SEMMME3166

Performing laser optical system alignment

Overview

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This standard identifies the competences you need to set up and align laser optical systems, in accordance with approved procedures. You will be required to use appropriate drawings, specifications and test documentation to set up and align the various items of equipment. You will be expected to use the specified/appropriate techniques to carry out the setting-up and alignment procedures in the correct sequence, in order to integrate the various elements into the laser system. The process will include setting up the various components/lenses, making adjustments to bring the settings within specification and final fixing of lenses in their correct positions.

The equipment to be set up and aligned could be from a wide range of industries from manufacturing, construction and processing of materials, where alignment is critical to the correct operation of the equipment.

Your responsibilities will require you to comply with organisational policy and procedures for the laser optical setting-up and alignment activities undertaken, and to report any problems with the activities, components or equipment that you cannot personally resolve, or that 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, 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 applying setting-up and alignment techniques and procedures to laser optical systems. You will understand the laser optical system being set up and aligned, and its application, and will know about the setting-up and alignment techniques and procedures, test equipment and methods, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the laser system functions to the required specification.

You will understand the safety precautions required when carrying out the setting-up and alignment operations, in particular those relating to exposure to laser light. You will

be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Performance criteria

You must be able to:

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1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow all relevant setting-up and operating specifications for the system being configured
3. follow the defined procedures and set up the equipment correctly, ensuring that all operating parameters are achieved
4. deal promptly and effectively with problems within your control and report those that cannot be solved
5. check that the configuration is complete and that the equipment operates to specification
6. complete all relevant documentation, accurately and legibly

Knowledge and understanding

You need to know and understand:

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1. how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. the safety procedures that must be carried out before work is started on setting up the laser optical equipment
3. the protective equipment (PPE) that you need to use for both personal protection of yourself and others, and protection of the system components
4. the hazards associated with setting up and aligning laser optical systems, and with the tools and test equipment that is used, and how to minimise them and reduce any risks
5. how to obtain and interpret drawings, standards, quality control procedures and specifications used in the setting up and alignment process (including, for example, BS, ISO or BSEN schematics, symbols and terminology)
6. how to carry out currency/issue checks on the specifications you are working with
7. the type of equipment that is to be set up and aligned
8. the basic principle of operation of the equipment being set up and aligned
9. the properties of light which lend itself to being used for alignment
10. the laser components to be set up and aligned, and their function within the particular laser system
11. the adjustments/corrections/tuning required to bring the equipment/system to operational standard through full range parameters
12. the quality control procedures to be followed during the setting-up and testing operations
13. types of test/alignment equipment to be used, and their selection for particular types of test
14. how to check/calibrate the test/alignment equipment to be used; or the organisational procedures for ensuring that the equipment is maintained and correctly calibrated
15. how to conduct any necessary checks/tests to ensure the integrity, functionality,

accuracy and performance of the system and its dependences
16. how to recognise defects
17. displaying/recording alignment test results, and the documentation to be used
18. how to interpret the alignment/test readings obtained, and the significance of the readings
19. the importance of ensuring that equipment is used only for its intended purpose and within its specified range and limits
20. potential problems or errors that could occur with the setting-up and alignment operations, and how these can be overcome
21. the environmental control and company operating procedures relating to the setting-up and alignment activities
22. the documentation required and the procedures to be followed on completion of the setting-up and alignment activities
23. 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

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1. Carry out all of the following during the setting up and alignment of the laser optical system:
    1.1 obtain and interpret correctly the documentation for the type of laser system being aligned
    1.2 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
    1.3 check that all tools and test equipment to be used are within their calibration dates
    1.4 obtain clearance to work on the system, and observe power isolation and safety procedures
    1.5 provide safe access and working arrangements for the work area
    1.6 carry out the setting-up and alignment activities, using safe and approved techniques and procedures
    1.7 return all tools and equipment to the correct location on completion of the activities
    1.8 leave the equipment and work area in a safe and clean condition on completion of the setting-up and alignment activities
2. Set up and align laser optical systems for one of the following types of equipment:
    2.1 laser welding
    2.2 laser guidance
    2.3 laser drilling
    2.4 laser imaging
    2.5 laser cutting
    2.6 telemetry systems
    2.7 laser marking out
    2.8 holographic systems
    2.9 laser inspection
    2.10 laser heat treatment
    2.11 other specific application
3. Set up and align all of the following optical system components, as applicable to the system being aligned:
    3.1 control units
    3.2 lenses
    3.3 lasers
    3.4 interferometers

3.5 mirrors
3.6 receiver units

4. Carry out alignments, adjustments and tests, using a range of tools and equipment, to include two of the following:
4.1 optical alignment scope
4.2 signal injection tests
4.3 centring detector
4.4 oscilloscope
4.5 beam targets
4.6 Foucault tests
4.7 rotating pentaprism
4.8 null test
4.9 laptop computer
4.10 other specific equipment

5. Use twelve of the following setting-up and alignment methods and techniques:
5.1 positioning equipment/components
5.2 optimising system parameters
5.3 levelling of equipment
5.4 lifting and handling
5.5 aligning of equipment
5.6 connecting wires and cables
5.7 assembly/connection of system components or sub-assemblies
5.8 securing by using mechanical fixings
5.9 securing by using adhesives
5.10 setting and sealing lenses in position
5.11 sealing
5.12 cleaning optics
5.13 applying screw fastener locking devices
5.14 determining and setting depth of focus
5.15 earth bonding
5.16 setting spot size and location
5.17 checking laser power output
5.18 ensuring the system cleanliness (such as covering lenses or components)

6. Set up and align laser optical equipment in compliance with one of the following standards:
6.1 BS, ISO or EN standards and procedures
6.2 customer (contractual) standards and requirements
6.3 company standards and procedures
6.4 specific equipment requirements/manufacturer's data
6.5 recognised compliance agency/body's standards
6.6 other accepted international standards

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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	SEMMME3166
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies, Engineering Technicians
Suite	Mechanical Manufacturing Engineering Suite 3
Keywords	Mechanical engineering; photonics; laser; optical; system; alignment; welding; drilling; cutting; marking out; inspection; heat treatment; guidance; imaging; holographic; telemetry; control unit; lens; interferometer; mirror; receiver unit