

Brochure

Traction motors Making trains fly

ABB can design and manufacture traction motors that are perfectly tailored to the operating conditions of each train that they power, enabling superior motor efficiency and lowest energy consumption.



Get ready for takeoff

Trains are the transportation of the future. No surprise, they offer superb comfort for passengers, cost effective transportation of cargo and climate friendly operation.

More and more rail projects are being planned and launched around the world – from inner-city tramlines to transcontinental mainlines. New job opportunities are created throughout the extensive rail supply value chain, including motor suppliers, propulsion system providers, railcar manufacturers and train operators, as well as in related infrastructure industries.

Trains are powered by the most refined of energy sources, electricity, which is costly in production, distribution and transmission. We must therefore seek new ways to reduce the use of electricity in trains. The key lies in optimizing the performance of the motors that drive their propulsion.

ABB holds a global leadership position in traction motors. We have delivered motors for 130 years, and 50,000 ABB traction motors are currently in operation worldwide. With 15,000 people in more than 100 countries working with motors and generators, we have the resources necessary to manage high-end traction motor design projects – and to address customer needs throughout the world.

We have the ability to create world-class motors that are perfectly adapted for actual operating conditions, thus enabling substantial energy reduction. With ABB motors inside, trains will lift to higher grounds. It's time to strap up and get ready for takeoff.



Can you tell the difference?

Two trains may look the same on the outside. But it's what's inside that makes a difference. By using motors optimized for your application, efficiency can be improved by several percent. And that will have a tangible effect, both on your energy bill and on the environment.

By customizing motor designs to your specific rail application, we can boost motor efficiency and consequently reduce energy use to an extent where it becomes truly tangible on your bottom line.

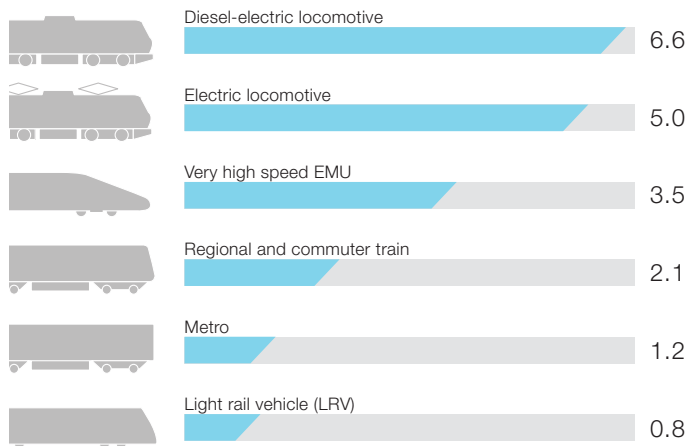
This purposeful optimization process can increase efficiency by several percent. And every percent means major energy savings over the lifetime of the motor. In fact, reducing energy consumption by only 1 percent means life-cycle savings by up to 5 times the purchase price of the motor.

Thanks to advanced in-house developed optimization software, ABB is able to maximize the impact of every operating parameter that will determine the performance of the motor. This presents the rail industry with new and largely unexploited opportunities.

It is good news to propulsion system providers, train manufacturers, train operators – and to society at large. An increased awareness of the potential energy savings can help fuel further investment in the railway industry.

Designing these energy efficient motors takes the support of massive computing power resources, provided by vast distributed computer networks. Only ABB has the resources necessary to manage such challenging projects.





The chart shows the value of a 1-percent energy reduction from an application-optimized ABB traction motor, calculated as multiples of the purchase price of the motor. For example, with a diesel-electric locomotive, savings equivalent to 6.6 motors are possible over the motor's 30-year life expectancy.

Data based on operations 16 hours/day, 330 days/year for 30 years. Interest rate same as energy price increase. Electricity price 0.1 €/kWh (0.25 €/kWh for diesel-electric locomotive), diesel price 1 €/liter.



Imagine the power of a thousand computers, connected together in a global distributed network, running advanced optimization software that calculates uninterruptedly 24/7. The result is a motor with the lowest possible energy consumption based on your rail application.



Traction motor design, ABB style

ABB has developed the software tools that make manufacturing of the world's most energy efficient motors possible. It takes a thousand computers in a distributed network to make full use of the software and to achieve the optimum traction motor design.

