

RelaySimTest

Software for system-based protection testing





RelaySimTest – Test the whole system

System-based testing

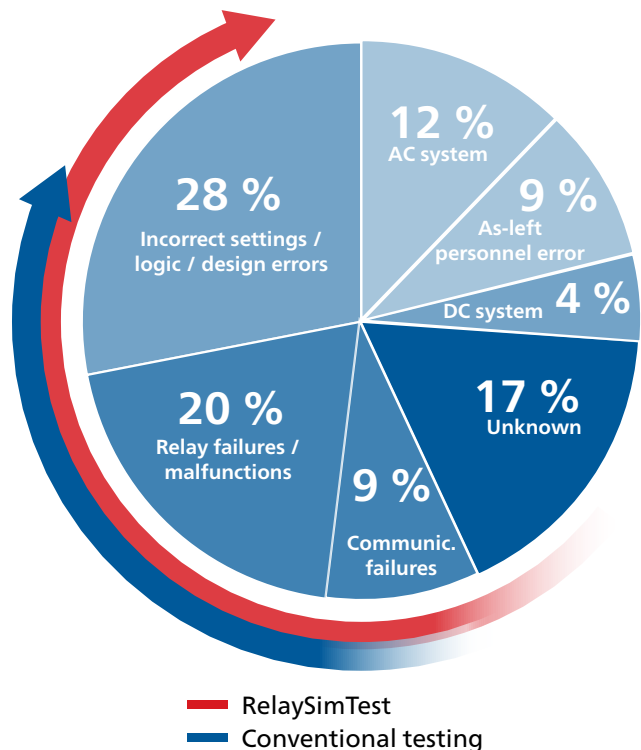
RelaySimTest is a software solution for OMICRON test sets that simplifies complex protection scheme testing.

Its innovative approach validates the correct operation of the entire protection system by simulating realistic power system events. In addition to common tests, RelaySimTest also reveals settings, logic and design errors in the scheme, which increases the confidence in the correct operation of your protection system. This paves the way for improved testing quality and time saving testing procedures.

Modern protective relays use adaptive algorithms. Simple steady-state tests are often not sufficient for testing such relays. RelaySimTest covers these new demands with a transient simulation of the primary power system.

System-based tests are independent from relay type, manufacturer and detailed parameters, which reduces the preparation effort. The correct protection system behavior is the only thing that counts.

ERO Misoperation Study 2019



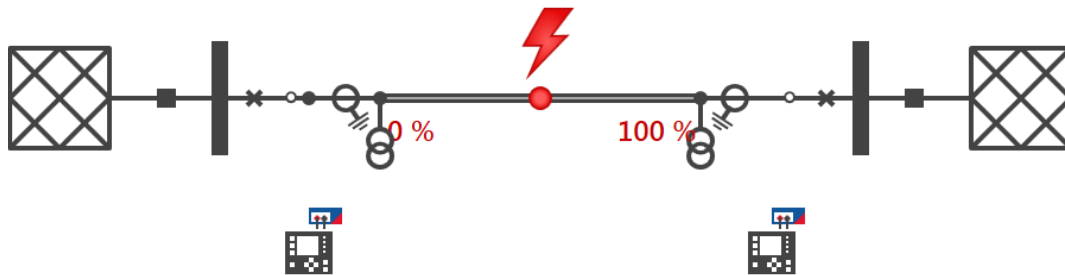
Get the highest level of system reliability

Compared with conventional testing methods (such as settings-based testing with Test Universe), RelaySimTest can detect errors in the settings, logic, and design of the protection system much more efficiently. This allows testers to verify their protection system's correct behavior faster and with a higher level of testing quality than ever before. Complementary to testing with Test Universe, RelaySimTest contributes to a more reliable power system.

Increasing complexity? – Keep testing simple!

Predefined templates get you started quickly and easily for the most common testing applications. With the flexible grid editor, you can adjust the power system and fault scenarios to your needs.

