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**Panasonic Develops Ultrahigh Accurate 3D Profilometer for
High-Precision Components**

Development of unique probe enables measuring vertical surface within $\pm 0.15 \mu\text{m}$ accuracy
The company to start taking orders in October 2009

Osaka Japan - Panasonic Corporation has developed an ultrahigh accurate three-dimensional profilometer with a unique, newly-developed probe^[1]. The new machine can measure surface profiles including pores at least $50 \mu\text{m}$ in diameter within a flat surface area of 100 mm in length and width and a vertical surface of a micromachined sensor^[2] to an accuracy of $\pm 0.15 \mu\text{m}^*$. The measurement can be done at a speed of 2 mm per second. This new 3D profilometer responds to increasing needs for extremely accurate measurement of high-precision components used in such products as mobile phones and automobiles to name a few.

Panasonic's new profilometer can measure surface profiles of not only such components themselves but also the interior and exterior walls of their metal molds accurately at a submicron order. On the other hand, conventional contact-type profilometers^[3] can achieve a measurement accuracy of only several microns. The new contact profilometer will help make the products even smaller and more sophisticated. It will also help increase production efficiency and reduce lead time.

When tracing an object, the newly-developed probe uses the slightest, infinitesimal contact force of 0.3 mN , equivalent to that caused by a mosquito's landing, without damaging the surface. By maintaining constant and steady contact with the object with such light load, the machine has achieved the ultrahigh accuracy of $\pm 0.15 \mu\text{m}$. This was made possible by Panasonic's optical servo control technology^[4] allowing for accurately controlling relative positions between the probe and the object.

The machine also employs Panasonic's vibration analysis technology to achieve optimal anti-vibration mechanism, evaluating the machine's frame structure and vibration effects of the machine itself and surrounding equipment on the same floor. As a result, the new

profilometer has an improved anti-vibration performance, while having a smaller footprint, a 50% reduction from the current Panasonic product. Now it can be installed on the same floor with the manufacturing equipment, no need for setting up a separate room dedicated to the machine.

The new profilometer also incorporates Panasonic's optical design technology. It uses semiconductor lasers for spot measurement on the vertical surface and continuous measurement of the horizontal surface. The technology has incorporated the horizontal and vertical optical systems into a single mirror inside the probe so that the user can measure both surfaces accurately and continuously without need for repositioning the object. (Figure 1)

In terms of accuracy, there are non-contact type profilometers^[5] using laser beams that can attain accuracy comparable to the new Panasonic machine. Because they need to incorporate a laser projector and a light detector, however, it is difficult to make them smaller. Besides, when measuring an object made of multiple kinds of materials with different light reflection properties, accuracy tends to be sacrificed.

Panasonic holds 57 patents in Japan and 17 patents in other countries on the new machine including pending applications.

Panasonic Factory Solutions Co., Ltd., a Panasonic subsidiary providing equipment and solutions to innovate manufacturing process, will add the new profilometer as new L Series to its UA3P lineup^[6]. The company will start taking orders in October 2009 in Japan.

*Relative displacement amount from a perfect sphere of 11 mm as a standard of measurement

[Explanation of Terms]

[1] Probe

The probe developed by Panasonic allows for continuous scanning of a vertical surface from the side with an imperceptible force of about 0.3 mN, equivalent to that caused by a mosquito's landing. When looked at the cross-section of a measured object in a horizontal position, the focus servo can follow from any direction (360 degree) only in a horizontal plane.

[2] Micromachined sensor

The sensor with the mechanism miniaturized by the fine machining processing technology and the silicon processing technology of semiconductor. Many sensors such as a pressure sensor, an angular rate sensor and an acceleration sensor, transduce physical quantities (energy) into electrical signals.

[3] Contact type measuring machine

A common 3D measuring device which, being equipped with a stable contact probe, detects displacement of up and down, right and left, and back and forth. This probe is large-scale

because both the airslide and the linear scale of XYZ axes directions are built into. Since the airslide is moved by repulsive force from a measuring object, the force acting on a measuring surface requires 1mN or more. Besides, the generation of backlash in the slide part and distortion all over the probe leads its accuracy to be 1 μ m or more.

[4] Servo control

A servo control means a feedback control which changes controlled variables to help follow target values, continuously comparing controlled variables and target values between the position and the angle.

[5] Non-contact type measuring machine

Using the light source such as a laser, it detects the light at the light-receiving detection part after reflecting the light emitted from the light irradiation part upon a surface of an object to be measured. As a result, it can measure the distance from the object by applying the triangulation method. But it is difficult to measure a slope and distinguish clearly a slope from a distance even though a slope is detected in some surface. And there is even a problem such as light scattering depending on either a surface condition or a material of the reflecting surface.

[6] UA3P-L Series

A lineup of Panasonic's ultra high precision 3D measuring machines (UA3P). L stands for Light, Layout-Free and In-Line. These products are based on the following three concepts.

- 1) New measuring method: LIGHT for difficult measurements such as a side surface shape in a microhole.
- 2) Compact size (small-footprint): installation on a narrow manufacturing site, laying out free.
- 3) Against vibration: installation in a production line on a manufacturing site with a processing machine. Measures must be taken to prevent the oil of a processing machine from floating in the air.

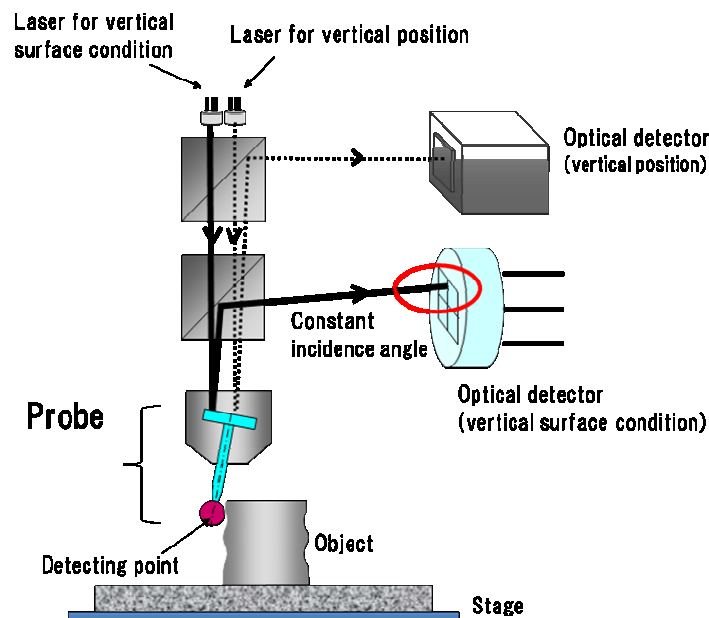


Fig.1 Optical System in Ultrahigh Accurate 3D Profilometer

About Panasonic

Panasonic Corporation is a worldwide leader in the development and manufacture of electronic products for a wide range of consumer, business, and industrial needs. Based in Osaka, Japan, the company recorded consolidated net sales of 7.77 trillion yen (US\$78.4 billion) for the year ended March 31, 2009. The company's shares are listed on the Tokyo, Osaka, Nagoya and New York (NYSE: PC) stock exchanges. For more information on the company and the Panasonic brand, visit the company's website at <http://panasonic.net/>.