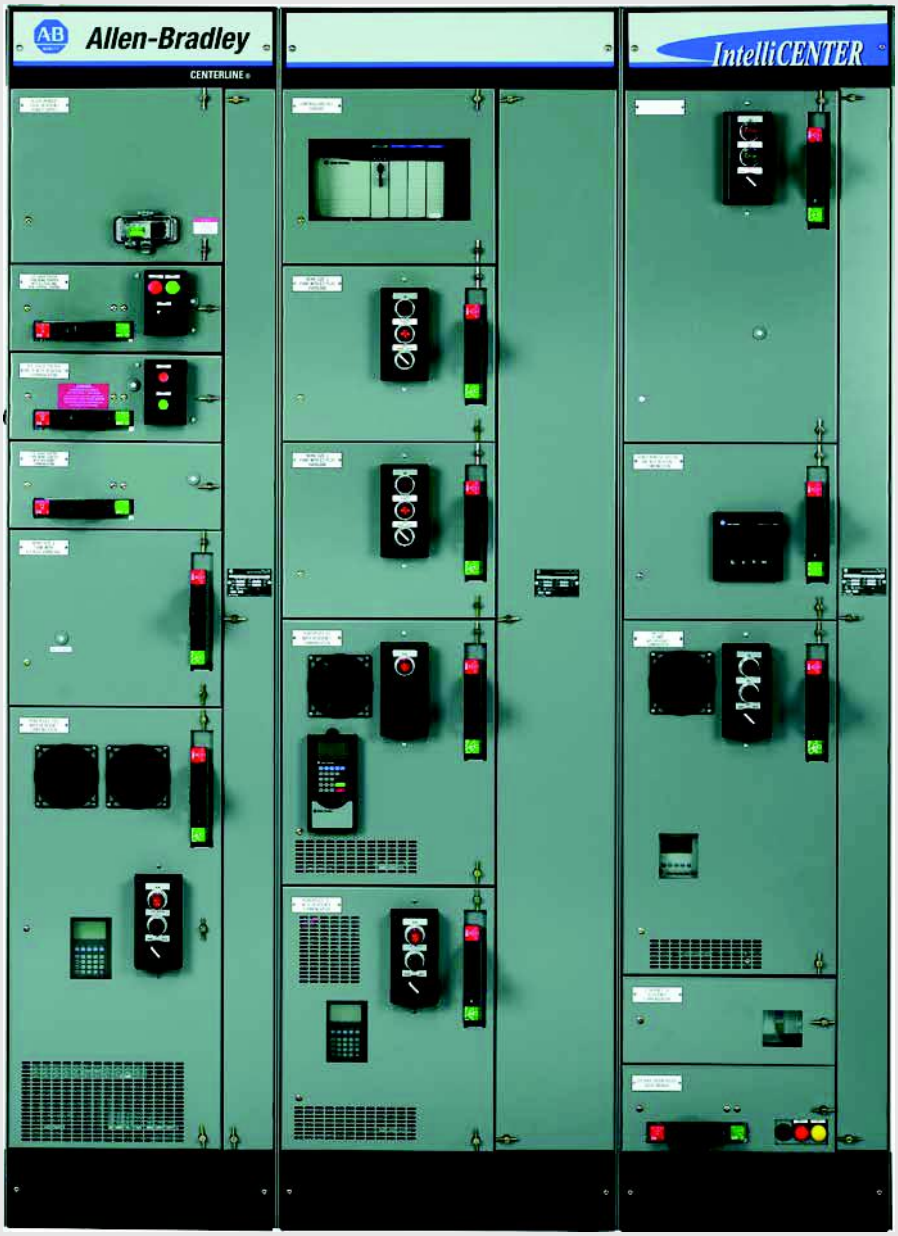
Procurement Specification

Allen-Bradley

CENTERLINE 2100 Low Voltage Motor Control Centers



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Notes:

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CENTERLINE® 2100 Low Voltage Motor Control Centers

General Information

The motor control center (MCC) shall be Allen-Bradley CENTERLINE 2100.

The MCC shall be designed, manufactured, and tested to meet or exceed the requirements within NEMA ICS-18, UL845, CSA C22.2 No. 14 and EN 60439-1 for motor control centers.

The MCC shall perform its function when exposed to a seismic event as defined by the 2006 International Building Code seismic requirements for electrical equipment.

The MCC shall have an altitude class of 6600 ft (2 km).

The MCC shall have an ambient operating temperature of 0…40 °C (32…104 °F) with up to 95% noncondensing humidity.

The MCC shall be designed, manufactured, and tested in facilities registered to ISO 9001 quality standards.

The MCC shall be dead front construction incorporating horizontal and vertical power bus, including neutral bus as required and horizontal and vertical ground bus as required.

