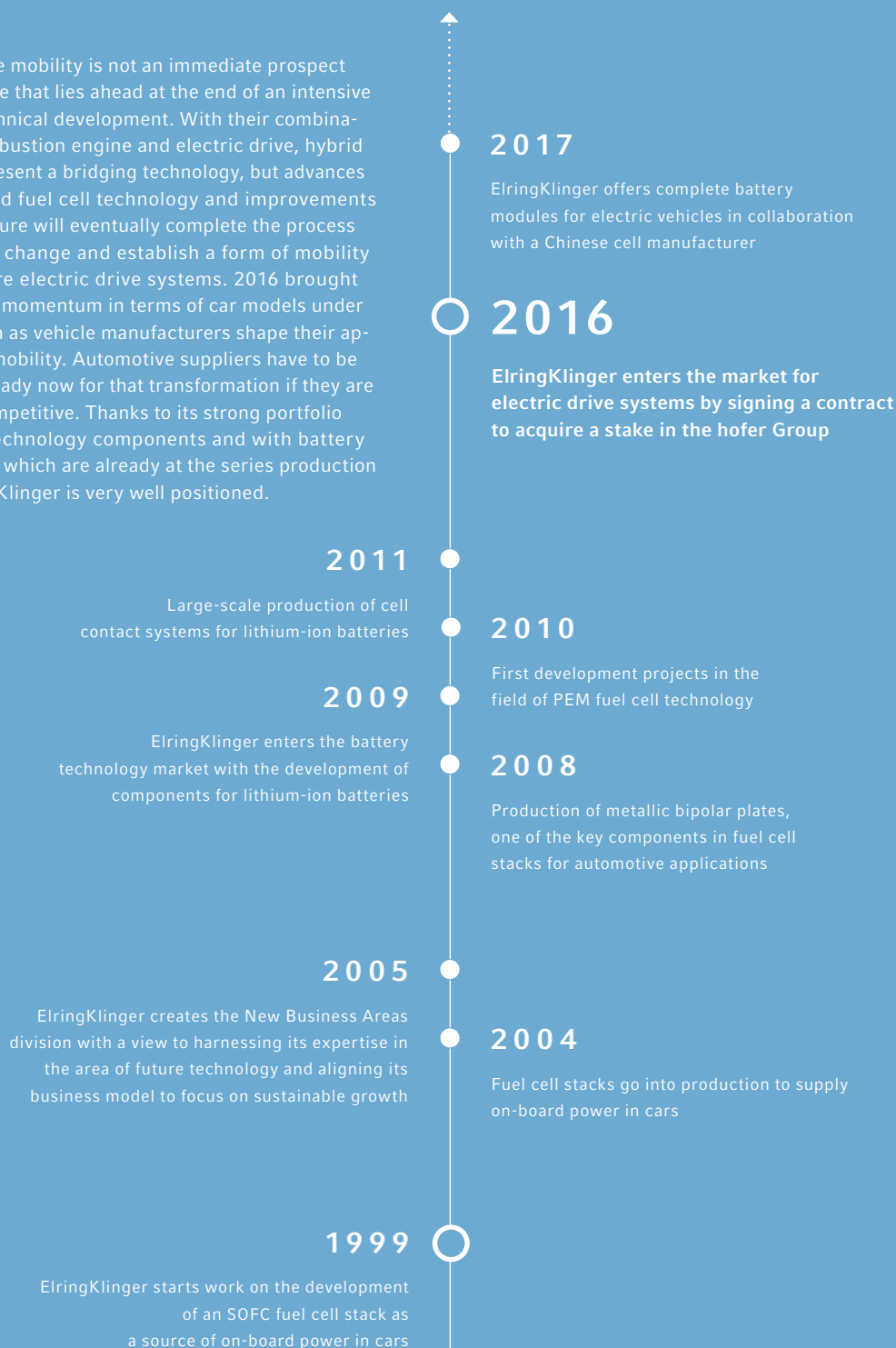


#5

PURE MOBILITY

E-VOLUTION

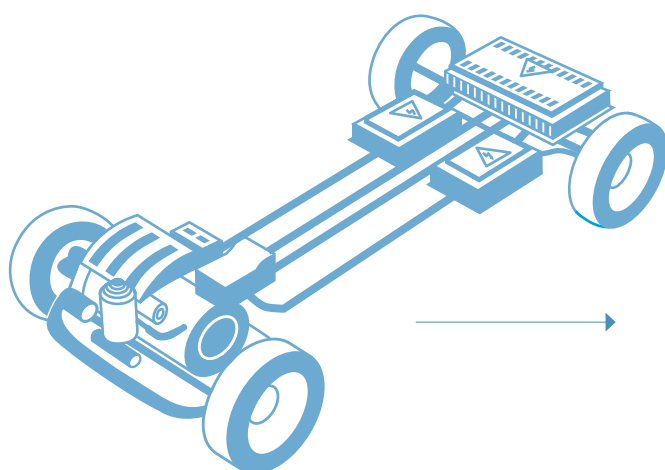
Emission-free mobility is not an immediate prospect but rather one that lies ahead at the end of an intensive period of technical development. With their combination of a combustion engine and electric drive, hybrid vehicles represent a bridging technology, but advances in battery and fuel cell technology and improvements in infrastructure will eventually complete the process of disruptive change and establish a form of mobility based on pure electric drive systems. 2016 brought considerable momentum in terms of car models under consideration as vehicle manufacturers shape their approach to e-mobility. Automotive suppliers have to be prepared already now for that transformation if they are to remain competitive. Thanks to its strong portfolio of fuel cell technology components and with battery components, which are already at the series production stage, ElringKlinger is very well positioned.



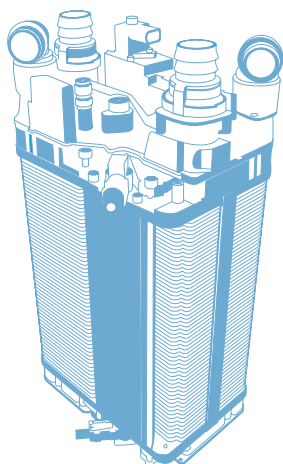
ElringKlinger decisively expanded its e-mobility portfolio in fiscal year 2016. Having acquired a strategically important holding in the systems specialist hofer, ElringKlinger now has access to additional development expertise and a greater capacity to innovate with regard to vehicle transmissions, electric motors, electronics, and software for the entire electric drivetrain. ElringKlinger and hofer will jointly supply drive systems, especially transmissions, electric drives, and battery systems for exclusive small-scale series production.

