

# Vehicle-mounted corrugation measurement: **RCA**

## RCA



RCA fitted to chassis of the caboose on a main-line grinding train.

RailMeasurement's **RCA** (Rail Corrugation Analyser) is used to monitor the results of reprofiling and to assess reprofiling requirements. The standard equipment is made to a "gullwing" design, but we also supply gauge-adjustable RCAs. RCAs have been made for grinding and milling trains, for small metro grinders and for a hi-rail vehicle; measuring trolleys have also been supplied. The equipment measures tiny irregularities, with an amplitude of microns. Varieties have been made to cover the speed range 0.5-50km/h. The equipment is CE-marked i.e. it complies with relevant European Standards.



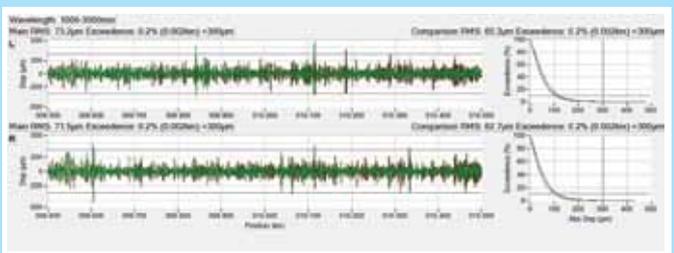
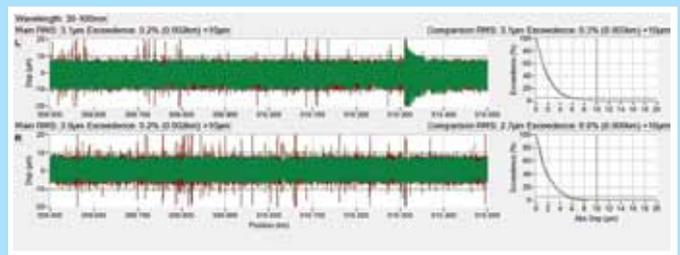
Gauge-adjustable RCA on a small metro grinder.

RCAs are extremely reliable. More than one RCA has been used routinely for more than a decade with minimal maintenance.



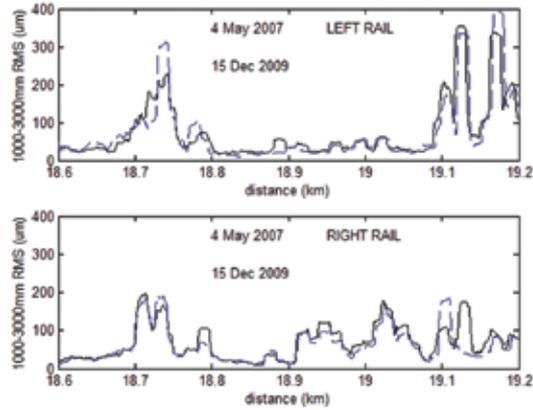
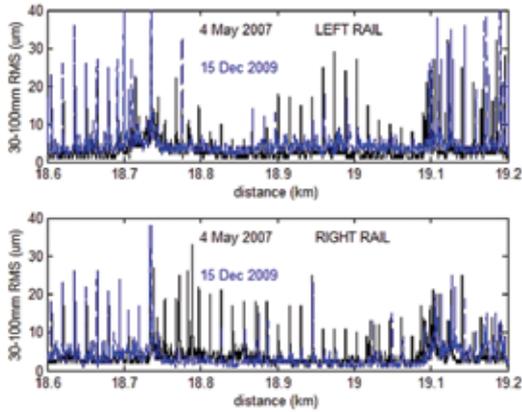
RCA being fitted to bogie of a reprofiling train using a forklift truck. Installation takes less than a day.

RCAs are supplied primarily to give the crew on reprofiling trains a reliable measurement of the severity of irregularities on the rail, and in particular to show if and where reprofiling is required.

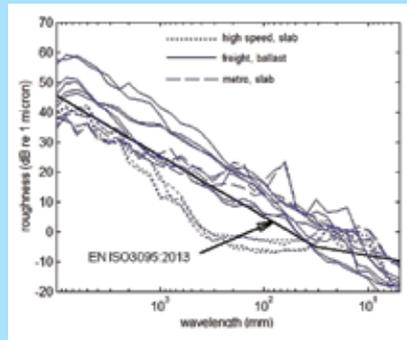


Successive measurements over 1km from an RCA used on a grinder on a dedicated high-speed railway system. Irregularities in short (30-100mm) and very long (1000-3000mm) wavelength ranges are shown. Not only are irregularities minute, but the repeatability of the system is extremely good, in these (and other) wavelength ranges.

