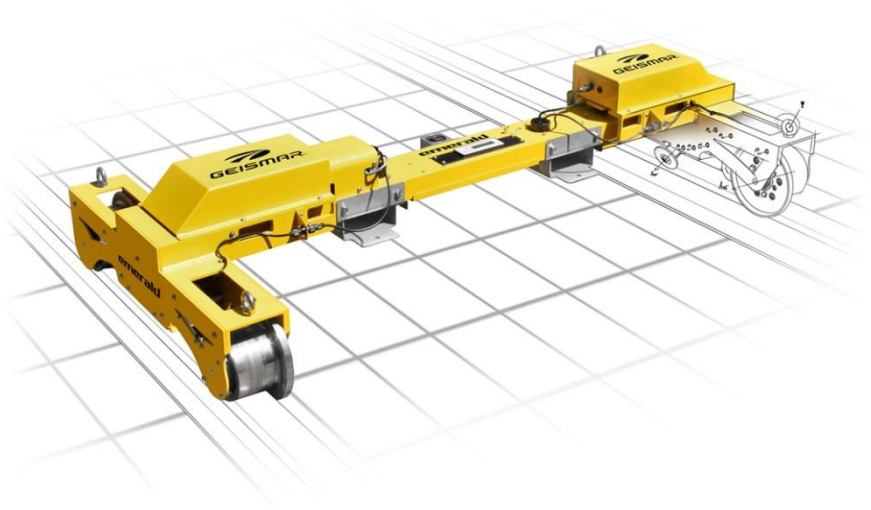
TOWED TRACK RECORDING UNIT

Model **EMERALD**

(article number N07552)



The ***Towed Track Recording Unit model EMERALD*** is designed to measure track gauge, cross-level, twist and horizontal alignment while being towed behind a road/rail vehicle at speeds up to 20 kph (dependant on the conditions of the track).

The Emerald Unit is characterized by its ease of use and is controlled by an Android based tablet computer which includes a GPS function enabling the collected data to be linked to a physical location.

1. DESCRIPTION AND OPERATION

The Emerald Towed Track Recording Unit consists of the following elements:

- Two longitudinal aluminium skate assemblies which support the stainless-steel running wheels and rail contact discs;
- A single piece aluminium transversal centre beam houses the inclinometer for cross-level measurement, two linear potentiometers for measurements of track gauge, external antenna connection, a display, the embedded electronics, and a spring mechanism to keep the Emerald in contact with both rails.
- The right-side assembly can move laterally, independent of the main centre beam. It houses the electromagnetic brake and provides a protective cover to the automatic actuator used for retracting the skate.
- The left-side assembly is fixed to the main centre beam and houses the rotary encoder and the battery pack which provides power to the Emerald electronics;
- The centre beam contains fork-lift pockets to assist lifting of the Emerald product. Without mechanical assistance the Emerald should NOT be manually lifted by less than 3 persons;

- One tablet computer system for data acquisition and display to be positioned in the vehicle cab.

Even though the Emerald is constructed using aluminium, each wheel is electrically isolated from the rest of the instrument and other wheels ensuring the Emerald will not trigger track circuits and will not short-circuit insulated rail joints.

The frame can be remotely retracted (using the tablet) and set to a known back-to-back wheel position to aid navigating some of the larger switches found on railways.

The Emerald Towed Track Recording Unit enables the operator to collect the following parameters:

- Track gauge;
- Cross-level;
- Twist;
- Warp;
- Left & right alignment (Horizontal versine);
- Overlapping Versine;
- Speed;
- Acceleration;
- Travelled distance;
- GPS*.

The equipment simultaneously calculates twist and overlapping versine on two different bases.

