IDS SAS

Station Automation
based on IEC 61850

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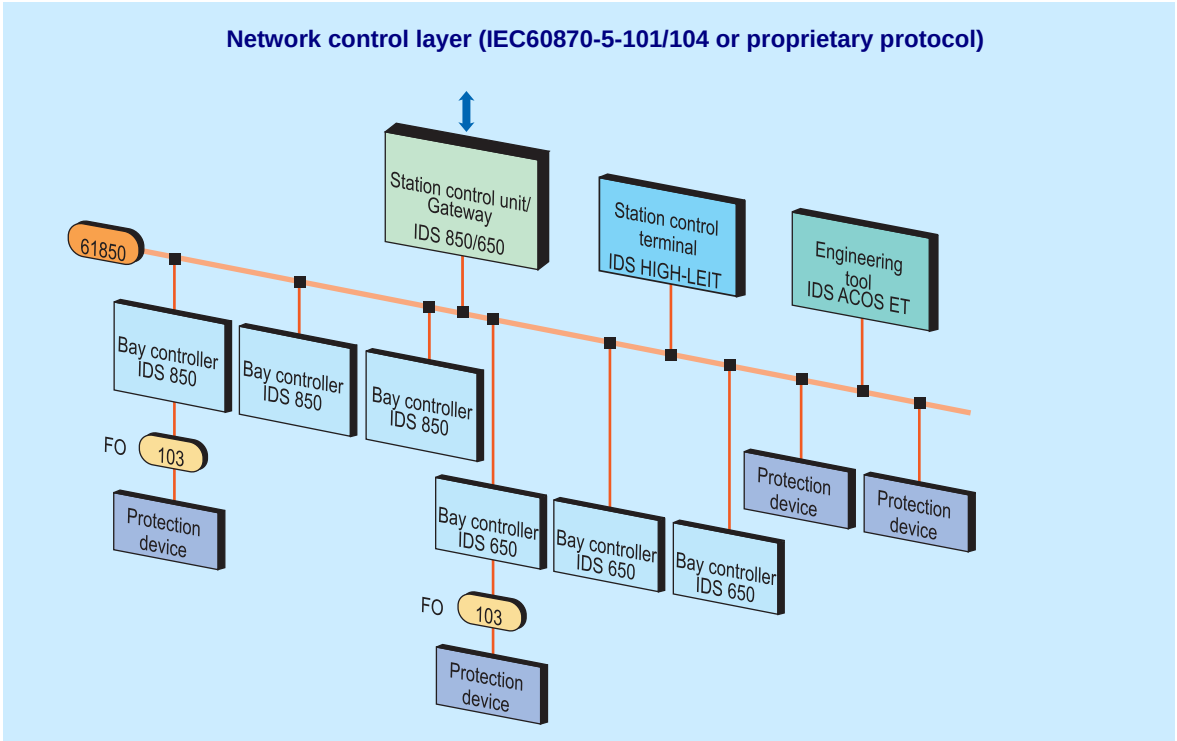
The IDS SAS station automation system was developed on the basis of the IEC 61850 standard. With this system, users gain a future-proof solution, which is able to cut the costs of station automation in the long term, since the time and expenditure for configuration and engineering is reduced and fast, low-price communication channels based on Ethernet and TCP/IP can be employed. Carefully devised migration solutions and gateway functions provide an entry to newcomers at any time.

The IEC 61850 standards

The IEC 61850 series of standards covers communications as a whole at process, field control and station control level, and includes both operation and engineering. This comprehensive application of standards enables smooth communication between systems from different manufacturers, and reduces the time spent on configuration. Moreover, the standard creates long-term flexibility, as the applications are no longer tied to a particular communication technology. Therefore, traditional communication based on point-to-point connections is currently being replaced to an increasing extent by modern network communications based on Ethernet and TCP/IP. This gives rise to considerable savings potentials for operators.

IDS SAS equipment and system technology

IDS SAS offers a comprehensive solution portfolio for digital station automation based on IEC 61850, as shown by a glance at the possible system configuration (see illustration below).



System architecture

The modular, scalable system concept is based on the IDS 650 and IDS 850 device

families, which are employed at both field and station level. An IDS HIGH-LEIT control system is used as the station operator terminal. The IDS ACOS ET graphic engineering tool is provided for engineering and diagnosis.

Communication with the network control level takes place using the IEC 60870-101/104 standards or manufacturer-specific procedures.

