



In 1999 the German Rail (Deutsche Bahn AG), ordered over 100 Class 189 four-system locomotives from Siemens Transportation Systems. Further orders followed for 45 locomotives for Siemens Dispolok GmbH, 18 Class 474 locomotives for the Swiss Federal Railways company and for private railway operators.

The locomotives in this class are deployed in cross-border heavy rail freight and passenger rail services. They can be operated in 15 kV/16.7 Hz and 25 kV/50 Hz AC networks as well as in 1.5 kV and 3 kV DC networks.

The Class 189 features individual axle control and achieves a maximum speed of 140 km/h or, as an option, 230 km/h. In AC networks the locomotives reach a power rating of 6,400 kW; while they have a rating of 6,000 kW in 3 kV DC networks and 4,200 kW in 1.5 kV DC networks.

Technical data

Wheel arrangement	Bo'Bo'
Track gauge	1,435 mm
Length	19,580 mm
Width	3,000 mm
Weight	87 t
Voltage systems	15 kV AC, 16.7 Hz; 25 kV AC, 50 Hz; 3 DC kV; 1.5 DC kV
Maximum speed	140 km/h, optional 230 km/h
Continuous rating	AC 6,400 kW 3 kV DC 6,000 kW 1.5 kV DC 4,200 kW
Starting tractive effort	300 kN
Continuous tractive effort	270 kN
Electric braking effort	150 kN ... 300 kN (variable)
Power factor	almost unity, controlled
Distance between bogie centers	9,900 mm
Bogie wheelbase	2,900 mm
Wheel diameter (new)	1,250 mm
Vehicle structure gauge	UIC 505-1
Temperature range	-30 °C ... +50 °C
Service altitude	up to 1,400 m above sea level
Homologation (as per 08/2006)	Germany, Austria, Switzerland, Italy, Sweden, Slovenia, Poland, Croatia
Border railway stations	Venlo (Netherlands), Decin (Czech Republic) Padborg (Denmark)

Eurosprinter ES64F4 Four-system high performance locomotive



Traction converter with HV-IGBT technology



Homologation in Europe (as per 08/2006)

The traction motors are each fed by a pulse-width-modulated inverter that is connected to a DC link. In AC networks the DC link voltage is generated by four-quadrant choppers, whereas in DC systems the overhead line voltage is fed directly into the DC links.

The controls of the locomotive are designed in compliance with other vehicles plans to use for its cross-border services. One such feature is the display of important data for the driver by means of a DMI display (Driver-Machine-Interface).

This class of locomotive is equipped with the electrical components necessary for operation in other European countries. The locomotives have been prepared for homologation in the following countries: Germany, Austria, Hungary, Switzerland, Denmark, Sweden, Norway, Italy, France, the Netherlands, Luxemburg, Belgium, Poland, the Czech Republic, the Slovak Republic, Slovenia and Croatia.

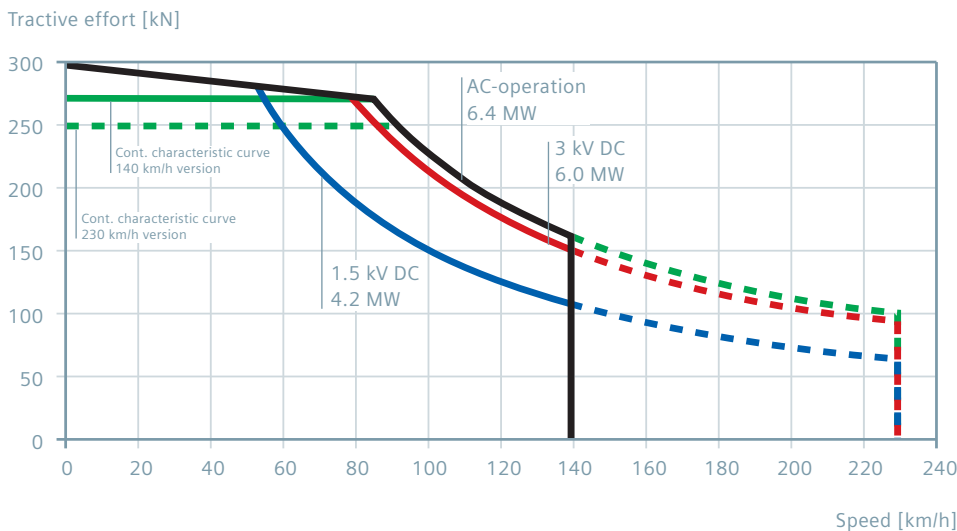
A major innovation for meeting the wide-ranging electrical and spatial requirements is the use of water-cooled high-voltage IGBT (Insulated Gate Bipolar Transistor) traction converters. For the first time, 6.5 kV IGBTs are being used and enable the line voltage in DC networks to be fed directly into the DC links without the need for step-down choppers.

