ABB Ability™ Symphony® Plus
SD Series Control and I/O

ABB

Introducing the SD Series
Flexible automation for a changing world

In our increasingly interconnected digital world, transformative collaborative business opportunities are everywhere – increasing productivity, improving performance, greater efficiencies and smarter operations.

Consider in a typical production plant, terabytes of data is generated daily by equipment, smart devices, and process and business systems – more data produced in one day than in a full month just ten years ago. For plant managers in the power and process industries, the challenge is to find a flexible automation solution that seamlessly adapts leading digital technology for smarter, safer and more reliable control.

Introducing the newest addition to the ABB Ability Symphony Plus family: the SD Series – a green portfolio of completely scalable control and I/O products that deliver a total plant automation solution for your process 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.

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Achieving total plant automation with a single control and I/O platform

Flexible, scalable portfolio
Fast, accurate and uninterrupted control for small, mid-range and high-end applications.
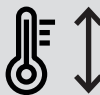
Operating in extreme conditions
Wide operating temperature eliminates costly climate control equipment and specialty sealed cabinets without degrading performance or operating life.

Compact, modular design
Sleek DIN-rail mounted design and streamlined vertical and horizontal mounting reduces control and I/O footprint.

Smart device integration
Seamless integration of intelligent devices produces tighter and more reliable control, greater visibility to device performance and cost-effective proactive maintenance practices.

Green, energy efficient design
Extremely low power consumption, lead free RoHS compliant build makes SD Series the most environmentally friendly control and I/O portfolio.

Time-tested and field-proven
SD Series' use of ABB's best-in-class control technologies allows for easy and risk-free reuse of time-tested and field-proven control application solutions.

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01 SD Series Control
and I/O provide flexible
control for the energy,
water and wastewater
and process industries.

Conventional
power

Renewable
energy

SD Series Control and I/O

Water and
Wastewater

Oil, Gas and
Petrochemical

Process
industries
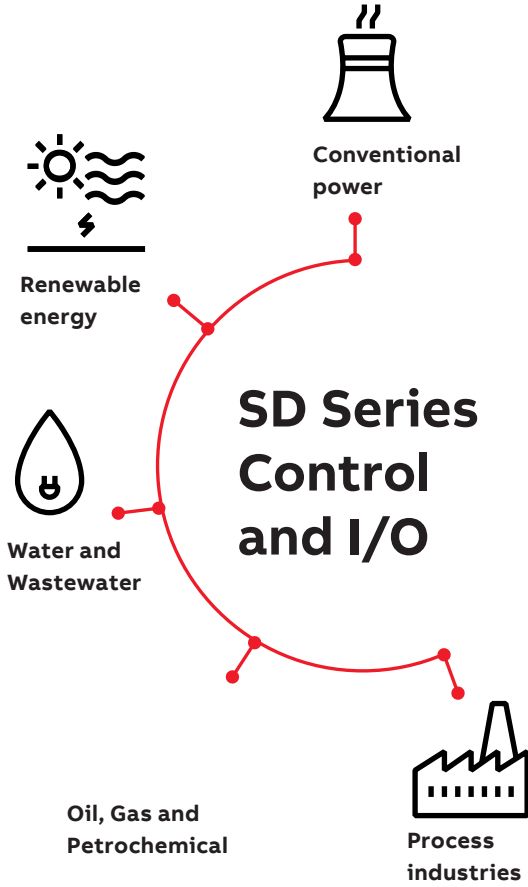
Designed for total plant automation for a wide and varied set of process applications, the SD Series features modular DIN rail packaging, a flexible, high-performance Fast Ethernet-based plant network, and intelligent electrical and field device integration via PROFIBUS, HART, IEC 61850, IEC 60870-5-104, DNP 3.0 and Modbus TCP communication protocols. The SD Series also protects investments made in previous controllers, while delivering higher performance, reliability and capacity.

