

Auto Refractometer
Auto Kerato–refractometer
User's Manual



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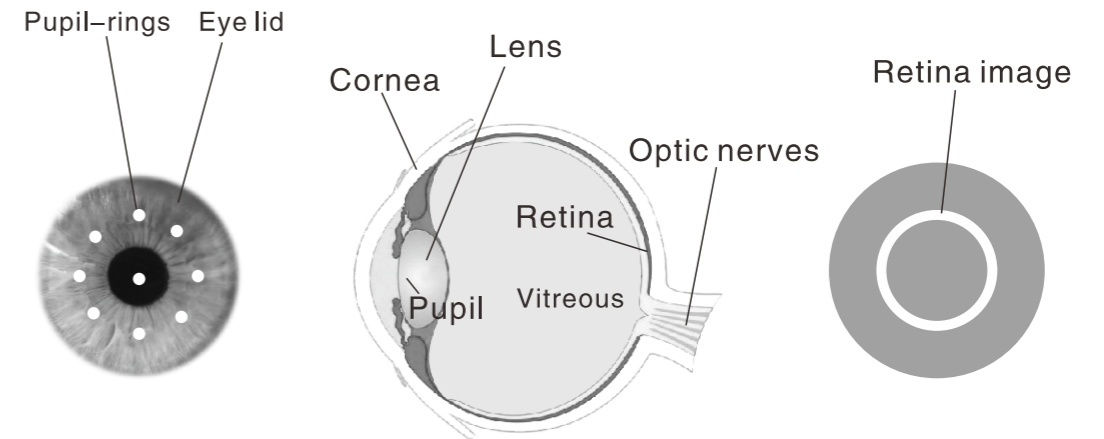
1. Description of the Instrument

This auto refractometer/kerato-refractometer is a precision ophthalmic instrument. It can be used to measure the parameters of farsightedness, nearsightedness, astigmatism, axis, pupil-distance and cornea curvity for prescription of vision correction.

Fig.1. Auto Refractometer/Kerato-refractometer



Fig.2. Principle of measurement



Pupil rings are formed by the instrument and used for good aiming at the eye.

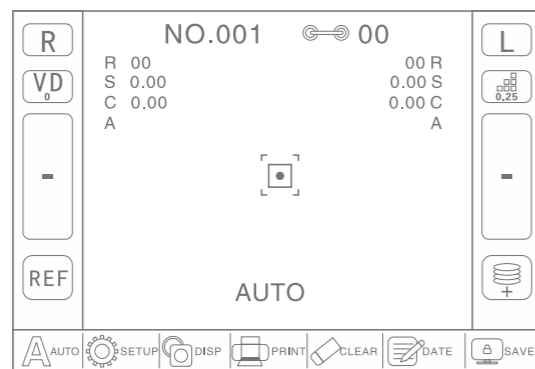
The eye adjusts its refraction power to focus the objects at different distances to the retina. But it may be nearsighted(myopia). A lens is needed to correct the refraction power.

A retina image is produced through projecting a standard image to the eye which is used to analyze the refraction power.

The Refractometer/Kerato-refractometer projects a standard infrared image (generally a circle) to the retina of an eye. By means of analyzing the image on the retina, it can measure hyperopia, myopia, astigmatism, axis and cornea curvity.

In order to make precision measurement, a good alignment with the eye is essential. Refractometer/Kerato-refractometer provides pupil rings to assist in operation. Pupil size smaller than the median ring means that its diameter is less than 2.0mm.

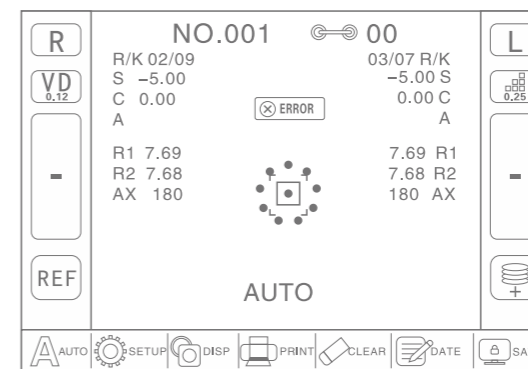
Fig.3. Screen display



NO.001 Measuring times

- PD value
- R/L eye sign
- Vertex distance button to choose among 0, 12 and 13.75
- Step button to choose measuring step between 0.12 and 0.25
- Mode switch button to switch different measurement mode among REF, KER and R&K (only use for kerato-refractometer)
- Cylinder mode button to choose among +, - and ±
- Auto focus sign/button to switch auto focus or manual focus function
- Setup button to display the setting menu
- Display button to display the retina image after measuring
- Print button to printing the measured data
- Clear button to eliminate the measured data
- Data button to display the measured data
- Save sign to save the data

Fig.4. Messages during measurement



- R/K 02/09 Measuring times of diopter or/and corneal curvity value
 - S -5.00 Sphere value
 - C 0.00 Cylinder value
 - A Axis value
 - R1 7.69 Radius value
 - R2 7.68 Radius value
 - AX 180 Axis value
- } only for kerato-refractometer



- Displayed when the eye blinks or moves.
- Displayed when pupil diameter is less than 2mm.
- Indicated that the signal reflected from retina is too weak.
- Indicated that the square mark is not well centered.



