

StationScout

Substation Automation System Testing



Smart testing for Automation, Control and SCADA communication

Visualize IEC 61850 and make testing easy

Testing automation and communication systems is as time consuming as testing the protection. StationScout, together with the MBX1 test set, simplifies these tests and reduces the required effort significantly.

Firstly, StationScout provides a clear status overview of your substation during commissioning and operation. Secondly, it makes it possible to trace signals through the whole system.

Finally, by using the powerful simulation features, the time

needed for testing the whole SCADA signalling can be shortened significantly.

Innovative views support commissioning and maintenance engineers during the entire lifecycle of Substation Automation Systems (SAS) based on IEC 61850. When working with IEC 61850, StationScout becomes the ideal solution.

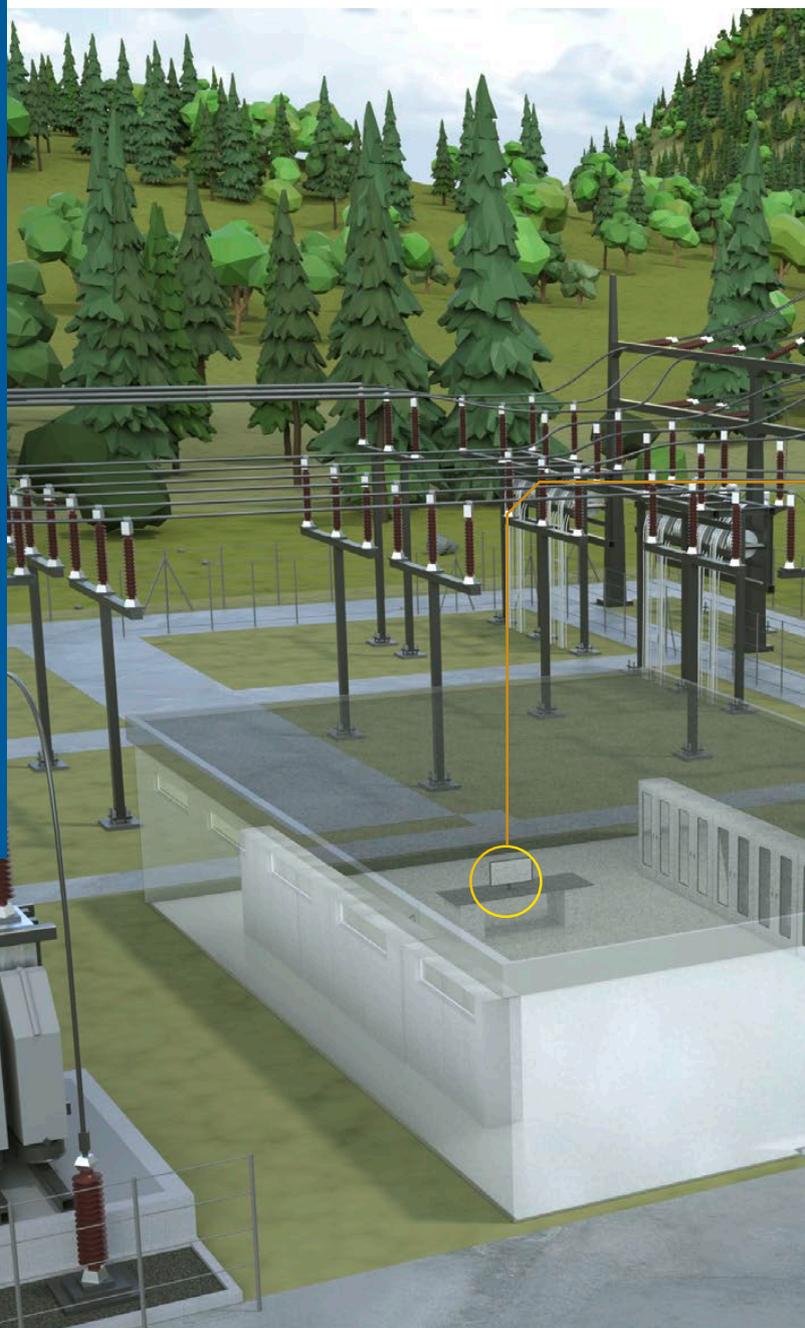
What is IEC 61850?

