Manufacturer:

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Automated Perimeter

PTS 920/PTS 925 series

Automated Projection Perimeter

PTS 2000 series

User Manual

Software ver. 3.5

User Manual rev. B

CE

Read this User Manual before you start using the device. Keep this manual in a safe place for future reference.

Symbol	Revision	Version	Description	Published on
PTS920/925/2000 series 3.5 A_EN	A	3.5	Updated contents to software version 3.5.	2020.06.08
PTS920/925/2000 series 3.5 B_EN	B	3.5	Updated contents to software version 3.5.1	2020.09.17

Trademarks

Windows is a registered trademark of the Microsoft Corporation.

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Contents

1. ***Symbols***

 Caution

 Follow operating instruction

 Warning: dangerous voltage

 General warning sign

 Fuse used here

 ON / OFF

 Type B applied parts

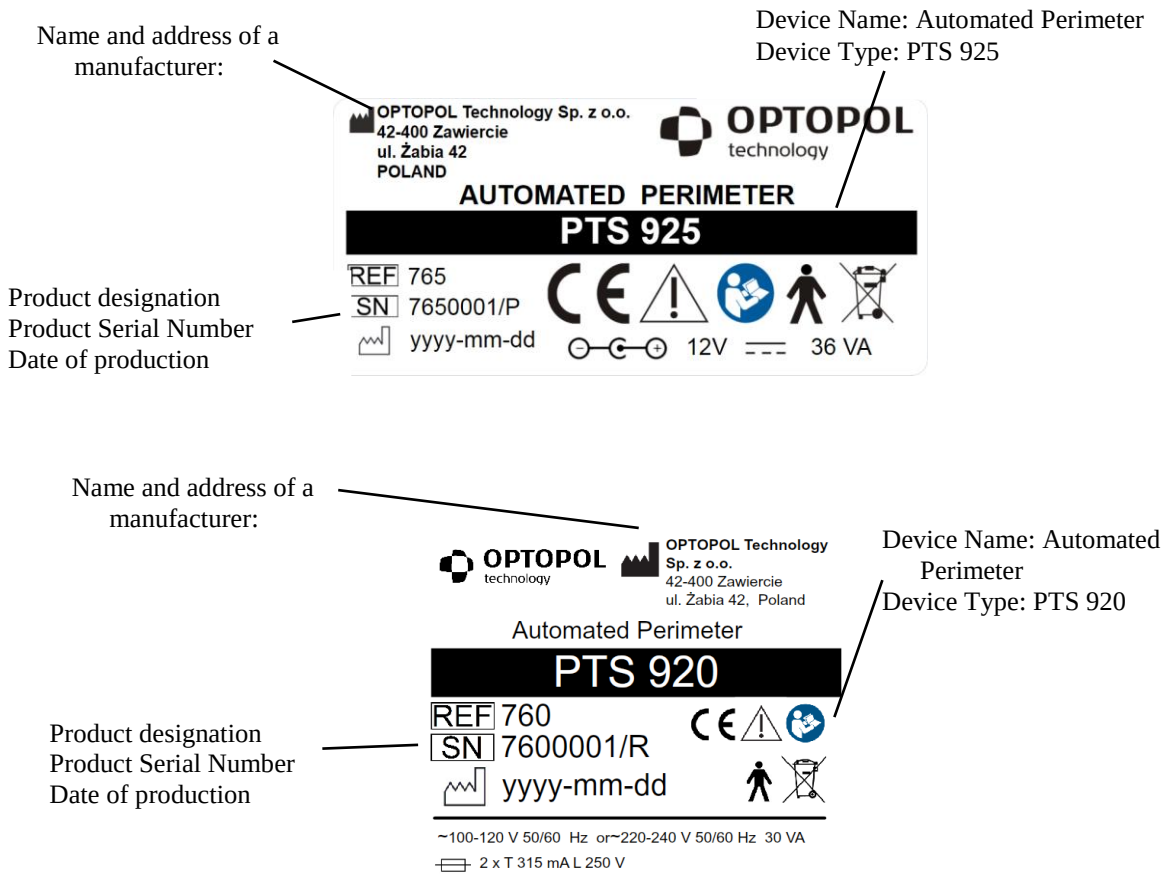
 Date of production

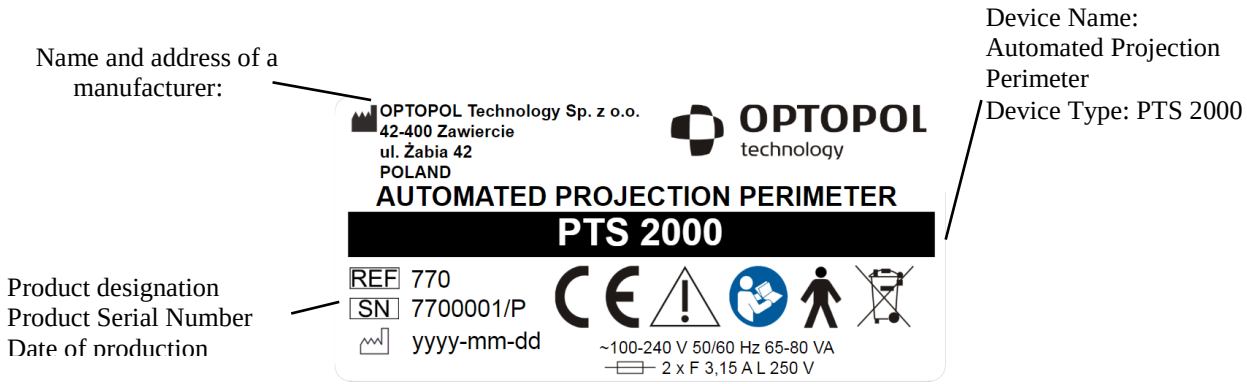
Manufacturer

Waste of electrical and electronic equipment. Waste of electrical and electronic equipment must not be disposed of with household waste.

Sign of conformity with essential requirements – The Medical Device Directive 93/42 EEC

PTS 920/925W/2000 device nameplates:




Name and address of a manufacturer:
OPTOPOL Technology Sp. z o.o.
42-400 Zawiercie
ul. Żabia 42
POLAND
OPTOPOL
technology
AUTOMATED PROJECTION PERIMETER
PTS 2000
Device Name:
Automated Projection Perimeter
Device Type: PTS 2000
Product designation
Product Serial Number
Date of production
REF 770
SN 7700001/P
yyyy-mm-dd
~100-240 V 50/60 Hz 65-80 VA
2 x F 3,15 A L 250 V

2. *Introduction*

This manual contains information about the operation of PTS 920/925/2000 series Automated Perimeter. It specifically describes:

- the concept of visual field testing
- installation and maintenance of PTS 920/925/2000 series Automated Perimeter and the software
- visual field testing procedure
- PTS 920/925/2000 series perimeter and software functions used in visual field testing and in the analysis of examination results
- additional software functions

Conventions used in this manual:

"Important note"

This is to highlight important information about the operation of PTS 920/925/2000 series

"Hint"

This is to highlight important information to simplify operation of PTS 920/925/2000 series

"Note"

This is to highlight information on patient and operator safety which the user must read and understand.

Intended use

PTS 920/925/2000 series Automated Perimeter is a diagnostic instrument designed for visual field testing. The device is used for early detection of glaucoma, cataract, neurological defects, diplopia, and retinal diseases, including macular degeneration, retinitis pigmentosa, or scintillating scotomas.

PTS 920/925/2000 series introduces a number of advancements in perimetry:

- Digital algorithms implemented in the system for detecting any defects in the visual field.
- The time of the stimulus exposition is automatically adjusted to the patient's reaction time. It reduces the exam duration and improves patient experience.
- PTS 920/925/2000 series Automated Periemter has a DEMO function so that the patient can become familiar with how the instrument works.
- Software now includes voice messages to help the operator and the patient work with the instrument.
- Fixation performance is monitored by a PC, either with the Heijl-Krakau technique or by digital image analysis for continuous fixation monitoring.
- Eye preview helps better position the patient's head and monitor patient behaviour during the exam.
- Electrical adjustment of the head rest.
- Automatic adjustment of the intensity of bowl illumination to the ambient lighting conditions.
- Flicker test strategy (Critical Fusion Frequency).
- Blue on Yellow test mode (Short Wave Automatic Perimetry).
- BDT strategy (Binocular Driving Test) – to determine the Esterman test results.
- Recording interim results of an exam to be continued later on.
- Software connected to MWL patient data servers of the DICOM system.
- Software connected to SCP exam data servers of the DICOM system.
- Self-testing system.

Basic operation

PTS 920/925/2000 series Automated Perimeter is essentially intended for visual field testing.

Principle of operation

Testing of the visual field is carried out using the static perimetry technique, where stimulus are presented on the bowl surface. Stimuli are generated by multiple LED (Light Emitting Diodes) mounted around the rear side of the bowl (PTS 920/925) or by the single LED and scanner module (PTS 2000). Stimuli of varying brightness are presented to the patient. During the visual field testing, the patient should look at fixation point. Once a stimulus point is spotted, the patient is asked to respond by pressing a response button. In the static perimetry technique, the stimulus is displayed at a particular spot on the bowl. The exam results are displayed on an external PC running the dedicated PTS 920/925/2000 series application. The results can be printed on a printer or in electronic format.

Patients

PTS 920/925/2000 series Automated Perimeter is intended for visual field testing in adults, in elderly patients, and in children aged 7 and older. PTS 920/925/2000 series is also suitable for patients with posture-related disorders, fixation disorders, deafness and obesity. To be eligible for the study, the patient should be able to sit on a stool or a chair, place the head on the chin rest and the forehead support, and keep a stable head position during the exam. The patient should also be able to hold a response button and press it during the test.

Contact with body parts

PTS 920/925/2000 series Automated Perimeter comes into contact with the patient's chin and forehead. The patient holds a response button and uses it in response to light points the patient sees during the test.

Application

PTS 920/925/2000 series Automated Perimeter is intended for continuous operation. It can be operated in outpatient and inpatient settings, hospitals, and training centers, at ambient temperature, in well-ventilated interiors. Refer to Section 15 *Operating Conditions*.

Dedicated Users

PTS 920/925/2000 series Automated Perimeter is intended for use by ophthalmologists, opticians, optometrists and other trained healthcare professionals.

Minimum level of knowledge

The operators must be able to distinguish between the left vs. the right eye, chin and forehead; they also must understand the terminology, and the principle of operation of PTS 920/925/2000 series software.

User Education

Ophthalmologist, optometrist, nurse, healthcare technician or assistant.

User Skills

The user should master the following operating skills:

- switching the perimeter on and off
- disinfecting the surfaces coming into contact with the patient's body
- introduction and modification of patient data

- preparing and positioning the patient and the device, adjusting table and chair height
- setting the device parameters, starting the examination, and saving the test results
- selecting and creating print previews
- checking the print preview for data completeness
- printing and exporting test results
- patient database backup and recovery

Professional Skills

The user should be trained to work with elderly, disabled and pediatric patients.

On-the-job requirements for the perimeter operation

Device operation training is obligatory for users authorized to operate the instrument. Users should be also trained on the analysis and management of ophthalmological diseases and other medical issues specifically related to ophthalmology. Computer literacy is also necessary to operate the perimeter.

This manual does not contain any guidelines or interpretations referring to clinical results. Medical practitioners must be sufficiently trained to interpret the test results. Optopol Technology Sp. z o.o. cannot be made liable for any diagnostic errors.

Disposal

Observe the national provisions of law governing waste disposal.

Do not use this instrument for purposes other than intended.

Intended Use of this Manual

This manual is a source of information for correct operation of the device and can be used as a training aid. This manual was compiled to facilitate comprehension of the device functions. Descriptions and figures are user-friendly form of instructions. Users are recommended to read all these instructions before starting work with the instrument. It is also recommended to consult this manual before patient examination.

This manual does not contain any guidelines or interpretations referring to clinical results. Medical practitioners must be sufficiently trained to interpret the test results. Optopol Technology Sp. z o.o. cannot be made liable for any diagnostic errors.

Accessibility of this manual

The PTS 920/925/2000 series User Manual in PDF format can be found on the original installation media of PTS 920/925/2000 series Automated Perimeter. PTS 920/925/2000 series installation media are supplied with every instrument. Download and install free Adobe Reader at www.adobe.com to read this manual in PDF format.

The User Manual in paper form is available on request. To receive user manual in hardcopy please contact authorized Optopol representative to receive it.

Using this Manual

This manual specifically refers to the operation of PTS 920/925/2000 series Automated Perimeter working with the dedicated software 2.0 or later version, if available.

Compatibility

CE PTS 920/925/2000 series is compatible with Directive 93/42/EEC on medical devices.

Safety

Observe the basic safety rules when operating the device:

PTS 920/925/2000 series perimeter should be shut down when unused for long periods of time.

PTS 920/925/2000 series perimeter should be used in dry, clean and dust-free rooms, at temperatures not exceeding the temperature range stated in the product specifications.

If the instrument is switched on, do not cover it to provide free flow of air.

Place the instrument on a flat, solid and stable surface.

The instrument must be connected to a mains socket outlet with a protective earthing connection to avoid electric shock.

Do not connect or disconnect any cables when the instrument is in operation.

Avoid direct contact with fluids.

Protect the instrument against contact with hot surfaces and open flame.

All works carried out with covers removed should be conducted by the manufacturer or authorized personnel.

Specifications

Class of protection against electric shock	Class I (PTS 920/2000 series) Class II (PTS 925 series)
Degree of protection against electric shock	Type B
Operation mode	continuous
High-oxygen environment	This instrument is not suitable for use in high-oxygen environments

3. *Technical Data*

Table 1. Technical data of the PTS 920 series perimeter

Simulator Bowl Type	Spherical, according to Goldmann's standard, radius 30 cm					
Field range (with fixation offset)	Left: 50° (80°) Rright: 50° (80°) Up: 50° Down: 50°					
Stimuli	Green, Goldman III: 570nm Blue, Goldman III: 465 nm (only PTS 920 BY)					
Stimuli brightness	Green: 0.03 – 1000 asb Blue: 0.02 – 650 asb (only PTS 920 BY)					
Dynamic range	48 dB					
Brightness resolution	1 dB					
Background	White (green stimuli) – 10 asb (3.18 cd/m^2) – automatic stabilization; chromacity (X,Y)=(0.374..0.473;0.366..0.432) Yellow (blue stimuli) – 314 asb (100 cd/m^2) – automatic stabilization (only PTS 920 BY); dominant wavelength (585..595) nm					
Stimuli exposure time	Adjustable within the range of 0.1s to 9.9s or adaptable					
Reaction time	Adjustable within the range of 0.1s to 9.9s or adaptable					
Intervals between exposures	Adjustable within the range of 0.1s to 9.9s or adaptable					
Fixations	Central, single (0°) Central, 4 points Left (30°) Right (30°)					
Predefined examination fields	Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points
	F-50 (Full)	50	50	50	50	163
	G-50 (Glaucoma)	50	22	22	22	103
	C-22 (Central)	30	30	22	22	99
	C-24A	30	22	22	22	58
	C-30A	30	30	30	30	69
	M-10 (Macula)	10	10	10	10	48

	C-30 (Fast)	30	30	30	30	60
	P-50 (Peripheral)	30-50	30-50	30-50	30-50	72
	E-80 (Extended)	50	80	30	30	105
	FeV G1	40	80	40	40	106
	FeV G2	60	80	40	40	113
	BDT (Drivers)	80 (L)	80 (R)	40	50	120
Test strategies	Threshold Dynamic Fast Threshold Advanced Screening 3-Zone 2-Zone BDT Flicker BSV					
Size of correcting lens	38 mm					
Dimensions (HxWxD)	645mm x 561mm x 385mm					
Weight	11 kg					
Power supply	100-120VAC 50/60Hz or 220-240V AC 50/60Hz, 30 VA					
Fuses	T 315mA, L 250V, 5x20mm					

Table 2. Technical data of the PTS 925 series perimeter

Simulator Bowl Type	Spherical, according to Goldmann's standard, radius 30 cm
Field range	Left: 50° (85°) Rright: 50° (85°) Up: 40° (55°)[1] Down: 40° (55°)

[1] PTS 925Wi only

Stimuli	PTS 925: Green, Goldman III: 570 nm PTS 925 BY: Green, Goldman III: 570 nm + Blue, Goldman III: 465 nm PTS 925 W : White, Goldman III: chromacity (X;Y)=(0.31±0.015;0.32±0.025)					
Stimuli brightness	Green: 0.03 – 1000 asb (tylko PTS 925 i PTS925 BY) Blue: 0.02 – 650 asb (tylko PTS 925 BY) White: 0.3 - 10000 asb (tylko PTS 925 W)					
Dynamic range	48 dB					
Brightness resolution	1 dB					
Background	White (green stimuli) – 10 asb (3.18 cd/m^2) – automatic stabilization (PTS 925 and PTS925 BY only); chromacity (X,Y)=(0.374..0.473;0.366..0.432) Yellow (blue stimuli) – 314 asb (100 cd/m^2) – automatic stabilization (PTS 925 BY only); dominant wavelength (585..595) nm White (white stimuli) – 31.4 asb (10 cd/m^2) – automatic stabilization (PTS 925 W only); chromacity (X,Y)=(0.374..0.473;0.366..0.432)					
Stimuli exposure time	Adjustable within the range of 0.1s to 9.9s or adaptable					
Reaction time	Adjustable within the range of 0.1s to 9.9s or adaptable					
Intervals between exposures	Adjustable within the range of 0.1s to 9.9s or adaptable					
Fixations	Central, single (0°) Central, 4 points Top (15°) Left (35°) Right (35°) Bottom (15°)[1]					
Predefined examination fields	Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points
	F50-2 (Full)	50	50	40	40	168
	G50-2 (Glaucoma)	50	27	27	27	104
	24-2	27	21	21	21	54
	24-2C	27	21	21	21	64

[1] PTS 925Wi only

	30-2	27	27	27	27	76
	30-2C	27	27	27	27	86
	5-2	3	3	3	3	16
	10-2	9	9	9	9	68
	P50-2 (Peripheral)	33-50	27-40	27-40	33-50	76
	Esterman M	50	75	34	55	100
	Esterman B	75 (L)	75(R)	34	55	120
	Gandolfo	50	50	34	42	100
	G0-2	21	27	21	21	28
	Sup 44[1]	40	40	55	-21	44
Test strategies	Threshold Dynamic Fast Threshold ZETA™ ZETA™Fast ZETA™Faster Advanced TOP TOP+ Screening 3-Zone 2-Zone BDT Flicker BSV					
Size of correcting lens	38 mm					
Dimensions (HxWxD)	410mm x 568mm x 410mm					
Weight	9 kg					

[1]PTS 925Wi only

Power supply	12V DC, 36 VA
Fuses	T 1.6 A, L 250V, 5x20mm

Table 3. Technical data of the PTS 2000 series perimeter

Simulator Bowl Type	Aspherical, according to Goldmann's standard, radius 30 cm					
Field range (with fixation offset)	Left: 90° Right: 90° Up: 60° (70°) Down: 70°					
Stimuli	White Goldmann I to V; chromacity (X,Y)=(0.3027..0.3221;0.3118..0.3475) Green Goldmann I to V; 528nm Blue Goldmann I to V; 470nm Red Goldmann I to V; 623nm					
Stimuli brightness	Green: 0.03 – 1000 asb Blue: 0.002 – 65 asb White: 0.3 - 10000 asb Red: 0.045 - 1500 asb					
Dynamic range	48dB					
Brightness resolution	1dB					
Background	White (green stimuli) – 10 asb (3.18 cd/m^2) – automatic stabilization; chromacity (X,Y)=(0.374..0.473;0.366..0.432) Yellow (blue stimuli) – 314 asb (100 cd/m^2) – automatic stabilization; dominant wavelength (585..595) nm White (white stimuli, red stimuli) – 31.4 asb (10 cd/m^2) – automatic stabilization; chromacity (X,Y)=(0.374..0.473;0.366..0.432)					
Stimuli exposure time	Adjustable within the range of 0. 1s to 9.9s or adaptable					
Reaction time	Adjustable within the range of 0. 1s to 9.9s or adaptable					
Intervals between exposures	Adjustable within the range of 0. 1s to 9.9s or adaptable					
Fixations	Central, single (0°) Central, 4 points Bottom (10°)					
Predefined examination fields	Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points
	F-50 (Full)	50	50	50	50	163
	G-50 (Glaucoma)	50	22	22	22	103
	C-22 (Central)	30	30	22	22	99

C-24A	30	22	22	22	58
C-30A	30	30	30	30	69
M-10 (Macula)	10	10	10	10	48
C-30 (Fast)	30	30	30	30	60
P-50 (Peripheral)	30-50	30-50	30-50	30-50	72
F50-2 (Full)	50	50	40	40	168
G50-2 (Glaucoma)	50	27	27	27	104
24-2	27	21	21	21	54
24-2C	27	21	21	21	64
30-2	27	27	27	27	76
30-2C	27	27	27	27	86
5-2	3	3	3	3	16
10-2	9	9	9	9	68
P50-2 (Peripheral)	33-50	27-40	27-40	33-50	76
Esterman M	50	75	34	55	100
Esterman B	75 (L)	75(R)	34	55	120
Gandolfo	50	50	34	42	100
G0-2	21	27	21	21	28
FF120	50	60	40	55	120
Sup 64	40	40	52	-24	64
N1	26	26	26	26	54
B1	-6.5	21.5	9.5	19	54
07	55	68	57	68	130
FF246	50	60	40	55	246
FF81	50	60	40	55	81
Nasal Step	50	23	22	22	18
BSV3	60	60	60	60	452

	BSV5	60	60	60	60	260
	60-4	54	54	42	54	60
	FeV G1	40	80	40	40	106
	FeV G2	60	80	40	40	113
Test strategies	Threshold Dynamic Fast Threshold ZETA™ ZETA™ Fast ZETA™ Faster Advanced TOP TOP+ Screening 3-Zone 2-Zone BDT Flicker BSV Kinetic					
Size of correcting lens	38 mm					
Dimensions (HxWxD)	606mm x532mm x438mm					
Weight	17 kg					
Power supply	100-240V AC 50/60 Hz, 65-80VA					
Fuses	F 3.15A, L 250V, 5x20mm					

3.1. *Minimum hardware requirements*

Processor	at least 2 computational cores, Intel® Core™ i3 M380 2,5GHz or equivalent
RAM	2GB
Operating system	MS Windows 7/8/10, 32 or 64 bit
Hard disk drive	1GB free space
Display	1280x768, 24-bit color depth (True color), 3D accelerator supporting OpenGL
Communication ports	1 x USB 2.0

4. *Unpacking and installation*

Depending on the perimeter version, the instrument package can include all or some of the following components:

- perimeter bowl
- single chin rest or single chinrest adapter (only for PTS 920/925)
- double chin rest (only for PTS 920)
- power cord (PTS 920/2000) or power adapter (PTS 925)
- response button
- USB cable to connect the perimeter to a PC
- Storage device with drivers and software installation package
- perimeter bowl cover

4.1. *Safety standards*

PTS 920/925/2000 series Automated Perimeter can only be connected to a mains socket outlet with a properly integrated protective earthing connection.

PTS 920/925/2000 series complies with the requirements of Directive 93/42/EC on medical devices. PTS 920/925/2000 series has class B applied parts (chin rest, forehead support, response button) and is provided with class I protection against electric shock.

PTS 920/925/2000 series Automated Perimeter is typically a part of a larger *Medical System* (encompassing both medical and non-medical devices). The *Medical System* in its entirety, and each of its components has to comply with the standard requirements laid down in IEC 60601-1 standard. This means that compliance with this standard has to be ensured by all suppliers and manufacturers of all components contained in the *Medical System* concerned.

PTS 920/925/2000 series is connected to a PC via USB cable. The USB cable is electrically separated from the perimeter. This provides extra protection when PTS 920/925/2000 series and the connected PC are powered from different sources, through neutral conductors of non-equal potential.

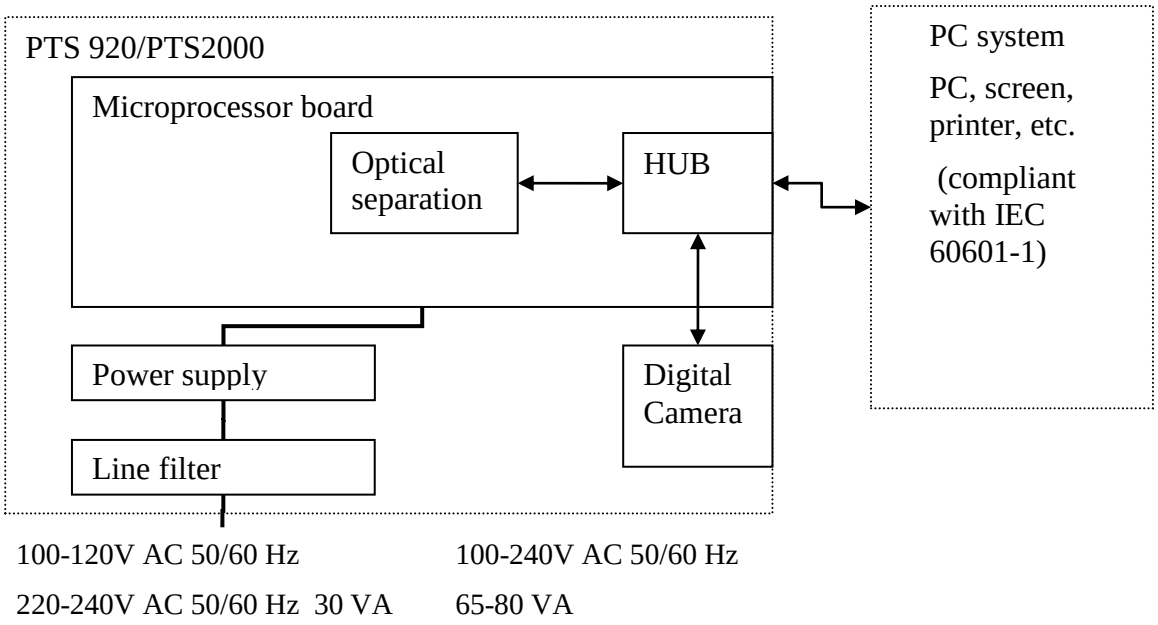


Figure 1 PTS 920/PTS 2000 series electrical connections in a Medical System

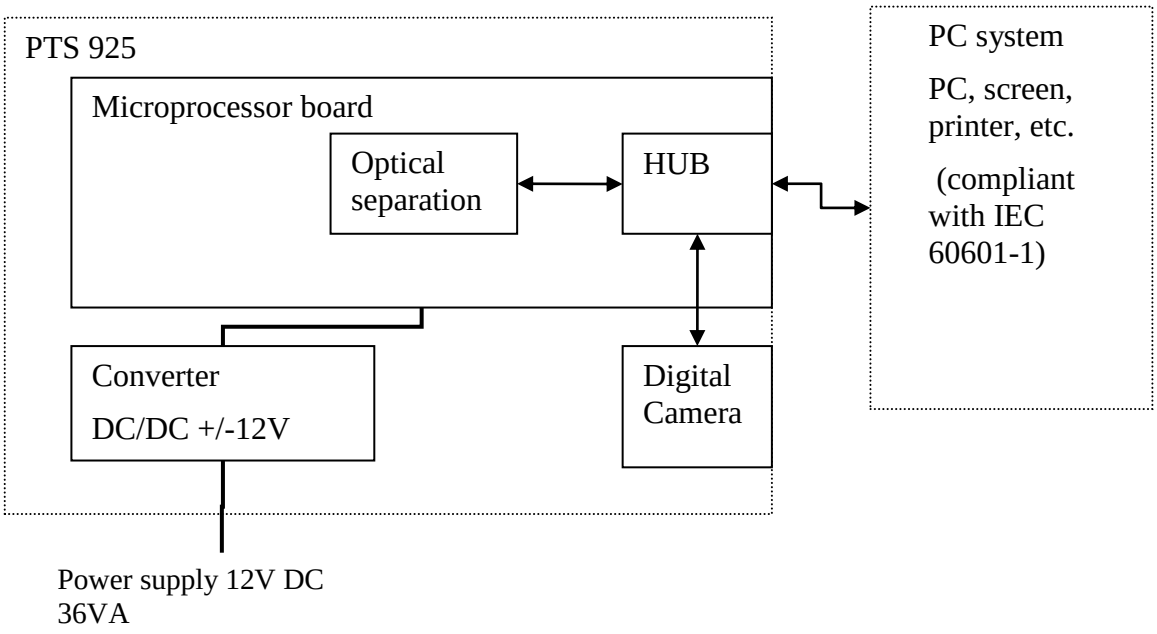


Figure 2. PTS 925 series electrical connections in a Medical System

4.2. *Installation Safety*

Before starting installation carefully read all installation instructions contained in this manual. Should you experience any problems with the installation, contact the supplier for assistance.

You should closely follow the safety rules during installation:

- Where PTS 920/925/2000 series and the Medical System have been installed by the manufacturer or authorized personnel, the manufacturer shall safeguard correct installation and compliance with the requirements of MDD.
- Connect the device to a three-wire power supply with a grounding wire to avoid an electrical shock hazard.
- Make sure the position of the PTS 920 power supply switch on the rear panel corresponds to the mains voltage and frequency: “115V” is for 100-120V AC50/60Hz, and “230V” is for 220-240V AC 50/60Hz.
- Do not use any extension cables and cable connectors incompatible with IEC 60601-1 standard to connect the device to the mains.
- Do not connect PTS 920/925/2000 series to overloaded power outlets.
- Do not connect any damaged cables or sockets. Contact the supplier for assistance.
- While installing PTS 920/925/2000 series, make sure that the fan outlet under the instrument is not covered or obstructed in any way.
- Never place the device on uneven or inclined surface.
- PTS 920/925/2000 series should be installed in low-light conditions, rear-facing the strongest source of light.
- All accessories used to operate PTS 920/925/2000 series must be approved by its manufacturer.
- All PCs and other devices connected to PTS 920/925/2000 series must comply with the requirements of MDD.
- Never install the device in humid environment.
- Always use fuses which correspond to the PTS 920/925/2000 series specifications.
- Always use certified Hi-Speed USB (USB 2.0) cables, no more than 3m long. Use of non-certified cables or extension cables can cause defective operation of the instrument and wrong measurements.
- Where PTS 920/925/2000 series and any peripheral devices are connected in a manner not specified in this manual or where the instrument has not been installed by PTS 920/925/2000 series manufacturer or authorized technicians, the manufacturer cannot be held liable for any infringements of the general safety instructions and the existing standards.

- PTS 920/925/2000 series can only be used with device approved for IEC 60950 at least

any other case the patient may be subjected to electrical shock.

Do not hold or carry the perimeter bowl by the hole in it. This can cause damage to the equipment.

Figure 3. Incorrect way of holding and carrying the perimeter

After unpacking, make sure you have all parts.

Check whether or not the device is mechanically damaged in a visible way. If the device is damaged, do not switch the perimeter on and contact the manufacturer without delay.

4.3. *Connection*

If the device has been kept at low temperature conditions, wait for at least an hour before the temperature of the device increases to the ambient temperature in the room where the device is installed. Otherwise vapor condensation may damage the equipment.

Follow this procedure to install the device:

Place the device on a solid and stable surface.

Assembly a single or double chin rest on the chin rest mechanism.

Connect the response button to the inlet socket on the rear panel.

Connect the device to a PC via USB cable.

Make sure the position of the PTS 920 power supply switch on the rear panel corresponds to the mains voltage and frequency: "115V" is for 100-120V AC50/60Hz, and "230V" is for 220-240V AC 50/60Hz.

Connect the power cable into a power socket with a properly integrated protective earthing connection.

Switch the power on by pressing the power button over the power socket on the rear panel.

4.4. *External components*

Surge protectors

OPTOPOL TECHNOLOGY recommends using a surge protector or uninterruptible power supply (UPS) with PTS 920/925/2000 series device. The device will be protected against electricity disruptions.

PC

All devices connected PTS 920/925/2000 series device, and particularly the computer set, should meet safety standards for medical devices according to Directive 93/42/EEC.

Printers

Reports should preferably be printed on a laser printer. Some color-coded information contained in the reports will be illegible when printed on a black-and-white printer.

A printer connected to the computer set, and all other devices connected to PTS 920/925/2000 series device through the PC (mice, other USB peripherals) should meet safety standards for medical devices according to Directive 93/42/EEC.

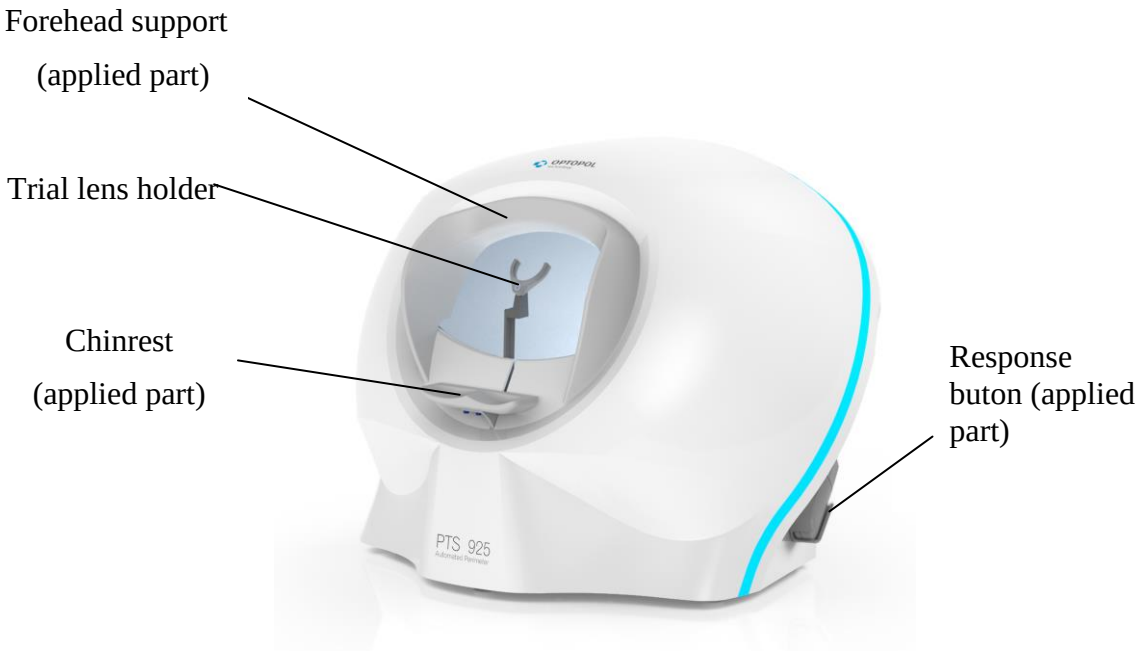


Figure 4. General view of PTS 925 series perimeter

Figure 5. General view of PTS 920series perimeter

Figure 6. General view of PTS 2000 series perimeter

4.5. *Software installation and configuration*

4.5.1. Screen resolution

Minimum screen resolution for PTS software is 1280 x 768 pixels and 24-bit color depth (True Color).

1. Right-click the Windows desktop and go to *Screen resolution*.
2. Set the parameters as appropriate.

4.5.2. Installing PTS 920/925/2000 series software and drivers in Windows 7/8/10

1. Switch the PTS perimeter bowl and the PC on. Wait until the Windows starts. Insert the memory storage to the PC. Use the USB cable to connect the PTS perimeter bowl and the PC with a USB cable. The Found New Hardware window will be displayed: USB camera and the perimeter.
2. Go to My Computer and select the disc delivered with the device to install the software, database server and drivers (it is possible to choose one of component during installation process).

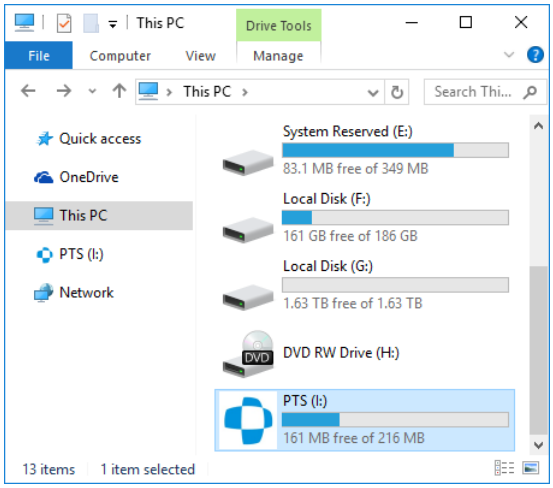


Figure 7. Selection of drive with the software and drivers of PTS 920/925/2000 series

3. Double click the *Setup* icon.

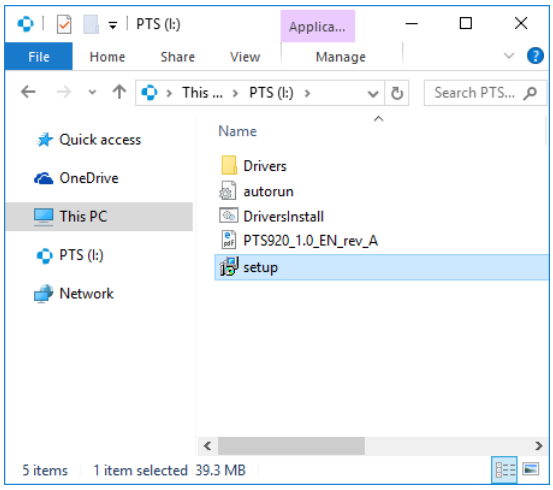


Figure 8. Selection of installer file

4. Click on ” *Next* >”button to continue installation process of perimeter software

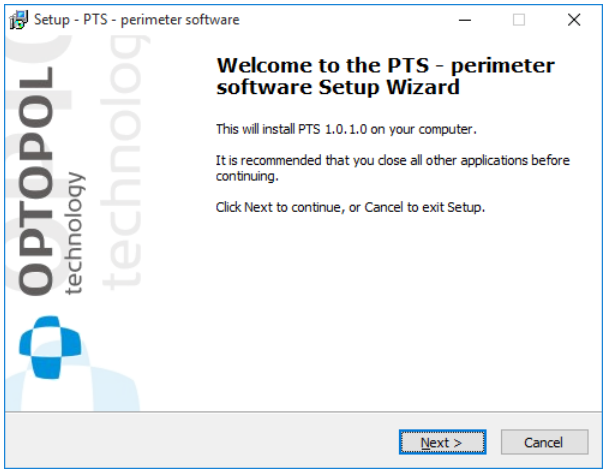


Figure 9. Welcome window of PTS software installer

5. Select “I accept the agreement” checkbox to accept the contract conditions and click the ”*Next* >” button

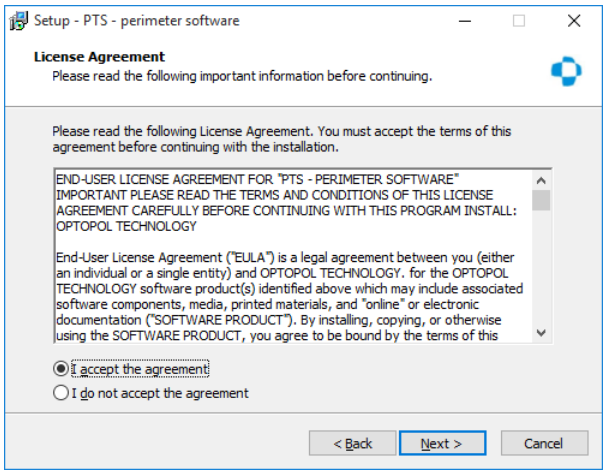


Figure 10. License agreement

6. Select destination location and click on ”*Next >*” button

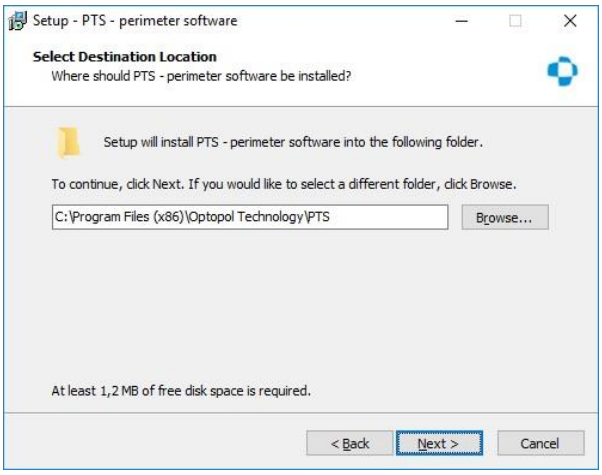


Figure 11. Selection of destination location

7. Select folder to store user data (data base, settings etc.) and click on ”*Next >*” button

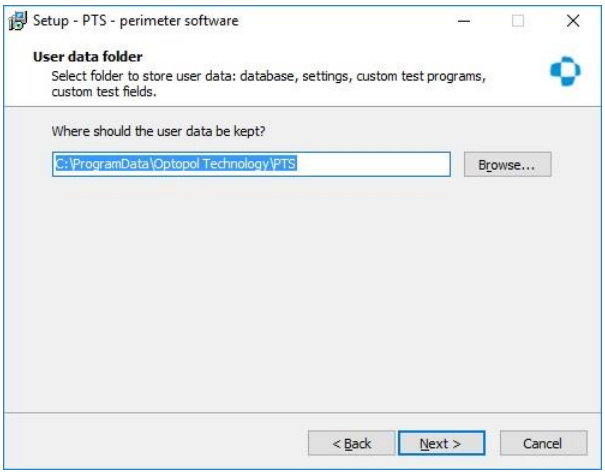


Figure 12. Selection of folder to store user data

8. Select components you want to install and click on ”*Next >*” button.

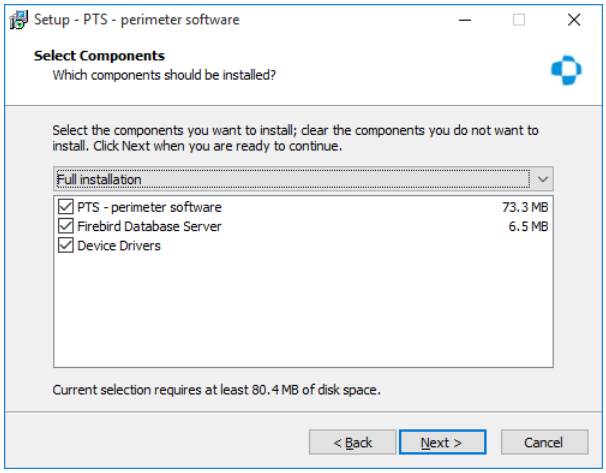


Figure 13. Components selection

9. Select the name of the folder in the Start menu in which PTS shortcuts will be residing. If you want to change folder in the Start menu, click on "*Browse*" button and select the folder. To approve change, click on "*Next* >" button.

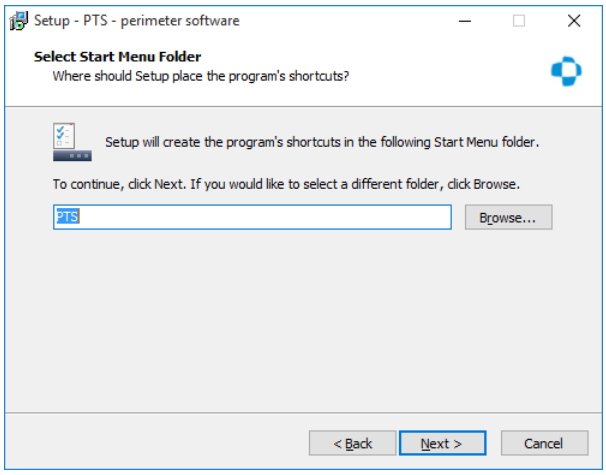


Figure 14. Selection of shortcut name and location in the Start menu

10. If you want to create PTS shortcut on the desktop, select "*Create a desktop icon*" checkbox. If you want to create PTS icon in Quick Launch bar, select "Create a Quick Launch icon" checkbox. To approve change, click on "*Next* >" button.

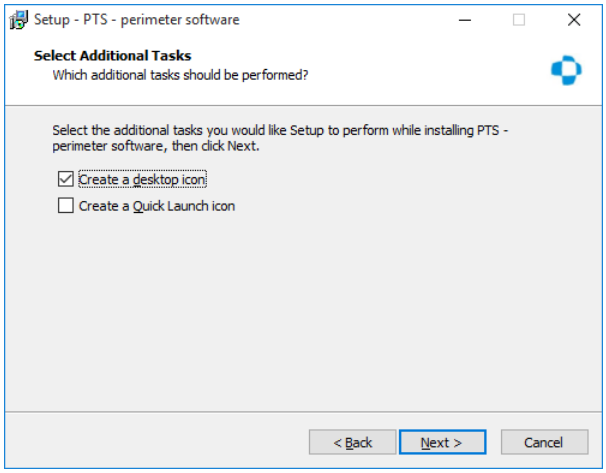


Figure 15. Selection of additional installation tasks

11. Check the setup summary and click ”*Install*” to install the selected components. If you want to change installation settings, click on “< *Back*” button.

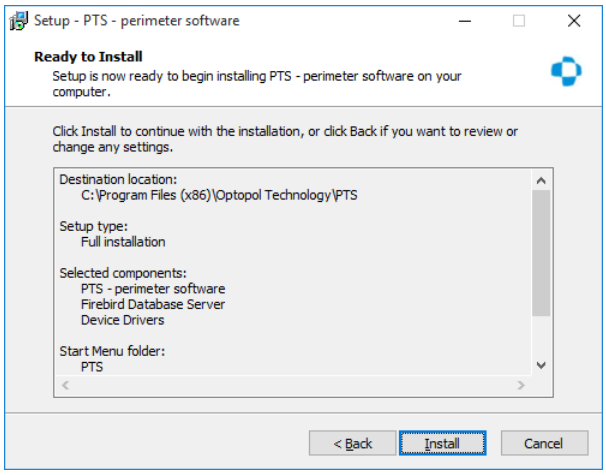


Figure 16. Summary of selected installation options

12. Installing the perimeter software. Wait until the process is completed.

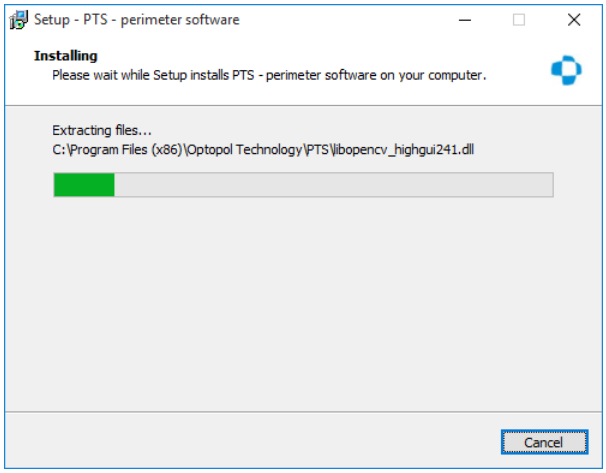


Figure 17. Installing the perimeter software

13. Click on ”*Next* >” button to continue installation process of device drivers.

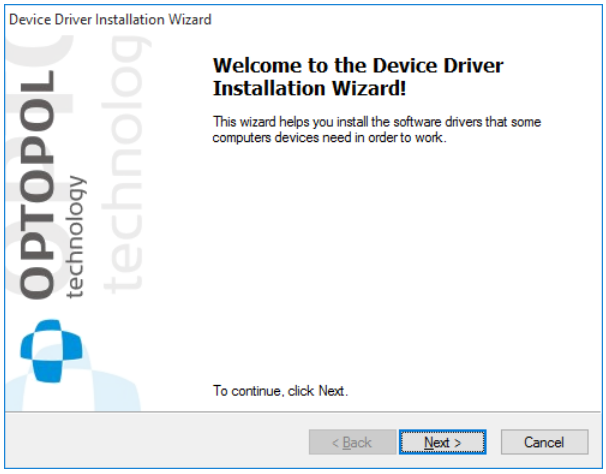


Figure 18. Welcome window of device drivers installer

14. Installing the device drivers. Wait for next message.

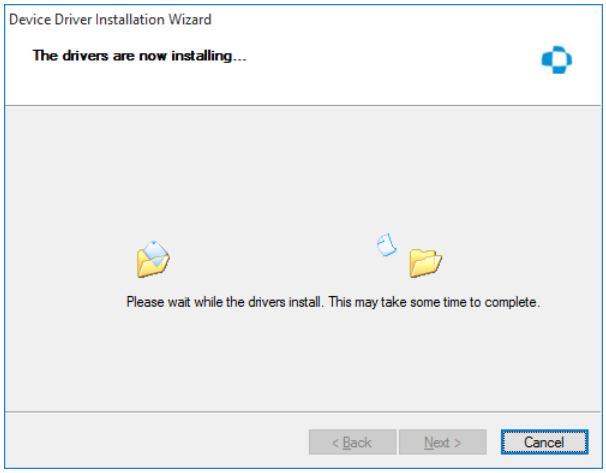


Figure 19. Installing the device drivers

15. If the message shown in Figure 20 appears on the screen, click on “*Install*” button

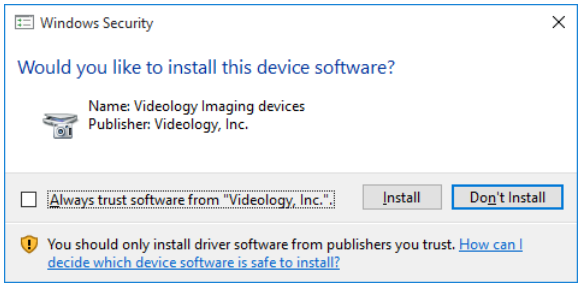


Figure 20. Message about the camera driver installation

16. Click on “*Finish*” button to complete the device drivers installation.

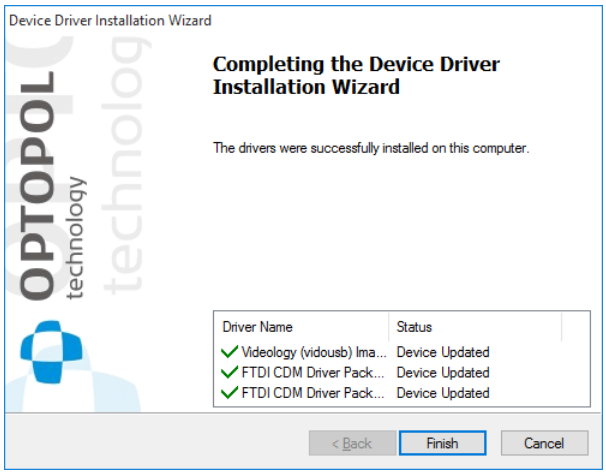


Figure 21. Summary of the device drivers installation

17. Click on "*Finish*" button to complete the software installation. At this point user can be asked to restart a computer.

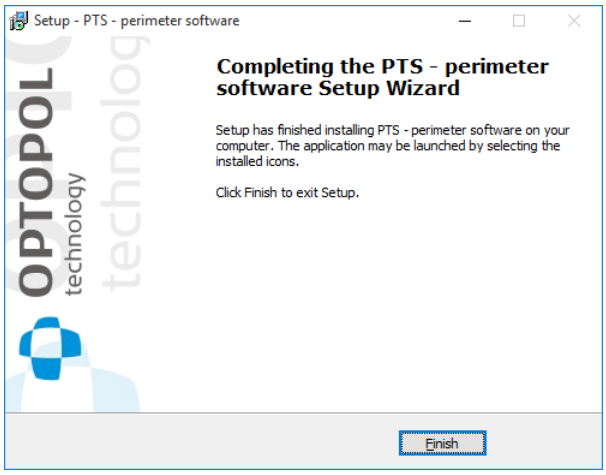


Figure 22. Completing the installation

18. Installed device drivers in Device Manager

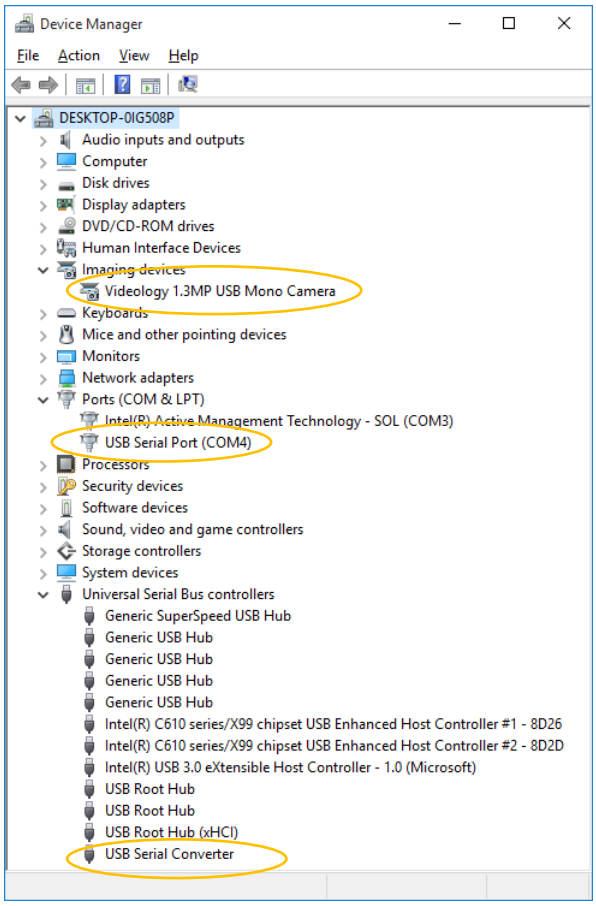


Figure 23. Installed drivers of PTS 920/925/2000 series device

4.6. *Closing PTS 920/925/2000 series*

To close the instrument, proceed as follows.

1. Close the PTS software.
2. Switch the perimeter bowl off.

If you want to restart the PTS 920/925/2000 series perimeter, wait a few seconds after the instrument is switched off.

5. *Maintenance of the PTS 920/925/2000 series perimeter*

All maintenance works can only be carried out after the supply of power is turned off from the perimeter bowl and the mains plug is pulled out of the socket.

The PTS 920/925/2000 series perimeter is virtually maintenance-free during the whole life cycle of the product. Keep the external surfaces and the interior of the bowl clean. Use gentle cleaning agents. Protect the bowl and the perimeter against ingress of water and other fluids. Check from time to time whether the bowl is not mechanically damaged. Check if the mains plug is not too loose.

For hygienic reasons, clean the chin rest and the forehead support with a disinfectant after each test.

5.1. *Cleaning the PTS 920/925/2000 series perimeter*

5.1.1. Cleaning the enclosure

Clean the instrument enclosure with a soft cloth. Use cleaning agents suitable for cleaning of electronic devices.

5.1.2. Cleaning the bowl

Clean the bowl with a soft and slightly damp cloth. Use cleaning agents suitable for cleaning of glass. Cleansers used for instrument cleaning should be fully transparent and colorless. Make sure no water gets into the interior of the instrument. Never spray cleaning agent inside the instrument directly onto the bowl surface.

5.1.3. Cleaning the application parts

The PTS 920/925/2000 series perimeter bowl has the following application parts:

chin rest, forehead support, and response button.

Application parts should be disinfected after each test. They should be also disinfected after an extended non-use period.

The chin rest can be removed for easier disinfection as shown in the figure below.

Never reach into the interior of the bowl, unless for cleaning.

Apply the dust cover onto the instrument if not in use.

There are no parts inside the instrument which qualify for repair by the user. Never remove the enclosure.

5.2. *Fuse replacement*

If you the test sequence of stimulus size and color is not displayed in the center of the perimeter bowl after you switch the instrument on, check if the fuses are working (PTS 920/2000). In PTS 925 series, the fuses replacement procedure can be performed only by a trained service personnel.

Fuses used in the instrument:

PTS 920 series T 315mA L 250V, 5x20mm

PTS 925 series T 1.6 A L 250V, 5x20mm

PTS 2000 series F 3.15A L 250V, 5x20mm

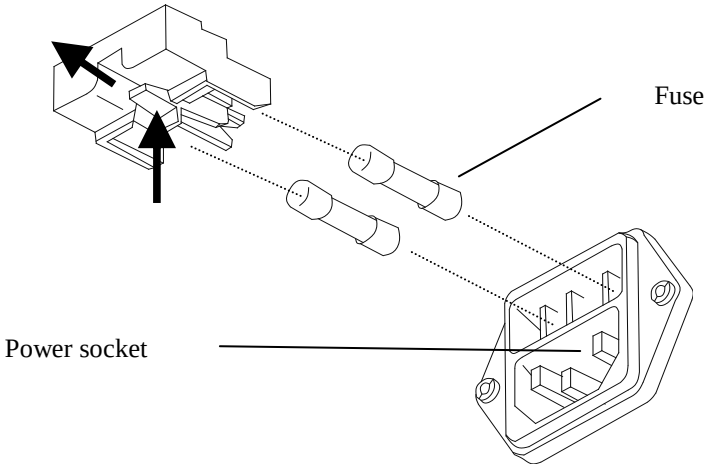
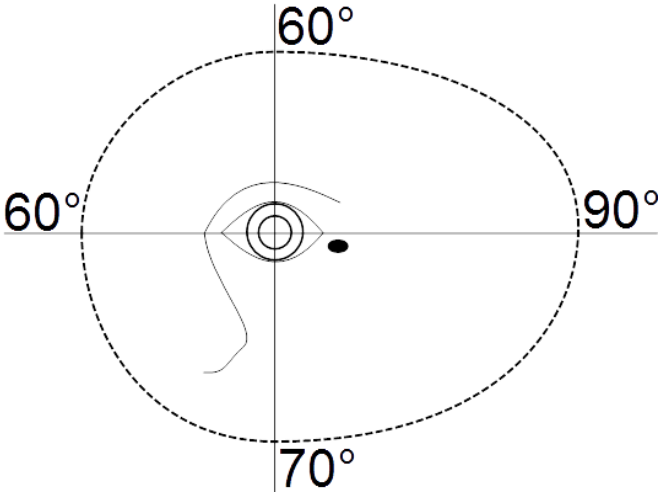


Figure 24. Fuse installation

6. *Introduction to perimetry*

6.1. *Visual field*

Visual field is the area seen by a non-moving eye. Visual acuity and visual field are two basic parameters with which the human vision is described. Visual field of a healthy human eye covers the following area:



The visual field is tested to:

gather important information about eye diseases, including cataract and glaucoma

identify neurological defects

monitor the progress of visual defects and neurological disorders

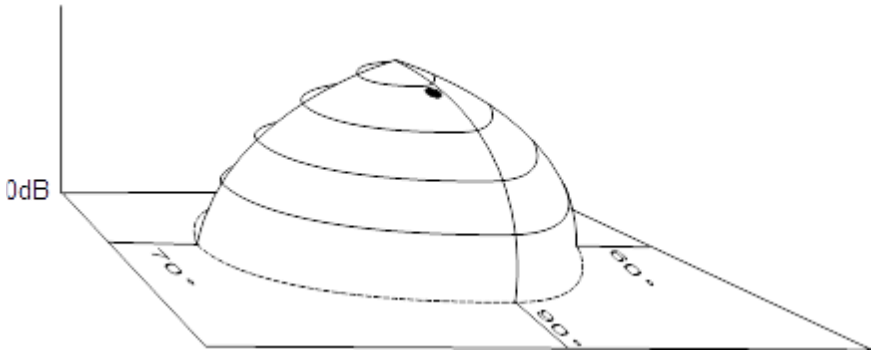
Visual field testing enables early detection and treatment of eye diseases. Monitoring the disease progress is an important way to test patient's response to treatment.

6.2. *Visual field testing*

Visual field testing is where the size of the visual field and the visual sensitivity within the visual field are tested. These parameters are tested by determining the contrast sensitivity of the eye being tested. Contrast sensitivity is the ability to see brighter objects against darker backgrounds.

Contrast sensitivity of a healthy eye is the highest in the center of the retina, in the fovea centralis, and decreases progressively towards the visual field periphery. Areas where contrast sensitivity is low or absent are called scotomas. Absolute scotoma is an area of lost vision within the visual field, whereas relative scotomas is where visual sensitivity within the visual field is restricted. Each healthy eye has one morphological blind spot. This is the place where the optic nerve passes through the optic disc, the area where no light-detecting photoreceptor cells are present. The blind spot is located 12.5° -18.5° temporally (towards the temple). Contrast sensitivity can be illustrated on a 3-D map, displaying the Hill of Vision (HoV). The higher the

HoV, the higher the contrast sensitivity at a particular point of the map.



Normal contrast sensitivity depends on many different factors. These include: brightness level of the background, patient age, size of the contrast stimulus, and exposure to stimulus.

6.3. *Visual field testing methods*

Visual field testing is largely based on cooperation between the examiner, the instrument, and the patient. In all visual field testing methods, the assumption is that the patient responds to a light stimulus or, in other words, that the patient does not respond unless he/she sees a stimulus.

There are two basic types of visual field tests: kinetic perimetry and static perimetry.

Kinetic perimetry uses a moving stimulus of constant brightness (intensity). While changing its position within the visual field at a constant speed, the stimulus at some point exceeds the contrast sensitivity threshold. The point where the contrast sensitivity threshold is reached determines the contrast sensitivity of the tested eye. Once several points of this kind are detected, they are connected with a contour line. This is the so-called isopter, a line connecting points of equal retinal sensitivity to a contrast stimulus in the visual field. The hill of vision (HoV) can be reproduced from isopters drawn for several contrast sensitivities.

Static perimetry is where stimuli of different brightness (intensity) are shown at specific points throughout the visual field, one at a time. By displaying stimuli of different brightness levels at particular points, the brightness (contrast) threshold can be determined that defines the transition from not-seen to seen. This value determines the contrast sensitivity of the tested eye at the particular point and directly refers the HoV height at this particular point. The shape of the hill of vision can be reproduced by determining threshold values at several dozen points within the visual field.

Static perimetry also differs in the way the threshold value is detected within the visual field, and delivers different types of results. On the one hand, threshold perimetry is where exact sensitivity values of the eye (in dB) are determined. Rapid screening techniques, on the other hand, are designed to determine whether eye sensitivity at a particular location is either normal or defective.

6.4. *Validity of test results*

Visual field testing is based on patient's response to a light stimulus. It is the patient who signals whether a light stimulus is seen or not seen. Thus, the validity and quality of visual field test results largely depend on the patient's performance. It is very important to make patients aware of their role in safeguarding examination validity, and to introduce them to the testing procedure. To make the test results as reliable as possible, make sure the patient feels comfortable both physically and mentally.

Also, it is extremely important to use proper correction lens to correct refractive errors, if any. A computer-based calculator can be used to select appropriate correction lens used during the test.

You can also use the Test Reliability function. Reliability of patient reactions to the stimuli can be monitored with false positive (FPOS) and false negative (FNEG) tests.

7. *Getting started*

7.1. *Starting the application*

You can start the application by clicking the icon on the desktop or by selecting the program in the Start menu. To use the application for testing (in the ONLINE mode), first connect the perimeter to a PC and switch the power on. Otherwise the application will be running in an OFFLINE mode and the testing functionalities will be disabled.

The application can work in two modes:

Standard mode – No login is required. All users who start the application obtain full administrator access rights and can fully control the application settings and the patient / examinations database.

User Accounts mode – login is required. All users who start the application have specific "roles" assigned by the administrator.

When started for the first time after installation, the application starts in the standard mode.

For more information about user accounts, refer to section Users.

7.2. *Activating the application*

The application must be activated after it is started for the first time after installation. The application will not start unless it is successfully activated.

Application can be only activated by the administrator of the computer system which runs the software.

You can activate the application by clicking the icon on the desktop or by selecting the program in the Start menu.

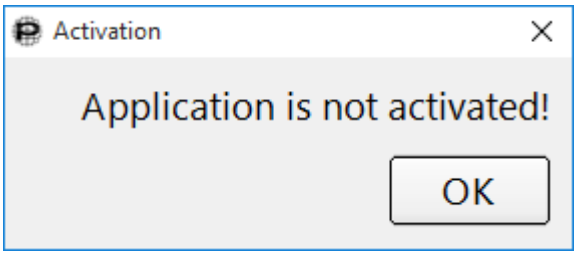


Figure 25. Inactive application

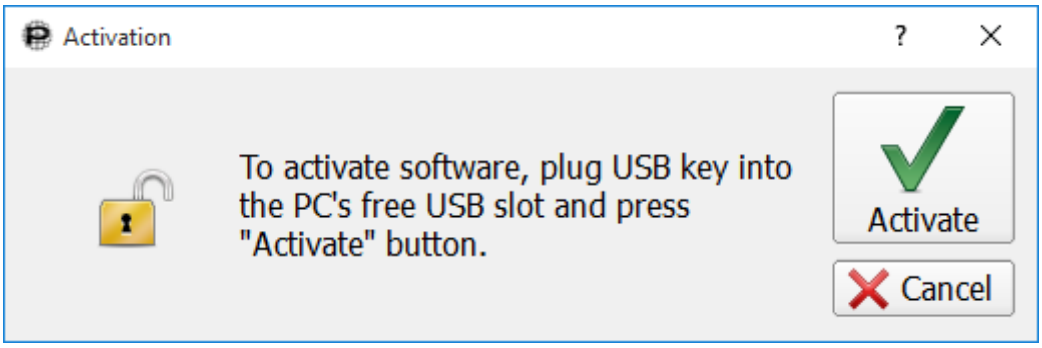


Figure 26. Activation dialog box

Plug the software key provided with the instrument into an available USB port on the computer when the activation dialog box is displayed on the screen and click Activate. Notification about successful activation will be displayed on the screen and the application will start. If the activation fails, please contact the distributor.

7.3. *Main screen*

Once you have logged into the application, the main screen will be displayed on the screen with the default tab: Start or Patient. The main window of the application is described below.

The application is arranged into tabs. Each tab is dedicated to specific functions:

– this tab is a default application entry point. It contains the Perimetry Wizard interface. It allows realization of all actions that are performed in normal practice workflow. The Perimetry Wizard is composed of 5 wizard pages

- "Patients page" – patient management:
- Register new patient
- Review and edit patient data
- Delete patients from the database
- Search for a patient using fast search
- Manage patient data incoming form EMR systems
- "Program page" – test programs management
- Select existing test program
- Create new test program
- Edit test program
- Delete test program
- Select the EMR work order for processing
- "Test preparation page"

- Select the tested eye
- Adjust a patient eye position
- Adjust the trial lens settings
- Adjust fixation target, reliability tests, skip fovea test and blind spot test

• "Examination page"

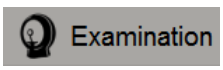
- Perform the STATIC visual field test (start, pause, stop)
- Run the demo test
- Adjust a patient eye position
- Adjust fixation target, reliability tests

• "Results page"

- Print the test results
- Perform the other eye test
- Perform the retest of selected points
- Export data with "Direct export interface"
- Store the examination result

– in this tab, you can access data of patients registered in the database. You can specifically:

- select the current patient
- register new patients
- review and edit patient data
- delete patients from the database
- search for a patient using search filters
- review list of tests associated with patients
- transfer tests between users
- import patient data and test results from XML files
- export patient data and test results to XML files



– in this tab, you can carry out visual field tests. You can specifically:

- examine the current patient
- change test settings
- create, modify and delete test programs
- retest the current patient

– in this tab, you can access the test results. You can specifically:

- view the test results of the current patient (as maps)
- filter test results
- change tools used in results analysis
- change the results display mode
- edit remarks
- import tests from GDT and XML files
- export tests to XML files
- generate test reports
- compare tests, analyze the disease progress


– Settings - in this tab, you can access application management tools. You can specifically:

- change user interface
- change sound settings
- change institution data
- change results display settings
- create and read database backup
- change auto-backup settings
- recover database
- configure a connection to a remote database
- create and delete user test fields
- configure data exchange mechanisms
- manage user accounts

7.4. *Closing the application*

To close the application, press “X” in the top right corner of the main window. Before you close the application, make sure all changes have been saved and confirm the closing.

Switch the power button and cover the instrument with the dust cover. It is recommended to switch off the power supply of the instrument before extended non-use period (not overnight), although the instrument is designed to work continuously. Disconnect the device from the source of power supply if the perimeter will not be in operation for a longer period of time (more than a day). This will help protect the instrument from voltage surge.

8. *Start – the Perimetry Wizard interface*

This chapter describes the Start tab with the Perimetry Wizard interface. The Perimetry Wizard offers the alternative workflow to the standard Patients>>Examination tabs. The following Perimetry Wizard pages will be reviewed:

- Patients Page
- Programs Page
- Test Preparation Page
- Examination Page
- Results Page

8.1. *Wizard Patients Page*

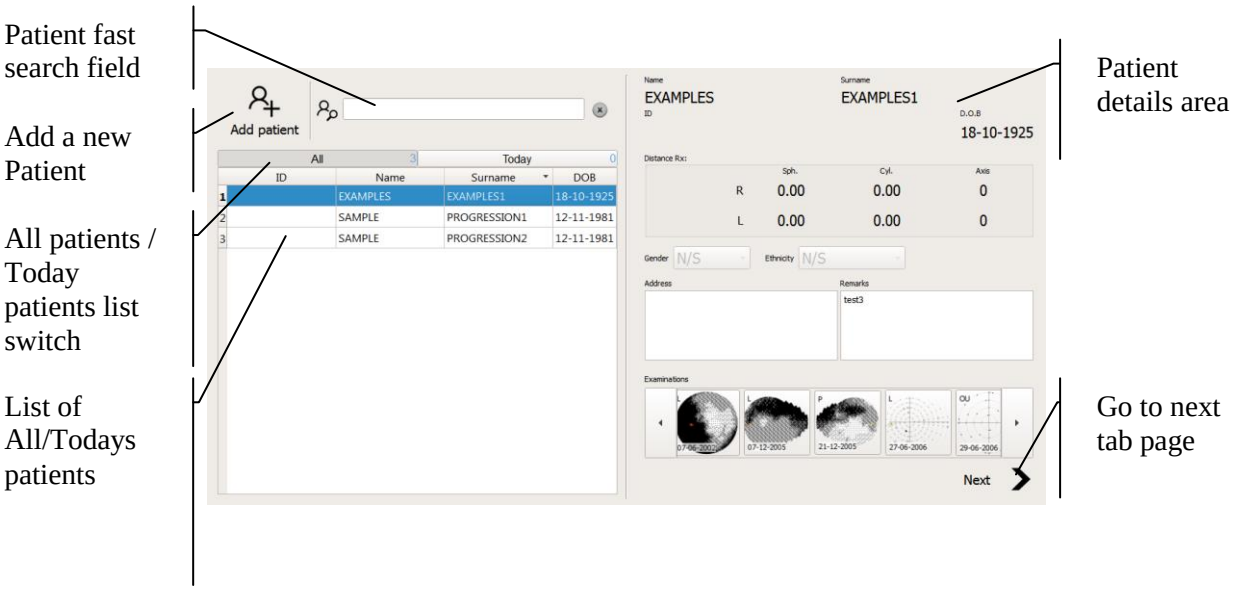


Figure 27. Perimetry Wizard Patients Page

Patients Page is the entry point of the Perimetry Wizard interface. The left part of the page shows the list of patients. The list can be switched to “All” or “Today” mode.

- The list in “All” mode simply displays all patients registered in the database.
- The “Today” mode contains all patients who had the examination results stored this day and patients incoming from the EMR/Dicom MWL interfaces.

Before the examination is carried, the patient record must be filled. User can select the patient already existing in the patients list or fill the new patient record.

The right part of the page contains the Patients details area. This area holds all the details about the patient which are stored in database.

To perform an examination of the patient it is not necessary to store his details in the database. Filling ten new patient record and using "Next" will create the temporary patient record which will not be stored in database unless the user decides to store the examination result. Therefore it is possible to generate the test reports without storing patient data.

To perform an examination of the patient it is only necessary to enter the patients Date of Birth. Therefore examination can be performed for anonymous patient.

8.1.1. Patient registration

To create a new patient, click the "Add patient" button above the patients list. The patient details area will be switched to edit mode.

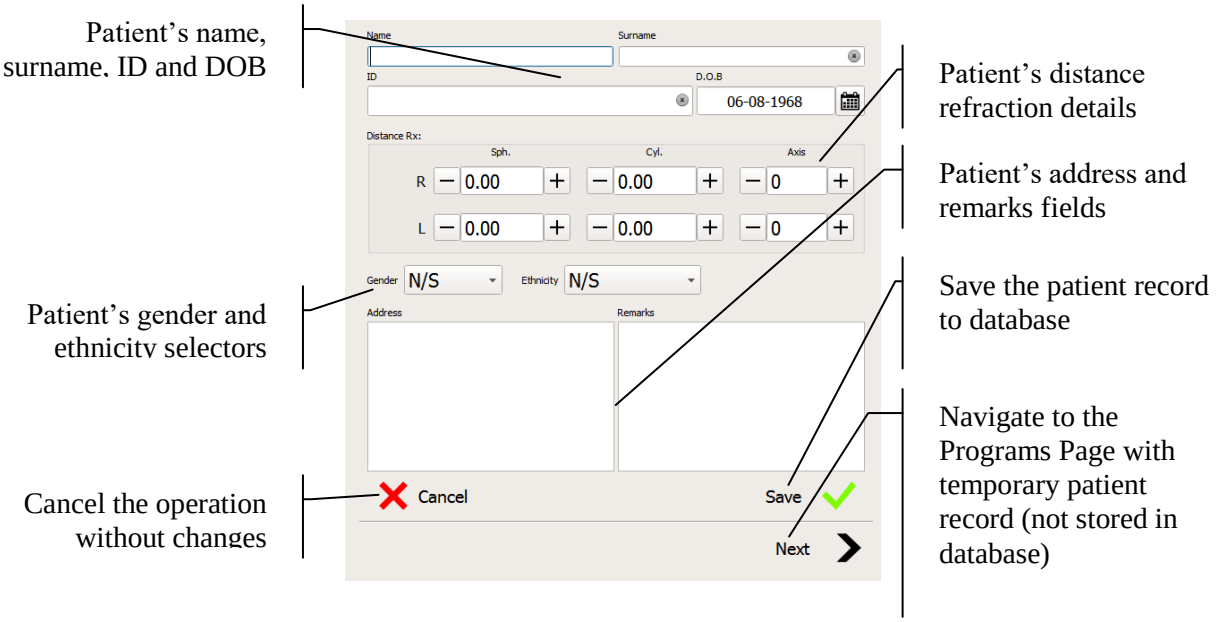


Figure 28. Patients page - patient details editor

The editing can be finished with one of three options:

Cancel – all changes done to the patient record will be canceled;

Save – the patient record will be changed and saved to database;

Next – the patient record will be kept but not stored in the database. The wizard will go to the next page.

When user inserts the patient name, surname, ID the list of patients in the left panel will be filtered and show patients matching the entered data. This can help identifying patients which are already registered and avoid duplicating the data in the database.

8.1.2. Editing patient data

The editing of the existing patient can be done in two ways:

Use a right mouse button over the patient row in the patients list to display the context menu. Select "Edit" form the context menu to switch the patient details area to edit mode.

Click any of the text labels contained in the patient details area.

The editing can be finished with one of two options:

Cancel – all changes done to the patient record will be canceled;

Save – the patient record will be changed and saved to database;

8.1.3. Deleting patient data

To remove the patient data form the database, use a right mouse button over the patient row in the patients list to display the context menu. Select "Remove" form the context menu.

Deleting patient data from the database means that all test results associated with the patient will be deleted as well. Once deleted, no patient data can be restored, so make sure to select the appropriate patient from the list of patients, and that you will never have to use the patient data again.

8.1.4. Patient lookup

To quickly find patient records from the list of registered patients, data sorting mechanism and filter & search module are provided in the program.

8.1.4.1. Sorting patient records

The list of patients can be sorted in either of four columns in an ascending or a descending order. The sorting mode can be changed by clicking on the header of the column of choice. The arrow in the column header indicates the currently sorted column and the sorting direction.

	ID	Name	Surname	DOB
1		TEST1	TEST1	23-06-1984
2		TEST2	TEST2	23-07-1950

Figure 29. Sorting patient records

8.1.4.2. Fast search

Fast Search mechanism allows to quickly search for patient records by entering a sequence of characters. Enter a sequence of characters in the fast search field and the list displayed in one of the columns will include patients who meet the search criteria.

To cancel the Fast Search mode, delete all characters from the edition field or click ‘X’ to delete the filter.

Use Ctrl + F to quickly search a patient in the Patients tab. The cursor will move to the Fast Search edition field. You can now enter the selected string of characters.

8.2. *Wizard Programs Page*

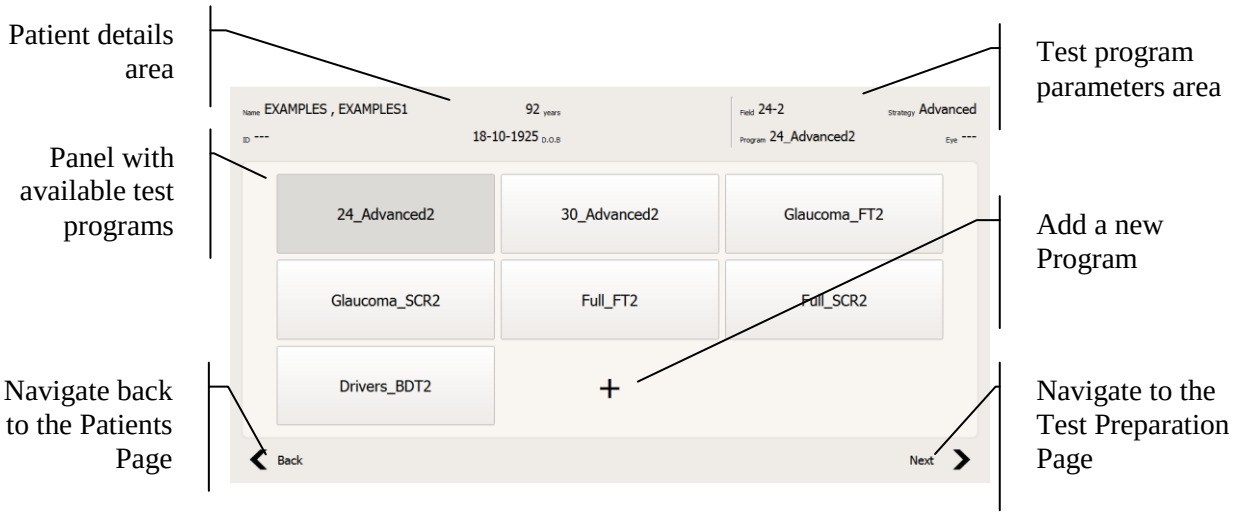


Figure 30. Perimetry Wizard Programs Page

Programs Page of the Perimetry Wizard interface is the first page which configures a perimetry examination. The central area contains a grid of buttons with test programs names. The top part contains the details of currently selected patient and parameters of the selected test program. The bottom area contains wizard navigation controls.

The Programs Page allows to:

- **Select an existing test program** – click the button with the name of a requested test program. The Perimetry Wizard will automatically navigate to the Test Preparation Page.
- **Create a new test program** – click the button with a "+" symbol at the end of the program buttons list. The Program Editing dialog will be displayed.
- **Edit an existing test program** – use a mouse to right click over the requested test program to display the context menu. Select the "Customize" option and the Program Editing dialog will be displayed.
- **Delete an existing test program**– use a mouse to right click over the requested test program to display the context menu. Select the "Remove" option and accept the confirmation message.

Clicking the particular test program button will select that test program and automatically forward the Wizard to the Test Preparation Page.

8.2.1. Editing a test program

The Program Editing dialog is used for editing of an existing test program or for adjusting parameters of a new test program.

