

ARTES



ARTES II Automatic Relay Test Systems

Automatic Relay Test Systems of the ARTES II Generation

System Description

All the test systems of the ARTES II product range have been especially developed for operation and transport in adverse conditions. The high degree of system integration has resulted in a compact design with a portable 19" test case. The ARTES II hardware is constructed entirely using the latest *32/128 bit DSP technology*.

The test values are calculated from the parameters entered via the software and are applied to the device under test via high-accuracy D/A converters and amplifiers. The synthetic generation of test values guarantees immunity to fluctuations in the main supply.

The reaction of the protection relay is measured in real-time, synchronously to the signal generation process and the results are evaluated directly. Thus, for example, during a

complete ARC (Auto Reclose) test sequence, the OPEN command from the protection relay is used to switch off and the RECLOSE command is used to reactivate the predefined short-circuit fault currents.

The powerful current and voltage amplifiers are electronically overload and short-circuit protected. Linear opto-couplers (*LOC technology*) are used for the galvanic separation of the measurement inputs.

All connections for linking up the device to be tested are arranged ergonomically on the front panel of the case for easy access. The binary inputs are protected against polarity reversal and can be configured as wet or dry contacts.

The high accuracy of the test systems can be optionally verified by a DKD certificate via an accredited calibration DKD-laboratory.



The purpose of power system protection devices is to recognize system faults quickly and reliably and to minimize impairments to the power supply by selectively switching off faulted sections of the power system.

The use of well-chosen protection devices which operate safely and reliably can have a decisive effect on the operational safety of complex electrical networks and plants.

The extent to which the reliability of protection devices can meet expectations depends initially on correct device selection and on the quality of the manufacturer's production process and final test and inspection procedures.

However, only regular testing of protection devices by the user can guarantee that they function correctly throughout their operational life.

These functional tests include the detailed examination of the characteristics configured and the functions used in order to check and, if necessary, restore the availability of the protection devices.





ARTES II

Precision Measurement Techniques for Relay Testing

Applications

The test modules of the latest ARTES II generation have been optimally designed for functional testing, and especially for the testing of the configured excitation and trigger response characteristics (including automatic reclose functions) of a wide range of protection devices, such as:

- distance protection relays,
- differential protection relays,
- overcurrent relays,
- f, V relays.

In addition, the ARTES II systems can be used to test and calibrate power, voltage, current and frequency transducers.

All the test systems are controlled by an external, standard PC. A variety of software modules, known as test monitors, are available for the purposes of test performance and evaluation. As a result, the models of the ARTES II generation are universal test systems providing the ideal solution for a wide variety of tasks beyond the scope of protection relay testing alone.

The three-phase test systems can, for example, also be used

as convenient three-phase function generators which are freely configurable in amplitude, frequency and phase angle. Even flicker signals can be generated.

In addition to static tests, ARTES II can also carry out dynamic tests during the course of which the amplitudes of the current and the voltage, the frequency and the phase angle can be adjusted automatically and simultaneously within a broad range. The test values for fault-specific tests are calculated fully automatically for different fault types. By taking the configured fault and source impedances into account, protection devices can be tested under realistic conditions.

In addition to the binary measurement inputs, ARTES 440 II also has eight analog measurement inputs which can be used to record currents and voltages in a similar way to a disturbance recorder. During tests these records can then be played back again via the hardware as transient waveforms.

Signal Generation

The relay test systems of the ARTES II product generation

have up to four voltage and six current signal sources with a very high output power. The supply voltage of the 25 A current amplifiers can be automatically adjusted from 5 V to 30 V by the operating programme. This means that even with low test currents, the current amplifiers can provide a high output voltage and thus a high output power. The parallel operation of the current amplifiers makes even test currents of up to 75 A / 600 VA possible. This means that all kinds of electromechanical relays, overcurrent relays and differential protection relays can be tested without any additional units.

In addition, special high-accuracy, low-level outputs make it possible to test protection devices with low-level signal inputs. The behaviour of different sensors, such as Rogowski coils, can be exactly simulated in this connection.

In addition, the protection device under test can be addressed with binary signals as well as analog values. These are generated synchronously to the analog values and can therefore give control commands to the protection device during the test.





ARTES Software

Simple Operation

The relay test systems of the ARTES II generation are operated entirely with the very latest version of the practical ARTES software. This modular software package has been specially developed for the requirements of protection testing by engineers with practical experience in the field. Despite the wide variety of functions and the individual configuration facilities, the operation of the programme is practically oriented. The clear, ergonomic design of the user interface means that the software can be operated intuitively and is easy to learn. The training period is thus reduced to a minimum.

