



USER'S MANUAL
Optomed Smartscope PRO
& Smartscope FA

Optomed SMARTSCOPE PRO and SMARTSCOPE FA are manufactured by
Optomed Oy.

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This sales package includes:

Smartscope M5 camera with optics lenses and accessories:

Model:	Description:	Accessories
Smartscope EY4	module for retinal imaging	eye cup, quick user guide
Smartscope FA	module for fundus fluorescein angiography imaging	eye cup, quick user guide
Smartscope ES2	module for anterior ophthalmic imaging	
Smartscope Cradle V1	for data transmission and battery charging	USB cord Power unit

If not all optics modules were purchased then the sales case does not include them or the accessories related to that optics module.

In addition the sales case includes:

- Batteries (2 pcs)
- Cleaning cloth
- User manual
- USB memory stick (Includes training material, WIFI SW & guide and Workstation SW & guide.)

Quick start guide

WHAT TO DO BEFORE THE FIRST USE:

1. Remove Optomed Smartscope M5 from the sales package and check that all parts are undamaged.
2. Install Battery as instructed in the **Appendix B, last page of this manual**.
3. Place Cradle on a desk next to the PC (Personal Computer).
4. Connect the USB-cable to the PC.
5. Connect power unit to the wall plug (mains)
6. Place Optomed Smartscope M5 to the cradle. Battery starts to charge. Charge battery for 4 hours before the first use. When device is not used, it may be stored in the Cradle.



Guideline for placing the camera to the cradle:

Camera will fit to the cradle when it's hold straight while placing it. Excessive force shall be avoided in order to prevent the camera and cradle connectors form breaking.



Guideline for device storage:

If battery is stored out of the camera for longer period of time, battery shall be charged every 9 months.

If battery is stored in the camera, camera shall be placed in the cradle with cradle power cable connected.

Normal battery life time is expected to be 1-2 years.

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Appendixes:

Appendix A: Electromagnetic compatibility information

Appendix B: Battery replacement

1. Indications for use

Smartscope M5 is a medical digital camera that is used with dedicated optics lens intended to take images of the eye fundus and surface of the eye.

Supported optics lenses and their intended uses are:

Model:	Description:
Smartscope EY4	Optomed Smartscope M5 digital camera with EY4 optics module is intended to capture digital images and video of the fundus of the human eye.
Smartscope FA	Optomed Smartscope M5 digital camera with FA optics module is intended to capture digital images of the fundus angiograms of the human eye.
Smartscope ES2	Optomed Smartscope M5 digital camera with ES2 optics module is intended to capture images and video of the surface of the human eye and surrounding areas.

2. Contraindications for use of the optics modules EY4, FA and ES2

Because prolonged intense light exposure can damage the retina, the use of the device for ocular examination should not be unnecessarily prolonged, and the brightness setting should not exceed what is needed to provide clear visualization of the target structures.

The retinal exposure dose for a photochemical hazard is a product of the radiance and the exposure time. If the value of radiance were reduced in half, twice the time would be needed to reach the maximum exposure limit.

While no acute optical radiation hazards have been identified for direct or indirect ophthalmoscopes, it is recommended that the intensity of light directed into the patient's eye be limited to the minimum level which is necessary for diagnosis. Infants, aphakes and persons with diseased eyes will be at greater risk. The risk may also be increased if the person being examined has had any exposure with the same instrument or any other ophthalmic instrument using a visible light source during the previous 24 hours. This will apply particularly if the eye has been exposed to retinal photography.

Smartscope EY4, FA and ES2 are classified as Class 2 based on standard ISO15004-2:2007. The daily usage time and maximum allowed number of pulses is calculated based on optical classification results according to standard ISO15004-2:2007.



CAUTION:

“The light emitted from this instrument is potentially hazardous. The longer the duration of exposure and the greater the number of pulses, the greater the risk of ocular damage. Exposure to light from this instrument when operated at maximum output will exceed the safety guideline after:

Maximum number of pulses (still images) allowed daily:

- EY4: 6300 pulses (still images) / eye
- FA: 5000 pulses (still images) / eye
- ES2: 250 pulses (still images) / eye

Or alternatively

Total daily usage time for continuous light (= video usage time + aiming light duration) shall be limited to:

- EY4: 1 h 30 min video usage / eye
- ES2: 8 min video usage / eye

3. Warnings and cautions



Use only accessories and battery provided by Optomed with this product.



Place PC and cradle outside the patient environment (at least 1.5 meters distance from the patient).



Connection between camera and workstation is USB and/or WIFI. Any authorization procedures should be carried out in workstation.



Images and videos can be copied from camera to workstation via USB and/or WIFI and then viewed in workstation.








USB write protection is on by default. When protection is on this feature will prevent writing to camera memory card from PC when connected to the cradle. In case device has WIFI functionality, USB write protection must be turned off.

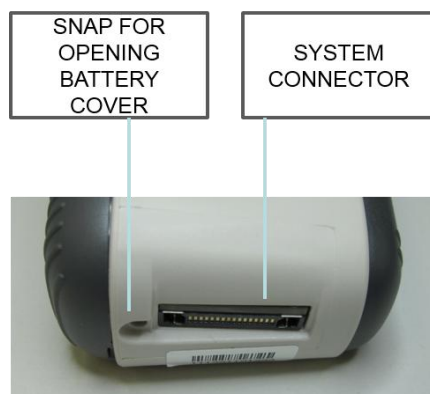


No modification of this equipment is allowed.

4. Important symbols

Symbol	Description
 <p>0598</p>	<p>The CE mark on this product indicates it has been tested and conforms to the provisions noted within the 93/42/EEC Medical Device Directive. CE mark with notified body identification number indicates a class IIa product.</p>
	<p>Read accompanying user documentation indicates that important operating instructions are included in this User's and Maintenance Manual. Failure to follow these instructions could place the patient or operator at risk.</p>
	<p>Type BF applied parts.</p> <p>Applied part is a part of Smartscope that in normal use necessarily comes into physical contact with the patient.</p>
 <p>9V, 1.1 A</p>	<p>Charger polarity symbol, voltage and power</p>
	<p>Sticker at the front of the device indicating Optomed's address, integrated general imaging optics focal length and F-number.</p>

5. Parts of the device







Cradle:





Soft key indicators:

Position	Indicator	Purpose
Left soft key		To power on the device To power off the device, with long press
Right soft key		Open menu with long press

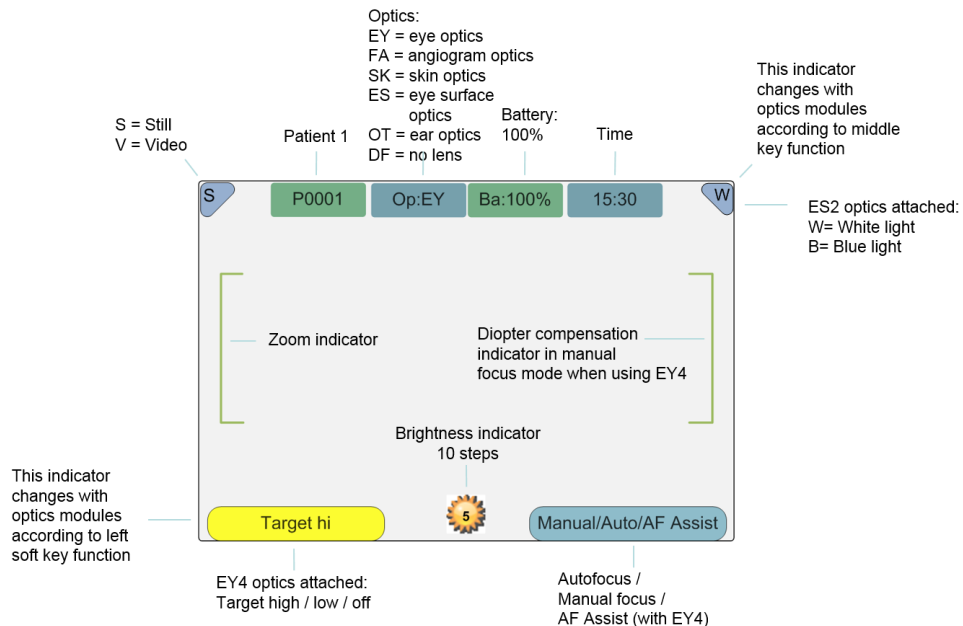
LED indicators:

The recharging and connection to PC is indicated with green (charging) and blue (connection) LED-lights:

Position	Indicator	Purpose
Left LED-indicator Green		Active when device is powered on, blinking when charging in cradle.
Right LED-indicator Blue		Active when devices is placed to the cradle and connected to a PC.