To test the relay, you can create a test case with multiple variations (for example, fault type, fault location, etc.). Afterwards, test results are automatically assessed according to the pre-defined time frame.



RelaySimTest is based on an intuitive and flexible grid editor

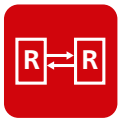
Your benefits

- > System-based testing for a higher level of testing quality
- > Independent of relay type and manufacturer
- > Distributed testing made easy by controlling multiple CMCs from one PC – direct or via Internet
- > Testing of advanced relay functions such as power swings, transient ground faults, and capacitive line phenomena

www.omicronenergy.com/relaysimtest

Typical applications

Transmission



Teleprotection and line differential

Test the protection including its communication channels. Control the test setup from one end without coordinating each test by phone. Independent of the teleprotection scheme being used.



Auto-reclosing

Simple testing of auto-reclosing sequences independent of the amount of cycles, single or three pole tripping. Simultaneous coordination testing for the reclosing cycles of multiple relays.



Three-terminal lines

Control all test sets at each terminal from one end without having to coordinate each test on the phone.



Traveling Wave

The simulation automatically calculates the transient signal and the travelling wave pulses for the TWX1 accessory.



Power-swing & out-of-step

Test the tripping & blocking for out-of-step and power-swing conditions. Combine power-swings with fault and breaker events.



Series-compensated lines

Test complex zone coordination on series compensated lines including the effects on time grading.



Parallel lines with mutual coupling

Simulate mutual coupling between line segments as they occur in your real world topology. Test for over- and underreach when parallel lines are in operation or grounded.



Phase shifter

Simulate phase shifting transformers according to IEC/IEEE 60076-57-1202 with all types of construction, such as single and dual core, symmetrical and asymmetrical. Use the dual-core simulation for transient protection system studies according to IEEE C37.245™-2018.

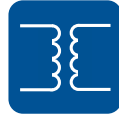
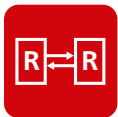
Combined applications

Examples of how RelaySimTest can be adapted flexibly for almost every application



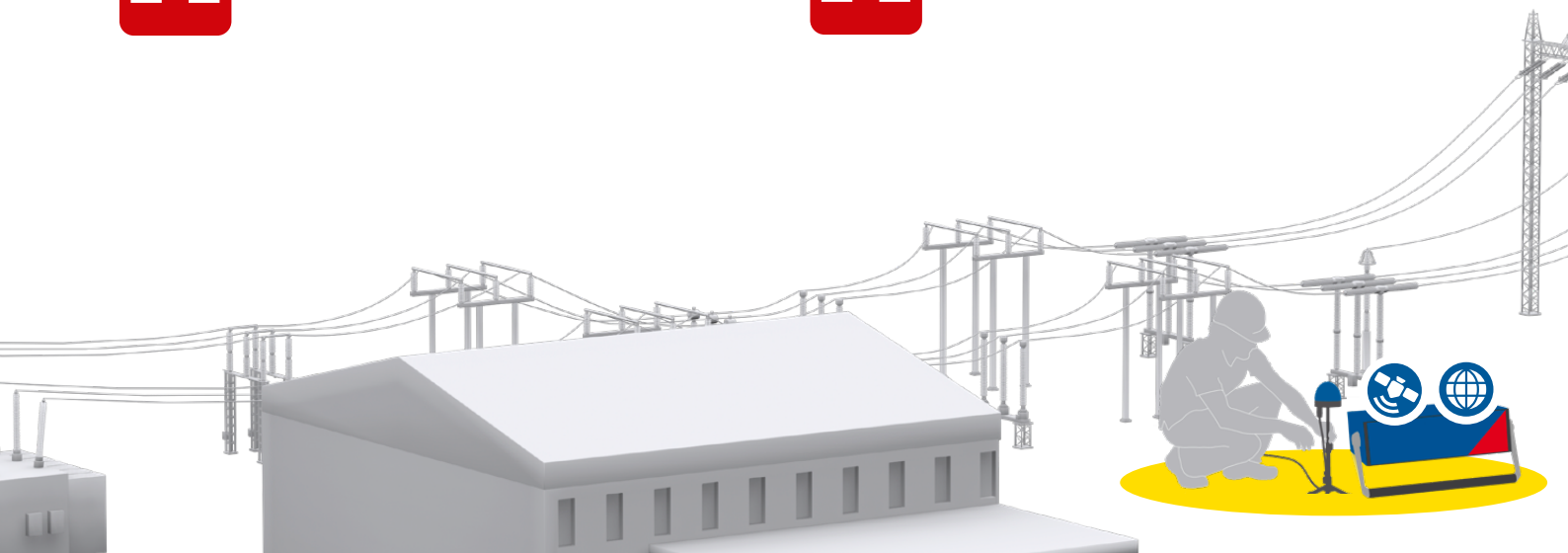
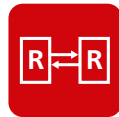
Teleprotection with auto-reclosing

