BROCHURE

# ABB Ability™ Symphony® Plus

## MR Series (Melody Rack)



# Scalable, highly available, easy to configure and efficient control system

Continuous productivity improvements and increased profitability are the driving force behind today's automation system. Furthermore, systems must support users with the power 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. However, as business goals have changed, using a scalable controller platform that possesses multi-functional capabilities, adapts to changing requirements, and maximizes openness and availability, is paramount to success.

ABB Ability Symphony Plus MR Series (Melody Rack) controllers, communication interfaces and I/O modules meet the most challenging requirements in each of these areas.

Thanks to their modular design, MR Series controllers can be adapted to 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.

## Features and benefits

**Flexible, cost-effective assembly**
Decentralized, DIN rail-mounted controller assembly can be combined with local or remote I/Os.



— 01 MR Series controller PM877

**Comprehensive I/O system**
A wide range of local and remote I/O is available with integrated intrinsic safety design and transmitter power supply options. Features such as sequence of events (SOE) time stamping (1 ms resolution), monitoring, filtering, as well as HART, PROFIBUS, Modbus RTU and TCP communication are supported with a wide range of I/Os such as Melody Rack local I/O, ABB's S800 and S900, and other remote PROFIBUS I/Os.

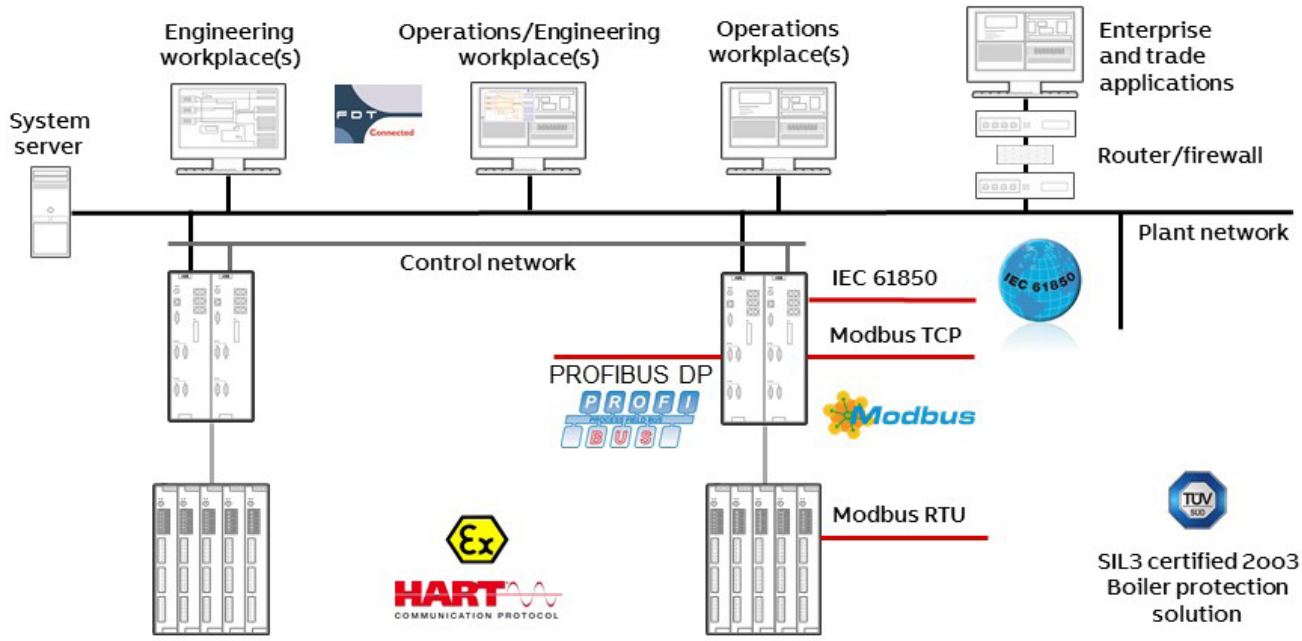
**Distributed capability**
ABB's S800 and S900 remote I/O and Melody Rack local I/O are connected via high-speed serial communication buses. Local I/O offers a high packing density to reduce mounting space to a minimum, whereas remote I/O fully supports distributed system configurations.

