



# Operation Manual

AUTO REF / KERATOMETER ERK-5400A









## Table of Contents

|                                                                |           |
|----------------------------------------------------------------|-----------|
| <b>1. IMPORTANT NOTICE .....</b>                               | <b>1</b>  |
| 1.1 Intended Use.....                                          | 1         |
| 1.2 Contraindications .....                                    | 1         |
| 1.3 Classifications.....                                       | 1         |
| 1.4 Caution.....                                               | 2         |
| <b>2. SAFETY.....</b>                                          | <b>3</b>  |
| 2.1 SAFETY INFORMATION .....                                   | 3         |
| 2.2 Symbol Information .....                                   | 4         |
| 2.3 General Safety Information .....                           | 6         |
| 2.4 Cautions in Installation , Storage and Transportation..... | 7         |
| 2.5 Patient environment .....                                  | 8         |
| 2.6 Labels.....                                                | 9         |
| <b>3. Features .....</b>                                       | <b>10</b> |
| <b>4. Notes for Using the Instrument.....</b>                  | <b>11</b> |
| <b>5. Prerequisites for safety .....</b>                       | <b>13</b> |
| 5.1 Preparation before use.....                                | 13        |
| 5.2 Preparation when you use.....                              | 13        |
| 5.3 Instruction and operation sequence.....                    | 13        |
| 5.4 Storage after use.....                                     | 13        |
| <b>6. Introduction.....</b>                                    | <b>14</b> |
| 6.1 Front side of body.....                                    | 14        |
| 6.2 Back side of body .....                                    | 15        |
| 6.3 Bottom side of body .....                                  | 16        |
| 6.4 Plugging .....                                             | 17        |
| 6.5 Release stage fixing .....                                 | 17        |
| 6.6 Engage printing papers .....                               | 17        |
| <b>7. GUI(User Interface) .....</b>                            | <b>18</b> |
| 7.1 Main Dialog .....                                          | 18        |
| 7.2 Size mode.....                                             | 20        |
| 7.3 Display Dialog.....                                        | 22        |
| 7.4 Setting Dialog.....                                        | 23        |
| 7.5 Update .....                                               | 30        |
| 7.6 Log View .....                                             | 32        |
| 7.7 Image Dialog.....                                          | 33        |
| <b>8. Print Mode.....</b>                                      | <b>37</b> |
| <b>9. Self Inspection and Maintenance .....</b>                | <b>38</b> |
| 9.1 Before Calling a Service Person .....                      | 38        |
| 9.2 Fuse Replacement.....                                      | 40        |

|                                                     |           |
|-----------------------------------------------------|-----------|
| 9.3 Service Information.....                        | 41        |
| <b>10. Specifications .....</b>                     | <b>42</b> |
| <b>11. ACCESSORY.....</b>                           | <b>43</b> |
| <b>12. Packing.....</b>                             | <b>44</b> |
| 12.1 Packing Foam Design.....                       | 44        |
| 12.2 Packaging step .....                           | 45        |
| <b>13. EMC (ELECTROMAGNETIC COMPATIBILITY).....</b> | <b>46</b> |
| <b>14. Disposal of waste products.....</b>          | <b>49</b> |





## 1. IMPORTANT NOTICE

### 1.1 Intended Use

The Auto Refractor/Keratometer **ERK-5400A** is used to determine the initial objective refractive values for a patient's eye in the workflow of refraction to determine the optical prescriptions for myopia, hyperopia and astigmatism.

### 1.2 Contraindications

People with eye disease, glaucoma patients and children under the age of 12 months shall be prohibited because it is difficult to precise measurement.

### 1.3 Classifications

#### **Classification under the provision of 21 CFR) Class I**

The ERK-5400A is classified as Class I device

#### **[Form of protection against electric shock] Class I**

The ERK-5400A is classified as Class I.

This product is always protected when you connect the power supply must be connected to ground included. Class I is a product in which the protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in such a way that means are provided for the connection of the product to the protective (ground) conductor in the fixed wiring of the installation in such a way that accessible metal parts cannot become live in the event of a failure in the basic insulation. Use a power outlet which is equipped with a grounding terminal.

#### **[Degree of protection against electric shock] Type B Applied Part**

The ERK-5400A is classified as a device with a Type B Applied Part

#### **[Degree of protection against ingress of liquids] IPX0**

The ERK-5400A is classified as IPX0

#### **[Degree of protection against flammability]**

The ERK-5400A is classified as a device not suitable to be used in a potentially flammable environment. Do not use near flammable materials

#### **[Method(s) of sterilization or disinfection recommended by the manufacturer]**

The forehead rest and chinrest should be wiped using a cloth dampened with soapy water as necessary

#### **[Mode of operation]**

Classification of ERK-5400A : continuous operation

## 1.4 Caution

This product may malfunction due to electromagnetic waves caused by portable personal telephones, transceivers, radio-controlled toys, etc.

Be sure to avoid having objects such as, which affect this product, brought near the product. It should be used under the supervision of medical staff of hospital

The information in this publication has been carefully checked and is believed to be entirely accurate at the time of publication. ERK-5400A assumes no responsibility, however, for possible errors or omissions, or for any consequences resulting from the No use of the information contained herein.

ERK-5400A reserves the right to make changes in its products or product specifications at any time and without prior notice, and is not required to update this documentation to reflect such changes.



" Do not modify this equipment without authorization of the manufacturer."  
" If this equipment is modified, appropriate inspection and testing must be conducted to ensure continued safe use of equipment"

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## 2. SAFETY

### 2.1 SAFETY INFORMATION

Accessory equipment connected to the analog and digital interfaces must be certificated according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment).

Furthermore all configurations shall comply with the system standard IEC 60601-1-2:2014. Everybody who connects additional equipment to the signal input part or signal output part configures a medical system, and is therefore responsible that the system complies with the requirements of the system standard IEC 60601-1:2005(Third Edition)+ CORR.1:2006+CORR.2:2007+A1:2012

If in doubt, consult the technical service department or your local representative.

### ISO 15004

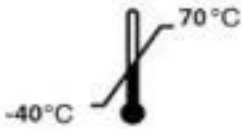
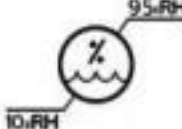
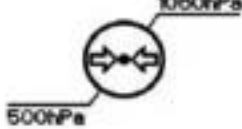
- This report provides information about the hazard to the examinee's eyes in compliance with ISO 15004-1:2006, ISO 15004-2:2007 Ophthalmic instruments – Fundamental requirements and test methods Part 2 – Light hazard protection. This condition is satisfied even when the instrument is operating at maximum light intensity and maximum aperture! (Maximum intensity is the highest brightness the instrument is capable of delivering, including the highest brightness achievable if overvoltage is provided) detailed radiation information at normal usage of this instrument is like bellows.

Radiation output: below 117.1  $\mu\text{W}/\text{cm}^2$  Limit by ISO15004: 100  $\text{mW}/\text{cm}^2$

| Number  | Radiation output [ $\mu\text{W}/\text{cm}^2$ ] |
|---------|------------------------------------------------|
| 1       | 107.0                                          |
| 2       | 117.1                                          |
| 3       | 115.5                                          |
| 4       | 115.7                                          |
| 5       | 103.6                                          |
| 6       | 103.7                                          |
| 7       | 108.8                                          |
| 8       | 109.0                                          |
| 9       | 105.6                                          |
| 10      | 105.8                                          |
| average | 109.1                                          |

## 2.2 Symbol Information

| Symbol                                                                              | Descriptions                                       |
|-------------------------------------------------------------------------------------|----------------------------------------------------|
|    | TYPE B EQUIPMENT                                   |
|    | Protective earth (ground)                          |
|    | Alternating current                                |
|    | Off (power: disconnect to the mains)               |
|   | On (power: connection to the mains)                |
|  | Do not throw away the waste to inappropriate place |
|  | Crushing hazard sign                               |
|  | Hand hazard sign                                   |
|  | Risk of electric shock                             |
|  | Instruction for user manual                        |
|  | Operating instructions                             |
|  | CAUTION                                            |
|  | Keep dry symbol                                    |
|  | DO NOT Hand Hooks symbol                           |
|  | Fragile symbol                                     |
|  | This way up symbol                                 |
|  | Handle with care symbol                            |
|  | Do not build up more than 2 boxes                  |
|  | Manufacture                                        |

|                                                                                   |                                       |
|-----------------------------------------------------------------------------------|---------------------------------------|
|  | Only one unit in the box              |
|  | Temperature between - 40 °C ~ 70 °C   |
|  | Humidity between 10%RH ~ 95%RH        |
|  | Air pressure between 500hPa ~ 1060hPa |



## 2.3 General Safety Information

If you see any warnings or cautions printed on the warning labels, follow the safety instructions in this manual. Ignoring such cautions or warnings while handling the product may result in injury or accident. Be sure to read and fully understand the manual before using this product.

Keep this manual in easy-to-access place.

### Safety Symbols and sign

|                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------|
|                               |
| This indicates hazardous situations which may result in crush your hand.                                        |
|                             |
| This indicates hazardous situations which may result insert your hand.                                          |
| <b>NOTE</b>                                                                                                     |
| This is used to emphasize essential information. Be sure to read this information to avoid incorrect operation. |



## 2.4 Cautions in Installation , Storage and Transportation

- Exposure to the direct sunlight or too bright indoor lights may influence on the result of accurate measurement. Use the appropriate Optometry room.
- Keep the objective glass of the examinee side clean. If it was stained, it may cause on ERROR or inaccurate measurements.
- In case you leave ERK-5400A without using for certain period, disconnect the power supply and protect the unit with dust cover.
- In case moving this ERK-5400A, fix the stage by using clamping bolt and stage holding knob, always keep power off, and then lift the bottom of the unit with both hands.
- In case moving this ERK-5400A, do not hold forehead.
- In case moving and connect other device this ERK-5400A, keep in touch with qualified technician or service agent and place the equipment plain.
- Get worked, store and move under the following environment conditions for proper operation.
- Operation environment :
  - Temperature : +10℃ ~ +40℃
  - Humidity : 30% ~ 90% RH
  - Atmospheric pressure range : 700 hPa ~ 1060 hPa
- Storage and Transportation environment :
  - Temperature : -40℃ ~ +70℃
  - Humidity : 10% ~ 95% RH
  - Atmospheric pressure range : 500 hPa ~ 1060 hPa

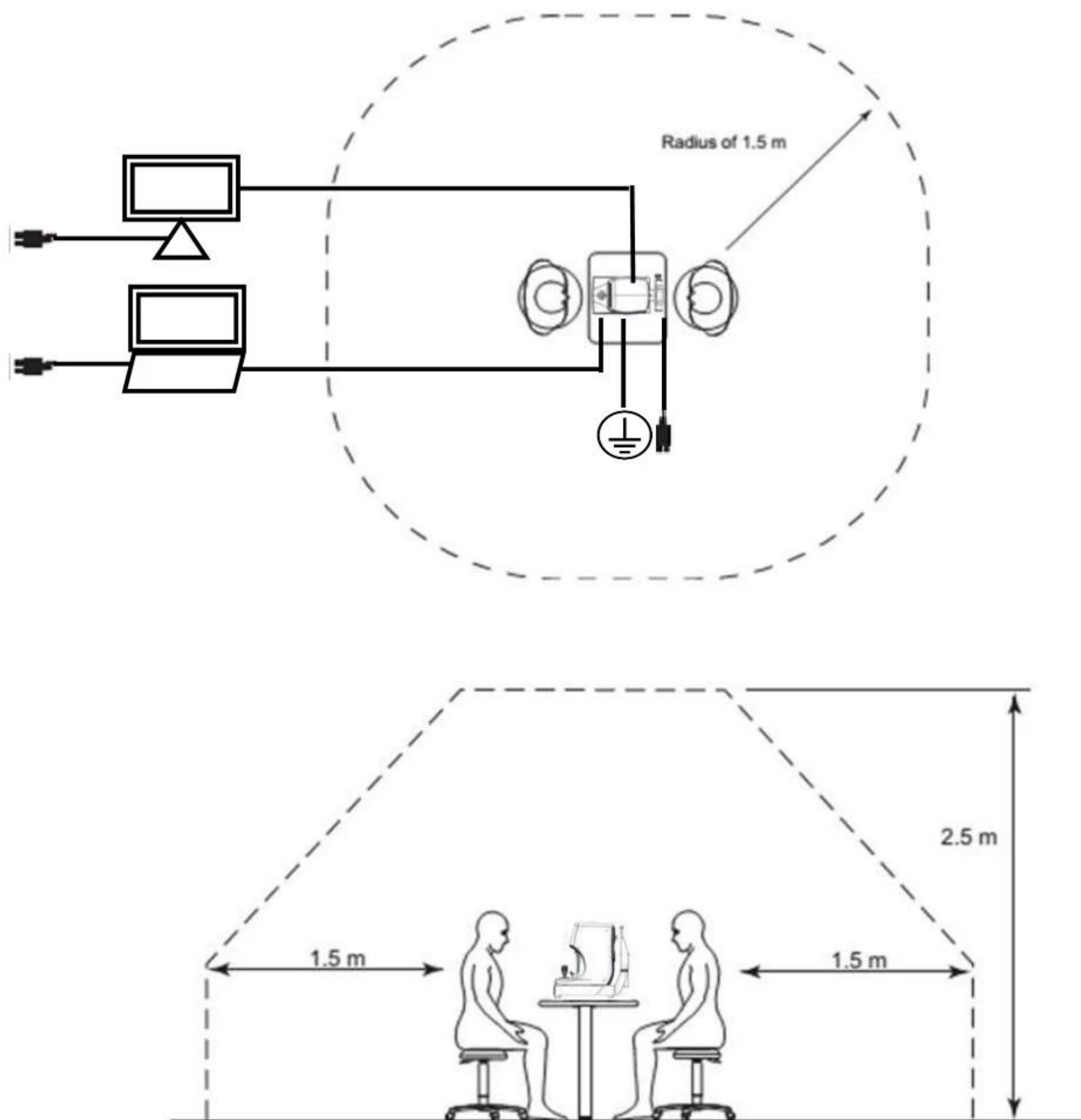


## 2.5 Patient environment

The patient environment represents a space where there is a possibility of direct contact between the patient or the operator and third person.

When another type of device is used in the patient environment, use a device that complies with IEC 60601-1. If the devices that do not comply with IEC 60601-1 are used, it is necessary to use an isolating transformer to power the device or to connect the devices to additional protective grounding.

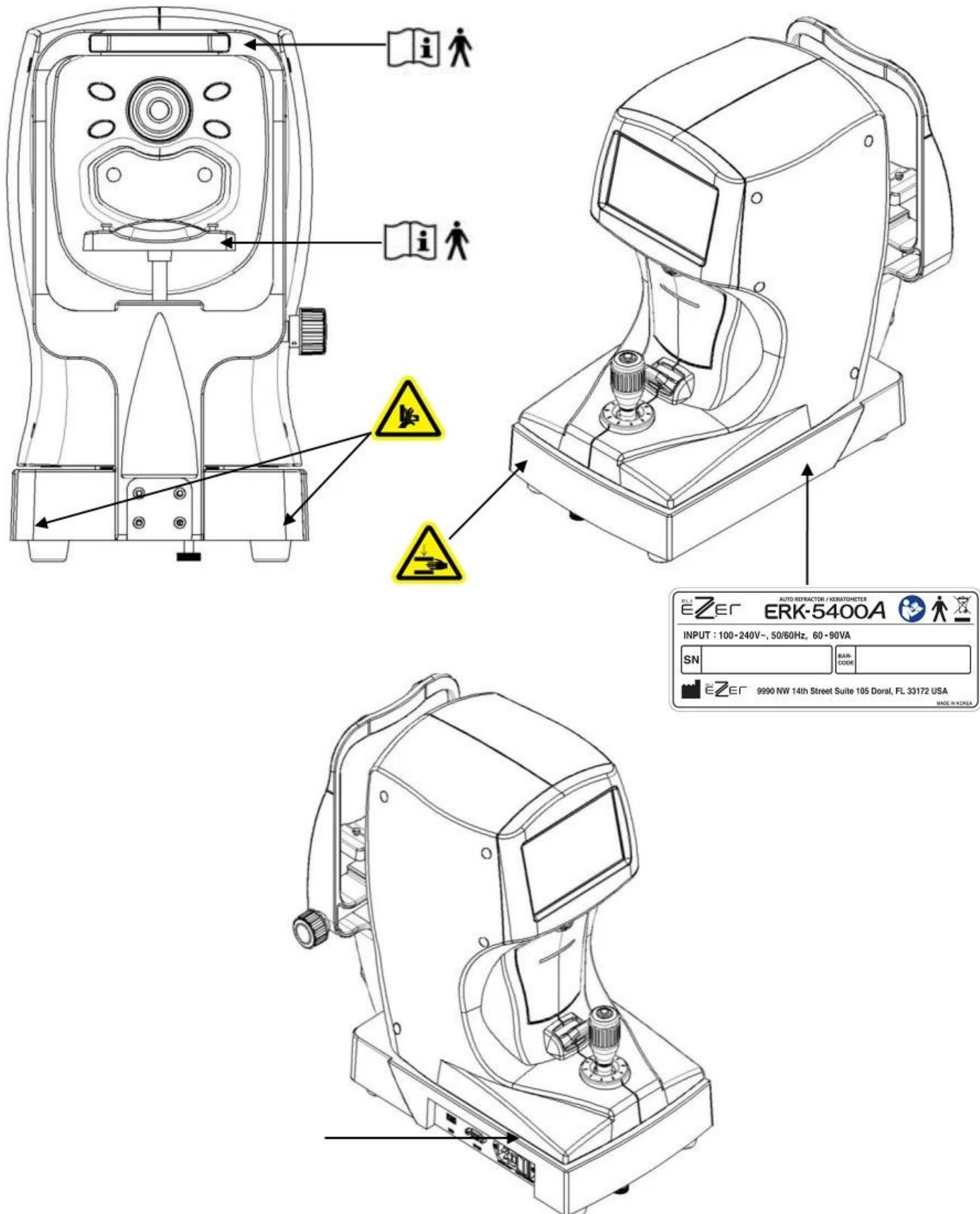
- ① Patient environment (represented by dotted line, extending exactly 1.5 meters)
- ② ERK-5400A equipment ③④ Peripheral equipment(EN XXXXX and IEC XXXXX)
- ⑥ Power cord(⑤included protective earth)





## 2.6 Labels

The following labels and indications are affixed to draw the operator's attention



### 3. Features

- **Various Measurements Supported**  
Not only the usual refractometry and keratometry, but also corneal diameter and base curve of contact lens can be measured with this one instrument. Thus, measurements of eye and prescriptions for glasses and contact lenses can be made more efficiently.
- **Wide Dioptric Measurement Range**  
Because the ERK-5400A covers a wide measurement range, from -25D to +22D, even an examinee with strong myopia can be measured.
- **More accurate Measurement**  
The fogging method of the eye fixation target makes examinee's eye comfortable and enables to get more accurate measurement data
- **Simple and convenient user's environment**  
Deliver more convenient user environment with wide viewed 7.0" TFT COLOR LCD screen and with simple and intimate design.
- **Easy Connection with other Equipment**  
This instrument is designed to connect other Equipment such as LCD monitor.



