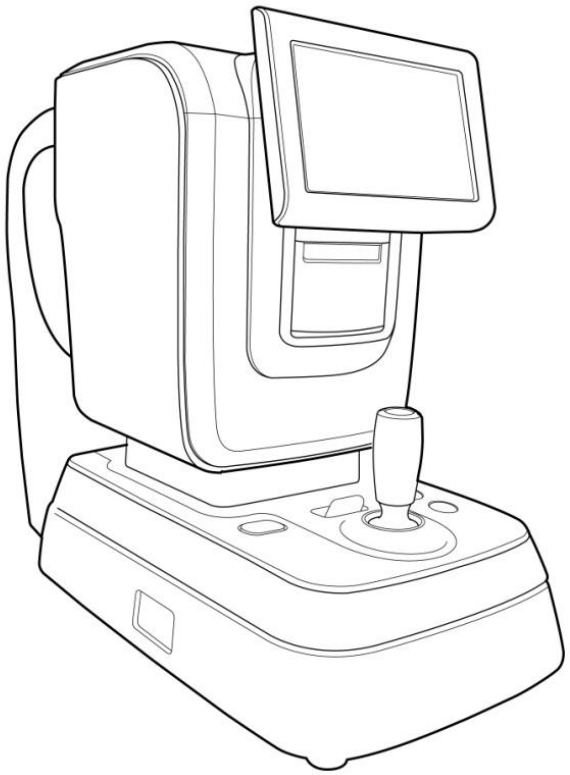
ENG

Huvitz

Auto Ref/Keratometer

HRK-8000A

USER MANUAL



IMPORTANT NOTICE

⚠ WARNING

Potential electromagnetic or other interference between medical equipments and other devices being operated together in the same environmental may expert an adverse influence on functioning of the medical equipment. Non-medical equipments not in compliance with the requirements of EN 60601-1 and EN 60601-1-2 should not be used together in the same environmental as the medical equipments.

Une interférence électromagnétique ou autre potentielle entre des équipements médicaux et d'autres appareils fonctionnant ensemble dans le même environnement peut entraîner une influence défavorable sur le fonctionnement de l'équipement médical. Les équipements non médicaux non conformes aux exigences des normes EN 60601-1 et EN 60601-1-2 ne doivent pas être utilisés ensemble dans le même environnement que les équipements médicaux.

This equipment has been tested and found to comply with the limits for medical devices in IEC 60601-1-2:2014. These limits are designed to provide reasonable protection against harmful interference in a typical medical installation.

Power Cord
For use of equipment in rated voltage less than 125Vac,minimum 6A,Type SJT or SVT , 18/3AWG,10A, max 3.0m long : One end with Hospital Grade Type, NEMA 5-15P Other end with appliance coupler. For use of equipment in rated voltage less than 250Vac,minimum 6A,Type SJT or SVT , 18/3AWG,10A, max 3.0m long : One end terminatesd with blade attachment plug(HAR) Type, NEMA 6-15P.

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

HUVITZ 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.

Revision History

Revision	Date	Approval	Description
A	2013.05		First Issued
B	2014-04-29		Revised user manual according to design change
C	-	-	Drop
D	2017-09-20		Updated manufacturer address Corrected due to Chapter 14.EMC Information rating error
E	2018-03-05		Added French to the description for each safety symbol Updated UL mark (consistent with manufacturing label) Updated safety precautions
F	2018-05-28		Changed the size of User Manual from A4 to B5
G	2018-07-10		Changed due to EMC 4th Renewal -Cover Page IEC-60601-1-2 standard year revision -Added safety precautions (Section 2.4, Item 18, Note) -Change of EMC Information (Section 13)
H	2018-09-11		Updated Chapter 2. Safety Information -. Symbols and marks related to the device and packing box
I	2018-10-29		Changed EMC information from Group 2 to Group 1 due to Light Hazard test result regarding the addition of Mire-Ring LED
J	2020-07-15		Updated US, Brazilian Authroized Representative Information (US Added French to safety related phrases for UL requirement

K	-	-	Revision Number deleted due to PDM (Product Data Management System) Error
L	2021-04-16		Updated Australian Authorized Representative Information
M	2022-03-25		Updated Switzerland Authrozied Representive Information
N	2022-07-21		Revised based on Medical devices - Information to be supplied by the manufacturer (ISO 20417:2021)
O	2023-05-10		Added information regarding Class I laser product Updated UL Mark Updated KER and KNR print image
P	2025.01.20		Added information regarding Class I laser product (Output, Duration) Updated the information of Brazil representative

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38, Burim-ro 170beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14055, Republic of Korea

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1

1. Introduction

1.1. Overview

Auto Ref/Keratometer HRK-8000A is the equipment to provide the information of Spherical, Cylindrical and Axis while measuring the refraction of examinee's eyes. Auto Ref/Keratometer HRK-8000A is the equipment that can measure the corneal curvature of examinee. In addition, it can measure PD (=distance in between pupils) and pupil size. Especially, as its peripheral (=corneal peripheral curvature) measurement is possible as measuring the corneal curvature of examinee, it is possible to know the information on the corneal peripheral curvature as well as the corneal core curvature, which enables the exact prescription for the examinee.

This equipment shall provide the optimal optometry information with Illumination (=observing illumination) to obtain an optimal figure of the eyes' state of examinee.
CLBC (Contact Lens Base Curve) measurement is also a basic function of this product.
The HRK-8000A is provided with an Auto-tracking function and a motorized chinrest function.
Auto-tracking mechanism that automatically achieves alignment in the up/down, right/left direction and focusing. A motorized up/down chinrest allows the operator to easily adjust the height of the chinrest.

The software embedded in the device HRK-8000A controls all system functions including the followings:

- To convert REF/KER LED signals to REF/KER measurements.
- To display focusing state and move to focus position automatically.
- To display measurement result.
- To print measurement result via a thermal printer.
- To support user setup for operation environment.
- To display wave front maps and coefficients.

1.2. Classificaiton

- Classification of Product: Class I with a measuring function according to Medical Device Regulation 2017/745(MDR) Annex VIII Rule 13
- Resistance against electric shock: Class I (earthed)
- Protection class against electric: Type B (headrest, chinrest paper)
- Classification of Laser Product: Class 1 (laser based on IEC 60825-1 Standard)
- Classification of Light hazard: Group I (EN/ISO15004-2 Standard)
- Protection against harmful ingress of water: Ordinary, IPX0
- Degree of safety in the presence of a flammable anesthetics mixture with air or with oxygen or with nitrous oxide: Not suitable for use in the presence of a flammable anesthetics mixture with air or with oxygen or with nitrous oxide.
- Mode of operation: Continuous

1.3. Intended Use

Auto Ref/Keratometer HRK-8000A is intended to provide the information of Spherical, Cylindrical and Axis while measuring the refraction of examinee's eyes.

1.4. Contraindication

1. Do not measure to patients who are sensitive to light. (ex> photophobia)

There is no any known residual risk other than risks arising from violating contraindication.
But, when unexpected event occurs or you encounter different problems, please contact your local distributor or Authorized Representatives.

1.5. Patient Requirement

The patient who undergoes and examination by this instrument must maintain concentration for a few minutes and adhere to the following instructions;

- After his/her face to the chinrest, headrest.
- Keep the eye open
- Understand and follow instructions when undergoing an examination.

If the patient does not conform to these conditions, it is not possible to take a picture correctly

1.6. Applied Standard

1. IEC/EN 60601-1: MEDICAL ELECTRICAL EQUIPMENT - Part 1: General requirements for safety
2. IEC/EN 60601-1-2: Medical electrical equipment Part1: General requirements for safety - Collateral Standard: Electromagnetic Compatibility-Requirements and tests
3. ISO15004-1: Ophthalmic instruments - Fundamental requirements and test methods General Requirements applicable to all Ophthalmic instrument
4. ISO 10342: Ophthalmic instruments - Eye refractometers
5. ISO 10343: Ophthalmic instruments – Ophthalmometers
6. IEC/EN 60825-1: Safety of laser products- Part 1: Equipment classification and requirements

2

2. Safety Information

2.1. Overview

Safety is everyone's responsibility. The safe use of this equipment is largely dependent upon the installer, user, operator, and maintainer. It is imperative that personnel study and become familiar with this entire manual before attempting to install use, clean, service or adjust this equipment and any associated accessories. It is paramount that the instructions contained in this manual are fully understood and followed to enhance safety to the patient and the user/operator. It is for this reason that the following safety notices have been placed appropriately within the text of this manual to highlight safety related information or information requiring special emphasis. All users, operators, and maintainers must be familiar with and pay particular attention to all Warnings and Cautions incorporated herein.

⚠ WARNING

"Warning" cautions against the existence of calamity that can cause severe personal injury, death or property loss in case of negligence.

"Warning" met en garde contre l'existence de calamités pouvant entraîner des blessures graves, la mort ou la perte de biens en cas de négligence.

⚠ CAUTION

"Caution" informs of the matters related to calamity that can cause minor injury or property loss in case of negligence.

La "Caution" informe des questions liées aux calamités qui peuvent causer des blessures mineures ou des dommages matériels en cas de négligence

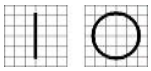
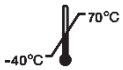
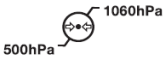
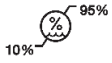
⚠ NOTE

"Note" explains important information related to installation, operation and management, and failure to comply may lead to calamity in case of negligence.

La "Note" explique les informations importantes relatives à l'installation, au fonctionnement et à la gestion, et le non-respect peut entraîner une calamité en cas de négligence.

2.2. Safety Symbol

The International Electrotechnical Commission (IEC) has established a set of symbols for medical electronic equipment which classify a connection or warn of any potential hazards. The classifications and symbols are shown below.

Symbol	Indication
	This symbol identifies a safety note. Ensure you understand the function of this control before using it. Control function is described in the appropriate User's or Service Manual. (Ce symbole identifie une note de sécurité. Assurez-vous de comprendre la fonction de ce contrôle avant de l'utiliser. La fonction de contrôle est décrite dans le manuel d'utilisation ou d'entretien approprié.)
	I and O on power switch represent ON and OFF respectively. (O sur l'interrupteur d'alimentation représentent respectivement ON et OFF.)
	Temperature Limitation (Limitation de température)
	Atmospheric pressure limitation (Limitation de pression atmosphérique)
	Humidity limitation (Limite d'humidité)
	Stack direction (Direction de la pile)
	Keep DRY (Garder au sec)
	Fragile, handle with care (Fragile, manipuler avec soin)
	Keep away from sunlight (Tenir à l'écart de la lumière du soleil)
	Stack layer limit (Limiter la couche de pile)
	CE Mark (Marque CE)



Use no hook
(N'utilisez aucun crochet)



WEEE Symbol – EU only
Disposal of your old appliance
When this crossed-out wheeled bin symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC.
All electrical and electronic products should be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or the local authorities.
The correct disposal of your old appliance will help prevent potential negative consequences for the environment and human health. For more detailed information about disposal of your old appliance, please contact your city office, waste disposal service or the shop where you purchased the product.
(Symbole WEEE- EU seulement
Mise au rebut de votre ancien appareil
Lorsque ce symbole de poubelle barrée est joint à un produit, cela signifie que le produit est couvert par la directive européenne 2002/96 / CE.
Tous les produits électriques et électroniques doivent être éliminés séparément du flux des déchets municipaux via des installations de collecte désignées par le gouvernement oules autorités locales. L'élimination correcte de votre ancient appareil aidera à prévenir les conséquences negatives potentielles sur l'environnement et la santé humaine.
Pour plus d'informations sur l'élimination de votre ancient appareil, veuillez contacter votre mairie, le service d'élimination des déchets ou le magasin où vous avez acheté le produit.)



Authorized representative in the European Community – EU ONLY
(Représentant autorisé dans la Communauté européenne-EU seulement)



Manufacturer
(Fabricant)



Date of manufacture
(Il indique l'année de fabrication et le fabricant.)



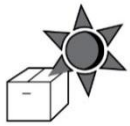
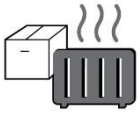
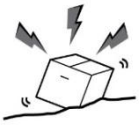
Refer to instruction manual/booklet
(Se reporter au manuel d'instructions / brochure)

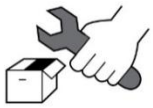
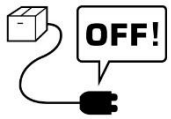
	Type B Isolated patient connection (Type B Connexion patient isolée.)
	Warning: Crushing or insert of hand (Attention: écrasement ou insertion de la main)
	QR code (QR code)
	Alternating Current (Courant alternative)
CE RoHS	CE for RoHS RoHS Directive Compliance 2011/65/EU (CE pour les RoHS Respect de la directive en matière de conformité 2011 / 65 / CE)
	Identifies the point where the system safety ground is fastened to the chassis. Protective earth connected to conductive parts of Class I equipment for safety purposes. (Identifie le point où la terre de sécurité du système est fixée au châssis. Terre de protection connectée aux parties conductrices des équipements de classe I à des fins de sécurité.)
	Class I Laser Product (Produit au laser de classe I)
CH REP	Authorized representative in Switzerland (Représentant autorisé dans la Suisse)
MD	To indicate this product is Medical device (Pour indiquer que ce produit est un dispositif medical)
 UL60601-1	MEDICAL GENERAL EQUIPMENT AS TO ELECTRICAL SHOCK, FIRE AND MECHANICAL HAZARDS ONLY IN ACCORDANCE WITH ANSI/AAMI ES60601-1:2005/A2:2021, CAN/CSA-C22.2 NO 60601-1 (Amendement 2: 2022) ÉQUIPEMENT MÉDICAL GÉNÉRAL EN CE QUI CONCERNE LES CHOCS ÉLECTRIQUES, LES INCENDIES ET LES RISQUES MÉCANIQUES UNIQUEMENT CONFORMÉMENT À

CAN/CSA C22.2 NO.601.1	ANSI/AAMI ES60601-1:2005/A2:2021, CAN/CSA-C22.2 NO 60601-1 (Amendement 2 : 2022)

2.3. Environmental Considerations

Please avoid the environment below for the operation and storage of the equipment.

	Place where device comes directly into contact with moisture (do not operate the device with wet hand)
	Place where device is exposed directly to sunlight.
	A place where the equipment can be exposed to direct ultraviolet.
	Place with severe temperature change (temperature for normal operation ranges from 10℃ to 40℃ while humidity level ranges from 30% to 90%).
	Where there is a hot equipment nearby.
	Where the humidity is extremely high or there is a ventilation problem.
	Where the machine is exposed to excessive shocks or vibrations.
	Where the machine is exposed to chemical material or explosive gas.
	Be cautious so that things like dust and metal do not fall inside the machine.

	Don’t disassemble or open the product. HUVITZ does not take responsibility for the possible problems
	Be careful not to block the fan of the machine.
	Don’t plug the AC power cord into the outlet unless all parts of the machine are completely connected. Otherwise, it will cause severe damage on the machine.
	Pull out the power cord with holding the plug, not the cord. To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth.

This instrument can withstand the following conditions:

1. Operation

- An ambient temperature range of 10℃ ~ 40℃ (50°F ~ 104°F)
- A relative humidity range of 30% ~ 90% (with non-condensing)
- An atmospheric pressure range of 800 ~ 1060hpa

2. Transportation

- An ambient temperature range of -40℃ ~ 70℃ (-40F ~ 158°F)
- A relative humidity range of 10% ~ 95%
- An atmosphere pressure range of 500 ~ 1060hpa

3. Storage

- An ambient temperature range of -10℃ ~ 55℃ (14°F ~ 131°F)
- A relative humidity range of 10% ~ 95% (with non-condensing)
- An atmosphere pressure range of 700 ~ 1060hpa

Avoid environments where the equipment is exposed to excessive shocks or vibrations.
Do not expose products or packing to environmental conditions outside of those specified above.

2.4. Safety Precaution

⚠ BEFORE USE, READ THIS MANUAL

The safety precautions and operating procedures must be thoroughly understood prior to operation of the device. The device complies with ISO 10342 subclause 4 (Ophthalmic instruments – Eye Refractometers) and ISO 10343 subclause 4 (Ophthalmic instruments - Ophthalmometers). The dioptric powers are indicated with reference wavelength λd = 546.07 nm or λd = 587.56 nm

Les précautions de sécurité et les procédures d'utilisation doivent être bien comprises avant d'utiliser l'appareil. Le dispositif est conforme au paragraphe 4de l'ISO 10342 (Instruments ophtalmiques - Réfractomètres oculaires) et au paragraphe 4 de l'ISO 10343 (Instruments ophtalmiques - Ophtalmomètres). Les puissances dioptriques sont indiquées avec une longueur d'onde de référence λd = 546,07 nm ou λd = 587,56 nm

This equipment has been developed and tested in conformity with domestic & international safety standards and regulations, which guarantees the high stability of this product. This guarantees a very high degree of safety for this device. The legislator expects us to inform the user expressively about the safety aspects in dealing with the device. The correct handling of this equipment is imperative for its safe operation. Therefore, please read carefully all instructions before switching on this device. For more detailed information, please contact our Customer Service Department or one of our authorized representatives.

1. This equipment must not be used (a) in an area that is in danger of explosions and (b) in the presence of flammable, explosive, or volatile solvent such as alcohol, benzene or similar chemicals.

2. The device should neither be kept nor installed in the place with high humidity. For the optimal operation, the humidity should be at the range of 30%~90%. The machine should not be exposed to the place where water splashes, drips or sprays. Do not place containers containing fluids, liquids, or gases on top of any electrical equipment or devices

3. The equipment must be operated only by, or under direct supervision of properly trained and qualified person/s.

4. Modifications of this equipment may only be carried out by Huvitz's service technicians or other authorized persons.

5. Customer maintenance of this equipment may only be performed as stated in the User's Manual and Service Manual. Any additional maintenance may only be performed by Huvitz's service technicians or other authorized persons.

6. The manufacturer is only responsible for effects on safety, reliability, and performance of this equipment when the following requirements are fulfilled: (1) The electrical installation in the respective room corresponds to the specifications stated in this manual and (2) This equipment

is used, operated and maintained according to this manual and Service Manual.

7. The manufacturer is not liable for damage caused by unauthorized tampering with the device(s). Such tampering will forfeit any rights to claim under warranty.

8. The equipment may only be used together with accessories supplied by Huvitz's. If the customer makes use of other accessories, use them only if there are usability under technical safety aspects has been proved and confirmed by Huvitz or the manufacturer of the accessory.

9. Only persons who have undergone proper training and instructions are authorized to install, use, operate, and maintain this equipment.

10. User's manual or service manual should be kept in the place where the persons in chare of operation and maintenance can access easily any time.

11. Do not force cable connections. If a cable does not connect easily, be sure that the connector (plug) is appropriate for the receptacle (socket). If you cause any damage to a cable connector(s) or receptacle(s), let the damage(s) be repaired by an authorized service technician.

12. Please do not pull on any cable. Always hold on to the plug when disconnecting cables.

13. This equipment may be used for the international application related to Refractometry and Keratometry according to this manual.

14. Before every operation, proceed with visual inspection on the equipment exterior to seek any mechanical damage(s) to ensure the proper functioning.

15. Do not obstruct any ventilation outlet for proper heat dissipation.

16. In case of any presence of smoke, spark or abnormal noise/smell from the machine, please power off immediately and pull out the plug.