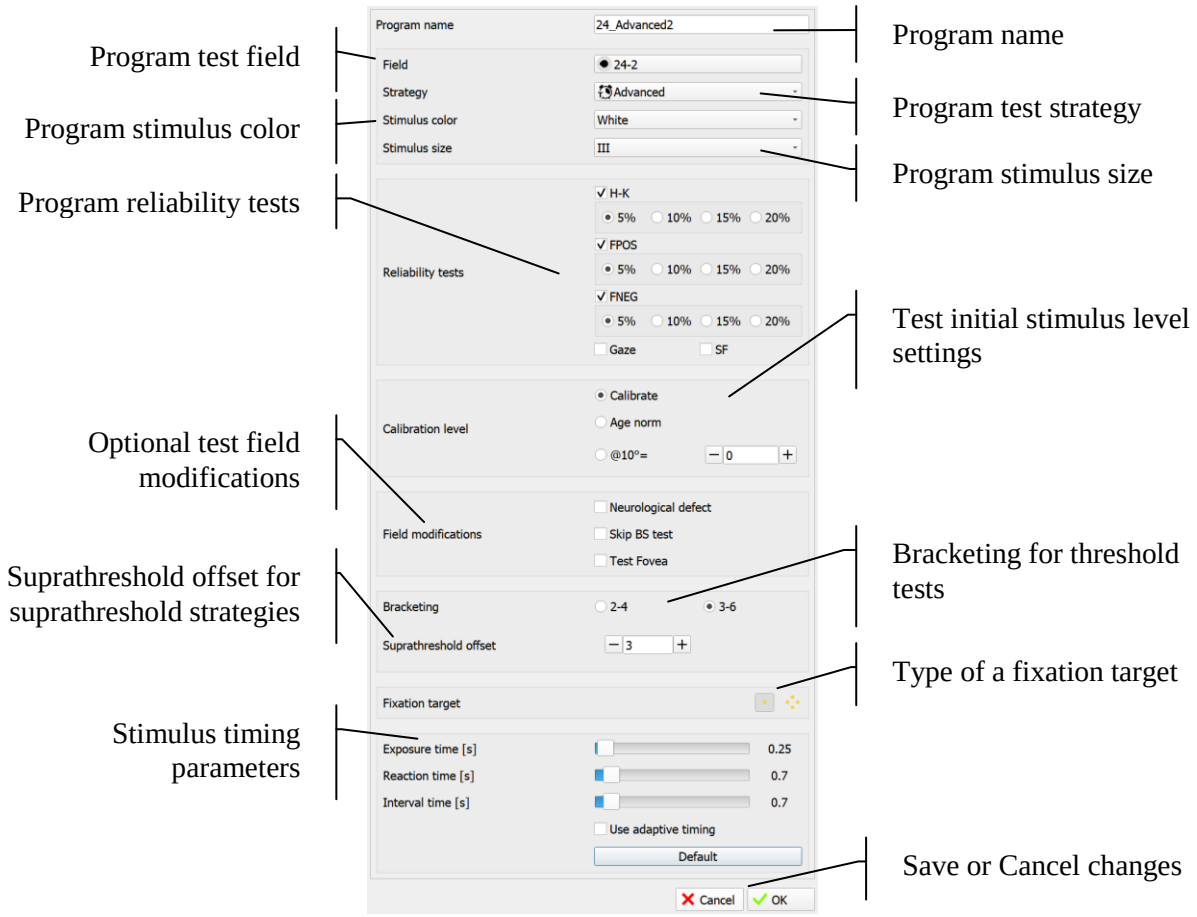


Figure 31. Editing test program

The controls in the dialog reflect the current settings in the edited or newly created test program. Meaning of particular test settings parameters is described in chapter 10.2Test settings.

8.3. *Wizard Test Preparation Page*

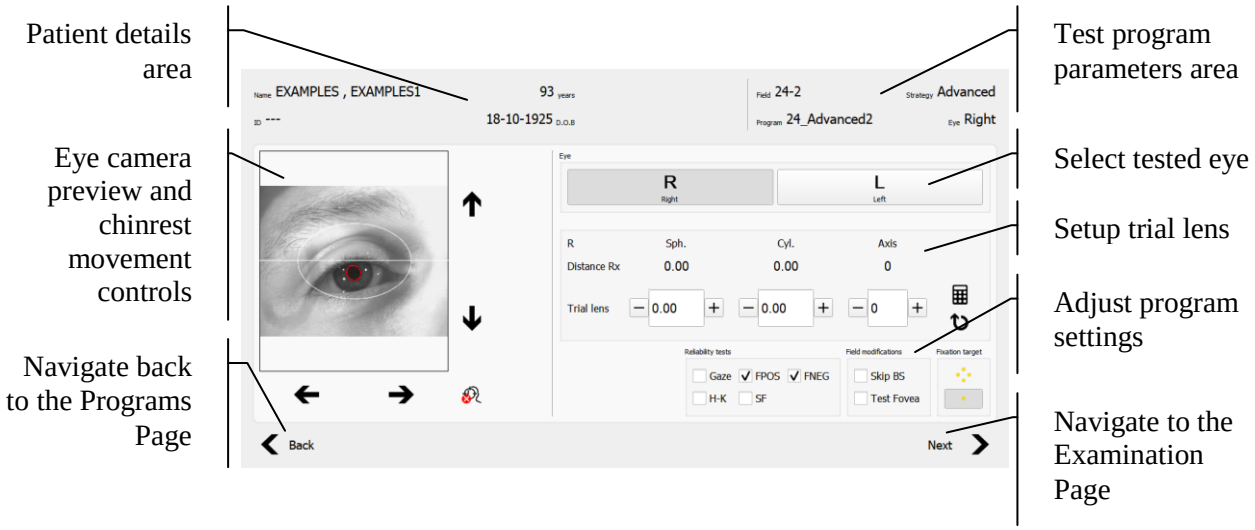


Figure 32. Perimetry Wizard Test Preparation Page

Main task of the Test Preparation Page is to allow user to adjust the test program parameters which are specific to patient.

The page allows to:

Select the tested eye – use buttons in "Eye" group to select which eye is to be tested.

Adjust the patient position – patient should be positioned so the tested eye is roughly in the middle of the eye camera preview (fits into the center ellipse). The chinrest movement buttons should be used to adjust the position in vertical and horizontal axis (if available).

Enter the trial lens parameters – use the manual controls to setup the lens parameters manually. Use the "Recall" button to get the settings used when testing the patient last time. Press the "Calculate" button to let the software propose the correction lens according to patients distance Rx value and his age.

Clicking the left mouse button over the patients distance Rx values, opens the editor controls and allows to temporarily modify the distance Rx. If the test result with modified values is stored to database, user will be asked whether to update the existing patient's record with a new distance Rx values.

Adjust the program test settings ad hoc – Reliability tests, field modifiers and fixation target can be changed to adjust the defined program settings to a particular patient and his condition.

When the selection on the Test Preparation Page is done, clicking the "Next" button will forward the Wizard to the Examination Page.

8.4. *Wizard Examination Page*

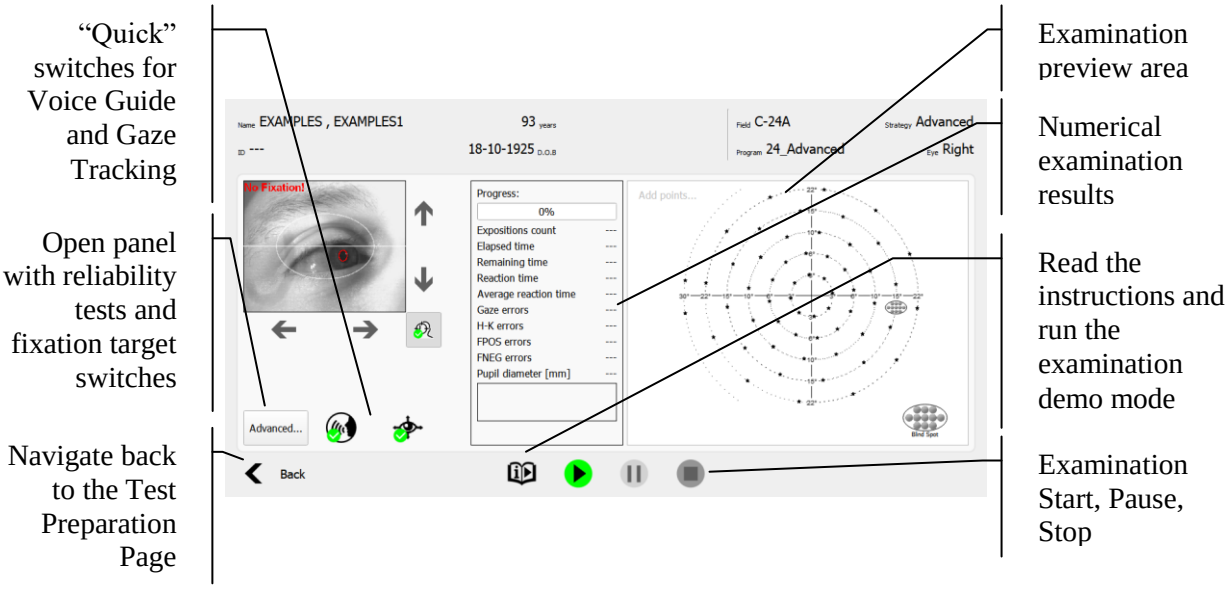


Figure 33. Perimetry Wizard Examination Page

The Examination Page is used for controlling and previewing a perimetry examination progress. The page allows to:

Adjust the chinrest position – patient should be positioned so the tested eye is roughly in the middle of the eye camera preview (fits into the center ellipse). The chinrest movement buttons should be used to adjust the position in vertical and horizontal axis (if available).

Adjust the program test settings ad hoc – Reliability tests and fixation target can be changed to adjust the defined program settings to a particular patient and his condition. Controls are normally hidden and can be opened by clicking the "Advanced.." button.

Temporarily switch off/on the Gaze Tracking – In case of problems with eye pupil detection, the examination can take a long time when the Gaze Tracking is active. In such situations it is suggested to deactivate the Gaze Tracking to complete the examination. This can be done with the quick "Gaze Tracking" button under the eye camera preview.

Temporarily switch off/on the Voice Guide – some operators prefer to guide their patients by themselves. The "Voice Guide" button located under the eye camera preview can be used to deactivate a built in Voice Guide functionality.

Run the Demo test – to familiarize unexperienced patients with the perimetry examination, the Demo test function can be used. The Demo test is a simple version of a regular test. The Demo test starts with the dialog containing instructions how patient should behave during the test. The instructions may be read by operator or by the software (if translations are available). After the instructions phase, the simplified version of the test is started. The test will run until it finishes or until stopped by operator. The Demo test result is not stored in database.

Start, Pause, Stop the examination – set of three intuitive controls located in the middle of

wizard navigation bar are used to control the progress of the examination.

When examination is stopped either by finishing the testing or by user's choice to stop unfinished test, the Wizard forwards to the Results Page.

8.5. *Wizard Results Page*

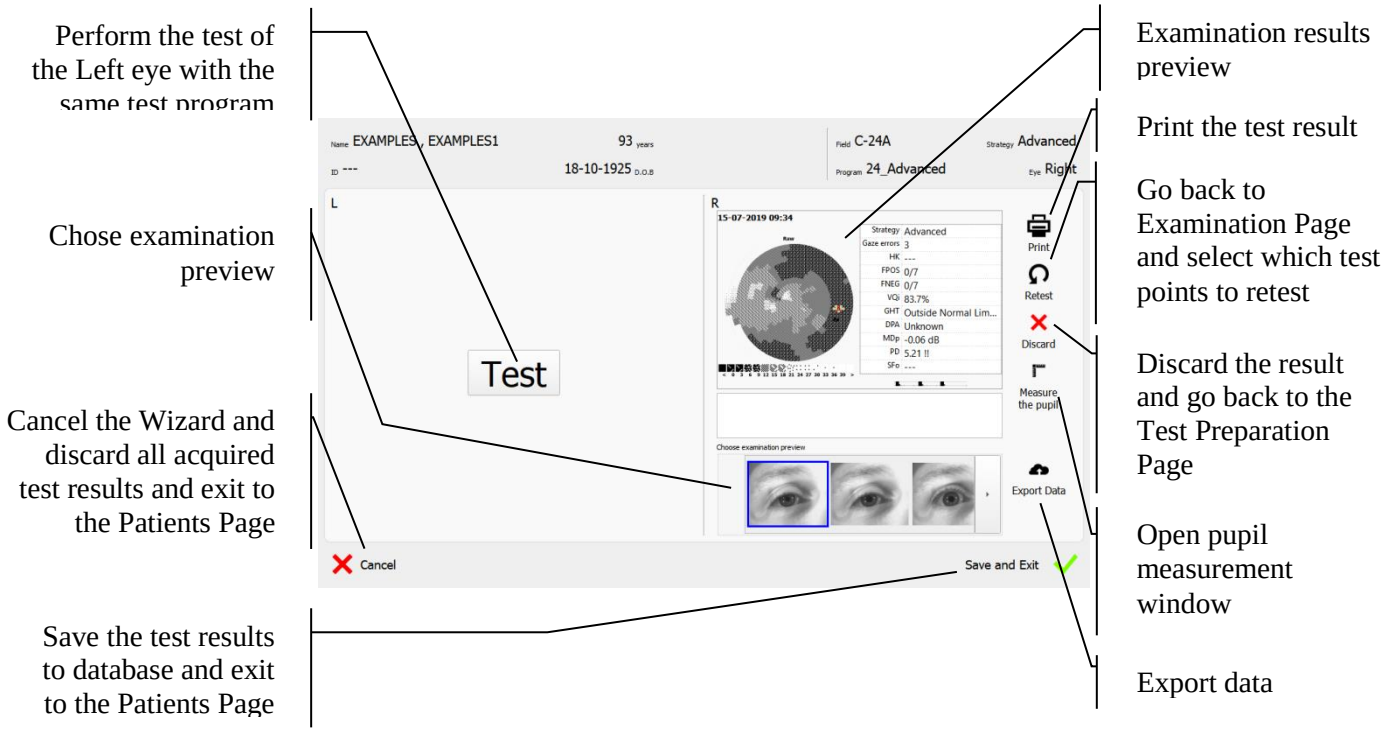


Figure 34. Perimetry Wizard Results Page

The Results Page contains the preview of completed examinations for the left and right eyes or for both eyes. The page allows to:

- **Print the examination report** – Click the "Print" button to open the report generation dialog with the test result.
- **Retest the examination** – Click the "Retest" button to go back to the Examination Page and select which points should be retested.
- **Discard the examination result** – Click the "Discard" button to discard the examination result and go back to the Test Preparation Page.
- **Test the other eye** – Click the "Test" button in the middle of the examination result area to go back to the Test Preparation Page with the other eye selected for testing. The examination result of the first eye will still be available in the Results Page.
- **Save the examination result** – Click the "Save and Exit" button to store the examination results of right/left/both eyes to database. After the test is stored, the Wizard jumps to the Patients Page and is ready for a new examination series.
- **Discard all acquired test results** – Click the "Cancel" button to discard the examination results of right/left/both eyes. After the current series is canceled, the Wizard jumps to the Patients Page and is ready for a new examination series.

9. *Patients*

This chapter describes the Patients tab.

patient registration

editing patient data

searching and sorting patients

deletion of patients from the database

9.1. *Interface of the Patients tab*

The Patients tab is where you can select patients for testing or for test results analysis.

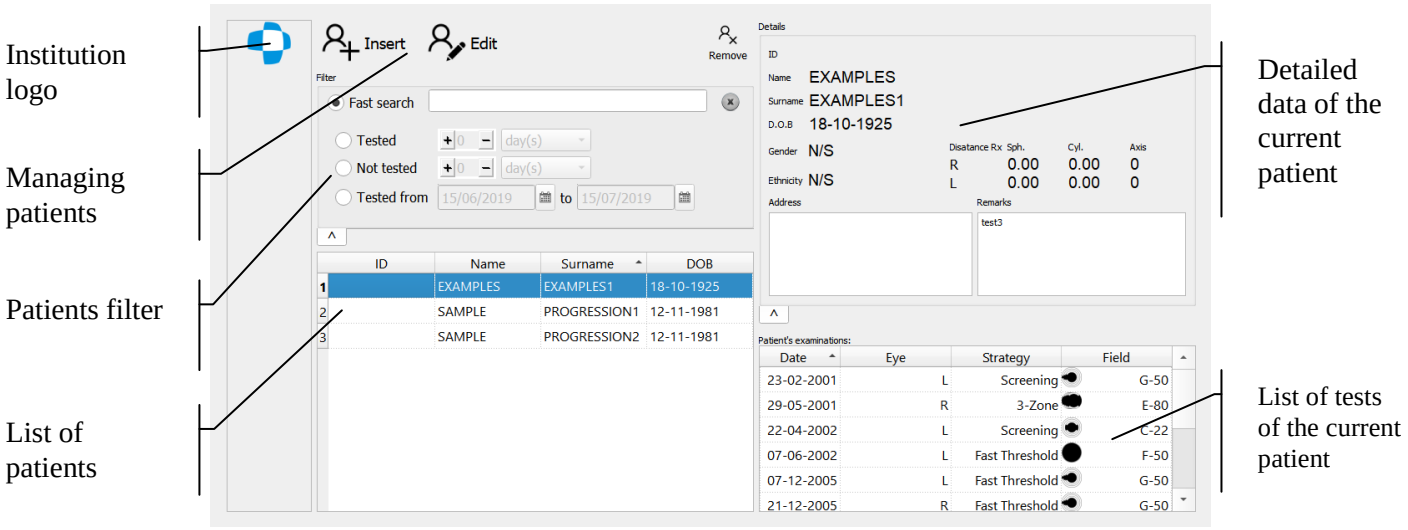


Figure 35. Patients tab

9.2. *Patient registration*

Before any examination is carried out, select a patient from the list of existing patients (registered patients) or register a new patient. To register a patient, go to the Patients tab.

To add a new patient, click the ‘Insert’ button on top of the list of patients. A new empty record will be added to the list of patients and a detailed patient data editing mode will be brought up. Manually enter the patient data:

- First name
- Surname
- Date of birth

Click ‘Save’ to confirm the data you have entered. A new patient record with the entered patient data will be added to the list of patients and will be automatically selected as the current patient.

Examination can now be carried out for the new patient.

By entering a lens correction factor, if necessary, you will be able to use a calculator in the test preview window to calculate the correction factor used in the test.

The patient record must by unique in the database scope. Every patient has to have at least the date of birth. If name and/or surname fields are left empty and identification number ID is not entered by operator, patient will get an automatically generated unique ID. To register two patients with exactly the same personal data (Name, Surname and DOB), they should have a unique identification number (ID) assigned.

9.3. *Editing patient data*

To add or update data of registered patients, go to the detailed patient data editing mode. Click 'Edit' to select this mode.

Use the Tab key to toggle between patient data fields.

With the detailed patient data editing mode on, press Enter key to save the data, or Esc key to cancel (except for the fields: address and remarks).

The database contains the following patient data:

Identification Number (ID) - an additional patient identification number (ID number, health insurance number, etc.). The reference number can consist of up to 64 alpha-numerical characters (including spaces, hyphen "-", and underscore "_"). The reference number is not case-sensitive.

Reference number is not obligatory. However, it must be unique if entered into the system. Do not assign two identical reference numbers to two different patients.

Name – patient's first name and middle name(s). It can consist of up to 64 characters.

Surname – patient's surname(s). It can consist of up to 64 characters.

Date of Birth (D.O.B) - patient's date of birth with which the patient is assigned to a particular age group. This information is used in analyzing deviations from age normative values and in calculating the refractive error correction in the examination window. The date of birth can be entered from the calendar or the keyboard. Click the button to the right of the date to access the calendar.

To enter the date of birth from the keyboard, double click the field of the first element of the date (day of month, etc.). The digits will be separated automatically.

Gender – patient's gender. This information is irrelevant for results analysis but can be useful for doctors in reviewing the test results.

Ethnicity – ethnic origin of the patient. This information is irrelevant for results analysis but can be useful for doctors in reviewing the test results.

Correction lens – left / right eye refractive error correction. Correction factors to be used during the test are calculated from this value. The range is between -18D and 18D in 0.25D intervals, and between 0° and 180° axis in 10° intervals.

Address – patient's contact data (address of residence, telephone number, e-mail address).

Remarks – additional remarks about the patient and his/her health status.

9.4. *Deleting patient data*

Press 'Remove' to delete data of the current patient.

Deleting patient data from the database means that all test results associated with the patient will be deleted as well. Once deleted, no patient data can be restored, so make sure to select the appropriate patient from the list of patients, and that you will never have to use the patient data again.

9.5. *Patient lookup*

To quickly find patient records from the list of registered patients, data sorting mechanism and filter & search module are provided in the program.

9.5.1. Sorting patient records

The list of patients can be sorted in either of four columns in an ascending or a descending order. The sorting mode can be changed by clicking on the header of the column of choice. The arrow in the column header indicates the currently sorted column and the sorting direction.

	ID	Name	Surname	DOB
1		EXAMPLES	EXAMPLES1	18/10/1925
2		SAMPLE	PROGRESSION1	12/11/1981
3		SAMPLE	PROGRESSION2	12/11/1981

Figure 36. Sorting patient records

9.6. *Patient data filters*

Data filters can be found in a box on top of the list of patients. Quick Search option is available in the standard view. Click '...' button to expand full list of filter options.

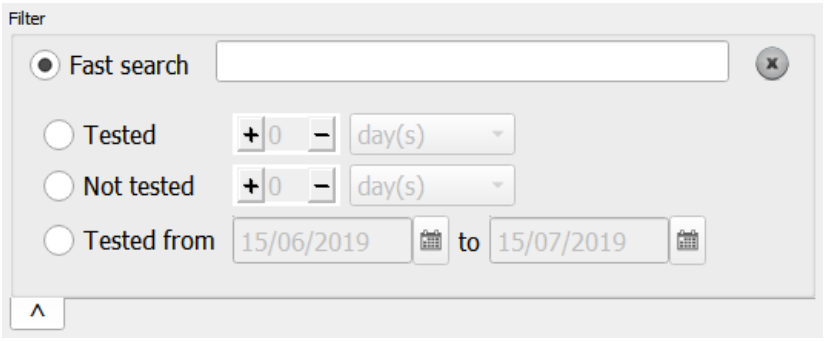


Figure 37. Patient data filters

Data filters can work in 4 modes.

Fast Search – quick search for patient records by entering a sequence of characters. Enter a sequence of characters in the fast search field and the list displayed in one of the columns will include patients who meet the search criteria.

To cancel the Fast Search mode, delete all characters from the edition field or click 'X' to delete the filter.

Use Ctrl + F to quickly search a patient in the Patients tab. The cursor will move to the Fast Search edition field. You can now enter the selected string of characters.

Tested – the system will display only patients who have been tested within the given period. The time period counts from today to X days, months or years back. The exact time range can be set using the selection controls for number of units and type of time units. To delete this filter, click 'X'.

Not tested – the system will display only patients who have not been tested within the given period. The time period counts from today to X days, months or years back. The exact time range can be set using the selection controls for number of units and type of time units. To delete this filter, click 'X'.

Tested from to – the system will display only patients who have been examined within a given time period. The period of time shall be counted from the date specified in 'from' to the date specified in 'to'. To define a period of time, you must change the values of both date edit controls or select a date from the window displayed after pressing one of the buttons with the calendar icon on the right side of the date edit control. To delete this filter, click 'X'.

To delete any filter type, click 'X' (to the left of the Fast Search mode).

9.7. *List of tests associated with the current patient*

The Patients tab also includes a table with all tests belonging to a patient.

Figure 38. List of tests in the Patients tab

This is an overview of tests belonging to a particular patient. You can also select an active test result from this list. By default, the active result will be displayed in the Results tab.

Right-click the test line in the table to open a context menu with the following options:

Review results – click to select an active test and to open the Results tab.

Follow-up test – click to select an active test and to open the Tests tab in the Follow-up Test mode.

The default order in which the previous test results are displayed is set according to the examination date and time. To change the sequence in which the results are displayed, click one of the column headers. The data sorting mode will be changed for the selected column.

Apart from standard test results, the list also contains information about whether the test has been completed, or whether incomplete results has been saved for an interrupted test. Unfinished tests will be presented in red font, in italics. In addition, a test completeness bar will be displayed in the background. The bigger the yellow field, the more examination points are left to test.

10. *Static examination*

This chapter describes the Static examinations tab

- setting the test parameters
- setting the instrument parameters
- managing the test programs
- preparation of follow-up tests

10.1. *Interface of the Static examinations tab*

The Static examinations tab is where you can access all tools necessary to prepare and run a test. This is where test parameters can be set. This window remains active until the test is completed.

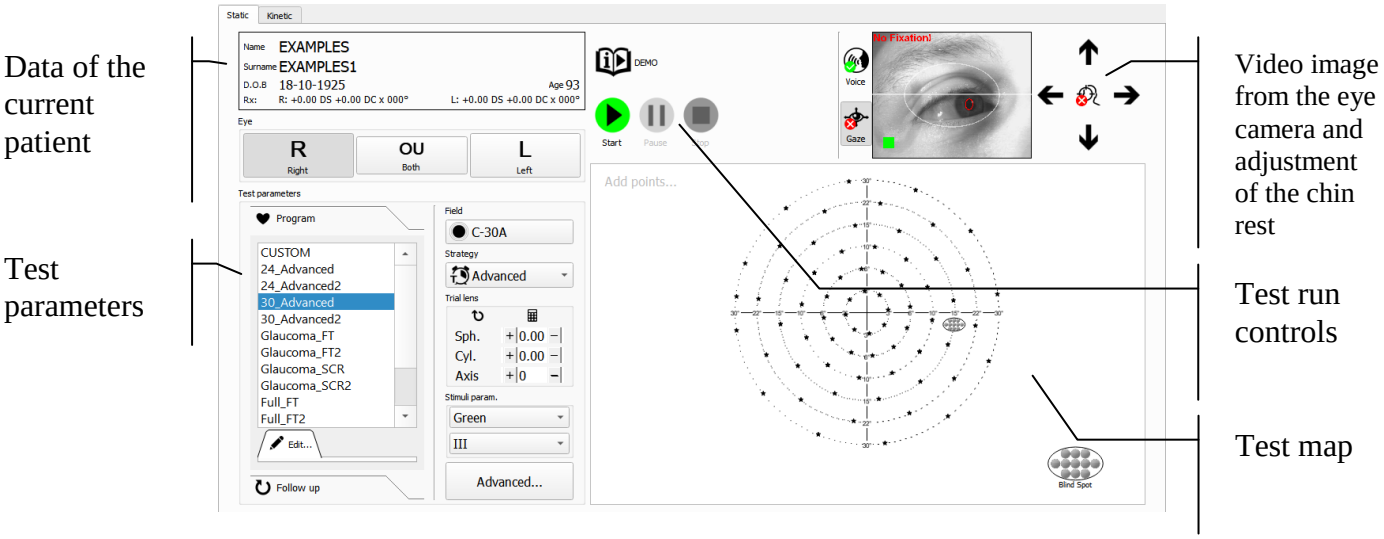


Figure 39. Static examinations tab

10.2. *Test settings*

Configure the test parameters before you start the test. You can either set all parameters manually for your current patient or use pre-defined test programs.

Some of the test parameters can be conflicting. For example, the BDT strategy can only be used for the OU (both eyes) setting.

If any conflicting settings are entered, the program will use the last change you have selected and will modify the conflicting setting accordingly. A message will be displayed that the setting has been changed. Read the message carefully and make sure the modification is acceptable.

10.2.1. Selecting the eye

The eye to test can be selected with a set of pushbuttons on the left side of the Tests tab.

Figure 40. Eye selection buttons

Click the appropriate button to change the tested eye. L, OU, and R abbreviations mean Left (left eye), oculus uterque (both eyes), and Right (right eye) respectively. The symbols are used in the interface and test reports to save space.

When the eye to test is changed, the arrangement of test points in the test preview window changes as well.

If the pre-selected test field and the test strategy are not suitable for the selected eye, the conflicting settings will be changed to the default settings of the eye selected. "Conflicting Settings" message will be displayed.

If the connected device offers a motorized left-right chinrest movement, the chinrest will automatically move to central or left-most position depending on binocular/monocular eye selection.

In the chinrest left-most position, the right chinrest slot is located in the middle of the bowl and should be used for binocular testing.

10.2.2. Selecting the test strategy

Test strategy is the test technique with which the selected eye will be tested. It defines the test accuracy and the type of test results delivered. These are discussed in the Test strategies section of this manual.

Test strategies can be selected from the Strategy dropdown list.

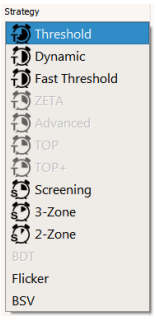


Figure 41. List of test strategies

To change the current test strategy, click the Strategy selection field and choose one of strategies listed.

If the pre-selected test field, eye, or stimulus color settings are not suitable for the selected test strategy, the conflicting settings will be changed to the default settings of the selected test strategy. "Conflicting Settings" message will be displayed.

10.2.3. Selecting the test field

Test field is the visual field area to be tested. The test field determines the size of the visual field to be tested and the arrangement of points that will be part of the test. Test fields are discussed in the Test Fields section of this manual.

To select the test field, use the "Field" button available on the programs of the test wizard and in the "Examinations" tab. After pressing the "Field" button, the field selection window will appear (Figure 42. Selected 'C-30A' field and its details - fields grouped by area). The examination fields are grouped according to:

- Area which is covered by test points
- Device type associated to the points layout.

To find out more about a particular test field, press the left mouse button on the button with the name and field thumbnail. On the selected field button, the symbol "i" will appear. To display the test field information move the mouse button over the symbol. The following information will be visible:

- number of test points
- estimated time of examination for specific examination strategies

To select a field for a test, left-click again on its button or click the accept button in the lower left corner of the window.

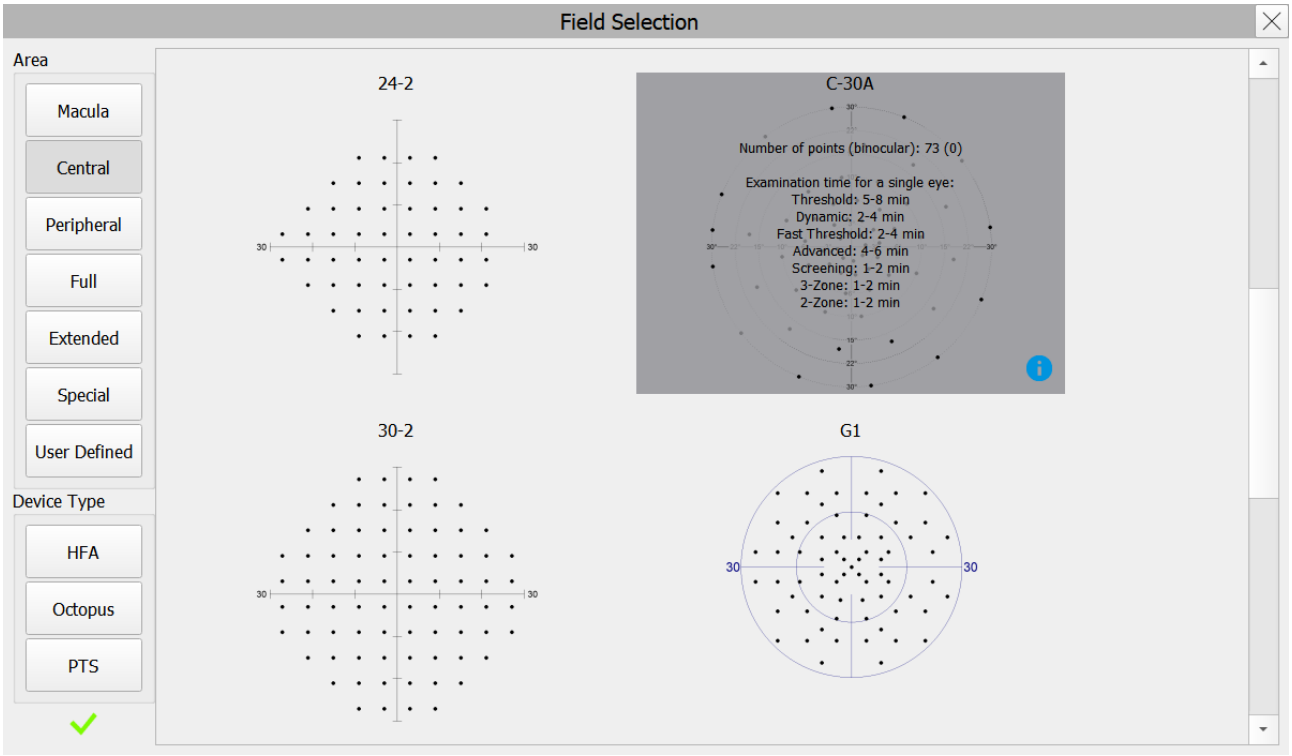


Figure 42. Selected 'C-30A' field and its details - fields grouped by area

The field selection window displays only those field that are compatible with the connected device.

If the pre-selected stimulus color is not suitable for the new test field, the conflicting settings will be changed to the default settings of the selected test field. "Conflicting Settings" message will be displayed.

Once the test field is selected, the arrangement of test points can be seen in the test preview window:

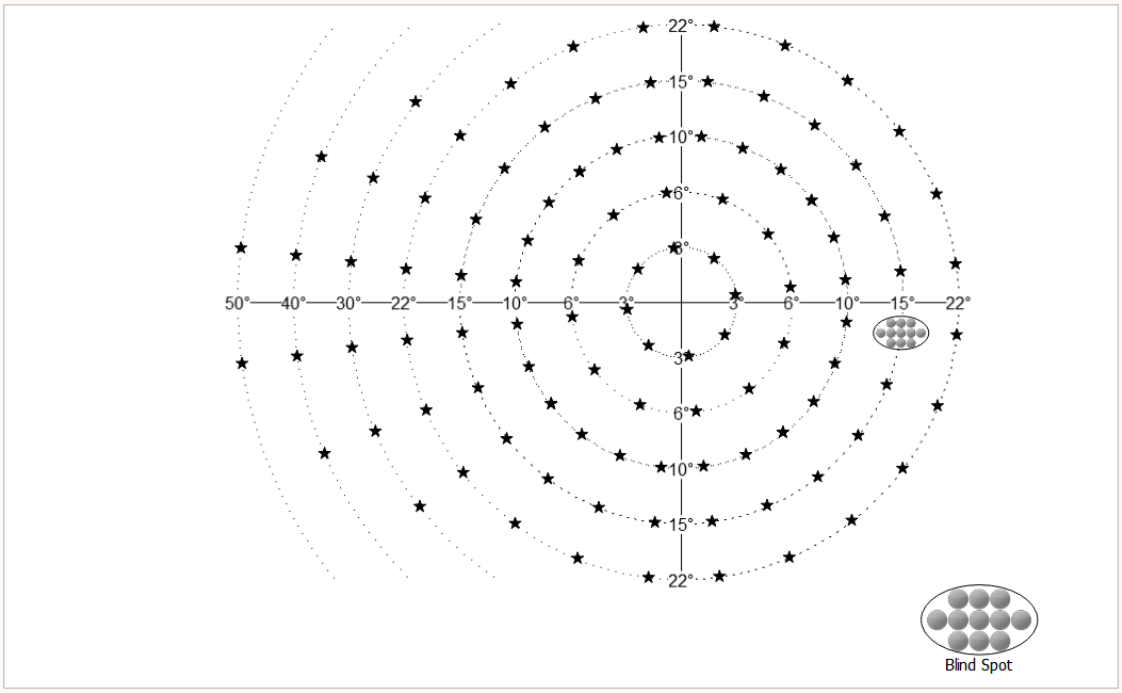


Figure 43. Test field preview

10.2.4. Selecting the Reliability Tests

The validity of visual field tests largely depends on patient cooperation and reliability, and the diagnosis should be based on both, test results and the test reliability score. There are special reliability testing procedures running simultaneously to the visual field test to help determine the test reliability. For more information about the reliability tests, go to the Test Reliability section of this manual.

Reliability tests running in parallel with the visual field test can be set with the Reliability switches.

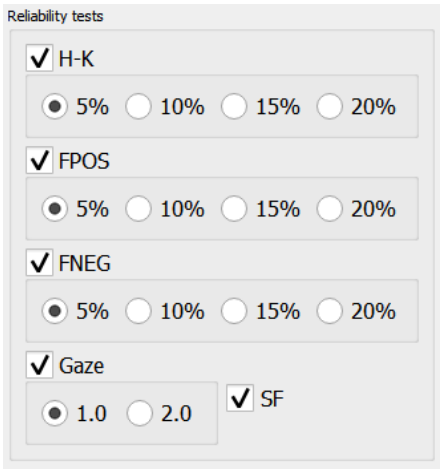


Figure 44. Selecting the Reliability Test

Gaze – tracking pupil shifts on a video image from the eye camera.

H-K – Heijl–Krakau blind spot monitoring

SF – short-time fluctuation in the test results

FPOZ – monitoring false positive results (reaction in absence of stimuli) during the test

FNEG – monitoring false negative results (no reaction to stimuli) during the test

Check / uncheck the box next to the test name to enable / disable the selected type of reliability tests to be run during the visual field test. To determine the frequency of reliability tests (H-K, FPOZ, FNEG) one of the four options under the name of each test should be marked. For example, the value of 5% means that approximately five percent of all stimulus exposures will be selected to testing as a reliability test.Setting lens correction for the test

It is important for the patient to clearly see all stimuli during the visual field test. Absence of reaction to stimuli should be attributed solely to eye diseases other than problems with eye refraction. Therefore correction lens is used to eliminate the possible influence of eye refraction problems on the test results.

Test lens of 38 mm in diameter are used for lens correction, placed in a holder in front of the patient. To get reliable test results, make sure that the correction lens option is enabled. The test will be divided into two phases:

- internal diameter of the visual field –within a 30° ring, tested with correction lens
- external diameter of the visual field – outside a 30° ring, tested without correction lens

This division is introduced to eliminate artifacts generated when some of the stimuli is covered by the lens holder and the correction lens frame.

To activate the correction lens option, enter a non-zero value in the correction lens settings:

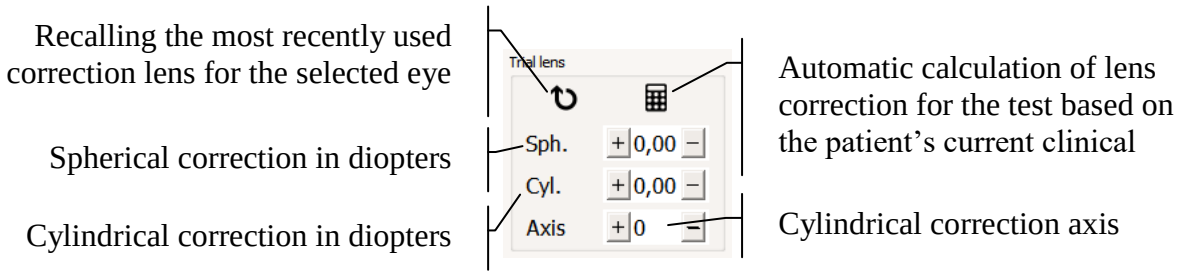


Figure 45. Settings of correction lens for the test

Correction values can be entered manually or with one of supporting tools. The available lens correction range is between -18D and 18D in 0.25D steps. Cylinder axis can vary within the range of 0° and 180°.

Recalling the recently used correction lens for the tested eye – this function browses all previous tests belonging to current patient. If the selected eye has been already tested, the system will recall the correction lens used in the previous test.

Lens calculator – it calculates the proposed correction lens based on the patient's current clinical refraction and age. The following calculation formulas are used:

Cylindrical refractive errors ≤ ±0.25D are ignored.

Cylindrical refractive errors (±0.25D, ±1> are substituted with a spherical equivalent rounded up to 0.25D.

Spherical refractive error is adjusted for patient age:

[30 years, 40 years) +1D;

[40 years, 45years) +1.5D;

[45 years, 50 years) +2D,

[50 years, 55 years) +2.5D,

[55 years, 60 years) +3D;

>60 +3.25D.

If the calculated spherical correction value ranges from [-3, 0), spherical correction is set to 0D.

If the calculated spherical correction value is <-3 (short-sightedness), 3.25D of spherical correction is added.

10.2.5. Setting the fixation type

There are two central fixation targets available:

a single illuminated point in the centre of the visual field

four illuminated points around the centre of the visual field, shaped in a diamond

Single-point central fixation is changed to four-point central fixation to test patients with an absolute defect in the central part of the visual field.

Central fixation can be switched with the Fixation Target controls.

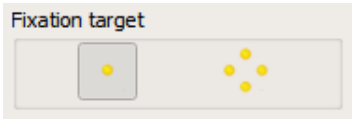


Figure 46. Selecting the fixation target

10.2.6. Setting the bracketing for threshold strategies

Threshold and Screening strategies are based on the varying brightness of stimuli used for thresholding. Stimulus brightness changes gradually. Graduation can be set to either 2-4 or 3-6 intervals. It can be set with the Bracketing controls.

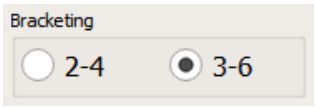


Figure 47. Selecting the bracketing for threshold strategies

2-4 – change interval below the visibility threshold equals 4dB, and is changed to 2dB when the threshold is exceeded. The accuracy of the threshold value is ±1dB.

3-6 – change interval below the visibility threshold equals 6dB, and is changed to 3dB when the threshold is exceeded. The accuracy of the threshold value is ±1.5dB.

10.2.7. Setting the calibration level (initial stimuli level)

In visual field testing strategies based on stimuli of varying brightness, an initial stimuli level of brightness is used as the reference point for visibility thresholding. The closer the initial stimuli level is to the visibility threshold, the shorter it takes to determine the threshold level. To reduce the test duration, each test starts with calibration, which is designed to determine the reference level. It is also possible to use a predefined value as a calibration level, or to use a normative value for the patient's age group.

To set the calibration level, use the Calibration Level controls.

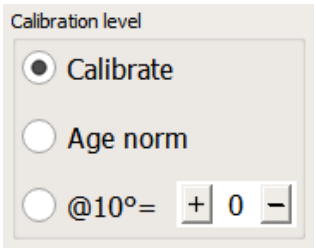


Figure 48. Setting the calibration level

Calibrate – initial brightness level of stimuli is determined through calibration. Calibration is when the threshold value is found in each of visual field quadrants at 10° distance from the centre. The 4 values obtained are filtered and a mean value is calculated. The mean value is the HoV level at 10° eccentricity. The initial stimuli levels for all field points are equivalent to the calculated HoV level at the particular point minus:

value of the smallest step in the selected bracketing setting (2dB for 2-4 or 3dB for 3-6) for threshold strategies

3dB for 2- and 3-zone strategies.

To determine the HoV level, HoV slope is assumed to be 3dB / 10°.

Age Norm – initial stimuli level determined for the test on the basis of age normative values. Unlike in the calibration phase, the age normative value is set for four points of the 10° radius, and these points are not tested. HoV is determined according to the age norm, and the initial stimuli levels are equivalent to HoV minus:

value of the smallest step in the selected bracketing setting (2dB for 2-4 or 3dB for 3-6) for threshold strategies

3dB for 2- and 3-zone strategies.

To determine the HoV level, HoV slope is assumed to be 3dB / 10°.

Set Value "=" - initial stimuli level determined for the test on the basis of a pre-set value The pre-set value is assigned to four calibration points of the 10° radius. HoV is determined

according to the pre-set value, and the initial stimuli levels are equivalent to HoV minus:

a) value of the smallest step in the selected bracketing setting (2dB for 2-4 or 3dB for 3-6) for threshold strategies

b) 3dB for 2- and 3-zone strategies.

To determine the HoV level, HoV slope is assumed to be 3dB / 10°.

10.2.8. Setting the suprathreshold offset

Each suprathreshold (screening) test uses the stimulus of a brightness that is higher than the expected patient's threshold. Bu default the screening strategies use the stimuli 3dB brighter that the calibration level which means that the stimuli brightness is twice as bright as expected threshold. The offset of the actual stimuli brightness over the expected patients's threshold can be adjusted with use of "Suprathreshold offeset" selector.

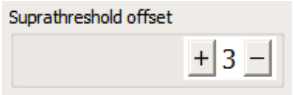


Figure 49. Setting the suprathreshold offset value

10.2.9. Field Modifications

There is a setting in the "Field Modifications" controls with which the number of tested field points can be reduced. This helps reduce test duration by eliminating unnecessary points.

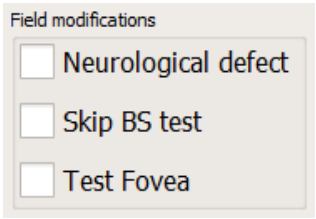


Figure 50. Setting the test field modification options

10.2.9.1. Neurological defect

By checking the Neurological Defect checkbox, the system will run a test for the presence of neurological defects in the visual field quadrants before the normal test begins. The tested patient is exposed to a maximum brightness stimulus at particular locations in each of the visual field quadrants. If the patient has reacted to the stimulus displayed in the tested visual field quadrant, the quadrant will be included in the standard test. If the patient has not reacted to the stimulus in three subsequent points within a single quadrant, the respective quadrant will be considered a neurological visual field quadrant.

After all quadrants have been tested, the user will be informed of the neurological visual field quadrants and will be asked if these quadrants are to be excluded from the test, or tested as normal.

10.2.9.2. Fovea test

By checking the Fovea checkbox, the system will run a test of the foveal sensitivity before the normal test begins. During the fovea test the fixation target is switched to four points outside of the center (so called diamond shaped). The stimulus is exposed between the fixation points and its intensity is varied with thresholding algorithm.

After the foveal sensitivity threshold is estimated, the fixation target is switched to the original one which was set in test settings and the test proceeds as normally.

10.2.9.3. Skip BS test

For some patient conditions it is not necessary to evaluate the location of the blind spot. To speed up the test, operator can set "Skip BS" option. It will make the test run without the blind spot evaluation phase.

The "Skip BS" option influences the Heijl-Krakau fixation monitoring which relays on a identified blind spot area. If the "Skip BS" option is set, the H-K reliability tests are switched off and set unavailable.

10.2.10. Setting the stimulus size, stimulus and background color

Depending on the device model, there is ability to change the size and color of the displayed stimulus. Apart from standard tests in which green (575 nm) or white stimuli are displayed against a white background (10 asb/31asb), the selected device models can also run tests using blue (465 nm) stimuli against yellow background (100 asb). This test is intended to study isolated blue cone cells, which are fewer and whose defects are easier to identify in glaucoma. With the yellow background, red and green cone cells are "excluded" from the test.

To change the size of the stimulus, color of the test points and the background, unfold the dropdown list in the Stimuli Param. box.

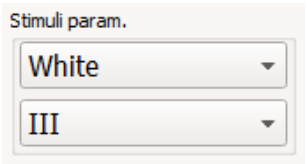


Figure 51. Setting the stimuli size, stimuli and background color

To change the current size or color, click the color or size selection box and choose one of colors/sizes listed.

Blue stimuli can be found in the central part of the visual field, within the 0°-30° range. Blue stimuli can only be used in a limited number of test fields.

If the pre-selected test field, eye, or test strategy are not suitable for the new color settings, the conflicting settings will be changed to the default settings of the selected stimuli color. "Conflicting Settings" message will be displayed.

When the stimulus color changes to blue, the bowl color will be illuminated bright yellow. For the test to be successful, wait around 30 seconds until the patient's eye accommodate to the change of light. Proceed the same way when the stimulus turns green.

10.2.11. Combinations of strategy, field, eye and stimulus color settings

The table below lists all possible combinations of test strategies and test field settings. Information about possible eye settings for the relevant test field and test strategy settings is provided at the intersection of the Strategy row and the Field column. Blue cells indicate combinations with which blue stimuli can be used in PTS 920BY (In PTS 2000 the blue stimuli can be used in all fields).

Table 3. Combinations of strategy, field, eye and stimulus color settings

field / strategy	*Threshold*	*Dynamic*	*Fast Threshold*	*ZETA™/ ZETA™ Fast/ ZETA™ Faster*	*Advanced*	*TOP*	*TOP+*	*Screening*	*3-Zone*	*2-Zone*	*BDT (Drivers)*	*Flicker*	*BSV*
Radial fields													
F-50	L R	L R	L R					L R	L R OU	L R		L R	OU
G-50	L R	L R	L R					L R	L R	L R		L R	
C-22	L R	L R	L R					L R	L R OU	L R		L R	OU
C-24A	L R	L R	L R		L R			L R	L R	L R		L R	
C-30A	L R	L R	L R		L R			L R	L R	L R		L R	
M-10	L R	L R	L R					L R	L R OU	L R		L R	OU

field / strategy	*Threshold*	*Dynamic*	*Fast Threshold*	*ZETA™/ ZETA™ Fast/ ZETA™ Faster*	*Advanced*	*TOP*	*TOP+*	*Screening*	*3-Zone*	*2-Zone*	*BDT (Drivers)*	*Flicker*	*BSV*
C-30	L R	L R	L R					L R	L R OU	L R		L R	OU
P-50	L R	L R	L R					L R	L R OU	L R		L R	OU
E-80	L R	L R						L R	L R	L R		L R	
BDT (Drivers)											OU		
FeV G1	L R	L R						L R	L R	L R		L R	
FeV G2	L R	L R						L R	L R	L R		L R	
User	L R	L R	L R					L R	L R	L R		L R	
Orthogonal fields													
F50-2	L R	L R	L R					L R	L R OU	L R		L R	OU
G50-2	L R	L R	L R					L R	L R	L R		L R	
24-2	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R		L R	
24-2C	L R	L R	L R	L R				L R	L R	L R		L R	
30-2	L R	L R	L R	L R	L R	L R	L R	L R	L R OU	L R		L R	OU
30-2C	L R	L R	L R	L R				L R	L R	L R		L R	
5-2	L R	L R	L R					L R	L R OU	L R		L R	OU
10-2	L R	L R	L R	L R				L R	L R OU	L R		L R	OU
P50-2	L R	L R	L R					L R	L R OU	L R		L R	OU
Esterman M								L R	L R	L R		L R	

field / strategy	*Threshold*	*Dynamic*	*Fast Threshold*	*ZETA™/ ZETA™ Fast/ ZETA™ Faster*	*Advanced*	*TOP*	*TOP+*	*Screening*	*3-Zone*	*2-Zone*	*BDT (Drivers)*	*Flicker*	*BSV*
Esterman B											OU		
Gandolfo									OU		OU		
G0-2	L R	L R	L R						L R	L R		L R	
Sup 44								L R	L R OU	L R		L R	
User	L R	L R	L R					L R	L R	L R		L R	
Projection fields													
FF 120								L R	L R	L R		L R	
Sup 64								L R	L R OU	L R		L R	
G1	L R	L R	L R		L R	L R		L R	L R	L R		L R	
N1								L R	L R	L R		L R	
B1	L P	L P	L P					L R	L R	L R		L R	
07								L R	L R	L R		L R	
FF 246								L R	L R	L R		L R	
FF 81								L R	L R	L R		L R	
Nasal Step	L R	L R	L R					L R	L R	L R		L R	
BSV 3													OU
BSV 5													OU
60-4	L P	L P	L P					L P	L R OU	L R		L R	OU

10.2.12. Stimuli time parameters settings

The progress of the test can be adapted to the individual capabilities and physical condition of the patient. The test conditions should be as comfortable as possible, the test should be as short

as possible, without sacrificing any accuracy of the test results.

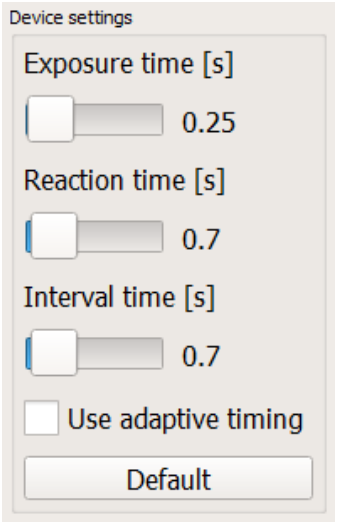


Figure 52. Test time settings

The progress of the test is determined by three parameters in the Advanced... section of the test settings (Figure 39. Static examinations tab):

Exposure Time – This is the time during which a light point is illuminated (unless the patient's reaction will dim it earlier).

The exposure time should be no longer than 0.4 s. A longer exposure time can negatively affect patient concentration on the fixation point, and therefore could reduce the test reliability.

Reaction Time – This is the time in which the patient can respond to a stimulus. It starts at the end of stimuli illumination. If the patient responds before the Reaction time ends, then the Reaction time is cut short and the Interval time starts immediately.

Interval Time – This is the time after the patient responds to a stimulus and before the next exposure begins. If the patient does not respond, then the Interval time equals 0.

The time relationship between the test parameters are shown below:

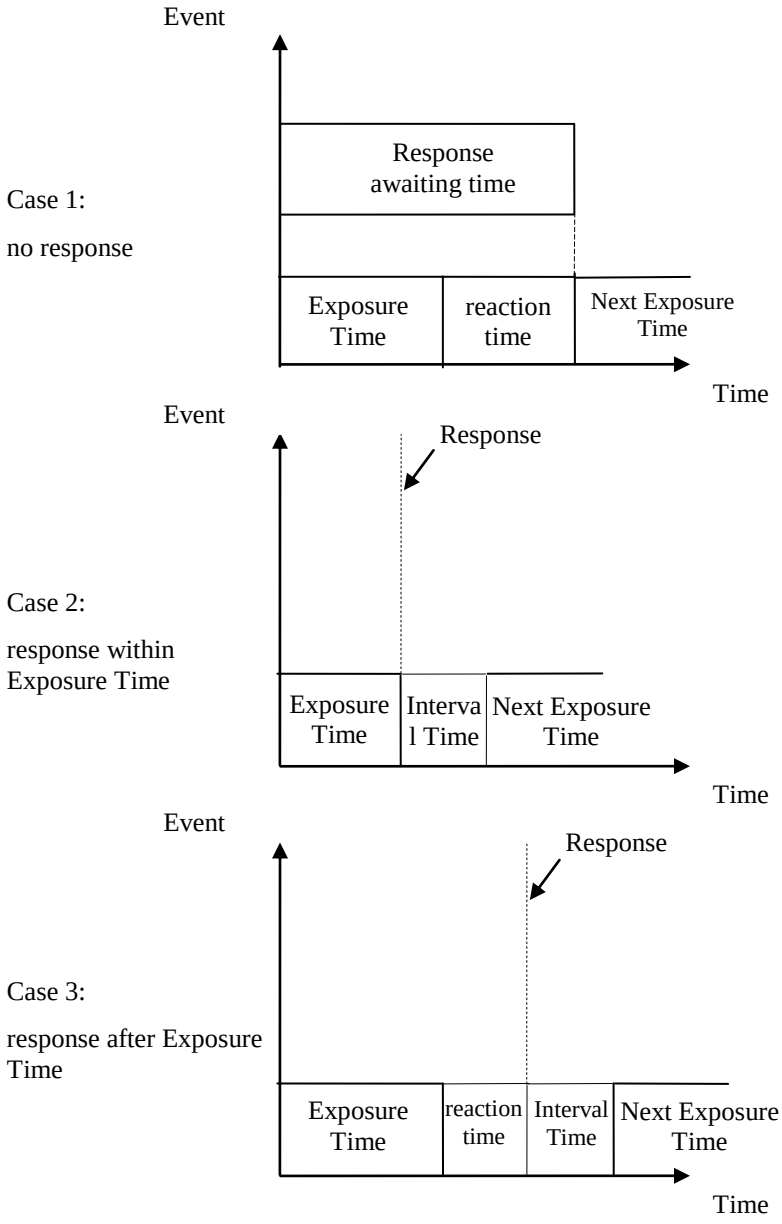


Figure 53. Time relations between light points

10.2.13. Adaptive Time Option

The system can automatically adapt time settings to the individual patient based on how quickly the patient responds to exposures. This option can be enabled by ticking the Use Adaptive Time

Option checkbox in the Advanced... section of the test settings (Figure 39. Static examinations tab).

The adaptive algorithm reduces or extends the exposure time, reaction time, and interval time depending on the individual mean reaction time during the test.

Adaptive Exposure Time – This is the mean reaction time minus 0.1s, no shorter than 0.2s and no longer than the set exposure time.

Adaptive Reaction Time – This is the mean reaction time plus 0.4s.

Adaptive Interval Time – Twice the reaction time, no shorter than 0.6s and no longer than the set interval time.

If the adaptive time mechanism is enabled, it is recommended to extend the time settings by 0.2 s for reaction time and interval time as compared to the default values. The adaptive time algorithm will reduce the time settings appropriately to the tested patients.

10.2.14. Sensitivity settings for BDT

Tests for drivers are a specific type of visual field testing where the stimuli intensity is constant at any point within the visual field. As a default, the brightness level is set to according to the current standards:

Green stimuli (1000asb max, 10asb background): 5dB.

White stimuli (10000asb max, 31asb background): 10dB

10.3. *Test Programs*

It can be time-consuming to adjust all test settings before the test. If some of the settings are regularly used for tests of patients with suspicion of specific visual defects, it would be a nuisance to set the same parameters over and over again. To simplify working with the instrument, test templates, or test programs can be created.

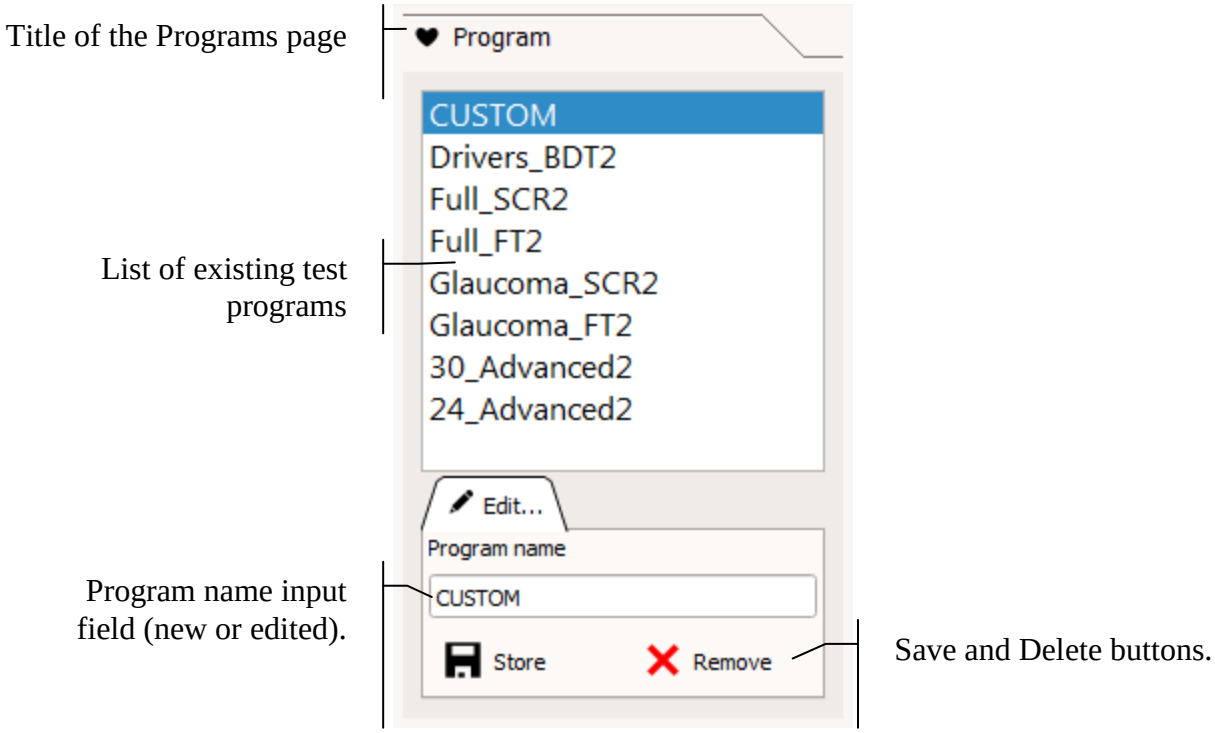


Figure 54. Test programs

Test Programs includes pre-set values of the following parameters:

test strategy

test field

reliability tests

central fixation target

test field modification options

bracketing of threshold strategies

determination or pre-set value of the initial stimuli level

stimulus color

stimulus time parameters

BDT sensitivity

After the test program has been loaded and before the test begins, the settings can be modified and adapted on a case-by-case basis – the settings of the stored test program will not be modified.

10.3.1. Managing the test programs

Types of test programs:

pre-defined – Can be accessed after the application has been installed

user-defined – Created by users

New program – To create a new test program, proceed as follows:

Change the test settings to the target settings to be brought up after the test is selected.

Enter the name for a new test program in the name input field.

Click the Save button below the name input field.

Modify – To modify an existing test program, proceed as follows:

Select the test program you want to edit from the list of existing test

Change the test settings to the target settings to be brought up after the test is selected.

Click the Save button below the name input field.

Confirm modification of the existing program in the warning box.

Delete – To delete a test program, proceed as follows:

1. Select the test program you want to delete from the list of existing test programs
2. Click the Delete button below the name input field.
3. Confirm deletion of the existing program in the warning box.

Create a new program from an existing one – To create a new test program from an existing one, proceed as follows:

1. From the list of existing test programs, select the one you want to use to create a new one.
2. Change the test settings to the target settings to be brought up after the test is selected.
3. Enter the name for a new test program in the name input field.
4. Click the Save button below the name input field.

10.4. *Retesting – uploading settings from previous tests*

If a patient has been tested in the past, another test can be performed by relying on the test parameters used with the previous tests. This way, two test results can be compared and the disease progress can be monitored.

You can easily upload previous test settings for a selected patient who has been tested before. In addition, you can also use initial stimuli levels calculated from the previous test results to reduce the test duration.

To view and select a source test for retesting, use the list of tests to the left of the test settings box on the Follow Up page (Figure 55. List of Source Tests for Follow Up).

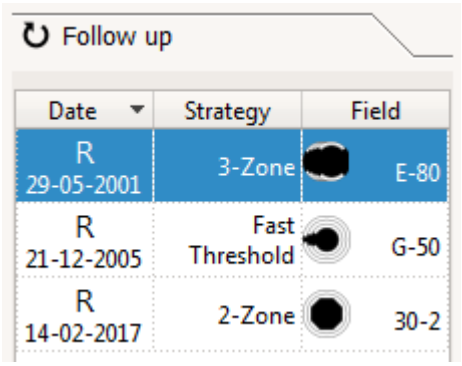


Figure 55. List of Source Tests for Follow Up

The List of Source Tests for Follow Up includes all previous tests of the current patient for the eye selected in the eye settings (Figure 55. List of Source Tests for Follow Up).

The following settings will be uploaded from the selected source test:

- strategy
- test field
- reliability tests
- correction lens settings
- central fixation settings
- calibration level (pre-set value from the source test)
- stimulus color

The selected source test results are shown in the test preview window.

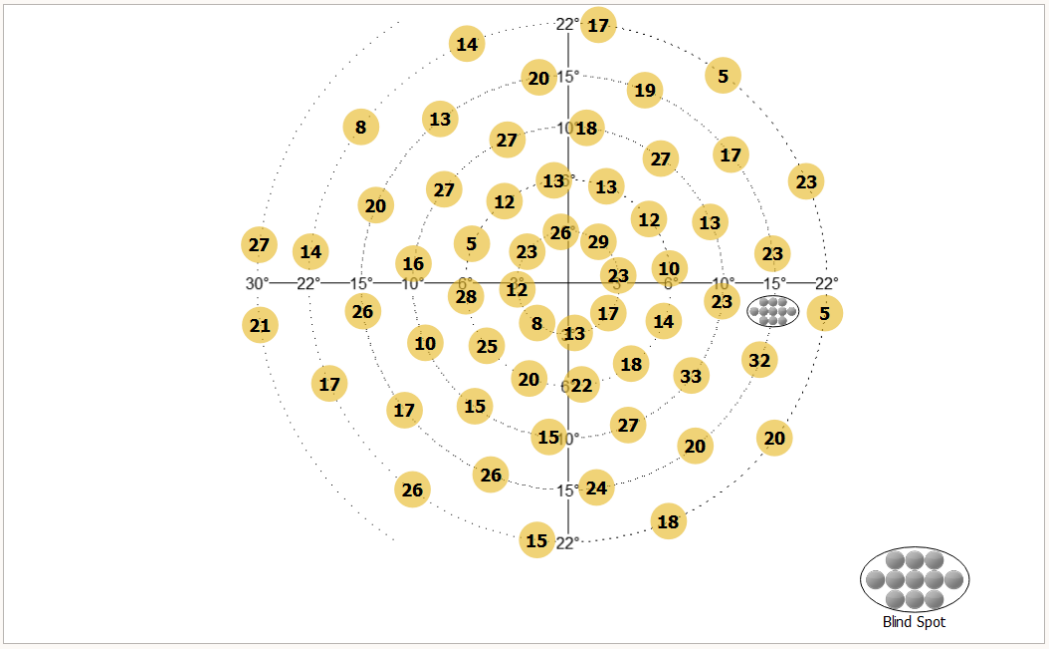


Figure 56. Source test preview for Follow Up

After the settings have been uploaded from the source test, the test parameters can be modified as in any other standard test. You can change the test field value, for example, and leave other parameters unchanged.

10.5. *Adjustment of the chin rest*

The position of the tested eye should be properly adjusted. It should be placed exactly opposite the fixation point shown in the video image from the eye camera.

To correctly position the eye, adjust the height of the chin rest using the indicators displayed in the camera window or activate automatic chin positioning, more on this in Chapter 12.2.10.

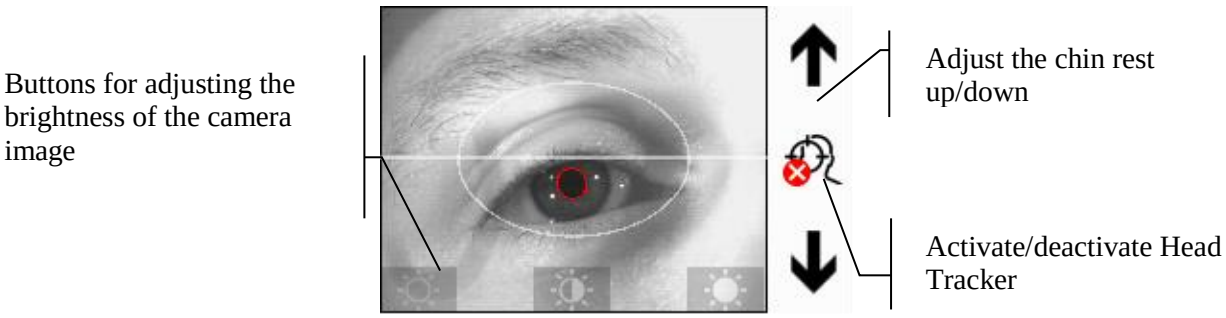


Figure 57. Indicators of the chin rest adjustment and automatic chin positioning button

If the eye is positioned correctly, the white horizontal line passes through the center of the pupil. The eye should be placed within the ellipse area which is drawn in camera preview.

10.6. *Controlling a test in progress*

To control a test in progress, i.e.:

Start a new test

Pause a test

Resume a paused test

Cancel / close a test in progress

Start a test in the demo mode

use the buttons located over the test preview window, as shown on the figure below.

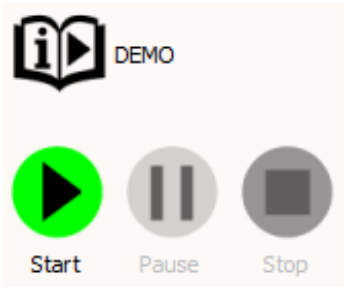


Figure 58. Controlling a test in progress

Start – Use this button to start a test using the selected test settings. If the current test has been paused, press Start to resume the paused test.

Pause – Use this button to pause the current test. If the test has been paused, a flashing TEST PAUSE message will appear in the test preview window.

Stop – Use this button to stop the current test. The test will be abandoned and the test results will be deleted or incomplete. If at least 3 test points have been tested, the incomplete test results can be saved (“Resuming an unfinished test”). Confirm that you want to close the test in the Warning window.

Demo – Use this button to start a test in the demo mode. The test results cannot be saved in the demo mode. Click Stop to close the demo mode.

11. *Kinetic examination*

Kinetic examination is the visual field evaluation technique which uses moving stimulus to test the patient's extents of vision. This technique can be successfully used to test the large areas in acceptable time on the cost of the sensitivity.

This chapter describes the Kinetic examinations tab

- course of kinetic examination
- setting the test parameters
- managing the test programs
- adjusting the view

Kinetic examination is available only for projection perimeters (i.e. PTS 2000). For static perimeters the Kinetic examination interface is not available.

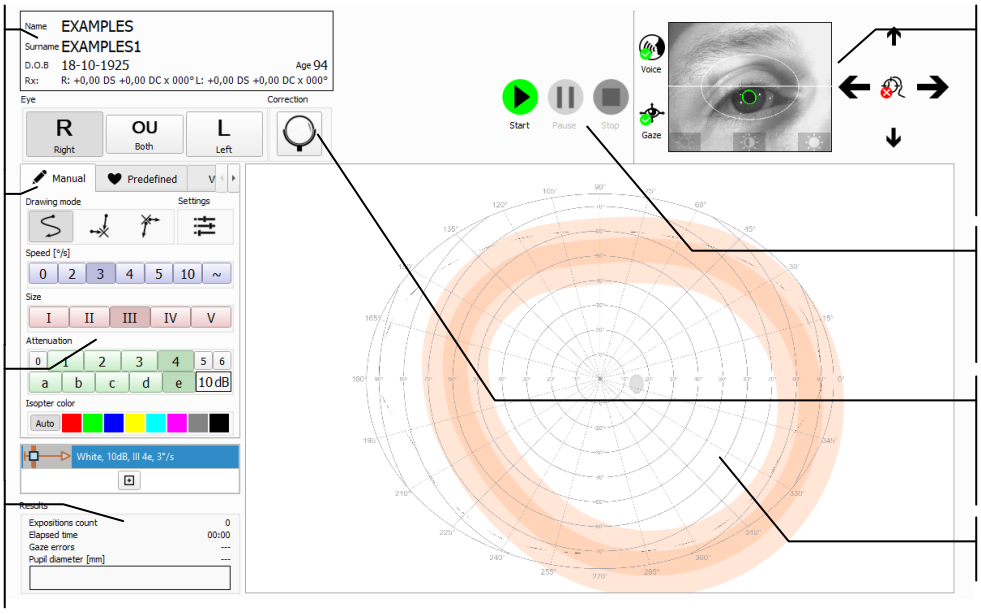
11.1. *Interface of the Kinetic examinations tab*

Data of the current patient

Test, device and view parameters

Stimulus parameters settings

Additional test information



Video image from the eye camera and adjustment of the chin rest

Test run controls

Correction lens settings

Test grid

Figure 59. Kinetic examinations tab

11.2. *Course of manual kinetic examination*

The examination consists in selecting stimulus parameters, including size, brightness, color and speed. Then, the operator draws the stimulus movement trajectory using a mouse. The device connected to a computer reproduces the stimulus movement path on the bowl in a continuous manner. The task of the patient is to look at the fixation point and press the reaction button whenever the stimulus appears within his field of view (unless the operator instructs otherwise).

In a standard examination scenario, the operator begins the examination by clicking “Start” button. Then, he presets stimulus parameters. The stimulus appears on the perimeter bowl upon pressing left mouse button in the vectors editing field called “Test grid”. Location of the stimulus on the bowl corresponds to position of the cursor in the “Test grid” at which the mouse button was clicked. Movement trajectory is registered whenever the mouse button is held depressed. Stimulus movement on the perimeter bowl will begin upon reaching the minimum length of the movement trajectory. At that time, any further movement of the mouse cursor on the screen will effect in the further registering of trajectory. The stimulus goes off upon the patient's reaction, or upon completing the entire movement trajectory on the bowl.

If the patient reacts to the displayed stimulus - be it static or moving - patient reaction symbol will be drawn in the trajectory area. The shape and color of the symbol depends on the stimulus parameters set, and may be verified on the "List of stimulus parameters settings used in the examination". In case of no reaction from the patient, no additional markers will be displayed in the trajectory area.

It is possible to erase/hide trajectory along with reaction markers during the examination, if they are deemed useless or erroneous. This is done with the right mouse button. To erase/hide trajectory along with marker, point the cursor to the trajectory to highlight it, and then click the right mouse button to open the context menu. Erasing will remove the trajectory permanently and cannot be undone. Hiding will only make the trajectory faded and will reject it from isopteran analysis.

The examination is completed by clicking “Stop”.

11.3. *Selecting the eye*

The eye to test can be selected with a set of pushbuttons on the left side of the Kinetic examinations tab.

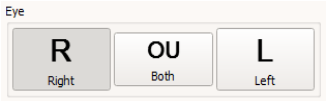


Figure 60. Eye selection buttons

Click the appropriate button to change the tested eye. L, OU, and R abbreviations mean Left (left eye), oculus uterque (both eyes), and Right (right eye) respectively. The symbols are used in the interface and test reports to save space.

When the eye to test is changed, the location of the blind spot area in the test preview window changes as well.

11.4. *Test controls*

Test controls are used to adjust the testing stimulus parameters in manual kinetic examination mode. The following parameters can be adjusted:

- stimulus path drawing mode
- color
- movement speed
- size
- intensity / attenuation

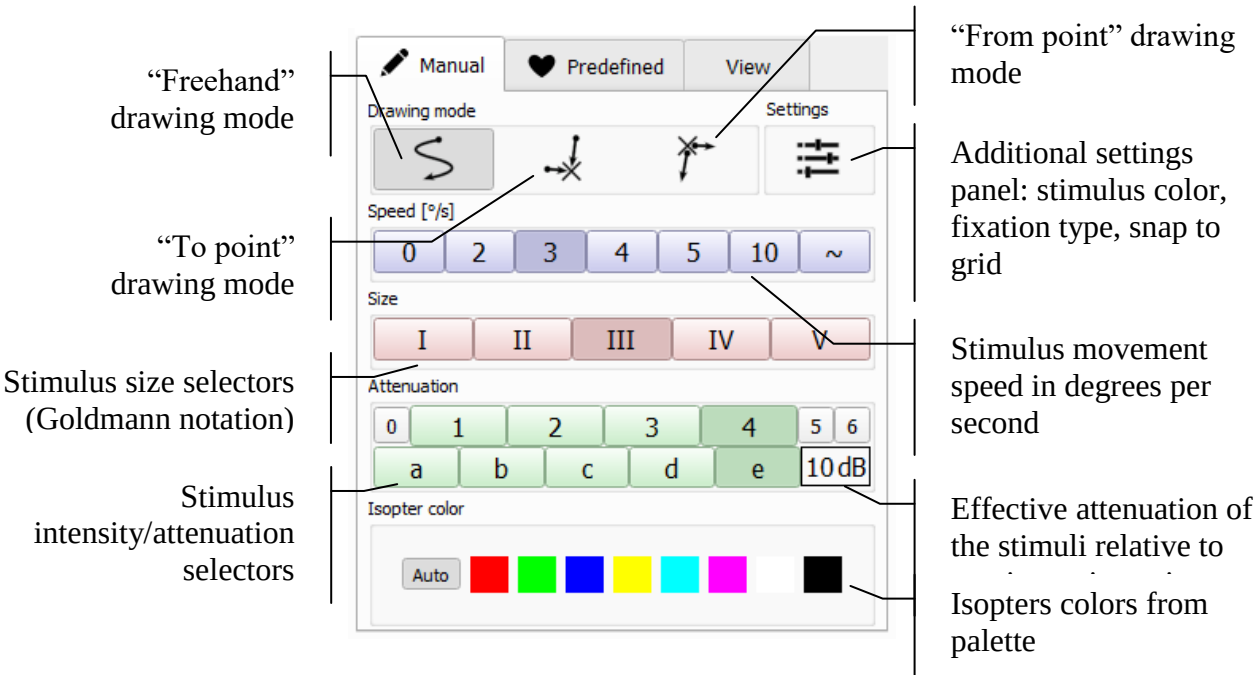


Figure 61. Kinetic examination settings

11.4.1. Stimulus path drawing mode

Movement trajectory may be drawn in three modes:

- "Freehand"
- "To point" – using the "End point" marker: **X**
- "From point" – using the "End point" marker: **X**

Application does not allow to create two input vectors with exactly the same parameters (color, intensity, size, speed, start position, end position, movement path points).

11.4.1.1. “Freehand” stimulus path drawing mode

This is the default mode of manual kinetic examination. In this mode, the operator may draw the trajectory freely in almost unrestricted way. This means that the stimulus movement path can be twisted in any way preferable, and movement speed can change at each section of the path drawn.

Clicking left mouse button at selected location in the Test grid will cause the perimeter device to set and light up the stimulus on the bowl at the respective location inside the bowl. By holding left mouse button depressed and moving the cursor, a trajectory is drawn from the cursor's starting position and it is updated along the mouse movement. Releasing the left mouse at any location will end stimulus path creation and will point a location in which the stimulus is turned off.

11.4.1.2. “To point” stimulus path drawing mode

In this mode it is possible to draw only paths consisting of linear sections with preset speed. These paths may be created by manually constructing the straight segment or by using a selected end point.

The first method allows to draw a vector with any desired end position. Clicking left mouse button at selected location in the Test grid will cause the perimeter device to set and light up the stimulus on the bowl at the respective location inside the bowl. By holding left mouse button depressed and moving the cursor, a linear vector is drawn from the cursor's starting position up to the current position. Releasing the left mouse button at the given location will end vector creation. At this point, the perimeter will begin movement of the stimulus along the vector drawn, and at preset speed.

The second method employs the vector “End point” marker **X**. Clicking left mouse button at selected location in the Test grid will cause the perimeter device to set and light up the stimulus on the bowl at the respective location inside the bowl. Releasing the left mouse button at the same starting point will cause a vector to be drawn all the way from the starting position to the vector “End point” marker **X** position. The perimeter will begin movement of the stimulus along the vector drawn, and at preset speed. “End point” marker **X** position can be changed by "drag & drop" method using the left mouse button.

11.4.1.3. “From point” stimulus path drawing mode

In this mode it is possible to draw only paths consisting of linear sections with preset speed. These paths may be created using a selected end point. Clicking left mouse button at selected location in the Test grid will cause the perimeter device to set and light up the stimulus on the bowl at the selected “End point” marker **X** and begin movement of the stimulus along the vector to the location defined by the click position. “End point” marker **X** position can be changed by "drag & drop" method using the left mouse button.

11.4.2. Selection of stimulus movement speed

The 7 buttons located in the upper part of the stimulus settings panel are used to select stimulus speed in manual kinetic mode.

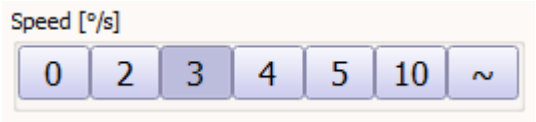


Figure 62. Stimulus movement speed controls

The speed is expressed in degrees per second ([°/s]). At small stimulus speed, the impact of patient's reaction delay on the position of the reaction registered is minimized. It is recommended not to exceed 10 °/s.

Stimulus speed values have the following effect on the operation of the system:

"0 °/s" - at this setting, the stimulus appears on the perimeter bowl upon pressing left mouse button, and at the location corresponding to the location of the cursor in the vectors editing area. The stimulus disappears upon the patient's reaction, or upon releasing the left mouse button. The stimulus cannot be moved in this setting - it will merely appear and go off at the starting point, regardless of any mouse movements.

