

KISTLER

measure. analyze. innovate.



**Braking reliability
and efficient
maintenance**

Brake testing in the depot and on the track

Condition data acquisition for brake systems in rail traffic



Absolute Attention for Tomorrow's World

Kistler develops measurement solutions consisting of sensors, electronics, systems and services. In the physical border area between emissions reduction, quality control, mobility and vehicle safety, we deliver excellence for a future-oriented world and create ideal conditions for Industry 4.0. We thereby facilitate innovation and growth for — and with — our customers.



Kistler stands for progress in motor monitoring, vehicle safety and vehicle dynamics and provides valuable data for the development of the efficient vehicles of tomorrow.



Kistler measurement technology ensures top performance in sport diagnostics, traffic data acquisition, cutting force analysis and other applications where absolute measurement accuracy is required.



Kistler systems support all steps of networked, digitalized production and ensure maximum process efficiency and profitability in the smart factories of the next generation.

Editorial



Efficient and sustainable transport systems are the backbone of economic development. They connect people and countries and ensure the exchange of goods. Rail traffic plays a significant role in this respect: given the rising volume of global trade and limited road capacities, its importance is ever-increasing. Not only that — environmental issues including noise, fine dust and emissions — are hiking up demand for rail transport as a more environmentally friendly alternative. Infrastructure, railway systems and rail vehicles must run smoothly and efficiently to maintain the attractiveness and safety of rail traffic at a high level. Manufacturers, maintenance contractors and rail network operators are responsible for their upkeep.

Kistler has been developing and selling sensors for measuring the brake force of rail vehicles for many years. The establishment of our Rail Technology division lets us increase our activities in the rail traffic sector and support it with suitable measuring systems for brake systems, vehicle dynamics and on-track train control mechanisms. The different measuring systems are used for maintenance and continuous condition monitoring. Train operators thus have access to reliable data for the consistent implementation of condition-based predictive maintenance.

Daniel Kobler Ammann
Business Development Manager
Rail Technology

Contents

Safety all along the line	4
Higher availability thanks to targeted maintenance	5
Brake diagnosis in rail traffic	6
Measuring brake force with maximum reliability	7
DTI technology for brake test analysis	9
Kistler service: measurably more success	10
At our customers' service across the globe	11



Brakes need to be checked regularly to prevent braking action being compromised

Safety all along the line

The safety of rail operations hinges on reliable brake systems. The harsh conditions to which rail vehicles are exposed result in soiling, increased wear and tear and brake system damage. Regular checks as part of a maintenance concept must be conducted to prevent braking action being compromised.

The maintenance of rail vehicles focuses on ensuring availability and operational reliability. Regular brake force checks let you measure the effectiveness and dynamic characteristics of every brake system and record changes over specific time periods. Users can therefore clearly identify wear and tear and the resultant impaired braking action in order to take appropriate action.

Rail vehicle maintenance in Europe

Statutory requirements for ensuring rail safety have changed dramatically in recent years. Those mainly affected include rail network operators, keepers and maintenance contractors. New roles and responsibilities like the ECM (Entity in Charge of Maintenance) are set out in the European regulations and guidelines. A key aspect is the clear assignment of responsibilities and transparency in the cooperation of those involved: while railway companies are responsible for the reliable operation of the rail vehicles, the ECM is in charge of their safe condition. The establishment and certification of a compliant and effective maintenance management system and a well-structured, well-founded maintenance program are particularly important in this connection.



Higher availability thanks to targeted maintenance

High requirements like low operating reserves, economic pressure and high train performance demand almost 100 % availability of rail vehicles. If faults or even failures occur, delays, unhappy passengers and loss of revenue may result. Therefore, it is important that rail vehicles and their infrastructure are suitably maintained and preserved in a good state of repair.

In rail vehicle maintenance, ensuring the function of the system, safety and profitability plays a significant role. Manufacturers, maintenance contractors and rail network operators are also attaching increasing importance to optimized efficiency. A switch to condition-based predictive maintenance is therefore recommended in order to achieve this goal.

Improving maintenance cycle planning

Measuring brake force is an appropriate way of optimizing rail vehicle maintenance and ensuring the required operational reliability. Based on periodic, systematically conducted brake pad force tests, condition-based maintenance can be reliably and safely rolled out. An important aspect is test process reproducibility, since vehicle brake function is directly related to the test process and the media used in it. A series of measurements lets users better plan their maintenance cycles and deploy their predictive maintenance concept.

