

Power management for rail



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Introducing power management, regenerative braking, and propulsion system capabilities for rail applications

Mature power management and propulsion technologies demonstrated in military and commercial applications reduce risk and time to market for rail operators.

BAE Systems' power management technologies are used in the rail market on more than 8,000 locomotives, in the mass transit industry on more than 3,000 hybrid buses, and on various combat and tactical military vehicles.

These products can be used in conjunction with diesel electric trains (diesel multiple units, or DMU, type), electric-powered trains (electric multiple units, or EMU, type), and in light rail on trams, streetcars, and subways.

When used in a DMU, a high-power-density, liquid-cooled, permanent-magnet generator supplies power to an electric traction motor and an energy storage system. When used in an EMU, the catenary — or main propulsion power line — supplies power to the electric traction motor and the energy storage system.

The electric motor turns the propulsion wheels, giving the train smoother acceleration

with no sudden jerks. When the train slows, the motor acts as a generator to recapture energy for later use.

The energy storage system provides power during acceleration and to supplement the traction system. The lithium-ion batteries in the HybriDrive propulsion system are lighter, longer-lasting, easier to maintain, and more efficient than competing alternatives.

The propulsion control system — a liquid-cooled, insulated-gate, bipolar, transistor-based, high-power-density power converter — directs the flow of energy to the right loads at the right time. For example, when the train needs to accelerate quickly, it draws power from the energy storage system and generator to drive the traction motor.

Description	Power	Propulsion system specifications	Dry weight/size
Energy storage system	Building block +/- 200 kW peak, 11.2 kWhr	<ul style="list-style-type: none"> Lightweight, nano-phosphate, lithium-ion technology Longer life with extended warranty Best power and energy density of any commercially available solution 	365 kg
Propulsion control system	465 kW continuous	<ul style="list-style-type: none"> Integrates control of the propulsion system Customized performance for optimal fuel economy and emissions Standard vehicle multiplex interface Onboard diagnostics 	79 kg Liquid-cooled – WEG
Motor	Power: 200 kW peak Torque: 5,100 Nm (3760 ft.-lbs.) peak	<ul style="list-style-type: none"> Compact, oil-cooled, high-power-density machine design High power-to-weight ratio Standardized mounting interfaces Self-contained cooling (includes pumps, filters, heat exchanger, and oil sump) 	RATINGS SIZE 361 kg Liquid-cooled – integrated WEG and oil
Integral starter-generator	200 kW continuous	<ul style="list-style-type: none"> Compact, brushless machine design Optimized for high efficiency, light weight, low maintenance, and low emissions Integrated starter Fully sealed and liquid-cooled – meets international standard (IP 67) 	145 kg

For more information and specifications on BAE Systems' full range of rail products, including power management systems, see our technical detail supplement.

BAE Systems: A leader in power management

8,000 equipped locomotives, 500 million revenue hours, MTBF greater than 200,000 hours

Investing in new technology to improve customer value and adapt to the future

Mature energy storage systems and advanced energy management maximize energy reuse through regenerative braking

BAE Systems' proven power management experience reduces development time and risk, and allows for a quicker time to market

Power management for rail provides a path to lighter weight, higher energy efficiency, and improved performance

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