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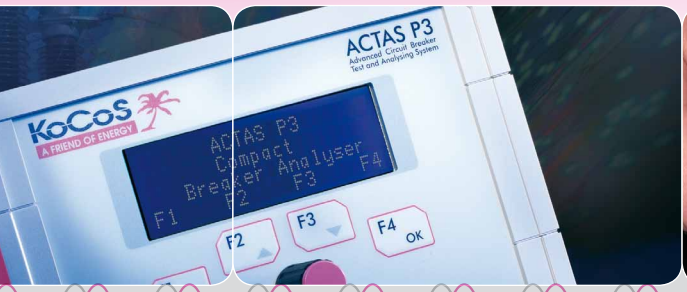
ACTAS P.

Portable Switchgear Test Systems



KOCOS MESSTECHNIK AG

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[ENG]

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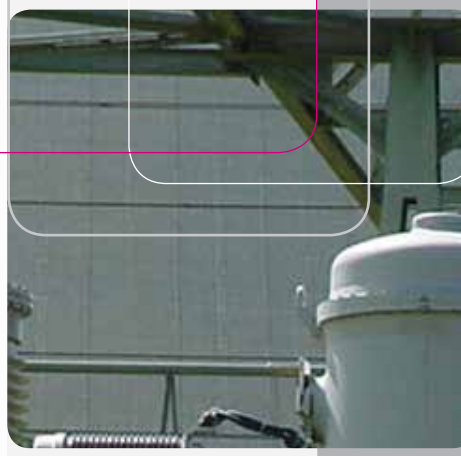
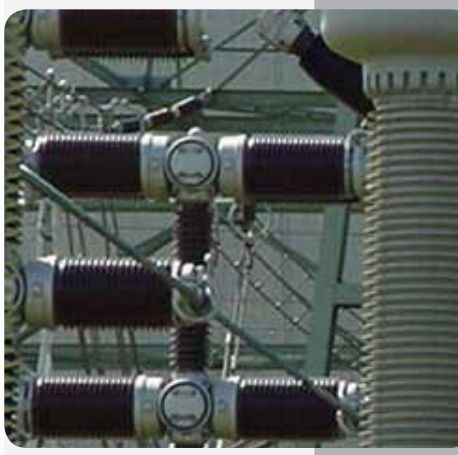
Portable Switchgear Test Systems

Switchgear devices 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 electricity supply systems.

Only regular, on-site tests can ensure that switchgear devices function perfectly throughout their operational life.

ACTAS test systems provide precise information as to the condition of the chamber and drive unit without requiring them to be opened. The sheer number of parameters to be determined, the wide variety of different types of switchgear equipment in use and the harsh environmental conditions encountered during on-site tests place extreme demands on test equipment.





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ACTAS P.

Product overview

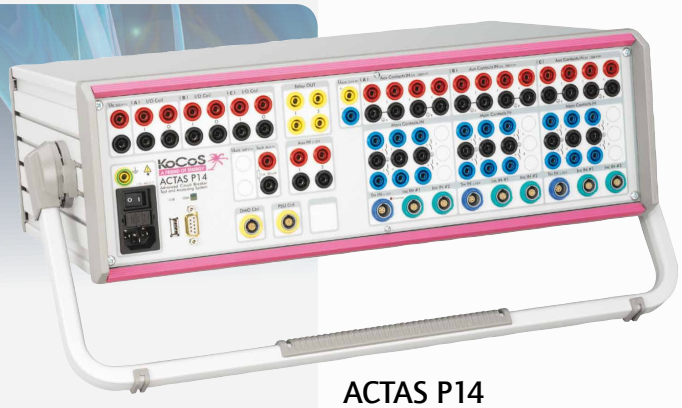
The ACTAS P series offers a broad spectrum of compact, portable test systems for carrying out on-site tests on switchgear devices.

ACTAS P3

Stand-alone breaker analyser with integrated control panel for testing operating times

ACTAS P6

Compact test system for one coil circuit with inputs for one analog and one digital travel transducer



ACTAS P14

Universal test system for three coil circuits with inputs for up to three analog and six digital travel transducers

ACTAS P22

Top-of-the range test system with the ability to measure operating times dynamically and carry out tests with earthing on both sides

ACTAS P.

Portable test systems for all requirements

The requirements a test system must fulfil are defined primarily by the type of construction and the specific equipment of the switchgear devices which are to be tested. For this reason, the test instruments of the ACTAS range have different numbers and types of inputs and outputs to meet these various requirements.

	ACTAS P22	ACTAS P14	ACTAS P6	ACTAS P3
Control outputs				
Closing coils	3	3	1	1
Opening coils	3	3	1	1
Relay outputs	2	2	1	
Analog measurement inputs				
Coil current	3 x 2 (I/O)*	3 x 2 (I/O)*	1 x 2 (I/O)	1 x 2 (I/O)
Coil voltage	2	1	1	
Motor current	1	1	1	
Motor voltage	1			
External sensors (travel/pressure)	3*	3*	2	
Incremental travel transducers	6	6	1	1
Sensor input for current clamp			1	
Universal input 0...10 V		2*		
Dynamic Timing channels	6			
Binary measurement inputs				
Main and resistive contacts	3 x 6 (3 x 8 ■)	3 x 6 (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 output for external voltage sources	2 ■	2 ■		1
Reference voltage for external sensors	10 VDC, 3 W	10 VDC, 3 W	10 VDC, 2W	
Other connections				
Interface for PROMET resistance measurement	1*	1*	1	
PC interface				
RS 232, USB	■	■	■	■
Bluetooth adapter	■	■	■	■
Housing	19", 4 U	19", 3 U	½ 19", 3U	ABS
Dimensions, (W x H x D) without handle [mm]	470 x 204 x 316	470 x 160 x 316	257 x 160 x 316	158 x 130 x272
Weight	11 kg	8 kg	4 kg	2.5 kg

