MEDIUM VOLTAGE CONTROLLERS
Manufacturers share the challenge of efficiently controlling motors to improve performance, reduce power consumption and protect motor investment. Of all the motors in your manufacturing process, medium voltage motors can have a large impact on your continued success. Developing medium voltage motor control and protection has been a core discipline for Rockwell Automation® for more than 100 years. Medium Voltage products, from across-the-line starters to soft starters and variable frequency AC drives, deliver enhanced protection in applications ranging up to several thousand horsepower. Bringing motors up to speed in a controlled manner, limiting wear on the motor and other mechanical components, and protecting your investment are key benefits of Rockwell Automation medium voltage systems.

**O.E.M. frames and components** provide OEMs and electrical equipment companies with custom-engineered solutions and high quality components. Both the medium voltage controller and SMC product lines offer smaller, more flexible individual components to reduce building and expansion costs. Open-frame style structures are also available with most medium voltage components already mounted within the frame. All OEM components are manufactured to meet UL, CSA, CE and IEC standards.

**Allen-Bradley® medium voltage motor controllers** are available in a wide range of control formats allowing the flexibility to select the best match for the application. Medium voltage full-voltage controllers, reduced voltage controllers, solid-state reduced-voltage controllers, two-speed controllers, synchronous controllers and load break switches provide integrated intelligence and the lowest cost solution for starting motors.
Solid-state reduced-voltage controllers apply reduced voltage to a medium voltage AC motor to allow soft starting and stopping, limitation of the inrush current, and reduction of the effects of water hammer in pumping systems. Allen-Bradley MV SMC™ Flex controllers include motor protection, communication and diagnostic capabilities and high flexibility, making it ideal for virtually any application.

IntelliCENTER™ provides MCC users with an integrated hardware, software and communication solution. The IntelliCENTER features pre-configured software which shows real-time data, trending, component history, wiring diagrams, user manuals and spare parts. The IntelliCENTER reduces installation time with its plug-and-play set-up and minimizes facility downtime by quickly providing intelligent diagnostic and predictive failure information.

Arc resistant controllers Rockwell Automation has enhanced the safety of its world recognized medium voltage control products to include an optional arc resistant class of medium voltage control equipment. ArcShield™ controllers provide the additional arc resistant safety features required by some industries. Most medium voltage control products can be provided with the ArcShield enclosure design which meets the arc resistant testing requirements of IEEE C37.20.7. ArcShield controllers use the same standard reliable internal components that continue to serve industries world wide.

Variable frequency AC drives Allen-Bradley medium voltage drives provide a single solution for all medium voltage speed control requirements. The PowerFlex® 7000 family of drives exceeds customer expectations by delivering superior reliability, ease of use and lower total cost of ownership. The advanced power semiconductor technology reduces component count to the lowest of any medium voltage drive available, translating to increased savings and reliability, less downtime and fewer spare parts.
Built-in DeviceNet
DeviceNet ports in horizontal wireway
• Simplifies installation
• Complex I/O interwiring is reduced to a single DeviceNet cable
• New 8 ampere, Class 1 DeviceNet cabling
• Tested for noise immunity

Power Monitor 3000
• Displays volts, amperes, hertz, watts, demand watts, peak demand, kWH/kVARH, power factor
• Logs min/max values, snapshot values, harmonic waveforms
• Programmable outputs indicate over voltage, under voltage and phase imbalance, loss or reversal
• Communicates via Ethernet, ControlNet, DeviceNet, Remote I/O, RS-232 or RS-485

DeviceNet Starter Auxiliary (DSA)
Interface module for non-intelligent devices
• Motor starter with eutectic alloy
• Feeders and mains 4 input points
• Ideal for monitoring contactor status, disconnect switch, overload trip and Hand-Off-Auto switch

E3 Solid-State Overload Relay
DeviceNet on-board
2 or 4 input points
1 or 2 output points
Information:
• Time-to-trip, time-to-reset
• % thermal capacity utilized
• Cause of last five trips and warnings
• Protective functions
  • Overload, underload
  • Phase loss / imbalance
  • Stall and Jam
  • Ground fault (Plus version)
  • Settings for protective functions
  • Trip level, Warning level
  • Time delay
• Phase and average current

825-P Modular Protection System
• DeviceNet communications (optional card)
• Three output relays
• Two configurable inputs
• Ground fault CT input
• Metering capability
• RTD scanner module with 12 inputs (optional)

IntelliVAC Plus
Interface module for non-intelligent devices
• DeviceNet communications
• Eight digital inputs and two digital outputs
• Provides consistent vacuum contactor control
• Supports multi contactor schemes
IntelliCENTER Software
- Spare parts lists specific to each unit
- AutoCAD® elevation and one-line drawings
- User manuals specific to each unit
- Event Logging, warnings, faults, parameter edits
Why use Smart Motor Controllers (SMCs)

SMCs provide many features to benefit your system:
- Minimize mechanical damage resulting from full voltage starting of AC induction motors, enabling longer system life
- Limit line disturbances from inrush currents, resulting in reduced downtime
- Multiple Start/Stop modes increase functionality
- Diagnostic monitoring helps prevent problems before they occur
- Satisfy electrical distribution restrictions by reducing inrush currents

SMCs are ideal for applications where:
- Belts, gears, and chains can be damaged by across-the-line starting
- Materials can be damaged by sudden starts and stops
- A step change in torque can damage equipment
- Power company line current restrictions are imposed

With SMC soft starters you benefit from:
- Advanced diagnostics, increasing system performance
- Greater product functionality for increased system flexibility
- Decreased downtime due to advanced protection of motor winding, equipment, and materials

The MV SMC Flex controller furnishes as standard a full range of starting and stopping methods for a variety of applications. Its unique control options offer enhanced motor starting and stopping capabilities to satisfy your most demanding applications.
**MV SMC™ Flex Smart Motor Controller offers:**

**Standard Control Module**
- Soft start - with selectable kickstart
- Soft stop
- Current limit start - with selectable kickstart
- Linear speed acceleration * - with selectable kickstart
- Linear speed deceleration
- Full voltage
- Preset slow speed

* requires motor tachometer

**Optional Control Module**
- Pump control (eliminates water hammer)
  - Separate start and stop profiles

**Standard Features of SMC Flex Controller**
- Electronic motor overload protection
- Metering
- Diagnostics
- Built-in DPI communications (other communication options available)
- Two-line, 16-character backlit LCD display keypad programming
- Three programmable auxiliary contacts

**MV SMC Flex Power Module**
- Current loop gate drive (patented)
- Efficient heat sink profile
The Allen-Bradley CENTERLINE® ArcShield arc resistant controller provides rugged process control for applications requiring a higher level of personnel protection. ArcShield products are compliant to the IEEE C37.20.7 standard, and provide Type 2B protection. The ArcShield product was tested and certified for 40 kA and 0.5 second. During an arc flash, the ArcShield controller safely redirects the arc flash energy out the top of the unit and away from personnel. This level of protection is also maintained when the low voltage door is open for maintenance purposes.

Actual photographs of successful ArcShield tests
Offering a wide variety of CENTERLINE ArcShield products:

The ArcShield products are available in a number of different controller configurations. Here are just a few of the products available:

- Bulletin 1591A/B Incoming units
- Bulletin 1512A/AT One high controller
- Bulletin 1512B/BT Two high controller
- Bulletin 1562E MV SMC Flex controller
- Bulletin 1506 Reversing controller

**Arc “Pressure Relief” Vent**
- Safely vents arc gases and material away from personnel during an arc flash
- Arc gases are vented out the top of the enclosure through the plenum exhaust structure

**Heavy Duty Enclosure Design**
- Reinforced side sheets, doors, roof, and back plates designed to contain arc flash energy while vents open
- Added support plates secured with multiple bolts provide increased rigidity and security

**Robust Power Cell Door Design**
- Multi-point latching mechanism, reinforced cross bracing and gasket sealing provide arc containment
- A viewing window in the power cell door allows the operator to view the status of the isolation switch before opening the door
- Once the latching mechanism is engaged, the power cell door is bolted shut for added protection
At Rockwell Automation, we are committed to providing the products and services that our customers demand. Over the past eighty years, Allen-Bradley medium voltage CENTERLINE® controllers have set the standard by which others are measured. Our unmatched quality and innovative designs have made us the leader in medium voltage motor control products.

