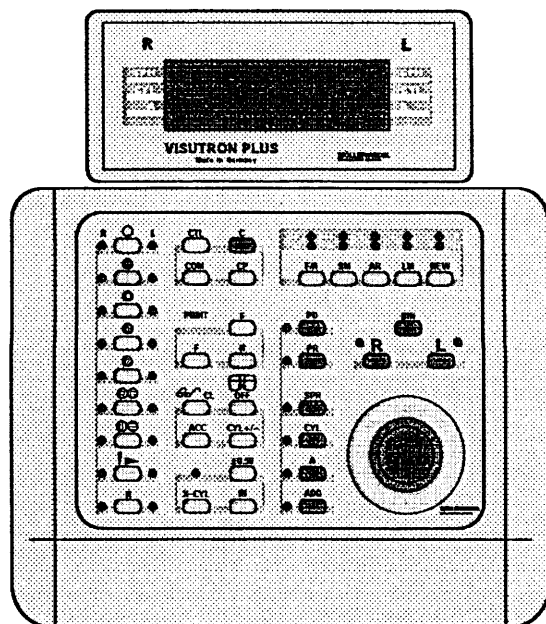
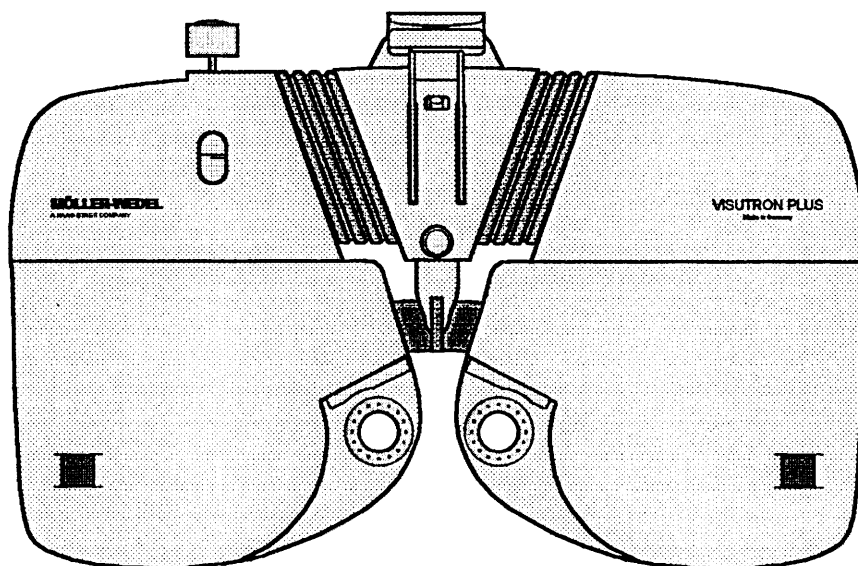


# Operating Manual

## Automatic Phoropter

### VISUTRON PLUS



## **1. WARRANTY AND LIMITATION OF LIABILITY**

MÖLLER-WEDEL warrants that the equipment is free from manufacturer defects in material or workmanship for a period of one year from the date of original purchase when used in accordance with manufacturer's manual.

In case of any defect during the warranty period, customer shall give MÖLLER-WEDEL prompt notice and MÖLLER-WEDEL will repair or replace the equipment at its option.

This warranty shall be void if the equipment is modified or serviced by persons not authorized by MÖLLER-WEDEL, in case of improper maintenance ( in the case of maintenance not carried out by MÖLLER-WEDEL), or in the case of improper handling of the equipment.

**THE FOREGOING IS A LIMITED WARRANTY AND MÖLLER-WEDEL MAKES AND CUSTOMER RECEIVES NO OTHER WARRANTY EXPRESSED OR IMPLIED AND ALL WARRANTIES OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.**

This expressed warranty is in lieu of all other liabilities and obligations of MÖLLER-WEDEL with respect to the equipment. In no event shall MÖLLER-WEDEL be liable to customer for any claims for damages whether direct, indirect, incidental, special, or consequential, including but not limited to lost business and lost profits whether foreseeable or not even if MÖLLER-WEDEL has been advised of the possibility of such damages.

### **Special Important Information for Technical Services**

All installations, repairs, modifications, maintenance, or other technical services must be carried out by personnel who are trained and explicitly authorized by MÖLLER-WEDEL for such work. Only original parts from MÖLLER-WEDEL must be used for maintenance or repairs.

Installations, maintenance, and repairs must be carried out according to technical manuals provided by MÖLLER-WEDEL. Modifications must be approved by the factory. After all technical services the equipment must be tested and re-adjusted according to MÖLLER-WEDEL's technical instructions.

For technical inquiries the part number should be indicated. When parts are replaced, added, or removed the laws or regulations concerning medical equipment (e.g. traceability, approvals for added parts, electrical safety, etc.) have to be considered. In any case of doubt please contact MÖLLER-WEDEL for clarification.

### **Safety Notes**

This unit is only permitted to be operated according to this Operating Manual and the destined use. For user's and patient's safety the maintenance prescriptions according to this Operating Manual should be observed, the reports of which have to be written down and stored. Although no regular maintenances are required we recommend to perform the yearly preventive inspections suggested by MÖLLER-WEDEL. It is essential to address MÖLLER-WEDEL or a person or company authorized by MÖLLER-WEDEL at least once within three years for information concerning safety measures.

Year of manufacturing and serial number of the unit: See the identification label.

Keep the Operating Manual for later use.

<b>Contents</b>	<b>Page</b>
<b>1. Warranty and Limitation of Liability .....</b>	<b>2</b>
<b>2. Normal Use .....</b>	<b>5</b>
<b>3. Functions and Set-Up of VISUTRON PLUS .....</b>	<b>7</b>
<b>3.1 Description of Functions .....</b>	<b>7</b>
<b>3.2 Description of Components .....</b>	<b>9</b>
<b>4. Operation .....</b>	<b>11</b>
<b>4.1 Switching-On and Adjustment to Patient's Eyes .....</b>	<b>11</b>
Switching-on .....	11
Interpupillary Distance .....	11
Height of eyes .....	11
Vertex distance .....	11
<b>4.2 Multifunction Knob .....</b>	<b>13</b>
PD-mode (pupil distance) .....	13
PR-mode (prism compensator) .....	13
SPH-, CYL- and ADD-mode (sphere, cylinder, and addition) .....	15
A-mode (axis) .....	15
X-CYL-mode (cross cylinder) .....	15
<b>4.3 Standard Functions .....</b>	<b>19</b>
Pre-selection mode for multifunction knob, blue button field (54) .....	19
Side selection, button field (56) .....	19
Button C, button field (59) .....	21
Memory functions, button field (58) .....	21
<b>4.4 Special Functions .....</b>	<b>23</b>
Cross cylinder mode .....	23
ADD (Addition), determination of comfortable addition .....	25
PR (prism compensation) .....	25
Special buttons, button field (53) .....	27
Additional buttons for special functions, button field (51) .....	29
°canceling procedures and special functions (C-buttons), button field (59) .....	31
BIN in PD-mode .....	33
PRINT, button group (57) .....	33
<b>4.5 Programing .....</b>	<b>35</b>
<b>4.6 End of Operation .....</b>	<b>37</b>
<b>5. Care and Disinfection .....</b>	<b>37</b>
<b>6. Order List and Accessories .....</b>	<b>37</b>
<b>7. Trouble Shooting and Remedies .....</b>	<b>39</b>
<b>8. Warranty and Service .....</b>	<b>39</b>
<b>9. Technical Data .....</b>	<b>41</b>

**Annex:**

CE EG - Declaration of Conformity

Edition

558 083 02/96



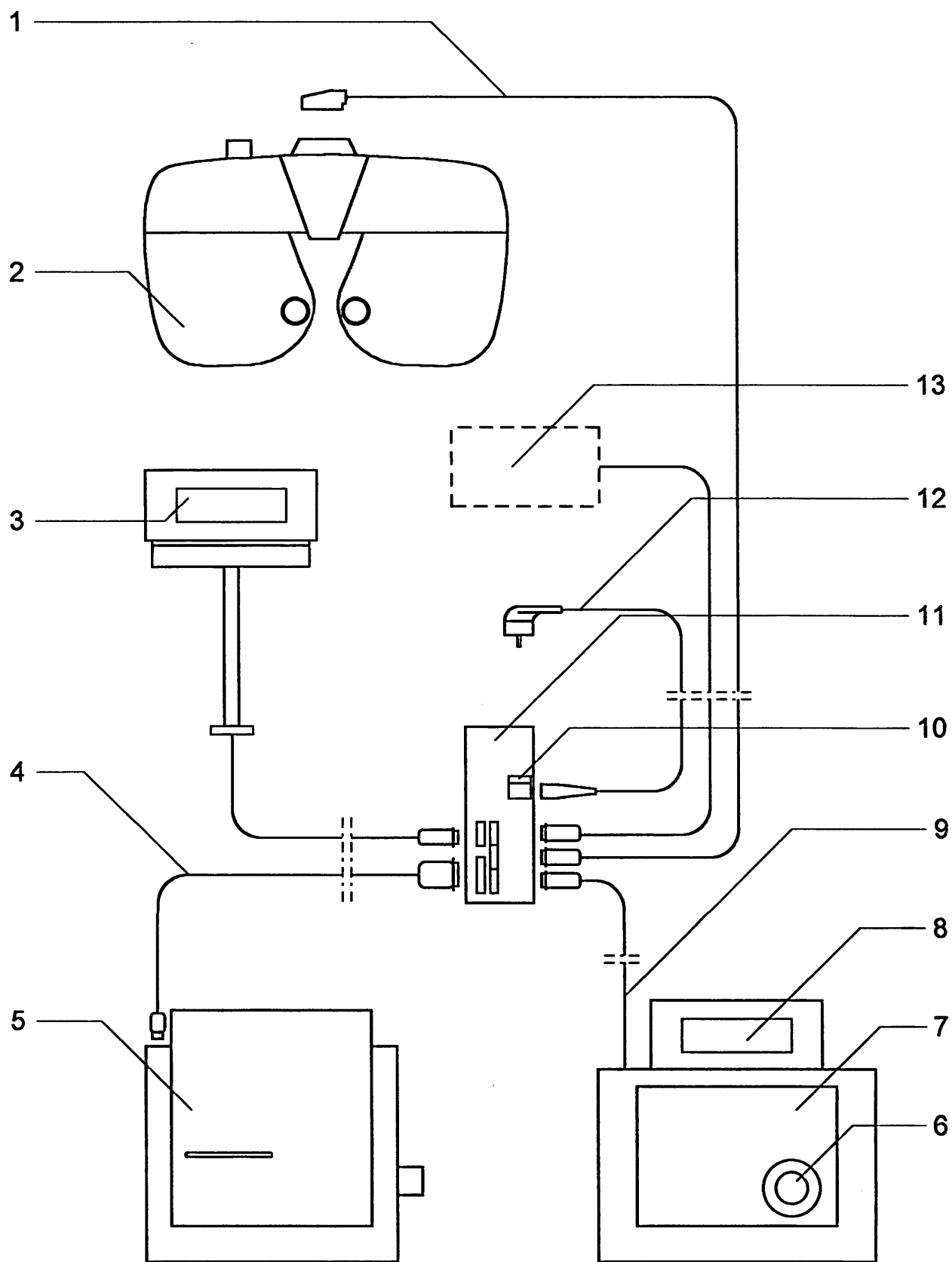
## **2. Normal Use**

The automatic MÖLLER Phoropter VISUTRON PLUS is intended for subjective refraction determination. It is designed for carrying units in refraction and examination rooms of physicians and optometrists.

Only physicians and optometrists are permitted to operate this equipment after proper instruction. The conditions of installation and operation must correspond to the requirements for medical equipment:

- Low vibration
- Careful handling
- Clean environment
- Avoidance of extreme external mechanical stress

Collisions with other equipment should be avoided.



### 3. Functions and Set-Up of VISUTRON PLUS

#### 3.1 Description of Functions

The automatic phoropter VISUTRON PLUS provides subjective refraction determination according to individual methods.

Different lenses or lens combinations are rotated in front of patient's eyes. Operation is performed via switchboard (7). The central controlling element is the multifunction knob (6). By rotation lenses are exchanged in steps of 0.25 or 1.0 D and axes of cylinder lenses in steps of 1 or 10°. The succession of steps in the program is selected by depressing the multifunction knob. Also prism power may be set in steps of 0.25 cm/m as an option. The values and the actual mode are indicated on a display mounted (8) to the switchboard or being separate (3).

The VISUTRON PLUS may receive the objective values, which were determined automatically, and store them temporarily. Also values transmitted from practice PC's may be stored intermediately and new values subjectively determined may be re-transmitted. Via VISUTRON PLUS switchboard also tests of a connected MÖLLER test type projector may be controlled.