Graphical indicators:

These indicators are displayed on the top row of the display during imaging:



6. Usage environment requirements



CAUTION:

Smartscope is not suitable for use in the presence of flammable anaesthetics.

Smartscope is intended to be used inside in a normal room temperature and normal humidity. Do not use Smartscope in an environment where there is possibility that water condenses to or inside the Smartscope. Type of the power source is indicated in Chapter 16, Technical description.



CAUTION:

It is only allowed to attach USB cable and Power source provided in the sales package into the cradle. If you need replacement to the USB cable or Power source please contact Manufacturer or your own Retailer.

USB Cable must be connected only to the USB port of a PC computer that complies with the IEC 60950 standard. Avoid using excessive power or twisting the connector when connecting the USB cord to a PC.

Place PC and cradle outside the patient environment (at least 1,5 meters distance from the patient).

To transfer patient image data the device must be used together with a PC (Personal Computer) running either Microsoft Windows XP®, Window Vista®, Windows 7®. The device does not need any drivers to be installed on a PC.

Optomed recommends to use the 2 GB SD / 4 GB SDHC card, which is supplied with the device.

In case device has WIFI functionality, memory card is permanently installed.

Writing to the memory card from PC is not enabled by default.

Device can be used with all major patient database applications supporting both textual and image data recording.

The device must be used according to this manual, quick reference guide and / or information found on Optomed's website www.optomed.com.

Electromagnetic compatibility information and recommended separation distances between portable and mobile RF communications equipment and the Optomed Smartscope are given in the Appendix A.

7. Operating instructions

This chapter gives instructions for using the device. More specific instructions for using optics lenses are given in the optics lens specific chapters.

7.1. Preparations

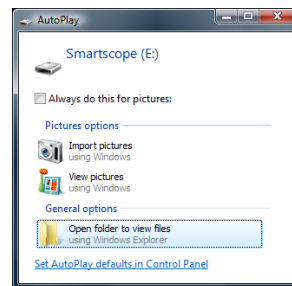
Smartscope is both charged and connected to PC (Personal Computer) using the provided cradle. When Smartscope is not used, it may be stored in the cradle. Storing device in the cradle is not harmful for the battery, because battery is charged only when charge is dropped below certain limit.

To connect Smartscope to the cradle gently place it to the connector hole. The device can be connected to the cradle with optics attached.

7.2. Connection to a PC

Image data transfer method to PC is similar as with a digital camera.

When connected to a PC running Microsoft Windows XP, Vista, 7 or 8, operating system displays query for AutoPlay. It is possible to select appropriate image viewing program or simply open the folder to view and then store files to the hard disk of the PC:



Writing to the memory card from PC is not enabled by default.

In case device has WIFI functionality, USB write protection must be turned off. WIFI enables wireless image transfer from camera to PC.

7.3. Basic use – starting up, shutting down and taking an image

Device is powered on by pressing left soft key.

It is possible to capture both still images and video. Image capture mode is changed from camera menu that opens by pressing right soft key for 1s.

Still image is captured using the dual action shutter to the second position. Video is captured by keeping the dual action shutter pressed down in the second position.

Taken image will stay on display until it is cleared by pressing right or left soft key. Image can be zoomed in instant preview by pressing middle key. There are four zoom levels. Pressing middle key activates the next level. Move around the image by using arrow keys.

To transfer images to a PC, place device to the cradle. The image transfer and charging is indicated with green and blue LED-lights and text on LCD-screen.

Smartscope verifies if image data is erased when:

- Device is powered on from power off mode or power save mode

- Device is removed from the cradle

It is recommended that image data storage is always erased with a new patient.

Device is powered off by keeping left soft key pressed down over 1 second.



NOTE:

When device is powered on, powered off or goes to standby mode the camera focus motor may make a sound. This sound is normal and is not a sign of any damage or problem.

7.4. Attaching and detaching optics module



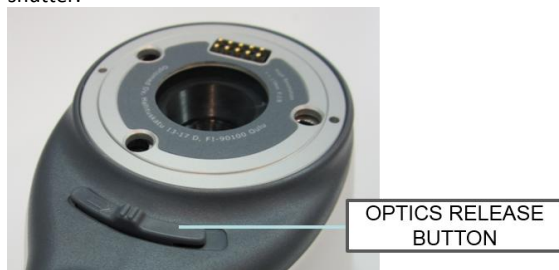
CAUTION:

Optic modules used with Optomed Smartscope M5 must include text "SMARTSCOPE". It is not allowed to attach other objects to the bayonet connector.

Optics is attached by placing it in front of the bayonet area of the device. Three bayonet legs are placed on the holes and optics is pressed firmly to the device:



Optics is released by sliding release button that is located in front of the device above the dual action shutter.

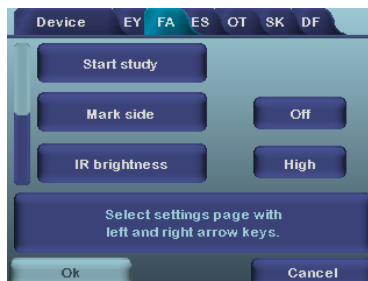


7.5. Device Menu

Menu is opened by pressing right soft key  for 1s.

Menu has six tabs. One is for device settings such as language selection. There is one tab for retinal imaging (EY), fundus angiogram imaging (FA), anterior eye imaging (ES), ear imaging (OT), skin imaging (SK) and general imaging (DF).

Arrow keys are used to move between tabs: use arrow key up until tab is active and use left and right arrow keys to change active tab. Light blue color indicates active tab.



Arrow keys change values in the menu. Active value is indicated with light blue color. Changed values are saved by using left soft key ("Ok") and cancelled by pressing right soft key ("Cancel"). Some values are confirmed by pressing the Middle key.

Table below includes explanations of the Device settings tab:

Setting	Values (default bolded)	Purpose
Preview images	Ok	To preview the images on camera press middle button.
New patient folder	Ok	To create a new patient folder press middle button. New patient folder can also be created in live view by long pressing the middle key.
Erase image memory	Ok	Select middle button to erase images and videos from camera SD card.
Display brightness	Low-Med-High	Use left and right arrow keys to adjust display brightness
Icons	On/Off	Show graphical icons when imaging.
Sounds	On/Off	When enabled, sound is played during image capture
Keyboard backlight	On/Off	When enabled, keyboard illumination is on
Select language	ENG-FIN-FRA-GER-ITA-JPN-POR-SPA-ZHO	Use left and right arrow keys to select camera language
USB write protection	On/Off	When enabled, writing to SD card is not allowed when device is in cradle. This feature helps prevent any viruses getting from PC to the camera.
Video file format	MPEG4/MPEG1	Use left and right arrow keys to select video file format
Image transfer method	UMS/WIA	Use WIA for automatic and UMS for end-user activated image transfer. UMS can be used in most cases.
Restore factory Setting	Ok	To restore all settings menus to factory defaults. Activate using the middle key
Date	DD-MM-YYYY	Use left and right arrow keys to set date. Use Middle key to select next field
Time	HH:MM	Use left and right arrow keys to set time. Use Middle key to select next field
Camera SW version	Show camera SW version	Browse version information with left and right arrow key
Start query	Era./Fol./None	Choose the startup query between memory erase, new patient folder or no query at all.
Set data cable type	CRA/SLI	This feature is currently not available
Remote trigger	On/Off	This feature is currently not available

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Preview images

Image preview is opened by selecting "Preview files" with a middle key. Images are browsed by using arrow keys. Display gives information about usage of the image preview.

Image can be zoomed while previewing by pressing middle key. Move around the image by pressing arrow keys. Change between the four zoom levels by pressing middle key.

Patient ID information can be edited in image browser.

New Patient Folder

A new patient folder is created by pressing middle key when the New patient folder selection is active in Device menu. A new patient folder can also be created by pressing Middle key for 3 seconds when in live view. If the current patient folder is empty a new folder cannot be created. Patient ID information can be edited after creating new patient folder.

Erase Image Memory

Image memory can be erased by selecting "Erase Image Memory" in Device menu. This selection is activated by pressing middle key. The camera also prompts the question "Erase image memory?" when camera is powered on or removed from cradle.

