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# Compact Control Builder

## When engineering efficiency matters



# Compact Control Builder

The Compact Control Builder, is a powerful tool based on the windows environment for creating control solutions and reusable control libraries for the AC 800M Process PLC. From binary logic to advanced regulatory control, from discrete process signals to high-level process objects.

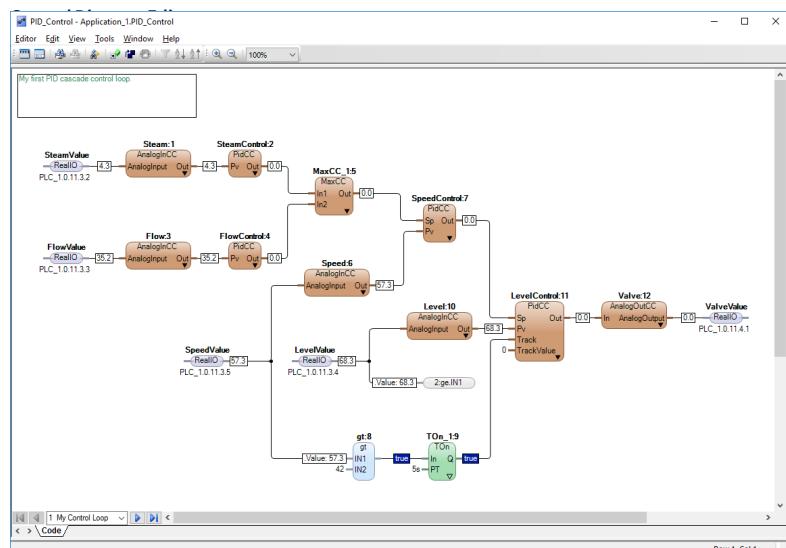
It provides freedom of choice, allowing you to select the best programming language for the task, supporting six different programming "languages", which are<sup>1</sup>: Instruction List, Structured Text, Function Block Diagram, Sequential Function Chart, Ladder Diagram, and

Control Modules, the latter being ABB's own contribution to higher application engineering efficiency and ease of use. Furthermore, feel free to mix these "languages" as you create your code by combining Structured Text, Function Blocks, Functions, Sequential Function Charts and ABB's Control Modules into the same block-based editor.

## Control Diagram Editor

Control Diagram Editor is the next generation editor which helps to increase engineering efficiency, reduce engineering mistakes, and enable the creation of logic which is easy to read and maintain.

Control modules in combination with Control Diagram Editor supports forward and feedback signals in one and the same variable. The result is powerful and easy to read control logic.

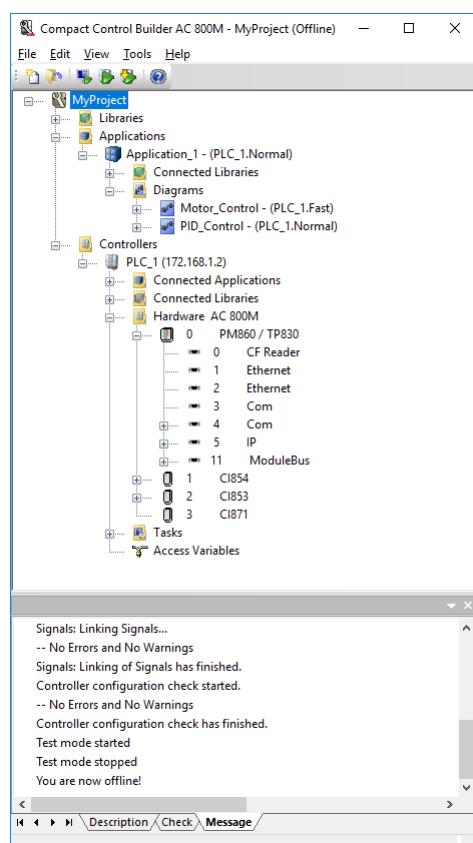


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Footnote 1:  
According to the  
IEC 61131-3 standard.

