OMT TOOLMAKERS MICROSCOPE

This is a copy of a set of notes which came with the instrument

There were 3 other documents with it. Some were simply advertising pamphlets.

These have been copied and saved in the files

1/ OMT-Notes

2/ OMT-Pamphlet1

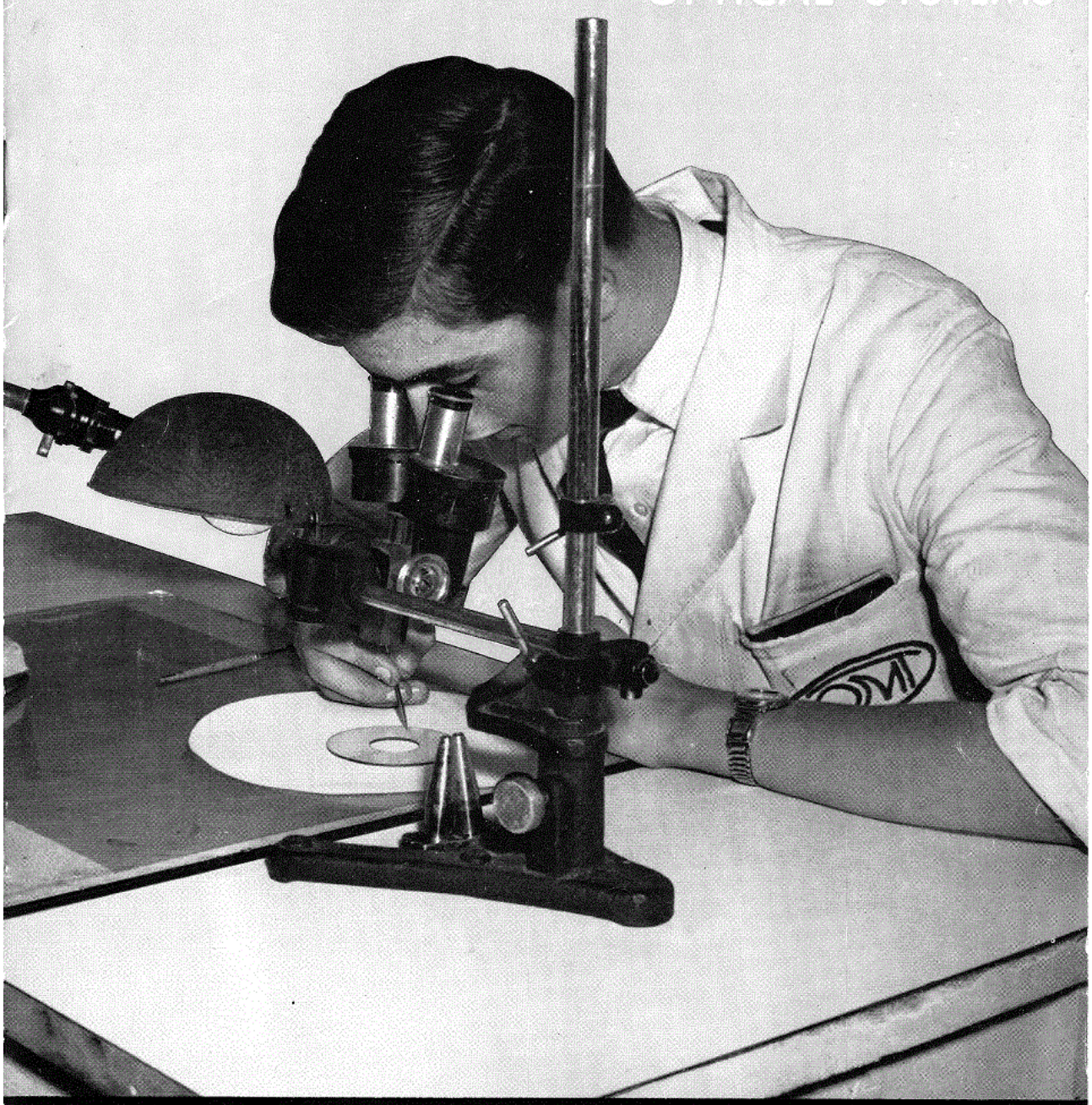
3/ OMT-Pamphlet2

4/ OMT-Booklet

Peter Smith

OMT

INDUSTRIAL OPTICAL ELEMENTS
OPTICAL SYSTEMS



OPTICAL MEASURING TOOLS LIMITED MAIDENHEAD · BERKSHIRE

ONE OF THE NEWALL GROUP

The Optical Department

OPTICAL MEASURING TOOLS LTD.

