

RTRI Develops a Dynamic Gauge and Twist Measurement Device TRACK²er

RTRI Developed a dynamic gauge and twist measurement device TRACK²er. This device is capable of measuring track displacement caused by passing trains. Since this device can be mounted on a maintenance vehicle instead of using a track inspection car, it is possible to measure track displacement more easily, with lower cost.

【Background】

If track geometry is distorted, running safety and ride comfort of trains will be affected. Railway operators measure track irregularity (consisting of 5 items: longitudinal level irregularity; alignment; gauge; cross level; twist) and use the data in repair work and in maintaining adequate track conditions. Track irregularity includes “static irregularity” which occurs without train load and “dynamic irregularity” caused by the load of passing trains. Railway operators monitor and manage either of the irregularities. It is more effective, in terms of derailment prevention, to manage dynamic gauge and twist.

Dynamic track irregularity is mainly measured by a specialized track inspection car equipped with measuring devices. However, this method requires a specialized vehicle and a lot of careful preparation work to measure a number of tracks including service tracks.

【Features of TRACK²er】

- Since TRACK²er is a small-sized device (940×220×270 mm) and can be mounted on maintenance vehicles and commercial trains (Fig. 1), it is capable of measuring dynamic gauge and twist during maintenance work and commercial operation and makes the planning of measurement easier.
- Rail positions are measured by a 2-dimensional laser sensor. The tilt of the sensor toward the track is adjusted by an angle sensor (Fig. 2). The measurement error margin is 0.5 mm for gauge and 1.0 mm for twist, which means the same level accuracy as that of the measurement by a track inspection car.
- The measurement data is shown in tabular format. (Fig. 3 right) The points exceeding the preset standard value for replacement, repair and other maintenance necessities are shown in red color and oversights can be prevented.
- Rail profiles are shown as figures. (Fig. 3 left) The figure indicates measurement points on the rail used to calculate track displacement. In case an outlier is detected, it is possible to distinguish whether it is due to a measurement error or to track irregularities.
- The cost of TRACK²er is about one tenth of the previous on-board device developed by RTRI and this device can be mounted on or dismounted from a vehicle in an hour.
- By adding an optional remote controlling function, measuring with this device can be started and stopped from personal computers at the office.