IEC 61850 is the established standard for communication in substations. The devices in such systems are IEDs (Intelligent Electronic Devices). IEDs use standardized communication to share information with each other, even if they are from different vendors. For the different types of communication, the following services are utilized:

C/S (Client/Server) for direct communication between two devices, where one acts as a server and one as a client – a typical application is a report from an IED to the HMI (Human Machine Interface). This communication is defined in IEC 61850-8-1 as MMS (Manufacturing Messaging Specification).

GOOSE (Generic Object Oriented Substation Event) for fast transmission of events such as protection trips. Sent out as multicast (one-to-many) GOOSE is also typically applied for interlocking.

SV (Sampled Values) to transmit measured values from measurement transformers ("Merging Units") to the substation network. Sent out as multicast.



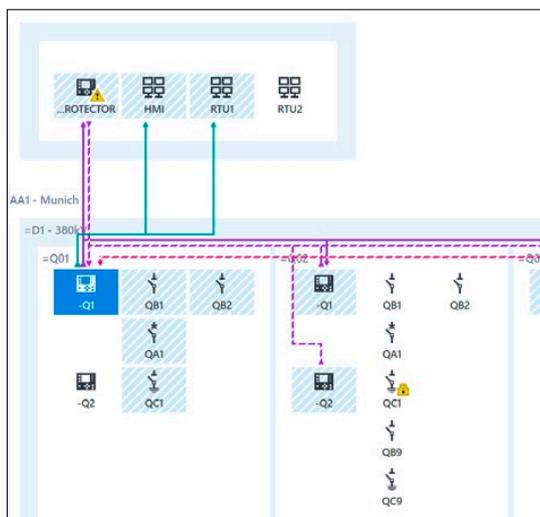
The concept

StationScout comes with innovative software and the digital substation test set, MBX1. The test set allows cyber secure connection to the substation network and can simulate dozens of IEDs with C/S and GOOSE.

The intuitive user interface visualizes communication in the SAS, delivering the characteristics of an IED in an easy to read manner and supports the user in finding relevant information quickly.

When connected to the substation network, the values within the IED data models, as well as the connected assets, can be seen and communication signals can be easily traced through the SAS. All IEDs which are not available may be simulated to make testing of the entire SAS possible.

✓ StationScout supports **all project phases** of IEC 61850 SAS.



Smart Overview visualizes communication links and status information of IEDs and primary assets. GOOSE subscription and report issues can be observed.

