PLC AUTOMATION

AC500 PLC

Infrastructure automation solutions

PLC Automation product family
Overview

ABB offers a comprehensive range of scalable PLCs and robust HMI control panels. Since its launch, the AC500 PLC platform has achieved significant industry recognition for delivering high performance, quality and reliability.

AC500 HA offers hot standby redundancy

Hot swap of S500 I/O modules for increased availability

S500 I/O modules run with various controllers

AC500 PLC integration in ABB Ability™ System 800xA

IEC 61850 protocol for substation and switchboard automation with AC500

AC500-S functional safety

Condition monitoring with AC500 PLC

AC500 PLC platform product ranges

PLC training and support offering

Application examples and notes

Automation Builder

Comprehensive range

- ABB delivers scalable, flexible and efficient ranges of automation components to fulfill all conceivable requirements of the most diverse automation applications.
- ABB's automation devices deliver solutions with high performance and flexibility to be effectively deployed within various industries and applications including water, building infrastructure, data centers, renewable energy, machinery automation, material handling, marine and many more.

Engineering suite

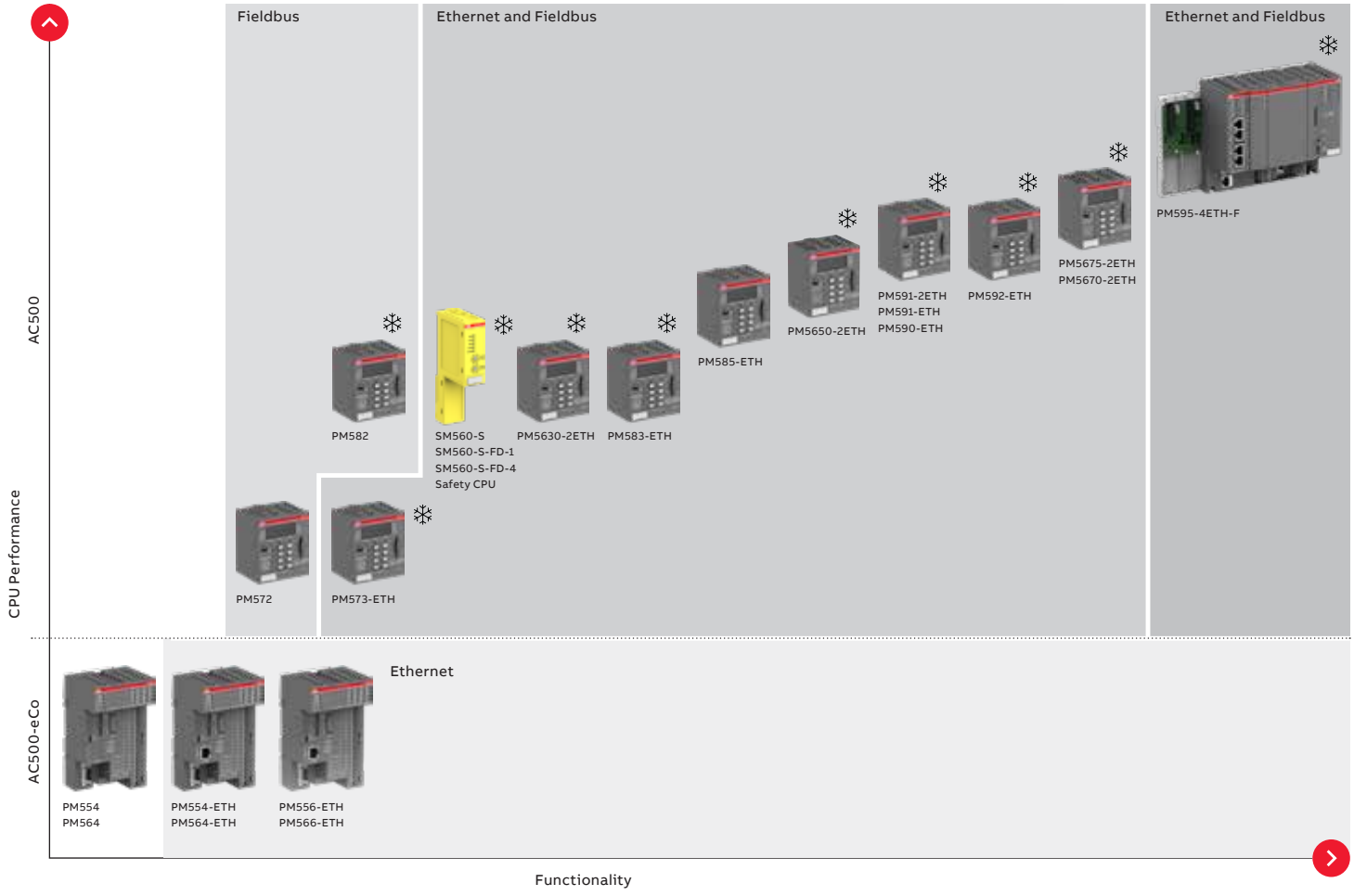
- ABB Automation Builder is the integrated software suite for machine builders and system integrators requiring state-of-the-art productive machine and system automation.
- Combining the tools required for configuring, programming, debugging and maintaining automation projects from one common intuitive interface, Automation Builder addresses the largest single cost element of most of today's industrial automation projects - software.

Programmable Logic Controllers PLCs

- The AC500-eCo, AC500, AC500-XC and AC500-S scalable PLC ranges provide solutions for small, medium and high-end applications.
- Our AC500 PLC platform offers different performance levels and is the ideal choice for high availability, extreme environments, condition monitoring, motion control or safety solutions.
- Our AC500 PLC platform offers interoperability and compatibility in hardware and software from compact PLCs up to high end and safety PLCs.