**Efficient field device integration**
Standardized field device tool/device type manager (FDT/DTM) interfaces enable plug-and-play integration of field devices.

**Easy to configure**
Module configuration and service is executed using S+ Engineering for Melody and its unrivaled library of fully tested and field-proven powerful function blocks.

**Inherent redundancy design**
System-integrated redundancy options for power supply, hardware and communication networks provide the highest level of availability.

**High performance modular network**
Symphony Plus MR Series based control systems uses a redundant, high-speed serial communication network with inherent capability for remote communication. The network is easy to expand without requiring routing configuration.




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02 Functional overview of MR Series capabilities

## Overview

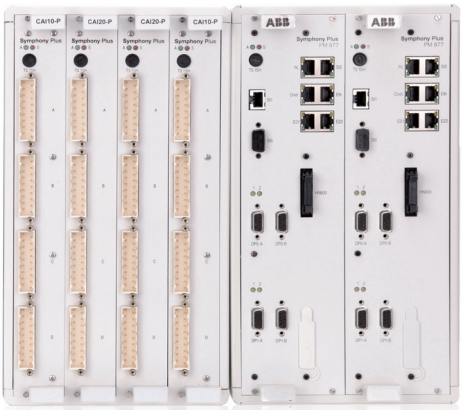
The MR Series includes a series of compact DIN rail mounted controllers, a wide range of I/O modules and modern, standardized fieldbus interfaces. These modules offer all the functions required for data acquisition and signal conditioning, as well as powerful open loop and closed loop control, sequence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

**Key features include:**

- A wide range of I/O interfaces with optionally integrated intrinsic safety (Ex i) design and transmitter power supply. Features such as time stamping with a 1 ms resolution, monitoring, filtering and HART communication are implemented directly in the I/O modules
- PROFIBUS interfaces provide connections to ABB's S800 and S900 remote I/O stations in Ex and non-Ex versions, as well as other PROFIBUS devices
- IEC 61850 interface to intelligent electronic devices (IEDs) for the integration of electrical subsystems
- Modbus RTU and TCP interfaces provide connections to 3rd party devices
- The MR Series control network uses a redundant, high-speed serial communication network with inherent capability for remote communication. The network is easy to handle, without requiring routing configuration
- Flexible mounting alternatives such as cabinet, DIN rail or 19" rack mounting. All three can be combined in one project. This allows optimal adaptation to all plant structures and supports flexible upgrades of existing installations
- An unrivaled high packing density in the system cabinets saves installation space
- Controller time synchronization based on a time precision of 0.5 msec
- Sequence of events (SOE) time stamping with a resolution of 1 ms is implemented in the controller and local I/O module level

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. The MR Series functional capabilities are summarized in figure 2.

# Wide range of intelligent I/Os, standard interfaces and libraries



03 MR Series control station (DIN rail housing)

## Scalable control stations

MR Series control stations are conveniently set up according to project needs and are made up of modular controllers and I/Os. Depending on the scope of the automation task, the controller is extended with I/O modules or communication interfaces.

The controllers are connected via the control network to ensure reliable, high speed and system wide real-time signal exchange with other control stations, with S+ Operations, with system level applications and with S+ Engineering for Melody.

Each node on the control network operates autonomously. Acting as its own communication manager, the system requires no traffic directors. The controller's associated I/O modules are connected using the high-speed redundant serial field network or PROFIBUS DP (DPV1 as well as DPV2).

## MR Series controllers

Melody controllers are designed for maximum computing power and modular scalability.

Each controller can handle up to 2,000 analog and/or digital I/O points from the local I/O, and additionally 6,000 analog and/or digital I/O points connected via PROFIBUS DP. In addition to the standard tasks such as signal processing, loop and logic control, the MR Series controller also performs complex computations such as sequential, batch and advanced controls.

