

METALS  
ARE  
OUR  
WORLD





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G.RAU GMBH & CO. KG IS A GLOBALLY ACTIVE SUPPLIER IN THE FIELD OF METAL ENGINEERING THAT HAS ACHIEVED A DEGREE OF SPECIALIZATION IN THE HIGHLY COMPLEX AND VERSATILE WORLD OF METALS OVER THE PAST 130 YEARS, REMAINING UNSURPASSED TO THIS DAY.



# METALS ARE OUR WORLD

G.RAU processes and refines far more than 200 various kinds of metals and metal alloys into products. This makes G. RAU an expert in the manufacturing of strips, tubes and wires made of precious metals, special alloys and composite materials. In addition, G.RAU also use these prematerials to manufacture precision parts and complex assemblies.

Since its foundation in 1877, originally to supply to the regional jewelry industry, the company has undergone constant changes and further developments. Thanks to its state-of-the-art technologies and facilities, it is now a global leader in metal solutions. This flexibility in combination with our innovative capacity and reliability are the characteristics that our customers appreciate. Consequentially, G.RAU has become an established preferred supplier to several distinguished enterprises in the fields of automotive supply, electrical engineering, measurement and control technology and medical engineering.

Today, with more than 540 employees, G.RAU is still a family-owned metal engineering company with three production sites in Pforzheim, one in Costa Rica and a subsidiary in the United States. G.RAU is also the parent company of several well-known suppliers in the field of medical technology: such as the two Pforzheim-based enterprises EUROFLEX GmbH and ADMEDES Schuessler GmbH. Both companies are global market leaders in their respective product areas. Whereas EUROFLEX predominantly supplies semi-finished products for implants, ADMEDES is specialized in the manufacturing of components made of Nitinol. Currently, another five companies are part of the G.RAU Group with around 1,300 employees in Germany, USA and Costa Rica.



# YOUR PARTNER FOR SOLUTIONS IN METAL

BASED ON OUR KNOWLEDGE AND LONGSTANDING EXPERIENCE,  
WE ARE A COMPETENT PARTNER FOR OUR CUSTOMERS IN THE  
REALIZATION OF ECONOMIC SOLUTIONS.

## From semi-finished products to functional assemblies

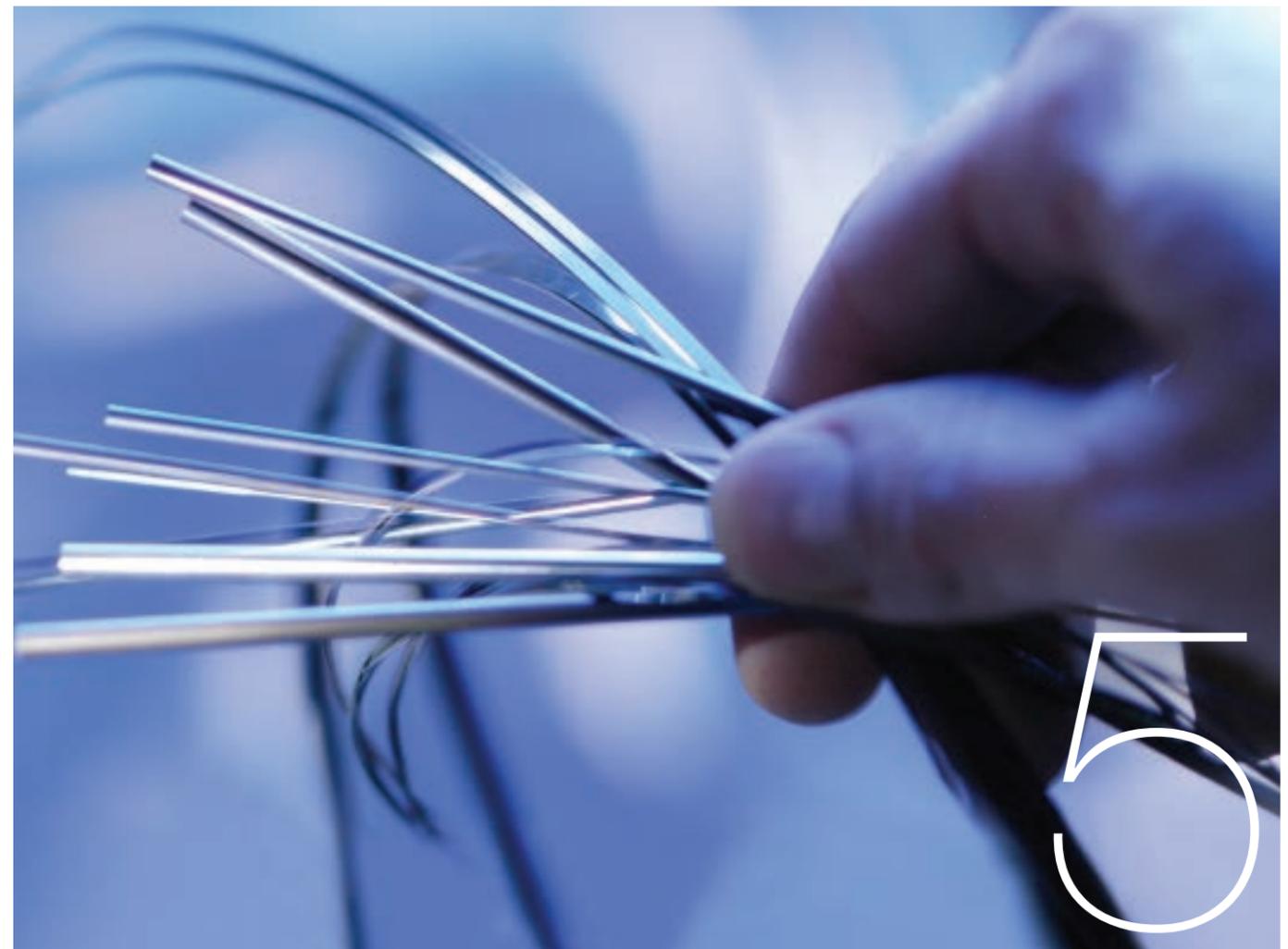
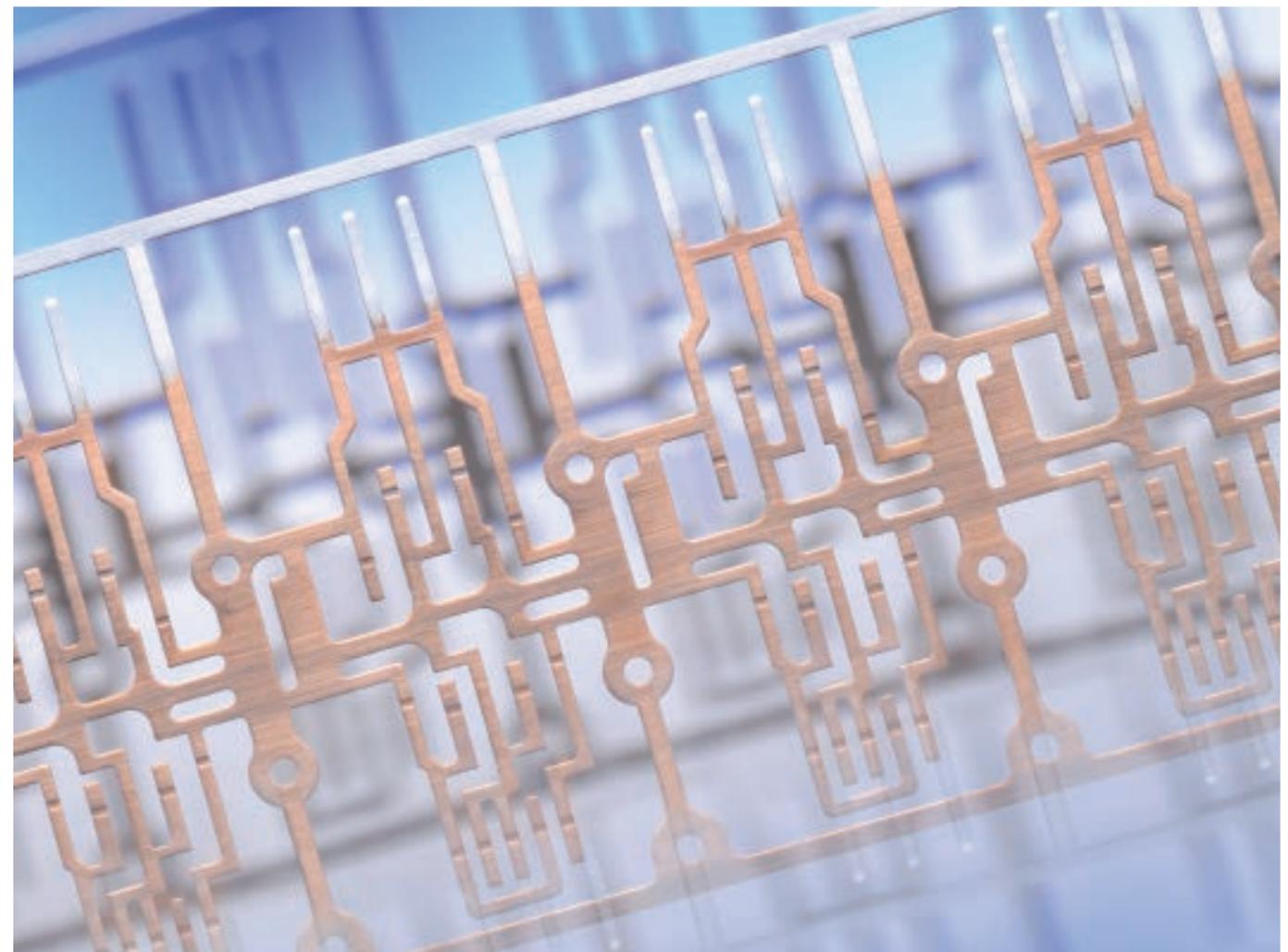
In addition to our product range from semi-finished products to assemblies, G.RAU offers a high degree of flexibility in the realization of individual and innovative products. To this extent, G.RAU has the technical competence to recommend and test new materials for specific applications, and is able to create and produce unique products in close collaboration with our customers. The product development efforts, in combination with the experience of inhouse toolmanufacturing capabilities and project management ensure professional assistance and advisory services in complex projects.