Simultaneous coordination testing for the reclosing cycles of multiple distributed relays. Testing for weak infeed scenarios and current reversal.



Teleprotection with transformer

Testing distributed line protection containing a transformer inside its protected zone. Transformer model takes care of vector group and transformer ratio automatically.



Substation



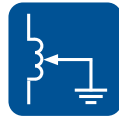
Busbar protection

Model any type of busbar topology. Simultaneous injection to any number of field units. Simulation of disconnector and breaker position. Faults on every node including dead-zone faults in the coupling field.



Breaker-and-a-half

Test 1 ½ breaker relays with all current and voltage inputs. No need to re-wire during the test. Check coordination of both relays e.g. for breaker-failure protection.



Insulated and compensated networks

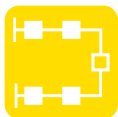
Simulate networks with insulated and compensated star-point grounding. Test behavior of the protection system for earth faults, intermitting faults and resulting two phase faults.



Transformer differential protection

Model two- and three-winding transformers, autotransformers, and phase shifting transformers and simulate tap changers, internal winding faults and inrush currents.

Distribution



Distribution loop scheme

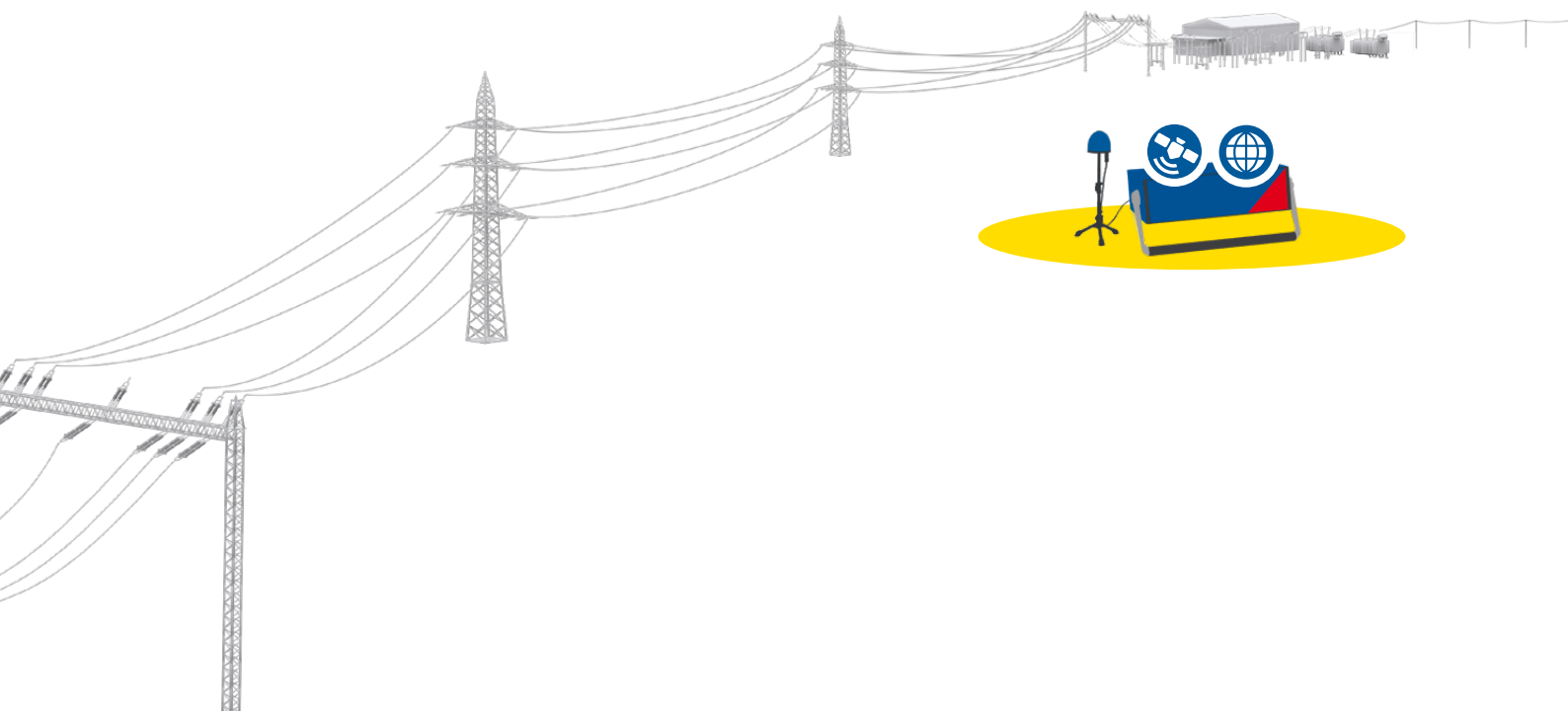
Inject to every single recloser unit in the loop scheme simultaneously. Tests the full operation sequence from fault isolation to service restoration.

Industry



Motor Protection

Simulate the behavior of asynchronous motors in order to test motor bus transfer schemes and motor protection systems.



Testing in IEC 61850 environments

