



# SYNDIS ESB

## Compact monitoring system of power transformers

SYNDIS ESB system functionality provides effective monitoring of grid or distribution transformers. System enables current supervising and parameter comparison in defined thematic groups for four transformers or autotransformers simultaneously, to support maintenance and asset management.

Compact stations SYNDIS ESB system is dedicated to effective monitoring of several power transformers in order to prevent sudden breakdown. System supports dispatch operational decisions and generates transformer status data to supervising personnel.

SYNDIS ESB is composed of sensors and measuring transducers, which are used to measure values like oil temperatures, surroundings temperature, windings currents, oil pressure, and data hubs which are installed in control cubicle of every monitored unit. Hubs collect measuring signals from sensors and transducers. Binary signals about cooling system, transformer protections and other components are also collected. Hubs also perform data pretreatment and certain calculation functions.

In certain applications hub can operate as transformer cooling controller, thus allowing not only monitoring but also effective cooling system work supervision.

Expert Monitoring System SYNDIS ESB has window interface to view and operate all functions of acquisition and any parameters presentation. System does not require any IT knowledge both in operator service and system administration. Almost all operations can be performed by using the mouse and all functions are realized intuitively.

SYNDIS ESB features modern network IP architecture which can be easy incorporated to any local or corporative asset management system.



## Features

- monitoring of 4 power transformers in the range of transformer aging parameters, loads, cooling system, tap changer,
- integration modules for monitoring, gas and moisture analyzers, bushing supervising devices, tap changer supervisors,
- expert functions of transformers status rating and necessary suggestions for support the maintenance,
- online data collecting and possibility of entering offline data and comments,
- cooperation with any local or remote station system SCADA/NMS,
- warnings and alarms about transformer status online generating, directed to station or corporation system,
- modular construction with IP network infrastructure,
- compatibility with any transmission protocol and standards applied in Station Automatics Systems,
- typically PN-EN 61850 for integration in station automatics systems,
- PN-EN 60870-5-104 for data transfer with supervision centers and other systems,
- possibility of online parameterization and calculating of separated thermal model for every transformer,
- online prediction of normal and emergency short and long-term acceptable loads ,
- simulative calculations of acceptable loads by using simulator function,
- inspections short and long-term forecasts,
- calculation of cellulose insulation aging,
- transformer cooling system supervision taking into consideration the thermal model,
- possibility of control OFAF, ODAF, ONAF and others cooling systems,
- tap changer operation supervision,
- short and long-term registration and archiving of overvoltages and loads,
- remote and local parameterization, such like thermal model, reports contents, advices for personnel content,
- short and long-term registration and archiving of data and informations about transformer.

## Server functions

Collected and calculated values in hubs are processed in monitoring server, to realize advanced analytic and statistic functions. For that purpose it is performed continuous, automatic data transmission from hubs, existing systems of EMS work supervision, controllers, sensors, transducers online; and acquisition of data which is entered via keyboard also documents in electrical form offline.

Results of implemented expert functions are suggestions for operator which actions should be performed and reports with waveforms, which describe monitored transformers status. They are available via www or by using a dedicated program. Server can also receive required data from digital protections, measuring transducers and other station devices.

Server archives short- and long-term informations about monitored transformers, collected online and offline.

