

ACTAS



ACTAS

Advanced Circuit Breaker Test
and Analysing Systems

Breaker Analysing Systems of the ACTAS Series

System Description

The automatic test systems of the ACTAS product range can determine and check the major electrical and mechanical parameters of all types of breakers. The universal modular concept behind the ACTAS systems enables us to provide exactly the right system for any specific application, from portable starter devices through to professional solutions for fully automated final factory tests. The voltage level and design of the primary and drive circuits are irrelevant as ACTAS systems are fully equipped to deal with all types of breakers.

An important feature of all ACTAS systems is the combination of robust hardware capable of real-time processing with the manifold possibilities afforded by convenient, PC-based software. Configuration, display and analysis are fully PC-supported. All test steps can thus be carried out from a dry, safe location enabling you to escape the adverse environmental conditions often encountered on site. The option of an integral industrial PC is also available for various models.

ACTAS test systems are constructed according to a modular design in 19" format and are based on the latest 32/128 bit DSP processor technology. All measurement inputs are, of course, galvanically separated from the input terminals. KoCoS *LOC circuits* (linear opto-couplers) are used for the analog channels guaranteeing very high levels of accuracy and an absolutely linear frequency response characteristic as well as trouble-free operation even in harsh electro-magnetic environments.

Circuit breaker tests are usually performed dynamically using various sequences of operations with simultaneous capture of the relevant measured values in the drive and primary circuits. All parameters are then automatically calculated and checked on the basis of the measured values.

The ACTAS product range offers a wide variety of different models and extension modules for specialist test situations. The *Dynamic Timing* option, for example, makes it possible to determine the contact times of breakers which are earthed at both sides by means of dynamic voltage drop measurement. All systems have control outputs for external modules for the purposes of static or dynamic determination of main contact resistances.



Breakers are situated at the key points of electrical energy transmission and distribution systems. Their reliability has a decisive influence on the availability, safety and economic efficiency of electrical supply networks.

Despite constant subjection to external influences such as dirt and fluctuations in humidity and temperature they must be able to function perfectly in the case of a fault, even if they have not been operated for some time. Should a short-circuit occur, circuit breakers must interrupt extremely high fault currents within just a few milliseconds.

Initially, the reliability of newly installed breakers depends on their construction, the manufacturing quality and the type and scope of final factory inspections and tests. However, once installed on site, only regular tests can guarantee perfect functioning throughout the operational life of a breaker.

Automatic test systems provide precise information as to the state of the switching chamber and drive unit throughout the entire operational life of a breaker without requiring these to be opened. The sheer number of parameters to be calculated, the wide variety of different breakers in use and the harsh environmental conditions encountered during on-site tests make extremely high demands on the test technology involved.





ACTAS

Applications

The test systems of the ACTAS product range have been specially developed to perform automatic general operating tests on all types of breaker, regardless of the type of drive unit, including, for example,

- circuit breakers
- load switches
- disconnectors and earthing switches

The first operating tests are carried out during breaker development. Once final factory tests and inspections have been carried out and the breaker has been installed, regular, on-site service tests safeguard the full operability of a breaker.

All the different models are suitable for both manual and automated tests. Freely configurable test plans make it possible to pre-define all the test steps and analysis functions for a wide variety of different types of breaker. As a result, the tests themselves can be carried out quickly and efficiently. Incorrect evaluations resulting from false operation or configuration can be almost completely ruled out.

The ACTAS range includes a broad spectrum of compact, portable test systems for on-site tests. The basic difference between the various devices lies in the number of measurement inputs for analog and binary signals. Stationary test systems with customer-specific configurations are currently being used by leading breaker manufacturers for final tests. Installation in 19" racks allows the integration of automatically

Advanced Measurement Techniques for Breaker Analysis

controlled voltage sources for supplying releases and drive units. Simulation of the plant conditions prevailing at future breaker locations makes it possible to test breakers under realistic and extreme fault conditions even before they have left the factory.

Both the stationary and portable test systems are also suitable for use in the laboratory for breaker development or type tests, for example. The freely programmable sequence control system makes it possible to simulate all kinds of switching operations and to repeat them almost indefinitely within the framework of fully automated repetitive operations. Even life tests with 10000 or more operating cycles present no problem.

Compatibility

All the test systems of the ACTAS product range are based on identical functional principles and are operated via the same software. This means that measurement results obtained in the factory can be compared with the results of subsequent on-site tests at any time, regardless of which ACTAS model was used at the time.

Measurement and Test Spectrum

ACTAS test systems automatically determine all the electrical and mechanical parameters relevant for the assessment

of switching behaviour without requiring the switching chamber or drive unit to be opened.

In the primary circuit these parameters include the operating and bounce times of all switching chambers including transition contacts connected in parallel. In addition to the usual analysis via the binary contact state, there is also the option of determining operating times via *Dynamic Timing*. Using this special method which is especially suitable for carrying out measurements on graphite contacts, the contact status of up to 6 switching chambers can be determined simultaneously via a voltage drop measurement. A further advantage of this method is that breakers can remain earthed at both sides even during the measurement itself.

