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Amtrak Cities Sprinter ACS-64 Electric Locomotive

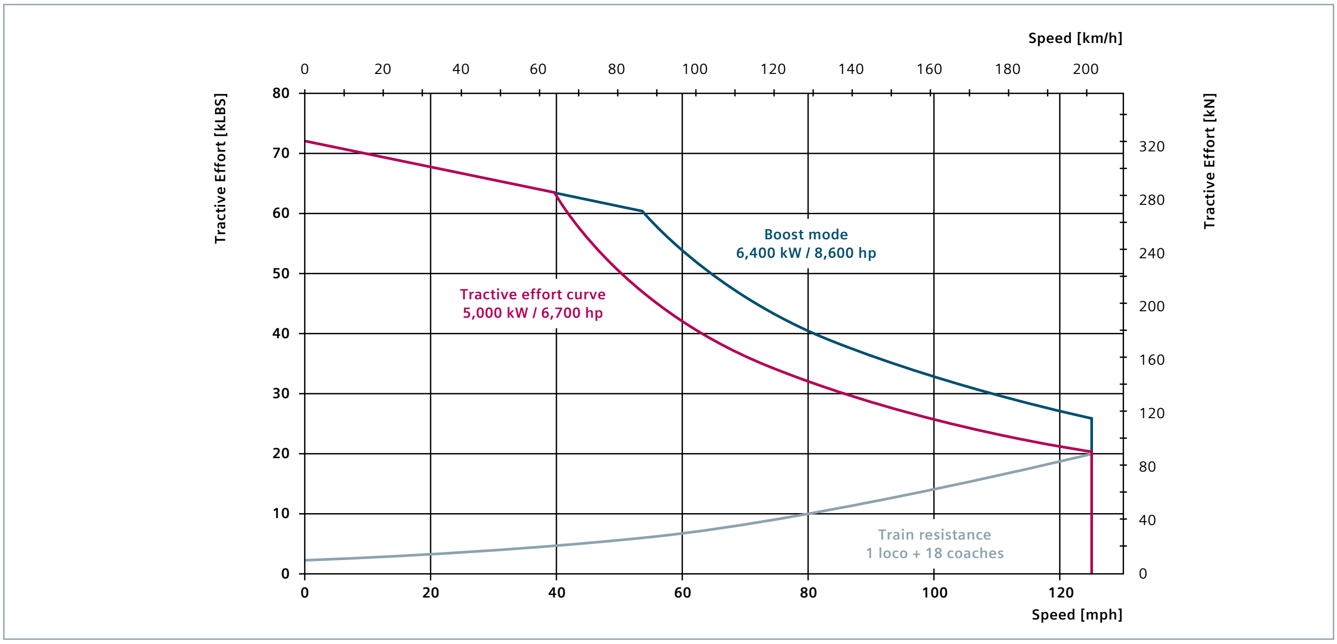
For Amtrak's North East Corridor (NEC) High Speed Passenger Service

In October 2010 the National Passenger Railroad Corporation of the United States, Amtrak ordered 70 new high speed electric passenger locomotives from Siemens for service on the NEC between Boston and Washington, D.C. Commercial operation has started February 2014.

This locomotive, the Amtrak Cities Sprinter ACS-64 is a development of Siemens' successful Eurosprinter locomotive, adapted to fit the needs of the North American passenger rail market for speeds up to 125 mph.

The locomotive is designed to be FRA compliant. The truck is an enhanced version of the SF4 for Siemens new European Vectron locomotive and the monocoque carbody is enforced to fulfil the requirements for higher buff strength and AAR Crash-Compliance. The electrical traction control system is based on standard components of the proven designs of Siemens electric locomotives.

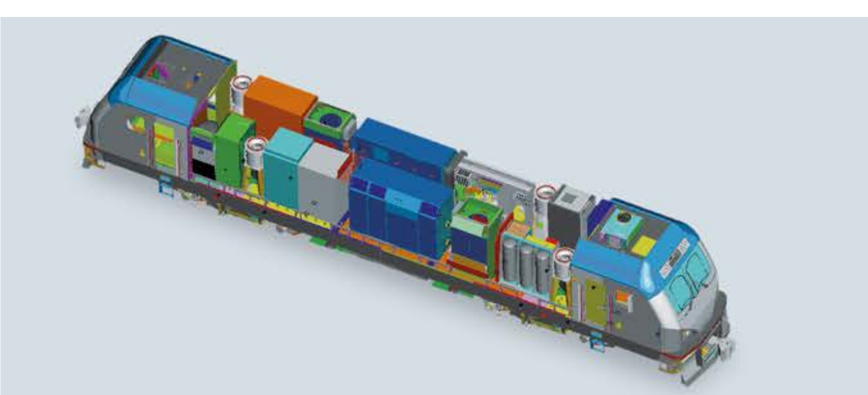
Technical data	
Wheel arrangement	Bo'Bo'
Weight	215,537 pounds / 97 t
Length	approx. 800 in / 20,320 mm
Width (incl. handrails)	approx. 117.5 in / 2,984 mm
Height (without pantograph)	approx. 150 in / 3,810 mm
Distance between truck centers	approx. 390 in / 9,900 mm
Wheel diameter (new / worn)	44 / 41 in 1,117 / 1,041 mm
Maximum speed	125 mph / 200 km/h
Catenary voltage & frequency	25 / 12.5 kV 60 Hz 12 kV 25 Hz
Rated power	6,400 kW max. 5,000 kW cont.
Head End Power	1,000 kVA
Tractive effort (max.)	72 klbs / 320 kN
Minimum curve radius	250 ft / 76 m



The locomotives were designed in Germany, Austria and the US and are manufactured at the Siemens plant in Sacramento, California. Major components of the traction system are built at Siemens plants in Alpharetta, Georgia and Norwood, Ohio. This is the first complete transfer of a high speed electric locomotive to the US.

