

# Pediatric Autorefractor

## plusoptix A09



### INSTRUCTION MANUAL

(Version 5.0.16.0)

Plusoptix GmbH  
Neumeyerstr. 48  
90411 Nuernberg  
Germany  
[www.plusoptix.eu](http://www.plusoptix.eu)

Copyright © 2009

## Table of contents

|     |  |    |
|-----|--|----|
| 1.  | Safety instructions.....                                   | 4  |
| 1.1 | Warning and Symbols .....                                  | 4  |
| 1.2 | Handling of the plusoptiX A09 .....                        | 5  |
| 1.3 | Exclusive use of the plusoptiX A09 .....                   | 5  |
| 1.4 | Operation of the plusoptiX A09 .....                       | 5  |
| 1.5 | Duties of the operator .....                               | 5  |
| 2.  | Delivery.....  | 6  |
| 2.1 | Storage .....  | 7  |
| 2.2 | Unpacking.....   | 7  |
| 2.3 | Setting up.....  | 7  |
| 3.  | Connecting and switching on the system.....                | 8  |
| 3.1 | Connection.....  | 8  |
| 3.2 | Switching on the system .....                              | 9  |
| 4.  | Settings.....  | 10 |
| 4.1 | General (Basic settings).....                              | 10 |
| 4.2 | Installing a printer.....                                  | 11 |
| 4.3 | Practice network .....                                     | 12 |
| 4.4 | My Address (License Z, optional).....                      | 13 |
| 4.5 | System .....   | 14 |
| 5.  | Binocular measurement .....                                | 15 |
| 5.1 | Measurement procedure .....                                | 15 |
| 5.2 | Documentation.....   | 19 |
| 5.3 | Viewing the video of the last measurement.....             | 22 |
| 5.4 | Storing a video.....                                       | 23 |
| 5.5 | Loading a video .....                                      | 25 |
| 6.  | Monocular measurement.....                                 | 26 |
| 7.  | Switching off the system.....                              | 27 |
| 8.  | Printing the measurement report (License Z, optional)..... | 28 |
| 8.1 | Adding an info column .....                                | 29 |
| 8.2 | Creating text modules.....                                 | 30 |
| 8.3 | Printing the measurement report.....                       | 31 |
| 9.  | Patient database (License D, optional) .....               | 32 |
| 9.1 | Entering patient data .....                                | 32 |
| 9.2 | Measurement data.....                                      | 33 |
| 9.3 | Deleting or modifying patient data .....                   | 34 |
| 9.4 | Backing up measurement results .....                       | 35 |

|                                   |    |
|-----------------------------------|----|
| 10. Warranty.....                 | 36 |
| 11. Service and maintenance ..... | 37 |
| 11.1 Service .....                | 37 |
| 11.2 Maintenance.....             | 37 |
| 12. Practical tips .....          | 38 |
| 12.1 Measurement results .....    | 38 |
| 12.2 Troubleshooting .....        | 41 |
| 13. Specifications .....          | 42 |

# 1. Safety instructions

Please read all of the instructions in this manual by all means in order to avoid any danger to life and health, to achieve reliable measurement results and to obtain the device in good working conditions.

## 1.1 Warning and Symbols



**ATTENTION:** This symbol is intended to advise the user of the presence of important operating or maintenance requirements.



Service or repair to be performed by qualified authorized personnel only. There are no user serviceable parts inside the instrument. Opening this device can expose the user to harmful invisible electrical shock.



Note: Disassembly of plusoptiX A09 device will void the warranty. Refer all servicing to Plusoptix authorized service representatives listed in the section Service and Maintenance (Chapter 11).



Do not sterilize the plusoptiX A09 device or any of the components.



**CAUTION:** Use of controls or adjustments or performance of procedures other than those specified herein may result in wrong measurements.

Use only with IEC 60601-1 approved printers or keep printer out of patient vicinity.



Double insulated power supply.



The CE mark on this device indicates that it has been tested and conforms to the provisions noted within the 2007/47/EG Medical Device Directive.



At the end of life time (electronic waste): Please ship your device back to the company you have purchased it from. The company will refund the shipping cost.



ESD sensitive device: Discharge human body by touching a grounded plane or use ground strips before installation or touching the connectors.



This symbol shows that this product keeps the requirements for an application part type B of EN 60601-1.

## **1.2 Handling of the plusoptiX A09**

The plusoptiX A09 is an optical electronic measuring device. The construction and functionality of the plusoptiX A09 is very similar of a video camera / camcorder. So, please handle the device as carefully as you would use your own camcorder. If you follow this advice, the plusoptiX A09 will last you for many years without any trouble.

## **1.3 Exclusive use of the plusoptiX A09**

The exclusive use the plusoptiX A09 device is to measure refractive data, asymmetry of the corneal reflexes, pupil size and pupil distance in real time. Both eyes are measured at the same time (binocular) from one meter (3.3 ft) away from the child.

Note: Detecting anisometropia in miosis is only possible with a binocular measurement of refractive data in real time, like with the plusoptiX A09. And in this case it is not important whether the children are accommodating during the measurement, because the refractive difference between both eyes is always the same. The measurement is from one meter distance to the patient and so +1.00 dpt accommodation is included into the measurement result.



The measurement results can only be translated into a prescription for glasses/contact lenses by a licensed eye care professional and are not to be taken directly for a prescription.

## **1.4 Operation of the plusoptiX A09**



Check all cable connections from the mains as well as the VGA cable between the plusoptiX A09 device and the monitor and, if present, the connection between keyboard, mouse and network are in good conditions every time before switching on the system.

Make sure that any cables or connectors which show any damage are replaced before switching on the plusoptiX A09 system.



Use only the delivered medical power adapter MES30B-3P1J and the delivered cables.

The plusoptiX A09 complies with the requirements of the directive of medical devices 2007/47/EG.

## **1.5 Duties of the operator**

The operator must ensure that only personnel who have been trained in handling of the plusoptiX A09 are permitted to operate the system. All users must read the operating manual and take note of the safety instructions and provisions.

Note: Training courses on the operation of the plusoptiX A09 subject to safety notes and provisions for medical products are available on request.



Where the operator connects systems other than those supplied by Plusoptix, he should ensure that these comply with norms EN 60601-1 and EN 60601-1-1 in conjunction with the plusoptiX A09.

## 2. Delivery

The plusoptiX A09 device is delivered in a paper carton. The following information is printed on the carton:



Only 5  
cartons on  
each other

This side  
up

Fragile

Keep dry

Carton  
manufacturer

CE conform

Recycleable



Inside the paper carton the measuring device is placed in a preformed inset to avoid damages to the plusoptiX A09 device during transportation.

Paper carton size: 51 cm x 41 cm x 20 cm (20 inches x 16 inches x 8 inches)  
Preformed insert: Polyurethane foam (volume weight 28 kg / CBM)  
Weight: 3.5 kg (7.7LB) carton including plusoptiX A09 device

In case the paper carton shows any damages which may be caused by external force during transportation, e.g. careless loading or unloading, please do not accept the delivery and inform the company you have purchased the device from.

## 2.1 Storage

The plusoptiX A09 device can be stored in the original package when the storage room fulfils the following requirements:

Temperature: 0°C to +50°C (32°F to 122°F)  
Humidity: 10% to 85% (no condensation)



Keep the plusoptiX A09 device away from any heat source.

## 2.2 Unpacking

Open the carton only in position „This side up“.



After unpacking the plusoptiX A09 please check that all items are delivered which are listed on the delivery note. Missing items can only be replaced when a claim has been forwarded to the company you have purchased the device from within one week after accepting the delivery.

Note: Please keep the original packing material in case later transportation may be required.



Do not store the packing material in a room with an open fire place.

## 2.3 Setting up

When you set up the plusoptiX A09 make sure that no cable can be reached by children.



Protect the plusoptiX A09 from direct sunlight.

### 3. Connecting and switching on the system

#### 3.1 Connection

For operation, the plusoptix A09 must be connected to a monitor and keyboard with a mouse. The monitor must fulfill the following system requirements:

Resolution: 1024 x 768 pixels  
Interface: VGA

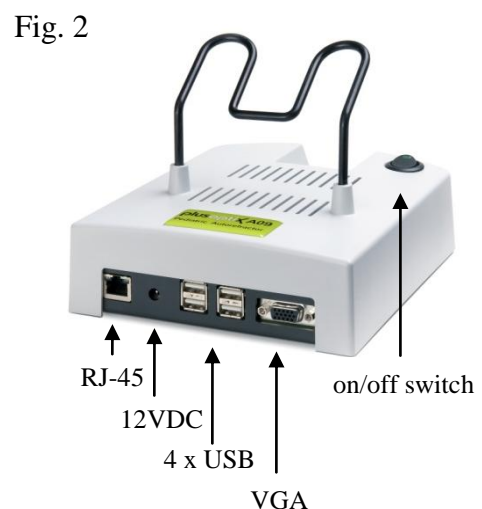
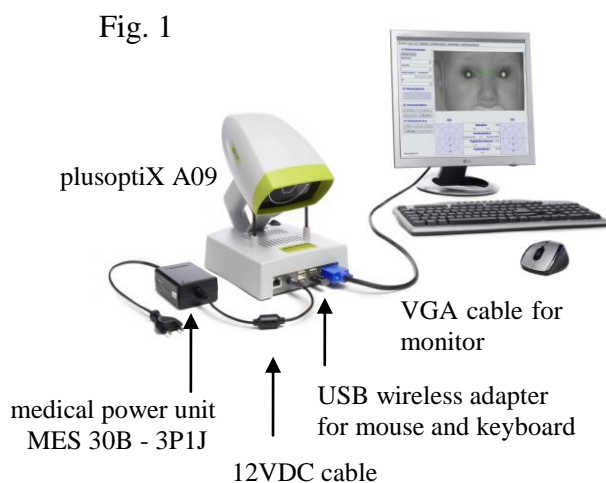
Four (4) USB ports of type A are available on the plusoptix A09 for connecting e.g. keyboard, mouse, printer or USB-sticks.

