Brake Disc Thickness Variation Drives Performance

Micron level disc thickness variations induce brake vibration and noise. LVDT probes provide insufficient profiles. ShaPix high-density data leads to customer satisfaction and lower warranty costs

ShaPix® Case Study #906

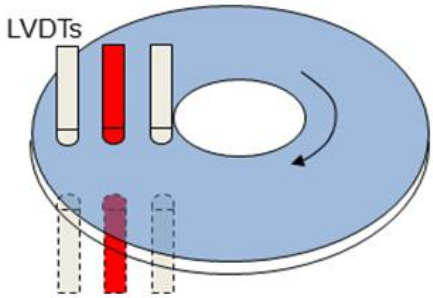
Brake noise/vibration important to driver satisfaction

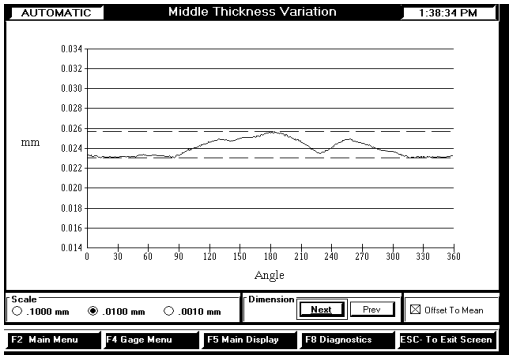
Micron level geometric dimensions of brake discs impact brake performance Brake noise, vibration and harshness (NVH) experienced by consumers is perceived as vehicle “ride quality”. As engines and power trains have become more efficient and quieter, braking system noise and vibration has become more apparent to drivers and passengers.

Present metrology insufficient

Brake disc parallelism and uniform thickness are required to avoid brake NVH that produces a poor ride quality perceivable by the driver. Poor ride quality results in customer dissatisfaction and excessive warranty repair costs leading to reduce repeat customer sales and higher product lifetime costs.

Traditional methods to control disc brake geometric dimensions use LVDT sensors where only a few radii around the brake rotor centroid are ever measured. This sparse measurement leads to inaccurate characterization of brake surface parallelism and planarity by leaving large sections unmeasured, increasing the risk of customer dissatisfaction and increased costs.





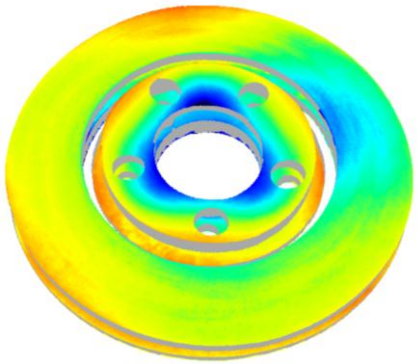
High-density 3D surface maps show the true picture

Brakes work over large areas therefore the whole area needs characterization for best performance. To ensure that all disc thickness variations (non-parallelism and/or non-planarity) are reliably detected to micron-level accuracy it is necessary to measure and analyze the entire surface of both sides of the brake disc, and specifically their relationship in a single coordinate system

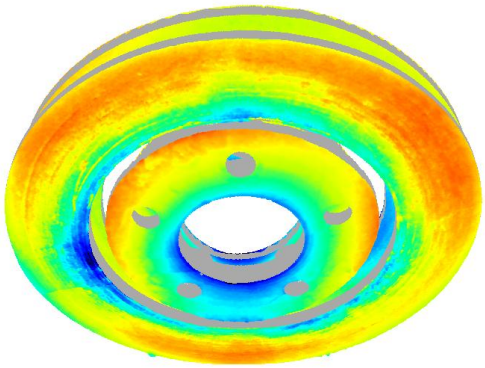
Coherix®

ShaPix measures all critical parameters

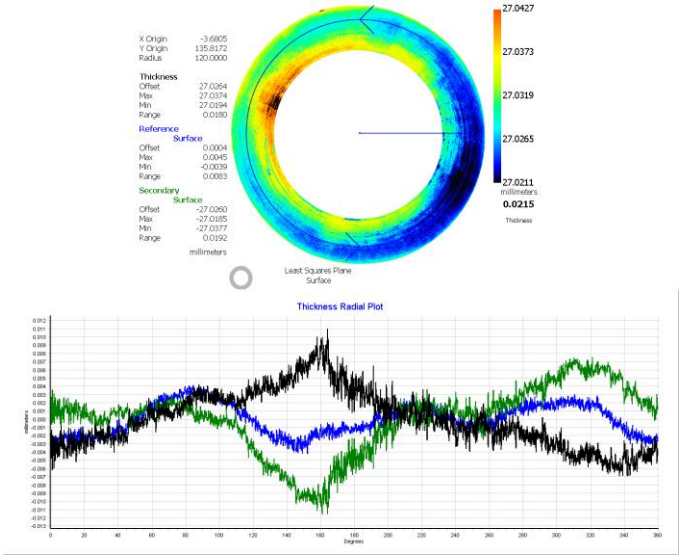
ShaPix produces a 3D map with less than 1 um height measurement uncertainty and 80 um image resolution on both surfaces (sides) of the brake disc. To accomplish this unique result, ShaPix employs a combination of fiducial-equipped fixtures and 3D measurement and analysis algorithms to accurately determine the entire geometric relationship of the two disc sides and produces a high-definition complete disc thickness map for the rotor. This entire measurement sequence takes less than five minutes.



3D Measurement of brake disc faces and hub mating surface.



The ShaPix results below show, in an immediately clear visual form, the thickness, parallelism and flatness including the relationships of all surfaces across the entire disc surface.



ShaPix increases customer satisfaction and lowers costs

ShaPix provides full characterizing of brake disc dimensional parameters not achievable by any other means at the rate of a few minutes per rotor. Full high definition maps show important surface relationships in clear high-resolution 3D maps. ShaPix gives manufacturing engineers the tools they need to reduce warranty costs while increasing a vehicle's customer-perceived and actual quality.

Coherix designs and delivers high-speed, high-definition, 3D metrology and inspection tools for product development and the management of manufacturing processes for the precision manufacturing and semiconductor industries.

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