



RAILWAY & HYPERLOOP

Measurement systems and sensor solutions for the railway and hyperloop industry



Your expert partner in sensors & controls

althensensors.com

ALTHEN
SENSORS & CONTROLS

INFORMATION ABOUT ALTHEN SENSORS & CONTROLS

Althen Sensors & Controls stands for pioneering measurement and sensor solutions. Since we are constantly looking to innovate we accept every measurement challenge, our engineers are only satisfied when the perfect solution for your measurement task is found. We develop customer-specific solutions in our in-house production facilities. Althen is partner of many recognized universities and leading organizations. We find ourselves in an intensive knowledge transfer, developing future technologies. Althen is one of the first companies in its branch with a certification by the German technical inspection association in Hessen (TÜV PROFICERT) in accordance with DIN EN ISO 9001:2015.



Our sensor solutions are divided into three main application areas: OEM, Test & Measurement and IIoT solutions.

Our in-house design and manufacturing capabilities allow us to develop customized sensor solutions and turn every measurement challenge into a sensor solution. In addition to our sensor solutions we offer complementary services such as: calibration, design & engineering, training and renting of measurement equipment. Your benefits of working with Althen: high quality sensor solutions, flexibility in developing a customized solution and fast prototyping.

Connecting the dots

Our main market is Western Europe and USA, with offices in Germany, the Netherlands, France, Sweden and the USA. With over 40 years of experience in sensor technology, Althen is your expert partner for sensor and measurement solutions.

For more information please visit our website www.althensensors.com

Althen, innovative sensor solutions for transportation systems of the future



CONTENTS

Information about Althen Sensors & Controls	2
Wheel maintenance measurement tools.....	4
Turn-key, portable, and plug and play solutions.....	6
Smart weighing and balancing system for tram/metro maintenance.....	7
3D automated wheel measurement system.....	8
Weighing In Motion system (AWIM)	10
The right solution for your requirements / our product scope.....	15

WHEEL MAINTENANCE MEASUREMENT TOOLS

The easiest and fastest way to get reliable and accurate wheel parameters. Our wheel measurement tools are based on laser technology and developed to be used in railway maintenance locations to measure the diameter, scan the profile and measure the back-2-back distance in a modern and innovative way.



DIAMETER GAUGE

PROFILOMETER

- Laser scanning and analysis of wheel profile
- Contactless measurement of wheel profile parameters
- PDA & software for wheel wear database support
- Bluetooth interface for data transfer



LIGHTRAIL PROFILOMETER

- Laser Wheel Profile Gauge model FDKP-short (Fig. A) with a shortened handle
- Laser Wheel Profile Gauge model FDKP-Super short (Fig. B) version for Ansaldo Breda low floor trams



DIAMETER GAUGE

- High-precision wheel diameter measurement
- Large numeric display
- Bluetooth interface for data transfer (optional)
- Measurement range: 600-1400 mm or on request
- Custom design possible



