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# The Challenges of Clamp-On Sensors for High-Resolution Phasor Measurement Unit Applications

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### Abstract

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- I. Introduction
- II. Contextualizing Background Information
- III. Lexicon Primer
- IV. Characterization of the Rogowski Coil in the Presence of Harmonics
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### Abstract:

The clamp-on paradigm for measuring devices has been utilized extensively during the past decade. Numerous portable powerline measuring devices prefer this approach for the sake of convenience, and this has extended to even some of the higher resolution measuring requirements; clamp-on sensors have been used to measure the primary characteristics in the power system including the current value. The prototypical design has centered upon the Rogowski coil for the sensor. However, for high-resolution requirements, the clamp-on sensor may not be the optimal approach vector, as clamp-on sensors utilize the current induction principle, and there is a parasitic air gap between the conductor and the clamp-on sensor. This can be considered, to some, to be an inherent deficiency of the clamp-on paradigm, as the air gap directly impacts the resolution of the measured value. While the involved Rogowski coil can be designed to be more insensitive to magnetic fields and parasitic air gaps, it is beset by other issues. For example, the coil should be well screened to reduce capacitively induced signals, as the cables used for industrial equipment systems may carry high voltages that change at high rates. In addition, the effective bandwidth of the coil needs to be carefully calculated, as transmission line effects cause a strong reduction of the output signal at discrete notch frequencies, the lowest of which defines the effective bandwidth of the coil. Moreover, apart from the magnetic fields and parasitic air gap issues, the constant movement of the conductor in relation to the clamp-on sensor also affects the resolution of the measuring value, as the results from each position shift of the conductor within the clamp-on sensor results in differing values. This paper examines how the resolving of certain problems, such as oscillation detection and classification requires higher certainty and resolution telemetry data, thereby potentially precluding the uncertainty of clamp-on app...

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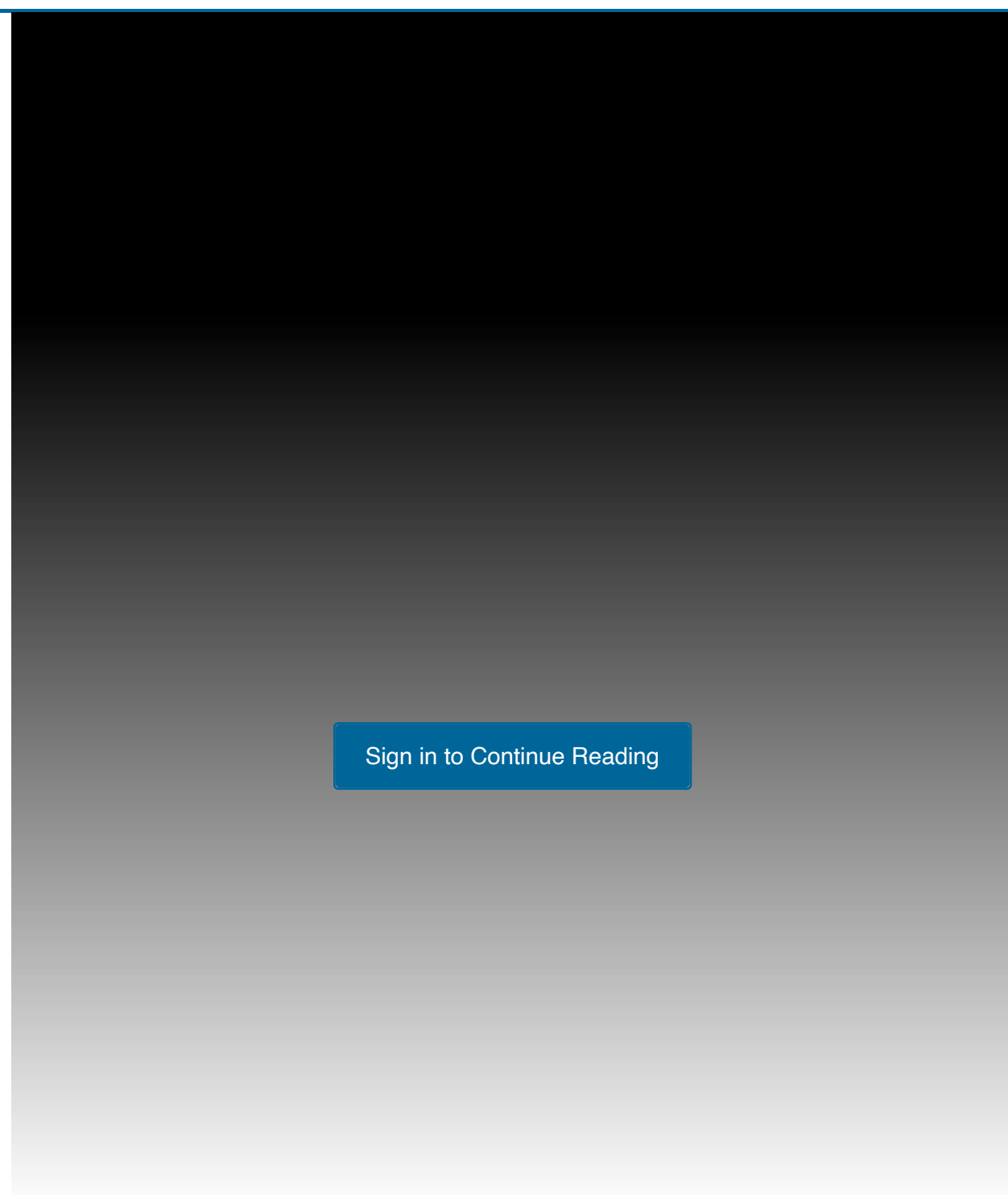
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