Technologies for powertrain concepts
A major challenge

Satisfying the growing demand for mobility in environmentally compatible ways and achieving climate goals requires efficient technologies.

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The powertrain scenario

In spite of increasing electrification – not least due to the expected market success of hybrid vehicles – conventional powertrains will continue to exist in large numbers.

Goals
Climate change and resource scarcity call for a reduction of energy consumption and emissions.

Requirements
More and more people, more and more goods need to be moved – without increasing the burden on the environment and infrastructure.

Means
We have to think in various directions and pursue multiple approaches. Developing innovative concepts is equally important as optimizing proven technologies.

Many solutions, one partner

As a globally active automotive supplier Schaeffler’s portfolio includes products for the engine, transmission and chassis – a perfect modular kit for tailored solutions and a tight supply chain.

Innovative
Schaeffler has been driven by its passion for pioneering solutions for more than 70 years. There is hardly another company in the world that has filed as many patents as Schaeffler has in the more recent past.

Focused
Based on cross-functional expertise, Schaeffler develops top-quality products – results-driven and efficiently.

Versatile
For nearly any requirement, Schaeffler has a solution – and if not, we will find one! On our own initiative and in close collaboration with the customer.

Schaeffer’s HEV/xEV product portfolio including chassis components.

“We offer an extensive, modular portfolio. With it we are already covering the future potential that can be estimated today. This is an investment in a sustainable future.”
Prof. Dr.-Ing. Peter Gutzmer
Deputy CEO and Chief Technology Officer

Source: IHS and assumption by Schaeffler for vehicles under 6 metric tons (hybrid = from 48 V mild hybrid to plug-in; electric = battery-electric vehicles including fuel cell).

*Annual production in million units.
Unique expertise

Material, engineering design, simulation, manufacturing: Schaeffler has extensive expertise in all areas and, accordingly, in-depth system know-how.

Products
Building on decades of experience in engineering design and precision manufacturing of mechanical components, Schaeffler has evolved into a supplier of complex mechatronic modules and systems.

Simulations
Schaeffler uses real-world operating data to test innovations prior to building the first prototype. The integration of digital processes accelerates the development stage as well.

Systems
The optimization, hybridization and electrification of the powertrain require a comprehensive understanding of systems. At Schaeffler, it extends from the engine to the transmission through to the chassis. This broad systems expertise enables the optimization of products and thus a significant reduction of consumption and emissions.

Holistic view

A holistic view of the powertrain and the interaction of all associated components are decisive for the efficiency of new or further developed concepts. Even external factors that go far beyond the vehicle are considered in Schaeffler's developments.

Variances
Added to the number of possible energy stores (fossil or synthetic fuels, batteries or fuel cells) are 3 types of engine/motor designs (gasoline, diesel, electric), 5 types of transmissions and at least 6 types of hybrid installation.

Environment
The quest for the “right” form of propulsion must incorporate the respective conditions (including standards, purchasing power, infrastructure, etc.) of individual markets and regions.

Interactions
Optimum results for all approaches pursued can only be achieved by taking all physical interactions between the systems into account as well – in other words not only traction and power transmission but also acoustical and thermal phenomena.

“This complex matrix requires high levels of powertrain and vehicle expertise in order to develop optimal solutions in terms of technology and economy.”

Matthias Zink
CEO Automotive OEM

Micro HEV
Mild HEV
PHEV
xEV
### Schaeffler powertrain matrix

Solutions for powertrain concepts – the key to efficient, sustainable and needs-based mobility for tomorrow. Schaeffler components and systems at a glance.

<table>
<thead>
<tr>
<th>Micro HEV</th>
<th>Mild HEV</th>
<th>PHEV</th>
<th>xEV</th>
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<tr>
<td>Solutions for micro hybrid vehicles</td>
<td>Solutions for mild hybrid vehicles</td>
<td>Solutions for plug-in hybrid vehicles</td>
<td>Solutions for fully electric vehicles</td>
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**Engine**
- Pulley decoupler (FEAD: Front end auxiliary drive)
- Camshaft phasing unit
- eRocker
- VCR (Variable compression ratio)
- Roller bearing for turbo charger
- DMF (Dual-mass flywheel)
- Double clutch
- Torque converter
- E-Clutch
- Clutch disk
- MCA (Modular clutch actuator)
- Hybrid damper
- EPA (Electric pump actuator)
- PRND actuator

**Transmission**
- E-Clutch
- Clutch disk
- Hybrid module with triple clutch
- Dedicated hybrid transmission DH-ST 6+2
- Bearing for e-motors
- Basis e-axle
- E-axle drive
- 48 V e-axle
- 48 V hybrid module
- UniAir
- Smart Valve
- Hybrid damper
- Parklock
- PRND actuator
- EPA (Electric pump actuator)
- MCA (Modular clutch actuator)

**E-mobility**
- 48 V e-axle
- 48 V hybrid module
- Dedicated hybrid transmission DH-ST 6+2
- Bearing for e-motors
- Basis e-axle
- E-axle drive
Schaeffler facts & figures

> 92,000 employees worldwide

170 Locations in 50 countries

14 billion euro sales in 2017

18 Research and development centers worldwide

Approx. 2,400 patents filed in 2017

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