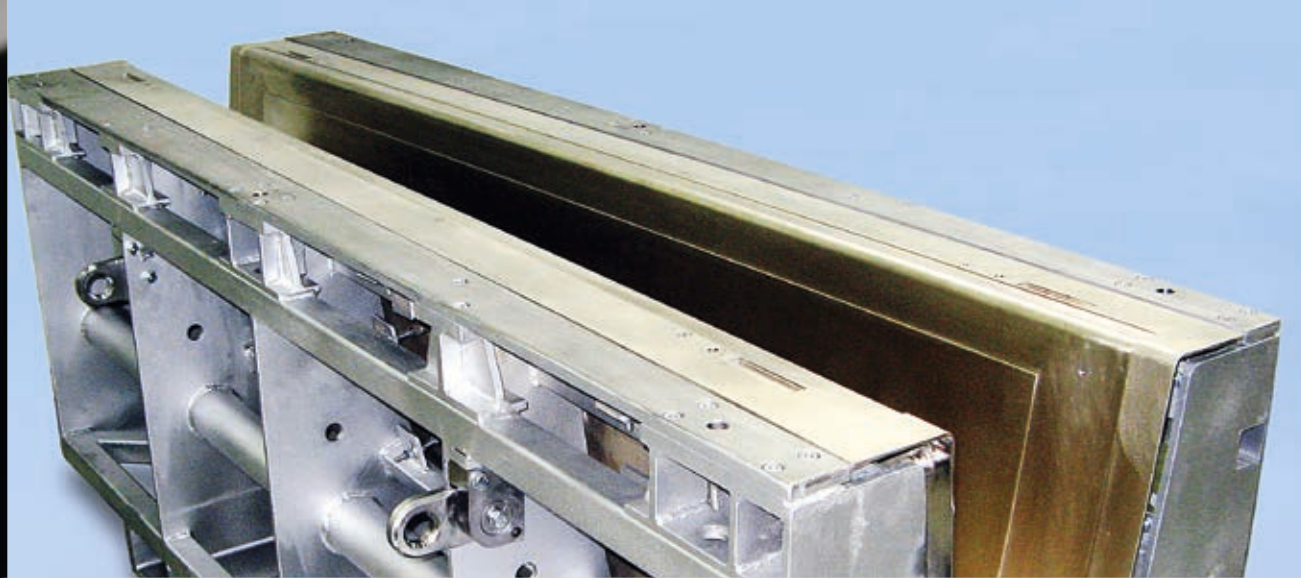
the process until delivery is checked into the most minute of detail. We achieve real cost-saving potential through our holistic approach: from model making in line with the customer specific CAD data record to the electroforming and manual machining (surface machining, blasting/priming) right through to delivery of the finished part or tool and complete tool system ready for use in production. And an additional benefit: we are pleased to accompany the installation of the tool in the facility so that a smooth start of the series is guaranteed.

### ON THE WAY TO AN ALL-IN-ONE SOLUTION TO EVERY PURPOSE

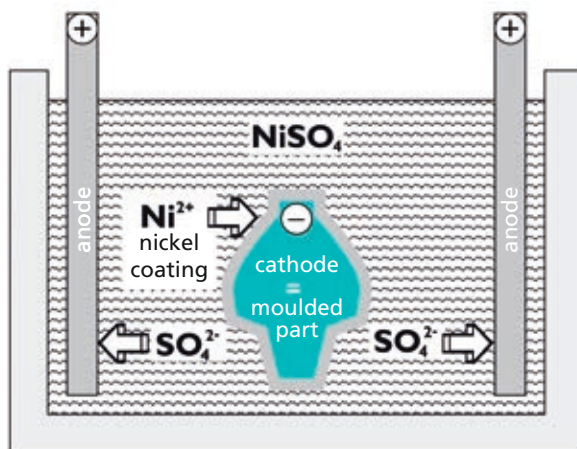
The sign of good co-operation is when heads stay cool at crucial moments, when solutions are found and swift decisions are reached. According to our company's philosophy we cultivate a partnership approach with our customers – characterised by trust, reliability and absolute loyalty.



