Technology for Life Science

Automatic Perimeter KOWA AP-7000™

Specifications

Stimulus presentation method	Projection
Stimulus color	White, Red, Blue, Green
Stimulus size	Goldmann I, II, III, IV, V
Maximum stimulus intensity	3,183 cd/m² (10,000 asb): white
Stimulus presentation time	0.2 sec.
Stimulus presentation interval	0.6~3.3 sec. (automatically adjusted)
Background intensity ★Automatic light adjustment	White: 10 cd/m² (31.5 asb) Yellow: 100 cd/m² (314.2 asb)
Examination distance	300 mm
Measurement range	80°
Measurement dome range	90°
External interface	USB, Ethernet
Fixation target	Orange LED Center 1 point, Auxiliary 4 points, Fovea examination 4 points
Eye fixation monitoring	Heijl - Krakau method, Eye fixation monitor, Gaze monitor
Printout	USB-connected printer〔separately available in the marketplace〕
Operation screen	Touch panel color LCD monitor
Data save	Built-in flash memory
Operation support	Oral instruction
Chin rest operation	Motor-driven
Power supply	Input : AC 100-230 V　50/60 Hz Power consumption : 200 VA
Dimensions	730(W)×430(D)×700(H) mm
Weight	26 kg

Examination

Screening	Program	Standard, Precision, Center, Periphery, Glaucoma, V.Meridian, Central #30, Central #24, CV
	Method	2zone, 3zone, 4zone, Quantify Scotoma, Intensity step : 5dB / probability value (p-value) Quick mode is available.(except Central#30, Central#24, CV)
Supra	Program	Standard, Macula, Mariotte, Optional, D-Test, Esterman Both
	Method	Same intensity 2 zone〔3 zone for D-Test〕
Threshold	Program	Central 30, Central 24, Central 10, Meridian, Periphery, Macula (21 points, 16 points)
	Method	Full Threshold, Quick 1, Quick 2, Super quick, Quick Alpha, smart Strategy*, smart Strategy Alpha*, smart Strategy Alpha +*　(* Only for Central 30, Central 24, Central 10)
Isopter (Kinetic)	Program	Standard, Isopter + Screening 1, Isopter + Screening 2, Isopter + Threshold
	Method	Auto, Manual
Custom	Program	Circle threshold, 1 Point Threshold, Quadrant Threshold, Optional Threshold#, Optional Threshold○, Optional Screening#, Optional Screening○
Perimetry on fundus		Perimetry combined with fundus image.
Fovea examination		It is available in the Threshold Center examination (Threshold - Central 30, Central 24, Isopter + Threshold).

Specifications and appearance are subject to change without notice.
The availability of this product varies among countries and regions. Please contact your local Kowa representative or distributor.

Distribution name: KOWA AP-7000

Kowa Company, Ltd.

REF FT11_2191200CO
Printed in Japan.

