ZEFIRO

A New Sense of Speed

Very High Speed Trains

BOMBARDIER
The Fastest Way to save the Planet

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How you can profit from a comprehensive Definition of Very High Speed

The main challenge in the past was very high speed. Nowadays criteria such as energy efficiency, high capacity, customized comfort and ecological sensitivity are becoming increasingly important.
Bombardier’s response to today’s challenges has been to introduce a radically new and comprehensive definition of very high speed (VHS). All the expertise and experience gained from building more than 850 high and very high speed trains in the past two decades has been invested in the development of a new VHS train: the *Bombardier*® *Zefiro*®. The outcome is a new sense of speed in VHS rail travel.

**A New Sense of Speed**

The *Zefiro* comprehensively redefines VHS rail travel by adding the dimensions of very high efficiency and very high dedication to that of very high performance. The *Zefiro* is the world’s most economical and eco-friendly VHS train. It combines the highest capacity in the market with pioneering levels of passenger comfort and employs leading-edge technologies and advanced aerodynamics to reduce energy consumption. Just the standard-setting VHS train you would expect from the world leader in rail transportation.
How Very High Efficiency will boost your Business

Very high speed alone is no guarantee of a train’s commercial viability. That is why Bombardier has designed the ZEFIRO to operate at outstanding levels of efficiency.

Groundbreaking levels of operational efficiency can only be achieved through improving reliability and availability, minimizing lifecycle costs and optimizing asset value. In the ZEFIRO this comes from improvements to existing Bombardier technologies and innovative new developments. By striving for the utmost efficiency in VHS rail travel, we help to boost your business.

ECO4
Energy is the key sustainability issue for our whole planet, not just for the transportation industry. As the global leader in rail transportation, Bombardier is committed to playing a key role in promoting sustainability initiatives to enhance energy efficiency. The launch of the revolutionary BOMBARDIER* ECO4* energy-saving technologies based on the four cornerstones of energy, efficiency, ecology and economy was just such a step.

Energy Efficiency
The unique aerodynamic design of the ZEFIRO leads to superior cross wind stability, aerodynamic drag and pressure pulses. Other innovative developments include the BOMBARDIER* EBI* Drive 50 Driver Assistance System, an enhanced drive style manager, and the ThermoEfficient Climatization System. As a result of these and other energy-saving measures, the ZEFIRO boasts the lowest energy consumption per seat of any VHS train.

Best Value for Money
The open tube layout in the ZEFIRO’s non-articulated train concept enables capacities to be adjusted to accommodate between 450 and 1,300 seats. If the maximum seating arrangement is chosen, the ZEFIRO has the highest capacity of any VHS train. Combine this with the lowest energy consumption per seat and you end up with the best value for money in VHS rail travel – and a rapid return on investment.
**ECO4 Technologies in ZEFIRO Products**

<table>
<thead>
<tr>
<th>Technology</th>
<th>Energy Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Management Control System</td>
<td>10%</td>
</tr>
<tr>
<td>EBI Drive 50 Driver Assistance System</td>
<td>Up to 14%</td>
</tr>
<tr>
<td>AeroEfficient Optimized Train Shaping</td>
<td>9%</td>
</tr>
<tr>
<td>ThermoEfficient Climatization System</td>
<td>Up to 38%</td>
</tr>
<tr>
<td>MITRAC* Permanent Magnet Motors</td>
<td>2%</td>
</tr>
<tr>
<td>EnerGplan* Simulation Tool</td>
<td>20%</td>
</tr>
</tbody>
</table>
Why Very High Performance needs a new Perspective

The concept of VHS rail travel needs rethinking. Because passengers are no longer satisfied with speed alone.

By comprehensively refining VHS rail travel through customized comfort, smart design details and a high degree of operational flexibility, the **ZEFIRO** puts very high performance in a new perspective – although its speed performance can certainly stand comparison with any other VHS train. A top operating speed of 380 kph and a VHS sleeper version that flies through the night at 250 kph are evidence enough. Nevertheless, Bombardier was far from satisfied with simply setting speed benchmarks and set out to redefine very high performance.

**Customized Comfort**
The open tube design of the **ZEFIRO** maximizes the available interior space to ensure excellent passenger flow and a pleasant feeling of spaciousness. Electrical switch cabinets, doors and toilets are situated at the end of the carbody to ensure full utilization of the interior space. Moreover, the interior layout can be customized to suit the specific needs of each operator. Even during the train’s lifetime, features can be easily added or removed since all interior fittings are mounted in C-rails with standard interfaces. This enables seat arrangements to be changed fast and luggage racks or partition walls to be added or removed.

