PRODUCT CATALOG

ABB Ability™ Symphony® Plus

SIMPLE, SCALABLE, SEAMLESS, SECURE™

ABB Ability™ Symphony® Plus

An automation system that lasts a lifetime

ABB Ability™ Symphony® Plus delivers total automation for the energy and process industries.

All around the world, ABB Ability™ Symphony® Plus total automation and digital solutions help industrial companies reduce energy use, lower costs and keep their operations failsafe, cyber-secure and profitable. As the global leader in control systems and digitally enabled products, ABB helps turn challenges into opportunities, while conserving our precious resources.

Let's write the future. Together.

Symphony Plus provides SIMPLE, SCALABLE, SEAMLESS, SECURE total automation for the benefit of all its users:

Simple
Intuitive workflow for system design and maintenance

Scalable
Flexible architecture to support a diverse range of industry applications

Seamless
Easily integrates all field devices, equipment and business systems

Secure
Ensures plant integrity and confidentiality with inherent system security

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ABB Ability Symphony Plus
Total plant automation

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What defines great performance? Dependable power delivery, rapid response to process upsets, asset availability, energy efficient production, reliable operations, repeatable design, secured data and networks, reduced carbon footprint, extended service life, on-time and on-budget project delivery, regulatory compliance and plant optimization to name but a few.

Great performance is achieved when plant management objectives are consistently met, competitive advantages maintained, and profitable growth sustained.

What is at the heart of every plant's great performance? The answer is clear: an automation system that integrates all areas of the plant for reliable, integrated and secure controls, operations and collaboration.

ABB Ability™ Symphony® Plus is one of the most widely used DCS and SCADA systems in energy and process applications worldwide. In all, there are more than 7,500 Symphony Plus control system installations in operation all over the world, with more than 5,000 of which are supporting energy applications.

Symphony Plus maximizes efficiency and reliability through automation, integration and optimization of the entire plant, facility or network. It provides SIMPLE, SCALABLE, SEAMLESS, SECURE™ total plant automation, including tight integration of all control equipment and geographical information systems. Symphony Plus is part of the ABB Ability portfolio of unified, cross-industry digital solutions that enable businesses to harness the power of industrial data and generate actionable insights that help them drive performance and productivity improvements.

With its built-for-purpose platform, Symphony Plus satisfies performance objectives in operations, maintenance, engineering, IT and management. And it meets the key focus areas of markets served – plant productivity, energy and water efficiency, operational and cybersecurity, plant safety and cost of ownership.

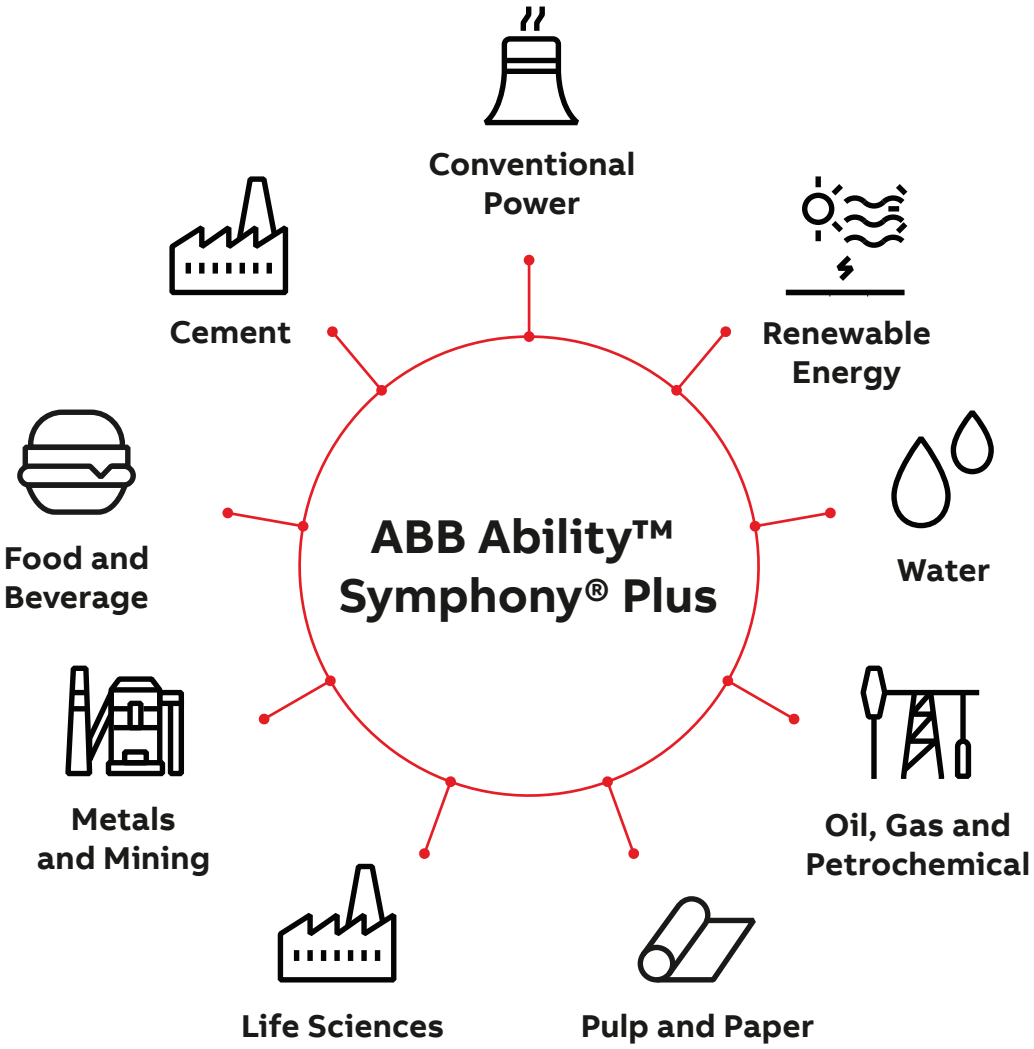
Symphony Plus is the best fit to meet your diverse automation and digital needs. The system platform easily adapts to any application – from very small to very large, from local to wide area networks.

- Meets remote management needs of wide area network SCADA applications such as renewable power generation (solar or wind) or water networks (distribution or transmission).
- Meets functionally distributed control requirements of central 'block' applications such as conventional power generation or process production plants.

Together, Symphony Plus provides you with a broad view of your entire plant, fleet or enterprise – all plants and at all levels.

Symphony Plus products and services provide automation and control solutions that maximize uptime and minimize the life cycle costs of plant control systems. With full support of industry standard communication protocols like Modbus TCP, PROFIBUS, HART and IEC 61850, as well as vibration monitoring solutions for rotating machinery, Symphony Plus offers a comprehensive control platform for a diverse set of industrial processes.

Symphony Plus service solutions keep the plant running smoothly while holding life cycle costs low. Software life cycle management, system fingerprints and system evolution programs are some of the services that extend the productive life of plant assets.



S+ Control and I/O

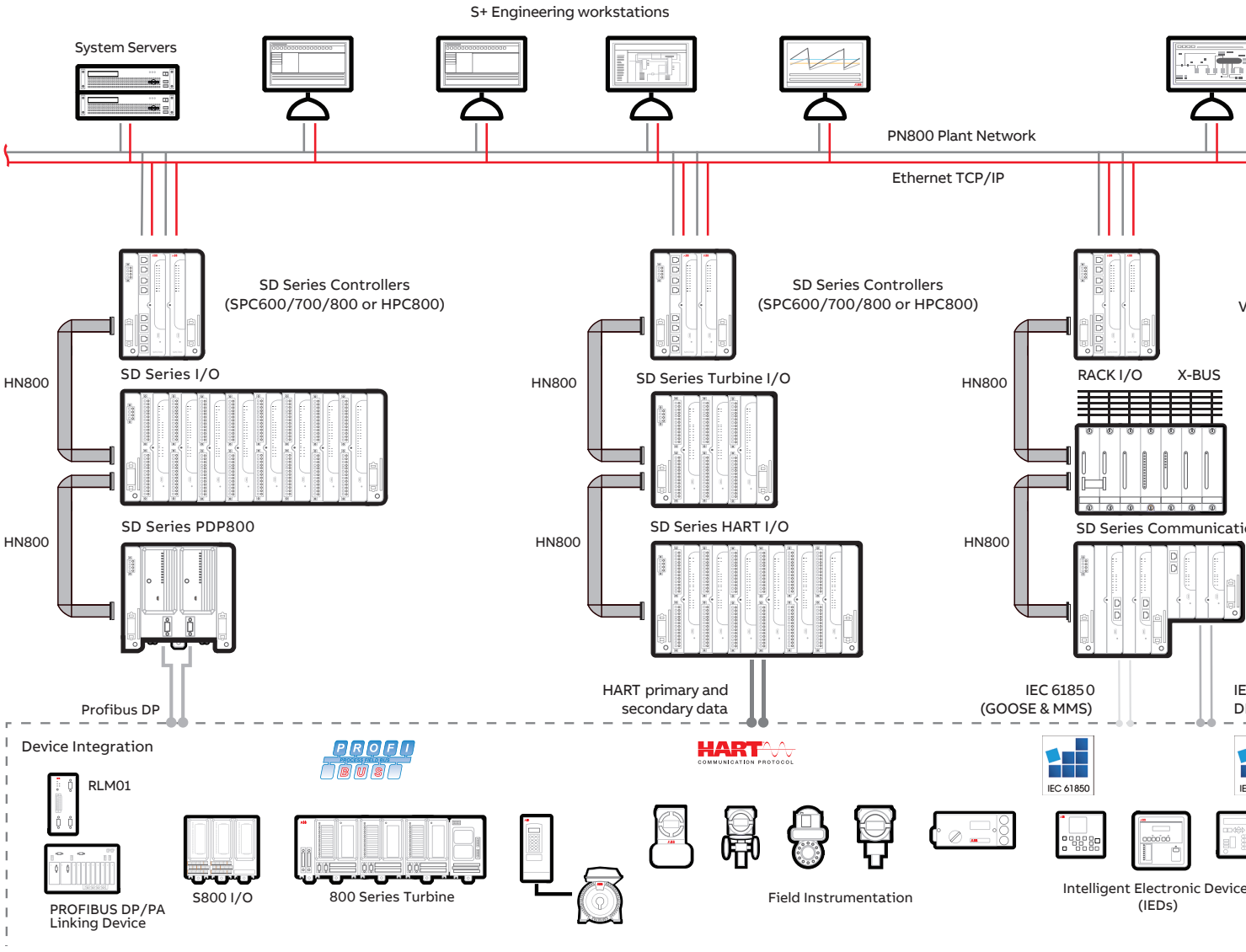
SD Series (Symphony DIN)

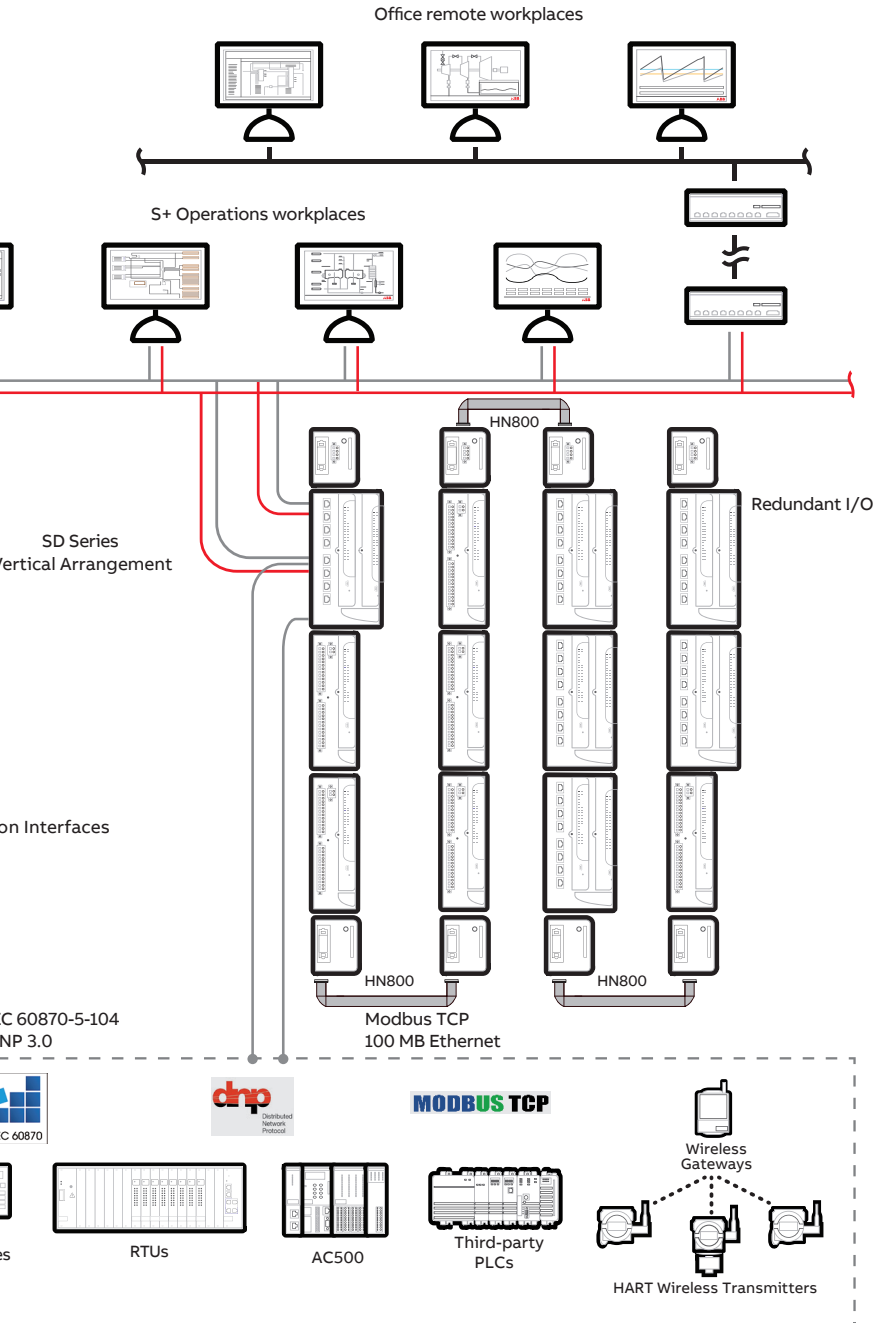
HR Series (Harmony Rack)

MR Series (Melody Rack)

SD Series (Symphony DIN)

The SD Series is a green portfolio of completely scalable control and I/O products that work in any process environment or geographic location, regardless of application type, size or physical setting. Energy efficient, compact, and providing a digital infrastructure to seamlessly integrate smart field devices makes SD Series the best automation solution for your new installation, upgrade or expansion.





The SD Series features modular DIN rail packaging, a flexible, high-performance Fast Ethernet-based plant network, and intelligent electrical and field device integration via PROFIBUS, HART, IEC61850, IEC 60870-5-104, DNP 3.0 and Modbus TCP communication protocols. The SD Series also protects investments made in previous rack controllers and I/O, while delivering higher performance, reliability and capacity.

The SD Series product portfolio includes:

SD Series controllers.
Powerful, scalable controller family for small, mid-range and large applications. Selection is dependent on number of I/O and process complexity.

SD Series I/O.
SD Series I/O family includes traditional analog, HART and digital I/O modules. Native turbine specific modules deliver a fully integrated single-vendor solution for all aspects of turbine automation within the plant automation platform.

SD Series Hardware.
SD Series control and I/O modules have been designed to consume very little power and to operate in extreme environments. SPCxxx controllers consume 3.6 W per module and SD Series I/O modules only consume 2.0 W on average. SD Series controller and I/O modules are designed to support operating temperature ranges from -40 to +70 °C. Furthermore, all SD Series hardware is available with ISA 74.01 G3 conformal coating.

SD Series device integration.
Seamless integration with intelligent field devices via standard protocol interfaces: PROFIBUS DP, HART, IEC61850 (GOOSE and MMS), IEC60870-5-104, DNP 3.0 and Modbus TCP.

SD Series soft control.
The SD Soft controller provides a virtual environment for developing and testing of process control logic. It executes the exact same process control algoritms as physical SD Series controllers. This makes it possible to directly transfer timing and tuning parameters from the soft controller to running system.

In summary, the SD Series offering provides users with the benefits of fast, accurate and uninterrupted process control at low design, installation and operating costs while providing the lowest possible risk.

SD Series controllers

HPC800

HPC800 (HC800 + CP800)

HPC800 is the ideal controller for large and complex control applications that require large capacity and high computing power. It accommodates up to 30,000 function blocks and provides closed loop control of up to 5,000 I/O points in under 250 milliseconds.

Technical data	
Processor	Industrial grade RISC type processor
Memory	64 MB RAM, 4 MB ROM, 2 MB NVRAM
Power requirements	24 VDC ± 10% at 400 mA; 10 W typical (5 W per module)
Redundant controllers	Optional redundancy, bumpless switchover
Programmability	Harmony function codes, C, Batch 90 and user defined function codes (UDF) Up to 30,000 function block addresses
Communications • Console HMI and engineering station • I/O and gateway bus • Controller peer-to-peer	 2 x redundant 10/100 Mbps Ethernet PN800 Plant Network Redundant 4 Mbps HN800 Redundant 4 Mbps CW800
Ports • Time synchronization • Foreign device interface	 1 10/100 Mbps Ethernet SNTP Protocol (EN1 A) 1 10/100 Mbps Ethernet (EN1 B), supports up to 8 Modbus TCP servers and 128 Modbus TCP clients when used with Harmony Gateway Software (HGS) version 6.0 or later 1 RS-232-C serial port (reserved for future use)
Service port	2 RS232C ports in mini-USB form factor, one on HC800 front plate, one on CP800 front plate
Ambient temperature	0 °C to 55 °C (32 °F to 131 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2, IEC/EN 60068-2-14

Bundled kits		**HPC800K01**	**HPC800K02**
HC800	Harmony control processor module	1	2
CP800	Communication processor module	1	2
MB810	Module mounting base	1	2
CTB810	Communication terminal board (left)	1	1
CTB811	Communication terminal board (right)	1	1
TER800	Bus terminator	4	4

HC800 – Control module. Supports 30,000 function blocks and executes Modbus TCP interface

CP800 – Communication module. Provides communication between HC800 and PN800 (Ethernet-based plant network)

MB810 – Mounting base for the HC800 and CP800 modules

CTB810 and CTB811 – Communication terminal boards for the left- and right-hand sides respectively of the HPC800

TER800 – Hnet bus terminator

SD Series controllers

SPC800

SPC800

The SPC800 is the ideal controller for large and complex control applications that require large capacity and high computing power. Extremely low power consumption and an extended ambient temperature range enable this versatile controller to operate in challenging remote locations. It accommodates up to 30,000 function blocks and provides closed loop control of up to 5,000 I/O points in under 250 milliseconds.

Technical data	
Processor	Industrial grade RISC type processor
Memory	128 MB RAM, 4 MB ROM, 2 MB NVRAM
Power requirements	24 VDC ± 10% at 150 mA; 3.6 W typical (per module)
Redundant controllers	Optional redundancy, bumpless switchover
Programmability	Harmony function codes (Future: C, Batch 90 and user defined function codes (UDF)) Up to 30,000 function block addresses, cycle time down to 1 millisecond
Communications • Console HMI and engineering station • S+ I/O, S800 I/O, Rack I/O	 2 x redundant 10/100 Mbps Ethernet PN800 Plant Network 2 x Ethernet ports EN2 A & EN2 B Redundant 4 Mbps HN800 (H-Net for HR Series Rack I/O)
Ports • Time synchronization • Foreign device interface	 1 10/100 Mbps Ethernet (EN2 A) SNTP Protocol 1 10/100 Mbps Ethernet (EN2 B), supports up to 8 Modbus TCP servers and 128 Modbus TCP clients when used with Harmony Gateway Software (HGS) version 6.0 or later
Service port	1 mini-USB port on front plate
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

Bundled kits (horizontal mounting)		SPC800K01	SPC800K02
SPC800	Processor module	1	2
MB705	Non-redundant controller module base	1	–
MB710	Redundant controller module base	–	1
TER810	Terminator	2	2

Bundled kits (vertical mounting)		SPC800VK01	SPC800VK02
SPC800	Processor module	1	2
VB705	Non-redundant controller module base	1	–
VB710	Redundant controller module base	–	1
TER810	Terminator	2	2

SD Series controllers

SPC700

SPC700

The SPC700 is the ideal controller for mid-size applications. Extremely low power consumption and an extended ambient temperature range enable this versatile controller to operate in challenging remote locations. It accommodates up to 10,000 function blocks and provides closed loop control of up to 1,000 I/O points in under 250 milliseconds.

Technical data	
Processor	Industrial grade RISC type processor
Memory	128 MB RAM, 4 MB ROM, 512KB NVRAM
Power requirements	24 VDC ± 10% at 150 mA; 3.6 W typical (per module)
Redundant controllers	Optional redundancy, bumpless switchover
Programmability	Harmony function codes Future: C, Batch 90 and user defined function codes (UDF) Up to 10,000 function block addresses, cycle time down to 1 millisecond
Communications • Console HMI and engineering station • S+ I/O, S800 I/O, Rack I/O	 2 x redundant 10/100 Mbps Ethernet PN800 Plant Network 2 x Ethernet ports EN2 A & EN2 B Redundant 4 Mbps HN800 (H-Net for HR Series Rack I/O)
Ports • Time synchronization • Foreign device interface	 1 10/100 Mbps Ethernet (EN2 A) SNTP Protocol 1 10/100 Mbps Ethernet (EN2 B), supports up to 4 Modbus TCP servers and 50 Modbus TCP clients
Service port	1 RS232C port in mini-USB form factor on front plate
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

Bundled kits (horizontal mounting)		**SPC700K01**	**SPC700K02**
SPC700	Processor module	1	**2**
MB705	Non-redundant controller module base	**1**	**–**
MB710	Redundant controller module base	**–**	**1**
TER810	Terminator	**2**	**2**

Bundled kits (vertical mounting)		**SPC600VK01**	**SPC700VK02**
SPC700	Processor module	1	**2**
VB705	Non-redundant controller module base	**1**	**–**
VB710	Redundant controller module base	**–**	**1**
TER810	Terminator	**2**	**2**

SD Series controllers

SPC600

SPC600

The SPC600 is the ideal controller for small applications. Extremely low power consumption and an extended ambient temperature range enable this versatile controller to operate in challenging remote locations. It accommodates up to 5,000 function blocks and provides closed loop control of up to 500 I/O points in under 250 milliseconds.

Technical data	
Processor	Industrial grade RISC type processor
Memory	128 MB RAM, 4 MB ROM, 512KB NVRAM
Power requirements	24 VDC ± 10% at 150 mA; 3.6 W typical (per module)
Redundant controllers	Optional redundancy, bumpless switchover
Programmability	Harmony function codes Up to 5,000 function block addresses, cycle time down to 1 millisecond
Communications • Console HMI and engineering station • S+ I/O, S800 I/O, Rack I/O	 2 x redundant 10/100 Mbps Ethernet PN800 Plant Network 2 x Ethernet ports EN2 A & EN2 B Redundant 4 Mbps HN800 (H-Net for HR Series Rack I/O)
Ports • Time synchronization • Foreign device interface	 1 10/100 Mbps Ethernet (EN2 A) SNTP Protocol 1 10/100 Mbps Ethernet (EN2 B), supports up to 1 Modbus TCP server and 4 Modbus TCP clients
Service port	1 mini-USB port on front plate
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

Bundled kits (horizontal mounting)		**SPC600K01**	**SPC600K02**
SPC600	Processor module	1	**2**
MB705	Non-redundant controller module base	**1**	**–**
MB710	Redundant controller module base	**–**	**1**
TER810	Terminator	**2**	**2**

Bundled kits (vertical mounting)		**SPC600VK01**	**SPC600VK02**
SPC600	Processor module	1	**2**
VB705	Non-redundant controller module base	**1**	**–**
VB710	Redundant controller module base	**–**	**1**
TER810	Terminator	**2**	**2**

SD Series communication

PNI800

PNI800

Symphony Plus Plant Network (PN800) is a bidirectional, high-speed and redundant Ethernet control network that operates at a communication rate of 100 Mbaud.

The PN800 network supports the 2010 version of the IEC 62439 Parallel Redundancy Protocol (PRP-0 or PRP) for increased Ethernet network reliability. The benefits of PRP include network redundancy and seamless failover caused by a single point of failure.

The PNI800 (Plant Network Interface) is an Ethernet-based communication module. It provides real-time communication between HPC800/SPC700 controllers S+ Engineering and S+ Operations PC workstations.

Technical data	
Power requirements	24 VDC ± 10% at 200 mA; 5 W typical
Communication ports	2 x redundant 10/100 Mbps Ethernet PN800 Plant Network
Service port	1 RS232C port in mini-USB form factor
Capacity: PN800	Up to 250 network segments per system. Up to 250 nodes per network segment.
Capacity: HMI	Each HMI server requires 1 PNI800; up to 30,000 tags
Capacity: Engineering stations	Each PNI800 can support up to 10 S+ Engineering workstations
Ambient temperature	0 °C to 55 °C (32 °F to 131 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2, IEC/EN 60068-2-14

Bundled kits		**PNI800K01**
PN800	Communication module	1
MB805	Mounting base for PN800	1

PROFIBUS communication

PDP800

PDP800

Symphony Plus allows seamless integration of intelligent field devices using the PROFIBUS communication protocol.

Some of the key features of the PDP800 PROFIBUS Interface module are:

- Module redundancy
- PROFIBUS DP line redundancy
- PROFIBUS DP V0, V1, V2
- PROFIBUS PA devices through third-party DP/PA linking device
- Electric and fiber optic media for PROFIBUS DP link
- Up to 12 Mbps rate of PROFIBUS DP link
- Up to 15 km by fiber optic using PROFIBUS DP link
- Up to 124 slave devices

Technical data	
Processor	Industrial grade RISC type processor
Memory	128 MB memory, 4 MB ROM
Power requirements	24 VDC ± 10% at 150 mA; 3.6 W typical
HPC800 controller	Redundant 4 Mbps HN800
PROFIBUS	2 x redundant PROFIBUS DP 9-pin D-Sub connectors
Service port	1RS232C port in mini-USB form factor, on PDP800 front plate
Capacity	Up to 124 slave devices Supported protocols: DP-V0, DP-V1, DP-V2, PA (through DP/PA linking device) Supported baud rate: 9.6 k, 19.2 k, 93.75 k, 187.5 k, 500 k, 1.5 M, 3 M, 6 M, 12 M Distance up to 15 km by fiber optic (using third-party hardware)
Ambient temperature	0 °C to 55 °C (32 °F to 131 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2, IEC/EN 60068-2-14

Bundled kits		PIO800K02
PDP800	PROFIBUS communication module	2
PTU810	Mounting base for PDP800	1

IEC 61850 communication

CI850

CI850

CI850 of the SD Series family allows for direct communication between SD Series controllers and intelligent electronic devices (IEDs), protection relays and other smart devices using the IEC 61850 communication protocol. The CI850 features:

- Dual high-capacity 32 bit CPUs
- Data modeling according to IEC 61850-7-3/4
- MMS client functionality according to IEC 61850-7-2
- GOOSE publisher and subscriber functionality
- Capability to send single and double commands
- Capability to send select before operate commands
- Support for up to 20 IEDs connected to a single CI850

Technical data	
Processor	Processor A (S+ platform processing): ColdFire 32-bit processor running at 240 MHz Processor B (IEC 61850 protocol):ColdFire 32-bit processor running at 266 MHz
Memory	Processor A: 128 MB RAM, 4 MB ROM, 8-bit data path Processor B: 128 MB RAM, 8 MB ROM, 32-bit data path Inter processor: 32 KB dual port RAM, 16-bit data path
Power requirements	24 VDC ± 10% at 200 mA; 4.8 W typical
Communications and ports • IEC 61850	Redundant 4 Mbps HN800 2 x 10/100 Mbps Ethernet Ports
Capacity • HN800	Up to 8 CI850 modules to one SPC800 or HPC800 controller Up to 4 CI850 modules to one SPC700 controller Up to 1 CI850 module to one SPC600 controller Distance up to 30 m, extendable up to 3 km by fiber-optic repeater
• IEC 61850	Up to 20 IEDs connected to a single CI850 Up to 160 IEDs via 8x CI850s to a single SPC800 or HPC800 Up to 80 IEDs via 4x CI850s to a single SPC700 Up to 20 IEDs via 1x CI850s to a single SPC600 Supported functionality: MMS Client GOOSE Publisher and Subscriber
Service port	1 RS232C port in mini-USB form factor
Ambient temperature (operational)	-40° to 70°C (-40° to 158°F) Tested according to IEC/EN 60068-2-1, IEC/EN 60068 2-2, IEC/EN 60068-2-14

Bundled kits		**CI850K01**
CI850	IEC61850 communication module	1
MB805	Mounting base for CI850	1

Multi-protocol communication interface

SCI200

SCI200

The SD Series SCI200 integration interface module provides real-time communications between SD Series controllers and devices such as Intelligent Electronic Devices (IEDs) and Remote Terminal Units (RTUs). This allows for easy integration of these devices with SD Series process controllers. Each device's resident information can then be used in real-time control strategies and higher level applications.

The SCI200 supports the following protocols and features:

IEC60870-5-104

- Can act as either Master or Slave
- Supports all major data types
- Capability to send Single and Double Commands
- Supports Direct Operate and Select Before Operate control modules
- As a Master, supports up to 16 devices
- As a Slave, supports up to 8 masters connected simultaneously to it

DNP 3.0

- Master capabilities
- Supports Level 3+ Data objects
- Supports Integrity polling and event class polling
- Capability to send Single, Double and Set-point Commands
- Supports Direct Operate and Select Before Operate control models
- As a Master, supports up to 16 DNP outstations and 1500 I/O points

Technical data	
Processor	ColdFire 32-bit processor running at 240 MHz
Memory	128 MB RAM, 4 MB ROM, 8-bit data path
Power requirements	24 VDC ± 10% at 150 mA (3.6 W typical) Supports power-status inputs from two redundant power supplies
Communications and ports IEC60870-5-104	HN800, redundant RS485 differential @ 4.0 Mbps 2x 10/100 Mbits Ethernet Ports
Capacity IEC60870-5-104 DNP 3.0	Up to 128 devices via 8x SCI200s to a single SPC800 or HPC800 Up to 64 devices via 4x SCI200s to a single SPC700 Up to 32 devices via 2x SCI200s to a single SPC600 Supported functionality: Master or Slave Supported functionality: Master
Service port	1 RS232C port in mini-USB form factor
Operating temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

Bundled kits		**SCI200K01**
125SCI200	SCI200 communications interface module	1
MB605	Non-redundant controller module base	1

Modbus TCP communication

SD Series controllers seamlessly integrate intelligent field devices using the Modbus TCP communication protocol. This provides access to a wide range of ABB and third-party IEDs including transmitters, actuators, motor control centers and flame scanners.

HPC800 and SPC800 controllers utilize the S+ Engineering Harmony Gateway Software for Modbus TCP communication. These controllers support up to 8 servers and up to 128 clients and up to 10,000 total points. Harmony Gateway Software licenses for varying point counts are shown below.

Modbus TCP communication	License
License for SD Series	8VZZ000105L0122
500 Modbus TCP points	8VZZ000105L0062
1,500 Modbus TCP points	8VZZ000105L0063
3,000 Modbus TCP points	8VZZ000105L0064
4,000 Modbus TCP points	8VZZ000105L0065
10,000 Modbus TCP points	8VZZ000105L0066

SPC700 and SPC600 controllers utilize a Function Code based Modbus TCP communication solution by using S+ Engineering Connectivity Engineering for Modbus tool. The SPC700 controller support up to 4 servers and up to 50 clients and up to 1,500 total points while the SPC600 controller supports up to 1 server and up to 4 clients and up to 500 total points. S+ Engineering Connectivity Engineering for Modbus licenses are shown below.

Modbus TCP communication	License
Modbus TCP/IP Configuration	8VZZ000493L0400
Modbus TCP/IP Instances (number of SPC700 controllers)	8VZZ000493L0410

S800 I/O Gateway

IOR810

IOR810

The IOR810 Symphony Plus to S800 I/O Gateway is a redundant interface that allows Symphony Plus controllers (HR Series as well as SD Series) to access the S800 I/O subsystem through the HN800 I/O bus in real time. It enables these controllers to utilize S800 I/O as part of a Symphony Plus control system. The IOR810 communicates to S800 using fiber optic Modulebus and it supports 1 ms accuracy on SOE capable digital input modules (such as DI825, DI830, DI831, etc).

Technical data	
Power requirements	24 VDC ± 10% at 220 mA; 5.28 W typical
Communication rate	Redundant 4 MBps HN800
Bus redundancy	Yes
Devices	Up to 66
Ambient temperature	0 °C to 55 °C (32 °F to 131 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2, IEC/EN 60068-2-14

Bundled kits		IOR810K02
IOR810	Gateway module	2
IOR810N200	Mounting base for Gateway module	1
TB842	Optical Modulebus ports	2

Remote Bus Extender

cRBX01

cRBX01

The cRBX01 is the redundant optical remote bus extender that allows Symphony Plus SD Series controllers and HR Series controllers to transparently extend communication to I/O devices on HN800 bus up to 3 km for remote applications. The cRBX01 can also be used to extend the CW800 bus, allowing peer-to-peer communication of SD Series HPC800 controllers to extend up to 3 km.

Technical data	
Power requirements	24 VDC +16%, -10%
Communication and ports • HN800 or CW800 • Fiber optic link	 Redundant 4 Mbps bus, I/O or Peer-to-Peer communication 2x ST style connectors
Fiber optic cable	Fiber size 62.5/125 µm Fiber attenuation -3.5 dB/km Index Graded Wavelength 840 nm Bandwidth 160 MHz/km Connector type6 ST style with right angle strain relief, 40 mm (1.5 in.) bend radius Transmission mode Multimode
Ambient temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

Communication accessories

CTB810

CTB811

cHBX01L/R

HBX01 L/R

VBX01T

VBX01B

Communication accessories	
CTB810	Communication Terminal Board. Connects to the left-hand side of the MB810 module base used for mounting HPC800 controllers. It provides connections for HN800 as well as CW800.
CTB811	Communication Terminal Board. Connects to the right-hand side of the MB810 module base used for mounting HPC800 controllers. It provides connections for HN800 as well as CW800.
cHBX01L	Compact Horizontal Bus Extender. Connects to the left-hand side of HN800 devices and provides an HN800 connector as well as 24 VDC power connection.
cHBX01R	Compact Horizontal Bus Extender. Connects to the right-hand side of HN800 devices and provides an HN800 connector.
HBX01L	Horizontal Bus Extender. Connects to the left-hand side of HN800 devices and provides an HN800 connector as well as 24 VDC power connection.
HBX01R	Horizontal Bus Extender. Connects to the right-hand side of HN800 devices and provides an HN800 connector.
TER800	HN800 or CW800 Bus Terminator. One terminator is required at each end of the bus.
TER810	Enhanced HN800 bus Terminator. One terminator is required at each end of the bus.
VBX01T	Vertical Bus Extender (Top). Connects to the top of column of HN800 devices and provides an HN800 connector as well as 24 VDC power connection.
VBX01B	Vertical Bus Extender (Bottom). Connects to the bottom of a column of HN800 devices and provides an HN800 connector.

Bundled kits		Qty.
cHBX01K02	Compact Horizontal Bus Extender Kit	
cHBX01L	Compact Horizontal Bus Extender, Left	1
cHBX01R	Compact Horizontal Bus Extender, Right	1
HBX01K02	Horizontal Bus Extender Kit	
HBX01L	Compact Horizontal Bus Extender, Left	1
HBX01R	Horizontal Bus Extender, Right	1
VBX01K02	Vertical Bus Extender Kit	
VBX01T	Vertical Bus Extender Top	1
VBX01B	Vertical Bus Extender Bottom	1

SD Series I/O modules

AI01

AI01

The AI01 analog input module processes up to 16 analog field inputs. Field inputs are isolated into two groups of eight. Each input channel can be individually programmed for:

- 4 to 20 mA
- 1 to 5 VDC
- 0 to 5 VDC
- 0 to 10 VDC
- 10 to +10 VDC

The AI01 can be used with HBS01-FPH, HBS01-EPD, VBS01-FPH, or VBS01-EPD base.

Technical data	
Power requirements	24 VDC +12%, -10% at 75 mA typical, 84 mA max.
Analog input channels • Current • Voltage	16 independently configured channels 4 to 20 mA 1 to 5 VDC
A/D Conversion • Resolution • Conversion time	1 A/D converter per group, 8 inputs per group 16 bits with polarity 22.5 ms per configured input; 180 ms if all channels are configured
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

AI02

AI02

The AI02 HART analog input module processes up to 16 high level analog field inputs for a Symphony Plus controller. The controller uses function code 221 (I/O Device Definition) to configure the module, and function code 222 (Analog In/Channel) to configure and access each module input channel. Each channel can be individually programmed for current or voltage inputs.

The AI02 can be used with HBS01-FPH, HBS01-EPD, VBS01-FPH, VBS01-EPD base.

Technical data	
Power requirements (logic power) • Operating voltage Current	 24 VDC ± 12%, -10% 100 mA typical
Power requirements (IO power) • Operating voltage Current	 24 VDC ± 10% 20 mA / channel
HART channels	16 independently configured channels, 4-20 mA
Analog input • Current • Voltage	 4 to 20 mA 1 to 5 VDC
HART function • Number of HART modem • Number of HART Secondary Variables • HART Secondary variable update rate	 1 modem per module Up to 4 per channel, 24 per module 2.5 seconds typical, 8 seconds maximum
A/D conversion • Resolution • Converstion update rate	1 A/D converter Up to 16 bits 100 ms for all channels
Ambient temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

SD Series I/O modules

AI05

AI05

The AI05 HART analog input module processes up to 8 high level analog field inputs for a Symphony Plus controller. The controller uses function code 221 (I/O Device Definition) to configure the module, and function code 222 (Analog In/Channel) to configure and access each module input channel. Each channel can be individually programmed for current or voltage inputs. Comparing to AI02, the AI05 module provides higher performance with additional features of individual channel isolation, dedicated HART modem and A/D converter per channel. AI05 supports up to 32 secondary variables.

The AI05 can be used with HBS01-EPD or VBS01-EPD base.

Technical data	
Power requirements (logic power) • Operating voltage • Current	 24 VDC ± 12%, -10% 100 mA typical
Power requirements (IO power) • Operating voltage • Current	 24 VDC ± 10% 20 mA / channel
Channels	8 independently configured channels
Analog input • Current • Voltage	 4 to 20 mA 1 to 5 VDC
HART function • Number of HART modem • Number of HART Secondary Variables • HART Secondary variable update rate	HART function is designed to work under current mode only 1 modem per channel, total 8 Up to 4 per channel, 32 per module 650 milliseconds typical, 750 milliseconds maximum
A/D conversion • Resolution • Conversion update rate	1 A/D converter 16 bit 100 ms for all channels
Operating temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

SD Series I/O modules

AI03

AI03

The AI03 analog input module processes eight channels of 2, 3 or 4 wire RTD temperature field inputs. Each channel can be individually programmed for one of the types in the table below. The module is automatically calibrated and compensated.

The AI03 can be used with HBS01-CJC or VBS01-CJC base.