From design conception through start-up and commissioning, the SD Series helps reduce project deployment costs by:
• Minimizing DCS and extended support footprint
• Simplifying design complexity
• Compressing project schedules

Once in operation, the SD Series lowers total cost of ownership by:
• Increasing process reliability
• Minimizing equipment downtime
• Improving production yields
• Reducing maintenance and support costs
• Reusing physical and intellectual asset investments
• Enabling new products and functions to be added with ease

01 SD Series Control
and I/O provide flexible
control for the energy, water and wastewater
and process industries.

SD Series
Green, energy efficient automation solutions

The SD Series is part of a solid portfolio of energy efficient products from ABB, which together can significantly reduce energy used and often wasted in plants and processes. Combined with ABB variable speed drives and high efficiency motors, the SD Series can significantly reduce your energy consumption and directly improve bottom line profits in the form of higher revenue or lower operating costs.

Controlling your green initiative
The SD Series energy efficient design results in power requirements that are a fraction of today's typical DCS control and I/O offerings. As low power consumers and low heat generators, these modular products require smaller cabinet space, without the need for costly fans, louvers, air filters or forced cooling. Smaller footprint and less moving parts translates in lower design

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02 Energy efficiency is fundamental to a sustainable future

and installation costs, lower annual maintenance costs and improvements in system reliability. As an added bonus, low power consumption reduces the system's UPS (Uninterruptible Power Supply) size requirements.
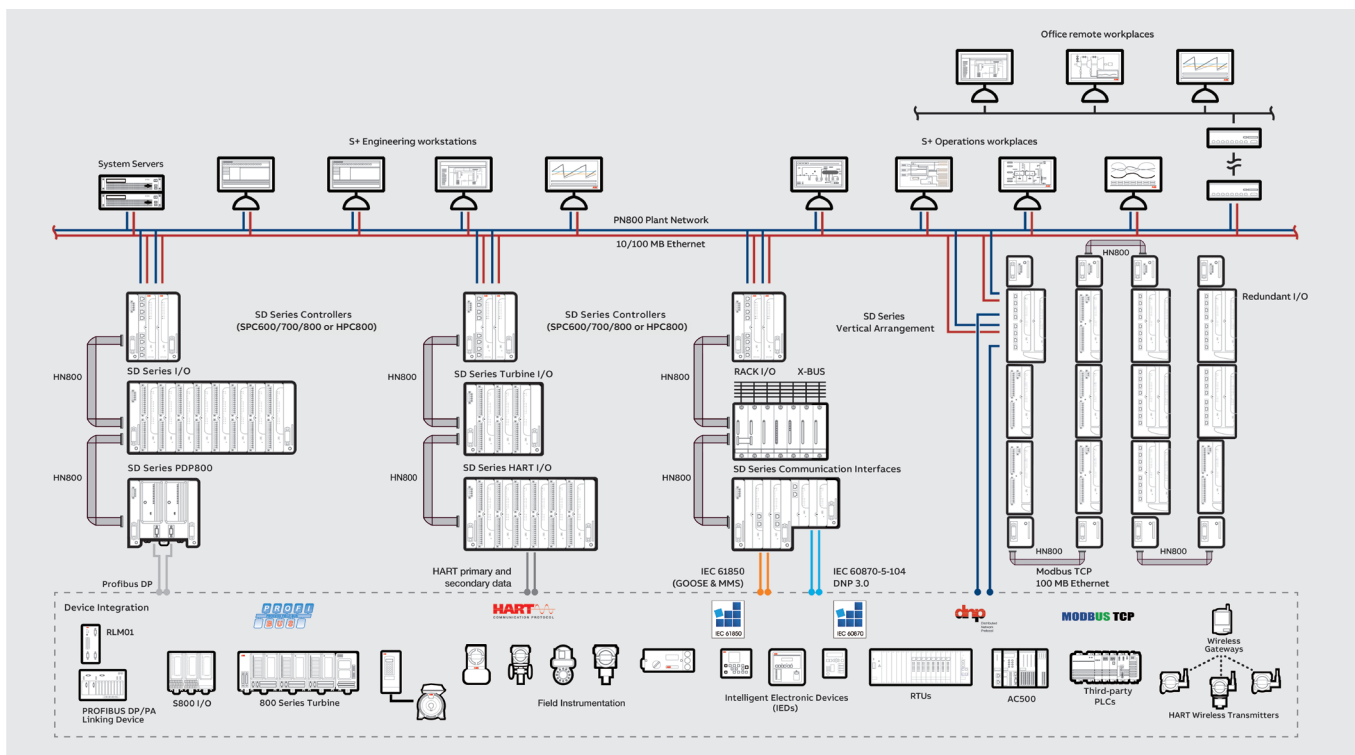
By using extreme-temperature rated components (-40° C to 70° C ambient), SD Series products can be installed near field devices and control elements they interface with, without additional costly climate control systems that are necessary in remote environments. As a result the overall footprint of SD Series installations is smaller, requiring fewer long-field cable runs and reducing installation costs. SD Series is equally suited for use in harsh or corrosive applications, such as the caustic environments associated with desalination or water treatment applications. SD Series G3 coating offsets the need for costly special sealed cabinets and air purging systems, without degrading performance or product life.

