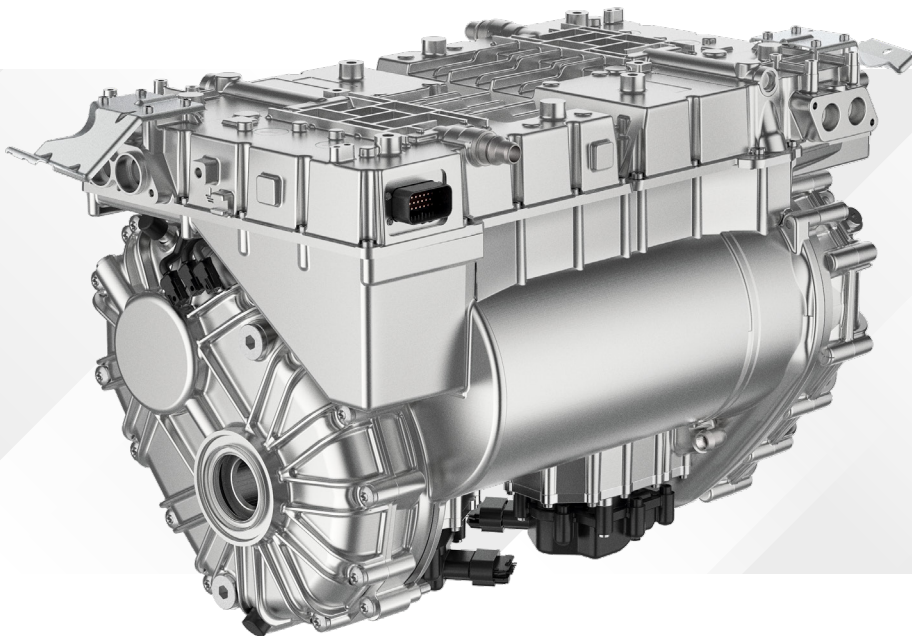


EXPERIENCE MOBILITY

# ELECTRIC DRIVE UNITS.

DRIVING FORCE FOR E-MOBILITY.



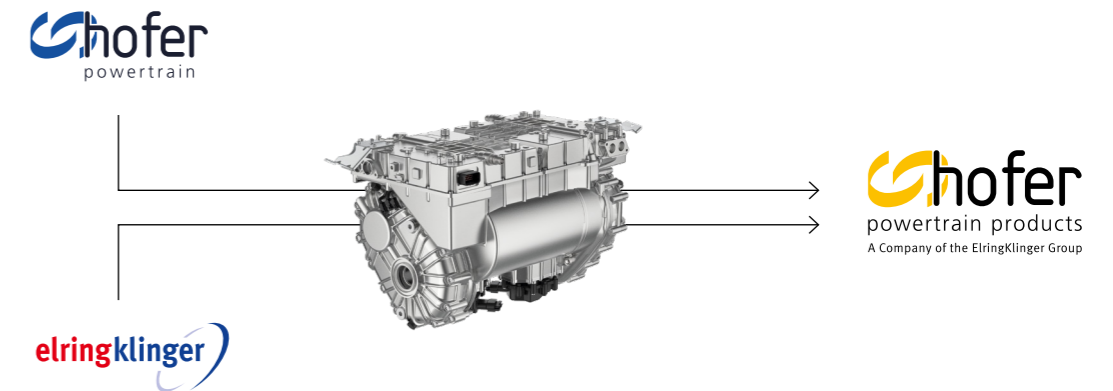
HOFER POWERTRAIN PRODUCTS

# A WIN-WIN PARTNERSHIP

The hofer powertrain products brand combines the expertise and strengths of both hofer and ElringKlinger.

“We look forward to unleashing our focused know-how in an effort to deliver high-tech solutions for electric drive units.”

Alexander Heinzlmann,  
Director Global Business Development



Together with the engineering company hofer, ElringKlinger is expanding its development knowledge to cover the entire electric powertrain – including energy storage, electric drives, and electronic control systems. The hofer portfolio perfectly complements the system and production expertise of ElringKlinger for series components for all kinds of applications. And in turn, through its partnership with ElringKlinger, hofer is benefitting from the comprehensive expertise of a global development partner and series supplier for the automotive industry.