Where a monitor is already available at a workstation, a switch (monitor switch TK 207 by “Trendnet”) can be used to connect this monitor to the plusoptix A09. This allows you to save space by using the monitor for your practice network and for the plusoptix A09.

The plusoptix A09 can also be attached to your practice network using an RJ-45 connection (network cable) via a GDT interface. Plusoptix supplies the software required for operation via a GDT interface at no charge, should you wish to connect the plusoptix A09 to your network. In this case please consult your practice network support personnel.

Fig. 1: Connect the VGA cable from the monitor to the plusoptix A09. The keyboard and mouse can be connected to the plusoptix A09 by means of a USB cable or a wireless USB adapter. Attach the 12V DC connector to the plusoptix A09 and the medical power unit to a 110 – 220 V AC (50 – 60 Hz) power plug. Ensure that the power plug is switched off after close of business. This is a precaution in case a short-circuit occurs during night-time which may cause a fire.

Fig. 2: Location of the connectors on the plusoptix A09





### 3.2 Switching on the system

Switch on the monitor before you switch on the plusoptiX A09 (see Fig. 2 on page 8 for the on/off switch).

After loading the software (approx. 1.5 minutes) the “Plusoptix Start Page” appears. You can now start measurements.

Note: When using the system for the first time, first click on “Settings” to adjust the settings as required for operation.

### Plusoptix Start Page

Optional License D License Z

Click here to open Settings Instruction manual

This brief description only appears after the system has been switched on.

Binocular OD OS Patients Measurement report Settings Instruction manual

**1) Patient data**

Next patient

Surname

First name

Date of birth Gender

ID

**2) Measurement result**

**3) Documentation**

Measurement report

Label Screenshot

**4) Video control**

Load video Save video

www.plusoptix.eu

Pay attention:  
1) Avoid direct sunlight and bright overhead light, like halogen spot lights during measurement.  
2) Avoid the child looking onto this monitor, not to interrupt fixation to the camera.

Measurement procedure:  
Hold the camera in about 1.20 meter from the child at eye level and press the trigger to activate the camera. A warble sound is emitted and the picture of the camera is shown in this part of the monitor. Adjust the camera that both eyes appear in this part of the monitor. Now move the camera slowly towards the child until green circles appear around the pupils and you hear the warble sound again. You are now 1 meter away from the child and the measurement starts automatically. Now do not move the camera anymore. Within 1 second you will hear a ping tone and the measurement is completed. The measurement data are shown between gaze charts below this part of the monitor. The measurement result "Measurement completed" appears at the left side of the monitor. If the measurement result is "Measurement aborted", please note the status messages in the red bar below the picture of the camera.

Status messages

| OD |                             | OS                                |
|----|-----------------------------|-----------------------------------|
|    | <b>Refraction</b> [dpt]     | n/a                               |
|    | <b>Corneal reflexes</b> [°] | Symmetric (0) n/a (20) Asymmetric |
|    | <b>Pupil size</b> [mm]      | n/a                               |
|    | <b>Pupil distance</b> [mm]  | n/a                               |

Please make sure that no USB-stick is inserted in the plusoptiX A09 during switching on, because it can lead to problems during booting. The USB adapters from keyboard and mouse as well as probably connected printers are excluded from this.

## 4. Settings

For the first start-up it is recommended to adapt settings e.g. general (basic settings), printer, network (GDT), your address and system to the conditions of your practice. With the exception of the general settings appears at each page a security query, where you have to type in “YES”, to perform settings if you are authorized to do that. If you are not authorized click on “Cancel”. Then you just can have a look at the existing settings and not perform any settings.

### 4.1 General (Basic settings)

Click on “Settings” and then on “General” to perform basic settings.

**A) Cylinder**

- Cylinder       + Cylinder

**B) Volume**

%     

**C) Video image**

Standard (Grey scale)       False color

Click here to switch the video image on the monitor from black and white to false colours. You can see the brightness profile of the pupils in colour (Brückner test).

Click here to test the volume of the warble sound.

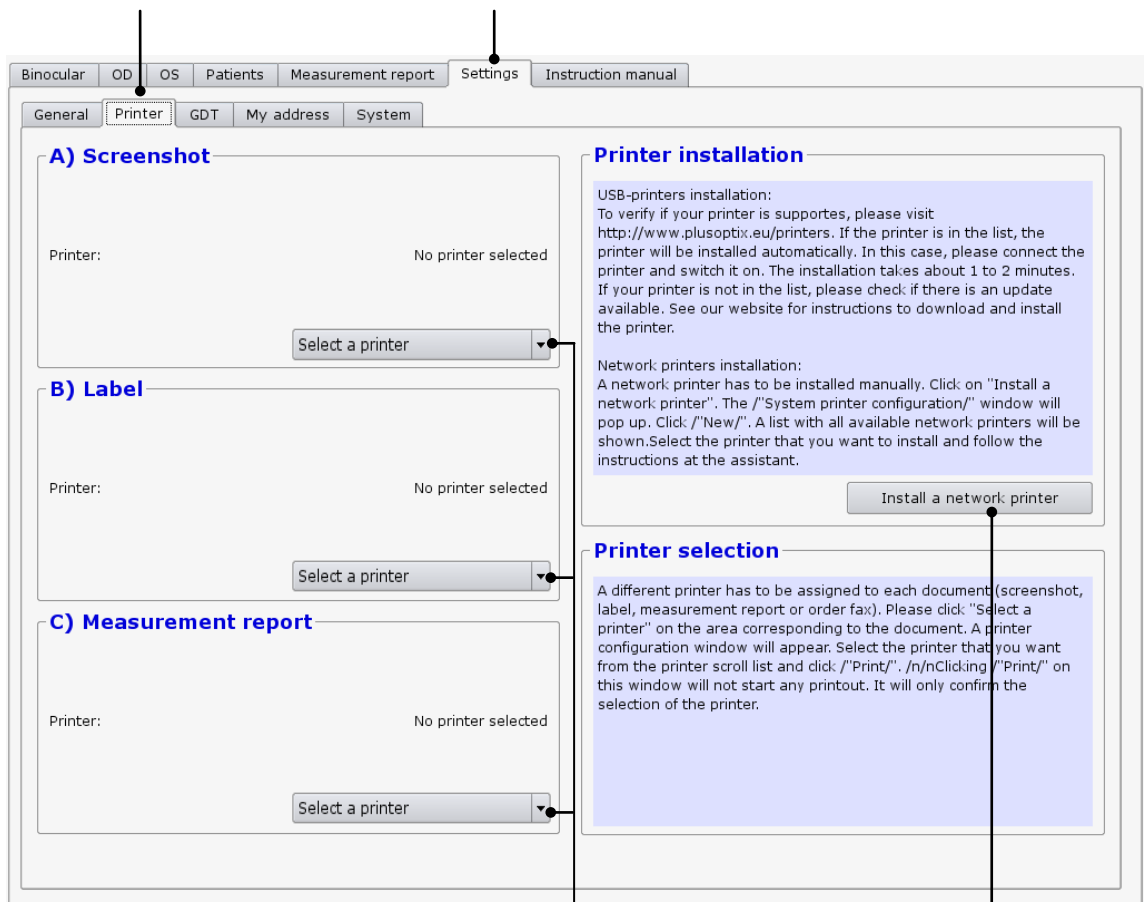
Click here and move the slide to the left using the mouse to decrease the volume of the warble sound, or to the right to increase the volume.

Click here to measure the astigmatism in minus cylinder or plus cylinder.

## 4.2 Installing a printer

To be able to print a screenshot, a self-adhesive label for the patient paper record or a measurement report (optional, License Z), suitable printer must be installed. You can attach the printer to the plusoptix A09 directly via the USB or via your practice network.

Click on “Settings” and then on "Printer".



Click here to select the network printer.

Click here to select the printer to be used to print the corresponding document.

A pdf-printer (“PDF”) is already installed on the plusoptix A09.

If you select the pdf-printer, it is necessary to insert a USB stick into one of the free USB ports on the plusoptix A09. After a successful measurement and after clicking on “Measurement report” or “Screenshot” the document will be saved automatically on the stick. After about 10 seconds you can remove the stick from the device and print the document at a computer connected to a printer.