Major components of the VISUTRON PLUS are:

- Phoropter (2)
- Switchboard (7) with display (8)
- Central unit (11) with two main fuses (10)
- Cable:
  - Power cable (1) phoropter – central unit, 7 m, separately
  - Power cable (9) switchboard – central unit, 5 m, attached to switchboard
  - Mains cable (12), 2 m, separately
- Optional:
  - ◆ Near vision rod with near vision test attachment (eight test fields on rotation disk)
  - ◆ Separate display (3), alternatively or additionally, is connected to the central unit (11) and located at any place with flexible metal hose, if required.
  - ◆ Periphery equipment (13), e.g. practice PC or autorefractor and autolensmeter. The practice PC is connected directly. For data conversion the autorefractor and/or autolensmeter are connected to the central unit via data transfer system DATRANS.
  - ◆ Common printer (5), applicable for self-adhesive labels, with data line (4), (on request)

The Phoropter (2) of the VISUTRON PLUS is adaptable to all common carrying units, if necessary via adapter. The power cable (1) (phoropter - central unit) should be put such that even in case of movements the bending radius should not be less than 130 mm.

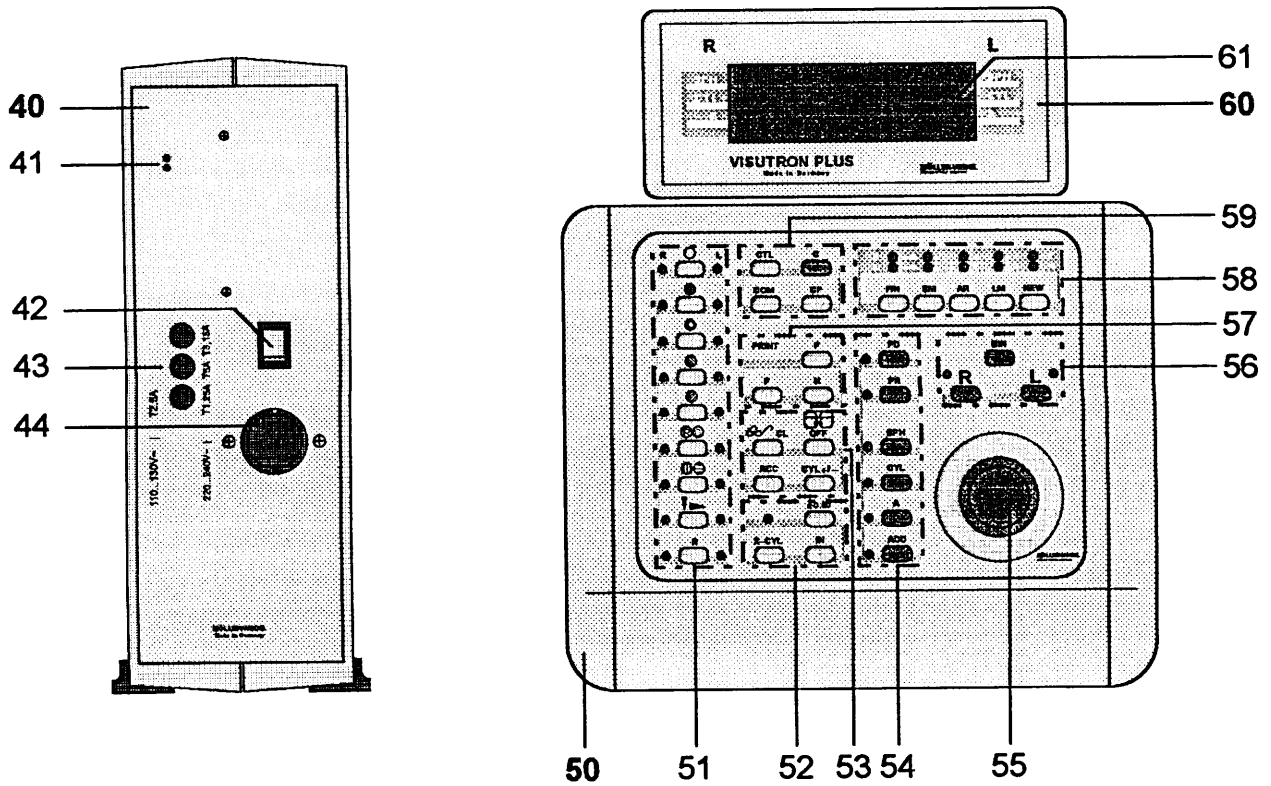
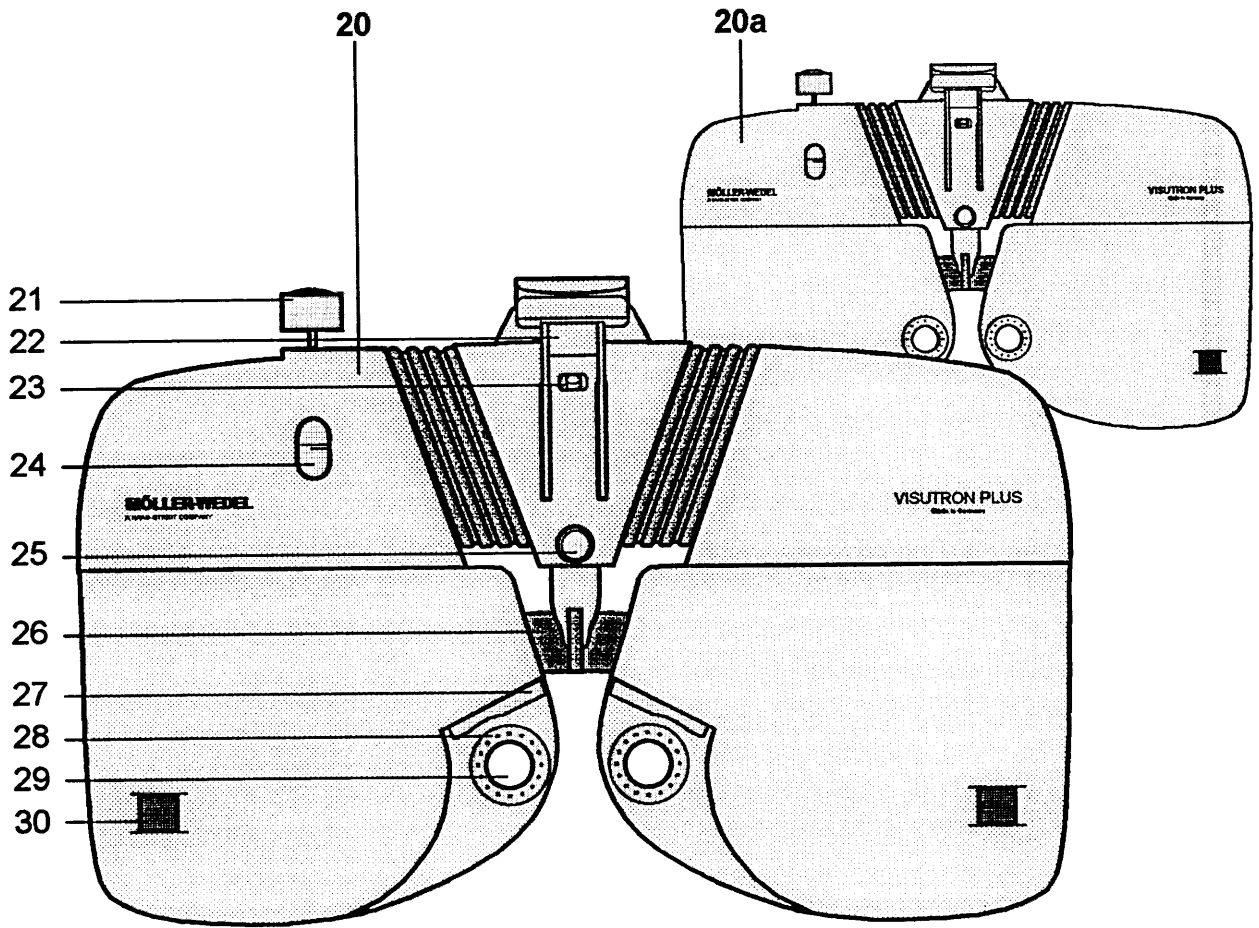
The central unit (11) may be located hidden anywhere or in the carrying unit. The mains voltage selector (44, page 8) must correspond to mains voltage!

The ON/OFF switch (42, page 8) of the VISUTRON PLUS is located on the central unit (11). Normally the central unit is provided via mains voltage of the carrying unit. So it is not necessary to use the ON/OFF switch of the VISUTRON PLUS.

**Note:** For providing mains voltage only original mains cable (12) is permitted without any modification due to a mains filter inside its plug.

One interface each to connect a practice PC, a printer, and a second display is available in the basic equipment. Connection to MÖLLER test type projectors may be performed by sliding in a PC board.

The switchboard (7) is freely movable and may be located at the right or left side of the patient according to the carrying unit. Make sure that the blue turning knob may easily be accessible.



## **3.2 Description of Components**

### **(20) Phoropter**

#### **(20a) Phoropter variant without rotary prism units (27)**

- (21) Turning knob for adjusting different heights of eyes**
- (22) Mounting support for near vision tests as well as lever for convergence setting**
- (23) Bubble**
- (24) Indication of height of phoropter halves**
- (25) Turning knob for adjusting forehead rest (vertex adjustment)**
- (26) Forehead rest**
- (27) Removable rotary prism**
- (28) Diode ring for indication of cylinder axis**
- (29) Viewing aperture**
- (30) View finder for monitoring the vertex distance**

### **(40) Central unit**

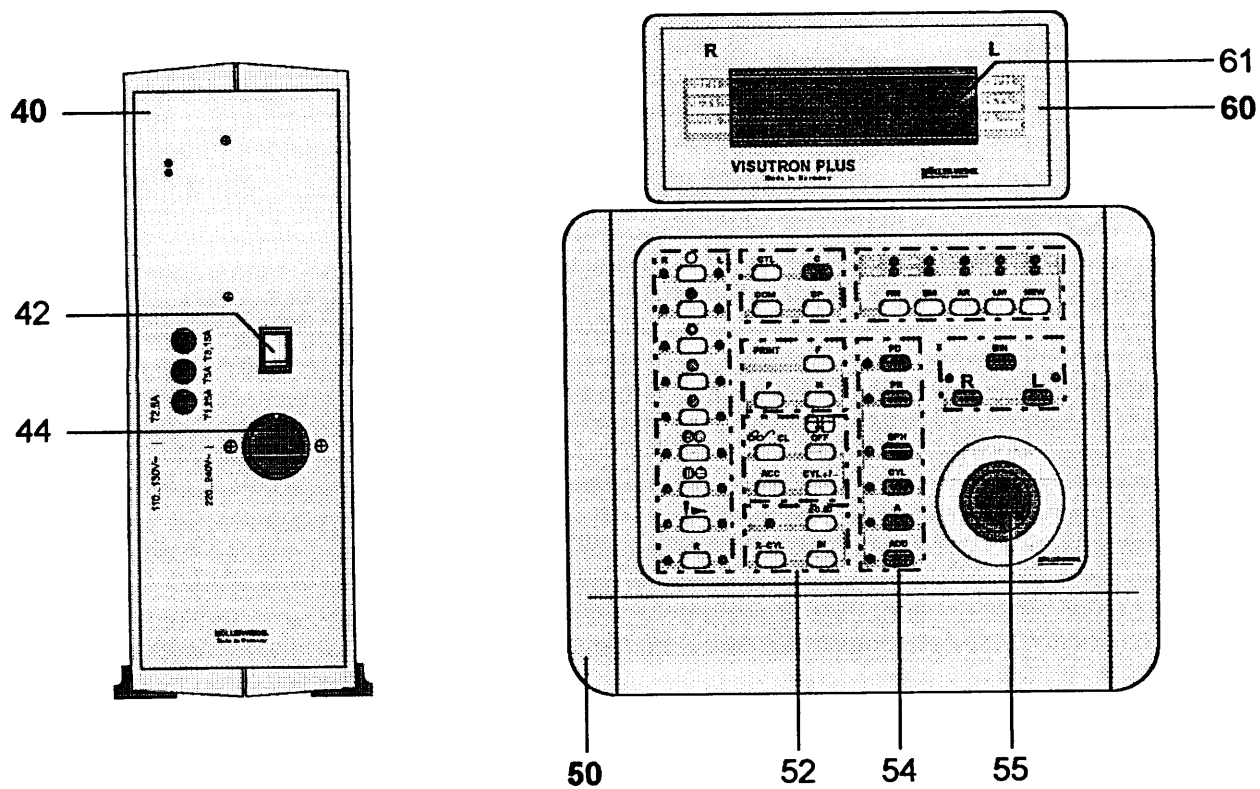
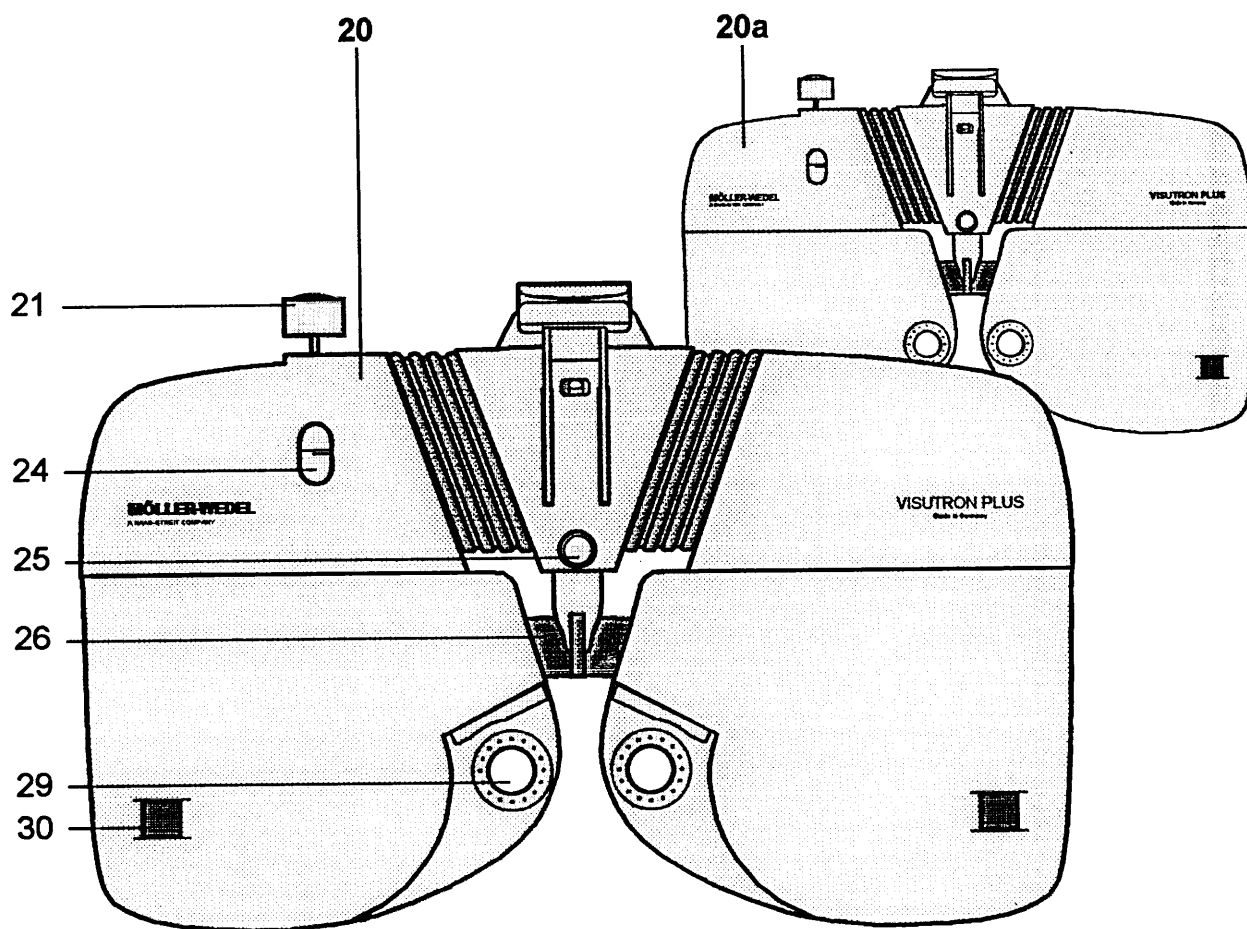
- (41) Function indicators (LED's) for output voltages 7 V (upper LED) and 30 V (lower LED)**
- (42) ON/OFF switch**
- (43) Fuses**
- (44) Mains voltage selector**