The MCC shall consist of one or more vertical sections bolted together forming a rigid, free-standing assembly designed to permit future addition of vertical sections and interchanging of the units.

The MCC shall be designed for up to 600V.

MCC Structure

Vertical Sections

Vertical sections shall be rigid, free standing structures with heavy duty internal mounting angles running continuous within the shipping block. Two clearance holes shall be provided in each section for bolting or welding to the prepared mounting site. Optional external mounting channels 1-1/2 x 3 in. (38.1 x 76.2 mm) shall be available. A removable continuous steel lifting angle shall be provided on all shipping blocks, except for NEMA Type 3R and Type 4 where the lifting angle is optional.

Each vertical section shall be 90 x 20 x 15 in. (2286 x 508 x 381 mm) HxWxD. Vertical sections shall also be available as 20 in. deep (508 mm). Some vertical sections may be wider than 20 in. (508 mm) due to larger equipment or extra-width vertical wireway.

Back-to-back vertical sections shall be made up of two separate vertical sections. The front and back sections shall have separate horizontal and vertical power bus providing the same phasing on units, both front and back. Full usage of unit space shall be available for front and back sections. There shall be no back plate between the sections. The horizontal power bus shall be linked, front to rear, with a factory installed U-shaped bus splice assembly.

The maximum standard number of sections per shipping block for front mounted section shall be three. The maximum standard number of sections for back-to-back sections shall be six.

Generally, any section wider than 20 in. (508 mm) shall require its own shipping block, but sections with 9 in. (229 mm) vertical wireway shall be available in a 2-section shipping block.

To minimize the chance of fault propagation to adjacent sections, each section shall have side sheets extending the full height and depth of the section.

Each vertical section shall be equipped with a removable one piece top plate. Removable end plates shall be used to cover the horizontal power bus and horizontal wireway openings at each end of the MCC.

Vertical sections shall contain 6.0 space factor or 78 in. (1981 mm) of plug-in space.

All enclosure metal work shall have rounded edges and shall be tightly fitted with no visible air gaps. Gasketing made of closed cell neoprene material shall be used. MCC enclosures shall be designed and built according to NEMA standards. The following NEMA Types shall be available:

- NEMA Type 1 (IP20, IP30, IP40)
- NEMA Type 1 with gasketing around perimeter of unit doors (IP20, IP30, IP40)
- NEMA Type 12 (IP54)
- NEMA Type 3R non walk-in (IP44)
- NEMA Type 4 non walk-in (IP65)

All structural metal parts shall undergo a multi-step cleaning, rinsing, and painting process resulting in complete paint coverage of uniform thickness. The process shall be maintained and controlled by ISO 9001 quality standards.

All interior and exterior surfaces shall be painted ANSI 49 medium light gray. The interior vertical wireways and unit back plates shall be painted high visibility gloss white. The exterior of NEMA Type 3R MCCs shall be painted ultraviolet resistant, high gloss white; recognized by UL for outdoor use.

All unpainted surfaces shall be plated for corrosion resistance.

Stainless steel structural parts shall not be painted.

MCC Structure Components

The approximate gauges of the components that make up the MCC structure shall be as listed.

Major Structural Components	Nominal		Approximate Gauge
	in.	mm	
Side Plates	0.075	1.905	14
Reinforcing "C" Channel	0.105	2.667	12
Backplate 20" Wide	0.075	1.905	14
Backplate 25" – 40" Wide	0.105	2.667	12
Bottom Mounting Angle	0.164	4.166	8
Right-Hand Unit Support	0.075	1.905	14
Covers and Panels			
Top Plate (all widths)	0.075	1.905	14
Bottom Plate	0.075	1.905	14
External End Plate	0.075	1.905	14
Horizontal Wireway Cover	0.060	1.524	16
Wireway Baffle	0.075	1.905	14
Top Horizontal Wireway Pan	0.060	1.524	16
Doors			
Unit Door (1.0 - 5.0 Space Factor)	0.075	1.905	14
Unit Door (6.0 Space Factor)	0.105	2.667	12
Vertical Wireway Door	0.060	1.524	16
Other Steel			
Pull Box Parts	0.075	1.905	14
Unit Wrap Around	0.075	1.905	14
Unit Support Pan	0.075	1.905	14

Horizontal Wireways

Top and bottom horizontal wireways shall extend the full depth of the MCC. Horizontal wireways shall be 6 in. (152.4 mm) high and extend the length of the MCC with at least one 25 $in.^2$ (16,129 mm^2) opening between sections. A single opening shall be provided for 15 in. (381 mm) deep sections, and two openings shall be provided for 20 in. (508 mm) deep sections. To prevent damage to cable insulation, the wireway openings between sections shall have rounded corners and the edges shall be rolled back. Horizontal wireways shall be isolated from all power bus bars. Horizontal wireways of back-to-back sections shall allow complete access front to rear. Horizontal wireways shall have removable covers held closed by captive screws.