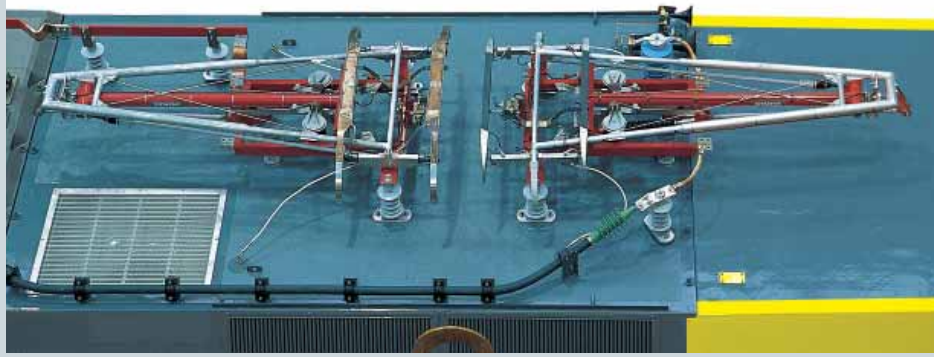
The regenerative and wear-free electric brake serves as the primary brake and feeds kinetic energy back into the overhead contact line. As energy recovery is not always possible in DC networks, the ES 64 F4 also features a rheostatic brake that has a rating of 2,600 kW.

In the 140 km/h version, the pneumatic brake acts on disk brakes mounted on all the wheels. The 230 km/h version comes with fully suspended separate braking shafts. Each shaft is assigned to one axle.

The high-performance bogies with center-pivot linkage represent an optimal compromise between permanent way compatibility, maximum transmission of tractive and braking efforts, and good running characteristics. They also meet the requirements stipulated in UIC 518.

Tractive effort curve for four voltage systems





Pantographs layout

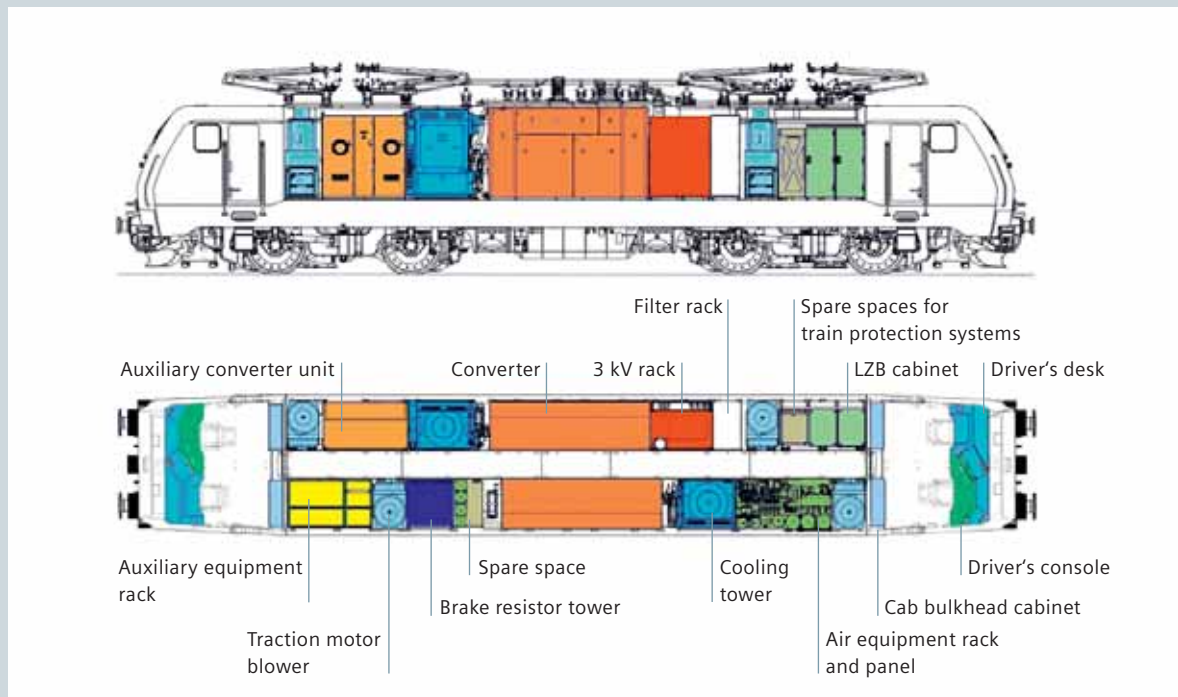
In addition to the four Siemens type SBS 2T pantographs, the roof-mounted equipment includes the high-voltage components for the AC systems such as the AC main circuit-breaker, the system disconnecter, the line voltage transformer and the surge arrester. The electrical connections are designed to carry high currents of up to 4,000 A.

The components for the DC voltage system, such as the DC main circuit-breaker, the DC line-current and line-voltage transformers are housed in the 3 kV rack. The contactors for feeding the train supply bus with voltages of 1,000 V AC 16.7 Hz, 1,500 V AC 50 Hz, 1,500 V DC and 3,000 V DC are also located here.

The auxiliary converter unit (ACU), which likewise features IGBT technology, has an output of 4 x 90 kVA, a variable output frequency and 75 % redundancy. It is fed by the DC link in the traction converter. The ACU supplies power to the traction motor blowers, the brake resistor blowers, the cooling tower blowers, the coolant pumps, the battery charger, the air-conditioning equipment and all the heaters.

Special signal lights and head lights have been developed for the ES64F4, which incorporate LED technology and integrated lens lamps. These features ensure compliance with the defined luminous intensity as per UIC 534 and 651 and help to realize the signal aspects and signal colors demanded by the various railway companies.

Equipment layout



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The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.