Technology for Life Science

Automatic Perimeter

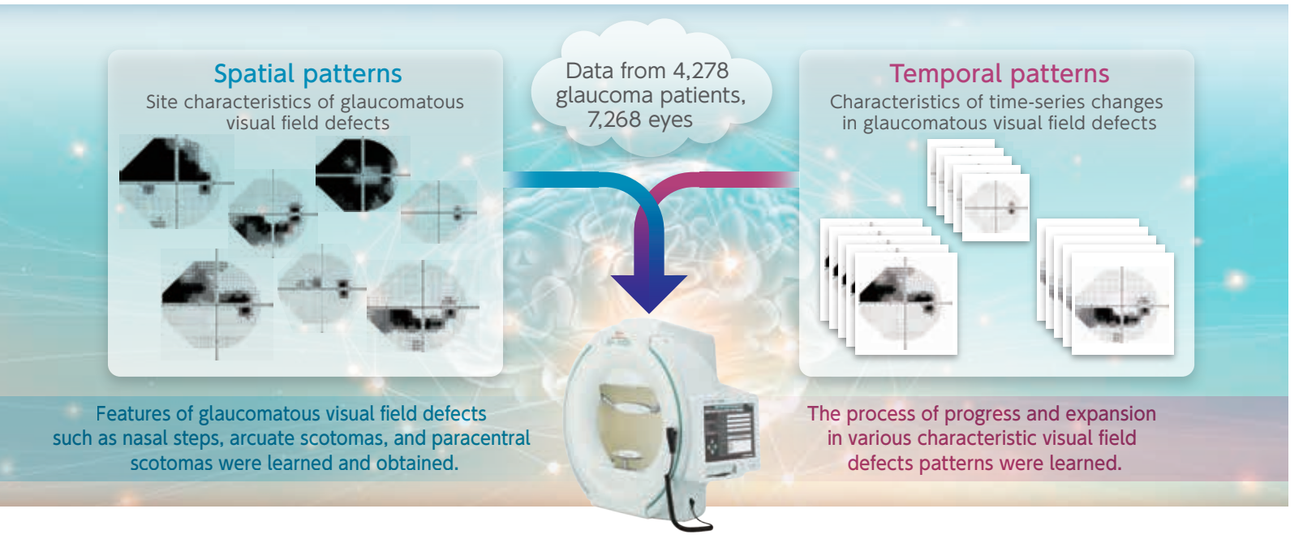
KOWA AP-7000™

Advanced perimeter with "smarter" functions

KOWA AP-7000 provides smart visual field examination with its own normative database and threshold test algorithms.

Short-time measurement algorithm using visual field prediction backed by "variational Bayes linear regression" (VBLR) method.

smart Strategy™ is born!

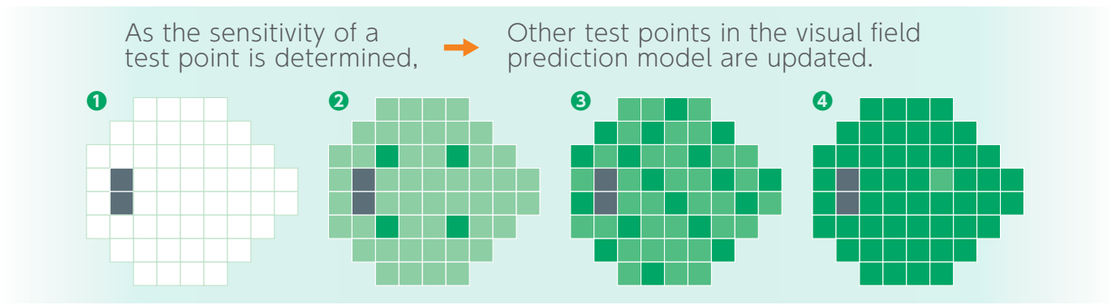


* Murata H, Zangwill LM, Fujino Y, et al. Validating variational Bayes linear regression method with multi-central datasets. Invest Ophthalmol Vis Sci. 2018;59:1897-1904. https://doi.org/10.1167/iovs.17-22907

** Murata H, Araie M, Asaoka R. A new approach to measure visual field progression in glaucoma patients using variational Bayes linear regression. Invest Ophthalmol Vis Sci. 2014;55:8386-8392. https://doi.org/10.1167/iovs.14-14625

Visual field prediction model update and threshold determination by variational Bayes linear regression method

The test is administered in the following order.
❶ Prior to the test, there is no visual field information except for the patient's age.
❷ The threshold values of the primary points (first 4 points) are tested, and the other test points in the visual field prediction model are updated from the results.
❸❹ As the threshold value of each test point is determined, the visual field prediction model in the other test points are updated. The intensity of stimuli is updated, and the threshold is determined.

