1. Which drawing type shows physical details as seen by the eye?

2. Which drawing is similar to a pictorial drawing but has circles or rectangles for components?

3. Which drawing type shows the circuitry necessary for operation but not the physical components or their location?

4. Which diagram shows the most direct path and logical sequence of operation?

5. What is necessary in an electrical circuit before current can flow?

6. What are the main parts of an electrical circuit?

7. What is the term used to describe a circuit where a person is required to initiate and action?

8. What is indicated when two wires cross with a dark black node on the point?

9. How is a start pushbutton indicated on a line diagram?

10. What are three actions that will stop the motor in Diagram 4-10 4th Edition (Diagram 2-12 5th Edition) once it has started?

11. What type of contact is required on a float switch to maintain a water level in a tank?

12. What is the term used to describe an electrical device that converts electrical energy into linear mechanical force?

13. Which device is constructed similar to a solenoid but is designed to operate a set of contacts with the linear movement?

14. What is the difference between a Contactor and a Magnetic Starter?
15. What is the proper procedure when an overload condition occurs in a motor starter?

16. Which components are typically located inside a control panel?

17. Which components for motor control circuit may be located outside the control panel?

18. What is the most common tester for troubleshooting a control circuit?

Chapter 8 (Pages 207-210 MCC) 4th Edition

Chapter 28 (Pages 647-648 MCC) 5th Edition

1. What are three parts of motor control circuits centralized by a motor control center?

2. How does a motor control center differ from a switchboard containing motor panels?

3. What are some control inputs that are typically wired into the motor control panel?

4. What is the output connected to a motor control center?

5. What are some of the control devices connected to motor control centers?

6. Where is a two-wire level switch connected on a motor control center?

7. What wire reference numbers are typically used for wires installed by the manufacturer in a motor control center?

Chapter 9 (4th Edition)

Chapter 12 (5th Edition)

1. Why were knife switches discontinued as a means of controlling motors?

2. What improvements were made to the knife switch?

3. What is the purpose of a knife switch in relation to motors?

4. What is the purpose of double-break contacts?

5. What is the purpose of the springs on the moveable contact of a starter?

6. What is silver mixed with to produce a low resistance silver alloy?

7. What should be done with silver-oxide contacts that appear tarnished?
8. What is indicated by heavy dark lines, thin lines, and dashed lines on a wiring diagram?
9. What is a mechanical interlock for a manual starter?
10. What is a locked rotor condition for a motor?
11. What are the three stages of a motor operation?
12. What percentage of the FLA for a motor is typically drawn during startup?
13. What is ambient temperature?
14. Will fuses blow if a motor is slightly overloaded and heating up?
15. What is the purpose of the fuses in a motor circuit?
16. What is the purpose of the overloads in a motor circuit?
17. What is the most popular method of providing overload protection?
18. What is a eutectic alloy?
19. What actually opens when a melting alloy overload relay trips?
20. What provides the mechanical force to open the overload contact when a melting-alloy overload trips?
21. What happens if you reset the motor after an overload condition without removing the overload condition?
22. How is the overload relay changed for different sized motors?
23. What are some considerations when selecting a motor starter?
24. Which conductors must be disconnected when controlling a device according to the CEC and NEC?
25. What type of motor protection is not provided with manual motor starters and contactors?
26. What are some limitations of three-phase manual motor starters?
27. Which loads are typically controlled by a contactor?
28. What are the two main advantages of a contactor over a manual motor starter?
29. What is low-voltage release?
30. What is low-voltage protection?
31. How many wires are required to a starter from an input that provides low-voltage release as well as low-voltage protection?