Beyond its power efficient design, SD Series IEC 61850 electrical integration options further reduce energy costs and losses by providing greater visibility to the performance of electrical equipment (i.e. motor control centers, switchgear, transformers, excitation systems and protective relays). Communication rates of 5 ms between the SD Series controllers and electrical devices improve plant or process availability with rapid response to power glitches or interrupts.

The environmentally sustainable SD Series products are lead-free and compliant with RoHS hazardous substance restrictions, thereby reducing end-of-life disposal and documentation costs.

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03 Functional overview of SD Series capabilities

SIMPLE, SCALABLE, SEAMLESS, SECURE™

Overview

The SD Series includes a set of high-performance, scalable process controllers that support a plant's total control requirements, from discrete and continuous, to batch and advanced control applications. Supported by a comprehensive range of I/O options, the SD Series delivers powerful, versatile and scalable automation solutions for plant applications of all sizes and requirements.

The common controller environment executes demanding process control applications that are both data and program intensive. Redundancy options are available at all levels resulting in maximum flexibility and availability.

Controllers connect to both DIN style and traditional Rack I/O modules. Intelligent I/O devices are seamlessly integrated through industry standard fieldbuses and networks with resident information used in control and higher level applications for tighter and more reliable process solutions. Inclusion of native turbine specific modules deliver a fully integrated single-vendor solution for all aspects of turbine automation within the plant automation platform.

The SD Series uses ABB's extensive set of field-proven standard function code algorithms and S+ Engineering's graphical design tools to develop control strategies. By using the same function code algorithms as previous generation Harmony and INFI 90 rack controllers, the SD Series supports easy and risk-free reuse

of time-tested, field-proven control application solutions.

All-in-all, SD Series products provide users with the benefits of fast, accurate and uninterrupted control of their process at the lowest design, installation, and operation cost.

S+ Operations, S+ Engineering and other applications communicate with SD Series Control and I/O over the flexible high-speed, high-throughput and high-security 100 Mbps Fast Ethernet-based redundant communications Plant Network (PN800). The network-centric architecture allows for integration of field devices, process and electrical system areas and business enterprise systems in a SIMPLE, SCALABLE, SEAMLESS, SECURE manner.

Protecting the integrity and confidentiality of system data

Process and power industries face intensifying cybersecurity risks. In order to increase stability, security and robustness in its solutions, ABB has established an independent Device Security Assurance Center (DSAC) where cybersecurity robustness is tested as part of the product development process. The DSAC test facility uses state-of-the-art open source, commercial and proprietary robustness and vulnerability analysis tools in its certification testing. All Symphony Plus Ethernet-based devices - including SD Series products such as the SD Series controllers, CI850, SCI200 - are continually tested at the DSAC center in different configurations and with an explicit focus on operational performance. This ensures that all Symphony Plus products are robust, secure and of the highest quality.

