

# MicroSense 6810

Ultra High Resolution Capacitive Position Sensor

The MicroSense 6810 is a low noise, high resolution non-contact capacitive sensor that is ideal for measuring position and displacement over ranges up to 2 millimeters. When combined with one of MicroSense's non-contact 6000 series probes, the 6810 provides measurement resolution down to the sub-nanometer level. The 6810 instrument features user-selectable measurement bandwidth up to 100 kHz, and is optimized for "high dynamic" applications such as measuring axial and radial run out of high speed air bearing spindles, precision stages or fluid dynamic bearing motors.



## Applications

Axial and radial run out measurement of high speed mechanisms including

- Hard disk drive motors
- Air bearing spindles
- Machine tool spindles

Precision stage straightness, flatness and vibration measurement

Fast tool servo loop feedback

Machine vibration measurement

Precision bearing measurement

Linear positioning sensing and servo feedback

Nanopositioning system feedback

## Benefits

Advanced low noise design provides sub-nanometer measurement resolution

Displacement measurement using capacitive sensing – target material or reflectivity has no effect on measurement accuracy

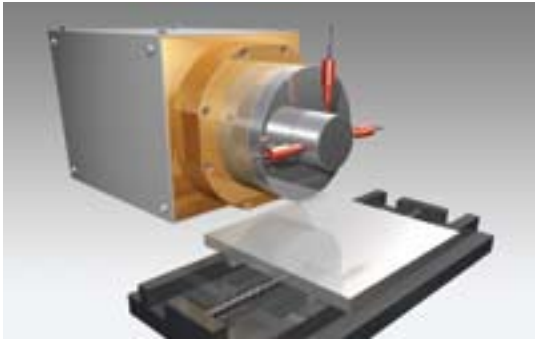
High measurement bandwidth, from 1 kHz up to 100 kHz for "high dynamic" applications

Completely non-contact design

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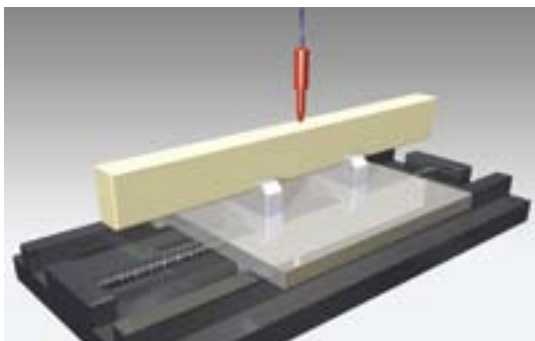
The 6810's advanced capacitance sensing circuitry provides precise displacement measurements, even in applications with poorly grounded targets: air bearings, ceramic bearings and fluid dynamic bearings.



Three 6000 series probes, shown in red, set up to measure milling machine spindle run out

## Spindle and Precision Motor Runout Measurement

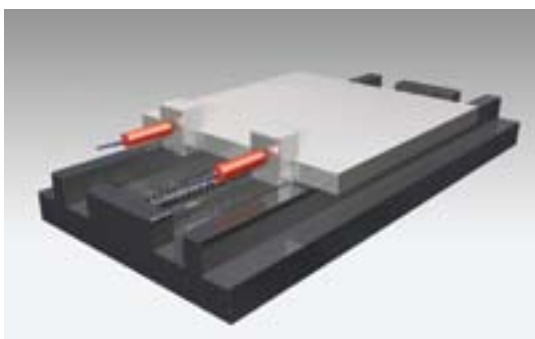
The MicroSense 6810 enables dynamic measurement of high speed spindle run out to verify spindle performance specifications. Since the 6810 is capable of nanometer resolution, it is particularly well suited for generating measurement data for analysis of both repeatable run out (RRO) and non-repeatable run out (NRRO). The non-contact measurement probes have standard sensors as small as 0.5 mm diameter so that measurements can be made at the tool point, using ground cylindrical targets. For Hard Disk Drive spindle motor measurement applications, it is possible to directly measure the rotating disk hub.



Precision stage flatness measurement, using special probe and ceramic target

## Straightness and Flatness Measurement

The MicroSense 6810 provides a method for making direct measurements of straightness and flatness of high precision machine tools and stages, without the averaging errors found in laser interferometer based systems.



