



Müller-BBM Rail Technologies GmbH develops and produces measuring and monitoring systems and software tools specifically tailored for the needs of railway operators, manufacturers and authorities. The applications of our systems focus on vehicle and track maintenance and acoustics.

Our measuring and monitoring systems are used at all types of rail systems as railways, metros or tramways.

The development of our systems is based on the longtime experience and know-how coming from decades of practical work and research in the fields of railway noise and maintenance.

We offer measurements with our products and also rent our measuring and monitoring systems.

We provide trainings for our products and organize conferences in the related railway sectors.

As a partner for technology development and research we support technical progress with our contributions in standardization committees.

Müller-BBM Rail Technologies GmbH is part of the Müller-BBM group, one of the leading companies in the field of acoustics.

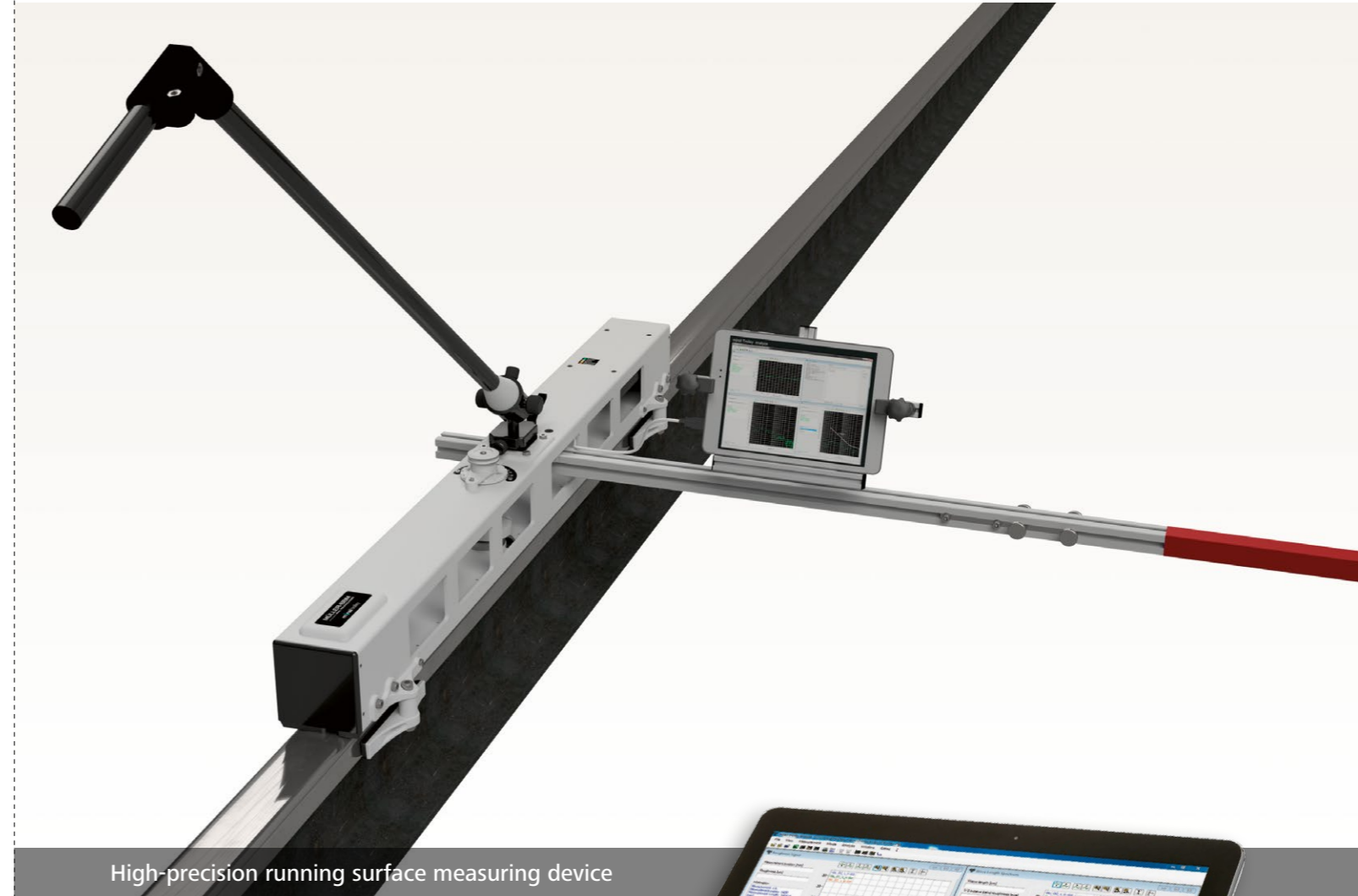
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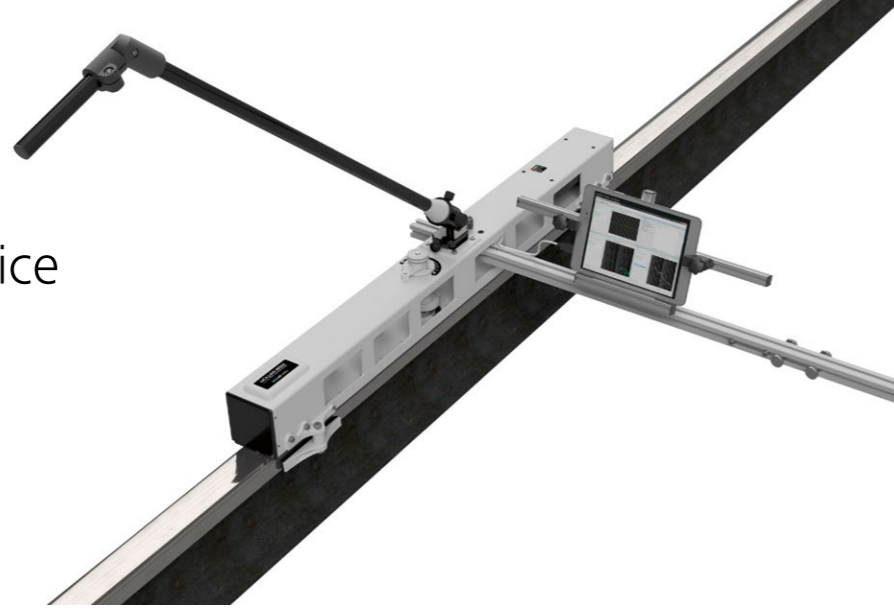
High-precision running surface measuring device

