

Setting CNC fabrication machines for production operations

Overview

This standard identifies the competences you need to prepare and set up computer numerically controlled (CNC) fabrication machines, in accordance with approved procedures. The CNC machines covered by this standard include shearing, punching, bending and forming, plasma, laser, water jet and gas cutting machines. You will be expected to select the appropriate workholding devices and to mount and secure them to the machine. You will also be required to select the appropriate cutting heads or forming tools, to mount and secure them to the appropriate tool holding devices and to place the cutting/forming tools in the relevant positions within the tool-posts, slides or tool change magazine/carousel, where this is applicable.

You will need to ensure that all the tools have been allocated a relevant tool number and that the relevant data on their co-ordinates and datum positions is entered into the operating program and machine. This will involve loading and proving component programs, checking for errors/faults, and editing and saving program changes. You must produce trial components and prove that the machine is working satisfactorily, before declaring the machine ready for production. 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 fabrication machine used and its application and will know about the workholding devices, tooling, machine operating programmes and setting-up procedures, in adequate depth to provide a sound basis for setting up the equipment, correcting faults and ensuring that the work output is to the required specification.

You will understand the safety precautions required when working with the machine and with 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.

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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 and set the required work-holding devices, work piece 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. deal promptly and effectively with problems within your control and report those that cannot be solved

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Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken when setting up workholding devices and tooling on CNC fabrication machines
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 the cutting and forming tools and workholding devices
4. the importance of wearing the appropriate protective clothing and equipment (PPE) and of keeping the work area clean and tidy
5. the hazards associated with working on CNC fabrication machines (such as moving machinery, automatic machine operation, handling of cutting and forming tools, lifting and handling workholding devices, handling sheet materials)
6. how to handle and store cutting and forming tools and operating programs, safely and correctly
7. how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken
8. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
9. how to carry out currency/issue checks of the specifications you are working with
10. the range of workholding methods and devices that are used on CNC fabrication machines
11. why it is important to set the workholding device/workpiece in relationship to the machine datums and reference points
12. the methods of setting the workholding devices/workpieces and the tools and equipment that can be used
13. the range of cutting and forming tools that are used on the CNC fabrication machine
14. how to check that the cutting and forming tools are in a safe and serviceable condition
15. the various tool holding devices that are used and the methods of correctly mounting and securing the cutting and forming tools to the tool holders
16. the advantages of using pre-set tooling and how to set the tooling using setting jigs/fixtures
17. the use of tool-posts, magazines and carousels and how to position and identify the tools in relationship to the operating program
18. how to place the machine into the correct operating mode and how to access the program edit facility in order to enter tooling data

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- (such as tool datums, positions, lengths, offsets and radius compensation)
19. how to conduct trial runs using single block run, dry run, and feed and speed override controls
 20. the items that you need to check before allowing the machine to operate in full program run mode
 21. how the various types of materials used will affect the feeds and speeds that can be used
 22. typical problems that can occur with the setting up of the tooling and workholding devices and what to do if they occur
 23. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

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Scope/range related to performance criteria

1. Carry out **all** of the following during the setting up of the CNC fabrication machines:
 1. confirm that the correct operating program has been loaded
 2. check that tooling is in a usable condition
 3. update the program tool data, as applicable
 4. position and adjust machine guards
 5. apply safe working practices at all times
2. Prepare **one** of the following CNC fabrication machines in readiness for production:
 1. shearing machine
 2. punching machine
 3. forming machine
 4. bending machine
 5. plasma cutting
 6. laser cutting
 7. gas cutting
 8. water jet cutting
3. Position and secure workpieces, using **two** of the following workholding methods and devices:
 1. jigs and fixtures
 2. clamps and stops
 3. pneumatic chucks
 4. other workholding devices
4. Select and mount, in the appropriate holding device, **two** of the following types of cutting/forming tool:
 1. shearing blades
 2. hole punching tools
 3. forming tools
 4. nibbling tools
 5. bending tools
 6. cutting heads/nozzles
5. Prepare the tooling by carrying out **all** of the following activities, as applicable to the machine type:
 1. pre-setting tooling, using setting jigs/fixtures
 2. setting tool datums

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3. mounting tools in the correct position in the tool-posts, turrets, magazine or carousel
 4. checking that tools have a specific tool number in relationship to the operating program
 5. entering all relevant tool data to the operating program (tool lengths, tool offsets, radius compensation)
 6. saving changes to the program
6. Set up the machine to produce components, combining several different operations and covering **four** of the following:
 1. straight cuts
 2. square/rectangular profiles
 3. curved profiles
 4. internal profiles
 5. holes linearly pitched
 6. holes radially pitched
 7. louvres
 8. swages
 9. bends at 90°
 10. bends of various angles
 11. multi-bend platework
 12. curved plates
 13. other specific operations
7. Set up the machine for production operations, using **one** of the following types of material:
 1. ferrous
 2. non-ferrous
 3. stainless
 4. special alloys
8. Make trial components to prove that the machine is operating to the required specification and check **all** of the following:
 1. dimensional accuracy is within specification tolerance
 2. components are free from deformity, burrs and sharp edges
 3. profiles conform to specification/template requirements

Behaviours

Behaviours:

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

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