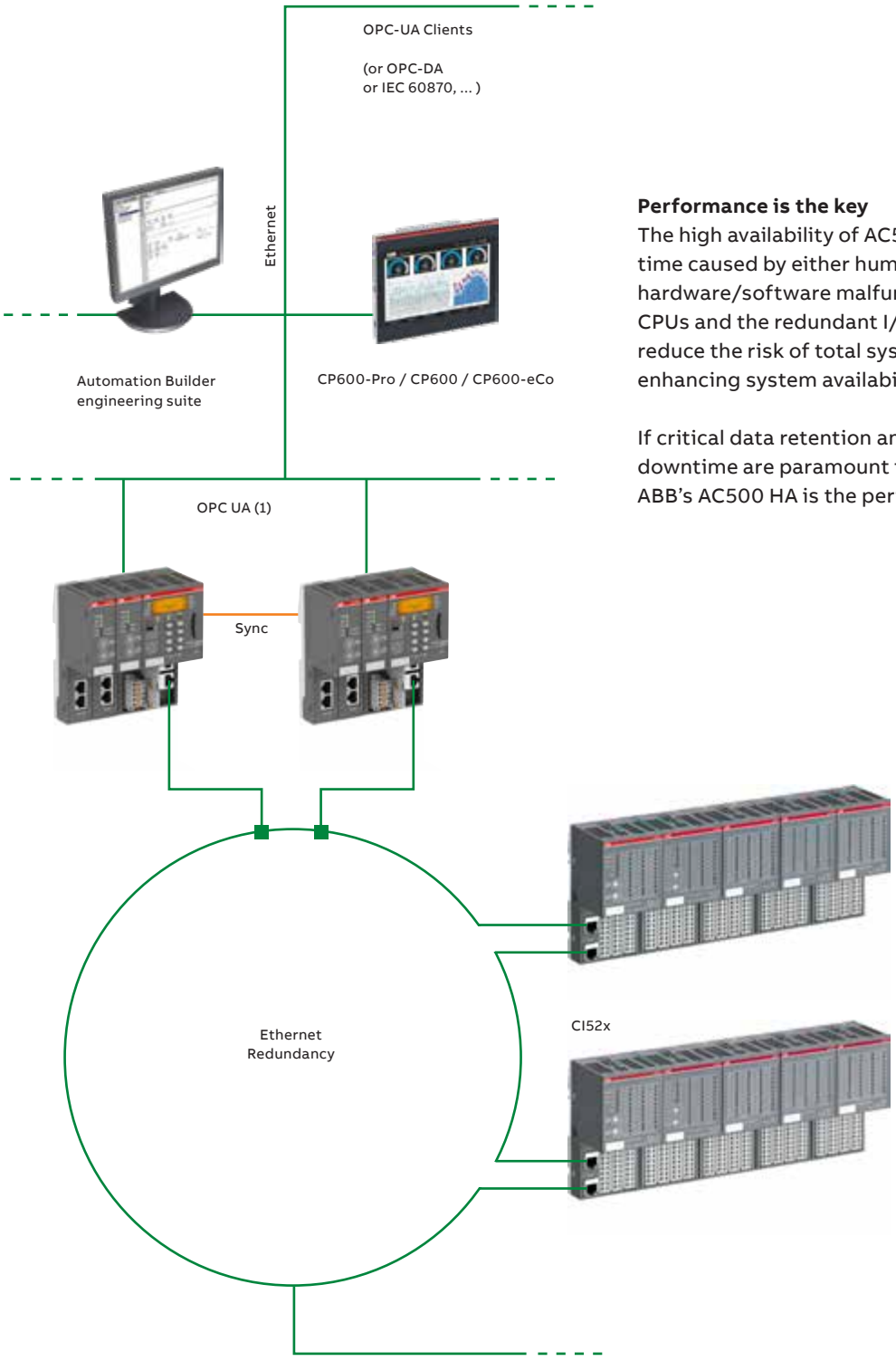
Control panels

- CP600-eCo, CP600 and CP600-Pro control panels offer a wide range of features and functionalities for maximum operability.
- ABB control panels are distinguished by their robustness and easy usability, providing all the relevant information from production plants and machines at one single touch.



Ethernet enabled
Fieldbus enabled
Ethernet, Fieldbus and High Availability enabled
Ethernet, Fieldbus, High Availability and enlarged memory
❄ eXtreme Conditions version available