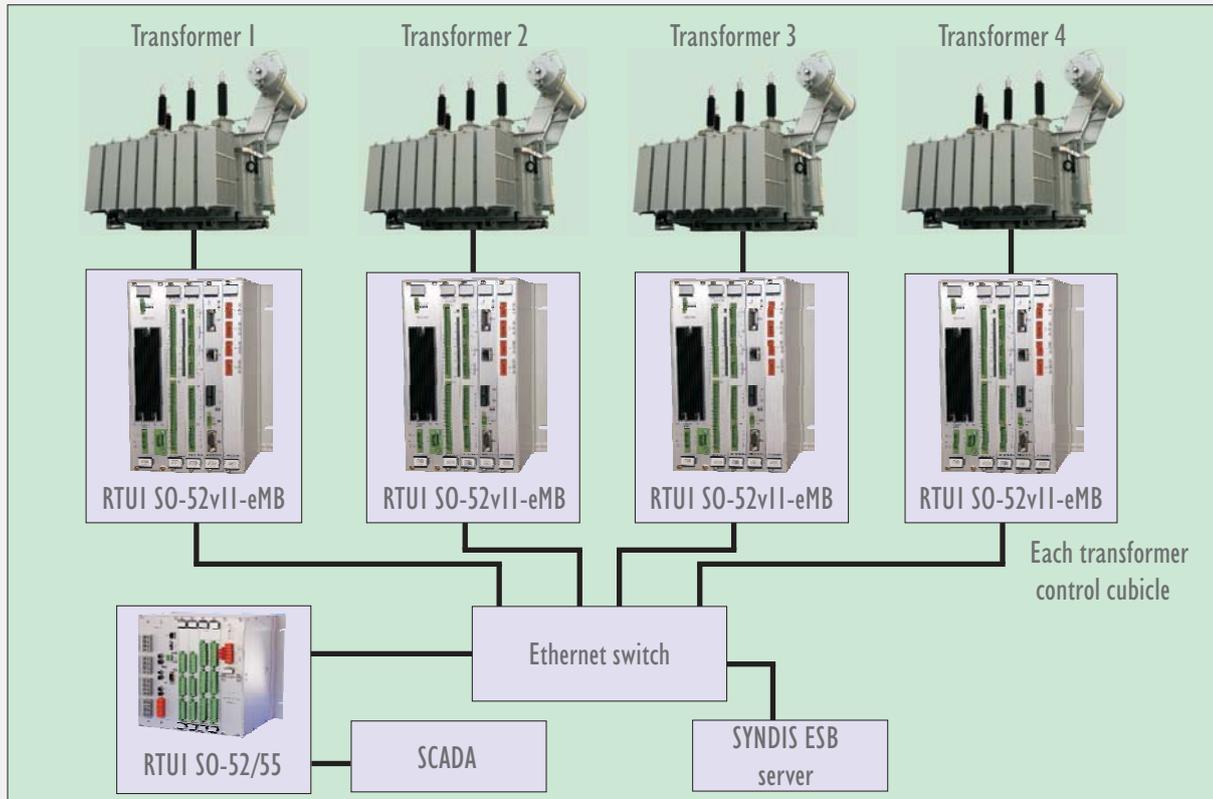
## Specialized devices

For new and aged transformers the specialized devices of any vendors can be also installed and integrated into SYNDIS ESB:

- moisture & gas analyzer (Calisto 9, Kelman TRANSFIX and Minitrans, HYDROCAL 1003, GAS-Guard 8, QUALITROL DGA 150/250/400, SERVERON TM8 On-line DGA Monitor, . . . others)
- on-line tap changer supervisor (TAPGUARD 260, USP-001-PZ produced by Mikronika, . . . others)
- bushing supervising device (IDD Bushing/CT diagnostic system, SMT-102 produced by Mikronika, . . . others)
- cooling controller (QUALITROL 509, SO-52vII-eMC produced by Mikronika, . . . others)
- PD supervising module (Doble, Omikron, . . . others)

# System structure

Basic architecture is designed to operate four transformers with hubs installed in control cubicles. Data is transmitted to system server via Ethernet switch. Field controller to link data about station voltage is also connected to Ethernet switch.



## Reports

System enables working out, creating, printing and sharing reports in the form of specifications and tables with charts histograms with possibility of configuration their content and look. Reports content is also customizable.

### Main report window with graphs configuration

SYNDIS - Windows Internet Explorer

Report

Choose report: TRc 25000/121

Dates: Start: 2013-09-17 11:41, End: 2013-09-17 12:41

Measurement: Samples filter: 1 minute, Show data: [checked]

Charts: Available: [empty], Selected: 0 HV, P HV, O HV, U L1-4.2 HV, U L2-4.3 HV, U L3-4.1 HV, I L1 HV

Execute

designed by mikronika

TAP CHANGER STATISTIC

| Diagram | Event log | Drive power | Statistic |
|---------|-----------|-------------|-----------|
| 1       | 0         | 0           | 0         |
| 2       | 0         | 0           | 0         |
| 3       | 0         | 0           | 0         |
| 4       | 0         | 0           | 0         |
| 5       | 1         | 3           | 15        |
| 6       | 8         | 27          | 37        |
| 7       | 15        | 43          | 34        |
| 8       | 27        | 34          | 3         |
| 9       | 43        | 14          | 0         |
| 10      | 34        | 0           | 0         |
| 11      | 14        | 0           | 0         |
| 12      | 3         | 0           | 0         |
| 13      | 0         | 0           | 0         |
| 14      | 0         | 0           | 0         |
| 15      | 0         | 0           | 0         |
| 16      | 0         | 0           | 0         |
| 17      | 0         | 0           | 0         |