"2-10 °/s" - speed of the stimulus movement on the bowl will be limited to the selected value, even if the user has drawn the trajectory with a mouse at higher speed. Additionally, an arrow head will be added to the trajectory drawn, indicating stimulus movement direction. The length of the arrow head will increase in proportion to the speed selected.

"~" - speed of stimulus movement on the bowl will only be limited by the device capacity 50°/s). In this setting, the color of the trajectory drawn on the screen will change depending on the stimulus speed resulting from the mouse movement. For speeds ≤10°/s, the trajectory drawn will be black. For speeds >10°/s, the trajectory drawn will be magenta.

11.4.3. Selection of stimulus size

The 5 buttons located on the stimulus settings panel below the speed buttons are used to select stimulus size in Manual Kinetic. The operator may select one of 5 Goldmann sizes: I, II, III, IV, V. Remember that the smaller the stimulus, the more difficult it will be for the patient to locate it. An excessively large stimulus, on the other hand, may result in omitting smaller defects and impact sensitivity of the examination. Each stimulus size has a different reaction symbol displayed by the program:

size I - ○

size II - △

size III - □

size IV - ◇

size V - ▽

11.4.4. Selection of stimulus brightness

Stimulus brightness in Manual Kinetic is selected using two groups of buttons located on the stimulus settings panel. Group I of buttons marked from 0 to 6 is used to change stimulus brightness at 5 dB increments.

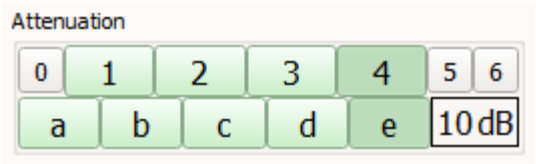


Figure 63. Stimulus intensity/attenuation controls

Group II of buttons marked from **a** to **e** is used to change stimulus brightness by at 1 dB increments. Initial brightness of the stimulus displayed on the bowl is the result of maximum stimulus brightness for the given colour, as defined in the system, and of any modifiers chosen. The resulting retinal sensitivity that may be examined using the given stimulus brightness (assuming that stimulus of Goldmann size III is used) is specified below the buttons in decibels [dB].

The values of brightness modifiers for both button groups are as follows:

Group I	
0	-30 dB
1	-25 dB
2	-20 dB
3	-15 dB
4	-10 dB
5	-5 dB
6	-0 dB

Group II	
a	-4 dB
b	-3 dB
c	-2 dB
d	-1 dB
e	-0 dB

Example 1: For white stimulus and **4e** modifiers setting, the perimeter will display a stimulus of maximum brightness 10000asb, modified by -10dB. As a result, a stimulus of circa 1000 asb brightness will appear on the bowl.

Example 2: For white stimulus and **6b** modifiers setting, the perimeter will display a stimulus of maximum brightness 10000asb, modified by -3dB. As a result, a stimulus of circa 5000 asb brightness will appear on the bowl.

11.4.5. Setting an isopter color

By default, the isopter's color is generated based on stimulus parameters such as size and color.

The “Isopter color” window (Figure 64. Setting an isopter color) allows you to manually define the color of the currently selected isopter, both during examination and in the examination review in the “Results” tab.

Figure 64. Setting an isopter color

To select a different isopter color, it is possible to replace the selected color from the window above with any color available from a wide range of colors. To do this, double-clik the left mouse button on the color you want to replace. A window will be displayed with the entire range of colors to choose from (Figure 65. Color palette):

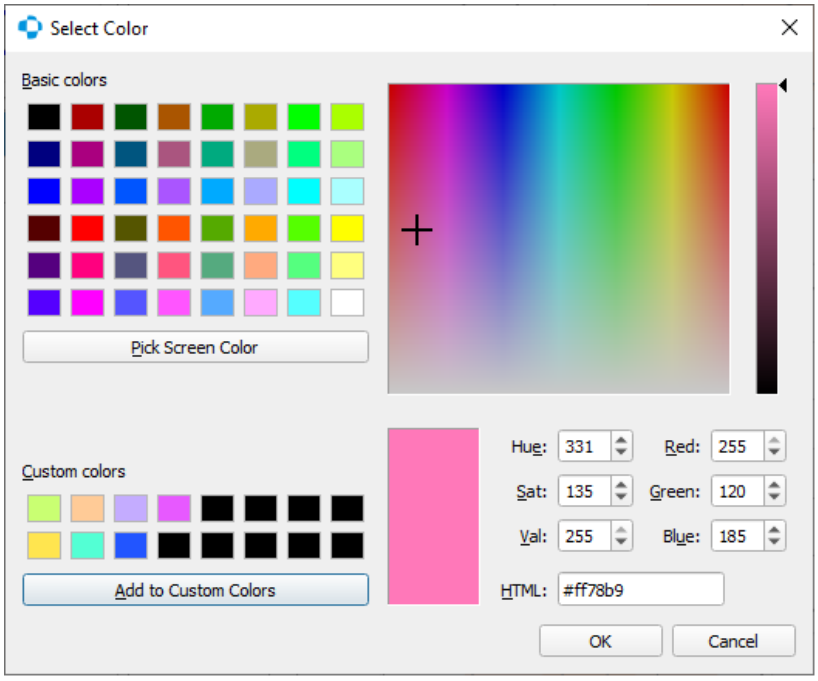


Figure 65. Color palette

11.4.6. Additional kinetic settings

Panel with additional settings for kinetic examinations mode is available after pressing the “Additional settings” button.

Figure 66. Additional kinetic settings

11.4.6.1. Kinetic stimulus color

The default white color of the stimulus can be changed to green, red or blue according to operators preferences. The change in stimulus color will affect the vectors which are drawn afterwards. Information about stimulus color can be read form kinetic vectors and reaction points. The arrowhead and reaction symbols are filled with white, light green, light red or light blue colors respectively to white, green red and blue stimulus colors. If the stimulus is static, then the “no reaction” result (circle) is filled with black, dark green, dark red or dark blue colors respectively to white, green red and blue stimulus colors (Figure 67. List of kinetic parameters settings).

11.4.6.2. Bowl fixation target

It is possible to change the bowl fixation target from the default single point fixation to the diamond shape pattern. This can be helpful in case of patients with defects in foveal area.

Changing the fixation target from single point to diamond shape, changes the bowl area available for testing. It is not recommended to change the fixation target when some of vector paths has already been drawn.

11.4.6.3. Snap to grid

To help in drawing vectors manually in repeatable way, application offers the “snap to grid” function. When “Snap to grid” is active, all vector paths, start points, end points, intermediate points are placed in the grid point which is closest to the current mouse cursor position. The size of the used grids can be changed to the following ones:

- 1° - the meridian and radius of the cursor position in polar coordinate system are rounded to the nearest integer with 1° step size
- 5° - the meridian of the cursor position in polar coordinate system is rounded to the nearest integer with 5° step size, the radius is rounded with 1° step size
- 10° - the meridian of the cursor position in polar coordinate system is rounded to the nearest integer with 10° step size, the radius is rounded with 1° step size

- 15°- the meridian of the cursor position in polar coordinate system is rounded to the nearest integer with 15° step size, the radius is rounded with 1° step size
- Off - the meridian and radius of the cursor position in polar coordinate system are not rounded

11.4.7. List of stimulus parameters settings used in the examination

While performing manual kinetic examination, each stimulus setting used in the examination is added to a list and displayed in the right section of the examination window as "Vectors list".

The vectors list allows to view and restore previously used stimulus settings in order to continue examinations with previous settings. After clicking an item on the list, all corresponding stimulus parameters (speed, size, brightness, colour) will be set in the current stimulus settings field. Additionally, all results that were generated with the use of current stimulus settings are always displayed on the examination area at full colour intensity. The results corresponding to other settings are greyed out. This allows for easier orientation as to which results on the screen come from which stimulus settings.

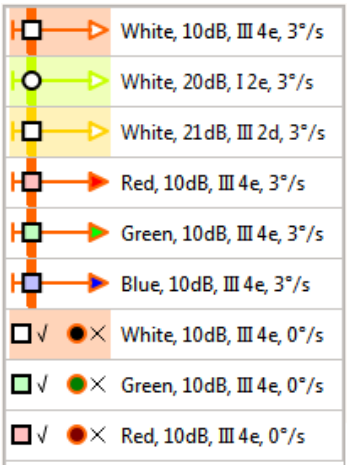


Figure 67. List of kinetic parameters settings

The user can clone the settings of stimulus parameters which will allow performing an examination with the same stimulus parameters multiple times during an examination. To clone the given settings, first select them from the list and then click the button with the “+” symbol located below the list of stimulus parameters (Figure 68. Clone stimulus parameters button):

Figure 68. Clone stimulus parameters button

After pressing the above button, a new position will be added to the list of stimulus parameters.

11.5. *Predefined tests*

The kinetic test can be carried out in manual way like in classic Goldmann perimeter approach, or in semi-automatic way. The semi-automatic way uses the predefined vectors path as a vectors trajectories. User can use some of built-in factory predefined paths and can also construct and store his own paths. To control the use of predefined paths use the “Predefined” tab in “Kinetic examination” window.

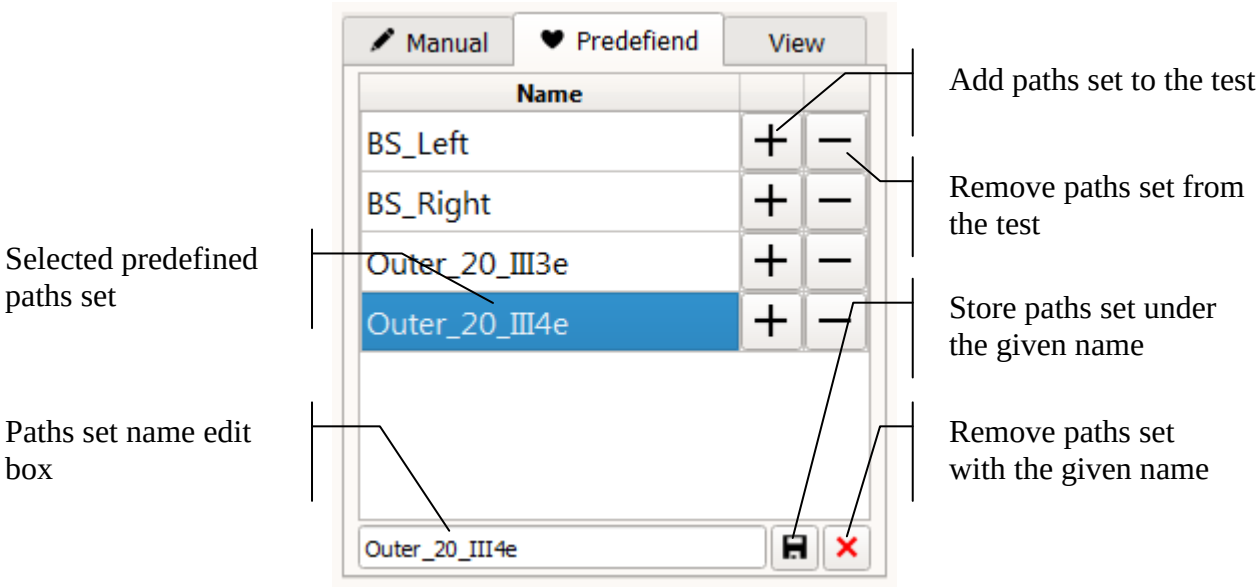


Figure 69. Controls of predefined kinetic test paths

11.5.1. Adding/Removing/Testing paths from predefined set

The predefined testing paths can be added and removed to the test set only in “Paused” test state. To add the testing paths from predefined set, open the “Predefined” tab and click the “+” button next to the chosen set’s name. This will make all the paths that are stored in the set to appear in the “Test grid”.

To remove the testing paths which were added and not yet tested, click the “-“ button next to the chosen set’s name. This will cause the removal of the paths form the “Test grid”.

To test the added paths, press the “Start” button in “Test run controls” area.

You can add paths from several sets and all of them will be tested. This allow to construct the functional kinetic tests in a flexible way.

11.5.2. Creating/Editing/Removing predefined paths sets

User can use the built-in paths sets or can create and use self-created sets.

11.5.2.1. Creating predefined paths sets

The best way to create the paths sets is to open the “Kinetic examination” window and start drawing the preferred vectors paths in “Stopped” test mode. In case of any mistakes the paths can be removed and redrawn until the desired configuration is created. Once it is done, user can enter the new paths set name in the edit box under the paths sets list and click the “Store” button.

11.5.2.2. Editing predefined paths sets

The easiest way to modify the existing paths set is to open the “Kinetic examination” window in “Stopped” test mode. User should select the set to edit from the paths sets list and click the “+” button to add the paths to the “Test grid”. Then the paths can be added and removed according to user’s needs. Once it is done, user should leave the original set’s name in the edit box under the paths sets list and click the “Store” button.

11.5.2.3. Removing predefined paths sets

To remove the predefined paths set the “Predefined” tab in kinetic test controls area should be opened. Then user should click the name of the set to be removed so its name appears in the name edit box under the list. To remove the set the “Remove” button should be clicked. This operation cannot be undone.

11.6. Kinetic result view controls

The Kinetic result view controls are used to adjust the visualization of the test result in the test grid. They allow to improve the look of the result and make the analysis easier.

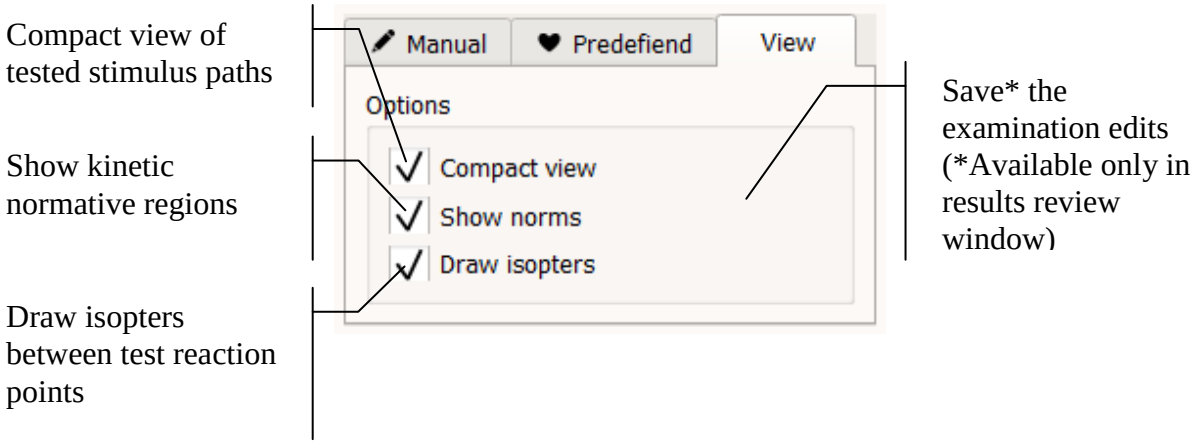


Figure 70. Controls of kinetic examination view

11.6.1. Compact view of the tested paths

When the “Test grid” contains a large numbers of tested trajectories the view of the result becomes obscured. It is hard to analyze such results set. In order to improve the quality of view, the software offers “Compact view” option.

When “Compact view” option is activated by setting the “Compact view” checkbox in the “View tab”, all test paths which were ended with patient reaction are reduced to a short segment. This segment shows the direction of the movement at the moment of the reaction so the seen/not seen area can be stated.

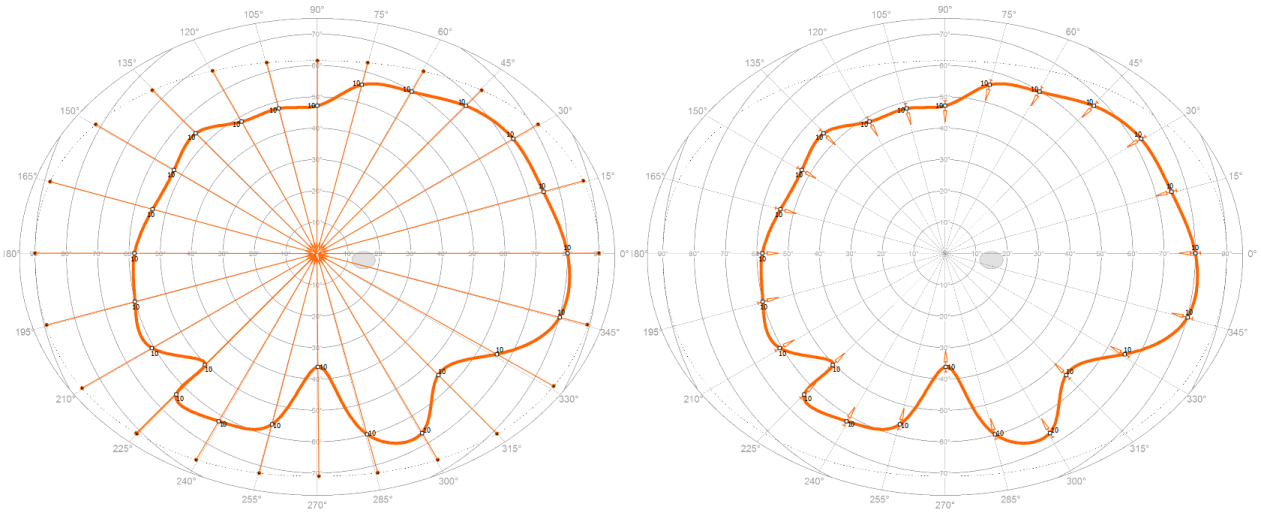


Figure 71. Kinetic paths and isopters view in normal (left) and compact (right) mode

The compact mode does not affect paths without patient reaction. This helps to identify whole regions in which patient did not see the stimulus.

11.6.2. Isopters modifications

In the review of the test results in the “Results” tab it is possible to change the way of connecting reaction points forming the isopter. This allows to correct errors resulting from the automatic generation of isopters. An example of such an error and its solution is presented in the figure below:

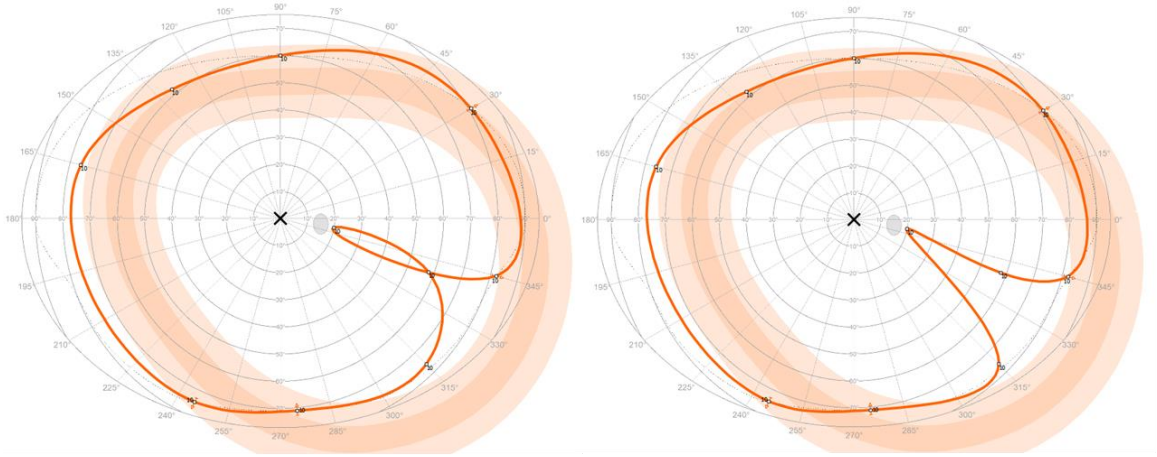


Figure 72. Incorrect field of view and its manual correction

To make corrections on an incorrectly generated field of view, select the reaction point that causes the error, and then move it to another fragment of the isopter. The isopter fragment is defined by a curve and limited by two other reaction points. If a given point is moved to such a fragment of the isopter, it will be redrawn again in such a way that it is in accordance with the new order of connecting points to that the moved point appears between the two points limiting the fragment of the isopter. Isopters can be freely transformed by changing the position of the points relative to the isopters, even in the case of two different isopters but with the same stimulus parameters. Please note that if modyfing the isopter in the results review in the “Results” tab, to save changes the “Save” button must be clicked.

To change the shape of the incorrect field of view, hover the mouse over the given reaction point, whose background will be highlighted in green as in the picture below:

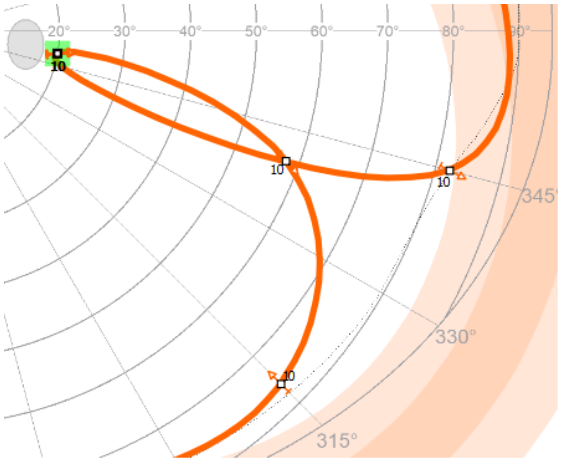


Figure 73. Reaction point chosen to field of view modification

Then, holding the left mouse button, move the selected reaction point to a fragment of the field of view bounded by two other reaction points. The sopter segment will be highlighted in green or red. Green means that a given poin can be moved to a given fragment () and red means that isopters are made of points with different stimulus parameters and these isopters cannot be modified in relation to each other ().

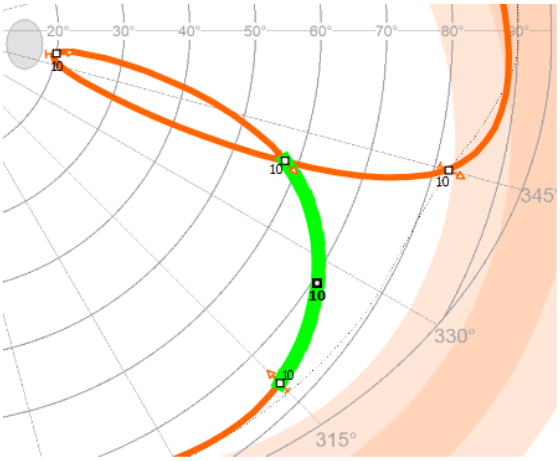


Figure 74. Field of view modification by changing the order of connected reaction points

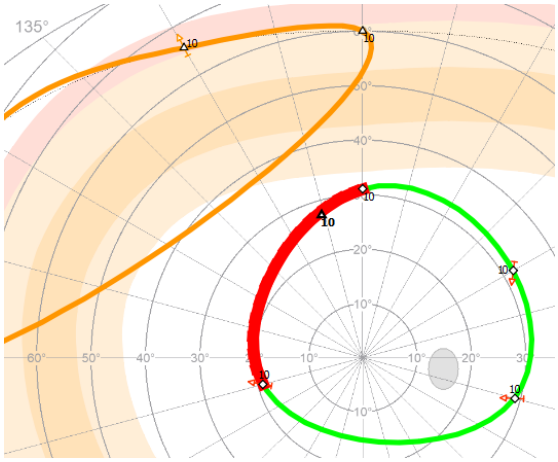


Figure 75. No possibility to change field of view because of differencies between stimulus parameters

As a result of the above operations, the isopter will be redrawn. Its fragment is presented in the picture below:

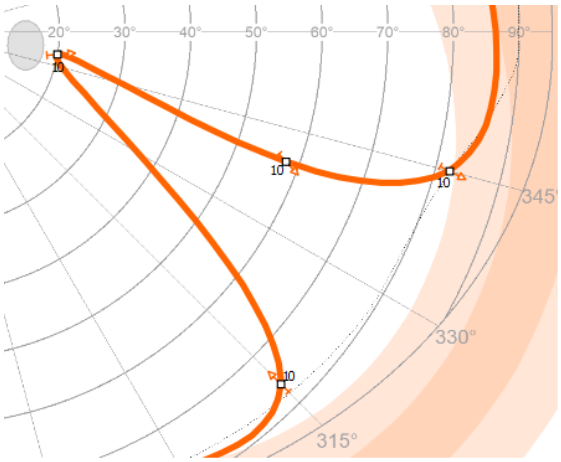


Figure 76. Fragment of the modified isopter

It is possible to disconnect a given reaction point from an isopter and to add it to a new isopter, which will be created with the same stimulus parameters. To do this, select a given reaction point by hovering over it with the mouse cursor. When the background of the reaction point is highlighted in green, right-click the “Add to new isopter” option:

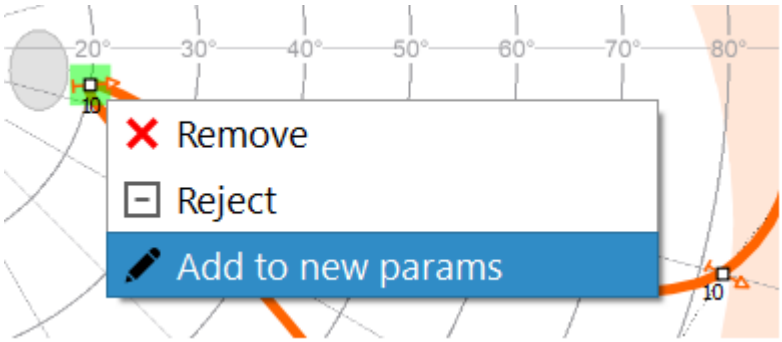


Figure 77. Disconnecting the reaction point and adding it to the new isopter

To add a different reaction point from other isopters (but with the same parameters) to a single point, select the point by clicking on it with the left mouse button, move the mouse over the given reaction point and release the left mouse button when the background of a single reaction point is highlighted in green:

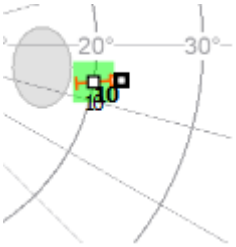


Figure 78. Adding reaction point to a single reaction point

This will create a pair of isopter’s points that will create a line as in the following figure:

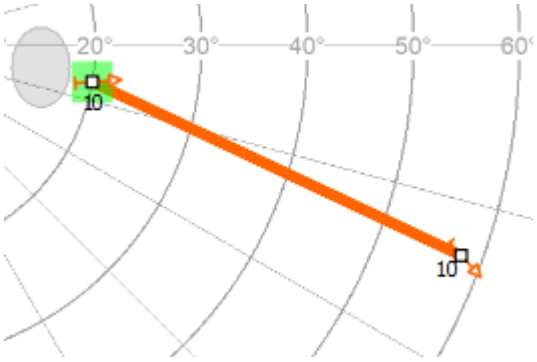


Figure 79. Two reaction points forming a line instead of an isopter

In the “Results” tab it is also possible to restore the shape of the isopter to the form of generated automatically, where the drawng direction of the isopter depends on the value of the angle on which the reaction points lie. To retest the isopter, right-click in the stimulus parameter settings selection widnow on the setting corresponding to the selected isopter:

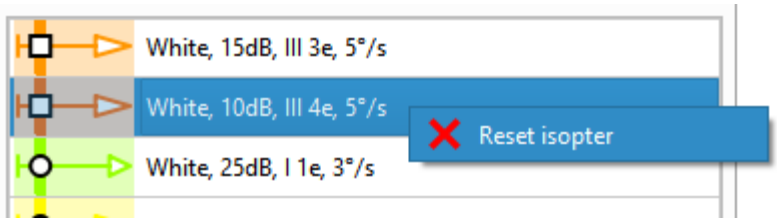


Figure 82. Resetting the isopter shape to automatically generated

After doing the above, the isopter will redraw automatically.

11.6.3. Age normative regions for kinetic tests

To help the user in judging the kinetic examination result, the application offers displaying of age normative regions under the test grid. To show/hide the age normative regions use the “Show norms” checkbox in “View” tab.

Each age normative region has a form of the closed ribbon. Ribbons have got the central area colored with the intense color and peripheral area with faded color. Ideally the isopter which is constructed form kinetic result test points should lay within the central area of the normative region.

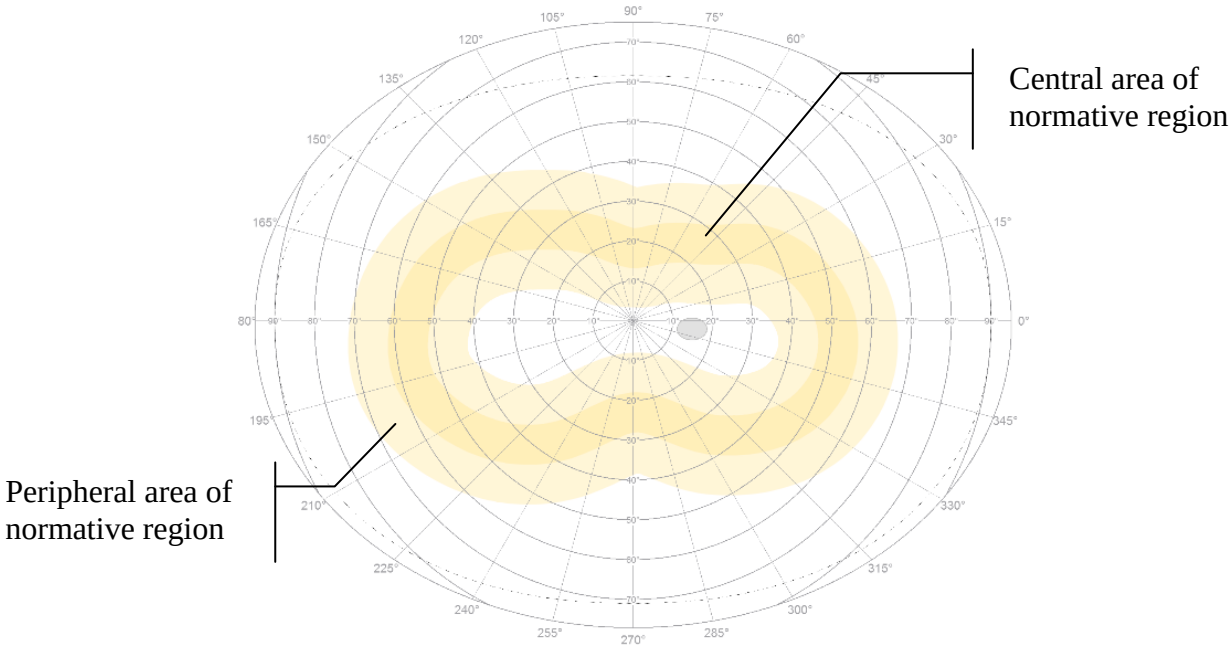


Figure 80. Normative region view in kinetic result

The color of the normative region is correlated with the color code of the stimulus parameters. It means that different stimulus parameters (size and intensity) produce the test paths and isopters of a specific color code. The same color code is used to denote the normative region valid for that stimulus parameters.

When the normative regions are overlapping then the stacking order is set to show the smallest regions on top. During the test, try to use the stimulus with a significant difference between normative area sizes. Otherwise it will be difficult to compare resulting isopters to their normative sizes.

To compare a particular resulting isopter to its normative region, user can select the adequate stimuli parameters from the parameters list. This will cause all other isopters and their normative regions to disappear form the "Test grid".

11.6.4. Automatic isopters outlining

Application offers the automatic isopters outlining with use of reaction points. To show/hide the automatic isopters use the "Show isopters" checkbox in "View" tab.

Automatic isopters outlining uses reaction points form the testing paths. To outline the isopter, only these reaction points are taken, which were registered during the stimuli movement. This rejects all static points (with speed set to 0°/s) as they usually denote the "seen" area and not the "seen" area boundary like isopter do.

In case that the isopter is faultily constructed because of some invalid result point, this point can be rejected from the isopter. To reject or include back the selected point form isopter, use the right mouse button click over that point. This opens the context menu with three possible options:

Remove – to permanently remove the path and reaction point (if this option is used in the "Results review" tab, this change needs to be manually saved to database afterwards by clicking "Save edits" button).

Reject – to mark the path and its reaction point as rejected. This causes that the reaction point is not used in the automatic isopter construction and both path and its reaction point are displayed dimmed in the "Test grid". (To permanently mark the path and the reaction point as rejected, this change needs to be manually saved to database afterwards by clicking "Save edits" button).

Include – to mark the rejected path and its reaction point as normal. This causes that the reaction point is included back in the automatic isopter construction and both path and its reaction point are displayed normally in the "Test grid". (To permanently mark the path and the reaction point as normal, this change needs to be manually saved to database afterwards by clicking "Save edits" button).

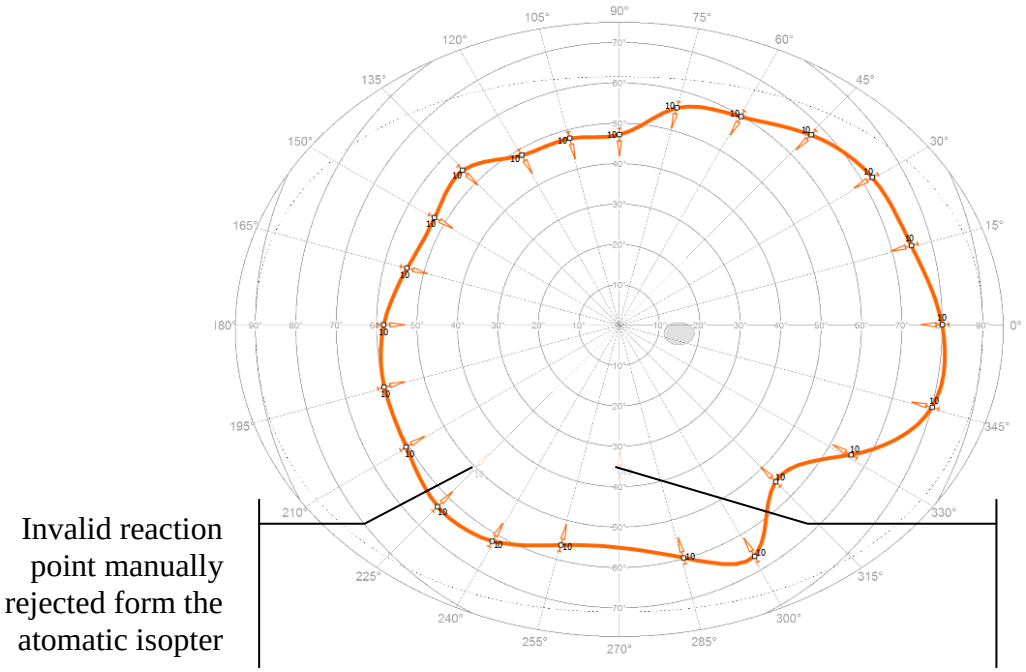


Figure 81. Autmatically outlined isopter

To outline the isopter, only these reaction points are taken, which were registered during the stimuli movement. This rejects all static points as they usually denote the "seen" area and not the "seen" area boundary like isopter do.

In case that the isopter is faultily constructed because of some invalid result point, this point can be rejected from the isopter. To reject or include back the selected point form isopter, use the right mouse button click over that point to open the context menu and select the "Reject" or "Remove" action.

12. *Testing a patient*

The following chapter describes how to perform a visual field examination. The chapter describes the following activities:

Preparing the room and the instrument

Preparing and positioning the patient

Starting a new exam

Follow up testing

Resuming an unfinished test

12.1. *Preparing the test*

For the test to be carried out correctly and to produce reliable and accurate results, you have to first prepare the instrument, the room, and the patient.

12.1.1. Preparing the room and the instrument

Visual field testing, due to its character and test duration, should be taking place at conditions comfortable for the patient. It will reduce fixation errors and improve the test reliability. Before starting the test, pay attention to the following:

the room temperature should be comfortable.

the room should be well ventilated, supplied with fresh air

the room should be quiet and free of distractions

avoid too much light in the room; all lights should be placed behind the instrument

the patient should sit on a comfortable chair with adjustable height

the table where the instrument is placed should be stable, with adjustable height

for single-eye tests, use single chin rest, for double-eye tests — use double chin rest.

12.1.2. Preparing the patient

Before starting the test take some care in positioning the patient and ensuring he or she is aware of what will happen during the exam. Pay attention to the following:

- ask the patient to adjust the height of the patient chair; the operator should adjust the height of the instrument table to position the patient as comfortable as possible The patient should sit straight, without having to lean forward or stretch his / her body toward the instrument
- for monocular tests, the second eye should be obstructed with an eye cover so that the patient cannot see the perimeter bowl
- for patients with refraction of 1D or higher, use correction lens and enter the correction lens parameters in the test settings

- if correction lens must be used, make sure there is no other lens in the holder, and that the lens holder is tilted to the side
- adjust the chin rest height so that the horizontal white line in the camera window passes through the centre of the pupil
- if the eye is significantly inclined to the left or to the right from the centre of the camera window, help the patient place the head in a correct position against the camera
- for tests other than examinations for diplopia, make sure the patient is able to see the single or quadruple fixation.

Before the test starts, instruct the patient as follows:

- the test can take from a few to up to several minutes
- tell the patient to look at the fixation point(s) in the centre of the perimeter bowl (except for diplopia tests)
- the patient should not avoid blinking
- ask the patient to press the response button:

for threshold, fast threshold, Screening, 2-zone, 3-zone, BDT strategies — when he / she sees the light point within the bowl

for CFF strategy — when the light point starts flashing

for diplopia test strategy — the response button should be pressed once if the patient sees a single light point, or twice if he / she sees two light points

- if the patient feels tired or inconvenient, he / she can pause the test by pressing and holding the response button for 3 seconds.

12.2. *Starting a new exam*

Before starting a new test:

- register a patient (“Patient registration”) or activate the record of a registered patient from the list of patients
- prepare the patient for a test (“Preparing the patient”)
- set the test parameters (“Test settings”, “Test Programs”)
- if you suspect the patient will not know how to behave during the test, run a test for several seconds in the demo mode (“Controlling a test in progress”)

To start a test, press Start on the test control window (“Controlling a test in progress”).

If correction lens is used in the test settings, you will be asked to insert the correct lens in the lens holder before the test begins.

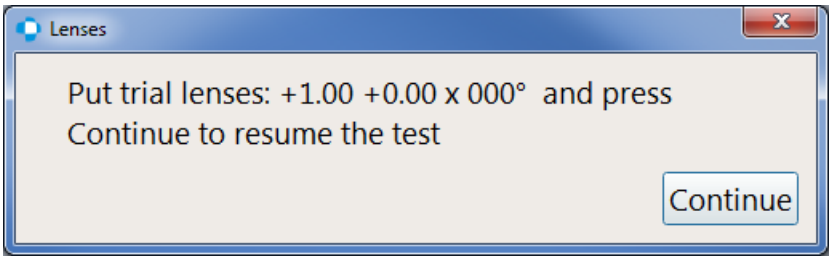
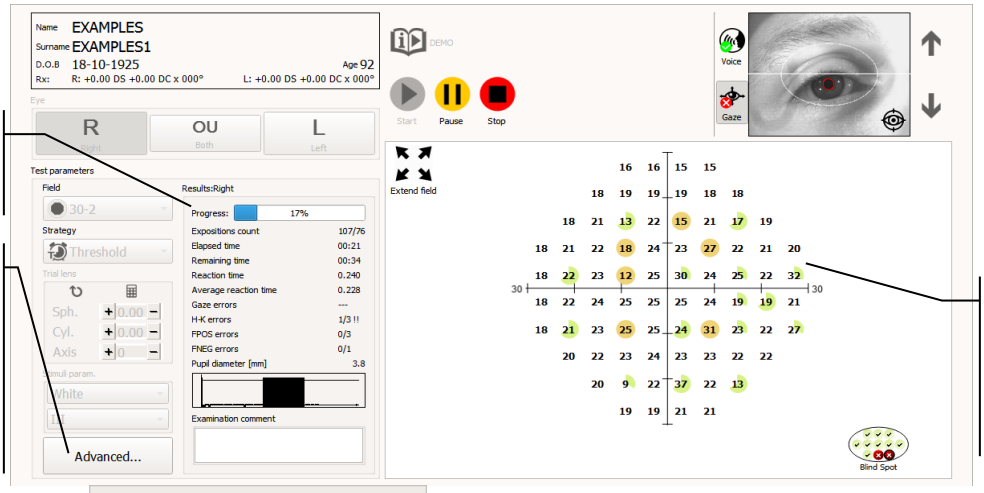


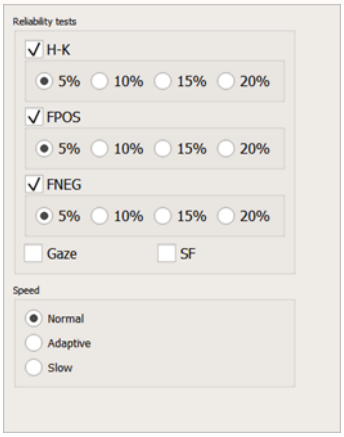
Figure 82. Insert Lens text message

Press Continue to continue the test after the lens have been inserted in the holder.

12.2.1. Test Control window

The following information will be displayed on the Test Control window, in the Tests tab:





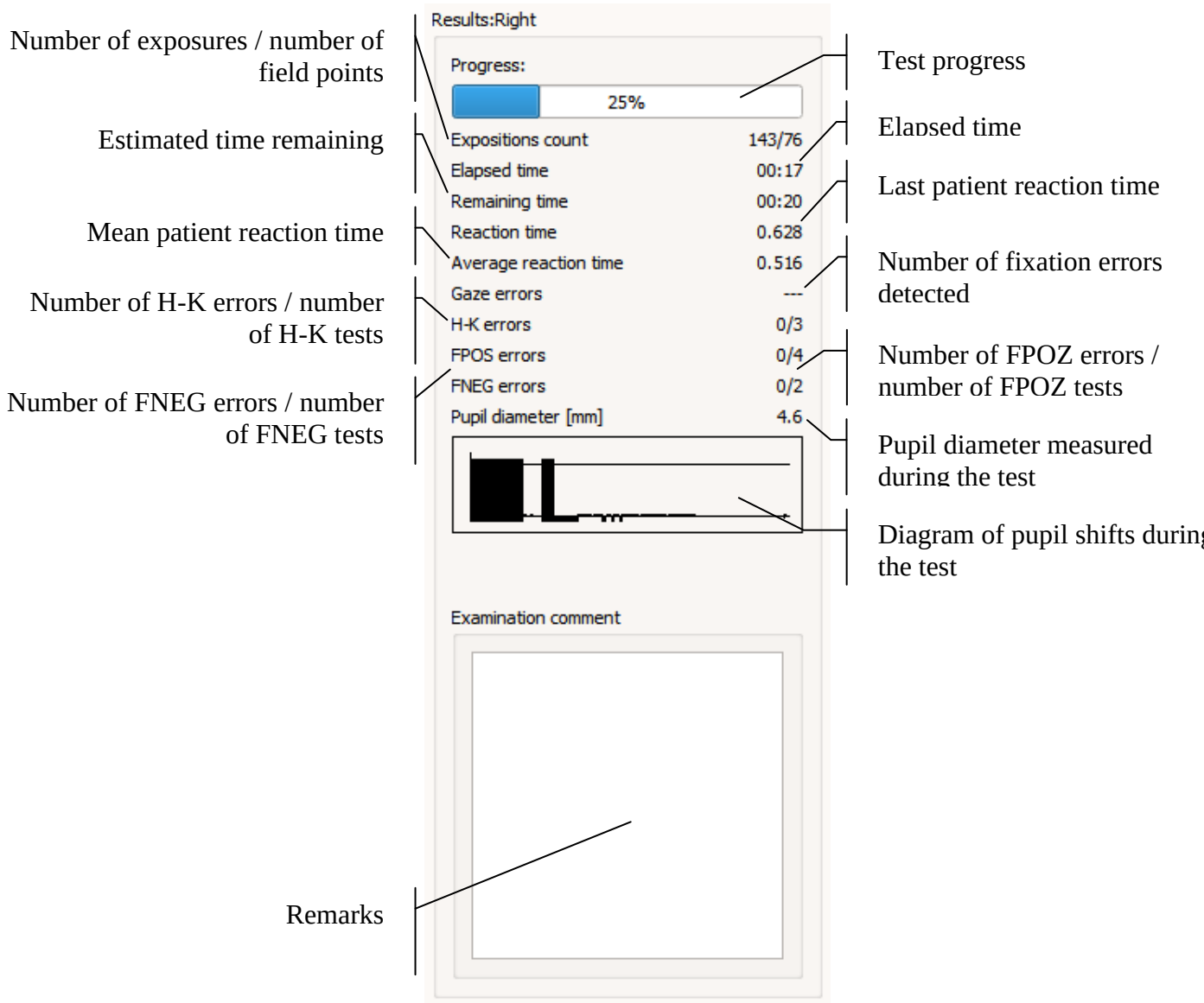


Figure 83. Statistics and test progress

All test points are displayed in the test preview window. Information about the current test level and the test progress is provided with each point. Test progress is illustrated with a green pie chart, which forms the background for the current point level.

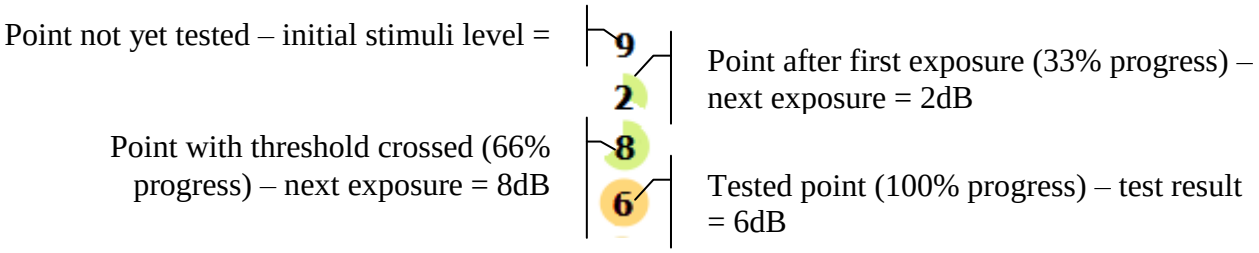


Figure 84. Test point display

The currently tested point (i.e. currently illuminated on the perimeter bowl) starts flashing.

The test point currently used in FNEG test is framed red.

Apart from the main test points, the test preview window also shows the blind spot. The currently tested blind spot point is framed black.

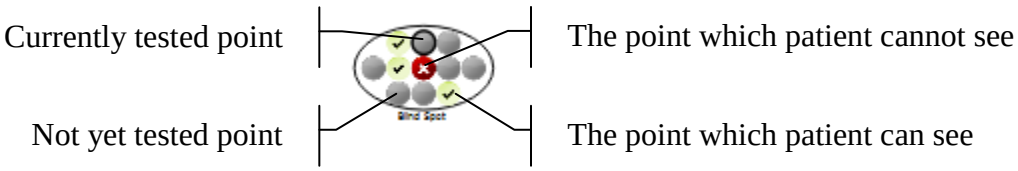


Figure 85. Blind spot test display

12.2.2. Test progress — calibration

If the initial stimuli level calibration is enabled ("Setting the calibration level (initial stimuli level)"), four points will be tested first, one in each quarter. If the calibration level turns out to be too low for the points tested, you will see a message asking you to choose one of calibration level selection options.

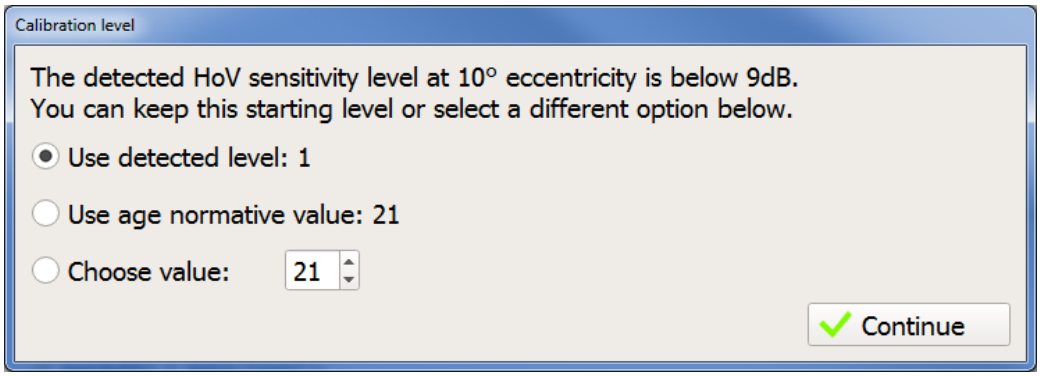


Figure 86. Calibration level selection window

Choose one of the options to continue the test.

12.2.3. Progress of the test – blind spot detection

Blind spot is detected along with initial level detection. Depending on the blind spot type selection in Settings (15.3.4 Selection of the Blind Spot), the blind spot area is tested using:

- Default (PTS) method - 11 test points in expected blind spot location. Each point out of 11 is tested in order to check if it falls into blind spot area.
- Alternative (HFA) method – test starts with exposition in the central and most probable location of the blind spot. If the exposition in the first point is not seen for three times in a row, the poitn is marked as not seen and the blind spot detection is finished with the identified location. If the first point is seen, then the algorithm is searching for blind spot edges vertically and horizontally.

It is important to correctly identify the blind spot area to provide for the accuracy of the

diagnosis. In addition, the blind spot is used during the test to control fixation by means of the Heijl–Krakau blind spot monitoring technique.

Depending on the H-K fixation control settings, one of the following messages will be displayed if the blind spot is not found.

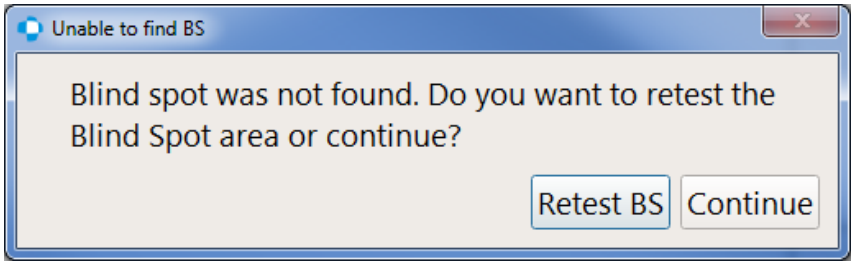


Figure 87. Blind spot detection error with disabled H-K fixation

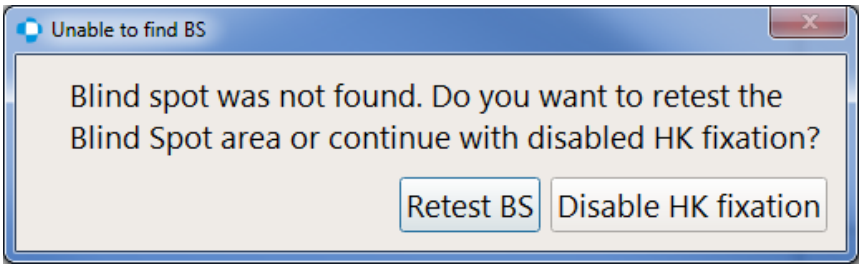
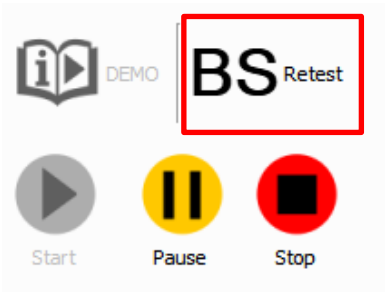


Figure 88. Blind spot detection error with enabled H-K fixation

Choose the Retest BS option to repeat the entire blind spot test. Choosing Continue or Disable HK fixation means no H-K fixation control can be used during the test.

Blind spot retest is also possible available during the examination. To perform a blind spot retest, simply click on the “BS” button next to examination control panel. The blind spot retest button is marked in the figure below:



Rysunek 1. Retest blind spot button

One of the most common causes for BS detection error is when the test is done for a different eye than the one selected to be tested (test settings for the right eye, and a test done for the left eye or the other way round). Before the test is continued, make sure the test settings and the actual progress of the test are coherent.

12.2.4. Progress of the test — fixation errors

FPOZ, FNEG, H-K fixation tests are run regularly during the test, along with gaze tracking (if the appropriate test options are enabled).

H-K: If an H-K fixation error is detected during a test, the test will be interrupted and the following message will be displayed:

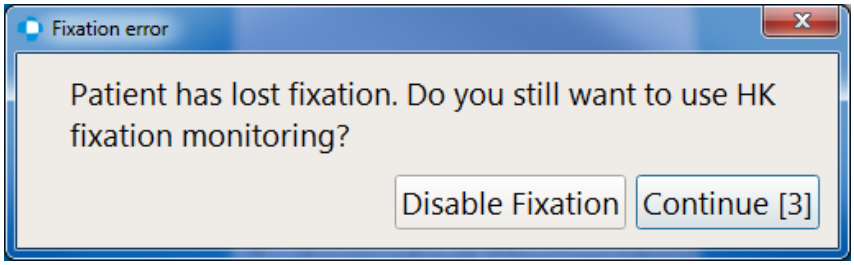


Figure 89. H-K fixation error

Tell the patient to stay focused on the fixation point(s). Press Continue to continue the test without introducing any modifications.

If the fixation error message appears frequently and the fixation control function interrupts the course of the test of a non-cooperating patient, H-K fixation can be disabled. Choose the Disable Fixation option to continue the test, and the H-K tests will be disabled.

If the H-K fixation is disabled after a fixation error, it can be enabled in the Reliability Test Settings panel on the left side of the window.

Gaze tracking - If the pupil movements exceed the allowed pupil shift, the system will detect and report a fixation error (if the "Gaze tracking" fixation option is enabled). The test will be paused and automatically resumed as soon as the pupil becomes stable.

If the fixation error message appears frequently and the fixation control interrupts the course of the test in a non-cooperating patient, the video fixation option can be disabled. Disable the "Gaze tracking" option in the Reliability Test Settings panel on the left, or press the quick fixation switch-off pushbutton on the left side of the eye camera window.

To enable the video fixation option, go to the Reliability Test Settings panel on the left, or press the quick fixation switch-off pushbutton on the left side of the eye camera window.

"Gaze" fixation needs to be supported by a high-quality video image from the eye camera where the eye pupils can be clearly seen. Bad room illumination or incorrect camera configuration can affect the quality of the video image and render the use of video fixation impossible.

12.2.5. Progress of the test — change of trial lenses

When the trial lenses are used correctly, the central area of the visual field can be tested within up to 30° radius. The field extending beyond the 30° radius will be covered by the trial lens frame. Therefore, where the test area extends beyond the 30° radius, the test is divided into parts: a test with the trial lenses, and a test without the trial lenses.

The test will be paused when the trial lens must be inserted or removed, and the appropriate message will be displayed.

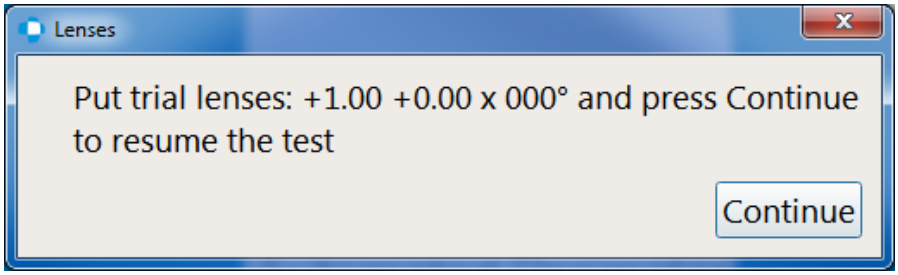


Figure 90. Insert Trial Lens text message

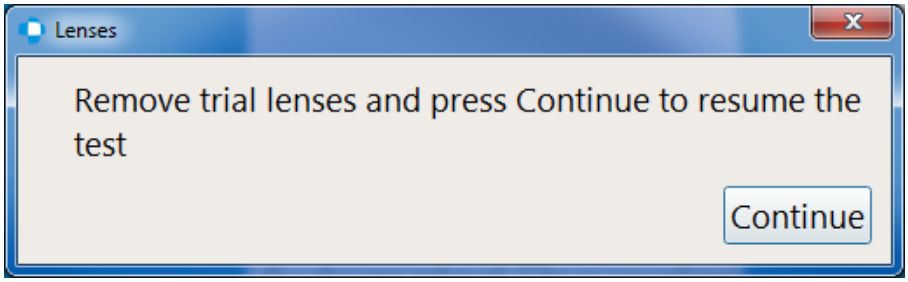


Figure 91. Remove Trial Lens text message

If the correction lens is not removed for visual field tests within the 30°-50° radius, the test may include artifacts, i.e. ring-shaped scotomas. This can lead to a false diagnosis.

12.2.6. Progress of the test – fixation offset

If the tested fields extend beyond the 50° radius, fixation offset by 30° to the left or to the right of the central fixation is used. The visual field extends to 80°. If the fixation offset is applied, the test is paused and the message appears, asking you to prepare the patient for a fixation change.

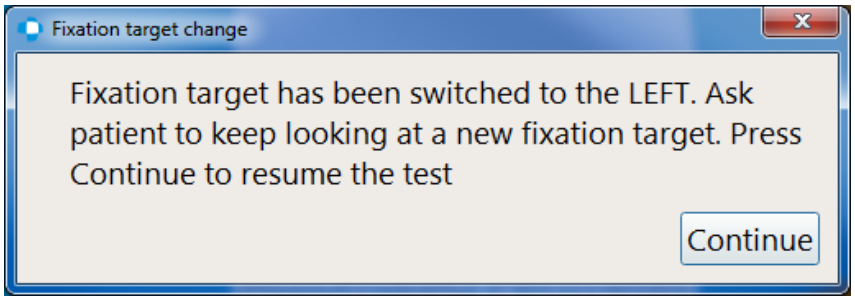


Figure 92. Fixation offset during a test

12.2.7. Progress of the test – retesting selected points

During the test it is possible to order a retest of a single point or group of points.

The retest is carried out after completing the examination of all the original points of the field. During the retest it is possible to select further points for retesting. The next points will then be added to the list of currently examined points. The exception is when a part of selected to retest points belong to the part of field which was originally tested with lens on or the opposite. In this case these points are going to be tested only after examination of other points. The retest can be carried out repeatedly for the points already examined.

Retest functionality is not available for the fields where the fixation shift occurs.

12.2.7.1. Retest order

To order a retest for a single point during examination, select point and right-click to select “Retest selected” from the context menu. The condition is that the selected point has already been examined.

To order a retest for a group of points during examination, hold left mouse button and drag it to select points and then release the left mouse button. Points that can be tested again (points already tested) will be highlighted. The next step is to right-click on the test field and select “Retest selected” from the context menu.

In order to do a retest of all tested points during examination, make sure that no point is selected and then right-click to select “Retest all” from the context menu.

Before the retest starts, the sensitivity values of the selected points will be restored to their initial values – depending on the selected calibration level method.

12.2.7.2. Retest cancelling

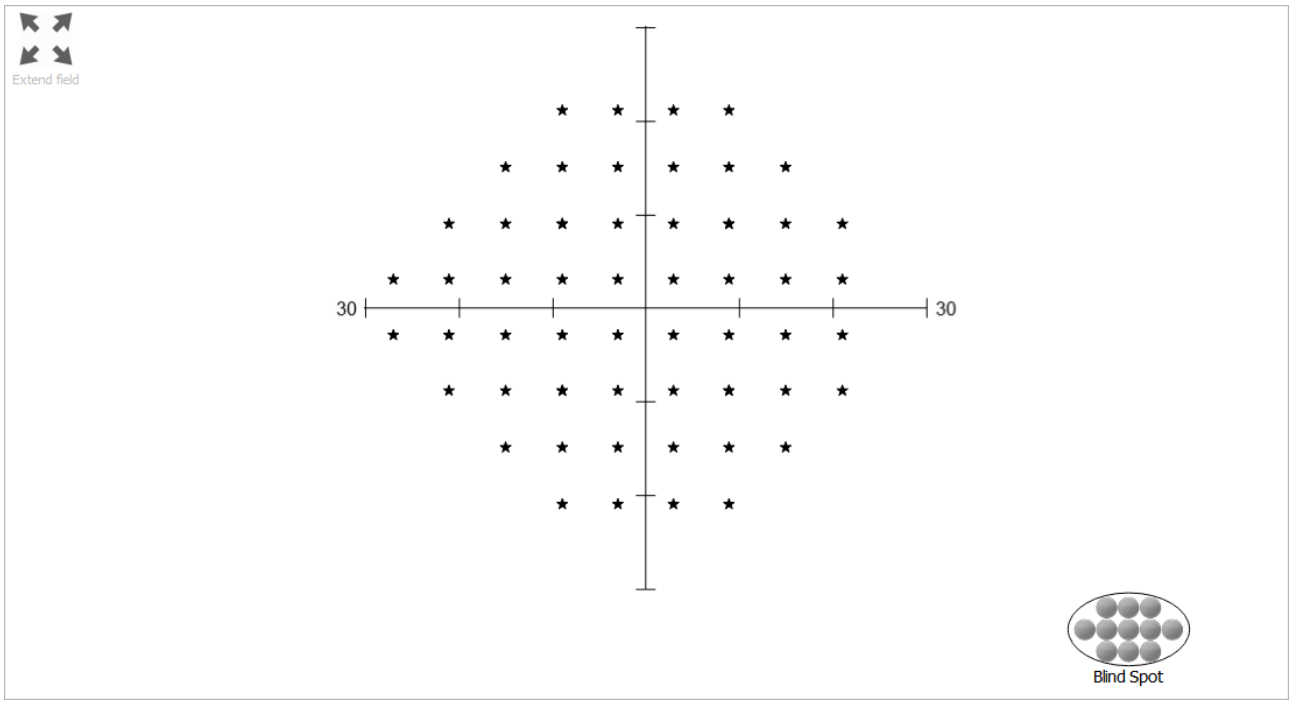
It is also possible to cancel the retest for a single point or group of points, provided that these

points do not belong to the group that is currently being retested. Cancelling can be made in a similar way to a retest order, by selecting points and choosing “Cancel retest selected” or “Cancel retest all” option from the context menu.

The sensitivity values of the points to be retested after cancellation of the retest will be restored to the final result values of the examined points.

12.2.8. Progress of the test – extending test field

During the test it is possible to extend the field with additional points provided for a given field. If a field is extendable there is a “Add points…” button in the upper left corner of the test field. Before starting the test, the button is inactive. The field extending is only possible during the normal test phase (after the possible calibration process).



After starting the test and completing the eventual calibration process, the extend field button will be unlocked. After pressing the button, addition button will appear, after pressing which the points located on the external or internal side of the field will be added to the test (Figure 93. Controls of the automatic including additional points to the field). After hovering over one of the available buttons, it will highlight additional points on the field in blue. Pressing the button again will remove additional points from the field, also if they are already examined or are currently being tested. It is also possible to manually add additional points by selecting them with the mouse and selecting the appropriate option from the context menu. The initial values of the added points depend on the chosen calibration method dna they are calculated along with the basic points.

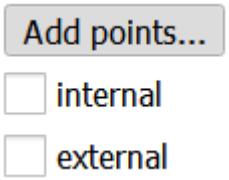


Figure 93. Controls of the automatic including additional points to the field

The examination field after its completion takes the form of an expanded field. It is possible to start the test of the repeated test in the extended field with results of additional points. In a situation where the field has been extended but no additional point has been added, the examination field will be saved to the database as a primary field.

During the examination it is possible to return to the original field by disconnecting all additional points.

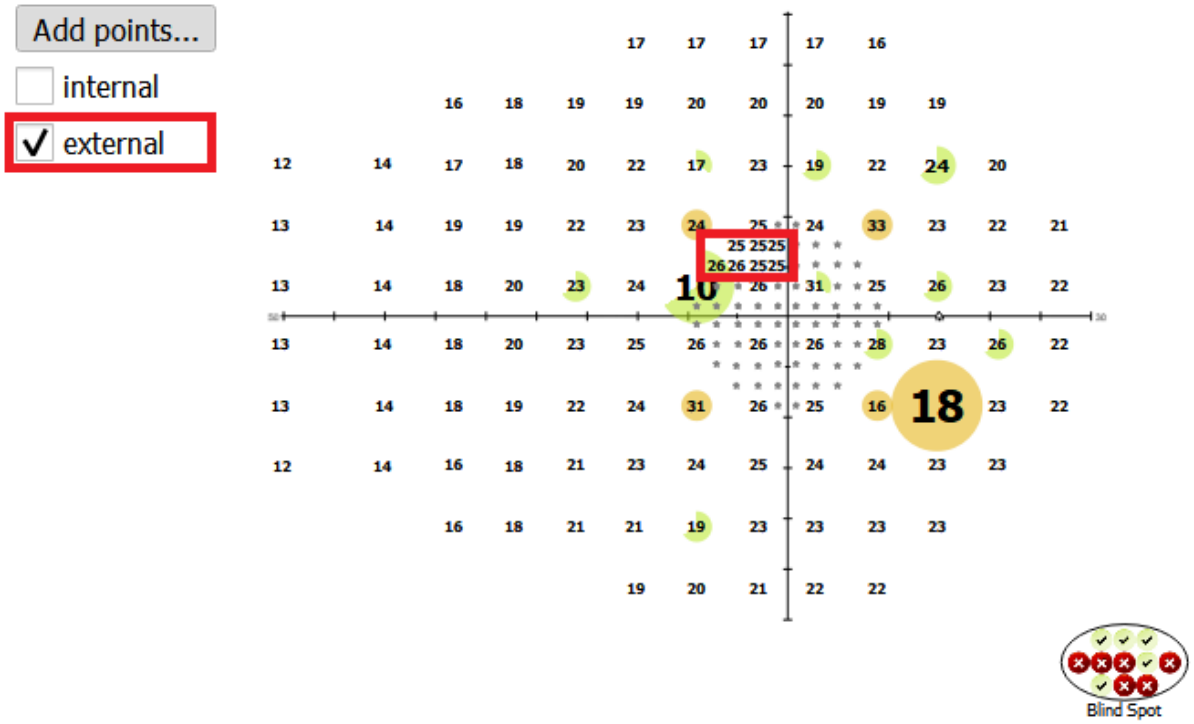


Figure 94. Adding additional external points to "24-2" field and a few external points manually

12.2.9. Progress of the test – eyeSee eye image registration

The EyeSee module is responsible for providing the eye fixation information gathered during the stimulus exposure. Depending on the EyeSee mode (Figure 95. Activated EyeSee module) this involves capturing images of the eye from the device's camera or only the numerical eye tracking data, and storing them together with the patient's test data. EyeSee images can be viewed during any examination, before follow up examination and in the "Results" tab. To use

the EyeSee functionality, make sure that it is enabled (default). Activation of an EyeSee module is described in chapter 15.3.6.3 EyeSee module.

The EyeSee/EyeSee Lite functionality may be not available in some of the software distributions due to the legal limitations. Please contact your local distributor to check which EyeSee modes are available in your version of the software.

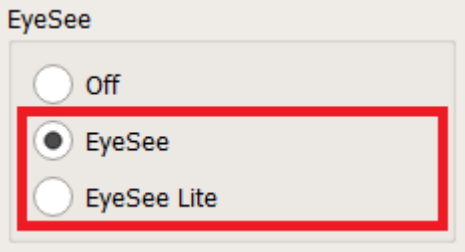


Figure 95. Activated EyeSee module

To display a list of EyeSee images of the examination, place the mouse cursor on any of the test points in the field window. On the left side of the window in the place of the examination details, a list of EyeSee images will appear in the order from the most recent to the oldest picture (Figure 96. EyeSee images registered at a moment of stimulus exposure). When the images do not fit in the displayed area, you can scroll the list with the mouse wheel up and down. To display the test details again, move the mouse cursor away from the test point.

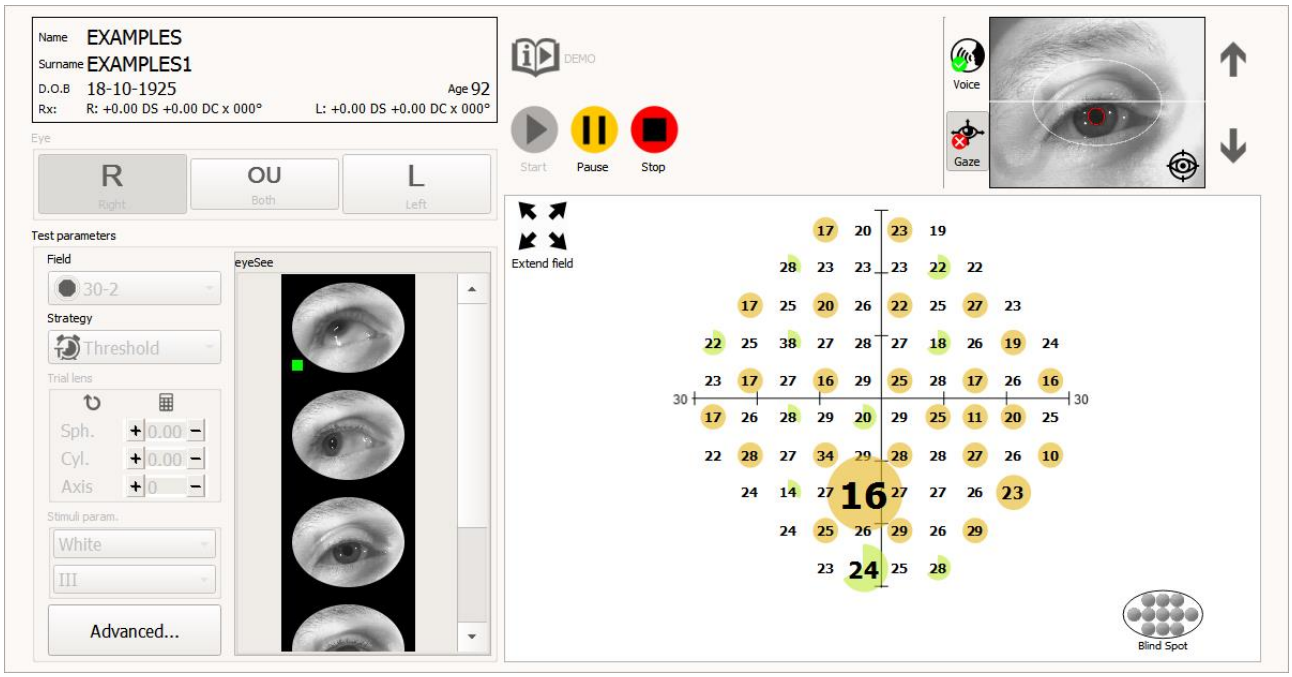


Figure 96. EyeSee images registered at a moment of stimulus exposure

In the lower left corner of a single eye image you can see the symbol in the form of a small

square filled with green color (Figure 97. Image of patient's eye registered when patient reacted to stimulus). This symbol means that the patient reacted to the stimulus.

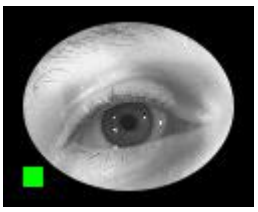


Figure 97. Image of patient's eye registered when patient reacted to stimulus

Along with eye images of regular test points, the images are also registered as a part of a short-term fluctuation test (SF). Eye images in this case are posted separately (Figure 98. EyeSee images registered as a part of SF test).

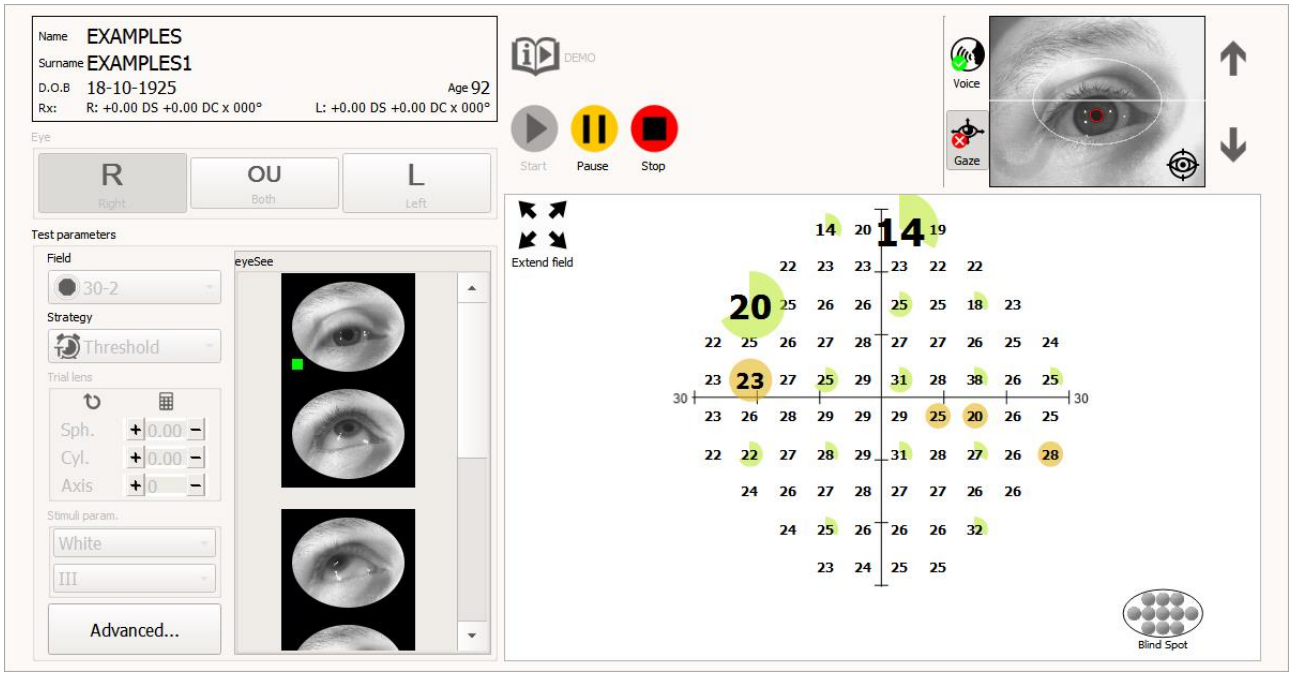


Figure 98. EyeSee images registered as a part of SF test

12.2.10. Head Tracker - Automatic positioning of the chin

The application allows automatic positioning of the chin before and during the examination. The condition of proper working of this function is correct detection of the pupil of the eye. The automatic positioning of the chin controls the chin motors so that the center of the pupil is in the middle of the camera view. Correction of the chin is performed when there is no stimulus and the pupil is correctly detected. To enabled the automatic positioning of the chin, left-click on the transparent button located in in between chinrest arrow buttons in the upper right part of the window in “Examinations” tab and on the left side of the window in “Start” tab (Figure 99). For perimeters without horizontal chinrest adjustments, the Left and Right arrow is not visible. After activating the Head Tracker function, manual chin button will be locked. Disabling the function will unblock the arrow buttons – as far as the examination is paused or not started.

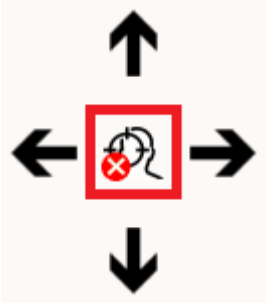
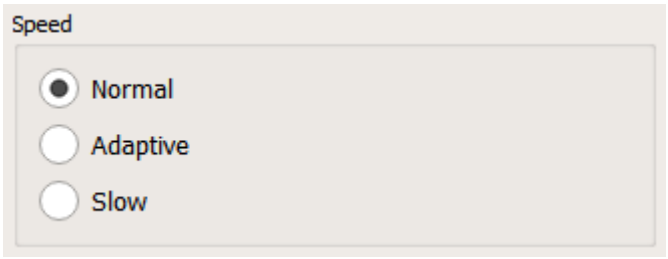


Figure 99. Head Tracker - automatic chin positioning button (PTS 2000)

12.2.11. The speed of the test

During the test, you can easily change the test speed by selecting one of the three available test speed modes available under the “Advanced” button (Figure 100. Test speed modes):

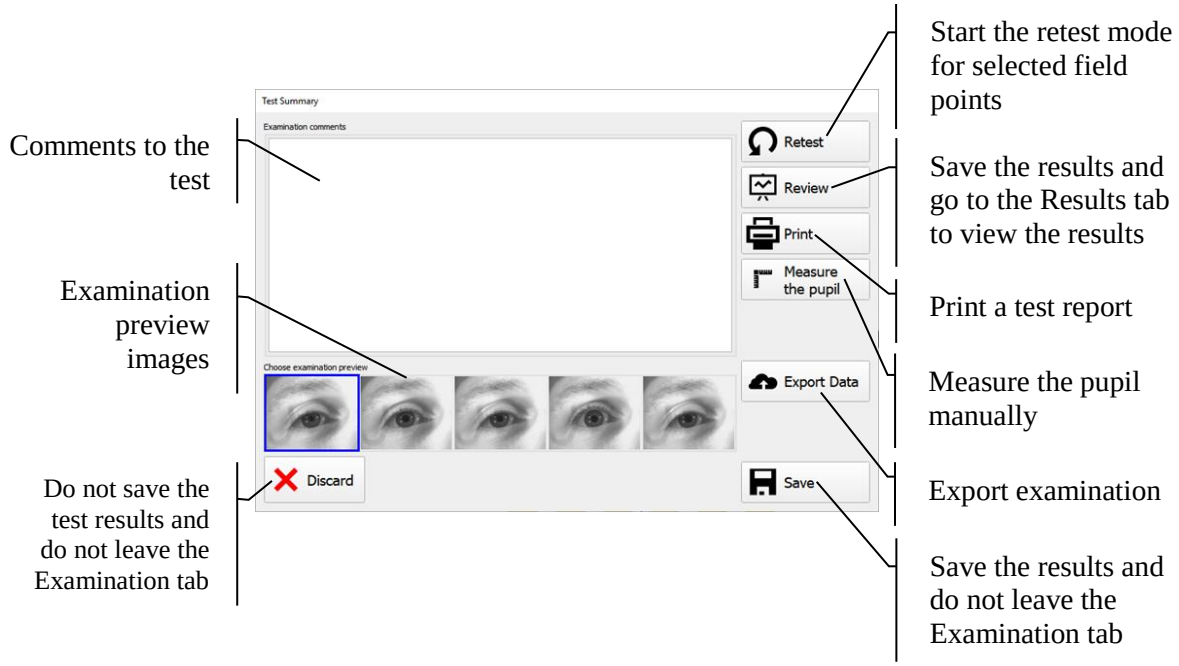
- **Normal** – time parameters such as in the currently selected program or taken from the time parameter controls if their values have been changed
- **Adaptive** – time parameters increased twice but subject to changes depending on the behavior of the patient during the test
- **Slow** – time parameters increased twice



12.2.12. Completing the test

As a rule, the test is finished when the final test results are obtained for all field points. The test can be completed earlier, once at least 3 field points have been tested.

A test summary is displayed after the test has finished.



12.2.12.1. Manual pupil measurement

After the test is finished, it is possible to perform manual eye pupil measurement. To open the manual pupil measurement window (Figure 101. Manual pupil measurement window), select the "Measure the pupil" option in the examination summary window. To measure the pupil, chose on of up to five available images of the patient's eye made during the examination and then use the mouse to set two vertical blue lines in such a way that a pupil of the eye is between them. To move a vertical line, move the mouse cursor over it and, holding down the left mouse button, move the mouse line to one edge of the pupil. By moving the vertical lines, the value of the pupil diameter will be updated in the lower right corner of the window. To save the new value of the pupil diameter, click on the "Save" button. To return to the examination summary window, clock on the "Cancel" button or by clicking on the "X" button in the upper right corner of the window. It is also possible to restore the original value of the pupil diameter calculated during the examination. To restore the original value, click on the button of the curved arrow above the "Save" button. If you click on the "Save" button, the examination summary window will be displayed. To save the new value of the pupil diameter, save the test by selecting the "Save" option in the examination summary window.