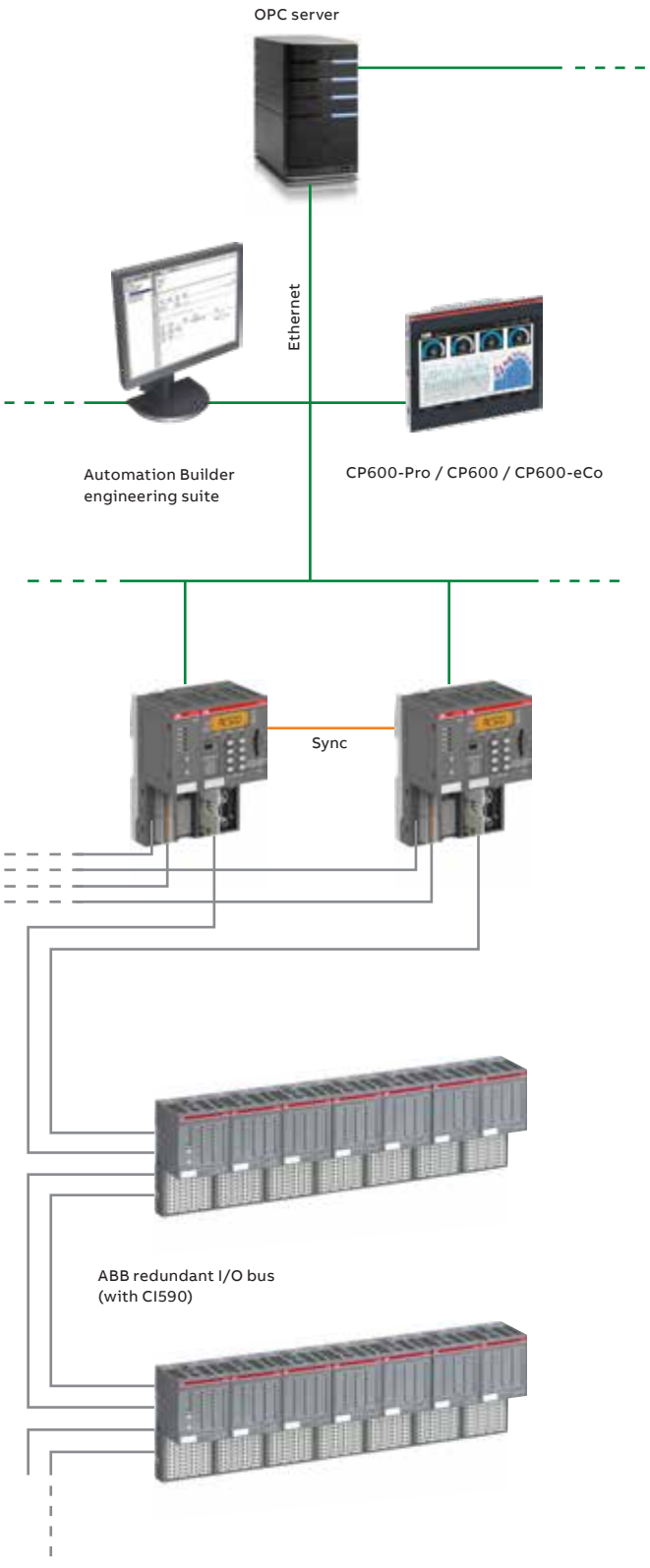
AC500 HA offers hot standby redundancy



Performance is the key
The high availability of AC500 HA prevents down-time caused by either human error or cabling/ hardware/software malfunction. Redundant CPUs and the redundant I/O communication reduce the risk of total system failure, thus enhancing system availability.

If critical data retention and the avoidance of downtime are paramount to your application, ABB's AC500 HA is the perfect solution.

(1) AC500 V3 CPUs only



What are the benefits of AC500 HA for your high availability solution?

- Hot standby: Both CPUs (and all communications) are hot: Permanently running in parallel, continuously synchronizing each other and monitoring the system. If the primary CPU is stopped, powered off or crashed, or if an I/O communication/cable has failed, the other hot standby CPU takes over immediately by adopting primary status.
- Higher resource utilization, no downtimes caused by cabling/hardware/software failure thanks to redundant CPUs and redundant communication to I/O and SCADA/HMI.
- Cost efficiency and easy system maintenance through the use of standard hardware.
- High availability is provided with standard CPUs. Cost matching hot standby quality for small or large systems.
- Scalable in both variants: CS31 redundancy bus or Ethernet.

Hot swap of S500 I/O modules for increased availability

Replacing S500 I/O modules while the system is running
The hot swap terminal units TU516-H, TU532-H and TU542-H allow no-load hot swapping of S500 I/O modules during operation. When replacing a S500 I/O module the other modules in the cluster continue operating.

This capability is available for an I/O cluster with the following fieldbuses:
- PROFIBUS
- PROFINET
- Modbus TCP

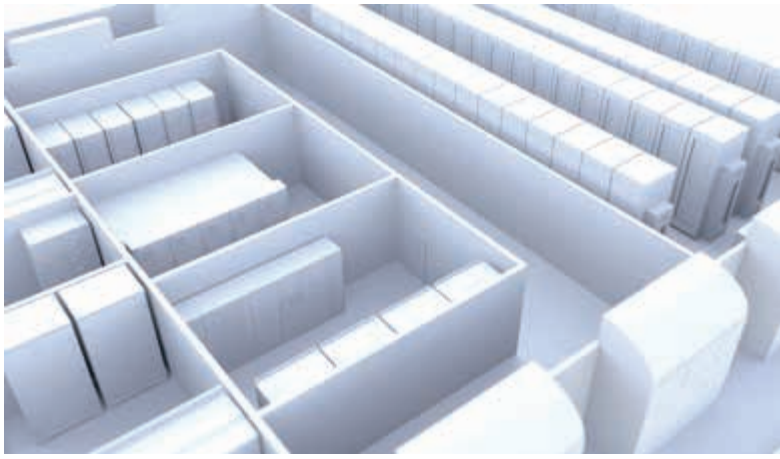
The capability is also available for I/O attached to AC500 CPU modules.

Permanent wiring
Due to the construction of the S500 system, the wiring remains untouched during hot swap. There is no need to remove terminal blocks.

A S500 I/O module can be removed and replaced while the other modules in the configuration continue operating.

As soon as a module is re-inserted, it will be configured automatically and put into operation.

Applications
Hot swap is needed in hybrid applications when the control system must not be switched off during the replacement of a module.



S500 I/O modules run with various controllers

S500 remote I/O
The availability of different fieldbus communication interfaces makes it easy to use S500 I/O modules as remote I/O for nearly any PLC and PC. The S500 remote I/O station consists of a communication interface and I/O modules. The smallest configuration can be just the communication interface with the onboard I/O channels. Communication interfaces are available for the following fieldbuses:

- PROFIBUS
- PROFINET/PROFIsafe
- EtherCAT
- Modbus TCP
- CANopen
- ABB CS31 System Bus

Easy engineering
The electronic configuration files that are provided by ABB for different fieldbus systems make it easy to configure the S500 remote I/O station in your engineering tool. The files such as GSD and GSDML are available for download at www.abb.com/plc. For Modbus TCP remote I/O stations a dedicated configurator is included in Automation Builder and for larger applications a Bulk Data Manager tool can be used.

AC500-eCo CPU as S500 remote I/O
When the AC500-eCo compact CPU is used as remote I/O, it can be programmed with Automation Builder for local intelligence while communicating via the open protocols Modbus TCP or Modbus RTU with a CPU that will then be the master of this intelligent remote I/O station. The AC500-eCo CPU can be expanded by I/O modules from the S500 and S500-eCo range.

