



TAMTRON

SCALEX WILD

**Type Approved Dynamic Railway Weighing and
Wheel Condition Monitoring Solution**

AGENDA



- INTRODUCTION
- SYSTEM OVERVIEW
- FEATURES AND BENEFITS
- DELIVERY SCOPE
- INSTALLATION
- REFERENCES
- TAMTRON OY



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Introduction:

*Why should we monitor
wheel condition and weights?*

INTRODUCTION

ACCIDENT: WHEEL FLATS CAN BREAK THE RAIL

- ▶ In January 2006 in England one bad wheel flat broke rail in three places during one trip.
- ▶ Many similar cases around the world.



Source: Rail Accident Report (Broken Rails at Urchfont and Kennington following the passage of a freight train 5 January 2006)

INTRODUCTION

ACCIDENT: WHEEL FLATS CAN DERAIL WAGONS

- ▶ In February 1999 in Finland one bad wheel flat broke the bearing and axle causing 15 wagons to derail. Tracks were badly damaged at a distance of about 9 km.
- ▶ Wheel failures have caused many similar accidents.



Source: Rail Accident Report (Freight Train Derailing at Jalasjärvi, Finland, on February 19, 1999)

INTRODUCTION

COMMON INTEREST

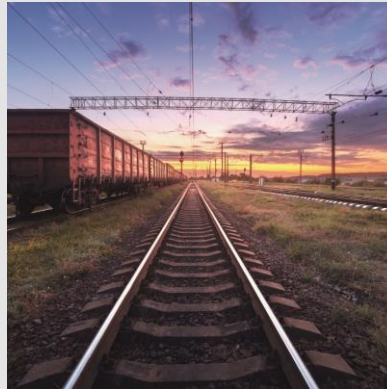
- ▶ Safety is the biggest interest for monitoring wheel condition and weights for passengers, personnel, society, track owner, operator, etc.



INTRODUCTION

TRACK OWNER'S INTEREST

- ▶ The track owner must control the overload and wheel condition for safety reasons.
- ▶ Defected wheels and overloads reduce the lifetime of the track and increase maintenance costs.
- ▶ Defected wheel increase noise and ground vibration.



INTRODUCTION

OPERATOR'S INTEREST

- ▶ Defected wheels harm bearings and bogies.
- ▶ Overloads and uneven loadings reduce the lifetime of the wagons.
- ▶ The whole wheel rim can not be checked in the non-moving wagon.
- ▶ Wheel maintenance costs can be reduced by identifying wheel which require maintenance early.
- ▶ The reported train weight may differ from the actual one thus creating problems in brakings and in uphill driving when utilized in the train control system.



INTRODUCTION

LEGAL-FOR-TRADE WEIGHING IN INDUSTRIES

- ▶ Scalex Wild is ideal for the following industries that require legal-for-trade weight information:
 - Timber products: lumber, pulp and paper
 - Aggregated and bulk solid materials
 - Scrap metal and steel
 - Waste management
 - Agriculture
 - Petro-chemical



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System Overview

SYSTEM OVERVIEW

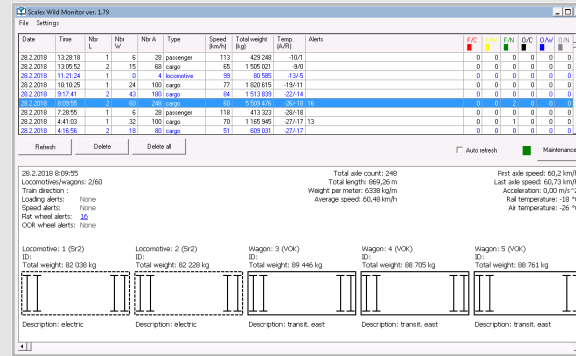
INTRODUCTION

- ▶ Scalex Wild monitors the wheel condition and detects wheel defects.
- ▶ The system gives weights for trains, wagons, bogies, axles and wheels, and thus recognizes overloads and loading errors.
- ▶ The measurement is done automatically at all operating speeds (10-250 km/h). Maximum transit speed is not limited.
- ▶ Dynamic legal-for-trade weighing of wagons and trains is possible with train speeds of 10-120 km/h in Europe.
- ▶ The system automatically sends alarms to the traffic control systems and thus to the maintenance staff.
- ▶ Scalex Wild increases safety and track and wagon lifetime. It also reduces maintenance costs as well as noise and ground vibration.

