

Medium Voltage Motor Control Assemblies

Arc Resistant AMPGARD



20.1 AMPGARD Motor Control

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AMPGARD Motor Control Assembly with Main Breaker, SC 9000 AFD, RVSS and Two-High FVNR



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Product Description

Eaton’s AMPGARD® medium voltage starter family provides flexibility never before available. Rated at 2200–15,000 volts up to 8000 hp, they are the first starters designed as integrated, complete units precisely matched to motor ratings, and engineered to provide component-to-component circuitry and front accessibility of all components and terminals. AMPGARD starters are used in a variety of industrial process applications, such as pulp and paper, petrochemical, HVAC (chillers), where proper control and protection of the motor and system are critical to the user. AMPGARD has been the industry leader in medium voltage motor control for over 60 years in these applications, and our starters have been designed with that experience behind them.

Application Description

AMPGARD starters are equipped with current limiting power fuses to interrupt the short-circuit faults shown below. The contactor and fuses are completely coordinated.

Squirrel Cage Motor Starters:

Starters for squirrel cage motors are available in full or reduced voltage designs in all ratings. Full voltage starters are available one-high or two-high in a factory-assembled structure. Electromechanical reduced voltage starters are available in either reactor or autotransformer type. Both provide closed transition from reduced to full voltage. See table on page 6 for application data.

SC 9000 Adjustable Frequency Drive (AFD)

This newest member of the AMPGARD family was designed for maximum flexibility in the control of medium voltage motors. The SC 9000 combines innovative technology with the reliable design and construction the industry has come to expect of the AMPGARD products. Rated at 2400 volts up to 2500 hp and 4160 volts up to 4500 hp, the SC 9000™ delivers the smallest footprint in the industry. The standard 24-pulse phase shifting isolating transformer and rectifier minimizes any harmonic noise sent back on to the supply.

The SC 9000 is a fully integrated, three-line-in—three-line-out, plug-and-play product that includes highly reliable AMPGARD medium voltage components on the input (isolation switch, power fuses and SL vacuum contactor), isolating transformer, rectifier, inverter and controls. The SC 9000 uses the same keypad and programming software as the

Eaton SVX9000 line of low voltage drives for a reliable, easy-to-use system that does not require time spent in learning new software. In addition, the SC 9000 can interface with many control systems, such as Modbus®, Ethernet, DeviceNet™, CANbus® and PROFIBUS® DP.

In an industry first, the SC 9000 can be placed in a lineup with other AMPGARD and Eaton motor control products on a common bus known as AMPGARD Medium Voltage Integrated Control Gear. Now, all types of motor starters, load break switches, integrated AFDs, AFD synchronous transfer control, AFD bypasses, and main and feeder breakers can be integrated into a single line. The Integrated Control Gear capabilities and reliable design make the SC 9000 the perfect choice for speed control in industries such as petrochemical, water/waste water, utility, HVAC, pulp and paper, and many more.

Reduced Voltage Solid-State

Starters: Offered as an alternative to traditional reactor or auto-transformer type reduced voltage starter, the AMPGARD RVSS allows the user to fine-tune starting parameters to meet a wide variety of unique load conditions. The onboard user-friendly microprocessor provides the ability to select the proper combination of initial current, maximum current and ramp time, resulting in smooth, stepless load acceleration while minimizing mechanical shock to system components.

The AMPGARD RVSS is available as a standalone starter or can be incorporated into a lineup with other AMPGARD starters. Adding to an existing AMPGARD installation is easy via a simple splice kit. Starters are available in 400 ampere and 720 ampere frame sizes.

Arc-Resistant AMPGARD:

When specified, AMPGARD is available in special arc-resistant construction. Two ratings are available: 30 kA and 50 kA. Both designs have been tested and verified to meet the requirements of IEEE® C37.20.7 for Type 2B construction. Type 2B construction is defined as arc-resistant at front, back and sides of the enclosure with the low voltage compartment door open. All types of 400 ampere and 800 ampere starters, as well as 24-inch wide incoming cable sections are available in arc-resistant construction. Main Breaker AMPGARD, SC 9000 AFD, LBS Load Break Switches are not available in arc-resistant construction. Consult Eaton for more details.

Main Breaker AMPGARD

(MBA): The MBA is the industry's first truly integrated medium voltage metal-enclosed main breaker and starter assembly combination.

The MBA comprises a metal-enclosed drawout vacuum circuit breaker section that is integrally connected via main bus to the balance of the AMPGARD starter assembly it protects.

The main bus configuration is in the same top-mounted location as on all AMPGARD assemblies, allowing for ease of installation with adjacent sections and addition for future sections.