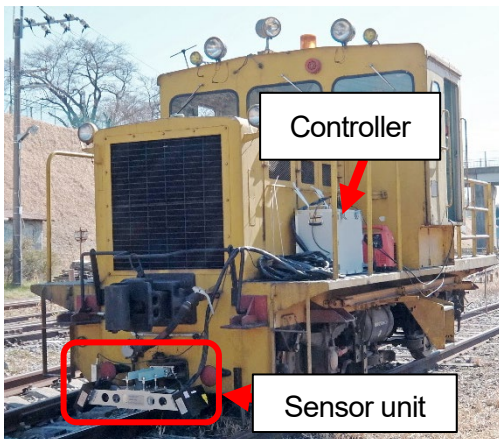


Fig. 1 TRACK²er mounted on a maintenance vehicle

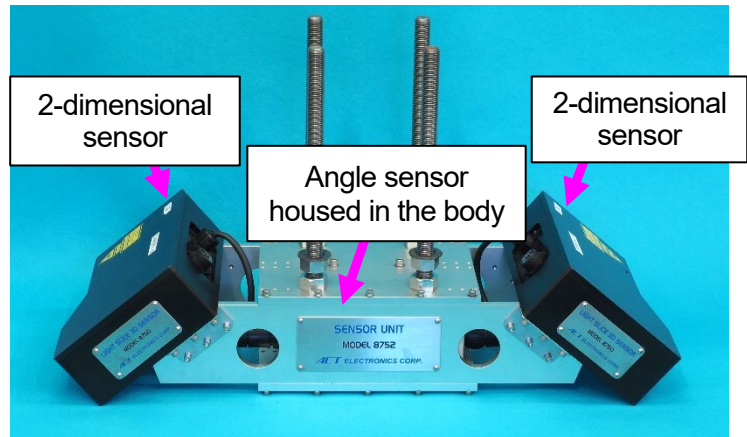


Fig. 2 Sensor unit

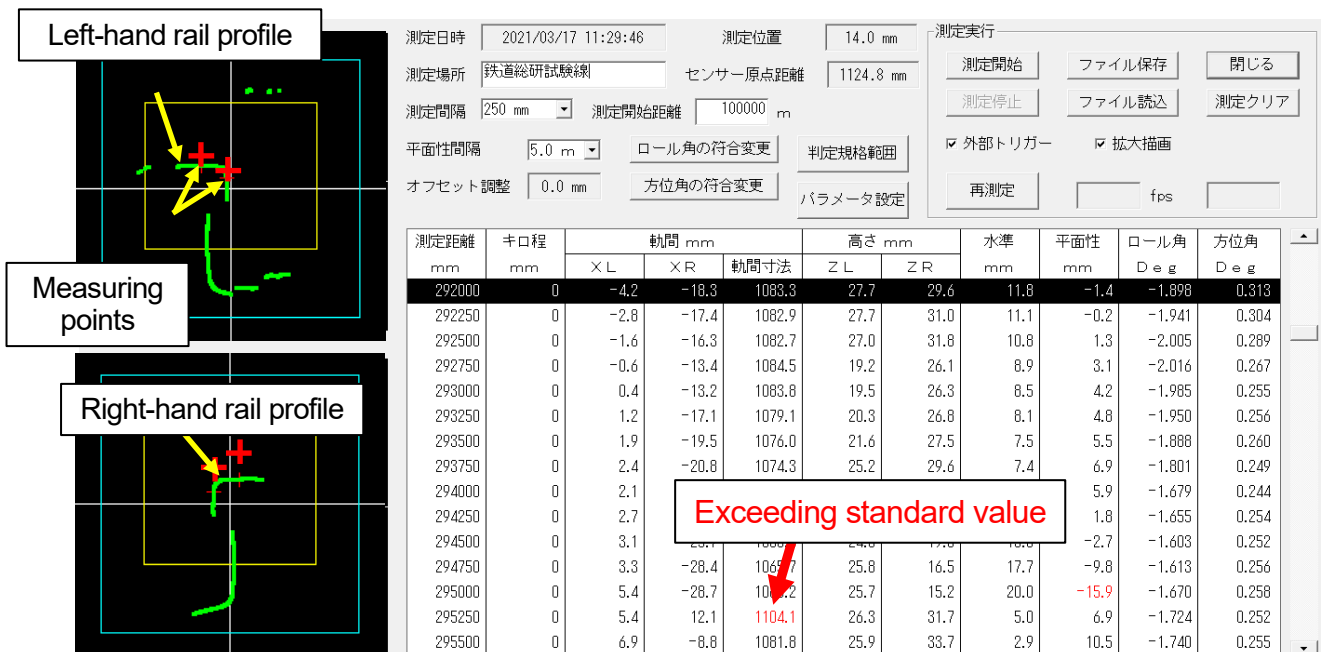


Fig. 3 Display of results

【Improving running safety】

TRACK²er enables dynamic measurement of gauge and twist without using conventional track inspection cars and contributes to improving running safety of trains.

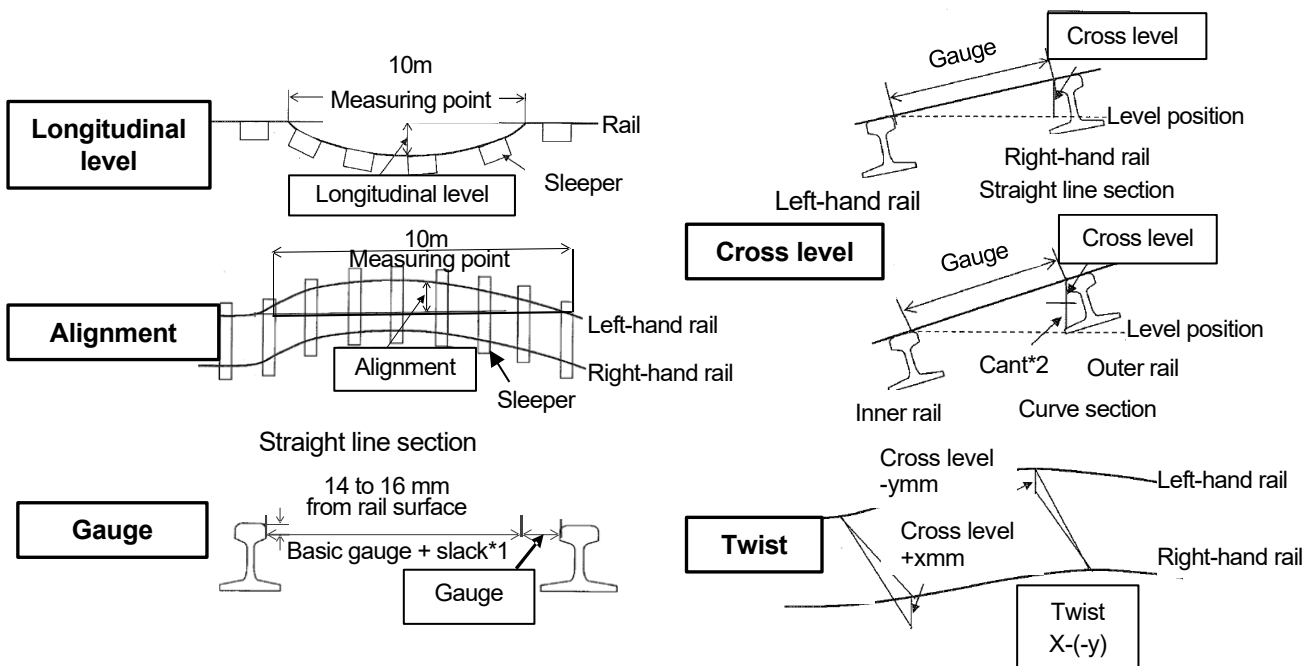
TRACK²er is a registered trademark of the Railway Technical Research Institute (registered trademark number 6442444).

[Reference]

Track irregularity:

Displacement and deformation of each part of railway tracks caused by repeated train passing and natural phenomena. Track irregularity includes following 5 factors.

| | Items | Description | Item for TRACK ² er measurement |
|--------------------|--------------------|--|--|
| Track irregularity | Longitudinal level | Vertical displacement of rails indicated by distance between top surface of rail and 10-meter line strained on the top surface. The distance is measured at the center of the line. | |
| | Alignment | Horizontal displacement of rails indicated by distance between inner side of rail and 10-meter line strained on the inner side. The distance is measured at the center of the line. For curves, design values depending on curvature radius are subtracted from the measured distance. | |
| | Gauge | Values obtained by subtracting rail-distance design value from distance between rail inner sides. | ✓ |
| | Cross level | Height difference between both rails. When cant is designated for curves, the cant is subtracted. | Measured to calculate Twist |
| | Twist | Level difference between both rails measured at two longitudinally distant points. The difference indicates distortion of track plane. | ✓ |



*1 Slack: Gauge allowance designed to enable trains to pass curve sections smoothly

*2 Cant : Height difference between outer and inner rail in curve sections designed to enable trains to pass curve sections smoothly