

# Battery Commuter Trains

A battery hybrid commuter train that operates seamlessly on electrified and non-electrified lines is pioneering a new best-in-class for reliable and sustainable rail travel.



The new generation of battery powered Masaccio trains brings improved performance across the fleet – lower CO<sub>2</sub> output, up to 50% reduction in fuel consumption, lower noise, reduced journey times, and increased range thanks to flexible, scalable battery capacity.

These battery commuter trains offer powerful performance with top speeds of 162km/h and acceleration of 1.10 m/sec<sup>2</sup>, and travel up to 150km on battery alone. Delivering reliability and longevity, the trains are designed for up to 25 years' service life with 130,000km yearly operation and up to 16 hours of daily commercial operation.

Battery hybrid technology provides a sustainable path to decarbonising train travel across Europe and can cut carbon emissions by 50% on existing lines.

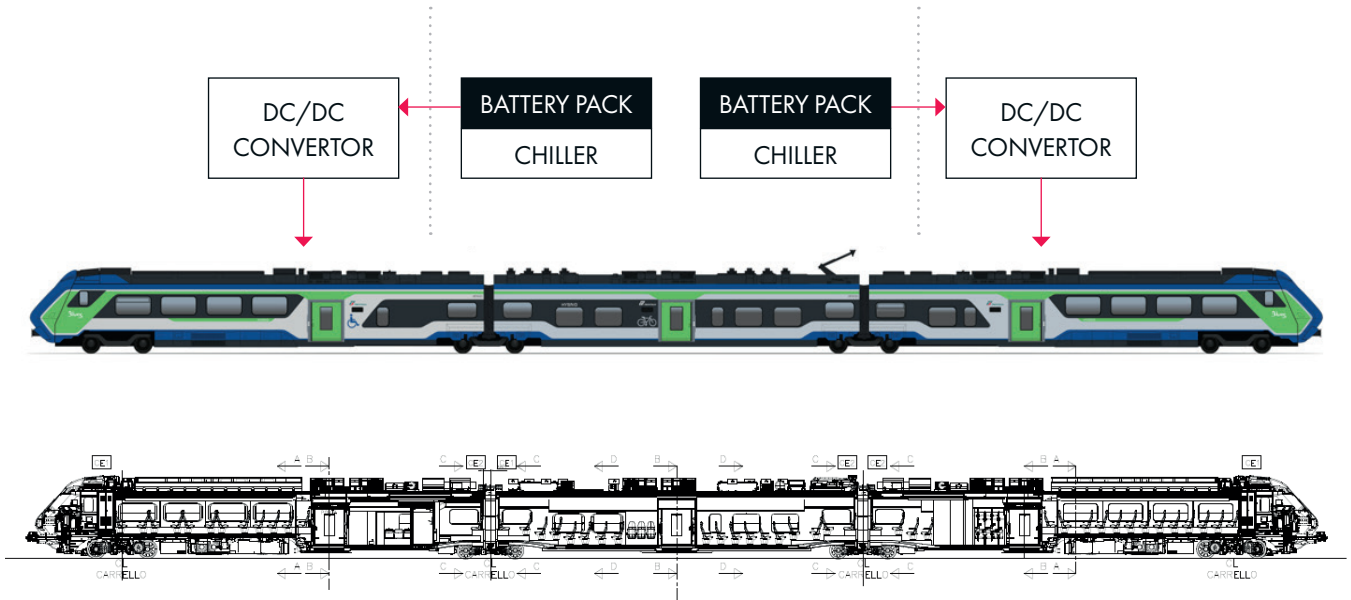


As of today, Hitachi Rail has developed three battery-driven technologies for the rail transport sector to support Net Zero targets. Whether full battery, "hybrid" battery-electric or "tri-brid" battery-electric-diesel, battery power offers the sustainable and environmental benefits of an electric railway, without the need for constructing and maintaining overhead lines across the entire infrastructure.

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HITACHI RAIL BATTERY TRAIN PORTFOLIO

	Full-battery train	2-mode hybrid train	3-mode tri-brid train
<b>Technical outline</b>	Top speed 144-162km/h Acceleration 1.10m/sec <sup>2</sup>	Retrofit program to remove diesel engines and replace with batteries over time	Works alternately between diesel engine, pantograph electric and battery power.
<b>Description</b>	Full battery technology enables the introduction of new environmentally friendly and cost-effective trains on non-electrified routes.	A quick and easy application of battery technology to install on existing or future Hitachi trains. Works with both pantograph electric power and battery power.	This system can run with diesel engines on non-electrified lines, with pantographs on electrified lines, and with batteries to travel first and last mile.
<b>Performance</b>	Full battery recharge from one pantograph in traction phase or from two pantographs at terminal stations Recharge time <10 minutes at 15kVac, 80A	Replacing one diesel engine with one battery can reduce fuel costs up to 20-30%. Offers a 20% reduction in whole life maintenance costs vs diesel engines.	Adds additional performance, reduce environmental impact on entry/exit into stations, and can contribute to reducing fuel costs and consumption by up to 50%.
<b>Range</b>	Travels up to 150km (4 battery packs) just on batteries and recharges whilst in motion under the wires.	Four cars: up to 11 km at 50km/h • 9 km at 70 km/h • 7 km at 100 km/h Three cars: up to 12 km at 50km/h • 10 km at 70 km/h • 7.7 km at 100 km/h	



BATTERY INNOVATION

- » Best-in-class lithium-ion batteries with high-rate charging capability, low temperature performance and charge/discharge efficiency
- » Liquid Cooling System to maintain uniform temperature distribution among cells and modules
- » Battery Management System to measure cell voltage and temperature, and ensure passive balancing of cells
- » Flexible, scalable battery capacity (peak power 750kW per battery pack)