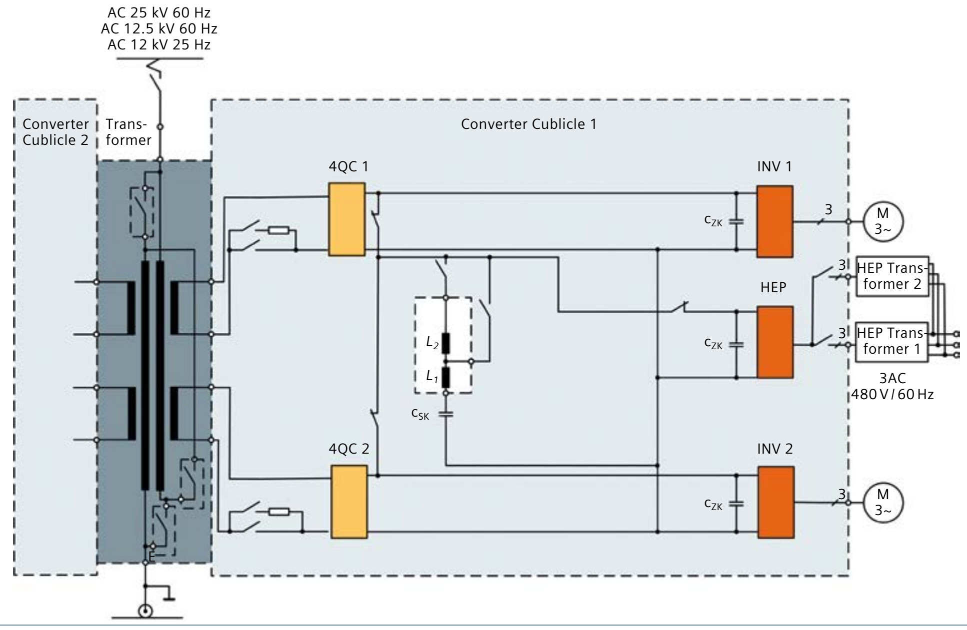
To compliment the Acela High Speed trains on the NEC, the locomotive has excellent acceleration capabilities and reaches a max. speed of 125 mph with 18 Amfleet coaches while at the same time providing up to 1 MVA of HEP power. The electrical brake system of the ACS-64 can feed up to 100% of train brake energy back into the catenary system, provided the grid can accept all the power. Energy feedback into the catenary system can sum up to 10–15% energy savings per year and thus help significantly reduce CO_2 emissions.

The carbody is designed to allow compression forces up to 3,5 MN (buff load = 800,000 lbs). It is equipped with a Crash Energy Managment (CEM) system that provides enhanced safety for the crews, consisting of an AAR F-Type coupler with pushback mechanism and crash elements.



The engine room layout is similar to the European Vectron locomotive and most of the electrical components are designed identical. This practice provides the customer with the benefits of a design proven under various operating conditions in applications worldwide.

Cab and engineer's desk are designed to meet the expectations of Amtrak's Brotherhood of Engineers Cab Committee. The right side arrangement will be adapted from the European Vectron design to suit the specific North American requirements. A locomotive audio / video digital recorder system is installed. Fridge, locker and space for baggage for the engineer's convenience are located at the back of the cab as well as a flip seat, emergency equipment and a waste receptacle. Side windows with mirrors and rearview looking cameras enable the engineer to safely control the passenger platform.



Traction and locomotive control are managed by the proven Sibas 32 control system. The core of the control system is the Multi-Vehicle-Bus (MVB), interfacing with the subsystem control computers, all the I/O stations as well as the Man-Machine-Interfaces such as controls and displays on the engineer's console.

State of the art installation of the ACSES control unit, including Train Radio, Automatic Train – and Positive Train Control are key features.

Locomotives connected in multiple unit and passenger coaches interface via the standard 27pin MU-trainlines. Optionally, a Wired Train Bus (WTB) interface for all train communications can be installed.

The electrical main diagram displays one half of the locomotive traction control system. It consists of two cubicles, each containing the components for one truck and the HEP supply – using water cooled inverters with IGBT power semiconductors. Two output inverters are connected to the two AC traction motors of one truck. Additionally, each DC link of one inverter cubicle supplies power to one HEP inverter, thus providing 100% redundant train power supply to the passenger coaches.

The truck arrangement is a center pin design with a low mount to the carbody. The frame is a welded structure which integrates all connecting points for the traction arrangement, drive units and truck brake equipment.

Primary and secondary suspension springs are of the Flexicoil type – a proven design installed in hundreds of Siemens trucks. Triangular Tie Rod assures stable wheel set guidance. Use of pivot elements and lateral mounting of secondary suspension springs significantly reduces the rotation stiffness of the truck, resulting in considerable reduction of wheel and rail wear.

The propulsion unit consists of a pinion hollow shaft drive with the traction motor mounted directly to the truck frame by rubber elements. The gear is axle mounted riding on the wheel set with the other side mounted to the motor case by a reaction rod.

Two multiple disc clutches are installed between traction motor and gear to allow movements between these two components. One clutch is located directly between motor and hollow shaft, the second clutch is located between hollow shaft and pinion.

The complete drive system is designed with sufficient clearance to the surrounding truck for operation, maintenance and repair. The components of the drive unit can be exchanged separately without disassembling the truck – a great advantage for the maintainer as the units return faster to revenue service after repair.

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