The Allen-Bradley Bulletin 1503VC IntelliVAC controller offers a superior and efficient means of controlling vacuum contactors. IntelliVAC controllers are a quantum leap beyond traditional electromechanical control circuits. Here are just a few of the beneficial characteristics:

- The performance and flexibility of digital control, allowing the control of a wide array of contactor types (400A, 800A electrically held, and mechanical latch)
- Enhanced reliability as a result of embedded self diagnostics and better coordination between unit power fuses and the vacuum contactor drop-out time
- Increased productivity with features like power loss ride through (TDUV) and contactor anti-kiss, which were previously offered as optional features
- Motor and process protection with delayed restart built-in
NON-LOAD BREAK ISOLATION SWITCH
• Electrical and mechanical interlocks prevent the switch from opening when the contactor is energized
• Ensures normal operation only when the switch is fully closed
• Allows for separate source testing when in the “OFF” position
• Grounded in the “OFF” position
• When in the open position, a visible barrier isolates the power cell from the power bus compartment
• Status of the isolation switch can be viewed through a window in the power cell door

HANDLE AND INTERLOCK MECHANISM
• Simple direct drive mechanism improves reliability and ensures operator safety
• Mechanical interlock mechanism remains part of the enclosure to eliminate setup adjustment
• Power cell door is interlocked with the handle mechanism to prevent the door from being opened when the cell is energized

LOW VOLTAGE COMPARTMENT
• Separate 120 volt source is required for “Test” position control power
• Allows testing and troubleshooting of the power cell without exposing personnel to medium voltage
• Prevents backfeeding medium voltage through the control transformer, in “Test” mode
• All low voltage components are located in the low voltage panel
• Low voltage panel interior painted white for better visibility

POWER CELL COMPARTMENT
• Power cell, low voltage panel, and bus compartment are isolated from each other for better fault containment
• Swing out low voltage panel for easy access to install load cables
• Isolated load cable compartments between top and bottom power cell
• Easy access for cable installation and stress cones
• Bar type current transformers are supplied as standard for overload protection and metering

POWER BUS COMPARTMENT
• CENTERLINE bus designed as an integral part of the structure
• Dissipates heat more efficiently
• Edge-to-edge configuration maximizes resistance to magnetic forces and minimizes moisture or dust collection
• Molded bus brace reduces maintenance and provides better distribution of forces during a fault
• Accessible without a ladder, for installation and maintenance
• Allows for incoming line cables to enter through the top or bottom of the compartment
We understand that you need to control performance, reduce downtime, improve safety, increase productivity, and perform diagnostics. That’s why we’ve combined leading-edge motor control and protection devices with the advanced networking and diagnostic capabilities of Rockwell Automation’s Integrated Architecture to provide you with Intelligent Motor Control.

Thanks to integrated I/O and advanced diagnostic and protection capabilities, all Intelligent Motor Control products constantly monitor the motor operation to help you follow performance trends and take remedial action before potential failures occur. Reduce unwanted downtime by 75% while increasing overall production efficiency by 10% or more.
COMMUNICATIONS

Because you have a wide range of application needs, Intelligent Motor Control offers a variety of motor control technologies.

Simplified control technologies are designed to suit your needs
• DeviceLogix™ component technology increases the control possibilities with function block diagrams that operate at the device level
• DriveLogix™ offers embedded Login control for application programmability and control of auxiliary functions in one package

Integrated Architecture enables you to reduce your total cost of ownership by using a single control infrastructure for the entire range of factory automation applications, large or small
• Reuse engineering designs and practices to reduce development time and cost
• Quickly respond to customer or market demands
• Reduce maintenance costs and downtime
• Easily access plant and production data from business systems or better management decision-making

COMMUNICATIONS

The key to intelligence in motor control...

Utilize open networked architecture to enhance motor protection, share diagnostic information and speed troubleshooting for a more productive, “intelligent” process.

• From simple I/O to complex power monitoring tasks, DeviceNet™ lets your cost effectively integrate many low-level manufacturing functions
• NetLinx open network technology provides seamless communications throughout your enterprise (DeviceNet, ControlNet, and EtherNet/IP)
• Flexibility and commonality of communications across the product offering makes Intelligent Motor Control easy to use
OEM Frames and components leverage the existing family of motor controllers built by Rockwell Automation. They also incorporate some of the most fundamental, high volume components available in our OEM product line for Original Equipment Manufacturers and electrical equipment companies.

Bulletin 1502 vacuum contactors are a comprehensive line of vacuum contactors used as isolating contactors or as bypass contactors. Light weight and maintainability are but two of the features of this fixed-mounted design.

Bulletin 1503F OEM components are a series of medium voltage frame-mounted components designed to mount into new or existing structures or enclosures. These assemblies can also be used to retrofit existing motor controllers. These products are available as a complete OEM frame or sold individually as components.

Bulletin 1503E MV SMC™ Flex OEM kits are a series of solid-state reduced voltage components designed to mount into new or existing structures or enclosures. These assemblies can also be used to retrofit existing motor controllers. These products are available as an OEM frame and components.

The Bulletin 857 motor and feeder protection device includes all the essential protection functions needed to protect feeders and motors in distribution networks of utilities, heavy industry, power plants and offshore applications. The Bulletin 857 can also be used to retrofit existing motor controllers.

The IntelliVAC control module is an efficient and flexible solution for controlling medium voltage contactors used in motor starter and feeder applications. The IntelliVAC control model manages 400 and 800 amp contactors, as well as both electrically-held and mechanically-latched contactor types.

The IntelliVAC Plus is an enhanced version of the IntelliVAC control module. Some of incremental benefits are DeviceNet communications (including IntelliCENTER software compatibility), digital I/O (8 inputs and 2 outputs), DeviceLogix control and enhanced diagnostics.
General Features

Medium Voltage Motor Controllers

Description of Features

Designed for Safety, Convenience and Reliability

The Allen-Bradley medium voltage controller offers:

- Three isolated compartments:
  - Power bus
  - Low voltage
  - Power cell
- Large swing-out low voltage panel painted white for high visibility
- Test circuit and plug for remote control power supply
- External operating handle to operate the isolation switch
- Bolted power cell door(s)
- Centerline® horizontal power bus with removable cover plates for accessibility
- 1/4” x 2” continuous copper ground bus
- Line, load and control wire conduit openings with removable cover plates at the top or bottom of the structure
- Base mounting sill channels with mounting holes and removable lifting means
- Hybrid epoxy powder paint finish

Controller Standard Features

- NEMA Class E2 design
- Removable lifting angles or brackets
- Non-removable sill channels
- Removable backplates
- Top or bottom plates to accommodate cable entry/exit
- Tin-plated copper horizontal power bus located in an isolated compartment
- A 1/4” x 2” continuous bare copper ground bus
- A main non-load break isolation switch with visible blades and shutter mechanism, and operating handle
- Mechanical and electrical interlocks between isolation switch, vacuum contactor and MV door
- Vacuum contactor(s)
- Three (3) current limiting power fuses for NEMA Class E2 operation
- Three (3) current transformers
- Control circuit transformer with primary and secondary fuses
- A low voltage control panel
- Space for necessary auxiliary control and metering devices
- Polycarbonate viewing window in power cell door
- IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  - Universal input voltage (110-240V AC, 50/60 Hz or 100-250V DC)
  - Selectable vacuum contactor drop-out time and consistent pick-up time
  - Altitude compensation
  - Power loss ride-through (TDUV) – may require additional hardware (external capacitor)
  - Anti-kiss and anti-plugging protection
  - Delayed motor re-start and temporary motor jog function
  - One device is suitable for all contactors and control schemes