Horizontal wireways for incoming line sections shall be 6 x 7 in. (152 x 178 mm) HxD isolating the wireway from the incoming line area.

Vertical Wireways

An integral 78 in. (1981 mm) full height vertical wireway shall be provided in each standard vertical section isolated from the horizontal and vertical power bus. A permanent vertical wireway wall shall separate the units from the vertical wireway, and remain intact when the units are removed. If a permanent vertical wireway wall cannot be provided, tie bars shall be included in each vertical wireway. Standard vertical wireways shall be 4-3/8 x 7 in. (111 x 178 mm) WxD. An optional 9 in. (228 mm) wide vertical wireway shall be available, making the section 25 in. (635 mm) wide. A removable hinged door with ¼-turn pawl-type latches shall cover the vertical wireway. Tie bars shall be available for the vertical wireway.

Power Bus

The power bus system shall be supported, braced, and isolated by a bus support molded of high strength, non-tracking glass polyester material. Horizontal and vertical power buses shall be fastened together with a bus clamp assembly. Minimum bus bracing shall be 42 kA rms symmetrical with 65 kA and 100 kA rms symmetrical available.

Horizontal Power Bus

The horizontal power bus shall be continuous in each shipping block and mounted near the vertical center of the structure, providing optimum heat distribution, power distribution, and ease of maintenance and splicing. The horizontal power bus shall be mounted on-edge in a vertical plane providing maximum strength to magnetic forces. The horizontal power bus shall be mounted in recessed channels of the bus support to protect against accumulation of dust and tracking between phases.

The horizontal power bus shall be available as follows:
600…800 A Aluminum with tin plating
600…3000 A Copper with tin plating or copper with silver plating

Splicing horizontal power buses shall be accomplished by using a splice kit of the same ampere rating as the horizontal power bus. Double stud clamp assemblies made up of flat washers and pre-assembled nuts and conical washers shall be used. These assemblies shall provide a minimum of two 3/8 in. (9.52 mm) bolted connections on each side of the splice. The splice connections shall be front accessible for servicing. The location of splices shall be indicated by a label on the inside of the vertical wireway door.

Vertical Power Bus

Vertical power bus bars shall be cylindrical to provide optimum contact with the unit plug-in stabs. Vertical power bus bars shall be continuously braced by a high strength, non-tracking glass polyester material and sandwiched by a glass-filled polycarbonate molded bus cover isolating the vertical power bus from the other vertical phases and the horizontal power bus. The vertical power bus shall be isolated from personnel by a red non-metallic molded cover.

The standard vertical power bus shall be a copper tube rated 300 A above and below the horizontal power bus for an effective 600 A rating. An optional copper rod rated 600 A above and below the horizontal power bus for an effective 1200 A rating shall be available.

The vertical power bus shall be tin-plated or silver-plated. The plating of the vertical power bus shall match the plating of the horizontal power bus.

Shutters shall automatically open when a unit is inserted and automatically close when a unit is removed, so personnel are not exposed to live vertical power bus bars and so the bus is isolated from arcing faults.

Horizontal Ground Bus

The horizontal ground bus shall be unplated copper or optional tin-plated copper and shall be located in the top and/or bottom horizontal wireway.

The ¼ x 1 in. (6.35 x 25.4 mm) horizontal ground bus shall have an effective 500 A continuous rating and the ¼ x 2 in. (6.35 x 50.8 mm) shall have an effective 900 A continuous rating.

The horizontal ground bus shall have various sized holes evenly spaced along the length for making ground connections.

A pressure type mechanical lug shall be mounted on the horizontal ground bus in the incoming line section.

An outgoing equipment ground lug, when specified, shall be mounted on the horizontal ground bus.

Vertical Ground Bus

A 3/16 x 3/4 in. (4.74 x 19.05 mm) zinc-plated vertical plug-in ground bus shall be provided in each standard vertical section. An optional 3/16 x 3/4 in. (4.74 x 19.05 mm) unplated copper or tin-plated copper vertical plug-in ground bus shall be available. The vertical plug-in ground bus shall be mechanically connected to the horizontal ground bus, forming a complete internal grounding system.

The vertical plug-in ground bus in combination with the unit ground stab shall establish a first make, last break operation of the ground connection with respect to the power connections for plug-in units.

An optional 3/16 x 3/4 in. (4.74 x 19.05 mm) unplated or tin-plated copper vertical unit load shall be available. The vertical unit load ground bus shall be mechanically connected to the horizontal ground bus.