Benefits of condition-based maintenance

- Reduction of maintenance costs by up to 20 %
- Increased component life cycle
- Guaranteed rolling stock availability

Brake diagnosis in rail traffic

Kistler supports ECMs and railway companies in their implementation of modern maintenance concepts. Vehicle, brake system and brake pad manufacturers gain a full insight into their processes thanks to tailored measuring systems. Take advantage of our long-standing know-how and advice of our experts. They possess wide-ranging experience and will help you to define and implement a customized service package. Our systems measure and check the braking process of rail vehicles in the following applications:



Brake diagnosis of entire train compositions

With Kistler's permanently installed brake testing systems, entire compositions like articulated multiple units can be tested in the shortest of times. The test analyzes the dynamic structure of the brake pad forces across the entire train.



Bogie and component overhauls

In this case, the function and safety of brake systems and entire bogies is checked separately from the rail vehicle. Maintenance quality and perfect component function are thus ensured.



Brake test analysis and recording

The data from the widely used brake test are collected, evaluated and recorded by Kistler measuring systems, which can be tailored to suit the railway company's specific application case.



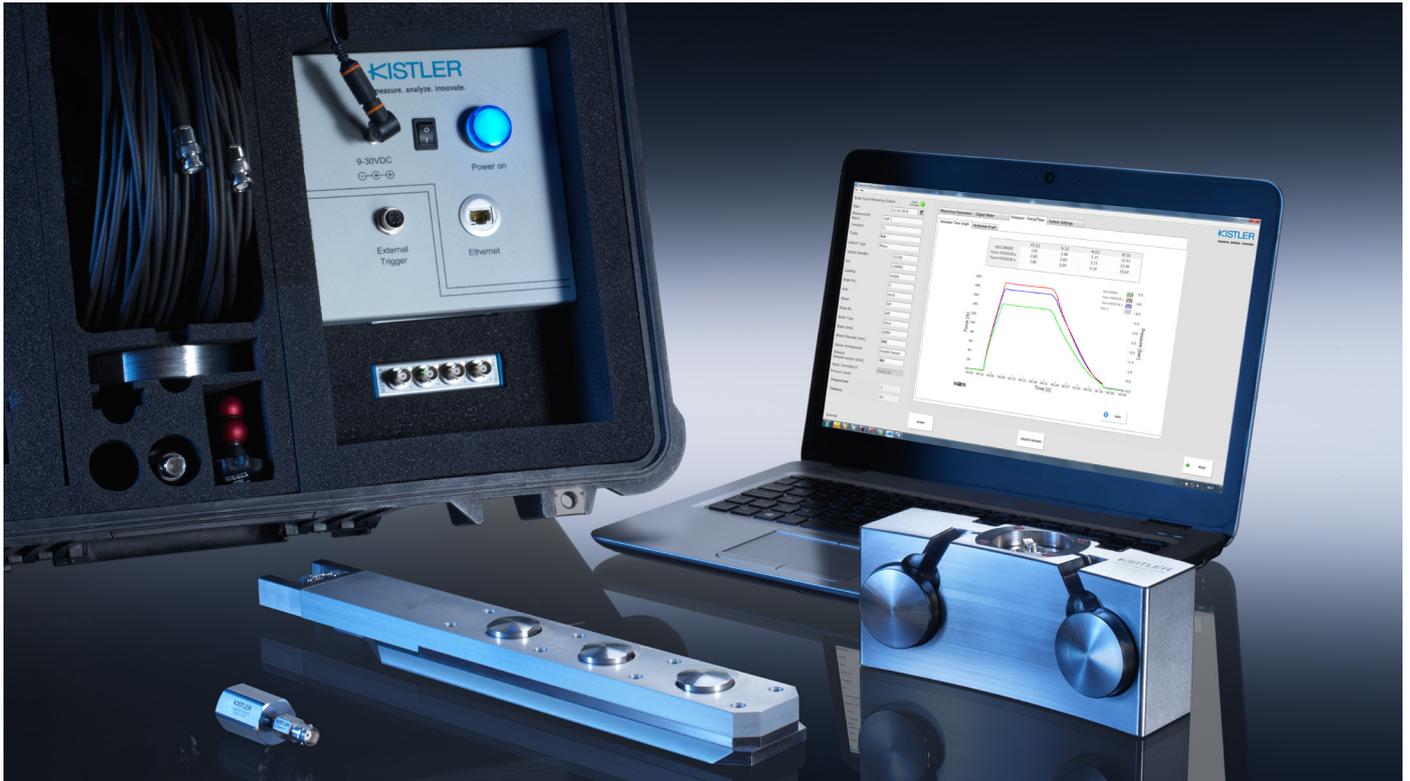
Brake testing on the rail vehicle

The Kistler brake force measuring system Type 2899A tests brake function directly on the rail vehicle as part of regular maintenance or non-scheduled inspections in the case of specific issues.