In substations utilizing IEC 61850, real-time information between the protection, automation, and control devices is exchanged via GOOSE messages and Sampled Values. A system-based test is highly recommended for ensuring that the whole protection system is operating as expected. RelaySimTest offers a unique feature set for performing system-based tests in substations utilizing IEC 61850.

Simplified & comprehensible test setup

By simply importing the IED descriptions (e.g. for protection IEDs, merging units, bay units etc.) from the substation configuration file (in SCL format), RelaySimTest visualizes the whole system under test in the single line diagram. GOOSE and Sampled Values can be mapped with one click. The hardware configuration will be reduced to a simple mapping of the test set's Ethernet ports to the substation network.

Secure testing

To ensure a secure and reliable operation, RelaySimTest runs an automatic validation process before every execution. The software will sniff the network to avoid misoperations caused by simulating duplicate GOOSE and Sampled Value messages. Additionally, the software automatically checks if the subscribed GOOSEs are present. All binary outputs, circuit breaker and switch positions can be latched according to the single-line-diagram or verifying the correct set-up.

Unique IEC 61850 features

- > Flexible Sampled Value data sets according to IEC 61869-9
- > Simulation of missing GOOSE messages
- > 4 Sampled Value streams per test set. Extendable by adding further test sets
- > Connection to multiple virtual or physically separated networks – no need to bridge networks



Transient simulation

To ensure your protection system is working as expected, RelaySimTest calculates its test signals via a transient power system simulation. This enables users to investigate their protection system under challenging conditions like CT saturation, power swings, weak infeed conditions, inrush and many more. As the test signals are like real world system events, even adaptive or time domain protection functions can be tested.