### Features and Benefits

- Promotes re-use of code by means of user-defined libraries of data- and function-block types
- Intuitive, graphical navigation by a Windows Explorer-like Project Explorer
- Libraries of ready-for-use functions for efficient programming
- Supports all the five IEC 61131-3 programming languages in a single integrated environment
- Supplements the five standard languages with Control Modules for high-level configuration of control applications graphically
- Supports multitasking, multicontroller and multi-user application development
- Offers powerful simulation and on-line facilities for testing and troubleshooting
- Alarm and Event handling
- Sequence of events
- Extensive on-line help
- Supports ABB S800 IO soft marshalling
- Auto IO allocation through signals

### Compact Control Builder



### Hierarchical Object Orientation

AC 800M application software is object-oriented in a structured way, which means that changes made to an object type or instance thereof only affects that type (and all of its instances) or that instance only. For this reason, subsequent bug fixes, updates, improvements, expansions etc. can be performed quickly and easily. It also means that the different program sections can be assigned their own priorities and cycle times with a large measure of freedom.

All solutions run in a common language runtime environment (CLR) in the controller, making it possible to access information between solutions in different languages seamlessly. So each contributing project engineer can develop solutions in the preferred language for each task without having to consider which languages related modules are written in.

### For Both Small and Large Projects

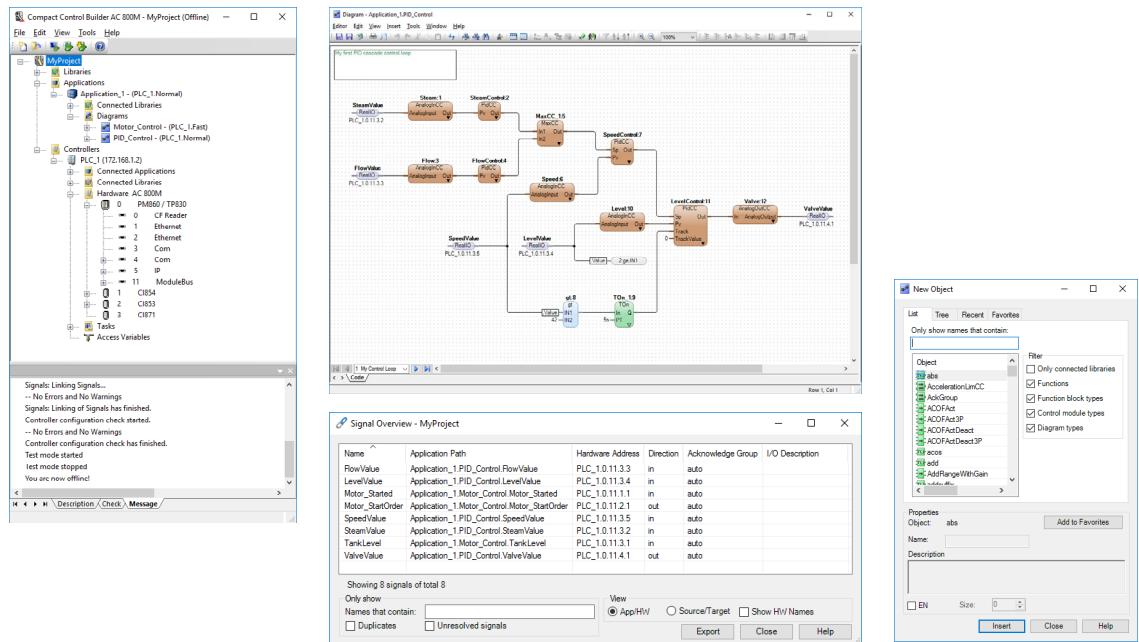
Compact Control Builder is intended for both small and large projects by not only efficiently supporting the development of "flat" and "linear" applications but also structured ones, solution libraries, multi-controller applications, multi-user applications, and multi-engineer projects.

To safeguard investments made in applications development, the resulting user software can be exported to and imported from other control systems featuring the AC 800M controller, e.g. ABB 800xA systems.

Users can create their own data types and functions and these can be re-used over and over again to increase engineering efficiency and quality. A Windows Explorer-like Project Explorer offers graphical navigation through the entire project, easy configuration of the system hardware and rapid creation/identification of program modules to be developed/edited. On-line, context-sensitive help speeds up data- and program-code entry.

A search engine makes it easy to find anything of interest, from entire program modules, to tiny symbols, including deployment locations of parameters and variables. Programs can be developed off line and execution be simulated without having the controller hardware connected. The entire project, including hardware settings, functionality libraries, and applications can be translated to MS Word™ documents for printing or further editing/reformatting.

