ZEISS

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# Continuous Filter Monochromator b

## Operating Instructions

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The numbers in the following text refer to the parts indicated in the illustrations on pages 20 and 21.

Description of the parts

A Continuous Filter Monochromator b (47 58 08)

1.1 Wavelength control with graduations 400 to 700 nm in 10 nm intervals.

1.2 Fiducial line on the filter housing.
The wavelength scale is matched individually to the filter, and is only suitable for the filter monochromator supplied with the housing. Turning the wavelength control moves the filter across and normal to the axis of the light path.
The filter is tilted along the longitudinal axis relative to the outer walls of the housing by $3^{\circ}$. This reduces glare effects resulting from the reflections on the surface of the filter.

1.3 Knurled knobs for defining the spectral range. They operate in
1.4 conjunction with stop-pins and micro-switches. Each of these knobs, when loosened, can be moved along the periphery of the wavelength control, thereby actuating a pin within the control against a second stationary pin (manual operation) or an electrical micro-switch (motorised operation). The stationary pins and switches are fixed to the filter housing.

1.3 The blue-fronted knob is for setting the starting wavelength, which is the shortest wavelength of the spectral range to be measured.

1.4 The red-fronted knob is for setting the finishing wavelength, which is the longest wavelength of the spectral range to be measured. Turning the wavelength control beyond the long wavelength setting moves the filter out of the light path.

1.5 Flat, parallel glass plates (glass windows) covering the light entrance and exit apertures for protecting the filter from dust.

1.6 Ball-catches:
These ensure the correct location of the filter housing in the filter monochromator carrier (47 58 06) or (47 56 44-9902) by fitting into a spring loaded groove.

Facility for photo-electric wavelength scanning (not illustrated). Inside the housing a disc operates in conjunction with the spindle of the wavelength control. The disc incorporates a series of radial slits equivalent in number to the graduations on the wavelength control (normally 31 slits according to the wavelength range, 400 to 700 nm graduated in 10 nm divisions). Turning the wavelength control rotates the slits in front of an illuminated "fork diode", thereby creating electrical signals. A slit will produce a signal precisely when a graduation of the wavelength scale is exactly coincident with the fiducial line. The signals are used for:

a) designating the wavelength for potentiometer recorders when recording the spectral curves,

b) controlling the motor for stepping-mode operation,

c) controlling the data transfer and/or the positioning of the filter for on-line operation with a mini-computer.

Note:
The standard coding disc matches the calibrations of the wavelength control. It can be exchanged for an alternative disc featuring another wavelength selection (e.g. a series of standard wavelengths or discs with larger or smaller spectral intervals). Special coding discs can be supplied if required.

2.1 Locking cap for enclosing the drive mechanism when a motor is not attached.
Before mounting the motor, screws (2.2) have to be removed and the holder ring (3.1) fixed with screws on to the housing. For this operation the motor housing must be separated from the holder ring (after loosening 3 grub screws 3.3).

After fixing the holder ring to the filter housing, the motor housing is attached by means of the grub screws (3.3). The motor housing must be mounted so that the coupling pin on the motor spindle locates in the slot in the tube attached to the spindle of the wavelength control. (Not visible in the illustration)

3.2 Motor drive (47 58 09).

3.3 Three grub screws for securing the motor housing (only 2 visible).

3.4 Socket for cable to control box (5.1).

3.5 Motor cable (for connection to the control box).

The motor drive comprises:

a) a D.C. motor, type PC 11-210

b) gear with slip clutch for connecting the spindle of the motor to the wavelength control spindle for reducing r.p.m. of the motor by a factor of 2000:1, so that the wavelength control has an r.p.m. of 1/2000th of the speed of the motor spindle. The slip clutch prevents the restriction of the motor if the wavelength control is restricted or the restriction of the wavelength control if the motor is restricted. The slip clutch also allows the wavelength control to be operated by hand when it is coupled to the motor.

Note:
The slip clutch is adjusted so that the wavelength control is attached with just sufficient firmness to the gear spindle. Care should be taken not to use too much force when moving the wavelength control if the motor is not running. The slip clutch will have been correctly adjusted before leaving the factory, but should the coupling force be reduced over a period of time and the motor will no longer drive the filter, please consult the ZEISS servicing organisation.

Technical specifications

a) Running Filter

Manufacturer: Schott, Mainz

Type: VERIL Z 160

Range: 400 to 700 nm

Linear dispersion: approx. 0.4 mm/nm

| Tolerances for | at 450 nm | at 550 nm | at 650 nm |
|---|---|---|---|
| the maximum transmittance (Tmax) (smallest value) and | 20 % | 25 % | 20 % |
| the half band width (HW) (largest value) | 18 nm | 15 nm | 18 nm |
| Steepness of the sides of the transmittance curve characterised by the proportion of 1/10 band width to half band width, approx. | 2 | 2 | 2 |

The continuous filter has a superfluous spectral range extending to 1000 nm with T < 0.01 % and to 1100 nm with T < 0.1 %.