*) With 1-phase coil current/travel measurement ■ Standard ■ Optional

Comprehensive measurements for switchgear analysis

ACTAS test systems allow comprehensive analysis of all types of switchgear based on a number of factors, including an assessment of the following parameters:

- Status of main and resistive contact
- Status of the auxiliary contacts
- Coil current and voltage
- Operating current of spring-charging motors or pump motors
- Pressure, travel and temperature values
- Mechanical main contact travel

The test fulfils all the requirements stipulated in IEC 62271-100 for assessing the mechanical behaviour of high-voltage circuit breakers.

Carrying out tests automatically

Once the device under test has been connected up to the test system, the test plan prepared in advance can be started immediately and run automatically. All the measured values and parameters required are determined during the course of a single test cycle.

The assessment of the measurement results is carried out using saved limit values and is displayed clearly directly in the test monitor.

Reliable operation even in extra-high-voltage environments

The use of tried and tested hardware components and the excellent electromagnetic compatibility of the test systems guarantee their safe functioning, even during on-site tests in extra-high-voltage environments.

A basic accuracy of 0.1% with an absolutely linear frequency response ensures that tests are carried out with extremely high precision. The sampling rates for the acquisition of analog measurement signals can be freely selected between 100 and 15000 Hz; the resolution is 16 bit.

External PC control for high flexibility and easy operation

ACTAS test instruments are controlled with ergonomic, easy-to-use software for Windows® operating systems. External operation, independent of the test instrument itself, brings significant benefits, including the possibility of using existing PCs. Not only does this make economic sense, the familiar PC environment also helps users get to grips with the software more easily.
A further advantage is that tests can be prepared and analysed without having to connect a test instrument or even leave the comfort of the office. Once on site, tests can be controlled from outside the danger zone, while the test instrument itself is positioned in the direct vicinity of the switchgear device.

Test plans for efficient test preparation and evaluation

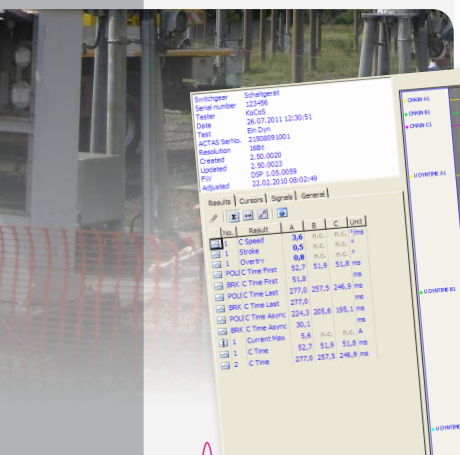
Test plans containing all the necessary switchgear and test parameters can be prepared in full with the aid of the ACTAS operating software. No further settings need to be made on site, the desired test can be carried out without delay. The algorithms and limit values which are needed for automatic evaluation are also saved in the test plan.
Test plans created with the ACTAS software can be used as a templates with any ACTAS test instrument. They can be applied to manual tests consisting of a single test step or to more complex tests which are run automatically.

DYNAMIC Timing

With the *DYNAMIC* Timing function, ACTAS manages to combine extended measurement and analysis functions with improved safety and convenience.
DYNAMIC Timing allows tests to be carried out simultaneously on up to six chambers with earthing on both sides, without using ferrite cores or other fault-prone aids. A detailed visualization of contact travel is provided. Even switchgear devices with different contact materials, such as graphite, tungsten or silver, can be tested reliably and precisely with *DYNAMIC* Timing.

Contact travel visualization

Unlike evaluation based on a simple binary signal, as is used in high-frequency measuring methods, *DYNAMIC* Timing enables a sound diagnosis of interrupter units throughout the whole switching operation. The result of the measurement is displayed in the form of a curve which visualizes in detail all the events of a switching operation. This allows an accurate assessment of the start of travel and the final position of the contacts and even reveals time differences between the movements of the main and resistive contacts.

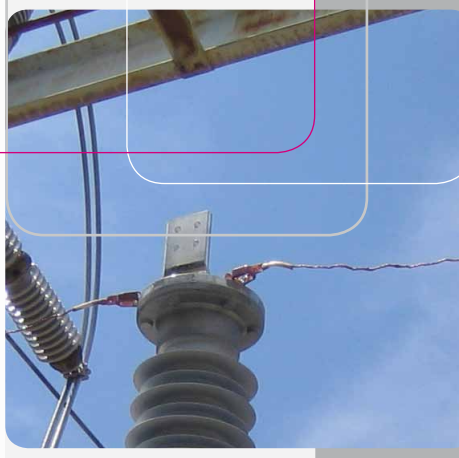


Testing with earthing on both sides

Switchgear equipment should be earthed on both sides when people are in the vicinity in order to prevent danger caused by capacitively coupled voltages from neighbouring components.
However, when switchgear equipment is tested using conventional measuring methods, earthing must be removed on at least one side.
With *DYNAMIC* Timing, measurements can be carried out with earthing on both sides. Not only does this make tests much safer, it also makes them simpler and quicker because all the steps which need to be taken in order to remove the earth lead are no longer required.

