### TONOREF™ III Specifications

**Auto Refractometer**
- **Measurement range:** Sphere: -30.00 to +25.00 D (OD: ±12 mm) (0.01 / 0.12 / 0.25 D increments)  
  Cylinder: 0 to ±12.00 D (0.01 / 0.12 / 0.25 D increments)  
  Axis: 0 to 180° (1° / 5° increments)
- **Minimum measurable pupil diameter:** 3.5 mm
- **Measurement area:** ø1 to ø5 mm

**Auto Keratometer**
- **Measurement range:** Curvature radius: 5.00 to 10.00 mm (0.01 mm increments)  
  Refractive power: 25.96 to 67.50 D (n = 1.3375) (0.01 / 0.12 / 0.25 D increments)  
  Cylindrical power: 0 to ±12.00 D (0.01 / 0.12 / 0.25 D increments)  
  Axis: 0 to 180° (1° / 5° increments)
- **Scenery Chart:** ø2 mm
- **ø1 to ø6 mm

**Non-contact Tonometer**
- **Measurement range:** 1 to 10 mm (1 mm increments)
- **Measurement area:** APC40, APC60 (APC=Automatic Puff Control), 40, 60
- **Working distance:** 11 mm
- **Eye fixation:** Inner fixation light
- **Non-contact Pachymeter**
  - **Measurement range:** 300 to 800 µm (1 µm increments)
  - **OP correction by corneal thickness:** Available
  - **Automated refraction:** Available
  - **Auto-refraction measurement range:** 0 to 10.00 D (0.01 / 0.12 / 0.25 D increments)
  - **Auto-refraction accuracy:** ±0.01 D
  - **Near point range:** 10 to 18.00 mm (1 mm increments)
- **Pupil size measurement range:** ø2.4 mm (R=7.8 mm), ø3.3 mm (R=7.7 mm)
  - **ø3.3 mm:** 25 to 80 mmHg (1 mmHg increments)
  - **ø2.4 mm:** 11 to 60 mmHg (1 mmHg increments)
  - **ø2.4 mm:** APC40, APC60 (APC=Automatic Puff Control), 40, 60
- **Auto-photodiode:** Available
  - **Display:** Tiltable 7.0-inch color LCD with touch panel
  - **Printer:** Thermal line printer with easy loading and auto cutter
- **Interface:** RS-232C: 2 port, LAN: 1 port, USB: 1 port
- **Power supply:** AC 100 to 240 V, 50 / 60 Hz
- **Power consumption:** 100 W
- **Dimensions / Mass:** 260 (W) x 495 (D) x 505 (H) mm / 22 kg at ARK standard mode
  - 260 (W) x 495 (D) x 460 (H) mm / 22 kg at NT standard mode
- **Limited to the USA, Canada, and other countries that implement the R&TTE Directive.
The space saving TONOREF™ III is a comfortable and efficient upgrade to your practice.

A MASTERPIECE of COMBINATION

Auto Refractometer
Auto Keratometer
Non Contact Tonometer

and

Non Contact Pachymeter
The space saving TONOREF™ III is a comfortable and efficient upgrade to your practice.

Auto Refractometer
Auto Keratometer
Non Contact Tonometer
and
Non Contact Pachymeter
Refraction

**Large Pupil Zone Imaging Method**

The use of a wide area measurement within the pupil increases the accuracy of measurement that is more indicative of the subjective refraction.

The large pupil zone imaging method measures the central refraction and a large area refraction.

The difference in the measurement allows assessment of the effect of pupil size on vision under mesopic conditions.

*The pupil diameter is measured simultaneously.*

Measurements can be performed on small pupils as small as 2 mm.

Super Luminescent Diode (SLD) Light and Highly Sensitive CCD Camera

The system combining the SLD Light and highly sensitive CCD camera significantly improves measurement capability even in dense cataractous eyes.

Optimal Fogging to Minimize Accommodation

Fogging is performed after correcting the patient's astigmatism with built-in cylinder lenses. This minimizes the effect of accommodation even of patients with high astigmatism.

Keratometry

**Double Mire Ring Method**

Keratometry measurements performed with the mire ring method reduces interference from the eyelids. The TONOREF™ III performs measurements at diameters of 3.3 mm and 2.4 mm.

Comparison of the two values allows a better understanding of the cornea shape.

Pachymetry

Non-contact optical pachymetry is used to measure corneal thickness.

The principle of specular reflection for pachymetry allows a more compact design of TONOREF™ III.

The system combining the SLD Light and highly sensitive CCD camera significantly improves measurement capability even in dense cataractous eyes.

The TONOREF™ III provides the automated calculation function of the corrected IOP based on the central corneal thickness.

Generally, the IOP is overestimated for thick corneas and underestimated for thin corneas. The corrected IOP value allows a more accurate assessment.

Automated Calculation of Corrected IOP

With APC

The pachymetry data can be used to display a corrected IOP value.

Patient-friendly Air Puff

Automatic Puff Control (APC)

In subsequent measurements, the APC function performs the measurement with the minimum air pressure based on the previous measurement data.

Softer and Quieter Air Puff

The new mechanical design of the TONOREF™ III reduces noise and air intensity to achieve a more gentle air puff over that of the TONOREF™ II.