SYSTEM OVERVIEW

MAIN PARTS

- ▶ Rail element (sleepers, rails, load cells, cabling to equipment room)
- ▶ Measurement electronics inside equipment room
- ▶ Industrial PC with analysis software
- ▶ Tamtron Train Information System (TTIS – cloud based user interface and reporting)



SYSTEM OVERVIEW

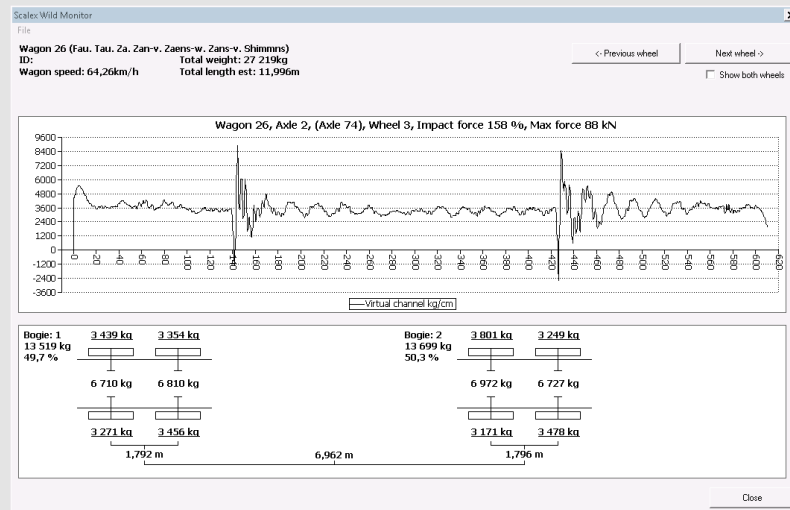
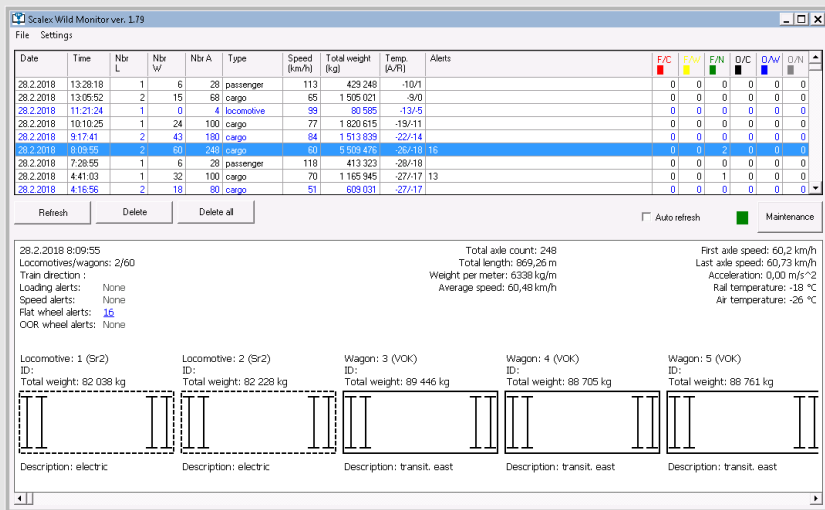
OPERATING PRINCIPLE