Simple test setup and high testing depth

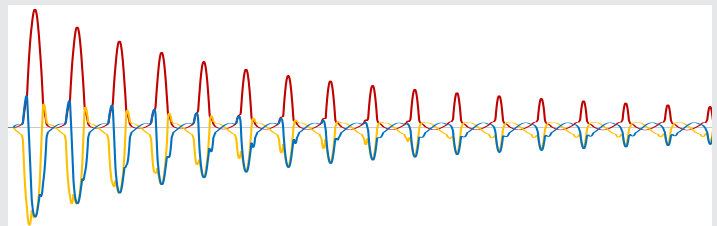
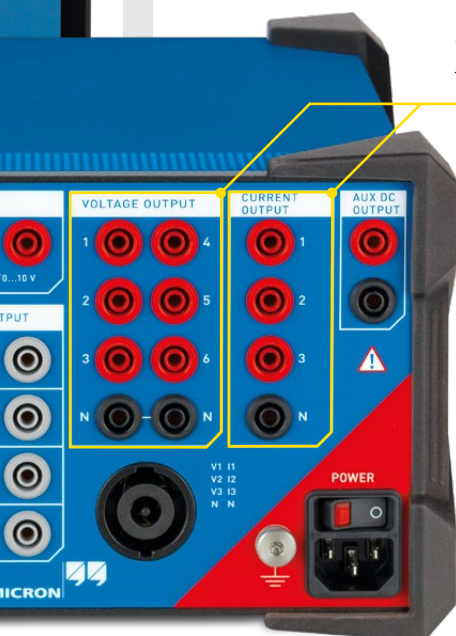
To set up a test, you can either use a predefined template or draw your power system with the intuitive editor. RelaySimTest only requires readily available data like nameplate data to yield a stable transient simulation – no expert knowledge in simulations is required. Each test case can be defined in seconds by simply adding faults or operating breakers. The simulation takes care of all calculations. This allows you to test your protection system in depth. The system-based testing approach enables you to set up tests with multiple relays. For example, you can set up an end-to-end configuration test in no time.

The ideal combination

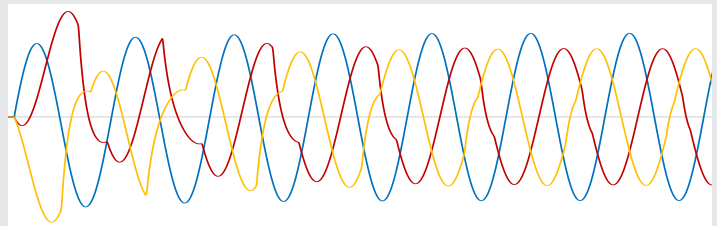
The ability to output high-precision signals makes CMC test sets¹ the ideal signal generators for transient signals.

The power system simulation in RelaySimTest is constantly being extended. Here are some examples of transient phenomena that can be simulated and used for testing protection systems.

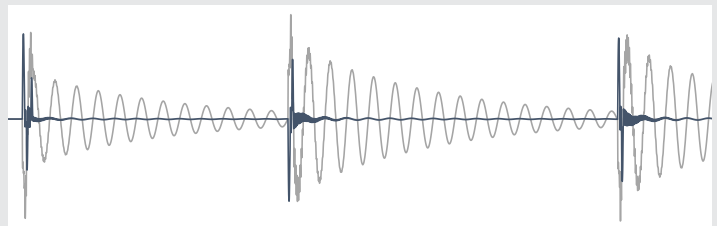
Outputs for
transient test signals



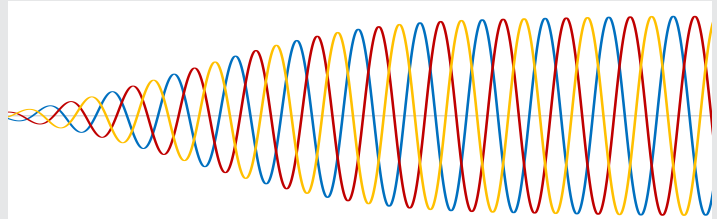
Transformer inrush current



CT saturation



Intermittent ground fault



Power swing

¹ Works with: CMC 356, CMC 256plus, CMC 430, CMC 353 and CMC 850

Distributed testing

With RelaySimTest you can control all connected CMCs from one PC with a simple network or Internet connection.