Earthing on both sides in GIS installations

When testing gas-insulated switchgear installations in particular, measuring the breaker contacts with earthing on both sides is problematic.
ACTAS uses the possibility of determining current differences during the switching operation to solve the problem. The constant-current sources of the *DYNAMIC* Timing function are connected to the interrupter unit for this purpose. The current in the earth leads is measured with high-accuracy current sensors and used for calculating the operating times.



Assessing the interrupter unit by analysing contact resistance

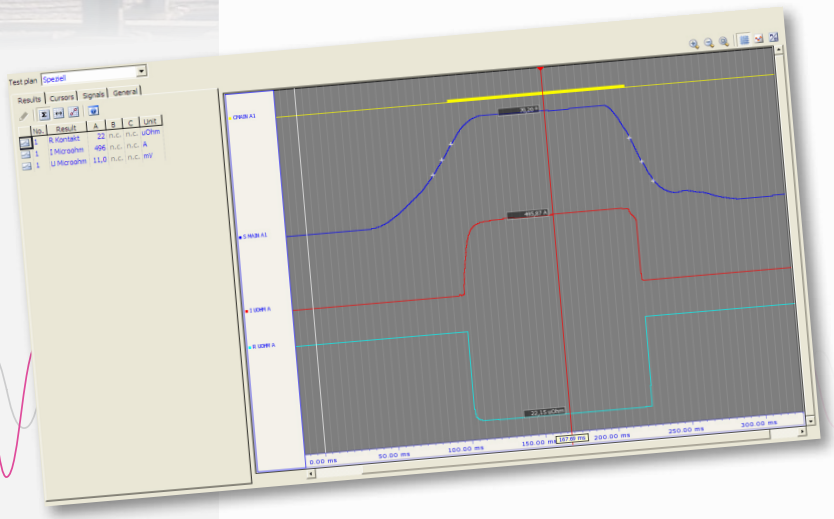
Regular measurements of the static and dynamic contact resistance allow accurate assessment of the state of the whole contact system, enabling maintenance requirements to be identified at an early stage and down times to be kept to a minimum. Contact resistance measurements can be carried out on three poles with KoCoS PROMET ohm meters and can be incorporated within the test procedure. The test current can be set to a maximum of 600 A. Even very low resistance values in the single-digit micro-ohm range can be measured extremely accurately. The measured values are used in the evaluation of tests and are included in the test report.

Static measurement

A high contact resistance within a switchgear device leads to high power loss coupled with thermal stress which can potentially cause serious damage to the switchgear device. Problems, such as high transfer resistance resulting from poor connections, can be identified by measuring static contact resistance.

Dynamic measurement

Dynamic contact resistance measurements can be used to determine the resistance characteristic during a freely definable switching operation. Measurements of this type give an indication of the length and state of the arcing contacts of high-voltage breakers, for example.



The ACTAS operating software

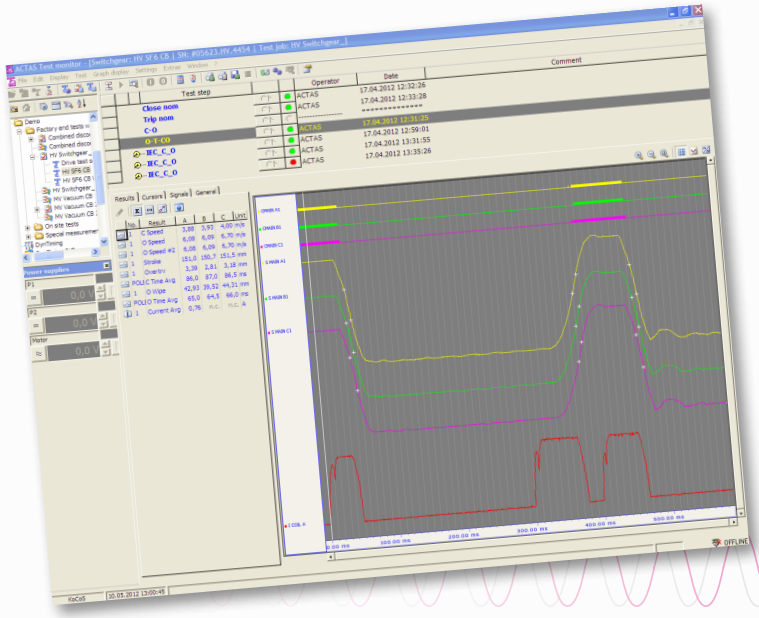
With ACTAS test systems, the output of switching sequences and the measurements performed on a switchgear device are fully controlled by means of the operating software.

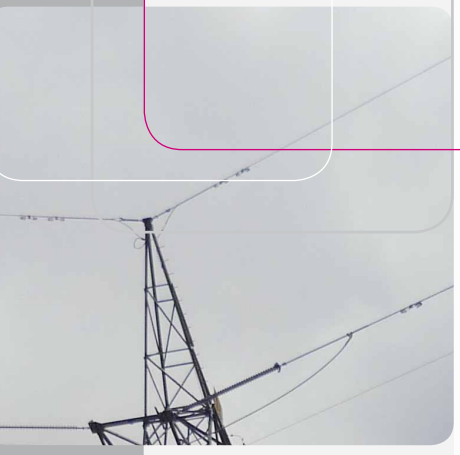
Know-how put into practice

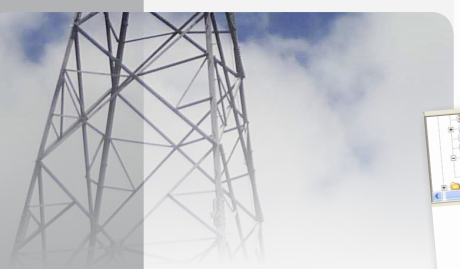
The ACTAS software is the product of many years of practical experience and close cooperation with network operators and switchgear manufacturers.
The resulting test applications can be used to solve any test task likely to be met in practice.

