

CENTERLINE 1500 Medium Voltage Motor Control Centers

Designed for Intelligence, Safety, and Reliability



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CENTERLINE 1500 Motor Control Centers



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Your critical applications rely on medium voltage motors for safe, repeatable operation in harsh industrial environments. To help improve the protection and performance of your systems, choose Allen-Bradley® CENTERLINE® 1500 medium voltage motor control centers (MVMCCs)—built tough to meet your application demands.

With one of the broadest suites of motor controls in the marketplace, CENTERLINE 1500 MVMCCs deliver premium quality, tailored solutions in a centralized package that integrates control and power in one efficient solution.

Matched to your requirements, our UL and NEMA certified medium voltage solutions are designed to mitigate risk and support an extensive range of control formats and configurations. The result? Smart, cost-effective systems that can deliver power, control, information, and safety capabilities on a common platform.

To extend system performance further, incorporate additional features—like industry-leading ArcShield™ arc-resistant enclosures and IntelliCENTER® technology, our built-in network and software package. Our flexible and scalable approach to design means you can choose the capabilities that you need to enhance safety and maximize productivity.

For nearly 80 years, Rockwell Automation has provided leading medium voltage motor control solutions—solutions like the CENTERLINE 1500 MVMCC.

Medium Voltage Motor Control Centers

The CENTERLINE 1500 Medium Voltage Motor Control Centers (MVMCCs) robust structures consist of sections, wireways, doors, and mountable intelligent motor control (IMC) devices.

Enclosure Features

CENTERLINE 1500 MVMCCs come in an array of enclosure types, in compliance with multiple standards. These enclosures feature line, load, and control wire conduit openings with removable cover plates for optimum accessibility and safety. All power cell doors are bolted for protection from the medium voltage power circuitry. Many of our enclosures can be ordered with a prepared space for future controller installations. For simplified installation, removable lifting angles and fixed base sill channels are provided.

Enclosure Types

- Arc-resistant Type 2B, 40 kA or 50 kA (NEMA Type 12, IP52)
- 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)

Standards Compliance

- Underwriters Laboratories, Inc. (UL), High Voltage Industrial Control Equipment 347
- Canadian Standards Association (CSA), Industrial Control Equipment C22.2 No. 253 (harmonized with UL 347, fifth edition)
- National Electrical Manufacturers Association (NEMA), Medium Voltage Controllers Rated 1501...7200 VAC ICS 3-2 (formerly ICS 2-324)
- American Nation Standards Institute (ANSI), Instrument Transformers C57.13
- Institute of Electrical and Electronic Engineers (IEEE) 519-1992
- IEEE C37.20.7, Type 2B for arc resistance
- National Electrical Code (NEC)
- Canadian Electrical Code (CEC)
- Occupational Safety and Health Act (OSHA)
- European Directives for EMC

Compartmentalization

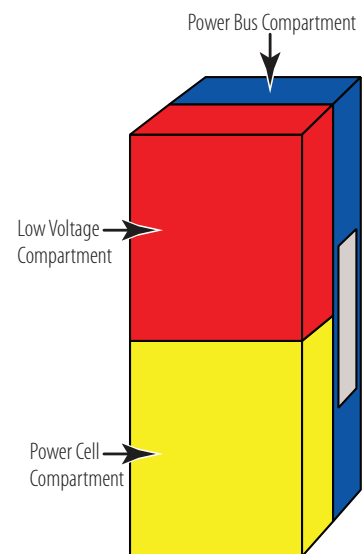
Each CENTERLINE 1500 MV MCC is assembled with completely isolated, easily accessible, and modular compartments:

- Centralized power bus compartment
- One or more medium voltage power cell compartments
- One or more low voltage compartments

Power Bus Compartment

The CENTERLINE 1500 MVMCC features a centralized horizontal power bus compartment with removable cover plates for premium accessibility and power distribution throughout the entire lineup.

- Controllers are expandable from the left-to-right or right-to-left
- Designed for direct connection of incoming line cables, from top or bottom
- Horizontal edge-to-edge bus bar configuration opposes magnetic forces, moisture, and dust collection
- One-piece 3-phase bus brace helps reduce maintenance and provides excellent distribution of forces during faults
- Side and rear access, which is protected by removable, bolted grounded plates; power bus accessible from the front for all motor controllers



Power Cell Compartment

The MVMCC power cell compartment is the heart of the controller. It contains all power circuitry, including proprietary non-load break isolation switches, integrated power fuses, contactors, and current and control power transformers. The MVMCC power cell compartment is fully interlocked (electrically and mechanically) to provide an enhanced safety level. See “Standard Features” on page 5 for detailed information about our market leading technology.

Low Voltage Compartment

The unique swing-out, low voltage compartment provides a separate and fully isolated area. All CENTERLINE 1500 low voltage compartments include these features.

- Enables controller testing and troubleshooting without exposing personnel to medium voltage for maximum safety
- By using the unique Test Selector Switch and external test power supply receptacle, all low voltage components can be configured and tested safely without medium voltage applied
- The Test Selector Switch additionally helps help prevent backfeeding through the control transformer
- All low voltage panels are painted white, providing increased visibility, better component identification, simple access, easy product integration, and higher maintainability

The low voltage compartment can house various low voltage Intelligent Motor Control (IMC) devices for diverse protection and measurement capabilities. These IMC devices include:

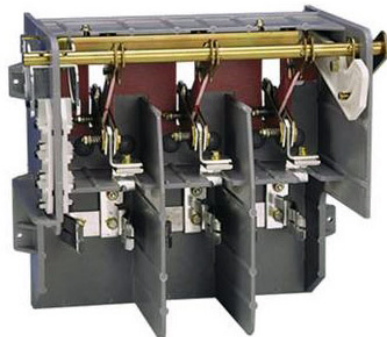
- Bulletin 193: E300™ Electronic Overload Relay
- Bulletin 1426: PowerMonitor™ 5000
- Bulletin 1503VC: IntelliVAC™ Contactor Control Module
- Bulletin 1794: Flex™ I/O
- Bulletin 857: Motor/Feeder Protection Relay
- Bulletin 865: Differential Protection Relay

Product Features

Each controller consists of functional modules for high reliability and virtually no maintenance. The following product highlights include some of our patented modular technologies, which are the foundation of our high-quality CENTERLINE 1500 MVMCCs.

Non-load Break Isolation Switch

Our integrated non-load break isolation switch features a proprietary shutter mechanism and an easily accessible handle to isolate the power cell safely from medium voltage. The power cell door is interlocked with the handle mechanism to help prevent the door from being opened when the cell is energized. The state of the isolation switch can be quickly determined through a polycarbonate viewing window.



Power Fuses

Three R-rated current-limiting power fuses are applied with the vacuum contactors so no transient overload current reaches the motor. E-rated power fuses are implemented for some sizes of transformer controllers. Both bolt-on and clip-on styles are available.



Vacuum Contactors

Compact and high-performance vacuum contactors are implemented within the power cell compartment of CENTERLINE 1500 MVMCCs.

These vacuum contactors are designed to enable repeatable activation and deactivation of the connected load. Their compact and low maintenance design also reduces the need to remove the contactor to replace power or control circuit transformer fuses, or do testing.



Control Power Transformers (CPT)

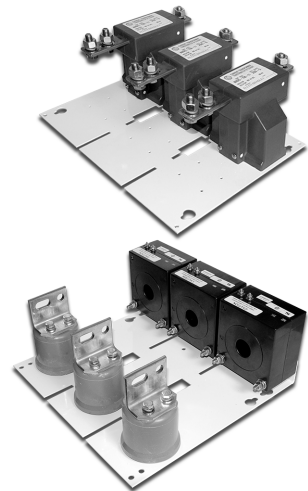
The standard CPT transforms the primary side medium voltage to a single-phase 120V or 240 V secondary side voltage to run the control circuitry efficiently in the isolated low voltage compartment. The CPT features a standard accuracy of $\pm 4\%$, with the option of $\pm 1\%$ accuracy per customer request.



Current Transformers

CENTERLINE 1500 MVMCCs use two styles of current transformers; donut type and bar type. Three of either types are used for overload protection and metering.

Optional ground fault (zero sequence style) current transformers are also available.



Bulletin 1502

Fixed Mounted Vacuum Contactors

The Allen-Bradley vacuum contactors are designed as fixed mounted devices for heavy-duty industrial performance. This design helps reduce the maintenance and reliability concerns that are associated with drawout-style contactors. Also, there are no drawout stab and finger assemblies, which require routine maintenance.

Our compact and low maintenance design reduces the need to remove the power cell. The contactors are designed to operate with Rockwell Automation's IntelliVAC family of control modules or optional pilot relay-type control.

Advantages

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

Applications

- Medium voltage (1000...7200V) vacuum switching for motor starter loads (asynchronous, synchronous)
 - Full-voltage
 - Reduced voltage
 - Variable-frequency drives
- Transformer feeder unit loads
- Capacitor loads



Fixed Mounted Vacuum Contactors

Bulletin 1503

Non-Load Break Isolation Switch

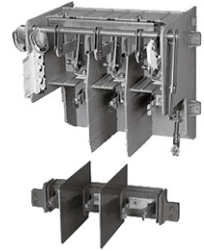
The isolation switch is a non-load-break type switch, available to support either clip-on or bolt-on fuses. When opened, the switch delivers a dead-fronted power cell for enhanced safety.

Positively driven auxiliary contacts provide safety interlocking of the low voltage control circuitry.

Electrical and mechanical interlocks help prevent the switch from opening or closing when the medium voltage vacuum contactor is energized, or if a power cell door is open.

Standard Features

- Three pole, gang operated
- 400, 600 or 800 A full load current
- Auxiliary contacts
 - 2 N.O./2 N.C. are standard
 - Provisions for 3 N.O./3 N.C.
- Contact type: Catalog No. 700-CPM
- Contact Rating: NEMA 2 x A600 and 2 x P600
- Clip-on or bolt-on fuses supported
- Line and load fuse clips or bolt-on locations
- Electrically and mechanically interlocked when used with the Allen-Bradley handle module and contactor
- Shutter mechanism fully isolates the power cell from medium voltage power bus
- Switch blades are grounded in the off position



Mechanical Interlocking

- A simple, heavy duty, direct drive mechanism improves reliability and helps provide excellent operator safety
- All mechanical interlock mechanisms remain part of the enclosure to minimize setup adjustment

Isolation Switch Handle Module

- Padlocking provision up to 3 padlocks in open position, 1 padlock in closed position
- Mechanical interlock with the power cell door, non-load isolation switch, and contactor
- Provision for mechanically trapped key interlocking



Bulletin 1502 Vacuum Controllers Electrical Ratings

			450 A	800 A		
Voltage ratings ⁽¹⁾	Rated voltage, max		7200	7200		
	System voltages		2400, 3300, 4160, 4800, 6600, 6900			
	Dielectric voltage withstand rating	For 60 seconds (kV)	18.2/20 (IEC)			
	Basic impulse level (BIL) withstand	Phase to ground, phase-to-phase (kV)	60			
	Frequency ratings (Hz)		50/60			
Current ratings ⁽¹⁾	Rated open continuous current		450	800		
	Interrupting current rating, max	RMS Sym Amps	2400V	6000	12,500	
			5000V			
			7200V ⁽²⁾			
	Interrupting MVA rating, max	Sym MVA	2400V	25	50	
			5000V			50
			7200V ⁽²⁾			
	Short-circuit withstand at rated voltage	Current peak 1/2 cycle (kA)	60	85		
	Short time current rating capacity	For 1 second (kA)	6.0	12.0		
		For 30 seconds (kA)	2.4	4.8		
	Chop current	Average RMS Amps (RMS A)	0.5			
	Make and break capability	At rated voltage (kA)	4.0	8.0		
Ambient temperature	°C (°F)	40 (104)				
Contactor coil data (IntelliVAC controlled)	110...240V AC or 110...250V DC ⁽³⁾ (V AC: $\sqrt{2} \times V_{CL}$) (V DC: $V_{CL} = V_{CL}$)	Close current (A_{DC} , 200 ms)	4.3	13.1		
		Hold current (A_{DC})	0.48	0.24		
		Pickup voltage ⁽³⁾	95	102		
		Drop-out voltage ⁽³⁾	75			
		Mechanical latch trip current (A_{DC} , 200 ms)	5.5	5.6		
		Trip voltage ⁽³⁾⁽⁴⁾	70			
Operational characteristics	Mechanical life (operations) x 1000 ⁽⁵⁾	Electrically held	2500	250		
		Mechanical latch	100			
	Electrical life (operations) x 1000 ⁽⁵⁾	1000		250		
	Switching frequency (operations/hr)	Electrically held	600			
		Mechanical latch	150			
	Capacitor switching (max. kVAR)	System voltage	2400V	800	2000	
4160V			1400	3000		
6900V			2000	4000		
General	Standard altitude capabilities, m (ft) ⁽¹⁾		-1000...+5000 (-3300...+16,500) ⁽⁶⁾	-1000...+5000 (-3300...+16,500) ⁽⁷⁾		
	Contactor weight, kg (lb)		21.8 (48)	45 (100)		
	Auxiliary contact rating		A600			
	Auxiliary contacts on the vacuum contactor, max ⁽⁸⁾		3 N.O./3 N.C.			