LIGHTRAIL DIAMETER GAUGE

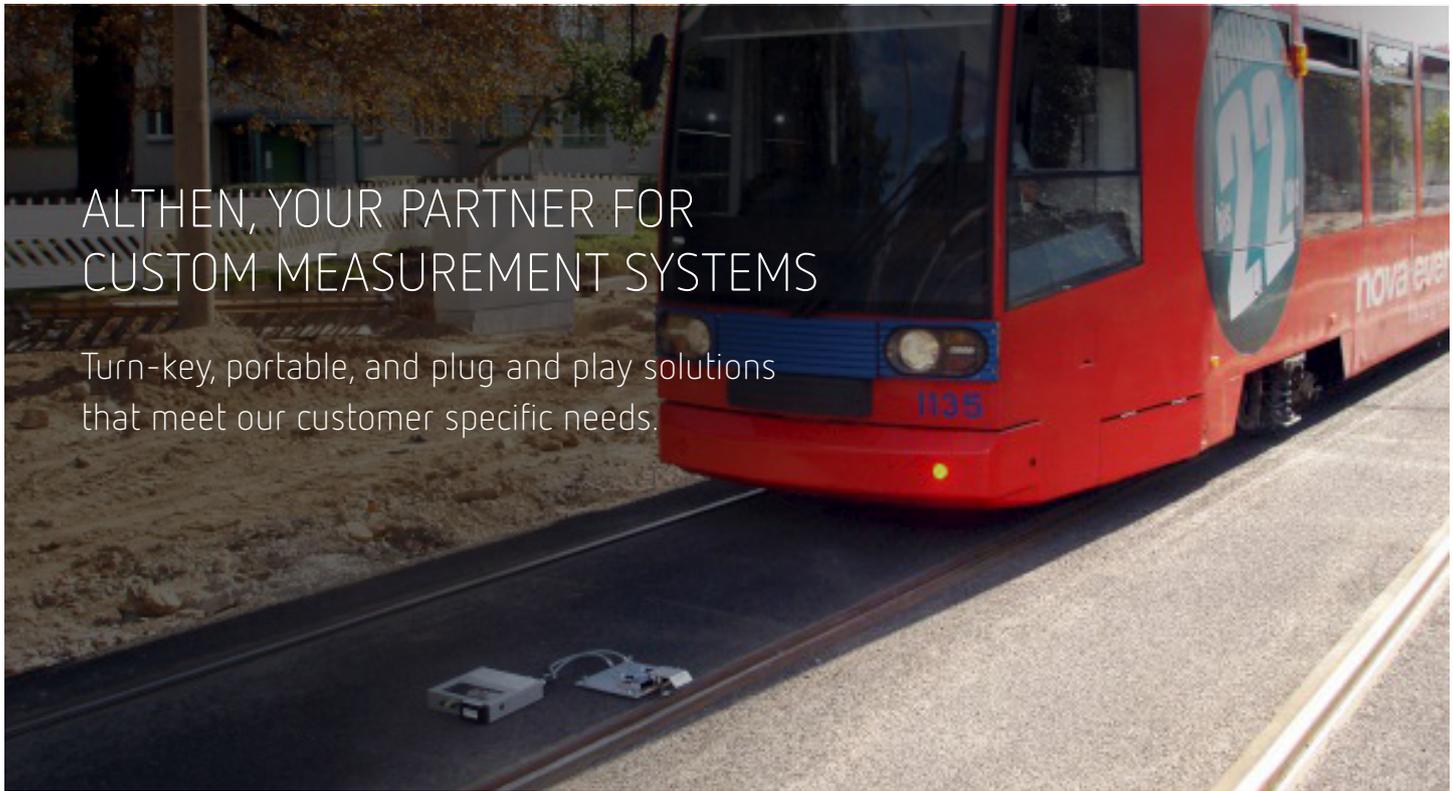
- High-precision wheel diameter measurement
- Large numeric display
- Bluetooth interface for data transfer (optional)
- Measurement range: 400-750 mm or on request
- Custom design possible
- Lightweight design



BACK-2-BACK GAUGE

- Contactless measurement of back-to-back distance between railway wheels
- Large numeric display
- Bluetooth interface (optional)
- Measurement range: 1340-1610, ± 15 mm. 0.2 mm (measurement error)





ALTHEN, YOUR PARTNER FOR CUSTOM MEASUREMENT SYSTEMS

Turn-key, portable, and plug and play solutions that meet our customer specific needs.

RAILWAY DISPLACEMENT MEASUREMENT SYSTEM

This portable measurement system has been developed to measure the vibration when a tram is passing by. It is mostly used in urban areas to determine if the rails are still in good condition and don't cause too many vibrations, that could potentially damage surrounding buildings and other infrastructure.

MAIN FUNCTIONALITY

- Measures vibration of rails when tram/train passes by
- Based on FDRF603 laser sensor
- Remote controlled measurement with remote controller
- Integrated amplifier and datalogger embedded into industrial housing

