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RAMPF ADVANCED POLYMERS

# Electro casting resins

Innovative casting systems for electrical and electronic components

# RAMPF

## #DiscoverTheFuture



### Chemical and Engineering Solutions



Advanced Polymers



Composite Solutions



Machine Systems



Production Systems

RAMPF Advanced Polymers is a company of the international RAMPF Group. Find out more on page 24.

# RAMPF Advanced Polymers

## High-performance. Customized. Eco-friendly.

**We have been developing and manufacturing reactive resin systems based on polyurethane, epoxy, silicone, and silane-modified polymers – for more than four decades.**

Our portfolio includes

- > Sealing systems, electro and engineering casting resins, edge and filter casting resins, and adhesives
- > Board and liquid materials for model and mold engineering
- > Chemical solutions for the manufacture of customized recycled polyols based on polyurethane, PET, and PIR residues

Our products and solutions are used globally and in a wide range of industries – from automotive and electromobility, electrics/

electronics, and white goods to aerospace, foundry, furniture, and mattresses.

We conserve resources and protect our environment, both in the development of our chemical products and in their manufacture and recycling.

Together with our customers and partners, we are working towards a successful and sustainable future.





## Products and services

High-performance, customized, and resource-saving technologies for a sustainable future



### INNOVATIVE MATERIALS & BRAND DIVERSITY

Plastic systems for sealing, design, insulating, bonding, protecting, and casting

|                           |                                  |                               |                              |
|---------------------------|----------------------------------|-------------------------------|------------------------------|
| <b>RAKU® POX</b><br>Epoxy | <b>RAKU® PUR</b><br>Polyurethane | <b>RAKU® SEAL</b><br>Sealants | <b>RAKU® SIL</b><br>Silicone |
|---------------------------|----------------------------------|-------------------------------|------------------------------|

Plastic systems and solutions for state-of-the-art model, mold, and tool engineering

|   |
|---|
| <b>RAKU® TOOL</b><br>Polyurethane and Epoxy |
|---|

Customized, high-quality recycling polyols

|  |                                |   |
|--|--------------------------------|---|
| <b>RECYPOL®</b><br>Ether and Ester Polyols | <b>PETOL®</b><br>Ester Polyols | <b>Polyols based on<br/>renewable raw materials</b> |
|--|--------------------------------|---|

### HIGH-PERFORMANCE & SUSTAINABLE

**Ambition. Reality. Tradition.**

Every day, we strive to make our products and solutions even more eco-friendly, from the selection of raw materials to the manufacturing process and delivery.

As a pioneer in the chemical recycling of polyurethane, we have been setting standards for over three decades. The raw materials obtained with our groundbreaking technologies are used in both our customers' products and our own.

It goes without saying that we procure energy sustainably – and use it intelligently. At our locations in Grafenberg and Pirmasens, we use only green electricity from renewable energy sources. An proactive environmental management system ensures that we never stand still but continuously improve our energy and environmental performance.

### SERVICE TODAY & IN THE FUTURE

**Customer-oriented. Competent. Committed.**

We provide our customers with comprehensive support – from product development to market launch and sales. And we do this around the globe: With production facilities on three continents and a worldwide network of distribution partners, we are always there for our customers, wherever they are.

In all this, people are always at the center. Trusting and successful collaboration with our customers is our top priority. Together, we develop the solutions of tomorrow – and have been doing so for more than forty years.



## Technologies | Best properties, premium quality

The optimum solutions for your application based on polyurethane, epoxy, and silicone

We have been designing and manufacturing made-to-measure electro casting systems for over 40 years. You can rest assured that we have the perfect material for your application and industry – made of polyurethane, epoxy, and silicone.