Front aligned, rear aligned, or front and rear aligned with back-to-back starters are available.

The main breaker is the industry-leading Type VCP-W drawout vacuum circuit breaker, which provides the performance our customers expect.

Lead-time is dramatically reduced, typically 50 percent less than the industry norm. Our single-source approach has cut delivery time from months to weeks. The extended waiting period between order placement and delivery has been eliminated.

Other Motor Starters:

Starters for wound rotor and multispeed motors are available. However, each application must be reviewed for proper motor protection and operation. Refer to the factory for pricing and equipment details.

Features, Benefits and Functions

Personnel Safety: A positive mechanical isolating switch with visible disconnect completely grounds and isolates the starter from the line connectors with a mechanically driven isolating shutter, leaving no exposed high voltage. Additional safety features include:

- Isolated cable entry for added safety. The starters and cables are completely isolated from each other by steel barriers

- All new low voltage wireway. Low voltage wire is isolated from the medium voltage compartment, and customer terminal blocks are accessible through the low voltage control panel
- Easily accessible low voltage panel completely isolated from the medium voltage compartment that offers generous device mounting space
- Standard viewing window for visual verification of isolation switch operation
- Optional remote operator for isolation switch allows user to open and close switch while remaining outside the equipment flash boundary

Ease of Installation: Current limiting fuses, contactor assembly and isolating switch assembly are easily removed from the enclosure; line and load terminals are completely accessible from the front. Standard structures are 36.00 W x 92.00 H x 30.00 in D (914.4 W x 2336.8 H x 762.0 mm D) including a 12.00 in (304.8 mm) top-mounted main bus compartment. The main bus compartment is top, side and front accessible, making maintenance and lineup extensions easy.

Ease of Maintenance:

All components are front accessible, facilitating routine inspection or parts replacement. Isolation switch life is 10,000 operations.

Vacuum Contactor:

The Type SL vacuum contactors were designed and engineered specifically for use in AMPGARD starters. They are self-supporting, compact, bolt-in or stab-in three-pole contactors. The contactors utilize a solid-state control board, allowing the user maximum flexibility to change control voltages and dropout times in the field, simply by adjusting DIP switch settings. To permit application matching of the starter to the motor rating, contactors are available for

2200–7200 volts at ratings of 400 and 800 amperes, and 15 kV at 250 amperes.

The 400 ampere contactor interrupting rating is the highest in the industry at 8500 amperes, allowing for higher levels of coordination with power fuses. The 800 ampere contactor has an interrupting rating of 12,500 amperes, also the highest in the industry.

Note: For full starter/contacter horsepower ratings and other technical data (including power fuse coordination), refer to Tab 13, Medium Voltage Power Contactors.

Motor Protective Relay:

When a motor protective relay is required, the AMPGARD starters are provided with the MP-3000 or MP-4000 microprocessor-based motor protective relay as standard. This package offers benefits like a 20-cycle voltage sag ride-through, UL 1053 certification for ground fault sensing that is internal to the relay, arm/disarm capability, a drawout case option, Intel-I-Trip overload protection for custom curve setting to precisely match your motor's requirements, and optional PowerNet™ or Modbus communications capability.

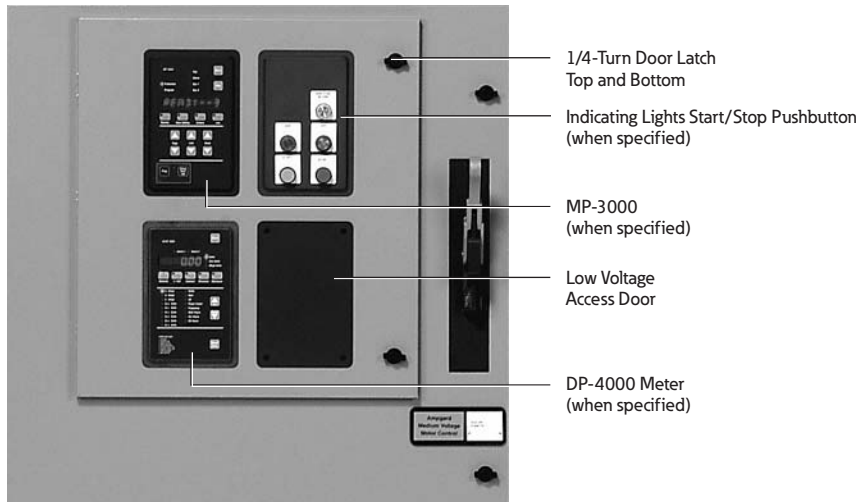
15 kV Starter: A 15 kV rated AMPGARD starter is available with the same features and capabilities as described for the 7.2 kV rated starter. The starter is supplied with a 250 ampere vacuum contactor and three power fuses (maximum 250E) for motors rated to 5000 horsepower. These starters may be supplied with the Eaton InsulGard™ relay for partial discharge detection.

