

## HIGH SPEED APPLICATIONS OF LINEAR MOTORS

In the magnet high-speed train Transrapid wheels and rail are replaced by a contact-less

working electromagnetic float and drive system. The floating system is based on attractive forces of the electromagnet in the vehicle and on the ferro-magnetic reaction rails in the railway. Bearing magnets pull the vehicle from below to the railway, guide magnets keep it on its way. An electronic control system makes sure, that the vehicle always floats in the same distance to the railway. Transrapid motor is a long-stator linear motor. Stators with moving field windings are installed on both sides along the railway. Supplied three-phase current generates an electromagnetic moving field within windings. The bearing magnets, and so also the vehicle are pulled by this field. Long-stator linear motor is divided into several sections. The section, in which the vehicle is located, is switched on. Sections, that make high demands on thrust, motor power is increased as necessary. Drive integrated in the railway and cancelling of mechanical components make magnet high-speed vehicles technical easier and safer. Transrapid consists of two light weight constructed elements.

Capacity of the vehicles can be adjusted to certain requirements. Operating speed is between 300 and 500 km/h. A linear alternator supplies floating vehicle with required power. Advantages of magnet highspeed train are effective in all speed areas. After driving only 5 km Transrapid reaches a speed of 300 km/h in contrast to modern trains needing at least a distance of 30 km. Comfort is not interfered

with jolts and vibrations. Since vehicle surrounds the railway Transrapid is absolutely safe from derailment. Magnet high-speed train makes less noise than conventional railway systems because there is no rolling noise. Also energy consumption is reduced compared with modern trains. This high-speed system is tested in continues operation at a testing plant in Emsland in Germany and some commercial routes in Germany are planned. A high-speed train route is currently under construction in Shanghai, China, further projects are either in progress or under review.



Fig. 256: high speed vehicle *Transrapid 08*, testing site Emsland, Germany (source: Thyssen)

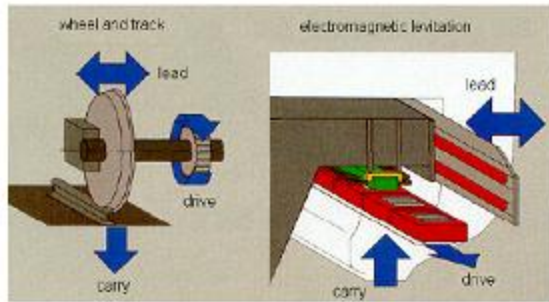


Fig. 257: basics of magnetic levitation (1)

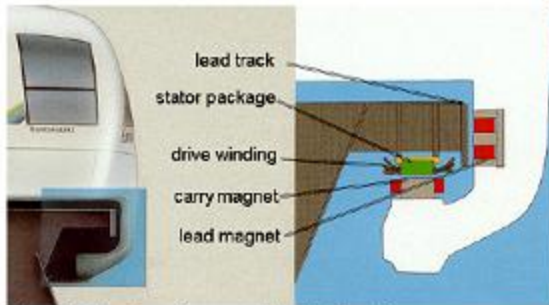


Fig. 258: basics of magnetic levitation (2)

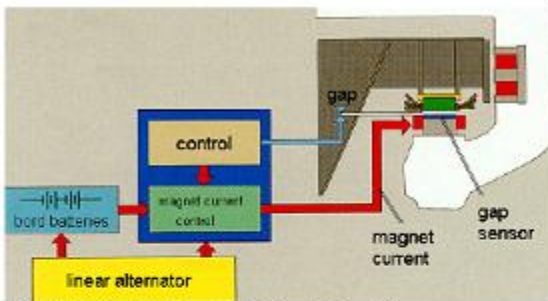


Fig. 259: basics of magnetic levitation (3)

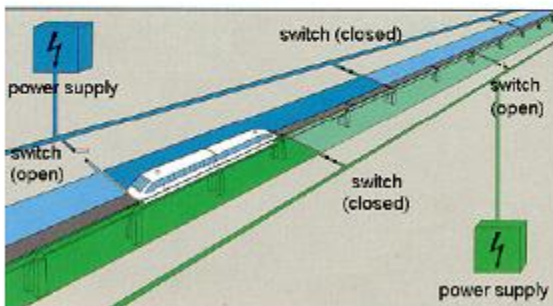


Fig. 260: track system