

## **MERLIN TEST APPARATUS**

### **BE 99**

The MERLIN (Machine for Evaluating Roughness using Low-cost Instrumentation) is a simple, cost-effective device designed to measure road surface roughness, which is critical for assessing road conditions and vehicle operating costs. Below, I address your queries about its features and provide a detailed explanation of its operation based on the provided information.

### **ADDRESSING YOUR QUERIES**

- **Easy to use:** MERLIN is user-friendly, requiring minimal training. It can be used for direct roughness measurement or to calibrate other instruments like the Vehicle Mounted Bump Integrator, making it versatile and accessible.
- **Self-calibrating:** The device is designed to be self-calibrating, eliminating the need for frequent external calibration, unlike many other complex instruments, which simplifies its operation.
- **Robust:** Constructed with a sturdy 1.8-meter metal frame and readily available components, MERLIN is durable and capable of withstanding field conditions.
- **Easily maintained:** Its simple design and use of common, readily available components make maintenance straightforward and cost-effective.
- **No complex calculations:** MERLIN's operation does not involve intricate calculations. The roughness is indicated by the spread of pointer positions on a chart with 5 mm wide columns, providing a simple, visual representation of road unevenness.
- **Measures displacement to less than a millimeter:** The device is highly precise, with a probe that measures vertical displacement to less than a millimeter. The arm's pivot amplifies this displacement, so a 1 mm vertical movement of the probe results in a 1 cm movement of the pointer, ensuring accurate readings.

### **PRINCIPLE OF OPERATION**

MERLIN consists of a 1.8-meter-long metal frame with a wheel at the front and a metal foot at the rear, with handles above the rear foot for easy movement. A probe, positioned midway between the wheel and foot, is attached to a weighted arm that keeps it in contact with the road surface. The arm is pivoted near the probe, amplifying vertical displacement: a 1 mm vertical movement of the probe translates to a 1 cm movement of a pointer at the other end of the arm. This pointer moves across a chart with 5 mm wide columns, providing a visual record of the probe's position relative to an imaginary line connecting the wheel and foot.

By recording the pointer's position at multiple points along a road, the spread of readings indicates the road's roughness. A greater spread corresponds to a rougher road surface, and this spread has been shown to correlate well with standard roughness scales, ensuring reliable measurements.

