

430.245 Method of Grounding. Connection to the equipment grounding conductor shall be done in the manner specified in Part VI of Article 250.

(A) Grounding Through Terminal Housings. Where the wiring to motors is metal-enclosed cable or in metal raceways, junction boxes to house motor terminals shall be provided, and the armor of the cable or the metal raceways shall be connected to them in the manner specified in 250.96(A) and 250.97.

Informational Note: See 430.12(E) for equipment grounding connection means required at motor terminal housings.

(B) Separation of Junction Box from Motor. The junction box required by 430.245(A) shall be permitted to be separated from the motor by not more than 1.8 m (6 ft), provided the leads to the motor are stranded conductors within Type AC cable, interlocked metal tape Type MC cable where listed and identified in accordance with 250.118(10)(a), or armored cord or are stranded leads enclosed in liquidtight flexible metal conduit, flexible metal conduit, intermediate metal conduit, rigid metal conduit, or electrical metallic tubing not

smaller than metric designator 12 (trade size $\frac{3}{8}$), the armor or raceway being connected both to the motor and to the box.

Liquidtight flexible nonmetallic conduit and rigid nonmetallic conduit shall be permitted to enclose the leads to the motor, provided the leads are stranded and the required equipment grounding conductor is connected to both the motor and to the box.

Where stranded leads are used, protected as specified above, each strand within the conductor shall be not larger than 10 AWG and shall comply with other requirements of this Code for conductors to be used in raceways.

(C) Grounding of Controller-Mounted Devices. Instrument transformer secondaries and exposed non-current-carrying metal or other conductive parts or cases of instrument transformers, meters, instruments, and relays shall be grounded as specified in 250.170 through 250.178.

XIV. Tables

Table 430.247 Full-Load Current in Amperes, Direct-Current Motors

The following values of full-load currents* are for motors running at base speed.

Horsepower	Armature Voltage Rating*					
	90 Volts	120 Volts	180 Volts	240 Volts	500 Volts	550 Volts
$\frac{1}{4}$	4.0	3.1	2.0	1.6	—	—
$\frac{1}{3}$	5.2	4.1	2.6	2.0	—	—
$\frac{1}{2}$	6.8	5.4	3.4	2.7	—	—
$\frac{3}{4}$	9.6	7.6	4.8	3.8	—	—
1	12.2	9.5	6.1	4.7	—	—
1½	—	13.2	8.3	6.6	—	—
2	—	17	10.8	8.5	—	—
3	—	25	16	12.2	—	—
5	—	40	27	20	—	—
7½	—	58	—	29	13.6	12.2
10	—	76	—	38	18	16
15	—	—	—	55	27	24
20	—	—	—	72	34	31
25	—	—	—	89	43	38
30	—	—	—	106	51	46
40	—	—	—	140	67	61
50	—	—	—	173	83	75
60	—	—	—	206	99	90
75	—	—	—	255	123	111
100	—	—	—	341	164	148
125	—	—	—	425	205	185
150	—	—	—	506	246	222
200	—	—	—	675	330	294

*These are average dc quantities.

Exception: Automatic reclosing of a circuit shall be permitted where the circuit is exposed to transient faults and where such automatic reclosing does not create a hazard to persons.

(3) Combination Protection. Overload protection and fault-current protection shall be permitted to be provided by the same device.

430.226 Rating of Motor Control Apparatus. The ultimate trip current of overcurrent (overload) relays or other motor-protective devices used shall not exceed 115 percent of the controller's continuous current rating. Where the motor branch-circuit disconnecting means is separate from the controller, the disconnecting means current rating shall not be less than the ultimate trip setting of the overcurrent relays in the circuit.

430.227 Disconnecting Means. The controller disconnecting means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.

XII. Protection of Live Parts — All Voltages

430.231 General. Part XII specifies that live parts shall be protected in a manner judged adequate for the hazard involved.

430.232 Where Required. Exposed live parts of motors and controllers operating at 50 volts or more between terminals shall be guarded against accidental contact by enclosure or by location as follows:

- (1) By installation in a room or enclosure that is accessible only to qualified persons
- (2) By installation on a suitable balcony, gallery, or platform, elevated and arranged so as to exclude unqualified persons
- (3) By elevation 2.5 m (8 ft) or more above the floor

Exception: Live parts of motors operating at more than 50 volts between terminals shall not require additional guarding for stationary motors that have commutators, collectors, and brush rigging located inside of motor-end brackets and not conductively connected to supply circuits operating at more than 150 volts to ground.

430.233 Guards for Attendants. Where live parts of motors or controllers operating at over 150 volts to ground are guarded against accidental contact only by location as specified in 430.232, and where adjustment or other attendance may be necessary during the operation of the apparatus, suitable insulating mats or platforms shall be pro-

vided so that the attendant cannot readily touch live parts unless standing on the mats or platforms.

Informational Note: For working space, see 110.26 and 110.34.

XIII. Grounding — All Voltages

430.241 General. Part XIII specifies the grounding of exposed non-current-carrying metal parts, likely to become energized, of motor and controller frames to prevent a voltage aboveground in the event of accidental contact between energized parts and frames. Insulation, isolation, or guarding are suitable alternatives to grounding of motors under certain conditions.

430.242 Stationary Motors. The frames of stationary motors shall be grounded under any of the following conditions:

- (1) Where supplied by metal-enclosed wiring
- (2) Where in a wet location and not isolated or guarded
- (3) If in a hazardous (classified) location
- (4) If the motor operates with any terminal at over 150 volts to ground

Where the frame of the motor is not grounded, it shall be permanently and effectively insulated from the ground.

430.243 Portable Motors. The frames of portable motors that operate over 150 volts to ground shall be guarded or grounded.

Informational Note No. 1: See 250.114(4) for grounding of portable appliances in other than residential occupancies.

Informational Note No. 2: See 250.119(C) for color of equipment grounding conductor.

Exception No. 1: Listed motor-operated tools, listed motor-operated appliances, and listed motor-operated equipment shall not be required to be grounded where protected by a system of double insulation or its equivalent. Double-insulated equipment shall be distinctively marked.

Exception No. 2: Listed motor-operated tools, listed motor-operated appliances, and listed motor-operated equipment connected by a cord and attachment plug other than those required to be grounded in accordance with 250.114.

430.244 Controllers. Controller enclosures shall be connected to the equipment grounding conductor regardless of voltage. Controller enclosures shall have means for attachment of an equipment grounding conductor termination in accordance with 250.8.

Exception: Enclosures attached to ungrounded portable equipment shall not be required to be grounded.