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Medium Voltage Motor Control Assemblies

AMPGARD Motor Control

Low Voltage and High Voltage Compartments

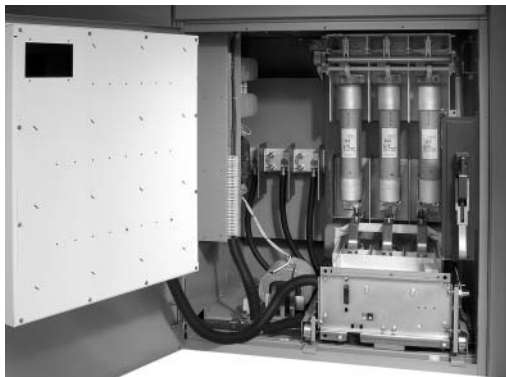


Isolated Low Voltage Control Panel



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Optional Stab-In Contactor, Bolted Main Fuses and Optional Blown Fuse Indicator



Standards and Certifications

UL and CSA Certification

AMPGARD starters are designed, assembled and tested to meet all applicable standards. AMPGARD meets ANSI, NEMA® and IEC standards, and is UL, CSA, cUL® and KEMA third-party certified. The major components, i.e., contactor, isolating switch, fuses, MP-3000, MP-4000, IQ DP-4000 and IQ Analyzer, are UL recognized.

UL or CSA labeling of a specific starter requires review to ensure that all requested modifications and auxiliary devices meet the appropriate standards. Refer to factory when specified.

Contact Eaton for details and part numbers for CSA-approved units.



Seismic Certification

AMPGARD starters are seismically tested and seismically qualified, and exceed requirements of both the International Building Code (IBC) and California Building Code Title 24.

Reference Information

- AMPGARD Brochure
BR02003002E
- AMPGARD RVSS Brochure
BR02003001E
- Technical Data
TD02003001E
- Renewal Parts
RP.48J.01.T.E
- AMPGARD Main Breaker
PA48D01SE
- 15 kV AMPGARD
Technical Data
TD02003002E
- Remote Operator
PA02003002E
- Arc-Resistant AMPGARD
SA02003003E
- 720A RVSS
PA02000001E

Product Selection

AMPGARD RVSS



AMPGARD RVSS

| Description | Catalog Number |
|-----------------|----------------|
| 400 ampere RVSS | SP10B4B |
| 720 ampere RVSS | SP10B8S |

Main Breaker AMPGARD



Main Breaker AMPGARD

| Description | Catalog Number |
|-----------------------------|----------------|
| 1200A, 250 MVA Main Breaker | BLR12 |
| 2000A, 350 MVA Main Breaker | BLR23 |
| 3000A, 350 MVA Main Breaker | BLR33 |

15 kV Starter with InsulGard



15 kV Starter

| Description | Catalog Number |
|---------------------------------|----------------|
| 13.8 kV FVNR Starter | S210B2SBB |
| 13.8 kV Autotransformer Starter | S610B2SBB |

Technical Data and Specifications

Main Breaker AMPGARD

| Description | Ratings | | Horsepower |
|--------------|---------------------|---------------|------------|
| | Amperes | Volts | |
| Main breaker | 1200, 2000 and 3000 | 2200 to 7200 | — |
| Starters | 400 and 800 | 2200 to 7200 | Up to 8000 |
| Starters | 250 | 10,000–15,000 | Up to 5000 |

Starting Characteristics

| Starter Type | % Motor Voltage | % Motor Current | % Line Current | % Torque |
|--|-----------------|-----------------|----------------|----------|
| Reactor Reduced Voltage | | | | |
| 80% tap | 80 | 80 | 80 | 64 |
| 65% tap ① | 65 | 65 | 65 | 42 |
| 50% tap | 50 | 50 | 50 | 25 |
| Autotransformer Reduced Voltage | | | | |
| 80% tap | 80 | 80 | 67 | 64 |
| 65% tap ① | 65 | 65 | 45 | 42 |
| 50% tap | 50 | 50 | 28 | 25 |

Interrupting Capacity—kVA

| Starter Maximum Horsepower | NEMA Class E2 | | |
|----------------------------|---------------|-----------|-----------|
| | 2300 Volt | 4600 Volt | 6600 Volt |
| 3000 | 200,000 | — | — |
| 5000 | 1,190,000 | — | — |
| 5500 | — | 400,000 | — |
| 8000 | — | — | 570,000 |

Note

① Factory set on 65% tap.