SD Series
High-performance, reliable controllers

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04 SD Series scalable con-
trollers SPC600, SPC700
and SPC800 for small,
medium and large scale
applications respectively

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05 S+ Engineering tool

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Powerful process controllers

SD Series controllers are the latest in a long line
of ABB field-proven process controllers and
can adapt to a broad spectrum of applications
and process requirements. Configured by S+
Engineering, SD Series controllers feature an
extensive library of predefined function codes
for easy building block design of complex control
strategies to fit any control application, including
continuous, sequential, batch and advanced
control.

SD Series controller features include:

• More than twice the performance of the
  BRC410 and 15 times the performance of
  previous generation Harmony Rack controllers
• Simultaneous support for SD Series I/O,
  Harmony Rack I/O and S800 I/O subsystems
• Execution of closed loop control of more than
  5,000 I/O (SPC800 / HPC800), 1,000 I/O
  (SPC700) and 500 I/O (SPC600) in less than 250
  msec
• Downloadable firmware
• Extended user configuration memory (NVRAM)
  and runtime memory (RAM)
• Scalable to 5,000 function blocks (SPC600),
  10,000 function blocks (SPC700) and 30,000
  function blocks (SPC800 / HPC800)
• Flexible, online configuration capability
• Support for up to 8 segment tasks, each
  segment supporting execution cycle time
  down to 1 msec
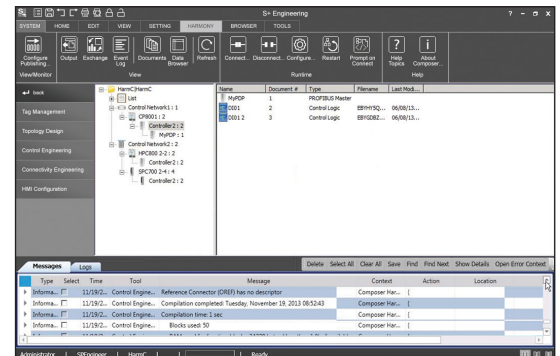
**Designed for maximum reliability and
availability**

SD Series controller subsystems are redundant at
all levels - CPU, power, internal bus, I/O networks,
communication ports and plant network.

Compliance with international standards assures
the highest level of reliability and quality needed
to meet the most rigorous global specifications
and requirements. Together, they provide users
with fast, accurate, uninterrupted control of their
process.

Further, SD Series controllers are designed to
specifically address cybersecurity threats as
defined by the industry leading standard IEC
62443. For example, SD Series controllers are
ISA Secure Component Security Assurance (CSA)
certified (formally known as Embedded Device
Security Assurance, EDSA).

Soft controller

Soft controllers dramatically reduce start-up and
commissioning time and costs by permitting
thorough testing and pre-tuning of control loops
prior to its implementation in the field. The SD
Series soft controller uses the same control logic
as the physical controllers. Coupled with virtual
communication devices, the entire SD Series
control-based system can be implemented within
one or more PCs with virtual environment testing
results directly transferable to the operating
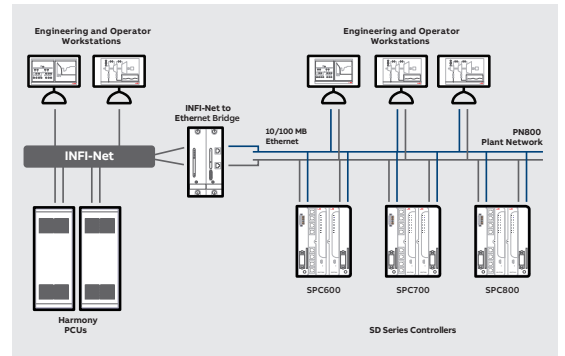system environment.

