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West German and foreign patents





The VISUSCOPE

Uses:

Retinoscopy with erect or inverted image.

Determination of area and position of infectious processes within anterior portion of eye and fundus.

Measurement of level differences.

Measurement of blood vessel widths.

Objective determination of refractive error, including astigmatism and it's main meridians.

Determination of fixation point of retina in cases of monocular excentric fixation.

Special Accessories:

For examination of anterior portion of the eyeball in optical section.

Diascleral illumination of the eye.

For the shadow test.

The Visuscope is essentially

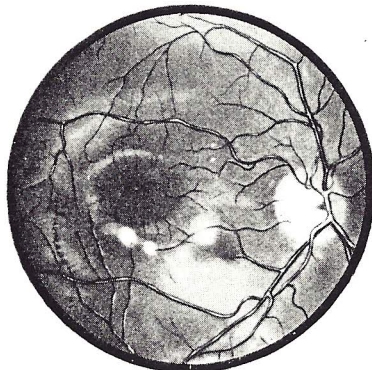
a normal hand ophthalmoscope. But with the help of additional test marks, which can be projected on the retina, it extends the field of examination to a point not possible with the ordinary hand ophthalmoscope.

The optical observation system

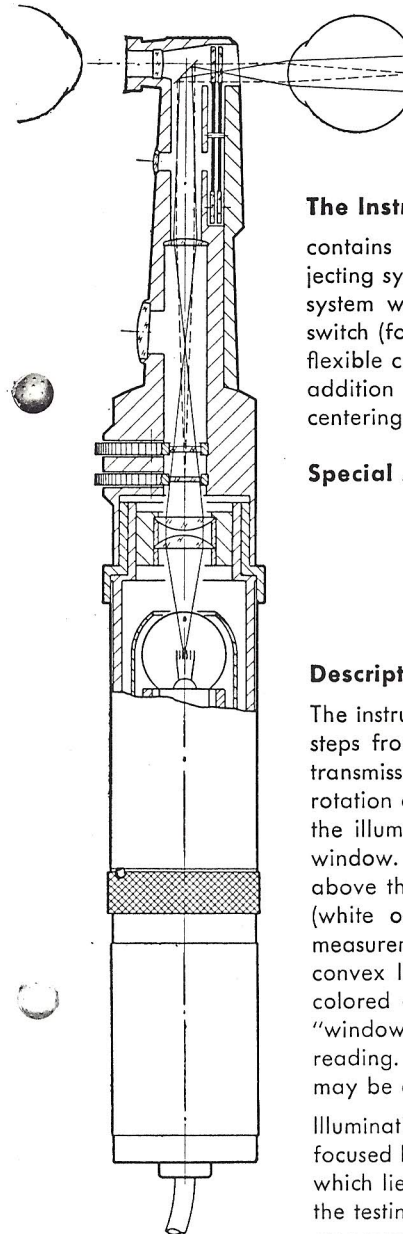
is adjustable to the patient's refractive error by means of newly arranged Rekoss discs ranging from plus 25 diopters to minus 25 diopters.

Automatic mercury switch

turns off light when instrument is laid down. But additional switch permits examination of patient in horizontal position.



Transformer is for either 110 or 220 volt house current. A. C. only. Output is 6 volt at 1 amp = 5 W. Special resistance may be had for direct current.



Course of rays
in the Visuscope

The Instrument Case

contains ophthalmoscope head with examination and projecting system of the test marks. In the handle is illuminating system with condenser, automatic mercury switch, bridge switch (for permanent illumination), a firmly attached highly flexible cable with 4 mm. prongs, and a 6 v. - 5 w. bulb. In addition the case contains three spare precentered bulbs, centering screw driver, and 13 diopter aplanatic loupe with rim.

Special Accessories

Slit lamp attachment

Diascleral cone, with protective case

Retinoscopy attachment

Eye piece for corrective lens

Description of Visuscope

The instrument has twin Rekoss discs graded in half diopter steps from plus 25 to minus 25 diopters. Because of high transmission, all dioptric adjustment are made by double rotation of control disc. On the disc is a diopter scale lit by the illuminating rays which can be seen through a loupe window. On the scale are two rows of numbers placed one above the other. Lower row shows convex measurements (white on black background). Top row shows concave measurements in reverse coloring. Whether concave or convex lenses have been put up is indicated by similarly colored concave and convex signs seen through a higher "window". Change in signs occurs at 0° and at the highest reading. Half diopters are shown only by lines but value may be determined by numbers on either side.