The G.RAU product development activities are further supported by a high-performance development unit, which closely collaborates with well known research institutes.

Our customers appreciate this intense dialog as well as our competent advice in the development of their new products and in the optimization of existing products. Together with our customers, we create innovative, individual and economic solutions.

This high degree of competence and innovation capability has made G.RAU the global leader in the field of shape memory alloys, which has enabled the company to achieve a unique selling point also in the field of actuators made of these alloys as well as actuators made of thermostatic bimetals.

With the latest certifications in accordance with DIN EN ISO 9001, DIN EN ISO 14001, DIN EN ISO 13485 and ISO/TS 16949, we put special emphasis on the compliance of the required standards as well as the continuous development and improvement of business processes. This has ultimately led to the great confidence that customers have placed in G.RAU.



# YOUR PARTNER FOR SOLUTIONS IN METAL

## Innovative solutions made out of metal

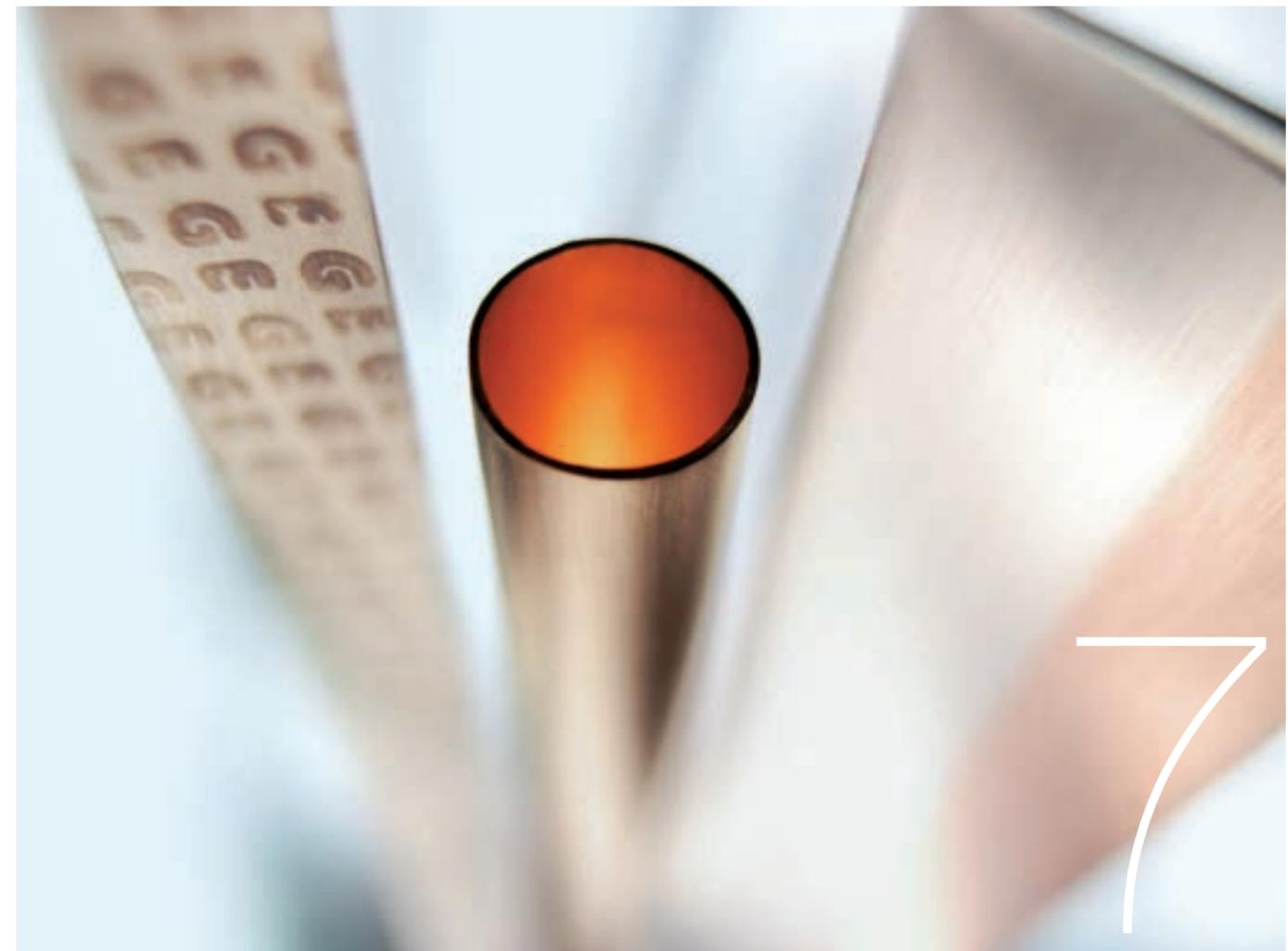
Today, G.RAU is a globally leading specialist for solutions out of metal. By combining the most diverse technologies, we are a competent partner for complex projects.