### 4.3 Practice network

To connect the plusoptix A09 to an existing practice network, proceed as follows:

Click on “Settings” and then on "GDT".

**A) Network settings**

**Id:**  
Local: PLUS Remote: REMO

Write pictures  Write measurement report

**Paths:** The plusoptix device provides a Windows/CIFS/SMB share

Input: remoplus.gdt / Output: plusremo.???

Input: plusremo.gdt / Output: remoplus.???

\\172.17.10.198\transfer\plusremo.gdt Input file with patient data.

\\172.17.10.198\transfer\remoplus.???

Output file(s) with measurement result(s)

**Hostname:** localhost 172.17.10.198

**B) Output format**

Follow strict GDT standard (GDT=german network system standard)

Result optimized for:

GDT: Use 8410, 8411, 8420 and 8421 fields for results

Format results as text in field 6220

Data exchange system settings:  
Please specify the local (this system) and remote (server) id which are usually four digits.

Plusoptix provides a Windows share, which can be mounted by every Windows system. You can store there a file with patient data and after every measurement you can find a new measurement result file.

If you are using a GDT-based system (Germany mainly), the measurement values can be exported via the 6220 field as formatted text (human readable) or via the quadruples 8410/8411/8420/8421

Output format of the measurement results in the network - Parser: output in field identifiers  
- Human readable: formatted text output

Adherence to GDT standard when transmitting measurement values. A selection can be made between formatted text and field identifiers 8410 to 8421.

Enter the name of the plusoptix A09 in the network here.

The paths for data input to the plusoptix A09 and for data export to the network are extracted from this value.

Identifiers for data exchange in the practice software.

Specifications for the GDT-standard is available at: <http://www.plusoptix.eu/gdt>

## 4.4 My Address (License Z, optional)

Enter the name, address, telephone, fax and email address of your practice here, to enable the details to appear on the measurement report.

Click on "Settings" and then on "My address".

Binocular OD OS Patients Measurement report Settings Instruction manual

General Printer GDT My address System

**My address**

This entry will appear on the measurement report.

**Name and title:**

**Address, phone, fax, email:**

Click here to enter the name of your practice.

Click here to enter the address, telephone, fax and email address of your practice.

## 4.5 System

The system settings have been carried out by the company you have bought the device from. In case you would like to change some system settings, please proceed as follows:

The screenshot shows the 'Settings' window with the 'System' tab selected. The interface includes several sections: 'A) Language' with a dropdown set to 'english'; 'B) License' with 'System-ID' 0000013E, an 'Activation code' field, and an 'OK' button; 'C) Keyboard' with a dropdown set to 'us USA'; 'D) Date format' with a dropdown set to 'yyyy-mm-dd'; and 'E) Date and time' with a 'Select' button. A 'Software version: 5.0.13.0 (120116-1605)' is displayed at the bottom. Five callout lines on the left side of the image point to each of these sections (A-E) and are connected to the corresponding text instructions below.

- Click here to set the current data and time of day.
- Click here to select the date format for entering the date of birth.
- Click here to set the keyboard layout.
- Click here to activate additional licenses.
- Click here to select the language for the operator interface.

Once you have performed all system settings, click on “Binocular” to return to the start page. You can then begin measurements.

## 5. Binocular measurement

### 5.1 Measurement procedure

**Step 1:** If the plusoptiX A09 is not connected to a practice network and the measurement results are to be documented, please enter the patient data. This data should be entered before the child is seated for measurement.

Enter patient data. The following data are valid:

- Patient data (Surname, first name, date of birth and gender) or
- Patient data and ID or
- ID and date of birth

Optional  
License D License Z

This brief description only appears after the system has been switched on.

The screenshot shows the software interface with the following sections:

- Navigation:** Binocular, OD, OS, Patients, Measurement report, Settings, Instruction manual.
- 1) Patient data:** Includes fields for Surname, First name, Date of birth, Gender, and ID.
- 2) Measurement result:** A large empty area for displaying results.
- 3) Documentation:** Includes buttons for Measurement report, Label, and Screenshot.
- 4) Video control:** Includes buttons for Load video and Save video.
- Instructions:**
  - Pay attention:**
    - Avoid direct sunlight and bright overhead light, like halogen spot lights during measurement.
    - Avoid the child looking onto this monitor, not to interrupt fixation to the camera.
  - Measurement procedure:**

Hold the camera in about 1.20 meter from the child at eye level and press the trigger to activate the camera. A warble sound is emitted and the picture of the camera is shown in this part of the monitor. Adjust the camera that both eyes appear in this part of the monitor. Now move the camera slowly towards the child until green circles appear around the pupils and you hear the warble sound again. You are now 1 meter away from the child and the measurement starts automatically. Now do not move the camera anymore. Within 1 second you will hear a ping tone and the measurement is completed. The measurement data are shown between gaze charts below this part of the monitor. The measurement result "Measurement completed" appears at the left side of the monitor. If the measurement result is "Measurement aborted", please note the status messages in the red bar below the picture of the camera.
- Status messages:** A red bar at the bottom of the instructions area.
- Measurement Results:**

|                             | OD            | OS              |
|-----------------------------|---------------|-----------------|
| <b>Refraction</b> [dpt]     | n/a           | n/a             |
| <b>Corneal reflexes</b> [°] | Symmetric (0) | (20) Asymmetric |
| <b>Pupil size</b> [mm]      | n/a           | n/a             |
| <b>Pupil distance</b> [mm]  | n/a           |                 |

**Step 2:** Hold the camera approximately 1.20 metres (3.3 feet) away from the child at eye level and start the camera by pressing once on the trigger in the handle. A warble sound can be heard to draw the child's attention to the camera. Avoid the child observing the monitor. The attention span of young children is extremely short. Consequently, distractions during measurement such as the monitor image or other persons in the room should be avoided.



## Camera



Note: You can repeat the warble sound as often as required during measurement to attract the attention of the child to the camera once again.



**Step 3:** Align the child's eyes in the white box on the monitor.

The screenshot shows the plusoptix software interface. At the top, there are tabs for 'Binocular', 'OD', 'OS', 'Patients', 'Measurement report', 'Settings', and 'Instruction manual'. The main window is divided into several sections:

- 1) Patient data:** Includes fields for Surname (Muller), First name (Lieschen), Date of birth (2008-09-09), Gender (female), and ID.
- 2) Measurement result:** A purple box indicating 'Measurement completed'.
- 3) Documentation:** Includes buttons for 'Measurement report', 'Label', and 'Screenshot'.
- 4) Video control:** Includes playback controls (rewind, play, stop) and buttons for 'Load video' and 'Save video'.

The central part of the screen shows a grayscale image of a child's eyes. A white box highlights the eyes, and a green line indicates a distance of 49 mm between the pupils. Below the image are two gaze charts, labeled 'OD' (right eye) and 'OS' (left eye). Each gaze chart shows a grid with a green target and a measurement of 20 mm. Between the gaze charts is a table of measurement results:

| Refraction [dpt]     |                     |
|----------------------|---------------------|
| +0.50 -1.00 172°     | +2.75 -1.00 21°     |
| Corneal reflexes [°] |                     |
| Symmetric (0)        | 4.2 (20) Asymmetric |
| Pupil size [mm]      |                     |
| 4.1                  | 4.5                 |
| Pupil distance [mm]  |                     |
| 49                   |                     |

Labels 'Gaze chart right eye' and 'Gaze chart left eye' point to the respective gaze charts.

Now move the camera slowly forwards until you can see green circles around both pupils and you hear another warble sound. You are now 1 m from the child; the measurement will start automatically. Do not change the distance after this point. Within one second, a ping tone will signal the end of measurement. The measurement values will be displayed between the gaze charts, and the measurement result "measurement completed" appears at the left side of the screen.

Note: If the measurement result "Measurement aborted" appears, the following could be the cause:

1. A white square around the pupil is a sign that the measurement distance of  $1\text{m} \pm 5\text{cm}$  was not adhered to. Use a tape measure to check the distance to the child and then start measurement again.
2. A red edge around the pupil is a sign that the pupil is too small. Reduce the light in the room to allow the pupils to dilate and repeat the measurement.
3. If the plusoptix A09 does not find the pupils within 20 seconds, the measurement procedure is automatically terminated. The most common reasons for this are:

- a) One or both pupils are not completely displayed on the screen, e.g. eyelashes or the eyelid is partially occluding the pupil. The mother should lift the child's eyelid gently. Repeat the measurement.
- b) If the corneal reflexes appear on one gaze chart as red point clouds and on the other as green point clouds, the asymmetry of the corneal reflexes is  $\geq 10$  degrees. In this case, it is not possible to perform a binocular measurement. You can however measure the eyes individually (see 6. Monocular measurement).
- c) One or both pupils show different brightness patterns. This indicates media blurring, corneal damage, a foreign particle or other reasons.