17. External equipment intended for connection to signal input, signal output or other connectors, shall comply with relevant IEC Standard (e.g., IEC60950 for IT equipment and IEC60601-1 series for medical electrical equipment). In addition, all such combination-system-shall comply with the standard IEC60601-1 and/or IEC60601-1-1 harmonized national standard or the combination. If, in doubt, contact qualified technician or your local representative the operator should not touch the patient and accessible male parts of the SIP/SOP connectors simultaneously.

18. For 120 Volt applications, use only UL listed detachable power cord with NEMA configuration 5-15P type (parallel blades) plug cap. For 240 Volt applications use only UL listed detachable power supply cord with NEMA configuration 6-15Ptype (tandem blades) plug cap.

19. Do not position the equipment so that it is difficult to operate the disconnecting device (disconnecting device: power cord, appliance inlet, etc.)

20. If you do not use the equipment, turn off the unit's power switch and disconnect the power cord.

21. To avoid the risk of electric shock, this equipment must only be connected to a supply main with protective earth.

22. When packing box is unintentionally open before use or damaged, please call A/S center.

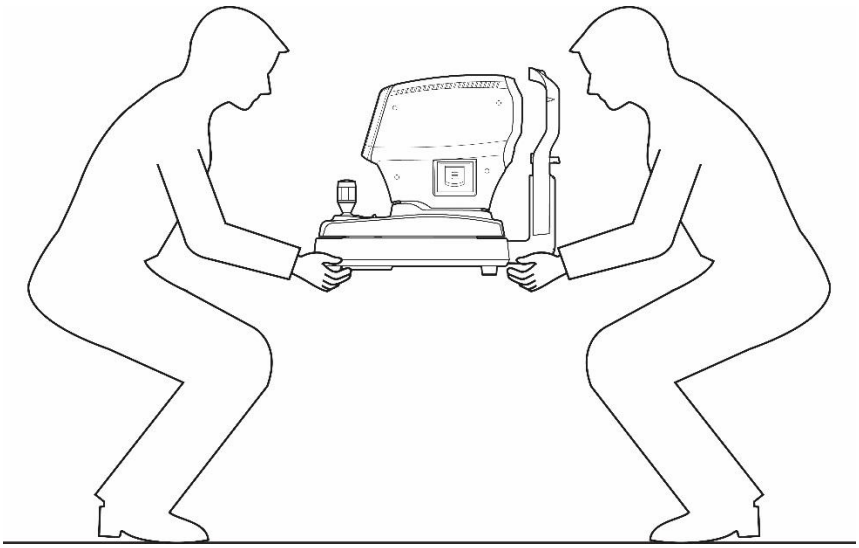
23. In the event of a serious incident involving the device, the user shall report it to the manufacturer and the competent authority of the Member State in which the user and/or patient are established.

24. Don't transmit data to other device or connect to other device when you find viruses in other device.

25. The connection of the electronic interface to an IT network that includes other equipment could result in previously unidentified risks to patients, users or third parties. The RESPONSIBLE ORGANIZATION is advised to identify, analyze, evaluate and control these RISKS.

26. Subsequent changes to the IT-NETWORK which is connected from external device could introduce new RISKS and require additional analysis. Changes to the IT-NETWORK include:
    1) changes in IT-NETWORK configuration
    2) addition of items (hardware platforms) to the IT-NETWORK
    3) removal of items from the IT-NETWORK
    4) update of hardware platforms on the IT NETWORK
    5) upgrade of hardware platforms on the ITNETWORK

27. The connection of the electronic interface to an When you carry this product, please hold on front and back bottom of the product. If you want the product to be installed on another place, please call A/S center.



NOTE

"The EMISSIONS characteristics of HRK-8000A make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment."

Intended User Profile

This device should be operated by qualified personnel with sufficient training or under such personnel's supervision.
(Ex. Optometrist, Ophthalmologist, Optician)
a. Age: adult (> 21 years of age)
b. Occupation: Optometrist, Ophthalmologist
c. Level of training: Recommend completing training how to use it is.
d. Education: Basic training is required for the use of equipment. (Obtains a certificate of qualification such as optics, medical school, etc., after completing a certain amount of education.)

⚠ CAUTION

The equipment is a Class I Laser Product. The Laser is emitted through the Measuring Object Lens and is safe under expected use conditions, including situations such as looking into the LED using optical equipment. However, observe the following precautions when using the equipment:

- Do not direct Laser beams to human eyes when unncecessary.
- Do not look into the objective lens for a prolonged time.

*** Laser Information**

a. Max output of laser radiation : < 0.78 mW
b. Pulse duration : 8.6 μs
c. Emitted wave length : 850nm

L'équipement est un produit laser de classe I. Le laser est émis à travers l'objectif de mesure (Measuring Object Lens) et est sûr dans des conditions d'utilisation prévues, y compris des situations telles que regarder dans la LED à l'aide d'un équipement optique. Cependant, veuillez respecter les précautions suivantes lors de l'utilisation de l'équipement :

- Ne dirigez pas les faisceaux laser vers les yeux humains sauf si cela est nécessaire.
- Ne regardez pas dans l'objectif (Objective Lens) pendant une période prolongée.

*** Informations sur le laser**

a. Puissance maximale de radiation laser : < 0,78 mW
b. Durée de l'impulsion : 8,6 μs
c. Longueur d'onde émise : 850 nm

3

3. Characteristics

1. It is possible to measure the refractive power and corneal curvature with one(1) set of the machine: Refractometry and Keratometry

2. As the measurement range of refractive power is wide from-30D to +25D, it can measure the severe myopia.

3. As measuring the curvature, the minimum measurable pupil diameter is Ø2.0 mm.

4. The equipment can measure the peripheral part of cornea so that user can see the value of curvature and eccentricity of each point while consecutively measuring the curvature of peripheral part around cornea to the direction of 90° degree to the upper/below/right/left from the core of cornea.

5. The refractive error can be showed in the form of Zernike topographic map.

6. The fogging technique which is applied to the internal fixed target is to make the more accurate measurement possible while letting the eyes of patient at the natural and comfortable state.

7. It is possible to select the display type of Refractometry and Keratometry.

8. It is possible to measure the distance in between pupils (PD).

9. Through the illumination, the HRK-8000A can observe the eyes' condition of cataract patients or the scratches on the surface of contact lenses. It can store the two (2) images for each eye, and show the patients displaying them on the monitor screen.

4

4. Note for Use

1. Do not hit or drop the instrument. The instrument may be damaged by the strong impact. The impact may damage the function of this instrument. Handle it with care.

2. The precision of measurement can be affected when the machine is exposed to the direct sunlight or too bright indoor illumination. It is recommended to perform the measurement in the dark optometry room.

3. If you want to use it as connecting the device to other equipment, please follow the guidance of our local representative.

4. Sudden heating of the room in cold areas will cause condensation of vapor on the protective glass in the measurement window and on optical parts inside the instrument. In this case, wait until condensation disappears before performing measurements.

5. Make sure to keep the lens in examinee side is clean at all times. In case that it has become dirty by dusts or other substances, it can cause errors in the machine or affect the precision of measurement.

6. In case of any presence of smoke, smell or noise during the use of machine, please contact our local representative after plugging it off from the socket (outlet).

7. If you clean the surface of the equipment with organic solvents such as alcohol, thinner, benzene, etc, it can damage the machine. So, please do not use them.

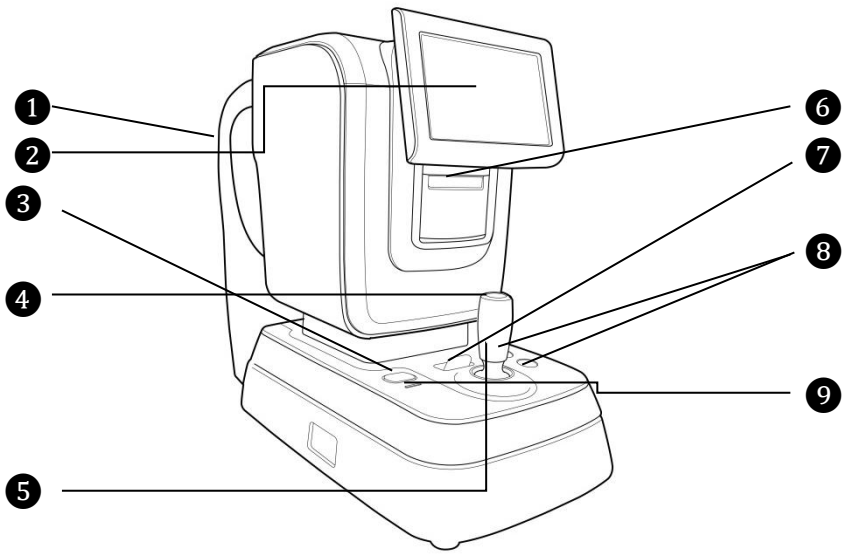
8. In case of moving HRK-8000A, carry it holding the lower part of machine body with both hands as fixing the stage after switching the machine off all the time.

9. In case of no use of the machine for a long time, please put the dust cover on the device after powering and plugging off.

5

5. Names and functions of each part

5.1. Main parts



[Figure 5-1. Front]

1. Height Adjustment Mark: Adjusts the eyes' height of examinees

2. Display Monitor: Monitor for measurement

3. Print Button: Button for printing of measuring results.

4. Measurement Button: Performing the measurement by pressing it after focusing.

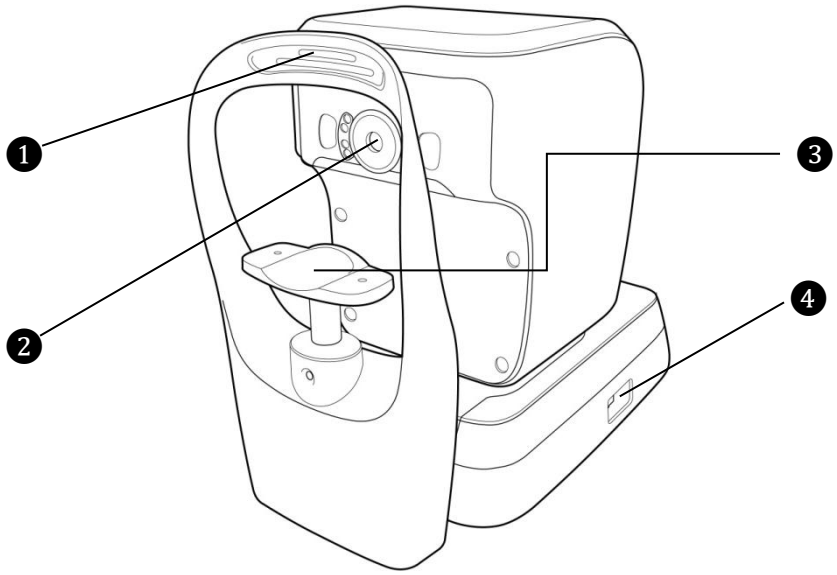
5. Operation Lever: Adjusting the focus by moving to the directions of forward / backward, left / right, up and down.

6. Printer: Printing the measured results

7. Stage Fixing Lever: Fixing the stage

8. Chinrest up/down Button: Move up or down the chinrest.

9. Operation Lamp: Indicates whether or not the electric power is on



[Figure 5-2. Back Section]

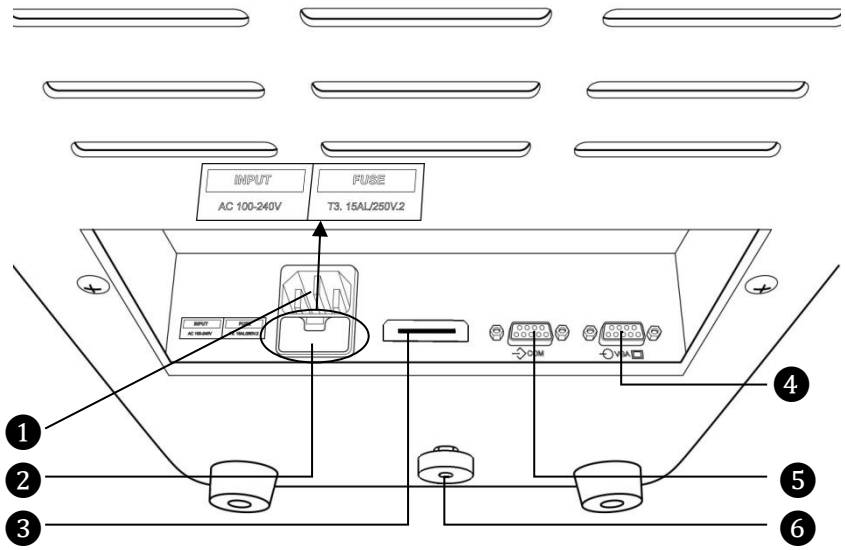
---

1. Forehead Rest: Preventing the vibration by fixing the forehead

2. Measuring Object Lens: Measuring the image imaging on the retina of eyes.

3. Chin Rest: Preventing the vibration by fixing the chin

4. Power Switch: Switch for power on/off



[Figure 5-3. Bottom Section]

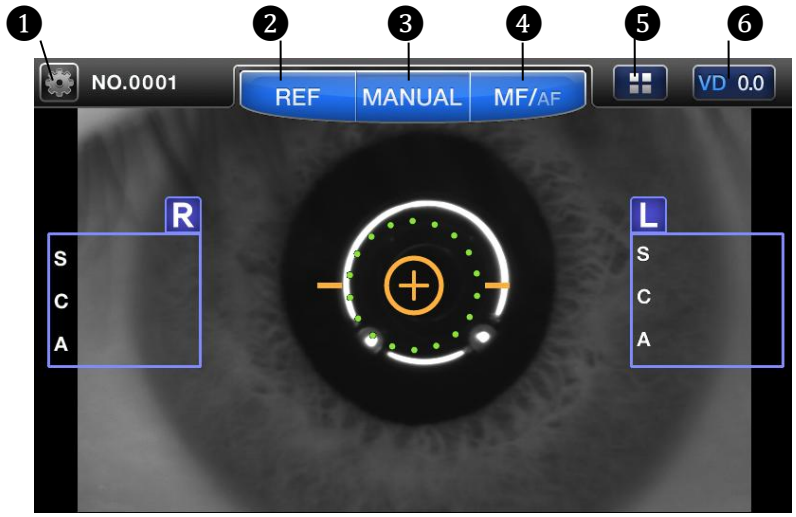
---

1. **Power Supply Socket:** A socket connecting to exterior power plug
2. **Fuse Holder:** 250 V T3.15 AL
3. **HDMI Connector:** Connecting into the exterior monitor
4. **Exterior Monitor Connection Connector:** Connecting into the exterior monitor
5. **Serial Interface Connector:** A terminal connecting to the exterior equipment\
6. **Clamping Bolt:** Fixing the system stage

NOTE

As connecting to exterior monitor, noise can appear on the monitor owing to the length or kind of cable, and the quality of monitor.

5.2. Explanation on Switches in Front



[Figure 5-4. Front Section Switches]

---

1.  **(SETUP) Button:** A switch to change the User setup mode
2.  **(MODE) Button:** A switch to change the mode (REF, KER, K&R, KER-P, CLBC) for measurement.
3.  **(MANUAL) Button:** A switch to begin to perform the measurement manually or automatically.
4.  **(MF/AF) Button:** A switch to change Auto Focus mode.
5.  **(MENU) Button:** A switch to change the Illumination, Zernike, Size, Virtual Comparison, Color View, Display mode.
6.  **(VD) Button:** To change the VD(Vertex Distance) value.

6

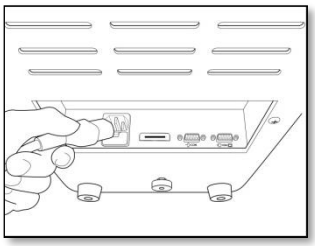
6. Installation of Equipment & Preparation of Measurement

1. Release of Lock on Stage Section

Unlock the clamping bolt at the button of the machine by rotating it counterclockwise, and change the stage fixing lever behind the joystick to the direction of UNLOCK.

2. Connection of Power Cable

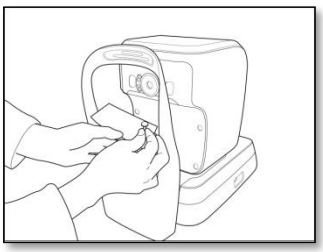
- Put HRK-8000A on the table.
- Insert the power cable into power connector at the bottom of the main body.
- After checking that the power of the machine is off, insert the power plug into the AC outlet (socket).



[Figure 6-1. Connection of Power Cable]

3. Inserting Chin Rest Paper

- Pull out the pushing pins at left/right sides.
- Insert the pushing pins into the holes at left/right sides of the chin-rest paper.
- Stick the chin-rest paper inserted with the pushing pins onto the Chin-rest.



[Figure 6-2. Inserting Chin-rest Paper]

4. Installation of Printing Paper

Please refer to section 8.2 regarding the sequence of installation of printing paper.

5. Input of Message

Input the contents desirable to be printed such as name or address of hospital, etc in the memory of message editing monitor in advance at all times.

6. Check of Setup

As for setup of corneal vertex distance, indication of CYL, unit of SPH/CYL, indication type of corneal measurement, corneal equivalent curvature, date, etc, please check them in SETUP mode.

7. Transmission to Other Machines

In case of transmitting the measured results to other machines, prepare other machines while connecting the cable into the interface connector of this machine.

The device conncected to Auto Ref / Keratometer (HRK-8000A) is Huvitz Digital Refractor, Lens

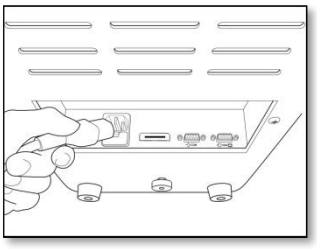
meter and PC with a software supplied by 3th-party.
The connect and communication settings can be different the connected devices so refer to the manual of the conennceted device and please set up the transmission speed (BPS) and Protocol (RS232) settings.

You can select the transmitting speed in the user's SETUP mode. Please contact to the agent where you bought this machine for details.

7

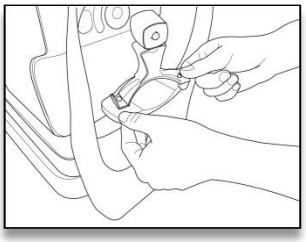
7. Exercise through Model Eye

1. Power On of Main Body
    - Connect the power plug appropriately as shown in the picture.
    - Let the power switch on.
    - Measuring screen appears as system check is completed.



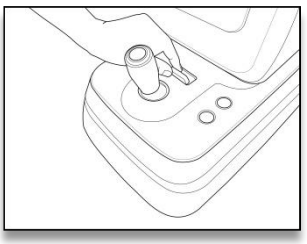
[Figure 7-1. Power Cable Connection]

2. Installation of Model Eye
    - As removing the chin-rest paper, insert the pushing pins after adjusting the lower hole of model eye to the hole of chin-rest.



[Figure 7-2. Model Eye Installation]

3. Convert the fixing lever
    - convert the stage fixing lever behind the joystick to the direction of UNLOCK.



[Figure 7-3. Release of Lock to Stage Section]

4. Change to K&R, REF Modes
    - If “K&R” or “REF” is not indicated on the monitor, Change a set to display one of two modes.

5. Adjustment of Position for Measurement & Focus
   - Tilt the operation lever over the model eye until the mire image appear around the external alignment ring.
   - Adjust so that the mire image shall come coincide the external alignment ring while watching the monitor.
   - Adjust the focus so that the focus-adjustment focus symbol shall appear on the internal alignment ring.

① Height Adjustment: Adjust it by rotating the operation lever or the chin-rest height adjustment lever.

② Left/Right Adjustment: Adjust so that the mire image shall come coincide the external alignment ring by tilting the operation lever to the directions of left/right.