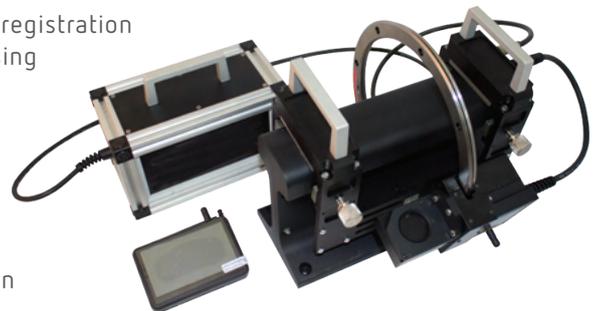


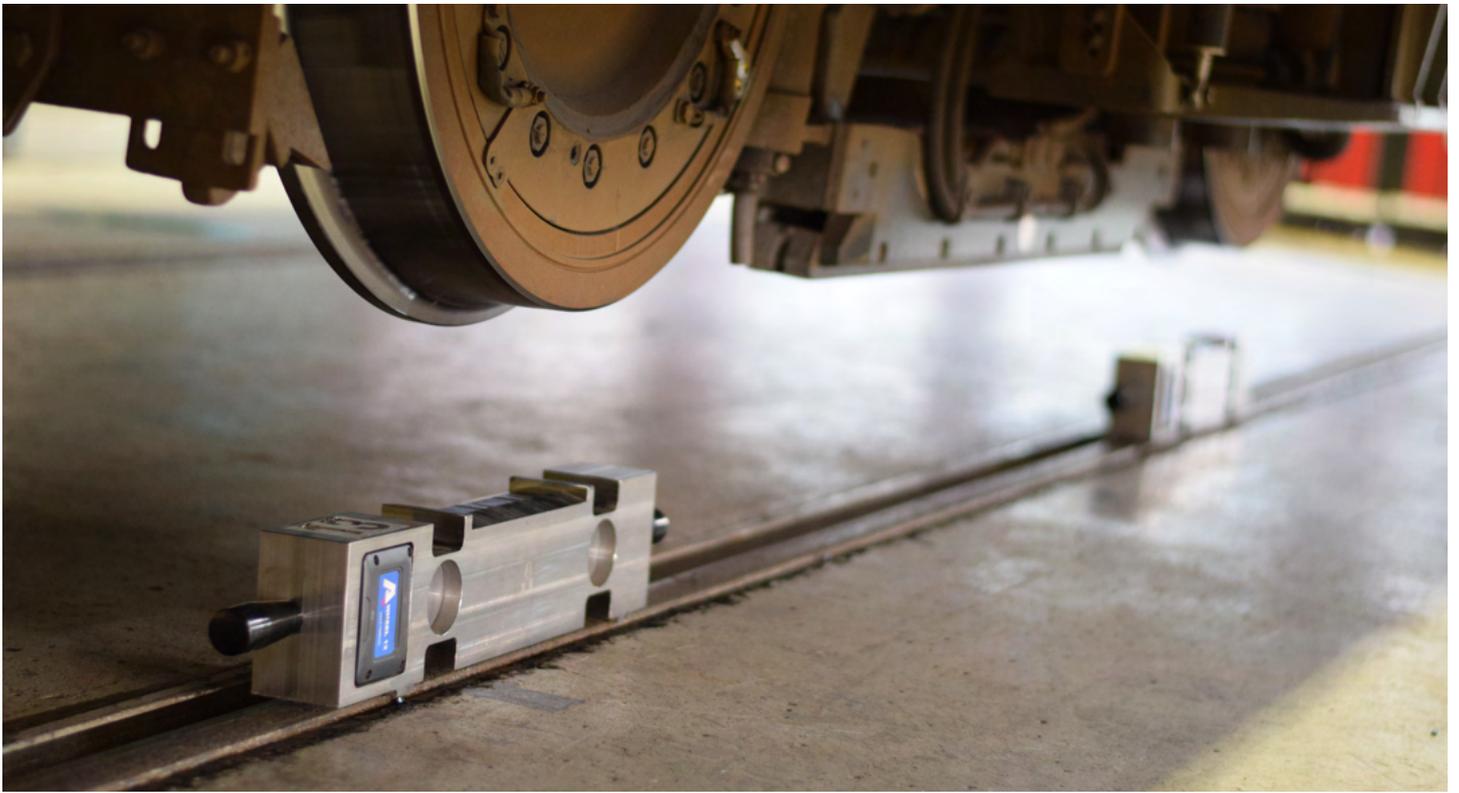
RAILWAY PROFILE MEASUREMENT GAUGE

Portable laser rail profilometer (PRP) is designed for non-contact registration of cross-section of the railhead. The profilometer scans the rail using non-contact laser technology.