m|rail trolley



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## Rail surface measuring device type M94757-2

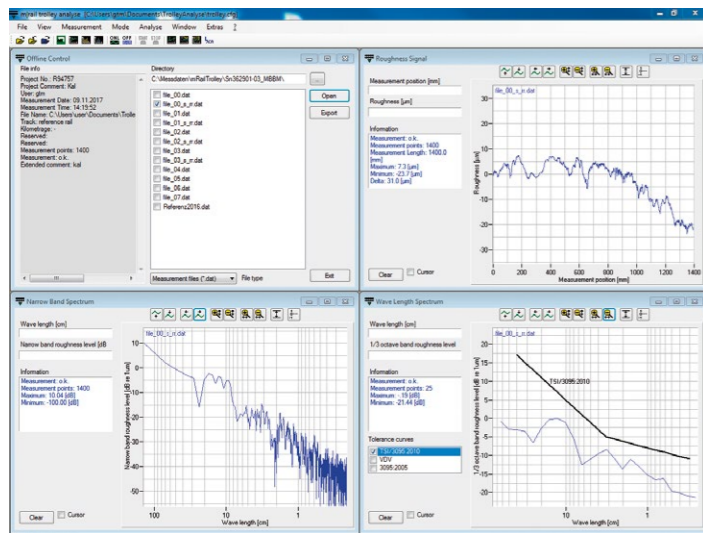


### High-precision rail surface measuring device

The rolling noise of rail vehicles depends on the roughness of rails and wheels. Therefore a detailed knowledge about the roughness of the running surface is essential to assess noise and vibration. This roughness is formed by imperfections in the dimension of a micrometer or even less. The measurement of the roughness thus forms high demands to the precision of the measuring system.

To cope with these requirements, the high-precise rail measuring device m|rail trolley was developed.

m|rail trolley is universal applicable for rail surface measurements in railway acoustics as well as in rail maintenance.



Müller-BBM Rail Technologies is one of the leading manufacturers of rail and wheel roughness measuring devices. The wheel roughness measuring device m|wheel and m|rail trolley are robust and user-friendly high-precision measuring devices. The calibration of our measuring systems is metrologically traceable. The system's software is always adjusted to the current standards.

### Product description

m|rail trolley is a light, moveable and highly precise device for continuous, longitudinal measurements of the rail surface. The calibration of the device fulfills the requirements for an accreditation according to [ISO/IEC 17025].

#### The typical applications of the m|rail trolley are:

- Normative quantification of a track section for acoustic homologation tests [prEN 15610] [EN ISO 3095], [TSI Noise], [EN ISO 3381]
- Determination of input data for acoustic simulations of the rolling noise (e. g. within the design phase)
- Monitoring of the rail quality within the rail network
- Assessment of acoustic grinding
- Evaluation of grinding results according to [EN 13231-3] (longitudinal profile)
- Detection of acoustic and vibration relevant defects as corrugation
- Research work

#### The most important characteristics of the m|rail trolley are:

- High measurement accuracy with high repeatability
- Patented magnetic guiding concept
- Fast and easy installation of the device onto the rail
- Direct measurement of the rail surface by a displacement transducer
- Fast and easy setting of the sensor position
- Graphical user interface provided by the software
- Real-time display of measurement signal (during measurement)
- Full access to the raw data for an extended analysis
- Simple connection to the I/O device through a USB-port
- Power supply via USB-port (no battery required)
- Product support is guaranteed for at least 10 years

