

Power management for rail

Technical details 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 quicker time to market
- Power management for rail provides a path to lighter weight, higher energy efficiency, and improved performance



System configuration and specifications

	Power	Specifications	Dry Weight/size
Energy storage system	Building block +/- 200 kW peak, 11.2 kWhr	<ul style="list-style-type: none"> • Lightweight, nano-phosphate-based lithium ion technology • High power and charge capacity • Longer life with extended warranty • Best power and energy density of any commercially available solution 	365 kg
Propulsion control system	465 kW	<ul style="list-style-type: none"> • Integrates control of the propulsion system • Customized performance for optimal fuel economy and emissions • Standard vehicle multiplex interface • Controls generator and traction motor • Onboard diagnostics 	79 kg Liquid-cooled – WEG
Motor	200 kW peak Torque: 5,100 Nm	<ul style="list-style-type: none"> • Compact, oil-cooled, high-power-density machine design • AC induction motor eliminates brush maintenance • Self-contained cooling 	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, lightweight, low maintenance, and low emissions • Integrated starter • Fully sealed and liquid-cooled standardized interface to engine 	145 kg
Auxiliary power system	17 kW DC/DC 600 V to 28 V 30 kW (208V AC inverter, 37.5 kVA, 3-phase, 50/60 Hz) 60 kW Inverter (3-phase, variable voltage/variable frequency)	<ul style="list-style-type: none"> • Eliminates oil blow-by in air compressor, which contaminates the pneumatic system • Eliminates the need for belt drives • Provides capability for electric accessories • Increased fuel economy with electric accessories • Safer — no engine fires due to hydraulic leakage • Reduced emissions 	102 kg Liquid-cooled – WEG
System cooling package	Heat rejection of 24 kW	<ul style="list-style-type: none"> • Integrated water-ethylene-glycol-based cooling system • Flexible mounting options • Built-in fluid level sensor • SAE J1939 CAN-based controls 	41 kg

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Diesel electronic fuel injection (currently in use in rail and mining vehicles)	N/A	<ul style="list-style-type: none"> Provides direct control of the injector solenoids of 6- to 18-cylinder diesel engines Controls fueling to prevent smoke discharge and protects the engine against: <ul style="list-style-type: none"> Overspeed Overload Low oil pressure Low coolant pressure Crankshaft overpressure Provides diagnostic capability to support engine maintenance 	Operating temperature: 40 deg. C to +85 deg. C
Battery charger (currently in use in rail and mining vehicles)	Power rating: 18 kW	<ul style="list-style-type: none"> Input: <ul style="list-style-type: none"> 480 VAC, 60Hz Outputs: <ul style="list-style-type: none"> Three output connections Externally controlled load contactors 72 VDC +/-1% nominal at 0 to 250 A Software adjustable from 40 VDC to 85 VDC Vibration and shock in accordance with IEC77 	73 kg
Logic power supply (currently in use in rail and mining vehicles)	1.6 kW peak	<ul style="list-style-type: none"> Used to supply regulated power to electronics onboard AC and DC locomotives Provides six independently regulated outputs All outputs are phase-shifted to reduce EMI Input voltage range: 25 VDC to 85 VDC 	Convection cooling
Cycle skipper (3X) (currently in use in rail and mining vehicles)	120 kW continuous	<ul style="list-style-type: none"> Input power: <ul style="list-style-type: none"> Three-phase AC-generator-supplied power 21 to 115 Hz (105 Hz nom.) 80 to 440 VAC (402 VAC nom.) Outputs: <ul style="list-style-type: none"> Three-phase silicon-controlled rectifier variable output Constant V/Hz motor control Full-synchronous speed operation (reverse) Phase currents up to 165 A continuous at 105Hz (nom.) Microcontroller-based design 	33 kg
Phase controller (3X) (currently in use in rail and mining vehicles)	Power rating: 44 kVA	<ul style="list-style-type: none"> Converts three-phase variable voltage and variable frequency source power to variable-voltage DC power Programmable output to: <ul style="list-style-type: none"> Charge a battery Control the field current of an AC generator z Input voltage: 0 Vrms to 1212 Vrms Output phase current: 110 Arms Output frequency: 30 Hz to 60 Hz Output voltage: 230 Vrms L-L 	68 kg

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