Industrial Solutions

DESCRIPTIVE BULLETIN

Evolution series E9000

Motor control center

by ABB

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Evolution series E9000 motor control center

The next level in motor control centers

The Evolution series E9000 motor control center provides a safe, flexible, and centralized means to protect and control motors.

ABB has driven the development of motor control centers, from the first plug-in combination starter to the first fully segregated units to contain fault damage.

The Evolution series E9000 introduced the first 600A plug-in units and the first snap-in low voltage vertical barriers.

Evolution's 850A vertical bus, snap-in shelves, plug-in feeders to 600A, and plug-in starters to size 5 provide customers with more flexibility to move buckets around and add them in the future.

The most recent additions to the E9000 product line include Arc Flash Mitigation (AFM) units and Arc-Resistant (AR) construction. The AFM units are designed to help reduce the likelihood of exposure to electrical shock and the potential of internal arcing faults from occurring during maintenance. The AR construction is a robust design which is tested per applicable sections of IEEE C37.20.7 with Type 2 accessibility to help provide an extra margin of safety.

These evolutionary advances extend to versatility in application – from the most complex auxiliary drive systems to the most basic control of fan or pump motors.

They also embrace the scope and caliber of components and systems required to satisfy those applications, from the latest in solid-state starters and drives to world-class programmable logic control to a wide variety of proven control and distribution devices.

Enhanced simplicity and safety along with reduced size all make the Evolution series E9000 the logical choice in motor control centers.

Overview

Customer feedback from structured focus groups provided the foundation for the Evolution series E9000. OEMs asked for the flexibility that came from a simplified design. Users wanted enhanced safety features and easier access for maintenance and troubleshooting. Consultants sought a smaller footprint so they could minimize electrical room space. Using the acclaimed Six Sigma process, a motor control center was designed to meet all those needs and more.

Simpler is Better

The Evolution series E9000 design has the following advantages:

- High density - customers can add more buckets and feeders because of compact unit design
- Ample wireway space - E9000's unique design allows for more wiring space despite its increased density
- Fewer parts - simplified design translates into greater flexibility, easier installation, and fewer stocked parts

The simplicity dramatically cuts order-to-shipment cycles and increases ability to respond quickly to changing project requirements. For example, the 600A plug-in stab assembly enables more flexibility for the factory, allowing them to move larger units around in the equipment, minimizing the impact that customer changes have on the production schedule. The 250A and 600A plug-in units also speed up field installation and make even last-minute changes for the end users faster and easier to execute.

Installation is further made simplified by these features:

- Deeper vertical wireway channels for greater wire bending space
- Hinged wireway doors - no loose covers to keep track of
- Rolled edges that protect wires on all four side access openings
- Front-accessible control terminal blocks that speed up installation

Key features and benefits

Arc flash mitigation
The E9000 AFM unit incorporates a retractable stab mechanism which allows for closed-door racking of the unit. This feature, described in IEEE 1683, helps provide added protection to electrical personnel from the dangers of an arc flash occurrence. Visual indicators offer personnel quick and easy indication of stab and shutter status.

Arc resistant construction
E9000 AR offers a heavy-duty enclosure which is tested per applicable sections of IEEE/ANSI C37.20.7 with Type 2 accessibility. Reinforced doors, latches, and pilot device brackets provide strength and an optional plenum allows flexibility for installation.

Evolution's minimum 65kAIC bus bracing provides customers with the ability to expand as their system requirements grow.

IBC-2015 seismic standard
Evolution's robust design, fewer parts, and stronger assembly allows for a Seismic Zone 4 standard rating for customer peace of mind.

Plug-in starters to size 5
Customers can plug starters up to Size 5, allowing easy installation and removal. In addition, Size 5 starters have been reduced to 36" high, so two units can fit in a single MCC section.

Plug-in feeder circuit breakers up to 600A
A large selection of plug-in feeders, provides customers with increased flexibility to quickly rearrange buckets.