AA2D1Q02Q1
Control for branch Q02 - Lindau

between phases

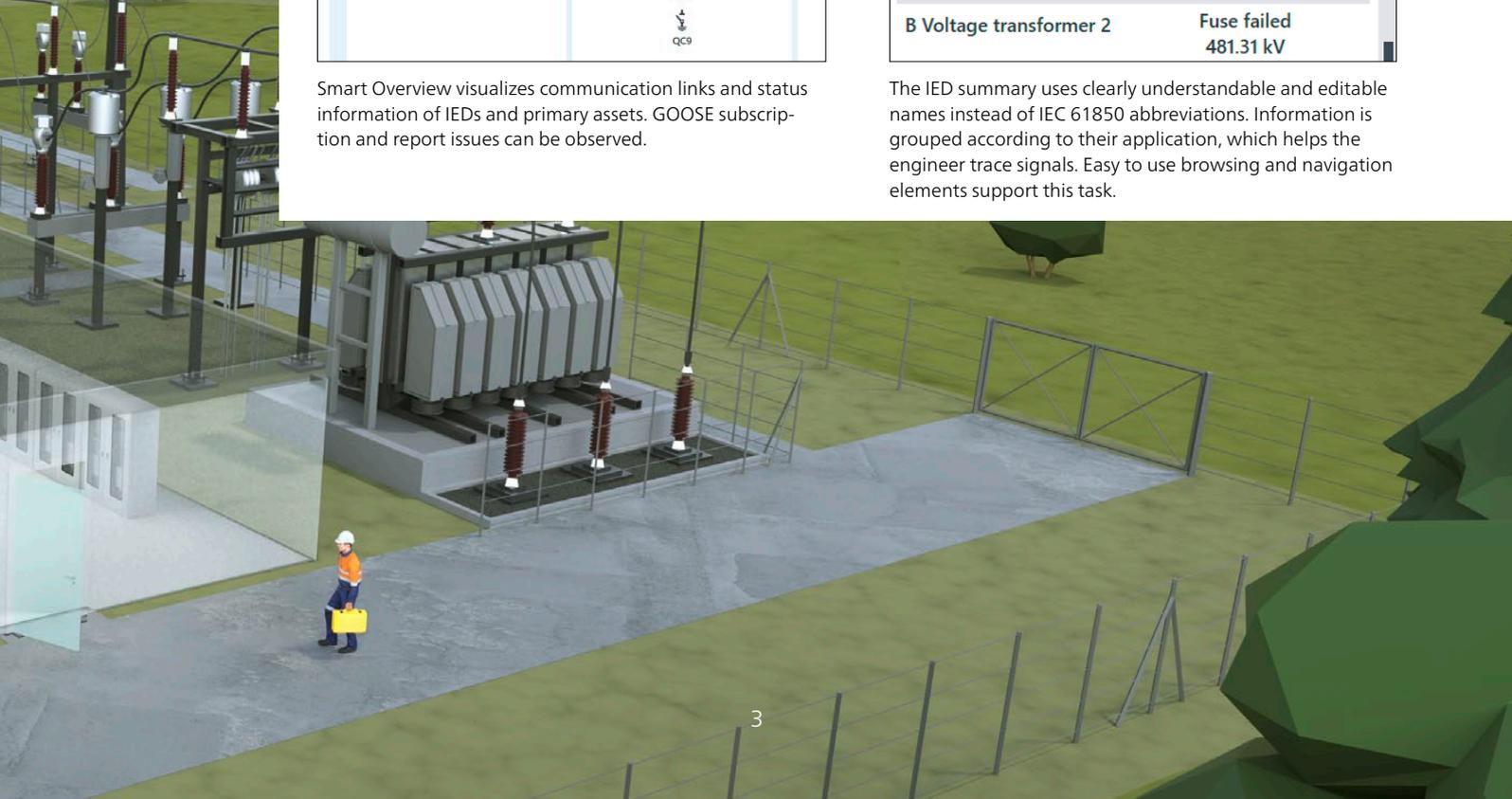
Interlocking

Interlocking 1	Health warning
Interlocking 2	All allowed

Measurement

A Voltage transformer 1	481.12 kV
B Voltage transformer 2	Fuse failed 481.31 kV

The IED summary uses clearly understandable and editable names instead of IEC 61850 abbreviations. Information is grouped according to their application, which helps the engineer trace signals. Easy to use browsing and navigation elements support this task.

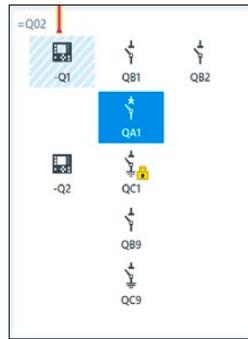


From overview to the details

No configuration required

The substation HMI (Human Machine Interface) visualizes the status of all assets and collects alarms and warnings – but during commissioning and troubleshooting this system might not be available. StationScout comes with its own kind of visualization. Because single line information is not available in most IEC 61850 engineering files (SCD), OMICRON introduces the **ZeroLine View**.

Automated and without any additional information, IEDs are grouped into bays and primary assets such as switchgear. They are displayed with live status information.



Clear presentation by the ZeroLine View

Clear IED summary

StationScout visualizes each IED data model in a new and innovative way. All information is summarized, translated and updated with the current value. Semantic values for over 150 Logical Nodes (LN) and over 200 different Data Objects (DOs) are implemented.

Summary status values

Clear names, can be modified

Protection status and measurement values

The screenshot shows the StationScout interface for a specific IED. The top bar displays the IED ID 'AA2D1Q03Q1' and the bay name 'Bay Q03 protection'. Below this, there are several sections:

- Details:** A table with key-value pairs for Status, IP address, Vendor, Model, Serial number, and Software version.
- Simulation:** A toggle switch to enable or disable simulation.
- Protection:** A table showing the status of various protection functions.
- Control:** A table showing the status of switch controllers.

