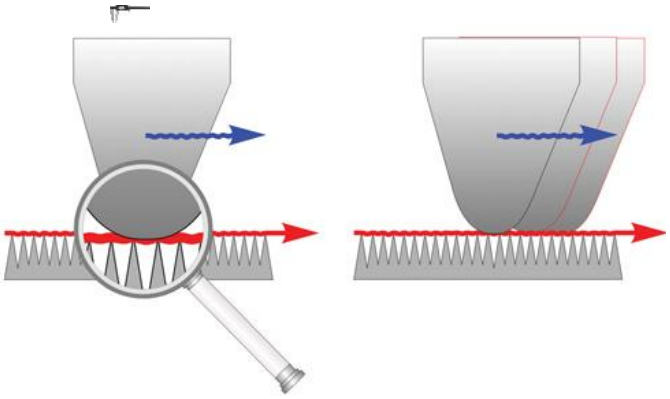
FACULTY OF ENGINEERING
DESIGN AND PRODUCTION ENGINEERING DEPARTMENT

Engineering Metrology
Credit Hour System

Report On:

( )

Roughness measurements



Metrology laboratory

Student Name	Remark
Class No:	Signature
B.N.	

2014/2015

Roughness Measurement - A

Objective:

The object of this test is to check the "R_t" and "λ" of the given specimens on the Schmaltz.

Equipment:

All the test in this part A will be carried out on the Schmaltz.

Theory of measurement

Optical sectioning (Schmaltz)

The optical sectioning technique (sometimes called the Schmaltz technique after its inventor) produces almost the same result as the physical sectioning but in a much easier – and non-destructive – manner.

The principle is illustrated in shown Figure. The surface is illuminated by a thin band of light delineating a profile section, which is then viewed at an angle with a microscope. Illumination and viewing angles are 45^o to the surface, a condition which produces the clearest profile, the apparent profile height is then h X $\sqrt{2}$ where h is the actual profile height (i.e. R_t). Measurements are made

using either an eyepiece graticule or an eyepiece incorporating a micrometer.

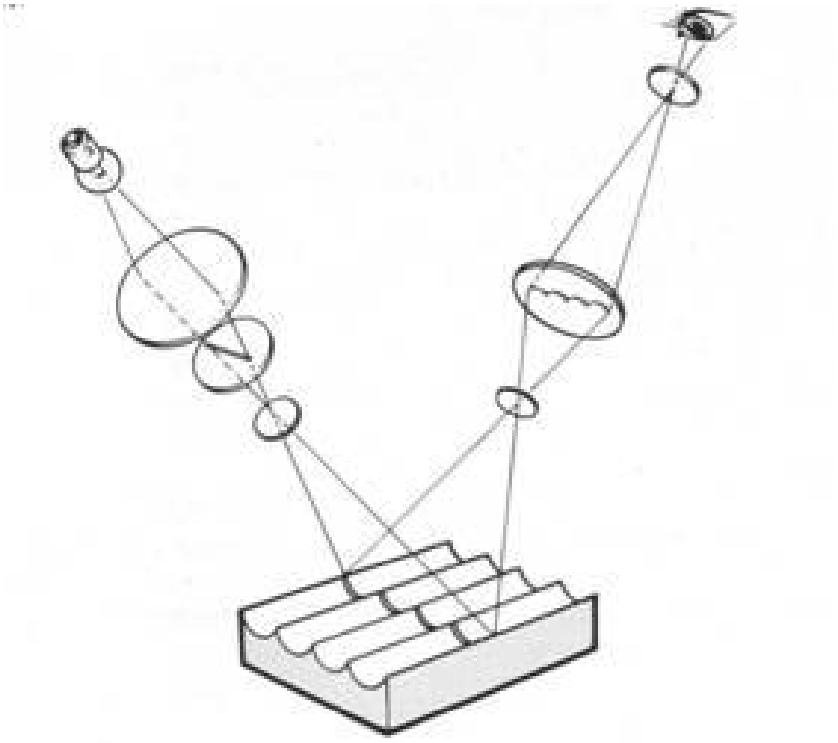


Fig.

An alternative method of viewing makes use of a workshop inspection projector, which gives an enlarged image on the screen, the profile height being measured with the aid of a special template

calibrated to compensate for the distortion introduced by the viewing angle.