We use a wide variety of production technologies, such as stamping, extrusion, deep drawing, punching and milling. We join materials by e.g. seam welding, warm and cold cladding, laser welding, resistance welding, toxing or riveting. In addition, we also offer the possibility to selectively or fully electro- or electroless plate parts and strips.

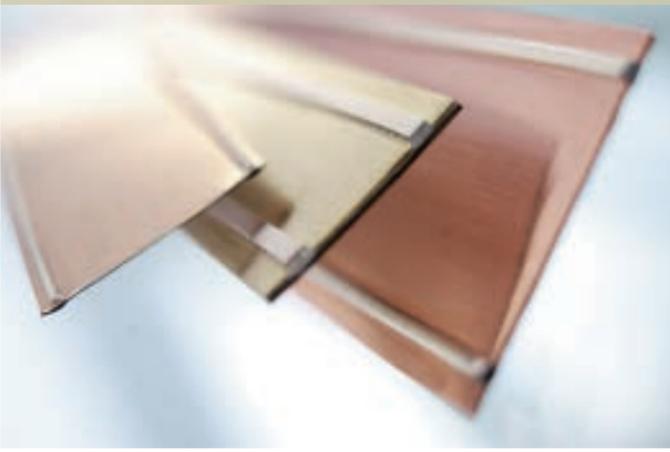
The use of these technologies enables us to offer a product range that extends from contact bimetals, thermobimetals, precision tubes and wires, profiles and stamping-bending parts, contact rivets, deep-drawn parts, extruded parts, metal-plastic composite components, actuators made from shape memory material as well as the manufacture of complex assemblies. Whether precious metals, alloys or composite materials, whether solid, cladded or plated – we will find the optimal solution that meets your specific requirements.

In collaboration with our design unit, we create solutions and develop economic tool concepts. Then, our inhouse tooling department produces these innovative and powerful tools, which ensure a high manufacturing capacity utilisation.

Our projects managers will assist you even after series release and will remain your competent partner.



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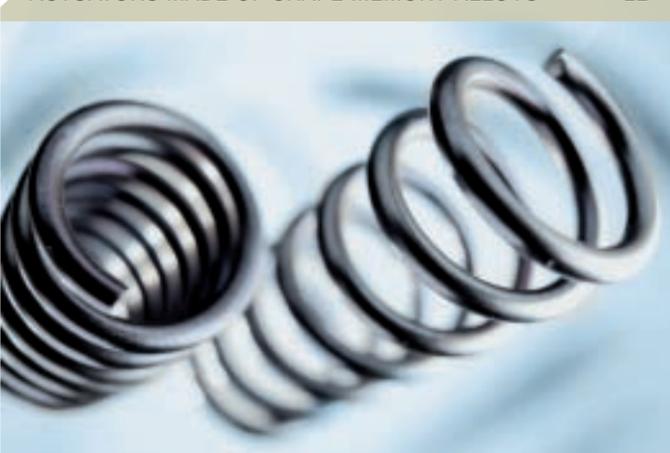
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# THE G.RAU PRODUCT RANGE



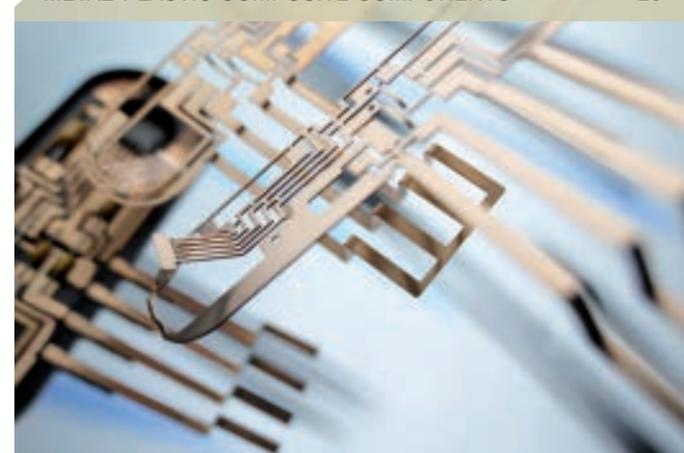
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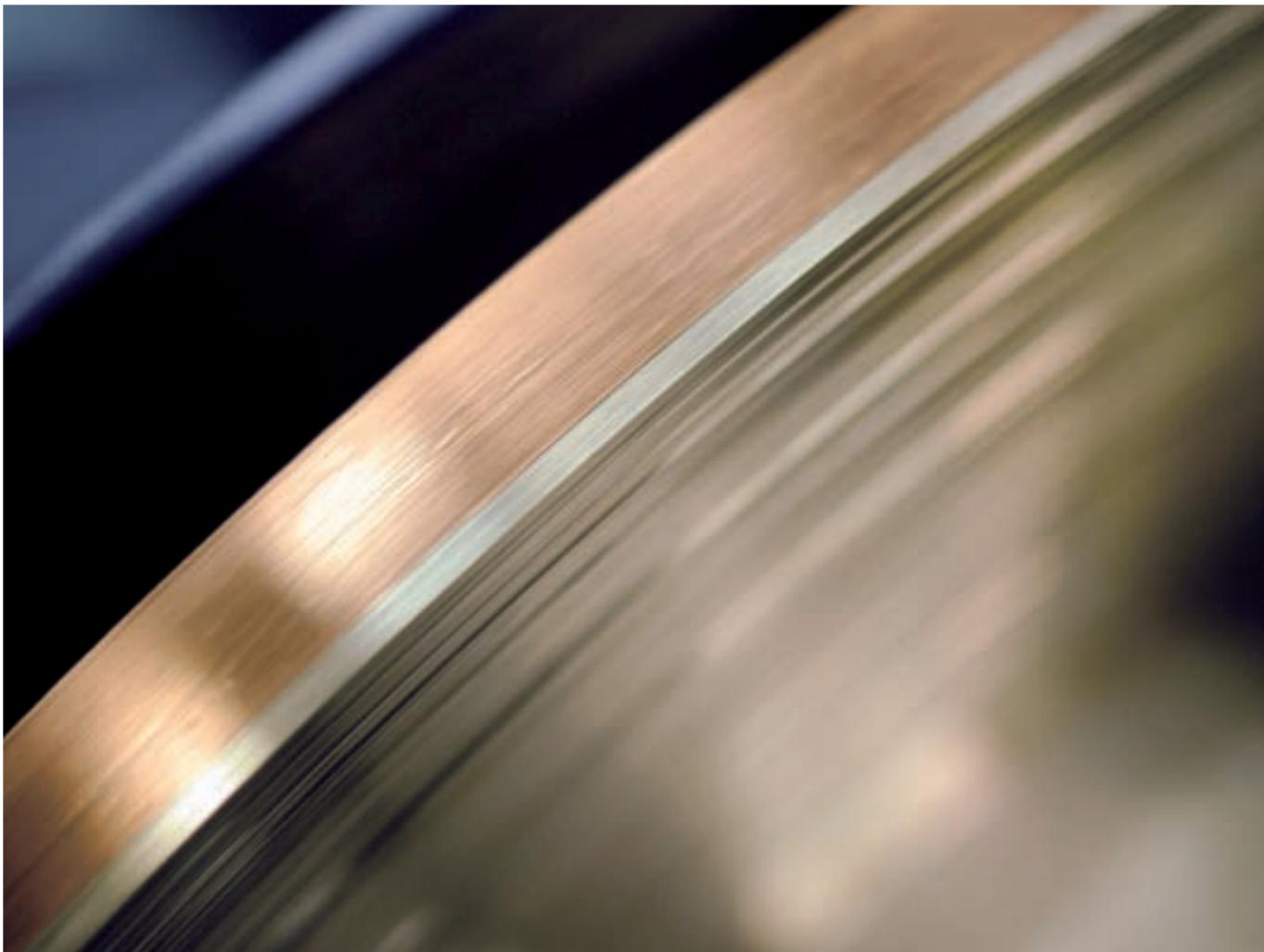


