Substation Automation Solutions
SAS 600 Series
ABB’s SAS 600 Series
More than IEC61850 compliant

The highlights of ABB’s SAS600 Series

- Fully IEC61850 compliant substation automation solutions
- Flexible station bus topologies including multiple networks
- State-of-the-art station HMI based on ActiveX technology
- Scalable architecture and functionality
- Integration of control and protection
- Simplified future extendibility in functionality and size
- Open connectivity through OPC interfaces
- Implementation and system performance proven by in-house System Verification Center

The SAS600 Series of modular station level solutions is designed for maximum safety, efficiency and reliability in local as well as remote control and monitoring of your substation. It incorporates ABB’s market-leading experience in substation automation and protection, vast expertise in IEC 61850 and proven system integration capabilities.

The series offers a smart choice for new stations, retrofit and migration projects and the confidence that you can invest into the future today.

The SAS600 Series together with BCS 600 Series Bay Control Solutions and BPS600 Series Bay Protection Solutions is the ultimate and most efficient strategy to build substation automation systems.
The SAS solution portfolio ranges from compact solutions for the safe control and monitoring of your substation to the most demanding applications where single points of failure are not tolerable and highest levels of availability are a necessity.

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Station level solution
based on IEC 61850 in a substation automation environment
Modular, scalable architecture

Advanced SAS – for extra high voltage and complex transmission substations

**SAS 690**  
Highest availability of local and remote control through separation as well as full redundancy of gateway and station computer / HMI

**SAS 670**  
Highest availability of local control provided by two redundant station computers in hot stand-by configuration with option for remote control

Enhanced SAS – for high voltage transmission substations

**SAS 650**  
For manned substations with completely independent HMI and gateway functionality using redundant station computers for local control and monitoring

**SAS 630**  
For unmanned substations with completely independent station computer / HMI and a highly reliable industrial gateway for remote control

**SAS 635**  
For unmanned substations with completely independent station computer / HMI and a RTU based station controller for remote control

Basic SAS – for distribution and subtransmission substations

**SAS 610**  
Compact solution featuring an industrial PC for local control and monitoring with optional access for remote control

**SAS 605**  
Compact and flexible solution for remote control using a RTU based station controller with optional integrated HMI

**Main components**

- **Station computer / HMI**
  - MicroSCADA Pro (SYS600)

- **Station computer / HMI with integrated gateway**
  - MicroSCADA Pro (SYS600 plus COM500i)

- **Independent gateway**
  - MicroSCADA Pro (SYS600C)

- **Station controller**
  - RTU560

- **Integrated HMI**
  - RTU560
IEC 61850 Station Bus
Flexible Ethernet Topologies

The chosen network topology for the IEC 61850 station bus is adapted to best suit the given physical location of the IEDs considering distances and number of IEDs concentrated in one place.

The most common basic architectures are explained below. In practice one of the described topologies or a combination of them might be used.

Centralized ring

Ethernet features
- Large switches in station cubicle
- High-speed Gigabit backbone
- Redundant power supply (option)

Applications
- Short bay IED-to-station distance
- Few IEDs per cubicle/compartment

Decentralized ring

Ethernet features
- Switches in bay and station cubicle
- Choice of large and small switches
- 100 Mbit/s or 1 Gbit/s backbone

Applications
- Long bay IED-to-station distance
- Many IEDs per cubicle/kiosk

Multiple networks

Ethernet features
- Up to 3 physically separated networks
- Free choice of topology per network (centralized or decentralized)

Applications
- Large systems
- Several voltage levels
- Separate control and protection systems
- Separate protection systems (Main 1, Main 2)
- High reliability requirements
ABB’s system design is fully distributed. The time-critical information exchange applies to the bay level only.

How to use IEC61850 for time-critical information exchange
There are several automated functions in the substation automation system, which require a time-critical exchange of information between functions located within the same bay or in different bays.

Examples:
- Exchange between line protection and autorecloser
- Exchange between bays for breaker-failure protection
- Exchange between bays for station interlocking
- DR triggering by protection functions

**Generic Object Oriented Substation Event**
For the exchange of this type of (binary) information via serial communication, IEC61850 introduces a specific information exchange service called GOOSE (Generic Object Oriented Substation Event) based on the publisher-subscriber concept. The content of a GOOSE message is defined with a dataset. The GOOSE message is sent as a multicast message via the communication network. This means that various devices can receive the message and retrieve the required information from it. The communication service is not confirmed; instead, the message is repeated several times.

