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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 zheleznije 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 operation on the Moscow–St. Petersburg and Moscow–Nizhny Novgorod lines. In December 2011, RZD ordered eight more trains. These new trains were equipped for double-traction operation in order to meet the high level of demand. They have been operating since August 2014. The complete first model series will also be retrofitted for double traction at a later date.

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	556 seats of which: 4 x VIP lounge 19 x Premium 52 x Business 40 x Restaurant 440 x Tourist 1 x mother + child seat	
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 three classes and a VIP lounge in which catering is provided for the passengers. The VIP lounge has an independent multimedia system so that business passengers can play their own presentations and view films from PCs they have brought with them. In the Premium class, touchscreens with a multimedia system are integrated in the seat. In Business and Tourist 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.

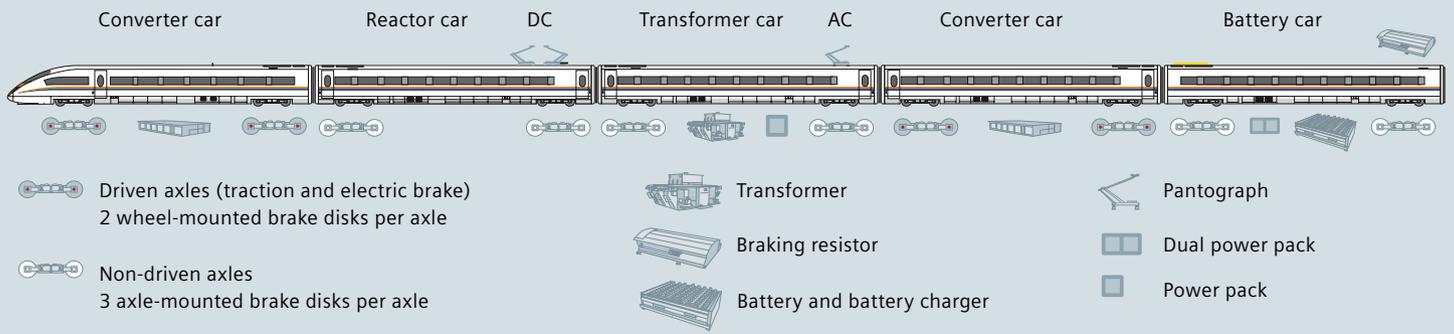
#### **Impressive traction**

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 556 passengers and full comfort. At both ends of the train, a lounge is located directly behind the driver's cab. The SR01 carriage contains the VIP lounge with 4 Premium class seats plus a wardrobe, folding table, space for a couch and a mini-bar.



An LED light with changeable colors that can be switched to different levels creates a warm atmosphere. The SR10 carriage has a lounge with a mother and child seat, where families young babies can be accommodated. A particular highlight is the optional transparent partition wall separating the lounge and driver's cab and giving passengers – an unobstructed view of the track ahead. This feature can also be controlled from the VIP lounge. 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.

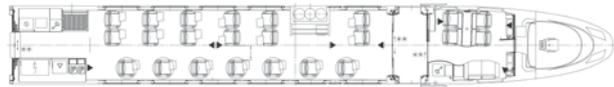
**The result**

A revelation in space that does not compromise on comfort.

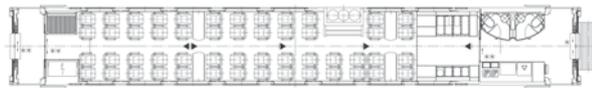
**Exciting entertainment**

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

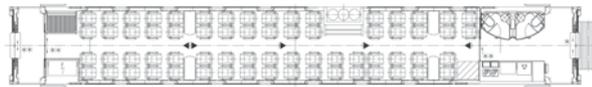
- In the Premium class, the touchscreen display integrated into the seat provides individual entertainment for every passenger. In the Business and Tourist classes (except in the bistro car), large video screens that are clearly visible from every seat provide exciting entertainment.
- The compatibility with advanced media and formats, such as DVD and MP3, makes sure that passengers have access to the latest productions in top quality.
- Six different stereo audio programs can be received at each seat in Business and Tourist class. Passengers throughout the train can also access the Internet via W-LAN.
- All cars are equipped with repeaters for improved mobile phone signals.



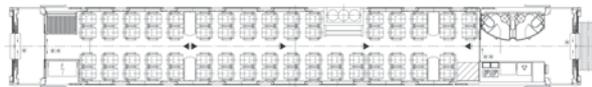
Converter car, Premium class, VIP-Lounge



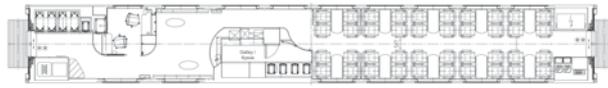
Reactor car, Business class



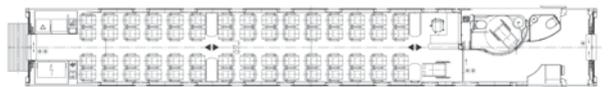
Transformer car, Tourist class



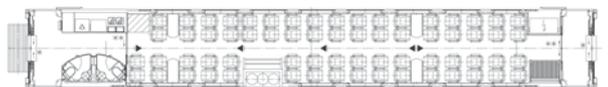
Converter car, Tourist class



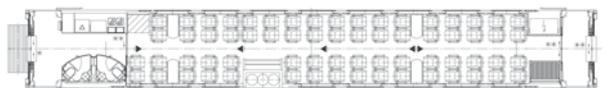
Battery car, Bistro restaurant, Tourist class



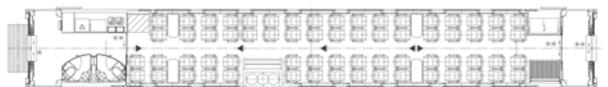
Battery car, Tourist class



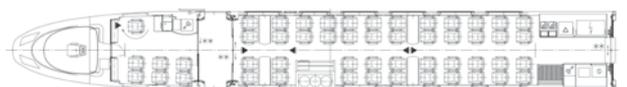
Converter car, Tourist class



Transformer car, Tourist class



Reactor car, Tourist class



Converter car, Tourist class



### 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.

### 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 520 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.

### Siemens AG

Mobility Division  
Nonnendammallee 101  
13629 Berlin, Germany

[siemensrailssystemcontact.ic@siemens.com](mailto:siemensrailssystemcontact.ic@siemens.com)

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