## 4. Notes for Using the Instrument

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <ol style="list-style-type: none"> <li>1. To avoid the risk of electric shock, this equipment as power protective earth connection must be connected</li> <li>2. Ensure that the examinee has not placed his/her hand or fingers under the chin rest. Otherwise, hand or fingers may be hurt.</li> <li>3. Do not hit or drop the instrument. The impact may cause damage to the function of this instrument. Please handle with care.</li> <li>4. Only operate the instrument with the power supply indicated on the rating plate. Otherwise, it may result in fire or electric shock.</li> <li>5. Never disassemble or modify. This can cause fire or electric shock.</li> <li>6. In case there is smoke, strange odor or noise during operation, disconnect the power supply and consult the distributor.</li> <li>7. For replacement parts (battery, fuse, or other parts), please contact the distributor from whom you purchased the product.</li> <li>8. The external connection device is used UL certificate device and the specified power code, paper and fuse are used.</li> </ol>                                                 |
|  | <ol style="list-style-type: none"> <li>1. A sudden heating of the room in cold areas will cause condensation on the protective glass in the monitor screen and on optical parts inside the instrument. In this case, just wait until condensation disappears before performing measurement.</li> <li>2. Keep the objective glass of the examinee side clean. If it was stained, it may cause on ERROR or inaccurate measurements.</li> <li>3. If you leave ERK-5400A without using for certain period, disconnect the power supply and protect the unit with dust cover.</li> <li>4. When moving this ERK-5400A, fix the stage by using clamping bolt and stage holding knob, always keep power off, and then lift the bottom of the unit with both hands.</li> <li>5. When moving this ERK-5400A, do not hold forehead.</li> <li>6. When moving and connect other device this ERK-5400A, keep in touch with qualified technician or service agent and place the equipment plain. .</li> <li>7. The patient should raise your hands in your lap when measuring</li> <li>8. When S/W version up, check the label on the main board.</li> </ol> |

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ol style="list-style-type: none"> <li>1. Don't use organic solvents such as alcohol, thinner, benzene, etc. to clean the surface of this instrument. It may damage the instrument.</li> <li>2. Do not store alcohol, thinner and other flammable vapors and liquids in the vicinity of this equipment.</li> <li>3. Do not turn off the instrument before finishing initialization. It may cause motor movement error.</li> <li>4. Do not use outdoors. The instrument is designed to be used only indoors.</li> <li>5. Do not use Humidity or dusty environment</li> <li>6. Never disassemble or modify this instrument because it may result in fire or electric shock. Also, since this instrument incorporates high-voltage parts and other hazardous parts, touching them may cause death or serious injury.</li> <li>7. Keep it away from other persons but qualified technician.</li> <li>8. Be sure to turn OFF the power switch before connecting or disconnecting the cables. Also, do not handle them with wet hands. Otherwise, you may get an electric shock that may result in death or serious injury.</li> <li>9. If you leave this instrument without using for certain period, disconnect the power supply</li> <li>10. This equipment may be able to be operated improper by micro waves from cellular phones, walkie-talkie, remote controlled electric toys. Keep it away.</li> </ol> |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

At the time of publishing the information in this book carefully identified and has been judged to be correct. However, there are mistakes and omissions that the USO, the use of the information contained in this book is not responsible for the results that occurred.



## 5. Prerequisites for safety

### 5.1 Preparation before use

- Do not operate under direct sunlight or too strong lights
- Do not store alcohol, thinner and other flammable vapors and liquids in the vicinity of this equipment.
- Check the voltage.
- Check chin rest is working properly
- Remove dusts, especially on the lens.

### 5.2 Preparation when you use

- Place this equipment plain
- Do not put others on this equipment
- Do not disassemble or modify on your own
- Stand 40 minutes and get it worked if it is stored at extended temperate place
- Keep it away from other persons but qualified technician.
- Be sure to unplug if do not use long.
- Do not turn off the instrument before finishing initialization.  
(Don't power off during loading)

### 5.3 Instruction and operation sequence

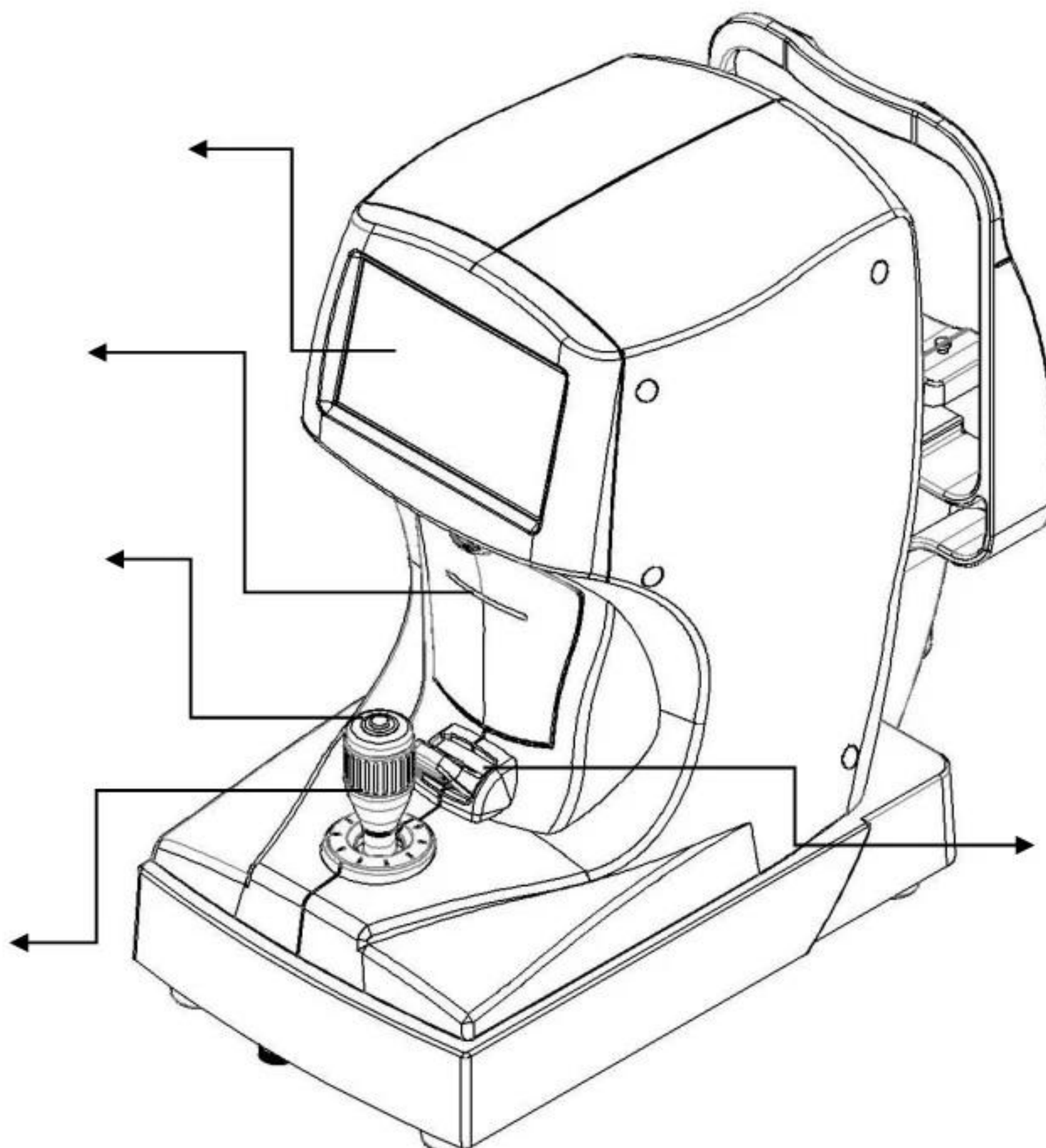
- Please connect the power plug.
- Press "ON"
- Put the chin on chin rest and make forehead stuck on to forehead rest
- Release stage by turning stage knob
- Press buttons what you want
- Try to get it worked as per the instructions of 7 and 9

### 5.4 Storage after use

- Cover it up and unplug if do not use long
- Clean with soft cloth, soaped and rinse, wipe dry
- Wipe lens and glass' dusts out with wind blower and with soft cloth.
- Fix by turning the fixation knob and keep it plain when you are about to move or lift up
- Do store at the following place
  - ① Not humid place
  - ② Not in the vicinity of water
  - ③ Not dusty and not in the vicinity of filthy place with salt or sulphur
  - ④ Plain place
  - ⑤ Not in the vicinity of vibration or shock
  - ⑥ Not in the vicinity of other flammables vapors or liquids
  - ⑦ Not in the vicinity of direct sunlight
- Store the accessories and cords for next operation.

## 6. Introduction

### 6.1 Front side of body

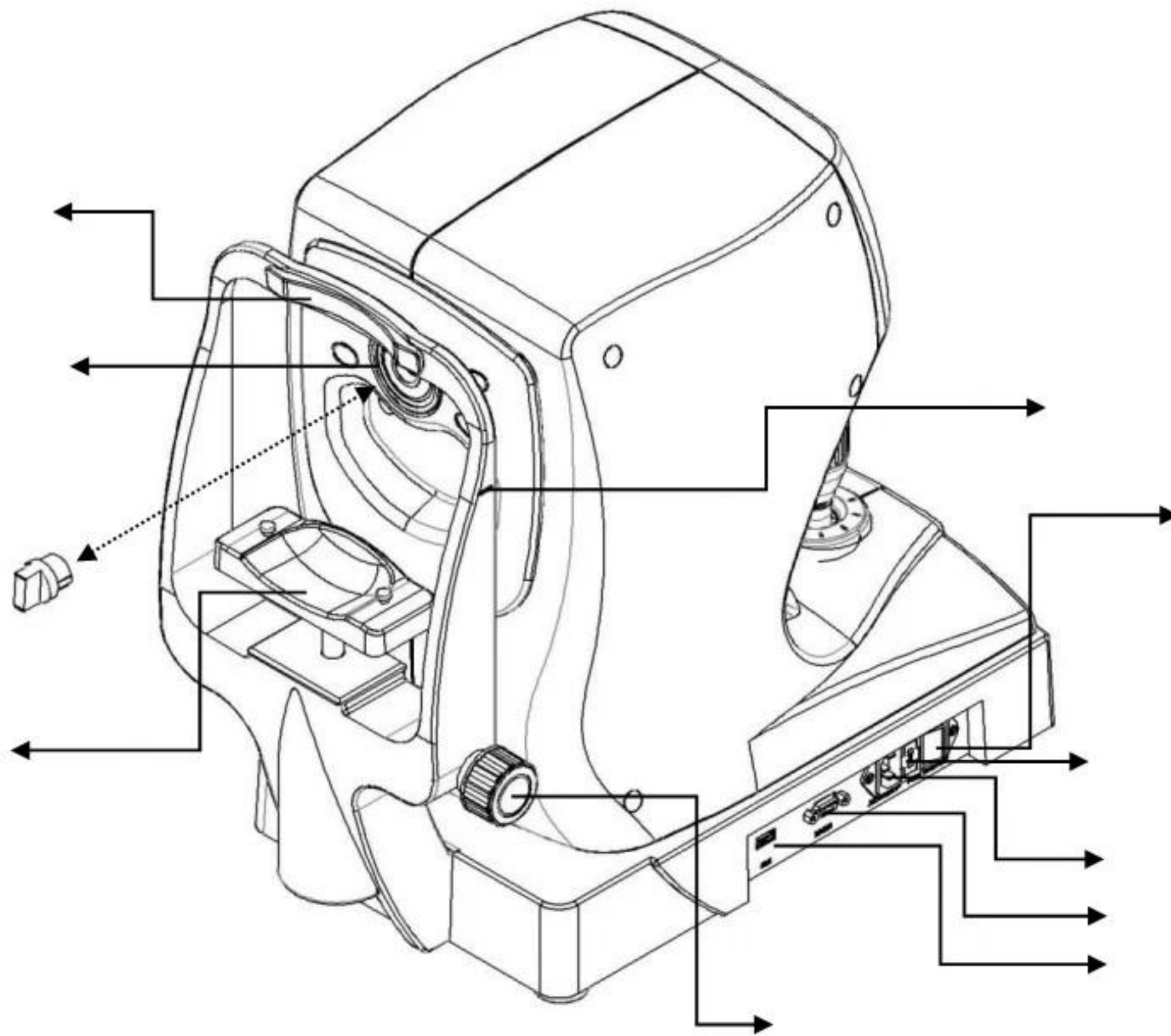


[ Drawing 1 ] Front Side

| Name                   | Functions                                |
|------------------------|------------------------------------------|
| ① Touch screen Monitor | Monitor that displays Measurement        |
| ② Measurement Button   | Press this button for measurement.       |
| ③ Joystick             | Control lever for lining up and focusing |
| ④ Printer              | Print the measured result                |
| ⑤ Stage Holding Knob   | Holds the movement of stage              |

[ Chart 1 ] Front side

## 6.2 Back side of body



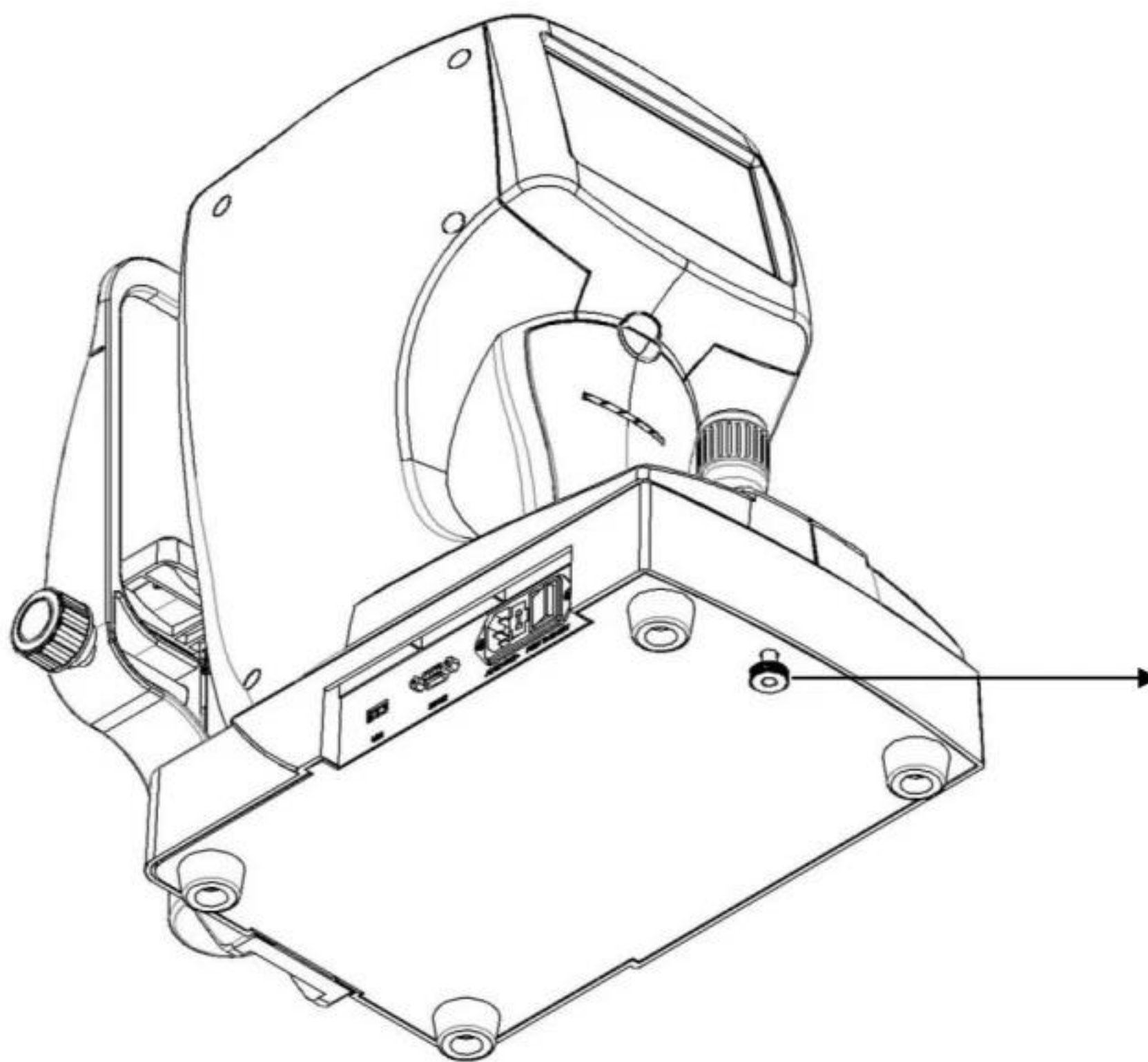
[Drawing 2 ] Back Side of Body

| Name                         | Function                                               |
|------------------------------|--------------------------------------------------------|
| ① Head Rest                  | Place the examinee's forehead against this rest.       |
| ② Measurement window         | Window for the examinee to look at for measurement     |
| ③ Dust Cap                   | Anti-dust cap                                          |
| ④ Chin Rest                  | Place the examinee's chin on the rest.                 |
| ⑤ Height lining mark         | Lining up eye level of patient by regulating chin rest |
| ⑥ Chin Rest adjustment lever | Regulating height of chin rest                         |
| ⑦ Power Switch               | Switch for turning power ON and OFF                    |
| ⑧ Fuse: T2AH 250V            | Protects instrument from the excess electric power     |
| ⑨ Power IN LET               | Connector for the power supply code                    |
| ⑩ RS-232 Connector           | Connect with PC                                        |
| ⑪ USB Connector              | For S/W Update(service port)                           |