Using a larger slit width results in a reduction of maximum transmission and in the enlargement of the half band width compared to the optical specification for a very narrow slit; e.g. for parallel light approximately,

| Slit width | Tmax | HW |
|---|---|---|
| 0.1 mm | 35 % | 13 nm |
| 2 mm | 34.5 % | 14.5 nm |
| 4 mm | 33 % | 16.5 nm |

b) Motor

Supply voltage 12 V

Output 1.3 W

Idling speed at full voltage 2.800 r.p.m.

B Control Box (47 74 26)

Power supply 100-110-115-127-220-240 V, 50 - 60 cycles. Power consumption 12 W.

The control box is set at the plant for 220 V mains voltage unless a different voltage is specified in the order. The supply voltage is indicated on the rating panel at the rear of the control box. At your request, the instrument can be subsequently converted to take a different voltage by our service technicians.

4.1 Main Switch

4.2 The push-button START for the motor drive lights up when depressed and will stay illuminated until the micro-switch (in the filter housing) functions or the push-button STOP is operated.

4.3 The push-button STEP/CONT facilitates selection of the continuous or stepping mode of the motor drive (see below).

4.4 The push-button STOP renders the filter stationary before the micro-switch is actuated (see below).

4.5 Indicator lamps which, when glowing, show that the relevant start
4.6 or stop micro-switches in the monochromator housing have been operated.

4.7 Socket for fuse (0.25 amp).

Function of the push-button STEP/CONT:
If the STEP/CONT button is in the highest position (not depressed), and the START button is pressed, then the filter will move by one step. The relevant control signal will also move the filter by one step. If the STEP/CONT button is depressed the filter will travel at a constant speed until the micro-switches are actuated.

Note:

I When the stepping mode is operative the filter travels in 10 nm steps from the short wavelength to the long wavelength, by intervals of 10 nm, e.g. 410, 420, 430 etc. to 700 nm. The motor operates at maximum speed for each step.

II With the on-line mode and mini-computer the command to the motor is issued by the computer, thereby rendering the START button inoperative. The button STEP/CONT must be in the upper position.

III Continuous drive of the filter monochromator (STEP/CONT button depressed).
After pressing the start button, the monochromator will travel to the longer wavelengths. If the STEP/CONT button is engaged in the upper position the filter will be rendered stationary. The STOP button will remain illuminated as long as the filter is not moving. When the STEP/CONT button is pressed to the lowest position traverse of the filter will re-commence. If during continuous operation the STOP button is pressed the filter will return immediately to the starting wavelength.

4.8 Potentiometer control for regulating the motor speed for continuous operation.

4.9 Scale and index for reproducing specific rpm of the motor and with that the relative speed of the filter in the continuous driving mode.

4.10 Opening for the screw-driver adjustment of a second potentiometer for regulating the speed of the motor used in stepping mode. The potentiometer is normally adjusted to maximum speed.

5.1 Connecting cable to the monochromator

Sockets: 5.2 for mains cable
5.3 for motor-drive cable
5.4 for cable (47 91 99-9001) to the interface of the WANG calculator
or
cable (47 91 99-9011) for the potentiometer recorder SERVOGOR S.

Operating Instructions

A Determining the spectral range for manual operation by adjusting the mechanical stops.

1. Set the wavelength control to the shortest wavelength (starting wavelength, i.e. the lower limit of the spectral range to be measured) and hold it in this position.

2. Slide the blue-fronted knob (1.3) in the direction of increasing wavelength until it reaches the mechanical stop and then tighten it.

3. Set the wavelength control to the longest wavelength (finishing wavelength, i.e. the upper limit of the spectral range to be measured) and hold it in this position.

4. Slide the red-fronted knob (1.4) in the direction of decreasing wavelength until it reaches the mechanical stop and then tighten it.

Note:
The smallest wavelength interval which can be selected by means of the mechanical stops is about 15 nm within the range of 400 to 700 nm. Larger wavelength intervals can be selected without limitations. The longest wavelength can be at 10 nm intervals, as graduated on the wavelength control, and also at points between the graduation, to which the wavelength control must be adjusted.

B Determining the spectral range for motorised operation of the wavelength drive.

Note:
The motor drives the filter in the direction of increasing wavelength only until the longest wavelength setting is reached, when the filter is returned automatically to the shortest wavelength setting (starting wavelength).

The total photoelectric unit (illuminator, amplifier, indicator unit etc.) must be switched on before operating the control box. If the control box is already switched on, electrical impulses, which may by created by switching on and off of these parts of the equipment, could start the motor.

a) Continuous drive.

