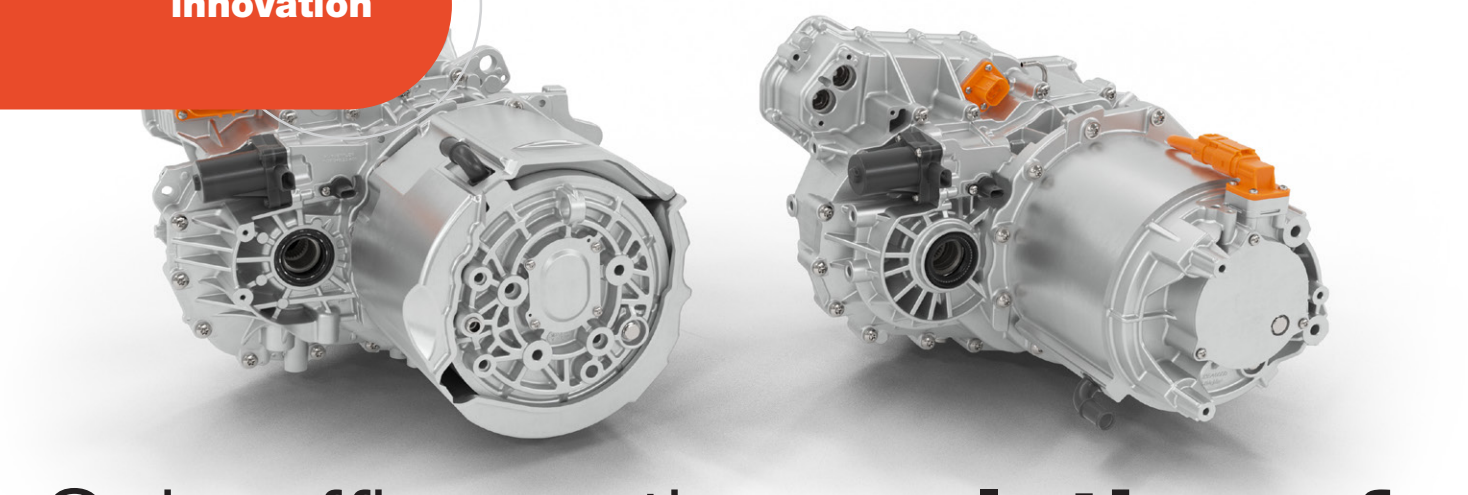
Schaeffler's EMR4 platform offers a choice between permanent magnet synchronous machines (left) and magnet-free externally excited synchronous machines (right).



Schaeffler on the **evolution of electric drives** for EVs

Battery technology grabs most of the limelight and publicity when it comes to advances in electric vehicle technology.

But, without an electric drive, the vehicle will not move. The more efficient the drive, the further it will go on a single charge.

André Metzner, SVP Business Division E-Drives & E-Mobility Europe at Schaeffler sums up the importance of the drive: "I am firmly convinced that in the Electric Drives business unit, we are laying the foundation for electromobility and setting the course for the future.

"Our highly efficient electric axle systems, e-motors, as well as hybrid and mild-hybrid systems, are all cutting-edge technologies. We receive significant worldwide recognition from our customers for our extensive expertise — from individual components to complete systems".

Matthias Zink, CEO Powertrain & Chassis at Schaeffler AG.

Under the banner of "The Motion Technology Company,"Schaeffler showcased its expanded portfolio at IAA MOBILITY 2025 for the first time since the successful acquisition of Vitesco Technologies.

Metzner says "the integration of Vitesco Technologies now enables us to offer our customers an even broader and more tailored product portfolio, optimally suited to each requirement.

"From cost-sensitive solutions for high-volume segments to powerful premium applications, we provide highly efficient drive systems that can be individually adapted to specific customer needs and installation situations thanks to a modular platform.

"The core technologies deployed range from synchronous machines with and without permanent magnets (PSM, EESM), from 400V silicon to 800V silicon carbide components, and from coaxial to parallel-axis gearboxes.

"I am particularly proud that in June, we celebrated a significant milestone: within just ten months, we successfully produced 100,000 EMR4 axle drives as a 3-in-1 solution at our Icheon site in South Korea.

"Our new developments are equally outstanding—such as drives with excellent power density, solutions for special requirements in the field of new mobility services, as well as our market leadership in coaxial e-axle gearboxes.

"To continue to consistently meet the needs of the market, we are working on highly interesting advancements—including improved cost efficiency, extended functional integration, and new e-drive topologies. With this, we aim to further strengthen our position as the preferred system supplier".

Technology showcased by Schaeffler at IAA MOBILITY 2025 focused on three core areas – electrified powertrain solutions, intelligent chassis and body solutions, and solutions for software-defined vehicles.

