Specifications

Refractive Power Measuring Range
-25.0D to +22.0D (0.01D/0.02D/0.25D steps) *

Cylinder Range
-12.00D to +10.00D (0.01D/0.02D/0.25D steps) *

Axis Range
0° ~ 180° (1°/5° steps)

Measurable Area
8 mm (max.)

Measurable Minimum Pupil Diameter
2.0 mm

Corneal Curvature Measuring Range

-5.0mm to +10.0mm (0.01mm steps)

Corneal Refraction
67.00D ~ 31.70D (0.05D/0.10D/0.25D steps)
(Previous corneal refractive index = 1.375)

Corneal Astigmatism
-100.00D to +120.00D (0.01D/0.02D/0.05D/0.25D steps)

Corneal Astigmatism Axis Angle
0° ~ 180° (1°/5° steps)
(Previous corneal refraction curvature = 8mm)

Measurable Corneal Area
8.0mm x 8.0mm (max.)

Measurable PD Range
20~65mm (0.5mm step)

Export Output Terminal
USB (IN/OUT), RS232C (OUT, LAN (IN/OUT)

* Previous Sphere Cylinder ± 0.02D, or Sphere Cylinder ± 0.05
Topcon, with its wealth of experience in designing and manufacturing refractometers and other diagnostic equipment for over 50 years, introduces a new diagnostic tool with 5 functions to support the evaluation of the visual performance of the human eye. The KR-1W combines aberrometry, topography, keratometry, pupillometry and autorefraction in one unit that is unparalleled in terms of functionality and reproducibility. At the same time the KR-1W is extremely easy to operate and allows fast patient throughput. The KR-1W will become the professional’s choice for comprehensive diagnosis of many ocular conditions.

**Features**

- 5 functions in 1 machine: (Auto-Refraction, Keratometry, Aberrometry, Topography and Pupillometry)
- Multiple maps for overview analysis
- Decision support for cataract and refractive procedures
- Less stress with invisible light measurement at topography
- Easier operation with R / L fully automated measurement and touch panel

**A Picture Says More Than a Thousand Words**

The multiple maps provide helpful insight for refractive procedures that are done on the corneal surface or intraocularly. It allows an objective quality control of the surgical procedures.
Perfection for Professionals: KR-1W

Topcon, with its wealth of experience in designing and manufacturing refractometers and other diagnostic equipment for over 50 years, introduces a new diagnostic tool with 5 functions to support the evaluation of the visual performance of the human eye. The KR-1W combines aberrometry, topography, keratometry, pupillometry and autorefraction in one unit that is unparalleled in terms of functionality and reproducibility. At the same time the KR-1W is extremely easy to operate and allows fast patient throughput. The KR-1W will become the professional’s choice for comprehensive diagnosis of many ocular conditions.

Features

» 5 functions in 1 machine:
  (Auto-Refraction, Keratometry, Aberrometry, Topography and Pupillometry)
» Multiple maps for overview analysis
» Decision support for cataract and refractive procedures
» Less stress with invisible light measurement at topography
» Easier operation with R / L fully automated measurement and touch panel

A Picture Says More Than a Thousand Words

The multiple maps provide helpful insight for refractive procedures that are done on the corneal surface or intraocularly. It allows an objective quality control of the surgical procedures.
Work Flow

The KR-1W provides you with the ideal tool to diagnose, follow up and make treatment plans for a broad range of ocular conditions. It can be very effectively used in your practice to speed up your workflow, improve your communication with patients and to monitor the outcomes of your treatments. With the KR-1W you are able to assess your patients functional visual performance over time or pre / post operatively with unsurpassed reproducibility and reliability.

Measure

Unsurpassed reproducibility and reliability with fully automated measurement and touch panel manipulation make your diagnosis and treatment decision easy.

Cataract Surgery

This is a case of cortical cataract displayed in the Multi Maps mode, for a clinical discussion of this case.

Corneal Pathology

This is a keratoconus case displayed in the Multi Maps mode, for a clinical discussion of this case.

Refractive Surgery

This is a case of myopia displayed in the Multi Maps mode. The concentric shape that can be observed in the Total Occular Higher Order Aberration map (see box) with a blue center and a yellow periphery, indicates a typical case of myopia.

Diagnosis / Consultation

Enrich your communication with patients showing them the effect of their ocular condition on their visual performance.

