Allen-Bradley

Specification Guide

Low Voltage Motor Control Center Specifications in CSI Format

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Low Voltage Motor Control Centers (MCCs)

B. Related Sections

1. Motor Starters
2. Solid State Reduced Voltage Starters
3. Variable Frequency Drives
4. Automatic Transfer Switch

1.2 REFERENCES

A. The MCC shall meet or exceed the requirements within the following standards for MCCs.

1. NEMA ICS 18
2. UL845
3. NEC (NFPA 70)
4. CSA (cUL)
5. EN 60439 - 1

B. The MCC shall be designed, manufactured and tested in facilities registered to the following quality standards.

1. ISO 9001

1.3 DESIGN REQUIREMENTS

A. Provide MCC based upon NEMA standards and in accordance with the detailed specifications and drawings.

B. The manufacturer of the MCC shall also be the manufacturer of the across the line motor starters, solid state reduced voltage starters and variable frequency drives. The use of third party supply and assembly is not acceptable and will be rejected.

C. The contractor shall confirm motor full load amperage ratings and provide those to the MCC manufacturer.

1.4 PRE-MANUFACTURE SUBMITTALS

A. Refer to Section _____ for submittal procedures

B. Shop Drawings
   1. MCC elevations showing dimensional information
   2. Structure Descriptions showing
      a. Bus ratings
      b. Enclosure ratings
      c. Short circuit withstand ratings
      d. Other information as required for approval
   3. Conduit locations
   4. Required bus splices
   5. Unit descriptions including starter sizes, circuit breaker frame sizes, circuit breaker continuous ampere ratings, pilot devices, etc.
   6. Nameplate information
   7. Schematic wiring diagrams

C. Product Data
   1. Motor Control Center Publications
   2. Data sheets and publications on all major components including but not limited to the following
      a. Motor starters
      b. Circuit breaker and fuse information including time current characteristics
      c. Control power transformers
      d. Pilot devices
      e. Relays

D. Specification Response
   1. Detailed response to this specification showing where in the literature each requirement is satisfied.
   2. All clarifications and exceptions must be clearly identified.

E. Testing and Test Reports
   1. Testing shall be per manufacturer's standard.
   2. A copy of the test reports shall be provided as part of the final documentation.

F. Installation Instructions
   1. Provide a copy of the manufacturer's installation instructions that includes the following
      a. General description for reading nameplate data, serial numbers, UL markings and short circuit ratings
      b. Installation procedures including splicing procedures
      c. Conduit and cable installation
      d. Installing and removing plug-in units
      e. Operation of operator handles and unit interlocks
      f. Checklist before energizing
      g. Procedure for energizing equipment
      h. Maintenance procedures

1.5 FINAL SUBMITTALS

A. Refer to Section _____ for procedure on submittal of final documentation.

B. The contractor shall provide certification that the MCC has been installed in accordance with the manufacturer's instructions.

C. The contractor shall provide certification that all circuit breaker settings have been adjusted per field requirements.

D. The contractor shall provide certification that all power fuses have been selected and installed per field requirements.

E. The contractor shall provide certification that all solid state motor overload settings have adjusted per installed motor characteristics.

F. The contractor shall provide certification that any timing devices required in the starting circuitry have been properly adjusted.

G. Final Drawings. The manufacturer shall provide final drawings reflecting the "As-Shipped" status of the MCC. The contractor shall be responsible for making any changes to the "As-Shipped" drawings from the manufacturer to reflect any field modifications.

H. Maintenance Data

1. MCC installation instructions
2. Installation / Operation instructions for major components such as automatic transfer switch, circuit breakers, etc.
3. MCC spare parts listing and pricing
4. Name and phone number for a local distributor for the spare parts.

1.6 QUALITY ASSURANCE

A. The manufacturer of the MCC shall be the manufacturer of the motor starters including across the line starters, solid state starters and variable frequency drives, as required on this project.