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

The 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 controller key features include:**

- Large variety of powerful functions available in tested libraries
- Easy configuration, service and commissioning with S+ Engineering
- Inherent redundancy without configuration/ wiring costs
- Real-time multitasking operating system
- Up to 16 different cycle times
- Comprehensive monitoring and diagnostic functions
- Interface for radio clock connection
- Bumpless downloadable firmware and application programs (no EPROMs)
- Cyber security proven
- PM 877 without battery

The range of available function blocks extends from simple control and individual drive functions to complex recipes based on S88 and NAMUR using sequential function charts based on IEC 61131-3.

Function blocks may also be used to set up customer-specific libraries in S+ Engineering for Melody.

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04 MR Series process interface modules (from left to right: CAO 10-P, CBI 20-P, CBI21-P Ex, CAI10-P)



## MR Series process interface modules

The controller sets new standards for user convenience with industrial process interface modules. A large variety of I/O modules can be combined to form an optimal automation solution.

Main components of the MR Series control station are the I/O modules and a high-speed, redundant serial field network. Together they operate as a subsystem dedicated to the controller.

**Local I/O types**
The following local I/O types are available:
- Analog input (CAI) Ex and non-Ex
- Temperature input (CTI)
- Analog output (CAO) Ex and non-Ex
- Digital input (CBI) Ex and non-Ex
- Digital output (CBO)
- Control modules (CAC/CBC)
- Frequency input (CFI)
- Serial communication interfaces (CCF)

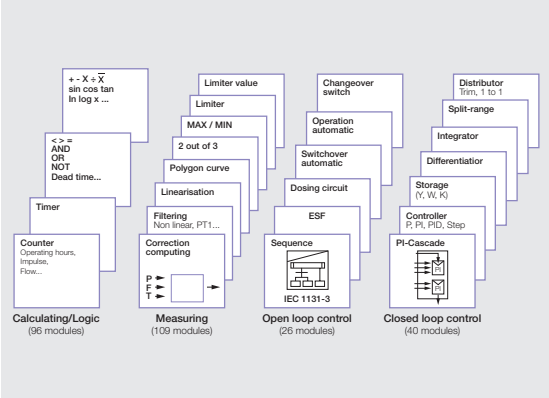
Redundant modular power supply is an option.

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.

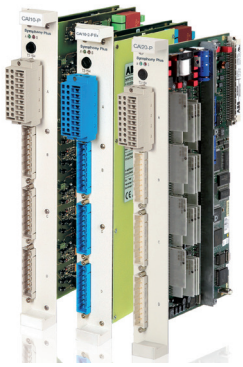
**Local I/O features**
- A processor in each I/O module provides advanced functions such as event detection and alarm generation, time stamping with 1 ms resolution and system diagnostics
- Downloadable firmware
- Local I/O modules provide integrated transmitter power supply, integrated intrinsic safety and HART communication
- HART variables can be used like the analog values within function plans
- Distribution of I/O modules reduces cable and installation costs. A high-speed serial communication bus (Fnet) that is designed for long distances combined with flexible cabinet mounting options enables both centralized and remote I/O locations
- Simplified user configuration eliminates the need for calibration or onboard jumper settings
- Maximum availability through inherent redundancy design including redundant communications via Fnet and optionally redundant I/O modules
- All local I/O can be reconfigured and extended online with new I/O module while in full normal operation
- Each input or output can go to a pre-defined value in case of disturbed values or communication loss

# Wide range of intelligent I/Os, standard interfaces and libraries

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05 Library of software function modules




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06 I/o module Ex and non Ex



**Control modules**
The following control I/O modules are used for closed loop and open loop control especially in the power generation industry.

The drive control (CBC 11-P) modules are used for:
- On/off actuators
- Motor drives
- Solenoid valves
- Hardwired individual control stations

The closed loop output (CAC 10-P) is used for:
- Continuous controller
- PI step controller
- Current signal output to I/P converter for pneumatic actuators
- Three-position step controller with PI behavior
- Three-point switch as positioning circuit, or
- Hardwired individual control station

Both modules operate independently of the controller.

