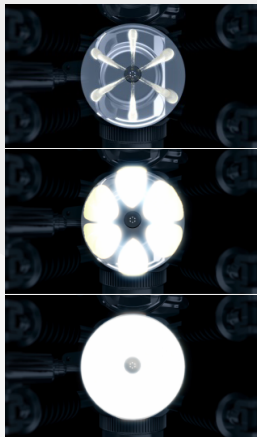
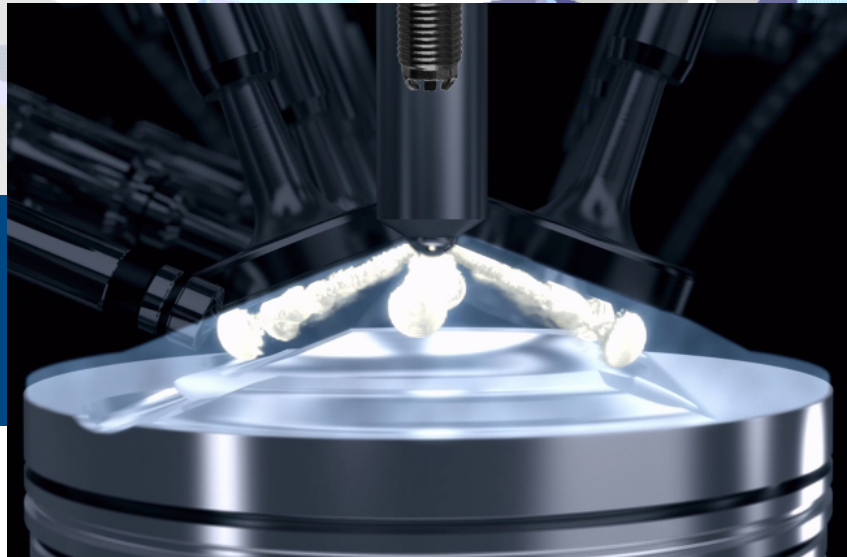


### MAHLE Powertrain Jet Ignition® (MJl) - Passive

- > Fast stable combustion
- Knock mitigation
- High efficiency

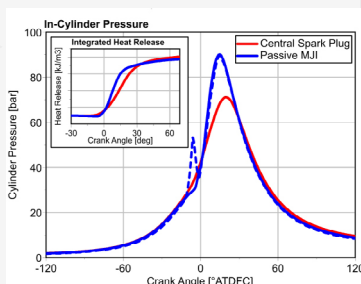


### MAHLE Jet Ignition®

Combustion development is a key enabler to achieving future vehicle fuel economy and emissions targets. For many years, MAHLE Powertrain has been conducting advanced combustion research, culminating in the development of the MAHLE Jet Ignition® system.

Passive MAHLE Jet Ignition® is a pre-chamber based combustion system, for spark ignited engines. The MJl insert features a small pre-chamber, housing the spark plug, connected to the main combustion chamber by a number of targeted nozzles.

- Fast, stable combustion (up to 40% reduction in 10-90% burn durations)
  - › Higher compression ratio for greater efficiency
  - › Enhanced  $\lambda=1$  capability at high load
- Whole map operation without the requirement for a 2<sup>nd</sup> ignition system in the main chamber
- Compatible with PFI or DI fuelling
- Stoichiometric operation enabling use of conventional aftertreatment systems
- Synergies for use with Miller cycle & cooled EGR



>> Cylinder pressure

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

MAHLE Powertrain LLC  
14900 Galleon Court  
Plymouth  
Michigan 48170  
USA  
Tel: 001 734 738-52 01

MAHLE Powertrain GmbH  
Einsteinring 5  
85609 Aschheim  
Germany  
Tel: +49 89 96 29 15-0

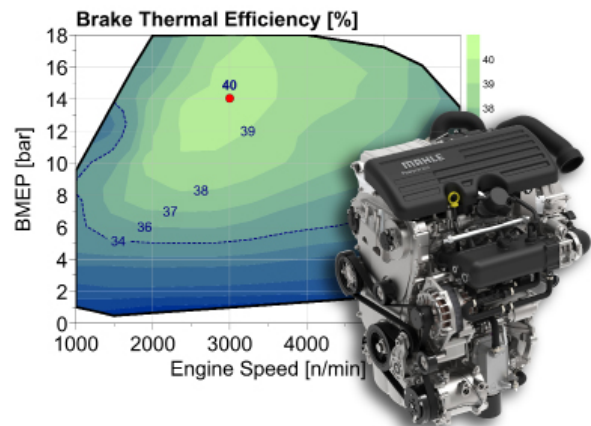
MAHLE ZG Transmissions  
Georg-Kollmannsberger-Straße  
3 85386 Eching  
Germany  
Tel. +49 89 18 94 169-0

# MAHLE Powertrain

## Jet Ignition® (MJJ) - Passive

### Demonstrator Engine

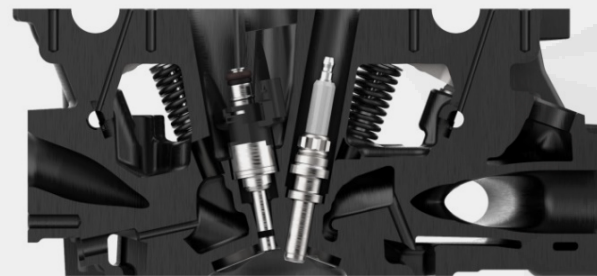
- >40% BTE from 1.5l 3-cylinder featuring a low cost technology package:
  - › Passive MJJ
  - › High geometric compression ratio
  - › Port fuel injection
  - › Low pressure cooled EGR
- 10% BSFC benefit over baseline T-GDI
- 110 kW at 5500rpm @  $\lambda=1$
- Idle & catalyst heating capability & feed gas emissions equal to conventional central spark plug



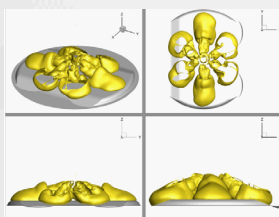
>> Engine efficiency map

### Compact Installation

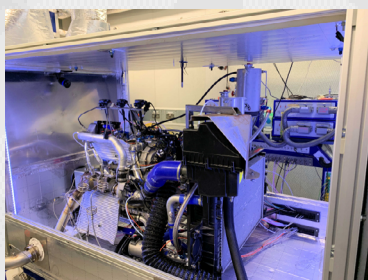
- Compact installation solutions
- Passive MJJ fits M12 spark plug package space
- Passive MJJ capability as sole ignition source
  - › Engineering into existing cylinder head designs
  - › Potential to use same casting with only machining & assemble process changes



>> Passive MJJ installation with DI fuel injector



>> Combustion analysis



>> Dedicated cold engine test cell

### Engineering Services

- Maximising Active MJJ benefits requires both pre-chamber & combustion system optimisation
- Full range of inter-related engineering services to develop solutions:
  - › Design
  - › Combustion, performance & structural analysis
  - › Engine development & testing
  - › Transient and cold emission capabilities
  - › Calibration & controls

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

MAHLE product information 12/2021

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