|                          | <b>POLYURETHANE<br/>(RAKU® PUR)</b>   | <b>EPOXY<br/>(RAKU® POX)</b>  | <b>SILICONE<br/>(RAKU® SIL)</b>  |
|--------------------------|---|---|--|
| <b>Chemical reaction</b> | <ul style="list-style-type: none"> <li>• 2-component</li> <li>• Polyaddition reaction</li> <li>• Low exothermic reaction</li> <li>• Curing at room temperature</li> <li>• Curing conditions can be flexibly adjusted by adding a catalyst</li> <li>• Low shrinkage pressure on cast components</li> </ul>   | <ul style="list-style-type: none"> <li>• 1- or 2-component</li> <li>• Homopolymerization (1- component) and polyaddition reaction (2- component)</li> <li>• Curing at room temperature</li> <li>• Curing can be accelerated using heat</li> <li>• Heat curing required for 1-component and hot-curing epoxy</li> <li>• Good impregnation properties</li> <li>• Low sensitivity to moisture</li> </ul> | <ul style="list-style-type: none"> <li>• 1- or 2-component</li> <li>• Polyaddition and polycondensation reaction</li> <li>• Low exothermic reaction</li> <li>• Curing at room temperature</li> <li>• Curing can be accelerated using heat</li> <li>• Curing without by-products possible (polyaddition reaction)</li> <li>• Low shrinkage pressure on cast components</li> <li>• Low sensitivity to moisture</li> <li>• Hydrophobic</li> </ul> |
| <b>Application range</b> | <ul style="list-style-type: none"> <li>• Application temperature range: -60 to +155 °C</li> <li>• Short-term: +160 °C</li> <li>• Wide range of mechanical properties, from tough to highly elastic</li> </ul>   | <ul style="list-style-type: none"> <li>• Application temperature range: -40 to +180 °C</li> <li>• Short-term: +200 °C</li> </ul>  | <ul style="list-style-type: none"> <li>• Wide application temperature range: -60 to +200 °C</li> <li>• Short-term: +250 °C</li> <li>• Best physical properties almost constant across the entire temperature range of the application</li> </ul>   |
| <b>Properties</b>        | <ul style="list-style-type: none"> <li>• Excellent resistance to fluctuations in temperature for sensitive components</li> <li>• High crack resistance of flexible products</li> <li>• Good chemical resistance</li> <li>• Low water absorption</li> <li>• Good electrical properties</li> <li>• Tg: -75 to +120 °C</li> <li>• RTI: to +155 °C</li> <li>• OBJS2-listed</li> </ul> | <ul style="list-style-type: none"> <li>• High heat distortion temperature</li> <li>• Low coefficient of thermal expansion</li> <li>• High dielectric strength</li> <li>• High media resistance to fuels</li> <li>• Low water absorption and water vapor permeability</li> <li>• Tg: -20 to +180 °C</li> <li>• OBJS2-listed</li> </ul>   | <ul style="list-style-type: none"> <li>• Excellent resistance to fluctuations in temperature</li> <li>• High crack resistance</li> <li>• Excellent chemical resistance for extreme environments</li> <li>• Low water absorption</li> <li>• High water vapor permeability</li> <li>• High UV and weather resistance</li> <li>• Tg: always &lt; 0 °C</li> </ul>  |
| <b>Bonding</b>           | <ul style="list-style-type: none"> <li>• Good adhesion to housings and components</li> <li>• Good adhesion to plastic: PA, PBT, ABS</li> </ul>  | <ul style="list-style-type: none"> <li>• Good adhesion to metals, housings, and components</li> </ul>   | <ul style="list-style-type: none"> <li>• Good adhesion to housings and components</li> </ul>   |
| <b>Flame retardancy</b>  | <ul style="list-style-type: none"> <li>• UL 94 V0 possible</li> </ul>   | <ul style="list-style-type: none"> <li>• UL 94 V0 possible</li> </ul>   | <ul style="list-style-type: none"> <li>• UL 94 V0 possible</li> </ul>  |



**+ YOUR BENEFITS**

- > More than 40 years of experience in developing and producing innovative 1- and 2-component electro casting resin systems
- > In-depth technical consulting on selecting the most suitable material
- > Joint process development and optimization
- > Material, machine, and process from a single source – the complete expert service from RAMPF