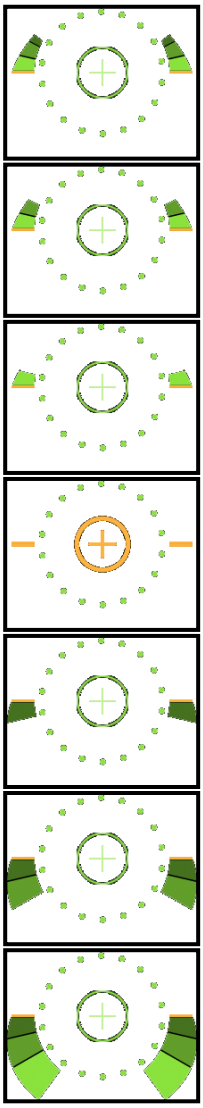
③ Focus Adjustment: Adjust the focus so that the focus-adjustment focus symbol shall appear on the internal alignment ring by tilting the operation lever forward/backward.

- **Auto-tracking Function**

  Set then AF/MF mode for Auto-tracking Function.

① Perform rough alignment and focusing by manipulating the joystick to place in the working range of auto-tracking.

② When the device is placed within the working ranfe of auto-tracking, it automatically starts alignment and focusing.
   - The mark is displayed, when the main body is not within the working range of auto-tracking.
   - At that time, manipulrate the joystick or chinrest up/down button in the direction of the as Figures.

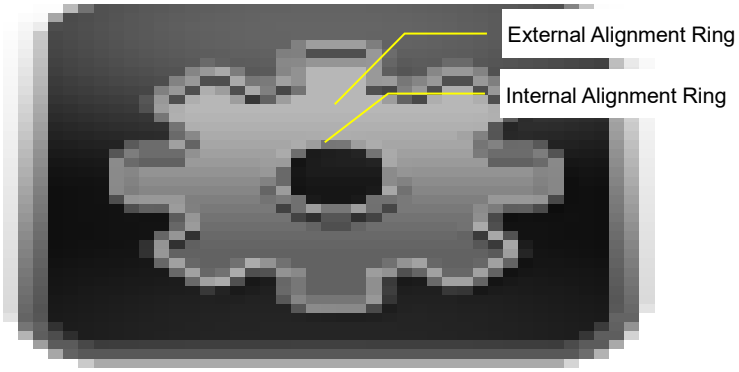


Too close to the patient's eye

Optimum condition.

Too far from the patient's eye

<Focusing Indicator>



[Figure 7-4. Adjustment of Measuring Position & Focus]

6. Measurement

① Manual Adjustment

- Adjust the focus and position of model eye as like in the procedure of adjusting measurement position & focus explained in the previous page.
- Push the measurement switch. In case that the measurement is not performed while the message of TRY AGAIN appears on the upper left side of the monitor, push the measurement switch again after repeating the procedure of (a).
- Check whether diopter value is measured or not. In case that the measured value is not satisfactory, measure it with the same way and check it again.

② Automatic Adjustment

- Push the MANUAL button which is top of monitor to set AUTO mode.
- Adjust the position and focus of model eye as like in like in the procedure of adjusting measurement position & focus explained in the previous page.
- It the focus is well adjusted as the mire image coincide with the external alignment ring and the focus-adjustment focus symbol appears on the internal alignment ring, then, the measurement starts automatically.

8. Measurement

⚠ WARNING

If the following situations happen, contact to the agents of Huvitz after immediately pushing the power switch off, and pulling the power cord out of AC Power connection part.

Si les situations suivantes se produisent, contactez les agents de Huvitz après avoir immédiatement poussé l'interrupteur d'alimentation hors tension et retiré le cordon d'alimentation de la partie de connexion d'alimentation CA.

● In case that smoke comes, or strange smell or sound is heard from the equipment.

Au cas où de la fumée viendrait, ou une odeur ou un bruit étrange serait entendu de l'équipement.

● In case that liquid is poured to the machine, or metallic substance is inputted into the equipment.

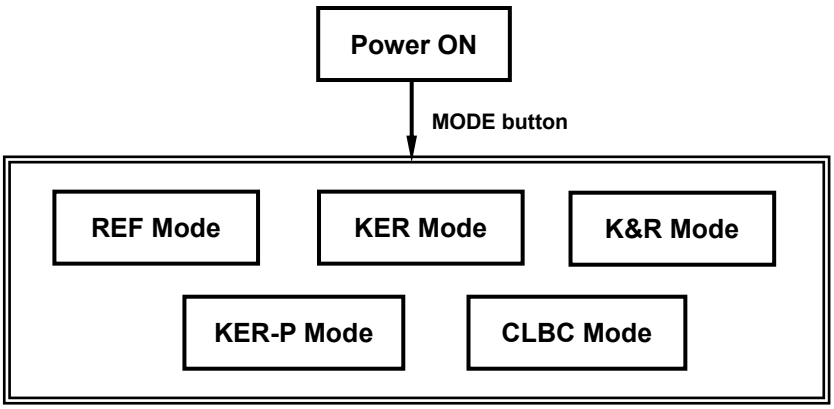
Dans le cas où du liquide est versé dans la machine ou une substance métallique est introduite dans l'équipement.

● In case that the equipment is fallen down, or the exterior case of it is broken

En cas de chute de l'équipement ou de casse du boîtier extérieur

⚠ NOTE

As the equipment does not operate for over 3 minutes while the power switch is at the state of “ON”, the power saving mode is to be performed. If you push any buttons in the power saving mode, it is changed to the mode of measurement preparation.

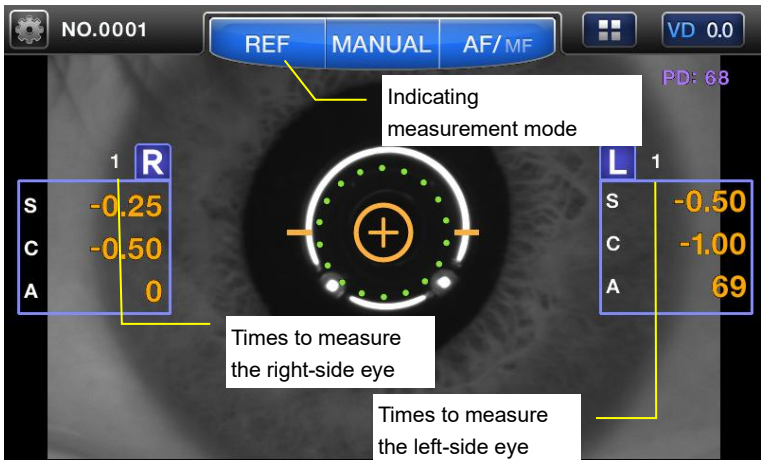


[Figure 8. Relation between button and measurement mode]

8.1. Refractometry (REF Mode)

It is the mode to measure the refractive power solely.

1. Let the power switch “ON”.
   - The measurement window as shown in the picture below appear on the screen of monitor as system check is completed.



[Figure 8-1-1. REF Mode Screen]

2. Check the measurement screen appeared on the monitor

NOTE

● If the measurement screen as shown in the above picture does not appear on the monitor screen, let the power switch “ON” again in 10 seconds after switching it off. If the measurement screen continues not to appear either, please contact to the agents of Huvitz.

3. Check the user Setup mode.

   Check and select the diverse functions relating to measurement including VD value or printing condition. Input the message wanted to be printed together with measurement data (refer to section user setup mode).

8.1.1. Manual Measurement Mode

As changing AF mode to the MF/AF mode, it changes to the manual measurement mode. If you select the MANUAL mode, the auto measurement function can be stopped. (refer to section user setup mode).

1. Adjustment of Eye Height
   - Let the examinee sit in front of the machine.

⚠ CAUTION

- Make sure that the examinee should not put his or her hands or fingers under chin-rest. The hands or fingers can get injured.

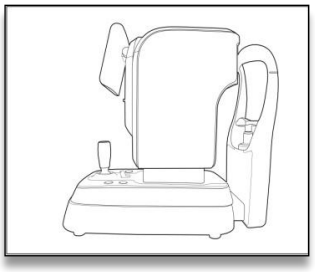
Assurez-vous que le candidat ne doit pas mettre ses mains ou ses doigts sous la mentonnière. Les mains ou les doigts peuvent se blesser.

- For the prevention of infection, cleanse the forehead-rest with a solvent such as ethanol for every different examinee.

Pour la prévention de l'infection, nettoyez le repose-front avec un solvant tel que l'éthanol pour chaque candidat différent.

- To keep it clean, change the chin rest paper for every different examinee.
Pour le garder propre, changez le papier de mentonnière pour chaque candidat différent.

- Let the patient sit comfortably by adjusting the table or chair of electric machine.
- Let the patient put his or her face on chin-rest and his or forehead stick closely to the forehead-rest.
- Adjust the examinee's eye height to the height array indicator by rotating the height adjustment lever as shown in the picture.



[Figure 8-1-2. Eye Height Adjustment]

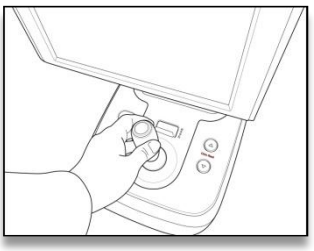
② Adjustment of Measurement Position and Focus

⚠ CAUTION

Do not insert your hands or fingers between stage and base. Also, make sure that the examinee should not put his or her hands or fingers there. Hands or fingers can get injured.

N'insérez pas vos mains ou vos doigts entre la scène et la base. Assurez-vous également que le candidat ne doit pas y mettre ses mains ou ses doigts. Les mains ou les doigts peuvent se blesser

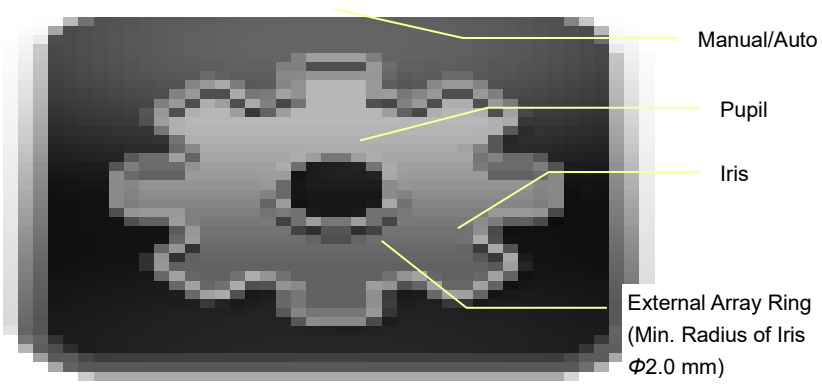
- Pull the body of equipment to the front of user by using the operation lever.



- Let the right-side eye of examinee appear at the center of monitor screen by slowly pushing and rotating the operation lever forward. At this time, let the Mire Image coincide with the external Alignment Ring.

[Figure 8-1-3. Height Adjustment]

- Ask the examinee to look at the internal fixed target.
- Adjust the focus so that the outline of Mire Image can be apparent. If the focus is adjusted appropriately, the focus symbol appears on the internal Alignment Ring.
- Height Adjustment: Adjust it by rotating the operation lever or push the chin-rest button.
- Left/Right Adjustment: Move the operation lever left and right so that the external Alignment Ring is aligned with the Mire
- Image
- Focus Adjustment: Adjust it to the Mire Image by tilting the operation lever forward/backward



[Figure 8-1-4. REF Manual Mode Screen]

NOTE

- As it is not enough to adjust it by tilting the operation lever, adjust it by pushing the stage to the directions of left/right.
- As consecutively measuring the refractive power, there can be errors in the measured value with regard to the examinee to which the adjustment power easily intervenes.
- As the Mire Image and the external Alignment Ring can not keep the same axis during the consecutive measurement, the error can be caused for measurement.

③ Measurement

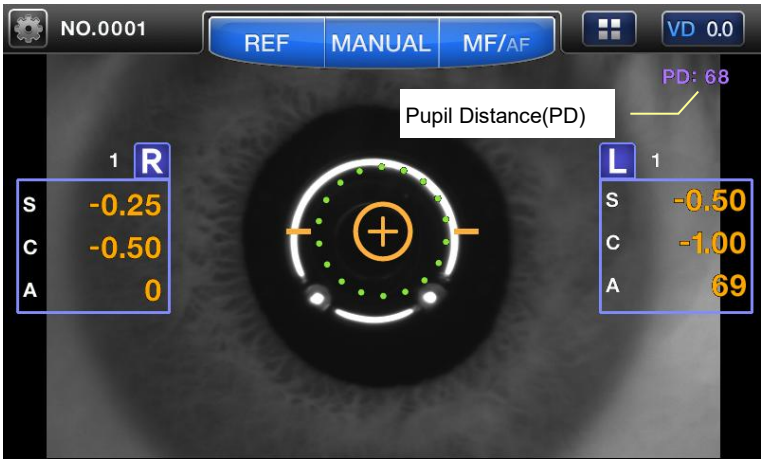
- Push the measurement button.
- If you stay while pushing the measurement button, the measurement is to be performed consecutively.
- As the measurement is completed, the measured result is to be indicated on the screen of monitor.
- In case of the consecutive measurement, the result of the previous measurement is indicated.

④ Repeated Measurement

- Measure repeatedly if necessary.
- The latest measured value is to be indicated every time new measurement is performed.
- It shall memorize the measured values by 99 times for each left/right eye(except for error). It can check last ten measure value in DISPLAY mode.

⑤ Measurement of Counter-side eye

- Measure the left-side eye by pushing the stage to the direction of right while holding the operation lever.
- As measuring the left/right eyes, the value of PD (Pupil Distance) is to be indicated on the monitor.



[Figure 8-1-5. Screen indicating the pupil distance]

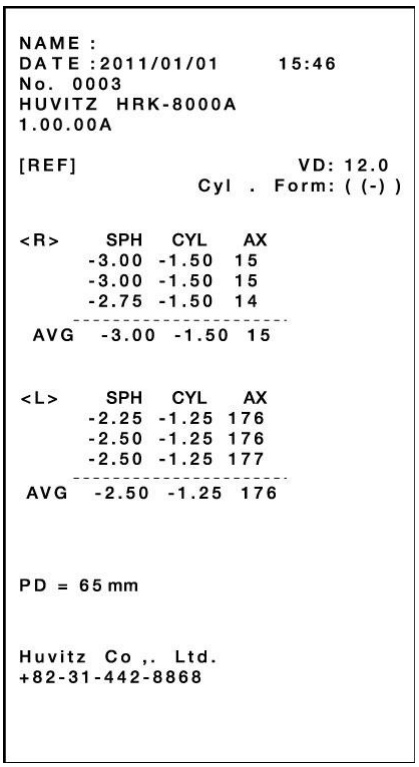
⑥ Print

- Print the measured result by pushing the PRINT button.

- The contents selected in SETUP mode is to be printed.(Refer to section user setup mode)
- Pull the printing paper. (Auto Cutting)
- Put the name of examinee in the blank of NAME if necessary.

NOTE

● As it is printed, the values measured so far are to be removed.
● As a thermal printing record, the printed characters are easy to be faded away. Please make it copied if you want to keep it for a long time.



```
NAME :
DATE :2011/01/01      15:46
No. 0003
HUVITZ HRK-8000A
1.00.00A

[REF]                    VD: 12.0
                  Cyl . Form: ( (-) )

<R>     SPH   CYL    AX
       -3.00 -1.50  15
       -3.00 -1.50  15
       -2.75 -1.50  14
     ----------------------
 AVG   -3.00 -1.50  15


<L>     SPH   CYL    AX
       -2.25 -1.25 176
       -2.50 -1.25 176
       -2.50 -1.25 177
     ----------------------
 AVG   -2.50 -1.25 176



PD = 65 mm


Huvitz Co ,. Ltd.
+82-31-442-8868
```

[Figure 8-1-6. Example of Print]

8.1.2. Auto Measurement Mode

As touching MANUAL button in Manual Measurement mode, it automatically changes to the Auto measurement mode.
As the condition of good array between the machine and the measured eye is reached, the measurement is to be performed automatically without pushing the Measurement button.

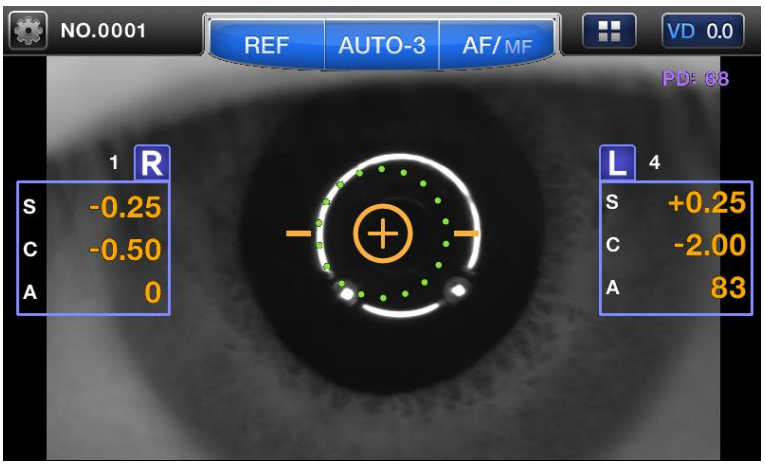
① Perform the ①, ② procedure of manual measurement mode.

② Measurement

- As the array and adjusting the focus is completed, the measurement is to be performed automatically.

- After the measurement of times (3 or 5 times) designated in user Setup mode is performed, the measured result appear on the screen of monitor.

- Maximum of 99 units of data is to be stored, and you can re-check last ten measure value in DISPLAY mode



[Figure 8-1-7. Screen indicating Auto Measurement Mode]

③ Measurement of Another Eye

- Measure the left eye according to the same procedure by moving the stage to the right side.

- As the measurement to both eyes is completed, the value of PD is to be indicated automatically on the screen of monitor.

④ Print

- Push the PRINT button in case that the measurement is conducted to the one eye only.

- In case of selecting the condition of A-Print as “ON” in Setup mode (refer to section user setup mode), the measured result is to be printed automatically as the measurement of both eyes is completed.

- The message selected in Setup mode is to be printed together with the measured data.

- As the message of TRY AGAIN happens, please refer to the explanation below.