Details	
Status:	Ready
IP address:	192.168.1.155
Vendor:	Company X
Model:	RELAY-0815
Serial number:	AZ007J
Software version:	7.123.45

Protection	
QA1: Synchronism check	Synchronized
Differential	No issue
Time overcurrent	Start True
Trip conditioning	No issue
Breaker failure	No issue

Control	
QB1: Switch controller 1	
QB2: Switch controller 2	



Straightforward signal tracing

To find communication errors in the SAS, commissioning engineers have to trace signals all the way from the source to each receiver. In hardwired systems this "point-to-point" testing is very time consuming, IEC 61850 systems are even more challenging in this regard. With StationScout it becomes easy to follow signals. The propagation of GOOSE and Report signals through the SAS are visualized in an intuitive diagram – the **Smart Overview**.

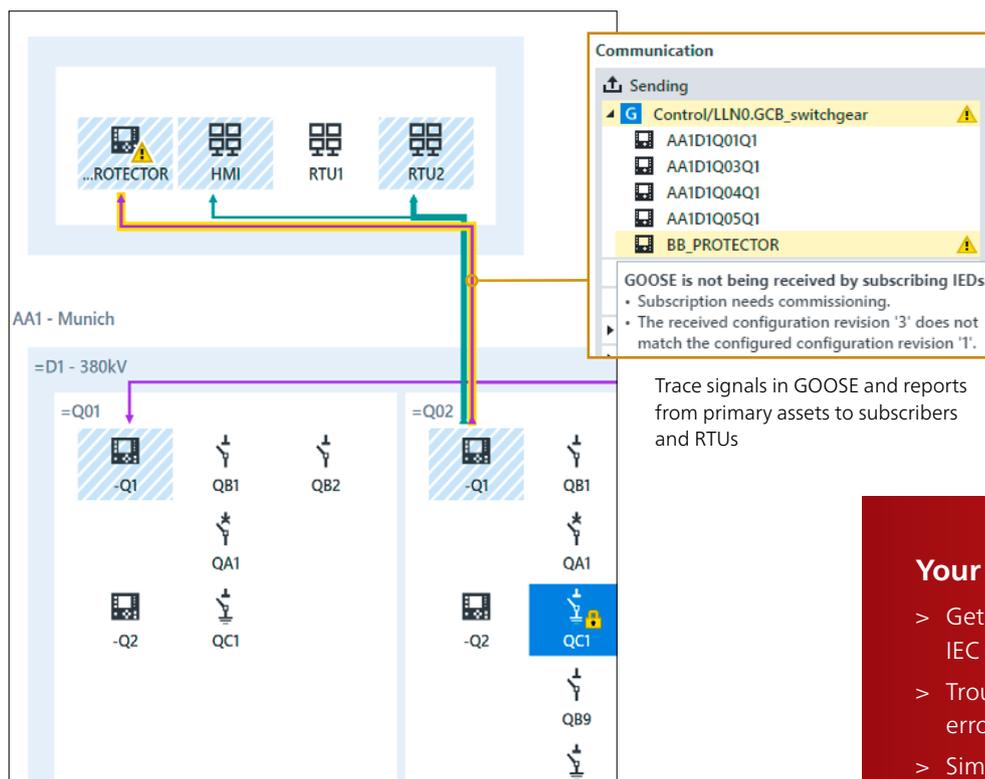
Being able to trace any signal in the overview screen significantly reduces troubleshooting time.

Furthermore, communication errors from both the sending and receiving side are displayed on the diagram making troubleshooting even simpler (receiving side errors are only shown if LGOS is supported by the IED). Immediately after loading an SCL configuration file (SCD file), StationScout visualizes all communication relationships in the SAS. When StationScout is connected to the substation, this information is augmented with live data.

Watch signals

Collect signals from whole substation into a single list to watch and to change values comfortably during simulation.

AA1D1Q02Q1	QA1: Circuit breaker	QA1: Switch position	15:06:20
AA1D1Q02Q2	QC9: Circuit switch 5	QC9: Switch position 5	15:06:14
AA1D1Q04Q1	QA1: Circuit breaker	QA1: Switch position	15:04:49
	QB2: Circuit switch 1	QB2: Switch position 1	15:04:49



Trace signals in GOOSE and reports from primary assets to subscribers and RTUs

Being able to **trace any signal** in the overview screen significantly reduces troubleshooting time.

