

## MERLIN - MODEL A1460

### Machine for **E**valuating **R**oad roughness using **L**ow cost **I**Nstrumentation

The MERLIN, based upon the UK Transport Research Laboratory (T.R.L.) design, is used to measure road roughness, usually as a method of calibrating other road roughness measuring instruments, such as the CNS Farnell Bump Integrator (Model A1471). The MERLIN is inexpensive, easy to use and easily maintained.

The longitudinal unevenness of a road's surface, 'roughness', is both a measure of the road's condition and an important factor in determining vehicle operating costs. It is usually measured on a standard roughness scale such as the Bump Integrator scale or the International Roughness Index (IRI). The MERLIN is designed to measure the roughness of calibration sections.

To measure the roughness over a road network, one technique is to fit a Bump Integrator into a vehicle to measure the movements between the back axle and the body. The equipment is then calibrated by running the vehicle over a series of test sections of 'known' roughness.

The MERLIN is supplied in kit form. When assembled, it has a rigid 1.8m long metal frame, with a wheel at the front, a curved foot at the rear and a probe mid-way between the two which rests on the road surface. If the road were perfectly smooth, the probe would always lie on a straight line between the bottom of the wheel and the rear foot. If the road were uneven, the probe would usually be displaced above or below the line. On a moderately rough gravel road, for example, the displacements would typically fall in the range  $\pm 10\text{mm}$ . A computer simulation showed that the spread of these displacements could be used to estimate roughness on the standard roughness scales.

To measure the displacements, the probe is attached to a pivoted arm, at the other end of which is a pointer which moves over a chart. The arm is pivoted close to the probe so that a movement of the probe of 1mm will produce a pointer movement of 1cm.



The roughness of a section of road is measured by wheeling the MERLIN along the road with the frame raised. Once every wheel revolution, the frame is lowered so that the probe and rear foot touch the ground and the resulting pointer position is recorded as a cross on the chart. Two hundred measurements are made to produce a histogram. The width of the central 90 per cent of the histogram is measured from the chart and this can be converted directly into roughness from conversion equations that is supplied.

#### **Specifications**

Case size: approx. 122x110x40cms  
Volumetric weight: approx. 90kgs.

Ref: *T.R.L. Report 229 (1996)*  
*World Bank Technical Paper 45.*