Display brightness

The Display brightness selection has three options: low, medium and high. Choose the suitable level of display brightness according to for example how the examination room is lit up.

Icons

The icons shown on camera screen can be enabled or disabled to the user's liking. The most essential icons such as Menu icon are always visible.

Sounds

By default the camera makes a sound during image capture. This sound can be turned off from Device menu.

Keyboard backlight

By default the camera keys have a backlight lit up when the camera is turned on. This light can be turned off from Device menu if it disturbs the user while taking images.

Language

The camera has nine different languages the user can choose from. Default language is English and the language selection is always shown in English in menu.

USB write protection

USB write protection is on by default. When protection is on this feature will prevent any virus from entering the camera from a PC when connected to the cradle.

In case device has WIFI functionality, USB write protection must be turned off.

Video file format

The camera has two file formats that user can choose for videos: MPEG4 and MPEG1. MPEG4 is a higher quality file format but may not be viewed with all video players. MPEG1 format is more widely supported by different SW applications.

Image transfer method

There are three options for the image transfer method: UMS (USB Mass Storage), WIA (Windows Image Acquisition) and WIFI.

Note: WIFI supported only if device has WIFI functionality.

Restore factory settings

By selecting “Activate” in Device menu “Restore factory defaults” selection the original factory settings will be returned.

Date

Date can be set using the left and right arrow keys. Move between day, month and year by pressing the middle key. Date format is DD MM YYYY for Finnish, German, French, Italian, Spanish, Portuguese. Date format is MM DD YYYY for Japanese and Chinese.

Time

Time can be set using the left and right arrow keys. Move between hours and minutes by pressing the middle key.

Camera SW version

This item in Device menu tells the camera SW version.

Start query


User can choose start-up query between erasing images, creating new patient folder or no query at all. When erasing images is chosen as the query the camera will prompt user on start-up whether all images and videos shall be deleted. When new patient folder query is chosen the camera will ask if a new patient folder shall be created upon start-up to prevent from mixing images with previous patient. If no query is selected then camera will go directly to live view upon start-up.

7.6. Adjusting focus and automatic focus

The camera has an autofocus function where camera finds correct focus place automatically. Automatic focusing start when shutter is pressed half way down (icon at the top right corner of the display shows icon “A”). The focus mode (Auto / Manual / AF assist) can be changed by pressing right soft key.

Image focus can be adjusted manually by pressing arrow keys up and down. When focus mode is set to manual and EY4 optics is attached a dioptre scale is visible on the screen.

7.7. Reset button

Reset button can be used if device behaviour is abnormal. Reset button is located in a small opening under display. Button is marked with circle. 



Reset button can be pressed with a thin object such as a paper clip.
Button needs to be pressed for over 7 seconds.

8. Retinal imaging using optics module Smartscope EY4

Optomed Smartscope EY4 digital ophthalmic camera is intended to capture digital images and video of the fundus of the human eye. The device set for retinal imaging consists of:

- Camera handset M5
- Attachable ophthalmic lens EY4
- Eye cup for EY4
- Cradle for charging and image transfer

Smartscope EY4 is intended for non-mydriatic imaging. This means that infrared is used for targeting image to the eye fundus and visible light is flashed when image is taken. Pupil does not respond to the infrared light so examination is convenient for the patient. Constant illumination can be selected from device menu if mydriatic drops are used. Pictures can also be taken using infrared light for both aiming and capturing.

Smartscope EY4 has 9 internal fixation targets for the patient to fixate at while imaging. Below section will guide how to control the fixation lights.

STEPS FOR RETINAL IMAGING:

1. The examination room should be as dark as possible.
2. Both the patient and the examiner shall be seated while taking the images.
3. Either autofocus or manual focus can be used. Autofocus range is -11 to +3 diopters, manual focus range is -20 to +20 diopters.

If patient has a refractive error and **autofocus is off**, focus need to be adjusted:

- Hyperopia: camera is focused to distance by pressing arrow key up. One click of the key is approximately 1 Dioptre.
- Myopia: camera is focused closer by pressing arrow key down. One click of the key is approximately 1 Dioptre.

4. **Aiming light is automatically turned on** when camera enters live view.
5. **The middle fixation target is lit** when pressing left soft key and it by default providing a macula centred image. To change the fixation target press Left Soft Key and use arrow keys to navigate between the 9 targets as shown in the graphics in lower left corner of the display. If fixation target is turned off ask patient to look at a target in a wall 2-3 meters behind the operator.
6. Light is adjusted using left and right arrow key. There are altogether 10 brightness levels. Default value is 5. Suitable illumination is typically 2 to 8. When using IR/White capture mode changing illumination brightness affects only the white capturing flash. If using IR/IR or White/White both aiming and capturing light are changed.

7. **Aim help circle on the screen guides user when to take image.** When retina is not fully in view the circle is red. Once the aim is good and retina fully appears on screen the circle turns green indicating a good moment for capturing the image.
8. Approaching the eye is started from 10 centimetres (4 inch) distance. If internal fixation target is not used patient is asked to look at a target in a wall 2-3 meters behind the operator (patient's eye targets to infinity and stays still). Pupil is approached until the reflection from the eye fundus can be seen. The right imaging distance is about 2 cm (0,8 inch). Eye cup must be compressed approximately half way down. Aim help circle on the display guides to take image once it turns from red to green.

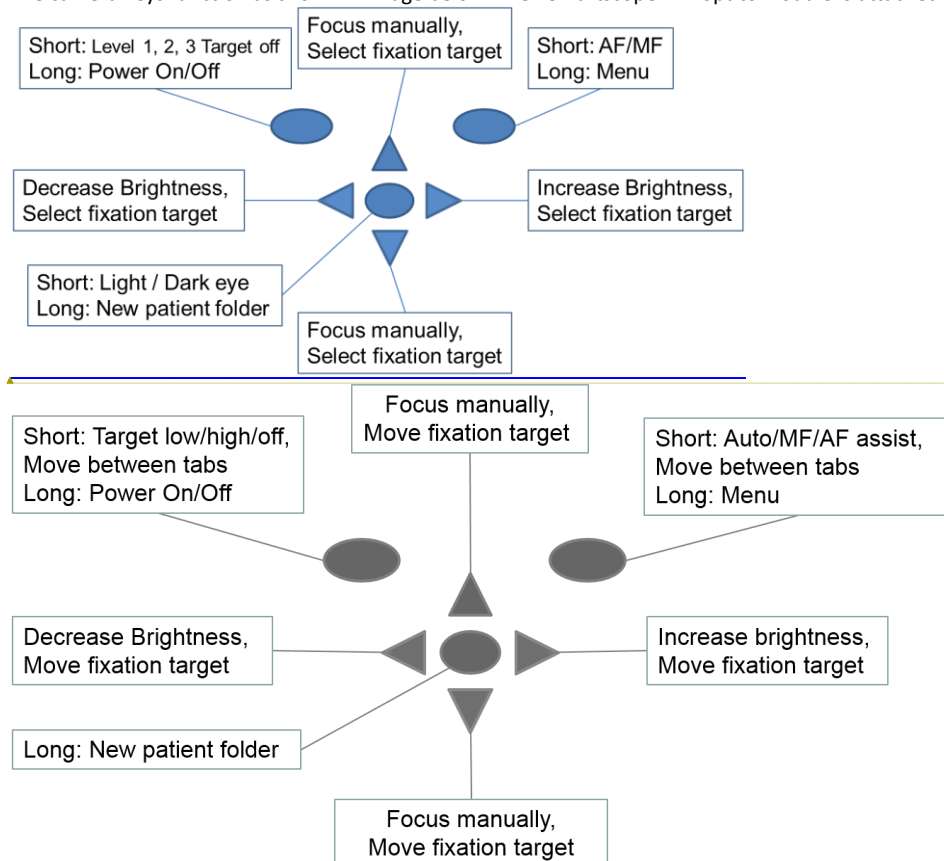
Camera is stabilised by keeping the outer side of the hand against the patient's forehead. Example of the correct usage position is shown below:



9. Still image is captured by pressing the shutter key all the way down. Video is captured by keeping shutter down. Taken image is displayed on screen until user clears the image by pressing shutter, left or right soft key. Image can be zoomed in instant preview by pressing middle key. There are four zoom levels. Pressing middle key activates the next level. Move around the image by using arrow keys.
10. If multiple patients are examined during one session, new file folder is created for each patient by pressing middle key for over 3 seconds.
11. Transfer images to a PC after capturing images. Images are transferred to the PC when camera is placed to the cradle. Smartscope works as any other digital camera.
12. To erase the image/video manually, choose Menu, then Preview Images. There will be an option to erase a specific image or a specific folder.
13. When camera is removed from the cradle it verifies image data storage erase. It is recommended that image data storage is always erased before images are captured of a new patient.

