In order to meet the requirement of heavy cargo railway transportation, improve the transportation capability of the railway of China, Ministry of Railway place order of 180 HXD1 high power AC electric freight locomotive to Siemens / ZELC consortium in 2004 under technical leadership of Siemens. The technology for this locomotive was thereby introduced to Chinese market. The locomotive will contribute to improve the expanding energy supply in China.

General Description
This new heavy haul electric locomotive is 8-axle double locomotive with Bo'Bo' + Bo'Bo' axle arrangement. In its standard equipment level, it has a weight of 184 tons, which corresponds to axle load of 23 tons. It is possible to increase the axle load by adding ballast up to 25 tons. This allows to reach even more tractive performance. Each half-locomotive has one driver's cab. The locomotive has been designed for operation in a AC 25 kV / 50 Hz system.

The technical concept is based on the Eurosprinter family of locomotives. So far, orders have been secured for more than 875 units from this family. In order to suit the severe operation condition, this locomotive is customized design for coal dusty protection.

Technical data	
Wheel arrangement	Bo'Bo' + Bo'Bo'
Track gauge	1,435 mm
Length over coupler at each end	35,550 mm
Distance between bogie center (single unit)	9,000 mm
Width (handrail)	3,247 mm
Wheel diameter (new)	1,250 mm
Wheel base of bogie	2,800 mm
Weight (single unit)	92 t / 100 t
Voltage system	25 kV, 50 Hz
Continuous power	9,600 kW
Starting tractive effort (23 t / 25 t axle load)	≥ 700 / 760 kN
Continuous tractive effort (23 t / 25t axle load)	494 / 532 kN
Maximum service speed	120 km/h
Maximum braking effort	461 kN

High Power AC Electric Freight Locomotive HXD1

For China Railway

Transportation Systems

SIEMENS

Due to the many years of positive experience gained with three-phase AC traction technology under various voltage systems, track gauges, and climatic conditions, the Chinese Railways expectations as regards modern technology, reliability, service life, and safety will be perfectly met.

Siemens used its experience in chinese railway technology from successful DJ1-locomotive and introduced with HXD1 the next evolution step of the chinese branch of Eurosprinter family. Many chinese supplier have been integrated into HXD1 concept during a wide technology transfer, bringing also benefit to local industry.

Mechanic Concept
As with all EuroSprinter locomotives, the aim was to give the new heavy haul electric locomotive a modular structure. This enables very short assembly times and pre-testing of the components outside the locomotive. The components can easily be installed in the machine room from above. This gives also high advantage regarding maintainability.

Propulsion Performance
The graph below shows the tractive and braking effort available at the wheels for 23 t and 25 t axle load, whose transmissibility is dependent on the track conditions. When an adhesion coefficient of at least 0.39 is available, a starting tractive effort of 700 kN with 23 t axle load and starting tractive effort of 760 kN with 25 t axle load can be transmitted well to the rails. The maximum electric braking effort of the locomotive is limited to 461 kN. The regenerative braking power at wheel is max. 9.6 MW.

Control system
Both half-locomotives have an identical control level structure. The structure of the electronic control level for a double locomotive is shown in the below figure.

The bus system for data communication between programmable equipment and rail vehicles consists of the Train Communication Network defined according to IEC 61375. This bus system consists of two parts – the WTB and MVB.

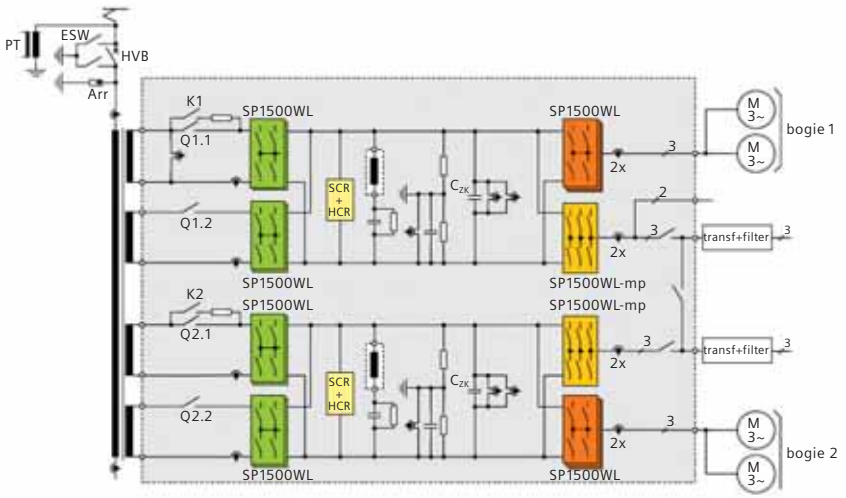
The central control unit (CCU) manages the vehicle control system. Higher-level control and monitoring functions of the vehicle control system either are carried out directly or their implementation is coordinated by the CCU. The CCU is composed of micro computer control units of the Siemens Sibas 32 railway automation system with 32-bit processors.