The whole test at a glance

The central element of the operating software is the test monitor. Tests are created, carried out and archived here.
All test parameters and results can be seen at a glance. Tests are started and monitored directly in the test monitor. Indicators show whether or not the measurement results lie within the defined limit values. A graph of all measured signal characteristics, featuring zoom functions and measurement cursors, offers additional options for detailed analysis.







Flexible directory structure for individual requirements

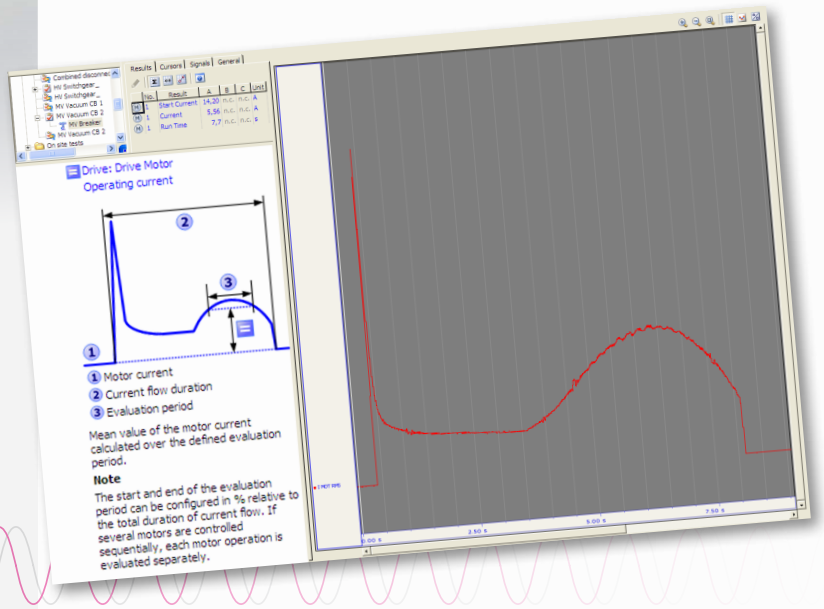
All switchgear data and test parameters, including the results, are automatically saved in a freely definable directory structure. This makes it easy for tests to be called up, edited or used as templates.
Compressing switchgear data and measurement results so that they can be sent by e-mail, for example, is made simple by the central storage of data. Archiving the data or exporting them to other data formats or databases is child's play too.

Result help

A help function supports users in the selection of the measurement results they require and the subsequent evaluation of those results. Descriptions and graphs facilitate the correct interpretation of the results obtained.

Automatic generation of test reports

The software includes an option for automatically creating test reports to document test results. As well as the results themselves, reports can also include curve characteristics of recorded signals, switchgear data and test parameters. The contents and layout of test reports can be customized to meet individual requirements.



ACTAS GO

The custom solution for all standard tests

The ACTAS GO software has been specially designed for testing switchgear devices on site and contains all the necessary functions. Whatever the task in hand, be it test preparation, test execution or test management, the clearly structured user interface gives fast, direct access to the functions required at any stage.

The user is guided step-by-step through the process of parameterization to the start of the test. Parameters which are not required for a certain test task or type of switchgear device are automatically hidden. This makes it very simple to define operating sequences and limit values or select measurement channels.

The graphical assignment of measurement channels to the corresponding connection sockets is extremely helpful when linking up the switchgear device to the test instrument. A virtual connection panel indicates where the individual measuring leads are to be connected.