Features of the IDS implementation

Flexible device modeling

True to its modular, scalable system design, the IDS implementation of the IEC 61850 provides maximum degrees of freedom with regard to device modeling. The standard defines approximately 92 logical nodes which – depending on the application – can be combined to form logical and physical devices.

In the IDS implementation, these “logical nodes” can be distributed among the logical and physical devices with absolute freedom. Likewise, there are no restrictions whatsoever regarding the assignment of operation-relevant information to context-specific IEC-61850 objects or attributes.

Dynamic report functions

Static and dynamic reports are supported, enabling simple, rapid configuration – both in the engineering phase and during plant operation.

Inter-device communication

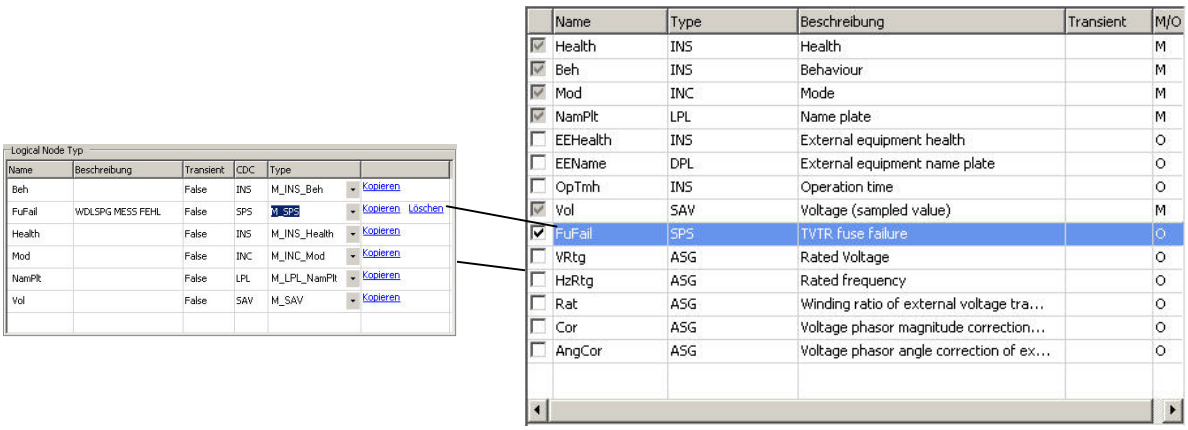
As communication is assisted by GOOSE (Generic Object Oriented Substation Event), information can be exchanged with high priority between devices (IEDs – Intelligent Electronic Devices).

Interoperability

A connection to other-make IEC 61850 systems can be established without problem, both as server (connection to other-make systems) and as client (connection from other-make devices).

IDS 650

The IDS 650 system is currently the most compact IEC 61850 system available on the market. It can be employed as a field unit (server) and a station unit (client).
Typical applications are its use both as a central station unit and gateway, and a field unit for controlling and monitoring medium-voltage systems.



Flexible device modeling: Example message “Machine tripping voltage transformer

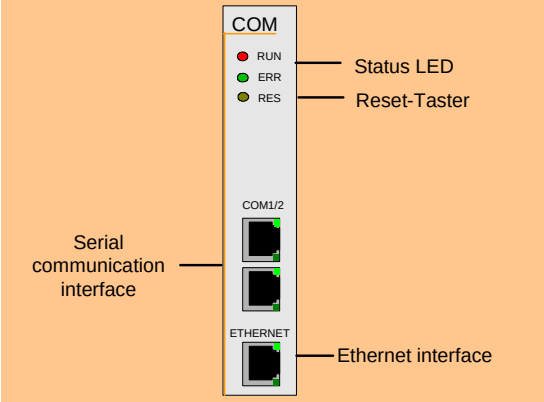
IDS 650 compact system

The IDS 650 system in brief:

- **GOOSE-compatible**
- **SAS and PLC function (IEC 61131)**
- **Time synchronization via SNTP / NTP**
- **Gateway to IEC 60870-5-101 /-104 and proprietary systems**
- **Proxy gateway from IEC 60870-5-103 systems**
- **1 ms time accuracy**
- **Fault data concentration**

Ethernet communication module

As the Ethernet communication module in the IDS 650 system, a powerful communication processor with 10/100 mbits per s Ethernet connection, in the form of the CC68A, is used. The heart of the processor component is a type MPC852T PowerPC chip with 64 MB RAM.