(1) The voltage and current ratings that are listed are valid up to 1000 m (3300 ft).
 (2) The IEC rating at 7200V (RMS Sym) for the 400 A contactor is 5300A/66 MVA.
 (3) Control voltage as measured at the input of the IntelliVAC module.
 (4) Provided that regular maintenance is performed as detailed in the Medium Voltage Motor Controllers Specification Guide, publication [1500-SR020](#).
 (5) The full altitude range is available only with the IntelliVAC module, and the IntelliVAC module is to be configured accordingly; see publication 1503-UM051. If used with electromechanical control, the standard mechanical latch contactors are designed for an altitude range of -1000...+1000 m (-3300...+3300 ft). Higher altitudes are possible if you change the contactor return springs.
 (6) Altitude is field adjustable with a mechanical arrangement.
 (7) The number of auxiliary contacts depends on the contactor type. Some of the contacts are used in the typical control schemes.
 (8) Some contactor configurations reduce the number of available auxiliary contacts.

Bulletin 857

Motor Protection Relay

- **Complete protection**
Comprehensive selection of protection functions for distribution network overhead line feeders, cable feeders, transformer feeders, and motors, which includes large motors, capacitor banks, and reactors.
- **Complete flexibility in display capabilities**
Take control with a fully configurable LCD HMI, including the display of up to six configurable measurement values, configurable interlocking schemes with basic logic functions, and a fully interactive MIMIC diagram.
- **Integrated 12-channel disturbance recorder**
Built-in disturbance recorder to evaluate all analog and digital signals.
- **Comprehensive energy management and measurements**
Widest range of measurement functions including phase-to-earth, phase-to-phase voltages, currents, frequency, active, reactive, and apparent power, active and reactive energy imported and exported, power factor, and negative phase sequence current.
- **Power quality**
Power quality assessment and analysis including supervision of harmonics up to the 15th order, THD, and voltage swells and sags.
- **Fault location**
Integrated fault location with distance indication for short circuits in distribution networks irrespective of power network earthing system and earth-faults in compensated networks.
- **Optional ultra-fast arc flash protection**
Unique integrated arc fault protection functionality for enhanced safety of switchgear, substations, people, and property.
- **Extensive communication capabilities**
Large number of supported communication protocols including EtherNet/IP, TCP/IP, IEC 61850, IEC 60870-5-101, IEC 60870-5-103, Modbus TCP, Modbus RTU, PROFIBUS DP, SPA-bus slave, DNP3.0, or DNP TCP.
- **Easy programming and management**
Easy commissioning, configuration, and operation supported by the free SetPointPS relay configuration and management software. Local or remote Internet configuration capabilities are available.

Bulletin 865

Differential Motor Protection Relay

- **Optimized protection**
Ideal for transformer, motor, generator, and short cable differential protection. Optimized for transformer protection.
- **Second and fifth harmonic blocking**
Full detection of inrush current magnitude with sensitivity selection and blocking of overcurrent elements during inrush current protection.
- **Integrated 12-channel disturbance recorder**
Built-in disturbance recorder for evaluating all analog and digital signals.
- **Optional ultra-fast arc flash protection**
Unique integrated arc fault protection functionality for enhanced safety of switchgear, substations, people, and property.
- **Complete flexibility in display capabilities**
Take control with a fully configurable LCD HMI including the display of up to six configurable measurement values, configurable interlocking schemes with basic logic functions along with a fully interactive MIMIC diagram.
- **Extensive communication capabilities**
Large number of supported communication protocols including EtherNet/IP, TCP/IP, IEC 61850, IEC 60870-5-101, IEC 60870-5-103, Modbus TCP, Modbus RTU, PROFIBUS DP, SPA-bus slave, and DNP3.0.
- **Easy programming and management**
Easy commissioning, configuration, and operation supported by the free SetPointPS relay configuration and management software. Includes local or remote Internet configuration capabilities.



Bulletin 193/592 E300 Electronic Overload Relay

The E300 Electronic Overload Relay is the next generation electronic overload from Allen-Bradley. Its modular design, communication options, diagnostic information, simplified wiring, and integration into Logix make it the ideal overload for motor control applications in an automation system. The E300 Overload Relay provides flexibility, helps reduce engineering time, and maximizes uptime for important motor starter applications. For a detailed product profile, see publication [193-BR029](#).



Modular Design

For exacting application needs

- Wide current range
- Multiple sensing capabilities
- Expansion I/O
- Operator interface

Intelligent Motor Control

Easy automation system integration

- Network connectivity
- Native I/O
- DeviceLogix technology enabled
- Integrated into Logix
- Preprogrammed operating modes

Diagnostic Information

Monitor motor performance, which includes:

- Voltage, current, and energy
- Trip/warning histories
- Percentage of thermal capacity use
- Time to reset
- Operational hours
- Number of starts

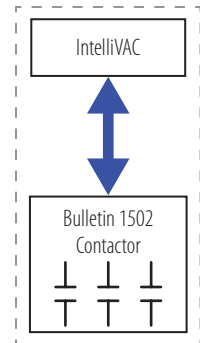
Bulletin 1503VC IntelliVAC Contactor Control Modules

The Bulletin 1503VC IntelliVAC controllers offer an excellent, efficient, and flexible means to control Bulletin 1502 vacuum contactors. The IntelliVAC control module family offers a scalable solution for multiple medium voltage control applications.



IntelliVAC Module

- Provides basic electronic control capabilities for Allen-Bradley Bulletin 1502, 400 A, 450 A, and 800 A contactors (electrically held and mechanical latch)
- Offers enhanced reliability through enhanced diagnostics and the ability to provide selective coordination between the power fuses and the vacuum contactor drop-out time.
- Inherent power loss ride-through (TDUV) and contactor anti-kiss and anti-plugging features provide excellent control and protection capabilities.



Bulletin 1503VC IntelliVAC Control Modules

Cat. No.	Description
1503VC-BMC5	IntelliVAC electrically held and mechanical latch

Bulletin 1503VC IntelliVAC Control Module Electrical Ratings and Approvals

		Contactor Ratings (Amps)	Control Voltage (AC or DC)	AC Rating	DC Rating
Main input voltage				110...240 V rms, +10/-15%, 47...63 Hz	110...250 V, +10/-15%
Main input current	Inrush	400/800	120/240	25 A peak (1/2 cycle)	25 A
	Idle			125 mA	35 mA
	Hold (max)			300 mA	4.9 A
	Close (0.2 s)	400	120	4.6 A	100 mA
				240	
		800	120	11.3 A	
				240	8.9 A
	Latch trip (0.2 s)	400	120	7.0 A	3.8 A
				240	
		800	120	7.0 A	
240				4.3 A	
Command inputs				70...240 V, rms	70...250 V
Output contacts				250V rms, 5 A, R load; 2A (reactive), PF = 0.4	30V, 5 A, R load; 2A (reactive), L/R = 7 ms
Standards and approval				c-UL-us, UL, CSA, IEC, CE	

- (1) All AC values are rms, except where noted.
- (2) The maximum currents that are shown are for either the Bulletin 1502 450 A or 800 A vacuum contactors. Close current duration is 200 milliseconds.
- (3) Applicable only to mechanical latch contactors.

Features

Allen-Bradley CENTERLINE 1500 MVMCCs with ArcShield arc-resistant enclosures provide rugged process control for applications that require a higher level of personnel protection. Products with ArcShield enclosures are tested and compliant to the IEEE C37.20.7 standard, and provide Type 2B protection during a 40 kA or 50 kA arc flash.

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

All ArcShield products have a robust enclosure design, which contains the arc flash energy and exhaust materials until vents on top of the enclosure open. Once opened, the vents provide a path for materials to exit the enclosure. An overhead plenum is used to direct the materials to a safe location away from personnel.

An optional chimney design redirects arc flash materials safely into clear space above the enclosure. The low voltage panel is reinforced and sealed, to help prevent arc flash exhaust materials from entering this compartment.

As standard, a plenum exhaust section is provided with each new ArcShield order. The plenum exhaust section can be mounted on either the left or right end of the line-up, and it extends past the end of the line-up. Engineered plenum designs are also available.

Engineered Safety Features

- Reinforced cabinet and power cell door closure mechanism
- Multi-point latching mechanism, reinforced cross bracing and gasket sealing
- Reinforced back plates—added support plates that are secured with multiple bolts provide increased rigidity and security
- Reinforced low voltage panel to withstand arc flash energy and shield maintenance personnel while working in the isolated low voltage compartment
- Arc ‘Pressure Relief’ vent to vent arc gases and material safely away from personnel during an arc flash
- Available with removable arc exhaust plenum or exhaust chimneys

ArcShield Enclosure Specifications

Bulletin Number	Controller Size	Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
		Width	Depth	Height	
1506	200/400 ⁽¹⁾	36 (915)	36 (915)	128.5 (3264)	2310 (1050)
1512A	200/400/450 ⁽¹⁾	26 (661)		128.5 (3264)	1320 (600)
	200/400/450 ⁽²⁾	44 (1118)	2435 (1107)		
	600 ⁽¹⁾	36 (915)	1700 (773)		
	600 ⁽²⁾	54 (1372)	2750 (1250)		
	800 ⁽¹⁾	62 (1575)	3080 (1400)		
	800 ⁽²⁾	80 (2032)	4135 (1882)		
1512AT	200/400/450 ⁽¹⁾	26 (661)	1320 (600)		
	600 ⁽¹⁾	36 (915)	1700 (773)		
1512B	200/400 ⁽¹⁾	36 (915)	2310 (1050)		
	200/400 ⁽²⁾	54 (1372)	3365 (1530)		
1512BT	200/400 ⁽¹⁾	36 (915)	2310 (1050)		
1562E	200/400	36 (915)	1950 (886)		
	200/400 ⁽²⁾	54 (1372)	3000 (1364)		
1591A/B	18 ⁽³⁾	18 (457)	91 (2315)	950 (432)	
	18 ⁽⁴⁾		128.5 (3264)	1020 (464)	
	36 ⁽¹⁾⁽⁵⁾	36 (915)	1459 (663)		
	36 ⁽⁴⁾				

- (1) Arc-resistant with plenum.
- (2) Arc-resistant with plenum plus PFCC option.
- (3) Arc-resistant without plenum.
- (4) Arc-resistant with plenum c/w low voltage panel.
- (5) 1591B
- (6) Added height above standard 91 in. (2315 mm) for the plenum.

