



Surface And Road Profiling Using An LCA-100 High Precision Inclinometer



- **Objectives:** Accurately measure surface roughness
- **Solution:** **Jewell Instruments LCA-100**
- **Benefits:** High-precision and repeatability
- **Results:** Reliable and detailed surface profiles

Overview

Surface Profiling is the process of quantifying the roughness of a surface. The device used to perform surface profiling is called a profilometer. There are two general types of profilometers: contact and non-contact.

Contact profilometers use a diamond stylus that touches the surface to be profiled. The radius of the stylus ranges from 20 nm to 25µm, and the stylus tracking force is less than 50 mg. As the stylus moves against a surface, its displacement is converted into a digital signal that

is stored, analyzed, and displayed by the profilometer.

Non-contact, or optical, profilometers are also used for surface profiling. Optical profilometers use various techniques for profiling, such as: laser triangulation, confocal microscopy, and digital holography. Non-contact profilometers are reliable and very fast. The optical spot size is in the micrometer range.

Surface profiling of roads is a popular application for non-contact profilometers. This involves the identification, measurement, and recording of pavement road-surface defects. Small vans are fitted with laser profilometers to perform digital imaging surveys. As the van is driven along the road, the profilometer collects data that document the roughness, rutting, and surface texture of the roadway. Data is used for verification of deterioration rates as well as the basis for planning maintenance.

Non-contact measurement is faster than contact measurement, especially for applications with high sampling rates. Because contact-type devices must touch and then traverse the object, measurement is slower. Non-contact systems



[Jewell Instruments LCA-100](#)



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can also measure more points at one time and without putting pressure on the object. In addition, non-contact measurement do not cause any surface damage, are able to measure smaller asperity than contact types.

International Cybernetics Corporation (ICC) has designed a surface profiling system for evaluating the smoothness of pavement. The Profiler uses an infrared laser and precision accelerometer to

obtain an accurate, precise profile measurement. It uses the measurement to calculate a profilograph index (PI), international roughness index (IRI), and ride number (RN) which is used to rate the surface smoothness. The system also generates a profilograph type plot with defect locations and must grind lines, which tells the user where the roughness exists and what corrective action to take.

Accurate, Efficient

The Profiler offers many benefits over the conventional method of measurement. It doesn't require any set up or breakdown and operates at speeds up to 65 MPH. This permits rapid, real-time measurements. This also eliminates the need for lane closures or traffic control to test existing pavements. When the Profiler is used on an ATV it is so lightweight it can test pavements before they have completely set up. The Profiler can be provided on any vehicle required by the user.

The ICC Profiler system consists of an industrial-hardened PC with printer, LCA-100-14.5 high precision accelerometer from Jewell Instruments, laser height sensor, data acquisition sub-system (DAS) and distance measuring instrument (DMI). The equipment is mounted to an all-terrain vehicle (ATV) or can be supplied to mount into any specified vehicle. The LCA-100 +/-5G precision accelerometer is used to measure vertical acceleration for road profiling. The system collects data in real-time as it traverses the pavement's surface. The raw data is processed, and the results

are output in standard or metric units on the flat panel display or graphics printer and are saved on a hard drive or floppy drive.

The equipment meets the requirements of an ASTM E950 Class 1 profiling device and is certified as an approved equal for the profilograph. The Profiler is a non-contact measuring device. The data collected is not affected by vehicle variations (i.e. speed, weight and suspension). Measurements are not affected by changes in temperature, pavement color or texture, sunlight, wind and speed.

System Features:

- Industrial Hardened PC High-Speed CPU
- Active Matrix Flat Panel Display
- High-Capacity Hard Drive
- Profilograph Simulation with bump i.d. and must grind lines
- Event Marking Keypad Photo Triggering Device for Automatic Start/Stop and Event Marking
- Graphics Printer



Dual-track Profiler configured with "Mule" records at up to 20 MPH.

About Jewell Instruments

Jewell Instruments is a world leader in the design, manufacture, and distribution of high-precision products. Our expertise includes acceleration and tilt sensors, electronic compasses, avionics components, solenoids, and panel meters. The extensive application knowledge we have obtained through decades of experience allows us to provide custom solutions for a diverse group of industries. In fact, customers from all over the globe contact us for solutions to aerospace, medical, industrial, and telecommunications applications - to name a few.

To find out more, visit our website!



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