Input Voltage

- 2400V, 3300V, 4200V, 6600V or 6900V AC (+5/-10%)
- 3 phase 50/60 Hz (± 3%)

Ambient Temperature

- 0°C to 40°C (32°F to 104°F) with relative humidity of up to 95% (non-condensing)

Enclosure Types

- NEMA Type 1 – General purpose (IP10)
- NEMA Type 1 w/g – General purpose with gasket (IP21)
- NEMA Type 12 – Dust-tight and drip proof (IP52)
- NEMA Type 3R – Non walk-in weatherproof (IP34)
- Arc Resistant (NEMA Type 12) – Accessibility Type 2B
  - Tested per IEEE C37.20.7-2001

Standards

- Canadian Standards Association (CSA), Industrial Control Equipment C22.2 No. 14 and TIL D-21
- American Nation Standards Institute (ANSI), Instrument Transformers C57.13
- Institute of Electrical & Electronic Engineers (IEEE)
- National Electrical Code (NEC)
- Occupational Safety & Health Act (OSHA)
- National Electrical Manufacturers Association (NEMA), Medium Voltage Controllers Rated 1501 to 7200 V AC ICS 3-2
  (formerly ICS 2-324)
- Underwriters Laboratories, Inc. (UL), High Voltage Industrial Control Equipment 347
- European Directives for EMC
Description of Features (cont.)

Paint Finishes

- **Description**: Hybrid epoxy power paint
- **Color**
  - ANSI 49 – medium light grey (standard)
  - ANSI 61 – light grey (optional)
- **Procedure**: Continuous paint line. All parts are painted before assembly
- **Preparation**
  - Alkaline wash/rinse/iron phosphate
  - rinse/iron-chrome sealer
  - rinse/recirculated de-ionized water
  - rinse and virgin de-ionized water rinse
- **Painting**
  - Air-atomized electrostatic spray
  - Total paint thickness – 0.002” (0.051 mm) minimum
- **Baking**
  - Natural gas oven at 179°C (355°F) minimum

Power Bus (Optional)

- Located at the center rear of the structure
- Mounted on the edge to a molded bus support insulator in a common vertical plane
- Centerline™ horizontal tin-plated copper bus
  - optional silver-plated or insulated
- 1200/2000/3000 A
- Front/rear access

Ground Bus

- Continuous bare copper ground bus 6 x 52 mm (1/4 in x 2 in) as standard
- #8 - #1/0 AWG or #6 – 250 MCM mechanical lug supplied at the incoming end of the lineup
Description of Features

The Rockwell Automation Medium Voltage Controller, Bulletin 1500, is comprised of three core elements:

- Power cell compartment
- Low voltage compartments
- Power bus compartments

Power Cell Compartment

Isolation Switch

- Electrical and mechanical interlocks prevent the switch from opening when the contactor is energized
- Ensures normal operation only when the switch is fully closed
- Allows for separate source testing when in the “OFF” position
- Grounded in the “OFF” position

Visible Isolation

- When in the open position, a visible barrier isolates the power cell from the power bus compartment
- Status of the isolation switch can be viewed through a window in the power cell door

Isolated Cable Ducts

- Easy access for cable installation
- Ample room for stress cones
- Provides isolated load cable compartments between top and bottom power cells

Vacuum Contactor

- Modular design for simplified maintenance and reliability
- Fixed mounted design eliminates hot spots and reduces maintenance
- Visible contact wear indicator eliminates the need for special tools

Swing-out Low Voltage Panel (for 2-high structure)

- Allows for easy access to install load cables
- Maximizes low voltage panel space

Operating Handle and Interlock Mechanism

- Simple direct drive mechanism improves reliability and ensures operator safety
- Mechanical interlock mechanism remains part of the enclosure to eliminate setup adjustment
- Power cell door is interlocked with the handle mechanism to prevent the door from being opened when the cell is energized

Current Transformers

- Three (3) current transformers are supplied as standard for overload protection and metering
- Five (5) amp secondary output

Control Power Transformers

- 110/120 or 220/240 V AC
- 500 VA as standard with 350 VA extra capacity
- Appropriately sized primary and secondary fuses
- 1000 VA, 2000 VA, and 3000 VA CPTs (optional)
Description of Features (cont.)

Low Voltage Compartment

Low Voltage Compartment Control Panel
- Separate 120 volt source is required for "Test" position control power
- Allows testing and troubleshooting of the power cell without exposing personnel to medium voltage
- Prevents backfeeding medium voltage through the control power transformer, in "Test" mode

Isolated Compartment
- All low voltage components are located in the low voltage panel
- Low voltage panel interior painted white for better visibility
- Power cell, low voltage panel, and bus compartment are isolated from each other for better fault containment
- IntelliVAC control module

Power Bus Compartment
Centerline Bus Design
- Designed as an integral part of the structure
- Dissipates heat more efficiently
- Edge-to-edge configuration maximizes resistance to magnetic forces and minimizes moisture or dust collection
- Molded bus brace reduces maintenance and provides better distribution of forces during a fault
- Accessible without a ladder, for installation and maintenance
- Allows for incoming line cables to enter through the top or bottom of the compartment
Description of Features

The Allen-Bradley Bulletin 1503VC family of IntelliVAC controllers offers a superior, efficient and flexible means of controlling vacuum contactors. The IntelliVAC family offers a scalable solution for multiple medium voltage control applications. The IntelliVAC family has three main products:

- **IntelliVAC** provides basic control capabilities for 400 and 800 Amp contactors (electrically held and mechanical latch) using a single device. It offers enhanced reliability through better diagnostics and coordination between the power fuses and the vacuum contactor drop-out time. Productivity is improved using the power loss ride through (TDUV) and contactor anti-kiss and anti-plugging features.

- **IntelliVAC Plus** builds on IntelliVAC with incremental benefits such as DeviceNet communication (including IntelliCENTER software compatibility), digital I/O (8 inputs, 2 outputs), DeviceLogix™ control and enhanced diagnostics.

- **IntelliVAC MC** is used in multi-contactor applications, allowing one IntelliVAC Plus to control up to four IntelliVAC MC control modules in a Master-Slave configuration. Control and timing logic is handled in DeviceLogix, minimizing control hardware and wiring.

IntelliVAC controllers are designed to perform with Bulletin 1502 vacuum contactors. These industry-proven contactors are available in 400A and 800A ratings up to 7,200 volts.

