MATISA
la passion du rail

Väylävirasto
Trafikledsverket

LA PASSION DU RAIL

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Teijo Saalasti

27.3.2024

RATEK 15 years

RAUTATIETEKNINEN OSAKEYHTIÖ
RATEK
EISENBAHNTECHNISCHE AKTIENGESELLSCHAFT

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AIHEET TÄNÄÄN

MATISA esittely

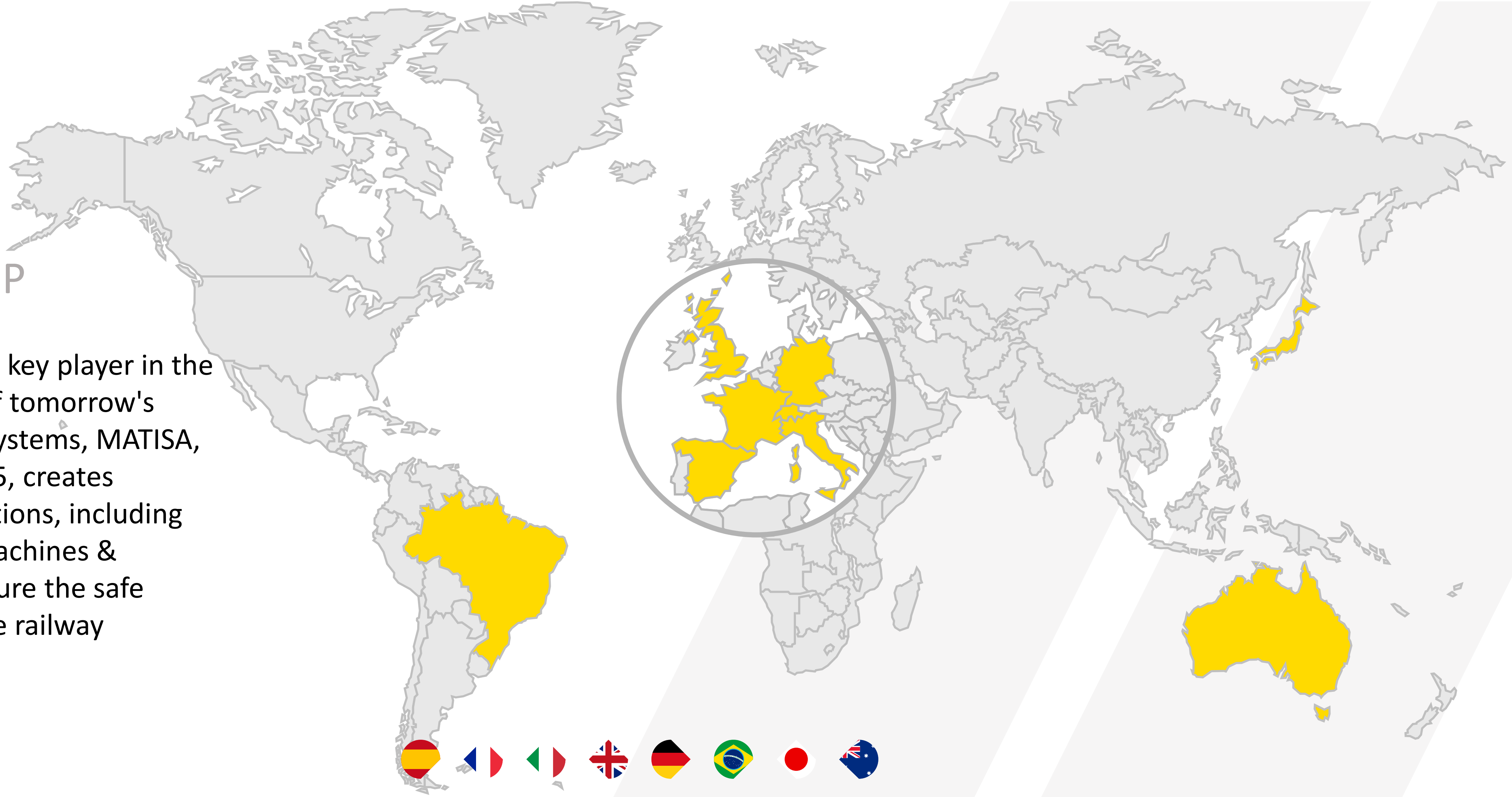
Tukikerroksen muotoilu ja skannaus

Inertiamittaus

MATISA.