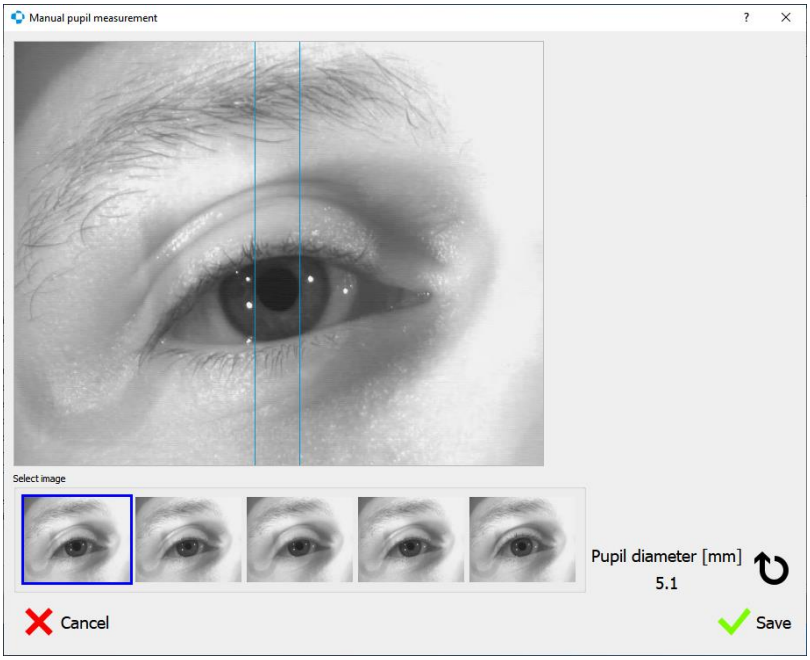


Figure 101. Manual pupil measurement window

12.2.12.2.Retest mode for selected field points

Selected field points can be retested after the test is finished. Choose the Retest option in the Test Summary window to start the retest mode. The Test Summary window will be closed and the test result will be displayed from which the points to be retested can be selected.

The points to retest has gray background.

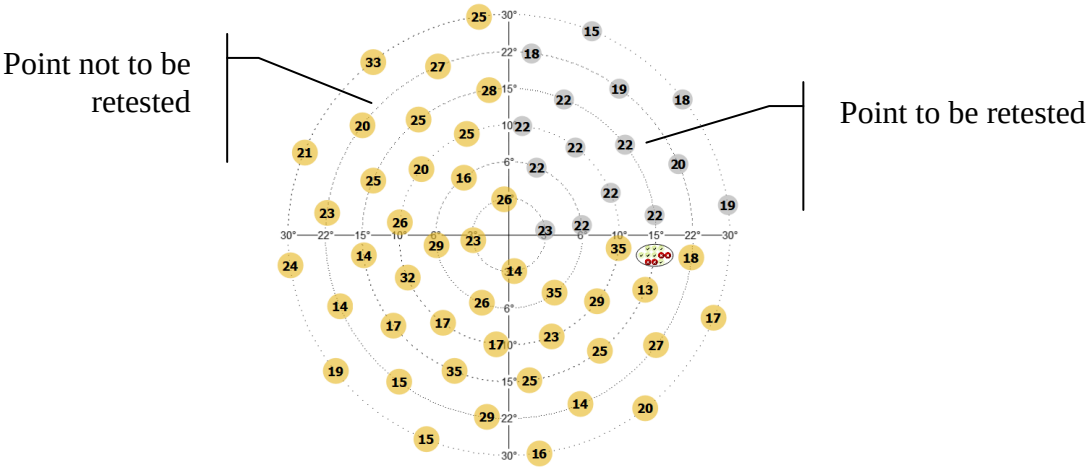


Figure 102. Selecting the field points for retesting

Select or unselect all points to be retested. You can right-click the field to bring up a context menu. The menu includes Retest All and Retest None options.

To make the selection of retested points faster, hold the left mouse button down to select a group of points. Next right-click one of the selected points to bring up a context menu. The menu includes Retest the Selected Points and Do not Retest the Selected Points options.

After you choose all points to be retested, click Start to begin the retesting phase.

The previous results for retested points will be lost. If the retest is discontinued prematurely, results for the non-retested points will not be available.

12.3. *Follow-up test*

To run a follow-up test, select the source test ("Retesting – uploading settings from previous tests") and click Start without leaving the "Follow-up action" page.

Before the follow-up test starts, choose the way the source test will be used.

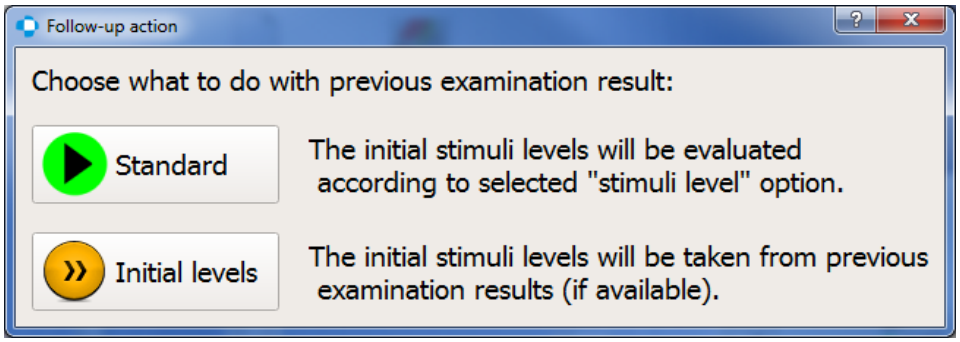
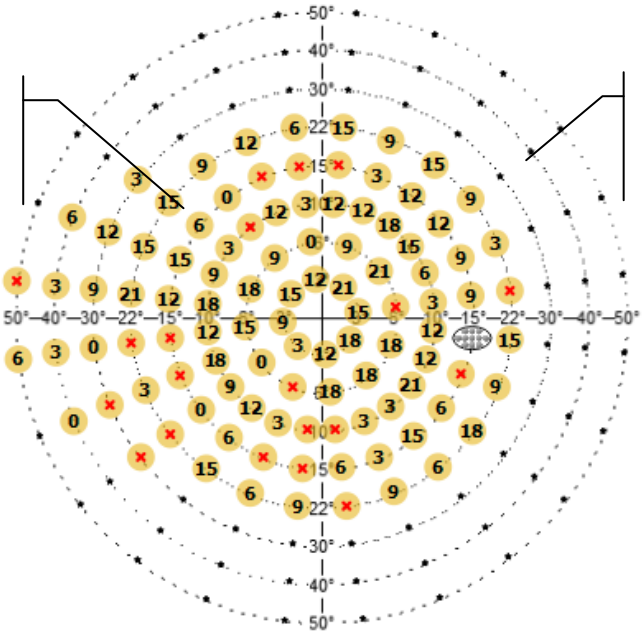


Figure 103. How to use a source test for a Follow Up test

Standard – results from the source test will not be used. As a default, only the calibration level from the source test will be set as the calibration level in the follow-up test. The test will respect the initial level settings. ("Setting the calibration level (initial stimuli level)").

Initial Levels – The source test results will be used as the initial stimuli levels for the corresponding visual field points in the follow-up test. The results for calibration points will be copied from the source test. If any test results are missing, the field points are marked with an asterisk, and the initial stimuli level will be calculated from the calibration points.

Field points with results from the source test



Field points that do not belong to the source test

Figure 104. Continuing previous unfinished test

12.4. *Resuming an unfinished test*

If the test is discontinued before it ends, the result of an unfinished test can be saved. An unfinished test can be continued with the results obtained from the already tested points.

To continue an unfinished test, select a test from the list in the “Follow-up action” page and click Start.

Before the follow-up test starts, choose the way the source test will be used.

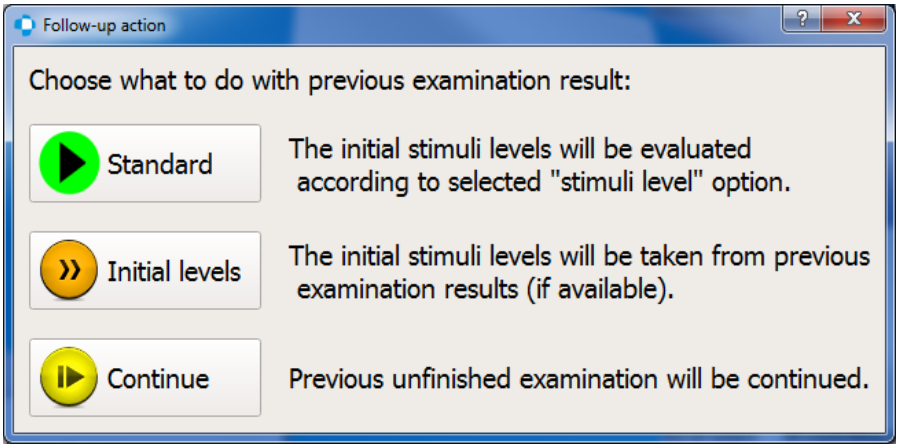


Figure 105. How to use an unfinished test for a Follow Up test

Standard – results from the unfinished test will not be used. As a default, only the calibration level from the source test will be set as the calibration level in the follow-up test. The test will respect the initial level settings. (“Setting the calibration level (initial stimuli level)”).

Initial Levels – The source test results will be used as the initial stimuli levels for the corresponding visual field points in the follow-up test. All points will be retested. The results for calibration points will be taken from the source test. If any test results are missing, the field points are marked with an asterisk, and the initial stimuli level will be calculated from the calibration points.

Continue – A previous unfinished test will be continued. Points tested during the source test will not be retested. The remaining points will have the initial level calculated from the calibration points.

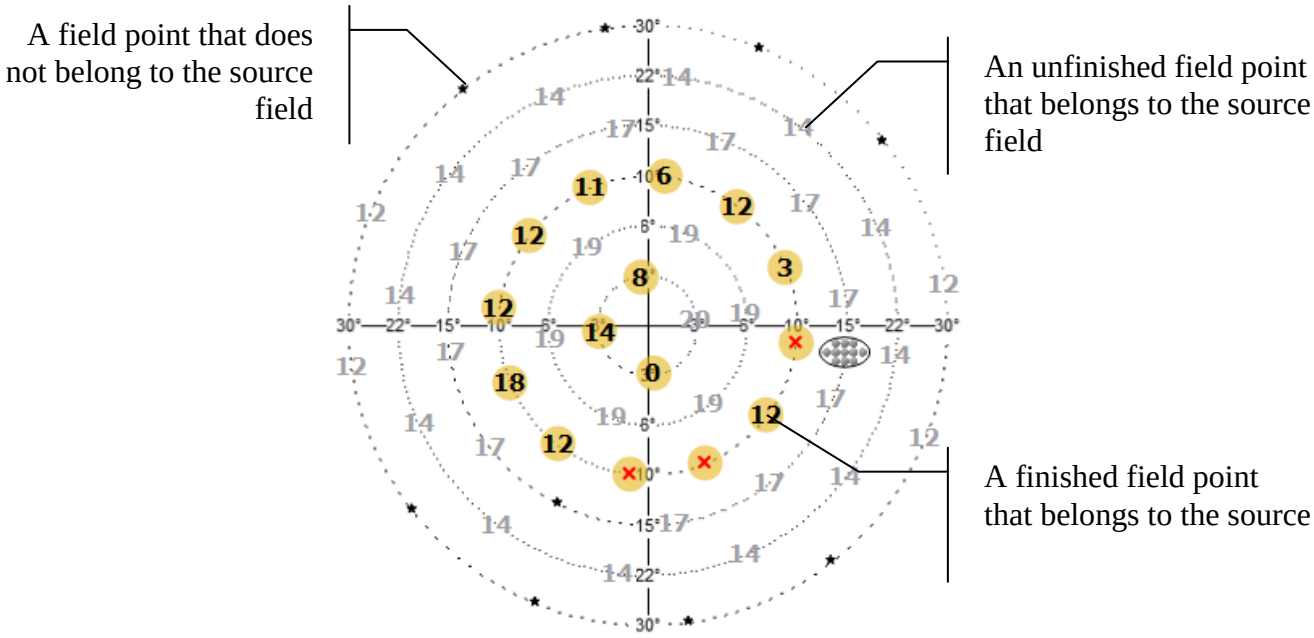


Figure 106. Test Control Window in the unfinished test continuation mode

12.5. *Selection of examination preview image*

Every examination result has got assigned one image form the preview camera. This image helps diagnosing diseases and evaluation of possible artifacts. It helps to identify situations such as dropping eyelid, trial lens holder shadows and many others which may influence the result of visual field evaluation.

After the test is finished, operator can select one from preview camera images to represent the examination. Available images are collected throughout the test in equal time segments to represent the whole test. Selected image is displayed in the results review next to the Eye Movement graph like pictured below.

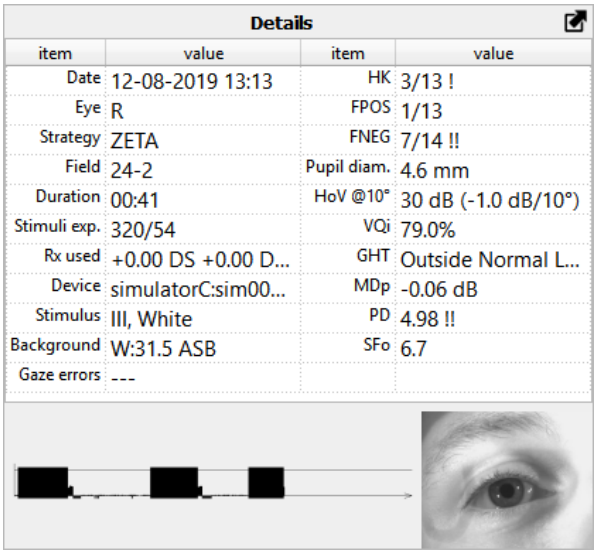


Figure 107. Examination details with examination preview image

13. *Test parameters*

This section describes the test parameters. It specifically addresses the following issues:

- test strategies
- test field
- reliability tests

13.1. *Test strategies*

Test strategy means visual field testing methodology with which information about visual quality within the tested visual field can be obtained. There are different test strategies designed for different purposes. With some test strategies, more detailed visual sensitivity data can be obtained, at the expense of a longer test duration. Other test strategies are much faster, however, they do not measure the exact visual sensitivity, instead looking for local defects of the visual field.

The test strategy should be selected not only in terms of the required diagnostic information, but also in terms of the condition and cooperation of the patient.

13.1.1. Threshold strategy

Threshold strategy provides the most accurate visual sensitivity data. In this strategy, stimuli of varying intensity are used. The patient is asked to respond to a particular stimulus. Each particular light point is tested until the visibility threshold is located with the accuracy equal to the minimum bracketing step size. The threshold strategy accurately determines the sensitivity level which is better than expected, and exactly identifies the depth of defects within the visual field.

Calibration level is first determined using 4 calibration points (one per each quadrant at 10°). Sensitivity values at these points are determined by means of the threshold strategy, unless other stimuli level settings have been enabled (“Setting the calibration level (initial stimuli level)”). Once the calibration level is known at 10°, the calibration level is determined for each point included in the test. This value is based on the correlation between retinal sensitivity and the eccentricity of the point within the visual field. Retinal sensitivity is assumed to be linearly decreasing by 3 dB per 10° eccentricity intervals.

The first light point intensity corresponds to the initial level of stimulus intensity, which is equal to the calibration level increased by the smaller bracketing step value (2dB or 3dB). The first light point is brighter than the expected minimum at the particular point within the visual field. Initial levels are updated progressively during the progress of the test.

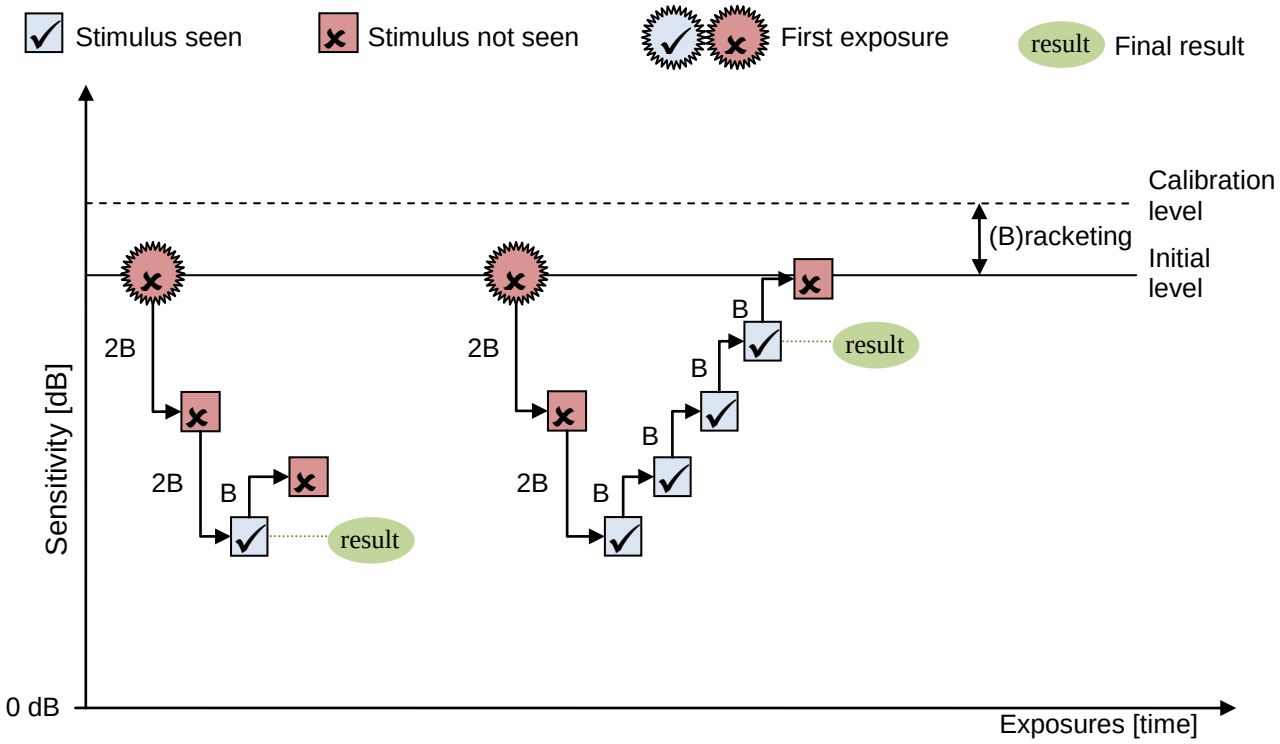


Figure 108. Threshold strategy algorithm – initial stimulus not seen

If the patient does not respond to the initial stimulus, another exposure corresponds to the previous level of stimulus intensity increased by the higher bracketing step value (4dB or 6dB). The light point intensity is increased until the patient responds to the stimulus or until the maximum light point intensity is reached (0 dB). Patient response to the stimulus means the patient's visibility threshold has been reached. Next, another exposure takes place, whose intensity is reduced by the smaller bracketing step value (2dB or 3dB). The bracketing with smaller step is repeated until the threshold is crossed for the second time and there is again no reaction from the patient. This approach can correct some invalid responses from the patient at the expense of duration. The threshold of visibility is determined to the accuracy of the smaller bracketing step size (2dB or 3dB).

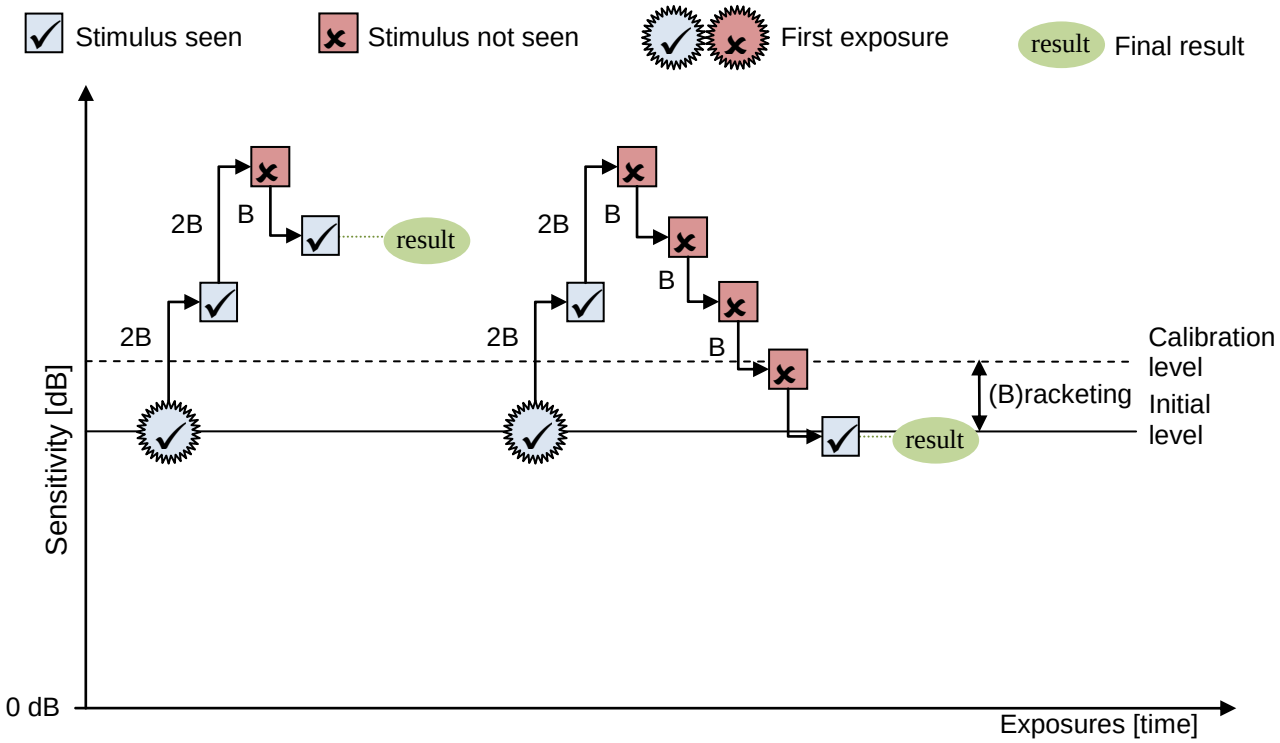


Figure 109. Threshold strategy algorithm – initial stimulus seen

If the patient responds to the initial stimulus, another exposure corresponds to the previous level of stimuli intensity reduced by the higher bracketing step value (4dB or 6dB). The light point intensity is reduced until the patient fails to respond to the stimulus or until the minimum light point intensity is reached (45 dB). Patient's lack of response to the stimulus means the patient's visibility threshold has been reached. Next, another exposure takes place, whose intensity is increased by the smaller bracketing step size (2dB or 3dB). The reversed bracketing with the smaller step is repeated until the threshold is crossed for the second time and patient reacts for the stimulus. This approach can correct some invalid responses from the patient at the expense of duration. The threshold of visibility is determined to the accuracy of the smaller step size (2dB or 3dB).

13.1.2. Screening strategy

Screening strategy is designed to quickly check the visual field and to measure the depth of defects within the visual field. In this strategy, stimuli of varying intensity are used. The patient is asked to respond to a particular stimulus. Each light point is tested once, unless the visual sensitivity deviates from the expected initial level. Otherwise the depth of the defect is measured to an accuracy of the smaller bracketing step value.

First, the calibration level is determined using 4 calibration points (one per each quadrant at 10°). Sensitivity values at these points are determined by means of the threshold strategy, unless other stimuli level settings have been enabled ("Setting the calibration level (initial stimuli level)"). Once the calibration level is known at 10°, the calibration level is determined for each point

included in the test. This value is based on the correlation between retinal sensitivity and the eccentricity of the point within the visual field. Retinal sensitivity is assumed to be linearly decreasing by 3 dB per 10° eccentricity intervals.

The first light point intensity corresponds to the initial level of stimulus intensity, which is equal to the calibration level increased by the smaller bracketing step value (2dB or 3dB). The first light point is brighter than the expected minimum at the particular point within the visual field.

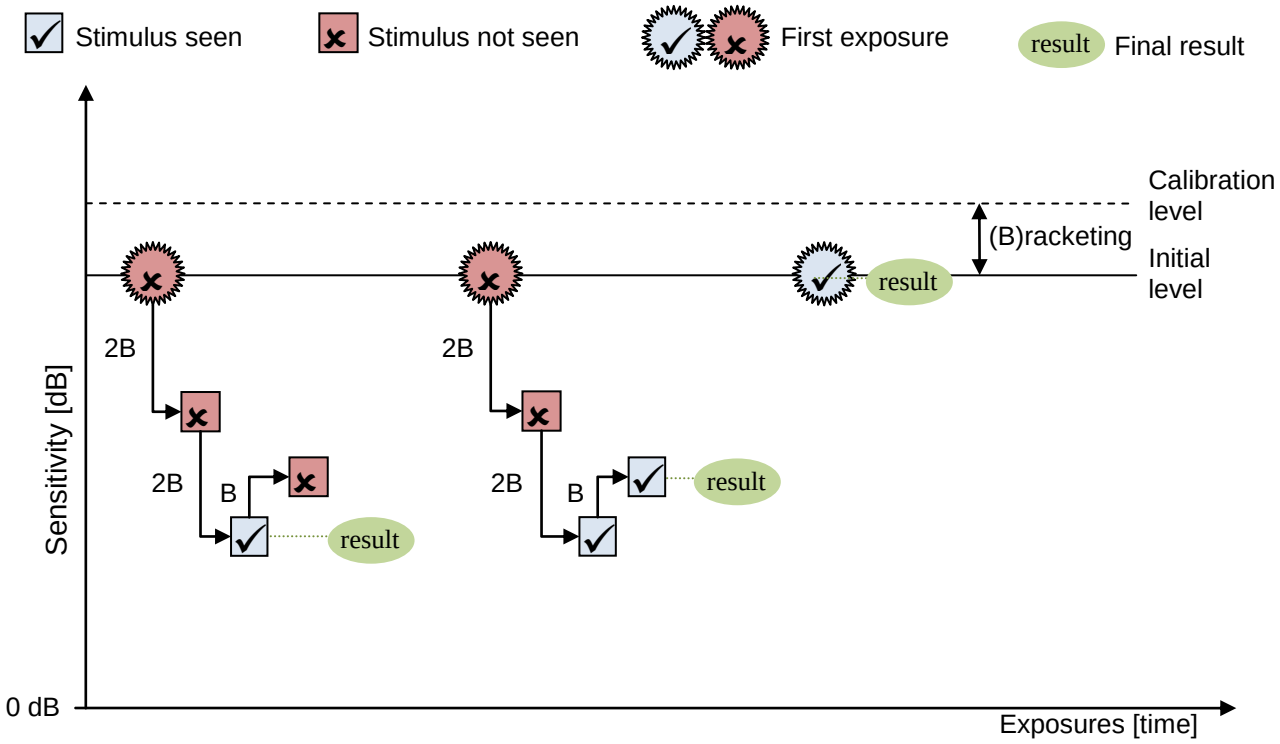


Figure 110. Screening strategy algorithm

If the patient responds to the initial stimulus, the light point assumes the final value equal to the initial level and is no longer tested.

If the patient does not respond to the initial stimulus, another exposure corresponds to the previous level of stimulus intensity increased by the higher bracketing step value (4dB or 6dB). The light point intensity is increased until the patient responds to the stimulus or until the maximum light point intensity is reached (0 dB). Patient's response to the stimulus means the patient's visibility threshold has been reached. Next, another exposure takes place, whose intensity is reduced by the smaller bracketing step value (2dB or 3dB). The depth of the defect is determined to the accuracy of the minimum step size (2dB or 3dB).

13.1.3. Fast threshold strategy

Fast threshold strategy is a compromise between the exact threshold strategy and the fast screening strategies. In this strategy, stimuli of varying intensity are used. The patient is asked to respond to a particular stimulus. The points within the visual field are divided into two groups.

Light points in each group are arranged regularly to cover the entire visual field.

First, the calibration level is determined using 4 calibration points (one per each quadrant at 10°). Sensitivity values at these points are determined by means of the threshold strategy, unless other stimuli level settings have been enabled (“Setting the calibration level (initial stimuli level)”). Once the calibration level is known at 10°, the calibration level is determined for each point included in the test. This value is based on the correlation between retinal sensitivity and the eccentricity of the point within the visual field. Retinal sensitivity is assumed to be linearly decreasing by 3 dB per 10° eccentricity intervals.

Each particular light point from the first group is tested until the visibility threshold is found to the accuracy of the smaller bracketing step size, similarly to the threshold strategy. The testing algorithm of light points from the first group is described in Figure 111. Fast Threshold strategy algorithm – initial stimulus not seen and Figure 112. Fast Threshold strategy algorithm – initial stimulus seen.

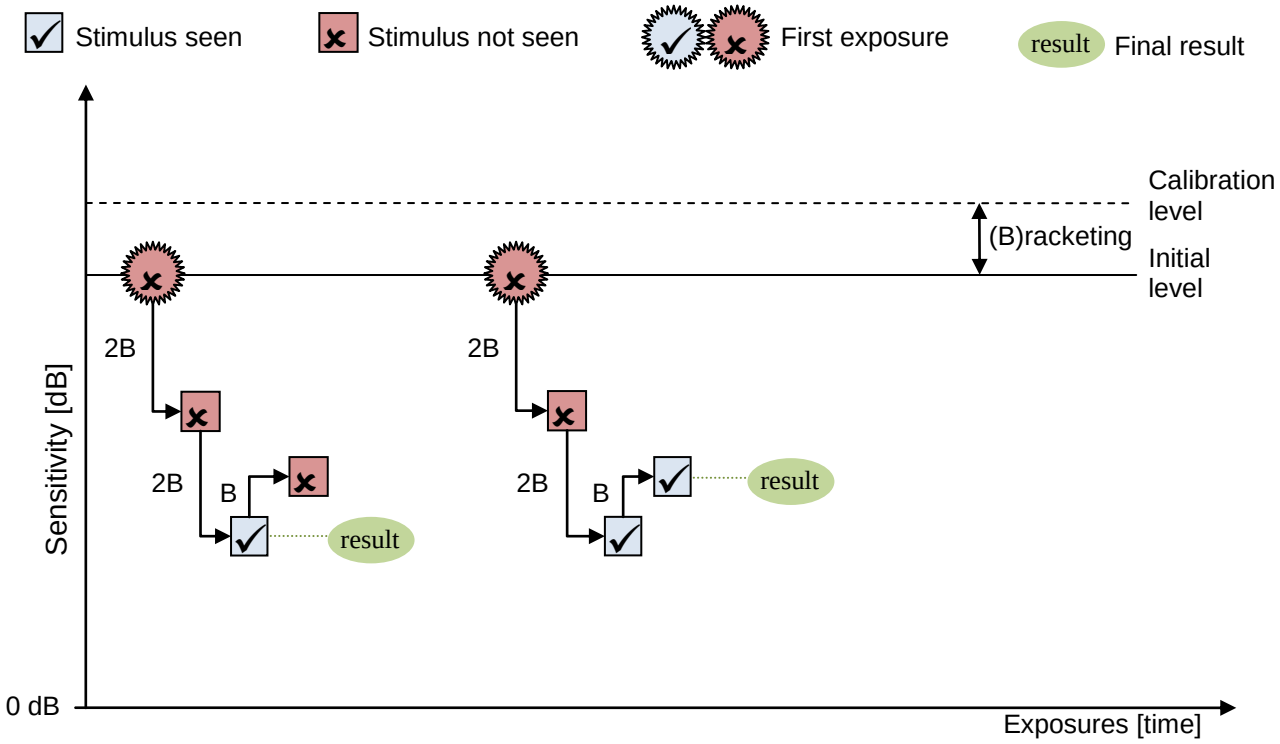


Figure 111. Fast Threshold strategy algorithm – initial stimulus not seen

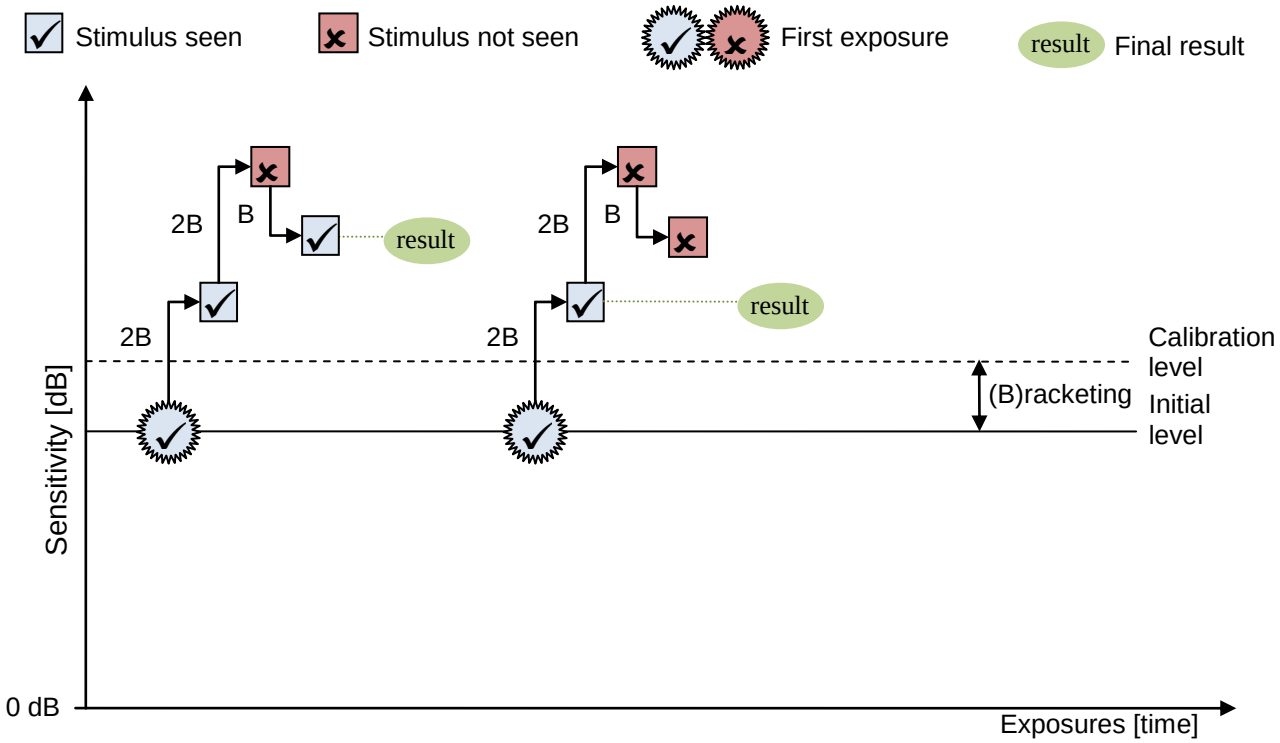


Figure 112. Fast Threshold strategy algorithm – initial stimulus seen

progress of the test. Each light point in the second group is tested only to measure the depth of defect. This means that, if the visual sensitivity at a particular point will be better than the initial level, the initial level value will be assigned to this particular point, which will be excluded from exact measurements. The testing algorithm of light points from the second group is described in Figure 110. Screening strategy algorithm.

13.1.4. ZETA™, ZETA™ Fast, ZETA™ Faster strategy

ZETA™ (Zippy Estimation Thresholding Algorithm) is a modern testing strategy allowing fast and precise estimation of sensitivity thresholds. The procedure uses statistical data and probability functions to determine the bracketing sequence and final threshold estimate. During the test procedure, with every next exposition the threshold estimates are continuously updated and the uncertainty of the estimation is reduced. When the estimation error for a given location is smaller than the predefined acceptance level, then the procedure is finished at that location. The final threshold is found as the most probable value read from probability function for a given location. In ZETA™, the bracketing procedure can be finished when the estimation error is acceptable, but only after at least one threshold crossing was detected.

ZETA™ Fast is a variant of ZETA™ procedure. It aims to reduce the time duration while keeping an acceptable precision. In ZETA™ Fast the accepted estimation error is greater than for ZETA™. To further reduce the time, the bracketing can be finished when estimation error is acceptable and at least one positive patient response is detected.

ZETA™ Faster is another variant of ZETA™ procedure which shortenes the test duration

further. It reduces the test time of healthy regions without compromise in precision of estimating the defects. The bracketing can be finished when estimation error is acceptable and at least one positive patient response is detected.

Due to the fact that the ZETA™, ZETA™ Fast, ZETA™ Faster strategy is based on spatial correlation among test locations, it's usage is limited to the 10-2, 24-2, 24-2C, 30-2, 30-2C test grids only. Hence, it may be not available on some of the devices (i.e. PTS 920 series).

If for the selected stimulus parameters the application does not provide the age normative data, then the ZETA™, ZETA™ Fast, ZETA™ Faster strategies will use the constant bracketing steps equal to the bracketing step selected in test settings. The examination in such a case can be longer than expected and it is suggested to use a Advanced strategy instead.

13.1.5. Advanced strategy

"Advanced" strategy is a fast threshold strategy of a new type. This strategy gives a clinically valuable results while making examination time shorter. In this strategy, stimuli of varying intensity are used. The patient is asked to response to a particular stimulus.

The methodology of "Advanced" strategy is based on "Fast Threshold" strategy. This strategy can be used only on specially designed test fields (10.2.11Combinations of strategy, field, eye and stimulus color settings).The strategy utilizes information about the relative position of points already tested and awaiting to be tested. Additionally the test points are positioned in the way, to cover clinically important areas of retina.

13.1.6. TOP strategy

The "TOP" strategy is a widely used fast procedure based on thresholding concept. It's characteristic feature is that each test location is tested only once. This assures extremely short test duration which is especially valuable for patients unable to maintain concentration for longer periods.

The "TOP" strategy utilizes the fact that that sensitivity thresholds at adjacent locations are correlated with each other. Result of testing one location with a given intensity influences the surrounding points. If the point was seen, the testing/resulting sensitivity of neighbours is increased with a defined fraction of the age normative value at this location. By dividing the

testing grid into groups of equally spaced test locations and adjusting the influence of test points onto its neighbours, the strategy assures that resulting sensitivity map gives a good and valuable approximation of a real sensitivity in a fraction of regular Threshold test duration.

Due to the fact that the TOP strategy is based on spatial correlation among test locations, it's usage is limited to the 24-2 and the 30-2 test grids only. Hence, it may be not available on some of the devices (i.e. PTS 920 series).

13.1.7. TOP+ strategy

The "TOP+" strategy is a modified variant of a standard "TOP" strategy. As in "TOP", it's characteristic feature is that each test location is tested only once. This assures extremely short test duration which is especially valuable for patients unable to maintain concentration for longer periods. The difference is in the selection of correlated points and the rate of influence between them.

In the "TOP+" strategy, the relations between points are not created based on distance only like in "TOP", but on the information about nerve fiber bundles related to these points.

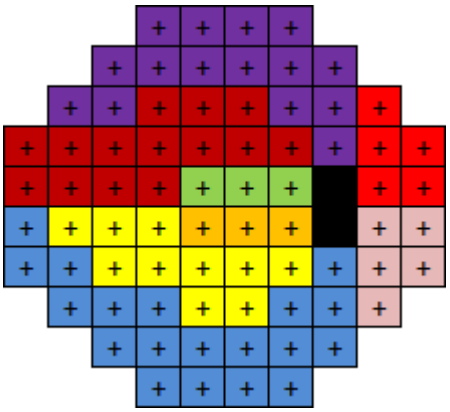


Figure 113. The 30-2 field points grouped by nerve bundles affiliation

Two points can be adjacent but belong to different nerve bundles. In such situation correlation of their sensitivity values is weak. On the other hand they have strong correlations with some other points which may lay not in a closest neighborhood. Thanks to this, the "TOP+" allows better approximation of glaucomatous visual fields with sharper edges of visual defects.

Due to the fact that the TOP+ strategy is based on spatial correlation among test locations, it's usage is limited to the 24-2 and the 30-2 test grids only. Hence, it may be not available on some of the devices (i.e. PTS 920 series).

13.1.8. 3-Zone Strategy

The 3-Zone strategy is a quick qualitative visual field testing method. The test result can be either "complete defect", "defect", or "normal" instead of visual sensitivity values in dB. In this strategy, stimuli of varying intensity are used. The patient is asked to respond to a particular stimulus. Each particular point within the visual field is tested no more than 2 times, which significantly reduces the test duration.

First, the calibration level is determined using 4 calibration points (one per each quadrant at 10°). Sensitivity values at these points are determined by means of the threshold strategy, unless other stimuli level settings have been enabled ("Setting the calibration level (initial stimuli level)"). Once the calibration level is known at 10°, the calibration level is determined for each point included in the test. This value is based on the correlation between retinal sensitivity and the eccentricity of the point within the visual field. Retinal sensitivity is assumed to be linearly decreasing by 3 dB per 10° eccentricity intervals.

The first light point intensity corresponds to the initial level of stimulus intensity, which is equal to the calibration level increased by 3 dB. The first light point is two times brighter than the expected minimum at the particular point within the visual field.

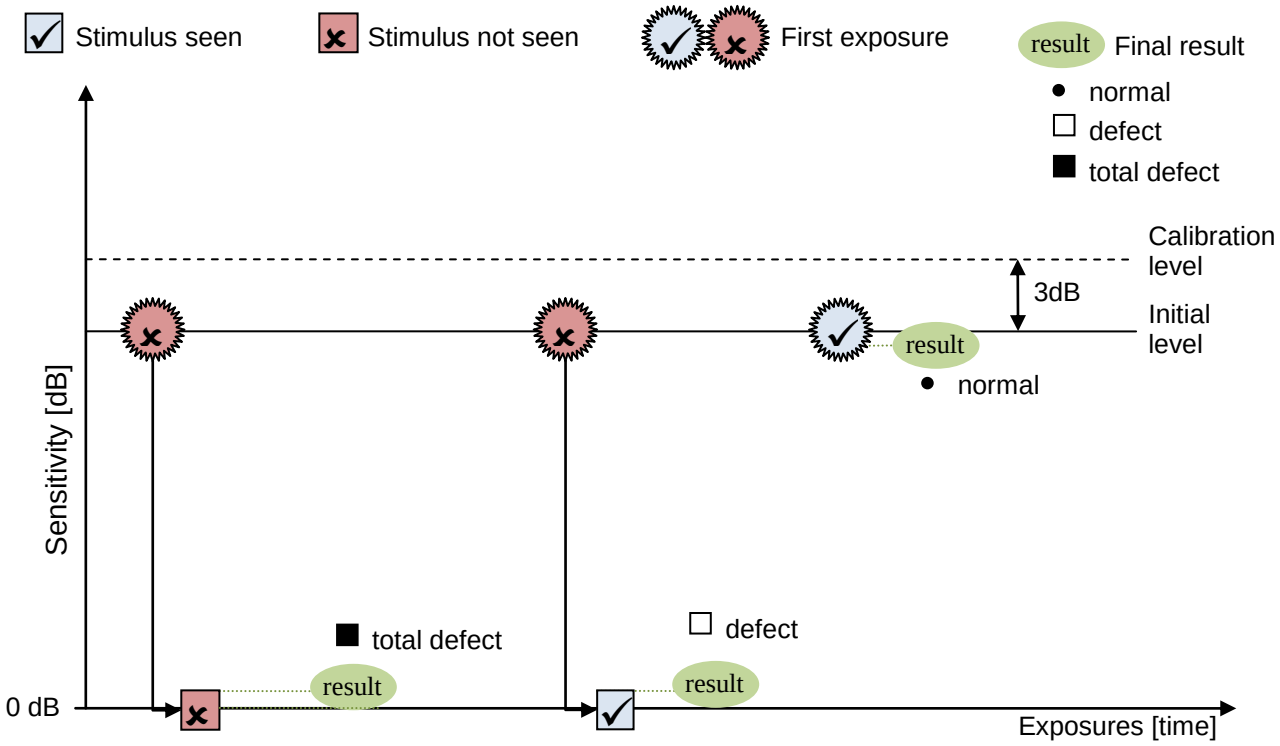


Figure 114. 3-Zone Strategy Algorithm

If the patient responds to the initial stimulus, the particular light point assumes the final "Normal" value and is no longer tested.

If the patient fails to respond to the initial stimulus, another exposure has the maximum intensity (0 dB). If the patient responds, this means that the particular point within the visual field has a defect, but not a complete defect). This particular point is marked as a "defect". If the patient fails to respond to the brightest stimulus, this particular point will be a "complete defect". In both cases the point will no longer be tested.

13.1.9. 2-Zone Strategy

The 2-Zone strategy is the quickest qualitative visual field testing method. The test results can be either "defect" or "normal" instead of visual sensitivity values in dB. In this strategy, stimuli of varying intensity are used. The patient is asked to respond to a particular stimulus. Each particular point within the visual field is tested only once, which significantly reduces the test duration.

First, the calibration level is determined using 4 calibration points (one per each quadrant at 10°). Sensitivity values at these points are determined by means of the threshold strategy, unless other stimuli level settings have been enabled ("Setting the calibration level (initial stimuli level)"). Once the calibration level is known at 10°, the calibration level is determined for each point included in the test. This value is based on the correlation between retinal sensitivity and the eccentricity of the point within the visual field. Retinal sensitivity is assumed to be linearly decreasing by 3 dB per 10° eccentricity intervals.

The first light point intensity corresponds to the initial level of stimulus intensity, which is equal to the calibration level increased by 3 dB. The first light point is two times brighter than the expected minimum at the particular point within the visual field.

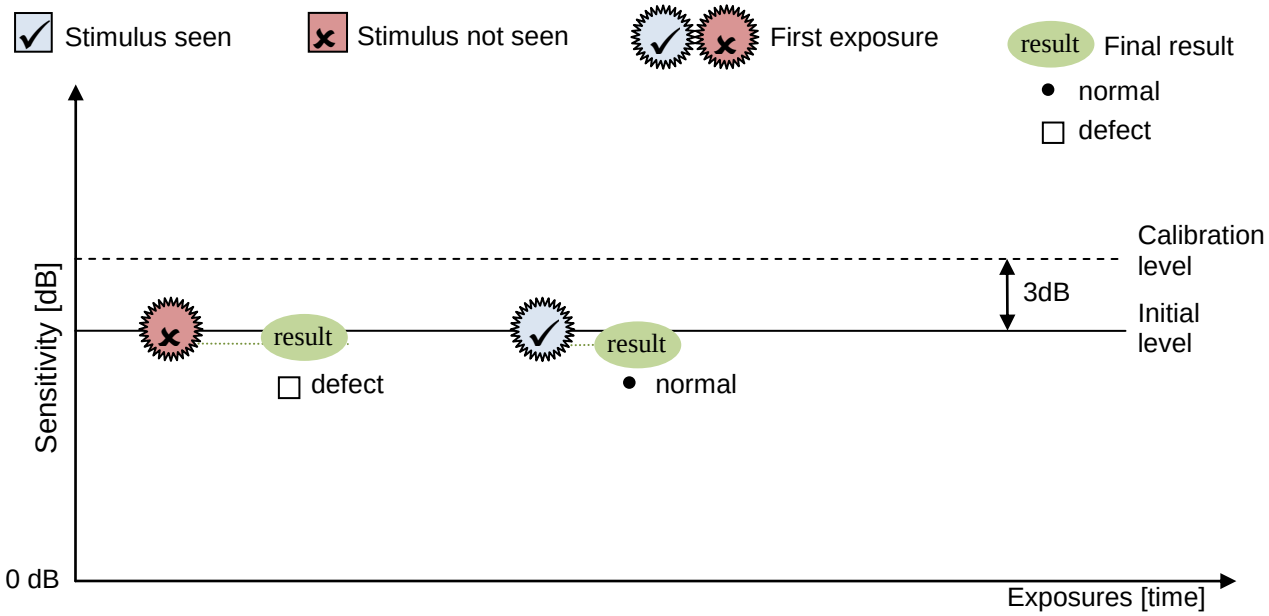


Figure 115. 2-Zone Strategy Algorithm

If the patient responds to the initial stimulus, the particular light point assumes the final "Normal" value and is no longer tested.

If the patient does not respond to the initial stimulus, the particular light point is a "Defect" and is no longer tested.

13.1.10. Binocular Driving Test

The Binocular Driving Test strategy is a type of 2-Zone strategy. Driver's Test analyses the driver's ability to see other vehicles. The patient is tested with both eyes open and light points covering the visual field within 160° radius horizontally. In this strategy, stimuli of constant intensity are used. The patient is asked to respond to a particular stimulus.

The Binocular Driving Test strategy can only be used in the Binocular Driving Test preview window and with the binocular test settings enabled.

Each particular point within the visual field is tested only once. Unlike the 3-Zone strategy, the calibration level is not determined for the Binocular Driving Test. Constant intensity of stimuli is set according to the BDT sensitivity setting ("Sensitivity settings for BDT").The test results can be either "no response" or "normal" instead of visual sensitivity in dB.

13.1.11. Flicker Test Strategy

The Critical Flicker Frequency strategy tests the ability to distinguish a flickering stimulus from a normal static stimulus. Specific deficits of flicker sensitivity were found to develop in glaucoma.

In the Flicker Test, the patient is asked to press the response button on seeing a flickering stimulus. The frequency of a flickering stimulus is progressively reduced from the level at which the patient sees to a static stimulus, until the patient is able to see a flickering stimulus.

First, the calibration level is determined using 4 calibration points (one per each quarter at 10°). Sensitivity values at these points are determined by means of the Flicker strategy, unless other stimuli level settings have been enabled ("Setting the calibration level (initial stimuli level)"). The initial stimuli level at all points within the visual field depends on the calibration level. It is constant and equals the value of the calibration level increased by 8Hz. The initial stimulus level is higher than the expected level.

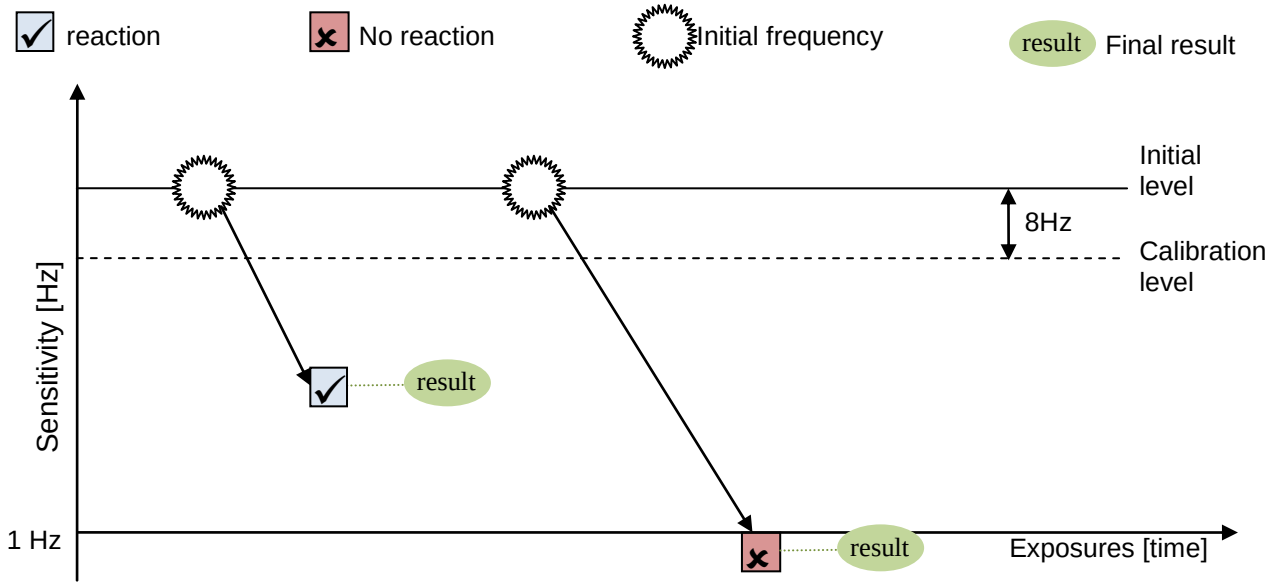


Figure 116. Flicker Strategy Algorithm

60 Hz is the maximum frequency of a flickering stimulus. This frequency is progressively reduced from the initial level to 1Hz or until the patient responds to the stimulus. The test determines the threshold frequency (patient's response) or absence of response for each tested point. Each point is tested once.

13.1.12. BSV Test Strategy

Binocular Single Vision (BSV) test is designed to detect diplopia. Diplopia may be a sign of neurological or motor disorders of the eye.

In this test, the stimulus appears as a single or doubled dot. If the light point appears as a single dot, the patient presses the response button once; if it appears doubled, the patient presses the

button twice. The result can either be “normal” where the patient has pressed the response button once for single stimuli, “doubled” where the patient has pressed the response button twice but only single stimuli was presented, or “no response” where the patient has not responded to the stimulus.

The Binocular Single Vision Test strategy can only be used in symmetric field and with the binocular test settings enabled.

13.1.13. Dynamic Strategy

Dynamic strategy is a modification of the Full Threshold strategy. The difference lies in the size of the bracketing step. In case of regular Threshold the step size takes one of two values. The bigger step is used up to the first threshold crossing and then the step is reduced by half.

In the Dynamic strategy the bracketing step changes with the difference between the actual stimulus intensity and age normative data. If the stimulus brightness checks the sensitivity close to the age normative level (<±6dB) then the step size is small (2dB). The step size is increased as the tested sensitivity falls out of the normal range and can be as big as 10 dB. The threshold is crossed only once. The final sensitivity is set at a level in the middle between last intensity with reaction and with no reaction from the patient.

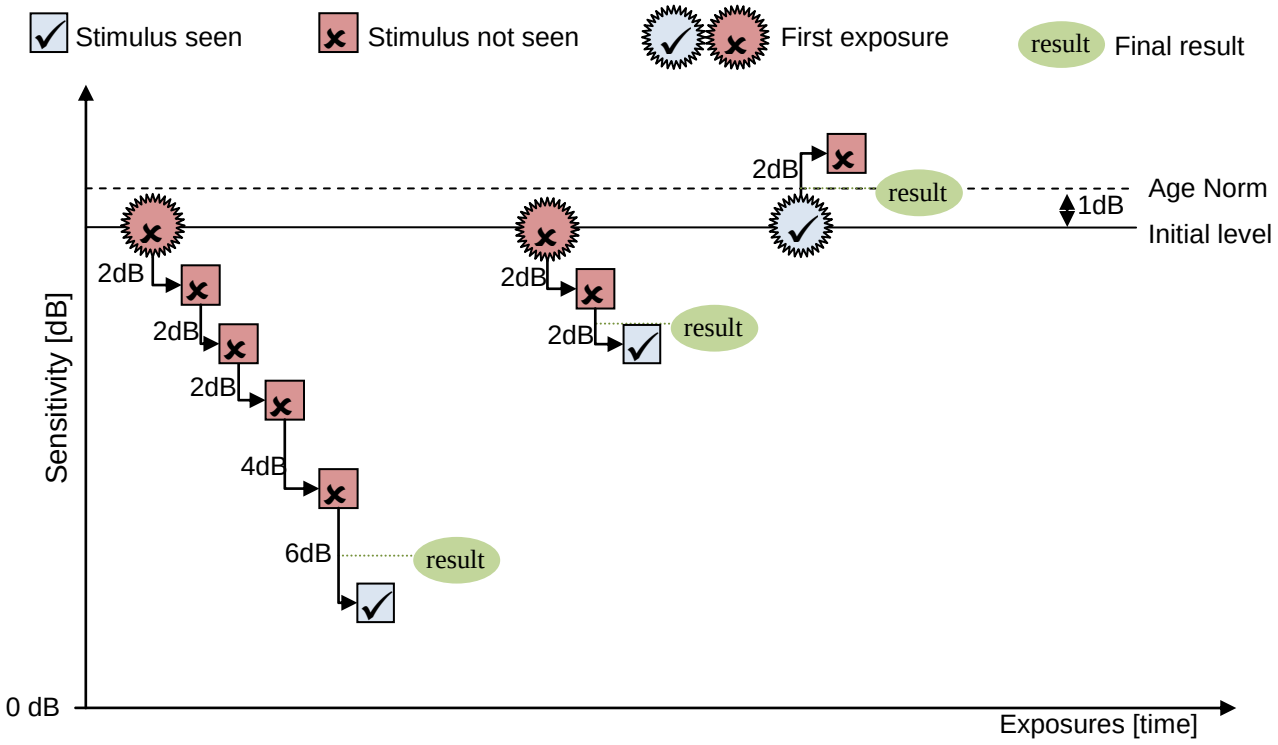


Figure 117. Dynamic Strategy Algorithm

This approach can reduce the test duration to about 60% of Full Threshold duration without a

significant change in results. The visual field areas with high sensitivity drops usually show high result variability, therefore the precise evaluation with the small bracketing step is excessive.

The first light point intensity corresponds to the initial level of stimulus intensity, which is equal to age norm increased by 1dB or to the calibration level increased by 1dB if age norm is not available. The first light point is brighter than the expected minimum at the particular point within the visual field. Initial levels are updated progressively during the progress of the test.

If for the selected stimulus parameters the application does not provide the age normative data, then the dynamic strategy will use the constant bracketing step equal to the bracketing step selected in test settings. The examination in such a case can be longer than expected and it is suggested to use a Fast Threshold strategy instead.

13.2. *Test Fields*

Test fields are a set of points within the entire visual field where the light stimulus is shown during the test. Test fields differ by range, or coverage of the visual field. In addition, the test fields can have a different arrangement of the test points.

The duration of a visual field test highly depends on the type of the test field used. The more points can be found within a test field, the longer the test will take to complete. Therefore the test strategy should be selected not only in terms of the required diagnostic information, but also in terms of the condition and cooperation of the patient.

13.2.1. Radial Fields

13.2.1.1. F-50 Field (Full Field)

F-50 field is a full symmetric test field of 50°. It is used for testing neurological deficiencies, and to detect peripheral defects while testing the center of the visual field as well. It includes other test field ranges (except for the extended test field). In terms of the number of test points, is most suitable for screening test strategies.

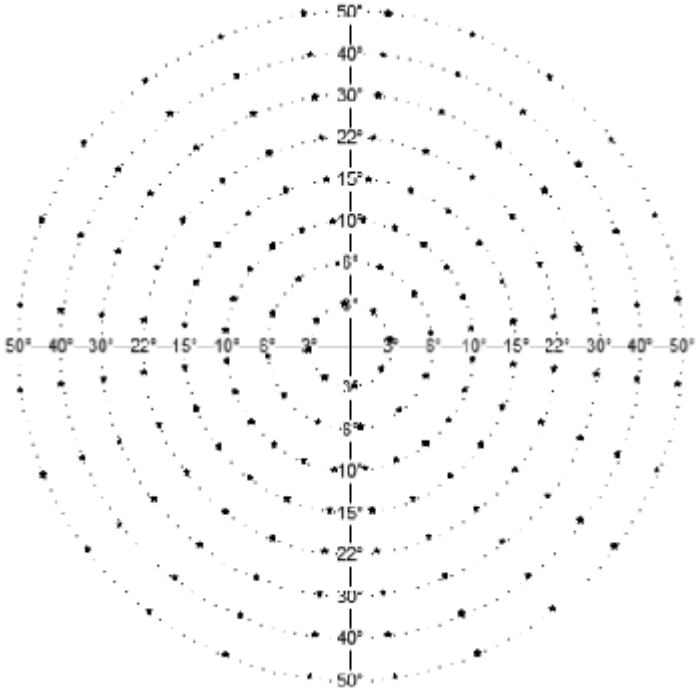


Figure 118. F-50 (Full)

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
F-50 (Full)	3-50	3-50	3-50	3-50	163 (164)	Threshold: 13-18 min Fast Threshold: 10-14 min Screening: 9-15 min 3-Zone: 4-6 min

Due to the large number of test points within this test field, tests based on the F-50 field used in combination with threshold strategies take several minutes to complete per eye. Patients may feel tired and the test reliability may be affected. Consider whether the test should be divided into two parts or paused for a while.

The range of the visual field is rather large in the nasal and superior direction, and therefore the test results may include artifacts of the nose and the brow ridge shadow. This should be taken into account so as not to confuse these artifacts with the actual eyesight impediments.

13.2.1.2. G-50 (Glaucoma)

G-50 covers the visual field area where early glaucoma can be detected. G-50 field is an asymmetric test field extending up to 50°. In terms of the number of test points, it is most suitable for fast threshold and screening test strategies. It is not suitable for use in binocular tests.

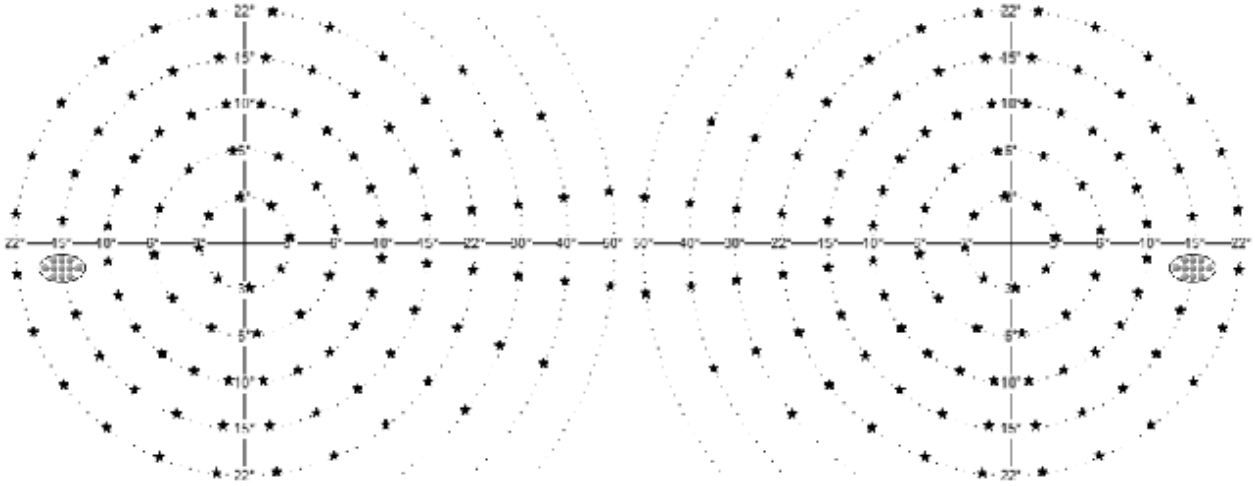


Figure 119. G-50 (Glaucoma) field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
G-50 (Glaucoma)	3-50	3-22	3-22	3-22	103 (-)	Threshold: 7-12 min Fast Threshold: 6-10 min Screening: 4-8 min 3-Zone: 3-5 min

13.2.1.3. C-22 (Central)

C-22 field is a symmetric horizontal test field of 30°. In this visual field, the central part of the visual field is monitored for possible visual defects. It can be used to diagnose glaucoma following the glaucoma field test. In terms of the number of test points, C-22 field is most suitable for fast threshold and screening test strategies.

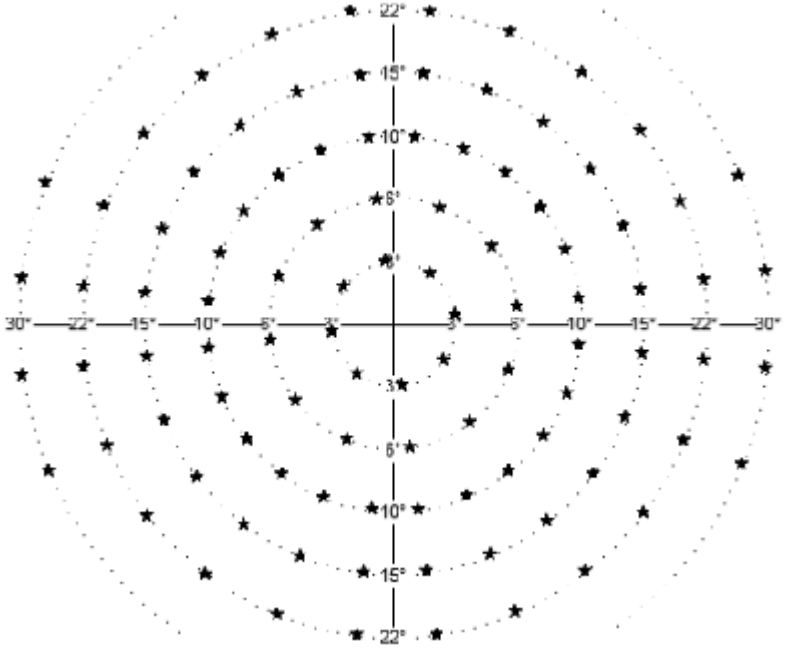


Figure 120. C-22 (Central)

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]]
C-22 (Central)	3-30	3-30	3-22	3-22	99 (100)	Threshold: 6-10 min Fast Threshold: 3-6 min Screening: 3-5 min 3-Zone: 2-4 min

13.2.1.4. C-24 A

C-24A field is an asymmetric test field extending up to 30° nasally – resembling popular test fields used in other devices. In this visual field, the central part of the visual field is monitored for possible visual defects. It can be used for rapid detection of glaucoma related defects. This field was specially designed to work with Advanced strategy, but can be used with others as

well. In terms of the number of test points, C-24A field is most suitable for precise threshold strategies.

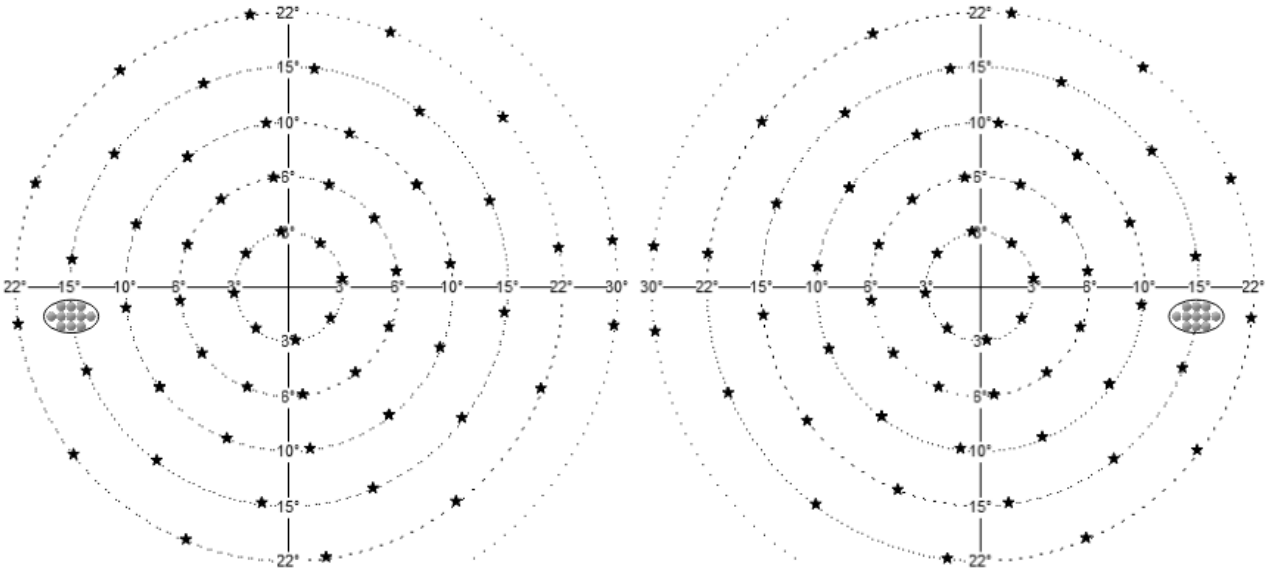


Figure 121. C-24A field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
C-24A	3-30	3-22	3-22	3-22	58	Threshold: 4-8 min Fast threshold: 3-4 min Advanced :3-4 min Screening: 2-3 min 3 – zone 2-3 min

13.2.1.5. C-30A field

C-30A field is an asymmetric test field extending up to 30° – resembling popular test fields used in other devices. In this visual field, the central part of the visual field is monitored for possible visual defects. It can be used for rapid detection of glaucoma related defects. This field was specially designed to work with Advanced strategy, but can be used with others as well. In terms of the number of test points, C-30A field is most suitable for precise threshold strategies.

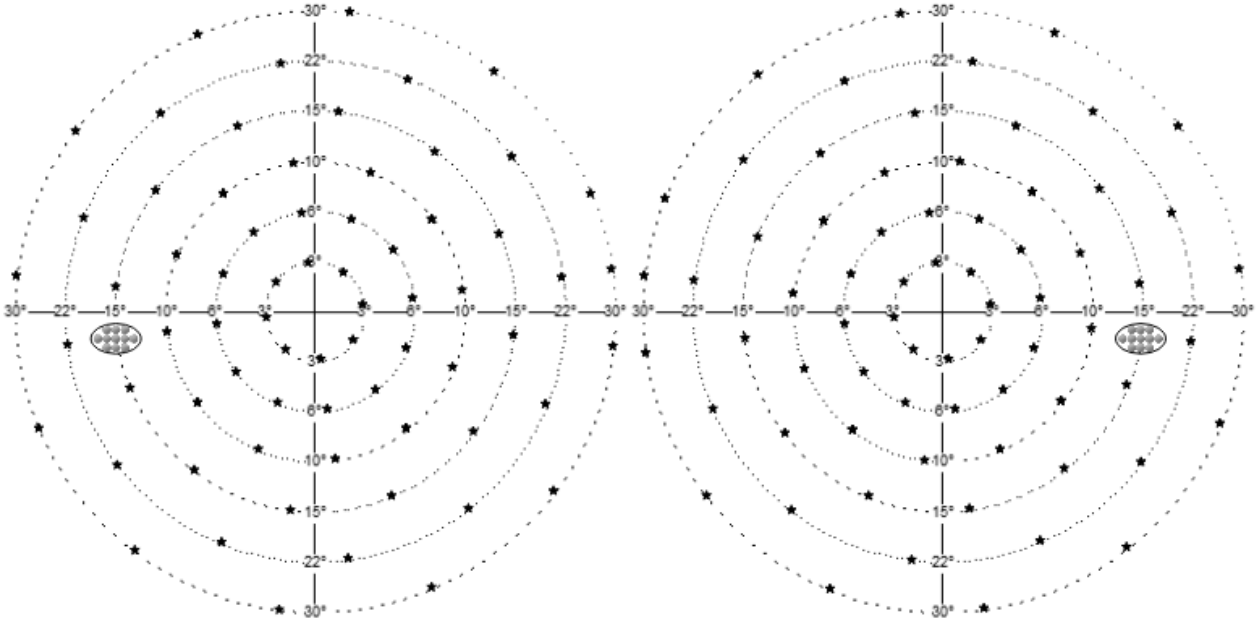


Figure 122. C-30A field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
C-30A	3-30	3-30	3-30	3-30	69	Threshold: 4-8 min Fast threshold: 3-4 min Advanced :3-4 min Screening: 2-3 min 3 – zone: 2-3 min

13.2.1.6. M-10 (Macula)

M-10 field covers the macula area. It is a symmetric test field extending up to 10°. M-10 is used in macular diseases, to detect visual defects of n. II , and to monitor the condition of a visual field of less than 10°. In terms of the number of test points, it is most suitable for macula tests using threshold test strategies.

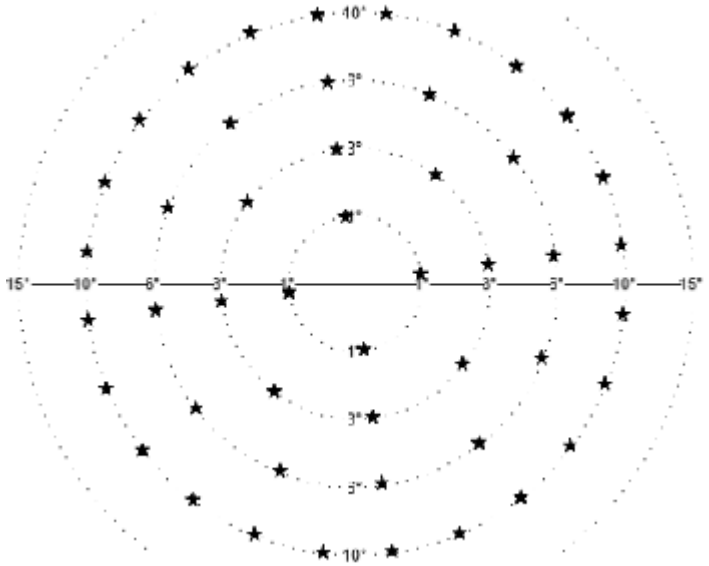


Figure 123. M-10 (Macula)

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
M-10 (Macula)	1-10	1-10	1-10	1-10	48 (48)	Threshold: 3-5 min Fast Threshold: 2-4 min Screening: 3-4 min 3-Zone: 2-3 min

13.2.1.7. C-30 (Fast)

C-30 covers the central part of the visual field and has a reduced number of test points. It is a pseudo-symmetric test field of 30° (symmetric rage with asymmetric distribution of test points). It is most commonly used to test a new patient to screen him/her for visual defects. In terms of the number of test points, it is most suitable for testing the central part of the visual field using threshold test strategies.

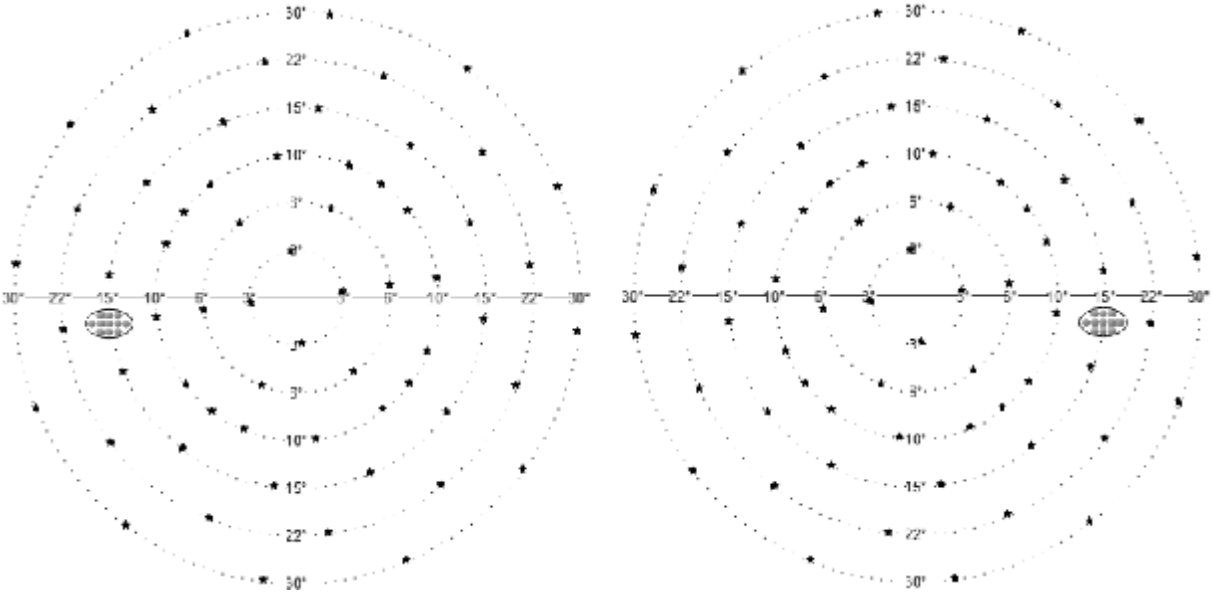


Figure 124. C-30 (Central) field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
C-30 (Central)	3-30	3-30	3-30	3-30	60 (60)	Threshold: 3-6 min Fast Threshold: 3-6 min Screening: 2-3 min 3-Zone: 1-2 min

13.2.1.8. P-50 Field (Peripheral)

P-50 covers the visual field peripheral. It is a symmetric test field of 50°, excluding the central area of the visual field. It is used to detect peripheral changes and can be used as a supplementary test aimed to follow up field loss above 22 degrees. In terms of the number of test points, it is most suitable for testing the peripheral part of the visual field using threshold test strategies.

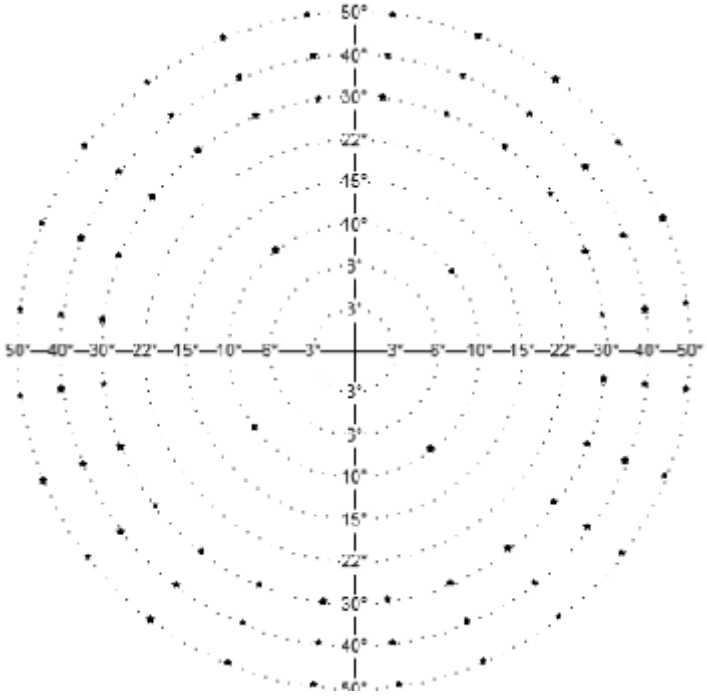


Figure 125. P-50 (Peripheral)

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
P-50 (Peripheral)	30-50	30-50	30-50	30-50	72 (72)	Threshold: 3-11 min Fast Threshold: 4-7 min Screening: 5-6 min 3-Zone: 3-4 min

13.2.1.9. E-80 (Extended)

E-80 covers almost all of the visual field. It is an asymmetric test field of 80° temporal range used for driving tests. In terms of the number of test points, it is most suitable for screening test strategies and Threshold.

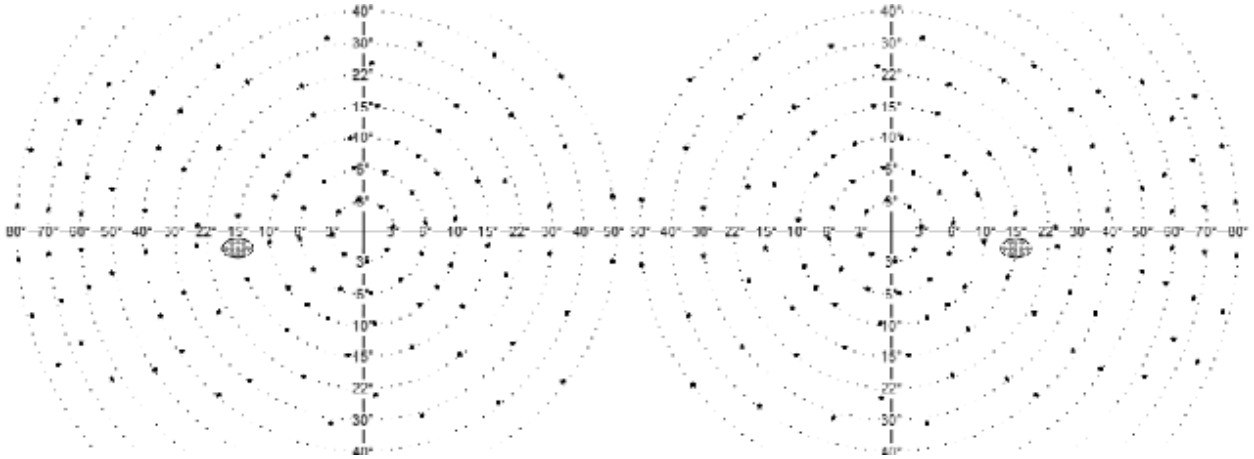


Figure 126. E-80 (Extended) field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
E-80 (Extended)	3-50	3-80	3-30	3-30	106 (-)	Threshold: 7-12 min Screening: 4-8 min 3-Zone: 3-6 min

13.2.1.10.BDT (Driving Test) Field

BDT field is used for Binocular Driving Tests. It covers drivers field range. Includes 120 points in 80 degrees horizontal and 50 degrees vertical ranges.

