

### MAHLE Powertrain Flexible ECU (MFE)



Rapid Prototyping

Full System Integration

Small Volume Production

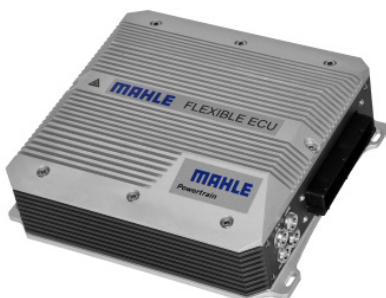
#### MAHLE Flexible ECU

At MAHLE Powertrain we wanted to develop our own controls and the ability to fully integrate these controls into a vehicle. We started with engines and the challenge of implementing full torque structure into the MAHLE Flexible ECU (MFE).

Subsequently we successfully developed a wide range of powertrain and related applications, including various new/novel engine technologies, all engine types, hybrid vehicle controls, motor controls, thermal controls and battery management and we have these systems integrated and running in vehicles.

MFE is a family of ECU platforms from different suppliers which run our software. Different applications have different requirements and we can select hardware for simple or complex applications, from 1-off concepts to low volume production and from off-the-shelf solutions to bespoke hardware.

Achieving rapid prototype control is not just about the speed of the software development but also the speed that the system can be calibrated. MAHLE has developed approaches and techniques to speed up the calibration process, applying closed loop combustion control and software in the loop (SIL) cosimulation within MFE.



>> MAHLE Flexible ECU

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)

## Our Tools, Facilities and Services

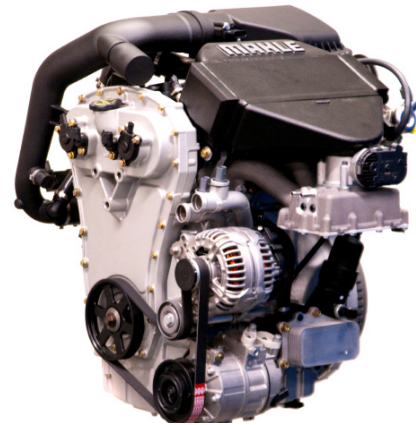
- MFE controllers provides cost effective, integrated, controls solutions for wide variety of applications
- New concepts or prototypes
- Small production or development fleets
- 'Turn-key' MFE solutions with fully functioning controls
- Initial configuration & calibration support
- Function developments on OEM specified prototype & production systems are supported
- Related in-vehicle display & data logger solutions



>> MAHLE Range extender demonstrator vehicle

## Engine application examples

- Small volume production application (2020)
- Full control for MAHLE Range Extender engine
- Development of new customer engine family
- Benchmarking & optimisation of OEM engines
- Single cylinder research engines (gasoline and diesel)
- Diesel aftertreatment research (DPF, SCR, LNT)
- Control of Stirling engine for power generation



>> MAHLE Downsizing Engine

## MFE Software

- Optimised complexity for development tasks
- Integration with automated testbed controls via ASAP3
- Interfaces for automated mapping & closed loop combustion control
- Semi-automated, assisted & manual operation modes
- Interfaces to in-vehicle displays & data logging
- Executable code is auto-generated from Simulink / TargetLink models
- Enables rapid debugging

### Key Features

- Range of MFE specs
- Rapid prototype controllers
- Small volume production
- Easily configured
- Model based function development

\*Customer intellectual property is protected

Contact Us:  
Powertrain@mahle.com

MAHLE Powertrain Ltd. 2021

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