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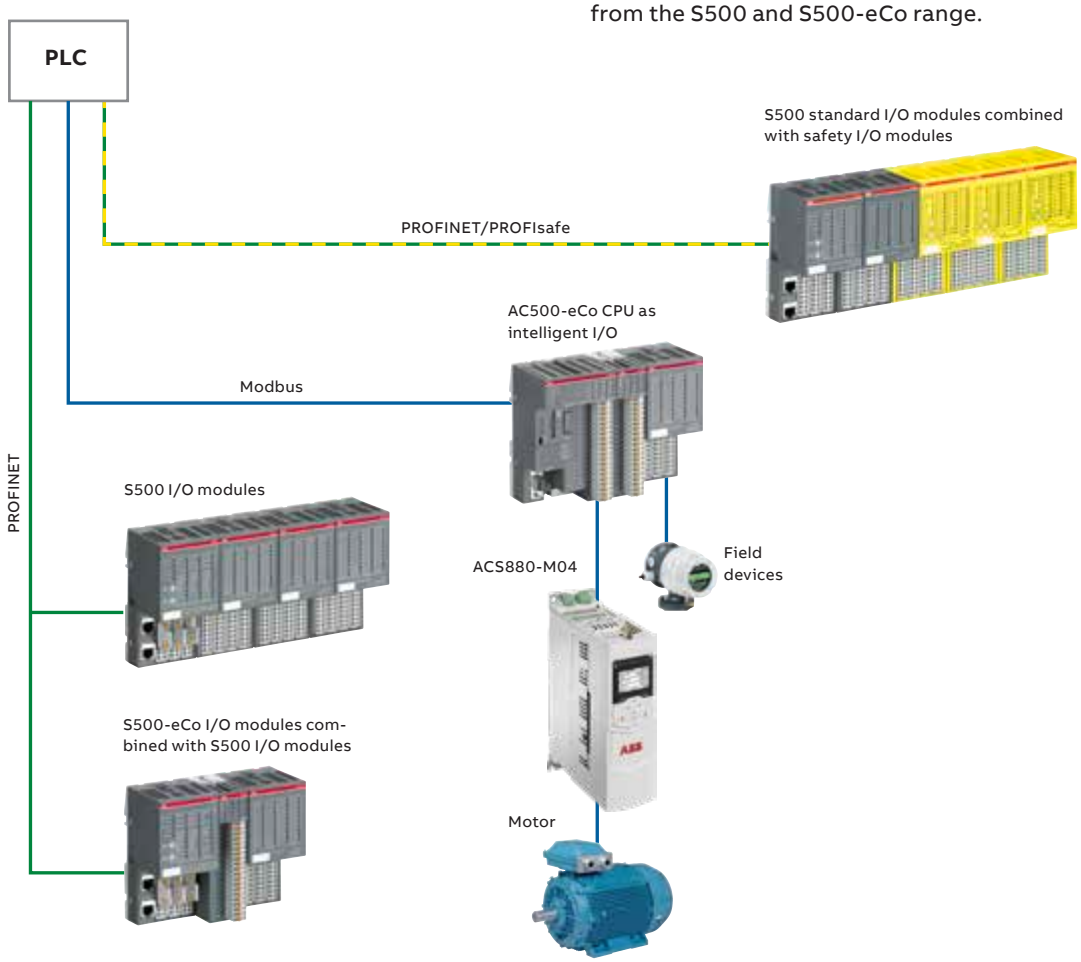
Third party PLC, IPC or machine controller

Controller can also be an IPC with ABB Ability™ for data center



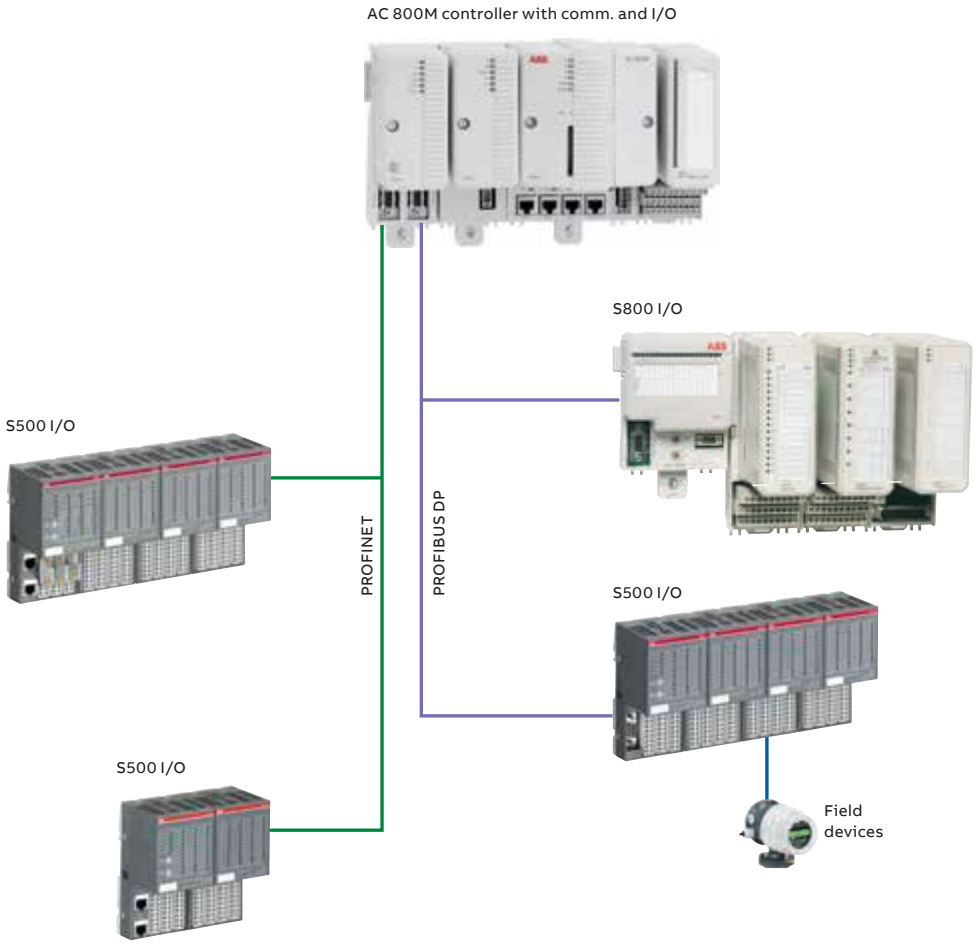
S500 remote I/O with Modbus TCP
ABB provides a configurator in the Automation Builder tool, which allows the configuration of Modbus TCP I/O stations with the communication interfaces CI521-MODTCP or CI522-MODTCP in the same style as the AC500 configuration. For larger applications a Bulk Data Manager tool can be used. The configuration can be stored in the communication interface, which allows using the configured station with any PLC or PC that supports Modbus TCP. This e.g. allows the use directly on other controllers or monitoring systems as e.g. ABB Ability™ Data Center Automation or external systems.