# Processing | Expertise and know-how

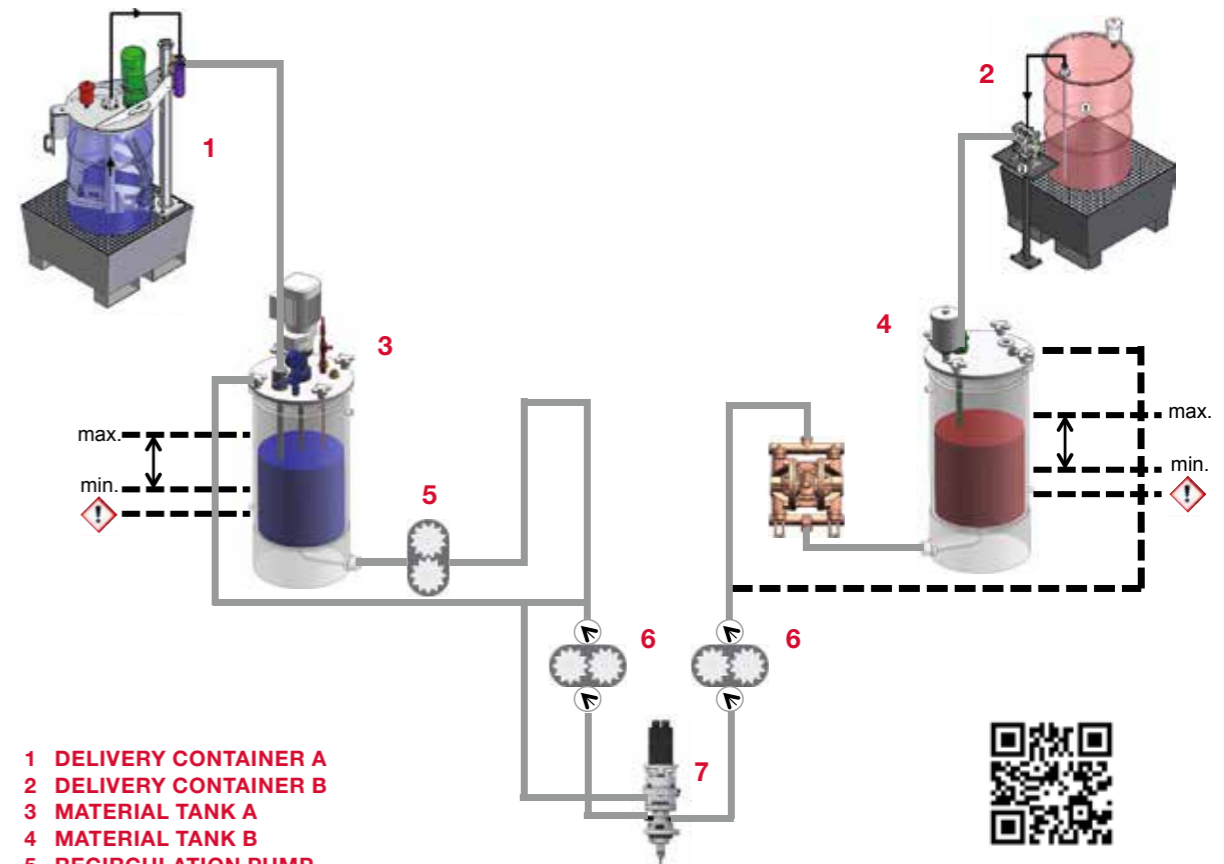
## Optimal material processing with RAMPF

Material quality and material processing are key to the correct functioning and durability of electrical and electronic systems.

1- and 2-component electro casting resin systems from RAMPF Advanced Polymers, combined with the application expertise of RAMPF Production Systems, one of the world's leading specialists for production systems with integrated dispensing technology, enable the rapid development of customized complete solutions for a wide range of electrical and electronic applications.

Whether manually, statically, dynamically, under atmospheric or vacuum conditions, or at high or low temperatures – RAMPF knows how to achieve optimal material processing.

**Material and machine from a single source – harness RAMPF's full range of services for your application.**



- 1 DELIVERY CONTAINER A
- 2 DELIVERY CONTAINER B
- 3 MATERIAL TANK A
- 4 MATERIAL TANK B
- 5 RECIRCULATION PUMP
- 6 DISPENSING PUMP
- 7 DYNAMIC MIXING HEAD



# Your industry | Your application

## Pioneering solutions for current and future challenges







When used in everything from sensitive electronic components, batteries, power electronics, and automotive sensors to transformers, motors, and numerous other electrical and electronic components, electro casting resins from RAMPF Advanced Polymers provide reliable and efficient protection against chemical substances and environmental influences such as heat, cold, and moisture.

They also ensure optimum heat dissipation, which helps the component perform more efficiently and achieve a longer service life.

Our polyurethane-, epoxy-, and silicone-based products – RAKU® PUR, RAKU® POX, and RAKU® SIL – offer a wide range of mechanical, thermal, and chemical properties and meet the highest quality requirements. They are used by leading manufacturers, including in the automotive and electronics industries.

Thanks to many years of experience in product development and processing technologies, we can provide comprehensive advice on materials and process engineering issues.