1.7 REGULATORY REQUIREMENTS

A. Installation shall conform to the requirements of the latest edition of the National Electric Code.

B. MCCs shall be constructed to meet or exceed the latest UL requirements.

1.8 QUALIFICATIONS

A. The manufacturer shall have ISO 9001 registered facilities for the design, manufacture and testing of MCCs.

1.9 DELIVERY, STORAGE AND HANDLING

A. The contractor shall coordinate the shipping splits with the MCC manufacturer for entry into the building.

B. The contractor shall store the MCCs in a clean, dry and heated space.

C. The contractor shall protect the units from dirt, water, construction debris and traffic.

D. During storage the contractor shall connect internal space heaters (if specified) with temporary power.

E. MCCs are to be shipped with external lifting angles at the top and running continuously for each shipping split. Lifting eyelets are not acceptable.

1.10 ENVIRONMENTAL REQUIREMENTS

A. The MCC enclosure rating shall be appropriate for the environment where the MCC is to be located.

1.11 FIELD MEASUREMENTS

A. The Contractor shall verify all field measurements prior to the fabrication of the MCC.

1.12 WARRANTY

A. The manufacturer shall provide their standard parts warranty for eighteen months from the date of shipment or twelve months from the date of being energized, whichever occurs first.

B. The manufacturer shall confirm this warranty as part of the submittal.

1.13 SPARE MATERIALS

A. Provide three of each size power fuse utilized.

B. Provide spare fuses equal to 10% of the installed quantity for primary and secondary control power transformer protection.

C. Provide one spare starter for each NEMA size provided on the project.

D. Provide one can of spray touch-up paint, ANSI 49.

PART 2 MOTOR CONTROL CENTER SPECIFICATIONS

2.1 MANUFACTURERS

A. Rockwell Automation® Allen-Bradley®

B. Substitutions: Any request for substitution must be made at a minimum of ten days prior to the bid date. The request for substitution must include the information required in the submittal portion of this specification. This information must include the specification response and all necessary product information showing compliance to the specification.

2.2 RATINGS

A. Voltage - Unless shown differently on the drawings, the MCC shall be rated for a 480V or 600V system.

B. Short Circuit Withstand Rating – Unless shown differently on the drawings, the MCC shall be rated for a fault current of 42,000A.

C. The MCC shall be fully rated for the available fault current shown. Use of series ratings for overcurrent devices is not acceptable.

2.3 ENCLOSURE

A. The MCC shall be NEMA _____.

B. Removable end plates on each end of the MCC shall cover all horizontal bus and horizontal wireway openings.

C. Each section shall be equipped with two full metal side sheets to isolate each vertical section.

D. All interior and exterior surfaces shall be painted ANSI 49 medium light gray. The vertical wireways and unit back plates shall be painted high visibility gloss white.

E. All unpainted parts shall be plated for corrosion resistance.

2.4 STRUCTURE

A. The MCC shall be of dead front construction and shall consist of one or more vertical sections bolted together to form a rigid, free-standing assembly. The systems shall be designed to allow for the addition of future sections at either end and to permit the interchanging of units

B. Vertical sections shall be rigid, free-standing structures.
   1. Vertical sections shall have internal mounting angles running continuously within the shipping block.
   2. Vertical sections shall be 90 inches high, 15 or 20 inches deep and 20 inches wide except where larger dimensions are required.
   3. Vertical sections shall be provided with a removable steel lifting angle on all shipping blocks. The angle shall run the length of the shipping block.

C. Provide full depth horizontal wireways at the top and bottom of the MCC.
   1. The horizontal wireways shall be isolated from the bus.
   2. The horizontal wireways shall have removable covers held in place by captive screws.

D. Provide a full height vertical wireway, independent of the plug-in units, in each standard vertical section.
   1. The vertical wireway shall be isolated from the vertical and horizontal buses.
   2. The vertical wireway shall be covered with a hinged and secured door.
   3. Wireway tie bars shall be provided.
   4. Isolation between the wireway and units shall be provided.

2.5 UNIT INFORMATION

A. The minimum compartment height shall be 13 inches and this shall be considered one space factor. One-half space factor compartment shall only be supplied when specified in the drawings.

B. NEMA Size 5 starters and below shall be provided as plug-in units.

C. Plug-in units
   1. Plug-in units shall consist of unit assembly, unit support pan and unit door assembly.
   2. Units shall be supplied with removable doors. The unit doors shall be fastened to the structure so that the doors can be closed when the unit is removed.

3. A unit support pan shall be provided for support and guiding units. Unit support pans shall remain in the structure when units are removed to provide isolation between units.
4. A service position shall be provided for plug-in units that allows for the unit to be supported, but disengaged from the bus. The unit shall be capable of being padlocked in the service position.