**PROFIBUS interface**
The MR Series controller integrates PROFIBUS-DP communication, thus enabling system level engineering of devices and device communications. In addition to communication with the system engineering environment, fault and diagnostic messages are displayed at the S+ Operations workplace or other ABB operator console.

Features include:
- PROFIBUS-DP (DPV0, DPV1 and DPV2)
- Two PROFIBUS lines per controller
- Redundancy of each PROFIBUS line
- Transfer rate adjustable in steps from 9.6 kbit/s to 12 Mbit/s
- PROFIBUS-DP/PA converter

**Modbus RTU and TCP interface**
A local interface card provides Modbus RTU where the MR Series controller provides Modbus TCP on board.

Features of Modbus TCP:
- 128 Modbus TCP server per controller
- 16 Mobus TCP slaves per controller

# Network and communication

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9 MR Series controller PM 877



## Network and communication

S+ Control: Melody control network is subdivided with respect to hierarchy and functionality.

The network is adapted to the plant size according to a hierarchical grouping into stations, plant areas and the entire plant. Hierarchical grouping supports automatic data transfer between the MR Series stations.

Functional subdivision of the network is effected in the control buses and operation buses.

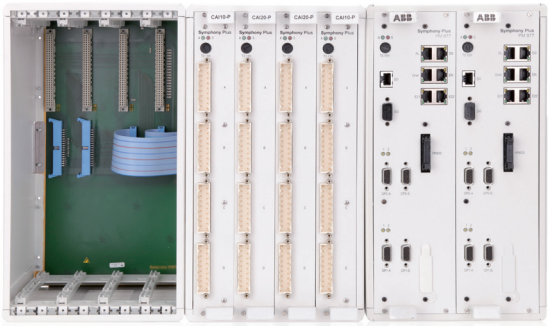
With respect to process visualization, configuration and maintenance of the system, all information is routed via the operation bus.

This division of tasks permits control loops to be closed via control buses and protective signals to be transmitted. No influx of messages, irrespective of their size, impedes the automation of the process.

Without additional configuration, a signal marshalling function automatically establishes the bus interconnection of the conditioned measured value (signal source) with all subsequent processing functions (signal sinks) throughout the system.

For each established interconnection, the active signal is cyclically and spontaneously transmitted individually from a signal source to a signal sink.

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10 MR Series DIN rail housing with extension



## Decentralized assembly system

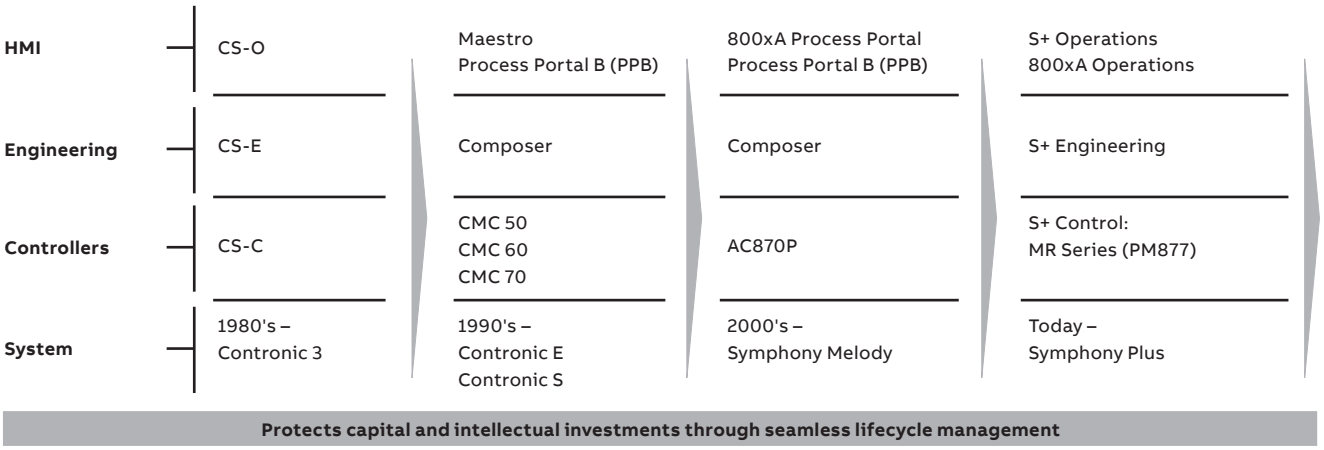
Common features include:
- Modules with 7 height units
- Front panel width 8 or 16 rack units
- Light emitting diodes for fault signaling
- Selective module protection