This optical sectioning method is suitable for surfaces having a roughness range of R_t between 2 and 200 μm. it

is useful for soft surfaces which could be deformed by a stylus and for measuring the depth of engraved lines, etc.,

Procedure:

Identify the main parts of the schmaltz shown in the following figure, then state the function of each part.

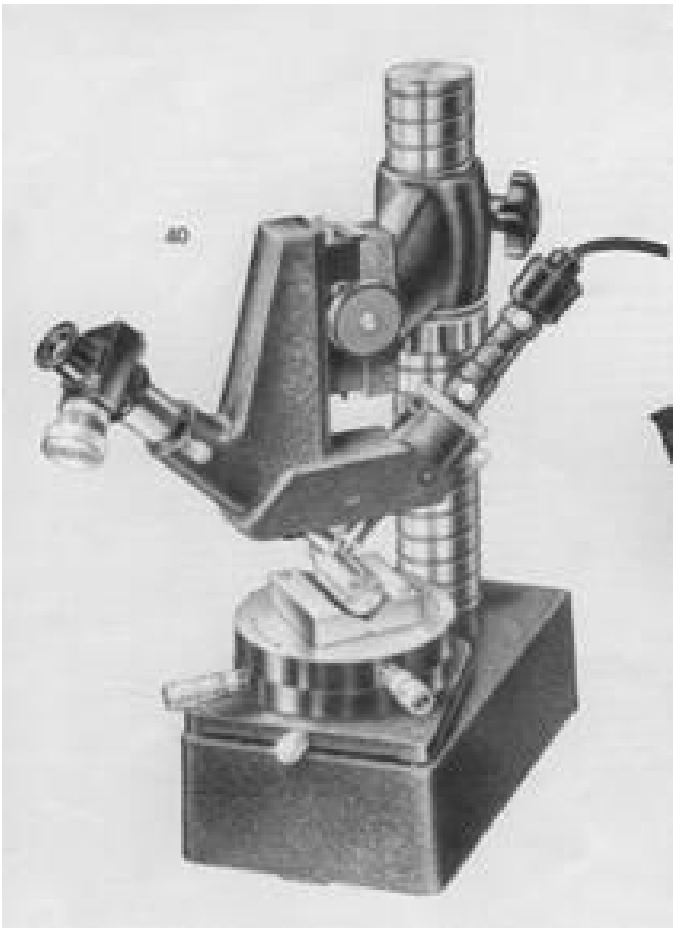


Fig.

	Part Name	Function
1		
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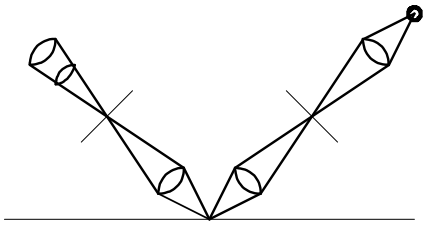
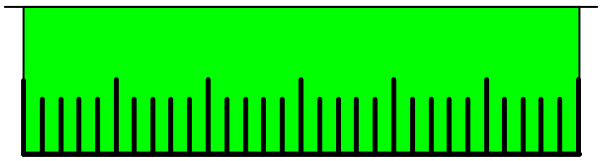
1 - Calibration of the ocular screw micrometer.

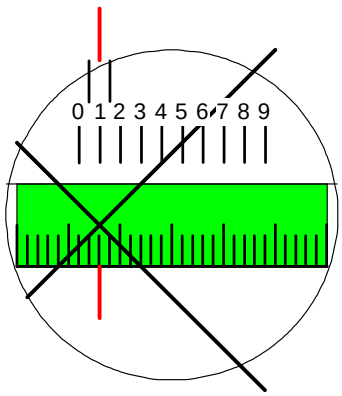
- Two similar lenses are chosen according to the required magnification.



- he value of ocular screw micrometer is determined using the “object micrometer”. The object micrometer is a glass plate with divisions of 0.01 mm engraved.



- The glass is placed on the instrument table, and focused. The object micrometer is moved on the table (by hand) until its scale will be seen in the light and the scale graduations will be square to its lateral axis.



- Note: if the image is not in the center of the field, it is necessary to adjust it by rotating the screw (7) and to make final focusing by rotating knob (8).
-

The screw which fastens the ocular, is released and the ocular itself is rotated in such a way, that the fastening screw is parallel to the image of the slit. Graduations of the scale of the ocular must be parallel to those of the object micrometer.