Based on the original motor design, we can run our software to perform hundreds of optimizations until the desired motor data is reached. By testing thousands of potential motor designs, the software will gradually narrow down the scope to the optimum design.

Optimization is based on train application and operating parameters, which in turn are converted into electromagnetic parameters such as load, torque and motor speed.

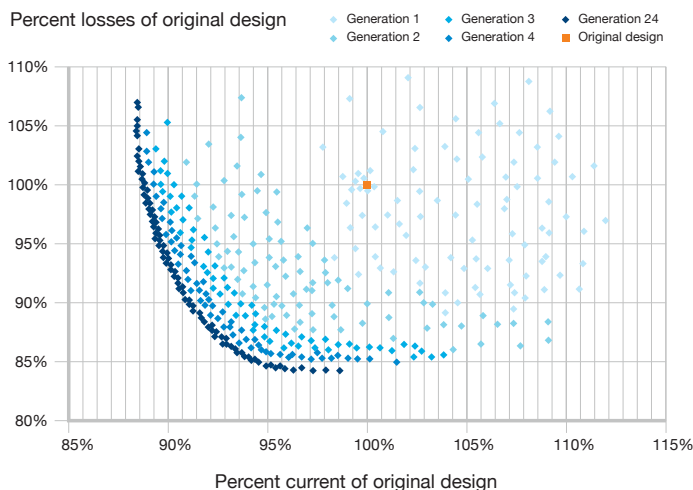
For example, running a train in a hilly or flat landscape means that very different topographic data is fed into our software.

Similarly, a busy train schedule means the motor must cope with more starts and stops and will need higher acceleration.

There is tremendous computer power at work to achieve this degree of optimization. About a thousand networked computers using 3,000 CPU cores to execute several teraflops (trillion floating-point operations per second) are necessary to truly optimize a traction motor.

The result is a motor with proven, validated design – and the highest energy efficiency available in the market. That's traction motor design, ABB style.

We have unmatched resources available to optimize motors for your application. Our muscle power is your reward – spelled out on your bottom line as reduced energy costs.



ABB's optimizing tools are used to calculate the most energy efficient motor design. Running the software numerous times to create different generations of motor designs will gradually generate the most favorable balance between current and losses based on the customer's requirements.

Optimization parameters

Some of the train's operating parameters that affect traction motor optimization:

- The ambient temperature
- High or low acceleration
- Many or few starts and stops
- Train's operating schedule
- Cargo load
- Inverter characteristics*

*Affects motor performance. The higher the current and voltage fed to the motor, the faster its acceleration.

Individually crafted for your train

Whatever your requirements, we can tailor the right motor for you. In-house production of key components and a wide network of trusted suppliers ensure high and consistent quality in every motor that we deliver.

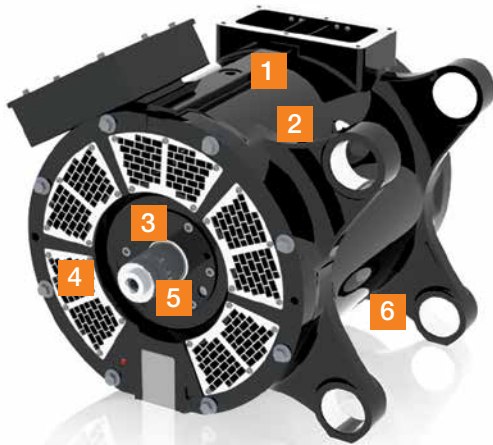
To meet the challenges of supplying top quality products competitively and with short response times, ABB has developed global manufacturing facilities and an independent supplier network. All of these arrangements are subject to stringent quality assurance procedures.

As an independent traction motor supplier, we design and manufacture our own motors and manufacture traction motors on a subcontracting basis. Close interaction with

converter manufacturers and train manufacturers allows us to design motors that meet stringent requirements.

Each motor design is customized based on customer demands. We can tailor motors by selecting from a complete and flexible product range including induction, synchronous and permanent magnet motors.

We use only Class 200 insulation materials, specified for lowest water absorption, from recognized suppliers. All materials are carefully selected based on decades of experience to meet the thermal, mechanical and chemical demands of each application.



