

Development of Gauge-Changeable EMUs

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Gauge-changeable EMUs (Electrical Motive Units. Fig. 1), which have been developed for through-operation between Shinkansen (1,435-mm gauge) and narrow-gauge (1,067-mm gauge) lines, are equipped with gauge-changeable trucks that feature the following.

- (1) Capability to change the gauge while running
- (2) Installation of traction motors
- (3) Stability of high-speed operation
- (4) Excellent performance for negotiating sharp-curves

There are two types of gauge-changeable trucks (type A and type B), both having a common gauge-changing unit (Fig. 2). The three-car test train is equipped with those two types of gauge-changeable trucks.

Each wheel of the truck type A (Fig. 3) rotates independently of other wheels. The truck is mounted with traction motors that are solid with wheels. The wheel unit of the outer-ring rotating type can slide along the non-rotating axle in the lateral direction. To fix the selected gauge, a dowel on the wheel unit engages with a hole on the axle box to be set in position and is locked by the carbody weight. During gauge changing operation, the carbody is suspended at the lower part of the axle box; the wheel unit drops due to its own weight in the axle box to unlock the dowel from the engagement hole; and wheels are guided along the guide rails on the ground to the other gauge section (Fig. 4). Since the truck type A does not have the self-steering function, it is based on a bogie-angle-linked steering mechanism.

The truck type B has an axle-wheel solid structure and uses the parallel Cardan driving system. The wheel units on the left and right sides can slide along the axle in the lateral direction and rotate together with the axle with which the wheel units are coupled with splines. To fix the selected gauge, a slide stopper engages in position with the groove cut on the axle box and axle arm, and is locked by the carbody weight. During gauge-changing operation, the carbody is suspended at the lower part of the axle arm; the slide stopper is lifted by an arm on the ground; and wheels are guided along the guide rails on the ground to the other gauge section (Fig. 6).

The gauge-changeable EMUs, which were subjected to gauge-changing tests and a high-speed endurance test for about



600,000 km on the standard gauge line at the Transportation Technology Center (Pueblo, Colorado, US), are now tested on a narrow-gauge line in Japan to check the performance for negotiating sharp-curves.

The gauge-changeable EMUs have been developed under a contract with the Japan Railway Construction Corporation.



Figure 1. Gauge-changeable EMUs.



Figure 2. Gauge-changing device.



Figure 3. Gauge-changeable truck (type A).



Figure 5. Gauge-changeable truck (type B).

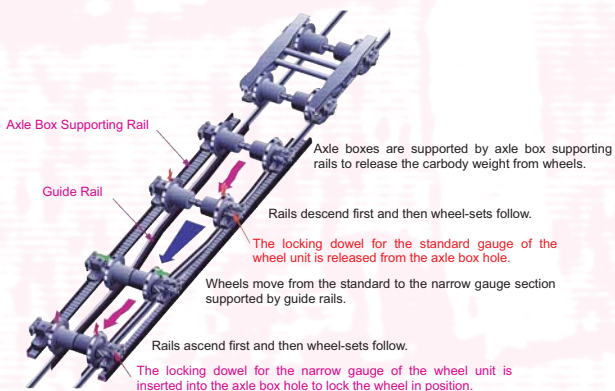


Figure 4. Gauge-changing operation (truck type A).

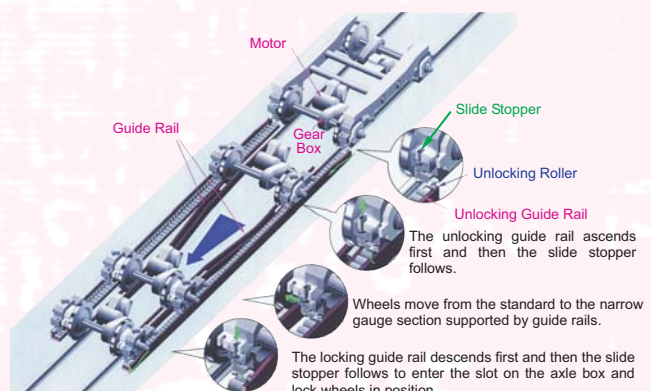


Figure 6. Gauge-changing operation (truck type B).