SEMMME247

Operating optical cylinder and dome process machines

Overview

This standard identifies the competences you need to carry out machining and finishing operations on optical cylinders and/or domes, in accordance with approved procedures, using optical 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.

For domes, you will be required to machine components that combine a mixture of processes identified for optical domes, using a selection of specified optical dome materials. You will be expected to produce a range of components that combine a number of different features, such as centre thickness, diameters, generated blanks, optical form, and optical power (radius of curvature).

For cylinders, you need to carry out optical cylinder processing, in accordance with optical approved procedures, including hand preparation, smoothing and polishing, using a selection of specified optical cylinder materials. You will be expected to produce a range of cylinder components that combine different features, such as centre thickness, angles, axis, blocking, parallelism, and optical power and form error.

You will be required to operate the machines in line with safe working practices and approved procedures, to continuously monitor the 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 machining activities undertaken, and to report any problems with the machining activities, materials or equipment used 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 machining procedures. You will have an understanding of the optical cylinder and dome materials,

the processes used 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 confirm that the machine is set up and ready for the machining activities to be carried out

P3 operate the machine controls in accordance with safe working practices and operational procedures

P4 produce components to the required specification and within the specified dimensional accuracy

P5 carry out quality sampling checks at suitable intervals

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

P7 complete and store all relevant documentation in accordance with organisational requirements

P8 shut down the equipment to a safe condition on conclusion of the machining 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 drawing, specifications and/or job instructions required for the components to be machined
K6 how to extract and use information from optical engineering drawings and related specifications in relation to work undertaken
K7 how to use imperial and metric systems of measurement
K8 the various optical cylinder/dome operations that can be performed
K9 how to handle and store all cutting tools and kit required, safely and correctly
K10 the application of roughing and finishing cuts, cylinder/dome pressures used, and the effects on tool life, surface finish and dimensional accuracy
K11 how tool wear affects surface finish and dimensional accuracy
K12 how the various types of material will affect the way the operation is performed
K13 the application of cutting fluids and polishing mediums with regard to the range of material being produced
K14 the effect of clamping the workpiece, and how this can cause distortion in the finished component
K15 how to recognise machine faults, and how to identify when tooling needs refurbishment
K16 the issues that can occur with optical cylinder/dome machining activities, and how they can be overcome
K17 the quality control procedures used, inspection checks to be carried out, and the equipment used
K18 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. Apply all of the following during the machining activities:

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

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 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 accuracy

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. Either - Operate two of the following types of optical cylinder processes:

2.1 cylinder preparation process

2.2 cylinder pitch polishing process

2.3 cylinder hand lapping to axis/angle process

2.4 cylinder silk polishing process

Or - Operate two of the following types of optical dome processes:

2.5 dome preparation process

2.6 dome silk polishing process

2.7 dome surface generation process

2.8 dome pitch polishing process

2.9 dome polyurethane process

3. Produce machined optical components that combine different operations and cover four of the following:

3.1 cylinder/dome centre thickness

3.2 cylinder/dome surface generation
3.3 cylinder/dome concentricity
3.4 cylinder/dome power analysis (radius)
3.5 cylinder/dome cosmetic defects
3.6 cylinder/dome form error analysis
3.7 cylinder/dome diameter
3.8 cylinder parallelism
3.9 cylinder/dome truncation
3.10 cylinder hand lapping process
3.11 dome preparation/smoothing process
3.12 dome transmitted wave-front analysis
3.13 dome transmission analysis

4. Either - Machine three different types of cylinder material from the following:
4.1 germanium
4.2 anomalous dispersion flour crowns
4.3 barium crowns
4.4 optical orange filter glass
4.5 dense flints
4.6 optical blue filter glass
4.7 flints/light flints
4.8 borosilicate crowns
4.9 lanthanum crowns
4.10 magnesium fluoride
4.11 barium dense flints
4.12 optical neutral density cut glass
4.13 other appropriate cylinder material
Or - Machine two different types of dome material from the following:
4.14 germanium
4.15 magnesium fluoride
4.16 zinc selenide
4.17 zinc sulphide
4.18 other appropriate dome material

5. Carry out the necessary checks for accuracy during production of four of the following:

5.1 dome diameter
5.2 cylinder/dome bevels
5.3 cylinder parallelism
5.4 cylinder/dome chamfers
5.5 cylinder/dome truncation
5.6 cylinder/dome cap height
5.7 cylinder/dome centre thickness
5.8 cylinder/dome surface power error
5.9 cylinder/dome cosmetic surface finishes
5.10 cylinder/dome surface form error

6. Produce components with dimensional accuracy, form and surface quality, which comply to one of the following
6.1 BS, ISO or BSEN standards and procedures
6.2 customer (contractual) standards and requirements
6.3 organisational standards and procedures
6.4 other accepted international standards

SEMMME247

Operating optical cylinder and dome process machines

Developed by	Enginuity
Version Number	3
Date Approved	31 Mar 2026
Indicative Review Date	01 Apr 2029
Validity	Current
Status	Original
Originating Organisation	Enginuity
Original URN	SEMMME2-47
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies, Engineering Technicians
Suite	Mechanical Manufacturing Engineering Suite 2
Keywords	engineering; manufacturing; mechanical; machining; optical; cylinders; domes; hand finishing cylinders; hand finishing domes; inspecting; operating