If the display state was selected at small in the setting menu, it displayed when you press DISPLAY switch after measurement.

Fig.5. Function button



- MEASURE Move the control stick to focus and start measuring by press measure button
- PRINT Print the measured data
- RESET Reset the refractometer/kerato-refractometer to initial status

Fig.6. Setting menu and Data menu

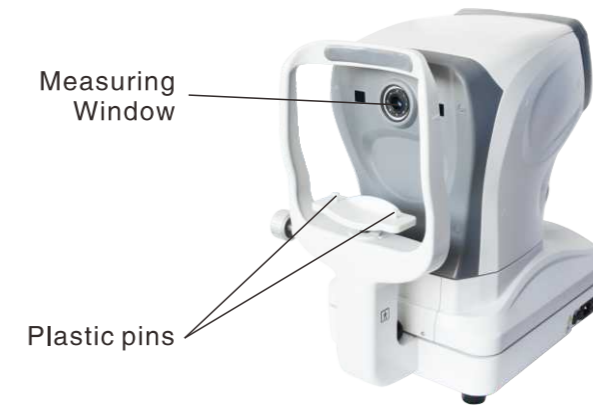
Press SETUP button to enter setting menu and change the it by pressing the options.

<p>SETTINGS 1/3</p> <p>VD VD <input type="radio"/> 0 <input checked="" type="radio"/> 12 <input type="radio"/> 13.75</p> <p>CYL <input type="radio"/> - <input type="radio"/> + <input checked="" type="radio"/> +/-</p> <p>STEP <input checked="" type="radio"/> 0,12 <input type="radio"/> 0,25</p> <p>10L <input checked="" type="radio"/> NORMAL <input type="radio"/> 10L+ <input type="radio"/> 10L-</p> <p>PRINT <input checked="" type="radio"/> 3 <input type="radio"/> 10</p> <p>SAVE <input checked="" type="radio"/> OFF <input type="radio"/> 5 <input type="radio"/> 10</p> <p>NEXT EXIT</p>	<p>SETTINGS 2/3</p> <p>DISPLAY <input type="radio"/> SMALL <input checked="" type="radio"/> BIG</p> <p>BIAS <input type="text" value="+0,00"/> +/-</p> <p>TRACKING <input checked="" type="radio"/> ON <input type="radio"/> OFF</p> <p>BAUDRATE <input checked="" type="radio"/> 19200 <input type="radio"/> 9600 <input type="radio"/> 4800 <input type="radio"/> 2400 <input type="radio"/> 1200</p> <p>DATE 2019-10-01 +/-</p> <p>TIME 09:44</p> <p>UPPER NEXT EXIT</p>	<p>SETTINGS 3/3</p> <p>SHOP</p> <p>Q W E R T Y U I O P</p> <p>A S D F G H J K L</p> <p>@ / Z X C V B N M</p> <p>123 A a</p> <p>UPPER EXIT</p>
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<p>L S C A [KRE] S C A [R]</p> <p>-3.12 -1.00 112 [1] -5.00 -0.75 40</p> <p>-3.37 -1.12 116 [2] -5.12 -0.62 36</p> <p>-3.37 -1.12 117 [3] -5.12 -0.62 36</p> <p>-3.37 -1.12 116 [4] -5.37 -0.50 36</p> <p>-3.37 -1.12 116 [5] -5.37 -0.50 36</p> <p>-3.37 -1.12 117 [6] -5.37 -0.50 39</p> <p>[7]</p> <p>[8]</p> <p>[9]</p> <p>[10]</p> <p>-3.37 -1.12 115 AVG -5.37 -0.62 37</p> <p>VD 12 <input type="radio"/> - <input checked="" type="radio"/> 0.25 <input type="radio"/> 59 PAGE EXIT</p>	<p>L R1 R2 AX [KRE] R1 R2 AX [R]</p> <p>7.35 7.28 147 [1] 7.42 7.33 23</p> <p>7.37 7.29 145 [2] 7.43 7.22 25</p> <p>7.37 7.29 145 [3] 7.41 7.30 25</p> <p>7.35 7.27 145 [4] 7.42 7.30 25</p> <p>7.34 7.27 163 [5] 7.43 7.30 28</p> <p>7.36 7.28 152 [6] 7.41 7.28 26</p> <p>[7]</p> <p>[8]</p> <p>[9]</p> <p>[10]</p> <p>7.36 7.28 149 AVG 7.42 7.31 25</p> <p>VD 12 <input type="radio"/> - <input checked="" type="radio"/> 0.25 <input type="radio"/> 59 PAGE EXIT</p>
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only for kerato-refractometer

Fig.7. Position the test-eye



The test-eye is used for checking the Refractometer/Kerato-refractometer. To avoid falling down, the test-eye should be fixed on the chin-rest with plastic pins.

