The GEOMON4D-IP resistivity meter – comparison to the old GEOMON4D system and improvements for monitoring applications

David Ottowitz[1], Birgit Jochum[1], Gerhard Kreuzer[2], Stefan Pfeiler[1], Anna Ita[1], Stefanie Gruber[1], Alexander Römer[1]

(1) Geological Survey of Austria/Department of Geophysics, Neulinggasse 38, A-1030 Vienna, Austria

(2) Liftoff, Karlsgasse 6, 3001 Tulbinger Kogel, Austria

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Although several commercial resistivity meters were put on the market (e.g. the IRIS Syscal, the AGI Super Sting R8, the ABEM Terrameter, etc.), a couple of research groups are developing their own resistivity meters. The motivation for those in-house developments is mainly the request to have a system at low hardware costs, which is highly adaptable to specific research questions. For monitoring applications, the full insight to system details as well as the possibility of quick repair of technical malfunctions (e.g. replacement of hardware components) play an important role.

The GEOMON4D system, developed by the Department of Geophysics at the Geological Survey of Austria (Supper et al., 2012), has been in operation in different monitoring applications and in standard field surveys for almost 2 decades. Within this period, just a few minor technical adaptions were made. Thus, the electro-technical components were not up to date anymore and a reliable supply of some specific spare parts became difficult. Subsequently, a larger redesign of the geoelectric system became necessary. In the course of this redesign, the GEOMON4D was extended to the possibility of time domain IP measurements. In a first step, the new GEOMON4D-IP resistivity meter was developed as a robust ERT/IP system for standard field surveys (in use since 2020). In a second step, all necessary tools for monitoring applications were implemented (remote access, definition of monitoring jobs, etc.) and final adaptions, based on the feedback from extensive field use, were made.

Compared to the old system, the new system received several improvements for monitoring applications. In addition to resistivity monitoring, now also time domain IP-effects can be monitored – this includes the possibility to define complete arbitrary measuring sequences (time of current injection, recording time (windows)) up to the option of a full waveform recording. Furthermore, current injection was changed from a constant voltage to a constant current source and the measured voltage range was expanded from 10 to 80 V. The sample frequency can be varied in defined steps from 2 to 15 kHz (resolution versus data amount). Similar to the former system, the full sample data can be read out from the GEOMON4D-IP and can be used for further processing steps (QC, filtering options, etc.). The reduced system/standby power consumption (20 W to 5 W now) saves energy and is a special improvement for remote monitoring locations without connection to the power grid. The update to the newest electro-technical components caused a higher measuring accuracy, which is particularly important for monitoring data. The final development step, which is planned for the next year, is the implementation of a climate box for corresponding temperature sensitive electronic parts, as well as the expansion to a two-channel system.

Supper, R., Römer, A., Kreuzer, G., Jochum, B., Ottowitz, D., Ita, A., & Kauer, S. (2012). The GEOMON 4D electrical monitoring system: current state and future developments. *Berichte der Geologischen Bundesanstalt*, **93**, 23–26.