SEMTS215

Assisting in producing or modifying operating programs for computer controlled machines

Overview

This standard identifies the competences you need to support colleagues with the production or modification of operating programs for computer controlled machines, in accordance with approved procedures. You will be required to activate the programming software and to check that the system is operating correctly. You will ensure that you have been provided with accurate, current and complete data and information, in-order to produce or modify the operating program.

You will be required to produce efficient and effective programs combining a range of operations. The program format will avoid unnecessary operations and tool movements, by using appropriate commands such as repeat programs/sub-routines, and by including the correct reference codes and preparatory commands for the machine management and auxiliary functions. On completion of the programming activities, you will be required to save and/or convert the program in the correct format, and to save it in the correct location.

Your responsibilities will require you to comply with organisational policy and procedures for producing the computer controlled machine programs, and to report any problems with these activities that you cannot personally resolve or that are outside your permitted authority, to the relevant people. You will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying the appropriate machine programming methods and procedures. You will have an understanding of the machining capabilities of the equipment and tools used in the process, and their application. You will also know about the materials being machined and the effect this has on material removal rates, speeds and feeds, and surface finish. You will understand the programming codes in sufficient depth to provide a sound basis for carrying out the activities, for correcting faults and for ensuring that the program produced will manufacture the components to the required specification in the most efficient way.

You will understand the safety precautions required when working on computer controlled machines and associated 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.

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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. produce computer control programs that contain all the relevant and necessary data for the engineering activity to be carried out
3. produce the control programs in the appropriate formats
4. make sure that codes and other references used in the programs are applicable to the type of controller used
5. pass on the programs to the appropriate people within agreed timescales
6. save and back up the program details, and store them securely in accordance with organisational requirements
7. undertake changes to program details within agreed control procedures

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken when working with computer systems (to include safety guidance relating to the use of visual display unit (VDU), equipment and work station environment (such as lighting, seating, positioning of equipment), repetitive strain injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections)
2. good housekeeping arrangements (such as cleaning down work surfaces; putting media, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)
3. the basic set-up and operation of the computer system, and of any peripheral devices that are used
4. the correct start up and shutdown procedures to be used for the computer systems
5. how to access the specific programming software, and the use of help menus, manuals and related documents to solve problems and aid the efficient programming of computer controlled machines
6. the importance of protecting the computer system from viruses, and the implications if the correct procedure is not followed
7. how to power up, log on and activate the computer system and programming software correctly
8. how to deal with system problems (such as error messages received, peripherals which do not respond as required)
9. the checks to be carried out to ensure that the peripheral devices are connected correctly
10. the correct procedure used to shut down the operating and programming system
11. how to create and structure directories and files correctly (such as importing, copying, transferring, exporting deleting, backing up and saving files)
12. the different types of storage medium that can be used to save program files
13. the offline programming methods used in computer controlled machines (such as computer aided machining (CAM), G code and conversational code)
14. the different programming codes used to identify factors such as machine axes, positional information, tooling identification and selection, tool/cutter direction, material removal, speeds and feeds, machine management and auxiliary functions
15. the information and data required in order to produce complete and accurate computer controlled machine programs
16. how to extract and interpret general and technical data and information from different sources (such as drawings, computer

models, symbols and conventions, BS or ISO standards) in-order to produce the computer controlled machine program

17. the factors to be taken into account when producing computer controlled machine programs (including the type of machine and its machining capabilities, the tooling available, safety, workholding equipment, the material being machined, component tolerances and surface finish required)

18. the different methods used to set tooling (such as manual methods, probing and tool setting arms)

19. how to produce effective and efficient programs to avoid unnecessary operations, tool movements and tool changes (including the use of macro programs and canned cycles), to reduce program size

20. the methods and procedures used to check that the completed program will produce the required component safely, accurately and efficiently

21. how to save the completed programs in the appropriate format, and the need to store programs safely and correctly, away from contaminants and sources of corruption

22. how to back up completed or edited programs, and the implications if this is not carried out effectively

23. the correct procedure to be followed before the program is released to the end user

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the extent of your own responsibility 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. Carry out **all** of the following in preparation for the machine programming:

    1. check that all the equipment is correctly connected and in a safe and usable working condition (such as cables undamaged, correctly connected, safely routed)
    2. power up the equipment and activate the programming software
    3. set up the computer system to be able to produce the program
    4. ensure that you have the necessary component data and information to produce the program
    5. identify and deal with problems (such as information-based and/or technical)

2. Assist in producing or modifying computer controlled machine operating programs for **one** of the following:

    1. turning
    2. machining centres
    3. milling
    4. industrial robots
    5. grinding
    6. laser profiling
    7. gear cutting
    8. fabrication machines (such as punching, bending, shearing)
    9. boring
    10. electro-discharge machining
    11. other specific computer controlled machine

3. Produce or modify programs using **one** of the following methods:

    1. computer aided machining (CAM)
    2. conversational code
    3. G code
    4. other specific method (such as macros)

4. Carry out **all** of the following, as applicable to the programming method selected:

    1. import component data file and/or produce shape/geometry of the component
    2. select a suitable or specified datum point
    3. select absolute and/or incremental systems of measurement
    4. select imperial or metric system of measurement

5. input the safe start position
6. input the material parameters
7. select or create tool/cutter information (such as number, type, lengths and offsets, radius compensation)
8. select appropriate reference codes
9. input the required positional information
10. input the cutting parameters (such as depth of cut, direction, feed in/out)
11. input the preparatory commands and machine management/auxiliary functions
12. use repetitive programs (sub-routines, canned cycles, labels, macros)
13. determine tool/cutter path, order and sequence
14. select and input the tool change positions
15. input any additional information (such as work-shift position)
16. convert the program into the correct format (post processing)

5. Carry out **all** of the following on completion of the programming activity:

1. check and review the program format and content
2. edit the program, using the correct procedure (where appropriate)
3. produce tooling sheets (to include information such as tool identification, type of tips, fixtures and methods of setting up, where appropriate)
4. check that the program is correctly titled and referenced
5. ensure that programs are stored safely and correctly, in the correct format and location
6. ensure that the program has been checked and approved before forwarding to the end user
7. send a copy of the approved program to the correct location for the end user
8. create a separate backup copy of the program, in case of file corruption

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