The hofer group of companies has built up over ten years of experience in the market for high-end solutions for the sports and luxury car segment, as a system developer for all types of drive technology. Today, the company's Powertrain Management solutions cover highly complex aspects of hybrid and electric drives with a focus on efficient driving performance combined with high safety standards. Previously the company manufactured components on a small scale itself. From now on, ElringKlinger will take over the industrialization of new projects. Together, ElringKlinger's process know-how and the development expertise of the hofer team with its 600 engineers have created a strong partnership.

ElringKlinger began investing in research and development for alternative drive systems at a very early stage. It has established an excellent market position since launching its first fuel cell technology project 18 years ago in response to an order from a premium car maker. ElringKlinger went on to apply its core expertise in metal working, coating technology, plastic injection molding, and high-performance plastics to develop and produce a growing number of its own components. Today, apart from the electrochemical cell, ElringKlinger's portfolio covers a large part of the value chain for the components of lithium-ion batteries, which are used in both hybrid vehicles and pure electric vehicles.

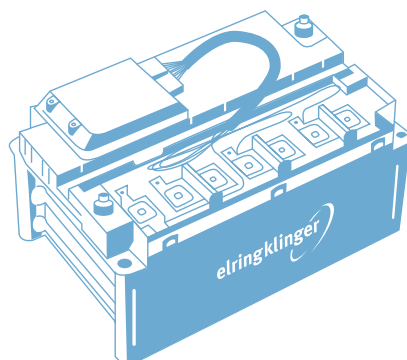


Electric drive system developed by hofer comprising the following main components: a high-voltage battery system, transmission with electric motor, power management electronics, and software.