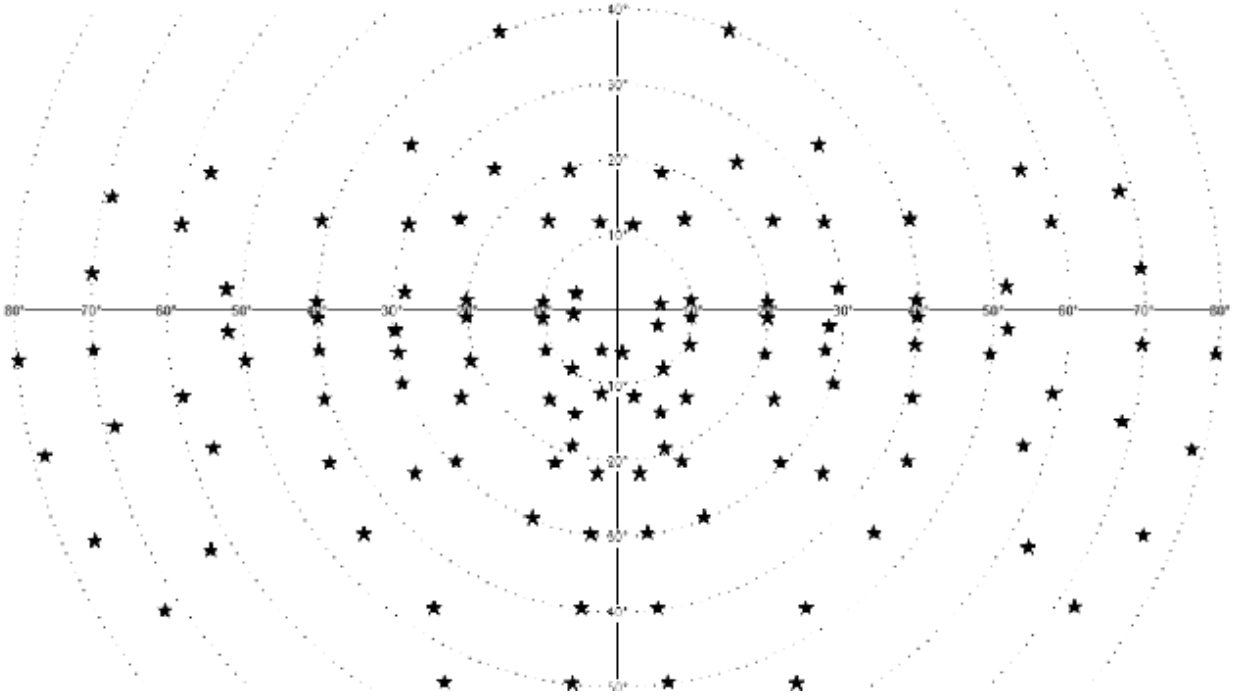


Figure 127. BDT (Driving Test) Field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration [minutes]
BDT (Drivers)	80	80	40	50	-(120)	Driving Test: 2-3 min

13.2.1.11. FeV G13

This is a special test field for drivers license Group 1 testing (European B-license classification), where the required horizontal extend of the test field is 120°. It is an asymmetric test field used for Driving Tests. In terms of the number of test points, it is most suitable for screening test strategies however thresholding is also possible.

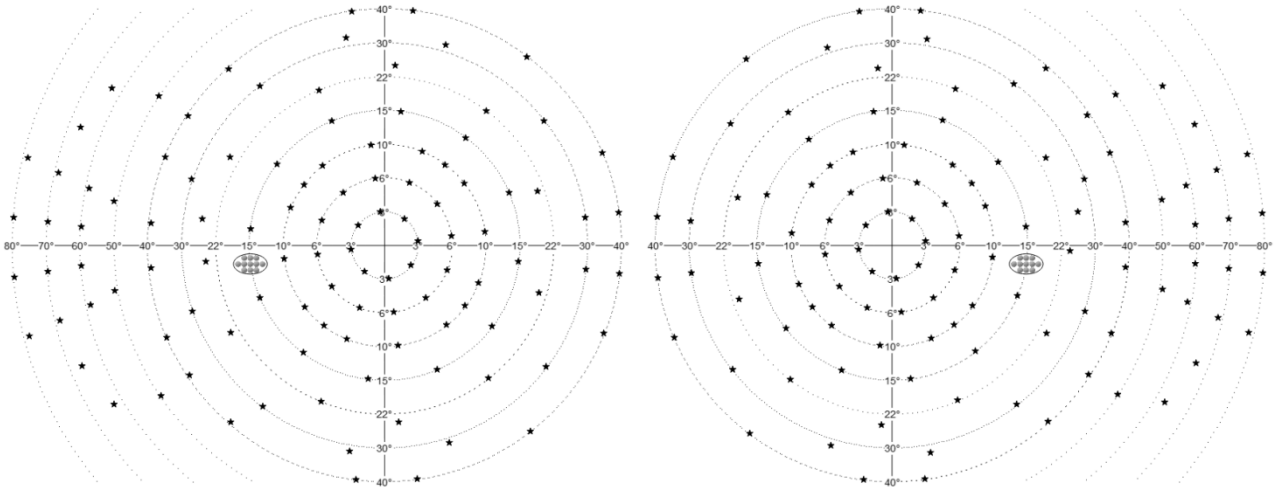


Figure 128. FeV G1 field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
FeV G1	3-40	3-80	3-40	3-40	106 (-)	Threshold: 7-12 min Screening: 4-8 min 3-Zone: 3-6 min

13.2.1.12.FeV G2

This is a special test field for drivers license Group 2 testing (European C and D-license classification), where the required horizontal extend of the test field is 140°. It is an asymmetric test field used for Driving Tests. In terms of the number of test points, it is most suitable for screening test strategies and Threshold.

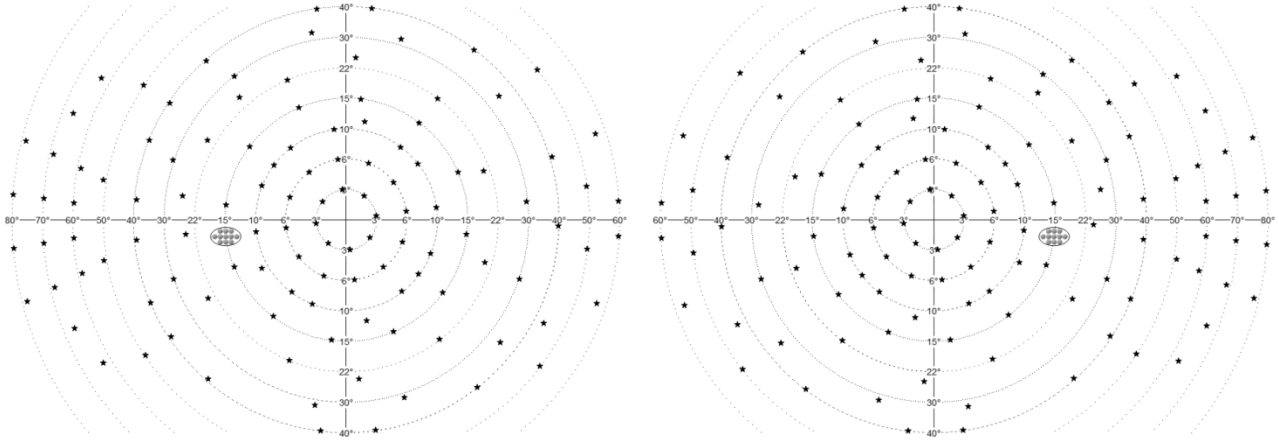


Figure 129. FeV G2 field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
FeV G2	3-60	3-80	3-40	3-40	113 (-)	Threshold: 7-12 min Screening: 4-8 min 3-Zone: 3-6 min

13.2.2. Orthogonal Fields

13.2.2.1. F50-2 field (Full)

F50-2 field is a full, symmetric test field of 50° horizontally and 40° vertically. It is used for testing neurological deficiencies, and to detect peripheral defects while testing the centre of the visual field as well. It includes other test field ranges (except for the extended test field). In terms of the number of test points, is most suitable for screening test strategies.

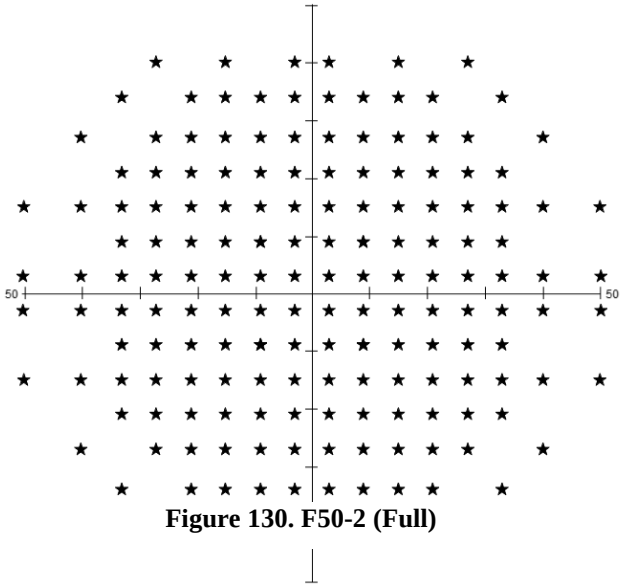


Figure 130. F50-2 (Full)

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
F50-2 (Full)	3-50	3-50	3-40	3-40	168 (168)	Threshold: 13-18 min Fast Threshold: 10-14 min Screening: 9-15 min 3-Zone: 4-6 min

Due to the large number of test points within this test field, tests based on the F-50 field used in combination with threshold strategies take several minutes to complete per eye. Patients may

feel tired and the test reliability may be affected. Consider whether the test should be divided into two parts or paused for a while.

The range of the visual field is rather large in the nasal and superior direction, and therefore the test results may include artifacts of the nose and the brow ridge shadow. This should be taken into account so as not to confuse these artifacts with the actual eyesight impediments.

13.2.2.2. G50-2 (Glaucoma) field

G50-2 covers the visual field area where early glaucoma can be detected. G50-2 field is an asymmetric test field extending up to 50°. In terms of the number of test points, it is most suitable for fast threshold and screening test strategies. It is not suitable for use in binocular tests.

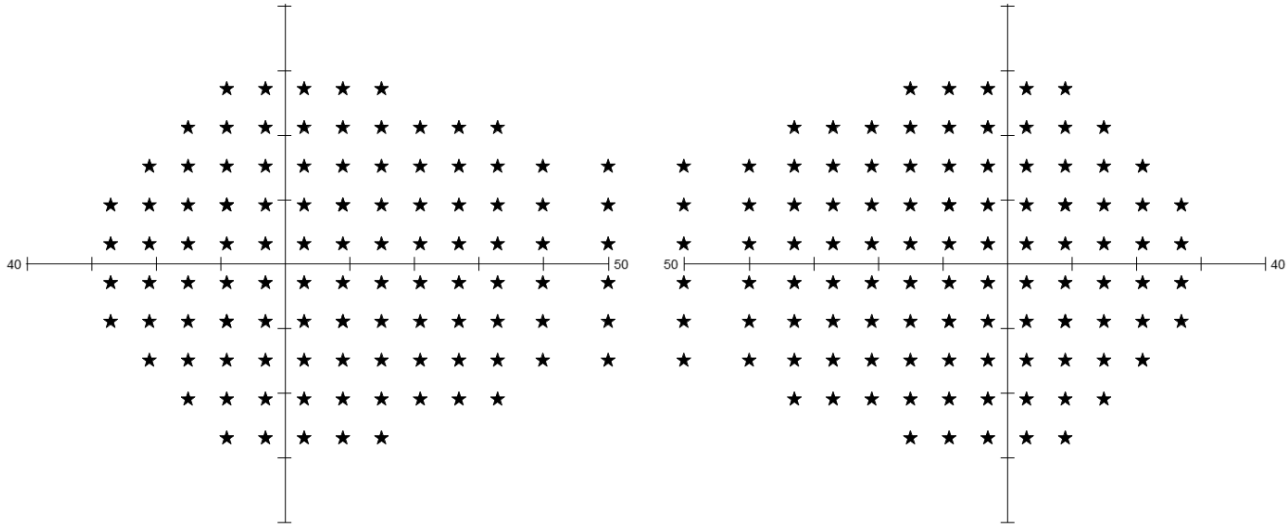


Figure 131. G50-2 (glaucoma) field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
G-50 (Glaucoma)	3-50	3-27	3-27	3-27	104 (-)	Threshold: 7-12 min Fast Threshold: 6-10 min Screening: 4-8 min 3-Zone: 3-5 min

13.2.2.3. 24-2 field

The 24-2 field is an asymmetric test field extending up to 27° in nasal direction. In this visual field, the central part of the visual field is monitored for possible visual defects. It can be used for rapid detection of glaucoma related defects. In terms of the number of test points, the 24-2 field is most suitable for precise threshold strategies.

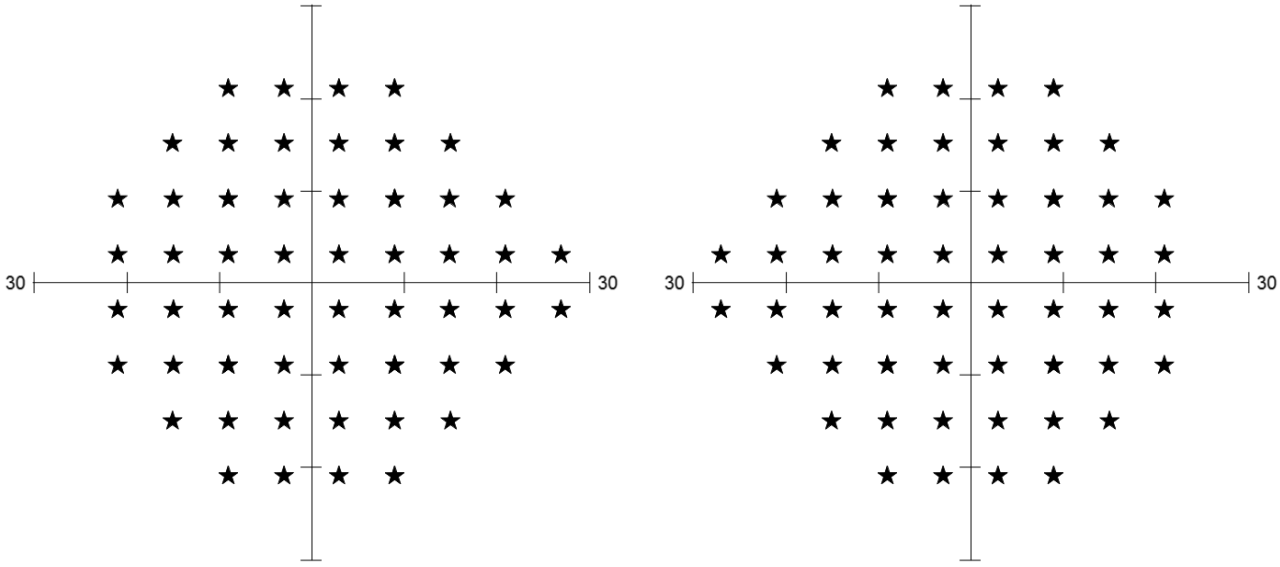


Figure 132. 24-2 field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
24-2	3-27	3-21	3-21	3-21	54	Threshold: 4-8 min Fast threshold: 3-4 min ZETA: 4-6 min ZETA Fast: 3-4 min ZETA Faster: 2-4 min Advanced :2-3 min TOP/TOP+: 1,5 min Screening: 2-3 min 3 – zone: 2-3 min

13.2.2.4. 30-2 field

The 30-2 field is a symmetric test field extending up to 27°. In this visual field, the central part of the visual field is monitored for possible visual defects. It can be used for rapid detection of glaucoma related defects. In terms of the number of test points, the 30-2 field is most suitable for precise threshold strategies.

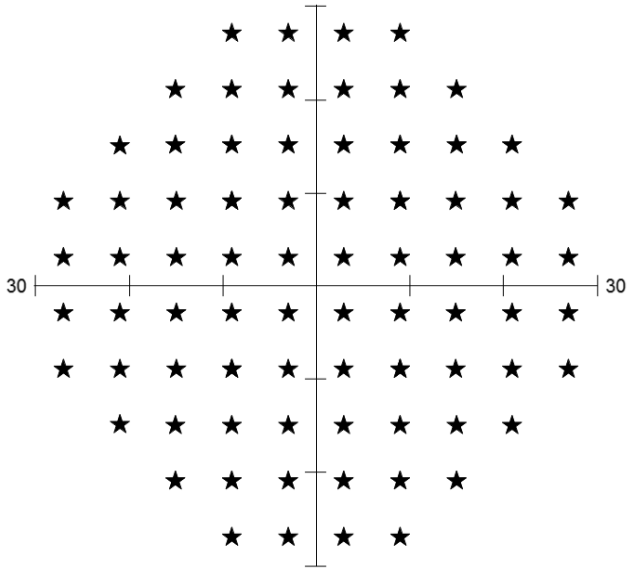


Figure 133. 30-2 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
30-2	3-27	3-37	3-37	3-37	76	Threshold: 4-8 min Fast threshold: 4-5 min ZETA: 5-7 min ZETA Fast: 4-5 min ZETA Faster: 3-5 min Advanced :3-4 min TOP/TOP+: 2 min Screening: 2-3 min 3 – zone: 2-3 min

13.2.2.5. 24-2C field

The 24-2C field is an asymmetric test field extending up to 27° in nasal direction. It is the 24-2 test field with additional test points in macular area to increase its diagnostic value. In this visual field, the central part of the visual field is monitored for possible visual defects. It can be used for rapid detection of glaucoma related defects. In terms of the number of test points, 24-2C field is most suitable for precise threshold strategies.

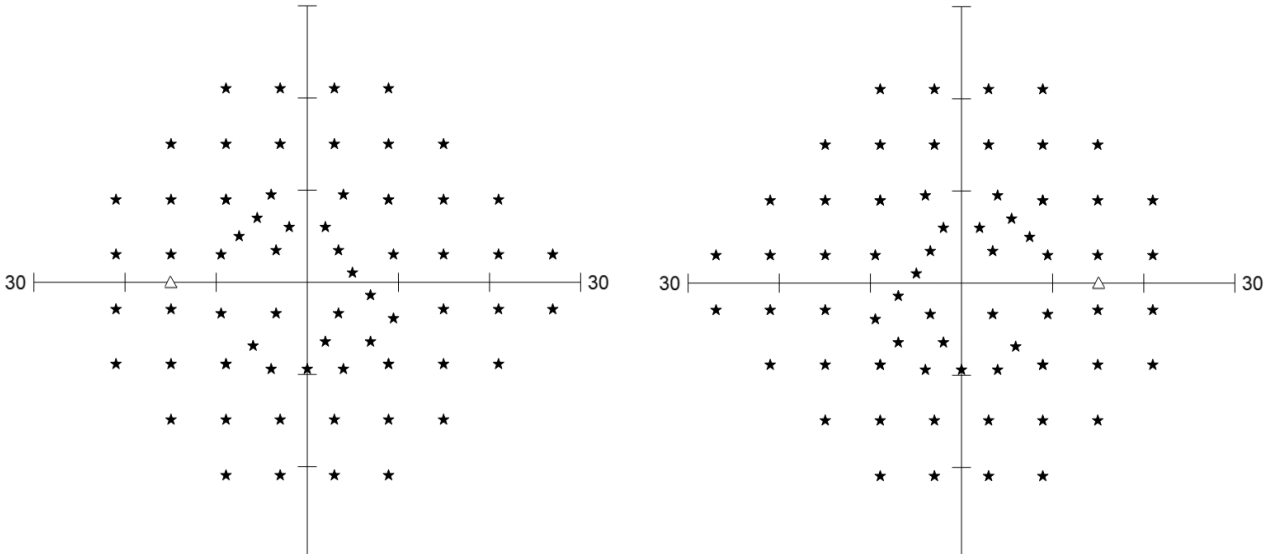


Figure 134. 24-2C field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
24-2C	3-27	3-21	3-21	3-21	64	Threshold: 4-8 min Fast threshold: 3-4 min ZETA: 4-6 min ZETA Fast: 3-4 min ZETA Faster: 2-4 min Screening: 2-3 min 3 – zone 2-3 min

13.2.2.6. 30-2C field

The 30-2C field is an asymmetric test field extending up to 27° in nasal direction. It is the 30-2 test field with additional test points in macular area to increase its diagnostic value. In this visual field, the central part of the visual field is monitored for possible visual defects. It can be used for rapid detection of glaucoma related defects. In terms of the number of test points, 30-2C field is most suitable for precise threshold strategies.

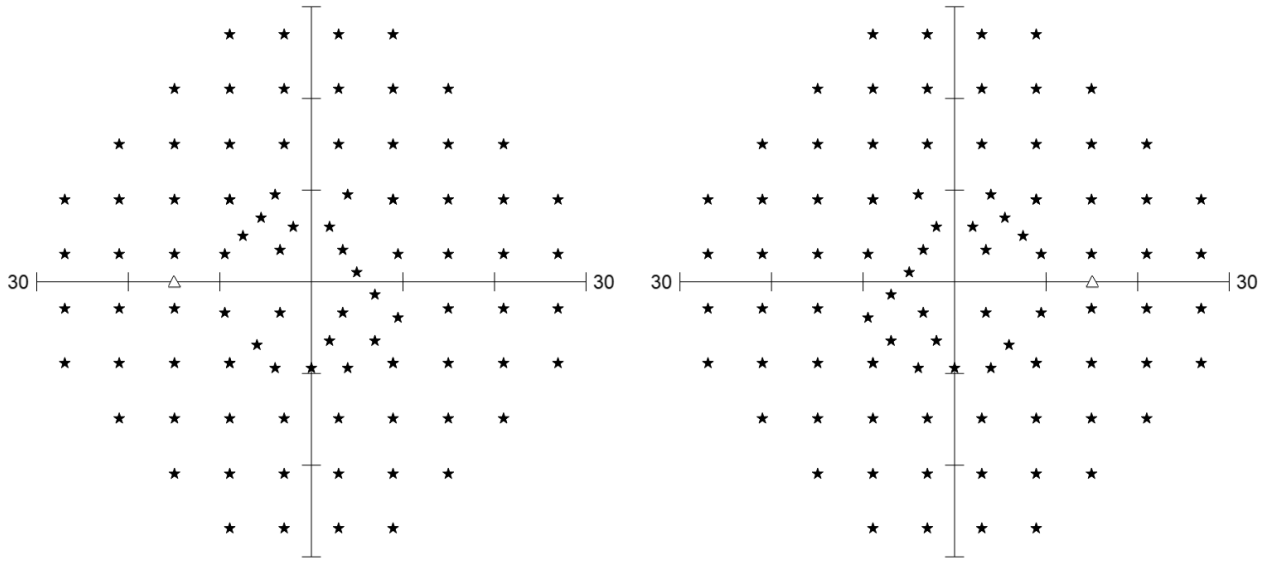


Figure 135. 30-2C field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
30-2C	3-27	3-27	3-27	3-27	86	Threshold: 4-8 min Fast threshold: 4-5 min ZETA: 5-7 min ZETA Fast: 4-5 min ZETA Faster: 3-5 min Screening: 2-3 min 3 – zone: 2-3 min

13.2.2.7. 5-2 field (Macula)

5-2 is a symmetric test field extending up to 3°. It is used for fovea test.

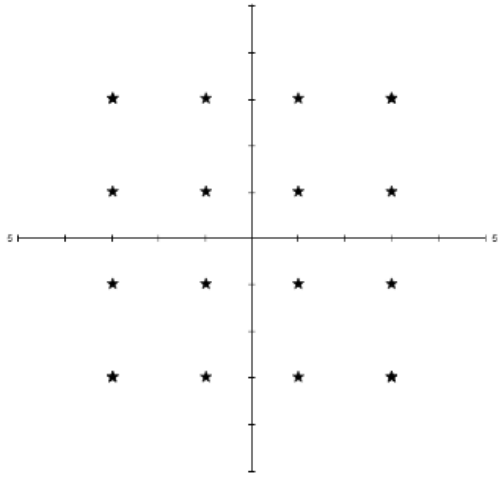


Figure 136. 5-2 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
M10-2 (Macula)	1-3	1-3	1-3	1-3	16 (16)	Threshold: 1-2 min Fast Threshold: 1-2 min Screening: 1 min 3-Zone: 1 min

13.2.2.8. 10-2 field (Macula)

10-2 field covers the macula area. It is a symmetric test field extending up to 9°. 10-2 is used in macular diseases, to detect visual defects of n. II , and to monitor the condition of a visual field of less than 10°. In terms of the number of test points, it is most suitable for macula tests using threshold test strategies.

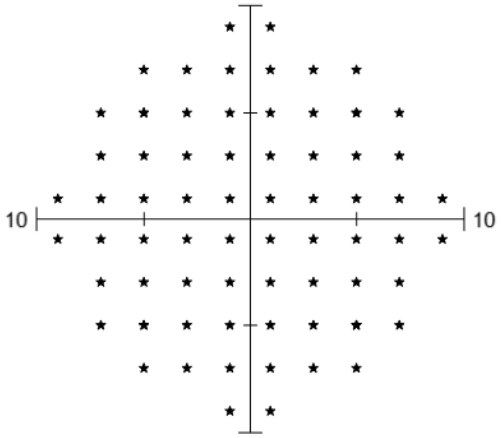


Figure 137. 10-2 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
M10-2 (Macula)	1-9	1-9	1-9	1-9	68 (68)	Threshold: 4-5 min Fast Threshold: 4-5 min Screening: 3-4 min 3-Zone: 2-3 min

13.2.2.9. P50-2 field (Peripheral)

P50-2 covers the visual field peripheral. It is a symmetric test field of 50°, excluding the central area of the visual field. It is used to detect peripheral changes and can be used as a supplementary test aimed to follow up field loss above 27 degrees. In terms of the number of test points, it is most suitable for testing the peripheral part of the visual field using threshold test strategies.

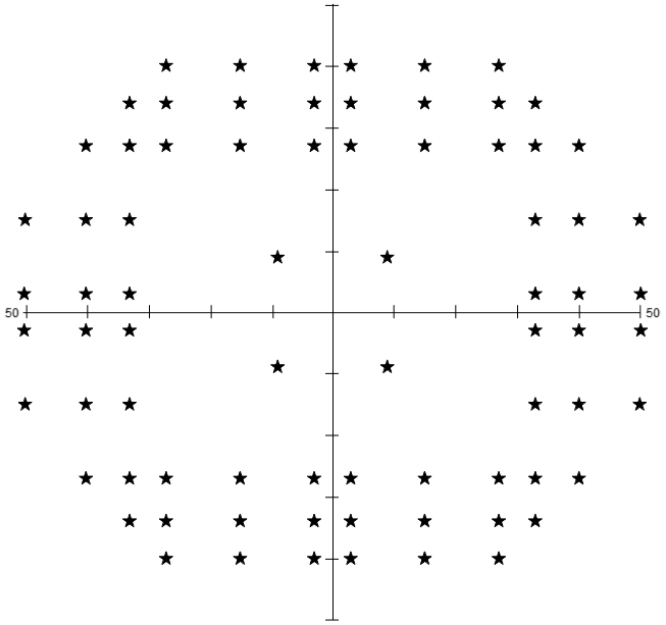


Figure 138. P50-2 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
P50-2 (Peripheral)	33-50	33-50	27-40	27-40	76 (76)	Threshold: 3-11 min Fast Threshold: 4-7 min Screening: 5-6 min 3-Zone: 3-4 min

13.2.2.10.Esterman M field (Extended)

Esterman M covers almost all of the visual field. It is an asymmetric test field of 75° (may use fixation shift). Used for Driving Tests. In terms of the number of test points, it is most suitable for fast screening test strategies.

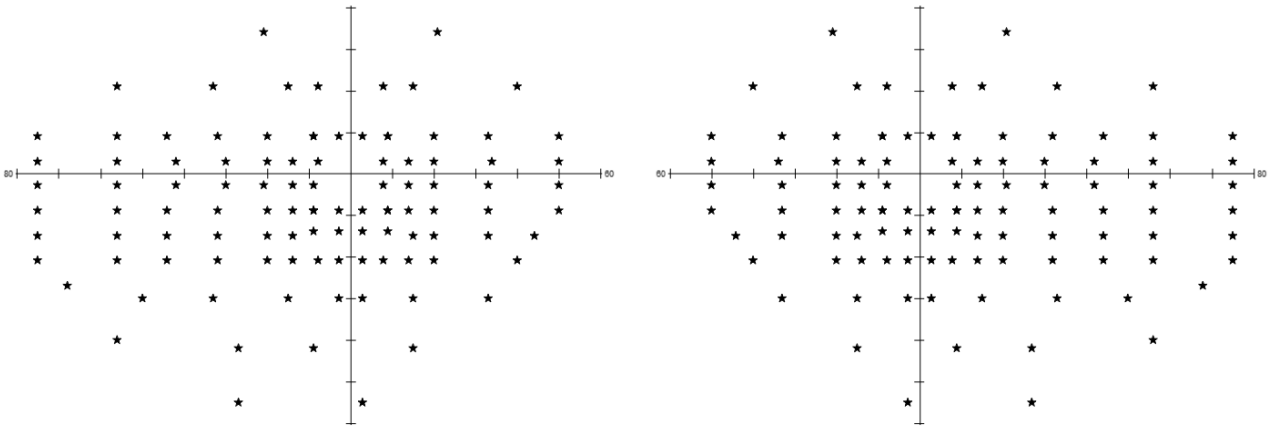


Figure 139. Esterman M (Extended) field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
E-80 (Extended)	9-50	9-75	9-34	9-55	100(-)	Threshold: 7-12 min Screening: 4-8 min 3-Zone: 3-6 min

13.2.2.11.Esterman B field (Driving Test)

Esterman B field is used for Binocular Driving Tests. It covers drivers field range. Includes 120 points in 75 degrees horizontal and 55 degrees vertical ranges.

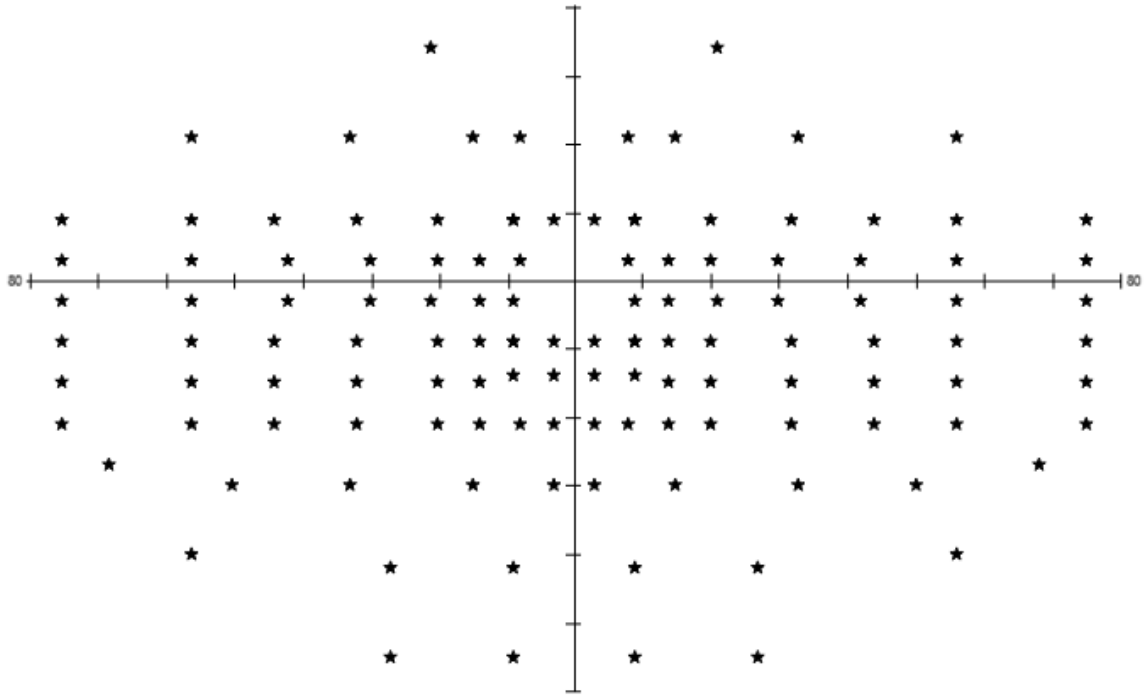


Figure 140. Esterman B field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration [minutes]
BDT (Drivers)	75	75	34	55	-(120)	Driving Test: 2-3 min

13.2.2.12.Gandolfo field

Gandolfo field is a binocular field used for evaluation of visual disability of patients. It covers the most important part of visual field in terms of every day's functional vision. It is used only with BDT or 3-zone strategy. Includes 100 points in 50 degrees horizontal and 42 degrees vertical ranges.

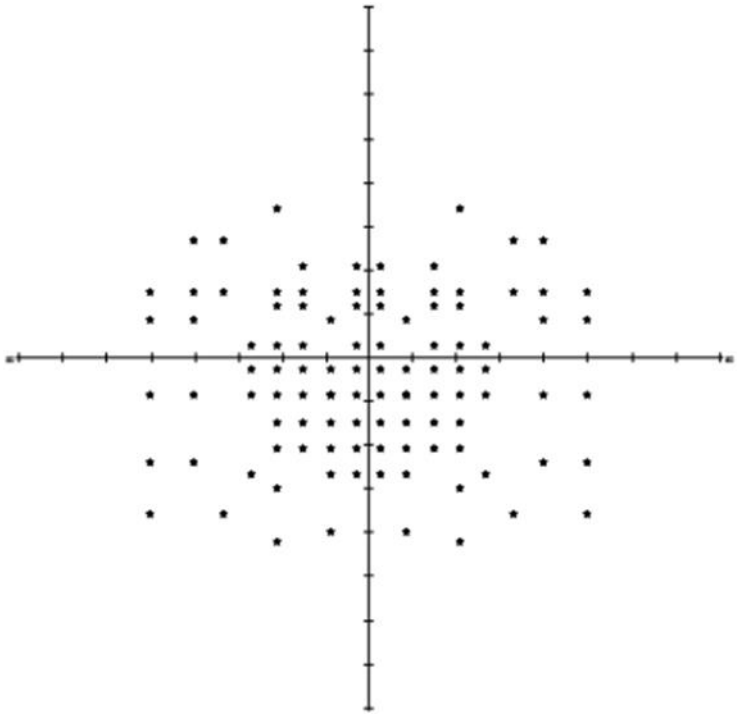


Figure 141. Gandolfo field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points binocular	Test duration [minutes]
Gandolfo	50	50	34	42	100	Driving Test: 2-3 min 3-zone: 3-4 min

13.2.2.13.G0-2 field

The G0-2 field is an asymmetric test field extending up to 27°. In this visual field, the central part of the visual field is monitored for possible visual defects. The layout of points reflects the layout of optic nerve fibers. This field was specially designed to allow very fast testing of locations crucial in glaucoma screening.

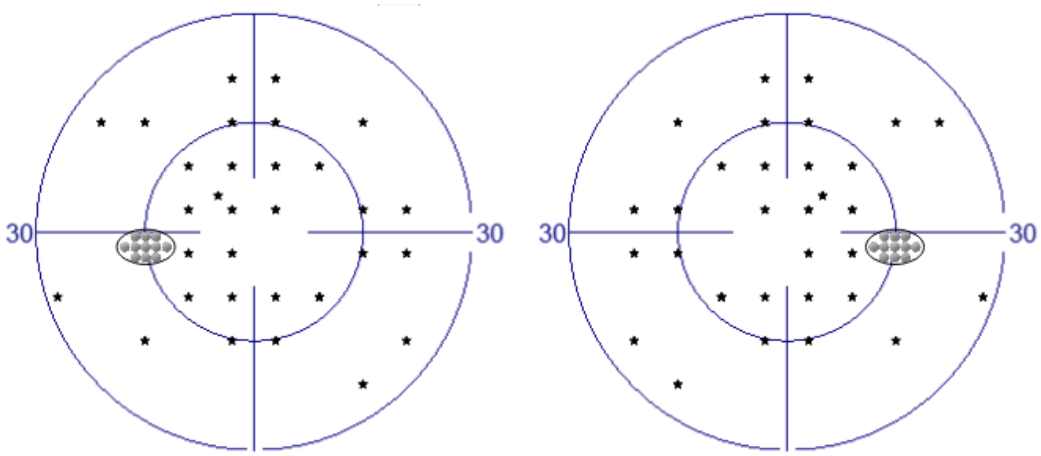


Figure 142. G0-2 test field for left and right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (Binocular)	Test duration [minutes]
G0-2	21	27	21	21	28(-)	Screening – 1-3 min 3-zone: 1-2 min 2-zone: 1 min

*13.2.2.14.Pole Sup 44 (Superior 44) **

Sup 44 field is a special asymmetrical field for testing the upper field of view only. This field can be used to assess ptosis. In terms of its intended use it is limited to be used only with screening strategies.

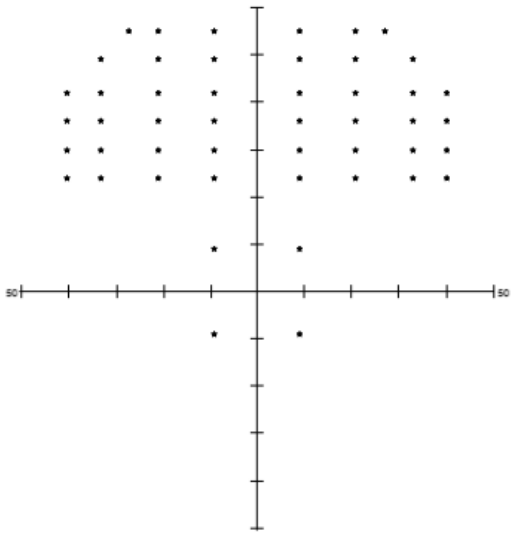


Figure 143. Sup 44 (superior 44) field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
Sup 44	40	40	55	-21	44 (44)	Screening: 1-2 min 3– zone: 1-2 min

***field is available for PTS 925Wi**

13.2.3. Projection Fields

13.2.3.1. FF120 field (Full Field 120)

FF 120 field is a full, asymmetric test field with range extended up to 60 degrees temporally. It is used for testing neurological deficiencies, and to detect peripheral defects while testing the center of the visual field as well. In terms of the number of test points, is most suitable for screening test strategies.

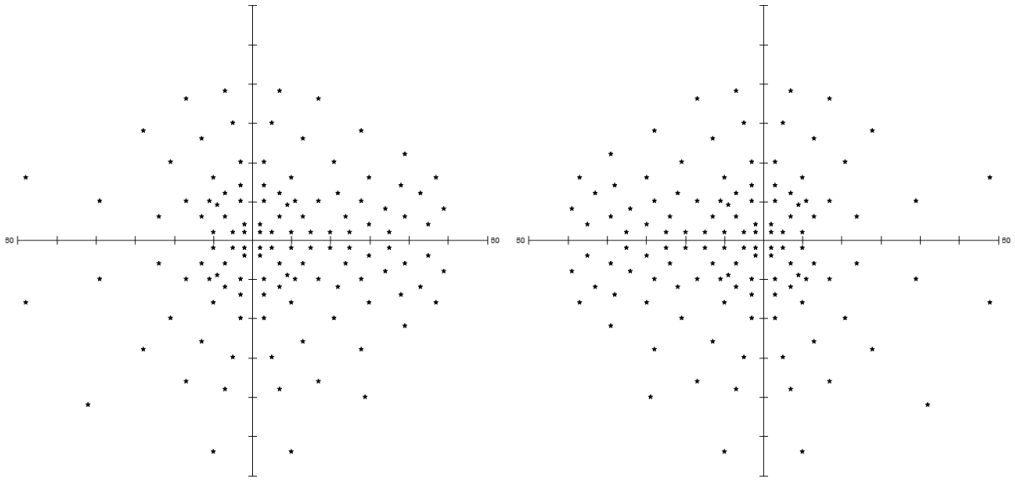


Figure 144. FF120 (Full Field) field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
FF120(Full Field)	2-50	2-60	2-40	2-55	120	Screening: 5-9 min 3-Zone: 4-6 min

Due to the large number of test points within this test field, tests based on the FF-120 field used in combination with Screening strategies take several minutes to complete per eye. Patients may feel tired and the test reliability may be affected. Consider whether the test should be divided into two parts or paused for a while.

The range of the visual field is rather large in the nasal and superior direction, and therefore the test results may include artifacts of the nose and the brow ridge shadow. This should be taken into account so as not to confuse these artifacts with the actual eyesight impediments.

13.2.3.2. Sup 64 field (Superior 64)

Sup 64 field is a special asymmetric field for testing only the extend of the superior part of a visual field. This field can be used for evaluating the ptosis. In terms of its intended use it is limited to be used only with screening strategies.

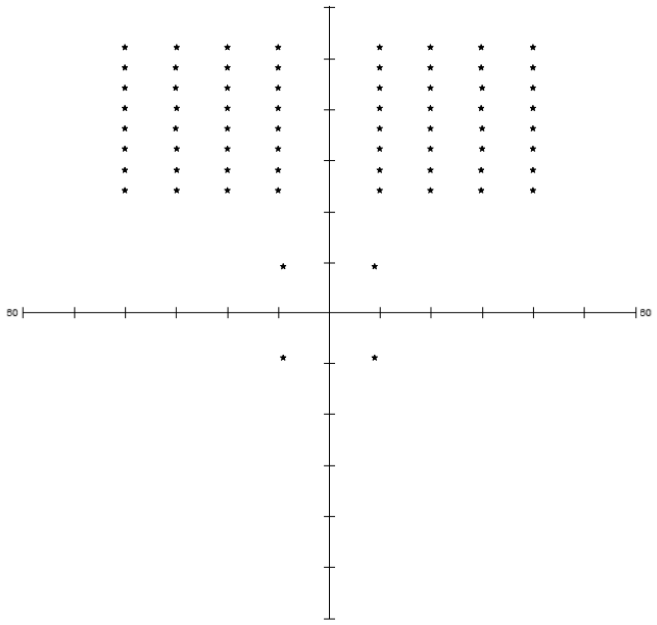


Figure 145. Sup 64 (Superior 64) field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
Sup 64 (Superior 64)	10-40	10-40	24-52	0	64 (64)	Screening: 2-3 min 3 – zone 2-3 min

13.2.3.3. G1 field

The G1 field is an asymmetric test field extending up to 28°. In this visual field, the central part of the visual field is monitored for possible visual defects. The layout of points reflects the layout

of optic nerve fibers. It can be used for rapid detection of glaucoma related defects. This field was specially designed to work with thresholding strategies.

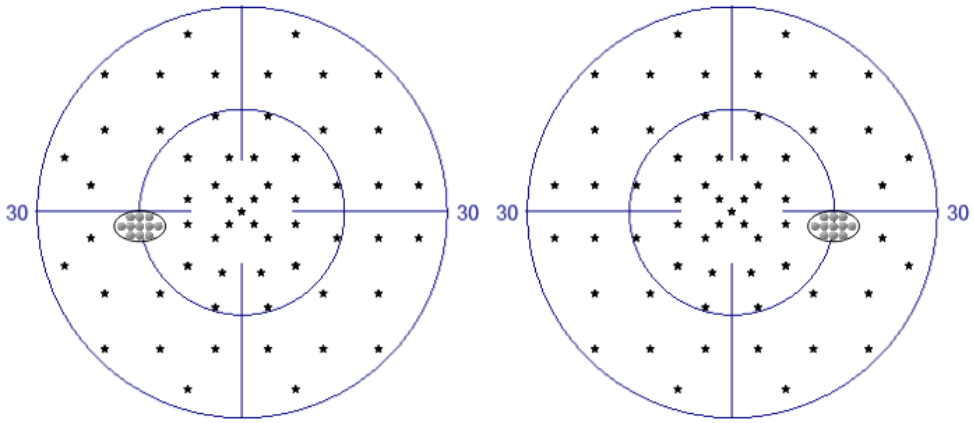


Figure 146. G1 field of the left and the right eye

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
G1	26	26	26	26	69 (-)	Threshold: 4-8 min Fast threshold: 4-5 min Advanced :3-4 min TOP/TOP+: 2 min Screening: 2-3 min 3 – zone: 2-3 min

13.2.3.4. N1 field

The N1 field is a specialist asymmetric field whose area reaches 28 degrees. It is used to identify neurological defects.

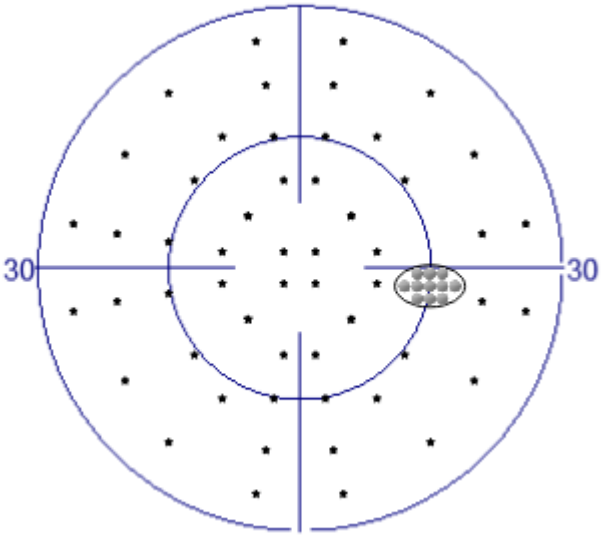


Figure 147. N1 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
Sup 44	26	26	26	26	54 (-)	Screening: 2-3 min 3 – zone: 2-3 min

13.2.3.5. B1 field

The B1 field is a specialist asymmetric field. It is used to test the area of the blind spot. Due to the number of points examined, this field is suitable for testing with threshold strategies.

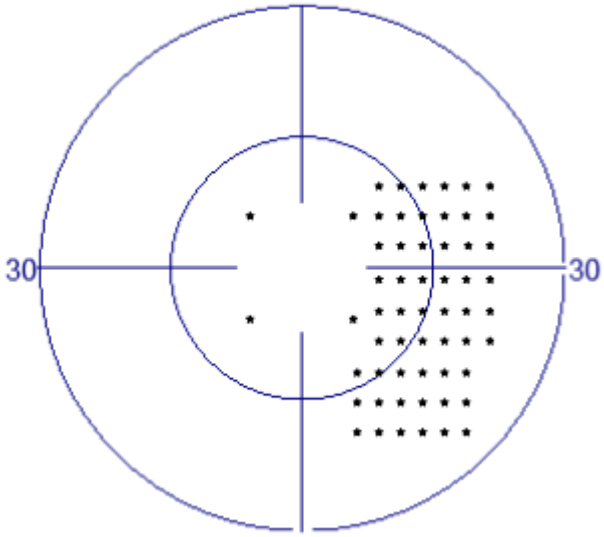


Figure 148. B1 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
B1	-6.5	21.5	9.5	54	54 (-)	Threshold: 3-6 min Fast threshold: 3-4 min Screening: 1-2 min 3 – zone: 1-2 min

13.2.3.6. 07 field

Field 07 is an asymmetrical full field whose area reaches 70 degrees temporally. It is used to assess neurological deficits and peripheral deficits while testing the central field. Due to the number of points examined, this field is best suited for screening strategies.

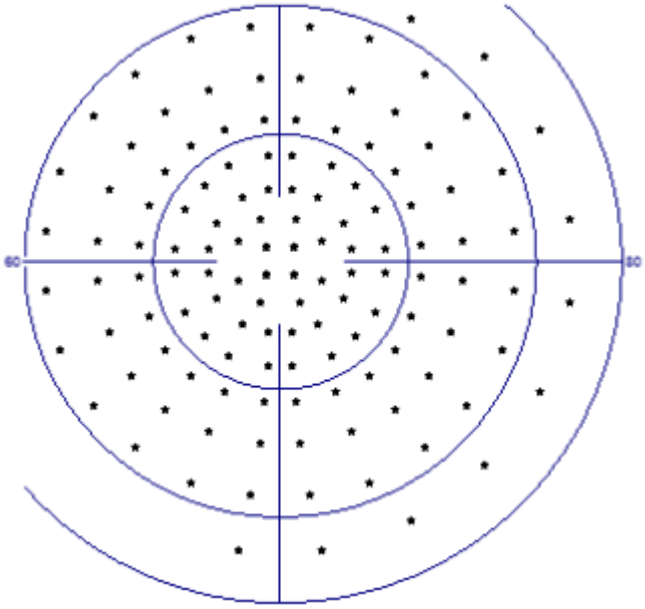


Figure 149. 07 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
07	55	68	57	68	130 (-)	Screening: 4-8 min 3 – zone: 4-6 min

13.2.3.7. FF246 field

FF 246 field is a full, asymmetric test field with range extended up to 60 degrees temporally. It is used for testing neurological deficiencies, and to detect peripheral defects while testing the center of the visual field as well. In terms of the number of test points, is most suitable for screening test strategies.

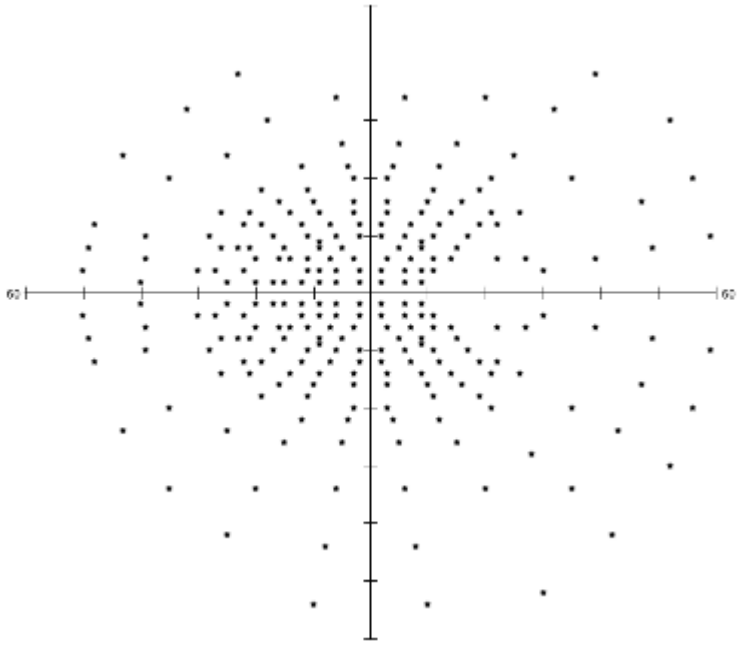


Figure 150. FF 246 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
FF246	50	60	40	55	246	Screening: 12-15 min 3-Zone: 8-10 min

Due to the large number of test points within this test field, tests based on the FF-246 field used in combination with Screening strategies take several minutes to complete per eye. Patients may feel tired and the test reliability may be affected. Consider whether the test should be divided into two parts or paused for a while.

The range of the visual field is rather large in the nasal and superior direction, and therefore the test results may include artifacts of the nose and the brow ridge shadow. This should be taken into account so as not to confuse these artifacts with the actual eyesight impediments.

13.2.3.8. FF81 field

FF 81 field is a full, asymmetric test field with range extended up to 60 degrees temporally. It is

used for testing neurological deficiencies, and to detect peripheral defects while testing the center of the visual field as well.

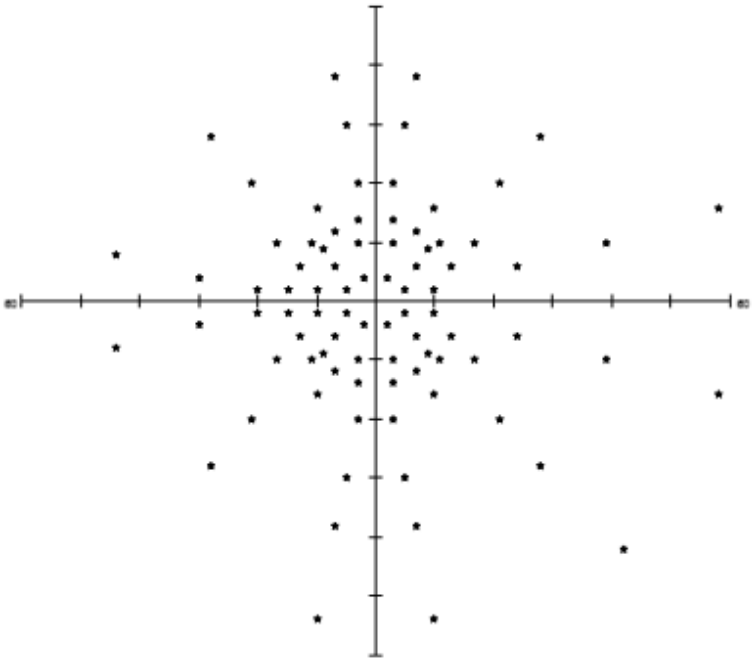


Figure 151. FF 81 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
FF81	50	60	40	55	81	Screening: 3-6 min 3-Zone: 2-4 min

13.2.3.9. Nasal Step field

Nasal Step field is a special asymmetric test field. It is designed for measurement of sensitivity asymmetry in Nasal Step area. Thus it extends up to 50 degrees nasally and has a reduced test locations to cover only the area of interest. It can be used with Thresholding and screening techniques.

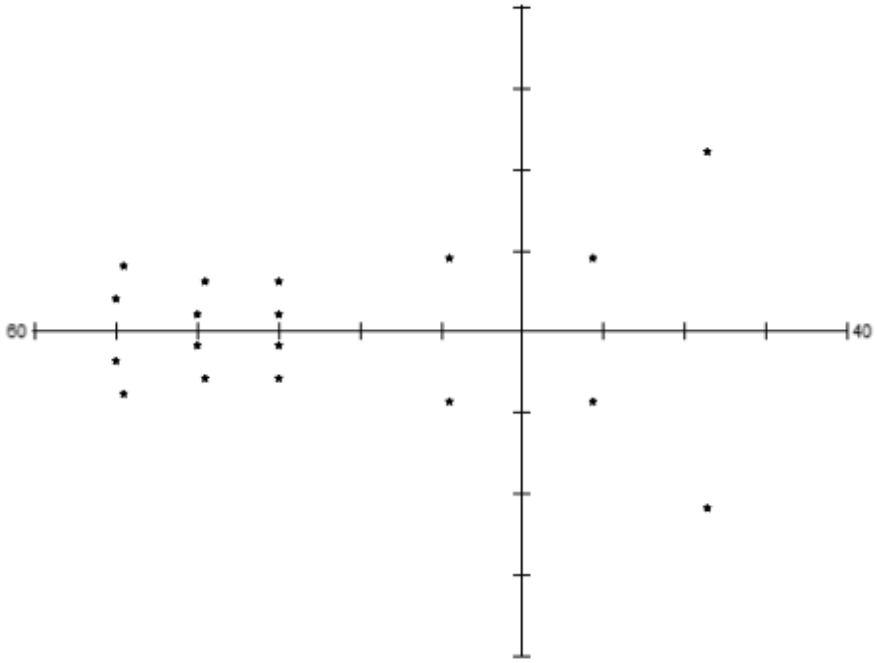
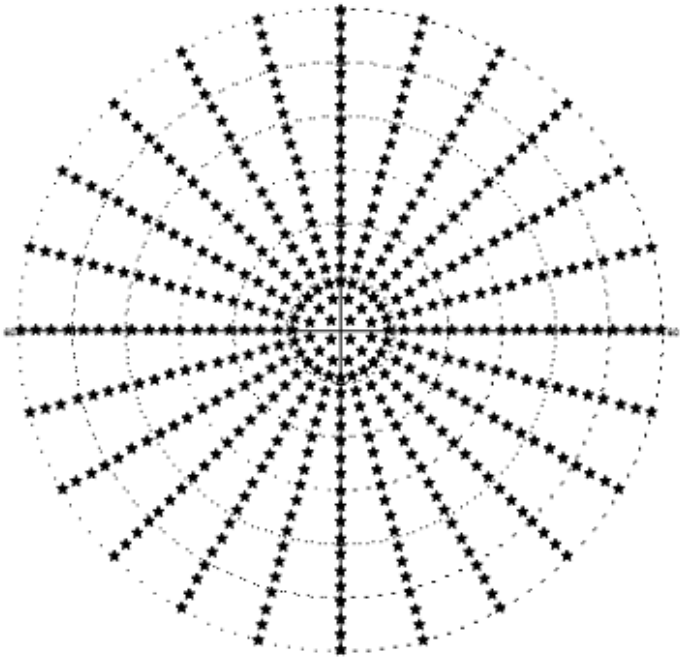


Figure 152. Nasal Step field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
Nasal Step	50	23	22	22	18	Screening: 2-3 min 3-Zone: 2-3 min Threshold: 2-4 min Dynamic:2-3 min Fast threshold: 2-3 min

13.2.3.10.BSV3 field

BSV3 is a special test field designed especially for BSV strategy. It allows to identify the VF regions with diplopy symptoms. The test field covers central 60 degrees. Test locations are laid along 24 meridians and spaced 3˚ apart.



Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
Nasalstep	60	60	60	60	452(452)	BSV: 20-25 min

Figure 153. BSV 3 field

13.2.3.11.BSV5 field

BSV3 is a special test field designed especially for BSV strategy. It allows to identify the VF regions with diplopy symptoms. The test field covers central 60 degrees. Test locations are laid along 24 meridians and spaced 5˚ apart.

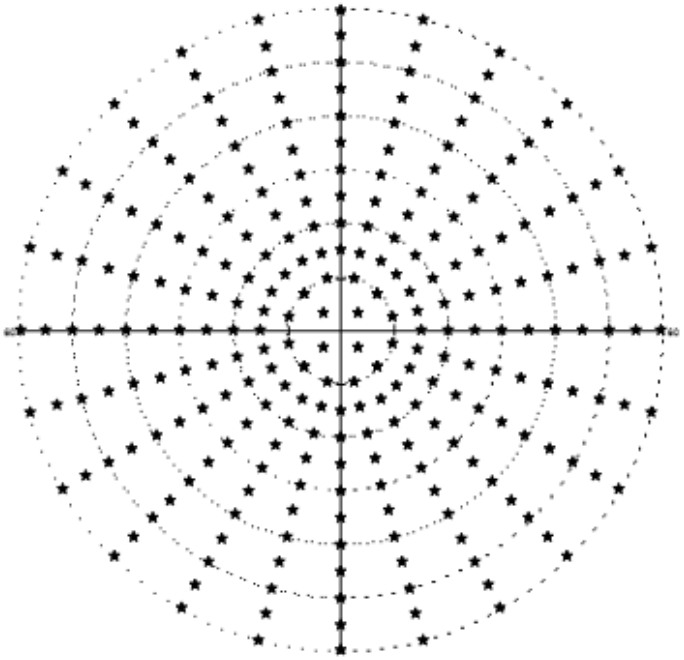


Figure 154. BSV 5 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
Nasalstep	60	60	60	60	260(260)	BSV: 10-15

13.2.3.12. 60-4 field

60-4 covers the visual field peripheral. It is a symmetric test field of 60°, excluding the central area of the visual field. It is used to detect peripheral changes and can be used as a supplementary test aimed to follow up field loss above 27 degrees. In terms of the number of test points, it is most suitable for testing the peripheral part of the visual field using threshold test strategies.

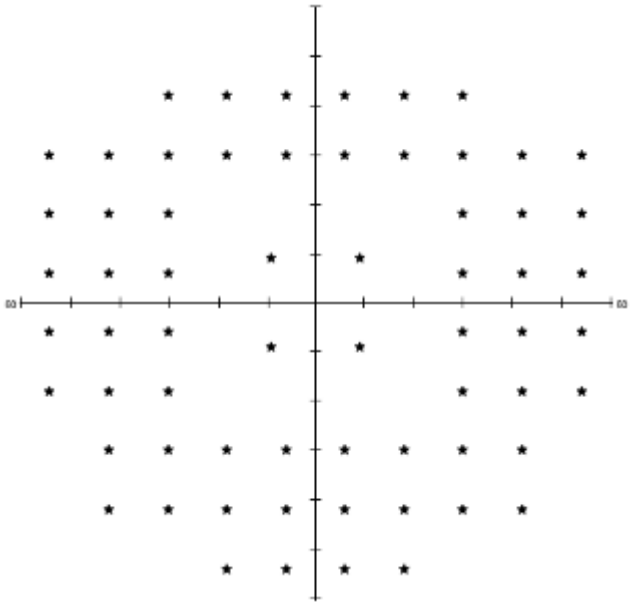


Figure 155. 60-4 field

Designation	Nasal range [°]	Temple range [°]	Top range [°]	Bottom range [°]	Number of points (binocular)	Test duration per eye [minutes]
60-4	54	54	42	54	60(60)	Threshold: Dynamic: Fast threshold: Screening: 3-Zone: 2-Zone:

13.3. *Test Reliability*

Reliable visual field testing largely depends on patient cooperation. By pressing the response button, the patient delivers information about the condition of his or her visual field. It is therefore very important to assess whether the patient can reliably respond to the light stimuli to deliver valid test results. Test results can be also validated by means of Test Reliability score, which can be integrated with the underlying visual field test.

13.3.1. Gaze Tracking

One of the main assumptions of visual field testing is that the patient's vision is fixed at the fixation target. This is the condition precedent to be able to reliably test different areas of the visual field and the retina. However, if the patient's vision is distracted from the fixation point and is focused on light stimuli, the test results will be invalid.

The operator is able to detect pupil shift during the test where the patient fails to focus on the fixation point by monitoring the video image from the eye camera. If any shift occurs, the patient can be reminded to look at the fixation point.

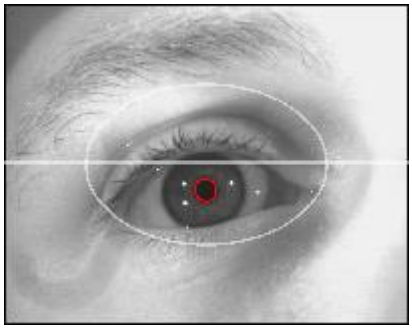


Figure 156. Eye camera - correct fixation

The system includes an automatic fixation control function. System analyses the video image from the eye camera and locates the position of pupil. Eye pupil is detected only within the ellipse area which is drawn in camera preview. The Gaze Tracking function uses the camera image analysis to improve the reliability of the test. The Gaze Tracker can be activated in one of two modes of operation: 1.0 or 2.0.

13.3.1.1. Gaze Tracker 1.0

In the Gaze Tracker 1.0, when the pupil shift exceeds the allowed shift margin, a fixation error is reported and the test is discontinued. The fixation error is recorded in the test reliability score and a voice message reminds the patient to look at the fixation point (if the voice messages function is enabled). The test will be automatically resumed when the pupil position becomes steady.

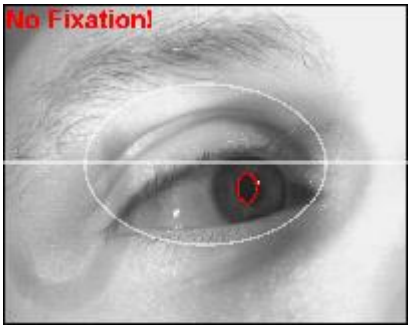


Figure 157. Eye camera - fixation error

If the Gaze Tracker 1.0 function is enabled, the test will be discontinued when the eye image is lost or if the patient blinks. This way continuation of the test stopped in case when the eye is badly positioned, if the patient has removed his head or closed the tested eye.

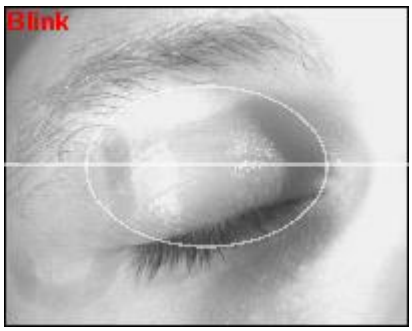


Figure 158. Eye camera - blink

The quality of the gaze analysis algorithm in the fixation control function largely depends on the quality of the video image from the eye camera. If the camera image is of bad quality, this option can significantly extend the duration of or permanently interrupt the test. Before a test is started with the fixation control enabled, you should first check the quality of gaze image on the eye preview camera.

13.3.1.2. Gaze Tracker 2.0

The Gaze Tracker 2.0 mode extends the 1.0 mode and further improves reliability. When the pupil tracking module allows the exposure of the stimulus, but during the exposure a blink has occurred and the patient has not responded, this stimulus exposure is ignored. The value of the point sensitivity does not change as if the point test did not take place. Similarily, if patient has lost the fixation during the stimulus exposure, the point test is ignored and repeated again later, regardless the patient response. This way, patient response or its absence is taken into consideration only when the proper fixation of the patient is assured.

13.3.2. H-K Fixation Control

Correct fixation is one of the cornerstones of visual field testing. Apart from direct gaze tracking, fixation can be controlled directly. The Heijl-Krakau technique is used for direct fixation monitoring.

H-K method relies on the blind spot area where the optic nerve leaves the eye. There are no photoreceptors on the optic disc in this area. If the blind spot is identified at proper fixation state, it can be used for gaze tracking.

In the H-K method, the blind spot is identified with several points. The blind spot is where the patient does not respond to a stimulus displayed at a particular point of the visual field. Therefore

the system regularly displays stimuli within the blind spot area during the test. If the patient fails to respond to the BS stimuli, the fixation is assumed to be preserved. If the patient responds to the stimuli within the blind spot area, the fixation point must have changed and the stimuli was shown outside the blind spot.

The H-K method can be unreliable in patients with extensive visual defects. If fixation is lost, a stimulus from the blind spot area can be shifted to a visual defect area. In this case, the patient will not react, and no fixation error will be detected.

The H-K method can only be used if at least one point has been detected in the blind spot area. Where the blind spot failed to be detected at the calibration stage, the H-K method will not be enabled. This can result in an error in the eye settings (left eye) or incorrect eye positioning against the perimeter bowl.

13.3.3. Short-term Fluctuation Measurement (SF)

Perimetry measures visual thresholds, or the boundaries between seeing and non-seeing. However, the exact threshold value cannot be determined. By definition, the visual threshold is based on statistical values and is determined as the 50% probability of responding to a stimulus and 50% probability of not responding to a stimulus. The boundary between seeing and not seeing also depends on the patient condition and other factors that may influence the progress of the test.

With the existing testing strategies, the visual threshold value can be estimated with reduced number of exposures at a particular point within the visual field. Short-term fluctuation measurements can be performed to add a further level of confidence.

Short-term fluctuation can be measured by re-testing selected points. In ideal circumstances, you should get two identical results. If the results are different, this indicates that the visual threshold has changed. This may be caused by:

patient fatigue

loss of fixation

external distractions

visual field defects manifested by high short-term fluctuation levels

If the SF option is enabled, four points within the visual field (one per each quadrant) will be retested. SF index will be calculated from the results obtained.

13.3.4. False Positive (FPOS) and False Negative (FNEG) tests

In perimetry, all diagnostic information comes from the patient. By pressing the response button,

the patient signals whether a stimulus has been noticed or not. However, this method carries the risk of low patient reliability. The patient can press the response button even when he / she saw no light point, or vice versa.

There are two tests that monitor patient reliability. Both can be integrated with the basic test.

False Positives (FPOS) – There is a pseudo exposure during the normal course of the test, i.e. no stimuli are presented to the patient to see if the patient responds correctly. If the patient behaves reliably, he / she will not press the response button without seeing any stimulus. False positives is where the patient presses the button without actually seeing a stimulus.

False Negatives (FNEG) – An additional exposure is added at a location with a known threshold value. In this test, the FNEG stimulus is at least two times more intensive than the threshold value determined earlier on. The patient should press the response button if he / she sees a light point brighter than his / her visibility threshold. False negatives is where the patient fails to respond to a stimulus which should be easier to notice than the previous stimuli that the patient did not miss.

14. *Results tab*

This chapter describes the Results tab and the ways to analyze the test results. It specifically addresses the following issues:

results display interface

tools used in results analysis

results display modes

results comparison / disease progress analysis interface

reports generator

14.1. *Results display interface*

The Results tab is where the test results can be displayed. It offers results review and analysis tools to facilitate diagnostic evaluation of the pa

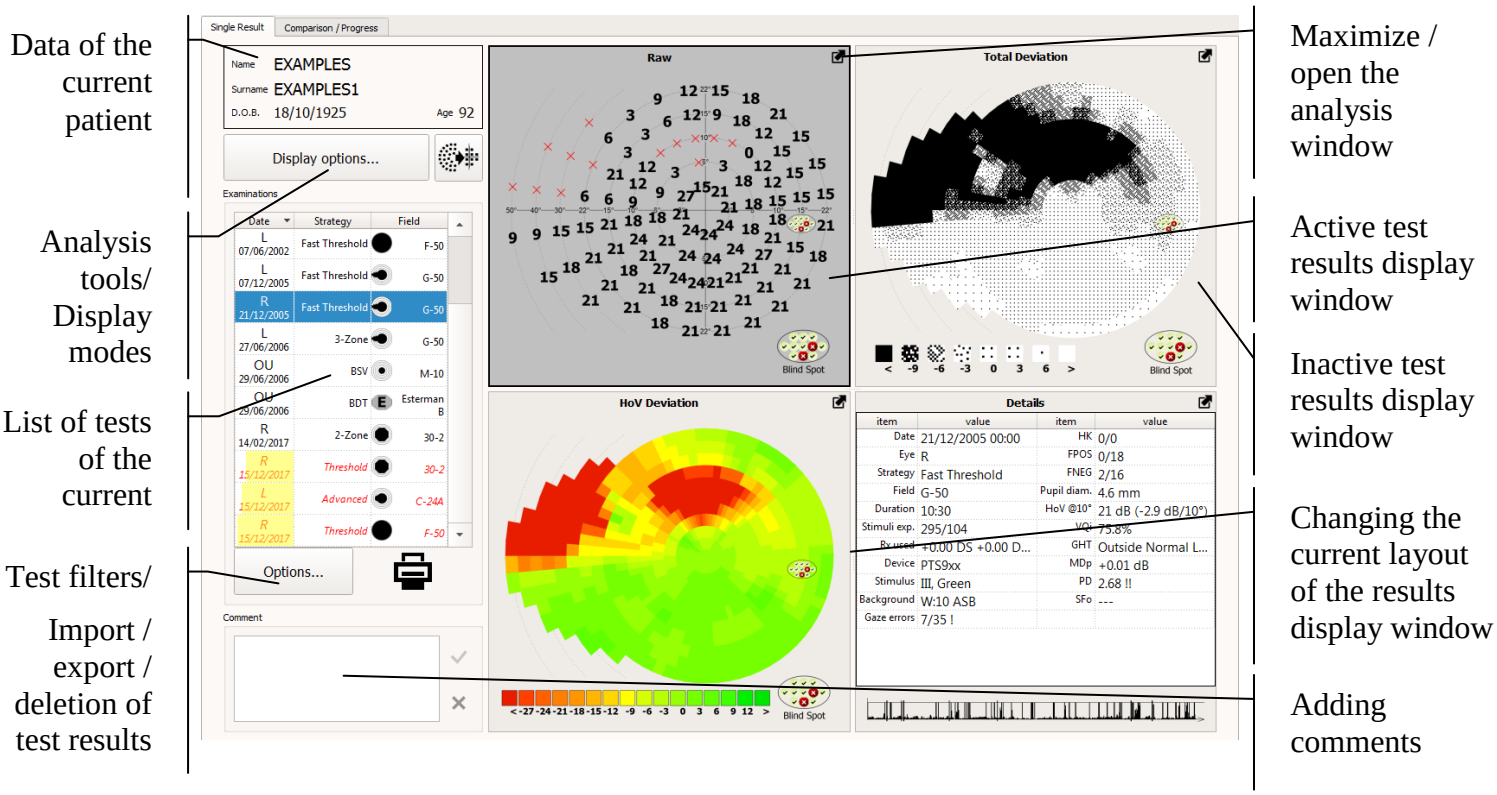


Figure 159. Results tab - analyzing a single test result

14.1.1. Results windows

The Results tab has 4 windows where the test results can be displayed. The results displayed in each window refer to the currently selected result from the list of test results. The windows are configured independently. Each window can display a different analysis and a different presentation.

14.1.1.1. Selection of the active window and change of analysis

To change the analysis parameters in any of the four windows, you have to first activate the window of choice. The active window is framed in black against a darker background (Figure 159. Results tab - analyzing a single test result). Click on the window to activate it. When the window is active, the window settings will be displayed in the analysis tools panel and the display type panel. Click the buttons in both configuration panels to change the analysis results in the active window.

14.1.1.2. Maximizing the Results window

You can maximize the active window to make the analysis results more legible. When the window is maximized, it occupies the entire Results tab, and the remaining windows are minimized.

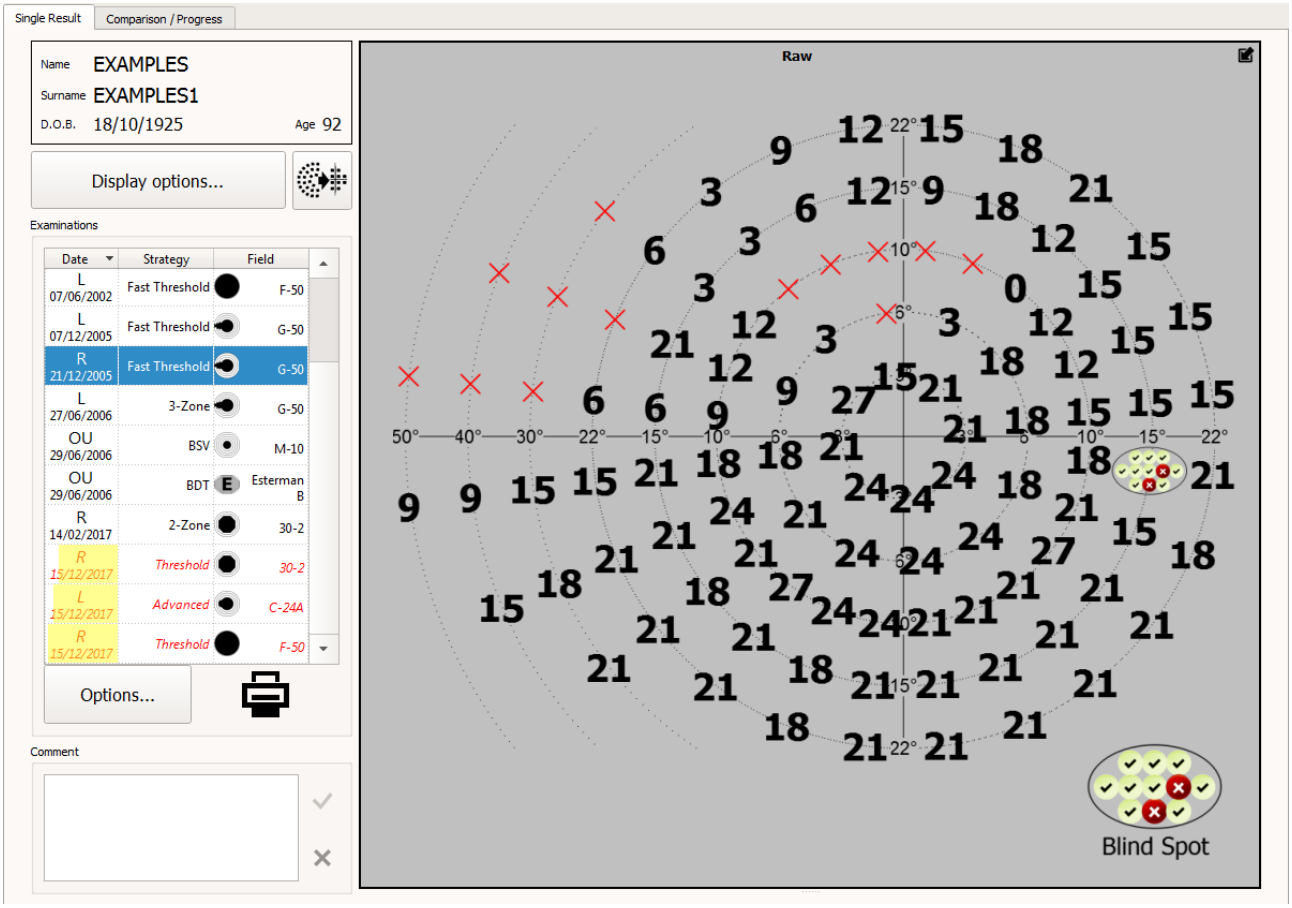


Figure 160. Maximized results window

To maximize the active window, click the Maximize button in the right top corner of the window (Figure 159. Results tab - analyzing a single test result) or double-click on the window area. To revert to normal window size, click the Maximize button or double-click on the window area.

14.1.1.3. Customizing the size of the windows in the Results tab

To make one of the results windows more legible, it can be enlarged while the other windows will become smaller. To customize the size of the windows, use the separation line between the windows (Figure 159. Results tab - analyzing a single test result).

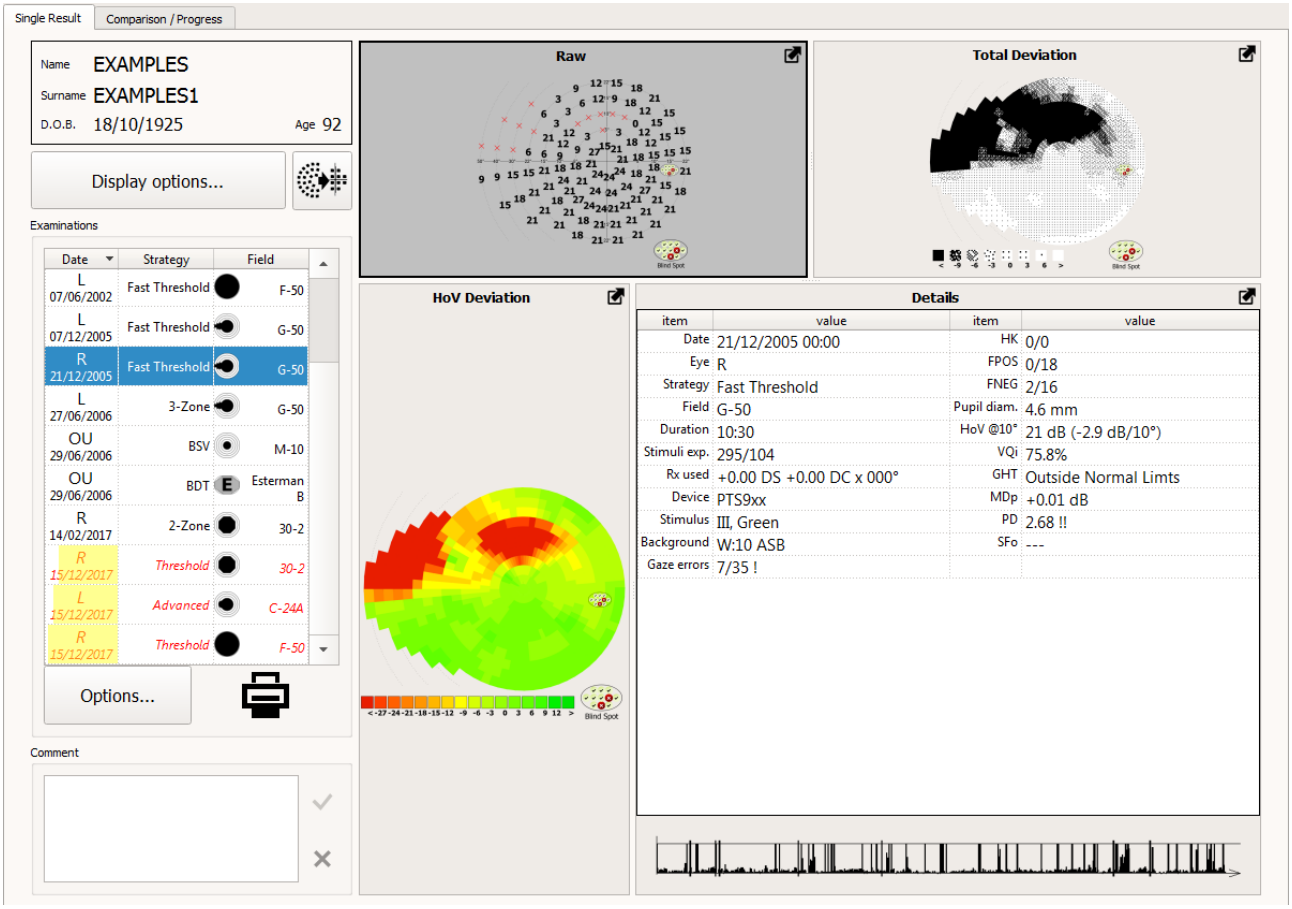


Figure 161. Rearranging the windows in the Results tab

To rearrange the windows, press the left mouse button over the move cursor, when the cursor changes to the move cursor. Keep the left mouse button pressed and drag the move cursor to the place of choice (Figure 161. Rearranging the windows in the Results tab).