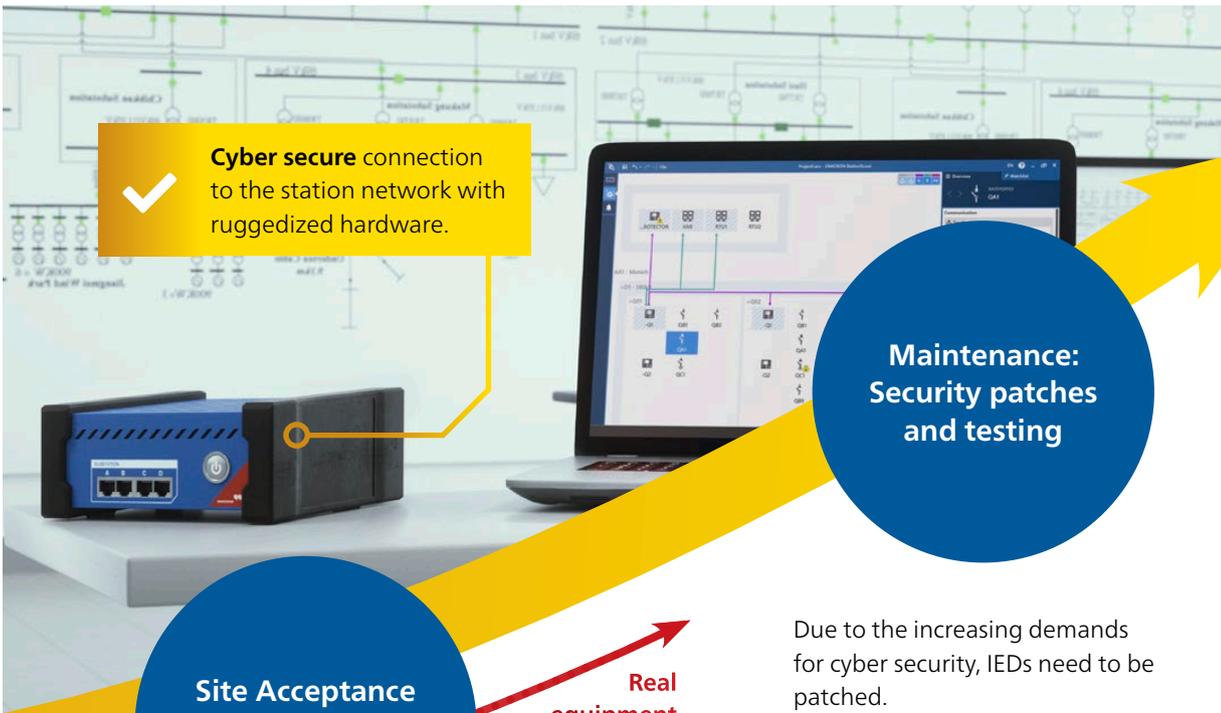
Your benefits

- > Get an overview of the signal flows in the IEC 61850 substation
- > Troubleshoot communication and logic errors faster
- > Simulate missing components or the whole SAS
- > Reuse test plans at recommissioning and after security patches

www.omicronenergy.com/StationScout

Covering the whole lifecycle of a SAS





✓ **Cyber secure** connection to the station network with ruggedized hardware.

Maintenance: Security patches and testing

Site Acceptance Testing (SAT) and commissioning

Real equipment

Due to the increasing demands for cyber security, IEDs need to be patched.

With StationScout you can use the prepared tests and simulate equipment that can not be taken out of service for testing. Even complex logic can be re-tested easily.

✓ **Formerly created test cases can be reused**

On-site tests have to be performed at least once with real equipment. Testing every point within the SCADA system (including all details) can be performed by simulating the client even without a control center.

✓ **Repeat previous tests and simulations**

Who uses StationScout?

- > Utilities performing factory- or site acceptance-tests
- > SAS commissioning experts
- > Protection testers
- > Communication and commissioning engineers
- > Developers of IEDs and SAS
- > Planners, certification labs, system integrators, SAS maintenance engineers, ...