1. Set the wavelength control to the starting wavelength and hold it in this position.

2. Slide the blue-fronted knob (1.3) in the direction of increasing wavelength until the left indicator lamp (4.5) shows that the micro-switch in the filter housing has been actuated. The knob is then tightened.

3. Set the wavelength control to the finishing wavelength and hold it in this position.

4. Slide the red-fronted knob (1.4) in the direction of decreasing wave-length until the right indicator lamp (4.6) shows that the micro-switch in the filter housing has been actuated. The knob is then tightened.

Note:

I The smallest wavelength interval which the starting and finishing switches can cover is about 15 nm in any position between 400 and 700 nm.

II Please note that the starting and finishing switches operate just before contact with the mechanical stops. The mechanical stops should not therefore be adjusted as described under A - but tightened precisely when the relevant indicator lamp lights up.

III When the knobs (1.3) and (1.4) are in close proximity to the micro-switches they must be moved extremely carefully, and tightened in exactly the position reached when the indicator lamp lights up.

IV Be certain that when tightening the knobs neither they nor the wavelength control are moved.

V It is advisable to check the operation of the starting and finishing switches after tightening the knobs. Commence the wavelength drive by pressing the START button (4.2), (with the motor running at the slowest speed) and read the position on the wavelength scale when the finishing wavelength setting is reached. This is exactly the same time as the motor starts returning the filter to the starting position. The scale should be checked for ensuring the filter has returned correctly to the selected wavelength. If the appropriate graduations on the scale do not coincide with the selected starting and finishing wavelengths, the knobs (1.3) and (1.4) have to be re-adjusted.

b) Drive with stepping mode

With the stepping mode the starting and finishing wavelengths can only be adjusted to correspond with the 10 nm graduations and the filter can only move in 10 nm steps.

1. Set the wavelength control to the starting wavelength to be measured and hold it in this position.

2. Slide the blue-fronted knob (1.3) in the direction of increasing wavelength until the indicator lamp (4.5) shows that the micro-switch in the filter housing has been actuated. The knob is then tightened. Check the position of the knob ensuring that the micro-switch is operating correctly and, if necessary, correct the adjustment in accordance with the instructions given in V.

3. Set the wavelength control to the finishing wavelength and hold it in this position.

4. Slide the red-fronted knob (1.4) in the direction of decreasing wavelength until the indicator lamp (4.6) shows that the micro-switch in the filter housing has been actuated. The knob is then tightened.

Note:

I The smallest wavelength interval is 10 nm, as determined by the closest proximity of the knobs (1.3) and (1.4).

II When the filter is operating in stepping mode the knob (1.4) has to be adjusted so that the micro-switch for the finishing position is not actuated before the last step is taken, that is to say before the filter has reached the finishing wavelength to the required full value, e.g. 680 nm. The micro-switch for the finishing wavelength position can only be reactivated by pressing the START button again (or STOP button or according to instructions from the computer). The filter will then be moved back into the starting position. The knob can be set in such a way that the micro-switch at the end of the range operates within the subsequent intervals, (e.g. between 680 and 689 nm). Also in such a case the filter will only be moved back to the starting position after pressing the START button again (or by instructions from the computer) but it will do one partial step which should not be evaluated.

C Combination of the continuous filter monochromator with the potentiometric recorder SERVOGOR S.

Note:

I For operation of the recorder refer to Operating Instructions BA-RE 530, 540.

II The recorder has to be fitted with one recorder pen for the measured values and one for the wavelength.

III The SERVOGOR records the spectral distribution of the measuring values as the filter is moved continuously at a constant speed.

IV The speed of the movement of the filter and of the recording paper must be coordinated. If the movement of the filter is too slow compared to that of the paper then the recorded curve will be too long. If the filter moves too fast then the peaks and troughs of the recorded spectral curve will be suppressed.

V The control box, when operative (main switch 4.1) will determine the starting and stopping of the movement of the recording paper.

1. Connect the control box to the recorder with the cable (47 91 99-9011).

2. When the control box has been switched on, both the main switch and the switch governing the paper movement of the recorder have to be turned on.

3. When the button START is depressed (button START/CONT in the continuous mode) the paper and the continuous filter monochromator begin to move simultaneously and both move until the micro-switch limiting the range in the monochromator is automatically operated. Pushing STOP (or setting STEP/CONT in the upper position) will stop the movement of the filter but not that of the paper.

Marking of the Wavelengths.
The photoelectric wavelength reading on the monochromator creates electrical impulses when the graduations on the wavelength control are reached. The pens respond to the signals transferred to the recorder by the control box and inscribe the curves on the paper.