### **(50) Switchboard**

- (51) Button group for additional lenses, diaphragms, and filters with function indicators (LED's), for patient's right and left eye separately.**
- (52) Button group for cross cylinder functions**
- (53) Button group for conversions, phoropter OFF, ACC (accommodation width)**
- (54) Blue button group for pre-selection of mode**
- (55) Multifunction knob**
- (56) Button group for side selection**
- (57) Button group PRINT for printing**
- (58) Button group for memory functions**
- (59) Button group 'C-buttons': Elimination procedures, special functions, and blue C-button**

### **(60) Display**

- (61) Alphanumeric indicator**



## 4. Operation

### 4.1 Switching-On and Adjustment to Patient's Eyes

#### Switching-On

Prior to switching on the VISUTRON PLUS (20/20a), central unit (40), switchboard (50), and display (60) should properly be cabled and the mains voltage selector (44) set to local mains voltage.

The ON/OFF switch (42) is located at the central unit (40). Usually the mains cable is connected to the carrying unit and the VISUTRON PLUS is powered via mains switch of the refraction unit. After initialization numbers will appear in the display (61) and indicate readiness for working which is also indicated by illuminated diodes (LED's) on the switchboard (50).

If the equipment is not operated for some minutes it changes to 'Sleep Mode', i.e. brightness of numbers in the display (61) will decrease. By depressing the actual blue button (button group 54) next to the illuminated LED the display is activated again.

The blinking right angular field (cursor) in front of the values in the display (61) indicates the actual mode of the multifunction knob (55). Parallely the corresponding LED on the switchboard is lit.

After switching on the VISUTRON PLUS automatically operates with minus cylinders in the cross cylinder mode 'test for astigmatism'. If plus cylinders are required a plus cylinder value must be selected prior to switching on the cross cylinder mode: Depress button CYL (button group 52), turn the multifunction knob (55) to the right and again to the left to cylinder value '0'.

#### Interpupillary distance (PD)

When depressing button PD (button group 54) in both phoropter halves (20/20a) the centering crosses and the orbita illumination will be switched on. In the display (61) the distance between center lines of the viewing apertures (29) will be indicated in mm. By illuminated rectangular fields the position of the phoropter halves to the center line is indicated. The blinking cursor (61) shows which phoropter half is activated.

Start by adjusting the left phoropter half. By turning the multifunction knob (55) it will be shifted. By depressing the multifunction knob and turning it, the right phoropter half will be moved laterally. (Described in details: Page 13, more setting possibilities: Page 33).

#### Heights of the eyes

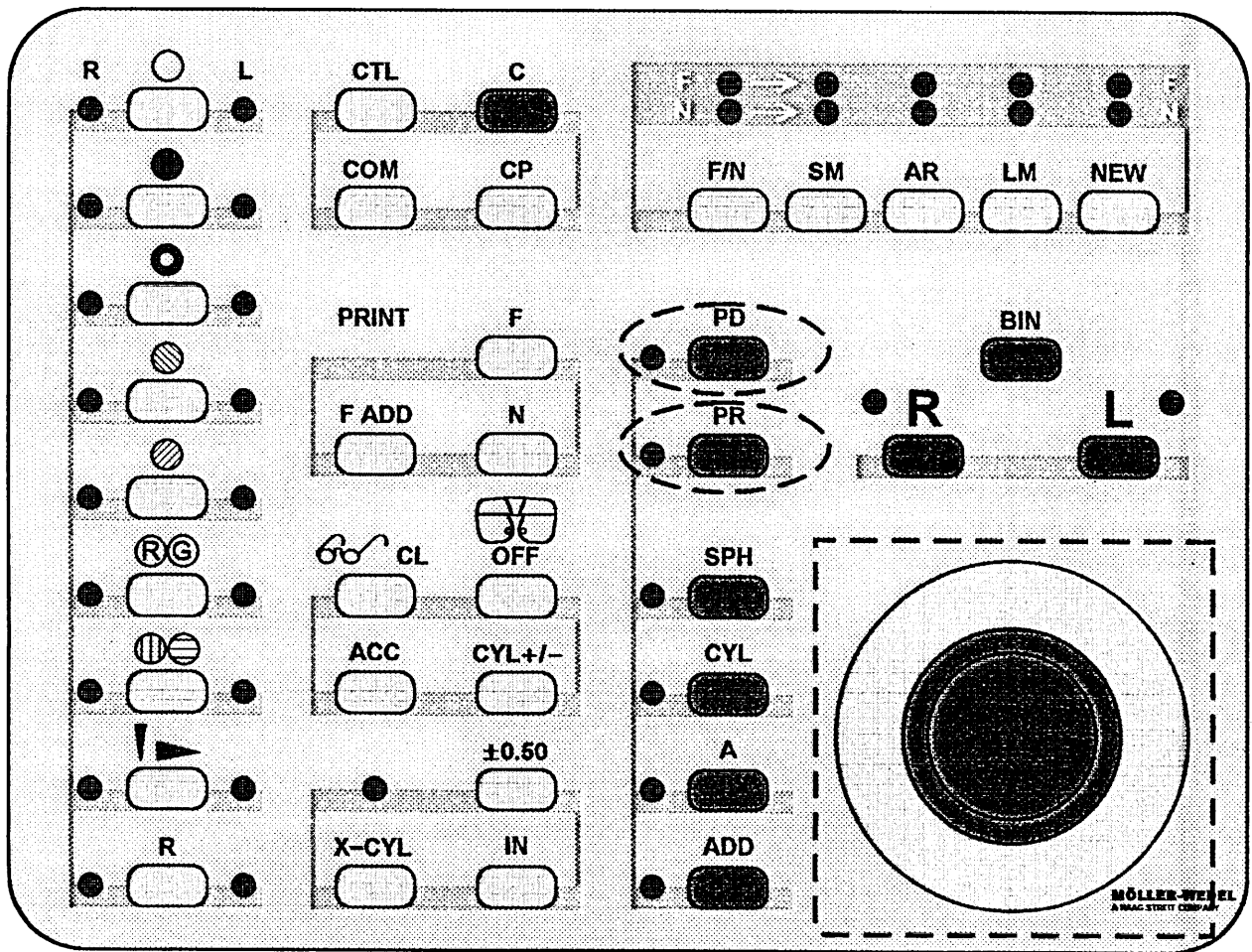
First the phoropter (20/20a) or the patient should be moved up or down such that the left phoropter half is centered in front of patient's left eye. In case of different heights of the eyes, the right phoropter half will be moved upwards by turning knob (21) to the right, downwards by turning to the left. The height is recognized by the indicator (24). If the markings are overlapping there is no difference of heights.

#### Vertex distance

The vertex distance is monitored through viewing apertures (30) and may be set by adjusting the forehead rest (26) via turning knob (25) at the front side of the phoropter. The examiner looks through the viewing apertures (30) such that the long line is located between the capture markings. By shifting the forehead rest or by changing the inclination of patient's head the image of the cornea will be put to the vertical line. The vertex distance amounts to 16 mm.

If the vertical line aligns with the nasal (or temporal) capture markings while the cornea touches the vertical line, the vertex distance amounts to 18 (or 14) mm.

If the forehead of the patient does not touch the forehead rest (26), this is indicated by the letters 'POS' (=position) on the display (61).



## 4.2 Multifunction Knob

The main control element of the VISUTRON PLUS is the multifunction knob (55). It may be turned to adjust values and depressed to change to the next adjustment mode. Short movements and noticeable click-in permit precise setting. The whole refraction determination may be performed via multifunction knob. All other buttons are only used for auxiliary and special functions.

The standard program e.g. provides changing from sphere to cylinder and axis for the right eye, to sphere, cylinder, and axis for the left eye and back to sphere, cylinder, and axis for the right eye etc.

In the individual program the next step of the pre-programmed succession is selected. One program step may consist of activation of several buttons (refer to 4.5 Programming, page 35).

Via multifunction knob - according to its name - many functions may be controlled according to the activated button by direct selection or according to program item:

### **PD-Mode** (Pupil distance)

By activating button PD the motor of the left phoropter half is switched on first.

By turning the multifunction knob to the right the phoropter half moves to the right, i.e. outwards, by turning to the left it moves to the left, i.e. inwards, by 0.5 mm per notch.

If an adjusting limit is reached a beep is heard.

By depressing the multifunction knob the motor of the right phoropter half is switched on.

By turning the multifunction knob to the right the phoropter half moves to the right, i.e. inwards, by turning to the left it moves to the left, i.e. outwards, by 0.5 mm per notch.