Technical data	
Power requirements	24 VDC +12%, -10% at 68 mA typical, 76 mA max.
Analog input channels	8 independently configured channels
• RTD	Supports 2-wire, 3-wire and 4-wire RTD inputs 100 Ω platinum US laboratory standard 100 Ω platinum US industry standard 100 Ω platinum European standard 120 Ω nickel Chinese 53 Ω copper
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

AI04

AI04

The AI04 analog input module processes 16 thermocouple or millivolt field inputs. Each channel can be individually programmed for one of the types in the table below. The module is automatically calibrated and compensated. Thermocouple cold junction compensation can be performed by embedded resistance temperature detectors inside the module base or by application input configured by the user.

The AI04 can be used with HBS01-CJC or VBS01-CJC base.

Technical data	
Power requirements	24 VDC +12%, -10% at 65 mA typical, 73 mA max.
Analog input channels	16 independently configured channels
• Thermocouple	Thermocouple type E, J, K, R, S, T, B, L, N (14 A WG), N (28 A WG), U, Chinese E, Chinese S
• Millivolt	0 to 100 mV -100 to +100 mV
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

SD Series I/O modules

AO01

AO01

The AO01 analog output module processes 16 high-level analog control outputs. Each channel is individually programmed. Each output channel reads back the signal to the field to ensure accurate operation and eliminate the need to calibrate outputs.

The AO01 can be used with HBS01-EPD or VBS01-EPD base.

Technical data	
Power requirements	24 VDC +12%, -10% at 52 mA typical, 58 mA max.
Analog input channels • Current • Voltage	16 independently configured channels 4 to 20 mA 1 to 5 VDC
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

AO02

AO02

The AO02 HART analog output module processes up to 16 high level analog control outputs for a Symphony Plus controller. The controller uses function code 221 (I/O Device Definition) to configure the module, and function code 223 (Analog Out/Channel) to configure each module output channel. Each channel can be individually programmed for current or voltage outputs. Each output channel reads back the signal to the field to insure accurate operation and eliminate the need to calibrate outputs.

The AO02 can be used with HBS01-EPD or VBS01-EPD base.

Technical data	
Power requirements (logic power) • Operating voltage • Current	 24 VDC ± 12%, -10% 100 mA typical
Power requirements (IO power) • Operating voltage • Current	 24 VDC ± 10% 16 mA typical (22 mA maximum) + 20 mA / channel
HART channels	16 independently configured channels, 4-20 mA
Analog input • Current • Voltage	 4 to 20 mA 1 to 5 VDC
HART function • Number of HART modem • Number of HART Secondary Variables • HART Secondary variable update rate	 1 modem per channel Up to 4 per channel, 24 per module 2.5 seconds typical, 8 seconds maximum
D/A conversion • Resolution	1 D/A converter 12 bits
Ambient temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

SD Series I/O modules

AO05

AO05

The AO05 HART analog output module processes up to 8, individually isolated, high level analog outputs for a Symphony Plus controller. The controller uses function code 221 (I/O Device Definition) to configure the module, and function code 223 (Analog Out/Channel) to configure each module output channel. Each channel can be individually programmed for current or voltage outputs. Each output channel reads back the signal to the field to insure accurate operation and eliminate the need to calibrate outputs. Compared to AO02, the AO05 module provides higher performance, individual channel isolation, and dedicated HART modem per channel. AO05 supports up to 4 secondary variables per CH for a total of 32 secondary variables.

The AO05 can be used with HBS01-EPD or VBS01-EPD base.

Technical data	
Power requirements (logic power) • Operating voltage • Current	 24 VDC ± 12%, -10% 100 mA typical
Power requirements (IO power) • Operating voltage • Current	 24 VDC ± 10% 16 mA typical (22mA maximum) + 20 mA / channel
Channels	8 independently configured channels
Analog input • Current • Voltage	 4 to 20 mA 1 to 5 VDC
HART function • Number of HART modem • Number of HART Secondary Variables • HART Secondary variable update rate	HART function is designed to work under current mode only 1 modem per channel, total 8 Up to 4 per channel, 32 per module 650 milliseconds typical, 750 milliseconds maximum
D/A conversion • Resolution	1 D/A converter 12 bits
Ambient temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

SD Series I/O modules

DI01

DI01

The DI01 digital input module processes up to 16 low-voltage digital field inputs. Each channel is optically isolated and accepts an input voltage of 24 VDC or 48 VDC. Each channel can be individually programmed as a SOE point with 1 ms time stamping.

The DI01 can be used with HBS01-FPH, HBS01-FPN, HBS01-EPD, VBS01-FPH, VBS01-FPH, or VBS01-EPD base.

Technical data	
Power requirements	24 VDC +12%, -10% at 60 mA typical, 67 mA max.
Digital input channels • Input Signal 1 • Input Signal 2	16 independently configured channels 24 VDC, 3.3 mA typical, 3.6 mA max. per channel 48 VDC, 6.8 mA typical, 7.2 mA max. per channel
SOE (sequence of events)	Each channel can be individually configured to enable/disable SOE Resolution 1 ms
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

DI02

DI02

The DI02 digital input module processes up to 16 high-voltage digital field inputs. Each channel is optically isolated and accepts an input voltage of 125 VDC or 120 VAC. Each channel can be individually programmed as a SOE point with 1 ms time stamping.

The DI02 can be used with HBS01-FPH, HBS01-FPN, HBS01-EPD, VBS01-FPH, VBS01-FPH, or VBS01-EPD base.

Technical data	
Power requirements	24 VDC +12%, -10% at 59 mA typical, 66 mA max.
Digital input channels • Input Signal 1 • Input Signal 2	16 independently configured channels 125 VDC, 3.0 mA typical, 3.3 mA max. per channel 120 VAC, 4.5 mA typical, 5.0 mA max. per channel
SOE (sequence of events)	Each channel can be individually configured to enable/disable SOE Resolution 10 ms for DC inputs, 20 ms for AC inputs
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

SD Series I/O modules

DI03

DI03

The DI03 digital input module processes up to 16 low voltage digital field inputs for a Symphony Plus controller. The Controller utilizes function codes 221 (I/O Device Definition) to configure the module, and 224 (Digital In/Channel) to Configure and access the module input channels. Each channel is optically isolated, and accepts input voltage of 24 VDC only. DI03 does not support SOE function.

The DI03 can be used with HBS01-FPH, HBS01-FPN, HBS01-EPD, VBS01-FPH, VBS01-FPH, or VBS01-EPD base.

Technical data	
Power requirements	24 VDC +12%, -10% at 60 mA typical, 67 mA maximum
Digital input channels	16 independently configured channels
Digital input operating range	24 VDC, 6.0 mA typical, 9.0 mA max. per channel
Ambient temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

DI04

DI04

The DI04 digital input module processes up to 16 low voltage digital field inputs for a Symphony Plus controller. The controller utilizes function codes 221 (I/O Device Definition) to configure the module, and 224 (Digital In/Channel) to configure and access the module input channels. Each channel is optically isolated, and accepts input voltage of 48 VDC only. DI04 does not support SOE function.

The DI04 can be used with HBS01-FPH, HBS01-FPN, HBS01-EPD, VBS01-FPH, VBS01-FPH, or VBS01-EPD base.

Technical data	
Power requirements	24 VDC +12%, -10% at 59 mA typical, 66 mA maximum
Digital input channels	16 independently configured channels
Digital input operating range	48 VDC, 4.4 mA typical, 5.6 mA max. per channel
Ambient temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

DO01

DO01

The DO01 digital output module processes 16 digital open-collector outputs. Each channel is optically isolated and can switch 24 VDC at 250 mA or 48 VDC at 250 mA. It can also be connected to a relay assembly to drive electromechanical relays.

The DO01 can be used with HBS01-FPH, HBS01-FPN, HBS01-EPD, VBS01-FPH, VBS01-FPH, or VBS01-EPD base.

Technical data	
Power requirements	24 VDC +12%, -10% at 65 mA typical, 73 mA max.
Digital output channels • Ambient range 1 • Ambient range 2	16 independently configured channels 24 VDC, 250 mA per channel 48 VDC, 250 mA per channel
Ambient temperature	-20 °C to 70 °C (-4 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

SD Series I/O modules

DO02

DO02

The DO02 digital output module processes up to 16 digital open-collector control outputs for a Symphony Plus controller. The DO02 module provides all of the features offered by the DO01 module along with additional features of output overcurrent protection, output overcurrent status monitoring and indication, and output read back status monitoring.

The DO02 can be used with HBS01-FPH, HBS01-FPN, HBS01-EPD, VBS01-FPH, VBS01-FPH, or VBS01-EPD base.

Technical data	
Power requirements	24 VDC +12%, -10% at 65 mA typical, 73 mA max.
Digital output channels • Digital output operating range 1 • Digital output operating range 2	16 independently configured channels 24 VDC, 250 mA per channel 48 VDC, 250 mA per channel
Output over-current protection	Enabled
Output over-current status monitoring and indication	Enabled
Output read back status monitoring	Enabled
Ambient temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

DO05

DO05

The DO05 digital output module processes up to 16 electromechanical relay contact outputs for a Symphony Plus controller.

The DO05 can be used with HBS02-EPD or VBS02-EPD base.

Technical data	
Power requirements	24 VDC +12%,-10% 208 mA maximum
Digital output channels	3 A @ 24 VDC, 1A @48 VDC, 250 mA @ 125 VDC, or 3 A @ 120VAC
Service port	1 RS232C port in mini-USB form factor
Relays • Type • Coil voltage • Contact configuration • Rating current Switching capability	 Electromechanical relay, form C 24 VDC nominal SPDT 3 A maximum 3 A @ 24 VDC (resistive load) 1.5 A @ 24 VDC (inductive load) 1 A @ 48 VDC (resistive load) 0.5 A @ 48 VDC (inductive load) 250 mA @ 125 VDC (resistive load) 125 mA @ 125 VDC (inductive load) 3A @ 120 VAC
Minimum switching load	10 V @ 50 mA
Contact material	Silver Tin Oxide
Contact life	100,000 operations

SD Series I/O modules

AD01

AD01

The analog drive modules have mixed analog and digital, input and output channels and are capable of all signals and commands for one or more analog control loops using a single I/O module. Each analog channel can be individually configured for 4 to 20 mA or 1 to 5 VDC, and support up to 4 HART digital variables when using current mode. Each digital input channel is optically isolated, accepts input voltages of 24 or 48 VDC and can be individually configured as a SOE point. Each digital output channel is an optically isolated open-collector output, and can switch up to 250 mA @ 24 VDC or 125 mA @ 48 VDC.

The AD01 can be used with HBS01-EPD or VBS01-EPD base.

Technical data	
Power requirements (logic power) • Operating voltage • Current	 24 VDC +12%, -10% AD01: 100 mA typical
Input / output channels	16 independently confi gured channels 4 analog inputs, 4 analog outputs, 4 digital inputs, 4 digital outputs
Analog Inputs and Outputs • Current • Voltage	 4 to 20 mA; HART function only works under current mode 1 to 5 VDC
HART function • Number of HART modem • Number of HART Secondary Variables • HART Secondary variable update rate	NOTE: HART function only works under current mode 1 modem per module Up to 4 channel, up to 32 per module 2.5 seconds typical, 8 seconds maximum
Digital Input SOE (Sequence of events)	Each digital input channel can be individually configured to enable/disable SOE. Remote SOE is supported by using RFO810 fiber-optic repeaters.
Digital outputs • Load voltage and rating current • Off leakage current • On voltage drop	Open-collectors 24 VDC at 250 mA maximum 48 VDC at 250 mA maximum 50 μA at 70°C (158°F) maximum 2 V at 70°C (158°F) maximum
Ambient temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

SD Series I/O modules

AD02

AD02

The analog drive modules have mixed analog and digital, input and output channels and are capable of all signals and commands for one or more analog control loops using a single I/O module. Each analog channel can be individually configured for 4 to 20 mA or 1 to 5 VDC, and supports up to 4 HART digital variables when in current mode. Each digital input channel is optically isolated, accepts input voltages of 125 VDC or 120 VAC, and can be individually configured as a SOE (Sequence of Events) point. Each digital output channel is an optically isolated open-collector output, and can switch up to 250 mA @ 24 VDC or 125 mA @ 48 VDC.

The AD02 can be used with HBS01-EPD or VBS01-EPD base.

Technical data	
Power requirements (logic power) • Operating voltage • Current	 24 VDC +12%, -10% AD02: 100 mA typical
Input / output channels	16 independently confi gured channels 4 analog inputs, 4 analog outputs, 4 digital inputs, 4 digital outputs
Analog Inputs and Outputs • Current • Voltage	 4 to 20 mA; HART function only works under current mode 1 to 5 VDC
HART function • Number of HART modem • Number of HART Secondary Variables • HART Secondary variable update rate	NOTE: HART function only works under current mode 1 modem per module Up to 4 channel, up to 32 per module 2.5 seconds typical, 8 seconds maximum
Digital outputs • Load voltage and rating current • Off leakage current • On voltage drop	Open-collectors 24 VDC at 250 mA maximum 48 VDC at 250 mA maximum 50 µA at 70°C (158°F) maximum 2 V at 70°C (158°F) maximum
Ambient temperature	-40° to 70°C (-40° to 158°F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

SD Series I/O modules

PI01

PI01

The PI01 pulse input module processes eight pulsed field inputs. Each channel is optically isolated and accepts an input voltage of 24 VDC.

The PI01 operates in four different modes depending on the function code configuration: period, frequency, totalize and duration.

The PI01 can be used with HBS01-FPH, HBS01-FPN, HBS01-EPD, VBS01-FPH, VBS01-FPH, or VBS01-EPD base.

Technical data	
Power requirements	24 VDC +12%, -10% at 59 mA typical, 66 mA max.
Pulse input channels • Voltage • Totalize • Frequency • Period	8 independently configured channels 24 VDC 0 to 16,777,215 (24-bit) 0.5 Hz to 100 kHz 10 microseconds to 30 seconds
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Service port	1 RS232C port in mini-USB form factor

SD Series Redundant I/O

RAI02

The RAI02 redundant analog input module processes up to 16 high level analog field inputs for a Symphony Plus controller. The controller uses function code 221 (I/O Device Definition) to configure the module, and function code 222 (Analog In/Channel) to configure and access each module input channel. Each channel can be individually programmed for current or voltage inputs.

The RAI02 can be used with HBR01-FPH, HBR01-EPD, VBR01-FPH, or VBR01-EPD base.

Property	Characteristic/value
Power requirements (logic power) • Operating voltage • Current	 24 VDC + 12%, -10% 100 mA typical
Power requirement (Analog IO power) • Operating voltage • Current	 24 VDC ±10% 20 mA/channel
Number of channel	16 independently configured channels
Analog inputs • Current • Voltage	 4 to 20 mA 1 to 5 VDC
HART function • Number of HART modem • Number of HART Secondary Variables • HART Secondary variable update rate	NOTE: HART function only works under current mode 1 modem per module Up to 4 per channel, up to 24 per module 2.5 seconds typical, 8 seconds maximum
Resistive load • Current mode (system powered)	 Up to 750 Ω
Input impedance • Current mode • Voltage mode	 Up to 340 Ω ≥ 250 kΩ
Resolution	12 bits
Conversion update rate	200 msec for all channels
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

SD Series I/O modules

RAI04

The RAI04 redundant analog input module processes up to 16 thermocouple or millivolt field inputs for a Symphony Plus controller. The controller uses function code 221 (I/O Device Definition) to configure the module, and function code 222 (Analog In/Channel) to configure and access each module input channel. Each channel can be individually programmed for input types E, J, K, R, S, T, B, L, N, U, Chinese E, and Chinese S.

The RAI04 can be used with HBR01-CJC or VBR01-CJC base.

Property	Characteristic/value
Power requirements (logic power) • Operating voltage • Current	 24 VDC + 12%, -10% 65 mA typical, 73 mA maximum
Number of channel	16 independently configured channels
Thermocouple	Thermocouple type E, J, K, R, S, T, B, L, N (14 A WG), N (28 A WG), U, Chinese E, Chinese S
Millivolt	0 to 100 mV –100 to +100 mV
Thermocouple cold junction compensation	User configurable Embedded RTD inside module base, or External RTD input to TB3 on module base, or Application input from control logic
Input impedance	≥ 1 MΩ
A/D conversion	4 A/D converters, each with 4 input channels
Resolution	16 bits
Conversion update rate	300 msec for all channels
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

SD Series I/O modules

RAO02

The RAO02 redundant analog output module processes up to 16 high level analog control outputs for a Symphony Plus controller. The controller uses function code 221 (I/O Device Definition) to configure the module, and function code 223 (Analog Out/Channel) to configure each module output channel. Each channel can be individually programmed for current or voltage outputs.

The RAO02 can be used with HBR01-EPD or VBR01-EPD base.

Property	Characteristic/value
Power requirements (logic power) • Operating voltage • Current	 24 VDC + 12%, -10% 100 mA typical
Power requirement (Analog IO power) • Operating voltage • Current	 24 VDC ±10% 16 mA typical (22 mA maximum) + 20 mA/channel
Number of channel	16 independently configured channels
Analog outputs • Current • Voltage	 4 to 20 mA 1 to 5 VDC
HART function • Number of HART modem • Number of HART Secondary Variables • HART Secondary variable update rate	NOTE: HART function only works under current mode 1 modem per module Up to 4 per channel, up to 24 per module 2.5 seconds typical, 8 seconds maximum
Output load • Current mode • Voltage mode	 0 - 750 Ω 22 KΩ to 1 MΩ
D/A conversion	1 D/A converter for each output channel
Resolution	12 bits
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

RDI01

The RDI01 redundant digital input module processes up to 16 low voltage digital field inputs for a Symphony Plus controller. The controller utilizes function codes 221 (I/O Device Definition) to configure the module, and 224 (Digital In/Channel) to configure and access the module input channels. Each channel is optically isolated, and accepts input voltage of 24 VDC or 48 VDC.

The RDI01 can be used with HBR01-FPH, HBR01-FPN, HBR01-EPD, VBR01-FPH, VBR01-FPH, or VBR01-EPD base.

SD Series I/O modules

RDI02

The RDI02 redundant digital input module processes up to 16 high voltage digital field inputs for a Symphony Plus controller. The controller utilizes function codes 221 (I/O Device Definition) to configure the module, and 224 (Digital In/Channel) to configure and access the module input channels. Each channel is optically isolated, and accepts input voltage of 125 VDC or 120 VAC.

The RDI02 can be used with HBR01-FPH, HBR01-FPN, HBR01-EPD, VBR01-FPH, VBR01-FPH, or VBR01-EPD base.

Property	Characteristic/value
Power requirements (logic power) • Operating voltage • Current	 24 VDC + 12%, -10% RDI01: 65 mA typical, 73 mA maximum RDI02: 59 mA typical, 66 mA maximum
Number of channel	16 independently configured channels
Voltage • RDI01 • RDI02	(±10%) 24 VDC 48 VDC 125 VDC 120 VAC
Current (typical) per channel • RDI01 • RDI02	 3.3 mA 6.8 mA 3.0 mA 4.5 mA
Current (maximum) per channel • RDI01 • RDI02	 3.6 mA 7.2 mA 3.3 mA 5.0 mA
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

RDO01

The RDO01 redundant digital output module processes up to 16 digital open-collector control outputs for a Symphony Plus controller. The controller utilizes function codes 221 (I/O Device Definition) to configure the module, and 225 (Digital Out/ Channel) to configure and drive the module output channels. Each channel is optically isolated, and can switch up to 250 mA @ 24 VDC or 48 VDC.

The RDO01 can be used with HBR01-FPH, HBR01-FPN, HBR01-EPD, VBR01-FPH, VBR01-FPH, or VBR01-EPD base.

Property	Characteristic/value
Power requirements (logic power) • Operating voltage • Current	 24 VDC +12%, -10% 65 mA typical, 73 mA maximum
Power requirement (IO power) • Operating voltage • Current	 24 VDC ±10% 48 VDC ±10% 250 mA/channel
Number of channel	16 independently configured channels
Digital outputs • Load voltage and rating current • Off leakage current • On voltage drop	Open-collectors 24/48 VDC at 250 mA maximum 50 μA at 70°C (158°F) maximum 2 V at 70°C (158°F) maximum
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

SD Series I/O modules

SD Series Compact Analog I/O

cAI01

The compact cAI01 analog input module processes up to 8 high level analog field inputs for a Symphony Plus controller. Each channel can be individually programmed for current or voltage inputs.

The cAI01 can be used with cHBS01-FPH, cHBS01-EPD, cVBS01-FPH, or cVBS01-EPD base.

Property	Characteristic/value
Power requirements (logic power) • Operating voltage • Current	 24 VDC + 12%, -10% 75 mA typical, 84 mA maximum
Power requirement (Analog IO power) • Operating voltage • Current	 24 VDC ±10% 20 mA/channel
Number of channels	8 independently configured channels
Analog inputs • Current • Voltage	 4 to 20 mA 1 to 5 VDC
Resistive load • Current mode (system powered)	 Up to 750 Ω
Input impedance • Current mode • Voltage mode	 Up to 340 Ω ≥ 250 kΩ
A/D conversion • Resolution • Conversion update rate	1 A/D converter 12 bits 200 msec for all channels
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

cAI04

The compact cAI04 analog input module processes up to 8 thermocouple or millivolt field inputs for a Symphony Plus controller.

The cAI04 can be used with cHBS01-CJC or cVBS01-CJC base.

Property	Characteristic/value
Power requirements (logic power) • Operating voltage • Current	 24 VDC + 12%, –10% 65 mA typical, 73 mA maximum
Number of channels	8 independently configured channels
Thermocouple	Thermocouple type E, J, K, R, S, T, B, L, N (14 A WG), N (28 A WG), U, Chinese E, Chinese S
Millivolt	0 to 100 mV –100 to +100 mV
Thermocouple cold junction compensation	User configurable Embedded RTD inside module base, or External RTD input to TB3 on module base, or Application input from control logic
Input impedance	≥ 1 MΩ
A/D conversion • Resolution • Conversion update rate	2 A/D converters, each with 4 input channels 16 bits 300 msec for all channels
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

SD Series I/O modules

cAO01

The compact cAO01 analog output module processes up to 8 high level analog control outputs for a Symphony Plus controller. Each output channel reads back the signal to the field to insure accurate operation and eliminate the need to calibrate outputs.

The cAO01 can be used with cHBS01-EPD or cVBS01-EPD base.

Property	Characteristic/value
Power requirements (logic power) • Operating voltage • Current	 24 VDC + 12%, -10% 52 mA typical, 58 mA maximum
Power requirement (Analog IO power) • Operating voltage • Current	 24 VDC ±10% 16 mA typical (22 mA maximum) + 20 mA/channel
Number of channels	8 independently configured channels
Analog outputs • Current • Voltage	 4 to 20 mA 1 to 5 VDC
Output load • Current mode • Voltage mode	 0 - 750 Ω 22 KΩ to 1 MΩ
D/A conversion	1 D/A converter for each output channel
Resolution	12 bits
Ambient temperature	-40 °C to 70 °C (-40 °F to 158 °F). Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2

SD Series I/O modules – Mounting bases

HBS01-XXX and VBS01-XXX

SD Series I/O horizontal mounting bases for single module	
HBS01-FPH	Horizontal row mounting base for single modules. Provides power for field devices (switch HOT). TB3 is a 5 A fused terminal block for field power input. Can be used with AI01, DI01, DI02, PI01
HBS01-FPN	Horizontal row mounting base for single modules. Provides power for field devices (switch NEUTRAL). TB3 is a 5 A fused terminal block for field power input. Can be used with DI01, DI02, DO01, PI01
HBS01-EPD	Horizontal row mount base for single modules. Externally powered from field device, system powered for analog output (AO). Can be used with AI01, AO01, DI01, DI02, DO01, PI01
HBS01-CJC	Horizontal row mount base for single modules. Embedded RTD for cold junction compensation. Can be used with AI03 and AI04
HBS02-EPD	Horizontal row mount base for single module, externally powered from the field device, high current up to 3A for use with DO05, 2x8 signal terminals, requires 2x16-pin 5mm pluggable connector.

VBS01-SFP

SD Series I/O vertical mounting bases for single module	
VBS01-FPH	Vertical column mount base for single module, system provides power for field device (switch hot), 2x8 signal terminals, 5A fused terminal block for field power input, requires 2x16-pin 5mm pluggable connector. Use with AI01, AI02, DI01, DI02, DI03, DI04, DO01, DO02, PI01
VBS01-FPN	Vertical column mount base for single module, system provides power for field device (switch Neutral), 2x8 signal terminals, 5A fused terminal block for field power input, requires 2x16-pin 5mm pluggable connector. Use with DI01, DI02, DI03, DI04, DO01, DO02, PI01
VBS01-EPD	Vertical column mount base for single module, externally powered from the field device,system powered for AO, 2x8 signal terminals, requires 2x16-pin 5mm pluggable connector. Use with AI01, AI02, AI05, AO01, AO02, AO05, DI01, DI02, DI03, DI04, DO01, DO02, PI01, AD01, AD02
VBS01-CJC	Vertical column mount base for single module, 2x8 signal terminals, embedded RTD for cold junction compensation, requires 2x16-pin 5mm pluggable connector. Use with AI03 or AI04
VBS01-SFP	Vertical column mount base for single module provides the ability to select I/O field power option (EPD-LV, EPD-HV, FPH-LV, FPH-HV, FPN-LV and FPN-HV) on a channel-by-channel basis. Base includes individual channel short circuit protection (fuse), blown fuse indication, channel disconnect, and signal power selection. Use with AI01, AI02, AI05, AO01. AO02, AD01, AD02, DI01, DI02, DI03, DI04, DO01, DO02 and PI01.
VBS02-EPD	Vertical column mount base for single module, externally powered from the field device, high current up to 3A for use with DO05, 2x8 signal terminals, requires 2x16-pin 5mm pluggable connector

SD Series I/O horizontal mounting bases for redundant modules	
HBR01-EPD	Horizontal row mount base for redundant modules, external field powered devices. System powered for AO, 2x8 signal terminals, requires 2x16-pin 5mm pluggable connector. Use with RAI02, RAO02, RDI01, RDI02, RDO01
HBR01-FPH	Horizontal row mount base for redundant modules. System provides power for field device (switch hot), 2x8 signal terminals, 5A fused terminal block for field power input, requires 2x16-pin 5mm pluggable connector. Use with RAI02, RDI01, RDI02, RDO01
HBR01-FPN	Horizontal row mount base for redundant modules. System provides power for field device (switch Neutral), 2x8 signal terminals, 5A fused terminal block for field power input, requires 2x16-pin 5mm pluggable connector. Use with RDI01, RDI02, RDO01
HBR01-CJC	Horizontal row mount base for redundant module, 2x8 signal terminals, Embedded RTD for cold junction compensation, requires 2x16-pin 5mm pluggable connector. Use with RAI04

SD Series I/O modules – Mounting bases

SD Series I/O vertical mounting bases for redundant modules	
VBR01-EPD	Vertical column mount base for redundant modules, external field powered devices. System powered for AO, 2x8 signal terminals, requires 2x16-pin 5mm pluggable connector. Use with RAI02, RAO02, RDI01, RDI02, RDO01
VBR01-FPH	Vertical column mount base for redundant modules. System provides power for field device (switch hot), 2x8 signal terminals, 5A fused terminal block for field power input, requires 2x16-pin 5mm pluggable connector. Use with RAI02, RDI01, RDI02, RDO01
VBR01-FPN	Vertical column mount base for redundant modules. System provides power for field device (switch Neutral), 2x8 signal terminals, 5A fused terminal block for field power input, requires 2x16-pin 5mm pluggable connector. Use with RDI01, RDI02, RDO01
VBR01-CJC	Vertical column mount base for redundant module, 2x8 signal terminals, embedded RTD for cold junction compensation, requires 2x16-pin 5mm pluggable connector. Use with RAI04

SD Series I/O horizontal mounting bases for single compact module	
cHBS01-EPD	Horizontal row mount base for compact single module, externally powered from the field device, system powered for AO, 8 signal terminals, requires 16-pin 5mm pluggable connector. Use with cAI01, cAO01
cHBS01-FPH	Horizontal row mount base for compact single module, system provides power for field device (switch hot), 8 signal terminals, 5A fused terminal block for field power input, requires 16-pin 5mm pluggable connector. Use with cAI01
cHBS01-CJC	Horizontal row mount base for compact single module, 2x8 signal terminals, embedded RTD for cold junction compensation, requires 16-pin 5mm pluggable connector. Use with cAI04

SD Series I/O vertical mounting bases for single compact module	
cVBS01-EPD	Vertical column mount base for compact single module, externally powered from the field device, system powered for AO, 8 signal terminals, requires 16-pin 5mm pluggable connector. Use with cAI01, cAO01
cVBS01-FPH	Vertical column mount base for compact single module, system provides power for field device (switch hot), 8 signal terminals, 5A fused terminal block for field power input, requires 16-pin 5mm pluggable connector. Use with cAI01
cVBS01-CJC	Vertical column mount base for compact single module, 8 signal terminals, Eembedded RTD for cold junction compensation, requires 16-pin 5mm pluggable connector. Use with cAI04

Cables

SPK800-XX	These cables are used to connect HN800 or CW800 buses of two DIN rail devices. SPK800-XX cables are available in lengths of 0.5 m to 4 m.
SPK800-PBA1-XX	These cables connect Harmony Rack (HR Series) controllers (via PBA800) to a HN800 electrical bus. SPK800-PBA-XX cables are available in lengths of 1 to 4 m.
SPK800-PBAT-XX	These cables connect Harmony Rack (HR Series) controllers (via PBA800) to two HN800 devices (with the controller in the middle). SPK800-PBAT-XX cables are available in lengths of 0.5m to 4 m.
SPK01B-XX	These are IO marshalling cables with flying leads that exit at the Bottom of the base. They are available in lengths of 4, 5, 6, and 10 meters.
SPK01T-XX	These are IO marshalling cables with flying leads that exit at the Top of the base. They are available in lengths of 4, 5, 6, and 10 meters.
SPK02B-XX	These are IO marshalling cables with standard cable hoods that exit at the Bottom of the base. They are available in lengths of 4, 5, 6, and 10 meters.
SPK02T-XX	These are IO marshalling cables with standard cable hoods that exit at the Top of the base. They are available in lengths of 4, 5, 6, and 10 meters.

SD Series – References

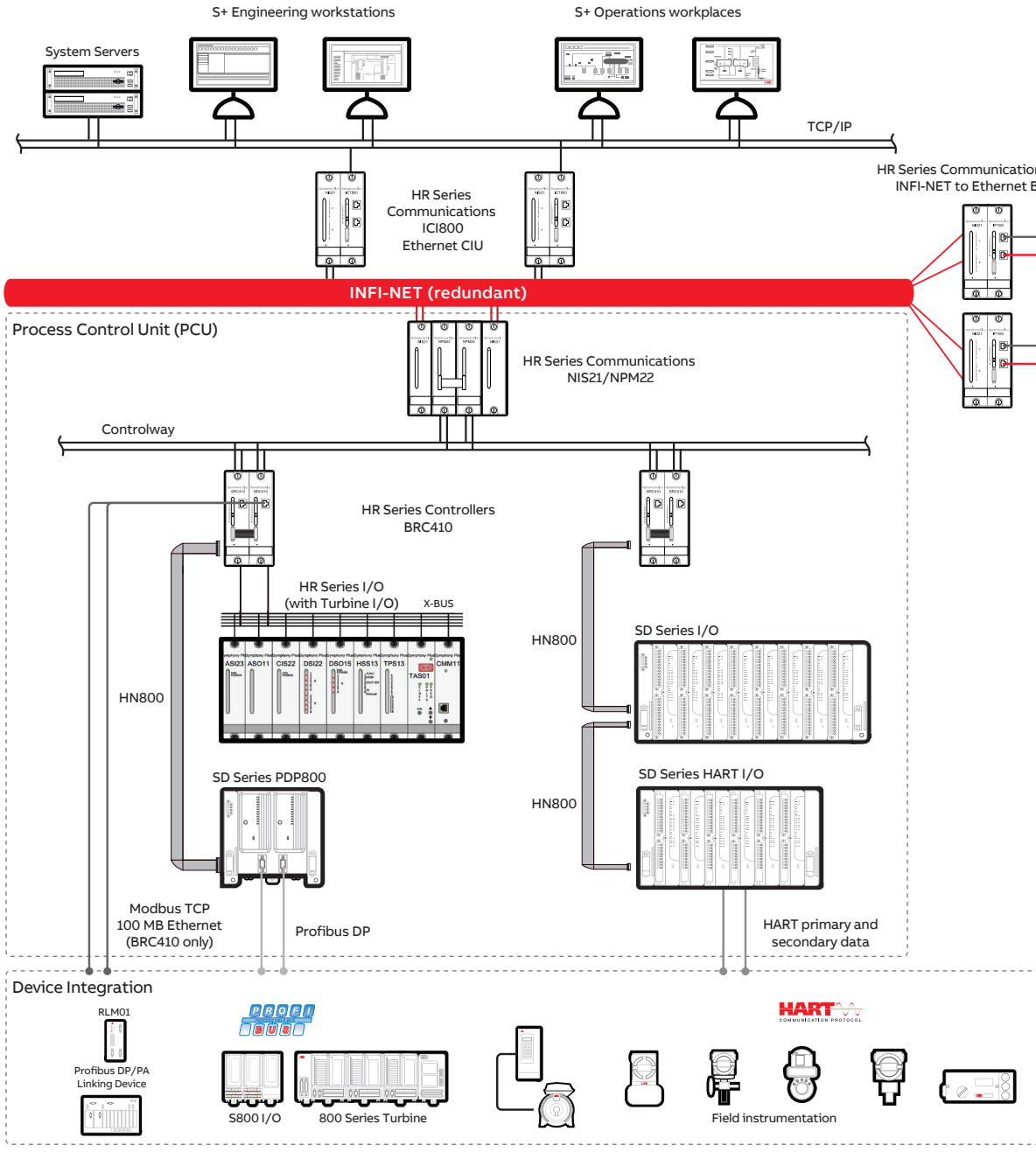
Document ID	Document Description
2VAA003956	SD Series control and I/O brochure
2VAA001981	HPC800 Process Controller data sheet
8VZZ001853T0001	SPC600/700/800 Process Controller data sheet
2VAA001984	PNI800 Plant Network Interface data sheet
8VZZ001903T0001	SD Series IEC 60870-5-104 plant communication network
2VAA001982	PDP800 Profibus DP Master data sheet
2VAA005508	CI850 IEC61850 Integration Interface data sheet
2VAA006225	SCI200 Communication Interface data sheet
8VZZ000161T0001	cRBX01 Fiber Optic Repeater data sheet
2VAA003090	IOR810 Gateway module data sheet
2VAA003742	Analog I/O modules (AI0x, AO0x) data sheet
2VAA003743	Digital I/O, Pulse input modules (DI0x, DO0x, PI0x) data sheet
2VAA006765	Analog Drive I/O modules (AD0x) data sheet
2VAA001983	HART I/O modules (HAI805, HAO805) data sheet
2VAA005932	HART I/O modules (AI02, AI05, AO02, AO05) data sheet
2VAA008524	Redundant I/O modules (RAI0x, RDI0x, RDO0x) data sheet
8VZZ000160T0000	SD Series Compact Analog I/O data sheet
8VZZ002944T0001	VBS01-SFP Selectable Field Power Base

For documentation not publicly available, please contact your ABB representative

For your notes

HR Series (Harmony Rack)

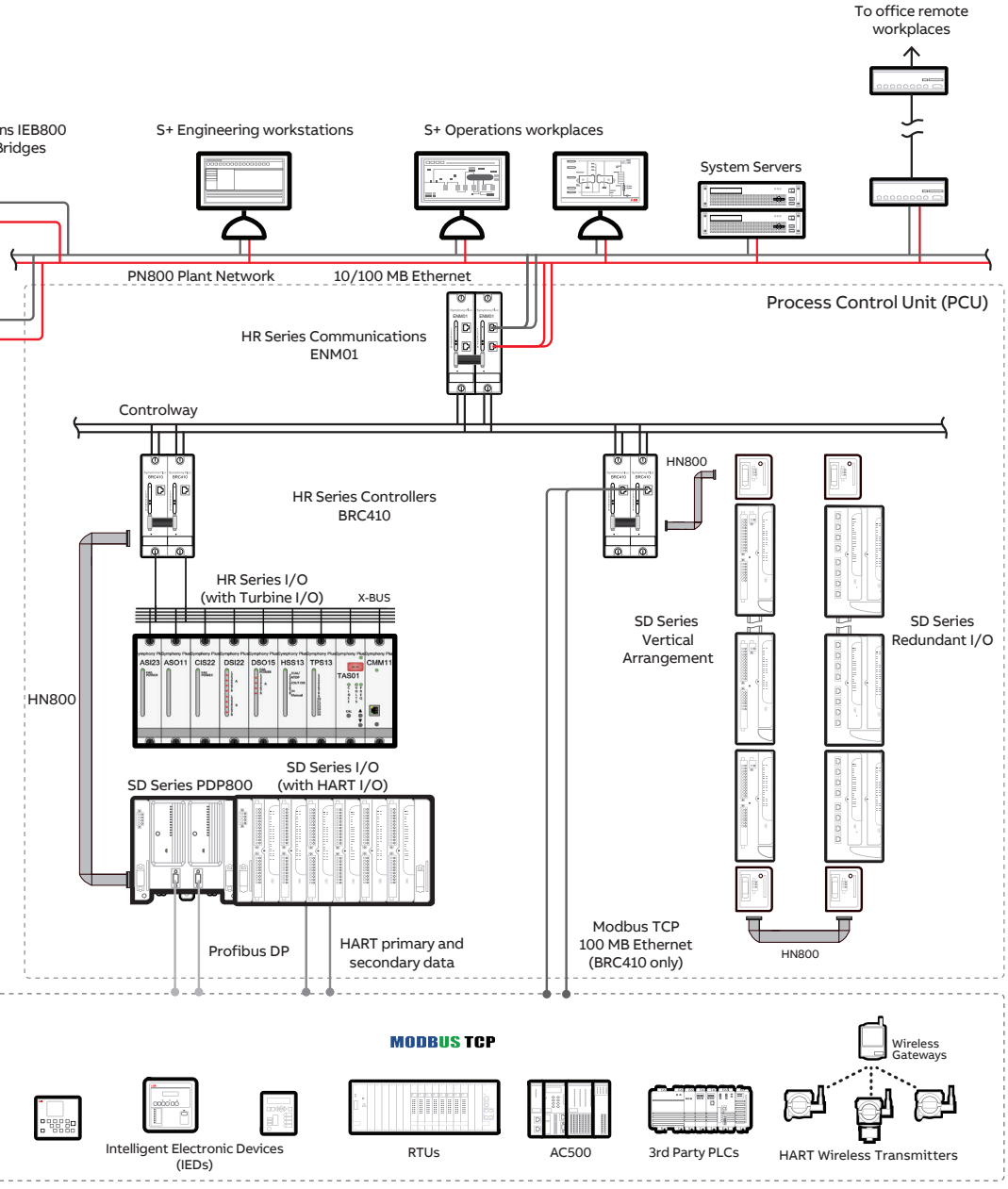
Included in Symphony Plus is a comprehensive suite of standards-based control and I/O hardware and software that meet owner requirements for total plant control. The suite includes a new and expanded version of Harmony Rack based equipment, HR Series. It consists of products that are compatible with previous generation (Network 90/INFI 90/Harmony) rack-mounted systems. The HR Series (Harmony Rack) meets the past, present and future needs of its users by protecting their previous control investments while delivering higher performance, reliability, and capacity.