The camera keys function as shown in image below when Smartscope EY4 optics module is attached:

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Below table provides explanations for the key functions:

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Key	Press	Function	Explanation
Left soft key	Short	Control Fixation target level and selection	Fixation target is off by default and can be turned on by pressing left soft key. Fixation target light has two levels: Low and High . If the patient cannot see the light on low level turn it up to high .
	Long	Power On / Off	Camera is powered on and off by pressing the Left soft key for longer than 2s.
Right soft key	Short	Manual / Auto / AF assist	Switch between focus modes by pressing Right soft key. Manual focus is on by default . Autofocus range is -11 to +3 diopters, manual focus range is -20 to +20 diopters.
	Long	Open Menu	Enter camera menu by pressing Right soft key for longer than 1s.

Middle key	Long	New patient folder	If multiple patients are examined during a same session, it is recommended to create a new file folder for each patient's images. New folder is created by pressing middle key for 3 seconds. Icon P at the top of the screen indicates number of the current patient folder. If the current folder does not have any images in it, a new folder cannot be created.
Left/Right arrow	-	Change brightness	Use left and right arrow keys to adjust capture light brightness. Icon above left soft key must be selected (lighter color) to change brightness.
		Move fixation target	Move between 9 internal fixation targets. Icon above left soft key turns to lighter color when fixation target selection mode is active.
Up/Down arrow	-	Focus manually	When manual focus is active use up and down arrow keys to focus. Press arrow key up when patient has myopia. Press arrow key down when patient has hyperopia.
		Move fixation target	Move between 9 internal fixation targets. Icon above left soft key turns to lighter color when fixation target selection mode is active.

Table below includes explanations of the EY settings tab for retinal imaging:

Setting	Values (default bolded)	Purpose
Capture mode	Still / Video	Use left and right arrow keys to choose between still capture and video capture.
Mark side	On/ Off	Mark side of the eye to the image data.
IR brightness	Low/ High	Aiming light brightness.
Red-free	On /Off	Saves a copy of an eye image using green color channel only.
Save IR image	On/ Off	Saves an image taken with IR light in addition to white light image when turned on.
Color correction	On/ Off	Capture color corrected copy in addition to normal fundus image.
Illumination mode	IR/Wh , IR/IR, Wh/Wh	Use left and right arrow keys to select aiming and capture light source.
Target blinking	On / Off	Fixation target light can be set to constant if needed.

Capture mode

Both still images and video can be taken with the Smartscope M5 camera. When taking video the shutter button must be held down while taking the video. The video recording will stop once the shutter button is released.

Marking side

It is possible to mark which eye was imaged. Marking side is enabled from the menu. When On side is marked to the file name and to the image. For video files, side is always marked only to the file name.

When marking side is enabled, camera verifies side after each captured image.

Identifiers used for eye images are OS for left and OD for right.

IR brightness

It is possible to set the aiming light brightness.

Save Red-free

If red-free image is enabled from menu, then camera will save a picture using only green channel at the same time when saving original picture.

Save IR image

If Save IR image is enabled from menu the camera will save an image taken with IR image in addition to saving a colour image taken with white light.

Color correction

It is possible to capture color corrected image.

Illumination mode

Illumination mode can be set to IR/White, IR/IR or White/White. In IR/White mode aiming is done using infrared light and image is captured using white light. The pupil does not react to infrared light and thus it is recommended to use IR/White mode whenever possible. In IR/IR mode both aiming and image capture are done with infrared light. In White/White mode aiming and image capture are done with white light

Camera stores selected menu settings when it is powered off.

Target blinking

By default the fixation target light is on with blinking illumination. If patient cannot keep their eye targeted well the light can be changed to constant to help focus on the target light.

9. Eye imaging using anterior ophthalmic module Smartscope ES2

Optomed Smartscope ES2 is intended to capture images and video of the surface of the human eye and surrounding areas. The device set for anterior ophthalmic imaging consists of:

- Camera handset M5
- Attachable anterior ophthalmic lens ES2
- Cradle for charging and image transfer

Smartscope ES2 optics module has two light sources, white and cobalt blue light. User can choose between the light sources by pressing middle key when ES2 module is attached. Cobalt blue light enables taking fluorescent pictures of the surface of the eye to reveal any cuts or defects.

STEPS FOR EYE SURFACE IMAGING:

1. After ES2 optics module is attached the light source is chosen by pressing middle key.
2. Still or video image is selected. Selection is made in ES menu.
3. **It is recommended to use autofocus.**
4. **Aiming light is turned on** by pressing the shutter key (in front of the device) half way down.
5. Light is adjusted using left and right arrow key. There are altogether 10 brightness levels. Default value is 5. Suitable illumination is typically 2 to 8.
6. Place the optics module cup on patient's eye. Patient can be asked to look at different directions depending on what area of the eye needs to be captured.

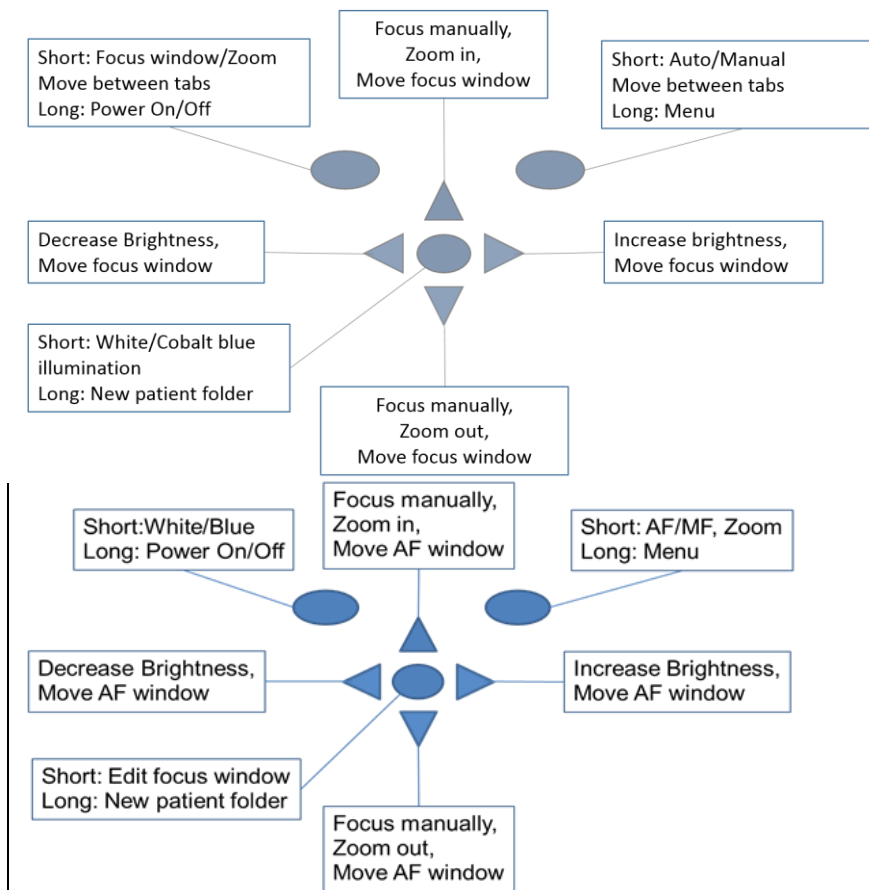
Camera is stabilised by keeping the outer side of the hand against the patient's forehead. Example of the correct usage position is shown below:



7. Still image is captured by pressing the shutter key all the way down. Video is captured by keeping shutter down. Taken image is displayed on screen until user clears the image by pressing shutter, left or right soft key. Image can be zoomed in instant preview by pressing middle key. There are four zoom levels. Pressing middle key activates the next level. Move around the image by using arrow keys.

8. If multiple patients are examined during one session, new file folder is created for each patient by pressing middle key for over 3 seconds.
9. Transfer images to a PC after capturing images. Images are transferred to the PC when camera is placed to the cradle. Smartscope works as any other digital camera.
10. Erase manually image / video by choosing Menu – Preview images. There can be chosen either the specific image or the specific folder to be erased.
11. When camera is removed from the cradle it verifies image data storage erase. It is recommended that image data storage is always erased before images are captured of a new patient.

