



## ZG4 Test Interface for the Alpha-A Modular Measurement System

- Test Interface for Dielectric, Conductivity, Impedance 2, 3 and 4 Electrode Spectroscopy and Gain Phase Measurements for the Alpha-A Modular Measurement System
- Very wide frequency range: 3  $\mu$ Hz to 40 MHz
- Extremely wide impedance range: 0.1 m $\Omega$  to 100 T $\Omega$ , i.e., 18 decades.
- Excellent phase and  $\tan(\delta)$  resolution and accuracy
- Driven shields reduce influence of cable capacity on the voltage measurement
- Connects your own sample cells to the Alpha-A system
- Recommended for usage with BDS 1200 and Novotherm-HT sample cells (not included)

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# ZG4

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**ZG4 Test Interface**

The ZG4 extension test interface for the Alpha-A modular measurement system features high quality general purpose dielectric, conductivity, impedance spectroscopy in two, three, and four point modes, and gain phase measurements.

Three and four point techniques are advantageously used to partly compensate electrode-sample interface polarization or contact impedance effects. The ZG4 test interface has the same functionality as the ZG2 interface but two additional differential voltage measurement channels for three and four point measurements.

The voltage channel input impedance of  $10^{12} \Omega \mid 10 \text{ pF}$  exceeds the corresponding values of most competing instruments by several orders of magnitude, representing a major improvement in broadband three- and four-point measurements. In order to reduce the cable capacity from the ZG4 voltage inputs to the voltage electrodes, the two voltage inputs support driven shield technology which keeps the potential of the outer coaxial cable shield at nearly the same potential as the sensitive inner cable conductor. The ZG4 has high general purpose performance but is especially recommended for dielectric or conductive samples with

- significant electrode contact impedance or electrode sample interface polarization like, e.g. electrolytes;
- low impedance samples (below  $1 \Omega$ ) like e.g. strong electrolytes, heavily doped semiconductors, metals, superconductors;
- electronic components or networks.

**ZG4 Specifications:****Ranges**

Frequency:  $3 \mu\text{Hz} \dots 40 \text{ MHz}$  (13.1 decades)\*  
 Impedance:  $10^{-4} \dots 10^{14} \Omega$  (18 decades)  
 Capacitance:  $1 \text{ fF} \dots 10 \text{ F}$  (16 decades)  
 Loss factor  $\tan(\delta)$ :  $10^{-5} \dots 10^4$   
 AC signal out:  $100 \mu\text{V} \dots 3 \text{ V}_{\text{rms}}$   
 DC bias out:  $-40 \text{ VDC} \dots +40 \text{ VDC}$ ,  $70 \text{ mA max}^{**}$   
 Signal generator output impedance:  $50 \Omega$   
 Voltage input:  $< \pm 4.3 \text{ Vp}$  dc or ac coupled

**Differential Voltage Inputs with Driven Shields**

Input impedance:  $10^{12} \Omega \mid 10 \text{ pF}$   
 Common Mode Rejection:  
 $< 10^{-4}$  below  $100 \text{ kHz}$ ;  $< 10^{-3} \text{ dB}$  below  $1 \text{ MHz}$   
 Input Bias Current:  $< 2 \cdot 10^{-12} \text{ A}$

**Base Accuracy**

Relative Impedance, Relative Capacity,  
 Loss factor  $\tan(\delta)$ :  $< 3 \cdot 10^{-5} \text{ ***}$   
 Phase Angle:  $< 0.002^\circ \text{ ***}$

**Resolution**

Relative Impedance, Relative Capacity,  
 Loss factor  $\tan(\delta)$ :  $< 10^{-5}$   
 Phase Angle:  $< 0.0006^\circ$

**User Calibrations:**

load, short, open, internal self calibration and diagnostics

\* in combination with the Alpha-A mainframe type AT  
 \*\* requires dc bias option B of the Alpha-A mainframe  
 \*\*\* for details refer to specification charts

The ZG4 can be combined with any type of sample cells for materials measurements in two/three/four wire modes via its BNC connectors. A sample cell is not included. For two-electrode configurations, the passive BDS 1200 sample cell is recommended. The external interface design allows to locate the ZG4 close to the sample in order to minimize cable effects due to, e.g., inductance and subsonic noise which may influence the results in the the high and low frequency ranges, respectively.

**System requirements**

- Impedance analyzer mainframe Alpha-A