Note:
If the switch on the recorder governing the paper movement is in the ON position when the control box is switched off (switch 1.4), then the recording paper will start moving. Therefore the switch for the paper movement and the switch (1.4) should be switched off simultaneously.
For use of the running filter monochromator and the control box with the WANG calculator 720, please refer to the Operating Instructions, G 41-824.12-d.

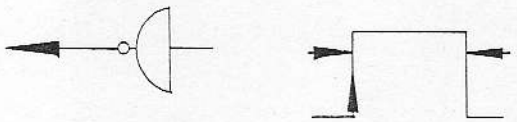
Table
Circuit points on the 14 pol Amphenol socket 5.4

Input ▼ Output ▲

Pin No.

1 ▼ Rhythm signal (especially for Interface WANG 47 74 32)

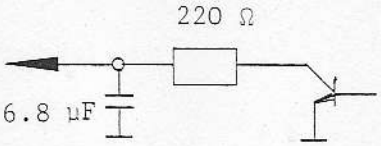
2 ▲



SN 74 LS 04 N

approx. 10 ms (permitted tolerance 4 - 15 ms)
Signal - end of measurement

3 ▲




START signal (Paperfeed, recording pen, Servogor)

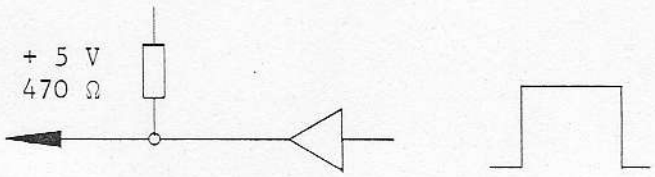
4 ▲ + 5 V (capacity approx. 20 mA)

5 ▲

approx. 10 ms
Lambda-Signal-(permitted tolerance 4 - 15 ms)

6 no circuit point

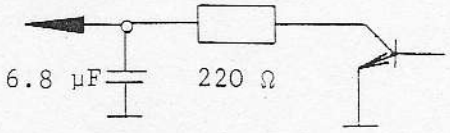
7 ▲




SN 74 07 N

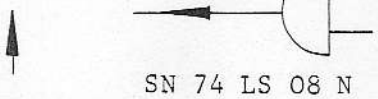
Signal indicating movement (especially for WANG Interface 47 74 32)
(Signal only functions together with the rhythm signal, Pin 1)

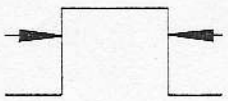
8 ▲



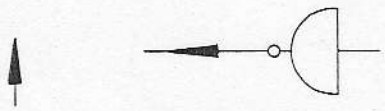

Lambda-Signal
(Marking pen Servogor)

9
10 Bridge (especially for Interface WANG 47 74 32)

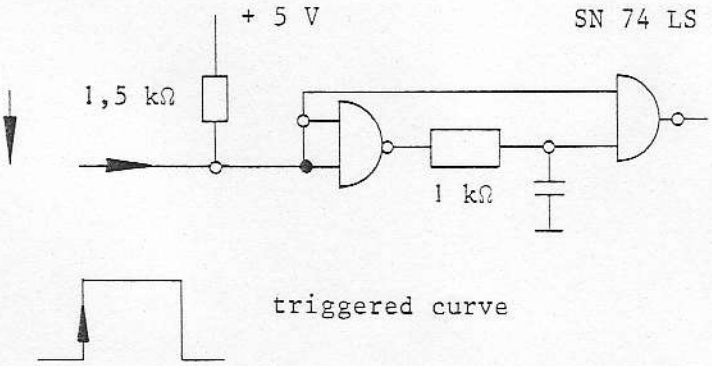
11 



Width depends on rhythm signal Pin 1. (especially for WANG Interface 47 74 32)

12 

Width depends on rhythm signal Pin 1. (especially for WANG Interface 47 74 32)