MAIN FUNCTIONALITY

- Obtaining the information on the cross-section profile of the working railhead surface
- Full profile scanning and analysis of the railhead
- Combined visualization of measured and reference cross-section





SMART WEIGHING AND BALANCING SYSTEM FOR TRAM/METRO MAINTENANCE

Our wireless weighing system measures the weight of each individual wheel within just a few seconds. All the specially designed load cells are equipped with a wireless communication module to transmit the measured data directly to the software.

You can view the results directly on your dedicated laptop. This includes a visual overview of the balance per axle. The software automatically calculates parameters such as axle load, load per bogie, total load of the tram/metro and can be customized to your requirements.

SYSTEM INCLUDES

- 16 x wireless Rail beam load cells
- Portable case with laptop
- Customized software
- Docking and charging cart (optionally)

MAIN ADVANTAGES

- Accurate data
- Time (labor) saving
- Wireless system
- Easy reporting function
- User friendly visualized software
- Synchronized tare function



3D AUTOMATED WHEEL MEASUREMENT SYSTEM

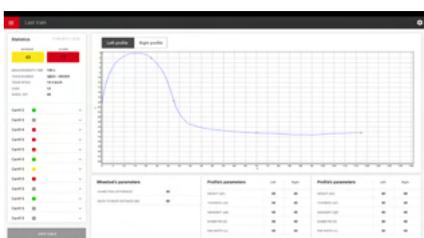
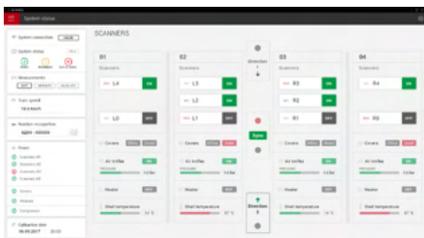
This innovative measurement system is developed for contactless automatic real-time measurement of geometrical parameters of railway wheels (trains, trams, metros). The system is based on a combination of high frequency 2D laser scanners mounted sideways of the rails that after calibration create a common 3D coordinate system.

3D AUTOMATED WHEEL MEASUREMENT SYSTEM

The new automated 3D wheel measurement system is collecting reliable and accurate data to improve railway maintenance activities and to prevent damage on rail infrastructure. By making use of high speed laser scanners, it is possible to measure all wheels even at high speeds.

BENEFITS OF 3D AUTOMATED WHEEL MEASUREMENT SYSTEM

- Getting all important data with one system instead of multiple tools
- Accurate and valuable data within seconds
- Eliminate manual measurement errors
- Integrated software system with all necessary calculations and parameters
- Real time measurement of moving train of tram wheels
- Simple train identification based on vision system
- Rfid identification of axles of the train
- Easy installation at any rail infrastructure



TECHNICAL DATA

The 3D automated wheel system can be installed in 3 variants:

- 1) Low speed variant for maintenance locations: up to 15 km/hour.
- 2) Medium speed variant for normal train/metro trajectory: up to 180 km/hour.
- 3) High speed variant for in high speed trajectory locations: up to 350 km/hour.

Parameter	Accuracy
Wheel profiles	mm 0,1 ±
Flange height	mm 0,1 ±
Flange width	mm 0,1 ±
Flange angle	mm 0,1 ±
Rim thickness	mm 0,1 ±
Tread width	mm 0,1 ±
Back to back gauge	mm 0,05 ±
Wheel diameter	mm 0,2 ±

SCOPE OF DELIVERY

- Frames with laser scanners
- Inductive sensors of wheel presence
- Industry computer
- Software
- Calibration frame
- Vehicle (carriage) identification system (Video, RFID)

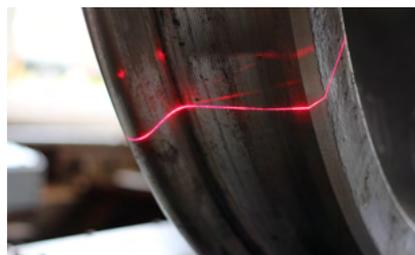
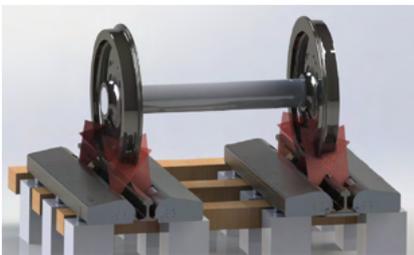
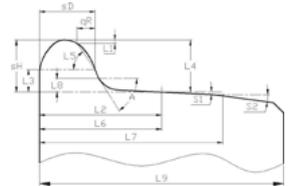
STATE OF THE ART SOFTWARE INTEGRATIONS

