15ST017 Investigation of planar coil for eddy current conductivity measurements in wide frequency range

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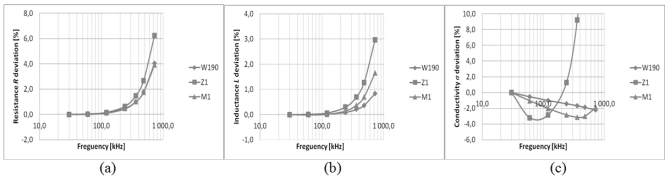
Several planar coil designs have been investigated for application in accurate AC conductivity measurements in the wide frequency range. The measurement method is based on the eddy-current probe-coils solutions proposed by Dodd and Deeds [1]. Coils parameters related to the theoretical model and measurement equipment used have been considered. The coil parameters affecting the performance of the model and the measurement instrument in the specified frequency range have been investigated.
Different designs were investigated including coils on a printed circuit board (PCB), coils on flexible substrate and on site manufactured coils winded from a copper wire with different diameters. The goal was to reach the inductance of the different coils to match the best-accuracy of the measuring instrument. Amongst the others, the important factor was to achieve the diameter of the coils small enough for practical applications.



Measured resistance (a) and inductance (b) deviations from 30 kHz value. Calculated conductivity deviations (c) from 30 kHz value.

15ST061 A Novel Capacitance-to-Digital Converter for Capacitive Sensors with AC Excitation

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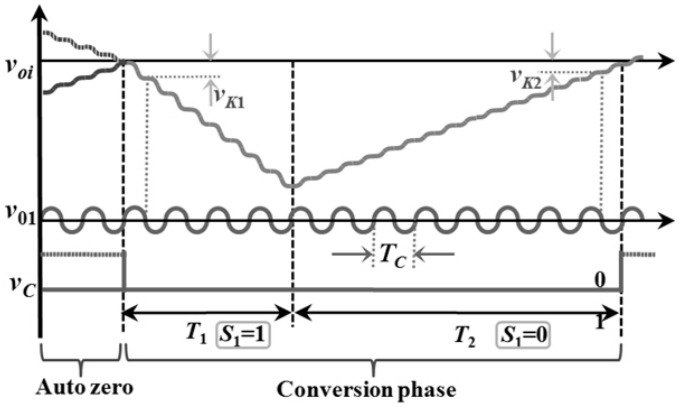
This paper proposes a novel, simple and high accuracy Capacitance-to-Digital Converter (CDC). Capacitive sensors are well known for industrial applications including humidity or moisture sensing, human touch sensing, flow measurement, ice detection, etc. In most of these applications a sinusoidal excitation of capacitive sensor is required or preferred to achieve high sensitivity and accuracy. In order to get a final digital output, conventionally, a bridge with capacitive sensor in one of its arms, followed by an ADC is commonly employed. CDCs wherein capacitive sensor is an integral part of sigma-delta ADC are available but they do not use sinusoidal excitation and hence cannot give the best output for above applications. This paper presents a new dual-slope CDC that is designed to accept output from a capacitive sensor, excited electrically by a sinusoidal source, and provides a direct digital output proportional to change in capacitance. Such a CDC, having a distinct combination of sinusoidal excitation and dual-slope principle, is not reported so far and it is best suited for above listed applications as it provides high accuracy, sensitivity, immunity-to-noise and interference, etc. A prototype CDC has been developed in the laboratory. Experimental results establish practicality of the scheme.



Signals at important points in the CDC.