Medium Voltage Controller Types

Bulletin 1512A

One-high Full-voltage Non-reversing Motor Starter

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 R-rated current-limiting power fuses
- Three 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 that include:
 - 'NORMAL-OFF-TEST' circuit
 - Receptacle for external test power supply
 - Set of control circuit terminal blocks
- Two-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)



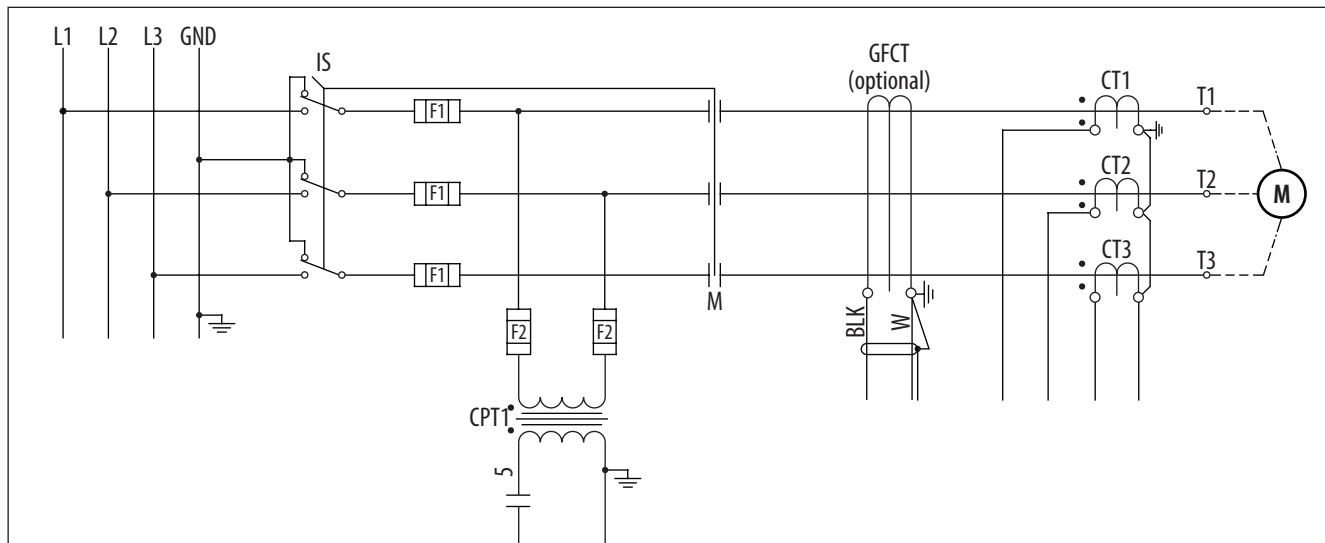
Bulletin 1512A Starter Specifications

Starter Size	Hp, max						Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	6600V	6900V	Width	Depth	Height	
200 A	800	1000	1250	1500	2250	2500	26 (661)	36 (915)	91 (2315) ⁽¹⁾	1075 (490) ⁽²⁾
400 A	1500	2250	2750	3000	4500	5000				
600 A	2750	3500	4500	5500	8000		36 (915)			1350 (611) ⁽²⁾
800 A	3000	5000	6000	7000	9000		56 (1422)			1800 (816)

(1) Height is 128.5 inches (3264 mm) with ArcShield enclosure with plenum.

(2) Weight is different with ArcShield.

Bulletin 1512A Power Circuit Schematic



Bulletin 1512AT Full-voltage Transformer Feeder Unit Starter

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 E-rated current-limiting power fuses (R-rated power fuses that are used for controller sizes and voltages)
- Three 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 that include:
 - 'NORMAL-OFF-TEST' circuit
 - Receptacle for external test power supply
 - Set of control circuit terminal blocks
- One-high structure design for one complete motor controller
- Available in optional ArcShield enclosure
- Also available as 'Prepared Space' (Bulletin 1512AP, only in 200 A and 400 A) or Feeder Kits (Bulletin 1512AU)



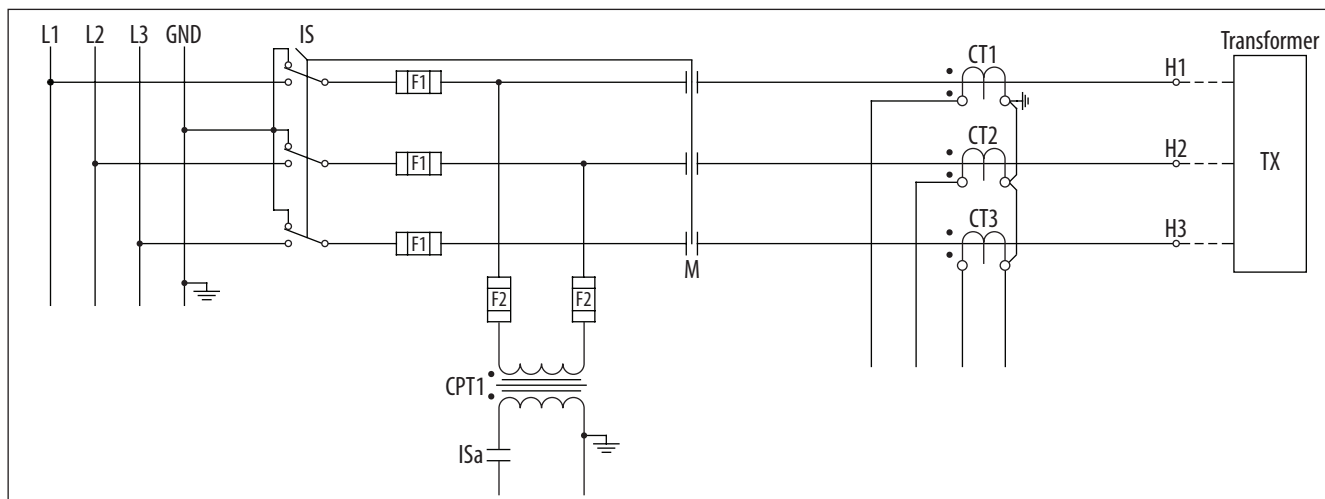
Bulletin 1512AT Starter Specifications

Starter Size	Transformer Size (kVA)						Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	6600V	6900V	Width	Depth	Height	
200 A	700	1000	1250		2000		26 (660)	36 (914)	91 (2311) ⁽¹⁾	1075 (490) ⁽²⁾
400 A	1250	2000	2500	2750	4500					1350 (611) ⁽²⁾
600 A	2250	3000	4000	4500	6500		36 (914)	91 (2311)	1800 (816)	
800 A	3000	4000	5500	6000	8000		56 (1422)			

(1) Height is 128.5 in. (3264 mm) with ArcShield enclosure with plenum.

(2) Weight is different with ArcShield.

Bulletin 1512AT Power Circuit Schematic



Bulletin 1512AD

One-high Full-voltage Non-reversing Drive Input Starter Controller

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 current-limiting power fuses
- Three current transformers

- Segregated low voltage panel to house circuit control fusing that includes:
 - 'NORMAL-OFF-TEST' circuit
 - Receptacle for external test power supply
 - Set of control circuit terminal blocks
 - Optional hardware for unit control and monitoring
- IntelliVAC control module for each vacuum contactor, mounted in low voltage panel, with advanced features:
 - Selectable vacuum contactor drop-out time and consistent pickup time
 - Altitude compensation
 - Anti-kiss and anti-plugging protection
 - Set of control circuit terminal blocks
- Unit output must be cabled to VFD input. Customer is responsible for interwiring between input contactor unit and variable-frequency drive (VFD)

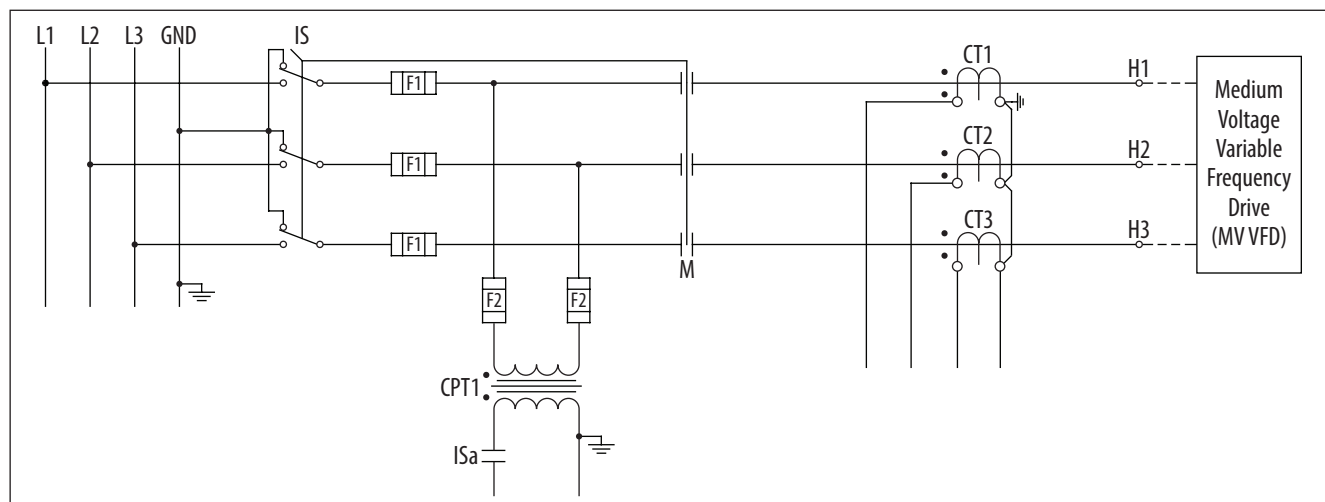
Bulletin 1512AD Starter Specifications

Starter Size	Transformer Size (kVA)	Dimensions, in. (mm), approx.			Weight, lb (kg), approx. ⁽²⁾
	2400...6900 V	Width	Depth	Height	
200 A	Sized based on variable-frequency drive and continuous current of the motor	26 (660)	36 (914)	91 (2311) ⁽¹⁾	1075 (488)
400 A					1350 (611)
600 A		36 (914)			1800 (816)
800 A		56 (1423)			

(1) Height is 128.5 in. (3264 mm) with ArcShield enclosure with plenum.

(2) Weight is different with ArcShield.

Bulletin 1512AD Power Circuit Schematic



Bulletin 1512B Two-high Full-voltage Non-reversing Motor Starter

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 R-rated current-limiting power fuses
- Three 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 that include:
 - 'NORMAL-OFF-TEST' circuit
 - Receptacle for external test power supply
 - Set of control circuit terminal blocks
- Two-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)



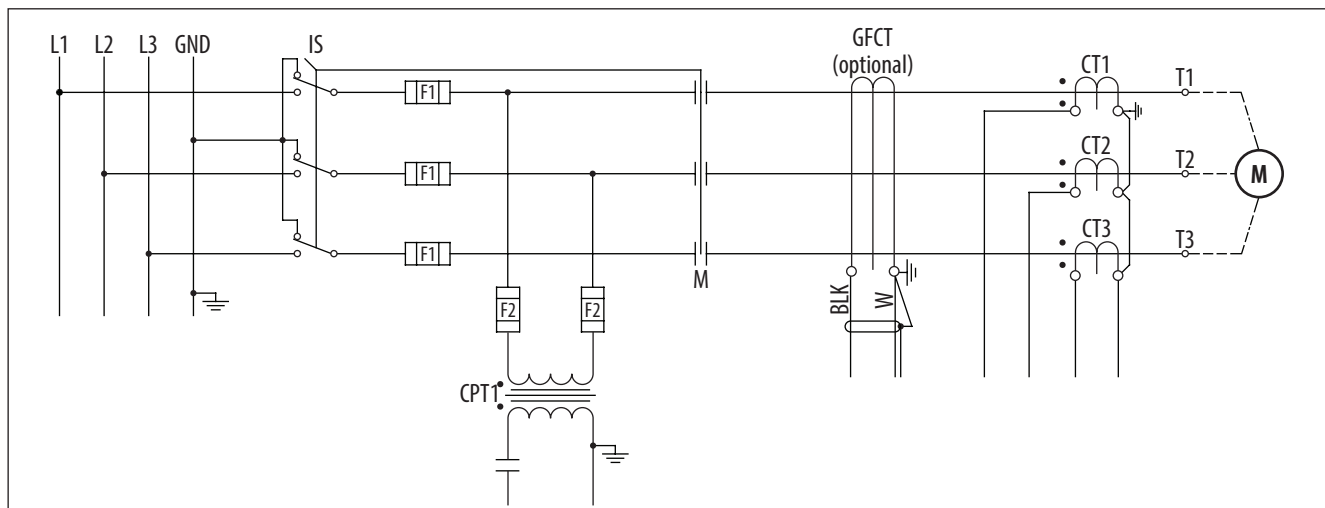
Bulletin 1512B Starter Specifications

Starter Size	HP, max						Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	6600V	6900V	Width	Depth	Height	
200 A	800	1000	1250	1500	2250	2500	36 (915)	36 (915)	91 (2315) ⁽¹⁾	1770 (802) ⁽²⁾
400 A	1500	2250	2750	3000	4000	4000				

(1) Height is 128.5 inches (3264 mm) with ArcShield enclosure with plenum.