[ Chart 2 ] Back side of body



## 6.3 Bottom side of body



[ Drawing 3 ] Bottom Side of Body

| Name                  | Function                                  |
|-----------------------|-------------------------------------------|
| ① Stage Clamping Bolt | To clamp the stage during transportation. |

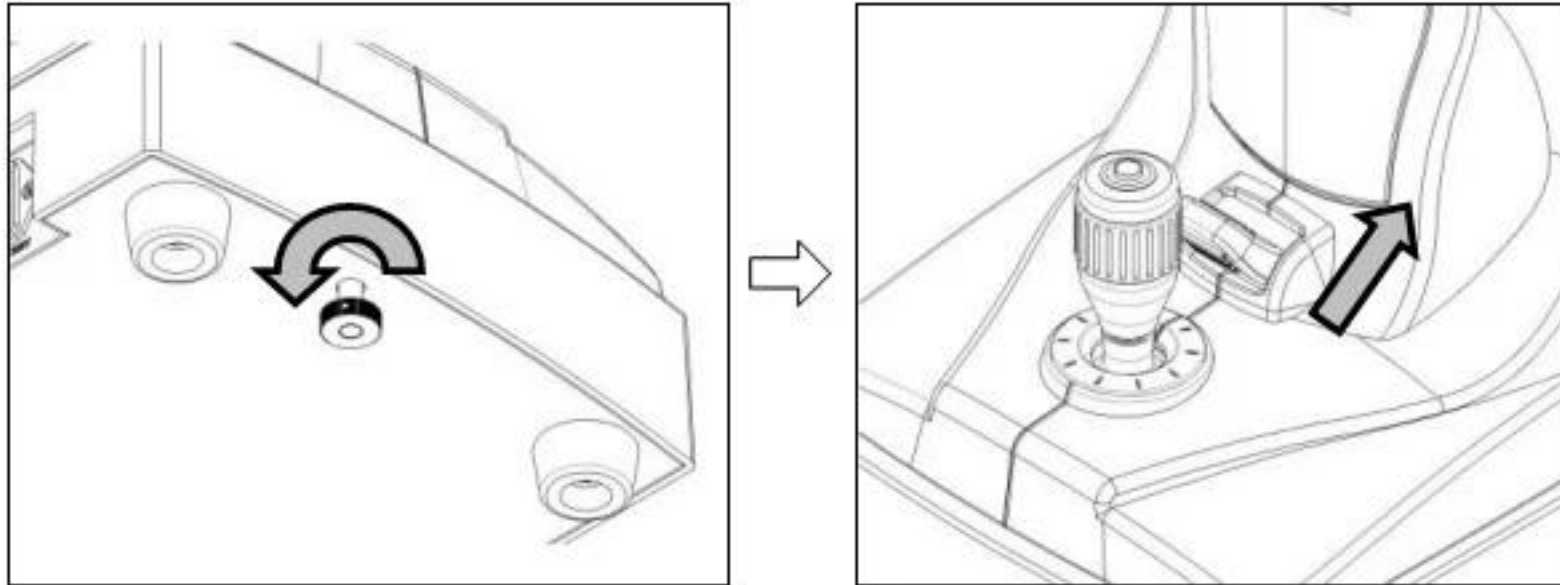
[ Chart 3 ] Bottom Side of Body



## 6.4 Plugging

- Put ERK-5400A on the table
- Connect power cord into power connector
- Check power switch OFF (O), plug into electrical outlet

## 6.5 Release stage fixing



- Rotate stage clamping bolt located in the bottom of body counterclockwise and release
- Lift stage holding knob straight up forward to 'UNLOCK'.
- Check whether stage is moving freely.

## 6.6 Engage printing papers

- Check printing papers are inserted.
- If paper need to be replaced, change it with new paper



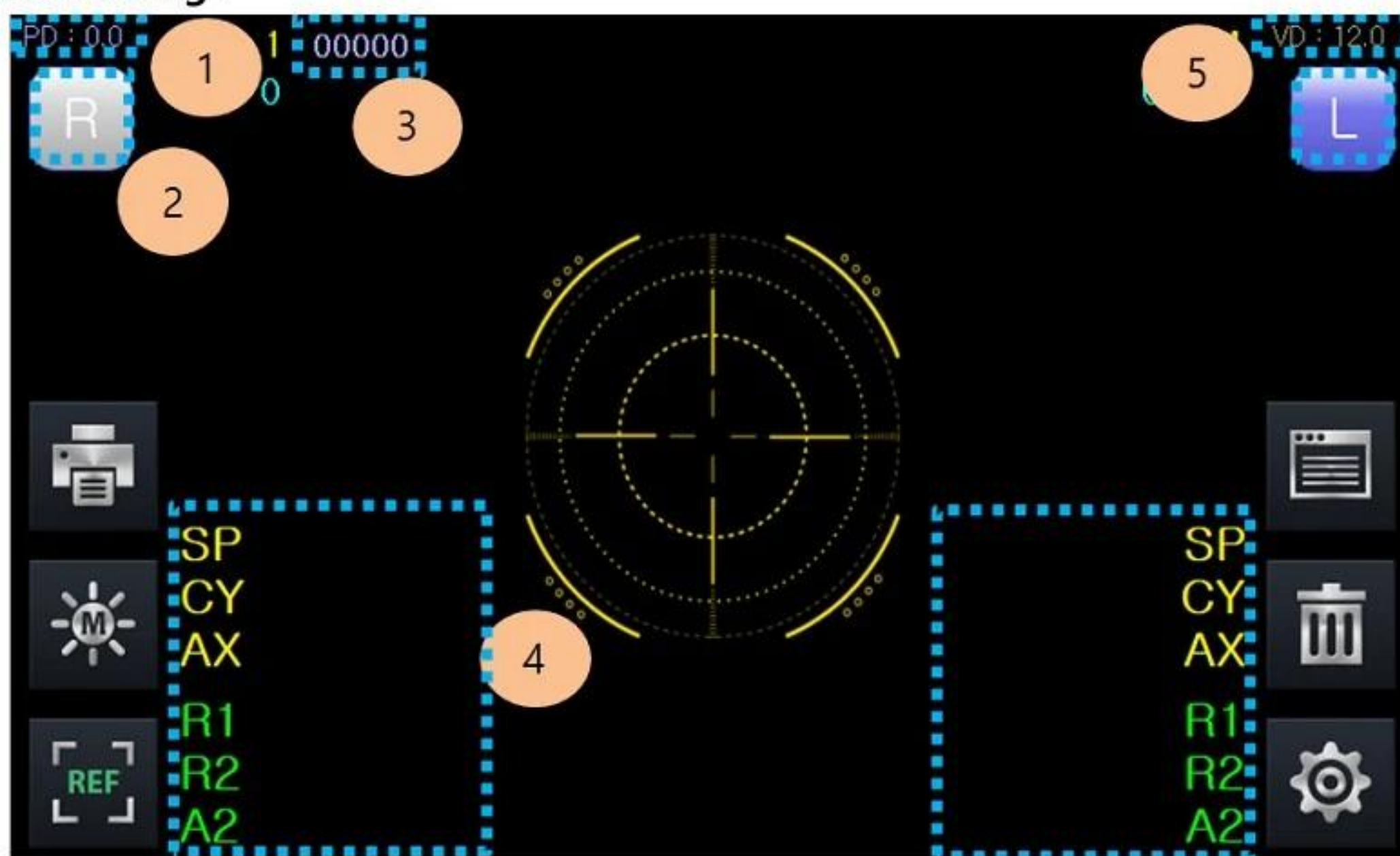
Turn off the power after connecting or disconnecting the power cable.  
Do not operate the unit with wet hands. Otherwise, to cause death  
or serious injury can result in electric shock.

## 7. GUI(User Interface)

The user interface was applied to the touch-screen buttons of the ERK-5400A. So the user's convenience and speed of operation is improved. The frequently used buttons is located on the left and right of the screen frame. In the measurement mode is commonly used. The remaining modes except measurement modes each mode, please refer to the description page

### 7.1 Main Dialog

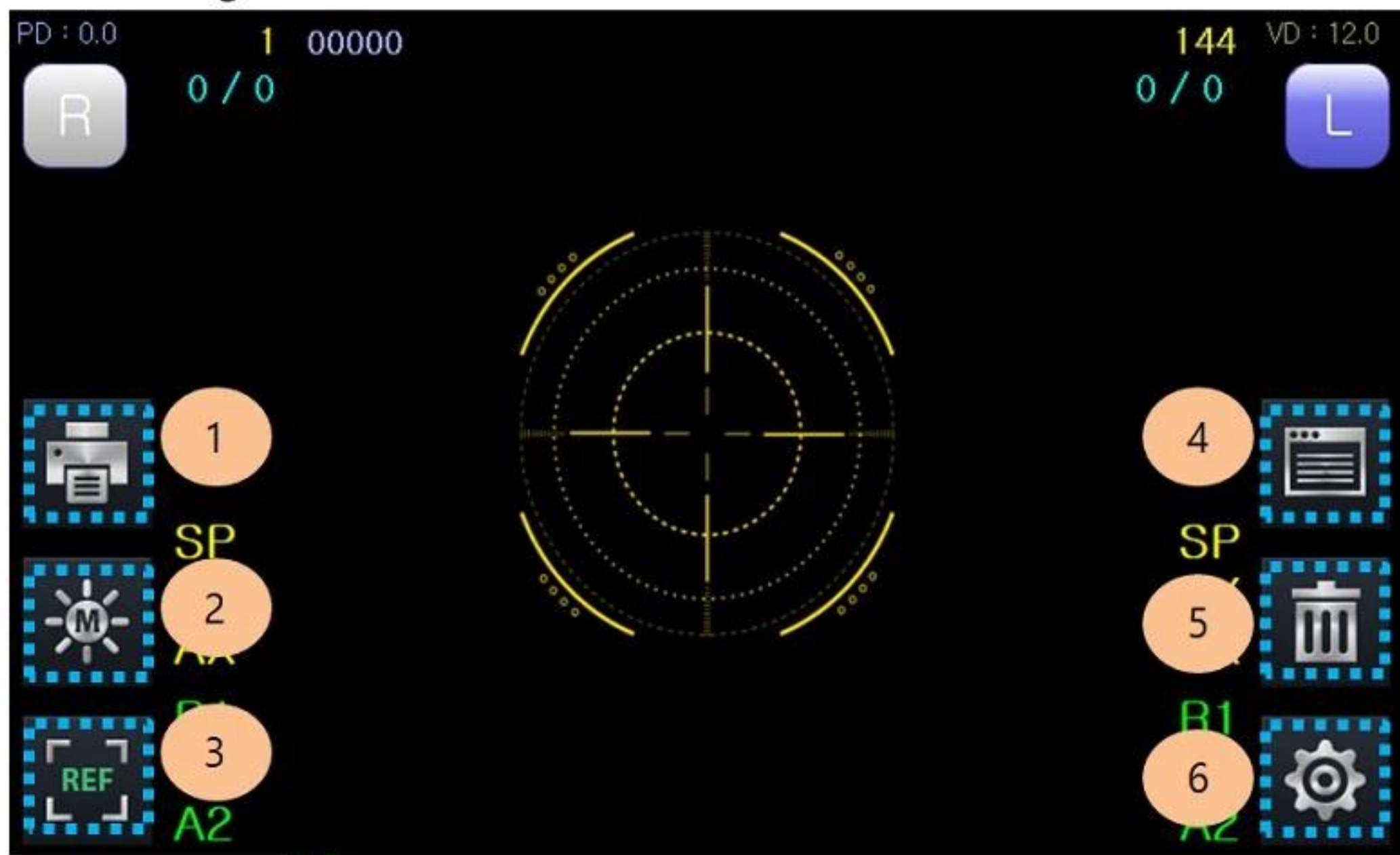
#### 1) Main Dialog1



| Name                              | Function                                                                                                                                                                                                                                 |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ① PD                              | Display of PD(Pupil Distance) results.                                                                                                                                                                                                   |
| ② Left/Right                      | Current (left / right) state                                                                                                                                                                                                             |
| ③ Number                          | The number of patients to be recorded on the print out.                                                                                                                                                                                  |
| ④ Measumemet Value (Right / Left) | Displays SPH, CYL., AXIS, R1, R2, A2 of measurement value(Right / Left)                                                                                                                                                                  |
| ⑤ VD (Vertex Distance)            | Display of VD(Vertex Distance) results.<br>When inactive, the touch screen entries and values VD.<br>When you touch active in the VD is inactive.<br>When you touch the value of the following values change:<br>0.0→10.0→12.0→13.5→15.0 |



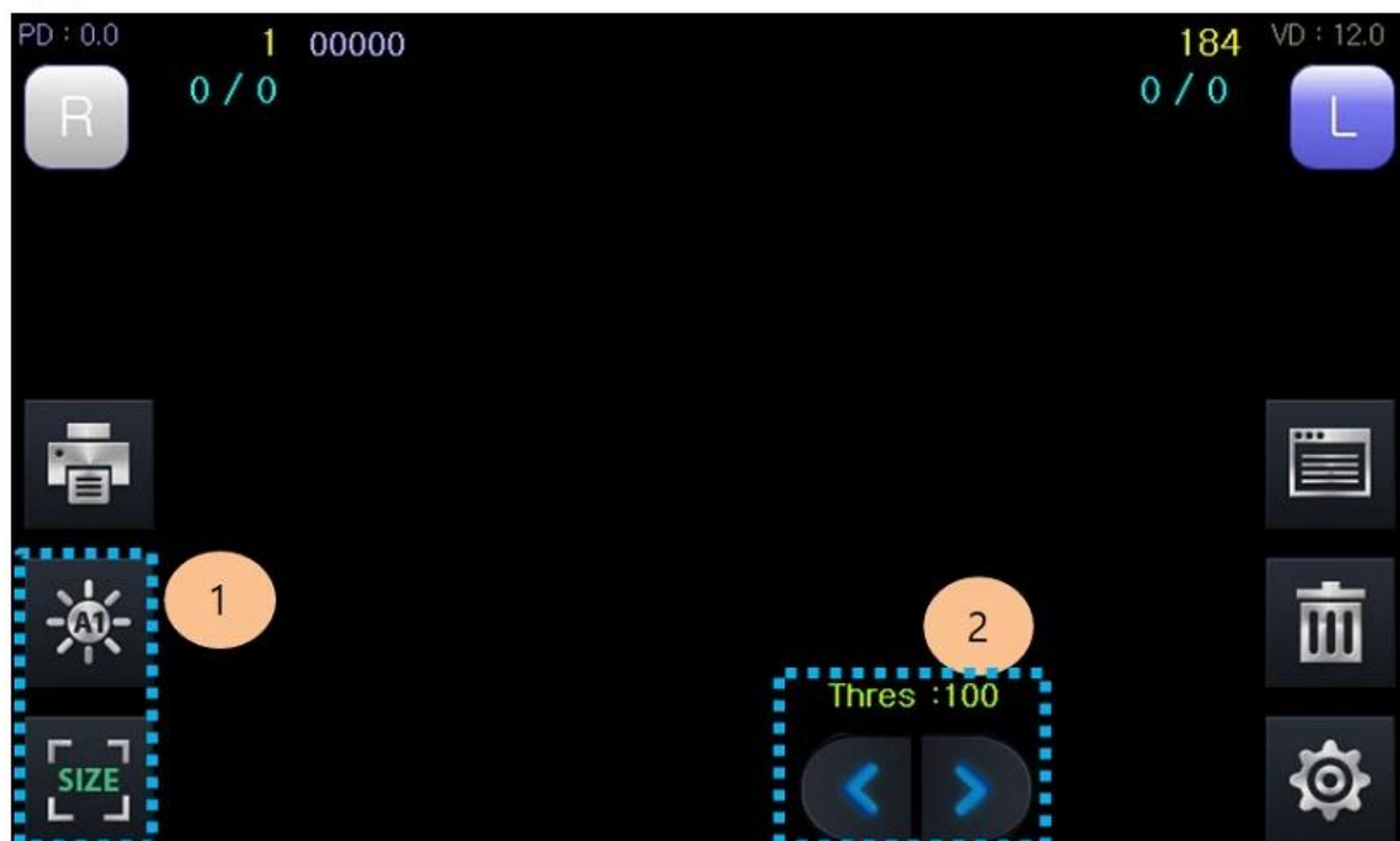
## 2) Main Dialog2



| Name                         | Function                                                                      |
|------------------------------|-------------------------------------------------------------------------------|
| ① Print out button           | Prints measurement results                                                    |
| ②. Measurement Mode 1        | - . A1: SIZE Auto measurement<br>- . M: Manual (measured at current position) |
| ③ Measurement Mode 2         | Selects a measurement from REF, KER, R&K, CLBC and SIZE                       |
| ④ Measurement Display button | Display of measument results.                                                 |
| ⑤ Trash can button           | Clears measurement data.                                                      |
| ⑥ Settings button            | Displays the Settings screen.                                                 |

