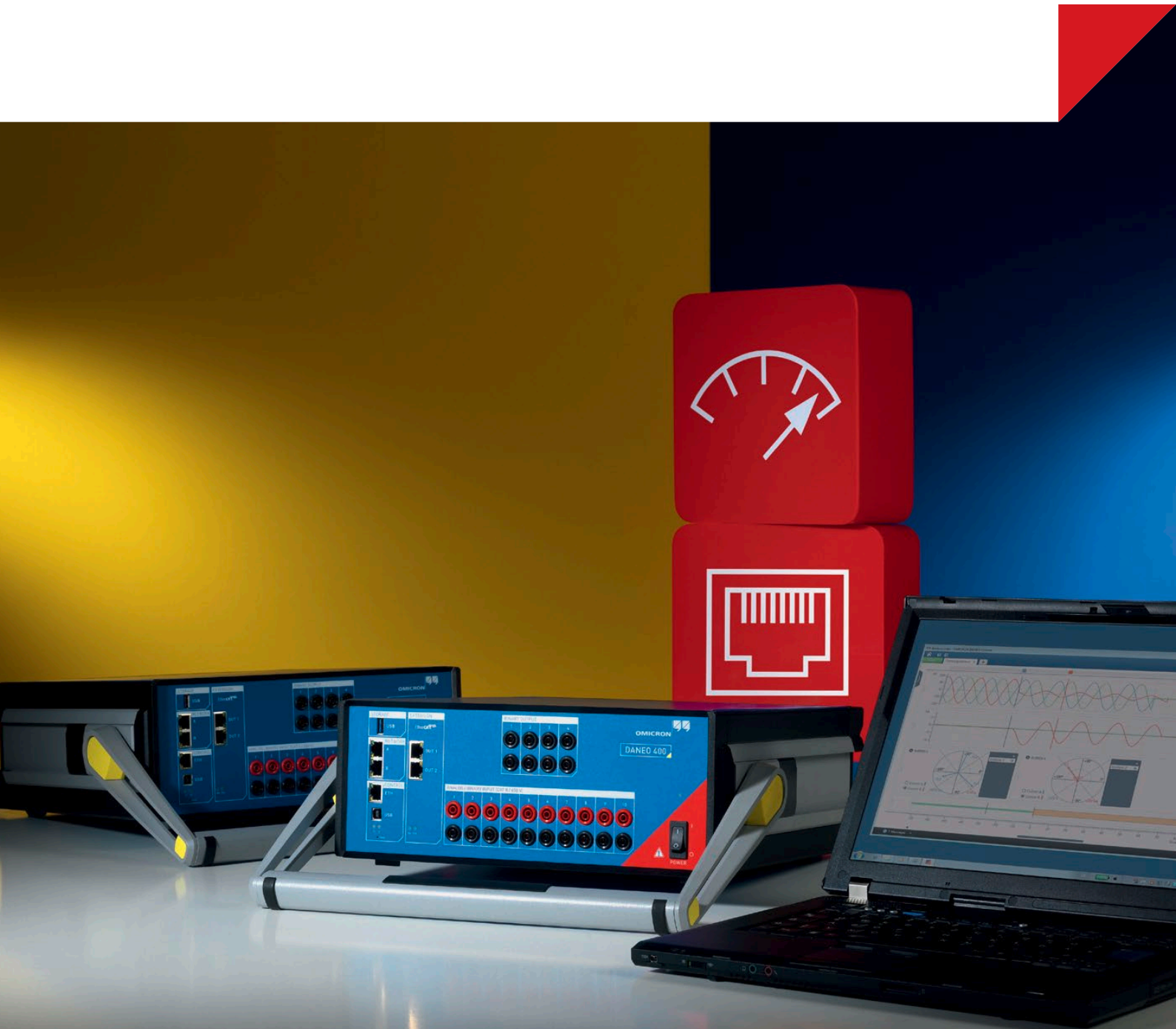


# DANEO 400

Hybrid Signal Analyzer for  
Power Utility Automation Systems



# DANEO 400 – analyzing all signals in a substation



DANEO 400 is a hybrid measurement system that records and analyzes all conventional signals (voltages, currents, hard wired binary status signals) and messages on the communication network in a substation. It measures signals from both of these worlds and can provide information to assess their proper coordination. With this device you can easily keep track of what is going on in the substation by obtaining information on the operational status and communication.