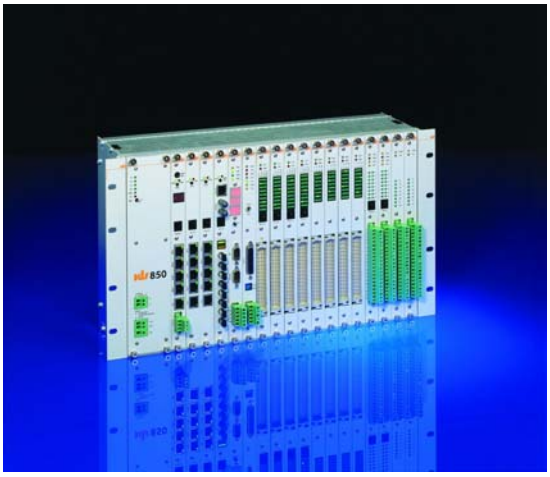
CC68A communication processor

The network interface can be operated in accordance with IEC 61850 (Server and Client) and via IEC 60870-5-104 (Server and Client). Apart from the Ethernet port, there are two RJ45 jacks as serial interfaces are available on the module as serial interfaces; they support the communication standards IEC 60870-5-101/-103 and Modbus Master.

IDS 850

The IDS 850 modular, scalable system can be used without restriction both at field and station level.

Typical examples of applications are its use as a field unit for high and ultra-high voltage systems, communication nodes and gateways to IEC 60870-5-101 /-104 and proprietary systems.



IDS 850 system

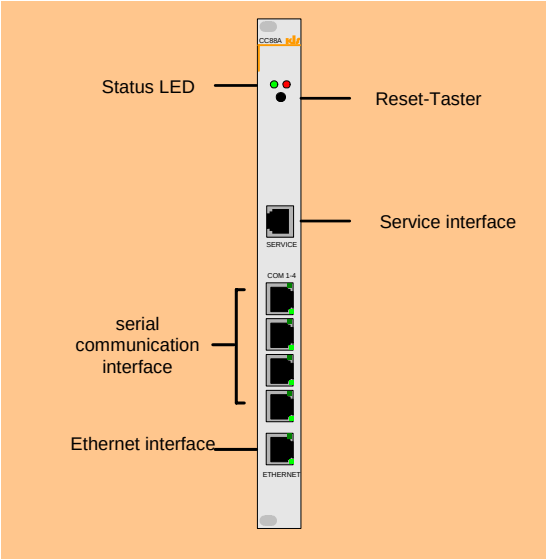
The IDS 850 system in brief:

- **GOOSE-compatible**
- **SAS and PLC function (IEC 61131)**
- **Time synchronization via SNTP / NTP**
- **Gateway to IEC 60870-5-101 /-104 and proprietary systems**
- **Proxy gateway from IEC 60870-5-103 systems**
- **Universal connection of other-make systems**
- **1 ms time accuracy**
- **Fault data concentration**

Ethernet communication modules

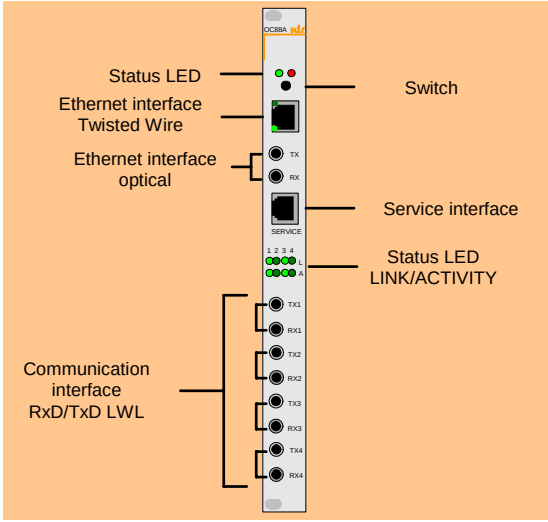
In the 850 system, too, the CC88A Ethernet communication module and OC88A fiber-optic version are available as high-performance communication processors based on PowerPC (also equipped with MPC852T with 64 MB RAM).

The CC88A module has a 10/100 mbits per s Ethernet connection, which is connected to an RJ45 jack by means of a shielded CAT5 cable. As in the 650 system, communication is achieved either via IEC 61850 server and client or IEC 60870-5-104 server and client. Furthermore, four serial interfaces are provided, on which various data link protocols can be run. The communication standards IEC 60870-5-101/ -103 and Modbus Master are supported.