#### Step 4: Measurement results

The screenshot shows the Plusoptix software interface. On the left, there are four sections: 1) Patient data (Surname: Muller, First name: Lieschen, Date of birth: 2008-09-09, Gender: female), 2) Measurement result (Measurement completed), 3) Documentation (Measurement report, Label, Screenshot), and 4) Video control (Load video, Save video). The main display area shows a video frame of a child's eyes with a green line indicating a pupil distance of 49 mm. Below the video frame are two gaze charts, one for the right eye (OD) and one for the left eye (OS). The OD gaze chart shows red point clouds and the OS gaze chart shows green point clouds. A table of results is displayed between the gaze charts.

| Refraction       |       | [dpt]           |                 |
|------------------|-------|-----------------|-----------------|
| +0.50            | -1.00 | 172°            | +2.75 -1.00 21° |
| Corneal reflexes |       | [°]             |                 |
| Symmetric (0)    | 4.2   | (20) Asymmetric |                 |
| Pupil size       |       | [mm]            |                 |
| 4.1              |       | 4.5             |                 |
| Pupil distance   |       | [mm]            |                 |
| 49               |       |                 |                 |

Labels in the image: Pupil distance (pointing to the 49 mm measurement), Gaze chart right eye (pointing to the OD chart), Gaze chart left eye (pointing to the OS chart).

#### Measurement results:

- Refraction:                   - Sphere [dpt]  
                                   - Cylinder [dpt]  
                                   - Axis [°]
- Corneal reflexes:         Symmetry of corneal reflexes [°]
- Pupil diameter:            Average [mm]
- Pupil distance:            PD [mm]
- Gaze chart:                 Position of corneal reflexes in relation to pupil centre [°]

## 5.2 Documentation

The following documents can be printed:

- Measurement report (measurement results with comments)
- Measurement results on self-adhesive label
- Screenshot

To print one of these documents later, videos must be saved to archive the data. To do so, see chapter 5.4 Storing a video and 5.5 Loading a video.

The screenshot shows the Plusoptix software interface with the following sections:

- 1) Patient data:** Includes fields for Surname (Muller), First name (Lieschen), Date of birth (2008-09-09), Gender (female), and ID.
- 2) Measurement result:** A box indicating "Measurement completed".
- 3) Documentation:** Buttons for "Measurement report", "Label", and "Screenshot".
- 4) Video control:** Playback controls (play, stop, load, save video).

The main display area shows a grayscale image of a child's eyes with a green line indicating a 49 mm pupillary distance. Below the image are two circular diagrams for OD (Right Eye) and OS (Left Eye) with corresponding measurement data:

| OD                          |  | OS              |  |
|-----------------------------|--|-----------------|--|
| <b>Refraction</b> [dpt]     |  |                 |  |
| +0.50 -1.00 172°            |  | +2.75 -1.00 21° |  |
| <b>Corneal reflexes</b> [°] |  |                 |  |
| Symmetric (0) 4.2           |  | (20) Asymmetric |  |
| <b>Pupil size</b> [mm]      |  |                 |  |
| 4.1                         |  | 4.5             |  |
| <b>Pupil distance</b> [mm]  |  |                 |  |
| 49                          |  |                 |  |

Click here to print the measurement report with the measurement results and your comments (optional, License Z).


Click here to print a screenshot.

Click here to print a self-adhesive label for the patient record.

Examples of a measurement report, a screenshot and a self-adhesive label can be found on the following pages.

## Measurement report (A4 and letter format)

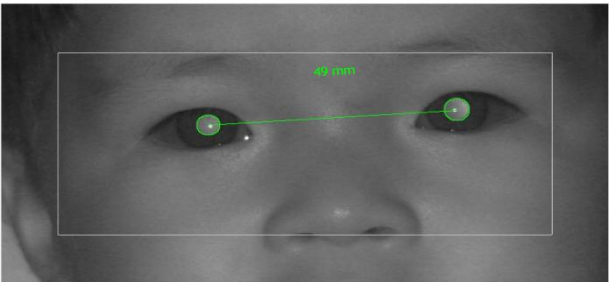
Space for  
your logo



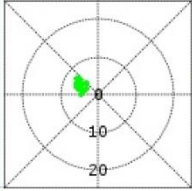
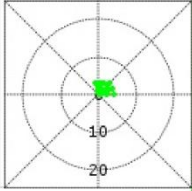
and other  
information

### Measurement results

Surname: Müller  
First name: Lieschen  
Date of birth: 2008-09-09  
Date of measurement: 2009-09-30



OD OS

|  |   |  |
|--|---|--|
|  | <p><b>Refraction</b> [dpt]</p> <p>+0.50 -1.00 172° +2.75 -1.00 21°</p> <p><b>Corneal reflexes</b> [°]</p> <p>Symmetric (0) 4.2 (20) Asymmetric</p> <p><b>Pupil size</b> [mm]</p> <p>4.1 4.5</p> <p><b>Pupil distance</b> [mm]</p> <p>49</p> |  |
|--|---|--|

Comment

This measurement is part of an eye examination.

**Measurement performed at:**  
Dr. Mustermann  
Neumeyerstraße 46  
90409 Nürnberg  
Tel: 0911 - 59 83 99 - 10  
Fax: 0911 - 59 83 99 - 90  
Email: email@mustermann.de

[www.plusoptix.eu](http://www.plusoptix.eu)

## Screenshot

Binocular OD OS Patients Measurement report Settings Instruction manual

**1) Patient data**

Next patient

Surname: Müller

First name: Lieschen

Date of birth: 2008-09-09 Gender: female

ID: [ ]

**2) Measurement result**

Measurement completed

**3) Documentation**

Measurement report Label Screenshot

**4) Video control**

Load video Save video

www.plusoptix.eu



| OD                   |  | OS              |  |
|----------------------|--|-----------------|--|
| Refraction [dpt]     |  |                 |  |
| +0.50 -1.00 172°     |  | +2.75 -1.00 21° |  |
| Corneal reflexes [°] |  |                 |  |
| Symmetric (0) 4.2    |  | (20) Asymmetric |  |
| Pupil size [mm]      |  |                 |  |
| 4.1                  |  | 4.5             |  |
| Pupil distance [mm]  |  |                 |  |
| 49                   |  |                 |  |

## Self-adhesive label

|                          |            |                  |  |
|--------------------------|------------|------------------|--|
| Lieschen Müller          |            | 2008-09-09       |  |
| OD                       | Refraction | OS               |  |
| +0.50 -1.00 172° [ dpt ] |            | +2.75 -1.00 21°  |  |
| Corneal reflexes         |            |                  |  |
| Symmetric (0) 4.2°       |            | (20) Asymmetric  |  |
| Pupil size               |            |                  |  |
| 4.1 mm                   |            | 4.5 mm           |  |
| Pupil distance 49 mm     |            |                  |  |
| plusoptix A09            |            | Date: 2009-09-09 |  |

Printer: Dymo Label Printer

Label Size 54 x 25 mm, Order no. 11352 (Europe), order no. 30336 (America)

Note: The order no. can differ in your country.

Check it on: <http://sites.dymo.com/pages/CountrySelector.aspx>

### 5.3 Viewing the video of the last measurement

You can view the video in individual images directly after measurement to:

- a) Detect media blurring
- b) Detect strabismus in false colours
- c) Trace eye movements
- d) Test the infrared component in the room

To redisplay the measurements, the video must be replayed in real time again.

The screenshot shows the Plusoptix software interface with the following sections:

- 1) Patient data:** Includes fields for Surname (Muller), First name (Lieschen), Date of birth (2008-09-09), Gender (female), and ID.
- 2) Measurement result:** A box indicating "Measurement completed".
- 3) Documentation:** Buttons for "Measurement report", "Label", and "Screenshot".
- 4) Video control:** Includes play/pause, stop, and load/save video buttons.

The main display area shows a grayscale image of a child's eyes with a green line indicating a 49 mm distance between the pupils. Below this are two circular diagrams for OD (Right Eye) and OS (Left Eye) showing corneal reflexes. A central table displays the following data:

| Refraction       |       | [dpt]           |
|------------------|-------|-----------------|
| +0.50            | -1.00 | 172°            |
| +2.75            | -1.00 | 21°             |
| Corneal reflexes |       | [°]             |
| Symmetric (0)    | 4.2   | (20) Asymmetric |
| Pupil size       |       | [mm]            |
| 4.1              | 4.5   |                 |
| Pupil distance   |       | [mm]            |
| 49               |       |                 |

Click here to play back the video of the measurements in individual images. The available measurement values from each image are displayed on the screen.

Click here to play back the video of the measurement in real time.

Click here to rewind the video to the beginning.