The assembly system of the MR Series is designed for decentralized applications.

The following variants are available:
- **Controllers housing:** The housings are mounted on standard rails.
  The controllers are easily connected via redundant interfaces. Each controller provides two redundant PROFIBUS DP interfaces, which may be used independently
- **Extension housing:** In addition to the redundant controller, up to eight local I/O interfaces may be added to the extension housings. Furthermore, the redundant Fnet may be attached to the field via repeaters (coaxial or fiber optic cable), in order to connect additional MR Series controllers.

Thus, the housings may be used with the proven local I/O as cost-efficient remote I/O, without the need for additional controllers.

# Evolution without obsolescence




A DCS is a significant capital investment. Plant engineers add to this investment by enhancing the control system components, tuning and refining control application code and developing knowledgeable staff who operate and maintain the plant and control system. One of the results of these initial investments is the creation of site specific control strategies and procedures that enable the plant to maintain high availability and excellent operational performance.

Since its introduction, Melody Rack has followed the ABB vision “evolution without obsolescence”. New MR I/O cards, interfaces and controllers are usually fit, form and functional compatible with their predecessor modules or ABB provides an easy way of evolution.

S+ Engineering for Melody fully supports the replacement of former modules or the extension with new modules of a system with easy to use replacement features. Our support team helps customers to evolve and extend their existing systems.

By adding new features to existing or new modules, the system can be updated and extended by new functionalities without changing the existing system topology or control logics.

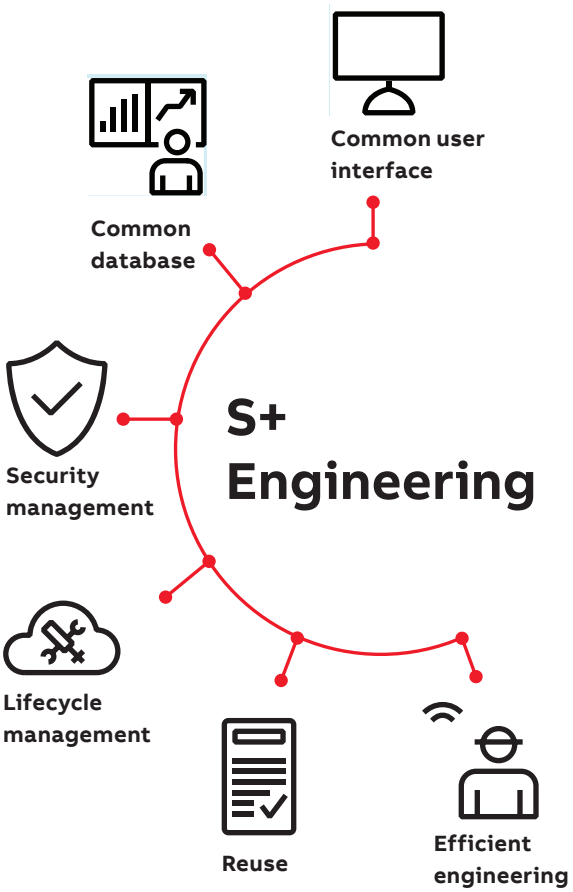
A good example is the new controller PM 877