THE GROUP

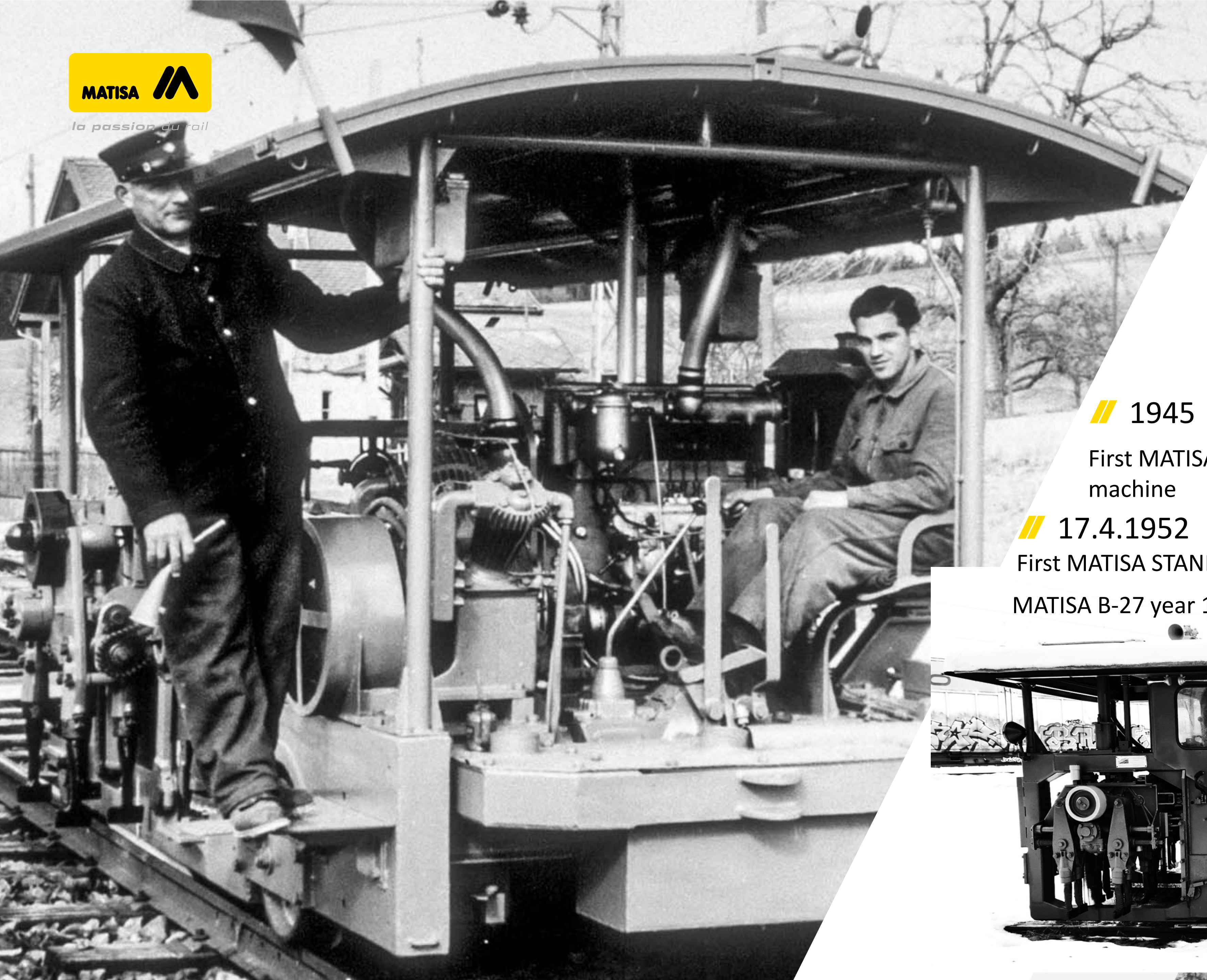
Recognized as a key player in the development of tomorrow's global railway systems, MATISA, founded in 1945, creates innovative solutions, including Swiss quality machines & services, to ensure the safe operation of the railway network.



GROUP HEADQUARTERS
IN CRISSIER, SWITZERLAND

8 SUBSIDIARIES, MULTIPLE AGENTS AND TECHNICIANS,
ALL FULLY TRAINED, IN OVER
22 COUNTRIES

550 EMPLOYEES WORLDWIDE



FOR almost 80 YEARS

AT THE SERVICE OF RAILWAYS

// 1945

First MATISA machine, the STANDARD tamping machine

// 17.4.1952

First MATISA STANDARD MACHINE in Finland

MATISA B-27 year 1958

MATISA.
SWITZERLAND

FACTORY

Ressources : approx. 300 employees

Area : 33’730 m² / Worshop 8’000 m²

OFFICES

Ressources : env. 180 employees

Area : 4’750 m² on 8 floors

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MATISA. INNOVATIVE MACHINE AND SERVICE SOLUTIONS

LAYING TRACKS

TRANSPORT WAGONS

TAMPING MACHINES

TRACK RENEWAL TRAINS

BALLAST CLEANERS

BALLAST REGULATORS

TRACK INSPECTION VEHICLES

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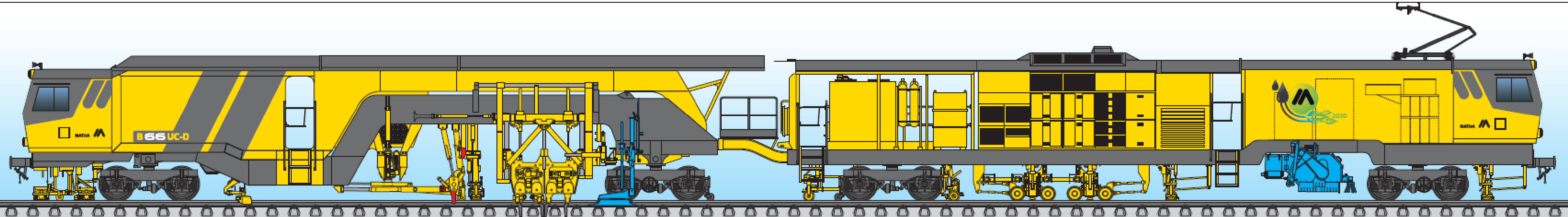
TAMPING MACHINES