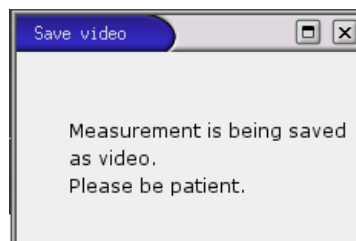
## 5.4 Storing a video

Videos are not stored in the plusoptix A09, but are rather overwritten by the next measurement. If a measurement indicates particular issues such as media blurring, the video can be stored directly after the measurement on a USB stick or an external hard drive with a maximum current consumption of 0.5 A. To do so, insert a USB stick into one of the free USB ports on the plusoptix A09 and proceed as follows:

The screenshot shows the plusoptix A09 software interface. On the left, there are four sections: 1) Patient data (Surname: Muller, First name: Lieschen, Date of birth: 2008-09-09, Gender: female), 2) Measurement result (Measurement completed), 3) Documentation (Measurement report, Label, Screenshot), and 4) Video control (Load video, Save video). The main area displays a video of a patient's eyes with a 49 mm measurement line. Below the video are two circular diagrams for OD and OS, and a table of measurement results.

| OD                          |  | OS              |  |
|-----------------------------|--|-----------------|--|
| <b>Refraction</b> [dpt]     |  |                 |  |
| +0.50 -1.00 172°            |  | +2.75 -1.00 21° |  |
| <b>Corneal reflexes</b> [°] |  |                 |  |
| Symmetric (0) 4.2           |  | (20) Asymmetric |  |
| <b>Pupil size</b> [mm]      |  |                 |  |
| 4.1                         |  | 4.5             |  |
| <b>Pupil distance</b> [mm]  |  |                 |  |
| 49                          |  |                 |  |

1. Wait after insertion of the USB stick approx. 5 seconds until the “Save video” button becomes active.
2. Now click on “Save video”. The “Save video” window appears on the monitor. The video is automatically stored on the USB stick and afterwards the window disappears again.



3. The “Save video” button will become active again after you perform the next measurement.

Replaying of the saved videos is only possible with the plusoptix A09 (see 5.5 Loading a video).

Is there not enough storage space on the inserted USB-stick, following window appears:



Click on “OK” and remove this USB-stick.

Take a new, empty USB-Sick and insert it into the plusoptiX A09 and click again on “Save video”, to save the video.

Keep the USB-stick to save the data, in case you would like to print out a document, like a measurement report, again.



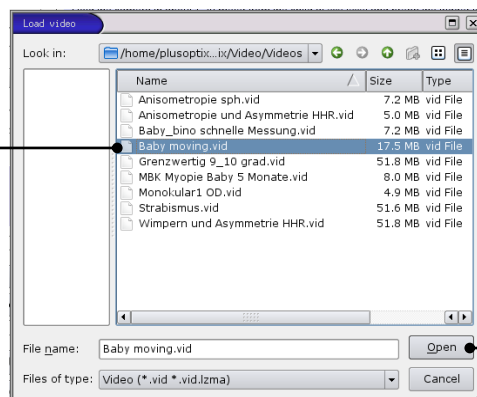
## 5.5 Loading a video

The plusoptix A09 allows you to load videos directly from a USB stick and to view them. You can only play back videos that have been recorded and stored using the plusoptix A09. To do so, insert a USB stick or an external hard drive with a maximum current consumption of 0.5 A into one of the free USB ports on the plusoptix A09 and proceed as follows:

The screenshot shows the plusoptix A09 software interface. On the left, there are four main sections: 1) Patient data (with fields for Surname: Muller, First name: Lieschen, Date of birth: 2008-09-09, Gender: female, and ID), 2) Measurement result (with a 'Measurement completed' button), 3) Documentation (with buttons for 'Measurement report', 'Label', and 'Screenshot'), and 4) Video control (with play/pause, stop, and 'Load video' buttons). The main area displays a video of a child's eyes with a 49 mm pupil distance measurement. Below the video are two circular diagrams for OD and OS eyes, and a central table of measurement results.

| Refraction       |            | [dpt]           |
|------------------|------------|-----------------|
| +0.50            | -1.00 172° | +2.75 -1.00 21° |
| Corneal reflexes |            | [°]             |
| Symmetric (0)    | 4.2        | (20) Asymmetric |
| Pupil size       |            | [mm]            |
| 4.1              |            | 4.5             |
| Pupil distance   |            | [mm]            |
|                  |            | 49              |

1. Wait after insertion of the USB stick approx. 5 seconds until the “Load video” button becomes active.
2. Now click on “Load video”. The window containing the available videos opens.



3. Select the video that you wish to play back and click on “Open”.
4. Click here to play the loaded video.

Do you replay a stored video, documents like a measurement report or a screenshot can be printed again.

## 6. Monocular measurement

Patients displaying asymmetric corneal reflexes  $\geq 10^\circ$  cannot be measured binocularly.

The monocular measurement function “OD” and “OS” allow you to measure each eye individually. The measurement is performed as for binocular measurement (see 5.1 Measurement).

Click here to measure the right eye.  
Cover the left eye.

Click here to measure the left eye.  
Cover the right eye.

The screenshot shows the software interface with the following sections:

- 1) Patient data:** Includes fields for Surname (Muller), First name (Lieschen), Date of birth (2008-09-09), Gender (female), and ID.
- 2) Measurement result:** A purple box indicating "Measurement completed".
- 3) Documentation:** Buttons for "Measurement report", "Label", and "Screenshot".
- 4) Video control:** Playback controls (play, stop, previous, next) and buttons for "Load video" and "Save video".
- Video feed:** A large image of the patient's eye with a green circle on the pupil.
- OD Results Table:**

| OD                            |                  |
|-------------------------------|------------------|
| <b>Refraction</b> [dpt]       | +0.75 -1.00 101° |
| <b>Corneal reflexes</b> [°]   | n/a              |
| Symmetric (0) Asymmetric (20) |                  |
| <b>Pupil size</b> [mm]        | 4.1              |
| <b>Pupil distance</b> [mm]    | n/a              |

Measurement results for the right eye.

Where the measurement system finds two pupils, the measurement is cancelled and “Measurement aborted” is displayed as the measurement result. In addition, the status message “Monocular: cover OD or OS” appears below the video image.

## 7. Switching off the system

First switch off the plusoptiX A09 using the on/off switch, followed by the monitor.



The on/off switch on the plusoptiX A09 flashes after switch-off until the program has been shut down completely.



If you are using a multiple socket outlet make sure that it is child-proof.



At the end of business day the monitor and the medical power unit must be separated from the power supply or you have to switch off the on/off switch at the multiple socket outlet. This is a precaution in case a short-circuit occurs during night-time which may cause a fire.

## 8. Printing the measurement report (License Z, optional)

Is a printer installed and connected, the measurement results can be printed together with your comments. The comments can be stored as freely editable text modules.

Click here to create text modules (see chapter 8.2)

The screenshot shows the Plusoptix software interface with the following sections:

- 1) Patient data:** Includes fields for Surname (Muller), First name (Lieschen), Date of birth (2008-09-09), Gender (female), and ID.
- 2) Measurement result:** A button labeled "Measurement completed".
- 3) Documentation:** Buttons for "Measurement report", "Label", and "Screenshot".
- 4) Video control:** Includes play/pause buttons, "Load video", and "Save video".

The main display area shows a video frame of a child's eyes with a green line indicating a 49 mm measurement. Below the video frame are two circular diagrams for OD (Right Eye) and OS (Left Eye) and a central table of measurement results.

| OD                          |  | OS              |  |
|-----------------------------|--|-----------------|--|
| <b>Refraction</b> [dpt]     |  |                 |  |
| +0.50 -1.00 172°            |  | +2.75 -1.00 21° |  |
| <b>Corneal reflexes</b> [°] |  |                 |  |
| Symmetric (0) 4.2           |  | (20) Asymmetric |  |
| <b>Pupil size</b> [mm]      |  |                 |  |
| 4.1                         |  | 4.5             |  |
| <b>Pupil distance</b> [mm]  |  |                 |  |
| 49                          |  |                 |  |

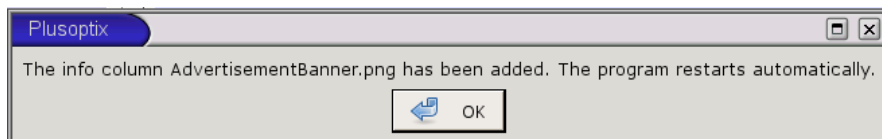
Click here to create a measurement report.

## 8.1 Adding an info column

You can add a personal info column on the left side of the measurement report. To create the info column you need a computer and a graphic software or you authorize an illustrator to do this.

Note:

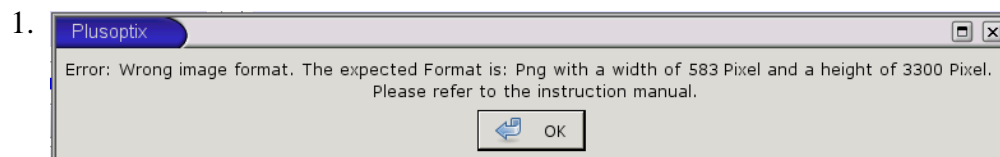
1. Create your information (text and images) with any graphic program in an exact dimension of 3.300 x 583 pixels.
2. Store this information as an image on the supplied USB stick. The name of the image may not contain any diacritical marks and must have a suffix of .png.
3. Switch on the plusoptiX A09 and wait until the start page appears.
4. Insert the USB stick into the plusoptiX A09. Following window appears.



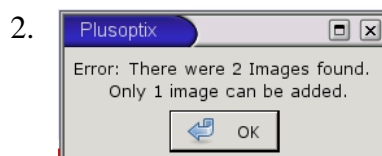
Click on “OK”. The program restarts automatically.