- Replacement of former controllers fully supported by S+ Engineering for Melody
- Replacement of CMC 50 and CMC 60 incl. communication modules CCO 30 and CCO 30-2 as well as CMC 70, PM 875(-x) and PM 876(-x)
- Existing I/O cards remain in place (375kBaud (option) and 2Mbit cards)
- Value add
  - Lower maintenance and support costs because no battery is needed
  - Higher performance compared with CMC 50 and CMC 60
  - 50% less power consumption compared with PM 875(-x) and PM 876(-x)
  - Cyber Security compliant (DSAC)
  - Additional interfaces
    - PROFIBUS DP
    - Modbus TCP
    - IEC 61850

In summary, MR Series (Melody Rack) reduces deployment costs and reduces total life cycle costs associated with system evolution. It preserves decades of intellectual know-how specific to the specific plant by allowing the existing configuration to be re-used.

# S+ Engineering for Melody

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11 Building blocks of an efficient engineering platform.




## Robust – efficient – comprehensive

S+ Engineering applications use client/server technology to support multiple users operating in a networked environment. The configuration server hosts/manages the configuration information. It can support up to ten simultaneous client connections and provide users with shared access to a system's configuration information and real-time plant data (via separate or combined communication server). This configuration server stores the data in a single database per system. Providing a single source of truth for all data within the system, S+ Engineering eliminates duplication of data entry, simplifies database management and automates configuration tasks. Information can be imported and exported in many of the commonly used file formats.

Changes in the runtime environment are deployed smoothly and securely. The strict separation of engineering and runtime enables offline engineering, makes the engineering workflow flexible, and integrates externally delivered lots without process interruption. During commissioning, S+ Engineering's multi-user and remote access capabilities are critical to on-time delivery. Especially during hot commissioning and project finalization, the ability of the engineer to commission and de-bug from loop level down to controller base functionality through a common tool ensures timely and on-budget startup. S+ Engineering's seamless tool integration, powerful workflow automation and comprehensive bulk import/export functions improve overall engineering efficiency. Integrated version control, version comparison and rollback framework offer progress tracking and significantly reduce commissioning time. Using intelligent bulk interfaces, S+ Engineering allows for full control of engineering data consistency in each phase of the project life cycle.

## Intuitive engineering interface – for today and tomorrow

S+ Engineering's comprehensive workbench provides a comprehensive range of engineering tools. These tools provide a visual environment for easy configuration of control system strategies and global configuration databases. Management of system libraries of reusable software components as well as integration and management of intelligent field devices is also readily accomplished through a single, unified platform.