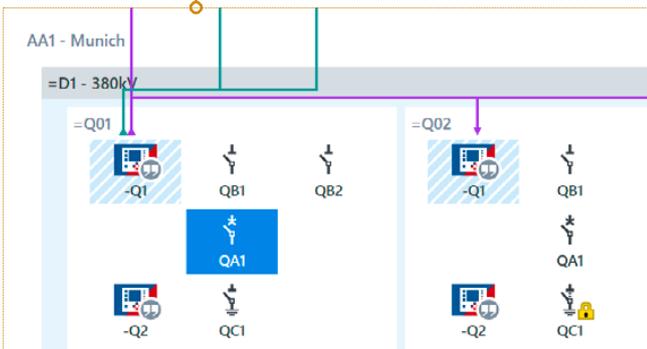
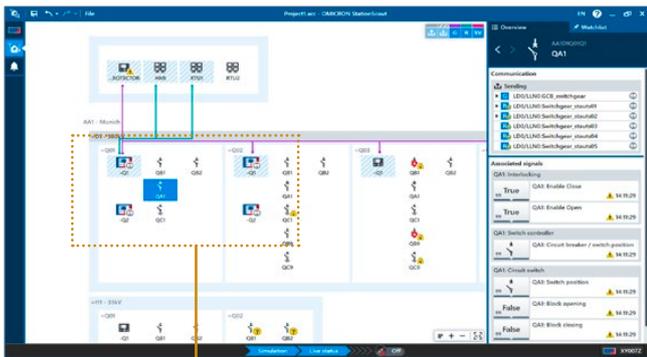
Simulation and security

Simulation when it's needed

Depending on project stage and on the testing situation, not all assets are available during the testing. The HMI might be missing while the protection is engineered, or the SCADA/HMI developers might need the protection staff for simulating certain messages, and of course, during the FAT none of the primary assets are available.

StationScout offers simulations as required during any stage and for any circumstance. Simulate missing IEDs, missing RTUs/Gateways/HMI, or any other equipment not available including binary I/O simulation for switchgear positions.

The StationScout unit MBX1 can directly power up to four ISIO 200 binary I/O accessory devices for this task.



Simulate IEDs, SCADA/HMI, and switchgear positions

Maximum cyber security in IEC 61850 substations

To connect to the substation network, perform tests and simulate IEDs, StationScout comes with the special MBX1 test set.

This test set ensures maximum security, reliability and performance when connected to the substation network. Therefore the industrial-grade MBX1 hardware is equipped with encrypted storage, a cryptoprocessor module (TPM), and a secure firmware. MBX1 can be used in combination with IEDScout, StationScout, as well as future OMICRON solutions for the testing of power utility communication.

MBX1 represents the license of the software and can be shared within teams. An IEDScout license is also included in all StationScout packages.

Additionally a 19" rack variant is available – the RBX1 platform for rack mounting.



Powerful and secure: the MBX1 test set



Cyber secure rack-mountable RBX1 platform

Troubleshooting and communication testing

Putting substation automation systems into operation is a time consuming task. Wiring and configuration errors have to be fixed – even after a successful factory acceptance test (FAT).

The **Smart Overview** in StationScout assists protection and control engineers by depicting what is configured in the engineering file as well as in the real substation.

- > Are the GOOSEs published and subscribed to properly?
- > Are the Report Control Blocks correctly used by the gateway?
- > How is a particular signal transmitted?