Variable frequency drives rated to 100 kAIC
Variable frequency drives are rated to 100 kAIC without fuses, saving customers footprint and additional expense, while offering a compact drive unit, specifically at higher horsepower.

Multilin MM200 and MM300 motor management relays
Multilin MM200 and MM300 protection relays provide the latest technology in motor protection and control. The features are suitable for industrial and process applications requiring varying levels of diagnostics and control and for critical applications requiring remote monitoring. MM300 functionality such as auto restart, wave form capture, and flex logic provides high-end capability to meet customers demand. Both MM200 and MM300 relays offer multiple choices for control panel, graphical display, or hand held programmer.

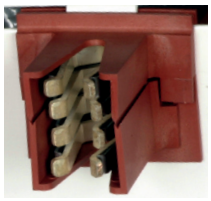
Integrated surge protection device (SPD)
SPD components ensure the smoothing of spikes and inherent noise in utility/generator power flowing through the motor control center.

General specifications

Standards and guidelines					UL 845 IEEE 1683, IEEE C.37.20.7 Type 2 (applicable sections)
Wiring					NEMA class (I, II), type (A, BD, BT, C)
Enclosures					Standard construction: NEMA Types 1, 1G, 2, 3R and UL Type 12 Arc resistant construction: NEMA 1 and UL Type 12
Seismic rating IBC-2015 standard					IBC-2015 standard
Dimensions	Sections	Main bus rating	W	H	D
		600 A–1200 A	20” or 24”	90”	13” or 20”
		1600 A–2500 A	20” or 24”	90”	22”
	Horizontal wireway				12” top, 6” bottom (12” bottom optional)
Bus system	Main horizontal bus				4” with 20” and 8” with 24”
	Main bus bracing				65 kAIC or 100 kAIC
	Vertical bus				300 A–600 A, 850 A with main bus ≥1000A
	Ground bus				300A (0.25” x 1”) or 600A (0.25” x 2”)
	Neutral bus				300 A–1600 A
Branch circuit protection	Molded case circuit breakers or fusible switches				
Construction	• Positive guidance for plug-in unit stabs • Tool-less unit insertion and removal • Lift-out unit shelves • Directly connected power stabs and unit disconnect • Plug-in construction in circuit breaker starter units Size 1-5, circuit breaker feeders ≤600A • Compartment doors: flange-formed pan type, section mounted, with removable hinge pins • Operating handles: direct drive, mechanically interlocked with door, ON-TRIP-OFF position indicators, provision for padlocking in the OFF position • Terminal blocks: split type on combination starter units with Type B or C wiring units up to Size 5 removable without disconnection or control leads from terminal blocks Arc resistant construction: • MCC shall be arc resistant up to 65 kA, bolted fault current at 480 V or 600 V • AR rating shall be for a minimum of 6 cycles at full current • AR rating shall meet IEEE C37.20.7 Type 2 accessibility rating with or without plenum • AR rating shall be met with either main circuit breaker or main lug only incoming Arc flash mitigation units: • Retractable stabs • Vertical bus isolation shutters actuated by unit installation • Visual indicators to display stab & shutter status • Safety interlocks to prevent opening unit door while unit is energized • IP20 options				
Communications provisions	Modbus RTU, DeviceNet, Profibus, Modbus TCP/IP, Ethernet IP - available network data: • Metering (average phase in amps, control voltage, motor runtime) • Starter status and configuration notification (run, overload, ground fault, phase imbalance, commanded trip, class setting) • Information (voltage, internal failure, motor load warning) remote control (ON, OFF, TRIP, RESET)				
Parts	Renewal parts for the E9000 Motor control center, and previous designs including 7700 Line and 8000 Line are available through your sales representative				