5. Remove the USB stick.

Following error messages can occur inserting the info column:



The size of the inserted picture is not 3.300 x 583 pixels. Click on “OK” and change the size of your picture into the requested one.



Two pictures are stored on the USB stick. Click on “OK” and remove one.

## 8.2 Creating text modules

You can enter a maximum of 20 different text modules. To do so, proceed as follows:

5. Click here to delete a selected text module and the title.
4. Click here to store the text module.
3. Click here to enter the text module.
2. Click here to enter the title of a text module.
1. Click here to create a title for a new text module.

To print comments onto a measurement report, up to 20 text modules including a short title can be stored and reused. The title will not be printed and it is just to identify the text module.

**Add a new text module:**  
Please click on "+", which adds a new empty line under "Title of text module", in which you can add a short brief title. Change to the field to "Text module" and specify your text, you want to print onto the measurement report.

**Change an existing text module:**  
Please choose an existing entry in the box "Title of text module". The chosen title and the belonging comment will be shown and can be edited. Confirm your changes by pressing the button "Save".

**To delete an entry, choose it in the title box and click "-".**

**Print text modules:**  
Please choose an existing entry in the box "Title of text module" and click ">". The belonging comment will be put in the box "Preview of measurement report comments". You can add and edit these text modules. Click "Print" for printing the measurement report.

The title of the text modules is used only to call up the corresponding text module, and is not printed with the measurement report.

### 8.3 Printing the measurement report

You can add different text modules to the measurement report as comments and edit these before printing. To do so, proceed as follows:

1. Click here to select a text module to be printed on the measurement report.
2. Click here to transfer the selected text module to the field "Preview of measurement report comments".
3. Click here to change the text.
4. Click here to print the measurement report with the comments.

**Comment**

**Title of text module**

- Anisometropia
- Hyperopia
- Myopia

**Text module**

Refractive difference between both eyes.

**Preview of measurement report comments**

Farsighted at the left eye.  
Refractive difference between both eyes.

Save Print

To print comments onto a measurement report, up to 20 text modules including a short title can be stored and reused. The title will not be printed and it is just to identify the text module.

**Add a new text module:**  
Please click on "+", which adds a new empty line under "Title of text module", in which you can add a short brief title.  
Change to the field to "Text module" and specify your text, you want to print onto the measurement report.

**Change an existing text module:**  
Please choose an existing entry in the box "Title of text module". The chosen title and the belonging comment will be shown and can be edited. Confirm your changes by pressing the button "Save".  
To delete an entry, choose it in the title box and click "-".

**Print text modules:**  
Please choose an existing entry in the box "Title of text module" and click ">". The belonging comment will be put in the box "Preview of measurement report comments". You can add and edit these text modules. Click "Print" for printing the measurement report.

## 9. Patient database (License D, optional)

The patient database is an alternative to a practice network. You can use the database to store patient data and measurement results, and to compare measurement results with previous ones.

### 9.1 Entering patient data

Enter patient data. The following data are valid:

- Patient data (Surname, first name, date of birth and gender) or
- Patient data and ID or
- ID and date of birth

Binocular OD OS Patients Measurement report Settings Instruction manual

**1) Patient data**

Next patient

Surname  
Muller

First name  
Lieschen

Date of birth 2008-09-09 Gender female

ID

**2) Measurement result**

**3) Documentation**

Measurement report

Label Screenshot

**4) Video control**

Load video Save video

www.plusoptix.eu

Pay attention:  
1) Avoid direct sunlight and bright overhead light, like halogen spot lights during measurement.  
2) Avoid the child looking onto this monitor, not to interrupt fixation to the camera.

Measurement procedure:  
Hold the camera in about 1.20 meter from the child at eye level and press the trigger to activate the camera. A warble sound is emitted and the picture of the camera is shown in this part of the monitor. Adjust the camera that both eyes appear in this part of the monitor. Now move the camera slowly towards the child until green circles appear around the pupils and you hear the warble sound again. You are now 1 meter away from the child and the measurement starts automatically. Now do not move the camera anymore. Within 1 second you will hear a ping tone and the measurement is completed. The measurement data are shown between gaze charts below this part of the monitor. The measurement result "Measurement completed" appears at the left side of the monitor. If the measurement result is "Measurement aborted", please note the status messages in the red bar below the picture of the camera.

Status messages

| OD            |                             | OS              |
|---------------|-----------------------------|-----------------|
|               | <b>Refraction</b> [dpt]     |                 |
| n/a           |                             | n/a             |
|               | <b>Corneal reflexes</b> [°] |                 |
| Symmetric (0) | n/a                         | (20) Asymmetric |
|               | <b>Pupil size</b> [mm]      |                 |
| n/a           |                             | n/a             |
|               | <b>Pupil distance</b> [mm]  |                 |
|               | n/a                         |                 |

To add a new patient to the database, enter the patient data in its entirety and then perform the measurement. The measurement values will be automatically stored together with the patient data.

If you enter two "John Smith" records with the same date of birth, the ID (patient number or medical insurance number) must also be entered to allow for differentiation.

Note:

- Before measuring a new patient, please do not omit to delete the patient data entered using the key "Next patient" and to enter the data for the new patient or to search the date with the scroll key.
- To select an existing patient, enter the first letter of the patients' name in the surname box (e.g. "S" for Smith). All patients' names beginning with this letter will appear and you can scroll for your patient. The more letters you enter, the faster your search will be (e.g. "Smi").



## 9.2 Measurement data

Click on “Patients” and enter the entire patient data or scroll down to the patient to have a look at these existing measurement data. The data are listed chronologically.

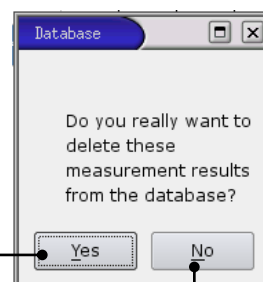
The screenshot shows the 'Patients' tab in the software. On the left, there is a form for entering patient data, including fields for Surname (Muller), First name (Lieschen), Date of birth (2008-09-09), and Gender (female). On the right, a table displays measurement data for multiple patients. The table has columns for Date, OD (Right eye) with sub-columns for Sph, Cyl, A, and Ø, OS (Left eye) with sub-columns for Sph, Cyl, A, and Ø, PD, and Asymmetry of corneal reflexes. The last row of the table is highlighted in blue, indicating it is selected for deletion. A 'Delete measurement result!' button is located at the bottom right of the table area.

| Date                | OD (Right eye)<br>Sph   Cyl   A   Ø | OS (Left eye)<br>Sph   Cyl   A   Ø | PD  | Asymmetry of<br>corneal reflexes |
|---------------------|-------------------------------------|------------------------------------|-----|----------------------------------|
| 05.11.2009 11:10:01 | -0.25 -0.25  168* 4.9               | -0.25 -0.75  2* 4.9                | 61  | 9.9                              |
| 24.10.2009 18:50:16 | n/a   n/a   n/a  n/a                | n/a   n/a   n/a  n/a               | n/a | 1.2                              |
| 24.10.2009 13:52:10 | +0.25 -0.25  137* 4.8               | -0.50 -0.75  29* 3.9               | 68  | 3.1                              |
| 24.10.2009 13:52:06 | +0.25 -0.25  139* 4.7               | -0.25 -0.50  31* 3.8               | 68  | 2.6                              |
| 24.10.2009 13:52:03 | +0.75 -0.25  158* 4.8               | +0.25 -0.75  25* 4.0               | 67  | 2.7                              |
| 24.10.2009 13:51:59 | +0.75 -0.25  152* 5.0               | +0.25 -0.50  34* 4.1               | 68  | 1.2                              |
| 24.10.2009 13:51:56 | +0.25 -0.25  143* 4.9               | 0.00 -0.50  24* 3.9                | 68  | 0.4                              |
| 24.10.2009 13:51:49 | +0.50 -0.25  140* 4.5               | 0.00 -0.50  11* 3.7                | 66  | 2.3                              |

If you would like to delete measurement data, proceed as follows:

1. Click on the line you would like to delete. The line will be marked blue.
2. Then click on “Delete!”.

Afterwards a window with a security query will appear.



3. Click on “Yes” and the marked line will be deleted.

If you would like to cancel this procedure, click on “No”.

### 9.3 Deleting or modifying patient data

To delete a patient record from the database, i.e. this patient data including measurement results, proceed as follows:

1. Call up the patient to be modified.

2. Click here to delete the selected patient data record.

Afterwards a window with a security query will appear.

3. Click on "Yes" and the patient data will be deleted.

4. If you would like to cancel this procedure, click on "No".

5. To modify the patient data record, click on "Change" and a new window will appear "B) Edit patient data".

The following page describes how you can modify the patient data record.