<table>
<tr><th>In case of TRY AGAIN</th><th>Management</th></tr>
<tr><td>Poor position adjustment</td><td>Measure it after adjusting the exact position again.</td></tr>
<tr><td>As eyelid or eyelashes hide the pupil</td><td>Let the examinee open the eye wide, or measure it while pushing the upper eyelid of examinee upward.</td></tr>
<tr><td>As the pupil is smaller than Alignment Ring</td><td>This machine’s measurable min radius of pupil is 2.0 mm. Though it is possible to measure in the bright place, make sure that the bright illumination or sunlight shall not shed directly on examinee’s eye.</td></tr>
<tr><td>As the examinee has the disease such as cataract</td><td>The minor cataract can be measured in Retro-Illum mode. As errors are worried to happen by the scratch on cornea or turbidization of crystalline lens, measure it in Retro-Illum mode. Measure the corneal curvature of cataract patient not in K&R mode, but in KER mode.</td></tr>
<tr><td>As Mire Image looks as if it changed to tears</td><td rowspan="2">Measure after letting the examinee blink several times.</td></tr>
<tr><td>As Mire Image is not apparent because the cornea is dry</td></tr>
<tr><td>As Mire Image has been transformed irregularly owing to strong negative astigmatism or corneal ailment.</td><td rowspan="2">Impossible to measure</td></tr>
<tr><td>As it exceeds the possible range of measurement</td></tr>
</table>

8.2. Keratometry (KER Mode)

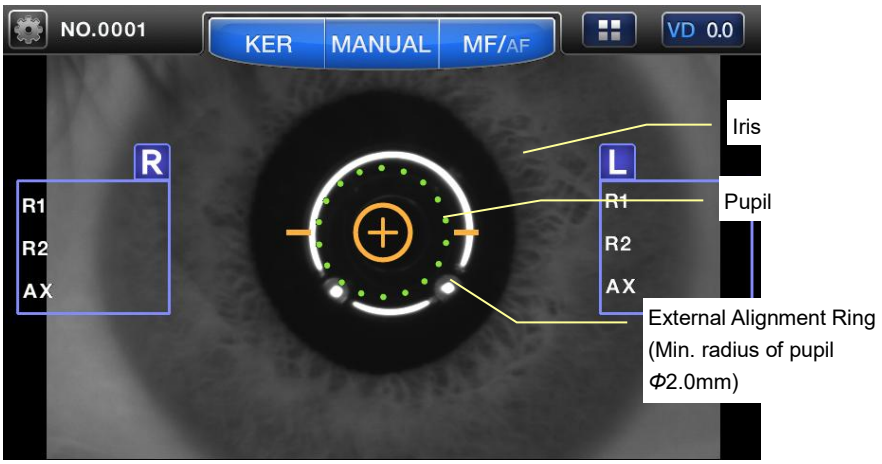
It is the mode to measure the corneal curvature solely.
Do not measure the base curve of hard contact lens in this mode. Please refer to CLBC mode in section 8.5 regarding the base curve of hard contact lens.

1. Check whether or not the screen of monitor is in measurement mode.
2. KER Mode Selection
   - You can see KER mode on the upper left side of the screen.

8.2.1. Manual Measurement Mode

① Perform the adjustment of array and focus as like in the procedure of section 8.1.1.

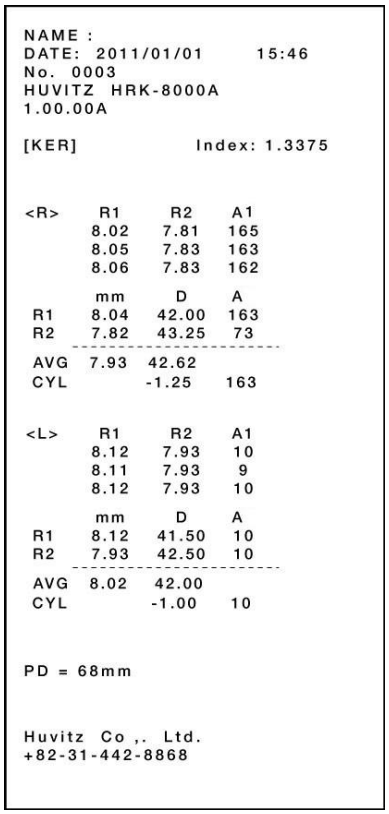
② Measurement
- Push the measurement button.
- The measurement continues to be performed as you keep pushing the measurement button.
- As the measurement is completed, the measured result is to be indicated on the screen of monitor. In case of the consecutive measurement, the result of previous measurement is to be indicated.



[Figure 8-2-1. Screen indicating KER mode]

③ Perform the same 4, 5 procedure of section 8.1.1.

④ Print the measured result through the same 6 procedure of section 8.1.1.



NAME :
DATE: 2011/01/01 15:46
No. 0003
HUVITZ HRK-8000A
1.00.00A

[KER] Index: 1.3375

<R>	R1	R2	A1
	8.02	7.81	165
	8.05	7.83	163
	8.06	7.83	162
	mm	D	A
R1	8.04	42.00	163
R2	7.82	43.25	73
AVG	7.93	42.62	
CYL		-1.25	163

<L>	R1	R2	A1
	8.12	7.93	10
	8.11	7.93	9
	8.12	7.93	10
	mm	D	A
R1	8.12	41.50	10
R2	7.93	42.50	10
AVG	8.02	42.00	
CYL		-1.00	10

PD = 68mm

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[Figure 8-2-2. Example of Print]

8.2.2. Auto Measurement Mode

As touching MANUAL button in Manual measurement mode, it is to be changed to Auto measurement mode. As the condition of good array between the machine and measured eye is reached, the measurement is to be performed without pushing the measurement button.

① Adjust the array and focus as like in procedure 2 of section 8.1.1

② The measurement is to be performed automatically as like in procedure 2 of section 8.1.2

③ Print the measured result as like in procedure 6 of section 8.1.1

8.3. Corneal Curvature / Refractive Power Measurement Mode (K&R Mode)

This is the mode to consecutively perform the measurement of corneal curvature and refractive power.

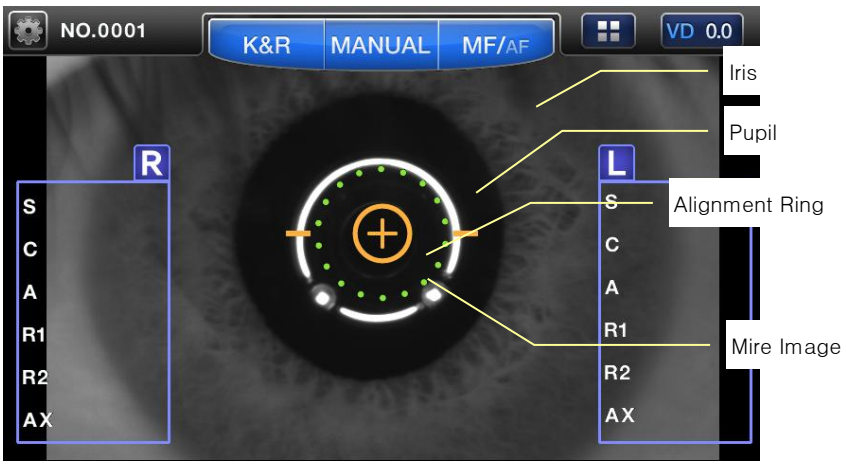
1. Check whether or not the measurement screen appears on the screen of monitor.
2. Set K&R measurement mode, You can see K&R mode on the upper left side of the screen.

8.3.1. Manual Measurement Mode

① Perform the adjustment of array and focus as like in procedure 1, 2 of section 8.1.1.

② Measurement

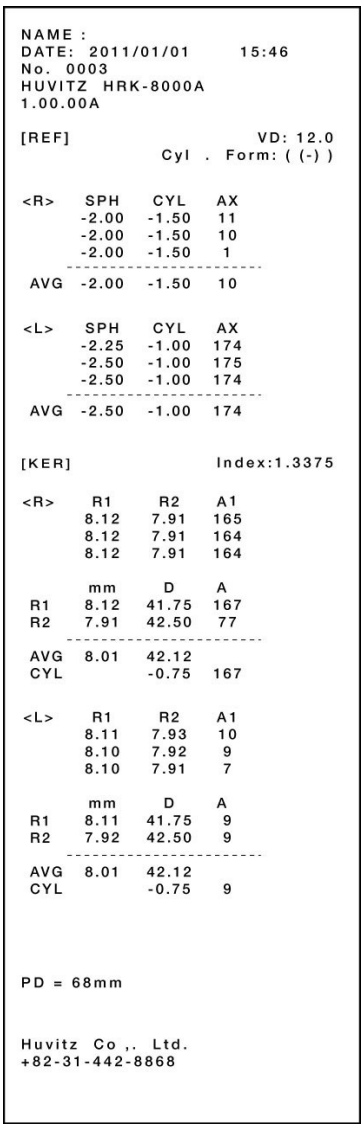
- Push the measurement button.
- As you keep pushing the measurement button, the measurement is to be performed consecutively.
- As the measurement is completed, the measured result is to be indicated on the screen of monitor.
- In case of consecutive measurement, the previous value is displayed.



[Figure 8-3-1. Screen indicating K&R Mode]

③ Perform the same procedure as like in procedure 4, 5 of section 8.1.1.