D. Power Stabs
1. Unit stabs for engaging the power bus shall be tin plated copper and provided with stainless back-up springs to provide and maintain a high pressure 4-point connection to the vertical bus.
2. Wiring from the unit disconnecting means to the plug-in stabs shall not be exposed to the rear of the unit. A separate isolated pathway shall be provided for each phase to minimize the possibility of unit fault conditions reaching the power bus system.
3. The power cable termination at the plug-in stab shall be a maintenance-free crimp type.

E. Handle
1. Units shall be provided with a heavy-duty, non-conductive industrial, flange mounted handle mechanism for control of each disconnect switch or circuit breaker.
2. The operator units may pivot in the vertical or horizontal plane.
3. The on-off condition shall be indicated by the handle position, red and green color indicators with the words ON and OFF, and the international symbols I and O along with a pictorial indication of the handle position.
4. Handles shall be capable of being locked in the OFF position with up to three padlocks.
5. The operator handle shall be interlocked with the unit door so the disconnect cannot be switched to the ON position unless the unit door is closed. A means shall be provided for purposely defeating the interlock during maintenance or testing.
6. The operator handle shall be interlocked with the unit so that the unit cannot be inserted or withdrawn with the operator handle in the ON position.

F. Pilot Devices
1. Where specified, units shall be furnished with Allen-Bradley NEMA Type 4/13 water tight / oil tight pushbuttons, selector switches or pilot lights.
2. When three or less pilot devices are utilized, the devices shall be Allen-Bradley Bulletin 800T or 800H 30.5mm devices. When more than three devices are required, the use of Allen-Bradley Bulletin 800E or 800F 22.5mm devices is permitted.

G. Terminal Blocks
1. Control terminal blocks shall be pull-apart on all plug-in units for easy removal of the unit from the structure.
2. Control terminal blocks on factory mounted units shall be fixed type.
3. Provide power terminal blocks on starters, rated NEMA size 3 and below. Power terminal blocks shall be pull-apart for NEMA size 1 and 2. Terminal blocks for NEMA size 3 starters shall be non-pull apart. Power terminal blocks are not required on NEMA size 4 and above. Exception: NEMA-Rated starter units where power terminal blocks are not required.
4. Terminal blocks shall not be located adjacent to or inside the vertical wireway.

2.6 BUS BARS
A. Horizontal Power Bus
1. The horizontal bus shall be rated as shown on the drawings.

2. The horizontal bus material shall be copper with tin plating.
3. The horizontal bus shall be supported, braced and isolated from the vertical bus with a high strength, non-tracking glass polyester material.
4. For standard sections the horizontal bus shall be continuous within each shipping block and shall be braced within each section
5. Horizontal bus splices shall have at least two bolts on each side.

B. Vertical Bus

1. The vertical power bus shall have an effective rating of 600A. If a center horizontal bus construction is utilized, then the rating shall be 300A above and below the horizontal bus for an effective rating of 600A. If a top or bottom mounted horizontal bus is utilized, then the full bus must be rated for 600A.
2. The vertical bus material shall be copper with tin plating.
3. The vertical bus shall attach to the horizontal bus with at least two bolts.
4. The vertical bus shall be continuously braced by a high strength non-tracking glass-filled polyester material and sandwiched by a polycarbonate molded cover.
5. Automatic shutters shall cover plug-in stab openings when units are removed.

C. Ground Bus

1. Provide a ground bus system consisting of a horizontal ground bus connected to vertical ground buses mounted in each section.
2. Provide an unplated copper (0.25 inch by 1 inch or 0.25 inch by 2 inch) horizontal ground bus mounted in the bottom of the MCC unless otherwise specified in the drawings.
3. Provide a pressure type mechanical lug mounted on the ground bus in the incoming line section.
4. Provide a unit ground stab on all unit inserts. The ground stab shall establish unit insert grounding to the vertical ground bus before the plug-in power stabs engage the power bus. The grounding shall be maintained until after the plug-in power stabs are disengaged.

The following specifications are only required if a unit load ground bus is required. Delete if a unit load ground bus is not being utilized.

5. Provide an unplated copper vertical unit load ground bus in each standard vertical section.
6. Provide a unit load connector on all units. The load connector shall provide a termination point for the load ground cable at the unit.

