Quality, performance and reliability –
Components and solutions for advanced rail vehicles

www.siemens.com/mobility
Demographic change, urbanization and climate change are all impacting society and they pose increasingly complex global challenges. The world’s population is growing all the time – as are life expectancies. According to the latest estimates, 9.2 billion people will be living on this planet by the year 2050 (at present, the world’s population is 6.6 billion).

This increase in population is accompanied by the other trend toward urbanization. Half of the world’s population is already living in major urban areas. As a direct consequence of these developments, global trade volumes will rise along with the need for personal mobility – and, therefore, the demand for transportation capacity. Therefore, it is obvious that mobility is the number one challenge to sustainable growth.

To ensure our mobility in future, we need networked transportation and information systems. And we will only meet these mobility requirements through efficient coordination and perfect meshing of all modes of transportation. This is why Siemens with its “Complete mobility” approach is offering integrated transportation and logistics solutions for safe, cost-effective and environment-friendly passenger and freight services. Siemens has the necessary competence to provide everything from infrastructure systems for railways and roadways to solutions for rolling stock, airport logistics and postal automation.

Key elements of “Complete mobility” are efficient solutions for rail-based transportation systems for cities and population centers and for connecting large cities and countries.
Components and solutions for advanced rail vehicles – what we offer

In the area of drive systems, “Components” offers and supports the complete range of electrical and mechanical components and systems for modern rail vehicles. We are shaping the future of drive technology in rail-based transportation with efficient, market-oriented and future proof system solutions from a single source. Nearly 10,000 IGBT-traction systems of the latest generations, sold since 1996, are proof of our competence.

The competence center for bogies in Graz is the world’s largest development and production line of bogies. Every year, up to 3,000 bogies are manufactured here for mass transit and mainline services around the world. State-of-the-art production methods and a perfectly organized logistics system mean quality and short delivery times. Modular design concepts ensure economical operation.

“Components” is located in Germany and Austria and manufactures at twelve locations for traction products and bogies worldwide.
Mass transit worldwide

Urban railways and trams
Today, the light rail market is characterized by trams and urban railways utilizing low-floor technology. The Avanto®/S70 family of vehicles, specifically developed for Europe and the US, use our compact drive solutions.

Avanto/S70 trams with SF 70/SF 40 type bogies offer a low-floor portion of more than 70% and a floor-level height of 38 mm and 655 mm respectively.

Customer benefits
- Individual versions with a high degree of quality
- Multi-system vehicles can be used for various voltage systems
- Different bogie types for all requirements of urban mobility.

Metro systems
Siemens has many years of global experience in metro systems including the associated traction equipment. Examples include metros in Vienna, BTS Bangkok, Tren Urbano in Puerto Rico, and many more.

The high competence for design and production of various heavy rail bogies for metros is widely recognized. The reference list contains more than 6,750 sold metro bogies around the world.

Customer benefits
- Low operating costs
- High degree of reliability using well-proven components and products
- Modular design of bogie families causing low maintenance and life-cycle costs as well as lowest noise level
- Green Mobility: Materials and components for Metro Oslo were designed for optimum environmental balance.
Locomotives

In operation worldwide
Locomotives from Siemens offer operating companies a maximum of efficiency and profitability – for every type of service. We have developed appropriate modular concepts for electric and diesel-electric locomotives. We supply equipment for Eurosprinter® and Eurorunner® family of locomotives and optimized and adapted solutions for passenger traffic and freight transport.

A wide range of modular designed bogie types covers all aspects of modern locomotive technology. More than 900 high performance bogies for "Taurus®" locomotives are running for the Austrian Federal Railways – 7,355 kW and a maximum speed of 230 km/h.

Customer benefits
- Tailored performance and the optimum tractive effort
- Highest degree of reliability and availability
- Environmentally friendly and low energy consumption
- Extensive calculations on running characteristics of bogies for optimum stability and ride quality values.
- Improved and optimized components of proven and tested bogies, ensuring high flexibility, easy maintenance, low service costs, and excellent riding comfort
The high-speed train Velaro® E for Spain is based on the experience we gained from the advanced ICE® 3 train.

It is the fastest train in commercial use in Europe: Traction power of 8,800 kW and a maximum speed of 350 km/h. We supplied the traction system, the train control and the bogies.

The technology of high-speed bogies is in use in renowned trains, like ICE (Germany), AVE® (Spain), and Velaro (Russia and China).

Customer benefits
- Lower power, service and operating costs
- High degree of reliability and availability of the vehicles
- Excellent ride comfort
- High speed both on straight tracks and on curves

Sibac – Platform based components for traction inverters

Siemens traction inverters are based on the component platforms building blocks and compact inverters throughout the whole product range. The usual voltages of DC 750V, 1,500V and 3,000V are served with 2 level inverters using fast-switching traction grade IGBTs. All types of cooling like water, forced air and natural cooling are supported.

For high power applications like locomotives and high speed trains a modular approach based on IGBT building blocks (phase leg level) is used, while for small and medium power (<1MW) the compact inverter based solution with integrated traction control unit is preferred.

Bogies

Bogie research and development is one of the key advantages for future-proof technology. More than 180 highly qualified engineers work on solutions, setting new standards in bogie technology.

Close cooperation with universities and research institutes over the world – for example the “virtual vehicle competence center” in Graz for engineering – together with a high level of production automation (more than 80%) provide highest operating reliability.
Customer benefits

- Flexible tailored inverter design with standard phase modules or compact inverters
- Inverters based on highly reliable traction IGBT provide low service costs, high efficiency and power density
- Optional interface for energy storage devices (double layer capacitors, batteries)
- High performance Sitrac® control for all types of inverters ensuring minimum vibration and noise, speed-sensorless control and regenerative braking down to zero speed
- Highly specific advantages of various bogie types
- Modular design allows extended modernization and retrofitting of used bogies

**Syntegra – Simplified drive system with improved efficiency and better environmental friendliness**

Our innovative Syntegra® concept fundamentally revolutionizes the characteristics of today’s powered bogies and represents a new and highly integrative approach in bogie design. Syntegra unifies the traction, bogie and braking technologies to form a mechatronic system which generates a large number of synergetic benefits.

This new generation of powered bogies employs permanent magnet direct drives and combines high efficiency and low weight with reduced life-cycle costs (LCC). Therefore Syntegra offers considerably better performance than conventional bogie solutions.

**Customer benefits**

- Reduced weight
- Low operating costs
- Reduced power consumption
- Low service & maintenance costs
- No gearbox required
- Small envelope dimensions
- High availability
- Low acoustic noise of drive system
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.