The screenshot shows the 'Patients' tab in the software. On the left, there are two sections: 'A) Patient data' and 'B) Edit patient data'. Section A shows the current patient's details: Surname (Muller), First name (Lieschen), Date of birth (2007-09-09), and Gender (female). Section B is an edit dialog box with the same fields, but the 'Surname' field is highlighted in yellow. Below the dialog box are 'Cancel' and 'OK' buttons. On the right, there is a table of measurement results. A 'Delete measurement result!' button is located at the bottom right of the table area.

| Date                | OD (Right eye) |       |      |     | OS (Left eye) |       |     |     | PD  | Asymmetry of corneal reflexes |
|---------------------|----------------|-------|------|-----|---------------|-------|-----|-----|-----|-------------------------------|
|                     | Sph            | Cyl   | A    | Ø   | Sph           | Cyl   | A   | Ø   |     |                               |
| 05.11.2009 11:10:01 | -0.25          | -0.25 | 168° | 4.9 | -0.25         | -0.75 | 2°  | 4.9 | 61  | 9.9                           |
| 24.10.2009 18:50:16 | n/a            | n/a   | n/a  | n/a | n/a           | n/a   | n/a | n/a | n/a | 1.2                           |
| 24.10.2009 13:52:10 | +0.25          | -0.25 | 137° | 4.8 | -0.50         | -0.75 | 29° | 3.9 | 68  | 3.1                           |
| 24.10.2009 13:52:06 | +0.25          | -0.25 | 139° | 4.7 | -0.25         | -0.50 | 31° | 3.8 | 68  | 2.6                           |
| 24.10.2009 13:52:03 | +0.75          | -0.25 | 158° | 4.8 | +0.25         | -0.75 | 25° | 4.0 | 67  | 2.7                           |
| 24.10.2009 13:51:59 | +0.75          | -0.25 | 152° | 5.0 | +0.25         | -0.50 | 34° | 4.1 | 68  | 1.2                           |
| 24.10.2009 13:51:56 | +0.25          | -0.25 | 143° | 4.9 | 0.00          | -0.50 | 24° | 3.9 | 68  | 0.4                           |
| 2009-10-02 09:54:32 | +0.25          | -0.25 | 175° | 5.9 | -0.75         | -0.50 | 2°  | 5.8 | 60  | 0.8                           |

1. Click here to perform changes.
  2. Click here to store changes.
- Click here to cancel the procedure.

## 9.4 Backing up measurement results

The system provides an option to back up the measurements on a regular basis. To do so, insert the supplied USB stick into a free USB port on the plusoptix A09. The data is automatically saved on the stick. The space available on the stick is sufficient to store about 10 years' worth of data.



Please ensure that you remove the USB stick from the plusoptix A09 after the back up, as this could lead to problems at boot time.

## 10. Warranty

The plusoptiX A09 is supplied with a 12-month guarantee, starting from the date of the delivery note.

All work processes at Plusoptix are included in a quality management system, thus providing the highest degree of assurance of error-free materials and workmanship. Should the plusoptiX A09 fail during the guarantee period or the method of operation not be in accordance with the operating instructions, Plusoptix will repair or exchange the system at no charge.

The guarantee is only supplied on new systems that have been sold by Plusoptix or an authorized sales partner of Plusoptix. Systems requiring repair can be returned to the authorized sales partner from whom the system was purchased. Before you return the device, please consider the advices in chapter 12.2 Trouble shooting. The customer is responsible for the transport costs of the system.

Note: A copy of the system delivery note must be included in the transport to ensure the validity of the guarantee claim.

The guarantee will not be provided on systems that have been damaged externally, and will be void in its entirety in the event of improper use, cleaning and transport as well as changes or intervention to the software and usage of the plusoptiX A09 contrary to the instructions. Claims under guarantee will also be void if the system is opened by persons not authorized by Plusoptix.

Note: Software updates during the guarantee period are supplied at no charge.

## 11. Service and maintenance

### 11.1 Service

For repairs or guarantee services, please send the plusoptiX A09 system in its original packaging to the company you have bought the device from or to:

**Plusoptix GmbH**

Service  
Neumeyerstr. 46  
90411 Nuernberg  
Germany  
Tel.: +49 - 911 - 598 399 - 20  
Fax: +49 - 911 - 598 399 - 90

**Plusoptix Inc.**

1205 Hillsboro Mile #202  
Hillsboro Beach  
Florida 33062  
USA

Note:

- The customer has to bare the transport cost for returning for repair to the company the device was purchased from or to Plusoptix.
- A copy of the delivery note must be attached to the transport for repair in order to prove the validity of the guarantee claim.

### 11.2 Maintenance

The plusoptiX A09 is maintenance-free. It is recommended that the system be covered with a cloth when not being used. Use only a lightly moist microfibre cloth to clean the system.



1. Do not use sprays, alcohol or other liquids to clean the plusoptiX A09.
2. Please use only a lightly moist microfibre cloth with a little cleaning liquid to clean the front panel of the system.

## 12. Practical tips

### 12.1 Measurement results

The major benefit of the plusoptix A09 is that binocular measurements in miosis in children can be performed from a distance of one meter. Device accommodation is therefore unnecessary, and the measurement is non-stressful for the child, the parent and the examiner. A value of 1.00 dpt is taken into consideration for accommodation in the measurement, at a distance of 1 meter.

#### 1. Myopia and astigmatism

Neither myopia nor astigmatism is influenced by accommodation. Consequently, these measurement values have a tolerance of  $\pm 0.50$  dpt in 80% of cases and a tolerance of max.  $\pm 1.00$  dpt in the remaining 20% of cases, in comparison to retinoscopy in mydriasis.

#### 2. Anisometropia

Regardless of the accommodation status, an anisometropia can be detected with certainty, as both eyes are measured simultaneously (binocular).

#### 3. Small-angle squint

During every measurement, the corneal reflex for both eyes is displayed simultaneously. Where the corneal reflexes are asymmetric, the possibility exists that the child has a squint (Fig. 2). In the case of infants however, asymmetric corneal reflexes can also be measured by a fixation that is not yet fully developed. Due to the camera resolution and the measurement distance, asymmetries of less than 2 degrees cannot be reliably detected.

Fig. 1: Symmetric corneal reflexes

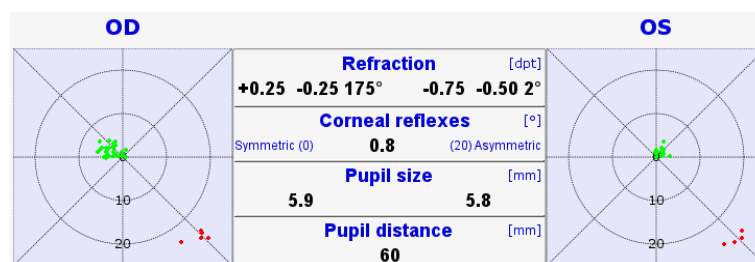
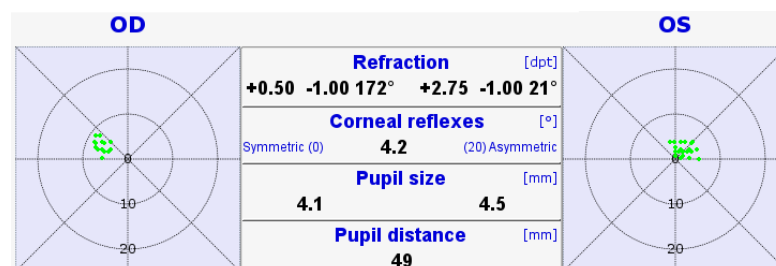


Fig. 2: Asymmetric corneal reflexes



#### 4. Hyperopia

A hyperopia can be either totally or partially compensated for by means of accommodation. As a result, a measurement in miosis does not provide exact values, respectively an existing hyperopia can be considerably underestimated. Regardless of this, a higher hyperopia can however possibly be detected in children older than 2 years by means of a measurement using +3.00 dpt lenses.

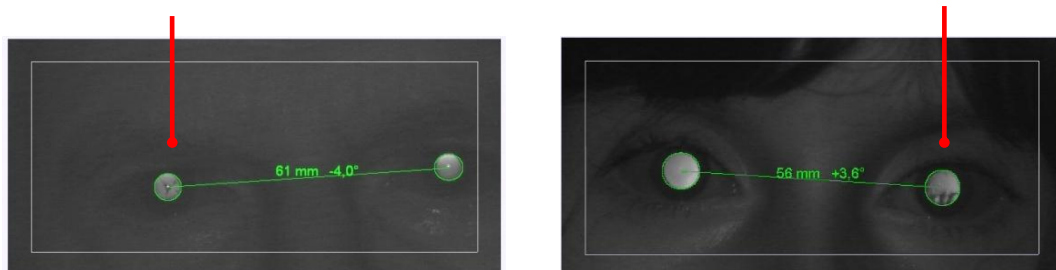
Examples:

| 1 <sup>st</sup> measurement value without lenses | 2 <sup>nd</sup> measurement value with +3.00 dpt lenses | Explanation   |
|--|---|---|
| +0.75 dpt  | +0.75 dpt   | Accommodation of 3.00 dpt or more during the first measurement; the child has a hyperopia of +3.75 dpt or more.   |
| 0.00 dpt   | -1.00 dpt   | Accommodation of at least 2.00 dpt during the first measurement; the child has a hyperopia of at least +2.00 dpt. |

Measurement using +3.00 dpt lenses is not possible in children under two years of age. These children can also be measured in cycloplegia with the plusoptiX A09, as the pupils are generally not larger than 8 mm. Note that 1.00 dpt must be subtracted from the spherical measurement values, as a value of 1.00 dpt is included in the measurement values for accommodation in miosis, at a distance of 1 metre.

