

## MODULE TESTING EQUIPMENT



Testing equipment, electronic systems

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Short description:  
Module testing equipment

### Intended purpose

The portable test equipment is intended to test signal filtering modules, as are currently integrated in the mobile communication cabins AUTOKO and BIGSTAFF.

The signal filtering modules have to reduce performance-related disturbances (NEMP, LEMP, interfering frequencies) on data and communication lines, which are conducted from outside into the cabin, to a permissible size. Therefore, they are an important protection against dangerous excess voltage to the operating personnel and the operating equipment.

With the help of the testing equipment, the functioning and intactness of the filtering modules and their over-voltage protection elements can be checked according to schedule and/or after a possible exposure (e.g. after a thunder storm). Damaged filtering modules can be quickly sent to the maintenance department for repair.

### Testing concept

The computer-assisted testing equipment logs and evaluates the specific characteristic data of every single line from the connected, signal filtering modules. After comparing the nominal and the actual performance parameters, an integrated display shows the operator, whether the internal lines or plug contacts of the module are faulty. After the automatic test run, the operator has the possibility to print a detailed test protocol. Alternatively, it is possible to send the test result to a PC, connected via a serial interface, and to save it.

For every module line these tests are possible:

- volume resistance test (inlet - outlet)
- insulation resistance test (line - line / line - casing)
- fine protection test with positive and negative polarity
- coarse protection test of the gas arrester

The above 4 tests can be made separately for all lines of one module or as a full test. In case a filtering module is tested for the first time, a full test has to be made first. Afterwards, separate tests, such as fine or coarse protection tests can be made.

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The tests may be described as follows:

### ➤ Volume resistance test

The test is made, to detect possible interruptions in the signal lines of the filtering module. The outlet of the line that needs to be tested is connected to the reference mass and a 30V D.C. is fed to the inlet. The resistance of the signal line is determined by the resulting power (range of measurement: 1  $\Omega$ ...200  $\Omega$ ) and then compared to the stored reference value. If the resistance is within the prescribed tolerance, the line passed the test.

### ➤ Insulation resistance test

Another important criterion for the quality of a filtering module is the insulation resistance between the lines and against the casing capacity. Every line is pulsed with 8 V...60 V D.C. against mass, depending on the tested device. If the measured value of the insulation resistance is more than 2% under the required minimum (< 1.95 M $\Omega$ ), the test failed. The measurement is based on the evaluation of the slight voltage drop on the possible creep distance.

### ➤ Fine protection test

To test the fine protection, every line is wired -one after the other between inlet and mass- with a constant current of  $I_E = 1$  mA. The line, that needs to be tested is driven by both positive and negative polarity. The voltage loss of the fine protection element, that has to be set for the current load, is measured and evaluated by the test equipment.

### ➤ Coarse protection test

The built-in over-voltage protection in the filtering module prevents inadmissible voltages, especially caused by lightning stroke, to the signal lines and/or to the connected terminals. For the coarse protection test, two measuring methods are used:

#### ◆ Peak pulse current measurement

This measuring method is used for filtering modules with resistance-decoupled coarse and fine protection elements. Every signal line is wired with a test pulse of ca. 900 V and the occurring peak current is measured. The evaluation is made according to the parameters specific to the device.

#### ◆ Power-follow current measurement

This measuring method is used with filtering modules with integrated fine protection elements > 20 V. While the signal lines are wired with a test pulse of ca. 900 V, at the same time a charged condenser is connected, which discharges after igniting the gas arrester. The resulting discharge current is called "power-follow current", of which the energy content is determined and evaluated. The duration of the "power-follow current" is an important weighting factor for the functionality of the gas arrester.



Set-up for testing



Test equipment with front lid