- After the cross lines of the ocular are brought to coincidence with any division of the object micrometer, the reading is taken from the thimble of micrometric head, Viewing through ocular,
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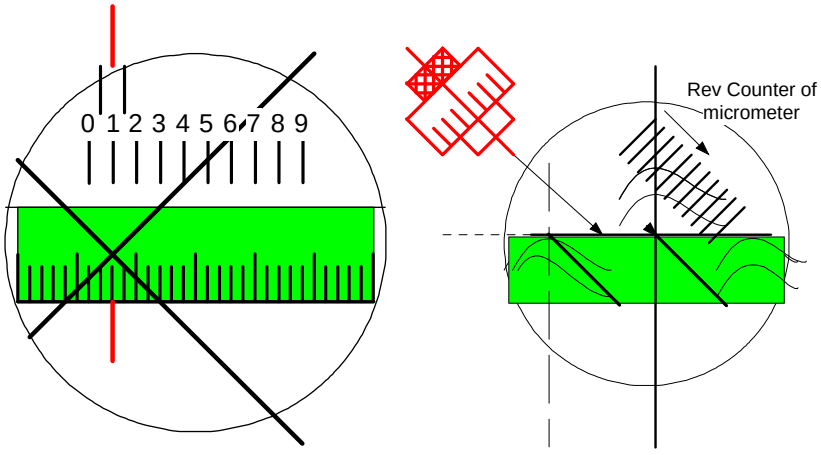
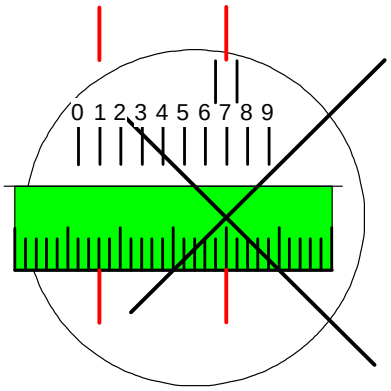


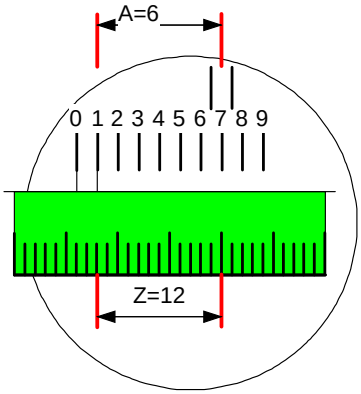
the cross lines are then moved to any other division of the object micrometer (the further from the first, the more accurate is calibration), and the second reading is taken from the thimble.



Full revolutions of the thimble are counted on the scale of ocular using byline 1

- The value of a division of the ocular is then calculated using the formula:

$$E = \frac{Z.T}{A}\cos^{2^2} 45^o = {}^{-o} = \frac{Z.T}{2A}$$



Where

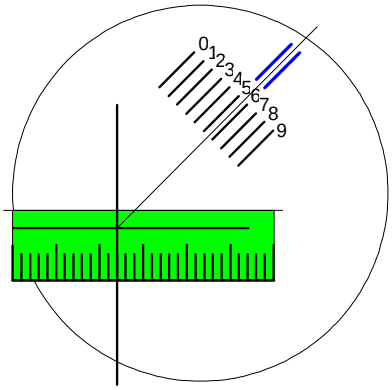
z - Number of divisions of the object micrometer traveled by cross lines.

T - Value of division of the object micrometer (in our case - 0.01 mm).

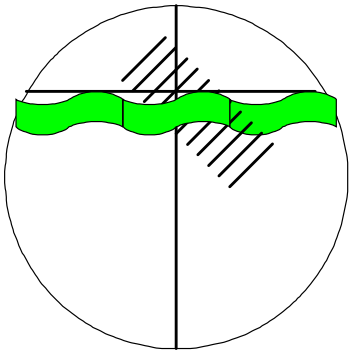
A -Difference between second and first readings of the thimble in divisions of the thimble.

2 - Examination of the height parameter ("R_a").

- Rotate the ocular in such a way that the horizontal line of the cross lines is parallel to the image of the slit, and is fastened in this position.



Replace the object micrometer by the part to be measured and focus the slit image on the machine part as it was described earlier.



- Orient the machine part in such a way the direction of irregularities is square with the slit image (as shown in A).