## Easy configuration and controlling

Easily configure and control one or more DANEO 400 units with the PC software DANEO Control. For controlling a single device, a selected feature set is also available via the built-in DANEO 400 web interface.

The control can be safely performed over the substation communication network without impairing the function of the SAS (Substation Automation System).

## Distributed recording with multiple units

A measurement system with multiple DANEO 400 units obtains a time aligned view on signals covering the entire scope of a distributed SAS. All acquisition units are accurately time synchronized, using the Precision Time Protocol (PTP) according to IEEE 1588-2008.



Network interfaces

Control interfaces

Extension interfaces

## One device – multiple applications

DANEO 400 covers a wide range of tasks in different applications:

> **FAT or SAT scenarios in local substations**

Easily verify, proof and document the outcome of test cases performed during factory and site acceptance tests (FAT, SAT). In case of a malfunction, the device provides information for debugging.

> **Distributed testing in substation-to-substation scenarios**

Simply measure and assess the transfer of status information between substations. The remote test sets are configured and controlled over the wide area network (WAN).

> **Troubleshooting**

The occurrence of malfunctions in substation automation systems is often not predictable. For this reason, DANEO 400 works autonomously and detects trigger conditions on its own for recording signals.

> **Commissioning**

DANEO 400 is a valuable tool in the field of commissioning and helps you to verify, proof and document that all the commissioned protection and control devices are working and communicating properly.

### Mass storage interface

### 4 x binary outputs



### 10 x analog / binary inputs

## Your benefits

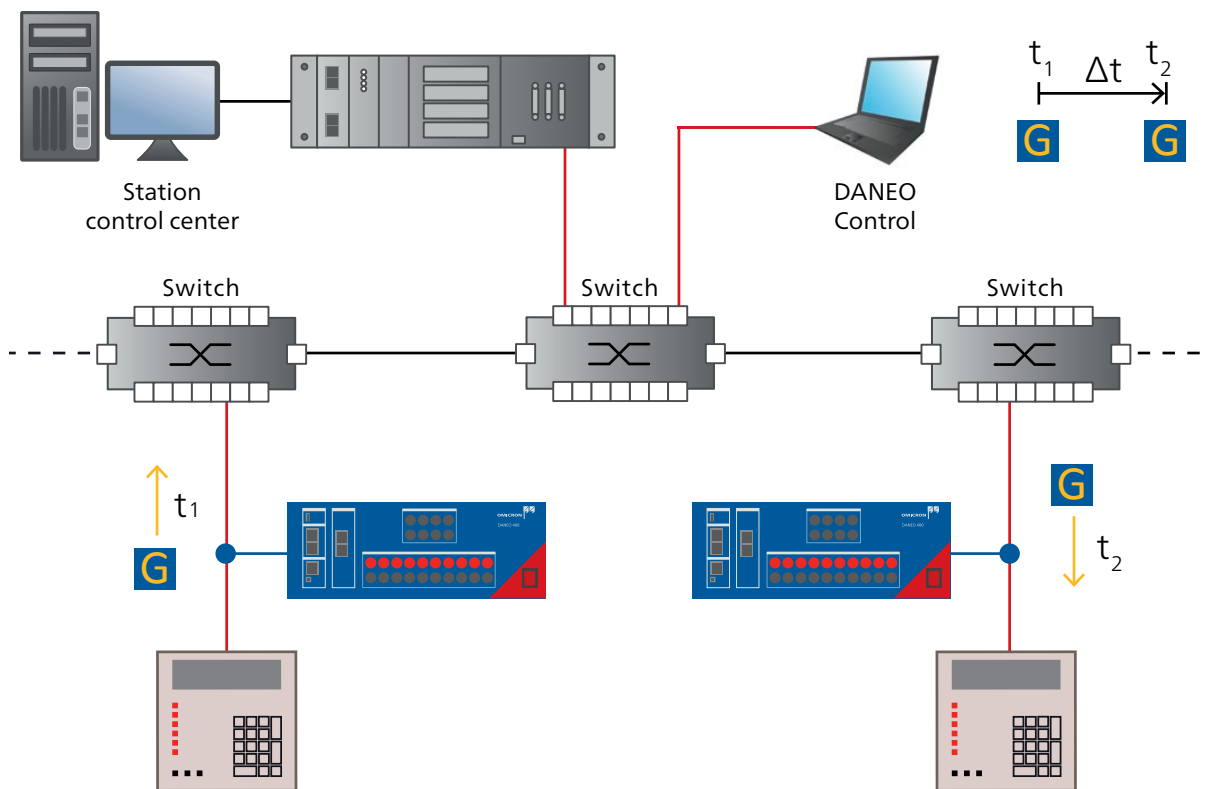
- > Simultaneous recording of analog/ binary signals and network traffic
- > Distributed recording with multiple units
- > Time synchronized measurements
- > IEC 61850 GOOSE and Sampled Values support
- > Aggregated and time-aligned presentation of results

