

## APPLICATION NOTE

# ABB traction motors

## Metro



Metros move millions of people around the world every day. Availability is vital and depends largely on the dependability of the traction motors. ABB's proven metro motors with robust aluminum rotors help train builders optimize reliability and cost.

### Balancing cost and reliability

The traction system is typically dimensioned to keep the vehicle operational for one day even with a broken converter, without delay in the timetable. It is also necessary to ensure cost efficiency. Group drive – car control or bogie control – using one converter to feed several traction motors, adds to a favorable price-performance ratio for a metro's traction system.

### Coping with different wheel diameters

In case of wheel diameter differences on axles connected in parallel, the motors will operate under different loads, as their torque is related to the wheel diameter. Long-term cost-efficiency depends on the traction system's ability to cope with different wheel diameters. The better this capability, the longer the intervals for re-grinding due to uneven wear and thermal aging, thus reducing the vehicle's life-cycle cost.

### Jointless die-cast aluminum rotor

In an ABB metro motor, the rotor's resistance is adjusted to reduce the torque difference between axles, and to even out motor temperatures. ABB favors aluminum technology, since our die-cast rotor has a jointless and robust structure and is efficient enough for most purposes. Aluminum is also beneficial from cost and reliability perspective.

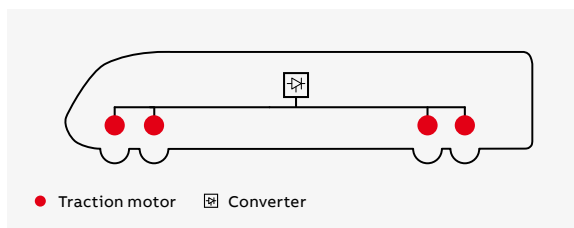
### Prepared for tomorrow's metro motors

In recent years, the price difference between converters and motors has been leveling out. There has been a rapid development of synchronous technologies, coinciding with ever-stricter demands for energy efficiency. These factors combined create opportunities to explore new propulsion concepts, for example synchronous or asynchronous motors used in single-axle control – introducing a step change in redundancy, slip control and energy efficiency.

# One size doesn't fit all.

## Group or single-axle drive?

Every metro is unique – and so should its motors be. Besides delivering tailored cost-effective traction motors with aluminum rotors, ABB is developing tomorrow's motor concepts, including single-axle drive and synchronous motor technologies.

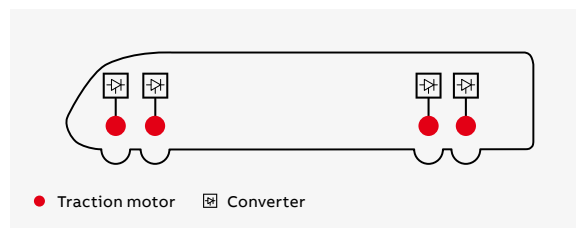


### Group drive

Group drive means that one converter feeds several motors, depending on whether car control or bogie control is used. This configuration keeps down the total cost of the vehicle and is the most common for metros around the world.

With group drive, the traction motors should be designed so that the rotor resistance allows the train to be operated with a specified wheel diameter difference. A high rotor resistance allows for a larger diameter difference, while a low rotor resistance provides higher efficiency.

ABB's favors die-cast aluminum rotors, allowing for larger wheel diameter differences – prolonging maintenance intervals and reducing costs. Aluminum rotors are also very robust. ABB's jointless aluminum rotors have proven reliable in thousands of metro motors worldwide.



### Group drive

Fueled by stricter energy efficiency demands, new traction drive solutions are beginning to be explored. One such example is single-axle control for metros, using induction, asynchronous or synchronous motor technologies.

With single-axle control, each converter feeds only one motor. Every axle is controlled individually, allowing for precise adhesive control. The solution also provides very high redundancy.

Using low-resistance copper rotors in the traction motors allows for more demanding mission cycles, while maintaining the vehicle's high energy efficiency. By utilizing advanced calculation tools, ABB is able to boost the energy efficiency of asynchronous technologies – while being at the R&D forefront for synchronous motors.

ABB offers customized traction motors based on pre-defined and proven technology platforms. We select technologies for e.g. rotors, suspension and cooling to cost-effectively tailor motors according to customer specification.



### ABB metro motors

Our metro motor platform focuses around our aluminum rotor. Die-cast, it is jointless and cost optimized, without the need to braze rotor bars and short-circuit rings. We also offer copper rotor solutions and synchronous technologies.