OLDFIELD HOUSE BRIDGE ROAD
MAIDENHEAD — ENGLAND

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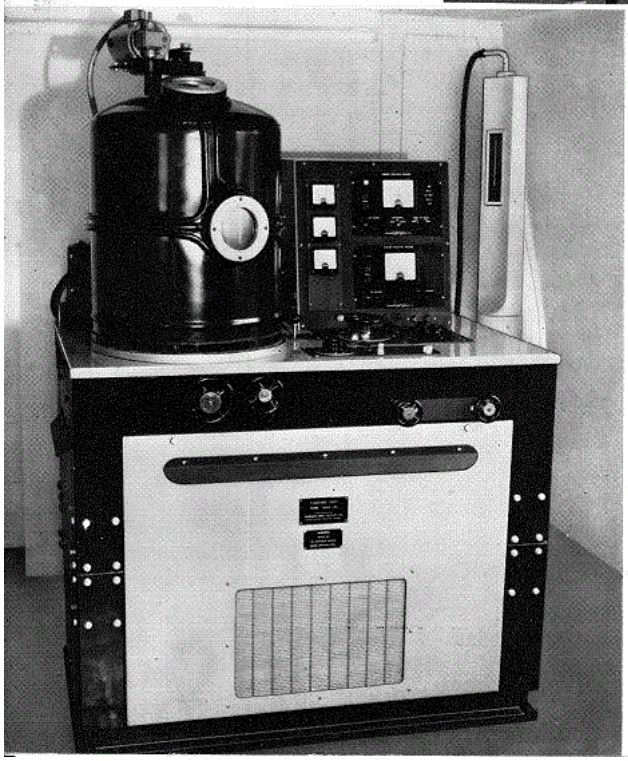
TELEGRAMS - 'OPTOOL' - MAIDENHEAD

Manufacture a comprehensive range of optical inspection equipment including :—

- Toolmakers' Microscopes
- Vertical Comparators
- Horizontal Comparators
- Workshop Projectors
- Projection Pantometers
- Measuring Machines
- Optical Dividing Heads
- Rotary Indexing Tables

Underground Scale Dividing Room

Vacuum Coating Installation



This brochure is designed to give abridged details of some of the more widely employed Optical elements manufactured by Optical Measuring Tools Ltd., who have one of the most modern installations for this purpose in Great Britain, and a staff of highly skilled personnel capable of producing the most complex optical components. The wide range of substances worked includes fused and natural quartz crystal and a variety of synthetic materials; metals are also surfaced to a high degree of optical polish and flatness.

Contracts for the manufacture of optical elements made from glass quartz (fused or crystalline) with plane, spherical or cylindrical contours are undertaken; surfaces can be worked to within ·000001" and angles corrected to seconds of arc.

An advisory service is offered for the computation of individual components, and complete optical systems are devised for customers' special requirements.

ONE OF THE NEWALL GROUP

SALES ORGANISATION

NEWALL GROUP SALES LIMITED

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OR
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Optical Flats

Optical flats have become widely accepted in recent years as providing a reliable method of accurately inspecting and measuring the surface flatness of many types of precision engineering equipment, such as slip gauges, test blocks, micrometer anvils, etc.

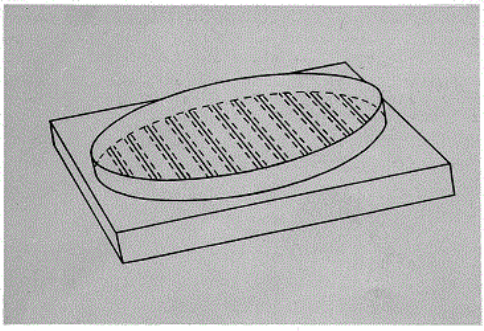
By their employment, gauge surface inaccuracies, of an order too small to be detected by a micrometer, may be determined. It is, indeed, possible to detect variations of 0·00001″ or to estimate differences in the range 0·000001″ to 0·000005″.

