



POWER FOR ELECTRIC DRIVE TECHNOLOGY

System partner for electrolaminations
and sheet stacks

 FEINTOOL

EXPANDING HORIZONS



Take advantage of our services and key technologies.

The entire process chain from a single source

- ▶ Development, engineering, project management
- ▶ Prototyping
- ▶ Tool and jig manufacturing
- ▶ Preproduction and high-volume production
- ▶ Quality management

Leverage all available technologies and processes

- ▶ Laser cutting and stamping
- ▶ Stacking (in-tool lamination core stacks, welding, gluing, baking, riveting)
- ▶ Metal and plastic joining
- ▶ Annealing

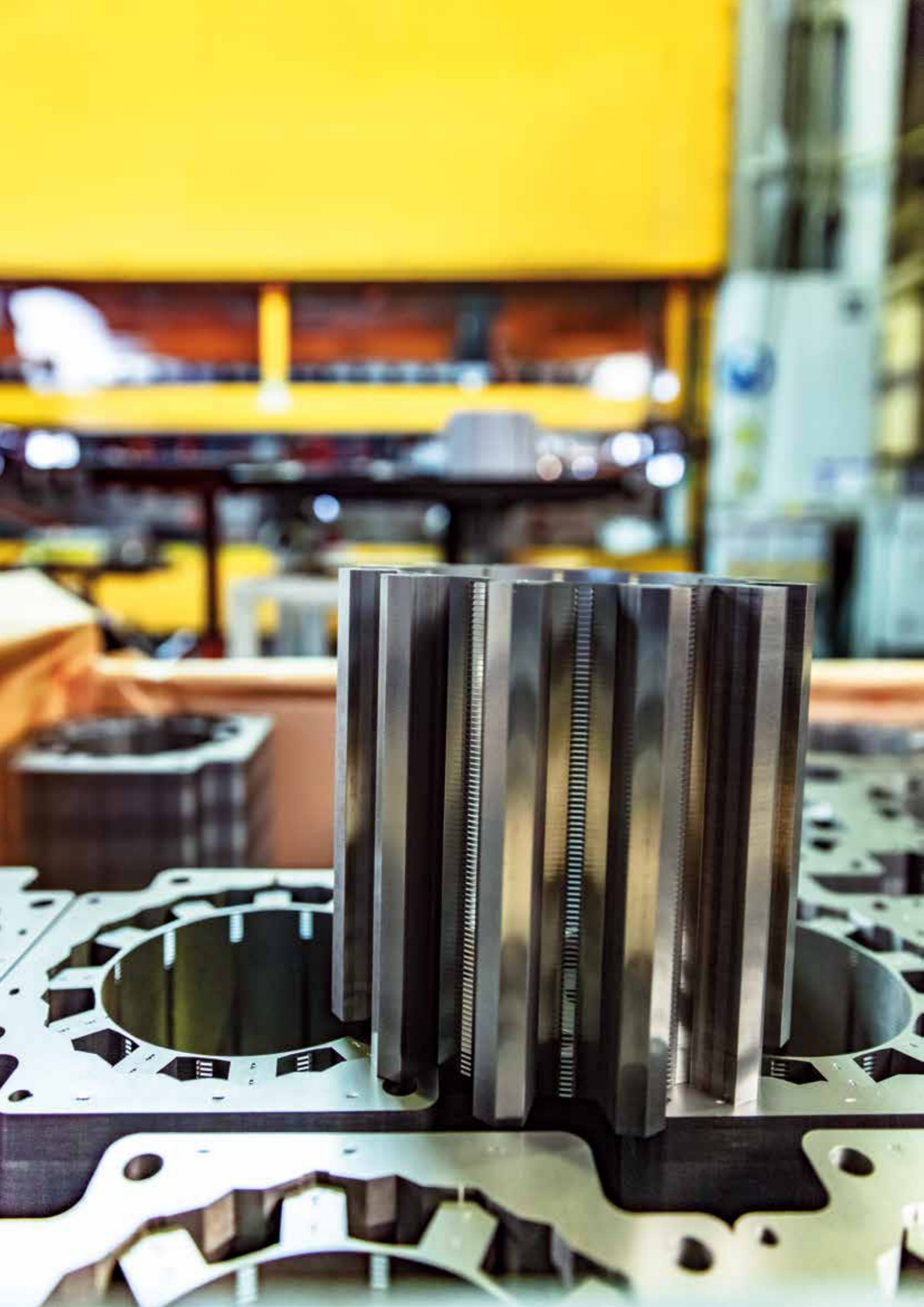
Feintool is the ideal partner for cutting-edge, cost-effective production processes, maximum precision, and maximum process reliability in the manufacture of electrolaminations and sheet stacks.