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06 Seamless electrical integration via IEC 61850

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07 SD Series Communication Interface include CI850 (IEC 61850) and SCI200 (IEC 60870-5-104; DNP 3.0)

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08 INFI-Net to Ethernet bridge (IEB800)

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Device integration capability

The SD Series controller architecture seamlessly integrates intelligent field devices and protocols using PROFIBUS DP, HART, Modbus TCP, IEC 61850, IEC 60870-5-104 and DNP 3.0. This provides access to a wide range of intelligent field devices from both ABB and other third-party vendors including transmitters, actuators, motor control centers (MCC), flame scanners, IEDs, etc. Each device's resident information can then be used in control strategies and higher level applications. In addition to producing tighter and more reliable process control solutions, these solutions lower installation costs by reducing wiring and system footprint.

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Based on field-proven technology

SD Series controllers use ABB's set of best-in-class control technologies to build its automation solutions. This allows users to effectively re-apply their extensive library of ABB field-proven, time-tested control solutions with these latest products.

Specifically, SD Series solutions:
- Use the extensive set of field-proven INFI 90 function code algorithms as previous generation controllers
- Use traditional INFI-Net exception reporting over redundant 100 Mbps Fast-Ethernet (PN800)
- Extend current Composer graphical design engineering tools with device management capabilities

Further, Symphony Plus Rack and SD Series control networks, INFI-Net and PN800 respectively, can be connected via a self-configuring INFI-Net to Ethernet bridge (IEB800) module (Figure 08). Use of this bridge makes resident data on either network available for use in control applications, or for display in the other system.

SD Series
Comprehensive I/O product portfolio

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09 SD Series non-
redundant and
redundant analog
and digital I/O

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10 Integrated turbine
control solutions

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The SD Series I/O product family includes DIN-Rail horizontally or vertically mounted digital and analog modules, as well as integration with intelligent field devices and protocols using PROFIBUS DP, HART, IEC 61850, IEC 60870-5-104, DNP 3.0, and Modbus TCP communications. Hardwire I/O and fieldbus I/O coexist and use the same function block library to build real-time control applications.

Traditional SD Series analog input modules interface with field inputs such as pressure and flow transmitter signals, thermocouple inputs, and resistive temperature device (RTD) inputs. Analog output modules provide output signals to adjust final control elements such as control valves, positioners, actuators, etc.

SD Series digital input modules have input channels to read the states of switches, relay contacts, solenoids, etc. Digital output modules provide output channels for DC or AC switching applications. The digital outputs can be used to drive annunciators and to drive two-state final control elements such as actuators, relays, and solenoids.

For SD Series Digital I/O, each channel can be individually configured as an SOE (Sequence of Events) point. This flexibility removes the cost and complexity of assigning additional digital inputs as SOE in the field. SOE with 1 msec timestamp is available across the entire system, whether the I/O is local or remotely located.

Redundant I/O
SD Series redundant I/O arrangements provide enhanced availability for your most critical field I/O. Available for both analog and digital I/O, these redundant I/O modules protect against common power, communications, hardware and software failures and I/O channel failures without requiring any additional configuration.

Local and remote options
24V DC power requirements, low module power consumption, and a module temperature rating of -40°C to +70°C (ambient) make SD Series I/O equally suited for local or remote I/O installations. G3 coating makes SD Series I/O suitable for use in corrosive environments without requiring costly sealed cabinets or purging systems. The software configuration is identical when configured as either local I/O or remote I/O or mixed.

Easy expansion of existing Rack systems
SD Series I/O modules are compatible with HR Series BRC300/400/410 controllers for easy, incremental expansion of existing Rack systems. Typical examples include expansion with remote I/O or HART enhancements to existing Rack installations.