**INNOVATIONS ARE MADE POSSIBLE BY EXCHANGING IDEAS AND BY LOOKING AT DETAILS FROM A DIFFERENT PERSPECTIVE**

Combining an established global supplier’s experience with an engineering company’s innovative solutions makes the team of ElringKlinger and hofer even more flexible and more skilled when it comes to developing and testing product solutions for efficient drives according to customer requirements, adapting them to environmental and operational conditions, and bringing them to series maturity for global production. Both partners have a shared vision: Promoting alternative and pioneering drive concepts together, under the hofer powertrain products brand.

## ELECTRIC DRIVE UNITS

# THE EDU – THE HEART OF E-MOBILITY.

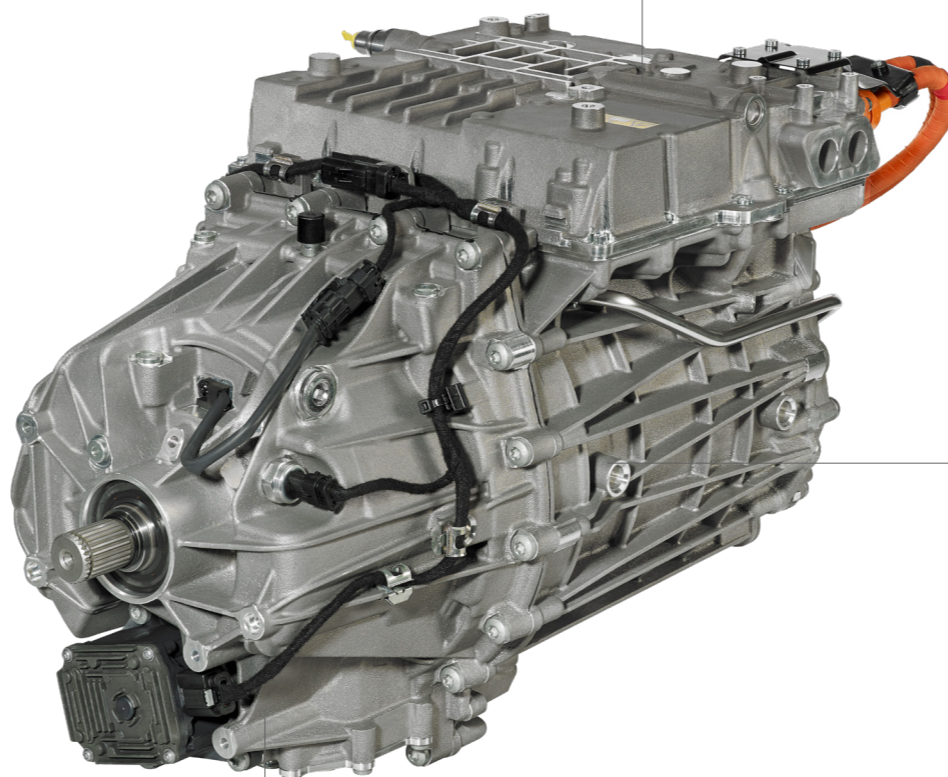
In collaboration with our strategic partner hofer powertrain, we develop and produce highly efficient electric drive units (EDUs) designed to unlock the true benefits of hybrid or all-electric vehicles where it matters most – on the road.

## COST-EFFECTIVE SOLUTIONS FOR HIGH-VOLUME AND SMALL-BATCH SERIES

Our capabilities span everything from solutions for high-volume production to small-batch manufacturing for standard applications or deployment in the luxury and performance segment. Alongside e-motor, transmission, and power electronics, this also includes control software, thermal management, and safety concepts. By taking an all-embracing approach to the entire drivetrain, we are able to exploit the full potential in respect of cost, quality, and efficiency. Regardless of which drive concept you choose, whether you opt for a concentric or an axially parallel design, a solution for single-motor drives or for torque-vectoring-enabled dual-motor drives – our components are engineered to deliver on every front.

## TRANSMISSION

The transmission can be configured as a planetary gear set for coaxial applications or as a spur gear for axially parallel applications. The design can be single or multi-level.