## 7.2 Size mode

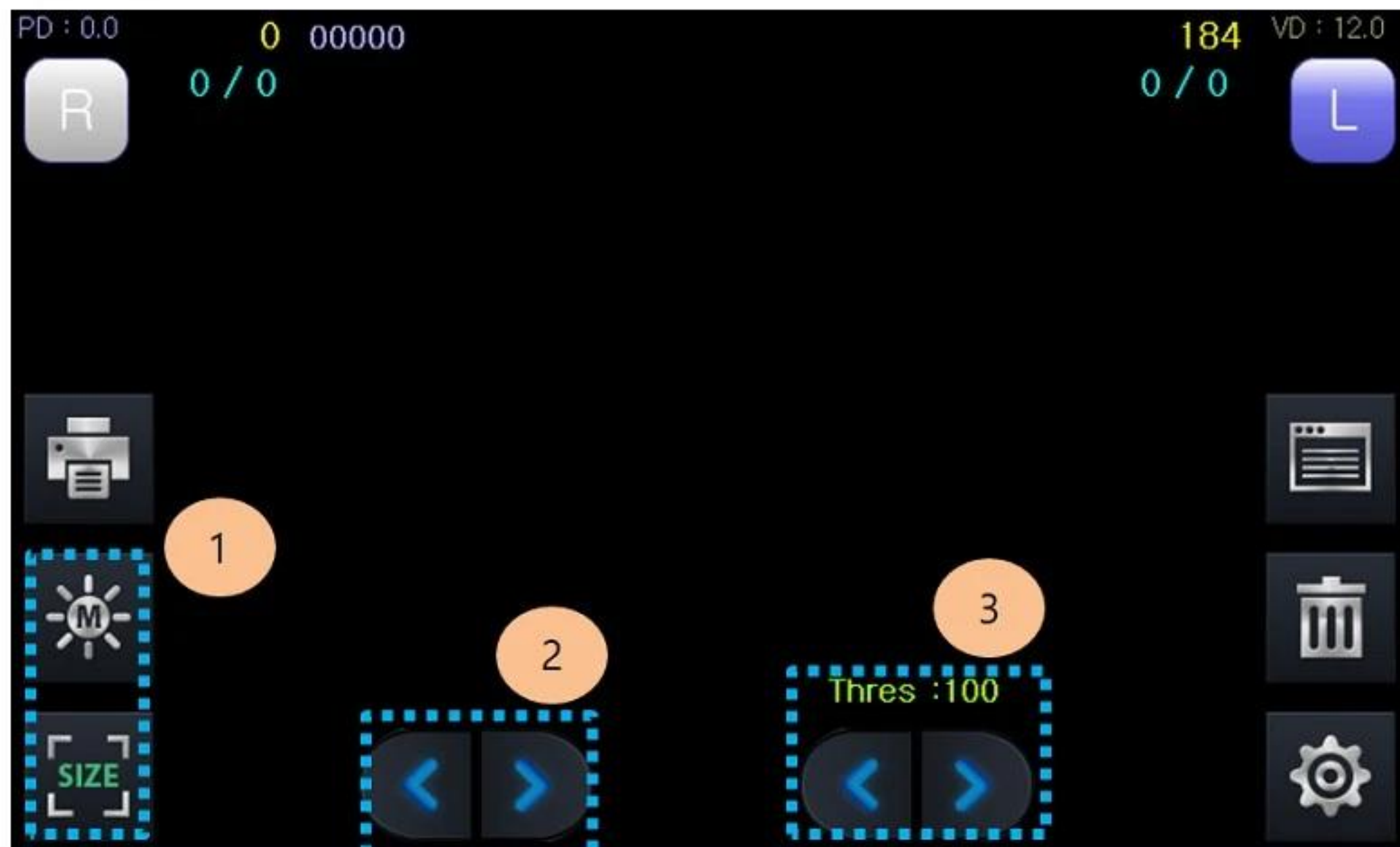
### 1) Auto



| Name                    | Function                                                     |
|-------------------------|--------------------------------------------------------------|
| ① Status                | It is in the state of A1                                     |
| ② Left and right button | Use the left and right arrows to adjust the Threshold value. |

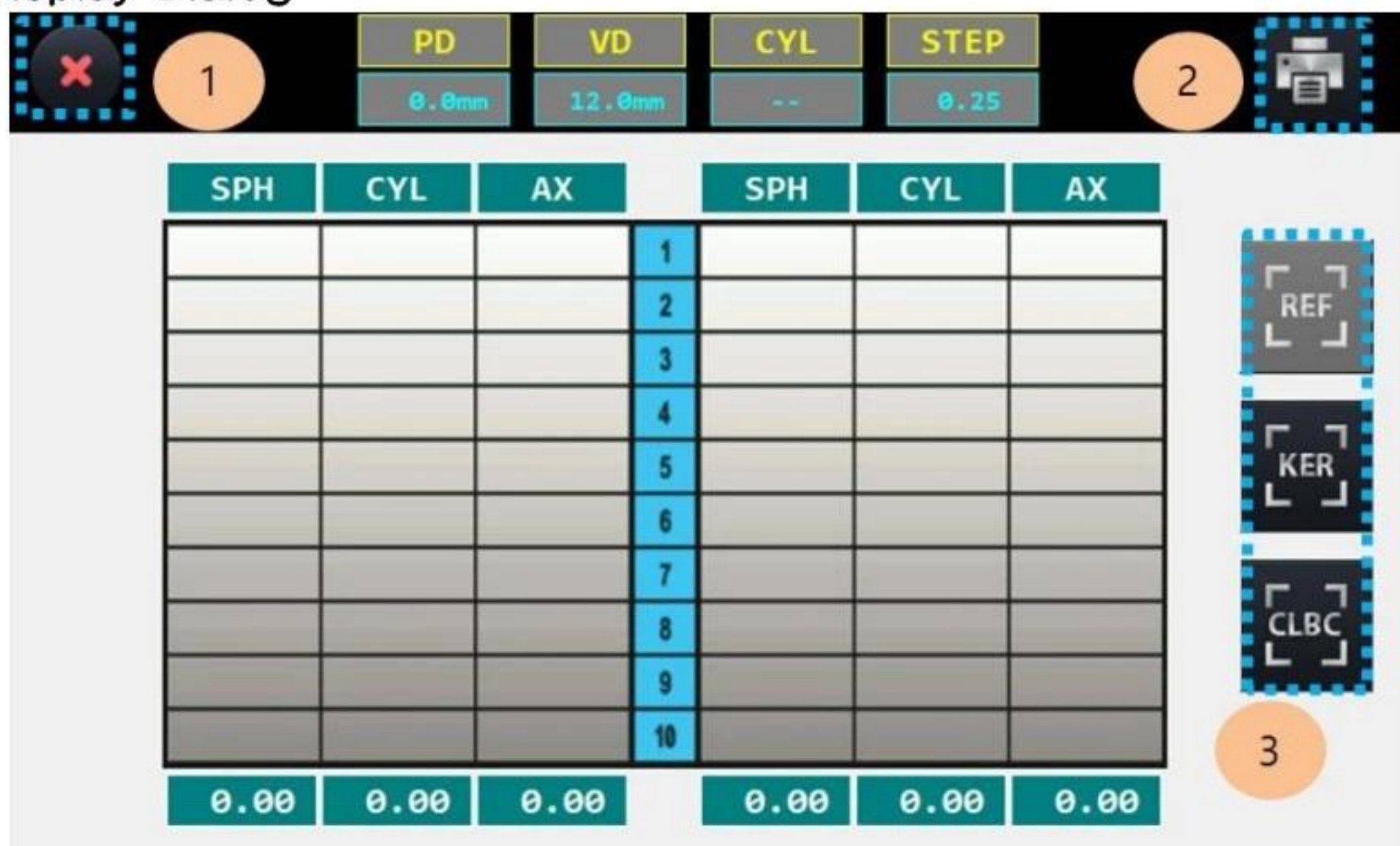


## 2) Manual



| Name                    | Function                                                                                                                                                                                                                      |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ① Status                | It is in the state of M                                                                                                                                                                                                       |
| ② Left and right button | <ul style="list-style-type: none"> <li>- Use left and right buttons to move left line.</li> <li>- Use the left and right buttons to move the right line.</li> <li>- Touch the image to move the right / left line.</li> </ul> |
| ③ Left and right button | Use the left and right arrows to adjust the ThresHold value.                                                                                                                                                                  |

## 7.3 Display Dialog

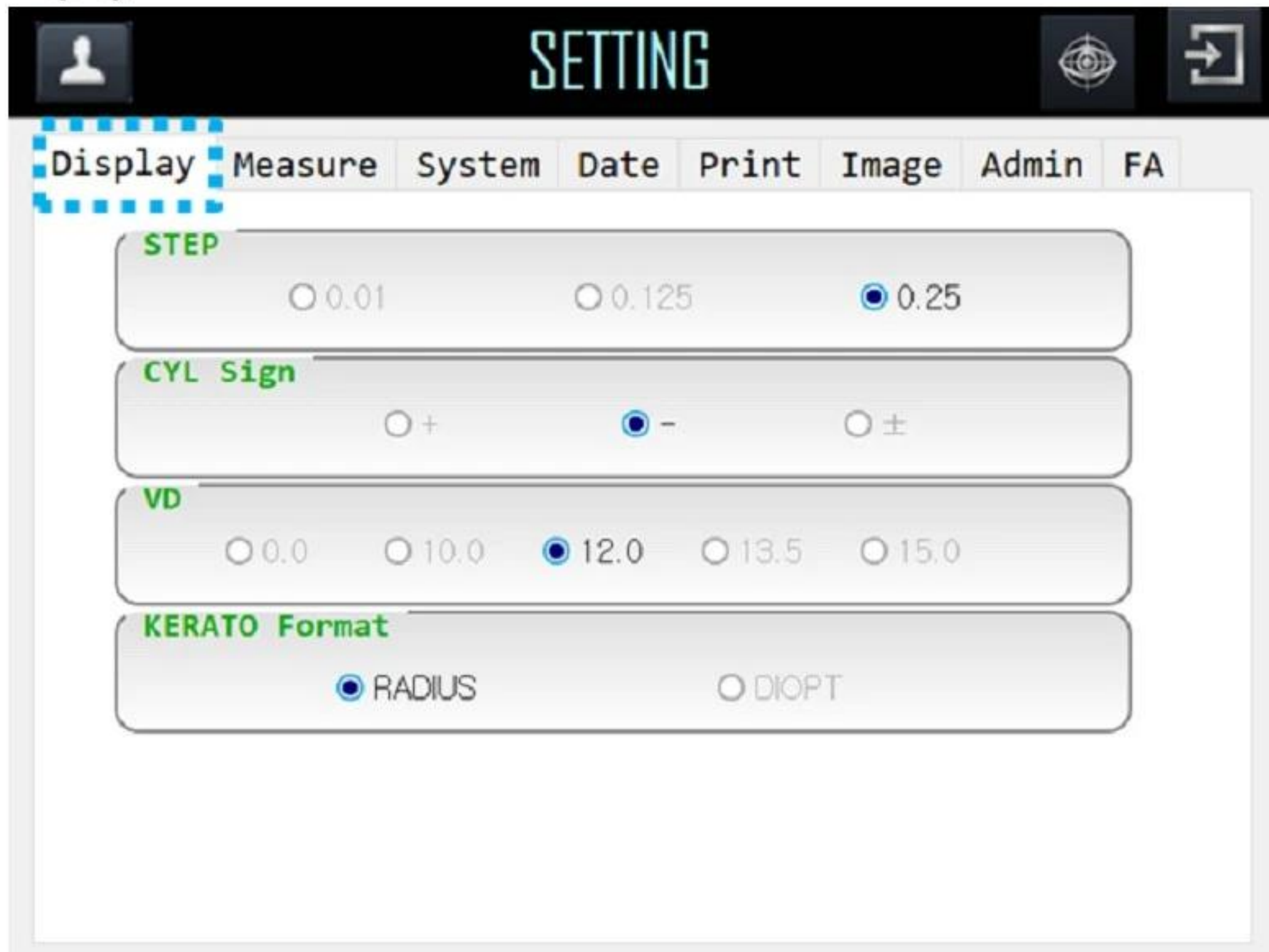


| Name           | Function                        |
|----------------|---------------------------------|
| ① Exit button  | Exit the current screen         |
| ② Print button | Print the measured value.       |
| ③ REF/KER/CLBC | Display KER / REF / CLBC value. |

Display the measured value.

## 7.4 Setting Dialog

### 1) Display



**SETTING**

Display Measure System Date Print Image Admin FA

**STEP**

☐ 0.01 ☐ 0.125 ☒ 0.25

**CYL Sign**

☐ + ☒ - ☐ ±

**VD**

☐ 0.0 ☐ 10.0 ☒ 12.0 ☐ 13.5 ☐ 15.0

**KERATO Format**

☒ RADIUS ☐ DIOPT

| Name            | Function                        |
|-----------------|---------------------------------|
| ① STEP          | Unit showing the measured value |
| ② CYL sign      | CYL code setting.               |
| ③ VD            | VD setting                      |
| ③ KERATO Format | RADIUS/DIOPT                    |



## 2) Measure

**SETTING**

Display **Measure** System Date Print Image Admin FA

① **Shooting Repeat** ☐ Chart Fog

② **Auto Repeat**

③ **Auto Start** ☒ Manual ☐ Auto ☐ Auto-P

④ **Sph Shift** ☒ - ☐ + ☐ 0.0

⑤ **Pupil ThresHold**

| Name              | Function                              |
|-------------------|---------------------------------------|
| ① Shooting Repeat | Unit showing the measured value       |
| ② Auto Repeat     | Setting of Auto Repeat                |
| ③ Auto start      | Manual1/Auto/Auto-P                   |
| ③ Sph Shift       | Determine the Sph code                |
| ④ Pupil Threshold | Threshold value of pupil in Size Mode |

### 3) System



| Name         | Function                                                                  |
|--------------|---------------------------------------------------------------------------|
| ① Language   | Unit showing the measured value                                           |
| ② LCD Bright | LCD Brightness Control                                                    |
| ③ Screen Off | Time to turn off the face (minutes), 0: No Use                            |
| ③ Key Sound  | Whether to use beep sound / time                                          |
| ④ Version    | If the version is 0.00, the communication with the board is not possible. |

#### 4) Date

The screenshot shows the 'SETTING' menu with the 'Date' tab selected. The current date is 2018-08-01 and the time is 02:30:57. The date display format is set to YMD (Year-Month-Day). The time display format is set to 12 Hour. The time is currently 02:18:43.

| Name                  | Function                        |
|-----------------------|---------------------------------|
| ① SET                 | Unit showing the measured value |
| ② Date display method | YMD/DMY/MDY                     |
| ③ Time display method | 12 Hour/24 Hour                 |



## 5) Print

**SETTING**

Display Measure System Date **Print** Image Admin FA

**Print Type**

☐ ALL ☐ IMG ☒ AVR ☐ OFF

**Print NO.**

☒ ON ☐ OFF

**Auto Cutting**

☐ OFF ☒ ON

**Auto Printing**

☐ YES ☒ NO

| Name            | Function                                                               |
|-----------------|------------------------------------------------------------------------|
| ① Print Type    | ALL/ IMG/ AVR/ OFF                                                     |
| ② Print No.     | Print paper stack number                                               |
| ③ Auto cutting  | Set whether to cut                                                     |
| ③ Auto Printing | Whether automatic printing is performed after measurement of both eyes |

## 6) Image

The screenshot shows the 'SETTING' interface with the 'Image' tab selected. The 'Measure Value Shift' section has two input fields: 'REF' and 'KER', both displaying '0.00'. The 'Mire Bright' section has two input fields: 'Std:1600' and 'Meas:1900'. To the right of these fields is a checkbox labeled 'Measure Capture' which is currently unchecked.

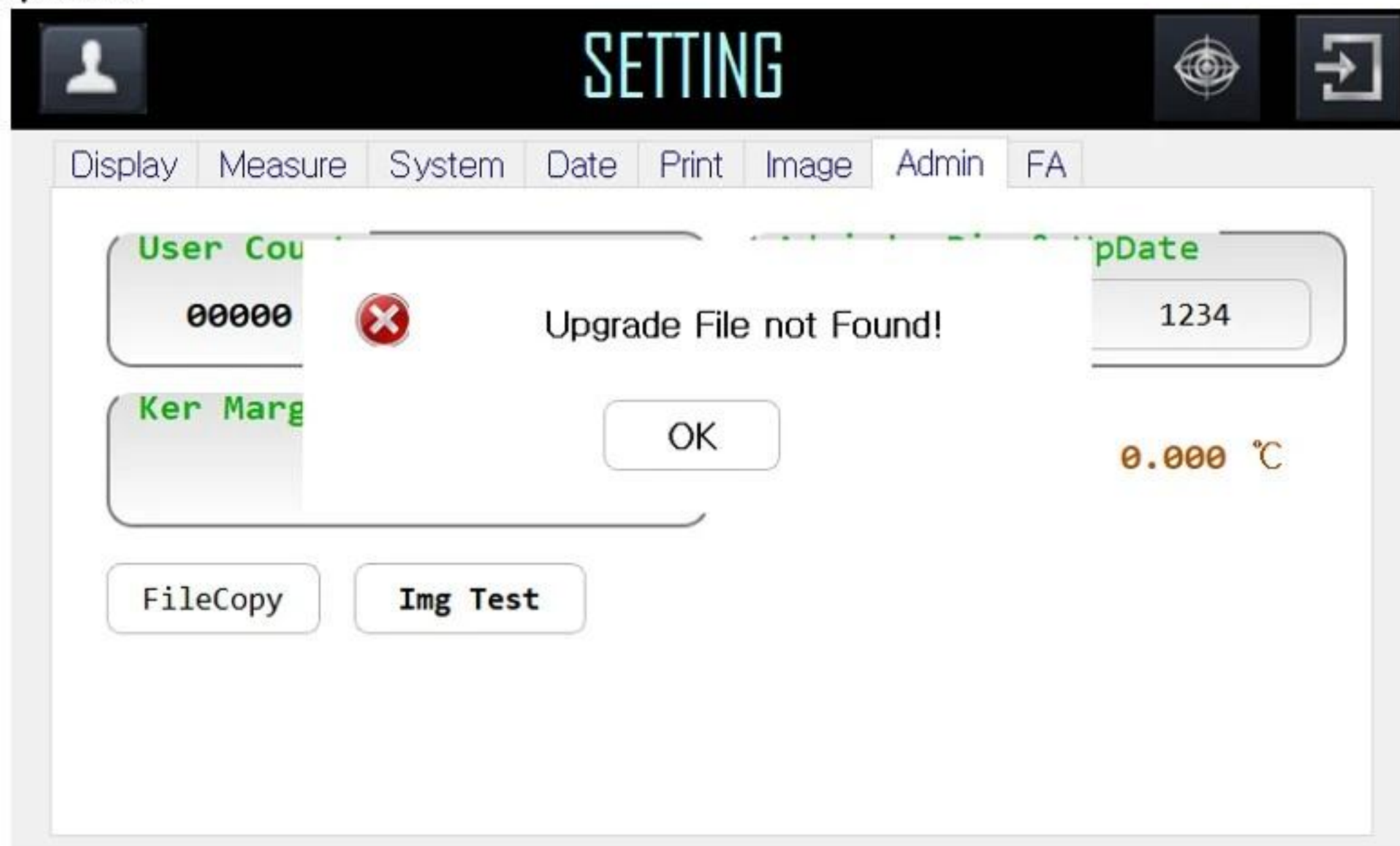
| Name                  | Function                                                                        |
|-----------------------|---------------------------------------------------------------------------------|
| ① Measure Value Shift | Measured value Shift (used when the measured value shows a constant difference) |
| ② Mire Bright         | Setting of Mire Bright Value                                                    |