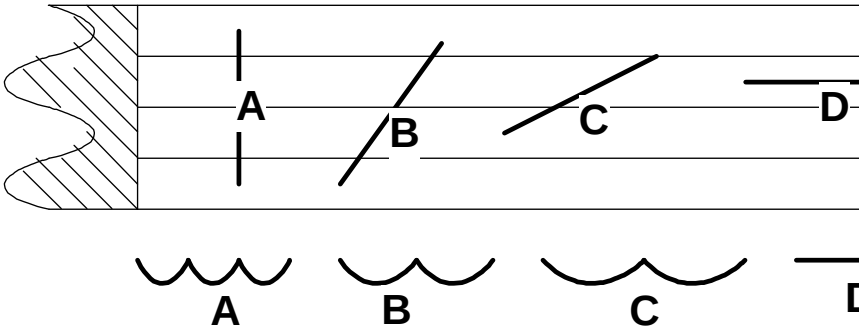
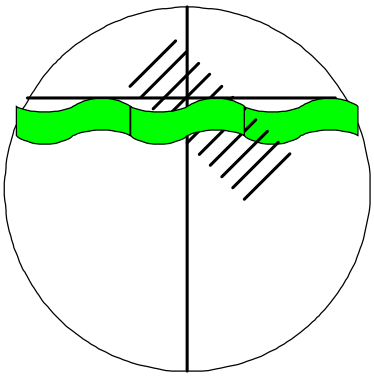
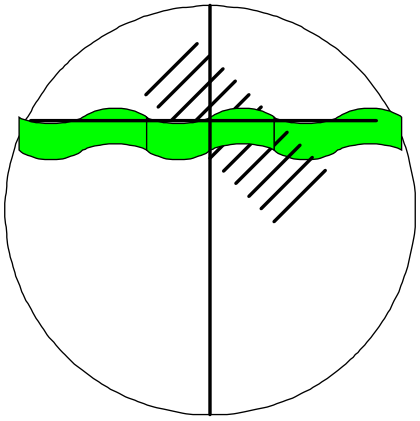


Fig.

- One side of the slit image is usually seen more in focus that the other, and the former is recommended for measurement.
- Horizontal line of the cross line is brought to the peak from the image.



and then to the valley from the same side of the image.



in both cases readings from the thimble are taken.

- The height of the irregularities (R) is calculated ad difference between readings, multiplied by the value of the division of the ocular E.
- Height of irregularities is calculated as mean of five maximum values of (R) measured within at least one basic length (see the standard).
- Movement the slit image along the workpiece surface is done by micrometer heads of the table.

Observation and Results

The readings are recorded as follows:

1. Value of division of the ocular with the lenses chosen :

$$E = \frac{Z.T}{2A}$$

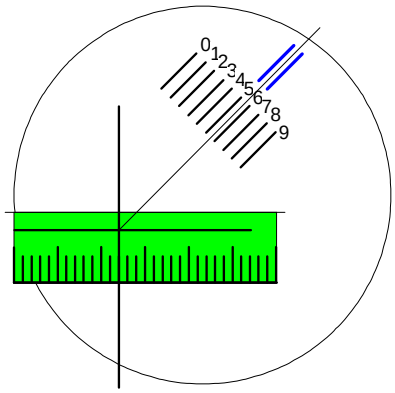
2. Length of measurement chosen .... mm.

Number of measurement	First Reading	Second Reading	Difference between them	Height in mm R= N.E	R_z= R/5

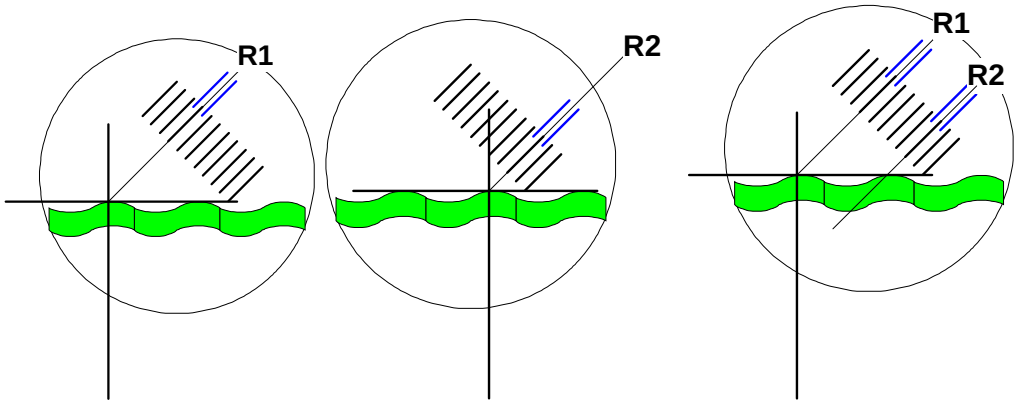
3. Measuring the wave length ("a").