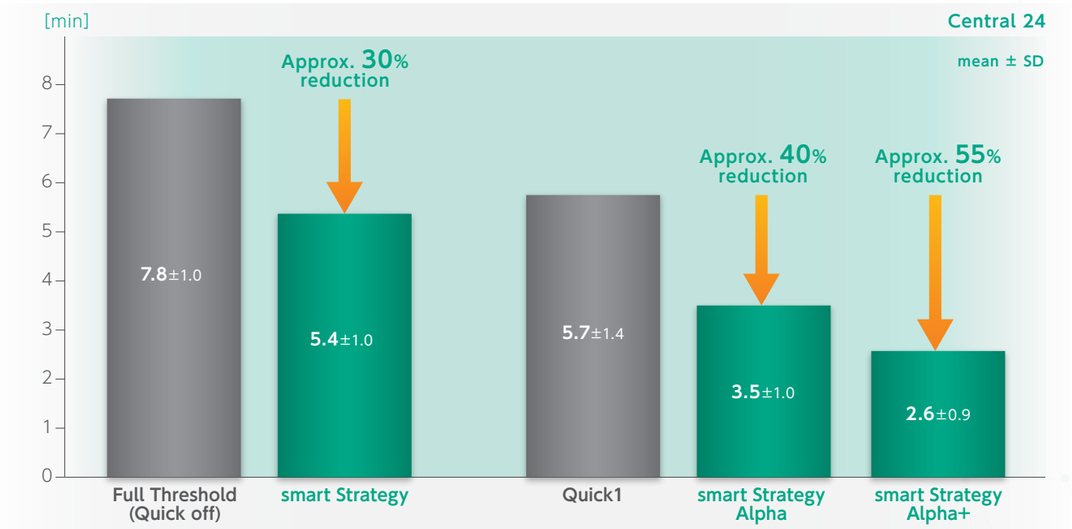


About smart Strategy

smart Strategy is a short-time measurement algorithm combined with a visual field prediction model based on VBLR. The prediction model learns spatial and temporal patterns of glaucomatous visual field defects using an enormous amount of glaucoma visual field data.
During the test, the visual field prediction model is continually updated according to the responses by the patient. By updating the intensity of stimuli and determining the sensitivity of each point, the number of stimulus presentations are then reduced to shorten test time.
Thanks to a substantial increase in accuracy of visual field prediction, test time is reduced without losing reliability.

3 smart Strategy Programs

smart Strategy is a program that offers shorter examination time without losing reliability by combining the above method with conventional Full-Threshold testing.
smart Strategy Alpha allows shorter examination time by the combination of a highly accurate visual field prediction and Kowa's conventional short-time algorithm (Quick 1).
smart Strategy Alpha+ is the fastest threshold test algorithm in KOWA AP-7000, suggested to be used for screening. It is based on Quick 1 as well as smart Strategy Alpha, but provides even shorter examination time by using further enhanced prediction methods.

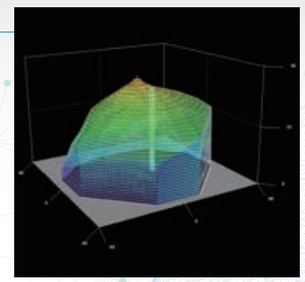


Average examination time comparison with conventional programs

Internal material: AP-7000 joint research with The University of Tokyo material No.2
† Simulation based on data from 547 glaucoma patients, 911 eyes

Normative Database

Normative database measured periphery 60° enables more precise judgment of periphery test results.



Equipped with Analysis Indices to support your Glaucoma Diagnosis

KOWA AP-7000

Threshold

In addition to central 30°, which is used to observe the progression of glaucoma, a wide variety of tests are available including central 10°, which is useful to identify visual field abnormalities in the macula.