## 7) Admin

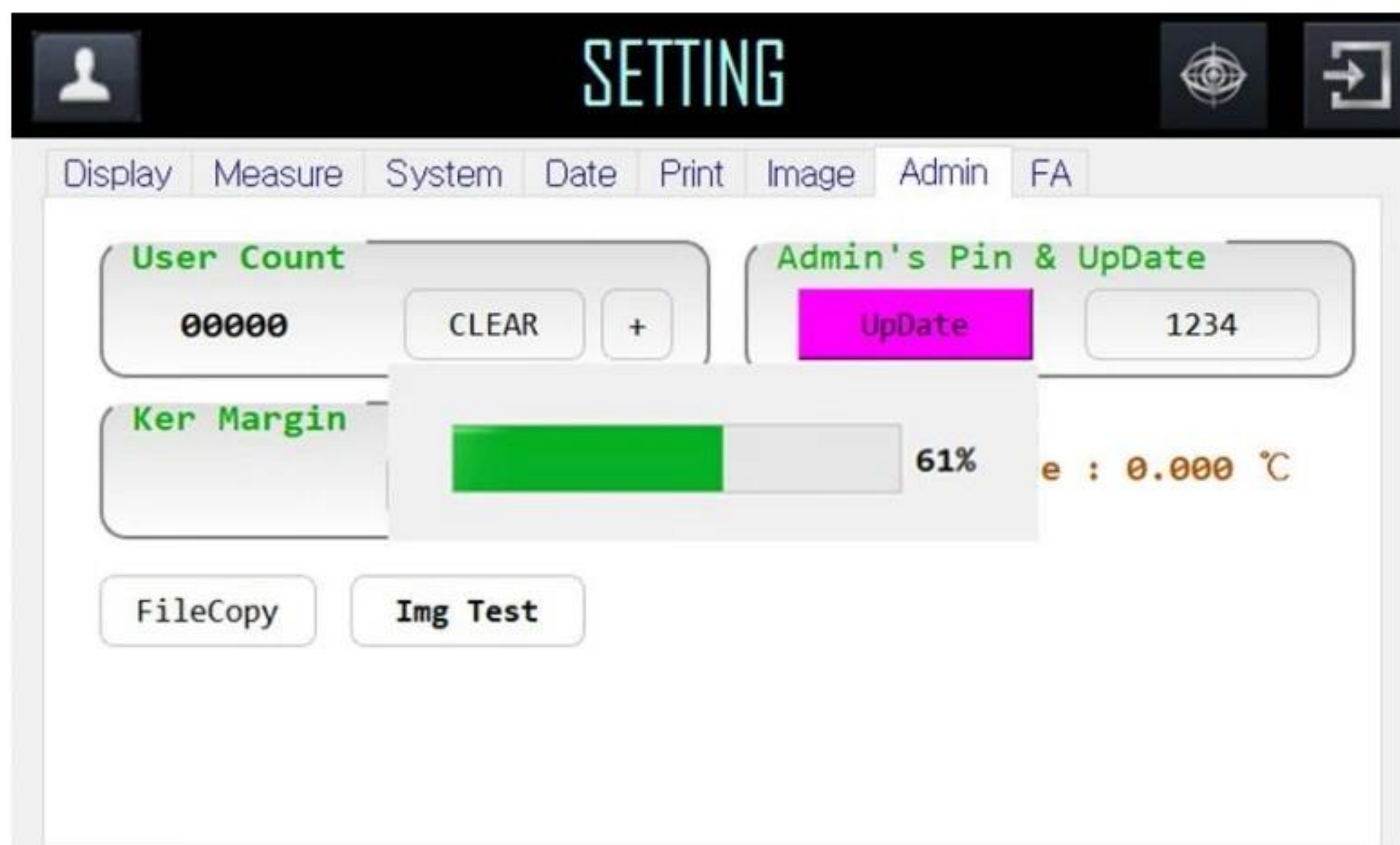
| Name                   | Function                                                                                                                                            |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| ① User Count           | Check / Reset User Count                                                                                                                            |
| ② Admin's Pin & UpDate | Password to view admin page, firmware update (using USB stick)                                                                                      |
| ③ Ker Margin           | A value that compensates for differences in major axis / minor axis during Ker measurement. (Indicated by the average value if less than the range) |
| ④ File Copy            | Copy user data to USB                                                                                                                               |
| ⑤ Img Test             | You can test the captured image                                                                                                                     |
| ⑥ Temperature          | Indicates the instrument temperature                                                                                                                |



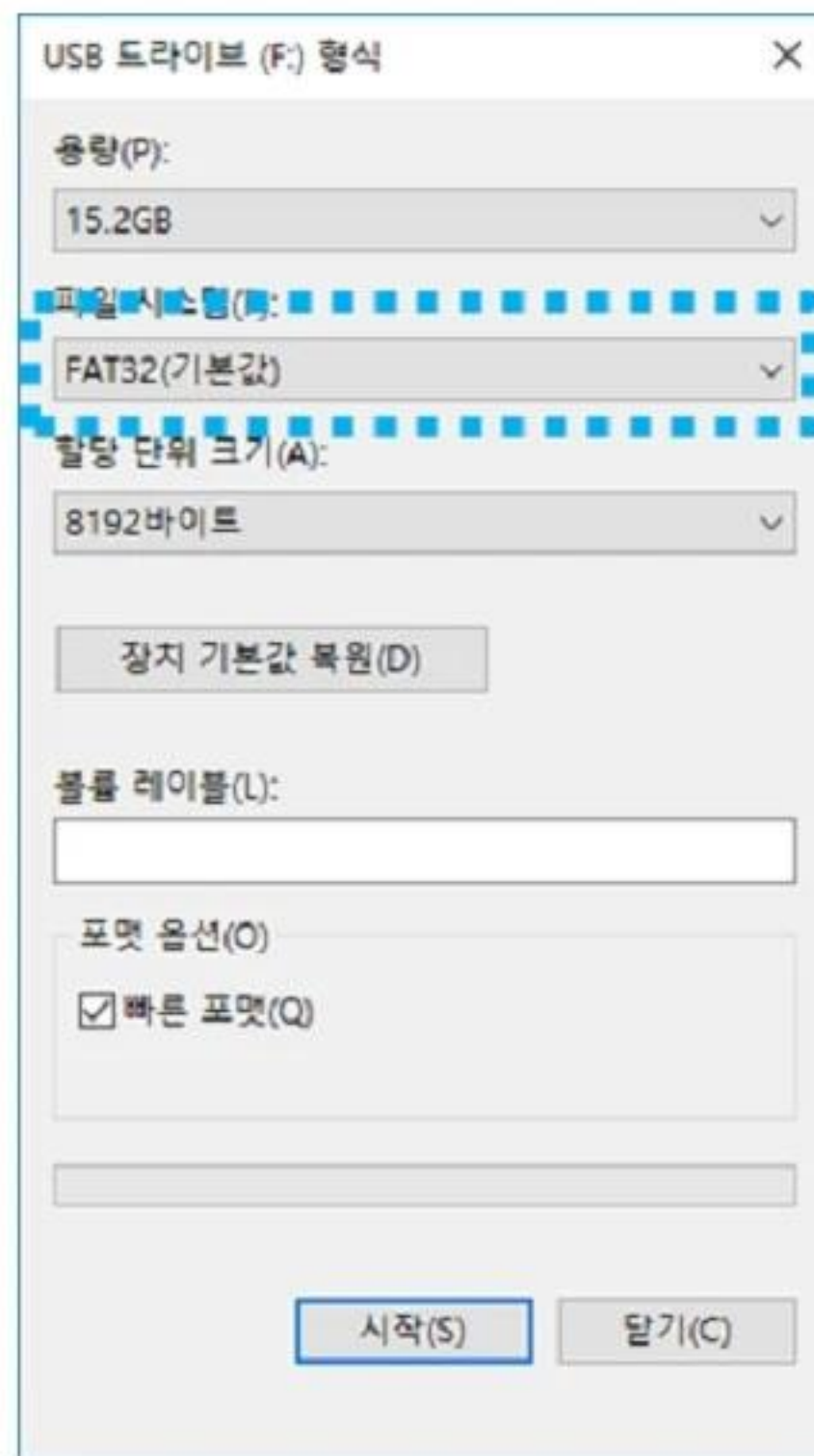
## 7.5 Update



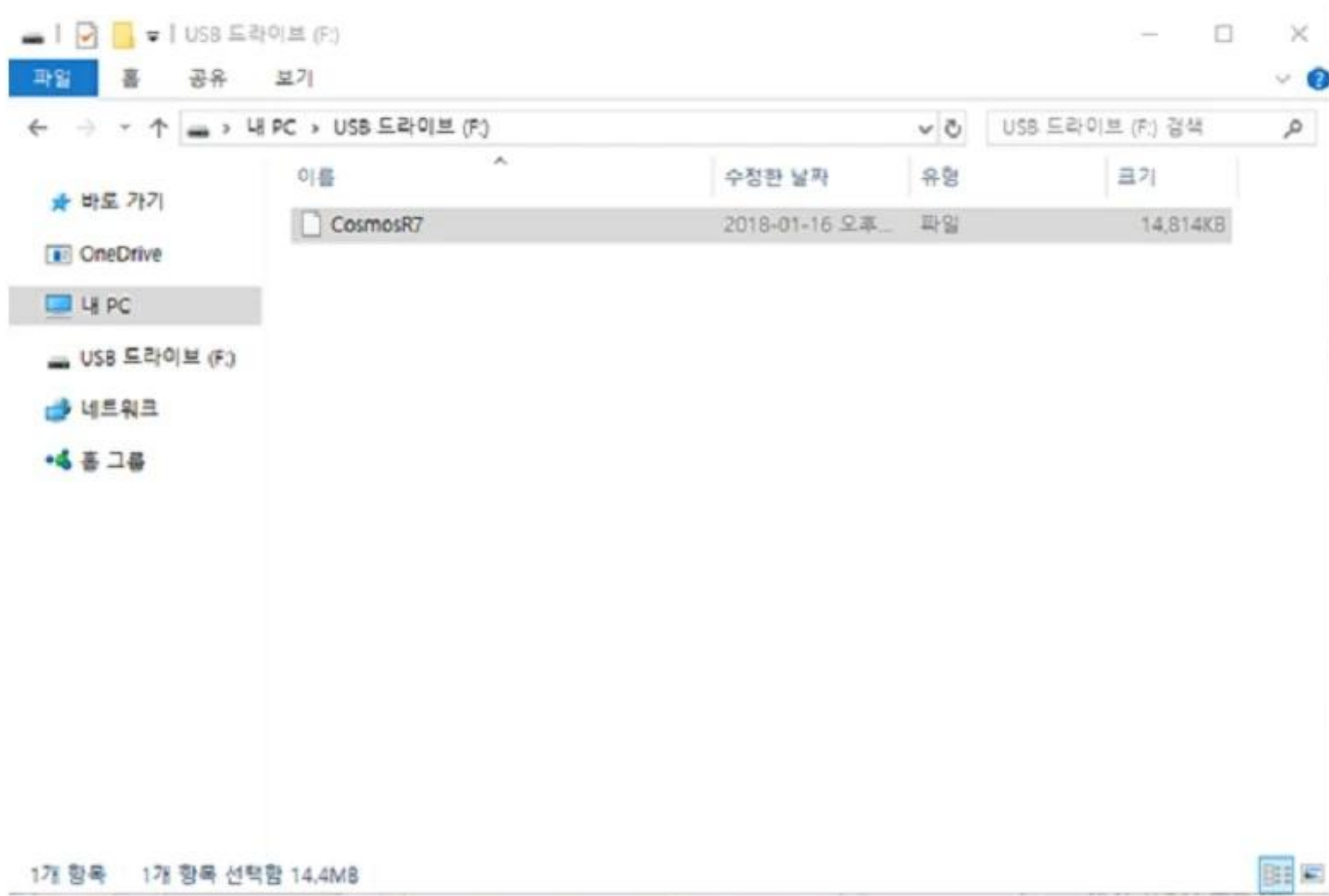
1. Click Settings - Admin - UpDate.
2. If there is no USB Stick, "Upgrade File not Found" message is displayed.



1. Click Settings - Admin - UpDate.
2. If there is an update file on the USB stick, the progress bar is displayed.
3. If you need to turn off the power after updating, wait 1 minute and turn off the power.

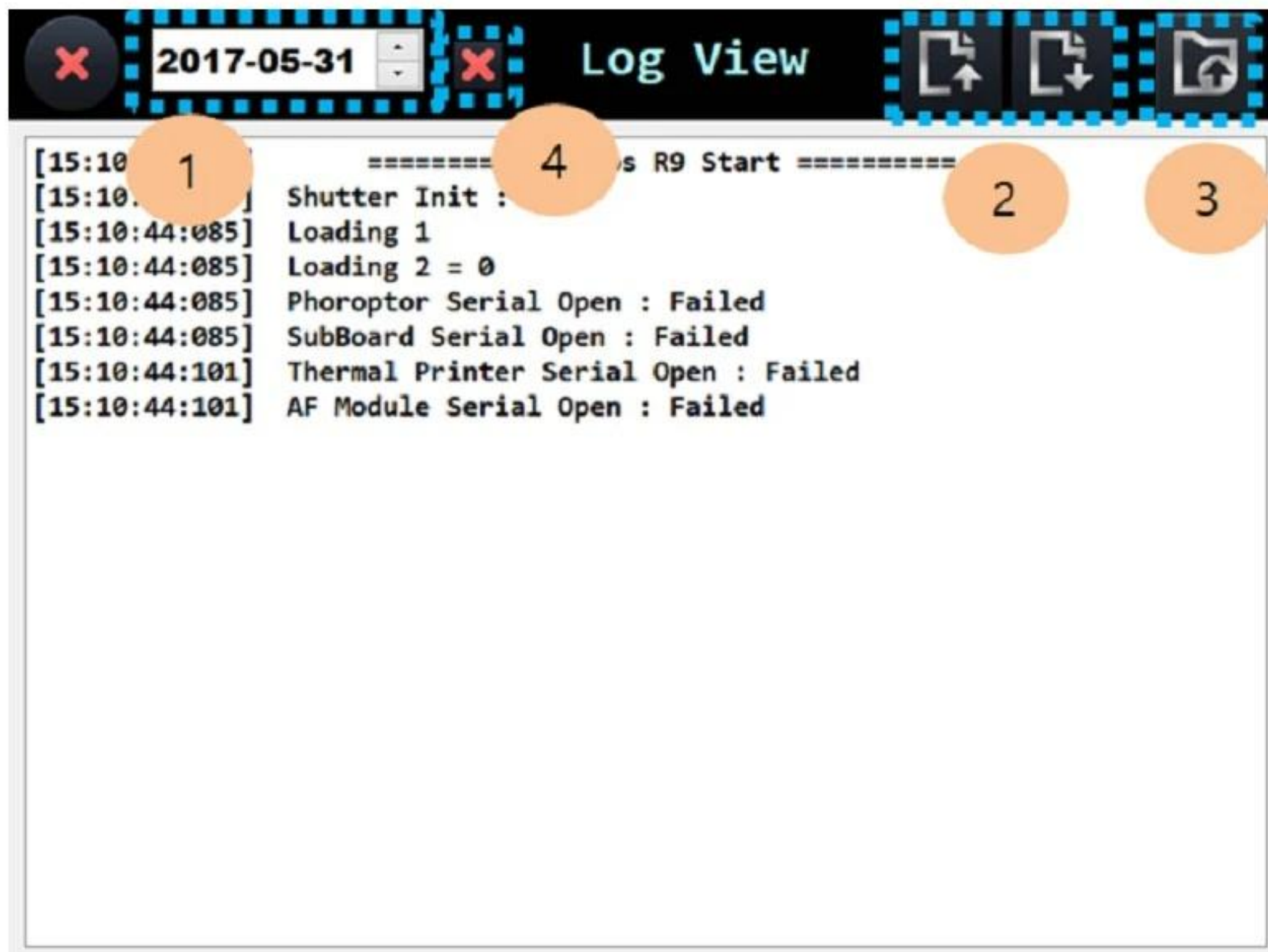


1. Connect the Usb Stick to the PC.
2. Format Usb Stick with FAT32



1. Copy the supplied file (CosmosR7) to usb stick.
2. Plug the USB stick into the bottom left corner of ERK-5400A.

## 7.6 Log View



| No. | Function                       |
|-----|--------------------------------|
| ①   | You can select the log date.   |
| ②   | Page Up / Dn the log contents. |
| ③   | Load the log contents.         |
| ④   | Delete the current log file    |