For the purposes of determining static and dynamic contact resistance, all ACTAS test systems are provided with interfaces for controlling optionally available KoCoS high-current sources. The dynamic method of measurement with DC test currents of up to 1000 A provides information as to the length and state of the arcing contacts.

Important parameters in the drive and control circuit including contact travel and velocities, release and motor currents, valve pressures and motor operation times are all part of the repertoire, as is the determination of the operating and pulse times of all auxiliary contacts.





ACTAS Software

Specialist System Solutions

The ACTAS software package was developed in close cooperation with leading breaker manufacturers and users by a team of engineers with many years of practical experience in the field of breaker test technology.

The test systems fulfil quality management requirements for functionality and operation both with regard to the manufacturing side as well as the specific requirements for on-site tests. Breaker manufacturers and users work with the same software and can exchange and compare test data and results simply and easily.

Technical points were not the sole consideration to influence the design of the user interface. Particular emphasis was also placed on ergonomic aspects and comprehensibility. The structure of the software is in line with current Windows standards making it easy to begin using the systems.

As an entirely software-controlled system, ACTAS enables pre-definition of all the parameters of the test sequence with the aid of the standard configuration software included with every test system. The flexible and user-friendly basic concept will help you to solve any conceivable test task. Analysis is carried out automatically using the measured data and breaker characteristic quantities.

Breaker Types

The creation of breaker types helps to reduce to a minimum the work involved in defining test and analysis specifications, despite the large number of freely editable parameters.

A breaker type functions as a central repository for all the characteristic quantities and parameters necessary for the test sequences and analyses for a specific type of breaker. Even the order of individual test

steps and freely definable repetitive operations is pre-defined here in the form of test plans. The definitions of all breaker types are stored in a central database and can be used amongst other things as the basis for the creation of further types.

Freely Definable Test Sequences

Individual test steps are based on the definitions of the basic switching sequence, such as O, C, CO or O-t-CO, for example. In addition to "classical" sequences, ACTAS also enables highly specialist test sequences to be defined and carried out, such as sequences for the determination of motor currents or release response thresholds or for the evaluation of manually triggered switching operations.

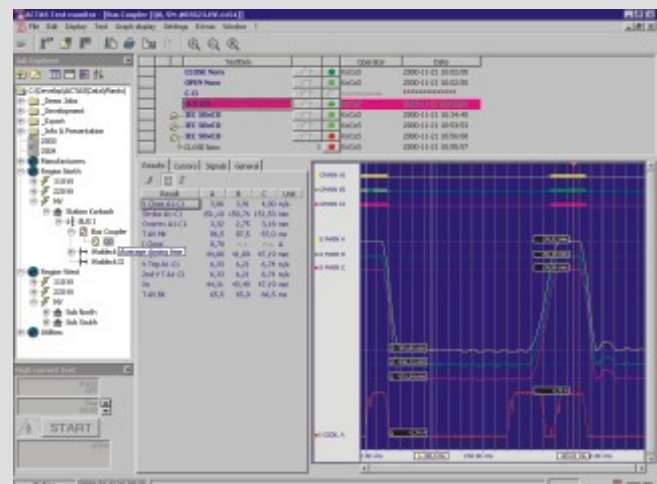
Test sequence control is carried out via the electronic switching outputs and the freely assignable relays of the ACTAS test

systems. Every output can be controlled completely and independently in increments of one millisecond. Parallel to the sequence control, the system captures all varying quantities in real time. A powerful transient recorder with sampling rates of up to 20 kHz and a maximum record duration of several minutes is provided for this purpose. The sampling rate can be altered signal-dependently for specialist recordings. The dynamic control of the record duration and sophisticated trigger functions ensure that only those events which are of real interest are captured.

Individual switching operations, once defined, can be combined to form a series of repetitive test operations with an almost infinite number of operating cycles. The chronological succession of individual tests and repetitive operations ultimately constitutes the test plan.



The ACTAS software package was developed in close cooperation with leading breaker manufacturers and users.





Test Jobs

All breaker tests carried out with ACTAS are clearly organised in the form of test jobs. Test jobs contain all the necessary test and analysis specifications, marginal conditions and plant parameters for fully testing one or more breakers. The data captured and the parameters determined during a test are also saved subsequently in the test job.

Test jobs can be organised according to any criteria, such as location, plant, year or client. The breakers contained in a test job are selected from the type database with just a few clicks of the mouse. For the purposes of comprehensive documentation, additional descriptive information pertaining to the breakers or plants or even commercial data such as statements of costs, for example, can also be saved in test jobs. The Job Explorer provides you with a powerful job management tool.

Test Monitor

The test monitor constitutes the control centre of the ACTAS software. It is used for the active execution of all manual and automatic test steps as well as for the analysis of tests which have already been carried out.

