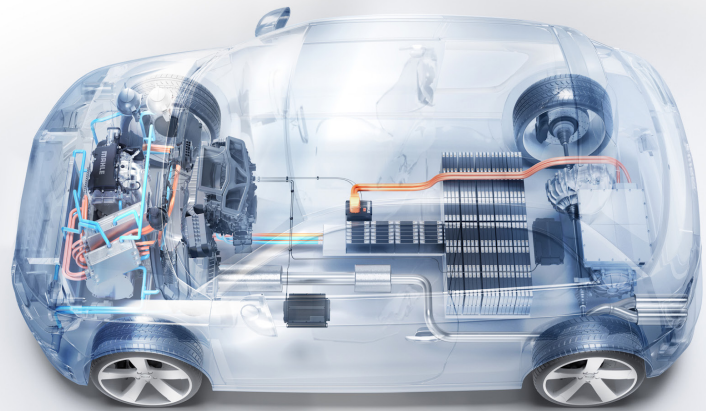




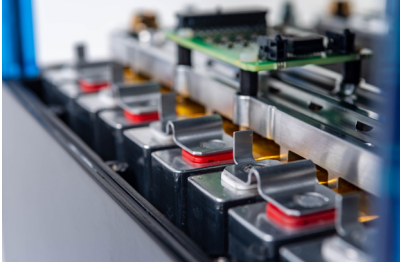
# MAHLE Powertrain Electrification Services



Complete Powertrain Electrification Partner

Analysis, Design and Prototyping of Components

eMachine, Power Electronics and Battery Packs



48V Battery Cells



eMotor Detail

### Electrification Services

MAHLE Powertrain has significant experience in a broad spectrum of electrification technologies from 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

### System Architecture

A critical question in the early design stages of an electrified vehicle is the selection of appropriate system architecture best suited to the vehicle application. Consideration must be given to the target parameters for performance, fuel economy and emissions, package constraints, cost and weight as well as specific requirements for the vehicle usage and the market or region where the vehicle will be sold.

Contact Us:  
Powertrain@mahle.com

MAHLE Powertrain Ltd  
Costin House, St James Mill Road  
Northampton, NN5 5TZ, UK  
Tel. +44 (0)1604 738 000

MAHLE ZG Transmissions  
Georg-Kollmannsberger-Straße 3  
85386 Eching, Germany  
Tel. +49 89 18 94 169-0

MAHLE Powertrain LLC  
14900 Galleon Court  
Plymouth, MI 48170 USA  
Tel. +1 734 738-52 01

[www.mahle-powertrain.com](http://www.mahle-powertrain.com)

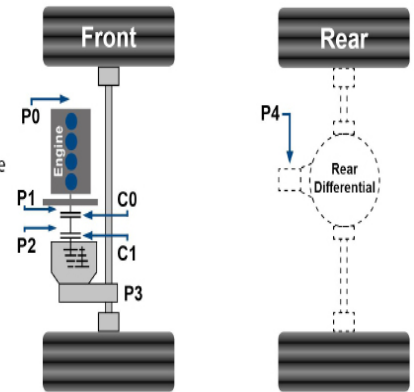


MAHLE Powertrain Electrification Services

High Power DC Supply

Electrification involves the introduction of a high power DC supply (e.g. battery or fuel cell) to either supplement or completely replace the conventional IC engine. Electrification can be achieved in many ways, from a simple belt-driven starter generator (P0) to a full battery electric vehicle with electric motors driving the wheels directly (P4). The challenge facing the whole industry is to design and develop electrical systems which are capable of delivering significant vehicle efficiency benefits, within reasonable constraints of cost, weight, package space, reliability and safety.

- 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

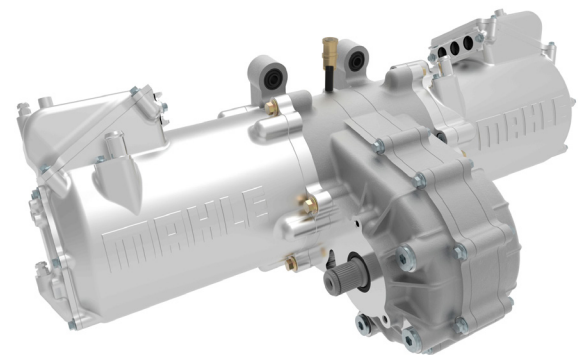


>> 48V Battery Pack

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

Test Facilities

New in-house facilities are now available for the characterisation and development testing of electrification systems. Battery cells and modules can be tested and characterised in a dedicated chamber incorporating all necessary measurement, data gathering and safety systems. Prototype eMotors and generators can be stripped, measured and instrumented prior to dynamic testing on a bespoke rig and the results can be evaluated against an extensive characterisation database.



>> 48V Twin Power Drive Unit

Contact Us:

Powertrain@mahle.com

MAHLE Powertrain Ltd. 2020

MAHLE Powertrain GmbH

Einsteinring 5  
85609 Aschheim, Germany  
Tel. +49 89 962915-0

MAHLE Powertrain Ltd

13.210-877  
Jundiaí / São Paulo, Brazil  
Tel. +55 11 4589-0400

MAHLE Automotive Technologies

No. 1299 Huan Cheng Bei Road, Fengpu Industrial Park  
201 401 Shanghai, Fengxian District, China  
Tel. +86 21 5136-0595