- ▶ <https://www.youtube.com/watch?v=8iDyK9GJ14k&feature=youtu.be>



SYSTEM OVERVIEW

USER INTERFACE – SCALEX WILD MONITOR





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Features and Benefits

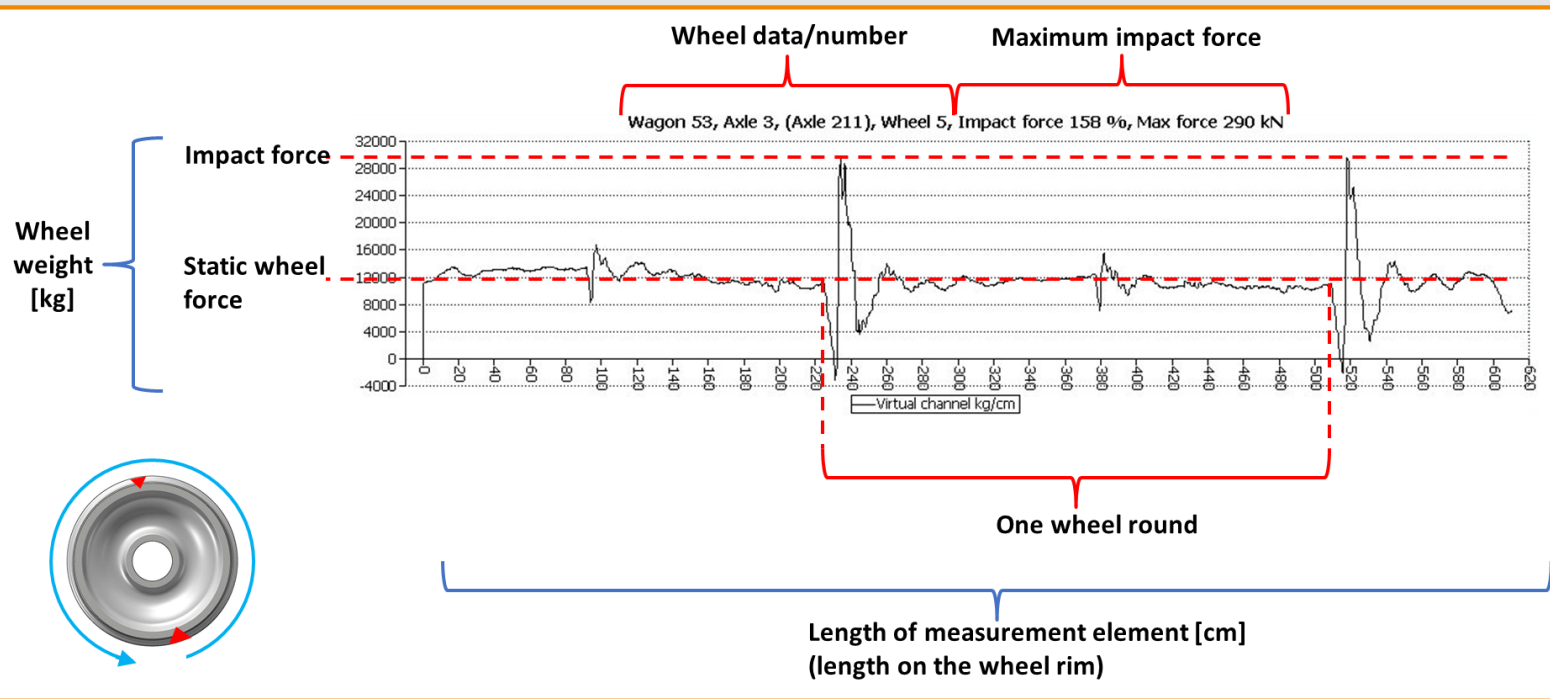
FEATURES AND BENEFITS

FEATURES

- ▶ Train composition:
 - Direction of train
 - Speed of train
 - Number of wagons
 - Types of wagons
- ▶ Measurements:
 - Date and time
 - Wheel flat detection
 - Polygonal wheel detection
 - Weighing per wheel/axle/bogie/wagon/train
 - Force diagram for each wheel
- ▶ Alarms:
 - Wheel flats and polygonal wheels (notice, warning, critical)
 - Overloads (axle/bogie/wagon)
 - Loading error (longitudinal or transverse imbalance)
- ▶ Maintenance over remote connection
- ▶ All data is stored to Tamtron TTIS and/or user's own information system