Thanks to the Modbus feature that allows several masters to exchange data with the same slave, it is possible to use the I/O station as shared devices with up to 10 PLC CPUs.

The Modbus masters can access the process data of the I/O stations in two different ways:
- Fixed mode: each I/O module in the station uses a separate register address range, which requires separate Modbus read/write operations for the modules in the station.
- The dynamic mode allows to pack the data of all I/O modules in the station in one data structure that can be exchanged in one single read/write operation.

S500 remote I/O with PROFINET/PROFIsafe
Simply extend your control system with ABB standard and safety I/Os to simplify wiring, reduce operating costs and benefit from the unique features of our safety I/O portfolio to increase the productivity of your machines.

S500 in hybrid applications with AC 800M Controller
The communication interfaces for PROFIBUS and PROFINET facilitate the integration of S500 as remote I/O stations in the System 800xA AC 800M family of controllers. System redundancy is supported with PROFINET. The configuration is integrated into the engineering tool of the DCS controller.



AC500 PLC integration in ABB Ability™ System 800xA

Integration of AC500 PLC into System 800xA
The AC500 PLC hardware can be used for certain process control functions while the operator benefits from user experience in System 800xA. Proven libraries are provided for System 800xA and AC500. This allows programming control tasks in the AC500 PLC while System 800xA is the operator interface. For large distributed projects, many AC500 PLCs can be connected to a System 800xA node.

Process Control objects
Twelve objects are available which cover the following functionalities:
- Digital and analog setpoints
- Analog measurement with threshold alarm functions
- Valve control
- Motor control with or without variable speed drives
- Proportional integral controller

Communication between System 800xA and AC500 PLC
Communication between the AC500 function blocks and the objects in System 800xA uses the PLC Connect option of System 800xA and the AC500 OPC Server.

Simplified engineering
The Process Control Objects (PCO) library for AC500 V2 contains a function block for each object. The control task is engineered with the AC500 engineering tool Automation Builder. The communication between the objects in System 800xA and the function blocks in AC500 is configured with Bulk Data Manager, which is part of the System 800xA Engineering toolset. A library with ready-made symbols and faceplates for the objects is available for System 800xA engineering.

Integrated documentation
For engineering, the function blocks for AC500 include the user documentation. The faceplates provide multi-language support for the text elements and allow adaptation of the color codes of the elements to the preferences of the application.

Availability
The Process Control Objects Library (PCO) for AC500 V2 is available in Automation Builder as of version 2.2.3. The Automation Builder installation also contains the required OPC server. The corresponding 800xA PLC Object Library for 800xA or Compact HMI can be ordered via the 800xA 6.0.3 add-on features list.

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System 800xA and AC500 PLC network architecture

IEC 61850 protocol for substation and switchboard automation with AC500

AC500 as freely programmable 61850 controller, gateway or IED

AC500 is used as Intelligent Electronic Device (IED), RTU or controller
IEC 61850 is a standard protocol for state-of-the art, future-proof substation automation, which replaces hard wiring of signals by communication over the network. The AC500 V3 can be programmed to act as an Intelligent Electronic Device (IED), RTU or used in control applications such as e.g. load shedding.

Interoperability between devices made easy
Generic Object-Oriented Substation Event (GOOSE) messages are used for the interoperability of devices with minimal delay, e.g. for fast tripping or interlocking or monitoring applications. With the IEC 61850 library and the comfortable communication the AC500 PLC can be used for the publishing of and subscribing to GOOSE messages.

The AC500 PLC can also act as server for connection-oriented communication according to the Manufacturing Messaging Specification (MMS).