# One device – multiple applications

## FAT or SAT scenarios in local substations

DANE0 400 verifies substation configuration language (SCL) information with the actual configuration “as found”. It checks, if all GOOSE messages and Sampled Values streams are present on the network as defined in the substation configuration description (SCD). The SCD file serves as a basis for the test.

Furthermore you can easily assess the network load and measure the propagation delay for GOOSE and Sampled Values in the substation communication network.



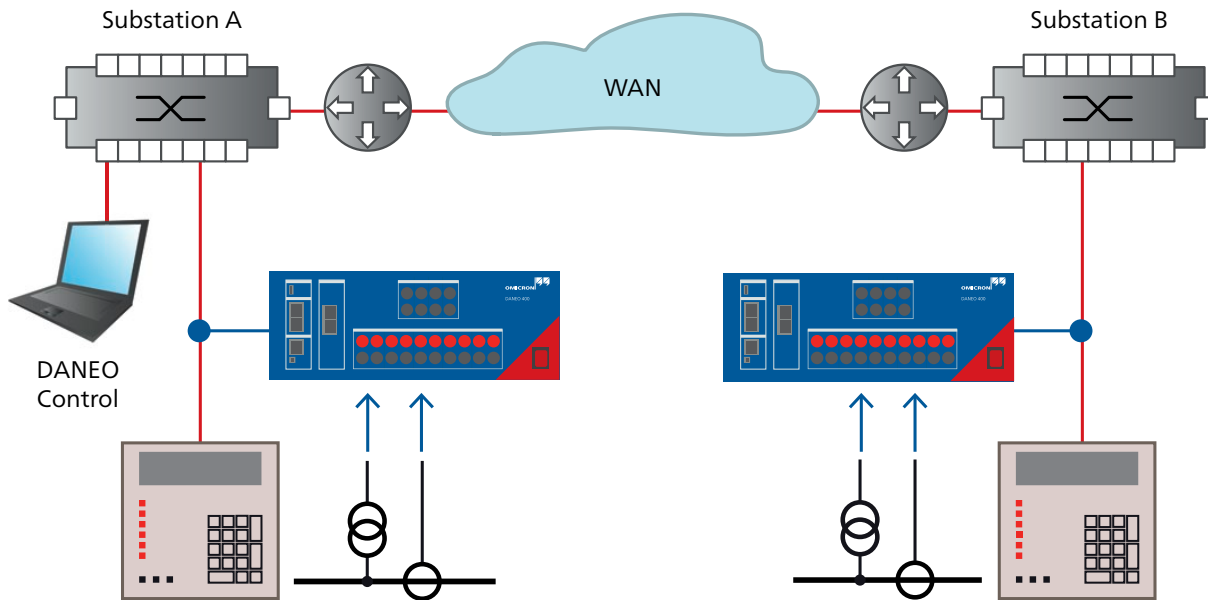
FAT/SAT scenario with two DANE0 400 in a local substation

## Distributed testing in substation-to-substation scenarios

To verify proper inter-substation communication, you can measure and assess the transfer of status information between substations with DANE0 400. The remote test sets are configured and controlled over the WAN.

To measure the performance of the communication path (e.g. GOOSE timing), DANE0 400 evaluates the propagation of the GOOSE messages. For instance, on the sending side, the gateway wraps the GOOSE into an IP packet and forwards it through the WAN to the remote substation. On the receiving side, the gateway un-wraps the GOOSE from the IP packet and publishes it to the LAN.