## Compact Control Builder dialogue examples



AC 800M application software is object-oriented in a structured way, which means that changes made to an object type or instance thereof only affects that type (and all of its instances) or that instance only.

When done, the application can either be stored on a non-volatile flash memory card and the card can simply be plugged into the target controller for easy commissioning. Or it can be downloaded to battery backed-up RAM in the Process PLC for applications where frequent changes/upgrades are envisaged in the future.

The execution of the application can be reviewed and optimized off-line or during the download to the controller, to avoid conflicts between different tasks.

A number of on-line facilities for testing, program modification and commissioning are offered, and the status of I/O signals, variables etc. can easily be inspected in real time. Faulty hardware is marked red, manually overridden inputs and outputs are marked yellow.

## Data Types, Variables and Functions

Compact Control Builder supports data types such as Booleans, integers, floating-point numbers, strings, time, date, etc. All in accordance with the IEC 61131-3 standard. These basic data types can be combined into new structured data types, which in turn may contain other structured data types. Variable identifiers may be up to 32 characters long.

The library of functions available is probably the industry's largest, containing everything from simple AND and OR gates to ready-for-use self-tuning – adaptive – PID controllers. Not to forget unique elements for direct interfacing with variable-speed drives and for easy handling of all the software-related redundancy features the AC 800M process PLC offers.

Basic functions can be combined into new, user-defined functions and these be re-used over and over again, currently or in the future.

# AC 800M

## scalable and flexible process PLC with high availability

Challenging business goals require a flexible and powerful process PLC. Working individually or in combination, AC 800M helps you control a broad spectrum of industrial processing applications thanks to its high flexibility, scalability, and availability.

AC 800M is a modular process PLC with a rich set of communication functions as well as full redundancy and support for a large range of I/O systems configured with Compact Control Builder software, AC 800M is open to participate in any kind of control solution. Re-use of code and libraries of ready-to-use functions also promotes an efficient configuration and setup.

The AC800M family is rail mounted based and built for the most harsh environments as well as the most demanding applications.

Flexible, cost-effective control solutions that are easy to implement and change are the hallmark of Compact Product Suite. Like other products in this range, the AC 800M Process PLC is built with openness in mind. Individually or in combination with other products on the market, it creates reliable control solutions that are easy to afford and manage. Its rich set of functions help improve production control, maximize availability and minimize maintenance.