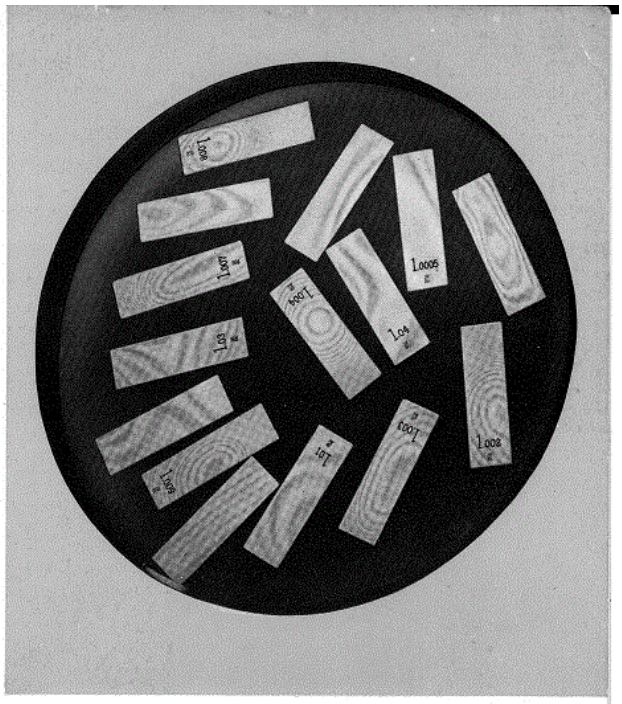
The use of optical flats is based on the fact that if a glass or quartz plate is put into close contact with another surface, a series of colour fringes or bands will be visible and these will indicate the inaccuracies of the surface being checked. These colour fringes are produced by the interference of light reflected from the two contacting surfaces. It is known that the distance between two colour fringes represents a surface inaccuracy of 0·00001 in., so a definite basis for comparison is available.

Appearance of Colour Fringes

In Fig. 1 is shown an optical flat used for checking a surface which is quite flat. It will be seen that the colour fringes, coloured like minute rainbows,

Fig. 1. Appearance of the colour fringes when checking a flat surface which is not in perfect contact with the optical flat.





Variations in surface flatness of a series of slip gauges is portrayed in this illustration.

are equi-distant and parallel. This indicates that the surface being checked is perfectly flat, but that the optical flat is not in true contact with this surface, being slightly raised at one end, possibly due to the presence of a speck of dust. As there are 11 colour fringes visible on the glass and as the distance between each two colour fringes represents a difference of 0·00001 in. in the space between the two surfaces, there must be a wedge of air between the two surfaces which is 0·00011 in. higher at one end than at the other.

If these two surfaces had been in very close contact, the colour fringes would not have been seen. Instead, there would have been a more or less solid tint of colour visible through the optical flat.

If one of these flats is applied to an irregular surface a whole series of colour fringes will be seen. Some of these may be circles, some arcs and some curved lines. In effect, the pattern taken up by the colour fringes constitutes a contour map of the surface which is being checked.

Some of the characteristic shapes assumed by the colour fringes are shown in Fig. 2. Briefly, the patterns taken up by the colour fringes indicate the following characteristics in the surfaces being checked :—

a. The surface is spherical, as the rings are more widely spaced at the centre than at the edges. As there are 4 colour fringes visible from the centre to the edge, the surface is convex or concave by $4 \times 0{\cdot}00001$ in., or 0·00004 in. The form of curvature is indicated by the colour fringes when the flat is pressed by the finger-tip at the point in question. In this case, it