D. Neutral Bus

1. If a 4-wire system is specified, yet there are no neutral loads in the MCC, only a neutral connection plate is required in the MCC; i.e. a full neutral bus is not required.
2. If neutral loads are specified within the MCC, a full neutral bus is required. Provide a neutral bus across the full width of the MCC, an incoming neutral lug pad in the incoming section, and neutral connection plates in sections as required.

2.7 DEVICENET COMMUNICATIONS

A. The MCC shall have DeviceNet wiring incorporated into its design.

1. The MCC shall have DeviceNet cabling incorporated throughout the vertical section.
2. Each motor starter, AC drive and soft starter unit in the MCC shall be supplied with a means to communicate via DeviceNet.

B. DeviceNet Cabling

1. All units shall be interwired and tested as a NEMA Class II MCC
2. Cable Ratings
   a. The DeviceNet cable shall be in compliance with Article 300.3(C)(1) of the National Electrical Code, 2005
   b. The insulating rating shall be equal to at least the maximum circuit voltage applied to any conductor within the enclosure or raceway.
   c. No special separation, barriers or internal conduit shall be required for the DeviceNet conductors.
   d. The trunk line cable shall be flat cable rated eight amperes, 600V, Class 1.
   e. The cable used to connect a unit to a DeviceNet port in the vertical wireway shall be round cable rated eight amperes, 600V, Class 1.

3. Layout
   a. A DeviceNet trunkline shall be routed through the MCC line-up. To prevent accidental mechanical damage during MCC installation, the trunkline shall be located behind barriers that isolate the trunkline from the unit space and wireways.
   b. Six DeviceNet ports shall be provided in the rear of each vertical wireway to simplify installation, relocation, and addition of plug in units.
   c. The DeviceNet component within each unit shall be connected to one of the six DeviceNet ports.

4. Power Supplies
   a. The MCC manufacturer shall check the user's design to ensure that adequate power supplies have been specified to conform with DeviceNet requirements.
   b. The power supply shall provide 24Vdc for the DeviceNet system and shall be rated no less than eight amperes.
   c. The power supply for the MCC DeviceNet system shall be supplied as a separate plug-in unit.

C. DeviceNet Interfaces
1. Motor Starter Units
   a. Motor starter units shall have an electronic overload relay that incorporates the following features.
      1.) On-board DeviceNet communications
      2.) LEDs for status indication
      3.) Test / Reset Button
      4.) Adjustable trip of NEMA Class 5 to 30. Unless indicated, the trip class shall be set for NEMA Class 20 operation.
      5.) Four inputs and two outputs. Refer to the drawings for connection requirements.
      6.) Protective functions
         a.) Functions shall provide a programmable trip level, warning level, time delay and inhibit window.
         b.) Protective functions shall include thermal overload, underload, jam, current imbalance, stall, phase loss, zero sequence ground fault and PTC thermistor input.
      7.) Current monitoring functions shall include phase current, average current, full load current, current imbalance percent, percent thermal capacity utilized and ground fault current (if specified).
      8.) Diagnostic information shall include device status, warning status, time to reset, trip status, time to overload trip and history of last five trips.

2. Variable Frequency AC Drives and Solid-State Controllers
    a. DeviceNet communication interface shall be supplied to allow for communications between the solid-state component and the DeviceNet system.
3. Miscellaneous Units
    a. Provide a DeviceNet interface for miscellaneous units as indicated on the drawings.
    b. The DeviceNet interface shall have four inputs and two outputs.
    c. Refer to the wiring diagrams for points to be monitored.

D. Programming and Testing
1. The MCC manufacturer shall load the DeviceNet MAC ID number (node address) into each unit.
2. The DeviceNet MAC ID number shall be as indicated or as provided by the contractor.
3. The DeviceNet network shall be designed and programmed for use at 250kB or 500kB.
4. The MCC manufacturer shall test the MCC to insure that each unit communicates properly prior to shipment.
5. Each DeviceNet device shall have a label showing the unit location, node address and baud rate.
6. The MCC manufacturer shall provide a disk containing applicable Electronic Data Sheet (EDS) files for the DeviceNet devices.