### AC 800M PM858

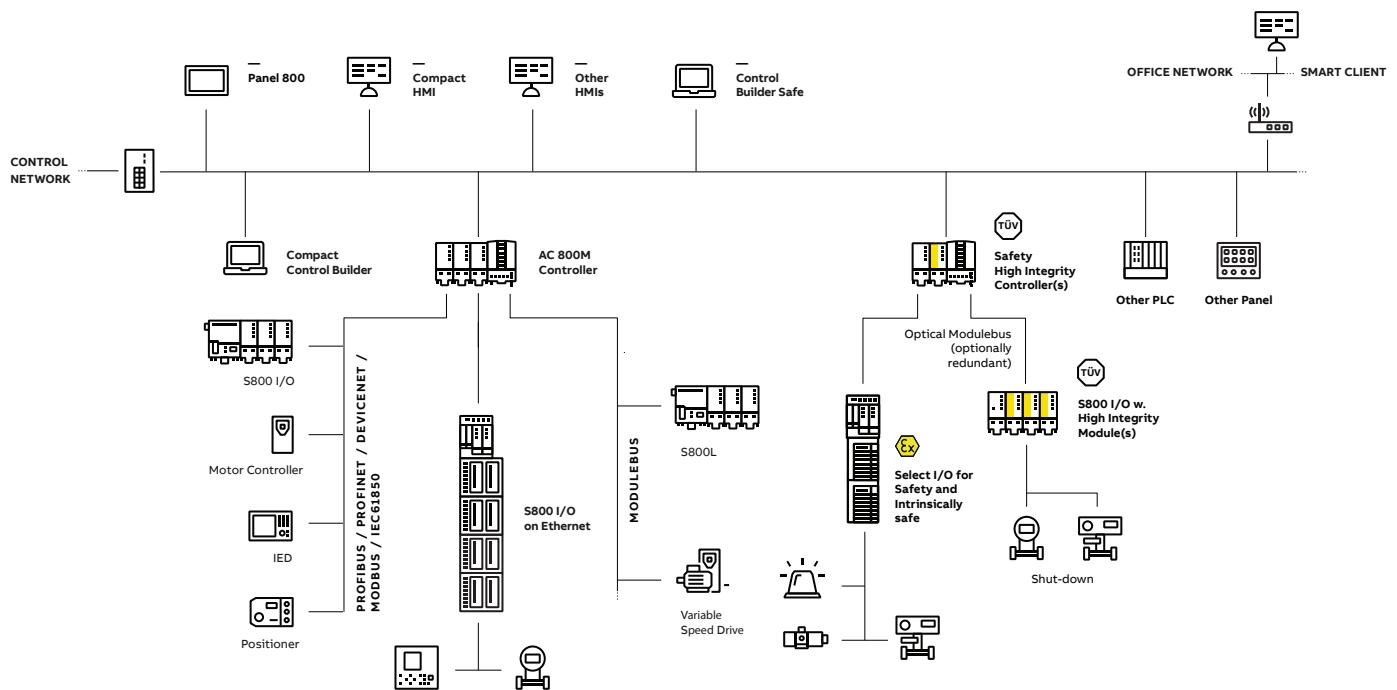


### Features and benefits

- Full modularitay and flexibility
- Scalable design for easy expansion
- Fault tolerance gives maximum availability.
- Powerful control solutions and reusable libraries
- Industrial controller made for demanding applications and harsh environments

### AC 800M PM891





### Full modularity and flexibility

Connectivity and expansion options make AC 800M exceptionally open and scalable; easy to connect and easy to adapt according to your changing control needs.

The CPU modules vary in terms of processing power, memory size, and redundancy support from low-cost, medium power to high-power, full redundancy. All controllers support up to 12 communication interfaces, these can be mixed according to your application needs allowing to integrate I/O systems and access a wide range of field devices.

These communication options enable the S800 I/O modules to be installed locally, remotely or as part of an Ethernet I/O network. With both single and redundant options, virtually any project requirement can be met.

Evenmore, AC800M is exceptionally flexible when it comes to host control applications changes, wether code expansions, modifications or removals all becomes easy and with minimal risks thanks to its internal mapping functionality.

### Scalable design for easy expansion

Scalability is a key attribute of the AC 800M Process PLC. Its modular design makes it just as effective for small systems as for large, integrated

automation applications. For a simple Compact Product Suite application, a basic controller station may consist of a process PLC, a power supply module and local I/O modules. To scale up, simply add the CPU, I/O, communication module and power-supply options you need. The AC 800M family makes it easy to match controller configuration with control need.