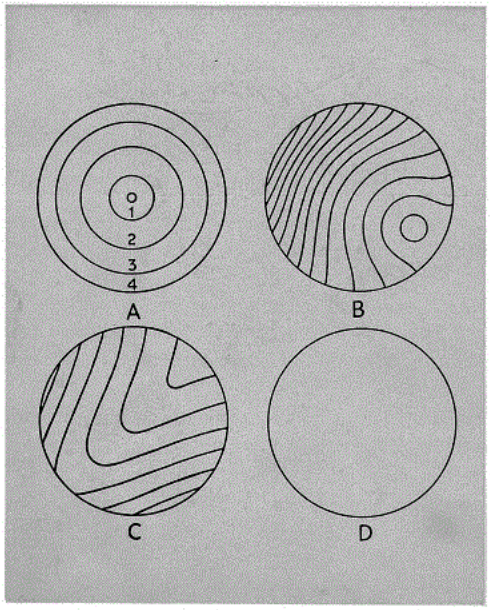


Fig. 2. Characteristic appearances of the colour fringes for various conditions.

is in the centre of the quartz plate. If the colour fringes are seen to move away from the finger, then a hill is indicated, but if the colour fringes move in towards the finger, there is a valley in the surface being checked. If this test is not conclusive, the head should be lowered to observe the surface more obliquely. In the case of a hill, the colour fringes will appear to contract, whilst in the case of a valley the fringes will appear to expand. With a convex surface the flat can be rocked, the rings following the point of contact.

b. This plate is either convex or concave near the lower right-hand edge. The existing conditions can be determined by applying finger pressure as described above for case "a."

c. This plate has either a ridge or a valley in the centre. The tests described in case "a" show which condition exists.

d. This indicates a perfectly flat surface in close contact with the optical flat, as no colour fringes are visible.

Recognition of Surface Conditions

It will be seen that by the use of optical flats it is possible to check very minute inaccuracies in surface flatness. With a little practice it is possible to recognize various surface conditions at a glance. By counting the number of colour fringes visible and bearing in mind that the distance between each two colour fringes represents the unit 0·00001 in., it is possible to measure these inaccuracies directly. In other words, if only one colour fringe is visible over a surface, then the inaccuracy is only 0·00001 in. over the complete length of that surface. Similarly, if the distance between two colour fringes is one inch, then the surface is inaccurate by 0·00001 in. over that inch of surface, and if the next colour fringe is only $\frac{1}{2}$ in. away, then the surface slopes still more steeply, being 0·00001 in. out in a distance of $\frac{1}{2}$ in.

For very accurate measurement of surfaces, it is necessary to measure the distance between colour fringes from the dark centre or from the edge of the red colour nearest the centre of the colour fringe. The measurement must always be made from the same colour in each band.

It should be observed that where straight colour fringes are encountered the direction of slope is always at right angles to these colour fringes.

As the height of the wedge of air between the surface being checked and the optical flats can be determined by counting the colour fringes, it will be realized that this principle makes possible the comparison of differences in heights where, of course, the difference is minute. This principle is very useful in comparing the heights of gauges with a standard block.

Although the foregoing describes only one of the many applications of optical flats, the method is indicative of their other forms of employment.

OMT Optical Flats

GLASS
ONE SIDE POLISHED

FLAT TO ·000005″

1½″ Dia. × ¼″ thick
2″ Dia. × ¼″ thick
2½″ Dia. × ¼″ thick
3″ Dia. × ¼″ thick
4″ Dia. × ¼″ thick
5″ Dia. × ¼″ thick
6″ Dia. × ⅜″ thick
7″ Dia. × ⅜″ thick
8″ Dia. × ⅜″ thick
10″ Dia. × 1″ thick
12″ Dia. × 1″ thick

QUARTZ CRYSTAL
ONE SIDE POLISHED

FLAT TO ·000001″

2″ Dia. × ¼″ thick
2½″ Dia. × ¼″ thick
2⅝″ Dia. × ¼″ thick
3″ Dia. × ¼″ thick
4″ Dia. × ¼″ thick

FLAT TO ·000005″

2″ Dia. × ¼″ thick
2½″ Dia. × ¼″ thick
2⅝″ Dia. × ¼″ thick
3″ Dia. × ¼″ thick
4″ Dia. × ¼″ thick

