SEMMME3014

Setting gear grinding machines for production

Overview

This standard identifies the competences you need to prepare and set up gear grinding machines, which cover gear grinding using formed wheels and gear grinding using generation methods, and will include the grinding of spur gears, helical, bevel gears and splines, in accordance with approved procedures. 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 also be expected to mount the gears to be ground, and to check that they are running true and concentric before starting the grinding operations.

You will be expected to prepare the grinding wheels for operation, by mounting the correct templates and dressing the wheels to the correct form, or mounting the correct crushing rolls and forming the wheels to the correct profiles. You must set up the appropriate mechanisms and controls for indexing, selecting and fitting appropriate change gears or roll gears for generation, workspeed, setting the angle of the wheelhead and workhead, feeds and speeds, as applicable for the particular gears and gear grinding methods being 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 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 gear grinding machines used, and their application, and will know about the workholding devices, grinding wheels, wheel forming and setting up procedures, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the work produced is to the required specification.

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 gear grinding, 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 gear 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. how to handle and store gear grinding wheels safely and correctly
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. terminology used in gear grinding in relation to the activities undertaken
11. the range of workholding methods and devices that are used on gear grinding machines
12. the methods of mounting and setting the workpiece in/on the workholding devices, and the tools and equipment that can be used
13. the various gear grinding operations that are used to produce the required gear forms, and the types of wheels that are used
14. how to check that the grinding wheels are in a safe and serviceable condition
15. the methods of mounting and securing the grinding wheels to the machine spindles
16. methods of forming the wheels to the required gear profile
17. the need for `trueing up' and dressing of wheels to prevent glazing and burning of workpiece
18. how to set up the various machines for the particular gears being ground
19. how the various types of material will affect the feeds and speeds that can be

used

20. the application of cutting fluids with regard to a range of different materials
21. the need to conduct trial runs, and to check that the machine is set up and running safely and correctly
22. problems that can occur with setting up of the grinding wheels, workholding devices and machine operating parameters, and what to do if problems occur
23. 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 (PPE) 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 gear grinding machines in readiness for production:
   2.1 gear grinding using formed wheels
   2.2 gear grinding using generation
3. Position and secure workpieces using two of the following workholding arrangements:
   3.1 mandrels
   3.2 pots
   3.3 chucks
   3.4 clamps
   3.5 jigs/fixtures
   3.6 arbors
   3.7 centres
   3.8 collets
   3.9 face plates
4. Select and mount grinding wheels to include all of the following:
   4.1 selecting gear grinding wheels for specific materials and gear pitch
   4.2 mounting wheels
   4.3 testing wheels for cracks
   4.4 balancing wheels, where appropriate
5. Set up gear grinding machines, to include four of the following as appropriate to machine type:
   5.1 setting up diamond tools for use in pantograph and wheel dressing units
   5.2 selecting and mounting correct templates for the specific gear tooth form
   5.3 selecting and mounting correct crushing rolls for the specific gear tooth form
   5.4 dressing and `trueing up' single and multi-ribbed grinding wheels
   5.5 setting index plates or change gears for number of teeth to be ground
   5.6 selecting and fitting of pitch block and tapes for diameter of pitch circle to be ground
   5.7 selecting and fitting workspeed gears
   5.8 setting wheelhead and workhead angle for helical gears

6. Set up a machine to grind two of the following gear forms applicable to the machine type:
    6.1 external spur gear
    6.2 single helical gear
    6.3 bevel gears
    6.4 involute splines
    6.5 internal spur gear
    6.6 double helical gear
    6.7 straight splines
    6.8 tip and root relief
7. Grind gears 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 dimensional tolerance equivalent to relevant standard
    8.2 surface texture 8 µin or 0.2µm
    8.3 components to be free from false grinding cuts, burrs and sharp edges

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