(2) Weight is different with ArcShield.

Bulletin 1512B Power Circuit Schematic



Bulletin 1512BT

Two-high Full-voltage Transformer Feeder Unit Starter

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 E-rated or R-rated current-limiting power fuses
- Three 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 that include:
 - 'NORMAL-OFF-TEST' circuit
 - Receptacle for external test power supply
 - Set of control circuit terminal blocks
- Two-high structure design for one complete motor controller
- Available in optional ArcShield enclosure
- Also available as 'Prepared Space' (Bulletin 1512BP) or Starter Kit (Bulletin 1512BU)



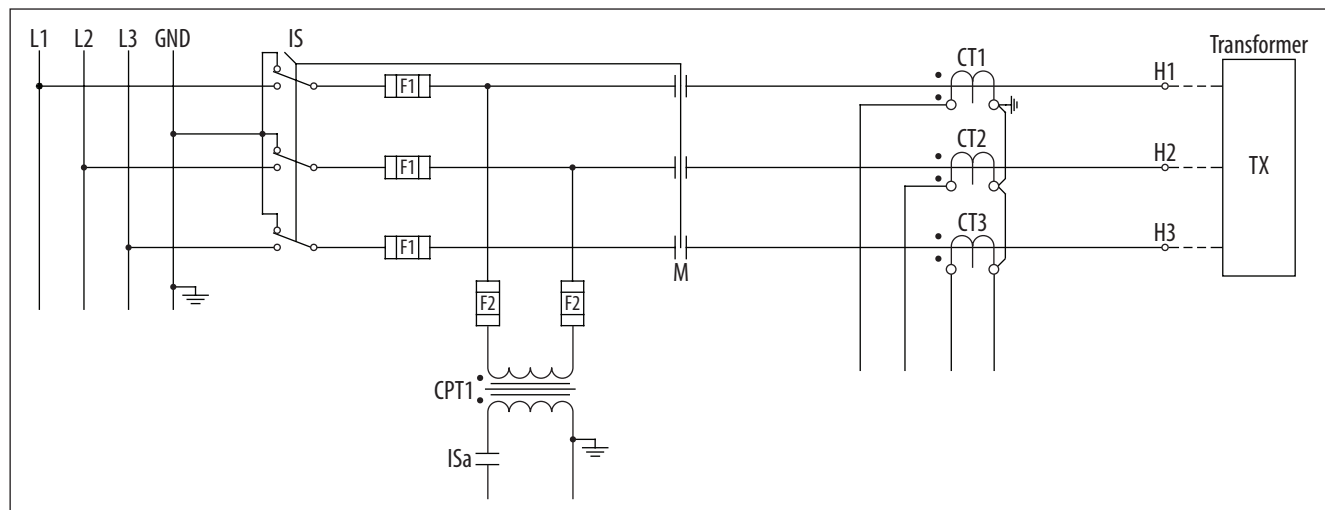
Bulletin 1512BT Starter Specifications

Starter Size	Transformer Size (kVA)						Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	6600V	6900V	Width	Depth	Height	
200 A	700	1000	1250		2000		36 (914)	36 (914)	91 (2311) ⁽¹⁾	1770 (802) ⁽²⁾
400 A	1500	2000	2500	2750	4000					

(3) Height is 128.5 in. (3264 mm) with ArcShield enclosure with plenum.

(4) Weight is different with ArcShield.

Bulletin 1512BT Power Circuit Schematic



Bulletin 1512BD Two-high Full-voltage Non-reversing Drive Input Starter Controller

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 R-rated current-limiting power fuses
- Three 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:
 - Selectable vacuum contactor drop-out time and consistent pickup time
 - Altitude compensation
 - Anti-kiss and anti-plugging protection

Unit output must be cabled to VFD input. Customer is responsible for interwiring between input contactor unit and VFD.

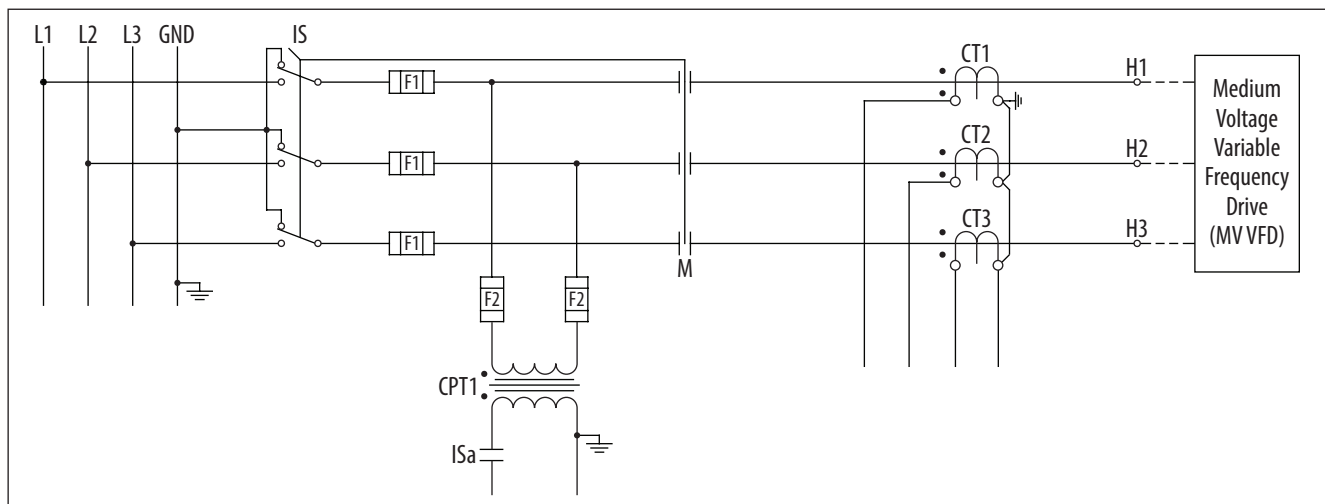
Bulletin 1512BD Starter Specifications

Starter Size	Transformer Size (kVA)	Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
	2400...6900V	Width	Depth	Height	
200 A	Sized based on VFD and continuous current of the motor	36 (915)	36 (915)	91 (2311) ⁽¹⁾	1770 (802) ⁽²⁾
400 A					

(1) Height is 128.5 in. (3264 mm) with ArcShield enclosure with plenum.

(2) Weight is different with ArcShield.

Bulletin 1512BD Power Circuit Schematic



Bulletin 1506 Full-voltage Reversing Motor Starter

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 R-rated current-limiting power fuses
- Three R-rated current-limiting power fuses
- Three 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 that include:
 - "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



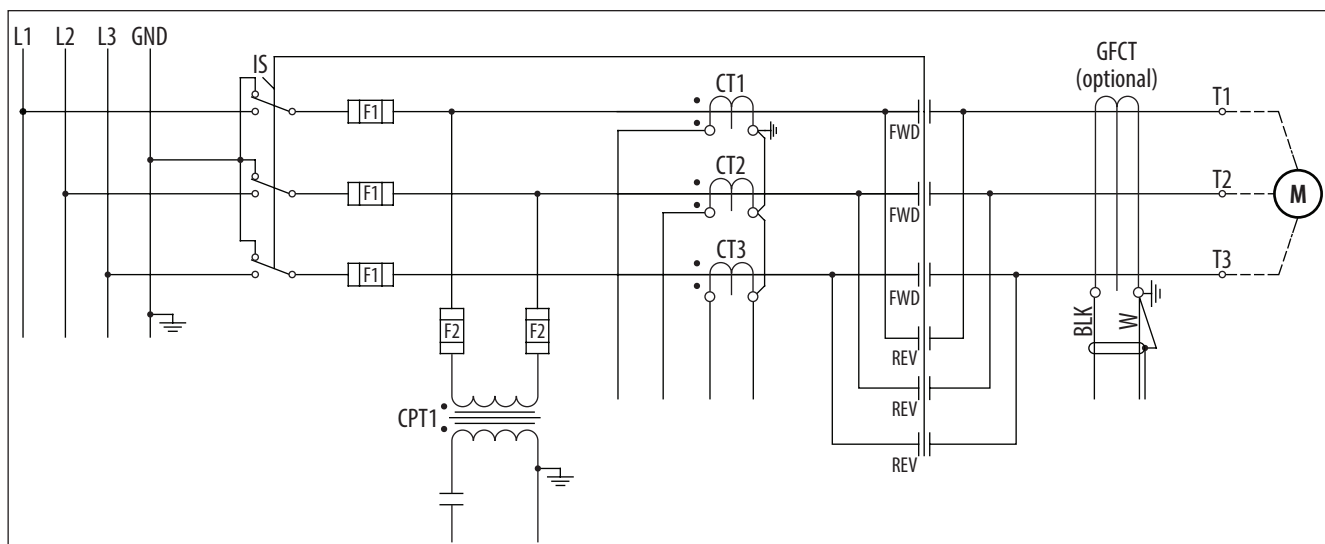
Bulletin 1506 Starter Specifications

Starter Size	Hp, max				Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	Width	Depth	Height	
200 A	800	1000	1250	1500	36 (914)	36 (914)	91 (2311) ⁽¹⁾	1770 (802) ⁽²⁾
400 A	1500	2250	2750	3000				
800 A	3500	5000	6000	7000	56 (1422)		91 (2311)	1950 (885)

(1) Height is 128.5 inches (3254 mm) with ArcShield enclosure and plenum.

(2) Weight is different with ArcShield.