HR Series control-based systems feature scalable, high performance controllers, a comprehensive set of I/O options, fast, secure and redundant communication, an efficient easy-to-use engineering tool and a state-of-the-art HMI workplace.

Newest additions to the HR Series portfolio include (1) the integration of intelligent electrical and field devices via HART, PROFIBUS, and Modbus TCP communication protocols, (2) upgrade of INFI-Net communications to redundant Fast Ethernet PN800 plant network and (3) compact DIN-rail mounted modular power system.

Together, HR Series control-based solutions lower the total cost of ownership by delivering the value needed to remain competitive in today's challenging business environments: increasing reliability, minimizing equipment downtime, improving production yields, reducing maintenance and support costs, reusing physical and intellectual asset investments, and adding new products and features with ease.



HR Series controllers

Symphony Plus Harmony Bridge controllers (BRC) are high-performance, high-capacity rack-mounted controllers. They are fully compatible with the Symphony Harmony and INFI 90 systems.

BRC controllers read process inputs, perform control logic algorithms and transmit control signals to process level devices. They import and export process data to and from other controllers or system nodes, and accept control commands from operators connected to the network.

All BRC controllers can be used in one-for-one redundant configuration for unparalleled reliability and system availability.

The BRC410 also provides high-speed, robust and real-time communication between Symphony Plus and third-party PLC systems, intelligent electronic devices (IEDs) and ABB's 800xA control system. This is performed via a 100 megabyte Ethernet network using the Modbus TCP communication protocol.

HR Series controllers

SPBRC410

SPBRC410

Technical data	
Processor	Industrial grade RISC type processor
Memory	8 MB DRAM, 2 MB NVRAM
Power requirements	Controller: 2 A at 5 VDC = 10 W PBA 100 mA at 5 VDC = 0.5 W
Redundant controllers	4 MB per second (normal operation)
Programmability	Function codes, Batch 90, user defined function codes (UDF)
Communications • Console HMI and engineering station • Controller peer-to-peer • HR Series I/O (Rack I/O) • SD Series I/O • S800 I/O via IOR810	 INFI-Net or PN800 exception reporting Controlway I/O expander bus HN800 (via PBA800) HN800 (via PBA800)
Ports	2 RS-232-C or 1 RS-232-C and 1 RS-485 1 10/100 Mbps Ethernet 1 mini-USB diagnostic port
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

Modbus TCP communication

The BRC410 controller seamlessly integrates intelligent field devices using the Modbus TCP communication protocol. This provides access to a wide range of ABB and third-party IEDs including transmitters, actuators, motor control centers and flame scanners.

Using Harmony Gateway software licenses, up to 4,000 Modbus TCP points can be integrated into the control configuration.

Type	License
License for HR Series	8VZZ000785L0121
500 Modbus TCP points	8VZZ000785L0062
1,500 Modbus TCP points	8VZZ000785L0063
3,000 Modbus TCP points	8VZZ000785L0064
4,000 Modbus TCP points	8VZZ000785L0065

HR Series communication

INFI-Net control network (Cnet) is a high-speed data communication highway between nodes in the Symphony Plus control system. It provides a data path for process control units (PCUs), the HMI and computers. High system reliability and availability are key characteristics of this mission-critical communication network.

PN800 Plant Network is a bidirectional, high-speed and redundant Ethernet control network that operates at a communication rate of 100 Mbaud. It supports the 2010 version of the IEC 62439 Parallel Redundancy Protocol (PRP-0 or PRP) for increased Ethernet network reliability and seamless fail-over caused by a single point of failure.

Reliability is bolstered by redundant hardware and communication media in a way that the backup module automatically takes over in the event of a fault in the primary module.

Extensive use of error checking and message acknowledgement ensures accurate communication of critical process data.

HR Series communication

SPIET800

SPIET800

The SPIET800 is an INFI-NET to computer transfer module. It enables communication with the host computer using the TCP/IP over Ethernet. It receives data from the controllers over the control network and sorts, organizes and stores this data until the host computer requests it. The SPICI800 is the related computer interface unit bundled kit and contains all the necessary modules, termination units, cables and mounting unit.

Technical data	
Memory	4 MB ROM; 64 MB RAM; 2 MB non-volatile RAM
Power requirements	+5 VDC at 1.05 A; 5.25 W typical
Ports	1 Ethernet port (a second Ethernet port is reserved for future use)
Communication rates	10/100 Mbps Ethernet
Tag capacity (point definitions)	30,000
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

Bundled kit		SPICI800
SPIET800	INFI-Net to Ethernet transfer module	1
SPNIS21	INFI-Net to node communication interface	**1**
NKLS01-10	SPNIS cable assembly, 10 ft.	**1**
IEMMU21	Module mounting unit	**1**
NFTP01	Field termination panel	1
NTCL01	Loop termination unit	1

SPIIT12

SPIIT12

The SPIIT12 is a remote transfer module for Cnet-to-Cnet communication. Using the RS-232-C protocol, it enables bi-directional communication between the central Cnet and a remote Cnet. The SPIIR01-232L is the related INFI-Net to INFI-Net remote interface bundled kit and contains all the necessary modules, termination units, cables and mounting unit.

Technical data	
Memory	256 KB ROM; 512 KB RAM; 256 KB NVRAM
Power requirements	+5 VDC at 2 A; 10 W typical
Ports	2 RS-232-C
Communication rates	User-selectable up to 19.2 kbaud
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

Bundled kit		SPIIR01-232L
SPNIS21	Network interface module	1
NKLS01-10	Communication module cable	**1**
NTCL01	Communication termination unit	**1**
SPIIT12	Local transfer module	**1**
NTMP01	Transfer module termination unit	**1**
NKTU01-10	Transfer module cable	**1**
IEMMU21	Module mounting unit	1
NFTP01	Field termination panel	1

HR Series communication

SPIIT13

SPIIT13

The SPIIT13 is a local transfer module that facilitates communication between two local Cnets. The SPIIL02-L is the related INFI-Net to INFI-Net local interface bundled kit and contains all the necessary modules, termination units, cables and mounting unit.

Technical data	
Memory	8 MB DRAM; 512 KB NVRAM; 2 MB flash ROM
Power requirements	+5 VDC at 2 A; 10 W typical
Ports	Diagnostic port P4, RS-232-C
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

Bundled kit		SPIIL02-L
SPNIS21	Network interface module	2
NKLS01-10	Communication module cable	2
NTCL01	Communication termination unit	2
SPIIT13	Local transfer module	1
IEMMU21	Module mounting unit	1
NFTP01	Field termination panel	1

SPNIS21

SPNIS21

The SPNIS21 network interface module is the front end of every Cnet communication interface. It is the intelligent link between nodes and the Cnet, allowing any node on the network to communicate with any other node. It works in conjunction with the SPNPM22 module.

Technical data	
Power requirements	+5 VDC at 825 mA; 4.1 W typical
Communication rates	Cnet: 10 MHz or 2 MHz
System capability	Cnet: Over 62,000 nodes in the system; 250 Cnet-to-Cnet interface nodes; 250 nodes on a single network in any combination of Cnet-to-HCU and Cnet-to-computer interfaces
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

SPNPM22

SPNPM22

The SPNPM22 network processing module is the gateway between Cnet and Controlway. It holds the Harmony control unit (HCU) database and directs the communication process between the modules residing on Controlway and the SPNIS21 module.

Technical data	
Memory	8 MB DRAM; 512 KB NVRAM; 2 MB flash ROM
Power requirements	+5 VDC at 2 A; 10 W typical
Ports	1 mini-USB Diagnostic port
Communication rates	Controlway: 1 Mbaud Modulebus: 83.3 kbaud
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

HR Series communication

SPCPM02

SPCPM02

The SPCPM02 communication port module connects an engineering work station to a single process control unit (PCU).

Technical data	
Memory	128 KB of ROM; 256 KB of RAM
Power requirements	+5 VDC at 750 mA; 3.8 W typical
Ports	1 isolated RS-232-C at up to 19.2 kbaud
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

SPRIO22

SPRIO22

The SPRIO22 remote I/O module enables communication between a HR Series controller and remotely located HR Series I/O modules over a distance of up to 3,000 meters. The remote link uses fiber optic cable in a star configuration. It supports full module and link redundancy. The SPRIORBX01K02 is the related HR Series HN800 remote I/O bundled kit and contains all the necessary modules, termination units, terminators and cables.

Technical data	
Memory	8 MB DRAM; 512 KB NVRAM; 2 MB flash ROM
Power requirements	+5 VDC at 2 A; 10 W typical
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

Bundled kit		SPRIORBX01K02
SPRIO22	Remote rack I/O module	2
PBA800	Process bus adapter	2
TRLRBX01K02	HN800 fiber optic termination unit kit	2
TER800	HN800/CW800 bus terminator	2
SPK800-PBA1-04	HN800 cable, 4.0 m	2
PMKHRMBRC3000A	RIO22 redundancy cable, 0.2 m	1

HR Series communication

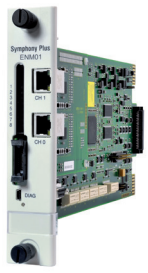
SPIPT800

SPIPT800

The SPIPT800 is the bi-directional transfer module between INFI-Net and PN800. It passes exception reports, control and configuration data between the INFI-Net and the PN800 using TCP/IP over Ethernet. The SPIEB800K02 is the related INFI-Net to PN800 Plant Network interface bundled kit and contains all the necessary modules, termination units, cables and mounting unit.

Technical data	
Memory	64 MB RAM, 2 MB NVRAM, 4 MB ROM
Power requirements	+5 VDC at 1.05 A; 5.25 W typical
Communication rates	10/100 Mbps Ethernet ports [CH 0 & CH 1]
System capacity	Up to 250 nodes on a single INFI-Net loop or PN800 network segment, 62,500 nodes total; up to 250 total INFI-Net loops or PN800 network segments
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

Bundled kit		**SPIEB800K02**
SPIPT800	INFI-Net to Plant Network transfer module	2
SPNIS21	Network interface module	2
NKLS01-10	Communication module cable	2
NTCL01	Communication termination unit	2
IEMMU21	Module mounting unit	1
NFTP01	Field termination panel	1
PBA800	Process bus adaptor 800	2
TER800	HN800/CW800 bus terminator	2
SPK800-RCL1	Bridge redundancy cable	1



SPENM01

SPENM01

The SPENM01 module combines the PCU communication functions performed by NIS and NPM modules into a single module and replaces INFI-Net with PN800 Plant Network.

Technical data	
Memory	All memory has 32-bit data path 64 Mbytes RAM; 4 Mbytes ROM; 2 Mbytes NVRAM
Power requirements	+5 VDC at 1.25 A; 6.25 W typical +5 VDC at 1.30 A; 6.5 W maximum
Communication and ports • Control Network • Diagnostic Service port	 2x redundant 100 Mbps Ethernet PN800 Plant Network 1x mini-USB port on module front plate
System capacity • PN800	 Up to 250 network segments per system. Up to 250 nodes per network segment
Ambient temperature	0° to 70°C (32° to 158°F)

HR Series I/O modules

SPASI23

SPASI23

The SPASI23 isolated analog input module processes up to 16 analog field inputs. Each channel features a dedicated analog-to-digital converter with a resolution of 24 bits. Input processing, calibration, point value calculations, lead wire resistance adjustment, cold junction compensation, gain and offset adjustment, and engineering unit conversion are all automatically performed by the SPASI23 module.

Technical data	
Power requirements	+ 5 VDC, ± 5% at 500 mA typical
Analog input channels	16 independently configured channels
High level	1 to 5 VDC, 0 to 5 VDC, 0 to 10 VDC -10 VDC to +10 VDC, or user specified range within -10 VDC and +10 VDC
Millivolt	-100 mV to +100 mV, 0 to 100 mV
Thermocouples	Type B, E, J, K, L, N (14 AWG), N (28 AWG), R, S, T, U Chinese type E and Chinese type S
3-wire RTD	100 Ω platinum: U.S. Lab. Standard 100 Ω platinum: U.S. Industry Standard 100 Ω platinum: European Standard 120 Ω nickel 10 Ω copper Chinese 53 Ω copper
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

SPFEC12

SPFEC12

The SPFEC12 module provides 15 channels of analog input signals. Each channel has a 14-bit resolution and can be individually programmed. The SPFEC12 interfaces analog signals from field devices to the controller. It is designed for use with conventional transmitters and standard analog inputs.

Technical data	
Power requirements	5 VDC, ± 5% at 85 mA typical +15 VDC, ± 5% at 25 mA typical –15 VDC, ± 5% at 20 mA typical 1.1 W typical
Analog input channels	15 independently configured channels
Current	4 to 20 mA
Voltage	1 to 5 VDC, 0 to 1 VDC, 0 to 5 VDC, 0 to 10 VDC, -10 to +10 VDC
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

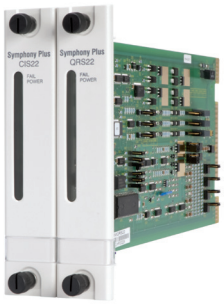
HR Series I/O modules

SPASO11

SPASO11

The SPASO11 provides 14 separate analog output signals that can be used to control a process. Each channel has a 10-bit resolution and can be individually programmed. Each output reads back the signal to the field to ensure accurate operation and eliminate the need to calibrate outputs.

Technical data	
Power requirements	+ 5 VDC, ±5% at 250 mA typical +15 VDC, ±5% at 100 mA typical - 15 VDC, ±5% at 90 mA typical + 24 VDC, ±10% at 310 mA typical
Analog input channels	14 independently configured channels
Current	4 to 20 mA
Voltage	1 to 5 VDC
Output load (current)	750 Ω maximum
Output load (voltage)	22 Ω minimum
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)



SPCIS22 and SPQRS22

SPCIS22 and SPQRS22

The SPCIS22 and SPQRS22 are the control I/O modules for the HR Series. These two modules are functionally identical, although the SPQRS22 provides approximately ten times faster response. The noise rejection of the SPQRS22 module is lower than that of the SPCIS22. Each I/O channel can be individually programmed.

Technical data	
Power requirements	5 VDC, ±5% at 100 mA typical, 180 mA max. +15 VDC, -2.5%, +5% at 27 mA typical, 35 mA max. -15 VDC, -5%, +2.5% at 23 mA typical, 30 mA max. 24 VDC, ±10% at 46 mA typical, 65 mA max. (from termination unit)
Analog input channels	14 independently configured channels
Digital inputs	3 optically isolated channels
Digital outputs	4 optically isolated, independently configured, open-collector channels
Analog inputs	4 4-20 mA independently configured channels
Analog outputs	2 4-20 mA independently configured channels
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

HR Series I/O modules

SPDSI13

SPDSI13

The SPDSI13 digital input module processes up to 16 digital field inputs for a Symphony Plus controller. Each channel is optically isolated and has a fixed input voltage of 24 VDC.

Technical data	
Power requirements	5 VDC, ± 5% at 95 mA typical
Digital input channels	16 optically isolated channels
Current	5.5 mA
Voltage	24 VDC
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

SPDSI14

SPDSI14

The SPDSI14 digital input module processes up to 16 digital field inputs for a Symphony Plus controller. Each channel is optically isolated and has a fixed input voltage of 48 VDC.

Technical data	
Power requirements	5 VDC, ± 5% at 95 mA typical
Digital input channels	16 optically isolated channels
Current	4.7 mA
Voltage	48 VDC
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

SPDSI22

SPDSI22

The SPDSI22 digital input module processes up to 16 digital field inputs for a Symphony Plus controller. Each channel is optically isolated and can be individually programmed for 24 VDC, 48 VDC, 125 VDC and 120 VAC input.

Technical data	
Power requirements	5 VDC, ± 5% at 95 mA typical
Digital input channels	16 optically isolated channels
Current	4.5 mA at 125 VDC; 6 mA at 120 VAC
Voltage	125 VDC; 120 VAC
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

HR Series I/O modules

SPDSM04

SPDSM04

The SPDSM04 pulse input module processes up to eight pulsed field inputs for a Symphony Plus controller. Each channel can be individually programmed for 5 VDC or 24 VDC contact input or 50 millivolts to 10 volts peak-to-peak. The SPDSM04 operates in four different modes depending on the function code being used: period, frequency, totalize or duration.

Technical data	
Power requirements	5 VDC, ± 5% at 1.4 A typical 24 VDC, ±10% at 62 mA typical (from termination unit)
Pulse input channels	8 independently configured, optically isolated channels
Range 1 • Voltage • Current • Logic 1 • Logic 0	 4.0 VDC to 6.0 VDC 14.8 mA max. at 6.0 VDC 4.0 VDC min., 6.0 VDC max. 0 V min., 1.0 V max.
Range 2 • Voltage • Current • Logic 1 • Logic 0	 21.6 VDC to 27.0 VDC 8.4 mA max. at 24.0 VDC 21.6 VDC min., 27.0 VDC max. 0 VDC min., 1.0 VDC max.
Range 3 • Voltage • Current • Logic 1 • Logic 0	 50 mV_{PP} to 10 V_{PP} (pre-amplifiers) 0.4 mA max. at 10.0 V_{PP} 25.0 mVP min., 5.0 VP max. -5.0 VP min., -25.0 mVP max.
Max. input frequency	50 kHz (at 50% duty cycle)
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

SPDSO14

SPDSO14

The SPDSO14 digital output module processes up to 16 digital open-collector control outputs for a Symphony Plus controller. Each channel is optically isolated and can switch 24 VDC at 250 mA and 48 VDC at 125 mA. The module can cable-connect to solid state relays on the NTDO02 termination unit. Optionally, the module can also cable-connect to a relay assembly to drive electromechanical relays.

Technical data	
Power requirements	5 VDC, ± 5% at 275 mA typical
Digital input channels	16 optically isolated, independently configured, open-collector channels
Load voltage	24 VDC at 250 mA max. 48 VDC at 125 mA max.
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

HR Series I/O modules

SPDSO15

SPDSO15

The SPDSO15 digital output module processes up to eight digital relay contact control outputs for Symphony Plus controllers. The output channels drive single pole, double throw (SPDT) relays that provide normally open or normally closed relay contacts.

Technical data	
Power requirements	5 VDC, ± 5% at 90 mA typical 24 VDC, ±10% at 120 mA typical (from termination unit)
Digital output channels	8 SPDT relay contacts
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

HR Series I/O modules – Sequence of events

HR Series Sequence of Events (SOE) provides distributed event monitoring, recording and reporting capabilities for the Symphony Plus control system. An SOE event is a transition of a digital single from on to off or vice versa. A series of SOE modules collects and time-stamps these digital transition events and makes them available to the system.

Server node
The SOE01 server node consists of the SPNIS21 module, the SPSEM11 SOE master module and the SPTKM01 time keeper master module.

SPSEM11

SPSEM11
The SPSEM11 SOE module communicates with the SPNIS21 and SPTKM01 modules.
It communicates with other nodes in the control network through the SPNIS21.
The SPSEM11 is responsible for managing the distributed SOE system, including:

- 1,500 points from Sequence of Event Digital (SED) and Sequence of Event Timing (SET) I/O modules
- 256 complex triggers with 16 operands each
- 3,000 simple triggers

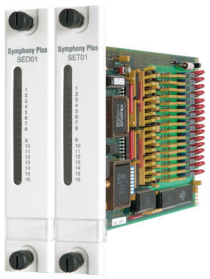
Technical data	
Power requirements	+ 5 VDC, ± 5% at 1.78 A typical
Microprocessor	16 bits at 10 MHz
Memory	2 MB RAM 512 KB ROM 512 KB NVRAM
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

SPTKM01

SPTKM01
The SPTKM01 time keeper master module provides time information to the SPSEM11 module and to the rest of the distributed SOE system through a time synchronization link.
The SPTKM01 module connects to an external receiver using the IRIG-B time code link.
The module transmits absoloute time to the rest of the system using the RS-485 time synchronization link.

Technical data	
Power requirements	5 VDC, ± 5% at 300 mA typical
Microprocessor	16 bits at 10 MHz
Communication • Input • Output	 IRIG-B in DC level shift format (through NTST01) RS-485 time synchronization at 62.5 kbaud (through NTST01)
Output time accuracy • Synchronization time • Absolute time (to SEM11)	 ±10 µsec ±1 msec
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

HR Series I/O modules – Sequence of events



SPSET01 and SPSED01

SPSET01 and SPSED01

The SPSET01 sequence of events timing module processes up to 16 digital field inputs, and receives and decodes the time synchronization link information sent by the SPTKM01 module. Each channel is optically isolated and can be individually programmed for 24 VDC, 48 VDC, 125 VDC and 120 VAC input.

The module communicates with the controller over an I/O expander bus. Only one SPSET01 module can operate on an I/O expander bus segment.

The SPSED01 sequence of events digital input module is similar to the SPSET01 module except that it only processes the 16 digital field inputs. It does not process information from the time synchronization link. Up to 63 SPSED01 modules can operate on an I/O expander bus segment along with one SPSET01 module.

Technical data	
Power requirements	+5 VDC, ±5% at 350 mA typical
Microprocessor	16 bits at 10 MHz
Memory	64 KB RAM 64 KB ROM
Digital input channels	16 optically isolated channels 24 VDC (±10%) 48 VDC (±10%) 125 VDC (±10%) 120 VAC (±10%) (only for system control logic)
Ambient temperature	0 °C to 70 °C (32 °F to 158 °F)

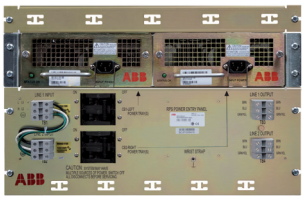
Termination units

Termination units	
NFTP01	The NFTP01 is a field termination panel. It is used for mounting termination units inside a 19" rack style cabinet. One NFTP01 can accommodate two termination units.
NTAI05	The NTAI05 analog input termination unit provides a signal path between 15 input signals from the field and the SPFEC analog input module.
NTAI06	The NTAI06 analog input termination unit provides signal paths between 16 input signals from the field and the SPASI analog input module.
NTCF21/NTCF22/NTCF23	The NTCF family of termination units interfaces the PCU communication node (NIS/NPM) modules to a fiber optic medium for long-distance communication. These termination units allow complete fiber optic or mixed fiber and copper cables. The NTCF21 is a fiber-to-fiber termination unit. It allows for direct connection of a 62.5 micron fiber optic cable for TX and RX. The NTCF22 is a fiber-to-copper termination unit. It allows direct connection of a 62.5 micron fiber optic cable at the RX end, and a standard coaxial or twinaxial INFI-Net cable at the TX end. The NTCF23 is a copper-to-fiber termination unit. It connects standard INFI-Net coaxial or twinaxial cables at the RX end and a 62.5 micron fiber optic cable at the TX end.
NTCL01	The NTCL01 communication termination unit terminates the control network (Cnet) connection to the SPNIS module. It supports either twinaxial or coaxial cable connections.
NTCS04	The NTCS04 is a termination unit which provides connections for the SPCIS and SPQRS modules.
NTDI01	The NTDI01 digital input termination unit provides signal paths between 16 digital input signals from the field and the SPDSI, SPDSO and SPDSM modules.
NTDI02	The NTDI02 is a hot switch termination unit that provides signal paths for 16 signals from the field and the SPDSI, SPDSO, SPDSM and SPASO modules.
NTDO02	The NTDO02 is a 16-channel digital output termination unit that provides up to 8 solid state relay outputs. The NTDO02 works with the SPDSO digital output module. Each of the 16 output signals from the DSO module can drive up to nine relays via the NTDO02 termination unit.
NTMP01	The NTMP01 is a multi-function processor termination unit used with rack-mounted controllers. It provides serial communication ports for a Harmony Rack controller and Cnet-to-Cnet communication interface. It features two isolated RS-232-C ports and one non-isolated RS-485 port.
NTST01	The NTST01 is a termination unit used with SOE applications. It can be used with the SPTKM or SPSET modules.

Cables

Cables	
NKAS01/NKAS11	The NKAS01 is a PVC-insulated cable used to connect the NTAI06 analog input termination unit to the SPASI analog input module. The cable has a single connector at the I/O module end and two connectors at the TU end. It is available in varying lengths of up to 100 ft. Non-PVC insulation is also available (NKAS11).
NKCL01/NKCL11	The NKCL01 is a PVC-insulated node-to-node cable used to connect two NTCL01 termination units in different cabinets. The cable connects to the NKTL01 coaxial adapter cable at each end, which in turn connects to the NTCL01. The NKCL01 is available in varying lengths of up to 100 ft. Non-PVC insulation is also available (NKCL11).
NKLS01/NKLS11	The NKLS01 is a PVC-insulated cable used to connect the NTCL01 termination unit to the SPNIS communication module. The cable has a hooded connector at the SPNIS module end and a socket connector at the NTCL01 termination unit end. It is available in varying lengths of up to 50 ft. Non-PVC insulation is also available (NKLS11).
NKTL01	The NKTL01 is a PTV-insulated cable used to connect two NTCL01 termination units, typically in different cabinets. The cable connects to the NTCL01 at one end, and to the NKCL01 at the other end via the coaxial adapter. It is available in lengths of 3 ft.
NKTT01	The NKTT01 is a PVC-insulated cable used to connect two NTCL01 termination units within the same cabinet. It has one coaxial connector at each end. It is available in lengths of 3 ft.
NKPL01	The NKPL01 is a twinaxial cable which can be used to connect two NTCL01 termination units. The cable supports slower speed and is primarily used for older plant loop networks. It has three twinaxial cable leads at each end. It is available in varying lengths of up to 100 ft.
NKDO01/NKDO11	The NKDO01 is a PV-insulated cable used to connect two NTDO02 termination units. It comes in lengths of 2, 3 and 5 ft. Non-PVC insulation is available (NKDO11).
NKSD01	The NKSD01 is a PVC-insulated cable used to connect the SPSED SOE module to the NTDI01 termination unit. It has a hooded connector at the module end (SPSED) and a socket connector at the termination unit (NTDI01) end. It is available in varying lengths of up to 25 ft.
NKST01/NKST11	The NKST01 is a PVC-insulated cable used to connect the SOE module SPSET to the NTST01 termination unit. Non-PVC insulation is also available (NKST11).
NKTK01	The NKTK01 is a PVC-insulated cable used to connect the SOE module SPTKM to the NTST01 termination unit.
NKTU01/NKTU11	The NKTU01 is a PVC-insulated cable used to connect I/O modules to the appropriate termination unit. The cable has a hooded connector at the I/O module end and a socket connector at the termination unit end. It is available in varying lengths of up to 200 ft. Non-PVC insulation is also available (NKTU11).

Modular Power System III



Modular Power System III (MPS III)

Modular Power System III (MPS III) is specifically designed for powering Symphony Plus/ Harmony rack-based modules and associated field-mounted devices. The MPS III can provide 5, +15, -15 and 24 VDC system power as well as 24, 48 and 125 VDC for field-powered devices. Special features of the MPS III include: power factor correction, online power supply replacement, power and cooling status monitoring, and adaptability to various power input sources. The MPS III assembly includes all the hardware necessary for: AC input power distribution to the individual power supplies, DC output distribution, power and fan monitoring, interconnecting cables, and cabinet mounting hardware. The MPS III is designed to support 2N power redundancy.

Modular Power System III (MPS III)	
Inputs	120/240 VAC or 125 VDC power feeds allowing mixed AC and DC operation.
Outputs	Provides system power of 5, +15, -15 and 24 VDC and field power of 24, 48 and 125 VDC.
Availability	Built-in power distribution schemes support single and dual (main and auxiliary, AC and DC) power feeds for 2N power configurations.
Durability	Automatic load sharing of dual supplies reduces the burden on an individual supply, increasing the overall reliability and achieving a high MTBF.
Serviceability	Local status indicators, disconnects and plug-in cable assemblies facilitate online fault isolation and replacement.
Monitoring	Provides system DC power outputs, field power outputs, fan status and cabinet temperature monitoring.
Industrial quality	Designed for ambient temperatures as high as 70 °C (inside the cabinet) as well as MIL-STD ratings for vibration, IEC standards for EMI and RFI, and UL rating for flammability.
Performance	Power factor correction, electronic output protection are inherent features.
Upward compatibility	Compact design allows for use in the new standard ABB cabinets and as replacement for older power systems supplied with Symphony and INFI 90 OPEN systems.

Modular Power System IV

Modular Power System IV (MPS IV)

The Modular Power System IV provides 5 VDC, 15 VDC, –15 VDC, 24 VDC, 48 VDC, and 125 VDC operating voltages to controller, I/O and communications modules as well as power to operate field devices. Enhanced reliability and availability is ensured with modern component design, 2N power redundancy, advanced redundant PFI monitoring and bumpless switchover. It directly accepts 110/240 VAC or 110/220 VDC inputs power with no switches or jumpers to set.

Modular Power System IV (MPS IV)	
Power input	
• Voltage	102 to 265 VAC, 102 to 370 VDC
• Peak in rush current	40 A peak
• Frequency (AC)	47 to 63 Hz
• Efficiency	≥80% at full load
• Power factor correction	≥0.90
Upward compatibility	The Modular Power System IV is fully compatible with INFI 90, Harmony, and Symphony Plus HR Series control systems. It has in general a smaller foot print than previous generations of Modular Power System I, II, or III, so it will fit well as an evolution solution.
Operational temperature	-20° to 70°C (-4° to 158°F)
Monitoring	Advanced redundant PFI monitoring of system DC power outputs.
Serviceability	Local status indicators, disconnects and plug-in cable assemblies facilitate online fault isolation and replacement.
Performance	Power factor correction, electronic output protection and bumpless switchover are inherent features.

HR Series – References

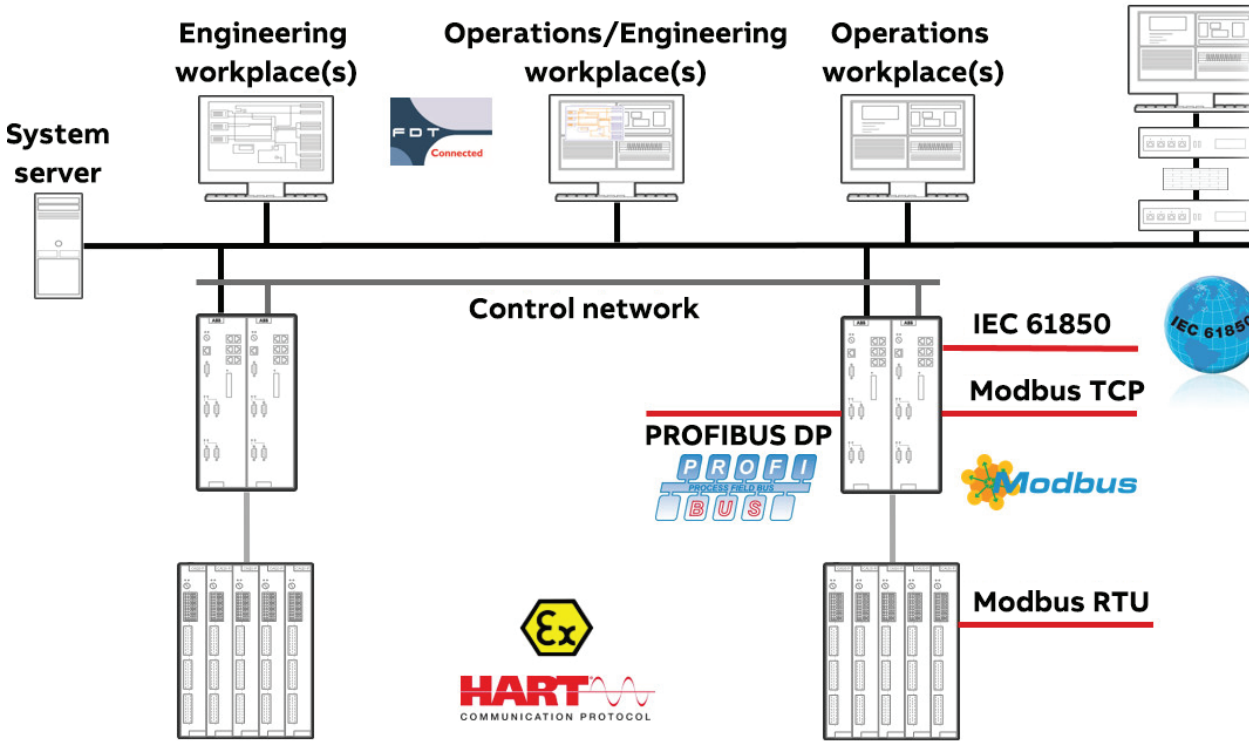
Document ID	Document Description
2VAA005093	HR Series control and I/O brochure
2VAA005507	HR Series Bridge Controllers data sheet
2VAA001180	ICI800 Ethernet CIU data sheet
8VZZ000344T0001	ENM01 Ethernet Network module data sheet
2VAA002014	HR Series Communications modules data sheet
2VAA002730	IEB800 INFI-Net to Ethernet Bridge data sheet
2VAA002016	HR Series Analog I/O modules data sheet
2VAA002017	HR Series Digital I/O modules data sheet
2VAA002018	HR Series Control I/O modules data sheet
2VAA002015	HR Series Sequence of Events data sheet
2VAA001765	HR Series Modular Power System III data sheet
8VZZ000095T0000	HR Series Modular Power System IV data sheet

For documentation not publicly available, please contact your ABB representative

For your notes

MR Series (Melody Rack)

Continuous productivity improvements and increased profitability determine a customer's choice of automation system. Such a system must support users with the ability to react quickly to ever rising demands from the markets they serve. Traditionally, production facilities maintained many controller subsystems, each of which had to meet specific plant needs. As business goals are continually changing, however, using a scalable controller platform that possesses multifunctional capabilities, adapts to changing requirements, and maximizes openness and availability, is paramount to success.



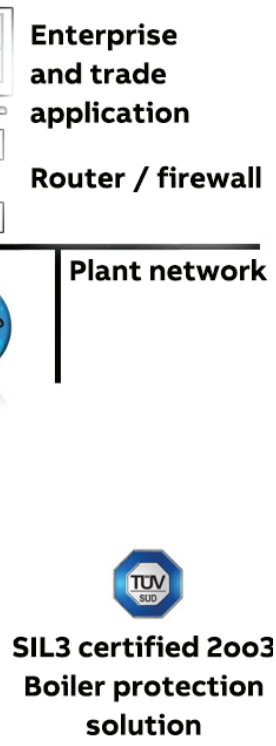
Symphony Plus MR Series (Melody Rack) controllers, communication interfaces and I/O modules meet the most challenging requirements. Thanks to their modular design, they can be easily adapted for a wide variety of plant types and sizes.

Supported by an efficient engineering workbench, MR Series control-based solutions contribute to a higher return on assets by improving overall production control, maximizing process availability and minimizing maintenance.

The MR Series includes a series of DIN rail-mounted controllers, a wide range of I/O modules and modern, standardized fieldbus interfaces. These modules offer all the functions required for data acquisition and signal conditioning, as well as powerful open loop and closed loop control, sequence control and monitoring.

Execution of all process management tasks is based on integrated complex control strategies. Without the need for configuration, the MR Series' inherent redundancy design – including integrated redundancy concepts for power supply, communication and I/O – provides the highest level of availability.

The control subsystem includes flexible communication options to I/O and intelligent field devices via system buses. HART as well as PROFIBUS information, including configuration and diagnostic information, is communicated via the control network. This information is available to system controllers and system level applications such as asset optimization and device management. The comprehensive bus concept of the system controller allows for the easy integration of HART, PROFIBUS, Modbus RTU and TCP field devices as well as of PROFIBUS and IEC 61850 electrical assets.



SIL3 certified 2oo3 Boiler protection solution

MR Series controllers

Symphony Plus MR Series controllers are designed for maximum computing power and modular scalability.

With this compact device customers receive the latest control technology perfected for wall-mounted or cabinet installation.

Without requiring additional configuration, the MR Series controllers' inherent redundancy design for power supply, communication and I/O provides users with the highest level of availability. The assembly consists of DIN rail-mounted housings, standard MR Series racks and 19" racks.

The CPU module uses a 32-bit processor for maximum computing power and modular scalability. The integrated redundant PROFIBUS interface provides connectivity to ABB's S800 and S900 I/O families and to other PROFIBUS devices. HART communication is system integrated, including configuration and diagnostics, through the control network. MR Series controllers are fully compatible with former Melody solutions, thus allowing reuse of the comprehensive portfolio of I/O modules and communication interfaces. They seamlessly integrate into the control network. The network is easy to handle and does not need any routing configuration. Each controller can handle up to 2,000 analog and/or digital I/O points from the local I/O, and 6,000 analog and/or digital I/O points connected via PROFIBUS DP. In addition to standard tasks such as signal processing, loop and logic control, the S+ Control & I/O MR Series controller also performs complex computations such as sequential, batch and advanced controls.

All Symphony Plus MR Series controllers are time synchronized with a precision of 0.5 ms. Sequence of events (SOE) time stamping with a resolution of 1 ms is supported directly at the controller and local I/O module level (time stamping on source level).

Diagnostic routines periodically check hardware and firmware integrity. Any abnormal conditions are automatically routed to the HMI or to other alarm or message collecting software.

Melody redundant design provides an automatic one-to-one backup, thus ensuring high system availability. If the primary controller is faulty, the hot standby controller, executing the same control strategy and process data, immediately takes over control.

MR Series controllers

PM 877

PM 877

The PM 877 is the latest addition to the MR Series controller line. It is the successor product for CMC 50 and CMC 60 (incl. communication modules CCO 30) as well as CMC 70, PM 875 and PM 876 and their variants. Existing installations can make use of PM 877 without the need to replace hardware components, change cabling or adjust existing control logic.

PM 877 is supported by S+ Engineering for Melody 1.0 onwards.
S+ Engineering also supports the automatic replacement of predecessor types by PM 877.

Technical data	
CPU	32-bit with integrated FPU
Flash	256 MB
RAM	DDR3, 512 MB
MRAM	6 MB
Supply voltage	20 to 33 VDC
Current consumption	0.7 A at 24 V (nominal) 0.85 A at 20 V (max.)
Power dissipation	Max. 17 W
Communication interfaces	
• Ethernet	Serial, 100 Mbit/s via RJ45 socket on the front panel 100BaseTX (RJ45) physical connection based on Ethernet IEEE 802.3 for Modbus TCP and IEC61850 communication
• Redundancy link (RL)	Serial, 100 Mbit/s via RJ45 socket on the front panel 100BaseTX (RJ45) physical connection based on Ethernet IEEE 802.3. Patch cable (normal or crossed) required between redundant PM 877
• HMI interface (Onet)	Serial, 100 Mbit/s via RJ45 socket on the front panel 100BaseTX (RJ45) physical connection based on Ethernet IEEE 802.3
• Control network (Cnet (SC))	Serial, 1 MBd redundant implementation accessible through the system plug at the rear
• Control network (Cnet (C))	Serial, 1 MBd redundant implementation accessible through the system plug at the rear
• Field network (to local I/O cards, Fnet)	Serial, 2 x 375 kBd OR 1 x 2 MBd redundant implementation accessible through the plugs at the rear
• PROFIBUS DP (DPnet 0 - DP0)	Serial, 9,600 bit/s ... 12 Mbit/s redundant implementation accessible via 9-pin SUB-D socket on the front panel
• PROFIBUS DP (DPnet 1 - DP1)	Serial, 9,600 bit/s ... 12 Mbit/s redundant implementation accessible via 9-pin SUB-D socket on the front panel
• Front panel interface	RS422 interface for connection of radio clock (SI0) accessible via 9-pin SUB-D socket on the front panel
• Service interface	RJ45 - RS232 interface (SI1) accessible via RJ45 socket on the front panel, RJ45 to SUB-D adapter cable needed
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	81.28 mm width, 311.15 mm height, 160 mm depth (3.2 in. width, 12.25 in. height, 6.3 in. depth)

MR Series controllers

PM 875-3

PM 875-3

The PM 875-3 controller is a variant of PM 875-2. It is limited for use with SIL 3 certified boiler protection applications only (2oo3D protection system, AC 870P).

