

Comparison of High Temperature Resistance and Delay Performance of PLC Spectrometers



Summary of Content

PLC spectrometers' high temperature resistance and delay performance depend on sensor design, ADC integration, and isolation techniques, with temperature stability and signal processing delays being key factors for reliable operation.

High Temperature Resistance

PLC spectrometers rely on temperature sensor interface modules to maintain accurate measurements under thermal stress. Modules like the ADS1220 24-bit delta-sigma ADC provide high-resolution sensing while operating in industrial environments with galvanic isolation and protection against fast transients, ESD, and surges, ensuring compliance with IEC61000-4 standards . The use of digital isolators, flyback transformers, and RC low-pass filters reduces noise pickup from thermocouples or RTDs, which is critical when the device is exposed to high temperatures or thermal gradients . Additionally, the Seebeck effect in thermocouples is leveraged for temperature measurement, but proper circuit design is required to prevent voltage offsets caused by thermal stress . On-chip spectrometers, particularly disorder-driven speckle spectrometers, demonstrate temperature stability by controlling scattering strength and device geometry. These devices can maintain spectral resolution across a range of operating temperatures, with studies showing tunable resolution from 2 nm to 20 pm while operating over several degrees of temperature variation . Temperature-induced variations in speckle patterns can affect measurement accuracy, so careful design is necessary to ensure high temperature resistance.

Article Content

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While previous research investigated the impact of sample and ambient temperature variations, we investigated the

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Based on the comprehensive analysis above, it is evident that these factors interact and collectively determine the performance of

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