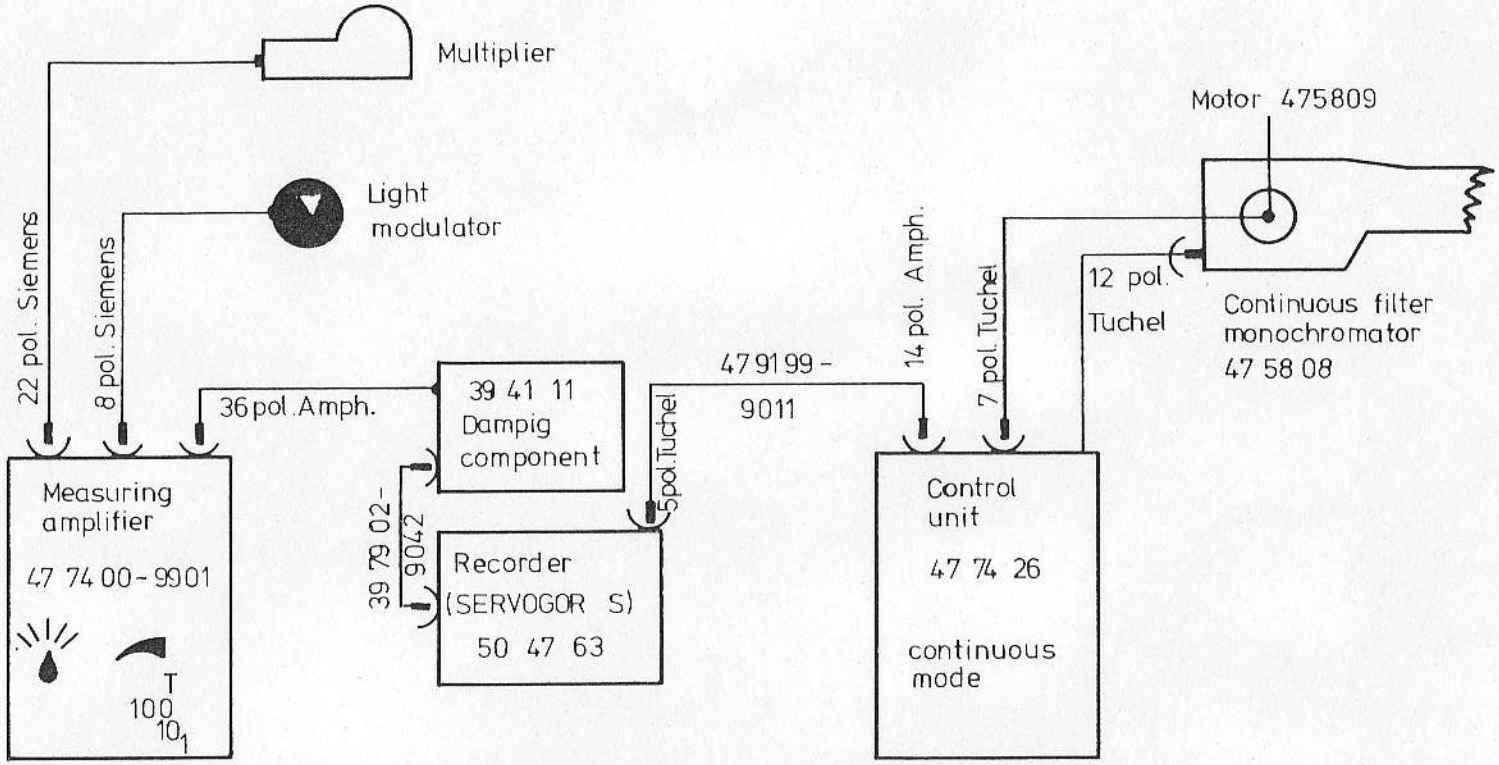
13 


external start

14 Signal zero potential

# Cable plan

## Microscope Photometer
## with:
## Continuous Filter Monochromator bwith motor drive
## Potentiometric recorder SERVOGOR S



