

Wiring electrical components and equipment in enclosures

Overview

This standard identifies the competences you need to wire electrical components and equipment in enclosures, in accordance with approved procedures. The final enclosure could be used for distribution equipment, switchgear or control systems. The rated operating voltage of the completed assembly will not exceed 1,500 volts DC or 1,000 volts AC, at frequencies not exceeding 1,000 Hertz. You will be required to select the appropriate tools and equipment to use, based on the operations to be performed and type of components to be wired and to check that they are in a safe and serviceable condition.

In carrying out the operations, you will be required to follow laid-down procedures and specific assembly techniques, in order to wire various components in enclosures, such as isolator switches, fuses/circuit breakers, contactors, relays, bases for plug-in devices, rail-mounted terminal blocks, trunking, earthing, bonding and sub-assemblies, such as power supplies, card racks, process controller units. The activities will also include making all necessary checks and adjustments to ensure that components are free from damage following the wiring operations.

Your responsibilities will require you to comply with organisational policy and procedures for the wiring activities undertaken and to report any problems with the activities, components or equipment that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work and will provide an informed approach to applying wiring techniques and procedures to electrical components. You will understand the distribution equipment, switchgear or control systems being wired, their application and the wiring techniques used. You know about the components used, in adequate depth to provide a sound basis for carrying out the wiring activities to the required specification.

You will understand the safety precautions required when carrying out the wiring operations. You will be required to demonstrate safe working practices throughout and will understand the responsibility you owe to yourself and others in the workplace.

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Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. follow the relevant instructions, assembly drawings and any other specifications
3. ensure that the specified components are available and that they are in a usable condition
4. assemble the components in their correct positions using appropriate methods and techniques
5. secure the components using the specified connectors and securing devices
6. check the completed assembly to ensure that all operations have been completed and it meets the required specification
7. deal promptly and effectively with problems within your control and report those that cannot be solved
8. ensure that work records are completed, stored securely and available to others, as per organisational requirements
9. leave the work area in a safe condition on completion of the activities, as per organisational and legal requirements

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Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken whilst carrying out the activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the health and safety requirements of the work area and the activities, and the responsibility these requirements place on you
3. the hazards associated with the activities, and how to minimise them and reduce risks
4. the personal protective equipment and clothing (PPE) to be worn during the activities
5. voltage ranges, what constitutes a hazardous voltage and how to reduce the risks of a phase to earth shock
6. how to deal effectively with victims of electric shock in the workplace (to include methods of safely isolating the power source and methods of first aid resuscitation)
7. how to obtain and interpret drawings, circuit and physical layouts, charts, specifications, graphical electrical symbols, wiring regulations and other documents needed for the electrical wiring activities
8. the basic operating principles of the equipment/circuits being wired and the purpose of individual components within the circuit
9. the different types of cabling and their application (such as multicore cables, single core cables, single insulated, double insulated, steel wire armoured (SWA), mineral insulated (MI), screened cables)
10. the application and use of a range of electrical components (such as contactors, switches, relays, solenoids junction boxes)
11. the assembly methods and techniques to be used when wiring electrical distribution equipment, switchgear or control systems (such as cable stripping, soldering, crimping, lacing/strapping)
12. the different types, applications and methods of attaching identification markers/labels during the electrical wiring activities
13. the visual checks and preparation requirements for the components to be wired
14. how to identify any orientation requirements, values or polarity for the components used in the electrical wiring activities
15. how to use appropriate lifting and handling equipment in the electrical wiring activities
16. the methods, tools and techniques used to prepare the electrical distribution equipment, switchgear or control systems equipment to be wired
17. how to check that tools and equipment are free from damage or defects, are in a safe and usable condition and are configured correctly/calibrated for the intended purpose

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18. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
19. how to access, use and maintain information to comply with organisational requirements and legislation

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Scope/range related to performance criteria

1. Carry out all of the following during the wiring activities:
 1. use the correct assembly drawings, specifications and job/order instructions
 2. adhere to health and safety regulations, systems and procedures to realise a safe system of work
 3. ensure that components and equipment used are free from damage, foreign objects, dirt or other contamination
 4. use safe and approved techniques to wire electrical components and equipment in enclosures
 5. leave the work area in a safe and tidy condition
2. Terminate and join cables/wires to ten of the following components:
 1. contactors
 2. timers
 3. limit switches
 4. overload relays
 5. relays
 6. power supplies
 7. programmable controllers
 8. transformers/chokes
 9. circuit boards
 10. plugs/sockets
 11. circuit breakers/fuses
 12. thermistors/thermocouples
 13. lighting fixtures
 14. panel meters (voltage, current)
 15. indicators (lamps, LEDs)
 16. batteries
 17. terminal blocks/junction boxes
 18. thermostats
 19. sensors
 20. switches (push button, toggle)
 21. busbars
 22. solenoids
 23. capacitors
 24. soft starters
 25. resistors
 26. variable speed drives
 27. rectifiers
 28. bases for plug-in devices
 29. other specific components

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3. Use ten of the following methods and techniques (and the associated tools) during the wiring activities:
 1. cable forming/bending
 2. cable/wire crimping
 3. screwed connections
 4. cable supporting/tying
 5. insulation stripping
 6. soldering (where appropriate)
 7. cable/wire clamping
 8. locking and retaining devices (such as cable ties, clips, proprietary fasteners)
 9. cable routeing
 10. cable protection (such as sleeving, grommets)
 11. torque setting of fasteners
 12. connecting pre-formed looms
 13. wire marking/colour coding
4. Use two of the following cable/wire types:
 1. single core cable
 2. mineral insulated cable
 3. twisted pair/ribbon cable
 4. multicore cable
 5. screened cable
 6. laminated copper
 7. fibre optic
 8. data/communication cable
 9. braided copper
 10. SWA armoured cable
 11. other specialist cable
5. Assemble electrical components in enclosures, to one of the following quality and accuracy standards:
 1. organisational drawings and procedures
 2. wiring regulations
 3. customer drawings and requirements
 4. current industry standards, codes of practice and procedures
 5. other international standards
6. Check all of the following on the completed assembly:
 1. location and position of items (such as components, labels, trunking covers, doors, cages)
 2. continuity of cable/wiring connections (such as battery and lamp checks)
 3. function of mechanical interlocks/switches (where appropriate)

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4. mechanical operation of overload protection devices (where appropriate)
5. enclosure free of debris (such as cable offcuts/insulation, enclosure/trunking breakouts)

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