Overview

This standard identifies the competences you need to set up CNC laser profiling machines and associated equipment, in accordance with approved procedures. You will be required to select the appropriate workholding devices, and to mount and secure them to the machine table in the correct relation to the operating program and machine parameters.

You will need to set up the machine conditions and adjust/edit program parameters, controlling the setting of the optical system, laser characteristics, laser alignment, electrical parameters, and the laser cutting speed. This will involve loading and proving component programmes, checking for errors/faults, editing and saving program changes. You must produce trial components, and prove the machine is working correctly and producing the components to the required specification, 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 equipment or setting 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 CNC laser profiling machine used, and its application, and will know about the workholding devices, machine operating programmes 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 on the 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 CNC laser profiling machines for production

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. the safe working practices and procedures to be observed when setting and operating CNC laser profiling machines (care when working with high power laser beams; machine guards; ventilation and fume extraction; 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 that the machine is isolated from the power supply before working with machinery; and of taking particular care when working with high-power laser beams
4. the importance of wearing the appropriate protective clothing (PPE) and equipment, and of keeping the work area clean and tidy
5. the hazards associated with setting laser machines (such as dangers from high power laser beams; live electrical components; moving parts of machinery), and how to minimise them and reduce any risks
6. how to save the programs in the appropriate format, and the importance of storing programs and storage devices safely and correctly, away from contaminants and possible corruption
7. the methods and procedures used to minimise the chances of infecting a computer with a virus
8. the implications if the computer you are using does become infected with a virus and who to contact if it does occur
9. the basic principles of laser profiling (such as using a laser beam to cut metals; forming component profile; process principles; nature of the laser beam; methods of generating a laser beam; guiding and optical focussing laser optics; parameters; how variation in the parameters influences the component feature, quality and output; terminology used in laser machining)
10. the key components and features of the equipment (such as types of laser beam generator, beam characteristics, power ranges; beam guiding and focusing arrangements; power sources; materials and thickness capabilities; facilities for manipulating the components for machining; and safety features)
11. how to extract and use information from engineering drawings or data and related specifications (to include symbols and
conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken
12. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
13. the range of workholding methods and devices used on laser profiling machines
14. methods of setting up the components in relation to the machine’s datums and operating parameters (such as to achieve correct laser alignment; manipulation of work holding equipment to present the component correctly relative to the laser).
15. setting up the laser equipment to achieve the component specification (such as electrical and optical conditions; focal distance; cutting speed)
16. how to place the machine in the correct operating mode, and how to access the program edit facility in order to make minor adjustments for production
17. how to conduct trial runs, using single block run, speed override controls, and checking that the machine functions to the required specification
18. why you would conduct a full dry run and single block run
19. how the various materials will affect the operating conditions used, and the cutting speed that can be applied
20. problems that can occur with laser cutting activities, and how these can be overcome (such as causes of distortion and methods of control, cutting characteristics of parent materials; sources of component defects and methods of prevention)
21. organisational quality systems (such as standards to be achieved; production records to be kept)
22. the extent of your 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 during the setting-up activities:
   1. obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation)
   2. adhere to procedures or systems in place for risk assessment, COSHH, 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. confirm that the correct operating program has been loaded
   5. ensure that the laser lens is in a clean and usable condition
   6. ensure that the material/workpiece is correctly positioned and secured without distortion
   7. update the program data as applicable
   8. ensure that correctly adjusted machine guards are in place
   9. leave the work area and machine in a safe and appropriate condition on completion of the activities

2. Position and secure materials/workpiece using three of the following workholding devices:
   1. machine vices
   2. direct clamping to machine table
   3. chucks
   4. Indexing tables/devices
   5. fixtures
   6. other specific workholding devices

3. Set up, in accordance with work instructions and specifications, all of the following:
   1. optical system
   2. saving changes to programme
   3. laser positioning
   4. laser alignment
   5. profiling parameters
   6. cutting speed

4. Set up the equipment to produce machined components which cover six of the following features:
   1. square/rectangular profiles
   2. holes linearly positioned
3. angular profiles  
4. holes radially positioned  
5. curved profiles  
6. slots and apertures  
7. circles  
8. ellipses  
9. other specific features

5. Machine **one** of the following types of material:  
   1. ferrous  
   2. non-ferrous  
   3. stainless  
   4. non-metallic

6. Set the machine to produce components within **all** of the following quality and accuracy standards, as applicable to the operations performed:  
   1. dimensional tolerance equivalent to BS EN 20286 or BS 1916 Grade 7  
   2. angles within +/- 0.5 degree  
   3. surface texture within 63µin or 1.6µm
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