Clear Display of Analysis Results

❶ Threshold (Measured Values)

❷ Gray Scale
Expressing threshold values in ten levels of gray scale

❸ Total Deviation
Deviation from the normal value for each age range

❹ Pattern Deviation
Deviation from the pattern of the normal visual field pattern

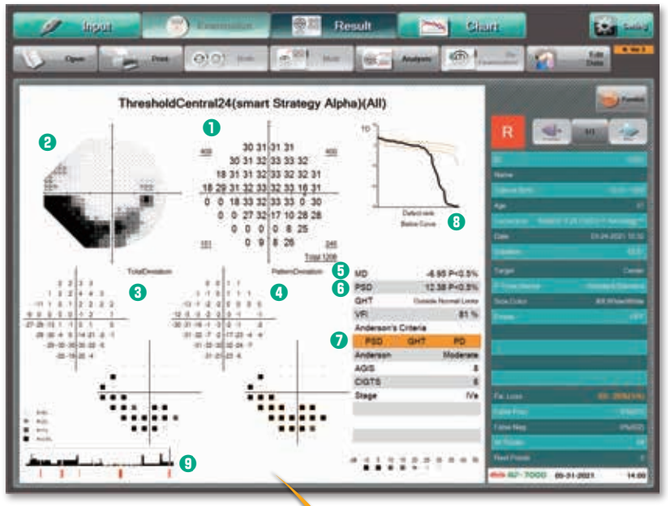
❺ MD (Mean Deviation)
Averaged degree of loss of visual field, across the whole field

❻ PSD (Pattern Standard Deviation)
Degree of deviation from the normal visual field pattern

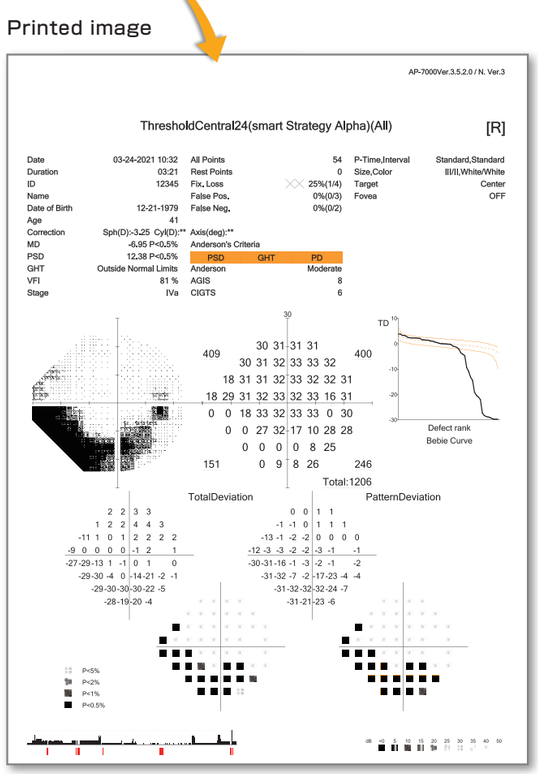
❼ Analysis Indices
Display of various analysis indices

❽ Bebie Curve
All total deviation values expressed as a curve

❾ Gaze Monitor
Measures eye fixation loss based on pupil position relative to corneal reflection



Printed image



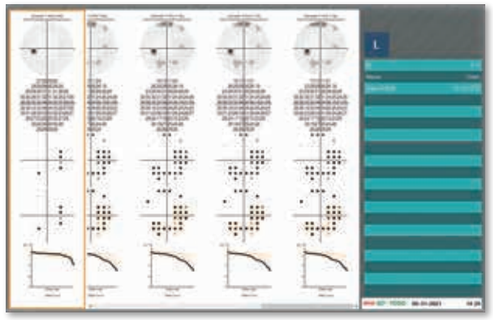
Analysis Indices

- **GHT (Glaucoma Hemifield Test)**
  For this index, threshold central test points are divided into 10 sectors. Corresponding sectors above and below the axis of the horizontal median are then compared.
- **VFI (Visual Field Index)**
  A percentage index in which a normal visual field is 100%, and total loss of visual field is 0%.
- **Anderson's Criteria Diagnostic Support Function**
  This criteria is for glaucomatous visual field defects.
  If any of the following conditions are satisfied, the colors turn orange.
  - PSD has p<5%
  - GHT is outside normal limits
  - Pattern deviation probability plot shows a cluster of 3 or more nonedge points that have p<5%, and one of the points has p<1%
    (The physician must judge whether the 3 points match the travel of NFL.)