	Article No.
ACTAS GO operating software	#6375

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ACTAS 2.50

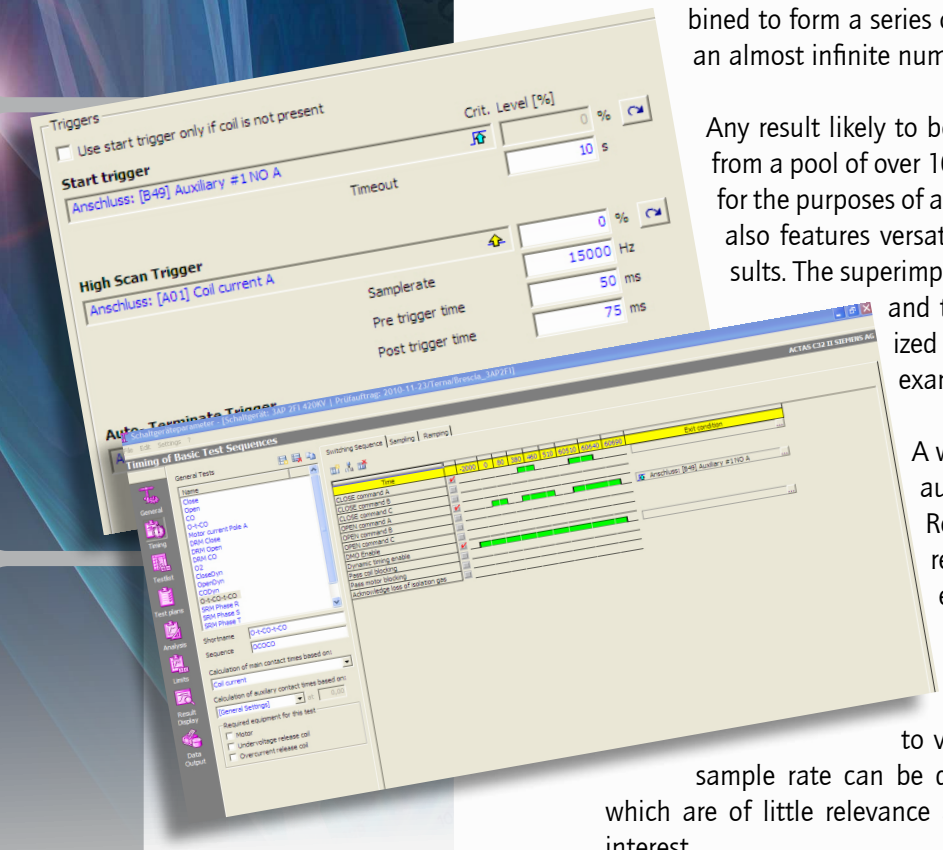
The solution for comprehensive switchgear tests

The ACTAS 2.50 operating software is the first choice when it comes to carrying out comprehensive tests or test procedures.
With its special application modules, the software delivers solutions for individual test tasks.

Variable times and control signals allow switching sequences to be defined freely.

Once defined, individual switching operations can be combined to form a series of repetitive operating sequences with an almost infinite number of operating cycles.

Any result likely to be required in practice can be selected from a pool of over 1000 pre-defined evaluation algorithms for the purposes of automatic test evaluation. The software also features versatile instruments for the analysis of results. The superimposition of various measurement curves and the assessment of signals using idealized reference characteristics are just two examples.



A wide range of trigger options allow the automatic issue of control commands. Recording can be started or stopped in response to the occurrence of specific events, for example.

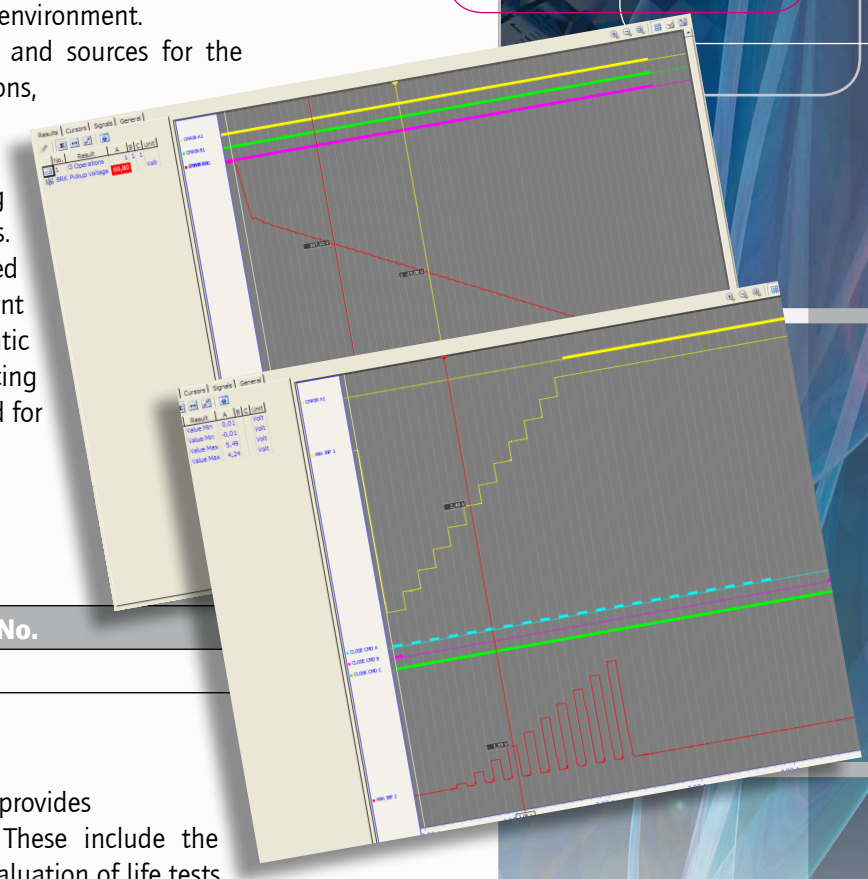
In order to reduce the volume of data in a recording, triggers can be used to vary the sample rate dynamically. The sample rate can be decreased for those parts of the test which are of little relevance and increased for areas of particular interest.

	Article No.
ACTAS operating software V2.50	#6032

Software modules for ACTAS 2.50

Control & Automation

The **Control & Automation** software module includes a wide variety of monitoring and control functions for automated switchgear testing in a test, factory and on-site environment.
Various internal and external actuators and sources for the provision of configurable test conditions, such as coil system selection, coil or motor voltage or drive pressure, for example, can be controlled via analog and binary channels or logical interfaces. Ramp signal characteristics can be issued to test undervoltage and overcurrent releases. A number of other useful automatic functions for monitoring the operating counter (including an alarm function) and for isolation tests complete the package.

