



## HIGH-SPEED TRAINS

# ICE 4 (BR 412)

In May 2011, the German national railway company Deutsche Bahn (DB) signed a framework agreement with Siemens Mobility for up to 300 trainsets, following an earlier order of 137 ICE 4-type trains. These trainsets will be used to handle the massive expansion of DB's interurban transport offerings. As the backbone of the ICE fleet, the ICE 4 will be responsible for over 50 percent of DB's interurban transport revenue.

The ICE 4 sets new standards in ICE interurban transport. Together with its partner Alstom, Siemens has developed a unique concept that allows the ICE 4 to be individually adapted to the requirements of various transport tasks.

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### Technical data

|  | 7-car trainset   | 12-car trainset  | 13-car trainset  |
|--|--|------------------|------------------|
| Maximum speed                                      | 250 km/h   | 265 km/h         | 265 km/h         |
| Train length                                       | 200 m  | 346 m            | 374 m            |
| Voltage system                                     | 15 kV / 16.67 Hz   | 15 kV / 16.67 Hz | 15 kV / 16.67 Hz |
| Number of Powercars                                | 3  | 6                | 7                |
| Traction output                                    | 4.95 MW  | 9.9 MW           | 11.5 MW          |
| Brakes   | Air brake with extra regenerative brake, track brake as electro-magnetic track brake |                  |                  |
| Number of axles                                    | 28 (12 driven)   | 48 (24 driven)   | 52 (28 driven)   |
| Number of bogies                                   | 14 (6 driven)  | 24 (12 driven)   | 26 (14 driven)   |
| Axle load  | < 18 t   | < 18 t           | < 18 t           |
| Number of cars                                     | 7  | 12               | 13               |
| Gauge  | 1,435 mm   | 1,435 mm         | 1,435 mm         |
| Car body   | Steel, 28 m  | Steel, 28 m      | Steel, 28 m      |
| Pantograph   | AC   | AC               | AC               |
| Service entry                                      | 12 / 2020  | 12 / 2017        | 02 / 2021        |
| Number of seats (total / first-class / restaurant) | 456 / 77 / 17  | 830 / 205 / 23   | 918 / 205 / 23   |

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### **The Powercar concept**

The ICE 4's drive concept is based on the so called Powercar concept. To achieve a high degree of modularity and therefore flexibility, the components of the traction system – basically transformer, traction converter, cooler, and four traction motors – are implemented in autonomic, powered identical cars (Powercars) and integrated beneath the cars. All trainset configurations – from five to fourteen cars – are possible within certain framework conditions. This means that the train can be optimally adapted to specific transport tasks in terms of acceleration, speed, and passenger capacity.

### **Electronic vehicle control system**

The architecture of the vehicle control system is consistent with the flexible car concept, made possible by the future Ethernet Train Bus industry standard that allows for a flexible car setup. Individual cars will be provided with control units as needed to ensure maximum autonomy. The advanced, industry standard PROFINET is used in each car.

### **SIBAS PN**

SIBAS PN is Siemens' innovative railway automation system. The system is based on SIMATIC components used in industrial automation systems and their integrated engineering environment. The communication network comprises two hierarchical levels: ETB (Ethernet Train Bus) and PROFINET vehicle bus. Both communication systems are based on Fast Ethernet (100 Mbit/s, Switched Ethernet) with optional redundancy.

### **Power bogie**

The ICE 4's power bogie is a further development of the tried-and-tested SF 500 family. This robust bogie meets high demands for bearing loads and traction forces and has already been successfully in use in high-speed transport and double-decker trains.





### **Trailing bogie**

The ICE 4 uses a further development of the Alstom FLEXX Eco® power bogie. It has been optimized for high-speed transport. This bogie is especially track-friendly and helps reduce energy consumption through its construction and skirt option. The trailing bogie is characterized by its low unsprung mass and its very low weight. Thanks to its lightweight characteristics it reduces the ICE 4's total weight by 5%.

### **Ecofriendly operation**

Despite its high seating capacity, the ICE 4 is relatively lightweight, with a superior weight-to-seat ratio. The ICE 4's modularity supports train configurations that require as few components as possible. Carefully selected innovations – like the combined use of lightweight trailing bogies with inside bearings and weight-optimized power bogies, and the further refinement of the aerodynamic design – help reduce weight and energy consumption. The ICE 4 needs more than 20% less energy than its predecessors.

### **Interior**

The ICE 4 is a true world champion when it comes to usable floor space. In only seven cars, it can comfortably accommodate more than 450 seats in a 200 meter long train. The individual steelbodied cars have been lengthened to 28 meters, thereby reducing the number of intercar gangways, components, and bogies while increasing car capacity. Electronics cabinets have been largely eliminated from the interior, and the functional areas have been combined spatially. In addition, new seats are being used with innovative ergonomics and seat kinematics.

Configuring the ICE 4's large usable floor space is easy and straightforward, thanks to the emptytube principle. The entire passenger area has a modular layout, so all the furnishings can be varied at will. As a result, last-minute changes to accommodate new requirements can be quickly and easily implemented. To ensure maximum flexibility, all passenger areas are equipped for easy reconfiguration. They're specifically designed for railway applications, are stain-resistant, easy to clean, and conform to fire, health, and environmental standards. Innovative seats provide an especially high degree of interior flexibility. They are mounted on C-rails along which they can be moved: and all the passenger conveniences, including reservation indicators and electrical outlets, are integrated in the seats themselves. First-class seats are also equipped with reading lamps.





### Lighting concept

The large panoramic windows (1,924 mm x 780 mm) ensure a well-lit interior and a bright, friendly atmosphere. At the same time, the innovative lighting in the passenger area provides bright, uniform illumination even when the luggage racks are full. The latest LED technology means that different colors can be selected to reflect different lighting scenarios, thereby adjusting the color and brightness of the lighting according to the time of day.



### Accessibility

To make travel more enjoyable for those with limited mobility, the ICE 4's multifunction car provides an area for wheelchairs that is located in direct proximity to a wheelchair lift and roomy universal restroom that conform to TSI PRM standards. The floor is also equipped with a touchsensitive guidance system to help blind or visually impaired passengers.

### Intelligent passenger information

The passenger information system keeps passengers constantly informed – both visually and audibly – of the itinerary and the available services. In different regions, texts and speech can be output in different languages, e.g. German, English, and French. The ICE 4 is equipped for GSM mobile phone reception and mobile Internet access (WiFi). In the future, DB's advanced "ITonICE" IT platform, which offers numerous passenger conveniences, will be used.

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Otto-Hahn-Ring 6  
81739 Munich  
Germany

[contact.mobility@siemens.com](mailto:contact.mobility@siemens.com)

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