CC88A communication processor

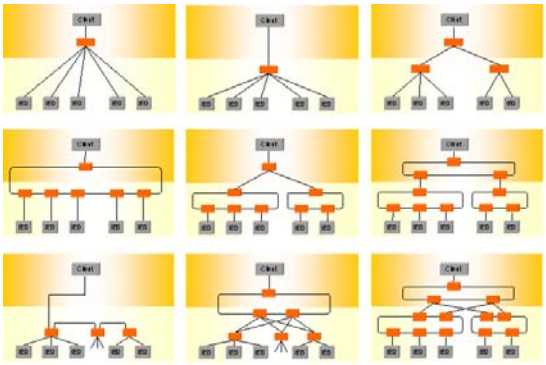
The OC88A communication processor functions in an identical manner to the CC88A. The difference consists in the fact that the Ethernet connection can be operated either via the RJ45 jack or via an optical fiber-optic ST interface. The interface is switched over by the software. The serial communication interfaces also take the optical form in the OC88A module.



OC88A communication processor

Flexible network structures

IDS SAS enables you to create diverse network structures, which satisfy the most demanding requirements in terms of availability.



Possible network structures

Migration solutions

IDS SAS offers various solutions for the step-by-step introduction of the IEC 61850 standard in existing systems, and these enable existing equipment to be reused and even permit the integration of devices from other manufacturers. With this concept, users can enjoy comprehensive support, from the formulation of the migration strategy right up to its implementation using intelligent gateway functions.

All aspects of migration are supported, from the replacement of individual devices through the upgrading of existing systems to the complete system retrofit.

Gateway and proxy solutions

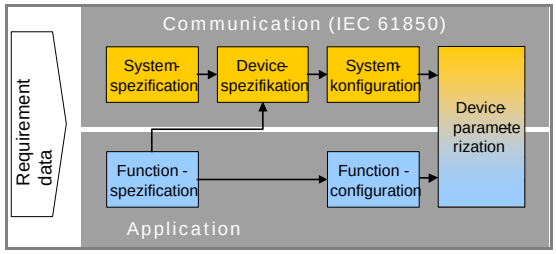
Different gateway and proxy solutions enable IDS SAS to be linked to other-make systems or existing protective relaying based on IEC 60870-5-103 to be integrated. These solutions have a functionality that greatly exceeds the pure application of protocols. They provide:

- Completely separate protocol stacks
- Backup storage of data
- Fault log conversion to COMTRADE
- FTP and web server function

The gateways are available as integrated system functions or as autonomous components (dedicated gateways).

Engineering

One of the IEC 61850 standard's major features is that in addition to operation, it also includes engineering in the application of the standard. In other words, not only has a uniform data model for the communication of operating information been created - now, for the first time, a uniform, standardized descriptive formalism exists for the configuration of equipment and the entire substation. The descriptive language SCL (Substation Configuration Language) is used as the formal representation of information.



Steps in IDS system and device configuration

The following individual steps are carried out during system and device configuration, with the assistance of the tools SCT and IDS ACOS ET:

Communication level: System specification

During this step, the primary technology is input and linked to the secondary technology. In practical terms, this is achieved by entering the primary system graphically in the form of single-line diagrams with the aid of the SCT tool. Next, the functions of the secondary technology are defined and linked to the primary system. The result of this system specification phase is the SSD (Substation Specification Description) file.