In-line braking action test

Effective braking performance can be permanently monitored and recorded by monitoring brake pressure and the resultant (delayed) braking action.



Kistler offers an all-in-one brake force measuring system for rail vehicle maintenance

Measuring brake force with maximum reliability

Rail vehicle brake forces need to be checked regularly and brakes maintained to ensure the maximum safety of railway operations. Kistler offers brake force measuring elements for various force ranges up to 60 kN for rail vehicle maintenance.

The Kistler brake force measuring system can be operated with force measuring elements for disc and shoe brakes. The measuring elements are fitted with piezoelectric force sensors and are installed in the brake systems instead of the brake pads. When the brakes are applied, the measuring elements are pressed against the wheel or disk brake. The brake force can thus be measured directly where it is applied. The force generated is then transferred to the piezo crystals in the measuring element, which in turn produce an electrostatic charge proportional to the applied force; the charge is then passed onto the charge amplifier module via a cable. The data acquisition unit is linked via WiFi to the service laptop, which clearly maps the resultant forces in real-time chart format.

A linear signal is generated through the pre-tensioned installation of the force sensors. Wearing parts can be flexibly replaced as required, thus guaranteeing the long-term use of the sensors. The force sensor measuring elements are calibrated and thus measure the absolute force.



Kistler — your partner for enhanced rail vehicle safety

The measuring and processing of operating parameters forms the basis for Industry 4.0 in rail technology. As the leading provider of sensors and measurement technology with many years of experience in dynamic force measurement, Kistler is the ideal partner for your requirements:



<https://youtu.be/xA3Syij5Xng>

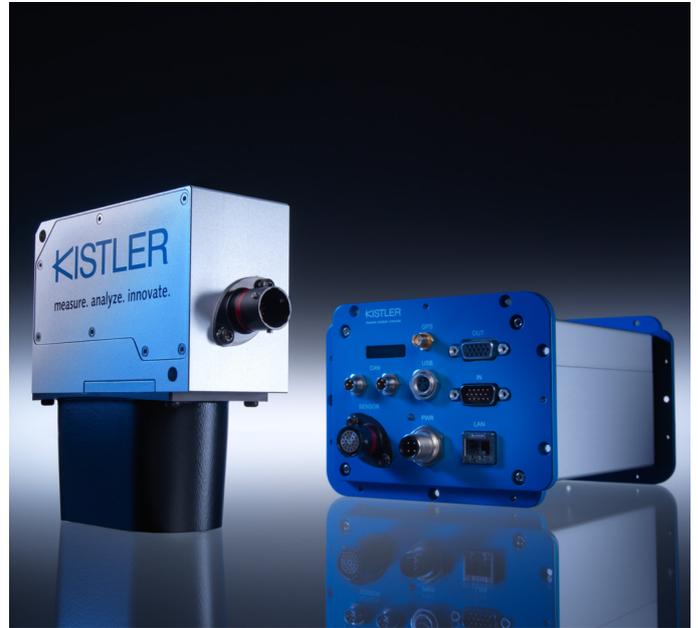


The Kistler brake force measurement system is easy to install

The Kistler brake force measurement system is fast and easy to use. The system comes in a sturdy case that contains all the necessary components from force and compressed air sensors to amplifiers and the data acquisition unit. As the sensor geometry is based on the relevant UIC guidelines, installation is completed at the turn of a hand. The sensors are connected to the measuring case with heavy-duty cables. These are the only cables required by the system: the computer link and power supply are wireless.

Benefits of our brake force measuring system

- Reliable, exact and rugged force sensors for shoe and disc brakes
- Definition of rail vehicle specific-parameters with special brake analysis software
- Reliable recording of the measured results
- Heavy-duty cables
- Flexible configuration for the same-time measuring of up to eight sensors; additional pressure and trigger sensors are possible
- Consistent separation of railway and workshop mass
- Battery power supply for mobile application around the rail vehicle
- WiFi link between system case and service laptop
- All-in-one solution in a practical case



DTI technology for brake test analysis

Kistler offers a mature, holistic measurement solution based on DTI technology in its portfolio for dynamic brake testing on rail vehicles and for all other vehicle dynamic tests. The portfolio includes sensors and triggers, the DTI logger and KiCenter measuring software.

