HyperHybrid®

The Smarter Electric Vehicle
Welcome to OBRIST Powertrain

OBRIST Powertrain is an Austrian engineering company focused on developing key components for hybrid electric and battery-powered vehicles.

Our components and systems are compact, simple, and incredibly cost effective. We offer scalable solutions perfectly suited for a variety of requirements, from affordable mass-market mobility solutions to premium segments.

In 2011, OBRIST Powertrain was founded as a natural extension of OBRIST Engineering, which had been working on eco-friendly thermal management solutions since 1996.

Our proprietary powertrain, HyperHybrid®, can operate with "zero emissions" and "negative emissions" by using ofRew® - the world’s first climate-positive energy carrier. Our plug-in hybrid electric powertrain solution boasts maximum energy efficiency and unmatched pricing – thanks to a smart and simple design that incorporates a multitude of functions.

The OBRIST team is a committed group of individuals with strong backgrounds in all major technical disciplines, especially thermal management, hybrid electric drivetrain development and control technology.

Creating tomorrow’s sustainable mobility.
We no longer need to worry about the environment.
HyperHybrid®

Powertrain

Series Hybrid Powertrain

Customers are intrigued by electric vehicles but suffer from range anxiety. Trips must be carefully planned based on the charging infrastructure available. HyperHybrid® – a series hybrid powertrain solution – combines electric driving with unlimited range at maximum efficiency and affordable costs.

The HyperHybrid® powertrain features an ultra-compact combustion engine boasting unmatched efficiency, a high-power, low-cost battery based on 18650 cells, and integrated thermal management covering the complete powertrain and the passenger cabin.

Customers can now decide whether or not to plug in the vehicle; it is no longer mandatory. The combustion engine with integrated generator is always able to provide energy for driving the vehicle without compromising performance or efficiency.

Accessing Various Segments

The ultra-compact drivetrain components can be integrated in various vehicle segments – even in small cars. In larger vehicles, Zero Vibration Generator provides an extra 250mm of bay space that can be used for increased passenger comfort or additional seating capacity. The compactness of the components significantly improves packaging freedom for automotive designers and engineers.

Pure Driving Passion and Comfort

• Electric rear-wheel drive with high torque for maximum driving passion
• Highest levels of NVH comfort comparable to battery electric vehicles (BEV)
• Packaging enables low center of gravity and perfect mass balancing between front and rear

The solution for global automotive mass markets.
HyperHybrid® Demonstrator

Real-Life Experience

The HyperHybrid® powertrain is installed in a fully functional demonstrator that has undergone intensive bench and road testing. The demonstrator represents the global mid-size car and is designed for a top speed of 170km/h (140km/h continuous).

The operating strategy utilizes battery power in the city and switches to hybrid mode on highways (ZV-Generator on). The innovative Zero Vibration Generator concept is responsible for BEV-comparable NVH values.

Our proprietary HyperHybrid® control unit manages energy fluxes in the hybrid system and takes care of thermal management, brake energy regeneration, and the Zero Vibration Generator operating strategy. Algorithms and hardware are designed at OBRIST Powertrain.

Powering our HyperHybrid® Demonstrator is afuel®, the world’s first climate positive energy carrier. afuel® enables HyperHybrid® to even reach negative CO₂ emissions, a previously unachieved milestone.

Benefits

• Price comparable to common gas/diesel drivetrains
• NVH comfort comparable to BEV
• Significant weight reduction compared to BEV
• Plug-in chargeable but not mandatory
• No range anxiety
• Battery range meets requirements for government subsidies

We invite you to test drive the future.
Zero Vibration Generator
The Next Generation

Leading Energy Efficiency up to 50% - thanks to aFuel®

The Zero Vibration Generator is a generator-integrated combustion engine boasting best-in-class efficiency, packaging and Euro 7 capability. Completely CO₂ emission free thanks to „green“ aFuel®.

The engine incorporates a engine control unit, inverter, and generator. Its ultra-compact design is reduced to its essentials. This goes hand-in-hand with a lightweight construction, and low assembly and maintenance costs. Its compact design and integration of multiple functions reduces costs.

Thanks to the global energy carrier aFuel®, which liquifies the sun energy, we can not only reduce our emissions to zero, we even bring them to CO₂ negativity.

Superior NVH Behavior

Special emphasis was placed on noise and vibration reduction during the design phase of the Zero Vibration Generator.

To overcome the vibration challenges of a two-cylinder engine, the B-Sample, the next Generation of the Zero Vibration Generator, integrates a bunch of innovative solutions:

- contra-rotating crankshafts to compensate the 1st order
- clover leaf shaped mass compensation for 2nd order
- fly wheel to compensate moment of inertia
- damped gear set to cancel out the gear rattling
- a steel case for constant tooth clearance
- isolation of the ZVG reduces the NVH level tremendously

This insulation also allows the thermal management system to use the engine as a heat source when temperatures are at their lowest. Avoidance of cold starts through this insulation technology.