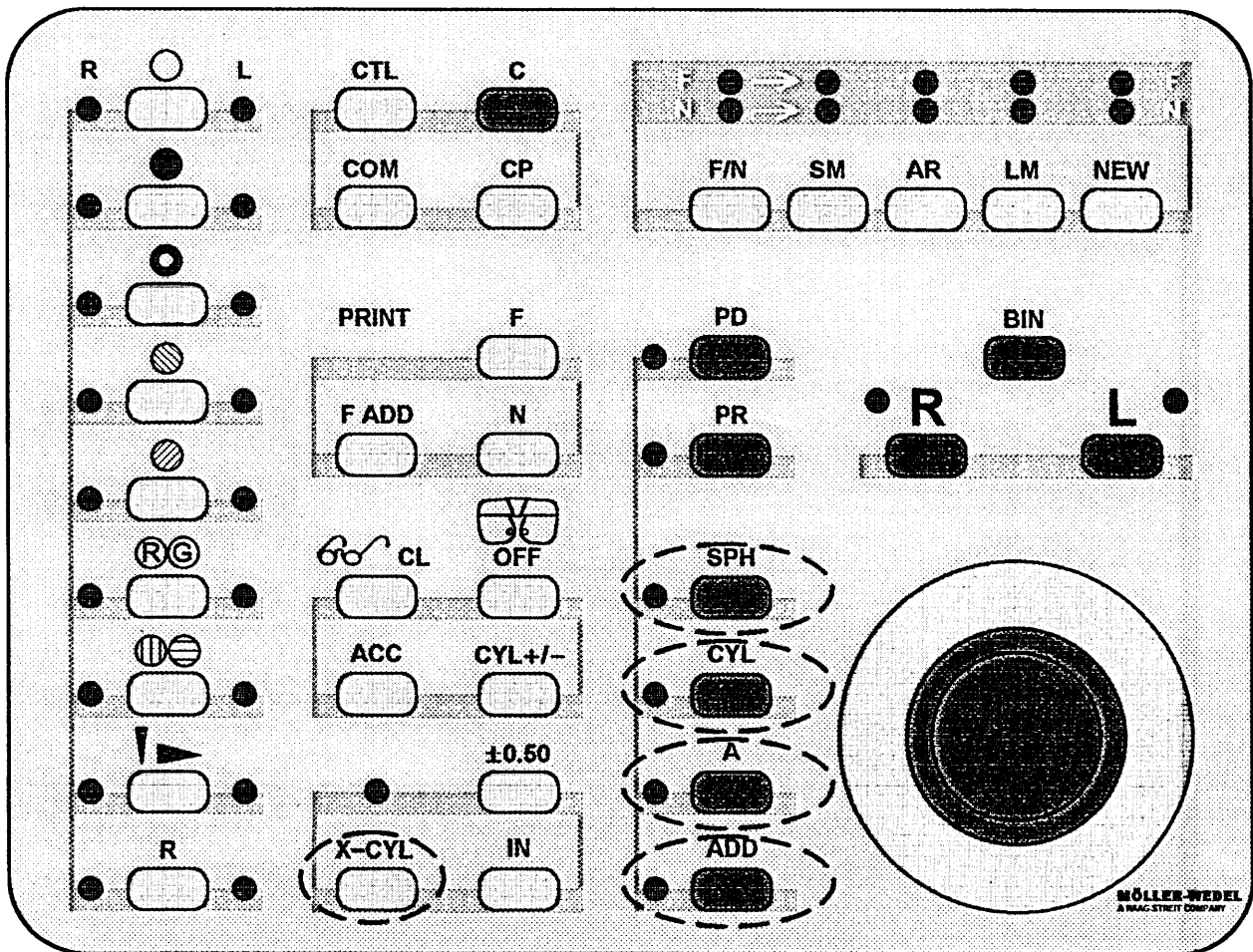
By activating buttons R or L for side selection the phoropter halves may be changed as required.

By depressing again the multifunction knob or by activating the button for the next function the PD-mode is stopped. The right viewing aperture is open, the left is closed.

*(More operations: Refer to 4.4 Special functions, BIN in PD-mode, page 33)*

### **PR-Mode** (Prism compensator)

By activating button PR and turning the multifunction knob prism power will be set or adjusted (refer to 4.4 Special functions, PR, page 25).



**SPH-, CYL- and ADD-  
Modes**  
(sphere, cylinder, and  
addition)

By activating buttons **SPH**, **CYL**, or **ADD** the corresponding values may be altered via multifunction knob.

Turning to the right means changing to plus direction.

Turning to the left means changing to minus direction.

By turning the multifunction knob to normal position the values will be changed by 0.25 D per notch.

By simultaneous depressing and turning the multifunction knob, the values are changed by 1.00 D per notch.

*(More operations: Refer to 4.3 Standard functions, page 19, and 4.4 Special functions, ADD, Determination of comfortable addition, page 25)*

**A-Mode**  
(Axis)

After activating button **A** the axis values may be changed via multifunction knob:

Turning to the right results in decreasing values (according to TABO). Turning to the left results in increasing values (according to TABO).

By turning the multifunction knob into normal position the values per notch are changed by 1°, by simultaneously depressing and turning the multifunction knob, the values are changed by 10° per notch.

The position of axis is marked by a simple line at the lens edge in case of minus cylinder effects, in case of plus cylinder effects by a double line.

The illuminated diodes around the viewing apertures are another aid for orientation.

**X-CYL**  
(Cross cylinder)

Via button **X-CYL** the cross cylinder mode is assigned to the multifunction knob and one eye is covered, if not yet performed.

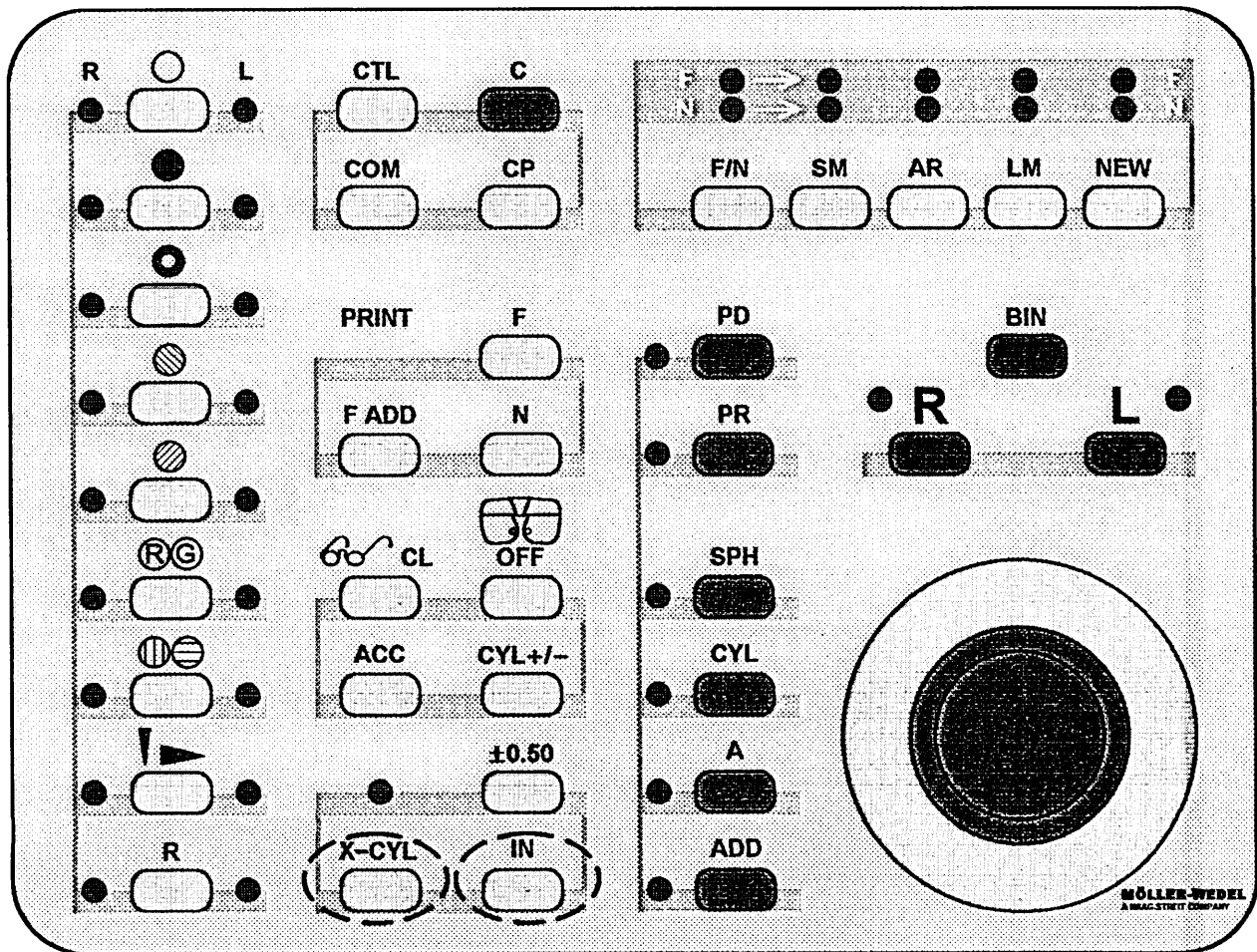
*(If there is no cylinder value, refer to 4.4 Special functions, cross cylinder mode, examination for astigmatism, page 23).*

**Checking of axis**

If a cylinder power is set in the display, first the axis check will be performed. By turning the multifunction knob to the right or left alternately the positions of a conventional cross cylinder are reached.

The knob must be turned by 3 to 7 notches. Counting is not necessary; by effortless rotation into one direction or the other the required position will be set.

The direction which was rotated into will be indicated on the display ('1', '2', and arrow head). Around the viewing aperture the position of the cross cylinder axis is recognized by the LED's.



**X-CYL**  
(continued)  
**IN**  
(Input)

If the patient prefers one position, the correcting cylinder axis must be altered in this preferred direction. Two possibilities are available:

**Programed alteration of axis**

By activating the button IN the axis will be altered in pre-programed steps. The dimension of the first change depends on the cylinder power - the higher the cylinder the smaller the change:

<u>cylinder</u>	<u>first alteration</u>
0.25 to 0.75 D	20°
1.00 to 2.75 D	10°
3.00 to 8.50 D	5°

After the first reversal of direction of change the steps will be halved.

**Freely selectable change of axis**

An individual change of axis is performed by rotating further the multifunction knob into the direction preferred by the patient. The change of axis starts after a beep and after the knob is turned by another notch. In the successive notches the change of axis starts by 1° per notch. If the multifunction knob is turned and simultaneously depressed, the axis will be changed by 10° per notch. By this procedure the user determines the changing dimension.

**Checking of cylinder power**

By briefly depressing the multifunction knob the change of cylinder power is selected. If a minus cylinder is available it will be increased by turning the multifunction knob to the left (cross cylinder axis parallel to the correcting cylinder axis), by turning to the right it will be decreased (cross cylinder axis perpendicular to the correcting cylinder axis).

In case of plus cylinder indication, turning to the left will decrease the cylinder power and increase by turning to the right.

There are two possibilities to change the cylinder power (like axis alteration):

**Programed changes of cylinder power**

By activating button IN a change of cylinder power may be performed in pre-programed steps in the position preferred by the patient.

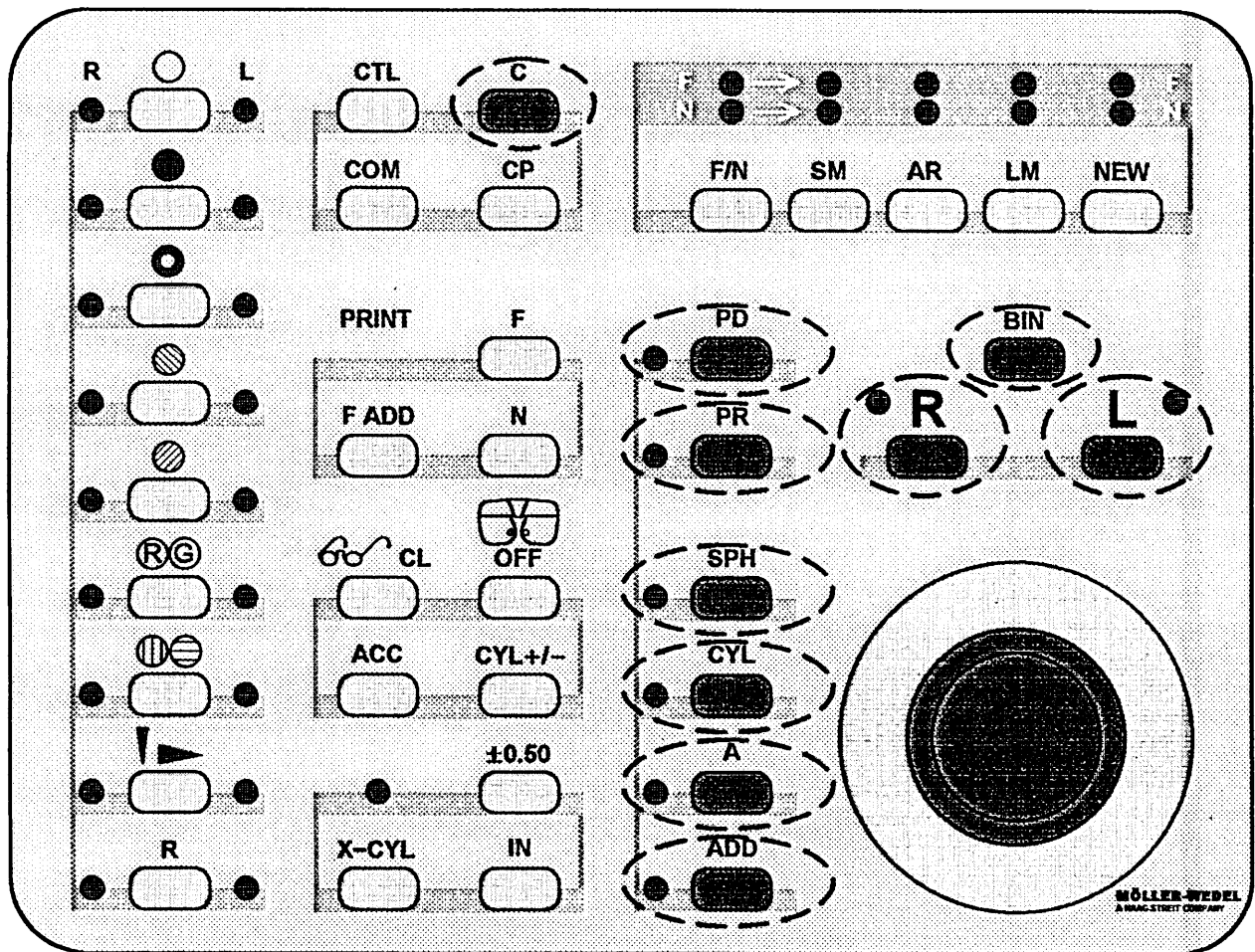
The cylinder power and the sphere will change, i.e. according to the total cross cylinder power.

