

ATLAS 0441 High Impedance Analyser

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ATLAS 0441 High Impedance Analyser

for diagnostics of anticorrosion coatings

ATLAS 0441 HIA is the instrument dedicated for the high impedance spectroscopy of technical objects modelled by multi-element two terminal networks. The measured impedance can extend up to 100 Gohm in a wide frequency range from very low 10 μ Hz up to 1 MHz. Particularly, the analyser is designed for monitoring and diagnostics of performance of anticorrosion coatings on the objects in laboratory conditions and directly in field.

Two measuring probes have been developed: two-terminal and three-terminal. The two-terminal measuring probe is designed for the impedance spectroscopy of the protective coatings on grounded objects in the field, like bridges, flyovers, pipelines and other, in the frequency range from 10 μ Hz to 100 kHz. The cables connecting the two-terminal measuring probe can have up to 10 meters, which allows measuring on the objects which are difficult to reach. Three-terminal probe allows measuring of the coating impedance measurement on the ungrounded objects in the laboratory, in the frequency range from 10 μ Hz to 1MHz.



The analyser allows impedance measurement in the range $100 \text{ ohm} < |Z_x| < 100 \text{ Gohm}$, thanks to the usage of the input circuitry build as measuring probe.

The amplitude of the harmonic measurement signal can be programmed from 1 mV to 1000 mV and DC offset can be set in the range $\pm 3 \text{ V}$ with 16-bit resolution.

The ATLAS 0441 HIA analyser has been made in form of virtual instrument. The analyser consists of small-dimension measurement module, which is connected to PC via USB interface. The module is easy to handle and install on experiment site.

Computer is used to program parameters of the measurement experiment and to collect measurement results. In the lab as well as in the field, the computer is able to trace the measurements and visualise on-line the results. The results stored in the computer memory can be transferred to other graphical and analysis software.



In the field, the analyser can be powered from 12V accumulator. The maximum supply current doesn't exceed 0,9A, which makes possible powering the instrument for many hours with small accumulator (e.g. 12-15Ah accumulator is enough for 8-10 hours of work). In the lab the device is powered from 230V supply-line using an external ac/dc 12V/2A adaptor.

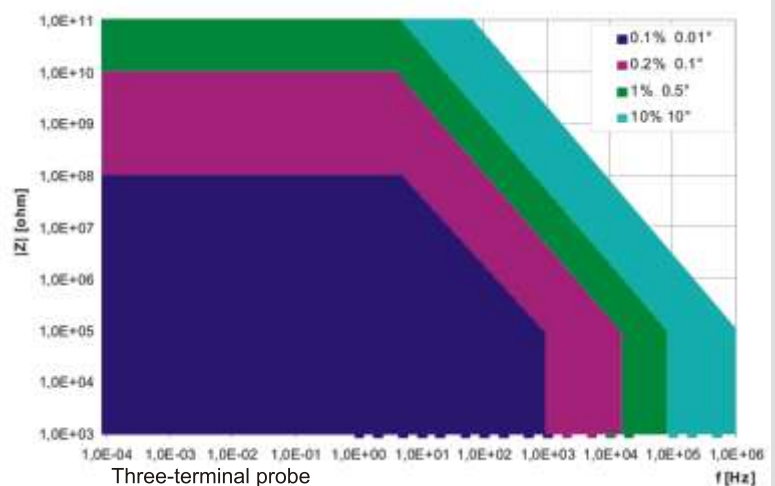
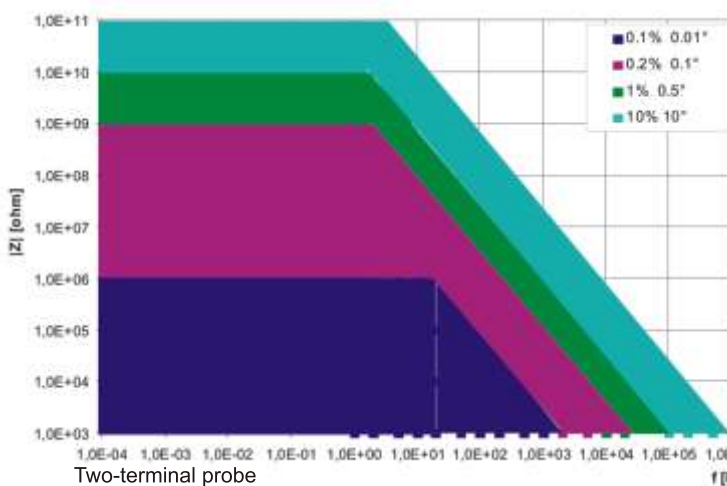
The measurement site using ATLAS 0441 HIA analyser can be equipped with an additional special measuring electrodes and reference electrodes and other elements for the measurement cell.

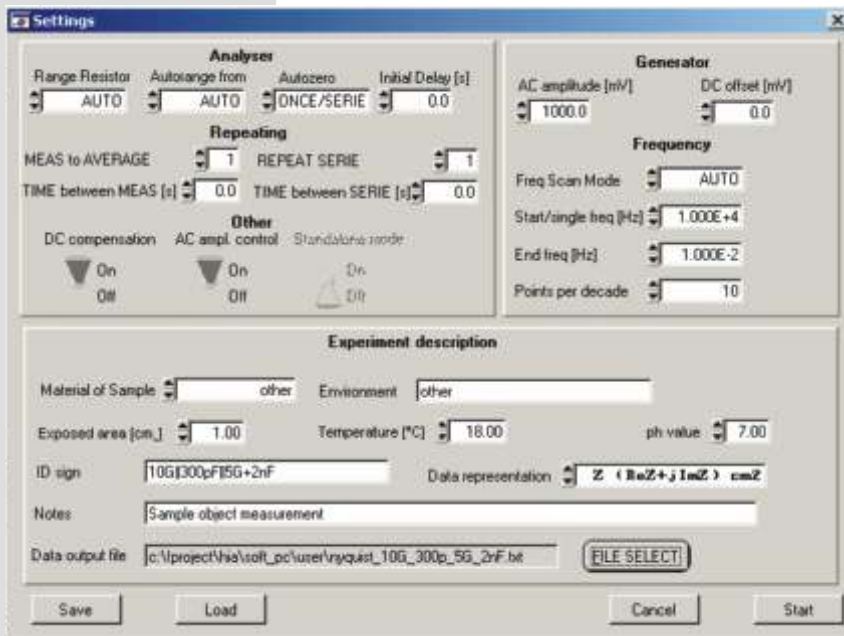
In the analyser modern solutions have been used for circuit s and software. The digital signal processing (DSP) technique has been employed to achieve measurement in a wide frequency range.