The RCA gives measurements of corrugation over the full wavelength range of 10-1000mm that is commonly treated by reprofiling trains. Over this wavelength range the RCA has been comprehensively validated by comparison to the CAT, whose use has been independently verified. The RCA also measures wavelengths of up to 10m with excellent repeatability. These waves are of interest for ground-borne noise and vibration and for track maintenance.



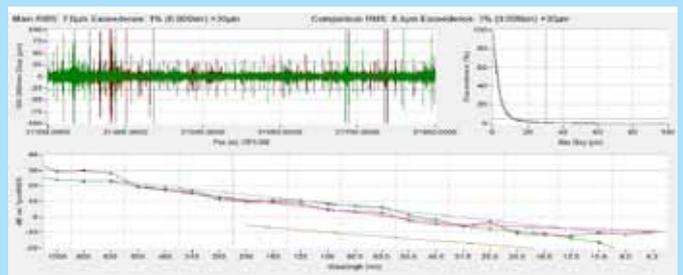
RCA measurements, 30-100mm and 1000-3000mm wavelength ranges, on a metro system taken more than 2 years apart. Although the rails would have been reprofiled during this time, both corrugation and long waves develop in the same place. This is a form of "track memory". Welds are distinct in the short wavelength measurements. Both long and short wave irregularities increase on the run into the station at 19.2km.



The RCA also measures wavelengths of up to 10m with excellent repeatability. These waves are of interest for ground-borne noise and vibration and for track maintenance. The spectra shown are from post-grind measurements made with RCAs on 3 very different railway systems.

The wavelength range is 5mm-10m. The slab track systems, both high speed and metro, have a relatively low level of long wavelength irregularities (1-10m). The "grinding signature" is very clear at wavelengths of 10-100mm. Extremely low irregularities have been obtained by grinding on the high speed railway in the 50-1000mm wavelength range.

Every RCA is validated by undertaking tests of repeatability and by demonstrating that effects of measuring speed, direction of measurement and reprofiling during measurement are minimal. A comparison is also made in situ with a RailMeasurement CAT to assess accuracy.



comparison of CAT and RCA measurements over 500m of track, 100-300mm wavelength range and one-third octave spectra (these are used for acoustics work)

### Technical Data: RCA

interval at which data are saved	2mm	Output compatible with requirements of	<ul style="list-style-type: none"> <li>EN 13231-3 and equivalents</li> </ul>
Measuring speed (typical)	<ul style="list-style-type: none"> <li>3-15km/h (typical)</li> <li>0.5-50km/h (variants)</li> </ul>	Output	<ul style="list-style-type: none"> <li>raw and filtered displacements</li> <li>moving average amplitudes (RMS and peak-to-peak) vs. distance</li> <li>percentage exceedences</li> <li>tabular output of areas exceeding prescribed limits, for planning of grinding</li> <li>ASCII data</li> </ul>
Precision of measurements (displacement)	0.1µm (0.0001mm)		
Measurement of	<ul style="list-style-type: none"> <li>plain line switch and crossing work</li> </ul>	Reproducibility grinding and not grinding (over site of >50m length within requirements of EN13231-3:2006)	Better than <ul style="list-style-type: none"> <li>1µm RMS 10-30mm</li> <li>1µm RMS 30-100mm</li> <li>2µm RMS 100-300mm</li> <li>5µm RMS 300-1000mm</li> </ul>
Minimum curve radius	<150m		
Accuracy c.f. CAT (over site of >50m length reprofiled within requirements of EN13231-3:2006)	Better than <ul style="list-style-type: none"> <li>1µm RMS 10-30mm</li> <li>1µm RMS 30-100mm</li> <li>2µm RMS 100-300mm</li> </ul>	Filters, built-in	<ul style="list-style-type: none"> <li>10-30mm, 30-100mm, 100-300mm, 300-1000mm, 1000-3000mm</li> <li>30-300mm, 300-3000mm</li> <li>150-1500mm, 1000-1500mm</li> </ul>
Data storage requirements	< 2MB per kilometre of track	Options	<ul style="list-style-type: none"> <li>gauge-adjustable measuring system</li> <li>detection and quantification of discrete defects</li> <li>hydraulic actuation</li> <li>training course</li> </ul>