*"The requirement profiles of our customers are the engine that drives us to the highest performance." Markus Tack, Sales Manager*



## The process stages in electroforming



## ELECTROFORMING – THE TECHNOLOGICAL BASIS

With the galvanic production of erosion protection profiles we were able to develop into the worldwide leading partner in the aviation industry and still hold this leading market position today. Differently to our tool moulds our technological competences in moulding smooth, perfect surfaces are demanded in series – profitability, efficiency and quality at the highest level.

Here we mould nickel/cobalt alloys electrolytically on previously produced bath models with our high performance baths. The resulting nickel shells possess an extremely high moulding accuracy and achieve coating thicknesses of 0.1 mm to many millimetres as well as a separation efficiency of 25 bis 50  $\mu\text{m/h}$  up to 1 mm/h. The technical requirement profiles characterize the high safety standard of these parts as erosion protection profiles are exposed to enormous climatic effects – often in combination with sand and dirt. Therefore our engineering team pursues the goal of creating optimum alloys, reducing weight and improving significantly the durability of the erosion protection profiles.





*"Our thinking and actions are controlled by absolute precision without compromise." Thomas Döpel, Chief Designer*

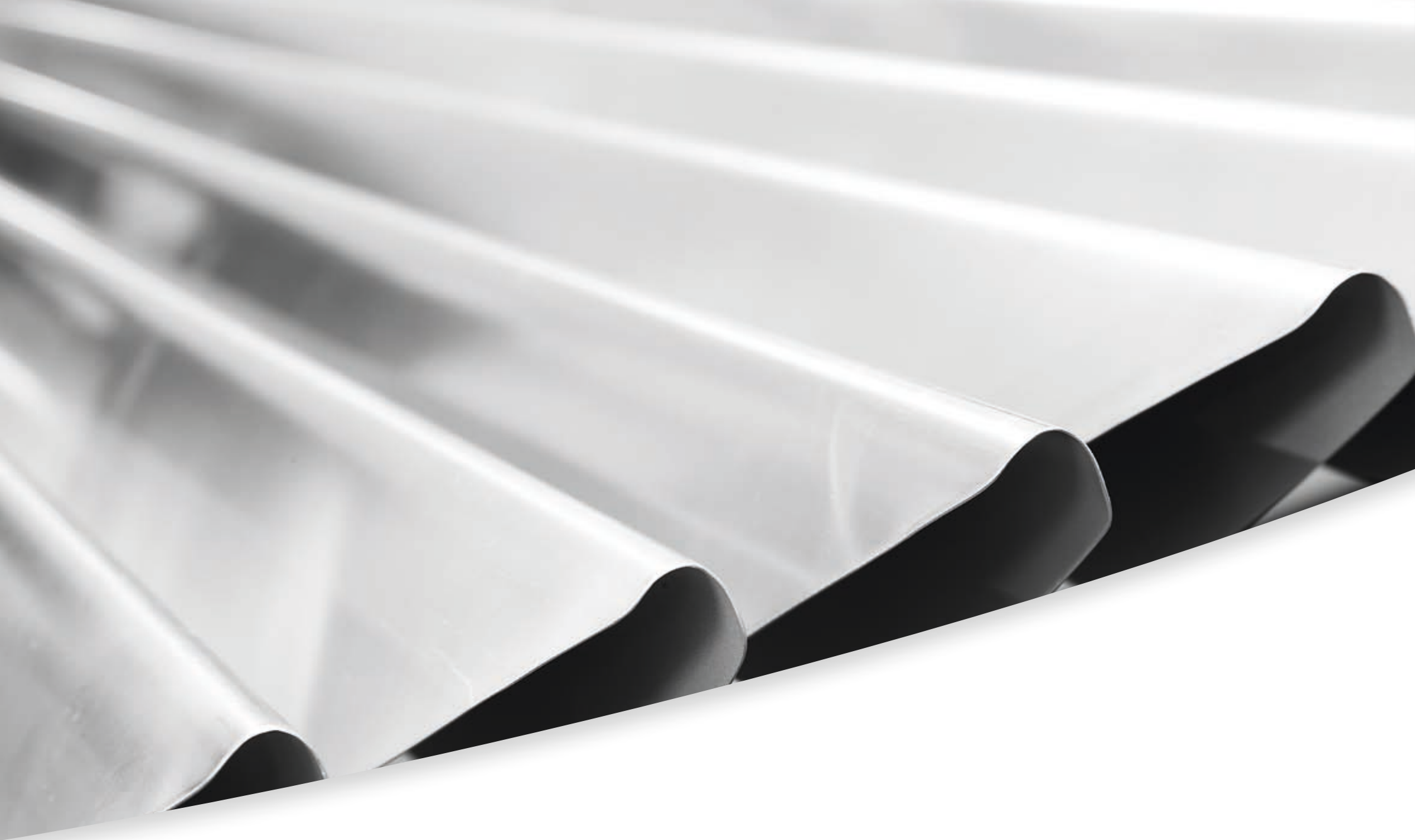




## ENGINEERING AND MODEL MAKING – GIVING SHAPE TO IDEAS

Every impulse and every idea becomes captivating when realized precisely and professionally. This is a crucial aspect for the field of engineering and model making that we pursue with every consequence. We already collaborate with renowned model makers during the manufacturing of our engineered and milled original models that we make according to customer specific CAD data. Our in-house model making facility takes over the custom-fit moulding and also the necessary manual rework of the models. Our CAD system guarantees a smooth interchange of data which is compatible with all standard interfaces.