14.1.2. List of results associated with the current patient

A list of all results assigned to the current patient can be found on the left side of the Results tab. If a test is selected from the list, the test results will be analyzed and displayed in the results display area.

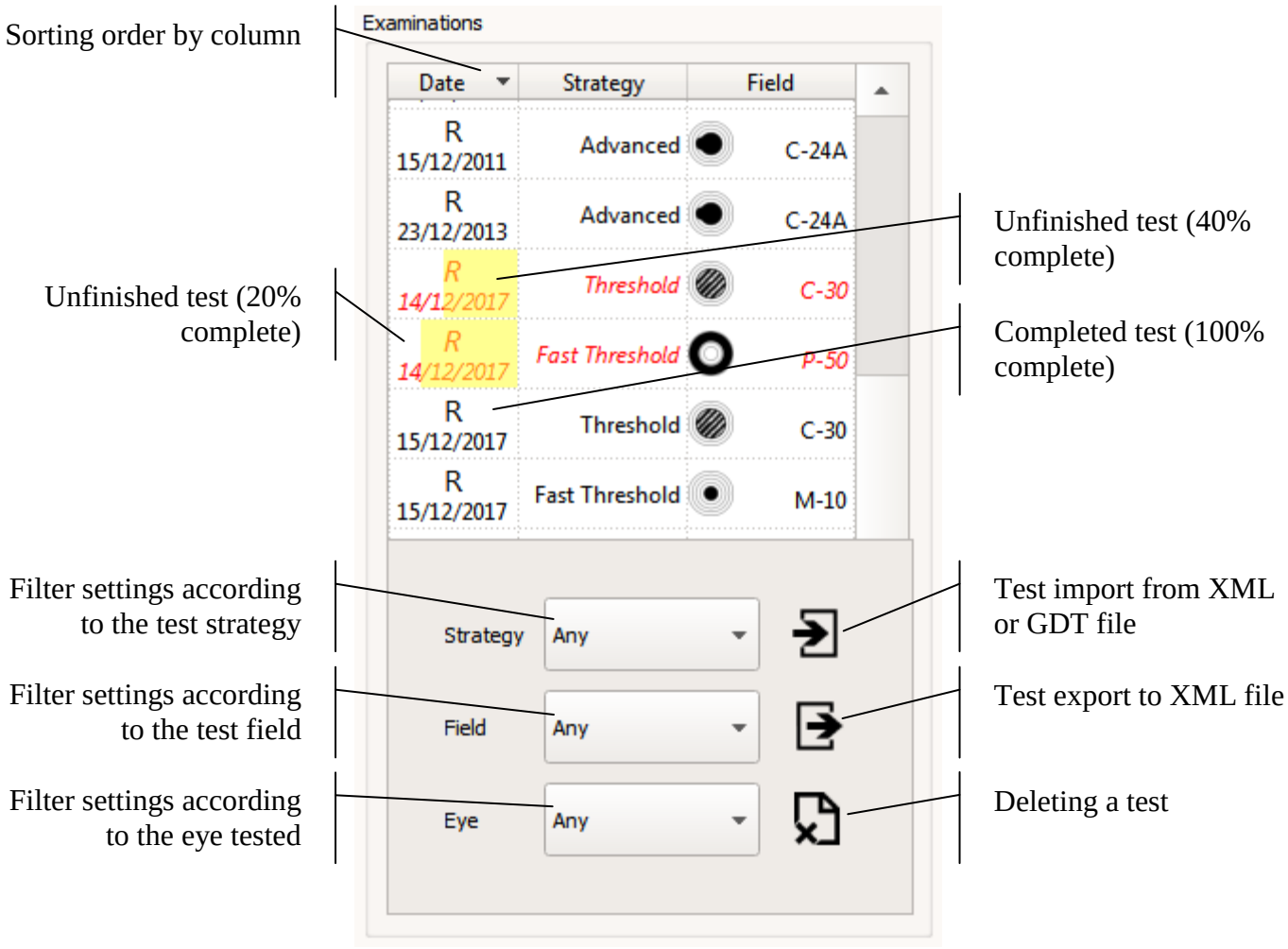


Figure 162. List of tests in the Results tab - analyzing individual test results

The list of tests has the following columns:

Date – the tested eye and the test date. Apart from standard test results, the list also includes information about whether the test has been completed, or whether an partial result has been saved for an unfinished examination. In addition, a test completeness bar will be displayed in the background. The bigger the yellow field, the more examination points are left to test.

Strategy – the currently used test strategy.

Field– the tested field.

The default order in which the previous test results are displayed is set according to the examination date and time To change the sequence in which the results are displayed, click one of the column headers. The data sorting mode will be changed for the selected column.

14.1.2.1. Filtering the list of tests

If the current patient has undergone an extensive number of tests, it may be difficult to find the test you are looking for. In a situation like this, you can use the test filter option.

Use the controls below the list of tests to enter the filter settings (Figure 162. List of tests in the Results tab - analyzing individual test results). With the filter settings, you can choose to display test that matches the strategy, field and / or tested eye criteria.

To display the tests run with, for example, a threshold strategy, select the “threshold” item in the “strategy” filter box. The list of tests will include only tests performed according to the threshold strategy. To disable the filter and display all tests from the lists, set ‘any’ in the “strategy” filter setting. Use the “field” and “eye” filter settings accordingly. All three filters overlap and only the tests that meet all the criteria are displayed.

14.1.2.2. Comments

User comments can be assigned to all tests. The comments field includes information displayed automatically, as well as remarks added by the user after the test or during results analysis. Information is added automatically if the test results are transferred between patients or if the test is discontinued prematurely.

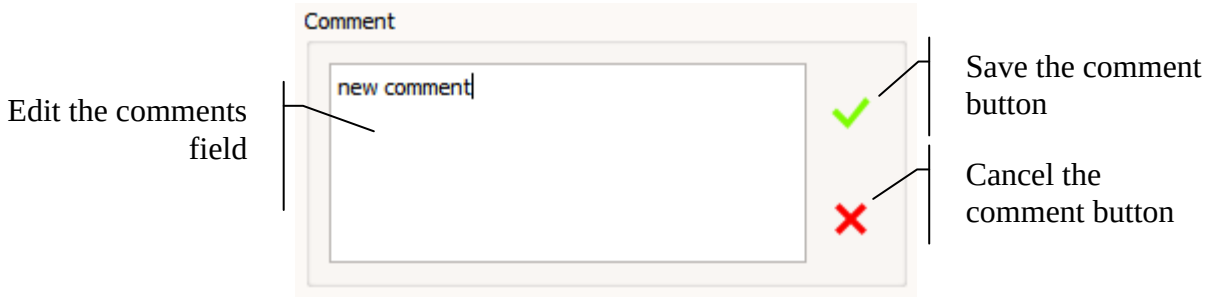


Figure 163. Editing comments

To save a modified annotation in the database, click the Save button. To abandon changes and restore the previously saved version of the comment, click the Cancel button.

14.2. Tools used in results analysis

Perimetry tests deliver a vast array of useful diagnostic data. All information collected during a test can be used to diagnose the eye functions. To make it easier to analyze the test results, there are many raw data processing algorithms used to filter out and expose the most valuable diagnostic data.

There is a number of data processing tools available with the system to simplify the diagnosis. The data processing tools generate maps of results in the results display windows. The tools cannot be applied universally to all tests. A tool-test mismatch is indicated by the “Result not available” message displayed.

14.2.1. RAW analysis – basic result

In the RAW analysis, the basic data collected during a test is displayed unprocessed. The

displayed data corresponds to the data seen in the test preview window.

Depending on the test strategy used, the RAW results can refer to:

retinal sensitivity threshold in dB – Threshold / Fast Threshold / Screening strategy (Figure 164. Results of the RAW analysis (dB) - simple display)

qualitative score symbols of retinal sensitivity – 3-Zone, 2-Zone, and Driving Strategies (Figure 165. Results of the RAW analysis (symbols))

qualitative score symbols of diplopia tests – Diplopia Strategy (Figure 166)

retinal sensitivity threshold to flicker stimuli in Hz – CF Strategy

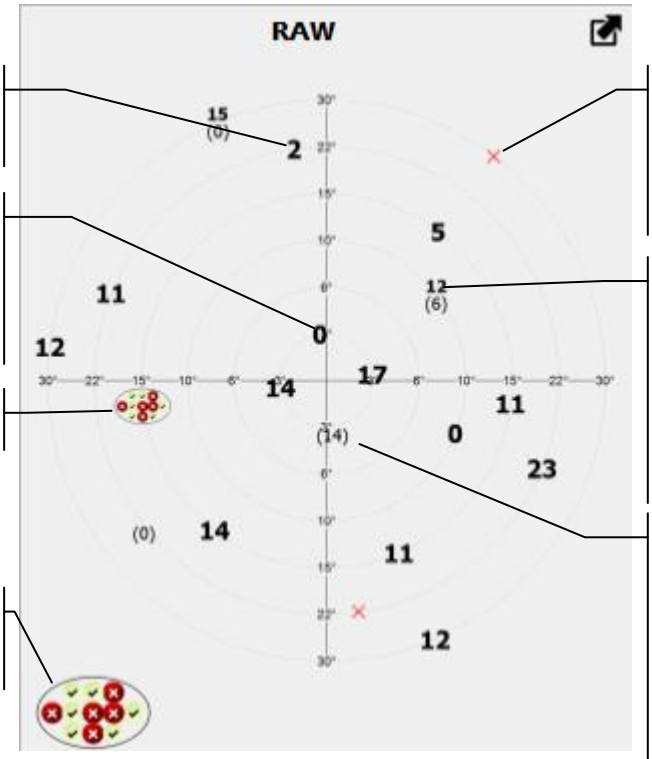


Figure 164. Results of the RAW analysis (dB) - simple display

RAW results only include data of completely tested points. If the test has been interrupted prematurely, partial results, i.e. the results of points which have not been completed, will be hidden (Figure 164. Results of the RAW analysis (dB) - simple display)

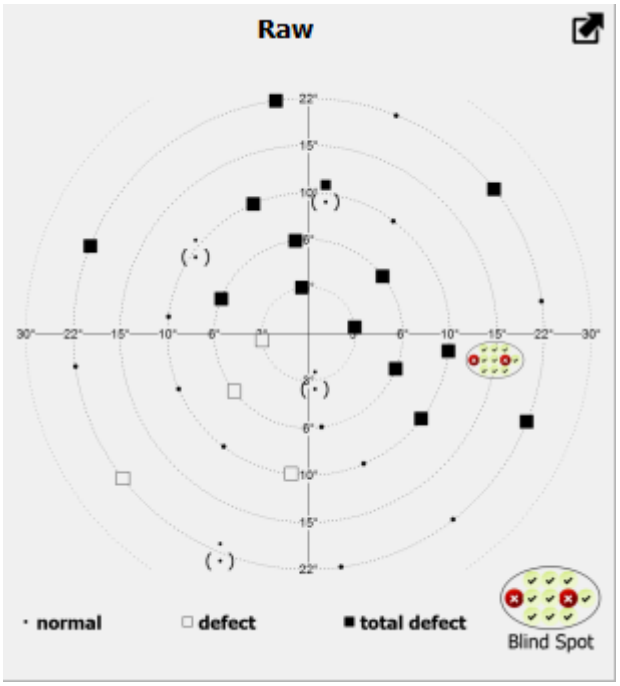


Figure 165. Results of the RAW analysis (symbols)

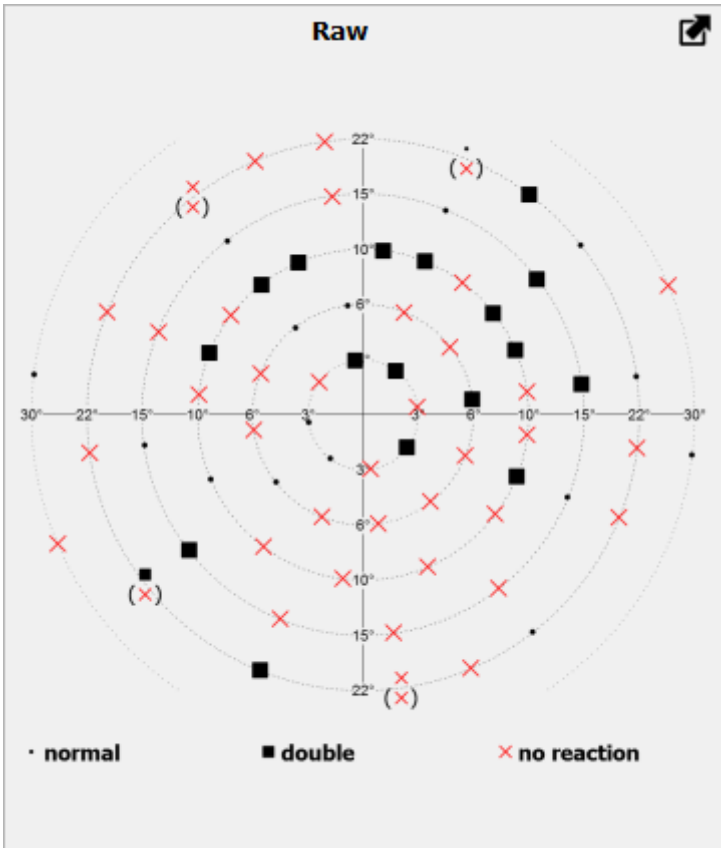


Figure 166. Results of the RAW analysis (BSV symbols)

14.2.2. HoV analysis – deviations from the HoV model

HoV analysis highlights local changes in the retinal sensitivity and omits global deviations from normal. This helps detecting local defects indicative of glaucoma in patients whose visual sensitivity has been reduced by other visual defects, such as refraction defects or cataract.

In HoV analysis, a “perfect” hill of vision profile is created from numerical results of the tested field points. The “perfect” profile has a regular shape without any local defects. The height and slope of the hill of vision are determined from lineal regression of field points with the best score (i.e. the most sensitive ones). The ideal HoV reflects the eye sensitivity without taking into account of any local glaucomatous visual field defects.

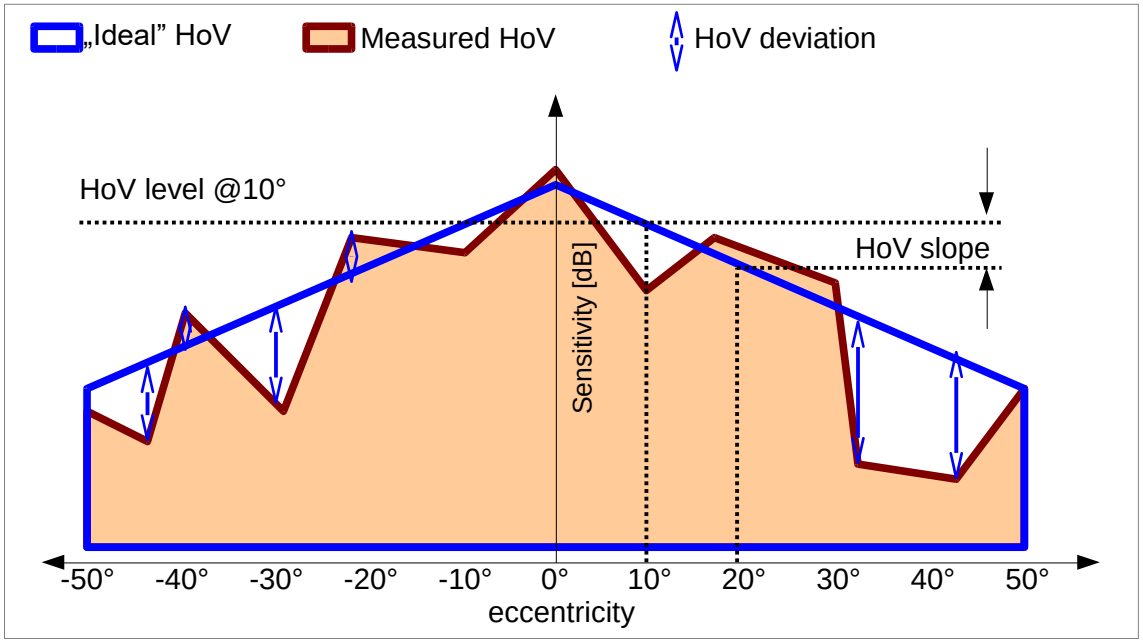


Figure 167. HoV analysis

HoV analysis delivers a set of deviations in the measured eye sensitivity from the “perfect” HoV profile. Points which are found to be defective, i.e. whose sensitivity value is below the value calculated from the “ideal” HoV will be assigned a negative deviation value. The points where the sensitivity values are higher than expected are assigned a positive value. The points where the deviation is lower than the “deviation hiding limit” defined in the application settings (“Figure 213. Changing the display options”) are marked with a dot. Absolute defect points (no response to the brightest stimulus) are marked with a red X.

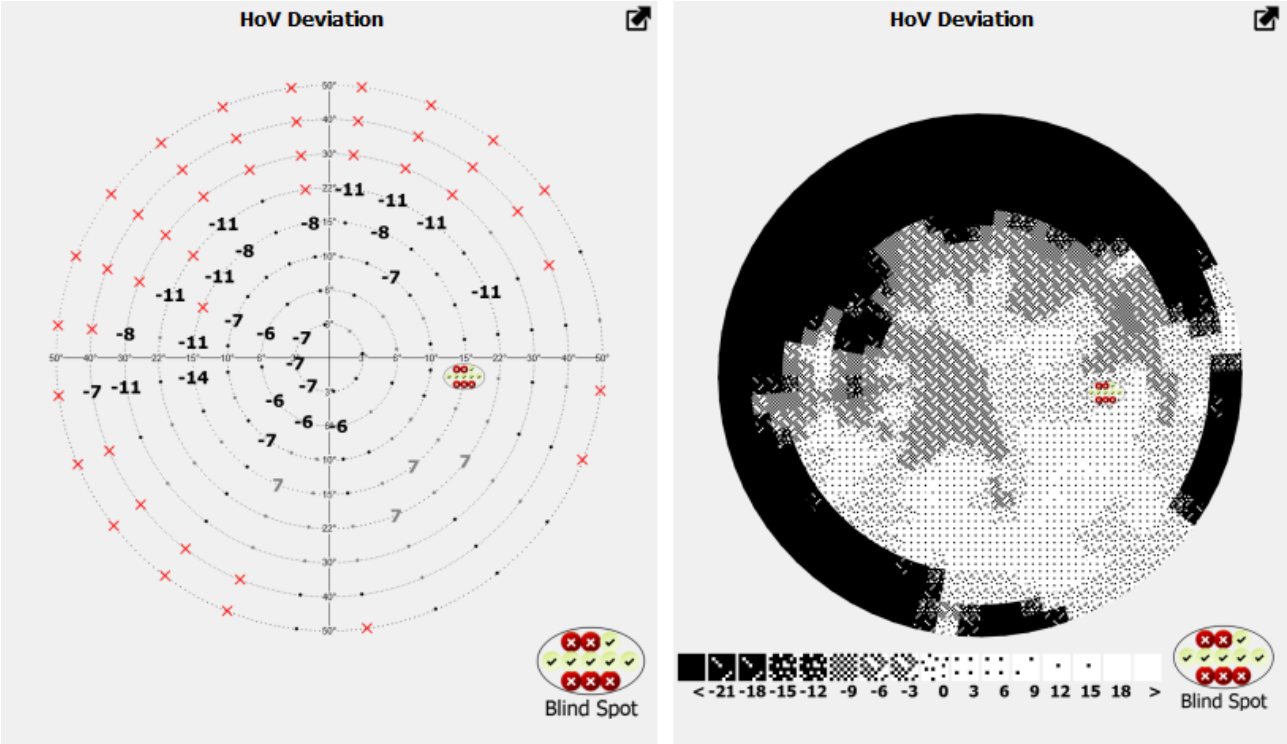


Figure 168. Results of the HoV analysis (in decibels and a dot scale)

Apart from the value of deviations from the ideal HoV, the diagnosis also relies on the HoV@10° parameter, which describes the "ideal" HoV profile. HoV@10° shows the height of the HoV profile at 10° eccentricity and the HoV slope angle in decibels at 10° eccentricity intervals.

14.2.3. TD Analysis – Age Normal Deviation

TD analysis is a very valuable diagnostic tool. It detects both local and diffuse defects from normal. It can facilitate diagnosis of both glaucoma and cataract.

TD analysis calculates sensitivity deviations from normal at tested points within the visual field. Age normal refers to healthy patients at a particular age. TD analysis displays the difference between the patient's tested visual sensitivity and the age normal Hill of Vision for a person in this age group.

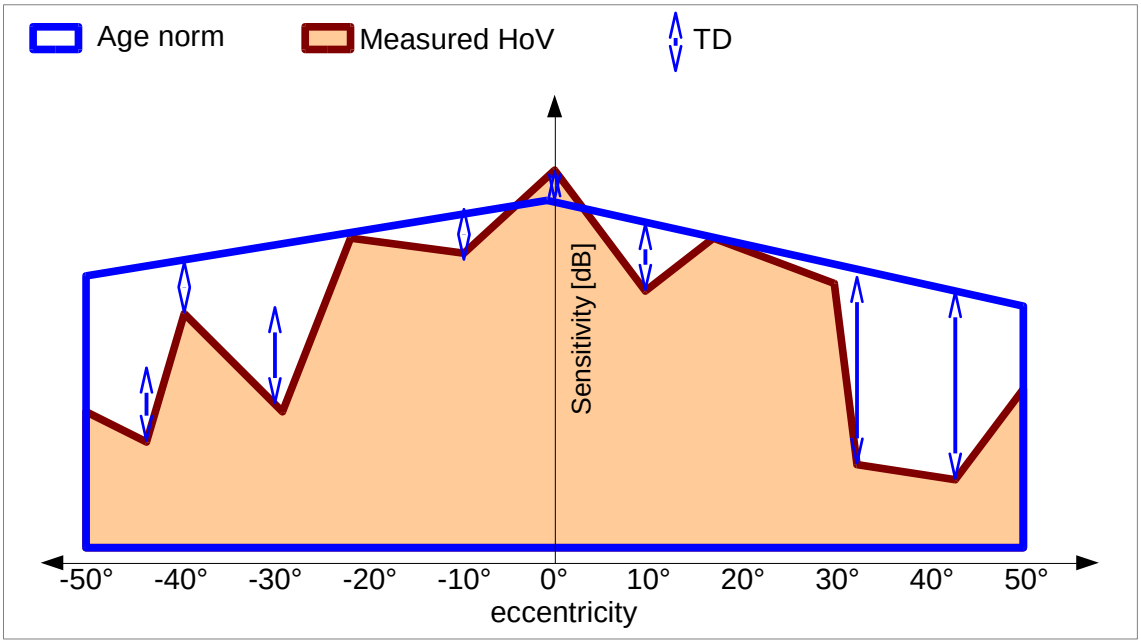


Figure 169. TD Analysis

TD analysis delivers a set of deviations between the measured sensitivity and the age normal Hill of Vision. Points which are found to be defective, i.e. whose sensitivity value is below the age normal, will be assigned a negative deviation value. The points where the sensitivity values are higher than expected are assigned a positive value. The points where the deviation is lower than the “deviation hiding limit” defined in the application settings (Figure 213. Changing the display options) will be marked with a dot. Absolute defect points (no response to the brightest stimulus) are marked with a red X.

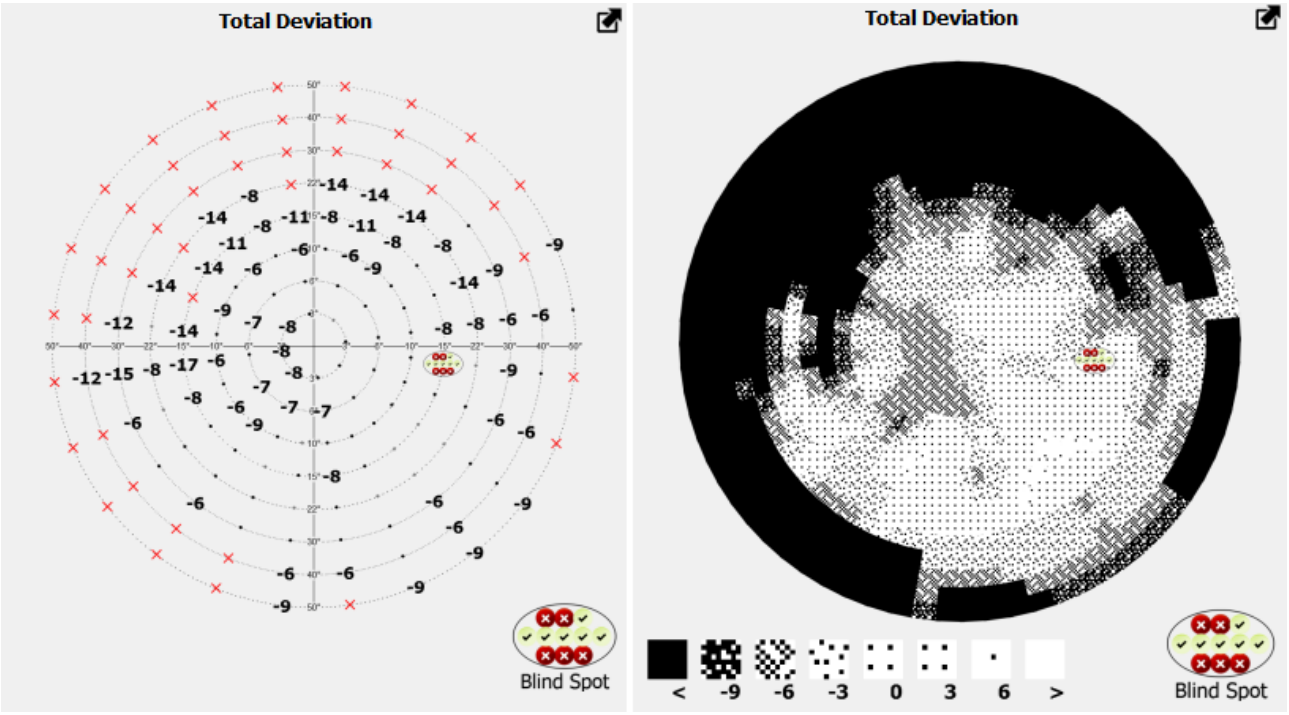


Figure 170. Results of the TD analysis (in decibels and a dot scale)

TD analysis is only available for tests performed using the Threshold, Fast Threshold and Advanced strategy.

14.2.4. PTD analysis – probability of deviations from age normal

TD analysis displays the exact deviation between the measured sensitivity and the mean age normal. The results within a particular age group are always divergent, and the test results should be referenced not only to a mean value, but also to the distribution of normative values. You may find out that the deviation from normal detected at a particular point within the patient's visual field indicates a broad distribution of normative values at the particular point rather than a disease.

PTD analysis is based on a normal mean and standard deviation of age normal sensitivity at the tested points within the visual field. It delivers information about the probability that the tested value is normal and is not a sign of a disease. The results are displayed as graphical symbols.

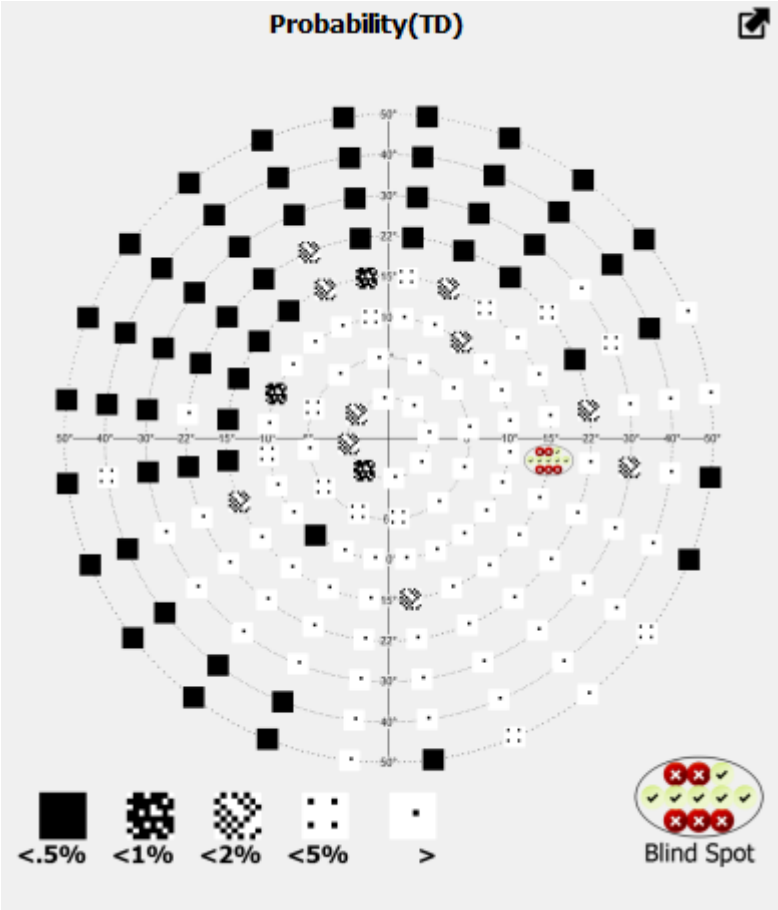


Figure 171. Results of the PTD analysis

PTD analysis is based on the results of the TD analysis. Each value is assigned a graphic symbol after the value is compared with the distribution of age normative values at a particular point within the visual field. If the value is lower than in 95% healthy patients, the point carries a <5% symbol. This means that the probability that the value is normal at a particular point and is not a manifestation of any disease is lower than 5%. Other symbols correspond to the probability score of <2%, <1%, and <0.5%.

PTD analysis is only available for tests performed using the Threshold, Fast Threshold and Advanced strategy.

14.2.5. PD Analysis – age normal deviation adjustment

TD analysis displays deviations from age normal without any additional data processing. The results of TD analysis can shed some light on both, diffuse reduction in visual sensitivity (caused by cataract), and local defects (attributed to glaucoma). It may be difficult to detect local defects of the sensitivity if the patient's sensitivity is found to be reduced diffusely. On the TD map, all results will be negative and it will be difficult to detect groups of values lower than the mean

value.

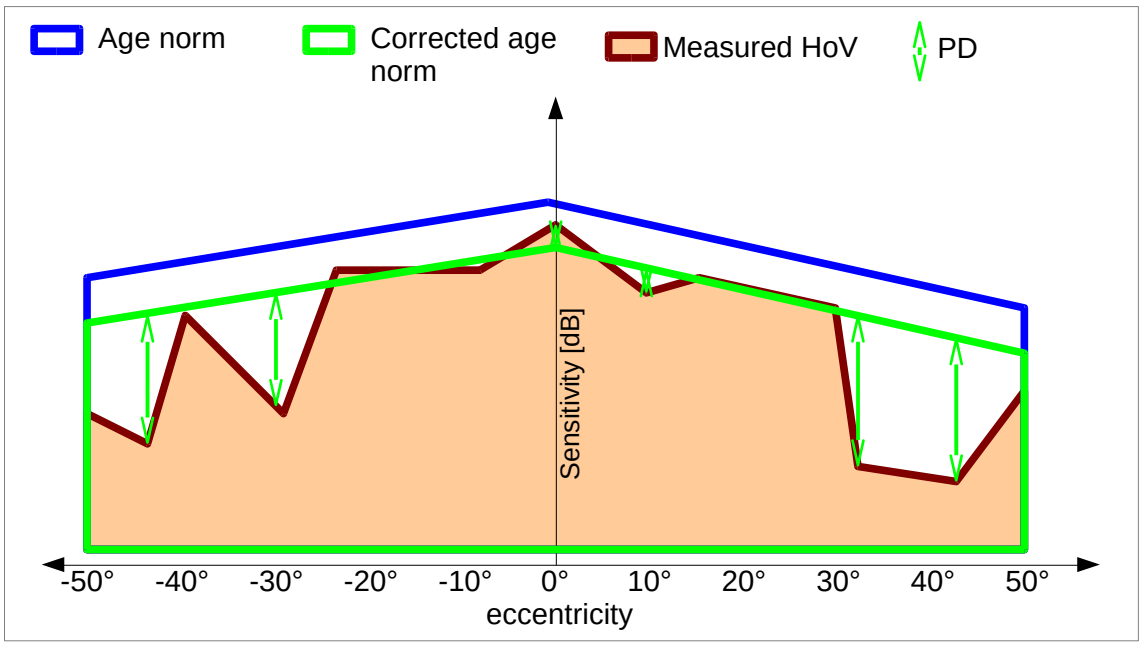


Figure 172. PD analysis

PD analysis solves this problem. It corrects the results of TD analysis to reject the diffuse reduction in patient's sensitivity in favor of local defects. This algorithm is designed to detect the values of diffuse sensitivity reduction and to adjust all results shown on the TD map by this value. This means that the points where the sensitivity was found to be reduced only by the value of the diffuse sensitivity reduction will equal 0, and the points where local reduction was detected will be assigned negative values.

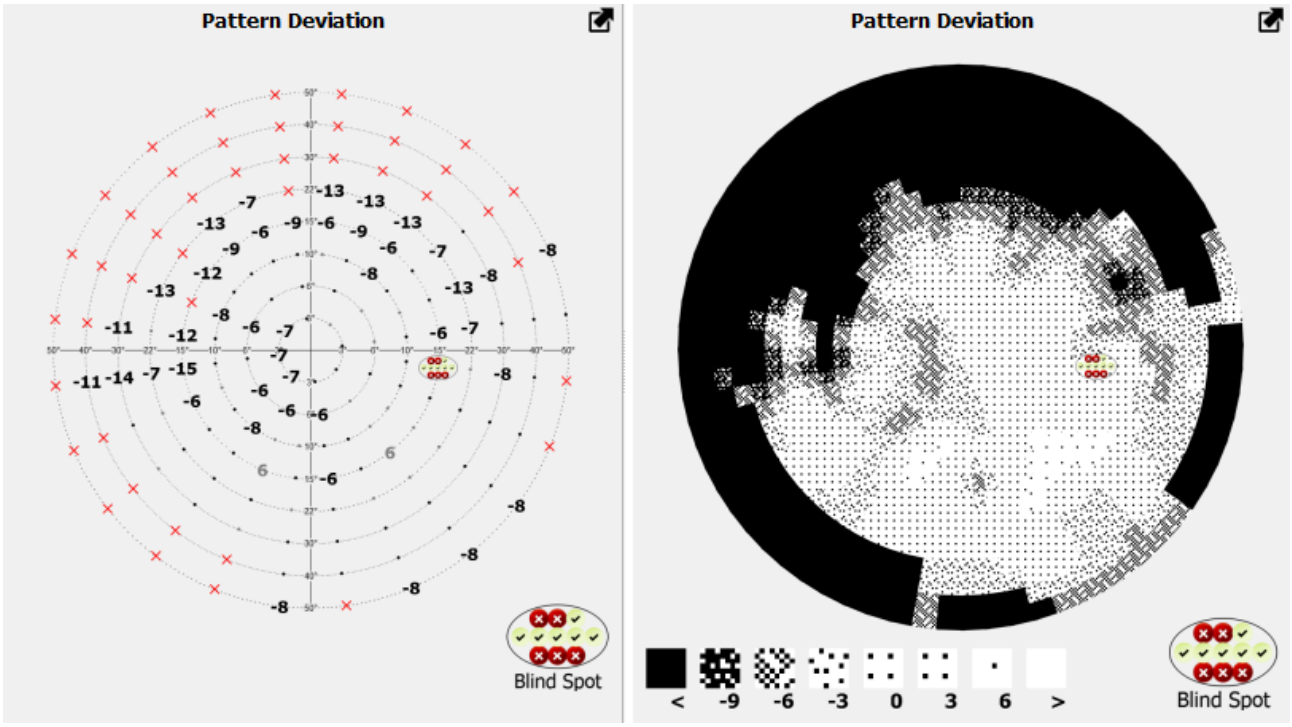


Figure 173. Results of the PD analysis (in decibels and a dot scale)

PD analysis is only available for tests performed using the Threshold, Fast Threshold and Advanced strategy.

14.2.6. PPD analysis – probability of adjusted deviations from age normal

The PTD analysis is intended to categorize deviations detected in TD analysis in terms of their probability among the normative group of patients (PTD analysis – probability of deviations from age normal), and PPD analysis uses the same mechanism to categorize deviations in the PD analysis. PPD analysis evaluates local defects even in patients with reduced visual sensitivity extending over a large area of the visual field (e.g. cataract).

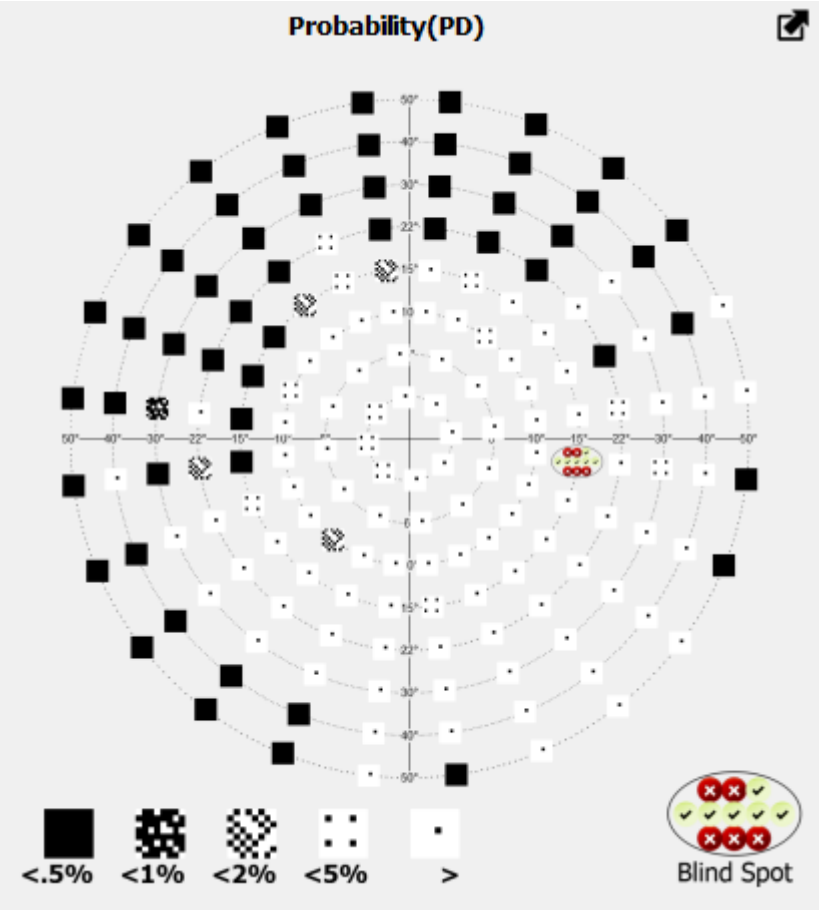


Figure 174. Results of the PPD analysis

PPD analysis is based on the results of the PD analysis. Each value is assigned a graphic symbol after the value is compared with the distribution of age normative values at a particular point within the visual field. If the value is lower than in 95% healthy patients, the point carries a <5% symbol. This means that the probability that the value is normal at a particular point and is not a manifestation of any disease is lower than 5%. Other symbols correspond to the probability score of <2%, <1%, and <0.5%.

14.2.7. Bebie analysis – the Bebie curve

The Bebie curve is a cumulative defect curve. It differentiates local and diffuse visual field defects.

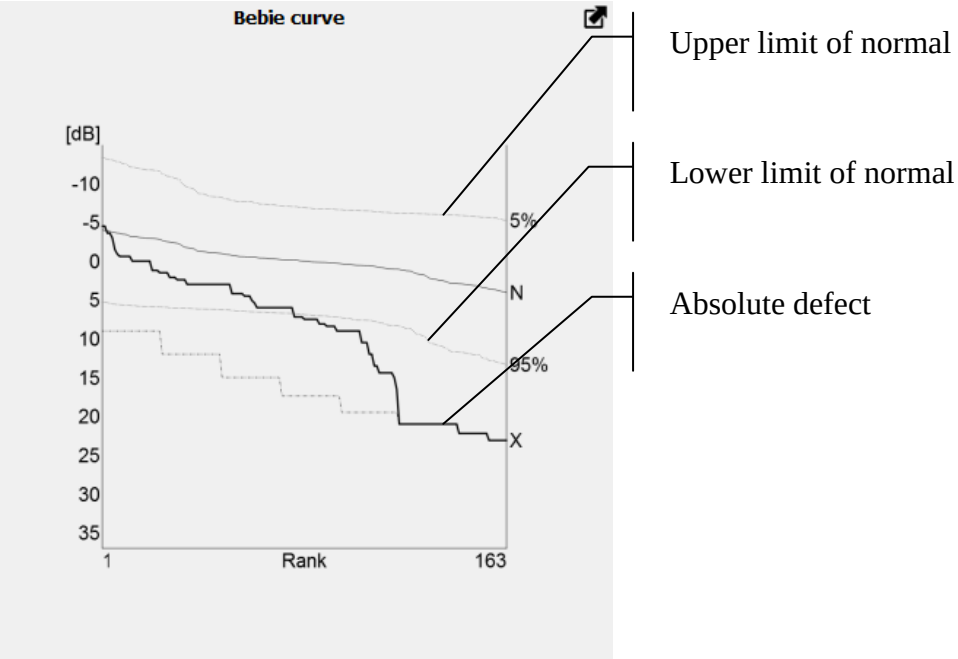


Figure 175. Bebie analysis – cumulative defect curve

The diagram includes deviations from age normal obtained from the TD analysis, arranged in a descending order (i.e. down to the deepest defect). The points are interconnected with a line to create a curve with a negative slope. The diagram also shows 5% and 95% thresholds of the normative area. Points below the 95% line are defects that are detected in less than 5% of normal population. Points above the 5% line are points of extremely high sensitivity present in less than 5% of the normal population.

An additional absolute defect line is marked with an X. It forms a diagram where all points of the analyzed visual field denote an absolute defect. Points of the analyzed field where no response was detected to the brightest stimuli extend to the absolute defect line. This way, the part of the visual field with zero-sensitivity can be determined.

14.2.8. Sectors and GHT analysis

Glaucoma Hemifield Test is the visual field analysis tool which is based on the statistical data and results of corrected age norm deviation probability maps (PPD). In this test the central part of VF is divided into 10 sectors: 5 in lower hemifield and 5 in upper one. Results of deviation probabilities of points contained in a particular sector are judged and summed as a whole sector result. Next, the sector results from upper hemisphere are compared to results of mirrored sectors from the lower hemisphere. The statistical data is then used to judge the test result:

- **Within Normal Limits** – all sectors from both hemispheres does not show any significant deviations.

- **Borderline** – at least one pair of sectors is showing a difference which exceeds that found in 3% of a healthy population.

- **Outside Normal Limits** - at least one pair of sectors is showing a difference which exceeds that found in 1% of a healthy population, or sum of probability scores in both sectors in any mirror image pair individually reaches the 0.5% limit of a healthy population.

- **General Reduction of Sensitivity** – the sensitivity offset which is used for PD analysis, displays the VF sensitivity drop that is found in less than 0.5% of a healthy population.

- **Abnormally High Sensitivity**- the sensitivity offset which is used for PD analysis, displays the VF sensitivity rise that is found in less than 0.5% of a healthy population.

The GHT test is displayed with the map which shows the probabilities of the results in each sector.

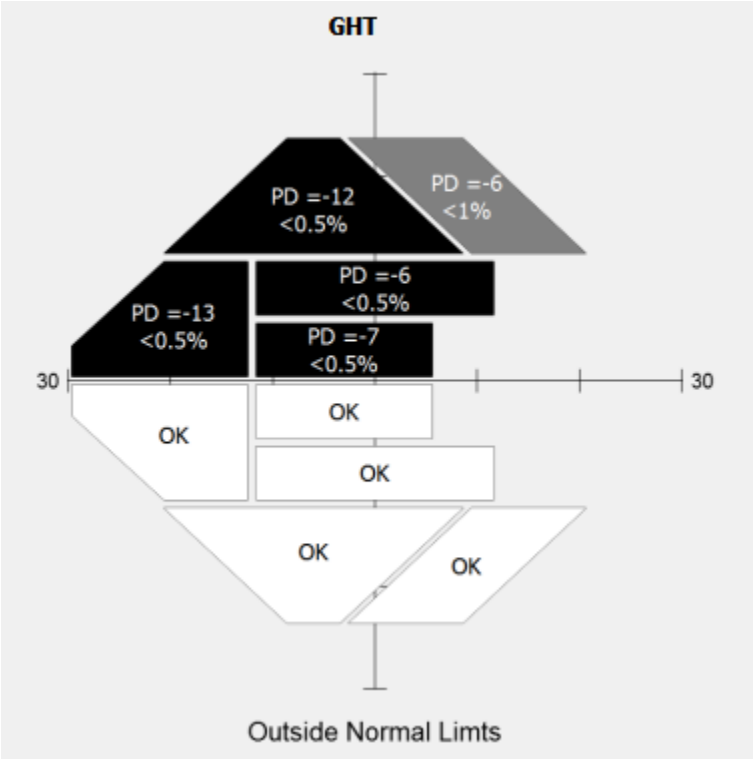


Figure 176. GHT test and sectors analysis result

If a particular sector has the PD probability result within 95% of a healthy population norm, then it is marked with OK. If the sector scores below the 5%, 2%, 1%, 0.5% limit of the healthy population then it is marked with the probability value and the numerical value of mean PD for points within this sector.

The sectors and GHT analysis is based on the interpolation of original test results. The interpolated results in the tested field areas are based on mathematical analysis and are not a diagnosis. They represent a probable condition of the test field between the tested points. The analysis result may be inaccurate if the original test field does not contain enough test points that lay in each

sector.

14.2.9. 3D analysis

3D analysis is an additional representation of numerical RAW-type results. 3D analysis displays an area of the tested hill of vision (HoV) in 3D. The surface depicts the map of retinal sensitivity and visualizes the HoV concept. The higher the area on the surface, the higher the sensitivity at the corresponding point of the visual field. A map of colors is also used to present the distribution of sensitivity.

The map is interpolated to present the eye sensitivity in 3D. The space between the tested points is shaped according to estimated values, calculated from the linear interpolation of the tested points. This is to make the perimetry testing more understandable to patients and to illustrate the identified defects of the visual field.

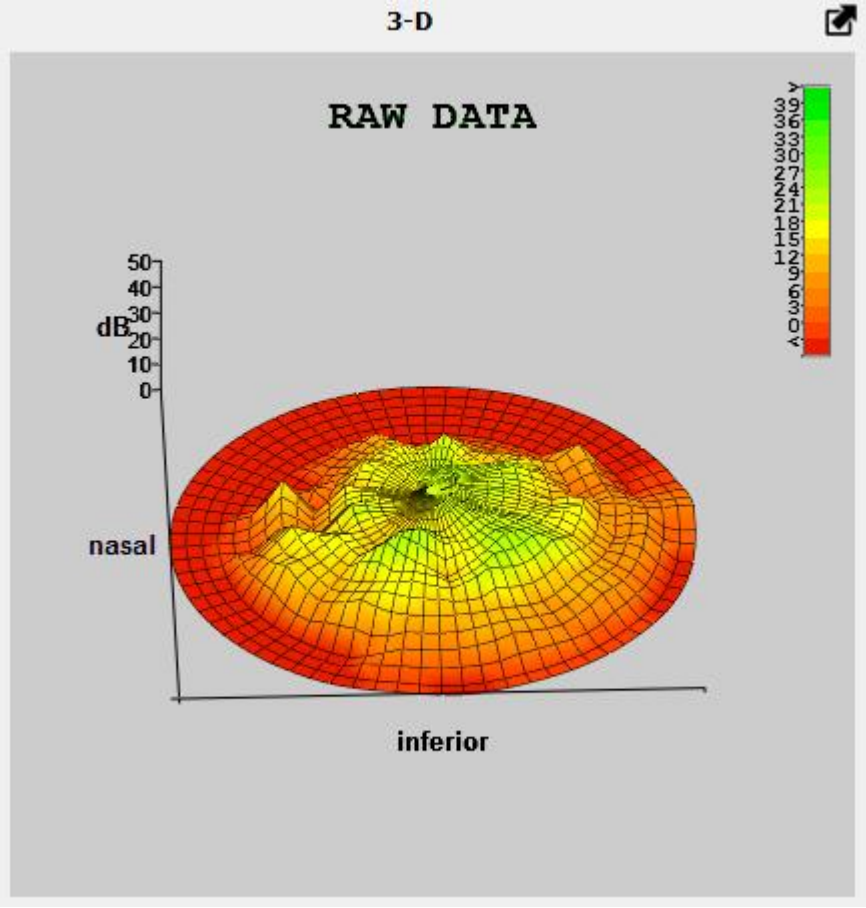


Figure 177. Results of the 3D analysis

The 3D analysis field can be rotated and enlarged. It can be enlarged using the scroll wheel. To

rotate the map, left-click the 3D map and move the mouse left, right, up and down while keeping the button pressed. If the button is released, the image will rotate until it stops.

The interpolated results in the tested field areas are based on mathematical analysis and are not a diagnosis. They represent a probable condition of the test field between the tested points. The actual condition of the visual field can be only determined through testing procedures.

14.2.10. "Details" analysis – test parameters and indexes

"Details" analysis is a table listing all important test data and the results of calculated indexes that describe the tested visual field.

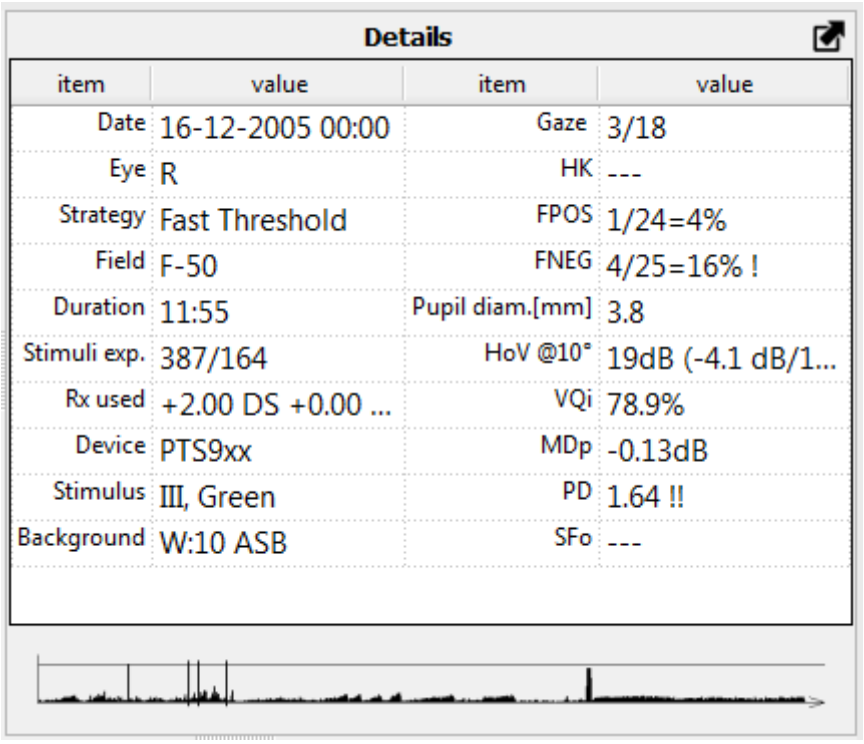


Figure 178. Results of the "Details" analysis

This table presents the following information:

Date – the exact date and time when the test was completed

Eye – the tested eye

Strategy – the test strategy used

Field- test field used during the test

Duration – the test duration

Stimuli exp. – number of exposed stimuli / number of tested points (number of field points)

Rx used – correction lens used during the test

Device – data of the device used in the test

Stimulus – size and color of the tested stimulus

Background – color and brightness of the background used in the test (W – white, Y-yellow)

Gaze – number of fixation errors detected on the eye camera

H-K – number of fixation errors detected / number of fixation tests using the Heijl-Krakau method

FPOZ – number of false positive errors detected / number of false positive tests

FNEG – number of false negative errors detected / number of false negative tests

Pupil diam. – pupil diameter measured on the eye camera during the test

HoV@10° - mean sensitivity of the tested hill of vision on a 10° ring in dB and the detected HoV slope in dB per every 10° (Screening, Threshold, and Fast-Threshold strategies). In strategies delivering a qualitative result (Two-Zones, Three-Zones), HoV@10° describes the brightness level of the stimulus used for tests at 10° and a reduction in the brightness level at 10° eccentricity intervals.

Stim. offset – difference between the calibration level and actual stimuli brightness displayed to patient. For example, -3dB stimuli offset in 2-zone strategy means that each exposition of stimulus was made with the intensity which was 3dB brighter than theoretically expected form calibration phase (or from other initial level selected in test settings)

Brightness – brightness level of the stimulus used for tests in dB. It applies to test strategies where stimuli of the same brightness are used (Driving Test, BSV).

VQi – quality index of the visual field accounting for glaucoma defects. VQi values are partial results calculated for each tested point within the visual field. They are weighted according to eccentricity and are included in VQi for the entire field. Defect-free visual field VQi equals 100%. VQi of a completely blind field equals 0%.

GHT – Glaucoma Hemifield Test result. Uses upper-lower hemifield differences in the probability maps to detect localized visual field loss. It also can detect abnormal sensitivity or general depression of the VF.

Mean defect – a group of indexes that denote deviation of the tested points from normal. Indexes are calculated according to different formulas depending on the settings introduced in "":

"HFA" - MDh – weighted mean value of deviations from age normal on the TD map

"H-S" - MDh – mean value of deviations from age normal on the TD map

"Default" – MDp – mean value of deviations of the tested averaged hill of vision from age normal

Irregularity – indexes that describe irregularity of the tested visual field excluding diffusely reduced visual field sensitivity. As a rule, the value of irregularity indexes rises with the increase

of local defects of vision. Indexes are calculated according to different formulas depending on the settings introduced in “Changing index types in the analyses”:

“HFA” - PSD – the level of deviations in the shape of the measured hill of vision from the normal field

“H-S” – LV(sLV) – irregularity of the field of vision (sLV – square root of LV).

“Default” – PD – mean value of deviations of the tested points from the tested averaged hill of vision

Short-term Fluctuation – indexes that describe the discrepancy between the results obtained at the same point during a test. Indexes are calculated according to different formulas depending on the settings introduced in “Changing index types in the analyses”:

“HFA” - SFh – weighted mean short-term fluctuation of points

“H-S” and “default” – SFo – mean short-term fluctuation of points

Gaze shift diagram during a test

14.2.11. Gaze shift diagram

Gaze shift diagram is a bar chart that illustrates the patient’s eye movements during a test. It helps to determine whether gaze fixation is correct and if the test results are reliable. An example of an gaze shift diagram is shown below (Figure 179. Gaze shift diagram).

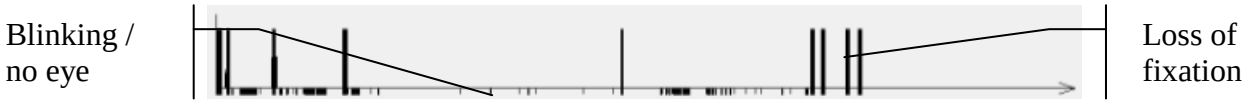


Figure 179. Gaze shift diagram

The diagram includes a horizontal time axis with bars of different heights. The following types of bars are used:

Bars above the horizontal axis – pupil shift. The higher the bar, the higher the pupil shift.

Bars below the horizontal axis – blinking. If the bars are longer, the eye has not been detected.

Bars extending over the whole height of the diagram (above and below the horizontal axis) are the detected fixation errors, i.e. pupil shift exceeding the allowed limit value of pupil shift (Setting the pupil shift limit).

14.3. *Results display modes*

Test result is judged from maps that display the results of various analysis. As a rule, the maps display exact numerical values at particular tested points of the visual field. The system uses alternative results display methods to make it easier to read the map and to identify areas of the visual field where visual defects are manifested.

Alternative results display methods only apply to strategies and analysis that produce results displayed on a map of numerical values. Alternative results display options cannot be used for test strategies that deliver qualitative results, and for analysis that deliver qualitative or probability results.

14.3.1. Basic display

Basic display is the simplest way the test results can be presented. The test results are displayed in the default mode. Depending on the test strategy, the results can be presented either as numerical values with sensitivity results in dB or Hz, graphical symbols representing a qualitative result (normal vision, defect, complete defect, double vision, no response), or symbols that denote the probability of a visual defect (TDP, PDP analysis).

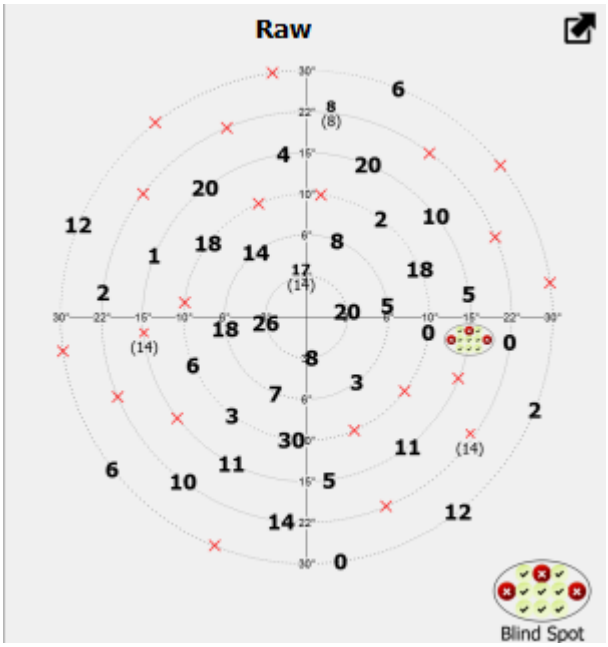


Figure 180. Basic visualization of the RAW analysis (in dB)

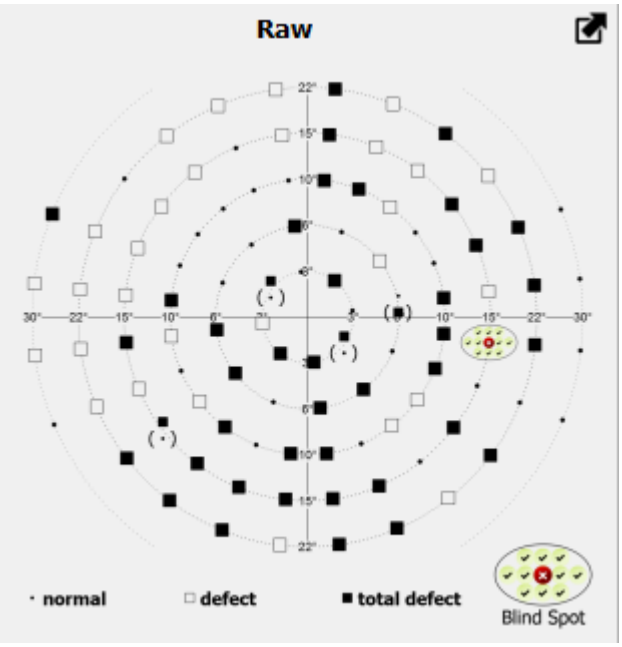


Figure 181. Basic visualization of the RAW analysis (qualitative symbols)

14.3.2. Dots

The dots are an alternative way to present a map of numerical values. For each tested point, there is a graphical symbol displayed. It is a white area covered with black dots. The number and density of black dots in the symbol depends on the results obtained at the particular points of the visual field. Symbols are explained next to the dot map.

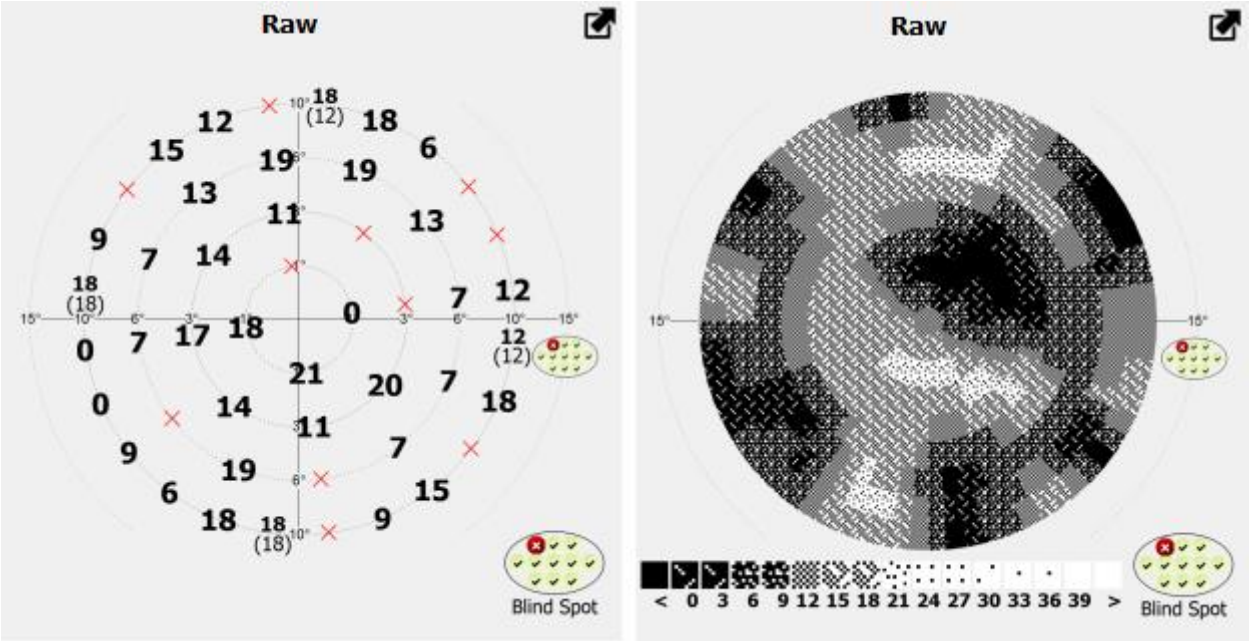


Figure 182. Basic display and the dot map of the RAW analysis

The dot map is interpolated. The space between the tested points is filled with symbols representing values estimated from the linear interpolation of the tested points. This way it is easier to read the map and to estimate the areas of visual defects.

The interpolated results in the tested field areas are based on mathematical analysis and are not a diagnosis. They represent a probable condition of the test field between the tested points. The actual condition of the visual field can be only determined through testing procedures.

14.3.3. Grey scale

The scale of grey map is an alternative way to present a map of numerical values. The results from each tested point shown on the map are grey-coded. The shade of the map that corresponds to the point of the tested visual field depends on the sensitivity value obtained at this particular point. The color code is explained next to the map.

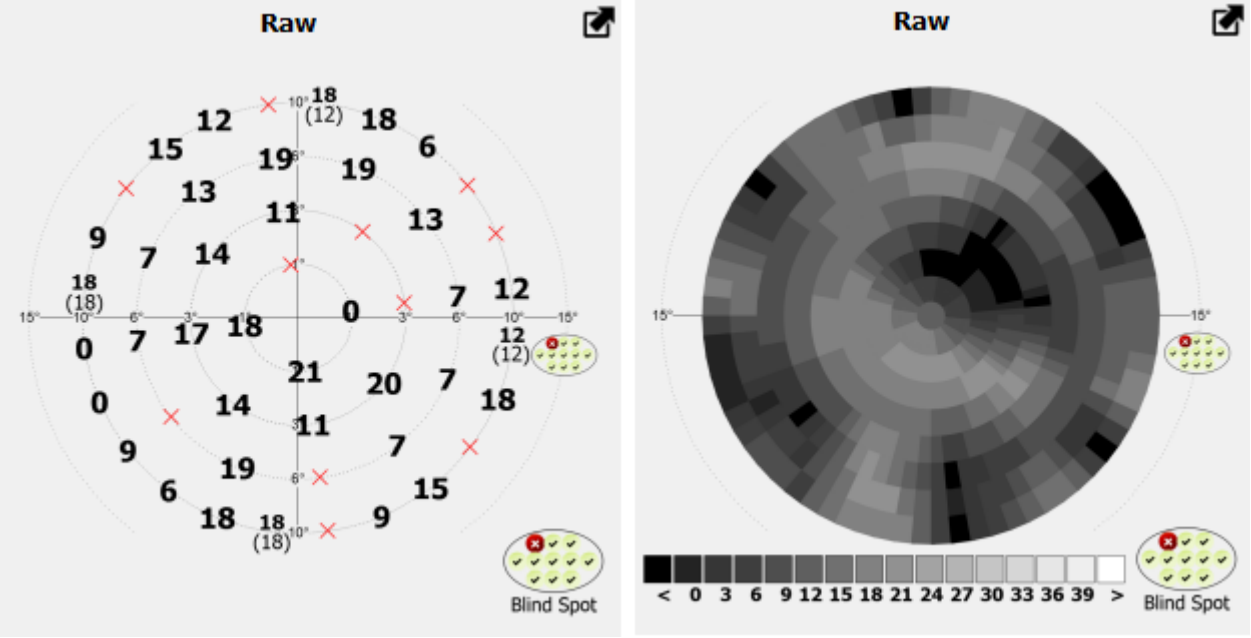


Figure 183. Basic display and the grey-coded map of the RAW analysis

The scale of grey map is interpolated. The space between the tested points is filled with symbols representing values estimated from the linear interpolation of the tested points. This way it is easier to read the map and to estimate the areas of visual defects.

The interpolated results in the tested field areas are based on mathematical analysis and are not a diagnosis. They represent a probable condition of the test field between the tested points. The actual condition of the visual field can be only determined through testing procedures.

14.3.4. Colors

The map of colors is an alternative way to present a map of numerical values. The results from each tested point shown on the map are color-coded. The color of the map that corresponds to the point of the tested visual field depends on the sensitivity value obtained at this particular point. The color code is explained next to the map.

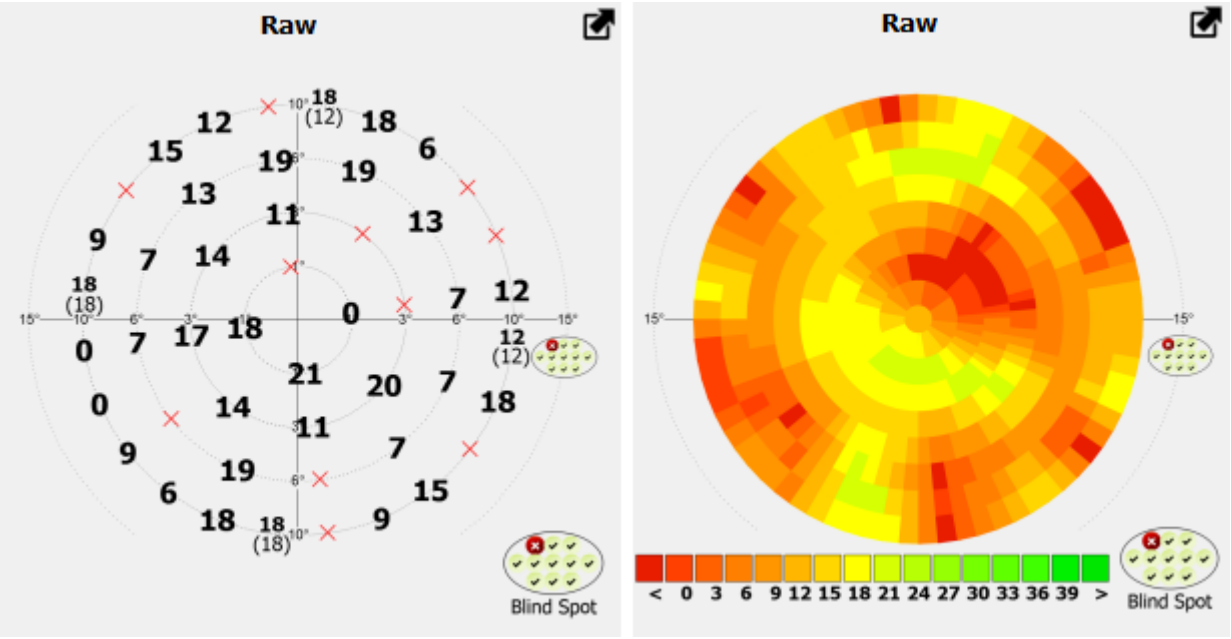


Figure 184. Basic display and the color-coded map of the RAW analysis

The color-coded map is interpolated. The space between the tested points is filled with symbols representing values estimated from the linear interpolation of the tested points. This way it is easier to read the map and to estimate the areas of visual defects.

The interpolated results in the tested field areas are based on mathematical analysis and are not a diagnosis. They represent a probable condition of the test field between the tested points. The actual condition of the visual field can be only determined through testing procedures.

14.3.5. Interpolation of results to maps 30-2, 24-2 and 10-2

The software allows to present the results of selected examinations in HFA-device style on maps 30-2, 24-2 and 10-2. The function is enabled by using "HFA Interpolation" button (Figure 185. "HFA Interpolation" button).

After enabling, the original examination result will be interpolated. As a result, a continuous retinal sensitivity map is generated, from which the presumptive sensitivity values at points that were not physically tested can be read. Locations belonging to commonly used test areas are used for displaying: 10-2, 24-2 and 30-2; these are popular for HFA devices. Whether the original result of examination is interpolated to map 10-2, 24-2 or 30-2 is dependent on the field

range from the original result.

The results interpolation function is only available for tests in which numerical levels of retinal sensitivity may be determined. These include examinations performed with different threshold strategies (Threshold, Fast Threshold, Screening and Advanced). For interpolation to be possible with the selected examination strategy, it must be completed in at least 75%, and the examination must be performed on a sufficiently large field of vision.

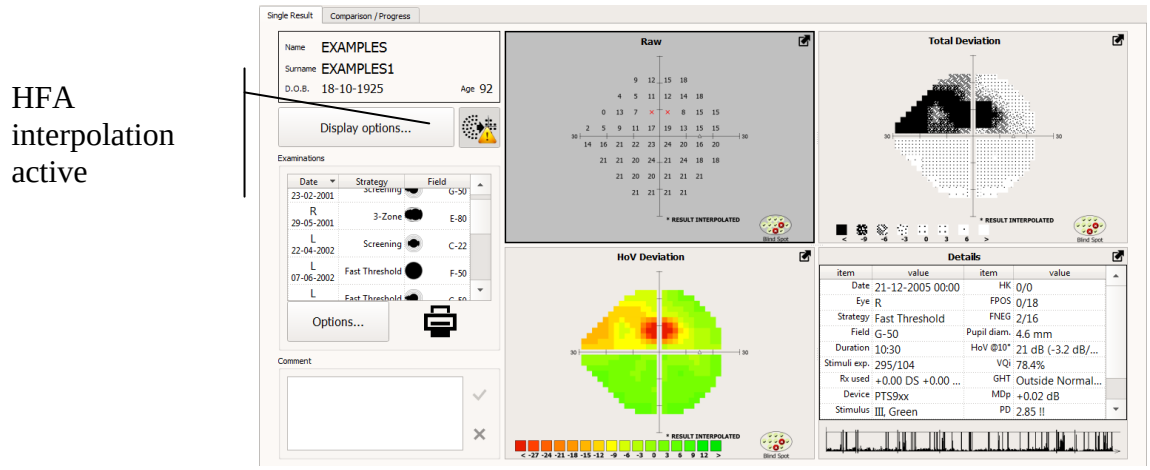


Figure 185. "HFA Interpolation" button

Remember that interpolated results have a high error. The values displayed on interpolated maps are not a measurement result, but merely a result of approximation based on measurements at different locations.

Results interpolated at unexamined field areas are based on mathematical analysis and do not constitute diagnostic data. They merely represent presumptive conditions of the field examined between the other examination points tested. The actual condition of the field at unexamined areas may only be determined by examination.

Default state of the "HFA Interpolation" button is dependent on the "Interpolation to HFA maps" setting on "General" page, "Settings" tab.

14.4. *Test report generator*

The test results can be summarized in a one-page report. The report can be printed or saved as PDF or JPG file in the selected directory. It can be also saved as DCM (Dicom) image format or sent to a configured DCM file server.

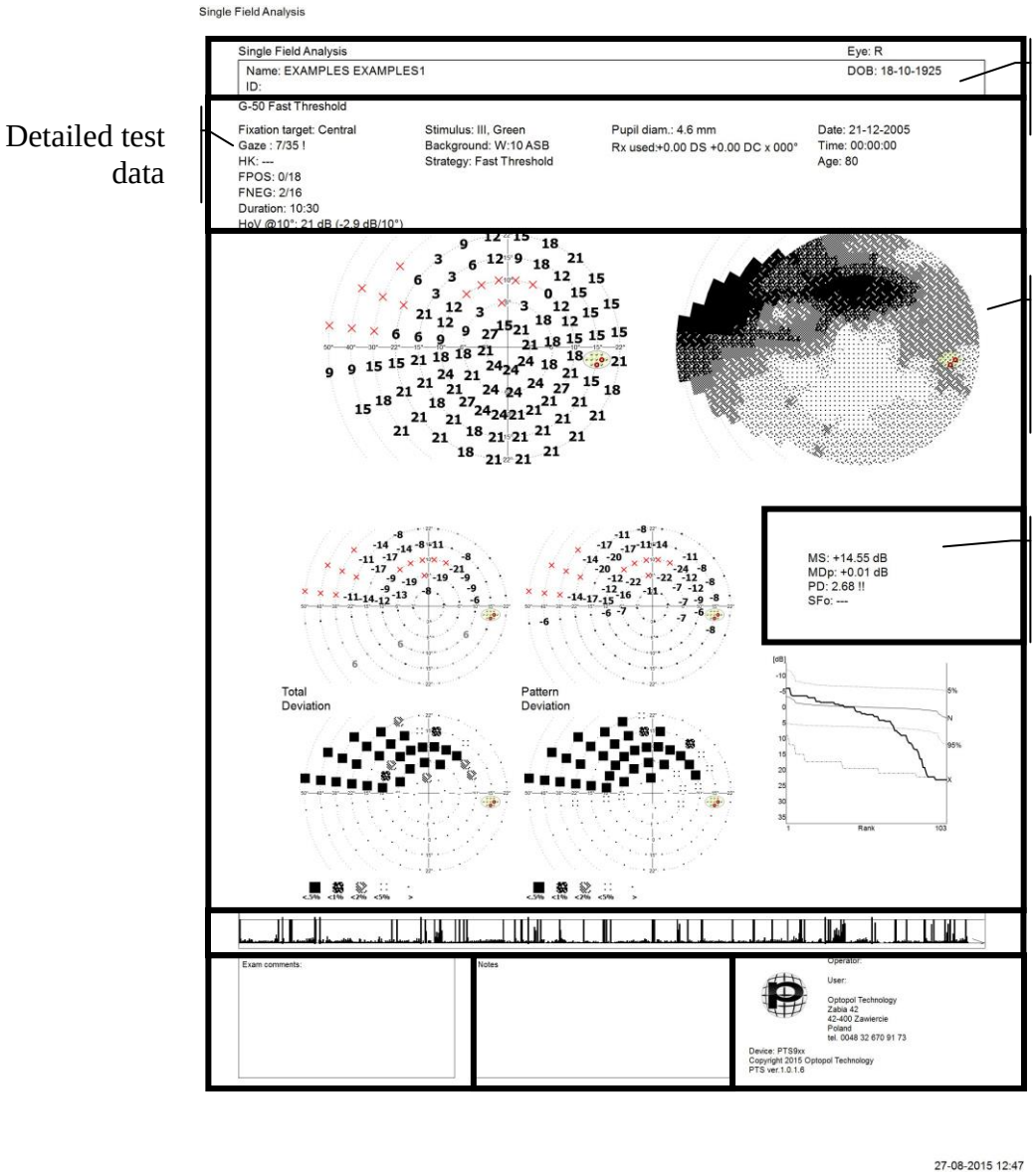


Figure 186. Single field analysis report (HFA+Bebie)

To generate a report on the single test analysis page, click the printer icon at the bottom left hand side of the window. After clicking this button, a print preview window will be displayed. From here, you can change the printer settings or choose how to save the report (paper, PDF, JPG, or DCM).

HFA interpolation may also be enabled or disabled (Interpolation of results to maps 30-2, 24-2 and 10-2). The state of the button after opening the print preview window depends on the setting chosen at the "Settings" and "Results" tabs.

Printer selection and settings

Hard copy printout

Temporary enabling/disabling of HFA interpolation

Saving printout to PDF file

Saving printout to JPG file

Saving printout to Dicom DCM

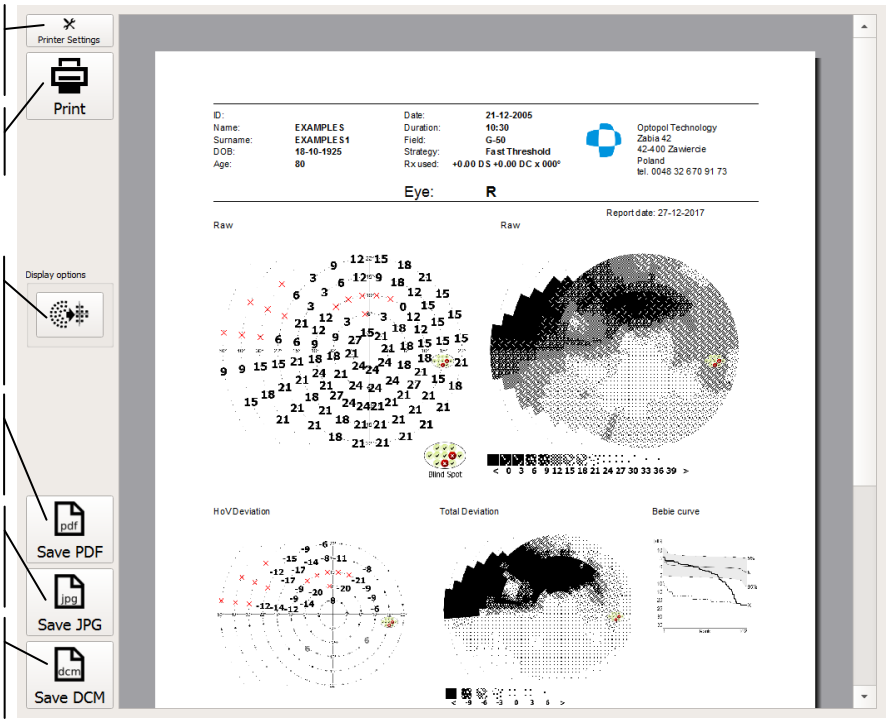


Figure 187. Print preview window

The layout and content of the report depends on the style selected (“Changing the style of reports printed and rendered to a file”) and the test strategy used. If the test strategy includes many analyses, the report will feature more information than other reports generated from the RAW analysis.