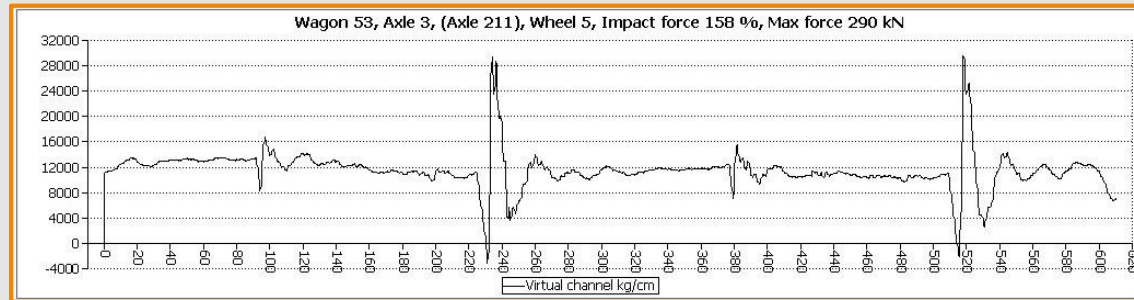
FEATURES AND BENEFITS

FORCE DIAGRAM



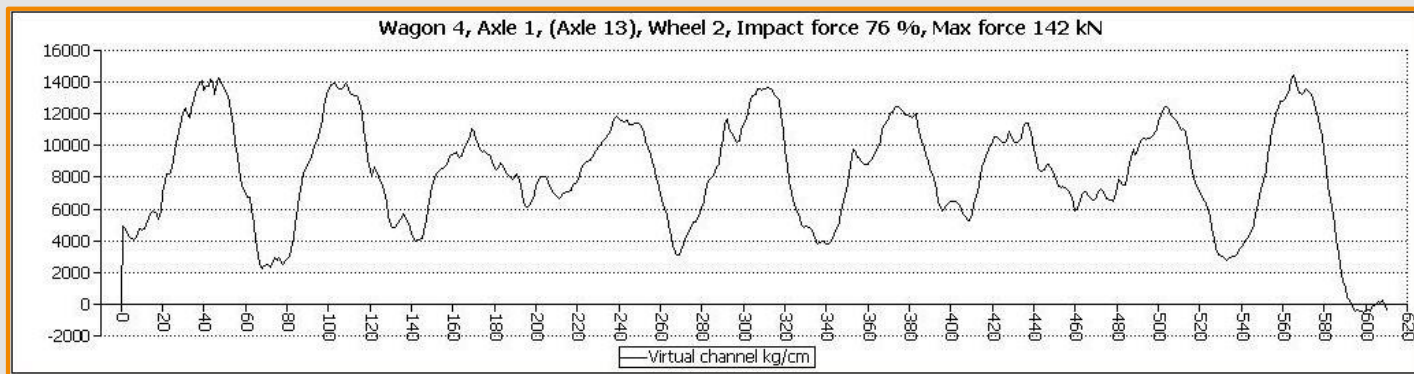
FEATURES AND BENEFITS

WHEEL FLATS



FEATURES AND BENEFITS

OUT-OF-ROUNDNESS



FEATURES AND BENEFITS

WEIGHING (TRAIN, WAGON, BOGIE, AXIS, WHEEL)

Date	Nbr L	Nbr W	Nbr A	Type	Speed (km/h)	Total weight (kg)	Temp. (A/R)	Alerts	F/C	S/W	F/N	O/C	O/W	O/N
13.12.2016		2	6	30 cargo	99	521 068	-6/-6		0	0	0	0	0	0
13.12.2016		2	6	30 cargo	98	521 578	-6/-6		0	0	0	0	0	0
13.12.2016		2	6	30 cargo	77	520 446	-6/-6		0	0	0	0	0	0
13.12.2016		2	6	30 cargo	79	520 298	-6/-6		0	0	0	0	0	0
13.12.2016		2	6	30 cargo	57	520 431	-6/-7		0	0	0	0	0	0
13.12.2016		2	6	30 cargo	60	521 303	-6/-6		0	0	0	0	0	0