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B 45 UE

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R 24

Agency Manager
Heavy rollingstock agency
Colas Rail

"Matisa R24 LGV Ballast Profiling Machine performs the profiling of LGV line regularly and its use gives complete satisfaction to us.
Its performance and quality fulfil our requirements perfectly ensuring the safety of workers."

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R 24 – HIGHLIGHTS

WE DELIVER SOLUTIONS – NOT ONLY MACHINES

First in Class Ballast regulator for High Speed lines (LGV)

- Bi-directional usage = less kilometers
- Maximization of volume of ballast handling by combining power engine and hydrostatic drive
- Highest ratio Ballast storage vs size of the machine. Improves flexibility and speed on working site.

- **SHORTER SHIFT TIME AND LESS DISTANCE COVERED TO PERFORM WORK = OPTIMIZED FLEET MANAGEMENT = LESS TIME AND LESS PERSONAL COSTS**
- **LESS OVERALL FUEL CONSUMPTION**

R 24 – HIGHLIGHTS

WE DELIVER SOLUTIONS – NOT ONLY MACHINES

First in Class Ballast regulator for High Speed lines

- Multiple brush concept ensures great output & quality for high-speed lines → Brushing speed of 5 km/h. (quicker shift, duration)
- Lifecycle of ploughs and brush box wear plates is 5 – 8 years
- Excellent visibility, lighting and embedded technology = increased working safety

