SWE

Huvitz

Auto Ref/Keratometer

HRK-8100A

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.

This equipment has been tested and found to comply with the limits for medical devices in IEC 60601-1-2 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 bade 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.

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1. Introduction

1.1. Overview

Auto Ref/Keratometer HRK-8100A is the equipment to provide the information of Spherical, Cylindrical and Axis while measuring the refraction of examinee's eyes. Auto Ref/Keratometer HRK-8100A 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-8100A 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.

1.2. Classificaiton

- Classification of Product: Class I with a measuring function according to Medical Device Regulation 2017/745 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-8100A 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

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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.

⚠ CAUTION

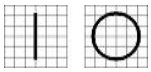
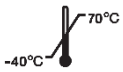
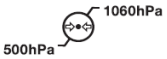
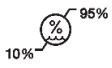
"Caution" informs of the matters related to calamity that can cause minor injury or property loss in case of negligence.

⚠ NOTE

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

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.

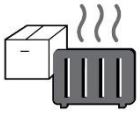
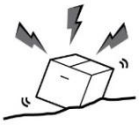
Symbol	Indication
	This symbol identifies a safety note. Ensure you understand the function of this control before using it. Control function is described in the appropriate User's or Service Manual. (Ce symbole identifie une note de sécurité. Assurez-vous de comprendre la fonction de ce contrôle avant 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)

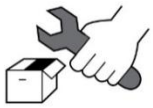
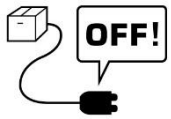
	Use no hook (N'utilisez aucun crochet)
	WEEE Symbol – EU only <u>Disposal of your old appliance</u> When this crossed-out wheeled bin symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC. All electrical and electronic products should be disposed of separately 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 <u>Mise au rebut de votre ancien appareil</u> 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 CAN/CSA C22.2 NO.601.1	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 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.

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

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.

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 wave-length 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 4 de 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

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 mains with protective earth.

22. Wireless communication equipment is used no closer than 30 cm (12 inches) to any part of HRK-8100A, including cables specified by HUVITZ

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

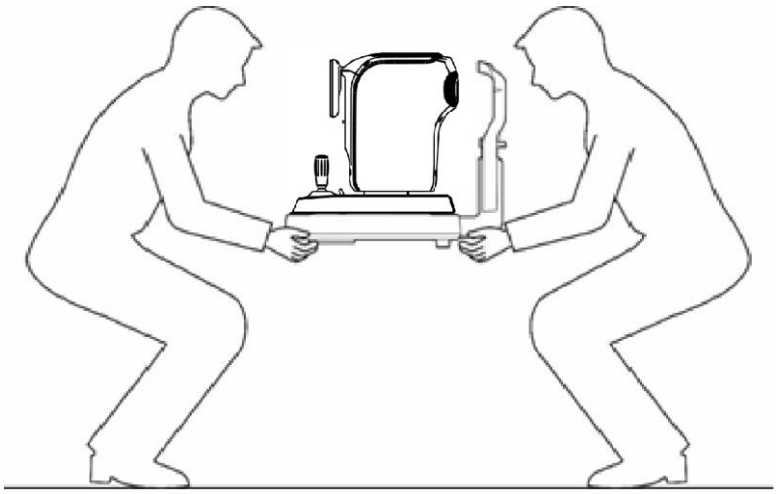
24. In the event of a serious incident involving the device, the user shall report it to the manufacturer and the competent authority of the Member State in which the user and/or patient are established.

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

26. 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.

27. 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:
- changes in IT-NETWORK configuration
- addition of items (hardware and/or software platforms or software applications to the IT-NETWORK
- removal of items from the IT-NETWORK
- update of hardware and/or software platforms or software applications on the IT NETWORK
- upgrade of hardware and/or software platforms or software applications on the ITNETWORK

28. When you carry this product, please hold on front and rback 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-8100A 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-8100A 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.

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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.

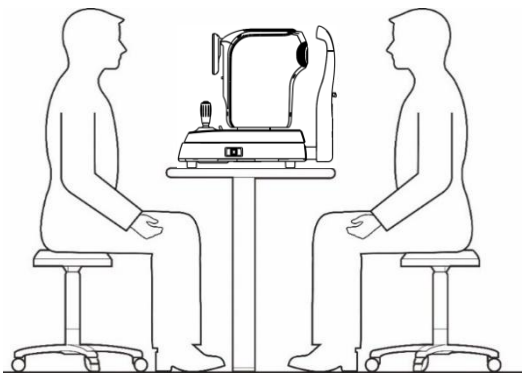
6. In case of any presence of smoke, smell or noise during the use of machine, please contact our local representative after plugging it off from the socket (outlet).

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-8100A, 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.

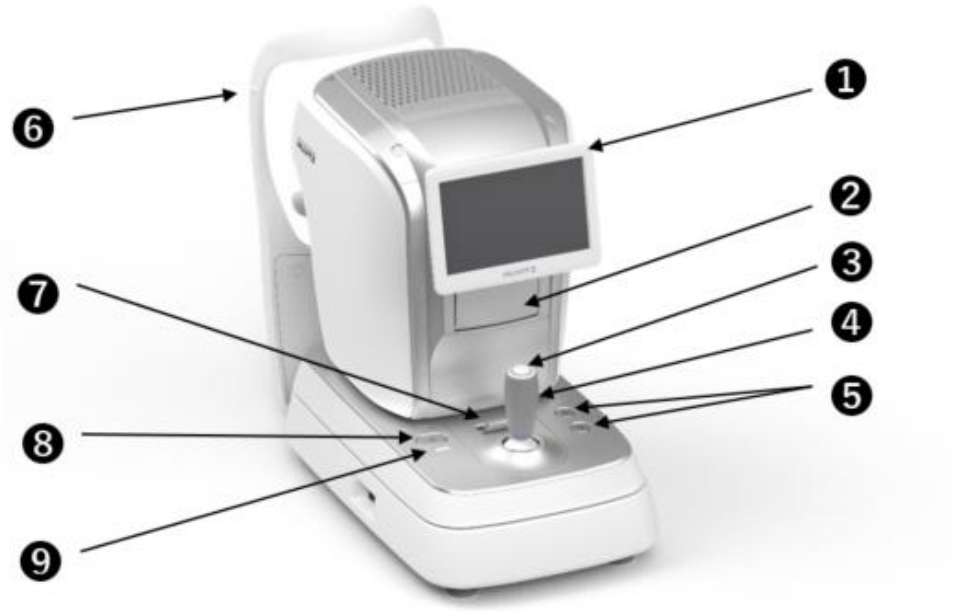
10. When using this equipment under normal state, then the proper location is as shown below.



5

5. Names and functions of each part

5.1. Main parts



[Figure 5-1. Front]

1. Display Monitor: Monitor for measurement

2. Printer: Printing the measured results

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

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

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

6. Eye height Mark: Indicates the position of the patient's eye

7. Stage Fixing Lever: Fixing the stage

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

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 window:** 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.

4.2. Explanation on bottons in screen



[Figure 5-4. Screen Bottons]

1. MEASURE **(MEASURE) Button:** Button that measures DATA
2. VD 12.0 **(VD) Button:** Button for converting VD to one of the following set up value (Default value: 12.0)
3. REF **(MODE) Button:** A switch to change the mode (REF, KER, K&R, KER-P, CLBC) for measurement.
4. **(MANUAL/AUTO) Button:** Button for selecting whether to use automatic tracking function (MT: manual /AT: automatic tracking)
5. **(MANUAL/AUTO) Button:** Button for selecting whether to carry out automatic measurement (MANUAL, AUTO-3, AUTO-5, AUTO-A)
6. **(MENU) Button:** A switch to change the Illumination, Zernike, Size, Virtual Comparison, Color View, Display mode
7. **(CYLINDER) Button:** Button that reverses cylinder value's sign (+ => -, - => +)
8. **(DATA CLEAR) Button:** Button that deletes measurement result
9. **(PRINT) Button:** Button that prints measurement result
10. **(SETUP) Button:** A switch to change the User setup mode

6

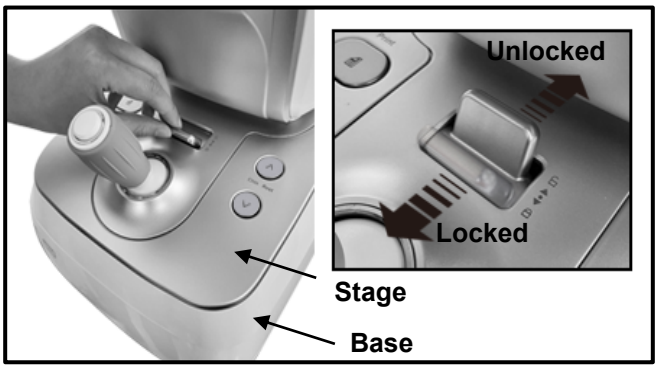
6.Installation of Equipment & Preparation of Measurement

1. Unlocking stage part's lock 1 (Clamping bolt)

Loosen up the 'Clamping bolt' that is at the backside of this device's lower part by turning it to the counter clock-wise direction, and convert the stage fixation lever that is at the joystick's backside into the UNLOCK direction.



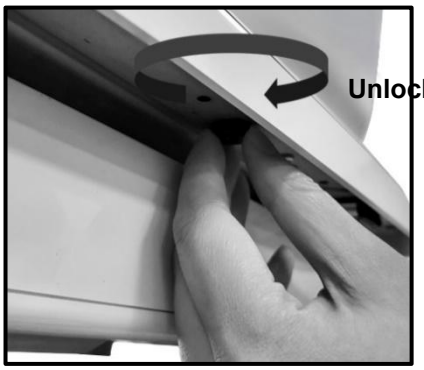
[Figure 6-1. Unlocking stage part's lock1] (Clamping bolt)



[Figure 6-2. Stage fixation lever]

2. **Unlocking stage part's lock 2 (Body locks)**

- As shown in the figure, the stage is forced to the right.
- Turn the body lock clockwise until it stops.
- Lock the body lock in the same way on the left.



[Figure 6-3. Unlocking stage part's lock2]

(Body locks)

3. Connection of Power Cable

- Place HRK-8100A on a table.
- Make sure the POWER switch of the instrument is OFF
- Put in the power cable into the power connector at the main body's lower part.
- Put in the power plug into the AC socket.



[Figure 6-4. Connection of Power Cable]

4. 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 6-5. Inserting Chin-rest Paper]

5. Installation of Printing Paper

Please refer to section 10.2 regarding the sequence of installation of printing paper.

6. 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. (refer to '9.7 User SETUP mode')

7. 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.

8. 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-8100A) 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.

⚠ 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.

- In case that smoke comes, or strange smell or sound is heard from the equipment.
- In case that liquid is poured to the machine, or metallic substance is inputted into the equipment.
- In case that the equipment is fallen down, or the exterior case of it is broken

7

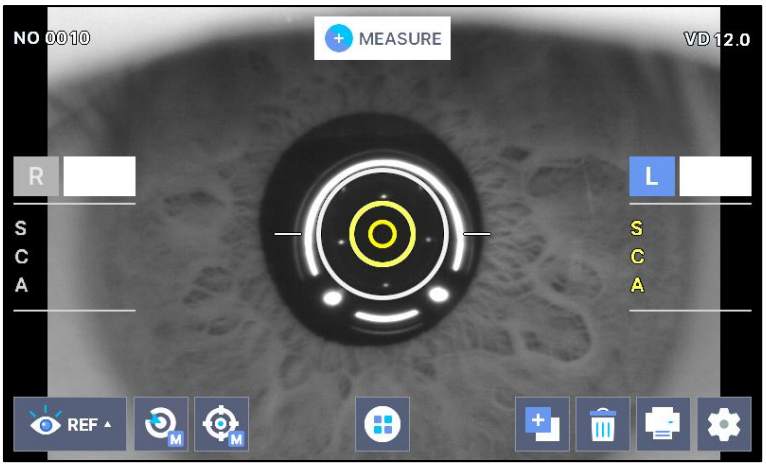
7. Measurement Method

1. Power On of Main Body

   - Turn on the power switch.
   - Measurement screen appears when system check is completed.

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.



[Figure 7-1. Measurement screen]

2. **Selecting the Measurement mode**

   This instrument has the measurement modes. (Initial value: REF).