**Freely selectable changes of cylinder power**

Starting from the position preferred by the patient the cylinder power may also be changed by turning the multifunction knob further and passing the beep. First the cylinder power is changed by 0.25 D. At the next notch the cylinder power is changed by another 0.25 D, but simultaneously also the sphere by 0.25 D vice versa etc.

Change of cylinder power is stopped by briefly depressing the multifunction knob or by activating button R or L. In case of another axis checking, the button A must be depressed in the cross cylinder mode.

*(Also refer to 4.4 Special functions, ±0,50 change of power, page 23)*



### 4.3 Standard Functions

The next important control elements are the blue buttons (button fields (54), (56), and button C).

#### Pre-selection mode for multifunction knob, blue button field (54)

**PD**  
(pupil distance) Via this button both phoropter halves may separately be adjusted to the center of patient's pupil (refer to 4.2 *Multifunction knob, PD-mode, page 13*).

**PR**  
(Prism compensation) This button should be selected to adjust the prism power via multifunction knob (refer to 4.4 *Special functions, PR, page 25*).

**SPH, CYL, A, ADD**  
(Sphere, cylinder, axis, and addition) These buttons should be selected if a function different from the programmed succession is required. Depending on the activated button **SPH, CYL, A**, or **ADD**, changes may be performed via multifunction knob according to side selection **R, L**, or **BIN** (refer to *side selection*).

By moving the mount for near vision examination downwards the phoropter halves swivel into convergence position and **ADD-Mode** is selected automatically. The multifunction knob is ready for setting the addition values recognized by illuminated LED next to button **ADD**. By activating the **ADD-mode** only via button **ADD** the display indicates by 'CONV' that the phoropter halves are set not convergently.

By swivelling back the convergence position is "canceled. If another far distance examination is followed the near vision examination and if the convergence position was not eliminated, this is recognized by blinking 'CONV' in the display.

In the **ADD-mode** also the comfortable addition is determined from the relative accommodation width (refer to 4.4 *Special functions, page 25*).

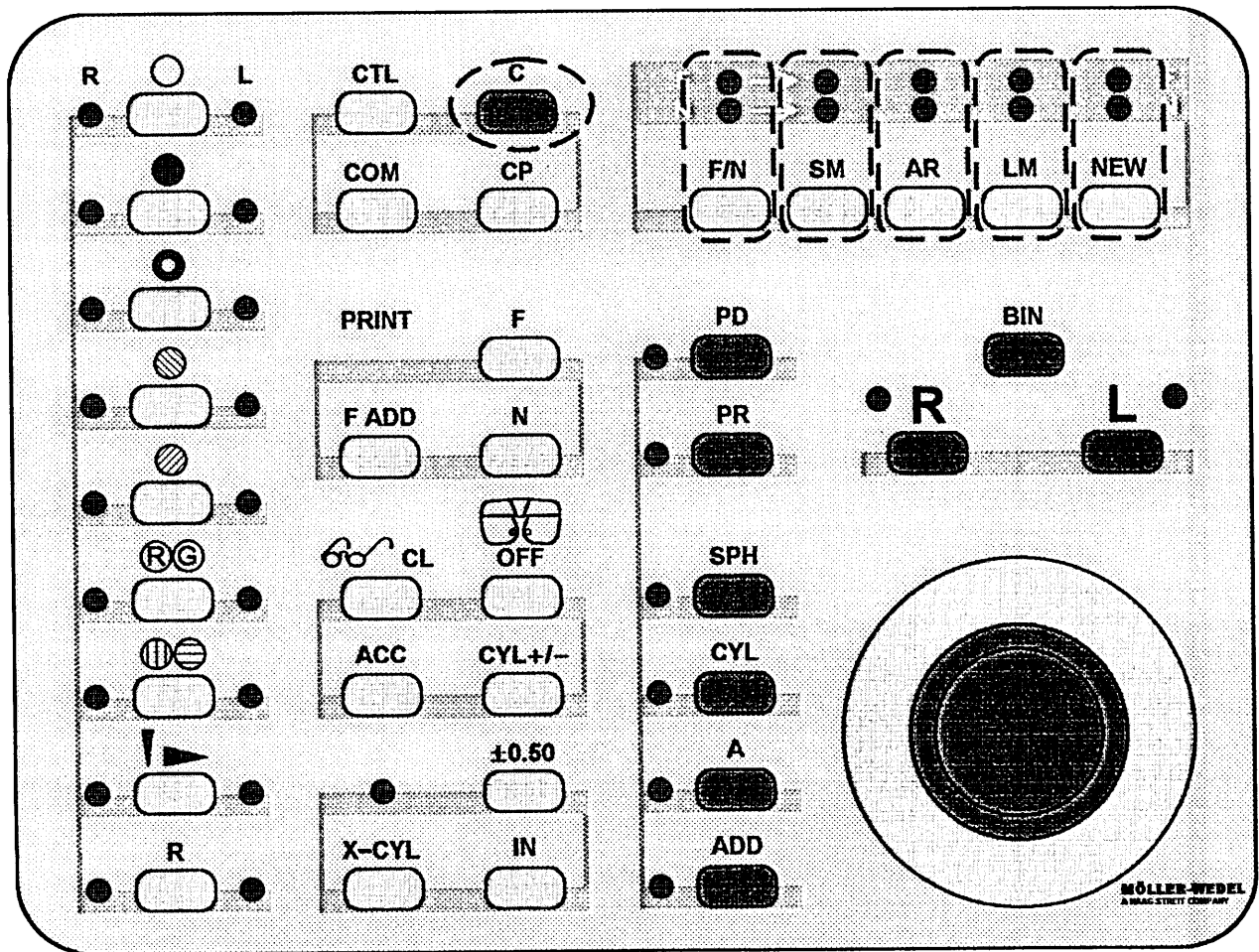
#### Side Selection, Button Field (56)

**R, L, BIN**  
(right, left, binocular) Via these buttons that half is pre-selected where the lenses shall be adjusted. On the switchboard the selected half is indicated by illuminated diodes (LED's) next to the buttons, on the display it is indicated by the cursor.

By switching on the right half is activated automatically. The viewing aperture is open for both eyes. By depressing button **R** the left viewing aperture is closed. Alternatively the left half may be activated by depressing button **L** and by depressing again the right viewing aperture will be closed.

In case of another change of sides, the other viewing aperture each will be closed.

In case of binocular adjustments both LED's are lit. By activating button **R** or **L** monocular adjustment is switched on.



### **Button C, Button Field (59)**

**C**  
(Clear)

Button **C** sets all values in the display and in the memories to zero. For safety reasons after depressing once a second depression is asked for - either on button **C** again in order to realize elimination or e.g. button **R** or **L** in order to stop the elimination procedure.

**Attention!** If prior to this procedure a **PRINT** button was depressed all values will be eliminated by the first button push.

**Note:** After every fifth refraction determination a system test should be activated by the elimination procedure:  
Button combination **CTL + C**.

### **Memory Functions, Button Field (58)**

By these buttons you may store or recall from the memories. The LED's above the buttons are destined for indication of stored functions. The memory places may be allocated either via switchboard or automatically by data transfer.

**F/N**  
(Far/Near)

Button **F/N** is only be used for recalling values and to select which values shall be set: Far distances or far distances with addition.

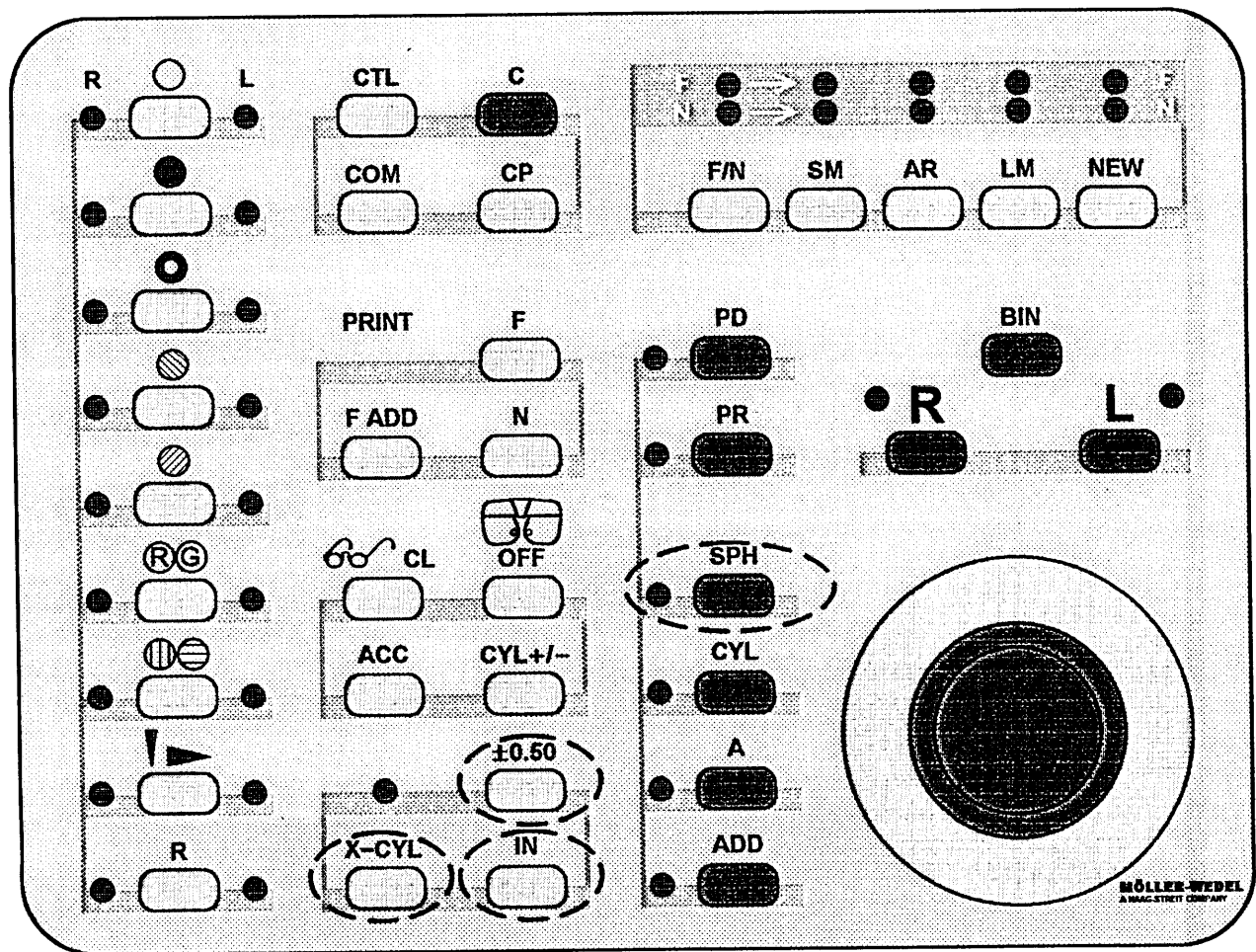
**SM**  
(Safety Memory)

By button **SM** values may be recalled from the memory only. This memory place is automatically allocated if a value indicated in the display is not yet stored during recalling. This happens for safety reasons.

In the middle of the first line in the display is indicated which storage value is located in the indicator. If a different value shall be stored at a place which is already occupied (not applicable with **SM**) this place must be cleared first by activating button **CP** and the button for the memory. After the LED extinguished, the value indicated in the display will be stored by another depressing the button, indicated by the LED being lit again.

**AR, LM, NEW**  
(Auto-refractometer, Lens-Meter correspond to old glasses, new value corresponds to new glasses)

Via buttons **AR**, **LM**, and **NEW** values are stored and recalled. If the pre-selected position **F/N** does not coincide with the stored value being available a beep is heard; the pre-selection must be changed correspondingly.



## 4.4 Special Functions

### Cross Cylinder Mode

**X-CYL**  
(Cross cylinder)

Via button **X-CYL** the cross cylinder mode is allocated to the multifunction knob (refer to 4.2 Multifunction knob, X-CYL-mode, page 15)

**IN**  
(Input)

#### Examination for astigmatism

If no cylinder value is available when activating the cross cylinder mode the zeros for the cylinder disappear from the display. Now the multifunction knob may be used for examining for astigmatism:

By turning the multifunction knob to the right by at least 3 notches a cross cylinder with axis 0° will be slid in, by turning it to the left a cross cylinder with axis 90°. This procedure may be repeated as required. The actual turning direction is indicated on the display.

By depressing button **A** the cross cylinder will be swung out, by another depressing button **A** the cross cylinder with the previous axis position will be swung in. After having swung out the cross cylinder a different axis position may be chosen by turning the multifunction knob. By depressing the multifunction knob oblique axes are switched. By turning to the right a cross cylinder with axis 45°, by turning to the left with axis 135° is swung in.

Only if a plus cylinder was previously selected, the axis position will be 90° by turning the multifunction knob to the right, by turning it to the left 0° or to the right 135° and to the left 45°.

At the axis direction preferred by the patient button **IN** must be depressed; the total cross cylinder value will be added to the initial spherical power.

Then the axis balance can be performed as described under 4.2 (refer to 4.2 Multifunction knob, X-CYL, page 15).