Precision stage repeatability test, using two probes

## Repeatability and Vibration Measurement

The MicroSense 6810 can directly measure machine repeatability and vibration. Compact measurement probes can directly measure at the point of interest. For example, vibration can be measured at the tooling mounting surface, such as a machine tool fixture or a wafer chuck mounted on a precision stage.

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## Features

- High resolution, down to sub-nanometer level  
(0.25 nanometer rms@ 5kHz over 50 micrometer measurement range)
- User selectable measurement bandwidth (1 kHz, 5 kHz, 20 kHz, 100 kHz)
- Measurement range from 20 micrometers up to several millimeters
- Industry standard  $\pm 10$  volt analog output
- Certified, NIST traceable calibration accuracy (calibration certificate supplied with every unit)
- Extremely compact, includes MicroSense isolated low noise power supply
- 3U Eurocard format available
- Compatible with MicroSense's 6000 series sensors, available in a variety of sizes

## Advanced Position Measurement Technology

The 6810 capacitive sensor is based upon MicroSense's patented ultra-low noise capacitance sensing technology. Capacitive sensing is the most precise means of electrically measuring linear displacement, providing resolution equivalent to a laser interferometer at a fraction of the cost. It can be used with any grounded, conductive target material. Special sensors are also available for detecting the surface of non-conductive targets such as glass or ceramic over ranges of a few hundred microns. Target material or target reflectivity has no effect on measurement accuracy. The 6810's advanced capacitance sensing circuitry provides precise displacement measurements even in applications with poorly grounded targets.

## 6000 Series Measurement Probes

A variety sensor heads, or probes, are available for use with our 6800 Series capacitive position sensors. The resolution of our capacitive position sensors is determined by a combination of the active sensing area of the probe, the measurement range, and the measurement bandwidth of the gauging module (electronics unit).



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Model 6800 OEM rack mount version



Model 6810 includes low noise isolated power supply

## Specifications

Standard Measurement Range	$\pm 25\mu\text{m}$ , $\pm 50\mu\text{m}$ , $\pm 100\mu\text{m}$ , $\pm 250\mu\text{m}$ , $\pm 500\mu\text{m}$ , $\pm 750\mu\text{m}$ (calibration range is sensor size dependent, see chart below)
Analog Output	$\pm 10$ volts full scale, single ended and differential (options $\pm 5$ volts, 0 – 10 volts)
Sensor Input	MicroSense 6000 series probes and sensors
Measurement Bandwidth (@-3dB)	1 kHz, 5 kHz, 20 kHz, 100 kHz (jumper selectable)
Linearity	0.25% over full scale range
Stability	200 ppm/°C
Target Material	Any conductive material (sensors for non-conductive materials such as glass or ceramic also available)
Over Range Detection	TTL outputs and front panel LEDs indicate near and far limit condition
Front Panel Adjustments	Scale factor, zero offset, limit settings
Operating Environment (Temperature)	0 to 50°C
Operating Humidity	<85% RH, non-condensing
Power Requirements	90 to 240 VAC, 50/60 Hz
Size	175mm (L) x 110mm(W) x 40mm (H)
Weight	0.5kg, power supply is 0.8kg

## Measurement Resolution

Typical measurement resolution in nanometers, r.m.s., by filter setting

Probe Model	Sensor Diameter	Measurement Range	1kHz	5kHz	20kHz	100kHz
6504-01	0.5mm	$\pm 25\mu\text{m}$	0.25nm	0.25nm	0.45nm	1.00nm
6504-01	0.5mm	$\pm 50\mu\text{m}$	0.35nm	0.50nm	1.00nm	5.00nm
6501	1.0mm	$\pm 100\mu\text{m}$	0.50nm	0.80nm	1.15nm	5.00nm
6501	1.0mm	$\pm 250\mu\text{m}$	2.75nm	4.75nm	12.00nm	35.00nm
6502	2.0mm	$\pm 100\mu\text{m}$	0.50nm	0.66nm	0.91nm	3.00nm
6502	2.0mm	$\pm 250\mu\text{m}$	1.00nm	1.00nm	3.50nm	12.00nm
6503	5.0mm	$\pm 500\mu\text{m}$	3.60nm	4.75nm	6.00nm	15.00nm
6503	5.0mm	$\pm 750\mu\text{m}$	4.00nm	4.00nm	11.50nm	20.00nm
6620-LR	0.25mm x 2.00 mm	$\pm 100\mu\text{m}$	1.25nm	1.80nm	-	-

Note-Probe to target standoff at center of range is equal to total measurement range

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