## POWER ELECTRONICS

Power electronics are designed to convert the direct current of a high-performance battery into an alternating current, in addition to handling motor management.

For this purpose, we offer three- or six-phase inverters that power one or several e-motors. It goes without saying that all components meet the latest safety standards.

## ELECTRIC MOTOR

Highly efficient permanent-magnet synchronous machines (PSMs) with an output of up to 300 kW. Higher output or asynchronous concepts are available on request.

## GOOD TO KNOW

ElringKlinger's expertise within the field of alternative drive solutions spans around two decades. Battery modules, fuel cell stack modules, and end-to-end systems are already being produced in large volumes.

ARCHITECTURE VERSIONS

# MODULAR EDU SYSTEM.

A high degree of flexibility is of paramount importance when it comes to compiling the electric drive units: be it a complete system or the integration of individual modules – we develop customized solutions for your specific requirements.

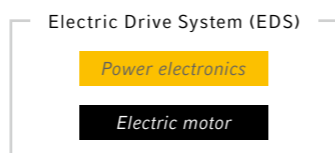
## VARIABLE DRIVE ARCHITECTURE – PERFECTLY COORDINATED

Irrespective of which powertrain elements are involved: our extensive expertise across all powertrain components enables us to offer complete systems or integrate the customer's own components into an overall concept and harmonize them to the highest standard possible.

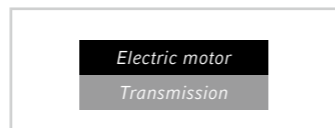
## ALL VERSIONS

Individual modules up to and including a highly integrated unit

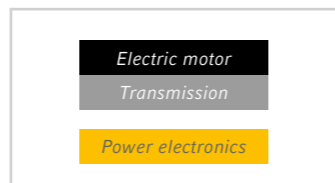
1. Individual components for integration into a complete system



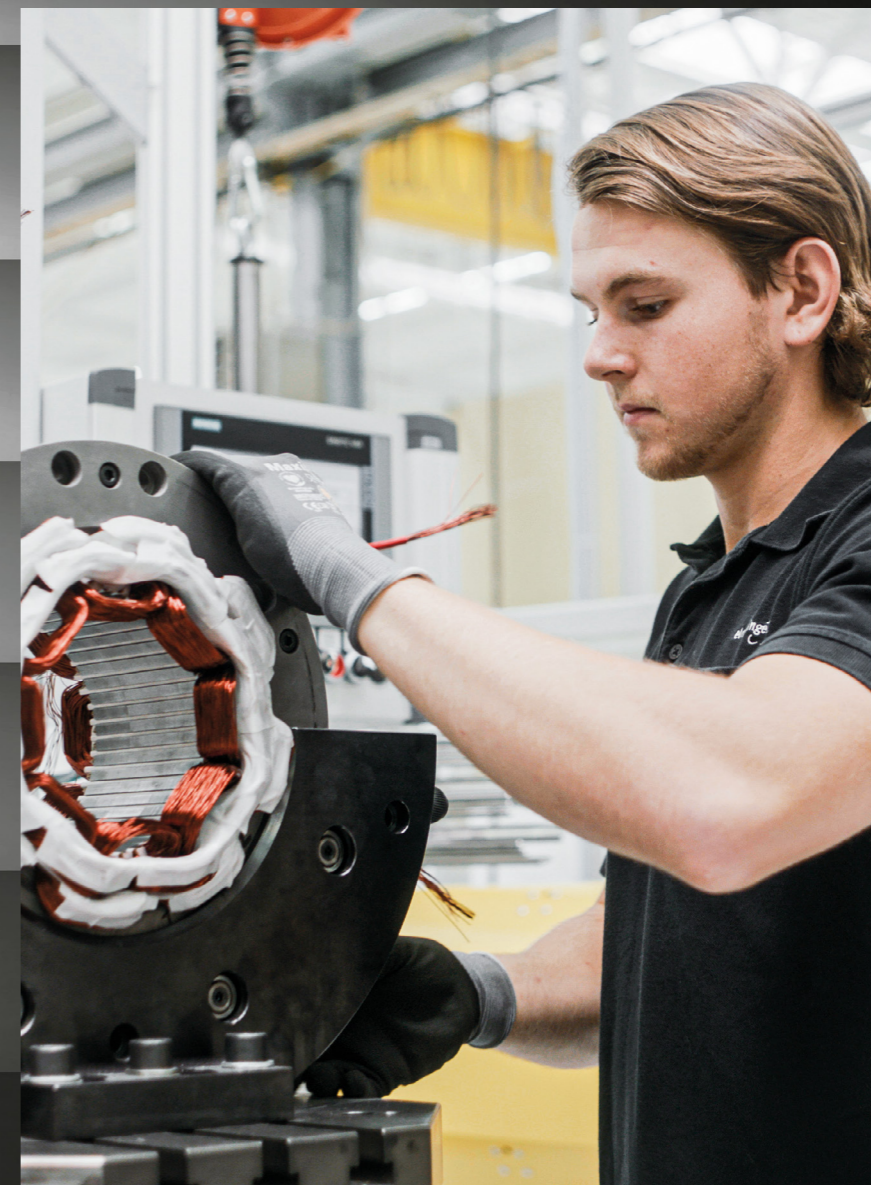
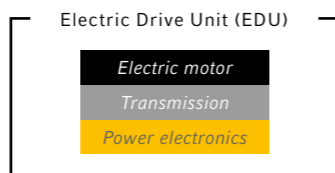
2. Integration of the electric motor into the transmission (box-in-box design)