- Frequency range of impedance spectroscopy: 10 μ Hz do 1 MHz;
- Impedance measurement range: 100 ohm $<|Z_x|<100$ Gohm (in 8 subranges);
- Impedance measurement accuracy has been shown in the figures
- Measurement signal AC amplitude can be programmed in the range 1 mV do 1000 mV (with 1mV step), is automatically kept on programmed level when changing measurement frequency and measurement subrange;
- DC offset can be programmed in range of +/- 3V with 16-bitów resolution.
The analyser allows automatic compensation of voltage from electrochemical cell appearing when undercoating corrosion exists ;
- The analyser uses autodiagnosics and auto-zeroing of the measurement path;
- The analyser is powered with DC voltage of 9-18 V or AC voltage of 230 V, it consumes 12 W of power.
- Standard cable connecting measurement probe to the instrument has 2 m. of length.
- The dimension of analyser: WxHxD = 260 x 160 x 380 mm

The ATLAS 0441 HIA analyser can be also used for impedance spectroscopy of dielectrics, semiconductors structures, batteries and cells, composites, polymers, mixtures of concrete, ceramics, and many other.

The usage can be even wider, as the impedance spectroscopy is used in biology and medicine where is applicable to examinations of physiology of plants and animals, and in processes of the transplantation of organs, dermatological studies and of recognizing of cancers.



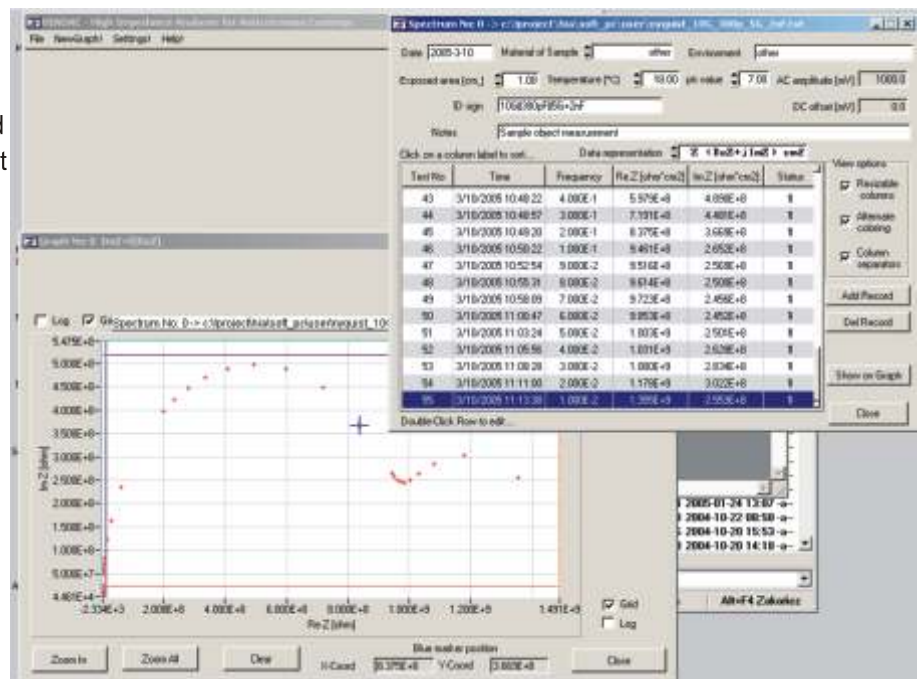


The user can communicate with the instrument using personal computer. The panel shown in the figure allows to program parameters of the experiment.

The panel allows to program parameters, which can be grouped in three areas:

- Measurement signal generation - the range of generated frequencies, number of points per decade (in linear or logarithmic order), AC signal amplitude and DC offset can be set here.
- Impedance measurement - user can program range here, the delay between consecutive measurements and between measurement series as well as automatic DC compensation mode and AC amplitude control mode.
- Description of the object and experiment conditions.

The figure presents panel, which shows results of impedance measurements for each frequency. The results can be shown as modulus and phase of impedance related to frequency (Bode plot) or as imaginary part related to real part, where frequency is a parameter (Nyquist plot). In the graph shown in the low-left corner, the possibility of reading of co-ordinates for each measurement point has been presented. To do this, the blue marker is to be moved to specified point and co-ordinates of the point appear in X-Coord and Y-Coord controls.



The instrument has been developed in the frame of European project Eureka E!3174 HIADAC titled: „High impedance analyser for diagnostics of anticorrosion coating”. The main participant and co-ordinator of the project was Department of Metrology and Electronic System, Gdansk University of Technology. The other partners of EUREKA project were: ATLAS-SOLLICH Electronic Systems Manufacture from Gdansk, Road and Bridges Research Institute from Warsaw and University of Trento (Italy). The implementation to production of the instrument has been performed in the first quarter of year 2005.