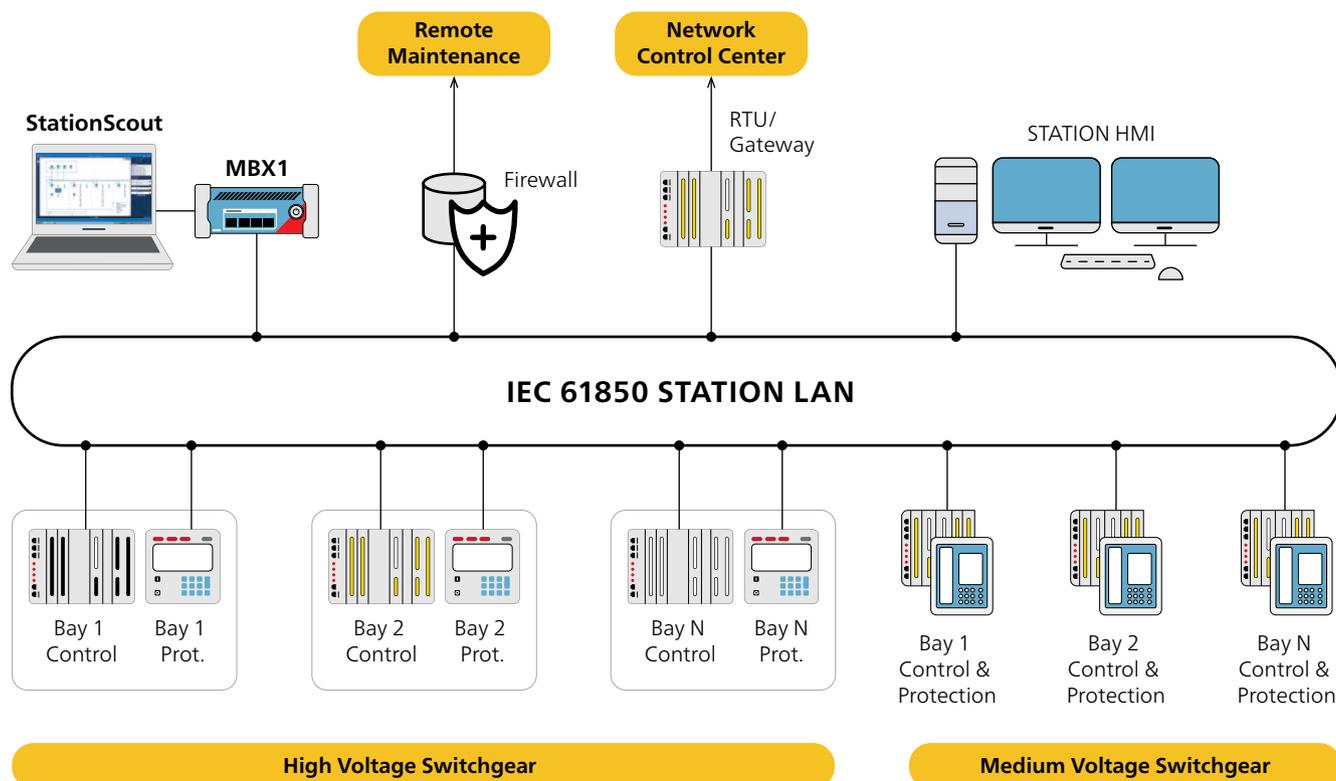
By clicking on an IED, a summary is shown detailing its relevant functions. Filters support selecting the communication of interest. Colored lines illustrate the signal flow. Engineering signal names are used from the SCL, if unavailable useful names are generated by StationScout or the utility's own naming conventions can be imported. Setup, workspace and configuration are stored in a file.

IEC 61850 terminology is avoided, drilling down to IEC 61850 level is still possible, but not necessary. Of course details, such as Report Control Blocks and GOOSE information, are still available if requested.

Main applications

- > SAS and SCADA testing
- > Logic testing
- > Commissioning
- > Protection testing
- > Troubleshooting
- > Testing after firmware upgrade

StationScout works with **any network topology** – just connect it to the substation LAN:



Commissioning features

SCADA, RTU/Gateway testing

When commissioning or recommissioning a substation, all data, such as warning signals and measurement values, must be tested along with their transmission to the SCADA system – local or remote.

With StationScout, SCADA signal testing can be simplified and accelerated. StationScout can inject all alert signals, switchgear status signals, and measurement values by simulating the IEDs. The engineer only needs to verify if the HMI and control center displays the signals correctly.

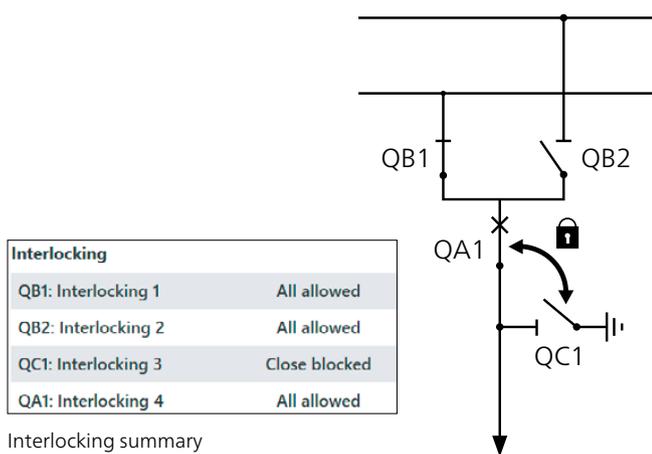
StationScout Commissioning License allows the definition of test cases. Assessing, stimulating signals and recording results automatically offers huge potential for cost savings.