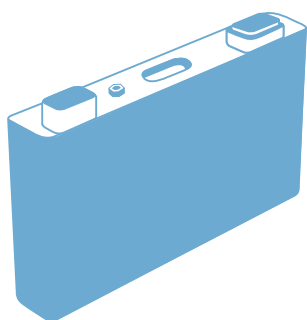
PEM fuel cell stack

features metallic bipolar plates as well as a casing and end/media modules for use in cars and industrial applications.



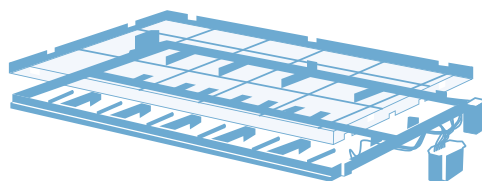
24 V lithium-ion battery module

for use in stationary and mobile applications. Thanks to high-quality connection technology and integral monitoring, the energy stored in the cells can be used to the best-possible effect. Another key benefit of the battery module is its operational safety.



Prismatic cell housing

for lithium-ion batteries with encapsulated material transition to combine the benefits of high output and low weight. The protection features are tailored to the electrochemical constituents of the cell in order to ensure maximum operational safety.



Cell contact system

for current feed in a battery module with integrated sensors for voltage and temperature monitoring. Cell connectors with integral compensation elements provide the basis for high power output and help to protect the cells against damage.

»ElringKlinger is superbly equipped to benefit from the technology revolution with its own fuel cell stacks, patented designs for metallic bipolar plates, and plastic media modules.«

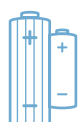
ARMIN DIEZ — Head of the Battery Technology and New Business Areas divisions

The shift towards electric vehicles is now unstoppable. One of the factors driving this transformation is new legislation on emissions based on the long-term objective of zero-emission mobility. The benefits for future car owners are even greater, however, in terms of financial savings and other “soft” factors such as the way the vehicle responds and the level of comfort. Within the foreseeable future, battery-powered electric vehicles will be able to compete on both price and technology with combustion engines. For the moment, the main obstacle to be overcome is that of battery storage capacity. Cars powered by fuel cells will

prove attractive on account of their range and fast refueling, but greater investment is needed in refueling infrastructure to ensure that they are more widely accepted.

Both fuel cells and batteries, each with their particular characteristics and advantages, will be needed to power the vehicles of the future. Depending on the way the vehicle is to be used, they can also complement each other, e.g. in the form of a zero-emissions truck with a battery-powered electric drive and a fuel cell to extend the vehicle’s range.

BATTERY TECHNOLOGY



Thanks to its portfolio of components in the area of battery technology, ElringKlinger is now a recognized system partner in the e-mobility sector. It has completely automated the production of cell contact systems, one of the vital components of the lithium-ion batteries used in both hybrid and pure electric vehicles. Another key element of the battery is the cell housing. As this is where the chemical reactions take place, it must be designed with a high degree of electrolytic resistance and excellent insulating and sealing properties. Very few manufacturers are able to produce this safety-critical product cost-efficiently in large volumes and in the required quality. For ElringKlinger, it was a natural step to include this component in its portfolio, and the company has now teamed up with a cell manufacturer so that it can offer complete high-voltage battery systems for automotive applications.

ElringKlinger is in the process of developing energy storage solutions for numerous applications outside the automotive industry, too. These include stationary storage systems, forklift trucks, electrified road maintenance vehicles, commercial vehicles, mobile equipment, e-scooters, and marine applications.

FUEL CELL TECHNOLOGY



ElringKlinger is involved in development projects with almost every single European car maker currently working on fuel cell drives. ElringKlinger’s particular area of expertise lies in the development and production of metallic bipolar plates, although the company has also designed other key stack components that can be configured for specific applications as part of the overall system.

The company has built up its expertise in the area of fuel cell technology through many projects and partnerships involving a wide range of applications. By way of example, ElringKlinger has developed PEM (polymer electrolyte membrane) fuel cell stacks for forklift trucks up to the series production stage in collaboration with a strategic partner. The company has also teamed up with a truck manufacturer and is currently developing an electric truck that combines a high-voltage battery and a PEM fuel cell stack for inner city and regional transportation. Another EU-funded project involves pure electric city buses. ElringKlinger now has the expertise and the technical capacity to expand its series production of fuel cell components.