Multiple Languages
English, Chinese, French, German, Italian, Portuguese, Russian, Spanish, Korean, Japanese

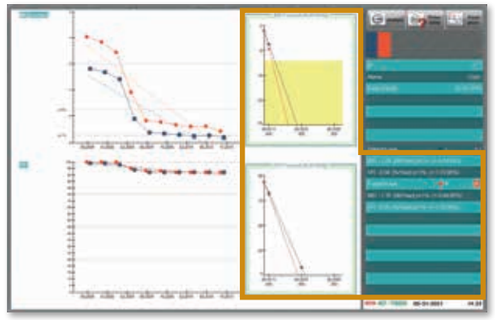
Time-series Display

A series of examination results such as examination information, scales, thresholds, total deviations (p-values), pattern deviations (p-values) and Bebie curves are displayed in chronological order. Each column lists the results of a single examination.
Base data can be set allowing the operator to easily observe the changes over time.

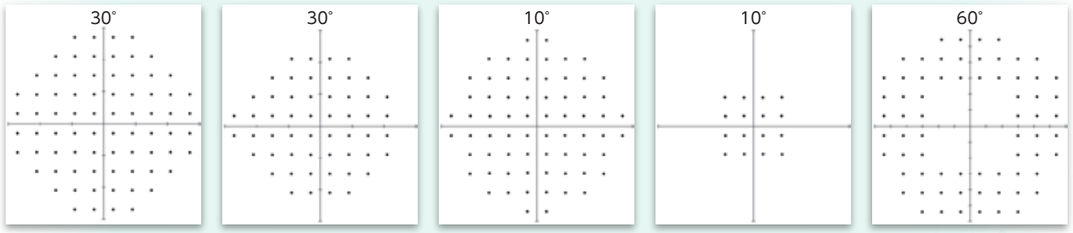


Chronological Change Display

Test result analytical indices such as MD, PSD, VFI, box plot, etc. can be graphically displayed as time series data to give a clear understanding of changes over time in the tested eyes. Furthermore, for MD and VFI, prediction graphs calculated from the linear rate of change of the analytical indices are displayed.



Major threshold test programs



Central 30 (equivalent to HFA 30-2) : 76 points

Central 24 (equivalent to HFA 24-2) : 54 points

Central 10 (equivalent to HFA 10-2) : 68 points

Macula 16 : 16 points

Periphery (equivalent to HFA 60-4) : 68 points

smart Strategy supports Central 30 (30-2), Central 24 (24-2), and Central 10 (10-2) in the threshold test programs.

Diverse Functions of the KOWA AP-7000

KOWA AP-7000

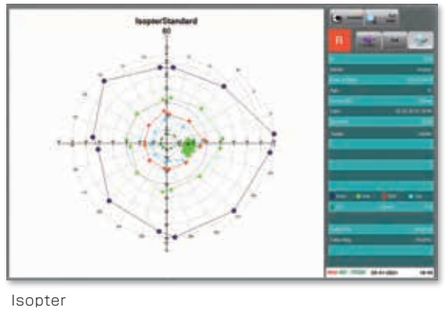
Isopter

Kinetic visual field examination

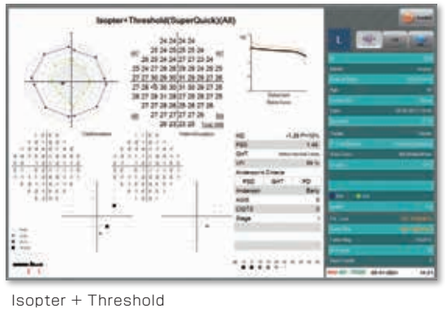
Supports automatic mode, manual mode, and automatic + manual mode. Can enlarge an image of a 30° range around the center.