- **LESS DOWN TIMES -> IMPROVES PRODUCTIVITY**
- **LESS SPARE PARTS NEEDED -> REDUCED COSTS**

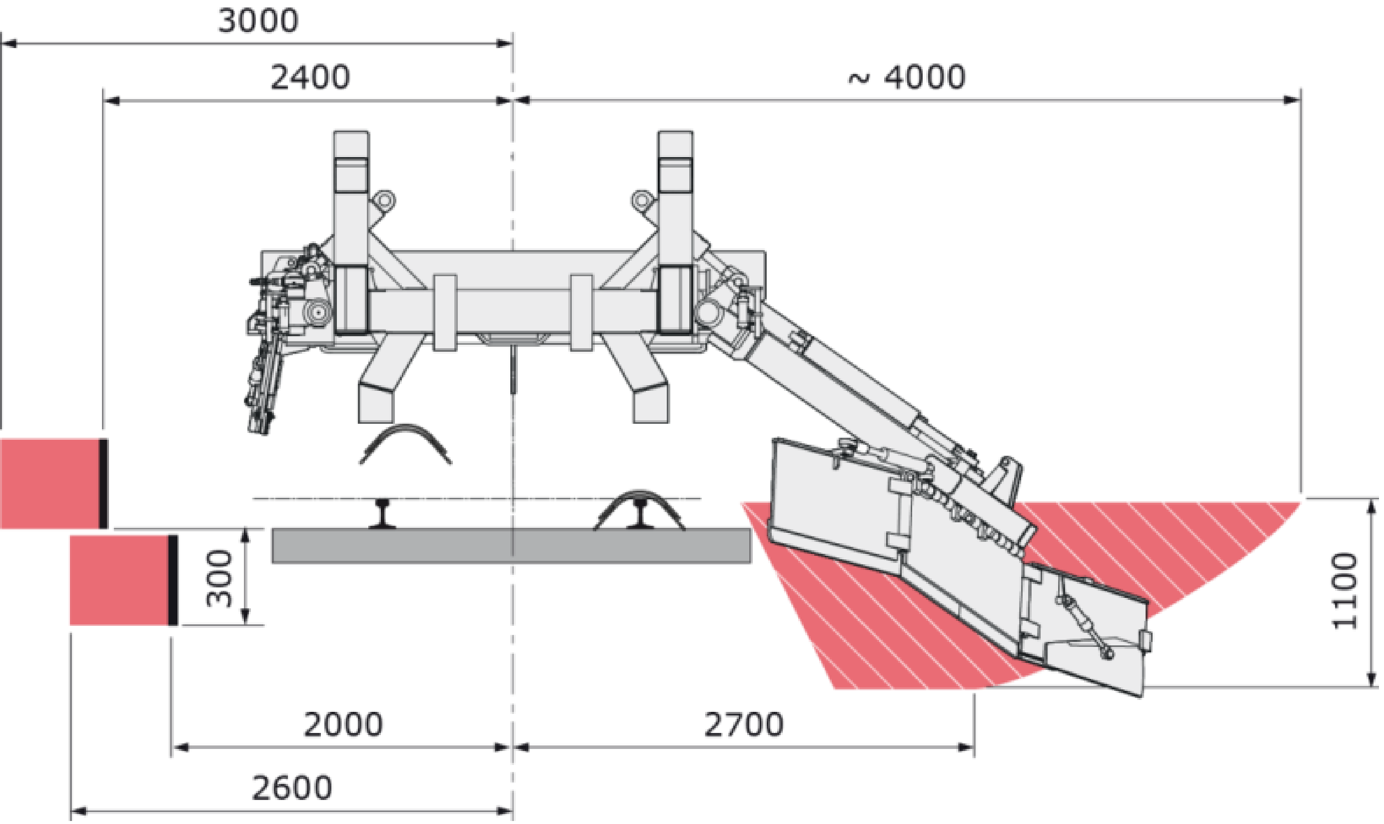
R 24 – COMPACT AND ROBUST

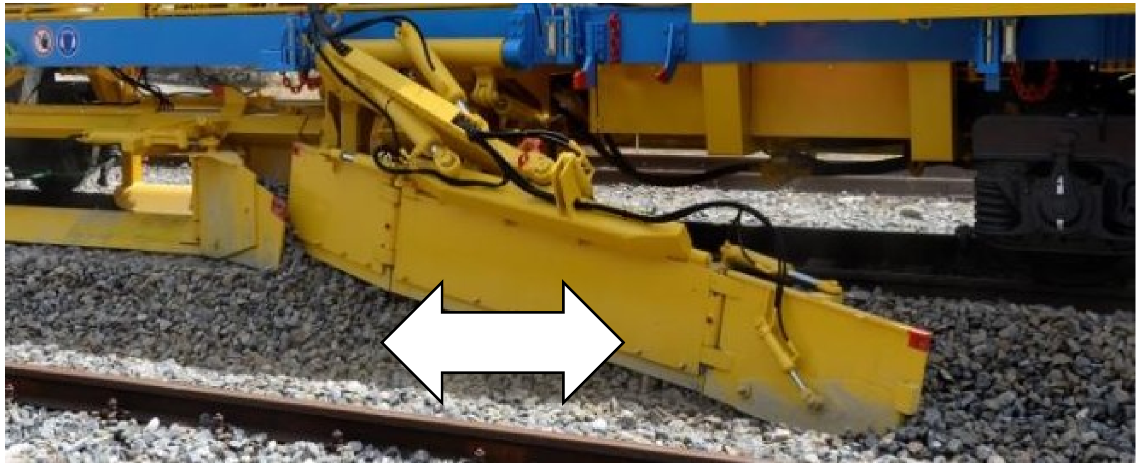
- Single cab & compact design
- Maximum working speed 15 km/h
- Brushing speed 4 km/h
- Hopper 12 m3
- 20 tons axle load
- 3 motorised axles
- Total mass 65 tons

R 24 – VERSATILITY – LATERAL PLOUGHS

REDUCED WORK SHIFT DURATION

Able to work on all different forms of ballast profiles and bi-directional





Track Ballast Scanner

Track Superstructure (Ratapenger)

The track superstructure consist of top ballast layer (Tukikerros) and sub-ballast or macadam layers (Välikerros, eristekerros).

Function of the track superstructure

During the building of the track, the track superstructure enables the laying of the sleepers and the track, and positioning of it them using a tamping machine.

During the use of the track it creates the track stability, distributes the vertical loads from the sleeper to the sub-layers and provides dynamic attenuation and damping of the vertical wheel loads.

It provides the longitudinal and lateral resistance of the track.

Other functions is eg. enabling the water penetration to the sub-layers of track.
Ballast layer plays also essential role in the maintenance of the track, as it enables the correction of track geometry, if it has changed due to the traffic loads or environmental conditions etc.

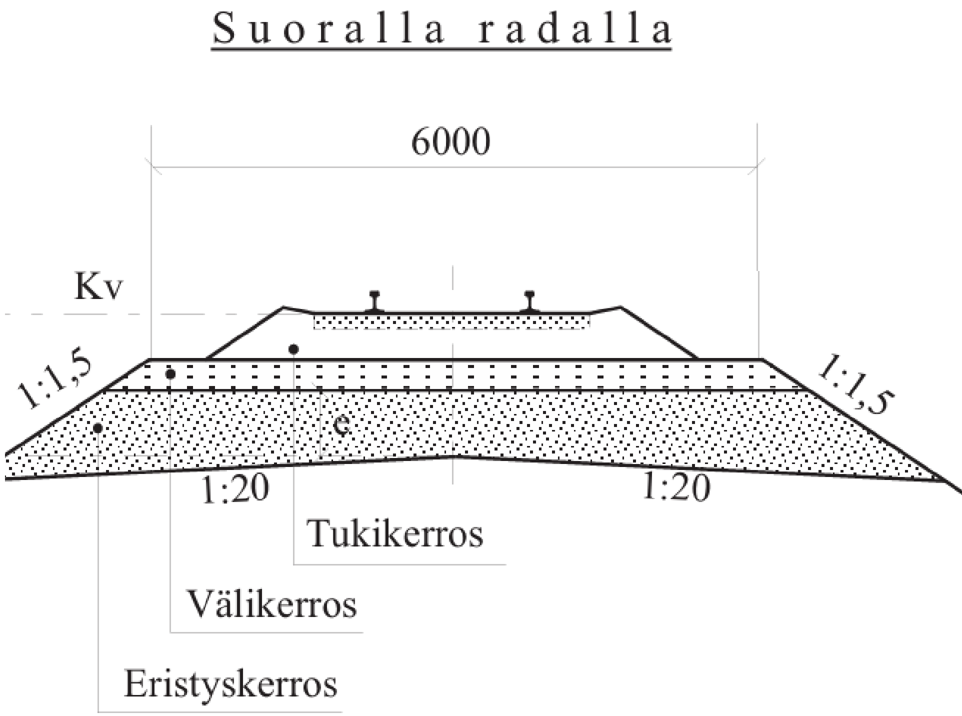
Possible consequences of inadequate ballast layer