You can execute distributed tests across substations as easily as single relay tests, regardless of how many CMC test sets are being used. By pressing execute, RelaySimTest calculates the required signals. After the signals have been sent to the test sets, they start the execution simultaneously. This has the following benefits:

- > No phone coordination required during execution. Multiple test steps can be executed automatically.
- > The automated assessment involves the response of each end and relay and gives an immediate response if the test has passed.
- > On-site changes in the test document are possible, if troubleshooting is required.
- > Iterative Closed-Loop simulation enables an automatic response to trip and close commands. This, for example, makes testing auto-recloser functions possible – even for end-to-end line protection.
- > A single test report summarizes all results in one document.



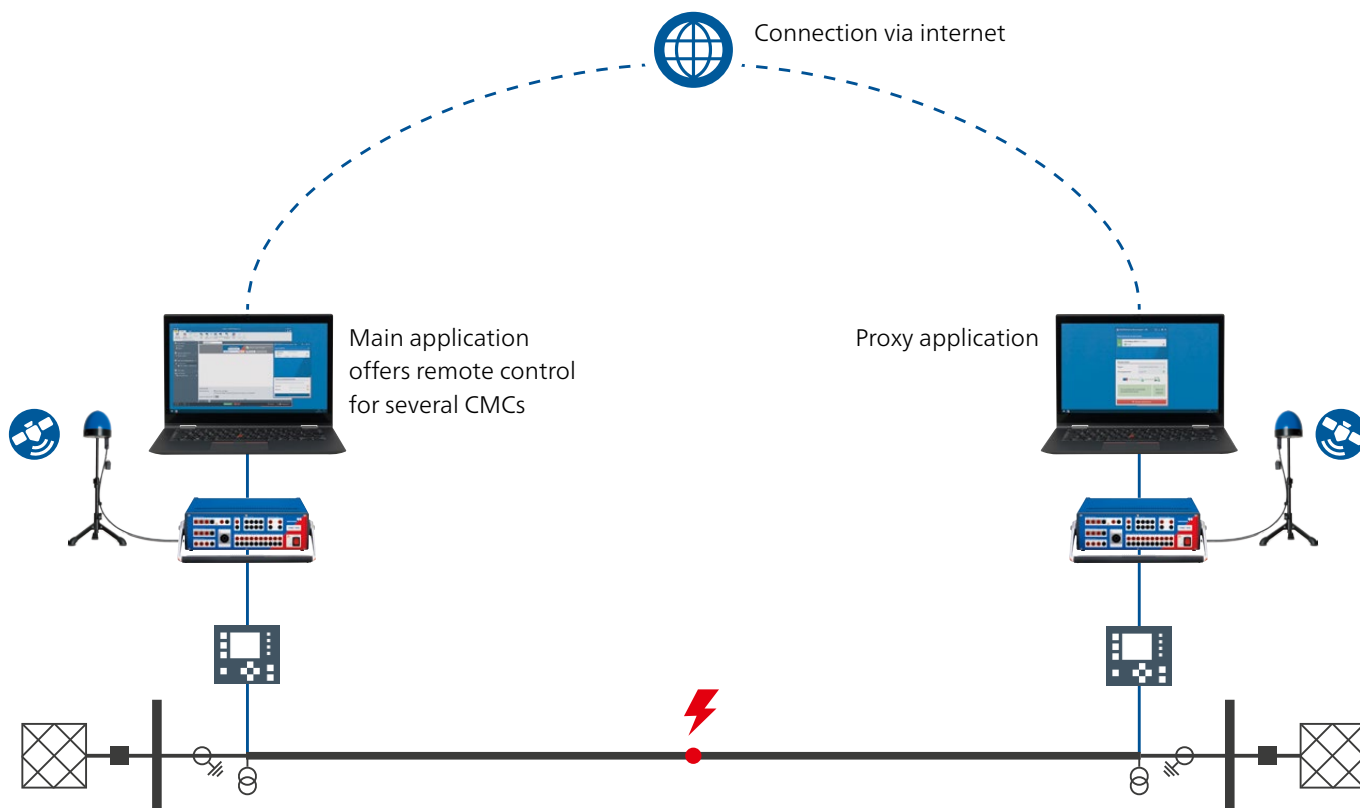
Remote control

Operate multiple CMCs remotely – no matter where you are. Our solution makes it easy to control the devices via network or Internet.



GPS synchronized

Synchronizing multiple CMCs is easy using the CMGPS 588 Grandmaster Clock.

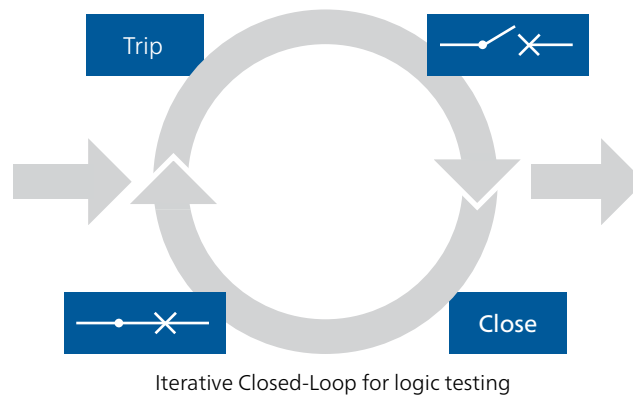