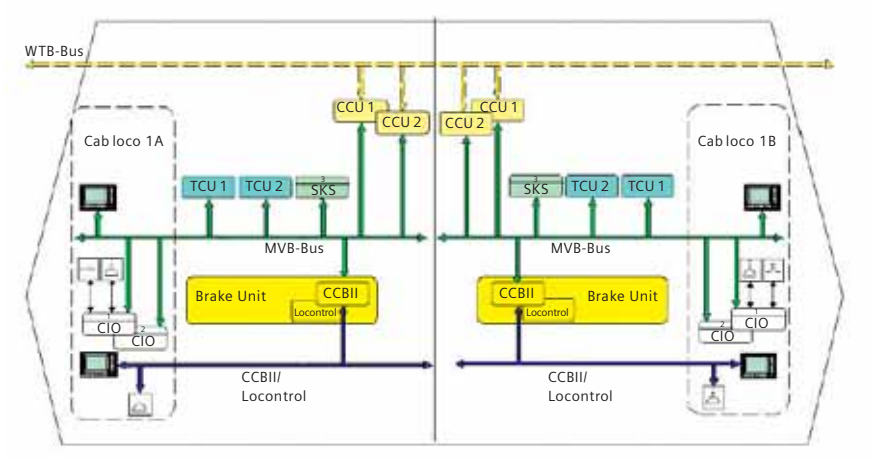
The traction control units (TCU) are responsible for open-loop and closed-loop control of the electrical traction equipment. Also integrated the control of the auxiliary PWM-inverter. There is one TCU for each dc link with its connected phase-modules.

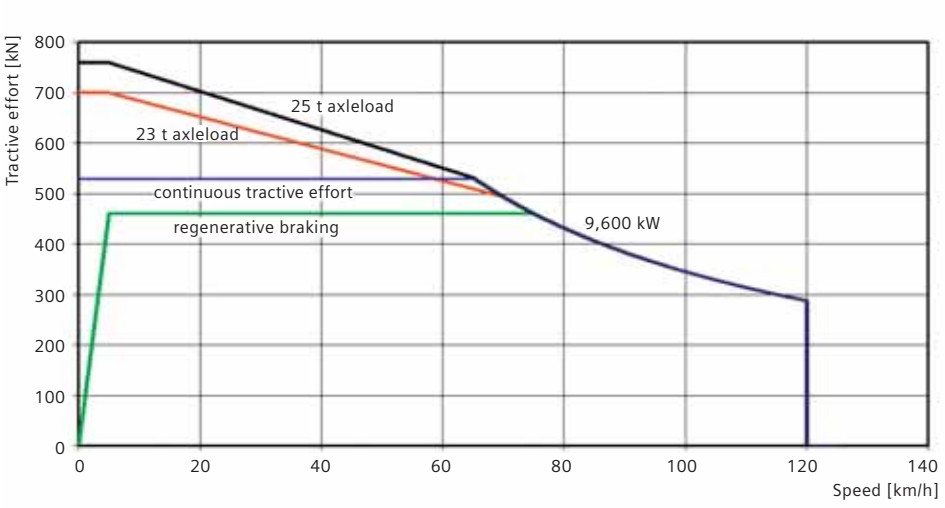
The complete control level shows a very high degree of redundancy with high effect to perfect reliabilty of locomotive during service. Maintainability and Reliabilty are increased by an efficient diagnosis system.

The train driver's MMI consists of a display unit. The display unit is the man-machine interface for the Sibas control and diagnostic equipment on rail vehicles.

The modular control level also allowed the easy integration of CCBII Brake system and provides easy interfaces to locomotive remote control system.







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