We have the best solution for your application in the following sectors:

-  **AUTOMOTIVE**
-  **ELECTRICAL / ELECTRONICS**
-  **E-MOBILITY**
-  **ENERGY MANAGEMENT**
-  **RENEWABLE ENERGY**
-  **HOUSEHOLD APPLIANCES**





**+ YOUR BENEFITS**

- > Comprehensive product range and broad spectrum of properties ensure the perfect material for your requirements

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- > RoHS and REACH compliance

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- > ISO 9001 and ISO/TS 16949 certification

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- > Used by leading manufacturers in the automotive industry

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- > Compliance with the test standards of leading OEMs



# Automotive

## Speed and reliability

### With customized electro casting resin systems

Automotive technology is developing at a rapid pace. The majority of innovations are occurring in the electrical and electronic fields, where high thermal, chemical, and mechanical resistance and reliable protection against environmental influences ensure safe and comfortable driving.

Electro casting resins play a key role here. RAKU® PUR, RAKU® POX, and RAKU® SIL brand products meet the above requirements, and a whole lot more, too. They can be adapted quickly to new industry specifications and, due to their high quality, ensure that components deliver consistent performance throughout their entire service lives and beyond as spare parts.

Thanks to our management system certified to IATF 16949, we ensure our customers top quality and a high level of innovation. That's why leading manufacturers and suppliers in the automotive industry put their trust in us.

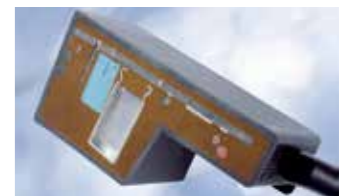
**Applications:**



**AC/DC AND DC/DC CONVERTERS**



**ON-BOARD POWER CONTROL**



**FUEL PUMP CONTROL**



**VENTILATION CONTROLS**



**SENSORS**



**TRUNK LATCHES**



**+ YOUR BENEFITS**

- > High resistance to fluctuations in temperature
- > High mechanical and thermal strength ensure your product functions correctly over the long term
- > Wide range of applications due to innovative, customized product development
- > High thermal conductivity
- > Meets the strictest requirements of test standards and listings such as UL 94 V0, RTI, and OBJS2



# Electrical / Electronics

## High-performance systems for maximum durability

### Diverse range of products for the protection of sensitive components

Electrical and electronic components play a key role in the development of numerous industries. Robust and fault-free electronics are essential for the long-term functionality of assemblies. High resistance to fluctuations in temperature is of major importance for material and components in this regard. These need to withstand extreme and rapid levels of cooling and heating without sustaining damage. Our high-performance electro casting resins under the RAKU® PUR, RAKU® POX, and RAKU® SIL brands protect sensitive electronic components due to their high thermal and mechanical strength, high resistance to moisture and chemicals, and high flame retardancy.

We also have the solution for extreme conditions. Thanks to their outstanding thermal capacity, our RTI electro casting resins permanently retain their properties and functions, and thus ensure the best performance of the electrical/electronic systems.