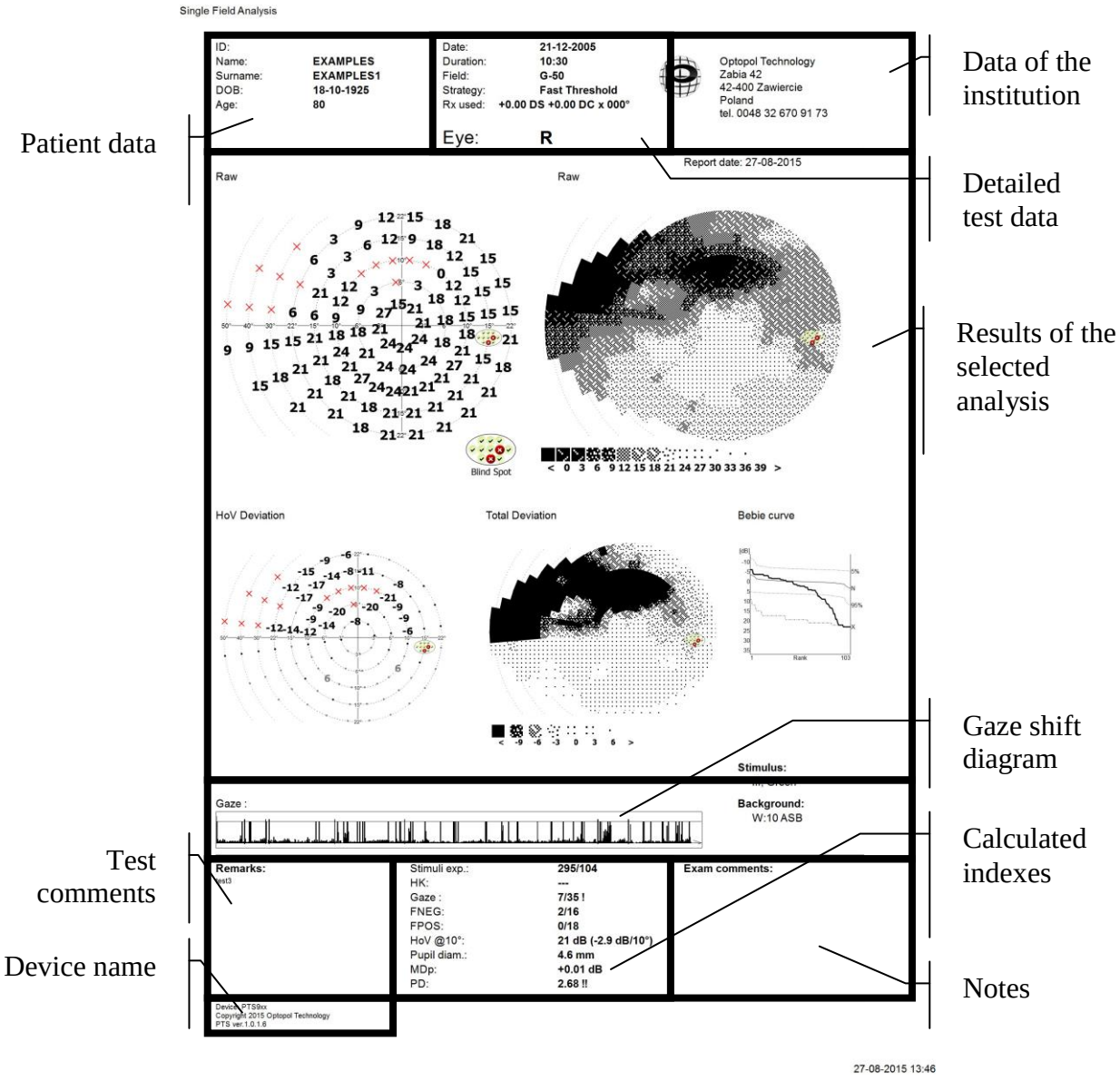


Figure 188. Single field analysis report (default)

Information contained in HFA reports based on tests run according to different test strategies:

Fast Threshold / Threshold and Advanced:

RAW numerical diagram of sensitivity

RAW dot diagram of sensitivity

numerical diagram of TD deviations (Age)

probability diagram of TD deviations – PTD

numerical diagram of PD deviations (model)

probability diagram of PD deviations – PPD

Bebie curve (HFA+Bebie) or GHT map (HFA+GHT)

Screening / Flicker:

RAW numerical diagram of sensitivity

dot diagram of RAW sensitivity

numerical diagram of HoV deviations

dot diagram of HoV deviations

Three-Zone, Two-Zone, and Driving Test:

RAW diagram of qualitative symbols of sensitivity

BSV:

RAW diagram of symbols for diplopia test

Information contained in default-style reports based on tests run according to different test strategies:

- **Fast Threshold / Threshold and Advanced strategy**:
    - RAW numerical diagram of sensitivity
    - RAW dot diagram of sensitivity
    - numerical diagram of HoV deviations
    - dot diagram of TD deviations (age)
    - Bebie curve
- **Screening / Flicker:**
    - RAW numerical diagram of sensitivity
    - RAW dot diagram of sensitivity
    - numerical diagram of HoV deviations
    - dot diagram of HoV deviations
- **Three-Zone, Two-Zone, and Driving Test**:
    - RAW diagram of qualitative symbols of sensitivity
- **BSV:**
    - RAW diagram of symbols for diplopia test

The reports generator can be brought up on the Summary window, directly after the test has been completed.

14.5. *Results progress analysis interface*

The result of a perimetry exam is characterized by a high degree of uncertainty. It is the patient who signals whether a light stimulus is visible or not, and the patient responsiveness is decisive for the final test reliability. It is risky to base your diagnosis on a single test result only. Visual defects can be detected correctly based on consistent results obtained through a series of tests. To confirm test reliability, you should first compare the results of subsequent tests, determine repeatability of the test results, and identify the common elements. To aid this process, you can use a results comparison module with which the differences in the results of tests taken at two different points of time can be compared.

Also, it is very important to monitor the progress of disease in patients with visual field defects. Another important issue is to control patient's response to therapy. In both cases the patient's visual field is tested at specific time intervals and the obtained results are compared with each other. The results comparison module offers tools with which the test results can be confronted with the results of a baseline exam or an averaged result of two tests. With these tools, you can easily trace and forecast the progress of the disease.

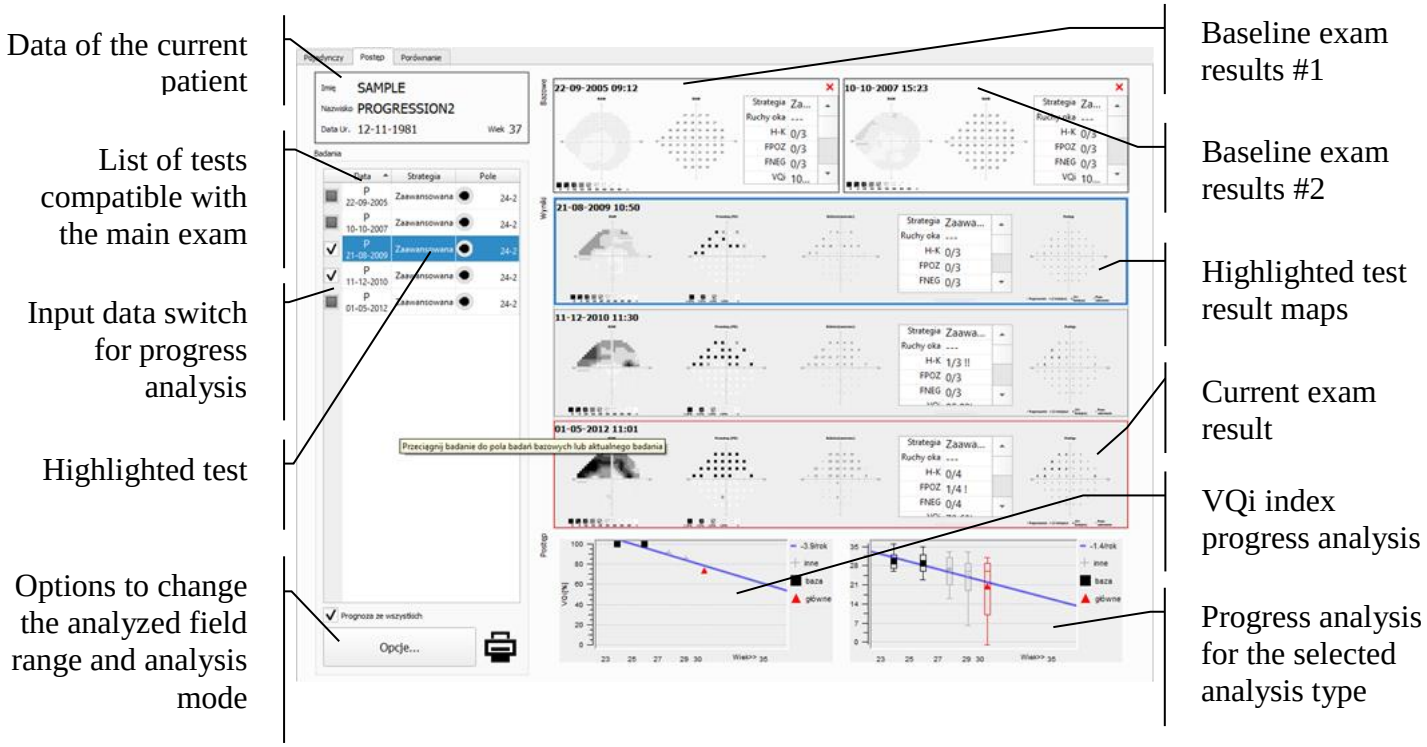


Figure 189. Results tab - comparison/progress analysis

The results progress analysis interface is available for tests run according to quantitative test strategies (delivering numerical values of eye sensitivity), including Threshold, Fast Threshold, Advanced, ZETA, ZETA Fast, Dynamic strategies.

14.5.1. List of tests

List of tests compatible with the current exam can be found on the left side of the Progress tab. The current exam is the test to which other tests are compared. Compatible tests are tests that can be compared with the main exams. Compatible tests are defined as tests in which the same eye was tested, using the same stimulus parameters, according to one of quantitative test strategies (delivering numerical values of eye sensitivity), and those which have been completed.

The list of tests includes test date, eye tested, test strategy, and the visual field area tested. By default, the tests are sorted by date. The sorting can be changed to another column by clicking the header of the column of choice.

From the list, you can choose the baseline exams to compare the results and analyze the disease progress. You can use the drag function - click a row in the table and keep the mouse button down while you drag the test. Drag the test into the baseline exam #1, #2 or the current exam results area.

14.5.2. Selecting the current exam

The current exam is the test which is a subject of comparison. When you compare two tests, the current exam will be the most recent one. When you analyze disease progress, the current exam will be the most recent test, which will be compared to baseline exam.

By default, when you open the Progress tab, the current exam will be the test currently displayed in the Single Result Analysis tab. The results of the current exam and the differential result are displayed in the middle row on the right side of the tab (Figure 189. Results tab - comparison/progress analysis)

The current exam can be changed to any other test from the list of compatible tests. To change the current exam, drag the test of choice from the list of tests into the current exam area. To drag the test, right-click the row in the test table and move the cursor into the selected area, keeping the mouse button down. Release the mouse button over the area of choice.

14.5.3. Selecting the baseline exam

The baseline exam is the test compared with a test performed more recently. To compare the results of two tests, there can be only one baseline test. To analyze the progress of a disease, you should preferably use two test as the baseline. You will use the mean values of two tests, which at least in part eliminates the influence of short-term fluctuation.

By default, after entering the Progress tab, the oldest test from the list of compatible tests will be set as the baseline. If more than one older test is listed, two oldest compatible tests will be added as the baseline tests. The results of baseline exams #1 and #2 are displayed in the first row on the

right side of the tab (Figure 189. Results tab - comparison/progress analysis).

The baseline exams can be changed to any other test from the list of compatible tests. To change the baseline exam, drag the test of choice from the list of tests into the baseline exam #1 or #2 area. To drag the test, right-click the row in the test table and move the cursor into the selected area, keeping the mouse button down. Release the mouse button over the area of choice.

Click X to delete baseline exam #1 or #2, leaving a single baseline exam. The X button can be found in the right corner of the baseline exam area #1 and #2.

14.5.4. Setting the range of analysis

The range of the analyzed test area can be reduced for comparison or progress analysis. This way in some cases, the calculated indexes describing the condition of the visual field will be less exposed to bias from peripheral areas of the visual field.

In the comparison / progress analysis, all results displayed are taken from the interpolation of the original test results. When the range of the analysis is changed, the interpolation will cover new field points. Thus, a different result will be displayed if the new points are within the interpolation area of the original test results. Points outside the original test area will have no values assigned.

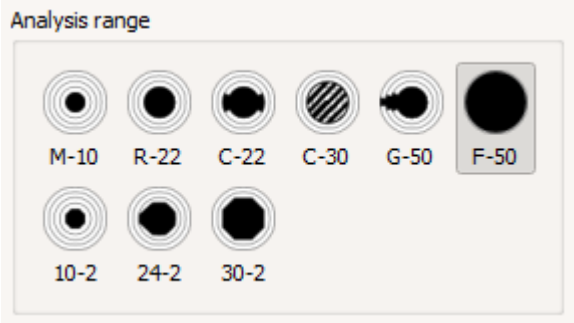


Figure 190. Setting the range of analysis

The interpolated results in the tested field areas are based on mathematical analysis and are not a diagnosis. They represent a probable condition of the test field between the tested points. The actual condition of the visual field can be only determined through testing procedures.

All values of the calculated indexes (mean defect index, irregularities index, fluctuation index, VQi) are computed from points that belong to the set range of analysis. This means that the index values can differ from the values displayed in the single result analysis tab for the test concerned.

By default, the range of analysis set in the progress tab will be the area common for the current exam and the baseline exams.

14.5.5. Selecting the analysis mode

By selecting different modes of analysis, you can change the type of results displayed for the baseline exams, the current exam, and the progress diagram. You can choose the following modes of analysis.

RAW – the basic type of analysis. Test-based visual sensitivity in dB is displayed for the baseline exams. The current exam will include, apart from the test-based visual sensitivity, also the dot map of these values, and the difference between the visual sensitivity of the current exam and the averaged sensitivity value from the baseline exams. If the difference is lower than the pre-set "difference display limit" ("Changing the results display options"), dots will be used instead of numerical values.

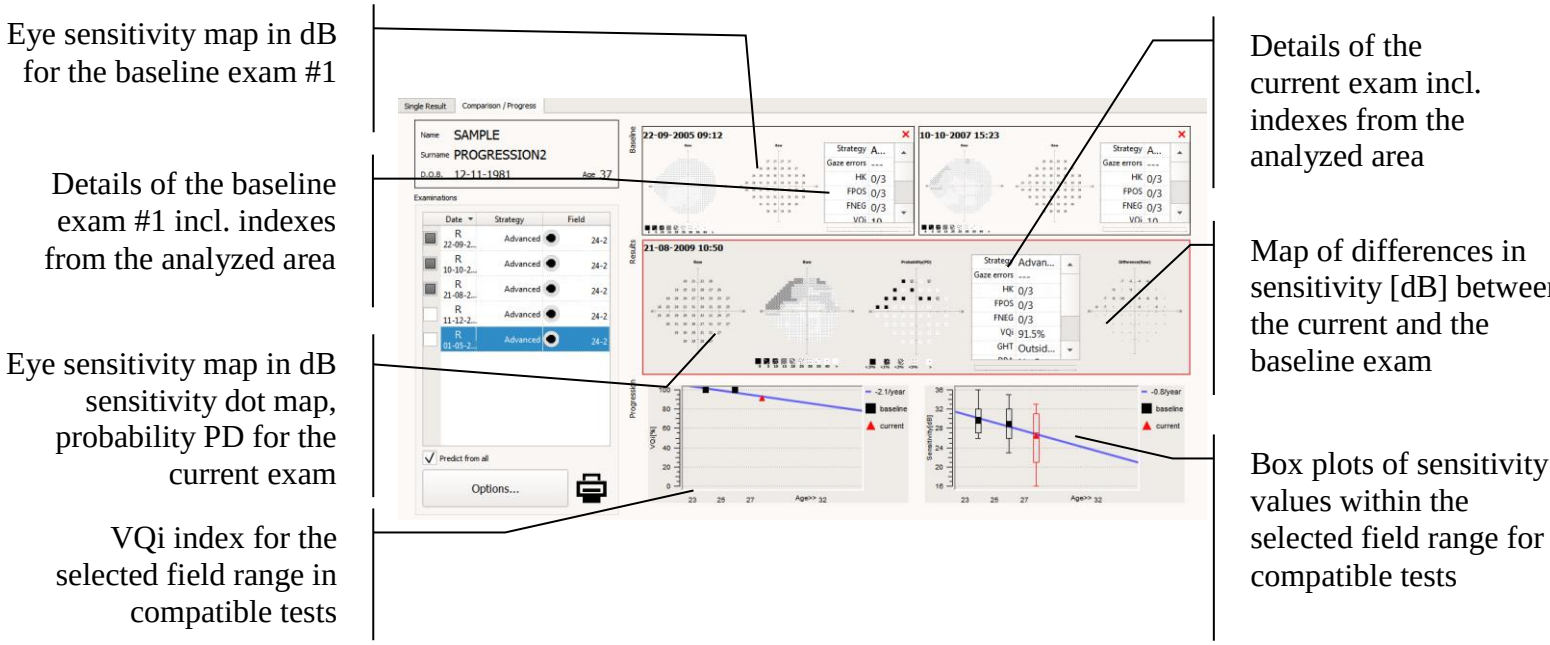


Figure 191. Comparison/progress analysis in the RAW mode

The first diagram of the progress analysis presents VQi values calculated for the selected field range from all compatible tests. The second diagram of the progress analysis presents box graphs of visual sensitivity calculated for the selected field range from all compatible tests. Symbols denote the mean sensitivity (MS) index. If there is an absolute defect on the baseline exam map and there is a defined sensitivity value in the same point on the main exam map, an application displays "+" on the difference map showing the immeasurable sensitivity improvement. If there is a defined sensitivity on the baseline exam map and there is an absolute defect in the same point on the main exam map, an application displays "X" on difference map meaning the immeasurable sensitivity drop.

TD – analysis of deviations from age normal. Deviations of the tested visual sensitivity in dB from age normal are displayed for the baseline exams. The current exam will include, apart from the test-based deviations in dB, also the dot map of these deviations, and the difference between the eye sensitivity deviations in the main exam and the mean deviations in the baseline exams. If

the difference is lower than the pre-set “difference display limit” (“Changing the results display options”), dots will be used instead of numerical values.

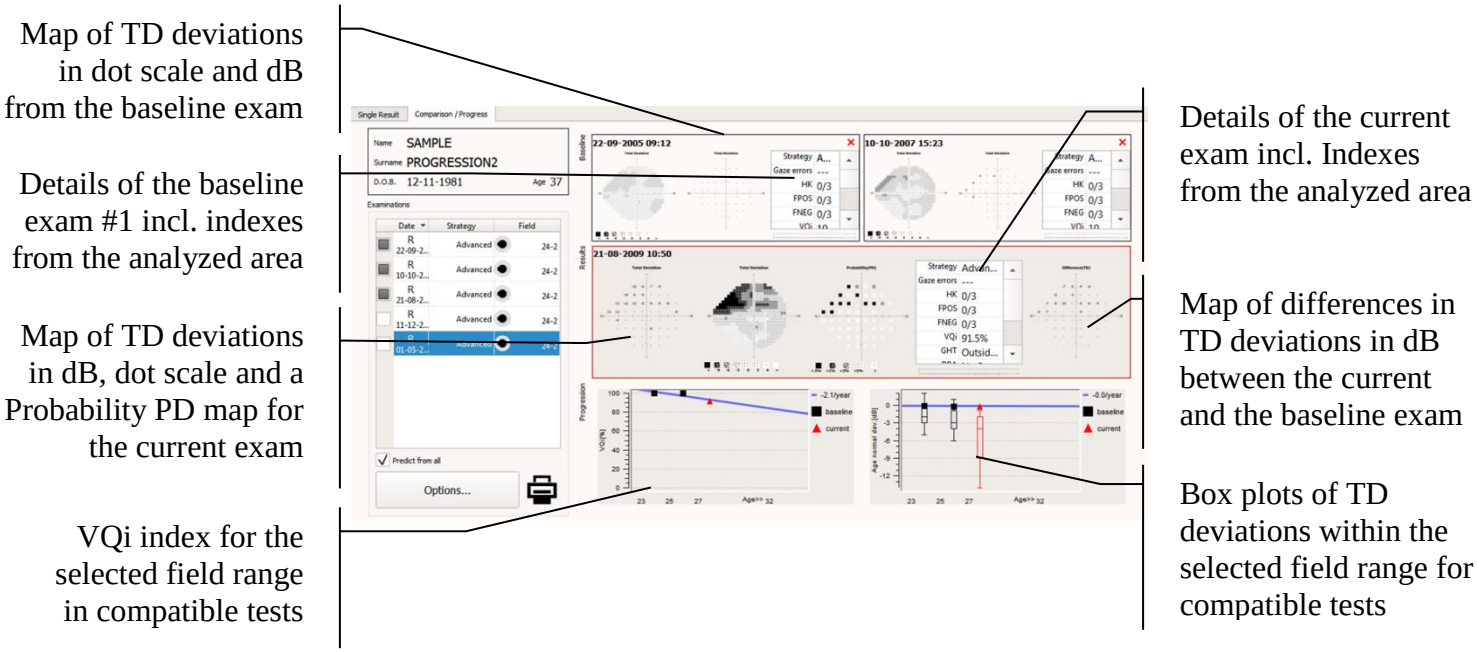


Figure 192. Comparison progress/analysis in the TD mode

The first diagram of the progress analysis presents VQi values calculated for the selected field range from all compatible tests. The second diagram of the progress analysis presents box graphs of deviations of visual sensitivity from age normal calculated from the selected field range for all compatible tests. Symbols denote indexes of field deviations from age normal (MDh, MDo, MDp).

PD - analysis of adjusted deviations from age normal. Deviations of the tested visual sensitivity in dB from age normal adjusted for identified diffuse reduction / increase of the sensitivity level are displayed for the baseline exams. The current exam will include, apart from the test-based deviations in dB, also the dot map of these deviations, and the difference between the eye sensitivity deviations in the current exam and the mean deviations in the baseline exams. If the difference is lower than the pre-set “difference display limit” (“Changing the results display options”), dots will be used instead of numerical values.

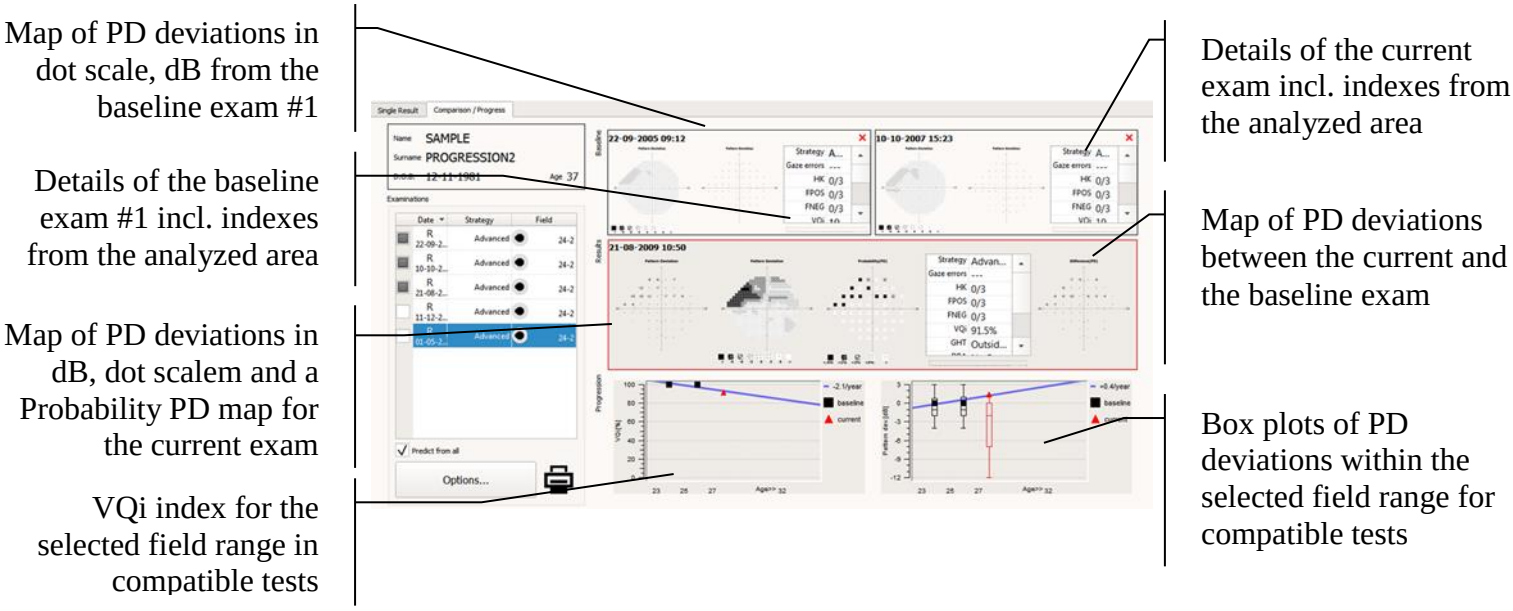


Figure 193. Comparison progress/analysis in the PD mode

The first diagram of the progress analysis presents VQi values calculated for the selected field range from all compatible tests. The second diagram of the progress analysis presents box graphs of adjusted deviations of visual sensitivity from age normal calculated for the selected field range from all compatible tests. Symbols denote field irregularity indexes (PSD, sLV, PD).

HoV - analysis of deviations from the perfect HoV model. Deviations of the tested visual sensitivity in dB from the perfect HoV model are displayed for the baseline exams. The current exam will include, apart from the test-based deviations in dB, also the dot map of these deviations, and the difference between the eye sensitivity deviations in the current exam and the mean deviations in the baseline exams. If the difference is lower than the pre-set “difference display limit” (“Changing the results display options”), dots will be used instead of numerical values.

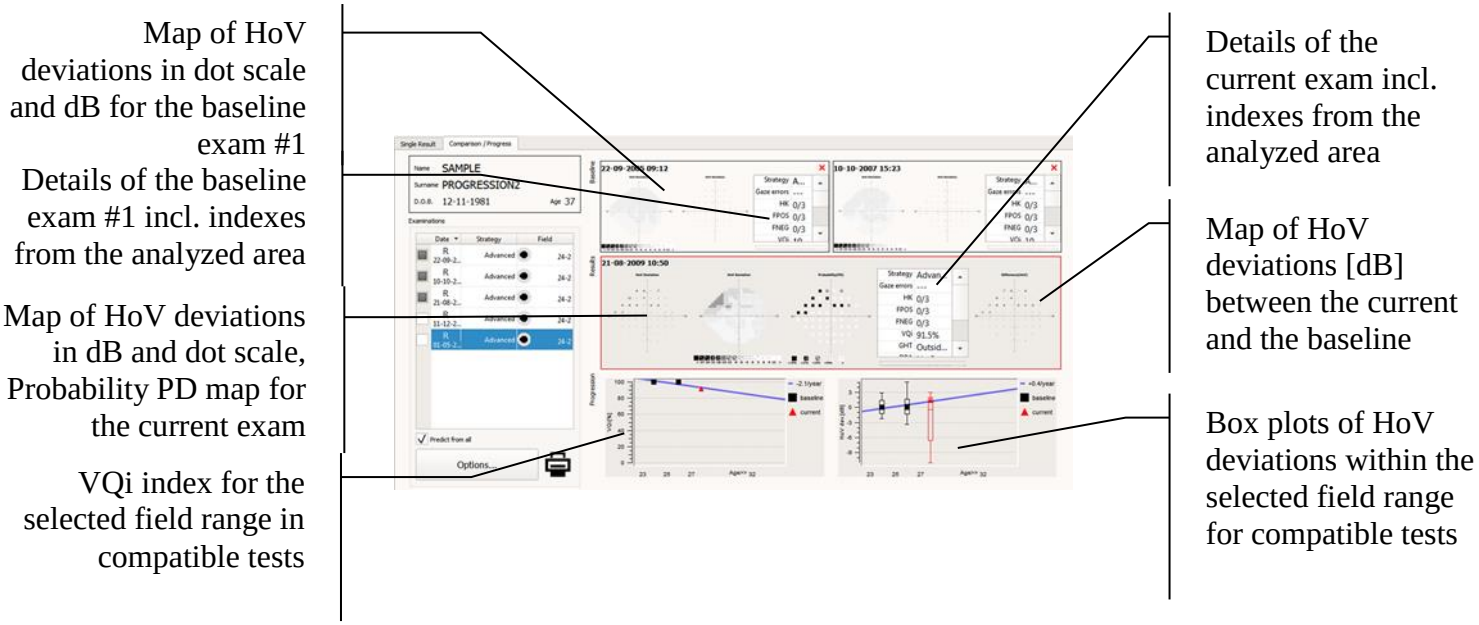


Figure 194. Comparison progress/analysis in the HoV mode

The first diagram of the progress analysis presents VQi values calculated for the selected field range from all compatible tests. The second diagram of the progress analysis presents box graphs of deviations from HoV calculated for the selected field range from all compatible tests. Symbols denote field irregularity indexes (PSD, sLV, PD).

DPA™ - (Defect Progression Analysis) it is an analysis of visual field defects in a long term scale. It helps to separate short term fluctuations from real VF defects. DPA uses comparison of several examinations to a baseline.

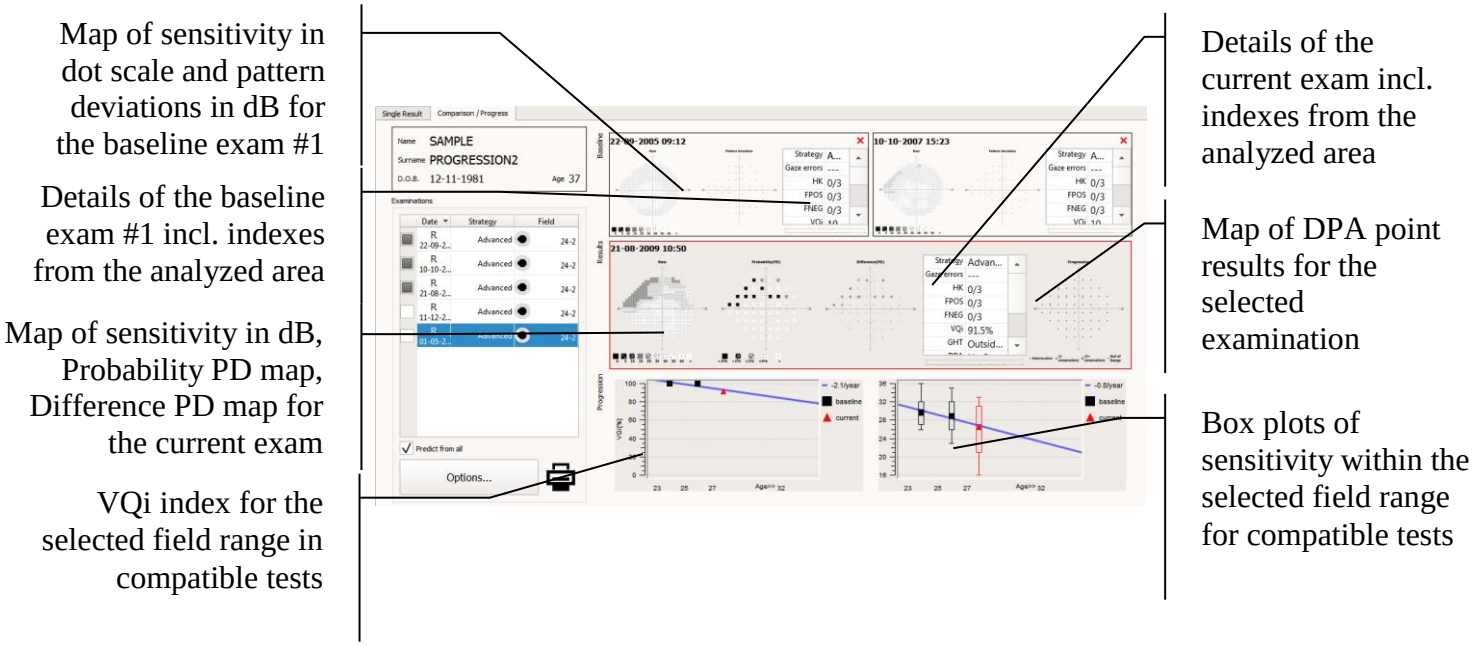


Figure 195. Comparison progress/analysis in the DPA mode

In compared examination, each test point location is assigned the Defect Progression result according to its Pattern Deviation difference from the baseline and to history of Defect Progression result at this location.

If in the first examination after the baseline, the Pattern Deviation difference form the baseline at a particular test location is statistically significant, then that location is marked as “Deterioration in this test”. If in the consecutive examination, the same location has again significant Pattern Deviation difference, then it is marked as “Deterioration in 2 consecutive tests”. If the situation repeats in third examination, than the location is marked as “Deterioration in 3 consecutive tests”. If the location has non-significant Pattern Deviation difference form the baseline in any of consecutive tests, then the “deterioration” counter is reset.

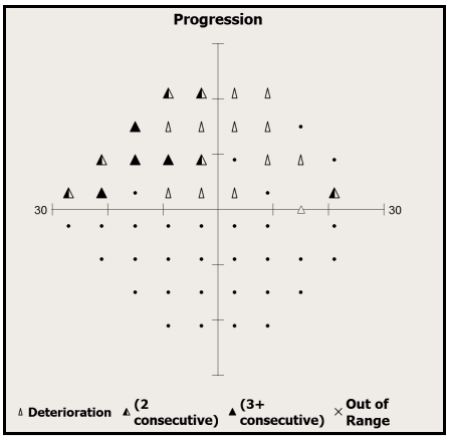


Figure 196. Single result DPA map

Possible results of comparison of a single test location to a baseline point:

- Normal (no deterioration)
- Deterioration in this test
- Deterioration in 2 consecutive tests
- Deterioration in 3 and more consecutive tests
- Out of range (baseline is already deteriorated)

Taking into consideration the DPA point results in consecutive tests, the tested field has assigned the progression likelihood, the DPA result:

- No progression
- Possible Progression - if there are 3 or more test locations with significant deterioration in 2+ consecutive tests.
- Likely Progression if there are 3 or more test locations with significant deterioration in 3+ consecutive tests.

14.5.6. Box plot

Box plot presents the distribution of values within a group of values. One plot captures information about layout, dispersion and shape of the value range.

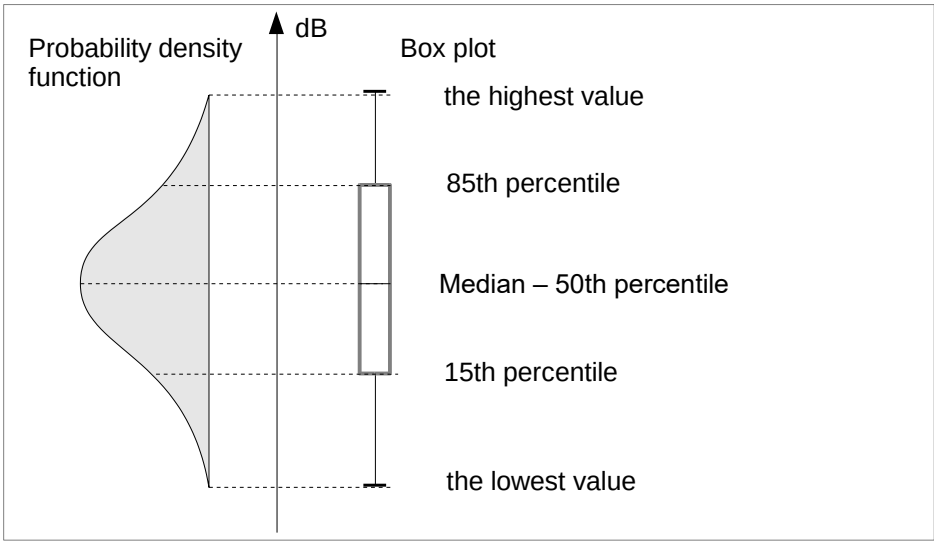


Figure 197. Box plot

A box plot is made up of a box and two margin lines extending from the box. The plot describes 5 values derived from selected range parameters. The top border line is equivalent to the highest value within the range. The bottom border line is equivalent to the lowest value within the range. The top and bottom side of the box denotes 85% and 15% of the value range. The line in the middle of the box is the range median, equivalent to 50% value range.

The box plot presents changes in the visual field in the course of comparison / progress analysis.

Depending on the type of analysis, the box plot includes the following values:

RAW – eye sensitivity in dB

TD – deviation of the tested sensitivity values from age normal at the analyzed points

PD – deviation of the adjusted sensitivity values from age normal at the analyzed points

HoV – deviations of the tested sensitivity from the perfect HoV model created for a test field based on the test results.

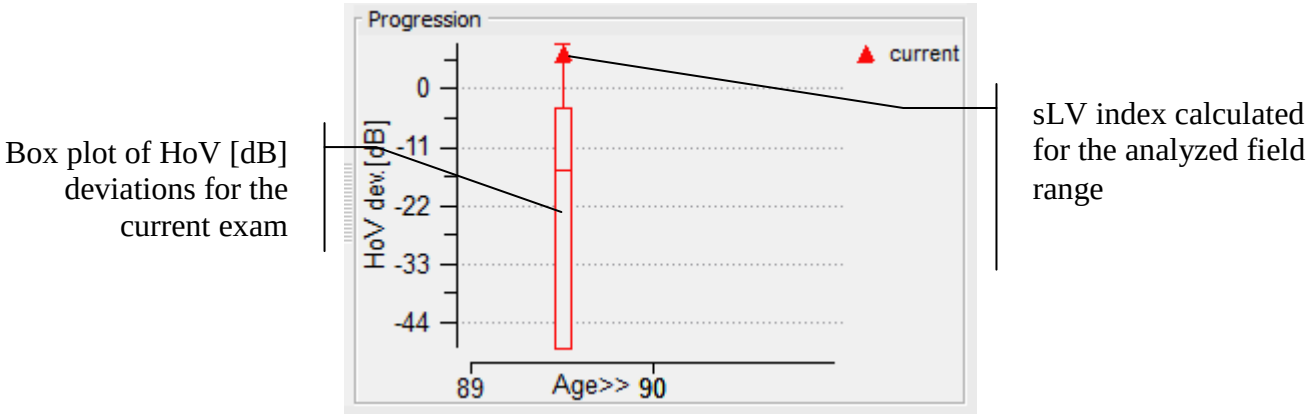


Figure 198. Box plot of HoV [dB] deviations in the main exam

Apart from a standard box plot, the diagram also includes a symbol of one of the indexes. The type of index depends on the type of analysis:

RAW – MS index – mean sensitivity in the analyzed area

TD – MDh, MDo or MDp index, according to the settings (“Changing the type of indexes used in analyses”)

PD – PSD, sLV or PD index, according to the settings (“Changing the type of indexes used in analyses”)

HoV – PSD, sLV or PD index, according to the settings (“Changing the type of indexes used in analyses”)

14.5.7. Progress analysis diagram

Progress analysis diagrams illustrate changes in the patient’s visual field over time, in a long-term perspective. The diagrams include box plots placed on the patient’s age axis. The diagram also contains a trend line drawn using linear regression analysis based on the values of indexes shown on the box graphs.

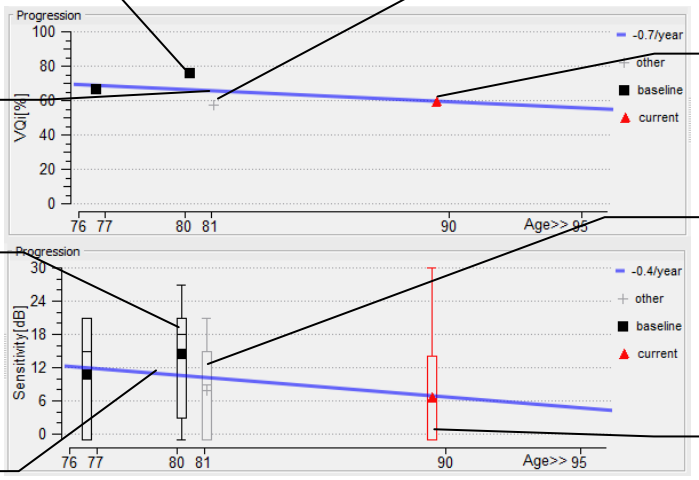
Typically, the progress analysis includes box plots for baseline exams #1 and #2 (if set) and the current exam. By default, these box graphs are the basis for the trend line. You can also include additional box graphs on the progress diagram, based on other compatible tests from the list. To select a test to display, check the box in the first column in the list of tests.

VQi calculated from baseline exam #1 and #2 (patient aged around 77 and 80 years)

VQi change trend and a 5-year forecast (change by -1.2% annually)

Mean sensitivity and a box graph of sensitivity calculated from baseline exam #1 and #2 (patient aged around 77 and 80 years)

Sensitivity change trend and a 5-year forecast (change by -0.4dB annually)



VQi calculated from an additional test (patient aged around 81 years)

VQi calculated from the current exam (patient aged around 90 years)

Mean sensitivity and a box graph of sensitivity from an additional test (patient aged around 90 years)

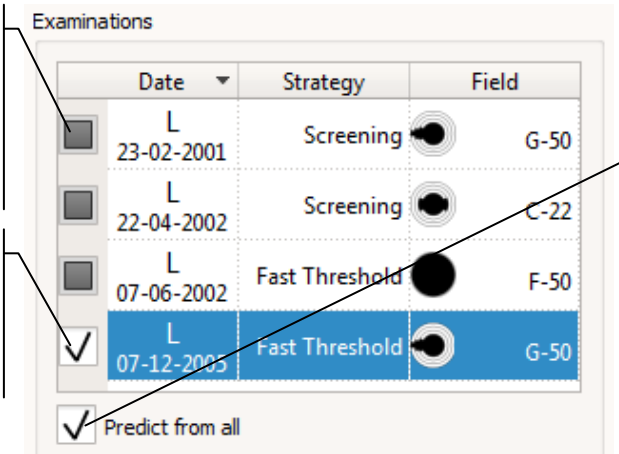
Mean sensitivity and box graph of sensitivity from the current exam (patient aged around 90 years)

Figure 199. Analysis of VQi index progress and mean sensitivity

As an alternative, the trend line can be drawn not only from baseline exams and the current exam, but also from all the tests displayed in the progress diagram. To change the display mode of the trend line, check the "Predict from all" box below the list of compatible tests.

The check box for baseline exams and the main exam is locked – the tests are always displayed in the progress diagram

The check box for baseline exams and the main exam to be displayed on the progress diagram



"Predict from all" option enabled – the trend line is drawn for all tests displayed in progression

Figure 200. List of additional tests and the progress forecast option

14.5.8. Generating reports for comparison and progress analysis

The results of comparative analysis and progress analysis can be summarized into a one-page

report. The report can be printed or saved as PDF or JPG file in the selected directory.

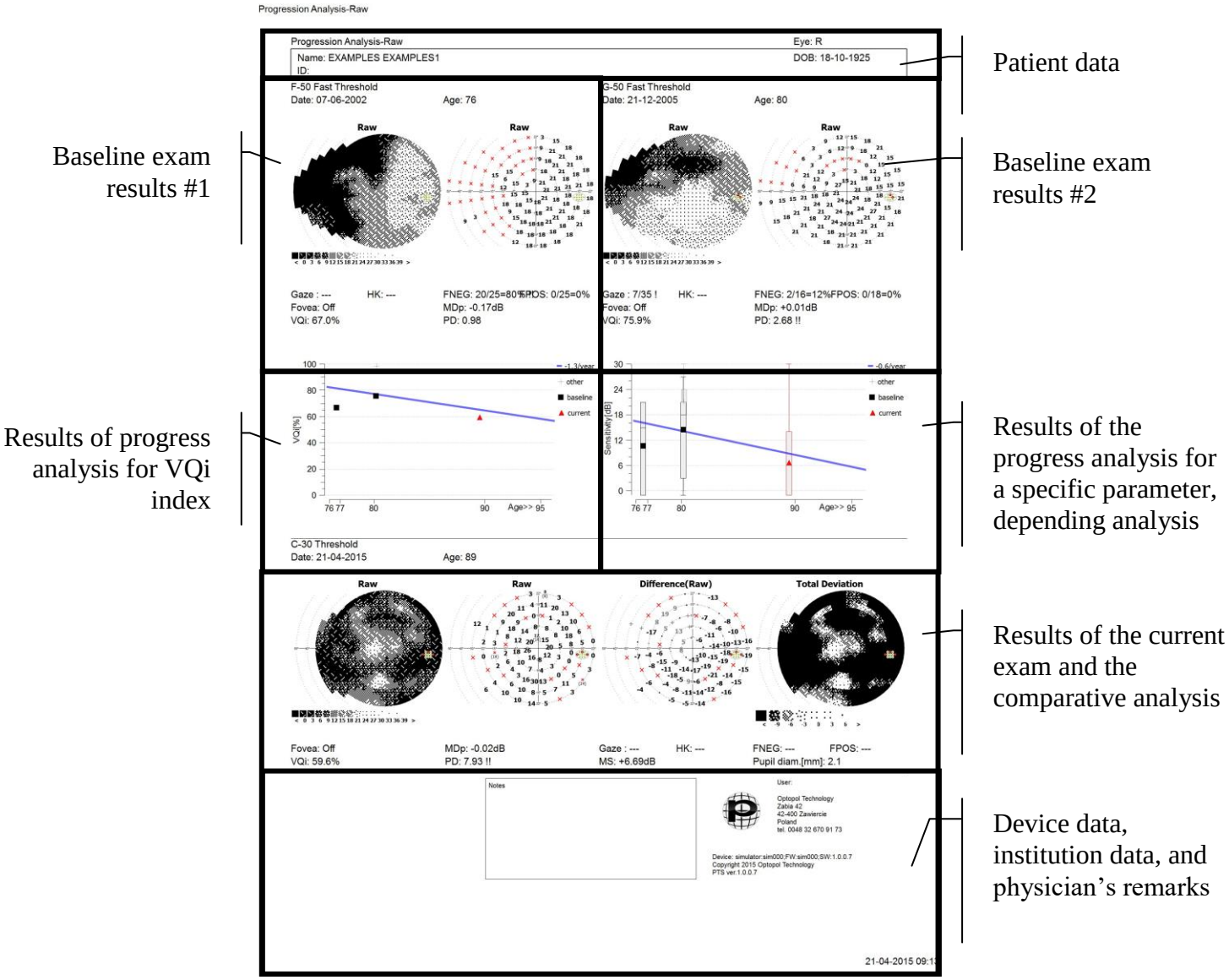


Figure 201. Comparison / progress analysis report - RAW mode

The report can be also saved as DCM (Dicom) image format or sent to a configured DCM file server.

To generate a report on the comparison / progress analysis page, click the printer icon on the bottom left hand side of the window. After clicking this button, a print preview window will be displayed. From here, you can change the printer settings or choose how to save the report (paper, PDF, JPG, or DCM).

The contents of the comparison / progress analysis report depend on the current analysis mode settings:

RAW:

- baseline exam – RAW dot map and map of numerical values
- current exam – RAW dot map and map of numerical values, numerical map of RAW differences, dot map of TD deviations
- Progress diagram: #1 – VQi index, #2 – sensitivity value and mean sensitivity index

TD:

- baseline exam – RAW dot map, PTD probability map
- current exam – RAW dot map, PTD probability map, numerical map of TD differences, dot map of TD deviations
- Progress diagram: #1 – VQi index, #2 – TD deviations and MD index (MDh, MDo, MDp)

PD:

- baseline exam – RAW dot map, PPD probability map
- current exam – RAW dot map, PPD probability map, numerical map of PD differences, dot map of TD deviations
- Progress diagram: #1 – VQi index, #2 – PD deviations and deviations from normal index (PSD, sLV, PD)

HoV:

- baseline exam – RAW dot map, numerical map of HoV deviations
- current exam – RAW dot map, numerical map of HoV deviations, numerical map of differences in HoV deviations, dot map of TD deviations
- Progress diagram: #1 – VQi index, #2 – HoV deviations and deviations from normal index (PSD, sLV, PD)

DPA™:

- baseline exams – RAW dot map, numerical map, Probability TD, Probability PD
- current exam – RAW dot map, Probability PD map, PD deviations from the baseline, DPA results for the current exam
- other exams – RAW dot map, Probability PD map, PD deviations from the baseline, DPA results for the other exams
- Progress diagram: #1 – VQi index

14.6. *Comparison analysis interface*

The “Comparison” tab allows to compare any two examinations of a given patient and display a

comparative map in any of the four analysis modes – RAW, HoV, TD and PD (Figure 202. Comparison analysis interface). In the left part of the window there is a list of tests of the selected patient, sorted by examination date – from the oldest examination to the newest one. After opening the "Comparison" tab, the curent examination is set as "Examination #2" and it is a main result. The results in differential map are calculated as a difference "Examination #2" – "Examination #1". In the case of symmetry analysis (comparison of left and right eye), result of "Examination #1" is mirrored. The result map presents results located as in "Examination #2".

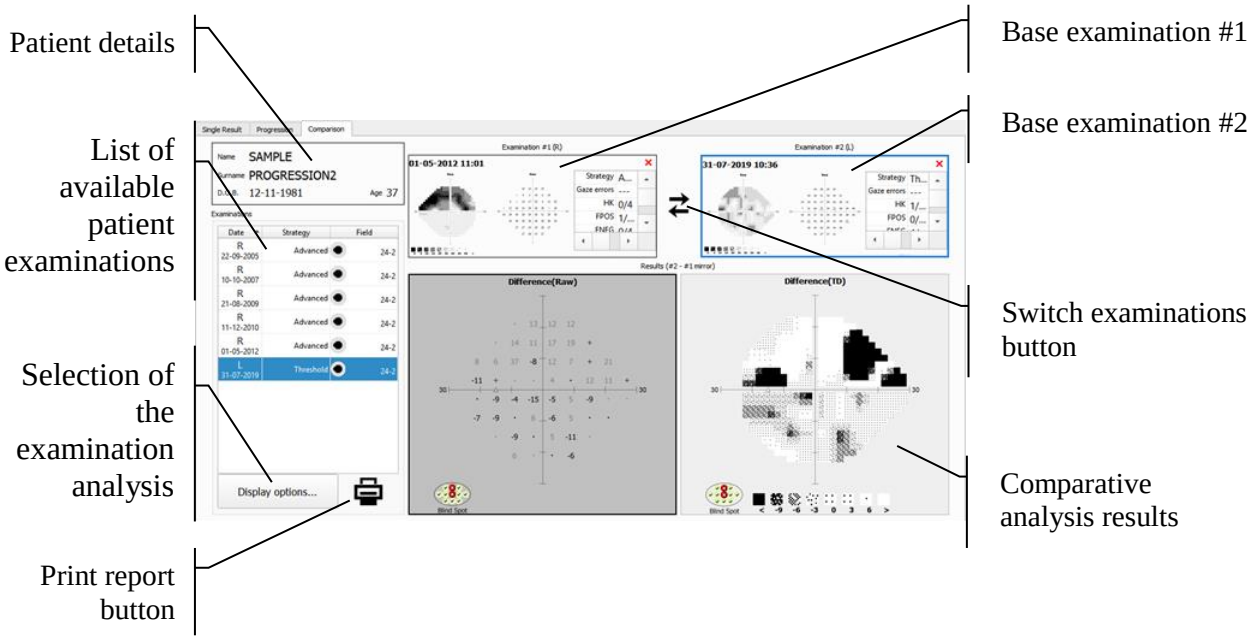


Figure 202. Comparison analysis interface

The blue frame surrounding the Examination #1/#2 window marks the examination selected in the examination list on the left.

The other compared examination should be dragged form the examinations list and dropped in "Examination #1" area. To do it select the examination on the list by clicking on it with the left mouse button. Then without releasing the mouse button, move the examination over one of the result frames named "Examination #1" and release the left mouse button. Comparative analysis will be performed automatically after this step. The main examination can be changed by dragging particular result from the examinations list and dropping it in "Examination #2" area.

To reverse the result of the comparative analysis, click on the arrows button located between the base examination frames.

14.7. *Importing / exporting / deleting the results of individual tests*

As a rule, test results and patient data are stored in the database and can only be accessed through the application. Results of individual tests and the data of the patient concerned can be saved into an XML file. This option is particularly helpful when the test results must be accessed from

another PC.

Figure 203. Import/export/deletion test controls

An XML file can be imported from one PC to another. Through the import option, the imported test result and patient record, if any, will be added to a local database. If the patient has been registered before, the patient data will be compared and you will be asked to update patient data, if necessary.

14.7.1. Exporting a test

To export a test result into an XML file, select the test of choice from the list of patient's tests in the single analysis window in the Results tab. The test results will be displayed in the analysis windows. Then click the Export button below the list of tests, to the right of the test filter (Figure 203. Import/export/deletion test controls). A window with the saving options will be displayed, where you can choose the export options (Figure 204. Examination export options dialogFigure 204. Examination export options dialog). Click "Disk" icon to select export folder and to confirm.

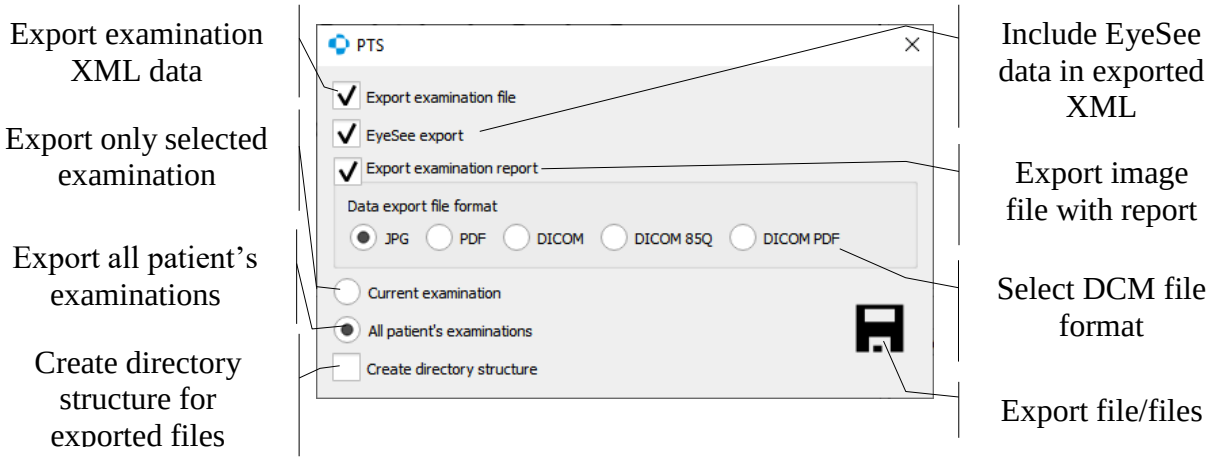


Figure 204. Examination export options dialog

14.7.2. Exporting multiple tests

Multiple tests of a single selected patient can be exported to an XML file using the drag & drop option. In this case, it is not necessary to enter the Results tab.

To export one or multiple tests, open the Patients tab. Then select one or more tests from the list

of patient's tests. To select more than one test, click a line from the list and keep Ctrl or Shift buttons pressed. Then drag and drop the selected line to the desktop or to a chosen directory (keeping the left mouse button pressed, move the selected file to the directory until the "+" symbol appears next to the cursor). Release the button to start exporting the tests to XML files.

14.7.3. Importing a test

To import tests results from an XML file, click the Import button below the list of tests, to the right of the test filter (Figure 203. Import/export/deletion test controls). A window with input options will be displayed. From the window, choose the XML file you want to import. Click Open to confirm. If you choose the correct XML file to import, test data will be uploaded to the correct patient record. If a particular test already exists in the database, a message appears indicating that the import has been abandoned. If the test refers to a patient who has not been registered in the database, a new patient record will be created and the imported test will be assigned to it.

If the import was successful or the imported test already exists in the database, the active patient and the active test records will be changed to "Imported" in the Results tab.

To import test reports of a patient, you do not have to create patient record in advance. The record will be created automatically. You can import a test while displaying other patient's tests in the Results tab.

To import a test of a non-registered patient or a patient with an empty list of tests (which means you cannot enter the Results tab), you can import the test directly to the Patients tab using drag & drop option (Importing multiple tests).

14.7.4. Importing multiple tests

You can import multiple XML files with test and patient data using drag & drop option. In this case, it is not necessary to enter the Results tab, which cannot be accessed if the patient has no tests assigned yet.

To import one or multiple tests, open the Patients tab. Then find and select the files you want to import. Then drag and drop the selected files to the Patients tab (keeping the left mouse button pressed, move the selected files to the Patients tab until the "+" symbol appears next to the cursor). Release the button to start importing the chosen XML files. A message will be displayed after the import has finished, indicating the number of added files and errors, of any.

14.7.5. Deleting a test

To delete a test from the database, select the test of choice from the list of patient's tests in the individual analysis window in the Results tab. The test results will be displayed in the analysis

windows. Then click the Delete button below the list of tests, to the right of the test filters (Figure 203. Import/export/deletion test controls). A window will be displayed, asking you to confirm. To delete the test, click Delete to complete.

15. *Settings tab*

This chapter describes the Settings tab and the ways to manage the system with the functionalities included in this tab. It specifically addresses the following issues:

- general settings of the application appearance
- examination related settings
- remote database configuration
- creating and reading database backup
- eye camera settings
- creating user test fields
- configuration of data exchange with external programs
- managing user accounts

15.1. *Settings interface*

The Settings tab is a collection of pages, each of which is dedicated to a different group of settings.

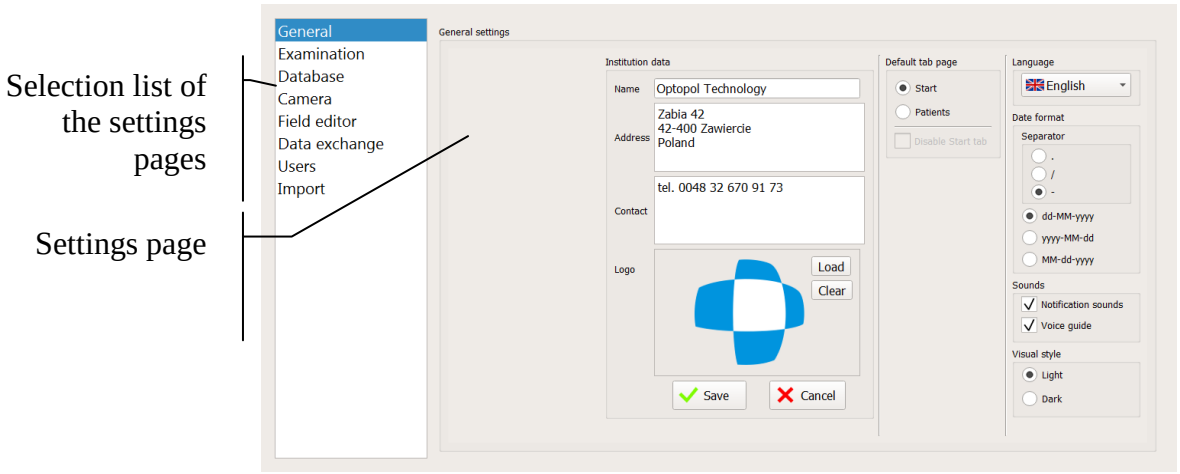


Figure 205. Settings tab

To change settings, click the selected page from the list of pages on the left side of the tab.

15.2. *General settings*

General settings are used to:

- change the language
- change sound settings
- change institution data

- change the date format
- change the visual style
- change a default tab

15.2.1. Language settings

You can change the language used in audio-visual communication with the user. Change of language will apply to all contents used in the system and the test reports.

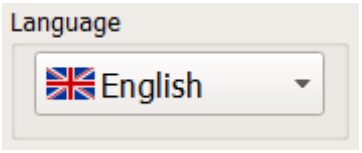


Figure 206. Language button

To change the language, use the drop-down list in the Language box (Figure 206. Language button). Click the Language button to change language settings. The list includes all languages to choose from. Select the chosen language from the list and restart the application.

To change the language settings in all areas, the application must be restarted.

15.2.2. Sound settings

In order to simplify operation of the device, the system uses short sound signals and audio messages to convey important information. Messages displayed on the screen are also accompanied by sound signals, and the type of sound signal depend on the type of message displayed (question, successful or failed operation, etc.) Sound messages are used mainly during a test and are addressed to the operator and the patient.

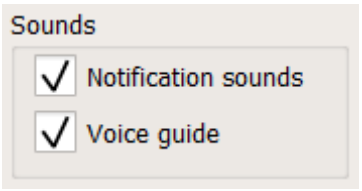


Figure 207. Sound settings

You can choose the sound signals used in the system. To change the settings, use the check boxes in the Sounds group of controls (Figure 207. Sound settings). To enable a specific group of sounds, select the check box next to the name of sounds.

15.2.3. Changing institution data

Institution data is included in all test reports and comparison / progress reports. Institution data include the following:

Name

Address

Contact data (telephone, fax)

Institution logo

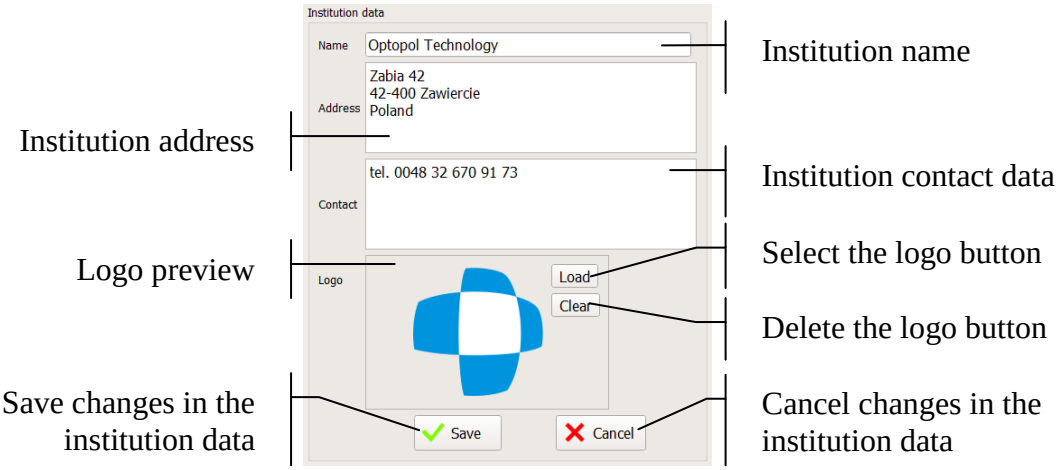


Figure 208. Editing institution data

To edit institution data, use the "Institution Data" box). Changes in the edition fields are not saved automatically. To save the changed data, click Save. To abandon changes and to restore the previous record, click Cancel.

The institution logo is a PNG, JPG or BMP file. To change the logo, press Load and select the chosen file. The file will be automatically scaled to fit in place. If the institution has no logo, press Clear. After you change or remove a logo, press Save to save changes.

After you enter new institution data, pay attention to the number of characters. If the data string is too long, it will not be printed in full in the test reports. After the institution data is changed, you should print a sample report.

15.2.4. Changing the date format

You can choose the date format displayed in the system windows and in the test reports. There are 3 different date formats available:

dd-MM-yyyy – day / month/ year

yyyy-MM-dd – year / month / day

MM-dd-yyyy – month / day / year

and one of 3 date separators:

.

/

To change the date format, use the “Date Format” box (Figure 209. Changing the date format).

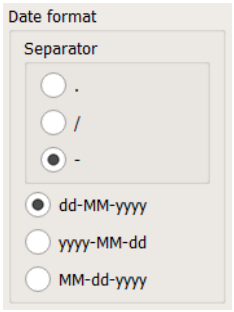


Figure 209. Changing the date format

15.2.5. Changing the visual style

You can change the visual style of application to Light or Dark mode. To change the style of the application, use the “Visual style” check boxes .

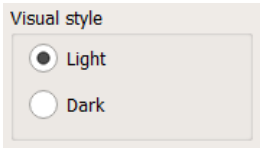


Figure 210. Changing application visual style

15.2.6. Changing a default tab

Starting from PTS version 3.2 the application contains the Start tab with the Perimetry Wizard interface. It serves as a default entry point for normal workflow. Some users may be accustomed to a previous workflow based on Patients>Examination tabs and do not want to change this scheme. These users can set the default tab to “Patients” in the “Default tab page” groupbox.

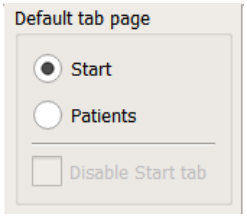


Figure 211. Changing a default tab page

If they do not intend to use the “Start” tab, it can be disabled and do not appear in the main window.

15.3. *Examination related settings*

General settings are used to:

- change the selected results display parameters
- change correction lens area

15.3.1. Changing index types in the analyses

To help users read the test results, especially those experienced with perimeters, there are 3 index types to choose from:

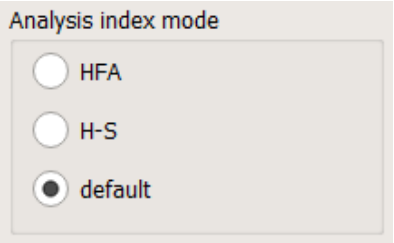


Figure 212. Selecting the index calculation method

Default:

- Mean defect – MDp – mean value of deviations of the tested mean hill of vision from age normal
- Irregularity – PD – mean value of deviations at the tested points from the tested mean hill of vision
- Short-term Fluctuation – SFo – mean short-term fluctuation at the test points

HFA:

Mean Defect - MDh – weighted mean value of deviations from age normal on the TD map

Irregularity - PSD – the level of deviations in the shape of the measured hill of vision from the normal field

Short-term Fluctuation - SFh – weighted mean short-term fluctuation at the test points

H-S:

Mean Defect - MDo – mean value of deviations from age normal on the TD map

Irregularity – LV(sLV) – irregularity in the field of vision (sLV – root of LV).

Short-term Fluctuation – SFo – mean short-term fluctuation at the test points

The H-S setting of index calculation mode does the additional changes in results display:

The age norm deviations (Total Deviation) values are positive when the measured sensitivity is lower than age normative value and negative when sensitivity is higher than the age norm (similarly Pattern Deviation values, HoV deviation values).

The total defect symbol is always displayed as a black square ("■") instead of red "X" or "<0" symbols.

The hidden deviations are always displayed as "+" symbol regardless the sign of the numerical value

15.3.2. Changing the results display options

To improve readability of the maps illustrating the results of analyses, several display parameters can be changed. By changing these parameters, you can customize the maps and the information displayed.

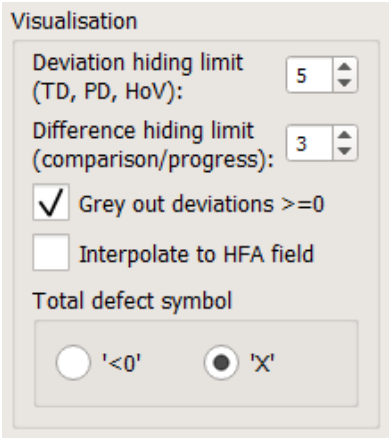


Figure 213. Changing the display options

15.3.2.1. Deviation hiding limit (TD, PD, HoV)

Numerical maps of TD, PD and HoV analyses include numerical values of deviations from normal and standards. If the maps are large, it is difficult to differentiate important deviations from negligible deviations ones. To make it easier to review numerical deviations, deviations whose absolute value is below the set limit value can be hidden. As a result, you will be able to quickly identify areas of the visual field where significant deviations from normal can be found.

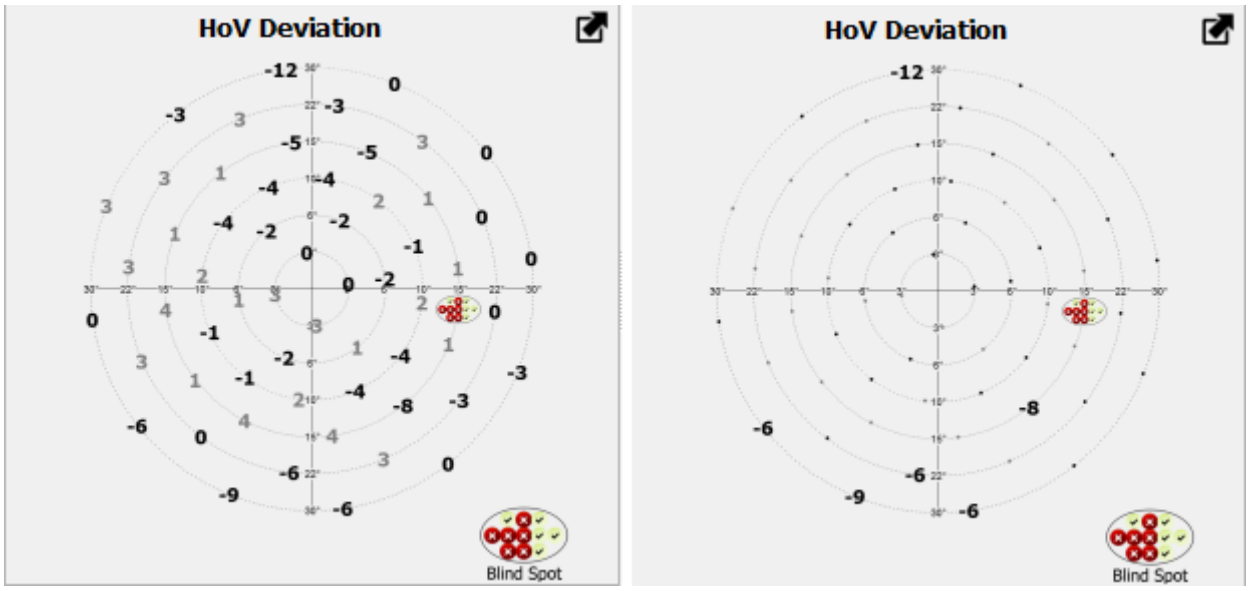


Figure 214. HoV map without and with deviation of less than 5 hiding option enabled

To change the deviation hiding limit for map of numerical values, use the “Deviation hidding limit (TD, PD, HoV)” box (Figure 214. HoV map without and with deviation of less than 5 hiding option enabled). The limit can be set within the range of 0 to 6. For example, if the limit is set to 5, deviations of -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5 will be displayed as a dot (Figure 214. HoV map without and with deviation of less than 5 hiding option enabled). To disable this setting and to display all deviations as numbers, set to the limit to -1.

15.3.2.2. Differences hiding limit (comparison / progress)

Numerical maps of comparison / progress analysis display numerical values of differences between tests in RAW, TD, PD and HoV modes. If the maps are large, it is difficult to differentiate important deviations from negligible deviations ones. To make it easier to analyze map of numerical values, differences whose absolute value is below the set limit value can be hidden. As a result, you will be able to quickly identify areas of the visual field where significant differences can be found.

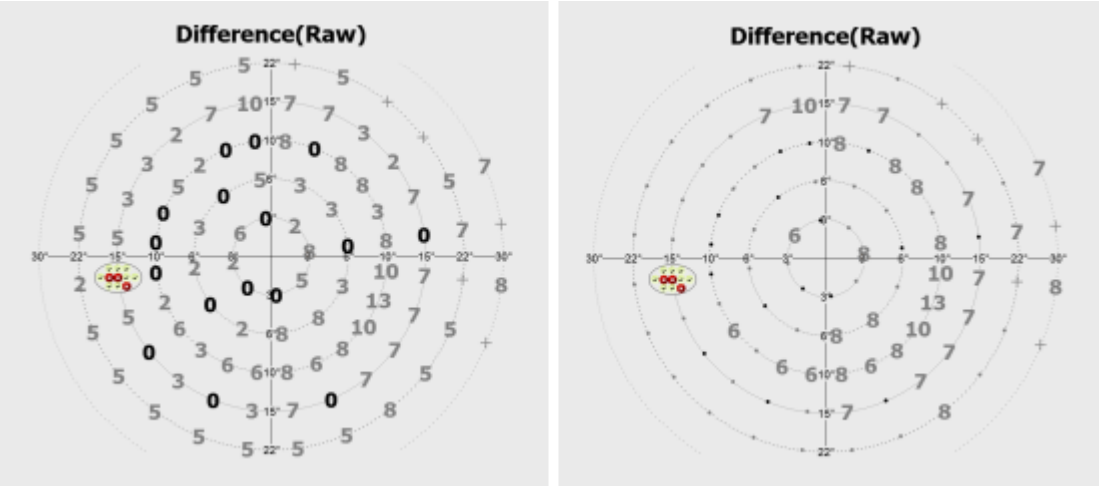


Figure 215. Map of RAW differences without and with deviation of less than 5 hiding option enabled

To change the differences hiding limit for map of numerical values, use the “Differences hiding limit (comparison / progress)” box (Figure 215. Map of RAW differences without and with deviation of less than 5 hiding option enabled). The limit can be set within the range of 0 to 6. For example, if the limit is set to 5, deviations of -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5 will be displayed as a dot (Figure 215. Map of RAW differences without and with deviation of less than 5 hiding option enabled). To disable this setting and to display all differences as numbers, set to the limit to -1.

15.3.2.3. Graying out deviations >=0

To increase legibility of defect maps, positive deviations may be grayed out. Positive deviations are areas where retinal sensitivity was higher than expected. After selecting this option, all deviations on the numerical maps, whose value indicates an above-expected sensitivity will change their color to gray. All negative deviations remain black, making them more visible.

15.3.2.4. Interpolation to HFA maps

The software allows to enable default interpolation of results to HFA-like maps. This option may prove helpful for comparing examination results from a PTS device with results from a HFA device. After marking the "Interpolation to HFA maps" selection field in the results overview and the report generator, HFA Interpolation function will be enabled by default. Details of the appearance and use of the HFA interpolation function are described in chapter „ Interpolation of results to maps 30-2, 24-2 and 10-2”.

15.3.2.5. Absolute defect symbol

The application allows to adapt the marking of absolute defect on numerical maps according to the user preferences. One of the two available options can be selected on the selection field of the "Absolute defect symbol" group.

Absolute defect is a retinal sensitivity examination result where the patient has not reacted to

even the brightest stimuli possible. In this case, sensitivity cannot be determined due to impossibility of further intensification of the stimulus. Since the brightest stimulus is marked as 0 dB, no reaction after its displaying can be marked with "<0" symbol. This means that the exact retinal sensitivity has not been measured, but it is evident that it is smaller than 0 dB.

Another method of marking an absolute defect is using the "X" symbol. This symbol does not have any numerical value that could be read as retinal sensitivity. It is very clear, however, and clearly identifies the area at which no reaction to highest-brightness stimulus was obtained.

15.3.3. Changing the style of reports printed and rendered to a file

You can change the style of test reports. The styles have different layouts, analysis results, and test data, relevant to the test analysis.

To change the style of the reports, use the “Report Style” box (Figure 216. Changing the report style).

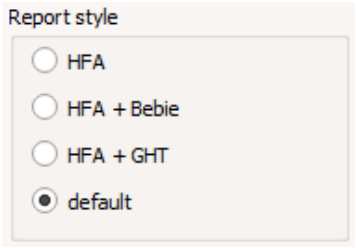


Figure 216. Changing the report style

15.3.4. Selection of the Blind Spot detection method

When working with the PTS 2000 model, the “Blind Spot detection method” button group appears in the “Examination” settings page, which contains two types of the blind spot detections:

- Default (PTS) – the classic blind spot detection type – 11 points located in the expected blind spot area
- Alternative (HFA)– an alternative method allowing faster and more broad determination of the blind spot location

Due to characteristic distribution of blind spot points for the Alternative type, this type is only available for the PTS 2000 device.

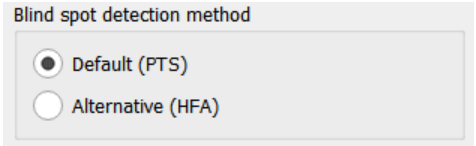


Figure 217. Selection of Blind Spot detection method

15.3.5. Changing correction lens area

Correction lens area defines the maximum stimulus radius that is tested with a correction lens mounted in a trial lens holder. All stimuli that have radius bigger than selected lens area will be tested after the correction lens is removed. The area can be adjusted to reduce the risk of a correction lens rim artifact in the visual field result. You can select the correction lens area from the following ranges:

- 15^o
- 22^o
- 30^o

To change correction lens area, use "Correction lens area" box (Figure 218. Changing correction lens area).

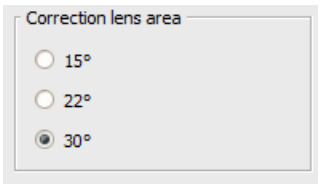


Figure 218. Changing correction lens area

15.3.6. Other examination settings

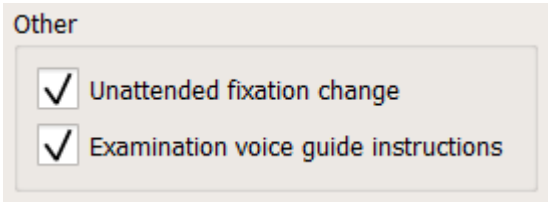


Figure 219. Other examination settings

15.3.6.1. Examination voice guide instructions

To familiarize unexperienced patients with the examination procedure it is advised to use the Demo mode examination prior to normal test. Before the test is started, operator should pass the most important instructions to the patient.

If the "Examination voice guide instructions" box is checked in the "Other" examination settings groupbox, the application will read the predefined instructions to the patient at the beginning of the Demo mode test:

"This is the check of your visual field.
Look straight ahead at the red light / look straight ahead between four red lights.
There will be lights flashing with different brightness around.
Some light flashes will be too dim to see.
Press the button whenever you see a light flashing.

You can blink normally during the test."

15.3.6.2. Unattended Fixation Change

During some tests it is necessary to change the fixation target. Normally the examination is paused at the moment when fixation is switched and only operator can continue the procedure. This behaviour can be changed with use of "Unattended fixation change" switch in the "Other" examination settings groupbox.

The "Unattended fixation change" setting is used in two scenarios:

- First one is when the test field uses the fixation shift method to expand the testing field. The change of fixation is signalled with blinking state of new fixation and needs to be confirmed either by operator or by patient. When the "Unattended fixation change" is activated, application will read use the voice guide instructions asking patient to confirm the changed fixation target by pressing the reaction stick button. Examination will then continue without intervention from operator.
- The second scenario is when the foveal threshold is tested. During the test the fixation is changed to four points outside of the centre. When the test is finished, the fixation target is returned to the originally set in settings. If the "Unattended fixation change" is active, the fixation target is returned without the operator's attention.