Turbine Control
In addition to traditional signal-type I/O, SD Series provides for integrated turbine control solutions via a series turbine control-specific modules and include:
• Hydraulic Servo Module (VP01)
• Turbine Protection Module (TP01)
• Turbine Auto Synchronization Module (AS01)
• Condition Monitoring Module (MCM800)

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11 Plant level access
to HART instrument
performance

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12 SD Series HART
I/O Analog I/O

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These unique modules make it possible to provide a fully integrated single-vendor solution for all aspects of turbine automation. Symphony Plus turbine solutions are based on proven technology that controls steam turbines, gas turbines and hydroelectric turbines in more than 15 different countries around the world, and have been tested, accepted, and used as part of their standard offering by several major global turbine manufacturers. With step change response times of less than 20 msec, the SD Series turbine offering delivers powerful governor control system solutions.

Intelligent HART I/O
HART field devices are seamlessly integrated through a variety of HART analog input and output modules. This provides access to a wide range of intelligent field devices including transmitters and actuators from ABB and other vendors. Besides the 4-20 mA primary variable, all secondary, tertiary and quaternary variables in a HART device can be accessed by Function Code control applications in the SD Series controller. Data can be calculated, used as part of a control strategy, or for display and alarm purposes at the S+ Operations console.

The SD Series` HART capabilities allow users to take full advantage of their HART instrumentation investments. Too often smart devices are under-utilized because of the limitations of the I/O system to accept the device's information. With SD Series HART modules, incorporation of the secondary variables in control strategies can reduce the overall number of field devices and I/O

