

Supervision System of Direct Current Network DCtest2

Stationary and Portable

Failure free operation of the DC network is a condition of correct operation of the systems and equipment powered from it, especially: control, protection measurement, recording, and SCADA systems.

DC networks in electric power plant (power plants, substations) and in industry are often very extensive (over 100 km). They are exposed to damages e.g. moisture, dirt, mechanical and thermal influences or aging. The supervision this is means the current monitoring of the DC network state and rapid location of fault places are an obvious need. The traditional location method of switching off parts of the network, or intentional grounding of the opposite pole of the network causes numerous troubles and threats :

- ▶ The risk of disturbances, or emergency shutdowns of equipment and systems powered by DC networks,
- ▶ The difficulty in localization the grounding place e.g. in the case when more than one ongoing is damaged at the same time,
- ▶ Long time localization,
- ▶ Increased number of maintenance people.

The continuously monitoring of the DC network in remote mode becomes an obvious necessity, especially in the case of - free operation and maintenance of an electrical power objects. The DCtest supervision system maximally shortens the time taken to locate the fault place and thus the time of failure in the DC network.

In very large/extensive DC networks "skeletal" system DCtest2 can be built for main DC switchgears supplemented portable metering clamps to locate the fault places. It is a cost effective solution.

The modern monitoring system for DC networks should have the following features and functionalities:

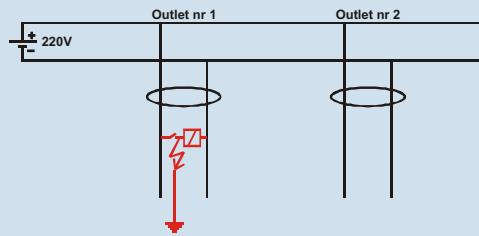
- ▶ Measure and monitoring (visualization) the current value of the entire network resistance and individual outgoings lets in $k\Omega$,
- ▶ Precise localization the fault place,
- ▶ The stationary system operation with portable measuring clamps,
- ▶ No-disturbance of operation of the relays in the networks - safe value of test pulses of current,
- ▶ Resistance on external disturbances,
- ▶ Detection all types of faults,
- ▶ Detecting connections between batteries and outgoings of two sections,
- ▶ High accuracy of measurement of ground currents without influence of DC networks capacitance,
- ▶ Access to the system via the internet.



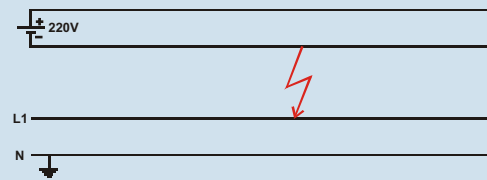
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DCtest2 detects all types of ground faults!

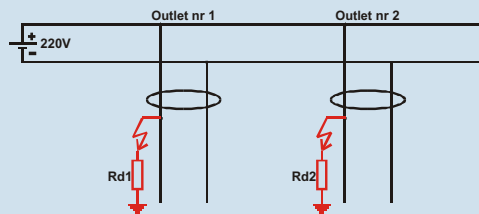
Single grounding



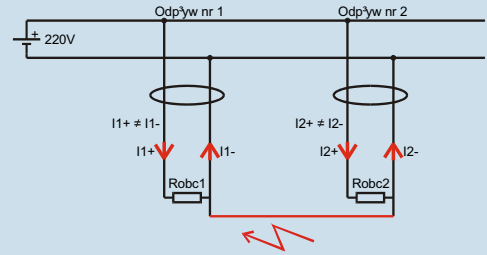
Short circuit to AC mains



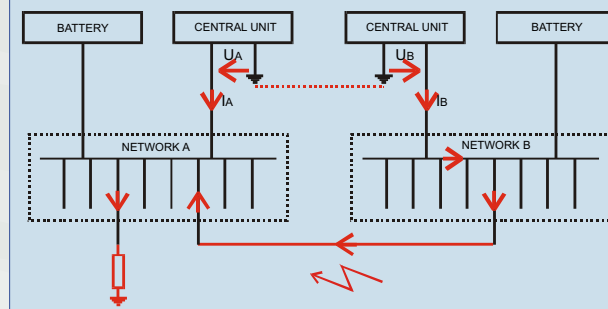
Two simultaneous groundings



Faults between ongoing



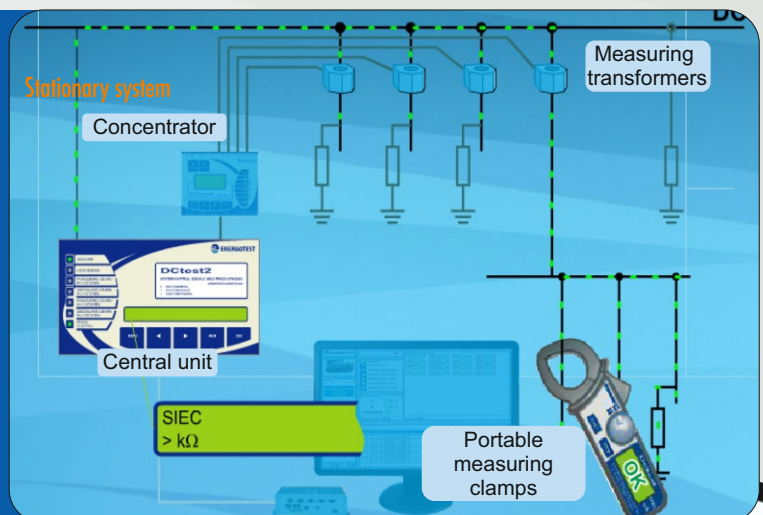
Faults between batteries



DCtest2 stationary system contains:

