

## Machining components using broaching machines

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### Overview

This standard identifies the competences you need to carry out broaching operations using horizontal or vertical broaching machines, in accordance with approved procedures. You will be required to check 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 contain features such as keyways, square holes, hexagonal and octagonal holes, holes with one flat, splines, serrations, and special forms.

You will be required to operate the machine in line with safe working practices and approved procedures, and to continuously monitor the machining operations, making any necessary 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 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 provide a good understanding of your work, and will provide an informed approach to applying machining procedures. You will understand the broaching process, and its application, and will know about the equipment, materials and consumables, in adequate depth to provide a sound basis 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, is the subject of another standard.

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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 machine is set up and ready for the machining activities to be carried out
3. manipulate the machine tool controls safely and correctly in line with operational procedures
4. produce components to the required quality and within the specified dimensional accuracy
5. carry out quality sampling checks at suitable intervals
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. complete the required production documentation
8. shut down the equipment to a safe condition on conclusion of the machining 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 procedure for checking that they function correctly
3. operation of the machine controls in both hand and power modes, and how to stop the machine in an emergency
4. the personal protective equipment (PPE) to be worn, and where this can be obtained
5. the hazards associated with carrying out the broaching operations, and how they can be minimised
6. the importance of keeping the work area clean and tidy
7. where to obtain the component drawings, specifications and/or job instructions required for the components to be machined
8. how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate standards) in relation to work undertaken
9. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
10. the various broaching techniques that can be used to produce the required shapes, and the types of broaches used
11. the methods that can be used to position the workpiece in relation to the broach
12. how to handle and store broaches safely and correctly
13. factors which affect the selection of broaching speeds
14. how the various types of materials will affect the broaching feeds that can be used
15. the application of cutting fluids with regard to a range of different materials
16. the effects of clamping the workpiece, and how this can cause distortion in the finished components
17. how to recognise broaching faults and identify when tools need re-sharpening
18. the quality control procedures used, inspection checks to be carried out, and the equipment to be used
19. the problems that can occur with the broaching activities, and how these can be overcome
20. the extent of your own authority and to whom you should report if you have problems that you cannot resolve

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### Scope/range related to performance criteria

1. Ensure that you apply 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. ensure that machine guards are in place and correctly adjusted
  4. hold components securely without distortion
  5. maintain cutting tools in a suitable condition
  6. apply safe working practices at all times
  7. adjust machine settings, as required, to maintain the required accuracy
  8. ensure that components produced meet specification
  9. leave the work area and machine in a safe and appropriate condition on completion of the activities
2. Operate one type of machine from the following:
  1. horizontal broaching machine
  2. vertical broaching machine
3. Produce machined components which cover four of the following:
  1. keyways
  2. octagonal holes
  3. flat sided holes
  4. splines
  5. square holes
  6. serrations
  7. hexagonal holes
  8. other/special forms
4. Machine components made from one type of material from the following:
  1. ferrous
  2. non-ferrous
  3. non-metallic
5. Carry out the necessary checks during production for accuracy of five of the following:
  1. dimensions
  2. squareness
  3. spline/serration fit
  4. surface finish
  5. keyway width
  6. keyway position

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6. Produce components within all the relevant quality and accuracy standards
  1. dimensional tolerance equivalent to relevant standards
  2. surface finish 63  $\mu\text{in}$  or 1.6 $\mu\text{m}$
  3. components to be free from false tool cuts, burrs and sharp edges

## Machining components using broaching machines

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