Motor

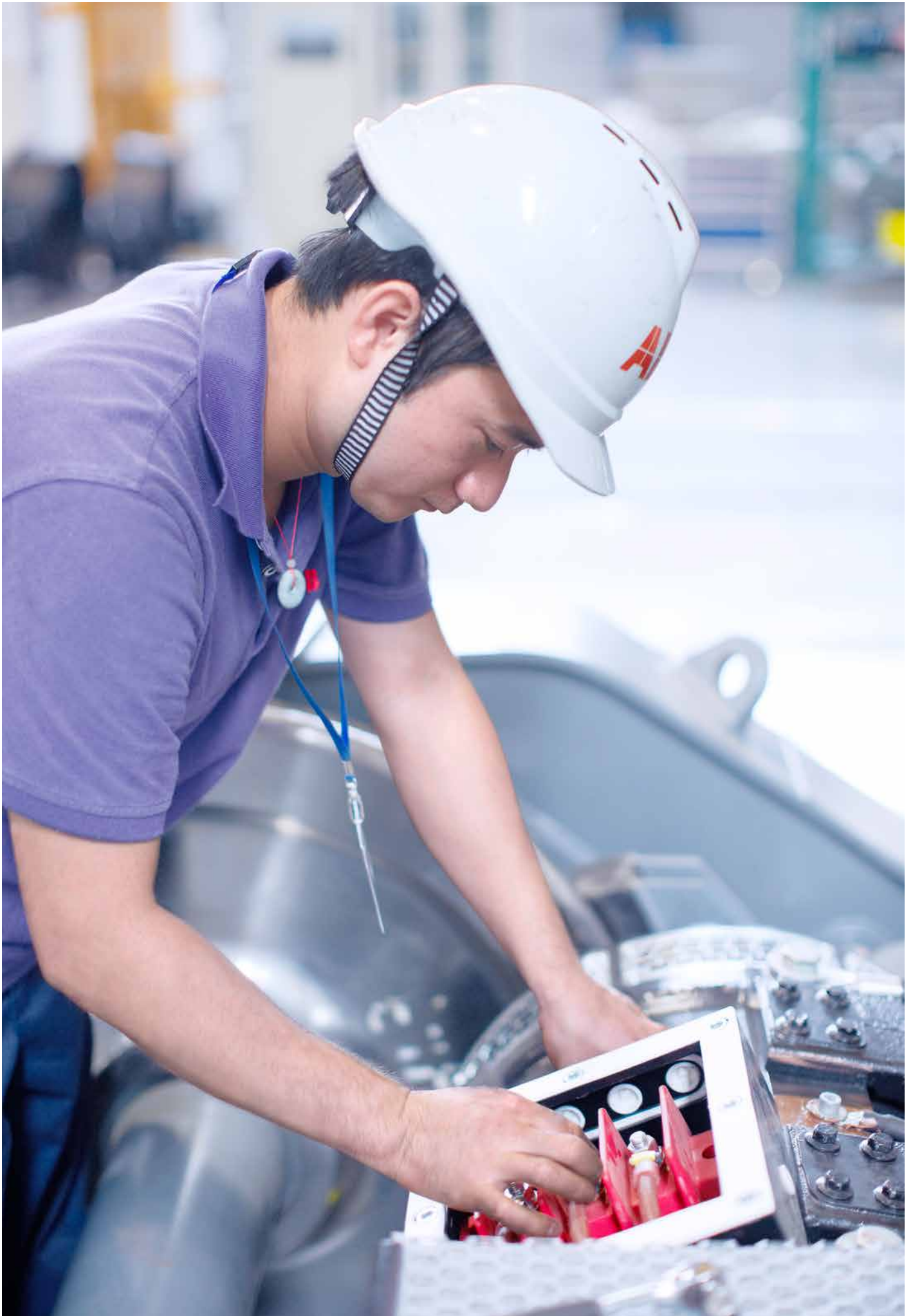
1. Shield and house of nodular iron or frameless
2. Strong supporting structure for the stator and rotor
3. High-tension steel and hybrid bearings (optional)
4. Closed self-ventilation, open self-ventilation, open forced ventilation, water cooling
5. High-alloy shaft
6. Axle hung, partly suspended drives, fully suspended drives



Stator

7. VPI insulation, silicone-based resin – low absorption of water
8. Corona resistant strand/part insulation
9. Extra protection of coil ends against abrasive wear and moisture
10. Form or random winding

Rotors are available in cast aluminum or copper



50,000 traction motors from ABB are in operation worldwide. From trams in crowded cities to locomotives crossing continents, ABB traction motors keep the wheels turning in railway rolling stock. All over the world.