### IntelliVAC Control Module

- The IntelliVAC control module has a universal input voltage range (110 - 240 VAC, 50/60 Hz or 110 - 250 VDC)
- Consistent vacuum contactor pick-up time, ensures optimal synchronization
- Selectable and repeatable vacuum contactor drop-out times (50, 75, 100, 130, 150, 175, 200 or 240 msec) for tighter coordination with power fuses
- Altitude compensation (-1,000 to 5,000 meters) eliminates mechanical hardware changes at high altitude (400 Amp vacuum contactors)
- Power loss ride-through logic (TDUV) with selectable drop out time (0.2, 0.5, 1.0 or 2.0 sec) requires only an external capacitor
- Anti-kiss and anti-plugging protection
- Status indication (LEDs and relay outputs) allows integration in control system and aids troubleshooting
- Temporary motor jog function (separate input) to allow process set-up
- Delayed motor re-start prevents rapid cycling of vacuum contactor, protecting the connected motor

### IntelliVAC Plus Control Module

The IntelliVAC Plus control module has the same feature as the IntelliVAC, with the additional capabilities below:

- DeviceNet communication
- DeviceLogix control
- Digital inputs (8), rated for 110 to 250 VAC or VDC, and outputs (2), rated up to 250 VAC or FDC, with all LEDs indicating status
- Support for multi-contactor (MC) control schemes, with up to four slave IntelliVAC MC units connected on RS485, and DeviceLogix pre-configured for standard MV controller logic (can also define Custom MC control configurations)
- Enhanced operational information and diagnostics with features like real-time clock, extended contactor close time monitoring and tracking of contactor usage
- IntelliCENTER software compatibility
- Configurable using either RS Networx or handheld configuration terminal (Bulletin 193-DNCT) for DeviceNet

### IntelliVAC MC Control Module

The IntelliVAC MC control module has the same feature as the IntelliVAC, with the additional capabilities below:

- Communication board (RS485) to allow the “MC” module to be controlled by one IntelliVAC Plus for multi-contactor control schemes
## Specifications

<table>
<thead>
<tr>
<th>IntelliVAC Catalog Number</th>
<th>Vacuum Contactor Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1503VC-BMC5</td>
<td>IntelliVAC</td>
</tr>
<tr>
<td>1503VC-BMC5-EM1</td>
<td>IntelliVAC Plus</td>
</tr>
<tr>
<td>1503VC-BMC5-MC1</td>
<td>IntelliVAC MC</td>
</tr>
<tr>
<td></td>
<td>Electrically Held or Mechanical Latch</td>
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<td></td>
<td>Electrically Held</td>
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### Ratings and Approvals

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>AC – 110 to 240 V, 47 to 63 Hz ①</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC – 110 to 250 V</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Current</th>
<th>AC ①</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC</td>
<td></td>
</tr>
</tbody>
</table>

| Inrush (max.)          | – 25 A (1/2 cycle)               |
| Idle (max.)            | – 125 mA                         |
| Close (max.)           | – 11.3 A                         |
| Hold (max.)            | – 300 mA                         |
| Latch Trip (max.)      | – 7.0 A                          |

| Inrush (max.)          | – 25 A                           |
| Idle (max.)            | – 35 mA                          |
| Close (max.)           | – 4.8 A                          |
| Hold (max.)            | – 100 mA                         |
| Latch Trip (max.)      | – 3.7 A                          |

| Command Inputs         | AC – 110 to 240 V, 9 mA max. ⑤    |
| DC – 50 to 250 V, 9 mA max. |

| IntelliVAC Plus Inputs | AC – 110 to 240 V, 9 mA max. ④    |
| DC – 50 to 250 V, 9 mA max. |

| Status Output Contacts | AC – 250 V, 5 A, R load ⑥         |
| DC – 30 V, 5 A, R load |

| IntelliVAC Plus Output Contacts | AC – 250 V, 5 A, R load ⑥         |
| DC – 30 V, 5 A, R load |

| Standards and Approval  | cULus, CSA, IEC, CE                |

① All AC values are rms, except where noted.
② The maximum currents shown are for either the 400 or 800 A Bulletin 1502 vacuum contactors.
③ Close current duration is 200 milliseconds.
④ Common ratings for all versions of IntelliVAC, except where noted.
⑤ Available with IntelliVAC Plus (1503VC-EMC1) only.
Description of Features
The Allen-Bradley vacuum contactors are designed as fixed mounted devices for heavy-duty industrial performance. This design eliminates the worries typically associated with drawout contactors. The compact design of the contactor eliminates the need for it to be removed from the power cell. Also there are no drawout stab and finger assemblies, which require routine maintenance.

The Series E contactors are designed for operation with Rockwell Automation’s IntelliVAC family of control modules.

Advantages
- Lightweight, compact design
- High interrupting capability
- Low chop current
- Visual contact wear indicator (no measurement tools required)
- Provisions for mechanical interlocking (to isolation switch)
- Excellent dielectric recovery allowing for high switching frequency
- Single coil/core magnet assembly (800 A only)
- Control power transformer primary fuse holders (400 A only)
- Minimal maintenance required
- All major components are easily accessed from the front
- Mechanical latch design (optional)
- Easily integrated into control circuit with quick connector and wire harness (optional)
- Designed to complement the advanced features of the IntelliVAC contactor control module

Applications
Medium Voltage (1,000 to 7,200 V) vacuum switching for:
- Motor Starters (asynchronous, synchronous)
  - Full voltage
  - Reduced voltage
  - Variable frequency drives
- Transformer feeder units
- Capacitors

Product Approvals
- UL347
- CSA 22.2 No. 14 and TIL D-21
- IEC 60470
- CE Mark

Modular Construction
- Designed to be interchangeable with other contactors of the same rating
- Horsepower rated devices are located elsewhere in the power cell, not on the contactor
- Easily removed for maintenance and repair

Vacuum Bottles
- Designed to industry specifications
- Arcing confined inside vacuum bottle for ionized gas protection
- Mounted on the front of the contactor for visible inspection
- Contact wear indicators located on the bottle eliminates the need for special tools
- Excellent dielectric recovery provides high switching frequency

Long Electrical and Mechanical Life
- 1,000,000 electrical operations (400 A)
- 2,500,000 mechanical operations (400 A)
## Specifications

### Bulletin 1502 Medium Voltage Contactor Ratings

<table>
<thead>
<tr>
<th>Voltage Ratings</th>
<th>400 A</th>
<th>800 A</th>
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<tbody>
<tr>
<td>Maximum Rated Voltage</td>
<td>7200</td>
<td>7200</td>
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<tr>
<td>System Voltages</td>
<td>2400</td>
<td>3300</td>
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<tr>
<td>4800</td>
<td>4160</td>
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<tr>
<td>Dielectric Voltage Withstand Rating</td>
<td>For 60 seconds (kV)</td>
<td>18.2 / 20 kV (IEC)</td>
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<tr>
<td>Basic Impulse Level (B.I.L.) Withstand</td>
<td>Phase to Ground, Phase to Phase (kV)</td>
<td>60</td>
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<tr>
<td>Frequency Ratings</td>
<td>Hertz</td>
<td>50/60</td>
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</tbody>
</table>

### Current Ratings

| Rated Open Continuous Current | 400 | 800 |
| Maximum Interrupting Current Rating (RMS Sym Amps) | 2400 V | 6300 | 12500 |
| 5000 V | 6300 | 12500 |
| 7200 V | 6000 | 12500 |
| Maximum Interrupting MVA Rating (Sym MVA) | 2400 V | 25 | 50 |
| 5000 V | 50 | 100 |
| 7200 V | 75 | 150 |
| Short-Circuit Withstand at Rated Voltage | Current Peak ½ cycle (kA) | 60 | 85 |
| Short Time Current Rating Capability | For 1 second (kA) | 6.0 | 12.0 |
| For 30 seconds (kA) | 2.4 | 4.8 |
| Chopp Current (Average RMS Amps) | 0.5 | 0.5 |
| Make and Break Capability at Rated Voltage (kA) | 4.0 | 8.0 |
| Ambient Temperature | °C | 40 | 40 |

### Contactor Coil Data

| 110 to 240 V AC or 110 to 250 V DC | V AC: VC = \( \sqrt{2} \times V_{CL} \) (Max.) | V DC: VC = V CL |
| Close Current (Acc. 200 ms) | 43 | 12 |
| Hold Current (Asc.) | 248 | 0.7 |
| Pick-up Voltage | 95 | 95 |
| Drop-out Voltage | 75 | 75 |
| Trip Current (Acc. 200 ms) | 5.5 | 5.2 |
| Trip Voltage | 70 | 70 |

### Operational Characteristics

| Mechanical Life (Operations) x 1000 | Electrically Held | 2500 | 250 |
| Mechanical Latch | 100 | 100 |
| Electrical Life (Operations) x 1000 | 1000 | 250 |
| Switching Frequency (Operations per hour) | Electrically Held | 600 | 600 |
| Mechanical Latch | 150 | 150 |
| Capacitor Switching (max. kVAR) | System Voltage | 2400 V | 300 |
| 4160 V | 2000 | 3000 |
| 6900 V | 4000 |