Illustrations

1. Continuous filter monochromator, front view.

2. Continuous filter monochromator, locking cap mounted.

3. Continuous filter monochromator, motor drive mounted.

4. Control box, front view.

5. Control box, rear view.

6. Continuous filter monochromator inserted in the illumination light path with support (47 56 44-9902).

7. Continuous filter monochromator inserted in the light path in front of the detector unit with holder (47 58 06).

8. Continuous filter monochromator on the AXIOMAT for

   a) upright transmitted light microscope

   b) upright incident light microscope

Fig. 1

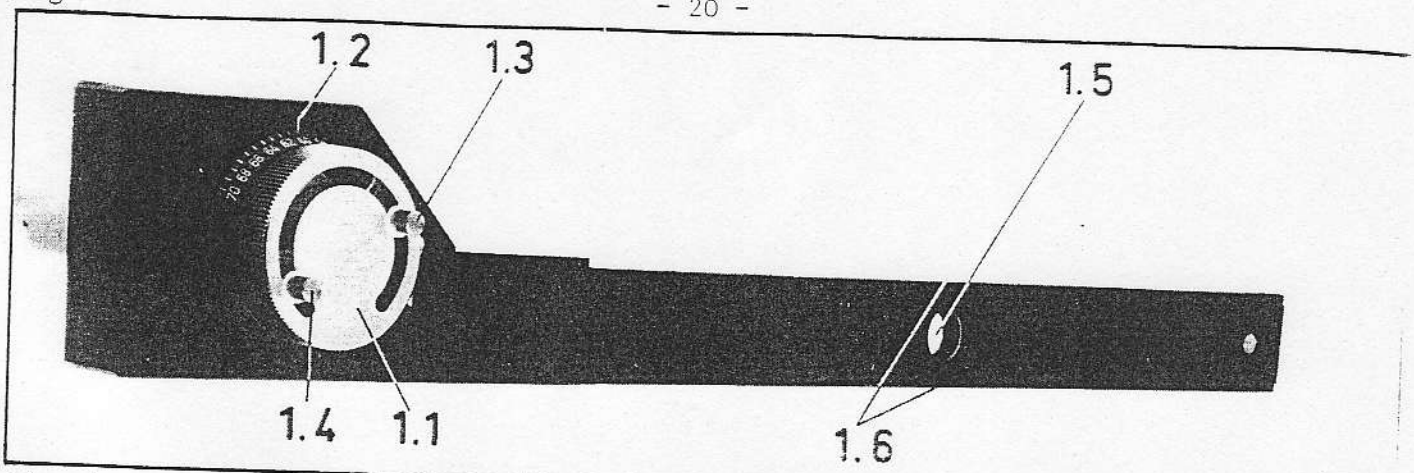



Fig. 2

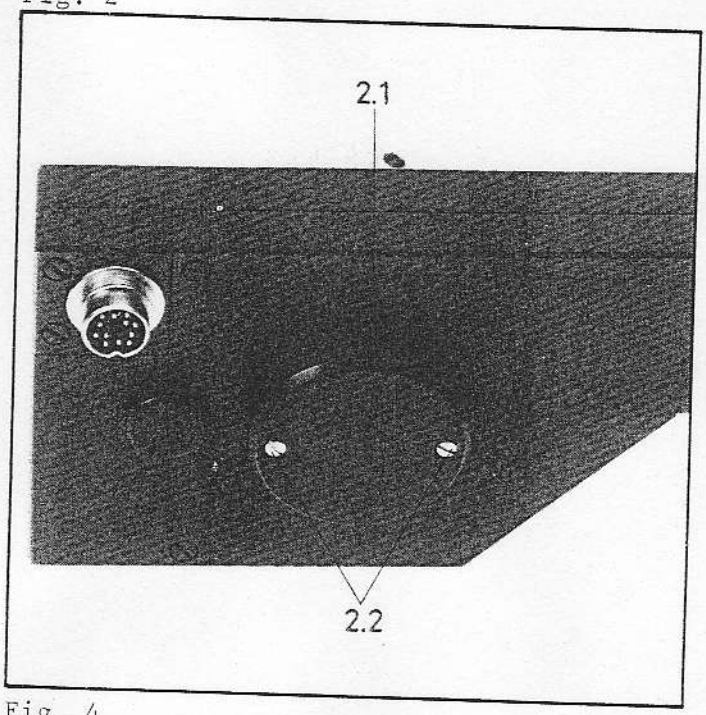



Fig. 3

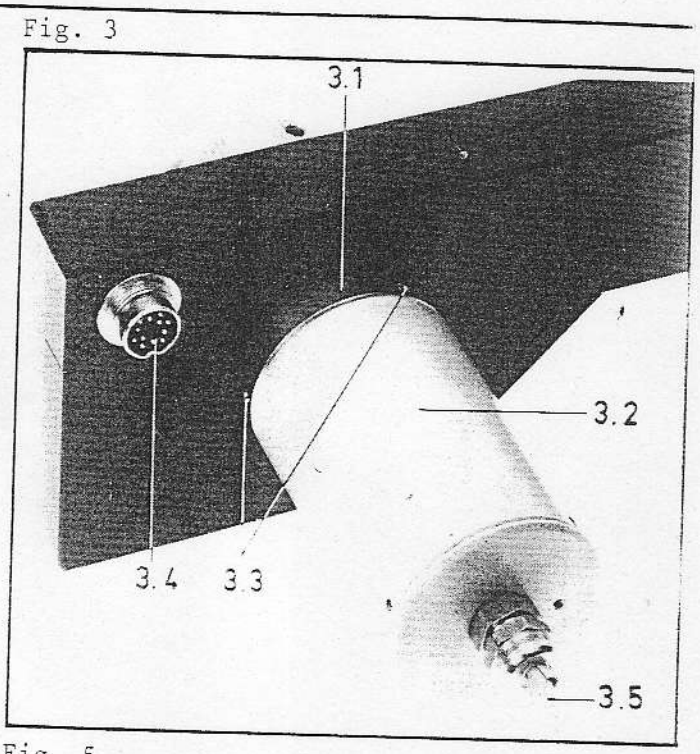