All manufactured models undergo our strict quality control. Here we check the bath models optically and tactilely before electroforming and synchronize the measurement data with the CAD data supplied by the customer. All results are documented and handed to the customer as a log.



Property solid nickel alloy:	Data:
Content	> 99,7 %
Composition	Ca. 80 % nickel, 20 % cobalt
Density	8,8 g/cm <sup>3</sup>
Melting point	1.460° C
Yield strength Rp 0,2	> 750 N/mm <sup>2</sup>
Tensile strength Rm	1.200 - 1.800 N/mm <sup>2</sup>
Elongation at break A5	> 3,5 %
Elastic modulus	130 - 180 GPa
Hardness	400 - 500 Vickers HV 0,5
Linear thermal expansion	13 x 10 <sup>-6</sup> /K
Thermal conductivity	0,215 cal/cm x s x °C



## Erosion protection profiles

Our galvanically produced erosion protection profiles are based on a nickel/cobalt alloy which gives us a lot of room to maneuver in the engineering of individual requirement profiles. Therefore it is possible for us to influence the distribution of the wall thickness significantly: a thicker coat is generated where erosion occurs and in all other places we use material carefully to conserve resources, to guarantee maximum stability and at the same time to manufacture cost-effectively. With around 13,000 erosion protection profiles manufactured annually and 30 years of expertise we have developed into the worldwide leading supplier in this segment.

## The benefits in an overview

- Optimum alloy composition to achieve the required mechanical properties
- Even microstructure, also in areas of varying wall thickness
- Realization of individual geometries (also producible in light rear segments with varying wall thickness)
- High durability against all known demands of erosion
- Good adhesion of the part with the rotor propeller blade
- Low tension
- Our solid nickel alloy shows ductile, plastic deformation during use, no brittle fracture, however.