STAND ALONE SOFTWARE PACKAGE INCLUDING:

- Configuration of the system
- Reference profiles / diameter / back-2-back info configurable
- Data storage of all measurements
- Information overview of which vehicle, wagon, and axles
- Per axle all measurement data easily accessible
- Warning and alarm functionality integrated
- Preparation of file sharing possibility to other systems in fixed format

MEASURED PARAMETERS:

- Diameter of wheels
- Wheel flange height
- Wheel flange thickness
- Wheel flange slope (QR in mm or degrees)
- Wheel hollow wear (in combination with position)
- Specific slopes and angles in profile
- Gap measurement
- Complete profile of wheel as X,Y model
- Back-2-back distance between wheels on same axle



WEIGHING IN MOTION SYSTEM (AWIM)

Our Weighing in Motion system is a stationary measurement system able to function as a dynamic weighing scale. This advanced in-motion system is used for Weighing in Motion, Wheel Flat Detection and Train Detection and much more!



ALTHEN WEIGHING IN MOTION

Consisting of various passive non-moving parts that are mounted on the side of the railbeam. These sensors are connected into a network and special electronics combine all signals using specific algorithms. Various parameters are calculated and logged together with unique vehicle identification features.

OFFERING THE FOLLOWING MEASUREMENTS AND SAFETY PARAMETERS:

- Train direction and speed
- Identification number, Locomotive- & Wagontype
- Very high accurate load measurements ($< \pm 0,5\%$)
- Very high accurate uneven load detection
- Weight of single wheel, axles, bogies and complete wagons
- Number of axles
- Overload detection
- Broken Bogie Suspension
- Wheel Flat Detection (defects)
- Detection system for Derailment Risk (!)

EXAMPLES OF OPERATIONAL USE

WEIGHING SINGLE WAGONS

A mining company needs to know that their wagons are not unevenly, under or overloaded.

WEIGHING COMPLETE TRAIN SETS

A railway operator needs to know the number of engines and wagons to charge traffic fee.

MONITORING ALL TRAIN SETS

The infrastructure owner needs to know how the track system is used.

DETECTING DERAILMENT RISKS

The track owner and the train operator wants information on if and when there is a increased risk for derailment.

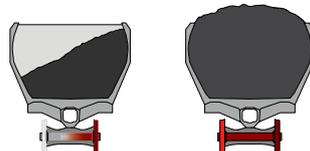
COST EFFECTIVE ACCURACY

Market leading cost of investment to accuracy ratio.

0.5%
OIML R106

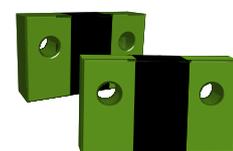
UNEVEN/OVERLOAD DETECTION

Increase safety by detecting faulty loading of the cars.



RUGGEDIZED AND ROBUST

Quality for harsh environments with a MTBF of 90,000 hours.

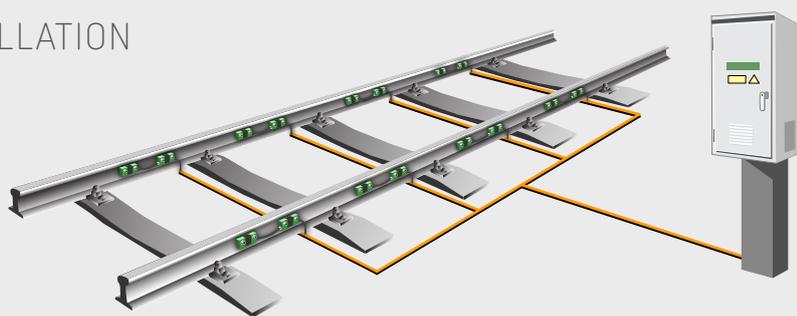
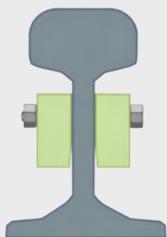




The accuracy of this system is based on measuring a complete train, consisting of a locomotive and various cars. Our AWIM system is equipped with eight weighing points. Formal tests by the Technical Research Institute of Sweden show even an average accuracy of $\pm 0,2\%$. When combining all measurements an overall accuracy of better than $\pm 0,5\%$ is achieved for passing trains with various speeds, complying with OIML R106, class 0,5.