Illumination is from special 6 v., 5 w. lamp. Rays of light are focused by condenser, and traverse the testing and filter discs which lie one above the other. Apart from a free aperture the testing disc has three figures, interchangeable at will, for measurement of areas and level differences of infectious and diverse processes on the fundus, as well as total refractive error of the eye.



Filter disc has red-free filter, a blind, and a star of $1^{\circ} 10'$ size for determining monocular fixation. The test disc images are projected exactly on the fundus (infinity) if the patient is emmetropic.

Patient's refractive error is overcome with help of the Rekoss discs. Accommodation of the Doctor is eliminated, as a **simultaneous** change occurs in the observation and projection of the test object. But, if the Doctor has refractive error, he **must wear glasses** during examination, or put correcting lens in the observation window. This correcting lens is made as a special accessory and can be ordered with spherical or toric action. Dioptric value should be given as order is placed.

The reading on the Rekoss discs correspond to refraction of patient's eyes at a distance of 15 mm when test mark is focussed exactly on the fundus.

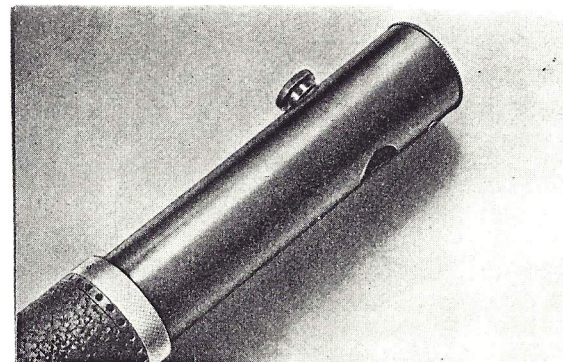
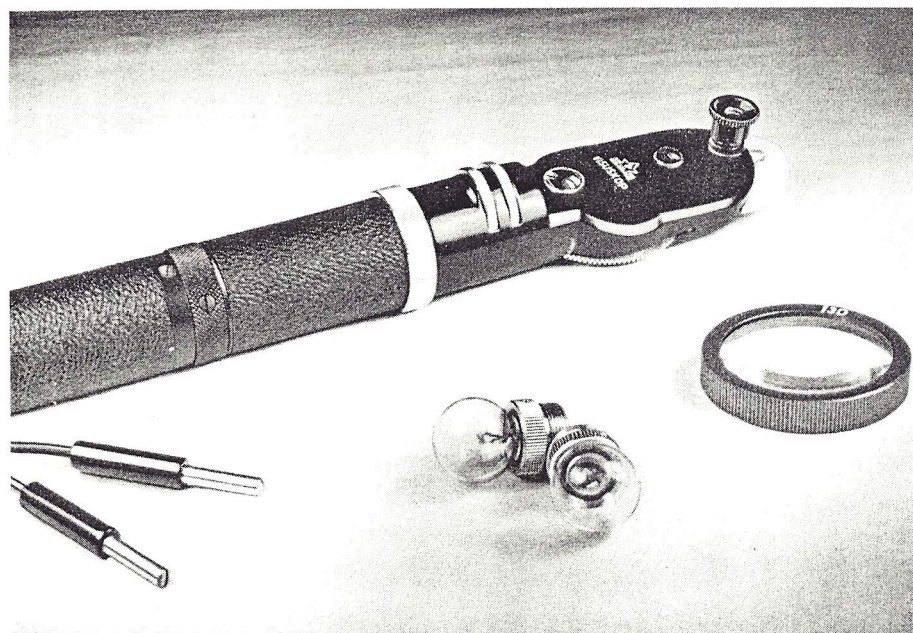
For use with alternating current

Either 110 v. or 220 v. transformer with output of 6 v., 1 amp., 5 watts. Transformer has rheostat.

