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High speed trainset Velaro RUS

for Russian Railways (RZD)

In May 2006, a contract was signed between the Russian railway company OAO "Rossijskije zheleznyje dorogi" (RZD) and Siemens for the development and construction of high speed trains. The project encompasses the supply of 8 trainsets equipped with components and systems whose performance characteristics have been adapted to the climatic requirements as well as to the standards of the Russian Federation. These trains make use of a distributed traction system and being supplied in two different versions, as single-system (3 kV DC) and dual-system (3 kV DC and 25 kV AC) trains. This kind of capability will enable the units to be universally deployed. In September 2009 the trains successfully started with high-speed passenger services on the Moscow–St. Petersburg and Moscow–Nizhny Novgorod lines. In December 2011, RZD ordered eight more trains.

The Velaro RUS is based on the modern technology of the Velaro platform of trains such as those which are already providing reliable service to the German Rail (DB AG), Spanish National Railways (RENFE) and those which have also been sold to the Chinese Ministry of Railways (MOR).

Technical Data	B1	B2
Maximum operating speed	250 km/h	
Train length	250 m	
Voltage	3 kV DC	25 kV AC, 50 Hz 3 kV DC
Brake system	Regenerative, pneumatic, rheostatic	
Wheel arrangement	Bo'Bo'+2'2'+Bo'Bo'+2'2'+2'2'+2'2'+ 2'2'+Bo'Bo'+2'2'+Bo'Bo'	
Maximum axle load	17 t	18 t
Number of cars per train	10	
Number of seats	604	
Track gauge	1,520 mm	
Operating temperature range	(-50 °C) - 40 °C ... +40 °C	
Signaling systems	KLUB-U	



The car body geometry and the arrangement of the interior furnishings have been specially coordinated to achieve the best combination of high travel comfort and high seating capacity. The train offers two classes in which catering is provided for the passengers. Passengers may also visit the bistro restaurant for snacks and beverages. In first and second class, a video and audio entertainment system meets high expectations. With an installed traction rating of 8,000 kW, the Velaro RUS is designed for a maximum service speed of 250 km/h. Upgrading to 300 km/h is possible. The electric brake permits the regenerative feedback of braking energy into the power system. A smooth ride and a high level of safety are ensured by the proven bogie technology from Siemens. The train is protected by the Russian Klub U safety system.

Service-proven trainset concept

Like its predecessors – ICE 3, Velaro E and Velaro CN – the Velaro RUS is based on a multiple-unit concept which distributes the traction and technical equipment over the entire underfloor area of the train. This makes the full length of the train available for passengers. Compared to conventional trains with locomotives, these trainsets offer a significantly higher seating capacity for the same train length, creating 20% more space than conventional trains with similar seating arrangement. This concept is increasingly embraced by customers and has become very successful at the international level. The trainset concept and its components have undergone continual further development for over 15 years, enhancing their reliability and availability.

The clear advantages

Optimized running performance.

The trainset concept results in the overall operating advantages:

- Improved leverage of the adhesion coefficient during acceleration because 40% of the axles are driven.
- Ability to run on line sections with steeper gradients.
- The evenly distributed weight over the entire trainset means lower individual axle loads. This lessens the amount of track wear and reduces the maintenance requirements of the running gear.

Additional benefit: Comfortable ride

The evenly distributed weight also improves the running characteristics and thus the ride.

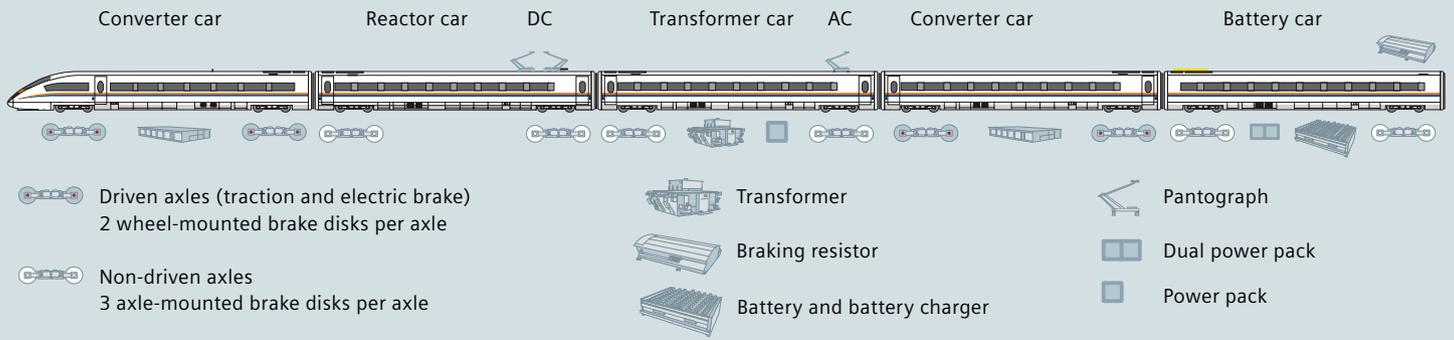
Impressive traction

The Velaro RUS has four identical, independent traction converter units. This principle provides clear advantages in continuous service:

- Any failure of one converter will not affect the remaining units. This enables the train to safely reach its destination with 75% of its maximum rated traction power.
- Low-maintenance three-phase asynchronous motors with cage rotors ensure high availability.
- At 8,000 kW, the power rating of the traction system is designed to ensure high acceleration and deceleration levels even at full load.

