

Preliminary specifications – Impedance measuring system

Rev 0

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Overview

The system comprises a USB analogue interface board with at analogue and digital inputs and outputs, a voltage to current converter, a relay switchboard and a special electrode. The system is intended to measure the complex impedance between several pairs of electrodes using the 4wire method.

Software specifications

1. The software will run on a standard PC
2. The software will recognize the USB interface module automatically.
3. The software will request the user to enter a specimen identifier SI (alphanumeric).
4. The software will read its operational parameters from a CSV file, in the following format:
N, Time, frequency, SS, Pause; where:
N – Line number
Time – Duration in mSec for that cycle
Frequency – Frequency of a 1VPtP sine wave output from one of the analogue outputs. 0 means no output.
Frequency range in 1Hz-100KHz
SS – 40 digit binary string
Pause – Pause in mSec between the end of this cycle to the beginning of the next cycle.
5. The software will perform the following sequence:
 - 5.1. Read new command line from the CSV file
 - 5.2. Activate the digital output line to output SS
 - 5.3. Activate the analogue output channel to generate a 1VPtP, zero DC offset sine wave at the specified frequency.
 - 5.4. Activate capture of two analogue inputs Signal and Reference, and record the two signals in a CSV file with name "SI_signalsN.CSV" (both analogue input and output will be performed at the highest possible sampling rate)
 - 5.5. Continue outputting and recording for the specified TIME period.
 - 5.6. When TIME is up, stop outputting and recording, set all digital output to zero
 - 5.7. Calculate the complex impedance from the PtP amplitude of the voltage recorded from the Signal analogue input, and the phase angle between the voltages at the Signal input to the voltage at the Reference input. Calculation will include only the signals between 10% and 90% of the Time.
 - 5.8. Append a DATA output CSV file with name "SI_data.CSV" with a new line as follows:
N, Time, Frequency, SS, Zreal, Zimg
N – Line number
Time – Duration in mSec for that cycle
Frequency – Frequency of excitation
SS – 40 digit binary string
Zreal – the real part of the calculated impedance
Zimg - the imaginary part of the calculated impedance
 - 5.9. When all lines have been executed, stop the software with output =0, and all SS=0.