Decreased track stability in lateral or longitudinal direction. In extreme cases it may cause catastrophic results such as track buckling.

Inadequate ballast also makes maintenance difficult as tamping cannot be done in a proper way.

Possible consequences of excess of ballast

Too high amount of ballast above the sleepers causes damages in the rolling stock due to the trains pressure wave causing the ballast to rise up and hitting on the undercarriage of the train.



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Track Ballast Scanner

Different methods to measure and record the amount and quality of ballast.

Measuring the geometry of the track

Measuring the geometry of the track gives information the amount or condition of the track superstructure. The most commonly used method but doesn’t give exact information of the ballast profile.

Ground penetrating radar.

Gives valuable information of the depth of the ballast and the condition of it, but not good for ballast profile measuring.

Lidar / Laser Scanning

Best system to measure the profile of the ballast layer but doesn’t give information of the quality of the ballast. The system commonly used in measuring cars.

How the ballast scanner can be used in ballast regulators?

Ballast regulating to prepare the track for tamping

Real-time display of the profile to help the operator prepare the track.
With a possible offset to anticipate corrections to be made.

The ballast Regulator works in front of Tamper

Scanning of the track, mainly to detect a lack of ballast, but also an excess. At this stage, it is already possible to compare the measured profile with a standard profile. The critical element to be identified by the measuring system is the lack of ballast between the boxes in the tamping zone. This makes tamping impossible in the event of a ballast shortage.

Finishing work by the Ballast Regulator after work done by the tamping machine

Scan of the track to demonstrate the quality of the final rendering.
(profile shape, boxes filled in, clean sleeper, compliance
with reinforced profile compared to standard profile).

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METEOR

MATISA EMBEDDED TECHN

The unique METEOR architecture integrates the latest digital applications that equip, with standard or optional, your machines.

9 innovative applications that provide
the operational benefits of control and predictivity and
position your machines
at the forefront of the latest software developments.

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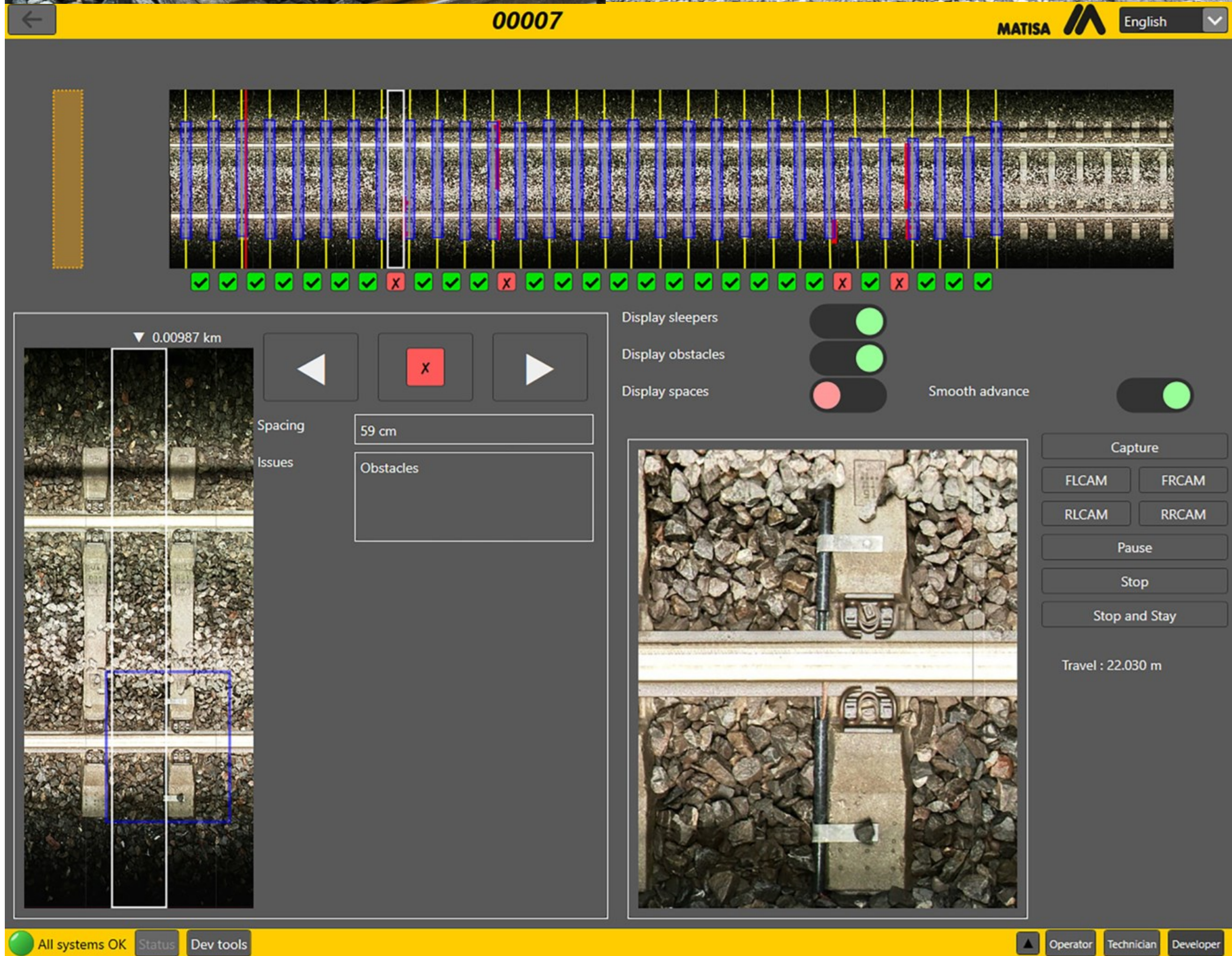
HATI