Bulletin 1506 Power Circuit Schematic



Bulletin 1522E/F/G Two-speed Non-reversing Motor Starter

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 R-rated current-limiting power fuses

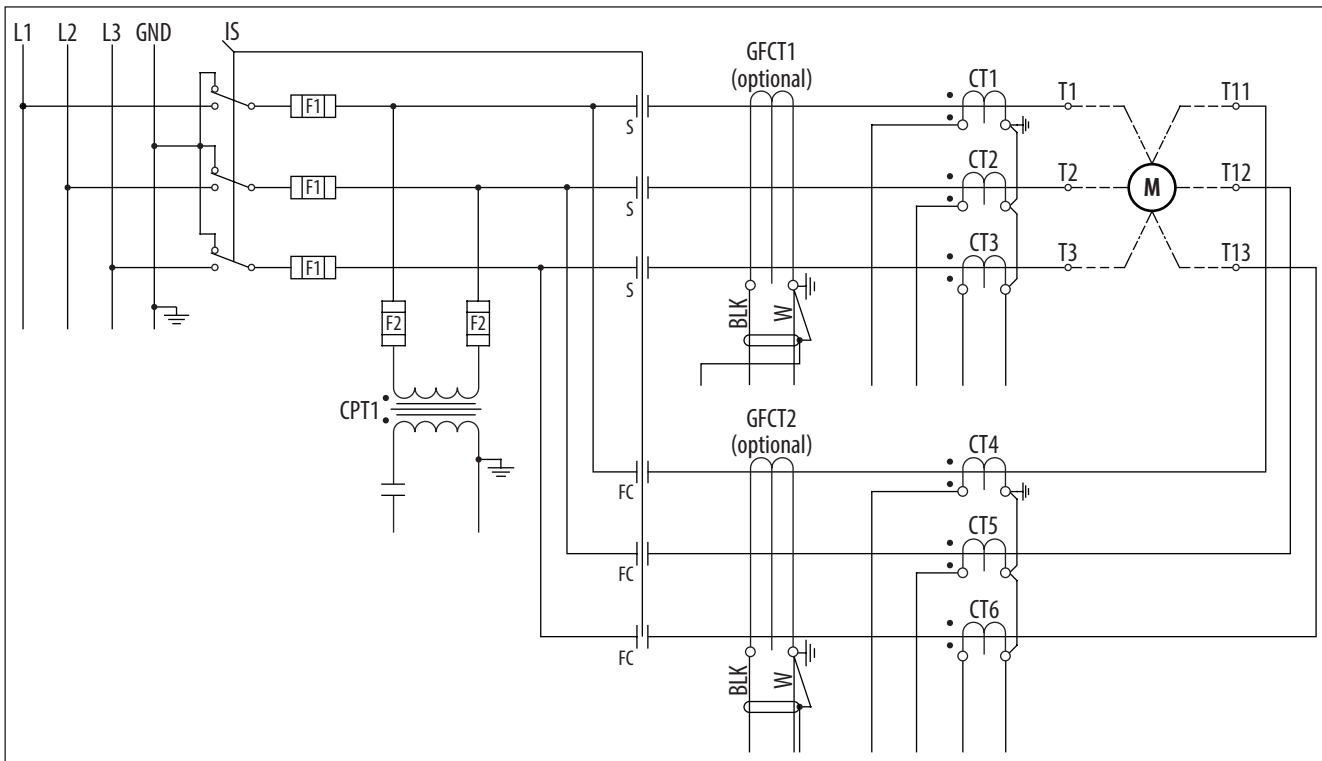
- Six current transformers
- Control power transformer with primary and secondary fuses
- Segregated low voltage panel to house standard and optional hardware for unit control and monitoring
- IntelliVAC control module for each vacuum contactor, mounted in low voltage panel, with advanced features
- Additional low voltage control panel accessories that include:
 - 'NORMAL-OFF-TEST' circuit
 - Receptacle for external test power supply
 - Set of control circuit terminal blocks
- Constant or variable torque, and constant horsepower applications



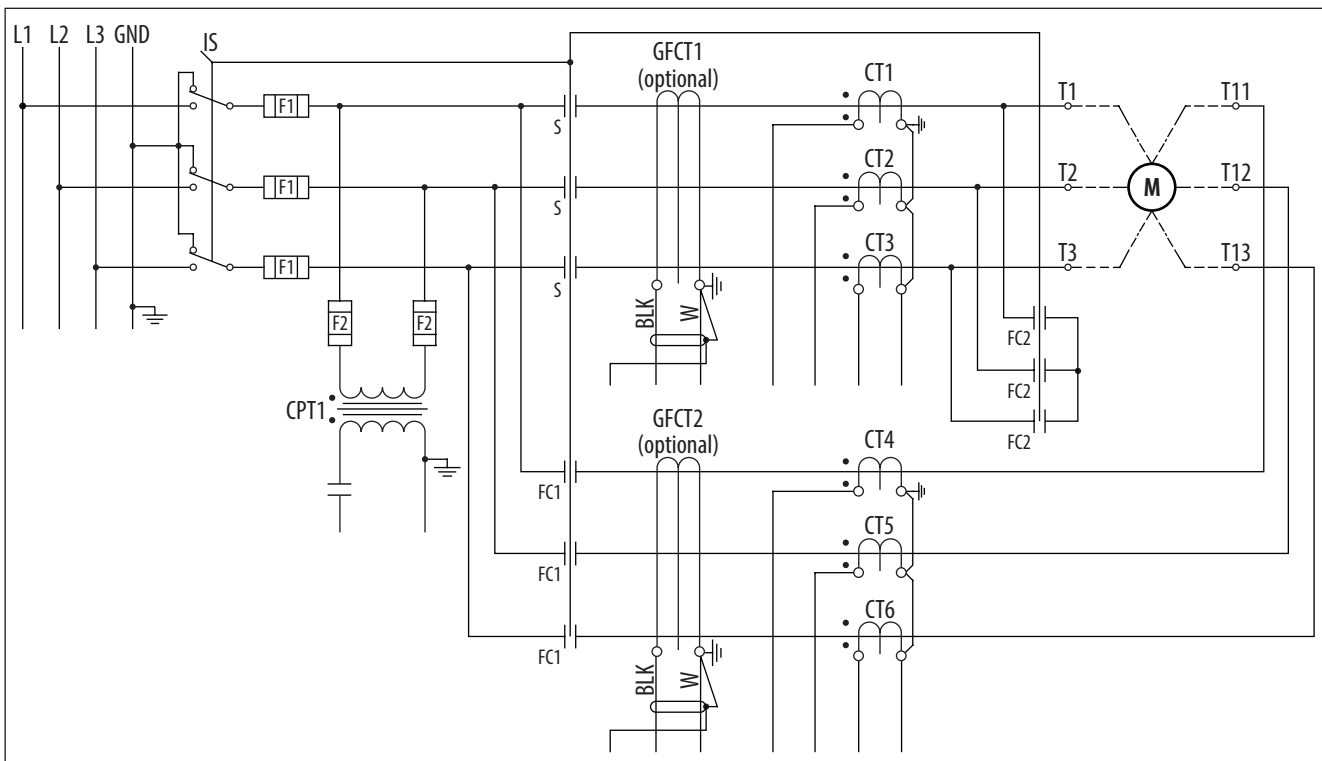
Bulletin 1522E/F/G Starter Specifications

Starter Size	Hp, max				Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	Width	Depth	Height	
200 A	800	1000	1250	1500	36 (915)	36 (915)	91 (2315)	1770 (802)
400 A	1500	2250	2750	3000				

Bulletin 1522E Power Circuit Schematic



Bulletin 1522F Power Circuit Schematic



Bulletin 1560F/1562F SMC-50 Smart Electronic Soft Start Motor Controller

Description of Features

The Bulletin 1562F is a flexible combination motor controller available in two main configurations:

- A modified two-high cabinet (two complete controllers)
- A combination of a one-high full-voltage non-reversing (FVNR) cabinet and a 1560F unit (one complete controller)

Based around the SMC™-50 Smart motor control module, we offer various advanced controlling and electronic motor-starting styles:

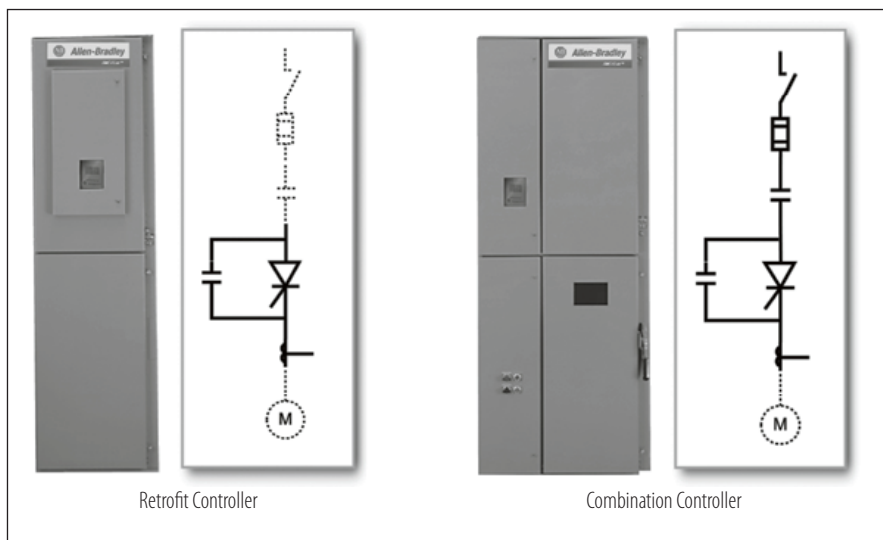
- Soft start with Selectable Kickstart
- Soft stop
- Pump control start/stop
- Torque control
- Current limit start with Selectable Kickstart
- Sensorless linear speed acceleration with Selectable Kickstart
- Sensorless linear speed deceleration
- Dual ramp with Selectable Kickstart
- Emergency run (full-voltage)



The SMC-50 control module offers advanced monitoring/ metering functions, and provides motor and controller protection.

The Bulletin 1562F features both isolation and bypass vacuum contactors. The Bulletin 1560F is a retrofit controller that is specifically designed to integrate smoothly with an existing customer-supplied starter to enable all combination controls listed in this section.