### measurement device m|rail trolley

Specifications	
Measurement sensor type	mechanical displacement transducer
Resolution of the measurement sensor	0.1 µm
Measurement range of the measurement sensor	12 mm
Radius of measurement sensor tip	7 mm (standard)
Longitudinal sampling sensor	incremental encoder with hollow shaft
Sampling distance (longitudinal)	1 mm
Lateral position selection	continuous
Lateral position selection range	60 mm
Measuring speed	max. 0.5 m/s
Wavelength range of the acoustic roughness	2,818 mm – 28,18 cm (3,15 mm – 250 mm one-third octave band)
Inherent noise level	< -20 dB re 1 µm
USB interface	FT232R USB UART IC (manufacturer FTDI Chip)
USB interface connector type	type B female
Track gauge range	870 mm – 1524 mm (with standard outrigger, additional range with accessories)
Compatible vignole rail profiles	S 41/10; S 41/14; S 49; S 54; S 64; UIC 54 E; UIC 54; UIC 60; R 65
Compatible embedded rail profiles	Ri 59; Ri 60 (with accessories)
Software	m rail trolley analyse
Ambient temperature range	-10°C – 40°C
Relative humidity	80 % (up to 31°C), linearly decreasing to 50 % at 40°C
Dimensions (length x width x height)	1110 mm x 127 mm 190 mm (without attachments)
Weight	12 kg (incl. outrigger, push rod and tablet-PC mount)
Power supply	5 V DC via USB-connection
Current consumption	280 mA
Housing material	aluminum

### System requirements

Measurement PC	e. g. Notebook, Tablet-PC
Operating system	Windows XP, Windows 7, Windows 8 or Windows 10
USB interface	type A (or corresponding adapter)
Memory (RAM)	min. 1 GB (recommended)
CPU clock frequency	min. 1 GHz (recommended)

### Standards

[ISO/IEC 17025]	General requirements for the competence of testing and calibration laboratories, 2017
[EN 15610]	Railway applications – Acoustics – Rail and wheel roughness measurement related to rolling noise generation
[EN ISO 266]	Acoustic – Preferred frequencies, 1997-08
[EN ISO 3095:2013]	Acoustics – Railway applications – Measurement of noise emitted by railbound vehicles, 2014-07
[EN ISO 3095:2005]	Acoustics – Railway applications – Measurement of noise emitted by railbound vehicles, 2005-11

### software m|rail trolley analyse

Specification of the standard software functionality	
Basic functionality	acquisition of measurement data, editing of measurement data, saving of program configurations, saving of descriptive data (header of measurement data)
Real-time display of measurement signal during measurement	Cartesian plot
Display of measurement signal	Cartesian plot
Spectral level analysis (dB re 1 µm)	third octave band [EN 15610], narrow band
Third octave band limit spectra (default implementation)	[TSI], [EN ISO 30952013], [EN ISO 30952005], [VDV 154]
File format of measurement data	ASCII
Export of graphical diagrams	EMF
Languages	English, German, Chinese (alternative languages on request)

### Specification of the extended software functionality

Enabling method of additional extended functionality	USB-dongle
Post processing of measurement data (single file processing and batch processing)	removal of spikes, curvature correction [EN 15610]
Averaging of measurement data	energetic average of roughness third octave band spectra
Single value indicator analysis (dB re 1 µm)	L <sub>A,C</sub>
Export of third octave band spectra	ASCII
Export of order spectra	ASCII
ISO diagram editor	Standardized third octave band plots [EN ISO 266]

### EN13231-3 software functionality

Profile filters	Gaussian filters according to [EN ISO 16610-21]
Profile filter wavelengths	10 mm – 30 mm, 30 mm – 100 mm, 100 mm – 300 mm, 300 mm – 1000 mm, [EN 13231-3]
Display of profiles	Cartesian plot
Assessment	Tabular, class 1 / class 2 [EN 13231-3]

[TSI Noise]	COMMISSION REGULATION (EU) No 1304/2014 of 26 November 2014 on the technical specification for interoperability relating to the subsystem 'rolling stock – noise', 2014-11
[EN ISO 3381]	Railway applications – Acoustics – Measurement of noise inside railbound vehicles, 2011-05
[VDV 154]	Geräusche von Schienenfahrzeugen des Öffentlichen Personen-Nahverkehrs (ÖPNV), 2011-10
[EN 13231-3]	Railway applications – Track – Acceptance of works – Part 3: Acceptance of reprofiling rails in track, 2012-04
[EN ISO 16610-21]	Geometrical product specifications (GPS) – Filtration – Part 21: Linear profile filters: Gaussian filters, 2013-06