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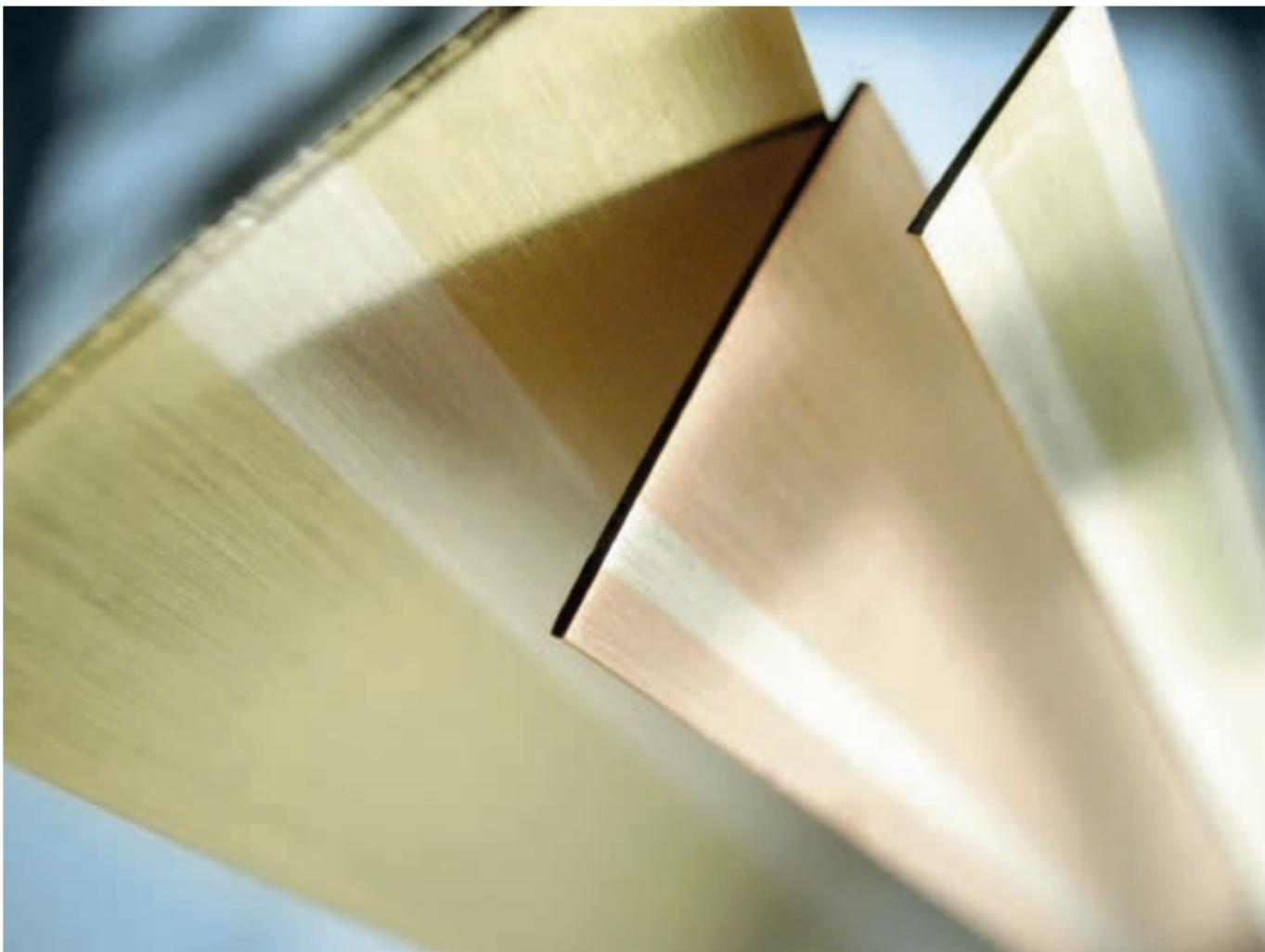
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# STRIPS MADE OF CONTACT BIMETAL

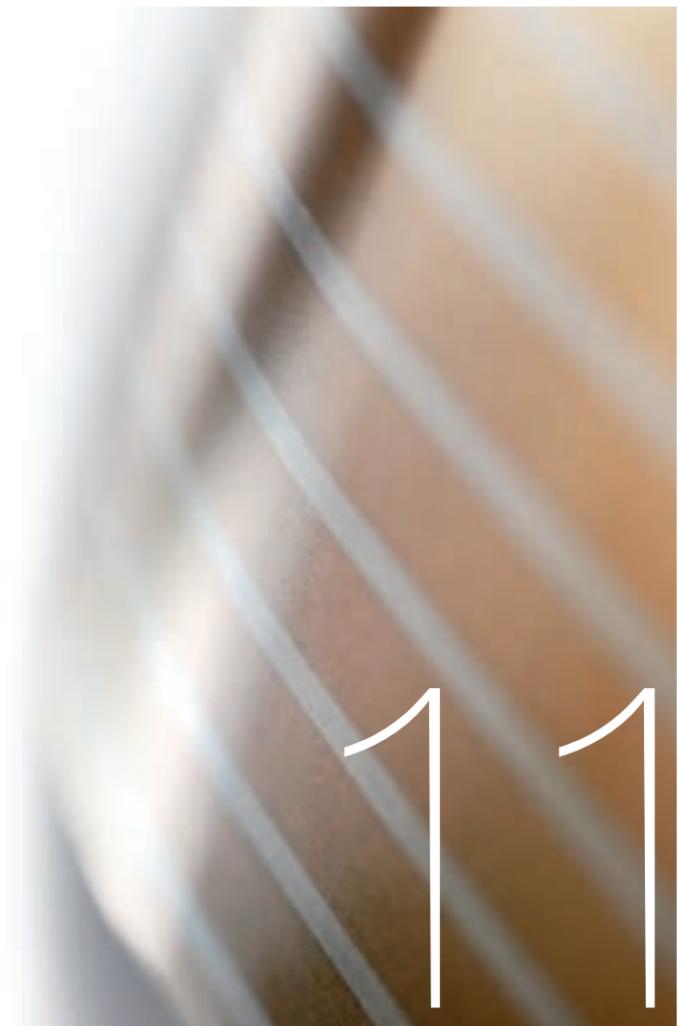
CONTACT BIMETALS ARE CLADDED MATERIALS WHICH COMBINE THE ADVANTAGEOUS PROPERTIES OF COST-EFFECTIVE CARRIER MATERIALS WITH SPECIAL CONTACT PROPERTIES OF PRECIOUS METALS OR PRECIOUS METAL ALLOYS.



Contact materials primarily require good switching characteristics, which is therefore the decisive factor for the selection of a precious metal or precious metal alloy. The carrier materials to be used are characterized by their high degree of electrical and thermal conductivity. Sufficient strength and spring properties as well as the very best technological properties such as solderability and weldability are beneficial.