## 7.7 Image Dialog



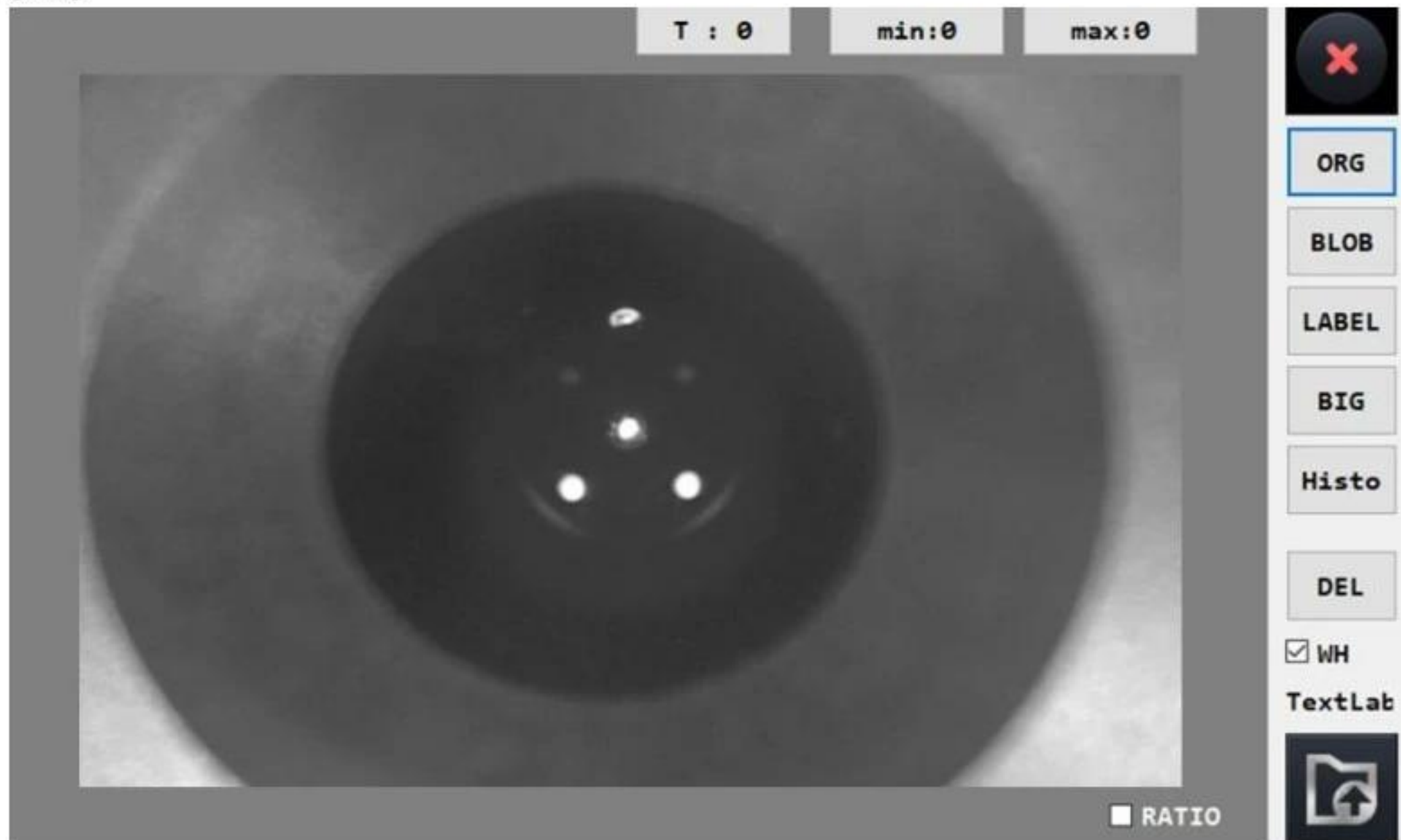
1. Image processing screen
2. Load the image and test the values required for image processing.

### OPEN



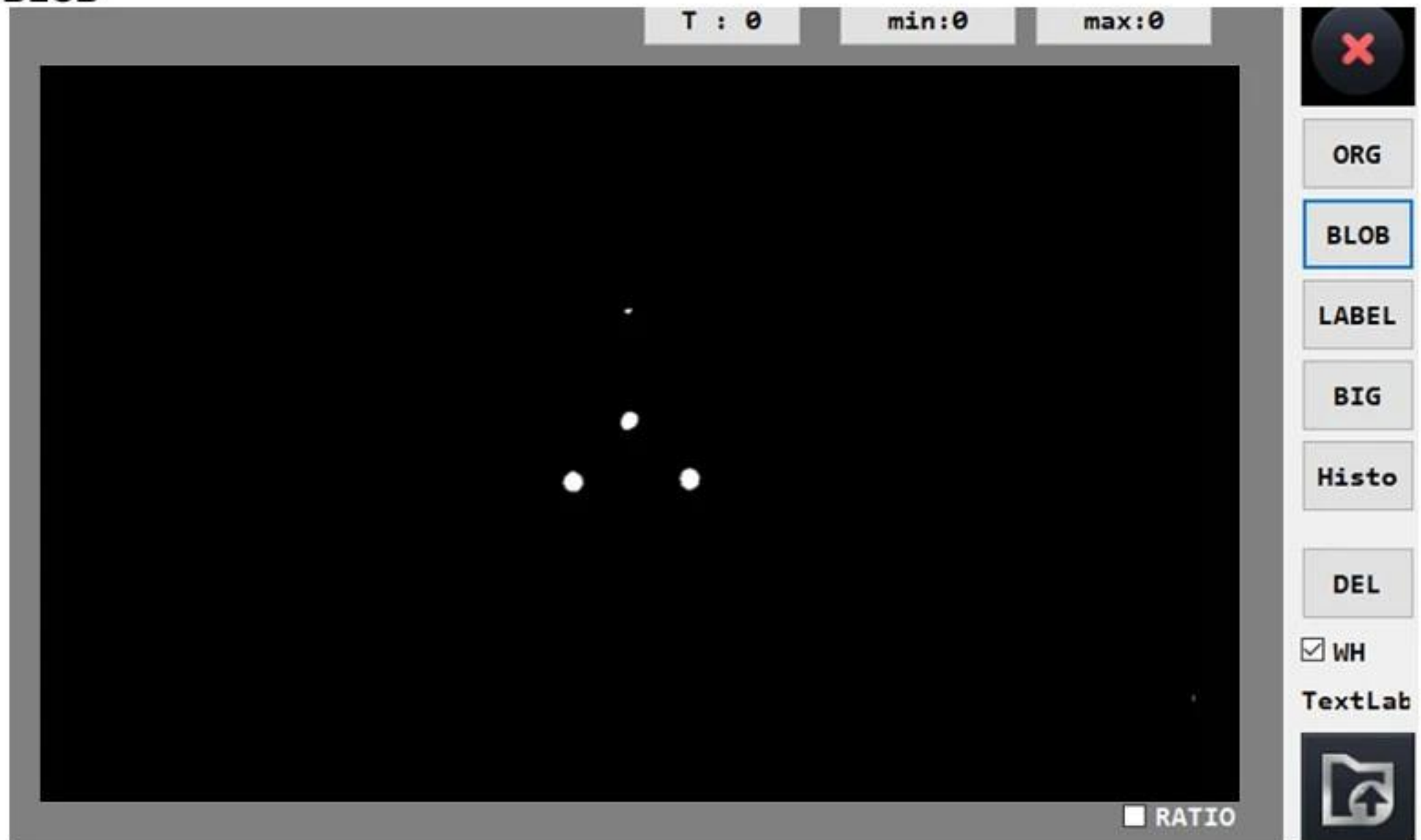
1. Load the image to be processed.

## ORG



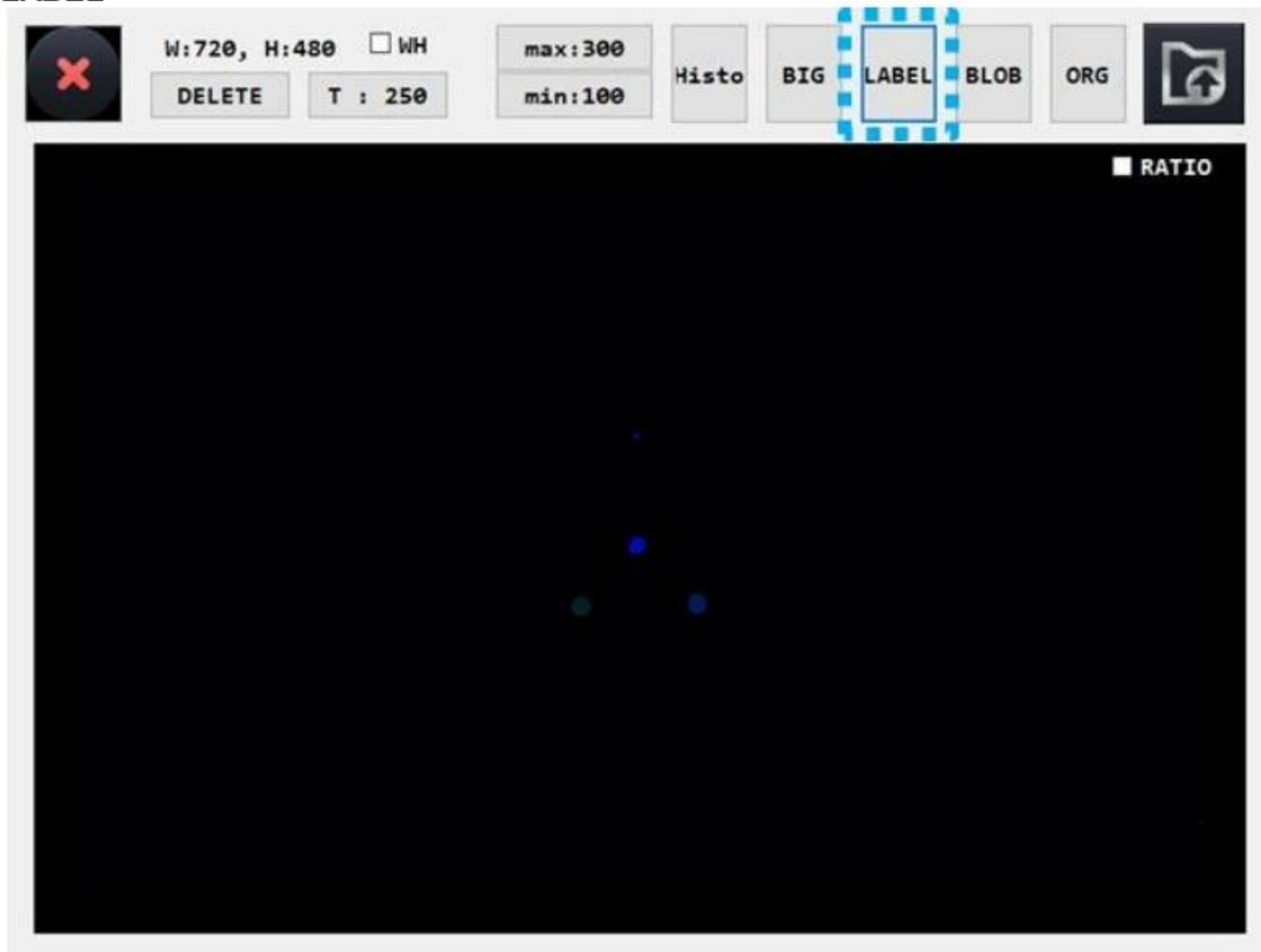
Displays the original image.

## BLOB



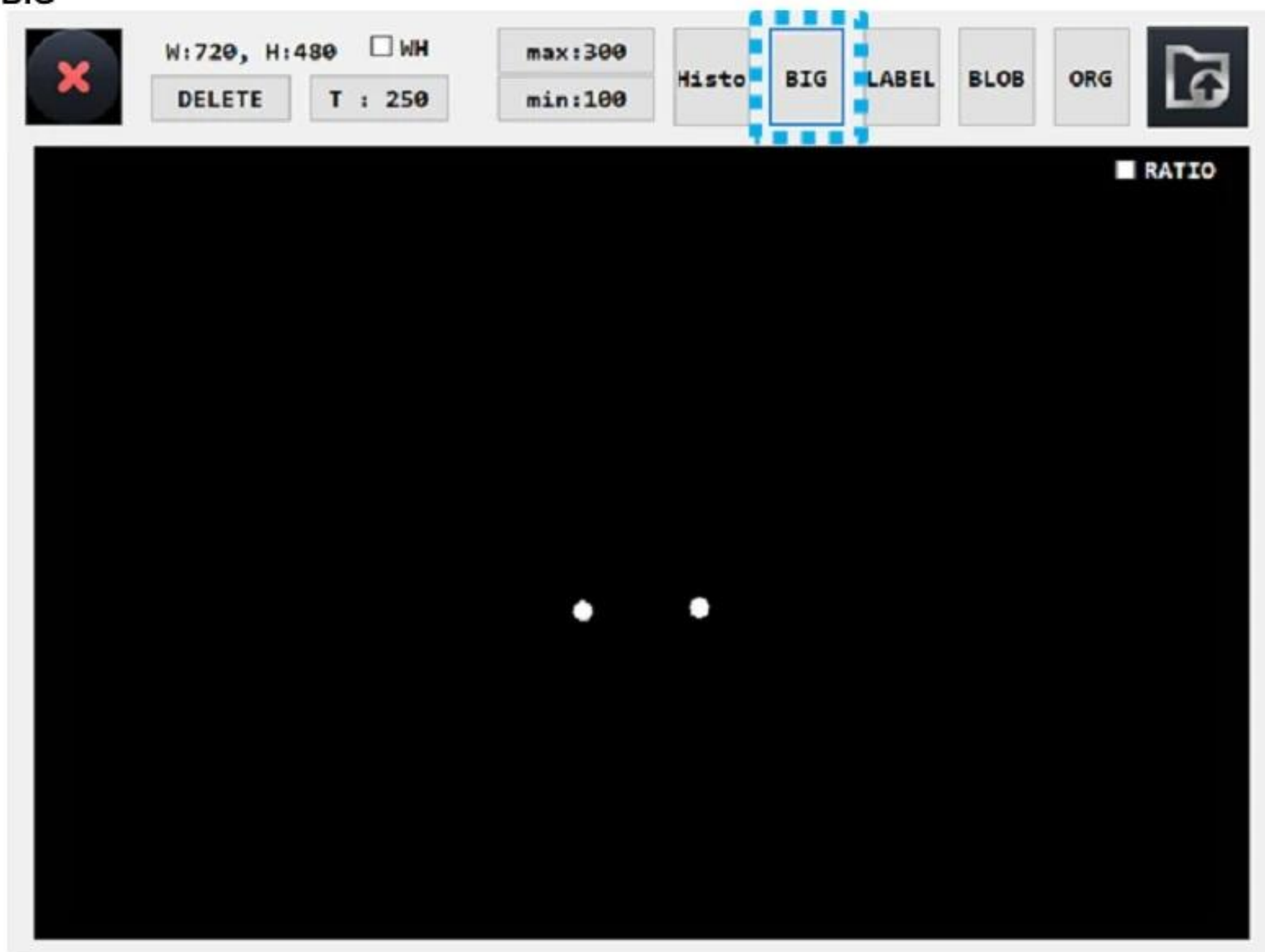
T: 250 (extract blob by applying threshold value)  
You can modify the Threshold value (0 to 255).

## LABEL



Displays an independent blob (labeling).

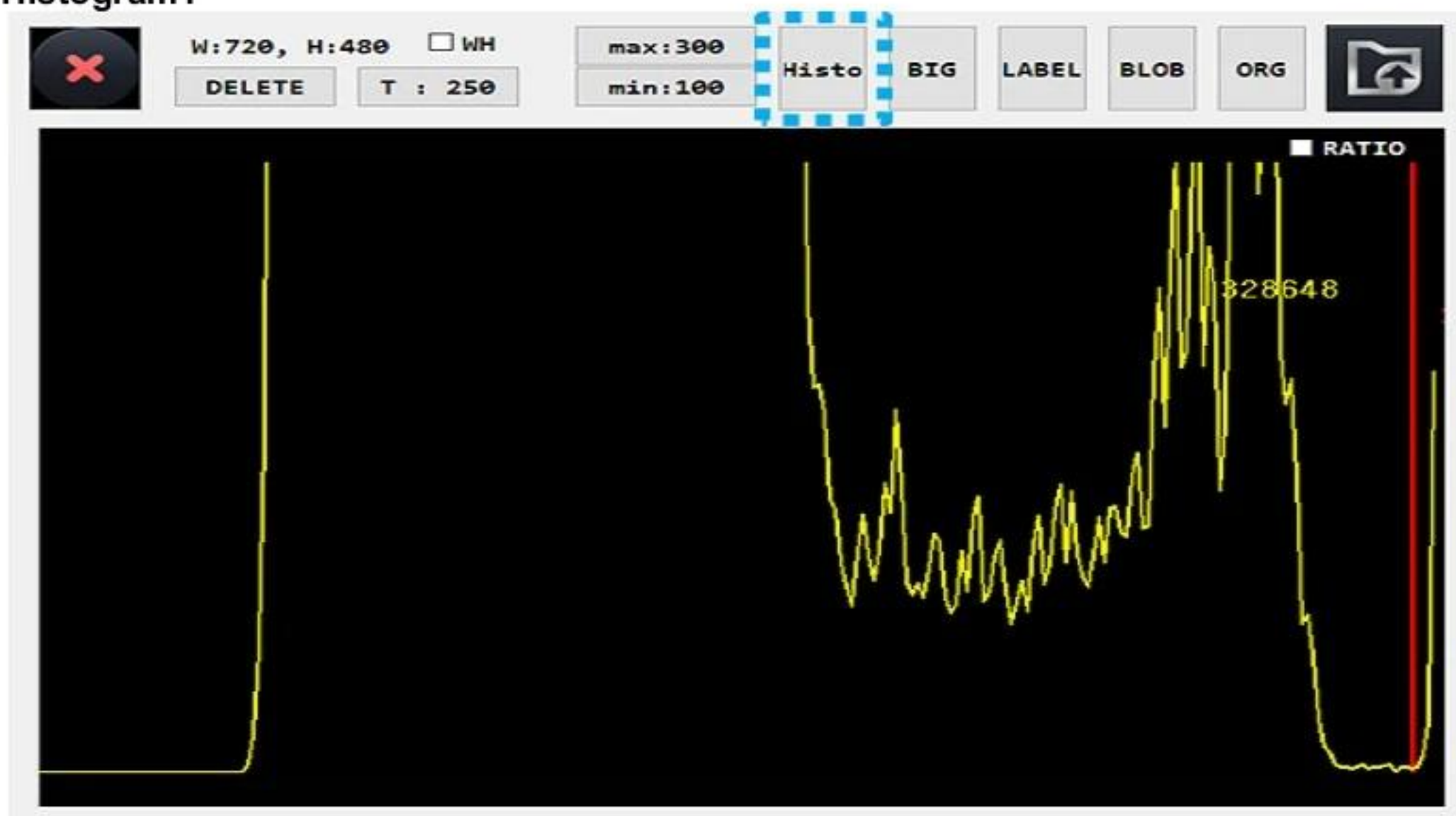
## BIG



Click the BIG button to show only blobs matching the conditions (min: 100 ~ max: 300).

