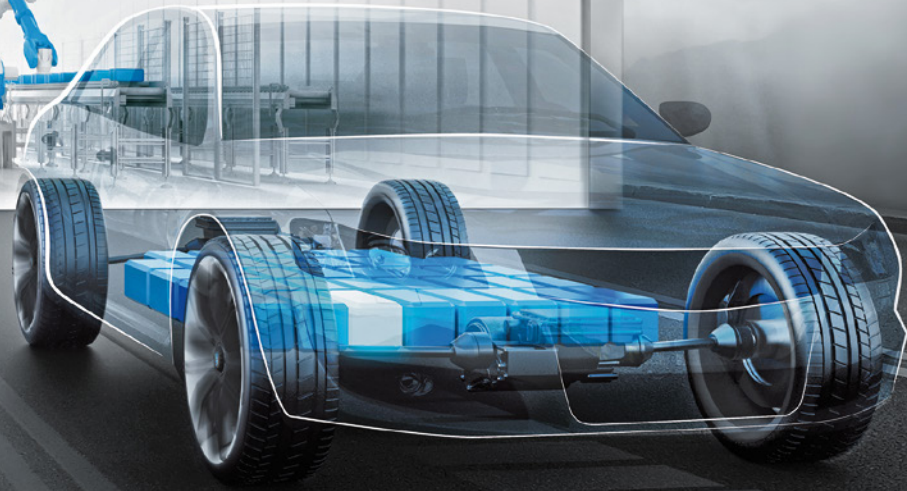


AVL



AVL ELECTRIC DRIVES FOR FUTURE E-MOBILITY DEVELOPMENT

"Highly Integrated, cost effective and efficient" – To support the overall target for CO₂ reduction on a global scale

THE CHALLENGE

The vehicle architectures for long distance BEV as well as for powerful PHEV vehicles increasingly require highly integrated e-drive systems. A highly integrated e-axle is the right answer to fulfill future needs for high efficiency, robustness and simplified vehicle integration concepts

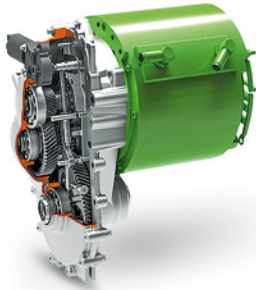
- The electric motor faces the challenge of being reduced in size and weight as much as possible
- New technical challenges in the area of bearings, sealing, lubrication and NVH in the transmission for high speed applications
- High integration of power electronics is an increasingly decisive factor in reducing wiring and connector complexity to improve weight, size and robustness.

THE AVL SOLUTION

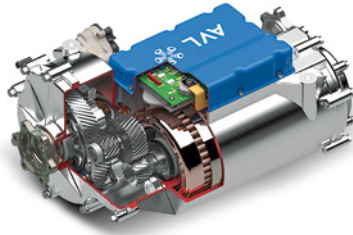
Highly integrated and optimized high efficiency design for best cost, mass and performance.

- High speed e-machine designs (up to 30,000 rpm) providing optimal performance and power density
- Direct oil-cooling solution allows a dedicated highly efficient cooling of the e-machine
- Shared cooling circuit with the integrated power inverter for direct routing without pipes and hoses, enabling a highly compact design
- Eliminating heavy copper cables and connectors resulting in a significant cost and weight reduction
- Use of advanced simulation techniques for optimized NVH for mechanical and electromagnetic excitations
- Advanced materials with high thermal stability for integrated power inverters (SiC) plus e-machine oil cooling circuit for further reduction of volume and weight

AVL ELECTRIC DRIVES FOR FUTURE E-MOBILITY DEVELOPMENT



Single speed layshaft



800V fully integrated e-axle



e-machine, highly integrated

15000 RPM

- Designed for bolt-on e-motor
- Optional gear ratios: 6.35, 7.36, 8.76 and 9.69
- Input torque 150 Nm
- Input speed 15,000 rpm
- Gross Vehicle Mass up to 2,150 kg
- Integrated park lock system
- Sensors for park position, speed and direction

20000 RPM

- Designed for C segment vehicle
- 800 V system
- 4320 Nm e-axle torque
- Layshaft transmission, $i=12$
- High power e-motor 20,000 rpm
- 230 kW peak
- Power density > 5.1 kW/kg
- Fully integrated inverter

30000 RPM

- Designed for premium segment vehicle
- 800 V system
- 5000 Nm e-axle torque
- Two layshaft transmissions
- Efficient gear lubrication system
- Torque vectoring
- 2x 150 kW peak
- Power density of active parts > 7.5 kW/kg
- Full integration of dual SiC inverter
- Integrated cooling

MULTI-SPEED VS. SINGLE SPEED

Multi-speed transmission pros:

- Downsized electric motor
- Higher overall efficiency with PMSM
- Embedded disconnect function
- Reduced noise at high vehicle speed

Multi-speed transmission cons:

- Extra costs, weight and complexity
- Shift Comfort (for non-powershifted transmission)
- Additional transmission losses (for powershifted transmission)
- More sophisticated powertrain controls

ADDED VALUE OF AVL SOLUTIONS

- State-of-the-art solutions based on extensive internal R&D and powertrain development experience for global customers
- One-stop-shopping for complete advanced design & development, controls software, calibration, total system integration and validation from concept stage to SOP

FIND OUT MORE:

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