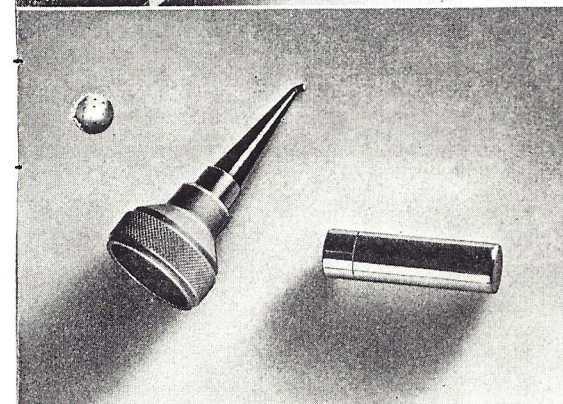
For use with direct current

Regulateable resistor of either 110 or 220 v. to 250 ohms or 1,3 amps.

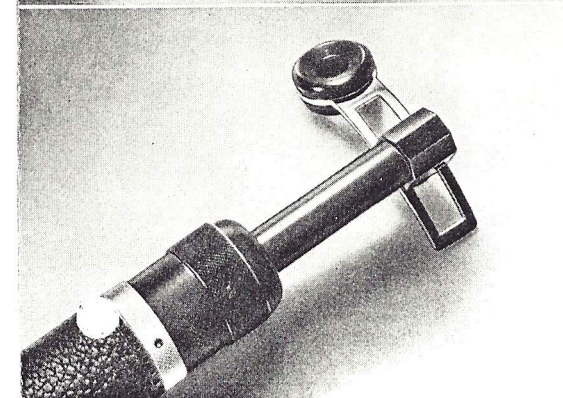
It is not necessary to use full illumination when testing the fundus. Set transformer at 4-5 v. For observation in red-free with intense illumination use 6 v.



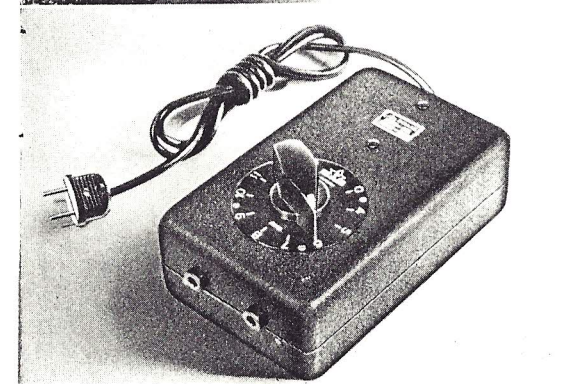
Retinoscopy attachment with mirrorless glass plate and light trap.



Diaphanoscope (transilluminator) attachment with protective case.



Slitlamp attachment with observation loupe. Tilts to 5 positions. Can be locked at angle.



Transformer with rheostat correction from 4 to 9 v., 1 and 2,5 amps.



To change bulb

Remove that part of the handle above rotary switch. Bulb is precentered and so are spare bulbs. Use small screwdriver in case for centering the bulb in socket.

After screwing handle together, head of instrument attached to central screw must be affixed to handle. When marking points are parallel, the lock is loosened. Switch on instrument and focus illuminated cone on white surface at a distance of 30 to 35 cm., put Rekoss disc at approximately plus 2,5 diopters so you can see the illuminated field. Now turn instrument head around far enough so shadows in illuminated field disappear. At this point tighten nickel cord ring again and be sure instrument head no longer turns on handle. Should there still be unilateral shadows then use screwdriver in instrument case to adjust position of precentered bulb.



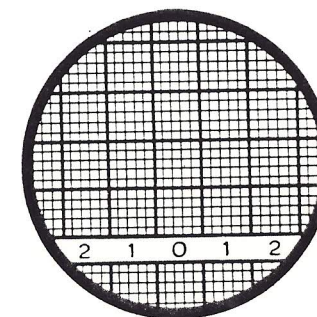
Automatic control switch

The Visuscope has an automatic mercury switch which turns off current when instrument is laid down or is tilted at an angle of 45° or more. This saves overheating and increases the life of the bulb. If patient is in bed or prone position use switch in center of handle. This will maintain permanent contact and must be turned off manually.



To use the Visuscope

For use as an ordinary ophthalmoscope switch on the filter and testing discs. If patient is ametropic, clear focussing of the image on the fundus is done by use of the Rekoss discs. Thus patient's refractive error can be corrected. Turned clockwise (downward) reading is from 00. into minus, and counterclockwise (upward) into plus. For examination in redfree light, blue-green filter in test disc is put up. So it is possible to see detail in better contrast to the fundus.



Testmark for determining area and measurement of level differences.