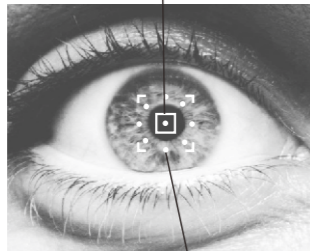
Fig.8. Position the patient



- Ensure the patient to sit on the chair comfortably.
- Let the patient's chin rest on the chin rest and his/her forehead on forehead rest.
- Press the Up-Down button for chin rest to match the eye height with the measuring window roughly.

Fig.9. Aim at the eye and start a measurement

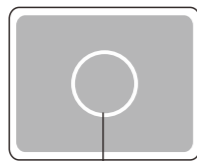
Square mark(should be in the center of the point-ring)



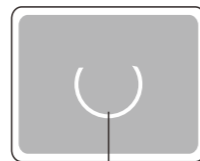
Pupil-rings in the eye (should be the clearest)

The control stick is used to move the measuring window horizontally and vertically. With the control lever, one can place the square mark in the center of the pupil-rings and make the pupil-rings sharply focused.

Fig.10. Observe retina image



A complete retina image



An incomplete retina image

After a measurement you can observe the stored retina image by pressing DISPLAY switch. Select the display state in the setting menu. If the image is an incomplete circle, the measurement is not reliable, and should be made once again.

Incomplete retina images may be caused by eye blinking or by eye movement. Sometimes the signal reflected from the retina is too weak, or pupil diameter is less than 2.0 mm.

Fig.11. Printout

If the stored measuring results were more than 3 and the print state was selected at 10, all results will be printed. Otherwise, at most 3 results will be printed.

Model	FA-6100C	Date and time	2019-10-01 10:23
Shop name	SHOP:	Cylinder	
Patient name	NAME:	Axis	
	REF. DATA		
	<R> S C A		
Sphere	+5.00 +0.0		Results of right eye
	+5.00 +0.0		
	+5.00 +0.0		
	* +5.00 +0.0		Average
	<L> S C A		
	-0.12 +0.0		Results of left eye
	-0.12 +0.0		
	-0.12 +0.0		
	* -0.12 +0.0		Average
	KER. DATA		
	<R> Mm1 Mm2 A		cornel curvature value (only for kerato-refractometer)
	7.68 7.64 124		
	7.68 7.64 125		
	7.68 7.64 123		
	D MH A		
	R1 43.87 7.68 126		
	R2 44.12 7.64 36		
	CYL:0.25		
	<L> Mm1 Mm2 A		
	7.71 7.69 117		
	7.72 7.68 160		
	7.73 7.70 125		
	D MH A		
	R1 43.62 7.72 121		
	R2 43.87 7.69 31		
	CYL:-0.25		
	VD=12	Vertex distance	
	PD=62	Pupil distance	

Fig.12. Load printing paper

▶ step1



▶ step2



▶ step3



- Pluck out the printer cover.
- Hold the print cover, replace the old paper and install new thermal paper correctly as above picture showed
- Push the print cover upward and tight it.

Note: Please use anti-roll thermal coating paper of the size 57*40

2.Unpack and Check

Unpack the box

- Tear off the adhesive tape.
- Remove the foam used for shipping.
- Take out the accessories.

CAUTION:

Please keep the box and foam for future use.

Check the accessories

The accessories in the box

- User's manual(1)
- Dust cover(1)
- Fuse(2)
- Test-eye(1)
- Print paper(1)
- Power cord(1)
- Cleaning cloth(1)

Select a proper place for the instrument

- Place the automatic table at a horizontal flat surface without direct sunlight. Then place the auto Refractometer/Kerato-refractometer on the automatic table.
- The instrument will work at an environment of +5°C to +35°C (41°F to 95°F) and 80% relative humidity.

CAUTION:

Don't place the refractometer in the following environment:

- Extremely hot or cold.
- Temperature rapidly changes.
- Damp and dirty.
- Near electromagnetic facilities.