channels required. Visibility of HART diagnostic data at the system level reduces maintenance costs through the proactive response to degrading performance of field devices before a failure occurs.
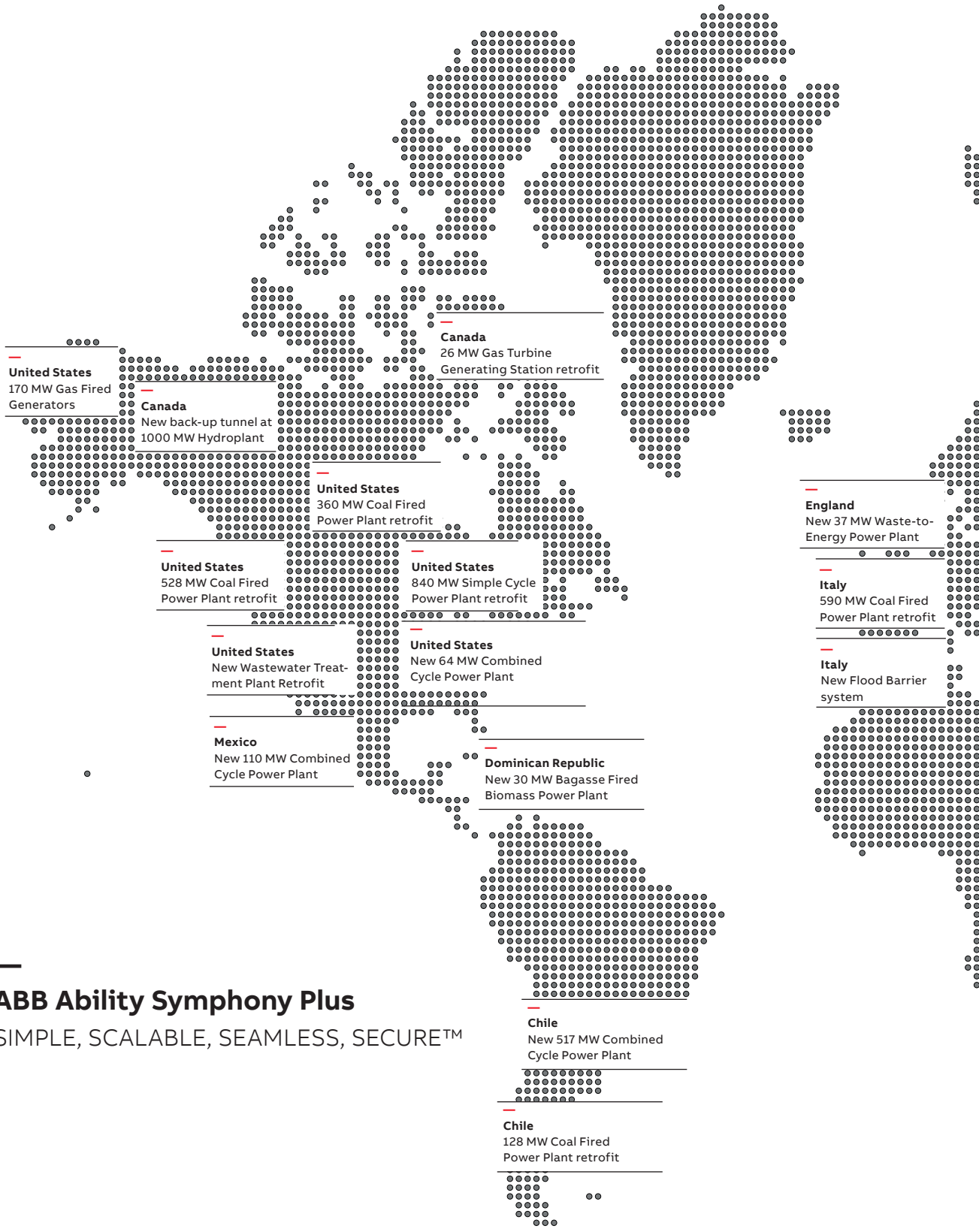
SD Series HART I/O features include:
• Each channel's secondary/tertiary/quaternary variables are available for use in control applications
• Update rate of secondary/tertiary/quaternary variables is less than one second (AI05 and AO05)
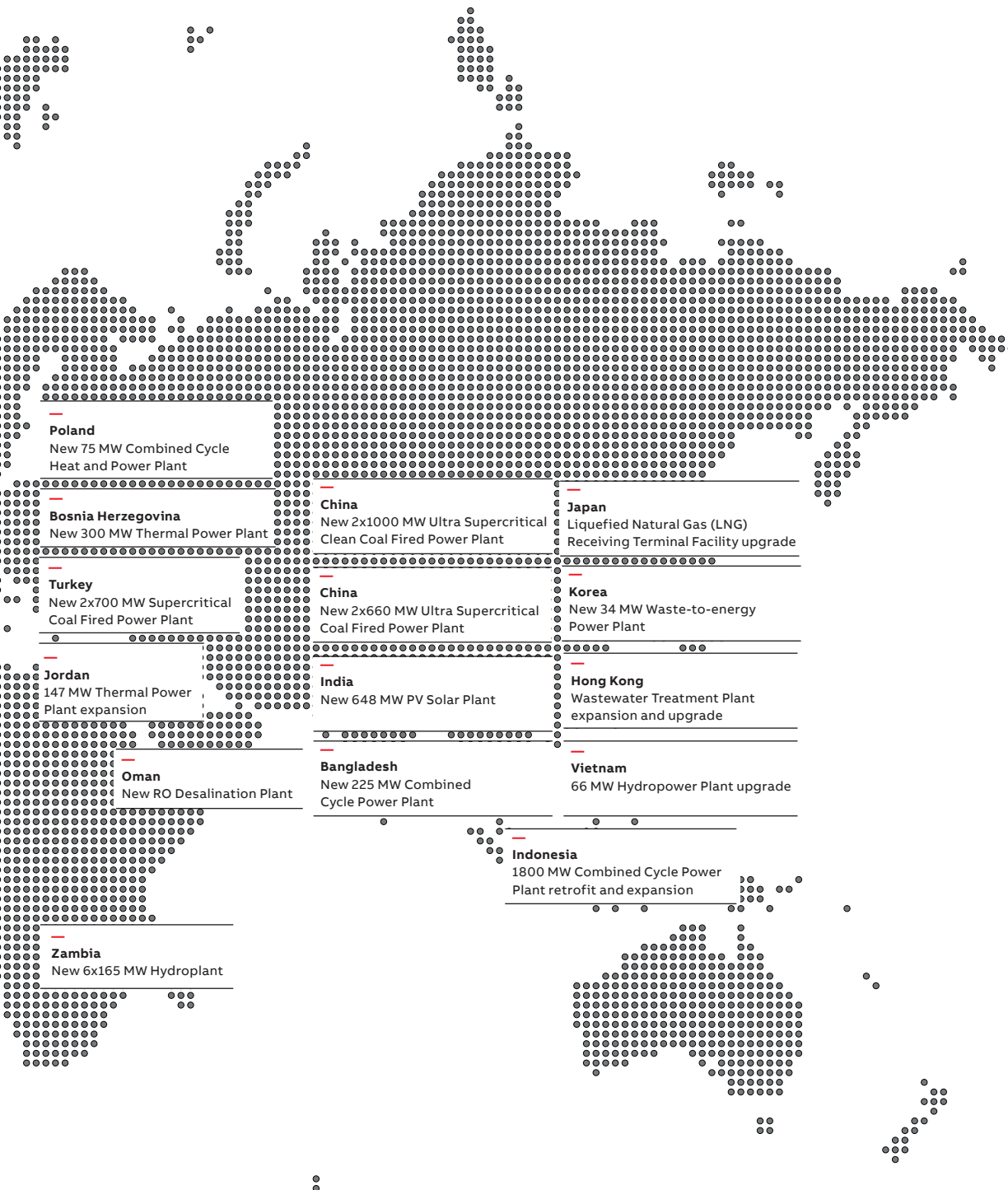
Field device management
HART and PROFIBUS devices are fully integrated with Symphony Plus, yielding benefits far beyond reduced footprint and cable costs. The S+ Engineering tool suite supports configuration, commissioning and maintenance of HART and PROFIBUS devices using device type manager (DTM) technology. 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. Individual DTMs can be accessed from the engineering tool's multiple data views, such as the system or location overview and others. S+ Engineering includes automatic net calculation and loading of process items by using the device specific channel configuration generated from the DTM.

