

## Machining components using CNC horizontal boring machines

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### Overview

This standard identifies the competences you need to carry out horizontal boring operations, in accordance with approved procedures, using Computer Numerical Control (CNC) machines. You will take charge of the prepared machine and check that it is ready for the machining operations to be performed. This will involve checking that all the required components and consumables are present, and that the machine has been approved for production. In operating the machine, you will be expected to follow the correct procedures for calling up the operating program, dealing with any error messages, and executing the program activities safely and correctly.

The components produced will have a number of different features, including bored holes to a depth and through the workpiece, tapered holes, external diameters, flat faces, square and parallel faces, angular faces, slots, indexed or rotated forms, internal and external profiles, grooves/undercuts, and drilled, reamed and tapped holes to depth and through the workpiece. You will be required to continuously monitor the machining operations, making any necessary adjustments to machine parameters, in line with your permitted authority. 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 activities undertaken, and to report any problems with the equipment, tooling, program, materials or activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

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

You will understand the safety precautions required when working with the 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 up of the machine, its tooling and associated workholding devices, are the subjects of other standards.

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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. confirm that the equipment is set up and ready for operation
3. follow the defined procedures for starting and running the operating system
4. deal promptly and effectively with error messages or equipment faults that are within your control and report those that cannot be solved
5. monitor the computer process and ensure that the production output is to the required specification
6. produce machined components
7. complete the required production documentation
8. 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:

1. how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. the safety mechanisms on the machine, and the procedures for checking that they are operating correctly
3. how to start and stop the machine in both normal and emergency situations
4. the hazards associated with working on CNC horizontal boring machines and how to minimise them and reduce any risks
5. the importance of wearing the appropriate protective clothing (PPE) and equipment, and of keeping the work area clean and tidy
6. the application of a range of CNC horizontal boring machines
7. how to extract and use information from engineering drawings or data and related specifications (to include symbols and conventions to appropriate 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 interpret the visual display and understand the various messages displayed
10. the function of error messages, and what to do when an error message is displayed
11. how to find the correct restart point in the program when the machine has been stopped before completion of the program
12. the operation of the various hand and automatic modes of machine control
13. how to operate the machine, using single block run, full program run, and feed/speed override controls
14. why you would conduct a full dry run and single block run
15. how to make adjustments to the program operating parameters to take account of tool wear
16. how to set and secure the workpiece to the machine spindle/workholding device; the effects of clamping the workpiece; and how material removal can cause warping/distortion of the finished workpiece
17. the various types of cutting tools used, and how they are located and secured to the machine tool posts, turrets, slides and tool magazine or carousel
18. the safe and correct handling and storage of tooling
19. how to check that the indexable tooling is in a serviceable condition, and the effects that worn tooling will have on the workpiece surface finish and tolerances
20. the problems that can occur with horizontal boring activities, and

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- how these can be overcome
21. the application of cutting fluids with regard to different materials being machined
  22. the quality control procedures used, inspection checks to be carried out, and the equipment that is used
  23. where to obtain component drawings, specifications and/or job instructions required for the components being machined
  24. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

### Scope/range related to performance criteria

1. Carry out all of the following during the machining 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. check that the operating program is at the correct start point
  4. ensure that machine guards are in place and correctly adjusted
  5. ensure that materials/components are correctly positioned and held securely without distortion
  6. check and maintain cutting tools in a safe and usable condition
  7. ensure that the workpiece is clear of the tooling before starting the machine
  8. use safe working practices and start up procedures at all times
  9. adjust machine settings, as required, to maintain the required accuracy
  10. leave the work area and machine in a safe and appropriate condition on completion of the activities
2. Operate one of the following CNC boring machines:
  1. CNC horizontal boring machine
  2. CNC boring centre
3. Produce components which combine several different operations and cover eight of the following:
  1. bored holes through the workpiece
  2. slots
  3. indexed or rotated forms
  4. bored holes to a depth
  5. grooves/undercuts
  6. tapered holes
  7. drilled holes
  8. external diameters
  9. reamed holes
  10. flat faces
  11. tapped holes
  12. square and parallel faces
  13. internal and external profiles
  14. angular faces
4. Machine one of the following types of material:
  1. ferrous
  2. non-ferrous
  3. non-metallic
5. Carry out the necessary checks during production, for accuracy of six of the following:
  1. external diameters

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2. thread fit
  3. internal diameters
  4. slot/recess width
  5. lengths/depths
  6. surface finish
  7. reamed hole size/fit
  8. flatness of faces
  9. taper/angles
  10. squareness of faces
6. Produce components within all of the relevant quality and accuracy standards, as applicable to the operations performed:
1. general dimensional tolerance  $\pm 0.15\text{mm}$  or  $\pm 0.006"$
  2. surface finish  $32\mu\text{in}$  or  $0.8\mu\text{m}$
  3. reamed and bored holes within H8
  4. flatness and squareness  $0.001"$  per inch or  $0.025\text{mm}$  per  $25\text{mm}$
  5. one or more specific dimensional tolerances within  $\pm 0.05\text{mm}$  or  $\pm 0.002"$
  6. angles within  $\pm 0.25$  degree
  7. screw threads BS medium fit

## Machining components using CNC horizontal boring machines

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