**Operational Flexibility**
Customized solutions are this train’s trademark. The train architecture allows for different configurations with scalable traction power to maximize operational flexibility. Customers can choose between 8- and 16-car configurations and scalable operating speeds between 250 and 380 kph. The **ZEFIRO** is equipped for multi-voltage propulsion with up to four systems – 1.5 kV DC, 3 kV DC, 15 kV AC and 25 kV AC – and all versions of the train are fully compliant with TSI standards.

By ensuring first-class levels of passenger comfort and integrating numerous smart interior details, the **ZEFIRO** will capture the imagination of travellers the world over – and make VHS rail travel a more attractive proposition. The successful symbiosis of customized comfort and operational flexibility adds a new perspective to very high performance.
Individual interior solutions for a passionate travel experience (design proposals)
Why Very High Dedication makes all the Difference

Our proven technology includes entire trains, car bodies, locos, propulsion systems and bogies. Our commitment to close business partnerships – a key feature of the ZEFIRO concept – is reflected not only in localized production facilities but also in our pursuit of long-term relationships and sustainable solutions. Our references from Europe, North America and China are impressive proof of our dedication to first-class technology and close business relationships.

Building a VHS train is one thing, ensuring its long-term success is a very different matter. That is where very high dedication makes all the difference.

As the global leader in rail transportation, Bombardier is dedicated to setting benchmarks in quality, efficiency, reliability, maintenance and delivery performance. More than two decades of experience in high speed and VHS rolling stock have made Bombardier a key partner in delivering the core engineering and systems required for VHS trains.

Our references:

- 43%¹ ACELA** USA
- 12%¹ ETR500** Italy
- 17%¹ Thalys** F/GER/B/NL
- 18%¹ TGV** France
- 20%¹ EUROSTAR** France
- 100%¹ REGINA Sweden
- 100%¹ X2000 Sweden
- 100%¹ XinShisu China
Reassuring Reliability
The unparalleled expertise of the world market leader in rail transportation ensures reassuring levels of reliability. The CRH1 is fine example of delivery performance and the Chinese are very satisfied with its high reliability and availability. By clearly focusing on service-proven solutions and technologies, Bombardier ensures that the ZEFIRO performs with reassuring reliability. In combination with an intelligent redundancy concept this ensures a high degree of traction availability with no significant performance reduction in case of fault.

Sustainable Solutions
Bombardier was committed to the principle of sustainable mobility long before eco-friendly solutions became fashionable. For more than 15 years, our Design for Environment (DfE) initiative has brought consistent improvements to the environmental compatibility of our vehicles. The ZEFIRO is no exception. As the world’s fastest eco-friendly transportation system, the ZEFIRO is the sensible, climate-friendly solution to VHS travel – and, most likely, the fastest way to save the planet.
What distinguishes our Very High Speed Portfolio

The ZEFIRO portfolio redefines VHS rail travel. Our comprehensive definition of very high speed sets the standard for sustainable mobility – now and in future.

Getting the 21st Century on Track

Very high speed trains are entering an exciting new era and increasingly winning over market shares from airlines. Studies by the UIC have shown that average travel times in most European countries will be reduced dramatically in the coming decade through HS and VHS trains.

Such trains will play a pivotal role in shaping the future of sustainable mobility as energy efficiency, ecological sensitivity, high capacity and passenger comfort become key factors in this transportation segment. Bombardier has responded to the demands of the 21st century travel by launching a new very high speed train platform, the ZEFIRO. In order to meet all this segment’s requirements, Bombardier has developed three different ZEFIRO modules: the ZEFIRO380 for ultra-high speed, the V300ZEFIRO for Europe’s VHS networks and the ZEFIRO250 for high speed travel.
ZEFIRO380

The ZEFIRO380 takes long-distance travel onto a higher plane of harmony between the oft-conflicting demands of economy and ecology. The world’s fastest series-production train benefits in its aerodynamic design from Bombardier’s aviation know-how. What’s more, the ZEFIRO380 offers the lowest energy consumption per seat in this speed segment thanks to Bombardier’s unique ECO4 technologies.

### Parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Service speed range</strong></td>
<td>Up to 380 kph</td>
</tr>
<tr>
<td><strong>Variants</strong></td>
<td>Seater coaches, 8- or 16-car non-articulated trainsets</td>
</tr>
<tr>
<td><strong>Capacity range</strong></td>
<td>• Up to 664 seats on an 8-car train, incl. bistro or restaurant</td>
</tr>
<tr>
<td></td>
<td>• Up to 1,336 seats on a 16-car train, incl. bistro or restaurant</td>
</tr>
<tr>
<td><strong>Train length</strong></td>
<td>215 m (8 cars), 428 m (16 cars)</td>
</tr>
<tr>
<td><strong>Carbody</strong></td>
<td>Aluminium carbody, wide profile, 1 or 2 doors per side</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>25 kV AC; other voltages possible</td>
</tr>
<tr>
<td><strong>Propulsion</strong></td>
<td>• Asynchronous motors, forced cooling</td>
</tr>
<tr>
<td></td>
<td>• Distributed drives (50% motorization)</td>
</tr>
<tr>
<td></td>
<td>• 20 MW (16 cars, 380 kph)</td>
</tr>
<tr>
<td><strong>Multiple operation</strong></td>
<td>Possible for two 8-car trainsets, not possible for 16-car trainset</td>
</tr>
<tr>
<td><strong>Starting acceleration</strong></td>
<td>&gt; 0.48 m/s²</td>
</tr>
<tr>
<td><strong>Service train weight</strong></td>
<td>934 t</td>
</tr>
<tr>
<td><strong>Axle load</strong></td>
<td>17 t</td>
</tr>
<tr>
<td><strong>Bogie</strong></td>
<td>FLEXX speed with 2.7 m wheelbase</td>
</tr>
</tbody>
</table>
V300ZEFIRO

The **V300ZEFIRO** redefines the concept of very high speed by offering capacity and comfort levels previously unheard of in this segment. Developed and built in cooperation with a strategic partner, the V300ZEFIRO has a multi-system capability that equips it for all of Europe's very high speed networks.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
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</thead>
<tbody>
<tr>
<td><strong>Service speed range</strong></td>
<td>From 300 kph to 360 kph</td>
</tr>
<tr>
<td><strong>Variants</strong></td>
<td>Seater coaches, up to 16-car non-articulated trainsets</td>
</tr>
<tr>
<td><strong>Capacity range</strong></td>
<td>• Up to 600 seats on a 202 m train, incl. bistro or restaurant</td>
</tr>
<tr>
<td></td>
<td>• Up to 1,200 seats on a 402 m train, incl. bistro or restaurant</td>
</tr>
<tr>
<td><strong>Train length</strong></td>
<td>202 m, 402 m</td>
</tr>
<tr>
<td><strong>Carbody</strong></td>
<td>Aluminium carbody, UIC profile, 1 or 2 doors per side</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>Up to 4 systems per train (25 kV AC; 15 kV AC; 3 kV DC; 1.5 kV DC)</td>
</tr>
<tr>
<td><strong>Propulsion</strong></td>
<td>• Asynchronous motors, forced cooling</td>
</tr>
<tr>
<td></td>
<td>• Distributed drives (50% motorization)</td>
</tr>
<tr>
<td></td>
<td>• 8.8 MW (202 m train, 300 kph)</td>
</tr>
<tr>
<td><strong>Multiple operation</strong></td>
<td>Possible for two 202 m trainsets, not possible for 402 m trainset</td>
</tr>
<tr>
<td><strong>Starting acceleration</strong></td>
<td>&gt; 0.6 m/s²</td>
</tr>
<tr>
<td><strong>Axle load</strong></td>
<td>17 t</td>
</tr>
<tr>
<td><strong>Bogie</strong></td>
<td>FLEXX speed with 2.85 m wheelbase</td>
</tr>
</tbody>
</table>
ZEFIRO250

By 2010, the ZEFIRO250 – the world’s fastest sleeper – will be transporting overnight travellers in China into new realms of comfort. A non-sleeper version of the ZEFIRO will be available for this speed segment of the European market in the near future.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
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<tbody>
<tr>
<td>Service speed range</td>
<td>Up to 250 kph</td>
</tr>
<tr>
<td>Variants</td>
<td>Sleeper or seater coaches, 8- or 16-car non-articulated trainsets</td>
</tr>
<tr>
<td>Capacity range</td>
<td>Sleeper 16-car configuration: 122 seats, 480 beds, 16 luxury beds</td>
</tr>
<tr>
<td>Train length</td>
<td>216 m (8 cars), 429 m (16 cars)</td>
</tr>
<tr>
<td>Carbody</td>
<td>Stainless steel carbody in wide profile</td>
</tr>
<tr>
<td>Voltage</td>
<td>25 kV AC, other voltages possible</td>
</tr>
<tr>
<td>Propulsion</td>
<td>• Asynchronous motors, forced cooling</td>
</tr>
<tr>
<td></td>
<td>• Distributed drives (63% motorization)</td>
</tr>
<tr>
<td></td>
<td>• 13.5 MW</td>
</tr>
<tr>
<td>Multiple operation</td>
<td>Possible for two 8-car trainsets, not possible for 16-car trainset</td>
</tr>
<tr>
<td>Starting acceleration</td>
<td>&gt; 0.6 m/s²</td>
</tr>
<tr>
<td>Service train weight</td>
<td>859 t (16-car trainset)</td>
</tr>
<tr>
<td>Axle load</td>
<td>16.5 t</td>
</tr>
<tr>
<td>Bogie</td>
<td>Regina type with 2.7 m wheelbase</td>
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</table>