

## Overview

This standard identifies the competences you need to prepare and set up grinding machines, such as surface grinding, external cylindrical grinding, internal cylindrical, universal, centreless, profile and thread grinding machines, in accordance with approved procedures. You will be expected to set up the machines to grind a range of component shapes, such as internal and external parallel, stepped and tapered diameters, flat, parallel, square and angular faces, steps, slots, radii, chamfers, threads and special forms. This involves selecting the appropriate workholding devices, and mounting and positioning them to the machine in the correct location for the type of operation being carried out.

You will also be expected to select the appropriate grinding wheels to use, check them for defects, balance them when appropriate, and mount and secure them to the machine spindle. You will be expected to prepare the grinding wheels for operation by 'trueing up' and dressing the wheels, and creating any necessary relief or form as applicable to the operation to be performed. You must set up the appropriate mechanisms, stops and controls for feeds and speeds, as applicable for the particular operations and machine type used. 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 grinding machines, equipment 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 grinding machine used, and its application, and will know about the workholding devices, grinding wheels, wheel forming, relevant materials, consumables and setting up procedures, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the work output is to the required specification.

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

This standard does not cover CNC activities, for which other standards apply.

## 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

## 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. your duties and responsibilities under the abrasive wheels regulations, with particular reference to the mounting of abrasive wheels
3. the hazards associated with setting grinding machines, and how to minimise them and reduce any risks
4. how to start and stop the machine in normal and emergency situations
5. the importance of ensuring that the machine is isolated from the power supply before mounting grinding wheels and workholding devices
6. the importance of wearing the appropriate protective clothing (PPE) and equipment, and of keeping the work area clean and tidy
7. the basic operation of the various grinding machines, and typical operations that they can perform
8. how to handle and store grinding wheels safely and correctly
9. 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
10. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
11. terminology used in grinding in relation to the activities undertaken
12. the range of workholding methods and devices that are used on grinding machines
13. the methods of mounting and setting the workpiece in/on the workholding devices, and the tools and equipment that can be used
14. the various grinding operations that are used to produce the required profiles, and the types of wheels that are used
15. how to check that the grinding wheels are in a safe and serviceable condition
16. the methods of mounting and securing the grinding wheels to the machine spindles
17. methods of forming the wheels to the required profile
18. the need for 'trueing up' and dressing of wheels to prevent glazing and burning of workpiece

19. how to set up the various machines for the particular operations being performed
20. how the various types of material will affect the feeds and speeds that can be used
21. the application of cutting fluids with regard to a range of different materials
22. the need to conduct trial runs, and to check that the machine is set up and running safely and correctly
23. problems that can occur with setting up of the grinding wheels, workholding devices and machine operating parameters, and what to do if problems occur
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 activities during setting up:
  - 1.1 obtain and use the appropriate documentation
  - 1.2 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
  - 1.3 follow safe practice/approved setting up procedures at all times
  - 1.4 ensure that correctly adjusted machine guards are in place
  - 1.5 check that grinding wheels are in a safe and usable condition
  - 1.6 hold components securely without distortion
  - 1.7 leave the work area and machine in a safe and appropriate condition on completion of the activities
2. Prepare one of the following types of grinding machine in readiness for production:
  - 2.1 horizontal surface
  - 2.2 external cylindrical
  - 2.3 universal
  - 2.4 thread grinding
  - 2.5 vertical surface
  - 2.6 internal cylindrical
  - 2.7 profile grinding
  - 2.8 roll grinding
  - 2.9 gear grinding
  - 2.10 centreless
  - 2.11 company specification
3. Position and secure workpieces using four of the following workholding methods and devices:
  - 3.1 chucks
  - 3.2 face plate
  - 3.3 clamps
  - 3.4 work rests
  - 3.5 injector mechanisms
  - 3.6 collets
  - 3.7 machine vices
  - 3.8 angle plates
  - 3.9 control stops
  - 3.10 magnetic blocks
  - 3.11 centres
  - 3.12 power chucks
  - 3.13 vee blocks
  - 3.14 fixtures
  - 3.15 pots
4. Select and mount grinding wheels, to include all of the following:

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- 4.1 selecting grinding wheels for specific materials and applications (such as grain size, grade, structure, bond)
- 4.2 mounting wheels (such as paper washers, flanges, locking pressure)
- 4.3 testing wheels for cracks
- 4.4 balancing wheels, where appropriate
5. Prepare gear grinding wheels to include carrying out two of the following:
  - 5.1 dressing and `trueing up' grinding wheels
  - 5.2 relieving the wheel sides
  - 5.3 wheel forming (such as chamfers, radii, angular forms, profiles)
  - 5.4 dressing and `trueing up' control wheels
6. Set up grinding machines to grind six of the following forms, as applicable to the machine type:
  - 6.1 flat faces
  - 6.2 parallel diameters
  - 6.3 internal threads
  - 6.4 vertical faces
  - 6.5 tapered diameters
  - 6.6 vee form threads
  - 6.7 external threads
  - 6.8 parallel faces
  - 6.9 counterbores
  - 6.10 left hand threads
  - 6.11 angular faces
  - 6.12 faces square to each other
  - 6.13 tapered bores
  - 6.14 right hand threads
  - 6.15 shoulders and faces
  - 6.16 parallel bores
  - 6.17 single start threads
  - 6.18 slots
  - 6.19 profile forms
  - 6.20 multi-start threads
  - 6.21 other specific thread forms
7. Grind components made from one of the following types of material:
  - 7.1 ferrous
  - 7.2 non-ferrous
  - 7.3 non-metallic
8. Set the machine to produce components within all of the following quality and accuracy standards, as applicable to the operations performed:
  - 8.1 tolerance to relevant standards
  - 8.2 surface texture 8  $\mu\text{in}$  or 0.2 $\mu\text{m}$
  - 8.3 components to be free from false grinding cuts, burrs and sharp edges

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