Gentle Nozzle Design

A gentle nozzle design reduces patient's perception of physical pressure.
**Refraction**

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A gentle nozzle design reduces patient's perception of physical pressure.
The accommodation measurement helps to assess such as pseudomyopia, eyestrain, and accommodative palsy. Objective measurement of accommodation is performed with patient's focusing on a target that moves from distance to near. The intelligence algorithm detects the patient's response and reduces the measurement time in patients with a slow or weak accommodative response.

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Retroillumination Image and NIDEK Cataract Indices

The retroillumination image allows evaluation of media opacity. NIDEK cataract indices indicate the severity of the opacity and helps to assess the progression of pathology.

NIDEK Cataract Indices

- [COI H] Opacity size within a diameter of 3 mm in the center (vertical diameter)
- [COI A] Opacity proportion within a diameter of 3 mm in the center
- [POI] Opacity proportion within the entire periphery

The NIDEK Cataract indices are for reference only. The following conditions may indicate different indices from ones of actual status.
- Peripheral image is darkly captured due to alignment position
- Observers are not in focus
- Bright spot reflecting observation light occurs on the cornea apex
- Fraction of the 3 mm diameter circle is drifted due to incorrect pupil detection caused by opacity location

The Accommodation Measurement

The accommodation measurement helps to assess such as pseudomyopia, eyestrain, and accommodative palsy. Objective measurement of accommodation is performed with patient's focusing on a target that moves from distance to near. The intelligence algorithm detects the patient's response and reduces the measurement time in patients with a slow or weak accommodative response.

Easy to Use Screen

- Tiltable 7-inch color LCD touchscreen
- Summary Display
  Summary screen allows easy and quick confirmation of patient data.

Easy Access to Patients Eyelids

The radical cut design allows direct access to patient eyelids.

3-D Auto Tracking and Auto Shot

The 3-D auto tracking and auto shot provide faster, simpler, and more accurate measurements. Once alignment is completed, the measurement starts automatically.

Joystick for Flexible Alignment

The joystick helps the operator make fine adjustments during alignment to improve the precision, even for eyes with poor fixation which cannot be tracked with automated tracking systems.

Wireless LAN (WLAN)

The TONOREF™ III connects with PC and peripheral devices using wireless LAN (WLAN)*, LAN cable, RS-232C cable, EyeCare Card, barcode scanner or magnetic card reader.

*Available for products shipped for USA, Canada, and other countries that implement the R&TTE Directive.

Automatic Anti Dew Heater

Automatic anti dew heater for measuring windows prevents condensation to provide accurate measurements in cooler rooms.
Accommodation Measurement

The accommodation measurement helps to assess such as pseudomyopia, eyestrain, and accommodative palsy. Objective measurement of accommodation is performed with patient's focusing on a target that moves from distance to near. The artificial intelligence algorithm detects the patient's response and reduces the measurement time in patients with a slow or weak accommodative response.

Opacity Assessment

Retroillumination Image and NIDEK Cataract Indices

The retroillumination image allows evaluation of media opacity. NIDEK cataract indices indicate the severity of the opacity and helps to assess the progression of pathology.

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NIDEK Cataract Indices

Eye with light opacity

Eye with dense opacity

User-friendly Design

Clinically Important Functions
TONOREF™ III Specifications

## Auto Refractometer
- **Measurement range**
  - Sphere: -30.00 to +25.00 D (0.12 mm increments)
  - Cylinder: 0 to ±12.00 D (0.12 / 0.25 D increments)
  - Axis: 0 to 180° (1° / 5° increments)
- **Minimum measurable pupil diameter**: 0.01 / 0.12 / 0.25 mm
- **Measurement area**: ø1 to ø6 mm
- **Chart**: Scenery chart

## Auto Keratometer
- **Measurement range**
  - Curvature radius: 5.00 to 13.00 mm (0.01 mm increments)
  - Refractive power: 25.96 to 67.50 D (n = 1.3375) (0.01 / 0.12 / 0.25 D increments)
- **Cylindrical power**: 0 to ±12.00 D (0.01 / 0.12 / 0.25 D increments)
- **Axis**: 0 to 180° (1° / 5° increments)

## Non contact tonometer
- **Measurement range**: 1.0 to 60 mmHg (1 mmHg increments)
- **Working distance**: 11 mm
- **Eye fixation**: Inner fixation light
- **Non contact pachymeter**
  - **Measurement range**: 300 to 800 µm (1 µm increments)
  - **OP correction by cornea thickness**: Automatic calculation

## Corneal topography
- **Curvature radius**: 5.00 to 13.00 mm (0.01 mm increments)
- **Refractive power**: 25.96 to 67.50 D (n = 1.3375) (0.01 / 0.12 / 0.25 D increments)
- **Cylindrical power**: 0 to ±12.00 D (0.01 / 0.12 / 0.25 D increments)
- **Axis**: 0 to 180° (1° / 5° increments)

## Disc topography
- **Diameter**: 2.0 mm
- **Scenery charts**: Available

## Display
- **Auto tracking**: X, Y, Z directions
- **Auto shut**: Available
- **Display**: Touchable 7.0-inch color LCD with touch panel

## Printer
- **Interface**: RS-232C: 2 port, LAN: 1 port, USB: 1 port
- **Power supply**: AC 100 to 240 V, 50 / 60 Hz

## Dimensions / Mass
- **Dimensions**: 260 (W) x 495 (D) x 460 (H) mm / 22 kg at NT standard mode
- **Mass**: 260 (W) x 495 (D) x 460 (H) mm / 22 kg at NT standard mode
- **Limited to the USA, Canada, and other countries that implement the R&TTE Directive.**