LEADING THE WAY WITH INNOVATION, QUALITY, AND PRECISION

Based on our long-standing experience with stamping operations, we possess the expertise to manufacture high-precision components for electrical drive technology that meet the most demanding requirements. Feintool's technologies are the key to the cost-effective production of efficient and long-lasting electric motors for all areas of application.

As a specialized supplier of electrolaminations and sheet stacks, we offer customized production concepts and deliver both smaller volumes and high-quantity. Our range encompasses cost-benefit analyses, product development, prototyping, tool and jig manufacturing, and high-volume production. We are proficient in all the relevant technologies, such as laser cutting, stamping loose laminations, in-tool lamination core stacks, and metal and plastic joining. We also supply windable assemblies in the form of plastic-insulated stacks.

Our global presence enables us to offer manufacturing capabilities across national borders, featuring identical processes and the highest standards of quality.



TECHNOLOGIES FOR ELECTRIC DRIVE SYSTEMS

Design the future more efficiently with electrolaminations and sheet stacks from Feintool.

Whether for micromotors, electric vehicles, or power plant gensets – Feintool's electrolaminations are built for maximum performance. They meet the highest standards of quality and marry a variety of different properties.

- ▶ Rugged and lightweight
- ▶ Outstanding electromechanical properties
- ▶ Minimal manufacturing tolerances

Well-engineered solutions

Feintool's manufacturing technologies play a key role in the core components of electric drives. We are proficient in all processes related to manufacturing high-quality products for electrolaminations and offer highly complex stacks thanks to the use of the latest joining technology.

The right process for every output

Feintool can provide the appropriate and cost-effective solution for all manufacturing processes for any output scenario.

- ▶ Laser-cut sheets for prototypes
- ▶ Combination products made by laser cutting and stamping
- ▶ High-volume production of stamped sheets and stacks

Efficient and flexible from the start

We use soft tools and prototype tools for the fast and cost-effective pilot production of stamped sheets in small quantities. Multistage tools are used as standard for high-volume production of large quantities.

Certified production capacity

The production lines in our plants perform several hundred million strokes per year. The processes are certified according to IATF 16949:2016 and ISO 9001:2015.

Personalized service packages for every customer need

A multitude of proven processes and our wide range of machines enable us to offer flexible and customized production solutions.

Our service packages at a glance

- ▶ In-house material cutting: short delivery times thanks to the slitting and cut-to-length process steps
- ▶ Samples and small series: dual-head laser cutters make rapid and efficient prototyping possible
- ▶ Loose laminations and stacks: electrolaminations and baked, welded, and glued packages in all required variations and quantities
- ▶ Production of sheets in medium quantities: single notching machines with press forces between 4 and 20 tons are available for manually operated or automated production
- ▶ Production of different diameters: high-speed blanking presses with press forces from 20 to 400 tons and installation areas for every tool size allow us to produce variable piece sizes

Our presses have a maximum table length of 3.7 meters. Diameters up to 600 mm can be stamped with progressive dies.