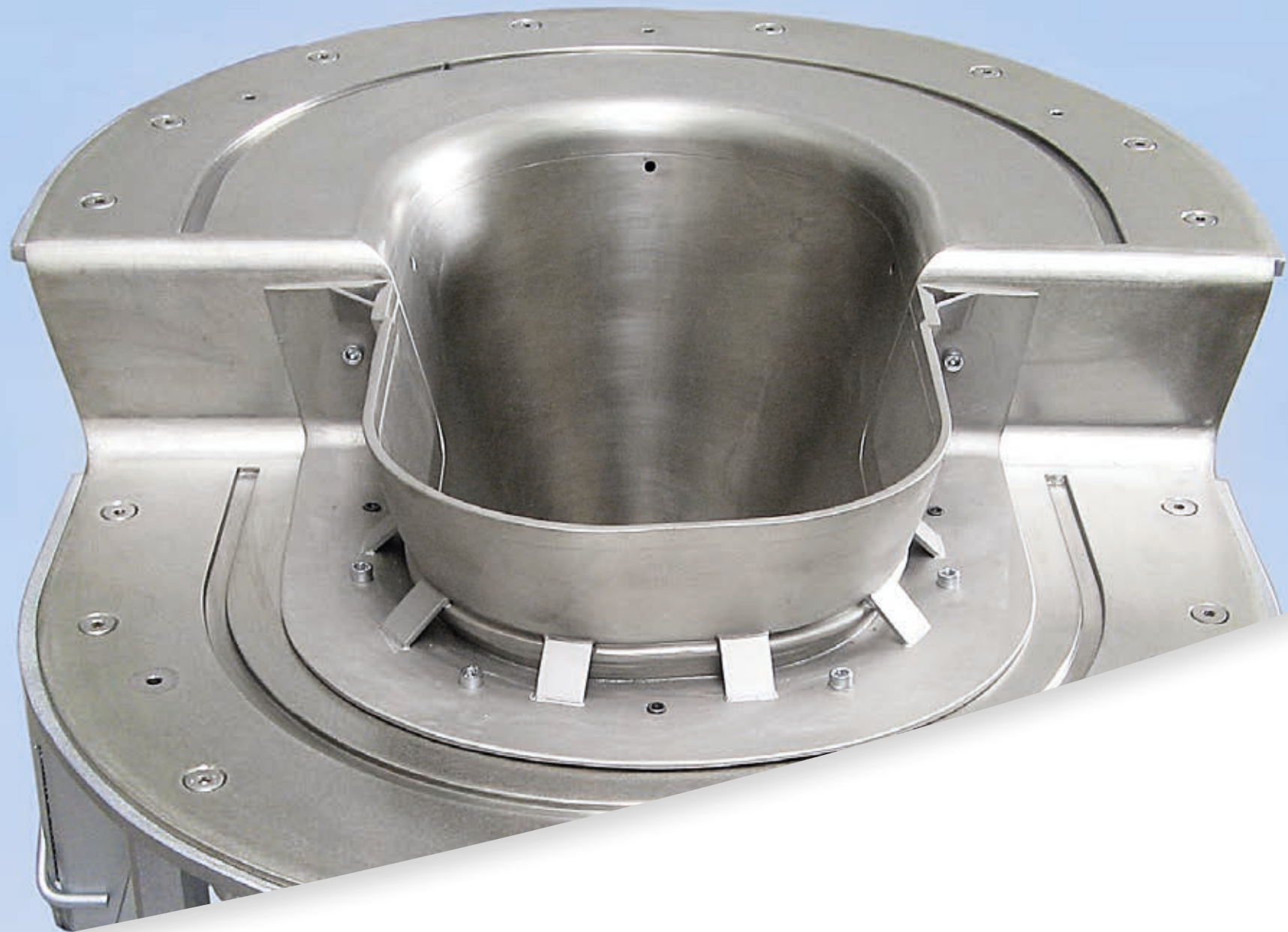


*Precision craftsmanship in a complete package*



## Erosion protection profiles – Comprehensive service

As per our holistic approach we deliver our erosion protection profiles to you as ready-to-use custom-made parts. We design the tools in accordance with your individual CAD data record and advise you already in this important phase on longer part durability and efficiency in the manufacturing process. All required tools for this are milled on our CNC controlled machining facilities and subsequently polished. They then undergo a dimensional tolerance test. Finally, we measure the tools tactilely or optically (GOM). In sequence the galvanic moulding follows which is then rounded off with our surface machining. This deburrs the profiles and gives them an even polish. Furthermore, with the manual machining we can focus on optimizing the wall thickness. For a smooth adhesion process the inner sides of the profiles are abrasive-blasted resulting in a roughened surface thus optimizing the adhesive surface for the primer applied afterwards. This again serves as a primer coat for secure, optimum adhesion to the rotor/propeller blade.