④ Print the measured result through the same procedure as like in procedure 6 of section 8.1.1.



```
NAME :
DATE: 2011/01/01      15:46
No. 0003
HUVITZ HRK-8000A
1.00.00A

[REF]                        VD: 12.0
                  Cyl . Form: ( (-) )

<R>    SPH    CYL    AX
       -2.00  -1.50   11
       -2.00  -1.50   10
       -2.00  -1.50    1
      ----------------------
 AVG   -2.00  -1.50   10

<L>    SPH    CYL    AX
       -2.25  -1.00  174
       -2.50  -1.00  175
       -2.50  -1.00  174
      ----------------------
 AVG   -2.50  -1.00  174


[KER]                  Index:1.3375

<R>     R1     R2     A1
       8.12   7.91   165
       8.12   7.91   164
       8.12   7.91   164

        mm      D      A
 R1    8.12   41.75  167
 R2    7.91   42.50   77
      ----------------------
 AVG   8.01   42.12
 CYL          -0.75  167

<L>     R1     R2     A1
       8.11   7.93   10
       8.10   7.92    9
       8.10   7.91    7

        mm      D      A
 R1    8.11   41.75   9
 R2    7.92   42.50   9
      ----------------------
 AVG   8.01   42.12
 CYL          -0.75   9



PD = 68mm


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```

[Figure 8-3-2. Example of Print]

⑤ Selection of Screen Indication Type

- In the measurement mode including the refractive power measurement, you can designate the sign of astigmatic refractive power in SETUP mode.

- Also, you can indicate the measured data of refractive power on the screen according to VD value in the measurement mode including the refractive power measurement.

- In the measurement mode including corneal curvature measure, you can designate the screen indication type (R1/R2/AX→K1/K2/AX→AR/CY/AX) in SETUP mode.

8.3.2. Auto Measurement Mode

As touching MANUAL button in manual measurement mode, it is to be changed to auto measurement mode.
As the condition of good array between the machine and measured eye is to be reached, the measurement is to be performed automatically without pushing the measurement button in Auto measurement mode.

Adjust the array and focus as like in procedure 2 of section 8.1.1.

The measurement is to be performed automatically as like in procedure 2 of section 8.1.2.

Print the measured result as like in procedure 6 of section 8.1.1.

8.3.3. Diverse Indications

	Kind	Name	Meaning of Signs	Measures
Measurement of Refraction	#	Indicating low reliability	Measured value of low reliability	Measure again
	+ OUT	Exceeding measurable range	SPH exceeds +25 D	Impossible to measure
	- OUT	Exceeding measurable range	SPH exceeds –30 D	
	C OUT	Exceeding measurable range	CYL exceeds ±12 D	
Measurement of Curvature	#	Indicating low reliability	Measured value of low reliability	Measure again
	+ OUT	Exceeding measurable range	Radius of curvature exceeds 13.0 mm	Impossible to measure
	- OUT	Exceeding measurable range	Radius of curvature is less than 5.0 mm	
	C OUT	Exceeding measurable range	Corneal astigmatism exceeds 15.00 D	

8.4. Keratometry Peripheral Measurement (KER-P Mode)

It is the mode to measure the curvature of part around cornea. Based upon the center of cornea, measure the curvature of part around cornea from the positions of up/down and left/right direction. It is to indicate the relative eccentricity while comparing the curvature of part around cornea with the curvature of corneal center.

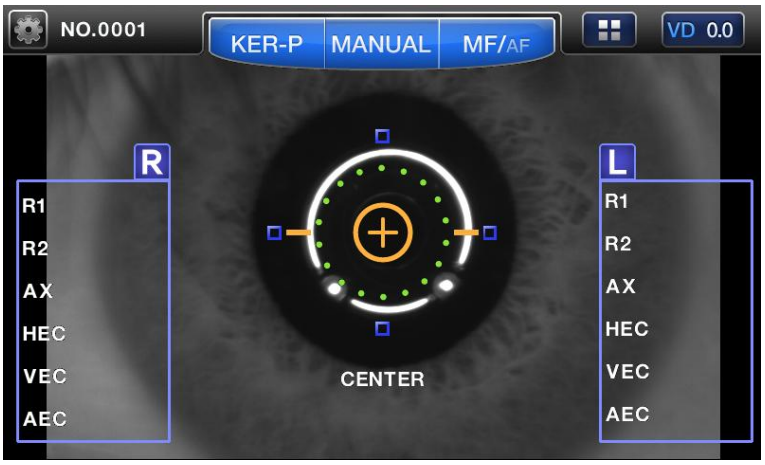
NOTE

The eccentricity means how even the part around cornea is compared to the corneal center. Generally, human cornea has the highest curvature and the longer the distance from the corneal center is it gets more even. Consequently, in case of prescribing lens such as RGP with corneal center curvature only, the patient can feel uncomfortable while putting on the lens. It is possible to select the appropriate lens considering the characteristics of patient by using the eccentricity of part around cornea calculated in KER-P mode.

1. Check whether or not the measurement screen appear on the screen of monitor.

2. Set KER-P mode, you can see KER-P mode on the upper left side of the screen.

3. Measurement of Corneal Center
   - The initial measurement position is the corneal center, and it is indicated as CENTER on the center bottom side of screen. The curvature measured in the corneal center is the same with the one measured in KER mode.



[Figure 8-4-1. Screen indicating KER-P mode]

In case of corneal center,

- R1 : Radius of curvature on maximum meridian
- R2 : Radius of curvature on minimum meridian
- AX : Axis on the radius of curvature on maximum meridian
- HEC : Eccentricity of horizontal direction in the entire eyeball
- VEC : Eccentricity of perpendicular direction in the entire eyeball
- AEC : Average eccentricity of the entire eyeball

4. Measurement of part around cornea

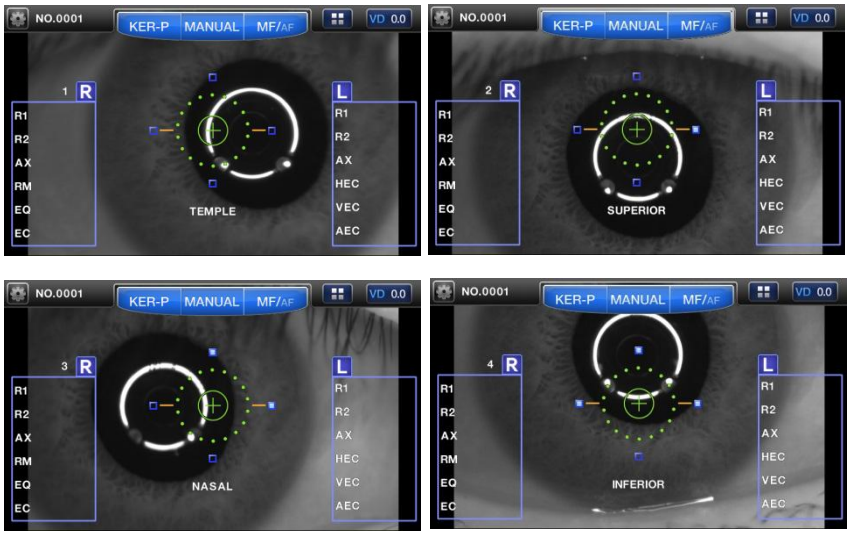
The direction of part around cornea which is measure at present is to be indicated at the bottom of measurement.
Four(4) boxes are to be indicated in up/down, left/right side of Mire Image. Each box indicates the proceeding state of measurement on part around cornea. If there is the measured result around part of cornea where the box is located, the inside of box is to be full with color: In case of no result, the box is to be indicated as an empty box. The relevant box indicated at the part around cornea which is measured now is to flicker.

Direction of part around cornea

- Superior (SUP) : Upside from corneal center
- Inferior (INF) : Downside from corneal center
- Temple (TEM) : To the temple of examinee from corneal center
- Nasal (NAS) : To the nose of examinee from corneal center

5. Sequence to measure the part around cornea

Measure it following the sequence of TEM -> SUP -> NAS -> INF
In case that the measurement in the direction of part around cornea becomes difficult, the direction lamp (guidance LED light) is to radiate in order to draw the examinee's sight around Mire ring actually. After the examiner shall ask the examinee to look at the light of direction lamp, then he or she can perform the measurement by adjusting the focus of Mire ring.



[Figure 8-4-2. Screen indicating KER-P Mode]

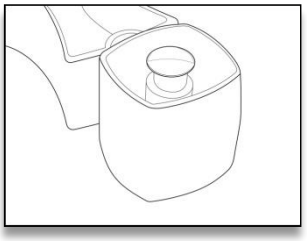
In case of part around cornea (SUP, INF, TEM, NAS),

- R1 : Radius of curvature on maximum meridian in periphery
- R2 : Radius of curvature on minimum meridian in periphery
- AX : Axis on the radius of curvature on maximum meridian in periphery
- RM : Average curvature in periphery
- EQ : Difference between diopter and corneal center
- EC : Eccentricity of periphery

8.5. Measurement of Contact Lens Base Curve(CLBC Mode)

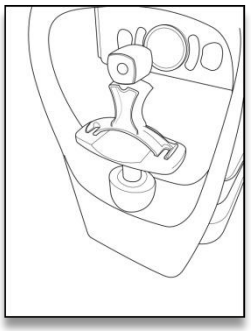
It is the mode to measure base curve of contact lens (concave surface).

1. Check whether or not the measurement screen appears on the screen of monitor.
2. Set CLBC mode, You can see CLBC mode on the upper left side of the screen.
3. Adhesion of Contact Lens
   - Put the surface of contact lens to be measured to the upward direction.
   - Contact lens is to be adhered by the surface tension.
   - Be careful lest contact lens should be adhered tilting. Also, make sure that air bubbles should not be generated behind contact lens.



[Figure 8-5-1. Adhesion of Contact Lens]

4. Sticking of Model Eye
   - Fix the model eye stuck with contact lens with pushing pin after taking the chin-rest paper away. Let contact lens directed to the measurement window.
5. Adjustment of Position and Focus
   - Let Mire image come into the center of external Alignment Ring by slowly pushing and rotating the operation lever.
   - Adjust the focus so that the outline of Mire Image can be seen most apparent. As the focus is adjusted, the focus symbol appears on the internal Alignment Ring.



[Figure 8-5-2. Adhesion of Model Eye]

6. Measurement
   - Push the measurement button.
   - As you keep pushing the measurement button, the measurement is to be performed consecutively.
   - As the measurement is completed, the measured result is to be indicated on the screen of monitor.

⚠ NOTE

The measure result of astigmatic axis in base curve(concave surface) of contact lens has the difference of 90° compared with the measured value of astigmatic axis in the corneal curvature(convex surface).



[Figure 8-5-3. Screen indicating CLBC Mode]

Information on the display is below.

- R1 : Radius of curvature on maximum meridian
- R2 : Radius of curvature on minimum meridian
- RM : Average curvature
- K1 : Rrefractive power on minimum meridian
- K2 : Rrefractive power on minimum meridian
- KC : corneal astigmatism

7. Print

- Press Print button.

9

9. Other Modes

9.1. ILLUMINATION Measurement Mode (ILLUM Mode)

Illum measurement mode is the measuring function to use usefully in the following cases.

1. It is to examine the crystalline lens of patient who has the severe symptom of cataract or undergoes it, or to measure its refractive power.

   - Examine the degree of opacity of crystalline lens with the shape of light reflected from retina while changing intensity of light shed on the eye.
   - In case that the crystalline lens is not much in opacity, it is possible to measure the sight refractive power of eye as well while observing the shape reflected from retina.

2. In case there are scratches on retina, observe the scratches: or observe whether or not the penetration of light into IOL is uniform after the implantation surgery of IOL.

9.1.1. Adjustment of Array and Focus

① Perform the adjustment of array and focus according to procedure 1, 2 of section 8.1.1.

② As pushing ILLUM button after pushing 

button while selecting Illum mode, the Illumination measurement mode screen.

■ [Observe]

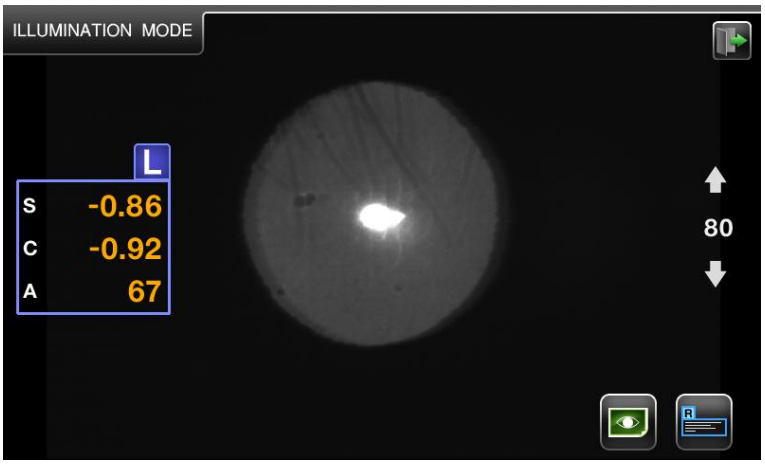
- As Illumination mode is to be selected by pushing ILLUM measurement button, [Observe] window is to appear on the screen together with Illumination image spread out reflected from retina.
- Diagnose the crystalline lens, opacity degree of cornea, and the degree of corneal scratches by observing the state of this Illumination image.



[Figure 9-1-1. Illumination Observation Window]

■ [Measure]

- If you push Measure button in [Observe] window, it is changed to [Measure] window.[Measure] window is to consecutively measure the sight refractive power, astigmatism and astigmatic angle, and to show them together with Illumination image on the screen at the same time.



[Figure 9-1-2. Illumination Measure Window]

<User Menu>

MEA : By using the joystick measurement button, you can store the observed Illumination image in memory while changing it as a static window.


: It is the button to change the window between [Observe] and [Measure].


: It is possible to divide the static window of Illum obtained by measurement button by two (2), and to show it by enlarging it for each left/right eye.

↑ Button: It is the button to increase the intensity of Ref LED for one (1) level.
30 : Ref LED Power display.
↓ Button: It is the button to decrease the intensity of Ref LED for one (1) level.

Measurement Mode Return: As pushing  button, it is to finish Illumination mode, and to return to the ordinary measurement mode.

9.1.2. Observation on Illumination

① Adjustment of brightness of LED to measure refractive power

- In order to take a close look at Illumination image, change the intensity of LED to measure refractive power by one (1) level using ↓ button and ↑ button.

② Observation on Illumination Image

- Let LED to measure the refractive power to be at incidence to eye while avoiding the part of opacity in crystalline lens by using the operation lever. It is effective for observation on Illumination to let LED light be shed on part around pupil.

NOTE

In order to protect the patient's eyes, avoid examining the eyes over 30 seconds.

③ Stopping Image

- After adjusting the focus of image by using the operation lever, stop the image by pushing the measurement button. If the stopped screen is not satisfactory, stop the image again after returning to the original screen by pushing  button.

④ Measuring Refractive Power and Stopping Image