- ▶ Central unit
- ▶ Stationary three-dimensional measuring transformers
- ▶ Concentrators for connecting stationary measuring transformers
- ▶ Portable measuring clamps (optional)

DCtest2 fulfills the requirements of the standards PN-EN-61557-8 and PN-EN-61557-9 and harmonized standards With the low voltage directive 2014/35/ and the electromagnetic compatibility directive 2014/30/UE



Central unit DC2-jc



The central unit contains:

- ▶ Testing pulse generator with adjustable frequency
- ▶ Insulation resistance calculation module for the entire network
- ▶ Internal and external signaling systems
- ▶ LCD display
- ▶ Communication module with plant SCADA and connection with internet

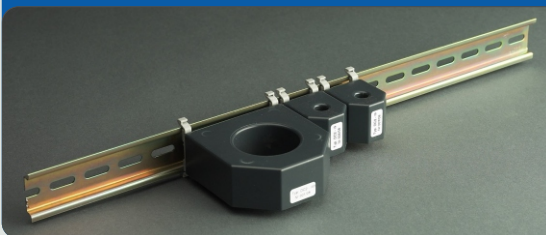


Concentrator DC2-k



The concentrator integrates measured transformers (up to 8). It is displaying values of these fault currents and the insulation resistance of each ongoings.

Stationary measuring transformers DC2-19, DC2-113, DC2-143



Diameter measuring transformers are follows:

- ▶ 9mm (DC2-19)
- ▶ 13mm (DC2-113)
- ▶ 43mm (DC2-143)

Measuring transformers are small and easy to install on a TS-35 rail

Transformers are connected to the concentrator with LY type cable (do not need twisted pair cable)

Up to 200 transformers via concentrators can be connected to one central unit

Portable clamps DC2-p



Portable clamps are part of the stationary localization system and are used to measure the current and insulation resistance in places, where stationary measurement transformers are not installed. Portable clamps cooperate with the DCTest central unit which is installed at the DC network.

Portable unit DCTest2



Portable measurement unit is a compact version of the DCTest2 system which includes a pulse generator and portable measurement clamp. This solution is especially recommended for users who have a few plants with relatively small DC networks, in case when they are not ready to install a stationary system on each plant.

Benefits of using DCtest2 system:

- ▶ Detection of all types of faults: metallic, through relay coil, two simultaneous earth faults, grounding shorts, short connection to other galvanic isolated networks, eg 400 / 230V AC,
- ▶ Detection of connection between batteries and ongoing of two sections,
- ▶ Possibility to complete the stationary system with portable measuring clamps,
- ▶ Safe for people measuring current (not exceeding 10mA),
- ▶ Minimize the risk of unwanted relay activation in secondary circuits,
- ▶ High system resistance to external electromagnetic disturbances (EMC),
- ▶ High measuring accuracy in all conditions, thanks to the ability to adjust the frequency of test pulses to DC network capacitance,
- ▶ Detection and localization of the groundings with relatively high resistance,
- ▶ Monitoring of insulation resistance values changes of the entire network as well as individual ongoing so the measures can be taken to prevent degradation of the DC network,
- ▶ Large, easy-to-read display where ongoing names are written in words as user expect,
- ▶ Communication with plant SCADA via Modbus RTU, Modbus TCP, IEC 61870-103 protocols in the standard without extra charge,
- ▶ The ability to communicate with the DCtest2 over the internet through the Web Server,
- ▶ Easy installation (width of measuring transformers adjusted to the width of the circuit breakers in switchgears),
- ▶ Fast and professional warranty and post-warranty service,
- ▶ Safety and reliability confirmed by a lot of references.

By installing the DCtest2 in the DC network:

- ▶ Eliminate the risk to the health and life of the staff
- ▶ Prevent dangerous and costly all plant or technological facilities shutdowns
- ▶ Create conditions for the optimal technical and organizational operation of the DC network.

The DCtest2 stationary system with portable measuring clamp is the solution for quick and accurate location of the faults at the lowest price.

The DCtest system is a solution developed in cooperation with the Silesian Technical University. The solution is constantly being developed. The system is applied on many plants (several hundreds) electrical power sector (transmission and distribution substations, power plants) and industry in Poland and abroad.

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