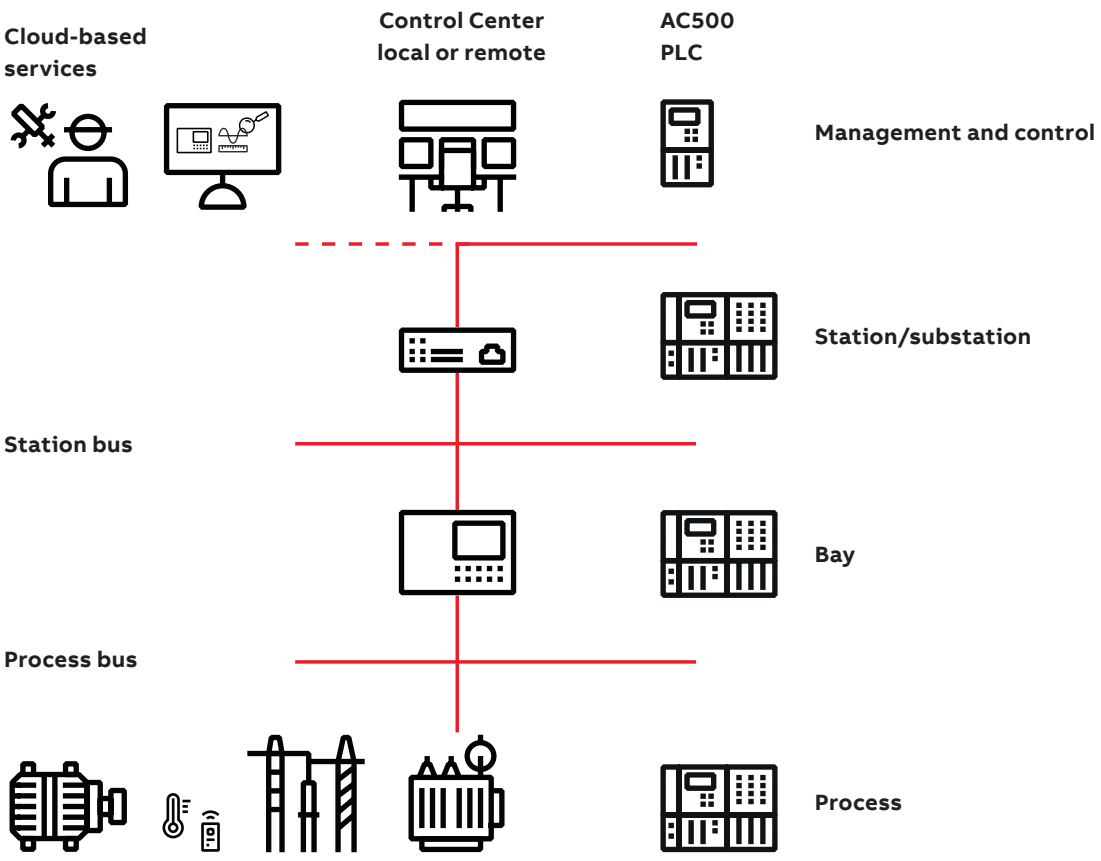
Easy engineering
Automation Builder integrates the IED configuration which supports the import and export of files in the Substation Configuration Language (SCL) and code creation for the AC500. SCL allows transferring configuration information between various IEDs. The functionality of the devices can be programmed in IEC 61131 languages with Automation Builder.

Integral solution
All-in-one platform 60870-104, 61850, Modbus, combined with OPC DA, OPC UA, MQTT. Automation Builder Engineering with the comfortable IED configuration tool and flexible IEC programming functionality and C-code integration.

Application example 61850
AC500 can precisely control and monitor all levels (switchboard, substation and process) and connect them via 61850 or interface to the outside world (RTU).

AC500 can interface to a large amount of IEDs and map their data in control and monitoring direction to a 60870-5-104 , OPC UA or MQTT communication as required or act on other IEDS e.g with advanced logic in load shedding control applications. AC500 can also help to modernize and digitalize an existing and aging infrastructure.

AC500 application levels



AC500-S functional safety

AC500-S safety PLC is the solution for both simple and complex machine safety applications requiring maximum reliability, efficiency and flexibility. This safety PLC protects people, machines and processes, the environment and investments - the ideal choice for wind turbine, crane, material handling, hoist, robot and other factory and process applications.

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01

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02

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03

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01 Safety CPU
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02 S500 Safety I/O module
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03 Safety terminal unit

Better integration and ease of programming
Featuring a consistent look and feel across the entire range, the AC500 is the PLC of choice for applications where uncompromised flexibility, comprehensive integration and seamless communication are a must. Automation Builder seamlessly integrates your safety application in ABB PLC, Safety, Drives, Motion and HMI. Through integrated standard languages, such as IEC 61131-3, Automation Builder is easy to use, thus, allowing you to get started in virtually no time at all. And what is more: intuitive system configuration using one single tool ensures optimal transparency.

The AC500-S safety PLC, ABB's latest addition to the AC500 family, facilitates the implementation of even most complex safety applications. Support of safety-relevant calculations, such as COS, SIN, TAN, ASIN, ACOS and LOG makes the AC500-S the ideal solution for crane engineering, wind power generation, robotics and hoisting applications. Safety programming with Structured Text (ST) and full support for Function Block Diagram (FBD) and Ladder Diagram (LD) programming and advanced features in PROFIsafe over PROFINET communication, like Shared Device functions, gives you greater flexibility and simplifies safety application development. The AC500-S safety PLC is also available in a version for extreme conditions.

Condition monitoring with AC500 PLC

Controller integrated or stand-alone condition monitoring
The AC500 condition monitoring module FM502 is a natural part of the AC500 platform and Automation Builder engineering suite, and can be used in different condition monitoring concepts, stand-alone or control integrated.

Due to the easy programming in PLC languages, it is usable for a variety of use cases and is especially suitable for plant, line and machine builders as easy extension of their offering.

If controller integrated
- it enables at very reasonable cost
- the best prediction horizon as it can measure online, when best measurement quality is given without scheduling production interruptions
- while continuously protecting the application in real time e.g. with the same or other sensor(s).
- Further inputs can be used as fast data logger e.g. precisely documenting process quality.

Therefore it is not only able to continually check the mechanical components but also gives fast protection for spontaneous and large failures even while measuring. The condition monitoring mode creates a database internally or externally for predictive maintenance. Automatic and user assisted responses can be enabled to prevent costly consequences including total failures.

As many as 16 vibration sensors + 2 encoder counters can be connected.

The recorded condition monitoring data can be stored in the CPU flash disk before communication or directly analyzed. Higher level indicators can be calculated and communicated to a local or remote HMI or database system.

Predictive performance for your process or machines
- Easy and cost saving integration of condition monitoring into the AC500 platform.
- Early detection of mechanical damages.
- Fast protection from spontaneous failures.
- Even complex C-code analytics can be used locally for meaningful own performance indicators.
- Leads to optimized planning of maintenance instead of fixed, scheduled service and spontaneous repair.
- No additional system or fixed software for diagnostics and visualization needed.
- Easy storage of the data, locally (4GB) or in remote servers and databases.
- Ideally suited also for retrofit of older equipment, as it can make use of mechanical reserves of still valuable equipment.