FUSED QUARTZ
ONE SIDE POLISHED

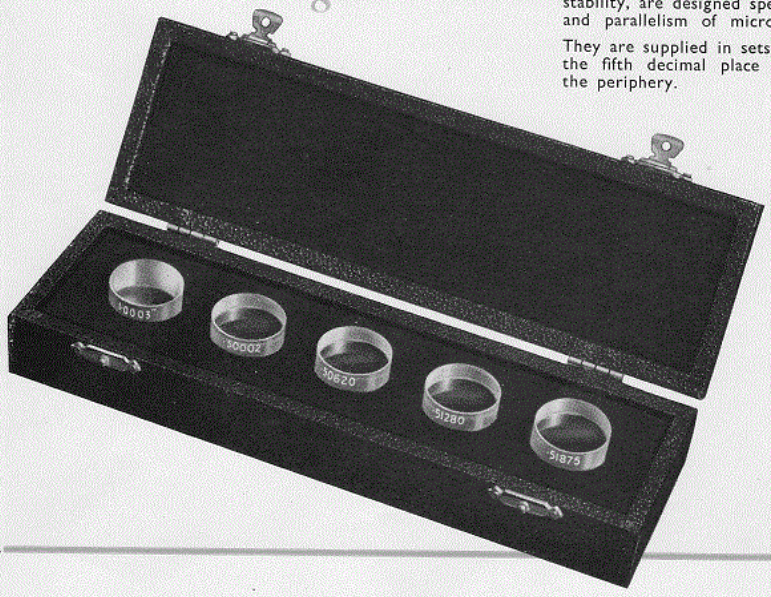
FLAT TO ·000001″

2½″ Dia. × ¼″ thick
3″ Dia. × 5/16″ thick
4″ Dia. × 5/16″ thick
5″ Dia. × 5/16″ thick
6″ Dia. × ⅜″ thick

FLAT TO ·000005″

2″ Dia. × ¼″ thick
2½″ Dia. × 5/16″ thick
3″ Dia. × 5/16″ thick
4″ Dia. × 5/16″ thick
5″ Dia. × 5/16″ thick
6″ Dia. × ⅜″ thick
7″ Dia. × ⅜″ thick
8″ Dia. × ⅜″ thick

OMT Quartz Crystal Micrometer Gauges



These superior quality gauges, manufactured from quartz crystal by reason of its hard wearing qualities and thermal stability, are designed specifically for checking the flatness and parallelism of micrometer measuring faces.

They are supplied in sets of five pieces each calibrated to the fifth decimal place and with the size engraved on the periphery.

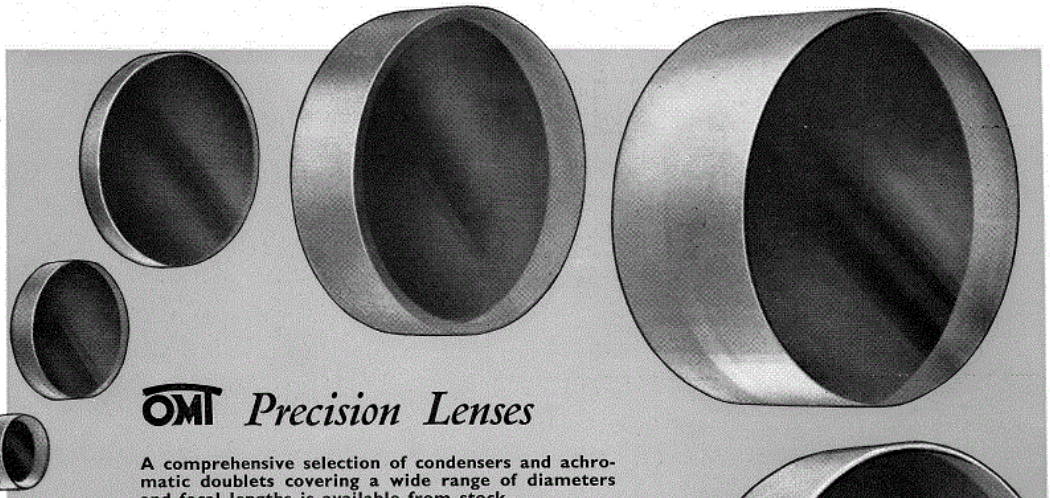
The size range has been established in order to permit the micrometer anvils to be checked at each quarter turn.