**SPH**  
(Sphere)

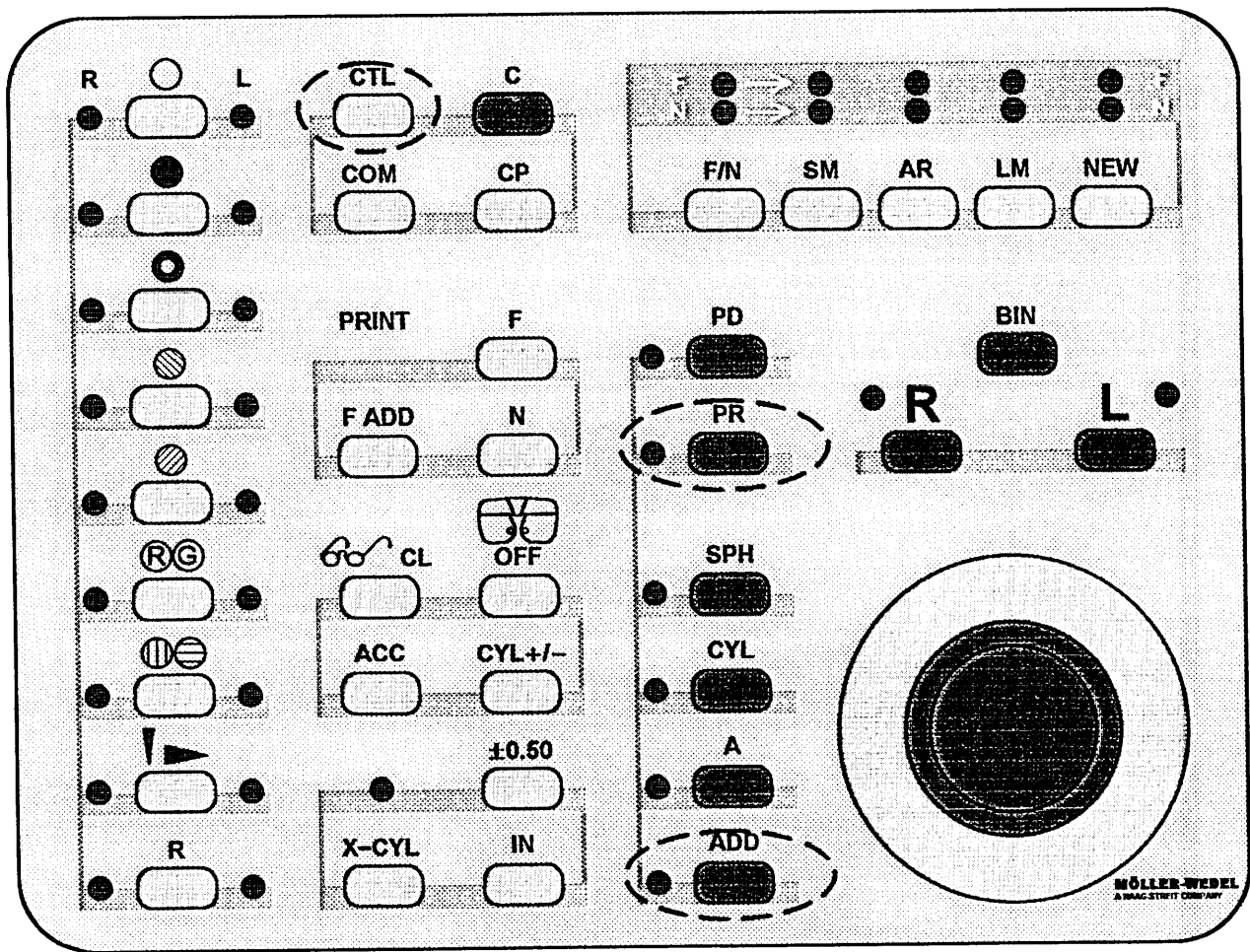
#### Change of spherical effect

Within the cross cylinder mode the spherical value of the correction lens may be changed, if the multifunction knob is turned while depressing button **SPH**.

**±0,50**  
(Change of values)

#### Change of values

Via button **±0.50** the standard value of the cross cylinder may be changed from  $\pm 0.25$  D to  $\pm 0.50$  D. The higher values are indicated in the display by 'X-C .5'. In case of power balance with cross cylinder  $\pm 0.50$  D, the cylinder power changes by 0.50 D and the sphere by 0.25 D cross cylindrically per notch by further turning the multifunction knob in the position preferred by the patient.



**ADD**  
(Addition)

**Determination of comfortable near vision glasses**

The near vision test is moved into position for examination.

Simultaneously by moving down the mount for near vision testing, the phoropter halves swivel into convergence position.

By the convergence setting the multifunction knob is automatically ready for setting the addition values which is recognized by the illuminated LED next to button **ADD**.

During examination the patient is requested to look at a test type - e.g. acuity value 0.6 - in the distance for which he intends to use his glasses.

After sliding in a preliminary addition (only binocular), this will slowly be decreased by turning the multifunction knob to the left until the test type will be recognized deficiently. This lower limit value is stored by depressing button **ADD**. In the display 'ADD' 'MEM' (memory) appears.

Then the multifunction knob is turned to the right, i.e. the addition will be increased until the test type is recognized as deficiently as during the earlier test procedure. This upper limit value is also stored by another depressing button **ADD**. At the same time the middle of the limit values is calculated automatically, set in the phoropter, and indicated on the display as addition.

**PR**  
(Prism compensation)

This button is selected in order to set prism power for compensation of heterophoria via multifunction knob. If button **BIN** is still activated, automatically switching to **R** is performed. At the same time the display is switched to the corresponding indication.

The prism compensators (detail 27 on page 8) are manually pulled off or pushed back. If the prism compensators in **PR**-mode are not swivelled before the patient's eye, 'PRISM' is blinking in the display. Setting prism power may be performed with prism compensators either swivelled out or in.

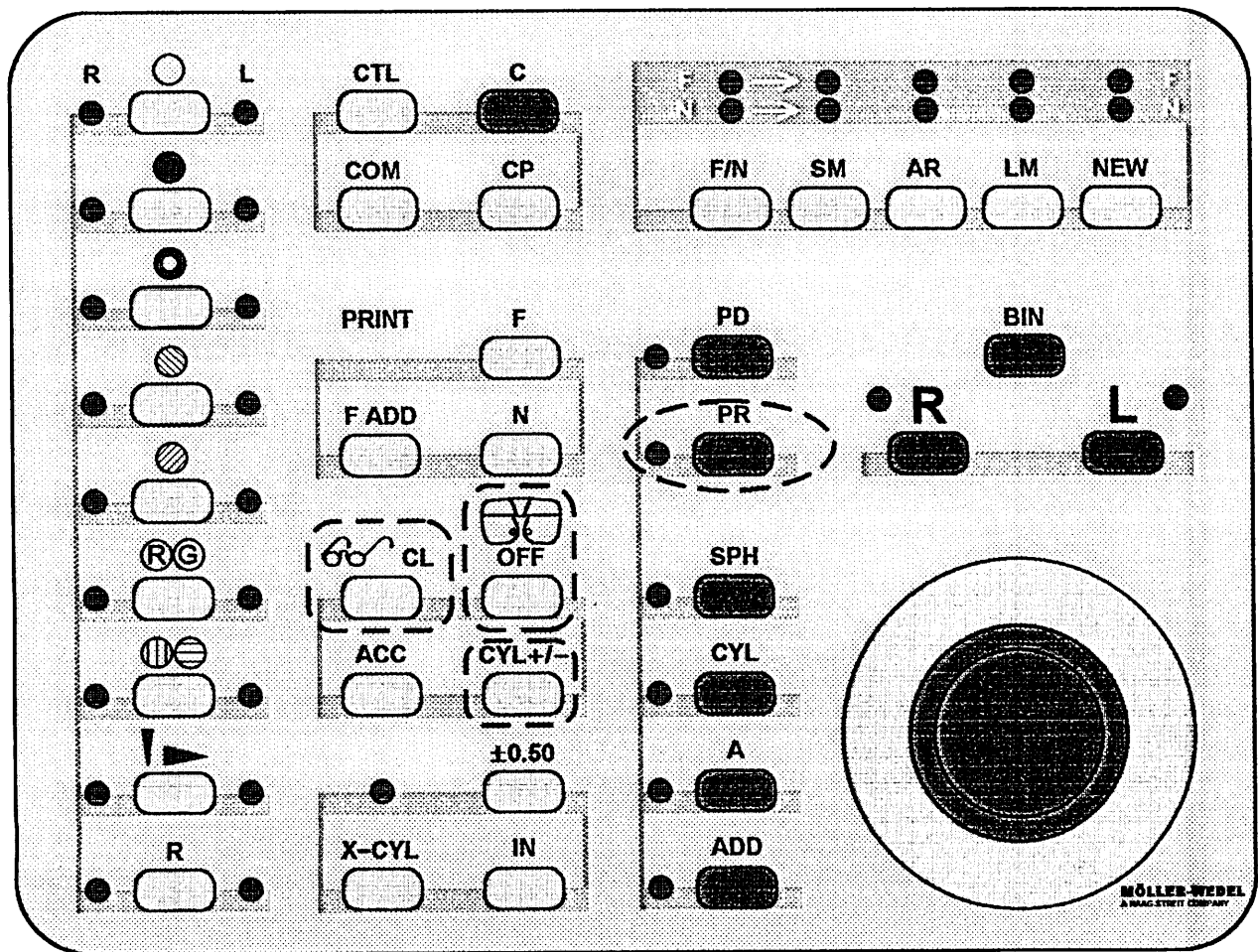
In the display the prism power and base position are indicated: For the right eye in horizontal base position 'OUT', 'IN'), for the left eye in vertical base position ('UP', 'DOWN'). The numbers '2' and '7' behind the comma mean '25' and '75'.

In case of side selection **R**, turning the multifunction knob to the right means prism power base in, turning to the left means base out.

In case of side selection **L**, turning the multifunction knob to the right means prism power base up, turning to the left means base down.

Each notch of the multifunction knob changes the prism power by 0.25 cm/m.

By depressing button **PR** and simultaneously depressing button **CTL** the base position for the right eye is vertical and for the left eye horizontal.



**PR**  
(Prism compensation)  
(continued)

In case of side selection **BIN**, within PR-mode fusion fields may be measured:

First push button **BIN** activates the horizontal measurement, another depressing activates the vertical measurement.

In horizontal base position prism power base in is adjusted by turning the multifunction knob to the right, prism power base out by turning the multifunction knob to the left. The added values determined for each eye result in the fusion field.

In this mode the 'Blur Point' may be determined from 'Break Point' and 'Recovery Point', if after finding the 'Break Point' and the 'Recovery Point' in each case the multifunction knob is depressed .


In vertical base position the prism power will be increased by turning to the right in case of R base up and L base down, by turning to the left in case of R base down and L base up.

By activating button **PR** the spherical and cylindrical values are indicated again. The determination of prisms is taken for finished.

By push buttons **SPH**, **CYL**, **A**, or **ADD** the PR-mode is left and at the same time the next function is selected. By this procedure the spherical values may also be changed during prism determination.


### Special Buttons, Button Field (53)

 **CL**  
(Conversion  
glasses ↔ Contact lenses)

Via button  **CL** the correction values for the glasses with vertex distance 16 mm are converted to the values for contact lenses with vertex distance 0 mm. They will not be set - recognized in the display by 'PHOR OFF'. Via the next button push, the spherical equivalent of the sphero-cylindrical combination for contact lenses is indicated. By third push the value of the glasses is indicated again.