The camera keys function as shown in image below when ES2 optics module is attached:



Below table provides explanations for the key functions:

Key	Press	Function	Explanation
Left soft key	Short	Edit focus window/ Activate Zoom	When focus window is visible it is possible to move it using arrow keys to better capture the wanted area. Digital zoom can be used for close up of features and image focus. Icon "Z" displayed in up right corner of display when active. Zoom value is saved to camera memory.
	Long	Power On / Off	Camera is powered on and off by pressing the Left soft key for longer than 2s.
Right soft key Right soft key	Short Short	Auto / Manual focus / Activate Zoom	Switch between Auto and Manual focus by pressing Right soft key. Press Right soft key to activate zoom function. Digital zoom can be used for close up of features and image focus. Icon "Z" displayed in up right corner of display when active. Zoom value is saved to camera memory.
	Long	Open Menu	Enter camera menu by pressing Right soft key for longer than 1s.
Middle key	Short	White / Blue	Choose between white and blue illumination by pressing left soft key. Blue light can be used with fluorescent applied on the eye to reveal any cuts or defects.
	Long	New patient folder	If multiple patients are examined during a same session, it is recommended to create a new file folder for each patient's images. New folder is created by pressing middle key for 3 seconds. Icon P at the top of the screen indicates number of the current patient folder. If the current folder does not have any images in it, a new folder cannot be created.
Left/Right arrow	-	Change brightness	Use left and right arrow keys to adjust capture light brightness.
	-	Move AF window	Move focus window left and right after pressing Middle key to activate. Window returns to original position when camera is put to cradle, turned off or optics module detached.
Up/Down arrow	-	Focus manually	Use up and down arrows to focus manually.
	-	Zoom In / Out	Zoom in using arrow key up. Zoom out using arrow key down. There are four zoom levels: 1,2,4 and 6. Zoom value is saved to camera memory.
	-	Move AF window	Move focus window left and right after pressing Middle key to activate.

Table below includes explanations of the ES settings tab for anterior eye imaging:

Setting	Values (default bolded)	Purpose
Capture mode	Still / Video	Use left and right arrow keys to choose between still capture and video capture.
Focus windows	Visible /Hidden	Use left and right arrow keys to choose between having focus window visible or hidden.
Mark side	On/ Off	Mark side of the eye to the image data.

Zoom cropping	On/Off	When turned on camera will save the zoomed area only. When turned off camera will save the whole image area even when zoom is used.
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Capture mode

Both still images and video can be taken with the Smartscope M5 camera. When taking video the shutter button must be held down while taking the video. The video recording will stop once the shutter button is released.

Focus Window

Focus Window helps user position the image. The Focus Window can be moved on the screen by first pressing Left soft key until icon "F" appears in up right corner of display and then using the arrow keys when aiming.

Marking side

It is possible to mark which eye was imaged. Marking side is enabled from the menu. When On side is marked to the file name and to the image. For video files, side is always marked only to the file name.

When marking side is enabled, camera verifies side after each captured image.

- Identifiers used for normal eye images are OS for left and OD for right.
- Identifiers used for red-free images are SG for left and DG for right.
- Identifiers used for save IR images are SI for left and DI for right.
- Identifiers used for color corrected images are SC for left and DC for right.

Zoom cropping

With zoom cropping on the camera will save the zoomed area instead of the whole image area. By default zoom cropping is turned off and camera will save the whole image area instead of the area that is visible on the camera screen when user has zoomed in.

Camera stores selected menu settings when it is powered off.

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10. Fluorescein Angiography imaging using optics module Smartscope FA

Optomed Smartscope FA digital ophthalmic camera is intended to capture digital images of the fundus angiography of the human eye. The device set for fundus angiography imaging consists of:

- Camera handset M5
- Attachable Smartscope FA
- Eye cup for EY4
- Cradle for charging and image transfer

Infrared is used for targeting image to the eye fundus and blue light is flashed when image is taken. Pupil does not respond to the infrared light so examination is convenient for the patient.

Smartscope FA has 9 internal fixation targets for the patient to fixate at while imaging. Below section will guide how to control the fixation lights.

STEPS FOR RETINAL IMAGING:

1. The examination room should be as dark as possible.
2. Both the patient and the examiner shall be seated while taking the images.
3. When using Smartscope FA optics, the device should be mounted on a slit lamp base using Slit lamp Adapter, its mandatory to achieve good images.
4. Either autofocus or manual focus can be used. Autofocus range is -11 to +3 diopters; manual focus range is -20 to +20 diopters.

If patient has a refractive error and autofocus is off, focus need to be adjusted:

- Hyperopia: camera is focused to distance by pressing arrow key up. One click of the key is approximately 2 Dioptres.
- Myopia: camera is focused closer by pressing arrow key down. One click of the key is approximately 2 Dioptres.

5. Aiming light is automatically turned on when camera enters live view.

6. The middle fixation target is lit ~~when pressing left soft key and it by default~~ [providing](#) a macula centred image. To change the fixation target press Left Soft Key and use arrow keys to navigate between the 9 targets as shown in the graphics in lower left corner of the display. If fixation target is turned off ask patient to look at a target in a wall 2-3 meters behind the operator.
7. Light is adjusted using left and right arrow key. There are altogether 10 brightness levels. Default value is 5. Suitable illumination is typically 2 to 8. Changing illumination brightness affects only the blue capturing flash.

8. Aim help square on the screen guides user when to take image. When retina is not fully in view the square is red. Once the aim is good and retina fully appears on screen the Square turn's green indicating a good moment for capturing the image.
9. Approaching the eye is started from 10 centimetres (4 inch) distance. Pupil is approached until the reflection from the eye fundus can be seen. The right imaging distance is about 2 cm (0,8 inch). Silicone support must be compressed approximately half way down. Aim help square on the display guides to take image once it turns from red to green.

Camera is stabilised by keeping the outer side of the hand against the patient's forehead. Example of the correct usage position is shown below:

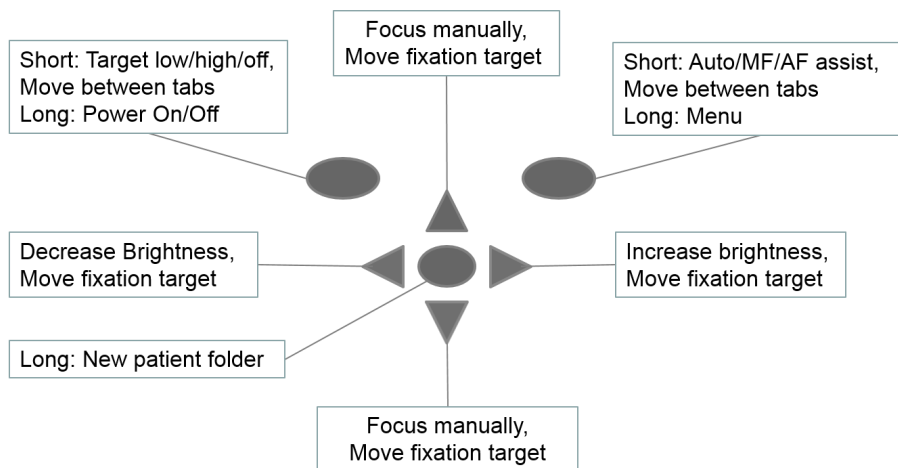


10. Still image is captured by pressing the shutter key all the way down. Video is captured by keeping shutter down. Taken image is displayed on screen until user clears the image by pressing shutter, left or right soft key. Image can be zoomed in instant preview by pressing middle key. There are four zoom levels. Pressing middle key activates the next level. Move around the image by using arrow keys.

This Instant Preview can be enabled/ disabled in the Smartscope FA optics menu.

11. If multiple patients are examined during one session, new file folder is created for each patient by pressing middle key for over 3 seconds.
12. Transfer images to a PC after capturing images. Images are transferred to the PC when camera is placed to the cradle. Smartscope works as any other digital camera.
13. When camera is removed from the cradle it verifies image data storage erase. It is recommended that image data storage is always erased before images are captured of a new patient.