STAMPING AND IN-TOOL LAMINATION CORE STACKS

The right choice for medium and large quantities.



We develop, manufacture, and supply electrolaminations and sheet stacks for all types and sizes of electric drives.

Stamping loose laminations is the basis for a huge variety of products. When it comes to the shape and size of the components, there are no limits. The spectrum ranges from drives for dentist's drills all the way to ship engines.

Versatile and innovative

We employ a wide range of innovative manufacturing options. Quality-assurance measurements and inspections guarantee the quality of your products at every stage of the process.

- ▶ Stacks in every design made from cookies or segments: welded, baked, riveted, or glued
- ▶ In-tool stacks for rotors and stators
- ▶ Single or multipart in-tool stacked sets

- ▶ Cookies, segments, single poles, rod cores, and linear stacks
- ▶ Laser-cut or stamped loose laminations
- ▶ Rotor and stator laminations
- ▶ Segment, pole, and strip laminations
- ▶ Special cuts
- ▶ Slit strips and plates

When it comes to finished in-tool lamination core stacks, we offer any desired stud contour. We incorporate a twist as well as sheet thickness compensation by means of spiral skewing.

LASER CUTTING, AND METAL AND PLASTIC JOINING

The right choice for prototypes and small quantities.



Laser cutting: highly flexible production of prototypes in small and medium quantities on state-of-the-art laser systems.



Metal and plastic joining: in-tool stacked components ready for assembly with plastic insulation.

Laser cutting is particularly suitable for manufacturing small and medium quantities of high-precision, thin-sheet parts from electrolaminations. Areas of application include the automotive industry, renewable energy, industrial robots, and the transportation sector.

Ideal for tool-free prototype production

Declining volumes and a growing variety of components make manufacturing processes increasingly challenging. Our laser-based production technologies are ideal for tool-free prototype manufacturing. We manufacture electrolaminations with thicknesses from 0.10 to 1.00 mm thickness with a precision of the cut of a few hundredths of a millimeter. Thanks to its flexibility, the laser process is the perfect choice for the fast, efficient, and, above all, cost-effective production of small and medium-sized series. Other areas of application include manufacturing repair and upgrade components as well as implementing special contours.

Metal and plastic joining: optimal quality for series products

Injection-molded slot insulators made of plastic are a worthwhile alternative to conventional paper insulators for electric motor components. We use this process to manufacture windable components. Stamping and injection molding are carried out in perfectly harmonized processes, which guarantee consistently high quality.

Variable processes for prototypes and series products

Baking, welding, and gluing stator and rotor stacks rounds out our technology portfolio. Aspects such as increasing productivity, guaranteeing quality, and shortening development time all play a key role in the use of these processes – while always taking a comprehensive view of the process chains.



SERVICE TAILORED TO YOUR NEEDS

Our customers' flexibility is our top priority.

We provide what you need every day

Our range of services extends across the entire process chain from feasibility analyses to high-volume parts production. The choice of manufacturing process depends on the specific requirements and order volume, with the cost-effectiveness of production being our top priority.

Cost-benefit analysis

We evaluate your output scenario and recommend the best manufacturing process for you: stamping or laser cutting, as well as the type of joining technology.

Prototyping/engineering

All high-volume parts production processes begin with prototypes. Laser cutting is the ideal process for producing prototypes of smaller production volumes. This does not require any tools, which has a positive effect on costs. The precision of the cut comes close to series tolerances. The combination of component design, tool development, and manufacturing concept results in a holistic, cost-effective manufacturing process. Feintool's engineers work with state-of-the-art processes, from CAD-assisted tool design and FMEA risk analyses to layouts for the complete manufacturing process.

Tool and jig manufacturing

We manufacture precision tools and the corresponding jigs in our in-house toolmaking department and handle their careful maintenance. We build soft tools for preliminary stamped sheets as well as multistation tools that are used for the largest production volumes with the highest precision requirements. The unrelenting trend towards greater power density, compactness, and lightness is making components ever more sophisticated. Competitive production depends on the right expertise and tools. Multistage tools are standard at Feintool. Net shaped parts are manufactured cost-effectively directly in the tool without secondary machining.