The vertical unit load ground bus in combination with the unit load connector shall provide a termination point for the load ground cable at the unit. This fixed connection shall not need to be removed when withdrawing the unit from the MCC.

Horizontal Neutral Bus

The horizontal neutral bus, when specified for four-wire systems, shall be located above or below the horizontal power bus. Connections to the horizontal neutral bus shall be made though neutral connection plates mounted in the horizontal wireways of various vertical sections. A neutral connection plate or incoming neutral bus riser shall be provided for the termination of the incoming neutral line.

A vertical neutral bus may be used in lieu of neutral connection plates connected to the horizontal neutral bus. This vertical neutral bus shall be located in a 9 in. (228 mm) wide vertical wireway and shall be mechanically connected to the horizontal neutral bus.

Incoming Line Lug Compartment

Main incoming line lug compartments shall be available in either top or bottom incoming and utilize mechanical or crimp compression lugs. Compartments shall be front accessible.

NEMA 2-hole spacing (1-3/4 in. [44.45 mm] between hole centers) and lugs for either aluminum or copper conductors shall be used.

Main Fusible Disconnect

Main fusible disconnect units shall consist of a heavy duty switch and fuse block assembly. The unit shall be front accessible and have removable protective barriers on the line side reducing the possibility of accidental contact with line terminals. Main fusible disconnect units shall be frame mounted (hardwired to horizontal power bus) and shall be located at the top or bottom of the vertical section.

Main fusible disconnects through 600 A shall be supplied with either Class J, R, or H fuse blocks while mains 800 A and above shall be supplied with Class L fuse blocks.

Main fusible disconnect switches rated through 400 A shall have visible blade-type movable contacts.

Main fusible disconnects rated 600…2000 A shall incorporate a bolted pressure contact switch with visible blades and viewing window.

Main fusible disconnect switches rated through 800 A shall be suitable for service entrance equipment while mains rated 1200 A and above may require ground fault protection for service entrance labeling.

Main Circuit Breaker

Main circuit breaker units shall have inverse time (thermal magnetic or electronic) circuit breakers. The unit shall be front accessible and has removable protective barriers on the line side reducing the possibility of accidental contact with line terminals. Main circuit breaker units shall be frame mounted and shall be located at the top or bottom of the section.

MCC Unit Design

Plug-in units shall consist of unit assembly, unit support pan, and unit door assembly.

Plug-in units shall be supported and guided by removable unit support pans. Rearranging unit support pans shall be accomplished without the use of tools.

Units shall be designed in 0.5 space factor increments. Each 0.5 space factor shall be 6.5 in. (165.1 mm) high.

Units shall be held securely in the section when inserted. Units shall also be designed so they cannot be inserted or withdrawn when the disconnect means is in the ON position.

- 0.5 space factor units shall use a single latch/interlock mechanism. This mechanism shall allow the unit to be held securely in two positions: Normal operating—where the power stabs are engaged with the vertical power bus, and service position—where the power stabs are disconnected from the vertical power bus, but separate control power can still be connected. With the unit fully inserted in the normal operating position, the latch/interlock mechanism shall be engaged with a bushing on the unit support pan. This shall securely hold the unit in the vertical section and shall not allow the unit to be removed with the handle in the ON position.
- 1.0 space factor and larger units shall use front mounted latches to secure the unit in the vertical section. There shall be at least one latch at the top and one latch at the bottom of the unit. Additionally, an interlock mechanism linked to the disconnect handle shall engage with the unit support pan above preventing the unit from being removed when the disconnect means is in the ON position. The interlock shall also be used to secure the unit in a service position.

The interlock mechanisms shall be such that they can be padlocked in the service position and be padlocked when the unit is withdrawn to prevent the insertion of the unit into a vertical section.

Non-reversing starters (FVNR) shall be plug-in through NEMA Size 5.

Power Stab Assembly

The two-piece stab housing shall be made of high strength, non-tracking glass polyester material and shall provide a separate isolated pathway for each phase.

The power cable connection at the plug-in stab shall be made with a maintenance free crimp-style connection. There shall be no exposed wiring at the back of the unit between the disconnecting means and the plug-in stabs.

Unit plug-in power stabs shall be free-floating and self aligning.

Unit plug-in power stabs shall be tin-plated copper for a low resistance connection and designed to tighten during heavy current surges.

Unit plug-in power stabs shall be backed by stainless steel spring clips to provide and maintain a high pressure, four-point connection to the vertical power bus.

Withdrawable Power Stabs

Plug-in units shall have the capacity of withdrawing the power stabs, allowing the primary voltage to be disconnected with the unit door closed. The withdrawable assembly shall accept a standard 1/4" hex-style drive socket. A complete power engagement shall occur when turning the mechanism ¼ turn in clockwise direction. Complete power disengagement shall occur when turning the mechanism ¼ turn in counter-clockwise direction.

