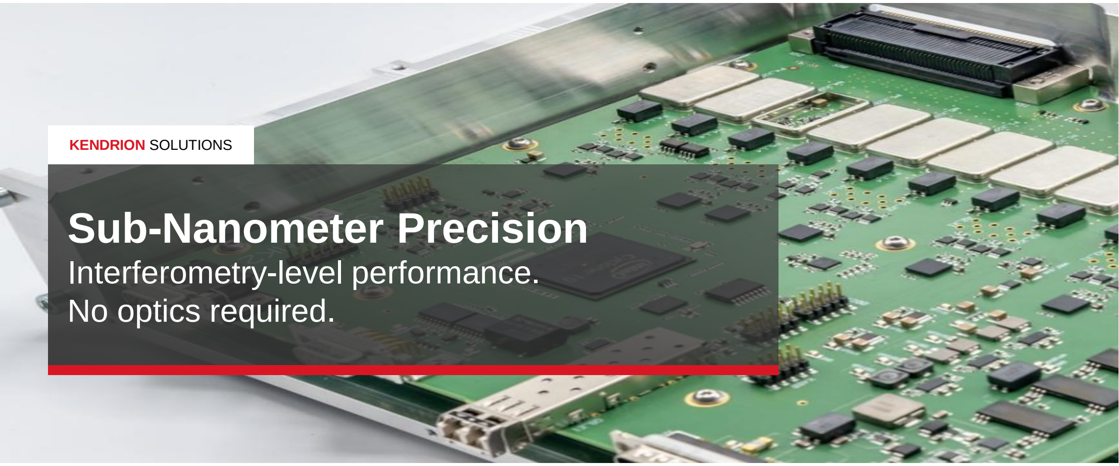
KENDRION



KENDRION SOLUTIONS

Sub-Nanometer Precision

Interferometry-level performance.
No optics required.

Sub-Nanometer Distance-Measurement System

This ultra-precise sub-nanometer distance-measurement system is built around capacitive (CAP) sensors and a low-cost Altera Cyclone-10LP FPGA. Its exceptional resolution and accuracy make it a compelling alternative to interferometric systems in demanding high-tech applications, but at a significantly lower cost.

The advanced analog front end is realized entirely with standard electronic components. Integrated preamplifiers are sampled at 1 MHz by 25-bit SAR ADCs, while the capacitive sensors are driven with a carrier signal to enable highly accurate, amplitude-modulation-based measurement.

Both the ADCs and DACs, used for sampling and generating the sensor excitation, are controlled by the FPGA. Within the FPGA, the system performs amplitude demodulation, digital filtering, and conversion of measured capacitance into position data. By employing quadrature modulation, the system can also accurately determine the sensor’s series resistance, providing valuable diagnostic insight into sensor health and cabling.

Interferometry-class performance for a low cost

Low-cost FPGAs can achieve clock speeds of around 100 MHz, approximately 100 times higher than the ADC sampling rate. This enables a highly efficient, deeply pipelined signal-processing architecture with excellent resource utilization. For measurement ranges up to approximately 500 µm, the system delivers interferometry-class performance at only a fraction of the cost.

Capacitive Measurement Platform

Kendrion 3T delivers interferometry-level precision at a fraction of the cost. The system is fully temperature-stabilized, production-calibrated, and highly flexible thanks to FPGA-based signal processing. Sub-nanometer accuracy is achieved without lasers, optics, or the high costs typically associated with interferometric systems.

The platform is a compact, temperature-stable, and fully configurable capacitive measurement system with sub-nanometer resolution and integrated sensor diagnostics. It is designed for demanding high-tech OEM applications.

Criteria	3T	Market Leader	Competitor A	Competitor B
Resolution	4	5	4	4
Accuracy	4	5	4	3
Noise Performance	4	5	4	3
Drift	4	5	4	3
Temperature Stability	4	5	4	3
Diagnostics	5	4	2	2
Customization	5	5	3	4
OEM Integration Ease	5	3	3	3
Cost	5	1	2	3
Total Score	40	38	30	28

Flexible Measurement Architecture

The platform offers complete configurability and supports high bandwidths. It is engineered to adapt seamlessly to a wide range of advanced measurement scenarios.
Its flexible architecture makes it suitable not only for high-precision signal analysis, but also for applications such as:

- Vibration monitoring
- Material characterization (multitone demodulation)
- Coating thickness measurement
- Predictive maintenance

This combination of precision, flexibility, and reliability provides a powerful foundation for innovators who require high-resolution data across diverse high-tech domains.

Kendrion 3T

Institutenweg 1
7521 PH Enschede
The Netherlands

T +31 53 433 6633
E info-3t-iac@kendrion.com
www.kendrion.com

03/’26