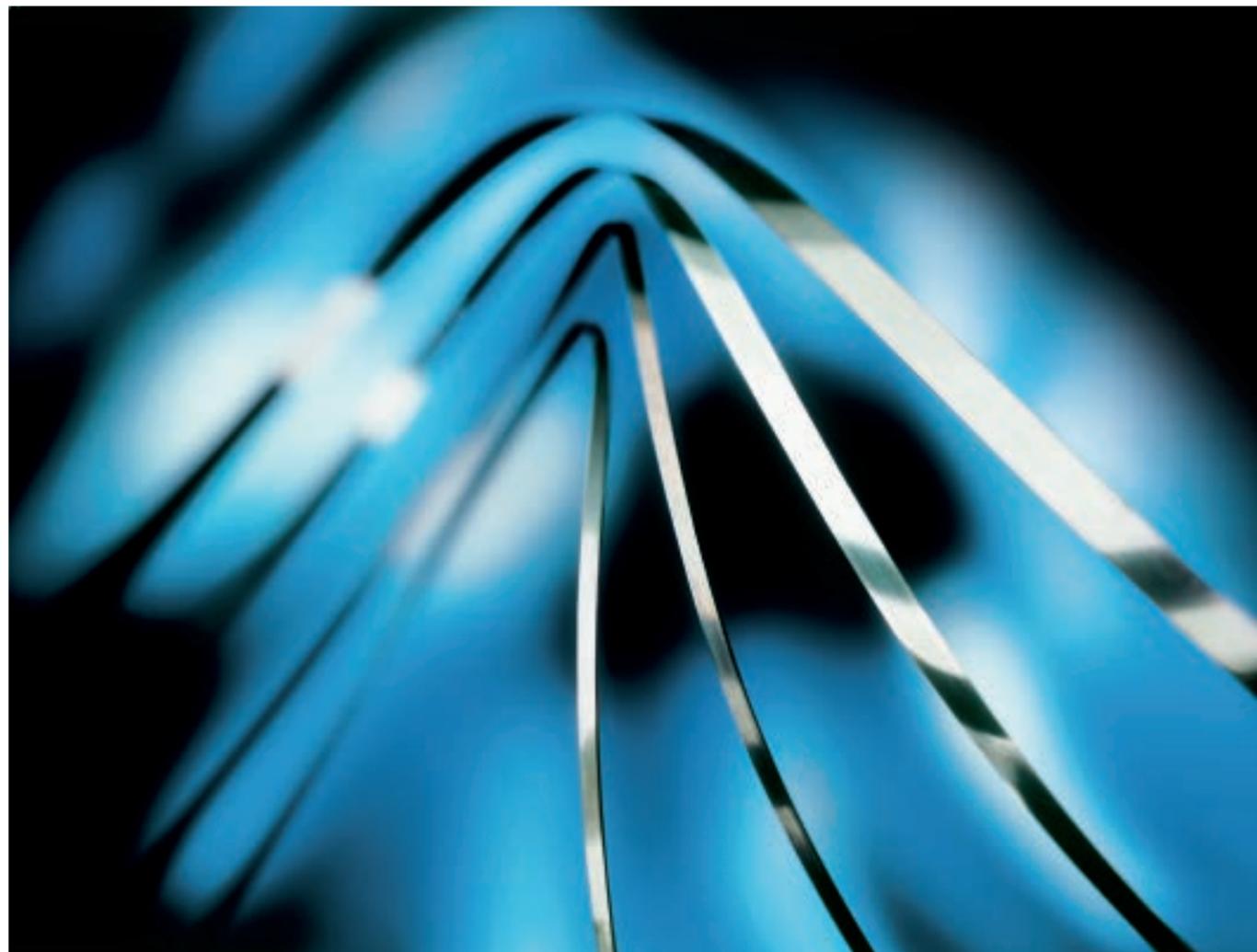
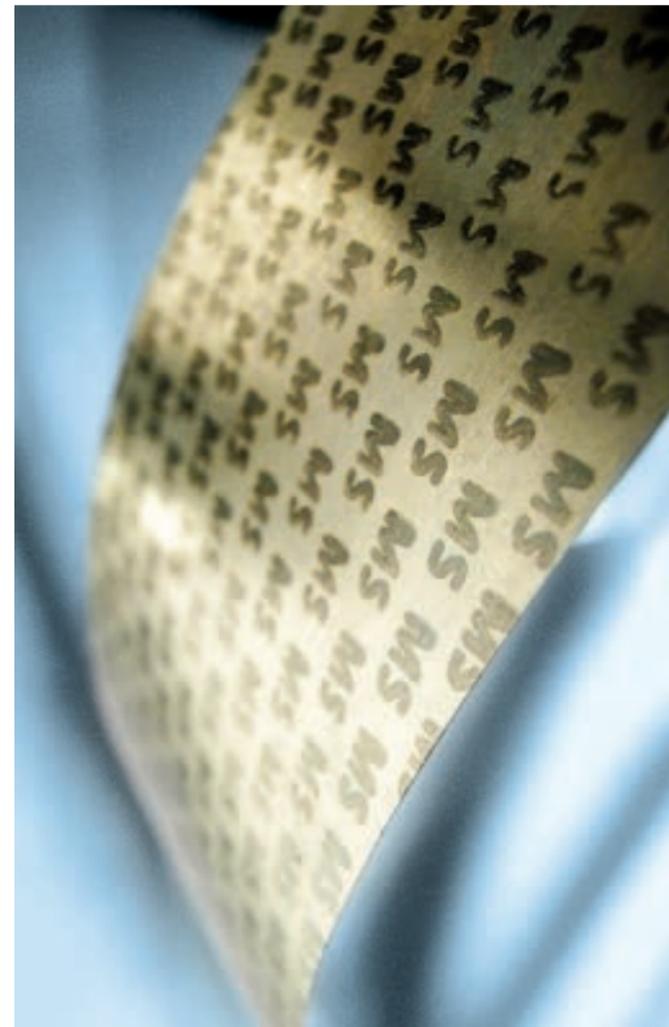
G.RAU produces contact bimetal strips by means of warm and cold cladding, welding and seam welding technologies. The selection of the manufacturing technology is based on the properties and sizes required by the customer as well as the material combination associated with this. Copper, copper alloys, nickel and nickel alloys and various types of precious metals are predominantly used as carrier material. Upon request, we can also supply electroplated strips.

We are also able to provide any advice you may need in terms of selecting the most suitable materials for your respective application.



# STRIPS MADE OF THERMOBIMETAL

THERMOBIMETALS ARE COMPOSITE MATERIALS THAT  
CONSIST OF AT LEAST TWO COMPONENTS WITH DIFFERENT  
THERMAL EXPANSION COEFFICIENTS.



## Thermal solutions

During heating, components expand to a certain degree, therefore causing the curvature of the thermobimetal. The greater the difference between the two components in thermal expansion is the greater the curvature will be. During practical application external forces often restrict a free movement of the thermobimetal. Any partial or complete restriction results in a corresponding force. This way a thermobimetal has the capacity of retaining or releasing energy.

G.RAU produces varieties with the highest thermal sensitivity or with defined electrical resistance. Our product range also contains thermobimetals with outstanding corrosion resistance and high thermal application limits. In addition to the thermobimetals certified in accordance with DIN 1715, G.RAU also produces several special grade thermobimetals.