#### 5. Media blurring

Where different brightness structures or black dots are detected in the pupils, media blurring, a foreign particle or corneal damage is indicated. The following images show clear cataract-like structures.



#### 6. Nystagmus

The plusoptiX A09 can be used to measure nystagmus in children in most cases, as the determination of refraction is performed at 50 Hz, i.e. every measurement is performed at 20 ms.

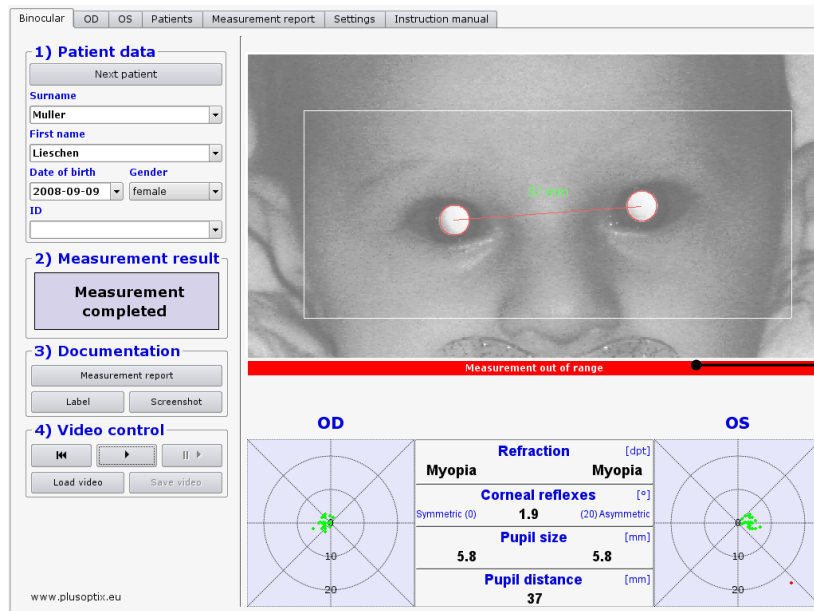
#### 7. Anisocoria

An anisocoria can be detected, as the plusoptiX A09 also indicates the pupil diameter of both eyes.

## 8. Measurement range

The measurement range of the plusoptiX A09 is between -7.00 dpt and +5.00 dpt and is based on the spherical equivalent of the measurement result. This measurement range can be extended by a max.  $\pm 3.00$  dpt by using flippers with plus or minus lenses.

## 9. Status messages



Status messages

**Pupils not found**

The plusoptiX A09 was unable to find pupils within 20 seconds. Restart the measurement procedure and ensure the correct distance to patient.

**Pupil too large**

One or both pupils are larger than 8.00 mm. Increase the lighting in the room to contract the pupils.

**Pupil too small**

One or both pupils are smaller than 4.00 mm. Decrease the lighting in the room to dilate the pupils.

**Infrared noise**

Infrared component in ambient light is too strong. Avoid direct sunlight and switch off “warm” light sources such as halogen or incandescent lamps.

**Measurement out of range**

If the spherical equivalent is  $\geq +5.00$  dpt the measurement value shows “Hyperopia”. The child is very far-sighted. If the spherical equivalent is  $\leq -7.00$  dpt the measurement value shows “Myopia”. The child is very short-sighted. In both cases please refer the child to an eye specialist.

**Monocular: Cover OS!**

In monocular mode, only one eye can be measured. Cover the patient’s left eye.

**Monocular: Cover OD!**

In monocular mode, only one eye can be measured. Cover the patient’s right eye.



## **12.2 Troubleshooting**

1. The monitor does not work

Check whether the power cable is connected to the power socket and whether it is switched on. Check also whether the monitor is connected and is switched on.

2. The plusoptiX A09 does not work.

If the green control lamp on the on/off switch on the plusoptiX A09 casing does not illuminate, check that the medical power unit is connected to the power socket and the 12 V outlet with the plusoptiX A09, and that the on/off switch is in the “on” position.

3. The program no longer responds

If the program no longer responds to commands, switch off the plusoptiX A09 at the on/off switch. Wait for 10 seconds until the switch is no longer flashing and then switch on the system again. The software is then rebooted, and the plusoptiX A09 will be ready for operation within approx. 1.5 minutes.

4. The monitor is switched on after the plusoptiX A09

The plusoptiX A09 does not boot completely. Switch off again the plusoptiX A09 at the on/off switch. Wait for approx. 10 seconds until the switch is no longer flashing. Afterwards switch on the monitor and then the plusoptiX A09.

5. The message “Boot error” appears on the monitor after switching on the plusoptiX A09

The plusoptiX A09 does not boot completely. Switch off again the plusoptiX A09 at the on/off switch. Check whether there is a flash drive or a printer with a card reader inserted into one of the 4 USB connectors. A connected USB flash drive and these types of printers are likely to disturb booting the device properly.

## 13. Specifications

### Measurements

|                       |   |
|-----------------------|---|
| Refraction            | binocular and monocular                         |
| Spherical range       | +5.00/-7.00 dpt in 0.25 dpt steps $\pm$ 0.25dpt |
| Cylindrical range     | +5.00/-7.00 dpt in 0.25 dpt steps $\pm$ 0.25dpt |
| Axis                  | 1-180° in 1° steps $\pm$ 15°                    |
| Pupil size            | 4.0 – 8.0 mm in 0.1 mm steps $\pm$ 10%          |
| Pupil distance        | mm in 1.0 mm steps $\pm$ 10 %                   |
| Time per measurement  | 0.02 s  |
| Measuring distance    | 1 m ( $\pm$ 5 cm)                               |
| Fixation target       | Warble sound                                    |
| Measurement principal | binocular, dynamic photostiascopy               |

### Interfaces and standards

|            |                                |
|------------|--------------------------------|
| Interfaces | 1 x VGA, 4 x USB and 1 x RJ-45 |
| Printers   | Linux compatible               |
| Standards  | EN 60601-1                     |

### Power

|                                      |                                 |
|--------------------------------------|---------------------------------|
| Medical Power Adapter<br>MES30B-3P1J | in 110-240VAC (50 - 60Hz), 0.8A |
|                                      | out 12VDC 2.5A                  |
| plusoptiX A09 power consumption:     | 12VDC, 1A max.                  |

### Environmental requirements

|             |           |                           |
|-------------|-----------|---------------------------|
| Temperature | operating | 10 to 35 °C (50 to 92 °F) |
|             | storage   | 0 to 50 °C (32 to 122 °F) |
| Humidity    | operating | 20 - 80 % not condensing  |
|             | storage   | 10 - 85 % not condensing  |

### Packaging

|                |                                      |                 |
|----------------|--------------------------------------|-----------------|
| Size of carton | 51 x 41 x 20 cm (20 x 16 x 8 inches) |                 |
| Weight         | A09 device                           | 2.2 Kg (4.9 LB) |
|                | Carton                               | 1.3 Kg (2.6 LB) |
|                | Total                                | 3.5 Kg (7.7 LB) |

## Guidance and manufacturer's declaration – electromagnetic emissions/immunity

The plusoptiX A09 is intended for use in the electromagnetic environment specified below. The customer or the user of the equipment should assure that it is in such an environment.

| Emissions Test  | Compliance | Electromagnetic environment - guidance  |
|---|------------|---|
| RF Emission CISPR 11                                  | Group 1    | The plusoptiX A09 uses RF Energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.  |
| RF Emission CISPR 11                                  | Class B    | The plusoptiX A09 system is suitable for use in all establishments, including domestic establishments and those directly connected to the public low Voltage power supply network that supplies buildings used for domestic purposes. |
| Harmonic emissions IEC 61000-3-2                      | Class B    |   |
| Voltage fluctuations/ flicker emissions IEC 61000-3-3 | Class B    |   |

| Immunity test   | IEC 60601 test level  | Compliance level  | Electromagnetic environment – Guidance   |
|---|---|---|--|
| ESD IEC 61000-4-2   | ± 6 kV contact<br>± 8 kV air  | ± 6 kV contact<br>± 8 kV air  | Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material the relative humidity should be at least 30 % |
| Electric fast transient/burst IEC 61000-4-4   | ± 2 kV for power supply lines   | ± 2 kV for power supply lines   | Mains power supply should be that of a typical commercial or hospital environment  |
| Surge IEC 61000-4-5   | ± 1 kV differential mode<br>± 2 kV common mode                                  | ± 1 kV differential mode<br>± 2 kV common mode                                  | Mains power supply should be that of a typical commercial or hospital environment  |
| Voltage Dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11 | 0% 0.5 periods 0°<br>40% 5 periods 0°<br>70% 25 periods 0°<br>0% 250 periods 0° | 0% 0.5 periods 0°<br>40% 5 periods 0°<br>70% 25 periods 0°<br>0% 250 periods 0° | Mains power supply should be that of a typical commercial or hospital environment  |
| Power Frequency (50/60 Hz) magnetic field IEC 61000-4-8   | 3 A/m   | 3 A/m   | Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.    |