Fig. 4

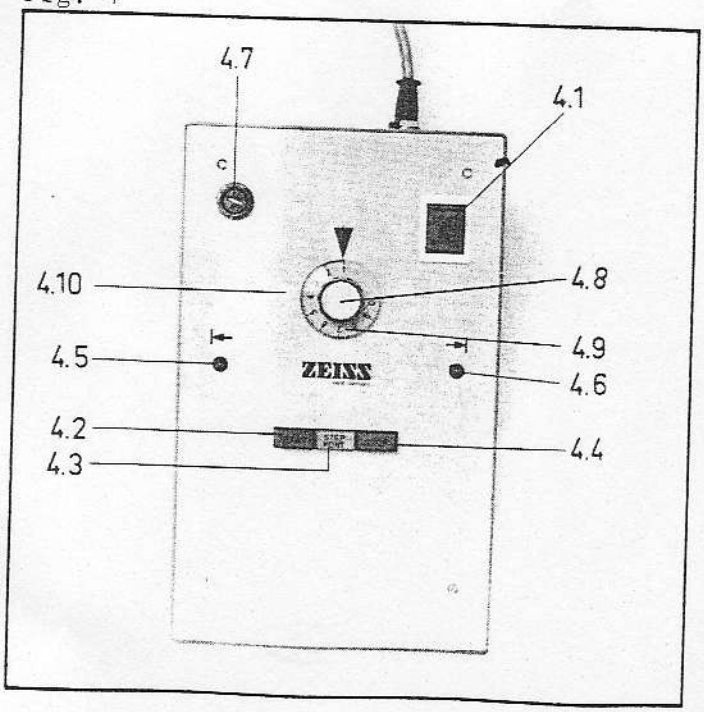



Fig. 5

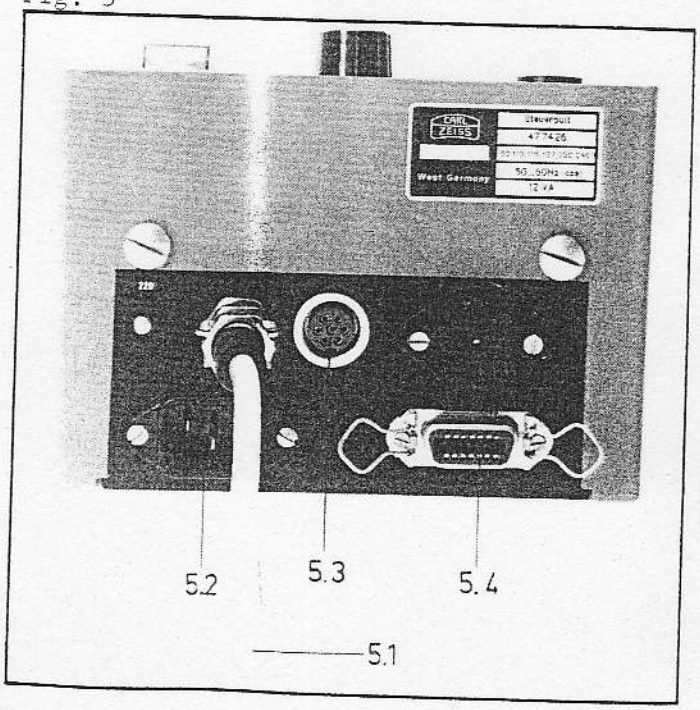


Fig. 6

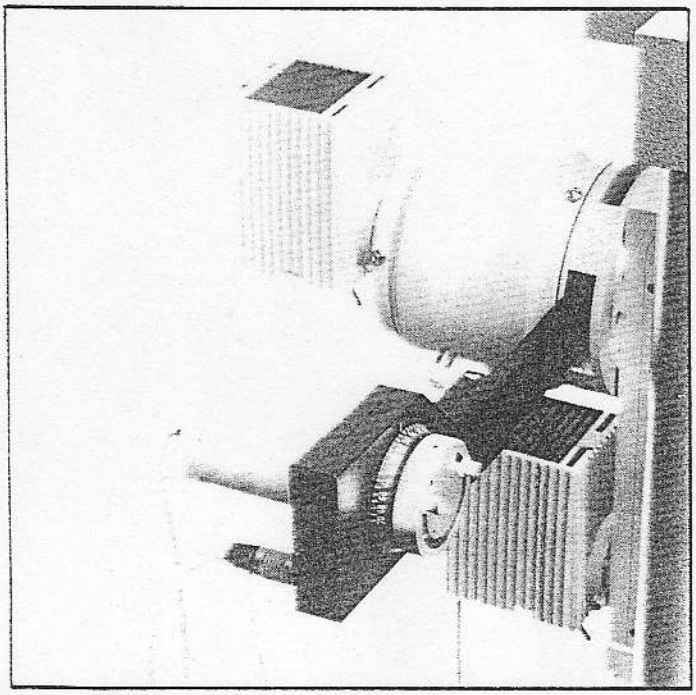


Fig. 7

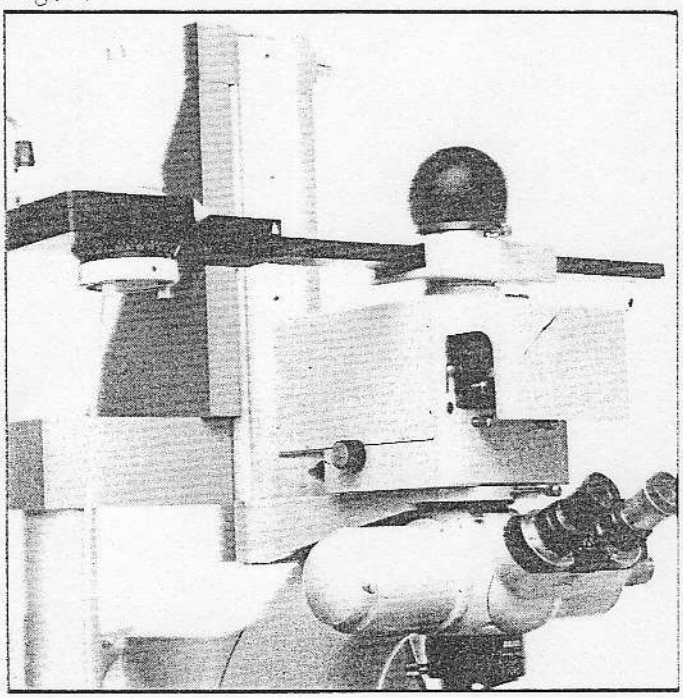


Fig. 8a

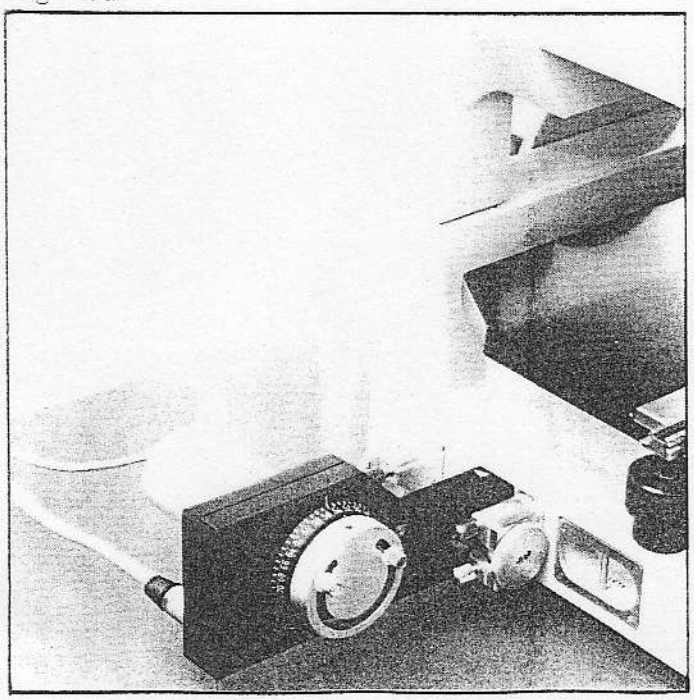
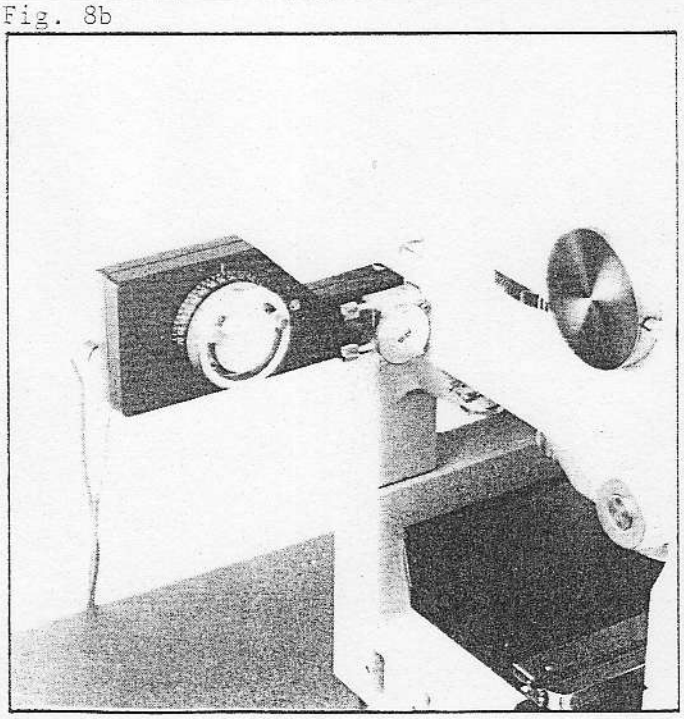


Fig. 8b



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