The effective information transfer at the interfaces to the real process is measured by assessing the changes in the analog and binary signals (e.g. binary I/O to binary I/O timing).



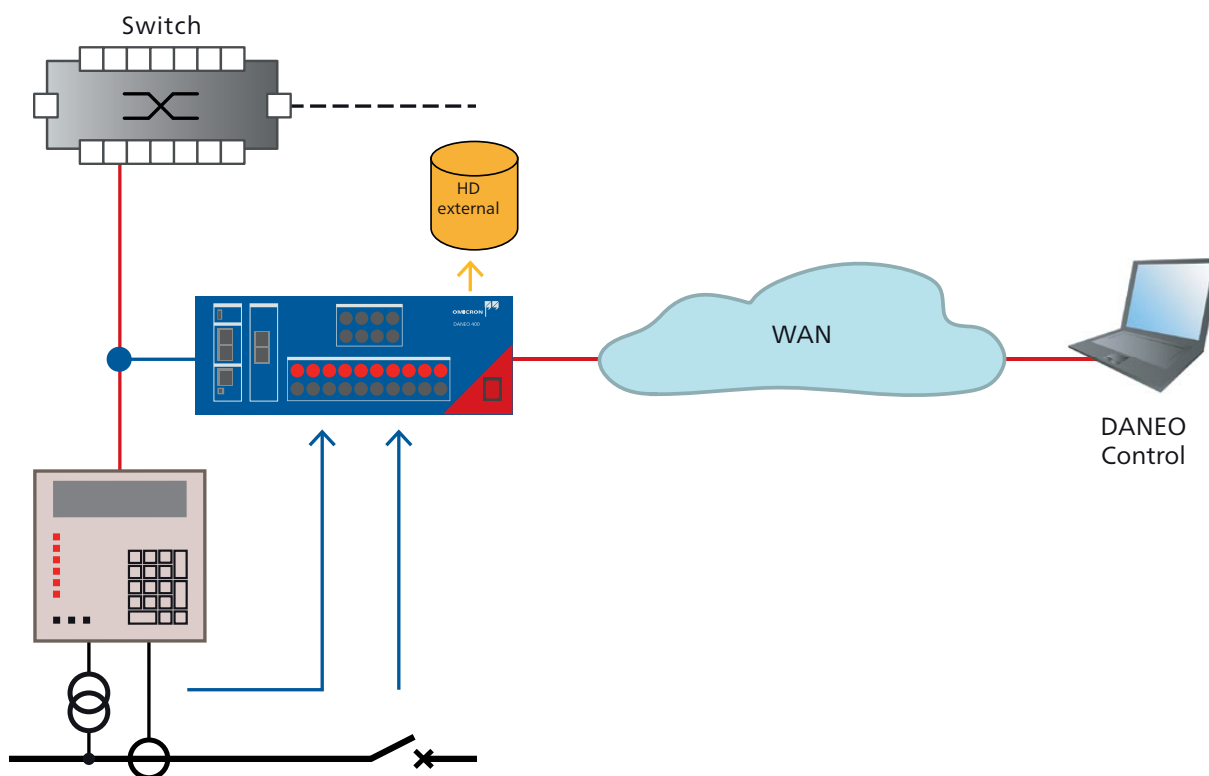
Distributed testing with DANE0 400 units between two substations

# One device – multiple applications

## Troubleshooting

Problems in substation automation systems occur infrequently and under conditions which are not always known. When they do occur it is critical to resolve such issues.

Often you need to react to situations without any preparation and you have to improvise without access to the full documentation of the SAS. DANE0 400 can help you to find out what may be causing the SAS to malfunction by analyzing the timing and coordination.



DANE0 400 autonomous operation

## Unattended operation of DANE0 400

As the occurrence of an event can not be predicted, DANE0 400 works autonomously. It detects the malfunction (trigger condition) on its own from the available signals.

## External hard drive

If large amounts of data are expected, an external hard drive can be connected for storing the recordings.

## Commissioning

The proper functioning of the communication network is an important precondition for the optimal performance of a SAS. With DANE0 400 you can commission and document that all protection and control devices are online and communicating appropriately.

The description of the communication system in the standardized IEC 61850 SCL format serves as the basis for the verifications. It is verified that the substation traffic (GOOSE, Sampled Values) is actually present on the communication network as it was configured. Because devices are put in operation one by one during commissioning, the verification can be performed incrementally without re-executing all the checks for all devices already verified.