### General

| Standard Altitude Capabilities (meters / feet) | -1000 to 5000 / -3300 to 16500 |
| Contactor Weight (kg / lbs) | 21.8 / 48 |
| Auxiliary Contact Rating | A600 | A600 |
| Auxiliary Contacts on the Vacuum Contactor (max.) | 3 N.O. / 3 N.C. | 3 N.O. / 3 N.C. |

1. The voltage and current ratings listed are valid up to 1,000 m (3,300 feet).
2. The IEC rating at 7200 V (RMS Sym.) is 5300 amps / 66 MVA.
3. Provided that regular maintenance is performed, as detailed in publication 1500-SR020_-EN-P.
4. The full altitude range is available with the IntelliVAC control module only, and the IntelliVAC is to be configured accordingly (refer to publication 1503-UM051_-EN-P).
5. The number of contactor auxiliary contacts depends on the contactor type. Some of the contacts are used in the typical control schemes.
6. Control voltage, as measured at the input of the IntelliVAC module.
7. Applicable to mechanical latch contactors only.
8. Altitude is field adjustable using a mechanical arrangement.
Description of Features

The Allen-Bradley 857 motor and feeder protection relay includes the essential functions needed to protect motors and feeders in diverse industrial applications. The programmable Bulletin 857 includes the optional arc protection feature, thermal, trip circuit supervision and circuit breaker protection. The device can include numerous communication protocols, as well as a twelve-channel RTD scanner mounted up to 1000m from the relay, with a fiber optic connection to the relay.

The Allen-Bradley Bulletin 865 differential protection relay includes the necessary functions to protect transformers for distribution networks of utilities, industry power plants and offshore applications, as well as motor and generator differential protection. The device’s programmable functions include thermal and circuit breaker protection, and numerous communication protocols. An optional arc flash protection system is available.

Description of Relay Features for Bulletin 857 and 865

- Fully digital signal handling utilizing a 16-bit microprocessor with high measuring accuracy on all the setting ranges through the utilization of a 16-bit A/D conversion technique.
- Wide setting ranges for the protection functions can reach sensitivities up to 0.5% accuracy
- Capable to disable certain Functions and Protection Elements for specific applications.
- The control of up to six external objects (e.g. circuit-breakers, contactors disconnects)
- Ability to actively display the status of eight objects on the local display panel (e.g. MIMIC for circuit breakers, contactors disconnects, switches, etc.)
- Capable of freely configuring of the Local Display with six selectable measurement values
- All settings, events and indications are stored in non-volatile memory
- Easily configuration from the Local Display or with the free SetPointPS user software
- Include a built-in, self-regulating, AC/AC power Supply with an operating range from 40-265 VDC or VAC.
The Bulletin 825-P Modular Protection System for motors offers a compact, modular design that uniquely allows an installer to configure a device’s functional capabilities to match the application requirements. Flexibility is also afforded by accommodating future expansion of the system as the application requirements grow. Ease of installation is provided through pluggable options and accessories.

Finally, this next generation design offers greater capabilities with the option of full metering for line voltage and power monitoring in addition to expanded RTD monitoring.

The 825-P Modular Protection System is a key component to Bulletin 1500 medium voltage controllers.

Converter Modules
- Compact Three-Phase current transformer modules
- Provides electrical isolation
- Six current ranges
  - 0.5 to 2.5 A
  - 2.5 to 20 A
  - 20 to 180 A
  - 160 to 630 A
- Compatibility with MCS PLUS Bulletin 100-D contactors

Core Balance Current Transformer
- Sensitive, low level ground fault detection
- 100:1 ratio
- 110 mm window opening

Note: The 825-P is compatible with core balance current transformer ratios of 1:1 to 2000:1.

RTD Scanner Module
- 12-channel inputs
- Compatible with 100½ Platinum, 100½ Nickel, 120½ Nickel, and 10½ Copper type RTDs
- Can be remote mounted near the motor, simplifying wiring
- Class 1, Division 2, Group T4A rated
- Noise immune fiber optic connection to the Basic Unit
- Channels are individually configurable for RTD type and location (winding, bearing, ambient, or other).

Option Cards

Voltage Input
- Input terminations for VA, VB, VC and VN
- Enables voltage and power measurement and related protection functions
- Accommodates potential transformers for levels exceeding 250V AC

DeviceNet™or Modbus™ Communications
- Direct network access for control and monitoring
- DeviceNet communications card features DeviceLogix™ component technology for enhanced control capability
- DeviceNet communication card provides compatibility with the IntelliCENTER software

Expansion I/O
- Three Configurable Inputs
- Four Auxiliary Relay Outputs
- 4 to 20mA Isolated Analog Output

System Overview

Basic Unit
- 0.5 to 5000A Current Range
- Suitable for Low- and Medium-Voltage Applications
- Built-in Keypad and Backlit 2-Line LCD
- Test / Reset Button
- Status LEDs
- Front accessible RS 232 port
- Wide Supply Voltage Range (110...240V AC/DC)
- Three Output Relays
- Two Configurable Inputs
- PTC thermistor Input
- Core Balance Current Transformer Input
- Fiber Optic Port for Remote RTD Scanner
- Three option card slots
- NEMA 12 (IP65) Housing
Description of Features

The Allen-Bradley Centerline ArcShield arc resistant controller provides rugged process control for applications requiring a higher level of personnel protection. ArcShield products are compliant to the IEEE C37.20.7 standard, and provide Type 2B protection during an arc flash.

The ArcShield controller safely redirects the arc flash energy out the top of the unit and away from personnel. This level of protection is also maintained when the low voltage door is open for maintenance purposes.

Specifications

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<th>Bulletin Number</th>
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<th>Approximate Weight</th>
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- Arc resistant with plenum
- Arc resistant with plenum, plus PFCC option
- Arc resistant without plenum
- Arc resistant with plenum c/w low voltage panel
- 1591B
- Added height above standard 91” for the plenum
Description of Features

- Fixed mounted vacuum contactors (FORWARD and REVERSE)
- Three-pole, gang-operated, non-load break isolating switch with an external operating handle, fully interlocked with main contactor and power cell doors
- A polycarbonate viewing window in the power cell door to view the position of the isolating switch
- Three (3) R-rated current-limiting power fuses
- Three (3) current transformers
- Control power transformer with primary and secondary fuses
- Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
- IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  - Additional low voltage control panel accessories including:
    - “NORMAL-OFF-TEST” circuit
    - receptacle for external test power supply
    - set of control circuit terminal blocks
- Available for motor loads
- Plugging or anti-plugging duty
- Mechanically and electrically interlocked contactors

Specifications

<table>
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<tr>
<th>Starter Size</th>
<th>Maximum Horsepower</th>
<th>Approximate Dimensions</th>
<th>Approximate Weight</th>
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- Height is 128.5 inches (3254 mm) with ArcShield enclosure and plenum.
- Weight will be different with ArcShield.

Power Circuit Schematic – 1506
Description of Features

- Fixed mounted vacuum contactor
- Three-pole, gang-operated, non-load break isolating switch with an external operating handle, fully interlocked with main contactor and power cell doors
- A polycarbonate viewing window in the power cell door to view the position of the isolating switch
- Three (3) R-rated current-limiting power fuses (R-rated power fuses used for 450 A, 600 A and 800 A starters)
- Three (3) current transformers
- Control power transformer with primary and secondary fuses
- Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
- IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  - Additional low voltage control panel accessories including:
    - “NORMAL-OFF-TEST” circuit
    - Receptacle for external test power supply
    - Set of control circuit terminal blocks
- 1-high structure design for one complete motor controller
- Available in optional ArcShield enclosure
- Also available as “Prepared Space” (Bulletin 1512AP, 200A and 400A only) or Starter Kits (Bulletin 1512AS)

Specifications

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- Height is 128.5 inches (3264 mm) with ArcShield enclosure with plenum
- Weight will be different with ArcShield.