Pupilometry

- Halos or glare at night time

IOL Selection Support

- Multifocal IOL
- Aspherical IOL
- Spherical IOL
- Multifocal IOL
- Toric IOL

Treatment / Surgery

Ideal tool to make treatment plans for a broad range of ocular conditions.

Contact Lens Fitting

- DSAEK
- DALK
- Limbal Relaxing Incision
- Others

Follow-Up

This work flow will increase patient satisfaction and confidence in their choice of treatment as you can objectively show the patient the outcome of your treatments.

Refractive Surgery

- LASIK
- LASIK
- PRK
- Others
Work Flow

The KR-W provides you with the ideal tool to diagnose, follow up and make treatment plans for a broad range of ocular conditions. It can be very effectively used in your practice to speed up your workflow, improve your communication with patients and to monitor the outcomes of your treatments. With the KR-W you are able to assess your patients’ functional visual performance over time or pre / post operatively with unsurpassed reproducibility and reliability.

Measure

Unsurpassed reproducibility and reliability with fully automated measurement and touch panel manipulation make your diagnosis and treatment decision easy.

Diagnosis / Consultation

Enrich your communication with patients showing them the effect of their ocular condition on their visual performance.

Treatment / Surgery

Ideal tool to make treatment plans for a broad range of ocular conditions.

Follow-Up

This work flow will increase patient satisfaction and confidence in their choice of treatment as you can objectively show the patient the outcome of your treatments.

CATARACT SURGERY

This is a case of cortical cataract displayed in the Multi Maps mode, for a clinical discussion of this case.

Pupillometry

- Multifocal IOL

IOL Selection Support

- Aspherical IOL
- Spherical IOL
- Multifocal IOL
- Toric IOL

IOL Implantation

CORNEAL PATHOLOGY

This is a keratoconus case displayed in the Multi Maps mode, for a clinical discussion of this case.

Contact Lens Fitting

- DSAEK
- DALK
- Limbal Relaxing Incision
- Others

REFRACTIVE SURGERY

This is a case of myopia displayed in the Multi Maps mode. The concentric shape that can be observed in the Total Ocular Higher Order Aberration map (see box) with a blue center and a yellow periphery, indicates a typical case of myopia.

Pupillometry

- Halo or glare at night time

Refractive Surgery

- LASIK
- LASEK
- PRK
- Others
Reliable Decision Support for the Demanding Cataract & Refractive Surgeon

**IOL Selection**
Important factors in making the right IOL selection for your patient at one glance.

1. **Corneal Higher Order Aberration Index**
   This index considers information on the potential visual outcome, including the aberration that cannot be corrected by an IOL. Additional treatments, i.e., contact lens fitting or corneal surface treatments, might be necessary to optimize the outcome.

2. **Post Refractive Surgery Index**
   This index provides information on corneal irregularities possibly caused by previous surface treatments of the cornea. This might lead to the necessity of calculating the power of the IOL using non-standard formulas with special attention.

3. **Corneal Astigmatism Index**
   This simple display of corneal astigmatism provides information for two important decisions:
   a. Amount of toric correction needed in a toric IOL.
   b. Patients with a high corneal astigmatism might not be the right candidate for a multifocal IOL.

4. **Review after Toric IOL Implantation**
   The result after implantation can be reviewed to check residual ocular astigmatism.

**Pupillometry**
Screening application to evaluate eyes for multifocal IOL implantation or refractive surgery.

- **Photopic**
- **Scotopic**
- **Glare Vision**
- **Normal Vision**

**Corneal Refractive Surgery**
For any refractive procedure, it is vitally important to diagnose the pupil very carefully in different light conditions. Also for refractive surgery, this tool gives you the necessary information to plan your treatment.

**Dynamic Pupil Diameter Measurement and Pupil Center Determination**
This information is very important for premium IOL implantation, as it will give you the possibility to select the right multifocal IOL design for the individual eye and also help exclude extreme cases of pupil decentration before surgery.

**Continuous Measurement Function**
Up to 10 measurements can be done continuously to observe the change in ocular HKA during about 10 seconds. This may have implication for dry eye diagnosis in the future.
Reliable Decision Support for the Demanding Cataract & Refractive Surgeon

IOL Selection
Important factors in making the right IOL selection for your patient at one glance.

1 Corneal Higher Order Aberration Index
This index provides information on the potential visual outcome considering the aberration that cannot be corrected by an IOL. Additional treatments, i.e., contact lens fitting or corneal surface treatments, might be necessary to optimize the outcome.