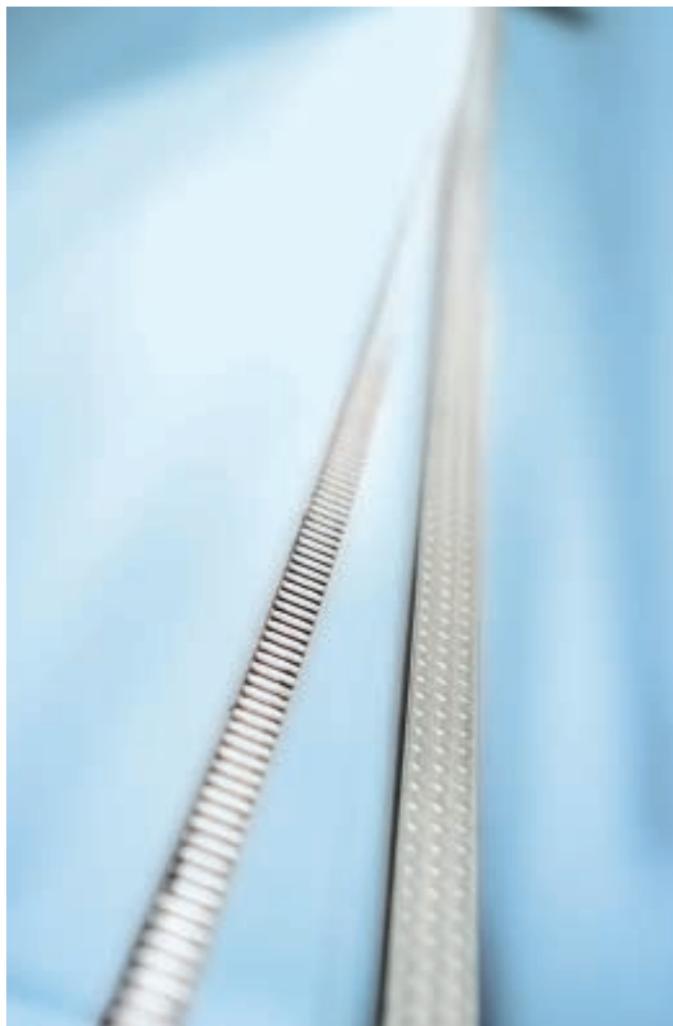
Strips can also be electroplated to achieve a higher degree of corrosion protection and weldability.

G.RAU manufactures strips with thicknesses from 0.08 mm to 2 mm and widths from 1 mm to 150 mm. Special sizes are also available. Tolerances vary depending on size; the lowest tolerance is  $\pm 0.1$  mm for width and  $\pm 0.002$  mm for thickness.

Our customer service would be happy to assist you in selecting the suitable thermobimetal variety.

# CONTACT AND MINIPROFILE

TO MEET THIS REQUIREMENT G.RAU PRODUCES  
MICROPROFILES SIZE OF 30  $\mu\text{m}$  WIDTH AND HEIGHT.

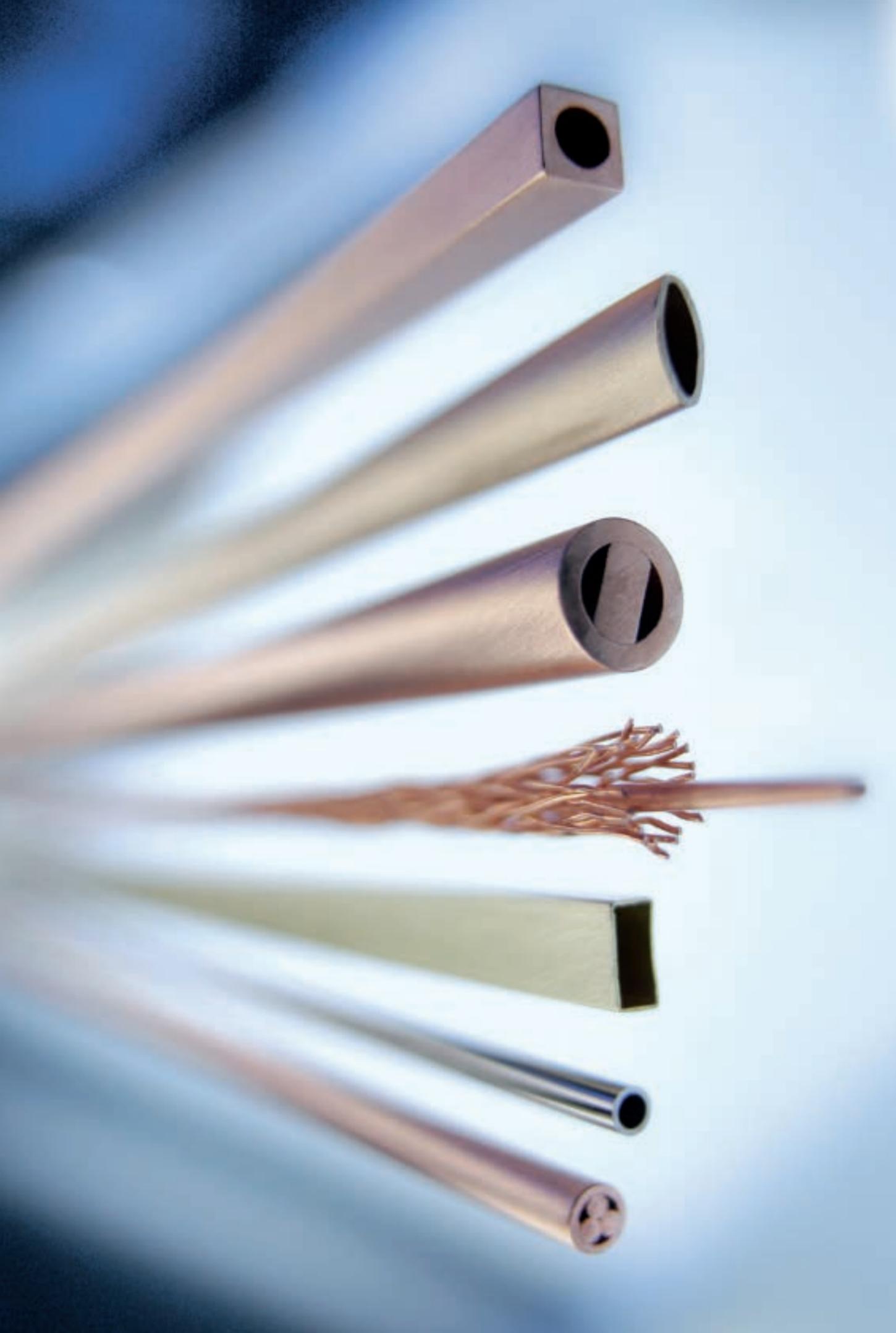


## Miniaturization in the world of electrical contacts

We refer contact profiles to composite materials which consist of various individual components, and are further refined to create complex geometries. Therefore, we can use various carrier materials and several types of precious metal alloys.

Contact profile wires are the basic material used to produce contacts that switch electrical currents. The relation of the layer thickness between carrier and contact material, as well as their composition, are defined by the respective application and required power range.

We would be happy to assist you in choosing the appropriate materials.



# TUBES WIRES PROFILES

G.RAU IS SPECIALIZED IN THE MANUFACTURE OF PRECISION SEMI-FINISHED PRODUCTS AND MEETS THE HIGHEST REQUIREMENTS – WITH REGARD TO SIZE TOLERANCES, SPECIAL GEOMETRIES AND SPECIAL MECHANICAL PROPERTIES.