With the help of projected testmarks measurements of the fundus may be made which heretofore were impossible with the ordinary ophthalmoscope. Here we call attention to the following.

Measurement of level differences and localization of infectious changes on the fundus

Two possibilities are fundamental in determining level difference. Where raised or detached tissue is not transparent, distortions and changing obscurities of the plane squares of the testmark permit the slightest unevennesses to be recognized. Further, measurement of level differences in normal surroundings is possible by putting up corrective lenses to allow clear focussing of the plane squares.

The second possibility concerns cases where transparent tissue is to be judged in its relative elevation above lower layers, such as serious detachment of the retina. In such cases focus the plane squares on the choroid, and determine the amount of retinal detachment by a second focussing on the retinal arteries. The difference in dioptric values shows, as in the table, the level differences in millimeters.

Dioptric Differences	Level Differences
0	0
1	0,4
2	0,8
3	1,2
4	1,6
5	2
6	2,4
7	2,7
8	3
9	3,3
10	3,9
11	4,2
12	4,5



Use of the redfree (blue-green) filter is helpful in that the test marks stand out better against the fundus. Also areal distances on the retina can be determined. The heavy lines of the squares are 0,3 mm., and faint partition lines are 0,06 mm., apart. So it is technically possible to check and judge the course of a number of ocular diseases.

Together with the star test of the filter slide, the test slide with the plane squares is used to measure eccentric fixation. In this test heavy lines of the squares are $1^{\circ} 10'$, and faint subdivision lines are $14'$ apart.

Areas of inflammation can be determined, and any changes, can be noticed by means of the plane squares. Differential diagnoses, for instance, between a naevus and a melanosarkoma can be made. Decision in such case is facilitated by the possible finding of distortion of the square network (presence of level difference).

From a surgical point of view the important question, in a case of retinal detachment, is whether the retina will reattach itself or not if the patient is kept in a suitable position of rest. This is easier to answer now than was previously possible with the ordinary ophthalmoscope. As for the operation itself it is of great importance to be able to measure the distance of the retinal image from the ora serrata. By means of the plane squares position of coagulation points in relation to hole in the retina can be determined during the course of the operation.

The special arrangement of the light rays of the Visuscope increases the accuracy of comparative measurements of level differences in the course of a disease, for instance in a case of a papilloedaema. If the plane squares are first projected exactly on the fovea centralis and then on the papilla (on the most prominent vessel) plus lenses must be put up in the latter case as long as any part of the netting remains clearly recognizable. The difference will show the amount of level difference. It is of special significance that in contrast to the usual ophthalmoscope the accommodation of the examiner cannot affect the focussing of the testmark on the fundus as the observation and illumination rays are of the same optical system. This fact much increases the accuracy of comparative measurements.



Measurement of the width of vessels on the fundus

The examination of the width of vessels plays an important part in conjunction with other symptoms in cases of high pressure diseases.

The measurements of BADTKE shows the following values for the width of the arteria temporalis superior at the edge of the papilla:

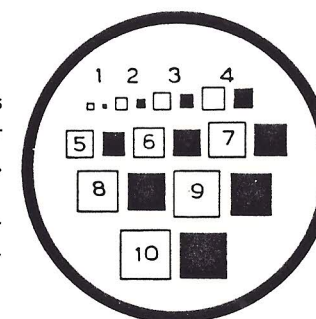
Normal	0,090 to 0,112 Average 0,105
Red High pressure	0,100 to 0,145 Average 0,117
Intermediate and pale high pressure	0,090 to 0,060 Average 0,070

According to the marks of the test disc testmarks 4 up to 5 (0,11 – 0,14) would characterize red high pressure and testmarks 2 up to 3 (0,058 – 0,085) the pale high pressure.

Refraction with the Visuscope

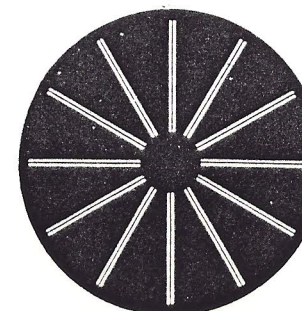
Here the principle of the refractometer must be applied in which the image of a test figure is projected on the fundus and the lenses necessary to bring the figure to sharp focus must be determined.