3. Partially integrated power electronics (shared-interface-design)



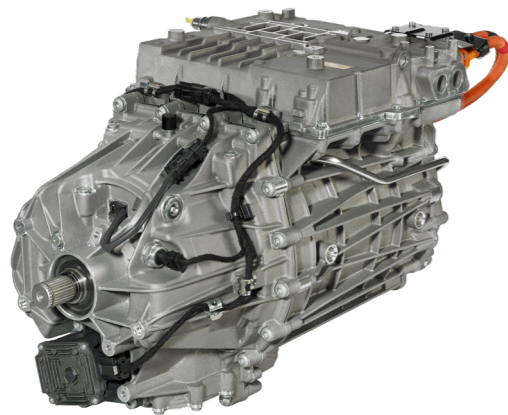
4. Fully integrated solution in a single housing



## EDU CONFIGURATIONS

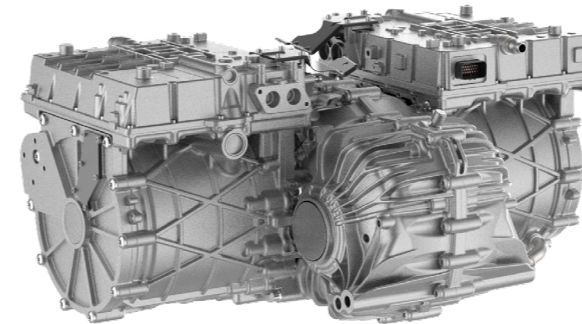
# INDIVIDUALITY COMES AS STANDARD.

Whether coaxial, axially parallel, with or without disconnection clutch – our EDUs can be configured individually and are also highly suitable as standard solutions for a number of requirements.



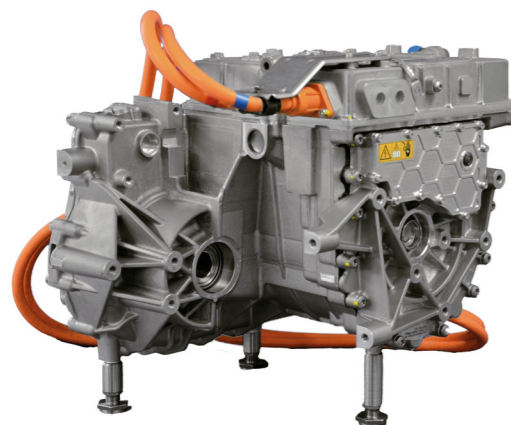
## COAXIAL EDU

A coaxial EDU version has been developed for space-saving requirements with very high power densities. The installation space is used logically thanks to the correspondingly designed configuration. Thanks to the service life of up to 600,000 km, this EDU version is ideal for people mover applications. Here, the electric motor and the power electronics can be configured in modular form. During operation, the electric motor's output is transferred to the planetary gear system and a differential. A disconnection clutch can be optionally integrated for additional safety functions.