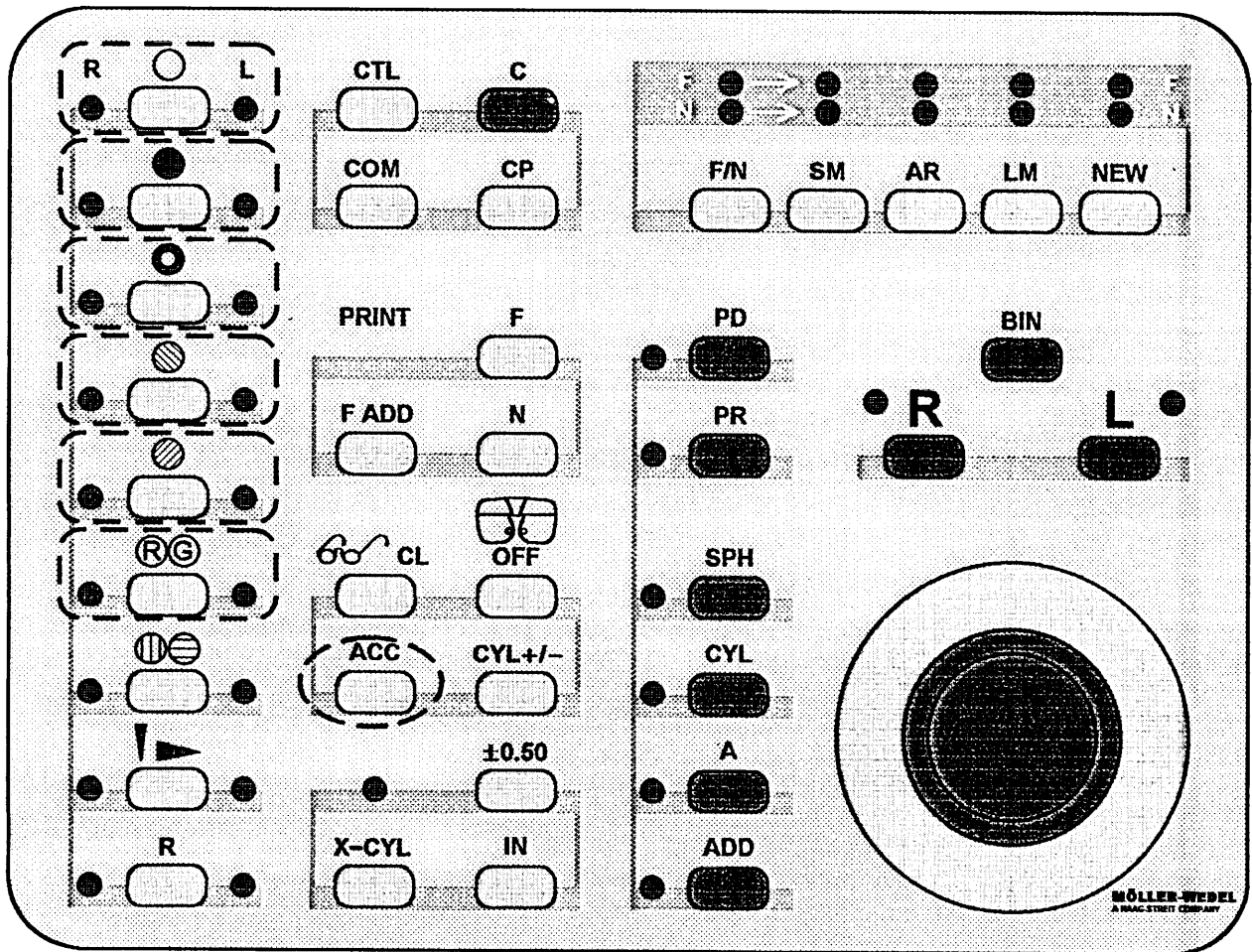


(Phoropter does not set)

After depressing button  **OFF** the recess disks in the phoropter do not move if the values are changed. This state is indicated in the display by 'PHOR OFF'. In this mode the values may be adjusted on the switchboard or recalled from the memory and evaluated without disturbing the patient and without hurry. After finishing the setting and selecting procedure, by a second button push all values indicated in the display are simultaneously set in the phoropter.

**CYL + / -**  
(Plus- ↔ Minus cylinder)

Button **CYL + / -** performs conversion of minus into plus cylinders and vice versa.



**ACC**  
(Accommodation width)

After distance correction the amplitude of accommodation may be determined by activating button **ACC** in the distance. While retaining the smallest size of test type which was seen, the multifunction knob is as long turned to the left, direction minus, as the patient can just recognize the test type. This value provides the monocular accommodation amplitude. Another button push **ACC** will store this value and cancel the **ACC** value in the phoropter.

For the other eye analogous procedure is applicable.

The stored value may again be recalled via button **ACC**. If a PC is connected these values are transmitted together with the correction values.

**Additional Buttons for Special Functions, Button Field (51)**

For this button group the activated button for side selection in button field (56) is applicable. In the binocular mode the following special functions - as far as single functions may be performed - are activated by the first step for the right side.

○ and ●  
(Open aperture and  
occluder)

If button **Open aperture** ○ or button **Occluder** ● is depressed while an LED is already lit, the other phoropter half is adjusted accordingly.

◐  
(Pin hole)

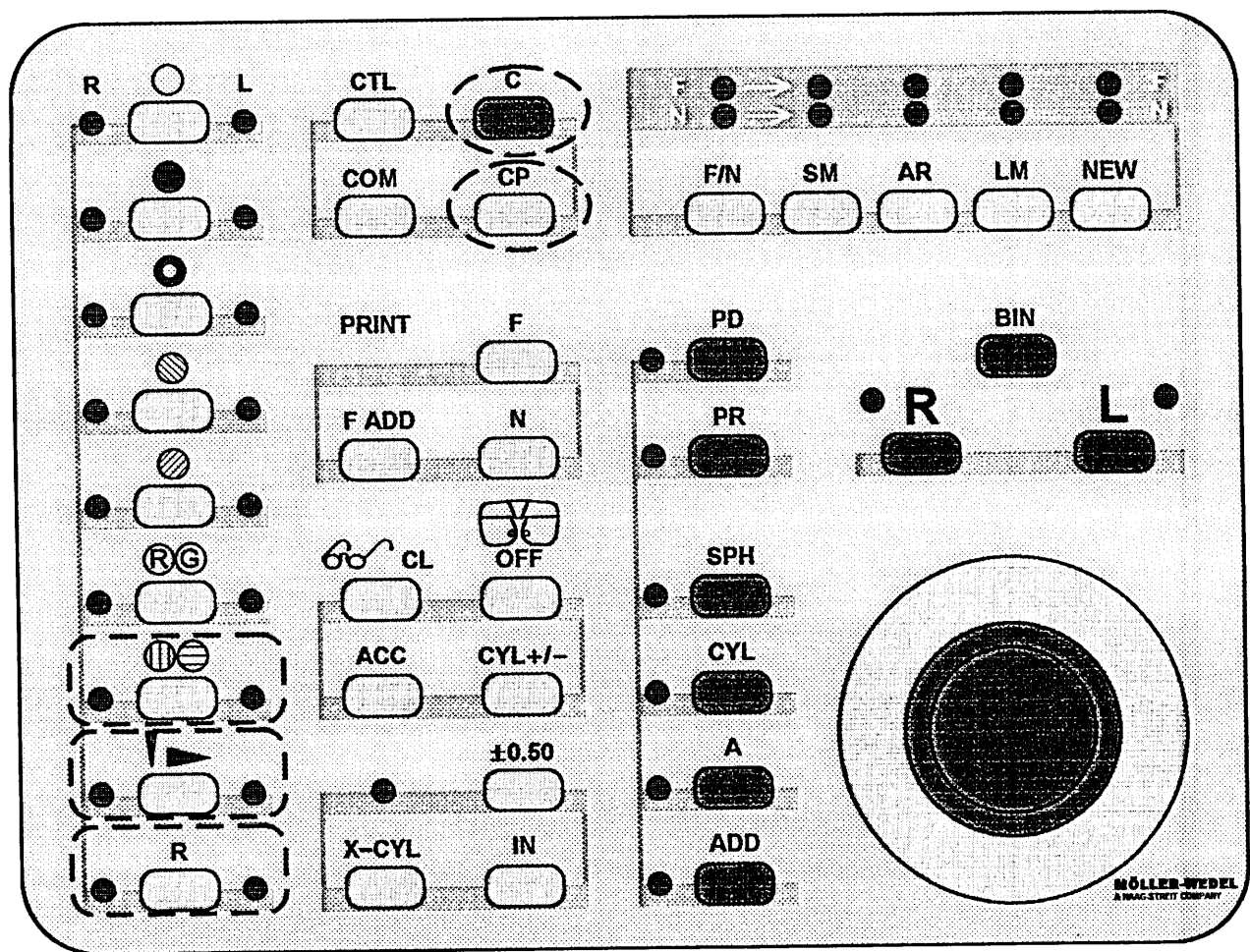
By only one step via button **Pin hole** ◐ the diaphragm is slid before one eye, the occluder before the other eye. If the button is depressed repeatedly, the pin hole and the occluder change to the other side respectively.

◑ and ◒  
(Polarizing filter)

If one of the buttons **Polarizing filter** ◑ or ◒ is depressed, the filters will automatically be swivelled in pairs. By depressing the other button the polarizing directions are exchanged. If one button is depressed twice both filters will be set with the same polarizing direction (malingerer's examination).


ⓂⓂ  
(Red/green lens)

By button push **Red/Green Lens** ⓂⓂ the red lens is switched before the right eye, the green lens is switched before the left eye. Repeated button push makes the red lens remain and the left aperture is open. Another button push makes the green lens swivel in again.





(Fixed cross cylinder or  
Maddox rods)


According to the actual equipment of the phoropter, button  slides in the built-in fixed cross cylinders or Maddox rods.

If **fixed cross cylinders** are available, the lenses  $\pm 0.5$  D with minus axis  $90^\circ$  are swivelled before both eyes upon button push for spherical fine adjustment. By repeated button push the cross cylinder will remain in front of the right eye, the left eye will be covered. Via another button push, the cross cylinder lens and the occluder will be exchanged.

If **Maddox rods** are available the Maddox lens will be slid before one eye while the other aperture remains open. By repeated button push alternately the horizontally aligned Maddox lens may be switched before the right eye and the vertically aligned Maddox cylinder glass may be switched before the left eye.



(Dissociating prisms)

Via button **Dissociating Prism**  a prism is swivelled before one eye while the other aperture remains open. By repeated button push alternately the prism 5 cm/m, base up, may be switched before the right eye, the prism 10 cm/m, base in, before the left eye.

**R**  
(Retinoscopy)

Via button **R** (retinoscopic) lenses +1.5 D will be switched before both eyes. On repeated button push instead of a retinoscopic lens a pin hole will be added. Further depressing provides exchange of the sides, i.e. retinoscopic lens and pin hole. The next button push provides sliding in both retinoscopic lenses.

#### Canceling Procedures and Special Functions (C-Buttons), Button Field (59)

**C**  
(Clear)

Button **C** sets all values in the display and in the memory to zero. After first activation a second button push is requested - either again button **C**, in order to really cancel all values, or e.g. button **R** or **L**, in order to stop the °canceling procedure (*Also refer to CTL+C page 33*).

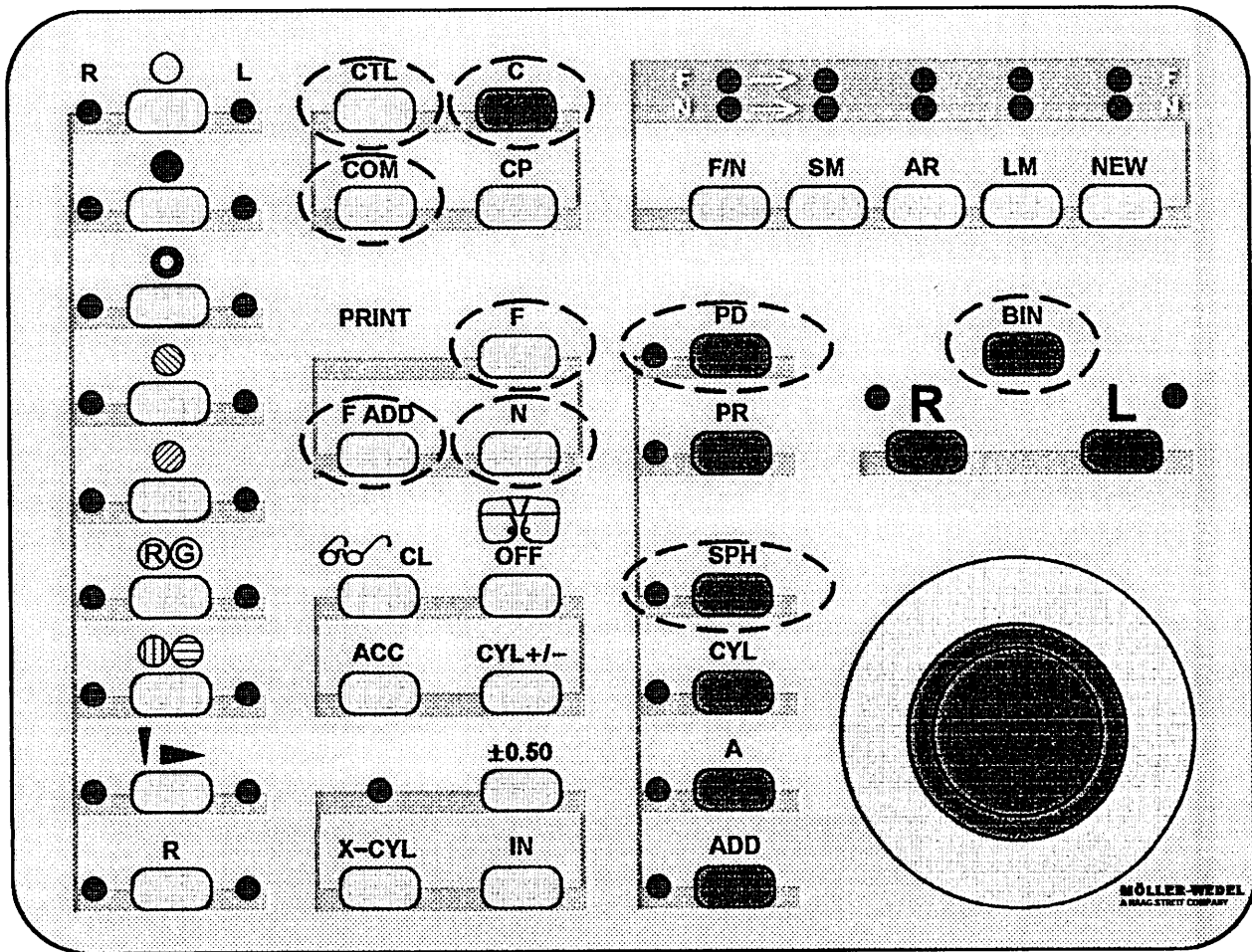
**Attention!** If a **PRINT** button was depressed before, all values will be °canceled by the first button push.