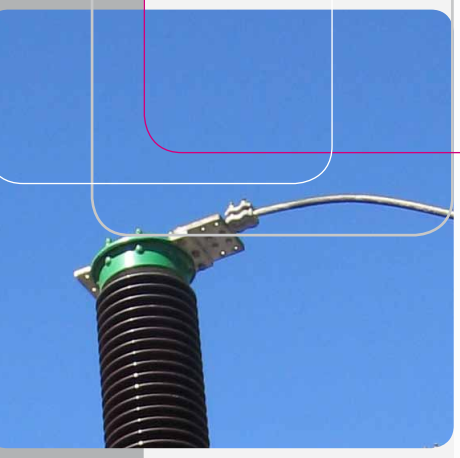


	Article No.
Control & Automation	#6131

Extended Testing & Analysis

The Extended Testing & Analysis module provides extended test and analysis functions. These include the unsupervised execution and statistical evaluation of life tests. The module also features tools for testing and assessing special drive types such as pneumatic or magnet drives, for example. Advanced mathematical methods are also included, such as the calculation of virtual channels for power analyses and the assessment of recorded signal characteristics using reference characteristics in accordance with IEC 62271 or custom reference curves, for example.

	Article No.
Extended Testing & Analysis	#6132



Statistics

The **Statistics** software module contains functions for logging and carrying out statistical analyses of switchgear faults identified by the test system or tester.

A freely configurable input dialogue box makes it easy to enter and classify any kind of fault types or causes. Entries are all made in a separate database and can be subjected to statistical analysis in accordance with various criteria. Another excellent feature is the attractive presentation of the evaluation in both text and graphical form.

Accumulations of faults in particular areas can be detected, making it possible to draw conclusions as to the constructional or functional weak points of specific types of switchgear.

	Article No.
Statistics	#6133

Data Interfaces

The **Data Interfaces** software module offers various interfaces for the import and export of measurement data, test results and test object data.
Using this module, records can be exported to text files and then processed further in external programmes, such as MS Excel.
Test results and test object data can be exported to MS Access databases for statistical purposes. In addition to data export, this software module also enables measurement data to be imported from various external systems for analysis in ACTAS. Connection to external database systems, such as SAP, is also possible via structured XML files, for the automatic generation of test jobs, for example.

	Article No.
Data Interfaces	#6130

Extended Data Management

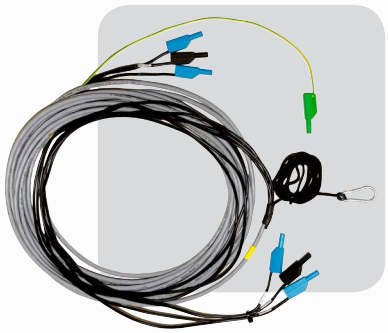
The **Extended Data Management** software module provides extended possibilities for handling test data and results, particularly when using ACTAS in a stationary, network-supported environment. Test data can be compressed and archived automatically.

	Article No.
Extended Data Management	#6134

ACCESSORIES

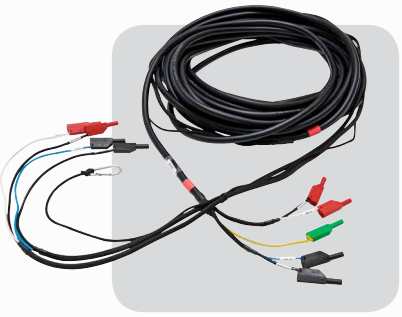
Standard cable sets

KoCoS provides complete cable sets for connecting the portable test instruments to the test object. The cable sets contain all the connection cables and accessories required for a function test. The cable sets consist of flexible, shielded, multi-core single cables which differ in length and in the number of cores for each cable set. All connection cables are fitted with 4 mm safety plugs at both ends.



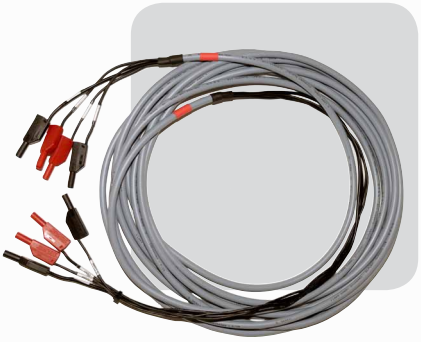
Main contact cable

3-core, flexible connection cable for measurement of the main contact. 4 mm safety plugs on both ends, 2 main contacts in series can be connected with one cable. Strain relief on the breaker side through rope and hook.



Main contact cable for ACTAS P22

4-core, flexible connection cable for measurement of the main contact. 4 mm safety plugs on both ends, for the purposes of the Dynamic Timing function 2 cores can be used for the current source and 2 cores for voltage feedback measurement. Strain relief on the breaker side through rope and hook.

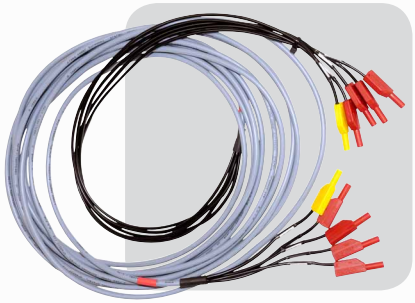


Coil connection cable

4-core, flexible connection cable for addressing one closing and opening coil, 4 mm safety plugs on both ends.

Motor connection cable
4-core, flexible connection cable for measurement of motor current and motor voltage, 4 mm safety plugs on both ends.