### Fault tolerance gives maximum availability.

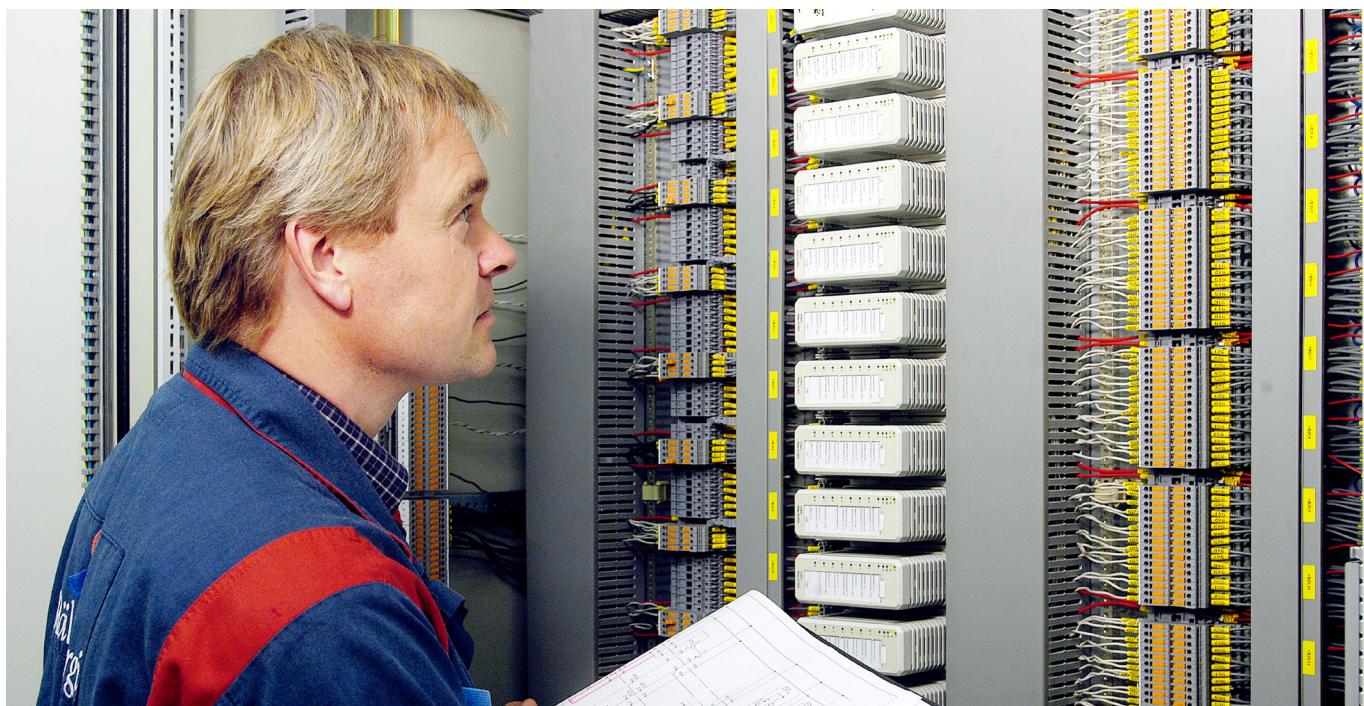
Robust design and redundancy options in all critical areas of the controller and its components eliminates single-point failures and secures maximum availability.

### Powerful control solutions and reusable libraries

AC 800M Process PLC is configured using the Compact Control Builder, a powerful software tool for creating logic, together they provide exceptional flexibility, to host control applications changes, wether code expansions, modifications or removals. Its powerful libraries are easily extended, making it the perfect tool for automation solution suppliers where standardization and reuse are the keys to cost-effective solutions. Compact Control Builder supports flash memory cards for loading applications direct into the target controller. Six programming languages are available; simply choose the one most suitable for your application.

# S800 I/O open process I/O system

S800 I/O is a open comprehensive, distributed, process I/O system that communicates with controllers by direct connection or over industry-standard field buses. Thanks to its open connectivity it fits a wide range of process controllers from ABB and others. Even more it carries the name ABB, the world leader in process automation.



By permitting installation in the field, close to sensors and actuators, S800 I/O reduces the installation cost by reducing the cost of cabling. And thanks to benefits such as:

#### Features and Benefits

- Comprehensive: S800 I/O offers costeffective solutions to practically all needs for field-device interfacing, including basic analog and digital I/O, as well as intrinsic-safety and high-integrity solutions.
- Flexible: S800 I/O is highly modular and offers a number of ways in which the modules can be interconnected and installed. Consequently, S800 I/O networks can be built in a near-infinite number of ways, from highly centralized to highly distributed.
- Compatible: Supports industry-standard field bus PROFIBUS DP which makes S800 I/O compatible also with non-ABB controllers.
- S800 I/O supports also ABB's Advant Fieldbus 100.

- Easy to configure: S800 I/O devices are configured transparently as part of their parent controllers, like local I/O. No additional knowledge or skills are required.
- Reliable: Comprehensive diagnostics, hot swapping of modules and redundancy solutions are available, ensuring that both the I/O system and the production plant will stay up.

# Comprehensive and flexible



## Comprehensive

Cost-effectiveness solutions are what S800 I/O has to offer, making for savings on hardware, cabling, installation and maintenance, including a wide range of different modules to practically cover all needs of field device interfacing, from simple analog and digital I/Os to specific industrial requirements as intrinsic safety, high integrity and sequence of events are made available.

There are inputs and outputs for industry-standard d.c. and a.c. signal levels and devices, including resistance-temperature sensors and thermocouples.

There are Sequence of event (SOE) modules that can time-stamp events, i.e. input signal transitions, at the source with millisecond accuracy. Thereby providing the basis for meaningful sequence-of-events recording by the host system. In tightly interlocked processes this is essential to finding the root causes of production disturbances.