A train with high seating capacity and full comfort

The Velaro RUS is a revelation in passenger space. Thanks to a wider car body, it offers seats for 604 passengers and full comfort. At both ends of the train, a lounge with 1st class seating is located directly behind the driver's cab. A particular highlight is the transparent partition wall separating the lounge and driver's cab and giving



passengers – an unobstructed view of the track ahead. An intermediate car with bistro restaurant provides catering with meals and beverages. Another intermediate car accommodates space for passengers in wheelchairs as well as a universal toilet.

The result

A revelation in space that does not compromise on comfort.

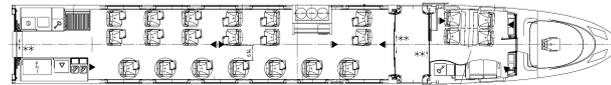
Exciting entertainment

The passenger information system is based on previous experience and incorporates advanced technologies.

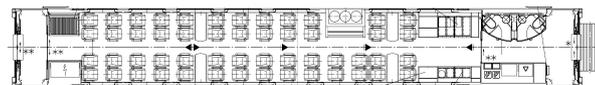
- In the 1st and 2nd class cars (except bistro car), large video screens that are clearly visible from every seat provide exciting entertainment.
- The compatibility with advanced media and formats, such as DVD and MP3, makes sure that passengers have access to the latest productions in top quality.
- Five different audio programs can be received at each seat in 1st and 2nd class cars (except bistro car). Passengers in the 1st class and the bistro restaurant car can also access the Internet over W-LAN.
- 4 cars equipped with repeaters for improved mobile phone signals.

The latest news for all passengers

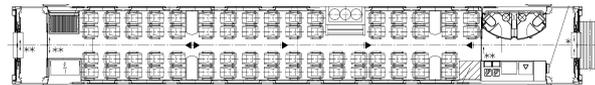
- The central announcements for all passengers are coordinated from the train manager's office via a computer.
- Announcements and internal messages can also be forwarded from fixed intercom stations in every car. Announcements can also be made for selected groups (e.g. for individual cars or car classes).
- Passengers receive information via interior and exterior LED displays.



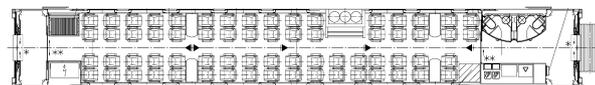
Converter car, Business class



Reactor car, Tourist class



Transformer car, Tourist class



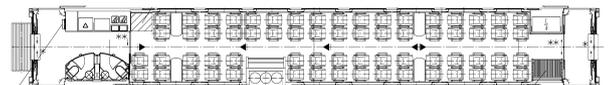
Converter car, Tourist class



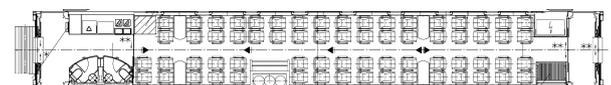
Battery car, Tourist class



Battery car, Bistro restaurant, Tourist class



Converter car, Tourist class



Transformer car, Tourist class



Reactor car, Tourist class



Converter car, Business class



Perfect control

The Train Communication Network (TCN), consisting of the train bus (WTB) and the vehicle bus (MVB), ensures smooth and reliable data transfer between the traction units of a train. The fully redundant design of the TCN system provides additional advantages:

- Significant improvement of the availability of the communications paths
- Savings in terms of hardware, installation dimensions, weight, and lifecycle costs
- Increased data transparency and shorter data propagation delays through the reduced number of interfaces

Efficient onboard power supply system

An efficient onboard power supply system reduces the energy consumption and increases the cost-effectiveness of the train. With the Velaro RUS, the onboard power network has been optimized with a view of the entire power supply system. The system topology is characterized by a low number of power conversion steps. Since every conversion causes losses, this allows an increase in overall system efficiency. In addition, redundant structures ensure the reliable supply of auxiliary equipment in all operational situations. For example, the auxiliary supply is maintained when the train passes through neutral sections and is temporarily disconnected from the traction power system.

Proven safety

The proven SF 500 bogies are designed for speeds up to 350 km/h, and contribute to the exemplary lateral guidance performance of the Velaro RUS. They also maximize the stability for excellent running comfort. Even more important than rapid acceleration is rapid deceleration. The Velaro RUS is equipped with a brake management system that controls automatic switchover between the electric and pneumatic brakes. Braking in (electric) regenerative mode is preferred in routine service. Only when the power system is no longer able to absorb the electric braking energy of the traction motors, is a gradual transition made to the pneumatic brake. This saves energy and also reduces mechanical wear.

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