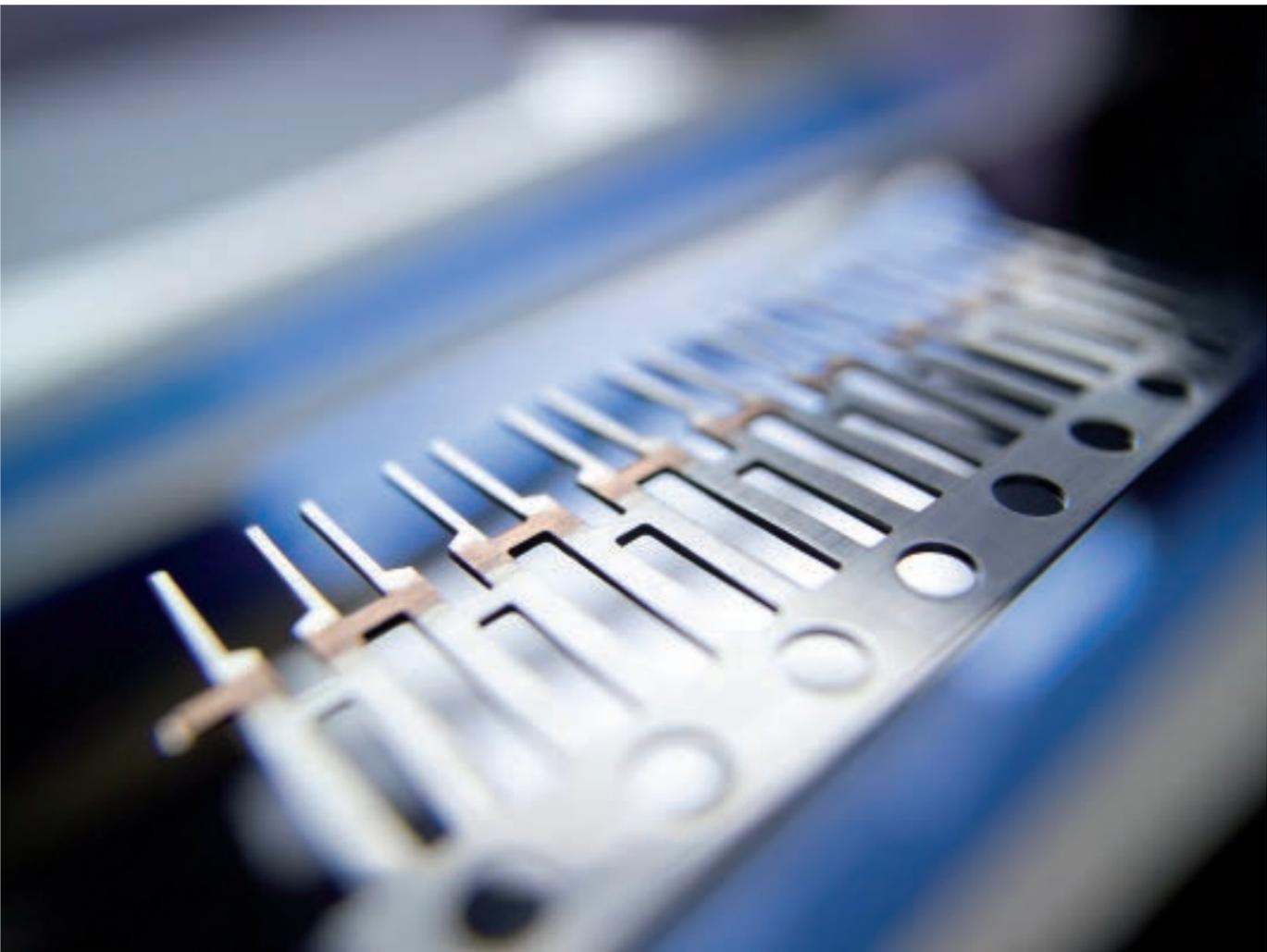
With this philosophy in mind we produce our tubes, wires and profiles made of metal materials for various applications in the fields of electrical engineering, measurement and control technology as well as in other industries.

Besides copper or nickel alloys such as CuSn8 or CuNi18Zn20, we process various types of titanium-free steels and stainless steel as well as various special materials. We are therefore also specialized in the manufacturing of clad, multilayer tubes and wires, which combine the positive characteristics of precious metal alloys with those of other materials.

G.RAU supplies round tubes, capillary tubes and profile tubes in various shapes. Thereby one of our major strength is the processing of extremely thin-walled tubes in the range of 30 µm. We produce wires and profiles with the exact same degree of precision.

Our team would be happy to help you select the suitable materials for your application and would be pleased to submit an individual offer.





# CONTACT STAMPED BENT PARTS AND ASSEMBLIES

G.RAU PRODUCES ALL  
CONTACT STAMPED BENT  
PARTS AND ASSEMBLIES  
ON STATE-OF-THE-ART  
STAMPING AND FORMING  
EQUIPMENT.

Fully automated, we can process several strips simultaneously into assemblies, weld contact materials or rivet contacts onto, cut threads or insert screws. Welding processes are executed by means of resistance welding or laser systems horizontally or vertically. The 100% vision system-based, process-integrated control guarantees the high quality of the products delivered.

The complex parts and assemblies are stamped from copper, copper alloy, nickel, nickel alloys, steel or stainless steel as well as from compound materials based on gold and silver. In addition, our surface engineering department can electroplate or chemically coat stamped strips and parts.

We would be happy to assist you in the selection of materials or plating technologies and are pleased to help with any technical question you may have.



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# ACTUATORS MADE OF THERMOBIMETAL



THE THERMOBIMETAL STRIPS  
MADE AT G.RAU ARE USED  
TO PRODUCE CUSTOMER-  
SPECIFIC ACTUATORS ON  
OUR HIGH-PERFORMANCE  
STAMPING AND BENDING  
MACHINES.

#### Movement through thermal energy

Actuators made of thermobimetal are thermally active assemblies that make a continuous movement during temperature changes. One special application is the use of thermal snap action discs and other snap action elements, which perform discontinued work on the basis of their shapes. Thermobimetal parts and assemblies can be tempered and coated with chemical or electroplated surface layers to improve corrosion resistance.

We would be happy to provide further assistance in the selection of materials and in defining shapes and tolerances.

# ACTUATORS MADE OF SHAPE MEMORY ALLOYS

## G.RAU is the expert for shape memory alloys

Assemblies made of shape memory alloys are used as thermal actuators in the automotive industry as well as in further applications of measurement and control technology, appliance technology, aviation industry as well as medical technology.

When heated, the actuators »remember« their original shape and are able to return to the original shape after deformation.

For more than 40 years, G.RAU has been researching and developing shape memory alloys and their applications. Quite rightly, we can call ourselves undisputed experts in this field, as we combine all manufacturing steps from the melt to the final complex part. at our facilities. Besides our predominant use of nickel-titanium alloy, we also use other special materials and also are constantly in the process of expanding our product range.

One-way effect elements only remember a high temperature shape to which they return upon heating. On the other hand, two-way effect elements remember the high temperature shape upon heating and the low temperature shape upon cooling. A two-way behavior can also be achieved by combining a one-way element with a counterforce. This reversible change of shape, with the aid of an external counterforce provides a self-sustaining solution.

G.RAU supplies parts according to customers' specifications as compression, tension, bending or torsion elements, as well as fasteners and sealing elements. Depending on the alloy and processing, the transformation temperatures of our memory elements are between -20 and +80 °C. Further developments should expand the transformation temperatures to higher ranges.