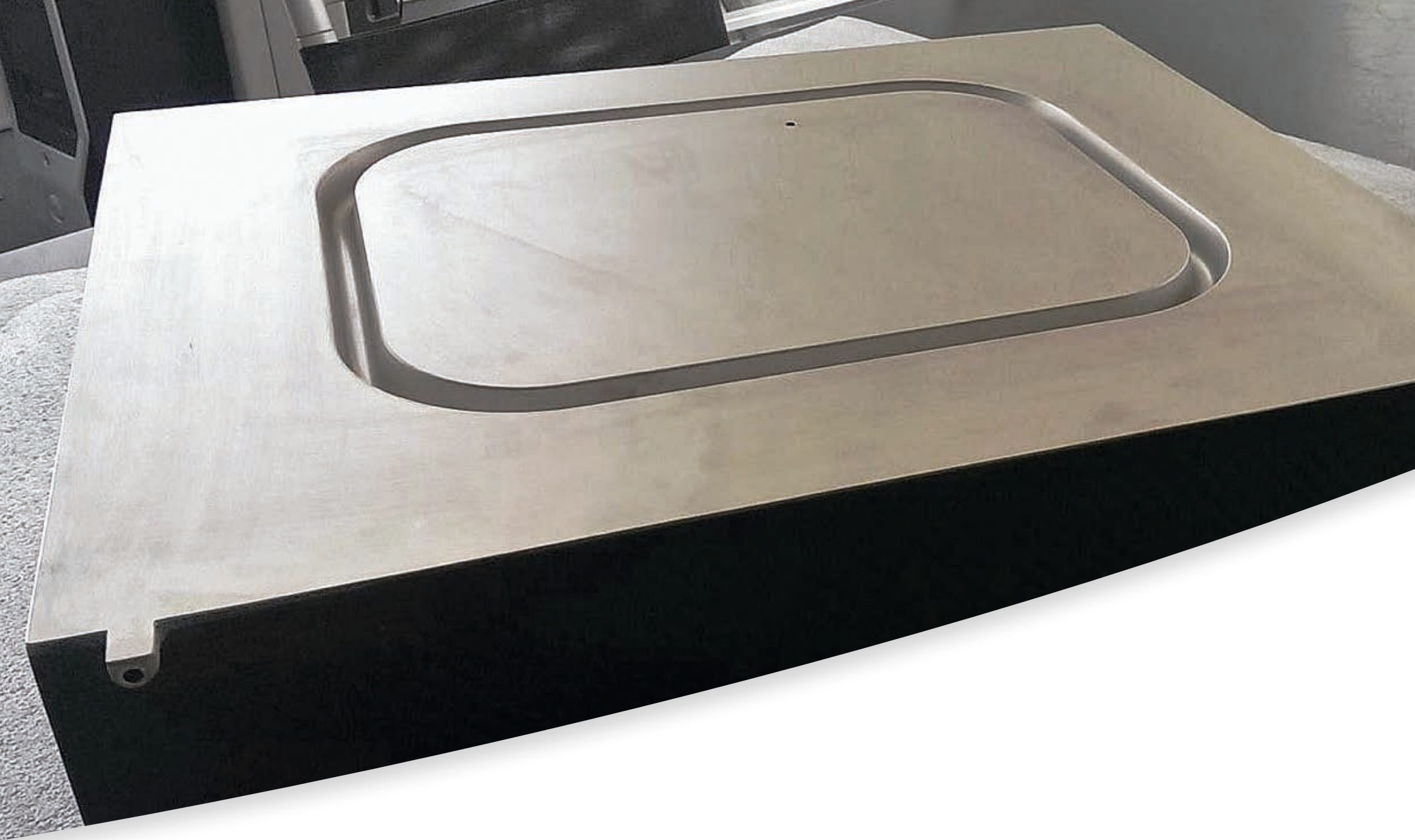




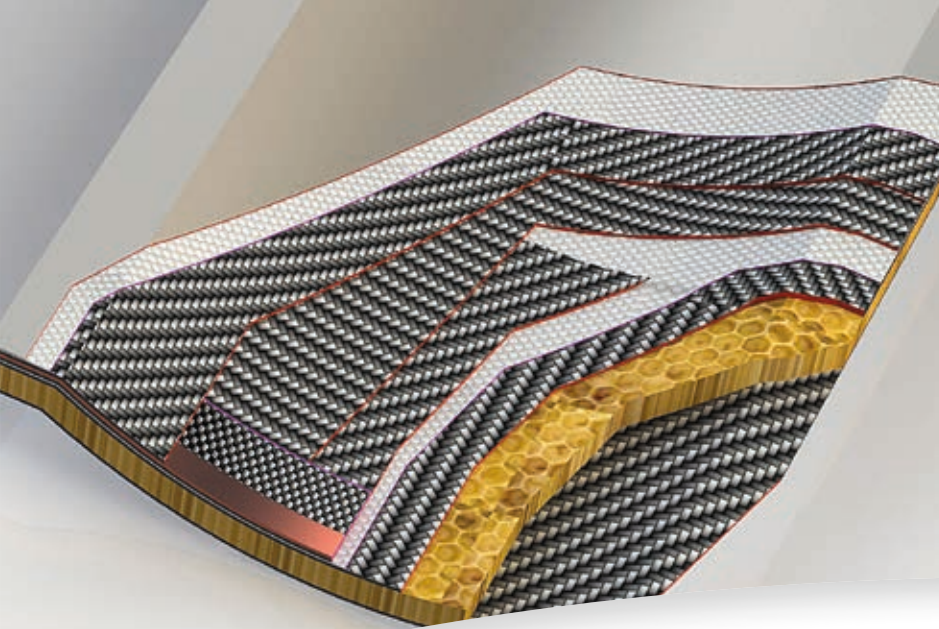


## Laminating devices

Besides the series production of erosion protection profiles our customers also benefit from our expertise in tool mould making. Our laminating devices are used especially when the production of large surface tools for the autoclave process is required. By means of a milled bath model an approx. 4 - 6 mm thick nickel shell is moulded galvanically and at the customers' request equipped with an individual rear frame. For this we take charge of all the required production stages and supply laminating devices with perfect surface quality to our customers – designed for short heating up times in the subsequent series process. On request our holistic approach takes effect here. We deliver the complete device from reading the data records right through to the manual machining, ready for use in production at our customer's premises.







## CRP/GRP moulds with a surface layer of nickel

The result of innovative and creative work is reflected especially in our CRP/GRP moulds. As a further development of our laminating devices for specially large surfaced tools these tool moulds consist of a galvanised coat of nickel with a sandwich core which is encased by a CRP/GRP fibre composite. The technical finesse: the tool moulds are already equipped with an integrated surface heating system which heats up the tool mould evenly and as a result eliminates the autoclaves and the tempering processes.

## Further benefits:

- Surface quality analogous to previous mould concepts
- Minimization of cycle times for the manufacture of the moulds
- Reduction of manufacturing costs in comparison to classical laminating devices
- Longer durability in comparison to conventionally produced CRP/GRP moulds without a surface layer of nickel







## Our service – Your benefit

We have numerous processes available for realizing our customers' various requirement profiles. Especially when our competence in solving problems is in demand, we combine relevant technologies and are then therefore able to solve problems efficiently. You receive appropriate procedures from us, customized to your very own requirements, which are transparent and clear.