13.12.2016
Locomotives/wagons: 2/6
Train direction :
Loading alerts: None
Speed alerts: None
Flat wheel alerts: None
OOR wheel alerts: None

Total axle count: 30
Total length: 147,52 m
Weight per meter: 3528 kg/m
Average speed: 56,58 km/h

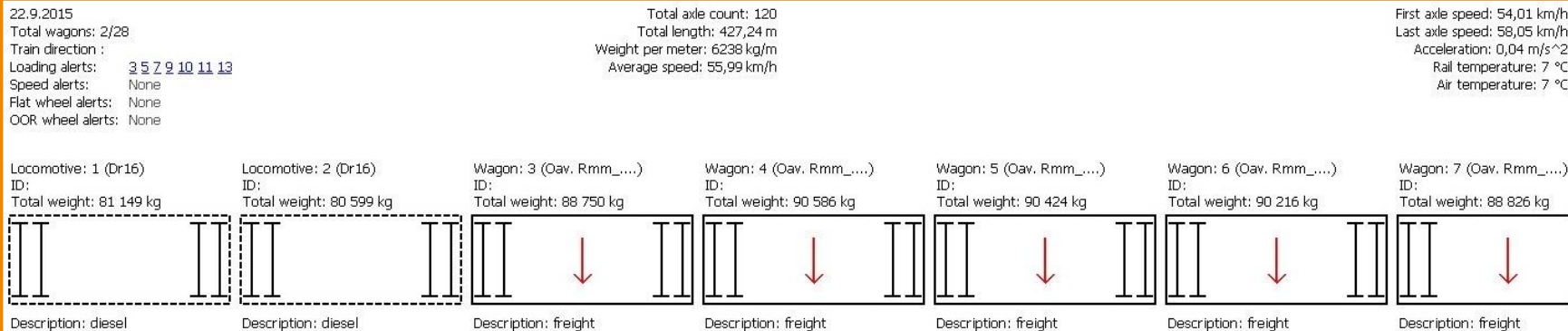
First axle speed: 55,49 km/h
Last axle speed: 57,85 km/h
Acceleration: 0,07 m/s^2
Rail temperature: -7 °C
Air temperature: -6 °C

Locomotive: 1 (Sr1)	Wagon: 2 (Sim. Simns...)	Wagon: 3 (Sim. Simns...)	Wagon: 4 (Oc. Oce. O...)	Wagon: 5 (Oc. Oce. O...)	Wagon: 6 (Elo-t. Fh....)
ID:	ID:	ID:	ID:	ID:	ID:
Total weight: 84 602 kg	Total weight: 58 362 kg	Total weight: 88 958 kg	Total weight: 22 678 kg	Total weight: 48 253 kg	Total weight: 44 901 kg
Description: electric	Description: freight	Description: freight	Description: freight	Description: freight	Description: freight



FEATURES AND BENEFITS

LOADING ERRORS AND SHIFTING OF THE LOAD



FEATURES AND BENEFITS

OTHER INFORMATION (E.G. SPEEDS AND ACCELERATIONS)

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Description: electric

Wagon: 2 (Sim. Simns...)
ID:
Total weight: 58 362 kg



Description: freight

Wagon: 3 (Sim. Simns...)
ID:
Total weight: 88 958 kg



Description: freight

Wagon: 4 (Oc. Oce. O...)
ID:
Total weight: 22 678 kg



Description: freight

Wagon: 5 (Oc. Oce. O...)
ID:
Total weight: 48 253 kg



Description: freight

Wagon: 6 (Elo-t. Fh....)
ID:
Total weight: 44 901 kg



Description: freight

FEATURES AND BENEFITS

ALARMS

- ▶ Critical: Train must be stopped asap
- ▶ Warning: Wagon must be inspected at next station
- ▶ Notice: Wagon must be inspected in next service
- ▶ Alarm limits for wheel flats, overload and loading errors defined based on customer requirements.