HUMAN ASSISTANCE TRACK INTELLIGENCE

HATI

- Detects and identifies obstacles based on an artificial intelligence algorithm
- Tools pre-positioning
- Preserves tools and infrastructure
- Confidence-building for the operator
- Anticipates track visualization
- Memorization and continuous optimization



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WHAT is
Inertial measurement?

- Inertial measurement Unit (IMU) is a device based on gyroscopes and accelerometers, sometimes magnetometers too, measuring the orientation of the body. Typical examples are in space technology,missiles, drones etc.
- In a gyroscope a spin which is mounted inside three gimbals (kardaaninen ripustus) so that the rotation of the body does not rotate the spin, which can then preserve its position thanks to its rotation energy and inertial principle. Typical examples are attitude indicator and direction indicators.
- Accelerometers are devices which detect and measure the acceleration based on the Newton’s law of motion F=ma
- Today electro-mechanical IMU’s are replaced by MEMS, micro-electromechanical systems and Fibre-optic gyroscopes FOG
- With an IMU it is possible to detect the position of the body without a GPS (dead reckoning; laskelmasuunnitstus)
- The disadvantage of dead reckoning is the accumulated drift of the IMU’s error

By Lucas Vieira - Oma teos, Public Domain, https://commons.wikimedia.org/w/index.php?curid=1247135

https://commons.wikimedia.org/wiki/File:Acelerometro_1.JPG#/media/File:Acelerometro_1.JPG

Gyroscope designed by Léon Foucault in 1852. Replica built by Dumoulin-Froment for the Exposition universelle in 1867. National Conservatory of Arts and Crafts museum, Paris.

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PALAS

THE AUTOMATED ABSOLUTE BASE

- Ensures track geometry as originally laid out, measures before and during work
- Covers the full range of track defect wavelengths
- Based on inertial measurement
- Combined with CATT, ensures foolproof correction of defects
- Easy to use, automatic process
- Compact and integrated solution
- Measures, guides and works in one pass

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MATS

MATISA TOTAL STATION

- Alternative to PALAS for measuring track geometry, measurements before and during work
- 2 modes of use: on-track trolley mounted or off-track equipment
- Input of track geometry, manually or via a file
- Easy to use like a laser surveyor
- Easy to use by machine operators
- Very small footprint