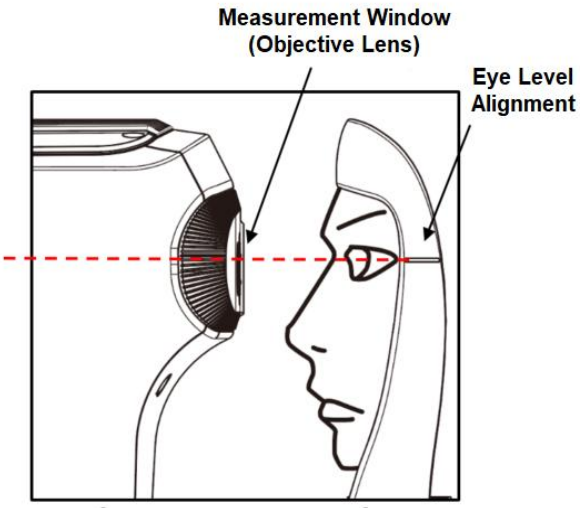
   - REF (REF single measurement)
   - KER (KER single measurement)
   - K&R (KER/REF continuous measurement)
   - KER-P (Measurement the cuvature of part around cornea)
   - CLBC (Measurement of Contact Lens Base Curve)



[Figure 7-2. Measurement mode]

3. **Height adjustment of patient**

- Have patient sit at the front part of the device.
- Adjust device's electric table or chair's height so that the patient can sit comfortably.
- Make sure place the patient's chin on the chin rest and check that his/her forehead is touching to the forehead rest.
- Adjust the chin rest height by chin rest up/down button until the eye height mark of the chin rest reaches the same height as the patient's eye
- confirm that the measuring window is at the height of the patient's visual line



[Figure 7-3. **Height adjustment of patient**]

CAUTION

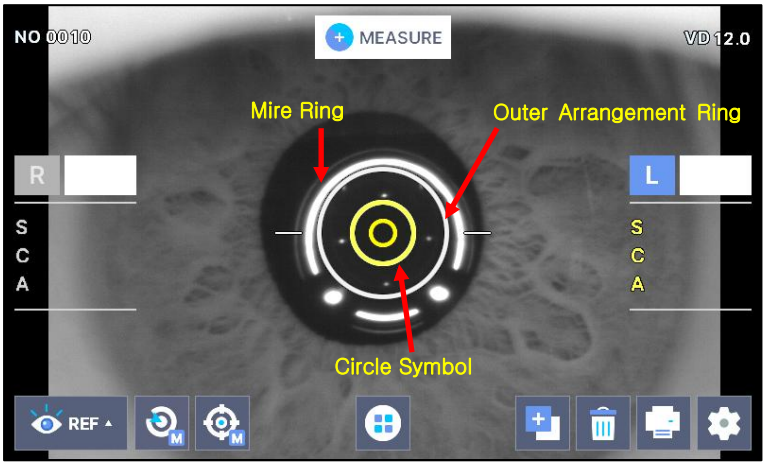
- Make sure that the examinee should not put his or her hands or fingers under chin-rest. The hands or fingers can get injured.
- For the prevention of infection, cleanse the forehead-rest with a solvent such as ethanol for every different patient.
- To keep it clean, change the chin rest paper for every different patient.

4. **Measurement location and focusing**

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.

- Use the operation lever to pull up the main body to the front of the user.
- Adjust to the left and right while pushing the operation lever to the front slowly so that patient's right eyes appear at the monitor screen's center. At this time, ensure that the shining Mire Ring and outer arrangement ring becomes concentric circle.
- Ask patient to watch the fixating target at the inside.
- Adjust the focus so that the Mire Ring's outline becomes clear. When the focus is adequate, Circle symbol appears at the inner side arrangement ring.



[Figure 7-4. **Measurement location and focusing**]

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

[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.

[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.



[Figure 7-5. **Operating the joystick for up/down adjustment**]



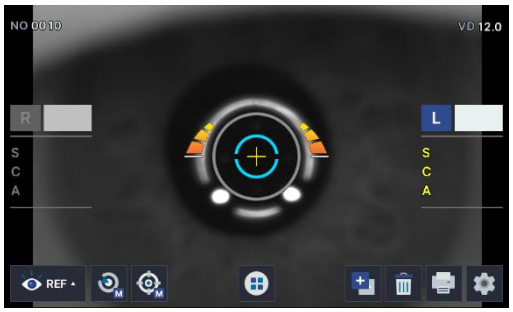
[Figure 7-6. **Operating the joystick for left/right & focus adjustment]**

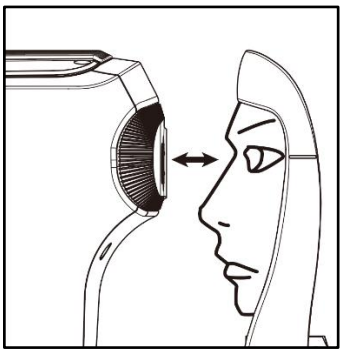
NOTE

- If trying to adjust by leaning the operation lever is not sufficient, adjust by pushing the stage to the front, back, left and right.
- When carrying out refractive power measurement continuously, then there may be margin of error when it comes to measurement in case of patient that finds intervention of accommodation force easy.
- Measurement margin of error may result when the Mire Ring and outer arrangement ring fails to maintain same axle during continuous measurement.

NOTE

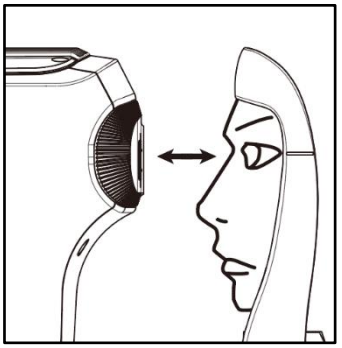
- Do not allow the eyelash and eyelid to cover the smallest measurable pupil diameter mark to ensure stable measurement.
- If the device is too near to the patient in comparison with the optimal alignment position, the alignment indicators are displayed the upper direction or if it is too far from the patient, the alignment indicators are displayed the lower direction



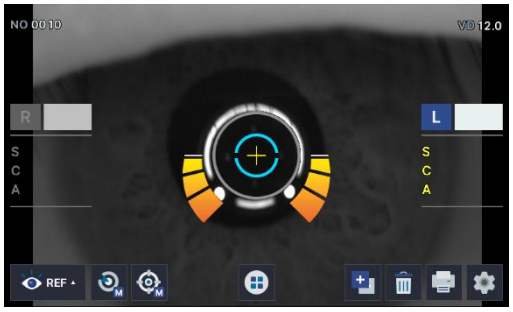


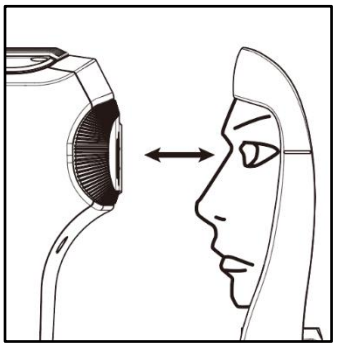
[Figure 7-7. **Too close**]





[Figure 7-8. **Location and Focus are correct**]





[Figure 7-9. **Too far**]

5. **Measurement**

① Manual Adjustment

- Adjust the focus and position of patient as like in the procedure of adjusting measurement position & focus explained in the previous page.
- Push the measurement switch.
- 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  button which is top of monitor to set AUTO mode .
- Adjust the position and focus of patient 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.

6. **Auto-tracking Function**

② Push the  button which is top of monitor to set Auto Tracking mode .

③ Perform rough alignment and focusing by manipulating the joystick to place in the working range of auto-tracking.

- 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.

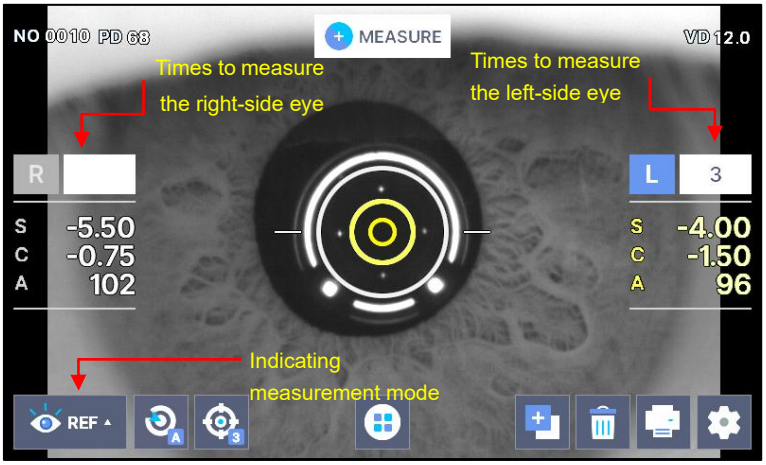
8

8. Measurement

8.1. Refractometry (REF Mode) Manual Measurement Mode

It is the mode to measure the refractive power solely.

- REF mode selection: Set in a way that the measurement mode indicator section on the screen turns into “REF” mode.



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

7.1.1. Manual Measurement Mode

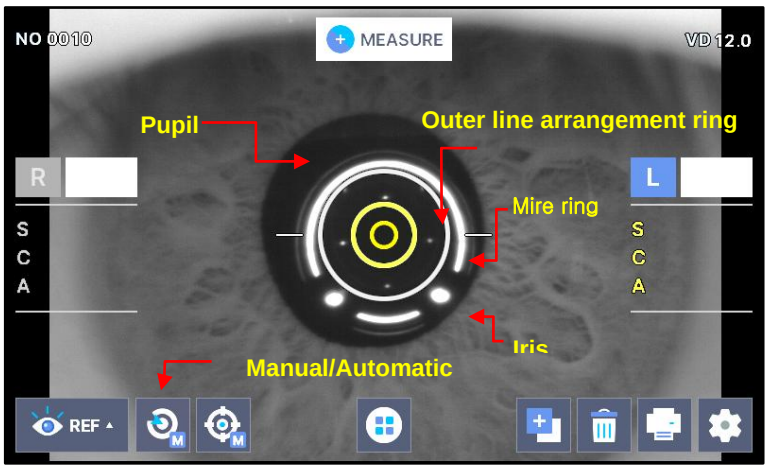
NOTE

The manual measurement mode has a minimum limit set to allow measurement even in unusual situations. Therefore, data errors may occur depending on the user's skill level. In general, automatic measurement mode is recommended

Mode gets converted to manual measurement mode when you press on the Auto button  while in the automatic measurement mode. It is possible to stop automatic measurement function when “Auto Measurement” category is selected as “OFF” while in the user Setup mode. (Refer to “9.7. User SETUP mode” part)

① Eye height adjustment.

② Measurement location and focusing



[Figure 8-1-2. REF manual measurement mode screen]

③ Measurement

- Press on the measurement button.
- Measurement is carried out continuously when measurement button is pressed on continually.
- Measurement result is indicated on the monitor when measurement is completed.
- Previous measurement result is indicated when carrying out continuous measurement.

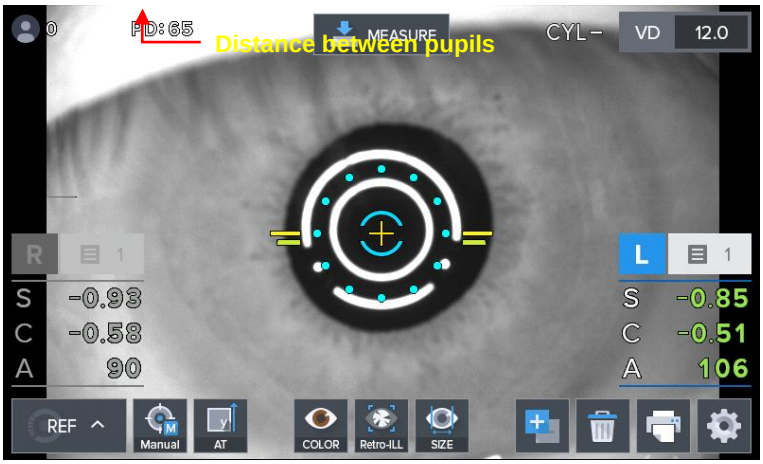
④ Repetitive measurement

- Measure repeatedly according to need.
- The latest measurement value is indicated every time measurement takes place.
- Up to 10 measurement frequencies (excluding measurement failure) are indicated for each of the eyes on the left and right.

It is possible to see up to the 10 latest measurement values on the DISPLAY mode's screen.

⑤ Measurement of the opposite eyes.

- Measures the left eyes while pushing the stage to the right side while holding the operation lever.
- PD value (distance between pupils, Pupillary Distance) gets indicated on the monitor when the left and right eyes are measured.



