

NanoGrid XY Metrology System: Model B (Standard Resolution)

PRODUCT DESCRIPTION

The NanoGrid[®] XY Metrology System is used to measure 2-dimensional ultra precision planar displacements. NanoGrid is an XY grid-based encoder system that avoids the turbulence effects which are commonly encountered with laser interferometers or the Abbe errors associated with separate linear scales. NanoGrid captures the precision of laser interferometry within the manufacturing process of the grid and packages it in a lower cost, more usable, and rugged format.

The XY encoder, or grid, has a basic period of 10 microns in both the X and Y directions, and the metrology system generates a measurement period of 5 microns. The NanoGrid patented three phase 90-element detector captures first order laser diffracted signals reflected from the grid. The three signals provide an unambiguous measurement of phase for extremely small movements.

The NanoGrid Model B metrology system is unique in a number of its features, but particularly in the low cost, fast, accurate interpolation. The Two-Axis PolarFlash[®] processes the sensor's signals and generates two pairs of A-quad-B outputs which describe the displacement of the grating relative to the sensor head with a resolution (selectable) down to 20 nanometers.

Several standard grid sizes are available to meet the requirements of semiconductor inspection or other equipment manufacturers. Custom grid sizes can also be purchased for an exact fit.

Yaw (rotation about the axis perpendicular to the plane) can be measured by adding a second single-axis sensor head.

NanoGrid is an excellent choice for submicron ultra precision XY positioning or as a calibration tool for high precision machine tools and stages.

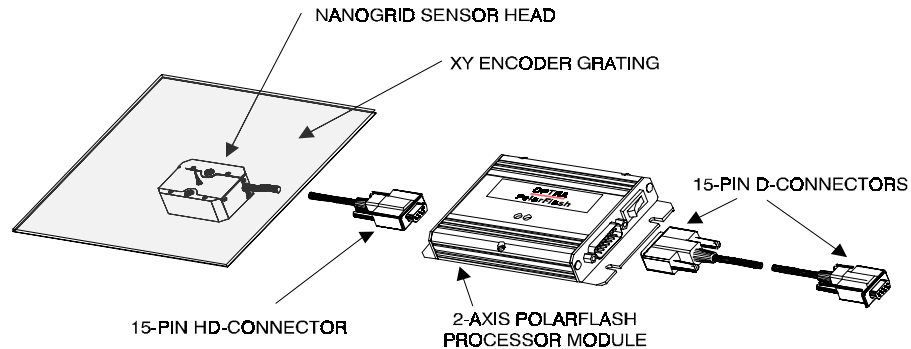


ADVANTAGES

- Measurement repeatability of ± 20 nm
- Low Abbe error
- Insensitivity to turbulence and atmospheric pressure changes
- Selectable measurement resolution down to 20 nanometers
- Easy to install; stress relieved grid mounts available
- 12 mm clearance between grid and sensor head
- Low sensitivity to alignment errors
- Vacuum compatible units available
- Full technical support; customization available
- Standard A-quad-B output
- Low cost for complete ultra precision XY metrology system

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TECHNICAL SPECIFICATIONS



System Performance

| | |
|------------|------------------|
| Resolution | 156nm up to 20nm |
|------------|------------------|

| | |
|-----------------------------------------------------------------------------|------------------------------------------|
| <i>¹(Temperature stabilization to ±0.25°C)</i> | |
| Maximum velocity ² | 1400mm/sec |
| <i>²(V-MAX = [selectable max .edge rate] × [selectable LSB])</i> | |
| Encoder to sensor head gap | 12.0 ±0.1 mm |
| Measurement areas (others available) | 40×45mm, 150×150mm, 210×210mm, 380×380mm |
| Operating temperature | +10°C to +40°C |
| Storage temperature | -20°C to +70°C |

NanoGrid Sensor Head

| | |
|----------------------|-----------------------------|
| Dimensions | 23.5 × 47.0 × 60.5mm |
| Housing material | 6061-T6 aluminum |
| Light source (785nm) | Class IIIb 3mW laser diode |
| Weight without cable | 110gm |
| Interface cable | 3 m cable, 15-pin connector |

Two-Axis PolarFlash[®] Processor (A-quad-B)

| | |
|-----------------------------|----------------------------------------------------------------|
| Resolution (selectable) | LSB = 5µm ÷ 2 ^N ; N = 5,6,7,8; ≈ 20,39,78,156 nm |
| Max. edge rate (selectable) | 1.25, 2.5, 5, 10 MHz |
| Data age | < 4µsec |
| Output format | A-quad-B differential TTL for each axis |
| Dimensions | 127mm × 84mm × 24mm |
| Power | +5VDC (± 0.25V) @ 350 mA |

NanoGrid Encoder

| | |
|----------------------------------------------------|----------------------------|
| Pitch (mechanical/optical) | 10 µm / 5µm |
| Soda-lime expansion coefficient: | 7.0 × 10 ⁻⁶ /°C |
| Quartz (fused silica) expansion coeff: | 0.7 × 10 ⁻⁶ /°C |
| <i>Other materials available – consult factory</i> | |

System Components

The NanoGrid B System consists of a mounted planar encoder (XY grid), sensor head with cable, and 2-axis PolarFlash[®] processor module.

NanoGrid Sensor Head

The NanoGrid Sensor Head contains a single laser diode source and separate optical systems for making planar position measurements. Output signals from the Sensor Head go to the PolarFlash Processor.

Two-Axis PolarFlash Processor

The Two-Axis PolarFlash Processor is a small printed circuit board in an aluminum housing. It supplies power to, and receives signals from the NanoGrid Sensor Head, via an interface cable. After processing these signals, it generates two pairs of A-quad-B signals which describe the displacement of the grating relative to the NanoGrid Sensor Head with a (selectable) resolution down to 20 nm. A binary flag (TTL level) indicates EXCESS SPEED; a green LED indicates proper alignment between the sensor head and the encoder grid.

NanoGrid Encoder

The standard NanoGrid encoder is a 10 µm pitch, 2-dimensional diffraction grating on soda-lime glass. The XY grid can be attached to a metal ring with incorporated flexures that provides kinematic KineFlex mounting with stress relief and ease of installation.

Documentation Package

This package contains dimensional and tolerance information needed to properly locate the NanoGrid sensor head relative to the NanoGrid encoder, instructions to mount the NanoGrid encoder, and an operating manual.

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