FEATURES AND BENEFITS

LEGAL-FOR-TRADE WEIGHING

- ▶ Main metrological characteristics:
 - Accuracy class (Train weight): 0,2, 0,5, 1 or 2
 - Accuracy class (Wagon weight): 0,5, 1 or 2
 - Maximum operating speed: 120 km/h
 - Minimum operating speed: 10 km/h
 - Maximum transit speed: not limited
- ▶ In accordance with:
 - Directive 2014/32/EU (valid in Europe)
 - OIML R 106:2011
 - WELMEC 7.2:2015



FEATURES AND BENEFITS

BENEFITS

- ▶ Increased safety
 - Detecting dangerous wheels
 - Detecting overloads, uneven loadings or shifting of the load
- ▶ Increased track and wagon lifetime
 - Detecting wheel defects harming the track and the wagon
 - Detecting overloads, uneven loadings or shifting of the load
- ▶ Optimized track and wagon maintenance
 - Maintenance based on real use (tonnage)
 - Identifying wheels which require maintenance early
- ▶ Train weighing in full speed
 - Weighing possibility in full speed
 - Dynamic legal-for-trade weighing of wagons and trains with train speeds of 10-120 km/h in Europe
- ▶ Less noise and ground vibration
 - Detecting wheel defects causing noise and ground vibration



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Delivery Scope

DELIVERY SCOPE

INITIAL INFORMATION NEEDED FOR THE PROPOSAL

- ▶ Can the client agree and commit to the installation site requirements and buyer obligations?
- ▶ Is there a test train available, fulfilling the requirements and enabling the recommended calibration procedure?
- ▶ What's the rail type, width and alignment?
- ▶ Is it allowed to drill to the rail (11 pcs per rail, diameter 19 mm, distance 600 mm from each other, at the neutral axis)?
- ▶ Can we get remote access to the site during startup?
- ▶ Is there an existing equipment room available (specs, drawings, photos)? What is the distance to the track?
- ▶ Is there a local workshop available for the track unit assembly?
- ▶ Do we use customer's or Tamtron sleepers (ready load cell holes)?
 - Are there any specific types / approvals required?
 - If supplier sleeper, drawings provided to Tamtron for checking dimensions and drill scheme
 - Is the height position OK (-495 mm from rail travel level)?

DELIVERY SCOPE

TAMTRON DELIVERY SCOPE

- ▶ Sleeper load cells (20 pcs), rail load cells (22 pcs), temperature sensors (2 pcs)
- ▶ Rail contactors (wheel detection sensors) (2 pcs)
- ▶ Needed cables, connectors and junction boxes from the sensors to the measurement unit at the equipment room
- ▶ Measurement unit including MU-48 card with software and other electric/electronic accessories with sensors cabled & connected
- ▶ Industrial PC & UPS, cables & connectors at the equipment room between PC & measurement unit
- ▶ “Trigger” communication and measuring program
- ▶ “Analyze” calculation program, including data connection interface
- ▶ Graphic user interface software
- ▶ Assembly instructions and supervision of the rail element (load cells, sleepers, rails) in target location
- ▶ Installation supervision of the rail element mounting to the track at the site
- ▶ Electrical connections at the site
- ▶ Start-up and calibration of the system
- ▶ On-site testing and commissioning of the complete system
- ▶ User and service training
- ▶ User and service documentation (manuals, instructions, as-built documents, mech & elect drawings)