Device Management

Device and test parameters are managed in the device database. A directory tree, similar to the Windows Explorer, is avail-

able to facilitate selection of the protective equipment to be tested. The structure of the tree is organised according to the criteria required by the user, such as the installation location, for example, or the device type of the equipment to be tested.

The results of previously performed tests are also saved in the device database. These results can therefore be called up at any time for the purposes of comparison or reproduction.

The device-specific storage of the results of each individual test, leads to the compilation of a complete and detailed history of the device under test.

Test List

An individual test list can easily be drawn up for each device to be tested. In this way, single tests can be combined to form complete device or type tests. These device or type tests can

then be repeated any number of times under exactly the same test conditions, thus facilitating the automation of tests.

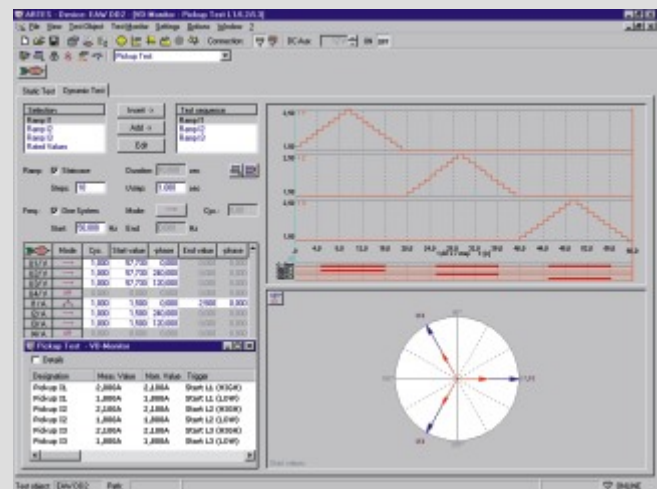
All tests can be freely configured and saved offline. This makes it possible to prepare a test step completely without leaving the office.

At the test location, it only remains to select the required test from the test list and run it. This enables a substantial amount of time to be saved, especially in the case of routine tests.

Test Monitors

Generally speaking, all test tasks can be performed using the VD-Monitor included in the system. This test monitor makes it possible to test any protection relay by configuring the generator values manually. In addition, the output signals can be ramp ascending and descending (linear or stepped) within the configured range.

The relay test systems of the ARTES II generation are operated entirely with the very latest version of the practical ARTES software.





The ARTES software also offers a wide range of convenient test monitors which are specially suitable for testing specific protection functions. Using these monitors can simplify, automate and greatly accelerate tests of various types of relays (overcurrent relays, distance protection relays, etc.). The following monitors are given as examples:

- **IMP-Monitor**
Fully automatic testing of distance protection relays
- **IT-Monitor**
Fully automatic testing of overcurrent protection relays
- **DIFF-Monitor**
Fully automatic testing of differential protection relays
- **SYNC-Monitor**
Fully automatic testing of synchronising equipment
- **TD-Monitor**
Fully automatic testing of transducers

- **PIC-Monitor**
Fully automatic determination of pick-up values
- **Smart Sequencer**
Testing with event-controlled sequences
- **TRANSIG-Monitor**
Testing of protection equipment using any previously recorded or any generated transient signal. The optional SIGNAL-Editor is an extension of the TRANSIG-Monitor which can be used to generate any signal characteristic.

The IMP-Monitor makes it easy for the user to test the operating times and impedance zones of distance protection devices. The required fault impedance, which can lie on the straight line representing the power line or in any of the four quadrants of the complex R/X plane, can be selected in the impedance plane or the Z-t diagram.

The programme automatically calculates all the test values (currents and voltages) for the configured fault impedances and the selected fault type. Additionally, the IMP-Monitor offers the possibility of checking the ARC (Auto Reclose) function of a protective device. The aim of the test is to establish the dead time(s) of a successful or unsuccessful ARC operation.

Presentation and Evaluation of Test Results

During a test, the magnitudes of the analog output values and the messages and commands of the device under test captured by the test system are displayed simultaneously in real-time on the screen, both graphically and numerically.