# MR Series
## Field proven technology

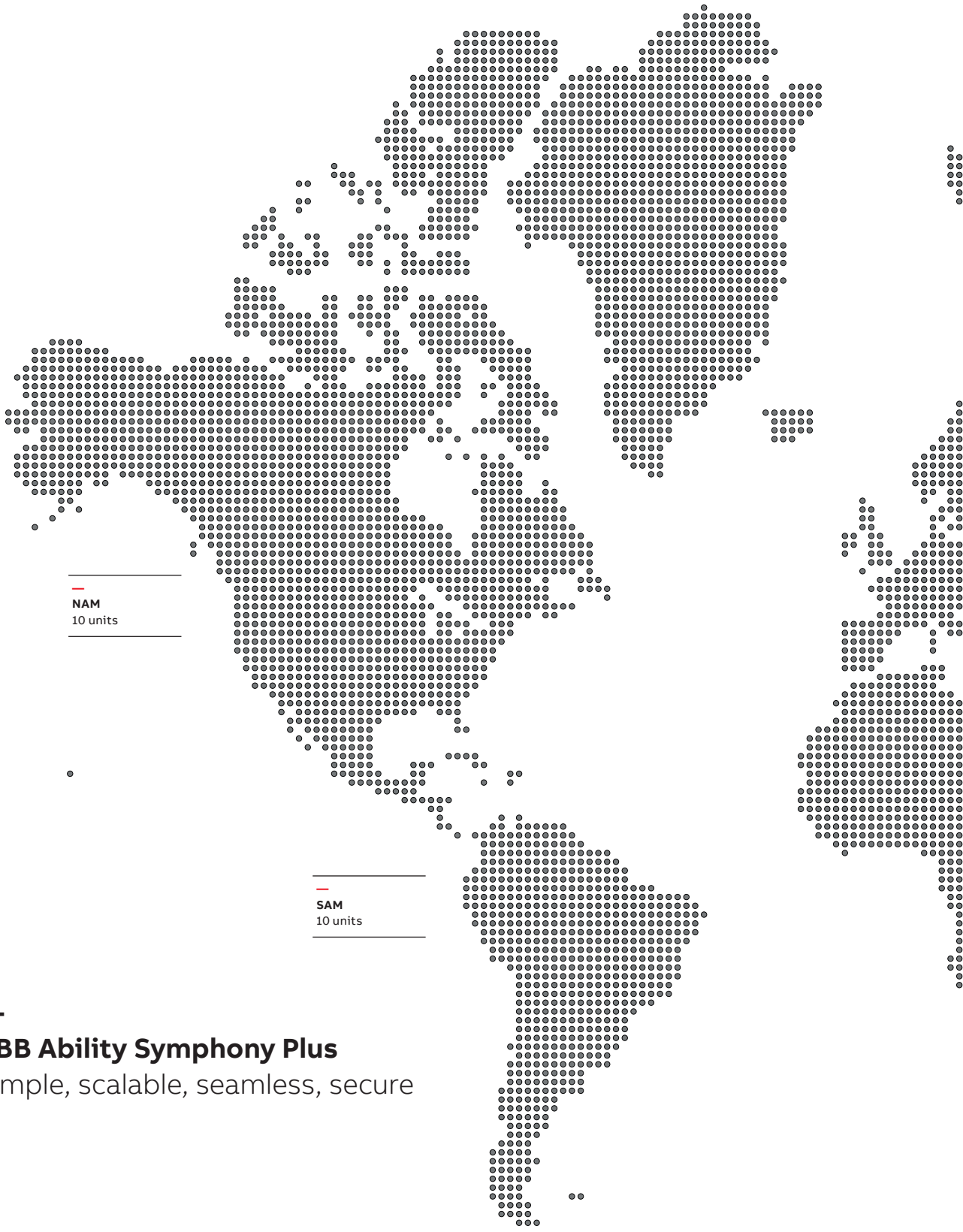
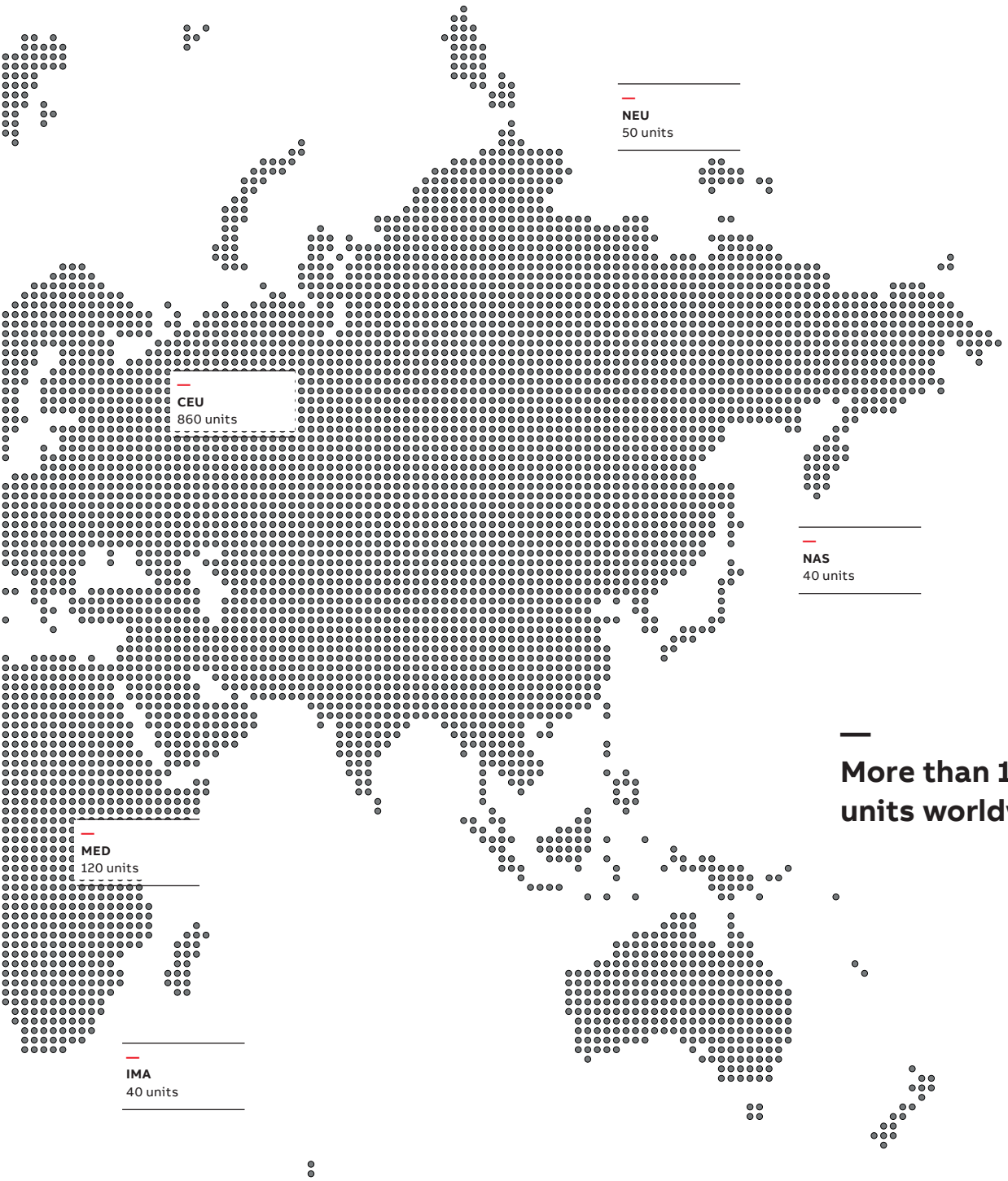