3. Installation and Test

Installation



- Place the instrument table on the floor.
- Gently place the refractometer on the instrument table.
- Unscrew the limit screw and uninstall two limiting stoppers first, then install the two steel covers.
- Connect power cord of the refractometer to the instrument table.
- Connect power cord of the instrument table to an outlet of main voltage. (100–240V AC) 50/60Hz.

Test

- Turn on the power switch. The power indicator will light.
- Set the test-eye on the chin-rest (see Fig.7).
- Roughly match the test-eye height with the measuring window by pressing Up-Down button for chin rest.
- With the control lever, place the square mark in the center of the pupil-rings (see Fig.9).
- Pull the moving part to make sure the point ring is the clearest.
- Press Measure button, the measurement result will be displayed in a moment. The displayed result should be identical to the parameter of test eye (-5.00D when VD=12mm).
- Check all other buttons of the screen by press the icons.
- Press the Print button to print the measured data.
- Press the Rest button to start initial status.
- If the measurement result is the same to the test-eye (an error of 0.25D is normal) and the functions are all okay, then the refractometer is ready for use.

4. Using the Instrument

- Turn on the power switch. The power indicator will light and the screen begin to display.
- Always reset the instrument when examine a new patient.
- Adjust the automatic table to ensure the patient to sit on the chair comfortably (see Fig.8).
- Let the patient's chin on the chin rest and forehead on the forehead rest.
- Roughly match the eye height with the measuring window.
- With the control stick, place the square mark in the center of the pupil rings (see Fig.9) .
- Pull the moving part to make sure the point ring is the clearest.
- Press Measure button, the measurement result will be displayed in a moment.
- It could also automatically track the eye vertically and automatically measure it by switch these functions when you start measurement.
- After both of the left and right eyes are measured, pupil distance (PD) value will be displayed on the tv screen.
- Press Print button to print out the results.

CAUTION:

- Strong light toward the measuring window will cause measurement error.
- The instrument should be regularly tested by the test-eye.
- Each eye should be measured at least three times.

5. Specifications

SPECIFICATIONS	
	Range of measurement
Sphere	-20~+20D(VD=12) 0.125D step
Cylinder	-8~+8D 0.125D step
Axis	0~180° 1° step
PD	45~88mm,1mm step
VD	0mm,12mm,13.75mm
Min.Pupil Size	Ø2.0mm
	Keratometry
Radius of curvature	5.0~10mm(increment: 0.01mm)
Corneal power	33.75~67.50D(when corner equivalent refractive index is 1.337) (increment selectable from 0.12, 0.25D)
Corneal astigmatism	0.0~8.00D(increment selectable from 0.12,0.25D)
Axis	1~180°(increment:1°)
Corneal diameter	2.0~14.0mm(increment: 0.1mm)
Memory of data	10 measure value for each right and left eye
	Others
Chart	Follow-up colorful fogging chart system
Display	7" TFT LCD
Print	Thermal printer
Power supply	220V±10% 50Hz 60VA
Dimension	492mm(W)×280mm(D)×464mm(H)~494mm(H)
Weight	~20kg(44lb)

★ Specifications are subject to change without notice.

6. Safety Notes and Maintenance

Safety notes

- The AC voltage should be 100–240V AC.
- Never put heavy objects on the instrument.
- Keep the instrument and the ambient air clean.
- Exposure to sunlight is prohibited.
- Handle the instrument with care when moving it.
- Do not use chemical on the surface of the instrument.
- The producer will not be responsible for the problems caused by unauthorized repairing.

Cleaning the instrument

- If dust accumulates on the measuring window, use a blower to blow off the dust.
- If there is fingerprint or oil on the measuring window, wipe lightly with clean gauze and a little camera lens cleaner.
- When the instrument cover is dirty, wipe with a dry soft cloth. Do not use benzine, thinner or a chemically treated cloth.

7.Troubleshooting

PROBLEMS	CAUSE or REMEDY
The power indicator does not light up.	<ul style="list-style-type: none"> • The power cord is not properly plugged into the power outlet. • The power cord is not connected to the instrument. • The fuse blow out.
Fuse blows immediately after power switch is turned on.	The line voltage is not right.
Too large error displays when measuring test-eye.	<ul style="list-style-type: none"> • Test-eye is set askew. • Measuring window is dirty. • Test eye surface is dirty.
Displays ERROR.	<ul style="list-style-type: none"> • The eye blinked. • The eye moves. • The pupil diameter is less than 2.0mm. • There is disease of eye.
Paper jams or no paper.	Replenish the thermal paper (see fig.12).
No data printed out	Please install thermal paper correctly. Please use anti-rolled thermal paper .
Only left/right displays on the screen.	Take the little black stick under moving part into the middle gap of basement.