SEMFWE227 - SQA Unit Code J4M5 04

Cutting and shaping using CNC plasma or gas cutting machines

Overview

This standard identifies the competencies you need to carry out cutting and profiling operations using computer numerical controlled (CNC) plasma or gas cutting and profiling machines, in accordance with approved procedures. You will take charge of the prepared machine and check that it is ready for the cutting operations to be performed. This will involve checking that all the required materials and consumables are present, and that the machine has been approved for production. In operating the machine, you will be expected to follow the correct procedures for calling up the machine-operating program, dealing with any error messages, and executing the program activities safely and correctly.

The components produced will have a number of different features, including square and rectangular profiles, angular profiles, curved profiles, circles, slots, holes linearly positioned and holes radially positioned. You will be required to continuously monitor the cutting and shaping operations, making any necessary adjustments to machine parameters, in line with your permitted authority.

Your responsibilities will require you to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the equipment, program or materials that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will be sufficient to provide a good understanding of your work, and will provide an informed approach to applying CNC plasma or gas cutting/profiling procedures. You will have an understanding of the CNC cutting 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 plasma/gas cutting machine and its 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.

Setting up the machine, its tooling, workholding devices and associated equipment, are the subjects of other units.

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 equipment is set up and ready for operation
3. follow the defined procedures for starting and running the operating system
4. deal promptly and effectively with error messages or equipment faults that are within your control and report those that cannot be solved
5. operate the machine to produce components
6. monitor the computer process and ensure that the production output is to the required specification
7. shut down the equipment to a safe condition on conclusion of the activities

Knowledge and understanding

You need to know and understand:

1. the safe working practices and procedures to be observed when operating CNC plasma and gas cutting/profiling machines (general workshop and site safety, appropriate personal protective equipment (PPE), fire and explosion prevention, protecting other workers; fume control; accident procedure; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials; machine safety devices)
2. how to start and stop the machine in normal and emergency situations, and how to close the machine down on completion of activities
3. the importance of ensuring the machine is isolated from the power supply before working with machinery; and the care needed when working with compressed gases
4. the equipment that needs to be worn when working with fabrications and thermal cutting equipment (such as leather aprons and gloves, eye/ear protection, safety helmets)
5. the hazards associated with using CNC thermal cutting equipment (naked flames, fumes and gases, explosive gas mixtures, oxygen enrichment, spatter, hot metal, moving parts of machinery), and how they can be minimised
6. the correct methods of moving or lifting plate materials and components
7. principles and operation of the plasma or gas cutting equipment, and the terminology used in thermal cutting, in relation to the operations being performed
8. how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International or ISO standards in relation to work undertaken)
9. how to interpret the visual display and understand the various messages displayed
10. the function of error messages, and what to do when an error message is displayed
11. how to find the correct restart point in the program when the machine has been stopped before completion of the program

12. the operation of the various hand and automatic modes of machine control (such as program operating and control buttons)
13. how to operate the machine using single block run, full program run and speed override controls
14. how to make adjustments to machine-operating programs to take account of out-of-specification components
15. setting of operating conditions; flame control and the effects of mixtures and pressures associated with thermal cutting
16. the effects of oil, grease, scale or dirt on the cutting process
17. care of equipment and operating programs, including safe storage of electronic materials away from possible contamination and corruption
18. monitoring the machine during the cutting process; recognition of problems and action to be taken
19. the actions to be taken prior to cutting (setting up the material/workpiece, checking cleanliness of materials used)
20. the holding methods that are used to aid thermal cutting, and equipment that can be used
21. the problems that can occur with thermal cutting and how they can be avoided; causes of distortion during thermal cutting and methods of controlling distortion
22. organisational quality systems (standards to be achieved; production records to be kept)
23. the extent of your authority and whom you should report to if you have problems that you cannot resolve
24. reporting lines and procedures, line supervision and technical experts

Scope/range related to performance criteria

1. Confirm that the plasma/gas cutting installation is ready for operation, to include checking all of the following:
    1. the machine has been approved for production
    2. all safety equipment and guards are in place and functioning correctly
    3. materials are correctly positioned and held securely without distortion
    4. the cutting nozzles are clean and in a suitable condition
    5. the operating program is at the correct start point
    6. the workpiece is clear of the machine spindle
    7. safe working practices and startup procedures are observed
    8. machine settings are adjusted as required to maintain accuracy

2. Use one of the following thermal cutting methods:
    1. oxy/fuel gas cutting
    2. plasma gas cutting

3. Produce components which are cut and shaped, and which cover six of the following features:
    1. square/rectangular profiles
    2. round holes
    3. angular profiles
    4. slots and apertures
    5. curved profiles
    6. angled cuts
    7. circles
    8. bevelled edge – weld preparations
    9. ellipses
    10. other specific features

4. Machine one of the following types of material:
    1. mild steel
    2. other alloy steels
    3. carbon steel
    4. aluminium
    5. copper
    6. stainless steel
    7. other appropriate material

5. Produce components within all of the following quality and accuracy standards:
    1. dimensional accuracy is within the tolerance specified on the drawing/specification or within +/- 1.5mm
    2. angled cuts are within specification requirements (perpendicular/angularity)
    3. cuts are clean and smooth and free from flutes
    4. components are free from distortion

Behaviours

Additional Information

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

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