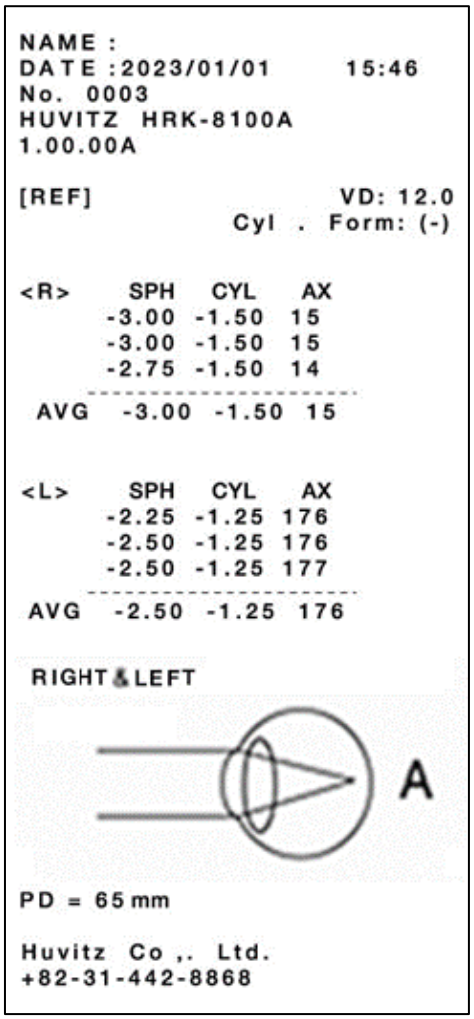
[Figure 8-1-3. REF Manual Mode Screen]

⑥ Printing

- Print measurement result by pressing on the print button.
- Contents selected from the user Setup mode get printed. (Refer to “9.5. User Setup mode” part)
- Cut out the printing page.
- Input patient’s name in the name space according to need.

NOTE

- Value measured until now is removed when printing is carried out.
- Printed text changes in a light manner since print is a thermal record. Copy when you want to keep measurement data for a long time.



[Figure 8-1-4. Example of Print]

7.1.2. Auto Measurement Mode

NOTE

The automatic measurement mode is composed of optimum measurement conditions and can be measured reliably. If the patient's eyes move and it is difficult to measure, press the measurement button on the joystick.

The mode gets converted to automatic measurement mode when MANUAL button is pressed on while in the manual measurement mode.
While in the automatic measurement mode, measurement is carried out automatically even when the measurement button is not pressed on when the state reaches a state in which arrangement in the device and measurement is realized effectively.

① (Eye height adjustment), (measurement location and focusing) process is carried out just like the manual measurement mode.

② Measurement
-Measurement is carried out automatically when the location arrangement and focusing are completed.
- Value for new measurement result appears on the monitor screen after measurement takes place up to the frequency (possible to select among three, five and continuous) designated on the user Setup mode.
-Up to 99 measurement frequencies are indicated and it is possible to check the measurement values up to the latest 10 times once again in the Display mode.



[Figure 8-1-5. Screen indicating Auto Measurement Mode]

③ Measurement of the other eye.
-Move the stage to the right side to measure the left eye using the same procedure.

-When the measurement of the two eyes is complete, PD value is indicated on the monitor screen automatically.

④ Printing

-Measurement result gets printed automatically when the measurement of the two eyes gets completed when the A-PRT category was selected as “ON” while in the user Setup mode.

-Print by pressing on the print  button when only one eye was measured or when the A-PRT category was selected as “OFF”.

-Gets printed along with the message input while in the user Setup mode with the measurement data.

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

In case of TRY AGAIN	Management
Poor position adjustment	Measure it after adjusting the exact position again.
As eyelid or eyelashes hide the pupil	Let the examinee open the eye wide, or measure it while pushing the upper eyelid of examinee upward.
As the pupil is smaller than Alignment Ring	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.
As the examinee has the disease such as cataract	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.
As Mire Image looks as if it changed to tears	Measure after letting the examinee blink several times.
As Mire Image is not apparent because the cornea is dry	
As Mire Image has been transformed irregularly owing to strong negative astigmatism or corneal ailment.	Impossible to measure
As it exceeds the possible range of measurement	

8.1.3. Message List

"MOVE RIGHT"	Move stage to right.
"MOVE LEFT"	Move stage to left.
"MOVE FORWARD"	Pull the stage to move it forward.
"MOVE BACKWARD"	Push the stage to move it backward.
"CHINREST DOWN"	Move chinrest down.
"CHINREST UP"	Move chinrest up.
"DATA TRANSMITTING"	Measurement data of HRK is being transmitted to external.
"DATA PRINTING"	Measurement data of HRK is being printed.
“ALIGN CENTER”	After outputting the measurement data, the measurement head position is initialized.
"TRY AGAIN"	- Center or eye cannot be found. - The patient’s eye blinks or moves during measurement. - There is too big difference from the previous measurement value. - If this message appears while measuring model eye, the instrument may have a problems. Contact your service engineer.

7.2. 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.

- KER mode selection: Set in a way that the measurement mode indicator section on the screen turns into “KER” mode.

7.2.1. Manual Measurement Mode

NOTE

The manual measurement mode has a minimum limit set to allow measurement even in unusual situations. Therefore, data errors may occur depending on the user's skill level. In general, automatic measurement mode is recommended.

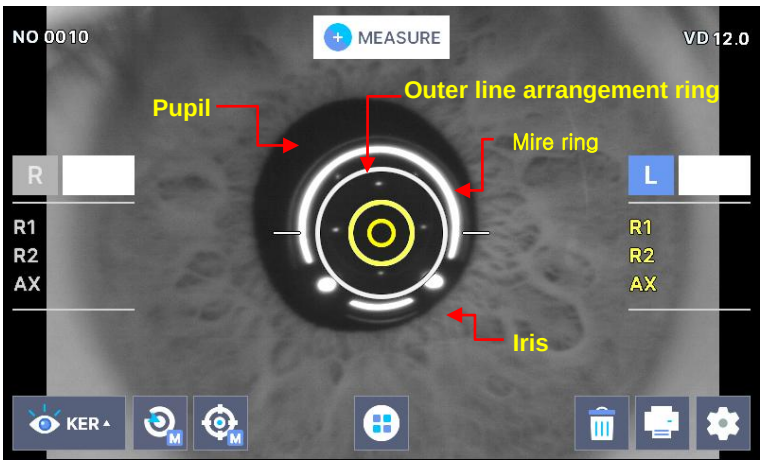
① Carry out the (eye height adjustment), (measurement location and focusing) process using the same method as that of the 8.1.1 refractive power measurement mode.

② Measurement

- Press on the measurement button.

- Measurement is carried out continuously when measurement button is pressed on continually.

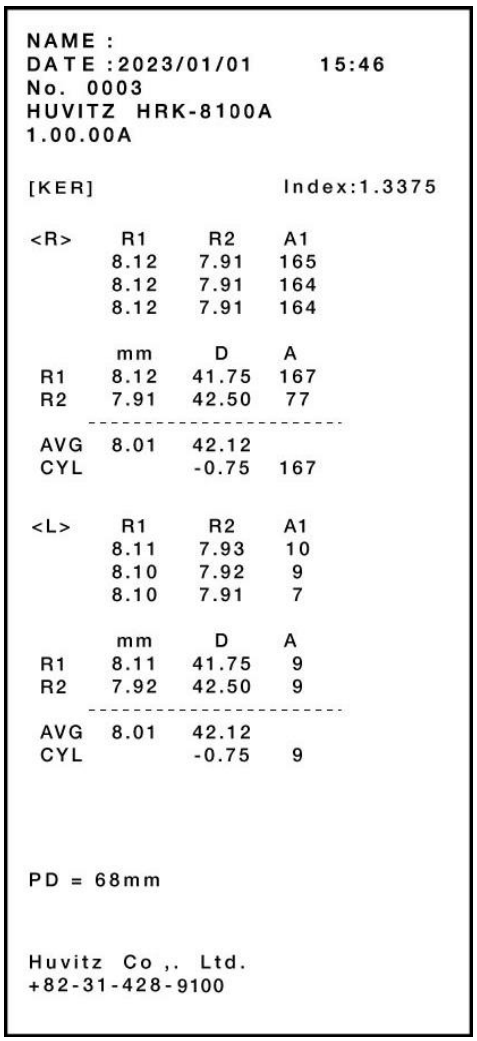
- Measurement result is indicated on the monitor when measurement is completed. The most recent measurement result is indicated when continuous measurement is taking place.



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

③ Carry out the process using the same process as that of the (repetitive measurement), (measurement of the opposite eyes) in the 8.1.1 refractive power measurement mode.

④ Print the measurement result using the process that is like the (printing) process while at the 8.1.2 refractive power measurement mode.



```
NAME :
DATE :2023/01/01      15:46
No. 0003
HUVITZ HRK-8100A
1.00.00A

[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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+82-31-428-9100
```

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

7.2.2. Auto Measurement Mode

NOTE

The automatic measurement mode is composed of optimum measurement conditions and can be measured reliably. If the patient's eyes move and it is difficult to measure, press the measurement button on the joystick.

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 8.1.2

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 8.1.2

7.2.3. Message List

- Please refer to Message List in section 8.1.3

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

This is the mode for carrying out the corneal curvature measurement and refractive power measurement continuously.

- K&R mode selection: Set so that the measurement mode indicator section on the screen becomes "K&R" mode.

7.3.1. Manual Measurement Mode

NOTE

The manual measurement mode has a minimum limit set to allow measurement even in unusual situations. Therefore, data errors may occur depending on the user's skill level. In general, automatic measurement mode is recommended

① (Eye height adjustment), (measurement location and focusing) process is carried out just like the 8.1.1 refractive power measurement mode.

② Measurement

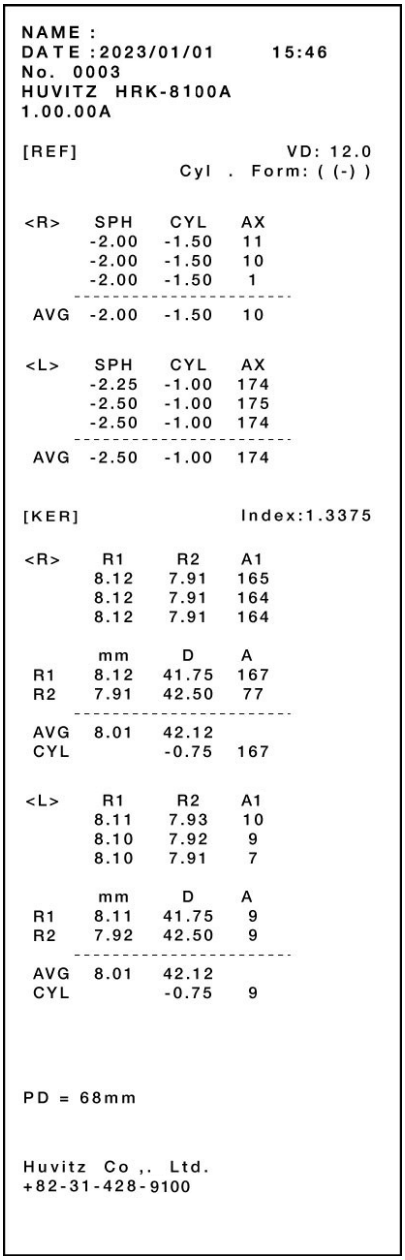
- Press on the measurement button.
- Measurement is carried out continuously when measurement button is pressed on continually.
- Measurement result is indicated on the monitor when measurement is completed.
- The most recent measurement result is indicated when continuous measurement is taking place.



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

③ Operation process that is the same as that of the (repetitive measurement), (measurement of the opposite eyes) was executed in the 8.1.1 refractive power measurement mode.

④ Prints measurement result through the process that is the same as that of the (printing) in the 8.1.1 refractive power measurement mode.



```
NAME :
DATE :2023/01/01      15:46
No. 0003
HUVITZ HRK-8100A
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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+82-31-428-9100
```

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

⑤ election 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.

7.3.2. Auto Measurement Mode

NOTE

The automatic measurement mode is composed of optimum measurement conditions and can be measured reliably. If the patient's eyes move and it is difficult to measure, press the measurement button on the joystick.

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.

④ Adjust the array and focus as like in procedure 2 of section 8.1.2

⑤ The measurement is to be performed automatically as like in procedure 2 of section 8.1.2

⑥ Print the measured result as like in procedure 6 of section 8.1.2

7.4. 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.