NOMINAL GAUGE SIZES

ENGLISH (All 1″ Dia.)	*METRIC* (All 25 mm Dia.)
0·5000″	12·000 mm
0·5062″	12·125 mm
0·5125″	12·250 mm
0·5187″	12·375 mm
1·0000″	25·000 mm

All O.M.T. Micrometer Gauges comply with National Physical Laboratory specifications.

N.P.L. certificates are supplied with gauges at slight extra charge.



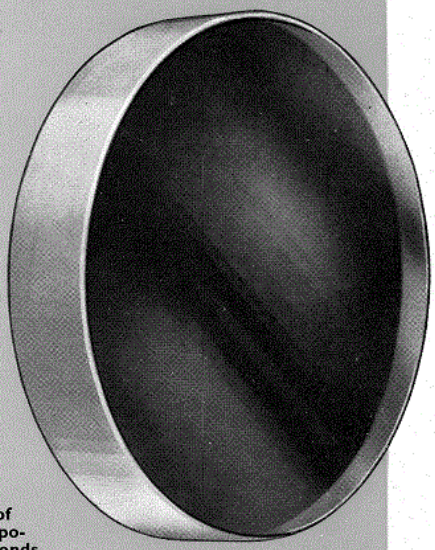
OMT *Precision Lenses*

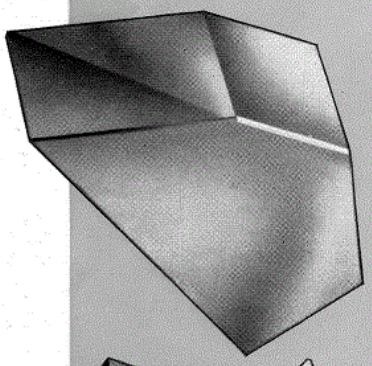
A comprehensive selection of condensers and achromatic doublets covering a wide range of diameters and focal lengths is available from stock.

The Company offers a highly qualified advisory service for the computation of individual components and manufacture lenses of quartz or glass to customers' specialized requirements.

On receipt of enquiries, the nearest stock items are offered, together with quotations for making units to the actual specifications required.

O.M.T. also supply, or contract for the production of, Schlieren mirrors to any specified radius and degree of surface accuracy.



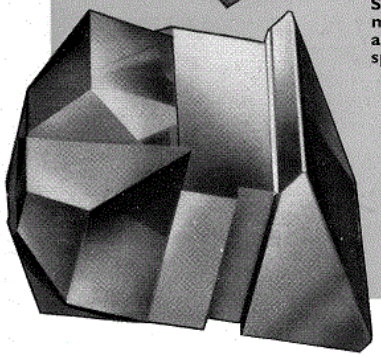


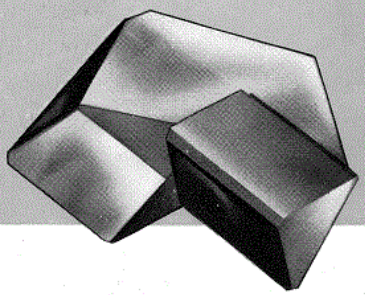
OMT *Prisms*

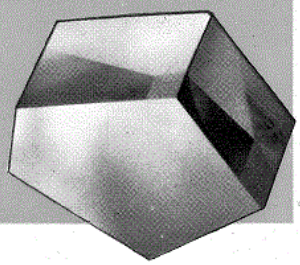
A wide range of glass or quartz optically worked prisms is available from stock, and the manufacture of special purpose, precision quality components, with angles corrected to two seconds of arc if required, is undertaken.