**Applications:**



**PLUGS**



**RELAIS**



**CAPACITORS**



**TRANSFORMERS**

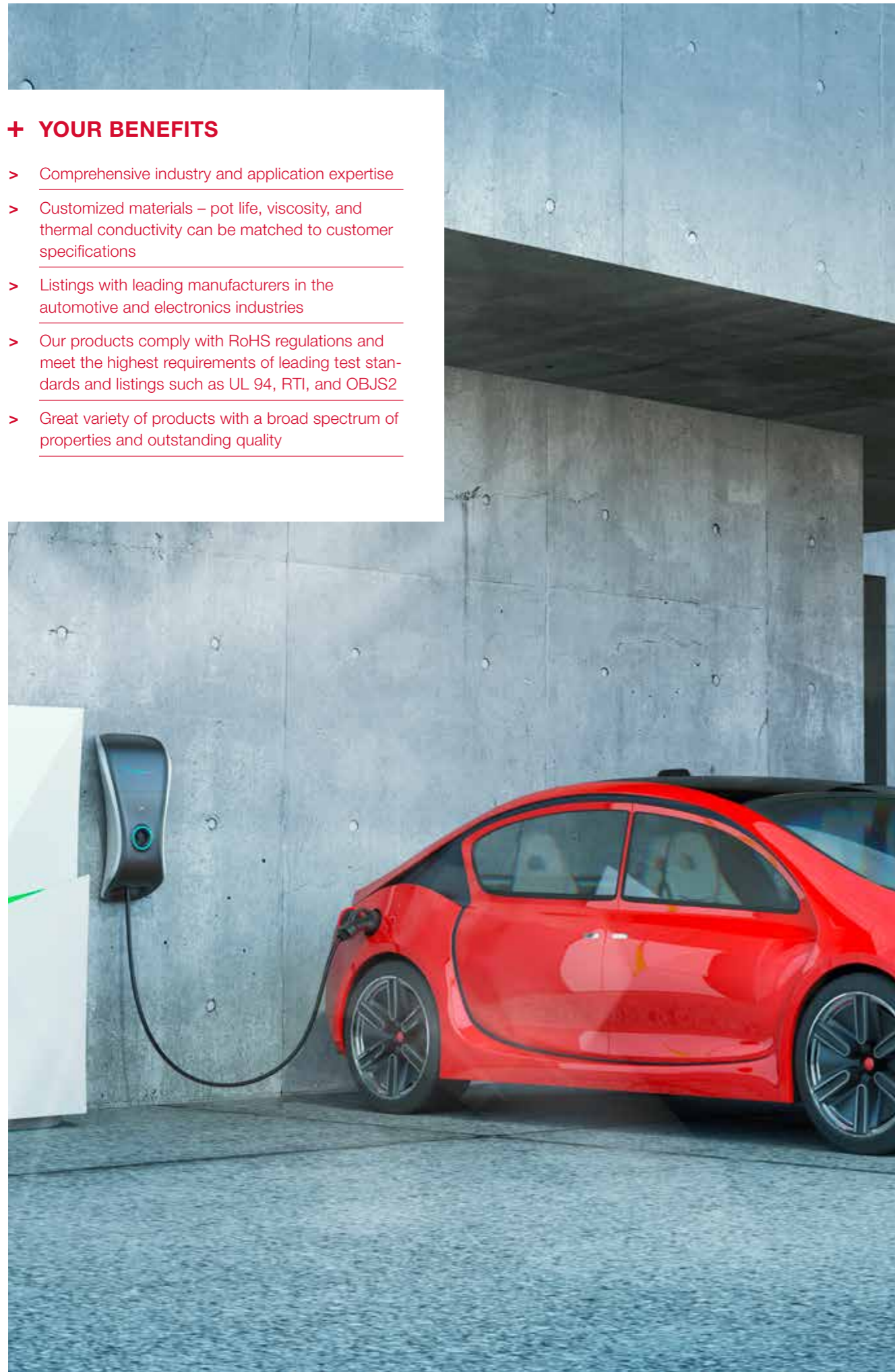


**MOTORS**



**CONTROL UNITS**





**+ YOUR BENEFITS**

- > Comprehensive industry and application expertise
- > Customized materials – pot life, viscosity, and thermal conductivity can be matched to customer specifications
- > Listings with leading manufacturers in the automotive and electronics industries
- > Our products comply with RoHS regulations and meet the highest requirements of leading test standards and listings such as UL 94, RTI, and OBJS2
- > Great variety of products with a broad spectrum of properties and outstanding quality



# E-Mobility

Innovative. High-tech.

## Smart products for smart technology

The electrification of mobility is in full swing. Electric vehicles are set to become an integral part of the mobility of tomorrow, and this field is currently experiencing enormous growth all over the world.

In times of such dynamic change, RAMPF Advanced Polymers is a technological pioneer with its high-performance electro casting resins based on polyurethane, epoxy, and silicone, which ensure optimum heat dissipation in batteries and power electronics and provide reliable protection against chemical substances and environmental influences – thus maximizing service life, reliability, and performance.

As “innovative heat managers”, gap fillers and heat-conductive casting materials made of polyurethane, epoxy, and silicone also ensure an optimized heat management of electrical and electronic components.