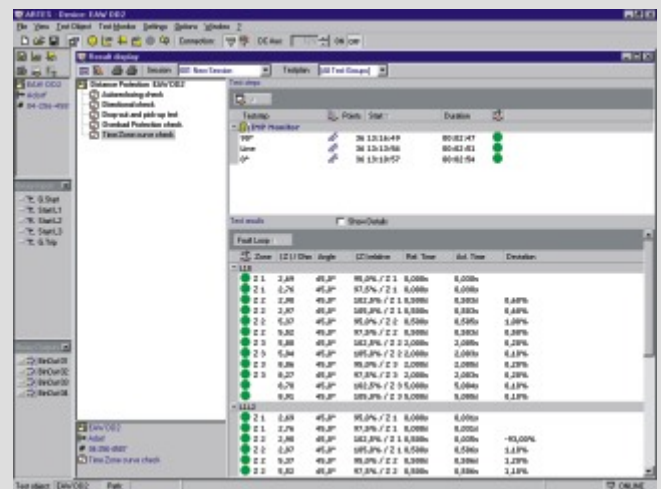
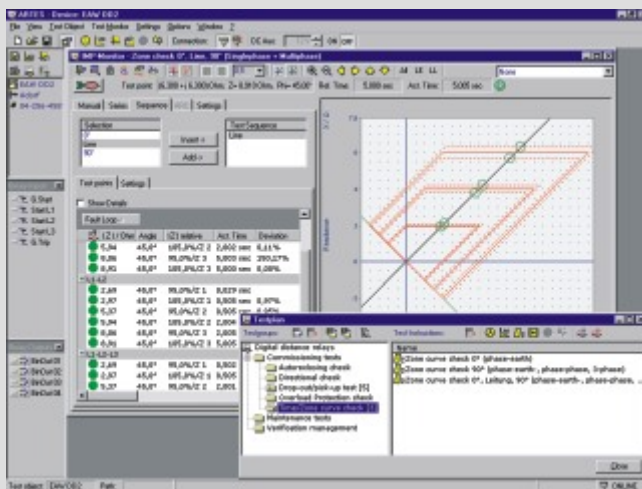
The reaction of the device under test is also evaluated automatically by the programme during the test. For each meas-

urement point, an online indicator shows whether the test result is within or outside the configurable tolerance range.

The evaluation of a test performed using the IMP-Monitor, for example, is carried out by comparing the command times measured by the test system with the release times defined by the tripping characteristic.

All results are displayed in table form immediately after the test. Each line of the table contains the information pertaining to a single measuring point.

The list of results can also be printed out in a test report. This report is automatically generated by the programme and contains all the relevant data, parameters and test results. Using the KoCoS Report Generator, the structure and layout of reports can be adapted in line with individual preferences and requirements.





Product Specifications



ARTES 440 II



ARTES 400 II



ARTES 330 II



ARTES 300 II



ARTES 220 II

Voltage amplifiers

4-ph.: 4 x 0 to 300 V/75 VA
 1-ph.: 1 x 0 to 600 V/150 VA
 3-ph.: 3 x 0 to 300 V/75 VA
 1-ph.: 1 x 0 to 600 V/150 VA
 1-ph.: 1 x 0 to 300 V/75 VA

Current amplifiers

6-ph.: 6 x 0 to 25 A/100 VA
 3-ph.: 3 x 0 to 50 A/200 VA
 1-ph.: 1 x 0 to 75 A/600 VA
 6-ph.: 6 x 0 to 12.5 A/40 VA
 3-ph.: 3 x 0 to 25 A/85 VA
 3-ph.: 3 x 0 to 25 A/200 VA
 1-ph.: 1 x 0 to 75 A/600 VA
 3-ph.: 3 x 0 to 25 A/85 VA

Low level outputs

10 x 0 to 10 V_{pk}

Auxiliary DC outputs

12 to 260 V, 50 Watt

Analog inputs

Number
 0 to ±10 V
 0 to ±20 mA
 2V~

Binary inputs

Number
 Groups

Binary outputs

Number

Connections

Gen. multi-pole connectors
 Input multi-pole connectors

Housing

Dimensions, (W x H x D)
 without handle [mm]

Weight

Certificates

DKD calibration certificate



8

8

2

2

2

4

3

1

1

1

4

1

1

1

1

4

4

24

8

8

8

4

3

2

2

2

1

4

2

2

2

2



470x162x436

470 x162x316

470x162x436

470x162x316

363x162x436

15 kg

11 kg

15 kg

10 kg

12 kg



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■ standard

■ optional