Technical data	
CPU	32-bit with integrated FPU
Flash	64 MB
RAM	256 MB
SRAM	16 MB
Supply voltage	20 to 33 VDC
Current consumption	1.5 A at 24 V (nominal), 1.7 A at 20 V (max.)
Power dissipation	Max. 36 W
Communication interfaces	
• Ethernet	Serial, 100 Mbit/s via RJ45 socket on the front panel 100BaseTX (RJ45) physical connection based on Ethernet IEEE 802.3
• Redundancy link (RL)	Serial, 100 Mbit/s via RJ45 socket on the front panel 100BaseTX (RJ45) physical connection based on Ethernet IEEE 802.3
• HMI interface (Onet)	Serial, 100 Mbit/s via RJ45 socket on the front panel 100BaseTX (RJ45) physical connection based on Ethernet IEEE 802.3
• Control network (Cnet (SC))	Serial, 1 MBd redundant implementation accessible through the system plug at the rear
• Control network (Cnet (C))	Serial, 1 MBd redundant implementation accessible through the system plug at the rear
• Field network (to local I/O cards, Fnet)	Serial, 2 Mbd redundant implementation accessible through the plugs at the rear
• PROFIBUS DP (DPnet 0 - DP0)	Serial, 9,600 bit/s ... 12 Mbit/s redundant implementation accessible via 9-pin SUB-D socket on the front panel
• PROFIBUS DP (DPnet 1 - DP1)	Serial, 9,600 bit/s ... 12 Mbit/s redundant implementation accessible via 9-pin SUB-D socket on the front panel
• Front panel interface	RS422 interface for connection of the radio clock (SS0) accessible via 9-pin SUB-D socket on the front panel
• Service interface	Plastic optical fiber interface (SS1) accessible via the front panel (special plastic optical fiber cable needed for conversion to RS232, max. length 15 m)
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	81.28 mm width, 311.15 mm height, 160 mm depth (3.2 in. width, 12.25 in. height, 6.3 in. depth)

MR Series communication – Couplers

CCC 37-P

CCC 37-P

The CCC 37-P coupling module provides a signal exchange between several Melody systems or islands. The coupling between systems takes place through a Cnet (SSC) automation bus, which provides a superordinate network. CCC 37-P functionally operates as a gateway. CCC 37-P is a form fit functional replacement of the CCC 30-2-P.

Technical data	
CPU	32-bit with integrated FPU
Flash memory	256 Mbyte
DDR3 SRAM memory	512 Mbyte
MRAM memory	6 Mbyte
CPU core clock rate	800 MHz
Cnet(C)	Serial, (redundant line 1MBd)
Cnet(SC)	Serial, (redundant line 1MBd)
Service interface SI1	RJ45 – RS232 interface Accessible through RJ45 socket on the front panel to SUB-D adapter cable needed Product ID: 3BSC630197R1 Product Description: TK212A tool cable
Service interface SI2	RJ45 – RS232 interface (intended to be used by the ABB service only)
Redundancy link backplane	Serial, 1.5 MBd accessible via system plug on the backplane. Accessible through the system plug in the rear Serves as backup redundancy link if the redundancy link RL on the front panel fails
RL - Redundancy link front panel	Ethernet, 100 Mbps through RJ45 socket on the front panel 100BaseTX (RJ45) Physical connection based on Ethernet IEEE 802.3 Patch cable (normal or crossed) required between redundant CCC 37-P.
Onet	Future use Ethernet, 100 Mbit/s via RJ45 socket on the front panel 100BaseTX (RJ45) Physical connection based on Ethernet IEEE 802.3
Eth	Future use Ethernet, 100 Mbit/s via RJ45 socket on the front panel 100BaseTX (RJ45) Physical connection based on Ethernet IEEE 802.3
Supply voltage	Uv = +20...+33 V
Permissible excess voltage	35 V (for t = 1 s) 45 V (for t = 10 ms)
Fuse	Fusible plug 5 * 20 T 3.15 H only
Current consumption	I_{NOM}=0.7 A at UV=24 V I_{MAX}=0.85 A at UV=20 V
Power dissipation	Maximum 17 W
Ambient temperature	0 ... 50 °C (temperature for ventilation of the module in the rack)
Dimensions	81.28 mm width, 311.15 mm height, 160 mm depth (3.2 in. width, 12.25 in. height, 6.3 in. depth

MR Series communication – Couplers

CCF 10-2-P

CCF 10-2-P
The CCF 10-2-P module provides a galvanically isolated Modbus RTU connection via one of the following hardware interfaces: RS422, RS485, RS232, TTY.

Interoperability of the Symphony Plus MR Series controllers with the CCF 10-2-P modules is achieved via a high-speed, redundant serial field network (Fnet). The modules are powered by a modular power supply, which can also be provided redundantly. All process signals are accessible from the front panel. The buses are connected to termination units on the front panel. A processor in each module provides advanced functions like event detection, system diagnostics and alarm generation.

Technical data	
Galvanic isolation	Central
Supply voltage	20 to 33 VDC
Current consumption	260 mA typical + interface load
Power dissipation	6.24 W typical + 0.4W (TTY) + 0.12 W (RS232) + 0.2 W (RS485/RS422)
Channels (No. and type)	1 Modbus (master) RTU: 230 input data words 90 output data words
Connection	RS422/RS485 (two-pair twisted, shielded cable) RS232C (two-pair twisted, shielded cable) TTY/20mAe
RAM	8 MB, buffered and parity protected
Line length (max.)	< 1,000 m (RS485 at 9 kBd) < 50 m (RS232C at 9 kBd)
Baud rates	300, 600, 1200, 2400, 4800, 9600, 19200 Bd
Supported function codes	FC1, FC2, FC3, FC4, FC5, FC6, FC15, FC 16, FC8
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series communication – Repeater

CCR 70-2-P

CCR 70-2-P
The CCR 70-2-P module is a repeater for Fnet or Cnet communication. It has galvanically isolated interfaces for point-to-point communication and for extensions to Y or star topologies. The Y and star topology extensions are achieved by plugging in up to four coax-modules (CM100-P) or fiber optic modules (FM200-P) into the repeater. The extension modules are accessible from the front panel.

CM 100-P is an extension module for CCR 70-2-P that can be used if the topology for Fnet or Cnet has to be extended to a Y topology.

FM 200-P is an extension module for CCR 70-2-P that can be used if a fiber optic cable is required or if the topology for Fnet or Cnet has to be extended to a star topology. Up to four additional FM 200-P modules can be plugged into the CCR 70-2-P repeater module.

CCR 70-2-P

Technical data	
Galvanic isolation	Yes
Supply voltage	20 to 33 VDC
Current consumption	35 mA at 24 V
Power dissipation	0.84 W (max.)
Channels (No. and type)	1 bus line (Fnet or Cnet)
Coaxial interface	RS 485, 75 Ohm
Connection	BNC
Line length (max.)	200 m 500 m (for point to point conversion)
Ambient temperature	0 °C to 70 °C (temperature for cooling the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series communication – Repeater

CM 100-P

Technical data	
Galvanic isolation	Yes
Supply voltage	Via CCR 70-2-P
Current consumption	5 mA at 24 V
Power dissipation	0.12 W (max.)
Channels (No. and type)	1 bus line (Fnet or Cnet)
Coaxial interface	RS 485, 75 Ohm
Connection	BNC
Line length (max.)	200 m 500 m (for point to point conversion)
Ambient temperature	0 °C to 70 °C (temperature for cooling the module in the rack)
Dimensions	20.32 mm width, 66.67 mm height, 83 mm depth (0.8 in. width, 12.25 in. height, 3.25 in. depth)

FM 200-P

Technical data	
Galvanic isolation	Yes
Supply voltage	Via CCR 70-2-P
Current consumption	15 mA at 24 V
Power dissipation	0.36 W (max.)
Channels (No. and type)	1 bus line (Fnet or Cnet)
Fiber optic interface	G50/125 multimode gradient index fiber 850 nm (wave length)
Connection	FSMA
Line length (max.)	2,000 m
Ambient temperature	0 °C to 70 °C (temperature for cooling the module in the rack)
Dimensions	20.32 mm width, 66.67 mm height, 83 mm depth (0.8 in. width, 12.25 in. height, 3.25 in. depth)

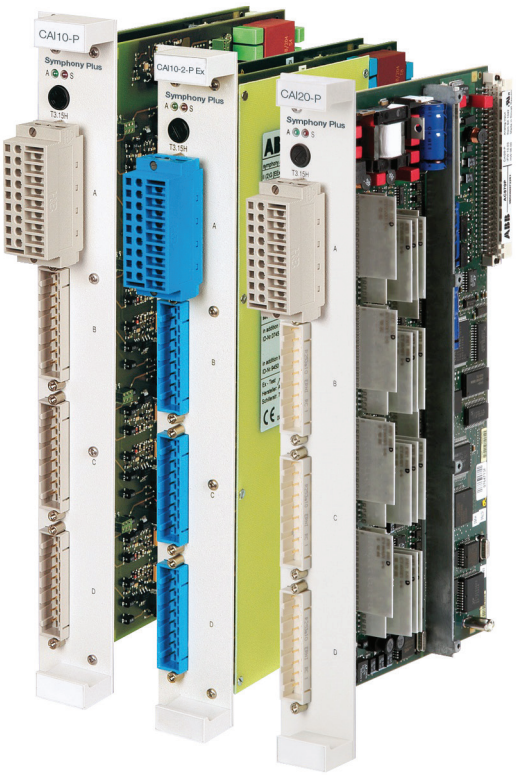
MR Series I/O modules

Interoperability of Symphony Plus MR Series controllers with local I/O modules is achieved via a high-speed, redundant serial field network (Fnet). An I/O module processes inputs from, and outputs to, field devices and transfers these signals to the controller with a time-stamped resolution of 1 ms. The I/O modules are powered by a modular power supply, which can also be provided redundantly.

All process signals are accessible from the front panel. The field cables are connected to cable termination units. For I/O redundancy, associated termination units are used. With these termination units, it is possible to replace defective modules without disconnecting the field cable and without field interruption, thus providing maximum availability.

A processor in each I/O module provides advanced functions like event detection, system diagnostics and alarm generation. The rack I/O firmware is downloadable.

Channel configuration can easily be done without need for calibration or any jumper settings on the I/O boards. Each module supports online replacement of I/O modules; this secures continuous production in redundant configurations.



MR Series I/O modules

CAI 10-P

CAI 10-P

The CAI 10-P module provides up to 16 analog input channels that are channel-wise galvanically isolated. The transmitter supply is onboard and protected against overload (short-circuit proof). CAI 10-P communicates digitally with the transmitter via the HART protocol.

Technical data	
Galvanic isolation	Channel-wise
Supply voltage	20 to 33 VDC
Current consumption	≤ 230 mA (no load) 580 mA at 24 V and simultaneity factor Eta = 0.75
Power dissipation	11.0 W at 24 V (max. for 16 2-wire transmitters) 13.6 W at 24 V (max. for 16 4-wire transmitters)
Channels (No. and type)	16 independently configured input channels
Nominal current range	4 to 20 mA (2-wire transmitter) 0/4 to 20 mA (4-wire transmitter)
Signal scope	3 to 23.0 mA (2-wire transmitter) 0/3 to 23.0 mA; Imax < 50 mA (4-wire transmitter)
Supply to transmitters/sensors • Voltage • Rated current	 ≥ 16.5 V (for 2-wire transmitter supply plus voltage drop on wire) 23 mA (for 2-wire transmitter supply)
Short-circuit current of transmitter supply	23.6 to 28.5 mA (short-circuit proof) (for 2-wire transmitter supply)
HART version	5.0 / 5.1
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

CAI 20-P

CAI 20-P

The CAI 20-P module provides up to 32 analog input channels that are module-wise galvanically isolated. The transmitter supply is onboard and protected against overload (short-circuit proof). CAI 20-P communicates digitally with the transmitter via the HART protocol.

Technical data	
Galvanic isolation	Central
Supply voltage	20 to 33 VDC
Current consumption	195 mA at 24 V (transmitter supply off) 865 mA at 24 V and simultaneity factor Eta = 0.75 (transmitter supply on)
Power dissipation	11.0 W at 24 V (max.)
Channels (No. and type)	32 independently configured input channels
Nominal current range	0/4 to 20 mA (voltage range 0 to 10 V)
Signal scope	0 to 22.5 mA (for measuring range 0/4 to 0 mA) 0 to 11.5 V (for measuring range 0 to 0 V)
Supply to transmitters/sensors • Voltage • Rated current	 ≥ 23 V (for measuring range 0/4 to 0 mA) 25 mA (for measuring range 0/4 to 0 mA)
Short-circuit current of transmitter supply	38 mA (short-circuit proof)
HART version	5.0 / 5.1
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

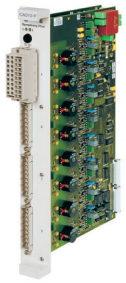
CAI 10-2-P-Ex

CAI 10-2-P Ex

The CAI 10-2-P Ex module provides up to 12 analog input channels that are channel-wise galvanically isolated and intrinsically safe according to the EU ATEX directive. The transmitter supply is onboard and protected against overload (short-circuit proof). CAI 10-2-P Ex communicates digitally with the transmitter via the HART protocol.

Technical data	
Galvanic isolation	Channel-wise
Supply voltage	20 to 33 VDC
Current consumption	≤ 200 mA (no load) 580 mA at 24 V and simultaneity factor Eta = 0.75
Power dissipation	9.25 W at 24 V (max. for 12 2-wire transmitters)
Channels (No. and type)	12 independently configured input channels
Nominal current range	4 to 20 mA
Signal scope	3 to 23 mA
Supply to transmitters/sensors • Voltage • Rated current	 13 to 18 V (non-redundant) 12.2 to 18 V (redundant) (for voltage drop over transmitter and wire) 23 mA
Short-circuit current of transmitter supply	32 to 38 mA (short-circuit proof)
HART version	5.0 / 5.1
Ex-type of protection intrinsic safety	II (2) G [Ex ib] IIC
Ex-type examination certificate	PTB 03 ATEX 2192 X
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules



CAO 10-P

CAO 10-P

The CAO 10-P module provides up to 16 analog output channels that are channel-wise galvanically isolated. The module is protected against overload (short-circuit proof). CAO 10-P communicates digitally with the transmitter via the HART protocol.

Technical data	
Galvanic isolation	Channel-wise
Supply voltage	20 to 33 VDC
Current consumption	150 mA at 24 V (power outputs disabled)
Power dissipation	13 W (max.)
Channels (No. and type)	16 independently configured output channels
Nominal current range	0 to 20 mA (dead zero) - 4 to 20 mA (live zero)
Signal scope	0 to 21.5 mA (dead zero) - 3.6 to 21.5 mA (live zero)
Supply to transmitters/sensors • Voltage	 0 to 15 V
Line break threshold	Iact < Inom; with Iact > 2 mA (dead zero) Iact < Inom; across entire signal range (live zero)
Load impedance	≤ 700 Ohm (incl. supply lines)
HART version	5.0 / 5.1
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

CAO 10-P Ex

CAO 10-2-P Ex

The CAO 10-2-P Ex module provides up to 16 analog output channels that are channel-wise galvanically isolated and intrinsically safe according to the EU ATEX directive. The module is protected against overload (short-circuit proof). CAO 10-2-P Ex communicates digitally with the transmitter via the HART protocol.

Technical data	
Galvanic isolation	Channel-wise
Supply voltage	20 to 33 VDC
Current consumption	150 mA at 24 V (power outputs disabled)
Power dissipation	13 W (max.)
Channels (No. and type)	16 independently configured output channels
Nominal current range	0 to 20 mA (dead zero) - 4 to 20 mA (live zero)
Signal scope	0 to 21.5 mA (dead zero) - 3.6 to 21.5 mA (live zero)
Supply to transmitters/sensors • Voltage	 0 to 12.9 V
Line break threshold	Iact < Inom; with Iact > 1 mA (dead zero)
Load impedance	≤ 600 Ohm (incl. supply lines)
HART version	5.0 / 5.1
Ex-type of protection intrinsic safety	II (2) G [Ex ib] IIC
Ex-type examination certificate	PTB 03 ATEX 2193 X
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

CAC 10-P

CAC 10-P

The CAC 10-P module provides up to four channels for closed loop control. For each control loop channel there is one analog input, two analog outputs, four inputs for binary signals, two power outputs, one standard binary output and one supply output for 2-wire transmitter supply. CAC 10-P controls intelligent servo drives, intelligent pneumatic drives, conventional electrical/pneumatic drives, 3-point positioners, step controllers and other devices.

Technical data	
Supply voltage	20 to 33 VDC
Current consumption	260 mA at 24 V (without load)
Power dissipation	13 W (max.)
Channels (No. and type)	4 independently configured closed loop control channels
Nominal current range	0 to 20 mA (dead zero) (current output) 4 to 20 mA (live zero) (current output) < 150 mA (power output); 110 mA (power output at 24 V)
Signal scope	(-10 to 0 to +10) V / (-1 to 0 to +1) V (voltage input) (-10 to 0 to +10) V (voltage output)
Supply to transmitters/sensors • Voltage • Rated current	 17.5 to 33 V 25 mA sensor supply output current (short circuit/overload proof) 110 mA
High/low threshold	Binary inputs: 12 to 35 V (high) -3 to +5 V (low)
Line break threshold	I actual < I nominal (for current outputs)
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

CBC 11-P

CBC 11-P

The CBC 11-P module provides up to seven channels for open loop control of individual drive modules. CBC 11-P provides 35 P-switching power outputs, 14 N-switching power outputs, 48 binary inputs and 15 supply outputs for a binary transmitter. CBC 11-P controls electrical actuators, drives, solenoid valves and other devices.

Technical data	
Galvanic isolation	Central channel-wise for the inputs from HW section 15 to 20
Supply voltage	20 to 33 VDC
Current consumption	150 mA at 24 V (without external switching)
Power dissipation	13 W (max.)
Channels (No. and type)	7 independently configured open loop control channels 35 P-switching power outputs 14 N-switching power outputs 48 binary inputs 15 supply outputs for binary transmitter
Signal scope	≤ 100 mA (power output/P-switching) ≤ 200 mA (power output/N-switching)
Supply to transmitters/sensors • Voltage	 0 V (high impedance output) 24 V (Io < 100 mA) 36 V (Io < 20 mA) (short-circuit proof and current limited)
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

CBI 20-P

CBI 20-P

The CBI 20-P module provides up to 32 binary input channels that are module-wise galvanically isolated. The transmitter supply is onboard and protected against overload (short-circuit proof). CBI 20-P interrogates the following types of sensor: contacts (48 V or 24 V), 3-wire and 4-wire initiators and NAMUR initiators (DIN 19234).

Technical data	
Galvanic isolation	Central
Supply voltage	20 to 33 VDC
Current consumption	200 mA at 8 V (NAMUR) 330 mA at 48 V (contact NC/NO at 48 V) 500 mA at 24 V (3-wire and 4-wire initiator)
Power dissipation	4.8 W at 24 V (NAMUR; Eta = 0.75) 7.9 W at 24 V (contact NC/NO at 48 V; Eta = 0.75) 6.2 W mA (3-wire and 4-wire initiator; Eta = 0.75)
Channels (No. and type)	32 independently configured input channels
Supply to transmitters/sensors • Voltage	 8 to 9 V (8.2 V typ.) (NAMUR) 43 to 50 V (48 V typ.) for external powering of up to 60 V (48 V contacts) 20.4 to 28.8V (24 V typ.) (24 V contacts or 3-wire and 4-wire initiators)
• Rated current	3 mA (NAMUR) 3 mA (48 V contacts) 4.2 mA (24 V contacts or 3-wire and 4-wire initiators)
High/low threshold	1.6 mA (NAMUR) 21 V (48 V contacts) 8.5 V (24 V contacts or 3-wire and 4-wire initiators)
Line break threshold	0.2 mA (NAMUR)
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

CBI 21-P Ex

CBI 21-P Ex

The CBI 21-P Ex module provides up to 32 binary input channels that are module-wise galvanically isolated and intrinsically safe according to the EU ATEX Directive. The transmitter supply is onboard and protected against overload (short-circuit proof). CBI 21-P Ex serves to interrogate NAMUR-initiators (DIN 19234).

Technical data	
Galvanic isolation	Central
Supply voltage	20 to 33 VDC
Current consumption	200 mA at 8 V (NAMUR)
Power dissipation	4.8 W at 24 V (Eta = 0.75)
Channels (No. and type)	32 independently configured input channels
Supply to transmitters/sensors • Voltage • Rated current	 8 to 9 V (8.2 V typ.) 3 mA
High/low threshold	1.6 mA
Line break threshold	Line break threshold
Ex-type of protection intrinsic safety	II (2) G [Ex ib] IIC
Ex type examination certificate	PTB 03 ATEX 2142 X
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

CBI 22-P Ex

CBI 22-P Ex

The CBI 22-P Ex module provides up to 32 binary input channels that are module-wise galvanically isolated and intrinsically safe according to the EU ATEX directive. The transmitter supply is onboard and protected against overload (short-circuit proof). CBI 22-P Ex interrogates contacts NO, NC and CO.

Technical data	
Galvanic isolation	Central
Supply voltage	20 to 33 VDC
Current consumption	260 mA at 24 V
Power dissipation	6.2 W at 24 V (Eta = 0.75)
Channels (No. and type)	32 independently configured input channels
Supply to transmitters/sensors • Voltage • Rated current	 15 to 18 V (16.5 V typ.) 2.75 mA
High/low threshold	3.2 mA
Line break threshold	0.38 V
Ex-type of protection intrinsic safety	II (2) G [Ex ib] IIC
Ex type examination certificate	PTB 03 ATEX 2142 X
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

CBO 10-P

CBO 10-P

The CBO 10-P module provides up to 24 binary output channels that are channel-wise galvanically isolated. CBO 10-P outputs are based on enclosed relays.

Technical data	
Galvanic isolation	Channel-wise
Supply voltage	20 to 33 VDC
Current consumption	150 mA at 24 V (Eta = 0.75)
Power dissipation	2.4 to 8.4 W at 24 V
Channels (No. and type)	24 independently configured output channels
Contact data • Contact potential difference • Current carrying capacity • Minimum contact load	 10 to 60 VAC/VDC 1 A 2 mA (where U>= 15 V)
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

CBO 22-P

CBO 22-P

The CBO 22-P module provides up to 32 binary output channels that are group-wise galvanically isolated.

CBO 22-P outputs are based on electronics. The output current can be provided from either the internal module supply or the external power supply. With external supply the current carrying capacity is up to 1 A. Signaling output is possible with ON/OFF (continuously lit) at 0.5 Hz, 2 Hz or 8 Hz.

Technical data	
Galvanic isolation	Group-wise (per group of 8 channels)
Supply voltage	20 to 33 VDC
Current consumption	150 mA (U = 24 V, module passive, basic current) I = 1,600 mA (module active, internal power supply, simultaneity factor: 0.75) 170 mA (module passive, internal power supply) 220 mA (module active, external power supply) 170 mA (module passive, external power supply)
Power dissipation	11.4 W (at Uv = 24 V; internal supply) 12.7 W (at Uv = 24 V: external supply)
Channels (No. and type)	32 independently configured output channels
Nominal current range	55 mA (per channel; internal supply) 110 mA (per 2 channels; internal supply) 220 mA (per 4 channels; internal supply) 250 mA (per channel; external supply) 500 mA (per 2 channels; external supply) 1000 mA (per 4 channels; external supply; if outputs are parallel-connected)
Signal scope	OFF / 0 Hz / 0.5 Hz / 2 Hz / 8 Hz
Supply to transmitters/sensors • Voltage • Rated current	 21.6 to 26.4 VDC (internal supply) 20.0 to 32.5 VDC (external supply) 1.8 A (max. sum output current, internal supply) 8.0 A (max. sum output current, external supply)
Short-circuit current of transmitter supply	≤ 1.3 A (protection by intermitted mode)
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

CFI 10-P

CFI 10-P

The CFI 10-P module provides up to four frequency input channels that are channel-wise galvanically isolated. The sensor power supply is onboard and protected against overload. For output powering it is also possible to use an external power supply.

CFI 10-P interrogates initiator and contact sensors for counting. In addition to the frequency and period measurement functions, it is also possible to use the module's control function for fast, operable closing circuits.

Technical data	
Galvanic isolation	Channel-wise
Supply voltage	20 to 33 VDC
Current consumption	300 mA at 24 V (no load)
Power dissipation	7.2 at 24 V (no load)
Channels (No. and type)	4 independently configured frequency input channels
Signal scope	f = 0.15 Hz to 50 kHz (input frequency) V = 1:1 to 1:10 for f < 5 kHz, 10 µs min. resolution (keying ratio) T = 3 µs (0 / 20 / 100 ms by software); f max. = 1 kHz at T = 0.5 ms (filter times)
Supply to transmitters/sensors • Voltage • Rated current	 +8.2 V +/-10 % (NAMUR initiator) +24 V +/-10 % (contact, 3-wire initiator) < 10 mA (NAMUR initiator) < 30 mA (contact, 3-wire initiator) (short-circuit and overload resistant)
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

CTI 21-P

CTI 21-P

The CTI 21-P module provides up to 32 temperature input channels that are module-wise galvanically, and channel-wise functionally, isolated. The transmitter supply is onboard.

CTI 21-P interrogates all types of thermocouples and resistance thermometers through scalable freestyle characteristics. Compensation of line resistance is possible.

Technical data	
Galvanic isolation	Central
Supply voltage	20 to 33 VDC
Current consumption	250 mA at 24 VDC
Power dissipation	6 W
Channels (No. and type)	32 independently configured temperature input channels
Signal scope	Configurable voltage ranges: -10 to +20 mV -10 to +80 mV -10 to +460 mV 0 to +1.0 V 0 to +6.0 V
Supply to transmitters/sensors • Rated current	 1.0 mA ± 1.7% (constant current; corrected by software)
Line break threshold	7 kOhm ± 10%
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

MR Series I/O modules

CTI 21-P Ex

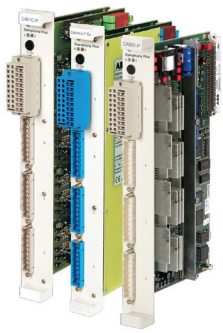
CTI 21-P Ex

The CTI 21-P Ex module provides up to 32 temperature input channels that are module-wise galvanically, and channel-wise functionally, isolated. They are intrinsically safe according to the EU ATEX directive. The transmitter supply is onboard.

CTI 21-P Ex interrogates all types of thermocouples and resistance thermometers through scalable freestyle characteristics. Compensation of line resistance is possible.

Technical data	
Galvanic isolation	Central (functional: channel-wise)
Supply voltage	20 to 33 VDC
Current consumption	250 mA at 24 V
Power dissipation	6 W
Channels (No. and type)	32 independently configured temperature input channels
Signal scope	Configurable voltage ranges: -10 to +20 mV -10 to +80 mV -10 to +460 mV 0 to +1.0 V 0 to +5.0 V
Supply to transmitters/sensors • Rated current	 1.0 mA ± 1.7% (constant current; corrected by software for thermocouples)
Line break threshold	2.5 kOhm ± 10%
Ex-type of protection intrinsic safety	II (2) G [Ex ib] IIC
Ex-type examination certificate	PTB 03 ATEX 2143 X
Ambient temperature	0 °C to 50 °C (temperature for ventilation of the module in the rack)
Dimensions	40.64 mm width, 311.15 mm height, 160 mm depth (1.6 in. width, 12.25 in. height, 6.3 in. depth)

Local I/O accessories – Termination units



Termination units

The inputs and outputs of the peripheral modules are connected to the signal lines with termination units. A Symphony Plus MR Series peripheral module has up to four front panel connection units. Signal lines can be assigned to 16 terminals (1 ... 16) for each termination unit.

The remaining two terminals (0 and 17) carry the reference potential of the isolated island. The pertaining blades in the blade connector (0 and 17) are leading. The termination unit comprises a broad spring contact strip with cage clamp springs. With redundancy configuration, it also comprises an 18-pole flat-cable connection and a narrow spring contact strip.

The use of cage clamp springs in the termination unit allows individual wires to be connected without using screws. Either cables with coarsely stranded wire JE-LiY(ST)Y or solid wires JE-Y(ST)Y with a cross-sectional area of 0.5 mm2 can be used.

Type	Description
CI 100	CI 100 provides connection to the field cables for a single I/O module
CI 101	CI 101 provides connection to the field cables for a redundant pair of I/O modules
CI 120 Ex	CI 120 Ex provides connection to the field cables for a single, intrinsically safe I/O module
CI 121 Ex	CI 121 Ex provides connection to the field cables for a redundant pair of intrinsically safe modules (binary input and temperature input)
CI 122-2 Ex	CI 122-2 Ex provides connection to the field cables for a redundant pair of intrinsically safe analog I/O modules. It includes current and voltage limitation

Racks and accessories – Standard cabinet

Standard cabinet

The Symphony Plus MR Series cabinet is a fixed frame cabinet made to DIN 41 488 and IEC 297-2/1982 standards, and to the dimensions preferred by the automation industry (W 900 mm x D 440 mm x H 2,200 mm).

Each of the tiers (A, C, E and G) can take one 100 HP wide PH 895 sub-rack including air guide. The lowest tier carries the power supply unit. The completely assembled cabinet has enclosure rating IP 20 or higher. In the case of the standard version, the cables enter the cabinet from below.

The PH 895 rack is composed of a standardized backplane with 12 slots for modules. All bus and power supply lines are routed to the backplane. Cabling between the racks and the external terminals is designed as connectors and laterally accessible from the front. The cable conduit and the cowl are situated beneath the modules. Ventilation is by natural convection.

The rack supports up to two redundant pairs of controllers. The backplane supports an additional single or redundant arrangement of central modules in slot 05 and 07 for this additional pair of redundant controllers.

The connection to the bus network is made by the CI 150 bus connection module in slot 04.

Type	Description
PH 895	Rack for Symphony Plus MR Series cabinets, Standard and Exi version, rack for up to 12 MR Series modules (12 slots), including Fnet termination and Fnet jumper
CS 800	230 VAC to 24 VDC, 30A, safe galv. isolation, PFC, CE-sign, paralleling, redundancy, hold-up time: 30 ms, voltage and temperature control
CS 810	110-300 VDC to 24 VDC, 30A, safe galv. Isolation, PFC, CE-Sign, paralleling, redundancy, hold-up time: 30 ms, voltage and temperature control
PH 821	Rack for 230 VAC and 110-300 VDC power supply, optionally redundant
PH 811	Rack for 24 VDC power supply
CS 430-P	20 ... 33 VDC/ 30 A, with power surge protector
CS 435-P	Rack fuses and diagnostics

Racks and accessories – DIN rail housing

DIN rail housing

The Symphony Plus MR Series control system includes compact DIN rail mountable housing, PH 875 and PH 870. With this compact and DIN rail-mounted device, customers get the latest control technology dedicated to installation in the field. Inherent redundancy design with integrated redundancy concepts for power supply, communication and I/O, without the need for additional configuration, provide the highest level of availability.

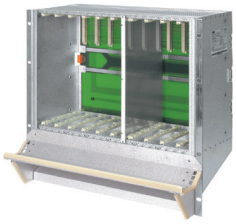
Wall fastening is possible with the optional mounting plate. In this case increased vibration requirements are fulfilled.

The assembly consists of a main CPU-housing and up to two connectable extension housings. Twelve slots can be accommodated in two extension housings.

A complete PH 875 within two PH 870 extension housings is able to handle redundant Symphony Plus MR Series controllers. Up to an additional eight I/O modules, 10 optional I/O modules and two Fnet repeaters can be installed to make a complete PH 875/PH 870 remote I/O solution.

Type	Description
PH 875	Main CPU housing, expandable with max. two PH 870s, 4 slots for Symphony Plus MR Series controller PM 875, PM 875, PM 876, PM 876-1 or PM 877, I/O modules, repeater CCR 70-P or interface module CCF 10-P, DIN rail mounting
PH 870	Extension housing, maximum of two PH 870s together with one PH 875, 4 slots for I/O modules, repeater CCR 70-P or interface module CCF 10-P, DIN rail mounting
Mounting plate	Mounting plate for mounting PH 875 / PH 870 in compliance with IEC 68000-2-6

Racks and accessories – 19-inch rack housing



19-inch rack housing

The Symphony Plus MR Series PH 890 “migration rack” is a pre-assembled 19” rack. The rack is designed for front connection in Contronic P, Contronic E and Contronic 3 cabinets, as well as in standard 19” cabinets.

It can also be wall-mounted in standard cabinets. The PH 890 is ABB’s solution for costefficient migration projects to the MR Series of Contronic systems and any other process control system in standard 19” cabinets.

This PH 890 contains 10 slots for MR Series modules (slot 3 to slot 12), instead of the 12 assembly slots (slot 1 to slot 12) for standard MR Series cabinet racks.

The 19” rack is able to handle MR Series I/O modules as well as the MR Series controller in the normal (slot 9) or redundant (slot 9 and 11) case.

Depending on the controller used, the CI 150 interface module is required (slot 8) to connect the Cnet system buses.

The PH 890 rack is designed to use the universal MR Series I/O modules and the intrinsically safe (IS) modules. Mixed IS and non-IS modules are not allowed in one rack. It is possible to place IS modules in slot 3 to 8 and the controller PM 875, PM 876, PM 877 or CMC 70 in slot 9 to 11. In this case a separating plate (3BDH000542R1 or 3BDH000543R1) has to be used between slot 8 and 9.

Type	Description
PH 890	19” module rack for up to 10 Symphony Plus MR Series modules (10 slots) for mounting in 19” cabinets, including one Fnet connection cable (rack to rack), one power supply connector (max. 2.5 mm²), one Fnet termination and mounting material.
SC 891	Power supply connection unit for redundant power supply in use with SD 891 or SD 894. With input and output terminals, fuses and redundancy. Each power input is supervised. Assembled on a 4 RU mounting plate, width 440 mm.
SD 891	Power supply module, input 230 VAC, output 24 VDC, 30 A. With input terminals and fuse. Assembled on a 4 RU mounting plate, width 19”. For redundant power supply two modules are needed.
SD 894	Power supply module, dual 24 VDC input and output. With input terminals, fuses, burst and surge protection. Assembled on a 4 RU mounting plate, width 19”.
Mounting plate Z	For mounting SC 891, SD 891 or SD 894 in 19” frames. Mounting material included.
Mounting plate L	For mounting SC 891 on the rear panel of PH 890. Mounting material included.

MR Series – References

Document ID	Document Description
3BUS095394	MR Series Control & I/O brochure
2VAA004444	PM 875-3 process controller user manual
8VZZ001574T0001	CCC 37-P coupling module user manual
2VAA003428	PM 877 process controller user manual
2VAA000595	Binary input module user manual
2VAA000592	Analog input module user manual
2VAA000596	Binary output module user manual
2VAA000594	Analog output user manual
2VAA000598	Control module user manual
2VAA000597	Frequency input module user manual
2VAA000593	Temperature input module user manual
2VAA000590	Communication coupler user manual
2VAA000591	Repeater module user manual
2VAA000600	Cubicle user manual
2VAA000603	PH 890 migration rack user manual

Data sheets embedded within user manuals
For documentation not publicly available, please contact your ABB representative

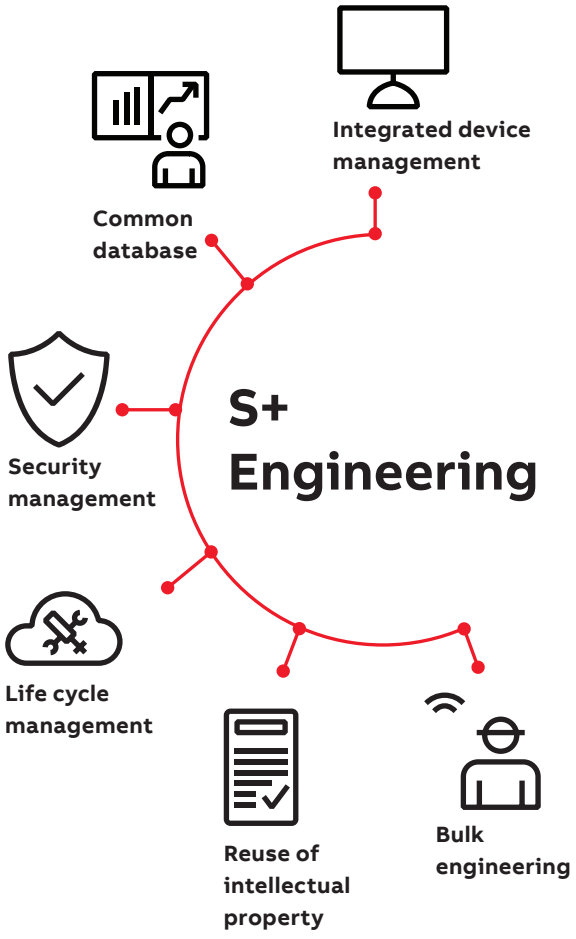
For your notes

For your notes

S+ Engineering

S+ Engineering

S+ Engineering offers all the necessary functionality needed to engineer, configure, administrate, secure, commission and maintain every component in a Symphony Plus automation system – from control and I/O to field instrumentation and electrical devices, network architecture, operations, engineering and advanced system applications. It provides a single platform to manage data from multiple sources.



S+ Engineering is the configuration engineering tool used to engineer Symphony Plus systems based on SD Series, HR Series and SCADA architectures.

S+ Engineering applications use client/server technology to support multiple users operating in a networked environment. The system consists of one base license for the configuration server. The configuration server stores the configuration data in a single database for each system. This eliminates duplication of data entries, simplifies database management and automates many configuration tasks.

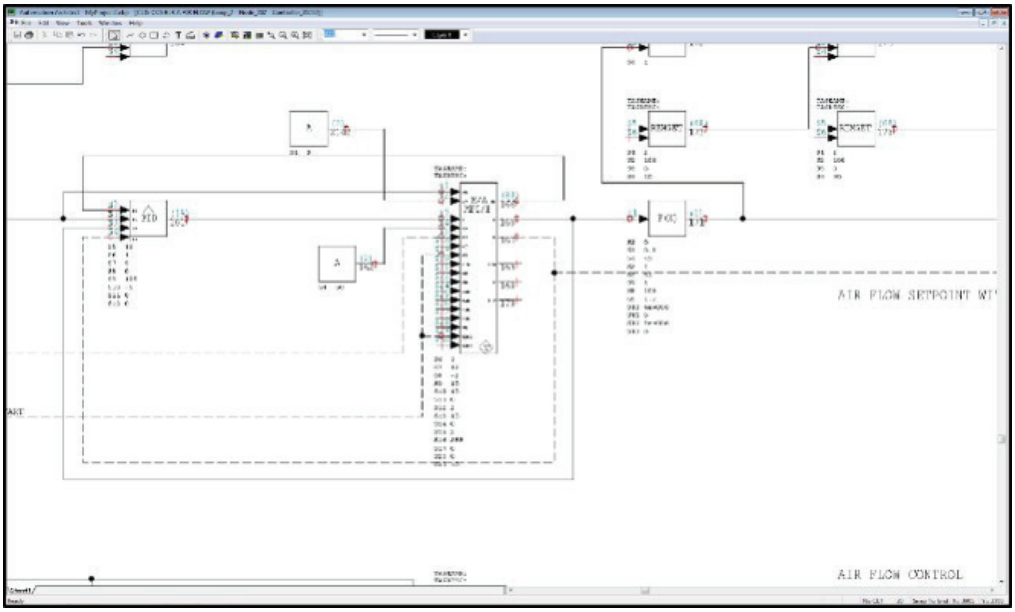
It can support up to 10 simultaneous client connections and provide users with shared access to the system's configuration information and real-time plant data.