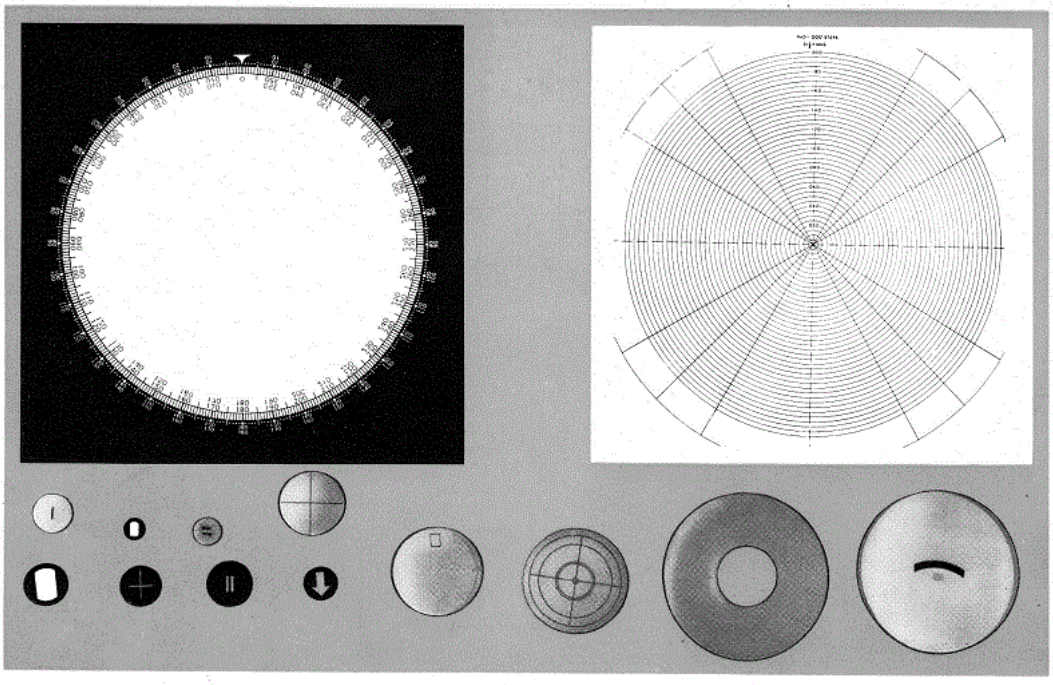
Prisms with roof angles corrected to within one second of arc and checked on a **TWYMAN GREEN INTERFEROMETER** are also manufactured to order.

O.M.T. specialise in the production of polyhedral beam splitting prisms of the type used in colour television, etc. Subject to the availability of the requisite quality raw materials, the Company is able to offer an unrivalled service and good delivery times for components made to customers' specifications.









The wide employment of numerous forms of graticules in the comprehensive range of O.M.T. high precision optical inspection equipment, has entailed installation of the most modern apparatus for manufacturing purposes and development of special production technique. As a result, the Company is able to offer a wide selection of photographic type graticules for use in optical, scientific and industrial fields. 'Specials,' with linear accuracies in the order of ·0001″ and angular tolerances within seconds of arc if necessary, can be supplied at short notice.

O.M.T. specialise in the manufacture of precise circular scales with overall accuracy of division throughout 360° not exceeding six seconds of arc and with lines as thin as ·0001″.

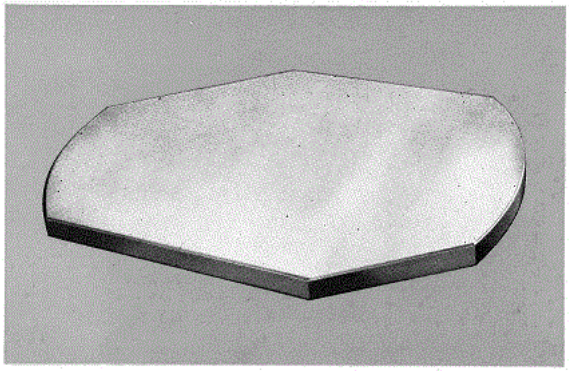
Linear engraved scales on metal or glass, with National Physical Laboratory certificate of accuracy, also feature in the O.M.T. Production Programme.

OMT *Graticules*

OMT *Vacuum Coating*

The O.M.T. high vacuum laboratory produces surface-coated mirrors, anti-reflecting coatings, multi-layer films, metallic electrical conducting coatings, neutral filters, etc., to customers' special requirements.

Quotations are submitted for large and small quantities of all first quality coatings up to a maximum diameter of 13 inches.



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