Simplicity and safety

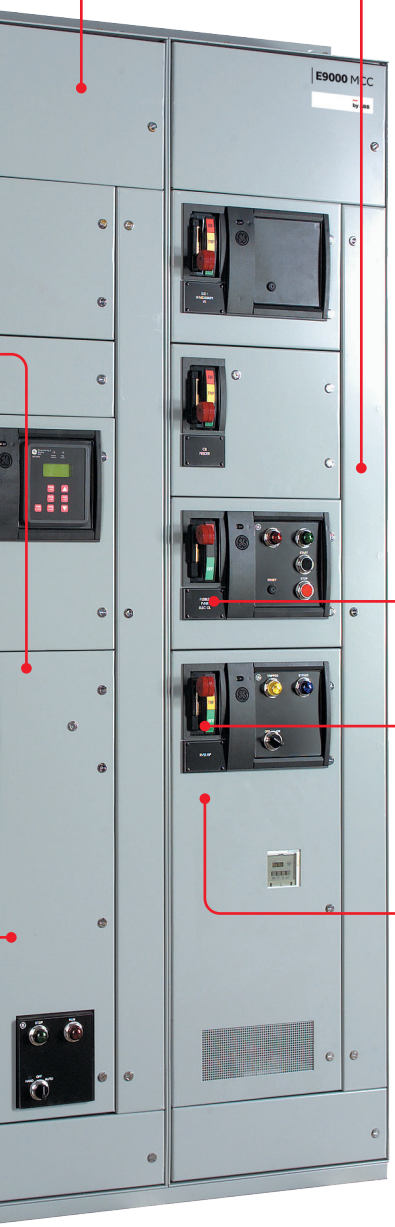
Vertical bus insulation and isolation
Higher amperage means customers can now place more buckets in a single section. The 850 A vertical bus also provides flexibility to add buckets as a facility's needs grow. The polyester-reinforced sandwich bus insulates the vertical bus to help prevent the spread of faults and small stab openings provide effective isolation. Optional automatic shutter barrier covers the vertical bus stab area when plug-in units are removed.



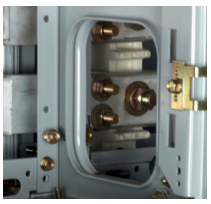
Plug-in stabs
Assure positive contact with the vertical bus while twostep engagement and a positive guidance system ease installation and removal.
Plugs-in stabs are rated 250 A and 600 A.

Optional unit bround bus stabs
Vertical copper ground bus allows direct grounding of unit saddles to the equipment ground bus. A unit ground bus stab engages the vertical ground bus before the unit power stabs engage the vertical bus. A load ground lug is available for customer cable grounding. Termination points are located at the rear of the bucket, next to starter.

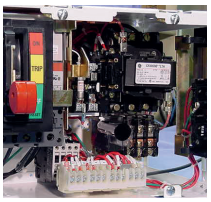
Lasting protection from the environment
A paint finish is applied to all un-plated steel parts. The powder coating process passes 600 hours (ASTM117B) salt spray test and provides lasting protection.



Isolated wire troughs and smooth-edged wireways
All case-side wireways feature a 1/2” roll-formed lip to reduce damage to wire insulation. In separate doors make wiring and inspection easy bus maintenance tests.



Plug-in units up to 600A
36” Plug-in starters to size 5 allow quick and easy insertion and removal of buckets, providing more flexibility and allowing two size 5 FNVR in one section. Compact and interchangeable NEMA size 1 and 2 FNVR starters in 12” high units make field modifications simple.



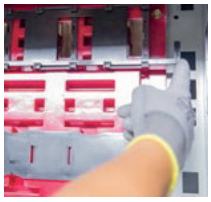
Oversized nameplates
Durable engraved labels identify units at a glance. Standard size is 2” x 3”.

Handles
Lift-up handles allow fast, full access to fused switches and circuit breakers. Horizontal handles to minimize space requirements for 6” and 12” feeder breakers and 6” starters. Unmistakable label Indicators provide clear indication of ON-TRIP-OFF status. Handles can also be locked in the OFF.