DELIVERY SCOPE

BUYER RESPONSIBILITIES

- ▶ 16 sleepers with mounting parts, delivered for the assembly
- ▶ 2 rails á 10 m, delivered for the assembly
- ▶ Assembly workshop and 2 technicians for rail element assembly at target location
- ▶ Transportation of ready rail element from the workshop to the site
- ▶ Civil works at track (cutting the rails, digging and tamping the bed, cable channels, traffic control, safety at track)
- ▶ Crane and all liftings at site
- ▶ Railway workers (2+1 safety person) with tools for the rail element installation, including welding
- ▶ Tamping machine
- ▶ Equipment room
 - Heated and air-conditioned, approx. 3...6 m²
 - 230 VAC power supply, power consumption 1 kW
- ▶ Free cable channels with protective tubes between the equipment room & track
- ▶ Test train for calibration, with real reference defects



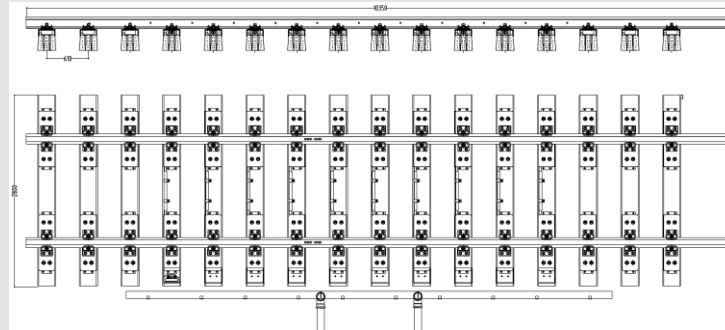
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Installation

INSTALLATION

ASSEMBLY WORKSHOP REQUIREMENTS

- ▶ Assembly of sensors to the rail element is to be done close to the installation site to minimize transporting big element (10 m of ready track with sleepers)
- ▶ 10 ton crane
- ▶ 2 assistant technicians (electrical/automation)
- ▶ Minimum 15 x 5 m free space
- ▶ Capability to get ready unit out at one piece (sufficient door width and unit moving arrangements)