The Job Explorer displays the structure of the loaded test job on the user interface as well as the test plan showing all the test steps which have already been completed. Individual test steps are started directly from the test plan. Once a test has started, the issue of control signals and the recording of switching operations are carried out in real time. The software automatically calculates all the characteristic quantities and parameters from the captured quantities in accordance with the analysis specifications entered by the user and displays them in a clearly structured table of results. Results which lie outside the configured tolerances are

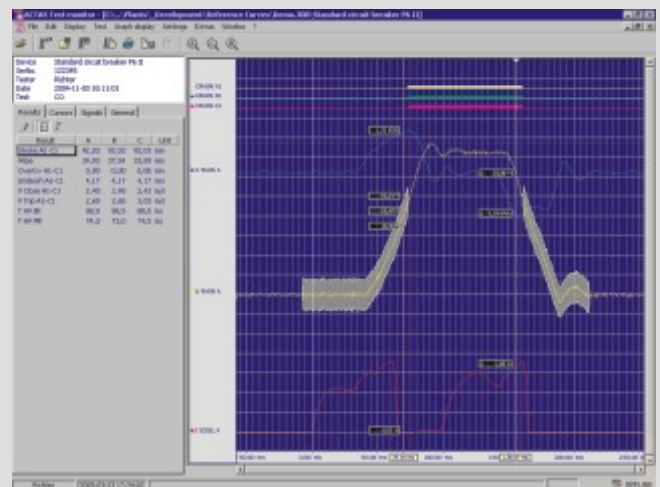
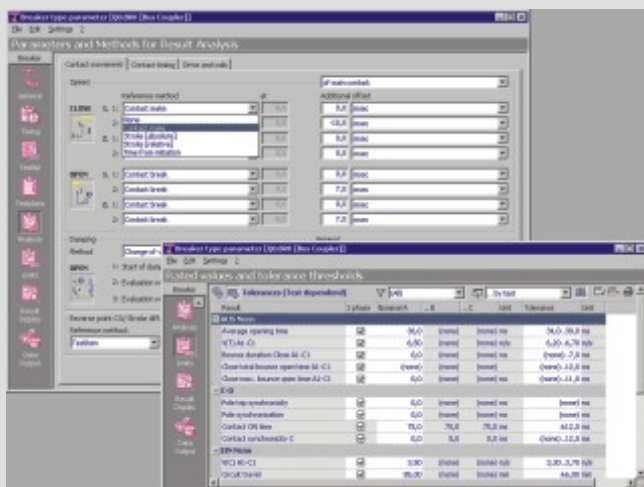
highlighted. All measured analog and binary signal characteristics are displayed clearly on the freely configurable graphical area of the test monitor. The real-time zoom function and the measured value cursors allow manual analysis of the signal characteristics. For the purposes of directly comparing various test steps it is possible to overlay signal characteristics in any manner.

Data Processing

All parameters, measured values and results are managed in an open and flexible data structure either locally or on a central network server. An integral compression tool is included to save memory capacity when archiving. Data export is also possible to structured text files (CSV format) and to various database formats such as Microsoft Access.

Test Report

For the output of test results, the programme automatically creates a test report which you can customize to meet your individual requirements with regard to both contents and layout. You yourself decide which data, test or breaker parameters should be included in a report and where they should be positioned. The information can be displayed in text or graphical form. The report generator is, of course, also equipped with various standard import filters for the integration of external graphics.





Product Specifications



ACTAS P22



ACTAS P14



ACTAS P6



ACTAS P3

Control outputs

Close coils	3	3	1	1
Trip coils	3	3	1	1
Relay outputs	2	2	1 ■	

Analog measurement inputs

Coil current	3 x 2 (I/O)*	3/1 x 2 (I/O)*	1 x 2 (I/O)	1 x 2 (I/O)
Coil/station voltage	2	1	1	
Motor current via shunt	1	1	1	
Motor voltage	1			
Ext. sensor (travel / press.)	3*	3*	2	
Incr. Travel transducer	6	6	1	1 ■
Micro Ohm current	1*	1*	1	
Micro Ohm voltage drop	1*	1*	1	
Sensor input (current clamp)			1	
Universal input	2*	2*	1	
Universal input II				

Binary measurement inputs

Main and resistive contacts	3 x 6 (3 x 8 ■)	3 x 6 (opt. 3 x 8 ■)	3 x 2	3 x 2
Auxiliary contacts	3 x 6	3 x 4	2 x 4	2 x 4

Analog outputs

Control outputs for external Power Supply Unit	2 ■	2 ■		1 ■
Const. current source 10 A	6 ■			
Reference voltage for external sensors	10 VDC, 3W ■	10 VDC, 3W ■	10 VDC, 2W ■	

Further connections

Control output for external Micro Ohm Meter	1	1	1	
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PC-Interface

RS 232, USB	■	■	■	■
Optical isolation	■	■	■	■
Bluetooth	■	■	■	■

Housing

Dimensions, (W x H x D) without handle [mm]	470x204x316	470x160x316	257x160x316	158x130x272
Weight	11 kg	8 kg	4 kg	2.5

*) at 1 phase coil current/phase travel measurement

■ standard

■ optional



Stationary Breaker
Test System ACTAS C16



KoCoS Messtechnik AG

Suedring 42
D-34497 Korbach ■ Germany
Phone +49 56 31 95 96-0
Fax +49 56 31 95 96-16

www.kocos.com