Application level: Function specification

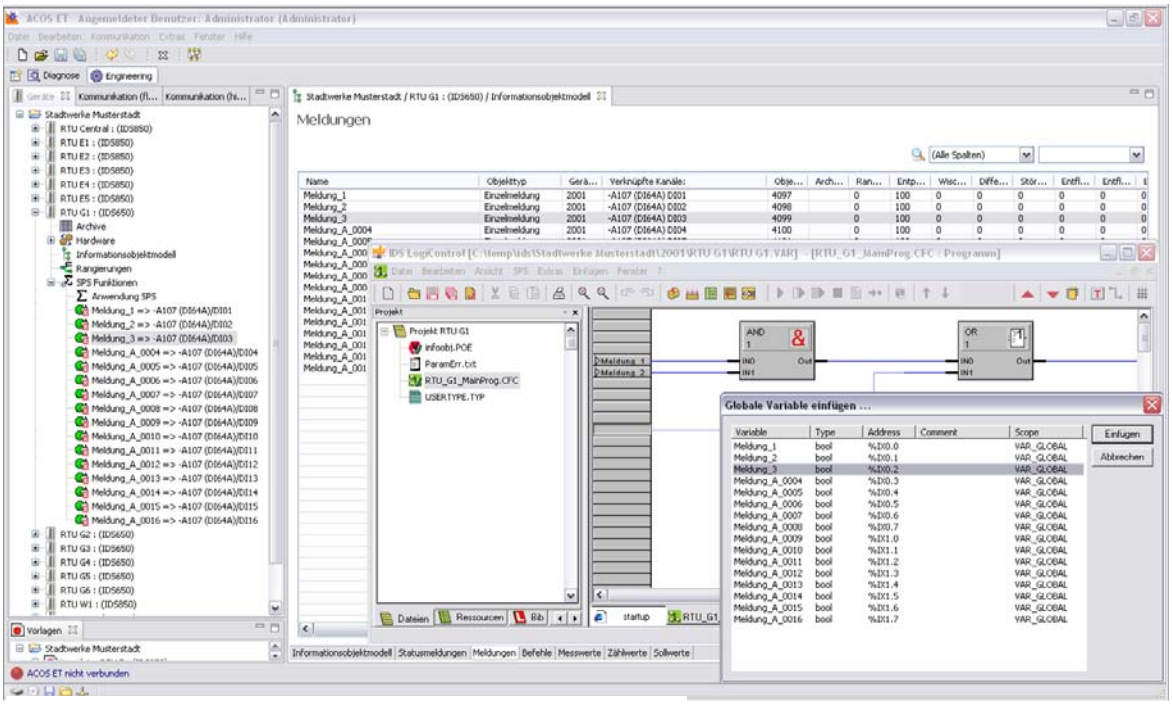
On the application level, the application-specific data models are constructed on the basis of functional and operational requirements. Here, it is necessary to define which information is to be exchanged between the devices, in order that switching devices throughout field level can be locked, for example.

Communication level: Device specification

The application-specific data model is mapped in line with the IEC 61850 in a device-based manner in the form of ICD (IED Capability Description) files using the IDS ACOS ET engineering tool.

Communication level: System configuration

During this step, a system configuration is derived from the system and device configurations. The SSD and ICD files are imported into SCT for this purpose. Here, the communication services are configured (compilation of reports and their transmission parameters). This step produces the SCD (Substation Configuration Description) file.



Application level: Function configuration with ACOS ET

Application level: Function configuration

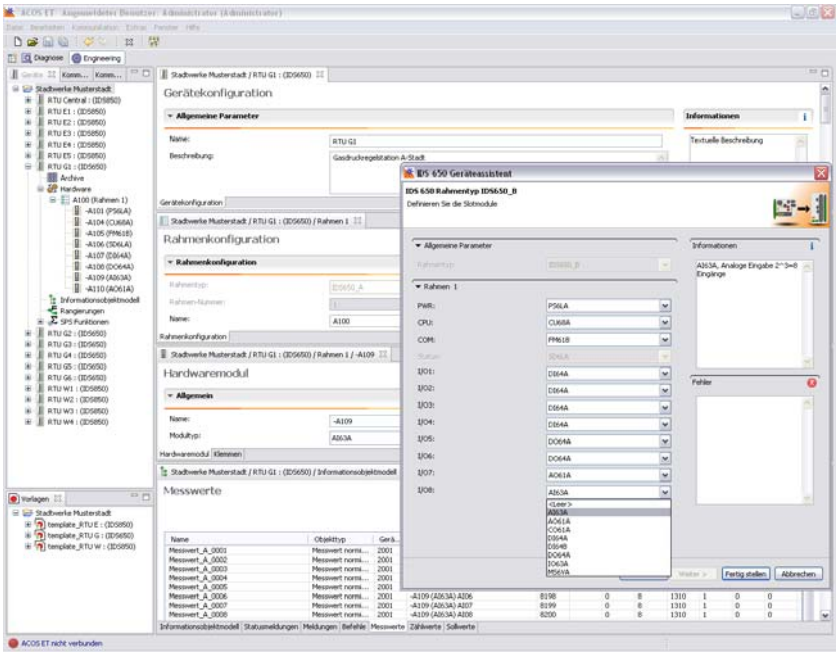
The individual functions of the application are now configured using the IDS ACOS ET engineering tool (locking functions, control rights, switching sequences...) and process and function parameters are set.