Bulletin 1560F and Bulletin 1562F Controllers

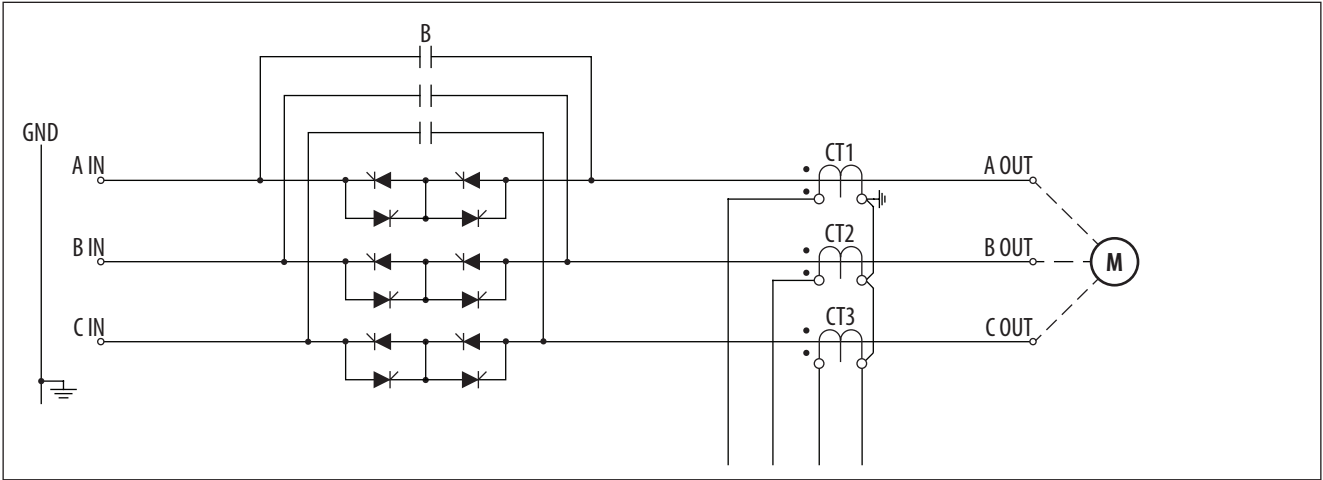


Bulletin 1560F/1562F Starter Specifications

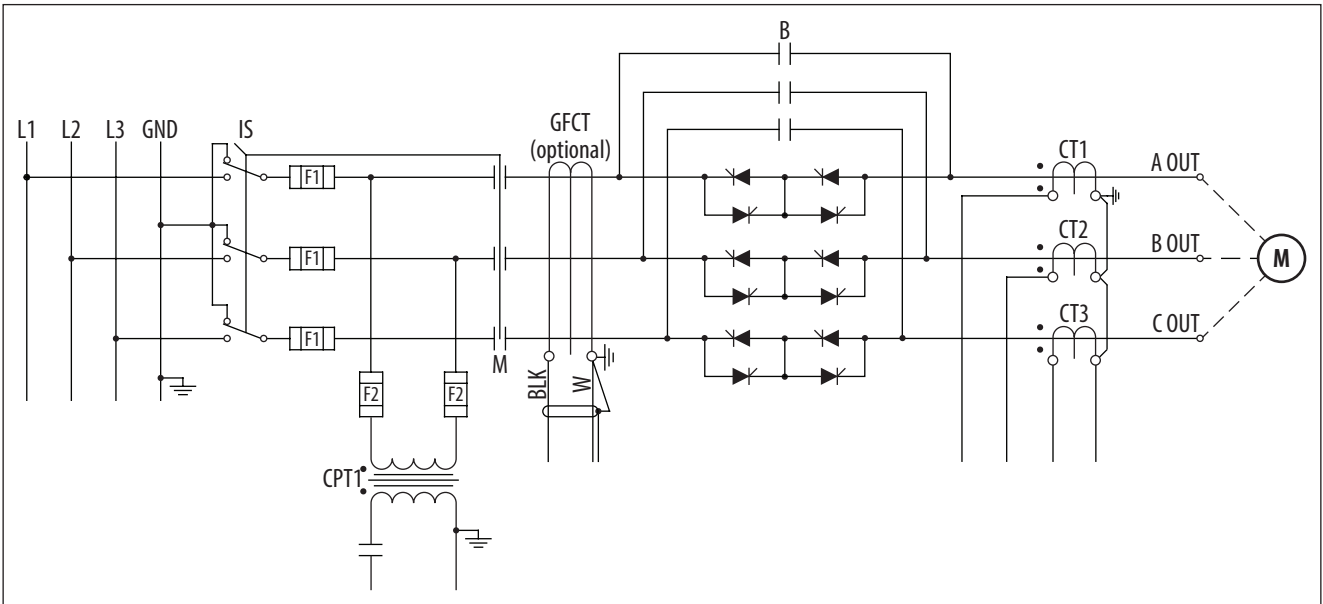
Bulletin	Voltage	Rating (A)	Hp, max	Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
				Width	Depth	Height	
1560F	2400	200	800	26 (660)	36 (914)	91 (2311)	800 (363)
		400	1500				
		600	2750	44 (1118)			1300 (590)
	3300	200	1000	26 (660)	36 (914)	91 (2311)	800 (363)
		400	2250				
		600	4000	44 (1118)			1300 (590)
	4160	200	1250	26 (660)	36 (914)	91 (2311)	800 (363)
		400	2750				
		600	4500	44 (1118)			1300 (590)
	6600	200	2250	36 (914)	36 (914)	91 (2311)	1400 (636)
		400	4500				
		600	7500	44 (1118)			1300 (590)
	6900	200	2500	36 (914)	36 (914)	91 (2311)	1220 (554)
		400	5000				
		600	7500	44 (1118)			1300 (590)
1562F	2400	200	800	36 (914)	36 (914) ⁽¹⁾	91 (2311) ⁽²⁾	1400 (636) ⁽³⁾
		400	1500				
		600	2750	80 (2032)	36 (914)	91 (2311)	2325 (1056)
	3300	200	1000	36 (914)	36 (914) ⁽¹⁾	91 (2311) ⁽²⁾	1400 (636) ⁽³⁾
		400	2250				
		600	4000	80 (2032)	36 (914)	91 (2311)	2325 (1056)
	4160	200	1250	36 (914)	36 (914) ⁽¹⁾	91 (2311) ⁽²⁾	1400 (636) ⁽³⁾
		400	2750				
		600	4500	80 (2032)	36 (914)	91 (2311)	2325 (1056)
	6600	200	2250	36 (914)	36 (914)	91 (2311)	1400 (636) ⁽³⁾
		400	4500				
		600	7500	80 (2032)			2700 (1227)
	6900	200	2500	62 (1575)	36 (914) ⁽¹⁾	91 (2311) ⁽²⁾	2325 (1056) ⁽³⁾
		400	5000				
		600	7500	100 (2540)	36 (914)	91 (2311)	4000 (1812)

(1) Depth is 46 in. (1168 mm) with ArcShield enclosure with plenum.
 (2) Height is 128.5 in. (3264 mm) with ArcShield enclosure with plenum.
 (3) Weight is different with ArcShield.

Bulletin 1560F Power Circuit Schematic



Bulletin 1562F Power Circuit Schematic



Bulletin 1572/1576/1582 Reduced Voltage Reversing and Non-reversing Autotransformer and Reactor Motor Starter

Description of Features

- Fixed mounted vacuum contactors
- (1S, 2S, and RUN) contactors, with closed transition operation, Bulletin 1572 non-reversing starter
- (1S, FORWARD, REVERSE, and RUN) contactors, with closed transition operation, Bulletin 1576 reversing starter
- A 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 R-rated current-limiting power fuses
- Three 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 that include:
 - “NORMAL-OFF-TEST” circuit
 - Receptacle for external test power supply
 - Set of control circuit terminal blocks
- NEMA medium duty, dry type, three-winding autotransformer with 50%, 65% and 80% taps. The 65% tap is used unless otherwise specified.

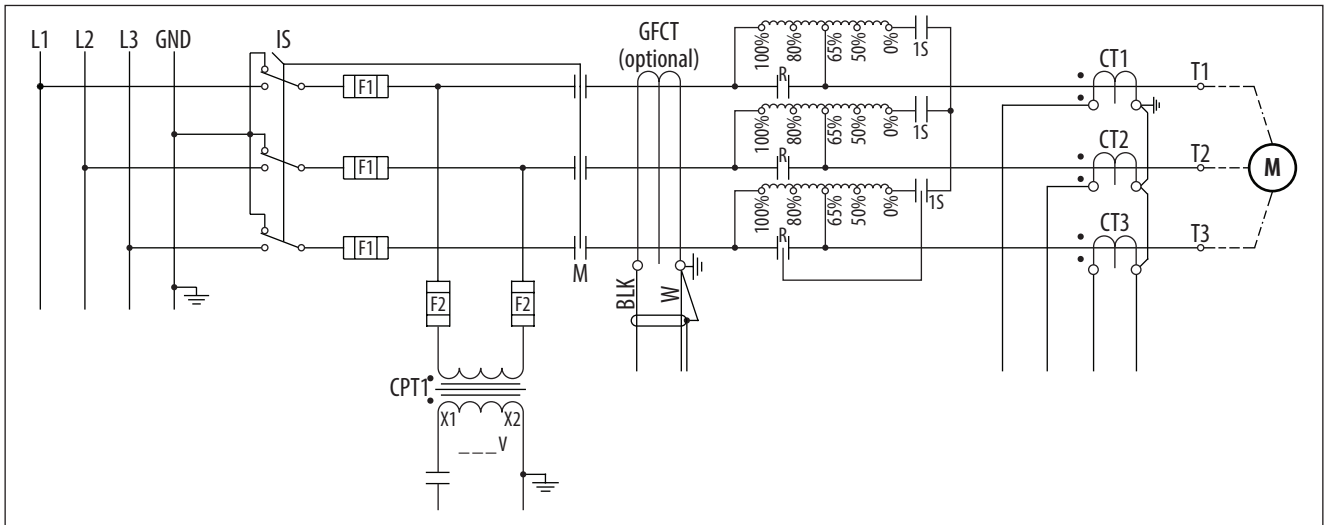


Bulletin 1572/1576/1582 Starter Specifications

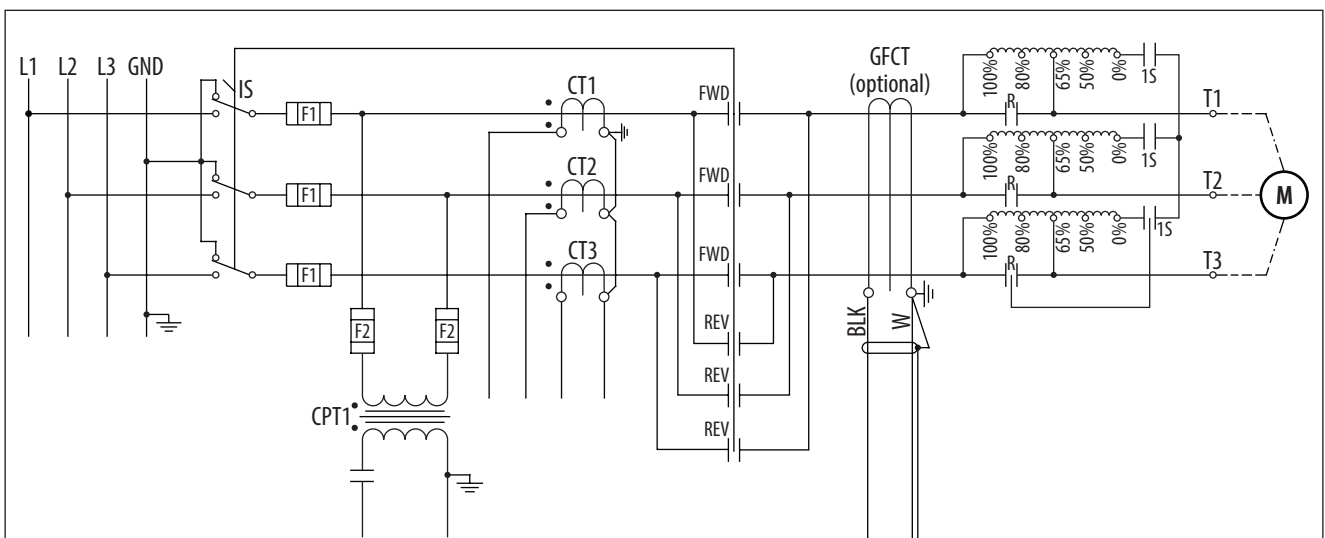
Controller Type	Starter Size	Hp, max				Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
		2400V	3300V	4160V	4800V	Width	Depth	Height	
1572	200 A	800	1000	1250	1500	56 (1422)	36 (914)	91 (2311)	3750 (1703)
	400 A	1500	2250	2750	3000				5000 (2270)
	600 A	2250	4000	4500	5500	80 (2032)			5000 (2270)
	800 A	3500	5000	6000	7000	100 (2540)			5000 (2270)
1576	200 A	800	1000	1250	1500	80 (2032)	36 (914)	91 (2311)	3750 (1703)
	400 A	1500	2250	2750	3000				5000 (2270)
	800 A	3500	5000	6000	7000	100 (2540)			5000 (2270)
1582	200 A	800	1000	1250	1500	56 (1422)	36 (914)	91 (2311)	3750 (1703)
	400 A	1500	2250	2750	3000				5000 (2270)
	600 A ⁽¹⁾	2250	4000	4500	5500	80 (2032)			5000 (2270)
	800 A ⁽¹⁾	3500	5000	6000	7000	100 (2540)			5000 (2270)

(1) 600 A and 800 A controllers require a separately quoted autotransformer with minimum dimensions of 52 in. (1321 mm) wide, 46 in. (1168 mm) deep, and 66 in. (1676 mm) high.