32. What is typically the maximum control circuit voltage for motor starters?

33. Why are DC coils not laminated like the AC coils?

34. What is the term used to describe the device that dissipates the energy present across opening contacts?

35. What two values increase as contacts start to open?

36. What two characteristics differ for DC contactors over AC?

37. What makes AC arcs self extinguishing?

38. What are the three components of the de-ion principle?

39. What is another name for a DC magnetic blowout coil?

40. Why are single-break contacts in large contactors typically made of copper?

41. How is resistance reduced in copper contacts that are seldom opened or closes?

42. What are the three considerations when selecting a starter?

43. What type of contacts are typically used for closing short-circuit currents?

44. What does the overload open on a manual starter?

45. What does the overload open on a magnetic starter?

46. Which type of overload relay has an adjustment for trip time and current?

47. Which overload relay resets quicker?

48. What is the main advantage of a bi-metallic overload relay?

49. What is the advantage of using overload current transformers?

50. What are the three considerations when selecting overload heaters for a motor?

51. What is the term used to describe the percentage of extra demand that can be placed on a motor for a short period of time without damage?

52. According to the CEC what is the rule around overload size and service factor?

53. What information is found on the faceplate of a magnetic starter?
54. Where is the heater selection chart for a starter typically found?

55. What are two types of inherent motor protectors?

56. What type of motor typically incorporates a bimetallic thermodisc?

57. What are the three parts of a thermistor overload device?

58. What is unique about a thermistor?

59. What is the principle of operation of an electronic overload?

60. What are the two methods of setting programmed overloads?

61. What is the motor nameplate current?

62. What is the result of allowing a motor to operate above rated HP for an extended period of time?

63. What is one feature of advanced parameter programming for motor drives?

64. What are some devices that may be added to magnetic motor starters?

65. What is a power pole?

66. Where are pneumatic timers typically mounted?

67. What type of circuit is typically used for transient suppression modules?

68. What are the differences between IEC devices and NEMA devices?

69. What is the first step in troubleshooting a contactor or starter?

70. What percentage of the rated motor voltage should be present?

71. What is the result of a broken or missing shading coil in a starter?

72. What are three causes of nuisance tripping?

Chapter 12 (4th Edition)

Chapter 15 (5th Edition)

1. How many sets of overload heaters are required for a manual reversing starter?

2. What is a mechanical interlock?
3. What would be the result of no mechanical or electric interlock on a reversing starter?

4. Which two leads should be changed for reversing a motor with a reversing starter?

5. How is the direction of rotation changed in a single-phase (split-phase) motor?

6. How is the start winding identified if it is not marked?

7. How is the direction of rotation typically changed for a DC motor?

8. How many leads are available on a DC permanent-magnet motor?

9. What type of switch is typically used to reverse (raise and lower) a crane when the operator must keep his eyes on the load being lifted?

10. Does a drum switch contain overloads?

11. Are interpoles (commutating windings) considered part of the armature circuit or part of the field circuit when reversing a DC motor?

12. What are the three types of interlocking for motor starters?

13. How is electrical interlocking provided for magnetic reversing motor starters?

14. How are Power and control circuits isolated from each other in a motor starter?

15. Where is a pilot light connected to indicate a motor is running?

16. How is overtravel protection provided in motor control circuits?

17. In diagram 12-24 4th Edition (Diagram 15-24 5th Edition) what is removed from the circuit by setting the selector switch to jog?

18. What are some advantages of a PLC reversing circuit?

19. Where are forward and reverse coils connected to a PLC?

20. What are the four basic methods of motor control wiring?

21. What are the main disadvantages of direct hard wired circuits?

22. Which two tasks are made easier with the direct wired using terminal strips method?

23. Which motor control method provides metering and display of voltage, amperage, etc?

24. Which motor control method provides the best overall performance and monitoring of a motor?

25. Where does troubleshooting start when a reversing motor controller is not working?
26. Where are the leads of a DMM placed to check the voltage of a reversing control circuit?

27. Where is the first check made for voltage in the power circuit of a reversing starter?

28. What precaution must be taken when manually operating starter contacts?

Chapter 15 Pages 453-460 (4th Edition)

Chapter 25 Pages 544-553 (5th Edition)

1. What are some features of solid-state motor starters not found on electromagnetic motor starters?

2. What are some components found on solid-state motor starters not found on electromagnetic motor starters?

3. What are three different types of connections on the control terminal strip?

4. What is the “trip class” setting on a solid-state overload?

5. What is the trip class setting based on?

6. How is a solid-state motor starter programmed for proper operation?

7. What precaution must be taken when setting the overload reset function?

8. What are the three common motor starting modes with solid-state starters?

9. Which of the three methods listed above is most common?

10. What are the three common stop modes with solid-state starters?

Chapter 18 (4th Edition)

Chapter 19 & 23 (5th Edition) *

1. What are some of the advantages of reduced-voltage starting?

2. What percentage of the FLA of a motor is drawn at startup?

3. What is the term used to describe the amount of current permitted by the utility in each step of startup?

4. What is the result of high starting currents in large DC motors?
5. Why does the starting current decrease as a motor gets up to speed?