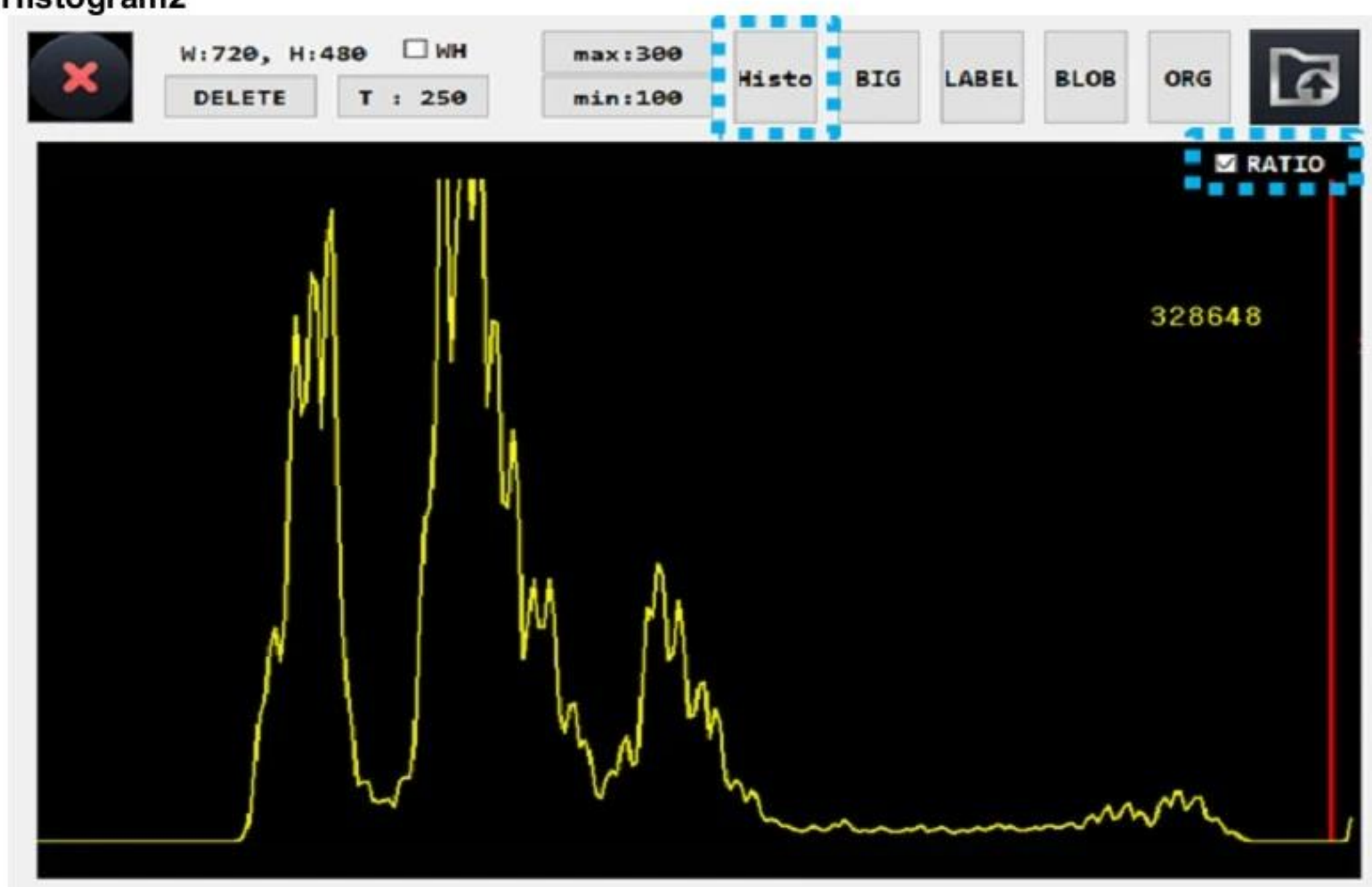


### Histogram1



Click the Histo button to display the histogram of the current screen.  
The middle red line is the current threshold value

### Histogram2



Click the Histo button to display the histogram of the current screen.  
The middle red line is the current threshold value.  
If you click RATIO, the ratio is adjusted and displayed.



Turn off the power after connecting or disconnecting the power cable.  
Do not operate the unit with wet hands. Otherwise, to cause death  
or serious injury can result in electric shock.

## 8. Print Mode

- Pressing the touch button(  ) to print the measured results. will be printed when you print.
- Depending on the user setup mode is selected in different prints.

2017-08-17 PM 04:51:37  
No. 105

Recognizing of  
measurement date

[ REF RESULT ]

Recognizing of  
measurement mode

VD : 12.0 mm CYL : -

<R> SPH CYL AX

AVE -0.79 0.00 0.0

1 -0.80 0.00 0.0

2 -0.78 0.00 0.0

3 -0.81 0.00 0.0

<L> SPH CYL AX

AVE -0.82 -0.34 107.8

1 -0.81 -0.36 111.2

2 -0.83 -0.33 107.0

3 -0.83 -0.33 105.1

Recognizing of  
measurement  
average value

[ KER RESULT ]

<R> mm D AX

AVE 7.48 7.46 47.8

1 7.46 7.46 0.0

2 7.50 7.45 143.3

3 7.47 7.47 0.0

<L> mm D AX

AVE 7.42 7.33 35.6

0 7.43 7.32 31.2

1 7.40 7.33 29.5

2 7.42 7.34 46.0

[ Drawing 10 ] Print Sample



## 9. Self Inspection and Maintenance

### 9.1 Before Calling a Service Person

Warning messages will be displayed on the monitor if some problems occur. It might be operation errors or problems of the machine. In this case, refer the following instructions. If the function is still not salvaged or recovered, disconnect the power supply and consult the dealer.

#### (1) Message When Power On

| Message         | Cause          | Remedy                                                                                                                                                                        |
|-----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FOG MOTOR FAIL  | Internal error | Turn OFF the power switch and turn on again after 10 seconds. If the message appears again, consult the dealer.                                                               |
| SHUT MOTOR FAIL |                |                                                                                                                                                                               |
| Measure Error   | Internal error | <ul style="list-style-type: none"> <li>- Try to re-measure if measurement fails.</li> <li>- If frequency is frequent, contact the CS team by attaching the number.</li> </ul> |

#### (2) Message On Measuring

| Message      | Cause                                                         | Remedy                                                                                                                                                                                                                                      |
|--------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RETRY        | Alignment is improper                                         | Measure after aligning the pupil and the Alignment Mark properly.                                                                                                                                                                           |
|              | Eyelid or eyelashes are covering the pupil.                   | Instruct the examinee to open his or her eyes wide, or lift up the eyelid lightly with your fingers and measure again                                                                                                                       |
|              | When the pupil is smaller than the Outer Alignment Mark.      | The minimum pupil diameter that can be measured is 2.0 mm. Although it is possible to measure in the bright place, don't expose examinee's eyes to the direct sunlight or too bright indoor lights to prevent the contraction of the pupil. |
|              | When the Mire Image is odd shaped because of tears.           | Instruct the examinee to open and close his or her eyes several times and measure again.                                                                                                                                                    |
|              | When the Mire Image is not clear because the cornea is dry.   |                                                                                                                                                                                                                                             |
|              | Examinee has strong irregular astigmatism or corneal disease. | Impossible to measure                                                                                                                                                                                                                       |
| AGAIN        | Measurement result is not reliable.                           | Measure again.                                                                                                                                                                                                                              |
| OUT+<br>OUT- | Data was out of valid measurement range.                      | Measurement result is unreliable. Please measure again.                                                                                                                                                                                     |



(3) Message On Printing

| Message  | Cause                | Remedy                     |
|----------|----------------------|----------------------------|
| NO PAPER | Empty printer paper. | Replace the printer paper. |

(4) Error during measurement

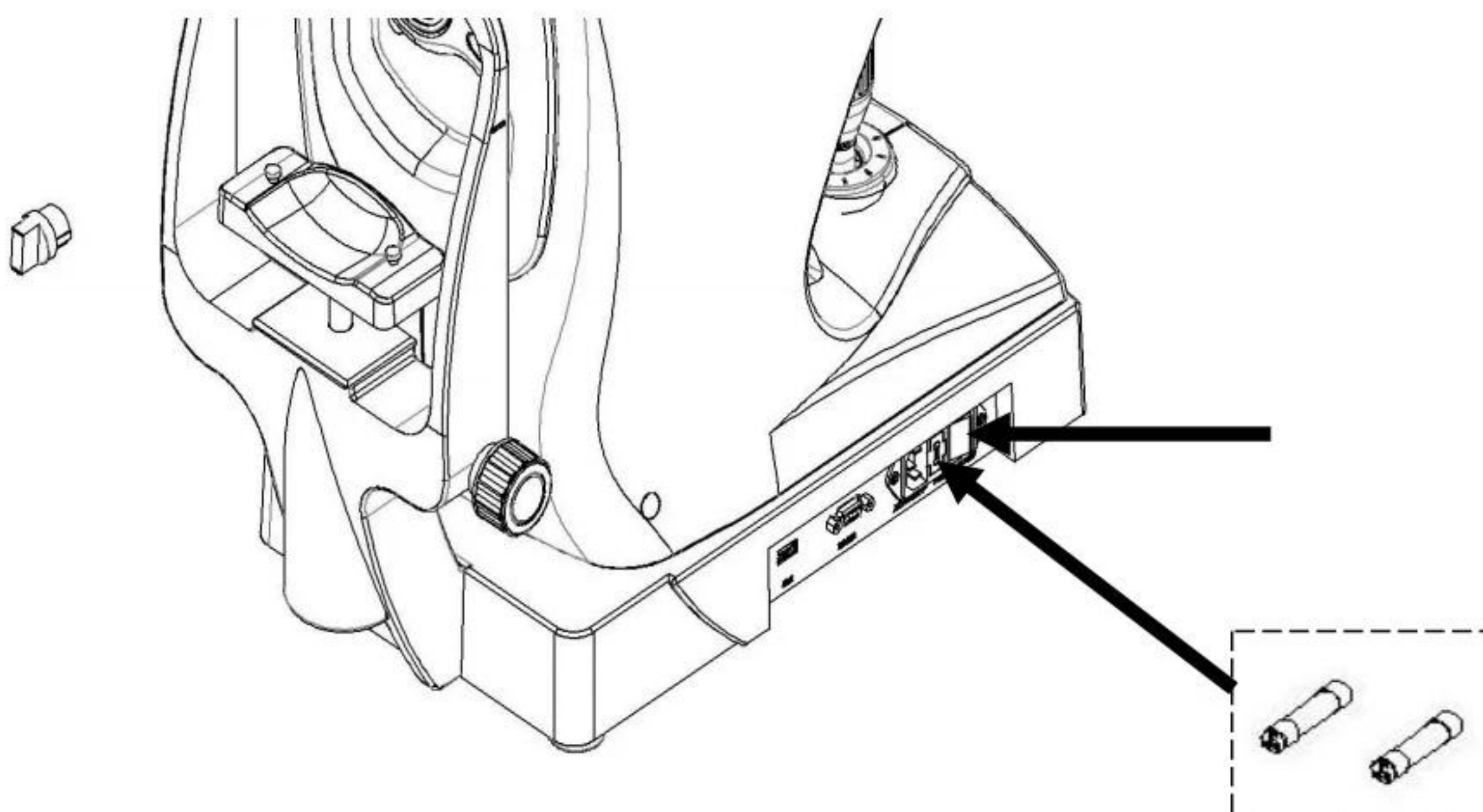
| Error                                                  | Cause          | Remedy                                                                                                                                                                                               |
|--------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| When power is applied, only the USO logo is displayed. | Internal error | <ul style="list-style-type: none"> <li>- Insert the USB stick that stores the file (CosmosR7) needed for the update and reboot.</li> <li>- Ask the manufacturer or supplier for the file.</li> </ul> |

## 9.2 Fuse Replacement

The power protection fuse protects the product from excess current. If the power monitoring protection circuit detects excess current, it shut off the current to the equipment in order to prevent overheating and to restrict the SMPS power output.



To avoid risk of electric shock, always disconnect the plug from the system prior to fuse replacement.



1. Turn off the system and disconnect the system power cord from the wall outlet.
2. Open the fuse cover.
3. Remove the old fuse and replace it with a new one.
4. After installing the new fuse, connect the plug to the product.

※ Fuse information is shown in the following table

| Input Ratings | Fuse Ratings | Maker      | Order No.   |
|---------------|--------------|------------|-------------|
| 100~120 VAC   | 2AH/250V     | Littelfuse | 216_code002 |
| 200~240 VAC   | 2AH/250V     | Littelfuse | 216_code002 |

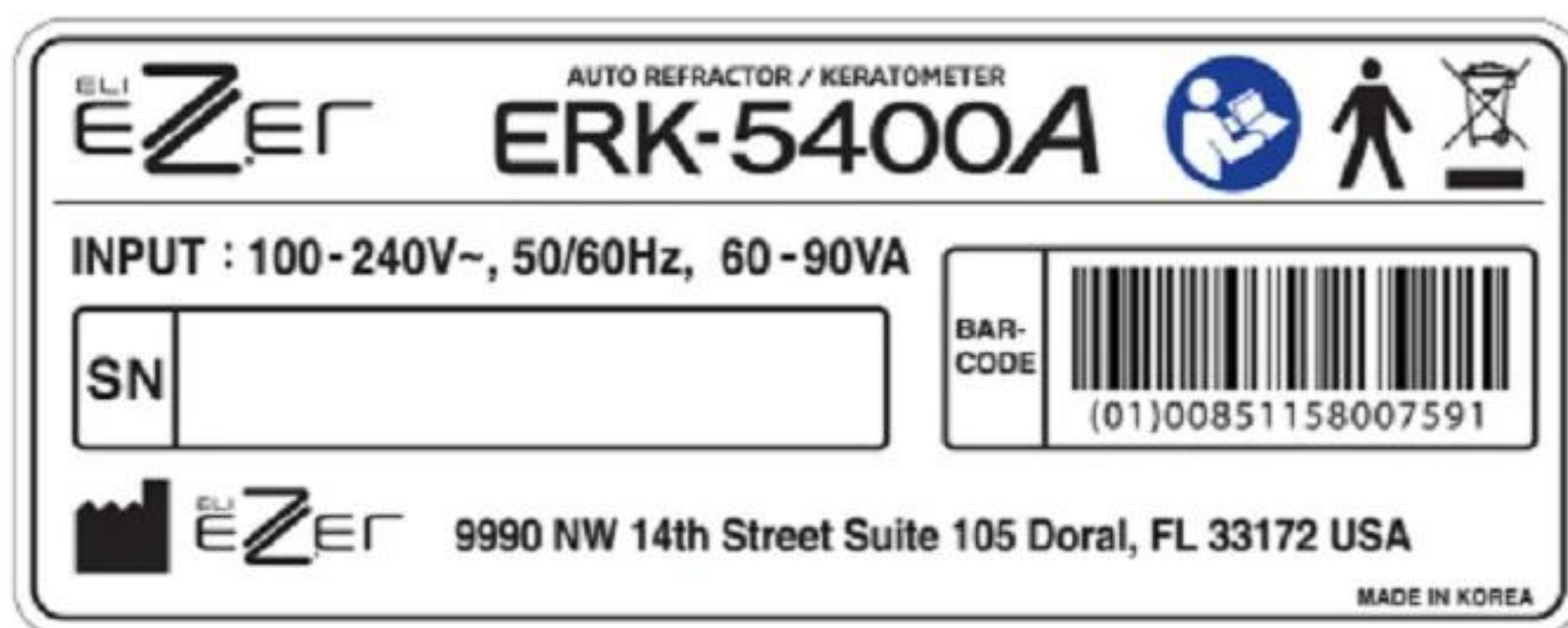
## 9.3 Service Information

### (1) Repair

If problem cannot be solved even after taking the measures indicated in section 9.1, contact ERK-5400A representative or distributor for repair.