**Applications:**

- |                            |   |
|----------------------------|---|
| > <u>Battery modules</u>   | > <u>Electronic Control Units (ECU)</u>           |
| > <u>Sensors</u>           | > <u>Charging connector for electric vehicles</u> |
| > <u>Power electronics</u> | > <u>Converters</u>                               |

# E-Mobility Applications

## SENSORS

2C Polyurethane

2C Silicone



## INVERTERS

2C Polyurethane

2C Epoxy



## POWER ELECTRONICS

2C Polyurethane

2C Silicone



## CHARGING PLUGS

2C Polyurethane



## ELECTRONIC CONTROL UNITS

2C Polyurethane

2C Silicone



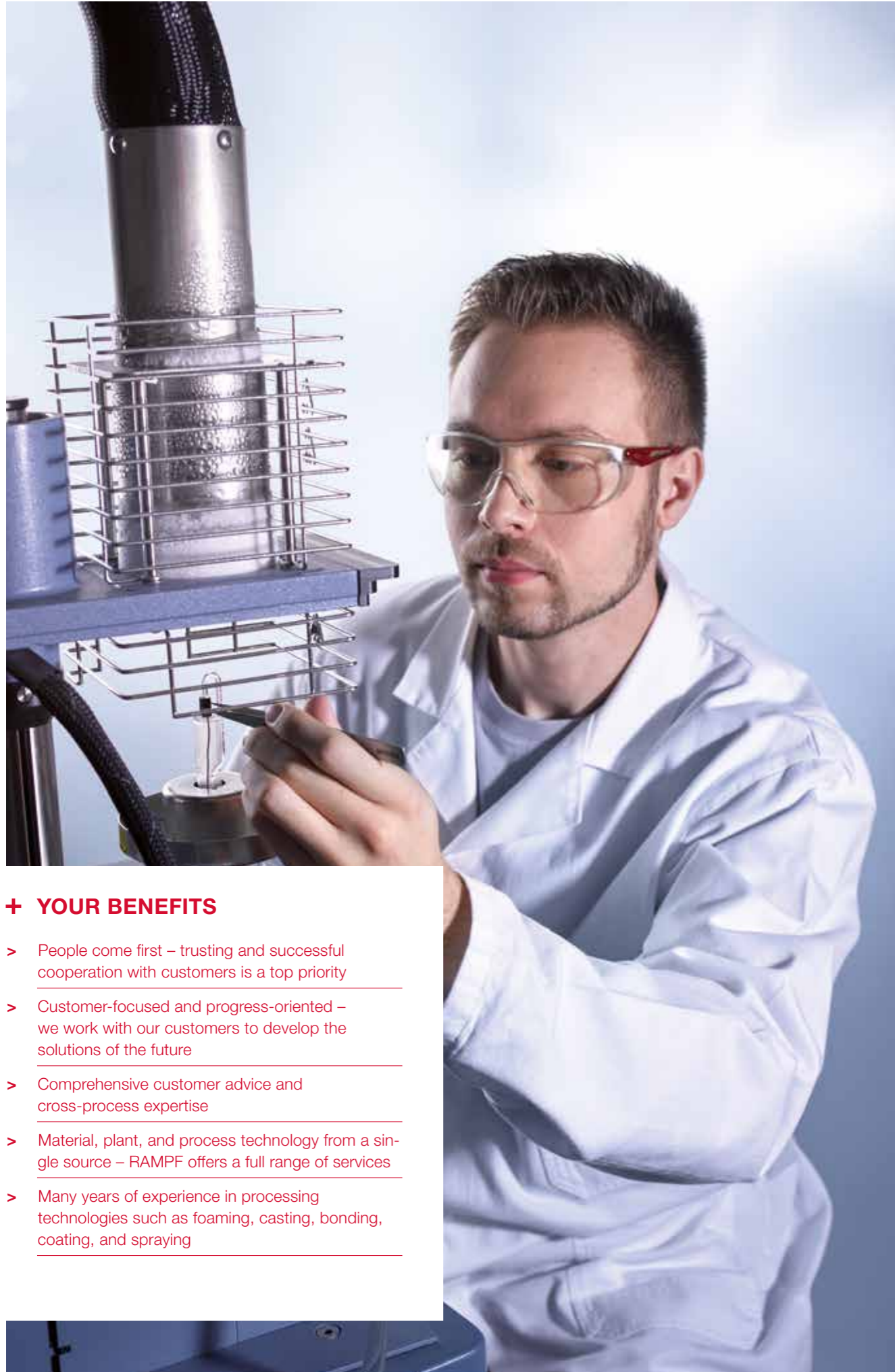
## BATTERY SYSTEMS

2C Epoxy

2C Polyurethane

2C Silicone





# Comprehensive support

## From concept to finished product

Materials, processing, consulting – your end-to-end partner

### + YOUR BENEFITS

- > People come first – trusting and successful cooperation with customers is a top priority
- > Customer-focused and progress-oriented – we work with our customers to develop the solutions of the future
- > Comprehensive customer advice and cross-process expertise
- > Material, plant, and process technology from a single source – RAMPF offers a full range of services
- > Many years of experience in processing technologies such as foaming, casting, bonding, coating, and spraying

