SEMMME3055

Setting multi-spindle automatic turning machines for production

Overview

This standard identifies the competences you need to prepare and set up multi-spindle automatic turning machines for production, in accordance with approved procedures. This will involve selecting the appropriate workholding devices, securing them to the machine spindle, selecting and setting suitable collets or chuck jaws, boring out soft jaws (where applicable) and mounting workpieces in jigs or fixtures. You will be expected to select the appropriate turning tools, check that they are in a usable condition, and mount and secure them to the relevant tool holding devices, in front and rear tool posts, tangential slides and turret head.

You will need to set the machine operating parameters to produce the workpiece to the required specification. This will involve selecting, mounting and setting up turret and slide operating cams, cam timing, setting trip dogs, limit switches, stops, feed and speed mechanisms, setting appropriate depths of cut for roughing and finishing operations, and setting up multiple cutting arrangements between turret and slides. You must produce trial cuts and prove 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 machine, tooling, 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 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 multi-spindle machine used, and its application, and will know about the workholding devices, turning tools, relevant materials, consumables and setting up procedures, in adequate depth to provide a sound basis for setting up the equipment, correcting faults and ensuring the work output is produced 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.

This standard does not cover CNC turning 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. the hazards associated with setting multi spindle automatic turning machines and how to minimise them and reduce any risks
3. how to start and stop the machine in normal and emergency situations
4. the importance of ensuring that the machine is isolated from the power supply before mounting turning tools and workholding devices
5. the importance of wearing the appropriate protective clothing (PPE) and equipment, and of keeping the work area clean and tidy
6. the basic principles of operation of the multi-spindle automatic turning machine and its accessories, and typical operations that they can perform
7. how to handle and store turning tools 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 multi-spindle automatic lathe turning in relation to the activities undertaken
11. the range of workholding methods and devices that are used on single spindle automatic lathes
12. the use of hard and soft jaws in chucks, and the methods of boring out soft jaws to suit the workpiece
13. the different types of turning tools that are used, and how they are selected, prepared and mounted to the machine tool holding devices (such as front tool box, rear tool box, tangential slides, turret head)
14. the use of pilot bars and shoes for the turret, and why they need to be accurately aligned
15. the need to produce a balanced turret arrangement, with tools appropriately positioned around the turret stations
16. the various specialist devices that can be used
17. the selection of cams, and how they are set up and timed in order to produce the components to he required specification
18. factors which determine speeds and feeds to be used
19. how the various types of material will affect the feeds and speeds that can be used
20. the types of cutting fluid that are used, and precautions to be taken

when handling and using them

21. how to set up the automatic lathe and its accessories for the particular operations being performed
22. the need to conduct trial runs, and to check that the machine is set up and producing the components correctly
23. problems that can occur with setting up the workholding devices, tooling and machine operating parameters, and what to do if they 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 during the setting-up 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. follow safe practice/approved setting up procedures at all times
    4. ensure that correctly adjusted machine guards are in place
    5. check that cutting tools are in a suitable condition
    6. hold components securely without distortion
    7. leave the work area and machine in a safe and appropriate condition on completion of the activities
2. Select, mount and secure the workpiece using two of the following workholding devices:
    1. power chucks with hard or soft jaws
    2. jigs/fixtures
    3. collet chucks
3. Use two of the following groups of turning tools:
    1. solid high-speed steel
    2. indexible tips (such as carbide, ceramic, diamond)
    3. brazed tungsten carbide
4. Select and mount roughing and finishing tools, to include eight of the following types of tools:
    1. turning tools
    2. parting off tools
    3. recessing tools
    4. expanding reamers
    5. facing tools
    6. thread chaser
    7. centre drills
    8. taps
    9. form tools
    10. single point threading
    11. twist/core drills
    12. dies
    13. chamfer/radius
    14. boring bars
    15. solid reamers
    16. knurling tools
5. Mount, secure and position tools mounted in seven of the following devices:
    1. front tool box
    2. rear tool post
    3. die boxes

4. roller boxes
5. vertically or tangentially in turret knee box
6. to produce multiple cutting arrangements
7. boring bars (single and multiple)
8. special purpose profiling boxes (such as square, hexagon)
9. chucks or floating arrangements
10. tangential tool posts

6. Set up machine in accordance with instructions and specifications, to include setting all of the following:
    1. setting stops
    2. setting spindle speeds
    3. setting linear feed rate
    4. cutting fluid flow rate
    5. position of workpiece in work holding device
    6. depth of cut for roughing and finishing
    7. position of turning tools in relationship to workpiece
    8. selecting and setting appropriate cams
    9. setting trip dogs and limit switches
    10. bar feed and stop mechanisms
    11. machine guards/safety mechanisms
7. Set up the machine to produce internal and external profiles that include ten of the following:
    1. flat faces
    2. drilled holes
    3. internal threads
    4. chamfers and radii
    5. parallel diameters
    6. bored holes
    7. external threads
    8. knurls/special finishes
    9. stepped diameters
    10. reamed holes
    11. eccentric features
    12. grooves/undercuts
    13. tapered diameters
    14. profile forms
    15. parting off
    16. counterbores
8. Machine components from one of the following types of material:
    1. ferrous
    2. non-ferrous
    3. non-metallic
9. Set the machine to produce components within all of the following quality and accuracy standards, as applicable to the operations performed:
    1. components to be free from false tool cuts, burrs and sharp edges
    2. dimensional tolerance as specified in relevant standard

3. reamed and bored holes within H8
4. screw threads BS medium fit
5. angles within +/- 0.5 degree
6. surface finish 63µin or 1.6µm

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Developed by	Enginuity
Version Number	3
Date Approved	30 Mar 2023
Indicative Review Date	31 Mar 2028
Validity	Current
Status	Original
Originating Organisation	Enginuity
Original URN	SEMMME3055
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies, Engineering Technicians
Suite	Mechanical Manufacturing Engineering Suite 3
Keywords	Engineering; manufacturing; mechanical; setting; multi-spindle automatics; parameters; workpiece; workholding devices; selecting; tools; speeds; feeds