The camera keys function as shown in image below when Smartscope FA optics module is attached:



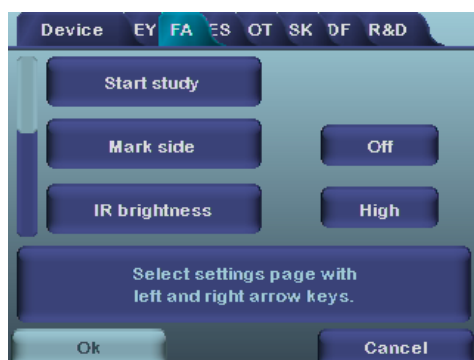
Below table provides explanations for the key functions:

Key	Press	Function	Explanation
Left soft key	Short	Control Fixation target level and selection	Fixation target is off by default and can be turned on by pressing left soft key. Fixation target light has two levels: Low and High. If the patient cannot see the light on low level turn it up to high.
	Long	Power On / Off	Camera is powered on and off by pressing the Left soft key for longer than 2s.
Right soft key	Short	Manual / Auto	Switch between focus modes by pressing Right soft key. Manual focus is on by default. Autofocus range is -11 to +3 diopters, manual focus range is -20 to +20 diopters.
	Long	Open Menu	Enter camera menu by pressing Right soft key for longer than 1s.
Middle key	Long	New patient folder	If multiple patients are examined during a same session, it is recommended to create a new file folder for each patient's images. New folder is created by pressing middle key for 3 seconds. Icon P at the top of the screen indicates number of the current patient folder. If the current folder does not have any images in it, a new folder cannot be created.
Left/Right arrow	-	Change brightness	Use left and right arrow keys to adjust capture light brightness. Icon above left soft key must be selected (lighter color) to change brightness.
		Select fixation target	Move between 9 internal fixation targets. Icon above left soft key turns to lighter color when fixation target selection mode is active.
Up/Down arrow	-	Focus manually	When manual focus is active use up and down arrow keys to focus. Press arrow key up when patient has myopia. Press arrow key down when patient has hyperopia.
		Select fixation target	Move between 9 internal fixation targets. Icon above left soft key turns to lighter color when fixation target selection mode is active.

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Table below includes explanations of the FA settings tab for fundus Angiography imaging:

Setting	Values (default bolded)	Purpose
Start Study		This enables the study to start. For every new study, user needs to go into the menu and start study to enable the study or Time counter.
Mark side	On/ Off	Mark side of the eye to the image data.
IR brightness	Low/ High	Aiming light brightness.
Instant Review	On /Off	Instant review can be ON/OFF according to user need, as available in FA Optics menu.
Target Blinking	On/ Off	By default the fixation target light is on with constant illumination. If patient cannot keep their eye targeted well the light can be changed to blink to help focus on the target light.
Calibration Frequency	(5,10, user)	User can manually set calibration frequency of the optics.



Start Study

This enables the study to start. For every new study, user needs to go into the menu and start study to enable the study or Time counter.

Marking side

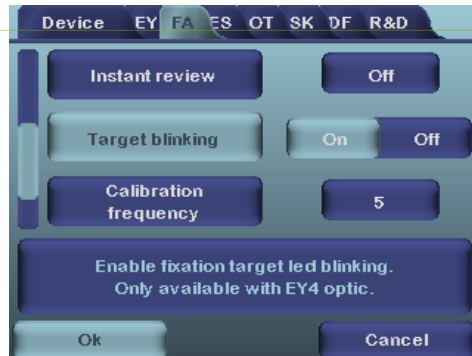
It is possible to mark which eye was imaged. Marking side is enabled from the menu. When On side is marked to the file name and to the image. For video files, side is always marked only to the file name.

When marking side is enabled, camera verifies side after each captured image.

Identifiers used for eye images are OS for left and OD for right.

IR Brightness

IR brightness values are Low/Med/High. This can be chosen by user by using left and right arrow keys. Always high is recommended.



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Instant review

Instant review can be ON/OFF according to user need, as available in FA Optics menu.

Target blinking

By default the fixation target light is on with constant illumination. If patient cannot keep their eye targeted well the light can be changed to blink to help focus on the target light.

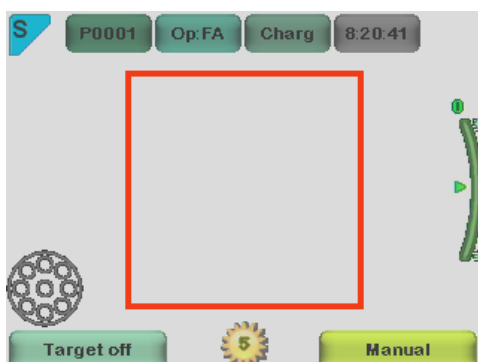
Calibration Frequency

User can manually set calibration frequency of the optics. For Example User selects 5, the device won't calibrate until next five consecutive images taken

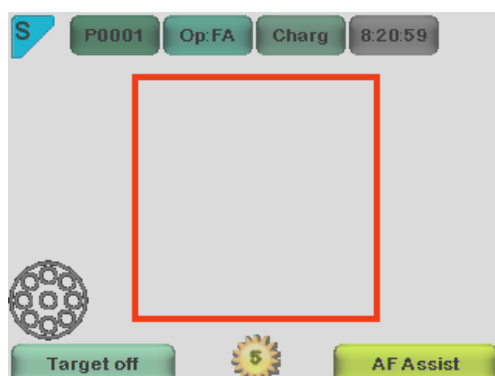
Camera stores selected menu settings when it is powered off.

Menu:

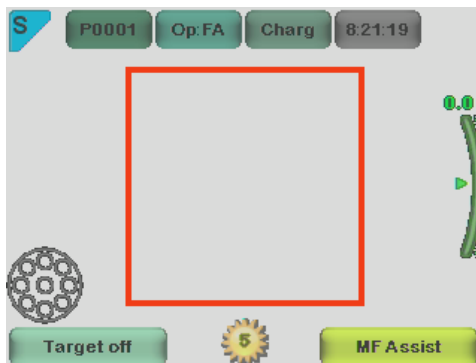
1. Default Display window when FA optics is attached using Manual Mode. You can adjust the dioptre scale according to patient diopter manually. Image can be taken when shutter button pressed long way.
2. op:FA → Optics recognized as FA for fundus angiography imaging.



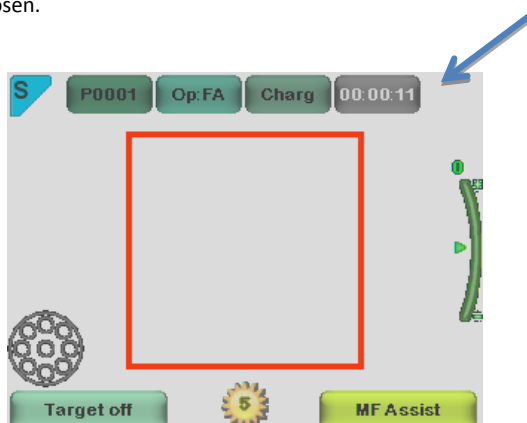
3. Default Display window when FA optics is attached using AF Assist mode. Diopter scale is automatically adjusted, Image can be captured when shutter button is pressed half a way.



4. Default Display window when FA optics is attached using MF Assist mode. Diopter scale is manually adjusted, Image can be captured when shutter button is pressed half a way.



5. When Right Arrow key is long pressed, Menu table appears on display. Default Device tab will be ON. By using left and right arrow keys you slide to the next tab. Here FA tab is chosen.



Time Counter:

Start study is selected from the FA optics menu. After pressing shutter button half a way for one time during the live view screen. Time counter will be ready appearing on the upper right (pointed with arrow on the image).

Time counter will be printed on the final images.

Time counter will guide you through out through the all phases of Angiography.

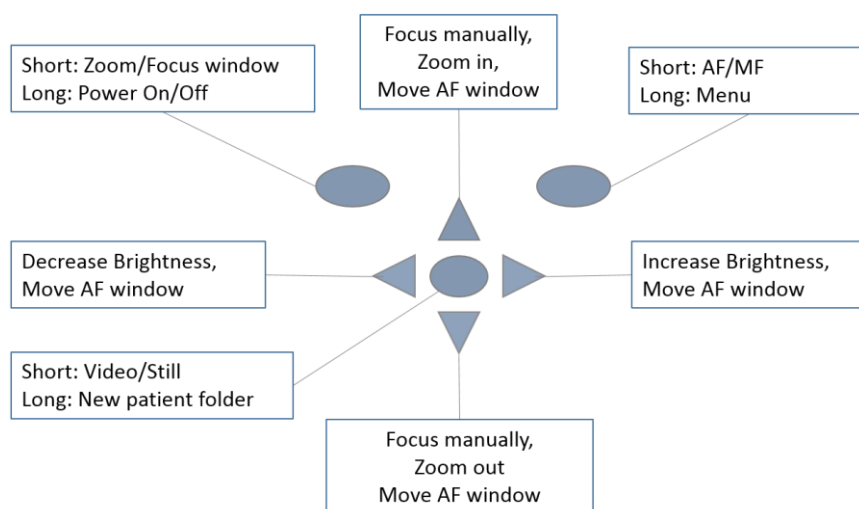
To stop the time counter after finishing the study, user need to switch to FA optics menu and press the STOP STUDY button.