RAMPF offers its customers complete support – from product development to market launch:



#### LABORATORY AND APPLICATION TECHNOLOGY

- Initial consultation on selecting the best material and processing procedure
- Customized development of your material or adaptation of a product from our comprehensive portfolio
- Application engineering consultation for component design and manufacture of sample parts in near-series conditions
- Manufacture of prototypes



#### PROCESSING EXPERTISE

- Support and consulting for applications as well as process development and optimization
- All-encompassing machinery pool for conducting near-series customer trials
- Mixing and dispensing systems from RAMPF Production Systems – perfect processing for all 1- and 2-component materials



#### AFTER-SALES SERVICE AND TRAINING

- Our customer service does not end with the start of series production: Technical field representatives, application technicians, and product developers are always at your service
- The RAMPF Academy offers product and application training courses that emphasize sharing experiences

# Think global | Act local

With production on three continents and sales partners worldwide, we are always there for our customers – wherever they are

RAMPF thinks globally and acts locally. In addition to our state-of-the-art production facility in Grafenberg, our products are also manufactured at key strategic sites in the United States and China.

No matter where they are produced, the same applies – when it says RAMPF, it is RAMPF. The highest standards of quality apply to our production in both the United States and China, which has helped our facilities become very successful. Our foreign subsidiaries RAMPF Group, Inc. (USA), and RAMPF (Nantong) Co., Ltd. (China) are experiencing rapid growth, and ever more customers are placing their trust in RAMPF quality.

Of course, there is more to it than production standards. The high quality of RAMPF products is also based on first-class advice and a comprehensive array of services.

This strategy is also supported by our global network of sales partners and experts at our sales offices in the United States, China, and Japan. They ensure our customers receive rapid and expert advice – no matter where they are and which industry they represent.



## + YOUR BENEFITS

- > Global presence of our products and experts
- > High level of flexibility in production
- > Short delivery times
- > Comprehensive consultation

# We are inventors. Team players. And a strong partner.

**RAMPF stands for pioneering chemical solutions and visionary engineering. Worldwide.**

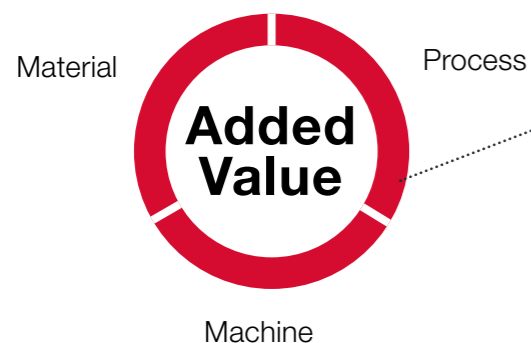
From a one-man operation to an international group with twelve sites spread across three continents – with our products and solutions centered around reactive resins, machine systems, and lightweight construction with composites, we rank among the market leaders in a whole host of industries.

Discover the future – this is both our corporate slogan and the foundation of our long-standing success story. In close cooperation with our customers and partners, we develop tomorrow's products and solutions today – for the decisive competitive advantage.

Sustainability has been a priority right from the outset. This is no mere buzzword but an integral part of our day-to-day activities. As pioneers of chemical recycling, we have been contributing to an effective circular economy for decades. The raw materials that we recycle are used both by our customers and within our Group.

We are also a sustainable employer. RAMPF grows with its employees – we invest in our staff and are keen for them to work with us in the long term. We achieve this by openly showing appreciation and offering extensive training and development opportunities.

A forward-looking, sustainable, and value-creating family-run business – as a partner to industry and as an employer, we attach the greatest of importance to trust and reliability. These qualities are an absolute must when it comes to establishing long-term, successful partnerships.



**RAMPF – Chemical and Engineering Solutions.**  
Utilize our wide-ranging innovative potential for Added.Value.





**RAMPF –**

discover the future

Developing the Solutions  
of Tomorrow – Today.

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**Mass production?**  
Not at RAMPF.

**We engineer  
made-to-order solutions.**