You are asked to measure "λ" by using the following three methods:

- Adjust the Schmaltz and the work-piece as shown in measuring (R_a).



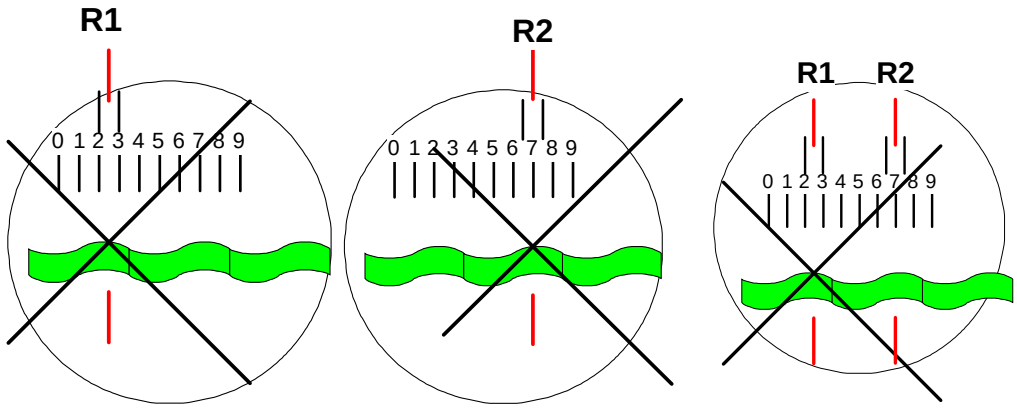
The vertical line of the cross lines is adjusted to the peak from one side of the image and then to the following peak from the same side of the image.



- Take the value of the division of the ocular micrometer E\ as following:

$$E^{\backslash} = \frac{Z.T}{A}\cos 45^{-}$$

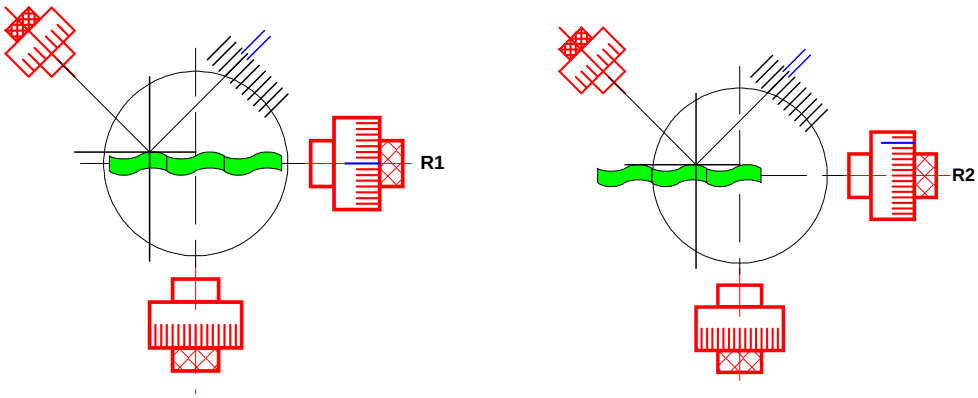
- Release the screw which fastens the ocular. Rotate the ocular until the fastening screw is parallel to the image (the ocular graduation is parallel to the line touches the peaks of the workpiece). Bring the intersection point of the cross lines of the ocular on a peak. Take the ocular micrometer reading. Move to the following peak and take the ocular micrometer reading.



The difference of the two readings is multiplied by

$$E'' = \frac{Z.T}{A}$$

- Adjust the axis of the two micrometer attached to the table to coincide with the cross line (as the workshop microscope) . Adjust the vertical line on a peak and take the table micrometer reading R_1. Move the workpiece using the table micrometer until the following peak become on the vertical line. Take the table micrometer reading R_2



$$\lambda = R_2 - R_1$$

Roughness Measurement - B

Object:

The object of this test is to check the "R_a" and other parameters available on surtronic 3P of the given specimens.

Equipment:

All the test in this part B will be carried out on the surtronic 3P.

Draw a schematic diagram of the taylsurf (surtronic – 3p) and identify all each elements and function of each.

	Part Name	Function
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(b) for the given test work piece measure all available roughness parameters.