The base license provides the basic access to the S+ Engineering application. This is a necessary license required by each system. Note, the Control Engineering for Harmony license is available and ordered separately.

S+ Engineering

The View and Monitor support feature gives management or maintenance personnel access to real-time plant data from any office PC, without the need to install the engineering software. In addition, it shall be possible to tune the Function Codes spec using the Block details utility.

	License
S+ Engineering Base license	8VZZ000821S0100
Engineering Client Support	8VZZ000821L0120
View and Monitor Client Support	8VZZ000821L0190
Control Engineering	8VZZ000821L0125



Control Engineering: Automation Architect

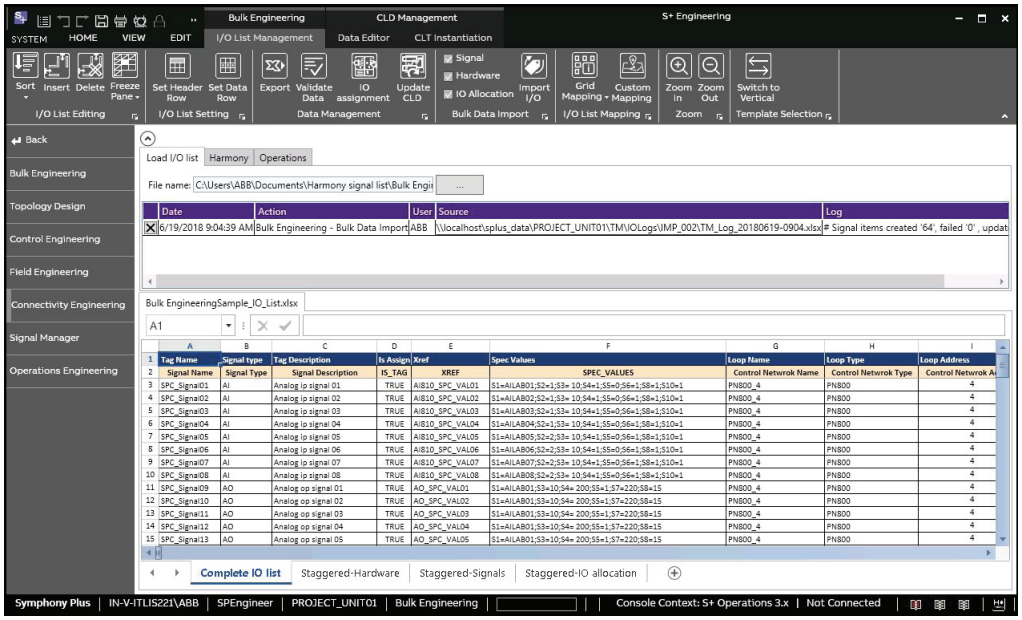
The ability to efficiently manage large amounts of data is a crucial part of any automation system. S+ Engineering provides intuitive ways to handle bulk data. Users can import process points or I/O spread sheets by which they can configure:

- Signal lists and properties
- Control hardware
- I/O assignment as well as I/O template instantiation
- Control logic template instantiation

S+ Engineering

Users can perform bulk configuration editing in MS Excel and then import it into the configuration server seamlessly.

	License
Bulk Engineering Tool	8VZZ000821L0160
OLE Automation Interface	8VZZ000821L0440
Advanced Trend Application	8VZZ000821L0450
Automatic Drawing Generator	8VZZ000821L0460
Virtual PIN (VPNI) Support	8VZZ000821L0140
Soft Controller	8VZZ000821L0550
Power Library	8VZZ000821L0570



Bulk Engineering tool

S+ Engineering allows engineers to create and re-use their expertise via Configurable Function Codes (CFC). CFCs allow engineers to create specific control logic using standard Harmony function codes and then save it as a package. This package (CFC) can then be used in the rest of the control logic design as a standard Harmony function code; eliminating the need to re-write the entire contents of this CFC in every instance it is used. The CFC can be represented by a custom shape, control logic, defined inputs, defined outputs, defined specifications and tag mapping. Further, CFCs can make its control strategy contents visible to users or completely hidden from users in white box and black box respective options.

	License
Configurable Function Code	8VZZ000821L0530

S+ Engineering

The field configurations client communicates with field devices using the PROFIBUS and HART protocols. It supports configuration, commissioning and maintenance of PROFIBUS devices using a device type manager (DTM) technology. For field devices that have conventional device description files (GSD), a basic PROFIBUS DTM is available to allow standardized offline configuration.

HART devices are integrated, configured and parameterized through standard HART protocols – without the need for additional tools – by using a standard HART DTM.

The field configurations client provides the following functionality:
- Configuration of field devices
- Commissioning of field devices
- Status monitoring
- Reporting to the engineering workstation

	License
Field Configurations	8VZZ000821L0250
Field Device Management	
• 100 PROFIBUS/HART Device Instances	8VZZ000821L0270
• 1,000 PROFIBUS/HART Device Instances	8VZZ000821L0280
• 5,000 PROFIBUS/HART Device Instances	8VZZ000821L0290

S+ Engineering also supports the control and supervision of intelligent electronic devices (IEDs) through the use of the IEC 61850 communication protocol. Configuration and maintenance of this interface is performed from S+ Engineering.

In other words, the engineering tool supports configuration for both control connectivity and HMI connectivity communication to the automation system. Horizontal communication to the controller is supported through GOOSE (generic object oriented substation event)/ MMS (manufacturing message specification), while vertical communication to S+ Operations is performed by MMS. It is possible to reimport the substation configuration design (SCD) and make changes to the configuration safely.

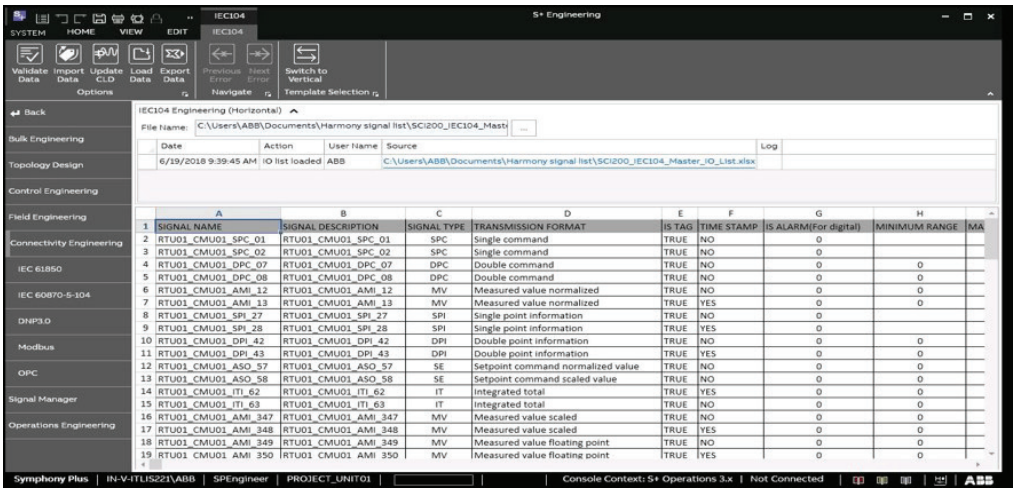
	License
IEC 61850 Configuration	8VZZ000821L0310
10 IEC 61850 IED Instances	8VZZ000821L0320
100 IEC 61850 IED Instances	8VZZ000821L0330

S+ Engineering

S+ Engineering supports control connectivity communication of IEC 60870-5-104 and DNP 3.0 protocols to SD Series controllers. Featuring high performance communications interface between S+ controllers and IEDs or RTUs, fully integrated functionality to launch the configuration application right from S+ Engineering environment and familiar commands and user interface for intuitive configuration and minimizing learning curves. S+ Engineering also has complete integration of Modbus TCP data within the control application by mapping Modbus points to function blocks in the controller.

Additionally, S+ Engineering supports HMI connectivity for IEC 60870-5-104 and Modbus within the application by using the integrated Universal connect module to perform the signal & HMI engineering.

	License
IEC 60870-5-104 (for control and HMI connectivity)	8VZZ000821L0350; 0360
DNP 3.0 (for control connectivity)	8VZZ000821L0380; 0390
Modbus TCP (for control (SPC700 & SPC600) and HMI connectivity)	8VZZ000821L0410; 0420
OPC UA (HMI connectivity only)	8VZZ000821L0430



Communications

Symphony Plus includes option for IEC 60870-5-104 for primary plant network communications. Specifically, the IEC 60870-5-104 plant network may be used with SD Series SPC700 control-based systems instead of using PN800 protocol. S+ Engineering supports the configuration of SPC700 with IEC 60870-5-104 as Control Network protocol to communicate to HMI, and peer-to-peer communication between SPC700 controllers.

	License
IEC 60870-5-104 Control Network Configuration	8VZZ000771L0590

S+ Engineering

Batch Data Manager (BDM) is a family of engineering tools for creating, editing, managing, downloading and debugging batch, sequential and user-defined function code configurations. It enables the engineer to create batch and sequential control applications using clear and concise natural syntax control statements.

BDM programs can be used to change controller set points, turn discrete devices on and off, change modes and perform a host of other supervisory operations. In effect, function codes execute base regulatory and discrete device control, while the BDM program performs supervisory control and process operation.

	License
Batch 90 for Phase Execution	8VZZ000821L0480
Batch 90 for Batch Sequencing	8VZZ000821L0490
User-Defined Function Codes	8VZZ000821L0500
Batch Recipe Approval	8VZZ000821L0510

Operator effectiveness is fundamental to a plant's performance. S+ Operations is designed for high performance in every aspect involved: human machine interface, integrated operations, seamless life cycle management, information management, alarm management, security, process optimization, and with flexible, scalable fault-tolerant design.

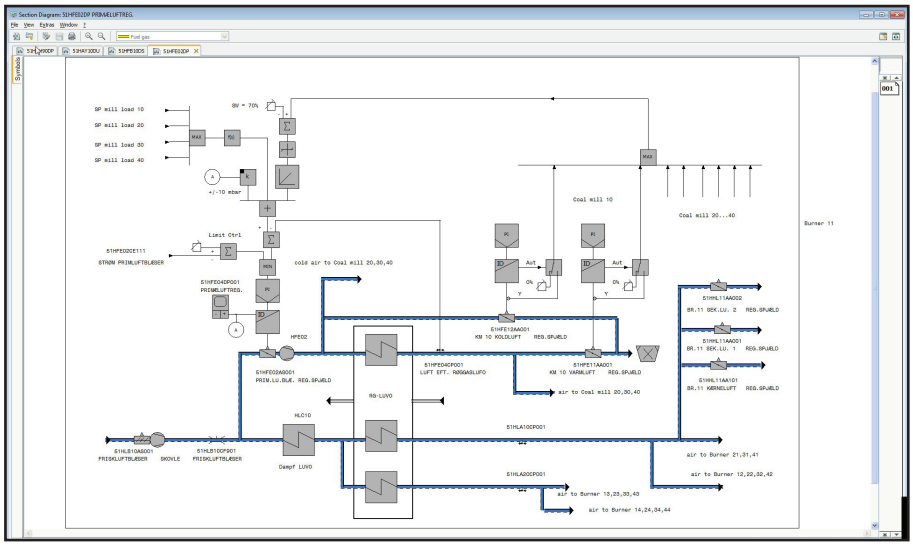
Operations Engineering basic license enables the OPC classic engineering with standard template approach.

	License
S+ Operations Engineering – Basic Basic engineering includes Single User and Single Project Engineering only	8VZZ000821L0180
S+ Operations Engineering – Extended Includes Basic plus additional features like Custom Deployment rules and User Management	8VZZ000821L0190
S+ Operations Engineering – Advanced Includes Extended plus advanced features like versioning and difference viewer and multi project engineering	8VZZ000821L0200

S+ Engineering for Melody

S+ Engineering for Melody is the configuration engineering tool used to engineer Symphony Plus systems based on the MR Series architectures. It offers offers all the necessary functionality needed to engineer, configure, administrate, secure, commission and maintain every component in a Symphony Plus automation system – from control and I/O to field instrumentation and electrical devices, network architecture, operations, engineering and advanced system applications. It provides a single platform to manage data from multiple sources.

S+ Engineering for Melody control engineering (known as Composer Melody) is designed to reduce the burden on engineers by making them more efficient according to international standards like VGB (European technical association for power and heat generation).

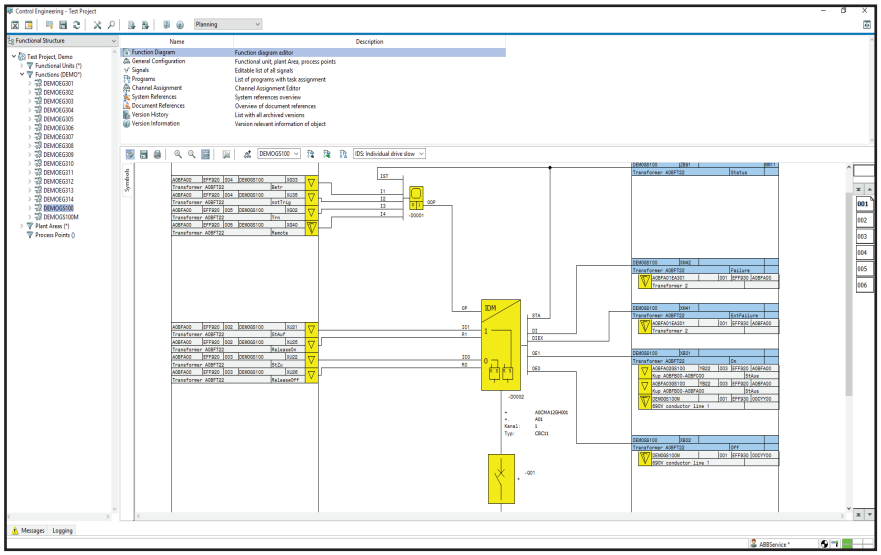


PI diagram

The ergonomic design is extremely valuable in day-to-day engineering operations. The ability to associate documents with the system architecture saves time and reduces complexity for the engineer.

Critical documents like P&I diagrams, cabinet arrangement drawings, graphic displays, field wiring diagrams, etc. are readily available without leaving the environment.

S+ Engineering for Melody



Process loops

Changes made to the tag data in the data browser view are saved on the S+ Engineering configuration server, which is the central repository for all tag information. This eliminates the need to replicate the same changes in multiple databases. A data browser window allows database filtering which makes configuration easier and faster by eliminating unnecessary information from the user's view.

Engineers can import and export tag data and perform automatic search and replace operations based on complex queries. The ergonomics of the software allow a user to navigate directly from a tag to its related configuration document.

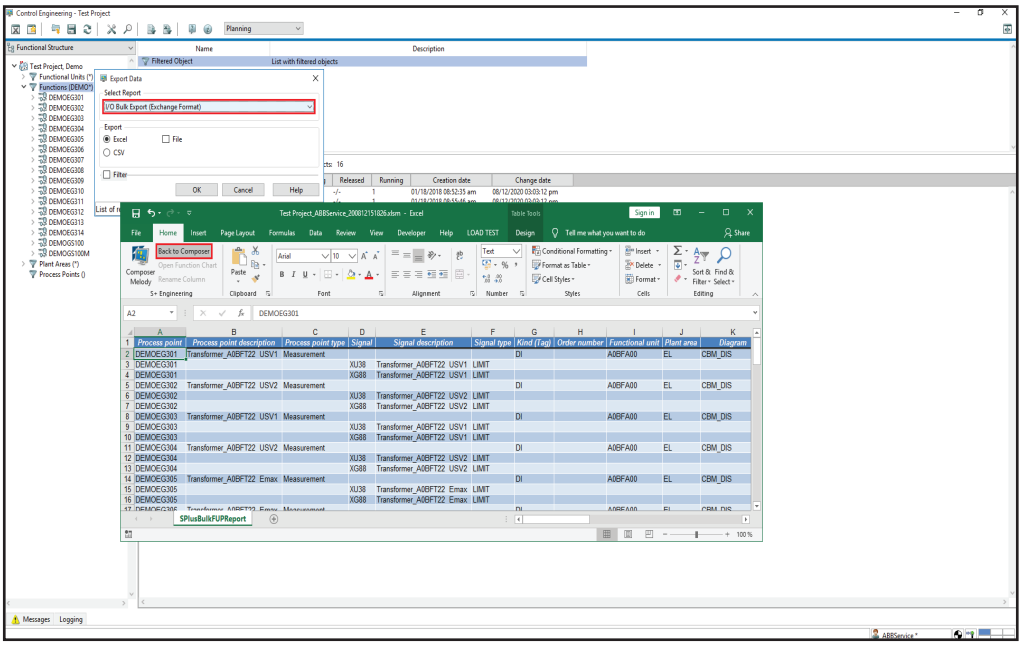
Server licenses

Name	Description	Item Number
S+ Eng for Melody Server v1.4 Base	Software license for one server • details for hardware requirements and additional needed software see Installation guide • each S+ Engineering for Melody Server has one embedded S+ Engineering Client, which provides a Standalone configuration	8VZZ000023S100

Client licenses

Name	Description	Item Number
Additional Client Support	Software license for one S+ Engineering for Melody client	8VZZ000023L110
Client Workplace Bundle – 1 License	Includes • One S+ Engineering for Melody Client • One Field Configuration Client	8VZZ000023L150
Client Support 800xA Navigation	With this extension, you will be able to call up S+ Engineering functions from the 800xA workplace. 800xA Navigation requires a S+ Engineering for Melody installation on the 800xA workplace	8VZZ000023L190
8Client Workplace Bundle 800xA 1 License	Software license for one 800xA workplace including: • One S+ Engineering for Melody Client license • One Field Configuration Client license • One 800xA Navigation license	8VZZ000023L200
Bulk Engineering Tool Client	With this option the system can benefit of bulk management of Process points and Signals. It includes: • Creation of hardware structure based on the import list • Auto creation of Functional drawings	8VZZ000023L310

S+ Engineering for Melody



Bulk Engineering tool

The ability to efficiently manage large amounts of data is a crucial part of any automation system. S+ Engineering provides intuitive ways to handle bulk data. Users can import process points or I/O spread sheets by which they can configure:

- Signal lists and properties
- Control hardware
- I/O assignment as well as I/O template instantiation
- Control logic template instantiation

Users can perform bulk configuration editing in MS Excel and then import it into the configuration server seamlessly.

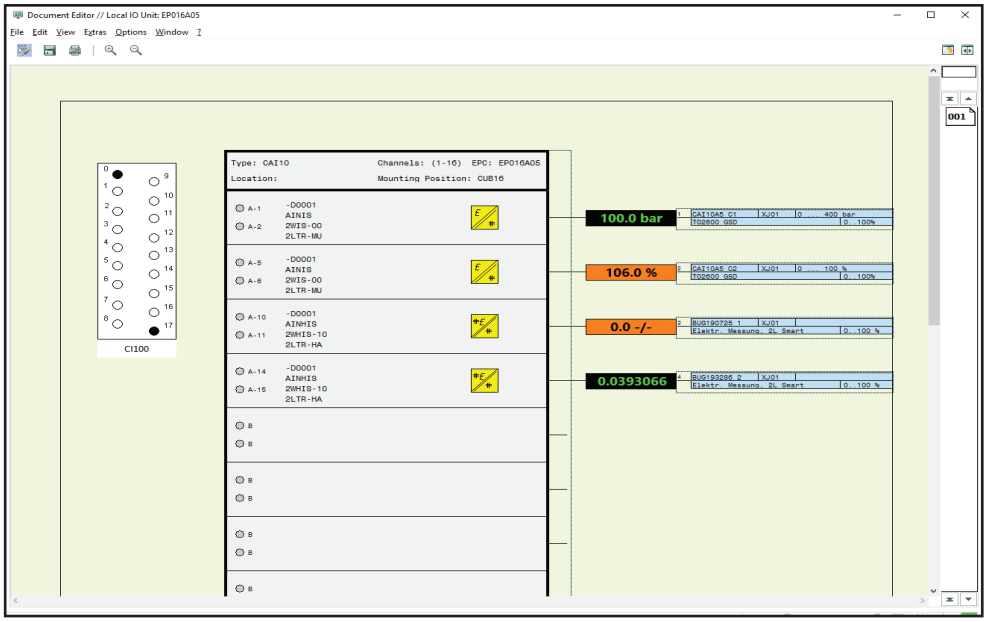
Controller and I/O licenses

S+ Engineering for Melody allows users to size the engineering platform based on the size of the control and I/O network. For each MR controller one controller license is required. The analog and binary (digital) I/O points in the system are licensed in groups of one hundred, rounded up.

The PM 877 – 375 kBaud license enable the 375 kBaud Fnet on the PM 877. Without this option PM 877 support 2 MBaud Fnet.

The High-Speed Task option enables a fast task on the controller for high performance applications like turbine control.

S+ Engineering for Melody



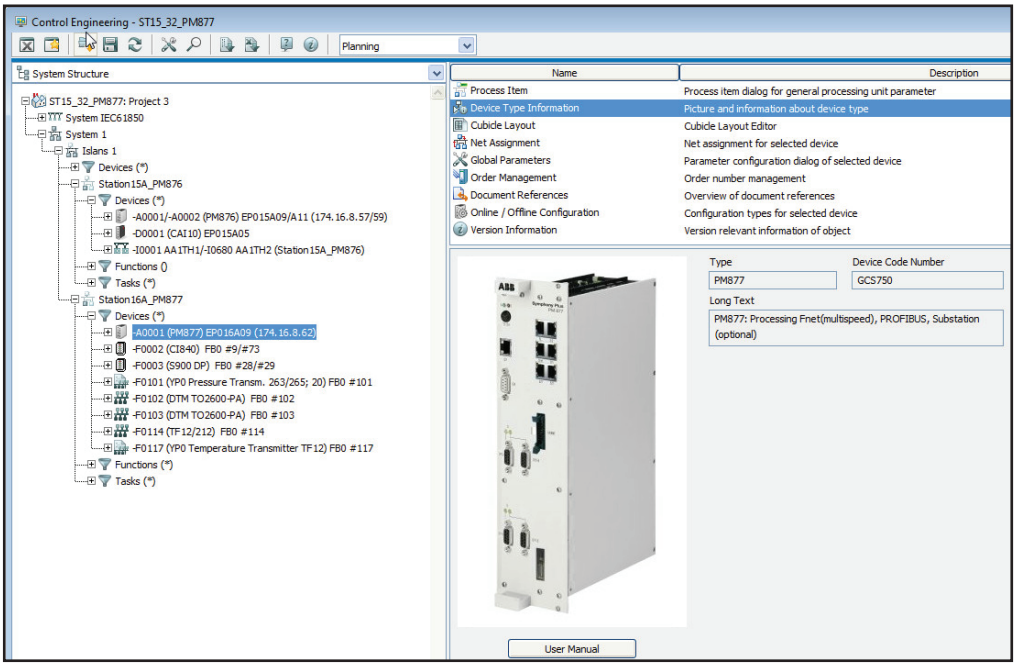
I/O diagram and analysis

Name	Description	Item Number
Base Software License for Controller	Base software license for Melody Controller (PM 87x, CMC xx) Only 1 license is required for a redundant pair of Melody Controller. The back-up (secondary) Controller does not require a separate license.	8VZZ000023L240
Binary/Frequency I/O License	per 100 I/Os License is required for Melody, Fieldbus and Modbus I/Os	8VZZ000023L250
Analog/Temperature I/O License	per 100 I/Os License is required for Melody, Fieldbus and Modbus I/Os	8VZZ000023L260
PM 877 – 375 kBaud Fnet License	n x PM 877, if 375 kBaud is required Not necessary for the redundant Controller.	8VZZ000023L245
High-Speed Task	License for use of Melody Controller with High-Speed Task Add On In redundant configurations just one license is required per redundant controller pair.	8VZZ000023L120

S+ Engineering for Melody

Fieldbus licenses

S+ Control Melody fully integrates field devices through PROFIBUS and HART technology. The S+ Engineering for Melody supports configuration, commissioning, and maintenance of PROFIBUS and HART field devices using device type manager (DTM) technology. For field devices that have conventional device description files (GSD), a basic PROFIBUS DTM is available to allow standardized configuration. HART devices are integrated, configured, and parameterized via standard HART protocol without the need for additional tools by using a standard HART DTM. The individual DTMs can be accessed from multiple data views, such as the system or location overview and others. It includes automatic fieldbus calculation and loading of process items by using the device-specific channel configuration generated from the DTM.



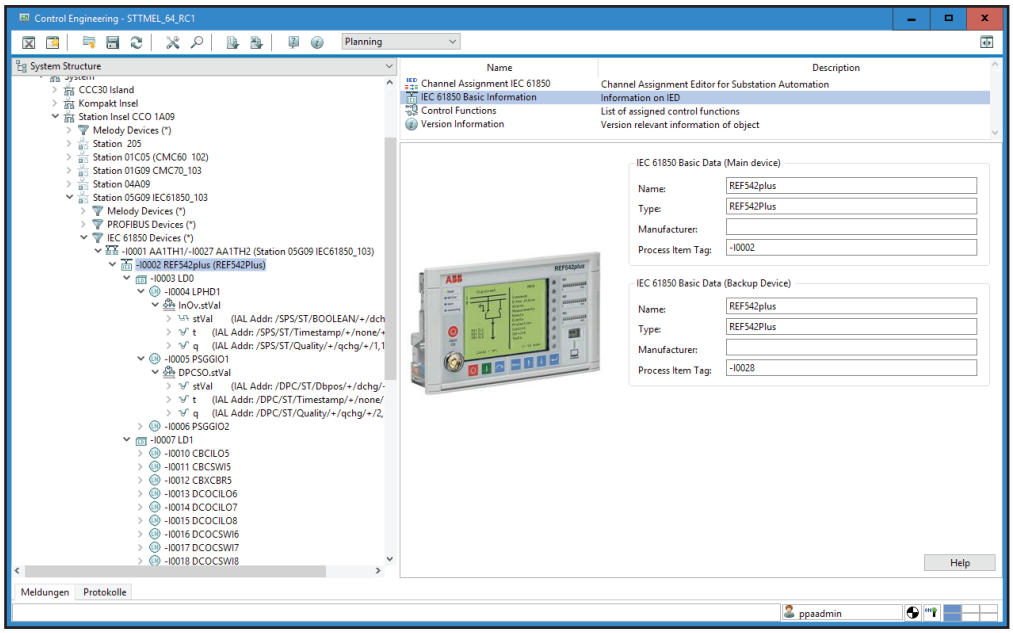
Field device integration tool

Name	Description	Item Number
Field Configuration Client	With this option the system can benefit of a common fieldbus configuration and man-agement tool. It includes: • PROFIBUS Support (FDT/DTM based and GSD based) • Configuration and maintenance of HART field devices (DTM) • Bulk interface to Profibus/HART to-pology (Excel export/ import) • Template system for GSD and DTM based Profibus devices • Enhanced data type support: un-signed integers and unsigned bytes (for S+ Flame Scanner and Turbine Control integration)	8VZZ000023L280
PROFIBUS-Controller License	n x CMC 7x / PM 87x Not necessary for the redundant Controller.	8VZZ000023L290

S+ Engineering for Melody

IEC61850 licenses

S+ Engineering also supports the control and supervision of intelligent electronic devices (IEDs) through the use of the IEC 61850 communication protocol. Configuration and maintenance of this interface is performed from S+ Engineering.



IEC 61850 configuration tool

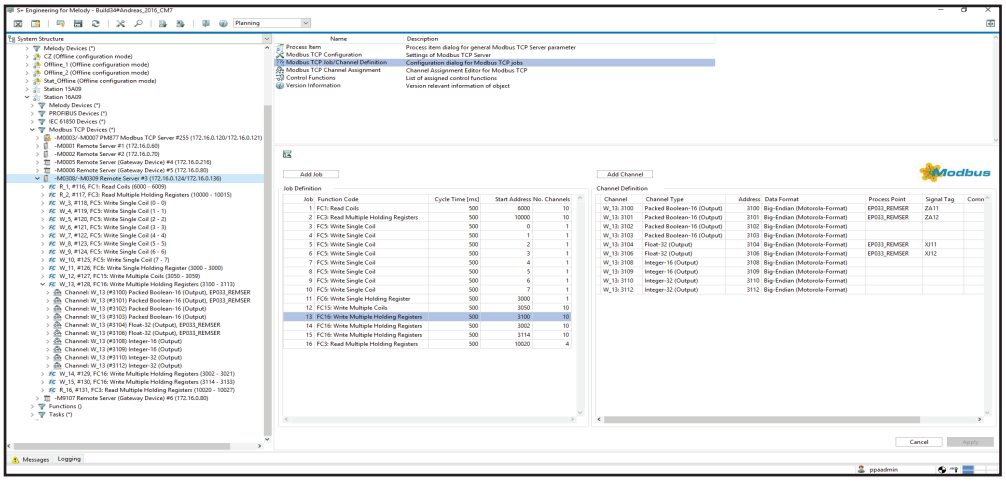
In other words, the engineering tool supports configuration for horizontal communication to the automation system through MMS (manufacturing message specification). It is possible to reimport the substation configuration design (SCD) and make changes to the configuration safely.

Name	Description	Item Number
IEC 61850 Configuration	With this option the system can benefit of a common IEC61850 configuration tool. Each IEC61850 IED (Intelligent Electronic Device) to be accessed by the tool counts as one instance. It includes: • SCD file Import • Horizontal integration to S+ Melody Controller (PM876 / PM877) • Vertical integration to S+ Operations This software license is valid for one Symphony Plus system.	8VZZ000023L130
10 IEC 61850 IED Instances	n x 10 IEC 61850 IED Instances	8VZZ000023L320
100 IEC 61850 IED Instances	n x 100 IEC 61850 IED Instances	8VZZ000023L330
PM 877 – IEC 61850 license	n x PM 876 / PM 877, if IEC 61850 is required Not necessary for the redundant Controller.	8VZZ000023L365

S+ Engineering for Melody

Modbus TCP licenses

MR Series fully supports Modbus RTU and TCP for the integration of 3rd party devices and systems in the control logics of Melody. An easy to use configuration allows the assignment of signals via Modbus which can be used like any other signal in the system.



Modbus TCP system structure

Name	Description	Item Number
ModBus TCP/IP configuration	With this option the system can benefit from ModBus TCP/IP signal configuration for the PM877 Controller Module	8VZZ000023L340
PM877 – ModBus TCP/IP Instances	n x PM 877, if ModBus TCP/IP is required Not necessary for the redundant Controller.	8VZZ000023L350

S+ Engineering – References

Document ID	License
2VAA004384	S+ Engineering brochure
2VAA004377	S+ Engineering for Melody brochure

For documentation not publicly available, please contact your ABB representative

S+ Operations and S+ Operations SCADA

S+ Operations

S+ Operations SCADA

S+ Operations

Operator effectiveness is fundamental to a plant's performance. However, with fewer plant operators, a generational shift in the operator workforce and increasing complexity of plant operations, operator effectiveness is becoming ever more challenging to maintain. Symphony Plus, with its intuitive, easy-to-use human machine interface (HMI), leads operators to greater awareness, faster response and better decisions.

S+ Operations is designed for high performance in every aspect involved: human machine interface, integrated operations, seamless life cycle management, information management, alarm management, security, process optimization, and with flexible, scalable fault-tolerant design.

Designed for high performance
S+ Operations provides operators with distraction-free, state-of-the-art process information and access.

Integrated operations
S+ Operations seamlessly integrates all plant devices and systems.

Seamless life cycle management
S+ Operations allows for seamless and incremental integration of new products, technology and functionality without the time and expense of re-engineering and retraining.

Information management
S+ Operations transforms data into meaningful information and presents it in intuitive user-specific desktop displays for real-time business decisions.

Alarm management
S+ Operations' superior integrated alarm management system includes the industry's leading EEMUA 191-compliant alarm management analysis system.

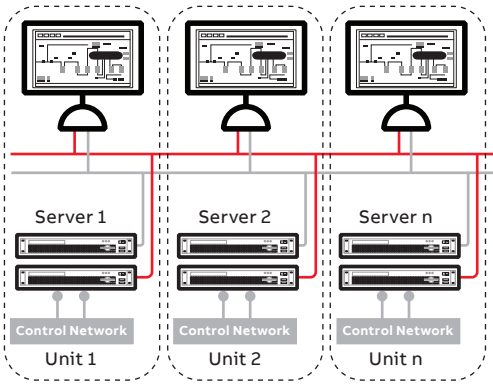
Security
S+ Operations provides users with a secure and reliable operations environment with built-in security features.

Process optimization
S+ Operations combined with ABB's OPTIMAX® optimization applications improves overall plant productivity.

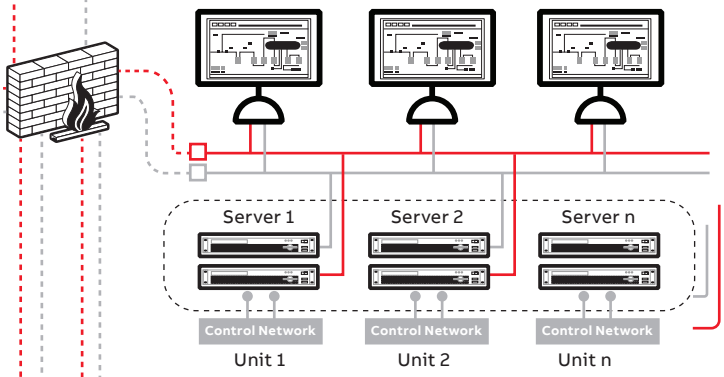
Flexible, scalable fault-tolerant design
S+ Operations' unique system architecture is easily adapted to any power or water application.

Enterprise layer
S+ Operations allows monitoring and control of entire fleet of plants from a single location. Reports and KPIs required for fleet wide business decisions can be generated from the corporate location.

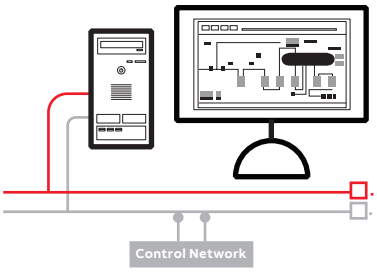
Segregated architecture
For medium to large applications where independent servers are required for plant areas. Each server only acquires and maintains data from related plant area but the clients can share graphical pages and tags from other servers.



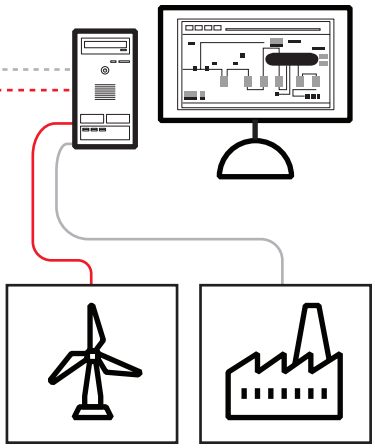
Composite architecture
For medium to large applications where servers are required to maintain a complete database. Each server acquires data from related plant via controllers and other area servers through the PN800. Clients can see all tags from all areas of the plant.



Standalone architecture
For small independent processes that do not need multiple nodes.

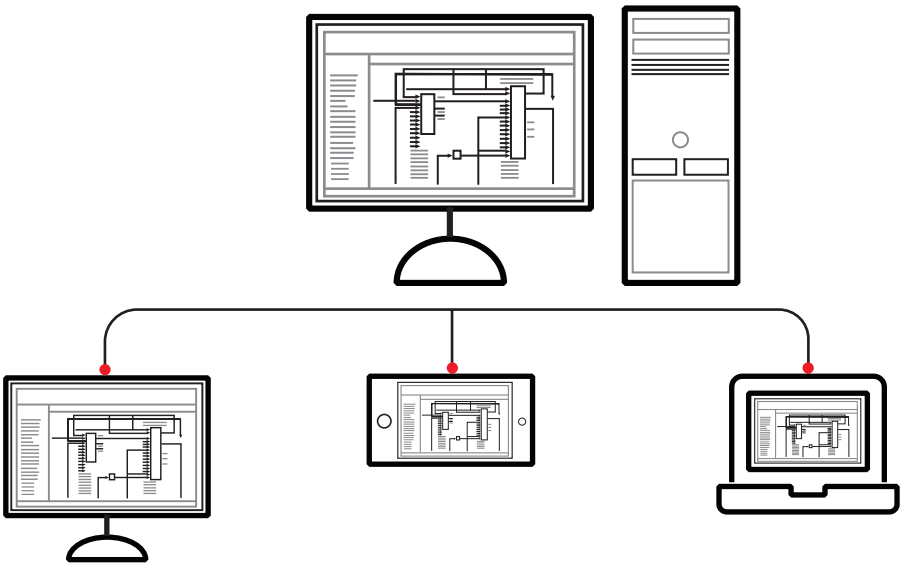


S+ Operations for SCADA applications
Scalability from very small to very large and from local to wide area networks. Interface to RTU, PLC and IED based protection systems. Seamless integration of your renewable plants into your portfolio.



S+ Operations
Base Software

Base licenses, as the name suggests, are the foundation of S+ Operations HMI software. Additional features can be added onto a base license to achieve the most effective and efficient HMI system. One of the following base licenses must be selected.



	License
Server based S+ Operations 3.3 license	8VZZ000841L0110
Serverless S+ Operations 3.3 license • Includes 1,000 real-time tags	8VZZ000841L0120
Display builder standalone • Server is used for generating graphics on site • No other features/options can be added to this license	8VZZ000841L0125

S+ Operations
Base Software

S+ Operations clients
Workstations for efficient control and operation

Operator clients
Operator clients (PowerExplorer). All packages are summed together for the total amount of all operator clients in the system. Check the data sheet for the max. quantity of operator clients allowed by each server connected at the same time. Operator clients do not include the Display Builder.

	License
1 Operator Client Package	8VZZ000841L0640
10 Operator Clients Package	8VZZ000841L0650
100 Operator Clients Package	8VZZ000841L0660

Developer Clients
Developer clients (PowerExplorer) include the operator client and the Display Builder. Check the data sheet for the max. quantity of operator clients allowed by each server connected at the same time.

	License
1 Developer Client Package	8VZZ000841L0670
10 Developer Clients Package	8VZZ000841L0680

PocketPortal Clients
The PocketPortal is a web based operator client with no operation rights. PocketPortal is the successor to ThinWebClient function and supports both IOS and Android operating systems. Check the data sheet for details. PocketPortal client packages are summed up to a total amount. The total amount is limited per web server and connected operation server.

	License
1 Pocket Portal Client	8VZZ000841L0700
10 Pocket Portal Clients	8VZZ000841L0710
100 Pocket Portal Clients	8VZZ000841L0720

Real Time Server Tags
All tags in the system must be of the same type, either all Single, all Redundant, or all Multi-redundant.