Feintool support: parts and tool design

Our focus is on the development stage – many years of experience in tool engineering and prototyping coupled with computer-based simulations ensure that we deliver ideal component and tool concepts. In this context, our emphasis is on shortening the development time from prototype to high-volume parts production.

Feintool tooling expertise

- ▶ Pilot production tools and soft tools
- ▶ Progressive cutting tools
- ▶ Interlocking tools
- ▶ Single notching tools
- ▶ Baking and welding fixtures
- ▶ Tool spare parts and parts subject to wear and tear

Unparalleled production quality for your competitive edge

Electric motors and components of all types and sizes will play an important role in the future. Electric mobility, renewable energy, cutting-edge automation processes, and the increasing use of industrial robots are driving innovation. Thanks to their cost-effectiveness and quality, Feintool innovation drivers technologies ensure that you are ideally positioned in lucrative growth markets. Since we consolidate all the key technologies for component development and production under one roof, you benefit from a very short time to market.

Quality management

Feintool's quality management extends from the development stage to the start of production. During high-volume parts production, we systematically monitor and seamlessly document every step of the manufacturing process. All Feintool plants comply with the ISO 9001 and ISO TS 16949 quality standards.

Research and development

Feintool conducts basic research with renowned partners from the worlds of science and industry. We develop new processes and applications to maintain our technological edge. We apply lean management and Six Sigma methods to continuously optimize the quality and efficiency of development and production.



ELECTROLAMINATIONS: IT'S ALL ABOUT VARIABILITY

Special solutions for all sectors and industry segments.

We offer our customers a comprehensive range of products and services in the field of electric motors, from automotive and industrial applications to power and rail technology to transformers and pumps.

The challenge when manufacturing electro-laminations and sheet stacks is the enormous versatility of the product-related solutions. The number of designs and sizes is as diverse as the range of electric drive and machine applications.

Stamping and machining electrolaminations via laser cutting or precision tooling has a significant impact on the durability, size, and weight of the products, as well as their performance and efficiency. We offer a wide range of products by combining manufacturing processes such as drawing, forming, bending, and coining as well as through the application of joining processes such as welding, gluing, or interlocking.

We achieve maximum product cost-effectiveness and performance through the use of complex progressive or interlocking cutting tools. Maximum dimensional accuracy, process reliability, and minimized form, position, and flatness tolerances are the key benefits. We achieve this thanks to highly trained specialists who work with the most high-precision manufacturing machinery and ensure that all process components interact perfectly.

Feintool's combined processes guarantee maximum flexibility and variability – for solutions in all industries and technology sectors.



Automotive industry: e-sheet stack for an electric motor that serves as a drive for the radiator and fan systems in the vehicle.



Industrial applications: e-sheet stack for an electric motor used as a drive for industrial automation equipment.



