

NanoGage 100: Short Range Position & Displacement Sensor

PRODUCT DESCRIPTION

NanoGage™ 100 is a non-contact ultra precision optical displacement sensor with a 100 micron measurement range and a resolution of 15 nanometers. It offers a 3mm working distance and can be used with a wide range of target materials including metal, semiconductor, or glass. The optical sensor is easy to adopt within existing designs and is equivalent to a high resolution capacitance gage while offering a larger stand-off. The NanoGage 100 sensor is an ideal tool to be used for maintaining constant position, vibration measurement, run-out measurement, or surface profiling.

NanoGage is a laser diode optical triangulation sensor assembled with exquisite precision and which employs diffraction-limited lenses. The small size of the NanoGage sensor allows for easy substitution when upgrading from other sensors, such as capacitance gages. It has a capture range of about 800 microns and a 100 micron linear measurement range. It is highly insensitive to temperature and electromagnetic interference. The small measurement footprint of a NanoGage can ensure proper measurement at a single point.

The large 3mm stand-off is advantageous in manufacturing applications where handling equipment requires additional clearance, such as with semiconductor wafers. It has been developed for convenience of installation. A large measurement bandwidth also makes the sensor well-suited for high speed run-out or vibration measurements.

OPTRA produces complementary high precision encoders, including NanoGrid and NanoScale, for feedback of all six degrees of freedom on ultra-precision positioning systems.



ADVANTAGES

- High measurement resolution
- Large stand-off: 3 mm
- Insensitive to temperature and electromagnetic interference
- Small measurement footprint: ~100 μm
- Large bandwidth: 100 kHz
- Easily replaces capacitance sensors
- Full technical support; customization available

APPLICATIONS

- Short-range servo control feedback
- Run-out measurements
- Auto focus sensor
- Vibration measurements
- Surface profiling

NanoGage 100

TECHNICAL SPECIFICATIONS

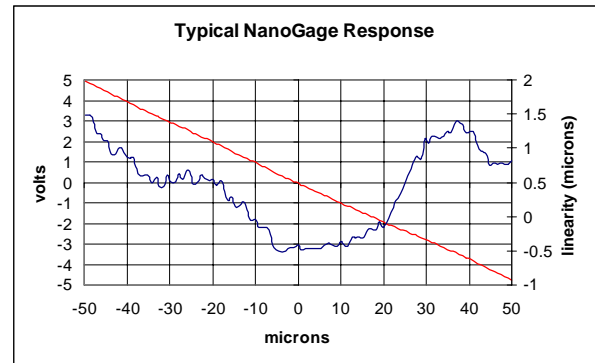
NanoGage 100 consists of a sensor head with a 0.46 meter (18 inch) cable attached to a small electronics module with a 9-pin output connector. A shielded extension cable can extend the length and connect to customer electronics. A 3-color diode indicates when the sensor has lost signal (red), when it is within the capture range (yellow) or near the zero crossing (green).

Performance

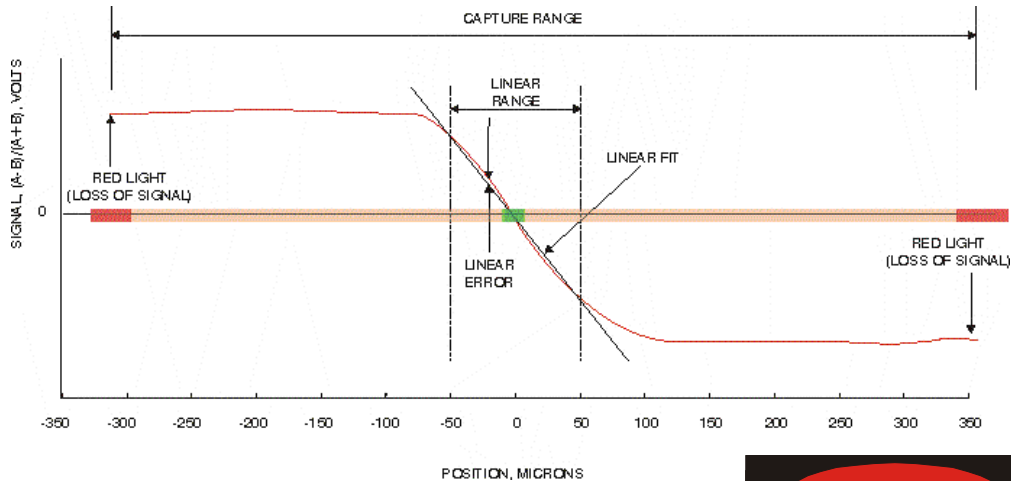
Resolution	15 nm rms @ $\Delta f = 100$ kHz
Measurement linear range	100 μm
Measurement linearity (over full measurement range)	$\pm 5 \mu\text{m}$ uncorrected
Measurement repeatability	$\pm 75\text{nm}$ peak to peak
Signal capture range ¹	$\pm 400 \mu\text{m}$
Bandwidth (3 dB) ²	100 kHz
Surface reflectivity for full resolution ³	4% to 100% specular

System

Nominal Responsivity ⁴	100 mV/ $\mu\text{m} \pm 10\%$
Sensor head standoff	3.0 mm
Perpendicular tolerance	± 0.1 degrees
Input power	± 12 VDC @ 80 mA
Mounting	0.500 inch (12.7 mm) diameter body for collet
Sensor body length	2.31 inch (58.7 mm)
Maximum sensor diameter	0.623 inch (15.9 mm)
Measurement spot diameter	$\approx 100 \mu\text{m}$
Cable length	46 cm (18")
Electronics module size	98 mm \times 32 mm \times 13 mm
Connector to customer cable	9 pin D-connector



All specifications are subject to change without notice.



¹ Range which unambiguously determines which side of zero the measurement is being taken.

² For a sinusoidal motion at 100 kHz, the measured displacement amplitude would be down 3 dB of its actual value at a slope of -12 dB/octave.

³ The sensor also works with smooth diffusely reflective surfaces such as milled aluminum or steel.

⁴ Each unit is shipped with a linear response factor and calibration plot from $-50 \mu\text{m}$ to $+50 \mu\text{m}$



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