6. Which two reduced-voltage starting methods are used with a DC motor?

7. When is the current highest in an AC motor?

8. What is the term used to describe the current taken from the power line with the rotor stopped?

9. What happens to the resistors as the motor accelerates to the set point with primary resistor starting?

10. What are the two additional requirements for multiple-step primary resistor starting?

11. Which reduced-voltage starting method produces more motor torque with less line disturbance, autotransformer or primary resistor?

12. What is the requirement of a motor for part-winding starting?

13. What is one advantage of part-winding starting circuits?

14. What is one disadvantage of part-winding starting circuits?

15. What is the minimum number of overloads for a part-winding starting circuit?

16. How much of the full motor torque is available at startup with a Wye/Delta starting circuit?

17. How many leads are required for a motor to be wired wye-delta?

18. What are the main advantages of Solid-state switches?

19. How is a transistor protected from high-voltage spikes when used as a switch?

20. What is the advantage of using two SCRs to switch high-level AC current instead of a triac?

21. How is a triac turned on and off?

22. What three functions of acceleration are controlled by an SCR in a Solid-state starting circuit?

23. What are some advantages of SCRs?

24. What is the life expectancy of SCRs when operated within specifications?

25. What is the result of a signal being applied to the gate of an SCR?
26. How are SCRs wired to control AC line current in both directions?
27. Which reduced-voltage starting method uses several potentiometers to set timers?
28. What are some of the considerations when selecting reduced-voltage starting method?
29. Which reduced-voltage starting methods are not adjustable?
30. Which method of reduced-voltage starting is most expensive?
31. Which method of reduced-voltage starting is least expensive?
32. Which method of reduced-voltage starting provides the most torque per amp?
33. How many leads are required for a motor to be started using the part-winding starting method?
34. Which method of reduced-voltage starting is reasonably inexpensive and well suited to long acceleration times or frequent starts?
35. Which method of reduced-voltage starting offers the most control?
36. What are the main parts of the power circuit for a reduced-voltage starting circuit?
37. What are the main parts of the control circuit for a reduced-voltage starting circuit?
38. What are the first two steps in troubleshooting a reduced-voltage power circuit?

2. Chapters 17 & 18 (5th Edition)
3. How does a regular motor stop without any interference?
4. What is the oldest braking method?
5. How are friction brakes typically held open?
6. How is a friction brake typically closed?
7. What is the advantage of using a rotor fastened to the shaft rather than using the shaft of a motor for braking?
8. How is braking pressure measured?
9. What are two advantages of friction brakes?
10. What is the main disadvantage of friction brakes?

11. What is the principle of plugging?

12. What is the function of a plugging switch on a motor braking system?

13. How is a plugging switch connected to a motor?

14. What are the two functions of the emergency stop button when using plugging for emergency stops?

15. Why are most split-phase and capacitor start motors not capable of being stopped by plugging?

16. What is the recommended Service Factor for a motor in plugging applications?

17. What is another name for electric braking?

18. Why is maintenance minimal with electric braking?

19. What force will keep a motor from coming to a complete stop during the first alignment of poles when the DC voltage is applied to the stator windings?

20. Where does the DC voltage come from in an electric braking circuit?

21. How is the amount of braking torque adjusted with electric braking?

22. What does “total interlocking” include?

23. What type of motor is typically used with dynamic braking?

24. What happens to the energy of a rotating motor with dynamic braking?

25. How does the size of the resistor affect the stop time for a motor using dynamic braking?

26. What are two limitations of dynamic braking?

27. How are the limitations (above) overcome?

28. What is added to a dynamic braking motor drive when stopping high inertia loads quickly?