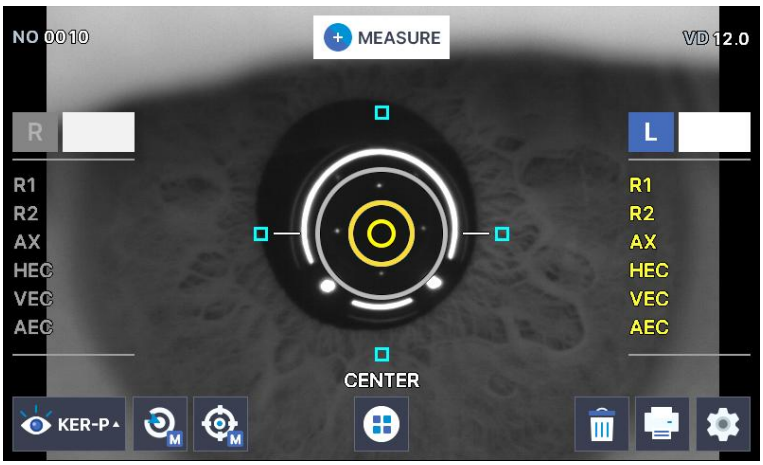
NOTE

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

2. 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

3. 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.

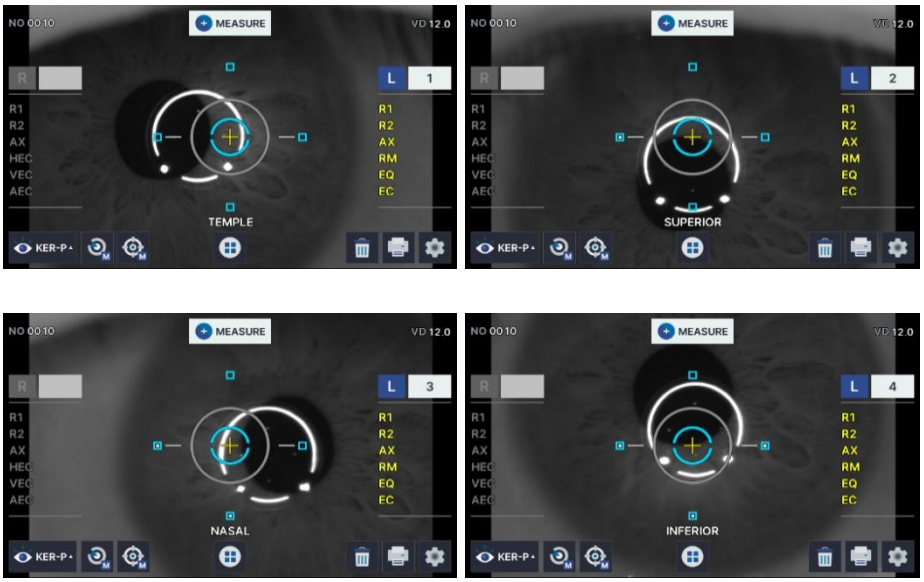
Direction of part around cornea

- 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

4. 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]

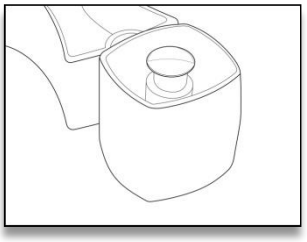
In case of part around cornea (SUP, INF, TEM, NAS),

- 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

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

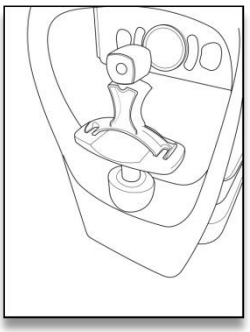
It is the mode to measure base curve of contact lens (concave surface).

1. Set CLBC mode, You can see CLBC mode on the upper left side of the screen.
2. 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]

3. 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.
4. 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.

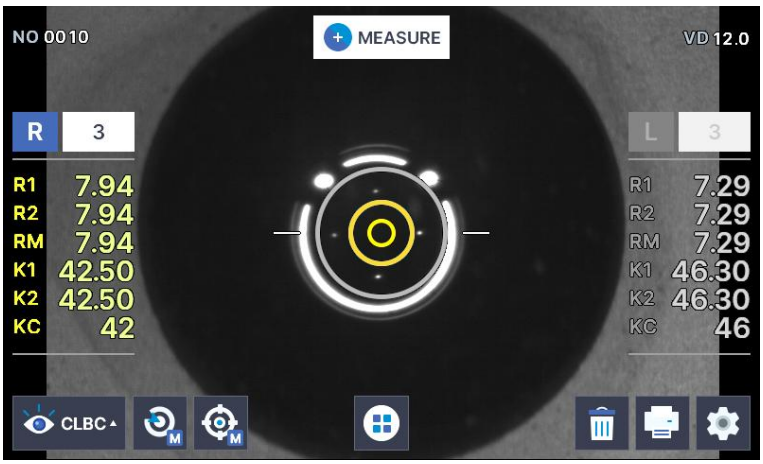


[Figure 8-5-2. Adhesion of Model Eye]

5. 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

6. Print

- Press Print button.

9

9. Other Modes

9.1 ILLUMINATION Measurement Mode (ILLUM Mode)

Retro-Illumination mode is the mode that can observe eye lens by using Retro-illumination method. It is possible to observe eye lens' state by observing the shape of the light that is reflected from the retina while changing the brightness of the light that is radiated onto the eyes through illumination.

It is possible to observe the human beings' eye lens with severe cataract symptom or that is being affected by the symptom or to measure the refractive power. Moreover, it is possible to test the eye lens' turbidity. When the eye lens are not very turbid, then it is possible to measure the eyes' refractive power at the same time while observing the shape that is reflected from the retina at the same time. Moreover, if there is a scratch on the cornea, it is possible to observe the light penetration and uniformity of the artificial eye lens after observing the scratch or after administering artificial eye lens (IOL) surgery.

9.1.1 Adjustment of Array and Focus

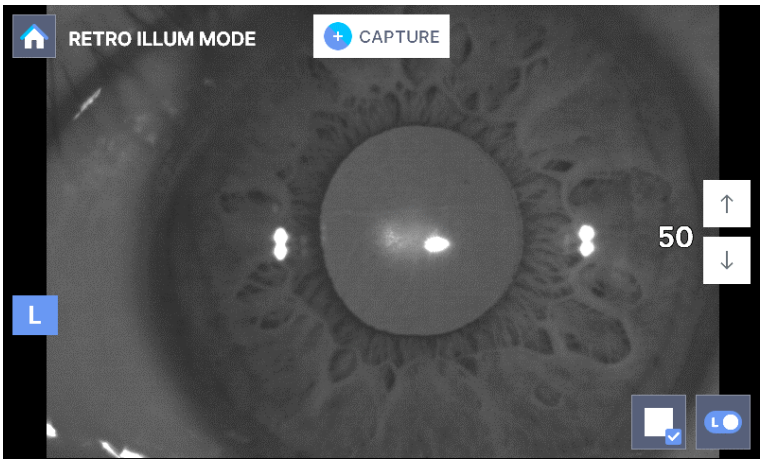
① (Eye height adjustment), (measurement location and focusing) process is carried out using the method that is the same as that of the 8.1.1 refractive power measurement mode.

② The mode turns into the Retro-Illumination mode when the Retro-Illumination button is pressed on after pressing on the MENU  button.

■ [Observe]

- When the Retro-Illumination mode is selected, [Observe] window is to appear on the screen together with Illumination image spread out reflected from retina.

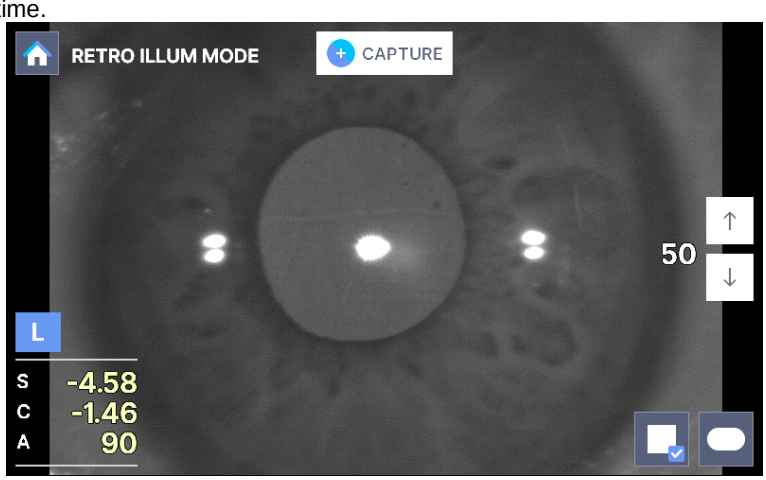
- Diagnose the crystalline lens, opacity degree of cornea, and the degree of corneal scratches by observing the state of this Illumination image.



[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>

CAPTURE : 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 Retro-Illumination mode, and to return to the ordinary measurement mode.

9.1.3. Observation on Retro-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 (**Operation Lever)**. 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.

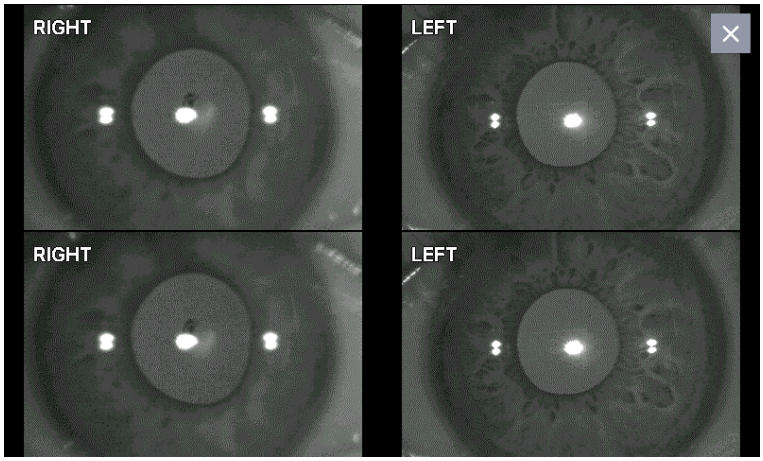
9.1.4 Storage

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.

9.1.5 Examination on the other eye

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

9.1.6 Call for Stored Image



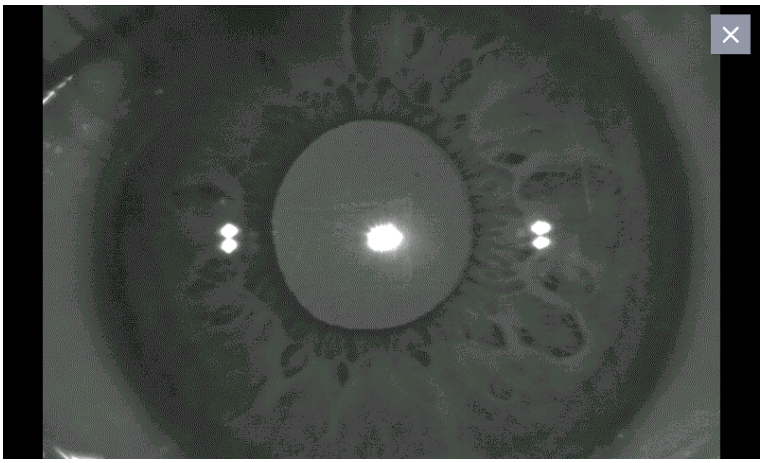
[Figure 9-1-3. Window indicating Stored Image]

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)]

9.1.7. Return to measurement mode

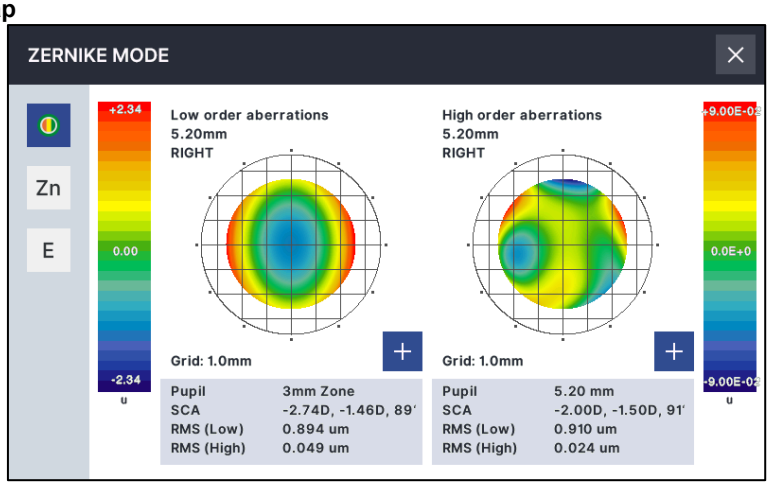
As pushing  button in [Observe] or [Measure] window, you can return to [REF], [KER], [K&R], [KER-P] or [CLBC] measurement mode.