Safe maintenance
Plug-in units to 600 A units can be withdrawn to a disconnected position and padlocked for maintenance tests.

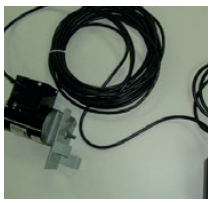
Arc flash mitigation unit features

Retractable stabs
The retractable stab mechanism allows for closed-door racking of the unit, helping to provide added protection to the electrical personnel from the dangers of an arc flash occurrence.



Vertical bus isolation shutter
As the AFM units are racked in or out, an vertical bus isolation shutter is automatically engaged to prevent incidental contact with energized parts.

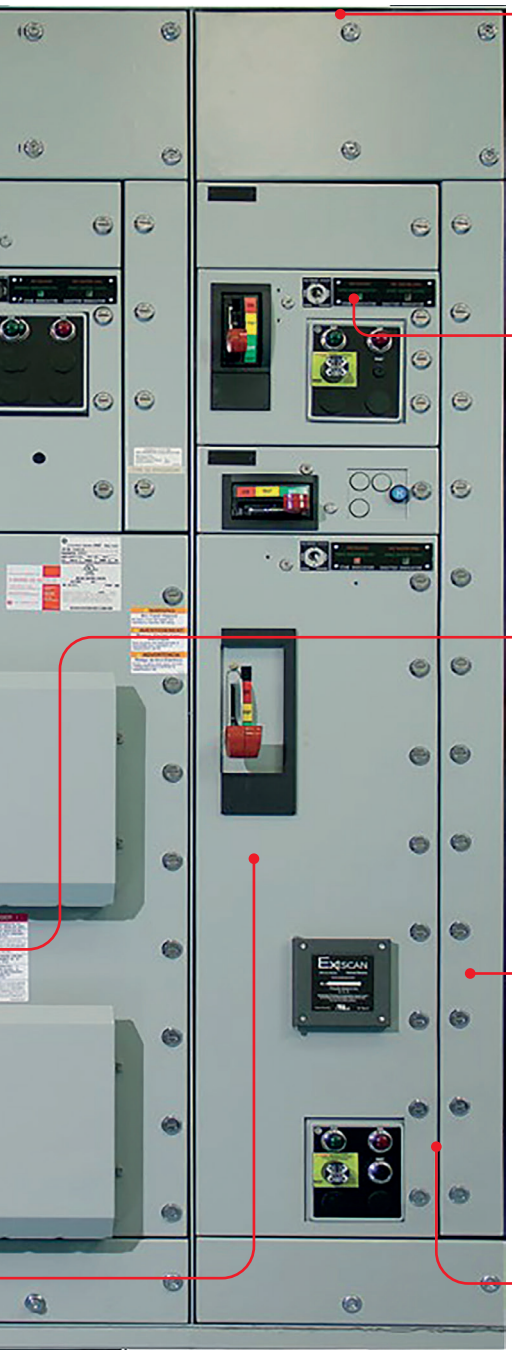
Safety interlock
The safety interlock prevents user from taking the unit out when stab is energized or, inserting the unit into the bus when stab is extended.



Remote racking
This electrically operated remote racking device allows maintenance personnel to be up to 40 feet away from an Arc Flash Mitigation (AFM) unit during the racking operation, beyond the arc flash boundary and is easily installed without extra tools.

AFM visual indicators/AFM packing screw
The visual indicators on the front of the units provide personnel with a clear view of the status of the stab and vertical bus isolation shutter. The racking screw and disconnect interlock prevents the user from racking the stab in/out of the unit with the disconnect in the “ON” position.

Arc-resistant features



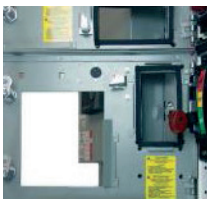
VFD fan shields
GE's unique design for arc resistant fan shields allows for large VFD's to be installed in an MCC while maintaining both arc resistant rating and free air flow.