The withdrawable stabs design shall include a set of stab assembly-mounted shutters. These shutters shall automatically open before the power stabs can extend and connect to the vertical bus. Likewise, the shutters shall close as soon as the power stabs are disconnected from the vertical bus and are completely inside the stab housing.

Withdrawable Power Stabs Interlock Mechanisms

The following interlock mechanisms shall be included:

1. Through-the-door mechanism that allows the unit to be locked in the "Power Stabs Disconnected" position. This mechanism shall be such that it can be padlocked to prevent the connection of the stabs to the vertical bus even when the unit is inserted into the vertical section. The unit door shall be capable of opening with the padlock and lockout engaged.
2. The unit disconnect handle must be in the OFF position (load side of the disconnect device removed from line power) before the stabs can be disconnected from the vertical bus. This mechanism shall also allow the removal of the unit from the vertical section but **only** after the disconnect handle has been turned OFF **and** the power stabs have been disconnected from the vertical bus. Likewise, the unit stabs have to be disconnected (withdrawn) before the unit can be re-inserted into the vertical section.

Withdrawable Power Stabs Feedback Mechanisms

The following feedback mechanisms shall be included and verifiable with the unit door closed:

1. A two-position indication system shall be provided (Power Stabs Connected/Disconnected) and shall be visible from the door.
   a. Connected with Red Indication–Primary voltage stabs fully engaged and connected to the vertical bus.
   b. Disconnected with Green Indication–Primary voltage stabs fully disconnected from the vertical bus.

2. Power stabs position

   A set of probes shall be located on the front of the unit. A positive continuity check between these probes shall verify that all three power stabs have been disconnected from the vertical bus and completely withdrawn inside the stabs housing.

3. Position of stab housing mounted shutters

   A set of probes shall be located on the front of the unit. A positive continuity check between these probes shall verify that the shutters are closed, meaning that all three power stabs have been disconnected and withdrawn inside the stab housing.

The withdrawable power stabs with door closed mechanism shall not increase the original unit height design so total space in the motor control center is optimized.

A remote operating device shall be supplied to allow the connection and disconnection of the power stabs with the door closed. The minimum distance shall be not less than three times the minimum default value recommended by the NFPA 70E (Arc Flash Protection Boundary–Annex D).

Disconnect Handle Mechanism

An industrial, heavy duty, flange-mounted handle mechanism shall be supplied for the control of the disconnecting means in each unit. The handle mechanism shall be engaged with the disconnecting means at all times as an integral part of the unit regardless of the position of the door.

The disconnect handle shall be made of non-conductive, 30% glass filled Type 6 nylon material.

The disconnect handle shall operate in the vertical plane for 1.0 space factor and larger units and in the horizontal plane for 0.5 space factor units.

The ON-OFF condition for the disconnect means shall be indicated by the following:

- Handle position
- Red and green colored indicators
- The words ON and OFF
- International symbols I (ON) and O (OFF)
- Pictorials representing handle positions (ON, OFF, and TRIPPED) for circuit breaker units

The disconnect handle shall be designed such that it can be locked in the OFF position with up to three 3/8 in. (9.5 mm) diameter shackle padlocks and in the ON position with one 3/8 in. (9.5 mm) shackle padlock.

The disconnect handle of all units shall be interlocked with the unit door so the disconnect means cannot be switched to the ON position unless the door is closed. This interlock shall also prevent opening the door unless the disconnect means is in the OFF position. An externally operated defeater shall be provided for access to the unit without interrupting service.

The disconnect handle shall be interlocked with the unit so the unit cannot be inserted or withdrawn with the disconnect handle in the ON position.

Disconnecting Means

Fusible disconnect switches shall be available in MCC units. The fusible disconnect switches shall have visible blade-type movable contacts and supplied with Class J, R, H, L, HRCII-C, or CC fuse clips. Fusible disconnect requirements above 400 A shall use a bolted pressure contact switch with a visible blade disconnect mechanism.

Circuit breaker disconnects shall be available in MCC units. Horsepower rated MCC units shall be provided with instantaneous circuit breakers, a motor circuit protector (MCP), or with inverse time (thermal magnetic or electronic) circuit breakers. Current rated MCC units shall be provided with inverse time (thermal magnetic or electronic) circuit breakers.