There are even pulse and frequency counters as well as intrinsic safety supporting modules. So just about all the process devices we can think of can be wired up to S800 I/O stations with a minimum of field cabling and intermediate signal conditioning.

To be even more competitive in the market a subset of the S800 I/O modules are made available denominated S800L I/O. These S800L I/O modules offer the same full-featured signal interfacing and high availability as the S800 I/O but have a lower cost because of their smaller foot print which includes the terminals in a one-piece module, allowing to save space and time in all phases of the installation.

## Flexible

S800 I/O is flexible in many ways, flexible for scaling, flexible for interconnecting and flexible for installing.

Scale and interconnect using Analog or Digital I/Os placing Local or remote stations according to your requirements. Since an S800 I/O station can accommodate 12 I/O modules, this means up to 192 digitals or 96 analogs per station or any mix between the two extremes.



S800 I/O permits virtually infinite number of installation arrangements, small or large, indoors or outdoors, wall mounting or floor standing, coming in three different mechanical designs: Three mechanical designs are available:

- Compact (plug-in modules with a basic I/O signal termination area).
- Extended (plug in modules with ample space for I/O cable termination, fuses, jumpering and field power distribution).
- S800L (all-in-one modules and bases with detachable screw terminal blocks for I/O signals) for installations not requiring hot-swap capability.

## Reliable

S800 I/O complies with the most demanding industrial standards in regards of availability, reliability and harsh environments. It includes features as:

- Input/Output Set as Predefined (ISP/OSP). Each input/output can be set individually to default to a predefined value or freeze in case of communication loss.
- Hot swap of modules. A faulty I/O module can be replaced live, i.e. without powering the station down and without the rest of the station being affected. A hardware key ensures that only modules of the right type can be inserted.
- Hot configuration in run (HCIR). An S800 I/O station can be reconfigured while in full normal operation, i.e. without having to switch it over to configuration mode.
- Redundancy options in all areas: power supply, fieldbus media, fieldbus interfaces and I/O modules.
- To withstand harsh environments, all S800 modules are compliant to G3 severity level of ISA-S71.04, Environmental Conditions for Process Measurement and Control Systems.

# Outline

Find below a outline of software and hardware components, for more detailed information please visit our Compact Product Suite hardware selector tool: [compacthardwareselector.com](http://compacthardwareselector.com)

## Compact Control Builder

CCB 6.1.1 features	
Windows operating systems	Windows 10 Pro 64-bit, Windows 10 Enterprise 2019 LTSC, Windows Server 2019, Windows 10 Enterprise 2016 LTSB and Windows Server 2016
Signal Concept	Supported
Bulk Data Manager 2 (BDM2)	Supported
S800 I/O on Ethernet	Supported

## AC 800M Controllers

Features / CPUs	PM851A	PM856A	PM858	PM860A	PM862
Processor Unit	<b>PM851AK01 incl:</b> 1 PM851 CPU and required optional items	<b>PM856AK01 incl:</b> 1 PM856 CPU and required optional items	<b>PM858K01 incl:</b> 1 PM858 CPU and required optional items <b>PM858K02 incl:</b> 2 PM858K01	<b>PM860AK01 incl:</b> 1 PM860 CPU and required optional items	<b>PM862K01 incl:</b> 1 PM862 CPU and required optional items. <b>PM862K02 incl:</b> 2 PM862K01
Clock Frequency / Memory	24 MHz / 12 MB	24 MHz / 16 MB	33 MHz / 16 MB	48 MHz / 16 MB	67 MHz / 32 MB
Features / CPUs	PM866A			PM891	
Processor Unit	<b>PM866AK01 incl:</b> 1 PM866A CPU and required optional items <b>PM866AK02 incl:</b> 2 PM866AK01			<b>PM891K01 incl:</b> 1 PM891 CPU and required optional items <b>PM891K02 incl:</b> 2 PM891K01	
Clock Frequency / Memory	133 MHz / 64 MB			450 MHz / 256 MB	

Features	BC810	BC820
Article number	3BSE031155R1	3BSE071500R1
Redundancy	Yes	Yes
High Integrity	Yes	No
Description	CEX-Bus Interconnection unit	CEX-Bus Interconnection unit