Universal voltage connection cable
4-core, flexible connection cable for measurement of coil and universal voltage, 4 mm safety plugs on both ends.



Auxiliary contacts connection cable
5-core, flexible connection cable for the measurement of the contact status of up to 4 auxiliary contacts, 4 mm safety plugs on both ends.

Measuring lead

Single core measuring lead, 4 mm safety plugs on both ends.

Screw clamp

Screw clamp for connecting a 4 mm safety plug to the head of a hex cap screw, max. 30 mm.

Test clamp for main contacts

Insulated test clamp for connecting to the main contacts with connection socket for 4 mm safety plug.

Colour: Black, red
Jaw opening: 25 mm

Terminal adapters

Adapter for connecting measuring leads with 4 mm safety plugs to standard rail-mounted terminals. The adapter converts a 4 mm safety plug to 2.5 mm² round Cu-wire.

Scope of delivery for standard cable sets

Standard cable set		ACTAS P3	ACTAS P6	ACTAS P6	ACTAS P14/ P22	ACTAS P22
		SCS P3	SCS P6 MV	SCS P6 HV	SCS P14/P22	SCS P22 DYN
	Art. No.:	#6177	#6198	#6162	#6080	#6312
Consisting of:						
Main contact cable	5 m	2	2			
Main contact cable	15 m			3	3	
Main contact cable for ACTAS P22	18 m					6
Coil connection cable	5 m	1	1			
Coil connection cable	10 m			1	3	3
Motor connection cable	5 m		1			
Motor connection cable	10 m			1	1	1
Universal voltage connection cable	10 m 4-core					1
Auxiliary contacts connection cable	5 m 4 auxiliary contacts	1	1			
Auxiliary contacts connection cable	10 m 4 auxiliary contacts			1	3	
Auxiliary contacts connection cable	10 m 6 auxiliary contacts					3
Connecting cable	15 cm			3	10	21
Connecting cable	60 cm	2	2	3	8	18
Test clamp	red	3	3	6	6	12
Test clamp	black	3	3	3	3	12
Screw clamp				9	9	24
Terminal adapter		12	12	12	50	80

Wrap-around bags and carrying cases

Carrying case for device

High-quality, robust carrying case with ABS plastic shell, anodised aluminium rim, snap locks and metal hinges. Easy manoeuvrability is provided by the retractable handle and smooth-rolling wheels. The case is delivered complete with a rigid foam insert to snugly fit the device inside.

Carrying case	ACTAS P3	ACTAS P6	ACTAS P14	ACTAS P22
Dimensions (LxWxH)	600x510x300 mm			
Weight:	6.5 kg			
Article No.:	#6367	#6038	#6081	#6319

Padded wrap-around bag

Robustly made, lightly padded wrap-around bag with shoulder strap and fitted carrying handle (ACTAS P3/P6). The bag has reinforced panels for dimensional stability and a separate compartment for accessories.

	ACTAS P3/P6	ACTAS P14
Dimensions (LxWxH)	380x240x350 mm	500x230x360 mm
Article No.:	#6321	#6322

Carrying case for travel transducer set

Robust plastic case for the practical storage and safe transport of travel transducer sets. The case is delivered complete with a snugly fitting, rigid foam insert for three travel transducers and accessories.

	Rotary transducers	Linear transducers
Dimensions (LxWxH)	540x430x130 mm	
Article No.:	#6385	#6386

Rotary transducers

Rotary transducers can be used to precisely measure the rotary movement of the operating and drive shafts of a switchgear device. They are delivered as a set, complete with all the components required to fix the travel transducer to the switchgear device and connect it to ACTAS test instruments. The scope of delivery also includes a robust plastic case with rigid foam insert for practical storage and safe transport.

A rotary transducer set contains the following components:

- Rotary transducer
- Articulated stand with base clamp and fine adjustment
- Coupling
- Transducer holder
- Adapter set to thread sizes M6, M8, M10, M12
- Connection cable
- Carrying case for rotary transducer set

Three-phase transducer sets contain three of each component.

Digital rotary transducer set WDG 58A

- Digital rotary transducer
- 3600 pulses per revolution
- Aluminium housing, 58 mm
- Stainless steel shaft, 6 mm, L 37 mm

	Article No.
Single-phase transducer set	# 6716
Three-phase transducer set	# 6383

Analog rotary transducer set IP 6501

- Rotary potentiometer transducer
- 360° mechanically continuous
- Electrical range 355° ±2°
- Aluminium housing, 55 mm
- Stainless steel shaft, 6 mm, L 37 mm

	Article No.
Single-phase transducer set	# 6016
Three-phase transducer set	# 6382

Linear transducers

Linear transducers can be used to precisely measure the linear movements of the switching and drive rods of a switchgear device. The scope of delivery for a set includes the connection cables for connection to the ACTAS test instrument and a robust plastic case with rigid foam insert. Three-phase transducer sets contain three of each component.