Terminal Blocks

When specified, control terminal blocks for Traditional NEMA starter units shall be the following:

- Front accessible in the unit
- Pull-apart type, rated 25 A, 600V (#12 AWG max) for plug-in units 1.0 space factor and above
- Pull-apart type, rated 10 A, 300V (#14 AWG max) for 0.5 space factor plug-in units
- Fixed type, rated 55 A, 600V (#8 AWG max) for frame mounted units
- Provided with terminal markings

When specified, control terminal blocks for Space Saving NEMA starter units shall be the following:

- Front accessible in the unit
- Pull-apart type, rated 10 A, 300V (#14 AWG max)
- Provided with terminal markings

When specified, power terminal blocks for Traditional NEMA starter units shall be the following:

- Pull-apart type, rated 60 A, 600V (#4 AWG max) for NEMA Size 1 and 2
- Fixed type, rated 175 A, 600V (2/0 AWG max) for NEMA Size 3
- Provided with terminal markings

Power terminal blocks shall not be provided for Space Saving NEMA starter units and NEMA Size 4 or larger Traditional NEMA starter units.

Control Wiring

Standard control wire shall be copper #16 AWG MTW (TEW) 90 °C (194 °F), VW-1 rated.

Copper #14 AWG (tinned) MTW (TEW) 90 °C (194 °F), VW-1 rated control wire shall be available.

Copper #14 AWG (tinned) SIS 90 °C (194 °F) control wire shall be available.

Brady Datab, heat shrink, or sleeve-type wire markers shall be available.

Power Wire

Power wire shall be 90 °C (194 °F) minimum, VW-1 rated. Minimum size used shall be #10 AWG.

Control Power

Unit control power shall be provided by a control circuit transformer, a separate control source, or common control:

- The control circuit transformer shall be mounted in the unit. The secondary side of the control circuit transformer shall have one leg fused and the other leg grounded. Primary protection shall be provided by primary fusing.
- The separate control source shall have an available auxiliary contact on the disconnect means and available separate control fuse.
- The common control source shall operate at line voltage with available common control fusing.

Pilot Devices

Pilot devices, when specified, shall be mounted in a door mounted polyester control station. The control station shall be easily removed using captive screws.

The control station shall accommodate up to three 30.5 mm pilot devices or up to six 22.5 mm pilot devices for units 1.0 space factor and above.

The control station shall accommodate up to four 22.5 mm pilot devices for 0.5 space factor units.

Pilot devices shall have NEMA ratings.

Unit Doors

Each unit shall be provided with a removable door mounted on removable pintype hinges that allow the door to open at least 110 degrees. The unit doors shall be removable from any location in the MCC without disturbing any other unit doors. The unit door shall be fastened to the structure so it can be closed to cover the unit space when the unit is removed. The unit doors shall be held closed with ¼-turn pawl type latches. Units with overload relays shall have an external reset button.

Nameplates

The MCC master nameplate, when specified, shall be located on the top horizontal wireway cover.

The MCC master nameplate shall be 6 x 2 in. (152.5 x 50.8 mm) with black lettering on a white background. The nameplate shall have up to five lines of engraving.

Unit nameplates shall be provided. The dimensions are 3-5/8 x 1-1/8 in. (92.07 x 28.57 mm):

- Clear cardholders shall be available. Blank cards shall be inserted into the cardholder.
- Engraved acrylic nameplates shall be available. They shall be white with black lettering or black with white lettering.
- Engraved phenolic nameplates shall be available. They shall be white with black lettering, black with white lettering, or red with white lettering.
- Engraved unit nameplates shall have three or four lines of engraving as follows:
  - 3-line nameplates:
    a. 0.22 in. (5.59 mm) letter size
    b. First line 17 characters
    c. Second line 15 characters
    d. Third line 17 characters

– 4-line nameplates:
  a. 0.18 in. (4.57 mm) letter size
  b. First line 25 characters
  c. Second line 22 characters
  d. Third line 22 characters
  e. Fourth line 25 characters

Nameplates shall be secured by using two steel self-tapping screws. Stainless steel screws shall be available.

The MCC shall have network cabling integrated throughout the vertical sections.

IntelliCENTER® Technology

Each motor starter, AC drive, and soft starter in the MCC shall be supplied with a means to communicate via the DeviceNet or EtherNet/IP network.

DeviceNet Cable

Per the National Electrical Code [article 300-3(c)(1)] and the Canadian Electrical Code (Rule 12-904) the DeviceNet cable shall have an insulating rating equal to at least the maximum circuit voltage applied to any conductor within the enclosure or raceway, that is, no special separation, barriers, or internal conduit is required for the DeviceNet conductors.

The DeviceNet cable used for the trunk line shall be flat cable rated 8.0 A, 600V, Class 1.

The DeviceNet cable used for the droplines to connect DeviceNet units shall be round cable rated at 8.0 A, 600V, Class 1.