Logic testing and test reports

Logic testing

The indispensable test of logic in protection systems usually involves a complex sequence of states triggered by trip and close commands.

Thanks to the patented "Iterative Closed-Loop" method, RelaySimTest can automatically adjust test signals according to the trip and close commands. This way testing an auto-reclose function becomes simple and transparent.

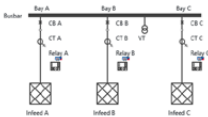


Test reports

RelaySimTest automatically generates protocols for all the performed test cases. For end-to-end tests the test report summarizes all results in one document.

To fulfill the user's needs, the report can be customized to contain test case results, single line diagrams, status of binary contacts and test set configurations.

RelaySimTest exports the report in the worldwide standard .docx format for easy further processing.

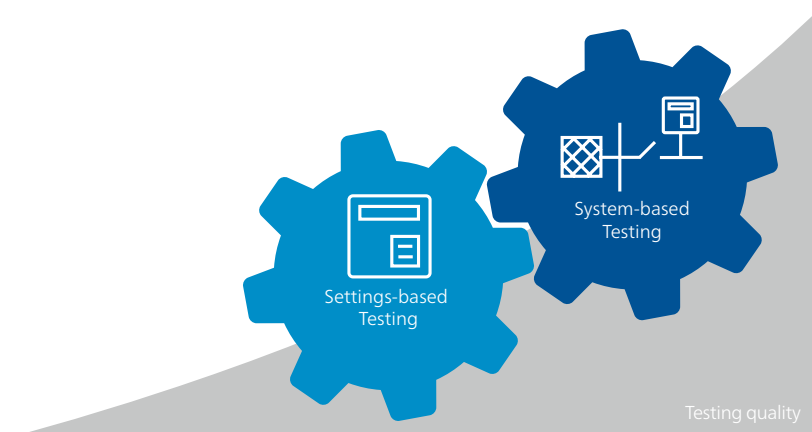
Busbar Protection with Reverse Blocking	
Creation date / last modified:	2020-09-04 11:28:30
Created by:	OMICRON Tester
Execution date:	2017-01-09 08:37:22
Executed by:	OMICRON Tester
Executed:	33 / 33
Issues:	0
Passed:	33
Failed:	0
Overall assessment:	Passed
Power System	
	