## AC 800M Communication

Module	CI853	CI854B	CI855	CI856	CI857	CI858	
Article number	3BSE 018103R1	3BSE069449R1	3BSE018106R1	3BSE026055R1	3BSE018144R1	3BSE018135R1	
Protocol	COMLI and MODBUS RTU	PROFIBUS DP-V1	ABB's MasterBus 300	ABB's S100 I/O	ABB's INSUM	ABB's DriveBus	
Module	CI865	CI867/CI867A	CI868/CI868A	CI869	CI871/CI871A	CI873/CI873A	
Article number	3BSE040795R1	3BSE043660R1 (CI867) 3BSE092689R1 (CI867A)	3BSE048845R1 (CI868) 3BSE092691R1 (CI868A)	3BSE049110R1	3BSE056767R1 (CI871) 3BSE092693R1 (CI871A)	3BSE056899R1 (CI873) 3BSE092695R1 (CI873A)	3BSE090784R1
Protocol	ABB's Satt I/O	MODBUS TCP Interface	IEC 61850	ABB's Advant Fieldbus 100	PROFINET IO	EtherNet IP / DeviceNet	DeviceNet

## S800 I/O Modules

<b>Digital input modules</b>	
DI810	16 channels, 2 groups of 8 channels, 24 V d.c., current sink.
DI811	16 channels, 2 groups of 8 channels, 48 V d.c., current sink.
DI814	16 channels, 2 groups of 8 channels, 24 V d.c., current source.
DI818	32 channels, 2 groups of 16 channels, 24 V d.c., current sink.
DI820	8 channels, separate returns, 110 V d.c., 120 V a.c.
DI821	8 channels, separate returns, 220 V d.c., 230 V a.c.
DI825	With time tagging, 8 channels, separate returns, 125 V d.c.
DI828	16 channels, separate returns, 110 V d.c., 120 V a.c. / d.c.
DI830	With time tagging, 16 channels, 2 groups of 8 channels, 24 V d.c., current sink. Resolution: < 0.5 ms.
DI831	With time tagging, 16 channels, 2 groups of 8 channels, 48 V d.c., current sink. Resolution: < 0.5 ms.
<b>Pulse input module</b>	
DP820	2 channels, separate returns, 0.25 Hz - 1.5 MHz, signal voltage: 5 / 12 V d.c.
DP840	8 channels, extended diagnostics, wire-fault detection, current limited sensor supply, 0.5-20 kHz, 12/24 V d.c or NAMUR, common return.
<b>Digital output modules</b>	
DO810	16 channels, 2 groups of 8 channels, 24 V d.c., max 0.5 A d.c., transistor, current source, short-circuit-proof.
DO814	16 channels, 2 groups of 8 channels, 24 V d.c., max 0.5 A, transistor, current sink, short-circuit-proof.
DO815	8 channels, 2 groups of 4 channels, 24 V d.c., max 2 A, transistor, current source, short-circuit-proof, wire-fault detection.
DO818	32 channels, 2 groups of 16 channels, 24 V, max 0.5 A d.c., transistor, current source, short-circuit-proof
DO820	8 channels, separate returns, 5-250 V, max 3 A a.c./d.c., relay (N.O.).
DO821	8 channels, separate returns, 5-250 V, max 3 A a.c./d.c., relay (N.C.).
DO828	16 channels, separate returns, 5-250V a.c. / 5-125V d.c. max 2A a.c./d.c., relay (N.O.).
<b>Analog input modules</b>	
AI810	8 channels, single-ended, 0(4)-20 mA, 0(2)-10 V, 12 bits.
AI815	8 channels with HART, 0(4)..20 mA, 0(1)..5 V, 12 bit, single ended, current limited transmitter supply.
AI820	Differential inputs, 4 channels, 0(1)-5 V, $\pm$ 0(2)-10 V, $\pm$ 0(4)-20 mA, 14 bits + sign.
AI825	Individually galvanically isolated channels, 4 channels, $\pm$ 0(2)-10 V, $\pm$ 0(4)-20 mA, 14 bits + sign.
AI830A	RTD inputs, 8 channels, Pt100, Ni100, Ni120, Cu10, resistor 0-400 ohms, 14 bits, 3-wire.
AI835A	TC inputs, 8 channels, (7+ ref. junction), separate returns. TC types B, C, D, E, J, K, L, N, R, S, T, U, -30...75 mV, 15 bits.
<b>Analog output modules</b>	
AO810V2	8 channels, common return, 0(4)-20 mA, 14 bits, load: 850 ohms (short-circuit-proof).
AO815	8 channels with HART, 4..20 mA, 12 bit, load: 750 ohms, common return, short-circuit-proof.
AO820	4 channels, individually galvanically isolated, separate returns, measuring range: $\pm$ 0(2)-10 V, $\pm$ 0(4)-20 mA, resolution: 12 bits + sign, load: 500 ohms (current) / 5 kohms (voltage), short-circuit-proof.
<b>Intrinsic-safety modules</b>	
DI890	8 channels, separate returns, proximity sensors (NAMUR) or voltage-free contact., current sink, wire-fault detection.
DO890	4 channels, separate returns, load 150-5000 ohms, 11 V @ 40 mA, current source, wire-fault detection, short circuit-proof.
AI890	8 channels, single-ended, 0(4)-20 mA, 12 bits, transmitter power supply.
AI893	8 channels, TC: 7 + ref. junction, sep. returns. TC types B, C, E, J, K, L, N, R, S, T, U, -10...80 mV. RTD: Pt50-1000, Ni100-500, Cu10-100, resistor 0-4000 W, 3-wire. 15 bits + sign.
AI895	8 channels, single-ended, 4-20 mA, 12 bits, transmitter power supply, HART pass-through.
AO890	8 channels, common return, 0(4)-20 mA, 12 bits, load: 725 ohms short-circuit-proof.
AO895	8 channels, common return, 4-20 mA, 12 bits, load: 725 ohms short-circuit-proof, HART pass-through.
<b>Redundant modules</b>	
DI840	16 channels, common return, 24 V d.c., current sink, extended diagnostics, time-tagging, current limited sensor supply.
DP840	8 channels, common return, 0.5-20 kHz, 12/24 V d.c or NAMUR, extended diagnostics, wire-fault detection.
DO840	16 channels, common return, 24 V d.c., max. 0.5 A, transistor, current source, short-circuit-proof, extended diagnostics.
AI843	TC input, 8 channels + ref. junction. TC types: B, C, E, J, K, L, N, R, S, T, U, -30...75 mV, 16 bits, extended diagnostics.
AI845	8 channels, 12 bits, 0(4)-20 mA 0(1)-5 V, extended diagnostics, HART pass-through, current limited transmitter supply, single ended.
AO845A	8 channels, 12 bits, common return, 4-20 mA, extended diagnostics, HART pass-through, 750 ohms.