If devices do not perform as desired, DANE0 400 supports the debugging process. You can easily assess the performance of the substation communication network itself, even if there are no devices connected. Enhanced tests like the distributed measurement of packet timings in the communication network will be simplified as much as possible.



# DANEO Control – easy configuration and control

The innovative DANEO Control is a PC software to control and configure your DANEO 400 measurement system easily. Set trigger conditions, receive measurements live from the acquisition units, analyze all signals in context or check the performance of the network traffic in your substation.

## Online observation of measured data

It is possible to observe the actual values present at the DANEO 400 devices even prior to detecting a trigger condition and acquiring recordings. Measurements are constantly taken by the DANEO 400 units and delivered to DANEO Control.

The observation view offers the actual values and graphs of the most recent history of the quantities selected for observation.



Online data observation with DANEO Control



## Timing and performance analysis of network traffic

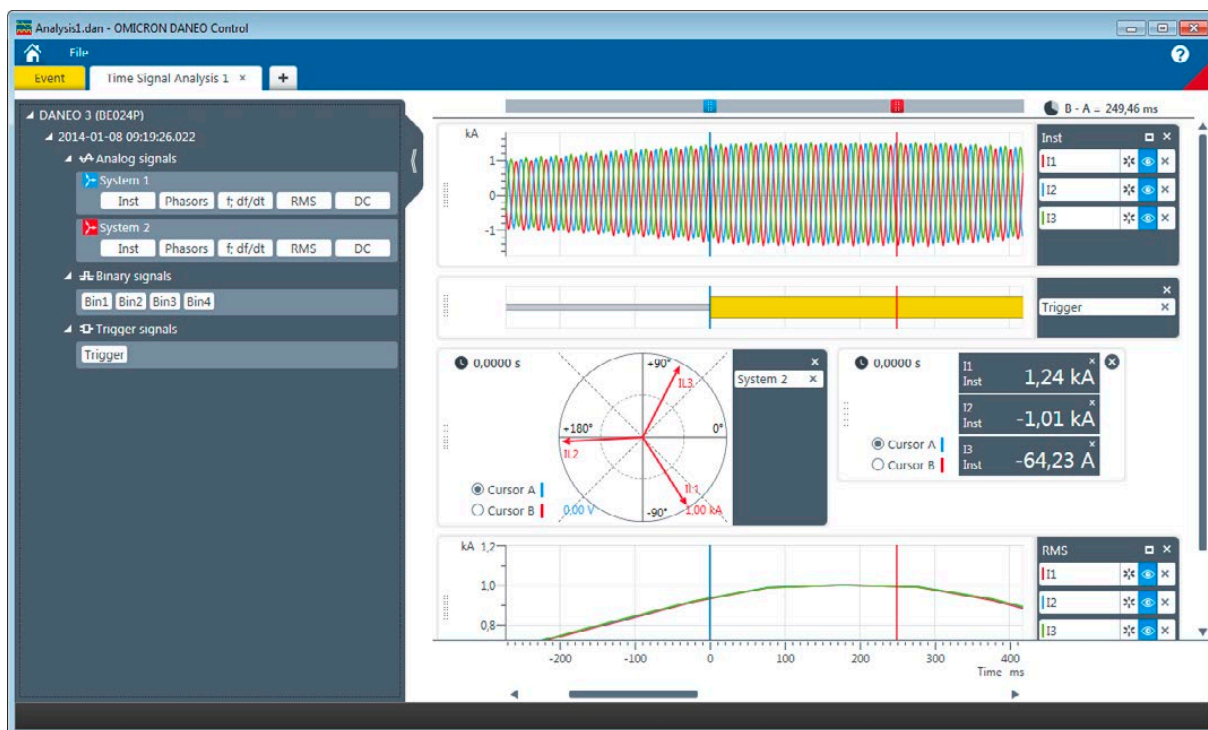
The otherwise hidden circumstances on the substation communication network become visible, obvious, and easily understandable with the evaluations provided:

- > Ethernet packets occurred in a time span
- > Bandwidth usage
- > Propagation time of a certain kind of messages in the network

## Analysis of recordings

All signals (voltages, currents, binaries) are presented in a familiar form.