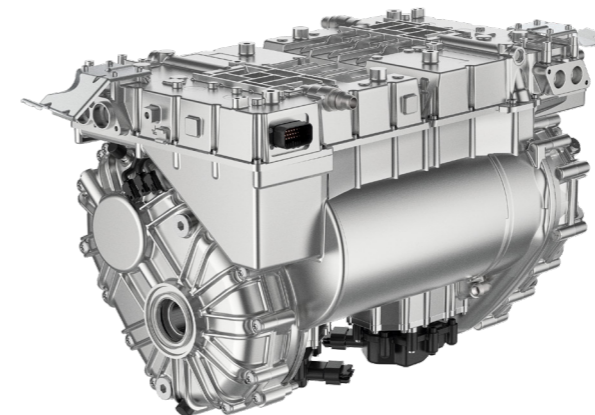
## HIGH PERFORMANCE TORQUE VECTORING EDU

Thanks to torque vectoring and its high power density, this EDU version offers special characteristics for demanding requirements. Two independent drives are combined in a single transmission housing in a compact design. This enables active torque vectoring and the speed per wheel can be accelerated or braked depending on the driving situations. The electric motor's power is transferred to the half-shafts using a two-stage spur gear system - for optimal torque vectoring implementation. The EDU version is used primarily in high-powered vehicles or all-wheel drive systems.



## OFFSET EDU

The transmission is characterized by its very compact design. The electric motor and power electronics can be configured in modular form. The electric motor's output is transferred to the half-shafts using a two-stage spur gear system and a differential. A parking lock can also be added as an option. Thanks to its compact design, the motor can be easily integrated into various vehicle platforms.



## HIGH COMPACT TORQUE VECTORING EDU

With the high compact torque vectoring EDU, two independent drives are combined in a single transmission housing. This enables active torque vectoring and the speed per wheel can be accelerated or braked depending on the driving situations. The intelligent combination of a planetary and spur gear enables a compact EDU design with very high power density. Thanks to its compact design, this EDU version can be integrated easily in different vehicle platforms and is used primarily in high-powered vehicles or all-wheel drive systems.