- As pushing Measure button in [Observe] window, it is to be changed to [Measure] window. At this time, as pushing Mode button again, [Observe] window is to return. Position the bright dot which indicates LED light to shed on the eye so that it can avoid the part of opacity of pupil by using the operation lever, and stop the image and the measured value by pushing the measurement button after well adjusting the focus of image appeared on the screen. If the stopped image is not satisfactory, stop the image again after returning to [Measure] window by pushing  button.

NOTE

The opacity of crystalline lens caused by cataract can lead in errors of measured value while causing the aberration by the decenteredness.

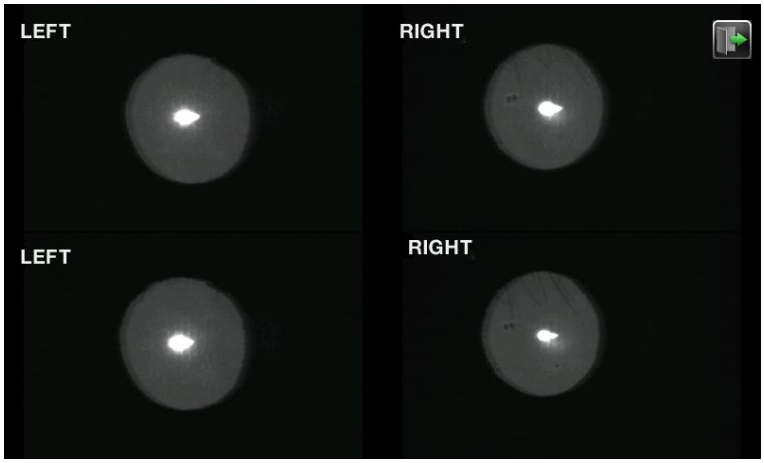
9.1.3. Storage

If you want to store the stopped image in memory, push the measure button. You can store max of two (2) images for each eye. If you want to return to [Observe] or [Measure] window, please push  button.

9.1.4. Examination on the other eye

Perform the examination on the other eye and the storage of its image by the same way.

9.1.5. Call for Stored Image



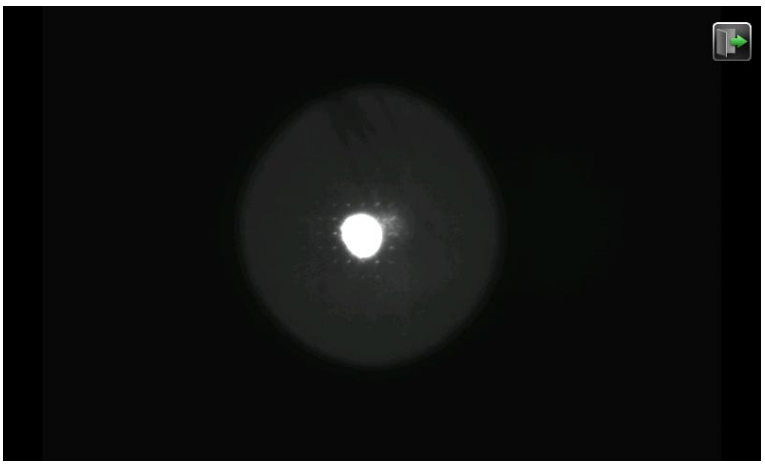
[Figure 9-1-3. Window indicating Stored Image]

① In order to call the stored Ret-Illumination image for two eyes on the screen of monitor, enter Display mode by pushing  button.

② For magnify image which is save in DISPLAY mode by touch it.

③ As pushing  button, it shall return from the enlarged window to the Display window.

④ As pushing  button in Display window, it is to return to [Measure] window.



[Figure 9-1-4. Window indicating stored image(enlarged)]

9.1.6. Return to measurement mode

As pushing  button in [Observe] or [Measure] window, you can return to [REF], [KER], [K&R], [KER-P] or [CLBC] measurement mode.

9.2. ZERNIKE Mode

Zernike Mode indicates the distribution of refractive power in pupil area. Based upon the wavefront of emmetropes, Z-Map is drawn as a kind of topographical map having the elevation according the degree of distortion(aberration) of wavefront come from myopia or hypermetropia. Zernike mode is to measure the refractive power in REF or K&R mode, and you can see it by pushing MANUAL button to ZMODE button.

9.2.1. Composition of Window

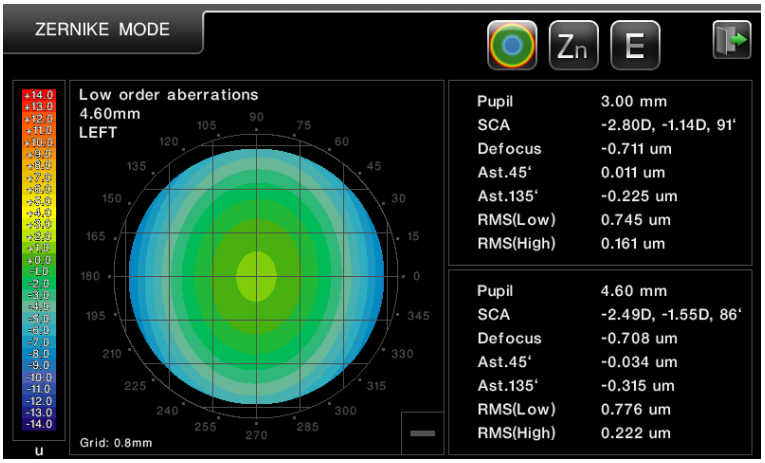
1. : Map



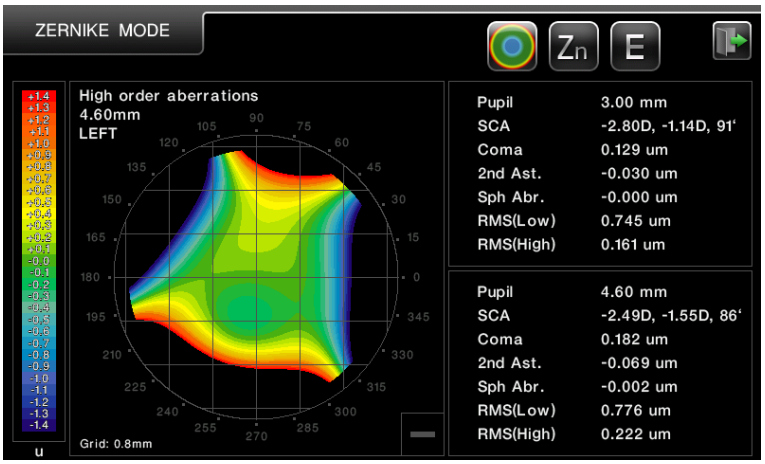
[Figure 9-2-1. Zernike mode Window (Map)]

Map information items indicated on bottom of window are as follows

- Pupil : measurement range. (3.00 mm radius from the center of the pupil)
- : measurement range. (4.60 mm radius from the center of the pupil)
- SCA : S=Spherical Abberation, C=Cylinder Abberation, A=Cylinder Axis
- RMS(Low) : aberration (low order aberration average)
- RMS(High) : aberration (high order aberration average)



[Figure 9-2-2. Zernike mode Window (Map)]



[Figure 9-2-3. Zernike mode Window (Map)]

Map Level on the left side in window is the aberration value of wavefront, and it is the color table to draw map. The max and min value of the aberration of measured wavefront is indicated by the unit of micrometer(um). The wavefront aberration of emmetropes is 0, and the severer the myopia and hypermetropia is, it is to have higher wavefront aberration of (+) and (-) sign respectively.

By using the color table defined in Map Level, the map in the center of window is to be drawn according to the areal wavefron aberration(refractive power) within pupil area. Emmetropes is as in green, hypermetropia is as in blue, and myopia is indicated as in red: the severer the abnormality of eye is, the thicker their colors become. In case including astigmatism, the refractive power topography of oval type is to be drawn to the direction of astigmatic axis.

Map at the bottom right of the image “+” button is pressed, the Map image is magnified, magnified in the lower right portion of Map Images “-“ button to return to the original image.

Map information items indicated on bottom of window are as follows

- Defocus : defocus
- Ast 45˚ : 45˚ Astigmatism
- Ast 135˚ : 135˚ Astigmatism
- Coma : Coma
- 2nd Ast. : representation aberration definition (2nd Astigmatism)
- Sph Abr. : representation aberration definition (Spherical Aberration)
- RMS(Low) : aberration (low order aberration average)
- RMS(High) : aberration (high order aberration average)

2. Zn : Graph

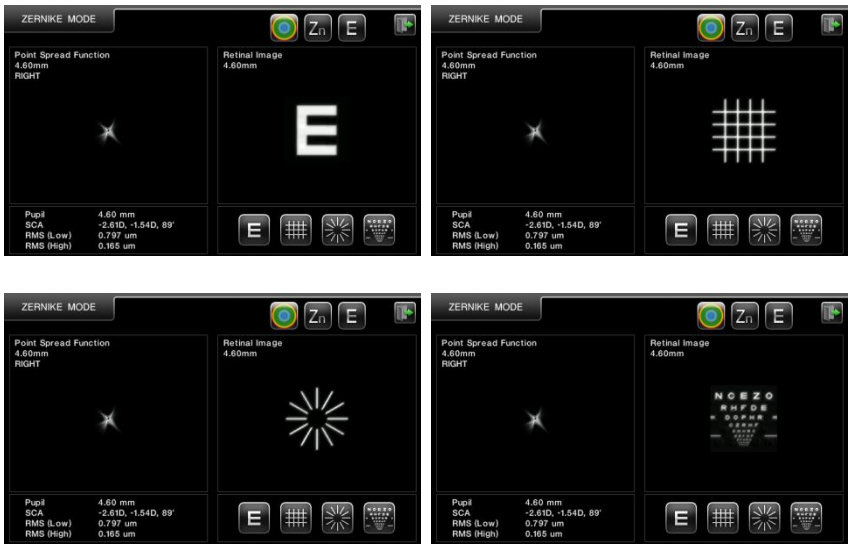


ZNo.	Order	Radial	Name	Micron	Graph
3	2	-2	Oblique Astigmatism	-0.034	
4	2	0	Defocus	-0.708	
5	2	2	Rule Astigmatism	-0.315	
6	3	-3	Oblique Trefoil	-0.043	
7	3	-1	Vertical Coma	0.203	
8	3	1	Horizontal Coma	-0.021	
9	3	3	Horizontal Trefoil	-0.054	
10	4	-4	Oblique Quatrefoil	-0.009	
11	4	-2	Oblique 2nd Astigm.	-0.030	
12	4	0	Spherical Aberration	-0.002	
13	4	2	Rule 2nd Astigm.	-0.039	
14	4	4	Horizontal Quadrafoil	0.007	

[Figure 9-2-4. Zernike mode Window (Graph)]

The graph shows coefficients of individual aberration compoments included in a group. (combination of aberration components). A side-by-side display of the preoperative and postoperative coefficient graphs tells differences in each aberration component.

3. : PSF image



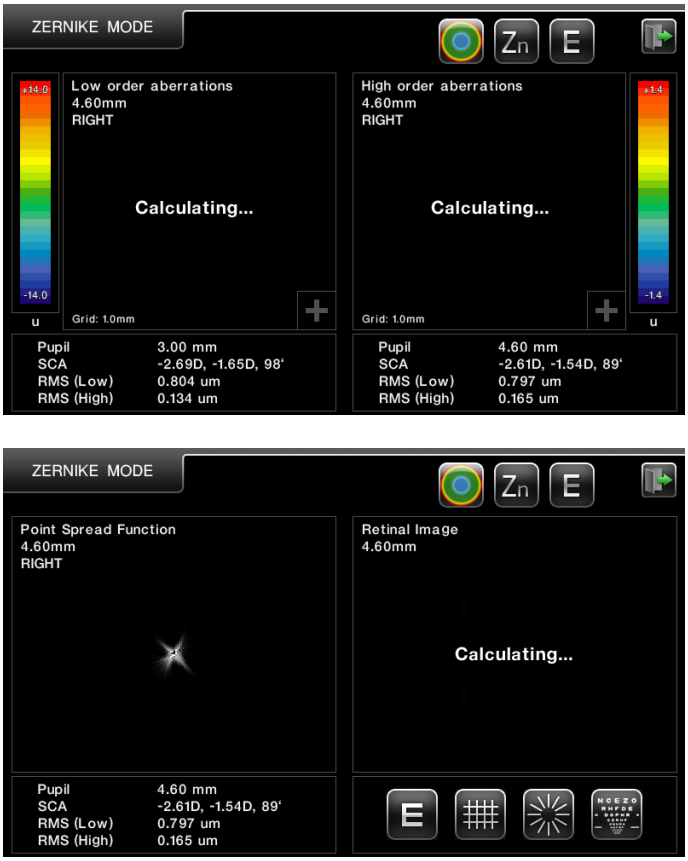
[Figure 9-2-5. Zernike mode Window (PSF image)]

PSF image information items indicated on bottom of window are as follows

- : E type chart
- : Grid type chart
- : Radiation type chart
- : ETDRS type chart

9.2.2. Change of Window

As changing the measurement position of examinee to left or right side by moving the joystick, the map is to changed again as a result obtained in the measured direction.
As the map is drawn for the first time, the guide message is to be indicated as “Calculating…” for some time of standby for calculation.



[Figure 9-2-6. Zernike mode (Map, PSF image) Window Change]

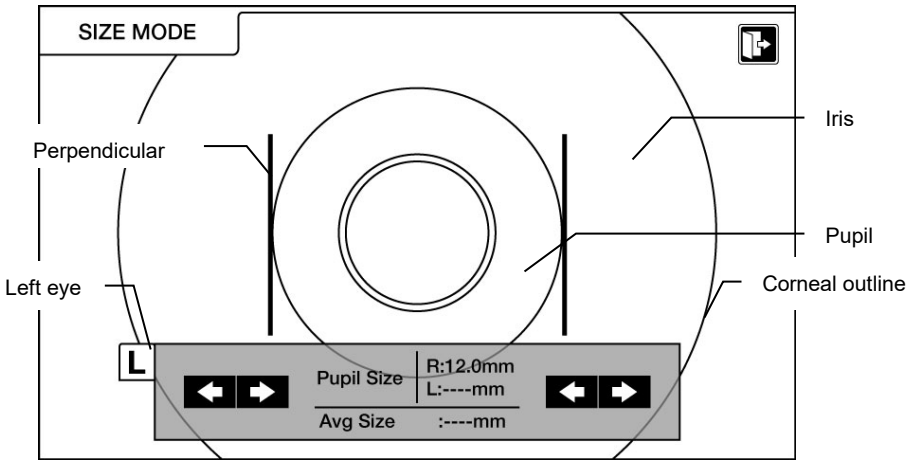
9.3. Measurement of Corneal Radius(SIZE Mode)

It is the mode to measure the corneal radius.

1. Check the measurement window on the screen of monitor.
2. Adjust the position and focus so that the image of eye to be measured can be seen apparently.
3. Push SIZE button after pushing MANUAL button while selecting SIZE measurement mode.



[Figure 9-3-1. Window indicating Size Mode (1)]



[Figure 9-3-2. Window indicating Size Mode (2)]

4. Adjustment of measurement position and focus
   - Ask the examinee to look at the internal fixed target.
   - Adjust the position so that the pupil shall be in between two(2) perpendicular bars by moving the

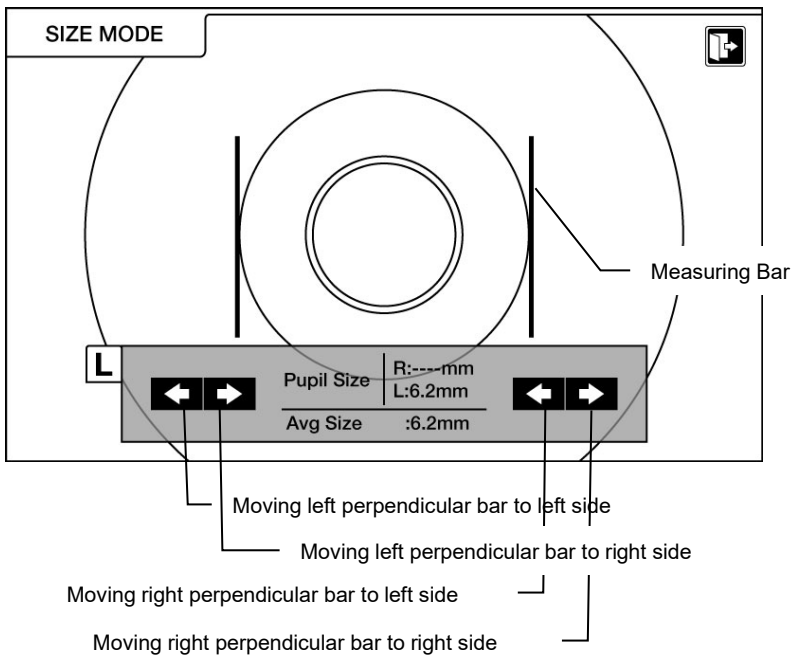
operation lever.

- Adjust the focus so that the corneal corner can be seen apparently.

NOTE

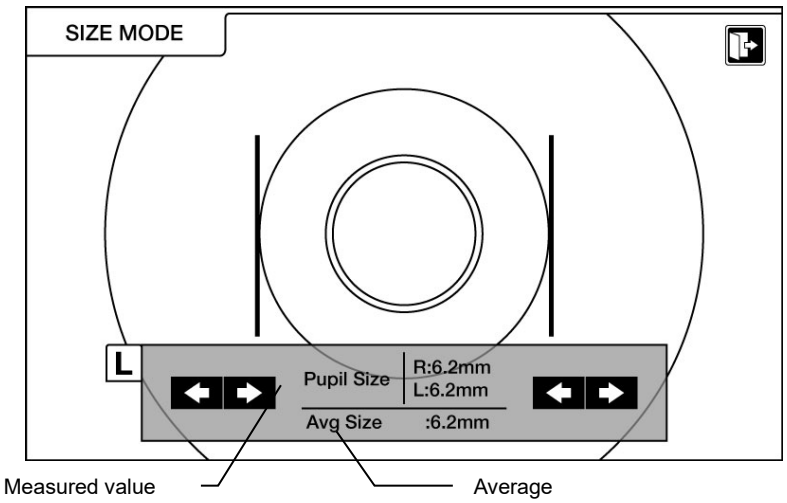
As adjusting the focus on the iris, it is impossible to measure the radius of pupil exactly.

5. Measurement
   - As pushing the measurement button, the window shall be stopped.
   - button and button in the left is to adjust the movement of left bar, and button and button in right side is to adjust the movement of right bar.
   - Move the relevant bar to left/right sides by pushing button or button.
   - The measured value shall be indicated on the screen of monitor.
   - Store the measured value by pushing the measurement button.
   - Measured pupil size “R” or “L”show in bottom-center of display. Measured Average value AVG SIZE show in next.
   - As pushing Measure button, the stopped window is cancelled.



[Figure 9-3-3. Window indicating Size Mode Measurement]

6. Repetition of Measurement
   - Repeat the measurement in the entry of measured value as many times as you need. Repeat the procedure of 2~4 as performing the measurement again.



[Figure 9-3-4. Window indicating repletion of Size Mode Measurement]

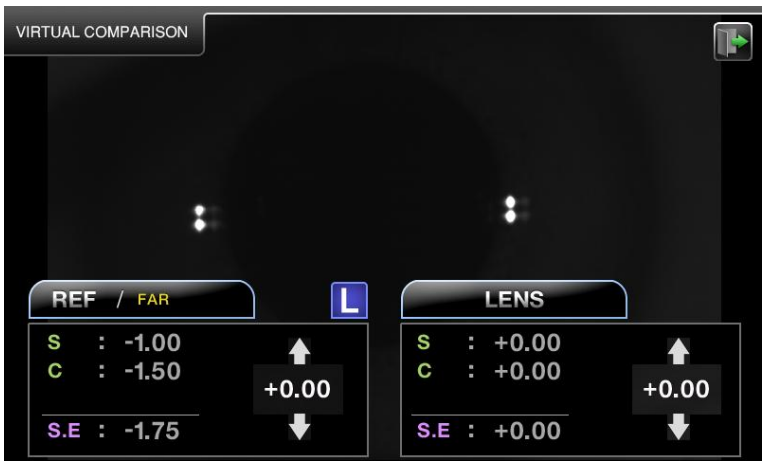
7. Measurement of the other eye
   - Move stage to opposite side, then change Pupil size “R” to “L” or “L” to “R”. You can measure opposite side eyeball in the same way.

8. Printout of Measured Result
   - The measured result of corneal radius is to be printed out as the item of “[CORNEAL SIZE]” in the built-in printer.

9.4. VIRTUAL COMPARISON Mode

A Virtual comparison Function allows the patient to compare the current uncorrected eye view with the corrected view.
By changing the distance to the chart, the patient can experience the virtual comparison.

1. Perform AR measurement.
2. As touching COMP button after touching MANUAL button.
3. To check the visual acuity with progressive prescription, touch the 'FAR' button in the REF/FAR mode, that switches it to REF/NEAR(40 mm) mode and shows add power in the data display area. Touching the add power toggles the progressive prescription check mode. Touching the area 'NEAR(40 mm)' on the display returns to REF/FAR mode.
4. Press the button to finish the virtual comparison function and return to the measurement screen.
5. Measure the other eye in the same manner.
6. When finishing the measurement, print the data out.



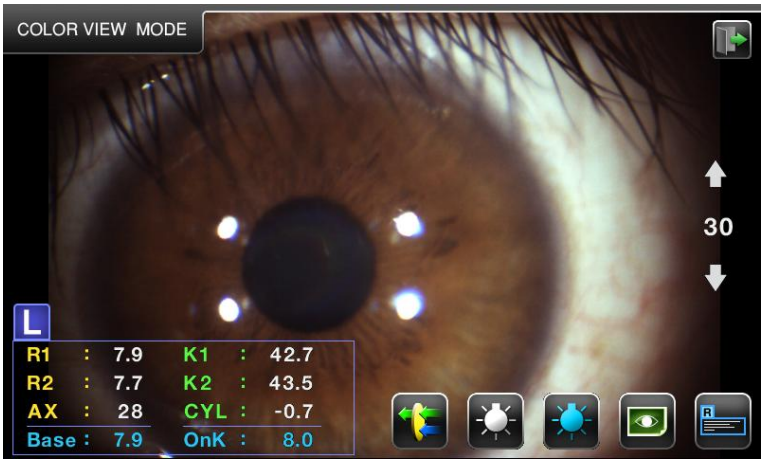
[Figure 9-4-1. Display of VIRTUAL COMPARISON Mode]

The item of Data information which are indicated in screen.

- REF/FAR or NEAR(40 mm) : HRK-8000A DATA
- LENS : Lensmeter DATA
- S (Spherical) : Spherical data.
- C (Cylinder) : Cylinder data.
- S.E : Spherical Equivalent data.
- ↑, ↓ : Down or Up of Shift data

9.5. COLOR VIEW MODE

Measures the radius of curvature of the cornea and see the condition which wears contact lens in White LED / Blue LED / Yellow Filter mode.



[Figure 9-5-1. Display of Color View mode]

The item of Data information which are indicated in screen.

- R1 : Radius of curvature on maximum meridian
- R2 : Radius of curvature on minimum meridian
- Ax : Axis on the radius of curvature on maximum meridian
- Base : Contact lens Base curve data.
- K1 : Refractive power on minimum meridian
- K2 : Refractive power on maximum meridian
- Cyl : Cylinder data.
- Onk : Contact lens Onk data

< User Menu >

 : Select to Yellow Filter.

 : Select to White LED.

 : Select to Blue LED.

 : capture image displayed on the screen.
(maximum LEFT 2, RIGHT 2)

 : Measurement data displayed on the screen.

↑ button : Up of LED Power

30 : Indicates current LED.

↓ button : Down of LED Power

9.5.1. White LED

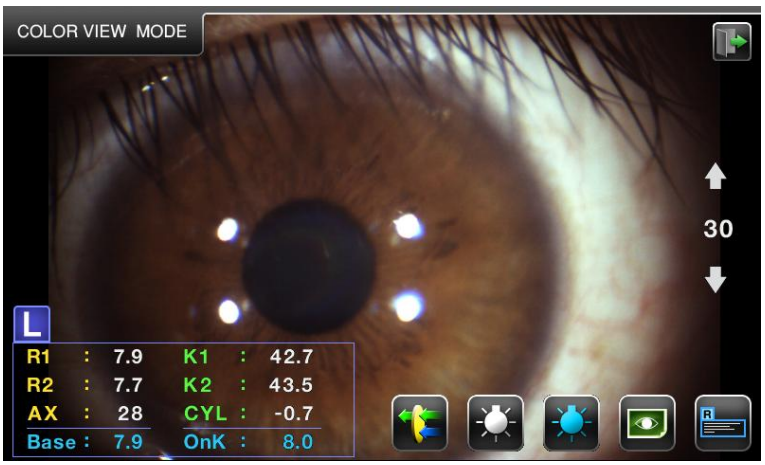
It is the function to observe of the patient eye by using White LED lighting in the color image.

① After when pressing MANUAL buttons in measure mode, presses COLOR buttons then COLOR VIEW MODE screen appear.

② If the corneal curvature is measured in the KER mode, the Base and On-K value will automatically calculate.

③ To view clear image of the patient eye, fix the position and focus of the patient eye using operation lever.

④ ↓ button and ↑ button regulate White LED of the proper brightness.



[Figure 9-5-2. Display of Color View mode (White LED)]

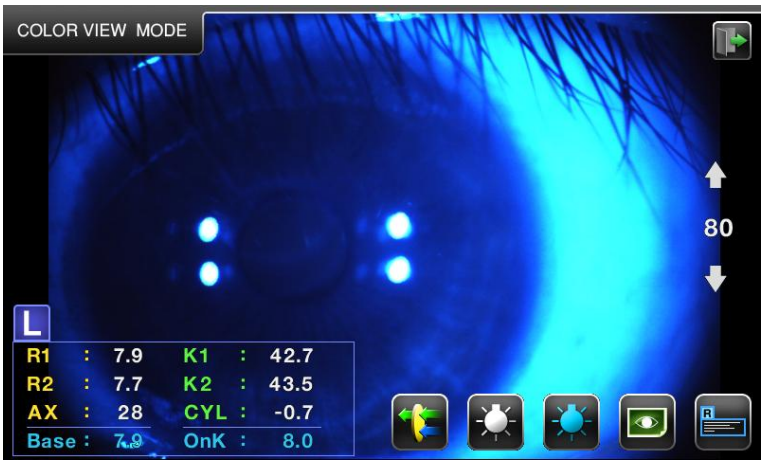
9.5.2. Blue LED

It is the function to observe the level of the fitness of contact lens with the patient eye using Blue LED and fluorescent solution.

① Put in the fluorescent solution into the patient eye and wear the contact lens.

② Press  button in color view mode, fix the position and focus of the patient eye focus of the patient eye using operation lever.

③ Adjust the Blue LED intensity using ↓ and ↑ button, and observe fitness level of the contact lens with the patient eye.



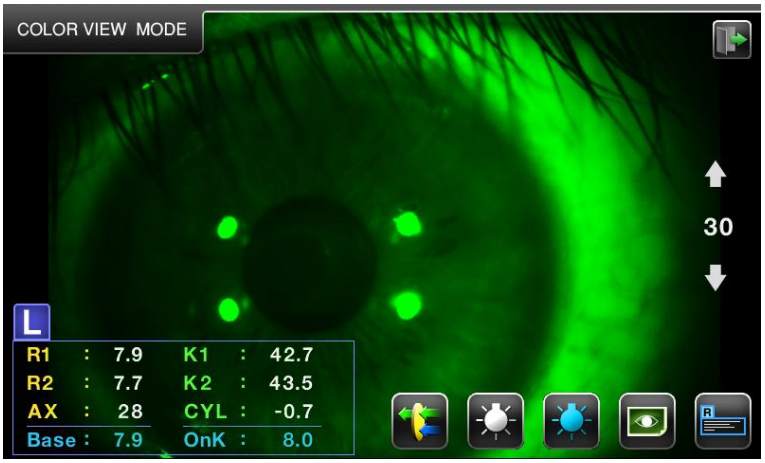
[Figure 9-5-3. Color View mode screen (Blue LED)]

9.5.3. Yellow Filter

The operator can see the level of the fitness of contact lens more clearly and definitely with this function.

① Perform the same procedure as like in procedure 2, 3 of section 9.5.2 and press the  button.

② Adjust the brightness using ↓ and ↑ button, and observe fitness level of the contact lens with the patient eye.



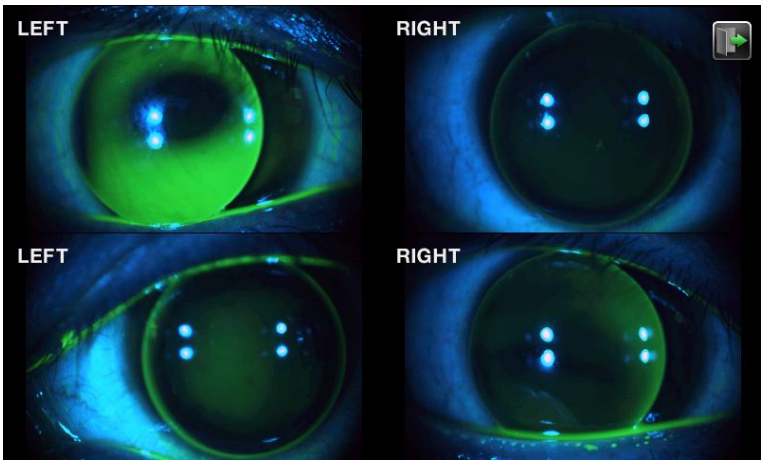
[Figure 9-5-4. Display of Color View mode (Yellow Filter)]

NOTE

The Yellow Filter function is the function which uses S/W.

9.5.4. Capture Screen

① After when pressing MANUAL buttons in measure mode, presses COLOR buttons then COLOR VIEW MODE screen appear.
② Press measurement button (joystick) to capture the image of examinee.
③ button is pressed, capture image is displayed on the screen. (Max LEFT 2, RIGHT 2)

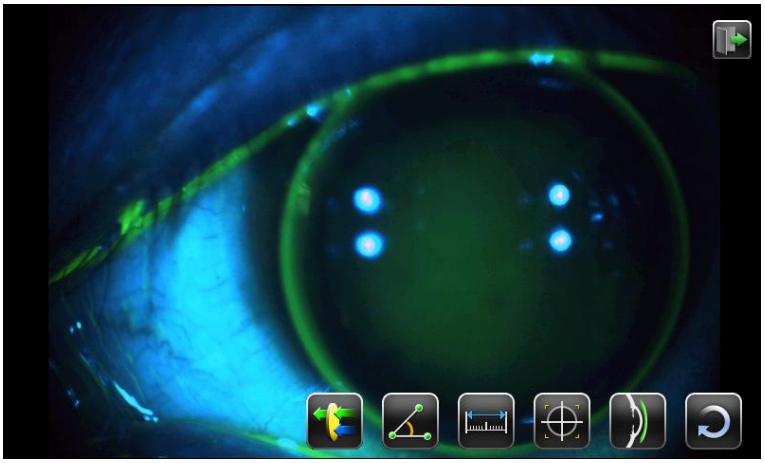


[Figure 9-5-5. Color View mode - capture screen]

9.5.5. Selected Capture Screen

① Select one of the captured images (LEFT2, RIGHT2) as like section 9.5.4.

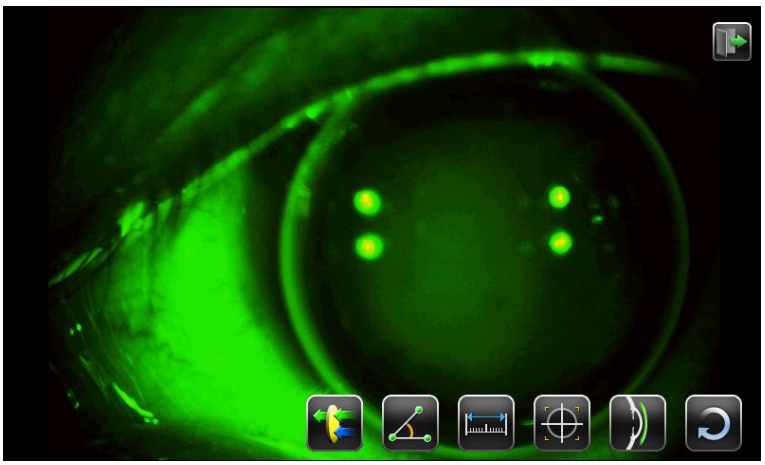