Metallic pilot device bracket
The arc resistant design includes a metallic pilot device bracket to strengthen the door structure and deflect exhaust gasses away from the door and to the back of the MCC.

Exhaust flaps
Aluminum flaps are located on the top of each section to allow a path of least resistance for exhaust through a plenum or above the equipment and away from personnel. Plenum-less design requires 4 feet of ceiling clearance. A plenum is optional and will add 12" to the height of the equipment.

Reinforced wireway
Reinforced wireways provide a strong structure for the entire arc resistant MCC.

Reinforced doors and latches
The robust design of the reinforced doors and latches are included in the arc-resistant design to provide customers with an industrial grade product that is built for strength.



Components, accessories, and service

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01
300-Line

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02
CR104P Pilot device

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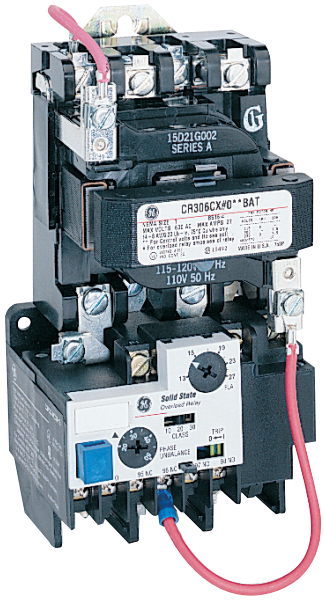
03
Spectra circuit breaker

Motor starters and protection
At the core of the Evolution series E9000 you'll find motor starters – nonreversing, reversing, two speed, and combination forms in NEMA sizes 1-6. They incorporate all of the most requested features and benefits.

- Fast contact inspection via tool-less contactor disassembly and highly visible contacts
- Fast coil change and contact replacement
- Overload relays with adjustable trip current or various optional solid-state overload relays: CR324, CR324X, as well as Multilin MM200 and MM300
- Molded coils that are impervious to moisture, dirt and oil
- Wedge-shaped contacts for positive make with minimum bounce
- Weld-resistant, cool-operating, long-lived contact tips on all 300-line motor starters.



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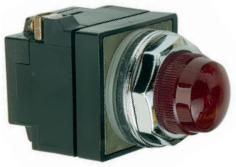
01

Pilot devices
CR104P pilot devices – which come in every conceivable form – deliver the high-class appearance and reliable operation that put a good face on and provide a good interface with the motor control center.



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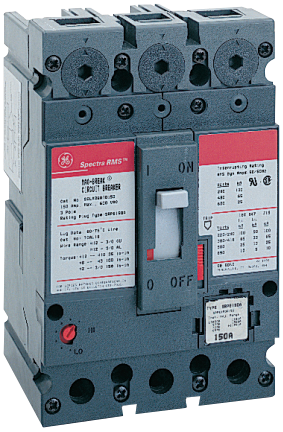
02

Circuit protection
The scope of circuit protection offered in Evolution series E9000 motor control centers is broad enough to meet every need. Mag-Break and Spectra RMS motor circuit protectors, heavy-duty fusible disconnects, high-pressure contact switches, and the rugged and reliable Power Break II insulated case breakers (featuring the EntelliGuard TU trip unit), offer the specific protection the system requires.



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04
ASTAT Solid state reduced-voltage starters

Programmable logic control
Evolution E9000 motor control centers take the next step in supporting automation control with programmable logic controllers.

Solid state reduced-voltage starters
ASTAT BP and ASTAT XT starters deliver smooth stepless motor acceleration or deceleration by gradually increasing voltage from a preset level to full voltage over a selected time period.