2.8 METERING COMPARTMENT

A. The MCC shall include a plug-in metering unit
B. The unit shall include the following
1. Fusible disconnect with fuses
2. Fused control circuit transformer
3. Current transformers shipped loose to be installed in the field
4. Power monitor with door mounted display

C. Power monitor
1. The power monitor shall be Allen-Bradley Powermonitor 3000
2. The power monitor shall be capable of displaying the following
    a. Line current for all three phases with plus or minus 0.2 percent full-scale accuracy
    b. Average three phase current with plus or minus 0.2 percent full-scale accuracy
    c. Line-to-neutral and line-to-line voltage with plus or minus 0.2 percent of full-scale accuracy
    d. Current and voltage unbalance
    e. Real, reactive, apparent and true power with plus or minus 0.4 percent full-scale accuracy
    f. KWh, KVARh and kVAHnet
    g. True RMS to the 45^{th} harmonic
    h. Frequency at plus or minus 0.5 percent
    i. Power factor at plus or minus 0.4 percent
3. The power monitor shall include min / max logs and trend logs with up to 45,867 data points.
4. The power monitor shall be capable of performing distortion analysis with THD, Crest Factor (I, V) and Distortion power factor.

5. The power monitor shall include a RS-485 communication port as standard and shall have options available for RS-232, DeviceNet, ControlNet, Remote I/O and EtherNet.
6. The power monitor shall include two form-C relays.

2.9 DISCONNECTS

A. Main Disconnect
1. The withstand rating of the main shall be greater than or equal to the bus bracing for the MCC.
2. Provide lugs to accommodate the conductors as indicated on the drawings.
3. If no overcurrent protection is indicated, provide a main incoming lug compartment.
4. Main Fusible Disconnect (if specified in drawings)
   a. Size fuses as shown on the drawings. Provide Class J or R fuses through 600Amps. Provide Class L fuses above 600Amps.
   b. Provide a removable protective barrier to reduce the possibility of contact with the line terminals.
   c. Provide one normally open and one normally closed auxiliary contact.
5. Main circuit breaker disconnect (if specified in drawings)
   a. Size the circuit breaker as shown on the drawings.
   b. Provide a circuit breaker of either the thermal magnetic or solid state type.
   c. Provide a removable protective barrier to reduce the possibility of contact with the line terminals.
   d. Provide one normally open and one normally closed internal auxiliary contact.
   e. For breakers rated 1,000A and above, provide integrated ground fault protection with adjustable pick-up and adjustable time delay

B. Feeder Disconnects and Transformer Disconnects
1. The disconnecting means for feeders and transformers shall be thermal magnetic circuit breakers.
2. The interrupting capacity rating shall be greater than or equal to the bus bracing requirement.
3. The minimum frame size shall be 150 amps
4. Provide one (1) N.O. internally mounted auxiliary contact for indication of “On” or “Off/Tripped.”

C. Motor Starter Disconnect
1. Across the line NEMA starters
   a. The disconnecting means for the across the line starters shall be motor circuit protectors.
   b. The short circuit withstand rating shall be greater than or equal to the bus bracing requirement.
   c. Units shall be supplied based upon the rules / requirements set forth in the NEC, NEMA and UL standards.
   d. Units shall be shipped at the lowest setting per UL standards. The contractor shall field adjust the units based upon the particular motor application.
   e. The minimum frame size shall be 150 amps.
   f. Provide one N.O. internally mounted auxiliary contact for indication of “On” or “Off/Tripped”.

2. Reduced Voltage Starters
   a. The disconnecting means for the across the line starters shall be motor circuit protectors

b. The short circuit withstand rating shall be greater than or equal to the bus bracing requirement.
c. Units shall be supplied based upon the rules / requirements set forth in the NEC, NEMA and UL standards.
d. Units shall be shipped at the lowest setting per UL standards. The contractor shall field adjust the units based upon the particular motor application.
e. The minimum frame size shall be 150 amps.
f. Provide one N.O. internally mounted auxiliary contact for indication of "On" or "Off/Tripped."

3. Solid State Controllers (Soft Starters and Variable Frequency Drives)
a. The disconnecting means for solid state controllers shall be fusible disconnect with current limiting fuses.
b. The short circuit withstand rating shall be rated 100,000 amperes (rms symmetrical).