2 Post Refractive Surgery Index
This index provides information on corneal irregularities possibly caused by previous surface treatments of the cornea. This might lead to the necessity of calculating the power of the IOL with non-standard formulas with special attention.

3 Corneal Astigmatism Index
This simple display of corneal astigmatism provides information for two important decisions:
- Amount of toric correction needed in a toric IOL
- Patients with high corneal astigmatism might not be the right candidate for a multifocal IOL.

4 Review after Toric IOL Implantation
The result after implantation can be reviewed to check residual ocular astigmatism.

5 Pupillometry
Screening application to evaluate eyes for multifocal IOL implantation or refractive surgery.

6 Corneal Refractive Surgery
For any refractive procedure, it is vitally important to diagnose the pupil very carefully in different light conditions. Also for refractive surgery, this tool gives you the necessary information to plan your treatment.

7 Dynamic Pupil Diameter Measurement and Pupil Center Determination
This information is very important for premium IOL implantation, as it will guide you the possibility to select the right multifocal IOL for the individual eye and also help exclude extreme cases of pupil decenteration before surgery.

8 Continuous Measurement Function
Up to 10 measurements can be done continuously to observe the change in ocular HOA during about 10 seconds. This may have implication for dry eye diagnosis in the future.
Full Flexibility for Your Data Viewing or Data Storage Needs

System Chart
The KR-1W is adaptable to your networking and data filing needs since various combinations are available. The patient database is provided with the optional KR-1W Viewer software.

* Contact your subsidiary or dealer for system configurations.
Precise Data Leads to Precise Diagnosis

Case Report

Keratoconus

This is a case of moderate keratoconus. The results of corneal topography are shown at the top row, axial power map, and a view typical topographic appearance of keratoconus such as inferior steepening (arrow pointing) and disker axis. The map for the corneal HRA (fingerprint asymmetry) shows moderate vertical coma aberration with enhanced wavefront (darker color) at the superior portion and reduced wavefront (lighter color) at the inferior area. The color coding represents the results of ocular aberrations. The ocular aberration map [color-coded wavefront] in the center. This suggests that spherical aberration wavefront is not good due to myopic astigmatism. The map for ocular wavefront [color-coded wavefront] shows that for cornea without indicating that ocular aberration is mainly attributing from coma and best correctable visual acuity is not good. Simulated nasal maps of the Landolt rings (suggest that corneal image will be seen because of vertical coma). In the lower half of the print, IOL selection map and four outputs are shown. The output for corneal astigmatism (ratio indicates the existence of significant irregular astigmatism with red signal). The difference between central power and K reading (K suggests that conventional IOL calculation might induce refractive error due to topographic abnormalities). The output for corneal spherical aberration (SA) suggests that the spherical RX (positive SA) is more appropriate than aspherical RX (negative SA) because of the negative corneal spherical aberration. The best output is for corneal cylinder and shows that regular astigmatism is extremely high.

Cortical Cataract

This is a case of a 82 year old female with cortical cataract. Her visual acuity is 0.5 with correction in the right eye. The corneal HRA [color-coded wavefront] shows a normal IOL but the TotalIOL [color-coded wavefront] shows a higher RMS (red indication) at 6mm pupil diameter. Refining this Component Maps in the lower half of the print, this corneal aberration is higher in modulus than in cornea. It is therefore easily observed that the corneal aberration is mainly caused by spherical aberrations (negative point). The spherical aberration is also higher in modulus than in cornea, indicating eye spherical aberration to increase in the corneal maps. Refining to the Landolt rings (ratio indicates that the images are virtually distorted which show the visual effect of the corneal astigmatism). The maps simulate the retinal image and ocular IOL, but it should be noted that the simulated IOL image might not coincide with actual patient vision because the quality of corneal lens and subsequent light scattering affects the retinal image differently with ocular IOL.