Simultaneous evaluation of the peripheral and central visual fields

Equipped with a program that combines Isopter with other static visual field examinations including threshold, allowing simultaneous examination of both the peripheral and central visual fields.



Isopter



Isopter + Threshold

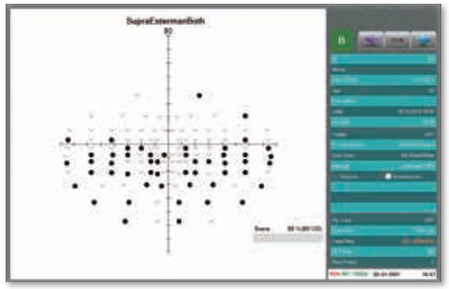
Supra

Enables simple examination with a single intensity level.

Esterman Both

The Esterman Both is an examination to carry out on both eyes (binocularly), which is applicable for patients who normally wear glasses when driving.

Example of supra examination result screen



Esterman Both

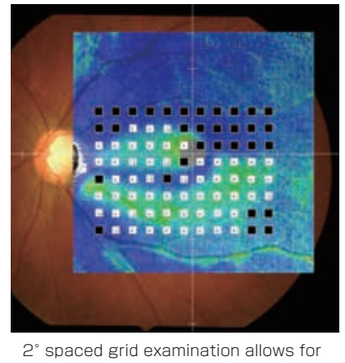
Screening

4-zone measurement that goes beyond screening, and programs using probability values (p-values) in intensity steps, are among the features that enable an effective test in less time.

Structure and Function

Fundus Oriented Perimetry

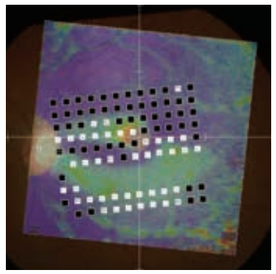
Fundus images or OCT images can be imported into the KOWA AP-7000, and selected regions of the fundus can be examined. This examination is particularly designed with a 2° spaced grid which gives more precise information than a general threshold examination with a 6° spaced grid.
Comparing the structure and function of the fundus may help detect glaucoma at an early stage.



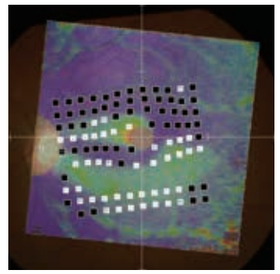
2° spaced grid examination allows for detection of small visual field defects.

RGC displacement

To evaluate the structure and function of the macular area, it is important to consider the difference in displacement between the photoreceptor cells and retinal ganglion cells.
It is said that the photoreceptor cells and retinal ganglion cells are displaced in the macular area. The results of a fundus-oriented visual field examination can be displayed alone or overlaid on a fundus image to reflect this difference.

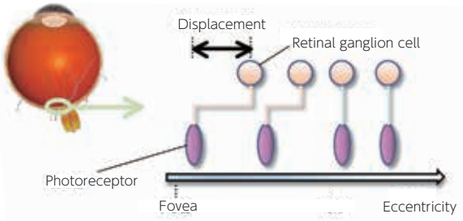


RGC displacement OFF



RGC displacement ON

Photo: Kanazawa University Department of Ophthalmology
(Shinji Ohkubo, M.D. and Kazuhisa Sugiyama, M.D.)



Reference
- Sjöstrand, J., Popovic, Z., Conradi, N., & Marshall, J. (1999). Morphometric Study of the Displacement of Retinal GanglionCells Subserving Cones Within he Human Fovea. Graefe's Archives for Clinical and Experimental Ophthalmology, 237, 1014-1023.
- Drasdo N, Millican CL, Katholi CR, Curcio CA. The length of Henle fibers in the human retina and a model of ganglion receptive field density in the visual field. Vision Res. 2007;47(22):2901-2911.

Integration of Structure and Function Provides Increased Interpretation of Visual Field Results

Decibels, deviation maps,and probability plots can be integrated with your patients fundus images.