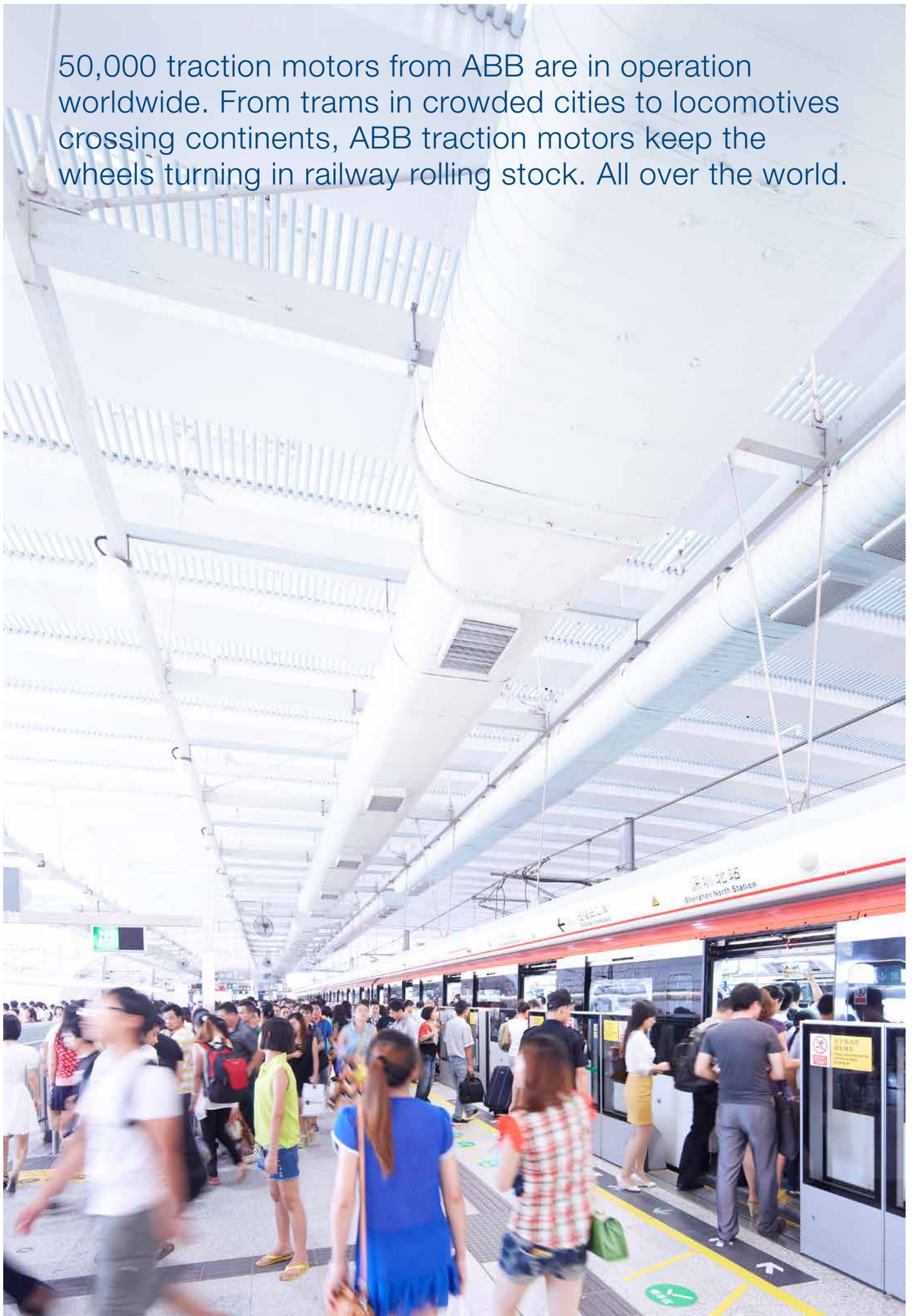


ABB traction motors are everywhere

ABB motors are aimed at trouble-free operation over the entire product life cycle. Our motors are designed to allow quick and easy maintenance so that maintenance costs and downtime can be minimized.