**Station-wide interlocking**
A typical example is the exchange of information between logical devices for station interlocking. Each IED distributes the required switch positions via GOOSE telegram via the station bus and also receives switch positions from other feeders. Therefore, each IED has access to all the information needed to verify the station-wide interlocking conditions.
SAS 605
Basic Automation Solution

Flexible and maintenance-free solution for safe remote control and monitoring. The solution with a RTU based station controller supports direct hardwired I/Os and various master protocols.

Control at the substation level is available using the integrated HMI server of the station controller.

Features
- Highly reliable station controller
- Remote control
- Basic monitoring and control functions

Options
- Integrated HMI
- Different master protocols for legacy IED integration
- I/O modules for hardwired interface

Typical applications for SAS605

Power Utilities
- Subtransmission and distribution level

Industry
- Distribution substations for power supply

Power plants
- Distribution substations for auxiliary supply

*Available Ethernet topologies
Centralized ring, decentralized ring or multiple networks
SAS 610
Basic Automation Solution

The compact solution for safe local control and monitoring. It features a single computer and can be upgraded at any time. The choice is yours in terms of advanced functions and/or remote control access.

Features
- Single industrial station computer with HMI
- Basic monitoring and control functions

Options
- Gateway functionality for remote control
- Printers for event printing and hardcopy
- Engineering and operator workstations
- Time server with integrated GPS receiver
- Router and firewalls with VPN functionality
- Proxy to connect legacy protocols and I/Os to IEC 61850
- Station alarm device
- Advanced monitoring functions
- Advanced control functions

Typical applications for SAS 610

Power Utilities
- Subtransmission and distribution level

Industry
- Distribution substations for power supply

Power plants
- Distribution substations for auxiliary supply

*Available Ethernet topologies
Centralized ring, decentralized ring or multiple networks
**SAS 630 / 635**

**Enhanced Automation Solution**

Safe control and monitoring for usually unmanned substations. A maintenance-free embedded gateway or RTU based gateway provides the access for remote control.

A dedicated computer is used for the local data acquisition and operation at the substation level.

**Features**
- SAS630: Highly reliable embedded gateway for remote control
- SAS635: Highly reliable RTU based gateway for remote control
- Single station computer
- Basic monitoring and control functions

**Options**
- Separate station LAN to interconnect station level devices
- Printers for event printing and hardcopy
- Engineering and operator workstations
- Time server with integrated GPS receiver
- Router and firewalls with VPN functionality
- Proxy to connect legacy protocols and I/Os to IEC61850
- Station alarm device
- Advanced monitoring functions
- Advanced control functions

**Typical applications for SAS 630 / 635**
- Power Utilities
  - Subtransmission and high voltage transmission level

*Available Ethernet topologies*
Centralized ring, decentralized ring or multiple networks

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SAS 650
Enhanced Automation Solution

The solution for the manned substation. Redundant station HMIs on a separate LAN are supplemented with an independent industrial gateway for remote control access.

Features
- Highly reliable embedded industrial gateway for remote control function
- Redundant industrial station computer with HMI independent of gateway
- Separate station LAN and IEC61850-8 network
- Redundant station LAN
- Basic monitoring and control

Options
- Printers for event printing and hardcopy
- Engineering and operator workstations
- Time server with integrated GPS receiver
- Router and firewalls with VPN functionality
- Proxy to connect legacy protocols and I/Os to IEC61850

- Station alarm device
- Advanced monitoring functions
- Advanced control functions

Typical applications for SAS 650
- Power Utilities
  - Subtransmission and high voltage transmission level

*Available Ethernet topologies
Centralized ring, decentralized ring or multiple networks
SAS 670
Advanced Automation Solution

The solution for highest availability of local control. Redundant station computers and HMIs leave no room for single points of failure. Complementing these with integrated gateway functionality for remote control access gives you additional peace of mind.