11. General imaging without optics module

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It is possible to take pictures using Smartscope M5 without any optics module. When taking images without additional optics, integration time that corresponds to the brightness of the image is adjusted using left and right arrow key. Indicator for integration time is shown at the bottom of the display.

Below picture shows the functions of camera keys when no optics is attached.



Below table provides explanations for the key functions.

Key	Press	Function	Explanation
Left soft key	Short	Edit focus window/ Activate Zoom	When focus window is visible it is possible to move it using arrow keys to better capture the wanted area. Digital zoom can be used for close up of features and image focus. Icon "Z" displayed in up right corner of display when active.
	Long	Power On / Off	Camera is powered on and off by pressing the Left soft key for longer than 2s.
Right soft key	Short	Auto / Manual focus	Switch between Auto and Manual focus by pressing Right soft key.
	Long	Open Menu	Enter camera menu by pressing Right soft key for longer than 1s.
Middle key	Short	Still / Video	Choose between still image and video shooting by pressing left soft key.
	Long	New patient folder	If multiple patients are examined during a same session, it is recommended to create a new file folder for each patient's images. New folder is created by pressing middle key for 3 seconds. Icon P at the top of the screen indicates number of the current patient folder. If the current folder does not have any images in it, a new folder cannot be created.

Left/Right arrow	-	Change brightness	Use left and right arrow keys to adjust capture light brightness.
	-	Move AF window	Move focus window left and right after pressing Middle key to activate. Window returns to original position when camera is put to cradle, turned off or optics module detached.
Up/Down arrow	-	Focus manually	Use up and down arrows to focus manually.
	-	Zoom In / Out	Zoom in using arrow key up. Zoom out using arrow key down. There are four zoom levels: 1,2,4 and 6.
	-	Move AF window	Move focus window left and right after pressing Middle key to activate.

Table below includes explanations of the DF settings tab for general imaging:

Setting	Values (default bolded)	Purpose
Capture mode	Still / Video	Use left and right arrow keys to choose between still capture and video capture.
Focus window	Visible /Hidden	Use left and right arrow keys to choose between having focus window visible or hidden.
Zoom cropping	On /Off	When turned on camera will save the zoomed area only. When turned on camera will save the whole image area even when zoom is used.

Capture mode

Both still images and video can be taken with the Smartscope M5 camera. Capture mode can be chosen in DF menu and left soft key when in live view. When taking video the shutter button must be held down while taking the video. The video recording will stop once the shutter button is released.

Focus Window

Focus Window helps user position the image. The Focus Window can be moved on the screen by first pressing Middle key until icon "F" appears in up right corner of display and then using the arrow keys when aiming.

Zoom cropping

With zoom cropping on the camera will save the zoomed area instead of the whole image area. By default zoom cropping is turned off and camera will save the whole image area instead of the area that is visible on the camera screen when user has zoomed in.

Camera stores selected menu settings when it is powered off.

11.12. Error messages

Optomed Smartscope M5 will display error messages about the limitations of the usage. Error message is always displayed with explanatory message providing information about possible actions.

List of the all possible error messages:

Error message:	What to do:
Memory full	Memory is full and you must empty memory card.
Optics type not detected	Reconnect optic lens. Contact maintenance if lens does not connect.
Optic failure # Please detach the optic and restart the camera.	Restart camera and reconnect optics lens. Contact maintenance if lens does not connect. The number after text "Optic failure" is an error code that can be needed by Optomed service team.
Image storage not found	Open battery cover and check the connection of SD / SDHC card. In case device has WIFI functionality contact Customer Service.
Battery error	Battery is either not well in place or has been damaged. Try to reattach battery or change it to a new one.
Light source temperature is too high	Restart camera and reconnect optics lens.

12.13. Cleaning instructions

Optomed Smartscope M5 is a precision optics instrument that should be handled with care. Please note following cleaning instructions:

- Shut down device before cleaning it
- Remove cradle from mains before cleaning it
- Disinfect housing with soft cloth moistened with alcohol (e.g. 70% ethanol). Avoid touching System connectors in the handset and cradle.
- Lenses may be cleaned with cleaning cloth. Also moist-cleaning tissue such as Hama Pro-Optic® cleaning tissue can be used.

Optomed Smartscope is not intended to be sterilized.

Clean Eye optics and Eye surface optics eye cup before each use on a new patient:

- disinfect eye cup with soft cloth moistened with alcohol (e.g. 70% ethanol), or
- soak eye cup in glutaraldehyde based solution, or hydrogen peroxide and peracetic acid solution such as Erisan OXY+
- rinse the eye cup under running water
- dry the eye cup (e.g. with clean paper towel) before subsequent use

If replacement for eye cup is needed, please contact Optomed or your own retailer.

Eye cup should be replaced if/when:

- the eye cup is discolored
- the eye cup form is deteriorated
- the eye cup is shattered, cracked or disintegrated



CAUTION:

Clean eye cup before each use on a new patient to avoid contamination.

~~13.14.~~ Device maintenance

Optomed Smartscope contains rechargeable Ni-MH battery pack. Service life of the battery is approximately 1-2 years. Battery needs to be replaced on planned intervals. When battery is at end of its service life, usage time of the device goes down.

Appendix B gives instructions for battery replacement.

There are no other maintenance procedures that can be carried out by the user. All servicing and repairs other than replacing the battery must be carried out by Optomed or Optomed certified service facilities and service personnel. Optomed Oy will make available work instructions to repair those parts of medical electrical equipment that Optomed Oy has designated as repairable by service personnel.



CAUTION:

If there are breaks in the device covers or other visual defects, contact Optomed Oy or Optomed certified service facility.

14.15. Technical description

CAMERA:

Type:	OPTOMED SMARTSCOPE M5
Image sensor:	CMOS, 5.0 Megapixels
Image memory type:	2 GB, micro SD card.
Display:	2.4", TFT-LCD, 262 000 colors, antireflective coating
Image format:	JPEG (file extension: jpg)
Video format:	MPEG-4 and MPEG-1
Connectivity:	PC with USB port
Operating systems:	Windows XP®, Windows Vista®, Windows 7, Windows 8 No driver installation needed.
Dimensions:	82,30(w) x166,50(h) x 66,50(d) mm
Weight:	400 g
Battery:	Rechargeable Ni-MH Cylindar cell, HR4U 700 AAA, 4.8 V, 1.0 Ah User can change battery. Batteries provided by Optomed.
Usage time:	1h 30min with full battery



CHARGING CRADLE:

Type:	OPTOMED SMARTSCOPE CRADLE V1
Dimensions:	170(w) x 35(h) x 150(d) mm
Weight:	380 g
Switching power supply connected to cradle:	Type: CINCON TR10R090, Input: 100-240 V ~0.4A 47-63 Hz, Output: 9V, 1.1A, 10 W
USB cable:	Type A to mini B, high-speed, unshielded, length 1,8 m



CAUTION:

It is only allowed to attach Battery and Power source provided in the sales package into the Cradle. If you need replacement to the Battery or Power source, please contact Optomed Oy or your own Retailer.

