

SPPE-1000 POSITION ENCODER

The SPPE-1000 system is a reflective diffraction position encoder with ultra-precision based on NanoWave's patents and FPGA engine, developed in part through collaboration with Nikon Corp. in Japan.

It also incorporates numerous new technologies such as a MEMS laser scanning mirror, a Super Luminescent Diode (SLD) light source, and an optical fiber guided light source in a compact and low cost package.



Figure 1 SPPE-1000 encoder head with signal processing board.

Nikon's new optical design combined with NanoWave's signal processing technology has enabled a long working distance and a wide set-up tolerance which is superior to the typical sub-micron resolution optical encoders, despite its extreme measurement resolution and accuracy. As a result, no special skill other than the ones typically required for sub-micron precision machine design is necessary to obtain the highest performance in operation.

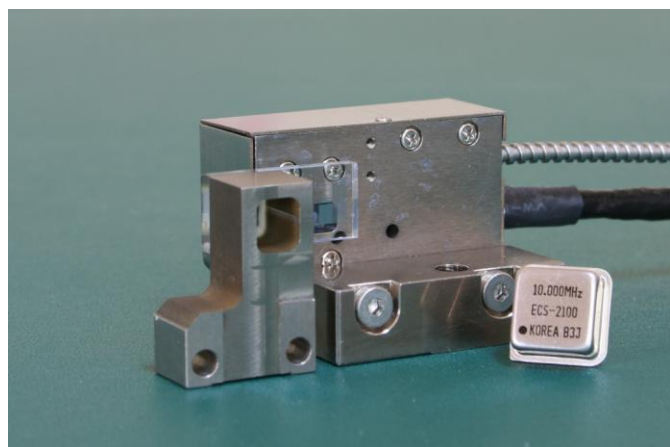


Figure 2 SPPE-1000 encoder head with grating scale.

STANDARD FEATURES

- 7.6 picometer resolution
- 2.4 mm allowed distance between head and scale.
- 3 mm measurement range (customizable up to 1 meter)
- 2 μ m pitch width for wide setup tolerance
- Guaranteed 10 nm repeatability
- Optical fiber guided light source for low heat operation
- Integrated reference scale: 1 nanometer longer-term stability
- Fast and customizable FPGA based signal processing core

SPPE-1000 SIGNAL PROCESSING UNIT

NanoWave implements the proprietary DSP (Digital Signal Processor) technology which is based on a custom-designed digital FPGA (Field Programmable Gate Array).

This patented approach provides high-bandwidth, high-precision and real-time processing, often not obtainable with conventional digital signal processors. The core functions of the position encoder are implemented in a high-speed and high-density FPGA which provides unprecedented flexibility to support future design changes, algorithm improvements, customization, and or revision updates.

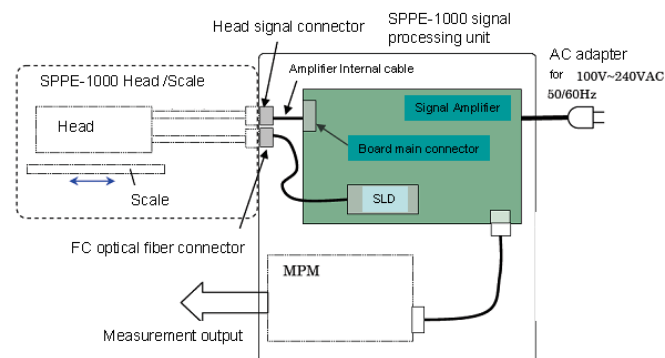


Figure 3 System diagram for SPPE-1000 position encoder.

PRODUCT APPLICATIONS

SPPE1000 encoders have a wide variety of industrial and research applications.

- Semiconductor Equipment
- Microscope Systems
- Laser Interferometer systems
- Fabry-Pérot interferometer
- Robotics
- Industrial Automation
- Precision Machining



SPPE-1000 HEAD AND SCALE SPECIFICATION*	
SPECIFICATION	
Minimum resolution	7.6 pm
Maximum speed	400 mm/sec
Travel range	3 mm
Bandwidth	5 kHz
Interpolation error	10 nm
Scale factor	± 10 nm over ± 100 μ m
Repeatability	10 nm
Zero index position repeatability	10 nm
Stability	± 1 nm
PHYSICAL CHARACTERISTICS	
Scale signal pitch	2 μ m
Light source	SLD (830 nm)
Head weight	215 g
Scale weight	5 g
θ_x	± 0.44 mrad
θ_y	± 1.45 mrad
θ_z	± 1.45 mrad
Operating gap distance	2.4 ± 0.1 mm
CABLE/OPTICAL FIBER	
Optical fiber length	1.25 m
Optical fiber diameter	$\Phi 2.9 \pm 0.2$ mm
Min. optical fiber radius of curvature	R40
Signal cable length	1.25 m
Signal cable diameter	$\Phi 5.1$ mm

*The specification above is guaranteed for normal operating conditions i.e. room temperature at 20 ± 0.01 degree C. For more information, please consult the product manual.

Distributed & Supported by NanoWave

NanoWave provides customization services such as signal processing core tweaking and interface development for potential SPPE-1000 OEM customers.

NanoWave can also license its SPPE Technology to other high-precision sensor and laser interferometer manufacturers.

For more information on products, services, technology licensing, prices, and deliveries, please visit our website at www.nanowave.com or send any questions to info@nanowave.com

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