② Selected image is displayed on the screen.



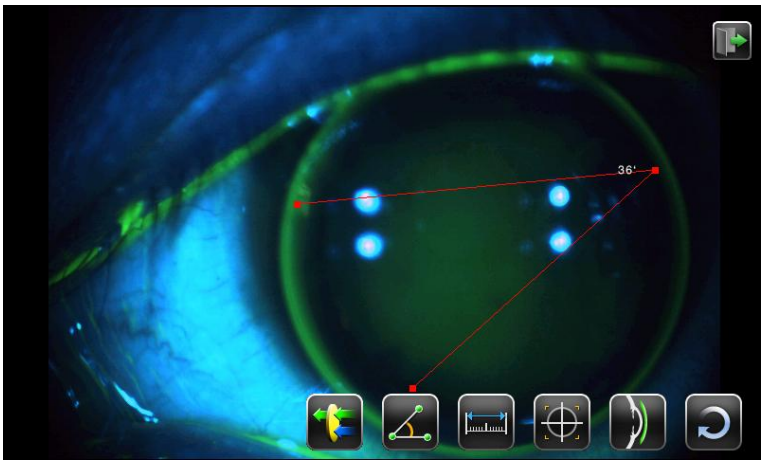
[Figure 9-5-6. Color View mode – selected capture image]

< User Menu >

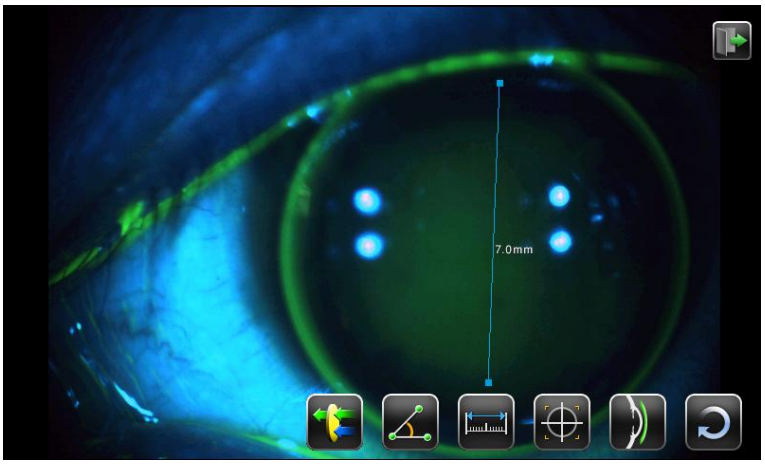
-  : Emphasizing the green contrast of the measurement image. (Check more easily with contrast emphasis of the measurement image.)



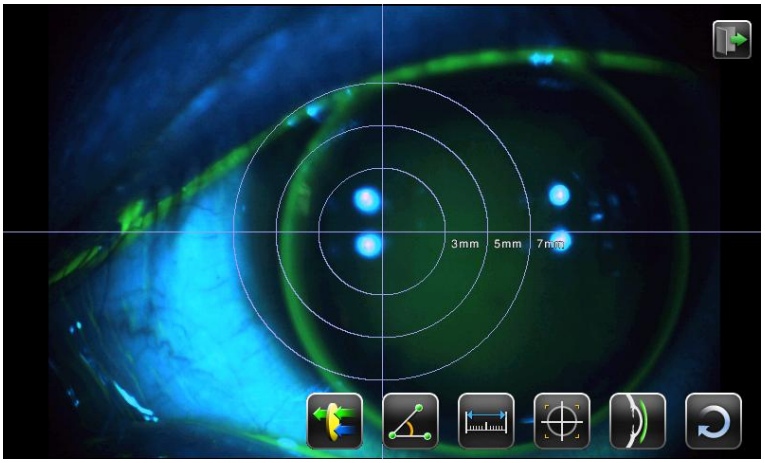
-  : Angle measurement.
(The angle of three points on the touch screen is measured)



-  : Length measurement.
(The length of two points on the touch screen is measured.)

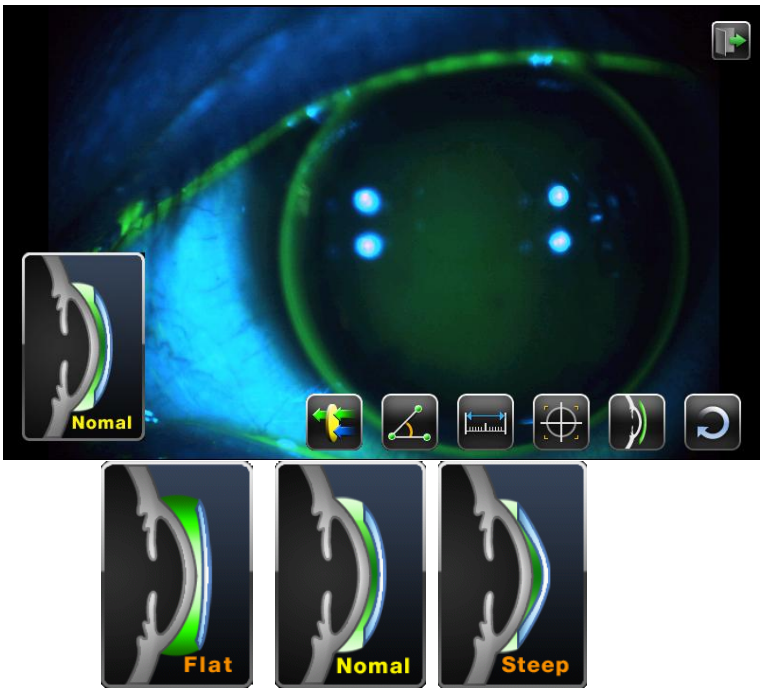


-  : Guide Line(3 mm, 5 mm, 7 mm) display.



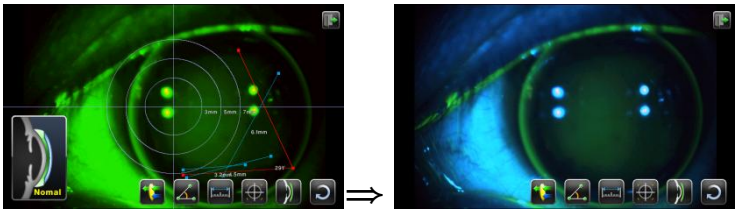
-  : fitting state display.

(The curvatures of the cormea and the contact lens displayed in screen. Automatically which are flat or normal or steep)



[Figure 9-5-7. Flat, Normal, Steep icon screen]

-  : Reverting to the previous screen.
(Displayed on the LCD screen to remove all things revert to the initial screen.)



9.5.6. Return to measure mode.

Presses  button in Color View mode then turns back [REF], [KER], [K&R], [KER-P] or [CLBC] mode.

9.6. DISPLAY Mode

You can see the measured results (Max ten(10) units of data) stored in memory in this mode. As pushing DISPLAY mode in the measurement mode, it changes to DISPLAY Mode. It returns to the measurement mode as pushing  button again.

NOTE

- In case of K/R mode, the page changes as pushing REF button or KER button.
- As pushing print button, the measured result stored in memory is to be printed out through the built-in printer, and it is removed completely for the new measurement.

1. Measured Result of Refractometry

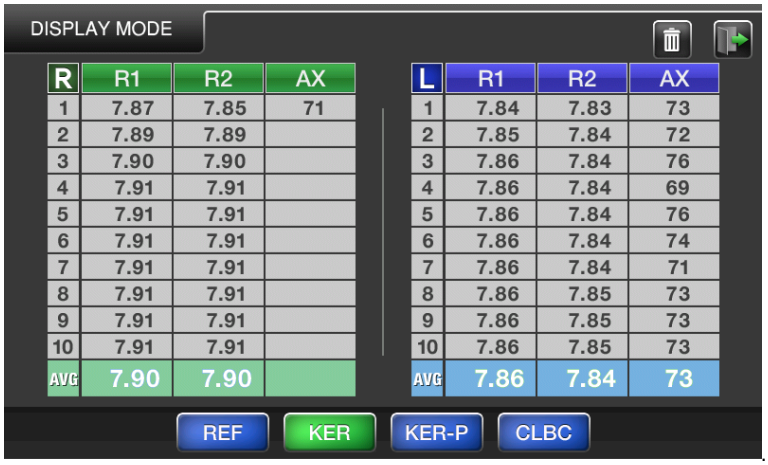
   - It indicates the latest measured result of max amount of ten(10) times(refractive power of left/right eyes). As pushing  button, the stored data is to be removed and returns to the measurement mode.



[Figure 9-6-1. Measured Result of Refractory]

2. Measured Result of Keratometry

- It indicates the latest measured result of max amount of ten(10) times(refractive power of left/right eyes). As pushing button, the stored data is to be removed and returns to the measurement mode.



[FIgure 9-6-2. Measured Result of Keratometry, Ker-p, CLBC]

9.7. User SETUP Mode

It is to perform many setups relating to measurement, print-out, etc. As pushing (SETUP MODE) button, it enters USER SETUP mode.

[How to change page]

- Select the wanted page while pushing ①, ②, ③, ④, ⑤, ⑥, ⑦ button.
- : it is to enter the previous page.
- : it is to enter the next page.

[How to change content]

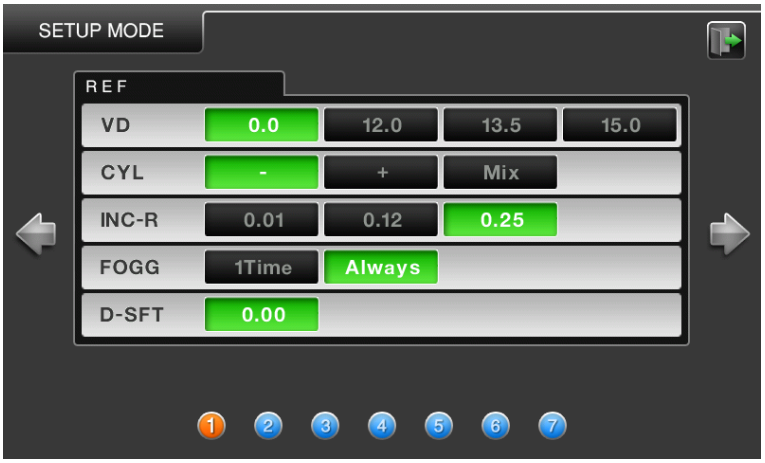
- If you want to change, then touch it. .

NOTE

You should change some contents in other way. The procedure of relating setup change is to be ordered under the explanation on each item.

[How to enter the measurement mode]

- Push button, save automatically and return to measure mode.

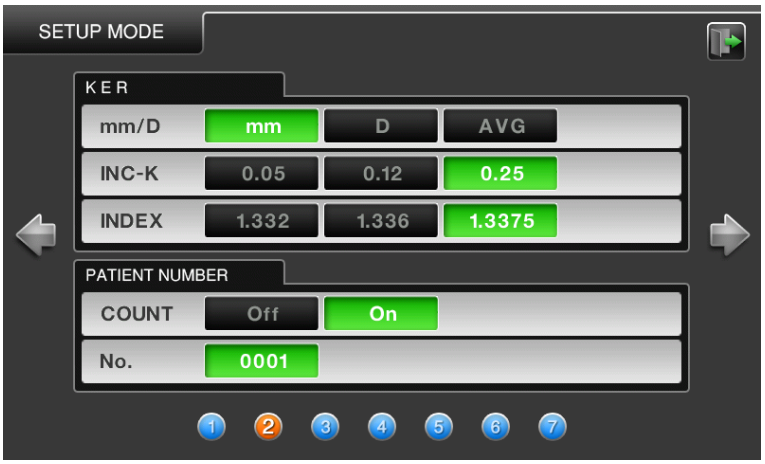


[Figure 9-7-1. Setup Mode Information (page 1)]

[Content of Item] : 1/7Page

REF (Refractometry measurement)

- **VD :** Corneal Vertex Distance
- **CYL :** Astigmatism Indication Type
- **INC-R :** Indication Unit of SPH and CYL
- **FOGG :** The number of times fogging system in continuous measure mode.
- **D-SFT :** Data Shift (range : -5.00 ~ +5.00)



[Figure 9-7-2. Setup Mode Information (page 2)]

[Content of Item] : 2/7 Page

KER (Keratometry measurement)

- **mm/D :** Indication Type of Corneal Measurement

  mm R1 ····· Radius of curvature on maximum meridian
  R2 ····· Radius of curvature on minimum meridian
  AX ·····Axis on the radius of curvature on maximum meridian

  D K1 ·····Refractive power on minimum meridian
  K2 ·····Refractive power on maximum meridian
  AX ·····Axis on minimum meridian

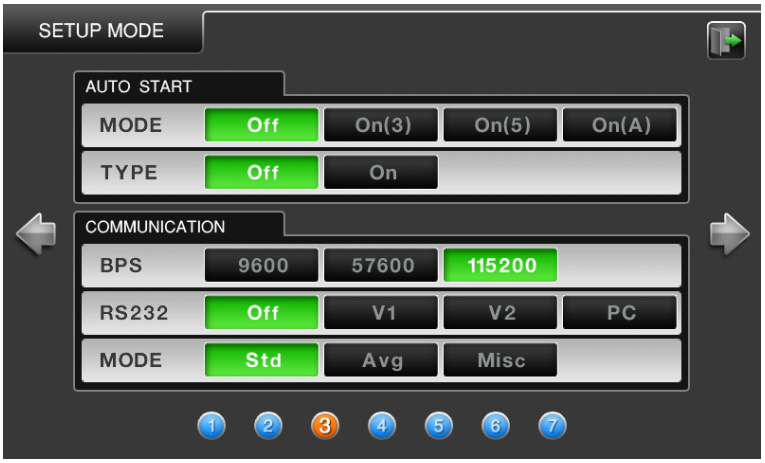
  AVG AR ·····Average radius of curvature
  CY ····· Corneal astigmatism
  AX ····· Axis of Corneal astigmatism

- **INC-K :** Increment of corneal power and astigmatism
- **INDEX :** Corneal equivalent refractive index

PATIENT NUMBER (Setup of Serial Number)

- **COUNT :** Selection whether or not to use serial number

- **NO. :** Setup of Serial Number (range : 0 ~ 9999)



[Figure 9-7-3. Setup Mode Information (page 3)]

[Content of Item] : 3/7 Page

AUTO START (Output format)

- **MODE** : Select of AUTO MODE
  I t is to measure in AUTO START Mode consecutively three(3) times only.
  It is to measure in AUTO START Mode consecutively five(3) times only.
  It is to measure in AUTO START Mode consecutively

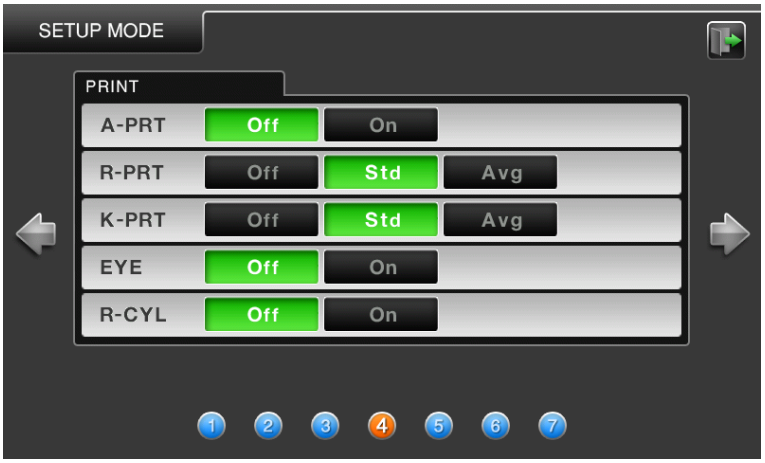
- **TYPE :** You can select “ON” or ”OFF” of AUTO START MODE.

COMMUNICATION (Setup for communication to other machines)

- **BPS :** Select the one among 9600, 57600, and 112500bps as its data transfer rate.

- **RS232 :** Setup of transmission method(method and version of other equipment)

- **MODE :** Data format setup of transmission method .



[Figure 9-7-4. Setup Mode Information (page 4)]

[Content of Item] : 4/7 Page

PRINT (Print Setup)

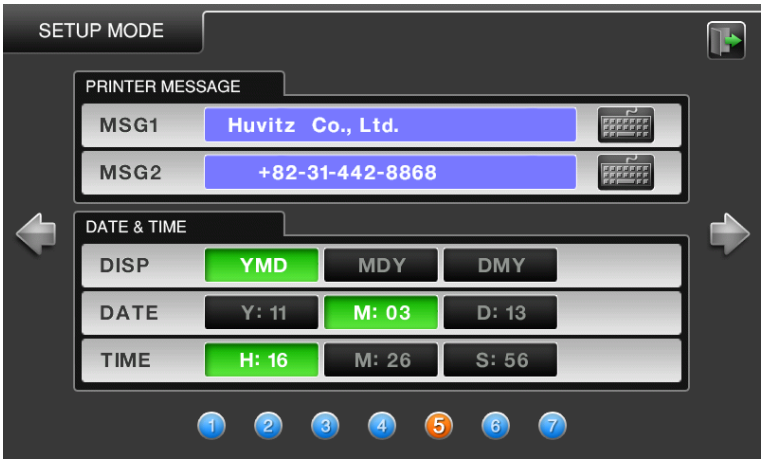
- **A-PRT** : In case of measuring in AUTO START Mode, it is to print out the measured result automatically as the each measurement to left/right eyes is completed one after the other.

- **R-PRT :** Refractometry -Output type of built-in printer for the measured result of Refractometry
  Off : It is not to be printed out.
  Std : The measured result & average value of max ten(10) times are to be printed out.
  Avg : Only average value is to be outputted printed out.

- **K-PRT :** Output type of built-in printer for the measured result of Keratometry
  Off : It is not to be printed out.
  Std : The measured result & average value of max ten(10) times are to be printed out.
  Avg : Only average value is to be outputted printed out.

- **EYE :** Off : It is not to be printed.
  On : Pictures of eye & refraction according to the measured result of Refractometry is to be outputted

- **R-CYL :** Select of remainder astigmatism output.



[Figure 9-7-5. Setup Mode Information (page 5)]

[Content of Item] : 5/7 Page

PRINT MESSAGE (Input the measured data and message to be outputted through printer by using the function of internal printer message input. It can print characters on two(2) lines.)

- **MSG1 :** Character input for the first line.

- **MSG2 :** Character input for the second line

DATE & TIME

- **DISP :** Setup of indication sequence of year/month/date

  YMD : Year/Month/Date

  MDY : Month/Date/Year

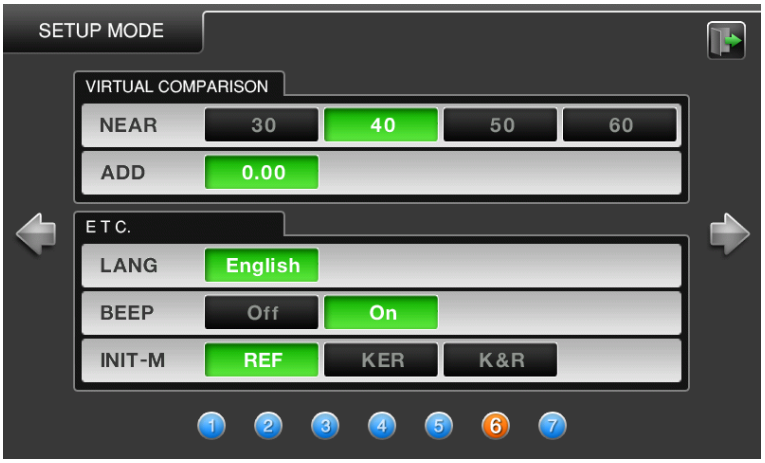
  DMY : Date/Month/Year

- **DATE :** Setting of date(year/menth/date)

  (range : Y = 00 ~ 99 , M = 01 ~ 12, D = 01 ~ 31)

- **TIME :** Setting of time(hour/minute/second)

  (range : H = 00 ~ 23 , M = 00 ~ 59, S = 00 ~ 59)



[Figure 9-7-6. Setup Mode Information (page 6)]

[Content of Item] : 6/7 Page

VIRTUAL COMPARISON

- **NEAR :** The near working distance of the chart can be set.

- **ADD :** The addition power can be set.

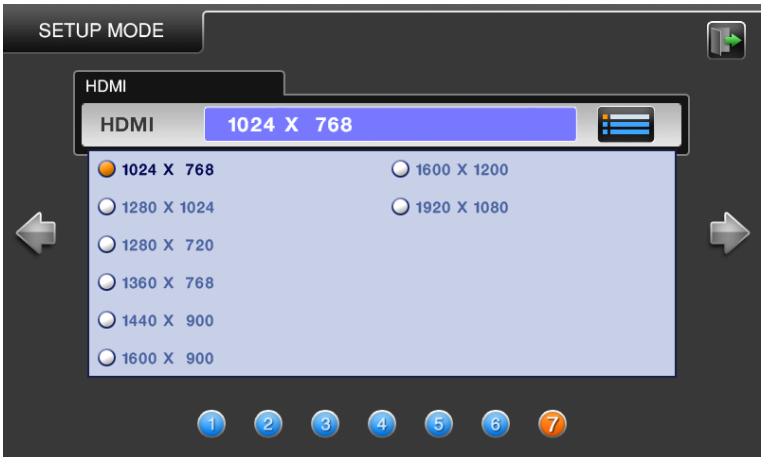
  (range : -5.00 ~ +5.00)

ETC. (Other Setup)

- **LANG :** You can select the language characters indicated on the screen and the print output.

- **BEEP :** Setup of Beep sound.

- **INIT-M :** Select of initial mode.



[Figure 9-7-7. Setup Mode Information (page 7)]

[Content of Item] : 7/7 Page

HDMI

- **HDMI :** Connecting into the exterior monitor.

  1024 X 768, 1280 X 1024, 1280 X 720, 1360 X 768,

  1440 X 900, 1600 X 900, 1600 X 1200, 1920 X 1080



[Figure 9-7-8. Other (Character) Input]

- Character Input -

CLR (Clear) : Erase of line.

BS (Back Space) : Erase of text.

ENT (Enter) : Change of line.

SAVE : Save of information.



[Figure 9-7-9. Other (Number) Input]

- Number Input –

range : Minimum ~ Maximum range which is possible of input. (If it will escape a range then will not save and displayed warning message “Out of Range!”)

: Erase of number.

C : Erase of All numbers.

ENT : Save number and exit number input mode.

9.8. Power saving Function

The power saving function begins to operate if you do not operate the machine at all for three(3) minutes or so. It is to return to the measurement mode as pushing any button optionally in saving mode.

10

10. Self diagnosis & Maintenance

10.1. Before calling for serviceman

In case that abnormality happens or the machine operates abnormally, a warning sign is to be indicated. In this case, perform the settlements below.
If the machine does not return to the normal condition in spite of the measures below, contact to the agent where you bought the machine after switching the power off.

1. As the power switch is on

Message	Cause	Method of settlement
Motor Error	Internal abnormality for the equipment	Re-input the power in 10 seconds after switching it off. In case that the message is indicated again, contact our sales representative.
EEPROM Error		
EEPROM Data Error		
System Error		
Clock Error		
INVALID SETUP DATA – REF	Abnormality in the internal data for Refractometry	Please contact our sales representative.
INVALID SETUP DATA - KER	Abnormality in the internal data for Keratometry	Please contact the selling agent.

2. Messages during measurement

Message	Cause	Method of Settlement
TRY AGAIN	Refer to page 15	Refer to page 15
	Objective glass in the measurement window is polluted	Clean the glass

+ OUT	Sphere of examinee's eye exceeds +25 D	Impossible to measure
	Curvature radius of examinee's eye exceeds 13.0 mm	
	Object lens within measurement window is polluted	Clean the glass
- OUT	Sphere of examinee's eye exceeds -30 D	Impossible to measure
	Curvature radius of examinee's eye is less than 5.0 mm	
	Objective glass in measurement window is polluted	Clean the glass
C OUT	Astigmatism of examinee's eye exceeds 12 D	Impossible to Measure
	Corneal astigmatism of examinee's eye exceed 15 D	
	Object lens within measurement window is polluted	Clean the glass

3. Message as printing

Message	Cause	Method of settlement
CHECK PAPER	-There is no printer paper or lever is not closed.	Install printer paper or close the lever.

10.2. Replacement

10.2.1. Printer paper

As red line appears on the paper, immediately change the print paper with new one.

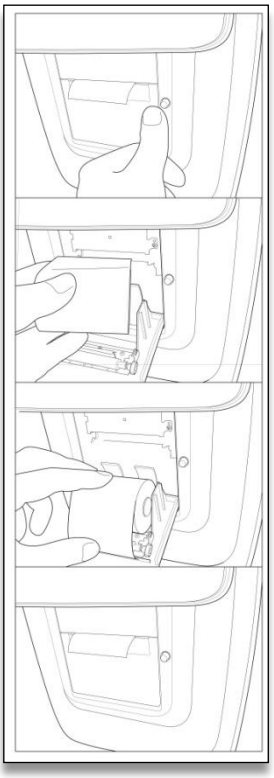
① Presses the button in the printer side, open the cover.

② Cut the paper inserted in the printer, and take it away from paper roll.

③ Put the new paper inserted into the printer case.

④ Fix the paper onto the printer. At this time, adjust the length of paper so that it can come out from the paper outlet of the printer cover.

⑤ Close the cover after inserting the end of paper into the hole of cover gap.



[**Figure 10-1. Changing printer paper**]

10.2.2. Chin rest paper

① Pull two(2) pins out of the chin-rest.

② Push the pins into the holes of chin-rest paper. You can put 50 sheets of it on.

③ Insert the pins into each one of two(2) holes in the chin-rest.

10.2.3. Replacing Fuse

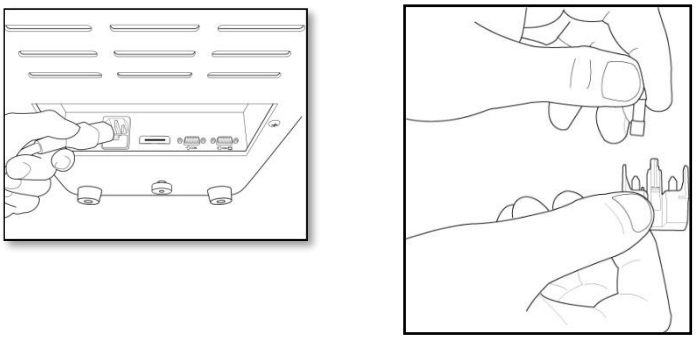
① Turn off and raise the HRK-8000A with two arm carefully.

② Remove the Power cord

③ Pick the fuse holder out from the Power inlet

④ Exchange the fuses

⑤ Insert the fuse folder



[**Figure 10-2. Replacing Fuse**]

⚠ WARNING

Use 250V, T3.15AL fuse for the Auto Ref/Keratometer HRK-8000A.

Utilisez un fusible 250V, T3.15AL pour le réf. / Kératomètre automatique HRK-8000A.

10.3. Cleaning and Disinfection Equipment

1. The equipment should be kept as clean basically. Do not use the solvents such as strongly volatile substance, thinner, benzene, etc.

2. Put some soapy water to the soft cloth, and twist the water out of the cloth. Then, polish each part of the equipment.

3. As polishing the parts of lens or glass, get rid of dusts on the surface of lens with wind-blower and use a dry cloth.

4. Always keep it clean for a patient to use chinrest paper in chin rest, to clean it often in head rest.

5. Always clean the patient contact parts (such as chin rest and head rest) and Hand-washing (Operator: such as an iodophor or chlorhexidine gluconate) prior to disinfection.

6. When using an FDA or CE-cleared (as appropriate) disinfecting agent, carefully follow the instructions provided the manufacturer of the product.