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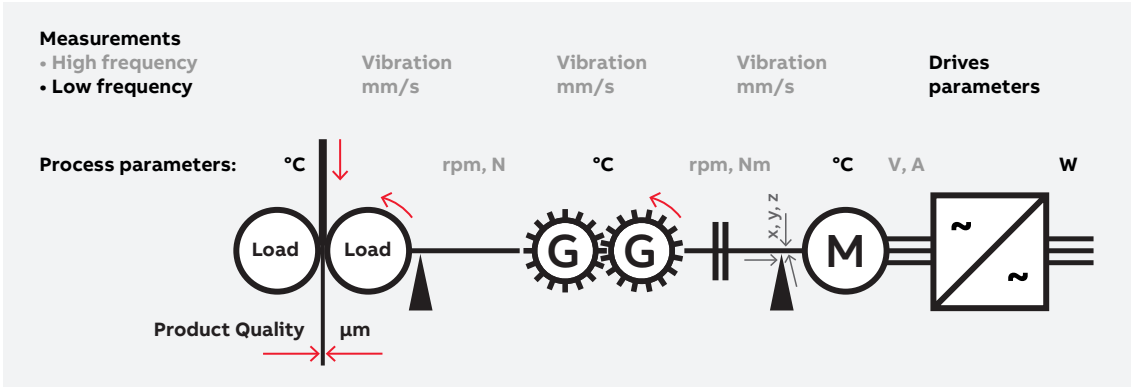
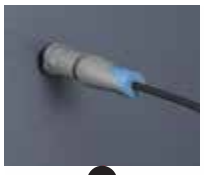
AC500 Condition Monitoring module FM502-CMS: Controller integrated or stand-alone CMS covering a complete drive train.





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Acceleration sensor mounting for integrated condition monitoring in cold rolling mill. With local warnings by key performance indicators, first analysis with detailed verification possibility via CP600 and remote connectivity.

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01 Winder
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02 Main motor
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03 Gearbox
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04 Rolling mill
—
05 Vibration sensor
—
06 Sensor cable
—
07 AC500 CMS controller integrated
—
08 Local / remote warning
—
09 Detailed analysis local / remote
—
10 Connectivity

Example: Cold rolling mill in steel processing:

- One FM502-CMS module can execute differently configured measurements at the same time and can be reconfigured at runtime.
- Several critical und unique components can be protected and condition predicted: Motors, gearbox, process (cold rolling mill).
- Production quality can be logged in parallel in real time.
- Remote diagnostics expertise and detailed analysis and reports only in case of warnings.

AC500 PLC platform product ranges

Engineering suite

Automation Builder

- Automation Builder connects the engineering tools for PLC, safety, control panels, SCADA, drives and motion.
- Automation Builder combines the tools required for configuring, programming, debugging and maintaining automation projects from one common intuitive interface.

Library packages

- For efficient engineering of demanding applications.
- Easy-to-use application examples.

Visualization

CP600-eCo

- The economical CP600-eCo control panel is aimed for standard functions and high usability for clear interaction with the operation process.

Programmable Logic Controllers PLCs

AC500-eCo

- Compact PLC offering optimally suited flexible and economical configurations for automation solutions in smaller applications.
- ABB's AC500-eCo has been designed to integrate seamlessly into the broader AC500 PLC platform.

I/O modules

S500-eCo

- Range of modular I/Os for economical configurations in smaller applications.
- The I/O modules can be connected directly to the AC500 or AC500-eCo CPU modules.
- S500-eCo I/O modules can be mixed with standard S500 modules and also used as remote I/O with fieldbus communication interface modules.

CP600

- The robust CP600 HMI provides high visualization performance, versatile communication and representative design for machines and systems.

CP600-Pro

- The CP600-Pro HMI portfolio comes with high end visualization performance, multi-touch operation, versatile trendsetting communication and representative design.

AC500

- Powerful PLC featuring a wide range of performance, communications and I/O capabilities for industrial applications.
- The ideal choice for complex, high-speed machinery and networking solutions.

AC500-XC

- Extreme condition PLC variant of the AC500 platform.
- With extended operating temperature, immunity to vibration and hazardous gases, use at high altitudes and in humid environments.

AC500-S

- Integrated safety PLC (SIL3, PL e) designed for safety applications involved in factory, machinery or process automation area.
- For simple and complex safety solutions.

S500

- Modular I/O assortment with protected outputs and comprehensive diagnosis, covering a wide range of signal types.
- The I/O modules can be installed as remote I/O with a communication interface module or be directly connected to the AC500 CPU.
- Support of different fieldbuses makes it possible to use the S500 I/O modules with PLCs from different manufacturers.

S500-XC

- Extreme condition variant of the S500 I/O system.
- With extended operating temperature, immunity to vibration and hazardous gases, use at high altitudes and in humid environments.

S500-S

- Safety variant of the S500 I/O system.
- Extreme condition variants available.

PLC training and support offering

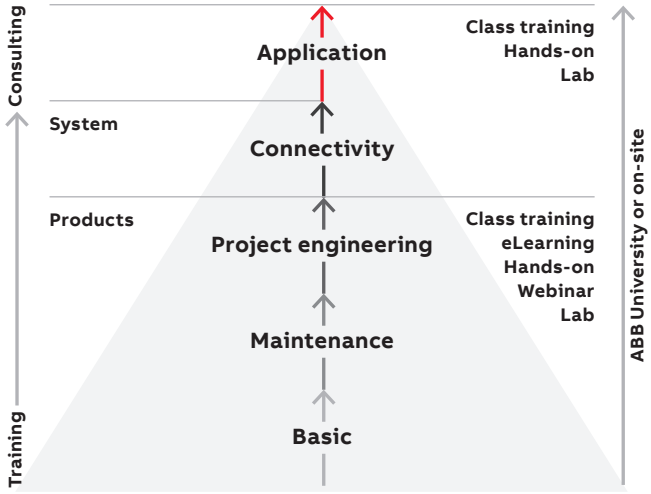


ABB provides training and technical support guiding you to the ideal PLC Automation products for your applications. Supported by one of the world's most extensive global sales and service networks, we offer PLC and Automation Builder software training designed for engineering, operation and maintenance of PLC automation solutions.

