Overview

This standard identifies the competences you need to carry out machining operations on optical prisms and flat components, in accordance with approved procedures, using a range of optical prism and flat 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. In operating the machine, you will be expected to produce a range of components that combine a number of different features such as angles, flats, parallelism, wedge shapes, chamfers and bevels, using a selection of specified optical prism and flat materials. You will also be required to check the finished components for accuracy and quality.

You will be required to operate the machine 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, tooling or consumables 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 produce.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying optical machining procedures. You will have an understanding of the optical prism and flat machining 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:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. confirm that the machine is set up and ready for the machining activities to be carried out
3. operate the machine tool controls safely and correctly in line with operational procedures
4. produce components to the required quality and within the specified dimensional accuracy
5. carry out quality sampling checks at suitable intervals
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. complete the required production documentation
8. shut down the equipment to a safe condition on conclusion of the machining activities
Knowledge and understanding

You need to know and understand:

1. the safe working practices and procedures to be followed while operating optical prism preparation, smoothing and polishing equipment
2. the safety mechanisms on the machines, and the procedure for checking that they function correctly
3. the operation of the machine controls in both set-up and run modes, and how to stop the machine in an emergency
4. the personal protective equipment (PPE) to be worn, and where this can be obtained
5. the hazards associated with carrying out optical prism process operations, and how to minimise them and reduce any risks
6. the importance of keeping the work area clean and tidy
7. how to extract and use information from optical engineering drawings and related specifications (to include symbols and conventions to appropriate BS, ISO or BSEN standards) in relation to work undertaken
8. how to use imperial and metric systems of measurement
9. the various optical prism operations that can be performed
10. the methods that can be used to set up the workpiece prior to the operation, to minimise optical wedge and parallelism in relation to the cutting tool (such as alloy jigs, plaster blocks, pitch pads)
11. how to handle and store all tools and kit required, safely and correctly
12. the application of roughing and finishing cuts and pressures, and their effects on tool life, surface finish and dimensional accuracy
13. how tool wear affects surface finish and dimensional accuracy
14. how the various types of material will affect the way the operation is performed
15. the application of cutting fluids with regard to the range of material being produced
16. the effect of clamping the workpiece, and how this can cause distortion in the finished component
17. the problems that can occur with optical prism machining activities, and how they can be overcome
18. the quality control procedures used, inspection checks to be carried out, and the equipment used to achieve required component
19. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve
1. Apply all of the following during the machining 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. confirm with the machine setter that the machine is ready for production
   4. where appropriate, seek any necessary instruction/training on the operation of the machine
   5. ensure that machine guards are in place and are correctly adjusted
   6. hold components securely, without damage or distortion
   7. follow the defined operating procedures and apply safe working practices and procedures at all times
   8. ensure that machine settings are adjusted as and when required (either by yourself or the setter) to maintain the required accuracy
   9. ensure that the components produced meet the required specification for quality and accuracy
   10. leave the work area and machine in a safe and appropriate condition on completion of the activities

2. Operate two of the following types of optical prism and flat process machine:
   1. preparation and smoothing
   2. twin lap flat polishing
   3. lap-master flat and prism
   4. hard lap flat and prism polishing

3. Produce machined optical components which combine different operations and cover four of the following.
   1. flat centre thickness
   2. angular tolerances
   3. flatness tolerances
   4. parallelism tolerances
   5. cosmetic tolerances
   6. transmission tolerances
   7. finished size tolerances
8. prism chamfers/bevels tolerances

4. Machine **two** different types of materials from the following:
   1. optical grade germanium
   2. zinc selenide prisms and flats
   3. zinc sulphide prisms and flats
   4. borosilicate crowns
   5. barium crowns
   6. dense flints
   7. optical orange filter glass
   8. optical neutral density glass
   9. barium dense flints
   10. optical blue filter glass
   11. flint/light flints
   12. lanthanum crowns
   13. anomalous dispersion flour crowns
   14. other appropriate optical material

5. Carry out the necessary checks for optical accuracy during production of **four** of the following:
   1. flatness
   2. prism chamfers and bevels
   3. flat centre thickness
   4. prism surface cosmetics
   5. prism flatness measurement
   6. flat surface cosmetics
   7. flat chamfers and bevels
   8. prism angular measurement
   9. flat parallelism
   10. prism balk height measurement
   11. flatness transmission

6. Produce components with dimensional accuracy, form and surface quality, which comply to **one** of the following
   1. BS, ISO or BSEN standards and procedures
   2. customer (contractual) standards and requirements
   3. company standards and procedures
   4. other accepted international standards
Operating optical prism and flat process machines

<table>
<thead>
<tr>
<th>Developed by</th>
<th>Semta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version Number</td>
<td>2</td>
</tr>
<tr>
<td>Date Approved</td>
<td>February 2016</td>
</tr>
<tr>
<td>Indicative Review</td>
<td>March 2019</td>
</tr>
<tr>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>Validity</td>
<td>Current</td>
</tr>
<tr>
<td>Status</td>
<td>Original</td>
</tr>
<tr>
<td>Originating</td>
<td>Semta</td>
</tr>
<tr>
<td>Organisation</td>
<td></td>
</tr>
<tr>
<td>Original URN</td>
<td>SEMMME2-44</td>
</tr>
<tr>
<td>Relevant Occupations</td>
<td>Engineering; Engineering and manufacturing technologies; Engineering Technicians</td>
</tr>
<tr>
<td>Suite</td>
<td>Mechanical Manufacturing Engineering Suite 2</td>
</tr>
<tr>
<td>Keywords</td>
<td>engineering; manufacturing; mechanical; machining; optical; prisms; flat components; polishing; lap master flat; roof prism; operating</td>
</tr>
</tbody>
</table>