This system is very accurate and remains accurate at high speeds. But at the same time we need to take into consideration that a train at high speeds will 'wobble' a lot more and increase the impact on the sensor causing more weight and thus increasing the weighing error. When choosing a location for a dynamic weighing system or scale it's also important to select a location where acceleration and braking of trains is reduced to a minimum, weighing a passing train at a more or less steady velocity will generate a reliable measurement. For this reason the chosen location should be as straight, flat and stable as possible.

FAST AND EASY INSTALLATION



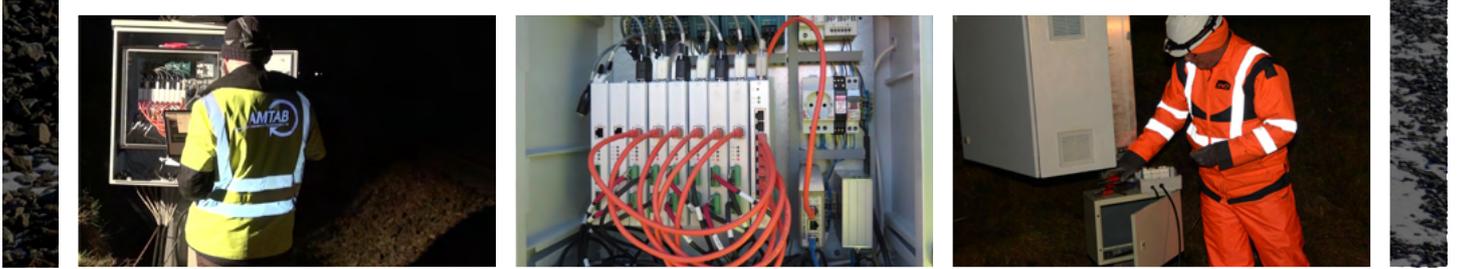
Our patented bolt-on sensors do not require the track to be closed during installation and maintenance which dramatically reduces traffic interferences. The sensors need to be bolted in place either through holes or using our weldable sockets.





WEIGHING IN MOTION SYSTEM (AWIM)

Our Weighing in Motion system is developed to measure the weight of trains or trams when they are driving by with full speed.



In order to identify the vehicle, the locomotive- and wagontype can be determined by our system thanks to an integrated algorithm comparing distances between passing wheels and bogies. In addition extra features can be added to increase identification of vehicles and axles. We offer an integrated RFID scanning system and as well Vision Technology Cameras to register the vehicle number and axle ID's.

Furthermore our AWIM system can easily be combined with our Laser Wheel Measurement system, 3D Wheel. To include diameter, back-2-back and the complete wheel profile of all wheels!

The system-cabinet installed just next to the track houses all electronics and processing units. All sensors are connected to this system and signals are being processed in real-time. The raw measurements are processed, analyzed and converted into ready-to-go data and results. These can be monitored and logged remotely, fast, save & easy!

SOME EXTRA UNIQUE FEATURES OUR SYSTEM OFFERS:

- In-built redundancy
- Easy to maintain & simple spare-parts
- Best price/performance ratio
- No speed & weight limitation
- No change in infrastructure
- Simple installation, no foundation needed
- No moving parts
- Fits on all rail standards
- Remotely operated, including maintenance & upgrades
- Complying to standards OIML R106, ISO9001 and ISO14001
- Protection degree: IP68



AWIM INCLUDES

Advanced Train Detection and Control is getting indispensable for more and more businesses. What those businesses have in common is the need for accuracy, reliability, and durability of the equipment, especially when used in rugged environments.

TRAIN DETECTION (TD)

When developing this system, the mission was to outperform traditional technology, which was vulnerable to wear and tear and sensitive to weather change. The result was a robust and reliable system with a minimum need for maintenance and a MTBF bordering on the extreme. The original requirement specification came from the Swedish National Rail Administration, and all AMTAB's following systems were developed accordingly.

DERAILMENT WARNING SYSTEM (DWS)

By monitoring each wagon's center of gravity, the system can alert on conditions that may cause derailment.