Learn online through our video tutorials, eLearning, application examples or user forum and attend our classroom training sessions.

- ABB University course locator
- Application examples
- Channel partner program
- FAQ
- PLC on YouTube
- PLC Training and Support

For more information, please visit
https://new.abb.com/plc/training
or contact your local sales organization.

Application examples and notes

CI52x-MODTCP modules, configuration and communication
This application example describes the configuration (TCP/IP address and parameters) of the CI52x communication interface modules with Automation Builder. The second part describes communication with the configured modules and an AC500 PLC.

AC500 BACnet IP, data exchange between 2 CPUs via the CP600 gateway
This application example demonstrates how to exchange data between PLC A and PLC B where both PLCs act as servers only. The trick is to use a CP600 panel as BACnet gateway. The panel acts as BACnet client.

AC500 PROFINET, configuration and engineering
This application example describes how to configure and setup a PROFINET communication with Automation Builder V2.0.x. The detailed step-by-step instruction shows all necessary steps and describes the relevant parameters which have to be set carefully to establish a reliable and robust PROFINET communication.

The second part of this application example contains general information on e.g. cables, plugs, switches and network topologies which helps you realize your own PROFINET application project.

Use of AC500 CMS filters
This application example explains in an easy to understand way how to filter measured signals in two different ways and calculate the RMS value with the filtered signal.

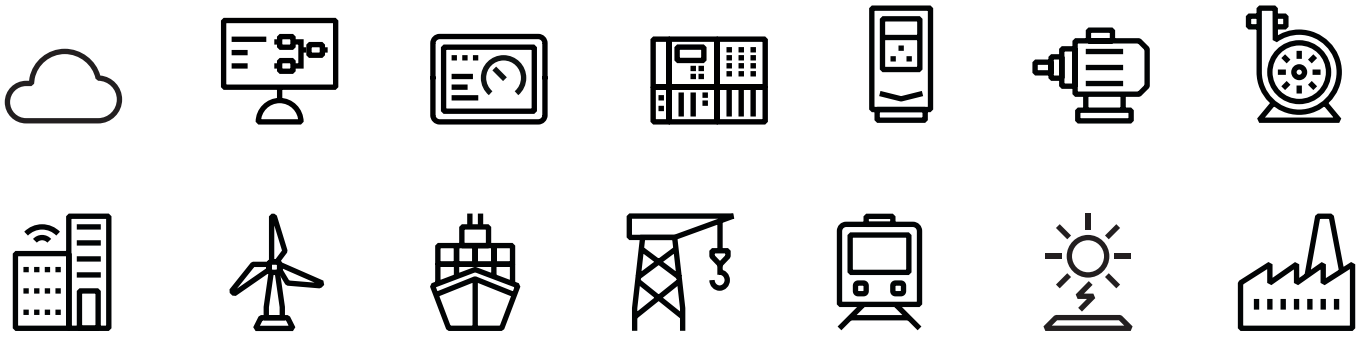
AC500 license and IP protection for Codesys V2.3 libraries
The license protection of Codesys libraries aims at controlling the use of a library within the engineering context.

For more application examples, please visit https://new.abb.com/plc/application-examples

Using DX581-S safety digital outputs with 2A 24 V DC electrical loads
The application note describes how the DX581-S safety I/O module developed for electrical loads with up to 500 mA 24 V DC can be used for switching 2A 24 V DC electrical loads such as big safety power contactors or solenoid valves. Details for wiring, channel configuration and safety calculation are provided.

For more information, please visit https://new.abb.com/plc/programmable-logic-controllers-plcs/ac500-s

https://new.abb.com/plc/documentsanddownloads



Automation Builder

Minimized efforts for project code and data administration
Configure and program all devices of your automation solution in one single project. This makes it easy to share your solutions with others. For more advanced usage the integrated version control system supports further scenarios like multi-user engineering or product line management.

Managing the life-cycle of your automation solutions is also easy. The annual Automation Builder release also supplies you with the latest versions of device firmware. The decision, whether to use the latest firmware with the latest feature set or to keep the current firmware with the current feature set can be made for each project and independent of the installed Automation Builder version.

Speeding up during commissioning and maintenance
Whenever there is an issue in the automation system, it is required to quickly and efficiently fix it. Automation Builder supports this by a generic three-step approach:

- General diagnosis provides a traffic light view on devices and (sub)systems.
- Detailed diagnosis provides detailed information e.g. about the source and the type of the issue.
- Extended diagnosis is available for some subsystems such as fieldbuses and offers advanced commissioning functions such as comparing connected vs. configured devices or manual control of bus states.

The diagnosis information is accessible not only via Automation Builder, but also via the AC500 display, the PLC application or operator panels.

Easily create a connected world
To achieve advanced connectivity, the ABB zenon software has been added to Automation Builder. The advantage of the ABB zenon software is that it provides high quality documentation for easy traceability and high transparency of automation system states as required in machine building or in infrastructure projects. It incorporates an energy data management system and comprehensive security features to unlock the potential of the Internet of Things.

Virtual commissioning – a game changer in engineering
Simulate and automate all kinds of applications with minimum effort. Test the complete system seamlessly before involving real hardware. Even complex systems can be built up efficiently, ensuring smooth interaction of all components and operator training at an early stage.

Download Automation Builder from
www.abb.com/automationbuilder
Familiarize yourself with Automation Builder using the 30-day test license.

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