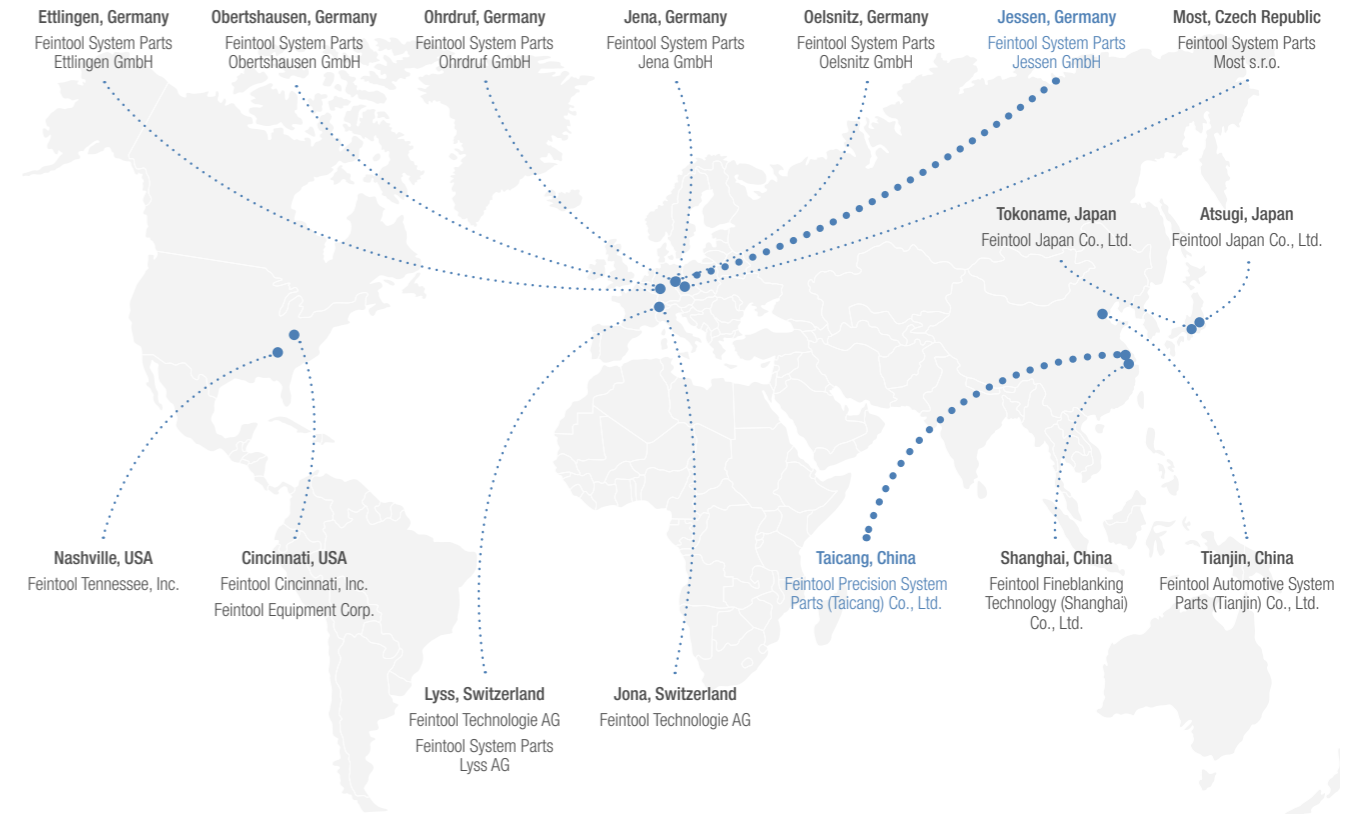
Power generation and distribution: e-sheet stack for an electric motor required as a generator for hydroelectric power generation.



Transportation: e-sheet stack for an electric motor used as a hybrid drive in buses.

FEINTOOL: YOUR STRONG PARTNER

Global competence. Local presence.



We support you worldwide

Feintool is the world's leading supplier of fineblanking, forming, and electrolamination stamping technologies. Headquartered in Switzerland, the company operates its own production plants and technology centers in Europe, the United States, China, and Japan. Feintool's approximately 2 600 employees work around the globe on new solutions and provide you, the customer, with decisive advantages in your market. You benefit from a powerful global network with a local presence in the world's most important economic regions.

Expanding horizons together

As a Feintool customer, you benefit from our many years of experience, our high level of innovative strength, our solution-driven approach, and our service mentality. This select group of companies relies on Feintool in the field of electric mobility: Pierburg, Brose, Continental, Bosch, VW, Daimler, SEW, Siemens, Baumüller, Wilo, Swoboda, Gruner, Lenze.

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