## Example of report with load parameters

### Report - Tap changer

CHP Borysow

- Type:
- Nominal power:
- Voltage:
- Connection relay:

- Serial number:
- Cooling type:
- Number of phases:
- Manufacturer:

| Transformer                         | TJ Rc 63000/121   | TJ Rc 25000/121     | TJ Rc 6300/10,5   | TJ Rc 10000/115     |
|-------------------------------------|-------------------|---------------------|-------------------|---------------------|
| Control mode                        |                   |                     | Automatic         | Manual              |
| Current position                    | 2                 | 2                   | 3                 | 3                   |
| Date of previous position change    | 2013-09-17 12:23  | 2013-09-17 12:23    | 2013-09-17 12:23  | 2013-09-17 12:23    |
| Current voltage / tap voltage       | 0.0 kV / 123.0 kV | 420.0 kV / 135.9 kV | 0.0 kV / 134.1 kV | 400.0 kV / 134.1 kV |
| Tap nominal current                 | 575.3 A           | 361.0 A             | 361.0 A           | 361.0 A             |
| Previous position                   | 3                 | 3                   | 2                 | 2                   |
| Contacts wear since last inspection | 0 %               | 0 %                 | 0 %               | 0 %                 |
| Extreme position                    | NIE               | NIE                 | NIE               | NIE                 |
| Tap in run up                       |                   |                     | NIE               | NIE                 |
| Tap in run down                     |                   |                     | NIE               | NIE                 |
| TC blockade below -25°C             |                   |                     | 0000-00-00 00:00  | 0000-00-00 00:00    |
| Last operation of TC protection     |                   |                     | 2013-04-25 15:04  | 0000-00-00 00:00    |
| Oil level in TC conservator         |                   |                     | Normal            | Normal              |
| Last operation of flow relay        |                   |                     | 0000-00-00 00:00  | 0000-00-00 00:00    |
| Date of last inspection             | 2010- 6- 1        | 2010- 6- 1          | 2010- 6- 1        | 2010- 6- 1          |
| Date of next inspection             | 2013- 5- 31       | 2013- 5- 31         | 2013- 5- 31       | 2013- 5- 31         |

## Monitoring of transformers group

The colour contents of main window Transformer status presents overall status of each separate transformer. It is distinguished between following states:

- normal** - normal transformer operation
- warning** - transformer operation with restrictions, necessary to schedule the maintenance activity
- alert** - risk of failure, necessary immediate reaction to avoid danger
- failure** - failure, necessary to take actions to decrease its consequences

**Transformers status**

**CHP BORYSOW**

| Transformer                            | TJ Rc 63000/121  | TJ Rc 25000/121   | TJ Rc 6300/10,5   | TJ Rc 10000/115  |
|--|--|---|---|--|
| Transformer is operating               | NO   | YES   | NO  | YES  |
| Transformer state signalization        | Failure  | Failure   | Normal  | Failure  |
| System status                          | Normal   | Normal  | Alarm   | Normal   |
| Load parameters                        | Alarm  | Warning   | Normal  | Normal   |
| Average current of HV winding          | 471.0 A <span style="font-size: small;">81.9 %I<sub>nom</sub></span> | 366.7 A <span style="font-size: small;">101.6 %I<sub>nom</sub></span> | 63.2 A <span style="font-size: small;">17.5 %I<sub>nom</sub></span> | 222.1 A <span style="font-size: small;">61.5 %I<sub>nom</sub></span> |
| Overload monitoring                    | Normal   | Normal  | Normal  | Normal   |
| Oil upper layer temperature            | 107.0 °C   | 31.0 °C   | 15.0 °C   | 29.0 °C  |
| Hot-Spot temperature of HV winding     | 107.2 °C   | 54.8 °C   | 0.0 °C  | 39.1 °C  |
| Hot-Spot temperature of LV winding     | 107.0 °C   | 31.0 °C   | 0.0 °C  | 29.0 °C  |
| Oil relative humidity RH%              | 0.0 %  | 0.0 %   | 0.0 %   | 0.0 %  |
| Oil level in main tank oil conservator | Normal   | Normal  | Normal  | Normal   |
| Transformer factory protections        | Normal   | Normal  | Normal  | Normal   |
| Cooling system                         | Failure  | Failure   | Normal  | Failure  |
| Tap changer                            |  |   | Warning   | Warning  |
| Tap changer position                   | 2  | 2   | 3   | 3  |