WHEEL FLAT DETECTION (WFD)

In order to assure safety for train traffic, it is crucial to track down wheel defects in time. The WFD is a highly robust and reliable product based on the technology used in our weighing system.

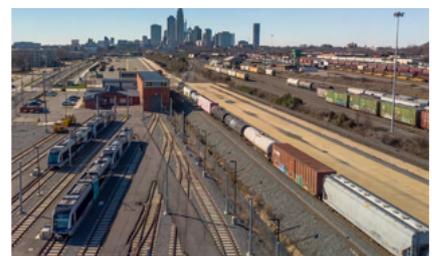
Due to the versatile data output, WFD is an excellent tool for collecting data to optimize maintenance.

WEIGHING IN MOTION (WIM)

By weighing the train when it's moving (even while being loaded) AWIM stands for efficiency and safety. Output data may, for example, be used to optimize automatic loading systems, and to collect data for production volumes and GTK on main lines. Safety being most important of all, data from the AWIM may be used to ensure that each car is evenly loaded, and to prevent overloading.

MAINTENANCE AND LOGISTIC SURVEILLANCE SYSTEM (MLSS)

Install systems above in your operational infrastructure, gather, monitor and store all data in your Railway Logistic Centre and you will have a Maintenance and Logistic Surveillance System second to none.