We provide customer support through our manufacturing centers and local offices. ABB is present in more than 100 countries so that although the support is global it also has the benefits of being local. Customer support is provided from the initial concept through to the operation and maintenance stages.

Our network of service workshops provides global coverage. The service organization has broad experience of motors and their applications, and can thus provide improved operational availability and life cycle profitability for customers.

Based on information and experience relating to maintenance schedules and costs, ABB uses life cycle management models to plan effective preventive maintenance procedures. This assists users in reducing total life cycle costs.

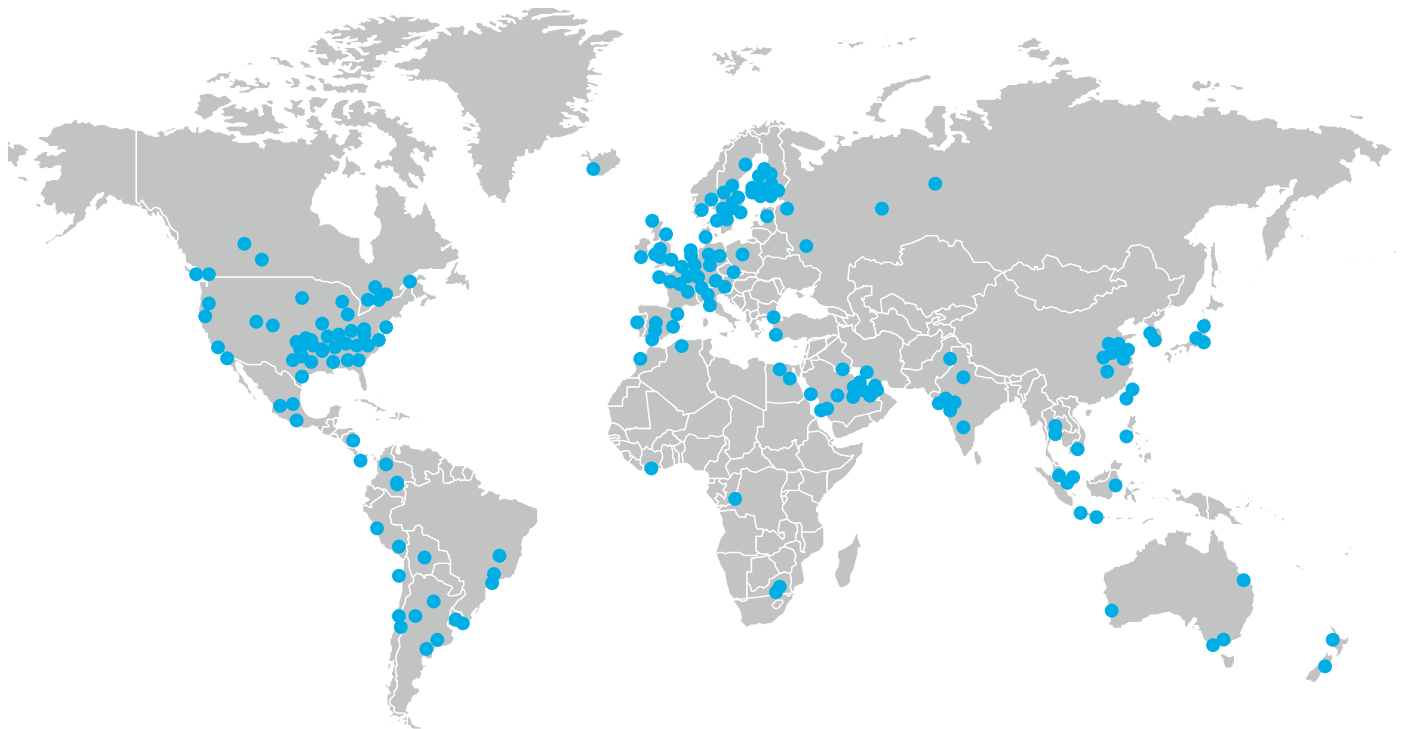


ABB Motors and Generators

Employees	More than 15,000
Presence	More than 100 countries
Manufacturing	41 factories in 12 countries
Service	65 ABB service centers and 93 authorized service providers
Channels	6,500 ABB external channels
Stocks	1,600,000 products in 7 logistic centers

Contact us

www.abb.com/motors&generators
www.abb.com/railway

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