As a hand refractometer a circle of rays are projected as an erect image on the macular region. The Rekoss disc, coming from plus numbers, must be held at the first place a clear focus is obtained. If the instrument is held 15 mm. from the center of the cornea, the Rekoss disc lenses correspond to the value in diopters of the correcting lens. This distance should be kept, as inaccuracies in the table that is with the Visuscope might occur in the higher readings if the distance is increased.



Testmark for measurement of width of vessels on fundus

Relative size	Millimeters
1	0,029
2	0,058
3	0,085
4	0,11
5	0,14
6	0,17
7	0,20
8	0,23
9	0,26
10	0,29



Circle of rays for refraction test



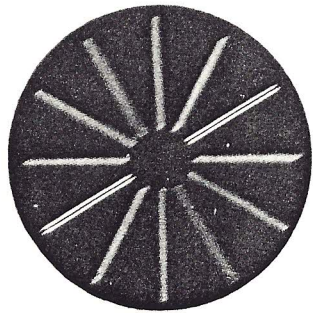
It should be remembered the Visuscope is a hand instrument and not a big refractometer. So, subjective correction, perhaps with cross cylinder, is necessary as with all other refractometers.

When there is astigmatism, double lines of only one group of rays are clearly seen, say horizontal while all others blurred. Further rotation of the Rekoss discs will clear the second meridian (vertical), and the difference shows the amount of astigmatism present. Coming from the plus side the minus cylinder axis lies at right angles to the first clear rays.

Let us take the correction of a hypermetropic astigmatism with the rule as an example. When coming from the plus the vertical double line clears first. The amount of error is read off. Further reducing the plus a horizontal group of lines comes into focus, and this latter reading shows the amount of spherical correction. Difference between the two readings is the amount of cylindrical correction and the minus cylinder axis is at 90° .

As has already been mentioned, any accommodation on the part of the examiner cannot influence the refraction test. This was also pointed out in dealing with level differences. Therefore, both for refractions and the measurement of

level differences results cannot be falsified by accommodation on the part of the examiner. It is essential the examiner be in a state of emmetropia, which can be achieved either by wearing glasses or inserting the special correcting lens previously mentioned (this is true only for erect image). If latent hypermetropia is overcome by self-accommodation measurements are not affected.



Distortion of radial strokes in astigmatism



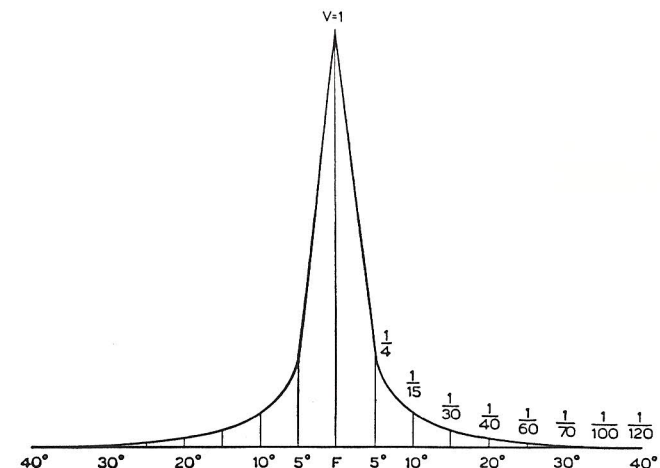
Determination of the foveal (parafoveal) fixation and measurement by means of star test

In treatment of a case of diminished visual acuity (concomitant squint) the important question will be — is this a case of true amblyopia "ex anopsia" or a so-called monocular extrafoveal fixation. This can be determined certainly by the star test of the Visuscope. In the first instance when the fully refracted patient fixes the star and at the same time observes the erect image, he will fix and project it foveally. In the second case the observer will note extrafoveal fixation and projection.

Visual acuity will then be the maximum possible for this parafoveal point of the retina to reach (see figure). The determination of the parafoveal fixation point in centrades to the fovea coincides with simultaneous projection of the star in the upper disc and the plane square in the lower one.

In the first case of amblyopia with foveal fixation, improvement of the visual acuity may be hoped for with the help of occlusion, but such treatment is absolutely contraindicated in the second case, as it would only strengthen the undesirable extrafoveal fixation. We draw attention to the catalog for the Oculus-Synoptophore for the therapeutic possibilities in such a case.

Test marks, excepting the refraction test, may also be used with inverted image.



Relation of visual acuity of the retina to distance from the fovea