The “one cable for all” concept ensures fast, efficient test setup, including the seamless configuration of all connected sensors in the KiCenter. The measuring software guides the user through the entire test — letting them focus fully on their work and gain valuable time during the test.

Optimum process reliability and use of time

The Kistler DTI technology lets you use one bus system for the entire application. All signals are directly converted into a digital output in the DTI sensors. The sensor data are collected in the central DTI logger and transferred via Ethernet to the computer for evaluation. Thanks to automatic sensor detection, test setup has never been easier: mounting position, calibrating values and the relevant physical quantities are automatically recognized by the Kistler KiCenter measuring software and can be configured in the GUI. Maximum process reliability and efficient use of time are guaranteed.

Advantages of DTI technology

- Efficient and space-saving: one cable for data, synchronization, configuration and power supply
- Decentral data acquisition possible
- Highly reliable mating connectors
- Compatible with existing sensors (GPS, acceleration, force etc.)
- Fast and easy sensor mounting
- Slip-free speed measurement over ground



Experienced Kistler service technicians ensure that the brake force measurement system is optimally installed onsite

Kistler service: measurably more success

Good service is the cornerstone of daily customer care. However, “good” is not good enough for Kistler, which is why you can expect a comprehensive service from us that is precisely tailored to your needs and requirements.

Our service does not stop when you purchase your sensors and electronic measuring equipment from Kistler. We will be happy to advise you with your measuring tasks and help you to select suitable components. Our experienced service technicians ensure that your new system is optimally installed, connected and configured in your plant. After a brief introduction, you can start immediately with your measuring task.

Calibration with seamless documentation

Our calibration service guarantees that Kistler sensors and systems will function perfectly throughout their service life — as the basis for precise and reliable measuring results. Every calibration routine is seamlessly documented. If you like, our measurement technology experts will perform calibration directly on your premises. Thanks to calibration laboratories in China, USA, Japan and Germany, we can perform recalibration quickly and easily at your location.

Custom solutions

As a system provider, Kistler supplies you with all-in-one solutions that optimally satisfy your measurement needs. Our ex-

perts will be happy to create new, tailored solutions with you to optimize performance in your test field.

Kistler services

- One point of contact on all matters
- Advice on selecting measurement equipment
- Setup
- Calibration
- Repair
- Engineering / resident engineering
- Training
- Software maintenance (installation, update, data maintenance, backup)

Other applications of Kistler Rail Technology

- Derailment detection
- Rail weigh-in-motion
- Track condition monitoring system
- Truck hunting monitoring
- Vehicle dynamics analysis
- Special applications: coupling force, traction, crash, test benches, special sensors



At our customers' service across the globe

Thanks to Kistler's global sales and service network, we are always close to our customers. Approximately 1900 employees at 61 locations are dedicated to the development of new measurement solutions and offer customized onsite support of individual applications.

Take the Lead – Right from the Start.
KISTLER
measure. analyze. innovate.
Biomechanics
Force Measurement Solutions for Motion Analysis, Sports Performance Diagnostics, Rehabilitation and Ergonomics
www.kistler.com

Safe braking thanks to efficient maintenance
KISTLER
measure. analyze. innovate.
Brake force measurement in the Rail transport sector
Sensors and accessories for precise brake force loading
www.kistler.com

Flexible to Create and Easy to Integrate
KISTLER
measure. analyze. innovate.
Weigh-In-Motion
Overview of equipment for the range of Traffic Data Collection, Enforcement and Toll Collection Applications
www.kistler.com

Measuring equipment for demanding T&M applications
KISTLER
measure. analyze. innovate.
Test & Measurement
Sensors and signal conditioning hardware
www.kistler.com

Achieve maximum efficiency and stable operation with combustion dynamics monitoring
KISTLER
measure. analyze. innovate.
Thermoacoustics
Measuring combustion dynamics in high temperature environments
www.kistler.com

Analyzing and Commanding Sophisticated Machining Processes
KISTLER
measure. analyze. innovate.
Cutting Force Measurement
Force Measuring Systems for Machining
www.kistler.com

Find out more about our applications:
www.kistler.com/applications

Kistler Group
Eulachstrasse 22
8408 Winterthur
Switzerland
Tel. +41 52 224 11 11

Kistler Group products are protected by various intellectual property rights. For more details visit www.kistler.com.
The Kistler Group includes Kistler Holding AG and all its subsidiaries in Europe, Asia, the Americas and Australia.

Find your local contact on
www.kistler.com

KISTLER
measure. analyze. innovate.