Single Tags
Tag packages for single realtime server systems where only non-redundant servers are used. Tag packs can be added to the total number of tags needed in the system.

	License
100 Single Tags pack	8VZZ000841L0360
1000 Single Tags pack	8VZZ000841L0370
10000 Single Tags pack	8VZZ000841L0380
100000 Single Tags pack	8VZZ000841L0390

Redundant Tags
Tag packages for redundant 1oo2 realtime server systems. Tag packs can be added to the total number of tags needed in the system.

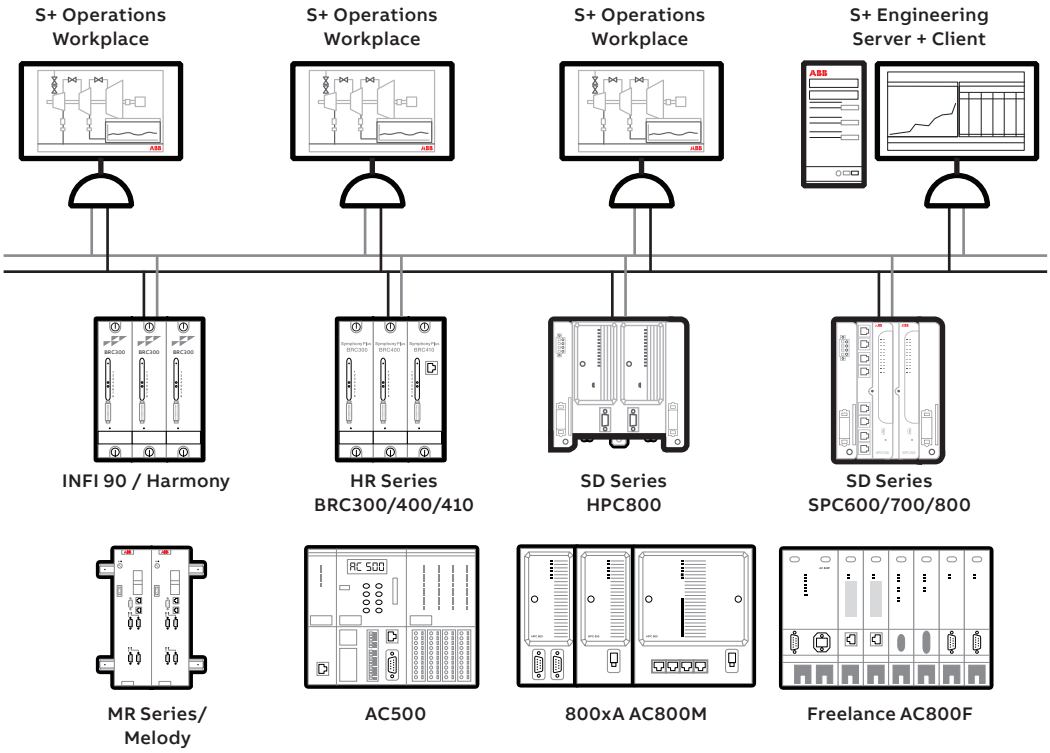
	License
100 Redundant Tags pack	8VZZ000841L0400
1000 Redundant Tags pack	8VZZ000841L0410
10000 Redundant Tags pack	8VZZ000841L0420
100000 Redundant Tags pack	8VZZ000841L0430

Multi Redundant Tags
Tag packages for systems where more than two redundant servers are used e.g. 1oo3 redundancy. Tag packs can be added to the total number of tags needed in the system.

	License
100 Multi Tags pack	8VZZ000841L0440
1000 Multi Tags pack	8VZZ000841L0450
10000 Multi Tags pack	8VZZ000841L0460
100000 Multi Tags pack	8VZZ000841L0470

S+ Operations
Connectivity to the control network

S+ Operations can be deployed as a HMI system for various control platforms. To integrate the electrical network into the DCS, select the IEC 61850 connectivity license along with any of the other licenses below. Only one license for any given type of connectivity is needed. It includes pre-defined faceplates and I/O tag importer.



	License
HR and SD Series Connect (includes VPNI)	8VZZ000486L0170
Melody Connect	TBD
Freelance, AC 800F Connect	TBD
AC800M Connect	8VZZ000486L0190
P13 Connect	TBD
P14 Connect	TBD
IEC 61850 Connect	8VZZ000486L0200
AC500 Connect	8VZZ000486L0180
Contronic E Connect	TBD

S+ Operations

Scanners
Scanners provide the connectivity to a specific or standard interface. There is no specific object uploader nor faceplate or symbols associated with them.

	License
OPC Client	8VZZ000841L0260
Modbus / Modbus TCP (Master)	8VZZ000841L0270
SPABUS	8VZZ000841L0280
IEC 870-5-101 (Master and slave)	8VZZ000841L0290
IEC 870-5-103 (Master)	8VZZ000841L0300
IEC 870-5-104 (Master and slave)	8VZZ000841L0310
Text	8VZZ000841L0320
Siemens Teleperm	8VZZ000841L0330
General Electric GSM (Mark V/VI)	8VZZ000841L0340
Application driver	8VZZ000841L0350
COMLI driver	8VZZ000841L0355

OPC server functionality – sharing real-time plant data
S+ Operations is fully capable of open platform communications with third-party systems. It supports OPC DA (data access), OPC HDA (historical data access) as well as OPC AE (alarms and events). Select either a read-only (RO) or a read-write (RW) license, depending on requirements.

	License
OPC (DA RO)	8VZZ000841L0230
OPC (DA RW)+AE	8VZZ000841L0240
OPC (DA RW)+AE+HDA	8VZZ000841L0250
OPC UA	8VZZ000841L0257

In addition to OPC, S+ Operations also supports application programming interface (API). API is used to ease the work of programming graphical user interface components. Select either application support or runtime support for API.

	License
API Support Application	8VZZ000841L0780
API Support Runtime	8VZZ000841L0790

S+ Operations
Integrated historian

S+ Operations features a fully integrated historian. This is an ABB solution that is built into the Symphony Plus system. A history server forms the basis of Symphony Plus historian. It is required for long-term storage of process data, alarms and events, report generation, long-term trends, and advanced plant performance calculation applications. It supports dedicated clients as well as Web browser-based clients for viewing, monitoring and analysis of data.

The number of history logs determines the size and capacity of the historian. The history server supports a maximum of 100,000 history logs. As for other limitations, please refer to the S+ Operations 3.x data sheet (8VZZ001064T0001) for latest details.

	License
History Server	8VZZ000841L0140

Short term logs use the same historian as long term logs but with less features.
In comparison, short term logs save three months with limited reporting features versus long term which saves logs as long as disk space remains with full reporting features.

Redundant Short Term Logs

	License
100 RST Logs Pack	8VZZ000841L0520
1000 RST Logs Pack	8VZZ000841L0530
10000 RST Logs Pack	8VZZ000841L0540
100000 RST Logs Pack	8VZZ000841L0550

Single Long Term Logs

	License
100 LT Logs Pack	8VZZ000841L0560
1000 LT Logs Pack	8VZZ000841L0570
10000 LT Logs Pack	8VZZ000841L0580
100000 LT Logs Pack	8VZZ000841L0590

Redundant Long Term Logs

	License
100 RLT Logs Pack	8VZZ000841L0600
1000 RLT Logs Pack	8VZZ000841L0610
10000 RLT Logs Pack	8VZZ000841L0620
100000 RLT Logs Pack	8VZZ000841L0630

S+ Operations
Integrated historian

Value-added options that maximize the potential of S+ Historian
Import and export real-time process data using the SQL interface into an MS SQL table. Feature is used to transfer data to applications such as customer web portal dashboards, SAP, etc.

	License
SQL Transmitter	8VZZ000841L0940

Perform detailed analysis of alarm data according to EEMUA P191 and ISA SP 18.2 guidelines.

	License
Alarm Portal Basic	8VZZ000841L0950
Alarm Portal Extended (includes real-time KPIs)	8VZZ000841L0960

Full Office Clients can read, display and analyze process data and create reports. These clients access the data through the history server. Multiple quantities may be selected, but no more than 50 full office clients per history server.

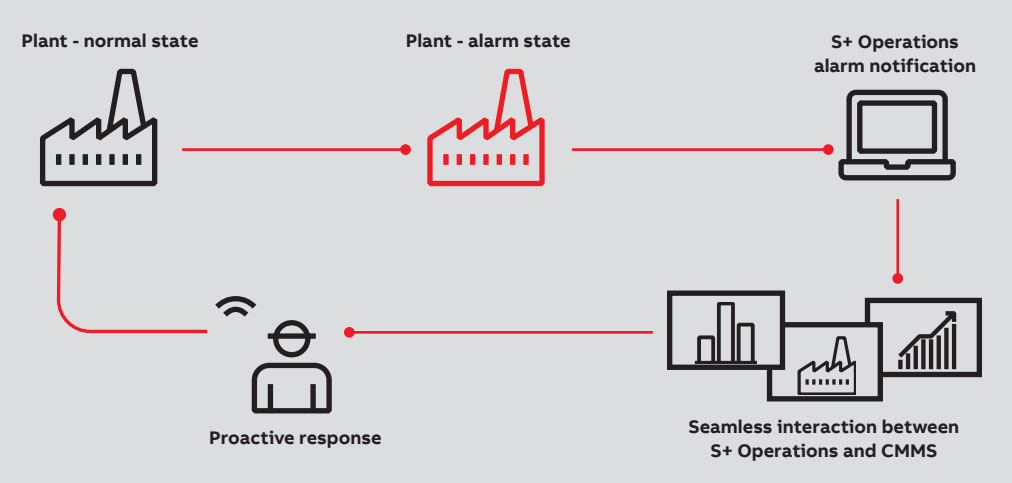
	License
Package of 1 Full Office Client	8VZZ000841L0730
Package of 10 Full Office Clients	8VZZ000841L0740

S+ Operations
High-performance operator workplace

S+ Operations offers productivity features that help reduce the plant's maintenance costs by streamlining operation and maintenance work processes.

Electronic Shift-Book
Think of this as an electronic diary. It is an electronic shift log application designed to be an alternative to paper-based shift logs and notes. Operator notes are easily stored in electronic format. Any open work actions at the end of a shift are passed on to the next shift. Shift changes are automatically noted in the log. Operators can automatically create a malfunction report within the shift-book.

CMMS Interface
Close integration with SAP PM and CMMS (computerized maintenance management systems) allows for easy communication with and navigation to asset-specific maintenance activities. Directly from the HMI screen, an operator can submit a malfunction report, view open maintenance requests and create a maintenance work order. CMMS integration allows for proactive maintenance and quick resolution of issues before they lead to a failure.



	License
Electronic Shift-Book clients	8VZZ000841L0970
Electronic Shift-Book / 1000 Tags packages	8VZZ000841L0980
Electronic Shift-Book / 10000 Tags	8VZZ000841L0990
CMMS Interface	8VZZ000841L1000

S+ Operations

Applications that take the HMI to the next level

SMS and E-Mail Notification allows users to configure the system to send SMS alerts to the operators' mobile devices in the event of alarms.

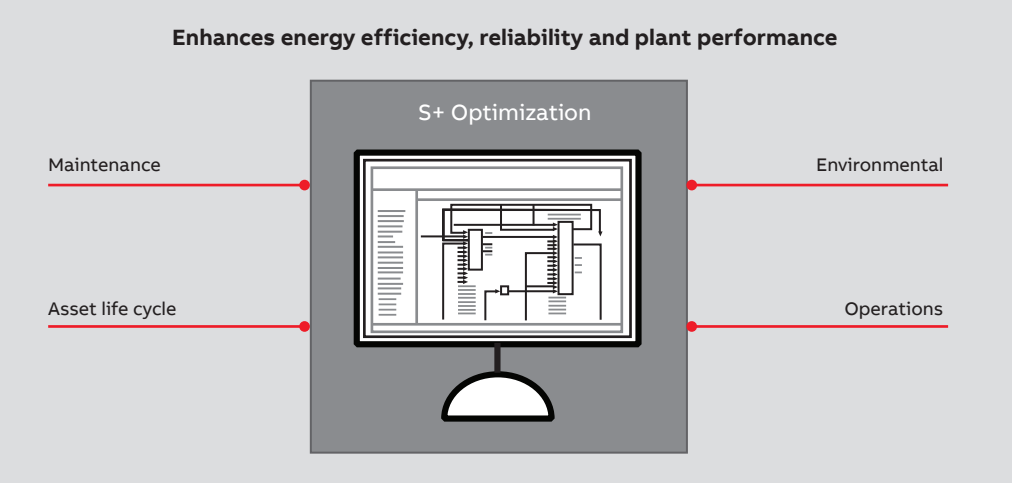
Central Audit Trail System tracks and archives in a central database all system changes and online actions to enable faster troubleshooting. Note, the central audit trail feature includes audit trail events for engineering actions. Normal operator events are included with the S+ Operations base software.

AQUA Reports are designated for water treatment plants and their specific usage of laboratory data. These AQUA reports are according to the M260 standard and come together with a powerful lab value tool.

	License
Calculation Engine	8VZZ000841L1120
SMS and E-Mail Notification	8VZZ000841L0870
Central Audit Trail System	8VZZ000841L0840
AQUA Reports	8VZZ000841L0945
Extended Operations	8VZZ000841L0800
Advanced Operations	8VZZ000841L0810
Multi-Screen Support	8VZZ000841L0830
Point of Control	8VZZ000841L0850
Takadu Interface	8VZZ000841L0860
S+ Publisher (Edgenius support)	8VZZ000841L0875

S+ Operations
Plant Performance packages

ABB offers advanced calculation software to optimize plant operation. These software packages are highly specialized for optimal tuning and performance of each of the plant's critical processes. Users must have a history server (S+ Historian) in the system for the software to perform the advanced calculations.



	License
Basic Package • Includes Calculation Server (with Core and Math) • Includes Water/Steam/Gas and AGA Natural Gas tools	8VZZ000841L1060
Gas Turbine Package • Basic Package • Gas Turbine Performance Library and Tech Calc module	8VZZ000841L1070
Combined Cycle Package • Basic Package and Gas Turbine Package • Performance Library and Tech. Calc. modules for: Feedwater Heater Performance, Pump Performance, Steam Turbine Performance, Condenser Performance, Flow Calculations, Heat Rate Calculations, Heat Exchanger (DIN) and HRSG Tools	8VZZ000841L1080
Fossil Package • Basic Package Includes Performance Library and Tech. Calc. modules) for: Air Heater Performance, Boiler Performance (ASME, PTC, DIN), Feedwater Heater Performance, Pump Performance, Fan Performance, Steam Turbine Performance, Condenser Performance, Flow Calculations, Heat Rate Calculation and Heat Exchanger (DIN).	8VZZ000841L1090
Fossil Package + Basic Package + Gas Turbine Package (calculation modules)	8VZZ000841L1100
Fossil Package + Basic Package + Combined Cycle Package (calculation modules)	8VZZ000841L1110

S+ Calculations

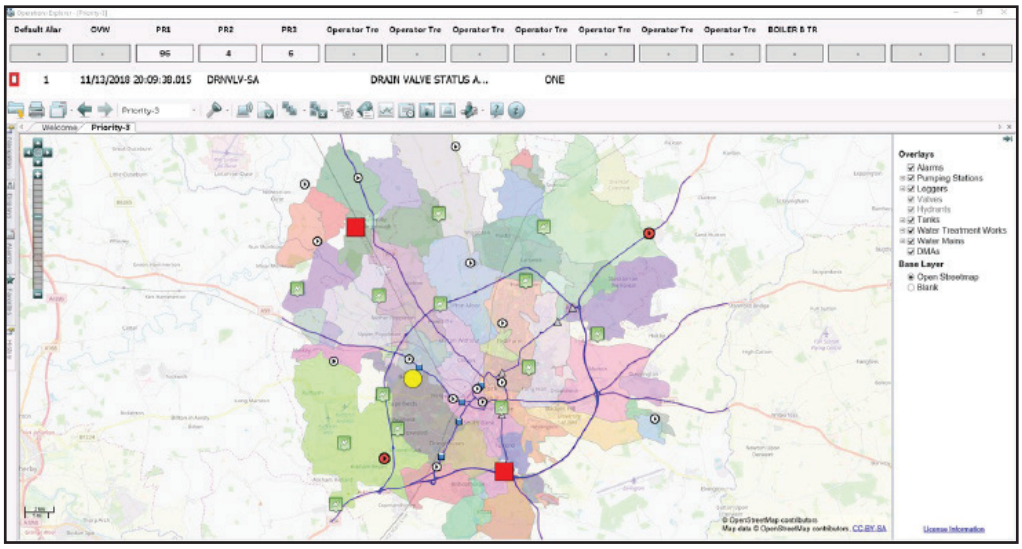
Real-time calculation engine provides fast calculation cycles, parallel calculations, event trigger based calculations, redundancy and time series calculation support.

	License
Calculation Engine	8VZZ000841L1120
Module Based Calculations	8VZZ000841L1130
Scripting Based Calculations	8VZZ000841L1140

S+ Operations

GIS integration – pinpointing the exact location of the problem

Symphony Plus offers tight integration between the operations environment and geographical information system (GIS). It enables users to zoom directly into the GIS from the process graphic or alarm list. GIS functionality is licensed by the size of the system.



Integrated GIS functionality

	License
GIS functionality for systems with up to 1,000 real-time tags	8VZZ000841L1150
GIS functionality for systems with up to 2,500 real-time tags	8VZZ000841L1160
GIS functionality for systems with up to 10,000 real-time tags	8VZZ000841L1170
GIS functionality for systems with more than 10,000 real-time tags	8VZZ000841L1180

S+ Operations
References

Document ID	Document Description
8VZZ003620T0001	S+ Operations brochure
3BUS095591	Symphony Plus Information Management flyer
2VAA009448	S+ Operations Alarm Portal brochure
2VAA006478	S+ Operations GIS Flyer
2VAA006479	S+ Operations Shiftbook and CMMS flyer
8VZZ001064T0001	S+ Operations Version 3.3 data sheet

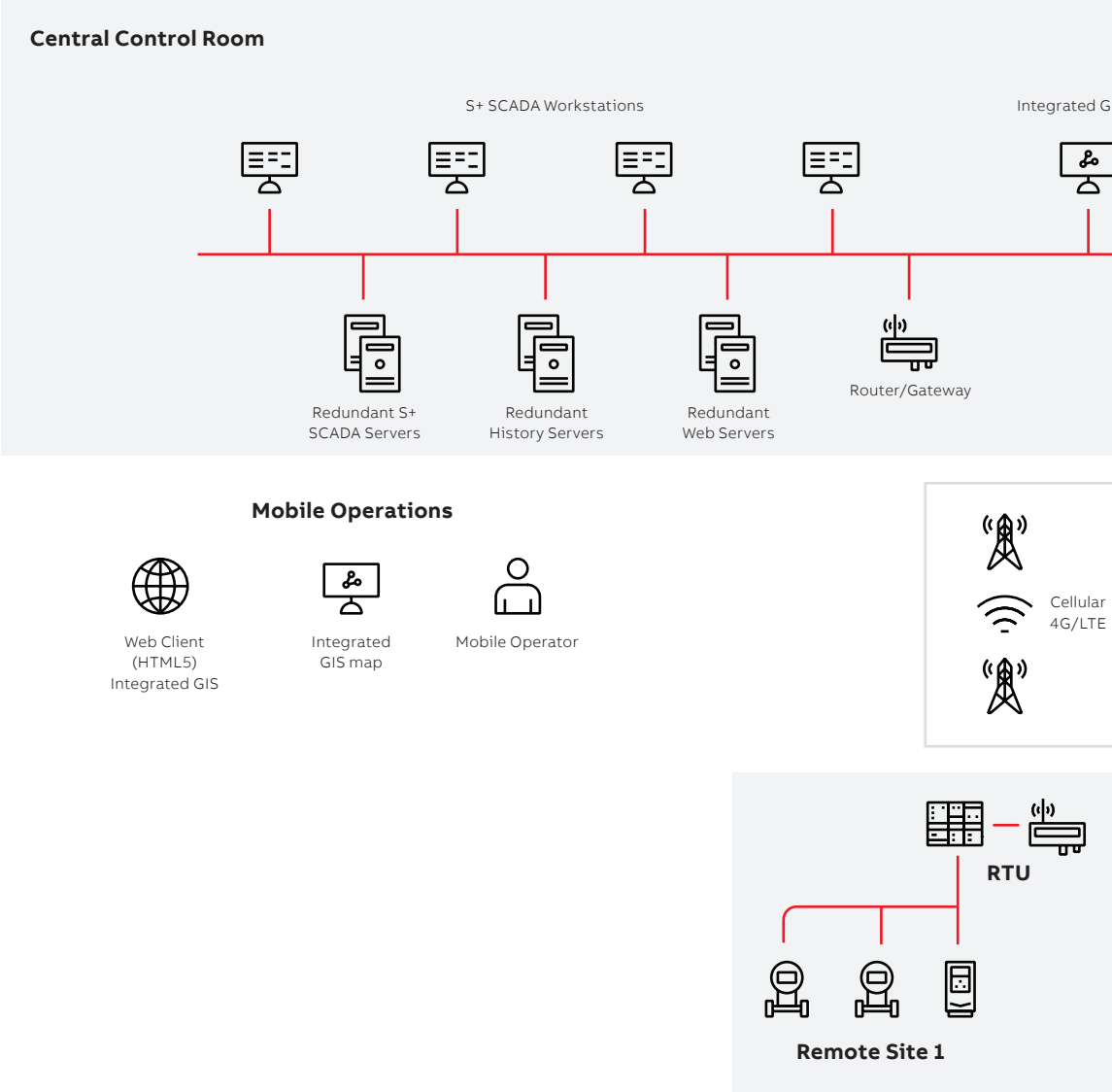
For documentation not publicly available, please contact your ABB representative

For your notes

S+ Operations SCADA

Supervisory monitoring and control through Integrated Remote Operations of geographically distributed industrial plants and remote sites is crucial to maintain efficiency and mitigate the down time of the plant. With increasing compliance and regulations, generational shift of the operator workforce, increasing use of mobile operator stations and increasing cyber security needs, it is becoming ever more challenging.

ABB Ability™ Symphony® Plus SCADA offers a true state of the art SCADA system. It is designed and built on field proven features and functions. It is an open, flexible and scalable platform which serves as a platform for all SCADA applications.



Flexible and scalable architecture deployment
S+ Operations SCADA quickly adapts to the architectural needs of SCADA applications; it offers to build a SCADA system which can also scale seamlessly over the time.

High performance HMI with advanced supervisory capabilities
S+ Operations SCADA offers high performance HMI as core of its Supervisory monitoring and control mechanism. It provides operators with distraction-free, state-of-the-art process information and access.

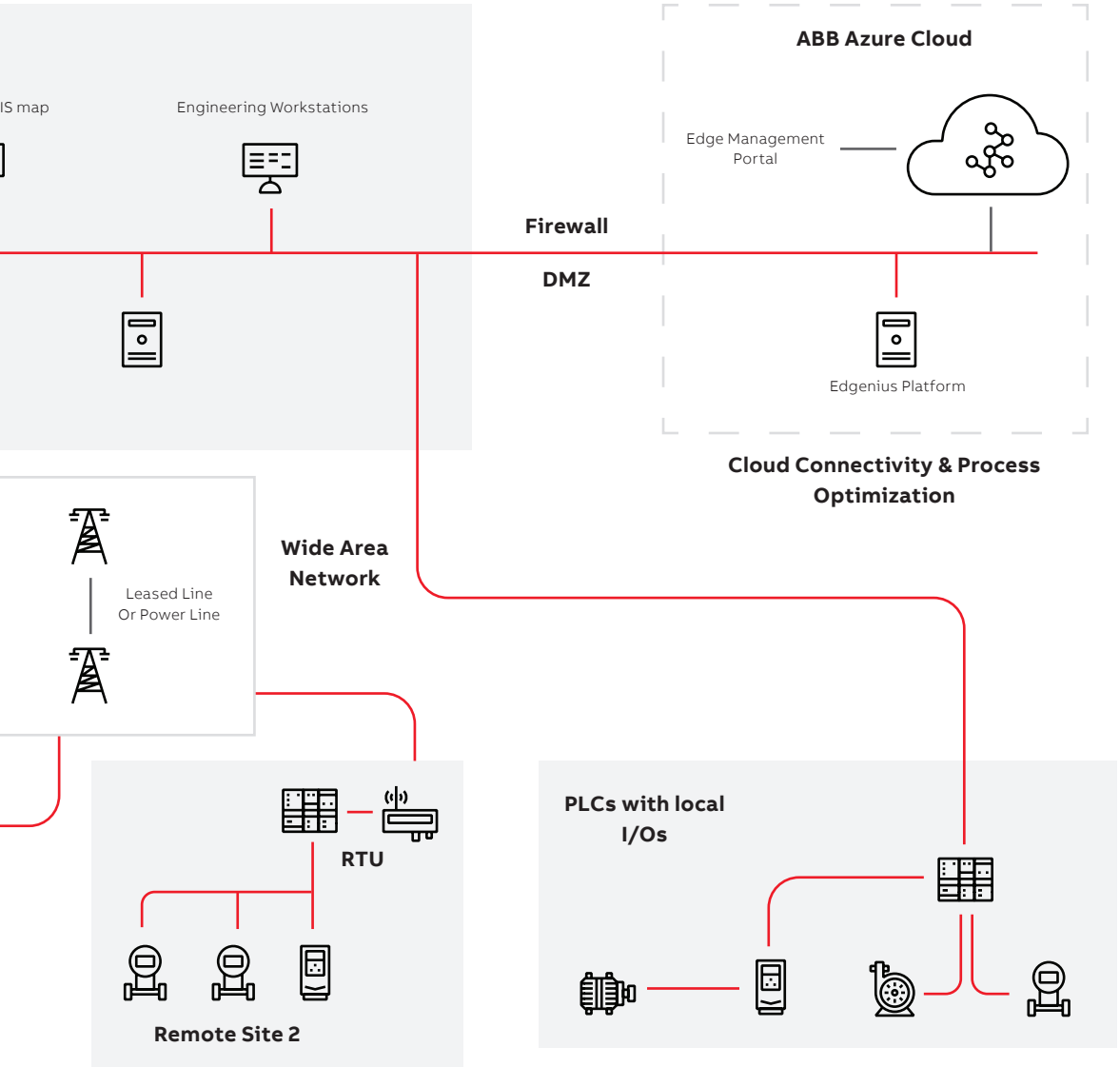
Remote Operations & Mobility
S+ Operations SCADA provides access to real-time and historical data from mobile devices like laptops, tablets and smart phones. Realtime information is accessible either by web interface or mobile apps.

Integrated Operations with uniform interfaces
S+ Operations SCADA seamlessly integrates all plant devices and systems with standard communication protocols required by SCADA applications like OPC UA, IEC 870-5-104 (IEC 104), Modbus TCP etc.

Object oriented SCADA engineering
S+ Operations SCADA provides object-oriented engineering to enable structured & efficient engineering for large SCADA applications.

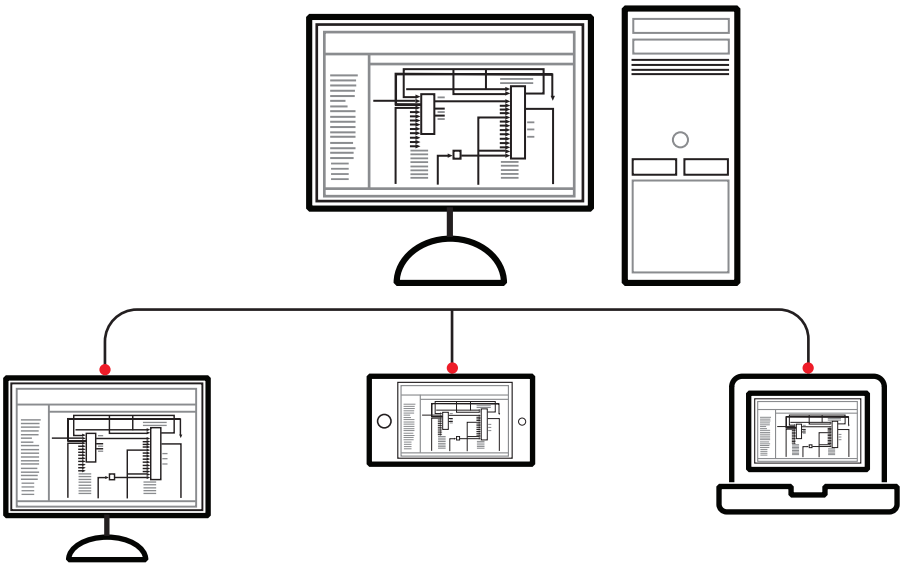
Easy Integration with Third Party systems & Cloud
S+ Operations SCADA provides easy possibility to integrate multiple vendors and third-party systems, it's also allowed to securely connect to the cloud using its connectivity with ABB Ability™ Edgenius platform.

Security
S+ Operations SCADA provides users with a secure and reliable operations environment with built-in security features.



S+ Operations SCADA
Base Software

Base licenses, as the name suggests, are the foundation of S+ Operations HMI software. Additional features can be added onto a base license to achieve the most effective and efficient HMI system. One of the following base licenses must be selected.



	License
Server based S+ Operations 3.3 license	8VZZ000841L0110
Serverless S+ Operations 3.3 license • Includes 1,000 real-time tags	8VZZ000841L0120
Display builder standalone • Server is used for generating graphics on site • No other features/options can be added to this license	8VZZ000841L0125

S+ Operations SCADA
Base Software

S+ Operations clients
Workstations for efficient control and operation

Operator clients
Operator clients (PowerExplorer). All packages are summed together for the total amount of all operator clients in the system. Check the data sheet for the max. quantity of operator clients allowed by each server connected at the same time. Operator clients do not include the Display Builder.

	License
1 Operator Client Package	8VZZ000841L0640
10 Operator Clients Package	8VZZ000841L0650
100 Operator Clients Package	8VZZ000841L0660

Developer Clients
Developer clients (PowerExplorer) include the operator client and the Display Builder. Check the data sheet for the max. quantity of operator clients allowed by each server connected at the same time.

	License
1 Developer Client Package	8VZZ000841L0670
10 Developer Clients Package	8VZZ000841L0680

PocketPortal Clients
The PocketPortal is a web based operator client with no operation rights. PocketPortal is the successor to ThinWebClient function and supports both IOS and Android operating systems. Check the data sheet for details. PocketPortal client packages are summed up to a total amount. The total amount is limited per web server and connected operation server.

	License
1 Pocket Portal Client	8VZZ000841L0700
10 Pocket Portal Clients	8VZZ000841L0710
100 Pocket Portal Clients	8VZZ000841L0720

Real Time Server Tags
All tags in the system must be of the same type, either all Single, all Redundant, or all Multi-redundant.

Single Tags
Tag packages for single realtime server systems where only non-redundant servers are used. Tag packs can be added to the total number of tags needed in the system.

	License
100 Single Tags pack	8VZZ000841L0360
1000 Single Tags pack	8VZZ000841L0370
10000 Single Tags pack	8VZZ000841L0380
100000 Single Tags pack	8VZZ000841L0390

Redundant Tags
Tag packages for redundant 1oo2 realtime server systems. Tag packs can be added to the total number of tags needed in the system.

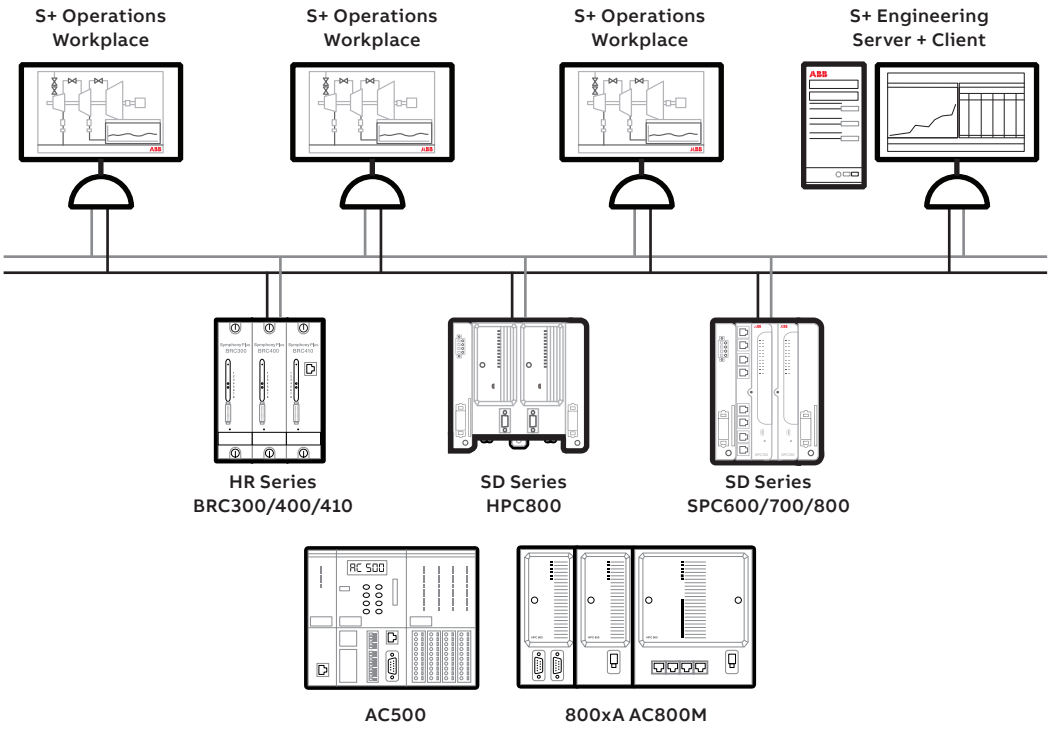
	License
100 Redundant Tags pack	8VZZ000841L0400
1000 Redundant Tags pack	8VZZ000841L0410
10000 Redundant Tags pack	8VZZ000841L0420
100000 Redundant Tags pack	8VZZ000841L0430

Multi Redundant Tags
Tag packages for systems where more than two redundant servers are used e.g. 1oo3 redundancy. Tag packs can be added to the total number of tags needed in the system.

	License
100 Multi Tags pack	8VZZ000841L0440
1000 Multi Tags pack	8VZZ000841L0450
10000 Multi Tags pack	8VZZ000841L0460
100000 Multi Tags pack	8VZZ000841L0470

S+ Operations SCADA
Connectivity to systems and field devices

S+ Operations can be deployed as a HMI system for various control platforms. To integrate the electrical network into the DCS, select the IEC 61850 connectivity license along with any of the other licenses below. Only one license for any given type of connectivity is needed. It includes pre-defined faceplates and I/O tag importer.



	License
HR and SD Series Connect (includes VPNI)	8VZZ000486L0170
AC800M Connect	8VZZ000486L0190
IEC 61850 Connect	8VZZ000486L0200
AC500 Connect	8VZZ000486L0180

S+ Operations SCADA

Scanners
Scanners provide the connectivity to a specific or standard interface. There is no specific object uploader nor faceplate or symbols associated with them.

	License
OPC Client	8VZZ000841L0260
Modbus / Modbus TCP (Master)	8VZZ000841L0270
SPABUS	8VZZ000841L0280
IEC 870-5-101 (Master and slave)	8VZZ000841L0290
IEC 870-5-103 (Master)	8VZZ000841L0300
IEC 870-5-104 (Master and slave)	8VZZ000841L0310
Text	8VZZ000841L0320
Application driver	8VZZ000841L0350
COMLI driver	8VZZ000841L0355

OPC server functionality – sharing real-time plant data
S+ Operations is fully capable of open platform communications with third-party systems. It supports OPC DA (data access), OPC HDA (historical data access) as well as OPC AE (alarms and events). Select either a read-only (RO) or a read-write (RW) license, depending on requirements.

	License
OPC (DA RO)	8VZZ000841L0230
OPC (DA RW)+AE	8VZZ000841L0240
OPC (DA RW)+AE+HDA	8VZZ000841L0250
OPC UA	8VZZ000841L0257

In addition to OPC, S+ Operations also supports application programming interface (API). API is used to ease the work of programming graphical user interface components. Select either application support or runtime support for API.

	License
API Support Application	8VZZ000841L0780
API Support Runtime	8VZZ000841L0790

S+ Operations SCADA
Integrated historian

S+ Operations features a fully integrated historian. This is an ABB solution that is built into the Symphony Plus system. A history server forms the basis of Symphony Plus historian. It is required for long-term storage of process data, alarms and events, report generation, long-term trends, and advanced plant performance calculation applications. It supports dedicated clients as well as Web browser-based clients for viewing, monitoring and analysis of data.

The number of history logs determines the size and capacity of the historian. The history server supports a maximum of 100,000 history logs. As for other limitations, please refer to the S+ Operations 3.x data sheet (8VZZ001064T0001) for latest details.

	License
History Server	8VZZ000841L0140

Short term logs use the same historian as long term logs but with less features.
In comparison, short term logs save three months with limited reporting features versus long term which saves logs as long as disk space remains with full reporting features.

Redundant Short Term Logs

	License
100 RST Logs Pack	8VZZ000841L0520
1000 RST Logs Pack	8VZZ000841L0530
10000 RST Logs Pack	8VZZ000841L0540
100000 RST Logs Pack	8VZZ000841L0550

Single Long Term Logs

	License
100 LT Logs Pack	8VZZ000841L0560
1000 LT Logs Pack	8VZZ000841L0570
10000 LT Logs Pack	8VZZ000841L0580
100000 LT Logs Pack	8VZZ000841L0590

Redundant Long Term Logs

	License
100 RLT Logs Pack	8VZZ000841L0600
1000 RLT Logs Pack	8VZZ000841L0610
10000 RLT Logs Pack	8VZZ000841L0620
100000 RLT Logs Pack	8VZZ000841L0630

S+ Operations SCADA
Integrated historian

Value-added options that maximize the potential of S+ Historian
Import and export real-time process data using the SQL interface into an MS SQL table. Feature is used to transfer data to applications such as customer web portal dashboards, SAP, etc.

	License
SQL Transmitter	8VZZ000841L0940

Perform detailed analysis of alarm data according to EEMUA P191 and ISA SP 18.2 guidelines.

	License
Alarm Portal Basic	8VZZ000841L0730
Alarm Portal Extended (includes real-time KPIs)	8VZZ000841L0740

Full Office Clients can read, display and analyze process data and create reports. These clients access the data through the history server. Multiple quantities may be selected, but no more than 50 full office clients per history server.

	License
Package of 1 Full Office Client	8VZZ000486L0730
Package of 10 Full Office Clients	8VZZ000486L0740

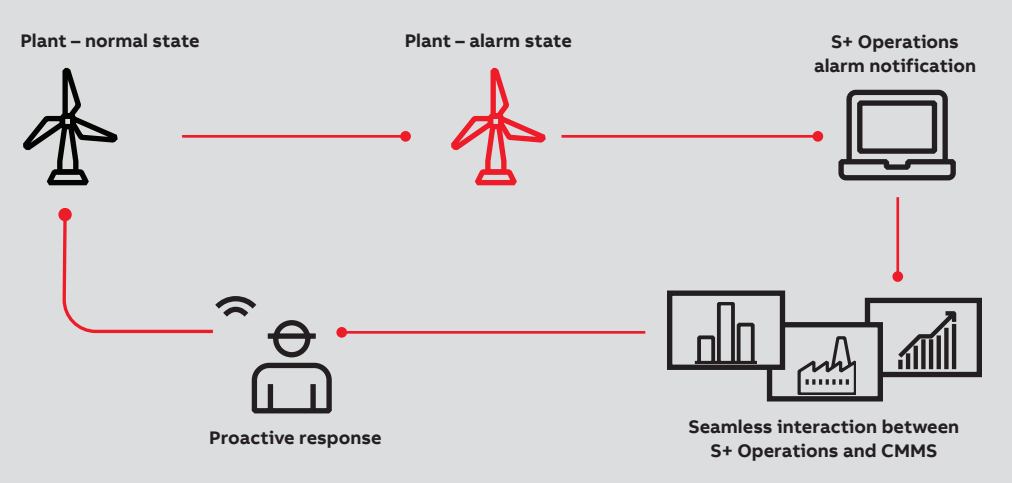
S+ Operations SCADA

High-performance operator workplace

S+ Operations offers productivity features that help reduce the plant's maintenance costs by streamlining operation and maintenance work processes.