Power Circuit Schematic – 1512A
Description of Features

• Fixed mounted vacuum contactor
• Three-pole, gang-operated, non-load break isolating switch with an external operating handle, fully interlocked with main contactor and power cell doors
• A polycarbonate viewing window in the power cell door to view the position of the isolating switch
• Three (3) E-rated current-limiting power fuses (R-rated power fuses used for 450 A, 600 A and 800 A starters, and for 400 A 6600V/6900V starters)
• Three (3) current transformers
• Control power transformer with primary and secondary fuses
• Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
• IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  • Additional low voltage control panel accessories including:
    – “NORMAL-OFF-TEST” circuit
    – receptacle for external test power supply
    – set of control circuit terminal blocks
• 1-high structure design for one complete transformer controller
• Available in optional ArcShield enclosure
• Also available as “Prepared Space” (Bulletin 1512AP, 200 A and 400 A only) or Feeder Kits (Bulletin 1512AU)

Specifications

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<th>Starter Size</th>
<th>Transformer Size (kVA)</th>
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<th>Approximate Weight lb (kg)</th>
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</table>

- Height is 128.5 inches (3264 mm) with ArcShield enclosure with plenum.
- Weight will be different with ArcShield.

Power Circuit Schematic – 1512AT
Description of Features

- Fixed mounted vacuum contactor
- Three-pole, gang-operated, non-load break isolating switch with an external operating handle, fully interlocked with main contactor and power cell doors
- A polycarbonate viewing window in the power cell door to view the position of the isolating switch
- Three (3) R-rated current-limiting power fuses
- Three (3) current transformers
- Control power transformer with primary and secondary fuses
- Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
- IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  - “NORMAL-OFF-TEST” circuit
  - receptacle for external test power supply
  - set of control circuit terminal blocks
- 2-high structure design for two complete motor controllers
- Available in optional ArcShield enclosure
- Also available as “Prepared Space” (Bulletin 1512BP) and Starter Kits (Bulletin 1512BS)

Specifications

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<tr>
<th>Starter Size</th>
<th>Maximum Horsepower</th>
<th>Approximate Dimensions</th>
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<td>4160V</td>
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<td>200A</td>
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<tr>
<td>400A</td>
<td>1500</td>
<td>2250</td>
<td>2750</td>
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</table>

- Height is 128.5 inches (3264 mm) with ArcShield enclosure with plenum.
- Weight will be different with ArcShield.

Power Circuit Schematic – 1512B
Description of Features

• Fixed mounted vacuum contactor
• Three-pole, gang-operated, non-load break isolating switch with an external operating handle, fully interlocked with main contactor and power cell doors
• A polycarbonate viewing window in the power cell door to view the position of the isolating switch
• Three (3) E-rated current-limiting power fuses
• Three (3) current transformers
• Control power transformer with primary and secondary fuses
• Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
• IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  • Additional low voltage control panel accessories including:
    – “NORMAL-OFF-TEST” circuit
    – receptacle for external test power supply
    – set of control circuit terminal blocks
  • 2-high structure design for two complete transformer controllers
• Available in optional ArcShield enclosure
• Also available as “Prepared Space” (Bulletin 1512BP) or Starter Kit (Bulletin 1512BU)

Specifications

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<tr>
<th>Starter Size</th>
<th>Transformer Size (kVA)</th>
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<td>1770 (802)</td>
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</tbody>
</table>

- Height is 128.5 inches (3264 mm) with ArcShield enclosure with plenum.
- Weight will be different with ArcShield.

Power Circuit Schematic – 1512BT
Description of Features

- Fixed mounted vacuum contactor
- HIGH and LOW speed settings for two-speed separate winding, Bulletin 1522E starter
- HIGH/LOW speeds and HIGH SPEED SHORTING settings for two-speed consequent pole, Bulletin 1522F/G starter
- Three-pole, gang-operated, non-load break isolating switch with an external operating handle, fully interlocked with main contactor and power cell doors
- A polycarbonate viewing window in the power cell door to view the position of the isolating switch
- Three (3) R-rated current-limiting power fuses
- Six (6) current transformers
- Control power transformer with primary and secondary fuses
- Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
- IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  - “NORMAL-OFF-TEST” circuit
  - receptacle for external test power supply
  - set of control circuit terminal blocks
- Constant or variable torque, and constant horsepower applications

Specifications

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<tr>
<th>Starter Size</th>
<th>Maximum Horsepower</th>
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</table>

Power Circuit Schematic – 1522E

Power Circuit Schematic – 1522F
Description of Features

Optimized Performance, Safety, Convenience and Reliability

The Rockwell Automation MV SMC Flex Smart Motor Controller offers:

Standard Control Module
- Soft Start – with Selectable Kickstart
- Soft Stop
- Current Limit Start – with Selectable Kickstart
- Linear Speed Acceleration* – with Selectable Kickstart
- Linear Speed Deceleration*
- Dual Ramp – with Selectable Kickstart
- Full Voltage
- Preset Slow Speed
  * requires motor tachometer

Optional Control Module
- Pump Control (eliminates water hammer)
  – separate start and stop profiles

Motor Protection
- Electronic motor overload protection Class 10, 15, 20 and 30 or OFF

Metering
- Access locally using the controller’s built-in LCD display, or remotely through the communication port
- Three-phase voltage
- Three-phase current
- Three-phase power (MW, MWh, power factor)
- Elapsed time
- Motor thermal capacity usage
- Motor speed (with optional use of tachometer input)

Diagnostics
- Line Fault
- Power Loss
- Voltage Unbalance
- Current Unbalance
- Ground Fault
- Communication Fault
- Phase Reversal
- Undervoltage
- Jam
- Overtemperature
- Stall
- Open Gate
- Overload
- Underload
- Extensive Starts per hour

Communication (optional)
- DeviceNet™
- ControlNet™
- EtherNet/IP
- Profinet DP
- Remote I/O
- RS485-DF1

Programming
- Three-level menu structure (using standard languages)
- Built-in LCD display and keypad
- Multiple languages: English, French, German, Italian, Mandarin, Portuguese, Spanish
- Optional Human Interface Modules (DPI-based)
- Configurable with DriveTools™ programming software

Vacuum Contactor
- Fixed mounted vacuum contactor is standard
- Main contactor for unit isolation (1562E)
- Bypass contactor removes SCR Power Stack from circuit, once at full voltage
  – Eliminates heat generated by SCRs - improves efficiency
  – Protects SCRs from voltage and current transients
- Contactor can be provided with IntelliVAC™ solid-state control

Complete Package
- Quick shipment of several standard configurations
  – Bulletin 1560E retrofit controller (does not include isolation switch, main contactor, power fuses and control transformer)
  – Bulletin 1562E combination controller
- Available with optional equipment
- Ready for immediate installation
- Complete installation documentation
- Built to Rockwell Automation quality standards and ISO9001:2000
- Fully load tested with a three-phase MV motor
### Specifications

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<tr>
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<td>600A</td>
<td>2750</td>
<td>80 (2032)</td>
<td>36 (914)</td>
</tr>
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<td>36 (914)</td>
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<td>4500</td>
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<td></td>
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<td>5000</td>
<td>62 (1575)</td>
<td>36 (914)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600A</td>
<td>7500</td>
<td>100 (2540)</td>
<td>36 (914)</td>
</tr>
</tbody>
</table>

- Height is 128.5 inches (3264 mm) with ArcShield enclosure with plenum.
- Weight will be different with ArcShield.
Description of Features

- Fixed mounted vacuum contactor
- (1S, FORWARD, REVERSE and RUN) settings, with closed transition operation, Bulletin 1576 Reversing starter
- (1S, 2S and RUN) settings, with closed transition operation, Bulletin 1572 Non-reversing starter
- Three-pole, gang-operated, non-load break isolating switch with an external operating handle, fully interlocked with main contactor and power cell doors
- A polycarbonate viewing window in the power cell door to view the position of the isolating switch
- Three (3) R-rated current-limiting power fuses
- Three (3) current transformers
- Control power transformer with primary and secondary fuses
- Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
- IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  - Additional low voltage control panel accessories including:
    - “NORMAL-OFF-TEST” circuit
    - Receptacle for external test power supply
    - Set of control circuit terminal blocks
- NEMA medium duty, dry type, three (3) winding autotransformer with 50, 65 and 80% taps. The 65% tap shall be used unless otherwise specified.