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 button to ZMODE button.

9.2.1. Composition of Window

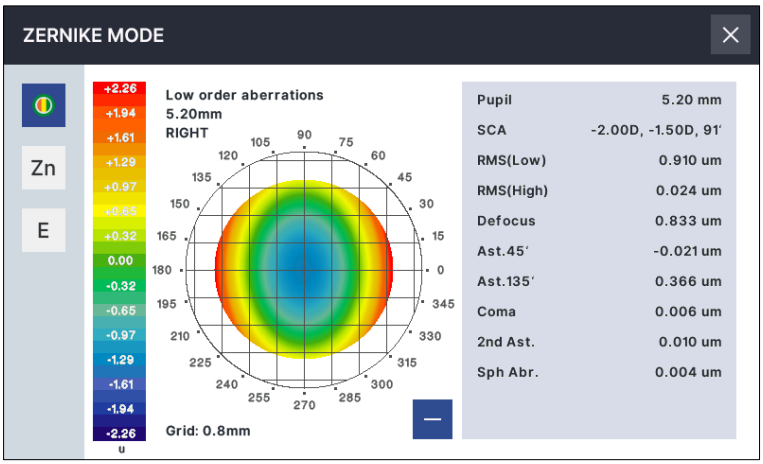
1. : Map



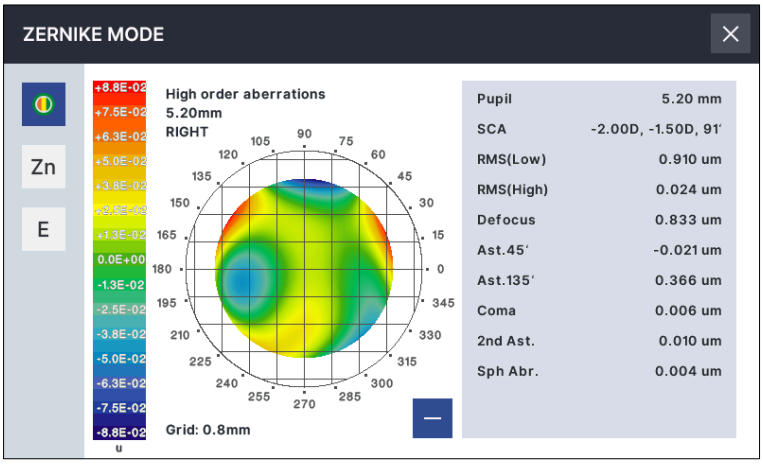
[Figure 9-2-1. Zernike mode Window (Map)]

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.

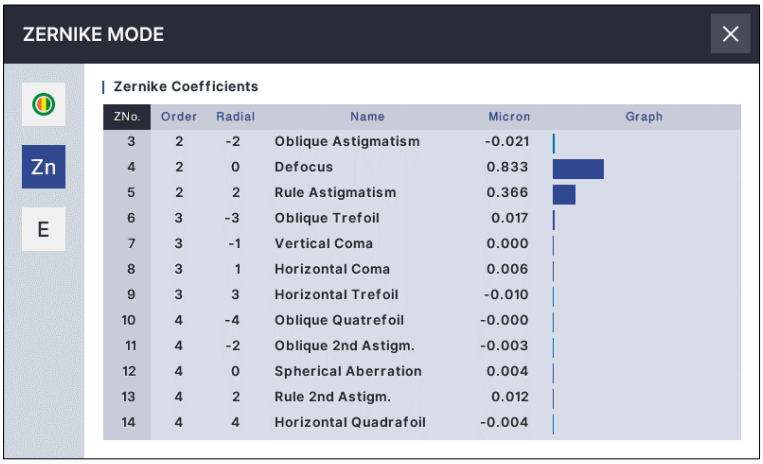
By using the color table defined in Map Level, the map in the center of window is to be drawn according to the areal wavefron aberration(refractive power) within pupil area. Emmetropes is as in green, hypermetropia is as in blue, and myopia is indicated as in red: the severer the abnormality of eye is, 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

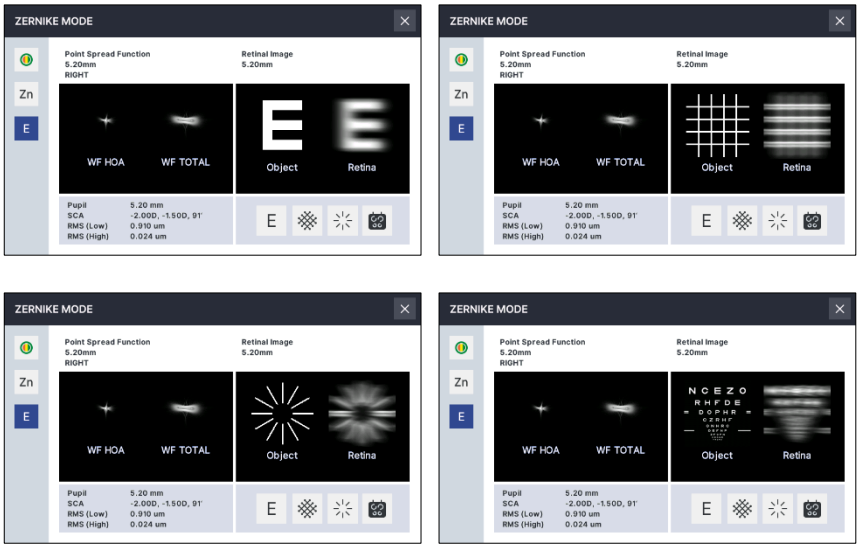


ZNo.	Order	Radial	Name	Micron	Graph
3	2	-2	Oblique Astigmatism	-0.021	
4	2	0	Defocus	0.833	
5	2	2	Rule Astigmatism	0.366	
6	3	-3	Oblique Trefoil	0.017	
7	3	-1	Vertical Coma	0.000	
8	3	1	Horizontal Coma	0.006	
9	3	3	Horizontal Trefoil	-0.010	
10	4	-4	Oblique Quatrefoil	-0.000	
11	4	-2	Oblique 2nd Astigm.	-0.003	
12	4	0	Spherical Aberration	0.004	
13	4	2	Rule 2nd Astigm.	0.012	
14	4	4	Horizontal Quadrafoil	-0.004	

[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. E : **PSF image**



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

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

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

9.2.2. Change of Window

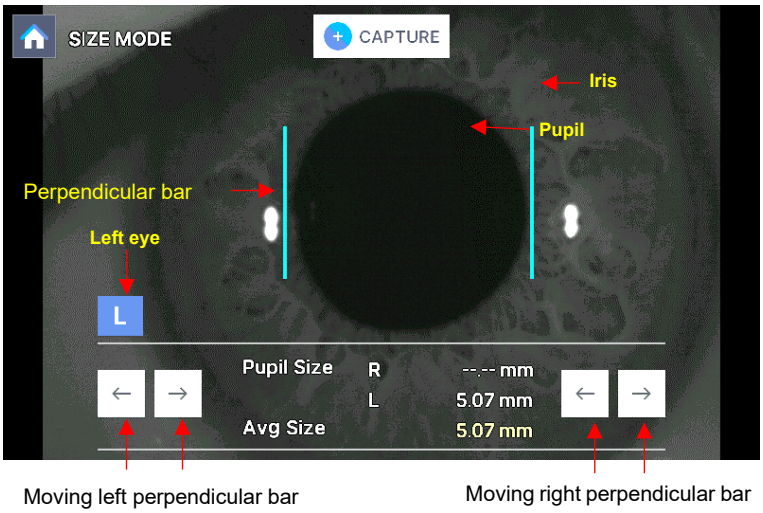
As changing the measurement position of examinee to left or right side by moving the joystick, the map is to changed again as a result obtained in the measured direction.
As the map is drawn for the first time, the guide message is to be indicated as “Calculating…” for some time of standby for calculation.

9.3. SIZE Mode (pupil diameter Measurement)

It is the mode to measure the pupil's diameter.

1. Press on the MENU button in the main measurement mode. Then, SIZE mode gets selected when the SIZE button is pressed on.

2. Adjust location and focus the image of the eye to be measured clearly.



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

3. Measurement location and focusing

- Ask patient to watch fixating target at the inside.
- Move the operation lever to adjust the location so that the pupil is in between two vertical bars.
- Focus is adjusted so that the cornea's corners are clearly visible.

NOTE

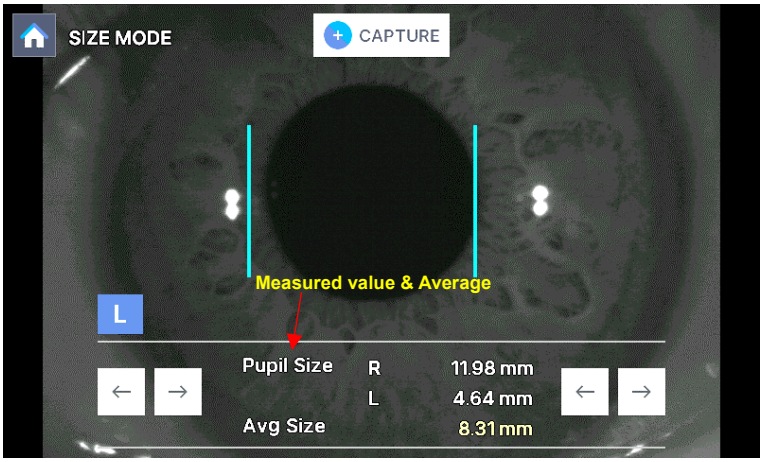
As adjusting the focus on the iris, it is impossible to measure the radius of pupil exactly.

4. 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.

5. Measurement repetition
   - It is possible to measure up to two measurement values when the measurement is repeated. Repeat the operation of 2 ~ 5 when measuring again.



[Figure 9-3-2. Window indicating repletion of Size Mode Measurement**]**

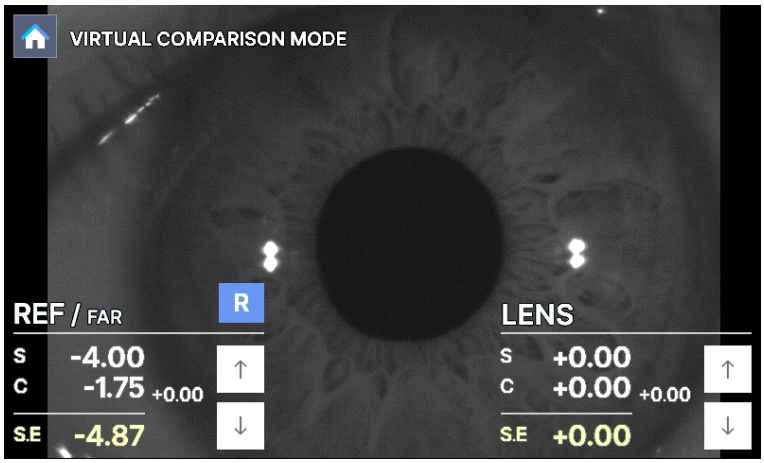
6. Measurement of the eye on the opposite side
   - Measure the eye on the opposite side using the same method after moving the stage to the opposite side.

7. Measurement result output
   - Measurement result is output as the “[PUPIL]” category by 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. Measure the patient's eye in REF mode.
2. Press the MENU botton in measurement mode and then press the vitural Comparison mode button to enter Virtural Comparion mode.
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.