Features
- Redundant industrial station computer/HMI
- Separate station LAN and IEC61850-8 network
- Redundant station LAN
- Basic monitoring and control
- Proxy to connect legacy protocols and I/Os to IEC61850
- Station alarm device
- Advanced monitoring functions
- Advanced control functions

Options
- Redundant gateway functionality for remote control
- Printers for event printing and hardcopy
- Engineering and operator workstations
- Single or redundant time server with integrated GPS receiver
- Router and firewalls with VPN functionality

Typical applications for SAS 670
Power Utilities
- Extra-high voltage transmission substations
Industry
- Complex distribution substations of high importance

*Available Ethernet topologies
Centralized ring, decentralized ring or multiple networks
SAS 690
Advanced Automation Solution

The fully redundant local and remote control solution meets even the highest availability requirements.

You are assured of the continuous controllability of your substation. After all, it is of prime importance.

**Features**
- Redundant, highly reliable embedded industrial gateway for remote control access
- Independent redundant industrial station computer with HMI
- Separate station LAN and IEC61850-8 network
- Redundant station LAN
- Basic monitoring and control
- Station alarm device
- Advanced monitoring functions
- Advanced control functions

**Options**
- Printers for event printing and hardcopy
- Engineering and operator workstations
- Single or redundant time server with integrated GPS receiver
- Router and firewalls with VPN functionality
- Proxy to connect legacy protocols and I/Os to IEC61850

**Typical applications for SAS690**

**Power Utilities**
- Extra-high voltage transmission substations

**Industry**
- Complex distribution substations of high importance

*Available Ethernet topologies*
Centralized ring, decentralized ring or multiple networks
Far beyond station control
Basic functionalities

Primary equipment supervision
- Continuous monitoring of switching objects
- Display of measurements
- Access to control dialogues

Control
- Dialogues for switching objects and tapchanger operation
- Single and double commands
- Analogue set values

Safety checks
- Select-before-operate
- Interlocking (bay and station-wide)
- Synchrocheck
- Double command blocking

Measurements
- Direct from VTs IEC, PTs ANSI and CTs
- mA- and V-signals
- Time-tagged at bay level
- Statistics

System supervision
- All bay and station level IEDs
- Auxiliary devices (printer, etc.)
- Communication network/links

Sequence of events
- Event list
- Historical events
- Filtering function
- Export facilities

Alarms
- Alarm list (persistent/fleeting alarms)
- Alarm acknowledgement
- User-defined alarm classes
- Control of acoustic alarm

User management*
- Different levels of user authorization
- Specific user group with access to each individual object
- User-specific authorization profile

Blocking list*
- Summary display of current blocking situation in the process database
- Blocking of alarms, events, updates, control, printing and reprocessing

Calendar*
- Start time-related activities
- Execution of activities during a certain time period, once or repetitively
- Flexible configuration, individual and independent configuration per day

*) Not available for SAS 605
Advanced functionalities

**Trends**
- Short-term observation and analysis
- Assignment of any process values
- Graphical or tabular representation
- Calculation formulae

**Measurement reports**
- Statistical measurement reports stored in report database
- Hourly/daily/weekly/monthly/yearly report
- Tabular or graphical representation
- Report data in ASCII or CSV format
- Sum, mean, average, min., max.

**IED parameterization**
- Configuration/parameter upload from IED
- Change of individual parameters or parameter sets
- Access to all IED parameters

**Disturbance record upload**
- Manual upload
- Cyclic upload
- Event-driven upload

**Disturbance record analysis**
- Waveform visualizations, signal vectors
- Fault location, advanced calculation
- Frequency deviation, apparent and reactive power calculation
- Automatic analysis

**Trip counter table**
- Maintenance information for CBs
- Numbers of opening operations
- Accumulated magnitude of the trip currents

**Dynamic busbar coloring**
- Dynamic coloring of the different switchgear parts
- One color per power source
- Enhanced overview for complex substations

**Automatic sequences**
- Execution of pre-defined switching sequences
- Safety checks (same as for switching of individual objects)
- Freely configurable sequences

**Load shedding**
- Control at bay level, configuration and supervision at station level
- Static load shedding
- Adaptive load shedding

**High-speed busbar transfer**
- Change-over of motor-feeding busbar from normal to backup supply and vice versa
- Control at bay level, configuration and supervision at station level

**External alarming**
- Fax, voice message
- SMS, pager system
- E-mail
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