15.3.6.3. EyeSee module

To use the EyeSee functionality, go to the Settings page and select the "Examination" from the list on the left. In the "Examination settings" window in the "EyeSee" group, one of the two available EyeSee presentation options should be selected (Figure 220. Setting the EyeSee method):

- EyeSee Lite – the lightweight mode of storing and presenting the eye fixation information from each stimulus exposition. In this method, eye fixation data is presented in the form of generated eye symbols (Figure 221. Typical EyeSee (Left) and EyeSee Lite (Right) data set). The eye images are generated form the numerical eye and pupil tracking data (eye position, gaze direction, pupil diameter). There is no recording of eye images to the database. This mode allows to keep the examination data small while providing the essential information about eye fixation throughout the test.
- EyeSee – this mode stores the eye fixation data as eye images captured from the device's camera. In case of start of the test with this option, it is possible to present EyeSee data for such a test (or performing a follow-up test) also in the form presented by the EyeSee Lite function depending on which method is selected in application settings (Figure 220. Setting the EyeSee method).

The EyeSee/EyeSee Lite functionality may be not available in some of the software distributions due to the legal limitations. Please contact your local distributor to check which EyeSee modes are

available in your version of the software.

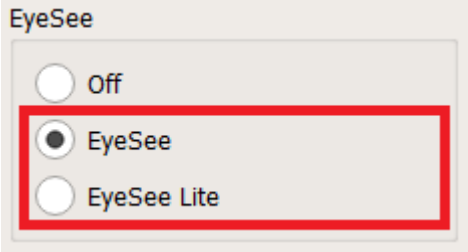


Figure 220. Setting the EyeSee method

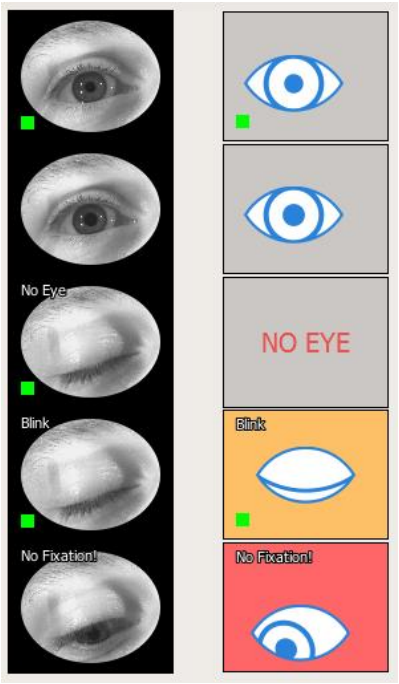


Figure 221. Typical EyeSee (Left) and EyeSee Lite (Right) data set

15.4. *Database management*

You can manage the database and other data mentioned in this chapter using the following functions:

- autobackup
- manual backup

- recovering database and settings from a backup file
- recover database
- configuring connection to a remote database

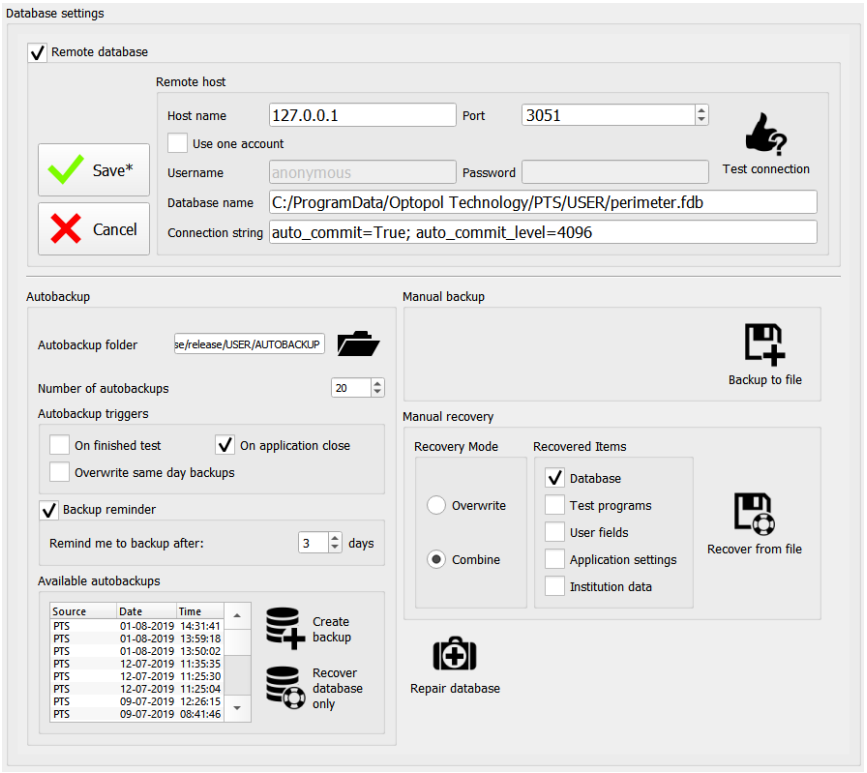


Figure 222. Database settings and management

15.4.1. Autobackup of the database and the settings

The database is exposed to a variety of different factors, including human errors, hardware and software failures, and computer viruses. To minimize or prevent the risk of data loss, you can use an autobackup function of the database and the settings with which the backup progress runs fully automatically.

Database and settings backup contains the following data:

- database
- application settings
- user test programs
- user test fields

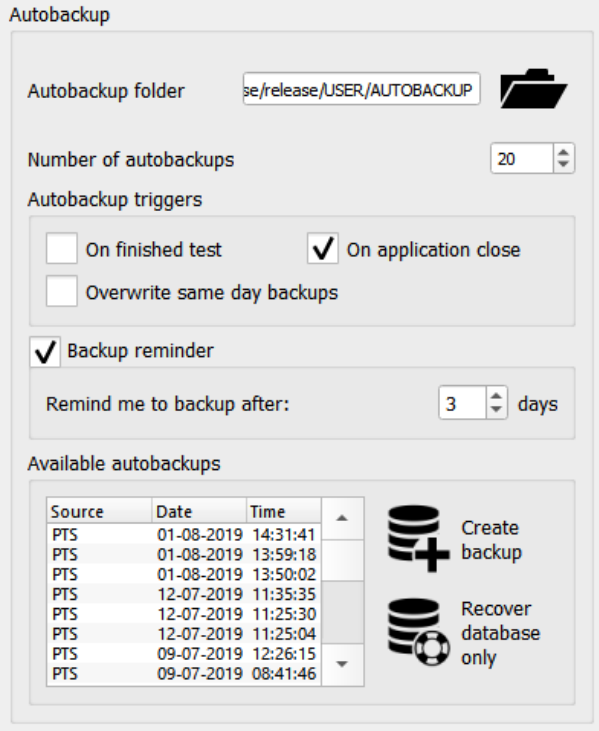


Figure 223. Autobackup options

Backup copies are saved automatically into the users-specified directory. To select the target directory, press the Folder button and navigate to the selected storage location. Unless the autobackup directory is configured, the user directory will be used as a default.

All backup files in the selected autobackup directory will be listed in the “Available Autobackups” box (Figure 223. Autobackup options)The list includes the date and time of the backup.

You can also limit the number of autobackups. To set the limit, use the “Number of Autobackups” option (Figure 223. Autobackup options). If the number of autobackups is higher than the limit value, the oldest backups will be deleted. “Number of Autobackups” value can be set within the range of -1 to 99. -1 means no limitations, i.e. the number of backups will be unlimited and the oldest backups will not be deleted.

Autobackups can be created after each test is completed and saved in the database and/or before the application is closed. These options can be configured in the “Autobackup triggers” box (Figure 223. Autobackup options).

To reduce the number of autobackups, you can limit autobackups to one per day. Enable this option by selecting the “Overwrite same day backups” check box (Figure 223. Autobackup options). If this option is active, each autobackup will overwrite other backups created on the same day.

To help create backups regularly, user can activate “Backup reminder” and set the minimum period from the last backup which will cause the reminder to appear.

You can manually trigger a backup in the autobackup directory by clicking “Create Backup”

button in the “Available autobackups” box (Figure 223. Autobackup options). When you trigger a backup manually, the daily limit and the general limit will not apply.

15.4.2. Recovering database and settings from a backup file

If any patient and / or test data is lost, or if you want to recover database as of a particular point in time, you can use the autobackup recovery function. To recover an autobackup, click the backup file of choice from the list of all backups in the autobackup directory. Then click the “Recover database only” button.

Only the database will be recovered from the autobackup file. Other elements contained in the backup (test programs, test fields, application settings) will remain unchanged. To recover all backup elements, use the Recovery from file option, having selected the chosen file from the autobackup directory.

After recovering backup it is obligatory to restart the application. Some of the test fields that appear in the test field lists might be invalid for the currently connected device and using them can lead to invalid examination data.

15.4.3. Manual backup of the database and settings

You can also manually create backups of the database and application settings to a location of choice. The backup will include the following data:

- database
- application settings
- user test programs
- user test fields

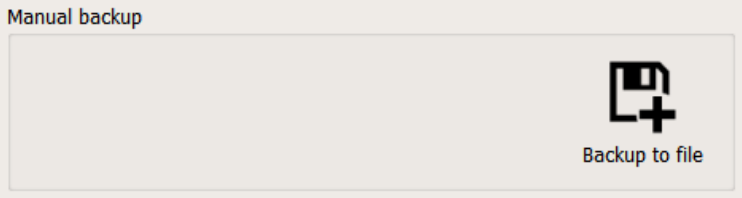


Figure 224. Manual backup of application data

To create a backup of application data, click the “Backup to file” option in the “Manual backup” box (Figure 224. Manual backup of application data). Then use the navigation window to select where you want the backup to be saved, and then confirm or modify the name of the backup.

15.4.4. Manual recovery

When you recover the backup manually, you can change the recovery mode and the recovered items from an autobackup or a manual backup. You can decide which of the items will be

recovered, and whether the recovered data should overwrite or merge with the locally saved data.

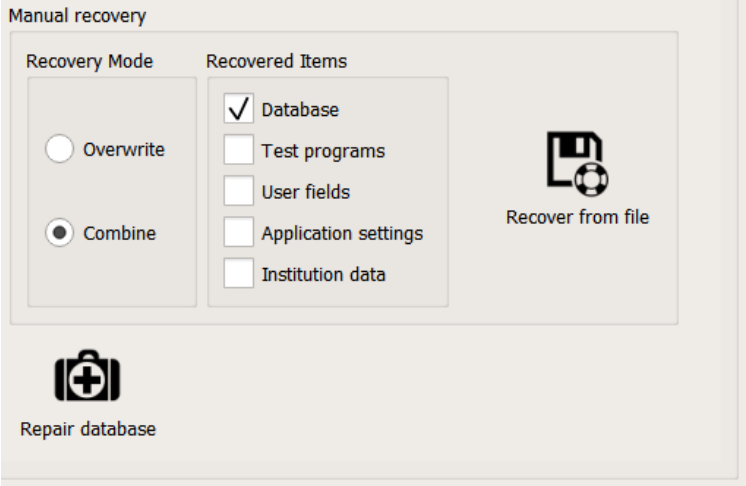


Figure 225. Manual recovery of application backup

There are 2 different modes of manual backup recovery:

- **Overwrite** – all recovered data will replace locally saved data. The existing local data from selected items will be first deleted and then the recovered items will be saved in their place. The local database will be replaced with a backup database.
- **Combine** – all recovered data will be added to the existing data. If the recovered files are saved locally, the files will be omitted. The local database will be merged with the backup database - only new patients and tests will be added to the local database.

Combining the backup database and the local database can last up to several hours if the databases contain hundreds of patient records. You should plan database recovery in the combine mode in advance so that your normal work will not be disrupted.

To choose a recovery mode, choose the proper option in the “Recovery Mode” check box in the “Manual recovery” box (Figure 225. Manual recovery of application backup).

In manual recovery, you can choose which items will be recovered from the backup, and which remain unchanged. To change the settings, use the check boxes in the “Recovered Items” box (Figure 225. Manual recovery of application backup). The following items can be recovered or left unchanged:

Database – records of registered patients and patient tests

Test programs – all test programs created by the user, other than standard tests.

User fields – all test fields designed by the user, other than standard fields

Application settings – all application settings configured in the Settings tab.

Institution Data – address and logo of the institution

To recover backup file, click “Recover from file”. Next, find the directory and the backup file of

choice in the navigation window. If you recover backup in the Combine mode, a recovery progress window will be displayed in which you can cancel the recovery.

After recovering backup it is obligatory to restart the application. Some of the test fields that appear in the test field lists might be invalid for the currently connected device and using them can lead to invalid examination data.

With each recovery attempt, the local data overwritten or deleted are copied to a temporary directory. If the recovery fails with any of the backup item, all modifications will be withdrawn and the data will be reinstated from the temporary directory.

15.4.5. Repairing database

Apart from patient data and test results, the backup file also includes many additional information with which the database can operate. After a system crash, errors and loss of data integrity can occur in the database. To prevent these serious problems, which can cause irrecoverable loss of data, you can check and repair the database file. If you delete information from a database, the space left is not released and can only be used is new data is introduced. The database repair process releases free space in the database file, and the file occupies the minimum space required.

To repair the database, click the “Repair database” button in the lower right corner of the database tools window (Figure 222. Database settings and management). To finish the repair, a message will be displayed with a list of detected and repaired problems.

15.4.6. Remote database

Database can be shared among several users within a computer network. Each instance of the application is a client and a database host. You can configure the application to connect as a client with a database shared by another host within a local network instead of connecting to the database on the local PC. Local instance can also share its own database as a host with other clients within the local network.

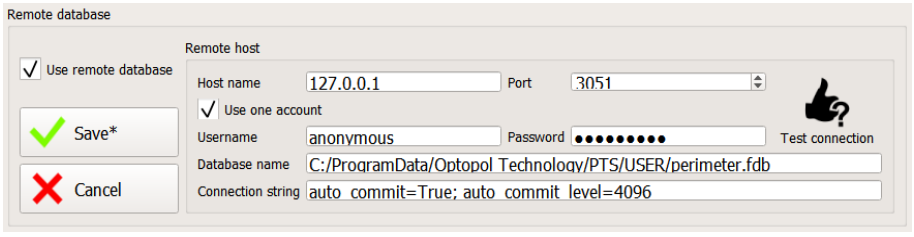


Figure 226. Remote database settings

To configure your local application to work as a client of a database host on another PC, go to the Remote Database box (Figure 226. Remote database settings). All changes introduced in this box will be introduced only after clicking the Save button and restarting the application. Press Cancel to return to the current settings from the configuration file.

To enable the configuration buttons, select the "Use remote database" check box. To successfully connect to a remote database, you should configure the following parameters:

- **Host name** – name or IP address of a remote host which shared the remote database within a computer network.
- **Port** – TCP where the remote host shares connection to the database. By default, the database host port is 3051. Make sure that the remote host does not block traffic on TCP 3051 port in the firewall software running on this PC. If necessary, add an exception to TCP 3051 and TCP 8100 ports in the firewall.
- **Use one account** – it is possible to enter the login details for all connections, if the connection to the remote database is to be setup always with the same account. When this option is used, the login details are stored and there is no need to enter them every time.
    - **User** – name of user registered in the remote database server used for connecting to the database. The user account can be created on the remote host locally using the options available in the Users tab.
    - **Password** – password to the user account registered in the remote database server used for connecting to the database. The user account can be created on the remote host locally using the options available in the Users tab.
- **Database name** – access path to the database file shared by a remote host.
- **Parameters** – additional parameters used when connecting to a remote database.

When the connection configuration is ready, you should check if the connection is correct. To do this, click the "Test Connection" button. If the connection fails, you will see a message indicating the error.

If the connection works, click Save to save the changes and restart the computer. When the computer is restarted, the software will automatically connect to the remote database.

If no connection with the remote database can be established when the software is started, an error message will be displayed and the system will switch over to the local database. If the connection errors keeps occurring, check the connection configuration, LAN settings, and the remote host firewall.

15.4.7. Data status from the remote / shared database

When you work with the application, you can see connection parameters with the local and remote database. It includes information about the user account used in the connection, and the remote host address.

Figure 227. Connection status bar

In the network mode, data from one database can be shared among many users. However, other users may replace data in the database and the data shown in the application need to be refreshed to actual data stored in database.

Changes in data by other users are indicated by an audio signal and the synchronization button. If the data shown may be outdated, the synchronization button changes from the green “Remote OK” to the red “Synchronize”. Press this button to synchronize the displayed data with the database, upon which the button will return to its normal status. The same applies when the local database - host is made accessible to remote PC - clients.

15.5. *Eye camera settings*

Eye camera settings are discussed in this chapter. These are:

- adjusting camera view parameters
- settings of the allowed pupil shift

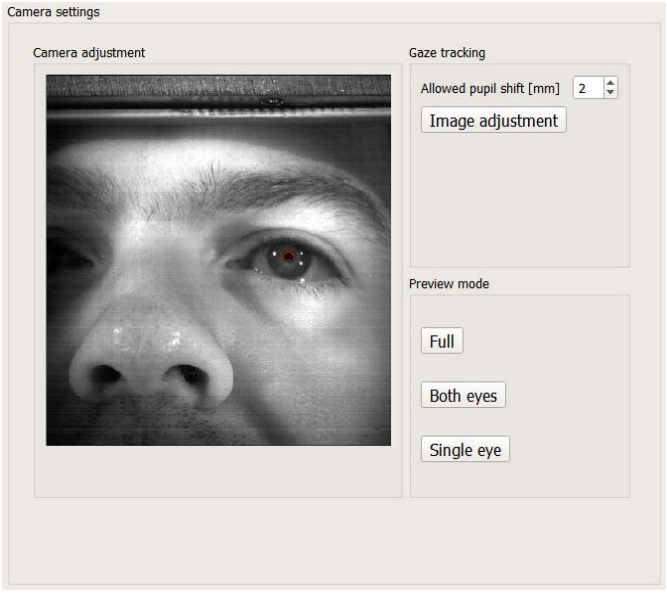


Figure 228. Eye camera settings

Changing the eye camera mode

You can monitor both eyes with the camera lens provided with the perimeter. You can also monitor gaze fixation in binocular tests. For monocular tests, the camera view and the analysis range are limited to the tested eye only. To check the quality of camera image in monocular and binocular tests, you can toggle between the image mode in the camera settings window. The "Preview mode" box is described below (Figure 228. Eye camera settings).

Full – the preview window shows full camera view without downsizing the field of vision.

Both eyes – the preview window shows the area analyzed in monocular tests

Single eyes – the preview window shows the area analyzed in binocular tests

15.5.1. Adjusting camera view parameters

To correctly monitor the gaze, you need a clear view of the eye from the eye camera. The video image quality largely depends on the surrounding environment. Some parameters of the camera, including shutter speed and input gain are adjusted automatically and need not be adjusted manually. Other parameters, such as the mirror reflection vertically and horizontally can be set in the configuration window of the camera parameters.

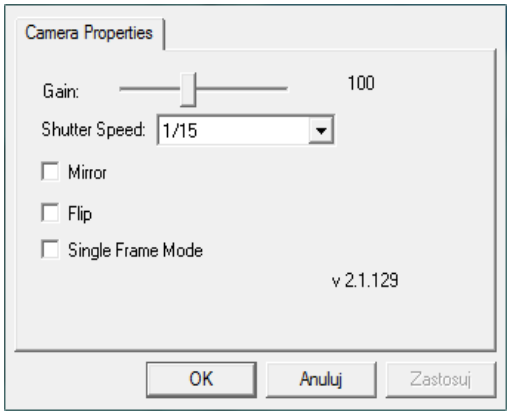


Figure 229. Configuration window of the camera parameters

Camera view parameters can be adjusted in the camera configuration window (Figure 229. Configuration window of the camera parameters). Click the "Image adjustment" button in the "Gaze tracking" box (Figure 228. Eye camera settings). This window can differ from figure, depending on the camera driver.

To adjust the settings, manipulate the parameters shown in the window and watch the video image of the eye displayed (Figure 228. Eye camera settings). The image of the eye is analyzed on a continuous basis, and you can watch how the modified parameters affect the quality of pupil detection. The following camera parameters can be manipulated manually:

- Mirror – horizontal reflection of the image – preferably unchecked
- Flip – horizontal reflection of the image – preferably unchecked

Once you find the optimum parameters, click OK to save the settings.

15.5.2. Setting the allowed pupil shift

Detecting fixation errors through gaze tracking essentially consists in tracking changes in the position of the pupil on the video image from the eye camera. Small shifts are typically acceptable as negligible image fluctuations and are neglected by the algorithm. If more significant changes recognized as gaze shifts that disqualify the test results occur, the test is interrupted. Negligible shifts are differentiated from significant shifts by comparing the pupil shift with the one determined from the limit of fixation error detection.

You can change the limit of fixation error detection using the "Allowed pupil shift [mm]" button in the "Gaze tracking" box (Figure 228. Eye camera settings). The limit value is defined within the range of 0 to 20 mm. 2 mm is the default value.

15.6. Editing user fields

To run a visual field test, you can choose one of the predefined test fields. Predefined test fields have been designed to cover areas of the visual field typically used in standard diagnostic scenarios. In special cases you can also use customized test fields, or user fields. In the user fields, you select the number and arrangement of points from all existing points. To create, delete and modify user fields, go to "Field editor" section in the Settings tab.

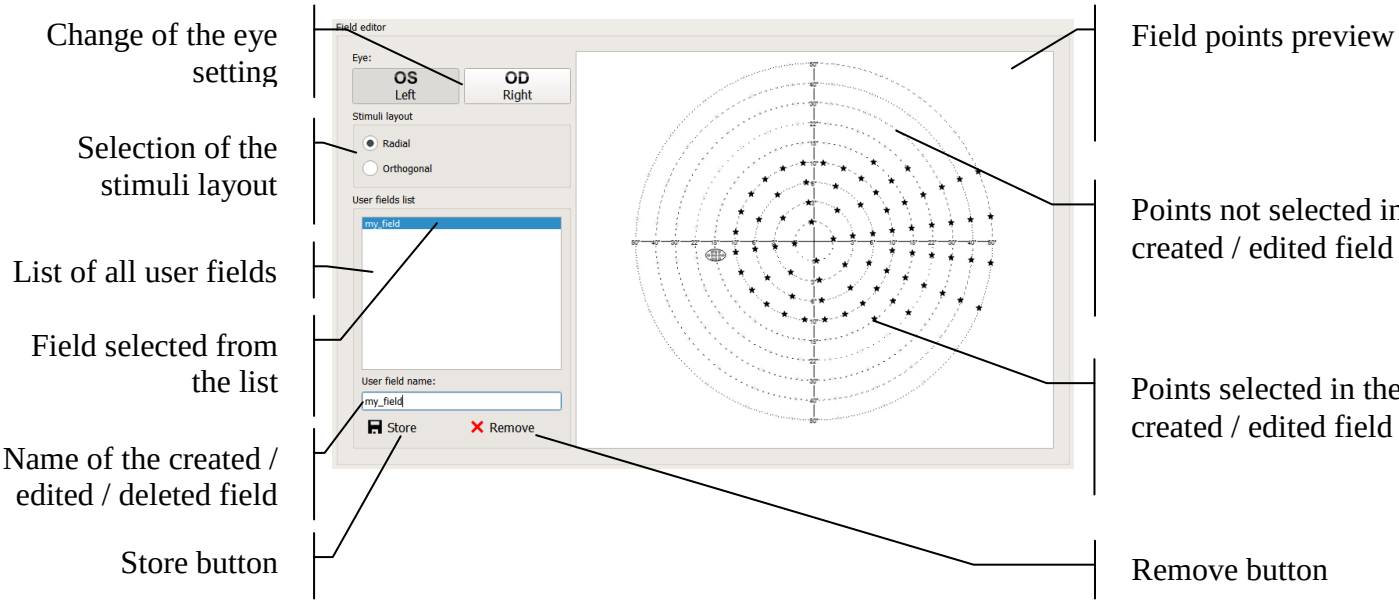


Figure 230. Field editor

15.6.1. Editing user fields

PTS software supports various device types with different stimuli layouts. Depending on the device type for which the user field is being designed, user should select appropriate "Stimuli layout":

"Radial" - supported by PTS 920/ PTS 920BY/ PTS 2000 devices

“Orthogonal” - supported by PTS 925W/ PTS 2000 devices

All selectable points are displayed in the field points preview window. Each point can be rendered in either of the following modes:

- **set (enabled)** – the point is displayed as a black star – the point will be included in the user field – it will be tested
- **unset (disabled)** – the point is displayed as a fuzzy star – the point will not be included in the user field – it will not be tested

The change the point status:

To enable or disable individual points from the user field, left click over the point of choice. If the point is disabled, it will be enabled when clicked. If the point was enabled, it will be disabled when clicked.

To enable or disable all points within the field, right click over an empty area of the preview window. A context menu will be displayed with two options: Set all or Unset all.

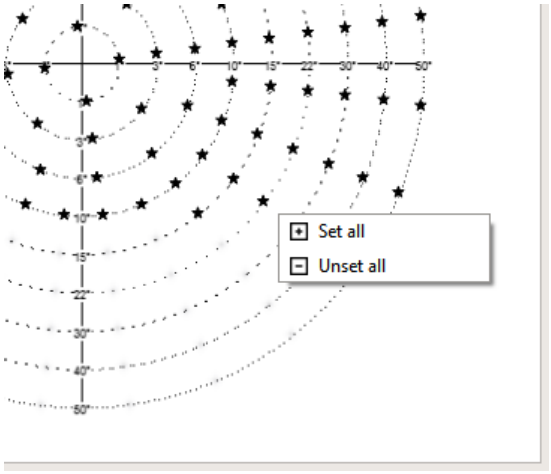


Figure 231. Changing the status of all points within the user fields

Use the “Set all” option to enable all points within the user field. Use the “Unset all” option to disable all points within the user field.

The third option is to select and then to set or unset selected points. Right click to select individual points within the user field. When you click the selected points, keep the Ctrl key pressed while making your selections. You can also select a group of points with a marquee. Left click over an empty area of the field and then create a marquee by moving the mouse with the left button pressed down.

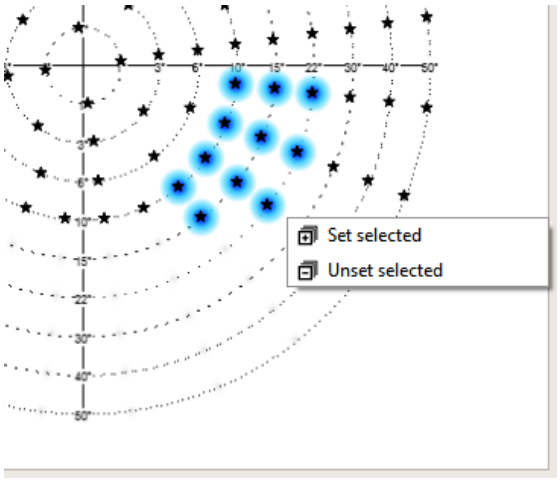


Figure 232. Changing the status of selected points within the edited user field

Click one of the selected points. A context menu will be displayed with two options: Set selected or Unset selected. Use the “Set selected” option to enable selected points within the user field. Use the “Unset selected” option to disable selected points within the user field.

15.6.2. Creating a new user field

To create a new user field, enter a new name (it must be unique) in the User field name box (Figure 230. Field editor), and click Save. The new user field will be created and the name of the new user field will be added to the list of existing user fields.

15.6.3. Editing existing user fields

To edit a user field, select one of the fields from the list of user fields. The selected user field will be displayed in the field preview window. Once you finish editing the points, click Save and confirm you want to overwrite the existing field. You can also overwrite one field while editing another one. Once you finish editing the points, enter the name of the user field you want to overwrite in the User field name field (Figure 230. Field editor), and click Save.

15.6.4. Deleting existing user fields

To delete a user field, select the user field of choice from the list of all user fields. Click Delete and confirm you want to delete the field selected.

15.7. *Data exchange interface*

This application was designed as an independent system to operate the device and to manage test and patient data. It also features data exchange interfaces with external applications and the EMR systems.

The application can ordered to run various orders (tasks) by external EMR systems. All tasks are queued in the list of Work Manager when the application operates. The following tasks can be performed, based on data collected from the data exchange interface:

registering patients in a local database

displaying the results of tests belonging to a patient

running tests according to the patient settings

generating a test report file to a predefined directory for a new or existing test

generating printed report for a new or existing test

There are 5 data exchange interfaces:

- Command-line interface
- Text File Interface
- GDT File Interface
- DICOM Interface
- Direct Export Interface

Interfaces are independent and can be used in parallel.

Data exchange interfaces can be set and activated from the Data Exchange page of the Settings tab (Figure 233. Data exchange interface settings)

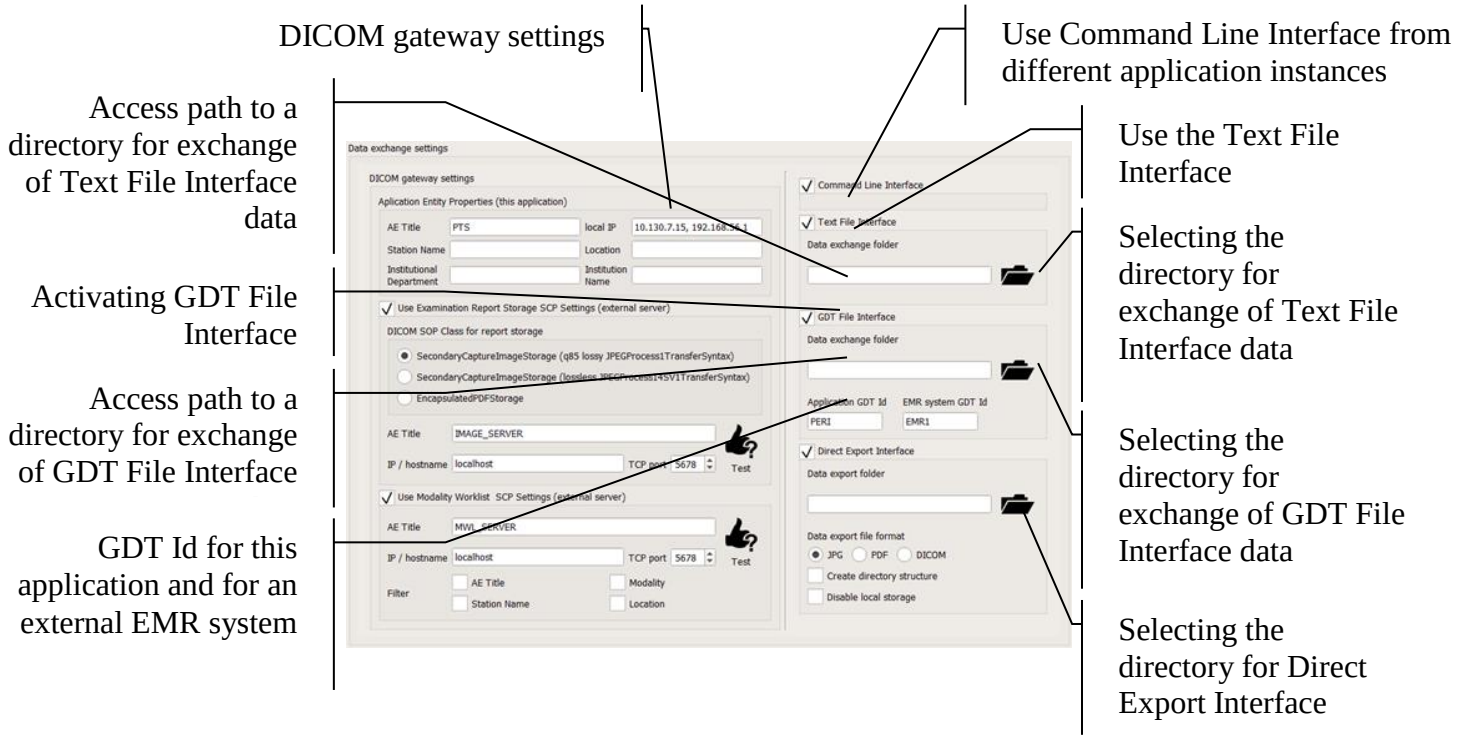


Figure 233. Data exchange interface settings

15.7.1. Command Line Interface

Command Line Interface is the easiest way to transfer information from external sources. Each time the program is started, it checks the command line parameters used to start the program. If any correct commands are identified, a new order is created and processed after the program is started. An order created from the command line arguments is always of the highest priority. This means that, if any other orders are delivered from other interfaces, the command line order will be the first to perform, right after the program is started.

Only one instance of the program can run on one PC. Any attempt to start another instance will be blocked, and the command line parameters from this instance can be lost. To prevent it, the running instance can capture the command line arguments from the attempts to run other instances of the program, and a queue of orders will be created in the Work Manager. Enable this function with the "Command Line Interface from different application instances" key (Figure 233. Data exchange interface settings). If this option is enabled, the program will capture arguments from other instances, and the data captured will be added to the Work Manager list in the Patients tab (Work Manager).

15.7.2. Text File interface

Text File Interface is based on data exchange with an external program or EMR system using *.txt files from a defined directory. In the Text File Interface, the external program or EMR system creates a patient.txt file featuring all order-relevant parameters. The programs reads this file and creates an order accordingly, which is later added to the Work Manager list. If the order is completed correctly, the patient.txt is deleted.

To enable the Text File Interface, select the "Text File Interface" check box (Figure 233. Data exchange interface settings). If the Text File Interface is enabled, the program monitors for patient.txt files in the data exchange directory of the Text File Interface.

To set the data exchange directory for the Text File Interface, click the Data Exchange Directory (Figure 233. Data exchange interface settings) and choose a location shared with an external program or EMR system which the user can read and save.

15.7.3. GDT File interface

GDT File Interface is based on data exchange with an external program or EMR system using GDT 2.1 („Gerätedaten-Träger" or "Device Data Carrier") files from a defined directory. Communication direction is defined with the name of the file, consisting of addressee's GDT ID and the sender's GDT ID.

As a rule, GDT Id = PERI denotes the local program that controls the device. This ID can be modified to avoid conflict with other devices. To change the ID, use the "Application GDT ID" option (Figure 233. Data exchange interface settings).

GDT Id = EMR1 is the standard identifier of an external application or the EMR system. To change this identifier and adapt it to the actual identifier used by the external EMR system, use the "EMR system GDT Id" option (Figure 233. Data exchange interface settings).

According to the principle of the GDT Interface, the EMR system creates a GDT file with the

order parameters (“PERIEMR1.GDT”). The programs reads this file and creates an order accordingly, which is later added to the Work Manager list. If the order is completed successfully, the order file will be deleted, and the application will generate a return file(s) in the GDT format (“EMR1PERI.GDT”). If multiple orders exist, the exchange file extensions are numbered („PERIEMR1.000” ↔ „EMR1PERI.000”, „PERIEMR1.001” ↔ „EMR1PERI.001”, etc).

To enable the GDT File Interface, select the “GDT File Interface” check box (Figure 233. Data exchange interface settings). If the GDT File Interface is enabled, the program monitors if any GDT files with orders reside in the data exchange directory of the GDT File Interface.

To set the data exchange directory for the GDT File Interface, click the Data Exchange Directory (Figure 233. Data exchange interface settings) and choose a location shared with an external program or EMR system which the user can read and save.

15.8. *DICOM Interface*

DICOM Interface consists of two client modules (SCU):

Test Report Storage

Modality Work List

DICOM client modules are based on communication with service providers (SCP hosts) within LAN TCP/IP. DICOM identifies the application based on unique ID (AE Title) and TCP/ID address. AE Title and TCP/ID address should be saved in the application settings and in all SCP hosts that cooperate with the application in the DICOM system.

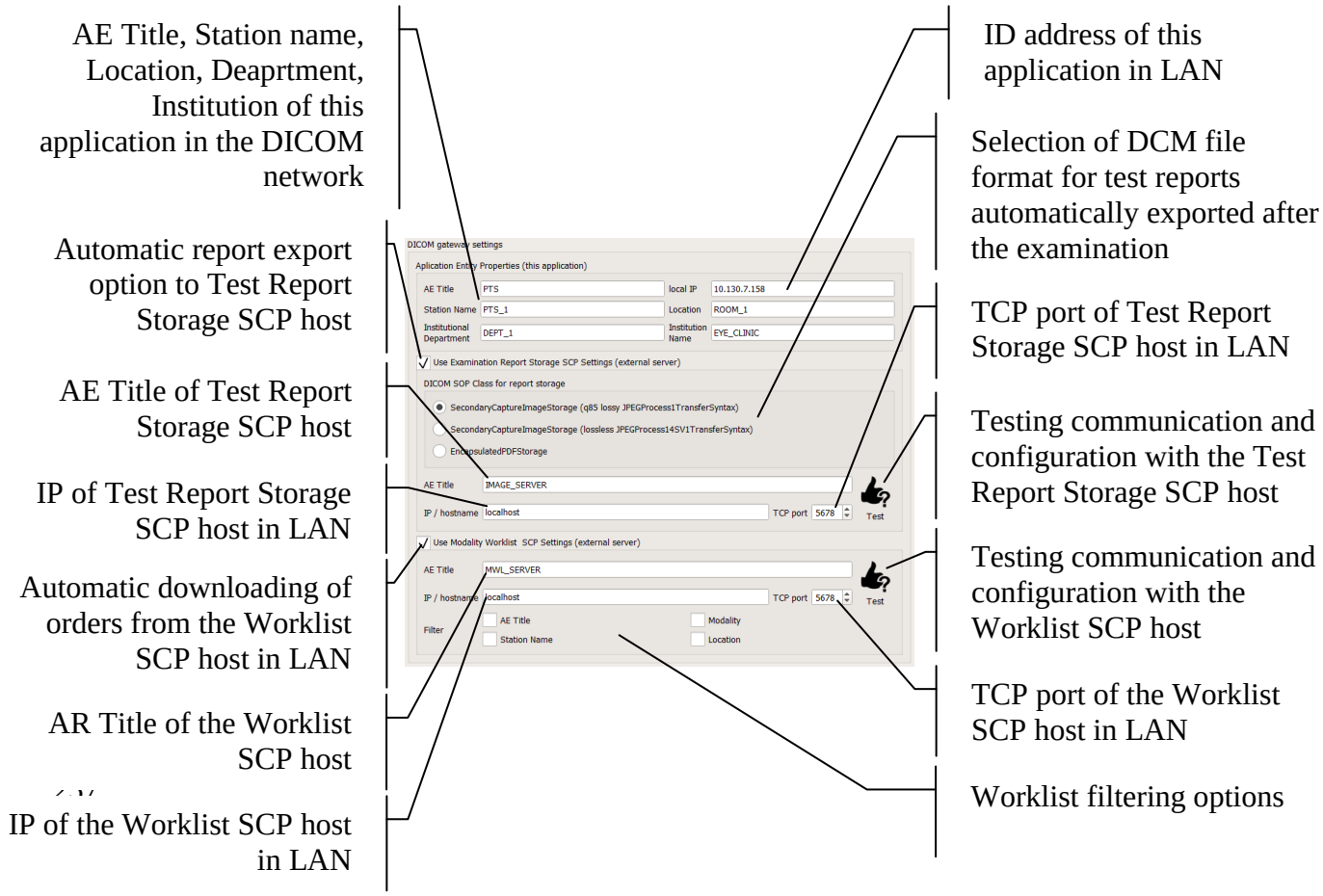


Figure 234. DICOM interface settings

15.8.1. Test Report Storage client

Test Report Storage client module creates DCM images featuring perimetry test reports. DCM images can be saved locally on the hard drive (refer to the Single Test Report Generator, Comparison / Progress Analysis Report Generator sections) or sent via LAN to a configured Test Report Storage SCP host.

The module communicates with the Test Report Storage SCP host whose ID (AE Title) and TCP/IP address can be configured in the "Use Test Report Storage SCP" section (Figure 234. DICOM interface settings).

When the check box "Use Test Report Storage SCP" is selected (Figure 234. DICOM interface settings), a report will be generated after each test is finished, in the default format, and will be sent as a DCM file to the Test Report Storage SCP host.

The report can be exported to several DCM file formats (Figure 234. DICOM interface settings):

JPG with 85% lossy compression (JPEGProcess1TransferSyntax) – files will be compressed with a small loss of quality, and will occupy less space (around 0.8mb per file).

JPG with lossless compression (JPEGProcess14SV1TransferSyntax) - the files will be compressed without any loss of quality, but they will occupy more space (around 3mb per file).

PDF in a DCM file - the PDF file will contain text (lossless compression) and compressed images of maps (around 0.6mb per file).

BMP – non-compressed images occupying large amount of space (around 18mb per file).

OPV – DCM file format for storing perimeter data (around 13kb per file)

The SCP host where the test reports will reside as DCM files must support the selected DCM file format. Otherwise the DCM files will not be saved. Press Test to check communication and compatibility of the SCP host with selected DICOM Interface settings (Figure 234. DICOM interface settings). After you check the communication and compatibility of the settings, you will see a message indicating successful completion of the order, or a list of errors.

15.8.2. Modality Work List client

The Modality Work List client module collects demographic data of patients registered for tests from an external Modality Work List. Orders are created from the patient data which, together with orders from other data exchange systems, are added to the Work Manager list.

The module communicates with the Modality Work List whose ID (AE Title) and TCP/IP address can be configured in the "Use Modality Work List SCP" section (Figure 234. DICOM interface settings).

When the check box "Use Modality Work List SCP" is selected (Figure 234. DICOM interface settings), the application will monitor the work list on the configured host on a continuous basis. Order records are created from the identified patient data, and are added to the Work Manager list.

Make sure that the SCP host delivering patients' demographic data for tests is correctly configured and active. Otherwise data collecting will fail. Press Test to check communication

with the server (Figure 234. DICOM interface settings). After you check the communication and compatibility of the settings, you will see a message indicating successful completion of the order, or a list of errors.

15.9. *Direct Export Interface*

Direct Export Interface is an unidirectional interface which can be used only to export the examination reports from the application. It allows to export the default test report right after examination into the specified network storage or local storage location before any data is stored onto the disk. This allows to get the report without need to keep the patient data in the local storage. The Direct Export Interface report is stored in form of JPG, PDF or DICOM file with the name formed form patient data, the unique time stamp sequence, type of the device and analysis type.

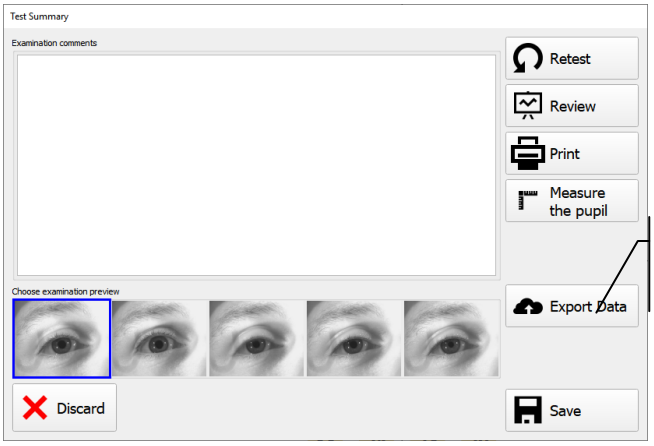


Figure 235. Examination summary dialog with direct export button

To enable the Direct Export Interface, select the “Direct Export Interface” check box (Figure 233. Data exchange interface settings). If the Direct Export Interface is enabled, the program will show the additional button in the Test Summary dialog “Export Data”. Clicking this button will export the default report form the completed examination into the configured Direct Export folder.

Selecting the “Create directory structure” check box in the “Direct Export Interface” group creates a directory to which the exported tests of a given patient will be sent. The name of such a folder consists of the patient’s data such as the reference number, surname, first name and data of birth separated by an underscore symbol.

If export directory is not set or doesn’t exist, the tests will be exported to the directory set in the interface settings window.

The “Disable local storage” checkbox in the “Direct Export Interface” group box configures the application to disable possibility to keep the test data in the local database. This allows the test results to be exported only via Direct Export Interface. In this scenario the regular “Save” button in the Test Summary dialog disappears and is replaced by “Export Data” button.

15.10. *Work Manager*

Work Manager is designed to manage tasks (orders) from the data exchange interface. If the Text File Interface, GDT File Interface or DICOM MWL interface is enabled, the Work Manager can be found in the Patients tab (Figure 236. Patients tab with the Work Manager).

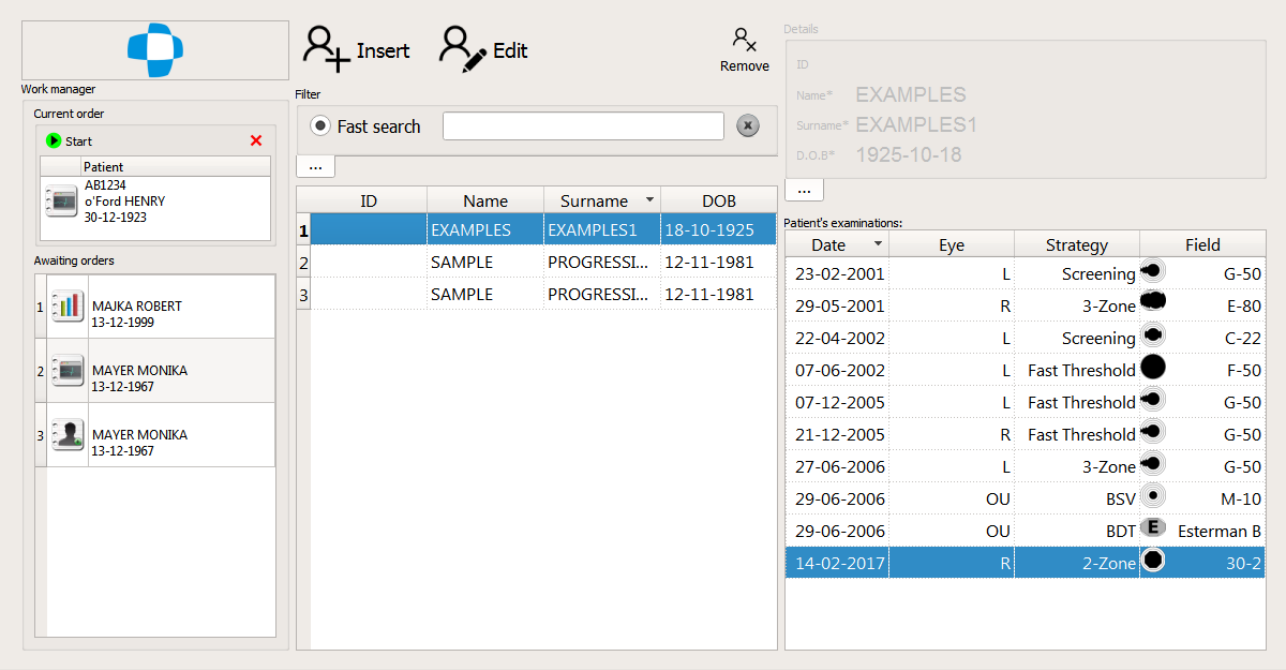


Figure 236. Patients tab with the Work Manager

In the Work Manager section, you can display the orders, change the order priority, select and change the current order, start or abandon an order, and delete the current order.

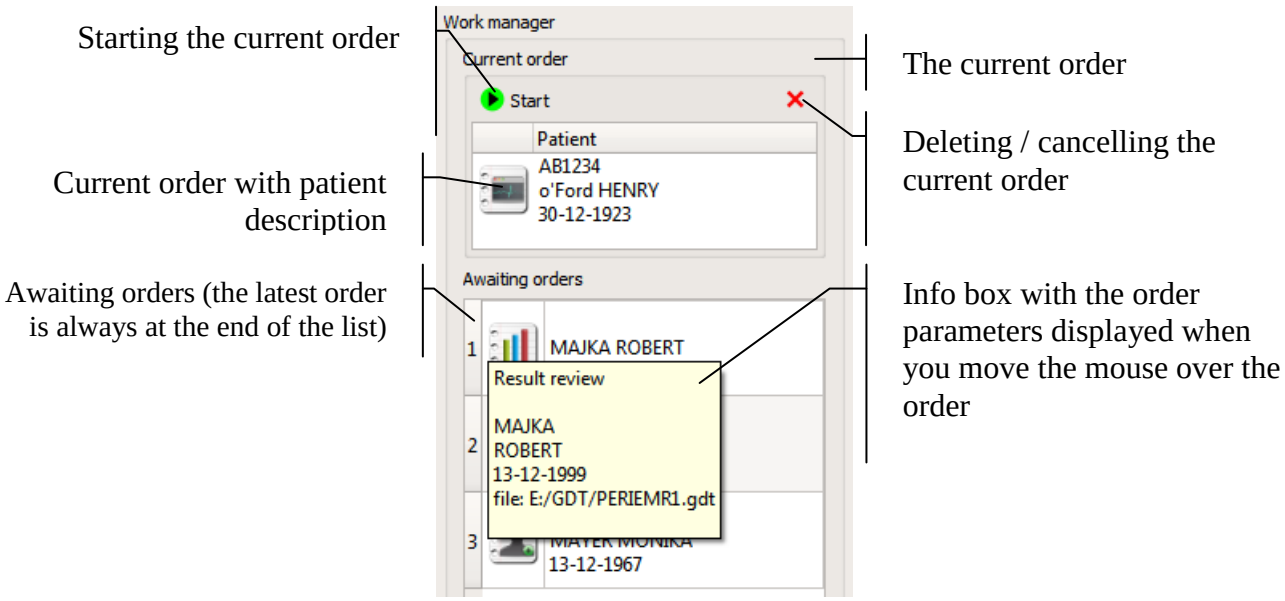


Figure 237. Work Manager items

The orders are arranged into four types:

 Enter / select patient – this order is completed after the given patient is registered and selected as the current patient.

 Test the patient – this order is completed after the given patient is tested and, as an option, after the summary file and the test report are generated.

 Review the test results for the given patient – this task is finished after the overall test results or a selected test result are displayed for the given patient.

 Generate test report – this order is completed after a test report is printed or saved for the given test.

A different symbol is used to represent different types of orders, with which you can easily recognize the nature of awaiting orders.

Move the mouse over the current test or a test from the list, and a prompt will be displayed with information about the relevant patient and the data exchange file from which the order was created (Figure 237. Work Manager items).

15.10.1. Performing orders

To start the currently selected order, click “Start” in the field of the current order (Figure 237. Work Manager items).

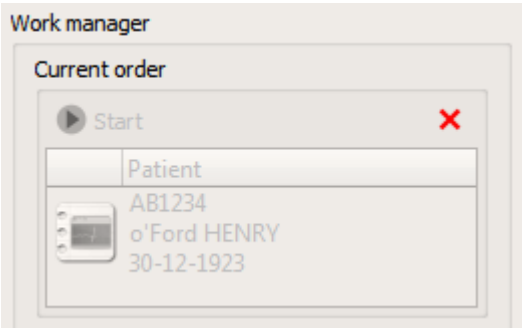


Figure 238. Initiated order

After the order is started, the current order is locked until it is finished or cancelled / deleted (Figure 238. Initiated order). After the order is successfully completed or fails, a summary window will be displayed with information about the operations completed or the problems identified.

15.10.2. Cancelling / deleting orders

The current order can be deleted from the list or cancelled and moved to the end of the work list (to be completed later). To delete or postpone an order, press X in the field of the current order (Figure 238. Initiated order).

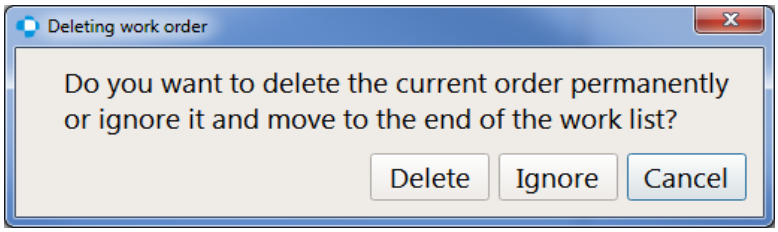


Figure 239. Confirmation window of order deletion/cancellation

A window will be displayed, asking you to confirm you want to delete / cancel the current order (Figure 239. Confirmation window of order deletion/cancellation). Select the option of choice or cancel.

15.10.3. Selecting the current order and changing the order priority

In standard settings, the orders are executed in the order in which they are submitted. All orders are added to the end of the list, and when the current order is finished, the next listed order from the list of awaiting orders is selected as the new current order. You can change the order priority using the drag & drop method.

Left-click the selected order and move the cursor to the place of choice in the list or the field of the current order, keeping the mouse button pressed. Then release the left mouse button in the place of choice.

To change the current order and replace it with a different order from the list of awaiting orders, select the order of choice from the list and drop it on the current order. To change the priority of orders, drag the selected order and drop it elsewhere on the list.

15.11. *Data exchange in the Perimetry Wizard interface*

Work orders can be processed within the Perimetry Wizard interface. Patients incoming form the data exchange interfaces are added to “Today” list. This list can be opened by clicking the “Today” header (Figure 240. Perimetry Wizard - list of patients from data exchange interfaces). Patient’s list will be updated with patients form data exchange and patients who have been already tested this day.

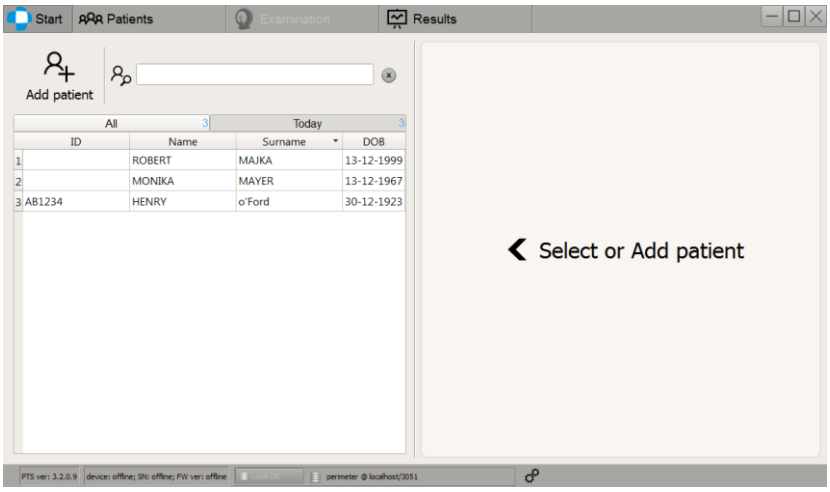


Figure 240. Perimetry Wizard - list of patients from data exchange interfaces

Patients on "Today" list cannot be edited or removed

After selecting a patient and clicking "Next", the "Programs" page will be displayed. If the selected patient has got awaiting work orders, then on the left of the programs panel there will be additional "Awaiting orders" list displayed (Figure 241. Perimetry Wizard - work order selection). To appear on the list, a work order should contain a strategy and field settings or a location for the exam report output file.

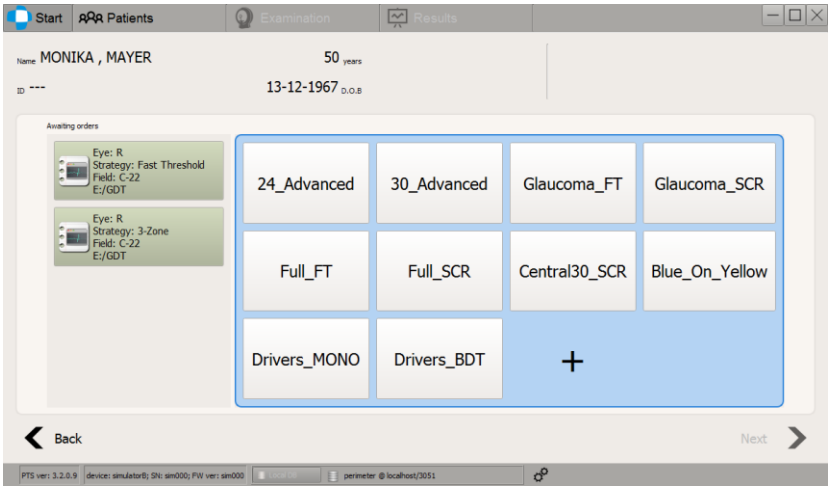


Figure 241. Perimetry Wizard - work order selection

Dark green buttons on the "Awaiting orders" list, represent the work orders from the data exchange interfaces related to currently selected patients. To select the work order for a current

patient, click one of the green buttons. If the work order contain the test strategy and test field, then one additional button will appear in the Test Programs panel (Figure 242. Perimetry Wizard – EMR test program selection). This button will be named according to test settings form the selected work order and can be used to set these settings for the upcoming test. If the test strategy or test field is not defined in work order, then one of the predefined test programs should be selected to proceed to the test preparation page. After the test with the selected work order is completed, the work order is automatically deleted together with the work order input file.

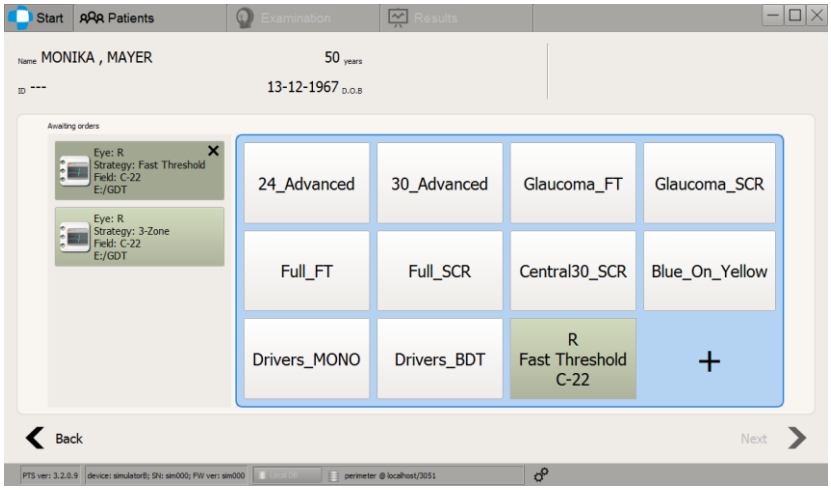


Figure 242. Perimetry Wizard – EMR test program selection

There is also possibility to perform the examination on the patient from Today list "outside" of the data exchange mechanism. When none of the work orders is selected in the "Awaiting orders" list, the examination will be performed in a regular way. None of the work orders will be automatically deleted after the examination is completed.

To manually delete the work order, click the "X" symbol in the upper-right corner of the selected work order button.

Removing the work order will cause the related data exchange input file to be deleted permanently. It will be not possible to restore this file.

15.12. *Users*

The application can work in two modes:

anonymous (default)

In the anonymous mode, you do not have to enter any password after the program is started. Every user can operate the application as an admin and can execute all tasks, including data management operations. This mode is recommended when you use the application in a closed user environment, where no unauthorized data tampering is likely to take place.

user accounts

In the user accounts mode, every user must log into the system to be able to operate the program. Choose the name of the user registered in the system and enter the password. Every registered user has one of defined user roles assigned, together with specific user rights.

The user roles and the assigned user rights are listed in the table below.

Table 1. User rights assigned to user roles

	Guest	Standard	Admin
Reviewing test results	V	V	V
Generating test reports	V	V	V
Executing orders	X	V	V
Editing test comments	X	V	V
Patient registration	X	V	V
Modifying application settings	X	V	V
Importing tests to the database	X	V	V
Transferring tests between patients	X	V	V
Modifying own user account	X	V	V
Adding / deleting / modifying user accounts	X	X	V

15.12.1. User logging

In the user accounts mode, a login screen will be displayed when the system is started. You must enter your user name and password to start the program. User accounts are created by the administrator.

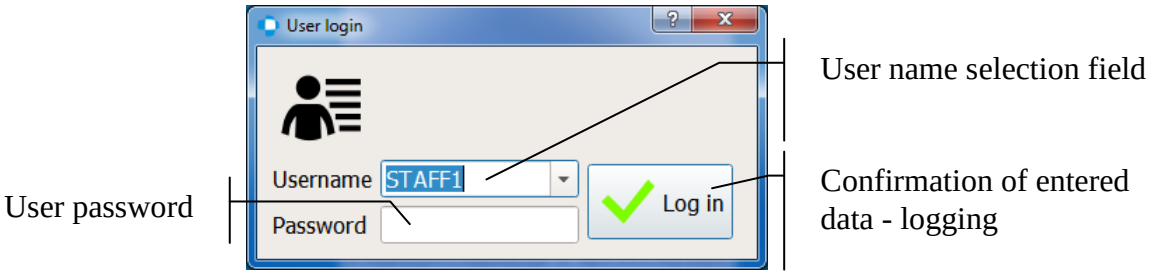


Figure 243. Login window to a local database

In the user name selection field, enter the user name or select the name of the user created in the local database from a drop-down list (Figure 243. Login window to a local database).

Enter the correct user password in the password input field (Figure 243. Login window to a local database). The password can consist of up to 8 alpha-numerical characters and will be automatically cut short when it is too long.

Click Login to confirm the entered data (Figure 243. Login window to a local database).

If the entered user name and password are validated, the program will be started, and the currently logged in user name will be displayed in the status bar on the main screen (Figure 243. Login window to a local database). If the data is incorrect, the login screen will be displayed.

15.12.2. Remote login

If the program is configured to operate with a remote database, the login screen will have keys to select a remote or a local database and a key with which connection to a local database can be checked.

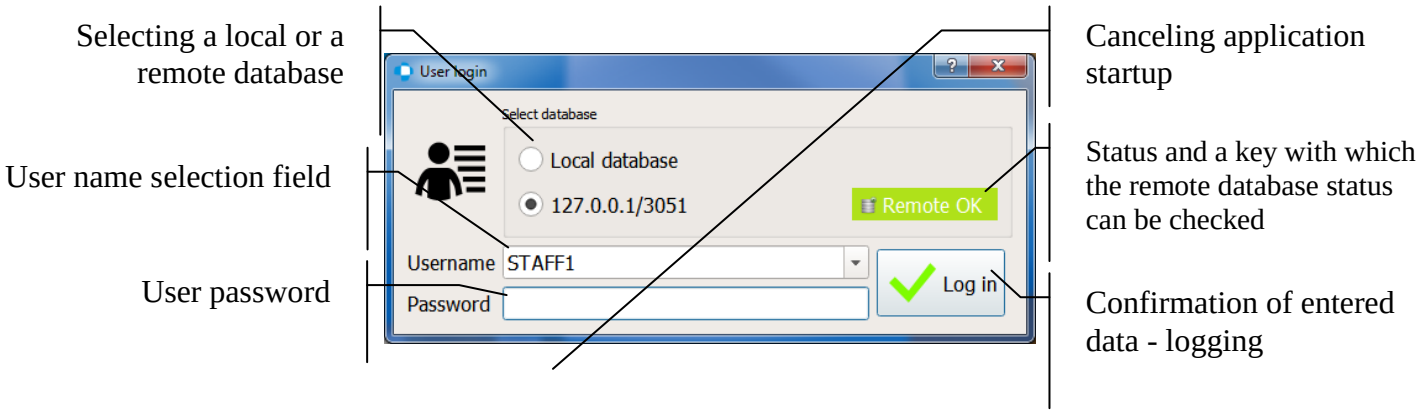


Figure 244. Login window to a remote database

To log in to a remote database, select the address of the remote database server configured in the application settings (Remote database) from the local vs. remote database selection window (Figure 244. Login window to a remote database) .

You can read the status of connection with the remote database server on the remote database status button (Figure 244. Login window to a remote database). To connect to the remote database, this button should be green with the "Remote OK" status. If the button is red, this means connection with the remote server failed. To check accessibility of the remote database and to refresh the list of registered users, click the remote database status button (Figure 244. Login window to a remote database).

If the remote database cannot be accessed or if you want to change the application settings, start the application in the local mode. To log in to a local database, select the "Local database" option from the local vs. remote database selection window (Figure 244. Login window to a remote database) and enter the user login and password to access the local database.

15.12.3. Managing user accounts

To manage user accounts, use the leys on the Users section of the Settings tab (Figure 245. Managing user accounts).

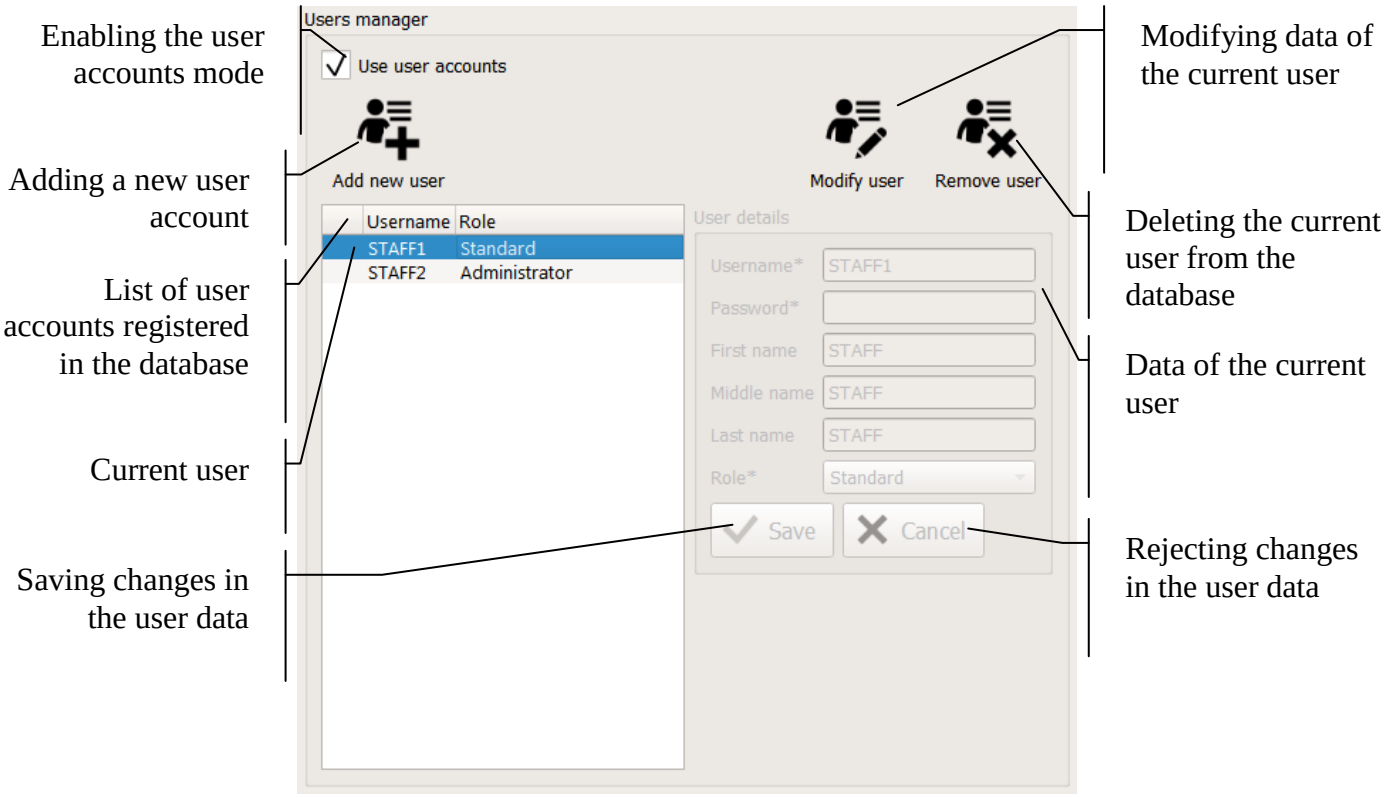


Figure 245. Managing user accounts

Only administrator role users are able to manage user accounts. Otherwise users can only modify their own data: password, first name, middle name, or surname.

15.12.4. Activating the user accounts system

To activate the login system, check the “Use user accounts” option (Figure 245. Managing user accounts) and restart the application.

To use the user accounts mode, at least one administrator account must be created in the system.

15.12.5. Adding user accounts

You need administrator rights to add a new account. To create a new account, click “Add User” button on top of the list of users (Figure 245. Managing user accounts).

After clicking the “Add User” button, a data field of the selected user will be enabled (Figure 245. Managing user accounts)The following user data must be entered:

User - user login

Password - user password

Role – rights assigned to the user

You can also enter the first name, middle name, and surname of the user. The user data will be saved along with test results and inserted into reports as the device operator data.

Do not use diacritics, only letters from basic latin alphabet are allowed.

User names must be unique.

User password is reduced by 8 characters.

To save the entered user data, click “Save” (Figure 245. Managing user accounts)at the bottom of the user data field.

Click “Cancel” to abandon the process (Figure 245. Managing user accounts) at the bottom of the user data field.

15.12.6. Modifying user accounts

You need administrator rights to modify an existing user account, unless you want to modify your own user account. To modify a user account, select the account of choice from the list of all user accounts and click “Modify User” button on top of the user data field (Figure 245. Managing user accounts).

After clicking the “Modify User” button, a data field of the selected user will be enabled (Figure 245. Managing user accounts)Here, the following data can be modified:

Password - user password

First name – first name of the user

Middle name – middle first name of the user

Surname – user surname.

Role – (administrator only) rights assigned to the user

To save the modified user data, click “Save” (Figure 245. Managing user accounts) at the bottom of the user data field.

Click “Cancel” to abandon the process (Figure 245. Managing user accounts) at the bottom of the user data field.

15.12.7. Deleting user accounts

You need administrator rights to delete an existing account. To delete a user account, select the account of choice from the list of all user accounts and click the “Delete User” button on top of the user data field (Figure 245. Managing user accounts).

A warning message will be displayed and you will be asked to confirm you want to delete the user account from the database. After the user account is deleted, the deleted user login and password will no longer be available.

16. *Troubleshooting*

Should you experience any problems with the operation of the PTS 920/925/2000 series Automated Perimeter, follow the instructions given in the table below.

Table 2. Troubleshooting

Problem	***Cause***	***How to solve***
"Cannot communicate with the device. (…)"	No communication between PC and perimeter	Make sure the power cord of the perimeter bowl is inserted into a power outlet. Make sure the bowl is switched on (the central fixation in the bowl is glowing).
The central fixation is not glowing after switching the device on.	No power supply to the bowl.	Make sure the bowl is connected to correct supply voltage and switch the bowl on with the main switch. If the device does not start in position 'I', check the fuses. The fuses are in the power outlet of the perimeter, over the plug.
After switching the device on, the right fixation	The reaction button was pressed during the device startup	Make sure that the reaction stick is not pressed during the device startup

Problem	*Cause*	*How to solve*
is glowing	The reaction button is damaged (always short circuit)	Contact the distributor or an authorized service provider.
The regular sound signal is heard after the device startup	The bowl is damaged.	Contact the distributor or an authorized service provider.
After startup the the central fixation is blinking and the software cannot communicate with the device (PTS 2000)	The device did not finished auto-calibration procedure successfully.	Check if there is no excessive light falling into the perimeter bowl which could influence auto-calibration procedure.

List of wear parts:

Fuse type: T 315mA L 250V, 5x20mm (PTS 920 series) - 2 pcs.

Fuse type: T 1.6A L 250V, 5x20mm (PTS 925 series) - 2 pcs.

Fuse type: F 3.15A L 250V, 5x20mm (PTS 2000 series) - 2 pcs.

(other types of fuses are permitted, but only of the same electrical parameters and the following characteristics: F– fast or M-medium or T-time lag according to IEC).

17. *Working conditions*

17.1. *Storage*

Temperature:	5 ÷ 40 °C
Relative humidity:	10 ÷ 90 %
Atmospheric pressure:	740 ÷ 1060 hPa

17.2. *Transportation*

Temperature:	-30 ÷ 40 °C
Relative humidity:	10 ÷ 90 %
Atmospheric pressure:	740 ÷ 1060 hPa

17.3. *Operation*

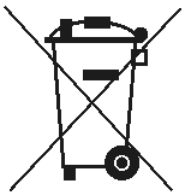
Temperature:	10 ÷ 35 °C
Relative humidity:	30 ÷ 75 %
Atmospheric pressure:	740 ÷ 1060 hPa

18. *Servicing*

Technical problems should be reported to a local distributor.

19. *Disposal*

The maximum life cycle of the device is 10 years from the date of production stated on the rating plate. After this period you should return the device to the distributor to agree the most convenient disposal method for the device parts (plastics, epoxy resins, polyurethane foam, metal, etc.)



APPENDIX A – Conversion of Goldmann units to decibels and apostilbs

Intensity		Actual Goldmann stimulus size				
dB	**Asb**	**I**	**II**	**III**	**IV**	**V**
0	10,000	III 4e	IV 4e	V 4e	---	---
l	7,943	III 4d	IV 4d	V 4d	---	---
2	6.310	III 4c	IV 4c	V 4c	---	---
3	5.012	III 4b	IV 4b	V 4b	---	---
4	3,981	III 4a	IV 4a	V 4a	---	---
5	3,162	II 4e	III 4e	IV 4e	V 4e	---
6	2,512	II 4d	III 4d	IV 4d	V 4d	---
7	1.995	II 4c	III 4e	IV 4c	V 4c	---
8	1,585	II 4b	III 4b	IV 4b	V 4b	---
9	1,259	II 4a	III 4a	IV 4a	V 4a	---
10	1,000	I 4e	II 4e	III 4e	IV 4e	V 4e
11	794	I 4d	II 4d	III 4d	IV 4d	V 4d
12	631	I 4c	II 4c	III 4c	IV 4c	V 4c
13	501	I 4b	II 4b	III 4b	IV 4b	V 4b
14	398	I 4a	II 4a	III 4a	IV 4a	V 4a
15	316	I 3e	II 3e	III 3e	IV 3e	V 3e
16	251	I 3d	II 3d	III 3d	IV 3d	V 3d
17	200	I 3c	II 3c	III 3c	IV 3c	V 3c
18	159	I 3b	II 3b	III 3b	IV 3b	V 3b
19	126	I 3a	II 3a	III 3a	IV 3a	V 3a
20	100	I 2e	II 2e	III 2e	IV 2e	V 2e
21	79	I 2d	II 2d	III 2d	IV 2d	V 2d
22	63	I 2c	II 2c	III 2c	IV 2c	V 2c
23	50	I 2b	II 2b	III 2b	IV 2b	V 2b
24	40	I 2a	II 2a	III 2a	IV 2a	V 2a
25	32	I 1e	II 1e	III 1e	IV 1e	V 1e
26	25	I 1d	II 1d	III 1d	IV 1d	V 1d
27	20	I 1c	II 1c	III 1c	IV 1c	V 1c
28	16	I 1b	II 1b	III 1b	IV 1b	V 1b
29	13	I 1a	II 1a	III 1a	IV 1a	V 1a
30	10	I^4e	I 1e	II 1e	III 1e	IV 1e
31	8	I^4d	I 1d	II 1d	III 1d	IV 1d
32	6	I^4c	I 1c	II 1c	III 1c	IV 1c
33	5	I^4b	I 1b	II 1b	III 1b	IV 1b
34	4	I^4a	I 1a	II 1a	III 1a	IV 1a
35	3.2	I^3e	I^4e	I 1e	II 1e	III 1e
36	2.5	I^3d	I^4d	I 1d	II 1d	III 1d
37	2.0	I^3c	I^4c	I 1c	II 1c	III 1c
38	1.6	I^3b	I^4b	I 1b	II 1b	III 1b
39	1.3	I^3a	I^4a	I 1a	II 1a	III 1a
40	1.0	I^2e	I^3e	I^4e	I 1e	II 1e
41	0.8	I^2d	I^3d	I^4d	I 1d	II 1d
42	0.6	I^2c	I^3c	I^4c	I 1c	II 1c
43	0.5	I^2b	I^3b	I^4b	I 1b	II 1b
44	0.4	I^2a	I^3a	I^4a	I 1a	II 1a
45	0.32	I^1e	I^2e	I^3e	I^4e	I 1e

APPENDIX B – EMC

<table>
<tr><td colspan="3">Guidance and manufacturer’s declaration – electromagnetic emissions</td></tr>
<tr><td colspan="3">PTS 920/925/2000 series Automated Perimeter is intended for use in the electromagnetic environment specified below. The customer or the user of the PTS 920/925/2000 series Automated Perimeter should assure that it is used in such an environment.</td></tr>
<tr><td>Emissions test</td><td>Compliance</td><td>Electromagnetic environment – guidance</td></tr>
<tr><td>RF emissions
CISPR 11</td><td>Group 1</td><td>PTS 920/925/2000 series 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.</td></tr>
<tr><td>RF emissions
CISPR 11</td><td>Class A</td><td rowspan="3">PTS 920/925/2000 series is suitable for use in all establishments other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purpose.
⚠ The emissions characteristic of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If the PTS 920/925/2000 series is used in a residential environment (for wchich CISPR 11 class B is normally used) this equipment might not offer adequate protection to radio-frequency communication service. The user might need to take mitigation measures such relocating or re-orienting equipment.</td></tr>
<tr><td>Harmonic emissions
IEC 61000-3-2</td><td>Class A</td></tr>
<tr><td>Voltage fluctuations/ flicker emissions IEC 61000-3-3</td><td>Compliant</td></tr>
</table>

<table>
<tr><td colspan="4">Guidance and manufacturer’s declaration – electromagnetic immunity</td></tr>
<tr><td colspan="4">PTS 920/925/2000 series Automated Perimeter is intended for use in the electromagnetic environment specified below. The customer or the user of the PTS 920/925/2000 series Automated Perimeter should assure that it is used in such an environment.</td></tr>
<tr><td>Immunity test</td><td>IEC 60601 test level</td><td>Compliance level</td><td>Electromagnetic environment – guidance</td></tr>
<tr><td>Electrostatic</td><td>± 6 kV</td><td>± 6 kV</td><td>Floors should be wood, concrete or ceramic tile. If floors are</td></tr>
</table>

discharge (ESD) IEC 61000-4-2	contact ± 8 kV air	contact ± 8 kV air	covered with synthetic material, the relative humidity should be at least 30 %.
Electrical Fast Transient / Burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	Mains power quality 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	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5s	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5s	Mains power quality should be that of a typical commercial or hospital environment. If the use of the PTS 920/925/2000 series Automated Perimeter requires continued operation during power mains interruptions, it is recommended that the equipment be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz)	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic

magnetic field IEC 61000-4-8			of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity			
PTS 920/925/2000 series Automated Perimeter is intended for use in the electromagnetic environment specified below. The customer or the user of the PTS 920/925/2000 series Automated Perimeter should assure that it is used in such an environment.			
Immunity test	Level test IEC 60601	Compliance level	Electromagnetic environment – guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the PTS 920/925/2000 series Automated Perimeter, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 V	$d = [1{,}17]\sqrt{P}$

Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	$d = [1{,}17]\sqrt{P}$ 80 MHz to 800 MHz $d = [2{,}33]\sqrt{P}$ 800 MHz to 2.5 MHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey [a] should be less than the compliance level in each frequency range. [b] Interference may occur in the vicinity of equipment marked with the following symbol: 

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy.

To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the PTS 920/925/2000 series Automated Perimeter is used exceeds the applicable RF compliance level above, the PTS 920/925/2000 series Automated Perimeter should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the perimeter.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [V_1] V/m.

Recommended separation distances between portable and mobile RF communications equipment and the PTS 920/925/2000 series Automated Perimeter

PTS 920/925/2000 series Automated Perimeter is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the PTS 920/925/2000 series Automated Perimeter can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the PTS 920/925/2000 series Automated Perimeter as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter		
	150 kHz to 80 MHz $d = [1{,}17]\sqrt{P}$	80 MHz to 800 MHz $d = [1{,}17]\sqrt{P}$	800 MHz to 2.5 MHz $d = 2{,}3\sqrt{P}$
0.01	0.17	0.17	0.23
0.1	0.37	0.37	0.73
1	1.17	1.17	2.3
10	3.7	3.7	7.4
100	11,7	11,7	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.

Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.

APPENDIX C – List of figures