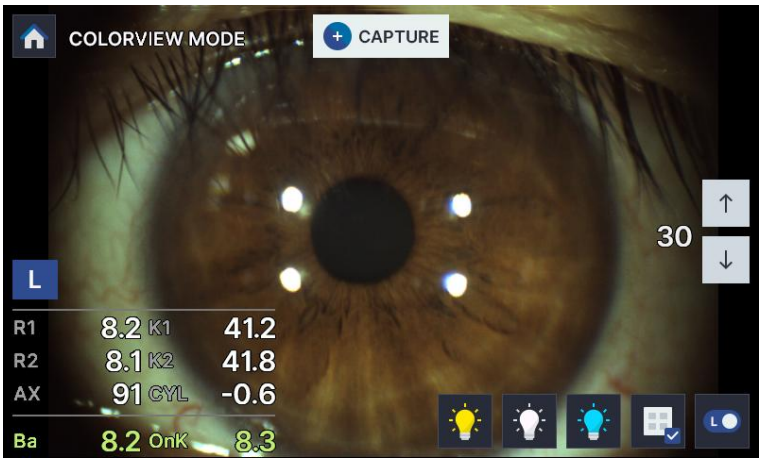
[Figure 9-4-1. Display of VIRTUAL COMPARISON Mode]

The item of Data information which are indicated in screen.

- REF/FAR or NEAR(40 mm) : HRK-8100A 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 button information which are indicated in screen.

 : 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

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

9.5.1. White LED

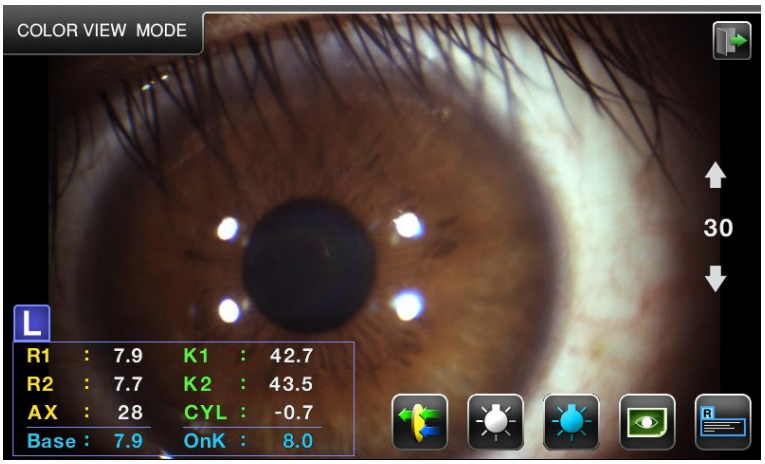
It is the function to observe of the patient eye by using White LED lighting in the color image.

① After when pressing  buttons in measure mode, presses Color view mode 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's 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)]

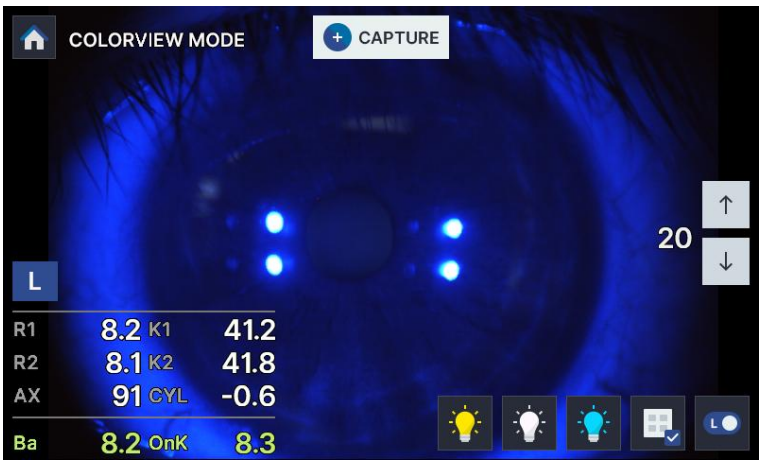
9.5.2. Blue LED

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.



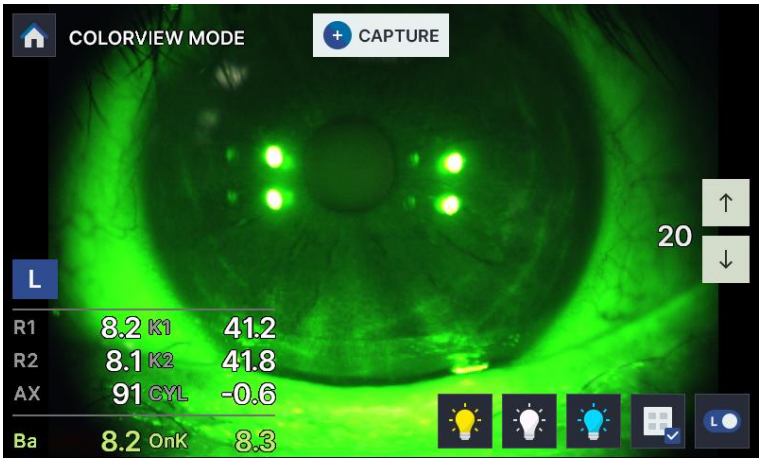
[Figure 9-5-3. Color View mode screen (Blue LED)]

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

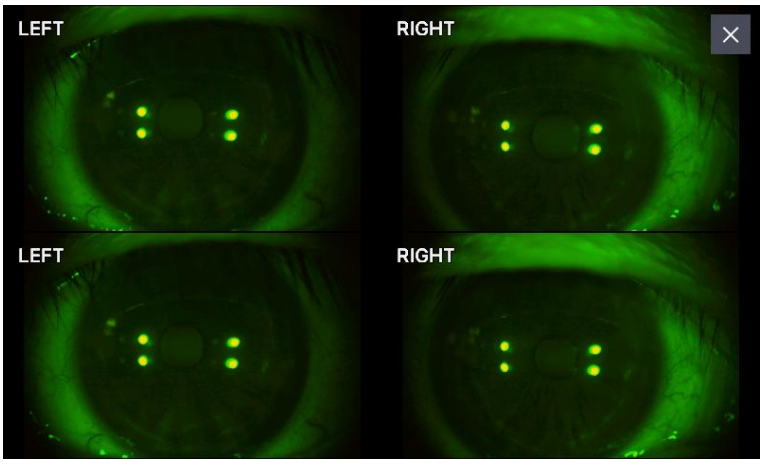
The Yellow Filter function is the function which uses S/W.

9.5.4. Capture Screen

① After when pressing  buttons in measure mode, presses Color view mode buttons then COLOR VIEW Mode screen appear.

② Press measurement button (operation lever) to capture the image of examinee.

③  button is pressed, capture image is displayed on the screen. (Max LEFT 2, RIGHT 2)

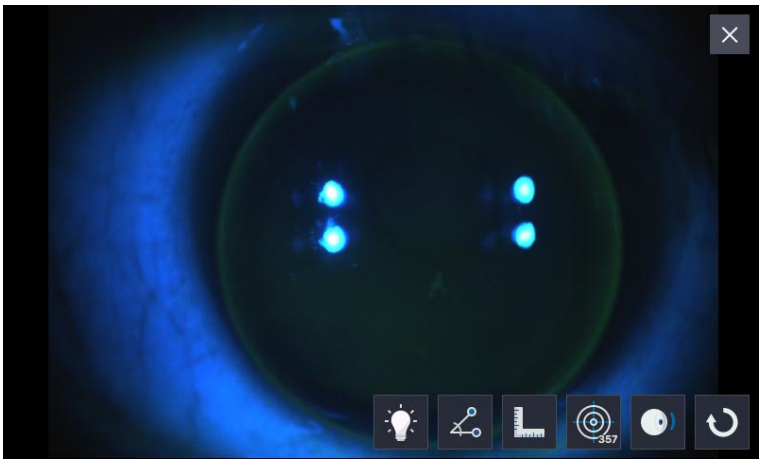


[Figure 9-5-5. Color View mode - capture screen]

9.5.5. Selected Capture Screen

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

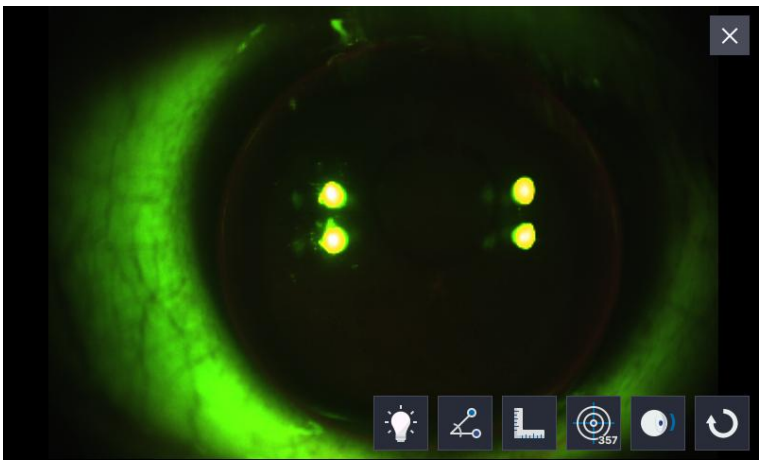
② Selected image is displayed on the screen.



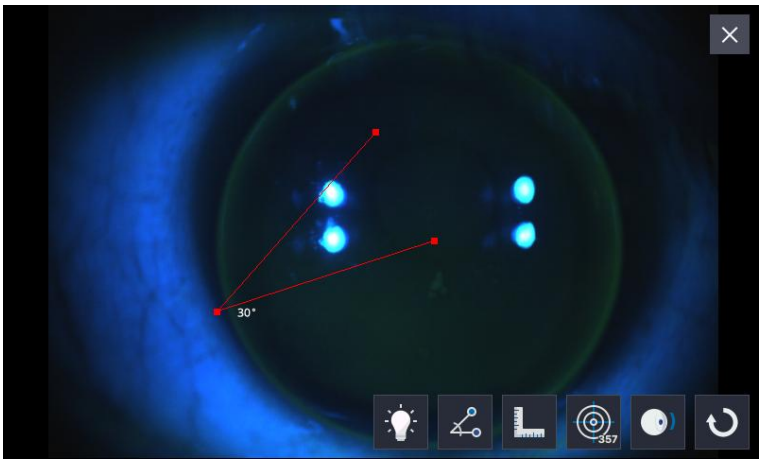
[Figure 9-5-6. Color View mode – selected capture image]

< User Menu >

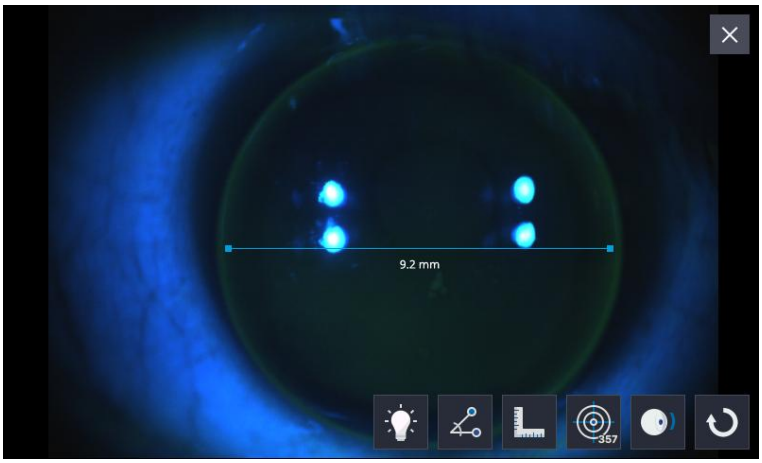
-  : Emphasizing the green contrast of the measurement image.
(Check more easily with contrast emphasis of the measurement image.)