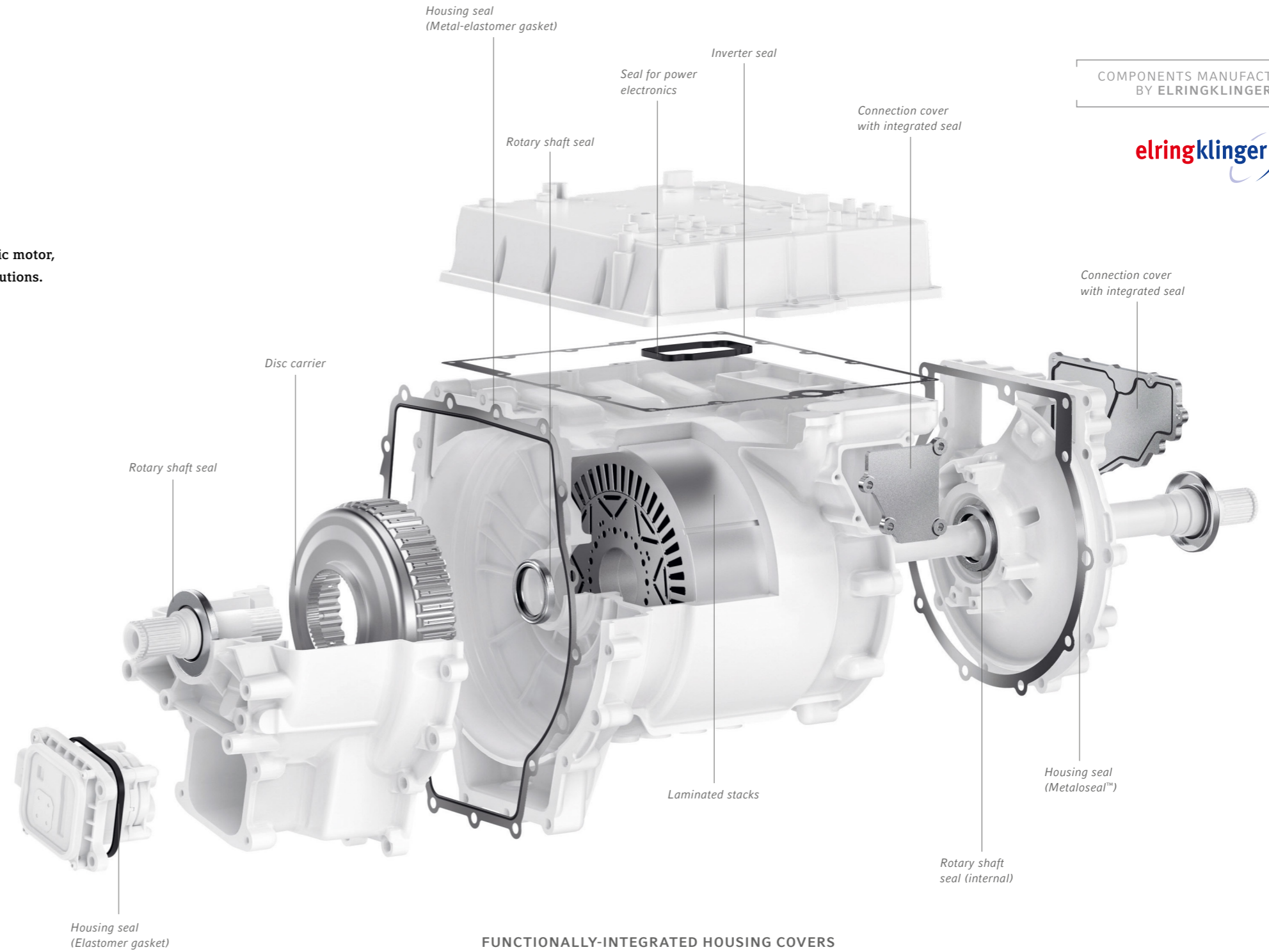
COMPONENTS FOR ELECTRIC DRIVE UNITS

# SEALING SOLUTIONS FOR NEW MOBILITY.

Seals and other components are used in various areas in an electric drive unit: electric motor, transmission, and inverter. Different requirements necessitate different, high-end solutions. ElringKlinger offers an extensive portfolio in this segment.

## BESPOKE SEALING SYSTEMS FOR EDUS

Metal-elastomer gaskets are particularly suitable for sealing highly stressed components. Cutting-edge injection molding technology can be used to join various elastomers to a metal or plastic substrate material. Pure elastomer sealing systems can also be used in virtually all electric drive unit joints. With Metaloseal™, ElringKlinger additionally offers a highly effective sealing system based on elastomer-coated or uncoated metal substrate materials. The material and design are optimally matched for each specific requirement. Our gaskets are multi-component parts. Additional and functional elements such as sensors, trim covers, filters, valves, and pre-assembled elements, for instance, can be integrated to optimize space and weight.



COMPONENTS MANUFACTURED BY ELRINGKLINGER



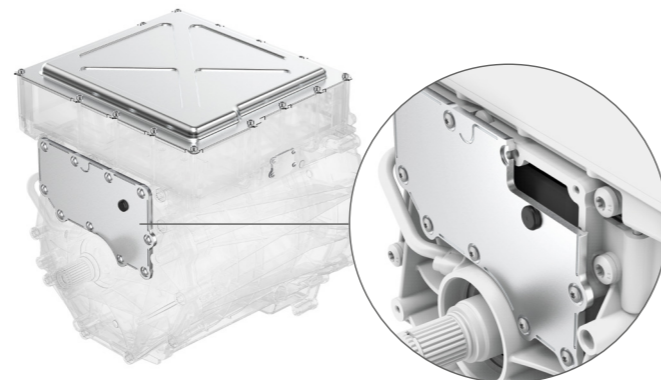
## FUNCTIONALLY-INTEGRATED HOUSING COVERS

ElringKlinger offers metal covers with an integrated seal for covering and sealing housings and passages in the EDU. The covers can be used in various areas: as service covers, to cover electronic components, or as end covers in the motor and transmission. Our product combines a cover and a seal in a single functional unit. The cover is manufactured using the stamping and deep drawing method; machining is not required. The elastomer seal is applied by means of the dispenser method. The robust and highly adaptive seal material reduces the required sealing flange

width and the seal contact pressure by 10–30%. The screw force is transferred through the stamped pressure limiters, with the result that no groove is necessary. Stamped steps and beads improve EMC behavior (electromagnetic compatibility) by establishing a direct metal/metal contact along the flange. Besides simple installation in the assembly line, the design of the mating parts can also be simplified (e.g., reduced flange width, fewer screws, no groove). The covers lead to simplified surface requirements.