2.10 AUTOMATIC TRANSFER SWITCH

A. Provide an automatic transfer switch if indicated on the drawings.

B. Provide the automatic transfer switch in compliance with the automatic transfer switch specification.

C. The automatic transfer switch shall be provided integral to the MCC.

2.11 COMBINATION NEMA RATED ACROSS THE LINE STARTERS

A. Starters shall be provided with a 3-pole Class 20 solid state. The overload shall provide overload and phase loss protection.

B. Starters shall be provided with a minimum of one N.O. and one N.C. auxiliary contact in addition to the hold in contact and auxiliary contacts shown on the drawings up to a maximum of seven beyond the hold-in contact.

C. Provide a 120 volt control power transformer with a primary and secondary fuse protection.

D. Provide a door mounted selector switch for Hand-Off-Auto operation. The Hand Mode shall provide local start control. In the Auto Mode, start control shall be provided through a remote contact. Provide an extra set of contacts on the selector switch for monitoring of switch position.

E. Provide door mounted 120 volt transformer type pilot lights for On (Red) and Off (Green) indication.

2.12 SOLID STATE MOTOR CONTROLLERS (SMC)

A. The unit shall be provided with a 120V control power transformer. The control power transformer shall be provided with primary and secondary fusing.

B. The SMC unit shall be provided with a separate bypass contactor for NEMA 12 designs. The bypass contactor shall be energized once the motor is up to full speed. The bypass contactor shall be fully rated for the motor load and be capable of starting the motor if so wired in the field. The unit shall be provided with a converter module so that the SMC overload can be utilized at all times.

C. SMC-3 applications shall feature an integrated bypass contactor that is energized once the motor is up to full speed. It should also include electronic overload protection with adjustable trip class and configurable auxiliary contacts.

D. SMC-Flex applications shall include integrated bypass and electronic overload, motor starting capabilities for star-delta and standard squirrel-cage induction motors.
The integrated bypass automatically closes when the motor reaches full speed.

E. Provide an input isolation contactor.

F. The SMC unit shall be provided with line side protective modules. The modules shall contain capacitors and metal oxide varistors (MOVs) that protect the internal power circuitry from severe electrical transients and / or high electrical noise.

G. Provide a door mounted selector switch for Auto-Manual control. In the auto mode, the start command shall be provided through a remote contact. In the manual mode, the start-stop control shall be provided through the door mounted push buttons. Provide extra contact blocks on the selector switch for monitoring of switch position.

H. Provide door mounted pushbuttons for start-stop and pump stop control. Stop pushbuttons shall always be active.

I. Provide door mounted transformer type pilot lights for indication of On (Red) and Off (Green).

2.13 VARIABLE FREQUENCY DRIVES

A. The unit shall be provided with a 120V control power transformer. The control power transformer shall be provided with primary and secondary fusing.

B. Provide a 120V control interface.

C. Provide a separate common mode choke on the output of the drive, if not already built in the unit.

D. Provide a door mounted selector switch for Auto-Manual control. In the auto mode, the start command shall be provided through a remote contact. In the manual mode, the start-stop control shall be provided through the door mounted push buttons. Provide extra contact blocks on the selector switch for monitoring of switch position.

E. Provide door mounted pushbuttons for start-stop control. Stop pushbuttons shall always be active.

F. Provide door mounted transformer type pilot lights for indication of On (Red) and Off (Green).

G. Provide a door mounted human interface module for programming, display and speed control.

H. Provide one isolated, configurable analog input and output.

I. For 18 Pulse applications, the 1336 Plus II Drive shall conform to the following:

1. Meets IEEE519-1992 at the drive input terminals

2. UL/cUL listed
3. Continuous horizontal power bus
4. Utilize a drive rollout construction for 75-250 HP
5. Allow splicing to any CENTERLINE MCC
6. Utilize patented 18 Pulse converter bridge and phase-shifting autotransformer

H. For Manual Isolated Drive Bypass applications shall conform to the following:

1. Design Overview
    a. The manual isolated drive bypass unit will consist of two units - an MCC bypass starter unit and an MCC variable frequency drive (VFD) unit. The intent of the manual isolated drive bypass unit is to isolate the variable frequency AC drive for servicing. When in bypass mode the MCC VFD unit shall meet NFPA 70E Hazard/Risk level 0. The MCC VFD unit door shall be interlocked with the MCC bypass starter unit. When in the bypass mode the motor can be energized and de-energized with the across-the-line bypass starter.
    b. All power components shall have a normal duty rating suitable for the nominal horsepower of the application.