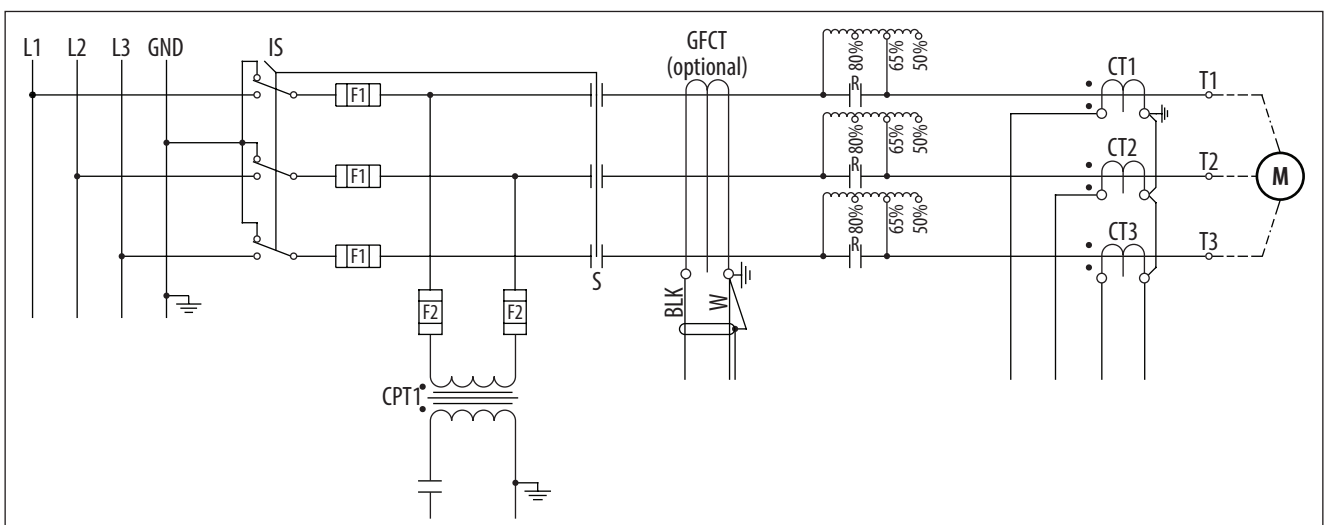
Bulletin 1572 Power Circuit Schematic



Bulletin 1576 Power Circuit Schematic



Bulletin 1582 Power Circuit Schematic



Bulletin 1906B/1912B Full-voltage Reversing and Non-reversing Brush-type Synchronous Motor Starter

- Forward-mounted vacuum contactors are implemented within the Bulletin 1906B starter
- The Bulletin 1912B starter showcases both forward and reverse vacuum contactors
- Standard SyncProll field application and protection system



Description of Features

- Bulletins 1906B and 1912B are designed as a complete reversing and non-reversing synchronous starter, respectively⁽¹⁾
- Available with or without static exciter
- Features a control power transformer (CPT) with primary and secondary fuses for converting line voltage to single-phase 120V for low voltage devices

(1) See the standard features provided with the Bulletin 1506 and 1512 motor controllers.

Bulletin 1906B Starter Specifications

Starter Size	Hp, max				Dimensions, in. (mm), approx. ⁽¹⁾			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	Width	Depth	Height	
200 A	800	1000	1250	1500	26 (660)	36 (914)	91 (2311)	1075 (490)
400 A	1500	2250	2750	3000				
800 A	3500	5000	6000	7000	92 (2337)			3570 (1619)

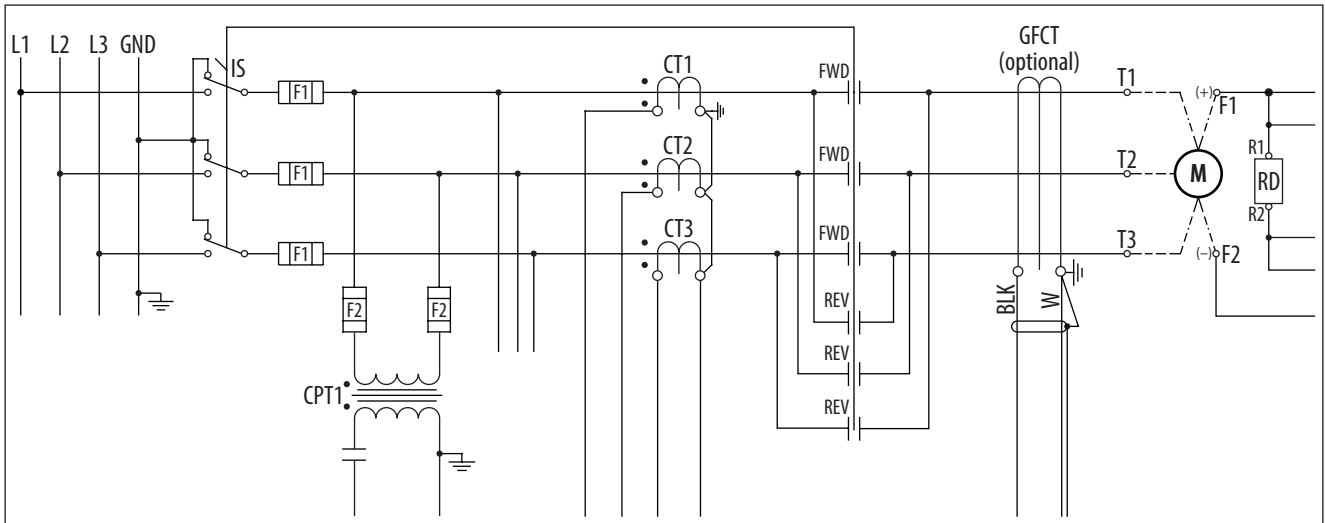
(1) These dimensions exclude static exciter.

Bulletin 1912B Starter Specifications

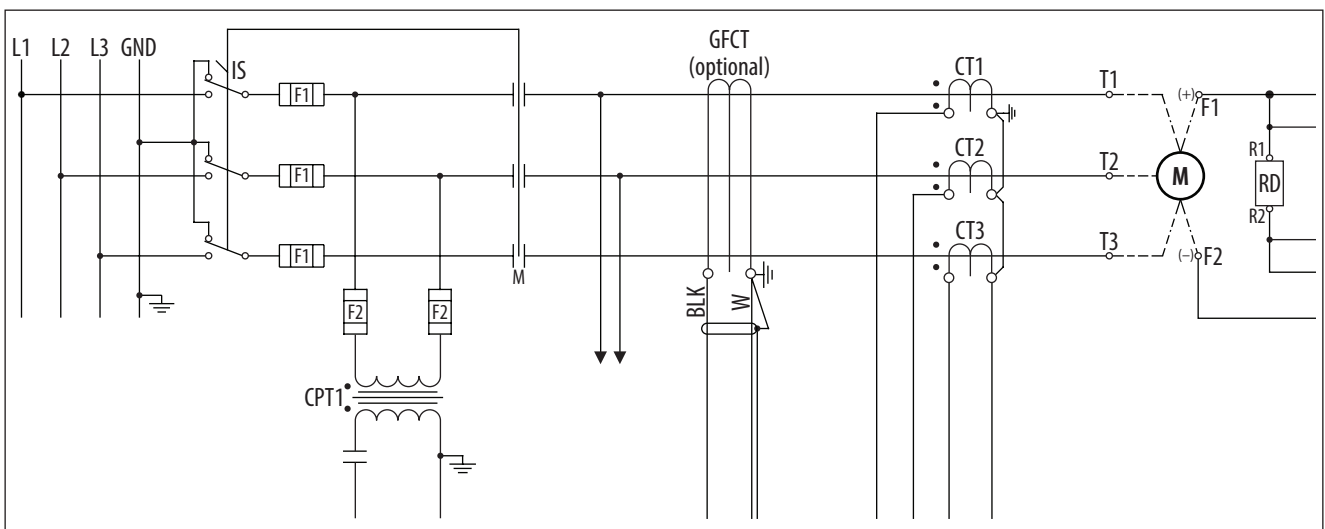
Starter Size	Hp, max						Dimensions, in. (mm), approx. ⁽¹⁾			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	6600V	6900V	Width	Depth	Height	
200 A	800	1000	1250	1500	2000	2250	26 (660)	36 (914)	91 (2311)	1075 (490)
400 A	1500	2250	2750	3000	4500					
600 A	2750	3500	4500	5500	Contact factory		36 (914)			1700 (773)
800 A	3500	5000	6000	7000			56 (1422)			1950 (885)

(1) These dimensions exclude static exciter.

Bulletin 1906B Starter Circuit Schematic



Bulletin 1912B Starter Power Circuit Schematic



Bulletin 1906L/1912L Full-voltage Reversing and Non-reversing Brushless Synchronous Motor Starter

Description of Features

- Bulletins 1906L and 1912L are designed as complete reversing and non-reversing synchronous starters, respectively⁽¹⁾
- Available with or without static exciter

- Features a control power transformer (CPT) with primary and secondary fuses for converting line voltage to single phase 120V for low voltage devices
- Forward-mounted vacuum contactors are implemented within the Bulletin 1906B starter
- The Bulletin 1912L starter showcases both forward and reverse vacuum contactors



(1) See the standard features provided with the Bulletin 1506 and 1512 motor controllers.

Bulletin 1906L Starter Specifications

Starter Size	Hp, max				Dimensions, in. (mm), approx. ⁽¹⁾			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	Width	Depth	Height	
200 A	800	1000	1250	1500	54 (1372)	36 (914)	91 (2311)	2370 (1076)
400 A	1500	2250	2750	3000				
800 A	3500	5000	6000	7000	74 (1880)			2400 (1090)

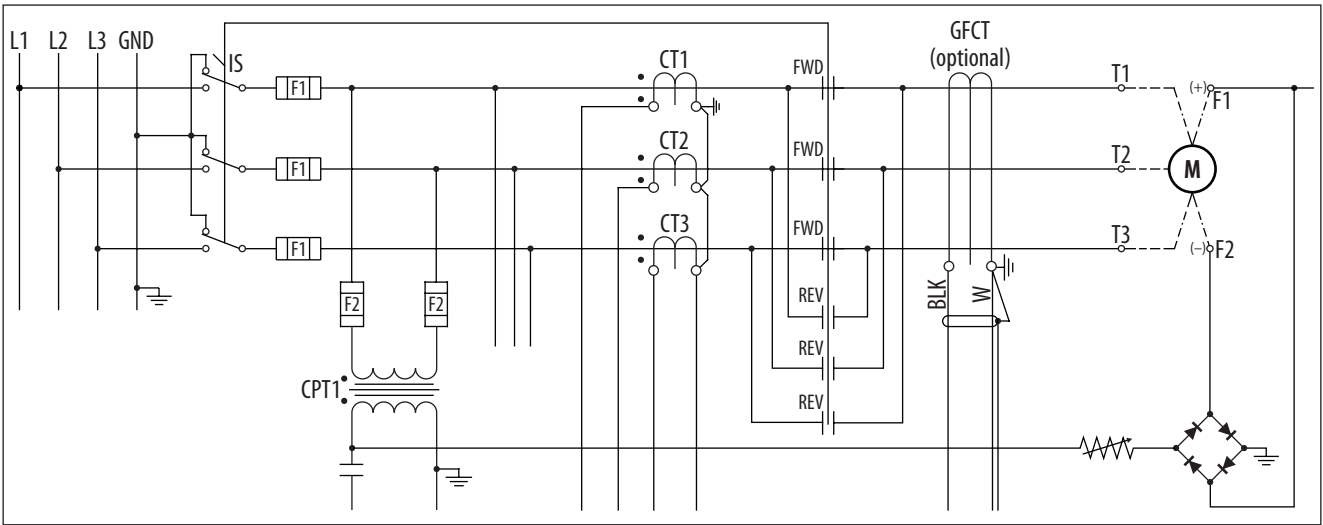
(1) These dimensions exclude static exciter.

