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. This paves the way for improved testing quality and time saving testing procedures. Modern protective relays use complex algorithms that adapt to networks and failures. Simple function 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. The protection behavior is the only thing that counts.
Easy and flexible

Predefined templates make starting fast and easy in standard testing situations. With the flexible grid editor even more complex power networks and fault scenarios can be modeled conveniently.

To test the relay, you can do a single shot or create multiple shots with varied parameters (for example, fault type, fault location, etc.). Afterwards, test results can be automatically assessed according to a simple time grading of the protected lines.

RelaySimTest is perfectly capable of simulating steady-state values and transient signals without even being connected to a CMC.

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.

Your benefits

> System-based testing for a higher test 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

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**Substation**

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

**Breaker-and-a-half**
Test 1 ½ breaker relays with six current-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 and resulting two phase faults.

**Transformer differential protection**
Simulation of 2- and 3-winding transformers, tap changer and phase shifter. This validates the configuration of transformer protection or distance protection.

**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.
### Transmission

<table>
<thead>
<tr>
<th>Teleprotection and line differential</th>
<th>Power-swing &amp; out-of-step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test the protection including its communication channels. Control the test setup from one end without coordinating each test over the phone. Independent of the teleprotection scheme being used.</td>
<td>Test the tripping &amp; blocking of the protection under out-of-step and power-swing condition. Combine power-swings with fault and breaker events.</td>
</tr>
<tr>
<td>Auto-reclosing</td>
<td>Series-compensated lines</td>
</tr>
<tr>
<td>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.</td>
<td>Test complex zone coordination on series compensated lines including how they are effecting time grading.</td>
</tr>
<tr>
<td>Three-terminal lines</td>
<td>Parallel lines with mutual coupling</td>
</tr>
<tr>
<td>Control each test set from three or more terminals on one end without having to coordinate each test on the phone.</td>
<td>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.</td>
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### Distribution

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<tr>
<th>Distribution loop scheme</th>
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<td>Inject to every single recloser unit in the loop scheme simultaneously. Tests the full operation sequence from fault isolation to service restoration.</td>
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RelaySimTest – Distributed testing

With RelaySimTest you can control all of the CMCs connected for the test via one PC. Remote CMCs can simply be controlled via an internet connection.

This results in the simplest distributed testing possible for systems such as teleprotection or line differential protection, regardless of how many CMC test sets are used.

Automatically synchronized

Perform distributed tests the same way you perform single-end shots, using the CMGPS 588 Grandmaster Clock – our plug-and-play solution for synchronizing distributed injections.

Then everything runs smoothly: RelaySimTest calculates the required injection signals for all ends automatically, making it much easier to troubleshoot the network.

Having all CMCs controlled from one application, makes testing much easier. Comprehensive reports can be generated from a single location across the entire test, covering all relays.

Furthermore, RelaySimTest simulates relay-controlled breaker operations. Iterative Closed-Loop simulation makes testing auto-recloser functions possible – even in distributed protection systems.

Remote control

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

GPS synchronized

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

- Transient simulation
- Iterative Closed-Loop for testing logic
- Full support for GOOSE and Sampled Values (with NET-2 option)
- Ready-to-use templates and flexible editor for more complex test cases
- Control of remote CMCs via a safe Internet connection from your PC (only out-going HTTP traffic required)

Test devices supported

- CMC 356, CMC 353, CMC 256plus, CMC 430, CMC 850, ARCO 400
- CMGPS 588 and CMIRIG-B interface for time synchronized testing
- ISIO 200 binary input/output terminal
- We recommend the NET-2 option for CMC test sets to use all functions

Software packages

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Description</th>
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<tbody>
<tr>
<td>VESM6007</td>
<td>One license for RelaySimTest</td>
</tr>
<tr>
<td>VESM6009</td>
<td>Package for distributed testing, including two licenses for RelaySimTest plus two CMGPS 588</td>
</tr>
<tr>
<td>VESM2735</td>
<td>RelaySimTest license for ARCO 400, enables synchronized distributed scheme testing for recloser controls</td>
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</tbody>
</table>

Test procedure

1. Model network
With the flexible grid editor, complex power networks can be modeled intuitively. Elements for lines, busbars, infeeds, loads, two-winding transformers, and more are available.

2. Define tests
RelaySimTest supports testing with extensive fault scenarios. This allows the simulation of realistic operating conditions for comprehensive tests.

3. Execute tests
All test steps are executed one after the other automatically, even with multiple distributed CMCs. The trip times can be auto-assessed based on the time grading of the protection system.

4. Create report
RelaySimTest automatically generates protocols for all the tests performed. Furthermore, you can decide which parts are included in the test report.
OMICRON is an international company serving the electrical power industry with innovative testing and diagnostic solutions. The application of OMICRON products allows users to assess the condition of the primary and secondary equipment on their systems with complete confidence. Services offered in the area of consulting, commissioning, testing, diagnosis and training make the product range complete.

Customers in more than 150 countries rely on the company’s ability to supply leading-edge technology of excellent quality. Service centers on all continents provide a broad base of knowledge and extraordinary customer support. All of this together with our strong network of sales partners is what has made our company a market leader in the electrical power industry.