

Welding materials using electron beam welding machines

Overview

This standard identifies the competencies you need to operate electron beam welding installations that have already been prepared for production, in accordance with approved instructions or welding procedures. You will be expected to check that the installation has been approved for production and that sufficient supplies of all required materials and consumables are present and correct, and are ready for production operations to be performed.

You must operate the installation safely and correctly, in accordance with instructions and approved procedures, and achieve a weld quality and tolerances that meet the product specification. The production output may be inspected by visual and non-destructive testing methods, to check that the specified quality is being achieved. You must continuously monitor the operation of the installation and make any necessary adjustments to equipment settings, in line with your permitted authority, in order to produce the welded joints to the required specification. Meeting production requirements will be an important issue, and your production records must show consistent and satisfactory performance.

Your responsibilities will require you to comply with organisational policy and procedures for operating the welding installation, and to report any problems or adjustments to the installation that you cannot 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 carry out.

Your underpinning knowledge will be sufficient to provide a sound basis of your work, enabling you to adopt an informed approach to applying welding procedures and instructions. You will have an understanding of how the electron beam welding process works and is applied in mechanised form, and will know about the equipment, materials and consumables, in adequate depth to provide a sound background to the process operation and for carrying out the activities 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.

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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. follow the relevant joining procedure and work instructions
3. confirm that the machine is set up and operating correctly, ready for the joining operations to be carried out
4. check that the parent material, components, consumables and joint preparation comply with specifications
5. carry out and monitor the machine operations in accordance with specifications and job instructions
6. achieve joints of the required quality and specified dimensional accuracy
7. make sure that the rate of output is as specified
8. deal promptly and effectively with problems within your control and report those that you cannot solve
9. shut down the equipment to a safe condition on conclusion of the joining activities

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Knowledge and understanding

You need to know and understand:

1. the safe working practices and procedures to be observed when operating electron beam welding installations (working with machinery; care in presence of high voltage; the use of appropriate personal protective equipment (PPE); protecting other workers; machine guards; operation of machine safety devices; x-ray dosimeters; closing the machine down on completion of activities; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials)
2. the hazards associated with electron beam welding machines (dangers from the mains and high voltage supplies; live electrical components; emission of x-rays, fumes and gases; hot metal; moving parts of machinery), and how they can be minimised
3. principles of electron-beam welding; terminology used in welding
4. the key components and features of the equipment (electron gun and control of beam power and characteristics; vacuum chamber and its construction; vacuum system and controls; in-chamber manipulating equipment; power sources and power range; material and thickness capabilities; safety features; facilities for loading chamber and work handling)
5. extracting the information required from drawings and welding procedure specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
6. operation of the machine; controls and their function; care of equipment
7. setting up and aligning the workpiece
8. monitoring the installation during the welding process; recognition of problems, and action to be taken
9. problems that can occur with the welding activities (materials and weld defects; beam instability, loss of alignment, increase in chamber pressure)
10. self inspection of completed work
11. organisational quality systems (standards to be achieved; production records to be kept)
12. personal approval tests and their applicability to your work
13. the extent of your own authority and whom you should report to if you have problems that you cannot resolve
14. reporting lines and procedures, line supervision and technical experts

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Scope/range related to performance criteria

1. Confirm that the installation is ready for operation, to include checking all of the following:
 1. the installation has been approved for production
 2. supplies of components and consumables are adequate and correctly prepared
 3. machine settings comply with instructions and the welding procedure specification
 4. chamber pressures checked
 5. all machine functions operate correctly
 6. all safety equipment is in place and functioning correctly
2. Produce welded components covering both of the following:
 1. two different components
 2. two different material groups
3. Monitor the process operation and machine function and make adjustments as required to parameters and mechanisms, to include all of the following, as appropriate to the machine type:
 1. electrical parameters
 2. welding speed
 3. chamber pressure
 4. weld alignment and characteristics
 5. beam tracking
 6. mechanical functions
4. Produce welded components which:
 1. achieve a weld quality equivalent to the relevant level of BS EN/ISO 13919 standards or relevant International standards, as required by the application standard
 2. meet the required dimensional accuracy within specified tolerances

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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Developed by	Enginuity
Version Number	3
Date Approved	30 Mar 2017
Indicative Review Date	31 Mar 2020
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMFWE212
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies, Metal Forming, Welding and Related Trades
Suite	Fabrication and welding suite 2
Keywords	engineering; welding; fabrication; machine welding; electron beam; characteristics; monitor weld condition; monitor equipment; monitor beam tracking