EtherNet/IP Cable

Per the National Electrical Code [article 300-3(c)(1)] and the Canadian Electrical Code (Rule 12-904) the EtherNet/IP cable shall have an insulating rating equal to at least the maximum circuit voltage applied to any conductor within the enclosure or raceway, that is, no special separation, barriers, or internal conduit is required for the EtherNet/IP conductors.

All EtherNet/IP cable used in the MCC shall be UL PLTC rated to 600V. EtherNet/IP cable shall be rated for use in a cable tray shared with high-voltage power cables.

No substitutes are allowed.

DeviceNet Cable Layout

A DeviceNet trunkline shall be routed through the MCC lineup, behind barriers that isolate the trunkline from the unit space and wireways to prevent accidental mechanical damage during MCC installation.

Six DeviceNet ports shall be provided in the rear of each full height vertical wireway to simplify installation, relocation, and addition of plug-in MCC units.

The DeviceNet component within each plug-in unit shall be connected to one of the six DeviceNet ports in the vertical wireway with cable outlined above in the DeviceNet Cable section.

The addition or removal of a unit from the DeviceNet system shall not interrupt the operation of other units within the system.

EtherNet/IP Cable Layout

Cable shall connect each section to one another in the top or bottom wireways.

The EtherNet/IP cable shall be routed through the MCC lineup from the top or bottom wireways. To prevent accidental mechanical damage during MCC installation, the cable shall be located behind barriers to isolate the cable from the unit space and wireways.

Eight Ethernet/IP ports shall be provided in the rear of each full height vertical wireway to simplify installation, relocation, and addition of plug-in MCC units.

The EtherNet/IP device within each plug-in unit shall be factory connected to one of the EtherNet/IP ports in the vertical wireway with the 600V UL PLTC rated cable outlined above in the EtherNet/IP Cable section.

The addition or removal of a unit from the EtherNet/IP system shall not interrupt the operation of other units within the system.

Power Supply

The DeviceNet system in the MCC shall include a power supply that conforms to DeviceNet requirements and has the ODVA checkmark. The power supply shall provide 24V DC and shall be rated no less than 8.0 A.

The EtherNet/IP system in the MCC shall provide a built-in 24V power supply and power distribution network. All the EtherNet/IP switches, as well as some of the components in various units, are powered from this 24V DC supply. There are several configuration options for this power supply including the following:

- User-supplied 115V source
- 480V source with disconnect option
- 480V source with circuit breaker option
- Redundant versions of the other three options

Power supply output shall be rated 8 A, 24V DC.

The power supply unit shall be provided with a buffer module to provide a minimum 500 ms ride-through at full load.

Scanner Modules

The DeviceNet system in the MCC shall include a DeviceNet scanner module that conforms to the DeviceNet requirements.

As an alternative to a traditional DeviceNet scanner module, linking devices can be used to link different communication networks to the MCC DeviceNet system (such as linking the ControlNet network to the DeviceNet network or the Ethernet network to the DeviceNet network).

DeviceNet System Performance

The DeviceNet system shall be designed to operate at 500 kbaud to maximize the system performance, unless precluded by the cumulative length of the trunk and drop lines. To achieve best performance, 250 kbaud shall be the minimum communication rate.

The DeviceNet system shall be qualified to communicate and perform under normal and adverse MCC electrical environments (for example, contactor electrical operation, contactor jogging duty, and unit short circuit fault).

The DeviceNet system shall be capable of Automatic Device Replacement (ADR).

The DeviceNet system shall be capable of On-line Scanlist changes at Run allowing network modifications to be performed on a DeviceNet system that is running.

The DeviceNet system shall be capable of the following scan modes: Polled, Change of State (COS), Strobe, and Cyclic.

The DeviceNet system shall be capable of transmitting and receiving data via I/O and explicit messaging.

DeviceNet Units

Motor Starter Units

Each motor starter shall have an electronic overload relay with the following features:

- On-board DeviceNet communication
- LEDs for status indication
- Test/Reset button
- Adjustable trip class (5 to 30)
- General purpose I/O (minimum 2I/1O, optional 4I/2O), rated for 110…120V AC or 24V DC as specified on drawing
- Unconnected Message Manager to allow the proxying of more than one master device
- Protective functions with programmable trip level, warning level, time delay, and inhibit window:
  - Thermal overload
  - Underload
  - Jam
  - Current imbalance
  - Stall
  - Phase loss
  - Zero sequence ground fault sensitive to 1.0 A (optional feature)
  - PTC thermistor input (optional feature)
- Current monitoring functions:
  - Phase current
  - Average current
  - Full load current
  - Current imbalance percent
  - Percent thermal capacity utilized
  - Voltage and energy measuring capabilities
  - Ground fault current (optional feature)
- Diagnostic information:
  - Device status
  - Warning status
  - Time to reset
  - Trip status
  - Time to overload trip
  - History of last five trips

Variable Frequency Drives and Soft Starters

Each variable frequency drive unit and soft starter unit shall have a DeviceNet communication module to communicate the status over the DeviceNet network.