Bulletin 1912L Starter Specifications

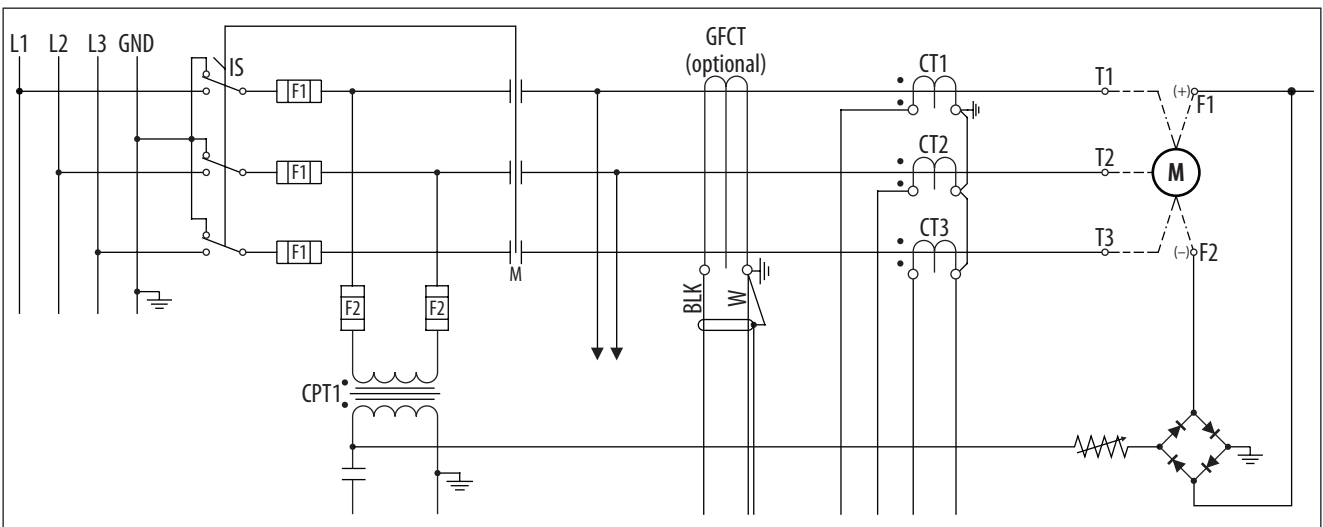
Starter Size	Hp, max					Dimensions, in. (mm), approx. ⁽¹⁾			Weight, lb (kg), approx.	
	2400V	3300V	4160V	4800V	6600V	6900V	Width	Depth		Height
200 A	800	1000	1250	1500	Contact factory		26 (660)	36 (914)	91 (2311)	1075 (490)
400 A	1500	2250	2750	3000						
600 A	2750	3500	4500	5500			54 (1372)			1950 (885)
800 A	3500	5000	6000	7000			74 (1880)			2400 (1090)

(1) These dimensions exclude static exciter.

Bulletin 1906L Starter Power Circuit Schematic



Bulletin 1912L Starter Power Circuit Schematic



Bulletin 1591A/B Incoming Line Units

Description of Features

- Incoming bus arrangement for top or bottom cables
- Provision for the low voltage panel and door
- Metering CTs and PTs available
- Lug pad with provision for multiple incoming cable lug terminations
- Only Bulletin 1591B comes as a two-high structure; also available in ArcShield designs



Bulletin 1591A/B Incoming Line Units Specifications

Voltage Rating	Incomer Size, in. (mm)	Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
		Width	Depth	Height	
2400...6900	18 (457)	18 (457)	36 (914)	91 (2311) ⁽²⁾⁽⁴⁾	600 (272) ⁽³⁾
	36 (914)	36 (914)		91 (2311) ⁽²⁾	800 (363) ⁽³⁾
	44 (1118) ⁽¹⁾	44 (1118)		91 (2311)	1200 (545)

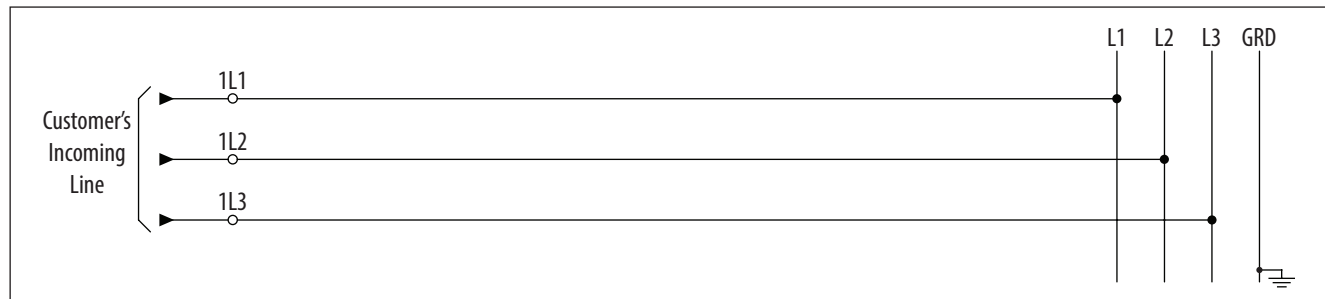
(1) A 44-in. (1118-mm) incomer is only available when a 3000 A power bus is used.

(2) Height is 128. in. (3264 mm) with ArcShield enclosure with plenum.

(3) Weight is different with ArcShield.

(4) Only available size for 1591B.

Bulletin 1591A/B Power Circuit Schematic



Bulletin 1592BF, 1592F/M, and 1594F/M Fused and Non-fused Load-break Switches

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 two-high structures
- Bulletin 1592BF – fused load break switch, which is designed as a feeder for two-high structures
- Bulletin 1592F/M – fused load break switch, fused feeder, and mains
- Bulletin 1594F/M – non-fused load break switch for feeder and mains



Bulletin 1592BF Switch Specifications⁽¹⁾

Starter Size	Transformer Size (kVA)						Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	6600V	6900V	Width	Depth	Height	
200 A	700	1000	1250		2000		36 (914)	91 (2311)	1770 (804) ⁽²⁾	
400 A	1500	2000	2500	2750	—				1770 (804)	

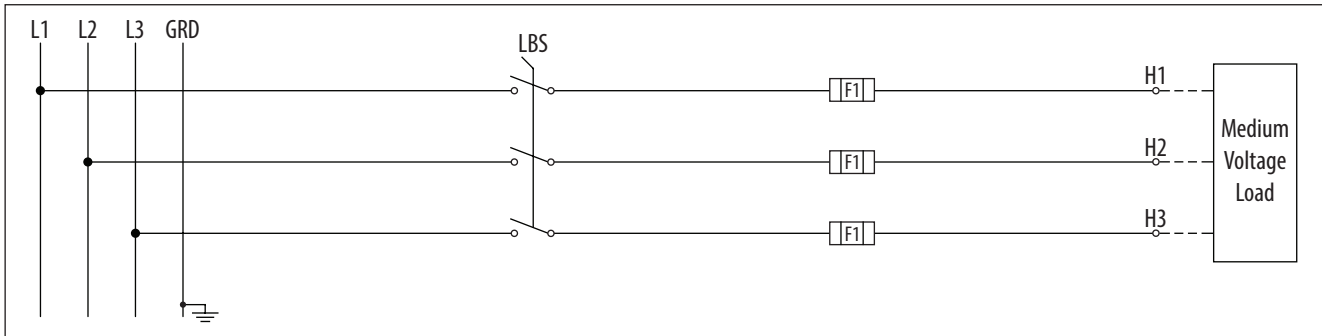
- (1) One 1592BF occupies half of a two-high structure.
 (2) Includes complete two-high structure weight with two 1592BF units.
 (3) Weight is different with ArcShield.

Bulletins 1592F/M and 1594F/M Switch Specifications

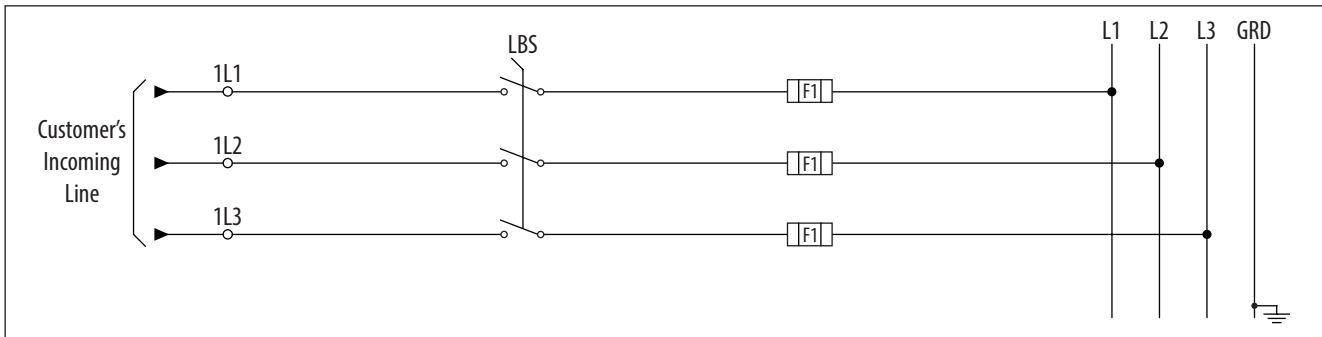
Switch Size	Switch Size, max						Dimensions, in. (mm), approx.			Weight, lb (kg), approx.
	2400V	3300V	4160V	4800V	6600V	6900V	Width	Depth	Height	
600 A	⁽¹⁾						36 (914) ⁽²⁾	36 (914)	91 (2311)	1770 (804)
1200 A	⁽¹⁾				—		54 (1372) ⁽³⁾	42 (1067)		2500 (1135)

- (1) Available in all sizes except 1200 A at 6600V and 6900V.
 (2) If an isolated, low-voltage panel is required, the width increases by 18 in. (272 mm) and weight increases accordingly.
 (3) If an isolated, low-voltage panel is required or incoming cables are fed from the bottom, the width increases by 18 in. (272 mm) and the weight increases accordingly. If the 42-in. deep unit is positioned on either end of 36-in. (94 mm) deep structures, the width increases by an additional 4 in. (104 mm).

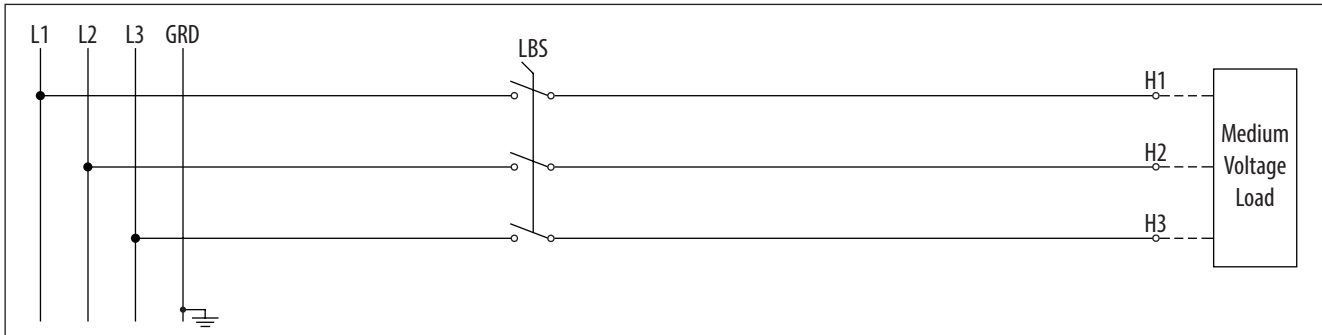
Bulletin 1592BF/1592F Power Circuit Schematic



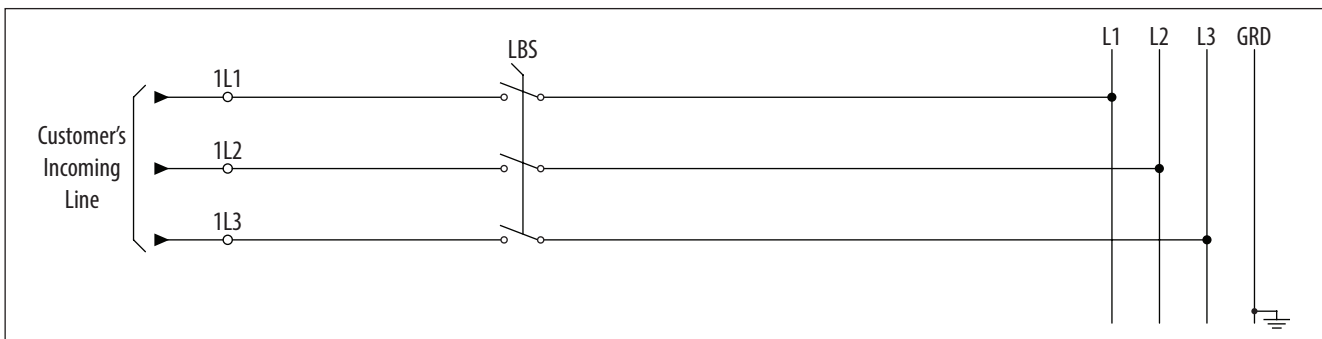
Bulletin 1592M Power Circuit Schematic



Bulletins 1592F and 1594F Power Circuit Schematics



Bulletins 1592M and 1594M Power Circuit Schematics



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