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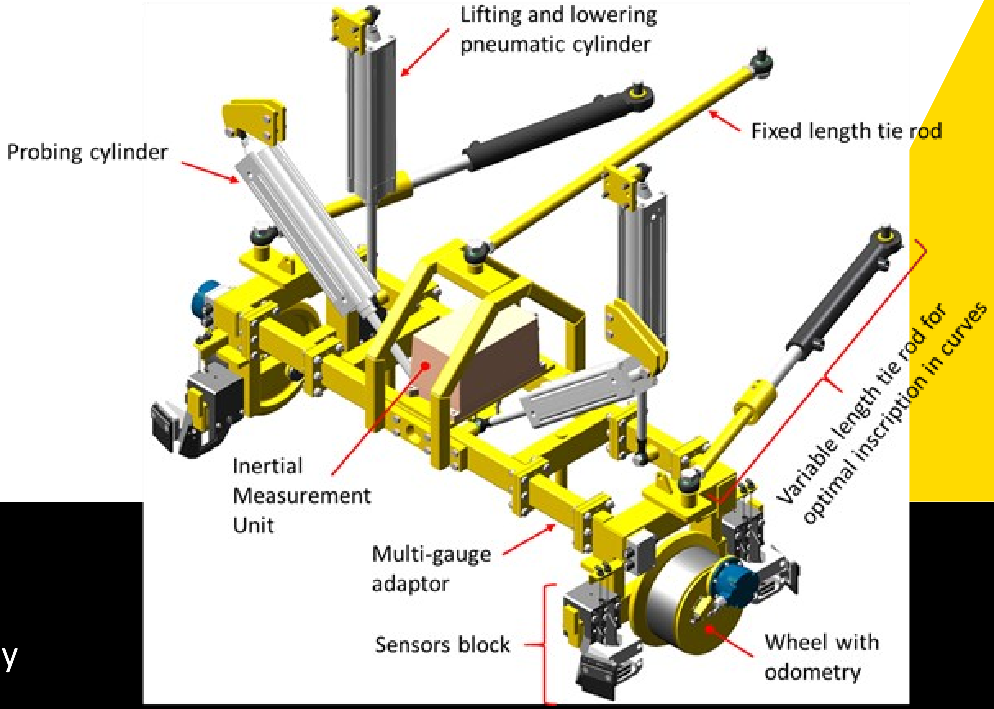
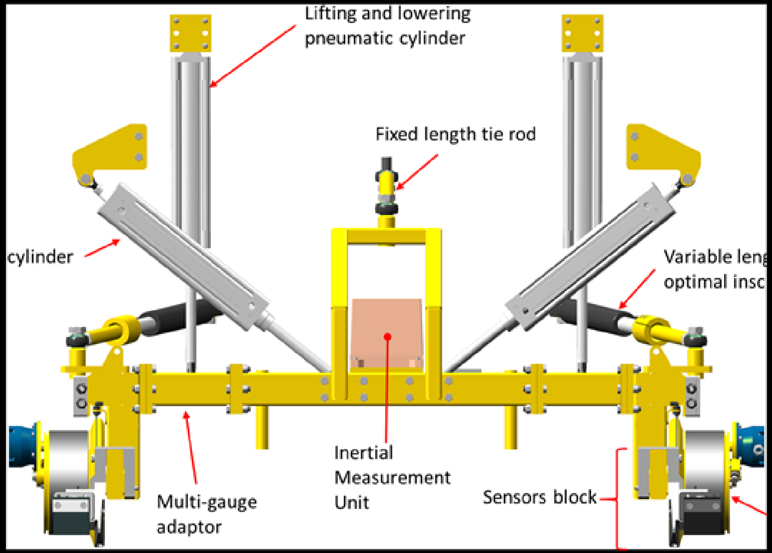
PEGAS
Inertial measuring trolley

- Fully compliant EN 13848
- The inertial measuring trolley is composed by a mechanical trolley which includes positioning sensors in relation to the rail.
- Tie rods are added to the trolley for the optimal inscription in small curvature radius.
- Inertial platform positioned on the center line of the track independently of the gauge
- 2 Integrated odometry sensors for wheel slip detection and curvature compensation.
- Pneumatic cylinder for lifting, lowering, and probing.
- Multi-gauge.





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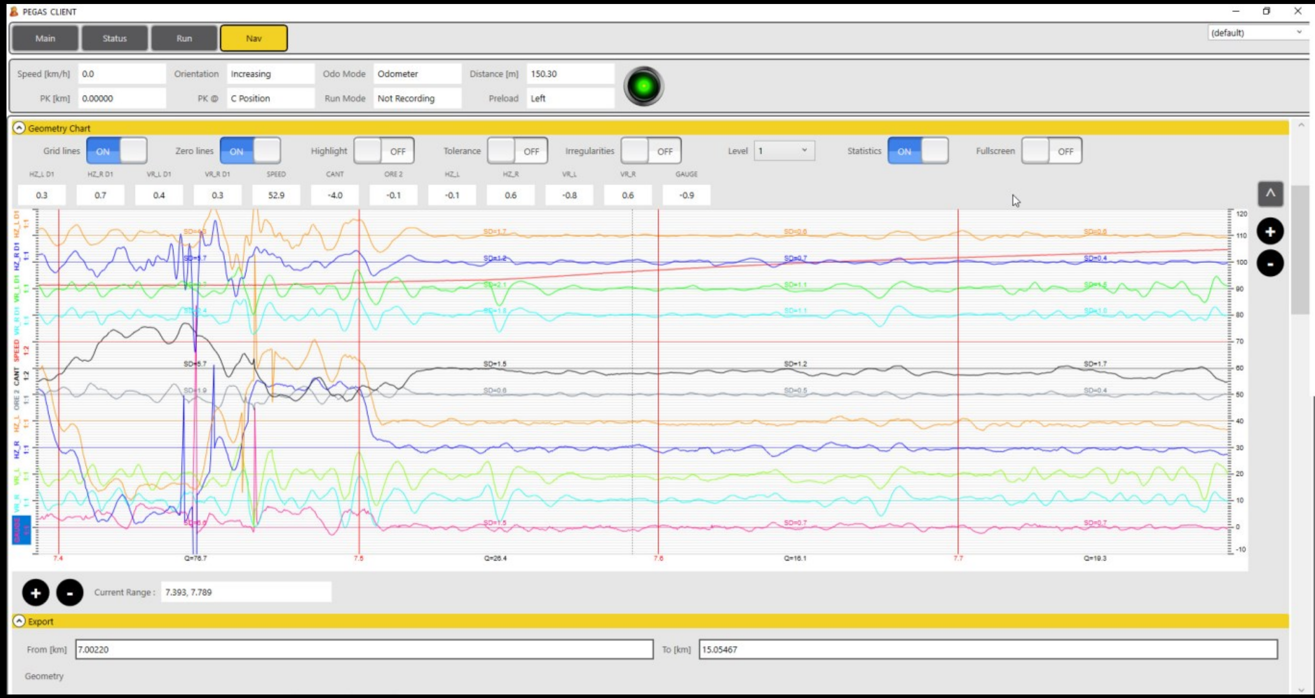
PEGAS

