

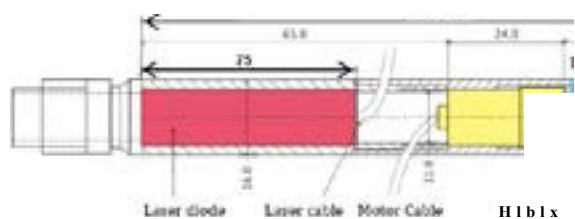
DEVELOPMENT OF LASER GUIDED DEEP-HOLE MEASUREMENT SYSTEM: ADJUSTMENT TO A SMALLER SIZE HOLE

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Introduction. Deep holes are bored with the meter, millimeter, and micrometer level diameters in engineering. Examples of such holes with large 100-millimeter-level diameters and meter-level lengths are the rotation shafts of jet engines, generators and cannons. Holes with normal 10-millimeter-level diameters and lengths of several hundred millimeters are used for the main spindles of machines, the small cylinder in plastic injection molding, the tube sheet for heat exchanger, and guns. To measure such components the proposed measurement system consists of a measurement head in order to scan hole wall, a laser interferometer for measuring surface parameters of the hole and an optical device at the backside for detecting attitude of the measurement head. As a result of experimental analysis, it is observed that deep hole having small diameter and long length can be measured automatically by the new developed measurement system [1-2].

Methodology. Figure 1 shows below the principal measurement components. The measurement unit consists of a measuring unit to scan hole wall, front and rear actuators mounted on an actuator holder, and a laser diode set in the back end of the holder. CCD cameras are used to detect the probe position and inclination instead of PSDs. The measuring unit consists of a pentaprism and a corner cube prism fixed on a feeler.



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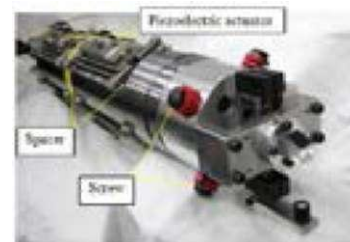


Figure 1. Laser guided deep hole-evaluating probes

Results and discussion. The results from the new type of measurement system are shown below in **Fig.2**. Roundness curve shows the measured roundness inside the manufactured component. And the cylindrical shape indicates the complete roundness for a 40 mm long hole.

Conclusions. The developed system is able to measure small diameter based long holes. The system can be adjusted to a bigger measurement unit consist of similar technique such as Jet Engine's Shaft, Shinkansen and Ship Turbines. It can also determine Lamda Ratio (X') in case of bearing surface measurement.

References.

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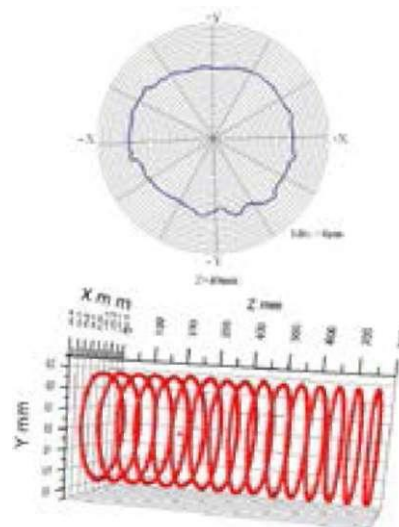


Figure 2. Roundness measurement results