Feeder Disconnects

Where required, fusible disconnect and circuit breaker feeder circuits shall have a DeviceNet I/O Module containing at least two inputs and one output. The inputs of the DeviceNet I/O module shall be rated for 110…120V AC or 24V DC as specified on drawings.

EtherNet/IP Units

EtherNet/IP Interface for Motor Starter Units

Motor starter units shall have an electronic overload relay that incorporates the following features:

- Built-in EtherNet/IP communication
- LEDs for status indication
- Test/Reset Button
- Selectable trip of NEMA Class 5 to 30. Unless indicated, the trip class shall be set for NEMA Class 20 operation.
- Four inputs and two outputs. Refer to the contract drawings for connection requirements.
- Protective functions:
  - Functions shall provide a programmable trip level, warning level, time delay, and inhibit window.
  - Protective functions shall include Thermal overload, Phase loss, Stall, Jam, Underload, Current imbalance, Remote trip, and PTC thermistor input.
  - Ground fault protection [is] [is not] required.

    If ground fault protection is required, the protection range shall be 1…5 A for NEMA Size 3 and smaller starters, and 20 mA…5A for NEMA Size 4 and larger starters.
- Current monitoring functions shall include phase current, average current, full load current, current imbalance percent, percent thermal capacity utilized, and ground fault current (if required).
- Voltage and energy measuring capabilities
- Diagnostic information shall include device status, warning status, time to reset, trip status, time to overload trip, and history of last five trips.
- Preventative maintenance information shall include Allowable starts per hour, required Time between starts, Starts counter, Starts available, Time until next start, total operating hours, and elapsed operating time.

- Overload relay shall include an on-board logic processor to allow basic logic to be performed within the overload relay based on network data and the status of the inputs to the overload relay.
- The overload relay shall support the following CIP messaging types: Polled I/O messaging, Change-of-state/cyclic messaging, Explicit messaging, Group 4 off-line node recovery messaging, and Unconnected Message Manager (UCMM).
- The overload relay shall provide the following functions to minimize network configuration time: Full parameter object support and Configuration consistency value.

EtherNet/IP Interface for Variable Frequency AC Drives and Solid-state Reduced Voltage Motor Controllers

The EtherNet/IP communication interface shall be supplied to allow for communication between the solid-state component and the Ethernet network.

EtherNet/IP Interface for Other Units

Provide an EtherNet/IP interface for other units as indicated on the contract drawings.

Refer to the contract drawing wiring diagrams for points to be monitored.

Programming of Parameters

DeviceNet System

The DeviceNet node address shall be set for each unit per the drawings. All other parameters may be left at the factory default setting.

The DeviceNet system components shall be preconfigured to operate at the appropriate communication rate.

EtherNet/IP System

The MCC manufacturer shall load the IP address into each unit.

The IP address shall be as indicated on the contract drawings or as provided by the contractor.

The MCC manufacturer shall test the MCC to ensure that each unit communicates properly prior to shipment.

Each unit shall have a label showing the IP address for the devices within it.

The MCC manufacturer shall provide a disk containing applicable electronic data sheet (EDS) files for the EtherNet/IP devices.

IntelliCENTER Software

The MCC shall be provided with preconfigured IntelliCENTER software. The software shall be capable of viewing multiple MCC lineups. The IntelliCENTER software communication driver shall allow the software to be installed and operated on Ethernet, ControlNet, or DeviceNet networks. The IntelliCENTER software shall be capable of functioning as a standalone software package or as an ActiveX control in a Human Machine Interface (HMI). The IntelliCENTER software shall be capable of displaying the following:

- Elevation View
  - Dynamically displays status information based on reading data from devices in MCC lineup
  - Sizeable view to allow ease of viewing multiple MCC lineups
  - Unit nameplate information
  - Unit status indicators (ready, running, warning, fault, no communication)
- Unit Monitor View
  - Preconfigured for a specific unit
  - Real time monitoring via analog dials and trending
  - Data configurable for customized viewing
  - Modifying device parameters
- Spreadsheet View
  - User configurable for customized monitoring
  - Sorting and cascading functions
  - Custom user fields
- Event Log
  - Track history of MCC unit
  - Automatic logging of trips, warnings, and changes
  - Manual entry of events
- Documentation
  - Front elevation drawings
  - Unit wiring diagrams
  - User manuals
  - Spare parts lists

Testing

The MCC with IntelliCENTER technology shall be powered up, configured, and tested in an ISO 9001 facility to ensure each unit communicates properly prior to shipment.

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support/, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support/.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

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