7. For low-level disinfection(normally), the patient contact parts may be wiped with any of the following low level disinfectants
   Methods to disinfect to HRK-8000A are as below:
   - Dry heat
   - Mechanical cleaning with disposable wipe / sterile gauze
   - Wipe with gauze soaked in alcohol or chemicals like hydrogen peroxide and Merthiolate
   - Soaking in chnicals like 70% isopropyl alcohol, 1:1000 Merthiolate, 3% hydrogen peroxide and 1:10 diluted house hold bleach(sodium hypochlorite)

Solution	Manufacturer	Cleaner/ Disinfectant	Active ingredient	Cleared/ Approved for use in
Alkazyme	Alkapharm	Cleaner	Proteolytic enzyme, Quat. Ammonia	Europe
Klenzyme	Steris/ Calgon Corp.	Cleaner	Enzymes	USA & Europe

8. For high-level disinfection(if needed), the patient contact parts may be wiped using on of the following disinfection agents:

Solution	Manufacturer	Cleaner/ Disinfectant	Active ingredient	Cleared/ Approved for use in
Cidex OPA	Adavaced Sterilzation Products	Disinfectant	Orthophtalade-hyde	USA & Europe

10.4. As changing the installation place of the equipment

1. Off the power switch of main body.
2. Take the power connection cable apart.
3. Lock the clamping bolt by rotating it clockwise.
4. Move it while maintaining the horizontality of it by holding the bottom of the main body.

10.5. Disposal

NOTE

To dispose the instrument, accessories, and components, follow local governing ordinances and recycling plans regarding disposal or recycling of instrument or device components. Especially a lithium battery may pollute the environment if the instrument or a lithium battery is abandoned.

When disposing packing materials, sort them by the materials and follow local governing ordinances and recycling plans.

CAUTION

Environment pollution may result when the device or lithium battery is discarded recklessly since this device uses lithium battery. To discard, outsource to a specialized waste disposal company.

La pollution de l'environnement peut se produire lorsque l'appareil ou la batterie au lithium est jeté de façon imprudente car cet appareil utilise une batterie au lithium. Pour éliminer, sous-traiter à une entreprise spécialisée dans l'élimination des déchets.

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11. Information needed for servicing

Repair: Contact the Huvitz's distributor after preparing the information on the following matters when the problem is not resolved even after taking the measures described on section 10 of this manual

- equipment name: HRK-8000A
- equipment's serial number: number on the name plate that is comprised of eight numbers and letters
- explanation of the symptom: detailed explanation
-

Year/month/day purchased: _____

Client name: _____

Client address: _____

Client contact number: _____

Model number: _____

Serial number: _____

Supply of parts needed for repair:

- The preservation period of parts required for repair of this machine is by eight (7) years after stopping to produce the product..

Parts that the service personnel need to repair:

- The following parts are consumables by nature and quality tends to decrease after using for a long time. But the user must not replace it in person. When the parts are consumed or deteriorated due to long time use, contact the Huvitz's distributor for replacement.
- Back-up battery for clock and data

Contact the Huvitz's service department directly by referring to the address and telephone numbers below if you cannot contact the distributor where you purchased the product.

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12.Main Specifications

Measurement Mode	
Continuous Keratometry & Refractometry (K/R Mode)	
Refractometry (REF Mode), Keratometry (KER Mode)	
Keratometry Peripheral (KER-P Mode)	
Base Curve of Contact Lens(CLBC Mode)	
Refractometry	
Vertex Distance(VD)	0.0, 12.0, 13.5, 15.0
SPH	- 30.00 ~ +25.00 D (In case of VD = 12 mm)
CYL	0.00 ~ ± 12.00 D (0.12/0.25 D Unit)
Axis(AX)	0 ~ 180˚ (1˚ Unit)
Cylinder Form	-, +, MIX
Pupil Distance(PD)	10 ~ 85 mm
Minimum pupil diameter	Ø2.0 mm
Keratometry	
Radius of Curvature	5.0 ~ 13.0 mm (0.01 mm Unit) ±0.03, required is ±0.05
Corneal Power	25.96 ~ 67.50 D (In case that the corneal equivalent refractive power is 1.3375, 0.05/0.12/0.25 D Unit)
Corneal Astigmatism	0.0 ~ - 15.00 D (Increments: 0.05/0.12/0.25 D)
Axis	0 ~ 180˚ (1˚ Unit)
Corneal diameter	2.0 ~ 14.0 mm (0.1 mm Unit)
Measurement Accuracy	± 2 ˚
Working range of auto-tracking	
Up & Down	± 15 mm
Right & Left	± 5 ± 2 mm
Back & Forth	± 5 ± 2 mm
Working range of auto-shooting	
Up & Down	± 0.13 mm or less
Right & Left	± 0.13 mm or less

Back & Forth	± 0.5 mm or less
Movable range of horizontal direction(by joystick)	
Up & Down	30 mm or more
Right & Left	92 mm or more
Back & Forth	38 mm or more

Data Storage	
Measured value of ten(10) times amount for each left/right eye	
Hardware specification	
Built-in printer	Line printer of heat printing type
Power saving function	As stopping to measure for about 3 minutes, the main power is shut. It returns as pushing buttons.
Monitor	7.0” TFT LCD with touch screen
Electrical Power	AC100 ~ 240 V, 50/60 Hz
Current	1-0.8 A

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13. Accuracy

- The accuracy specifications are based on the results of model eye testing performed in accordance with ISO10342 Ophthalmic instruments- Eye Refractometers, ISO10343 Ophthalmometers.

1) Refractometry

Criterion	Measuring range	Maximum scale interval	Test device	Tolerance
SPH	-15D ~ +15D (Maximum meridional vertex power)	0.25D	0D, ±5D, ±10D	±0.25D
			±15D	±0.50D
CYL	0D ~ 6D	0.25D	Sphere: approx. 0D	±0.25D
Axis	0° ~ 180°	1°	Cylinder:-3D Axis: 0°, 90°	±5°

a. The refractive error of the test device shall not differ by more than 1,0 D from the nominal value above.
b. Cylinder axis shall be indicated as specified in ISO 8429.

2) Keratometry

NO	Criterion		Requirement
1	Measuring range		6.5 mm to 9.4 mm (52.0 KD to 36.0 KD)
2	Indications given in terms of radii of curvature	Continuously indicating instruments	scale interval of 0.02 mm (0,125 KD)
		Digitally indicating instruments	increment 0,02 mm (0,125 KD)
3	Measurement accuracy (twice the standard deviation, i.e. 2σ)		±0.025㎜

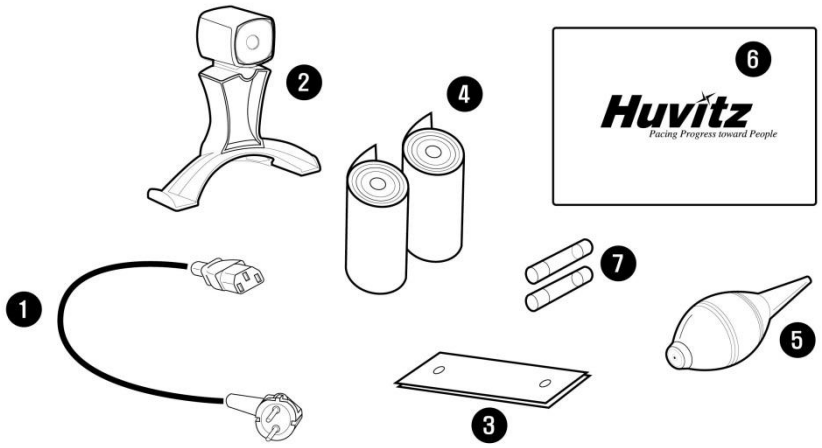
3) Measurement of direction of principal meridians

NO	Criterion		Requirement
1	Measuring range		0° to 180°
2	Meridian direction reading	continuously indicating scales	scale interval 5°
		digitally indicating scales	increment 1°
3	Measurement accuracy using test device (twice the standard deviation, i.e. 2σ)	for principal meridional differences in radii of curvature < 0,3 mm	±4°
		for principal meridional differences in radii of curvature < 0,3 mm	±2°

Angular indications shall be in accordance with ISO 8429.

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14. Accessories



[Figure 13-1. Accessories]

1. Power Cable·····1 unit
2. Model Eye·····1 unit

   (SPH: –2.50D~-2.75D, CYL: -1.25D~-1.50D, R1: 7.95~8.00, R2: 7.78~7.83)
3. Chin Rest Paper(100 sheets)····· 1 bundle
4. Printer Paper·····2 rolls
5. Wind-blower·····1 unit
6. Dust Cloth·····1 piece
7. Fuse(250 V / 3.15 A)·····2 units

⚠ WARNING

For continued protection against risk of fire replace only with same type & rating of fuse. - Fuse (250 V T3.15 AL)

Pour une protection continue contre les risques d'incendie, remplacer uniquement par le même type et la même valeur de fusible. - Fusible (250 V T3.15 AL)

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15. EMC Information

Manufacturer announcement – electromagnetic waves trouble

Electromagnetic waves trouble	
HRK-8000A should be used in the below mentioned electromagnetic wave environment. HRK-8000A purchaser or user needs to confirm whether HRK-8000A is used in this type of environment.	
Trouble test	**Question of appropriateness**
RF emissions CISPR 11	Group 1
RF emissions CISPR 11	Class A
Harmonic emissions IEC 61000-3-2	Class A
Voltage fluctuations/flicker IEC 61000-3-3	Complies

Manufacturer announcement – electromagnetic waves tolerance

electromagnetic waves tolerance		
HRK-8000A is to be used in the below designated electromagnetic wave environment. HRK-8000A customer and user need to guarantee that the HRK-8000A will be used in this type of environment.		
Tolerance test	**IEC 60601 test level**	**Appropriateness level**
Electrostatic discharge(ESD) IEC 61000 - 4 - 2	contact ±8 kV in the air ±15 kV	contact ±8 kV in the air ±15 kV
Electric rapid transients/bust IEC 61000 - 4 - 4	power supplying line ±2 kV input/output line ±1 kV	power supplying line ±2 kV input/output line ±1 kV
Surge IEC 61000 - 4 - 5	between lines ±1 kV between line and grounding ±2 kV	differential mode ±1 kV common mode ±2 kV
Voltage dip, instantaneous interruption, voltage fluctuation at the power input line IEC 61000 - 4 - 11	For 0.5 cycle < 5 %*U*T(*UT's* > 95 % decrease) For 5 cycle 40 %*U*T(*UT's* 60 % decrease) For 25 cycle 70 %*U*T(*UT's* 30 % decrease) For 5 seconds < 5 % *U*T(*UT's* > 95 % decrease)	For 0.5 cycle < 5 %*U*T(*UT's* > 95 % decrease) For 5 cycle, 40 % *U*T(*UT's* 60 % decrease) For 25 cycle, 70 %*U*T(*UT's* 30 % decrease) For 5 seconds, < 5 % *U*T(*UT's* > 95 % decrease)
Power frequency magnetic field (50/60 Hz) IEC 61000 - 4 - 8	30 A/m	30 A/m
Other *U*T is the a.c. power voltage for before approving the test level.		

Electromagnetic waves tolerance		
HRK-8000A is to be used in the below mentioned electromagnetic wave environment. HRK-8000A purchaser or user needs to confirm whether HRK-8000A issued at this environment.		
Tolerance test	**IEC 60601 test conditions**	**Appropriateness level**
Conductivity RF electromagnetic field IEC 61000 - 4 - 6	3 Vrms 150 kHz~80 MHz 6 Vrms in ISM band 6.765 MHz to 6.795 MHz 13.553 MHz to 13.567 MHz 26.957 MHz to 27.283 MHz 40.66 MHz to 40.70 MHz	3 Vrms 6 Vrms
Radioactivity RF electromagnetic field tolerance IEC 61000 - 4 - 3	3 V/m 80 MHz~2.7 GHz scope	3 V/m

Annex A

Data Transfer by RS232C Interface

1. Outline

This document describes how to transfer the HRK data to other device like PC via RS232C interface according to HRK protocol version.

2. Specifications

A. Communication Method : Asynchronous method
B. Communication Mode : Full duplex
C. Baud Rate : one of 9600/57600/115200 bps
D. Data Code : AscII code
E. Data Bit : 8 Bit
F. Parity Check : No
G. Stop Bit : 1 Bit
H. Control Code

Signal	Control Code	Description
ENQ	05H	Send start.
SOH	01H	Header start.
STX	02H	Packet start.
ETX	03H	Packet end.
ACK	06H	Positive response.
EOT	04H	Send end.
CR	0DH	Carriage Return
LF	0AH	Line Feed.

3. Communication Protocol

I. Overview

HRK uses one of three types of protocol version which are called as previous (V1) and new version (V2) to transfer its data. The currently used protocol can be selected from RS232 menu in HRK User Setup.

By the previous version (V1), HRK sends data at a time. It needs none of response from receiver. The sent data just includes each average of measured values.

By the new version (V2), HRK sends a part of data and waits a response from receiver, then sends next part of data. If there is no response in specified time, sends it again. This method enables more reliable data transmission. The sent data includes all of measured values. Its content is same to the printed one on HRK.

HRK will try new data transmission whenever a user presses PRT key after a measure.

II. Previous version (V1)

(1) HRK sends target device one more data packets via Converter box.
(2) Each data packet begins with a character ‘S’, ends with a ‘E’
(3) HRK finishes the transmission.

III. New version (V2)

(1) HRK sends target device an ENQ to start.
    1. <ENQ><ETX>
(2) Target device sends HRK an ACK.
    2. <ACK>
(3) HRK sends target device a SOH to start a header.
    3. <SOH><Data of Header><ETX>
    4. Data of header is empty at now.
(4) Target device sends HRK an ACK.
(5) HRK sends target device a data packet.
    1. <STX><Data Packet><ETX>
(6) Target device sends HRK an ACK
(7) If ACK, HRK sends the next data packet.
(8) If no response above (1) ~ (7), HRK sends the packet again.
    1. HRK waits a period of time for a response. (=1.5 sec)
    2. HRK tries to retransmit the packet until 3 times.
    3. After that, HRK cancels the transmission.
(9) After sending data, HRK sends an EOT for completion.
    1. < EOT><ETX>