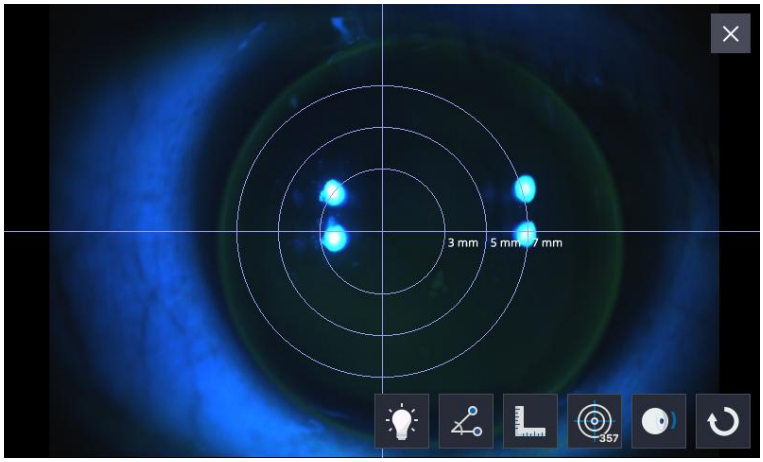
-  : Angle measurement.
(The angle of three points on the touch screen is measured)



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

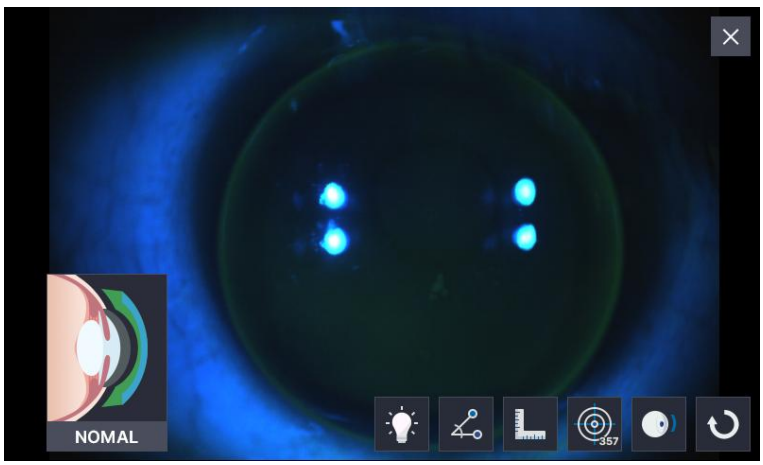


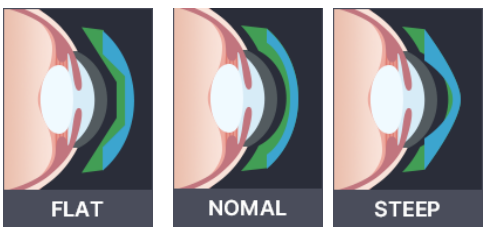
-  : Guide Line(3 mm, 5 mm, 7 mm) display.



-  : fitting state display.

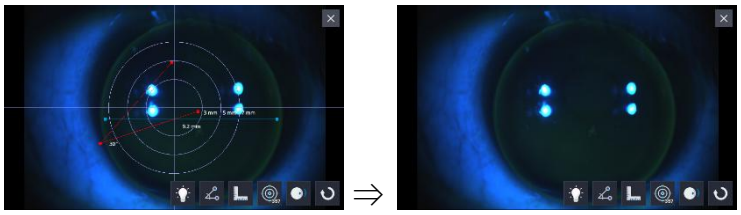
(The curvatures of the cormea and the contact lens displayed in screen. Automatically which are flat or normal or steep)





[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

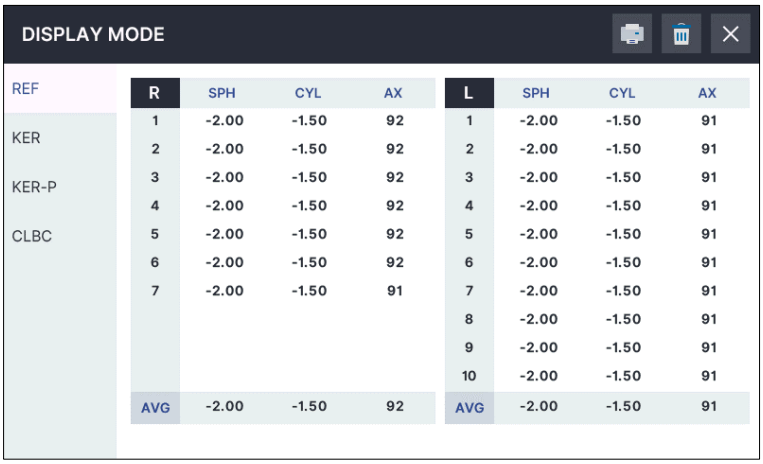
It is possible to see the measurement results that are saved in the memory (up to 10 for the left and right eyes).

The mode changes into the DISPLAY mode when the measured value indicated on the screen's left and right sides is touched after measuring refractive power.

It returns to the measurement mode as pushing  button.

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.



R	SPH	CYL	AX
1	-2.00	-1.50	92
2	-2.00	-1.50	92
3	-2.00	-1.50	92
4	-2.00	-1.50	92
5	-2.00	-1.50	92
6	-2.00	-1.50	92
7	-2.00	-1.50	91
AVG	-2.00	-1.50	92

L	SPH	CYL	AX
1	-2.00	-1.50	91
2	-2.00	-1.50	91
3	-2.00	-1.50	91
4	-2.00	-1.50	91
5	-2.00	-1.50	91
6	-2.00	-1.50	91
7	-2.00	-1.50	91
8	-2.00	-1.50	91
9	-2.00	-1.50	91
10	-2.00	-1.50	91
AVG	-2.00	-1.50	91

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

. Categories of the buttons that are indicated on the screen are as follows.

REF : This is the screen that shows Refractometry measurement result.

KER : This is the screen that shows Keratometry measurement result.

KER-P : This is the screen that shows Refractometry measurement result.

CLBC : This is the screen that shows Keratometry measurement result.

 : Button for deleting saved DATA and that returns to the measurement mode.

 : Button for printing saved DATA.

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.

9.7.1. List of setup items & Initial

Setup items are categorized in to 8 large indexes

- REF
- KER
- AUTO START
- COMMUNICATION
- PRINT
- DISPLAY
- ETC

9.7.2. Initial setting

Items	Descriptions	Options	Initial value
REF	VD	0.0 / 12.0 / 13.75 / 15.0	12.0
	CYLINDER	- / + / Mix	-
	STEP	0.01 / 0.125 / 0.25	0.25
	FOGGING	1Time / Always	1Time
	D-SFT	Input value	0.00
KER	mm/D	mm / D / Avg	mm
	STEP	0.05 / 0.12 / 0.25	0.05
	INDEX	1.332 / 1.336 / 1.3375	1.3375
AUTO START	AUTO MEASUREMENT	Off / On(3) / On(5) / On(A)	On(3)
	AUTO TRACKING	Off / On	On
COMMUNICATION	BPS	9600 / 57600 / 115200	115200
	RS232	Off / V1 / V2/ EXT	V2
	MODE	Std / Avg / Misc	Std

PRINT	A-PRT	Off / On	Off
	R-PRT	Off / Std / Avg	Std
	K-PRT	Off / Std / Avg/mm+D	Std
	QR-PRT	Off / On	Off
	EYE IMAGE	Off / On	Off
	R-CYL	Off / On	Off
	LM-PRT	Off / On	Off
	DATE/TIME DISPLAY	YMD / MDY / DMY	YMD
	DATE	Input date	Korea date
	TIME	Input time	Korea time
	PRINT MESSAGE1	Input text	Huvitz
	PRINT MESSAGE2	Input text	Huvitz
DISPLAY	EXT. OUTPUT	Off / On	On
	EXT. OUTPUT RATIO	4:3 / 16:9 / 5:4 / 16:10	4:3
	EXT. LED (RETRO-ILL)	Off / On	On
	LANGUAGE	English / German / Chinese	English
	VC-NEAR	30 / 40 / 50 / 60	40
	VC-ADD	Input value	0.00
	PATIENT NUMBER	Off / On	On
	NO.	Input value	1
ETC	BEEP	Off / On	On
	INITIAL MODE	REF / KER / K&R	REF
	SLEEP MODE	Off / 3min / 5min / 10min	3min
	MEASURE/CAPTURE BUTTON	Off / On	On

9.7.3. Detailed description of setting

[Method for changing contents]

- It is possible to select the desired tab to indicate the set value on the screen, and to change the setting by touching on the category to be modified.

[Method for changing page]

-  : Moves to the previous page.
-  : Moves to the next page.

[Method for entering into the measurement mode]

- Press on the  button to save the contents automatically, and the mode returns to the main measurement mode.



[Figure 9-7-1. Setup Mode Information]

[Contents of the category]

1. REF (Refractometry measurement)

- **VD (0.0/12.0/13.75/15.0)**
  : Distance between corneal apex and corrective lens

- **CYLINDER (-/+/Mix)**
  : Astigmatism marking form

- **STEP (0.01/0.12/0.25)**
  : Unit for indicating spherical prescription and astigmatism prescription

- **FOGGING (1Time/Always)**
  : Select whether to carry out the mist execution frequency once or every time when carrying out continuous measurement

- **D-SHIFT (0.00) (Refer to 'Figure 9-7-2')**
  : Set up the applicable value to correct the diopter measurement value
  (Scope: -5.00 ~ +5.00)

2. KER (Keratometry measurement)

- **mm/D (mm/D/AVG)**
  : cornea measurement의 marking form

mm	R1	major axis radius
	R2	minor axis radius
	AX	major axis's angle
D	K1	minimum cornea refractive power
	K2	maximum cornea refractive power
	AX	minimum cornea refractive power's angle
AVG	AR	average curvature radius
	CY	cornea astigmatism prescription
	AX	cornea astigmatism's angle

- **STEP (0.05/0.12/0.25)**
  : Unit for indicating cornea refractive power and cornea astigmatism prescription

- **INDEX (1.332/1.336/1.3375)**
  : Selection of cornea equivalence's refractive power

3. AUTO START (automatic function)

- **AUTO MEASUREMENT(Off/On (3)/On (5)/On (A))**
  : Select whether to use the automatic measurement function when the arrangement and focus are Correct.

ON (3) Measure three times in a row

ON (5) Measure five times in a row

ON (A) Continue to measure

OFF automatic measurement function is not used

- **AUTO TRACKING (Off/On)**

  : Select whether to use automatic tracking function or not

4. COMMUNICATION (setting up the communication with other device)

- **BPS (9600/57600/115200)**

  : Select data transmission speed with other device (9600, 57600, 115200bps)

- **RS232 (Off/V1/V2/Ext)**

  : Setting up the transmission method (other equipment method and Version)

- **MODE (Std/Avg/Misc)**

  : Data format setting for transmission method.

5. PRINT (printing setting)

- **A-PRT (Off/On)**: When measurement takes place in automatic measurement mode, measurement result is printed automatically when the measurement is completed in sequence for the left and right eyes.

- **R-PRT (Off/Std/Avg):** Built-in printer output form for the Refractometry measurement result

  Off: Did not get output.

  Std: Outputs only the most recent 10 measurement results and average values.

  Avg: Outputs only the average value.

- **K-PRT (Off/Std/Avg):** Built-in printer output form for Keratometry measurement result.

  Off: Did not get output

  Std: Outputs only the most recent 10 measurement results and average values.

  Avg: Outputs only the average value.

- **QR-PRT (Off/On): O**utput measurement data in QR CODE format..

  Off: Did not get output

  On: Output QR CODE

- **EYE IMAGE (Off/On):** Selects output of the eyeball and curve figures following REF measurement result

  Off: Did not get output

  On: Selects output of the eyeball and curve figures following Refractometry measurement result

- **R. CYL (Off/On):** Selects remaining astigmatism output.

- **LM-PRT (Off/On):** Sets whether to print the data imported from the connected lensmeter (HUVITZ HLM-1) using the built-in printer of the device. When “On” is selected, the data is printed from the device printer by pressing the print button of the lensmeter.

- **DISPLAY (YMD/MDY/DMY):** year/month/day marking form setting
  YMD: year/month/day
  MDY: month/day/year
  DMY: day/month/year

- **DATE (Refer to ‘Figure 9-7-2’)**
  Modification of the setting for date (year/month/day)
  (Scope: Y = 00 ~ 99, M = 01 ~ 12, D = 01 ~ 31 (1 ~ 28 when the M is February))

- **TIME (Refer to ‘Figure 9-7-2’)**
  Modify setting for time (hour/minute/second)
  (Scope: H = 00 ~ 23, M = 00 ~ 59, S = 00 ~ 59)

- **PRINT MESSAGE 1 (Refer to ‘Figure 9-7-3’)**
  Inputs message to be output along with measurement data at the time of printing.