Please refer to the name plate and let us have the following information:

- Name of the instrument : ERK-5400A
- Serial Number : 10-digit characters indicated on the name plate
- Phenomenon : In detail
- Size : 79mm(W) x 31mm(D)



[Drawing 34 ] Labeling

### (2) Limit for Supplying Performance Parts for Repair

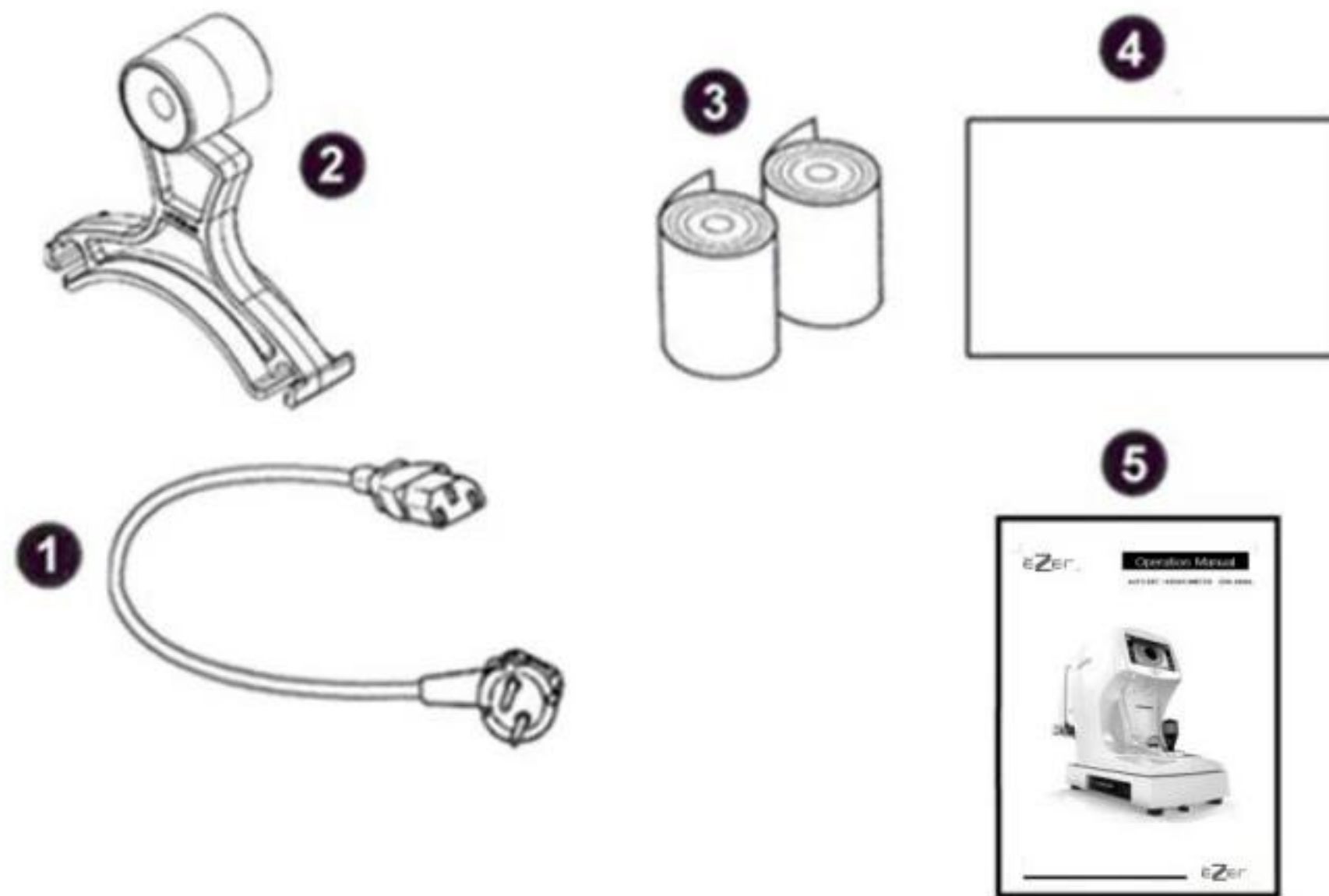
Performance part (required to maintain the functioning of the product) of this product will be stocked for six years after discontinuation of product, to allow for repair



## 10. Specifications

| Refractometry                    |                                                                                                                                                                                                         |                      |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Vertex Distance(VD)              | 0.0 , 10.0, 12.0, 13.5, 15.0mm                                                                                                                                                                          |                      |
| Sphere(SPH)                      | -25.00 ~ +22D (VD 12mm)                                                                                                                                                                                 | Unit : 0.12 / 0.25 D |
| Cylinder(CYL)                    | 0.00~±10.00D                                                                                                                                                                                            | Unit : 0.12 / 0.25 D |
| Axis(AX)                         | 1~180°                                                                                                                                                                                                  | Unit : 1°            |
| Cylinder form                    | -, +, MIX                                                                                                                                                                                               |                      |
| Pupil Distance(PD)               | 10~85mm                                                                                                                                                                                                 |                      |
| Minimum Pupil Diameter           | Ø2.0mm                                                                                                                                                                                                  |                      |
| Keratometry                      |                                                                                                                                                                                                         |                      |
| Radius of Curvature              | 5.0~10.2mm                                                                                                                                                                                              | Unit : 0.01mm        |
| Corneal Power                    | 33.00~67.50D                                                                                                                                                                                            | Unit : 0.12/ 0.25 D  |
| Corneal Astigmatism              | 0.00~-15.00D                                                                                                                                                                                            | Unit : 0.12/ 0.25 D  |
| Axis                             | 1~180°                                                                                                                                                                                                  | Unit : 1°            |
| Corneal Diameter                 |                                                                                                                                                                                                         |                      |
| Corneal Diameter                 | 2.0~12.00mm                                                                                                                                                                                             | Unit : 0.1mm         |
| ETC.                             |                                                                                                                                                                                                         |                      |
| Storage Memory                   | 10 measurement each eyes                                                                                                                                                                                |                      |
| Internal Printer                 | Thermal printer                                                                                                                                                                                         |                      |
| Display                          | 7.0 inch TFT COLOR LCD Monitor, Touch                                                                                                                                                                   |                      |
| Chin rest movement               | Max 65mm                                                                                                                                                                                                |                      |
| Operation environment            | Temperature : +10℃ ~ +40℃<br>Humidity : 30% ~ 90% RH<br>Atmospheric pressure range : 70 kPa ~ 106 kPa<br>Shock (without packaging) : 10g / 6ms                                                          |                      |
| Storage and Movement environment | Temperature : -40℃ ~ +70℃<br>Humidity : 10% ~ 95% RH<br>Atmospheric pressure range : 50 kPa ~ 106 kPa<br>Shock : 30g / 6ms<br>Permanent shock : 10g / 6ms<br>Oscillate(sine curve) : 10Hz ~ 500Hz, 0.5g |                      |
| Power supply                     | AC100V ~ 240V, 50/60Hz                                                                                                                                                                                  |                      |
| Power consumption                | 60 - 90VA                                                                                                                                                                                               |                      |
| Dimension                        | 248mm(W) x 476mm(D) x 473mm(H)                                                                                                                                                                          |                      |
| Weight                           | 21kg                                                                                                                                                                                                    |                      |

## 11. ACCESSORY

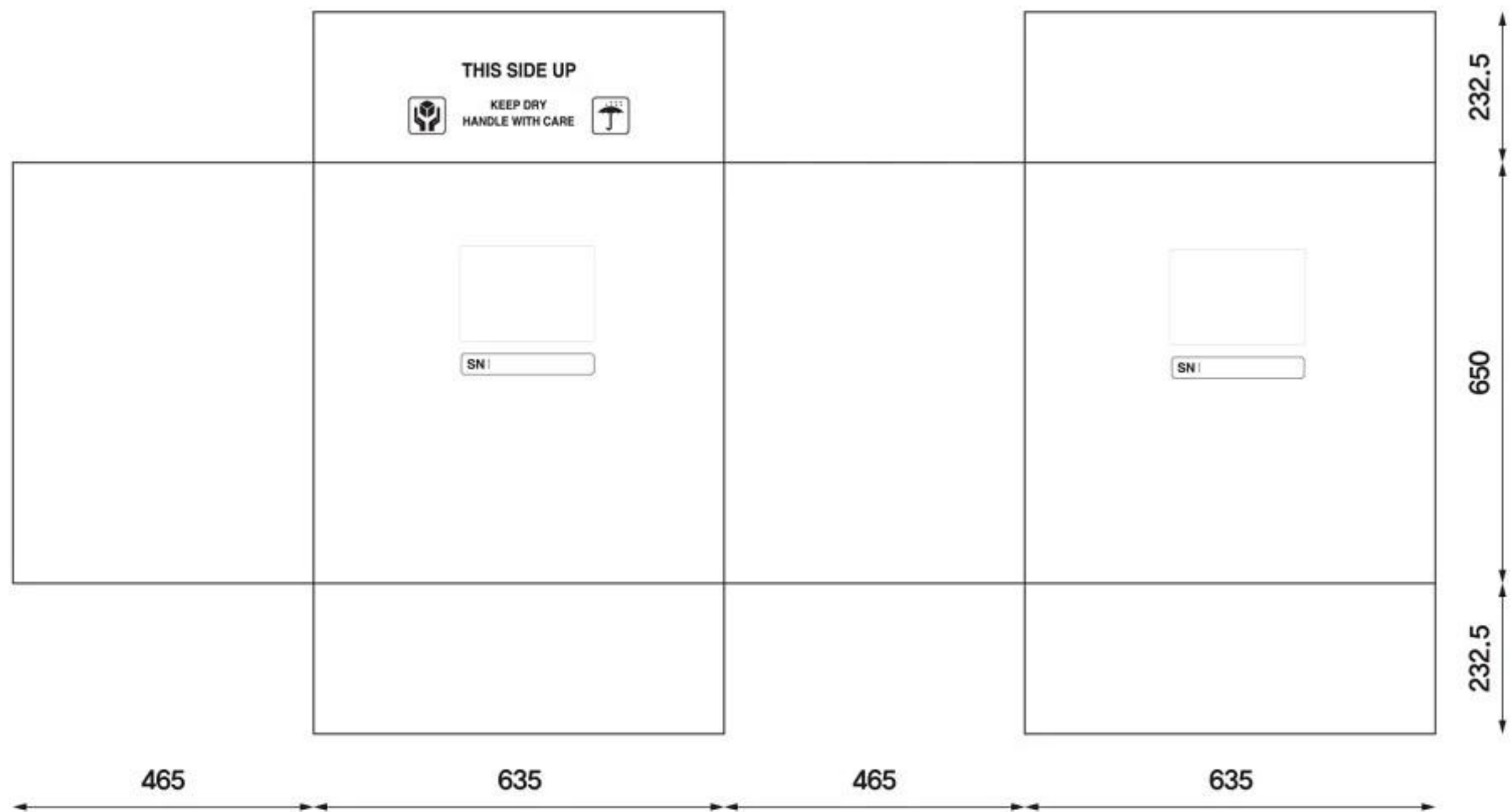


[Drawing 35 ] ERK-5400A Accessory

| Name                 | Standard                                      | Quantity |
|----------------------|-----------------------------------------------|----------|
| ① Power Supply Cable | H05VV-F 175mm, 3G 0.75mm <sup>2</sup> , 175mm | 1EA      |
| ② Model Eye          | Diopters : 1.5168, 110mm X 105mm X 35mm       | 1EA      |
| ③ Printing Paper     | T 12 * 57 * 50 mm                             | 2 rolls  |
| ④ Dust cover         | 260mm(W) X 490mm(D) X 475mm(H)                | 1EA      |
| ⑤ Operation Manual   | B5(254mm X 180mm)                             | 1EA      |

## 12. Packing

### 12.1 Packing Foam Design



[Drawing 36 ] ERK-5400A Packing Box



[Drawing 37 ] ERK-5400A Packing Box Sticker



## 12.2 Packaging step

|        |                                                                                                                 |                                                                                       |
|--------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Step 1 | Plastic bag packaging<br>Material : PE<br>Size : 0.4Tx750x1300<br>Color : transparency                          |    |
| Step 2 | Foamed polystyrene packaging<br>Material : poly urethane<br>Size : 635x650x232.5 ( pair)<br>Color : Silver      |    |
| Step 3 | Paper box packaging<br>Material : KLB225.CK.K.CK.KLB225<br>Size : 635x650x465<br>Color : 1 degree black, yellow |    |
| Step 4 | Rope packaging<br>Material : P.P<br>Size : 15mm<br>Color : yellow                                               |   |
| Step 5 | Finish packaging                                                                                                |  |

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ol style="list-style-type: none"> <li>1. Be cautious not to fall down or not to drop when carrying.</li> <li>2. Be cautious not to be hurt on your finger when holding the rope to carry.</li> <li>3. Please contact manufacturer or distributor if the packing box is damaged because it may damage a equipment.</li> <li>4. Please contact manufacturer or distributor if it's contaminated by rainwater because it may damage a equipment or it may present a risk of electric shock.</li> </ol> |
|  | <ol style="list-style-type: none"> <li>1. Please use gloves when unpacking box.</li> <li>2. Hold the both side of rope when cutting to prevent any injury.</li> </ol>                                                                                                                                                                                                                                                                                                                                |
|  | <ol style="list-style-type: none"> <li>1. Do not store and move the packing box being upside down.</li> <li>2. Do not place heavy things over 20kg when keeping.</li> <li>3. Do not throw it or drop from high.</li> </ol>                                                                                                                                                                                                                                                                           |

## 13. EMC (ELECTROMAGNETIC COMPATIBILITY)

The Electromagnetic Compatibility Directive sets the essential requirements for electrical and electronic equipment that may disturb or even be disturbed by other equipment. The ERK-5400A complies with these requirements as tabled below. Follow the guidance on the tables for use of the device in the electromagnetic environment.

### EMC Information (IEC 60601-1-2:2014)

| Emissions                                  |               |                                                         |
|--------------------------------------------|---------------|---------------------------------------------------------|
| Test items                                 | Standard      | Limit                                                   |
| Conducted emissions                        | CISPR 11      | Group 1 Class A                                         |
| Radiated emission                          | CISPR 11      | Group 1 Class A                                         |
| Harmonics Current Emission                 | IEC 61000-3-2 | Class A                                                 |
| Voltage fluctuations and Flicker emissions | IEC 61000-3-3 | Pst: 1<br>Plt: 0.65<br>Tmax:0.5<br>dmax: 4%<br>dc: 3.3% |

| Immunity                                    |                |                                                                                          |
|---------------------------------------------|----------------|------------------------------------------------------------------------------------------|
| Test items                                  | Standard       | Test level                                                                               |
| Electrostatic discharge                     | IEC 61000-4-2  | ± 8 kV/Contact,<br>± 2, ± 4, ± 8, ± 15 kV/Air                                            |
| Radiated RF electromagnetic field           | IEC 61000-4-3  | 3 V/m<br>80 MHz-2.7 GHz<br>80% AM at 1 kHz                                               |
| Electrical fast transient/Burst             | IEC 61000-4-4  | AC Mains: ± 2 kV, 100 kHz repetition frequency                                           |
|                                             |                | I/O Lines: ± 1 kV, 100 kHz repetition frequency                                          |
| Surge                                       | IEC 61000-4-5  | Line to Line<br>± 0.5 kV, ± 1 kV<br><br>Line to Ground<br>± 0.5 kV, ± 1 kV, ± 2 kV       |
| Conducted disturbances induced by RF fields | IEC 61000-4-6  | 3 V<br>0.15-80 MHz<br>6 V in ISM bands<br>Between 0.15 MHz and 80 MHz<br>80% AM at 1 kHz |
| Power frequency magnetic field              | IEC 61000-4-8  | 30 A/m, 50 & 60 Hz                                                                       |
| Voltage dips                                | IEC 61000-4-11 | 0 % $U_T$ : 0.5 cycle<br>At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°                |
|                                             |                | 0 % $U_T$ ; 1 cycle<br>and 70 % $U_T$ ; 25/30 cycles<br>Single phase: at 0°              |
| Voltage interruptions                       | IEC 61000-4-11 | 0 % $U_T$ ; 250/300 cycle                                                                |

| Immunity to radiated radio frequencies, caused by wireless communications equipment in accordance with IEC 60101-1-2:2014 |            |                                                                 |                                     |                  |
|---------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------|-------------------------------------|------------------|
| Standard                                                                                                                  | Band [MHz] | Service                                                         | Modulation                          | Test level [V/m] |
| IEC 61000-4-3                                                                                                             | 385        | TETRA 400                                                       | Pulse modulation 18 Hz              | 27               |
|                                                                                                                           | 450        | GMRS 460, FRS 460                                               | FM $\pm$ 5 kHz deviation 1 kHz sine | 28               |
|                                                                                                                           | 710        | LTE Band 13, 17                                                 | Pulse modulation 217 Hz             | 9                |
|                                                                                                                           | 745        |                                                                 |                                     |                  |
|                                                                                                                           | 780        |                                                                 |                                     |                  |
|                                                                                                                           | 810        | GMS 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5          | Pulse modulation 18 Hz              | 28               |
|                                                                                                                           | 870        |                                                                 |                                     |                  |
|                                                                                                                           | 930        |                                                                 |                                     |                  |
|                                                                                                                           | 1720       | GSM 1800, CDMA 1900, GSM 1900, DECT, LTE Band 1, 3, 4, 25, UMTS | Pulse modulation 217 Hz             | 28               |
|                                                                                                                           | 1845       |                                                                 |                                     |                  |
|                                                                                                                           | 1970       |                                                                 |                                     |                  |
|                                                                                                                           | 2450       | Bluetooth, WLAN, 802.11b/g/n RFID 2450, LTE Band 7              | Pulse modulation 217 Hz             | 28               |
|                                                                                                                           | 5240       | WLAN 802.11a/n                                                  | Pulse modulation 217 Hz             | 9                |
|                                                                                                                           | 5500       |                                                                 |                                     |                  |
|                                                                                                                           | 5785       |                                                                 |                                     |                  |



**CAUTION – GENERAL HAZARDS**

Portable and mobile RF communications equipment may affect the device. When operating radio devices or components for radio transmission.

“Portable RF communication equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm to any part of the ERK-5400A including cables specified by the USO. Otherwise, degradation of the performance of this equipment could result”

**CAUTION – HAZARDS DUE TO ELECTROMAGNETIC INTERFERENCE RADIATION**

The ERK-5400A may not be placed next to or stacked together with other equipment, except in the device configurations described in this user manual. If operation close to or together with other devices is necessary, the ERK-5400A must be closely observed in order to monitor its proper functioning in this configuration.

**CAUTION – REPLACEMENT CABLES MAY ONLY BE PURCHASED AT USO**

The use of accessories, all types of transducers and cables not specified in this user manual or not sold by USO as replacement part may result in higher emissions or reduced immunity of the ERK-5400A

## 14. Disposal of waste products

When disposing of the products below to contact us

COMPANY : US Ophthalmic

Address : 9990 NW 14th Street, Suite 105 Doral, FL33172, US

Tel : 888.802.2466



This instrument incorporates a lithium battery, which may pollute the environment if the instrument is disposed.  
Please ask a professional waste disposal company to handle disposal or your distributor before disposing of the instrument.