Specifications

<table>
<thead>
<tr>
<th>Type of Controller</th>
<th>Starter Size</th>
<th>Maximum Horsepower</th>
<th>Approximate Dimensions</th>
<th>Approximate Weight</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>2400V</td>
<td>3300V</td>
<td>4160V</td>
</tr>
<tr>
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<td>400A</td>
<td>1500</td>
<td>2250</td>
<td>2750</td>
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<tr>
<td></td>
<td>600A</td>
<td>2250</td>
<td>4000</td>
<td>4500</td>
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<tr>
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</tr>
<tr>
<td>1576</td>
<td>200A</td>
<td>800</td>
<td>1000</td>
<td>1250</td>
</tr>
<tr>
<td></td>
<td>400A</td>
<td>1500</td>
<td>2250</td>
<td>2750</td>
</tr>
<tr>
<td></td>
<td>800A</td>
<td>3500</td>
<td>5000</td>
<td>6000</td>
</tr>
</tbody>
</table>
Description of Features

- Fixed mounted vacuum contactors (START and RUN) with closed transition operation
- Three-pole, gang-operated, non-load break isolating switch with an external operating handle, fully interlocked with main contactor and power cell doors
- A polycarbonate viewing window in the power cell door to view the position of the isolating switch
- Three (3) R-rated current-limiting power fuses
- Three (3) current transformers
- Control power transformer with primary and secondary fuses
- Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
- IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  - Additional low voltage control panel accessories including:
    - “NORMAL-OFF-TEST” circuit
    - Receptacle for external test power supply
    - Set of control circuit terminal blocks
- NEMA medium duty, dry type, three (3) winding reactor with 50, 65 and 80% taps. The 65% tap shall be used unless otherwise specified.

Specifications

<table>
<thead>
<tr>
<th>Type of Controller</th>
<th>Starter Size</th>
<th>Maximum Horsepower</th>
<th>Approximate Dimensions Inches (mm)</th>
<th>Approximate Weight lb (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2400V 3300V 4160V 4800V</td>
<td>Width Depth Height</td>
<td></td>
</tr>
<tr>
<td>1582</td>
<td>200A</td>
<td>800 1000 1250 1500</td>
<td>56 (142) 36 (91) 91 (231)</td>
<td>3750 (1703)</td>
</tr>
<tr>
<td></td>
<td>400A</td>
<td>1500 2250 2750 3000</td>
<td>56 (142) 36 (91) 91 (231)</td>
<td>3750 (1703)</td>
</tr>
<tr>
<td></td>
<td>600A</td>
<td>2250 4000 4500 5500</td>
<td>80 (203) 36 (91) 91 (231)</td>
<td>5000 (2270)</td>
</tr>
<tr>
<td></td>
<td>800A</td>
<td>3500 5000 6000 7000</td>
<td>100 (254) 36 (91) 91 (231)</td>
<td>5000 (2270)</td>
</tr>
</tbody>
</table>

Note: 600 and 800A controllers require a separate autotransformer with W x D x H dimensions of 52 (1321) x 46 (1168) x 66 (1676).
Bullet 1591A/B
Medium Voltage Incoming Line Units

Description of Features (1591A)
- Incoming bus arrangement for top or bottom cables
- Provision for low voltage panel and door
- Lug pad with provision for incoming cable lug terminations

Description of Features (1591B)
- Incoming bus arrangement for top or bottom incoming cables
- Provisions for the low voltage panel and door
- Lug pad with provision for incoming cable lug terminations
- Comes as a 2-high structure

Specifications

<table>
<thead>
<tr>
<th>Type of Controller</th>
<th>Voltage Rating (Volts)</th>
<th>Incomer Size Inches (mm)</th>
<th>Approximate Dimensions Inches (mm)</th>
<th>Approximate Weight lb (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1591A/B</td>
<td>2400/3300</td>
<td>18 (457)</td>
<td>Width: 18 (457)</td>
<td>91 (2325)</td>
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<tr>
<td></td>
<td>4160/4800</td>
<td>36 (915)</td>
<td>Depth: 36 (915)</td>
<td>91 (2325)</td>
</tr>
<tr>
<td></td>
<td>6600/6900</td>
<td>44 (1118)</td>
<td>Height: 44 (1118)</td>
<td>91 (2325)</td>
</tr>
</tbody>
</table>

Note: A 44” incomer is only available when a 3000A power bus is used.

Power Circuit Schematic – 1591A/1591B
Bulletin 1592BF/M, 1594F/M

Medium Voltage Feeders – Fused and Non-Fused Load-Break Switch

Description of Features

- Main load break switch for switching primary power source
- Feeder load break switch for switching other loads
- Isolation between upper and lower power cells
- The operating handle is fully interlocked with the power cell door
- Provisions on the operating handle for key interlocking
- A polycarbonate viewing window in the power cell door to view the position of the isolation handle
- Protective guard over the line terminals, inside the power cell, to barrier off medium voltage when the power door is open
- Feeders for 2-high structures
- Bulletin 1592BF – fused load break switch, designed as a feeder for 2-high structures
- Bulletin 1592F/M – fused load break switch, designed for feeder and mains
- Bulletin 1594F/M – non-fused load break switch, designed for feeder and mains

Specifications – 1592BF

<table>
<thead>
<tr>
<th>Starter Size</th>
<th>Transformer Size (kVA)</th>
<th>Approximate Dimensions (Inches (mm))</th>
<th>Approximate Weight lb (kg)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2400V</td>
<td>3300V</td>
<td>4160V</td>
</tr>
<tr>
<td>200A</td>
<td>700</td>
<td>1000</td>
<td>1250</td>
</tr>
<tr>
<td>400A</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
</tr>
</tbody>
</table>

- One 1592BF occupies half of a two-high structure.
- Includes complete two-high structure weight with two 1592BF units.

Specifications – 1592F/M / 1594F/M

<table>
<thead>
<tr>
<th>Switch Size</th>
<th>Maximum Switch Size</th>
<th>Approximate Dimensions (Inches (mm))</th>
<th>Approximate Weight lb (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2400V</td>
<td>3300V</td>
<td>4160V</td>
</tr>
<tr>
<td>600A</td>
<td>36 (915)</td>
<td>36 (915)</td>
<td>91 (2315)</td>
</tr>
<tr>
<td>1200A</td>
<td>54 (1372)</td>
<td>42 (1067)</td>
<td>91 (2315)</td>
</tr>
</tbody>
</table>

- If an isolated low voltage panel is required, the width increases by 18 inches (272 mm) and weight increases accordingly.
- If an isolated low voltage panel is required or incoming cables are fed from the bottom, the width increases by 18 inches (272 mm) and the weight increases accordingly. If the 42-inch deep unit is positioned on either end of 36-inch (94 mm) deep structures, the width increases by an additional 4 inches (104 mm).
- Available in all sizes except 1200A at 6600V and 6900V.
Medium Voltage Feeders – Fused and Non-fused Load-break Switch