Analog linear transducer set LWG

- Potentiometer transducer
- Low-backlash pivot heads with large angle of movement
- IP65 protection

Maximum travel path in mm:	75	150	225	300	360	600
Single-phase transducer set	#6128	#6127	#6096	#6020	#6094	#6349*
Three-phase transducer set	#6387	#6388	#6389	#6390	#6391	——

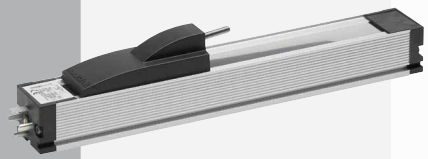
* case is not included

Analog linear transducer set type TS

- Linear potentiometer transducer
- Ball coupling eliminates shearing forces
- Compact design

Maximum travel path in mm:	25	50	100	150
Single-phase transducer set	#6089	#6088	#6090	#6092
Three-phase transducer set	#6394	#6395	#6396	#6397

Analog linear transducer TLH



- Potentiometer transducer
- Rodless coupling on the long side
- Metal slider
- Ball coupling eliminates shearing forces

Maximum travel path in mm:	150	225	750
Single-phase transducer set	#6361	#6360	#6072*
Three-phase transducer set	#6398	#6399	——

* case is not included

Digital linear transducer PMI

- Magnetic scale position sensor
- Non-contact operation, no wear and tear
- Slider with high profile
- For high travel speeds

Maximum travel path in mm:	150
Single-phase transducer set	#6350
Three-phase transducer set	#6384

Pressure transducers and cable-actuated transducers

Analog cable-actuated transducer WS 10750

- For precisely measuring the linear movements of the switching and drive rods of a switchgear device
- Ideal for use in tight spaces

Max. measured length in mm:	750
Article No.	#6023

Pressure transducer GEMS

- For measuring the pressure in switchgear devices
- Connection thread ¼ inch
- Output voltage 0-5 VDC
- Supply voltage 12/24 VDC
- Accuracy 1%

Max. pressure	25 bar	40 bar
Article No.	#6024	#6165

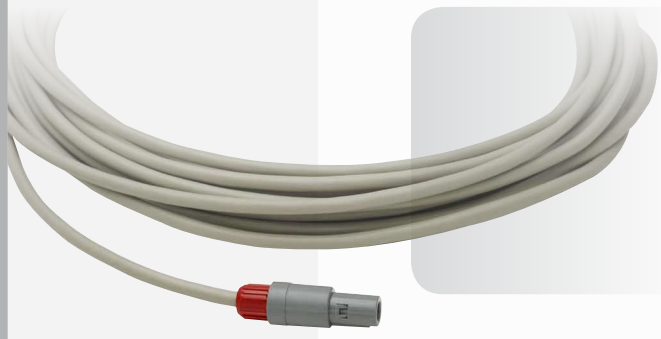
Connection cables and adapters

Connection cable Trv IN for analog transducers

Shielded measurement cable, 4-core, 10 m long, for connecting an analog transducer (potentiometer) to the Trv IN input. The cable also provides the transducer with the reference voltage supplied by the test instrument. One end of the cable is fitted with a coded 5-pole push-pull plug for connection to the test instrument; the other end of the cable has an open end for connection to the transducer. Article No.: #6304

Connection cable Inc IN for connecting digital transducers to ACTAS Px

Shielded measurement cable, 4-core, 12 m long, for connecting a digital transducer to portable ACTAS test instruments. The cable also provides the transducer with supply voltages of 5 and 24 VDC. One end of the cable is fitted with a coded 10-pole push-pull plug for connection to the test instrument; the other end of the cable has an open end for connection to the transducer. Article No.: #6306



Connection cable CC IN for current clamp input

Shielded measurement cable, 4-core, 10 m long, for connecting a current clamp to the CC IN voltage input. One end of the cable is fitted with a coded 5-pole push-pull plug for connection to the test instrument; the other end of the cable has an open end for connection to the current clamp. Article No.: #6307

Customized connection plug

For the transducer end of connection cable #6304 and #6306. Article No.: #6188

Connection cable Aux IN for additional measurement input

Shielded measurement cable, 4-core, 10 m long, for connecting a signal to the Aux IN voltage input of the ACTAS P6. One end of the cable is is fitted with 4 mm safety plugs for connection to the switchgear device.
Article No.: #6309

Control cable PSU Ctrl for connecting external sources to ACTAS P14/P22

3 m cable for connecting up to two external voltage sources to the PSU Ctrl output. The cable is used to supply the specified values and the control signals for release and AC/DC switching to the sources. One end of the cable is fitted with a coded 14-pole push-pull plug for connection to the test instrument; the other end of the cable has an open end for connection to the source. Article No.: #6944

Control cable PSU Ctrl for connecting external sources to ACTAS P3

3 m cable for connecting one external voltage source to the PSU Ctrl output. The cable is used to supply the specified values and the control signals for release and AC/DC switching to the source. One end of the cable is fitted with a coded 10-pole push-pull plug for connection to the test instrument; the other end of the cable has an open end for connection to the source. Article No.: #6947

USB-to-serial adapter with protection against external interference

High-quality adapter for connecting measuring and test systems equipped with a serial RS232 interface to a PC with a USB interface. The adapter is particularly immune to electro-magnetic disturbances.
It enables largely interference-free operation of measuring and test systems even in areas where such systems are subject to high levels of interference.
Article No.: #1273

Adapter for connecting Trv IN to 4 mm safety sockets

Adapter for an analog sensor which is to be connected to a test system by means of 4 mm safety plugs. The safety sockets for connecting the sensor are built into a connection box. Length 30 cm.
Article No.: #6968

ACTAS

KoCoS
A FRIEND OF ENERGY

KoCoS Messtechnik AG
Südring 42
34497 Korbach, Germany
Tel. +49 5631 9596-0
Fax +49 5631 9596-17
info@kocos.com
www.kocos.com