Electronic Shift-Book
Think of this as an electronic diary. It is an electronic shift log application designed to be an alternative to paper-based shift logs and notes. Operator notes are easily stored in electronic format. Any open work actions at the end of a shift are passed on to the next shift. Shift changes are automatically noted in the log. Operators can automatically create a malfunction report within the shift-book.

CMMS Interface
Close integration with SAP PM and CMMS (computerized maintenance management systems) allows for easy communication with and navigation to asset-specific maintenance activities. Directly from the HMI screen, an operator can submit a malfunction report, view open maintenance requests and create a maintenance work order. CMMS integration allows for proactive maintenance and quick resolution of issues before they lead to a failure.



	License
Electronic Shift-Book clients	8VZZ000841L0970
Electronic Shift-Book / 1000 Tags packages	8VZZ000841L0980
Electronic Shift-Book / 10000 Tags	8VZZ000841L0990
CMMS Interface	8VZZ000841L1000

S+ Operations SCADA

Applications that take the HMI to the next level

SMS and E-Mail Notification allows users to configure the system to send SMS alerts to the operators' mobile devices in the event of alarms.

Central Audit Trail System tracks and archives in a central database all system changes and online actions to enable faster troubleshooting. Note, the central audit trail feature includes audit trail events for engineering actions. Normal operator events are included with the S+ Operations base software.

AQUA Reports are designated for water treatment plants and their specific usage of laboratory data. These AQUA reports are according to the M260 standard and come together with a powerful lab value tool.

	License
Calculation Engine	8VZZ000841L1120
SMS and E-Mail Notification	8VZZ000841L0870
Central Audit Trail System	8VZZ000841L0840
AQUA Reports	8VZZ000841L0945
Extended Operations	8VZZ000841L0800
Advanced Operations	8VZZ000841L0810
Multi-Screen Support	8VZZ000841L0830
Point of Control	8VZZ000841L0850
Takadu Interface	8VZZ000841L0860
S+ Publisher (Edgenius support)	8VZZ000841L0875

S+ Operations SCADA
Calculation packages

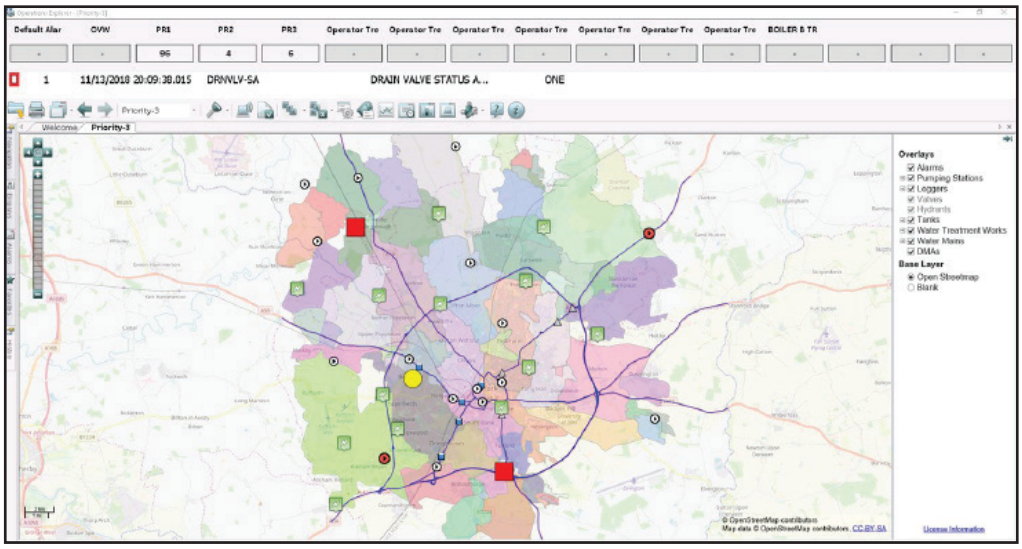
S+ Calculations
Real-time calculation engine provides fast calculation cycles, parallel calculations, event trigger based calculations, redundancy and time series calculation support.

	License
Calculation Engine	8VZZ000841L1120
Module Based Calculations	8VZZ000841L1130
Scripting Based Calculations	8VZZ000841L1140

S+ Operations SCADA

GIS integration – pinpointing the exact location of the problem

Symphony Plus offers tight integration between the operations environment and geographical information system (GIS). It enables users to zoom directly into the GIS from the process graphic or alarm list. GIS functionality is licensed by the size of the system.



Integrated GIS functionality

	License
GIS functionality for systems with up to 1,000 real-time tags	8VZZ000841L1150
GIS functionality for systems with up to 2,500 real-time tags	8VZZ000841L1160
GIS functionality for systems with up to 10,000 real-time tags	8VZZ000841L1170
GIS functionality for systems with more than 10,000 real-time tags	8VZZ000841L1180

S+ Operations SCADA
References

Document ID	Document Description
3BUS095591	Symphony Plus Information Management flyer
2VAA009448	S+ Operations Alarm Portal brochure
2VAA006478	S+ Operations GIS Flyer
2VAA006479	S+ Operations Shiftbook and CMMS flyer
8VZZ003534T0001	S+Operations SCADA Version 3.3 data sheet

For documentation not publicly available, please contact your ABB representative

For your notes

S+ Turbine

S+ Turbine

For several decades, ABB has been one of the world's leading providers of turbine control systems, delivering cost-efficient and technologically advanced solutions designed to meet the needs of both retrofit and greenfield markets. With Symphony Plus, all this experience comes together in S+ Turbine to take ABB's turbine control offering to a new level of unmatched functionality and performance.

Above all, S+ Turbine is a highly integrated total solution for the automation of all turbine types, sizes and manufacturers. It makes use of the industry's most powerful processors, along with proven digital algorithms and dedicated high-end solutions for turbine protection, valve positioning, generator synchronization, condition monitoring and mechanical/hydraulic upgrading.

S+ Turbine includes several turbine specialty modules that address a large variety of turbine functions in dedicated high-speed and high-reliability design implementations.

These modules are fully integrated into the HR Series (rack-based) or DIN rail-based control architecture, engineering environment and HMI graphics. The end result is a powerful turbine solution that utilizes the very same technology and infrastructure that controls the rest of the plant. The functions addressed by the turbine modules include valve control, valve position indication, speed indication, turbine protection, generator auto synchronization, and condition monitoring.

SD Series Turbine Control Solutions

Symphony® Plus SD Series includes a set of highly advanced turbine specific modules that allow for a fully integrated turbine control solution in the DIN Rail mounted form factor. These modules have been designed to offer the industry's highest level of performance, along with the most comprehensive set of turbine control and protection functions.

All this capability is housed inside of a modern, high density and reduced footprint SD form factor package. Being part of the SD Series family, the SD Turbine Modules integrate directly and seamlessly into the HN800 network, S+ Control and S+ Engineering environments. A custom function code interface is available specifically for these turbine products to ensure high speed data transmissions and short turbine governor response times. All SD Turbine Modules offer built-in SOE capability for proper event timing analysis. The parameter configuration is performed via graphical windows for a more efficient and user friendly application customization process.

The SD Turbine Modules are compatible with all turbine types, sizes and manufacturers. They provide solutions for the following applications:

- Turbine Protection: TP01
- Auto-Synchronization: AS01
- Valve Positioning: VP01

The Relay Output Module (ROM810) can be used in combination with the SD Turbine Modules to provide heavy duty relay output capabilities that in most cases can be wired directly to the final element (trip solenoid, test solenoid, generator breaker, etc.).

SD Turbine Control Solutions

Property	Characteristic/Value General (all three SD Turbine Modules)
Mounting	Standard 35mm wide DIN-rail, horizontally or vertically
Communications and ports • HN800 • Service port	 Redundant 4 Mbps I/O bus (3 Amp Maximum per row, or 16 turbine module limit) 1 RS232C port in mini-USB form factor
Capacity HN8001	Up to 64 devices in total per electrical bus, up to 8 horizontal Bus Segments or 10 vertical Bus Segments per electrical bus, up to 24 devices per horizontal Bus Segment, up to 8 devices per vertical Bus Segment. Up to 30 m in total length per electrical bus, extended up to 3 km by fiber-optic repeater, up to 4 pairs of fiber-optic repeaters in Star configuration.
Processor	MCF54415 at 128 MHz, with 4 MB flash, 128 MB SDRAM
Overvoltage category	Tested according to EN 61010I for power for inputs and outputs
Maximum field cable length	600 meters (656 yards)
Dimensions • SD I/O module with HBS01 base • SD I/O module with VBS01 base • SD I/O module(VP01 only) with HBR01 base • SD I/O module(VP01 only) with VBR01 base • HBX01L (HN800 horizontal bus extender, left) • HBX01R (HN800 horizontal bus extender, right) • VBX01T (HN800 vertical bus extender, top) • VBX01B (HN800 vertical bus extender, bottom)	 51mm width, 190 mm height, 138 mm depth (2 in. width, 7.48 in. height, 5.43 in. depth) 66 mm wide, 218 mm height, 138 mm depth (2.6 in. width, 8.58 in. height, 5.43 in. depth) 90 mm width, 190 mm height, 138 mm depth (3.45 in. width, 7.48 in. height, 5.43 in. depth) 103 mm width, 218 mm height, 138 mm depth (4.06 in. width, 8.58 in. height, 5.43 in. depth) 33mm width, 190 mm height, 46 mm depth (1.3 in. width, 7.48 in. height, 1.82 in. depth) 33 mm width, 190 mm height, 31 mm depth (1.3 in. width, 7.48 in. height, 1.2 in. depth) 66 mm wide, 76 mm height, 48 mm depth (2.6 in. width, 3 in. height, 1.89 in. depth) 66 mm wide, 76 mm height, 33 mm depth (2.6 in. width, 3 in. height, 1.3 in. depth)
Weight	0.65lbs (TP01)
Ambient temperature (operational)	-20° to 55°C (-4° to 131°F) Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2
Temperature (storage)	-40° to 85°C (-40° to 185°F). Tested according to MIL-STD-810G
Relative humidity	20% to 95%@ 40°C (104°F) non-condensing Tested according to IEC/EN 60068-2-78, IEC/EN 61298-3
Vibration (operational sinusoidal)	5 to 60 Hz 0.137 mm (0.0054 in.) 60 to 150 Hz 1.0 G. Tested according to IEC/EN 60068-2-6
Vibration (transportation)	10 to 500 Hz. Tested according to MIL-STD-810G
Shock (storage)	15 G, 11 msec. Tested according to IEC/EN 60068-2-27
Drop	100 mm. Tested according to IEC/EN 60068-2-31
Altitude (operational)	Sea level to 3,048 meters (10,000 ft.) Tested according to MIL-STD-810G
Altitude (storage)	Sea level to 12,192 meters (40,000 ft.) Tested according to MIL-STD-810G
Air quality	ISA S71.04 G1 ISA S71.04 G3 compliance version is also available
ESD immunity	Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-5, Severity level 3
Surge immunity	Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-5, Severity level 3
Electrical fast transient immunity	Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-4, Severity level 3
Radiated RFI immunity	Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-3, Severity level 3
Conducted immunity	Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-6, Severity level 3
Magnetic field immunity	Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-8, Severity level 4
Radiated emission	Tested according to IEC/EN 61000-6-4, CISPR 11 + A1, CISPR 16-1-1, Group 1, Class A, ISM equipment
Conducted emission	Tested according to IEC/EN 61000-6-4, CISPR 11 + A1, CISPR 16-1-1, Group 1, Class A, ISM equipment
Voltage dips and interruption immunity	Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-11
Certification • Canadian Standards Association (CSA) • CE Mark	Certified for use as process control equipment in a non-hazardous (ordinary) location, and for the following categories in a hazardous non-incendive location Class I, Division 2, Groups A,B,C,D CE Mark EMC directive 2004/108/EC & Low voltage directive 2006/95/E

SD Series turbine control solutions

TP01

TP01

The Turbine Protection TP01 is a SIL3* rated turbine protection module that offers a complete set of Built-in protection functions for all types of gas, steam and hydro turbines. These functions include: Overspeed Trip, Overspeed Protection, Acceleration Protection, Anti-Surge Protection, Trip Anticipation, Load Drop Anticipation, and three different variations of Power Load Unbalance. The TP01 can be configured to interface to all types of speed probes, transducers, switches and trip solenoids. It will detect an overspeed condition and generate a turbine trip output in under 5 milliseconds.

Technical data		
Power requirements (Logic power)	Operating voltage Current	24 VDC + 12%, -10% 160 mA maximum
Power requirements (Analog IO power)	Operating voltage Current	24 VDC ± -10% 85 mA + external system powered loads
Analog Inputs		
Number of channel		5 group operated
Current Mode – System Powered Voltage Mode – Field or System Powered		4 to 20 mA (All 5 Channels) 1 to 5 VDC (Configurable On Channels 3-5)
Input impedance	Current mode Voltage mode	250 Ω ≥ 210 kΩ
A/D conversion • Resolution • Conversion update rate		2 A/D converters, each with 4 input channels (3 channels used for internal diagnostics only) 16 bits unipolar 1 msec for all 8 channels
Accuracy (% of full scale range at 25°C)	Current mode Voltage mode	±0.1% of FSR, FSR = 22 mA ±0.1% of FSR, FSR = 5.5 VDC
Input to logic isolation • Isolation voltage • Common-mode transient immunity		Galvanic isolated UL1577 1000 VRMS for 1 minute 15kV/us
Analog Outputs		
Number of channel		2 group operated
Current		0 to 24 mA
Output load		0 - 1KΩ (at 20mA)
D/A conversion Resolution		2 D/A converters, each channel has a dedicated D/A converter 16 bits
Accuracy (% of full scale range at 25°C)		±0.08% of FSR, FSR = 24 mA
Input to logic isolation • Isolation voltage • Common-mode transient immunity		Galvanic isolated UL1577 1000 VRMS for 1 minute 15kV/us
Current limiting Short circuit protection		24 mA nominal output current limit
Diagnostics	Calibration Functional Test	Factory Always-on Open Circuit and Over Temperature detection

* Certification pending

SD Series turbine control solutions

Technical data		
Speed Inputs		
Power requirements		Included in logic power requirements (isolated converters always on)
Number of channel		2 independently operated
Frequency Range		0.5Hz to 20KHz
Frequency Measurement	• Pulse Timer Resolution • Calculation update rate	32-bits at 64MHz Greater of 1msec or signal cycle time for each channel
Input impedance	• Hi-Sensitivity • Medium-Sensitivity • Low-Sensitivity	≥ 340 kΩ ≥ 55 kΩ ≥ 12 kΩ
Accuracy	• 0 - 1000RPM • 1000 - 12000RPM • 12000 - 20000RPM	0.01RPM 0.001% of actual 0.002% of actual
Input to logic isolation • Isolation voltage • Common-mode transient immunity		Galvanic isolated UL1577 1000 VRMS for 1 minute 15kV/us
Diagnostics Functional Test		On-Demand Test Signal Injection
Digital Inputs		
Power requirement (Digital IO power) • Operating voltage • Current		Required for system powered inputs and built-in diagnostics 24-48 VDC ±10% Max 5mA per channel
Number of channel		5
Configurations • Extra Low Voltage – System Powered • Low Voltage – Field Powered		Minimum Threshold: TBD 24-48VDC (All 5 Channels) 24-125VDC/120VAC (Configurable On Channels 3-5)
Input impedance		≥ 15 kΩ
Current limiting		2.7mA on Channels 3-5
Input to logic isolation • Isolation voltage • Common-mode transient immunity		Galvanic isolated UL1577 1000 VRMS for 1 minute 15kV/us
Diagnostics Functional Test		Automatic on Startup and Periodic Configurable Test Signal Injection
Digital Outputs		
Number of channel		2 1-Form A
Rated Current		1A
Rated Voltage		120VAC/149VDC
Current limiting Short circuit protection		NONE
Diagnostics Driver Feedback		Voltage measurement performed on SSR driver to determine if activated
Auxiliary Digital Outputs (via TRA01/ROM810)		
Number of channel		6 2-Form C
Rated Current		3A
Rated Voltage		120VAC/149VDC
Current limiting Short circuit protection		NONE
Protection Function Response Time		
Overspeed Trip		Typ 2.5ms
Rate Sensitive Power Load Unbalance		Typ 15ms
Early Valve Actuation		Typ 20ms
Load Drop Anticipator		Typ 6ms
Close Intercept Valve		Typ 20ms
Trip Anticipator		Typ 7ms
Acceleration		Typ 30ms

Typ – Typical response time with default parameters using built in relays

SD Series turbine control solutions

VP01

VP01

The Valve Positioner VP01 provides control of the flow of steam, gas, or water through a turbine by precisely regulating the position of the inlet valves. It is intended for modulation of hydraulic actuators via servo valves or I/H converters. The VP01 performs closed loop control for servo valves utilizing single or redundant position feedback devices, or open loop control for current drive valves. It offers a response time from input to output under 1 millisecond and can generate servo output signals up to 500 milliamps per servo coil output. The feedback devices can be AC or DC LVDT's and the control output can be Proportional-Integral or Proportional-Only. The VP01 module supports traditional dual redundancy (master/backup) as well as TMR (Triple Modular Redundancy).

Power Requirements	
Module Power Product Rev. < F Product Rev. ≥ F	+24 VDC ±5 % 330 mA typical, 500 mA max, up to 2 A inrush 125 mA typical, 175 mA max, up to 1.75 A inrush (200 µs) **Note:** Double these values for a redundant module configuration **Note:** The maximum continuous current draw from the +24 V logic power source for a single segment of SD I/O and SD Turbine modules is 3 A.
Analog Power Product Rev. < F Product Rev. ≥ F	+24 VDC ±5 % 60 mA max. 210 mA typical, 300 mA max, up to 1.75 A inrush (350 µs)
Coil Driver Power	±15 VDC ±5% 50mA max. + load current. [typical V] -or- ±24 VDC ±5% 50mA max. + load current. [maximum V]
Power Dissipation	
Module Power Product Rev. < F Product Rev. ≥ F	 7.92 W (+24 VDC) typical. 3 W (+24 VDC) typical.
Analog Power Product Rev. < F Product Rev. ≥ F	 1.44 W (+24 VDC) max. 5.04 W (+24 VDC) typical, 7.2 W (+24 VDC) max.
Coil Driver Power	±0.75 W max (±15 VDC) -or- ±1.20 W max (±24 VDC)
Technical Data	
Position Feedback (2)	AC LVDT, DC LVDT, AC LVRT, 4-20 mA, bipolar DC transducer, unipolar DC transducer
AC LVDT Excitation (2)	1.05 - 8.96 VRMS, 400 - 15,000 Hz
Position Feedback Input Range	AC LVDT = ±12 Vp, unipolar DC transducer = 0 – 12 VDC and bipolar DC transducer = ±6 VDC -or- ±12 VDC.
Coil Driver Output (2)	±502 mA max.
Analog Input (1)	4-20 mA (Field Power)
Analog Output (2)	4-20 mA (System Power)
Digital input (3)	+24 VDC, 6 mA each (Field Power)
Digital Output (2)	Dry Contact (1-Form A): +24 VDC, 400 mA max. each
External Digital Output (4)	Dry Contact (2-Form C): 3A @ 149 VDC, 5A @ 120 VAC
A/D conversion • Resolution • Conversion update rate	2 A/D converters, each with 4 inputs and embedded filtering 24 bits 1.5 ms for all channels
Digital I/O isolation voltage	500 VRMS at 60 Hz
Coil driver short circuit protection	506 mA nominal output current limit
LVDT excitation short circuit protection	150 mA nominal output current limit
Coil output open/short detection time	1 ms max.
Feedback open/short detection time	1 ms max.
New demand to output change time	1 ms max.

SD Series turbine control solutions

AS01

AS01

The Auto Synchronizer AS01 provides automatic breaker closure during generator to line synchronization or during peer to peer bus synchronization in switchyard applications. The AS01 automatically matches voltage, frequency, and phase, and is also capable of detecting a dead bus to initiate safe breaker closure from a live bus to a de-energized bus. In addition to the main synchronization circuit, the AS01 makes use of a built-in independent synchronization check circuit for maximum safety and reliability.

Technical data	
Power requirements (logic power) • Operating voltage • Current	 24VDC +/-5% 175 mA maximum
Power requirement (Analog IO power)	Included in logic power requirements (isolated converters always on)
Bus Inputs	
Number of channel	2 channels, each electrically duplicated
Rating	Up to 134VAC, 40-70Hz
Input impedance	≥ 1MΩ
A/D conversion Resolution	2 A/D converters, each with 4 input channels (2 channels, duplicated plus internal diagnostics only) 16 bits unipolar
Accuracy (% of full scale range at 25°C) • Current mode • Voltage mode	 ±0.1% of FSR, FSR = 22 mA ±0.1% of FSR, FSR = 5.5 VDC
Input to logic isolation • Isolation voltage • Common-mode transient immunity	Galvanic isolated UL1577 1000 VRMS for 1 minute 15kV/us
Diagnostics • Calibration • Functional Test	 Factory Duplicate circuitry for each channel allows for completely independent calculation paths
Digital Inputs	
Power requirement (Digital IO power) • Operating voltage • Current	Required for system powered inputs 24-48 VDC ±10% Max 5mA per channel
Number of channel	7
Configurations • Extra Low Voltage – System Powered • Low Voltage – Field Powered	 24-48VDC (All 7 Channels) 24-125VDC/120VAC (Configurable On Channels 1-2)
Input impedance	≥15 kΩ
Current limiting	2.7mA on Channels 1-2
Input to logic isolation • Isolation voltage • Common-mode transient immunity	Galvanic isolated UL1577 1000 VRMS for 1 minute 15kV/us
Digital Outputs	
Number of channel	7 1-Form A
Rated Current	1A (DO1 and DO2), 400mA (DO3-DO7)
Rated Voltage	120VAC/149VDC (DO1 and DO2), 60VDC/40VAC (DO3-DO7)
Current limiting Short circuit protection	NONE
Diagnostics Driver Feedback	Voltage measurement performed on SSR driver to determine if activated
Auxiliary Digital Outputs (via TRA01/ROM810)	
Number of channel	6 2-Form C
Rated Current	3A
Rated Voltage	120VAC/149VDC
Current limiting Short circuit protection	NONE

HR Series turbine control solutions

The ABB Symphony® Plus Harmony Rack turbine control solution accounts for one of the largest turbine control installed bases in the world. The core of this technology platform has been extensively proven in use and includes several turbine specialty modules addressing a large variety of turbine functions in dedicated high speed and high reliability design implementations. These modules are fully integrated into the Harmony Rack control architecture (via Expander Bus connectivity), engineering environment and HMI graphics. The end result is a powerful turbine solution utilizing the very same technology and infrastructure that controls the rest of the plant.

The functions addressed by the Harmony Rack turbine modules include valve control, valve position indication, speed indication, turbine protection, generator auto synchronization, and condition monitoring. The modules each consist of a single printed circuit board that occupies one slot in a module mounting unit (MMU). In general, jumpers and switches on the printed circuit board and jumpers and dipshunts on the termination unit are used to configure the module and its I/O channels. A cable connects the I/O module to its termination unit. The physical connection points for field wiring are on the termination unit.

HR Series turbine control solutions

SPHSS13

SPHSS13

The SPHSS13 hydraulic servo module is a valve position control module. It provides an interface through which a HR Series controller can drive a servo valve or I/H converter to provide manual or automatic control of a hydraulic actuator.

Typical areas of use for the SPHSS13 module are positioning the steam turbine throttle and control valves, gas turbine fuel valves, inlet guide vanes and nozzle angle. By regulating the current to the servo valve, it can initiate a change in actuator position. The hydraulic actuator can then position, for example, a gas turbine fuel valve or a steam governor valve. As the valve opens or closes, it regulates fuel or steam flow to the turbine, thus controlling the turbine speed. A linear variable differential transformer (LVDT) provides actuator position feedback to the hydraulic servo module. The SPHSS13 module interfaces to AC or DC LVDTs and can operate in Proportional-Only mode.

The SPHSS13 is an intelligent I/O device with an onboard microprocessor, memory and communication circuitry. In most applications, the SPHSS13 will work in coordination with a speed detection module (SPTPS13) to form the turbine governor system.

Technical data	
Operating voltage	+5 VDC, ±5% at 576 mA typical +15 VDC, ±5% at 15 mA typical -15 VDC, ±5% at 12 mA typical +24 VDC, ±10% at 335 mA typical (from termination unit)
Power dissipation	2.88 W (+5 VDC) typical 0.23 W (+15 VDC) typical 0.18 W (-15 VDC) typical 8.04 W (24 VDC) typical
LVDT secondary 2-position inputs	4 analog inputs total, 2 LVDT secondary inputs (each with 2 secondaries) 24 V_{pp} ±7 VDC common mode, 10 kΩ differential input impedance
LVDT supply primary excitation outputs	2 analog outputs: LVDT primary 1 and 2 Ambient frequency: 400 Hz to 15 kHz
Servo valve coil outputs	2 analog outputs with servo output protection. Shorting or opening 1 output does not affect the other output Servo mode: ± 300 mA I/H mode: 4-20 mA or 20-160 mA
Position panel meter output	1 analog output (scaled feedback output)
Unscaled position feedback output	1 analog output
Test mode output	1 analog output
Digital inputs	3 optically isolated (250 VDC) contact inputs (raise, lower and trip bias)
Digital outputs	-1 independent, optically isolated (250 VDC), open collector output (hard manual)
Ambient temperature	0° C to 70° C (32° F to 158° F)
Dimensions	35.56 mm width, 177.80 mm height, 298.45 mm depth (1.40 in. width, 7.00 in. height, 11.75 in. depth)

HR Series turbine control solutions

SPLPS01

SPLPS01
The Symphony Plus LVDT position module (SPLPS01) provides an interface through which a Symphony Plus controller can read the position of two linear variable differential transformers (LVDTs) or rotary variable differential transformers (RVDTs).

The SPLPS01 has three ambient modes:

Normal
Reads LVDT position and sends it to the multi-function processor (MFP) or bridge controller (BRC). Calibration values are locked in while in this mode and cannot be altered.

Manual calibration
A technician uses an oscilloscope to adjust the module using the front panel display pushbuttons.

Automatic calibration
The valve is moved by the operator to opposite extremes. The microprocessor automatically adjusts the internal parameters to the optimum values.

Technical data	
Memory	PLM Provide
General	
System communications	8 bit parallel
Mounting	One slot in standard INFI 90 Module Mounting Unit (MMU)
I/O termination	NTDI01 Digital Input Termination Unit
Operating	
LVDT primary supply	1.85 KHz, 10, 20, or 23 V_{pp} Minimum LVDT primary impedance 500 ohms
LVDT secondary Positive inputs	30 volts peak-to-peak, -12 to +15 common mode 20 kΩ (differential input) impedance
LVDT primary output protection	Current limiting resistor allows output to be shorted to ground without damage
Electrical	
Operating voltage	+5 VDC ±5% at 175 mA +15 VDC ±5% at 75 mA -15 VDC ±5% at 75 mA
Power dissipation	0.875 W at +5 VDC 1.125 W at +15 VDC 1.125 W at -15 VDC
Environmental	
Electromagnetic/radio frequency interference	Values not available at this time. Keep cabinet doors closed. Do not use communications equipment any closer than two meters from the cabinet.
Ambient temperature	0° C to 70° C (32° F to 158° F)
Humidity	5% to 90% RH (±5%) up to 55°C (non-condensing) 5% to 40% RH (±5%) up to 70°C (non-condensing)
Atmospheric pressure	Sea level to 3 km (1.86 miles)
Air quality	Non-corrosive
Installation category	Category 1 per ANSI/ISA-S82.01-1994
Mean time between failure	17.33 years
Dimensions	35.56 mm width, 177.80 mm height, 298.45 mm depth (1.40 in. width, 7.00 in. height, 11.75 in. depth)

HR Series turbine control solutions

SPTAS01

SPTAS01

The Symphony Plus turbine auto synchronization module (SPTAS01) integrates automatic generator circuit breaker closure into the Symphony Plus control system. The module supports high and low range (eg, 0-150 VAC and 0-50 VAC) generator and line input voltages ambient at either 50 or 60 Hz. The module is capable of automatically matching line and generator voltage, frequency and phase, and automatic closure of the generator breaker. The automatic functions can be individually disabled, in which case the module monitors for the correct conditions but takes no action to modify the parameters.

When the SPTAS01 is in the normal mode and the generator is not synchronized, the module checks the generator and line voltage inputs continually. The synchronization sequence will not start until the line voltage is greater than 75% of the target synchronization value, the generator voltage is greater than 33% of the target synchronization value, and the generator and line frequencies are within the acceptable window configured by the user.

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Technical data	
Memory	PLM Provide
General	
System communications	8 bit parallel
Mounting	One slot in standard INFI 90 Module Mounting Unit (MMU)
I/O termination	NTDI01 digital input termination unit
Operating	
Contact output rating	24 VDC, 51 mA maximum
AC inputs (Gen/Line Volts)	0-50 or 0-150 VAC 50 or 60 Hz 21 kΩ impedance
Electrical	
Operating voltage	+5 VDC ±5% at 400 mA +15 VDC ±5% at 50 mA -15 VDC ±5% at 75 mA
Power dissipation	2.0 W at +5 VDC 0.75 W at +15 VDC 1.125 W at -15 VDC
Environmental	
Electromagnetic/radio frequency interference	Values not available at this time. Keep cabinet doors closed. Do not use communications equipment any closer than two meters from the cabinet.
Ambient temperature	0° C to 70° C (32° F to 158° F)
Humidity	5% to 90% RH (±5%) up to 55°C (non-condensing) 5% to 40% RH (±5%) up to 70°C (non-condensing)
Atmospheric pressure	Sea level to 3 km (1.86 miles)
Air quality	Non-corrosive
Installation category	Category 1 per ANSI/ISA-S82.01-1994
Mean time between failure	18.05 years
Dimensions	35.56 mm width, 177.80 mm height, 298.45 mm depth (1.40 in. width, 7.00 in. height, 11.75 in. depth)

HR Series turbine control solutions

SPTPS13

SPTPS13
The SPTPS13 module represents the latest generation of speed detection and turbine protection modules for the Symphony Plus Harmony Rack platform. This module has been designed to replace and consolidate all existing older Harmony Rack products of this type (SPTPS02, SPFCS01 and SPTSA01). As a result of its multi-function purpose, the SPTPS13 is compatible with several termination units (TPTU02 and NTDI01, NTDI02) and can interface to several Harmony function codes:

a. FC 145/79/83/84 for TPS02 replacement applications
b. FC 145 for FCS01 replacement applications
c. FC 103 for TSA01 replacement applications

In addition, the SPTPS13 makes use of three small adapter boards (TPS, FCS, TSA) which can be used to configure the functionality and the I/O channel mapping of the SPTPS13 to match those of the three modules being replaced. Therefore, the SPTPS13 has three different modes of operation, depending on what adapter board is plugged on to the motherboard.

TPS Mode
Three SPTPS13 modules plug to a single TPSTU02 termination unit using standard NKTU01 cables. All electronic overspeed related protective functions are monitored and initiated in the modules and termination unit. These protective functions are independent of the Symphony Plus Bridge Controller (BRC) and data highways. Triple redundant inputs, 2-of-3-protection logic, and on-line testing capability are used to provide high reliability. Each of the protective functions utilizes relays on the termination unit to control activation of the function, three of which have four relay outputs for use with hydraulic manifolds such as those provided by ABB, which use “1-of-2-twice” logic that allows for on-line testing of the manifolds. The module utilizes an on-board microprocessor and memory to process input data, control outputs, and communicate with the ABB Symphony Plus control system. The module provides the following protective functions:

- OverSpeed Protection (OSP): Typically activates the Overspeed Manifold that shuts the Governor and Intercept Valves to control an overspeed situation without having to initiate a turbine trip.

- Turbine Trip (TRIP): Operates in parallel with or in lieu of the OEM electrical turbine trip (typically a solenoid dump valve in the turbine control oil circuit) that rap-idly shuts all of the turbine valve actuators. The setpoint is typically 110% of rated turbine speed.

- EHC Protection (EHC): Operates in conjunction with the TRIP function to acti-vate the EHC Manifold, which dumps the hydraulic pressure to all of the valve actuators. The setpoint is the same as the TRIP setpoint.

- Power Load Imbalance (PLI): Megawatts (electrical load output) and Intermediate Pressure (IP) Turbine Exhaust Pressure (mechanical load input) are compared to determine if there is an imbalance between the two. If the turbine mechanical load input exceeds the electrical load output by a set amount, an overspeed situation is anticipated and a digital output is generated for a specified time period, which is typically used to briefly close the Intercept Valves.

HR Series turbine control solutions

FCS Mode
FCS mode is strictly a speed detection mode, where no protection functions are being applied locally by the SPTPS13 module. The speed channel channel is the only physical I/O channel that is used in this mode. Turbine speed is calculated by the TPS13 and passed through to the main controller (BRC4XX) via Expander Bus.

TSA Mode
The TSA mode provides turbine speed detection and calculation, overspeed protection and acceleration calculation. In addition, the TAS mode includes hardware based speed probe failure diagnostics designed to detect most speed probe open and short circuit conditions.

Under the TSA mode of operation, the overspeed setpoint of the SPTPS13 can be automatically adjusted making use of a set of three digital inputs: Auto, Manual, and Test. In the code, the module calculates each of these setpoints, stores them in an array, and selects one for the overspeed setpoints based on the state of the Digital Inputs every cycle.

The TSA01 will detect an overspeed once the calculated turbine speed exceeds the current threshold value as determined by the state of the digital inputs. Upon detecting the overspeed condition, the SPTPS13's only action is to activate the digital outputs (no additional signals are sent through XBUS).

Technical data		
General		
System communications	8 bit parallel	
Speed signal resolution	Accuracy 0 - 1000RPM 1000 - 12000RPM 12000 - 20000RPM	0.01 RPM 0.001% of actual 0.002% of actual
Mounting	One slot in standard Symphony Plus Modular Mounting Unit	
I/O termination	Turbine Protection System Termination Unit (TPSTU02) NTDI01 for TSA01 and FCS01 modes	
Operating		
Speed probe input	0.5–20 kHz, 0.05–120 VAC	
Analog input	4–20 mA or 1–5 VDC (field inputs from termination unit)	
Analog output	4–20 mA or 1–5 VDC (field outputs to termination unit)	
Digital input	24 VDC (field inputs from termination unit) (24–125 VDC, or 24–120 VAC converted on TPSTU02 termination unit). 120 VAC/125 VDC for TSA01	
Digital output	24 VDC (to termination unit) for TPS02, 120 VAC/125 VDC for TSA01	
Electrical		
Operating voltage	+15 VDC ±5% at 320 mA +24 VDC ±10% at 75 mA	+5 VDC ±5% at 100 mA
Power dissipation	4.8 W @ +15 VDC 1.8 W @ +24 VDC	0.5 W @ +5 VDC
Environmental		
Electromagnetic/radio frequency interference	Values not available at this time. Keep cabinet doors closed. Do not use communications equipment any closer than two meters from the cabinet.	
Ambient temperature	0° to 70° C (32° to 158° F)	
Humidity	5% to 90% RH (±5%) up to 55°C (non-condensing) 5% to 40% RH (±5%) up to 70°C (non-condensing)	
Atmospheric pressure	Seal level to 3 km (1.86 miles)	
Air quality	Non-corrosive	
Installation category	Cateory II per ANSI/ISA-S82.01-1994	

800 Series (DIN rail-based) turbine control solutions

The S+ Turbine portfolio also includes the 800 Series Turbine Modules. These modules are well established in the turbine control market and are characterized by their universal and flexible nature. Their open communication capability (Profibus) allows for local or remote integration into many different DCS platforms. Their Stand Alone capability allows for operation without a DCS or through hardwired integration.

S+ Turbine 800 Series comprises the AS800, VP800 and TP800 modules. Each module provides flexible mounting on a standard DIN rail and uses standard 24 VDC power supplies. They can be easily adapted to existing installations or new projects. The ability to remote-mount the modules and use PROFIBUS communications saves wiring costs and reduces design complexity for new installations.

Some of the key features of the PROFIBUS DP interface of S+ Turbine modules are:

- DP/V1 communication standard
- Up to 12 MD communication rate
- Conforms to PROFIBUS PNO slave specification system (master) redundancy and flying (line) redundancy
- 2 independent PROFIBUS slave hardware interfaces in each module

The building blocks of these turbine control solutions are:

CPM810
- Executes the defined function of the module, interfaces with the ASM810 module and communicates to the control system via PROFIBUS DP

ASM810
- Receives and conditions the field I/O signal, transfers the conditioned signal to the CPM810 module and provides an independent synchronization check

VPM810
- Receives and conditions field I/O, converts input signals to digital output signals, and transfers the digital output signals to the CPM810 module

TPM810
- Receives and conditions field I/O, converts signals to digital outputs, and transfers the digital signal to the CPM810 module

TBU810
- Contains terminals for power, field connections, communication and connectors for modules

ROM810
- Comprises a relay output module that provides digital output signals such as raise/lower volts, raise/lower frequency, close breaker and indicheck

ROM830
- Voter module that can be used in combination with 3 ROM810 modules, turning the individual relay outputs into a single 2 out of 3 voted output.

PCM810
- The Phase Current Module allows for the generator current signal from a current transformer to be brought into the TP800 module for power load unbalance calculations.

800 Series (DIN rail-based) turbine control solutions

AS800

AS800
Auto Synchronizer AS800 provides automatic breaker closure during generator-to-grid synchronization or during peer-to-peer bus synchronization in switchyard applications.

The AS800 compares and identifies the voltage, frequency and phase between two buses, typically a line and generator. It sends control signals to adjust voltage and turbine speed in order to synchronize the two buses. It is also capable of detecting a dead bus while initiating safe breaker closure.

The AS800 provides flexibility to operate efficiently in all turbine control environments. The module supports high and low voltage ranges (eg, 0-130 VAC and 0-50 VAC) ambient at either 50 or 60 Hz (40-70 Hz).

The AS800 can either be operated in harmony with a PROFIBUS capable master controller like HCP800, or it can operate independently with hard-wired digital inputs and serial communication via a RS-232 physical interface.