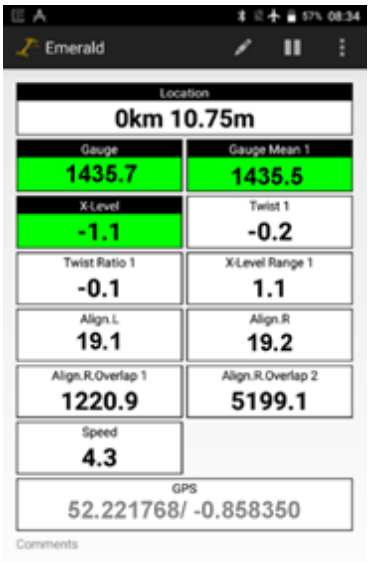


Image for guidance only

The data is processed in real time and the measurement values from the Emerald are displayed on a rugged tablet which has a clear large display for easy reading. This tablet has been chosen to make the Emerald a powerful measurement system implementing the latest technologies:

- The tablet is IP67 rated, includes a 7”, 1,280 x 720 touch screen and runs under the Android operating system;
- The tablet screen is easy to view in any weather thanks to its TFT high brightness technology;
- The tablet is GPS enabled, providing GPS co-ordinates of the systems location and any defect’s. A small icon indicates a valid GPS fix and when collecting data the current GPS co-ordinates are displayed on the screen. *The GPS receiver is in the tablet, not on the Emerald trolley, therefore the distance between the driver’s location in the towing vehicle and the Emerald trolley must be considered when referring to the GPS data. If the tablet is unable to get a GPS fix then the software shows the message “No Fix”.
- A wireless Bluetooth link connects the trolley and the tablet;
- The Emerald Bluetooth antenna has a magnetic base with 3-meter cable (optionally 6 meters which enables the antenna to be located in the optimum position on the towing vehicle);
- Data is saved on internal memory or SD memory cards for an easy transfer of data through a mainstream PC;

Data transfer is a simple and straightforward process. The operator connects the tablet to a PC via the USB cable or docking station (optional), ‘drag and drop’ data from the tablet to the PC.

Further analysis of the measurements file can be done through the Geismar Display and Analysis Software (DAS) or MS Excel® (or equivalent). A separate file is also created which contains only those points where one (or more) measurements are out of tolerance, the out-of-tolerance measurements being displayed in colour. The GPS location of any exceedance is recorded in the exceedance file as a web-link, if connected to the internet then clicking on the co-ordinate displays the location of the defect in GoogleMaps.

Real-time audible and visual alerts indicate to the operator that one (or more) measurements exceed a tolerance threshold, three levels of exceedance are available for tolerance thresholds. Other alarms and alerts, such as the skate retraction and loss of communication with the Emerald trolley are enunciated using 'voice alerts'.

The Emerald is powered by two internal rechargeable batteries.

A wooden shipping crate is supplied for shipment of the Emerald.

2. TECHNICAL DATA

2.1. Emerald trolley

- Track gauge: ..... 1,435 mm (*others on request*)
- Number of stainless-steel wheels: 4
- Battery (x2):..... 7,000 mA.h
- Autonomy:..... 8 hours
- Units:..... metric or imperial (*at operator's choice*)
- Emerald program languages: ..... English, French, Spanish, Italian, German (*others by request*)
- Operating temperature:..... From -5°C to +60°C
- Dimensions with skate fully released (*1,435 mm track gauge*):
  - Length (*skate retracted*): ..... 1,627 mm
  - Length (*skate extended*): ..... 1,714 mm
  - Width: ..... 750 mm
  - Height:..... 321 mm
  - Chord:..... 630 mm
- Mass (*1,435 mm gauge*): ..... 63.5 kg (*excluding tablet*)

2.2. Tablet

- Operating system: ..... Android
- Processor:..... Intel Atom

- Capacitive touch screen: ..... 7 inches (*virtual keyboard*)
- Screen resolution: ..... 1,280 x 720 pixels
- Internal memory: ..... 32 Gb
- Measuring points memory capacity: ..... Approximately 4,000 km/GByte (*at 8 samples/m*)
- RAM ..... 2 GByte
- Memory Expansion: ..... MicroSD (*not supplied*)
- Battery ..... 8,400 mAh
- Connexion: ..... WiFi, Bluetooth
- Operating temperature: ..... From -20°C to +55°C
- Storage temperature: ..... From -40°C to +70°C
- Environmental:
  - Protection rate: IP67
  - Military standard: 810-G
  - Fall test: ..... 6 feet
- Dimensions:
  - Depth: ..... 142 mm
  - Width: ..... 218 mm
  - Height: ..... 27 mm
- Mass: ..... 780 g