Passed or failed tests within a certain stage of the project can be exported and printed. The same tests performed during commissioning can be repeated later after firmware upgrades or refurbishments.

GOOSE and binary I/O logic testing

Logic is used in interlocking as well as in many other substation automation functions. Testing such logic functions is an essential part of FAT and SAT. In case of interlocking, the result of these logic conditions is exposed in the IEC 61850 logical node CIL0. StationScout reads those values and automatically evaluates the interlocking behavior. After the issues are fixed, the test can be repeated, according to “test-fix-repeat”.

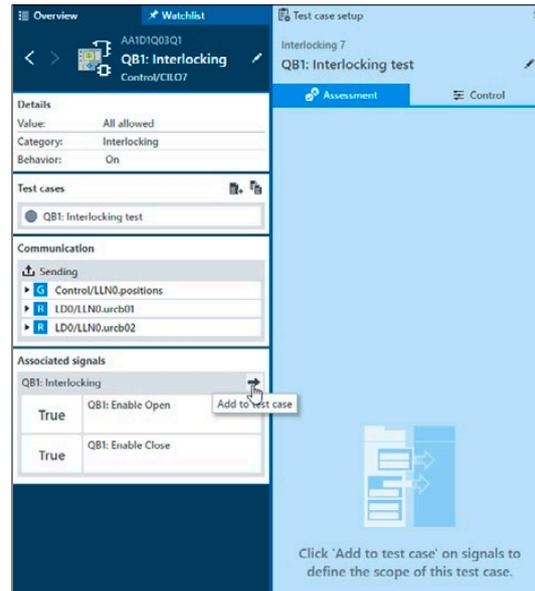
Unavailable assets can be simulated, allowing testing during any project phase.



Interlocking summary

Define test cases

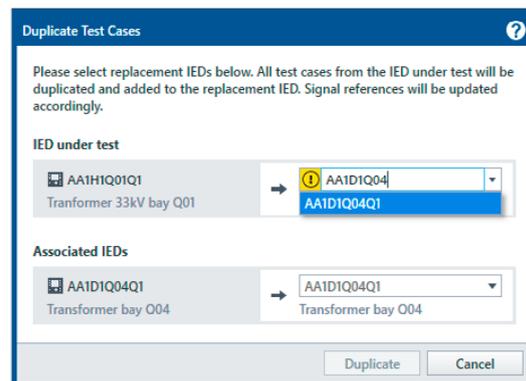
A test case is created while selecting the signals under test as well as the signals associated. A test case can be assessed, saved and repeated.



Setup of test cases

Write tests only once

Tests can already be developed in the specification phase and test cases can be re-used as templates from bay to bay.



Duplication of test cases

Future developments

As all OMICRON products StationScout will be maintained and further developed. The automated testing functions will be extended in upcoming releases.

Ordering information

StationScout consists of a test set and either the Smart Overview License, or the Commissioning License. For the test set there are two options available. The mobile MBX1 test set, or the rack-mountable RBX1 platform for permanent installation in substations.

Software licenses

The **Smart Overview License** helps you visualize substations' data models and communications in a tidy overview.

Features:

- > Smart Overview
- > ZeroLine View shows substation topology, feeders and bays
- > Multiple bays or whole substations with dozens of IEDs can be simulated comfortably
- > Simulation of IEDs
- > Detects communication problems
- > IEDScout included

StationScout

[Smart Overview License](#) VESC7001

The **Commissioning License** has all the functionality of the Smart Overview License and comes with dedicated powerful features for testing and commissioning of IEC 61850 SAS.

Features:

- > Smart Overview License functionality included
- > Creation of own test cases
- > Repeat tests previously created
- > Re-apply test cases to other bays
- > Documentation of all tests performed
- > Assessment of test cases

StationScout

[Commissioning License](#) VESC7002

Hardware options

The **Smart Overview License** and the **Commissioning License** are available for the MBX1 and RBX1 test set.

	Description	Order No.
MBX1	Mobile platform	VE007000
RBX1-40	19-inch platform with 100-240 V supply	VE007011
RBX1-44	19-inch platform with redundant 100-240 V supply	VE007012
RBX1-20	19-inch platform with 44-75 V DC supply	VE007010
RBX1-22	19-inch platform with redundant 44-75 V DC supply	VE007013

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 160 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.

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