Technical data	
General	
Microprocessors	MCF5272 with 16 MB Flash, 25 MHz, 16 MB DRAM
System communications	Profibus DP
Modular mounting	Each module occupies one slot in a Termination Base Unit (TBU810)
I/O termination	Termination Base Unit (TBU810)
TBU810 cabinet mounting	Standard 35mm DIN Rail
TU terminal blocks	24A/250V compression: 0.2-4 mm² [solid] / 0.2-2.5 mm² [stranded] / 24-12 AWG
Operating	
Low voltage (LV1-6)	Up to 48 volts
High voltage (HV1-2)	Up to 150 VAC/VDC
Digital inputs (DI 1-2)	Up to 150 VAC/VDC
Digital outputs (DO1-6)	Dry relay contact (2-Form C) 3A @ 150 VDC / 5A @ 120 VAC
Electrical	
Module operating	+24 VDC ±5% @ 264 mA typical
Module comsumption	6.4 W typical
Field I/O power via TBU810	+24 VDC (fused @ 1/4 amp)
ROM810 normal operating (No Field I/O)	+24 VDC ±5% @ 0.02 A typical de-energized (Both Coils) +24 VDC ±5% @ 0.17 A typical energized (Both Coils)
Performance	
Analog Inputs (Voltage)	1% of full scale
Analog inputs (frequency)	± 0.01 Hz
Phase difference	± 0.1 degrees
Environmental	
CE Mark	This product, when installed in a cabinet, was designed to comply with the following Directives/Standards for CE Marking.
EMC96 Directive (89/336/EEC)	EN50082-2 Generic Immunity Standard – Part 2: Industrial Environment
Low Voltage Directive (73/23/EEC)	EN61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use – Part 1: General Requirements
Certifications	
Canadian Standards Association (CSA)	This card was designed for use as process control equipment in an ordinary (non-hazardous) location
Humidity	5% to 90% RH (±5%) up to 55°C (non-condensing) 5% to 40% RH (±5%) up to 70°C (non-condensing)
Atmospheric pressure	Sea level to 3 km (1.86 miles)
Air quality	Non-corrosive
Installation category	Category II per ANSI/ISA-S82.01-1994
Dimensions	124 mm width, 186 mm height, 127 mm depth (4.88 in. width, 7.32 in. height, 5 in. depth)

800 Series (DIN rail-based) turbine control solutions

VP800

VP800

Valve Positioner VP800 controls the flow of steam or gas through a turbine by precisely regulating the position of the inlet valves. The VP800 is part of a distributed modular I/O system. It provides easy installation and reliable performance using advanced control technologies.

The VP800 provides easy installation of the modules and process cabling. The VP800 and a Profibus DP Communication Interface are combined to communicate to a control system. A Common Processor Module (CPM810) and an Application Module (VPM810) plug into a Termination Base Unit (TBU810) to form the VP800. One or more Relay Output Modules (ROM810) may be connected to the basic VP800 to provide digital output signals. Additionally, two VP800's may be connected together to form a redundant configuration. In this configuration one VP800 will actively provide control of the valve while the other VP800 operates in Stand-By mode, waiting to take over if a problem occurs on the active VP800. The two VP800's may be connected to the same or to separate field I/O devices.

Technical data	
General	
Microprocessors	MCF5272 at 25 MHz, with 16 MB Flash, 16 MB DRAM DSP56F807 at 80 MHz, with 140 KB Flash, 12 KB RAM
System communications	Profibus DP
Module mounting	Each module occupies one slot in a Termination Base Unit (TBU810)
I/O termination	Termination Base Unit (TBU810)
TBU810 cabinet mounting	Standard 35mm DIN Rail
TU terminal blocks	24A/250V compression: 0.2-4 mm^2 [solid] / 0.2-2.5 mm^2 [stranded] / 24-12 AWG
Operating	
Low voltage (LV1-6)	Up to 12 V_{peak}
High voltagge (HV1-2)	Up to 12 VDC, 200 mA
Digital inputs (DI1-2)	24 VDC
Digital output (DO1-6)	Dry relay contact (2-Form C) 3A @ 150 VDC / 5A @ 120 VAC
Electrical	
Module operating (No field I/O)	+24 VDC ±5% @ 500 mA typical (One Coil) +24 VDC ±5% @ 700 mA maximum (Two Coils)
Module consumption	12 W typical (One Coil) 16.8 W maximum (Two Coils)
Field I/O power via TBU810	+24 VDC (fused @ 1/4 amp)
ROM810 operating (No field I/O)	+24 VDC ±5% @ 0.02 A typical de-energized (Both Coils) +24 VDC ±5% @ 0.17 A typical energized (Both Coils)
Performance	
Coil output precision	12 bits, 5.859 mV per bit, ±12 V full scale
Position input precision	12 bits, 0.806 mV per bit, 3.0 V full scale
Time from demand change to valve movement	1 ms typical 2.1 ms maximum
Profibus input update rate	1 ms
Profibus output update rate	50 ms
DSP communication rate	2 ms
DSP control process rate	0.1 ms
Manual mode movement rate	2.5 % / s
Time to feedback failure to initiate error action or failover	2 ms typical

800 Series (DIN rail-based) turbine control solutions

Technical data (continued)	
Environmental	
CE Mark	This product, when installed in a cabinet, was designed to comply with the following Directives/Standards for CE Marking.
EMC96 Directive (89/336/EEC)	EN50082-2 Generic Immunity Standard – Part 2: Industrial Environment
Low Voltage Directive (73/23/EEC)	EN61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use – Part 1: General Requirements
Certifications	
Canadian Standards Association (CSA)	This card was designed for use as process control equipment in an ordinary (non-hazardous) location
Ambient temperature	0 to 55 °C (32 to 131 °F)
Humidity	5% to 90% RH (±5%) up to 55°C (non-condensing) 5% to 40% RH (±5%) up to 70°C (non-condensing)
Atmospheric pressure	Sea level to 3 km (1.86 miles)
Air quality	Non-corrosive
Installation category	Category II per ANSI/ISA-S82.01-1994
Dimensions	124 mm width, 186 mm height, 127 mm depth (4.88 in. width, 7.32 in. height, 5 in. depth)

800 Series (DIN rail-based) turbine control solutions

TP800

TP800

The Turbine Protection TP800 provides a complete set of functions for comprehensive turbine protection and is safety certified by TUV Rheinland. These functions include:

- Overspeed Trip
- Overspeed Protection (including Acceleration Protection)
- Trip Anticipation
- Load Drop Anticipation
- Power Load Unbalance (3 different variations).

A Common Processor Module (CPM810) and an Application Module (TPM810) plug into a Termination Base Unit (TBU810) to form the TP800. One or more Relay Output Modules (ROM810) may be connected to the basic TP800 to provide digital output signals. An EIM810 may be connected to the TBU810 for additional inputs and outputs. In addition, a Phase Current Module (PCM810) may also be included with a TP800 system when interfacing to generator current transformers, sometimes used for power load unbalance calculations.

The SIM810 module is used to upgrade the firmware for the TP800. It is also used in the Stand Alone configuration. The ROM830 is used for 2oo3 voting with the ROM810v2.
The TP800 modules have been IEC/EN 61508 SIL3 (Safety Integrity Level 3) certified for Functional Safety by TUV Rheinland. For specific details on the setup of a SIL3 compliant configuration please contact ABB, Inc. The TP800 modules have been CE Mark certified.

Technical data	
General	
Microprocessors	MCF5272 with 16 MB Flash, 25 MHz, 16 MB DRAM
System communications	Profibus DP
Modular mounting	Each module occupies one slot in a Termination Base Unit (TBU810)
Operating voltage	+24 VDC ±5% at 200 mA typical
I/O termination	Termination Base Unit (TBU810)
TBU810 cabinet mounting	Standard 35mm DIN Rail
TU terminal blocks	24A/250V compression: 0.2-4 mm^2 [solid] / 0.2-2.5 mm^2 [stranded] / 24-12 AWG
Operating	
Low voltage (LV1-6)	Up to 48 volts
High voltage (HV1-2)	Up to 150 VAC/VDC
Digital inputs (DI1-2)	Up to 220 VAC/VDC
Digital outputs (DO1-6)	Dry relay contact (2-Form C) 3A @ 150 VDC / 5A @ 120 VAC
Electrical	
Module normal operating (No Field I/O)	+24 VDC ±5% @ 0.21 A typical +24 VDC ±5% @ 0.3 A maximum
Module comsumption	5.0 W typical 7.2 W maximum
Field I/O	+24 VDC (fused @ 1/4 amp)
ROM810 normal operating (No Field I/O)	+24 VDC ±5% @ 0.02 A typical de-energized (Both Coils) +24 VDC ±5% @ 0.17 A typical energized (Both Coils)

800 Series (DIN rail-based) turbine control solutions

Technical data (continued)	
Performance	
Speed input precision	Full cycle average (reported via Profibus) 0.1 Hz (0-4000 Hz) 0.25 Hz (4000-12000 Hz) Internal protection functions 0.25 Hz (0-12000 Hz)
Speed update rate	Full cycle average (reported via Profibus) 4 ms full cycle average Internal protection functions 4 ms
Analog input precision	0.26% full scale
Analog input update rate	20 ms
Digital input update rate	10 ms
Digital output update rate	4 ms
Profibus process variables in	20 ms
Overspeed trip	< 8 ms (measured at I/O terminals, from speed input to relay driver output)
Overspeed protection	< 12 ms (measured at I/O terminals, from speed input to relay driver output)
Trip anticipator protection	< 18 ms (measured at I/O terminals, from speed input to relay driver output)
Load drop anticipation	< 18 ms (measured at I/O terminals, from speed input to relay driver output)
Power load imbalance	TBD
Acceleration protection	TBD
Environmental	
TUV IEC/EN 61508 SIL3 (Safety Integrity Level 3)	This product complies with Functional Safety Standard under IEC/EN 61508 SIL3.
CE Mark	This product, when installed in a cabinet, was designed to comply with the following Directives/Standards for CE Marking.
EMC96 Directive (89/336/EEC)	EN50082-2 Generic Immunity Standard – Part 2: Industrial Environment
Low Voltage Directive (73/23/EEC)	EN61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use – Part 1: General Requirements
Certifications	
Canadian Standards Association (CSA)	This card was designed for use as process control equipment in an ordinary (non-hazardous) location
Ambient temperature	0° to 55° C (32° to 131° F)
Humidity	5% to 90% RH (±5%) up to 55°C (non-condensing) 5% to 40% RH (±5%) up to 70°C (non-condensing)
Atmospheric pressure	Sea level to 3 km (1.86 miles)
Air quality	Non-corrosive
Installation category	Category II per ANSI/ISA-S82.01-1994

S+ Turbine Condition Monitoring

The Symphony Plus suite of condition monitoring products has been developed to meet the needs of a wide range of industries. They have been installed on all types of rotating machinery at sites all over the world. They continuously monitor and protect rotating machinery by measuring relative, seismic and absolute vibration, along with specialized turbine supervisory measurements such as eccentricity, thrust, case expansion, differential expansion and rotor/stator air gap.

The suite consists of the MCM800 and CMM11 condition monitoring modules and Analyst™ graphical analysis software. Each module has multiple channels that can be configured independently for vibration and additional supervisory functions, providing safe operation of critical and essential rotating machinery.

S+ Turbine Condition Monitoring
HR Series

SPCMM11

SPCMM11

The SPCMM11 is a rack-based module that is integrated directly into the Symphony Plus HR Series based control system. It monitors bearing vibration, eccentricity and axial rotor position on any type of rotating machinery. In addition, the SPCMM11 can measure rotor-to-case differential and case expansion of a turbine shell. The module has four measurement channels and can accept any combination of industry standard transducers including proximity probes, accelerometers, velocity probes and DC LVDT inputs.

Technical data	
Processor	68EN302, 20 MHz DSP56303, 24 MHz (96 MHz PLL operation)
Memory	128 KB EPROM 64 KB DPRAM 4 MB DRAM
Communication	10BaseT, 10 MBaud TCP/IP protocol
Operating voltage	+5 VDC 5% at 650 mA +15 VDC 5% at 175 mA -15 VDC 5% at 175 mA
Power dissipation	8.5 W typical
Transducer inputs	Velocity probes, proximity probes, accelerometers, DC LVDTs and acoustic pulsation probes, using 18/24 V
Analog output	Direct buffered transducer signal for each channel using BNC
Digital output	Dry relay contact (1 Alert and 1 Danger) 2 A at 24 VDC
Ambient temperature	0 °C to 55 °C (32 °F to 131 °F)
Dimensions	35.56 mm width, 177.80 mm height, 298.45 mm depth (1.40 in. width, 7.00 in. height, 11.75 in. depth)

S+ Turbine Condition Monitoring
800 Series

MCM800

MCM800

Machinery condition monitoring module MCM800 is ABB's latest technology in proactive condition monitoring. It adds supervisory functions to both proprietary and open architecture systems. This DIN rail-mounted module provides a complete set of functions for comprehensive turbine supervisory instrumentation and is part of ABB's Symphony Plus technology platform. The modules that comprise the MCM800 operate independently from the main DCS controller, providing dedicated monitoring and protection features including vibration monitoring, eccentricity, thrust (rotor) position, differential expansion and case expansion. In addition to normal vibration measurements, the MCM800 has special features designed for gas turbines and hydro turbines. This includes air gap sensors measuring the air gap between the rotor and stator of hydro turbines.

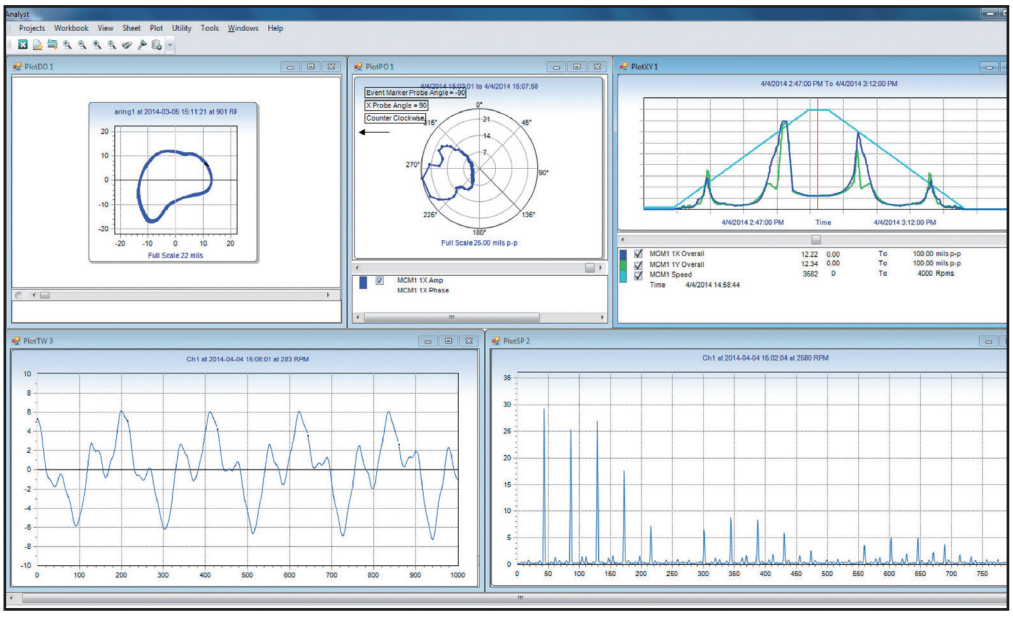
Technical data	
Processor	MCF5282 at 64 MHz PLL MC56321 DSP at 250 MHz PLL
System communications	PROFIBUS DP Modbus RTU (Output only) Modbus TCP (Input and Output) Ethernet 10/100 Base T, TCP/IP
Operating voltage	+24 / -24 VDC ±5% at 300 mA each (typical)
Power dissipation	7.5 W each supply (typical)
Analog inputs	Channels 1 - 4, +/- 24 VDC or 4-20mA
Event marker input	System power: 24 VDC, 30 mA
Outputs	Alert (2A at 24 VDC / VAC (resistive load) Normally de-energized/energized (selectable) Danger (2A at 24 VDC / VAC (resistive load) Normally de-energized/energized (selectable)
Ambient temperature	0 °C to 55 °C (32 °F to 131 °F)
Dimensions (with base)	124 mm width, 186 mm height, 127 mm depth (4.88 in. width, 7.32 in. height, 5 in. depth)

S+ Turbine Condition Monitoring
Condition monitoring software

Analyst is a graphical analysis software application that provides specialized plots for assessing the condition of rotating machinery. The application uses various plot types to present the current and historical vibration data to the vibration expert, so that significant patterns and trends can be quickly recognized. This enables the user to proactively identify problems and deviations in the condition of the rotating machinery and address them before they adversely affect operations. With remote options, one expert can monitor multiple assets at multiple locations.

Analyst includes option for a Fast Data Logger (FDL) that can store high speed process variable data down to 10 ms resolution. Additionally, it can interface to the MCM800, SPCMM11 and the WiMon 100 wireless sensor.

Condition monitoring software	License
Base Software License for Analyst	
• Small: number of clients 1 - 4	2VAA003813R100
• Medium: number of clients 5 - 8	2VAA003813R120
• Large: number of clients 9 - 12	2VAA003813R140
1 X MCM800 or CMM11 Analyst License Package	2VAA003813R200
10 X MCM800 or CMM11 Analyst License Package	2VAA003813R220
100 X MCM800 or CMM11 Analyst License Package	2VAA003813R230
10 X WiMon Analyst License Package	2VAA003813R240
100 X WiMon Analyst License Package	2VAA003813R250



Waveform reports

S+ Turbine – References

Document ID	Document Description
3BUS095410	Symphony Plus Condition Monitoring brochure
2VAA007551	SD Series Turbine control modules data sheet
2VAA005905	HR Series Turbine control modules data sheet
2VAA005836	AS800 Autosynchronization module data sheet
2VAA005838	VP800 Valve Positioner module data sheet
2VAA005837	TP800 Turbine Protection module data sheet
2VAA005839	MCM800 Condition Monitoring module data sheet

For documentation not publicly available, please contact your ABB representative

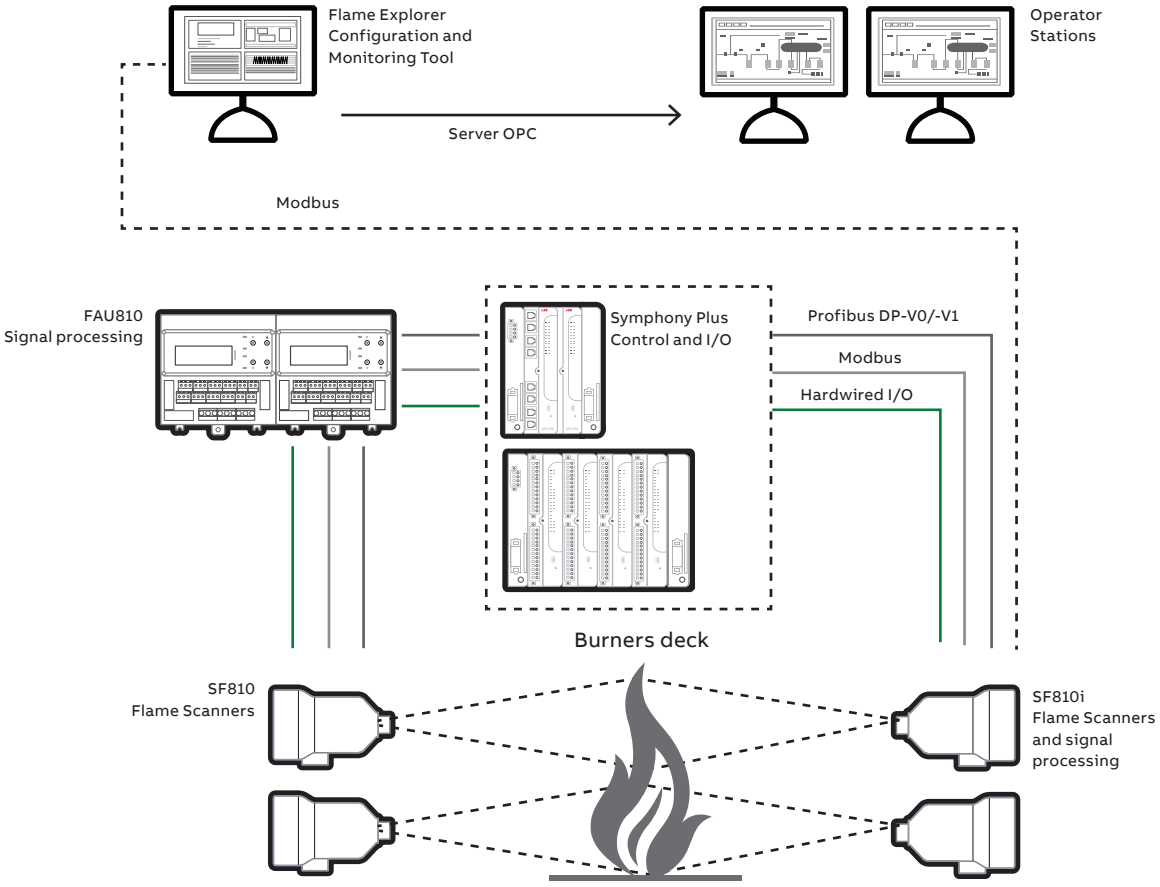
For your notes

Combustion instruments

Combustion instruments

For several decades, ABB has been one of the world's leading providers of combustion monitoring and safety systems, delivering cost efficient and technologically advanced solutions designed to meet the needs of both, retrofit and greenfield markets. With Symphony Plus, all this experience comes together in its combustion instrumentation to take ABB's offering to a new unmatched level of functionality and performance. The specific features built into the system's combustion instrument components are a direct reflection of ABB's diverse in-depth knowledge and experience in measurement accuracy and reliability.

Combustion instrumentation is a key part of the Symphony Plus technology family, offering tight integration into all of the system's functional areas including: S+ Engineering, S+ Operations and S+ Control & I/O. These environments provide the necessary libraries, faceplates, symbols, function codes, interfaces and graphics necessary for the design, configuration and operation of the entire range of devices. There is no need for additional tools, interfaces or related training. In addition, the tightly integrated Symphony Plus infrastructure eliminates any need for local configuration or calibration of the individual modules.



Combustion instruments

Flame scanners take advantage of the Symphony Plus system's architecture, its unmatched scalability and simplicity, CPU power and communication speed. The Uvisor SF810 and SF810i are multi-fuel scanners designed to provide stable and reliable information of both the presence of flame and its quality on utility and industrial boiler burners. The scanners have screw type removable terminals as standard and are available with either IP66/67 or ATEX II 2 GD EX d IIC T6 quick release connectors for ease of maintenance for non-hazardous and hazardous areas respectively.

- Solid state sensor modules, covering the whole flame radiant spectrum (UV, IR, dual sensor UV-IR and dual sensor IR-IR)
- Signal processor unit – an extremely powerful module capable to run the ABB proprietary flame analysis
- Communication drivers – redundant PROFIBUS DP-V1 links or standard Modbus links are available to provide high speed data transfer to an external monitoring and supervisory system
- Termination and configuration board with local display and push-buttons to allow the preliminary set up and on-line aiming assistance
- Live flame temperature reading (SF810/SF810i-PYRO only)

Applications

- Utility and industrial boilers
  - Wall fired, corner fired, supplementary fired WHRB, down-shot, cyclone burner
- Process heaters
- Sulphur recovery
- Gas turbine
- Off-shore boiler and furnace installation (stainless steel housing AISI316L)

Fuel types

- Natural, coke oven and sulphur gas
- Light and heavy fuel oil
- Orimulsion
- Pulverized coal
- Biomass

Safety, communication and signaling

- Redundant PROFIBUS DP-V1 (isolated)
- Redundant Modbus (isolated)
- 4-20mA (isolated)
- Fail-to-safe flame relay N.O. contact
- Fail-to-safe fault relay N.O. contact
- Real time flame flicker frequency display
- Real time AC amplitude display
- Real time flame intensity display
- Real time flame quality display
- Real time live flame temperature display
- Rejects mains frequencies and artificial lighting (EN298 compliant)

Flame Explorer software

Flame Explorer is the configuration and interrogation tool for the SF810, SF810i and SF810/SF810i-PYRO flame scanners. This tool enables the operator to set the flame drop-out and pull-in limits and the prarmeters used to optimize the flame discrimination between burners. In addition, the Flame Explorer evaluates and records trends of the important flame parameters including intensity, flicker frequency, AC amplitude, flame quality and flame temperature. Monitoring of these parameters will enable the operator to spot deterioration in a burner before it becomes critical and to plan preventive maintenance.

Combustion instruments

SF810i

SF810i-PYRO

SF810i

Technical data	
Property	
Optical sensor technology	IR versions: Si photodiode Spectral response peak @ 920nm UV versions: SiC photodiode Spectral response peak @ 280nm UVIR version: Si + SiC photodiode[1] Spectral response peak @ 280nm and 920nm PYRO version: Si-Si dual IR color photodiode[2] [1]Si and SiC photodiodes signals can be processed individually or both combined as per burner operation [2]Only SF810i-PYRO contains dual IR sensor
Measured temperature range	800°C to 1800°C (1472° F to 3272°F) @ +/-1% absolute accuracy[1] [1]SF810i-PYRO only
Power supply voltage	24 VDC (-25%, +20% = 18 to 29 VDC)
Power supply current	150 mA typical
Power consumption	3.6W typical, 4W max
Inrush current	6A peak, 2ms settling time
FFRT	Flame Failure Response Time: 0.2s to 4s
Flame pull-in time delay	0 to 10 s
Flame Relay	Contacts: 1 NO, for each relay
Safe Relay	240 VAC / 1.5A cycles ≥100,000 240 VDC / 100 mA 30 VDC / 300mA Minimum load 10mA, 5 VDC
Analog output	4 to 20 mA (R load <= 500) Galvanically isolated Precision: +/-5% f.s.
Digital inputs, 24 VDC	Nr. 2 digital inputs (opto coupled), to allow selection of one out of four different sets of parameters; return signal common to both inputs. Nominal voltage 24Vdc (5 mA typical) Max Voltage 36 VDC Off: < 5 VDC On: > 18 VDC
Communication ports	Two, redundant, RS-485 serial channels configurable in PROFIBUS DP-V1 or Modbus RTU protocols. PROFIBUS DP-V1: max speed 12 Mbit/s Modbus RTU: max speed 115.200 bit/s
Local configuration interface	4 push-button (UP, DOWN, LEFT, RIGHT) 3-digits LED display
Air source for lens cleaning	From clean ambient air
Air flow for lens cleaning	LOS (Line Of Sight) versions: 115 l/min (4 SCFM) Excessive contaminants might require a flow up to 400 l/min (14 SCFM) FOC (Fiber Optic Cable) versions: 400 l/min (14 SCFM)
Minimum cleaning air pressure	LOS (Line Of Sight) versions: 20mm H2O (1" W.C.) above the max wind box pressure measured at the “Y” connection inlet. FOC (Fiber Optic Cable) versions: 400mm H2O (12" W.C.) above the max wind box pressure measured at the “Y” connection inlet.
Maximum fiber optic continuous operating	482° C (900° F) for VL and IR fiber optic cables 350° C (662° F) for UV and dual sensor UVIR fiber optic cable
Housing mounting thread	1" NPT male
Cable entry thread	3/4" NPT female (N/A for connectorized versions)
Electrical connections (terminal versions)	Removable terminals with screws Allowable cable section: AWG24-AWG12, 0.2-2.5mm2 for Relay contacts (J1 connector) AWG28-AWG16, 0.08-1.5mm2 for all other terminals

Combustion instruments

SF810i (continued)

Environmental specifications	
Property	
Safety specifications	EN 61010-1 (IEC 61010-1)
Class of installation	I
Over voltage category	II
Pollution degree	2
Protection (EN 60529)	IP66 - IP67
Environmental	
Ambient operating temperature (EN/IEC 60068-2-1/2/14)	-40° to 70°C (-40° to 158 °F) -20° to 70°C (-4° to 158 °F) with quick connector Ex models "QC" (Ref.: SF810i Versions and ordering codes)
Ambient storage and transportation temperature (EN/IEC 60068-2-1/2/14)	-40°C to 85°C (-40°F to 185°F)
Relative humidity (EN/IEC 60068-2-78)	40°C, RH 95%
Vibration sinusoidal operating (IEC 654-3 Severity Class VH4) (IEC 60068-2-6)	Frequency range: 5 to 200 Hz, Acceleration: 20m/s2 peak (2 G) Displacement: 0.15 mm peak
Shock operating (IEC 60068-2-27)	Acceleration: 15G – Duration of pulses: 11 ms duration (half sine wave) – Three shocks in each direction (6 pulses in each axis)
Mechanical specifications	
Dimensions	Diameter 95 mm max (3.7") Overall length: 180 mm approx. (7")
Weight	1.3 Kg approx. (2.86 lb)
Degree of protection	IP66 – IP67 (CEI EN 60529)

Combustion instruments

SF810

SF810-PYRO

SF810

Technical data			
Property			
Optical sensor technology	IR versions: UV versions: UVIR version: PYRO (IRIR) version: [1]Si and SiC photodiodes signals can be processed individually or both combined as per burner operation [2]Only SF810-PYRO contains dual IR sensor	Si photodiode SiC photodiode Si + SiC photodiode[1] Si-Si dual IR color photodiode[2]	Spectral response peak @ 920nm Spectral response peak @ 280nm Spectral response peak @ 280nm and 920nm
Measured temperature range	800°C to 1800°C (1472° F to 3272°F) @ +/-1% absolute accuracy[1] [1]SF810-PYRO only		
Power supply voltage	Flame Analysis Unit FAU810 Powered		
Power supply current	150 mA typical		
Power consumption	Max 300 mW/600 mW (Dual Sensor)		
Local configuration	No		
Air source for lens cleaning	From clean ambient air		
Air flow for lens cleaning	LLOS (Line Of Sight) versions: 115 l/min (4 SCFM) Excessive contaminants might require a flow up to 400 l/min (14 SCFM) FOC (Fiber Optic Cable) versions: 400 l/min (14 SCFM)		
Minimum cleaning air pressure	LOS (Line Of Sight) versions: 20mm H2O (1" W.C.) above the max wind box pressure measured at the "Y" connection inlet. FOC (Fiber Optic Cable) versions: 300mm H2O (12" W.C.) above the max wind box pressure measured		
Maximum fiber optic continuous operating temperature	482° C (900° F) for VL and IR fiber optic cables 350° C (662° F) for UV and dual sensor UVIR fiber optic cable		
Housing mounting thread	1" NPT male		
Cable entry thread	– 3/4 "NPT female tread (Scanner models "T" and "TL") – 16 contacts quick release connector type CVB-EX. Protection mode: Ex d IIC T6 tD A21 IP66/IP67 T85°C (Scanner models "QC") – 16 contacts quick release connector. Protection mode: IP66/IP67 (Scanner models "Q")		
Electrical connections (terminal versions)	Removable terminals with screws Allowable cable section: AWG 28-AWG16, 0.08-1.5mm^2 Recommended ABB standard cable: – Single Sensor scanner drawing no. EC-DWG-G041ELE803 – Dual Sensor scanner drawing no. EC-DWG-GO41ELE802		
Compatible Control Unit	The SF810-PYRO flame scanner is compatible only with the Flame Analysis Unit FAU810 (FW Vers. =/> 3.13)		

Combustion instruments

SF810 (continued)

Environmental specifications	
Property	
Safety specifications	EN 61010-1 (IEC 61010-1)
Class of installation	I
Over voltage category	I
Pollution degree	2
Protection (EN 60529)	IP66 - IP67
Environmental	
Ambient operating temperature (EN/IEC 60068-2-1/2/14)	- 40° to 70°C (-40° to 158 °F) in ATEX T6 classified zones - 60° to 80°C (-40° to 176 °F) NO Ex zones - 60° to 105°C (-76° to 221 °F) w/air cooler
Ambient storage and transportation temperature (EN/IEC 60068-2-1/2/14)	-40°C to 85°C (-40°F to 185°F)
Relative humidity (EN/IEC 60068-2-78)	40°C, RH 95%
Vibration sinusoidal operating (IEC 654-3 Severity Class VH4) (IEC 60068-2-6)	Frequency range: 5 to 200 Hz, Acceleration: 20m/s2 peak (2 G) Displacement: 0.15 mm peak
Shock operating (IEC 60068-2-27)	Acceleration: 15G – Duration of pulses: 11 ms duration (half sine wave) – Three shocks in each direction (6 pulses in each axis)
Mechanical specifications	**Value**
Dimensions	Diameter 95 mm max (3.7") Overall length: 180 mm approx. (7")
Weight	1 kg approx. (2.2 lb)
Degree of protection	IP66 – IP67 (CEI EN 60529) Equivalent NEMA 4x

Combustion instruments

FAU810

FAU810

Technical data	
Power supply voltage	24 VDC ± 20%
Flame Failure Relay Drop-Out	Configurable 0.2 to 2.5 seconds
Flame Relay(s)	Three total, each with Form C contacts
Flame Relay Contact Ratings	250 VAC, 3A, 750 VA; 220 VDC, 300 mA, 66 Watts
Fault Relay Contact Ratings	250 VAC, 3A, 750 VA; 220 VDC, 300 mA, 66 Watts
Analog Flame Signal Outputs	Two channels of 4-20 mA signals. Each channel may independently monitor Intensity, Frequency, Quality, or AC Amplitude
Serial Data Communication	Two Galvanically isolated RS-485 interfaces (fully independent for redundancy)
Serial Data Format	MODBUS (default), PROFIBUS DP-V1 (selectable)
Self Checking Time Cycle	Electronics shall be checked every 0.1 seconds
Ambient Temperature	0° to 60°C, 95% non-condensing atmosphere
Power Consumption	4 Watts Minimum, 10 Watts Maximum, Typical 6 Watts
Remote Programming	Remote programming of functions via RS-485 link and Flame Explorer software
RS 485	2 RS-485 interfaces, one for each channel for redundancy (each interface has access to both channels)
Relay Outputs	3 – Flame #1, Flame #2, and Flame #3 or Fault
Analog Outputs	Two 4-20 ma analog outputs for Trending or Monitoring of Frequency, Intensity, Quality, or AC Amplitude
Dimensions (with base)	110 mm width, 130 mm height, 120 mm depth (4.33” width, 5.11” height, 4.72 depth)

Combustion instruments – References

Document ID	Document Description
8VZZ001363T0001	ABB Ability™ Symphony® Plus Multi Fuel Safe Flame Scanners leaflet
8VZZ001361T0001	Multi Fuel Safe Flame Scanner Uvisor™ SF810 Series data sheet
8VZZ001183T0001	Multi Fuel Safe Flame Scanner Uvisor™ SF810i Series data sheet

For documentation not publicly available, please contact your ABB representative

Service

Service

Distilled from many decades of ABB experience in the industrial automation sector, ABB Service provides customers with best practices and solutions in such areas as life cycle management, diagnostics and sustainability solutions, cyber security, and process optimization.

Industrial automation customers need more than just a supplier of spare parts, on-site work, repairs, and system upgrades. By developing deeper ties and an integrated, partnership approach with customers, ABB can help them operate their plants more efficiently, reduce costs, plan better long-term operational solutions, and ensure protection against unplanned events.

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ABB offers a comprehensive portfolio of life cycle management and services for the energy and process industries - a portfolio based on extensive process and application know-how and one of the largest installed bases in the world.

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- Collaborative Operations
- Advanced Digital Services
- Training
- Technical support and Repairs
- Spares and consumables
- Maintenance
- Extensions, upgrades, retrofits and evolution

Please contact your local ABB service representative for details:
abb.com/service
solutions.abb/symphonyplus

Service – References

Document ID	Document Description
Webpage	ABB Industrial automation service
Webpage	ABB Services for distributed control systems
Webpage	ABB Service for Energy Industries
9AKK107904	ABB Care for Energy Industries - brochure
3BDD015294	Automation Sentinel Program - brochure

For documentation not publicly available, please contact your ABB representative

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References

Summary of references

Document ID	Document Description
2VAA003956	SD Series control and I/O brochure
2VAA001981	HPC800 Process Controller data sheet
8VZZ001853T0001	SPC600/700/800 Process Controller data sheet
2VAA001984	PNI800 Plant Network Interface data sheet
8VZZ001903T0001	SD Series IEC 60870-5-104 plant communication network
2VAA001982	PDP800 Profibus DP Master data sheet
2VAA005508	CI850 IEC61850 Integration Interface data sheet
2VAA006225	SCI200 Communication Interface data sheet
8VZZ000161T0001	cRBX01 Fiber Optic Repeater data sheet
2VAA003090	IOR810 Gateway module data sheet
2VAA003742	Analog I/O modules (AI0x, AO0x) data sheet
2VAA003743	Digital I/O, Pulse input modules (DI0x, DO0x, PI0x) data sheet
2VAA006765	Analog Drive I/O modules (AD0x) data sheet
2VAA001983	HART I/O modules (HAI805, HAO805) data sheet
2VAA005932	HART I/O modules (AI02, AI05, AO02, AO05) data sheet
2VAA008524	Redundant I/O modules (RAI0x, RDI0x, RDO0x) data sheet
8VZZ000160T0000	SD Series Compact Analog I/O data sheet
8VZZ002944T0001	VBS01-SFP Selectable Field Power Base

Document ID	Document Description
2VAA005093	HR Series control and I/O brochure
2VAA005507	HR Series Bridge Controllers data sheet
2VAA001180	ICI800 Ethernet CIU data sheet
8VZZ000344T0001	ENM01 Ethernet Network module data sheet
2VAA002014	HR Series Communications modules data sheet
2VAA002730	IEB800 INFI-Net to Ethernet Bridge data sheet
2VAA002016	HR Series Analog I/O modules data sheet
2VAA002017	HR Series Digital I/O modules data sheet
2VAA002018	HR Series Control I/O modules data sheet
2VAA002015	HR Series Sequence of Events data sheet
2VAA001765	HR Series Modular Power System III data sheet
8VZZ000095T0000	HR Series Modular Power System IV data sheet

Document ID	Document Description
3BUS095394	MR Series Control & I/O brochure
2VAA004444	PM 875-3 process controller user manual
8VZZ001574T0001	CCC 37-P coupling module user manual
2VAA003428	PM 877 process controller user manual
2VAA000595	Binary input module user manual
2VAA000592	Analog input module user manual
2VAA000596	Binary output module user manual
2VAA000594	Analog output user manual
2VAA000598	Control module user manual
2VAA000597	Frequency input module user manual
2VAA000593	Temperature input module user manual
2VAA000590	Communication coupler user manual
2VAA000591	Repeater module user manual
2VAA000600	Cubicle user manual
2VAA000603	PH 890 migration rack user manual

Document ID	Document Description
2VAA004384	S+ Engineering brochure
2VAA004377	S+ Engineering for Melody brochure

Document ID	Document Description
8VZZ003620T0001	S+ Operations brochure
3BUS095591	Symphony Plus Information Management flyer
2VAA009448	S+ Operations Alarm Portal brochure
2VAA006478	S+ Operations GIS Flyer
2VAA006479	S+ Operations Shiftbook and CMMS flyer
8VZZ001064T0001	S+ Operations Version 3.3 data sheet
8VZZ003534T0001	S+Operations SCADA Version 3.3 data sheet

Document ID	Document Description
3BUS095410	Symphony Plus Condition Monitoring brochure
2VAA007551	SD Series Turbine control module data sheet
2VAA005905	HR Series Turbine control modules data sheet
2VAA005836	AS800 Autosynchronization module data sheet
2VAA005838	VP800 Valve Positioner module data sheet
2VAA005837	TP800 Turbine Protection module data sheet
2VAA005839	MCM800 Condition Monitoring module data sheet

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Document ID	Document Description
Webpage	ABB Industrial automation service
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3BDD015294	Automation Sentinel brochure

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