Whenever the corresponding network traffic (GOOSE, Sampled Values, or other) is of interest, the related messages are looked up and presented in context.



Data analysis with DANEEO Control

## Documentation

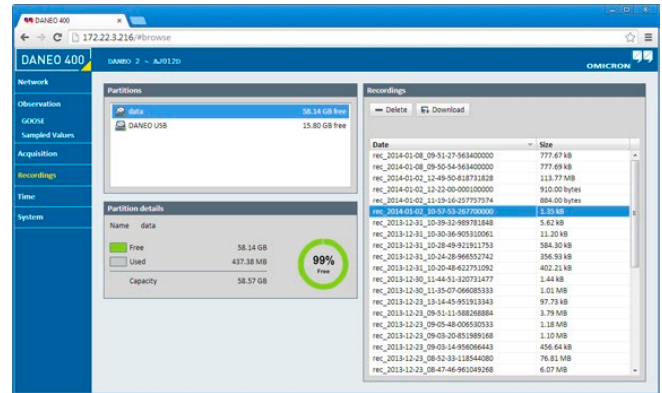
The measurements and findings can be saved to document the proper operation of the substation automation system during the tests.

The recorded data can be exported in COMTRADE or PCAP format for further analysis with third-party tools.

# DANEO 400 – the flexible solution

## Web interface

The DANEO 400 has a built-in web interface. Certain functions of a single device can be accessed by simply connecting with a web-browser. The supported feature set focuses on functions related to the traffic on the communication network. The device status can be checked and available recordings can be downloaded for further analysis.



DANEO 400 web interface

## IEEE 1588 / PTP grandmaster clock

If the PTP protocol for time synchronization is not yet available on the communication network and a dedicated PTP grandmaster clock is required, OMICRON offers a suitable accessory.

For more information contact your sales representative.



PTP grandmaster clock with integrated GPS receiver on tripod

## Technical specifications DANEO 400

### Network interfaces

Network ports (A,B) 2 Ethernet ports 10/100/1000 Base-TX (RJ45); configurable as network TAP

### Control interfaces

Control port (ETH) 1 Ethernet port 10/100/1000 Base-TX (RJ45)  
 USB port 1 USB 2.0 device port; High-Speed (Type B)

### Mass storage interface

USB port 1 USB 3.0 host port; SuperSpeed (Type A)

### Extension interfaces

Extension ports (OUT 1,2) 2 EtherCAT® ports (RJ45)

### Analog inputs

Number max. 10 (shared with binary inputs)  
 Sampling frequency 10 kHz or 40 kHz  
 Nominal ranges 10 mV, 100 mV, 1 V, 10 V, 100 V, 600 V

### Binary inputs

Number max. 10 (shared with analog inputs)  
 Level detection Potential-free contacts or DC voltage compared to threshold voltage

### Binary outputs

Number 4

### Internal storage

Technology Solid State Disc (SSD)  
 Capacity approx. 58 GB

### Power supply

Nominal supply voltage 100 – 240 VAC, 1-phase  
 Nominal frequency 50/60 Hz  
 Power consumption max. 100 W

### Mechanics

Dimensions (W x H x D, without handle) 345 mm x 145 mm x 390 mm  
 13.6 in x 5.7 in x 15.4 in  
 Weight 7.0 kg (15.4 lbs)

## Flexible housing

The housing of the DANEO 400 is very flexible. It can be configured for different working positions by rotating and moving the device handle.

For placing the DANEO 400 on the floor, the handle can be used as floor stand (see picture below). If the handle is not required (e.g. stacking of multiple devices) you can easily move it to the rear side of the DANEO 400.



DANEO 400 handle used as floor stand

## Ordering information

Description	Order no.
<b>DANEO 400 Basic</b> Signal Analyzer for Power Utility Automation Systems. Measuring and recording conventional (analog and binary) signals.	VESC1700
<b>DANEO 400 Standard</b> Hybrid Signal Analyzer for Power Utility Automation Systems. Measuring and recording conventional (analog and binary) signals and traffic from power utility communication networks (GOOSE, Sampled Values,...).	VESC1701
<b>Upgrade</b> from DANEO 400 Basic to DANEO 400 Standard	VESC1711

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 140 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.