**CP**  
(Clear partial)

Button **CP** is destined for °canceling single values. After activating this button the letters **CP** in the display indicate that the °canceling procedure is initiated.

Then that button has to be depressed the value of which is assigned to, e.g. **CYL**. If at this moment e.g. the LED near **R** is lit, only the cylinder lens in front of the right eye will disappear.

If button **CP** was erroneously depressed the procedure may be stopped by repeated button push.



**COM**  
(Communication) Button **COM** is assigned to communication with the PC. By button push **COM** values will be recalled from a connected practice PC or values indicated in the display will be transmitted to the PC.

**CTL**  
(Control) Button **CTL** itself does not initiate any function. It corresponds to a shifting button. According to this sense it will be kept depressed and additionally that button assigned to the required special function.

Examples:

**CTL+C** The combination of buttons **CTL+C** cancels all values and initiates a system test. Any occurring errors will be indicated in the display. This system test should be performed approximately after the fifth refraction determination each.

**CTL+SPH** The combination of buttons **CTL+SPH** recalls the spherical equivalent of the spherocylindrical correcting values in the phoropter and in the display.

**CTL+COM** The combination of buttons **CTL+COM** switches between standard and personal program succession to and fro.

**BIN in PD-Mode**

**BIN**  
in PD-Mode In the PD-mode (refer to 4.2 Multifunction knob, page 13) more operational possibilities are available, if button **BIN** is activated: By turning the multifunction knob both halves move outwards or inwards. The distance between center lines will be increased by turning to the right, it will decrease by turning to the left.

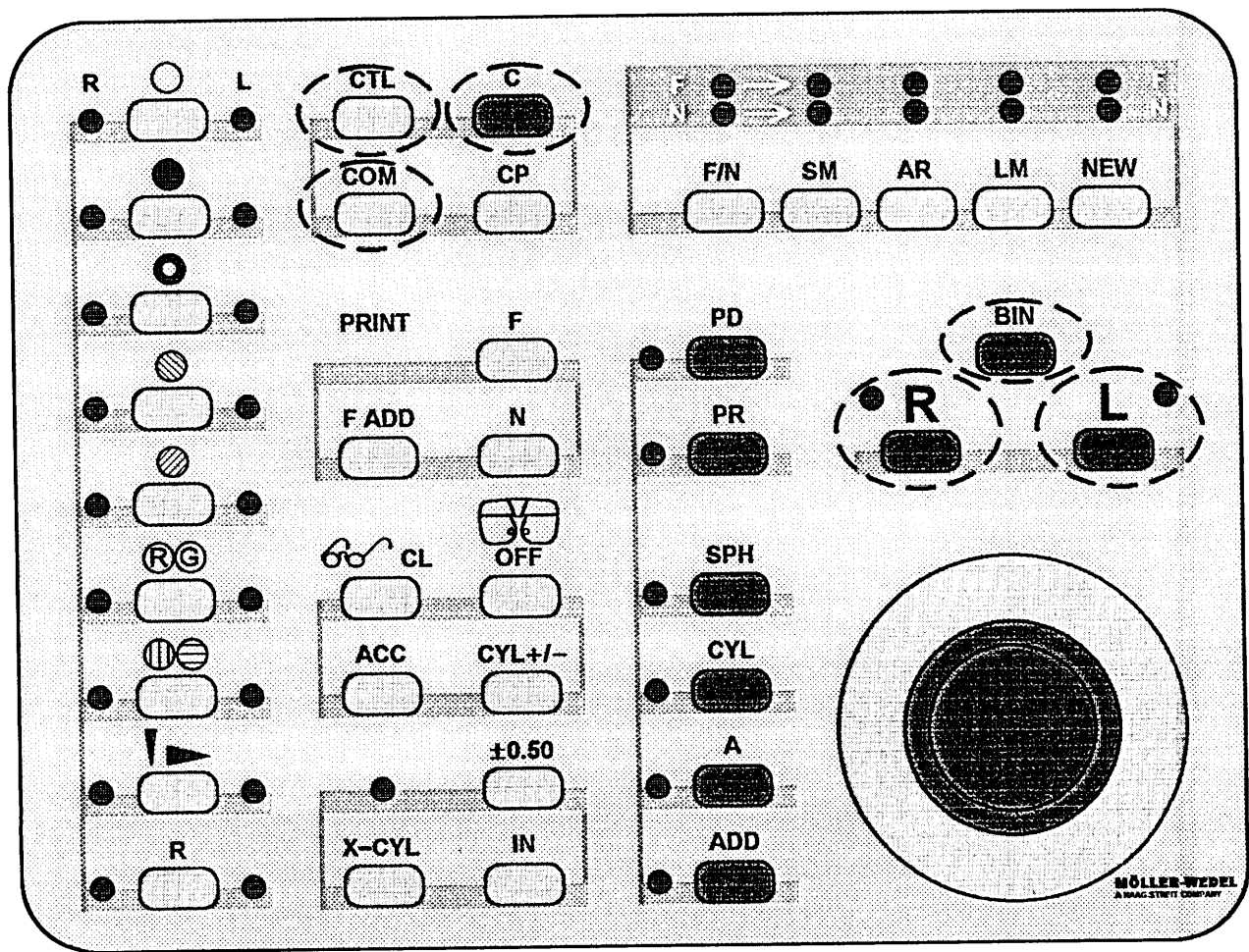
If the multifunction knob is simultaneously depressed and turned to the right both phoropter halves will move to the right, by turning to the left they will move to the left.

**PRINT, Button Group (57)**

Via **PRINT** buttons the values indicated in the display may be printed. Pupil distance and prismatic effects will only be printed in case of any alterations.

**F ADD**  
(Distance value and addition) By button push **F ADD** the values for distance lenses and addition may be printed. According to the printer the values will be printed twice onto two self-adhesive labels, sized according to German health insurance forms.

**F, N**  
(Distance value, near value) If the values for distance glasses and near vision glasses shall be glued on one prescription, buttons **F** and **N** must be depressed simultaneously. By button push **F** or **N** only the corresponding value will be printed.



## **4.5 Programing**

The VISUTRON PLUS provides individual programing. Program changes may be performed by overwriting the actual program.

For programing, reading, or printing of the individual program, the multifunction knob must briefly be depressed while keeping button CTL depressed. In the display is indicated what may be performed via what button.

By button push L the system is ready for individual programing. The succession of programing is menu-controlled via display. The first program step is determined by activating the corresponding button and is indicated in the display. If the program step just selected shall be corrected, button C should be depressed. Then the next program step will be selected for programing by depressing the multifunction knob. After having put forward all programing steps, this will be completed by button push CTL and the multifunction knob.

If an appropriate printer is connected, the succession of steps of the individual program may be printed by button push BIN. It is essential that the single program steps should be testified. Furthermore the program steps may be read in the display by button push R.

If the programing mode shall be left, this is performed by another depressing the multifunction knob. If a refraction determination is followed, the next step each of the individual program is selected by depressing the multifunction knob. At any time by activating the relevant selection button, functions may be selected that are not actually assigned in the program succession.

By depressing button combination COM+CTL between standard and individual program may be changed.

°canceling procedures do not affect the individual programs. After switching off the VISUTRON PLUS the individual program may be selected again by button combination CTL + COM if required.



#### **4.6 End of Operation**

In general the VISUTRON PLUS is switched off via main switch of the refraction unit which provides power. If a separate mains connection is available the switch (42, page 8) on the central unit must be activated.

#### **5. Care and Disinfection**

Phoropter, switchboard with display, and central unit should be kept dustfree with a soft brush or a fluff-free soft cloth.

The viewing apertures of the phoropter may be cleaned with cleansing liquid for optics (only damp but not wet, do not spray!).

Surfaces touched by patients at the rear of the phoropter should be wiped with a fluff-free, soft cloth damped with disinfectant for surfaces.

#### **6. Order List for Accessories**

558 415	Near vision rod and near vision attachment with rotatable disk and 8 test fields
556 150	Protection drape for phoropter
690 160	Cleansing kit for optics



## 7. Trouble Shooting and Remedies

Malfunction	Remedy
LED's on phorofter and switchboard are not lit.	Provide power connection (refer to page 6). Switch on switch (42, page 8) on central unit.
No illumination on phorofter and switchboard despite switching position 'ON' (42, page 8) on central unit	Exchange defective fuses (10, page 6) at cable input on central unit
No illumination on phorofter and switchboard despite switching position 'ON' (42, page 8) and illuminated LED's (41, page 8) on central unit	Check trafo fuses (43, page 8) on central unit and, if required, exchange them. Provide proper cable connection to switchboard and phorofter (refer to page 6)

If malfunctions cannot be remedied, address the local MÖLLER-WEDEL representative for service.

## 8. Warranty and Service

### Warranty:

Refer to General Sales and Delivery Conditions

### Service:

#### National

J.D. MÖLLER Optische Werke GmbH

Technischer Service, Rosengarten 10, D-22880 Wedel

Tel. 04103 - 709 286

Fax. 04103 - 709 370

#### International

Please address the local MÖLLER-WEDEL representative.



## 9. Technical Data

### Phoropter:

Spherical power.....	+ 29.5 to – 26.25 D
Steps .....	0.25 and 1.0 D
Cylinder power.....	up to – 8.5 (+ 8.5) D
Steps .....	0.25 and 1.0 D
Adjustment of axis.....	0° to 180°
Steps .....	1° and 10°
Cross cylinder test .....	± 0.25 and ± 0.5 D
Prism power .....	up to 20 cm/m per eye
Steps .....	0.5 cm/m binocular
.....	0.25 cm/m monocular
Vertex distance.....	16 mm
Range of adjustment.....	14 to 18 mm
Interpupillary distance.....	50 to 80 mm
Steps .....	1 mm binocular
.....	0.5 mm monocular
Convergence .....	400 mm
Height of eyes, balance .....	± 3 mm
Leveling.....	via bubble
Free viewing aperture .....	19 mm
Thickness of housing at viewing aperture.....	27 mm
W x H x D (at PD = 64 mm).....	440 x 275 x 100 mm
Weight with prism compensator.....	6.5 kg

### Switchboard with display:

W x H x D.....	300 x 110 x 320 mm
Weight.....	2.2 kg

### Display:

W x H x D.....	190 x 110 x 45 mm
Weight.....	0.8 kg

### Central unit:

W x H x D.....	120 x 295 x 310 mm
Weight.....	6.0 kg
Operating voltage .....	110; 120; 130; 220; 230; 240 VAC / 50 to 60 Hz
Power consumption .....	max. 100 VA

### Operation and storage conditions:

Operation temperature.....	+ 10° to + 40° C
Storage temperature.....	– 20° to + 60° C
Relative air humidity .....	30 to 85 %
Air pressure .....	600 to 1300 hPa
Operation in explosion hazard atmosphere not permitted	

Due to continuous technical improvements the figures shown in this manual may not be identical with the equipment delivered to you.



**EG - Konformitätserklärung**  
*Declaration of Conformity*

Hiermit erklären wir  
*We herewith confirm*

**MÖLLER - WEDEL**  
J.D.MÖLLER Optische Werke GmbH  
Rosengarten 10  
D-22880 Wedel ,

daß das Produkt  
*that the device*

Brillenbestimmungsgerät / *Automatic Phoroopter*  
**VISUTRON PLUS**  
mit allen Varianten und Systemkomponenten  
*in all variations including system components*

Ident-Nr. / P/N	ab Serien-Nr. / S/N and higher
558 100	1000
558 101	1000
558 105	1000
558 106	1000
558 201	2000
558 280	2000

- ein Medizinprodukt im Sinne von Artikel 1 Absatz 2 der Richtlinie 93/42/ EWG ist  
*is a medical device according to para 1, item 2 of the Directive 93/42/EEC*
- und den im Anhang I der Richtlinie angegebenen Grundlegenden Anforderungen entspricht / *and corresponds to the Basic Requirements stated in annex I of the Directive.*

Angewendete harmonisierte Normen / *Relevant harmonized standards:*

EN 60 601-1	Medizinische elektrische Geräte; Allgemeine Festlegungen für die Sicherheit <i>Medical electrical equipment;</i> <i>General requirements for safety</i>
EN 60 601-1-2	2. Ergänzungsnorm; Elektromagnetische Verträglichkeit <i>2. Collateral Standard ; Electromagnetic compatibility</i>
pr EN 1441	Medizinprodukte Risikoanalyse <i>Medical devices; Risk analysis</i>

Wedel, den 8.12. 1995

i.V. Dr. Twisselmann  
Leiter Entwicklung / *Manager R&D*

i.V. N. Warming  
Leiter Qualitätswesen / *Manager Quality*

## **MÖLLER-WEDEL GmbH**

Rosengarten 10  
D-22880 Wedel / Germany

Tel. + 49 - (0) 4103 - 709 01  
Fax + 49 - (0) 4103 - 709 350

e-mail: [sales@moeller-wedel.com](mailto:sales@moeller-wedel.com)  
<http://www.moeller-wedel.com>