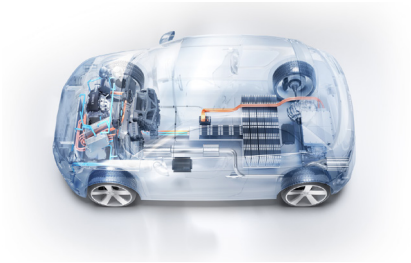
MAHLE Powertrain

Electrification Design & Development



HV generator

eMotor detail

Complete Powertrain Electrification Partner

MAHLE Powertrain has significant experience in a broad spectrum of electrification technologies form the detailed simulation of total system energy flow and thermal energy management to the design of high performance eMotors, eDrive systems, battery packs and EV cooling systems. We provide extensive support for the development of low and high voltage electrical system architecture and proven capabilities in the design and optimisation of integrated systems and whole vehicle control systems.

- Battery pack design, build & test
- eMotor design, development & test
- Control strategy development
- Control hardware (prototype and production)
- Whole vehicle system integration

MAHLE Powertrain's electrification design and development offers complete analysis, design and prototyping of components, as well as eMachines, power electronics and battery packs. Our team has a wealth of experience in electrification projects dating back to 2007.

eMachines, power electronics & batteries
Analysis, design & prototyping

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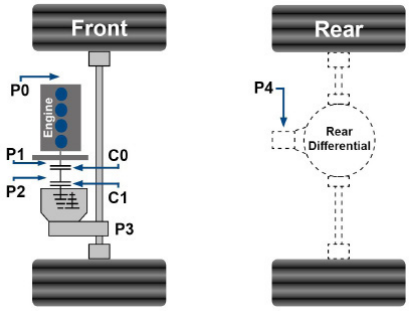
High Power DC Supply

• Electrification can be achieved in many different ways
  › Simple belt-driven starter generator (P0)
  › Full electric vehicle with electric motors driving wheels directly
• We overcome the challenge facing the industry to design and develop electrical systems which are capable of delivering significant vehicle efficiency benefits:
  › Offering reasonable constraints of cost
  › Weight
  › Package space
  › Reliability and safety

48V battery pack

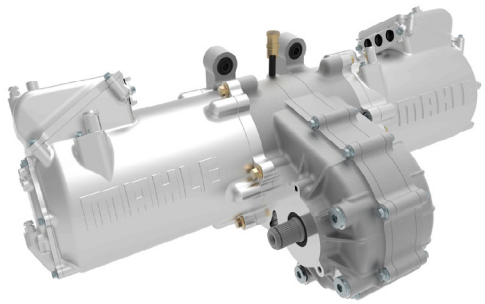
- P0 = Belt Starter - Generator (BSG)
- P1 = Starter-generator on the crankshaft
- P2 = E-Machine after the engine clutch
- P3 = E-Machine in the gearbox output
- P4 = E-axle
- C0, C1 = Clutch



Hybrid drive configurations

Projects

- 2007 Hybrid vehicle energy management analysis
- 2009 Bespoke range extender engine (30 kW)
- 2010 Hybrid vehicle cooling system analysis
- 2011 Hybrid vehicle control unit (HVCU)
- 2012 Range extended demonstrator vehicle
- 2014 Parallel hybrid demo vehicle using wheel motors
- 2016 48V eSupercharged MHEV demonstrator vehicle
- 2017 eAxle Electric Drive Unit (EDU) concept
- 2018 Production EV high voltage battery pack design
- 2018 High power / high charge rate 48V battery pack
- 2019 Fully integrated PHEV drive unit



48V twin power drive unit

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