INSTALLATION

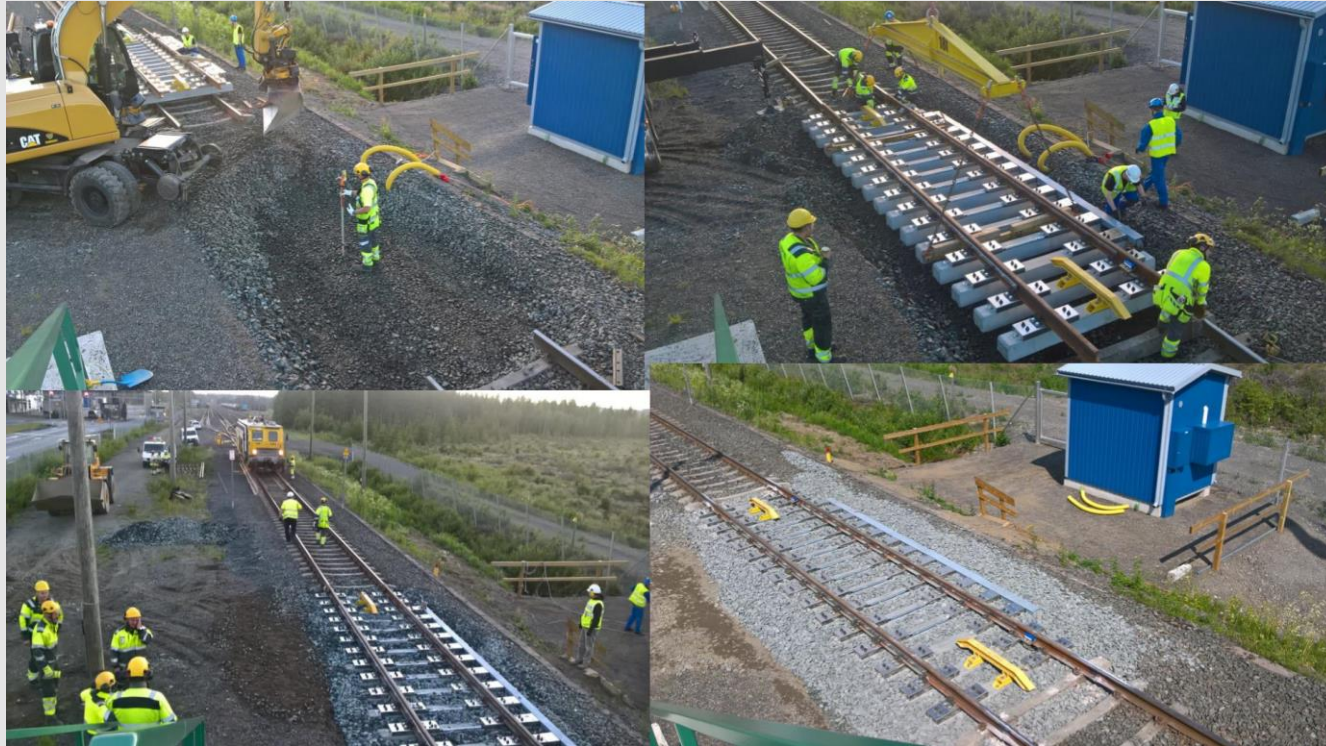
FIELD INSTALLATION

- ▶ 10 meters long rail element, rail cut is needed
- ▶ Ballast bed is required
- ▶ Drilling to the rail is required
- ▶ More photos on next slide



INSTALLATION

FIELD INSTALLATION





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References

REFERENCES

REFERENCE LIST

- ▶ 16 Wild systems in Finland (delivered for Finnish Traffic Agency)
- ▶ 3 Wild systems in Russia (delivered for RZD, connected to RZD's automatic wagon number recognition system)
- ▶ 3 Wild systems in Poland (2 delivered for a private enterprise, 1 for local passenger train operator)
- ▶ 1 Wild system in Finland (delivered for Finnish State Railways, connected to Wheel Profile and Brake Measuring Systems)
- ▶ 1 Wild test unit in Finland (owned by Tamtron, measuring data available for Finnish Traffic Agency, 200 km/h track section)



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Tamtron Oy

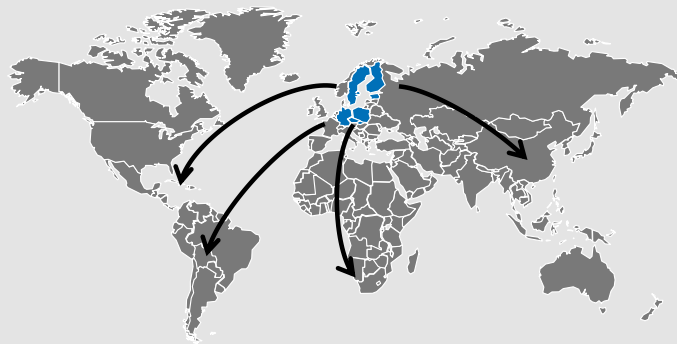
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TAMTRON – LEADING WEIGHING SOLUTIONS PROVIDER

Overview

- ▶ Founded in 1972 in Tampere, Finland
- ▶ A leading internationally operating industrial weighing solutions provider
- ▶ Onboard scales, e.g. for wheel loaders, container handlers and cranes
- ▶ Truck scales for both static and in-motion weighing
- ▶ Railway scales and railway safety solutions
- ▶ 2017 turnover 22 m€

Northern European platform



- ▶ 140 employees in 7 countries
 - HQ in Tampere, Finland
 - Subsidiaries in Sweden, Poland, Czech Republic, Slovakia, Germany and Estonia
- ▶ 50 export countries

WHY TAMTRON?

We are specialized especially into dynamic condition monitoring and weighing applications with modern data communication capabilities.

- ▶ Focused & experienced expert on demanding industrial measurement
- ▶ Broad range of solutions to various industries
- ▶ Customer value at top priority – accuracy, reliability, efficiency, uptime
- ▶ Flexible and reliable partner – we listen and adapt to customer needs, and we deliver what we promise.





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