    c. MCC Bypass Starter Unit
        i. The MCC bypass starter unit shall include the fusible disconnect or circuit breaker, the bypass contactor and overload relay, control circuit transformer and terminal blocks. “DRIVE ON” and “BYPASS ON” pilot lights shall be provided to indicate operational status.
    d. MCC VFD Unit
        i. The MCC VFD component shall be a PowerFlex® 70 or PowerFlex 700 VFD. A “DRIVE-OFF-BYPASS” selector switch, a “BYPASS START” push button and a “BYPASS STOP” push button shall be provided. These pilot devices shall be located in the same control station as the “DRIVE ON” and “BYPASS ON” pilot lights on the MCC bypass starter unit.

2. Isolating Disconnect
    a. The isolating disconnect shall be a six-pole device capable of making and breaking the load. Auxiliary isolating disconnect contacts will permit the operation of only one unit at a time either the MCC Bypass Starter or the MCC VFD.

3. Isolation Switch Operation
    a. Bypass Mode
        i. When in bypass mode the “BYPASS ON” pilot light shall be energized when the bypass motor control circuit is energized. When in bypass mode the MCC bypass starter unit and the MCC VFD unit are isolated from one another. In addition, the isolation switch shall have means to be padlocked, to prevent being switched to drive mode. In this mode no power shall be present in the MCC VFD unit. The MCC VFD unit shall be available for service at NFPA 70E Hazard/Risk Level 0.

    b. Drive Mode
        i. When in drive mode the isolating disconnect shall permit the MCC starter bypass unit to supply power to the MCC VFD unit and connects the MCC VFD unit to the motor. When the isolation switch is in the drive mode the “DRIVE ON” pilot light shall be energized. In addition, the isolation switch shall have means to be padlocked to prevent being switched to bypass mode.

4. Assembly
    a. The MCC bypass starter unit and the MCC VFD unit shall be factory assembled and wired to complete the manual isolated drive bypass unit.

5. Testing
    a. The manual isolated drive bypass unit shall meet cUL US listed according to safety standard UL 845 (UL) and be tested in an ISO9001 facility to ensure each unit conforms with this specification.

2.14 CONTROL AND LIGHTING TRANSFORMER

A. Provide control and lighting transformers as shown on drawings. The rating shown on the drawings shall be the minimum acceptable rating.

B. The insulation shall be 180°C insulation with 80°C rise.

C. Provide thermal magnetic circuit breaker for primary protection.

D. The primary circuit breaker compartment and transformer compartment shall be wired and interlocked together.

E. Provide secondary fuse protection for the transformer.

F. Provide vented doors with filters for NEMA Type 1 with gaskets and NEMA Type 12 structures.

2.15 LIGHTING PANEL

A. Provide lighting panel as shown on the drawings.

B. The lighting panel shall be rated for 10kA interrupting capacity.

1. Provide bolt-on branch breakers as shown on the drawings.

2.16 SCADA/PANEL

A. Provide a SCADA panel or PLC as shown on the drawings.

B. The SCADA/panel shall be provided with a thermal magnetic circuit breaker disconnect.

C. The programmable controller as specified in Section _____ shall be mounted in the SCADA panel.

D. The manufacturer of the MCC shall provide all interwiring between the SCADA panel and the specified points within the MCC.

PART 3 EXECUTION

3.1 INSTALLATION

A. Contractor shall install MCC in accordance with manufacturer's instructions.

B. Contractor shall tighten accessible bus connections and mechanical fasteners to the manufacturer's torque requirements.

C. Contractor shall select and install fuses in fusible switches based upon field requirements.

D. Contractor shall adjust circuit breaker settings based upon field requirements.

E. Contractor shall adjust solid state overloads to match the installed motor characteristics.

3.2 MANUFACTURER'S SERVICES

A. The manufacturer of the MCC shall be capable of providing the programming for the programmable logic controller and the operator interface if provided within the MCC.

B. The manufacturer of the MCC shall be capable of providing start-up services as part of the supply of the MCC.

3.3 TRAINING

A. A course outline shall be submitted as part of the MCC submittals.

B. The manufacturer shall offer off-site training on the concepts, knowledge and tools necessary to design, specify, install, troubleshoot and use a DeviceNet MCC.

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