Regardless of the holistic approach our customers receive all process technologies also separately and directly on our customers' site:

- Repair galvanizing or section galvanizing
- Laser welding
- Model making
- Milling with three linear and two rotational axes
- Tool repairs
- Manual engraving



*"Standard isn't enough for us - we pursue highest quality standards for more durability and efficiency." Dipl.-Ing. Kurt Stricker, Managing Director*





## QUALITY MANAGEMENT – OUR PLEDGE FOR MORE EFFICIENCY

Sustainability and the demand of consistent quality awareness is the maxim which we pursue in each of our stages of production – without compromises. The delivery quality is not only a crucial factor of success for us – but also for our customer. Parallel to our internal quality philosophy we test our performance in continuous intervals in order to push optimizations – for the highest degree of customer satisfaction and a sustainable foundation of trust. We fulfil the guidelines of ISO 9001:2008 and the aviation standard EN 9100:2009.



*"Nobody can do everything, some people can do a little, together we reach the goal." Your contact persons at Fichtner & Schicht*





## BENEFITS – FOR THE ADDITIONAL EXTRA IN TOOL MAKING

Convince yourself of our capability and become our partner!

Holistic approaches – we deliver from the coordination of the CAD data right through to the finished tool, from one source. That saves time and costs and allows a high level of control of the whole process.

Customer orientation – we accept our customers' challenges and have been realizing them in reliable processes for over 40 years.

Down-to-earth company management – we are aware of our responsibility towards our

employees, customers and partners and manage our family business with greatest care and farsightedness.

Further development – we are investing continuously in our know-how and in our facility technology.

Flexibility – we stand for fast decisions and flexible process adjustments when the heat is on.



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*A selection of our customers:*



mt-propeller