Thanks to our extensive experience in working with these materials, we are able to realize new and innovative solutions in collaboration with our customers.

We would be happy to answer any questions you may have about shape memory alloys.



## DEEP DRAWN PARTS

G.RAU PRODUCES COMPLEX DEEP DRAWN PARTS WITH TIGHT TOLERANCES, SPECIAL SHAPES, DRILLHOLES, CUTOUTS AND OPTIMIZED SURFACES SUITABLE FOR SEALINGS AND TREAD AREAS.



### Customized solutions

Depending on customer specifications, steels, stainless steels, copper, non-ferrous metals and clad materials made of stainless steel are processed. Upon request, materials with special physical properties, such as special expansion characteristics and magnetism can be used for our deep-drawn sleeves.

Our precision deep-drawn parts are produced on transfer presses with up to 18 manufacturing steps as well as in complex progressive compound tools. As assemblies, the parts can also be connected with straps by connecting links, bounds, blockers, as well as other additional mechanically required parts. The parts can also be heat treated as well as chemically coated or electroplated.

Our G.RAU team would be happy to assist you in choosing the suitable material and in designing your deep drawn parts.

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## EXTRUDED PARTS

G.RAU USES MULTITRANSFER PRESSES TO PRODUCE TIGHT TOLERANCE EXTRUSION PARTS BY USING THE MATERIALS COPPER, COPPER ALLOYS, STEEL AND STAINLESS STEEL.



### Economical production

The shapes and parts volumes are designed to enable manufacturing without any material losses. Extruded parts are therefore a cost-effective alternative to turned parts.

We adapt the materials and sizes of the parts in close collaboration with you to meet your specific requirements. All parts can be treated with electroplated or chemical surfaces for oxidation protection, better soldering properties and optimized electrical contact properties.

We are also available to provide any advice you may need in terms of selecting the geometric shape and the most suitable materials for your respective application.



# CONTACT RIVETS



# METAL-PLASTIC COMPOSITE COMPONENTS

## Multiple material combinations

G.RAU produces solid and bimetal rivets from all precious metal alloys and contact materials on double pressure machines as well as by means of cold and warm welding.

Bimetal contact rivets are frequently used to reduce the input weight of precious metal. Hereby the required contact material is mostly cold or warm welded onto the copper base.

The contact rivets are manufactured with a pole diameter of 0.7 to 5 mm and a head diameter of 1 to 15 mm. If requested, we can add an electroplated surface layer onto the contact rivet.

Our team would be happy to help you select the suitable materials for your application and submit an appropriate offer to you.

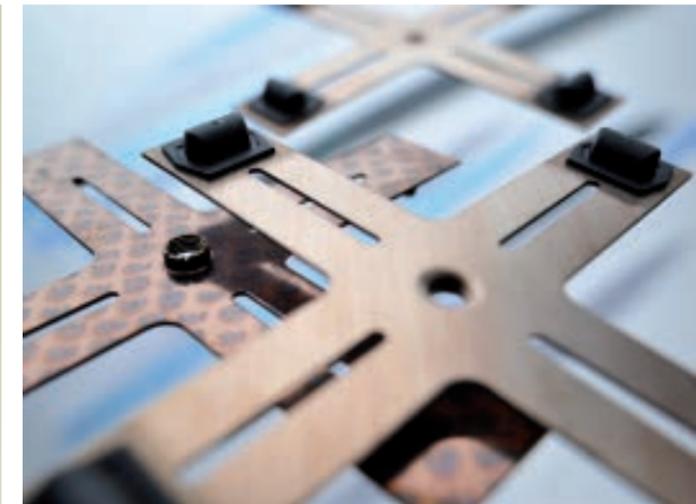


## Optimum synergy of metal and plastic

The constantly increasing complexity of electro-mechanical assemblies has led to the design of sophisticated hybrid assemblies. We are meeting these new demands through close collaboration with our partner companies, whose longterm experience in plastic injection molding technology has enabled us to realize innovative parts.

Together with them, we are able produce various function-based assembly designs right at as the development and design phase.

We would be happy to develop an individual solution for you. G.RAU provides competent advice on all possibilities.





# SURFACE ENGINEERING

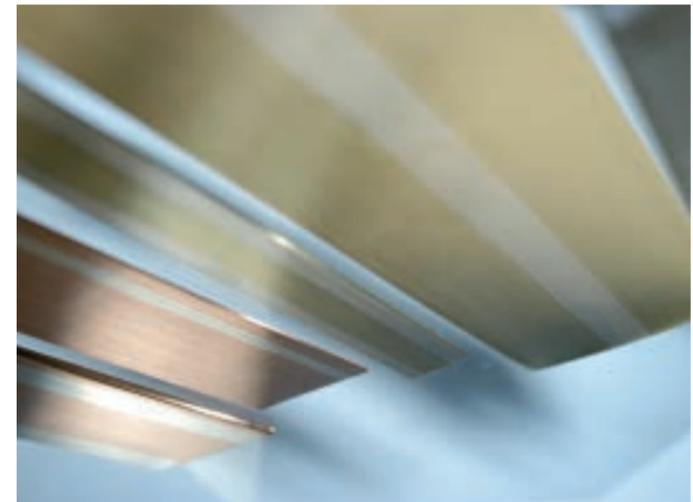
TO PROTECT AGAINST WEAR AND EXTENSIVE CORROSION,  
TO IMPROVE CONDUCTIVITY AND SOLDERABILITY OR FOR  
DECORATIVE PURPOSES: THE USE OF SURFACE ENGINEERING  
PROCESSES IS VERY VERSATILE.



G.RAU uses various electroplating and electroless plating surface treatment processes to coat parts, strips and wires on all common metals fully or selectively and is therefore able to meet all the increasing demand with regard of the surface.

There are special processes such as electropolishing of Nitinol or coating of many other alloys, which are practice proven procedures e.g. in the medical technology for implants or in the automotive industry.

Special processes are also use to meet highest particle requirements in the automotive supply industry and electrical engineering.



# MATERIAL AND PROCESS DEVELOPMENT

AS YOUR RELIABLE AND COMPETENT PARTNER,  
WE WILL SUPPORT YOU IN THE MATERIAL AND PROCESS  
DEVELOPMENT PROCESS.



We have all the necessary departments and facilities inhouse, from consulting, conceptual design, developing the samples to serial production and are your competent partner in all phases of the product from the idea till the realization.

Our development department, which also consists of a chemical and physics lab, a scanning electron microscope and several other testing systems, is available to you when developing processes or materials.

Your collaboration with G.RAU will result in innovative solutions and materials from the semi-finished product to functional assemblies which offer you a unique selling point in your specific market.

# PROJECT MANAGEMENT

WITH US, YOUR PROJECT IS IN THE VERY BEST OF HANDS.  
IN COLLABORATION WITH YOUR COMPANY, WE WILL  
DEVELOP SOLUTIONS FOR THE PRODUCTS YOU REQUIRE.

One of our project managers will take on the entire coordination of the project, from material recommendation and selection to development and serial production. This enable us to lay the foundation for the quality of your products.

In collaboration with our design department, we develop the optimum solution for your application in accordance with your requirements, also with the aid of state-of-the-art 3D CAD systems and simulators. This way, you will develop economic and high-performance tool concepts. Finally, our inhouse tooling facilities will build up your innovative and sophisticated tools, which ensure a high degree of production capacity.

Our project managers are there for you even after serial production release and will remain your competent contact.

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