- **PRINT MESSAGE 2 (Refer to ‘Figure 9-7-3’)**
  Inputs message to be output along with measurement data at the time of printing. **(**



[Figure 9-7-2. Other (number) input]

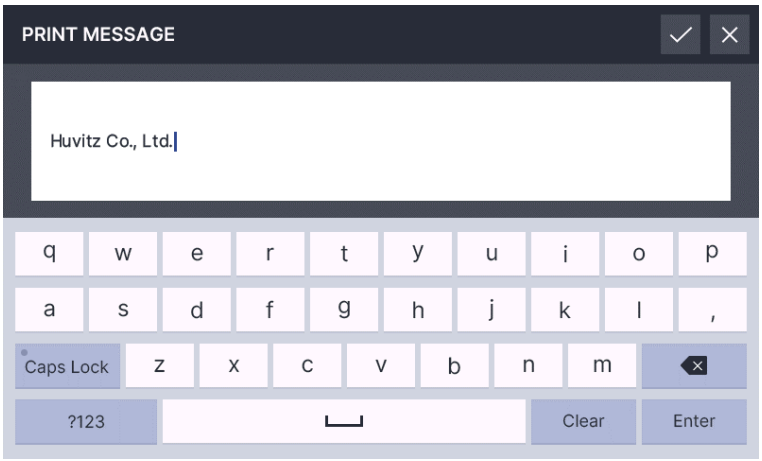
[Number input]

- When inputting D-SFT or VC-ADD, +/– buttons and . buttons can be used.
- When inputting D-SFT or VC-ADD, +/– buttons and . buttons cannot be used.
- Range: Minimum ~ maximum scope that can be input
  (Does not get saved when the scope is deviated from, and the warning message, “Out of Range!” appears.)

: Deletes the last number.

C : Deletes all the numbers

: Saves number and exists number input mode



[Figure 9-7-3. Other (text) input]

[Text input]



: Converts capital letter/small letter input mode.



: Deletes all the input texts.


: (Back Space) deletes only one letter in front of the cursor.



: Converts the space in between the first and second lines.


: Saves input text.

6. DISPLAY

- EXT. OUTPUT (Off/On)

: Select whether to use external display output

- EXT. OUTPUT RATIO (4:3 / 16:9 / 5:4 / 16:10)

: Select resolution of external display output

- EXT. LED (RETRO-ILL) (Off/On)

: Select whether to use external LED

- LANGUAGE (English/German/Chinese)

: Selects the language that is indicated on the screen and printer output door.

- VC-NEAR (30 / 40 / 50 / 60)

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

- VC-ADD (Refer to 'Figure 9-7-2')

: The addition power can be set. (Range: -5.00 ~ +5.00)

- PATIENT NUMBER (Off/On)

: select whether to use the serial number or not

- NO. (PATIENT NUMBER) (Refer to 'Figure 9-7-2')

: Serial number selection (Scope: 0 ~ 9999)

7. ETC (other setting)

- BEEP (Off/On)

: select whether to use the **beef sound** or not.

- INITIAL MODE (REF/KER/K&R)

: select of initial measurement mode.

- SLEEP MODE (Off/3min/5min/10min)

: Sets up the time required for entering into the power-saving mode

- MEASURE / CAPTURE BUTTON (Off/On)

: Set to measure by touching the screen in measurement mode.

(Same function as the measurement button on the operation lever)

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

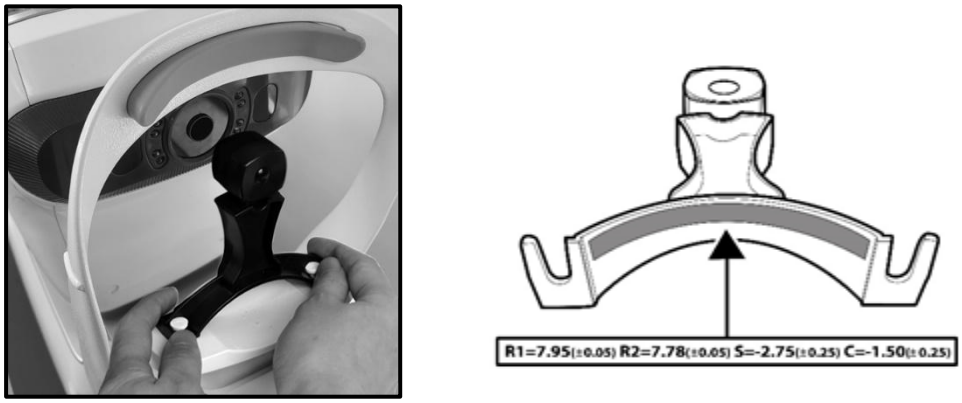
10. Self diagnosis & Maintenance

10.1. REF / KER Accuracy check

- Remove chin rest page, and fit in the pressing pin after aligning the hole at the Model Eye's lower part with chin rest's hole.

- Perform the measurement and compare with the display value at the bottom of the model eye. (STEP 0.01)

- Perform the accuracy check at regular intervals. (Daily checkup)



[**Figure 10-1. REF / KER Accuracy check**]

⚠ CAUTION

If the measurement result is widely different from the value shown on the model eye, call your dealer

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 10-2. Changing printer paper**]

⚠ CAUTION

Be sure to use only the printer paper (9010A000001-A, W 57mm, D 50mm) specified by HUVITZ.

If printer paper other than those specified is used, the printer head may be damaged due to printing failure or paper jam.

⚠ NOTE

Be sure that printer paper is not loaded in a tilted angle and that the core of the roll is properly placed. Printer paper may not be fed properly.

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

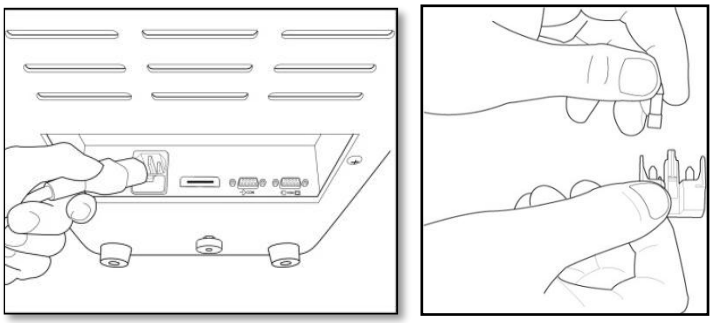
① Turn off and raise the HRK-8100A with two arm carefully.

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 10-3. Replacing Fuse**]

⚠ WARNING

Use 250V, T3.15AL fuse for the Auto Ref/Keratometer HRK-8100A.

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-8100A 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. Cleaning

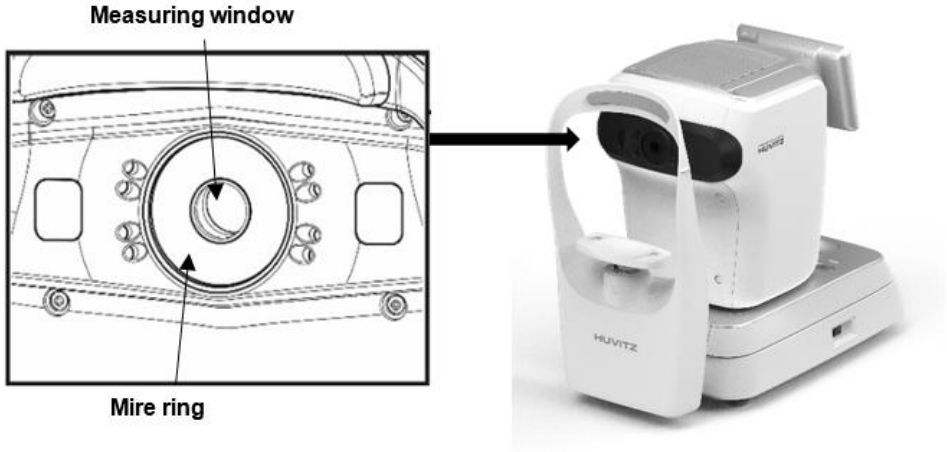
10.4.1. Cleaning the measuring window

When the measuring window gets fingerprints or dust on it, the reliability of the measured values is impaired substantially. Check for dirt on the measuring window before use, and then clean it if it is dirty.

1) Blow off and dust on the measuring window with a blower.
2) Wrap lens cleaning paper around a thin stick such as a chopstick (or cotton swab) and wipe the lens of the measuring window with a material moistened with alcohol.

⚠ CAUTION

- Use a thin stick that will not scratch glass lenses.
- Wipe lightly from the center of the measuring window to the outside in a circular motion



[**Figure 10-4. Measuring window & Mire ring**]

10.4.2. Cleaning the mire ring

When the mire ring gets fingerprints or dust on it, the reliability of the measured values is impaired substantially. Check for dirt on the mire ring before use, and then clean it if it is dirty.

1) If the mire ring and the cover get soiled, wipe the surface with dry cloth.
2) If the mire ring and the cover are noticeably stained, wipe the surface with a damp cloth which is

moistened in a tepid water solution of neutral detergent.

⚠ CAUTION

Do not clean plastic parts with solvents. Benzene, thinner, ether and gasoline may cause discoloring and decomposition.

10.4.3. Cleaning the forehead rest and chin rest

- Wipe the forehead rest and the chin rest with a cloth moistened with a tepid solution of neutral detergent for kitchenware

10.5. 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. When power switch is turned on

   Warning appears on the screen when there is a problem or when this device malfunctions.

   Take the following measures in case of the following.

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. Check list

When	Remedy
The LCD does not turn on.	- The power cord may not be correctly connected. Reconnect it securely - Check whether proper voltage is applied to the power outlet. - The power switch may not have been turned on. Check the power switch.
The LCD does not turn on(not clear) even though power is on	- The sleep function may have been activated. Press joystick button (or touch the screen) to exit from sleep mode.
The screen disappears suddenly.	- Sleep mode may have been activated. Press joystick button (or touch the screen) to exit from sleep mode.
The main body cannot be moved laterally	- The stage fixation lever may be locked. Unlock the stage fixation lever at the back of the joystick.(Refer to 6 phase) - The body lock may be locked. Unlock the body lock on both sides of the main body. (Refer to 6 phase) - The clamping bolt may be locked. Unlock the clamping bolt on the bottom of the device. (Refer to 6 phase)
Print does not start	- Check the printer paper. If the paper has been used up, load new printer paper.
The printer does operate, however, printed results cannot be obtained.	- The printer paper may be loaded with the incorrect side up. Set it with the correct side up.
Printer paper does not feed properly	- Printer paper may be loaded in tilted or the core of the roll may not be placed properly. Open the printer cover and make sure that printer paper is properly loaded.

10.6. 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.

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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 10.5 of this manual

- Equipment name: HRK-8100A
- 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:

- Parts needed to repair for this device will be keep for 7 years.

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) (0.01/0.12/0.25D Unit)
CYL	0.00 ~ ± 12.00 D (0.01/0.12/0.25D 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)
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)
Auto trabel distance	
Up & Down	30 mm (± 3 mm)
Right & Left	10 mm (± 2 mm)
Back & Forth	10 mm (± 2 mm)
Automatick tracking scope	
Up & Down	10 mm (± 2 mm)
Right & Left	10 mm (± 2 mm)
Back & Forth	10 mm (± 2 mm)
Chin rest travel distance	

Up & Down	60 mm (± 3 mm)
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 / Auto cutting
Power saving function	As stopping to measure for about 3/5/10 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	1.0-0.8 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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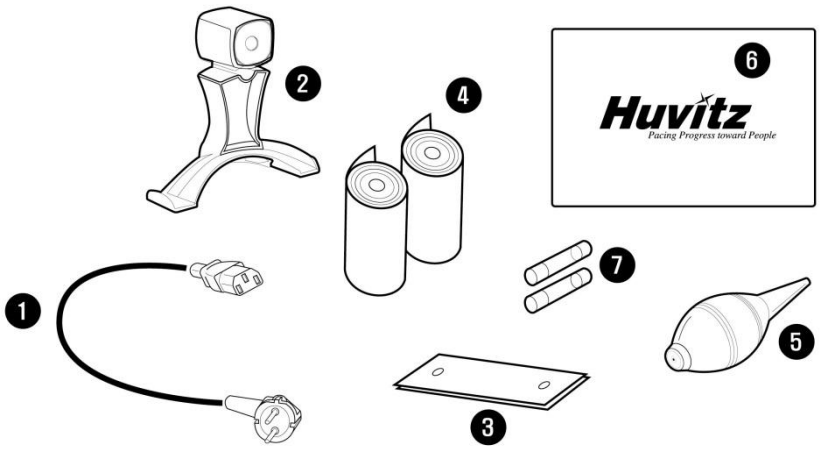
14. Accessories



[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)

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15. EMC Information

Manufacturer announcement – electromagnetic waves trouble

Electromagnetic waves trouble	
HRK-8100A should be used in the below mentioned electromagnetic wave environment. HRK-8100A purchaser or user needs to confirm whether HRK-8100A 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-8100A is to be used in the below designated electromagnetic wave environment. HRK-8100A customer and user need to guarantee that the HRK-8100A 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-8100A is to be used in the below mentioned electromagnetic wave environment. HRK-8100A

purchaser or user needs to confirm whether HRK-8100A 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>