2.3. Measurements

2.3.1. Metric

Parameters	Measuring range (mm)	Repeatability (mm) σ	Resolution (mm)
Track gauge	-20/+50	± 1.0	± 0.1
Average gauge[1]	-20/+50		± 0.1
Gauge change[2, 7]	-20/+50		± 0.1
Cross level (0-10 kph)[5]	-200/+200	± 1.5	± 0.1
Cross level (0-15 kph)[5]		± 2.8	
Cross level (0-20 kph)[5]		± 5.0	
Twist/warp (0-10 kph)[3, 4, 7]	0-100	± 2.0	± 0.1
Twist/warp (0-15 kph)[3, 4, 7]		± 4.0	
Twist/warp (0-20 kph)[3, 4, 7]		± 7.0	
Horizontal alignment (versine)[8]	-15.5/+5.5	± 1.0	± 0.1
Distance	Limited only by internal memory	< 5 mm/m	10 mm
Speed[6, 9]	0-20 kph		

1 – Average Gauge is measured over a user definable distance from 1 to 150 m in steps of 1 m.
2 – Gauge Change (Rate of change of gauge) is measured over a user definable base from 1.0 to 25.0 m in steps of 0.1 m
3 – Twist is measured over a user definable twist base from 1.0 to 25.0 m in steps of 0.1 m
4 – Twist can be recorded as mm or mm/m
5 – Cross-level accuracy depended on condition of track, specification assumes jointed track
6 – Speed is derived from the time between samples resolution and accuracy is dependent upon the sample size
7 – Two independent bases can be defined for Gauge Change, Twist and Warp
8 – Specified over the trolley chord length
9 – Maximum speed is also impacted by the chosen sample rate, maximum speed of 20 kph is only supported at samples rates > 100 mm

2.3.2. Imperial

Parameters	Measuring range (inches)	Repeatability (inches) σ	Resolution (inches)
Track gauge	-0.8/+2.0	± 0.04	± 0.01
Average gauge(1)	-0.8/+2.0		± 0.01
Gauge change(2, 7)	-0.8/+2.0		± 0.01
Cross level (0-10 kph)(5)	-8.0/+8.0	± 0.06	± 0.01
Cross level (0-15 kph)(5)		± 0.1	
Cross level (0-20 kph)(5)		± 0.2	
Twist/warp (0-10 kph)(3, 4, 7)	0-4.0	± 0.08	± 0.01
Twist/warp (0-15 kph)(3, 4, 7)		± 0.15	
Twist/warp (0-20 kph)(3, 4, 7)		± 0.27	
Horizontal alignment (versine)(8)	-0.6/+0.2	± 0.04	± 0.01
Distance	Limited only by internal memory	< 0.2''/yard	0.4''
Speed(6, 9)	0-20 kph		

1 – Average Gauge is measured over a user definable distance from 3.28 to 492 ft in steps of 1 ft
2 – Gauge Change (Rate of change of gauge) is measured over a user definable base from 3.28 to 82 ft
3 – Twist is measured over a user definable twist base from 3.28 to 80.021 ft
4 – Twist can be recorded as inches or inches/ft
5 – Cross-level accuracy depended on condition of track, specification assumes jointed track
6 – Speed is derived from the time between samples resolution and accuracy is dependent upon the sample size
7 – Two independent bases can be defined for Gauge Change, Twist and Warp
8 – Specified over the trolley chord length
9 – Maximum speed is also impacted by the chosen sample rate, maximum speed of 20 kph is only supported at samples rates > 100 mm

The technical specification of the equipment of the present offer strictly conforms to the Commercial/Financial quotation. The technical characteristics, including the conformity to the standards mentioned, the components, dimensions and access diagrams would have, prior to starting of execution and manufacturing of the equipment, to be approved by the customer as ''conforming to the particular specification and various track loading gauge(s)'' of the network(s) on which the equipment to be delivered is to be operated.

All modifications and/or eventual technical alteration arising after the date of the offer could result to a review of the commercial offer.

We reserve the right to modify any equipment specification of the present offer to take into account the latest technical improvements and working conditions at the date of manufacturing.

In case of any discrepancy between our offer and the attached documentation, the technical specification of our offer should be taken into consideration. Photographs may include options.

Masses and dimensions may vary ± 5%.