PRECISION ELECTRONIC GEOMETRY AQUISITION SYSTEM

- Reliable and accurate track geometry data after work
- Tolerances according to EN 13848-3
- Analyses according to European standards
- Customisation of tolerance zones
- Exportable data in different formats
- Simplification of the work rendering
- Possibility to customise the output report



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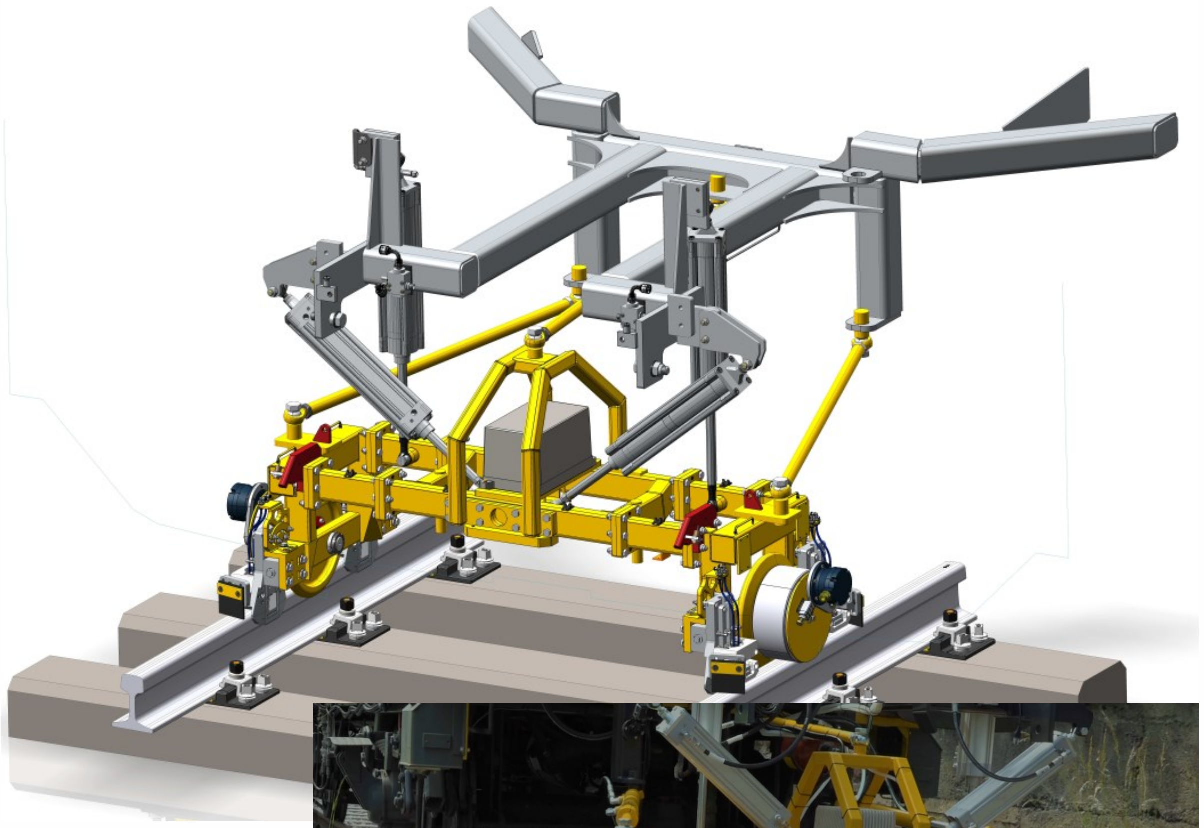
2. PEGAS Inertial Measurement System – System Spec

- Two wheels trolley
- Pushed / pulled by vehicle
- Optical (Nemo) and chord basis compatibility
- EN 15273-2 GI2 / UIC 505-1 compatibility
- Recording: 0 to 40km/h
- Working: Discontinuous and continuous
- Stops: Unlimited



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THANK YOU FOR YOUR ATTENTION