

Setting CNC electro-discharge machines for production

Overview

This standard identifies the competences you need to prepare and set up Computer Numerical Control (CNC) electrical discharge machines, such as spark erosion and wire erosion machines, in accordance with approved procedures. You will be expected to select the appropriate workholding devices, and to mount and secure them to the machine table in the designated or appropriate position, as required by the machine-operating program. You will also be expected to select the appropriate electrode cartridge holders or wires, and to mount and secure these to the appropriate machine head/slide and/or tool change holder mechanism, where this is applicable.

You will need to ensure that all electrode cartridges/holders and/or wires have been allocated a relevant tool number, and that the relevant data on their co-ordinates and datum positions are entered into the operating program of the machine. This will involve loading and proving component programs, checking for errors/faults, editing and saving program changes. Making adjustments to settings to achieve specification, and solving machine-related problems during production, will also form part of your role.

Your responsibilities will require you to comply with organisational policy and procedures for the machine setting activities undertaken, and to report any problems with the equipment, tooling programs or setting-up activities 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 the setting-up procedures used. You will understand the CNC electrical discharge machine used, and its application, and will know about the workholding devices, tooling, machine operating programs and setting-up procedures, in adequate depth to provide a sound basis for setting-up the equipment, correcting faults and ensuring the work output is produced to the required specification.

You will understand the safety precautions required when working with the CNC electro-discharge machine and its associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Setting CNC electro-discharge machines for production

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow the correct specifications for the component to be produced
3. determine what has to be done and how the machine will be set to achieve this
4. mount, set and secure the required workholding devices, workpiece and cutting tools
5. set the machine tool operating parameters to achieve the component specification
6. check that all safety mechanisms are in place and that the equipment is set correctly for the required operations
7. complete the required production documentation
8. deal promptly and effectively with problems within your control and report those that cannot be solved

Setting CNC electro-discharge machines for production

Knowledge and understanding

You need to know and understand:

1. how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. how to start and stop the machine in normal and emergency situations
3. the importance of ensuring that the machine is isolated from the power supply before mounting electrodes, cartridges/holders and workholding devices
4. the importance of wearing the appropriate protective clothing (PPE) and equipment, and of keeping the work area clean and tidy
5. the hazards associated with CNC electro-discharge operations (such as moving parts of machinery, electrical components, handling dielectrics, fumes), and how to minimise them and reduce any risks
6. how to handle and store electrodes or wire, electrode cartridges/holders and programs, safely and correctly
7. how to save the programs in the appropriate format, and the importance of storing programs and storage devices safely and correctly, away from contaminants and possible corruption
8. the methods and procedures used to minimise the chances of infecting a computer with a virus
9. the implications if the computer you are using does become infected with a virus and who to contact if it does occur
10. how to extract and use information from engineering drawings or other data supplied and related specifications (to include symbols and conventions to appropriate standards) in relation to work undertaken
11. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
12. the range of work holding methods and devices that are used on CNC electrical discharge machines
13. why it is important to set the workholding device in relation to the machine datums and reference points
14. the methods of setting the workholding devices, and the tools and equipment that can be used
15. the range of eroded features that are produced on CNC electrical discharge machines
16. how to check that the electrodes or wires are in a good and serviceable condition
17. the different types of electrodes/wire, and the material conditions determining their use
18. selecting the correct grade and type of electrode/wire for the

Setting CNC electro-discharge machines for production

- materials and profiles being machined
19. the various electrode tool holding devices that are used, and the methods of correctly loading, securing and setting the electrodes/wire in the electrode cartridge/holder/feed mechanism and the machine head/wire guides
 20. the use of tooling magazines or technology settings, and how to position and identify the tools in relation to the operating program
 21. how to place the machine into the correct operating mode, and how to access the program edit facility, in order to enter tooling data
 22. how to conduct trial runs using single block run, dry run and feed/speed override controls
 23. why you would conduct a full dry run and single block run
 24. typical faults that occur when electrical discharge machining and die sinking
 25. the items that you need to check before allowing the machine to operate in full program run mode
 26. how the various types of materials will affect the feeds and voltage that can be used
 27. the application of dielectric fluids with regard to a range of different materials
 28. typical problems that can occur when setting-up electrodes/wires in cartridges/holders/feed mechanisms and with using workholding devices, and what to do if problems occur
 29. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

Setting CNC electro-discharge machines for production

Scope/range related to performance criteria

1. Carry out all of the following during the setting-up activities:
 1. obtain and use the appropriate documentation
 2. adhere to procedures or systems in place for risk assessment, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
 3. follow safe practice/approved setting up procedures at all times
 4. confirm that the correct operating program has been loaded
 5. check that the electrode or wire is of the correct type and in a usable condition
 6. check that the dielectric fluid is at an appropriate level
 7. ensure that the workpiece is correctly positioned and secured without distortion
 8. update the program tool data as applicable
 9. ensure that correctly adjusted machine guards are in place and safety devices are working
 10. leave the work area and machine in a safe and appropriate condition on completion of the activities
2. Prepare one of the following electro-discharge machines for operation:
 1. CNC wire erosion machine
 2. CNC spark erosion machine
3. Position and secure workpieces using two of the following workholding methods and devices:
 1. clamping direct to machine table
 2. fixtures
 3. other specific workholding device
4. Select, load and set in the appropriate tool holding device, one of the following electrode types:
 1. plain electrodes
 2. profile electrodes
 3. hollow electrodes
 4. wires
5. Prepare the tooling by carrying out all the following activities, as applicable to the machine type:
 1. pre-setting electrodes in tooling cartridges/holders manually or by using setting jigs/fixtures
 2. loading and threading wire through wire feed mechanism and wire guides
 3. positioning electrode cartridges/holders in correct position on machine head or magazine/docking station
 4. checking electrode cartridges/holders/wire have a specific tool number or technology setting in relation to the operating program

Setting CNC electro-discharge machines for production

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5. entering all wire data to the operating program (such as wire type and size, material thickness, number of skims)
 6. entering all relevant tooling data to the operating program (such as cartridge/holder position, offsets)
 7. setting tool/wire datum point
 8. saving changes to programme (as appropriate)
 6. Set up to produce machined components, which combine different operations and cover ten of the following:
 1. flat faces
 2. parallel faces
 3. tapered faces
 4. angular faces
 5. open ended slots/recesses
 6. faces square to each other
 7. holes on pitch circles
 8. internal profiles
 9. enclosed slots/recesses
 10. linear holes (rows, angles)
 11. external profiles
 12. tapered holes
 13. special profiles (such as concave, convex)
 14. parallel and tapered steps/slots/shoulders
 15. circular/curved profiles (internal and external)
 16. other special forms or activities
 7. Machine components from one of the following types of material:
 1. ferrous
 2. non-ferrous
 8. Set the machine to produce components within all of the following quality and accuracy standards, as applicable to the operations performed:
 - dimensional tolerance as identified in relevant standard
 - flatness and squareness 0.001" per inch or 0.025mm per 25mm
 - components to be free from false starts and sharp edges
 - surface finish 32µin/0.8µm, 18VDI
 - machined holes within H8
 - angles within +/- 0.5 degree

Setting CNC electro-discharge machines for production

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