Pseudophakic Eye with Toric IOL

This measurement shows in the upper half the IOL selection map, where it can be seen that the Toric IOL is properly indicated and the corneal aberration is compensated by the IOL. Reference values and parameters are Coma/Irregular Abnormalization (showed 17390886), Double Antiglusion (showed 00739981) and Internal Antiglusion (showed +22359971). In the lower half the Simulated maps show that objective visual quality should be good as can be seen from the simulated PSF, that gives an indication of optimal image quality, and from the MTF that gives an indication of contrast sensitivity.
Precise Data Leads to Precise Diagnosis

Case Report

Keratoconus
This is a case of moderate keratoconus. The results of corneal topography are shown at the top row, axial power map, and corneal topographic appearance of keratoconus (with inferotemporal corneal thinnings) and skier asty. The map for the corneal HRA (regional astigmatism) shows regional corneal flattening with advanced wavefront (wavefront scalar) at the posterior pachymetry and inferior wavefront (wavefront scalar) at the inferior cornea. The anterior tear represents the results of ocular aberrations. The ocular tear-alignment map shows delayed wavefront in the center. This suggests that the corneal aberation is a result of corneal astigmatism. The map for ocular aberation analysis data of the corneal HRA indicates that ocular astigmatism is primarily attributed to corneal astigmatism. The anterior tear shows that corneal aberation will be seen because of corneal astigmatism. In the inferior part of the cornea, ocular aberation map, and four outputs are shown. The output for corneal aberation analysis (3) indicates the existence of a significant corneal aberation with red signal. The difference between central power and kerating (2) suggests that conventional aberation calculation might induce refractive error due to topographic aberation. The output for corneal aberation (1) suggests that the aberation (1) is more corrected than aberation (2). The aberation (1) is more corrected than aberation (3). The aberation (1) is more corrected than aberation (4). This output is for corneal aberation and shows that corneal aberation is a significant factor.

Cortical Cataract
This is a case of a 62-year-old female with cortical cataract. Her visual acuity is 0.8 with correction in the right eye. The central HDI (4) is within normal limit but shows a higher RMH (red indication) at 4mm pupil diameter. Referring to the Component Maps in the lower half of the print, the cataract aberation is higher in modulus than in cornea. It is shown easily observed that the cataract aberation is heavily caused by spherical aberation (spherical aberation) (6) and spherical aberation is also higher in modulus than cornea indicating the spherical aberation is increased in the cataract area (7). Referring to the Landskron wavefront profile, it can be seen that the cataract aberation is heavily caused by spherical aberation (spherical aberation) (6) and spherical aberation is also higher in modulus than cornea indicating the spherical aberation is increased in the cataract area (7). It should be noted that this simulated image might not coincide with actual patient vision because the opacity of crystals and subsequent light scattering affects the retinal image differently with ocular aberation.

Pseudophakic Eye with Toric IOL
This measurement shows the corneal toric IOL selection map, where it can be shown that the toric IOL is properly implanted and the corneal aberation is compensated by the IOL. Reference value parameters are Astigmatism (showing -1.30/90D). Distance Astigmatism (showing -0.27/90D) and Internal Astigmatism (showing -0.27/90D) (8) in the lower half of the IOL selection maps show that objective visual quality should be good as can be seen from the simulated PSF, that gives an indication of optical image quality, and from the MTF that gives an indication of contrast sensitivity.

Example
2 axes maps of your choice can be assembled to print layout on 1 page for printing and/or sending images to external systems. For MAGeyeT.

Clinical Data: Osaka University Hospital
Editorial supervisor: Masayuki Hanada, MD
### Specifications

<table>
<thead>
<tr>
<th>Refractive Power Measuring Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sphere Range</strong></td>
</tr>
<tr>
<td><strong>Cylinder Range</strong></td>
</tr>
<tr>
<td><strong>Axis Range</strong></td>
</tr>
<tr>
<td><strong>Measurable Area</strong></td>
</tr>
<tr>
<td><strong>Measurable Minimum Pupil Diameter</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corneal Curvature Measuring Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corneal Curvature Radius</strong></td>
</tr>
<tr>
<td><strong>Corneal Refraction</strong></td>
</tr>
<tr>
<td>(Presico: corneal refractive index = 1.375)</td>
</tr>
<tr>
<td><strong>Corneal Astigmatism</strong></td>
</tr>
<tr>
<td><strong>Corneal Astigmatism Axial Angle</strong></td>
</tr>
<tr>
<td>(Presico: corneal curvature = 8mm)</td>
</tr>
<tr>
<td><strong>Measurable Corneal Area</strong></td>
</tr>
<tr>
<td><strong>Measurable PD Range</strong></td>
</tr>
</tbody>
</table>

**Export Output Terminal**: USB IN/OUT, RS232C/OUT, LAN IN/OUT

* Presico: Corneal Radius 6.15D, Corneal Refractive Index = 1.375.