1.1. REFERENCE STANDARDS

1.2. GENERAL

1.2.1. Motor controllers shall comply with IEEE, NEMA, NFPA, UL, and as shown on the drawings.

1.2.2. Motor controllers shall be separately enclosed, unless part of another assembly. For installation in motor control centers, provide plug-in, draw-out type motor controllers up through NEMA size 4. NEMA size 5 and above require bolted connections.

1.2.3. Motor controllers shall be combination type, with magnetic controller and with one of the following, if required:

1.2.3.1. circuit breaker
1.2.3.2. fused switch
1.2.3.3. motor circuit protector
1.2.3.4. disconnecting means, with external operating handle with lock-open padlocking positions and ON-OFF position indicator.

1.2.4. Fuses in starters to be CSA certified Form 1, current and energy limiting type 200,000 ampere interrupting capacity with NEMA Class “J” rejection type mountings.

1.2.5. Size fuses installed in starters or in disconnect switches used in conjunction with magnetic starters, for motor and branch circuit protection in accordance with fuse manufacturer’s recommendations.

1.3. MAGNETIC MOTOR CONTROLLERS (STARTERS)

1.3.1. Controllers shall be general-purpose, Class A magnetic controllers for induction motors rated in horsepower. Minimum NEMA size 0.

1.3.2. Where combination motor controllers are used, combine controller with protective or disconnect device in a common enclosure.

1.3.3. Provide phase loss protection for each controller, with contacts to de-energize the controller upon loss of any phase.

1.3.4. Unless otherwise indicated, provide full voltage non-reversing across-the-line mechanisms for motors less than 75 HP, closed by coil action and opened by gravity. For motors 75 HP and larger, provide reduced-voltage or variable speed controllers. Equip controllers with 120 VAC coils and individual control transformer unless otherwise noted.

1.3.5. Hand Off Automatic (H O A) switch is required. H-O-A switch shall be operable without opening enclosure door. H-O-A switch is not required for manual motor controllers.

1.3.6. Incorporate into each control circuit a 120 Volt, electronic time-delay relay (ON delay), minimum adjustable range from 0.3 to 10 minutes, with transient protection. Time-delay relay is not required where H O A switch is not required.

1.3.7. Unless noted otherwise, equip each motor controller with not less than two normally open (N.O.) and two normally closed (N.C.) auxiliary contacts.

1.3.8. Provide green (RUN) and red (STOP) pilot lights.

1.3.9. Motor controllers incorporated within equipment assemblies shall also be designed for the specific requirements of the assemblies

1.4. CIRCUIT BREAKERS (WHERE APPLICABLE):

1.4.1. Bolt-on thermal-magnetic type with a minimum interrupting rating as indicated on the drawings.

1.4.2. Equipped with automatic, trip free, non-adjustable, inverse-time, and instantaneous magnetic trips for less than 400A. The magnetic trip shall be adjustable from 5x to 10x for breakers 400A and greater.

1.4.3. Additional features shall be as follows:

1.4.3.1. A rugged, integral housing of molded insulating material.
1.4.3.2. Silver alloy contacts.
1.4.3.3. Arc quenchers and phase barriers for each pole.
1.4.3.4. Quick-make, quick-break, operating mechanisms.
1.4.3.5. A trip element for each pole, a common trip bar for all poles, and one operator for all poles.

1.5. FUSED DISCONNECTS (WHERE APPLICABLE)

1.5.1. Quick-make, quick-break type.

1.5.2. Minimum duty rating shall be NEMA classification General Duty (GD) for 240 Volts and NEMA classification Heavy Duty (HD) for 480 Volts.

1.5.3. Horsepower rated, and shall have the following features:

1.5.3.1. Copper blades, visible in the OFF position.
1.5.3.2. An arc chute for each pole.

1.5.3.3. Fuse holders for the sizes and types of fuses specified or as shown on the drawings.

1.5.4. Motor Circuit Protectors (where applicable)

1.5.4.1. Magnetic trip only.
1.5.4.2. Bolt-on type with a minimum interrupting rating as indicated on the drawings.
1.5.4.3. Equipped with automatic, adjustable magnetic trip. Magnetic trip shall be adjustable up to 1300% of the motor full load amperes.

1.6. ENCLOSURES:

1.6.1. Enclosures shall be NEMA-type rated 1, 3R, or 12 as required per the installed environment.

1.6.2. Enclosure doors shall be interlocked to prevent opening unless the disconnecting means is open. A "defeater" mechanism shall allow for inspection by qualified personnel with the disconnect means closed. Provide padlocking provisions.

1.6.3. All metal surfaces shall be thoroughly cleaned, phosphatized, and factory primed prior to applying light gray baked enamel finish.

1.7. MOTOR CONTROL CIRCUITS:

1.7.1. Shall operate at not more than 120 Volts.

1.7.2. The power for the control circuit shall be from the downstream of the breaker supplying power for the motor.

1.7.3. Shall be grounded, except where the equipment manufacturer recommends that the control circuits be isolated.

1.7.4. For each motor operating over 120 Volts, incorporate a separate, heavy duty, control transformer within each motor controller enclosure.

1.7.5. Incorporate primary and secondary over current protection for the control power transformers.

1.8. OVERLOAD RELAYS:

1.8.1. Thermal, Induction, Temperature Probe Thermal Relay, Electronic type, as specified. Devices shall be NEMA type.

1.8.2. One for each pole.

1.8.3. External overload relay reset pushbutton on the door of each motor controller enclosure.

1.8.4. Overload relays shall be matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

1.8.5. Thermal overload relays shall be tamperproof, not affected by vibration, manual reset, sensitive to single-phasing, and shall have selectable trip classes of 10, 20 and 30.