"We are ideally placed to serve as a key partner in the industry's transformation – in Germany, across Europe, and worldwide," says Matthias Zink, CEO Powertrain & Chassis at Schaeffler AG.

"Our goal is clear: to shape the future of mobility with our customers – decarbonized, automated, and connected."

Thomas Stierle, CEO E-Mobility at Schaeffler AG, adds: "On this journey, innovation, agility, strong execution, and customer focus are key to our success".

Technology showcased by Schaeffler included:

EMR4 electric axle drive

By 2035, battery-powered electric vehicles are expected to be the dominant drive technology. To meet this demand, Schaeffler is developing and manufacturing a wide range of electromobility solutions – from individual components such as electric motors, power electronics, and thermal management modules to complex high-voltage axle drives and electronic control units.

The EMR4 (Electronics Motor Reducer, 4th generation) combines a permanent-magnet synchronous motor, power electronics, and transmission in a single compact housing. Its modular architecture allows for precise adaptation to a wide variety of vehicle concepts.

Standardized interfaces ensure maximum compatibility and simplify integration into the vehicle.

"The EMR4 platform is designed as a modular system, offering free configuration," says Stierle. "Different inverter, reducer, rotor and stator, and housing variants enable us to deliver tailored solutions that meet the diverse performance and packaging requirements of our customers worldwide."

A variant that operates without rare-earth magnets is also available. In addition to electric drive systems, thermal management is playing an increasingly greater role in improving overall powertrain efficiency. Adaptability to future regulatory requirements is another key factor, particularly when considering the use of alternative refrigerants such as R744 (CO_2) and R290 (propane).

Schaeffler's broad, modular thermal management portfolio supports both natural refrigerants.

From PHEV to REEV

Schaeffler offers solutions for every hybrid architecture Hybrid architectures such as plug-in hybrids, mild hybrids, and range extenders.

"Schaeffler provides the full range of solutions – from individual components to complete systems – for all hybrid topologies," says Zink.

"Our dedicated hybrid transmission, for example, combines power electronics with smart hydraulics featuring integrated cooling, a clutch system, and a parking lock mechanism."

This all-in-one solution is suitable for both full hybrids and plugin hybrids and can be operated in electric, serial, or parallel configurations. In serial mode, this flexibility allows the internal combustion engine to operate consistently at optimum efficiency.

Schaeffler demonstrated the technology at IAA MOBILITY with an internal combustion engine demonstrator developed specifically for hybrid applications.

It features innovative damper solutions and electromechanical camshaft phasing units designed to meet future NVH requirements and emission standards.

To further enhance emissions control when using decarbonized fuels, Schaeffler offers the Flex Fuel Sensor, which measures ethanol concentration and fuel temperature with a high degree of precision prior to injection.

Chassis technologies for automated driving

By 2035, one in ten vehicles produced is expected to be highly automated (Level 4), with a further 15% featuring partial automation (Level 3).

These advancements create new expectations and requirements for safety and comfort.

"Through innovative damper and steering systems, supported by dedicated software, we are already delivering solutions today," says Zink.

"At the same time, we are advancing our steer-by-wire technologies, such as the force feedback function in the Hand Wheel Actuator (HWA)."

This Schaeffler solution combines a magnetorheological brake with an optimized BLDC motor to provide a precise steering feel while ensuring efficient energy use.

The combination significantly reduces the requirement for copper and rare earths compared to conventional steer-by-wire technologies.

At the same time, it paves the way for innovative forms of vehicle control such as joystick steering.

Thomas Stierle, CEO E-Mobility at Schaeffler AG.

Software as the key to future vehicle platforms

With the movement toward the "software-defined vehicle," software-based vehicle functions will be consolidated in the future into centralized and zonal controllers, resulting in a significant reduction in both the complexity of vehicle architectures and wiring effort.

Schaeffler is developing technologies that form the electronic backbone of these future architectures.

"One of the highlights at our booth was a visualization of a modern E/E platform that is scalable, powerful, and both function- and service oriented," explains Stierle.

"Thanks to our many years of expertise in electronics and software, we can deliver not only innovative solutions, but also the corresponding services."

Examples include Master Control Units (MCUs) and Zone Controller Units (ZCUs).

The Zone Controller serves as a versatile communications interface, managing, connecting, and supplying all types of control units, sensors, and actuators within a defined zone.

The MCU forms the heart of the E/E platform, processing data for lateral and longitudinal acceleration, thermal and energy management, driving and charging strategies, and by-wire systems.

Based on a microprocessor, the MCU supports the highest level of functional safety (ASIL-D) while ensuring secure communication.

"In this way, Schaeffler is contributing to the functional safety and efficiency of future vehicle architectures," says Stierle. AI