## GOOD TO KNOW

ElringKlinger offers efficient and bespoke solutions for diverse sealing tasks in the electric drive unit. To accomplish this, we bring over 140 years of sealing know-how to bear.



# DYNAMIC PRECISION PARTS FOR MAXIMUM DEMANDS.

ElringKlinger offers dynamic precision parts for use in the electric drive unit and the powertrain.

COMPONENTS MANUFACTURED  
BY ELRINGKLINGER



## DISC CARRIERS: HIGH-PERFORMANCE LIGHTWEIGHTS



Clutch plates use the gearing in the disc carrier to establish a positive connection, as a result of which the drive torque is applied or connected to the transmission.

The disc carriers have to withstand very high mechanical stresses and rotational speeds while operating efficiently and reliably. The ready-to-install disc carriers from ElringKlinger meet all of these requirements to perfection.

They not only ensure high stiffness, maximum precision, and functional reliability for vehicles with an electric motor, hybrid, or combustion engine but also offer the additional advantage of up to 50% less weight compared to the solutions commonly available on the market.

Roll-finishing technology is used for the gearing. The tooth thickness is increased with the help of plastic material allocation in highly stressed areas. This also leads to the additional option of integrating the hoop banding design and transferring higher torques.

The components' mechanical connection technology enables the transfer of high torques, and additional elimination of the welding process also avoids exposing the component to thermal loads. Thanks to our tool-integrated solutions, subsequent machining is not usually necessary.

### GOOD TO KNOW

We want to create scope for our customers to achieve goals more quickly and further advance sustainable mobility. That's why we always have the entire system in mind and make targeted use of our know-how and innovative strength to realize optimal product solutions.

## LAMINATED STACKS FOR INCREASED EFFICIENCY



A high sheet package density in the rotor and stator ensures efficient operation in the electric motor.

In the first step, sheet metal coils are coated holohedrally with an adhesive developed specifically by ElringKlinger to implement the ElringKlinger multilayer sheet design. In the second step, several of these sheets are joined to form a multilayer compound sheet. This compound sheet is then punched in the third production step, and the layers are bonded directly in the tool to form complete sheet packages. In contrast to other methods, this technology allows the required packet height to be achieved with fewer punching strokes and simultaneously enables more efficient electric motor operation thanks to the use of thinner sheets.

## COST AND WEIGHT-REDUCING DIFFERENTIAL HOUSING



The ElringKlinger differential housing made from molded sheet metal is a low-cost approach for weight reduction in applications with a high torque.

The molded sheet design enables efficient series production on forming presses, mechanical joining methods to eliminate welding processes and the use of high-strength materials for transferring high torques.



#### CRUCIAL COMPONENT: PLANETARY CARRIER

Planetary gear systems offer a number of different ratio options and, with an optimized installation space, are able to transfer high torques. The planetary carrier is a functional component that is crucial for planetary gear systems in conventional and electric powertrains.

ElringKlinger is implementing a new approach in which the planetary gears are integrated in a solidly molded sheet metal part. The technical advantages of this version include a significant weight saving of up to 50%, high torques, high rotational speeds, and extensive cost reduction potential.

Thanks to the corresponding technology, the formed parts are particularly characterized by high stiffness and maximum precision. Mechanical connection technologies are also used in the planetary carrier.

The fact that the central torque pickup extends the service life of the gears due to reduced axle incline also deserves highlighting and is a particular advantage of planetary carriers developed by ElringKlinger.

Further information and fact sheets about the individual products are available at [www.elringklinger.com](http://www.elringklinger.com) in the section entitled Products & Technologies.





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