Other engineering components

The IDS ACOS ET engineering tool lends support to users beyond the parameterization of system and devices. On the one hand, it produces detailed documentation in the form of circuit diagrams, test documents and SCL system configurations (SCD files); on the other hand, it provides an array of testing and diagnostic functions (tracing, simulation).

Device parameterization

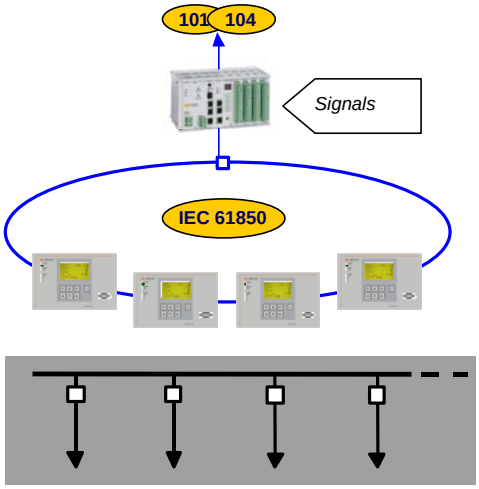
During the concluding device parameterization, the system configuration (the SCD file from SCT) is imported into IDS ACOS ET and the device-specific CID part (CID = Configured IED Description) is transmitted to the respective device together with the function configuration.



Device parameterization with IDS ACOS ET

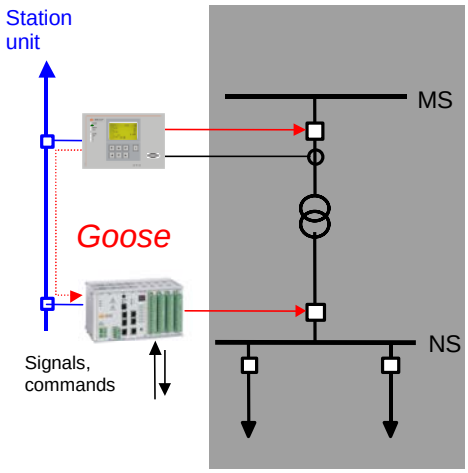
Application examples

Central station unit and gateway for MS systems



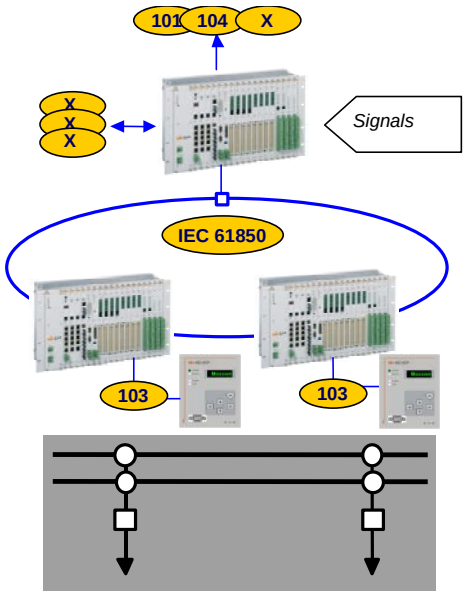
The combined protective devices are connected to the IDS 650 station unit by means of a network ring with IEC 61850. The station unit records further pieces of galvanic process information via I/O modules. Moreover, the station unit maps the IEC 61850 information and services on the network control center data link in accordance with IEC 60870-5-101/-104. Fault logs are gathered centrally from the protective devices and made available in the station unit for retrieval by file transfer.

Field unit for low-voltage supplies with transfer function



The task of the field unit is the acquisition of galvanic process information such as state information, measured values and commands. A transfer initiated by the higher-level protective device is transmitted to the field unit via GOOSE, where it results in the tripping of the circuit-breaker.

Station automation system for high-voltage systems



The IDS 850 field units are connected to the IDS 850 station unit via a network ring with IEC 61850. Existing protective devices with IEC 60870-5-103 interface are integrated in the IEC 61850 station bus by means of the proxy function of the field units. The station unit maps the IEC 61850 information and services on the network control center data link in accordance with IEC 60870-5-101 /-104, or on proprietary protocols. Further devices/systems can be connected to the station unit.

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