**ABB Ability Symphony Plus**
Simple, scalable, seamless, secure

ABB has delivered or is delivering ABB Ability Symphony Plus solutions that control more than 60,000 MW of new power generation. These solutions range in complexity from the simplest to the most challenging of automation requirements, and for power and water facilities of all sizes. Below is a sample of the breadth of Symphony Plus MR Series based solutions selected for power generation and water installations around the world.




**More than 1,200 units worldwide**

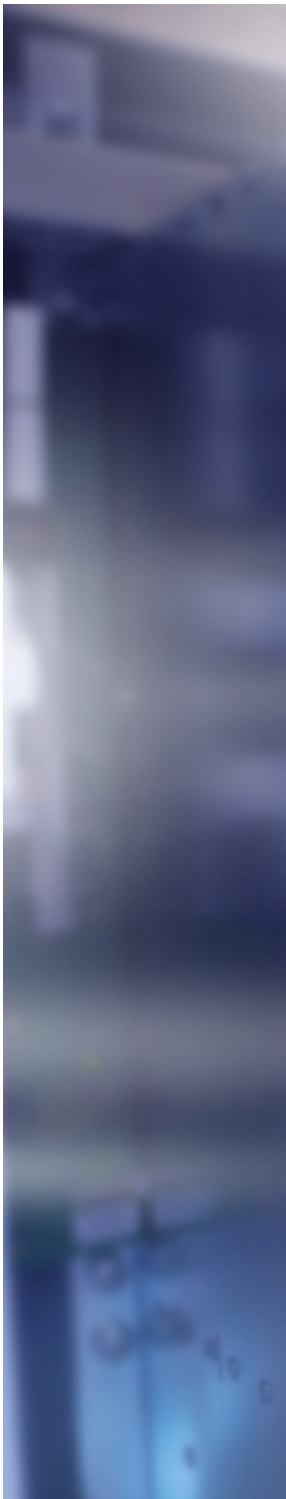


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