# SEMMME2-24 - SQA Unit Code H2AC 04
Operating CNC Electro-Discharge Machines

## Overview

This unit identifies the competences you need to operate Computer Numerical Control (CNC) electro-discharge machines, such as spark erosion and wire erosion machines, in accordance with approved procedures. You will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components/materials and consumables are available. You will be expected to produce a range of components that cover a number of different features, such as flat, tapered and angled faces, internal and external profiles, parallel and tapered slots and steps, parallel and tapered holes which are linearly or radially pitched.

You will be required to operate the CNC machine in line with safe working practices and approved procedures, to continuously monitor the machining operations and, where necessary, make minor adjustments or seek the help of the setter to make the required adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets will be an important issue, and your production records must show consistent and satisfactory performance.

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

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying procedures for electro-discharge machining. You will have an understanding of the CNC electro-discharge process and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound background for carrying out the activities to the required specification.

You will understand the safety precautions required when working with the machine, 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 up of the machine, its programming, tooling and associated workholding devices, is the subject of another unit and is the responsibility of the machine-tool setter.

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## Performance criteria

*You must be able to:*

P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines

P2 confirm that the equipment is set up and ready for operation

P3 follow the defined procedures for starting and running the operating system

P4 deal promptly and effectively with error messages or equipment faults that are within your control and report those that cannot be solved

P5 monitor the computer process and ensure that the production output is to the required specification

P6 shut down the equipment to a safe condition on conclusion of the activities

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## Knowledge and understanding

*You need to know and understand:*

K1 the safe working practices and procedures to be followed whilst operating CNC electro-discharge machines

K2 the safety mechanisms on the CNC electro-discharge machine, and the procedure for checking that they function correctly

K3 how to stop the CNC electro-discharge machine in both normal and emergency situations, and the procedure for restarting after an emergency

K4 the hazards associated with the electro-discharge machining operations (such as moving machine parts, electrical components, handling dielectrics, fumes), and how to minimise them and reduce any risks

K5 the personal protective equipment to be worn, and where this can be obtained

K6 the importance of keeping the work area clean and tidy

K7 the main features of the CNC electro-discharge machines, and the accessories that can be used

K8 the various CNC electro-discharge operations that can be performed, and the methods and equipment used

K9 the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons)

K10 how to use the visual display and understand the various messages displayed

K11 the function of error messages, and what to do when an error message is displayed

K12 how to find the correct restart point in the program when the machine has been stopped before completion of the program

K13 where to obtain the component drawings, specifications and/or job instructions required for the components to be machined

K14 how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken

K15 how to use imperial and metric systems of measurement

K16 the application of dielectric and ionised fluids with regard to a range of different materials

K17 the effects of clamping the work piece in a chuck/work holding device, and how this can cause distortion in the finished components

K18 how to recognise CNC electro-discharge machining faults, and when actions need to be taken

K19 the quality control procedures used, inspection checks to be carried out, and the equipment that will need to be used

K20 the problems that can occur with the CNC electro-discharge machining

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| | activities, and how these can be overcome |
| K21 | the extent of your own authority and to whom you should report if you have problems that you cannot resolve |

## Additional Information

### Scope/range related to performance criteria

*You must be able to:*

1. confirm that the machine is ready for operation by checking **all** of the following:
   - 1.1 obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation)
   - 1.2 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
   - 1.3 confirm with the machine setter that the machine is ready for production
   - 1.4 where appropriate, seek any necessary instruction/training on the operation of the machine
   - 1.5 ensure that machine guards are in place and are correctly adjusted
   - 1.6 hold components securely, without distortion
   - 1.7 ensure that the dielectric fluid is at an appropriate level
   - 1.8 check that the operating program is at the correct start point
   - 1.9 follow the defined operating procedures and apply safe working practices and procedures at all times
   - 1.10 ensure that machine settings are adjusted as and when required (either by yourself or the setter) to maintain the required accuracy
   - 1.11 ensure that the components produced meet the required specification for quality and accuracy
   - 1.12 leave the work area and machine in a safe and appropriate condition on completion of the activities
2. operate **one** of the following CNC electro-discharge machines:
   - 2.1 CNC spark erosion machine
   - 2.2 CNC wire erosion machine
   - 2.3 CNC electro-discharge machining centre
3. produce machined components which cover **six** of the following:
   - 3.1 flat faces
   - 3.2 parallel faces
   - 3.3 tapered faces
   - 3.4 angular faces
   - 3.5 open-ended slots/recesses
   - 3.6 faces square to each other
   - 3.7 holes on pitched circles
   - 3.8 internal profiles
   - 3.9 enclosed slots/recesses
   - 3.10 linear holes (rows, angles)
   - 3.11 external profiles
   - 3.12 tapered holes

3.13 special profiles (e.g., concave, convex)
3.14 parallel and tapered steps/slots/shoulders
3.15 other special forms or features
3.16 circular/curved profiles (internal and external)

4. machine components made from **one** of the following types of material:
   4.1 ferrous based
   4.2 non-ferrous based
5. produce components with dimensional accuracy, form and surface texture within **all** of the following quality and accuracy standards as is applicable to the operations performed:
   5.1 dimensional tolerance equivalent to BS4500 or BS 1916 Grade 7
   5.2 flatness and squareness within 0.001" per inch or 0.025mm per 25mm
   5.3 components to be free from false starts, and sharp edges
   5.4 angles within +/- 0.5 degree
   5.5 machined holes within H8
   5.6 surface finish 32 µin; 0.8 µm; 18VDI
6. use appropriate gauges or instruments to carry out the necessary checks, during production, for accuracy of **three** of the following:
   6.1 dimensions
   6.2 parallelism
   6.3 squareness
   6.4 profile
   6.5 position
   6.6 angle/taper
   6.7 surface texture

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