System under Test	
Nominal frequency:	50,00 Hz
Relay A	
Manufacturer:	
Device type:	
Device address:	
Serial/model number:	
CT A	630,00 A : 1,0000 A
Type	Three-phase
VT	110,00 kV : 100,00 V
Type	Three-phase
CB A	Simulation of auxiliary contacts active
Breaker type:	Three-pole
Trip time	20,000 ms
Close time	50,000 ms
Relay B	
Manufacturer:	
Device type:	
Device address:	
Serial/model number:	
CT B	630,00 A : 1,0000 A
Type	Three-phase

Embedded in OMICRON's world of testing

Complementary testing with Test Universe

Test Universe is made for advanced testing and offers a wide range of test modules. Customized templates allow users to achieve a high degree of automation and standardization. The software is the ideal solution for frequent and recurring testing, and a wide application range of testing. Complementary to settings-based testing with Test Universe, RelaySimTest contributes to a more reliable power system by testing the protection system with real world scenarios.

Good to know: RelaySimTest is included as standard in the Test Universe packages **Enhanced** and **Complete**.



Get the highest level of power system reliability with the combination of settings-based and system-based testing.

Ordering information



Supported test devices & accessories

CMC 356, CMC 353, CMC 256plus, CMC 430, CMC 850, ARCO 400

CMGPS 588 and CMIRIG-B for time synchronized testing

ISIO 200 binary input/output terminal

TWX1 traveling wave testing accessory

Please note: For the full application range, the CMC option NET-2 is recommended.

Software packages

Order no.

One license for RelaySimTest

P0006620

Package for distributed testing, including two licenses for RelaySimTest plus two CMGPS 588

P0006621

RelaySimTest license for ARCO 400, enables synchronized distributed scheme testing for recloser controls

P0006611

Trafo license

P0006853

Motor license

P0008107

RelaySimTest is included in the Test Universe packages **Enhanced** and **Complete**

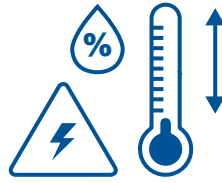
RelaySimTest is included in the ARCO 400 package **Advanced**

We create customer value through ...

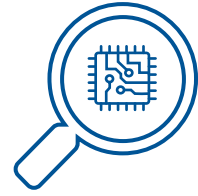
Quality



Highest safety and security standards

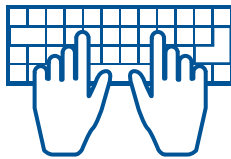


Up to 72 hours burn-in tests



100% routine testing for all components

Innovation



>200 developers keep our solutions up-to-date



Reinvestment >15% in R&D

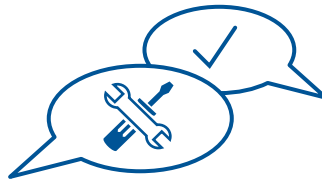


Up to 70% time saving through automation

Support



Professional technical support



Cost-effective repair & calibration



25 offices worldwide

Knowledge



>300 Academy trainings per year



OMICRON hosted training & events



Free papers & application notes

OMICRON is an international company that works passionately on ideas for making electric power systems safe and reliable. Our pioneering solutions are designed to meet our industry's current and future challenges. We always go the extra mile to empower our customers: we react to their needs, provide extraordinary local support, and share our expertise.

Within the OMICRON group, we research and develop innovative technologies for all fields in electric power systems. When it comes to electrical testing for medium- and high-voltage equipment, protection testing, digital substation testing solutions, and cybersecurity solutions, customers all over the world trust in the accuracy, speed, and quality of our user-friendly solutions.

Founded in 1984, OMICRON draws on their decades of profound expertise in the field of electric power engineering. A dedicated team of more than 900 employees provides solutions with 24/7 support at 25 locations worldwide and serves customers in more than 160 countries.

For more information, additional literature, and detailed contact information of our worldwide offices please visit our website.