Power Circuit Schematic – 1592BF/F

Power Circuit Schematic – 1592M

Power Circuit Schematic – 1594F

Power Circuit Schematic – 1594M

Visit our Web site:  www.ab.com.catalogs
Description of Features

- Fixed mounted vacuum contactor for Non-reversing Bulletin 1912B
- Fixed mounted vacuum contactors (FORWARD and REVERSE) for reversing Bulletin 1906B
- For constant speed applications
- Available with or without static exciter
- Three-pole, gang-operated, non-load break isolating switch with an external operating handle, fully interlocked with main contactor and power cell doors
- A polycarbonate viewing window in the power cell door to view the position of the isolating switch
- Three (3) R-rated current-limiting power fuses
- Three (3) current transformers
- Control power transformer with primary and secondary fuses
- Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
- IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  - Additional low voltage control panel accessories including:
    - control circuit fusing
    - “NORMAL-OFF-TEST” circuit
    - receptacle for external test power supply
    - set of control circuit terminal blocks
  - Synchronous control package:
    - Field application and protection relay (SyncPro II standard)
    - Field application control pilot relays
    - Field excitation switch (2-pole contactor standard, when optional Exciter is not provided as part of the unit)
    - Field discharge resistor bank

Specifications – 1906B

<table>
<thead>
<tr>
<th>Starter Size</th>
<th>Maximum Horsepower</th>
<th>Approximate Dimensions Inches (mm)</th>
<th>Approximate Weight lb (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2400V</td>
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<td>4160V</td>
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<tr>
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<td>800A</td>
<td>3500</td>
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</table>

Note: These dimensions do not include static exciter.

Specifications – 1912B

<table>
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<th>Approximate Dimensions Inches (mm)</th>
<th>Approximate Weight lb (kg)</th>
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<td>1250</td>
</tr>
<tr>
<td>400A</td>
<td>1500</td>
<td>2250</td>
<td>2750</td>
</tr>
<tr>
<td>450A</td>
<td>1750</td>
<td>2500</td>
<td>3000</td>
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<tr>
<td>600A</td>
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<tr>
<td>800A</td>
<td>3500</td>
<td>5000</td>
<td>6000</td>
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</tbody>
</table>

Note: These dimensions do not include static exciter.
Description of Features

- Fixed mounted vacuum contactor for Non-reversing Bulletin 1912L
- Fixed mounted vacuum contactors (FORWARD and REVERSE) for reversing Bulletin 1906L
- For constant speed applications
- Three-pole, gang-operated, non-load break isolating switch with an external operating handle, fully interlocked with main contactor and power cell doors
- A polycarbonate viewing window in the power cell door to view the position of the isolating switch
- Three (3) R-rated current-limiting power fuses
- Three (3) current transformers
- Control power transformer with primary and secondary fuses
- Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
- IntelliVAC™ control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
  - Additional low voltage control panel accessories including:
    - control circuit fusing
    - “NORMAL-OFF-TEST” circuit
    - receptacle for external test power supply
    - set of control circuit terminal blocks
- Provisions for optional factory or customer supplied field exciter (contact Cambridge to ensure low voltage panel space is available for customer supplied field exciter.)

Specifications – 1906L

<table>
<thead>
<tr>
<th>Starter Size</th>
<th>Maximum Horsepower</th>
<th>Approximate Dimensions (inches)</th>
<th>Approximate Weight (lb (kg))</th>
</tr>
</thead>
<tbody>
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<td>1000</td>
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<tr>
<td>400A</td>
<td>1500</td>
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</tr>
<tr>
<td>800A</td>
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<td>5000</td>
<td>6000</td>
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Specifications – 1912L

<table>
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<th>Maximum Horsepower</th>
<th>Approximate Dimensions (inches)</th>
<th>Approximate Weight (lb (kg))</th>
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</thead>
<tbody>
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<td>4160V</td>
</tr>
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<td>200A</td>
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</tr>
<tr>
<td>800A</td>
<td>3500</td>
<td>5000</td>
<td>6000</td>
</tr>
</tbody>
</table>
Description of Features

The SyncPro II consists of a programmable small logic controller (Allen-Bradley MicroLogix 1500) and protection system for squirrel-cage, brush-type synchronous motors.

The SyncPro II system is designed to provide supervisory protection and field control to a brush-type synchronous motor controller, proper field application timing, squirrel-cage protection against long acceleration and stall conditions as well as running pullout protection by monitoring motor power factor. When combined with a suitable induction motor protection relay, the SyncPro II provides the necessary overload protection to the brush type synchronous motor.

The SyncPro II is an integral component in our Bulletin 1912B brush type synchronous, full voltage non-reversing starter.

Designed for Performance

The SyncPro II consists of:

- PanelView 300E
- Power factor transducer
- Analog/Digital pulse board
- Conditioning resistor
- Interposing relays FSR and ESR

Designed for Safety, Convenience and Reliability

- Programmable motor parameters and setpoints
- Wide range of settings for greater user flexibility
- Monitors field contactor coil condition
- Stores data from last 10 trips
- Digital user interface with a high visibility two-line back-lit display
- Displays trip and alarm conditions
- Terminal block assembly for simple interwiring
- Modular concept
- Ideal for retrofit applications
- Suitable for low voltage and medium voltage slip ring synchronous motor applications
- Self diagnostics

Protection/Control

- Squirrel-cage winding protection
- Field winding application control
- Incomplete sequence
- Field voltage failure
- Auto load
- Stall protection
- Pull-out protection (power factor)
- Restart lockout

Display/Metering

- Detected fault conditions
- Slip frequency and starting time during start-up
- Power factor
- Enter/view setpoints through the DTAM
SyncPro II Component Configuration
The Allen-Bradley 857 motor and feeder protection relay includes the essential functions needed to protect motors and feeders in diverse industrial applications. The programmable Bulletin 857 includes the optional arc protection feature, thermal, trip circuit supervision and circuit breaker protection. The device can include numerous communication protocols, as well as a twelve-channel RTD scanner mounted up to 1000m from the relay, with a fiber optic connection to the relay.

The Allen-Bradley Bulletin 865 differential protection relay includes the necessary functions to protect transformers for distribution networks of utilities, industry power plants and offshore applications, as well as motor and generator differential protection. The device's programmable functions include thermal and circuit breaker protection, and numerous communication protocols. An optional arc flash protection system is available.
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Meet Your Everyday Technical Needs

<table>
<thead>
<tr>
<th>Online &amp; Phone Support</th>
<th>Training Services</th>
<th>OnSite Support</th>
<th>Repair Services</th>
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<td>- System-level support</td>
<td>- Instructor-led and computer or web-based courses</td>
<td>- Embedded engineering</td>
<td>- Product remanufacturing</td>
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<td>- Unlimited, real-time support</td>
<td>- Virtual classroom</td>
<td>- Preventive maintenance</td>
<td>- Third-party repair</td>
</tr>
<tr>
<td>- Unlimited, online resources and tools</td>
<td>- Training assessments</td>
<td>- Migrations and conversions</td>
<td>- Annual repair agreements</td>
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<tr>
<td>- Live chat and support forums</td>
<td>- Workstations and job aids</td>
<td>- Start-up and commissioning</td>
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Maximize Your Automation Investment

<table>
<thead>
<tr>
<th>MRO Asset Management</th>
<th>Network &amp; Security Services</th>
<th>Safety Services</th>
<th>Energy Services</th>
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<tr>
<td>- Warranty tracking</td>
<td>- Control system lifecycle services</td>
<td>- Safety assessments</td>
<td>- Energy monitoring and analysis services</td>
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<tr>
<td>- Consolidated asset reports</td>
<td>- Manage network convergence</td>
<td>- Safety design, integration and validation services</td>
<td>- General and comprehensive energy audits</td>
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<tr>
<td>- Quick access to global spare parts inventory</td>
<td>- Security technology, policies and procedures services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Owned and managed spare parts inventory</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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