



## Important Notes on Resistivity-IP Instruments

### Why constant current transmitters are preferred

Most transmitters for resistivity-IP surveying on the market are designed so that they put out a constant voltage and measure the transmitted current via a shunt resistor. The instruments in the ABEM Terrameter family are equipped with constant current transmitters instead, thus they transmit a predefined current with good accuracy (better than 0.5%) by adjusting the output voltage in case the load varies. If the requested current cannot be transmitted due to high electrode contact resistance or strongly varying load, current transmission is terminated and an error message issued. Since the transmitted current is the key parameter for the signal source in resistivity-IP surveying, this is the preferable design for a current transmitter.

In automatic current mode the current level is automatically adjusted according to predefined threshold levels in order to optimise the performance in relation to the contact resistance.

### Why galvanically separated input channels are preferred

Most multi-channel instruments on the market are designed so that the measurement channels share a common ground. Generally these instruments connect the measurement ground of all channels to a common electrode that acts as measurement ground. This works well under favourable measuring conditions, but may lead to serious measurement errors under certain conditions that occur frequently in the field, especially when doing automated multi-electrode surveying.

Consider a situation where an electrode take-out that is designated as common ground is not properly grounded because of outcropping rock or road crossing. This can result in very large errors for all measurement channels, and with a standard measurement protocol used for a 2D or 3D resistivity imaging (ERT) survey a large number of data points can be ruined by this. Such situations will occur if a multi-electrode survey is carried out with a standard measurement protocol and one or more electrodes in the layout are excluded for some reason. Similarly, if one of the measurement channels is subjected to overload due to noise or high input signal it is likely to ruin the data measured by the other channels as well.

Another problematic situation can be when measuring a number of potentials between electrode pairs arranged after each other along a line, as is the case for the dipole-dipole, pole-dipole or multiple gradient arrays. The accumulated potential along the electrode layout may then exceed the input range of the measuring channels, even if the measured potential of an individual channel does not give an over-range indication, which can lead to severe measurement errors.

The ABEM Terrameter SAS4000 is designed in a different way in that all the measurement channels are galvanically separated from each other. This design is superior for multi-channel multi-electrode surveying, as the loss of grounding or overloading of one of the measurement channel will not disturb the data recorded by the other channels. Furthermore, as the measurement range is automatically adjusted for signals up to  $\pm 400V$  the risk of over-voltages on the input channels practically eliminated. For the Terrameter SAS1000 the single input channel is of course galvanically separated from the transmitter part of the instrument.