## S800L I/O Modules

### S800L modules

DI801	16 channels, 1 group, 24 V d.c., current sink.
DI802	8 channels, 110 V d.c., 150 V a.c.
DI803	8 channels, 220 V d.c., 230 V a.c.
DO801	16 channels, common return, 24 V, max 0.5 A d.c., transistor, current source, short-circuit-proof.
DO802	8 channels, 5-250 V, max 2 A a.c./d.c., relay (N.O.).
AI801	8 channels, single-ended, 0(4)-20 mA, 12 bits.
AO801	8 channels, common return, 0(4)-20 mA, 12 bits, load: less than 750 ohms.

### Accessories

TU805K01	For DI801 & DO801. With field power distribution screw terminals. For two or three wire connection.
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## S800 I/O

### Communication interfaces

Feature	CI801	CI840A	CI845	TC810
Article number	3BSE022366R1	3BSE041882R1	3BSE075853R1	3BSE076220R1
Function	PROFIBUS-DPV1 fieldbus communication interface. Supervisory functions of I/O ModuleBus. Isolated power supply to I/O modules. OSP handling and configuration. Input power fused. Hot Configuration In Run. HART pass-through.	PROFIBUS-DPV1 fieldbus communication interface. Supervisory functions of I/O ModuleBus. Isolated power supply to I/O modules. OSP handling and configuration. Input power fused. Power supply supervision. Hot Configuration In Run. HART pass-through.	Ethernet Fieldbus Communication Interface Module for connection of S800 I/O or Select I/O to Ethernet. For redundant configuration two Fieldbus Communication Interfaces CI845, two Ethernet Adapters TC810 and one TU860 or one TU865 are needed.	Ethernet Adapter for copper media with built in 2-port switch. Hosts two RJ45 ports. Use as single or redundant, together with CI845 and TU860.
Redundant	No	Yes	Yes	Yes

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