SEMMME248

Operating vacuum coating optical process machines

Overview

This standard identifies the competences you need to carry out optical thin-film coating operations, in accordance with approved procedures, using optical thin-film coating process machines. You will confirm with the machine setter that the machine is ready for the operations to be performed and that all the required components, materials and consumables are available. You will be required to operate a range of equipment, in order to produce components that combine a mixture of processes identified for optical thin-film coating, using a selection of specified optical materials. You will be expected to produce a range of components that combine a number of different features, such as optical transmission, flatness, surface defects and transmitted wavelength.

You will be required to operate the coating machine in line with safe working practices and approved procedures, to continuously monitor the coating machining operations and, where necessary, make minor adjustments or seek the help of the machine setter to make the adjustments, in order to ensure that the work output is to the required quality and accuracy. Meeting production targets 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 the optical coating activities undertaken, and to report any problems with the coating activities, materials or equipment 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 carry out.

Your underpinning knowledge will be sufficient to provide a good understanding of your work, and will enable you to adopt an informed approach to applying optical coating procedures. You will have an understanding of the optical thin- film coating processes, and their application, and will know about the equipment, materials and consumables, in adequate depth to provide a sound background for carrying out the activities to the required specification.

You will understand the safety precautions required when working with the machines, their 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.

Setting up of the machine, its tooling and associated workholding devices, is the subject of another standard and is the responsibility of the machine-tool setter.

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines

P2 ensure that material surfaces to be treated are suitably prepared for the finishing operations to be carried out

P3 check that the finishing equipment and treatment solutions are set up and maintained at satisfactory operating conditions and levels

P4 produce optical coated components in accordance with operating procedures

P5 ensure that the treated workpiece achieves the required characteristics and meets the finishing specification

P6 deal with problems within your control and report those that cannot be solved

P7 dispose of waste materials in line with organisational and environmentally safe procedures

P8 complete and store all relevant documentation in accordance with organisational requirements

P9 shut down the finishing equipment to a safe condition on completion of the processing activities

Knowledge and understanding

You need to know and understand:

K1 how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
K2 the safety mechanisms on the machine, and the procedure for checking that they function correctly
K3 the operation of the machine controls in both set-up and run modes, and how to stop the machine in an emergency
K4 the importance of wearing the appropriate personal protective equipment (PPE), and of keeping the work area clean and tidy
K5 where to obtain the component drawings, specifications and/or job instructions, in order to produce the required components to be coated
K6 how to extract the necessary information from the drawings and specifications, in order to produce the required optical coating component
K7 the factors which effect the selection of machine set-up, in order to achieve correct coating specification
K8 the preparation of coating material sources
K9 how to load and unload coating components correctly into coating jigs and fixtures

K10 how to clean and store components prior to coating operations
K11 how to prepare the coating plant prior to the coating process
K12 how to correctly identify the component face to be coated
K13 how to strip the coating plant after coating operations have been carried out
K14 the issues that can occur with optical thin-film coating activities, and how they can be overcome
K15 the quality control procedures used, inspection checks to be carried out, and the equipment used to achieve the required component
K16 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

1. Carry out all of the following during the setting up and operating activities:

1.1 obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation, material data sheets)

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 confirm with the machine setter that the machine is ready for production

1.4 where appropriate, seek any necessary instruction/training on the operation of the machine

1.5 ensure that machine guards and safety mechanisms are in place and are correctly adjusted

1.6 hold components securely, without damage or distortion

1.7 follow the defined operating procedures and apply safe working practices and procedures at all times

1.8 ensure that machine settings are adjusted as and when required (either by yourself or the setter) to maintain the required quality

1.9 ensure that the components produced meet the required specification for quality and accuracy

1.10 leave the work area and machine in a safe and appropriate condition on completion of the activities

2. Operate one of the following types of optical thin-film coating process machine from the following:

2.1 infra-red/special material coating

2.2 polycarbonate material coating

2.3 visible dichroics/edge filters coating

2.4 basic anti-reflection coating

2.5 graded coating

2.6 other coating processes

3. Produce optical thin-film coated components that combine different operations and cover four of the following:

3.1 coated flatness tolerance

3.2 coated cosmetic defects

3.3 coating material sources

3.4 coated reflection and transmission
3.5 coating component preparation/cleaning
3.6 coated specifications tolerances
3.7 coating component loading/unloading

4. Thin-film coat two different types of component materials from the following:
4.1 germanium
4.2 zinc selenide prisms and flats
4.3 zinc sulphide prisms and flats
4.4 polycarbonate
4.5 borosilicate crown
4.6 barium dense flints
4.7 barium crown
4.8 flint/light flints
4.9 lanthanum crowns
4.10 dense flints
4.11 anomalous dispersion flour crown
4.12 optical orange filter glass
4.13 optical blue filter glass
4.14 optical neutral density glass
4.15 other appropriate material

5. Carry out the necessary checks for accuracy, during production, of all of the following:
5.1 transmission measurement
5.2 flatness measurement
5.3 surface defect measurement
5.4 coating adhesion test

6. Produce components which comply to one of the following standards:
6.1 BS, ISO or BSEN standards and procedures
6.2 customer (contractual) standards and requirements
6.3 organisational standards and procedures
6.4 optical coating specifications
6.5 other accepted international standards

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