SD Series
Field proven technology

Canada
26 MW Gas Turbine
Generating Station retrofit

United States
170 MW Gas Fired
Generators

Canada
New back-up tunnel at
1000 MW Hydroplant

United States
360 MW Coal Fired
Power Plant retrofit

United States
528 MW Coal Fired
Power Plant retrofit

United States
840 MW Simple Cycle
Power Plant retrofit

England
New 37 MW Waste-to-
Energy Power Plant

Italy
590 MW Coal Fired
Power Plant retrofit

United States
New Wastewater Treat-
ment Plant Retrofit

United States
New 64 MW Combined
Cycle Power Plant

Italy
New Flood Barrier
system

Mexico
New 110 MW Combined
Cycle Power Plant

Dominican Republic
New 30 MW Bagasse Fired
Biomass Power Plant

ABB Ability Symphony Plus
SIMPLE, SCALABLE, SEAMLESS, SECURE™

Chile
New 517 MW Combined
Cycle Power Plant

Chile
128 MW Coal Fired
Power Plant retrofit

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Poland
New 75 MW Combined Cycle
Heat and Power Plant

—
Bosnia Herzegovina
New 300 MW Thermal Power Plant

—
Turkey
New 2x700 MW Supercritical
Coal Fired Power Plant

—
Jordan
147 MW Thermal Power
Plant expansion

—
Oman
New RO Desalination Plant

—
Zambia
New 6x165 MW Hydroplant

—
China
New 2x1000 MW Ultra Supercritical
Clean Coal Fired Power Plant

—
China
New 2x660 MW Ultra Supercritical
Coal Fired Power Plant

—
India
New 648 MW PV Solar Plant

—
Bangladesh
New 225 MW Combined
Cycle Power Plant

—
Indonesia
1800 MW Combined Cycle Power
Plant retrofit and expansion

—
Japan
Liquefied Natural Gas (LNG)
Receiving Terminal Facility upgrade

—
Korea
New 34 MW Waste-to-energy
Power Plant

—
Hong Kong
Wastewater Treatment Plant
expansion and upgrade

—
Vietnam
66 MW Hydropower Plant upgrade

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