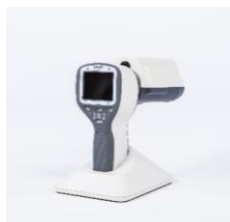
NON-MYDRIATIC OPHTHALMIC MODULE CONNECTED TO THE SMARTSCOPE M5 CAMERA

Type:	Smartscope EY4
Intended use:	Intended to capture digital images and video of the fundus of the human eye.
Illumination:	Infrared LED for targeting Visible white LED for photographing , 10 illumination brightness levels 9 red Internal fixation target LEDs
Maximum Luminance output level towards eye:	95,8 cd/cm ²
Field of view:	40°
Dioptrre compensation:	- 20 D to + 20 D
Image resolution:	1536x1152 px (total 1,8 Mpix, informational area 1,41 Mpix)
Dimensions:	160x73mm
Weight:	310 g



FUNDUS ANGIOGRAPHY MODULE CONNECTED TO THE SMARTSCOPE M5 CAMERA

Type:	Smartscope FA
Intended use:	Intended to capture digital images of the fundus angiograms of the human eye.
Illumination:	Infrared LED for targeting Blue LED for photographing, 10 illumination brightness levels 9 red internal fixation target LEDs
Maximum Luminance output level towards eye:	8,07 cd/cm ²
Field of view:	40°
Dioptrre compensation:	- 20 D to + 20 D
Image resolution:	1536x1152 px (total 1,8 Mpix, informational area 1,41 Mpix)
Dimensions:	160x73mm
Weight:	310 g



Comment [I1]: 8,07 cd/cm²

EXTERNAL OPHTHALMIC MODULE CONNECTED TO THE SMARTSCOPE M5 CAMERA

Type:	Smartscope ES2
Intended use:	Digital eye anterior optics module. Intended to capture digital images and video of the surface of the human eye and surrounding areas.
Illumination:	Visible white and cobalt blue LED for photographing, 10 illumination brightness levels
Maximum Luminance output level towards eye:	192 cd/cm ²
Image resolution:	2560x1920 px
Dimensions:	79x70 mm
Weight:	90 g



ENVIRONMENTAL CONDITIONS FOR USE, STORAGE AND TRANSPORTATION:

IP Code: IPX0 (Equipment not protected against the ingress of water)

Intended to be use indoors:

Temperature, use: + 10 °C to 35 °C
Relative humidity, use: 10 % to 80 %
Atmospheric pressure: 800 hPa to 1060 hPa
Please note also EMC information given in Annex A.

Temperature, storage - 10 °C to 40 °C
Relative humidity, storage: 10 % to 95 %
Atmospheric pressure: 500 hPa to 1060 hPa

NOTE: If stored over 1 month, it is recommended to remove battery. Appendix B gives instructions for removing the battery.

Transported in protective aluminium carrying case:

Temperature: - 40 °C to + 70 °C
Relative humidity: 10 % to 95 %
Atmospheric pressure: 500 hPa to 1060 hPa
Sinusoidal vibration: 10 Hz to 500 Hz: 0,5 g
Shock: 30 g, duration 6 ms
Bump: 10 g, duration 6 ms



CAUTION:

Do not leave the eye cup in direct sunlight as it may warm up and burn patients head when taking image.

SERIAL NUMBERING:

Sticker indicating serial number of the Handset is attached to the Warranty certificate and in the sticker next to system connector. Warranty certificate is part of this user's manual

Serial number of the cradle is in a sticker attached to the underside of the cradle.

Serial numbers of the attachable optics modules are attached to the modules and also to the Warranty certificate.

Year of manufacture is can be found from the serial number (digits 3 to 4).

SW version is displayed in the device menu.

EXPECTED USAGE LIFE OF THE SMARTSCOPE:

There are no strict limitations on expected usage life of the Smartscope. Usage life is approximately five years.

INTELLECTUAL PROPERTY RIGHT INFORMATION:

Windows XP, Windows Vista, Windows 7 and Windows 8 are trademarks of Microsoft Corporation.

Hama Pro-Optic is a trademark of Hama GmbH & Co KG.

Erisan OXY+ is a trademark of Farnos Ltd

DISPOSING THE OPTOMED SMARTSCOPE M5:

Do not dispose Optomed Smartscope M5 as unsorted municipal waste. Prepare Optomed Smartscope M5 for reuse or separate collection as specified by Directive 2002/96/EC of the European Parliament and Council of the European Union on Waste Electronic and Electrical Equipment (WEEE). If this product is contaminated, this directive does not apply.

For more specific information, please contact Optomed Oy or your own retailer.

CONTACT

If you wish to contact your local support personnel please call to:

+358 20 741 3380 or email to us at service@optomed.com

15.16. Warranty

Optomed Oy gives device a 1 year warranty for the parts and labor. Warranty for battery is 6 months.

Submitting claim:

Any claim under this warranty must be submitted in writing before the end of warranty period to Optomed Oy. The claim must include a written description of the failure that the device have.

Warranty does not cover:

Products that have been subjected to abuse, accident, alternation, modification, tampering, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation of the product, or if the model or serial number has been altered, tampered with, defaced or removed. Warranty does not cover damage caused by dropping the device or damage caused by normal wearing. Any issue related to the stickers attached to the device coming off are not covered by warranty. Repair or service done by non Optomed certified service facility is not covered by warranty.

For customer support, contact: service@optomed.com

Appendix A

Electromagnetic compatibility information



MEDICAL ELECTRICAL SYSTEM needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided.

Portable and mobile RF communications equipment can affect MEDICAL ELECTRICAL SYSTEM.


Optomed Smartscope M5 should not be used adjacent to or stacked with other equipment and that if adjacent or stacked use is necessary, the EQUIPMENT or SYSTEM should be observed to verify normal operation in the configuration in which it will be used.

Manufacturer's declaration – electromagnetic immunity:

SMARTSCOPE M5 is intended for use in the electromagnetic environment specified below. The customer or the user of the M5 should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	± 2 kV, ± 4 kV, ± 6 kV indirect contact ± 2 kV, ± 4 kV, ± 6 kV contact ± 2 kV, ± 4 kV, ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for AC power supply ±1 kV for serial cable	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 for AC power supply, 1 Phase without Protective 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 5 sec	Manufacturer's test shows conformance to the requirements of the IEC 61000-4-11/EN 61000-4-11	Mains power quality should be that of a typical commercial or hospital environment. If the user of the Smartscope M5 requires continued operation during power mains interruptions, it is recommended that the Smartscope M5 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity:

The Smartscope M5 is intended for use in the electromagnetic environment specified below. The customer or the user of the Smartscope M5 should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	<p>Portable and mobile RF communications equipment should be used no closer to any part of the Smartscope M5, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance</p> $d = 1,2 \sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2,5 GHz	3 V/M	<p>$d = 1,2\sqrt{P}$ 80 MHz to 800 MHz $d = 2,3\sqrt{P}$ 800 MHz to 2,5 GHz,</p> <p>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 metres (m).</p> <p>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.</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
<p>NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.</p> <p>NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p>			
<p>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 Smartscope M5 is used exceeds the applicable RF compliance level above, the Model 006 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Smartscope M5.</p> <p>b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</p>			

Manufacturer's declaration – electromagnetic emissions:

SMARTSCOPE M5 is intended for use in the electromagnetic environment specified below. The customer or the user of the Smartscope M5 should assure that it is used in such an environment.		
Emissions test	Compliance level	Electromagnetic environment – guidance
RF emissions CISPR 11	Group 1	M5 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. M5 is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
RF emissions CISPR 11	Class B	
Harmonic emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Recommended separation distances between portable and mobile RF communications equipment and the Optomed Smartscope M5:

The Optomed Smartscope M5 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Optomed Smartscope M5 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Optomed Smartscope M5 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 m		
	150 kHz to 80 MHz $d = 1,2 \sqrt{P}$	150 kHz to 80 MHz $d = 1,2 \sqrt{P}$	800 MHz to 2,5 GHz $d = 2,3 \sqrt{P}$
0,01	0,12	0,12	0,23
0,1	0,38	0,38	0,73
1	1,2	1,2	2,3
10	3,8	3,8	7,3
100	12	12	23
<p>For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (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.</p> <p>NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.</p> <p>NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p>			

Appendix B - Replacing the battery

Battery pack is specially designed and manufactured for this device. Optomed and Optomed's retailers provide suitable battery packs. Labels in the battery and label inside the battery cover display following information:

NiMH battery
4/HR-4U AAA
4.8V/1000 mAh

Procedure for replacing the battery is:



1. Open the battery compartment cover by pushing and tilting the snap through the hole next to the connector in the bottom of the device. A pen, screw driver or similar pointy small device can be used to assist in opening the cover.



2. Remove the battery compartment cover by lifting it up.



3. Remove old battery. Squeeze battery wires with fingers and pull the connector out from its socket.



4. Put the new battery in the same position and attach the connector to its socket.
5. Replace the battery compartment cover and secure it in place by snapping it firmly to place.