

Portable electricity analyzer compatible with the cloud service

1. Purpose of the exercise:

The exercises aim to familiarize with the possibilities, provide a network parameter analyzer that works with cloud applications, develop analytical skills, and understand the importance of monitoring and analyzing electrical parameters in energy management.

2. Tasks to be completed:

- Connecting the energy analyzer to the test circuit.
- Establishing communication with the device.
- Creation of the user interface.
- Measurement data analysis.
- Generating reports.

3. Theoretical introduction

The electricity analyzer is a device that monitors and analyzes electrical parameters such as voltage, current, active power, and reactive power. The communication gateway enables to transfer data from the electricity analyzer to the cloud platform, where it is analyzed. In the created device, the energy analyzer, which in the classic solution is used as a stationary control and measurement device in electrical switchgear, has been used as a primary measuring device in a mobile analyzer of power network parameters. This way, flexible possibilities of using commonly used technological solutions were shown.

The presented solution is mobile and does not require access to a traditional Ethernet network. However, there is also such a possibility. The communication gateway has a GSM module, which allows it to connect to the telecommunications network. Thanks to this solution, the electricity analyzer can be used in different locations, regardless of the availability of the Ethernet network.



After configuring the electricity analyzer and connecting it to the tested circuit, data on electrical parameters are collected and sent via a communication gateway to the computing cloud. The gateway uses a GSM, WiFi, or Ethernet network for data transmission, allowing real-time energy consumption monitoring.



Figure 1 Suitcase with a mobile network parameters analyzer

A mobile solution using GSM and WiFi wireless transmission is also necessary for electricity monitoring on a larger scale in the case of extensive facilities or areas where installing an Ethernet network would be difficult or expensive. The electricity analyzer and the communication gateway enable remote monitoring of many locations simultaneously, effectively managing and optimizing energy consumption in various areas.

A cloud service in this exercise allows for safe and scalable storage of the collected measurement data. Easy access to collected data from various places and devices facilitates data analysis and processing. In addition, the cloud service offers various analytical tools for deeper analysis of collected energy data, identifying events and trends, and optimizing energy consumption.

Rogowski coils are used to measure the current. Current sensors enable precise and non-invasive measurement of the current flowing through the wires. The operation of Rogowski coils is based on the principle of electromagnetic induction. The measurement voltage is proportional to the flowing current.



Figure 2 Rogowski coil

Essential features of Rogowski coils are:

- safety - Rogowski coils offer non-invasive current measurement because they do not require disconnecting wires,
- convenient mounting - they are flexible and easy to assemble. They can be easily fitted around wires for easy installation and removal
- wide current range - they can measure both small and large currents. They are available in various sizes, which allows them to adapt to the required current range.
- minimal disturbances – they are more resistant to disturbances and the phenomenon of saturation than classic current transformers.

4. Guidance questions - check yourself

- How do Rogowski coils work, and what are the advantages of using Rogowski coils to measure current compared to traditional transducers?
- What information can be obtained from analyzing data collected with an electricity analyzer?
- What are the possibilities of using a cloud service in the context of this exercise? What are the benefits of storing data in the cloud and using analytical tools available in the cloud?
- What additional analysis and conclusions can come from the collected energy data?

5. Exercise program

- A. Connect the measuring device to the test circuit according to the measuring diagram.
- B. Turn on the device.
- C. Familiarize yourself with the energy analyzer user interface. Check current readings.
- D. Connect the RJ-45 cable to the Energy Analyzer's Ethernet port.
- E. Observe the communication gateway status LEDs to check the connection status.
- F. Using a web browser, connect to the cloud service <https://sitemanager.ability.abb> (the teacher provides data necessary for connection)
- G. Familiarize yourself with the user interface and available widgets of the cloud application.
- H. In the "Explore -> Connectivity" tab, check the status of the analyzer's connection to the cloud service.
- I. Current and power measurement of various devices

Select different types of energy receivers and measure the current and power of these devices using a portable electricity analyzer. Then generate a measurement report.



J. Real-time energy consumption monitoring

Perform real-time energy consumption monitoring in a specific facility or installation. Analyze trends and identify potential energy savings through conscious consumption management.

K. Power quality analysis

Investigate power quality in different locations. Simulate voltage dips, voltage dips, and load swells. Customize the interface in such a way that it informs the user about such events.