Application

With its engine characteristics, the Zero Vibration Generator is an ideal power source for electrified vehicles, boats, aircrafts and houses. It is perfect to model a serial powertrain.

Due to its compactness and design features, the engine’s mounting position can be arbitrarily selected, providing engineers with unprecedented freedom in hybrid powertrain packaging.

The Zero Vibration Generator: aFuel® Technical Data

- Engine displacement of 999ccm – aFuel® calibration
- DC-Power @ 5.000 rpm: 45kW (potential for 50kWe)
- Thermal Efficiency (Best Point): 43%
- Engine weight (without fluids): 129kg
- Mass Balancing: F1, F2, M1, M2 inertia moment
- DC Efficiency: 37%

Vibration Comparison for Fully Balanced Engines

<table>
<thead>
<tr>
<th></th>
<th>ZVG (999ccm)</th>
<th>V90 (999ccm)</th>
<th>kibo (999ccm)</th>
<th>kibo (999ccm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 cylinder, 5000rpm</td>
<td>2 cylinder, 4000rpm</td>
<td>3 cylinder, 4000rpm</td>
<td>4 cylinder, 4000rpm</td>
</tr>
<tr>
<td>Force 1st order</td>
<td>F1 (max) [N]</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Force 2nd order</td>
<td>F2 (max) [N]</td>
<td>0</td>
<td>1568</td>
<td>0</td>
</tr>
<tr>
<td>Torque 1st order</td>
<td>T1 (max) [Nm]</td>
<td>0</td>
<td>0</td>
<td>77</td>
</tr>
<tr>
<td>Torque 2nd order</td>
<td>T2 (max) [Nm]</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gas &amp; Inertia Torque</td>
<td>TGI (max) [Nm]</td>
<td>0</td>
<td>807</td>
<td>605</td>
</tr>
</tbody>
</table>

Thermal Efficiency

- ZVG aFuel® Volume Design lean λ
- ZVG Gasoline Volume
- ZVG aFuel® Volume Design
- ZVG: Zero Vibration Generator
High Voltage Li-Ion Battery

More Energy – Less Weight

OBRIST Powertrain batteries for PHEV and BEV applications are designed to fulfill customer expectations mostly related to increased specific energy and reduced costs.

For instance, our 17.3kWh Vacuum Fixation Technology battery reaches the specific energy density level of 197Wh/kg and a weight of 97.6kg.

Cost Reduction

The most significant factor here is the choice of commodity – 18650 cells that are available at very low costs compared to prismatic or pouch-type Li-ion cells. For the housing, we use lightweight aluminum at only 2mm thickness. In addition, the whole system was designed with a strong focus on excellent component integration to reduce complexity and material costs. The battery architecture has been tailored to automated production to achieve an extra level of reliability.

Design Features

• Additional Water Cooling Technology
• Innovative Vacuum Fixation Technology
• Thermal insulation for better service life and performance
• Low cost and high flexibility with 18650 cells (pouch optional)
• Air cooled design (liquid cooling optional)
• Low weight with highest specific energy density values
• Lightweight aluminum housing (2mm thick)
• Battery Management System for precise cell control and active thermal management
• Full mounting flexibility

Key Facts

• Vacuum Fixation Technology
• Lightweight aluminum housing (2mm thickness)
• Battery weight: 97.6kg (w/o BDU 92.2kg)
• Dimensions: 159 x 348 x 1005mm (w/o BDU 899mm)

Technical Data:

• High power: 17.3kWh with 3000mAh
• Nominal voltage: 360VDC (420V-240V)
• Continuous discharge power: 110kW (200kW pulse)
• Continuous charge: 26kW
• Specific Energy Density: 177Wh/kg (module only 196Wh/kg)

Water cooled Design - meet in Class AJ
<3K @ 4C continuous discharge rate

Battery Management System (BMS)
Your hybrid and battery technology partner of choice.
High Performance Version

HyperHybrid® for Premium Segments

Our high-performance drivetrain solutions are focused on premium vehicle segments. This powertrain concept is derived from OBRIST Powertrain's mass-market components and comes in various versions with different performance levels. With a variety of component configurations anything is possible, for example, two- or four-wheel drive.

Perfect Mass Balancing for a Superior NVH Performance

- Turbocharged combustion engine with 90kWe provides consistent high power
- Two-generator/inverter design for a fully balanced engine
- Better NVH comfort than a V12 engine

Battery System

For higher battery electric power and longer battery electric ranges, the installed battery capacity has to be enlarged in this drivetrain concept.
Affordable

Series PHEV

Smart and simple

Reliability

Energy density

Beneficial

Compact

Electric drive

Thermal management

CO2 neutral

Silent

Progress and change

Technology

Superior NVH

Plug-in chargeable

Driving passion

Future Mobility

Global

Improved lifetime

Innovative

Safety

Compact

Comfort

Efficiency

High torque

Flexibility

Modularity

CO2 negative

Low complexity

Future Mobility

Global

Improved lifetime

Innovative

Safety

Compact

Comfort

Efficiency

High torque

Flexibility

Modularity

CO2 negative

Low complexity