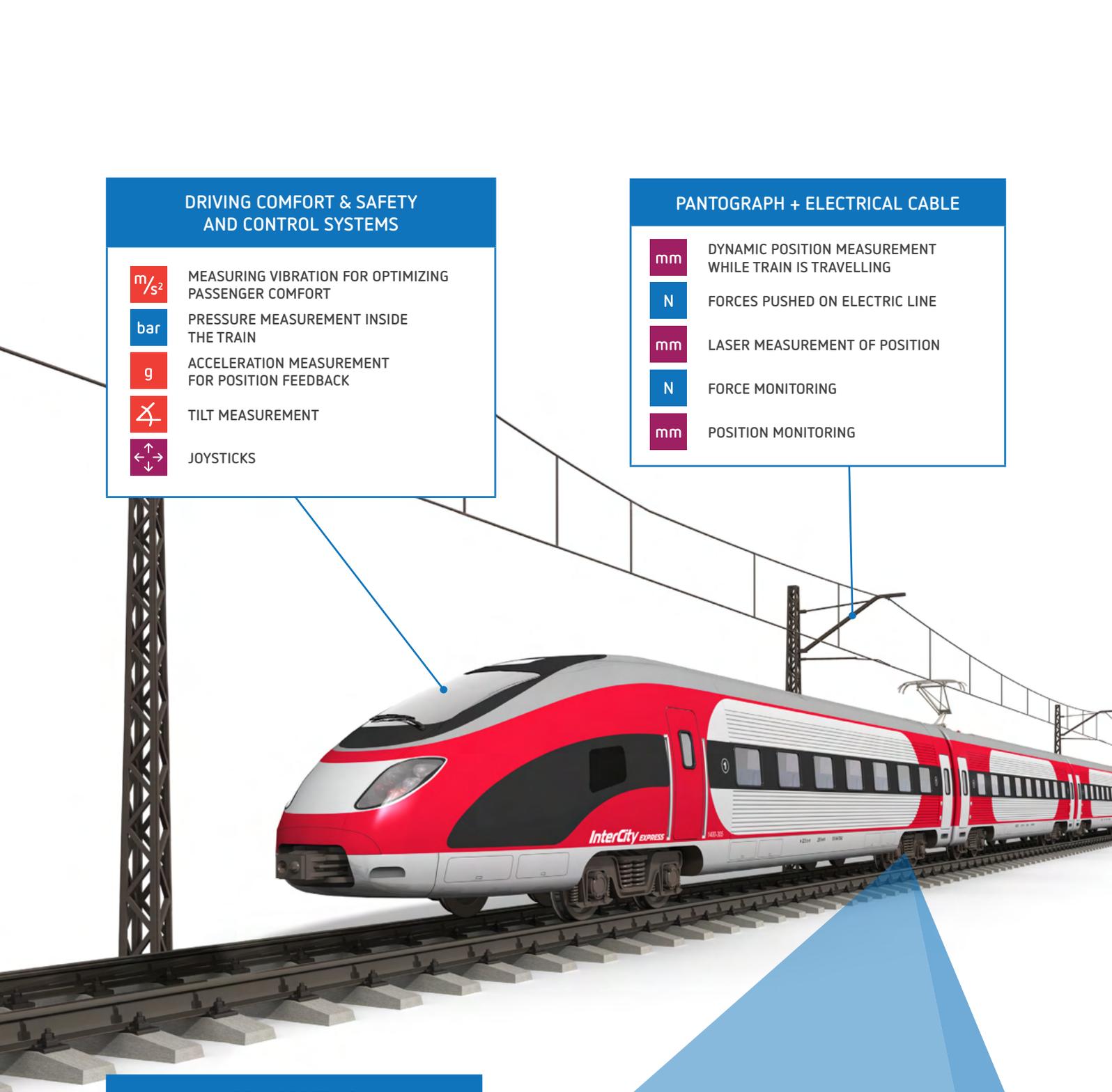


DRIVING COMFORT & SAFETY AND CONTROL SYSTEMS

- m/s^2 MEASURING VIBRATION FOR OPTIMIZING PASSENGER COMFORT
- bar PRESSURE MEASUREMENT INSIDE THE TRAIN
- g ACCELERATION MEASUREMENT FOR POSITION FEEDBACK
-  TILT MEASUREMENT
-  JOYSTICKS

PANTOGRAPH + ELECTRICAL CABLE

- mm DYNAMIC POSITION MEASUREMENT WHILE TRAIN IS TRAVELLING
- N FORCES PUSHED ON ELECTRIC LINE
- mm LASER MEASUREMENT OF POSITION
- N FORCE MONITORING
- mm POSITION MONITORING



BRAKE TESTING

- N FORCE TESTING OF DISK BRAKES
- bar PRESSURE MEASUREMENT OF LIQUID IN THE BRAKES
- m/s^2 VIBRATION MEASUREMENT
- N VARIOUS FORCE SENSORS TO MEASURE ABSORBER LOAD IN ACTION
- Nm LINEAR POSITION SENSOR

BOGIE + WHEELS





FAST & ACCURATE
PROFILE MEASUREMENT

THE RIGHT SOLUTION FOR YOUR REQUIREMENTS

Thanks to our decades of experience, we at Althen can provide both standard and highly specialized custom sensors as well as complete measurement systems for our customers.

Our product portfolio covers all physical measurements, and we use a wide range of technologies to ensure you always get the best solution for your measurement requirements. Thanks to our vast knowledge, technical expertise, our strong team of engineers from various professional backgrounds, and our broad range of products, we can offer you the most efficient solution for almost any application in every industry.

Our team will be happy to give you advice!

You can call us at **+31 (0)70 3 92 44 21** or send an email to sales@althen.nl

OUR PRODUCT SCOPE

bar	Pressure	mm	Displacement	g	Acceleration		Amplifier
N	Force	α	Rotation	m/s²	Vibration		Data Loggers
Nm	Torque		Joystick	°/s	Angular Rate		Automation
ε	Strain		Inclination	°C	Temperature		Measurement Solutions



ALTHEN SENSORS & CONTROLS

■ Netherlands | Belgium | Luxembourg

ALTHEN Sensors & Controls B.V.
 Verrijn Stuartlaan 40
 2288 EL Rijswijk
 Netherlands
 Phone: +31 70 3 92 44 21
 Email: sales@althen.nl

■ Germany | Switzerland | Austria

ALTHEN GmbH Mess- und Sensortechnik
 Dieselstraße 2
 65779 Kelkheim
 Germany
 Phone: +49 6195 7 00 60
 Email: info@althen.de

■ France

ALTHEN / MIDIF
 26, avenue de la Méditerranée
 34110 Frontignan
 France
 Phone: +33 4 67 78 61 66
 Email: info@althensensors.fr

■ USA | Canada

ALTHEN Sensors & Controls Inc
 2340 Littler Lane
 Oceanside CA 92056
 USA
 Phone: +1 858 6 33 35 72
 Email: info@althensensors.com

■ Sweden | Norway | Denmark | Finland

ALTHEN Sensors & Controls AB
 Stora Torget 6C
 761 30 Norrtälje
 Sweden
 Tel: +46 8 7 95 24 90
 E-Mail: info@althensensors.se



Further information can be found at www.althensensors.com