To the Evolution E9000, they bring a range of advanced functions, plus:

- Increased productivity and reliability
- Enhanced motor protection
- Built-in Modbus RTU
- Digital precision and speed
- LCD Display and 6-button keypad that can be mounted remotely through the door
- Multilanguage interface
- LED indicators
- Data readouts, fault diagnostics, and statistical data
- High level of immunity
- Easy operation, adjustment and maintenance
- Pump control, jog, and tachometer control
- Isolation and bypass
- Plug-in units to 100HP at 460V for ASTAT BP
- Plug-in units to 50HP at 460V for ASTAT XT with external bypass in NEMA 1 or 12
- Available in 600V ratings to 500HP

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04

Variable frequency drives

Variable torque drives
AC drives are ideal for variable torque loads such as fans, pumps and compressors. Commands from the keypad or facility management system - along with pre loaded motor parameters - make for quick and easy installation.

Constant torque drives
These drives offer flexibility across a range of constant torque applications. They employ process control systems that make any task simple and profitable, and they can be configured to operate in a flux vector control mode.

*Active or passive harmonic solution to meet IEEE-519

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05
Integrated surge protection device (SPD)

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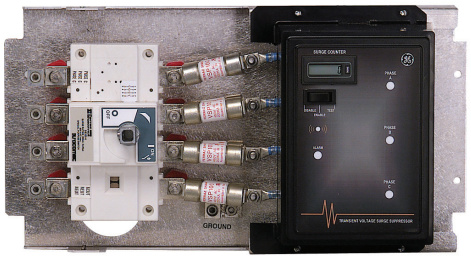
06
MM200 and MM300 Motor Management Relays with Interfaces

Integrated surge protection device (SPD)
SPD components ensure the smoothing of spikes and inherent noise in utility/generator power flowing through your control center. The integrated features minimize wire connections and offer greatly improved clamping characteristics.

Engineered for reliability, flexibility and long life in the most extreme surge environments, the SPD maintains its true maximum surge current rating unlimited by fusing. This superior design has been proven successful in third-party tests.



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05

Much more
In addition to still more components—relays contactors, electronic control modules, voltage monitors—Evolution Series E9000 motor control centers are available with a variety of other products and equipment.

These Include:
- Zenith automatic transfer switches
- Operator and metering panels
- Relay panels
- Lighting and distribution panelboards
- Distribution transformers

Multilin MM200* and MM300* motor management relays
The MM200 and MM300 provide the latest technology in motor protection and control found in high-end protection relays.

Available features include:
- Comprehensive motor protection
- Motor performance data metering
- Advanced automation capabilities for customized protection and integrated process control
- Advanced FlexLogic to reduce requirements for local PLCs
- Powerful communications including Modbus RTU, Modbus TCP, Profibus, and DeviceNet protocols for easy integration into manufacturing systems
- Motor diagnostic information, including sequence-of-event records and waveform capture to provide reports for troubleshooting and to improve uptime
- Small form factor and remote display options designed to fit in MCC buckets, door jack, control panel, graphical display, or hand held programmer available.

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*Active or passive harmonic solution to meet IEEE-519

The MM200 and MM300 can be networked to communicate diagnostic and process information to remote computers to help speed maintenance, reduce downtime, and increase productivity. Optional snap-in steel wireway barriers enhance isolation of low-voltage signal wiring between units.

Other smart overload relays with additional communication options are also available upon request.

World-class customer service
ABB's knowledgeable staff offers an ever-expanding array of customer service tools such as:

- Empower quotation program, which quickly generates layout and pricing information
- Automated Requisition Engineering software, which reduces the time needed for project drawing approval
- Toll-free product resolution number for service after it arrives
- Pre-engineered plug-in units with discrete Fastrac catalog numbers available from the factory

Product information: 1-800-431-7867

Industrial services: 1-888-434-7378 (US)
1-540-378-3280 (Int'l)

ABB, Inc.
305 Gregson Drive
Cary, NC 27511 USA
abb.com/contacts

abb.com/lowvoltage

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